ej Technologies

install4j Manual

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Welcome To Install4j

Thank you for choosing install4j. To help you get acquainted with install4j's features, this manual is divided into two sections:

- Help topics [p. 7]

  Help topics present important concepts in install4j. They are not necessarily tied to a single configuration step. Help topics are recommended reading for all install4j users.

  The help topics section does not cover all aspects of install4j. Please turn to the reference section for an exhaustive explanation of all features that can be found in install4j.

- Reference [p. 86]

  The reference section covers all configuration step, all dialogs and all features of install4j. It is highly hierarchical and not optimized for systematic reading.

  The reference section is the basis for install4j's context sensitive help system. Each configuration step and each dialog have one or more corresponding items in the reference section.

We appreciate your feedback. If you feel that there's a lack of documentation in a certain area of if you find inaccuracies in the documentation, please don't hesitate to contact us at support@ej-technologies.com.

Install4j Licensing

With a 60-day evaluation license you can integrate install4j into your build process before purchasing it. The evaluation period can be renewed until you actually start distributing installers.

install4j licenses can be purchased easily and securely online. We accept a large variety of payment methods including credit cards, checks and purchase orders. Pricing information is available online.

install4j licenses are either

- **Per-developer licenses**

  With one license a single user is allowed to install install4j on multiple machines.

  For automated builds, you have to ensure that the install4j IDE is not running when running your build, otherwise the GUI will terminate and the build will fail.
- **Floating licenses**

  A floating license purchase includes a license server which allows a maximum concurrent user count. An arbitrary number of developers may install install4j.

  A floating license includes an **unlimited number of automated build agents**.

install4j comes in two editions

- **Windows Edition**

  This edition can only generate installers for Microsoft Windows. The install4j IDE and the command line compiler themselves can run on other supported platforms as well.
- **Multi-Platform Edition**

  This edition can generate installers for all supported platforms.

Please read the included file `license.txt` to learn more about the scope of the license. For licensing questions, please contact sales@ej-technologies.com.

You can enter your license key by invoking `Help->Enter license key` from install4j's main menu. To make it easier for you to enter the license key, you can use the **[Paste from clipboard]** button, after copying any text fragment which contains the license key to your system clipboard. If a valid license key can be found in the clipboard content, it is extracted and displayed in the dialog.

If a license has been entered, the licensing information is visible in the about dialog (`Help->About install4j`). The install4j command line compiler [p. 353] also prints licensing information except when invoked with the quiet option [p. 354] .

Your license contains the information whether is is a license for the Multi-Platform or Windows edition. If the evaluation mode is different than the scope of your license, you will have to restart install4j.

A Help Topics

A.1 Concepts

A.1.1 Install4j Projects

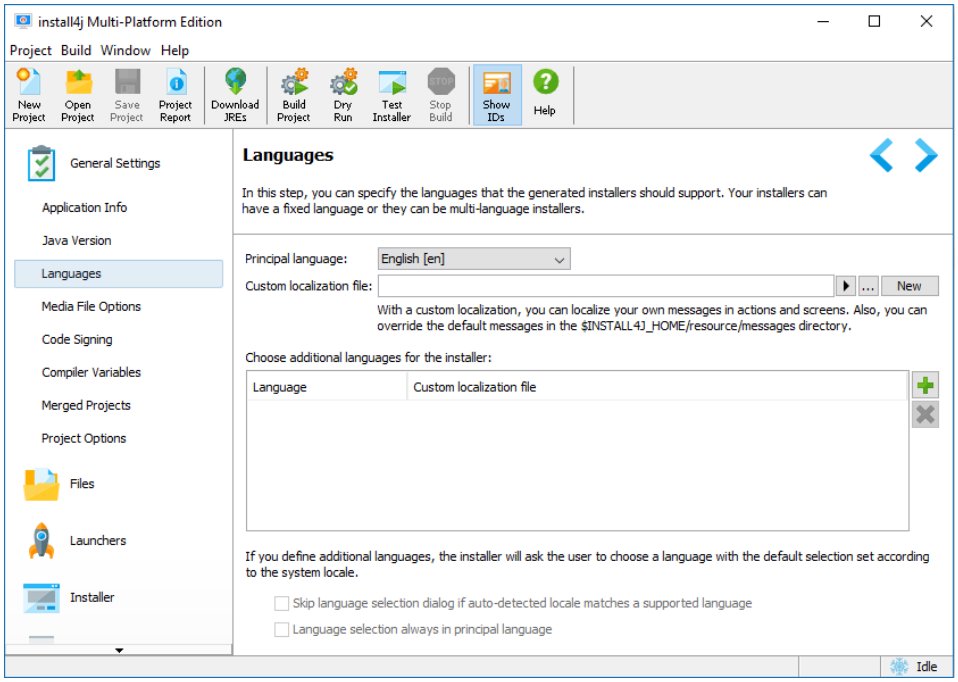
Project files

A project in install4j is the collection of all information required to build media files. A project is saved to a single XML file with an `.install4j` extension. Project files are platform-independent, you can open and compile them on any supported platform. Any paths that you enter in install4j are saved as absolute paths by default. This allows you to move the project file to a different location on your computer and the compilation will still work. If you wish to use your project file on multiple computers or platforms or compile your launchers by automatic build agents, it is more convenient to use relative paths. install4j provides an option to convert all paths to relative paths [p. 98] when you save your project.

install4j keeps a list of recently opened projects under `Project->Reopen`. By default, install4j opens the last project on startup. This behavior can be changed in the preferences dialog [p. 352] . You can pass the name of a project file as a command line parameter to install4j to open it on startup. Also, the command line compiler [p. 353] expects the project file name as its argument.

Contents of a project

The following paragraphs give a high-level overview of the elements that you can configure in install4j. Each of the configuration sections in install4j as seen in the screenshot below represents a top-level concept in install4j.



Typically, a project defines the distribution of a single application. An application has an automatically generated application ID [p. 315] that allows installers to recognize previous installations.

At the core of the project definition is the sequence of installer screens and actions [p. 11] . They determine what the users see, what information they can enter and what the installer does. install4j offers a lot of flexibility regarding the configuration of of your installer. Besides creating traditional application installers, install4j is equally suited to create small applications that modify the target system in some way. The install4j runtime is localized into many languages. You can configure your installers to support one or multiple languages [p. 91] .

Most installers install files to a dedicated directory and optionally to several existing directories on the target computer. That's what the "Files" section [p. 103] in the install4j IDE is for. Here, you define a "distribution tree", and optionally "installation components" which can also be downloaded on demand [p. 334] . The actual installation of these files is handled by a special action (the "Install files" action) which is part of the default project template. If your installers should not install any files, you can remove that action and ignore the "Files" configuration section. When the "Install files" action is executed, it creates an uninstaller. The uninstaller offers the same flexibility as the installer and is configured in the same way.

Unless the installed files are only static data, you will need application launchers to allow the user to start your application. You can define one or several application launchers in the "Launchers" section [p. 120] . Launchers generated by install4j have a rich set of configuration options including an optional splash screen or advanced features like a single instance mode. Configured launchers can also be "services" that run independently of logged-on users. install4j offers special installation screens and actions for services.

install4j has many advanced features concerning the runtime-detection or bundling of JREs. You define Java version constraints and a search sequence [p. 89] for both your installers and your generated launchers. In this way, you ensure that the launchers run with the same JRE as your installers. Bundling of JREs is configured on a per-media set basis [p. 336] and includes an optional on-demand download of a JRE.

Finally, the media file definitions define the actual executables that you distribute. They capture platform-specific information and provide several ways to override project settings. You typically define one media file for each platform. Multiple media files for the same platform can be added as needed. Media files are either installers or archives. Archives simply capture the launchers and the distribution tree. Archives are a limited way to create a distribution and might not be suitable if you rely on the flexibility that is offered by installers.

Project reports

A project, and especially the definition of the installer and uninstaller, is very hierarchical and possibly quite complex. In order to check all your projects settings on a single page, or to print out your project definition, install4j offers a project report. This action is available from the menu and toolbar. When you generate a report, an HTML file is written to disk. In addition, a directory named `install4j_images` is created which holds all required icons. The export directory for project reports is remembered across restarts of install4j. install4j will suggest a file name based on the project name. If that file already exists, a number will be appended to make the file name unique.

A.1.2 File Sets And Installation Components

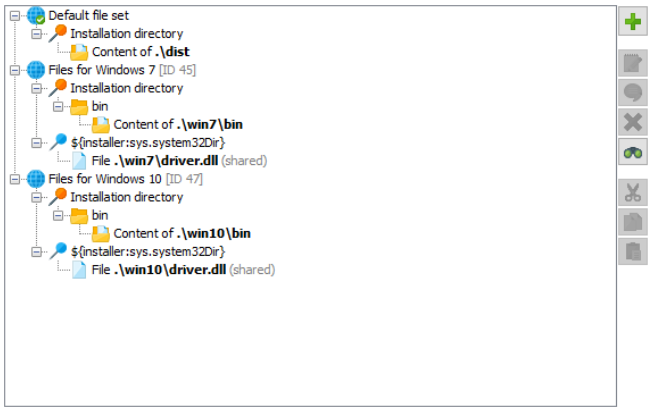
Introduction

install4j offers two mechanisms to group files: File sets and installation components. File sets are configured in the distribution tree and can be used in a variety of use cases as building blocks for your installers. Installation components are presented to the user at runtime and mark certain parts of the distribution tree that have to be installed if the user chooses an installation component.

Both file sets and installation components are optional concepts that can be ignored if they are not required for an installer project: There is always a "Default file set" to which you can add files in the distribution tree and on the installation components tab you do not have to add any components.

File sets

File sets are a way to group files in the distribution tree. When you need to select files in other parts of the install4j IDE, you can select the file set node instead of selecting single files and directories. Each file set has a special "Installation directory" child node that maps to the installation directory selected by the user at run time. Custom installation roots are defined separately for different file sets. If you require the same installation root in two different file sets, you simply define the same root twice.



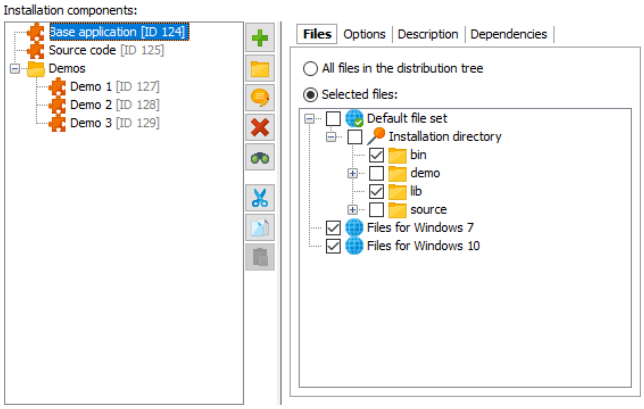
The installation of file sets can be toggled programmatically at run time. The code snippet to disable the installation of a file set at run time is `context.getFileSetById("123").setSelected(false);` if the ID of the file set is "123". You could insert this snippet into a "Run script" action that is placed before the "Install files" action on the screens & actions tab [p. 145]. File set IDs are displayed when the "Show IDs" toggle button in the lower right corner of the distribution tree is selected.

A common use case is to exclude platform-specific files from certain media files. You can define file sets for different platforms and exclude all unneeded file sets in the media wizard [p. 338]. This is an example of how to use file sets at design time in the install4j IDE.

Within one file set, all relative paths must be unique. However, the same relative path can be present in different file sets. Suppose you have different DLL files for Windows 7 and for Windows 8 and higher. You can create two file sets so that the installer contains both alternative versions. Once you find out whether you run on Windows 7 or on Windows 8 and higher, you can disable the file set that should not be installed with the code snippet shown above. By default, all included file sets are installed. If the same relative path occurs twice, it is undefined which version is used. In this case you have to make sure to disable the file sets that are not appropriate.

Installation components

If you define installation components. the installer can ask the user which components should be installed. In the configuration of an installation component you mark the files that are required for this component. A single file or directory can be required by multiple installation components.



Installation components are defined in a folder hierarchy. This means you can have groups of installation components that are enabled or disabled with a single click. Most options in the configuration of an installation component are used by the "Installation components" screen [p. 163] . They decide how the installation component is presented to the user, whether it should be initially selected or mandatory, and if it has dependencies on other installation components that should be automatically selected.

Another important feature of installation components is that they can be marked as "downloadable". If you configure the download option in the media wizard [p. 334] , separate data files will be created for the downloadable components.

install4j also offers a two-step selection for installation components: In the first step, the user is asked for the desired "installation type". An installation type is a certain selection of installation components. Typical installation type sets are [Full, Minimum, Customize] or [Server, Client, All]. The display and the configuration of installation types is handled by the "Installation type" screen. For each configured installation type, you can decide whether the user should be able to further customize the associated installation component selection in the "Installation components" screen or not.

A.1.3 Screens And Actions

Introduction

With screens and actions you configure two separate aspects of the installer: the user interface that is displayed by your installer and uninstaller and the actual installation and uninstallation. Every screen can have a list of actions attached that are executed when the user advances to the next screen. install4j offers a wide variety of pre-defined screens and actions that you can arrange according to your needs. Some of these screens and actions are quite generic and can be used as programming elements, such as the "Configurable form" [p. 15] screen and the "Run script" action.

Installer applications

Building an install4j project creates media files which are either installers or archives. An installer is defined as a sequence of screens an actions and is executed when the user executes the media file. Installers usually install an uninstaller which removes the installation. The uninstaller, too, is a freely configurable sequence of screens and actions. Archives do not have an installer or uninstaller and the user extracts the contained data with other tools.

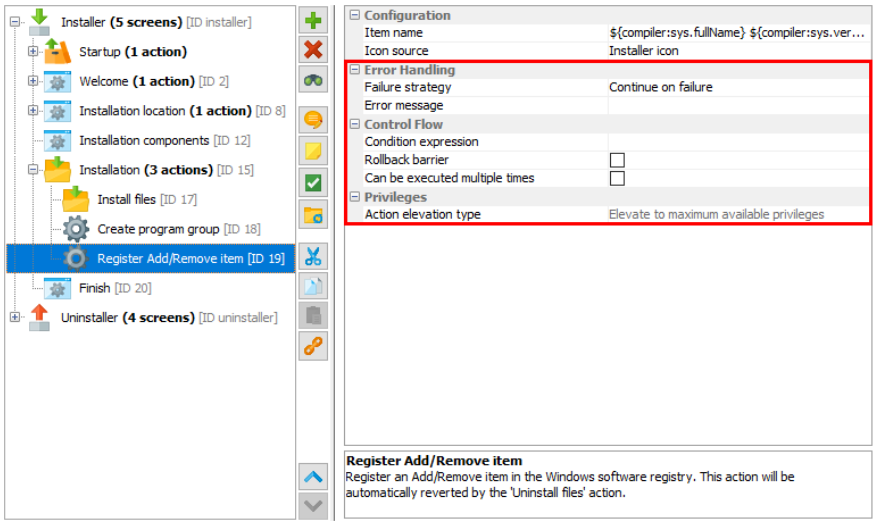
In addition to the installer and uninstaller, you can define custom installer applications [p. 148] that are added to the distribution tree. These custom installer applications can use the same screens and actions that the installer can use. Unlike installer and uninstaller, they are also added to archives. They can be used to write separate maintenance applications for your installations that are either invoked directly by the user or programatically by your application.

An important use-case for custom installer applications is to create a first-run installer for archives. While there is no need to install files to the installation directory in the case of an archive, there will usually be screens and actions that set up the environment of your application. In order to avoid the duplication of screens and actions, install4j offers the possibility to create links to screens and actions. In this way, a custom installer application can include a partial set of the screens and actions in the installer. Such a first-run installer should be added to the `.install4j` runtime directory in order to no expose it as part of the application. This is done by specifying its executable directory property as the empty string. You can invoke the first-run installer programatically with the `com.install4j.api.launcher.ApplicationLauncher` utility class. Please see the Javadoc for more information. You can query if any of the generated launchers of an installed archive are run for the first time by calling `ApplicationLauncher.isNewArchiveInstallation()` at the beginning of your main method to decide whether to launch the first-run installer or not.

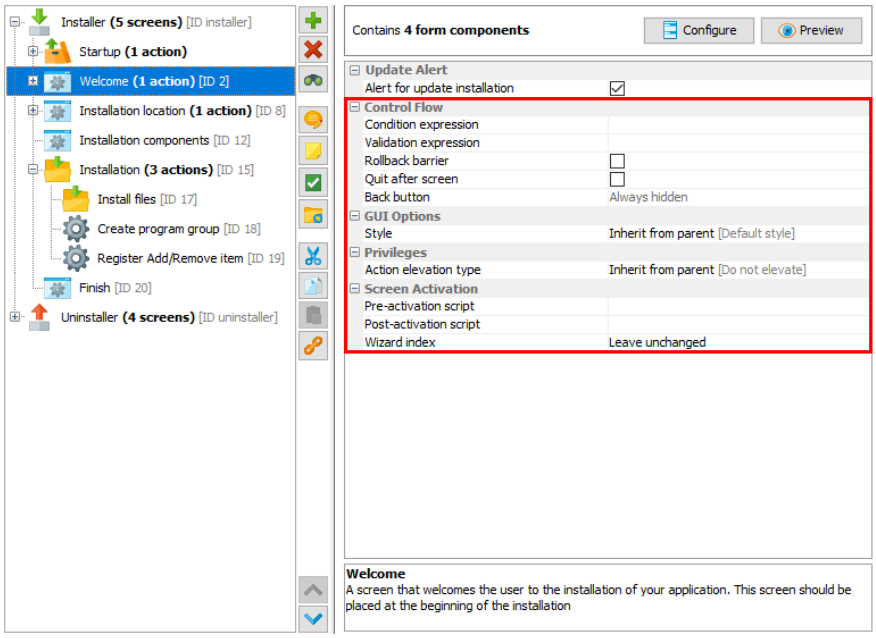
Another common use case for custom installer applications is to create auto-updaters. Auto-updaters are described in detail in a separate help topic [p. 53] .

Control flow

At runtime, install4j instantiates all screens and actions and organizes the screen flow and action execution. There are a number of aspects regarding this control flow that you can customize in the install4j IDE. Both screens [p. 163] and actions [p. 177] have an optional "Condition expression" property that can be used to conditionally show screens and execute actions. Screens have a "Validation expression" property that is invoked when the user clicks on the "Next" button allowing you to check whether the user input is valid and whether to advance to the next screen. These are the most commonly used hooks in the control flow for "programming" the installer. All "expression" properties in install4j can be simple Java expressions or scripts of Java code as described on the help page for the Java code dialog [p. 320] .



Common properties of actions



Common properties of screens

If you use a series of screens to query information from the user, the users expect to be able to go back to previous screens in order to review or change their input. This is fine as long as no actions are attached to the screen. When actions have been executed, the questions is what should happen if the user goes back to a screen with actions and clicks on "Next" again. By default, install4j executes actions only once, but that may not be what you want, if they operate on the user input in a screen. Since install4j has no way of knowing what should happen in this case, it applies a "Safe back button" policy by default: if the previous screen had actions attached, the back button is not visible. You can change this policy for each screen, either making the back button always visible or always hidden. The "Can be executed multiple times" property of each action is relevant in the case where you you make the back button always visible for the next screen.

Another hook into the control flow is the ability to declare every screen as a "Finish" screen, i.e. the "Next" button will be replaced with a "Finish" button and the installer will quit after that button is pressed. Consider to use a "banner" screen in that case since it alerts the user that a special screen has been reached.

Rollback behavior

At any time in the installation sequence the user can hit the "Cancel" button. The only exception in the standard screens is a customizable progress screen where the "Cancel" button has been disabled. install4j is able to completely roll back any modification performed by its standard actions. However, the expectation of a user might not be that the installation is rolled back. Consider a series of post-installation screens that the user doesn't feel like filling out. Depending on the installer, the user might feel that installation will work even if the installer is cancelled at that point. A complete rollback would then irritate the user. That's why install4j has the concept of a "rollback barrier". Any action or screen can be a rollback barrier which means that any actions before and including that action or screen will not be rolled back if the user cancels later on.

By default, only the "Installation screen" is a rollback barrier. This means that if the user cancels while the installation is running, everything is rolled back. If the user cancels on any of the following screens, nothing that was performed on or before the installation screen is rolled back. With the "Rollback barrier" property of actions and screens you can make this behavior more fine-grained and customize it according to your own needs.

Error handling

Every action has two possible outcomes: failure or success. If an action succeeds the next action is invoked. When the last action of a screen is reached, the next screen is displayed. What should happen if an action doesn't succeed? This depends on how important the action is to your installation. If your application will not be able to run without the successful execution of this action, the installer should fail and initiate a rollback. However, many actions are of peripheral importance, such as the creation of a desktop link. Declaring that the installer has failed because a desktop link could not be created and rolling back the entire installation would be counterproductive. That's why the failure of an action is ignored by install4j by default. If a possible failure of an action is critical, you can configure its "Failure strategy" to either ask the user on whether to continue or to quit immediately.

Standard actions in install4j fail silently, i.e. the "Create a desktop link" action will not display an error message if the link could not be created. For all available failure strategies, you can configure an error message that is displayed in the case of failure. The "Install files" action has its own, more granular failure handling mechanism that is automatically invoked after the installation of each file.

Standard and customizable screens

install4j offers a series of standard screens that are fully localized and serve a specific purpose. These standard screens have a preferred order, when you insert such a screen it will insert itself automatically in the correct position. This order is not mandated, you can re-order the screens in any way you like, however they may not yield the desired result anymore. If for example you place the "Services" screen after the screen with the "Install service" actions (typically the "Installation" screen), the "Services" screen will not be able to modify the service installations anymore and the default values are used.

The customizable screens don't have a fully defined purpose, their messages are configurable and empty by default. For example the "Display progress" screen is similar to the "Installation" screen, however the title and the subtitle are configurable. Customizable screens also do not have any restriction with respect to how many times they can occur. While the "Installation" screen (and other screens) can occur only once for an installer, the "Display progress" screen could be used multiple times.

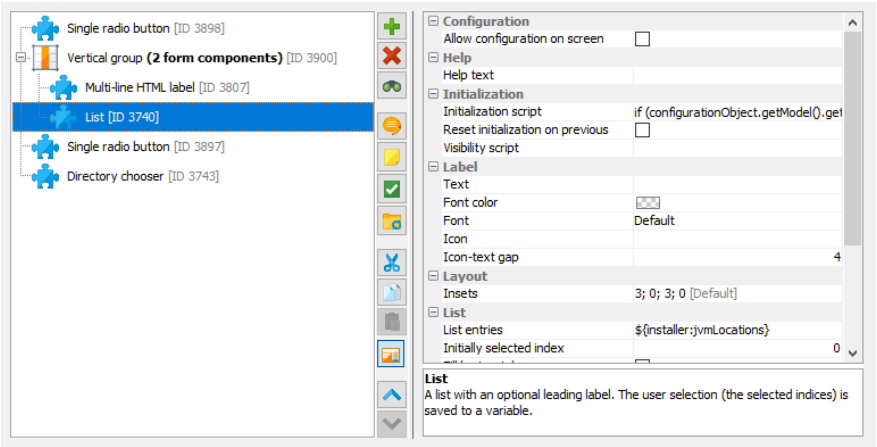
The "Welcome" and "Finish" screens have a special layout that is called "banner screen" in install4j. There are customizable banner screens to help you reproduce this layout if you require it in a different context. The most flexible of all customizable screens are the "configurable form" screens. They allow you to freely define the contents of a screen and are described in a separate help topic [p. 15] .

A.1.4 Form Screens

Introduction

Some screens in install4j contain a configurable form. In these screens, you can configure a list of form components [p. 248] along the vertical axis of the form. install4j provides you with properties to control the initialization of form components and the way the user selection is bound to installer variables [p. 28] . With this facility you can easily generate good-looking installer screens that display arbitrary data to the user and request arbitrary information to be entered.

Standard screens that have a configurable form include the "Additional confirmations" and the "Finish" screen. In addition, install4j offers a customizable form screen (similar to the "Additional confirmations" screen) and a customizable banner form screen (similar to the "Finish" screen). For screens that have a configurable form, a "Form Components" tab is shown in the "Configuration" section of the screen configuration [p. 163] . The actual configuration of the form components is performed in a separate dialog:



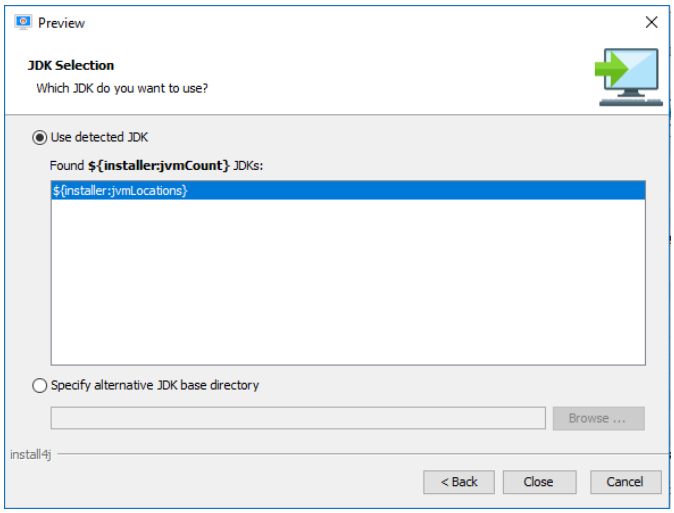
By default, a form is top-aligned and fills the entire available horizontal space. You can change this default behavior in the properties of the containing screen. For example, for a set of radio buttons that should be centered horizontally and vertically, the "Fill horizontal space" and "Fill vertical space" properties of the screen must be set to "false".

Form components

install4j offers a large number of form components that represent most common components available in Java and some other special components that are useful in the context of an installer. All components that expect user input have an optional leading label. The components themselves are left-aligned on the entire form. If you leave the label text empty, the form component will occupy the entire horizontal space of the form.

Every form component has configurable insets. For vertical gaps that are meant to separate groups of form components, consider using a "Vertical spacer" form component since it makes the grouping clearer and allows to to reorder form components more easily.

You can preview your form at any time with the **[Preview Form]** button. The preview dialog performs all variable replacements of compiler variables and custom localization keys, but not of installer variables. No initialization scripts are run. The preview is intended to give you quick feedback about visual aspects of your form. It does not show the actual screen where the form mights be smaller and other elements might be present. For example, the "Finish" screen is a banner screen where form occupies a relatively limited space in the bottom right corner and is intended to show a few check boxes at most.



Every form component always has its preferred vertical height. For some form components such as the "List" form component, this preferred vertical size is configurable. If the vertical extent of the form exceeds the available vertical space, a scroll bar is shown. If you want such a form component to fill the entire available vertical space, you can select the "Fill vertical space" property for the form component and deselect the "Scrollable" property of the form screen. In that case, there will be no scroll bar for the form.

User input

If a form component can accept user input, you need some way to access the user selection afterwards. install4j saves user input for such form components to the installer variable [p. 28] whose name is specified in the "Variable name" property. That variable can then be used later on, for example in condition expressions for screens and actions. If you have a check box that saves its user input to a variable called "userSelection", the condition expression

```
context.getBooleanVariable("userSelection")
```

will skip the screen or action for which that condition expression is used. The user selection in form components is written to the variables before the validation expression for the screen is called. If you have a text field that saves its input to the variable "fileName", the validation expression

```
Util.showOptionDialog("Do you really want to delete " + context.getVariable("fileName"),
      new String[] {"Yes", "No"}, JOptionPane.QUESTION_MESSAGE) == 0
```

used on the same screen will block the advance to the next screen if the user answers with "No".

The values of installer variables accommodate the general type `java.lang.Object`. Every form component saves its user input in its "natural" data type, for example:

- For check boxes, the type `java.lang.Boolean` is used. For this special case the context offers the convenience method `getBooleanVariable`.
- For text fields, the type `java.lang.String` is used.
- For drop down lists the type `java.lang.Integer` is used (the selected index).
- For date spinners, the type `java.lang.Date` is used.

The description of the value type for each form component that accepts user input is shown in the registry dialog [p. 319] when you select the form component.

Initialization

For each form component, install4j offers several properties that allow you to customize its initial state. However, there may be other advanced properties or a more complex logic is required for modifying the form component. For this purpose, the "Initialization script" property is provided. Form components can expose a well-known component in the initialization script that allows you to perform these modifications. This so-called "configuration object" is usually contained in the form component itself. For example a "Check box" form component exposes a configurationObject parameter of type `javax.swing.JCheckBox` and a "Text field" form component exposes a `javax.swing.JTextField`.

As with actions and screens [p. 11] in general, the possibility that the user moves back and forth in the screen sequence presents a dilemma to install4j. Any form components that accepts user input has a configurable initial value and any form component can have an initialization script. This initialization is performed when the user enters the screen for the first time. Should this initialization be performed again when the user moves back and then enters the screen once again? Since install4j does not know, it initializes every form component only once by default. This policy can be changed with the "Reset initialization on previous" property for each form component.

A.1.5 Layout Groups

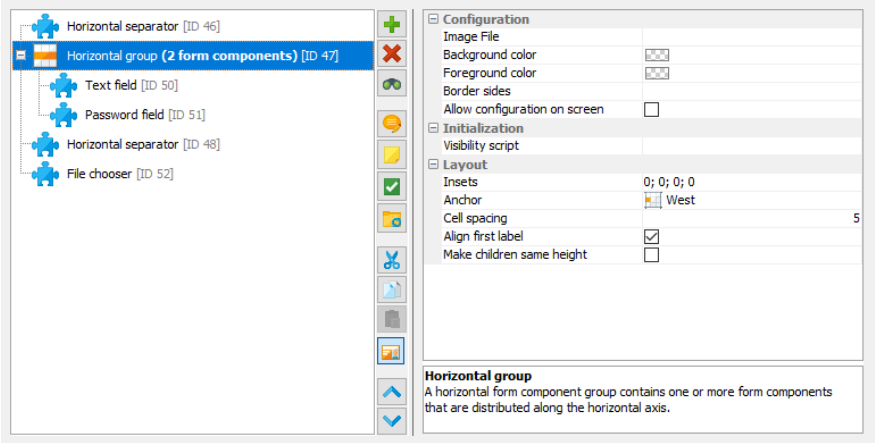
Introduction

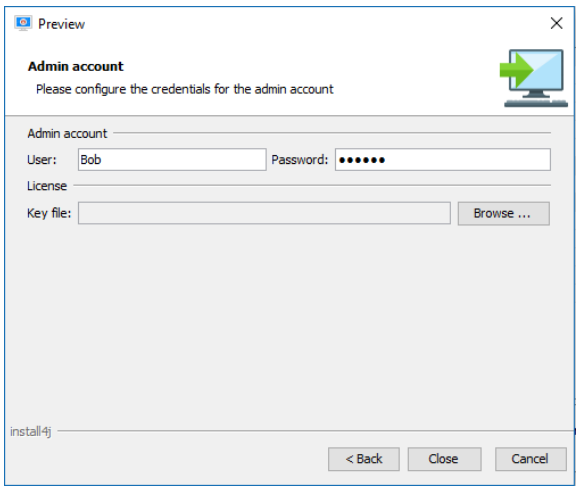
A layout group is an element in a form screen [p. 15] . It contains a number of form components and other layout groups. With layout groups you can achieve virtually any kind of visual layout.

There are two different kinds of layout groups: vertical and horizontal groups. A horizontal group puts the contained elements side by side, while a vertical group organizes them from top to bottom. Essentially, the top-level of a form screen is a vertical layout group itself.

Use case: Side by side

Putting two form components side by side is done with a single horizontal group:

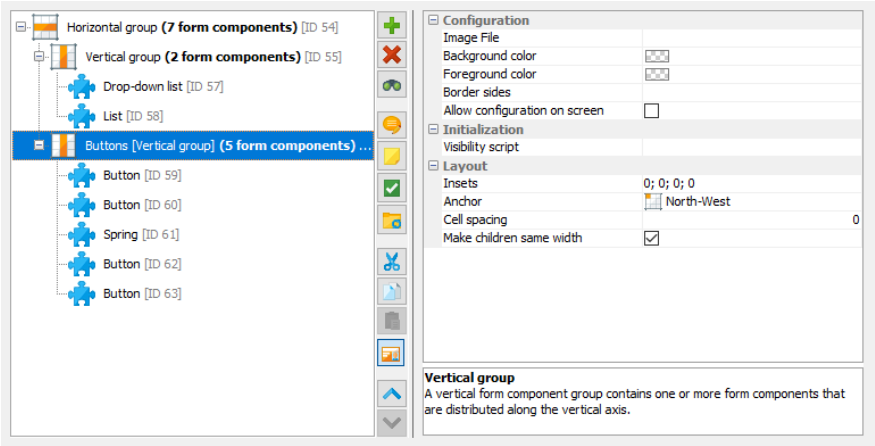


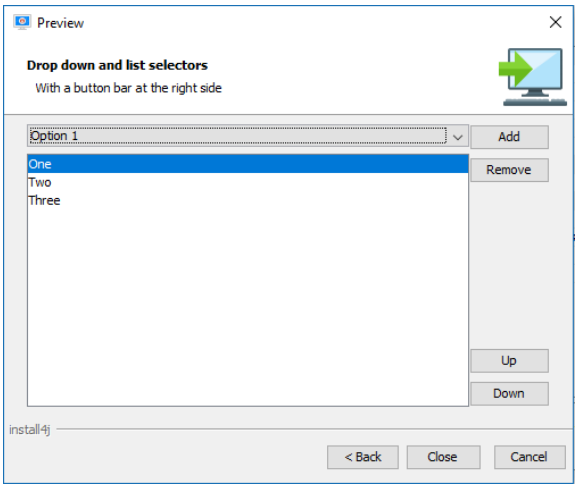


The leading labels of the first form component in the horizontal layout group ("User:") and those of the form components on the same level as the horizontal group ("Key file:") are aligned. There is a property on the horizontal layout group to switch off this alignment.

Use case: Two columns

Two columns of form components are realized with two vertical layout groups inside a horizontal layout group:

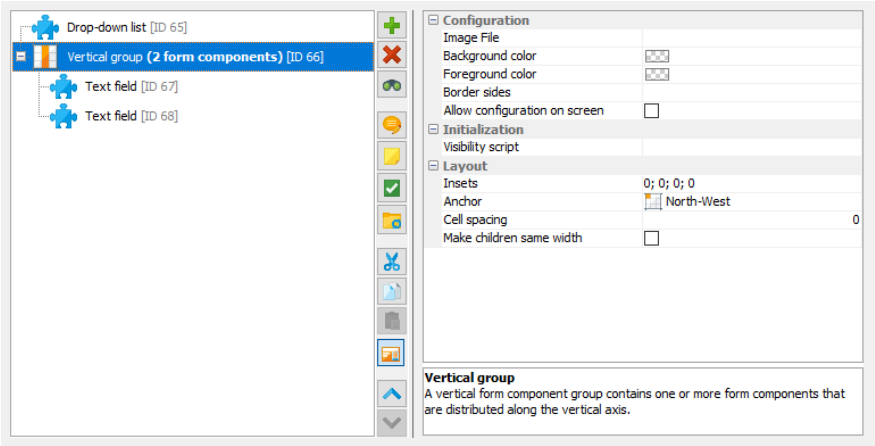


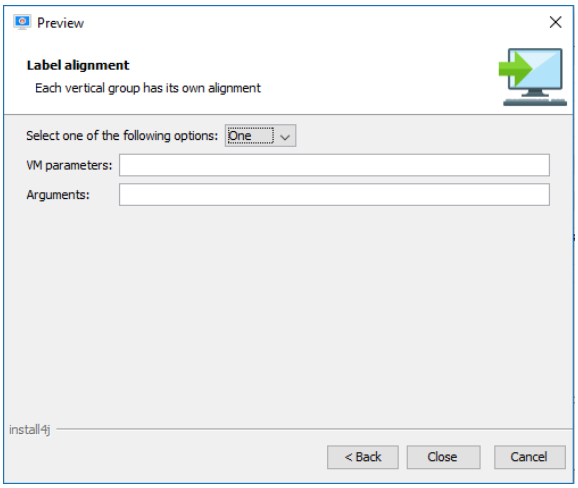


In this case the second column with the buttons takes up a fixed amount of horizontal space, since buttons do not automatically grow beyond their preferred size. In order to make all buttons of equal size, the "Make children same width" property has been selected. Two buttons are aligned at the top of the column, two buttons at the bottom. This is achieved with a "Spring" form component after the second button that has its axis set to "Vertical". It pushes all further components to the bottom.

Use case: Breaking label alignment

Alignment of leading labels can be broken by introducing vertical layout groups:

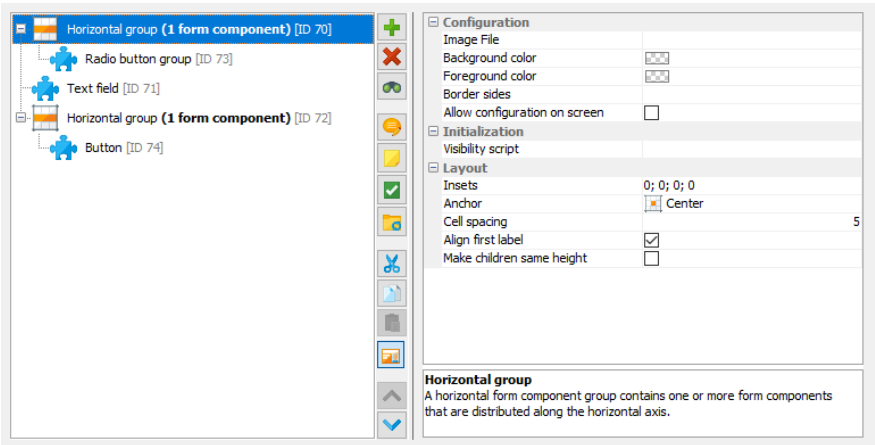


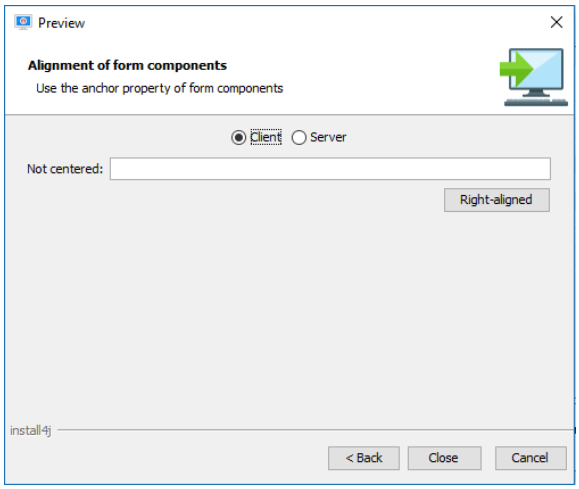


Here, the long leading label of the first form component does not enlarge the leading labels of the two text field form components. The latter are aligned only among themselves.

Use case: Center and right alignment

Single form components can be centered or right-aligned if you enclose them in a horizontal layout group and set the "Anchor" property on the layout group accordingly.





For the layout group with the radio button group, the anchor has been set to "Center", for that with the button the anchor has been set to "East". This only works with form components that do not grow horizontally. Some form components that do grow horizontally can be restricted to a fixed horizontal size, such as the text field by specifying a non-zero column count.

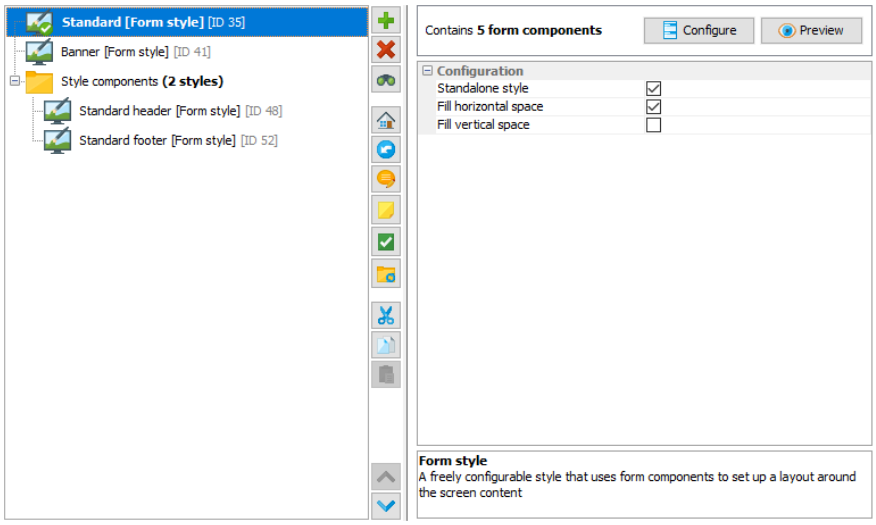
A.1.6 Styles

Introduction

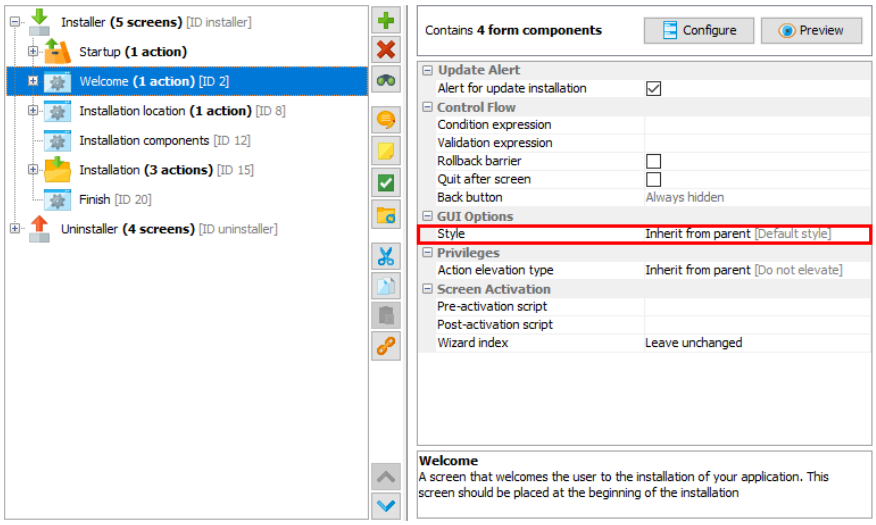
Install4j has a flexible model for styling the UI of installer applications that allows you to arrange content and styling elements in arbitrary ways. While there is an API to do this programatically, you can configure form styles in the install4j IDE without any custom code. Form styles use the same foundation as form components [p. 248] for screens. All default styles are created with form styles, so the details of the default styles can we tweaked very easily and new styles can be developed by starting with the default styles.

Configuring styles

Styles are configured on a per-project basis. On the "Installer->Styles" step of the install4j IDE, all available styles are listed. When you add a style, it can either be a configurable form style, or a style implementation from your custom code. Styles are either standalone or not. A non-standalone style cannot be used directly, but is only available for nesting into other styles. One single style is marked as the default style and is shown with a bold font. With the "Set As Default" action you can change the default style. Styles can be grouped into folders for organizing them according to your individual preferences. For example, in the default styles, the nested styles are grouped into a separate folder whereas the standalone styles are located at the top level.



On the "Installer->Screens & actions" step of the install4j IDE, you can apply styles. Installer applications, screen groups and screens all have a "Style" property. For installer applications, this is property is set to "Default". You can change it to any standalone style. For screen groups and screens, the "Style" property is set to "Inherit from parent". The property also indicates which style is actually inherited. Alternatively, you can choose to explicitly set a style for the selected element. Any screen groups and screens below it will now inherit this style.



Some screens have a preference for a particular style. For example, the "Welcome" and "Finish" screens want their style set to "Banner". When adding such a screen, the IDE matches the style by name. In this example, if no style named "Banner" is available, the default style is used. Otherwise, install4j keeps track of style associations by ID and you can rename styles without breaking any associations.

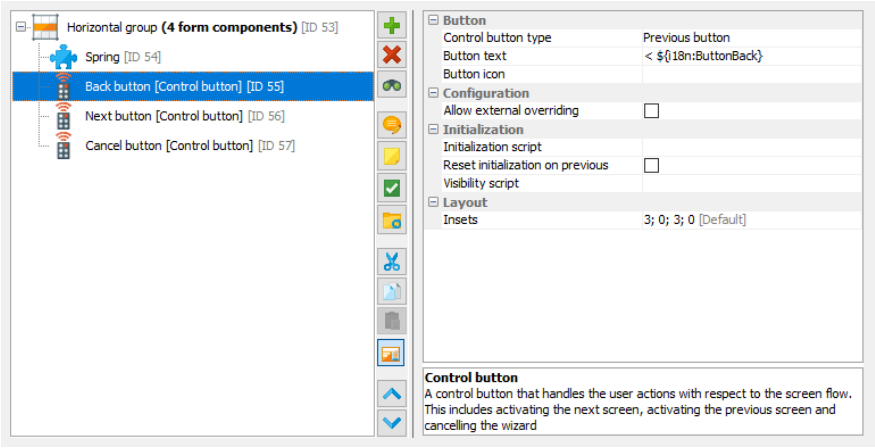
If you delete a style, all its style associations are broken. Compiling the installer will now fail and you will have to visit all installer applications, screen groups and screens where this style was explicitly selected and choose a new style.

Should you want to return to the default styles, there is a "Reset Styles To Default" action for that purpose. Existing style associations are matched by name in that case, so style associations with the "Banner" style survive this reset, for example.

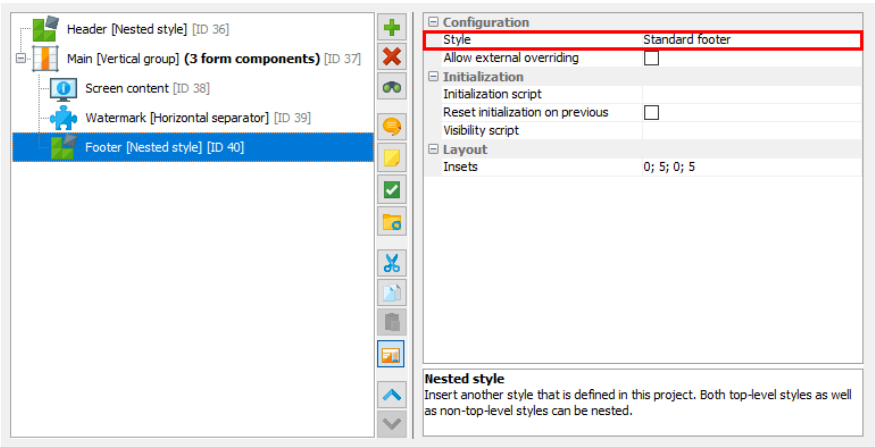
Form styles

A restricted set of the form components that are available for building form screens [p. 248] can be used to build form styles. Form components that take user input are not suitable for styles because styles have a different life-cycle than screens.

In addition, form styles can use a set of special form components. The "Screen content" form component contains the UI component of the screen and is changed each time when a screen is activated. When you preview the style, this content area is shown with a placeholder. The "Screen Title" form component shows the title or the subtitle of the screen, depending on its "Title type" property. The "Control button" form component is used for realizing the "Next", "Previous" and "Cancel" buttons.

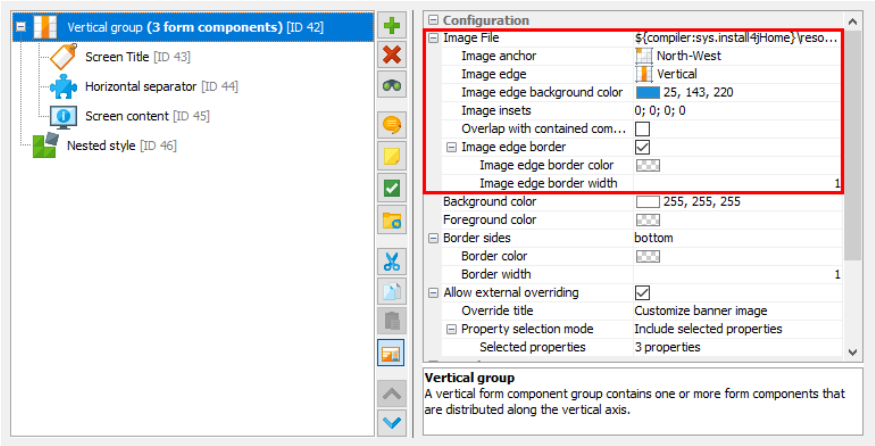


Finally, the "Nested style" form component allows you to embed another style. In this way you can build a set of styles that share common parts. For example, in the default styles, the navigation buttons at the bottom are the same. With the "Standard Footer" style that is used by both the "Standard" and the "Banner" standalone styles, you have a single place to change its settings.



Graphical styling elements

A key concern of styling is the placement of images, either in the foreground or in the background. Both kinds of placements are handled by layout groups in form styles. For both vertical and horizontal form groups, setting their "Image file" property shows additional properties that allow you to place the image in the layout group. If you place the image in the foreground, it cuts off an entire edge of the rectangle that can get its own background and border. In that way, the image can blend seamlessly into its surroundings.



To place an image into the flow of form components, you can use the "Image insets" property and set its "Icon" property.

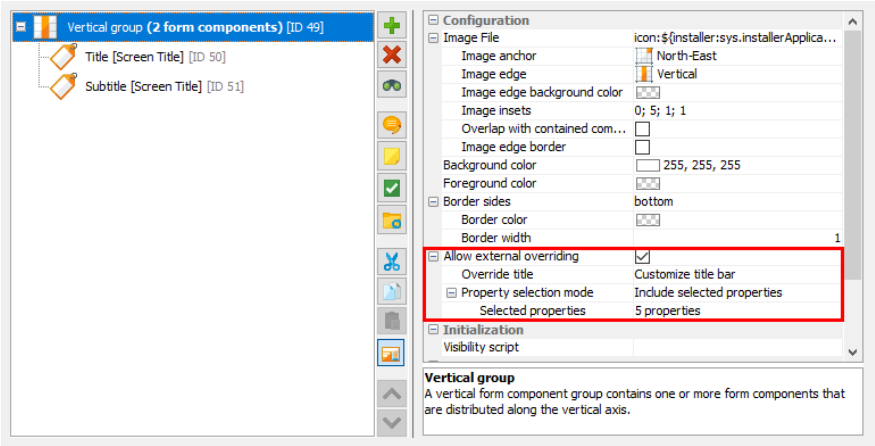
Other important styling elements are borders and separators. Again, this is handled by layout groups. With their "Border sides" property you can define which sides of the border should be drawn. Color and thickness of borders are also configurable.

By default, layout groups and form components are transparent, so that the default background color of the window shines through. By setting the "Background color" property of a layout group, you can make it opaque and give it a specific color. The "Foreground color" property sets the font color for contained form components that do not have their color set explicitly.

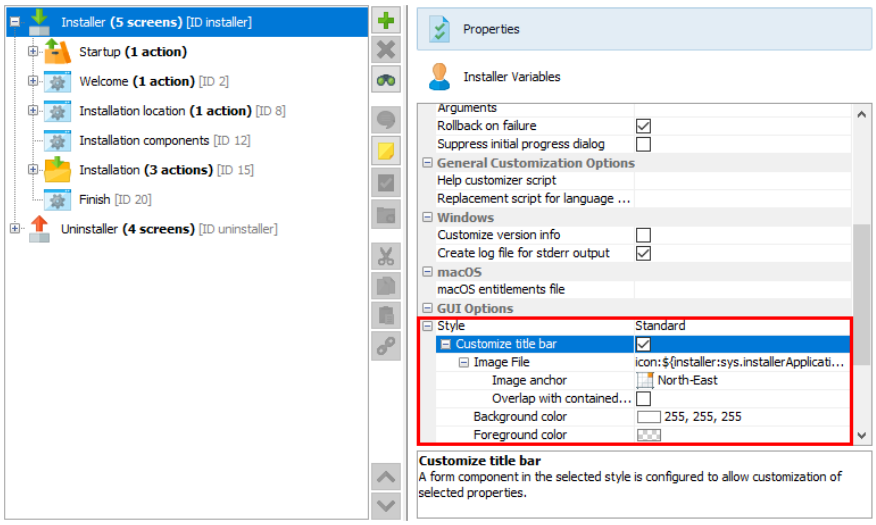
Overriding properties

Some styles can have elements that are specific to particular screens or particular installer applications. For example, the header image in the "Standard" style or the banner image of the "Banner" style could be required to change for each screen. Instead of duplicating styles in this scenario, install4j allows you to designate certain properties of selected form components and layout groups that should be overridable when the style is applied.

When editing the form components of a form style, each form component has an "Allow external overriding" property. If you select that property, a named overriding entry will be offered when you explicitly apply the style on the "Installer->Screens & actions" step. With the "Override title" property, you specify the displayed name for the override entry and that name is used for saving the overridden properties. This means that the name must be unique for a single style and that overrides are lost if you change the name. The "Property selection mode" property then lets you select which properties should be overridable, either all properties are overridable, or a list of properties is included or excluded.



When you select a style on the "Installer->Screens & actions" step, install4j scans the style and all its nested styles for form components and layout groups with defined overrides. Each named override is presented as a check box property. If you select the check box, the overridable properties of the form component or layout group are copied and displayed as child properties. You can now change the properties to different values. Note that the overridable properties lose their connection to the default values in the original form component or layout group. If you change a default property value, you have to manually change it in all overrides, if necessary.



For more complex overriding cases, consider adding a "Nested style" form component and making its "Style" property overridable. When applying such a style, you can substitute a different nested style as appropriate.

API

Under some circumstances, styles are more easily implemented with the API. For example, if you want to have configurable properties that determine the construction of the style or if the styling cannot be realized with the facilities of the form style.

The sample project "customCode" includes a style class `SunnySkyBackgroundStyle` and its associated BeanInfo `SunnySkyBackgroundStyleBeanInfo` that show such an example style. It paints a background image that depends on the window dimensions and continues up to the

window border. In the "customCode" project, look for the "Configurable form" screen in in the installer and preview the form in order to see what it looks like.

That example also shows how to implement a style that wraps a user-selectable style. The main style is still the standard style and the "Sunny sky background" style takes the function of a decorator. To make development of such wrappers easier, the API includes a convenience class `com.install4j.api.styles.WrapperStyle`.

Merging styles from other projects

Instead of duplicating styles across projects, you can develop them in one project and merge them into other projects. The merge projects functionality [p. 50] in install4j includes an option to merge styles.

If styles are merged, the "Style" property of installer applications, screen groups and screens shows the merged styles as well, with their names prefixed with the project name that was assigned in the merge settings.

If you link to screens or screen groups of merged projects, they will use their configured styles from the merged project only if style merging is enabled. Otherwise, install4j tries to match a style by name in the main project.

A.1.7 Variables

Introduction

With variables you can customize many aspects of install4j. They can be used in all text fields and text properties in the install4j IDE as well as from the install4j API [p. 81] . The general variable syntax is

```
${prefix:variableName}
```

where prefix denotes the functionality scope of the variable and is one of

- **compiler**

  Compiler variables are replaced by the install4j compiler when the project is built.
- **installer**

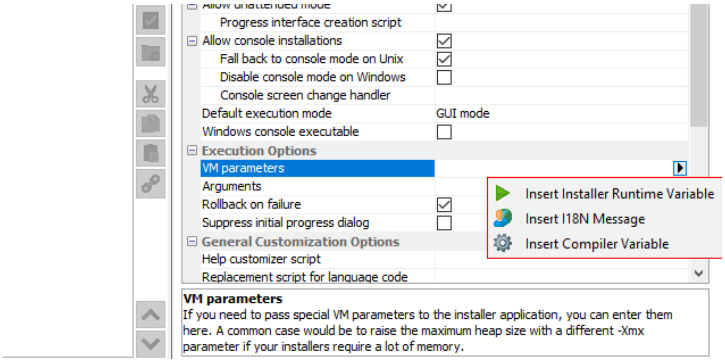
  Installer variables are evaluated when the installer or uninstaller is running.
- **launcher**

  Launcher variables are evaluated when a generated application launcher is started.
- **i18n**

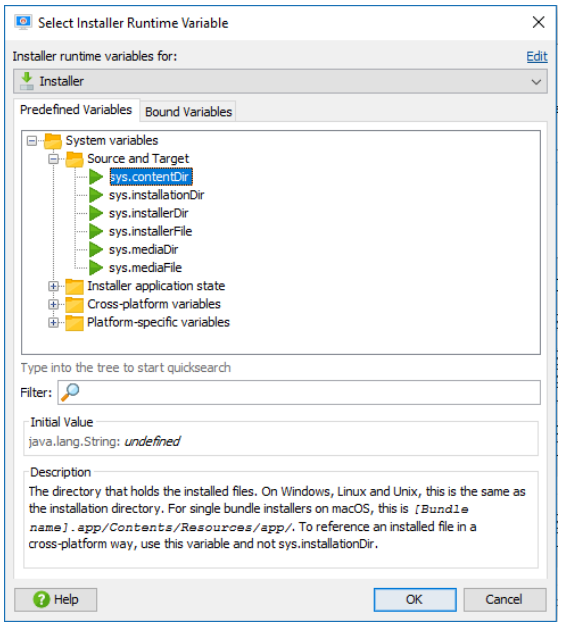
  Custom localization keys are evaluated at runtime and depend on the chosen installer language.
- **(no prefix)**

  Variables with no prefix resolve to environment variables when used in the launcher configuration.

Text fields in the install4j IDE where you can use variables have a ▶ variable selector [p. 99] next to them. In the popup menu, you first choose a variable system from the available variable types. In text properties of an installer element [p. 145] or a form component [p. 248] , you can use compiler variables, installer variables and custom localization keys, but not launcher variables.



The variable selection dialog then shows all known variables of the selected variable type.



For both compiler and installer variables install4j offers a fixed set of "system variables". These variables are prefixed with "sys.". These variables are not writable and it is discouraged to use this prefix for your own variables.

Compiler variables

Compiler variables are written as

```
${compiler:variableName}
```

The value of a compiler variable is a string that is known and replaced at compile time. The installer runtime or the generated launchers do not see this variable, but just the value that was substituted at runtime.

You can use compiler variables for various purposes. The most common usage of a compiler variable is the possibility to define a string in one place and use it in many other places. You can then change the string in one place instead of having to look up all its usages. An example of this is the pre-defined "sys.version" variable that contains the value of the text field where you enter the application version [p. 88] . Another usage for compiler variables is to override certain project settings on a per-media file basis. For example, if you want to include one directory in the distribution tree for Windows but another one for macOS, you can use a compiler variable for that directory and override it [p. 338] in the media file wizard. Finally, compiler variables can be overridden from the command line compiler [p. 353] and the ant task [p. 357] .

When you use a compiler variable in your project that is not a system variable, it must be defined in on the Compiler Variables tab [p. 97] of the General Settings step [p. 87] . If an unknown variable is encountered, the build will fail. You can use other variables in the value of a variable. Recursive definitions are detected and lead to a failure of the build. It is not possible to define compiler variables with the name of a system variable.

install4j provides a number of system compiler variables:

- **sys.version**

  The version of your application as configured under General Settings->Application Info.
- **sys.shortName**

  The short name of your application as configured under General Settings->Application Info.

- **sys.fullName**

  The full name of your application as configured under General Settings->Application Info.
- **sys.publisher**

  The publisher of your application as configured under General Settings->Application Info.
- **sys.publisherUrl**

  The publisher URL of your application as configured under General Settings->Application Info.
- **sys.setName**

  The display name in the install4j IDE of the currently compiled media file as configured in the Media section. If the default name of the media file is not suitable, you can rename the media file.
- **sys.platform**

  The platform descriptor of the currently compiled media file. One of "windows", "linux", "unix", "macos". The value of this variable depends on your choice in the platform step of the media file wizard.
- **sys.languageId**

  The 2-letter ISO 639 code (see https://www.loc.gov/standards/iso639-2/php/code_list.php) for the principal language of the installer. This variable can be overridden on the command line or the ant task which is useful if you build different installers for different languages.
- **sys.withJre**

  A variable that contains "_with_jre" if a JRE is statically bundled with a media file and the empty string if not. This is useful if media files with and without JRE are built.
- **sys.date**

  The current date in the format <tt>YYYYMMDD</tt> (e.g. "20090910").The value is set at the start of a build and will not change during a single build.
- **sys.time**

  The current time in the format <tt>HHMMSS</tt> (e.g. "153012") where HH is the hour in 24-hour format, MM is the minute and SS is the second. The value is set at the start of a build and will not change during a single build.
- **sys.javaMinVersion**

  The minimum Java version as configured under General Settings->Java Version
- **sys.javaMaxVersion**

  The maximum Java version as configured under General Settings->Java Version
- **sys.install4jHome**

  The installation directory of the install4j IDE.
- **sys.applicationId**

  The application ID as configured under Installer->Update Options
- **sys.updatesUrl**

  The URL where auto updaters can download the update descriptor file <tt>updates.xml</tt> as configured under Installer->Auto-Update Options. This variable is usually used in the "Update descriptor URL" property of a "Check for update" action.
- **sys.fileSeparator**

  The platform-dependent separator for directories in a file path. On Windows, this is a backslash ("\"), on Unix a forward slash ("/").<p>Note that this is the value at compile-time, not at runtime.

- **sys.pathlistSeparator**

  The platform-dependent separator for lists of directories. On Windows, this is a semicolon (";"), on Unix a colon (":").<p>Note that this is the value at compile-time, not at runtime.

You can access environment variables on the build machine with the syntax

```
${compiler:env.environmentVariableName}
```

where "environmentVariableName" is the name of an environment variable. This only works if no compiler variable with the same name is defined on the Compiler Variables tab. This is resolved at build time, not at run time.

In order to debug problems with compiler variables, you can switch on the `extra verbose output` flag in the Build step [p. 346] . All variable replacements will be printed to the build console.

Installer variables

Installer variables are written as

```
${installer:variableName}
```

The value of an installer variable is an arbitrary object that is not known at compile time. Installer variables are evaluated when requested in the installer or uninstaller. Installer variables can be predefined in the install4j IDE like compiler variables, but this is not necessary. Undefined installer variables come into existence the first time they are defined at runtime. However, it is an error to use an undefined variable. For example, if you use an installer variable in an action, you have to make sure that the installer variable is defined before the action is executed.

Installer variables are used to wire together actions, screens and form components at runtime. The user input in screens is saved to variables, which can be used in the properties of certain actions. Furthermore, variables are routinely used in condition and validation expressions. Some examples are given in the help topic on form screens [p. 15] . In expression/script properties, you retrieve variables by invoking

```
context.getVariable(String variableName)
```

Variable value can be set with the installer API by invoking

```
context.setVariable(String variableName, Object variableValue)
```

You can analyze the bindings of an installer variable on the "Installer Variables" tab of an installer application configuration. It will show you a list of bound variables together with all bindings. In order to document and categorize bound installer variables, you can pre-define them and set a description for them, which will be displayed in the installer variable selector in the install4j IDE.

A common scenario is the need to calculate a variable value at runtime with some custom code and use the result as the initial value of a component in a screen. To achieve this you can add a "Set a variable" action to the startup screen and set its "Variable name" property to some variable name. In contexts where a variable name is expected by install4j, you must not use the `${installer:variableName}` syntax but specify `variableName` only. The return value of the "Script" property is written to the variable. If, for example, the variable represents the initial directory that is displayed for a customizable "Directory selection" screen, you then set the "Initial Directory" property of that screen to `${installer:variableName}`. In this way you have wired an action with a screen.

Another important use of installer variables is for the locations of custom installation roots [p. 104] . In most cases a custom installation root contains an installer variable that is resolved at runtime. Often, one of the system installer variables that represent a "magic" folder can be used, such as the Windows `system32` directory.

Installer variables can be passed to the installer or uninstaller from the command line prefixed with -V (for example -VmyVar=test). Alternatively, you can specify a property file containing installer variables with -varfile (for example -varfile myfile.prop). The variables will be String objects.

install4j provides a number of system installer variables:

- **sys.installationDir [Source and Target]**

  The installation directory for the current installation. The value of this variable can change in the installer as the user selects an installation directory in the "Installation directory" screen or the installation directory is set via <tt>context.setInstallationDirectory(File installationDirectory)</tt>. Note that for single bundle installers on macOS, the installation directory is usually just <tt>/Applications</tt>, not a separate subdirectory.

- **sys.contentDir [Source and Target]**

  The directory that holds the installed files. On Windows, Linux and Unix, this is the same as the installation directory. For single bundle installers on macOS, this is <tt>[Bundle name].app/Contents/Resources/app/</tt>. To reference an installed file in a cross-platform way, use this variable and not sys.installationDir.

- **sys.mediaFile [Source and Target]**

  The path of your media file. Not available for uninstallers. On Windows and Unix this is the same as sys.installerFile. On macOS, this is the path to the DMG file. If you want to reference the installer file, use sys.installerFile instead.

- **sys.mediaDir [Source and Target]**

  The path of the directory where your installer file is located. Not available for uninstallers. On Windows and Unix this is the same as sys.installerDir. On macOS, this is the directory where the DMG file is located. If you want to reference files inside the DMG file, use sys.installerDir instead.

- **sys.installerFile [Source and Target]**

  The path of your installer file. Not available for uninstallers. On Windows and Unix this is the same as sys.mediaFile. On macOS, this is the path to the installer inside the mounted DMG. If you want to reference the DMG file, use sys.mediaFile instead.

- **sys.installerDir [Source and Target]**

  The path of the directory where your installer file is located. Not available for uninstallers. On Windows and Unix this is the same as sys.mediaDir. On macOS, this is the path into the mounted DMG. If you want to reference files in the same directory as the DMG file, use sys.mediaDir instead.

- **sys.resourceDir [Installer application state]**

  The directory where the resource files are present that have been configured on the Installer->Custom Code & Resources tab.

- **sys.installationTypeId [Installer application state]**

  The ID of the selected installation type. This is only relevant if the "Installation Type" screen has been added to the installer. The value is <tt>null</tt> as long as no installation type has been selected.

- **sys.version [Installer application state]**

  For installers, the version of your application as configured under General Settings->Application Info. In that case, the variable yields the same value as the compiler variable of the same name. For custom installer applications, the installed version,which might not be the same as the version for which the custom installer application was originally compiled.

- **sys.logFile [Installer application state]**

  The full path to the currently used log file. This is a path in the <tt>TEMP</tt> directory. For installers, this changes after the "Install Files" action, when the log file is moved to a path in the installation directory.

- **sys.responseFile [Installer application state]**

  If a response file is supplied with a <tt>-varfile</tt> command line argument, the full path to the response file. If no response file is used, the variable value is <tt>null</tt>.

- **sys.preferredJre [Installer application state]**

  The home directory of the JRE that will be used by the installed launchers. This variable will only be set after the "Install files" action has run. It will be the same as <tt>System.getProperty("java.home")</tt> or the <tt>sys.javaHome</tt> installer variable unless a bundled JRE (shared or non-shared) has been installed. This variable is not available in the uninstaller or custom installer applications, use the <tt>sys.javaHome</tt> directory there.

- **sys.languageId [Installer application state]**

  The 2-letter ISO 639 code (see https://www.loc.gov/standards/iso639-2/php/code_list.php) for the actual language of the installer. For fixed-language installers, this is the same as the compiler variable of the same name. For multi-language installers, the value is determined at runtime.

- **sys.installerApplicationMode [Installer application state]**

  A string that reports the type of the installer application: "installer" for the installer, "uninstaller" for the uninstaller and "custom" for custom installer applications.

- **sys.programGroupDisabled [Installer application state/Program group]**

  If the user has disabled program group creation on the "Standard program group" screen. This applies to both the Windows program group and the Linux/Unix launcher link directory selection. If no "Standard program group" screen is present, the variable value will be <tt>null</tt>.

- **sys.programGroupName [Installer application state/Program group]**

  The name of the program group that user has selected on the "Standard program group" screen. If no program group has been selected, the variable value will be <tt>null</tt>. Only set in Windows installers.

- **sys.programGroupDir [Installer application state/Program group]**

  The directory that has been selected as the program group. This is the full path to the actual location of the program group, not just the name of the program group. If no program group has been selected, the variable value will be <tt>null</tt>. Only set in Windows installers.

- **sys.programGroupAllUsers [Installer application state/Program group]**

  If the user has selected to create menu entries for all users on the "Standard program group" screen. If no "Standard program group" screen is present, the variable value will be <tt>null</tt>. Only set in Windows installers.

- **sys.symlinkDir [Installer application state/Program group]**

  The name of the directory for launcher links that user has selected on the "Standard program group" screen. If no program group has been selected, the variable value will be <tt>null</tt>. Only set in Linux/Unix installers.

- **sys.fileSeparator [Cross-platform variables]**

  The platform-dependent separator for directories in a file path. On Windows, this is a backslash ("\"), on Unix a forward slash ("/").

- **sys.pathlistSeparator [Cross-platform variables]**

  The platform-dependent separator for lists of directories. On Windows, this is a semicolon (";"), on Unix a colon (":").
- **sys.userHome [Cross-platform variables]**

  The user home directory, typically something like <tt>C:\Users\$USER</tt> on Windows or <tt>/home/$USER</tt> on Unix platforms.
- **sys.userName [Cross-platform variables]**

  The user account name.
- **sys.workingDir [Cross-platform variables]**

  The working directory. For the installer, this is the temporary directory that the installer was extracted to.
- **sys.tempDir [Cross-platform variables]**

  The temporary directory of the operating system. On all supported platforms, this is the value of the <tt>TEMP</tt> environment variable.
- **sys.javaHome [Cross-platform variables]**

  The Java home directory of the currently used JRE.
- **sys.javaVersion [Cross-platform variables]**

  The Java version of the currently used JRE.
- **sys.confirmedUpdateInstallation [Cross-platform variables]**

  If the user has confirmed an update installation on top of a previous installation. If a previous installation is detected, the "Welcome" screen asks the user whether to perform an update installation or choose another installation directory. The result of that question is saved to this variable. If the "Welcome screen is not shown, this variable is not set and <tt>Context#getBooleanVariable(...)</tt> returns false for this variable.
- **sys.desktopDir [Cross-platform variables]**

  The directory used to physically store file objects on the desktop. On Windows, a typical path is <tt>C:\Users\[user name]\Desktop</tt>. On macOS, this is the <tt>~/Desktop</tt> directory and on Unix the freedesktop.org setting for the <tt>XDG_DESKTOP_DIR</tt> directory is returned.
- **sys.docsDir [Cross-platform variables]**

  The directory used to physically store a user's common repository of documents. On Windows, a typical path is <tt>C:\Users\[user name]\Documents</tt>. On macOS, this is the <tt>~/Documents</tt> directory and on Unix the freedesktop.org setting for the <tt>XDG_DOCUMENTS_DIR</tt> directory is returned.
- **sys.downloadsDir [Cross-platform variables]**

  The directory used to physically store a user's downloads. On Windows, a typical path is <tt>C:\Users\[user name]\Downloads</tt>. On macOS, this is the <tt>~/Downloads</tt> directory and on Unix the freedesktop.org setting for the <tt>XDG_DOWNLOAD_DIR</tt> directory is returned.
- **sys.appdataDir [Platform-specific variables]**

  The directory that serves as a common repository for application-specific data. On Windows, a typical path is <tt>C:\Users\[user name]\AppData\Roaming</tt>. On macOS, this is the <tt>~/Library/Application Support</tt> directory.
- **sys.localAppdataDir [Platform-specific variables]**

  The user-specific directory that serves local applications to store computed data. On Windows, a typical path is <tt>C:\Users\[user name]\AppData\Local</tt>. On macOS, this is the

<tt>~/Library/Caches</tt> directory. On Unix, the value of the <tt>XDG_CACHE_HOME</tt> environment variable or if not defined <tt>~/.cache</tt> is returned.

- **sys.windowsDir [Platform-specific variables]**

  The Windows installation directory, typically <tt>C:\Windows</tt>.

- **sys.system32Dir [Platform-specific variables]**

  The system32 directory of your Windows installation, typically <tt>C:\Windows\system32</tt>.

- **sys.commonDir [Platform-specific variables]**

  The common files directory of your Windows installation, typically <tt>C:\Program Files\Common Files</tt>.

- **sys.programDataDir [Platform-specific variables]**

  The directory where applications can save data that is not specific to particular users. A typical path is <tt>C:\ProgramData</tt>.

- **sys.startMenuDir [Platform-specific variables]**

  The directory containing Start menu items. A typical path is <tt>C:\Users\[user name]\AppData\Roaming\Microsoft\Windows\Start Menu</tt>.

- **sys.programsDir [Platform-specific variables]**

  The directory that contains the user's program groups. The groups are themselves file system directories. A typical path is <tt>C:\Users\[user name]\AppData\Roaming\Microsoft\Windows\Start Menu\Programs</tt>.

- **sys.startupDir [Platform-specific variables]**

  The directory that corresponds to the user's Startup program group. The system starts these programs whenever any user logs onto Windows. A typical path is <tt>C:\Users\[user name]\AppData\Roaming\Microsoft\Windows\Start Menu\Programs\Startup</tt>.

- **sys.sendToDir [Platform-specific variables]**

  The directory that contains Send To menu items. A typical path is <tt>C:\Users\[user name]\AppData\Roaming\Microsoft\Windows\SendTo</tt>.

- **sys.templatesDir [Platform-specific variables]**

  The directory that serves as a common repository for document templates. A typical path is <tt>C:\Users\[user name]\AppData\Roaming\Microsoft\Windows\Templates</tt>.

- **sys.favoritesDir [Platform-specific variables]**

  The directory that serves as a common repository for the user's favorite items. A typical path is <tt>C:\Users\[user name]\Favorites</tt>.

- **sys.programGroupDir [Platform-specific variables]**

  The directory of the program group that will be or was created by the "Create standard program group" action. If this action is not present, the value will be <tt>null</tt>. The value of this variable can change in the installer as the user selects a program group on the "Create program group" screen.

- **sys.fontsDir [Platform-specific variables]**

  The folder that contains fonts. A typical path is <tt>C:\Windows\Fonts</tt>. On macOS, the value is <tt>/Library/Fonts</tt>.

- **sys.programFilesDir [Platform-specific variables]**

  The directory where programs are installed, typically something like <tt>C:\Program Files</tt>. On macOS, the value is <tt>/Applications</tt>.

Launcher variables

Launcher variables are written as

```
${launcher:variableName}
```

The value of a launcher variable is a string that is not known at compile time. Launcher variables are evaluated when a generated application launcher is started. Launcher variables can only be used in the VM parameters text field [p. 126] of the launcher wizard [p. 122] . No user-defined launcher variables exist, the available system launcher variables are:

- **sys.launcherDirectory**

  The directory in which your launcher has been installed at runtime.
- **sys.jvmHome**

  The home directory of the JVM that your launcher is running with. This is useful to put JAR files from the JRE into your boot classpath. The "home directory" is the directory that contains the "bin" directory of the JRE.
- **sys.pathlistSeparator**

  The platform-dependent separator for lists of directories. On Windows, this is a semicolon (";"), on Unix a colon (":").
- **sys.tempDir**

  The temporary directory for the current user.

I18N messages

I18N messages are written as

```
${i18n:keyName}
```

The value of an I18N message depends on the language that is selected for the installer. You can use this facility to localize messages in your installers if they support multiple languages [p. 91] . You can supply key value pairs for internationalization in the custom localization file. The variable selection dialog for I18N messages shows all system messages as well as all messages in the custom localization file for the principal language of your project.

All standard messages displayed by install4j can be referenced with this syntax as well. You can locate the key name in one of the `message_*.utf8` files in the `$INSTALL4J_HOME/resource/messages` directory and use it anywhere in your project. The standard messages can be overwritten by your custom localization files.

Using variables your own applications

Many times there is a need in the installed applications to access user input that was made in the installer. The install4j API provides the helper class `com.install4j.api.launcher.Variables` to access the values of installer variables.

There are two ways that installer variables can be persisted in the installer: First, installer variables are saved to the default response file `.install4j/response.varfile` that is created when the installer exits or if a "Create response file" action is executed. Only response file variables are saved to that file. Please see the help topic on response files [p. 71] for more information. Second, selected installer variables can be saved to the Java preference store. The `com.install4j.api.launcher.Variables` helper class offers methods to load variables from both sources.

Saving to the Java preference store is interesting if you want to modify those variable values in your applications and save back the modified values. The Java preference store is available on a per-user basis so that it is possible to modify settings even if the user does not have write

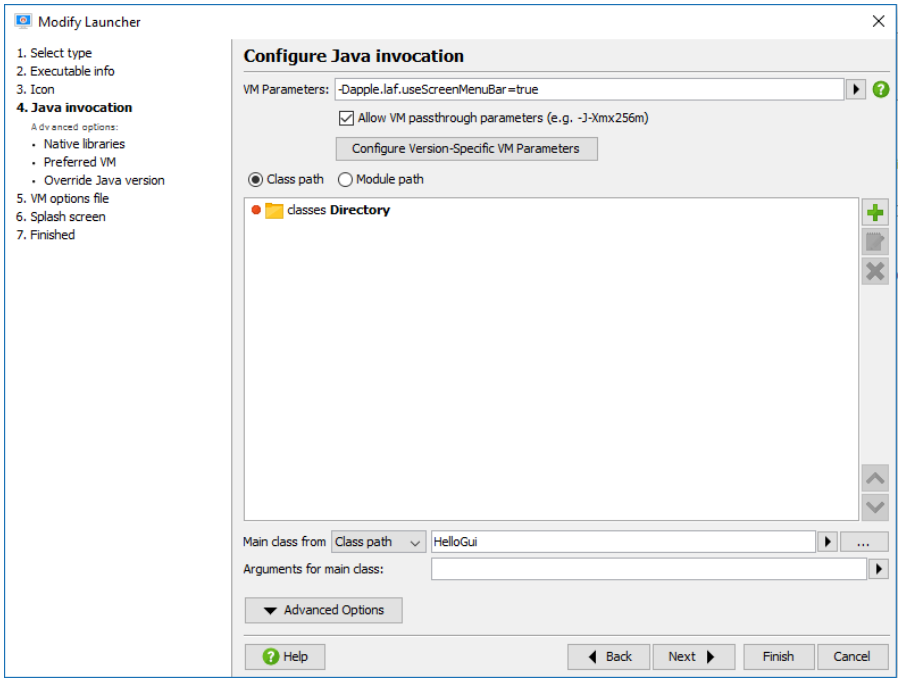
permissions for the installation directory. The `com.install4j.api.launcher.Variables` helper class has methods for loading and saving the entire map of installer variables that way saved by the installer. Also, it is possible to specify an arbitrary package to which the installer variables are saved, so that communication of settings between installers is made possible.

Lastly, it is useful to access compiler variables in your own applications. For example, the version number configured in the install4j IDE can be accessed in your own application through the `com.install4j.api.launcher.Variables` helper class.

A.1.8 VM Parameters

Fixed VM parameters

Fixed VM parameters can be configured in the launcher wizard [p. 126] where you can use compiler variables [p. 28] to handle platform-specific changes or launcher variables [p. 28] to use runtime-dependent variable in your VM parameters.



install4j has the ability to add specific VM parameters depending on the Java version. To set this up, click on the **[Configure version specific VM parameters]** button. In the dialog, add rows for each Java version that should receive specific VM parameters. The comparison checks if the Java version string starts with the specified characters, so "1.8" will match "1.8.0_60", for example. These VM parameters are added after the common VM parameters so you can use them to override common settings.

*.vmoptions files

A common requirement is to adjust the VM parameters of your application launchers depending on the runtime environment like the target platform or some user selection in the installer.

In addition to the fixed VM parameters, a parameter file in the same directory as the executable is read and its contents are added to the existing VM parameters. The name of this parameter file is the same as the executable file with the extension `.vmoptions`. For example, if your executable is named `hello.exe`, the name of the VM parameter file is `hello.vmoptions`. In this file, each line is interpreted as a single VM parameter. The last line must be followed by a line feed. install4j adapts your .vmoptions files during the compilation phase so that the line endings are suitable for all platforms. For example, the contents of the VM parameter file could be:

```
-Xmx128m
-Xms32m
```

The `.vmoptions` files allow the installer as well as expert users to modify the VM parameters for your application launchers.

It is possible to include other `.vmoptions` files from a `.vmoptions` file with the syntax

```
-include-options [path to other .vmoptions file]
```

For maximum cross-platform capability use just one include per `.vmoptions` file. Recursive includes are supported. You can also add this option to the fixed VM parameters of a launcher. In that way, you do not have to create `.vmoptions` files for all your launchers, but you can have a single `.vmoptions` file for all of them.

This allows you to to centralize the user-editable VM options for multiple launchers and to have `.vmoptions` files in a location that can be edited by the user if the installation directory is not writable. You can use environment variables to find a suitable directory, for example

```
-include-options ${APPDATA}\My Application\my.vmoptions
```

on Windows and

```
-include-options ${HOME}/.myApp/my.vmoptions
```

on Unix. If you have to decide at runtime where the included `.vmoptions` file is located, use an installer variable:

```
-include-options ${installer:vmOptionsTargetDirectory}/my.vmoptions
```

and add a "Replace installer variables in a text file" action to replace it after you have set the the `vmOptionsTargetDirectory` installer variable to a suitable path with a "Set a variable" action.

In addition to the VM parameters you can also modify the classpath in the `.vmoptions` files with the following options:

- **-classpath [classpath]**
  Replace the classpath of the generated launcher.
- **-classpath/a [classpath]**
  Append to the classpath of the generated launcher.
- **-classpath/p [classpath]**
  Prepend to the classpath of the generated launcher.

For GUI launchers on macOS, the VM options are stored in a file called `Info.plist` inside the application bundle. The "Add VM options" action described below handles these platform-specific differences. On macOS, .vmoptions files are only supported if Java 7+ is used, i.e. the Oracle JRE option has been selected in the media file wizard.

Environment variables

You can use environment variables in the VM parameters and the `.vmoptions` file with the syntax `${variableName}` where you replace `variableName` with the desired environment variable.

This environment variable syntax also works in the arguments text field and the classpath configuration.

"Add VM options" action

In order to handle VM parameter additions in the installer in a cross-platform fashion, install4j includes an "Add VM options" action [p. 177] that adds VM parameters to the `.vmoptions` file on Microsoft Windows and Unix and modifies the `Info.plist` file on macOS.

The Add VM options action creates a `.vmoptions` file if necessary or adds your options to the `.vmoptions` file if it already exists. However, a number of VM parameters can only occur once so the action replaces the following parameters if they already exist:

- -Xmx
- -Xms
- -Xss
- -Xloggc
- -Xbootclasspath
- -verbose
- -ea / -enableassertions
- -da / -disableassertions
- -splash

as well as the install4j-specific classpath modification options (see above).

To set an -Xmx value that depends on the total memory of the target system, you can use a "Set a variable action" to calculate the numeric part of the -Xmx value using the utility method `SystemInfo.getPhysicalMemory()` and use that variable in the "VM options" property of the "Add VM options" action. For example, in order to use 50% of the total memory for the maximum heap size, you do the following after the "Install files" action:

1. Add a "Set a variable" action with variable name "xmx" and expression

```
"-Xmx" + Math.round(SystemInfo.getPhysicalMemory() * 0.5 / 1024 / 1024) + "m"
```

2. Add a "Add VM options" action with VM options

```
"${installer:xmx}".
```

A.1.9 JRE Bundles

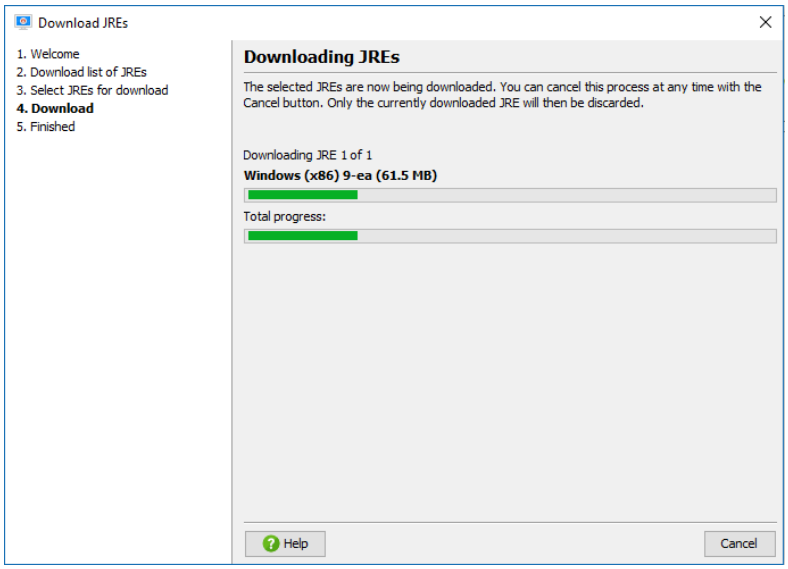
Introduction

When deploying a Java application to users that are not all in the same environment, it is advisable to bundle a JRE with your application or at least to offer a download with a bundled JRE. install4j offers you a number of strategies for JRE bundling. A statically bundled JRE is always distributed along with your application. Dynamical bundling means that if the installer cannot find a suitable JRE on the target computer, it will download a JRE bundle from your web server.

Any JRE bundle that is installed by install4j will not interfere with default JRE installations. In particular, it will not be integrated into browsers and no registry entries will be written. However, it is possible to install JRE bundles as "shared", meaning that other installers generated by install4j will be aware of these bundles. A shared JRE bundle will not be uninstalled when the application that has installed the bundle is uninstalled itself. If you dynamically bundle a JRE for multiple installers and install it as a shared JRE, only the first time when a user installs one of your installers, a JRE will be downloaded. Subsequent installations of other installers will find that shared JRE.

Obtaining JRE bundles

ej-technologies offers a JRE bundle download service [p. 348] that is invoked from the install4j IDE.

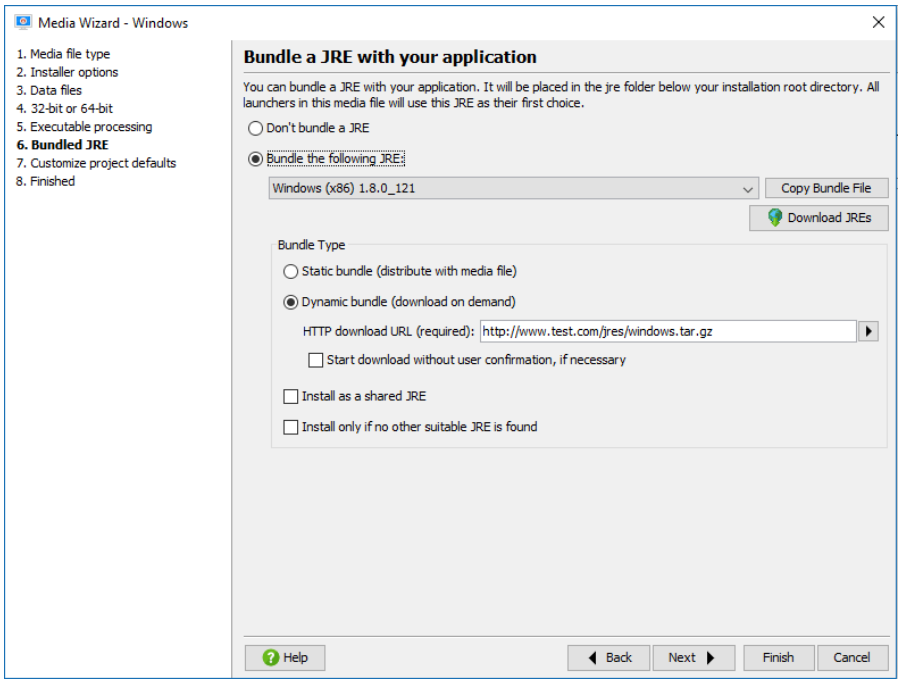


All JREs are saved with a `tar.gz` extension to the directory `$INSTALL4J_HOME/jres` or, if that directory is not writable, to `$HOME/.install4j7/jres`. If you require JRE bundles on a computer without an internet connection, you can transfer these files to the equivalent location of that computer.

Please note that on macOS, only Oracle JREs can be bundled (Java 7+). The Apple JRE (Java 6) is part of the operating system and may not be be installed by third parties.

Using JRE bundles

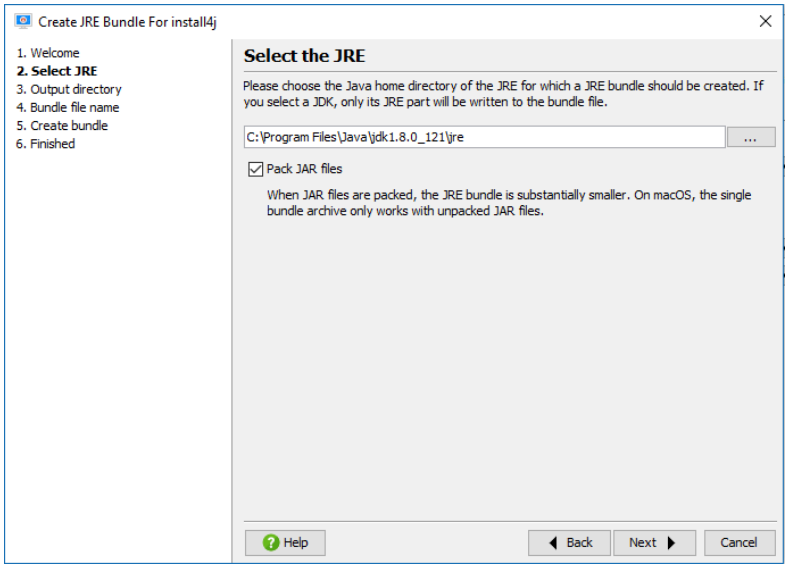
Downloaded JREs can be selected for bundling in the Bundled JRE [p. 336] step of the media wizards [p. 329] . All generated launchers [p. 120] use the bundled JRE as their first choice.



If you would like to put your JRE bundles in a different directory, such as a directory in a version-controlled location, you can copy the `.tar.gz` file (see above) to that directory and choose the "Manual entry" JRE bundle to enter the path to the bundle file.

Creating JRE bundles

If the JRE bundles created by ej-technologies do not satisfy your needs, you can create a JRE bundle from any installed JRE on your file system. install4j offers the "Create a JRE bundle" wizard [p. 349] to make this task as simple as possible.



If you wish to automate the process, a command line tool as well as an ant task [p. 349] for building JRE bundles are available as well.

Packaging your own JRE can be useful if you want to add standard extensions such as the Java Communications API to your JRE. The JRE bundle wizard only works for the platform you are running on. That means, to create a JRE bundle for Windows, you have to run install4j on Windows, to create a bundle for Linux, you have to run install4j on Linux.

In special cases you might want to create or modify a JRE bundle programmatically, i.e. without using the install4j IDE or the command line tools. This can be done with the standard GNU tools `tar` and `gzip`. A JRE bundle for install4j is simply a file with the naming scheme:

```
[operating system]-[architecture]-[JRE version].tar.gz
```

For windows bundles, the operating system name must be "windows", for other platforms any name can be used. The `.tar.gz` file directly contains the JRE, i.e. the `bin` and `lib` folders. The steps to create a bundle are outlined below:

```
cd jre
tar cvf minix-x86-1.5.0.tar *
gzip minix-x86-1.5.0.tar
cp minix-x86-1.5.0.tar.gz /usr/install4j/jres
```

First you change into the top-level directory of the JRE, then you tar all files and directories and gzip the tar archive. The last step copies the bundle into the directory `$INSTALL4J_HOME/jres`. You have to restart install4j for the JRE to be listed in the "Bundled JRE" step of the media file wizard.

If you choose to bundle your JRE this way on Microsoft Windows, you have to install the tar and gzip tool available at

- tar: http://gnuwin32.sourceforge.net/packages/gtar.htm
- gzip: http://gnuwin32.sourceforge.net/packages/gzip.htm

A.1.10 Services

Introduction

Many applications have a component that has to run in the background without user interaction. On Windows, this is called a "service", on Unix a "daemon", in install4j the term "service" is used exclusively. install4j can generate and install4j service launchers for your own application. On Windows, managing services is a particularly demanding area and so other service executables that have not been generated by install4j are supported as well.

Generated Service Launchers

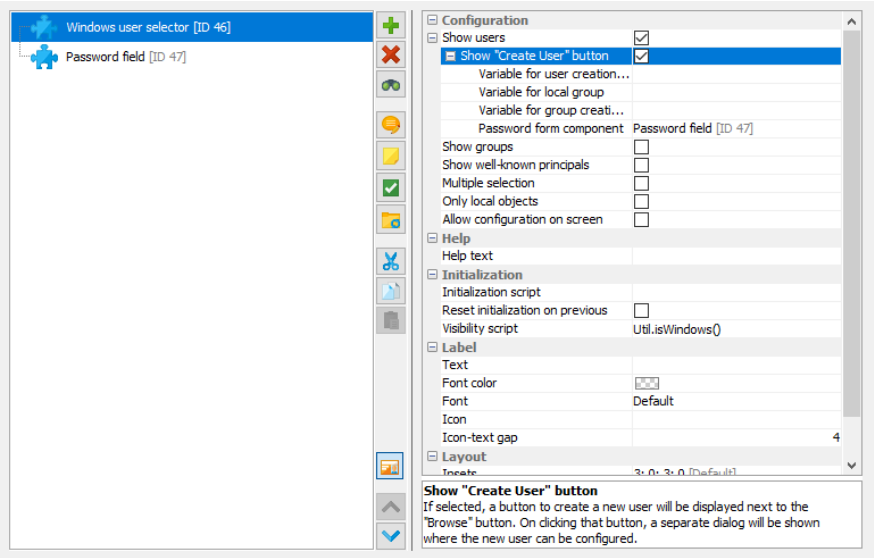
A service launcher will be generated if the selected executable type in the "Executable" step [p. 123] of the launcher wizard is set to "Service". There are no special requirements for your code, when the service is started, the `main` method of the configured main class will be called as for GUI or console launchers. Also, there is no special "shutdown" interface for the service to be notified when the service is stopped. To do any cleanup, use the `Runtime.addShutdownHook()` method to register a thread that will be executed before the JVM is terminated.

A generated service launcher has to be installed and started, otherwise it will not run. These actions are not performed by default. You have to add the following actions to the installer:

- **Install a service**

  Installs a service, so that it can be started automatically when the computer is started. By default, the name of the installed service is the launcher name that is configured in the launcher section of the install4j IDE. You can select the launcher and rename in order to change the service name. If you require a user-configurable service name or if you wish to install the service multiple times, please use the method for external service launchers on Windows as described below. If you treat the service launcher as an external service, you can specify a service name in the install4j IDE.

  You can configure the user account that is used for running the service. There are a few well-known user accounts, like "Local System" (the default) or "Local Service" that you can choose directly in the configuration of this action. In some cases, you might want to create a separate user to run a service. install4j offers API support for creating new user accounts with the `com.install4j.api.windows.WinUser` class. If you would like to query the user for details on the user account, it is possible to do that without using the API. On a configurable form, add a "Windows user selector" component and select the "Show 'Create User' button" property. The SID of the created or selected user is saved to the configured variable, say "serviceUser". You also have to query the user for the password of the account. For that purpose, add a "Password field" form component, set its variable to "servicePassword" and choose that form component in the "Password form component" property of the user selector form component. In the "Install a service" action, you can then choose `Other` in the "Account" property and enter `${installer:serviceUser}` in the nested "Account name or SID" property as well as `${installer:servicePassword}` in the nested "Password" property.



- **Start a service**

  Installing a service does not start it. You need this action to actually execute your code.

When the "Install Files" action runs and a previous installation is being updated, any running services that are associated with the same executables are stopped.

Command Line Options Of Generated Service Launchers

Under some circumstances, services must be able to be installed and started manually from the command line. While this is required functionality on Unix, on Windows service executables usually offer no command line functionality. On Windows it is expected that there is a special program that installs an uninstalls the service. This is done by the "Install a service" and "Uninstall a service" actions in install4j. In addition, one can start and stop services in the Windows service manager. install4j offers "Start a service" and "Stop a service" actions to do this programatically in the installer. To improve usability, install4j adds Unix-like arguments to the generated service launchers on Windows as well.

For Unix service executables, the usual `start`, `stop` and `status` of daemon start script arguments are available for the generated start script. The stop command waits for the service to shut down. The exit code of the status command is 0 when the service is running and 3 when it is not running.

For debugging purposes, you may want to run the executable on the command line without starting it as a background service. This can be done with the `run` parameter. In that case, all output will be printed on the terminal. If you want to keep the redirection settings, use the `run-redirect` parameter instead. On Windows, the corresponding parameters are `/run` and `/run-redirect`.

To install a service on Windows from the command line, pass `/install` to the generated service executable. In this way, your service is always started when Windows is booted. To prevent the automatic startup of your service when the computer is booted, pass the argument `/install-demand` instead. As a second parameter after the `/install` parameter, you can optionally pass a service name. In that way you can

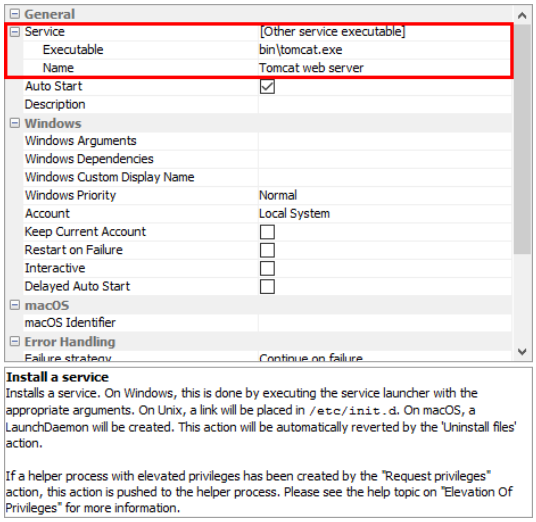
- install a service with a different service name than the default name.
- Use the same service executable to start multiple services with different names. To distinguish several running service instances at runtime, you can query the system property `exe4j.`

`launchName` for the service name. Note that you also have to pass the same service name as the second parameter if you use the `/uninstall`, `/start` and `/stop` parameters explained below.

Generated windows services are always uninstalled by passing `/uninstall` to the generated service executable. To start or stop the service, the `/start` `/stop` and `/restart` options are available. In addition, the `/status` argument shows if the service is already running. The exit code of the status command is 0 when the service is running, 3 when it is not running and 1 when the state cannot be determined (for example when it is not installed on Windows). All command line switches also work with a prefixed dash instead of a slash (like `-uninstall`) or two prefixed dashes (like `--uninstall`).

External Service Launchers On Windows

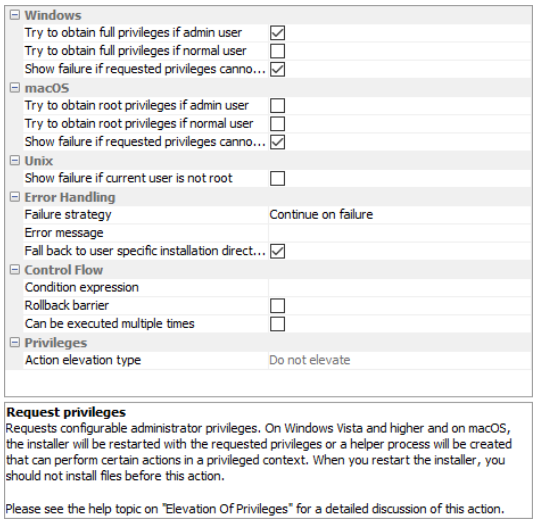
As part of 3rd party software, you may want to install and start services that were not generated by install4j. Both the "Install a service" action as well as the "Start a service" action provide a way to select other service executables. In the drop-down list of the "Service" property, if you choose `[Other service executable]` two new nested properties are shown: The "Executable" property allows you to specify the external service executable. Note that this action does not provide "service wrapper" functionality for regular executables. The selected executable has to be a service executable, otherwise the action will not work. The "Name" property allows you to specify the name of the installed service.



A.1.11 Elevation Of Privileges

Introduction

Most operating systems have the concept of normal users and administrators. While regular applications can run with limited privileges, installers often need full administrator privileges because they make modifications to the system that are not granted to limited users. The required privileges depend on two factors: The operating system and the type of operations that are performed by the installer. The "Request privileges" action that is present in the "Startup" sequence of both installers and uninstallers by default takes care of elevating the privileges to the required level and optionally terminating the installer with an error message if the required privileged cannot be obtained. Due to the differences for the different operating systems, this configuration is made separately for Windows, macOS and Unix.



For the installer and the uninstaller, the privileges should be the same. This is why by default the uninstaller has a "Request installer privileges" action that will request the same privileges that were obtained in the installer. If you have more complex requirements, you can have multiple "Request privileges" actions with appropriate condition expressions, each with a link in the uninstaller.

Windows privileges

Since Windows Vista, "User Account Control" (UAC) limits privileges for all users by default. An application can request full privileges, with different effects for normal users and admin users: A normal user cannot be elevated to full privileges, so the user has to enter credentials for a different administrator account. A normal user is not likely to have these credentials, so by default the "Request privileges" action does not try to obtain full privileges for normal users. An admin user can be elevated. A UAC prompt will be shown in this case and the user simply has to agree in order to elevate privileges for the installer. Since it is not possible to write to the program files directory without elevated privileges, this elevation is performed by default. With the "Try to obtain full privileges if admin user" and the "Try to obtain full privileges if normal user" properties in the "Windows" category, you can configure this behavior according to your own needs.

By default, the installer will fail if the requested privileges cannot be obtained. You can deselect the "Show failure if requested privileges cannot be obtained" property in the Windows category to continue and let the user install into the user home directory or another writable directory.

Under some circumstances, for example if you want to manage services in your installer, you absolutely require full privileges. In this case, you can select the "Try to obtain full privileges if

normal user" property in the Windows category. When you insert a service action and the elevation properties are not selected, you will be asked whether the necessary changes should be made automatically.

macOS privileges

Similar to Windows, macOS limits privileges for all users by default and normal users and admin users behave differently with respect to privilege elevation: A normal user cannot be elevated to full privileges, so the user has to enter the root password. A normal user is not likely to have the root password, so by default the "Request privileges" action does not try to obtain full privileges for normal users. To elevate an admin user, an authenticate dialog will be shown and users have to enter their own password. Contrary to Windows, admin users can always write to the `/Applications` directory, even without full privileges. That's why on macOS no elevation of privileges is requested by default.

Like on Windows, the installer will fail by default if the requested privileges cannot be obtained. In the default setting this has no effect, because privileges are never requested.

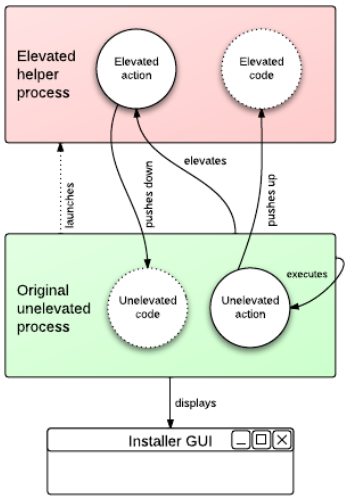
Service installations require full privileges, so the "Try to obtain full privileges if admin user" and the "Try to obtain full privileges if normal user" properties in the macOS category should be selected in that case. Again, service actions will suggest to make the necessary changes automatically when they are inserted into the project.

Unix privileges

install4j does not support elevation of privileges on Linux and Unix. Partly this is due to the different incompatible systems of elevation, most notably "su" and "sudo" which cannot be easily detected. If full privileges are required, the user has to elevate the installer manually, either with "su" or with "sudo" or with the corresponding GUI tools. In this case, the "Show failure if current user is not root" has to be selected, so that an error message is shown if the installer is not started as root.

Elevation mechanism

install4j does not elevate the entire process, but it starts an elevated helper process with full privileges.



All actions have an "Action elevation type" property that can be set to "Inherit from parent", "Do not elevate" and "Elevate to maximum available privileges". The root element in the element

hierarchy is always an installer application whose "Action elevation type" property is set to "Do not elevate by default".

Actions whose "Action elevation type" property results to "Elevate to maximum available privileges" will run in the helper process. They have full access to all installer variables as long as the contents of the variables are serializable.

Actions can have a preferred elevation type that is set automatically when you add the action. Actions that need to be elevated include

- the "Install files" and "Uninstall files" actions
- service actions
- actions that add rights on Windows
- actions that write files
- the "Run executable or batch file" action

Actions that are explicitly not elevated by default include

- the "Show URL" action
- the "Show file" action
- the "Execute launcher" action
- actions that should run as the original user, such as registry actions
- actions that interact control the GUI of the installer application

Elevated actions can only interact with the GUI in a limited way. All methods in the `com.install4j.api.Util` class for displaying message dialogs or option dialogs are supported. You cannot call context.getWizardContext() or directly display a GUI using the Java Swing API. Also, calling methods in the `com.api.install4j.context.Context` that change screens is not supported. Since an elevated action runs in a different process, you cannot access any static state in custom code. Installer variables are the only means to modify state from elevated actions.

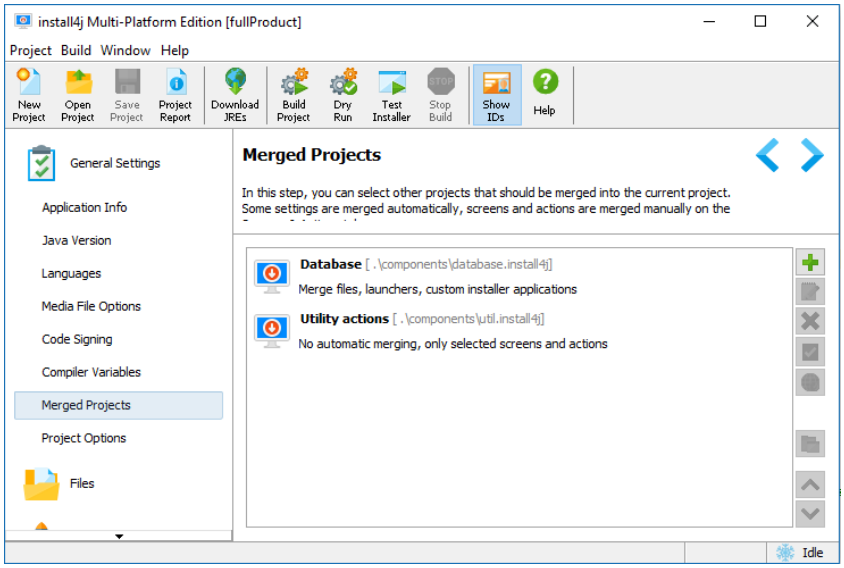
For your own scripts or custom code, the API offers a way to push a piece of code to the elevated helper process or to the original process if they exist. This is done by wrapping the code in a `com.install4j.api.context.RemoteCallable` and calling `context.runElevated(...)` for the elevated helper process and `context.runUnelevated(...)` for the original process with the `RemoteCallable`. The `RemoteCallable` must be serializable, so its fields can be transferred to the other process. Its `execute()` method that contains the code returns a `Serializable` so you can return a result to the calling process. Several actions in install4j use this mechanism, as explained in the next section.

A.1.12 Merged Projects

Introduction

There are two fundamental needs for merged projects: First, there are large projects where a monolithic project file is undesirable since multiple developers work on the installer. Second, if you have multiple products that share certain components, it is undesirable to duplicate configuration for their installers.

The merged projects feature [p. 96] in install4j is a solution for both of these problems. You can create project files that are separate installers by themselves, such as a "database installer" and reuse them in multiple projects. On the other hand, you can also create project files that do not install anything by themselves, but just contain a collection of "Run script" actions that are useful in several of your installers.



Flat Merging Considerations

Merged projects in install4j are not sub-projects that will retain their structure at runtime. Merging inserts selected elements into the main project before the main project is compiled. Files, launchers and custom installer applications are inserted automatically, while elements from the installer and the uninstaller have to be inserted manually by adding links to the installer and uninstaller in your main project. At runtime, all merged elements are equivalent to the elements that were defined directly in the main project.

Merging works across an arbitrary number of levels and is performed in a bottom-to-top fashion: If the main project A includes a merged project B which in turn includes a merged project C, then C is first merged into B and the result is merged into A.

As a result of flat merging, there are no intermediary artifacts for merged projects, the result of the compilation is a single monolithic installer. This has the advantage of being easy and flexible, but collisions can occur unless concerns are properly separated between the main project and its merged projects. In particular, all elements in the final result share the same namespace for compiler and installer variables. All custom localization files are merged, so that localization in merged projects is not impacted unless there is a collision in the message keys. Such problems can be avoided if unique prefixes are used for compiler variables and installer variables as well as custom localization keys. For example in project A, all variables could be prefixed with "a." and in project B with "b.".

One area where such collisions are not possible is for IDs of any entity in a project, such as launchers, file sets, actions, screens or form components. When a project is merged, install4j prefixes all IDs with the application ID of that project. For example, if the application ID of a merged project is "1406-2150-6354-3051" and a launcher has the ID "2265", the ID is changed to "1406-2150-6354-3051:2265" after merging. This ensures that all IDs remain unique no matter how many projects are merged. Beans (screens, actions and form components) in the merged project are passed a special context that automatically prefixes all unqualified IDs with this application ID. For example, if you have a script in your merged project that calls `context.getLauncherById("2265")` this will succeed, even though the ID is now actually "1406-2150-6354-3051:2265". If you want to access that same launcher configuration from a script in the main project, you would have to call `context.getLauncherById("1406-2150-6354-3051:2265")`.

Generally it is recommended to organize merged projects so that they are relatively self-contained and only interact with their main project through common installer variables. In that way, the main project can continue to work if the merged project is removed and the merged project can work as a standalone installer.

Display Of Merged Elements

Merged project files are only displayed on the Merged Projects tab [p. 96] . There is no hierarchical display of the elements of merged project files in the main project. Merging is only done at compile time and the merged elements are added to the media file.

One exception is the merging of screens and actions which is not done automatically, but through the placement of links on the screens & actions tab [p. 145] .

Merging Of Files

If you have enabled file merging for a merged project, files are merged automatically according to the following rules: All files from the default file set of the merged project are merged into the default file set of the main project. Roots are merged if the main project has roots with the same name, otherwise they are discarded. Files in each other file set of the merged project are only merged if the main project has a file set with the same name. To facilitate the set up of file sets in the main project, there is an action to synchronize file sets in merged projects.

If there are files with the same relative paths, the main project has the highest precedence and the most deeply nested merged project has the lowest precedence. For merged projects on the same level, a project with a lower position in the list has a higher precedence than a project with a higher position.

There is no merging of installation components. Installation components can only be defined in the main project. However, with the appropriate definition of file sets in merged projects you can easily contribute files to installation components in the main project. For example, if your merged project installs your database, and you want to ask the user whether to install the database, define a file set named "database" in the merged project and add all files to that file set. In your main project, you also add a file set named "database" (when adding the merged project, you will be asked whether to add that file set automatically). In your installation component for the database, choose the file set "database". It will not contain any files in the IDE, but during compilation, the files from the merged project will be added to it.

Merging Of Launchers And Custom Installer Applications

Launchers and custom installer applications are merged automatically if you have enabled merging for launchers and custom installer applications. It is not an error if there are collisions of launchers or custom installer applications with the same relative paths and the rules of precedence are the same as for the merging of files. However, it is recommend not to hide launchers in this way since this can lead to unexpected problems at runtime.

Both launchers and custom installer applications can be attributed to a particular file set. In that case, they are only merged if the file set also exists in the main project. The attribution to a particular installation component in the main project is done in this way, analogous to the way it is done for files.

Merging Of Styles

If style merging is enabled, all styles from the main project are made available for installer applications, screen groups and screens. This allows you to centrally manage a set of styles and re-use it in multiple projects.

See the help topic on styles [p. 22] for more information on how merged styles can be used in the project.

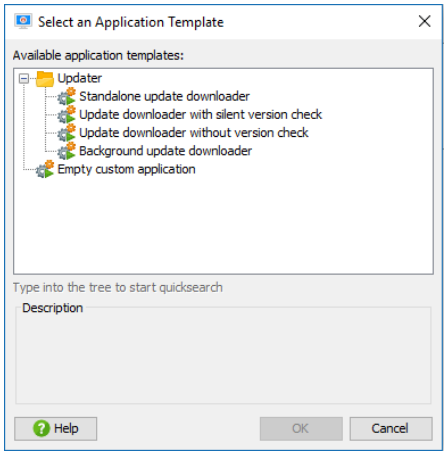
A.1.13 Auto-Update Functionality

Introduction

install4j can help you to include auto-updating functionality into your application. Auto-updating means two things: First, there must be a way to check if there is a newer version available for download. This check can be initiated by the user in various ways or the check can be triggered automatically by your application. Second, there must be a way to download and execute an appropriate installer for the new version.

install4j creates a special file `updates.xml` in the media output directory when you build the project. This file describes the media files of the current version. If you want to use install4j's auto-update functionality, you have to upload this file to a web server. This file is downloaded by deployed installations as described below and delivers information about the current version.

Downloading and installing the new version is done with a custom installer application [p. 148] . install4j offers several templates for updaters that correspond to the update strategies outlined below in this help topic.



Quick start

To get update functionality similar to the one you see with install4j, please follow these instructions:

1. When you build your project, install4j will create a file named `updates.xml` in the media file output directory. Upload that file together with your media files to a directory on your web server.
2. Go to Installer->Auto-Update Options and enter the URL for `updates.xml`. This must be the full URL to the file (like `https://www.server.com/download/updates.xml`).
3. Go to Installer->Screens & Actions, click on the add button, choose `Add application` from the popup menu, select the "Updater with silent version check" template and confirm with **[OK]** to add the application.
4. Enter the "Executable name" property for the new updater application (for example `automaticUpdater`).
5. Activate the "Launcher integration" tab for the new updater application and select the "Start automatically when launcher is executed" check box. Leave all other settings at their default.
6. In your installer, add a "Configurable form" and add an "Update schedule selector" form component to it.

That's it. In the installer, the user will get the possibility to choose the frequency of the update checks. When the user executes a launcher after you publish an update, the updater will be shown after the application window is displayed and tell the user about the new version. If the user accepts, the new installer is downloaded and installed.

Of course your ideas for auto-update might be different. Maybe you do not have a GUI application and you want to perform unattended updates, or you want to notify your users about updates directly in your application. That's why we have made the auto-update functionality so flexible. The updater installer application is composed of standard form components and actions, so you can tailor it to your needs. Also, you can use the API to check for updates. Please read on for a more in-depth explanation of the auto-update process and different auto-update strategies.

updates.xml

The `updates.xml` file is created in the media output directory each time you build the project. You can use this file as is, however, some situations require that you modify the file before uploading it to the web server. The file looks like the sample below:

```
<?xml version="1.0" encoding="UTF-8"?>
<updateDescriptor baseUrl="">
  <entry targetMediaFileId="8" updatableVersionMin="" updatableVersionMax=""
fileName="hello_windows_4_0.exe"
         newVersion="4.0" newMediaFileId="8" fileSize="2014720" bundledJre="">
    <comment />
  </entry>
  <entry targetMediaFileId="9" updatableVersionMin="" updatableVersionMax=""
fileName="hello_linux_4_0.rpm"
         newVersion="4.0" newMediaFileId="9" fileSize="817758" bundledJre="">
    <comment />
  </entry>
  <entry targetMediaFileId="10" updatableVersionMin="" updatableVersionMax=""
fileName="hello_macos_4_0.dmg"
         newVersion="4.0" newMediaFileId="10" fileSize="1359872" bundledJre="">
    <comment />
  </entry>
</updateDescriptor>
```

The root of the `updates.xml` file is the `updateDescriptor` element. It contains the `baseUrl` attribute that can be used to specify an alternate download URL for the installers. By default, it is empty which means that the installers must be located in the same directory as the `updates.xml` file. The `updateDescriptor` element contains one or more `entry` elements which correspond to the media files that were created by the build.

When install4j determines whether an entry in the update descriptor is a match for the current installation, it looks at three attributes of the `entry` element: Most importantly, the `targetMediaFileId` attribute has to match the media file ID of the current installation. You can show media file IDs by invoking `Project->Show IDs` in the main menu. If you discontinue a media file, you can migrate users of that media file to a different media file by duplicating the desired entry in `updates.xml` and changing the `targetMediaFileId` attribute to that of the discontinued media file. Another criterion is the installed version of the application. Depending on that version, you might want to offer different updates. The `updatableVersionMin` and the `updatableVersionMax` attributes can set lower and upper limits for the installed versions that should download the associated entry in the update descriptor. By default, these attributes are empty, so no version restrictions apply.

Attributes that describe the update installer include `fileName` which is necessary to construct the download URL, and `fileSize` which contains the size of the file in bytes. `newVersion` contains the available version while `newMediaFileId` is the media file ID of the update installer which is the same as `targetMediaFileId` unless you changed it yourself. Lastly, `bundledJre` contains the original file name of the JRE bundle without the `.tar.gz` extension or the empty

string if no JRE is bundled in the installer. In addition to the above attributes, the nested `comment` element can contain a description that should be displayed to the user. All of this information can be used for custom logic to select a suitable update installer or be displayed to the user in the updater. In addition, you can add any number arbitrary attributes to the `entry` element yourself.

The update descriptor

The install4j runtime API contains the `com.install4j.api.update.UpdateChecker` utility class that can download the `updates.xml` file and translate it to an instance of `com.install4j.api.update.UpdateDescriptor`. From there, you can get a suitable `com.install4j.api.update.UpdateDescriptorEntry` with a single method call. Please see the Javadoc for more detailed information. The above API is primarily intended for use in your application. The install4j runtime API contained in `resource/i4jruntime.jar` is always on the class path for a generated launcher.

In a custom installer application, you would rather use a "Check for update" action that performs the same actions as `UpdateChecker` and saves the downloaded `UpdateDescriptor` to an installer variable. All updater templates included with install4j execute the "Check for update" action at some point.

Instances of `UpdateDescriptorEntry` expose all attributes of the corresponding `entry` element in the `updates.xml` file. They also give access to additional attributes added to the `entry` element so you can implement custom logic to find a suitable update. The most important method of the `UpdateDescriptorEntry` class is the `getUrl()` method that constructs the full URL from which the update installer can be downloaded. If no `baseUrl` has been specified on the `updateDescriptor` root element, the URL starts with the parent directory from which the `updates.xml` file has been downloaded.

Some information in the update descriptor, such as the file names, file sizes, the new media file IDs and others are known to the compiler and are automatically filled in when the `updates.xml` file is created. Other information, such as the base URL, is information that can be customized on the auto-update options [p. 316] tab. Other customizable information includes version requirements for the installed application, a localizable comment that can be displayed in the updater and custom attributes that can be used for custom logic in updaters.

Strategy 1: Standalone updater

The easiest way to provide auto-update functionality to your users is to create a self-contained updater application. This is done by adding an application on the screens & actions tab [p. 145] and choosing the "Standalone updater" application template. Such an auto-updater can by invoked manually by the user, on Windows, it can also be added to the start menu. No changes in in your application code are required so far.

If you have a GUI application, you could provide integration with the updater by offering a "Check for update" menu item or similar that invokes the updater. One problem in this scenario is that if the updater downloads and executes the update installer, your application will still be running and the user will receive a corresponding warning message in the installer. The solution to this problem is to use the `com.install4j.api.launcher.ApplicationLauncher` class to launch the updater. With this utility class you can launch the update installer by passing its ID as an argument. IDs can be shown on the screens & action tab by toggling the "Show IDs" tool bar button. If you launch an installer application such as an updater that way, the "Shut down calling launcher" action will be able to close your application. To react to the shutdown, for example, to invoke your own shutdown routine, you can pass a callback to the `ApplicationLauncher.launchApplication(...)` call. After you were notified through the call back, your application will be terminated with a call to `System.exit()`.

To easily get the code snippet for invoking the updater, select the updater application on the Screens & Actions tab and click on the **[Start Integration Wizard]** button on the right.

Strategy 2: Updater with silent version check

In this scenario, you invoke the updater like in strategy 1, but rather than offering a "Check for update" menu item, you do so on a regular schedule. For example, you automatically check for updates every week or each time the user starts the application. In that case, the standalone updater template is not suitable since you only want to give the user feedback if there is actually a new version available. However, the standalone updater always starts with a "Welcome" screen, verbosely checks for updates and informs the user that no new version is available. Most likely, your users will be bothered if this is done automatically.

The "Updater with silent version check" application template is intended for this use case. It checks for an update in the startup sequence and terminates the updater if no new version is available. This means that if there is no new version available, your users will not see that a check has taken place. Only if a new version is available will the updater display its window and inform the user of the possibility to download the update installer.

For such an automatic check you will likely want to invoke the updater in a blocking fashion. If you call `ApplicationLauncher.launchApplication(...)` with the `blocking` argument set to `true`, the method will not return until the update installer has exited. If the user decides to run the installer on the "Finish" screen, your application will terminate as explained in strategy 1.

Strategy 3: Updater without version check

If you want to take the integration one step further and display the availability of a new version in your application yourself, you can use the `com.install4j.api.update.UpdateChecker` class as explained under the "updates.xml" heading. In this way, you can create your own panel that announces the new version and lets the user decide whether to download it or not. If the user decides to download, the "Updater with silent version check" template is not suitable since it informs the user about the new version once more.

The "Updater without version check" application template is intended for this use case. It immediately starts downloading the new version and then proceeds to the "Finish" screen where the user can decide to start the downloaded installer. In the other two templates the user can choose the directory where the downloaded installer should be saved. That screen is omitted in this template and the installer is downloaded to the user home directory by default. You can change this default directory be passing the argument `-DupdaterDownloadLocation=[directory]` to the `ApplicationLauncher.launchApplication(...)` call. Again, the updater will terminate your application if the user starts the installer as explained for strategy 1.

Strategy 4: Background updater

A background updater has no UI, and automatically downloads an updater installer if available. It will not execute the downloaded update installer because that would disrupt the work of the user. Instead, it executes a "Schedule update installation" action to register the downloaded updated installer for later execution.

There are two options to execute an update installer that is scheduled for execution:

- **Programmatic invocation**

  By calling `com.install4j.api.update.UpdateChecker.executeScheduledUpdate(...)` you can execute the downloaded update installer programatically, usually after using `com.install4j.api.update.UpdateChecker.isUpdateScheduled()` to check whether such a download has been completed. You can do that while the launcher is running or at startup.

Notifying the user about this event or letting the user defer the installation is handled by your own code. For GUI and server launchers, this is the only option.

The "HelloGui" class the in the "hello" sample contains a complete demonstration of how to use the API to check for updates programatically and use a background updater to download and install updates.

- **Automatic invocation**

  For GUI launchers, you can edit the launcher, go to the "Executable info->Auto-update integration" step and select the `Execute downloaded updater installers at startup` check box. When the GUI installer is started and a downloaded update installer has been scheduled for installation, the update installer will be executed.

Update schedule registry

A common requirement is to check for an update on a regular schedule. install4j comes with a standard implementation of an update schedule registry that frees you of the task to implement one yourself. This update schedule registry is fully integrated with the launcher integration that starts update downloaders when launchers are executed, but it is also available in the API.

The `com.install4j.api.update.UpdateScheduleRegistry` class is intended to be used in your application. You configure an `com.install4j.api.update.UpdateSchedule` with a call to `UpdateScheduleRegistry.setUpdateSchedule(...)` and call `UpdateScheduleRegistry.checkAndReset()` each time your application is started. If you get a positive response, you can start a suitable updater as explained above. Please see the Javadoc for more information.

To facilitate the configuration of the update schedule in your installer, install4j offers a special "Update schedule selector" form component whose initial value is set to the current setting (if any) and automatically updates the setting for the installed application when the user clicks "Next".

A.1.14 Code Signing

Introduction

Code-signing ensures that the installer, uninstaller and launchers can be traced back to a particular vendor. A third party certificate authority guarantees that the signing organization (you) is known to them and has been checked to some extent. The certificate authority has the ability to revoke a certificate in case it gets compromised.

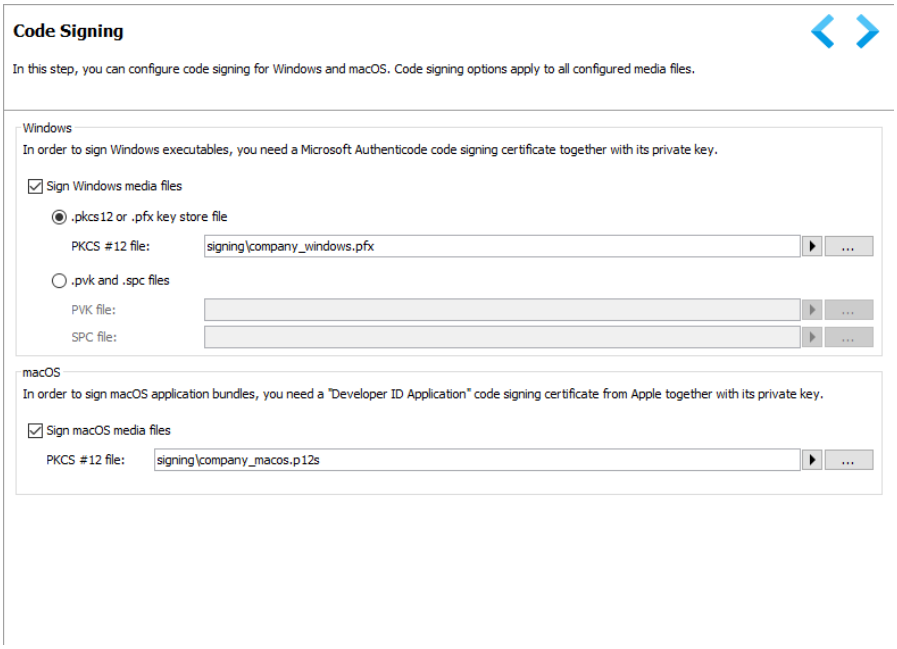
The basis for code signing is a private key / public key pair that you generate on your computer. The private key is only known to you and you never give it to anyone else. The certificate provider takes your public key and signs it with its own private key. That key in turn is validated by an official root certificate that is known to the operating system. The private key, the public key and the certificate chain provided by the certificate provider are required for code signing.

On Windows, code signing is particularly important since Windows Vista. For unsigned applications that require admin privileges, Window Vista and higher will display special warning dialogs to alert the user that the application is untrusted and may harm the computer.

On macOS 10.8 or higher the default security setting makes it more difficult for the end user to install an application that has not been signed, so code signing is practically required.

Obtaining Code Signing Certificates

You need different certificates for code signing on Windows and macOS:



- **Windows**

  Purchase a code signing certificate from a certificate provider such as Thawte. You will create a .pvk file on your computer using makecert.exe and you will get an .spc file from the certificate provider that you can reference on the code signing tab [p. 95] .

  If you have private key, public key and certificate chain in some other format, you can use openssl to convert them to a PKCS #12 file (extension .p12) and specify that file instead.

- **macOS**

  Request a "Developer ID Application" Mac code signing certificate on a macOS machine. You have to log in to the Member Center on Apple's Developer site to generate the certificate.

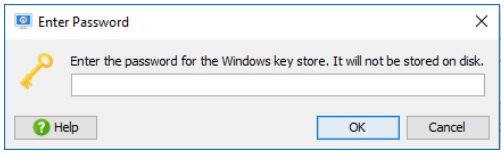
  Afterwards open the Keychain Access utility on your Mac, go to "keys" and export the key that belongs to your "Developer ID Application" certificate by right clicking on it. Choose .p12 as file format. The keychain tool will ask you for a new password for the exported file. This is the password you will have to specify during the install4j build to access your key.

  You can find general information about code signing on Mac here.

Key Store Passwords

Private keys are sensitive information. If they get into the wrong hands, your identity is compromised. Because of that, private keys are secured with a password. When install4j signs your installers and launchers, it needs to work with the private key.

When you start a build in the install4j IDE, you will be asked for the Windows and macOS key store passwords as required. install4j does not store those passwords to disk, but they are cached on a per-project level as long as the install4j IDE remains open.



When you do a command line build, the install4j command line compiler will ask you for the required passwords. If you want to fully automate a build with code signing, you can pass passwords on the command line by setting the `--win-keystore-password=[password]` and `--mac-keystore-password=[password]` command line parameters. The install4j ant task offers the corresponding "winKeystorePassword" and "macKeystorePassword" attributes. Please note that adding these passwords to shell scripts or ant build files constitutes a security risk.

In a setup where only a restricted number of people can build signed executables, you can use the `--disable-signing` command line parameter, the "disableSigning" ant task attribute or the corresponding build option in the "Build" step of the install4j IDE to temporarily disable code signing. In that way, other developers can build fully functional, unsigned installers without modifying the project file.

HTTP connections during code signing

Code signing certificates issued by certificate providers expire after a certain time. For Windows code signing, the expiry time is usually one or two years, after which you have to purchase a renewal from your certificate provider. Executables that were signed while the certificate was still valid are trusted indefinitely unless the certificate is revoked.

A computer that validates an executable compares the signing time and the expiry time of your certificate. Certificate providers want to prevent you from turning back the clock of your computer to circumvent the expiry of your certificate. This is why the signing time has to be counter-signed by a certificate provider. Certificate providers offer free web services that will confirm that a signature has been performed at a particular time. This counter-signature is not related to a particular certificate - so one can use the web service of any certificate provider, regardless of where the certificate came from. install4j uses the VeriSign time stamp service.

The consequence of this scheme is that you need an internet connection at build time in order to get a trusted time-stamp counter signature. Many build servers are behind fire walls and you might need to set up a proxy to get internet connectivity. install4j will try to auto-detect the proxy

information. If that fails, the IDE will ask you for proxy information, but the command line builds will not ask for user-input in order to avoid hanging builds due to temporary internet connectivity problems.

For command line builds, you can pass the following VM parameters to the command line compiler:

- -DproxySet=true
- -DproxyHost=[host name]
- -DproxyPort=1234
- -DproxyAuth=true
- -DproxyAuthUser=[user name]
- -DproxyAuthPassword=[password]

The authentication parameters are optional, only the first 3 parameters are required to set up a proxy.

If you pass these parameters to the command line compiler, you have to prefix them with "-J" (such as -J-DproxySet=true) to mark them as VM parameters. In the ant task [p. 357] , use nested "vmParameter" elements to pass the above parameters (without the "-J" prefix).

A.1.15 Styling Of DMGs On MacOS

Introduction

On macOS, software is usually delivered as a DMG. DMG stands for "Disk image" and contains a file system that can be mounted, rather than an archive that can be extracted. When the user double-clicks on a DMG file in the Finder, it is mounted to `/Volumes/[volume name]` and a new Finder window is opened for the mount point.

The Finder can by styled on a per-directory basis and the information about that styling is saved to a file named `.DS_Store` in every directory. This means that you can ship styling information with a DMG file. Styling includes setting a background image for the Finder window and that image file can be added to the DMG as well.

For single bundle GUI applications, a styled DMG generally includes a symbolic link to `/Applications` in the top-level folder of the DMG, so that user can drag the application bundle into the default installation directory with minimum effort.

install4j allows you to add any number of files and symbolic links to the DMG. All macOS media file types have a step named "Additional files in DMG" as a sub-step of the "Installer options" step. Here, you can add the top-level `.DS_Store` files, a background image and the symlink to `/Applications`.

Step-By-Step Instructions

To create your `.DS_Store` file, please follow the steps below. You will need a Mac with macOS 10.7+ and an installation of install4j on that machine.

1. **Compile DMG**

   The first step is to compile your macOS media file from install4j - without any custom styling. This DMG will be the template for which we will define the style. You cannot use just any other DMG, because each media file has a unique ID. When using background images, the `.DS_Store` file must have been created for a DMG with the same ID, otherwise the image will not be found reliably.

   When you recompile the media file in install4j, this ID remains the same, so you can add the `.DS_Store` file from a previously compiled DMG to the additional DMG files in the media wizard.

2. **Convert the read-only DMG to a writable DMG**

   The generated DMG is a read-only image. In order to make any modifications at all, we have to convert the DMG to a writable format.

   First, make sure that the DMG is not mounted. In a terminal, cd to the directory where the DMG was created and execute

   ```
   hdiutil convert hello.dmg -format UDRW -o hello_rw.dmg
   ```

   where "hello" has to be replaced by the actual name af your media file. Note that the last argument has "_rw" appended at the end, because the output DMG must be different from the input DMG.

3. **Enlarge the writable DMG**

   By default, a DMG generated by install4j is full. It is not possible to add any more files simply because the file system in it has no more available space. To enlarge the DMG, we first determine its current size by executing

   ```
   hdiutil resize hello_4_0_rw.dmg
   ```

The "cur" column of the output shows the number 512-byte sectors. To add about 10 MB, we add 20000 to that number and execute

```
hdiutil resize -sectors [new number of sectors] hello_4_0_rw.dmg
```

To check the new size, run

```
hdiutil resize hello_4_0_rw.dmg
```

again.

4. **Mount DMG**

   We now mount the read/write DMG by executing

   ```
   hdiutil attach hello_4_0_rw.dmg
   ```

   and note the mount point /Volumes/[volume name] that is given by the output of the above command.

5. **Copy background image to DMG**

   To add a background image, we first have to copy the image to the DMG. We do not want the image file to show up in the finder, so we create a hidden directory in the DMG. To do that, we execute

   ```
   cd /Volumes/[volume name]
   mkdir .background
   ```

   To open this hidden directory in the Finder, we execute

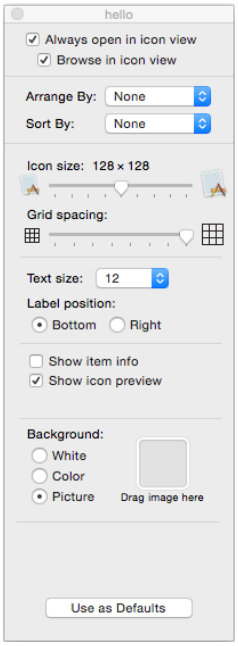
   ```
   cd .background
   open .
   ```

   Now, we open another Finder window, locate our background image and copy it to the hidden directory that is visible in the original Finder window.

6. **Select background image for DMG top-level folder**

   Since we need the Finder with the hidden directory in a minute, we leave it as it is, and double-click on the mounted volume on the desktop to open the default Finder window for the DMG. We position the new Finder window side-by side with the Finder window that shows the hidden directory.

   To start changing styles, we invoke `View->Show View Options`. This will show a tool window with styling controls. In the "Background" section, we choose "Picture" and notice the drop target for a picture file.



Now we have to perform a somewhat tricky operation. From the Finder window that shows the hidden directory, we drag the image to the mentioned drop target in the view options dialog without activating that Finder window (otherwise the view options dialog would change its target folder).

Finally, we see can see the background image applied to our read/write DMG.

7. **Adjust DMG finder window**

   Two properties of the Finder window should be adjusted: Invoke `View->Hide Toolbar` and resize the window so that it fits the size of the background image.

8. **Add link to /Applications for single-bundle archives**

   If you have a single-bundle archive media file type, you probably want to add a drop-target for the installation. In the terminal, we execute

   ```
   cd /Volumes/[volume name]
   ln -s /Applications " "
   ```

   This creates a link with an empty name that immediately shows up in the Finder window. The empty name is a good strategy to get around localization issues. The Applications folder has a special icon and is easily recognizable, so a name is not necessary.

9. **Adjust icons**

   Now you can position the icons as needed and adjust the "Icon size" property in the view options dialog until they fit with your background image.

10. **Extract .DS_Store file**

    The result of your work above is the `.DS_Store` file in the top-level folder of the DMG. Go to the terminal and copy it to your project folder so that you can reference it in the install4j IDE:

    ```
    cp .DS_Store [project folder]/DS_Store
    ```

    Note that we have omitted the leading dot before DS_Store in the target path. This makes it easier to work with the file and prevents confusion with the Finder.

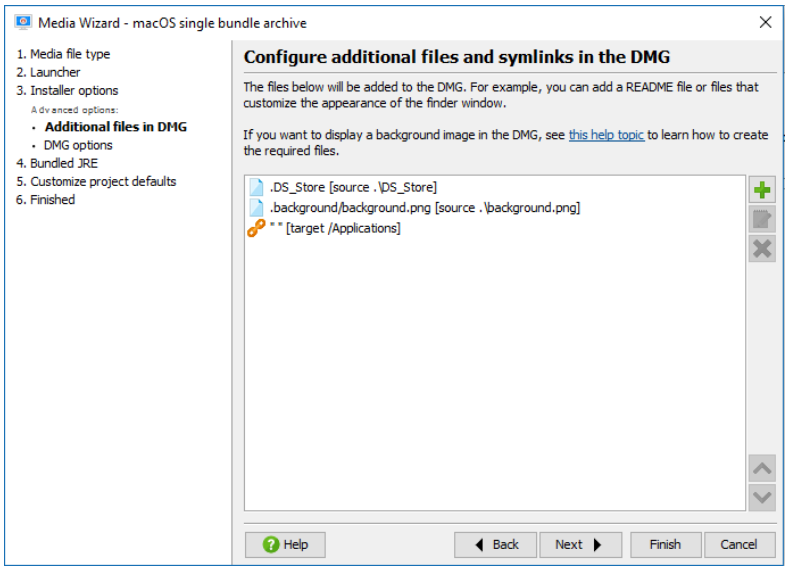
At this point, our work with the read/write DMG is finished. We should now delete it and also remove it from the Trash. If we don't do this, subsequent tests will automatically mount this DMG again. This is due to the "alias" feature in macOS. The .DS_Store contains an alias to the configured background image and as long as the original DMG still exists somewhere, it will open it from the template DMG instead of from the newly generated DMG.

Configuring The Media File

In the media file wizard of the install4j project, we can now use the generated `.DS_Store` file. On the "Installer Options->Additional files in DMG" step we enter the `[project folder]/DS_Store` and give it the name `.DS_Store` in the DMG.

The background image is added with the name `.background/[image name with extension]` where the image name must be the same as on the read/write DMG. The `.background` folder will be created automatically.

If you have added a symbolic link to `/Applications`, you can add a corresponding symbolic link entry here, the name should also be set to the same name as in the read/write DMG. An empty name is entered as " " (with the quotes).



With the above files and symbolic links the DMG, a newly generated DMG will look the same as the read/write DMG where the styling was added. When you tweak your styling in the future, you don't start from zero but with the styles that are already present in the generated DMG.

A.2 Generated Installers

A.2.1 Installer Modes

Introduction

Installers generated by install4j can be run in three modes:

- **GUI mode**

  The default mode for installer and uninstaller executables is to display a GUI installer or uninstaller.
- **Console mode**

  If the installer is invoked with the `-c` argument, the interaction with the user is performed in the terminal from which the installer was invoked. The same applies to the uninstaller.
- **Unattended mode**

  If the installer is invoked with the `-q` argument, there is no interaction with the user, the installation is performed automatically with the default values. The same applies to the uninstaller.

The screen flow and the action sequence is executed in the same way for all three modes. If some actions or screens should not be traversed for console or unattended installations, you can use the methods `context.isConsole()` and `context.isUnattended()` in their "Condition expression" properties.

Also see the command line options [p. 67] reference for installers.

GUI mode

In GUI mode the keyboard shortcut `CTRL-SHIFT-L` shows the log file in the Explorer on Windows, in the Finder on macOS and in the file manager on Linux/Unix. This shortcut is not advertised to the user, but you can communicate it to the user for debug purposes.

Console mode

Installers generated by install4j can perform console installations, unless this feature has been disabled in the application configuration [p. 148] of the Installer step [p. 144] . In order to start a console installation, the installer has to be invoked with the `-c` argument.

All standard screens in install4j present their information on the console and allow the user to enter all information as in the GUI installer. Not all messages in the GUI installer are displayed to the console installer, for each screen the subtitle is displayed as the first message. All standard screens in install4j have a question as their subtitle, if you add customizable screens to the screen sequence [p. 145] , you should phrase their subtitles as questions in order to create a consistent user experience for the console installer.

Also, form screens [p. 248] are fully mapped to console installers, each form component is displayed on the console, form components that expect user input will allow the users to modify or enter values.

On Microsoft Windows the information of whether an executable is a GUI executable or a console executable has to be statically compiled into the executable. Installers are GUI executables, otherwise a console would be displayed when starting the installer from the explorer. This is also the reason why the JRE supplies both the `java.exe` (console) and the `javaw.exe` (GUI) on Windows.

A GUI executable can attach to a console from which it was started, though. GUI executables are started in the background by default, therefore you have to use the start command like this to start it in the foreground and be able to enter information:

```
start /wait installer.exe -c
```

On older Windows versions a new console is opened.

If you develop new screens or form components, you have to override the method

```
boolean handleConsole(Console console) throws UserCanceledException
```

Displaying default data on the console and requesting user input is made easy with the `Console` class that is passed as a parameter.

Unattended mode

Installers generated by install4j can perform unattended installations, unless this feature has been disabled on the application configuration [p. 148] of the Installer step [p. 144] . In order to start an unattended installation, the installer has to be invoked with the `-q` argument. The installer will perform the installation as if the user had accepted all default settings.

There is no user interaction on the terminal. In all cases, where the installer would have asked the user whether to overwrite an existing file, the installer will not overwrite it. You can change this behavior by passing `-overwrite` as a parameter to the installer. In this case, the installer will overwrite such files. For the standard case, it is recommended to fine-tune the overwrite policy [p. 110] in the distribution tree instead, so that this situation never arises.

The installer will install the application to the default installation directory, unless you pass the `-dir` parameter to the installer. The parameter after `-dir` must be the desired installation directory. Example:

```
installer.exe -q -dir "d:\myapps\My Application"
```

For the unattended mode of an installer, response files [p. 71] are an important instrument to pre-define user input.

On Windows, the output of the installer is not printed to the command line for unattended installation. If you pass the `-console` parameter after the `-q` parameter, a console will be allocated the displays the output to the user. This is useful for debugging purposes.

If the installation was successful, the exit code of the installer will be `0`, if no suitable JRE could be found it will be 83, for other types of failure it will be `1`.

If you develop new screens or form components, you have to override the method

```
boolean handleUnattended()
```

in order to support unattended installations.

A.2.2 Command Line Options For Generated Installers

Installers generated by install4j recognize the following command line parameters:

Name	Explanation
-h or -help or /?	Show help for common command line parameters. This will be shown in a message box, regardless of the default execution mode. If the GUI display fails, it will be printed on the console.
-manual	This option applies to Microsoft Windows only. The default JRE search sequence [p. 73] will not be performed and bundled JREs will not be used either. The installer will act as if no JRE has been found at all and display the dialog that lets you choose a JRE or download one if a JRE has been bundled dynamically. If you locate a JRE, it will be used for the installed application. On Unix, you can define the environment variable INSTALL4J_JAVA_HOME_OVERRIDE instead to override the default JRE search sequence.
-c	Executes the installer in the console mode [p. 65] .
-q	Executes the installer in the unattended mode [p. 65] .
-g	Forces the installer to be executed in GUI mode [p. 65] . This is only useful if the default execution mode [p. 148] of the installer has been configured as console mode or unattended mode.
-console	If the installer is executed in unattended installation mode [p. 65] and -console is passed as a second parameter, status messages will be printed on the console from which the installer was invoked.
-overwrite	Only valid if `-q` is set. In the unattended installation mode [p. 65] , the installer will not overwrite files where the overwrite policy [p. 110] would require it to ask the user. If `-overwrite` is set, all such files will be overwritten.
-wait [timeout in seconds]	Only valid if `-q` is set. In the unattended installation mode [p. 65] , the installer will perform the installation immediately. On Windows, this can lead to locking errors if the installer is called by an updater or by a launcher. If -wait is specified, the installer application will wait until all installed launchers and installer applications (including the updater) have shut down. If this does not happen

Name	Explanation
	until the specified timeout, the installer application exits with an error message.
-dir [directory]	Only valid if `-q` is set. Sets a different installation directory for the unattended installation mode [p. 65] . The next parameter must be the desired installation directory. The directory can be absolute or relative. If it is relative, it will be resolved relative to the media file.
-splash [title]	Only valid if `-q` is set. Instead of being completely quiet in unattended installation mode [p. 65] , a small window with a progress bar and the specified title will be shown to inform the user about the progress of the installer application. This is useful if you start the installer application programmatically and do not require user input.
-Dinstall4j.nolaf=true	Do not set the native look and feel but use the default. In some very rare cases, the Windows look and feel with the classic theme (Windows 2000-like appearance) is broken and prevents the use of the installer or any other Java GUI application. Switching to the default Windows theme solves this problem. Alternatively, passing this parameter to the installer will prevent the native look from being set.
-Dinstall4j.debug=true	By default, install4j catches all exceptions, creates a "crash log" and informs the user about the location of that log file. This might be inconvenient when debugging an installer, so this system property switches off the default mechanism and exceptions are printed to stderr.
-Dinstall4j.keepLog=true or -Dinstall4j.alternativeLogfile=[path]	install4j creates a log file prefixed `i4j_log` for all installations and uninstallation in your temp directory. This log file can be helpful for debugging purposes. If your installer contains an "Install files" action and terminates successfully the log file is copied to `[installation dir]/.install4j/installation.log`, otherwise it will be deleted after the installer or uninstaller terminates by default. With the `-Dinstall4j.keepLog=true` option, the log file won't be deleted in this case. With the `-Dinstall4j.alternativeLogfile=[path]` the log file will be copied to the file specified with `[path]`. This should be an absolute path name.

Name	Explanation
	Note that both options have no effect if the log file has already been copied to the installation directory.
-Dinstall4j.logToStderr=true	In addition to the log file created by the installer or uninstaller, you can duplicate all log messages to stderr with this argument.
-Dinstall4j.logEncoding=[character set name]	By default, the installer will write the log file in the default encoding of the system where the installer is running. Should you wish to choose a different encoding you can pass this VM parameter to the installer. Some common character set names are • UTF-8 • ISO-8859-1 • US-ASCII • UTF-16LE • UTF-16 Most JREs support a large number of char sets. You can execute `java.nio.charset.Charset.availableCharsets()` to check the names of supported character sets for your JRE.
-Dinstall4j.suppressStdout=true	In unattended mode, status messages of actions that are displayed in the installer are printed on stdout. To suppress those messages, you can set this VM parameter.
-Dinstall4j.detailStdout=true	In unattended mode, detailed messages regarding file installations are not printed on stdout. To enable those messages, you can set this VM parameter.
-Dinstall4j.suppressUnattendedReboot=true	In unattended mode, a reboot may be undesirable. To prevent reboots, you can set this VM parameter.
-Dinstall4j.showProxyConfig=true	If an action that downloads a file is present in the installer, show the proxy configuration dialog for the first such action before the connection is attempted. This can be useful to edit cached proxy information that is working but should be changed for testing purposes. If the connection fails, the proxy dialog will be displayed in any case regardless of this option.
-Dinstall4j.clearProxyCache=true	Clear the proxy information cached by install4j. This can be useful for testing purposes. On Windows, the proxy information by the default

Name	Explanation
	browser may be loaded again automatically after the cache is cleared.
-Dinstall4j.noProxyAutoDetect=true	Do not try to automatically detect proxy information from browser configurations.
-Dinstall4j.language=[ISO code]	Overrides the language selection for a multi-language installer. The language selection dialog will not be displayed in this case, unless the specified language is not included in the installer.
-Dsun.locale.formatasdefault=false	Forces the installer locale to be detected from the Display language setting set in Windows Region and Language Control Panel. If this option isn't specified, the locale will be detected from the Format setting.
-D`propertyName=value`	You can set further arbitrary system properties with the standard command line parameter.
`-J[VM parameter]`	Specifies a VM parameter (e.g. `-J-Xmx512m`). Can be cited more than once.
-V`variableName=value`	You can set arbitrary installer variables with the -V parameter. The variable name should be used without prefix, so if you have a variable called ${installer:variableName} in the GUI the parameter would be -VvariableName=value. The variable will be a String object.
-varfile [fileName]	Alternatively, you can specify a property file containing the variables you want to set. The variable names should be used without prefix, too, so if you have a variable called ${installer:variableName} in the GUI the entry would be variableName=value. The variables will be String objects. This option shares the same mechanism with response files [p. 71] .

On macOS, you can use the INSTALL4J_ARGUMENTS environment variable to pass arguments to the installer.

On Unix, the environment variable INSTALL4J_TEMP determines the base directory for self-extraction. If the environment variable is not set, the parent directory of the installer media file is used.

A.2.3 Response Files

Introduction

With a response file you can change the default user selection in all screens. A response file is a text file with name value pairs that represent certain installer variables. All screens provided by install4j ensure that they write all user selections to appropriate installer variables and bind their user interface components to these variables. This includes form screens [p. 248] .

Installer variable values are of the general type `java.lang.Object`. In a response file, only variables with values of certain types are included: The default type is `java.lang.String`. In addition the types `java.lang.Boolean`, `java.lang.Integer`, `java.util.Date`, `java.lang.String[]` and `int[]` are supported. In order to let the installer runtime know about these non-default types, the variable name in the response file is followed by a '$' sign and an encoding specifier like 'Integer' or 'Boolean'.

Response file variables are variables that have been registered with `context.registerResponseFileVariable(...)` in the installer. All variables that are bound to form components are automatically registered as response file variables. Also, system screens register response file variables as needed to capture user input.

All installer variables live in the same name space. If you use an installer variable more than once for different user inputs, the response file only captures the last user input and may lead to erroneous behavior when the installer is run with a response file. If you would like to optimize your installers for use with a response file, you have to make sure that the relevant variable names are unique within your installer.

A response file can be used to

- Configure the installer for unattended execution mode
- Change the default settings in the GUI and console installer
- Get additional debugging information for an installation

When applying a response file to an installer, all variable definitions are translated into installer variables [p. 28] . The response file shares the same mechanism with the variable file offered by the -varfile [p. 67] installer option. You can add the contents of a response file to a variable file and vice versa.

Generating response files

There are two ways to generate a response file:

- A response file is generated automatically after an installation is finished. The generated response file is found in the `.install4j` directory inside the installation directory and is named `response.varfile`. When you request debugging information from a user, you should request this file in addition to the installer log file.
- install4j offers a "Create a response file" action [p. 177] that allows you to save the reponse file to a different file in addition to the automatically generated response file. Here, you can also specify variables that you would not like to be included in the reponse file. Together with an appropriate form component on the "Additional confimations" screen you can query the user whether to create such a response file or not.

Applying response files

When an installer is executed, it checks whether a file with the same name and the extension **.varfile** can be found in the same directory and loads that file as the response file. For example,

if an installer is called `hello_setup.exe` on Windows, the response file next to it has to be named `hello_setup.varfile`.

You can also specify a response file explicitly with the -varfile [p. 67] installer option.

Response files work with all three installer modes [p. 65] , GUI, console and unattended.

Response file variables

The variables that you see in the response file exist at runtime independently of the response file. You can use these installer variables to access or change user selections on system screens. For example, the "Create program group" screen on Windows binds the user selection for the check box that asks the user whether to create the program group for all users to the variable **sys.programGroup.allUsers**. To access the current user selection from somewhere else, you can use the expression

```
context.getBooleanVariable("sys.programGroup.allUsers")
```

To change that selection, you can invoke

```
context.setVariable("sys.programGroup.allUsers", Boolean.FALSE)
```

A.2.4 How Installers Find A JRE

Installers generated by install4j are native and can start running without a JRE. However, the installer itself requires a JRE in order to perform its work and so the first action of the installer is to locate a JRE that is suitable for both the installer and your application. In this process it performs the following steps:

- **Look for a statically bundled JRE**. If a statically bundled JRE is included with the installer, it will unpack it and use it. First, this JRE is unpacked to a temporary directory, later it is copied to a location that depends on whether the bundled JRE is configured as shared or not.

  - **Not shared**

    It is copied to the `jre` directory in the installation directory of your application. No other installer generated by install4j will find this JRE. It will not be made publicly available (e.g. in the Windows registry).

  - **Shared**

    It is copied to the `i4j_jres` directory in a common folder which depends on the operating system:

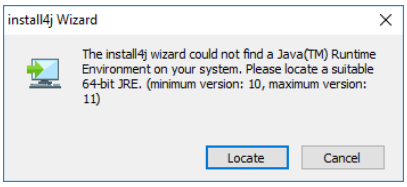
    - `C:\Program Files\Common Files` on Microsoft Windows with an English locale.
    - `/opt` if it exists, otherwise `/usr/local` on Unix.

    If the above folder is not writable, the `i4j_jres` directory will be created in the use home directory and the shared JRE will only be shared for the current user.

    Other installers generated by install4j will find this JRE. It will not be made publicly available (e.g. in the Windows registry). For each Java version, only one such JRE can be installed. Shared JREs are never uninstalled.

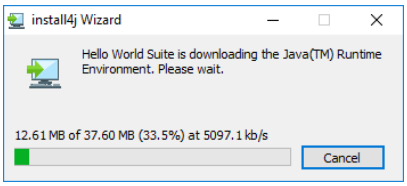
  Your application will also use the JRE selected by the installer.

- **Look for a suitable JRE in the configured search sequence**. The installer uses the same search sequence and Java version constraints as your launchers which are configured for the entire project [p. 89] . The most important search sequence element in this respect is the "Search Windows registry and standard locations" entry. On Microsoft Windows the registry contains information on installed JREs, on Unix platforms there is a number of standard locations which are checked, on macOS the location of installed JREs is always the same.
- If no JRE has been found, the installer notifies the user



  and offers the following options:

  - Download a dynamically bundled JRE



as configured in the Bundled JRE [p. 336] step of the media wizard [p. 329] .

- Manually locate a JRE
- Cancel the installation

You can force the installer to skip the first two steps and show this dialog immediately with the `-manual` command line parameter [p. 67] .

A.2.5 File Downloads

Actions that perform file downloads

Several actions can perform a file download, including

- the "Install files" action as it downloads installation components that have been marked as "Downloadable" provided that the data files option has been set to "Downloadable" as well in the media file wizard
- the "Check for updates" action as it downloads the update descriptor "updates.xml" from the specified web server in order to check if there is a new version available
- the "Download file" action as it downloads the specified file from the web server

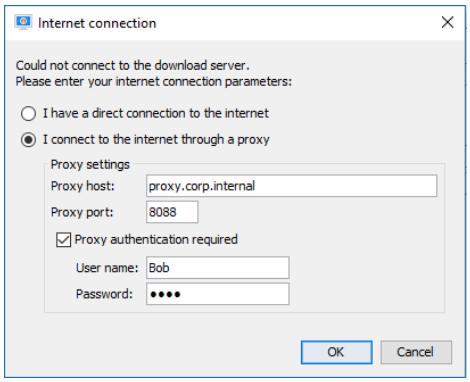
Both HTTP and HTTPS connections are supported. HTTPS requires that at least a 1.4 JRE is used for the installer.

When creating an HTTP connection to the requested resource there are three different concerns that may require user interaction: Proxy selection, proxy authentication and server authentication.

Proxy selection and authentication

On Windows, the installer will try to obtain the proxy settings of the default browsers and use them for the HTTP connection. If no such proxy information is available, a direct connection will be made. If the direct connection fails, a proxy dialog will be opened that allows the user to enter the proxy or edit the cached information.

If the proxy requires credentials, the user can enter the credentials in the same dialog. All user input on this dialog will be cached, except for the password. The password has to be re-entered every time the installer is run. If there are several download actions in the same installer, the password has to be entered just once.



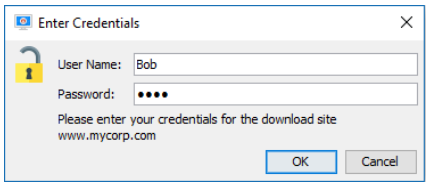
This proxy information will be cached globally for all installers created by install4j. If the proxy requires a password, the above proxy dialog will be displayed the first time a connection is made in the installer. To clear the cached proxy information for testing purposes, you can start the installer with the argument `-Dinstall4j.clearProxyCache=true`. If the proxy information can be taken from the default browser, that data is applied again after the previously cached information has been cleared. Also, you can force the proxy dialog to be shown for testing purposes by passing the argument `install4j.showProxyConfig=true`. This allows you to specify a proxy even if the direct connection succeeds.

If a selected proxy is not available, the installer will fall back to a direct connection. If the proxy is available and the password is wrong, the proxy dialog will be shown again.

Entering proxy data is supported in console mode as well. In unattended mode there is no user interaction, so the proxy information has to be given as arguments to the installer. The standard Java properties for proxy configuration have to be used for that case: `-DproxySet=true`, `-DproxyHost=[host name]` and `-DproxyPort=[port number]`. If the proxy requires credentials, you have to specify `-DproxyAuth=true`, `-DproxyAuthUser=[user name]` and `-DproxyAuthPassword=[password]` as well.

Server authentication

The download URL can be password protected. In this case, the user has to supply a user name and password.

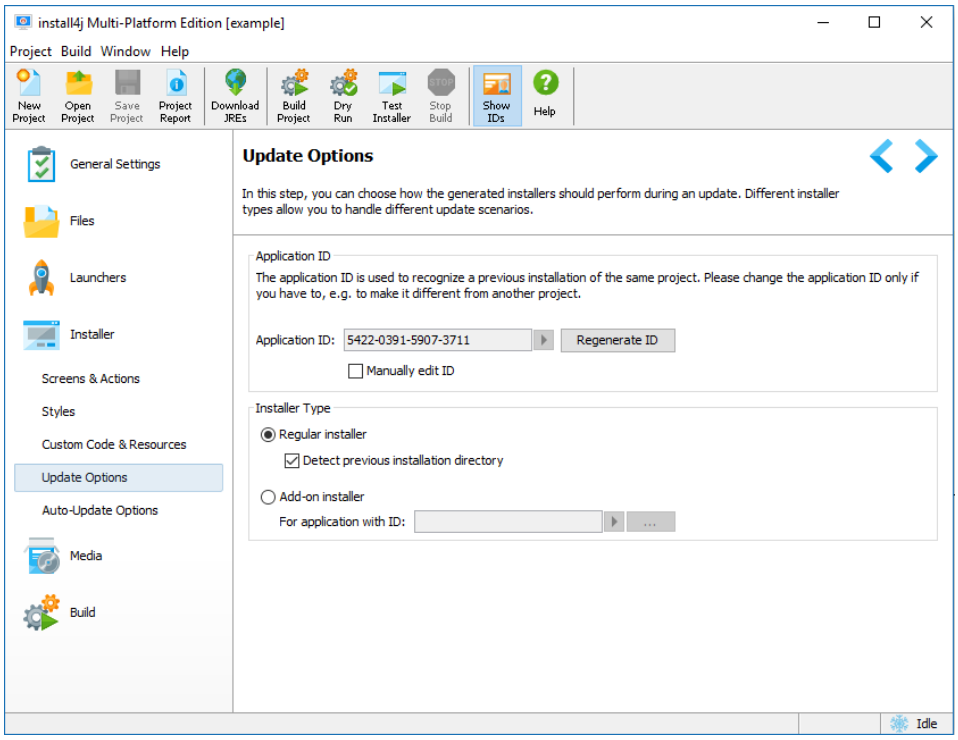


Neither the user name nor the password is cached by install4j. In unattended mode you have to pass the arguments `-DserverAuthUser=[user name]` and `-DserverAuthPassword=[password]`. You can set these system properties via `System.setProperty("serverAuthUser", "[user name]")` and `System.setProperty("serverAuthPassword", "[password]")` if you want to hard-code the credentials or if you have another source for obtaining the credentials.

A.2.6 Updates

Introduction

Installers generated by install4j actively handle updates. On the Update Options [p. 315] tab in the installer section, you can configure how an installer should behave in the event of an update. An update occurs when the user installs an application into a directory where an installation with the same application id already exists.



Typically, minor upgrades of an application should be installed into the same directory as earlier installations. The default behavior of install4j is to suggest the previous installation directory and program group, so that the user is guided into installing the application into the same directory. If this behavior is not desired, you can switch off these suggestions or change the application id [p. 315] .

Updates into the same installation directory

The following points are of interest with respect to updates into the same installation directory:

- Generated installers will refuse to install on top of installations with a different application ID by default. You can change this behavior on the "Installation location" screen.

  Note: installers generated with install4j <= 3.0.x do not have an application ID, it is always possible to install on top of such an installation.
- Generated installers will detect if any of the previously installed launchers are still running and will ask the user to shutdown these applications. This happens when the "Install files" action is executed.
- Deployed services will be stopped and uninstalled before the installation. This happens when the "Install files" action is executed. You can optionally stop your services earlier with the "Stop a service" action if your update process requires it.

- During an update, the installation databases will be merged, so that files, menu entries, file associations, etc. of old installations can still be uninstalled when the uninstaller is executed.
- After an update, only the (optional) uninstall actions of the newer installation will be executed when the uninstaller is executed. However, the auto-uninstall actions from previous installations will be executed, too (for example the uninstallation of a service that is automatically registered by an "Install service" action during installation).

If you would like to uninstall the previous installation before installing any new files, you can add the "Uninstall previous installation" action before the "Install files" action. In this context, the uninstallation policies [p. 110] that exclude updates are of interest. With these uninstallation policies you can preserve certain files for updates, but uninstall them when the user manually invokes the uninstaller. The uninstaller invoked by the "Uninstall previous installation" action is running in unattended mode. You can use `context.isUninstallForUpgrade()` to exclude certain actions for an update uninstaller.

Add-on installers

For distributing enhancements and patches, install4j offers the add-on installer type that can be configured on the Update Options [p. 315] tab in the installer section.

An add-on installer will only install on top of an installation of a specified application id. It does not have a separate uninstaller.

A.2.7 Error Handling

Debugging on Windows

On Windows, when an installer is executed it always generates a log file in the temp directory that contains information about the JRE search sequence and can be used for debugging purposes. The name of the log file starts with `i4j_nlog_`. If you have a problem with JRE detection or the installer startup, please send this log file along with your support request.

It is also possible to generate this log for the JRE detection of the generated Windows launchers. In order to switch on logging, please define the environment variable `INSTALL4J_LOG=yes` and look for the newest text file whose name starts with `i4j_nlog_` in the temp directory. This is done silently, without notifying the user and is also suitable for situations where launchers are called automatically or repeatedly.

An easier way for a user to create a log file is to start the launcher with the `/create-i4j-log` argument. The launcher will notify the user where the log is created and will offer to open an explorer window with the log file selected. After the message box, the launcher will continue to start up.

Debugging on macOS

Similar to Windows, macOS launchers also support the `INSTALL4J_LOG=yes` environment variable definition for debug logging. Rather than writing a log file, they write to the system log. You can display the system log by starting the "Console" application which is located in `/Applications/Utilities`.

Setting the environment variable can be done by opening a terminal and executing

```
launchctl setenv INSTALL4J_LOG=yes
```

Then all newly started applications in the Finder will have this environment variable set. The current terminal will not have it set until you quit the Terminal application and start it again.

Rather than setting the environment variable for all install4j launchers, you can set it for a particular invocation only. To do that, call the `Contents/MacOS/JavaApplicationStub` inside the application bundle and prefix the call with the definition of the environment variable. For an application bundle "MyApp.app", the call looks like this:

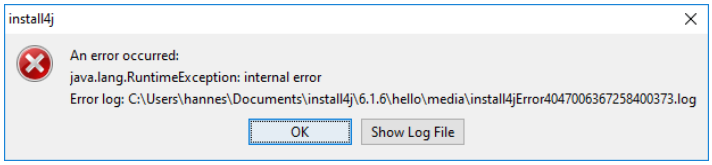
```
INSTALL4J_LOG=yes MyApp.app/Contents/MacOS/JavaApplicationStub
```

In this case, the log output will also be written to the terminal. Using `/usr/bin/open` will not work with this technique, since the latter gets the environment variables from the Finder.

Note that logging only works for GUI launchers and not for command line and service launchers which are implemented as Unix shell scripts. Also, launchers for the Apple JRE (Java 6) do not support logging. There is no command line argument that activates logging, like on Windows.

Error logs

If an exception is thrown in the installer, it prepares an error log and informs the user about its location



You can force the installer to print exceptions to stderr for debugging purposes with the `-Dinstall4j.debug=true` command line option [p. 67] .

Installation log

Additionally, all installers and uninstaller generate an installation log that can be used for debugging purposes. After a successful installation it is located in `[installation dir]/.install4j/installation.log`. For uninstallation or if the end of the installation cannot be reached, you can find it in your temp directory if you pass `-Dinstall4j.keepLog=true` to the installer or uninstaller. The file is prefixed `i4j_log`. If you would like the installer to log to stderr as well, you can pass `-Dinstall4j.logToStderr=true` to the installer. Both arguments can also be useful for debug installers and uninstallers, where they have to be passed as VM parameters.

Error handling of Actions

You can define the error handling for every installation or uninstallation action separately. Please find more information in the Screens and Actions help topic [p. 11] .

Return values

The process of an installer returns `0` if the installation was completed successfully, `1` if the installation fails and 83 if the installer could not find a suitable JVM to run. These exit codes are especially useful to check the result of an unattended installer run [p. 65] .

A.3 Extending Install4j

A.3.1 Developing With The Install4j API

Introduction

There are two different circumstances where you might want to use the install4j API: Within expression/script properties [p. 320] in the configuration GUI and for the development of custom elements in install4j. The development of custom elements in install4j is rarely necessary for typical installers, most simple custom actions can be performed with a "Run script" action and most custom forms can be realized with a "Customizable form" screen.

If you would not like to miss your IDE while writing more complex custom code, you can put a single call to custom code into expression/script properties. The location of your custom code classes must be configured [p. 312] , so install4j will package it with the installer and put in into the class path. In this way you can completely avoid the use of the interfaces required to extend install4j.

When you want to use install4j classes within your IDE, you can add `$INSTALL4J_HOME/resource/i4jruntime.jar` to your classpath (in your IDE). Do not distribute this jar file with your application, install4j will handle this for you.

Expression/script properties

Using expression/script properties in install4j is required for wiring together screens and actions [p. 11] as well as for the conditional execution of screens and actions. The most important element in this respect is the **context** which is an instance of

- **com.api.install4j.context.InstallerContext**
  in an installer
- **com.api.install4j.context.UninstallerContext**
  in an uninstaller

The context allows you to query the environment and the configuration of the installer as well as to perform some common tasks.

Please see the documentation of the com.install4j.api.context package for the complete documentation of all methods in the context. Some common applications include:

- **Setting the installation directory**
  By using `context.setInstallationDirectory(File installationDirectory)` in the installer context, you can change the default installation directory for the installer. Typically, this call is placed into a "Run script" action on the "Startup" screen.
- **Getting and setting installer variables**
  The `getVariable(String variableName)` and `setVariable(String variableName, Object value)` methods allow you to query and modify installer variables. Note that besides the "Run script" action, there is also a "Set a variable action" where you don't have to call `setVariable` yourself.
- **Conditionally executing screens or actions**
  Often, condition expressions for screens and actions check the values of variables. In addition, the context provides a number of boolean getters that you can use for conditionally executing screens and actions depending on the installer mode and environment. These methods include `isConsole()`, `isUnattended()` and others.

- **Navigating between screens**

  Depending on the user selection on a screen, you might want to skip a number of screens. The `goForward(...)`, `goBack(...)` and `goBackInHistory(...)` methods provide the easiest way to achieve this.

Many other context methods are only useful if you develop custom elements for install4j.

Also have a look at the `com.install4j.api.Util` class which offers a number of utility methods that are useful in expression/script properties.

Developing custom elements for install4j

For a general overview on how to start developing with the install4j API, how to set up your IDE and how to debug your custom elements, please see the API overview in the javadoc.

install4j provides three extension points:

- Actions [p. 177]

  Please see the documentation of the com.install4j.api.actions package for the complete documentation on how to develop actions.
- Screens [p. 163]

  Please see the documentation of the com.install4j.api.screens package for the complete documentation on how to develop screens.
- Form components [p. 248]

  Please see the documentation of the com.install4j.api.formcomponents package for the complete documentation on how to develop form components.

All actions, screens and form components in install4j use this API themselves. To make your custom elements selectable in the install4j IDE, you first have to configure the custom code locations [p. 312] . When you add an action, screen or form component, the first popup gives you the choice on whether to add a standard element or search for suitable elements in your custom code [p. 318] .

If you use your custom code in multiple projects, consider packaging an install4j extension [p. 84] , which displays your custom elements alongside the standard elements that are provided by install4j and allows you to ship them easily to third parties.

Serialization

install4j serializes all instances of screens, actions and form components with the default serialization mechanism for JavaBeans that is present in Java since version 1.4 (the minimum Java version for installers).

To learn more about JavaBeans serialization, please visit

- https://docs.oracle.com/javase/8/docs/api/java/beans/XMLEncoder.html for API documentation on the long-term persistence mechanism for JavaBeans.
- http://www.oracle.com/technetwork/java/persistence4-140124.html/ for information on how to write your own persistence delegates. In your bean infos for screens, actions and form components you can specify a list of additional persistence delegates for non-default types.

Compiler variables are replaced in the serialized representation of a bean. In this way, compiler variable replacement is automatically available for all properties of type `java.lang.String`. The values of installer variables and localization keys are determined at runtime, so you have to

call the utility methods in `com.install4j.api.beans.AbstractBean` before you use the values in the installer or uninstaller. For more information on variables, please see the separate help topic [p. 28] .

A.3.2 Extensions

Introduction

All standard actions [p. 177] , screens [p. 163] and form components [p. 248] in install4j use the installer API [p. 81] themselves. With this API you can create new elements that are displayed in the standard registries [p. 319] by packaging a JAR file with a few special manifest entries and putting that JAR file into the `extensions` directory of your install4j installation.

Configurability

An extension to install4j will likely need to be configurable by the user. install4j uses the JavaBean specification to control the user presentation of properties in the install4j IDE. Screens, actions, and form components correspond to beans in this context.

Optionally, you can add BeanInfo classes. In essence, a BeanInfo class next to the bean itself describes which properties are editable and optionally gives details on how they should be presented. Please see the documentation of the com.install4j.api.beaninfo package for the complete documentation on how to develop BeanInfo classes. Also, the `$INSTALL4J_HOME/samples/customCode/src` directory contains a sample action with the associated BeanInfo class.

JAR manifest

In order to tell install4j which classes are screens, actions or form components, you have to use the following manifest keys:

- **Install-Action**
  for actions implementing `com.install4j.api.actions.InstallAction`
- **Uninstall-Action**
  for actions implementing `com.install4j.api.actions.UninstallAction`
- **Installer-Screen**
  for screens implementing `com.install4j.api.screens.InstallerScreen`
- **Uninstaller-Screen**
  for screens implementing `com.install4j.api.screens.UninstallerScreen`
- **Form-Component**
  for form components implementing `com.install4j.api.formcomponents.FormComponent`
- **Style-Component**
  for form components implementing `com.install4j.api.formcomponents.FormComponent` that should also be available in styles. Such form components should not take any user input because they will have a different life-cycle in styles than in screens.

Please note that usually you do not implement these interfaces yourself, but rather extend one of the abstract base classes.

A typical manifest with one action and one screen looks like this:

```
Depends-On: driver.jar common.jar

Name: com/mycorp/actions/MyAction.class
Install-Action: true

Name: com/mycorp/screens/MyScreen.class
Installer-Screen: true
Uninstaller-Screen: true
```

Note: If you only have named sections and no global section in your manifest file, the first line must be an empty line since it separates the global keys from the named sections.

The `Depends-On` manifest key can specify a number of relative JAR files separated by spaces that must be included when the extension is deployed. That key can also occur separately for each named section.

As you see in the example for the screen, each class can have multiple keys if the appropriate interfaces are implemented.

Localization

Extensions can provide localized messages. During development, you can keep these messages in the custom localization file of the project that you use for testing purposes. When packaging the extensions, these custom localization files have to be given special names and be put into a particular location in the extension JAR file.

The names of the extension localization files have to be the same as those of the system localization files in the `$INSTALL4J_HOME/resource/messages` directory, i.e. `messages_en.utf8` and similarly for other languages. The java.util.Properties file encoding is also supported if the file name has a .properties extension, like `messages_en.properties`.

When creating the extension JAR file, all extension localization files have to be put into the directory `messages`. No special directives in the manifest are required. Dependencies included with the `Depends-On` manifest key are not scanned for extension localization files.

Extension deployment

On startup, install4j will scan the manifests of all JAR files that it finds in the `$INSTALL4J_HOME/extensions` directory. Any screens, actions or form components that are found in the manifests are added to the standard registries [p. 319] . If a bean cannot be instantiated, the exception is printed to stderr which is captured in `$INSTALL4J_HOME/bin/error.log` and no further error is displayed.

If any of those screens, actions or form components are selected by the user, the required JAR files are deployed with the generated installers. This means that installing extensions does not create an overhead for installers that do not use them.

B Reference

B.1 Steps For Configuring An Install4j Project

To learn more about install4j projects, please see the corresponding help topic [p. 7] or other help topics about concepts in install4j [p. 7] .

install4j's main window is organized into 6 steps that are required to build a set of media files. The side bar on the left as well as the forward and back buttons in the top right corner let you navigate between these steps:

- Step 1: General Settings [p. 87]

  (CTRL-1) In the **General Settings step**, you provide important information about your application and the build preferences, such as the name of your application, the JRE search sequence and the directory where the media files should be placed.
- Step 2: Files [p. 103]

  (CTRL-2) In the **Files step**, you define your **distribution tree**, that means you collect files from different places to be distributed in the generated media files. You can optionally define installation components.
- Step 3: Launchers [p. 120]

  (CTRL-3) In the **Launchers step**, you define the properties of the **native launchers** that will enable your users to start your application.
- Step 4: Installer [p. 144]

  (CTRL-4) In the **Installer step**, you configure the installer screens and actions.
- Step 5: Media [p. 326]

  (CTRL-5) In the **Media step**, you define the **media files** that will be created to distribute your application to your end users.
- Step 6: Build [p. 346]

  (CTRL-6) In the **Build step**, you start the actual generation of the media files.

B.2 Step 1: General Settings

B.2.1 Step 1: Enter General Project Settings

In the **General Settings step**, you provide important information about your application and specify project-wide build settings.

There are several tabs in this section:

- Application Info [p. 88]

  On this tab you enter information about your application, such as name and version.
- Java Version [p. 89]

  On this tab define the version requirements for the JRE that your application launchers should use as well as the detailed JRE search sequence.
- Languages [p. 91]

  On this tab define the principal language as well as other languages supported by the installer.
- Media File Options [p. 93]

  On this tab you enter general options regarding media file generation such as the output directory for media files and compression settings.
- Code Signing [p. 95]

  On this tab you configure code signing for Windows and macOS media files.
- Compiler Variables [p. 97]

  On this tab you can define compiler variables for your project.
- Merged Projects [p. 96]

  On this tab you can choose other projects that should be merged into the main project.
- Project Options [p. 98]

  On this tab you you can adjust options regarding your install4j project.

B.2.2 General Settings - Application Info

On this tab of the General Settings step [p. 87] you enter general information about your application.

Only options with bold labels have to be filled in. The available options are:

- **Full name**

  (required) the long name used in situations where there is plenty of space for displaying a name.
- **Short name**

  (required) the alternative short name for situations where there is limited space for displaying a name or where a name should be as short as possible. The short name is used to create suggestions for installation directories in the Media step [p. 326] . It may not contain spaces.
- **Version**

  (required) the version number of your application. This value can be overriden from the command line [p. 353] or the ant task [p. 357] .
- **Publisher**

  the name of your company or your own name (e.g. used for the support information dialog in the Windows control panel)
- **Publisher URL**

  the web address of your company (e.g. used for the support information dialog in the Windows control panel)

A build will not be possible until all required fields have been completed. If a required field is missing when starting a build [p. 346] , this tab will be displayed with a warning message.

B.2.3 General Settings - Java Version

On this tab of the General Settings step [p. 87] you enter the version requirements and the search sequence for the JRE or JDK that apply to your installers [p. 144] and application launchers [p. 120] .

In the `Java version` section, you can constrain the version of the Java VM.

- The **minimum Java version** must be specified. For example, enter a value of `1.8`.
- The **maximum Java version** can optionally be specified. For example, enter a value of `9.0`.

The maximum Java version can be entered with less numeric detail than the minimum Java version to prevent the use of a higher major or minor release. For example, a minimum version of 1.4.1 and a maximum version of 1.4 ensures that the highest available 1.4.x >= 1.4.1 JRE is used, but not a 1.5 JRE. Similarly, a minimum version of 1.4.1_03 and a maximum version of 1.4.1 ensures that the highest available 1.4.1 >= 1.4.1_03 JRE is used, but not a 1.4.2 JRE.

By default, JREs with a beta version number or JREs from an early access release cycle will not be used by the launcher. If you would like to enable the use of these JREs, please check the option `allow JREs with a beta version number`.

The JRE search sequence determines how install4j searches for a JRE on the target system. New configurations get a pre-defined default search sequence. install4j has a special mechanism which allows you to bundle JREs with your media files. If you choose a particular JRE for bundling [p. 336] in one of the media file wizards [p. 329] , this JRE will always be used first and you do not need to adjust the search sequence yourself.

If you have problems with JRE detection at runtime, please see the help topic on error handling [p. 79] for a description on how to get diagnostic information.

The following types of search sequence entries [p. 99] are available:

- Search registry
- Directory
- Environment variable

The control buttons on the right allow you to modify the contents of the search sequence list:

- Add search sequence entry (key `INS`)

  Invokes the search sequence entry dialog [p. 99] . Upon closing the search sequence entry dialog with the **[OK]** button, a new search sequence entry will be appended to the bottom of the search sequence list.

- Remove search sequence entry (key `DEL`)

  Removes the currently selected search sequence entry without further confirmation.

- Move search sequence entry up (key `ALT-UP`)

  Moves the selected search sequence entry up one position in the class path list.

- Move search sequence entry down (key `ALT-DOWN`)

  Moves the selected search sequence entry down one position in the class path list.

The **design time JDK** determines which JDK or JRE is used for the following purposes:

- **Code compilation**

  install4j uses a bundled eclipse compiler, so it does not need this functionality from a JDK. However it needs a runtime library against which scripts entered in the installer configuration [p. 144] are compiled. The version of that JDK should correspond to the minimum Java version for the project configured above.

  By default, the `rt.jar` runtime library of the JRE that is is used to run the install4j IDE is used for code compilation. If your minimum Java version is lower than the Java version used to run install4j, runtime errors can occur if you accidentally use newer classes and method.

- **Context-sensitive Javadoc help**

  If you configure a separate design-time JDK or JRE, you can enter a Javadoc directory to get context-sensitive Javadoc help for the runtime library in the Java code editor [p. 320] . By default, context-sensitive Javadoc help is only available for the install4j API.

- **Enhanced code completion functionality**

  If you configure a separate design-time JDK (and not a JRE), the Java code editor [p. 320] will show completion proposals for methods in the runtime library with parameter names. By default, parameter names for methods in the runtime library are not available.

The drop-down list next to the `JDK` option shows the name of all configured JDKs together with their Java versions. In order to configure a new design time JDK, select the `JDK` option, and click on **[Configure JDKs]**. This shows the Configure JDKs dialog [p. 101] .

The list of available design time JDK is saved globally for your entire install4j installation and not for the current project. The only information saved in your project is the name of the JDK configuration. In this way, you can bind a suitable JDK on another installation and on other platforms. If the JDK name saved in the project cannot be found in your install4j installation, the name will be displayed in red color with a "[not configured]" message attached. In that case, when clicking on **[Configure JDKs]**, you will be asked if you would like to configure this JDK.

A build will not be possible until all required fields have been completed. If a required field is missing when starting a build [p. 346] , this tab will be displayed with a warning message.

B.2.4 General Settings - Languages

On this tab of the General Settings step [p. 87] you define the principal language as well as additional languages supported by your installers [p. 144] .

The following options are available:

- **Principal language**

  The principal language is the language that your installer defaults to if no other supported languages match the locale at runtime.

- **Custom localization file**

  A custom localization file is text file with key-message pairs in the format of

  - **a Java properties file**

    a Java properties file has ISO 8859-1 encoding, all other characters must be represented as Unicode escape sequences, like `\u0823`.

  - **a properties file with UTF-8 encoding**

    A properties file with UTF-8 encoding has the advantage that you do not have to use escape sequences. However it might not be supported by i18n tools.

  A custom localization file can be used to

  - **override system messages**

    If any of the default messages in the installer is not appropriate for your use-case, you can change it by looking up the corresponding keys in the appropriate `$INSTALL4J_HOME/resource/messages/messages_*.utf8` file and define the same key in your custom localization file to override that message.

  - **localize your installer**

    Anywhere in the install4j IDE where you can enter text that is used at runtime, you can use custom localization keys [p. 28] , i.e. variables of the form `${i18n:myKey}`. Those keys are read from your custom localization file and offered by the variable selection dialog [p. 99] .

  If required, you can use parameters for your messages by using the usual `{n}` syntax in the value and listing the parameters in function-like manner after the key name in the variable instance. For example, if your key name is `myKey` and your message value is

  ```
  Create {0} entries of type {1}
  ```

  you can use a variable

  ```
  ${i18n:myKey("5", "foo")}
  ```

  in order to fill the parameters, so that the actual message becomes

  ```
  Create 5 entries of type foo
  ```

  However, in the context of localizing an installer this is rarely necessary.

- **Additional languages**

  With install4j, you can build multi-language installers that offer the user a choice between a number of languages. If you ✚ add languages to the additional languages table, the installer becomes a multi-language installer, otherwise is is a fixed-language installer. When you add a new language, the language selection dialog [p. 99] is displayed. A new entry is then added

to the table and you can configure the custom localization file by double-clicking on the appropriate cell.

- **Skip language selection dialog if auto-detected locale matches a supported language**

  This check box ensures that the language selection is only displayed if the installer cannot find a match between a supported language (either principal or additional language) and the auto-detected locale at runtime. By default this option is not selected and the language selection dialog is always displayed.

The principal language and the associated custom localization file can be overridden for each media file [p. 338] . In this way you can **build multiple fixed-language installers each with a different language**.

B.2.5 General Settings - Media File Options

On this tab of the General Settings step [p. 87] you enter general options regarding media file generation.

Only options with bold labels have to be filled in. The available options are:

- **Media file output directory**

  (required) the directory where the generated media files should be placed. If the project has already been saved, a relative directory will be interpreted as relative to the project file.

- **Media file name pattern**

  (required) the default rule for naming your media files. This text field should contain system compiler variables [p. 28] in order to be unique for each media file. If two media file names are equal, the build will fail. If the desired name for the media file cannot be obtained through the use of variables, you can override the media file [p. 338] name in the media wizard.

- **Convert dots to underscores**

  By default, dots ('.') will be converted to underscores ('_') when the media file name is evaluated. If you would like to keep all dots in your media file name, please de-select this option.

- **Compression level**

  The desired level of compression for your media files, chosen from a range of 1-9. "1" means least compressed and "9" means most compressed. Please note that extracting the media files will take longer for higher compression levels.

- **Use LZMA compression**

  LZMA compression achieves much better results, but is considerably slower, especially for compilation. LZMA compression is only used for installers and not for archives.

- **Use Pack200 JAR compression**

  Pack200 compression is a compression algorithm that's designed for JAR files and achieves exceptional results, especially for large JAR files. Since the Pack200 deflater is only included since JRE 1.5, this compression is only used if the minimum Java version requirement [p. 89] for your project is 1.5.

  If you have signed JAR files or JAR files that create a digest, please apply the `$JDK_HOME/bin/pack200` executable in your build process like

  ```
  pack200 --repack my.jar
  ```

  before signing the JAR files. Pack200 rearranges JAR files but the reordering is idempotent, so this pack/unpack sequence creates a stable JAR file.

  Pack200 compression can be quite slow, Pack200 decompression is relatively fast. Pack200 compression is only used for installers and not for archives.

  To avoid problems with external JAR files, you can check the "Exclude signed JARs or JARs creating digests" option. If you would like to exclude selected JAR files only, you can place an empty `*.nopack` file next to it. For example, if the jar file is named `app.jar`, then a file `app.jar.nopack` in the same directory will disable Pack200 compression for that file.

  To pass options to the packer, create a file `*.packoptions` next to the file and add one option per line. Currently, only `-P` and `--pass-file` are supported.

- **Shrink runtime**

  If selected, the runtime JAR file `i4jruntime.jar` that contains the support classes for the installer and the API will be shrunk, meaning that all unused classed will be removed. Usages from custom code and classes in generated launchers are considered during the shrinking

process. If you have Java code in external launchers that uses the API, then shrinking might lead to `ClassNotFoundException`s at runtime. In this case, please disable runtime shrinking.

Note that if you have configured merged projects [p. 96] , and one of the projects in the project tree has disabled runtime shrinking, then runtime shrinking will be disabled for the main project as well.

- **Create common data files where possible**

  If you use the "external" or "downloadable" data file settings in the Data Files [p. 334] step of the media wizard, you might want to generate common data files for different media files in order to save disk space. If this option is selected, a directory `common_files.dat` will be created in the media output directory during the compilation that holds the data files that can be used by all media files. This only works for installation components that have the same content for different media files.

- **Create files with MD5 sums for checking the integrity of data files**

  If you want to verify the integrity of downloaded data files, this option enables the generation of MD5 checksum files next to the data files. The installer will try to download the MD5 files first and check the downloaded data files against it.

A build will not be possible until all required fields have been completed. If a required field is missing when starting a build [p. 346] , this tab will be displayed with a warning message.

B.2.6 General Settings - Code Signing

On this tab of the General Settings step [p. 87] you configure code signing for Windows and macOS media files. Please read the help topic on code signing [p. 58] for detailed information on how code signing works in install4j.

The code signing settings apply to all media files [p. 327] .

If you enable code signing for Windows media files, you either have to specify .pvk and .spc files or a single .p12 (PKCS #12) file.

If you enable code signing for macOS, you have to specify a single .p12 (PKCS #12) file. You can export the private key with Apple's keychain tool as PKCS #12 file. This will include your developer certificate. install4j will add the required certificate chain automatically.

A build will not be possible until all required fields have been completed. If a required field is missing when starting a build [p. 346] , this tab will be displayed with a warning message.

B.2.7 General Settings - Merged Projects

On this tab of the General Settings step [p. 87] you can configure other projects that are merged into the main project. Please read the help topic on merged projects [p. 50] for more information.

The control buttons on the right allow you to modify the merged projects:

- Add a merged project (key `INS`)

  Invokes the merged projects edit dialog [p. 102] . If you have chosen to merge files and the merged project contains file sets that are not present in the current project, you will be asked whether you want to create the missing file sets (see below) after you close the merged projects edit dialog with the **[OK]** button.

- Edit a merged project (key `ENTER`)

  Invokes the merged projects edit dialog [p. 102] for the selected item, so that you change merge settings.

- Remove a merged project (key `DEL`)

  Removes the currently selected merged projects. If you have added links into the merged projects on the screens & actions tab [p. 145] , these links will be broken and the project will not be able to compile until you remove those broken links.

- Enable or disable merged projects (keys `ALT+Plus` and `ALT+Minus`)

  You can temporarily disable merged projects when developing your main project. If you have added links into the merged projects on the screens & actions tab [p. 145] , these links will simply be omitted.

- Synchronize file sets

  Inspects the selected file sets and suggests that missing file sets be added to the main project. This is also done when you add a merged project, but if file sets in merged projects change later on, you might want to synchronize the file sets again. File sets are displayed in the definition of the distribution tree [p. 104] . This action only checks merged projects for which you have chosen to merge files.

- Move up (key `ALT-UP`)

  Move down (key `ALT-DOWN`)

  Changes the order in the list of merged projects. The order can be significant if several projects contribute files with the same paths. Later merged projects overwrite files from earlier merged projects, so you have to move a merged project down in order to give it a higher priority. The main project always has the highest priority.

B.2.8 General Settings - Compiler Variables

On this tab of the General Settings step [p. 87] you enter compiler variables for your project.

Defining compiler variables is optional and not required for a working project. For an explanation of compiler variables, please see the help topic on variables [p. 28] .

The control buttons on the right allow you to modify the contents of the compiler variables list:

- Add variable (key `INS`)

  Adds a new variable. The variable name must be unique and must not be the name of a system variable.

- Remove variable (key `DEL`)

  Removes the currently selected variable.

- Move variable up (key `ALT-UP`)

  Moves the selected variable up one position in the variables list.

- Move variable down (key `ALT-DOWN`)

  Moves the selected variable down one position in the variables list.

In order to edit any column, please double-click on it.

B.2.9 General Settings - Project Options

On this tab of the General Settings step [p. 87] you can adjust options regarding your install4j project.

The following options are available:

- **Make all paths relative when saving the project file**

  If this option is checked, install4j will try to convert all absolute paths to relative paths when saving the project file. Relative paths are always interpreted **relative to the project file**.

  If you save your project under a different path, all relative paths will be adjusted accordingly.

  Note: for cross platform usage of a single project file enabling this option is highly recommended, since file system roots are inherently incompatible across platforms.

- **Create backup files when saving**

  If this option is checked, install4j will create a backup copy of existing project files by appending "~" to the file name.

- **Auto save every 5 minutes**

  If this option is checked, install4j will save your project file every 5 minutes. Note that if the project has never been saved before, no auto save operation will be attempted.

B.2.10 Dialogs

B.2.10.1 Search Sequence Entry Dialog

The search sequence entry dialog is shown when clicking on the add button in the Java Version tab [p. 89] of the General settings step [p. 87] . Upon closing this dialog with the **[OK]** button, a new search sequence entry will be appended to the bottom of the search sequence list on that tab.

To define a search sequence entry, you select the entry type and fill out the `Detail` section of the dialog which is dependent on the selected entry type. The following entry types are available:

- **Search registry**

  Search the Windows registry and well-known standard locations for installed JREs and JDKs by Sun Microsystems.

- **Directory**

  Look in the specified directory. This is useful if you distribute your own JRE (not one provided by install4j) along with your application. In that case, be sure to supply a relative path. Note that relative directories will be interpreted as relative to the installation root directory.

- **Environment variable**

  Look for a JRE of JDK in a location that is defined by an environment variable like `JAVA_HOME` or `MYAPP_JAVA_HOME`.

B.2.10.2 Language Selection Dialog

The variable selection dialog is displayed when you click on the **[Add Language]** button on the Languages tab [p. 91]

Select one of the supported languages with a double-click or the **[OK]** button. You may also select more than a language at a time before pressing on the **[OK]** button. Next to each language the ISO code is displayed that is required if you override the principal language from the command line with the sys.languageId variable [p. 354] .

B.2.10.3 Variable Selection Dialogs

When you click on the variable selector which can be found next to most text fields in install4j, you can choose variables from a number of variable systems [p. 28] . If there is more than one variable system applicable for the text field, a popup menu will be displayed that lets you select the desired variable system first.

A dialog is then brought up that shows you all known variables of the selected type. The variable will be inserted at the current cursor position, if you close the variable selection dialog with the **[OK]** button or of you double-click on a variable. In text fields, the appropriate variable syntax will be used (like `${installer:myVariable}`), in code editors, an appropriate API call will be inserted (like `context.getVariable("myVariable")`.

Please see the help topic on variables [p. 28] more information on variables.

The following variable systems are available:

- Installer variables

  Installer variables are only available for text properties of screens [p. 163] , actions [p. 177] and form components [p. 248] .

The variable selection dialog shows both predefined variables as well as all bound variables. Installer variables are shown for the currently edited installer application. The drop-down list at the top allows to you change the installer application.

The `Edit` link in the top right corner allows you to add pre-defined installer variables on the fly.

- Compiler variables

  Compiler variables [p. 97] are available for all text fields. The `Edit` link in the top right corner allows you to add compiler variables on the fly.

- I18N messages

  I18N messages are available for text properties of screens [p. 163] , actions [p. 177] and form components [p. 248] and selected other text fields in the install4j IDE.

  The variable selector shows both system messages as well as custom localization keys from the file that has been defined for the principal language on the Languages tab [p. 91] .

  The `Edit` link in the top right corner allows you to add custom localization keys on the fly.

- Launcher variables

  Runtime variables are system variables that are evaluated at runtime of the launcher or installer. They are only shown in the variable selector next to the VM parameter text field in the Java invocation step [p. 126] of the launcher wizard [p. 122] .

B.2.10.4 Variable Edit Dialogs

The variables edit dialogs are displayed when you click the `Edit` link in the variable selection dialogs [p. 99] for compiler and installer variables. For installer variables this dialog can also be accessed from the "Installer Variables" tab of the configuration of an installer application on the Screens & Actions [p. 145] tab.

The dialog contains the same controls as the Compiler Variables tab [p. 97] in the General Settings step [p. 87] . Upon closing the dialog with the **[OK]** button, the contents of the tree in the variable selection dialog will be updated.

Unlike compiler variables, installer variables do not have to be strings. In order to support variable types that are commonly used by form components, the installer variable edit dialog offers several value types:

- **Undefined**

  If you just wish to document and categorize an installer variable, leave the type as "Undefined". The variable value will be set at runtime when the variable is first bound or assigned to.

- **String**

  An instance of `java.lang.String`

- **Integer**

  An instance of `java.lang.Integer`

- **Long**

  An instance of `java.lang.Long`

- **Boolean**

  An instance of `java.lang.Boolean`

- **String array**

  An instance of `java.lang.String[]`. Enter the array entries surrounded by quotes and separated by commas. Use the backslash to quote quotes and backslashes.
- **Int array**

  An instance of `int[]`. Enter the array entries surrounded separated by commas.

B.2.10.5 Input Dialog

The input dialog allows you to enter a simple string value. Depending on the context, you can use compiler variables [p. 28] in the value. To select a variable, you can click on the ▸ variable selector [p. 99] .

For entities that have a unique ID, you can specify your own custom ID. Setting a custom code only provides a benefit if you plan to reference an entity in a script. In scripts, you can then use that verbose custom ID which is more readable than using the generated numeric ID. Custom IDs must not start with a number. The numeric internal ID is never discarded and continues to work. If you disable the custom ID at a later point, the ID will be reverted to the numeric ID.

Custom IDs are inserted into scripts instead of the numeric IDs by the ID selection dialog [p. 324] . All `get...ById()` methods in the API accept both the custom ID and the internal numeric ID. This means that you can set a custom ID without breaking anything in the project. However, if you use the custom IDs in scripts and change the custom ID or revert to the numeric ID, those scripts will break.

B.2.10.6 Configure JDKs Dialog

The JDK configuration dialog is displayed when you click the **[Configure JDKs]** button on the Java version [p. 89] tab or in the Java editor settings dialog [p. 323] .

In this dialog, you can add one or more JDKs that will be available for the purposes outlined on the Java version [p. 89] help page. The JDK configurations are **not saved in the project**, they are saved globally for your install4j installation.

When you add a new JDK, you are asked for the home directory of the JDK that you want to enter. Instead of a JDK, you can also select a JRE, in which case no parameter names will be available in the code completion proposals of JDK methods. After you select the home directory, install4j will check whether the directory contains a JDK or JRE and runs `java -version` to determine the version of the selected JDK or JRE.

The table that shows the configured JDKs has several columns:

- **Name**

  This is a symbolic name that describes the JDK, like "JDK 9.0" When you select a design time JDK on the Java version [p. 89] tab or in the Java editor settings dialog [p. 323] , only this symbolic name will be saved in the project file. When users on other computers and other platforms configure a JDK with the same symbolic name in their install4j installation, it will be used automatically for code compilation and code completion.

  When you add a JDK, the name "JDK [major version].[minor version]" will be suggested by default. If the selection is a JRE, "JRE [major version].[minor version]" will be suggested instead. The name of the JDK configuration must be unique.
- **Java Home Directory**

  This is the Java home directory that you selected when you added the configuration. You can change the Java home directory by editing this column. The Java version check will be performed again and the version displayed in the "Java Version" column will be updated. The symbolic name of the configuration will not be changed.

- **Javadoc Directory**

  In this column, you can enter the location of the Javadoc that should be associated with this JDK configuration. The Javadoc directory can remain empty in which case no context-sensitive Javadoc help will be available for classes from the runtime library.
- **Java Version**

  This uneditable column shows the version of the selected JDK configuration.

When you delete the JDK configuration that is currently used by the project, the project will still reference the same configured symbolic name for the JDK. It will then be shown in red color with a [not configured] message attached.

Changing the order of JDK configuration changes the order in the drop-down list on the Java version [p. 89] tab or in the Java editor settings dialog [p. 323] .

B.2.10.7 Merged Projects Edit Dialog

The merged projects edit dialog is shown when adding or editing a merged project on the Merged Projects tab [p. 96] of the General settings step [p. 87] . Please read help topic on merged projects [p. 50] for more information.

You can select a project file with the **[...]** button. Relative path names are interpreted relative to the main project file. The full name of the project as configured on the Application Info [p. 88] tab is extracted and displayed in the text field below. That name is displayed in the list of merged projects and it can be changed for documentation purposes. The name is not used at runtime.

In the **Merge Settings** section of the dialog, you can configure which entities should be merged into the main project:

- **Files**

  If selected, all files [p. 104] from the default file set of the merged project will be merged into the default file set of the main project. Files from other file sets in the merged project will be merged to file sets with the same name in the main project.
- **Launchers**

  If selected, all launchers [p. 120] in the merged project will be added to the main project.
- **Custom installer applications**

  If selected, all custom installer applications [p. 145] in the merged project will be added to the main project.

All selections are transitive for nested merged projects. For example, if the merged project contains another merged project for which merging of files is enabled, those files are only merged if file merging is enabled in the main project.

Screens and actions are not merged automatically. On the Screens & Actions tab [p. 145] you can merge single elements from merged projects such as screen groups or action groups at any point.

B.3 Step 2: Files

B.3.1 Step 2: Configure Distributed Files

In the **Files step**, you define your **distribution tree**. This means that you collect files from different places to be distributed in the generated media files. In addition, you can optionally define installation components.

There are three tabs in this section:

- Define distribution tree [p. 104]

  On the definition tab, you can **add and edit the structural elements** that make up the distribution tree. You can create your own directory structure and "mount" directories from your hard disk or add single files in arbitrary directories.
- View results [p. 113]

  On the results tab, you see the **actual file tree** as it will be collected and distributed by the generated media files [p. 326] . Go to this tab to check whether your actions on the definition tab have actually produced the desired results.
- Installation components [p. 117]

  On the components tab, you can optionally define parts of the distribution tree as installation components to **allow users to customize the installation** of your application.

B.3.2 Defining The Distribution Tree

B.3.2.1 Files - Defining The Distribution Tree

The distribution tree shows your file selections and the distribution directory structure created by you. The distribution tree is **drag-and drop enabled**.

To check whether your definition actually produces the desired results, please go to the View Results tab [p. 113] of the Files steps [p. 103] .

The top-level nodes in the distribution tree are called **file sets**. There is one "Default file set" that cannot be deleted or renamed. The relative paths of all files that are added to a file set must be unique. Please see the help topic on file sets and installation components [p. 9] for more information on how to use file sets.

Within a single file set, it causes an error if the installation paths for two files collide. For example, if you have added the contents of two different directories into the same folder in the distribution tree and both directories contain a file `file.txt`, building the project will fail with a corresponding error message. In this case, you have to exclude the file in one of the directory entries. This is only valid for files, sub-directory hierarchies on the other hand are merged and can overlap between multiple directory entries and explicitly added folders.

You can create new file sets with the **[New File Set]** action in the add menu on the right side. Each file set has its own "Installation directory" root. If you define custom roots that should be present in multiple file sets, you have to duplicate them.

When using the install4j API, you reference file sets with IDs. You can show IDs in the distribution tree by activating the **[Show IDs]** button on the lower right side of the distribution tree. The automatically generated numerical IDs are then shown in brackets. The selection will be remembered across restarts of install4j.

The child nodes of a file set are called **installation roots**. Their location is resolved when the installer runs. There are two types of roots:

- The **default root of the distribution tree** is labeled as "Installation directory" and has a special icon. This is the directory where your application will be installed on the target system. The directory is dependent on user actions at the time of installation. In regular installers a user can select an arbitrary directory where the application should be installed. For RPM media files, a user can override the default directory with command line parameters. For archives, the files are simply extracted into a commmon top-level directory.

  The installation directory will only be created if you execute an **"Install files" action** in the installer configuration [p. 145] . By default, the "Install files" action is placed on the "Installation" screen. If your installer should not create an installation directory, you can ignore this root and remove the "Install files" action.

  To learn more on the various installer modes, please see the corresponding help topic [p. 65] .
- If your application needs to install files into directories outside the main installation directory, you can add **custom roots** to the distribution tree. This is done with the **[New Root]** action in the add menu on the right side or in the context menu. The actual location of this root is defined by its name and has to resolve to a valid directory at runtime. There are several possibilities for using custom roots. The name of a custom root can be

- **a fixed absolute path known at compile-time**

  This works for custom environments where there's a fixed policy for certain locations. For example, if you have to install some files to `D:\apps\myapp`, you can enter that path as the name for your custom root.

  If you build installers for different platforms, that root is likely to be different for each platform. In that case, you can use a compiler variable [p. 97] for the name of the custom root and override its value for each media file [p. 338] .

- **an installer variable that you resolve at runtime**

  If you would like to install files into the directory of an already installed application, such as a plugin for your own application, you can use an installer variable that you resolve at runtime. Installer variables have an `installer:` prefix, such as `${installer:rootDir}`, and can be set in a variety of ways [p. 28] .

  The most common case would be to add a "Directory selection" screen to the screen sequence [p. 145] and set its variable name property to the variable that you've used as the name of the custom root. For the above example, that would be "rootDir" (without the ${installer:...} variable syntax).

  Alternatively, you could use a "Set a variable" action to determine the location programmatically.

- **a pre-defined installer variable**

  install4j offers several variables for "magic folders" that point to common directories, such as `${installer:sys.userHome}` which resolves to the user home directory or `${installer:sys.system32Dir}` which resolves to the `system32` directory on Windows.

If a custom installation root is not bound at runtime or if it points to an invalid directory, the contained files will not be installed. There will be no error messages, if you require error handling, you can use a "Run a script" action before the "Install files" action with the appropriate error message and failure strategy.

Note: For archive media file types [p. 327] , custom installation roots are not installed. If you require these custom roots for your installation, you cannot use archives.

An alternative way to redirect installed files to different directories is to use the "Directory resolver" property of the "Install files" actions. Also, the "File filter" property of that action can be used to conditionally install files. The use of these properties is only recommended if you require their full flexibility. Otherwise, using custom installation roots and installation components [p. 117] is a better approach.

Beneath an installation root, you can add files or create folders:

- To create a folder, use the **[New folder]** action in the add menu on the right side or in the context menu. A folder named "New Folder" will be created below the selected directory. If no directory or installation root is selected, it will be created below the "Installation directory" root node. Right after its creation, the default name is editable and you can enter the intended name of the folder. Confirm your entry with `Enter`. To configure further properties of the folder, you can edit the folder node (see below) to show the folder property dialog [p. 119] .
- To add files, use the **[Add files and directories]** action in the add menu on the right side or in the context menu. The file wizard [p. 107] will be displayed.

In the distribution tree you can

- **Move entries**

  Entries are moved by dragging them with the mouse to the desired location. Both directories, file entries and directory content entries can be moved. To select a target directory inside a closed directory while dragging, hover with the mouse over the closed directory and it will open after a short delay. While dragging, the insertion bar shows you where the entry would be dropped.
- **Delete entries**

  Entries can be deleted by hitting the DEL key or using the corresponding tool bar button or menu entry.
- **Rename entries**

  Some types of entries can be renamed by using the **[Rename]** action on the right side of the tree or from the context menu. The name of the entry can then be edited in-place.

  Renaming entries is possible for:

  - File sets
  - Roots
  - Folders

- **Edit the contents of entries**

  The contents of some types of entries can be edited by using the **[Edit]** action on the right side of the tree or hitting the ENTER key while the entry is selected.

  Editing entries is possible for:

  - **Folders**

    Editing a folder means opens the folder property dialog [p. 119] .
  - **Single file entries**

    Editing a single file entry will bring up the file wizard [p. 107] . Only the selected file will be shown in the "Select files" step, even if you initially selected multiple files with the wizard. If you add additional files in this step, they will be added below the selected file in the distribution tree. If you delete the selected file in this step, it will also be deleted in the distribution tree.
  - **Directory content and compiler variable entries**

    Editing a directory content entry or a compiler variable entry will bring up the file wizard [p. 107] .

Using compiler variables [p. 28] in the distribution tree allows you to make **compile-time conditional includes**:

- if a directory node resolves to the empty string after variable replacement, the directory and any contained entries will not be included in the distribution.
- if the source directory of a "contents of directory" node resolves to the empty string after variable replacement, no files will be included through that entry.
- if the file name of a single file node resolves to the empty string after variable replacement, no file will be included.

For conditions that are evaluated at runtime or for adding platform dependent files, you should use files sets [p. 9] instead.

B.3.2.2 File Wizard

The file wizard is displayed when you invoke the **[Add files and directories]** action in the add menu on the right side of the file definition tree. To get more information about the distribution tree and related concepts, please see the overview [p. 104] .

In the first step of the file wizard you choose whether you want to add

- **the contents of a directory and its subdirectories**

  Choose this wizard type if you want to recursively add the contents of a directory. You will have the possibility of excluding certain files and subdirectories and exclude files based on their file suffix. If you would like to specify different settings for one or several files in the included directory, you have to exclude them and add them as single files in the appropriate directory.

  The subsequent steps in the wizard for this selection are:

  - Select directory [p. 109]
    Choose the directory that should be distributed.
  - Installation options [p. 110]
    Select installation options like access rights as well as overwrite and uninstallation policies.
  - Exclude files and directories [p. 112]
    Select files or directories that should not be distributed.
  - Exclude suffixes [p. 112]
    Enter a list of file suffixes that should be ignored,

- **a number of single files**

  Choose this wizard type if you collect a small number of files (possibly from different locations) into a single directory. Example: a number of support libraries from different directories are added into the top level directory `lib`.

  The subsequent steps in the wizard for this selection are:

  - Select files [p. 109]
    Choose the files that should be distributed.
  - Installation options [p. 110]
    Select installation options like access rights as well as overwrite and uninstallation policies.

- **files that are passed with a compiler variable**

  Choose this wizard type if you collect lists of files in your build tool and want to use that information to dynamically build the distribution tree.

  The subsequent steps in the wizard for this selection are:

  - Compiler variable [p. 109]
    Choose the compiler variable that should be read.

- Installation options [p. 110]
  Select installation options like access rights as well as overwrite and uninstallation policies.

B.3.2.3 Wizard Steps

B.3.2.3.1 File Wizard: Select Directory

In this step of the file wizard [p. 107] , you select the directory whose contents should be recursively added to the distribution tree. This step is only shown if you select "Directory" in the first step.

You can either enter the directory manually or use the chooser button **[...]** to the right of the text field to select a directory from your file system.

By default, the files that are contained in the selected directory are added directory to the currently selected node in the distribution tree. Alternatively, you can suggest a subdirectory that should be created below the currently selected node as a parent directory for the included files. This must be a simple directory name and not a path name with multiple components.

B.3.2.3.2 File Wizard: Select Files

In this step of the file wizard [p. 107] , you select the files that should be added to the distribution tree. This step is only shown if you select "Single files" in the first step.

To edit the list of files you can

- **add a new entry** by clicking on the right side of the window. If you choose "Browse for file" in the popup menu, you can select one or multiple files in a file chooser. If you choose "Manual entry", you can also use compiler variables.
- **copy a file list from the system clipboard** by clicking on the right side of the window. The file list must consist of
  - a single file entry
  - multiple file entries separated by the standard path separator (";" on Windows, ":" on Unix) or by line breaks.

  Each file entry can be
  - **absolute**

    The file entry is added as it is.
  - **relative**

    On the first occurrence of a relative path, install4j brings up a directory chooser and asks for the root directory against which relative paths should be interpreted. All subsequent relative paths will be interpreted against this root directory.

  Only unique file entries will be added to the list. If no new file entry could be found, a corresponding error message is displayed.
- **remove an existing file entry** by using the **[Remove]** action while the file is selected.
- **change the position of an existing entry** by using the **[Move Up]** and **[Move Down]** actions.

B.3.2.3.3 File Wizard: Compiler Variable

In this step of the file wizard [p. 107] , you specify the compiler variable whose value will be used for adding more files to the distribution tree. This step is only shown if you select "Compiler variable" in the first step.

The selected compiler variable must exist and will be read at compile time. Its value will be split with the configured path list separator. Note that the compiler variable must be defined, otherwise the build will fail and you have to specify the plain name of the compiler variable, without any surrounding variable replacement syntax.

For each file that does not exist, a warning will be printed during the build.

For the separator, the compiler variable `${compiler:sys.pathlistSeparator}` can be used to separate path lists with `;` on Windows and `:` on Unix. The separator is interpreted as a regular expression, so you can use `\n` for separating files with new lines, for example.

B.3.2.3.4 File Wizard: Install Options

In this step of the file wizard [p. 107] , you select options regarding the installation of the selected files and directories.

Except for the "Shared file" option, all configuration options have default settings that are defined on the File Options [p. 114] tab. To override the default settings, select the check boxes in front of each configuration option.

The following install options are available:

- **Shared file (Windows only)**

  Microsoft Windows has a concept of "shared files" where a usage counter is monitored for each file or directory. When the usage counter reaches zero the installer will delete the file or directory. This is especially useful if you install DLLs into the system32 directory that are shared by multiple applications.
- **Overwrite policy**

  This setting determines what the installer will do if the file is already present. It does not apply for archives (including RPM archives). The overwrite policy can be one of:

  - **Always ask, except for update**

    If the file is already present, the installer asks the user whether to overwrite it, regardless of the file modification dates. However, files that have been proviously installed by install4j will be overwritten.
  - **Always ask**

    If the file is already present, the installer asks the user whether to overwrite it, regardless of the file modification dates and whether install4j has previously installed this file.
  - **If newer, otherwise ask**

    If the file is already present, the installer silently overwrites the file if the installed file is newer, otherwise is asks the user.
  - **If newer**

    If the file is already present, the installer silently overwrites the file if the installed file is newer, otherwise it does not install it.
  - **Always**

    The installer silently overwrites the file in all cases.
  - **never**

    The installer does not install the file.

- **Uninstallation policy**

  This setting determines how the uninstaller decides whether an installed file should be uninstalled or not. The uninstallation policy can be one of:

- **If created**

  If the file or directory was created by the installer, it will be deleted.
- **Always**

  The file or directory will always be deleted regardless of whether it was created by the installer. Please be careful when choosing this option, since deleting directories that were not created by the installer can have severe unintended consequences.
- **Never**

  The file or directory will not be deleted ny the uninstaller.
- **If created, but not for update**

  If the file or directory was created by the installer, it will be deleted. However, if the uninstaller is running as part of the update (invoked by an "Uninstall previous installation" action), the file or directory will not be deleted.
- **Always, but not for update**

  The file or directory will always be deleted regardless of whether it was created by the installer. However, if the uninstaller is running as part of the update (invoked by an "Uninstall previous installation" action), the file or directory will not be deleted. Please be careful when choosing this option, since deleting directories that were not created by the installer can have severe unintended consequences.

- **Unix file and directory mode**

  On Unix-like platforms (including Linux and macOS), the file mode governs the access rights to the installed files. The access mode is composed of three octal numbers (0-7) and each number completely expresses the access rights for a particular group of users:

  - **First number**

    The first octal number contains the access rights for the **owner of the file**.
  - **Second number**

    The first octal number contains the access rights for the **user group** that the file is attached to.
  - **Third number**

    The third octal number contains the access rights for **all other users**.

  For a desired combination of access rights, the octal number is calculated by adding:

  - **1**

    For the right to **execute** the file or to browse the directory. Only set this flag for directories, executables and shell scripts.
  - **2**

    For the right to **write** to the file or directory.
  - **4**

    For the right to **read** from the file or directory.

  For example, read/write rights are calculated as 2 (for writing) + 4 (for reading) = 6, read-only rights are just 4, and the rights to read/execute a file are calculated as 1 (for executing) + 4 (for reading) = 5.

The **default access rights for files** are 644, i.e. the owner can read and write the file and all others can only read it. Since usually applications on Unix-like systems are installed by the administrator (usually called root), this means that users will only be able to read files but not to write to them. For launchers, the installer sets access rights for files to 755, which is equivalent to 644 only that everyone can execute the launchers. If you have files that your users should be able to write to, you have to add these files to the distribution tree with a different access mode. For example, 666 would be appropriate in that case. You can reset the default mode with the **[Reset to default]** button.

The **default access rights for directories** are 755, i.e. the owner can read and write and browse the directory and all others can only read and browse it. Just as for files, this means that except for root, users will only be able to browse directories and read from them but they will not be able to create files in them. If you have directories that your users should be able to create files in, you have to add these directories to the distribution tree with a different access mode. For example, 777 would be appropriate in that case. You can reset the default mode with the **[Reset to default]** button.

B.3.2.3.5 File Wizard: Excluded Files And Directories

In this step of the file wizard [p. 107] , you can select files and subdirectories that should be excluded from distribution. This step is only shown if you select "Directory" in the first step.

The tree labeled "Excluded files and subdirectories" shows the tree of all files in the directory selected in the previous step [p. 109] . Each file and subdirectory has a check box attached. If you select that check box, the entry will **not** be distributed. Selections of subdirectories are recursive. If you select a subdirectory, its contents are hidden from the tree since they will be excluded anyway.

B.3.2.3.6 File Wizard: Excluded Suffixes

In this step of the file wizard [p. 107] , you can enter file name suffixes that should be excluded from distribution. This step is only shown if you select "Directory" in the first step.

In addition to the explicit selections of excluded files and subdirectories in the previous step [p. 112] , a list of file name suffixes separated by commas can be entered here to exclude them from the distribution. For example, entering `*.java, *.java~` will prevent files with these extensions from being distributed.

The suffixes entered on this screen are combined with the global excludes that are defined in the Files Options [p. 114] .

B.3.3 Files - Viewing The Results

On this tab you can check the results of your definition of the distribution tree [p. 104] .

The tree shows all files that will be distributed in the generated media files [p. 326] .

You cannot remove files from this tree or add them to it. If you would like to remove a file that has been added with a directory entry, you have to use the excluded files and directories step [p. 112] or the excluded suffixes step [p. 112] in the files directory wizard. To exclude files and directories on a per-media set basis, please see the customize project defaults [p. 338] step in the media file wizard [p. 329] .

On activating this tab, the file tree is re-read if the definition of the distribution tree [p. 104] has changed since the last time the file tree was shown. This background process can take a short while and is indicated by a `"Please wait ..."` entry in the result tree.

Should the contents of your hard disk have been modified in the meantime, you can use the **[Refresh]** button to re-read the displayed file tree.

B.3.4 Files - File Options

On this tab you can set global options that apply to all files and directories that are included by the definition of the distribution tree [p. 104] .

In the **Global excludes** section, you can define patterns to exclude files and subdirectories from directory entries in the definition of the distribution tree. If you do not want to distribute file or directories that have certain suffixes, please specify them in the text field as a comma separated list of wildcard entries.

For example, if you want to exclude files from the selected directory that end in .txt and .java, as well as .svn directories, please enter `*.txt,*.java,.svn` in the text field.

You can add further suffixes to this default for each entry in the definition of the distribution tree [p. 112]

In the **Installation Options** section, the following settings are available:

- **Shared file (Windows only)**

  Microsoft Windows has a concept of "shared files" where a usage counter is monitored for each file or directory. When the usage counter reaches zero the installer will delete the file or directory. This is especially useful if you install DLLs into the system32 directory that are shared by multiple applications.
- **Overwrite policy**

  This setting determines what the installer will do if the file is already present. It does not apply for archives (including RPM archives). The overwrite policy can be one of:

  - **Always ask, except for update**

    If the file is already present, the installer asks the user whether to overwrite it, regardless of the file modification dates. However, files that have been proviously installed by install4j will be overwritten.
  - **Always ask**

    If the file is already present, the installer asks the user whether to overwrite it, regardless of the file modification dates and whether install4j has previously installed this file.
  - **If newer, otherwise ask**

    If the file is already present, the installer silently overwrites the file if the installed file is newer, otherwise is asks the user.
  - **If newer**

    If the file is already present, the installer silently overwrites the file if the installed file is newer, otherwise it does not install it.
  - **Always**

    The installer silently overwrites the file in all cases.
  - **never**

    The installer does not install the file.

- **Uninstallation policy**

  This setting determines how the uninstaller decides whether an installed file should be uninstalled or not. The uninstallation policy can be one of:

  - **If created**

    If the file or directory was created by the installer, it will be deleted.

- **Always**

  The file or directory will always be deleted regardless of whether it was created by the installer. Please be careful when choosing this option, since deleting directories that were not created by the installer can have severe unintended consequences.
- **Never**

  The file or directory will not be deleted ny the uninstaller.
- **If created, but not for update**

  If the file or directory was created by the installer, it will be deleted. However, if the uninstaller is running as part of the update (invoked by an "Uninstall previous installation" action), the file or directory will not be deleted.
- **Always, but not for update**

  The file or directory will always be deleted regardless of whether it was created by the installer. However, if the uninstaller is running as part of the update (invoked by an "Uninstall previous installation" action), the file or directory will not be deleted. Please be careful when choosing this option, since deleting directories that were not created by the installer can have severe unintended consequences.

- **Unix file and directory mode**

  On Unix-like platforms (including Linux and macOS), the file mode governs the access rights to the installed files. The access mode is composed of three octal numbers (0-7) and each number completely expresses the access rights for a particular group of users:

  - **First number**

    The first octal number contains the access rights for the **owner of the file**.
  - **Second number**

    The first octal number contains the access rights for the **user group** that the file is attached to.
  - **Third number**

    The third octal number contains the access rights for **all other users**.

  For a desired combination of access rights, the octal number is calculated by adding:

  - **1**

    For the right to **execute** the file or to browse the directory. Only set this flag for directories, executables and shell scripts.
  - **2**

    For the right to **write** to the file or directory.
  - **4**

    For the right to **read** from the file or directory.

  For example, read/write rights are calculated as 2 (for writing) + 4 (for reading) = 6, read-only rights are just 4, and the rights to read/execute a file are calculated as 1 (for executing) + 4 (for reading) = 5.

  The **default access rights for files** are 644, i.e. the owner can read and write the file and all others can only read it. Since usually applications on Unix-like systems are installed by the administrator (usually called root), this means that users will only be able to read files but not to write to them. For launchers, the installer sets access rights for files to 755, which is

equivalent to 644 only that everyone can execute the launchers. If you have files that your users should be able to write to, you have to add these files to the distribution tree with a different access mode. For example, 666 would be appropriate in that case. You can reset the default mode with the **[Reset to default]** button.

The **default access rights for directories** are 755, i.e. the owner can read and write and browse the directory and all others can only read and browse it. Just as for files, this means that except for root, users will only be able to browse directories and read from them but they will not be able to create files in them. If you have directories that your users should be able to create files in, you have to add these directories to the distribution tree with a different access mode. For example, 777 would be appropriate in that case. You can reset the default mode with the **[Reset to default]** button.

These defaults can be customized for each entry in the definition of the distribution tree [p. 110]

In the **Modification Times** section, you can choose between two ways to set the modification times of installed files:

- **Keep original file modification times**

  The original modification times are kept for the installed files. This is the default mode.
- **Use build timestamp**

  All installed files have the build time as the same modification time.

In the **Build Options** section, you can define the behavior if some files or directories in the definition of the distribution tree are missing while the project is being compiled. install4j can then take one of the following actions:

- **Ignore**

  Do not print any warnings and ignore. This setting is suitable if you intentionally add files or directories to your distribution tree that are no present for all builds. If the `Enable extra verbose output` option is selected on the Build step [p. 346] , the warning is still printed.
- **Print a warning and continue**

  This is the default setting.
- **Raise an error and abort**

  If missing files are not acceptable in your project, you should choose this option. If a missing file is encountered, the build will fail with a corresponding error message.

B.3.5 Files - Defining Installation Components

On this tab you can optionally define installation components.

Installation components can be used to allow the user to customize the installation. GUI installers will present a step that lists all available installation components in a tree with check boxes and lets the user choose which components to install. Console installers will also present a list of installation components to the user for selection. If no installation components are defined, that step will be omitted and the entire distribution tree is installed.

On the left side you configure a tree of installation components and component folders. To every component folder you can add installation components and component folders as child nodes. The component tree is **drag-and drop enabled**.

In the component tree you can

- **Move entries**

  Components or component folders are moved by dragging them with the mouse to the desired location. To select a target folder inside a closed component folder while dragging, hover with the mouse over the closed component folder and it will open after a short delay. While dragging, the insertion bar shows you where the entry would be dropped.

- **Add installation components**

  With the **[Add Installation Component]** action, a new installation component is added to the currently selected component folder, or at the top-level if no component folder is selected. The name of the installation component can be edited in-place immediately.

- **Add component folders**

  With the **[Add Component Folder]** action, a new component folder is added to the currently selected component folder, or at the top-level if no component folder is selected. The name of the component folder can be edited in-place immediately.

- **Delete entries**

  With the **[Delete]** action or the DEL key, you can remove the currently selected installation component or component folder. All child nodes of component folders are removed as well.

- **Rename entries**

  With the **[Rename]** action, you can rename an installation component or a component folder.

To internationalize the name of the component for different media files, please use custom localization keys [p. 28] .

When using the install4j API, you reference installation components with IDs. You can show IDs in the component tree by activating the **[Show IDs]** button on the lower right side of the component tree. The automatically generated numerical IDs are then shown in brackets. The selection will be remembered across restarts of install4j.

This ID can be used in expressions, scripts and custom code when you want to check if the installation component has been selected for installation. A typical condition expression for an action would be `context.getInstallationComponentById("123").isSelected()` if the ID of the component is "123". In this way you can conditionally execute actions depending on whether a component is selected or not.

The right pane displays the properties of the selected element in the component tree. The options are organized into several tabs. There are different configuration options, depending on whether you've selected an installation component or a component folder:

- **Installation component**

  Installation components have the following specific tabs:

  - **Files**

    To choose the contents of an installation component, you first have to decide whether the component contains all files or just a selection of files or directories. For a selection of files and directories, you then choose the desired contents in the tree. Installation components are not mutually exclusive and you can include the same files in multiple installation components.
  - **Options**

    The available options are:

    - **Initially selected for installation**

      Whether the check box for the currently selected installation component is selected or not.
    - **Mandatory component**

      Whether the currently selected component must be installed or not. If the component is mandatory, the user cannot deselect it and the check box in the installer is grayed out.
    - **Downloadable component**

      Whether the currently selected component should be externalized for installers whose data file type [p. 334] is set to "Downloadable". These components can then be placed on a web server and are downloaded on demand if the users selects them.

  - **Dependencies**

    If the currently selected installation component only works if a number of other components are installed as well, you can select those components on the "Dependencies" tab. When this installation component is selected, the dependencies become automatically selected and mandatory. When this installation component is deselected again, the previous selection state of the dependencies is restored. The list of components in the "Dependencies" tab only shows components that will not lead to circular dependencies.

- **Component folder**

  Component folders have an "Options" tab where you can configure whether the component folder should be initially expanded or not.

Both installation components and component folders also have a **Description** tab. You can optionally display a description below each component in the installer. Any component or component folder with a description will have a toggle button with help icon on the right side. This toggle button controls whether the description is displayed below the element. You can also use the F1 key to toggle the visibility of the description. The **Expand description automatically** check box allows you to show descriptions by default.

Note: The user can only select which installation components should be installed if the "Installation components" screen or the "Installation type" screen is part of the screen sequence [p. 145] .

The "Installation type" screen offers a selection between sets of installation components, such as "Full", "Standard" and "Custom", while the "Installation components" screen shows the tree of components that you define on this tab with check boxes in front of each node. The "Installation components" screen has a number of properties that let you customize the appearance of the descriptions. If both are present, the "Installation components" screen will only be shown if the selected installation type was configured to be customizable.

B.3.6 Dialogs

B.3.6.1 Distribution Tree File Chooser Dialog

The distribution file chooser dialog shows files or directories in the distribution tree. This tree does not necessarily correspond to a portion of the filesystem of your hard disk, since a virtual folder hierarchy with arbitrarily mounted directories from your hard disk can be defined on the Definition tab [p. 104] of the Files step [p. 103] .

The shown files or directories are a subset of the result tree [p. 113] in the Files step [p. 103] . The actual filter depends on the particular context of your action and is displayed in the title bar of the dialog.

Should the contents of your hard disk have been modified in the meantime, you can use the **[Refresh]** button to re-read the displayed file tree.

B.3.6.2 Folder Properties Dialog

The folder properties dialog is displayed when you edit a folder in the distribution tree [p. 104] .

In the folder properties dialog you can set the **access rights** for the selected folder. On Unix-like platforms (including Linux and macOS), the file mode governs the access rights to the installed directories. The access mode is composed of three octal numbers (0-7) and each number completely expresses the access rights for a particular group of users:

- **First number**

  The first octal number contains the access rights for the **owner of the file**.
- **Second number**

  The first octal number contains the access rights for the **user group** that the file is attached to.
- **Third number**

  The third octal number contains the access rights for **all other users**.

For a desired combination of access rights, the octal number is calculated by adding:

- **1**

  For the right to **browse** the directory.
- **2**

  For the right to **write** to the directory.
- **4**

  For the right to **read** from the directory.

The **default access rights for directories** are 755, i.e. the owner can read and write and browse the directory and all others can only read and browse it. Since usually applications on Unix-like systems are installed by the administrator (usually called root), this means that except for root, users will only be able to browse directories and read from them but they will not be able to create files in them. If you have directories that your users should be able to create files in, you have to set a different access mode for them. For example, 777 would allow all users to create, read, write and delete files in the directory. You can reset the default mode with the **[Reset to default]** button.

B.4 Step 3: Launchers

B.4.1 Step 3: Configure Launchers

Launchers are responsible for starting your application. There are two types of launchers:

- **Generated launchers**

  install4j can generate native launchers that start your application. For example, on Windows, a `.exe` file will be created that among other things takes care of finding a suitable JRE, displaying appropriate error messages in case of need and then starts your application. Using launchers generated by install4j has numerous advantages as compared to using home-grown batch files and shell scripts.

  Each launcher definition is compiled separately for each defined media set [p. 326] . Therefore, for the majority of all cases, a single launcher definition will be sufficient to start your application. If, for example, your distribution contains two GUI applications and a command line application, you have to define 3 launchers, regardless of how many media files [p. 326] you define.

  When your application is started with a launcher generated by install4j, you can query the system property **install4j.appDir** to get the installation directory and and **install4j.exeDir** to get the directory where the launcher resides. Use `System.getProperty("install4j.appDir")` and `System.getProperty("install4j.exeDir")` to access these values.
- **External launchers**

  If you already have an external launcher for your application, you can let install4j use that launcher instead of generating one. Since external launchers are most likely platform dependent, you will have to add external launchers for each platform that is targeted by your media files [p. 326] . Make sure to exclude the irrelevant launchers [p. 338] in your media file definitions in this case.

To define a new launcher, you double-click on the new launcher entry in the list of defined launchers or choose `Launcher->New launcher` from install4j's main menu. The launcher wizard [p. 122] will then be displayed. Once you have completed all steps of the launcher wizard, a new launcher entry will be displayed in the list of launchers. The icon of a launcher indicates if it is a

- GUI application launcher
- Console application launcher
- Service application launcher
- External launcher

In the list of launchers you you can

- **Reorder launcher definitions**

  Launcher definitions are reordered by dragging them with the mouse to the desired location. While dragging, the insertion bar shows you where the launcher definition would be dropped. The order of launchers is not relevant for install4j, reordering is provided only for the purpose of letting you arrange the launcher definitions according to your personal preferences.
- **Copy launcher definitions**

  Launcher definitions are copied by copy-dragging them (e.g. on Windows, press CTRL while dragging) or using the **[Copy Launcher]** action while the source launcher is selected.

The name of the copied launcher definition will be prefixed with "Copy of". You can change this default name by renaming the launcher definition (see below).

- **Rename launcher definitions**

  Launcher definitions can be renamed by selecting `Rename Launcher` from the context menu or `Launcher->Rename launcher` from install4j's main menu.

  An input dialog will be displayed where the current name can be edited. Please note that the name of the launcher is for your own information only and is not used in the distribution.

- **Delete launcher definitions**

  Launcher definitions can be deleted by using the **[Delete Launcher]** action or by hitting the `DEL` key while the launcher definition is selected.

- **Edit a launcher definition**

  Launcher definitions can be edited by using the **[Edit Launcher]** action or by hitting the `ENTER` key while the launcher definition is selected.

  The launcher wizard [p. 122] will be displayed for the selected launcher definition. Please note that you can directly access any step in the wizard by clicking on it in the index.

B.4.2 Launcher Wizard

The launcher wizard is displayed when you add a new launcher or when you edit an exiting launcher. To learn more information about the launchers, please see the overview [p. 120] .

In the first step of the launcher wizard you choose whether you want to create

- **a generated launcher**

  The subsequent steps with the associated advanced options [p. 123] capture all information required to start your Java application.
- **an external launcher**

  The external launcher wizard queries the following data:

  - **Launcher executable**

    Enter the path to the executable in the distribution tree. You can select a file from the distribution tree by clicking the **[...]** chooser button.
  - **Menu integration**

    The menu integration options are the same as for the generated launcher [p. 136] .

B.4.3 Wizard Steps

B.4.3.1 Launcher Wizard: Configure Executable

In this step of the launcher wizard [p. 122] , you enter the properties of the executable that is to be generated.

The following properties of the executable can be edited in the `Executable` section of this step:

- **Executable type**

  Executables created by install4j can be either GUI applications, console applications or service applications

  - **GUI application**

    There is no terminal window associated with a GUI application. If stdout and stderr are not redirected (see the redirection advanced step [p. 130]), both streams are inaccessible for the user. This corresponds to the behavior of `javaw(.exe)`.

    On Windows, if you launch the executable from a console window, a GUI application can neither write to or read from that console window. Sometimes it might be useful to use the console, for example for seeing debug output or for simulating a console mode with the same executable. In this case you can select the **Allow -console parameter** check box. If the user supplies the -console parameter when starting the launcher from a console window, the launcher will try to acquire the console window and redirect stdout and stderr to it. If you redirect stderr and stdout in the redirection settings [p. 130] , that output will not be written to the console.

    If your GUI application uses **SWT or QT Jambi instead of Swing**, please select the `uses SWT or QT` check box below this radio button. This is mainly important for correct behavior on macOS where the application must be started differently in this case.

  - **Console application**

    A console application has an associated terminal window. If a console application is opened from the Windows explorer, a new terminal window is opened. If stdout and stderr are not redirected (see the redirection advanced step [p. 130]), both streams are printed on the terminal window. This corresponds to the behavior of `java(.exe)`.

  - **Service application**

    A service runs independently of logged-on users and can be run even if no user is logged on. A service cannot rely on the presence of a console, nor can it open windows. On Microsoft Windows, a service executable will be compiled by install4, on macOS a startup item will be created and on Unix-like platforms a start/stop script will be generated.

    When you develop a service please note the following requirement: The `main` method will be called when the service is started.

    To handle the shutdown of your service, you can use the `Runtime.addShutdownHook()` method to register a thread that will be executed before the JVM is terminated.

    For information on how services are installed or uninstalled, please see the help on help topic on services [p. 44] .

- **Executable name**

  Enter the desired name of the executable without any trailing `.exe` or `.sh`.

- **File set**

  Choose the file set to which the launcher should be added. File sets are defined in the distribution tree [p. 104] . If you do not use different file sets, "Default file set" will be the only option which is activated by default.

- **Directory**

  Enter the directory in the distribution tree where the executable should be generated. If you leave this field empty, the executable will be generated in the installation root directory. You can select a directory from the distribution tree by clicking the **[...]** chooser button.

- **Allow only a single running instance of the application**

  If you select this check box, the generated executable can only be started once. Subsequent user invocations will bring the application to the front. In the `StartupNotification` class of the install4j launcher client API you can register a startup handler to receive the command line parameters. In this way, you can handle file associations with a single application instance. This feature is only available on Microsoft Windows, on macOS, single bundle media files always behave this way.

- **Fail if an exception in the main thread is thrown**

  Executables created by install4j can monitor whether the main method throws an exception and show an error dialog in that case. This provides a generic startup error notification facility for the developer that handles a range of errors that would otherwise not be notified correctly. For example, if an uncaught exception is thrown during application startup, a GUI application might simply hang, leaving the user in the dark about the reasons for the malfunction. With the error message provided by the install4j executable, reasons for startup errors are found much more easily.

- **Working directory**

  For some applications (especially GUI applications) you might want to change the working directory to a specific directory relative to the executable, for example to read config files that are in a fixed location. To do so, please select the `Change working directory to` check box and enter a directory relative to the executable in the adjacent text field. To change the current directory to the same directory where the executable is located, please enter a single dot.

B.4.3.2 Launcher Wizard: Define Launcher Icon

In this step of the launcher wizard [p. 122] , you define the icon for the generated launcher.

If you would like to associate a custom icon with your launcher, select the "add icon to launcher" check box.

- In the `Cross platform` section you can choose icon files in the PNG image format (extension `*.png`) in various sizes. It is recommend to add at least the formats 16x16, 32x32, 48x48 and 128x128. On Microsoft Windows and macOS, the generated executable will have an icon with these images, on other platforms, these image files will be used for desktop integration. It is recommended to use 32-bit images with an alpha channel, 8 bit-palette images will be generated where required. Generated Windows icons contain traditional 256 color images and 32-bit images with an alpha channel. However, it is also possible to use 8 bit-palette images with a transparency color for the input image files.
- If you have an **external icon file for Microsoft Windows**, you can select the `Use ICO file` option in the `Windows` section and choose an icon file (extension `*.ico`) in the text field below. With the `Generate from PNG files` option, the icon will be generated as described in the `Cross platform` section.
- If you have an **external icon file for macOS**, you can select the `Use ICNS file` in the `macOS` section and choose a macOS icon file (extension `*.icns`) in the text field below. With the `Generate from PNG files` option, the icon will be generated as described in the `Cross platform` section. macOS icons can be generated on macOS with the Icon Composer application located in `/Developer/Applications`. Other possibilities are the free IMG2ICNS and png2icns applications.

Note: If the project has already been saved, relative file paths will be interpreted as relative to the project file.

B.4.3.3 Launcher Wizard: Configure Java Invocation

In this step of the launcher wizard [p. 122] , you enter the information required to start your application.

The following properties of the Java invocation can be edited in the `General` section of this step:

- **Main class**

  Enter the fully qualified main class of your application. Next to the text field is a **[...]** chooser button that brings up a dialog with a list of all public main classes [p. 141] in the class path. To use this facility, you have to set up your classpath first (see below).

- **VM parameters**

  If there are any VM parameters you would like to specify for the invocation of your Java application, you can enter them here (e.g. `-Dmyapp.myproperty=true` or `-Xmx256m`).

  Note: You must quote parameters that contain spaces. Please quote the entire parameter like `"-Dapp.home=${launcher:sys.launcherDirectory}"` and not just the value. Incorrect quoting will lead to failure of the launcher.

  Please read the help topic on VM parameters [p. 38] for more information on how install4j can help you with **adjusting the VM parameters at runtime**.

- **Arguments**

  If you need to specify arguments for your main class, you can enter them here. Arguments passed to the executable will be appended to these arguments.

- **Allow VM passthrough parameters**

  If you would like to allow the user to specify VM parameters with the syntax `-J[VM parameter]` (e.g. `-J-Xmx512m`), select the `Allow VM passthrough parameters` check box.

  Note: This setting applies only to Windows launchers. On Unix platforms you can use the `INSTALL4J_ADD_VM_PARAMS` environment variables to add VM parameters to the launcher. On macOS, you can edit the `Info.plist` file to change the VM parameters.

In the `Class path` section of this step you can configure the class path and the error handling for missing class path entries. The class path list shows all class path entries that have been added so far. The following types of class path entries [p. 141] are available:

- Scan directory
- Directory
- Archive
- Environment variable
- Compiler variable

The symbol • prepended to an entry indicates that an error with that entry will lead to a startup failure with an error message displayed to the user.

The control buttons on the right allow you to modify the contents of the class path list:

- Add class path entry (key `INS`)

  Invokes the class path entry dialog [p. 141] . Upon closing the class path entry dialog with the **[OK]** button, a new class path entry will be appended to the bottom of the class path list.

- Remove class path entry (key `DEL`)

  Removes the currently selected class path entry.

- Move class path entry up (key `ALT-UP`)

  Moves the selected class path entry up one position in the class path list.

- Move class path entry down (key `ALT-DOWN`)

  Moves the selected class path entry down one position in the class path list.

To change the error handling mode of a class path entry [p. 141] , select the class path entry and press **[Toggle 'fail on error']** right below the class path list or choose the corresponding menu item from the context menu.

B.4.3.4 Launcher Wizard: VM Options File

In this step of the launcher wizard [p. 122] , you can configure a VM options file for the launcher.

For detailed information on VM options files, please see the help topic on VM parameters [p. 38] .

If you select the `Copy template file with explanations for user` or the `Generate with the following contents` options, a VM options file is placed next to the launcher with the same file name and a `.vmoptions` extension. It contains **one VM parameter per line** for the launcher.

It is also possible to add a VM options file directly to the distribution tree [p. 104] , in this case, please select the `Do not generate a vmoptions file` option, otherwise the file in the distribution tree takes precedence over the generated file and a warning is printed.

VM options files are **not supported for Java 6 on macOS**. Any VM options that you specify on this screen and that are not already contained in the fixed VM parameters configured in the Java invocation [p. 126] will be merged into the Info.plist file of the application bundle. To navigate to the Info.plist file inside the bundle, select the launcher bundle file choose in a finder window on macOS, choose `Action->Show Package Contents` from the menu and open the `Contents` directory. The Info.plist file is an XML file and can be edited by the user.

For Java 7 on macOS, VM options file are fully supported.

B.4.3.5 Launcher Wizard: Configure Splash Screen

In this step of the launcher wizard [p. 122] , you can configure a splash screen for your application.

If the "Show splash screen" check box is selected, the Java splash screen is shown with the specified image file. If you decide to display a splash screen, you have to enter an image file. The file format can be PNG or GIF.

Please note that you cannot specify the `-splash:` VM parameter in the "Java Invocation" step [p. 126] , since this VM parameter is parsed by the default Java launchers (`java.exe` and `javaw.exe`) which are not used by install4j.

If you select the "Native splash screen on Windows" option, Windows launchers will use its own implementation of a splash screen that can be shown extremely quickly. The native splash screen does not support translucent images. In that case, you cannot use the `java.awt.SplashScreen` API to modify the splash screen. However, the text lines [p. 126] on the splash screen work with the native splash screen as well.

B.4.3.6 Advanced Options

B.4.3.6.1 Launcher Wizard: Configure Redirection

In this step of the launcher wizard [p. 122] , you can configure the redirection settings for stderr and stdout.

Note: this advanced option screen is reachable by selecting the "Executable" step [p. 123] and choosing "Redirection" from the **[Advanced options]** popup menu or by clicking directly on the index.

The following redirection settings can be edited:

- **Redirection of stderr**

  To redirect stderr to a file, select the `Redirect stderr` check box and enter a file name in the adjacent text field.
- **Redirection of stdout**

  To redirect stdout to a file, select the `Redirect stdout` check box and enter a file name in the adjacent text field.

File name are interpreted relative to the executable. Enter `/dev/null` if you want to suppress output completely for all platforms. You can choose whether the redirection file is overwritten each time the launcher is started or if output should be appended to an existing redirection file.

Note that redirection files are created lazily. This means that if nothing is written to the redirected stream, the file file will not be created or overwritten.

B.4.3.6.2 Launcher Wizard: Configure Windows Version Info Resource

In this step of the launcher wizard [p. 122] , you can configure whether a version info resource should be generated for the Microsoft Windows executable and what values the version info fields should take. **This step is only relevant for Microsoft Windows** and is important if your application wants to obtain the "Designed for Windows" logo.

Note: this advanced option screen is reachable by selecting the "Executable" step [p. 123] and choosing "Windows version info" from the **[Advanced options]** popup menu or by clicking directly on the index.

A version info resource will enable the Windows operating system to determine meta information about your executable. This information is displayed in various locations. For example, when opening the property dialog for the executable in the Windows explorer, a "Version" tab will be present in the property dialog if you have chosen to generate the version info resource.

The version info resource consists of several pieces of information. If you check `Generate version info resource`, there are several fields whose values must be entered in the text fields on this step. Note that the "original file name", the "company name", the "product name" and the "product version" fields in the version info resource are filled in automatically by install4j.

- **Product name**

  By default, the full name configured in the general settings is used by this value. If you want to use another value, you can enter it here.
- **File version**

  If you want to specify a version for the file which is a different from the product version, you can do it here. If this field is left empty, the product version entered on the Application Info tab [p. 88] of the General Settings step [p. 87] will be used for the file version.
- **Internal name**

  Choose a short internal name for identifying your application.
- **File description**

  Enter a description of the application.
- **Legal copyright**

  Enter a copyright statement for your application.

B.4.3.6.3 Launcher Wizard: Windows Manifest Options

In this step of the launcher wizard [p. 122] , you can configure manifest options for your Windows executables. The manifest of a Windows executable is a resource entry that can enable or disable certain features provided by the operating system.

Note: this advanced option screen is reachable by selecting the "Executable" step [p. 123] and choosing "Windows manifest options" from the **[Advanced options]** popup menu or by clicking directly on the index.

The execution level can be one of

- **As invoker**

  This is the default setting. The executable will be executed with the rights of the current token. If the user is an Administrator, this will be a filtered token so the executable will not have all administration rights.
- **Highest available**

  This level will raise the rights of the executable to the maximum extend available for the current user. This applies to Administrators that usually run with a filtered token. Windows Vista and higher will show a question to the user if he wants to elevate the rights of this application. For a standard user this is the same as "As invoker".
- **Require administrator**

  This is the same as "Highest available" when the user is an Administrator running with a filtered token. If the user is a standard user, Windows Vista and higher will ask for the credentials of an Administrator account.

The user can set the Windows DPI setting to a value that is larger than 100%. This is particularly relevant for high-resolution screens.

If your application can deal with different DPI settings, you can tell install4j to add the manifest entry to the executable that enables DPI-awareness. If this option is not selected, the GUI will be scaled up automatically and may look somewhat blurry.

B.4.3.6.4 Launcher Wizard: Unix Options

In this step of the launcher wizard [p. 122] , you can configure an optional settings for Unix launchers.

Note: this advanced option screen is reachable by selecting the "Executable" step [p. 123] and choosing "Unix options" from the **[Advanced options]** popup menu or by clicking directly on the index.

In the "Executable options" section, you can change the default Unix mode for launchers. By default, the Unix mode is set to 755, allowing everyone to execute the launcher, but only the owner to delete it.

For RPM and DEB Linux archives, service executables are enabled and started automatically if systemd is present. You can deactivate this behavior in this section. In that case, only the link in `/etc/init.d` will be created and you can enable the service manually.

In the "Custom script fragment" section, you can configure an optional script that is executed before the Java invocation.

If you specify a Bourne shell custom script, the entered script fragment will be inserted into the launcher script immediately before the Java invocation of your launcher takes place. This is a hook for experienced users to make custom changes in the environment.

You can select one of:

- **No custom fragment**

  No custom script fragment will be inserted.
- **Custom fragment from file**

  Specify a file from which the custom script will be read. If you enter a relative file, the file will be interpreted relative to the project file.
- **Direct entry**

  Enter your custom script fragment in the text area below.

B.4.3.6.5 Launcher Wizard: MacOS Options

There are two steps in the launcher wizard [p. 122] , where you can configure optional settings for macOS launchers.

Note: these advanced option screens are reachable by selecting the "Executable" step [p. 123] and choosing "macOS Info.plist file" or "macOS options" from the **[Advanced options]** popup menu or by clicking directly on the index.

In the "Info.plist fragment" section, you can configure an optional XML fragment that is inserted into the Info.plist file of the generated application bundle. This can be useful to customize the behavior of your launcher in ways that are not directly supported by install4j.

You can select one of:

- **No custom fragment**

  No custom XML fragment will be inserted.
- **Custom fragment from file**

  Specify a file from which the custom XML fragment will be read. If you enter a relative file, the file will be interpreted relative to the project file.
- **Direct entry**

  Enter your custom XML fragment in the text area below.

You can specify a custom Mac bundle identifier for the launcher.The bundle identifier string identifies your application to the system. Explicit control over this string can can be useful if you need to refer to the launcher from outside install4j. The identifier will be written to the `CFBundleIdentifier` key in in the Info.plist file. If this option is not set explicitly, install4j will generate a bundle identifier for you.

This string must be a uniform type identifier (UTI) that contains only alphanumeric (A-Z,a-z,0-9), hyphen (-), and period (.) characters.

If you have configured code signing [p. 95] for macOS media files, it may make sense to specify an entitlements file on the "macOS options" step.

Entitlements confer specific capabilities or security permissions to your app. If your media file is a single bundle archive, you can publish it to the App Store only if the launcher and the bundled JRE are sandboxed. Without entitlements, the launcher will not be able to perform a lot of operations.

For installers, entitlements can be used to enable certain features on macOS, such as iCloud storage or push notifications. If your application uses these features and you create an installer, you have to select the "Sign installed launchers" check box on the "Installer Options" [p. 331] step of the media wizard.

By default, the generated application bundle for a GUI application uses the "Executable name" property from the Executable info [p. 123] step of the launcher wizard. If you choose compact names as appropriate for Windows and Unix, you may not be happy with the appearance in the Finder on macOS.

Here, you can specify a different application bundle name that should be used for macOS media files. macOS application bundle names are localizable. If you specify an i18n variable as the application bundle name, such as `${i18n:myLauncherName}`, install4j will name the application bundle directory with the value for the principal language [p. 99] of your project. In addition, it will take the values for all additional configured languages and set up the appropriate localization in the application bundle.

For example, if your prinicipal language is English and you have French as an additional language, the application bundle name on the disk will always be the English version, regardless of the locale. On a French locale, the French name will be displayed to the user in the finder. In a terminal, the user would still see the English name for the application bundle.

Note that i18n messages can take parameters in `java.text.MessageFormat` style, so if your i18n message is `My launcher for {0}`, you can specify `{i18n:myLauncherName(My application}` or even use compiler variables for the arguments, like in `{i18n:myLauncherName(${compiler:sys.fullName})}`.

This setting only has an effect if the launcher is a GUI launcher.

B.4.3.6.6 Launcher Wizard: Configure Menu Integration

In this step of the launcher wizard [p. 122] you customize the start menu integration of the launcher.

Note: this advanced option screen is reachable by selecting the "Executable" step [p. 123] and choosing "Menu name" from the **[Advanced options]** popup menu or by clicking directly on the index.

The "Create standard program group" action [p. 177] optionally adds menu entries for launchers on Microsoft Windows and creates links for launchers in a suitable directory on Unix. Please choose one of three possibilities:

- **Integrate into menus with standard name**

  By default, the name of the launcher configuration in the list of launchers [p. 120] will be used for any desktop integration of the launcher, such as the start menu entry in Windows.
- **Integrate into menus with custom name**

  To use a different name for the menu integration, choose this option and enter the desired name in the text field below. To put the launcher in a sub-folder in the Windows program group, just enter a path (like `Client\Launcher`) here or use a compiler variables [p. 28] to make this change for the Windows media file definitions only.
- **Exclude from menu integration**

  To entirely exclude this launcher from any menu integration, choose this option. If this option is chosen, no links will be generated for this launcher on Unix by the "Create standard program group" action.

B.4.3.6.7 Launcher Wizard: Auto-Update Integration

In this step of the launcher wizard [p. 122] you can configure if a GUI launcher should execute downloaded update installers at startup.

Note: this advanced option screen is reachable by selecting the "Executable" step [p. 123] and choosing "Menu name" from the **[Advanced options]** popup menu or by clicking directly on the index.

In the screens & actions [p. 145] step, you can add a "Background updater" installer application that runs in the background and automatically downloads an updater installer. Such a background updater will not execute the downloaded update installer because that would disrupt the work of the user. Instead, it executes a "Schedule update installation" action to register the downloaded updated installer for later execution.

For GUI launchers, you can select the `Execute downloaded updater installers at startup` check box in this step. When this GUI installer is started and a downloaded update installer has been scheduled for installation, the update installer will be executed.

By default, the execution mode of the update installer is set to "Unattended mode with progress dialog", but in this step you can change it to a different execution mode. If "Unattended mode with progress dialog" is selected, you can customize the message in the progress window.

For more on auto-update functionality, please see the corresponding help topic [p. 53] .

B.4.3.6.8 Launcher Wizard: Configure Native Library Directories

In this step of the launcher wizard [p. 122] , you can configure directories that contain native libraries.

Note: this advanced option screen is reachable by selecting the "Java invocation" step [p. 126] and choosing "Native libraries" from the **[Advanced options]** popup menu or by clicking directly on the index.

If your application uses native libraries that you would lke to load with a `System.loadLibrary()` call, the directory where the native library is located must be included in a system-dependent environment variable. You can add such directories in the path list of this step.

- Add native library directory (key `INS`)

  Lets you add a new directory to the end of the list. The native libraries entry dialog [p. 142] will be displayed. You can use compiler variables [p. 28] to change native library directories for different media files. For this purpose, you can define one variable and override it in each media file definition.

- Remove native library directory (key `DEL`)

  Removes the currently selected native library directory entry.

- Move entry up (key `ALT-UP`)

  Moves the selected native library directory entry up one position in the path list.

- Move entry down (key `ALT-DOWN`)

  Moves the selected native library directory entry down one position in the path list.

B.4.3.6.9 Launcher Wizard: Choose Preferred VM

In this step of the launcher wizard [p. 122] , you can configure the preferred VM that install4j will choose to invoke your application. This setting only influences the choice of the VM type after a JRE has been selected according to the search sequence. The search sequence for the JRE is specified on the Java Version tab [p. 89] of the General Settings step [p. 87] .

Note: this advanced option screen is reachable by selecting the "Java invocation" step [p. 126] and choosing "Preferred VM" from the **[Advanced options]** popup menu or by clicking directly on the index.

After install4j finds a suitable JRE or JDK, it tries to honor the setting you make in this step. You can select one of the following:

- **Default VM**

  install4j will use the default VM for the found JRE.
- **Client hotspot VM**

  install4j will try to use the client hotspot VM for the found JRE. This is equivalent to using the `-client` switch when invoking `java` from the command line.
- **Server hotspot VM**

  install4j will try to use the server hotspot VM for the found JRE. This is equivalent to using the `-server` switch when invoking `java` from the command line.

Please note that it is not an error if the selected JVM is not present for the found JRE. install4j will simply use another JVM to launch your application in that case.

B.4.3.6.10 Launcher Wizard: Text Lines On Splash Screen

In this step of the launcher wizard [p. 122] , you can configure text lines on the splash screen.

Note: this advanced option screen is reachable by selecting the "Splash screen" step [p. 129] and choosing "Text lines" from the **[Advanced options]** popup menu or by clicking directly on the index.

If you would like to overlay lines of text for status and version information on the splash screen, you can select the check box at the top.

The `Status line` and `Version line` sections allow you to position the text lines on the splash screen and configure their font. The status line is dynamically updatable with install4j's splash screen client API while the text of the version line may be overridden with a command line option [p. 354] of the install4j compiler.

You can configure the following properties of a text line

- **Text**

  The (initial) text displayed in the text line.
- **Position**

  The x and y-coordinates of the text line on the splash screen. The origin of the coordinate system is the top left corner of the splash screen window.
- **Font**

  The font used for drawing the text line:

  - **Size**

    The size of the font in points.
  - **Bold**

    Whether the font weight should be bold or not.
  - **Color**

    The color of the font. By clicking on **[...]**, a color chooser dialog is brought up.

In both text lines, you can use the `%VERSION%` variable to substitute the version entered on the Application Info tab [p. 88] of the General Settings step [p. 87] .

To **visually position the text lines** with mouse and keyboard on the actual splash screen image, please click on the **[Position text lines visually]** button. The visual positioning dialog [p. 142] will then be displayed. On exiting the dialog with the **[OK]** button, the X/Y coordinate text fields (see above) will be updated for both text lines.

B.4.3.7 Dialogs

B.4.3.7.1 Main Class Selection Dialog

The main class selection dialog is shown when clicking on the **[...]** chooser button next to the main class text field in the Java invocation step [p. 126] . It shows all classes with a public main method.

Please choose a main class from the list and confirm with **[OK]** or double-click on the selected class.

B.4.3.7.2 Classpath Entry Dialog

The class path entry dialog is shown when clicking on the ✚ add button in the "Configure Java Invocation" step [p. 126] of the launcher wizard [p. 122] . Upon closing this dialog with the **[OK]** button, a new class path entry will be appended to the bottom of the class path list of that step.

To define a class path entry, you first select the entry type, then check the `fail if an error occurs with this class path entry` check box in case you want the startup to be terminated if this class path entry is faulty and finally fill out the `Detail` section of the dialog which is dependent on the selected entry type. The following entry types are available:

- **Scan directory**

  Scan a directory for archives with the extensions `*.jar` and `*.zip` to be added to the class path. In the `Detail` section of the dialog you must choose a directory either by entering the path in the text field or by clicking **[...]** and choosing it with a file chooser.

  Error handling:

  If `fail if an error occurs with this class path entry` is checked, the application will terminate with an error message if this directory does not exist.

- **Directory**

  Add a directory to the class path. In the `Detail` section of the dialog you must choose a directory either by entering the path in the text field or by clicking **[...]** and choosing it with a file chooser.

  Error handling:

  If `fail if an error occurs with this class path entry` is checked, the application will terminate with an error message if this directory does not exist.

- **Archive**

  Add an archive with the extension `*.jar` or `*.zip` to the class path. In the `Detail` section of the dialog you must choose an archive either by entering the path in the text field or by clicking **[...]** and choosing it with a file chooser.

  The last path component can include a * as a placeholder for a frequently changing version number. This is not a wildcard for processing multiple matching paths, rather it is intended for systems like maven where the version number on dependencies is part of the file name and is frequently changed. An example is `bin/commons-io-*.jar` which will match a file like `bin/commons-io-1.0.jar` at compile time. This replacement is performed at compile-time and not a runtime.

  Error handling:

If `fail if an error occurs with this class path entry` is checked, the application will terminate with an error message if this archive does not exist.

- **Environment variable**

  Add the contents of an environment variable to the class path. In the `Detail` section of the dialog you must enter the name of an environment variable.

  Error handling:

  If `fail if an error occurs with this class path entry` is checked, the application will terminate with an error message if this environment variable is not defined.

- **Compiler variable**

  Reads the value of a compiler variable, splits it with the configured path separator and adds that list of JAR files to the class path. Note that the compiler variable must be defined, otherwise the build will fail and you have to specify the plain name of the compiler variable, without any surrounding variable replacement syntax.

  For the separator, the compiler variable `${compiler:sys.pathlistSeparator}` can be used to separate path lists with `;` on Windows and `:` on Unix. The separator is interpreted as a regular expression, so you can use `\n` for separating files with new lines, for example.

  The JAR files in the compiler variable must already be present in the distribution tree, they are not added automatically. To change the directory where files should be resolved within the distribution tree, select the `Relative path prefix` check box and enter a relative path. The relative path can be empty in which case the JAR files must be located directly in the installation directory. If you pass a list of absolute files in the compiler variable, you must select the `Relative path prefix` check box, otherwise the build will fail.

  Error handling:

  If `fail if an error occurs with this class path entry` is checked, the application will terminate with an error message if any of the archives that are referenced in the compiler variable are not found.

Except for the "Environment variable" and "Compiler variable" classpath types, you can use environment variables in the text field with the following syntax: `${VARIABLE_NAME}` where you replace VARIABLE_NAME with the desired environment variable.

Note that for path selections by means of a file chooser (**[...]** buttons), install4j will try to convert the path to be relative to the distribution source directory.

B.4.3.7.3 Native Libraries Entry Dialog

The native libraries entry dialog is shown when clicking on the ➕ Add button in the Native libraries [p. 138] advanced options step below Java invocation step [p. 126] .

Please enter a directory that contains native libraries by entering the relative path to the distribution tree root directly or choosing it with the **[...]** chooser button next to the text field. You can use compiler variables [p. 28] to change native library directories for different media files. For this purpose, you can define one variable and override it in each media file definition [p. 338] .

B.4.3.7.4 Visual Positioning Of Text Lines

The visual positioning dialog is shown when clicking on the **[Position text lines visually]** button in the "configure splash screen" step [p. 129] of the launcher wizard [p. 122] . Upon closing this

dialog with the **[OK]** button, the X/Y coordinate text fields will be updated for status and version text lines in that step.

The visual positioning dialog displays the selected image with overlaid status and text line placeholders that are surrounded on the left and bottom by lines. These lines flash for the selected text line. You can position the selected text line on the image by dragging it with the mouse or using the cursor keys. Pressing CTRL with the cursor keys moves the text line in larger steps.

Please note that only the font color is reflected in the font of the text line placeholders. Font weight, font size and font name are only used in the runtime version of the splash screen.

B.5 Step 4: Installer

B.5.1 Step 4: Configure The Installer

In the **Installer step**, you configure all aspects of your installer, most importantly the screens and actions representing the user input and the actual installation.
The Installer step is divided into several tabs which are located at the bottom of install4j's main window:

- Screens & actions [p. 145]

  On this tab you configure the screens and actions in your installer and uninstaller as well as custom installer applications.
- Custom Code & Resources [p. 312]

  On this tab you configure the location of your custom code for additional libraries to be used in scripts as well as your own implementations of actions, screens and form components.
- Update Options [p. 315]

  On this tab you configure how your installers handle installations when an earlier version has already been installed.
- Auto-Update Options [p. 316]

  On this tab you configure settings for the auto-update descriptor file `updates.xml` that is generated by a build.

B.5.2 Installer - Screens And Actions

For more information on screens and related concepts, please see the corresponding help topic [p. 11] .

The screens and actions tab shows a tree representation of the installer, the uninstaller and other installer applications, such as updaters. The nodes in the tree are of the following types:

- Applications [p. 148]

  An application consist of a series of screens.

- Screens [p. 163]

  A screens displays information to the user, optionally gathers user input and optionally executes a series of actions when the user moves to the next screen.

- Actions [p. 177]

  An action usually makes a modification to the installation.

The **[Add]** button shows a popup window where you can select whether to add

- an action [p. 177] , a screen [p. 163] or an application [p. 148] . Actions and screens are made available by install4j or are contributed by an installed extension [p. 84] . A registry dialog [p. 319] will be shown where you can select the desired screen or action. When adding an application, the application template dialog [p. 319] is displayed.
- an action or a screen that is contained in your custom code. New types of reusable actions or screens can be developed with the install4j API [p. 81] . In your custom code configuration [p. 312] you can specify code locations that are scanned for suitable classes. A class selector [p. 318] will be shown where you can select the desired class.
- an action group or a screen group [p. 244] . The new group is initially empty. Note that you can also create groups directly from a selection in the tree of installer elements (see below).

Installer elements can only be added to appropriate parent elements. If no appropriate parent element is selected, install4j tries to find one by moving in the ancestor hierarchy from the current selection. If no appropriate parent element can be found, an error message is displayed.

- **Applications**

  are added at the top level.

- **Screens and screen groups**

  can be added to applications or screen groups.

- **Actions and action groups**

  can be added to screens or action groups.

If you select a single installer element in the tree of installer elements, you can edit its properties on the right side. Selecting multiple installer elements is possible on the same tree level, i.e. all selected elements have to be siblings in the tree.

When the configuration area is focused, you can transfer the focus back to the tree of installer elements with the keyboard by pressing `ALT-F1`.

The tree of installer elements provides the following actions in the toolbar on the right that operate on the current selection. You can also access these actions from the context menu or use the associated keyboard shortcuts.

- **Delete**

  All selected installer elements will be deleted after a confirmation dialog when invoking the **[Delete]** action. The deleted installer elements cannot be restored.

- **Rename**

  After you add a installer element, the tree of installer elements shows it with its default name. This is often enough, however, if you have multiple instances of the same installer element alongside, a custom name makes it easier to distinguish these instances. You can assign a custom name to each installer element with the **[Rename]** action. The default name is still displayed in brackets after the custom name. To revert to the default, just enter an empty custom name in the rename dialog.

- **Comment**

  By default, installer elements have no comments associated with them. You can add comments to selected installer elements with the **[Add Comments]** action. When a comment is added, the affected installer elements will receive a "Comments" tab. After adding a comment to a single installer element, the comment area is focused automatically. Likewise, you can remove comments from one or more installer elements with the **[Remove Comments]** action.

  In order to visit all comments, you can use the **[Show next comment]** and **[Show previous comment]** actions. These actions will focus the comment area automatically and wrap around if no further comments can be found.

- **Disable**

  In order to "comment out" installer elements, you can use the **[Disable]** action. The configuration of the disabled installer elements will not be displayed, their entries in the tree of installer elements will be shown in gray and they will not be checked for errors when the project is built.

- **Copy and paste**

  install4j offers an inter-process clipboard for installer elements. You can **[Cut]** or **[Copy]** installer elements to the clipboard and **[Paste]** them in the same or a different instance of install4j. Note that references to launchers or references to files in the distribution tree might not be valid after pasting to a different project.

  Pasted installer elements are appended to the end of the same level that would be chosen if you added installer elements of that type. Sequence restrictions with respect to the already present installer elements may force a different order.

- **Reorder**

  If your selection is a single contiguous interval, you can move the entire block up or down in the list. The selection can only be moved on the same level with the reorder actions. To move the selection to a different parent, you can cut and paste it (see above).

- **Group**

  You can create a screen group or an action group [p. 244] from the selected installer elements with the **[Create Group]** action. The new group will be inserted in place of the selected installer elements.

You can dissolve a group with the **[Dissolve Group]** action. This action is only enabled if the selection consists of a single screen group or action group. The elements contained in the group will be inserted in place of the group. Nested groups will not be dissolved.

- **Link**

  You can reuse screens and actions by linking to a single definition. This is particularly useful if you define a installer maintenance application [p. 148] that should repeat parts of the installer, such as a number of forms that query the user for initial values to set up your application. Also, links are the only way to integrate screens and actions from the installer or uninstaller merged project [p. 96] into the main project.

  In order to link to a screen, action, screen group or action group, you click on the add button and select `Add Link Into` from the popup menu. The first entry in that popup menu is always "This project" for links into the current project. If you have set up merged projects [p. 96], then you get an entry for each merged project. The configuration area of a link will only contain a button that selects the original definition in the tree of installer elements. For merged projects, the merged project is opened in a new window, unless it is already open.

  Another way to add a link into the same project is to select the installer element and invoke the **[Copy Link]** action. Then you navigate to the installer element where the link should be inserted and invoke the **[Paste Link]** action.

  For links into the same project, install4j ensures that there are no broken links in the tree of installer elements. When you delete an installer element, all links to it will be deleted as well. If that is the case, the deletion message will tell you how many links are about to be deleted. Links into merged projects may be broken, this condition is shown in in the configuration pane.

When using the install4j API, you reference installer elements with IDs. You can show IDs in the tree of installer elements by activating the **[Show IDs]** button on the lower right side of the tree of installer elements. The automatically generated numerical IDs are then shown in brackets. The selection will be remembered across restarts of install4j.

In order to adjust the information density in the tree of installer elements, you can change the **icon size** by choosing large or small icons in the `Icon Size` sub-menu in the context menu. The default setting is to show large icons. The selection will be remembered across restarts of install4j.

B.5.3 Installer - Configuring Applications

Applications are configured on the screens & and actions tab [p. 145] .

The top-level nodes represent the different applications that can be configured for the project. There are 3 types of applications:

- **Installer**

  The installer is the application that is executed when the media file is invoked by the user, for example, when the user double-clicks on the installer executable in the Windows explorer. The installer cannot be deleted from the tree of installer elements.

- **Uninstaller**

  The uninstaller is a special application for uninstalling an installation. It is used in various contexts:

  - Directly invoked by the user
  - Invoked from the Windows software registry
  - Invoked by the "Uninstall previous installation" action

  The uninstaller cannot be deleted from the tree of installer elements. If you do not wish to generate an uninstaller, you can disable it [p. 145] .

- **Custom installer application**

  You can add any number of custom installer applications that can be invoked after the installation. install4j comes with several templates for auto-updaters [p. 53] . Custom applications can also be used for writing maintenance applications for your installation.

  You can add new custom installer application by clicking on the **[Add]** button on the right side of the list and choosing `Add Application` from the popup. The application templates dialog [p. 319] will be displayed and lets you choose a starting point for your custom installer application. Application templates are entirely made up of existing screens, actions and form components. You can modify the selected application template after adding it.

  Unlike the installer and uninstaller above, custom applications are also created for archive media files [p. 327] . Please see the help topic on screens and actions [p. 11] for more information on how to create first-run installers for archives.

  Custom installer applications with a non-empty "executable directory" property are automatically added to the "Default file set". Unlike launchers, they cannot be assigned to specific file sets. If your installation components do no include the root of the default file set, you have to select the custom installer applications explicitly in the installation component configuration. If the custom installer application is added to the `.install4j` directory by leaving the executable directory empty, they will always be included.

Each installer application has a **startup sequence** of actions [p. 177] . Those actions are executed before the installer application presents a user interface. If any of these actions fails and has a "Quit on failure" failure strategy, the installer application will not be shown.

The configurable properties of the three types of applications are listed below:

Installer

The installer is the sequence of screens and actions that are executed when the user invokes the media file.

Properties:

- **Action elevation type [Privileges]**

  If any contained actions should run in the elevated helper process, if their "Action elevation type" property is set to "Inherit from parent".An elevated helper process is available on Windows and macOS if the process has been started without admin privileges and the "Request privileges" action has been configured to require full privileges.
- **Style [GUI Options]**

  The default screen style for this installer application. Screens and screen groups can override this style.
- **Customize title bar**

  A form component in the selected style is configured to allow customization of selected properties.
- **Customize banner image**

  A form component in the selected style is configured to allow customization of selected properties.
- **macOS entitlements file [macOS]**

  If you have configured code signing for macOS, an entitlements file can unlock certain features on macOS, such as iCloud storage or push notifications.
- **Executable icon [Executable]**

  By default, a standard installer icon is used for the executable. To customize the icon, press the customizer button in the configuration pane.
- **Allow unattended mode [Execution Modes]**

  If selected, the user can pass <tt>-q</tt> as an argument to run the installer application without a GUI. No user input is required, the installer applications works with the default values. Please see the corresponding help topic on installer modes for more information. All standard actions and standard screens support unattended installations. If your policy forbids unattended installations or if you include custom code that cannot handle unattended installations, you can disable them by deselecting this property.
- **Progress interface creation script**

  If you would like to implement your own way of displaying progress information for unattended installations, you can do so by returning a custom implementation of <tt>com.install4j.api.context.UnattendedProgressInterface</tt> from this script. If you return <tt>null</tt>, no progress information will be shown just as if this script had not been set. There is a default implementation <tt>com.install4j.api.context.DefaultUnattendedProgressInterface</tt> that does nothing for all its operations. You can derive from that class if you just need to implement a few particular methods in the progress interface.<p>If you just need a simple dialog that shows progress information in unattended mode, please choose the "Unattended mode with progress dialog" execution mode instead.

  Note: This property is only visible if "Allow unattended mode" is selected.

- **Allow console installations [Execution Modes]**

  If selected, the user can pass <tt>-c</tt> as an argument to run the installer application on the console. The installer asks for user input on the console in that mode. Please see the corresponding help topic on installer modes for more information. All standard actions and standard screens support console installations, form screens are also fully mapped to console installers. If your policy forbids console installations or if you include custom code that cannot handle console installations, you can disable them by deselecting this property.

- **Fall back to console mode on Unix**

  On Unix, users often operate in environments where no X11 server is available and no GUI can be displayed. The installer will fallback to console mode if console mode execution is allowed and this option is selected. Otherwise an error message will be displayed that tells the user how to invoke the installer in console mode.

  Note: This property is only visible if "Allow console installations" is selected.

- **Disable console mode on Windows**

  Offer console mode only on non-Windows platforms.

  Note: This property is only visible if "Allow console installations" is selected.

- **Console screen change handler**

  By default, a screen in console mode does not show any particular separation. You insert your own custom display with this script. The title parameter gives you access to the title of the screen. In console mode, screens display their subtitle only, so the title string will not be displayed again.

  Note: This property is only visible if "Allow console installations" is selected.

- **Default execution mode [Execution Modes]**

  The default execution mode for the installer application. By default, a GUI wizard will be shown, but it is also possible to run in console mode or unattended mode by default.

- **Title for progress dialog**

  The title for the progress dialog, for example "Updating installation".This title and the unattended mode with a progress window can also be set by passing <tt>-splash [title]</tt> as an argument from the command line.

  Note: This property is only visible if "Default execution mode" is set to "Unattended mode with progress dialog".

- **Windows console executable [Execution Modes]**

  If selected, a console executable will be created on Windows. A non-hideable console will be shown when the installer is double-clicked in the explorer. This improves the user experience for a console-only installer (default execution mode set to console) and allows execution through <tt>rsh</tt>.

- **VM parameters [Execution Options]**

  If you need to pass special VM parameters to the installer application, you can enter them here. A common case would be to raise the maximum heap size with a different -Xmx parameter if your installers require a lot of memory.

- **Arguments [Execution Options]**

  If you need to pass fixed default arguments to the installer application, you can enter them here. For example, if you want to display a splash screen in unattended mode by default, you can set the arguments to <tt>-splash "Installing ..."</tt>. Please note

that command line arguments will be appended to this list, so it is not possible to "override" a fixed argument from the command line.

- **Rollback on failure [Execution Options]**

  If selected, the installer application will try to restore the state before the last rollback barrier by rolling back all actions that were executed since the last barrier. Any screen or action can be selected as a rollback barrier with the property "Rollback barrier". If no rollback barrier was encountered, all executed actions will be rolled back.

- **Suppress initial progress dialog [Execution Options]**

  If selected, the initial native progress dialog of the installer is not displayed.

- **Window width [GUI Options]**

  The width of the window displayed by the installer application. The default value is 500. If the "Size client area" property is selected, this does not include the size of the window frame border.

- **Window height [GUI Options]**

  The height of the window displayed by the installer application. The default value is 390.If the "Size client area" property is selected, this does not include the size of the window frame border.

- **Size client area [GUI Options]**

  If selected, the supplied size for the window will not be applied to the outer dimensions of the window, but to the actually usable area inside the window. Unusually large window frame borders can occur due to user settings (accessibility, window themes, etc.) and may interfere with banner images or introduce unwanted scroll bars to form screens.

- **Resizable [GUI Options]**

  If selected, the window displayed by the installer application is resizable.

- **Help customizer script [General Customization Options]**

  If the user starts the installer application with one of the arguments <tt>-h -help /?</tt>, help regarding the available command line options will be displayed. If you have your own command line options you can customize this help with this script. The script receives a <tt>List</tt> containing <tt>String</tt> arrays of length 2 with the options and explanations. You can add options like this: <tt>options.add(new String[] {"/mySwitch", "Explanation of mySwitch"}}</tt>. You can also delete default options in the list.Attention: The context parameter has not been initialized at that point.<p>In order to get extra command line arguments in the installer, call <tt>context.getExtraCommandLineArguments()</tt> in any script.

- **Replacement script for language code [General Customization Options]**

  With this script you can replace the language that the installer will run with. <p>Parameters: The parameter <tt>languageCode</tt> contains the 2-letter ISO 639 code of the auto-detected language. If auto-detection has not been enabled on the languages step of the general settings, the parameter will be <tt>null</tt>. <p>Return value: If you return <tt>null</tt>, the language selection dialog will be shown, if you return a language code, the language selection dialog will not be shown and the returned language will be used. If the returned language code is a language that is not configured for this installer, the language selection dialog will be shown.

- **Customize version info [Windows]**

  If selected, you can customize the fields of the Windows version info in the nested properties. A windows version info is always generated for the executable with default values for product name and file version taken from the general settings.

- **Product name**

  The product name field in the version resource. If empty, the full name from the general settings is used.

  Note: This property is only visible if "Customize version info" is selected.

- **File version**

  The file version field in the version resource. If empty, the version from the general settings is used. The file version must consist of 4 numbers separated by spaces, commas or dots.

  Note: This property is only visible if "Customize version info" is selected.

- **Internal name**

  The internal name field in the version resource. If empty, the short name from the general settings is used.

  Note: This property is only visible if "Customize version info" is selected.

- **File description**

  The file description field in the version resource. If empty, the full name from the general settings is used.

  Note: This property is only visible if "Customize version info" is selected.

- **Copyright**

  The copyright field in the version resource. If empty, the publisher name from the general settings is used.

  Note: This property is only visible if "Customize version info" is selected.

- **Create log file for stderr output [Windows]**

  If selected, and output on stderr is detected, an file named error.log will be created next to the installer and all output to stderr will be redirected to that file.

Uninstaller

The uninstaller removes the installed application. If you do not wish to provide an uninstaller, you can disable it.

Properties:

- **Action elevation type [Privileges]**

  If any contained actions should run in the elevated helper process, if their "Action elevation type" property is set to "Inherit from parent".An elevated helper process is available on Windows and macOS if the process has been started without admin privileges and the "Request privileges" action has been configured to require full privileges.

- **Style [GUI Options]**

  The default screen style for this installer application. Screens and screen groups can override this style.
- **Customize title bar**

  A form component in the selected style is configured to allow customization of selected properties.
- **Customize banner image**

  A form component in the selected style is configured to allow customization of selected properties.
- **macOS entitlements file [macOS]**

  If you have configured code signing for macOS, an entitlements file can unlock certain features on macOS, such as iCloud storage or push notifications.
- **Executable icon [Executable]**

  By default, a standard installer icon is used for the executable. To customize the icon, press the customizer button in the configuration pane.
- **Executable name [Executable]**

  The name of the executable for the uninstaller. Please enter a name without any path components and without a file extension.
- **Executable directory [Executable]**

  The directory to which the executable of the uninstaller will be written. If empty, it will be placed in the <tt>.install4j</tt> directory.
- **Allow unattended mode [Execution Modes]**

  If selected, the user can pass <tt>-q</tt> as an argument to run the installer application without a GUI. No user input is required, the installer applications works with the default values. Please see the corresponding help topic on installer modes for more information. All standard actions and standard screens support unattended installations. If your policy forbids unattended installations or if you include custom code that cannot handle unattended installations, you can disable them by deselecting this property.
- **Progress interface creation script**

  If you would like to implement your own way of displaying progress information for unattended installations, you can do so by returning a custom implementation of <tt>com.install4j.api.context.UnattendedProgressInterface</tt> from this script. If you return <tt>null</tt>, no progress information will be shown just as if this script had not been set. There is a default implementation <tt>com.install4j.api.context.DefaultUnattendedProgressInterface</tt> that does nothing for all its operations. You can derive from that class if you just need to implement a few particular methods in the progress interface.<p>If you just need a simple dialog that shows progress information in unattended mode, please choose the "Unattended mode with progress dialog" execution mode instead.

  Note: This property is only visible if "Allow unattended mode" is selected.
- **Allow console installations [Execution Modes]**

  If selected, the user can pass <tt>-c</tt> as an argument to run the installer application on the console. The installer asks for user input on the console in that mode. Please see the corresponding help topic on installer modes for more information. All standard actions and standard screens support console installations, form screens are also fully

mapped to console installers. If your policy forbids console installations or if you include custom code that cannot handle console installations, you can disable them by deselecting this property.

- **Fall back to console mode on Unix**

  On Unix, users often operate in environments where no X11 server is available and no GUI can be displayed. The installer will fallback to console mode if console mode execution is allowed and this option is selected. Otherwise an error message will be displayed that tells the user how to invoke the installer in console mode.

  Note: This property is only visible if "Allow console installations" is selected.

- **Disable console mode on Windows**

  Offer console mode only on non-Windows platforms.

  Note: This property is only visible if "Allow console installations" is selected.

- **Console screen change handler**

  By default, a screen in console mode does not show any particular separation. You insert your own custom display with this script. The title parameter gives you access to the title of the screen. In console mode, screens display their subtitle only, so the title string will not be displayed again.

  Note: This property is only visible if "Allow console installations" is selected.

- **Default execution mode [Execution Modes]**

  The default execution mode for the installer application. By default, a GUI wizard will be shown, but it is also possible to run in console mode or unattended mode by default.

- **Title for progress dialog**

  The title for the progress dialog, for example "Updating installation".This title and the unattended mode with a progress window can also be set by passing <tt>-splash [title]</tt> as an argument from the command line.

  Note: This property is only visible if "Default execution mode" is set to "Unattended mode with progress dialog".

- **Windows console executable [Execution Modes]**

  If selected, a console executable will be created on Windows. A non-hideable console will be shown when the installer is double-clicked in the explorer. This improves the user experience for a console-only installer (default execution mode set to console) and allows execution through <tt>rsh</tt>.

- **VM parameters [Execution Options]**

  If you need to pass special VM parameters to the installer application, you can enter them here. A common case would be to raise the maximum heap size with a different -Xmx parameter if your installers require a lot of memory.

- **Arguments [Execution Options]**

  If you need to pass fixed default arguments to the installer application, you can enter them here. For example, if you want to display a splash screen in unattended mode by default, you can set the arguments to <tt>-splash "Installing ..."</tt>. Please note that command line arguments will be appended to this list, so it is not possible to "override" a fixed argument from the command line.

- **Rollback on failure [Execution Options]**

  If selected, the installer application will try to restore the state before the last rollback barrier by rolling back all actions that were executed since the last barrier. Any screen

or action can be selected as a rollback barrier with the property "Rollback barrier". If no rollback barrier was encountered, all executed actions will be rolled back.

- **Window width [GUI Options]**

  The width of the window displayed by the installer application. The default value is 500. If the "Size client area" property is selected, this does not include the size of the window frame border.

- **Window height [GUI Options]**

  The height of the window displayed by the installer application. The default value is 390.If the "Size client area" property is selected, this does not include the size of the window frame border.

- **Size client area [GUI Options]**

  If selected, the supplied size for the window will not be applied to the outer dimensions of the window, but to the actually usable area inside the window. Unusually large window frame borders can occur due to user settings (accessibility, window themes, etc.) and may interfere with banner images or introduce unwanted scroll bars to form screens.

- **Resizable [GUI Options]**

  If selected, the window displayed by the installer application is resizable.

- **Help customizer script [General Customization Options]**

  If the user starts the installer application with one of the arguments <tt>-h -help /?</tt>, help regarding the available command line options will be displayed. If you have your own command line options you can customize this help with this script. The script receives a <tt>List</tt> containing <tt>String</tt> arrays of length 2 with the options and explanations. You can add options like this: <tt>options.add(new String[] {"/mySwitch", "Explanation of mySwitch"}}</tt>. You can also delete default options in the list.Attention: The context parameter has not been initialized at that point.<p>In order to get extra command line arguments in the installer, call <tt>context.getExtraCommandLineArguments()</tt> in any script.

- **Unix mode [Unix]**

  The executable mode for the uninstaller on Unix.

- **Customize version info [Windows]**

  If selected, you can customize the fields of the Windows version info in the nested properties. A windows version info is always generated for the executable with default values for product name and file version taken from the general settings.

- **Product name**

  The product name field in the version resource. If empty, the full name from the general settings is used.

  Note: This property is only visible if "Customize version info" is selected.

- **File version**

  The file version field in the version resource. If empty, the version from the general settings is used. The file version must consist of 4 numbers separated by spaces, commas or dots.

  Note: This property is only visible if "Customize version info" is selected.

- **Internal name**

  The internal name field in the version resource. If empty, the short name from the general settings is used.

  Note: This property is only visible if "Customize version info" is selected.
- **File description**

  The file description field in the version resource. If empty, the full name from the general settings is used.

  Note: This property is only visible if "Customize version info" is selected.
- **Copyright**

  The copyright field in the version resource. If empty, the publisher name from the general settings is used.

  Note: This property is only visible if "Customize version info" is selected.
- **Use custom application bundle name [macOS]**

  If selected, a different application bundle name is used on macOS. Executable names on macOS are localizable. Otherwise, the value of the "Executable name" property is used for the application bundle name.
- **Custom application bundle name**

  The application bundle name to be used for macOS media files. Bundle names on macOS are shown in the Finder and are localizable. For example, the executable name could be set to <tt>${i18n:myLauncherName(${compiler:sys.fullName})}</tt> where <tt>myLauncherName</tt> is an i18n message with value "Launcher for {0}".

  Note: This property is only visible if "Use custom application bundle name" is selected.

Custom application

A custom installer application is installed by the installer. Users can start it manually or it can be executed programmatically from your own code via the API.

Properties:

- **Action elevation type [Privileges]**

  If any contained actions should run in the elevated helper process, if their "Action elevation type" property is set to "Inherit from parent".An elevated helper process is available on Windows and macOS if the process has been started without admin privileges and the "Request privileges" action has been configured to require full privileges.
- **Style [GUI Options]**

  The default screen style for this installer application. Screens and screen groups can override this style.
- **Customize title bar**

  A form component in the selected style is configured to allow customization of selected properties.

- **Customize banner image**

  A form component in the selected style is configured to allow customization of selected properties.

- **macOS entitlements file [macOS]**

  If you have configured code signing for macOS, an entitlements file can unlock certain features on macOS, such as iCloud storage or push notifications.

- **Executable icon [Executable]**

  By default, a standard installer icon is used for the executable. To customize the icon, press the customizer button in the configuration pane.

- **File set [Executable]**

  Choose the file set to which the installer application is added. File sets can be defined on the Files->Define Distribution Tree step.

- **Executable name [Executable]**

  The name of the executable for the custom application. Please enter a name without any path components and without a file extension.

- **Executable directory [Executable]**

  The directory to which the executable of the custom application will be written. If empty, it will be placed in the <tt>.install4j</tt> directory.

- **Allow unattended mode [Execution Modes]**

  If selected, the user can pass <tt>-q</tt> as an argument to run the installer application without a GUI. No user input is required, the installer applications works with the default values. Please see the corresponding help topic on installer modes for more information. All standard actions and standard screens support unattended installations. If your policy forbids unattended installations or if you include custom code that cannot handle unattended installations, you can disable them by deselecting this property.

- **Progress interface creation script**

  If you would like to implement your own way of displaying progress information for unattended installations, you can do so by returning a custom implementation of <tt>com.install4j.api.context.UnattendedProgressInterface</tt> from this script. If you return <tt>null</tt>, no progress information will be shown just as if this script had not been set. There is a default implementation <tt>com.install4j.api.context.DefaultUnattendedProgressInterface</tt> that does nothing for all its operations. You can derive from that class if you just need to implement a few particular methods in the progress interface.<p>If you just need a simple dialog that shows progress information in unattended mode, please choose the "Unattended mode with progress dialog" execution mode instead.

  Note: This property is only visible if "Allow unattended mode" is selected.

- **Allow console installations [Execution Modes]**

  If selected, the user can pass <tt>-c</tt> as an argument to run the installer application on the console. The installer asks for user input on the console in that mode. Please see the corresponding help topic on installer modes for more information. All standard actions and standard screens support console installations, form screens are also fully mapped to console installers. If your policy forbids console installations or if you include custom code that cannot handle console installations, you can disable them by deselecting this property.

- **Fall back to console mode on Unix**

  On Unix, users often operate in environments where no X11 server is available and no GUI can be displayed. The installer will fallback to console mode if console mode execution is allowed and this option is selected. Otherwise an error message will be displayed that tells the user how to invoke the installer in console mode.

  Note: This property is only visible if "Allow console installations" is selected.
- **Disable console mode on Windows**

  Offer console mode only on non-Windows platforms.

  Note: This property is only visible if "Allow console installations" is selected.
- **Console screen change handler**

  By default, a screen in console mode does not show any particular separation. You insert your own custom display with this script. The title parameter gives you access to the title of the screen. In console mode, screens display their subtitle only, so the title string will not be displayed again.

  Note: This property is only visible if "Allow console installations" is selected.
- **Default execution mode [Execution Modes]**

  The default execution mode for the installer application. By default, a GUI wizard will be shown, but it is also possible to run in console mode or unattended mode by default.
- **Title for progress dialog**

  The title for the progress dialog, for example "Updating installation".This title and the unattended mode with a progress window can also be set by passing <tt>-splash [title]</tt> as an argument from the command line.

  Note: This property is only visible if "Default execution mode" is set to "Unattended mode with progress dialog".
- **Windows console executable [Execution Modes]**

  If selected, a console executable will be created on Windows. A non-hideable console will be shown when the installer is double-clicked in the explorer. This improves the user experience for a console-only installer (default execution mode set to console) and allows execution through <tt>rsh</tt>.
- **Change working directory [Execution Options]**

  If selected the working directory will be changed to the value in 'Working directory' at startup.
- **Working directory**

  The working directory to be used when 'Change working directory' is selected.

  Note: This property is only visible if "Change working directory" is selected.
- **Single instance [Execution Options]**

  If checked the application will ensure at startup that there is only one instance running per user account.
- **VM parameters [Execution Options]**

  If you need to pass special VM parameters to the installer application, you can enter them here. A common case would be to raise the maximum heap size with a different -Xmx parameter if your installers require a lot of memory.

- **Arguments [Execution Options]**

  If you need to pass fixed default arguments to the installer application, you can enter them here. For example, if you want to display a splash screen in unattended mode by default, you can set the arguments to <tt>-splash "Installing ..."</tt>. Please note that command line arguments will be appended to this list, so it is not possible to "override" a fixed argument from the command line.
- **Rollback on failure [Execution Options]**

  If selected, the installer application will try to restore the state before the last rollback barrier by rolling back all actions that were executed since the last barrier. Any screen or action can be selected as a rollback barrier with the property "Rollback barrier". If no rollback barrier was encountered, all executed actions will be rolled back.
- **Window title [GUI Options]**

  The title of the application window.
- **Show message when user cancels [GUI Options]**

  If selected, a message will be shown when the user cancels the installer application by clicking on the "Cancel" button or closing the application frame.
- **Cancel message**

  The message that is shown if the user cancels the installer application by clicking on the "Cancel" button or closing the application frame. The options that are presented to the user are "Cancel" or "Continue".

  Note: This property is only visible if "Show message when user cancels" is selected.
- **Window width [GUI Options]**

  The width of the window displayed by the installer application. The default value is 500. If the "Size client area" property is selected, this does not include the size of the window frame border.
- **Window height [GUI Options]**

  The height of the window displayed by the installer application. The default value is 390.If the "Size client area" property is selected, this does not include the size of the window frame border.
- **Size client area [GUI Options]**

  If selected, the supplied size for the window will not be applied to the outer dimensions of the window, but to the actually usable area inside the window. Unusually large window frame borders can occur due to user settings (accessibility, window themes, etc.) and may interfere with banner images or introduce unwanted scroll bars to form screens.
- **Resizable [GUI Options]**

  If selected, the window displayed by the installer application is resizable.
- **Help customizer script [General Customization Options]**

  If the user starts the installer application with one of the arguments <tt>-h -help /?</tt>, help regarding the available command line options will be displayed. If you have your own command line options you can customize this help with this script. The script receives a <tt>List</tt> containing <tt>String</tt> arrays of length 2 with the options and explanations. You can add options like this: <tt>options.add(new String[] {"/mySwitch", "Explanation of mySwitch"}}</tt>. You can also delete default options in the list.Attention: The context parameter has not been initialized at that point.<p>In

order to get extra command line arguments in the installer, call <tt>context.getExtraCommandLineArguments()</tt> in any script.

- **Unix mode [Unix]**

  The executable mode for the custom application on Unix.

- **Execution level [Windows]**

  The execution level for this application. If you want to modify files in the installation direction, you most likely need administrator rights. This is only relevant for Windows Vista and higher.

- **Customize version info [Windows]**

  If selected, you can customize the fields of the Windows version info in the nested properties. A windows version info is always generated for the executable with default values for product name and file version taken from the general settings.

- **Product name**

  The product name field in the version resource. If empty, the full name from the general settings is used.

  Note: This property is only visible if "Customize version info" is selected.

- **File version**

  The file version field in the version resource. If empty, the version from the general settings is used. The file version must consist of 4 numbers separated by spaces, commas or dots.

  Note: This property is only visible if "Customize version info" is selected.

- **Internal name**

  The internal name field in the version resource. If empty, the short name from the general settings is used.

  Note: This property is only visible if "Customize version info" is selected.

- **File description**

  The file description field in the version resource. If empty, the full name from the general settings is used.

  Note: This property is only visible if "Customize version info" is selected.

- **Copyright**

  The copyright field in the version resource. If empty, the publisher name from the general settings is used.

  Note: This property is only visible if "Customize version info" is selected.

- **Use custom application bundle name [macOS]**

  If selected, a different application bundle name is used on macOS. Executable names on macOS are localizable. Otherwise, the value of the "Executable name" property is used for the application bundle name.

- **Custom application bundle name**

  The application bundle name to be used for macOS media files. Bundle names on macOS are shown in the Finder and are localizable. For example, the executable name could be set to <tt>${i18n:myLauncherName(${compiler:sys.fullName})}</tt> where <tt>myLauncherName</tt> is an i18n message with value "Launcher for {0}".

  Note: This property is only visible if "Use custom application bundle name" is selected.

The second tab in the configuration area for installer applications is the **Installer variables** tab. Here, you can check the bindings for all detected installer variables and pre-define installer variables. For more information, please see the help topic on variables [p. 28] and the help on the variable selection dialog [p. 99] .

An additional feature with respect to the variable selection dialog is that you can navigate to a binding by selecting an element in the binding tree at the bottom and click on the **[Go To Selection]** button.

Custom installer applications have a **Launcher integrations** tab in the configuration area that helps you to start them when launchers are executed.

The first way to start an installer application is programmatically, by using the API contained in `[install4j installation directory]/resource/i4jruntime.jar`. To get the code snippet for starting the selected installer application, click on the **[Start integration wizard]** button. The integration wizard will present a number of options that control the condition and possible call backs from the installer application. Note that you do not have to distribute `i4jruntime.jar`, since it is automatically available for installed applications.

The second way to start an installer application is automatically, by defining a **launch schedule** and a **launch mode**. The launch schedule is one of

- **Always**

  Every time you start the launcher, the installer application will be started as well.
- **According to update schedule**

  install4j provides a built-in update schedule registry that can be configured by the user on a form screen with an "Update schedule selector" form component. Also, you can programatically modify the update schedule through the class `com.install4j.api.update.UpdateScheduleRegistry` in the API. The selected installer application will be started only if the update schedule requires an update check.
- **First run of any launcher in archive media file by the current user**

  For archive media files (such as a Windows ZIP file), no installer is available. To execute a sequence of screens and actions when a launcher is started for the first time after the archive has been extracted, use this launch schedule. It may be convenient to link to screen groups in the installer in order to avoid duplicating configuration in your custom installer application.

  In your launcher, you can check for this condition with `com.install4j.api.launcher.ApplicationLauncher.isNewArchiveInstallation()` in case you want to perform some actions outside of a custom installer application.

The launch mode is one of

- **Blocking at start up**

  When the launcher is started, the selected installer application will be started first. When the installer application terminates, the launcher will then start up (unless a "Shut down calling launcher" action has been executed).
- **Non-blocking at start up**

  When the launcher is started, the selected installer application will be started immediately. The launcher continues to start up in parallel.
- **When first window is shown**

  The selected installer application will be started when the first window is shown. This works for AWT, Swing and SWT applications. If you have a SWT application, the "Uses SWT" check box in the executable info [p. 123] step of the launcher wizard [p. 122] must be selected.

Just like with the API, the installer application can be started in the launcher process itself or in a new process. By default, the installer application is started in the same process. If the "Blocking at start up" or "Non-blocking at start up" launch modes are selected, the look and feel it set to the system look and feel. For the "When first window is shown" launch mode, the look and feel is not changed, so your own look and feel will be used. When the installer application is executed in the same process, the "Shutdown calling launcher" action has a different effect: The whole process will be terminated when the installer application exits.

By default, the selected installer application is started for all launchers in your project. If this is not desired, you can restrict the integration to selected launchers. Note that if "All launchers" is selected and the project is merged into another project, the integration will be performed for all launchers in the main project as well.

B.5.4 Installer - Configuring Screens

Screens are configured on the screens & and actions tab [p. 145] .
Please see the list of available screens [p. 166] that come with install4j.

A screen is a **single step in an installer application**. It displays information to the user or gathers user input.

If a screen has attached actions [p. 177] , there will be an expand control to the left of the screen icon that allows you to show the associated actions.

Common properties of screens are:

- **Action elevation type [Privileges]**

  If any contained actions should run in the elevated helper process, if their "Action elevation type" property is set to "Inherit from parent".An elevated helper process is available on Windows and macOS if the process has been started without admin privileges and the "Request privileges" action has been configured to require full privileges.
- **Style [GUI Options]**

  The default screen style for this installer application. Screens and screen groups can override this style.
- **Customize title bar**

  A form component in the selected style is configured to allow customization of selected properties.
- **Customize banner image**

  A form component in the selected style is configured to allow customization of selected properties.
- **Condition expression [Control Flow]**

  This expression is evaluated to decide whether the screen is displayed. If the expression or script returns false, the current screen will be skipped. This expression or script should not have any side-effects, it will be called while another screen is still being displayed.
- **Rollback barrier [Control Flow]**

  If the screen should be a rollback barrier. When a rollback barrier is completed, none of the preceding actions will be rolled back. You can use this property to prevent an incomplete rollback of complex changes or to protect actions from rollback when the user hits "Cancel" in the post-install phase.
- **Exit code [Control Flow]**

  If the "Rollback barrier" property is selected, and a rollback terminates at this screen, this property determines the exit code of the installer. By default, reaching a rollback barrier during a rollback is considered a success, but you can signal a failure by specifying a non-zero exit code here.

  Note: This property is only visible if "Rollback barrier" is selected.
- **Validation expression [Control Flow]**

  This expression or script is called when the user clicks the next button. If it returns false, the current screen will be displayed again. You can use this to validate user input. Error messages are not displayed automatically, you can use the Util.showErrorMessage(String errorMessage) method in your script.
- **Quit after screen [Control Flow]**

  If the screen should have a "Finish" button instead of a "Next" button. The installer or uninstaller will quit after this screen. The "Cancel" button will not be visible if this option is checked.

- **Back button [Control Flow]**

  Allowing the user to go back to previous screens can be problematic if the previous screen has actions attached that cannot be executed multiple times. By default, every action is just executed once, all actions have a property to allow multiple execution. The default behavior is the "Safe back button", where the back button is hidden if the previous screen has actions attached that cannot be executed multiple times.
- **Wizard index [Screen Activation]**

  Every screen can set or change the current wizard index. The wizard index is an optional panel on the left side of the wizard that shows overall installation progress. You can leave the index unchanged as it was set by a previous screen, change the step in the current wizard index, removed the current wizard index ot configure a new wizard index. For conditional construction of a wizard index, please use the <tt>com.install4j.api.context.WizardIndex</tt> class in the "Pre-activation" script.
- **Step key**

  The key for the step in the wizard index that should be activated.

  Note: This property is only visible if "Wizard index" is set to "Activate another step".
- **Steps**

  The steps that are displayed by the wizard index. Each step has a key that you can use to switch to that step later on by setting the wizard index property to "Activate another step" and specifying that key.

  Note: This property is only visible if "Wizard index" is set to "Set a new wizard index".
- **Initial key**

  The key of the step in the wizard index that should be initially selected. Leave empty to select the first step.

  Note: This property is only visible if "Wizard index" is set to "Set a new wizard index".
- **Partially defined**

  If selected, the list of wizard index steps will be partially defined. This means that a "..." entry will be appended at the bottom.

  Note: This property is only visible if "Wizard index" is set to "Set a new wizard index".
- **Numbered**

  If selected, the steps in the wizard index are numbered.

  Note: This property is only visible if "Wizard index" is set to "Set a new wizard index".
- **Maximum width**

  The maximum width of the wizard index in pixels. The preferred with is determined by the longest step name, the maximum width is an upper bound for the actual width.

  Note: This property is only visible if "Wizard index" is set to "Set a new wizard index".
- **Minimum width**

  The minimum width of the wizard index in pixels. The preferred with is determined by the longest step name, the minimum width is a lower bound for the actual width.

  Note: This property is only visible if "Wizard index" is set to "Set a new wizard index".
- **Background color**

  The background color for the index panel. Set to "None" to restore the default color.

  Note: This property is only visible if "Wizard index" is set to "Set a new wizard index".

- **Foreground color**

  The foreground color for the index panel. Set to "None" to restore the default color.

  Note: This property is only visible if "Wizard index" is set to "Set a new wizard index".
- **Background image**

  The image file for the background of the wizard index panel. Leave empty if no background image is required.

  Note: This property is only visible if "Wizard index" is set to "Set a new wizard index".
- **Image anchor**

  The anchor for the background image. The default value is "North".
- **Pre-activation script [Screen Activation]**

  This script is called each time just before the screen is displayed.
- **Post-activation script [Screen Activation]**

  This script is called each time just after the screen has been displayed. It is not invoked in console or unattended mode.

Some screens only make sense when corresponding actions are used later on in the installer or uninstaller. For example, the "Services" screen will only be displayed at runtime if there are "Install a service" actions present on a subsequent screen. If such a dependency is not fulfilled after adding a screen, a corresponding notification is displayed.

B.5.5 Installer - Available Screens

Empty form

An empty form to which form components can be added. By default, form components are layouted along the vertical axis, but you can use layout groups for greater flexibility. Form components with user input are bound to installer variables that can by referenced by other elements in the installer, for example by actions.

Applies to: Installer, Uninstaller

Properties:

- **Fill horizontal space [Form]**

  If set, the form will fill the entire horizontal extent of the screen. Otherwise, it will be added at the selected anchor and all form components will not be wider than their preferred widths.
- **Horizontal anchor**

  If "Fill horizontal space" is not selected, the form can be placed at different locations in the available space.

  Note: This property is only visible if "Fill horizontal space" is selected.
- **Fill vertical space [Form]**

  If set, the form will fill the entire vertical extent of the screen. Otherwise, it will be at the selected anchor. Note that form components always have their preferred heights when the "Scrollable" property is selected. If "Fill vertical space" is selected, the form starts at the top and any remaining space is empty.
- **Vertical anchor**

  If "Fill vertical space" is not selected, the form can be placed at different locations in the available space.

  Note: This property is only visible if "Fill vertical space" is selected.
- **Scrollable [Form]**

  If set, the form will be wrapped in a scroll pane. If not set, certain form components which can grow in the vertical direction (like the text area form component) can claim remaining vertical space. Please note that those components have to be configured accordingly.
- **Screen title [Messages]**

  The title of the screen, shown in a bold and larger font. Should be a concise subject. This question is also used by the console installer for presenting the screen.
- **Screen subtitle [Messages]**

  The subtitle of the screen, shown below the title in a normal font. Should be a short question. This question is also used by the console installer for presenting the screen.

Category: Form templates

Banner with header at the top

A form that has "Banner" as the default style and a configurable header label at the top.

Applies to: Installer, Uninstaller

Properties:

- **Fill horizontal space [Form]**

  If set, the form will fill the entire horizontal extent of the screen. Otherwise, it will be added at the selected anchor and all form components will not be wider than their preferred widths.
- **Horizontal anchor**

  If "Fill horizontal space" is not selected, the form can be placed at different locations in the available space.

  Note: This property is only visible if "Fill horizontal space" is selected.
- **Fill vertical space [Form]**

  If set, the form will fill the entire vertical extent of the screen. Otherwise, it will be at the selected anchor. Note that form components always have their preferred heights when the "Scrollable" property is selected. If "Fill vertical space" is selected, the form starts at the top and any remaining space is empty.
- **Vertical anchor**

  If "Fill vertical space" is not selected, the form can be placed at different locations in the available space.

  Note: This property is only visible if "Fill vertical space" is selected.
- **Scrollable [Form]**

  If set, the form will be wrapped in a scroll pane. If not set, certain form components which can grow in the vertical direction (like the text area form component) can claim remaining vertical space. Please note that those components have to be configured accordingly.
- **Screen title [Messages]**

  The title of the screen, shown in a bold and larger font. Should be a concise subject. This question is also used by the console installer for presenting the screen.
- **Screen subtitle [Messages]**

  The subtitle of the screen, shown below the title in a normal font. Should be a short question. This question is also used by the console installer for presenting the screen.

Directory selection

A form that asks the user to select a directory. All displayed messages are configurable.

Applies to: Installer, Uninstaller

Properties:

- **Fill horizontal space [Form]**

  If set, the form will fill the entire horizontal extent of the screen. Otherwise, it will be added at the selected anchor and all form components will not be wider than their preferred widths.
- **Horizontal anchor**

  If "Fill horizontal space" is not selected, the form can be placed at different locations in the available space.

  Note: This property is only visible if "Fill horizontal space" is selected.
- **Fill vertical space [Form]**

  If set, the form will fill the entire vertical extent of the screen. Otherwise, it will be at the selected anchor. Note that form components always have their preferred heights when the "Scrollable" property is selected. If "Fill vertical space" is selected, the form starts at the top and any remaining space is empty.
- **Vertical anchor**

  If "Fill vertical space" is not selected, the form can be placed at different locations in the available space.

  Note: This property is only visible if "Fill vertical space" is selected.
- **Scrollable [Form]**

  If set, the form will be wrapped in a scroll pane. If not set, certain form components which can grow in the vertical direction (like the text area form component) can claim remaining vertical space. Please note that those components have to be configured accordingly.
- **Screen title [Messages]**

  The title of the screen, shown in a bold and larger font. Should be a concise subject. This question is also used by the console installer for presenting the screen.
- **Screen subtitle [Messages]**

  The subtitle of the screen, shown below the title in a normal font. Should be a short question. This question is also used by the console installer for presenting the screen.

Display PDF file

A form that displays a PDF file in an embedded cross-platform PDF viewer.

Applies to: Installer, Uninstaller

Properties:

- **Fill horizontal space [Form]**

  If set, the form will fill the entire horizontal extent of the screen. Otherwise, it will be added at the selected anchor and all form components will not be wider than their preferred widths.
- **Horizontal anchor**

  If "Fill horizontal space" is not selected, the form can be placed at different locations in the available space.

Note: This property is only visible if "Fill horizontal space" is selected.

- **Fill vertical space [Form]**

  If set, the form will fill the entire vertical extent of the screen. Otherwise, it will be at the selected anchor. Note that form components always have their preferred heights when the "Scrollable" property is selected. If "Fill vertical space" is selected, the form starts at the top and any remaining space is empty.

- **Vertical anchor**

  If "Fill vertical space" is not selected, the form can be placed at different locations in the available space.

  Note: This property is only visible if "Fill vertical space" is selected.

- **Scrollable [Form]**

  If set, the form will be wrapped in a scroll pane. If not set, certain form components which can grow in the vertical direction (like the text area form component) can claim remaining vertical space. Please note that those components have to be configured accordingly.

- **Screen title [Messages]**

  The title of the screen, shown in a bold and larger font. Should be a concise subject. This question is also used by the console installer for presenting the screen.

- **Screen subtitle [Messages]**

  The subtitle of the screen, shown below the title in a normal font. Should be a short question. This question is also used by the console installer for presenting the screen.

Display progress

A form that displays a progress bar with a status line capturing the progress information of associated actions. The default post-activation script executes any associated actions immediately when the screen is activated. All displayed messages are configurable.

Applies to: Installer, Uninstaller

Properties:

- **Fill horizontal space [Form]**

  If set, the form will fill the entire horizontal extent of the screen. Otherwise, it will be added at the selected anchor and all form components will not be wider than their preferred widths.

- **Horizontal anchor**

  If "Fill horizontal space" is not selected, the form can be placed at different locations in the available space.

  Note: This property is only visible if "Fill horizontal space" is selected.

- **Fill vertical space [Form]**

  If set, the form will fill the entire vertical extent of the screen. Otherwise, it will be at the selected anchor. Note that form components always have their preferred heights when the "Scrollable" property is selected. If "Fill vertical space" is selected, the form starts at the top and any remaining space is empty.

- **Vertical anchor**

  If "Fill vertical space" is not selected, the form can be placed at different locations in the available space.

  Note: This property is only visible if "Fill vertical space" is selected.
- **Scrollable [Form]**

  If set, the form will be wrapped in a scroll pane. If not set, certain form components which can grow in the vertical direction (like the text area form component) can claim remaining vertical space. Please note that those components have to be configured accordingly.
- **Screen title [Messages]**

  The title of the screen, shown in a bold and larger font. Should be a concise subject. This question is also used by the console installer for presenting the screen.
- **Screen subtitle [Messages]**

  The subtitle of the screen, shown below the title in a normal font. Should be a short question. This question is also used by the console installer for presenting the screen.

Display text

A form that displays text to the user, either plain text or HTML. All displayed messages are configurable.

Applies to: Installer, Uninstaller

Properties:

- **Fill horizontal space [Form]**

  If set, the form will fill the entire horizontal extent of the screen. Otherwise, it will be added at the selected anchor and all form components will not be wider than their preferred widths.
- **Horizontal anchor**

  If "Fill horizontal space" is not selected, the form can be placed at different locations in the available space.

  Note: This property is only visible if "Fill horizontal space" is selected.
- **Fill vertical space [Form]**

  If set, the form will fill the entire vertical extent of the screen. Otherwise, it will be at the selected anchor. Note that form components always have their preferred heights when the "Scrollable" property is selected. If "Fill vertical space" is selected, the form starts at the top and any remaining space is empty.
- **Vertical anchor**

  If "Fill vertical space" is not selected, the form can be placed at different locations in the available space.

  Note: This property is only visible if "Fill vertical space" is selected.

- **Scrollable [Form]**

  If set, the form will be wrapped in a scroll pane. If not set, certain form components which can grow in the vertical direction (like the text area form component) can claim remaining vertical space. Please note that those components have to be configured accordingly.
- **Screen title [Messages]**

  The title of the screen, shown in a bold and larger font. Should be a concise subject. This question is also used by the console installer for presenting the screen.
- **Screen subtitle [Messages]**

  The subtitle of the screen, shown below the title in a normal font. Should be a short question. This question is also used by the console installer for presenting the screen.

Program group selection

A screen that allows the user to select a program group on Microsoft Windows. All displayed messages are configurable.

Applies to: Installer, Uninstaller

Properties:

- **Fill horizontal space [Form]**

  If set, the form will fill the entire horizontal extent of the screen. Otherwise, it will be added at the selected anchor and all form components will not be wider than their preferred widths.
- **Horizontal anchor**

  If "Fill horizontal space" is not selected, the form can be placed at different locations in the available space.

  Note: This property is only visible if "Fill horizontal space" is selected.
- **Fill vertical space [Form]**

  If set, the form will fill the entire vertical extent of the screen. Otherwise, it will be at the selected anchor. Note that form components always have their preferred heights when the "Scrollable" property is selected. If "Fill vertical space" is selected, the form starts at the top and any remaining space is empty.
- **Vertical anchor**

  If "Fill vertical space" is not selected, the form can be placed at different locations in the available space.

  Note: This property is only visible if "Fill vertical space" is selected.
- **Scrollable [Form]**

  If set, the form will be wrapped in a scroll pane. If not set, certain form components which can grow in the vertical direction (like the text area form component) can claim remaining vertical space. Please note that those components have to be configured accordingly.

- **Screen title [Messages]**

  The title of the screen, shown in a bold and larger font. Should be a concise subject. This question is also used by the console installer for presenting the screen.
- **Screen subtitle [Messages]**

  The subtitle of the screen, shown below the title in a normal font. Should be a short question. This question is also used by the console installer for presenting the screen.

Category: Standard screens

Welcome

A screen that welcomes the user to the installation of your application. This screen should be placed at the beginning of the installation

Applies to: Installer

Display license agreement

A screen that displays a license agreement to the user, either plain text or HTML. The license agreement must be accepted before the installation continues.

Applies to: Installer

Installation location

The screen that asks the user where to install the application. This determines the principal installation directory.

Applies to: Installer

Installation type

A screen that displays a list of installation types that correspond to configurable component sets. The default types "Full","Standard" and "Customize" are provided by default. The "Installation components" screen may be hidden by this screen, depending on the installation type selected by the user. This screen will not be shown if no installation components are defined.

Applies to: Installer

Properties:

- **Installation types**

  Installation types are principally defined by a configurable set of components. The first installation type is selected by default in the installer. Each installation type has the following configurable properties: <list><item>A name for the installation type. This name is presented to the user</item><item>An optional description of the installation type. This description is displayed below the name and

can be shown or hidden by the user</item><item>If the description is displayed by default or not</item><item>If the installation type is customizable or not. If the user-selected installation type is customizable, the "Installation components" screen will be shown if present, otherwise that screen will be skipped.</item><item>A set of installation components. Installation components are configured in the install4j IDE on the Files->Installation Components tab.You can choose between the options of installing all defined components, the default selected components as configured on the Files->Installation Components tab, or directly select a number of installation components in a check tree.</item></list> By default, 3 universally usable installation types are added whose names and descriptions are internationalized. You can change or delete the default installation types as well as add new ones.

- **Bold font [Description]**

  Use a bold font for the descriptions
- **Italic font [Description]**

  Use an italic font for the descriptions
- **Smaller font [Description]**

  Use a smaller font for the descriptions

Installation components

A screen that displays all installation components and asks the user which components should be installed. This screen will not be shown if no installation components are defined.

Applies to: Installer

Create program group

A screen that allows the user to select the default program group. Under Windows, this screen sets installer variables that influence "Create program group" and "Create start menu entry" entry actions. Under Unix, the screen asks the user whether and where symbolic links to launchers should to be created. Under macOS, the screen is not shown.

Applies to: Installer

Properties:

- **User can disable creation [General]**

  If the user can disable all program group actions that rely on a default program group, such as the "Create standard program group action". If the user disables program group creation, the variable <tt>sys.programGroupDisabled</tt> will be set to <tt>Boolean.TRUE</tt>.
- **Initially enabled**

  If the check box for enabling program group or launcher link creation should be selected by default.

  Note: This property is only visible if "User can disable creation" is selected.

- **Create symlinks [Unix]**

  If symbolic links for all relevant launchers (those with "menu integration" enabled) should be created on UNIX. If this property is deselected, the variable <tt>sys.programGroupDisabled</tt> will be set to <tt>Boolean.TRUE</tt> in Linux/Unix installers.
- **Directory for links**

  The default value for the directory in which links for all relevant launchers (those with "menu integration" enabled) will be created on UNIX. The user selection will be saved to the variable <tt>sys.symlinkDir</tt>.

  Note: This property is only visible if "Create symlinks" is selected.
- **Program group name [Windows]**

  The default value for the program group where entries for all relevant launchers (those with "menu integration" enabled) will be created. If the "Create program group" screen is present, the user can change this selection. If you leave this property empty, the links will be created at the top level. The user selection will be saved to the variable <tt>sys.programGroupName</tt>.
- **User can change "all users" [Windows]**

  If the user can override the default value of the "Create for all users" property in the "Create standard program group" action. The user selection will be saved to the variable <tt>sys.programGroupAllUsers</tt>.
- **Initially selected**

  If the "Create for all users" check box be selected by default.

  Note: This property is only visible if "User can change "all users"" is selected.
- **Show warning if program group exists [Windows]**

  If selected, a warning will be shown if the selected program group already exists.

File associations

A screen that displays a list of all subsequent file association actions and asks the user which associations should be made. This screen will not be shown if there are no corresponding file association actions after this screen.

Applies to: Installer

Additional confirmations

A screen that displays a list of confirmations as check boxes whose results can be used in condition expressions for actions. While other types of form components can be added to this screen, only check boxes and other simple elements are consistent with the displayed text. For arbitrary forms, use the "Configurable form" screen instead.

Applies to: Installer, Uninstaller

Installation

The screen that displays displays the installation progress. Where possible, installation actions should be added to this screen.

Applies to: Installer

Properties:

- **Cancel enabled**
  If the cancel button should be enabled.

Display information

A screen that displays text to the user, either plain text or HTML. In contrast to the "Display text" form template, all messages on this screen are pre-defined and localized.

Applies to: Installer, Uninstaller

Finish

A screen that tells the user that the installation is finished. This screen should be placed at the end of the installation.

Applies to: Installer

Uninstall Welcome

A screen that welcomes the user to the uninstallation of your application. This screen should be placed at the beginning of the uninstallation.

Applies to: Uninstaller

Uninstallation

The screen that displays displays the uninstallation progress. Where possible, uninstallation actions should be added to this screen.

Applies to: Uninstaller

Uninstallation failure

The screen that is displayed if the uninstallation was not completed successfully. Further information regarding the uninstallation problems is displayed to the user. This screen is not shown if the uninstallation was completed successfully or if it is placed before the uninstallation screen. The uninstaller will terminate after showing this screen in case of failure.

Applies to: Uninstaller

Properties:

- **Show directories [General]**
  Also show initially created directories that could not be deleted. If unchecked, only undeleted files will be shown.

Uninstallation success

The screen that is displayed if the uninstallation was completed successfully.

Applies to: Uninstaller

B.5.6 Installer - Configuring Actions

Actions are configured on the screens & and actions tab [p. 145] .

Please see the list of available actions [p. 179] that come with install4j.

An action performs a **configurable unit of work** of the installer application.

Actions are attached to screens [p. 163] or they are part of the **startup sequence** that allows you to perform actions before the installer or uninstaller is displayed. If any of these actions fails and has a "Quit on failure" failure strategy, the installer application will not be shown.

Common properties of actions are:

- **Action elevation type [Privileges]**

  If the action should run in the elevated helper process.An elevated helper process is available on Windows and macOS if the process has been started without admin privileges and the "Request privileges" action has been configured to require full privileges.
- **Condition expression [Control Flow]**

  This expression is evaluated to decide whether the action is executed. If the expression or script returns false, the current action will be skipped. This expression or script should not have any side-effects, it will be called while another screen is still being displayed.
- **Rollback barrier [Control Flow]**

  If the action should be a rollback barrier. When a rollback barrier is completed, none of the preceding actions will be rolled back. You can use this property to prevent an incomplete rollback of complex changes or to protect actions from rollback when the user hits "Cancel" in the post-install phase.
- **Exit code [Control Flow]**

  If the "Rollback barrier" property is selected, and a rollback terminates at this action, this property determines the exit code of the installer. By default, reaching a rollback barrier during a rollback is considered a success, but you can signal a failure by specifying a non-zero exit code here.

  Note: This property is only visible if "Rollback barrier" is selected.
- **Can be executed multiple times [Control Flow]**

  If the action can be executed multiple times. If unselected, the action will only be executed once and do nothing for subsequent invocations of the containing screen. The default settings for screens ensure that a screen with actions that cannot be executed multiple times is only shown once. However, if the "Back button" property is changed of if you skip screens programmatically, a screen might be shown multiple times.
- **Failure strategy [Error Handling]**

  If an action fails (i.e. returns <tt>false</tt>), the installer or uninstaller can continue, quit, or ask the user what to do. If you select something other than "Continue on failure", you should enter an error message in the "Error message" property unless the action displays the error itself.<p>For "Return to the parent screen", no further actions will be executed and the previous screen will be displayed again. If the action is contained in the "Startup" node, the first screen will be shown and in unattended mode the application will quit.
- **Error message [Error Handling]**

  If the action fails, this error message is displayed to the user, otherwise the action fails silently.

Most often, actions are added to the "Installation" or "Uninstallation" screens. The advantage of those screens is that they have a progress and status bar that is utilized by actions. If a screen does not expose a progress interface, the status and progress messages of attached actions are

lost. This is no problem for near-instantaneous actions such as setting an environment variable, but for time-consuming operations the user should be informed about progress, even if it is only an indeterminate progress bar. As an alternative to the "Installation" or "Uninstallation" screens, you can use "Display progress" screens to create additional installation phases.

Some actions have an **"affinity" to a particular screen** and will suggest to add themselves to that screen, such as the actions in the "Final options" category which would like to go to the "Finish" screen. However, this is only a suggestion to guide you for the most common use case.

Some actions have an **associated screen** that allows the user to modify the behavior of the action. For example, the "Install a service" action has a corresponding "Services" screen that allows the user to decide whether the service should be installed and started on bootup. If such a relationship exists, a corresponding notification is displayed after adding an action.

B.5.7 Installer - Available Actions

Category: Control

Change cancel button state

Changes the visibility and the enabled state of the cancel button. This action works in GUI mode as well as in unattended mode when the <tt>-splash</tt> option has been passed on the command line and the simple unattended progress dialog with a cancel button is shown.

Applies to: Installation, Uninstallation

Properties:

- **Button state**
  The new button state for the cancel button.

Run script

Runs a custom script. The script must return a boolean value. If it returns false, the installation will be canceled.

Applies to: Installation, Uninstallation

Properties:

- **Script [General]**
  The script that will be executed. The script must return a boolean value. If it returns false, the installation will be canceled.
- **Optional Rollback Script [General]**
  The script that will be executed in case of a rollback. The return type is void.

Set a variable

Sets a variable by running a custom script. The script can return any <tt>java.lang.Object</tt>.

Applies to: Installation, Uninstallation

Properties:

- **Script [General]**
  The script that will be executed. The script can return any <tt>java.lang.Object</tt>.
- **Variable name [General]**
  The name of the variable that will be set. Enter the variable without the installer prefix and the dollar sign.

- **Only if undefined [General]**

  The variable will only be set if it was previously undefined. This is useful for variables that your user can pass via <tt>-V</tt> or <tt>-varfile</tt> at the command line.
- **Fail if value is null [General]**

  If selected, the action will fail if a null value is returned from the script.
- **Register for response file [General]**

  If selected, the variable will be saved to the response file <tt>.install4j/response.varfile</tt> that is created automatically when the installer exits. This is equivalent to calling <tt>context.registerResponseFileVariable(variableName)</tt> in a script.<p>If the variable is present in the response file, the "Load response file" action in the startup node of the uninstaller will make this variable available in the uninstaller.

Set messages

Sets the messages in the progress interface.

Applies to: Installation, Uninstallation

Properties:

- **Use status [General]**

  If the status message should be set.
- **Status message**

  The status message.

  Note: This property is only visible if "Use status" is selected.
- **Use detail [General]**

  If the detail message should be set.
- **Detail message**

  The detail message.

  Note: This property is only visible if "Use detail" is selected.

Set the progress bar

Change the value of the progress bar or set it to indeterminate mode.

Applies to: Installation, Uninstallation

Properties:

- **Type of change**

  Change the progress bar either to a percentage value, add progress, set it to indeterminate mode, start a timer, or return from indeterminate mode and show the last percentage value.
- **Percent value**

  The progress value from 0 to 100. This property is only used when a percentage value is set or added.

  Note: This property is only visible if "Type of change" is set to "Set percentage value".
- **Timer period**

  The time in milliseconds for one percent. This property is only used when the timer is started.

  Note: This property is only visible if "Type of change" is set to "Start a timer".
- **Timer maximum value**

  The maximum progress value to be set by the timer. This property is only used when the timer is started.

  Note: This property is only visible if "Type of change" is set to "Start a timer".

Sleep

Sleep a specified number of milliseconds. This is useful to ensure that a progress screen is displayed for at least a certain period of time.

Applies to: Installation, Uninstallation

Properties:

- **Sleep time**

  The sleep time in milliseconds.

Category: Desktop integration

Add a desktop link

Create a link on the desktop to an installed executable or file. This action will be automatically reverted by the 'Uninstall files' action.

Applies to: Installation

Properties:

- **Target file**

  The installed file or executable for which a link will be created on the desktop
- **Name**

  The name of the desktop icon

- **Arguments**

  Optional arguments to the executable for Windows and Unix.
- **Icon file [Unix]**

  An optional image file (*.png) for the entry. If empty, no icon will be written to the desktop file.
- **Create for all users [Windows]**

  If the desktop link should be created for all users. If unselected, the link will be created for the current user only. If a "Create program group" screen is present, the "Create shortcuts for all users" check box will override this property.
- **Icon file [Windows]**

  An optional different icon (*.ico) for the link on Windows.
- **Tooltip description [Windows]**

  An optional description for Windows that will be displayed in the tooltip.
- **Start in [Windows]**

  An optional working directory for the started executable.
- **Run as administrator [Windows]**

  If the desktop link should be always run as administrator.
- **Target is Single Bundle [macOS]**

  If selected and the media set is a single bundle installer, the desktop icon will point to the bundle instead.

Add a startup executable on Windows and macOS

Add an installed executable to the startup folder on Windows or to the login items on macOS so that it will be started automatically when the user logs in. This action will be automatically reverted by the 'Uninstall files' action.

Applies to: Installation

Properties:

- **Startup executable**

  The executable that should be started when the user logs in
- **Entry name [Windows]**

  The name of the entry in the startup folder
- **Create for all users [Windows]**

  If the startup item should be created for all users. If unselected, the link will be created for the current user only.
- **Set the hide flag [macOS]**

  If the hide flag should be set for the login item.

Add an executable to the dock

Add an installed executable to the dock on macOS. This action will be automatically reverted by the 'Uninstall files' action.

Applies to: Installation

Properties:

- **Executable**

  The executable that should be added to the dock.

Create a Windows URL link

Create a URL link on Windows. This is a special text file with a .url link that is supported by the Windows desktop, start menu and explorer. To create links in the start menu, the "Create program group" action can be used as well. This action will be automatically reverted by the 'Uninstall files' action.

Applies to: Installation

Properties:

- **URL**

  The URL that should be linked to. If no protocol is given, <tt>http://</tt> is assumed.
- **Target file**

  The path of the URL link, including the name of the link, but without the <tt>.url</tt> extension. To create a link on the desktop, prefix with <tt>${installer:sys.desktopDir}</tt>
- **Icon file**

  An optional icon file (*.ico) for the URL link. If empty, the default icon will be used.
- **Use favicon**

  If the favicon file of the URL domain should be used. This only works if the icon has been cached by Internet Explorer.

Create a file association

Create an association between a file extension and a launcher, so that the launcher is invoked when the user double-clicks a file with the selected extension. <p>On Windows, if the application has not yet been started, the arguments to the main method will contain the file name. Subsequent invocations and all invocations on macOS can be intercepted with the <tt>com.install4j.api.launcher.StartupNotification</tt> class. Only effective on Windows and macOS. This action will be automatically reverted by the 'Uninstall files' action.

Applies to: Installation

Properties:

- **File extension [General]**

  The file extension for which the file association should be created. Must not include the leading dot.
- **Description [General]**

  A description that is presented to the user as the text next to the corresponding checkbox in the "File associations" screen.
- **Launcher [General]**

  The launcher that will be invoked when the file association is invoked by the user.
- **Selected [General]**

  If the file association is selected in the "File associations" screen.
- **Execute on Windows [Windows]**

  If the file association should be performed on Windows.
- **Icon file for Windows [Windows]**

  An optional icon file (*.ico) for the file association on Windows. If empty, a default icon will be used.
- **Additional parameters [Windows]**

  Optional additional parameters that will be passed to the executable in front of the file to be opened.
- **Execute on macOS [macOS]**

  If the file association should be performed on macOS.
- **Icon file for macOS [macOS]**

  An optional icon file (*.icns) for the file association on macOS. If empty, a default icon will be used.
- **Role [macOS]**

  The role the application can take for this file type.
- **Restart Finder [macOS]**

  If true the Finder should be restarted at the end of the installation. This might be necessary for the icon (and sometimes the association itself) to be picked up immediately. Note that users might find this restart disruptive. Additionally, if you launch an application at the end of the installation, it can be hidden by Finder windows.

Create program group

Create standard program group entries on Windows and freedesktop.org compatible UNIX desktops. This action will be automatically reverted by the 'Uninstall files' action.

Applies to: Installation

Properties:

- **Add default launcher links**

  If generated launchers are placed into the program group automatically with their default menu integration properties. You can rename and move the default menu integrations in the program group entries tree. If you delete them, the default menu

integration can be enabled again on the "Executable info->Menu integration" step of the launcher wizard.

- **Program group entries**

  On Windows, the entries in the program group tree will be created in the start menu by the installer. The control buttons allow you to modify the contents of the list of program group entries. You can add new sub-folders and new file links.In the edit dialog, you have to fill in the <emph>display name</emph> of the program group entry.as wellas the <emph>target file</emph> for the of the program group link. This has to be a file or directory relative to the distribution root directory. Please note that if you select a directory as the target, it will not "fly out" in the program group, but a separate explorer window will be opened if the user clicks on it. To display all files in a directory, please add all of them as separate program group entries. Optionally, you can specify an <emph>icon</emph> that is used for this program group entry. The icon file must point to an <screen>*.ico</screen> file. If the file name is relative, it is interpreted as relative to the project file. If you do not specify an icon, the default icon is determined by the system.

- **Create symlinks [Unix]**

  If symbolic links for all relevant launchers (those with "menu integration" enabled) should be created on UNIX.

- **Directory for links**

  The directory in which links for all relevant launchers (those with "menu integration" enabled) will be created on UNIX.

  Note: This property is only visible if "Create symlinks" is selected.

- **Fail if symlinks are not created**

  If selected, the action will fail if the symlinks cannot be created. Usually this is due to missing write permissions which is a common condition, so that the action does not fail by default.

  Note: This property is only visible if "Create symlinks" is selected.

- **Create menu entries [Unix]**

  If menu entries should be created on freedesktop.org (KDE, GNOME) systems.

- **Application categories**

  The freedesktop.org (KDE, GNOME) application categories used to determine the best place in the applications menu. Multiple categories can be separated by semicolons.

  Note: This property is only visible if "Create menu entries" is selected.

- **Program group name [Windows]**

  The default value for the program group where the links will be created. If you leave this property empty, the links will be created at the top level.

- **Create for all users [Windows]**

  If the program group is created for all users or only for the current user. If the <tt>sys.programGroupAllUsers</tt> is set (typically by the "Create program group" screen), the variable value will override this property.

- **Add uninstaller [Windows]**

  If the uninstaller should be added to the program group. This has no effect for Windows 8 and higher.

- **Uninstaller menu name**

  The name in the program group that will be used for the uninstaller.

  Note: This property is only visible if "Add uninstaller" is selected.

Create start menu entry

Create a single start menu entry on Windows and Unix. For creating multiple program group entries, please see the "Create program group" action. This action will be automatically reverted by the 'Uninstall files' action.

Applies to: Installation

Properties:

- **Entry name**

  The entry name in the start menu. On Windows, the name can contain sub-folders with backslashes.
- **Target file**

  The installed file or executable for which a start menu entry will be created
- **Arguments**

  Optional arguments that should be passed to the executable when started with this entry.
- **Application categories [Unix]**

  The freedesktop.org (KDE, GNOME) application categories used to determine the best place in the applications menu. Multiple categories can be separated by semicolons.
- **Icon file [Unix]**

  An optional image file (*.png) for the entry. If empty, no icon will be written to the desktop file.
- **Icon file [Windows]**

  An optional icon file (*.ico) for the entry. If empty, the default icon will be used.
- **Create for all users [Windows]**

  If the program group is created for all users or only for the current user.
- **Program group name [Windows]**

  The default value for the program group where the link will be created. If you leave this property empty, the link will be created at the top level.
- **Start in [Windows]**

  An optional working directory for the started executable.
- **Run as administrator [Windows]**

  If the executable should be always run as administrator.

Register Add/Remove item

Register an Add/Remove item in the Windows software registry. This action will be automatically reverted by the 'Uninstall files' action.

Applies to: Installation

Properties:

- **Item name**

  The name of the item that is displayed in the Windows software registry.
- **Icon source**

  The source of the icon in in Windows software registry. You can use the icon of the installer or specify a custom .ico file.
- **Icon file**

  An optional icon file (*.ico).

  Note: This property is only visible if "Icon source" is set to "Custom icon".

Category: File operations

Add Windows file rights

Adds access rights to files and directories on Windows.<p>If a helper process with elevated privileges has been created by the "Request privileges" action, this action is pushed to the helper process. Please see the help topic on "Elevation Of Privileges" for more information.

Applies to: Installation, Uninstallation

Properties:

- **Files and directories**

  The files and directories whose rights should be modified. In the edit dialog you can choose files from the distribution tree or enter them manually. Files and directories that are installer variables with array values (e.g. String[], Object[] or File[]) are expanded as separate files and directories, this allows you to build a variable length list of files and directories at runtime. The rights for a directory will be inherited by all subdirectories and their contained files.
- **Trustee [Rights]**

  The trustee for which the access right should be granted.
- **SID or Account Name**

  The SID in String form or the account name for which the access right should be granted.

  Note: This property is only visible if "Trustee" is set to "SID or Account Name".
- **Read [Rights]**

  The right to read the object.
- **Write [Rights]**

  The right to write to the object.

- **Execute [Rights]**

  The right to execute the object.
- **All [Rights]**

  All available rights.

Copy files and directories

Copy files and directories. This action will be automatically reverted by the 'Uninstall files' action.

Applies to: Installation, Uninstallation

Properties:

- **Destination directory**

  The destination directory. If you have selected a single source file, this can also be a file rather than a directory. The destination directory will not be created, it must exist before this action is executed, otherwise it will be treated as a destination file.
- **Source files or directories**

  The files and directories to be copied. In the edit dialog you can choose files from the distribution tree or enter them manually. Files and directories that are installer variables with array values (e.g. String[], Object[] or File[]) are expanded as separate files and directories, this allows you to build a variable length list of files and directories at runtime.
- **File filter script**

  The file filter script is invoked for each file that is about to be processed by this action. The script is not invoked for directories. You can return <tt>true</tt> if the file should be processed or <tt>false</tt> if it should be excluded from processing.
- **Directory filter script**

  The directory filter script is invoked for each directory that is about to be processed by this action. The script is not invoked for files. You can return <tt>true</tt> if the directory should be processed or <tt>false</tt> if it should be excluded from processing.
- **Show progress**

  If selected, and a progress bar is available on the current screen, the action will show its progress in the progress bar.
- **Show file names**

  If selected, the names of the files that are processed will be shown during the installation.

  Note: This property is only visible if "Show progress" is selected.
- **Resolve relative file in**

  A relative destination file can be resolved against the installation directory or against the root of the temporarily extracted archive.
- **Resolve relative files in**

  Relative files can be resolved against the installation directory or against the root of the temporarily extracted archive.

- **Overwrite mode**

  How to handle an existing destination file.
- **Uninstall mode**

  The mode how the uninstaller should handle the files created with this action.
- **Access mode [Unix]**

  The UNIX access mode for files.
- **Directory access mode [Unix]**

  The UNIX access mode for directories.
- **Shared file [Windows]**

  If created files should be registered as a shared files.
- **Delay if necessary [Windows]**

  If selected and a destination file cannot be replaced, the operation will be scheduled for the next reboot. The context method <tt>isRebootRequired()</tt> will return <tt>true</tt> in this case.
- **Trigger reboot if required [Windows]**

  If selected and the operation is delayed until reboot, the user will be asked for a reboot automatically at the end of installation.

Create a symbolic link

Creates a symbolic link. This action has no effect on Windows.

Applies to: Installation, Uninstallation

Properties:

- **File**

  The file or directory that the symbolic link should point to.
- **Link file**

  The link file that should be created. Relative files will be resolved relative to the installation directory.
- **Remove on uninstall**

  If the link should be deleted by the 'Uninstall files' action in the uninstaller.

Delete files and directories

Deletes files and directory. Directories can be deleted recursively.

Applies to: Installation, Uninstallation

Properties:

- **Files and directories**

  The files and directories to be deleted. In the edit dialog you can choose files from the distribution tree or enter them manually. Files and directories that are installer variables with array values (e.g. String[], Object[] or File[]) are expanded as separate files and directories, this allows you to build a variable length list of files and directories at runtime.
- **File filter script**

  The file filter script is invoked for each file that is about to be processed by this action. The script is not invoked for directories. You can return <tt>true</tt> if the file should be processed or <tt>false</tt> if it should be excluded from processing.
- **Directory filter script**

  The directory filter script is invoked for each directory that is about to be processed by this action. The script is not invoked for files. You can return <tt>true</tt> if the directory should be processed or <tt>false</tt> if it should be excluded from processing.
- **Recursive**

  If selected, the operation will be performed recursively on directories.
- **Backup for rollback**

  If selected, a backup of the files to be deleted will be made and restored in case of rollback.

Move files and directories

Moves files and directories. The newly created files are subject to removal by the 'Uninstall files' action.

Applies to: Installation, Uninstallation

Properties:

- **Destination directory**

  The destination directory. If you have selected a single source file, this can also be a file rather than a directory. The destination directory will not be created, it must exist before this action is executed, otherwise it will be treated as a destination file.
- **Source files or directories**

  The files and directories to be moved. In the edit dialog you can choose files from the distribution tree or enter them manually. Files and directories that are installer variables with array values (e.g. String[], Object[] or File[]) are expanded as separate files and directories, this allows you to build a variable length list of files and directories at runtime.
- **File filter script**

  The file filter script is invoked for each file that is about to be processed by this action. The script is not invoked for directories. You can return <tt>true</tt> if the file should be processed or <tt>false</tt> if it should be excluded from processing.

- **Directory filter script**

  The directory filter script is invoked for each directory that is about to be processed by this action. The script is not invoked for files. You can return <tt>true</tt> if the directory should be processed or <tt>false</tt> if it should be excluded from processing.
- **Show progress**

  If selected, and a progress bar is available on the current screen, the action will show its progress in the progress bar.
- **Show file names**

  If selected, the names of the files that are processed will be shown during the installation.

  Note: This property is only visible if "Show progress" is selected.
- **Resolve relative file in**

  A relative destination file can be resolved against the installation directory or against the root of the temporarily extracted archive.
- **Resolve relative files in**

  Relative files can be resolved against the installation directory or against the root of the temporarily extracted archive.
- **Overwrite mode**

  How to handle an existing destination file.
- **Uninstall mode**

  The mode how the uninstaller should handle the files created with this action.
- **Access mode [Unix]**

  The UNIX access mode for files.
- **Directory access mode [Unix]**

  The UNIX access mode for directories.
- **Shared file [Windows]**

  If created files should be registered as a shared files.
- **Delay if necessary [Windows]**

  If selected and a destination file cannot be replaced, the operation will be scheduled for the next reboot. The context method <tt>isRebootRequired()</tt> will return <tt>true</tt> in this case.
- **Trigger reboot if required [Windows]**

  If selected and the operation is delayed until reboot, the user will be asked for a reboot automatically at the end of installation.

Set the UNIX access mode of files and directories

Sets the UNIX access mode of files and directories. This action has no effect on Windows.

Applies to: Installation, Uninstallation

Properties:

- **Files and directories**

  The files and directories that the access mode should be set for. In the edit dialog you can choose files from the distribution tree or enter them manually. Files and directories that are installer variables with array values (e.g. String[], Object[] or File[]) are expanded as separate files and directories, this allows you to build a variable length list of files and directories at runtime.
- **File filter script**

  The file filter script is invoked for each file that is about to be processed by this action. The script is not invoked for directories. You can return <tt>true</tt> if the file should be processed or <tt>false</tt> if it should be excluded from processing.
- **Directory filter script**

  The directory filter script is invoked for each directory that is about to be processed by this action. The script is not invoked for files. You can return <tt>true</tt> if the directory should be processed or <tt>false</tt> if it should be excluded from processing.
- **Recursive**

  If selected, the operation will be performed recursively on directories.
- **Mode**

  The mode to be set. This can be an octal mode like <tt>750</tt> or a symbolic mode that can be used with <tt>chmod</tt>, like <tt>u+x</tt>. For the permission flags in the symbolic mode, only <tt>rwxugo</tt> are supported.
- **Perform on**

  The type of file this action should be performed on.

Set the modification time of files

Sets the modification time of files.

Applies to: Installation, Uninstallation

Properties:

- **Files and directories**

  The files and directories that the modification time should be set for. In the edit dialog you can choose files from the distribution tree or enter them manually. Files and directories that are installer variables with array values (e.g. String[], Object[] or File[]) are expanded as separate files and directories, this allows you to build a variable length list of files and directories at runtime.
- **File filter script**

  The file filter script is invoked for each file that is about to be processed by this action. The script is not invoked for directories. You can return <tt>true</tt> if the file should be processed or <tt>false</tt> if it should be excluded from processing.
- **Directory filter script**

  The directory filter script is invoked for each directory that is about to be processed by this action. The script is not invoked for files. You can return <tt>true</tt> if the directory should be processed or <tt>false</tt> if it should be excluded from processing.

- **Recursive**

  If selected, the operation will be performed recursively on directories.
- **Time**

  The new modification time.

Set the owner of files and directories

Sets the owner and optionally the group of files and directories. This action has no effect on Windows.

Applies to: Installation, Uninstallation

Properties:

- **Files and directories**

  The files and directories that the owner should be set for. In the edit dialog you can choose files from the distribution tree or enter them manually. Files and directories that are installer variables with array values (e.g. String[], Object[] or File[]) are expanded as separate files and directories, this allows you to build a variable length list of files and directories at runtime.
- **File filter script**

  The file filter script is invoked for each file that is about to be processed by this action. The script is not invoked for directories. You can return <tt>true</tt> if the file should be processed or <tt>false</tt> if it should be excluded from processing.
- **Directory filter script**

  The directory filter script is invoked for each directory that is about to be processed by this action. The script is not invoked for files. You can return <tt>true</tt> if the directory should be processed or <tt>false</tt> if it should be excluded from processing.
- **Recursive**

  If selected, the operation will be performed recursively on directories.
- **Owner**

  The owner to be set. If you want to set the group, too, please add it with a colon (example: <tt>user:group</tt>). To only change the group, prefix the group name with a colon (example: <tt>:group</tt>).

Category: Final options

Execute launcher

Execute an installed launcher and return immediately. This action is intended to be placed on the "Finish" screen. A confirmation can be added automatically to the "Finish" screen.<p>If the main installation process has been elevated by the "Request privileges" action, this action is pushed to the original process with limited rights. Please see the help topic on "Elevation Of Privileges" for more information.

Applies to: Installation

Properties:

- **Launcher**

  The launcher that will be executed. Service launchers are not shown.
- **Arguments**

  The arguments passed to the launcher. Please note that in the edit dialog, each argument starts on a new line. Arguments that are installer variables with array values (e.g. String[], Object[] or File[]) are expanded as separate arguments, this allows you to build a variable length list of arguments at runtime.

Open PDF viewer

Displays a PDF file in a cross-platform PDF viewer. A separate window will be opened.

Applies to: Installation, Uninstallation

Properties:

- **Dialog title**

  The title of the PDF viewer dialog.
- **PDF file [PDF]**

  The PDF file that should be displayed.

Reboot computer

Reboot the computer on Windows and macOS. This action will trigger a reboot that takes place at the end of installation or uninstallation. By default, the user will be asked whether to reboot or not.

Applies to: Installation, Uninstallation

Properties:

- **Ask user**

  Ask the user whether the reboot should be performed or not.

Show URL

Show a URL in the default browser. This action is intended to be placed on the "Finish" or the "Uninstallation success" screen.<p>If the main installation process has been elevated by the "Request privileges" action, this action is pushed to the original process with limited rights. Please see the help topic on "Elevation Of Privileges" for more information.

Applies to: Installation, Uninstallation

Properties:

- **URL**
  The URL that will be shown.

Show file

Show a file with the associated application. Usually, a text file or an HTML file is appropriate. This action is intended to be placed on the "Finish" screen. A confirmation can be added automatically to the "Finish" screen.<p>If the main installation process has been elevated by the "Request privileges" action, this action is pushed to the original process with limited rights. Please see the help topic on "Elevation Of Privileges" for more information.

Applies to: Installation

Properties:

- **File**
  The file that will be shown.

Category: HTTP and network

Download file

Download a URL and save it to a file

Applies to: Installation, Uninstallation

Properties:

- **URL**
  The URL from which the file should be downloaded. The URL must start with <tt>http://</tt> or <tt>https://</tt>. If you add a query string, it must already be URL encoded.
- **Target file**
  The file to which the downloaded URL will be saved.
- **Request headers**
  A list of name-value pairs that should be set as additional headers for the request.<p> Request headers that are installer variables with array values (e.g. String[], Object[] or File[]) are expanded as separate request headers, this allows you to build a variable length list of request headers at runtime.
- **Retry if interrupted**
  If selected, ask the user to retry if a successfully started download is interrupted.

- **Check for md5sums**

  If selected, the action will try to download a file named <tt>md5sums</tt> from either the directory of the above URL or from the optional URL given below. If the download is successful and the file contains an entry for the target file name, it will be checked. If the MD5 checksums do not match and the "Silent failure" option is not selected, a dialog will be shown that offers the possibility to retry the download.

- **Optional md5sums URL**

  An optional URL for the <tt>md5ums</tt> file. If specified, only this URL will be used.

  Note: This property is only visible if "Check for md5sums" is selected.

- **Silent failure**

  If selected, the action will fail immediately if a mismatch in the MD5 checksums occurs. Otherwise the user will be presented with a dialog box that explains the failure and offers the possibility to retry the download.

  Note: This property is only visible if "Check for md5sums" is selected.

- **Show progress**

  If selected, and a progress bar is available on the current screen, the action will show its progress in the progress bar.

- **Show file name**

  If selected, the name of the downloaded file and the target directory will be displayed. This setting has no effect if "Show progress" is not selected.

  Note: This property is only visible if "Show progress" is selected.

- **Delete downloaded file on exit**

  If selected, the downloaded file will be deleted when the installer application terminates.

- **Ask for proxy if necessary [Error Handling]**

  At first, the connection is attempted with the proxy information that is set for the default browser. If that fails, and this property is selected, a proxy dialog will be shown where the user can configure the proxy that should be used to connect to the web server.

- **Network failure script [Error Handling]**

  A script that is executed if the HTTP connection fails in such a way, that the proxy dialog would have to be shown. If you return <tt>ErrorHandlingMode.IGNORE</tt>, the regular proxy or failure handling will proceed, if you return <tt>ErrorHandlingMode.CANCEL</tt>, the action will fail immediately. If you can take corrective action in the script, you can return <tt>ErrorHandlingMode.RETRY</tt> to make the same HTTP request again. However, you have to take special care not to enter an infinite loop. Typically, there should be user input before you retry and the user should be given the option to cancel.<p>The script is only executed for actual network failures, and not if the server or the proxy connection require authentication.

- **Accept all SSL certificates [Error Handling]**

  If the protocol of the URL starts with "https" and this property is selected, the SSL certificate will not be checked for validity. This is only recommended for testing purposes when working with self-signed certificates.

- **Connect timeout [Error Handling]**

  The timeout for establishing the socket connection in milliseconds. A timeout of zero is interpreted as an infinite timeout.

- **Read timeout [Error Handling]**

  The timeout for reading data from the socket connection in milliseconds. A timeout of zero is interpreted as an infinite timeout.
- **Show error message [Error Handling]**

  Show a default error message if the download fails.

HTTP request

Make an HTTP request to a specified URL. All common HTTP request methods are supported for REST calls. For mime types starting with <tt>text</tt> or containing "charset" information, the response body can be saved to an installer variable. To download large files, use the "Download file" action instead.<p>The action will succeed if a HTTP response code in the 2xx range is received, otherwise it will fail. You can save the response code to a variable to inspect it in a later action.

Applies to: Installation, Uninstallation

Properties:

- **Ask for proxy if necessary [Error Handling]**

  At first, the connection is attempted with the proxy information that is set for the default browser. If that fails, and this property is selected, a proxy dialog will be shown where the user can configure the proxy that should be used to connect to the web server.
- **Network failure script [Error Handling]**

  A script that is executed if the HTTP connection fails in such a way, that the proxy dialog would have to be shown. If you return <tt>ErrorHandlingMode.IGNORE</tt>, the regular proxy or failure handling will proceed, if you return <tt>ErrorHandlingMode.CANCEL</tt>, the action will fail immediately. If you can take corrective action in the script, you can return <tt>ErrorHandlingMode.RETRY</tt> to make the same HTTP request again. However, you have to take special care not to enter an infinite loop. Typically, there should be user input before you retry and the user should be given the option to cancel.<p>The script is only executed for actual network failures, and not if the server or the proxy connection require authentication.
- **Accept all SSL certificates [Error Handling]**

  If the protocol of the URL starts with "https" and this property is selected, the SSL certificate will not be checked for validity. This is only recommended for testing purposes when working with self-signed certificates.
- **Connect timeout [Error Handling]**

  The timeout for establishing the socket connection in milliseconds. A timeout of zero is interpreted as an infinite timeout.
- **Read timeout [Error Handling]**

  The timeout for reading data from the socket connection in milliseconds. A timeout of zero is interpreted as an infinite timeout.

- **URL [Request]**

  The URL for the HTTP request. The URL must start with <tt>http://</tt> or <tt>https://</tt>. If you add a query string, it must already be URL encoded.<p>To post a query string with URL-encoded key-value pairs, use the "Form data" property instead of adding the query string here.

- **HTTP request method [Request]**

  The request method for the HTTP protocol can be one of GET, POST, HEAD, OPTIONS, PUT, DELETE, TRACE. For POST and PUT, the values entered in the "Form data" property are transmitted in the HTTP message body with the mime type "application/x-www-form-urlencoded". For other request methods, the data is appended as a query string to the URL.

- **Custom request body**

  If selected, a custom request body is sent. For form data, use the "Form data" property instead. If both form data and a custom request body are present, the form data is appended to the URL.

  Note: This property is only visible if "HTTP request method" is set to "POST".

- **Content type**

  The content type of the request body. For JSON, use <tt>application/json</tt>.

  Note: This property is only visible if "Custom request body" is selected.

- **Request body**

  The request body as a string.

  Note: This property is only visible if "Custom request body" is selected.

- **Form data [Request]**

  A list of key-value pairs that should be transmitted with this request. Depending on the request method, they are either appended as a query string to the URL or transmitted in the HTTP message body.<p> Key-value pairs that are installer variables with array values (e.g. String[], Object[] or File[]) are expanded as separate key-value pairs, this allows you to build a variable length list of key-value pairs at runtime.

- **Request headers [Request]**

  A list of name-value pairs that should be set as additional headers for the request.<p> Request headers that are installer variables with array values (e.g. String[], Object[] or File[]) are expanded as separate request headers, this allows you to build a variable length list of request headers at runtime.

- **Perform rollback request [Request]**

  If selected, a request is performed in case of a rollback. You can configure the rollback request with the child properties. All other properties, such as error handling are shared with the regular request.

- **Rollback URL**

  The URL for the rollback request. The URL must start with <tt>http://</tt> or <tt>https://</tt>. If you add a query string, it must already be URL encoded.

  Note: This property is only visible if "Perform rollback request" is selected.

- **Rollback HTTP request method**

  The request method for the HTTP protocol can be one of GET, POST, HEAD, OPTIONS, PUT, DELETE, TRACE. For POST and PUT, the values entered in the "Form data" property

are transmitted in the HTTP message body with the mime type "application/x-www-form-urlencoded". For other request methods, the data is appended as a query string to the URL.

Note: This property is only visible if "Perform rollback request" is selected.

- **Custom request body**

  If selected, a custom request body is sent. For form data, use the "Form data" property instead. If both form data and a custom request body are present, the form data is appended to the URL.

  Note: This property is only visible if "Rollback HTTP request method" is set to "POST".

- **Content type**

  The content type of the request body. For JSON, use <tt>application/json</tt>.

  Note: This property is only visible if "Custom request body" is selected.

- **Request body**

  The request body as a string.

  Note: This property is only visible if "Custom request body" is selected.

- **Rollback form data**

  A list of key-value pairs that should be transmitted with this request. Depending on the request method, they are either appended as a query string to the URL or transmitted in the HTTP message body.<p> Key-value pairs that are installer variables with array values (e.g. String[], Object[] or File[]) are expanded as separate key-value pairs, this allows you to build a variable length list of key-value pairs at runtime.

  Note: This property is only visible if "Perform rollback request" is selected.

- **Variable name for response body [Response]**

  Optionally, you can enter a variable name that will be set with the text of the response body as an instance of <tt>java.lang.String</tt>. The variable value will not be written to the log file.Enter the variable without the installer prefix and the dollar sign.<p>The variable will not be set if the mime type does not start with <tt>text/</tt> or contain "charset" information.

- **Variable name for response code [Response]**

  Optionally, you can enter a variable name that will be set with the response code as an instance of <tt>java.lang.Integer</tt>. Enter the variable without the installer prefix and the dollar sign.

- **Variable name for response headers [Response]**

  Optionally, you can enter a variable name that will be set with the response headers as an instance of <tt>java.util.Map</tt>. The keys in the map are the header names, and the values are instances of <tt>java.util.List<String></tt> with the header values. The variable value will not be written to the log file.Enter the variable without the installer prefix and the dollar sign.

Upload file

Upload a file to an HTTP server with a POST request.

Applies to: Installation, Uninstallation

Properties:

- **File**

  The file that will be uploaded.
- **URL**

  The URL to which the file should be uploaded. The URL must start with <tt>http://</tt> or <tt>https://</tt>. If you add a query string, it must already be URL encoded.
- **Request headers**

  A list of name-value pairs that should be set as additional headers for the request.<p> Request headers that are installer variables with array values (e.g. String[], Object[] or File[]) are expanded as separate request headers, this allows you to build a variable length list of request headers at runtime.
- **Retry if interrupted**

  If selected, ask the user to retry if a successfully started upload is interrupted.
- **Show progress**

  If selected, and a progress bar is available on the current screen, the action will show its progress in the progress bar.
- **Show file name**

  If selected, the name of the uploaded file and the target directory will be displayed. This setting has no effect if "Show progress" is not selected.

  Note: This property is only visible if "Show progress" is selected.
- **Ask for proxy if necessary [Error Handling]**

  At first, the connection is attempted with the proxy information that is set for the default browser. If that fails, and this property is selected, a proxy dialog will be shown where the user can configure the proxy that should be used to connect to the web server.
- **Network failure script [Error Handling]**

  A script that is executed if the HTTP connection fails in such a way, that the proxy dialog would have to be shown. If you return <tt>ErrorHandlingMode.IGNORE</tt>, the regular proxy or failure handling will proceed, if you return <tt>ErrorHandlingMode.CANCEL</tt>, the action will fail immediately. If you can take corrective action in the script, you can return <tt>ErrorHandlingMode.RETRY</tt> to make the same HTTP request again. However, you have to take special care not to enter an infinite loop. Typically, there should be user input before you retry and the user should be given the option to cancel.<p>The script is only executed for actual network failures, and not if the server or the proxy connection require authentication.
- **Accept all SSL certificates [Error Handling]**

  If the protocol of the URL starts with "https" and this property is selected, the SSL certificate will not be checked for validity. This is only recommended for testing purposes when working with self-signed certificates.
- **Connect timeout [Error Handling]**

  The timeout for establishing the socket connection in milliseconds. A timeout of zero is interpreted as an infinite timeout.

- **Read timeout [Error Handling]**

  The timeout for reading data from the socket connection in milliseconds. A timeout of zero is interpreted as an infinite timeout.

Wait for HTTP server

Wait until an HTTP or HTTPS port becomes available. This is useful if you start a server, for example with a "Start a service" action, and need to wait until the server is operational before proceeding with the installation.

Applies to: Installation, Uninstallation

Properties:

- **URL**

  The URL that should be checked. The URL must start with <tt>http://</tt> or <tt>https://</tt>. If you add a query string, it must already be URL encoded.
- **Timeout**

  The timeout in seconds. After this timeout, the action will give up waiting for the HTTP port and fail. A timeout of 0 or a negative value means that the action will wait indefinitely for the HTTP port.
- **Set indeterminate progress**

  If selected, the progress bar will be set to indeterminate mode while the action is running. Note that this only has an effect if a progress bar is available on the current screen.
- **Accept all response codes**

  If selected, all response codes returned by the HTTP server will by accepted for the action to succeed. Otherwise, the action will continue to wait for a 2xx response code.
- **Variable name for response code**

  If set, the response code will be saved to this installer variable. The variable will only be set in case of success. If the action fails, it always fails due to the timeout and there is no associated response code.

Wait for Socket

Wait until a socket can be connected to. This is useful if you start a non-HTTP server. For HTTP and HTTPS, use the "Wait for HTTP server" action instead.

Applies to: Installation, Uninstallation

Properties:

- **URL**

  The host on which the server socket should be checked. Can be a host name or an IP address.

- **Port**

  The port on which the server socket should be checked.
- **Timeout**

  The timeout in seconds. After this timeout, the action will give up waiting for the HTTP port and fail. A timeout of 0 or a negative value means that the action will wait indefinitely for the HTTP port.
- **Set indeterminate progress**

  If selected, the progress bar will be set to indeterminate mode while the action is running. Note that this only has an effect if a progress bar is available on the current screen.

Category: JDBC

Check JDBC connection

Check if a connection can be made to the configured JDBC database. If no connection can be made, the action will fail. If the action is attached to a form screen that queries a database location, set its "Error message" property to an appropriate error message and the "Failure strategy" property to "Return to the parent screen".

Applies to: Installation, Uninstallation

Properties:

- **Use a custom SQL query**

  By default, the action executes "select 1 from dual" for Oracle databases and "select 1" for other database. If you would like to use another statement, select this property.
- **Custom SQL query**

  An SQL query that returns at least one row. If the statement fails or of it returns zero rows, the action will fail.

  Note: This property is only visible if "Use a custom SQL query" is selected.
- **JDBC Driver class name [Connection]**

  The class name of the JDBC driver. The JDBC driver JAR file must be added to the "Installer->Custom code & Resources" step.
- **JDBC URL [Connection]**

  The JDBC URL that will be used to connect to the database. For example, to connect to a MySQL database named "test" and installed locally, the connection string is <tt>jdbc:mysql://localhost/test</tt>.
- **User [Connection]**

  The user name for connecting to the database. Can be empty if no user name is required.
- **Password [Connection]**

  The password for connecting to the database. Can be empty if no password is required.

- **Additional JDBC properties [Connection]**

  Additional properties for configuring the JDBC driver. Property definitions that are installer variables with array values (e.g. String[], Object[] or File[]) are expanded as separate property definitions, this allows you to build a variable length list of property definitions at runtime.
- **Variable name for error messages [Connection]**

  The name of the variable that will be set with the error messages that were logged during the execution of the action. There may be multiple error messages in the order of occurrence, each error message starts on a new line. If no error occurred, the variable will be set to the empty string.<p>Enter the variable without the installer prefix and the dollar sign.

Execute SQL query

Execute a single SQL query and store the result in an installer variable. If only the first row is taken, the row value is stored directly, otherwise the variable will contain an instance of <tt>java.util.List</tt> with the row values. If the query is for a single column, the row value is the Java object representation of the return type, e.g. <tt>java.lang.String</tt> for <tt>VARCHAR</tt> or <tt>java.lang.Long</tt> for <tt>INT</tt>.

Applies to: Installation, Uninstallation

Properties:

- **JDBC Driver class name [Connection]**

  The class name of the JDBC driver. The JDBC driver JAR file must be added to the "Installer->Custom code & Resources" step.
- **JDBC URL [Connection]**

  The JDBC URL that will be used to connect to the database. For example, to connect to a MySQL database named "test" and installed locally, the connection string is <tt>jdbc:mysql://localhost/test</tt>.
- **User [Connection]**

  The user name for connecting to the database. Can be empty if no user name is required.
- **Password [Connection]**

  The password for connecting to the database. Can be empty if no password is required.
- **Additional JDBC properties [Connection]**

  Additional properties for configuring the JDBC driver. Property definitions that are installer variables with array values (e.g. String[], Object[] or File[]) are expanded as separate property definitions, this allows you to build a variable length list of property definitions at runtime.
- **SQL query [SQL execution]**

  The SQL query. For example, <tt>select count(*) from customers</tt> will return a single row with a single column. To get the integer result directly in the installer variable, you also have to select the "Take first row only" property, otherwise a <tt>List<Object></Object></tt> with one element will be stored in the

variable.<p>For queries that return multiple rows, like <tt>select first_name, last_name from customer</tt>, each row is stored as an instance of <tt>List<Object></tt>. If "Take first row only" is selected, the variable will contain that list, otherwise it will contain an instance of <tt>List<List<Object>></tt> with the entire table of the result set.

- **Take first row only [SQL execution]**

  If selected, the result will at most consist of a single row. If the result has only one column, the cell value will be stored directly in the installer variable, otherwise a <tt>List<Object></Object></tt> with all column values will be stored. Also, if no row is returned, the installer variable will be set to <tt>null</tt>.<p>If not selected, the result will be a <tt>List<Object></tt> for a single column and a <tt>List<List<Object>></tt> for multiple columns.

- **Fail if zero rows returned [SQL execution]**

  If selected, and zero rows are returned, the action will fail, and the installer variable will not be changed.

- **Variable name for result [SQL execution]**

  The name of the variable that will be set with the result of the query as explained in the descriptions of the "SQL query" and the "Take first row only" properties. Enter the variable without the installer prefix and the dollar sign, or leave empty if the error message should not be saved.

- **Variable name for error messages [SQL execution]**

  The name of the variable that will be set with the error messages that were logged during the execution of the action. There may be multiple error messages in the order of occurrence, each error message starts on a new line. If no error occurred, the variable will be set to the empty string.<p>Enter the variable without the installer prefix and the dollar sign.

Execute SQL script

Execute a single SQL statement or a script of SQL statements.

Applies to: Installation, Uninstallation

Properties:

- **JDBC Driver class name [Connection]**

  The class name of the JDBC driver. The JDBC driver JAR file must be added to the "Installer->Custom code & Resources" step.

- **JDBC URL [Connection]**

  The JDBC URL that will be used to connect to the database. For example, to connect to a MySQL database named "test" and installed locally, the connection string is <tt>jdbc:mysql://localhost/test</tt>.

- **User [Connection]**

  The user name for connecting to the database. Can be empty if no user name is required.

- **Password [Connection]**

  The password for connecting to the database. Can be empty if no password is required.

- **Additional JDBC properties [Connection]**

  Additional properties for configuring the JDBC driver. Property definitions that are installer variables with array values (e.g. String[], Object[] or File[]) are expanded as separate property definitions, this allows you to build a variable length list of property definitions at runtime.

- **Script source [Script Execution]**

  You can either enter the SQL statements directly in the install4j IDE, or read a file that contains the SQL script. In both cases, installer variables will be replaced.

- **SQL script**

  Either a single SQL statement or a sequence of statements separated by the configured delimiter. Installer variables will be replaced before the execution. If no delimiter is found, the entire input is treated as a single SQL statement.

  Note: This property is only visible if "Script source" is set to "Direct entry".

- **SQL script file**

  A file containing the SQL script, either a single SQL statement or a sequence of statements separated by the configured delimiter. Installer variables will be replaced before the execution.The file may also be gzipped (with the Unix gzip command line utility), the action will then automatically decompress the file on the fly.

  Note: This property is only visible if "Script source" is set to "Read from file".

- **Encoding**

  The encoding of the file. If you leave this empty the system default will be used. Common encodings are UTF-8, UTF-16, ISO-8859-1.

  Note: This property is only visible if "Script source" is set to "Read from file".

- **Statement delimiter [Script Execution]**

  A regular expression that separates SQL statements. To match line breaks, enter <tt>\n</tt>. If the delimited contains characters that have a special meaning in regular expressions, you have to quote them, like in <tt>\.</tt> for a literal dot.

- **Commit each statement [Script Execution]**

  If selected, each SQL statement will be committed separately. Otherwise, the entire script will be committed at the end. If the script contains a single statement, the setting has no effect.

- **Ignore errors [Script Execution]**

  If selected, errors from single SQL statements will be ignored, and processing will not be stopped. Otherwise, processing stops at the first error and a database rollback will be performed unless "Commit each statement" is selected.

- **Variable name for error messages [Script Execution]**

  The name of the variable that will be set with the error messages that were logged during the execution of the action. There may be multiple error messages in the order of occurrence, each error message starts on a new line. If no error occurred, the variable will be set to the empty string.<p>Enter the variable without the installer prefix and the dollar sign.

JDBC container action

This action allows you to configure connection properties just once and then execute a list of JDBC actions with the same connection.

Applies to: Installation, Uninstallation

Properties:

- **JDBC actions**

  The JDBC actions that should be executed run with the same connection.
- **JDBC Driver class name [Connection]**

  The class name of the JDBC driver. The JDBC driver JAR file must be added to the "Installer->Custom code & Resources" step.
- **JDBC URL [Connection]**

  The JDBC URL that will be used to connect to the database. For example, to connect to a MySQL database named "test" and installed locally, the connection string is <tt>jdbc:mysql://localhost/test</tt>.
- **User [Connection]**

  The user name for connecting to the database. Can be empty if no user name is required.
- **Password [Connection]**

  The password for connecting to the database. Can be empty if no password is required.
- **Additional JDBC properties [Connection]**

  Additional properties for configuring the JDBC driver. Property definitions that are installer variables with array values (e.g. String[], Object[] or File[]) are expanded as separate property definitions, this allows you to build a variable length list of property definitions at runtime.

Category: Java preference store

Delete a node or key in the Java preference store

Delete an entire package node or a key-value pair in the Java preference store.

Applies to: Installation, Uninstallation

Properties:

- **Package name**

  The name of the package node in the preference store that should be deleted or contains the key-value pair to be deleted. The action does not return an error if this package node does not exist.<p>For your convenience, install4j replaces "." with "/" and "_" with "-" in package names to make it possible to use the package syntax rather than the path syntax. If you do not want these characters to be replaced, you have to prefix them with a backslash, like "\."

- **Key**

  The key that should be deleted. If you leave this empty, the entire package node will be deleted instead. The action does not return an error if this key does not exist.
- **Preference root**

  If you want to delete the node or key-value pair for the current user, all users, or both.
- **Only if empty**

  If a node should only be deleted when it contains no sub-nodes or keys.

Load installer variables from the Java preference store

Load installer variables from the Java preference store that have been previously saved by the "Save installer variables to the Java preference store" action.

Applies to: Installation, Uninstallation

Properties:

- **Package name**

  The name of the package node in the preference store where the installer variables should be loaded from. By default, this is set to the application ID.<p>For your convenience, install4j replaces "." with "/" and "_" with "-" in package names to make it possible to use the package syntax rather than the path syntax. If you do not want these characters to be replaced, you have to prefix them with a backslash, like "\."
- **Preference root**

  If you want to load the installer variables for the current user, all users, or first read the settings for all users and then override with the user-specific settings.

Read a key from the Java preference store

Read the value of a key from the Java preference store and save it to an installer variable. Only string values can be read.

Applies to: Installation, Uninstallation

Properties:

- **Package name**

  The name of the package node in the preference store where the key is located.<p>For your convenience, install4j replaces "." with "/" and "_" with "-" in package names to make it possible to use the package syntax rather than the path syntax. If you do not want these characters to be replaced, you have to prefix them with a backslash, like "\."
- **Key**

  The key whose value should be read.

- **Use a default value**

  If selected, a default value will be saved to the variable if the key cannot be found in the preference store. Otherwise a missing key will result in the failure of the action and the variable will not be set.
- **Default value**

  The default value that will be used if the key cannot be found in the preference store.

  Note: This property is only visible if "Use a default value" is selected.
- **Preference root**

  If you want to read the value of the key for the current user, all users, or first read the settings for all users and then override with the user-specific settings.
- **Variable name**

  The name of the variable that will be set with the string value. Enter the variable without the installer prefix and the dollar sign. If the key cannot be found in the preference store, the variable value will not be set.

Save installer variables to the Java preference store

Save installer variables to the Java preference store. This can be used to communicate installer variables to the uninstaller or to installers with different application IDs.

Applies to: Installation, Uninstallation

Properties:

- **Package name**

  The name of the package node in the preference store where the installer variables should be set. By default, this is set to the application ID.<p>For your convenience, install4j replaces "." with "/" and "_" with "-" in package names to make it possible to use the package syntax rather than the path syntax. If you do not want these characters to be replaced, you have to prefix them with a backslash, like "\."
- **Preference root**

  If you want to save the installer variables for the current user only or for all users. Due to access rights it can happen that the system preference registry is not writable, in that case a fallback to the user specific registry can be tried.
- **Installer variable names**

  A list of installer variable names. Just enter the names of the installer variables, not including the surrounding <tt>${installer:...}</tt> syntax used for variable substitution in text fields. Variables with value null will be ignored. In the edit dialog, you have to enter one item per line. Entries that are installer variables with array values (e.g. String[], Object[] or File[]) are expanded as separate entries, this allows you to build a variable length list of entries at runtime.

Set a key in the Java preference store

Set a key-value pair in the Java preference store. The package node is created if necessary. This is the most convenient way to communicate settings to related installers. Only string values can be set.

Applies to: Installation, Uninstallation

Properties:

- **Package name**

  The name of the package node in the preference store where the key-value pair should be set.<p>For your convenience, install4j replaces "." with "/" and "_" with "-" in package names to make it possible to use the package syntax rather than the path syntax. If you do not want these characters to be replaced, you have to prefix them with a backslash, like "\."
- **Key**

  The key for which a value should be set.
- **Value**

  The string value that should be set for the key.
- **Preference root**

  If you want to set the key for the current user only or for all users. Due to access rights it can happen that the system preference registry is not writable, in that case a fallback to the user specific registry can be tried.

Category: Miscellaneous

Add VM options

Adds VM options for a launcher by modifying or creating a <tt>.vmoptions</tt> file or by changing the Info.plist file. This action will be automatically reverted by the 'Uninstall files' action.

Applies to: Installation

Properties:

- **Launcher**

  The launcher that the VM options should be added for.
- **VM options**

  The unquoted options that should be added. Note that system property definitions must be prefixed with -D just as on the command line, e.g. -Dkey=value. In the edit dialog, you have to enter one item per line. VM options that are installer variables with array values (e.g. String[], Object[] or File[]) are expanded as separate VM options, this allows you to build a variable length list of VM options at runtime.
- **Target file on macOS [macOS]**

  For application bundles on macOS, there are two locations for .vmoptions files. One in the "Contents" directory inside the application bundle, and the other next to the application bundle. Both files are read by the launcher, but the contained file takes

precedence. If the launcher is signed, you should choose the location next to the application bundle, otherwise the signature will be broken.

Check for running processes

Check for installed launchers and additional running processes on Windows and macOS.

Applies to: Installation, Uninstallation

Properties:

- **Include launchers**

  If selected, the operation will check for running launchers in the current installation directory.
- **Additional executables**

  The additional executables that should be checked. In the edit dialog you can choose files from the distribution tree or enter them manually. Additional executables that are installer variables with array values (e.g. String[], Object[] or File[]) are expanded as separate additional executables, this allows you to build a variable length list of additional executables at runtime. From relative files, only the file name is used for comparison. This enables checking for executables with an unknown location. To reference executables relative to your installation directory, please prefix them with ${installer:sys.installationDir}/. This is an optional property.
- **Close strategy**

  The strategy used when processes are running.
- **Ignore button**

  Add an ignore button to the dialog. The action will return successfully if the user clicks this button.
- **Time out for close**

  The time out for the soft close strategy in milliseconds.
- **Message**

  The message to be displayed at the top of the dialog.

Modify an environment variable on Windows

Sets, appends to, or prepends to an environment variable on Windows. This action can be automatically reverted by the 'Uninstall files' action.

Applies to: Installation, Uninstallation

Properties:

- **Modification type**

  Modification type

- **Variable name**

  The name of the variable that should be modified.
- **Value**

  The value to be set, appended or prepended.
- **User specific**

  If the variable is user specific or system wide.
- **Revert on uninstallation [Uninstallation]**

  Revert the change automatically on uninstallation if this action is used for an installer.
- **Only if not modified**

  Revert the change only if the environment variable hss not been modified in the mean time. This is mainly useful for the 'set' modification type.

  Note: This property is only visible if "Revert on uninstallation" is selected.

Modify classpath

Changes the classpath of a launcher by modifying or creating a <tt>.vmoptions</tt> file or by changing the Info.plist file. This action will be automatically reverted by the 'Uninstall files' action.

Applies to: Installation

Properties:

- **Launcher**

  The launcher that the classpath should be changed for.
- **Classpath entries**

  The classpath entries. In the edit dialog, you have to enter one item per line. Entries that are installer variables with array values (e.g. String[], Object[] or File[]) are expanded as separate entries, this allows you to build a variable length list of entries at runtime.
- **Modification type**

  Modification type
- **Target file on macOS [macOS]**

  For application bundles on macOS, there are two locations for .vmoptions files. One in the "Contents" directory inside the application bundle, and the other next to the application bundle. Both files are read by the launcher, but the contained file takes precedence. If the launcher is signed, you should choose the location next to the application bundle, otherwise the signature will be broken.

Request privileges

Requests configurable administrator privileges. On Windows Vista and higher and on macOS, the installer will be restarted with the requested privileges or a helper process will be created that can perform certain actions in a privileged context. When you restart

the installer, you should not install files before this action.<p>Please see the help topic on "Elevation Of Privileges" for a detailed discussion of this action.

Applies to: Installation, Uninstallation

Properties:

- **Fall back to user specific installation directory [Error Handling]**

  If administrator privileges cannot be obtained change the installation directory to a user-specific default value.
- **Show failure if current user is not root [Unix]**

  If set and the current user is not root a failure message will be shown and the installation will be canceled. This property overrides the "Failure strategy" property of the action. A separate property is necessary since the behavior can be configured differently for Windows, macOS and Unix.
- **Try to obtain full privileges if admin user [Windows]**

  If set and the user is an admin user with limited privileges on Vista and higher, the action will try to start a new process with full privileges.
- **Try to obtain full privileges if normal user [Windows]**

  If set and the user is a non-admin user, the action will either try to start a new process with full privileges on Vista and higher or fail on previous versions of Windows.
- **Show failure if requested privileges cannot be obtained [Windows]**

  If set and the privileges required above could not be obtained a failure message will be shown and the installation will be canceled. This property overrides the "Failure strategy" property of the action. A separate property is necessary since the behavior can be configured differently for Windows, macOS and Unix.
- **Try to obtain root privileges if admin user [macOS]**

  If set and the user is an admin user, the action will try to start a new process with root privileges. The user will have to enter his password.
- **Try to obtain root privileges if normal user [macOS]**

  If set and the user is a non-admin user, the action will try to start a new process with root privileges. The user will have to enter the password of an admin account.
- **Show failure if requested privileges cannot be obtained [macOS]**

  If set and the privileges required above could not be obtained a failure message will be shown and the installation will be canceled. This property overrides the "Failure strategy" property of the action. A separate property is necessary since the behavior can be configured differently for Windows, macOS and Unix.

Require installer privileges

Require the same privileges as the ones that were obtained during the installation. On Windows Vista and higher and on macOS, the uninstaller or custom installer application will be restarted with the requested privileges if necessary. This action only has an effect if a "Load response file" action is executed previously.<p>Please see the help topic on "Elevation Of Privileges" for a detailed discussion of this action.

Applies to: Installation, Uninstallation

Properties:

- **Show failure if required privileges cannot be obtained [General]**

  If set and the privileges that were obtained in the installer could not be obtained by this action, a failure message will be shown and the installer application will be canceled.

Run executable or batch file

Runs an executable or a Windows batch file. The action can optionally wait for termination of the executable.

Applies to: Installation, Uninstallation

Properties:

- **Executable**

  The file that should be executed. Please do not add arguments here, there is a separate "Arguments" property.
- **Working directory**

  The working directory for the execution.
- **Arguments**

  The arguments passed to the executable. Please note that in the edit dialog, each argument starts on a new line. Arguments that are installer variables with array values (e.g. String[], Object[] or File[]) are expanded as separate arguments, this allows you to build a variable length list of arguments at runtime.
- **Use rollback executable**

  If selected, an executable is invoked in the case of rollback. You can configure the executable with the child properties. All other properties, such as redirection and environment variables are shared with the regular executable.
- **Rollback executable**

  The file that should be executed in the case of rollback. Please do not add arguments here, there is a separate "Arguments" property.

  Note: This property is only visible if "Use rollback executable" is selected.
- **Rollback working directory**

  The working directory for the execution of the rollback executable.

  Note: This property is only visible if "Use rollback executable" is selected.
- **Rollback arguments**

  The arguments passed to the rollback executable. Please note that in the edit dialog, each argument starts on a new line. Arguments that are installer variables with array values (e.g. String[], Object[] or File[]) are expanded as separate arguments, this allows you to build a variable length list of arguments at runtime.

  Note: This property is only visible if "Use rollback executable" is selected.

- **Wait for termination**

  If the action should wait for termination of the process and check if the return value is 0.

- **Variable name for return code**

  If set, the return code will be saved to this installer variable. The type of the variable will be <tt>java.lang.Integer</tt>. Under Windows, this variable will always be equal to 0 if the "Show console window" option below is selected.If a timeout has been set and the process is killed after the timeout, the return value will be -10000.

  Note: This property is only visible if "Wait for termination" is selected.

- **Timeout in seconds**

  If set to a value greater than 0, the executable will be killed after that number of seconds if it does not return earlier.In that case, the return value will be -10000.

  Note: This property is only visible if "Wait for termination" is selected.

- **Wait for output streams**

  If selected, the action will wait until the output streams of the process are fully written. If the process has launched child processes, this can mean that the action will wait until those child processes have terminated. If that is not desired, please deselect this option.

  Note: This property is only visible if "Wait for termination" is selected.

- **Log arguments**

  If the arguments should be written into the log file or not. Disabled by default due to security reasons.

- **Include parent environment variables [Environment Variables]**

  If selected, the environment variables of the parent process (the installer) will be set. Otherwise, only the environment variables in the "Specific environment variables" will be set. This option is ignored on macOS.

- **Specific environment variables [Environment Variables]**

  Specify additional or modified environment variables that should be set for the executed process.<p>Use previous values with the syntax <tt>${PATH};additional</tt>.

- **Redirect stdout [Redirection]**

  Redirection mode for stdout

- **Installer variable name**

  An installer variable name to which the stdout output of the executed process is saved. The contents of the variable will not be displayed in the log file.

  Note: This property is only visible if "Redirect stdout" is set to "To installer variable".

- **Redirection file**

  A file to which the stdout output of the executed process is saved. If you specify <tt>/dev/stdout</tt>, the output will be printed to the default <tt>stdout</tt> stream of the installer application. Relative paths are relative to the working directory of the installer application. In order to use a file in the installation directory, enter a path like <tt>${installer:sys.installationDir}/log.txt</tt>.

  Note: This property is only visible if "Redirect stdout" is set to "To file".

- **Fail on error**

  If selected, the action fails if the redirection file cannot be written. Otherwise, errors are silently ignored.

  Note: This property is only visible if "Redirect stdout" is set to "To file".
- **Redirect stderr [Redirection]**

  Redirection mode for stderr
- **Installer variable name**

  An installer variable name to which the stderr output of the executed process is saved. The contents of the variable will not be displayed in the log file.

  Note: This property is only visible if "Redirect stderr" is set to "To installer variable".
- **Redirection file**

  A file to which the stderr output of the executed process is saved. If you specify <tt>/dev/stderr</tt>, the output will be printed to the default <tt>stderr</tt> stream of the installer application. Relative paths are relative to the working directory of the installer application. In order to use a file in the installation directory, enter a path like <tt>${installer:sys.installationDir}/log.txt</tt>.

  Note: This property is only visible if "Redirect stderr" is set to "To file".
- **Fail on error**

  If selected, the action fails if the redirection file cannot be written. Otherwise, errors are silently ignored.

  Note: This property is only visible if "Redirect stderr" is set to "To file".
- **Redirect stdin [Redirection]**

  Redirection mode for stdin
- **Input string**

  A string that should be fed to the input stream of the executed process.

  Note: This property is only visible if "Redirect stdin" is set to "From string".
- **Redirection file**

  A file which should be fed to the input stream of the executed process. If you specify <tt>/dev/stdin</tt>, the input from the default <tt>stdin</tt> stream of the installer application will be used. Relative paths are relative to the working directory of the installer application. In order to use a file in the installation directory, enter a path like <tt>${installer:sys.installationDir}/log.txt</tt>.

  Note: This property is only visible if "Redirect stdin" is set to "From file".
- **Fail on error**

  If selected, the action fails if the redirection file cannot be written. Otherwise, errors are silently ignored.

  Note: This property is only visible if "Redirect stdin" is set to "From file".
- **Show console window [Windows]**

  Show a console window with the console output of the executable. This makes only sense if a command line executable is called.

- **Keep console window**

  If selected, the console window will not be closed when the executable has finished. The user has to close the console window manually. This can be useful for debugging purposes. If the "Wait for termination" property is selected, the action will not terminate until the user has closed the console window.

  Note: This property is only visible if "Show console window" is selected.

Category: Persistence of installer variables

Create a response file

Create a response file at an arbitrary location to save user input for subsequent installations. This file can be used with the <tt>-varfile</tt> command line option.

Applies to: Installation, Uninstallation

Properties:

- **File**

  The response file that should be created. If it already exists, it will be overwritten.
- **Variable selection mode**

  Determines which response file variables are written to the response file.
- **Excluded variables**

  The variable that should be excluded from the response file. If empty all variables will be used. In the edit dialog, you have to enter one item per line. Entries that are installer variables with array values (e.g. String[], Object[] or File[]) are expanded as separate entries, this allows you to build a variable length list of entries at runtime.

  Note: This property is only visible if "Variable selection mode" is set to "All except specified response file variables".
- **Included variables**

  The variable that should be included in the response file. If empty, no variables will be used. In the edit dialog, you have to enter one item per line. Entries that are installer variables with array values (e.g. String[], Object[] or File[]) are expanded as separate entries, this allows you to build a variable length list of entries at runtime.

  Note: This property is only visible if "Variable selection mode" is set to "Only specified response file variables".

Load a response file

Load a response file that has previously been saved with the "Create a response file" action.

Applies to: Installation, Uninstallation

Properties:

- **File**

  The response file that should be loaded. If empty, the action will try to load the automatically created response file named <tt>response.varfile</tt> that has been saved by a previous installer in the installation directory.

- **Excluded variables**

  The variables in the response file that should be ignored. If empty, all variables will be loaded. In the edit dialog, you have to enter one item per line. Entries that are installer variables with array values (e.g. String[], Object[] or File[]) are expanded as separate entries, this allows you to build a variable length list of entries at runtime.

- **Overwrite strategy**

  If "Overwrite existing" is selected, already defined installer variables will be overwritten by variable definitions in the response file. With "Do not overwrite command line", you can give priority to command line variable definitions of the form <tt>-Vname=value</tt>, but still overwrite previous variable definitions for other variables.

- **Register variables for response file**

  If selected, all variables in the response file will be registered as response file variables, except forvariables that are excluded or system variables (starting with "sys."). Response file created by subsequent "Create a response file" actions and the automatically created response file by the installer will contain these variables. <p>Note that form screens register bound variables for response files only when they are displayed, so if this option is deselected, the response file created by an update installation may not contain all variables from the original installation.

Modify a response file

Update all variables in an existing response file. The action does not delete variables in the response file for which no installer variables are defined, but keeps them as they are.<p>This action is useful for updating a response file from a custom installer application, where not all installer variables are available.

Applies to: Installation, Uninstallation

Properties:

- **File**

  The response file that should be created. If it already exists, it will be overwritten.

- **Variable selection mode**

  Determines which response file variables are written to the response file.

  Note: This property is only visible if "Add response file variables" is selected.

- **Excluded variables**

  The variable that should be excluded from the response file. If empty all variables will be used. In the edit dialog, you have to enter one item per line. Entries that are installer variables with array values (e.g. String[], Object[] or File[]) are expanded as separate entries, this allows you to build a variable length list of entries at runtime.

Note: This property is only visible if "Variable selection mode" is set to "All except specified response file variables".

- **Included variables**

  The variable that should be included in the response file. If empty, no variables will be used. In the edit dialog, you have to enter one item per line. Entries that are installer variables with array values (e.g. String[], Object[] or File[]) are expanded as separate entries, this allows you to build a variable length list of entries at runtime.

  Note: This property is only visible if "Variable selection mode" is set to "Only specified response file variables".

- **Add response file variables**

  If selected, the specified response file variables are added to the response file. Otherwise only the existing definitions in the response file are updated with their current values.

Category: Properties files

Read a properties file

Read a properties file and save a <tt>java.util.Map</tt> object with the properties to an installer variable. If you use a "Write properties to file" action to write the variable back to disk, the comments on the existing property definitions will be preserved.

Applies to: Installation, Uninstallation

Properties:

- **Properties file**

  The properties file that will be read.

- **Encoding**

  Encoding for the properties file. If "java.util.Properties" is selected, the format of <tt>java.util.Properties</tt> will be emulated. For other encodings, the escaping for property values will be less aggressive.

- **Character set name**

  The character set name as recognized by <tt>java.nio.Charset.forName(...)</tt>. Values supported by all JREs include "US-ASCII" "ISO-8859-1" and "UTF-16".<p>Specifying ISO-8859-1 is not the same as selecting "java.util.Properties" for the "Encoding" property, because - except for comments - that format only writes characters from the US-ASCII character set and escapes more basic characters in property values.

  Note: This property is only visible if "Encoding" is set to "Other".

- **Variable name**

  The name of the variable that will be set with an instance of <tt>java.util.Map</tt>. Enter the variable without the installer prefix and the dollar sign.

- **Merge into existing variable**

  If the variable already contains a value of type <tt>java.util.Map</tt>, the properties will be merged with the entries in that map. The actual map object after the action has

run may be different, since install4j supplies a special map that can retain comments on property definitions.

Remove keys from properties file

Remove selected keys from a properties file. The line separator of the properties file is conserved.

Applies to: Installation, Uninstallation

Properties:

- **Properties file**

  The properties file that will modified.
- **Encoding**

  Encoding for the properties file. If "java.util.Properties" is selected, the format of <tt>java.util.Properties</tt> will be emulated. For other encodings, the escaping for property values will be less aggressive.
- **Character set name**

  The character set name as recognized by <tt>java.nio.Charset.forName(...)</tt>. Values supported by all JREs include "US-ASCII" "ISO-8859-1" and "UTF-16".<p>Specifying ISO-8859-1 is not the same as selecting "java.util.Properties" for the "Encoding" property, because - except for comments - that format only writes characters from the US-ASCII character set and escapes more basic characters in property values.

  Note: This property is only visible if "Encoding" is set to "Other".
- **Remove keys**

  The names of the keys that should be removed. In the edit dialog, you have to enter one item per line. Keys that are installer variables with array values (e.g. String[], Object[] or File[]) are expanded as separate keys, this allows you to build a variable length list of keys at runtime.

Write properties to file

Write property definitions to a properties file. The properties can come from an installer variable with a <tt>java.util.Map</tt> object, another properties file or from direct entry.<p>If the "Merge into existing file" property is selected, the new property definitions will be added to the existing ones.

Applies to: Installation, Uninstallation

Properties:

- **Properties file**

  The properties file that will be written or modified.

- **Encoding**

  Encoding for the properties file. If "java.util.Properties" is selected, the format of <tt>java.util.Properties</tt> will be emulated. For other encodings, the escaping for property values will be less aggressive.

- **Character set name**

  The character set name as recognized by <tt>java.nio.Charset.forName(...)</tt>. Values supported by all JREs include "US-ASCII" "ISO-8859-1" and "UTF-16".<p>Specifying ISO-8859-1 is not the same as selecting "java.util.Properties" for the "Encoding" property, because - except for comments - that format only writes characters from the US-ASCII character set and escapes more basic characters in property values.

  Note: This property is only visible if "Encoding" is set to "Other".

- **Line separator**

  The line separator that should be used for writing the properties file.

- **Merge into existing file**

  If selected, and the properties file already exists, the file will be read first and the new property definitions will be added to the existing ones.

- **Update existing keys**

  If selected, the values of existing keys will be updated with the new values.

  Note: This property is only visible if "Merge into existing file" is selected.

- **Update existing comments**

  If selected, the comments of existing keys will be updated with the new comments. An existing comment will not be deleted if the new comment is empty.

  Note: This property is only visible if "Merge into existing file" is selected.

- **Source of property definitions**

  The source of the new property definitions that should be written to the properties file.

- **Property definitions**

  The new property definitions that should be written to the properties file. Comment lines starting with # and empty lines can be interspersed with the property definitions.

  Note: This property is only visible if "Source of property definitions" is set to "Direct entry".

- **Source properties file**

  The source file with the new property definitions that should be written to the target properties file. The encoding must be the same as that of the target properties file.

  Note: This property is only visible if "Source of property definitions" is set to "Properties file".

- **Source variable name**

  The variable name with a <tt>java.util.Map</tt> object containing the new property definitions that should be written to the properties file. If the map was read by a "Read a properties file" action, the original comments will be used.

  Note: This property is only visible if "Source of property definitions" is set to "Installer variable".

- **Replace installer variables**

  If selected, installer variables written in the syntax <tt>${installer:variableName}</tt> will be replaced with their current values for all property values. If an installer variable does not exist, an error message will be inserted.
- **Sort properties**

  This property determines where new properties should be inserted with respect to existing properties. If the keys are sorted, then existing and new properties are sorted together.

Category: Services

Install a service

Installs a service. On Windows, this is done by executing the service launcher with the appropriate arguments. On Unix, a link will be placed in <tt>/etc/init.d</tt>. On macOS, a LaunchDaemon will be created. This action will be automatically reverted by the 'Uninstall files' action.<p>If a helper process with elevated privileges has been created by the "Request privileges" action, this action is pushed to the helper process. Please see the help topic on "Elevation Of Privileges" for more information.

Applies to: Installation

Properties:

- **Service [General]**

  The service launcher that will be installed.
- **Executable**

  The service executable.
- **Name**

  The name of the service.
- **Auto Start [General]**

  If the service should be started automatically at boot time.
- **Description [General]**

  An optional description for the service.
- **Account Name or SID**

  The account name or a SID in String form.

  Note: This property is only visible if "Account" is set to "Other".
- **Password**

  The password for the specified account.

  Note: This property is only visible if "Account" is set to "Other".
- **Windows Arguments [Windows]**

  Optional arguments passed to the main function of the service executable.

- **Windows Dependencies [Windows]**

  Optional dependencies for Windows. Specify as a comma-separated list of the names of the services that must be started before this service. You do not have to enter core OS services these services will always be initialized before your service is launched.
- **Windows Custom Display Name [Windows]**

  Optional display name for the service. If empty, the service name is used.
- **Windows Priority [Windows]**

  The base priority class for the service. This only applies to services generated by install4j.
- **Account [Windows]**

  The account the service should run under. Use Local System if you are not sure what you need.
- **Keep Current Account [Windows]**

  If the service was already installed, use the currently specified account instead of the values above.
- **Restart on Failure [Windows]**

  If the service should be automatically restarted if it doesn't exit with exit code 0 or if it crashes.
- **Interactive [Windows]**

  If the service can interact with the desktop. Not recommended for Windows Vista and higher.
- **Delayed Auto Start [Windows]**

  If checked and "Auto Start" is also selected the service will be started after all other auto start services with an additional short delay.
- **macOS Identifier [macOS]**

  The launch daemon identifier for macOS. Typically, this is something like com.mycorp.myService.

Start a service

Starts a service by executing the service launcher with the appropriate arguments.<p>If a helper process with elevated privileges has been created by the "Request privileges" action, this action is pushed to the helper process. Please see the help topic on "Elevation Of Privileges" for more information.

Applies to: Installation

Properties:

- **Service [General]**

  The service launcher that will be started.
- **Executable**

  The service executable.
- **Name**

  The name of the service.

- **For "Auto start installations" only [General]**

  If selected, the service will only be started when it is installed as an "Auto start" service on Windows and macOS. This is a property on the "Install a service" action.

Stop a service

Stops a service by executing the service launcher with the appropriate arguments.<p>If a helper process with elevated privileges has been created by the "Request privileges" action, this action is pushed to the helper process. Please see the help topic on "Elevation Of Privileges" for more information.

Applies to: Installation, Uninstallation

Properties:

- **Service [General]**

  The service launcher that will be stopped.
- **Executable**

  The service executable.
- **Name**

  The name of the service.

Category: Text files

Fix line feeds

Changes the line feeds of text files to the platform specific type.

Applies to: Installation, Uninstallation

Properties:

- **Text files**

  The text files that should be fixed. In the edit dialog you can choose files from the distribution tree or enter them manually. Text files that are installer variables with array values (e.g. String[], Object[] or File[]) are expanded as separate text files, this allows you to build a variable length list of text files at runtime. You can add directories as well. In this case, all files in the selected directories that satisfy the "Suffixes" property will be fixed.
- **Suffixes**

  The suffixes with a leading dot of the files to be fixed if the "File" property is a directory. If empty, all files will be used. In the edit dialog, you have to enter one item per line. Suffixes that are installer variables with array values (e.g. String[], Object[] or File[]) are expanded as separate suffixes, this allows you to build a variable length list of suffixes at runtime.

- **Recursive**

  If selected, the operation will be performed recursively on directories. If no selected, all files in directories will be fixed, but subdirectories will not be touched.

Modify text files

Modify installed text files by replacing a search value in the selected files. This action does not read the entire file into memory and can work on arbitrarily large text files.

Applies to: Installation, Uninstallation

Properties:

- **Text files**

  The text files that should be modified. In the edit dialog you can choose files from the distribution tree or enter them manually. Text files that are installer variables with array values (e.g. String[], Object[] or File[]) are expanded as separate text files, this allows you to build a variable length list of text files at runtime.
- **Search value**

  The value that should be searched
- **Replace value**

  The value that should be used instead
- **Log replacement**

  If the replacement text should be written into the log file or not. If the modified file has different security settings than the log file, you might want to disable this property for security reasons.
- **Fail if no replacement occurred**

  If selected, the action will fail if no replacement was performed by the action. Note that you have to set the error message property in order to display the error to the user.
- **Escape for property file**

  If set, the replaced values will be escaped for use in a Java property file.
- **Encoding**

  The encoding of the file. If you leave this empty the system default will be used. Common encodings are UTF-8, UTF-16, ISO-8859-1.

Modify text files with regular expressions

Modify installed text files by applying a regular expression.

Applies to: Installation, Uninstallation

Properties:

- **Text files**

  The text files that should be modified. In the edit dialog you can choose files from the distribution tree or enter them manually. Text files that are installer variables with array values (e.g. String[], Object[] or File[]) are expanded as separate text files, this allows you to build a variable length list of text files at runtime.
- **Match expression**

  The match expression, which is applied to the entire contents of the file. If you wish to use the characters <tt>^</tt> and <tt>$</tt> for matching line start and line end, please prefix the expression with <tt>(?m)</tt>. This switches on multi-line mode. For case-insensitive expressions, prefix with <tt>(?i)</tt>.
- **Replacement**

  The replacement.
- **Replace all**

  If all occurrences should be replaced or only the first one.
- **Quote variables**

  If values of installer variables in the match and replacement expressions should be quoted. This means that the characters of replaced installer variables will be treated literally instead of modifying the search or replace expressions with special characters such as \ or $.
- **Log replacement**

  If the replacement text should be written into the log file or not. If the modified file has different security settings than the log file, you might want to disable this property for security reasons.
- **Fail if no replacement occurred**

  If selected, the action will fail if no replacement was performed by the action. Note that you have to set the error message property in order to display the error to the user.
- **Escape for property file**

  If set, the replaced values will be escaped for use in a Java property file.
- **Encoding**

  The encoding of the file. If you leave this empty the system default will be used. Common encodings are UTF-8, UTF-16, ISO-8859-1.

Read text from file

Read the content of a text file and save it to an installer variable. The variable value will be of type <tt>String</tt>.

Applies to: Installation, Uninstallation

Properties:

- **File**

  The file from which the text should be read. If the file does not exist, the variable value will not be set.

- **File encoding**

  The encoding of the text file. If empty, the native encoding of the operating system will be used.
- **Variable name**

  The name of the variable whose value will be set to the text content of the file. If the file cannot be found, the variable value will not be set.

Replace installer variables in text files

Modify installed text files by replacing all occurrences of installer variables of the form <tt>${installer:myVariable}</tt> with their current values. The action also replaces i18n variables like ${i18n;myKey} and compiler variables like <tt>${compiler:myCompilerVariable}</tt>

Applies to: Installation, Uninstallation

Properties:

- **Text files**

  The text files that should be modified. In the edit dialog you can choose files from the distribution tree or enter them manually. Text files that are installer variables with array values (e.g. String[], Object[] or File[]) are expanded as separate text files, this allows you to build a variable length list of text files at runtime.
- **Ignore missing variables**

  If selected, all missing occurrences of variables will be left as they are. If unselected, a missing variable will be a fatal error leading to the termination of the installer.
- **Fail if no replacement occurred**

  If selected, the action will fail if no replacement was performed by the action. Note that you have to set the error message property in order to display the error to the user.
- **Escape for property file**

  If set, the replaced values will be escaped for use in a Java property file.
- **Encoding**

  The encoding of the file. If you leave this empty the system default will be used. Common encodings are UTF-8, UTF-16, ISO-8859-1.

Write text to a file

Write text to a new file or append text to an existing file.

Applies to: Installation, Uninstallation

Properties:

- **File**

  The file that the text should be appended to. If it doesn't exist it will be created.
- **Text**

  The text that should be appended.
- **Encoding**

  The encoding of the file. If you leave this empty the system default will be used.
- **Escaped text**

  If selected, escape sequences like \n,\t or \u1234 in the text property will be replaced.
- **Append**

  If selected, and the file exists, the text will be appended to the existing file. If the file does not exist, it will be created in any case.
- **Log text**

  If the text should be written into the log file or not. If the written file has different security settings than the log file, you might want to disable this property for security reasons.

Category: Update

Check for update

Load the update descriptor from the a URL and save it to the a variable. If successful, the variable will contain an instance of <tt>com.install4j.api.UpdateDescriptor</tt>

Applies to: Installation, Uninstallation

Properties:

- **Update descriptor URL**

  The URL from which the update descriptor for this project can be downloaded. The update descriptor file is automatically created when compiling the project and can be found in the media output directory. The URL must start with <tt>http://</tt> or <tt>https://</tt>. If you add a query string, it must already be URL encoded.<p>For testing purposes, you can also use a file URL like <tt>file:/c:/test/updates.xml</tt>.
- **Request headers**

  A list of name-value pairs that should be set as additional headers for the request.<p> Request headers that are installer variables with array values (e.g. String[], Object[] or File[]) are expanded as separate request headers, this allows you to build a variable length list of request headers at runtime.
- **Variable**

  The installer variable to which an instance of class <tt>com.install4j.api.UpdateDescriptor</tt> will be saved if the action is successful.
- **Ask for proxy if necessary [Error Handling]**

  At first, the connection is attempted with the proxy information that is set for the default browser. If that fails, and this property is selected, a proxy dialog will be shown

where the user can configure the proxy that should be used to connect to the web server.

- **Network failure script [Error Handling]**

  A script that is executed if the HTTP connection fails in such a way, that the proxy dialog would have to be shown. If you return <tt>ErrorHandlingMode.IGNORE</tt>, the regular proxy or failure handling will proceed, if you return <tt>ErrorHandlingMode.CANCEL</tt>, the action will fail immediately. If you can take corrective action in the script, you can return <tt>ErrorHandlingMode.RETRY</tt> to make the same HTTP request again. However, you have to take special care not to enter an infinite loop. Typically, there should be user input before you retry and the user should be given the option to cancel.<p>The script is only executed for actual network failures, and not if the server or the proxy connection require authentication.

- **Accept all SSL certificates [Error Handling]**

  If the protocol of the URL starts with "https" and this property is selected, the SSL certificate will not be checked for validity. This is only recommended for testing purposes when working with self-signed certificates.

- **Connect timeout [Error Handling]**

  The timeout for establishing the socket connection in milliseconds. A timeout of zero is interpreted as an infinite timeout.

- **Read timeout [Error Handling]**

  The timeout for reading data from the socket connection in milliseconds. A timeout of zero is interpreted as an infinite timeout.

- **Show error message [Error Handling]**

  Show a default error message if the download fails.

Schedule update installation

Schedule a downloaded media file to be started upon the next start of a launcher configured accordingly or by calling UpdateChecker.executeScheduledUpdate().

Applies to: Installation

Properties:

- **Installer file**

  The downloaded installer or macOS single bundle archive.

- **Version**

  The version of the new installer.

- **Installer arguments**

  Optional additional arguments that should be passed to the installer.

- **Maximum retries on error [Installation Error Handling]**

  The maximum number of the times the installer will be executed if an error occurs during installation. Retry is inhibited for one day after an error.

- **Maximum retries on cancel [Installation Error Handling]**

  The maximum number of the times the installer will be executed if it was cancelled by the user. Retry is inhibited for one day after cancellation.

Shut down calling launcher

Shut down the launcher that called this application if it was started with the <tt>com.install4j.api.launcher.ApplicationLauncher</tt> API.

Applies to: Installation, Uninstallation

Properties:

- **Wait**

  If selected the action will wait for the calling launcher to exit.
- **Timeout**

  The timeout in seconds this action will wait if the 'Wait' property is true. If set to 0 there will be no timeout.

Category: Windows registry

Add access rights for a key in the Windows registry

Add access rights for a key in the Windows registry.<p>If a helper process with elevated privileges has been created by the "Request privileges" action, this action is pushed to the helper process. Please see the help topic on "Elevation Of Privileges" for more information.

Applies to: Installation, Uninstallation

Properties:

- **Registry root**

  The Windows registry root where the key is located.
- **Key name**

  The name of the registry key without a leading backslash.
- **Trustee [Rights]**

  The trustee for which the access right should be granted.
- **SID or Account Name**

  The SID in String form or the account name for which the access right should be granted.

  Note: This property is only visible if "Trustee" is set to "SID or Account Name".
- **Read [Rights]**

  The right to read the object.

- **Write [Rights]**
  The right to write to the object.
- **Execute [Rights]**
  The right to execute the object.
- **All [Rights]**
  All available rights.

Delete a key or value in the Windows registry

Delete a key or value in the Windows registry.

Applies to: Installation, Uninstallation

Properties:

- **Registry root**
  The Windows registry root where the key or value should be deleted.
- **Key name**
  The name of the registry key that should be deleted or contains the value to be deleted without a leading backslash.
- **Value name**
  The name of the registry value that should be deleted. If you leave this empty, the key will be deleted instead.
- **Only if empty**
  If a key should only be deleted when it contains no sub-keys or values.

Read a value from the Windows registry

Read a value from the Windows registry and save it to an installer variable. The type of the value depends on the type in the registry, it will be an instance of one of the following classes: <tt>String, Integer, String[], byte[], WinRegistry.ExpandString</tt>.

Applies to: Installation, Uninstallation

Properties:

- **Registry root**
  The Windows registry root where the key is located.
- **Key name**
  The name of the registry key where the value is located without a leading backslash.
- **Value name**
  The name of the registry value whose string content should be read.

- **Use a default value**

  If selected, a default value will be saved to the variable if the key cannot be found in the registry. Otherwise a missing registry value will result in the failure of the action and the variable will not be set.
- **Default value**

  The default value that will be used if the value cannot be found in the registry.

  Note: This property is only visible if "Use a default value" is selected.
- **Variable name**

  The name of the variable that will be set with the value. Enter the variable without the installer prefix and the dollar sign. If the value cannot be found in the registry, the variable value will not be set.

Set a value in the Windows registry

Set a value in the Windows registry. This action can also create the appropriate key if necessary.

Applies to: Installation, Uninstallation

Properties:

- **Registry root**

  The Windows registry root where the key should be created
- **Key name**

  The name of the registry key that contains the value or that should be created without a leading backslash.
- **Value name**

  The name of the registry value.
- **Value**

  The value that should be written into the registry.
- **Create key**

  If set the key will be created if it doesn't exist.

Category: XML files

Apply an XSLT transform

Transform an installed file by applying an XSLT stylesheet.

Applies to: Installation, Uninstallation

Properties:

- **Source file**

  The source for the transformation. This can be the same file as the destination.
- **Destination file**

  The output of the transformation. This can be the same file as the source.
- **Stylesheet**

  The XSLT stylesheet to apply.
- **Download external entities [XML parser]**

  If selected, a DTD referenced with an HTTP system ID will be downloaded as the document is parsed. The success of the action requires a direct internet connection in that case.
- **Validate XML file [XML parser]**

  If selected, the XML parser will validate the document according to a associated DTD or XML schema. If the validation is unsuccessful, the action will fail.

Count nodes in XML file

Count the occurrences of an XPath expression in an XML file and save the result to an installer variable.

Applies to: Installation, Uninstallation

Properties:

- **XML file**

  The XML file that should be read. It will not be validated, and no external entities will be downloaded.
- **XPath expression**

  The XPath expression whose occurrences should be counted. Example for counting attributes: <tt>/myRootNode/myChildNode/@myAttribute</tt>. Example for counting regular nodes: <tt>/myRootNode/myChildNode</tt>
- **Variable name**

  The name of the variable that will be set to the result of the count as a <tt>java.lang.Integer</tt>. Enter the variable without the installer prefix and the dollar sign?. If the XPath expression cannot be found, the variable value will be zero.

Insert XML fragment into XML files

Insert an XML fragment into the position defined by an XPath expression. The fragment can replace an existing element node, or it can be inserted as a child or a sibling.

Applies to: Installation, Uninstallation

Properties:

- **XML files**

  The XML files that should be modified. In the edit dialog you can choose files from the distribution tree or enter them manually. XML files that are installer variables with array values (e.g. String[], Object[] or File[]) are expanded as separate XML files, this allows you to build a variable length list of XML files at runtime.

- **XPath expression**

  The XPath expression to the DOM nodes for which the insertion or replacement should be performed. The result of the XPath expression should consist of one or more element nodes and not of attribute or text nodes.<p> Example for selecting nodes by position: <tt>/levelOne[2]/levelTwo[4]</tt>.
Example for selecting nodes by attribute: <tt>/myRootNode/myChildNode[id='123']</tt>.<p>If no match can be found, the action will fail.

- **XML fragment source**

  The XML fragment that is inserted can either be entered directly in a text editor or be read from a file.

- **XML fragment text**

  The XML fragment that should be inserted. The fragment must not include an XML declaration and can contain multiple top-level elements.<p>Example: <tt><insert>1</insert><insert>2</insert><tt>

  Note: This property is only visible if "XML fragment source" is set to "Direct entry".

- **XML fragment file**

  The source file with the XML fragment that should be inserted. The file has to contain a well-formed XML file. The root element is discarded and the XML fragment is formed from its immediate children.

  Note: This property is only visible if "XML fragment source" is set to "Fragment file".

- **Insert mode**

  For each result of the XPath expression, the selected action is performed. You can replace the matched element, insert the fragment as a sibling or as a child.<p>To insert as the n-th child, enter a positional XPath expression like <tt>/root/nested[3]</tt>, and choose "Insert before".

- **Download external entities [XML parser]**

  If selected, a DTD referenced with an HTTP system ID will be downloaded as the document is parsed. The success of the action requires a direct internet connection in that case.

- **Validate XML file [XML parser]**

  If selected, the XML parser will validate the document according to a associated DTD or XML schema. If the validation is unsuccessful, the action will fail.

Read value from XML file

Read a string value from an XML file specified by an XPath expression and save the result to an installer variable.

Applies to: Installation, Uninstallation

Properties:

- **XML file**

  The XML file that should be read. It will not be validated, and no external entities will be downloaded.

- **XPath expression**

  The XPath expression to the DOM node whose string value should be read. Example for reading text from an attribute: <tt>/myRootNode/myChildNode/@myAttribute</tt>. Example for reading text from an element: <tt>/myRootNode/myChildNode/text()</tt>

- **Variable name for string value**

  The name of the variable that will be set with the string value of the matched node. Enter the variable without the installer prefix and the dollar sign. If the XPath expression cannot be found, the variable value will not be set. If the XPath expression matches a node with a null node value, such as en element, the variable will be set to <tt>null</tt>.

- **Variable name for node**

  The name of the variable that will be set with the node as an <tt>org.w3c.dom.Node</tt> instance. Enter the variable without the installer prefix and the dollar sign. If the XPath expression cannot be found, the variable value will not be set.

Remove nodes from XML files

Remove selected nodes from XML files by specifying an XPath expression.

Applies to: Installation, Uninstallation

Properties:

- **XML files**

  The XML files that should be modified. In the edit dialog you can choose files from the distribution tree or enter them manually. XML files that are installer variables with array values (e.g. String[], Object[] or File[]) are expanded as separate XML files, this allows you to build a variable length list of XML files at runtime.

- **XPath expression**

  The XPath expression to the DOM nodes that should be removed. The result of the XPath expression can be or any node type.<p> Example for selecting element nodes: <tt>/myRootNode/myChildNode[id='123']</tt>.
Example for selecting attribute nodes: <tt>//@removedAttribute</tt>.
Example for selecting text nodes: <tt>//container/text()</tt>.<p>If no match can be found, the action will fail.

- **Download external entities [XML parser]**

  If selected, a DTD referenced with an HTTP system ID will be downloaded as the document is parsed. The success of the action requires a direct internet connection in that case.

- **Validate XML file [XML parser]**

  If selected, the XML parser will validate the document according to a associated DTD or XML schema. If the validation is unsuccessful, the action will fail.

Replace text in XML files

Modify installed XML files by selecting nodes with an XPath expression and applying a regular expression on the selected values.

Applies to: Installation, Uninstallation

Properties:

- **XML files**

  The XML files that should be modified. In the edit dialog you can choose files from the distribution tree or enter them manually. XML files that are installer variables with array values (e.g. String[], Object[] or File[]) are expanded as separate XML files, this allows you to build a variable length list of XML files at runtime.

- **XPath expression**

  The XPath expression to selected DOM nodes that have a value (this includes attributes and text).<p>Example for replacing text in an attribute: <tt>/myRootNode/myChildNode/@myAttribute</tt>.
 Example for replacing text in an element: <tt>/myRootNode/myChildNode/text()</tt>. This will also work if myChildNode is an empty node.<p> If you want to match line breaks with the dot as well, prefix the regular expression with <tt>(?s)</tt>. If you want the comparison to be case insensitive, prefix it with <tt>(?i)</tt>.

- **Match expression**

  The match expression. This is a regular expression.

- **Replacement**

  The replacement. The replacement string may contain references to subsequences, see the javadoc for <tt>java.util.regex.Matcher#appendReplacement</tt> for more details

- **Replace all**

  If all occurrences should be replaced or only the first one.

- **Quote variables**

  If values of installer variables in the match and replacement expressions should be quoted. This means that the characters of replaced installer variables will be treated literally instead of modifying the search or replace expressions with special characters such as \ or $.

- **Log replacement**

  If the replacement text should be written into the log file or not. If the modified file has different security settings than the log file, you might want to disable this property for security reasons.

- **Download external entities [XML parser]**

  If selected, a DTD referenced with an HTTP system ID will be downloaded as the document is parsed. The success of the action requires a direct internet connection in that case.

- **Validate XML file [XML parser]**

  If selected, the XML parser will validate the document according to a associated DTD or XML schema. If the validation is unsuccessful, the action will fail.

Category: ZIP files and archives

Create a ZIP file

Create a ZIP file from the specified source files and directories.

Applies to: Installation, Uninstallation

Properties:

- **ZIP file**

  The ZIP file that should be created.
- **Source files or directories**

  The files and directories to be zipped. In the edit dialog you can choose files from the distribution tree or enter them manually. Files and directories that are installer variables with array values (e.g. String[], Object[] or File[]) are expanded as separate files and directories, this allows you to build a variable length list of files and directories at runtime.
- **File filter script**

  The file filter script is invoked for each file that is about to be processed by this action. The script is not invoked for directories. You can return <tt>true</tt> if the file should be processed or <tt>false</tt> if it should be excluded from processing.
- **Directory filter script**

  The directory filter script is invoked for each directory that is about to be processed by this action. The script is not invoked for files. You can return <tt>true</tt> if the directory should be processed or <tt>false</tt> if it should be excluded from processing.
- **Show progress**

  If selected, and a progress bar is available on the current screen, the action will show its progress in the progress bar.
- **Show file names**

  If selected, the names of the files that are processed will be shown during the installation.

  Note: This property is only visible if "Show progress" is selected.
- **Resolve relative file in**

  A relative zip file can be resolved against the installation directory or against the root of the temporarily extracted archive.
- **Add top level directories**

  If selected, all directories that you have added to the source files, will be added under the name of the directory. Otherwise, the contents of the directories will be added directly to the root of ZIP file.

Extract a DMG file on macOS

Extracts the content of a DMG file to an arbitrary location on macOS.

Applies to: Installation, Uninstallation

Properties:

- **DMG file**

  The DMG file that contains the content to be extracted.
- **File filter script**

  The file filter script is invoked for each entry in the archive file that is about to be processed by this action. The script is invoked for both directories and files, which are passed as relative files. You can return <tt>true</tt> if the file or directory should be processed or <tt>false</tt> if it should be excluded from processing. If you leave the script empty, all files and directories are processed.
- **Destination directory**

  The destination directory. Relative directory information in the zip file will be added to this value. If the destination directory does not exist, it will be created.
- **Show progress**

  If the action should show its progress with the progress bar and the detail message.
- **Show file names**

  If selected, the names of the files that are processed will be shown during the installation.

  Note: This property is only visible if "Show progress" is selected.

Extract a TAR file

Extracts the content of a tar or tar.gz file to an arbitrary location.

Applies to: Installation, Uninstallation

Properties:

- **Tar file**

  The tar or tar.gz file that contains the content to be extracted.
- **File filter script**

  The file filter script is invoked for each entry in the archive file that is about to be processed by this action. The script is invoked for both directories and files, which are passed as relative files. You can return <tt>true</tt> if the file or directory should be processed or <tt>false</tt> if it should be excluded from processing. If you leave the script empty, all files and directories are processed.<p>Note that tar files have no hierarchical directory structure, so it is not guaranteed that you are passed directory entries before entries of contained files. This also means that by excluding a directory, you do not automatically exclude its contents, you have to check and reject each contained file as well.
- **Destination directory**

  The destination directory. Relative directory information in the zip file will be added to this value. If the destination directory does not exist, it will be created.
- **Show progress**

  If the action should show its progress with the progress bar and the detail message.

- **Show file names**

  If selected, the names of the files that are processed will be shown during the installation.

  Note: This property is only visible if "Show progress" is selected.

Extract a ZIP file

Extracts the content of a ZIP file to an arbitrary location.

Applies to: Installation, Uninstallation

Properties:

- **Zip file**

  The zip file that contains the content to be installed.
- **File filter script**

  The file filter script is invoked for each entry in the ZIP file that is about to be processed by this action. The script is invoked for both directories and files, which are passed as relative files. You can return <tt>true</tt> if the file or directory should be processed or <tt>false</tt> if it should be excluded from processing. If you leave the script empty, all files and directories are processed.<p>Note that ZIP files have no hierarchical directory structure, so it is not guaranteed that you are passed directory entries before entries of contained files. This also means that by excluding a directory, you do not automatically exclude its contents, you have to check and reject each contained file as well.
- **Destination directory**

  The destination directory. Relative directory information in the zip file will be added to this value. If the destination directory does not exist, it will be created.
- **Show progress**

  If the action should show its progress with the progress bar and the detail message.
- **Show file names**

  If selected, the names of the files that are processed will be shown during the installation.

  Note: This property is only visible if "Show progress" is selected.
- **File name encoding**

  The encoding for names of ZIP file entries. If you leave this property empty, UTF-8 will be used. Only has an effect on Java 7+.
- **Resolve relative file in**

  A relative destination directory can be resolved against the installation directory or against the root of the temporarily extracted archive.
- **Resolve relative file in**

  A relative zip file can be resolved against the installation directory or against the root of the temporarily extracted archive.

- **File access mode [Unix]**

  The UNIX access mode of extracted files.
- **Dir access mode [Unix]**

  The UNIX access mode of extracted directories.

Install content of a ZIP file

Installs the content of an external ZIP file to an arbitrary location. This action will be automatically reverted by the 'Uninstall files' action.

Applies to: Installation

Properties:

- **Zip file**

  The zip file that contains the content to be installed.
- **File filter script**

  The file filter script is invoked for each entry in the ZIP file that is about to be processed by this action. The script is invoked for both directories and files, which are passed as relative files. You can return <tt>true</tt> if the file or directory should be processed or <tt>false</tt> if it should be excluded from processing. If you leave the script empty, all files and directories are processed.<p>Note that ZIP files have no hierarchical directory structure, so it is not guaranteed that you are passed directory entries before entries of contained files. This also means that by excluding a directory, you do not automatically exclude its contents, you have to check and reject each contained file as well.
- **Destination directory**

  The destination directory. Relative directory information in the zip file will be added to this value. If the destination directory does not exist, it will be created.
- **Show progress**

  If the action should show its progress with the progress bar and the detail message.
- **Show file names**

  If selected, the names of the files that are processed will be shown during the installation.

  Note: This property is only visible if "Show progress" is selected.
- **File name encoding**

  The encoding for names of ZIP file entries. If you leave this property empty, UTF-8 will be used. Only has an effect on Java 7+.
- **Overwrite mode**

  How to handle an existing destination file.
- **Uninstall mode**

  The mode how the uninstaller should handle files created with this action.
- **File access mode [Unix]**

  The UNIX access mode of installed files.

- **Dir access mode [Unix]**

  The UNIX access mode of installed directories.
- **Shared file [Windows]**

  If the file should be registered as a shared file.
- **Delay if necessary [Windows]**

  If selected and a destination file cannot be replaced, the operation will be scheduled for the next reboot. The variable sys.rebootRequired will be set to Boolean.TRUE in this case.
- **Trigger reboot if required [Windows]**

  If selected and an operation is delayed until reboot, the user will be asked for a reboot automatically at the end of installation.

Modify a ZIP file

Modify the contents of a ZIP file with a configurable list of actions.

Applies to: Installation, Uninstallation

Properties:

- **Zip file**

  The zip file that should be modified.
- **Modification actions**

  The actions that modify the contents of the ZIP file. All actions operate in the root directory of the temporarily extracted ZIP file, except where configurable otherwise.<p>The "Copy files and directories" action can be used to copy files into or from the archive, the "Delete files and directories" action is used for removing files. All actions for modifying text files, XML files, property files and ZIP files are also supported.
- **Show progress**

  If the action should show its progress with the progress bar and the detail message.

Download and install component

Download a specified downloadable component and install it. This action only works for installation components that have been marked as "downloadable" on the "Options" tab of the installation component configuration.<p>Note: The "Install Files" action already downloads and installs all selected downloadable installation components.This action is intended for scenarios where an installation component has to be downloaded after the "Install files" action has run. For example, you could use this in a custom installer application to install optional files.

Applies to: Installation

Properties:

- **Installation component**

  The installation component to be downloaded. Only downloadable installation components are displayed
- **Show progress**

  If selected, and a progress bar is available on the current screen, the action will show its progress in the progress bar.
- **Show file names**

  If selected, the names of the files that are installed will be shown during the installation.
- **File filter [Handlers]**

  Expression or script that is invoked for each file to decide whether to install the file or not.
- **Directory resolver [Handlers]**

  Expression or script that resolves the actual installation directory separately for each installed file. Return <tt>null</tt>, if you would like to choose the standard installation directory for a file.
- **Delay if necessary [Windows]**

  If selected and a destination file cannot be replaced, the operation will be scheduled for the next reboot. The context method <tt>isRebootRequired()</tt> will return <tt>true</tt> in this case.
- **Trigger reboot if required [Windows]**

  If selected and an operation is delayed until reboot, the user will be asked for a reboot automatically at the end of installation.
- **Install in single bundle [macOS]**

  This option only applies to single bundle media types. If selected, files will be resolved inside the bundle. In this case, the behavior is equivalent to the "Install files" action. If unselected files will be resolved like specified in the distribution tree. A "Directory resolver" script can be used to specify a useful installation location.

Execute previous uninstaller

Uninstalls the previous installation of this application in the selected installation directory by executing the previous uninstaller.

Applies to: Installation

Properties:

- **Installation directory**

  The installation directory for which the uninstaller should be run. Leave empty for the current installation directory.
- **Only if the same application ID is found**

  If selected, the action will only be performed if the application ID found in the installation directory is the same as that of the currently executed installer.

- **Uninstall services**

  If selected, the uninstaller will auto-uninstall services. Deselect this option if you want to retain previous service settings like the user account setting on Windows. Works only with uninstallers built with install4j 6.1+.

- **Installer variables**

  Specify installer variables that should be passed to the uninstaller.<p>Use the button on the right side to open a dialog for easy entry or enter a list of definitions separated by semicolons like <tt>var1=value1;var2=value2</tt>. Use installer variables from the installer with the usual syntax <tt>var1=${installer:otherVar}</tt>.<p>

Install files

Install all files in the distribution tree that are contained in the selected installation components.

Applies to: Installation

Properties:

- **Validate application id**

  Check if another application is installed in the selected directory or if the application is not the correct target for an add-on installer. If you have an "installation location" screen, you don't have to select this option.

- **Insufficient disk space warning**

  Show a warning message if there is not sufficient disk space for the installation on the selected target drive.

- **Install runtime**

  Create the installation directory and install the install4j runtime. If your installer just modifies some folders and does not need launchers, an uninstaller or custom installer applications, you can deselect this option and use other installation roots in the distribution tree to install files.

- **Update bundled JRE**

  Update a bundled JRE if it already exists. If your application uses the JRE outside the generated launchers, an update of a bundled JRE might fail. In that case you can deselect this property to keep the old JRE and skip the update.

- **Save downloaded files**

  If this property is set and the action downloads files it will try to place them next to the media file. In this case, the installer won't have to download the files again if it is invoked another time.

- **Show file names**

  If selected, the names of the files that are installed will be shown during the installation.

- **File filter [Handlers]**

  Expression or script that is invoked for each file to decide whether to install the file or not.

- **Directory resolver [Handlers]**

  Expression or script that resolves the actual installation directory separately for each installed file. Return <tt>null</tt>, if you would like to choose the standard installation directory for a file.
- **Installation size calculator [Handlers]**

  Expression or script that calculates a custom installation size in bytes. The default size in bytes is passed as a parameter.
- **Delay if necessary [Windows]**

  If selected and a destination file cannot be replaced, the operation will be scheduled for the next reboot. The context method <tt>isRebootRequired()</tt> will return <tt>true</tt> in this case.
- **Trigger reboot if required [Windows]**

  If selected and an operation is delayed until reboot, the user will be asked for a reboot automatically at the end of installation.

Uninstall files

Uninstall all installed files.

Applies to:
Uninstallation

B.5.8 Installer - Screens And Actions Groups

Screen and action groups can be configured on the screens & and actions tab [p. 145] .

Actions and screens can be grouped in the tree of installer elements. Groups of the same type can be nested, meaning that you can put a screen group into a screen group or an action group into an action group.

You can nest as many levels of groups as you wish. Next to the label of the screen or action group in the tree of installer elements, the number of all contained screens or actions is shown in bold font. Elements in nested groups are counted as well.

Grouping offers the following:

- **Organization**

  If you have many screens or actions, groups emphasize which elements belong together. You can add a common comment to the group.
- **Common condition**

  Groups have a "Condition expression" property that allows you to skip the group with a common condition instead of having to repeat the condition for each contained element.
- **Single link target**

  If you want to reuse a set of adjacent screens or actions in a different part of your project, you can put them in a group and add a single link to that group instead of linking to each element separately.
- **Looping**

  A group has a "Loop expression" property that allows you to execute the group repeatedly until the loop expression returns `false`.
- **Jump targets (screen groups only)**

  When you jump to a screen programmatically (with `context.gotoScreen(...)`), it is more maintainable to jump to a group instead of to a single screen. You can think of the group as taking the function of a label in this case.

The configurable properties of screen and action groups are:

Screen group

A screen group contains multiple screens that can be disabled with a single condition expression on the group.

Properties:

- **Action elevation type [Privileges]**

  If any contained actions should run in the elevated helper process, if their "Action elevation type" property is set to "Inherit from parent".An elevated helper process is available on Windows and macOS if the process has been started without admin privileges and the "Request privileges" action has been configured to require full privileges.
- **Style [GUI Options]**

  The default screen style for this installer application. Screens and screen groups can override this style.

- **Customize title bar**

  A form component in the selected style is configured to allow customization of selected properties.
- **Customize banner image**

  A form component in the selected style is configured to allow customization of selected properties.
- **Condition expression [Control Flow]**

  This expression is evaluated just before the screen is displayed. If the expression or script returns <tt>false</tt>, the entire screen group will be skipped.
- **Loop [Control Flow]**

  If selected, the screen group will be looped. With the child properties you can set an expression that terminates the loop and configure a loop index that is available inside the loop.

Note: If actions should be repeated in a loop, their "Can be executed multiple times" property has to be selected. If form components in a screen should be re-initialized on each loop, their "Reset initialization on previous" property has to be selected.
- **Loop index start value**

  The start value for the loop index variable that is passed to the "Loop expression"

  Note: This property is only visible if "Loop" is selected.
- **Loop index step**

  The step for the loop index variable that is passed to the "Loop expression". At the end of each loop, this step is added to the loop index. It is added before the "Loop expression" is evaluated. To decrement, specify a negative value.

  Note: This property is only visible if "Loop" is selected.
- **Loop expression**

  This expression is evaluated when the end of the screen group is reached. If it returns <tt>true</tt>, all screens will be repeated. If you leave the expression empty, no loop will be performed.

  Note: This property is only visible if "Loop" is selected.
- **Loop index variable name**

  If you want to use the loop index in a screen that is contained in the group, you can optionally save the value to an installer variable. Specify the variable name to which the value should be saved as a <tt>java.lang.Integer</tt>.

  Note: This property is only visible if "Loop" is selected.

Action group

An action group contains multiple actions that can be disabled with a single condition expression on the group.

Properties:

- **Action elevation type [Privileges]**

  If any contained actions should run in the elevated helper process, if their "Action elevation type" property is set to "Inherit from parent".An elevated helper process is available on Windows and macOS if the process has been started without admin privileges and the "Request privileges" action has been configured to require full privileges.
- **Condition expression [Control Flow]**

  This expression is evaluated just before the action is executed. If the expression or script returns <tt>false</tt>, the entire action group will be skipped.
- **Loop [Control Flow]**

  If selected, the action group will be looped. With the child properties you can set an expression that terminates the loop and configure a loop index that is available inside the loop.

Note: If actions should be repeated in a loop, their "Can be executed multiple times" property has to be selected. If form components in a screen should be re-initialized on each loop, their "Reset initialization on previous" property has to be selected.
- **Loop index start value**

  The start value for the loop index variable that is passed to the "Loop expression"

  Note: This property is only visible if "Loop" is selected.
- **Loop index step**

  The step for the loop index variable that is passed to the "Loop expression". At the end of each loop, this step is added to the loop index. It is added before the "Loop expression" is evaluated. To decrement, specify a negative value.

  Note: This property is only visible if "Loop" is selected.
- **Loop expression**

  This expression is evaluated when the end of the action group is reached. If it returns <tt>true</tt>, all actions will be repeated. If you leave the expression empty, no loop will be performed.

  Note: This property is only visible if "Loop" is selected.
- **Loop index variable name**

  If you want to use the loop index in a action that is contained in the group, you can optionally save the value to an installer variable. Specify the variable name to which the value should be saved as a <tt>java.lang.Integer</tt>.

  Note: This property is only visible if "Loop" is selected.
- **On error break group [Error Handling]**

  If selected, and one of the contained actions returns with an error, the control flow will step out of the action group and continue with the next element after the group. This behavior only takes effect if the problematic action has its failure strategy set to "Continue on failure".
- **Retry expression**

  If this expression is set and returns <tt>true</tt>, the action group is repeated. If the action group is configured to loop, the loop index will not be incremented.

  Note: This property is only visible if "On error break group" is selected.

- **Failure strategy**

  The failure strategy that should be chosen if the action group fails. The "Error message" property will be used for the option dialog. If you also define a "Default error message", you will get two option dialogs, the first one from the action that causes the failure.

  Note: This property is only visible if "On error break group" is selected.

- **Error message**

  If the action group fails, this error message is displayed to the user, otherwise the action group fails silently.

  Note: This property is only visible if "On error break group" is selected.

- **Default error message [Error Handling]**

  A default error message used by all actions that have no dedicated error message.

B.5.9 Installer - Configuring Form Components

For more information on form screens and related concepts, please see the corresponding help topic [p. 15] .

Please see the list of available form components [p. 258] that come with install4j.

The **[Add]** button shows a popup window where you can select whether to add

- a form component. Form components are made available by install4j or are contributed by an installed extension [p. 84] . A registry dialog [p. 319] will be shown where you can select the desired form component.
- a form component that is contained in your custom code. New types of reusable form components can be developed with the install4j API [p. 81] . In your custom code configuration [p. 312] you can specify code locations that are scanned for suitable classes. A class selector [p. 318] will be shown where you can select the desired class.
- a layout group [p. 250] , either a vertical group or a horizontal group. The new layout group is initially empty. Note that you can also create layout groups directly from a selection in the tree of installer elements (see below).

If you select a single form component in the list of form components, you can edit its properties on the right side. Selecting multiple form components is possible on the same tree level, i.e. all selected elements have to be siblings in the tree.

When the configuration area is focused, you can transfer the focus back to the list of form components with the keyboard by pressing `ALT-F1`.

The list of form components provides the following actions in the toolbar on the right that operate on the current selection. You can also access these actions from the context menu or use the associated keyboard shortcuts.

- **Delete**

  All selected form components will be deleted after a confirmation dialog when invoking the **[Delete]** action. The deleted form components cannot be restored.
- **Rename**

  After you add a form component, the list of form components shows it with its default name. This is often enough, however, if you have multiple instances of the same form component alongside, a custom name makes it easier to distinguish these instances. You can assign a custom name to each form component with the **[Rename]** action. The default name is still displayed in brackets after the custom name. To revert to the default, just enter an empty custom name in the rename dialog.
- **Comment**

  By default, form components have no comments associated with them. You can add comments to selected form components with the **[Add Comments]** action. When a comment is added, the affected form components will receive a "Comments" tab. After adding a comment to a single form component, the comment area is focused automatically. Likewise, you can remove comments from one or more form components with the **[Remove Comments]** action.

  In order to visit all comments, you can use the **[Show next comment]** and **[Show previous comment]** actions. These actions will focus the comment area automatically and wrap around if no further comments can be found.

- **Disable**

  In order to "comment out" form components, you can use the **[Disable]** action. The configuration of the disabled form components will not be displayed, their entries in the list of form components will be shown in gray and they will not be checked for errors when the project is built.

- **Copy and paste**

  install4j offers an inter-process clipboard for form components. You can **[Cut]** or **[Copy]** form components to the clipboard and **[Paste]** them in the same or a different instance of install4j. Note that references to launchers or references to files in the distribution tree might not be valid after pasting to a different project.

  Pasted form components are appended to the end of the list of form components.

- **Reorder**

  If your selection is a single contiguous interval, you can move the entire block up or down in the list. The selection can only be moved on the same level with the reorder actions. To move the selection to a different parent, you can cut and paste it (see above).

- **Group**

  You can create a layout group [p. 250] from the selected form components with the **[Create Horizontal Group]** and **[Create Vertical Group]** actions. The new group will be inserted in place of the selected elements.

  You can dissolve a group with the **[Dissolve Group]** action. This action is only enabled if the selection consists of a single layout group. The elements contained in the group will be inserted in place of the group. Nested groups will not be dissolved.

Common properties of form components are:

- **Insets [Layout]**

  This insets around the form component. The format is top;left;bottom;right, use the drop-down button at the right side to show the insets editor.

- **Initialization script [Initialization]**

  A script that initializes the form component. To configure the contained principal component, such as a JCheckBox, use the configurationObject parameter (if available). This script will run after the internal initialization of the form component, just before the component appears on the screen. It will not be invoked in console mode.

- **Reset initialization on previous [Initialization]**

  If set, the component will be initialized each time the user enters in the forward direction. Otherwise, the initialization will be performed only once. This setting affects both the internal initialization as well as the initialization script.

- **Visibility script [Initialization]**

  A script that determines whether the form component will be visible or not. This works for both GUI and console modes. In GUI mode, the script will be invoked each time just before the form component is initialized.

You can preview a form screen with the **[Preview]** button which is also available on the property page of a screen. For screens that embed forms, the preview may not show the actual screen. However, the layout of the form itself will be the same at runtime.

B.5.10 Installer - Layout Groups

Layout groups can be configured on the form components [p. 248] configuration dialog.

For more information on layout groups, please see the corresponding help topic [p. 18] .

Form components can be grouped in horizontal and vertical layout groups.

You can nest as many levels of groups as you wish. Next to the label of the layout group in the tree of form components, the number of all contained form components is shown in bold font. Form components in nested groups are counted as well.

Grouping offers the following benefits:

- **Custom layout**

  Instead of a simple sequence of form components on a form screen, you can use horizontal layout groups to put form components side-by-side. Nesting vertical and horizontal form components allows you to achieve virtually any layout.

  Sometimes, enclosing groups and sibling groups span a cell that cannot be entirely filled with a layout group. With the **"Anchor"** property you can determine where the layout should be placed. By default, horizontal form components are anchored "West" and vertical form components are anchored "North-West".

  Layout groups have a **configurable cell spacing**. For vertical layout groups, this is the vertical gap between two form components (0 pixels by default), for horizontal layout groups this is the horizontal gap between two adjacent form components (5 pixels by default)

  For each layout group, you can specify **insets** that are inserted around the entire layout group. By default, the insets a zero in all directions.

  By default, horizontal layout groups align a leading label of the first form component in the group with other form components from a direct vertical parent group. This is usually appropriate when horizontal groups are used to attach additional form components to the right side. If this alignment is not desired, you can use the "Align first label" property of a horizontal layout group to switch off the alignment.

  Vertical layout groups always break alignment of leading labels. Within a vertical group, leading labels are aligned, but between vertical groups, the width of leading labels is unrelated.
- **Organization**

  If you have many form components on a screen, vertical groups emphasize which form components belong together. You can add a common comment to the group.
- **Common visibility script**

  Groups have a "Visibility script" property that allows you to hide the entire group with a common condition instead of having to repeat the condition for each contained form component.
- **Single target for coupled form components**

  If a set of form components should be coupled to the selection state of a check box or a single radio button, you can select the containing layout group as the target instead of selecting all coupled form components separately.

The configurable properties of horizontal and vertical layout groups are:

Horizontal group

A horizontal form component group contains one or more form components that are distributed along the horizontal axis.

Properties:

- **Image File**

  An image that is shown on the edge or as a background. Apart from an image that is anchored to the center of the group, the image can optionally cut off an entire edge from the group. In that case it is possible to set a background color for the edge stripe so that the image can blend into the surroundings. Can be empty. To add a high-resolution image for retina displays, create a file with an additional <tt>@2x</tt> after the name (e.g. <tt>image.png</tt> and <tt>image@2x.png</tt>) and the duplicate resolution next to the selected image. The install4j runtime JAR file <tt>i4jruntime.jar</tt> contains a number of image files that you can reference here by prefixing the icon file name with "icon:". For example, <tt>icon:lock_open_32.png</tt> loads a 32x32 icon showing an open lock.

- **Image anchor**

  The anchor where the image will be attached to in the layout group. If Center is chosen, the image is always displayed in the background.

- **Image edge**

  For corner anchors, you have to select either the horizontal or the vertical edge that will optionally be filled with the image edge background color and that will be cut of from the layout group if the image is not displayed in the background.

- **Image edge background color**

  The background color that the image edge should be filled with. If the image terminates with the same color, the image will blend with the background and the entire edge will look like a single visual element. Not available if the anchor is set to "Center"

- **Image insets**

  The insets around the image. The format is top;left;bottom;right, use the drop-down button at the right side to show the insets editor.

- **Overlap with contained components**

  If selected, the image will by used as a background image and form components contained in the layout group will overlap with the image. Otherwise, the image edge will be cut off from the layout group and form components will not overlap with the image. In that case, the insets of the layout group will be applied to the actual content area that excludes the image edge. Not available if the anchor is set to "Center"

- **Image edge border**

  If selected, the image edge will be separated by a line border from the content area. Not available if the image overlaps the contained components.

- **Image edge border color**

  The color of the image edge border. Leave empty to choose the default separator color of the current look and feel.

  Note: This property is only visible if "Image edge border" is selected.

- **Image edge border width**

  The width of the image edge border in pixels.

  Note: This property is only visible if "Image edge border" is selected.

- **Background color**

  The background color of the layout group. Can be empty.
- **Foreground color**

  The foreground color of the layout group. Can be empty. If set, all contained form components will use this foreground color except those that have an explicitly configured foreground color.
- **Border sides**

  On which sides a line border should be painted around the form component, a list of "top", "right", "bottom" and "left", separated by semicolons. Use the drop-down button to select the sides visually.
- **Border color**

  The color of the drawn border sides. Leave empty to choose the default separator color of the current look and feel.
- **Border width**

  The width of the drawn border sides in pixels.
- **Visibility script [Initialization]**

  A script that determines whether form components in the group (and all descendant components in nested groups) will be visible or not. This works for both GUI and console modes. In GUI mode, the script will be invoked each time just before the form components are initialized. Visibility scripts of nested form components can further hide single form components, but they cannot show them if a parent layout group is already hidden.
- **Insets [Layout]**

  The insets around the entire group. The format is top;left;bottom;right, use the drop-down button at the right side to show the insets editor.
- **Anchor [Layout]**

  The position in the available space where the group is anchored in the layout. This is only relevant if the group takes less space than the cell that is created by the surroundings.
- **Cell spacing [Layout]**

  The cell spacing determines how many pixels are inserted between single components in the layout group.
- **Align first label [Layout]**

  If the horizontal group is directly added to a vertical group or to the top-level of a form, the leading label in the horizontal group is aligned with other leading labels in the vertical parent group. If this alignment is not desired, you can deselect this property.
- **Make children same height [Layout]**

  If all contained elements should have the same height.

Vertical group

A vertical form component group contains one or more form components that are distributed along the vertical axis.

Properties:

- **Image File**

  An image that is shown on the edge or as a background. Apart from an image that is anchored to the center of the group, the image can optionally cut off an entire edge from the group. In that case it is possible to set a background color for the edge stripe so that the image can blend into the surroundings. Can be empty. To add a high-resolution image for retina displays, create a file with an additional <tt>@2x</tt> after the name (e.g. <tt>image.png</tt> and <tt>image@2x.png</tt>) and the duplicate resolution next to the selected image. The install4j runtime JAR file <tt>i4jruntime.jar</tt> contains a number of image files that you can reference here by prefixing the icon file name with "icon:". For example, <tt>icon:lock_open_32.png</tt> loads a 32x32 icon showing an open lock.

- **Image anchor**

  The anchor where the image will be attached to in the layout group. If Center is chosen, the image is always displayed in the background.

- **Image edge**

  For corner anchors, you have to select either the horizontal or the vertical edge that will optionally be filled with the image edge background color and that will be cut of from the layout group if the image is not displayed in the background.

- **Image edge background color**

  The background color that the image edge should be filled with. If the image terminates with the same color, the image will blend with the background and the entire edge will look like a single visual element. Not available if the anchor is set to "Center"

- **Image insets**

  The insets around the image. The format is top;left;bottom;right, use the drop-down button at the right side to show the insets editor.

- **Overlap with contained components**

  If selected, the image will by used as a background image and form components contained in the layout group will overlap with the image. Otherwise, the image edge will be cut off from the layout group and form components will not overlap with the image. In that case, the insets of the layout group will be applied to the actual content area that excludes the image edge. Not available if the anchor is set to "Center"

- **Image edge border**

  If selected, the image edge will be separated by a line border from the content area. Not available if the image overlaps the contained components.

- **Image edge border color**

  The color of the image edge border. Leave empty to choose the default separator color of the current look and feel.

  Note: This property is only visible if "Image edge border" is selected.

- **Image edge border width**

  The width of the image edge border in pixels.

  Note: This property is only visible if "Image edge border" is selected.

- **Background color**

  The background color of the layout group. Can be empty.

- **Foreground color**

  The foreground color of the layout group. Can be empty. If set, all contained form components will use this foreground color except those that have an explicitly configured foreground color.
- **Border sides**

  On which sides a line border should be painted around the form component, a list of "top", "right", "bottom" and "left", separated by semicolons. Use the drop-down button to select the sides visually.
- **Border color**

  The color of the drawn border sides. Leave empty to choose the default separator color of the current look and feel.
- **Border width**

  The width of the drawn border sides in pixels.
- **Visibility script [Initialization]**

  A script that determines whether form components in the group (and all descendant components in nested groups) will be visible or not. This works for both GUI and console modes. In GUI mode, the script will be invoked each time just before the form components are initialized. Visibility scripts of nested form components can further hide single form components, but they cannot show them if a parent layout group is already hidden.
- **Insets [Layout]**

  The insets around the entire group. The format is top;left;bottom;right, use the drop-down button at the right side to show the insets editor.
- **Anchor [Layout]**

  The position in the available space where the group is anchored in the layout. This is only relevant if the group takes less space than the cell that is created by the surroundings.
- **Cell spacing [Layout]**

  The cell spacing determines how many pixels are inserted between single components in the layout group.
- **Make children same width [Layout]**

  If all contained elements should have the same width.

In addition to the above layout groups, you can add **tabbed panes** to a form. A tabbed pane is added by choosing `Tabbed Panes->Add Tabbed Pane` from the dropdown menu displayed by the **[Add]** button. Below the tabbed pane, you have to add one or more single tabs by choosing `Tabbed Panes->Add Single Tab For Tabbed Pane`. Each single tab can then contain arbitrary form components or layout groups.

The configurable properties of tabbed panes and single tabs are:

Tabbed pane

A tabbed pane contains a number of single tabs, which in turn contain form components.

Properties:

- **Visibility script [Initialization]**

  A script that determines whether form components in the group (and all descendant components in nested groups) will be visible or not. This works for both GUI and console modes. In GUI mode, the script will be invoked each time just before the form components are initialized. Visibility scripts of nested form components can further hide single form components, but they cannot show them if a parent layout group is already hidden.
- **Insets [Layout]**

  The insets around the entire group. The format is top;left;bottom;right, use the drop-down button at the right side to show the insets editor.
- **Anchor [Layout]**

  The position in the available space where the group is anchored in the layout. This is only relevant if the group takes less space than the cell that is created by the surroundings.
- **Tab placement [Tabbed Pane]**

  The location where the tabs will be displayed.
- **Tab layout policy [Tabbed Pane]**

  The layout policy for tabs determined what should be done if there is not enough horizontal space to display all tabs. The default policy "Wrap" creates multiple lines of tabs to accommodate all tabs, the policy "Scroll" shows a scroll button and keeps a single line of tabs.
- **Fill horizontal space [Tabbed Pane]**

  If set, the tabbed will fill all the available horizontal space regardless of its content, otherwise it will be as wide as required by the preferred size of the contained form components.
- **Fill extra vertical space [Tabbed Pane]**

  If set, the tabbed pane will expand to fill remaining vertical space. Extra vertical space is only available, if the form is not scrollable. Custom form screens have a "Scrollable" property, which must be set to false. If this property is not selected, the tabbed pane will be as high as required by the preferred size of the contained form components.

Single tab

A single tab can be added to a tabbed pane group. It can contain any kind of form components

Properties:

- **Image File**

  An image that is shown on the edge or as a background. Apart from an image that is anchored to the center of the group, the image can optionally cut off an entire edge from the group. In that case it is possible to set a background color for the edge stripe so that the image can blend into the surroundings. Can be empty.<p>To add a high-resolution image for retina displays, create a file with an additional <tt>@2x</tt> after the name (e.g. <tt>image.png</tt> and <tt>image@2x.png</tt>) and the duplicate resolution next to the selected image.<p>The install4j runtime JAR file

<tt>i4jruntime.jar</tt> contains a number of image files that you can reference here by prefixing the icon file name with "icon:". For example, <tt>icon:lock_open_32.png</tt> loads a 32x32 icon showing an open lock.

- **Image anchor**

  The anchor where the image will be attached to in the layout group. If Center is chosen, the image is always displayed in the background.

- **Image edge**

  For corner anchors, you have to select either the horizontal or the vertical edge that will optionally be filled with the image edge background color and that will be cut of from the layout group if the image is not displayed in the background.

- **Image edge background color**

  The background color that the image edge should be filled with. If the image terminates with the same color, the image will blend with the background and the entire edge will look like a single visual element. Not available if the anchor is set to "Center"

- **Image insets**

  The insets around the image. The format is top;left;bottom;right, use the drop-down button at the right side to show the insets editor.

- **Overlap with contained components**

  If selected, the image will by used as a background image and form components contained in the layout group will overlap with the image. Otherwise, the image edge will be cut off from the layout group and form components will not overlap with the image. In that case, the insets of the layout group will be applied to the actual content area that excludes the image edge. Not available if the anchor is set to "Center"

- **Image edge border**

  If selected, the image edge will be separated by a line border from the content area. Not available if the image overlaps the contained components.

- **Image edge border color**

  The color of the image edge border. Leave empty to choose the default separator color of the current look and feel.

  Note: This property is only visible if "Image edge border" is selected.

- **Image edge border width**

  The width of the image edge border in pixels.

  Note: This property is only visible if "Image edge border" is selected.

- **Background color**

  The background color of the layout group. Can be empty.

- **Foreground color**

  The foreground color of the layout group. Can be empty. If set, all contained form components will use this foreground color except those that have an explicitly configured foreground color.

- **Border sides**

  On which sides a line border should be painted around the form component, a list of "top", "right", "bottom" and "left", separated by semicolons. Use the drop-down button to select the sides visually.

- **Border color**

  The color of the drawn border sides. Leave empty to choose the default separator color of the current look and feel.

- **Border width**

  The width of the drawn border sides in pixels.

- **Visibility script [Initialization]**

  A script that determines whether form components in the group (and all descendant components in nested groups) will be visible or not. This works for both GUI and console modes. In GUI mode, the script will be invoked each time just before the form components are initialized. Visibility scripts of nested form components can further hide single form components, but they cannot show them if a parent layout group is already hidden.

- **Insets [Layout]**

  The insets around the entire group. The format is top;left;bottom;right, use the drop-down button at the right side to show the insets editor.

- **Anchor [Layout]**

  The position in the available space where the group is anchored in the layout. This is only relevant if the group takes less space than the cell that is created by the surroundings.

- **Cell spacing [Layout]**

  The cell spacing determines how many pixels are inserted between single components in the layout group.

- **Tab title [Tab]**

  The title that is displayed on the tab. To configure a keyboard shortcut, prefix the mnemonic character in the title with &, e.g."&User". The prefixed character will be underlined and the platform-specific keyboard shortcut (e.g. ALT+[character] on Windows) will allow the user to quickly navigate to this tab with the keyboard.

- **Tab icon [Tab]**

  An image file with an icon that is displayed on the tab. Can be empty.<p>To add a high-resolution image for retina displays, create a file with an additional <tt>@2x</tt> after the name (e.g. <tt>image.png</tt> and <tt>image@2x.png</tt>) and the duplicate resolution next to the selected image.<p>The install4j runtime JAR file <tt>i4jruntime.jar</tt> contains a number of image files that you can reference here by prefixing the icon file name with "icon:". For example, <tt>icon:lock_open_32.png</tt> loads a 32x32 icon showing an open lock.

- **Tooltip text [Tab]**

  An optional tooltip text that is displayed when the user hovers with the mouse over the tab.

- **Activation script [Tab]**

  A script that is executed when the tab is activated.

B.5.11 Installer - Available Form Components

Category: Action components

Button

A standard button with an optional leading label. When the user clicks on the button, an action script is executed.

Properties:

- **Button text [Button]**

  The text that is displayed on the button. Can be empty if the button icon is set.

- **Button icon [Button]**

  The icon displayed on the button. Can be empty if the button text is set.<p>To add a high-resolution image for retina displays, create a file with an additional <tt>@2x</tt> after the name (e.g. <tt>image.png</tt> and <tt>image@2x.png</tt>) and the duplicate resolution next to the selected image.<p>The install4j runtime JAR file <tt>i4jruntime.jar</tt> contains a number of image files that you can reference here by prefixing the icon file name with "icon:". For example, <tt>icon:lock_open_32.png</tt> loads a 32x32 icon showing an open lock.

- **Action type [Button]**

  The type of the action that should be executed by the button is clicked. You can either choose to configure a single script or an entire list of actions.

- **Action script**

  The script that is executed when the button is clicked by the user. The return type is <tt>void</tt>.

  Note: This property is only visible if "Action type" is set to "Script".

- **Action list**

  A list of actions that is executed when the button is clicked by the user.

  Note: This property is only visible if "Action type" is set to "Action list".

- **Help text [Help]**

  If a text is entered into this property, a tooltip label with a help icon will be created on the right side of the form component that will display the help text when the user hovers with the mouse above the icon. The text can be plain text or HTML. For multi-line labels, use HTML like this: <tt><html>This is line one
This is line two</tt></html>.

- **Text [Label]**

  The text of the label. Can be empty. To configure a keyboard shortcut, prefix the mnemonic character in the label text with &, e.g."&User". The prefixed character will be underlined and the platform-specific keyboard shortcut (e.g. ALT+[character] on Windows) will allow the user to quickly navigate to this form component with the keyboard.

- **Font color [Label]**

  The color of the label font. If empty, the default color will be used.

- **Font [Label]**

  The font type of the label. For a derived form, you can optionally change size, and font attributes, with a custom font you can also choose a different font face.
- **Font specification**

  The font specification for the label.

  Note: This property is only visible if "Font" is set to "Custom".
- **Font style**

  The font style of the label.

  Note: This property is only visible if "Font" is set to "Derived".
- **Font size in percent**

  The font size of the label in percent relative to the default font.

  Note: This property is only visible if "Font" is set to "Derived".
- **Icon [Label]**

  An image file with an icon for the labellabel. Can be empty.<p>To add a high-resolution image for retina displays, create a file with an additional <tt>@2x</tt> after the name (e.g. <tt>image.png</tt> and <tt>image@2x.png</tt>) and the duplicate resolution next to the selected image.<p>The install4j runtime JAR file <tt>i4jruntime.jar</tt> contains a number of image files that you can reference here by prefixing the icon file name with "icon:". For example, <tt>icon:lock_open_32.png</tt> loads a 32x32 icon showing an open lock.
- **Icon-text gap [Label]**

  The gap between the label icon and the label text in pixels.
- **Request focus [User input]**

  If selected, the form component will request the focus after the form is activated. If you have multiple form components in a single form that have this property selected, the result is undefined.

Hyperlink URL label

A label that displays a hyperlink. When the user clicks on the hyperlink, the appropriate action is performed, depending on the protocol of the URL.

Properties:

- **Hyperlink text**

  The text that is displayed on the hyperlink label.
- **URL**

  The URL for the hyperlink. For example <tt>https://www.ej-technologies.com</tt>
- **Help text [Help]**

  If a text is entered into this property, a tooltip label with a help icon will be created on the right side of the form component that will display the help text when the user hovers with the mouse above the icon. The text can be plain text or HTML. For multi-line

labels, use HTML like this: <tt><html>This is line one
This is line two</tt></html>.

- **Text [Label]**

  The text of the label. Can be empty.

- **Font color [Label]**

  The color of the label font. If empty, the default color will be used.

- **Font [Label]**

  The font type of the label. For a derived form, you can optionally change size, and font attributes, with a custom font you can also choose a different font face.

- **Font specification**

  The font specification for the label.

  Note: This property is only visible if "Font" is set to "Custom".

- **Font style**

  The font style of the label.

  Note: This property is only visible if "Font" is set to "Derived".

- **Font size in percent**

  The font size of the label in percent relative to the default font.

  Note: This property is only visible if "Font" is set to "Derived".

- **Icon [Label]**

  An image file with an icon for the labellabel. Can be empty.<p>To add a high-resolution image for retina displays, create a file with an additional <tt>@2x</tt> after the name (e.g. <tt>image.png</tt> and <tt>image@2x.png</tt>) and the duplicate resolution next to the selected image.<p>The install4j runtime JAR file <tt>i4jruntime.jar</tt> contains a number of image files that you can reference here by prefixing the icon file name with "icon:". For example, <tt>icon:lock_open_32.png</tt> loads a 32x32 icon showing an open lock.

- **Icon-text gap [Label]**

  The gap between the label icon and the label text in pixels.

Hyperlink action label

A label that displays a hyperlink. When the user clicks on the hyperlink, an action script is executed

Properties:

- **Hyperlink text**

  The text that is displayed on the hyperlink label.

- **Action type**

  The type of the action that should be executed by the button is clicked. You can either choose to configure a single script or an entire list of actions.

- **Action script**

  The script that is executed when the button is clicked by the user. The return type is <tt>void</tt>.

  Note: This property is only visible if "Action type" is set to "Script".
- **Action list**

  A list of actions that is executed when the button is clicked by the user.

  Note: This property is only visible if "Action type" is set to "Action list".
- **Help text [Help]**

  If a text is entered into this property, a tooltip label with a help icon will be created on the right side of the form component that will display the help text when the user hovers with the mouse above the icon. The text can be plain text or HTML. For multi-line labels, use HTML like this: <tt><html>This is line one
This is line two</tt></html>.
- **Text [Label]**

  The text of the label. Can be empty.
- **Font color [Label]**

  The color of the label font. If empty, the default color will be used.
- **Font [Label]**

  The font type of the label. For a derived form, you can optionally change size, and font attributes, with a custom font you can also choose a different font face.
- **Font specification**

  The font specification for the label.

  Note: This property is only visible if "Font" is set to "Custom".
- **Font style**

  The font style of the label.

  Note: This property is only visible if "Font" is set to "Derived".
- **Font size in percent**

  The font size of the label in percent relative to the default font.

  Note: This property is only visible if "Font" is set to "Derived".
- **Icon [Label]**

  An image file with an icon for the labellabel. Can be empty.<p>To add a high-resolution image for retina displays, create a file with an additional <tt>@2x</tt> after the name (e.g. <tt>image.png</tt> and <tt>image@2x.png</tt>) and the duplicate resolution next to the selected image.<p>The install4j runtime JAR file <tt>i4jruntime.jar</tt> contains a number of image files that you can reference here by prefixing the icon file name with "icon:". For example, <tt>icon:lock_open_32.png</tt> loads a 32x32 icon showing an open lock.
- **Icon-text gap [Label]**

  The gap between the label icon and the label text in pixels.

Category: Labels and spacers

Horizontal separator

A horizontal separator with an optional label.

Properties:

- **Text [Label]**

  The text of the label. Can be empty.
- **Font color [Label]**

  The color of the label font. If empty, the default color will be used.
- **Font [Label]**

  The font type of the label. For a derived form, you can optionally change size, and font attributes, with a custom font you can also choose a different font face.
- **Font specification**

  The font specification for the label.

  Note: This property is only visible if "Font" is set to "Custom".
- **Font style**

  The font style of the label.

  Note: This property is only visible if "Font" is set to "Derived".
- **Font size in percent**

  The font size of the label in percent relative to the default font.

  Note: This property is only visible if "Font" is set to "Derived".
- **Icon [Label]**

  An image file with an icon for the labellabel. Can be empty.<p>To add a high-resolution image for retina displays, create a file with an additional <tt>@2x</tt> after the name (e.g. <tt>image.png</tt> and <tt>image@2x.png</tt>) and the duplicate resolution next to the selected image.<p>The install4j runtime JAR file <tt>i4jruntime.jar</tt> contains a number of image files that you can reference here by prefixing the icon file name with "icon:". For example, <tt>icon:lock_open_32.png</tt> loads a 32x32 icon showing an open lock.
- **Icon-text gap [Label]**

  The gap between the label icon and the label text in pixels.
- **Use special title font [Label]**

  If selected, a special font and color are used for the separator label. The actual font depends on the look and feel. This setting overrides all other font settings for the label.
- **Show enabled text [Label]**

  If selected, the title text is shown like for an enabled title, otherwise the title text is shown like for a disabled label.

Key value pair label

A pair of labels. The first ('key') label aligns with other leading labels on the form, the second ('value') label consumes the remaining horizontal space,

Properties:

- **Help text [Help]**

  If a text is entered into this property, a tooltip label with a help icon will be created on the right side of the form component that will display the help text when the user hovers with the mouse above the icon. The text can be plain text or HTML. For multi-line labels, use HTML like this: <tt><html>This is line one
This is line two</tt></html>.

- **Text [Key Label]**

  The text of the key label. Can be empty.

- **Font color [Key Label]**

  The color of the key label font. If empty, the default color will be used.

- **Font [Key Label]**

  The font type of the key label. For a derived form, you can optionally change size, and font attributes, with a custom font you can also choose a different font face.

- **Font specification**

  The font specification for the key label.

  Note: This property is only visible if "Font" is set to "Custom".

- **Font style**

  The font style of the key label.

  Note: This property is only visible if "Font" is set to "Derived".

- **Font size in percent**

  The font size of the key label in percent relative to the default font.

  Note: This property is only visible if "Font" is set to "Derived".

- **Icon [Key Label]**

  An image file with an icon for the key labellabel. Can be empty.<p>To add a high-resolution image for retina displays, create a file with an additional <tt>@2x</tt> after the name (e.g. <tt>image.png</tt> and <tt>image@2x.png</tt>) and the duplicate resolution next to the selected image.<p>The install4j runtime JAR file <tt>i4jruntime.jar</tt> contains a number of image files that you can reference here by prefixing the icon file name with "icon:". For example, <tt>icon:lock_open_32.png</tt> loads a 32x32 icon showing an open lock.

- **Icon-text gap [Key Label]**

  The gap between the key label icon and the key label text in pixels.

- **Text [Value Label]**

  The text of the value label. Can be empty.

- **Font color [Value Label]**

  The color of the value label font. If empty, the default color will be used.

- **Font [Value Label]**

  The font type of the value label. For a derived form, you can optionally change size, and font attributes, with a custom font you can also choose a different font face.

- **Font specification**

  The font specification for the value label.

Note: This property is only visible if "Font" is set to "Custom".

- **Font style**

  The font style of the value label.

  Note: This property is only visible if "Font" is set to "Derived".

- **Font size in percent**

  The font size of the value label in percent relative to the default font.

  Note: This property is only visible if "Font" is set to "Derived".

- **Icon [Value Label]**

  An image file with an icon for the value labellabel. Can be empty.<p>To add a high-resolution image for retina displays, create a file with an additional <tt>@2x</tt> after the name (e.g. <tt>image.png</tt> and <tt>image@2x.png</tt>) and the duplicate resolution next to the selected image.<p>The install4j runtime JAR file <tt>i4jruntime.jar</tt> contains a number of image files that you can reference here by prefixing the icon file name with "icon:". For example, <tt>icon:lock_open_32.png</tt> loads a 32x32 icon showing an open lock.

- **Icon-text gap [Value Label]**

  The gap between the value label icon and the value label text in pixels.

Label

A single label. It is left-aligned with leading labels from other form components and extends beyond other leading labels.

Properties:

- **Text [Label]**

  The text of the label. Can be empty.

- **Font color [Label]**

  The color of the label font. If empty, the default color will be used.

- **Font [Label]**

  The font type of the label. For a derived form, you can optionally change size, and font attributes, with a custom font you can also choose a different font face.

- **Font specification**

  The font specification for the label.

  Note: This property is only visible if "Font" is set to "Custom".

- **Font style**

  The font style of the label.

  Note: This property is only visible if "Font" is set to "Derived".

- **Font size in percent**

  The font size of the label in percent relative to the default font.

  Note: This property is only visible if "Font" is set to "Derived".

- **Icon [Label]**

  An image file with an icon for the labellabel. Can be empty.<p>To add a high-resolution image for retina displays, create a file with an additional <tt>@2x</tt> after the name (e.g. <tt>image.png</tt> and <tt>image@2x.png</tt>) and the duplicate resolution next to the selected image.<p>The install4j runtime JAR file <tt>i4jruntime.jar</tt> contains a number of image files that you can reference here by prefixing the icon file name with "icon:". For example, <tt>icon:lock_open_32.png</tt> loads a 32x32 icon showing an open lock.
- **Icon-text gap [Label]**

  The gap between the label icon and the label text in pixels.
- **Add empty leading label [Label]**

  If selected, the label will not be aligned at the very left, but it will start after the leading labels of other form components in the same vertical group.

Leading label

A form component that only has a leading label and no central component. This can also be used to create standalone help tooltips.

Properties:

- **Help text [Help]**

  If a text is entered into this property, a tooltip label with a help icon will be created on the right side of the form component that will display the help text when the user hovers with the mouse above the icon. The text can be plain text or HTML. For multi-line labels, use HTML like this: <tt><html>This is line one
This is line two</tt></html>.
- **Text [Label]**

  The text of the label. Can be empty.
- **Font color [Label]**

  The color of the label font. If empty, the default color will be used.
- **Font [Label]**

  The font type of the label. For a derived form, you can optionally change size, and font attributes, with a custom font you can also choose a different font face.
- **Font specification**

  The font specification for the label.

  Note: This property is only visible if "Font" is set to "Custom".
- **Font style**

  The font style of the label.

  Note: This property is only visible if "Font" is set to "Derived".
- **Font size in percent**

  The font size of the label in percent relative to the default font.

  Note: This property is only visible if "Font" is set to "Derived".

- **Icon [Label]**

  An image file with an icon for the labellabel. Can be empty.<p>To add a high-resolution image for retina displays, create a file with an additional <tt>@2x</tt> after the name (e.g. <tt>image.png</tt> and <tt>image@2x.png</tt>) and the duplicate resolution next to the selected image.<p>The install4j runtime JAR file <tt>i4jruntime.jar</tt> contains a number of image files that you can reference here by prefixing the icon file name with "icon:". For example, <tt>icon:lock_open_32.png</tt> loads a 32x32 icon showing an open lock.
- **Icon-text gap [Label]**

  The gap between the label icon and the label text in pixels.

Multi-line HTML label

A multi-line label that wraps text as needed and displays simple HTML. In particular you can include HTML links that open a browser.

Properties:

- **HTML [Label]**

  The HTML for the label. The value should start with <html>, otherwise the plain text will be displayed in the preview. You can include HTML links that open a browser when clicked by the user. URLs in <a href="..."> links should start with <tt>http://</tt>, <tt>https://</tt> or <tt>file://</tt>.

Multi-line label

A multi-line label that wraps text as needed.

Properties:

- **Text [Label]**

  The text of the label.
- **Hide if text is blank [Label]**

  If the text is blank, hide the form component when the form is activated. In that case you can also leave the "Text" property empty.
- **Font color [Label]**

  The color of the label font. If empty, the default color will be used.
- **Font [Label]**

  The font type of the label. For a derived form, you can optionally change size, and font attributes, with a custom font you can also choose a different font face.
- **Font specification**

  The font specification for the label.

  Note: This property is only visible if "Font" is set to "Custom".

- **Font style**

  The font style of the label.

  Note: This property is only visible if "Font" is set to "Derived".
- **Font size in percent**

  The font size of the label in percent relative to the default font.

  Note: This property is only visible if "Font" is set to "Derived".

Spring

An invisible spring that can be used in horizontal and vertical layout groups to push subsequent components to the right or to the bottom

Properties:

- **Axis**

  The direction along which the spring will push subsequent components. In a horizontal layout group, use the "Horizontal" setting, in a vertical layout group, use the "Vertical" setting.

Vertical spacer

An invisible vertical spacer of configurable height.

Properties:

- **Spacer height**

  The height of the spacer in pixels. The spacer itself is invisible.

Category: Option selectors

Check box

A check box with an optional leading label. The user selection (<tt>Boolean.TRUE</tt> or <tt>Boolean.FALSE</tt>) is saved to a variable.

Properties:

- **Text [Check box]**

  The text of the check box. Can be empty.
- **Initially selected [Check box]**

  If set, the check box is initially selected

- **Selection script [Check box]**

  The script that is executed when the selection state of the check box is changed by the user. The return type is <tt>void</tt>.

- **Coupled components**

  You can select other components on the same form screen which are enabled only if the check box is selected.

- **Inverse coupling**

  If set, the coupling of other form components will be inverted with respect to the selection state of the check box.

- **Help text [Help]**

  If a text is entered into this property, a tooltip label with a help icon will be created on the right side of the form component that will display the help text when the user hovers with the mouse above the icon. The text can be plain text or HTML. For multi-line labels, use HTML like this: <tt><html>This is line one
This is line two</tt></html>.

- **Text [Label]**

  The text of the label. Can be empty. To configure a keyboard shortcut, prefix the mnemonic character in the label text with &, e.g."&User". The prefixed character will be underlined and the platform-specific keyboard shortcut (e.g. ALT+[character] on Windows) will allow the user to quickly navigate to this form component with the keyboard.

- **Font color [Label]**

  The color of the label font. If empty, the default color will be used.

- **Font [Label]**

  The font type of the label. For a derived form, you can optionally change size, and font attributes, with a custom font you can also choose a different font face.

- **Font specification**

  The font specification for the label.

  Note: This property is only visible if "Font" is set to "Custom".

- **Font style**

  The font style of the label.

  Note: This property is only visible if "Font" is set to "Derived".

- **Font size in percent**

  The font size of the label in percent relative to the default font.

  Note: This property is only visible if "Font" is set to "Derived".

- **Icon [Label]**

  An image file with an icon for the labellabel. Can be empty.<p>To add a high-resolution image for retina displays, create a file with an additional <tt>@2x</tt> after the name (e.g. <tt>image.png</tt> and <tt>image@2x.png</tt>) and the duplicate resolution next to the selected image.<p>The install4j runtime JAR file <tt>i4jruntime.jar</tt> contains a number of image files that you can reference here by prefixing the icon file name with "icon:". For example, <tt>icon:lock_open_32.png</tt> loads a 32x32 icon showing an open lock.

- **Icon-text gap [Label]**

  The gap between the label icon and the label text in pixels.
- **Variable name [User input]**

  The name of the variable to which the user input is assigned. The variable value will be one of <tt>Boolean.TRUE</tt> or <tt>Boolean.FALSE</tt>, depending on the user selection.The type of the variable value is <tt>java.lang.Boolean</tt>
- **Request focus [User input]**

  If selected, the form component will request the focus after the form is activated. If you have multiple form components in a single form that have this property selected, the result is undefined.

Combo box

A combo box with an optional leading label. The user can enter arbitrary text into the combo box. The user selection (the selected item as a string) is saved to a variable.

Properties:

- **Combo box entries [Combo box]**

  The items in the combo box. In the edit dialog, you have to enter one item per line. Items that are installer variables with array values (e.g. String[], Object[] or File[]) are expanded as separate items, this allows you to build a variable length list of items at runtime.
- **Initially selected index [Combo box]**

  The zero-based index of the initially selected item in the combo box.If you would like to compute this value at runtime, please set the bound variable to a <tt>java.lang.Integer</tt> value before this screen is shown.
- **Fill horizontal space [Combo box]**

  If set, the combo box will fill all the available horizontal space, otherwise it will be as wide as required for the widest item.
- **Help text [Help]**

  If a text is entered into this property, a tooltip label with a help icon will be created on the right side of the form component that will display the help text when the user hovers with the mouse above the icon. The text can be plain text or HTML. For multi-line labels, use HTML like this: <tt><html>This is line one
This is line two</tt></html>.
- **Text [Label]**

  The text of the label. Can be empty. To configure a keyboard shortcut, prefix the mnemonic character in the label text with &, e.g."&User". The prefixed character will be underlined and the platform-specific keyboard shortcut (e.g. ALT+[character] on Windows) will allow the user to quickly navigate to this form component with the keyboard.
- **Font color [Label]**

  The color of the label font. If empty, the default color will be used.

- **Font [Label]**

  The font type of the label. For a derived form, you can optionally change size, and font attributes, with a custom font you can also choose a different font face.
- **Font specification**

  The font specification for the label.

  Note: This property is only visible if "Font" is set to "Custom".
- **Font style**

  The font style of the label.

  Note: This property is only visible if "Font" is set to "Derived".
- **Font size in percent**

  The font size of the label in percent relative to the default font.

  Note: This property is only visible if "Font" is set to "Derived".
- **Icon [Label]**

  An image file with an icon for the labellabel. Can be empty.<p>To add a high-resolution image for retina displays, create a file with an additional <tt>@2x</tt> after the name (e.g. <tt>image.png</tt> and <tt>image@2x.png</tt>) and the duplicate resolution next to the selected image.<p>The install4j runtime JAR file <tt>i4jruntime.jar</tt> contains a number of image files that you can reference here by prefixing the icon file name with "icon:". For example, <tt>icon:lock_open_32.png</tt> loads a 32x32 icon showing an open lock.
- **Icon-text gap [Label]**

  The gap between the label icon and the label text in pixels.
- **Variable name [User input]**

  The name of the variable to which the user input is assigned. The variable value will be the selected item text.The type of the variable value is <tt>java.lang.String</tt>
- **Selection change script [User input]**

  A script that is executed when the selection is changed by the user. This script is only required for advanced customizations of the form screen. The return type is <tt>void</tt>.
- **Input validation expression [User input]**

  An expression or script that validates the user input when the combo box loses the focus. If the expression returns false, the focus remains in the combo box. In that case you should display an error message.
- **Request focus [User input]**

  If selected, the form component will request the focus after the form is activated. If you have multiple form components in a single form that have this property selected, the result is undefined.

Drop-down list

A drop-down list with an optional leading label. The user selection (the selected index as a <tt>java.lang.Integer</tt>) is saved to a variable.

Properties:

- **Drop-down list entries [Drop-down list]**

  The items in the drop-down list. In the edit dialog, you have to enter one item per line. Items that are installer variables with array values (e.g. String[], Object[] or File[]) are expanded as separate items, this allows you to build a variable length list of items at runtime.

- **Initially selected index [Drop-down list]**

  The zero-based index of the initially selected item in the drop-down list.If you would like to compute this value at runtime, please set the bound variable to a <tt>java.lang.Integer</tt> value before this screen is shown.

- **Fill horizontal space [Drop-down list]**

  If set, the drop-down list will fill all the available horizontal space, otherwise it will be as wide as required for the widest item.

- **Help text [Help]**

  If a text is entered into this property, a tooltip label with a help icon will be created on the right side of the form component that will display the help text when the user hovers with the mouse above the icon. The text can be plain text or HTML. For multi-line labels, use HTML like this: <tt><html>This is line one
This is line two</tt></html>.

- **Text [Label]**

  The text of the label. Can be empty. To configure a keyboard shortcut, prefix the mnemonic character in the label text with &, e.g."&User". The prefixed character will be underlined and the platform-specific keyboard shortcut (e.g. ALT+[character] on Windows) will allow the user to quickly navigate to this form component with the keyboard.

- **Font color [Label]**

  The color of the label font. If empty, the default color will be used.

- **Font [Label]**

  The font type of the label. For a derived form, you can optionally change size, and font attributes, with a custom font you can also choose a different font face.

- **Font specification**

  The font specification for the label.

  Note: This property is only visible if "Font" is set to "Custom".

- **Font style**

  The font style of the label.

  Note: This property is only visible if "Font" is set to "Derived".

- **Font size in percent**

  The font size of the label in percent relative to the default font.

  Note: This property is only visible if "Font" is set to "Derived".

- **Icon [Label]**

  An image file with an icon for the labellabel. Can be empty.<p>To add a high-resolution image for retina displays, create a file with an additional <tt>@2x</tt> after the name (e.g. <tt>image.png</tt> and <tt>image@2x.png</tt>) and the duplicate resolution

next to the selected image.<p>The install4j runtime JAR file <tt>i4jruntime.jar</tt> contains a number of image files that you can reference here by prefixing the icon file name with "icon:". For example, <tt>icon:lock_open_32.png</tt> loads a 32x32 icon showing an open lock.

- **Icon-text gap [Label]**

  The gap between the label icon and the label text in pixels.

- **Variable name [User input]**

  The name of the variable to which the user input is assigned. The variable value will be the index of the selected item.The type of the variable value is <tt>java.lang.Integer</tt>

- **Selection change script [User input]**

  A script that is executed when the selection is changed by the user. This script is only required for advanced customizations of the form screen. The return type is <tt>void</tt>.

- **Request focus [User input]**

  If selected, the form component will request the focus after the form is activated. If you have multiple form components in a single form that have this property selected, the result is undefined.

List

A list with an optional leading label. The user selection (the selected indices) is saved to a variable.

Properties:

- **Help text [Help]**

  If a text is entered into this property, a tooltip label with a help icon will be created on the right side of the form component that will display the help text when the user hovers with the mouse above the icon. The text can be plain text or HTML. For multi-line labels, use HTML like this: <tt><html>This is line one
This is line two</tt></html>.

- **Text [Label]**

  The text of the label. Can be empty. To configure a keyboard shortcut, prefix the mnemonic character in the label text with &, e.g."&User". The prefixed character will be underlined and the platform-specific keyboard shortcut (e.g. ALT+[character] on Windows) will allow the user to quickly navigate to this form component with the keyboard.

- **Font color [Label]**

  The color of the label font. If empty, the default color will be used.

- **Font [Label]**

  The font type of the label. For a derived form, you can optionally change size, and font attributes, with a custom font you can also choose a different font face.

- **Font specification**

  The font specification for the label.

Note: This property is only visible if "Font" is set to "Custom".

- **Font style**

  The font style of the label.

  Note: This property is only visible if "Font" is set to "Derived".

- **Font size in percent**

  The font size of the label in percent relative to the default font.

  Note: This property is only visible if "Font" is set to "Derived".

- **Icon [Label]**

  An image file with an icon for the labellabel. Can be empty.<p>To add a high-resolution image for retina displays, create a file with an additional <tt>@2x</tt> after the name (e.g. <tt>image.png</tt> and <tt>image@2x.png</tt>) and the duplicate resolution next to the selected image.<p>The install4j runtime JAR file <tt>i4jruntime.jar</tt> contains a number of image files that you can reference here by prefixing the icon file name with "icon:". For example, <tt>icon:lock_open_32.png</tt> loads a 32x32 icon showing an open lock.

- **Icon-text gap [Label]**

  The gap between the label icon and the label text in pixels.

- **List entries [List]**

  The items in the list. In the edit dialog, you have to enter one item per line. Items that are installer variables with array values (e.g. String[], Object[] or File[]) are expanded as separate items, this allows you to build a variable length list of items at runtime.

- **Initially selected index [List]**

  The zero-based index of the initially selected item in the list.If you would like to compute this value at runtime, please set the bound variable to a <tt>java.lang.Integer</tt> value before this screen is shown.

- **Fill horizontal space [List]**

  If set, the list will fill all the available horizontal space, otherwise it will be as wide as required for the widest item.

- **Visible rows [List]**

  If the list is scrollable, this property determines the height of the list.

- **Fill extra vertical space [List]**

  If set, the form component will expand to fill remaining vertical space. Extra vertical space is only available, if the form is not scrollable. Custom form screens have a "Scrollable" property, which must be set to false.

- **Scrollable [List]**

  If set, the list will be wrapped in a scroll pane.

- **Multi-selection [List]**

  If set, the user can select multiple entries at the same time.

- **Variable name [User input]**

  The name of the variable to which the user input is assigned. If multiple items can be selected, the variable value will be an <tt>int[]</tt> array with the selected indices, otherwise the variable value will be the index of the selected item as a <tt>java.lang.Integer</tt>

- **Selection change script [User input]**

  A script that is executed when the selection is changed by the user. This script is only required for advanced customizations of the form screen. The return type is <tt>void</tt>.
- **Request focus [User input]**

  If selected, the form component will request the focus after the form is activated. If you have multiple form components in a single form that have this property selected, the result is undefined.

Radio button group

A number of radio buttons in a common button group with an optional leading label.
The user selection (the selected index as a <tt>java.lang.Integer</tt>) is saved to a variable.

Properties:

- **Help text [Help]**

  If a text is entered into this property, a tooltip label with a help icon will be created on the right side of the form component that will display the help text when the user hovers with the mouse above the icon. The text can be plain text or HTML. For multi-line labels, use HTML like this: <tt><html>This is line one
This is line two</tt></html>.
- **Text [Label]**

  The text of the label. Can be empty.
- **Font color [Label]**

  The color of the label font. If empty, the default color will be used.
- **Font [Label]**

  The font type of the label. For a derived form, you can optionally change size, and font attributes, with a custom font you can also choose a different font face.
- **Font specification**

  The font specification for the label.

  Note: This property is only visible if "Font" is set to "Custom".
- **Font style**

  The font style of the label.

  Note: This property is only visible if "Font" is set to "Derived".
- **Font size in percent**

  The font size of the label in percent relative to the default font.

  Note: This property is only visible if "Font" is set to "Derived".
- **Icon [Label]**

  An image file with an icon for the labellabel. Can be empty.<p>To add a high-resolution image for retina displays, create a file with an additional <tt>@2x</tt> after the name (e.g. <tt>image.png</tt> and <tt>image@2x.png</tt>) and the duplicate resolution next to the selected image.<p>The install4j runtime JAR file <tt>i4jruntime.jar</tt>

contains a number of image files that you can reference here by prefixing the icon file name with "icon:". For example, <tt>icon:lock_open_32.png</tt> loads a 32x32 icon showing an open lock.

- **Icon-text gap [Label]**

  The gap between the label icon and the label text in pixels.

- **Radio button labels [Radio buttons]**

  The labels of all the radio buttons. In the edit dialog, you have to enter one item per line. Labels that are installer variables with array values (e.g. String[], Object[] or File[]) are expanded as separate labels, this allows you to build a variable length list of labels at runtime.

- **Initially selected index [Radio buttons]**

  The zero-based index of the initially selected radio button. If you would like to compute this value at runtime, please set the bound variable to a <tt>java.lang.Integer</tt> value before this screen is shown.

- **Axis [Radio buttons]**

  The direction along which the radio buttons will be laid out.

- **Selection script [Radio buttons]**

  The script that is executed when a radio button is selected by the user. The return type is <tt>void</tt>.

- **Variable name [User input]**

  The name of the variable to which the user input is assigned. The variable value will be the index of the selected radio button.The type of the variable value is <tt>java.lang.Integer</tt>

Single radio button

A single radio button with an optional leading label. If selected, a specified string is saved to a variable. If you place multiple instances of this form component on a form screen and give them the same variable name, they will form a radio button group.

Properties:

- **Coupled components**

  You can select other components on the same form screen which are enabled only if the radio button is selected.

- **Inverse coupling**

  If set, the coupling of other form components will be inverted with respect to the selection state of the radio button.

- **Help text [Help]**

  If a text is entered into this property, a tooltip label with a help icon will be created on the right side of the form component that will display the help text when the user hovers with the mouse above the icon. The text can be plain text or HTML. For multi-line labels, use HTML like this: <tt><html>This is line one
This is line two</tt></html>.

- **Text [Label]**

  The text of the label. Can be empty. To configure a keyboard shortcut, prefix the mnemonic character in the label text with &, e.g."&User". The prefixed character will be underlined and the platform-specific keyboard shortcut (e.g. ALT+[character] on Windows) will allow the user to quickly navigate to this form component with the keyboard.
- **Font color [Label]**

  The color of the label font. If empty, the default color will be used.
- **Font [Label]**

  The font type of the label. For a derived form, you can optionally change size, and font attributes, with a custom font you can also choose a different font face.
- **Font specification**

  The font specification for the label.

  Note: This property is only visible if "Font" is set to "Custom".
- **Font style**

  The font style of the label.

  Note: This property is only visible if "Font" is set to "Derived".
- **Font size in percent**

  The font size of the label in percent relative to the default font.

  Note: This property is only visible if "Font" is set to "Derived".
- **Icon [Label]**

  An image file with an icon for the labellabel. Can be empty.<p>To add a high-resolution image for retina displays, create a file with an additional <tt>@2x</tt> after the name (e.g. <tt>image.png</tt> and <tt>image@2x.png</tt>) and the duplicate resolution next to the selected image.<p>The install4j runtime JAR file <tt>i4jruntime.jar</tt> contains a number of image files that you can reference here by prefixing the icon file name with "icon:". For example, <tt>icon:lock_open_32.png</tt> loads a 32x32 icon showing an open lock.
- **Icon-text gap [Label]**

  The gap between the label icon and the label text in pixels.
- **Radio button label [Radio button]**

  The text of the radio button.
- **Initially selected [Radio button]**

  If selected, the radio button will be initially selected.
- **Selection script [Radio button]**

  The script that is executed when the radio button is selected by the user. The return type is <tt>void</tt>.
- **Variable name [User input]**

  The name of the variable to which the user input is assigned. The variable value will be the string defined in the "Variable value" property.The type of the variable value is <tt>java.lang.String</tt>
- **Variable value [User input]**

  The value that should be written to the variable if this radio button is selected.

- **Request focus [User input]**

  If selected, the form component will request the focus after the form is activated. If you have multiple form components in a single form that have this property selected, the result is undefined.

Category: Sliders and spinners

Slider

A slider with an optional leading label. The user input (a <tt>java.lang.Integer</tt>) is saved to a variable.

Properties:

- **Help text [Help]**

  If a text is entered into this property, a tooltip label with a help icon will be created on the right side of the form component that will display the help text when the user hovers with the mouse above the icon. The text can be plain text or HTML. For multi-line labels, use HTML like this: <tt><html>This is line one
This is line two</tt></html>.
- **Text [Label]**

  The text of the label. Can be empty. To configure a keyboard shortcut, prefix the mnemonic character in the label text with &, e.g."&User". The prefixed character will be underlined and the platform-specific keyboard shortcut (e.g. ALT+[character] on Windows) will allow the user to quickly navigate to this form component with the keyboard.
- **Font color [Label]**

  The color of the label font. If empty, the default color will be used.
- **Font [Label]**

  The font type of the label. For a derived form, you can optionally change size, and font attributes, with a custom font you can also choose a different font face.
- **Font specification**

  The font specification for the label.

  Note: This property is only visible if "Font" is set to "Custom".
- **Font style**

  The font style of the label.

  Note: This property is only visible if "Font" is set to "Derived".
- **Font size in percent**

  The font size of the label in percent relative to the default font.

  Note: This property is only visible if "Font" is set to "Derived".
- **Icon [Label]**

  An image file with an icon for the labellabel. Can be empty.<p>To add a high-resolution image for retina displays, create a file with an additional <tt>@2x</tt> after the name (e.g. <tt>image.png</tt> and <tt>image@2x.png</tt>) and the duplicate resolution

next to the selected image.<p>The install4j runtime JAR file <tt>i4jruntime.jar</tt> contains a number of image files that you can reference here by prefixing the icon file name with "icon:". For example, <tt>icon:lock_open_32.png</tt> loads a 32x32 icon showing an open lock.

- **Icon-text gap [Label]**

  The gap between the label icon and the label text in pixels.
- **Minimum value [Slider]**

  The minimum value on the left side of the slider.
- **Maximum value [Slider]**

  The maximum value on the right side of the slider.
- **Initial value [Slider]**

  The initial value of the slider.
- **Major tick spacing [Slider]**

  The spacing between major ticks expressed as a value.
- **Minor tick spacing [Slider]**

  The spacing between minor ticks expressed as a value.
- **Snap to ticks [Slider]**

  If set, the user selection is snapped to the closest tick value.
- **Variable name [User input]**

  The name of the variable to which the user input is assigned. The type of the variable value is <tt>java.lang.Integer</tt>
- **Request focus [User input]**

  If selected, the form component will request the focus after the form is activated. If you have multiple form components in a single form that have this property selected, the result is undefined.

Spinner of dates

A spinner with date and time values with an optional leading label. The user input is saved to a variable.

Properties:

- **Help text [Help]**

  If a text is entered into this property, a tooltip label with a help icon will be created on the right side of the form component that will display the help text when the user hovers with the mouse above the icon. The text can be plain text or HTML. For multi-line labels, use HTML like this: <tt><html>This is line one
This is line two</tt></html>.
- **Text [Label]**

  The text of the label. Can be empty. To configure a keyboard shortcut, prefix the mnemonic character in the label text with &, e.g."&User". The prefixed character will be underlined and the platform-specific keyboard shortcut (e.g. ALT+[character]

on Windows) will allow the user to quickly navigate to this form component with the keyboard.

- **Font color [Label]**

  The color of the label font. If empty, the default color will be used.

- **Font [Label]**

  The font type of the label. For a derived form, you can optionally change size, and font attributes, with a custom font you can also choose a different font face.

- **Font specification**

  The font specification for the label.

  Note: This property is only visible if "Font" is set to "Custom".

- **Font style**

  The font style of the label.

  Note: This property is only visible if "Font" is set to "Derived".

- **Font size in percent**

  The font size of the label in percent relative to the default font.

  Note: This property is only visible if "Font" is set to "Derived".

- **Icon [Label]**

  An image file with an icon for the labellabel. Can be empty.<p>To add a high-resolution image for retina displays, create a file with an additional <tt>@2x</tt> after the name (e.g. <tt>image.png</tt> and <tt>image@2x.png</tt>) and the duplicate resolution next to the selected image.<p>The install4j runtime JAR file <tt>i4jruntime.jar</tt> contains a number of image files that you can reference here by prefixing the icon file name with "icon:". For example, <tt>icon:lock_open_32.png</tt> loads a 32x32 icon showing an open lock.

- **Icon-text gap [Label]**

  The gap between the label icon and the label text in pixels.

- **Date format pattern [Spinner]**

  A pattern to format dates for display and input as described in the javadoc of <tt>java.text.SimpleDateFormat</tt>. An example is <tt>yyyy.MM.dd 'at' HH:mm:ss z</tt>. If empty, a locale-dependent default pattern with date and time components will be used.

- **Initial value [Spinner]**

  The initial value of the spinner.

- **Variable name [User input]**

  The name of the variable to which the user input is assigned. The type of the variable value is <tt>java.util.Date</tt>

- **Request focus [User input]**

  If selected, the form component will request the focus after the form is activated. If you have multiple form components in a single form that have this property selected, the result is undefined.

Spinner of enumerated values

A spinner with enumerated values with an optional leading label. The user input is saved to a variable.

Properties:

- **Help text [Help]**

  If a text is entered into this property, a tooltip label with a help icon will be created on the right side of the form component that will display the help text when the user hovers with the mouse above the icon. The text can be plain text or HTML. For multi-line labels, use HTML like this: <tt><html>This is line one
This is line two</tt></html>.

- **Text [Label]**

  The text of the label. Can be empty. To configure a keyboard shortcut, prefix the mnemonic character in the label text with &, e.g."&User". The prefixed character will be underlined and the platform-specific keyboard shortcut (e.g. ALT+[character] on Windows) will allow the user to quickly navigate to this form component with the keyboard.

- **Font color [Label]**

  The color of the label font. If empty, the default color will be used.

- **Font [Label]**

  The font type of the label. For a derived form, you can optionally change size, and font attributes, with a custom font you can also choose a different font face.

- **Font specification**

  The font specification for the label.

  Note: This property is only visible if "Font" is set to "Custom".

- **Font style**

  The font style of the label.

  Note: This property is only visible if "Font" is set to "Derived".

- **Font size in percent**

  The font size of the label in percent relative to the default font.

  Note: This property is only visible if "Font" is set to "Derived".

- **Icon [Label]**

  An image file with an icon for the labellabel. Can be empty.<p>To add a high-resolution image for retina displays, create a file with an additional <tt>@2x</tt> after the name (e.g. <tt>image.png</tt> and <tt>image@2x.png</tt>) and the duplicate resolution next to the selected image.<p>The install4j runtime JAR file <tt>i4jruntime.jar</tt> contains a number of image files that you can reference here by prefixing the icon file name with "icon:". For example, <tt>icon:lock_open_32.png</tt> loads a 32x32 icon showing an open lock.

- **Icon-text gap [Label]**

  The gap between the label icon and the label text in pixels.

- **List entries [Spinner]**

  The items in the spinner. In the edit dialog, you have to enter one item per line. List items that are installer variables with array values (e.g. String[], Object[] or File[]) are

expanded as separate list items, this allows you to build a variable length list of list items at runtime.

- **Initially selected index [Spinner]**

  The zero-based index of the initially selected item in the spinner.

- **Variable name [User input]**

  The name of the variable to which the user input is assigned. The type of the variable value is <tt>java.lang.String</tt>

- **Request focus [User input]**

  If selected, the form component will request the focus after the form is activated. If you have multiple form components in a single form that have this property selected, the result is undefined.

Spinner of integer values

A spinner with integer values with an optional leading label. The user input is saved to a variable.

Properties:

- **Help text [Help]**

  If a text is entered into this property, a tooltip label with a help icon will be created on the right side of the form component that will display the help text when the user hovers with the mouse above the icon. The text can be plain text or HTML. For multi-line labels, use HTML like this: <tt><html>This is line one
This is line two</tt></html>.

- **Text [Label]**

  The text of the label. Can be empty. To configure a keyboard shortcut, prefix the mnemonic character in the label text with &, e.g."&User". The prefixed character will be underlined and the platform-specific keyboard shortcut (e.g. ALT+[character] on Windows) will allow the user to quickly navigate to this form component with the keyboard.

- **Font color [Label]**

  The color of the label font. If empty, the default color will be used.

- **Font [Label]**

  The font type of the label. For a derived form, you can optionally change size, and font attributes, with a custom font you can also choose a different font face.

- **Font specification**

  The font specification for the label.

  Note: This property is only visible if "Font" is set to "Custom".

- **Font style**

  The font style of the label.

  Note: This property is only visible if "Font" is set to "Derived".

- **Font size in percent**

  The font size of the label in percent relative to the default font.

Note: This property is only visible if "Font" is set to "Derived".

- **Icon [Label]**

  An image file with an icon for the labellabel. Can be empty.<p>To add a high-resolution image for retina displays, create a file with an additional <tt>@2x</tt> after the name (e.g. <tt>image.png</tt> and <tt>image@2x.png</tt>) and the duplicate resolution next to the selected image.<p>The install4j runtime JAR file <tt>i4jruntime.jar</tt> contains a number of image files that you can reference here by prefixing the icon file name with "icon:". For example, <tt>icon:lock_open_32.png</tt> loads a 32x32 icon showing an open lock.

- **Icon-text gap [Label]**

  The gap between the label icon and the label text in pixels.

- **Minimum value [Spinner]**

  The minimum value on the left side of the spinner.

- **Maximum value [Spinner]**

  The maximum value on the right side of the spinner.

- **Initial value [Spinner]**

  The initial value of the spinner.

- **Step size [Spinner]**

  The step size for the spinner.

- **Variable name [User input]**

  The name of the variable to which the user input is assigned. The type of the variable value is <tt>java.lang.Integer</tt>

- **Request focus [User input]**

  If selected, the form component will request the focus after the form is activated. If you have multiple form components in a single form that have this property selected, the result is undefined.

Category: Special selectors and displays

Directory chooser

A directory chooser with an optional leading label. The user selection is saved to a variable.

Properties:

- **Manual entry allowed [Chooser Dialog]**

  If selected, the user can enter the directory manually in the text field. Otherwise, the text field is disabled.

- **Initial directory [Directory Chooser]**

  The initially selected directory. The variable value takes precedence, so this value will only be used if the variable value is undefined. Can be empty.

- **Initial browser directory [Directory Chooser]**

  The initial directory that is shown in the browser if no directory is selected. If empty, the browser will start in the user home directory. If a directory is entered in the text field, the browser will use that path instead.

- **Border title [Directory Chooser]**

  The description of the kind of directory that the user should select, in a few words, e.g. "ABC directory". This will be shown in a titled border around the text field.

- **Standard directory [Directory Chooser]**

  A directory name that should be appended to the user selection in the directory browser. Should be empty if an existing directory has to be selected.

- **Next screen on enter [Directory Chooser]**

  If selected and the user hits the enter key while the text field is focused, the next screen is activated.

- **Help text [Help]**

  If a text is entered into this property, a tooltip label with a help icon will be created on the right side of the form component that will display the help text when the user hovers with the mouse above the icon. The text can be plain text or HTML. For multi-line labels, use HTML like this: <tt><html>This is line one
This is line two</tt></html>.

- **Text [Label]**

  The text of the label. Can be empty. To configure a keyboard shortcut, prefix the mnemonic character in the label text with &, e.g."&User". The prefixed character will be underlined and the platform-specific keyboard shortcut (e.g. ALT+[character] on Windows) will allow the user to quickly navigate to this form component with the keyboard.

- **Font color [Label]**

  The color of the label font. If empty, the default color will be used.

- **Font [Label]**

  The font type of the label. For a derived form, you can optionally change size, and font attributes, with a custom font you can also choose a different font face.

- **Font specification**

  The font specification for the label.

  Note: This property is only visible if "Font" is set to "Custom".

- **Font style**

  The font style of the label.

  Note: This property is only visible if "Font" is set to "Derived".

- **Font size in percent**

  The font size of the label in percent relative to the default font.

  Note: This property is only visible if "Font" is set to "Derived".

- **Icon [Label]**

  An image file with an icon for the labellabel. Can be empty.<p>To add a high-resolution image for retina displays, create a file with an additional <tt>@2x</tt> after the name (e.g. <tt>image.png</tt> and <tt>image@2x.png</tt>) and the duplicate resolution

next to the selected image.<p>The install4j runtime JAR file <tt>i4jruntime.jar</tt> contains a number of image files that you can reference here by prefixing the icon file name with "icon:". For example, <tt>icon:lock_open_32.png</tt> loads a 32x32 icon showing an open lock.

- **Icon-text gap [Label]**

  The gap between the label icon and the label text in pixels.

- **Allow spaces in directory name [Unix]**

  If selected, spaces are valid characters in the installation directory name for Unix/Linux installers, otherwise an error message is displayed if the user chooses a directory with spaces in it. Some JREs do not work on Unix if installed to a path that contains spaces, so spaces are disallowed by default.

- **Variable name [User input]**

  The name of the variable to which the user input is assigned. The type of the variable value is <tt>java.lang.String</tt>

- **Validation script [User input]**

  The script that is executed when the directory is selected with the chooser button and when the user clicks on the Next button of the screen. If the script returns <tt>true</tt>, the selection is accepted, if it returns <tt>false</tt>, the selection is discarded.

- **Standard validation [User input]**

  If selected, the standard validation for well-formed directory names will be performed. This validation is performed before the validation script and will canonicalize the directory name before passing it to the validation script.

- **Allow empty input [User input]**

  If selected, the user can leave the directory empty or clear the initial directory (if manual entry is allowed) and there will be no validation error.

- **Only accept writable directories [User input]**

  If selected, non-writable directories will be rejected.

- **Request focus [User input]**

  If selected, the form component will request the focus after the form is activated. If you have multiple form components in a single form that have this property selected, the result is undefined.

File associations selector

A form component that displays a list of all subsequent file association actions and asks the user which associations should be made. This form component will be empty if there are no corresponding file association actions after this screen.

Properties:

- **Show selection buttons**

  If selected, the screen will show buttons for selecting and deselecting all file associations.

- **Position of selection buttons**

  The selection buttons can be added at the top or at the bottom of the form component.

Note: This property is only visible if "Show selection buttons" is selected.

- **Fill extra vertical space**

  If set, the form component will expand to fill remaining vertical space. Extra vertical space is only available, if the form is not scrollable. Custom form screens have a "Scrollable" property, which must be set to false.

File chooser

A file chooser with an optional leading label. The user selection is saved to a variable.

Properties:

- **Manual entry allowed [Chooser Dialog]**

  If selected, the user can enter the file manually in the text field. Otherwise, the text field is disabled.

- **Initial file [File Chooser]**

  The initially selected file. The variable value takes precedence, so this value will only be used if the variable value is undefined. Can be empty.

- **Initial browser directory [File Chooser]**

  The initial directory that is shown in the browser if no file is selected. If empty, the browser will start in the user home directory. If a file is entered in the text field, the browser will use that path instead.

- **Use file filter [File Chooser]**

  If a file filter should be used. Configure the file filter in the nested properties once you enable this option.

- **File filter name**

  The name of the file filter which is displayed to the user in the drop-down filter list of the file chooser.

  Note: This property is only visible if "Use file filter" is selected.

- **Filtered file extension**

  The list of the filtered file extension. A file extension may be written as <tt>*.xml</tt>, <tt>.xml</tt> or <tt>xml</tt>, all three notations are equivalent. In the edit dialog, you have to enter one item per line. File extensions that are installer variables with array values (e.g. String[], Object[] or File[]) are expanded as separate file extensions, this allows you to build a variable length list of file extensions at runtime.

  Note: This property is only visible if "Use file filter" is selected.

- **Help text [Help]**

  If a text is entered into this property, a tooltip label with a help icon will be created on the right side of the form component that will display the help text when the user hovers with the mouse above the icon. The text can be plain text or HTML. For multi-line labels, use HTML like this: <tt><html>This is line one
This is line two</tt></html>.

- **Text [Label]**

  The text of the label. Can be empty. To configure a keyboard shortcut, prefix the mnemonic character in the label text with &, e.g."&User". The prefixed character will be underlined and the platform-specific keyboard shortcut (e.g. ALT+[character] on Windows) will allow the user to quickly navigate to this form component with the keyboard.
- **Font color [Label]**

  The color of the label font. If empty, the default color will be used.
- **Font [Label]**

  The font type of the label. For a derived form, you can optionally change size, and font attributes, with a custom font you can also choose a different font face.
- **Font specification**

  The font specification for the label.

  Note: This property is only visible if "Font" is set to "Custom".
- **Font style**

  The font style of the label.

  Note: This property is only visible if "Font" is set to "Derived".
- **Font size in percent**

  The font size of the label in percent relative to the default font.

  Note: This property is only visible if "Font" is set to "Derived".
- **Icon [Label]**

  An image file with an icon for the labellabel. Can be empty.<p>To add a high-resolution image for retina displays, create a file with an additional <tt>@2x</tt> after the name (e.g. <tt>image.png</tt> and <tt>image@2x.png</tt>) and the duplicate resolution next to the selected image.<p>The install4j runtime JAR file <tt>i4jruntime.jar</tt> contains a number of image files that you can reference here by prefixing the icon file name with "icon:". For example, <tt>icon:lock_open_32.png</tt> loads a 32x32 icon showing an open lock.
- **Icon-text gap [Label]**

  The gap between the label icon and the label text in pixels.
- **Variable name [User input]**

  The name of the variable to which the user input is assigned. The type of the variable value is <tt>java.lang.String</tt>
- **Validation script [User input]**

  The script that is executed when the file is selected with the chooser button and when the user clicks on the Next button of the screen. If the script returns <tt>true</tt>, the selection is accepted, if it returns <tt>false</tt>, the selection is discarded.
- **Request focus [User input]**

  If selected, the form component will request the focus after the form is activated. If you have multiple form components in a single form that have this property selected, the result is undefined.

HTML display

A scroll panel that displays HTML text. The HTML is easily localizable since the file selection allows you to enter separate files for all supported languages.

Properties:

- **Text source [HTML display]**

  The source from which the text is loaded. For multi-language installers, the "File" source is recommended since it is more easily localizable than the direct entry.
- **Variable name [HTML display]**

  Optionally, you can save the actually displayed text to a variable. Enter the variable name without the installer prefix and the dollar sign. This is useful if you display localized text and want to save the actually displayed text with a "Write text to a file" action later on.
- **Text file**

  The file from which the text is loaded.

  Note: This property is only visible if "Text source" is set to "File".
- **Text**

  The text that is displayed in the screen, either plain text or HTML. For HTML, the value should start with <tt><html></tt>, otherwise the plain text will be displayed. The text is displayed in a scrollable text area.

  Note: This property is only visible if "Text source" is set to "Direct".
- **Height [HTML display]**

  The height of the HTML display in pixels.
- **Fill extra vertical space [HTML display]**

  If set, the form component will expand to fill remaining vertical space. Extra vertical space is only available, if the form is not scrollable. Custom form screens have a "Scrollable" property, which must be set to false.
- **Help text [Help]**

  If a text is entered into this property, a tooltip label with a help icon will be created on the right side of the form component that will display the help text when the user hovers with the mouse above the icon. The text can be plain text or HTML. For multi-line labels, use HTML like this: <tt><html>This is line one
This is line two</tt></html>.
- **Text [Label]**

  The text of the label. Can be empty.
- **Font color [Label]**

  The color of the label font. If empty, the default color will be used.
- **Font [Label]**

  The font type of the label. For a derived form, you can optionally change size, and font attributes, with a custom font you can also choose a different font face.
- **Font specification**

  The font specification for the label.

  Note: This property is only visible if "Font" is set to "Custom".

- **Font style**

  The font style of the label.

  Note: This property is only visible if "Font" is set to "Derived".
- **Font size in percent**

  The font size of the label in percent relative to the default font.

  Note: This property is only visible if "Font" is set to "Derived".
- **Icon [Label]**

  An image file with an icon for the labellabel. Can be empty.<p>To add a high-resolution image for retina displays, create a file with an additional <tt>@2x</tt> after the name (e.g. <tt>image.png</tt> and <tt>image@2x.png</tt>) and the duplicate resolution next to the selected image.<p>The install4j runtime JAR file <tt>i4jruntime.jar</tt> contains a number of image files that you can reference here by prefixing the icon file name with "icon:". For example, <tt>icon:lock_open_32.png</tt> loads a 32x32 icon showing an open lock.
- **Icon-text gap [Label]**

  The gap between the label icon and the label text in pixels.

Installation components selector

A form component that displays all installation components and asks the user which components should be installed.

Properties:

- **Selection change script [Component Selector]**

  A script that is invoked each time the selection state of a component is changed. If a component has dependencies that are changed as well, or if entire folders are toggled, this script will be called repeatedly, once for each installation component whose selection state is changed. If the <tt>dependency</tt> parameter is <tt>false</tt>, this tells you that the corresponding installation component belongs to the node that the user has actually toggled. If a folder is toggled, <tt>dependency</tt> will be <tt>true</tt> for all installation components.
- **Fill extra vertical space [Component Selector]**

  If set, the form component will expand to fill remaining vertical space. Extra vertical space is only available, if the form is not scrollable. Custom form screens have a "Scrollable" property, which must be set to false.
- **Bold font [Description]**

  Use a bold font for the descriptions
- **Italic font [Description]**

  Use an italic font for the descriptions
- **Smaller font [Description]**

  Use a smaller font for the descriptions

Installation directory chooser

An installation directory chooser with an optional display of required and free space. The user selection is set as the installation directory.

Properties:

- **Suggest application directory [Application ID]**

  When the user chooses a directory, always append the default application directory configured in the media file wizard. You should only switch this off if you substitute a different installation directory in the screen validation.
- **Existing directory warning [Application ID]**

  Ask the user whether to install the application in the selected directory if it already exists and the installation is not an update.
- **Validate application id [Application ID]**

  Check if another application is installed in the selected directory or if the application is not the correct target for an add-on installer.
- **Check if directory is writable [Application ID]**

  Check if the directory is writable with the currently available privileges and show a warning message if it is not. If you deselect this option, and the directory is not writable, you should execute a "Request privileges" action before installing files to the installation directory.
- **Manual entry allowed [Chooser Dialog]**

  If selected, the user can enter the installation directory manually in the text field. Otherwise, the text field is disabled.
- **Insufficient disk space warning [Disk Space]**

  Show a warning message if there is not sufficient disk space for the installation on the selected target drive.
- **Show required disk space [Disk Space]**

  Show the disk space that is required for the installation. You should switch this off if your installation includes other data sources.
- **Show free disk space [Disk Space]**

  Show the disk space that is available on the selected drive or partition. This setting is only effective for Windows, macOS and Linux.
- **Help text [Help]**

  If a text is entered into this property, a tooltip label with a help icon will be created on the right side of the form component that will display the help text when the user hovers with the mouse above the icon. The text can be plain text or HTML. For multi-line labels, use HTML like this: <tt><html>This is line one
This is line two</tt></html>.
- **Text [Label]**

  The text of the label. Can be empty. To configure a keyboard shortcut, prefix the mnemonic character in the label text with &, e.g."&User". The prefixed character will be underlined and the platform-specific keyboard shortcut (e.g. ALT+[character] on Windows) will allow the user to quickly navigate to this form component with the keyboard.

- **Font color [Label]**

  The color of the label font. If empty, the default color will be used.
- **Font [Label]**

  The font type of the label. For a derived form, you can optionally change size, and font attributes, with a custom font you can also choose a different font face.
- **Font specification**

  The font specification for the label.

  Note: This property is only visible if "Font" is set to "Custom".
- **Font style**

  The font style of the label.

  Note: This property is only visible if "Font" is set to "Derived".
- **Font size in percent**

  The font size of the label in percent relative to the default font.

  Note: This property is only visible if "Font" is set to "Derived".
- **Icon [Label]**

  An image file with an icon for the labellabel. Can be empty.<p>To add a high-resolution image for retina displays, create a file with an additional <tt>@2x</tt> after the name (e.g. <tt>image.png</tt> and <tt>image@2x.png</tt>) and the duplicate resolution next to the selected image.<p>The install4j runtime JAR file <tt>i4jruntime.jar</tt> contains a number of image files that you can reference here by prefixing the icon file name with "icon:". For example, <tt>icon:lock_open_32.png</tt> loads a 32x32 icon showing an open lock.
- **Icon-text gap [Label]**

  The gap between the label icon and the label text in pixels.
- **Allow spaces in directory name [Unix]**

  If selected, spaces are valid characters in the installation directory name for Unix/Linux installers, otherwise an error message is displayed if the user chooses a directory with spaces in it. Some JREs do not work on Unix if installed to a path that contains spaces, so spaces are disallowed by default.
- **Validation script [User input]**

  The script that is executed when the installation directory is selected with the chooser button and when the user clicks on the Next button of the screen. If the script returns <tt>true</tt>, the selection is accepted, if it returns <tt>false</tt>, the selection is discarded.
- **Standard validation [User input]**

  If selected, the standard validation for well-formed directory names will be performed. This validation is performed before the validation script and will canonicalize the directory name before passing it to the validation script.
- **Request focus [User input]**

  If selected, the form component will request the focus after the form is activated. If you have multiple form components in a single form that have this property selected, the result is undefined.

License agreement

A form component that displays a license agreement to the user, either plain text or HTML. The license agreement must be accepted before the next screen can be shown.

Properties:

- **Help text [Help]**

  If a text is entered into this property, a tooltip label with a help icon will be created on the right side of the form component that will display the help text when the user hovers with the mouse above the icon. The text can be plain text or HTML. For multi-line labels, use HTML like this: <tt><html>This is line one
This is line two</tt></html>.
- **Text [Label]**

  The text of the label. Can be empty.
- **Font color [Label]**

  The color of the label font. If empty, the default color will be used.
- **Font [Label]**

  The font type of the label. For a derived form, you can optionally change size, and font attributes, with a custom font you can also choose a different font face.
- **Font specification**

  The font specification for the label.

  Note: This property is only visible if "Font" is set to "Custom".
- **Font style**

  The font style of the label.

  Note: This property is only visible if "Font" is set to "Derived".
- **Font size in percent**

  The font size of the label in percent relative to the default font.

  Note: This property is only visible if "Font" is set to "Derived".
- **Icon [Label]**

  An image file with an icon for the labellabel. Can be empty.<p>To add a high-resolution image for retina displays, create a file with an additional <tt>@2x</tt> after the name (e.g. <tt>image.png</tt> and <tt>image@2x.png</tt>) and the duplicate resolution next to the selected image.<p>The install4j runtime JAR file <tt>i4jruntime.jar</tt> contains a number of image files that you can reference here by prefixing the icon file name with "icon:". For example, <tt>icon:lock_open_32.png</tt> loads a 32x32 icon showing an open lock.
- **Icon-text gap [Label]**

  The gap between the label icon and the label text in pixels.
- **Text source [License agreement]**

  The source from which the license is loaded. For multi-language installers, the "File" source is recommended since it is more easily localizable than the direct entry.

- **Variable name [License agreement]**

  Optionally, you can save the actually displayed text to a variable. Enter the variable name without the installer prefix and the dollar sign. This is useful if you display localized text and want to save the actually displayed text with a "Write text to a file" action later on.
- **License file**

  The file from which the license is loaded.

  Note: This property is only visible if "Text source" is set to "File".
- **License**

  The license that is displayed in the screen, either plain text or HTML. For HTML, the value should start with <tt><html></tt>, otherwise the plain text will be displayed. The text is displayed in a scrollable text area.

  Note: This property is only visible if "Text source" is set to "Direct".
- **Height [License agreement]**

  The height of the HTML display in pixels.
- **Fill extra vertical space [License agreement]**

  If set, the form component will expand to fill remaining vertical space. Extra vertical space is only available, if the form is not scrollable. Custom form screens have a "Scrollable" property, which must be set to false.
- **Initially accepted [License agreement]**

  If selected, the "Accept" radio button is initially selected.
- **User must scroll to bottom [License agreement]**

  If selected, the user can only accept the license if the text area with the license text has been previously scrolled to the bottom. Has no effect if the "Initially selected" property is selected.
- **Radio buttons axis [License agreement]**

  The axis along which the radio buttons for accepting the license agreement are layouted.

PDF display

Displays a PDF file in an embedded cross-platform PDF viewer.

Properties:

- **PDF file [PDF]**

  The PDF file that should be displayed.

Program group selector

A form component that allows the user to select a program group on Microsoft Windows.

Properties:

- **Variable name for selection [Program Group Selector]**

  The name of the variable to which the selected program group is saved when the user advances to the next screen.
- **Initial program group [Program Group Selector]**

  The initially selected program group. Can be empty if no program group should be initially selected.
- **Program groups for all users [Program Group Selector]**

  If selected, the program groups for all users are shown, otherwise the program groups for the current user are shown.
- **Show warning if program group exists [Program Group Selector]**

  If selected, a warning will be shown if the selected program group already exists.
- **Fill extra vertical space [Program Group Selector]**

  If set, the form component will expand to fill remaining vertical space. Extra vertical space is only available, if the form is not scrollable. Custom form screens have a "Scrollable" property, which must be set to false.

Progress display

An progress display that can show the progress of the actions attached to the containing screen.

Properties:

- **Hide initially**

  If selected, the progress bar is hidden when the form is shown. When the actions attached to the screen are executed, the progress bar is made visible.
- **Status line visible**

  If selected, the status line is visible.
- **Initial status message**

  The initial status message displayed by the progress screen. You can change this message with "Set messages" actions or by invoking <tt>Context.getProgressInterface().setStatusMessage("...")</tt>.

  Note: This property is only visible if "Status line visible" is selected.
- **Detail line visible**

  If selected, the detail line is visible.
- **Initial detail message**

  The initial detail message displayed by the progress screen. You can change this message with "Set messages" actions or by invoking <tt>Context.getProgressInterface().setDetailMessage("...")</tt>.

  Note: This property is only visible if "Detail line visible" is selected.

Update alert

A pair of radio buttons offering the user a choice whether to update an existing installation or not. If the existing installation should be updated, the installer variable sys.confirmedUpdateInstallation is set to <tt>true</tt>. Several standard screens use that installer variable in their default condition expression.

Properties:

- **Alert for update installation**

  If selected, the form component will check if a previous installation can be found by calling <tt>context.isUpdateInstallation()</tt>. In this case, the user will be presented with the choice to update the existing installation or select a new installation directory. If the update is selected, the installer variable <tt>sys.confirmedUpdateInstallation</tt> will be set to <tt>Boolean.TRUE</tt>. The default condition expressions on the "Installation location" screen and the "Create program group" screen are set so that the screen is skipped in that case.

Note that this only works if "Detect previous installation directory" is selected on the "Installer->Update Options" tab.
- **Selection script [User input]**

  Invoked when the user changes the selection or when the screen is activated and this form component is visible.

Update schedule selector

Drop-down box that lets the user select an update schedule for your application. You can use the <tt>com.install4j.api.update.UpdateScheduleRegistry</tt> class in your application to check if you should launch an updater. Please see the Javadoc for more information. Please note that simply adding this form component does not automatically launch an updater at regular intervals.

Properties:

- **Initial update schedule**

  The initially selected update schedule. If the user has already installed the application before, the currently active selection by the user will be selected and this value will be ignored.
- **Help text [Help]**

  If a text is entered into this property, a tooltip label with a help icon will be created on the right side of the form component that will display the help text when the user hovers with the mouse above the icon. The text can be plain text or HTML. For multi-line labels, use HTML like this: <tt><html>This is line one
This is line two</tt></html>.
- **Text [Label]**

  The text of the label. Can be empty. To configure a keyboard shortcut, prefix the mnemonic character in the label text with &, e.g."&User". The prefixed character will be underlined and the platform-specific keyboard shortcut (e.g. ALT+[character] on Windows) will allow the user to quickly navigate to this form component with the keyboard.
- **Font color [Label]**

  The color of the label font. If empty, the default color will be used.

- **Font [Label]**

  The font type of the label. For a derived form, you can optionally change size, and font attributes, with a custom font you can also choose a different font face.
- **Font specification**

  The font specification for the label.

  Note: This property is only visible if "Font" is set to "Custom".
- **Font style**

  The font style of the label.

  Note: This property is only visible if "Font" is set to "Derived".
- **Font size in percent**

  The font size of the label in percent relative to the default font.

  Note: This property is only visible if "Font" is set to "Derived".
- **Icon [Label]**

  An image file with an icon for the labellabel. Can be empty.<p>To add a high-resolution image for retina displays, create a file with an additional <tt>@2x</tt> after the name (e.g. <tt>image.png</tt> and <tt>image@2x.png</tt>) and the duplicate resolution next to the selected image.<p>The install4j runtime JAR file <tt>i4jruntime.jar</tt> contains a number of image files that you can reference here by prefixing the icon file name with "icon:". For example, <tt>icon:lock_open_32.png</tt> loads a 32x32 icon showing an open lock.
- **Icon-text gap [Label]**

  The gap between the label icon and the label text in pixels.
- **Request focus [User input]**

  If selected, the form component will request the focus after the form is activated. If you have multiple form components in a single form that have this property selected, the result is undefined.

Windows user selector

A component for selecting Windows users or groups in the native Windows user dialog. Optionally, you can display a button to create a new user. The selection is saved as a SID to a string variable. If multiple selection is enabled, the result is a string array of SIDs.

This component does not do anything in console mode, since it requires the native Windows dialog for selecting users and groups.

Properties:

- **Show users**

  Show users in the native user selection dialog.
- **Show groups**

  Show users in the native user selection dialog.

- **Show well-known principals**

  Show well-known principals like "SYSTEM" or "SERVICE" in the native user selection dialog.

- **Multiple selection**

  If selected, multiple users or groups can be selected. The variable type is a string array of SIDs in that case, otherwise it is a string with the single selected SID. Multiple selection cannot be combined with the "Create User" option.

- **Only local objects**

  If selected, only local users and groups will be displayed.

- **Show "Create User" button**

  If selected, a button to create a new user will be displayed next to the "Browse" button. On clicking that button, a separate dialog will be shown where the new user can be configured.

  Note: This property is only visible if "Show users" is selected.

- **Variable for user creation flag**

  The name of the variable which will be set to <tt>Boolean.TRUE</tt> if the selected user has been created by the user. If the selected user has not been created, the variable value will be set to <tt>Boolean.FALSE</tt>. This is useful if you would like to determine if the uninstaller should delete the user. Users can be deleted with the install4j API.<p>This variable name can be empty, in which case the creation status will not be saved.

  Note: This property is only visible if "Show "Create User" button" is selected.

- **Variable for local group**

  The name of the variable which will be set to the local group used for a newly created user. This variable name can be empty, in which case the created local group name will not be saved.

  Note: This property is only visible if "Show "Create User" button" is selected.

- **Variable for group creation flag**

  The name of the variable which will be set to <tt>Boolean.TRUE</tt> if a group for the selected user has been created by the user. If the selected user has not been created or if an existing group was used, the variable value will be set to <tt>Boolean.FALSE</tt>. This is useful if you would like to determine if the uninstaller should delete the local group. Groups can be deleted with the install4j API.<p>This variable name can be empty, in which case the creation status will not be saved.

  Note: This property is only visible if "Show "Create User" button" is selected.

- **Password form component**

  A text field or password field form component that should be updated with the password that was chosen for the created user.If not selected, no such update will be performed.

  Note: This property is only visible if "Show "Create User" button" is selected.

- **Help text [Help]**

  If a text is entered into this property, a tooltip label with a help icon will be created on the right side of the form component that will display the help text when the user hovers with the mouse above the icon. The text can be plain text or HTML. For multi-line

labels, use HTML like this: <tt><html>This is line one
This is line two</tt></html>.

- **Text [Label]**

  The text of the label. Can be empty.

- **Font color [Label]**

  The color of the label font. If empty, the default color will be used.

- **Font [Label]**

  The font type of the label. For a derived form, you can optionally change size, and font attributes, with a custom font you can also choose a different font face.

- **Font specification**

  The font specification for the label.

  Note: This property is only visible if "Font" is set to "Custom".

- **Font style**

  The font style of the label.

  Note: This property is only visible if "Font" is set to "Derived".

- **Font size in percent**

  The font size of the label in percent relative to the default font.

  Note: This property is only visible if "Font" is set to "Derived".

- **Icon [Label]**

  An image file with an icon for the labellabel. Can be empty.<p>To add a high-resolution image for retina displays, create a file with an additional <tt>@2x</tt> after the name (e.g. <tt>image.png</tt> and <tt>image@2x.png</tt>) and the duplicate resolution next to the selected image.<p>The install4j runtime JAR file <tt>i4jruntime.jar</tt> contains a number of image files that you can reference here by prefixing the icon file name with "icon:". For example, <tt>icon:lock_open_32.png</tt> loads a 32x32 icon showing an open lock.

- **Icon-text gap [Label]**

  The gap between the label icon and the label text in pixels.

- **Variable name [User input]**

  The name of the variable to which the user input is assigned. The variable value will be a string with the selected SID, or, if multiple selection is enabled, a string array of SIDs.

Category: Text fields

Password field

A password text field with an optional leading label. The user input is displayed with '*' characters. The user input is saved to a variable.

Properties:

- **Help text [Help]**

  If a text is entered into this property, a tooltip label with a help icon will be created on the right side of the form component that will display the help text when the user hovers with the mouse above the icon. The text can be plain text or HTML. For multi-line labels, use HTML like this: <tt><html>This is line one
This is line two</tt></html>.

- **Text [Label]**

  The text of the label. Can be empty. To configure a keyboard shortcut, prefix the mnemonic character in the label text with &, e.g."&User". The prefixed character will be underlined and the platform-specific keyboard shortcut (e.g. ALT+[character] on Windows) will allow the user to quickly navigate to this form component with the keyboard.

- **Font color [Label]**

  The color of the label font. If empty, the default color will be used.

- **Font [Label]**

  The font type of the label. For a derived form, you can optionally change size, and font attributes, with a custom font you can also choose a different font face.

- **Font specification**

  The font specification for the label.

  Note: This property is only visible if "Font" is set to "Custom".

- **Font style**

  The font style of the label.

  Note: This property is only visible if "Font" is set to "Derived".

- **Font size in percent**

  The font size of the label in percent relative to the default font.

  Note: This property is only visible if "Font" is set to "Derived".

- **Icon [Label]**

  An image file with an icon for the labellabel. Can be empty.<p>To add a high-resolution image for retina displays, create a file with an additional <tt>@2x</tt> after the name (e.g. <tt>image.png</tt> and <tt>image@2x.png</tt>) and the duplicate resolution next to the selected image.<p>The install4j runtime JAR file <tt>i4jruntime.jar</tt> contains a number of image files that you can reference here by prefixing the icon file name with "icon:". For example, <tt>icon:lock_open_32.png</tt> loads a 32x32 icon showing an open lock.

- **Icon-text gap [Label]**

  The gap between the label icon and the label text in pixels.

- **Initial text [Password field]**

  The initial text in the text field. The variable value takes precedence, so this value will only be used if the variable value is undefined. Can be empty.

- **Prevent empty user input [Password field]**

  If selected, empty user input is not accepted and a default error message is shown in that case. This is a quick validation option so that you do not have to validate user input in the validation script of the form screen, as it would be necessary for more complex validations.

- **Font [Password field]**

  The font type of the text field. For a derived form, you can optionally change size, and font attributes, with a custom font you can also choose a different font face.
- **Font specification**

  The font specification for the text field.

  Note: This property is only visible if "Font" is set to "Custom".
- **Font style**

  The font style of the text field.

  Note: This property is only visible if "Font" is set to "Derived".
- **Font size in percent**

  The font size of the text field in percent relative to the default font.

  Note: This property is only visible if "Font" is set to "Derived".
- **Text field columns [Password field]**

  The width of the text field, expressed as a multiple of the width of the character 'm'. If zero, the text field will fill the entire horizontal space.
- **Write encoded value to response file [Password field]**

  Write an encoded value of the entered password to the response file. Note that the encoding only prevents casual observation of the password. Do not enable if you require strict security for the password.
- **Show icon to toggle password visibility [Password field]**

  If selected, an icon will be shown inside the text field to toggle the visibility of the password.
- **Variable name [User input]**

  The name of the variable to which the user input is assigned. The type of the variable value is <tt>java.lang.String</tt>
- **Key validation expression [User input]**

  An expression or script that validates each key that is pressed in this component by the user.<p>The <tt>text</tt> parameter does not contain> the modifications of this key event.
- **Key listener script [User input]**

  A script that is executed each time that a key is pressed in this component by the user.<p>The <tt>text</tt> parameter already contains the modification of this key event.
- **Input validation expression [User input]**

  An expression or script that validates the user input when the password field loses the focus. If the expression returns false, the focus remains in the password field. In that case you should display an error message.
- **Enter goes to next screen [User input]**

  If selected, hitting the ENTER key while the text field is focused, will go to the next screen, just as if the user had clicked on the "Next" button.

- **Request focus [User input]**

  If selected, the form component will request the focus after the form is activated. If you have multiple form components in a single form that have this property selected, the result is undefined.

Text area

A text area with an optional leading label. The user input is saved to a variable.

Properties:

- **Help text [Help]**

  If a text is entered into this property, a tooltip label with a help icon will be created on the right side of the form component that will display the help text when the user hovers with the mouse above the icon. The text can be plain text or HTML. For multi-line labels, use HTML like this: <tt><html>This is line one
This is line two</tt></html>.
- **Text [Label]**

  The text of the label. Can be empty. To configure a keyboard shortcut, prefix the mnemonic character in the label text with &, e.g."&User". The prefixed character will be underlined and the platform-specific keyboard shortcut (e.g. ALT+[character] on Windows) will allow the user to quickly navigate to this form component with the keyboard.
- **Font color [Label]**

  The color of the label font. If empty, the default color will be used.
- **Font [Label]**

  The font type of the label. For a derived form, you can optionally change size, and font attributes, with a custom font you can also choose a different font face.
- **Font specification**

  The font specification for the label.

  Note: This property is only visible if "Font" is set to "Custom".
- **Font style**

  The font style of the label.

  Note: This property is only visible if "Font" is set to "Derived".
- **Font size in percent**

  The font size of the label in percent relative to the default font.

  Note: This property is only visible if "Font" is set to "Derived".
- **Icon [Label]**

  An image file with an icon for the labellabel. Can be empty.<p>To add a high-resolution image for retina displays, create a file with an additional <tt>@2x</tt> after the name (e.g. <tt>image.png</tt> and <tt>image@2x.png</tt>) and the duplicate resolution next to the selected image.<p>The install4j runtime JAR file <tt>i4jruntime.jar</tt> contains a number of image files that you can reference here by prefixing the icon file

name with "icon:". For example, <tt>icon:lock_open_32.png</tt> loads a 32x32 icon showing an open lock.

- **Icon-text gap [Label]**

  The gap between the label icon and the label text in pixels.

- **Initial text [Text area]**

  The initial text in the text field. The variable value takes precedence, so this value will only be used if the variable value is undefined. Can be empty.

- **Prevent empty user input [Text area]**

  If selected, empty user input is not accepted and a default error message is shown in that case. This is a quick validation option so that you do not have to validate user input in the validation script of the form screen, as it would be necessary for more complex validations.

- **Font [Text area]**

  The font type of the text field. For a derived form, you can optionally change size, and font attributes, with a custom font you can also choose a different font face.

- **Font specification**

  The font specification for the text field.

  Note: This property is only visible if "Font" is set to "Custom".

- **Font style**

  The font style of the text field.

  Note: This property is only visible if "Font" is set to "Derived".

- **Font size in percent**

  The font size of the text field in percent relative to the default font.

  Note: This property is only visible if "Font" is set to "Derived".

- **Text area columns [Text area]**

  The width of the text area, expressed as a multiple of the width of the character 'm'. If zero, the text area will fill the entire horizontal space.

- **Text area rows [Text area]**

  The height of the text area, expressed as a multiple of line heights. Must be greater than zero.

- **Fill extra vertical space [Text area]**

  If set, the form component will expand to fill remaining vertical space. Extra vertical space is only available, if the form is not scrollable. Custom form screens have a "Scrollable" property, which must be set to false.

- **Wrap lines [Text area]**

  If selected, lines will wrap at the end of the text area. Otherwise a horizontal scroll bar will be show when needed.

- **Wrap entire words [Text area]**

  This property is only relevant when lines are wrapped. If set, lines will wrap on word boundaries if possible.

- **Use label font [Text area]**

  If selected, the default label font is used and other font settings are ignored.

- **Variable name [User input]**

  The name of the variable to which the user input is assigned. The type of the variable value is <tt>java.lang.String</tt>
- **Key validation expression [User input]**

  An expression or script that validates each key that is pressed in this component by the user.<p>The <tt>text</tt> parameter does not contain> the modifications of this key event.
- **Key listener script [User input]**

  A script that is executed each time that a key is pressed in this component by the user.<p>The <tt>text</tt> parameter already contains the modification of this key event.
- **Input validation expression [User input]**

  An expression or script that validates the user input when the text area loses the focus. If the expression returns false, the focus remains in the text area. In that case you should display an error message.
- **Request focus [User input]**

  If selected, the form component will request the focus after the form is activated. If you have multiple form components in a single form that have this property selected, the result is undefined.

Text field

A text field with an optional leading label. The user input is saved to a variable.

Properties:

- **Help text [Help]**

  If a text is entered into this property, a tooltip label with a help icon will be created on the right side of the form component that will display the help text when the user hovers with the mouse above the icon. The text can be plain text or HTML. For multi-line labels, use HTML like this: <tt><html>This is line one
This is line two</tt></html>.
- **Text [Label]**

  The text of the label. Can be empty. To configure a keyboard shortcut, prefix the mnemonic character in the label text with &, e.g."&User". The prefixed character will be underlined and the platform-specific keyboard shortcut (e.g. ALT+[character] on Windows) will allow the user to quickly navigate to this form component with the keyboard.
- **Font color [Label]**

  The color of the label font. If empty, the default color will be used.
- **Font [Label]**

  The font type of the label. For a derived form, you can optionally change size, and font attributes, with a custom font you can also choose a different font face.
- **Font specification**

  The font specification for the label.

Note: This property is only visible if "Font" is set to "Custom".

- **Font style**

  The font style of the label.

  Note: This property is only visible if "Font" is set to "Derived".

- **Font size in percent**

  The font size of the label in percent relative to the default font.

  Note: This property is only visible if "Font" is set to "Derived".

- **Icon [Label]**

  An image file with an icon for the labellabel. Can be empty.<p>To add a high-resolution image for retina displays, create a file with an additional <tt>@2x</tt> after the name (e.g. <tt>image.png</tt> and <tt>image@2x.png</tt>) and the duplicate resolution next to the selected image.<p>The install4j runtime JAR file <tt>i4jruntime.jar</tt> contains a number of image files that you can reference here by prefixing the icon file name with "icon:". For example, <tt>icon:lock_open_32.png</tt> loads a 32x32 icon showing an open lock.

- **Icon-text gap [Label]**

  The gap between the label icon and the label text in pixels.

- **Initial text [Text field]**

  The initial text in the text field. The variable value takes precedence, so this value will only be used if the variable value is undefined. Can be empty.

- **Prevent empty user input [Text field]**

  If selected, empty user input is not accepted and a default error message is shown in that case. This is a quick validation option so that you do not have to validate user input in the validation script of the form screen, as it would be necessary for more complex validations.

- **Font [Text field]**

  The font type of the text field. For a derived form, you can optionally change size, and font attributes, with a custom font you can also choose a different font face.

- **Font specification**

  The font specification for the text field.

  Note: This property is only visible if "Font" is set to "Custom".

- **Font style**

  The font style of the text field.

  Note: This property is only visible if "Font" is set to "Derived".

- **Font size in percent**

  The font size of the text field in percent relative to the default font.

  Note: This property is only visible if "Font" is set to "Derived".

- **Text field columns [Text field]**

  The width of the text field, expressed as a multiple of the width of the character 'm'. If zero, the text field will fill the entire horizontal space.

- **Variable name [User input]**

  The name of the variable to which the user input is assigned. The type of the variable value is <tt>java.lang.String</tt>
- **Key validation expression [User input]**

  An expression or script that validates each key that is pressed in this component by the user.<p>The <tt>text</tt> parameter does not contain> the modifications of this key event.
- **Key listener script [User input]**

  A script that is executed each time that a key is pressed in this component by the user.<p>The <tt>text</tt> parameter already contains the modification of this key event.
- **Input validation expression [User input]**

  An expression or script that validates the user input when the text field loses the focus. If the expression returns false, the focus remains in the text field. In that case you should display an error message.
- **Enter goes to next screen [User input]**

  If selected, hitting the ENTER key while the text field is focused, will go to the next screen, just as if the user had clicked on the "Next" button.
- **Request focus [User input]**

  If selected, the form component will request the focus after the form is activated. If you have multiple form components in a single form that have this property selected, the result is undefined.

Text field with date format

A text field with an optional leading label and a date format. The user input (a <tt>java.util.Date</tt>) is saved to a variable.

Properties:

- **Date format [Format]**

  The date format specifies the components of the date that should be editable, i.e. date, time or date and time.
- **Date display style [Format]**

  The date display style specifies the verbosity of the date component.
- **Time display style [Format]**

  The time display style specifies the verbosity of the time component.
- **Initial value [Format]**

  The initial date in the text field.
- **Help text [Help]**

  If a text is entered into this property, a tooltip label with a help icon will be created on the right side of the form component that will display the help text when the user hovers with the mouse above the icon. The text can be plain text or HTML. For multi-line

labels, use HTML like this: <tt><html>This is line one
This is line two</tt></html>.

- **Text [Label]**

  The text of the label. Can be empty. To configure a keyboard shortcut, prefix the mnemonic character in the label text with &, e.g."&User". The prefixed character will be underlined and the platform-specific keyboard shortcut (e.g. ALT+[character] on Windows) will allow the user to quickly navigate to this form component with the keyboard.

- **Font color [Label]**

  The color of the label font. If empty, the default color will be used.

- **Font [Label]**

  The font type of the label. For a derived form, you can optionally change size, and font attributes, with a custom font you can also choose a different font face.

- **Font specification**

  The font specification for the label.

  Note: This property is only visible if "Font" is set to "Custom".

- **Font style**

  The font style of the label.

  Note: This property is only visible if "Font" is set to "Derived".

- **Font size in percent**

  The font size of the label in percent relative to the default font.

  Note: This property is only visible if "Font" is set to "Derived".

- **Icon [Label]**

  An image file with an icon for the labellabel. Can be empty.<p>To add a high-resolution image for retina displays, create a file with an additional <tt>@2x</tt> after the name (e.g. <tt>image.png</tt> and <tt>image@2x.png</tt>) and the duplicate resolution next to the selected image.<p>The install4j runtime JAR file <tt>i4jruntime.jar</tt> contains a number of image files that you can reference here by prefixing the icon file name with "icon:". For example, <tt>icon:lock_open_32.png</tt> loads a 32x32 icon showing an open lock.

- **Icon-text gap [Label]**

  The gap between the label icon and the label text in pixels.

- **Font [Text field]**

  The font type of the text field. For a derived form, you can optionally change size, and font attributes, with a custom font you can also choose a different font face.

- **Font specification**

  The font specification for the text field.

  Note: This property is only visible if "Font" is set to "Custom".

- **Font style**

  The font style of the text field.

  Note: This property is only visible if "Font" is set to "Derived".

- **Font size in percent**

  The font size of the text field in percent relative to the default font.

  Note: This property is only visible if "Font" is set to "Derived".
- **Text field columns [Text field]**

  The width of the text field, expressed as a multiple of the width of the character 'm'. If zero, the text field will fill the entire horizontal space.
- **Variable name [User input]**

  The name of the variable to which the user input is assigned. The type of the variable value is <tt>java.util.Date</tt>
- **Key validation expression [User input]**

  An expression or script that validates each key that is pressed in this component by the user.<p>The <tt>text</tt> parameter does not contain> the modifications of this key event.
- **Key listener script [User input]**

  A script that is executed each time that a key is pressed in this component by the user.<p>The <tt>text</tt> parameter already contains the modification of this key event.
- **Input validation expression [User input]**

  An expression or script that validates the user input when the text field loses the focus. If the expression returns false, the focus remains in the text field. In that case you should display an error message.
- **Enter goes to next screen [User input]**

  If selected, hitting the ENTER key while the text field is focused, will go to the next screen, just as if the user had clicked on the "Next" button.
- **Request focus [User input]**

  If selected, the form component will request the focus after the form is activated. If you have multiple form components in a single form that have this property selected, the result is undefined.

Text field with format mask

A text field with an optional leading label and an arbitrary format mask. The user input is saved to a variable. The default mask is that of an SSN. For more information, please see the javadoc of <tt>javax.swing.text.MaskFormatter</tt>.

Properties:

- **Input mask [Format]**

  The input mask as defined be the javadoc of <tt>javax.swing.text.MaskFormatter</tt>.
- **Placeholder character [Format]**

  The character that is displayed for empty characters of the input mask that still have to be filled out by the user.
- **Valid characters [Format]**

  If not empty, this string defines the characters that are valid for user input.

- **Invalid characters [Format]**

  If not empty, this string defines the characters that are invalid for user input.

- **Allow invalid input [Format]**

  If set, invalid input will be allowed during editing. When the text field loses focus, invalid input will not be accepted, so the final value is guaranteed to be valid in any case.

- **Return literal characters [Format]**

  If set, the value that is saved to the variable contains literal characters defined in the input mask.

- **Help text [Help]**

  If a text is entered into this property, a tooltip label with a help icon will be created on the right side of the form component that will display the help text when the user hovers with the mouse above the icon. The text can be plain text or HTML. For multi-line labels, use HTML like this: <tt><html>This is line one
This is line two</tt></html>.

- **Text [Label]**

  The text of the label. Can be empty. To configure a keyboard shortcut, prefix the mnemonic character in the label text with &, e.g."&User". The prefixed character will be underlined and the platform-specific keyboard shortcut (e.g. ALT+[character] on Windows) will allow the user to quickly navigate to this form component with the keyboard.

- **Font color [Label]**

  The color of the label font. If empty, the default color will be used.

- **Font [Label]**

  The font type of the label. For a derived form, you can optionally change size, and font attributes, with a custom font you can also choose a different font face.

- **Font specification**

  The font specification for the label.

  Note: This property is only visible if "Font" is set to "Custom".

- **Font style**

  The font style of the label.

  Note: This property is only visible if "Font" is set to "Derived".

- **Font size in percent**

  The font size of the label in percent relative to the default font.

  Note: This property is only visible if "Font" is set to "Derived".

- **Icon [Label]**

  An image file with an icon for the labellabel. Can be empty.<p>To add a high-resolution image for retina displays, create a file with an additional <tt>@2x</tt> after the name (e.g. <tt>image.png</tt> and <tt>image@2x.png</tt>) and the duplicate resolution next to the selected image.<p>The install4j runtime JAR file <tt>i4jruntime.jar</tt> contains a number of image files that you can reference here by prefixing the icon file name with "icon:". For example, <tt>icon:lock_open_32.png</tt> loads a 32x32 icon showing an open lock.

- **Icon-text gap [Label]**

  The gap between the label icon and the label text in pixels.
- **Initial text [Text field]**

  The initial text in the text field. The variable value takes precedence, so this value will only be used if the variable value is undefined. Can be empty.
- **Prevent empty user input [Text field]**

  If selected, empty user input is not accepted and a default error message is shown in that case. This is a quick validation option so that you do not have to validate user input in the validation script of the form screen, as it would be necessary for more complex validations.
- **Font [Text field]**

  The font type of the text field. For a derived form, you can optionally change size, and font attributes, with a custom font you can also choose a different font face.
- **Font specification**

  The font specification for the text field.

  Note: This property is only visible if "Font" is set to "Custom".
- **Font style**

  The font style of the text field.

  Note: This property is only visible if "Font" is set to "Derived".
- **Font size in percent**

  The font size of the text field in percent relative to the default font.

  Note: This property is only visible if "Font" is set to "Derived".
- **Text field columns [Text field]**

  The width of the text field, expressed as a multiple of the width of the character 'm'. If zero, the text field will fill the entire horizontal space.
- **Variable name [User input]**

  The name of the variable to which the user input is assigned. The type of the variable value is <tt>java.lang.String</tt>
- **Key validation expression [User input]**

  An expression or script that validates each key that is pressed in this component by the user.<p>The <tt>text</tt> parameter does not contain> the modifications of this key event.
- **Key listener script [User input]**

  A script that is executed each time that a key is pressed in this component by the user.<p>The <tt>text</tt> parameter already contains the modification of this key event.
- **Input validation expression [User input]**

  An expression or script that validates the user input when the text field loses the focus. If the expression returns false, the focus remains in the text field. In that case you should display an error message.
- **Enter goes to next screen [User input]**

  If selected, hitting the ENTER key while the text field is focused, will go to the next screen, just as if the user had clicked on the "Next" button.

- **Request focus [User input]**

  If selected, the form component will request the focus after the form is activated. If you have multiple form components in a single form that have this property selected, the result is undefined.

Text field with integer format

A text field with an optional leading label and an integer format. The user input is saved to a variable with type <tt>java.lang.Long</tt>.

Properties:

- **Minimum number of digits [Format]**

  The minimum number of digits that are acceptable for user input.
- **Maximum number of digits [Format]**

  The maximum number of digits that are acceptable for user input. If zero, there is no limit.
- **Use grouping separator [Format]**

  If set, a locale-dependent grouping separator is displayed.
- **Allow invalid input [Format]**

  If set, invalid input will be allowed during editing. When the text field loses focus, invalid input will not be accepted, so the final value is guaranteed to be valid in any case.
- **Help text [Help]**

  If a text is entered into this property, a tooltip label with a help icon will be created on the right side of the form component that will display the help text when the user hovers with the mouse above the icon. The text can be plain text or HTML. For multi-line labels, use HTML like this: <tt><html>This is line one
This is line two</tt></html>.
- **Text [Label]**

  The text of the label. Can be empty. To configure a keyboard shortcut, prefix the mnemonic character in the label text with &, e.g."&User". The prefixed character will be underlined and the platform-specific keyboard shortcut (e.g. ALT+[character] on Windows) will allow the user to quickly navigate to this form component with the keyboard.
- **Font color [Label]**

  The color of the label font. If empty, the default color will be used.
- **Font [Label]**

  The font type of the label. For a derived form, you can optionally change size, and font attributes, with a custom font you can also choose a different font face.
- **Font specification**

  The font specification for the label.

  Note: This property is only visible if "Font" is set to "Custom".
- **Font style**

  The font style of the label.

Note: This property is only visible if "Font" is set to "Derived".

- **Font size in percent**

  The font size of the label in percent relative to the default font.

  Note: This property is only visible if "Font" is set to "Derived".

- **Icon [Label]**

  An image file with an icon for the labellabel. Can be empty.<p>To add a high-resolution image for retina displays, create a file with an additional <tt>@2x</tt> after the name (e.g. <tt>image.png</tt> and <tt>image@2x.png</tt>) and the duplicate resolution next to the selected image.<p>The install4j runtime JAR file <tt>i4jruntime.jar</tt> contains a number of image files that you can reference here by prefixing the icon file name with "icon:". For example, <tt>icon:lock_open_32.png</tt> loads a 32x32 icon showing an open lock.

- **Icon-text gap [Label]**

  The gap between the label icon and the label text in pixels.

- **Initial text [Text field]**

  The initial text in the text field. The variable value takes precedence, so this value will only be used if the variable value is undefined. Can be empty.

- **Prevent empty user input [Text field]**

  If selected, empty user input is not accepted and a default error message is shown in that case. This is a quick validation option so that you do not have to validate user input in the validation script of the form screen, as it would be necessary for more complex validations.

- **Font [Text field]**

  The font type of the text field. For a derived form, you can optionally change size, and font attributes, with a custom font you can also choose a different font face.

- **Font specification**

  The font specification for the text field.

  Note: This property is only visible if "Font" is set to "Custom".

- **Font style**

  The font style of the text field.

  Note: This property is only visible if "Font" is set to "Derived".

- **Font size in percent**

  The font size of the text field in percent relative to the default font.

  Note: This property is only visible if "Font" is set to "Derived".

- **Text field columns [Text field]**

  The width of the text field, expressed as a multiple of the width of the character 'm'. If zero, the text field will fill the entire horizontal space.

- **Variable name [User input]**

  The name of the variable to which the user input is assigned. The type of the variable value is <tt>java.lang.Long</tt>

- **Key validation expression [User input]**

  An expression or script that validates each key that is pressed in this component by the user.<p>The <tt>text</tt> parameter does not contain> the modifications of this key event.
- **Key listener script [User input]**

  A script that is executed each time that a key is pressed in this component by the user.<p>The <tt>text</tt> parameter already contains the modification of this key event.
- **Input validation expression [User input]**

  An expression or script that validates the user input when the text field loses the focus. If the expression returns false, the focus remains in the text field. In that case you should display an error message.
- **Enter goes to next screen [User input]**

  If selected, hitting the ENTER key while the text field is focused, will go to the next screen, just as if the user had clicked on the "Next" button.
- **Request focus [User input]**

  If selected, the form component will request the focus after the form is activated. If you have multiple form components in a single form that have this property selected, the result is undefined.

Console handler

Allows you to interact with the user in a console installer. All standard form components expose appropriate behavior in console mode, however, there are situations where you need to fine-tune your console installer with additional messages or questions. In GUI or unattended mode, this form component does not have any effect.

Properties:

- **Console script**

  The script that is executed in console mode. The "console" parameter gives you access to the console and many helper methods. The return type is boolean and indicates whether the installer should be cancelled or not.

B.5.12 Installer - Custom Code & Resources

Custom code is used for

- specifying additional libraries that can be used in scripts and expressions [p. 320] of screens [p. 163] , actions [p. 177] and form components [p. 248] .
- developing new types of actions, screens or form components with the install4j API. Please see the help topic on using the API [p. 81] for more information.

  Before you start to develop a new action, please have a look at the available actions [p. 179] and screens [p. 166] . If it's just a few lines of code, you can use the "Run script" action to enter them directly into install4j. If you would like to collect user input, most use cases can be solved with a "Configurable form" screen.

  An alternative way of adding your beans to the install4j is packaging them as an extension [p. 84] . In that case, you can select them directly from the standard registry dialogs instead of having to go through the "Search in custom code" menu entries when adding beans to the installer.
- including resource files into the installer. Resource files are arbitrary files like DLLs, external executables or text files that have to be available before the "Install files" action has run. While all class files are packed into a single `user.jar` file, archives and resource file are extracted to the `user` subdirectory in the working directory of the installer. You can access a resource file with the following expression:

  ```
  new File("user", "[file name]")
  ```

  For example, if you have added a native library `jni.dll` to your custom code, you can load it in a "Run script" action by calling

  ```
  System.load(new File("user", "jni.dll").getPath());
  ```

In the **[Custom code]** section you can specify the location of your custom code. The following custom code location types [p. 318] are available:

- Class or resource files
- Directories
- Archives

All classes used by your custom code have to be included in these locations (except for Java runtime classes and install4j framework classes).
The control buttons allow you to modify the contents of the list of custom code locations, the **[Add]** button displays the custom code entry dialog [p. 318] .

After you have chosen your custom code locations, you will be able to select your own screens, actions and form components.

Files that are present in both the custom code as well as the distribution tree will **not be packaged twice**. You can add files that are also in the distribution tree freely to your custom code, they will not increase the size of your installer. The compiler checks the source path of included files to determine if they are already present in the installer.

B.5.13 Installer - Styles

For more information on styles, please see the corresponding help topic [p. 22] .

The ✚ **[Add]** button shows a popup window where you can select whether to add

- a configurable style. Styles can be constructed with a restricted set of the form components [p. 248] for screens that do not take user input and some special form components that are relevant in a styling context.
- a style that is contained in your custom code. New types of reusable styles can be developed with the install4j API [p. 81] . In your custom code configuration [p. 312] you can specify code locations that are scanned for suitable classes. A class selector [p. 318] will be shown where you can select the desired class.
- a group for organizing styles, so you have a better overview of which styles belong together.

If you select a single style in the list of styles, you can edit its properties on the right side. Selecting multiple styles is possible on the same tree level, i.e. all selected elements have to be siblings in the tree.

When the configuration area is focused, you can transfer the focus back to the list of styles with the keyboard by pressing `ALT-F1`.

The list of styles provides the following actions in the toolbar on the right that operate on the current selection. You can also access these actions from the context menu or use the associated keyboard shortcuts.

- **Delete**

  All selected styles will be deleted after a confirmation dialog when invoking the ✖ **[Delete]** action. The deleted styles cannot be restored.

- **Rename**

  After you add a style, the list of styles shows it with its default name. This is often enough, however, if you have multiple instances of the same style alongside, a custom name makes it easier to distinguish these instances. You can assign a custom name to each style with the **[Rename]** action. The default name is still displayed in brackets after the custom name. To revert to the default, just enter an empty custom name in the rename dialog.

- **Comment**

  By default, styles have no comments associated with them. You can add comments to selected styles with the **[Add Comments]** action. When a comment is added, the affected styles will receive a "Comments" tab. After adding a comment to a single style, the comment area is focused automatically. Likewise, you can remove comments from one or more styles with the **[Remove Comments]** action.

  In order to visit all comments, you can use the **[Show next comment]** and **[Show previous comment]** actions. These actions will focus the comment area automatically and wrap around if no further comments can be found.

- **Disable**

  In order to "comment out" styles, you can use the ✅ **[Disable]** action. The configuration of the disabled styles will not be displayed, their entries in the list of styles will be shown in gray and they will not be checked for errors when the project is built.

- **Copy and paste**

  install4j offers an inter-process clipboard for styles. You can **[Cut]** or **[Copy]** styles to the clipboard and **[Paste]** them in the same or a different instance of install4j. Note that references to launchers or references to files in the distribution tree might not be valid after pasting to a different project.

  Pasted styles are appended to the end of the list of styles.
- **Reorder**

  If your selection is a single contiguous interval, you can move the entire block up or down in the list. The selection can only be moved on the same level with the reorder actions. To move the selection to a different parent, you can cut and paste it (see above).

- **Group**

  You can create a group [p. 250] from the selected styles with the **[Create group from selection]** action. The new group will be inserted in place of the selected elements.

  You can dissolve a group with the **[Dissolve Group]** action. This action is only enabled if the selection consists of a single layout group. The elements contained in the group will be inserted in place of the group. Nested groups will not be dissolved.

Form styles have the following properties:

- **Standalone style**

  If selected, the style can be selected for installer applications, screen groups and screens. If a style is not standalone, it can only be used in other styles.
- **Fill horizontal space**

  If selected, all available horizontal space is filled by this style. This setting is also used when it is nested in another style by a "Nested style" form component.
- **Horizontal anchor**

  If "Fill horizontal space" is not selected, the style can be placed at different locations in the available space.

  Note: This property is only visible if "Fill horizontal space" is selected.
- **Fill vertical space**

  If selected, all available vertical space is filled by this style. This setting is also used when it is nested in another style by a "Nested style" form component.
- **Vertical anchor**

  If "Fill vertical space" is not selected, the style can be placed at different locations in the available space.

  Note: This property is only visible if "Fill vertical space" is selected.

You can preview a style with the **[Preview]** button which is also available on the property page of a style.

B.5.14 Installer - Update Options

Please see the help topic on updates [p. 77] for a general discussion on how generated installers handle installations when an earlier version has already been installed.

Every install4j project has an application ID. When you create a new project, the application ID is calculated. The ID is displayed on this tab. If you have to change the ID, you can use the **[Regenerate ID]** button. You can also change the ID manually if the `manually edit ID` check box is checked. You should only change the ID if you want to change the **identity** if your project. The application ID ensures that later versions of your application will be able to find and recognize earlier installations.

install4j offers two types of installers:

- **Regular installer**

  This generates standalone installer. The following options related to updates are available for regular installers:

  - **Detect previous installation directory**

    If a previous installation can be detected on the computer, the installer will suggest the directory of that previous installation. In that case, the "Welcome" screen will ask the user if the previous installation should be updated. This question can be suppressed in the configuration of the "Welcome" screen.

- **Add-on installer**

  This generates an installer that can **only** be installed on top of an installation of a certain installation. An add-on installer doesn't have a separate uninstaller. This is useful to distribute patches and enhancements.

  If the add-on installer type is selected, you have to enter an application ID for the base application in the text field below. With the **[...]** chooser button, you can select an install4j project file from your file system, and extract its application ID.

B.5.15 Installer - Auto Update Options

Please see the help topic on auto-updates [p. 53] for a general discussion on how to implement auto-update functionality in your project.

All settings on this tab are returned at runtime by instances of `UpdateDescriptorEntry` objects that are returned by the `UpdateDescriptor` object. There are two different scenarios for working with these objects:

- **In updater installer applications**

  If you have added an updater installer application on the screens & actions tab [p. 145] , the updater uses a "Check for update" action to download `updates.xml`, instantiate an `UpdateDescriptor` object and save it to the installer variable named "updateDescriptor". A "Set a variable" action is used to save the appropriate `UpdateDescriptorEntry` object to te installer variable named "updateDescriptorEntry"

  You can use the above installer variables directly in your updater application.

- **From the API**

  If you want to check updates from your own code, you can call `com.install4j.api.update.UpdateChecker.getUpdateDescriptor(...)` to obtain an instance of `UpdateDescriptor`.

The **URL for updates.xml** setting sets the contents of the `sys.updatesUrl` compiler variable. When you insert an updater on the screens & actions tab [p. 145] , it contains a "Check for updates" action, that will have its "Update descriptor URL" property set to `${compiler:sys.updatesUrl}`. If there are any "Check for updates" actions in your project that use this compiler variable, you have to define it in this text field. Note that this must be the full URL to which you will upload the update descriptor file `updates.xml`, for example `https://www.server.com/donwload/updates.xml`. You do not have to name the file `updates.xml` on the server, it can have any name.

The **base URL** setting controls how the download URL of a new installer is constructed by an auto-updater. By default, new installers have to be located in the same directory as the `updates.xml` update descriptor file. If they should be downloaded from another source, activate the base URL setting and specify the base URL. The URL should start with `http://` or `https://` and point to a directory where the installers are located, not to a particular installer.

The configured value is returned by `UpdateDescriptor#getBaseUrl()`. It is not possible to set different base URLs for different media files by using a compiler variable.

The **minimum and maximum updatable versions** control if updater applications of already installed applications should recognize the current version as a possible update. For example, if the installed version is 1.0 and a minimum updatable version of 2.0 is specified, the return value of `UpdateDescriptor#getPossibleUpdateEntry()` will be `null` and the updater application will not detect a new version.

The configured values are returned by `UpdateDescriptorEntry#getUpdatableVersionMin()` and `UpdateDescriptorEntry#getUpdatableVersionMax()`. They can be overridden for each media file in the "Customize project defaults->Auto-update options" step of the media file wizard.

The **files with comments** setting allows you to embed an comment in text or HTML format in the update descriptor. You can configure a file for each language [p. 91] that is supported by the installer. If you configure a comment file for at least the principal language, a hyperlink that shows the comment in the appropriate language will be added to the "New version available" screen in updaters that perform a version check.

The comment in the user-selected language is returned by `UpdateDescriptorEntry#getComment()`. Comment files can be overridden for each media file in the "Customize project defaults->Auto-update options" step of the media file wizard.

The files with comments must be encoded in **UTF-8**.

Additional attributes can be used for custom logic in updaters. Attributes are simple key-value pairs.

The configured attributes are returned by `UpdateDescriptorEntry#getAdditionalAttribute(...)`. They can be overridden for each media file in the "Customize project defaults->Auto-update options" step of the media file wizard.

B.5.16 Dialogs

B.5.16.1 Custom Code & Resources Entry Dialog

The custom code entry dialog is shown when clicking on the ✚ add button in the Custom Code & Resources tab [p. 312] .
The following entry types are available:

- **Class or resource files**

  For simple actions, screens or form components that do not depend on other classes, it is easiest to insert their class files directly, especially if you build your installer extensions together with your application. Anonymous inner classes will be included automatically. If you select a resource file, e.g. an image, it will be added to the top-level directory of the custom JAR file and will be available via `Class.getResourceAsStream()`.

- **Directories**

  With this type of entry you can add an entire directory. Please make sure to select a classpath root directory, otherwise your classes cannot be loaded.

- **Scan Directories**

  With this type of entry you can add all JAR and ZIP files in a selected directory.

- **Archives**

  With this type of entry you can add a JAR file. JAR files can optionally ne mapped to installed JAR files, so that they are not duplicated if they are used by both custom code and launchers. Please see the help on the Custom Code & Resources tab [p. 312] for more information.

Use the **[...]** chooser button to select files and directories from your file system. A relative path will be interpreted relative to the project file.

B.5.16.2 Class Selector Dialog

The custom class selection dialog is shown when you add an action [p. 177] , a screen [p. 163] or a form component [p. 248] from your custom code.

The custom class selector shows all classes that implement the appropriate interface, depending on the context:

- `com.install4j.api.actions.InstallAction` for actions in the installation mode.
- `com.install4j.api.actions.UninstallAction` for actions in the uninstallation mode.
- `com.install4j.api.screens.InstallerScreen` for screens in the installation mode.
- `com.install4j.api.screens.UninstallerScreen` for screens in the uninstallation mode.
- `com.install4j.api.formcomponents.FormComponent` for form components.

Note that you usually do not implement these interface directly but rather extend one of the abstract classes in the respective packages.

Please see the API description for a detailed explanation of these base classes.

B.5.16.3 Registry Dialog

The registry dialog is displayed when you add a standard action [p. 177] , screen [p. 163] or form component [p. 248] . It shows all built-in elements as well as any elements contributed by installed extensions [p. 84] .

The registry dialog is **quick-search enabled**, you can start typing your query when the tree is focused. The search term will be displayed in a yellow dialog at the top of the tree. If no match is found, the search term is displayed in red. If a match is found, the search term is displayed in black and the match is made visible. The matched portion is drawn inverted with a green background.

To navigate between matches, you can use the arrow keys or `F3` and `SHIFT-F3`.

You can use wildcards in your search term, for example: `Font*Handle`.

B.5.16.4 Application Templates Dialog

The application templates dialog is displayed when you add an application [p. 148] on the screens & actions [p. 320] tab.

Available application templates are grouped into categories. If you select the top-level `Empty custom application`, a new application will be added that initially does not contain any screens and actions.

install4j comes with several updater templates. Please see the help topic on auto-update functionality [p. 53] for more help on creating updaters.

The application templates dialog is **quick-search enabled**, you can start typing your query when the tree is focused. The search term will be displayed in a yellow dialog at the top of the tree. If no match is found, the search term is displayed in red. If a match is found, the search term is displayed in black and the match is made visible. The matched portion is drawn inverted with a green background.

To navigate between matches, you can use the arrow keys or `F3` and `SHIFT-F3`.

You can use wildcards in your search term, for example: `Font*Handle`.

B.5.16.5 Link Selection Dialog

The link selection dialog is displayed by choosing `Add Link Into` from the popup menu that is shown when clicking on the ✚ **[Add]** button in the Screens & Actions tab [p. 145] .

The dialog shows a tree of installer elements either of the current project or of the selected merged project. After you close the dialog with the **[OK]** button, a link to the selected element is added at the current position in the tree of installer elements.

In order to avoid placing to many links, it is recommend to create a screen group or an action group to collect several screens and actions. A single link to that screen or action group is less fragile than multiple links to the single elements.

B.5.16.6 String Edit Dialog

The string edit dialog is shown from the action [p. 177] , screen [p. 163] or form component [p. 248] editors when you click on the **[...]** for a

- a "multi-line string" property. Multi-line strings cannot be edited inline in the property sheet.
- a "list of strings" property. While the inline editor in the property sheet accepts items separated by semicolons (';'), this dialog separates item by line breaks. When you wish to enter a new item, you have to put it on a new line.

All key bindings in the editor are configurable. Choose `Settings->Key Map` to display the Key map editor [p. 324] .

The editing functionality in the `Edit` menu includes:

- **Undo/Redo**
- **Copy/Cut/Paste**

  The "Paste with dialog" action shows previous selections.
- **Rectangular selections**
- **Extended selection and deletion**

  This included actions like "Select word" and "Delete line".
- **Join lines**
- **Duplicate lines**
- **Indent/Unindent selection**
- **Toggle case**

By choosing `Edit->Insert Variable` from the menu, you can add a compiler variable or custom localization key at the current cursor position. It will be added with the text field variable syntax, like ${i18n:myKey} for a custom localization key or ${compiler:myVariable} for a compiler variable.

The search functionality in the `Search` menu includes:

- **Find**

  Find simple or regular expressions in the selected or the entire text with options of case sensitivity and word matching. With "Find next occurrence" and "Find previous occurrence" you can quickly move among the search results.
- **Replace**

  Same as "Find" with an option to replace the found items.
- **Quick search**

  Search text by typing directly in the editor and highlighting the search results as you type.

B.5.16.7 Java Code Editor

The Java code editor is shown from the screens & actions [p. 145] tab or the form component [p. 248] editor when you click on the **[...]** for a Java code property.

Please see the help on the string editor dialog [p. 319] for common editing functionality.

The box above the edit area show the available parameters for the Java code property as well as the return type. If parameters or return type are classes (and not primitive types), they will be shown as hyperlinks. Clicking on such a hyperlink opens the Javadoc in the external browser. If you would not like the default browser to be opened, you can configure your own browser in the preferences dialog [p. 352] .

To get more information on classes from the `com.install4j.*` packages, please choose `Help->Show Javadoc Overview` from the menu and read the help topic for the install4j API [p. 81] . In addition, the Java code editor offers a code gallery [p. 324] that contains useful snippets that show you how to get started with using the install4j API. The code gallery is invoked from the tool bar or by choosing `Code->Insert from Code gallery` from the menu.

A number of packages can be used without using fully-qualified class names. Those packages are:

- java.util.*
- java.io.*
- javax.swing.*
- com.install4j.api.*
- com.install4j.api.beans.*
- com.install4j.api.context.*
- com.install4j.api.events.*
- com.install4j.api.screens.*
- com.install4j.api.actions.*
- com.install4j.api.formcomponents.*
- com.install4j.api.update.*
- com.install4j.api.windows.*
- com.install4j.api.unix.*

You can put a number of import statements as the first lines in the text area in order to avoid using fully qualified class names.

Java code properties can be

- **expressions**

  An expression doesn't have a trailing semicolon and evaluates to the required return type.

  Example: `!context.isUnattended() && !context.isConsole()`

  The above example would work as the condition expression of an action and skip the action for unattended or console installations.
- **scripts**

  A script consists of a series of Java statements with a return statement of the required return type as the last statement.

  Example: `if (!context.getBooleanVariable("enterDetails")) context.goForward(2, true, true); return true;`

  The above example would work as the validation expression of a screen and skip two screens forward (checking the conditions of the target screen as well as executing the actions of the current screen) if the variable with name "enterDetails" is not set to "true".

install4j detects automatically whether you have entered an expression or a script.

The primary interface to interact with the installer or uninstaller is the **context** which is always among the available parameters. The context provides information about the current installation and gives access to variables, screens, actions and other elements of the installation or uninstallation. The parameter is of type

- `com.install4j.api.context.InstallerContext` for screens and actions in the installation mode
- `com.install4j.api.context.UninstallerContext` for screens and actions in the uninstallation mode
- `com.install4j.api.context.Context` for form components.

Apart from the context, the action, screen or form component to which the Java code property belongs is among the available parameters. If you know the actual class, you can cast to it and modify the object as needed.

The Java editor offers the following code assistance powered by the eclipse platform:

- **Code completion**

  Pressing `CTRL-Space` brings up a popup with code completion proposals. Also, typing a dot (".") shows this popup after a delay if no other character is typed. While the popup is displayed, you can continue to type or delete characters with `Backspace` and the popup will be updated accordingly. "Camel-hump completion" is supported, i.e. typing `NPE` and hitting `CTRL-Space` will propose `NullPointerException` among other classes. If you accept a class that is not automatically imported, the fully qualified name will be inserted.

  The completion popup can suggest:

  - variables and default parameters. Default parameters are displayed in bold font.
  - packages (when typing an import statement)
  - classes
  - fields (when the context is a class)
  - methods (when the context is a class or the parameter list of a method)

  You can configure code completion behavior in the Java editor settings [p. 323] .

- **Problem analysis**

  The code that you enter is analyzed on the fly and checked for errors and warning conditions. Errors are shown as red underlines in the editor and red stripes in the right gutter. Warnings (such as an unused variable declaration) are shown as a yellow backgrounds in the editor and yellow stripes in the right gutter. Hovering the mouse over an error or warning in the editor as well as hovering the mouse over a stripe in the gutter area displays the error or warning message.

  The status indicator at the top of the right gutter is

  - **green**

    if there are no warnings or errors in the code.
  - **yellow**

    if there are warnings but no errors in the code.
  - **red**

    if there are errors in the code. In this case the code will not compile and the installer cannot be generated.

  You can configure the threshold for problem analysis in the Java editor settings [p. 323] .

- **Context-sensitive Javadoc**

  Pressing `SHIFT-F1` opens the browser at the Javadoc page that describes the element at the cursor position. If no corresponding Javadoc can be found, a warning message is displayed. Javadoc for the Java runtime library can only be displayed if a design time JDK is configured and a valid Javadoc location is specified in the design time JDK configuration [p. 101] .

  You can set the design time JDK in the Java editor settings [p. 323]

All key bindings in the Java code editor are configurable. Choose `Settings->Key Map` to display the Key map editor [p. 324] .

Screens, actions and form components are wired together with **installer variables**, please see the help topic on screens and actions [p. 11] for more information. Setting and getting installer variables is done through the context parameter with the `context.getVariable(String variableName)` and `context.setVariable(String variableName, Object value)` methods. The convenience method `context.getBooleanVariable(String variableName)` makes it easier to check conditions. Any object can be used as the value for a variable. To use installer variables in text properties of actions, screens and form components, write them as `${installer:myVariableName}`.

If the gutter icon in the top right corner of the dialog is green, your script is going to compile unless you have disabled error analysis in the Java editor settings [p. 323] . In some situations, you might want to try the actual compilation. Choosing `Code->Test Compile` from the menu will compile the script and display any errors in a separate dialog. Saving your script with the **[OK]** button will not test the syntactic correctness of the script. When your install4j project is compiled, the script will also be compiled and errors will be reported.

B.5.16.8 Java Editor Settings

The Java editor settings dialog is shown when you select `Settings->Java Editor Settings` from the menu in the Java code editor dialog [p. 320] .

In the **code completion popup settings** section, you can configure the following options:

- **Auto-popup code completion after dot**

  If selected, each time you type a dot (".") in the Java code editor, the code completion popup will be displayed after a certain delay unless you type another character in the meantime.
- **Delay**

  The "Auto-popup code completion after dot" feature above uses a configurable delay. By default, the delay is set to 1000 ms.
- **Popup height**

  The height of the completion popup in number of entries is configurable.

In the **display code problems** section, you can configure the threshold for which code problems are shown in the editor.

- **None**

  No code problems are displayed at all.
- **Errors only**

  Only problems that prevent code compilation are displayed. Errors show as red underlines in the editor and red stripes in the right gutter.
- **Errors and warnings**

  In addition to errors, warnings are displayed. Warnings cover all kinds of suspicious conditions that could be sources of bugs such as an unused local variable. Warnings are displayed as yellow backgrounds in the editor and yellow stripes in the right gutter.

In the **Javadoc Settings** section, there is an option to use the online documentation for the install4j API instead of the bundled HTML files. Since Windows 7, it is not possible to use anchors when showing URLs anymore, so JavaScript redirection files are used to navigate to anchors in the Javadoc documentation. When Internet Explorer is used, two warnings are displayed each

time you invoke a show Javadoc action. By using the online documentation, these warnings are eliminated.

The **design time JDK** section mirrors the design time JDK configuration on the Java version [p. 89] tab of the general settings [p. 87] .

B.5.16.9 Code Gallery

The code gallery dialog is displayed by choosing `Code->Insert from Code Gallery` from the menu in the Java code editor dialog [p. 320] .

Available code snippets are grouped into categories. They show how to use the install4j API in common use cases. The script is shown in a preview on the right side. You can either copy a portion of the script with `CTRL-C` or click **[OK]** to insert the entire script at the current cursor position.

Please note that not all code snippets might be directly usable in the script that you are editing.

Some java script properties have **special code snippets** that are only shown for this property. If such code snippets exist, they are displayed in a category with the name of the java script property in bold font.

The code gallery dialog is **quick-search enabled**, you can start typing your query when the tree is focused. The search term will be displayed in a yellow dialog at the top of the tree. If no match is found, the search term is displayed in red. If a match is found, the search term is displayed in black and the match is made visible. The matched portion is drawn inverted with a green background.

To navigate between matches, you can use the arrow keys or `F3` and `SHIFT-F3`.

You can use wildcards in your search term, for example: `Font*Handle`.

B.5.16.10 Key Map Editor

The key map editor is displayed by choosing `Settings->Key map` from the menu in the Java code editor dialog [p. 320] or the string edit dialog [p. 319] .

The active key map controls all key bindings in the editor. By default, the **[Default]** key map is active. The default key map cannot be edited directly. To customize key bindings, you first have to copy the default key map. Except for the default key map, the name of a key map can be edited by double-clicking on it.

When assigning new keystrokes or removing existing key strokes from a copied map, the changes to the base key map will be shown as "overridden" in the list of bindings.

The key map editor also features search functionality for locating bindings as well a conflict resolution mechanism.

Key bindings are saved in the file `$HOME/.install4j7/editor_keymap.xml`. This file only exists if the default key map has been copied. When migrating an install4j installation to a different computer, you can copy this file.

B.5.16.11 ID Selection Dialog

The ID selection dialog is displayed by choosing `Edit->Insert ID of a configuration component` from the menu in the Java code editor dialog [p. 320] .

Available configuration components are grouped into categories such as file sets or installation components. IDs are required for certain finder methods in the context object. For example, in the following code

```
context.getFileSetById("756").setSelected(false);
```

the ID "756" is not be readily available in the script. With the ID selector, you type

```
context.getFileSetById(
```

and then open the ID selector. You open the "File sets" node, and select the desired file set. When the dialog is closed with the **[OK]** button, the ID will be inserted into the edited script surrounded by quotes.

The ID selection dialog is **quick-search enabled**, you can start typing your query when the tree is focused. The search term will be displayed in a yellow dialog at the top of the tree. If no match is found, the search term is displayed in red. If a match is found, the search term is displayed in black and the match is made visible. The matched portion is drawn inverted with a green background.

To navigate between matches, you can use the arrow keys or `F3` and `SHIFT-F3`.

You can use wildcards in your search term, for example: `Font*Handle`.

B.5.16.12 Integration Wizard For Custom Installer Applications

The integration wizard for custom installer applications is displayed when you click the **[Start Integration Wizards]** button at the top of the configuration pane for any custom installer application on the screens & actions tab [p. 145] .

With this wizard, you can create a code snippet that you can paste into the Java code of your own application in order to call the selected custom installer application.

This has several advantages with respect to simply using `Runtime.exec()`:

- It works as expected on all supported platforms, including macOS
- It uses the ID of the application and not the path, so the code snippet still works when you rename the executable in your project
- It allows the \"Shut down calling launcher\" action to close your application
- It provides a callback to react to a shutdown of your application or an exit of the custom installer application

B.6 Step 5: Media

B.6.1 Step 5: Configure Media

Media files are the final output of install4j: single installer files that are used to distribute your application to your users. The creation of a media file has platform dependent options, so for each platform, you have to define a media file. It also makes sense to define several media files for one platform in case you wish to distribute different subsets of your distribution tree, or if you distribute your application with and without a bundled JRE.

To define a new media file, you double-click on the new media file entry in the list of defined media files or choose `Media->New media file` from install4j's main menu. The first step of the media wizard will then be displayed. The subsequent steps [p. 329] depend on your choice of the media file type [p. 327] in this first step.

Once you have completed all steps of the media wizard and clicked **[OK]** in the final step, a new media file entry will be displayed in the list of media files.

In the list of media files, you can

- **Reorder media file definitions**

  Media file definitions are reordered by dragging them with the mouse to the desired location. While dragging, the insertion bar shows you where the media file definition would be dropped. The order of media files determines the order in which the media files are generated. Reordering is mainly provided for the purpose of letting you arrange the media file definitions according to your personal preferences.
- **Copy media file definitions**

  Media file definitions can be copied by copy-dragging a media file definition or using the corresponding tool bar button or menu entry. The name of the copied media file definition will be prefixed with "Copy of".
- **Rename media file definitions**

  Media file definitions can be renamed by using the corresponding tool bar button or menu entry. An input dialog will be displayed where the current name can be edited. Please note that except for the `%SETNAME%` variable used in the media file options [p. 93], the name of the media file is not used in the distribution but is for your own information only.
- **Delete media files definitions**

  Media file definitions can be deleted by hitting the `DEL` key or using the corresponding tool bar button or menu entry.
- **Edit a media file definition**

  Media file definitions can be edited by hitting the `ENTER` key or using the corresponding tool bar button or menu entry.

  The appropriate media wizard [p. 326] will be displayed for the selected media file definition. Note that you can directly access any step in the wizard by clicking on it in the index.

Each media file definitions has an ID which can be used to select certain media files when building the project from the command line [p. 354]. To show all IDs, choose `Project->Show IDs` from the main menu. The IDs will then be shown in square brackets next to the names of the media file definitions.

B.6.2 Available Media File Types

There are two fundamentally different types of media files:

- **Installers**

  The media file is an executable that invokes the installer. Optionally, the installer can be executed as an unattended installer or as a console installer. Please see the corresponding help topic [p. 65] for more information.

  - **Windows media file**

    a media file for Windows is a native setup executable that installs your application with an installer wizard.

    The installer can download a JRE if no suitable JRE is found on the target system.

  - **macOS single bundle media file**

    a single bundle media file for macOS is a DMG file that contains an installer wizard that is started by double clicking on it. The wizard installs your application as a **single application bundle**. If you wish to support multiple GUI launchers, please choose the "macOS folder media wizard" (see below). Command line launchers and service launchers are contained in the application bundle.

    The default JRE (which is always present on macOS) is used during the installation phase.

    If you would like to create a separate directory next to the generated application bundle that contains user files, you cannot add it directory to the "Installation directory" root of the distribution tree, since all files under that node will end up in the application bundle. The solution to this problem is to use the single bundle installer and to add another installation root to the distribution directory, that root should be set to

    ```
    ${installer:sys.installationDir}/My Application Documents
    ```

    if you want to call the additional folder "My Application Documents". That folder will be created next to the installed application bundle.

  - **macOS folder media file**

    a folder media file for macOS is a DMG file that contains an installer wizard that is started by double clicking on it. The wizard installs your application as a folder that contains the entire distribution tree and **multiple application bundles** for each included launcher.

    The default JRE (which is always present on macOS) is used during the installation phase.

  - **Unix/Linux GUI installer media file**

    a Unix/Linux GUI installer media file is an executable shell script that extracts an installer and installs your application with an installer wizard.

    The installer can download a JRE if no suitable JRE is found on the target system.

- **Archives**

  The media file is an archive that the user can extract to an arbitrary location. No screens are shown and no actions are executed. If you define additional installation roots, the files in them are not installed. No components can be downloaded.

  Archives are intended as a fallback or as additional packages such as documentation bundles. If your installer heavily relies on actions, screens and additional installation roots, you should not use archives to distribute your application. The main advantages of archives such as the ability to install them at the command line is also available from installers by using their unattended or console installation modes [p. 65] .

- **Windows archive media file**

  an archive media file for Windows is a ZIP-file that contains your application.

  Note: This media file type **does not have a GUI installer**. If you wish to create a GUI installer for Windows, please choose the "Windows media wizard" (see above).

- **macOS single bundle archive media file**

  a single bundle media file for macOS is a DMG or .tgz archive that contains a **single bundle** for your application. If you wish to support multiple GUI launchers, please choose the "macOS folder archive media wizard" (see below). Command line launchers and service launchers are contained in the application bundle.

  Note: This media file type **does not have a GUI installer**. If you wish to create a GUI installer for macOS, please choose the "macOS single bundle media wizard" (see above).

- **macOS folder archive media file**

  a folder media file for macOS is a DMG or .tgz archive that contains the entire distribution tree and **multiple application bundles** for each included launcher.

  Note: This media file type **does not have a GUI installer**. If you wish to create a GUI installer for macOS, please choose the "macOS folder media wizard" (see above).

- **Linux RPM media file**

  an RPM archive for Linux can be installed and uninstalled with the `rpm` command on Linux distributions that use the Redhat package management. There are also a large number of graphical package management tools that Linux users can use to install an RPM archive.

  Note: This media file type **does not have a GUI installer**. If you wish to create a GUI installer for Linux, please choose the "Unix/Linux GUI installer media wizard" (see below).

- **Linux Deb media file**

  an Deb archive for Linux can be installed and uninstalled with the `dpkg` command on Linux distributions that use the Debian package management. There are also a large number of graphical package management tools that Linux users can use to install a Deb archive.

  Note: This media file type **does not have a GUI installer**. If you wish to create a GUI installer for Linux, please choose the "Unix/Linux GUI installer media wizard" (see below).

- **Unix/Linux archive media file**

  a Unix/Linux archive media file is a gzipped TAR archive that contains your application.

  Note: This media file type **does not have a GUI installer**. If you wish to create a GUI installer for Unix or Linux, please choose the "Unix/Linux GUI installer media wizard" (see above).

Note: GUI launchers on macOS only start a single instance of your application. Subsequent launches will not start additional JVMs. You can use the `com.install4j.api.launcher.StartupNotification` from the install4j API to be informed about those invocations.

B.6.3 Media File Wizards

The media file wizard is displayed when you add a new media file or when you edit an exiting media file. To learn more information about the various media file types, please see the overview [p. 327] .

The media file wizards show a number of steps which depend on the media file type. Common steps are:

- Platform [p. 330]
  Choose the media file type.
- Installer options [p. 331]
  Define options for the installer.
- Data files [p. 334]
  Specify where the installer data should be placed. Not displayed for archives.
- Bundled JRE [p. 336]
  Decide if and how a JRE should be bundled with the installer. Not displayed for macOS media file types.
- Customize project defaults [p. 338]
  A number of project settings can be customized on a per-media file basis.

In addition, there are a number of steps that depend on the media file type:

- 32-bit or 64-bit [p. 340]
  For Windows media files only.
- Executable processing [p. 341]
  For Windows media files only.
- Launcher [p. 342]
  For macOS single bundle media files only.
- 64 bit settings [p. 343]
  For macOS media files only.
- Additional files in DMG [p. 344]
  For macOS media files only.
- DMG options [p. 345]
  For macOS media files only.

B.6.4 Wizard Steps

B.6.4.1 Media File Wizard: Platform

In this step of the media file wizard [p. 329] you select the media file type [p. 327] . If you are creating a new media file definition, the subsequent steps are undefined at this point.

If you are editing an existing media file definition, changing the media file type away from from the current selection will change the wizard into a different one and data that has been entered in the subsequent steps will be lost after a warning message has been confirmed.

B.6.4.2 Media File Wizard: Installer Options

In this step of the media file wizard [p. 329] you define options for the installer, most importantly the default installation directory.

This step is different for installers and archives:

- **Installers:**
  - **Installation directory**

    Enter a simple directory name (without backslashes). The standard location for applications will we prepended to this directory name. In other words: do not enter `C:\Program Files\MyApplication` but only `MyApplication` The installer will find out the correct equivalent for `C:\Program Files`, `/opt` or similar standard locations at runtime. By default, install4j will suggest the short name you have entered in the general application options [p. 88] . It is also possible to enter a composite relative directory like `My Corp\MyApplication`.

    Note that this value will be overridden if an installer with the same application ID has been previously installed and "Detect previous installation directory" is selected on the update options tab [p. 315] of the installer section.
  - **Use custom installation base directory**

    If you do not want to install your application to the standard application directory, you can enter a custom base directory here. This is useful for internal deployments with non-standard directory policies. The installation directory entered above will be appended to the custom base directory. For example, if the application should be installed in `D:\apps\MyApplication`, check the custom installation base option, enter `D:\apps` in the text field below it and enter `MyApplication` in the installation directory text field above.

    On Unix, if you want to suggest a directory below the user home directory, you can use ~ as the custom installation base directory.

- **Archives:**

  With the installation directory you determine the top level directory for the archive. All files will be contained in the top level directory. Enter a simple name without slashes, such as `myapp`. By default, install4j will suggest the short name you have entered in the general application options [p. 88] .

  For macOS single bundle archives, it is not possible to set an installation directory since all files in a single bundle are in contained in a single directory whose name is determined by the name of the main launcher. The user can move the entire bundle somewhere else by dragging the displayed icon.

  For macOS bundle archives, you can configure whether the media file should be a DMG or a .tar.gz file. For GUI applications, DMG is preferred. For command line applications or for folder bundles, you may want to select the .tar.gz file.

For **Windows installer media files**, this step includes an option `Verify integrity of installer file` that allows you to disable the built-in integrity verification. You might have to do that if you use EXE-wrapper software for licensing purposes or similar tools that modify the installer executable.

For **macOS installer media files**, this step has an option `Sign installed launchers`. By default, only the installer is signed on macOS. If you have configured entitlements for code signing in the "Executable info->macOS options" step [p. 134] of the launcher wizard, these entitlements will only be used for your launchers if the above option is selected.

Note that it is not possible to modify the Info.plist file at runtime if you select this option.

For **Linux Deb media files**, this step includes the following options:

- **Register files with overwrite policy "Never" as config files**

  If selected, all files that have an overwrite policy "Never" from their configuration in the distribution tree [p. 110] are marked as config files. When updating the package through the package manager, those files will not be changed and they are kept when the package is removed.
- **Use bzip2 compression method**

  If selected, the bzip2 compression method will be used. It is slower, but more efficient than the standard gzip compression method.
- **Archive description**

  Enter an optional description that will be displayed by package managers.
- **Dependencies**

  Enter optional dependencies that will have to be present in the package management for the installation to succeed. Enter a comma separated list of packages.
- **Maintainer email**

  Optionally enter the email of the maintainer that will be displayed by package managers.

For **Linux RPM media files**, this step includes the following options:

- **Register files with overwrite policy "Never" as config files**

  If selected, all files that have an overwrite policy "Never" from their configuration in the distribution tree [p. 110] are marked as config files. When updating the package through the package manager, those files will not be changed and they are kept when the package is removed.
- **Operating system**

  By default, the operating system of the RPM is set to "linux", here you can change it to something else.
- **Architecture**

  By default, the architecture system of the RPM is set to "i386", here you can change it to something else.

For **Unix/Linux GUI installer media files**, this step has a **Installer custom script** sub-step.

If you specify a Bourne shell custom script, the entered script fragment will be inserted into the launcher script immediately before the Java invocation of your installer takes place. This is a hook for experienced users to make custom changes in the environment.

You can select one of:

- **No custom fragment**

  No custom script fragment will be inserted.
- **Custom fragment from file**

  Specify a file from which the custom script will be read. If you enter a relative file, the file will be interpreted relative to the project file.
- **Direct entry**

  Enter your custom script fragment in the text area below.

For **Linux RPM and Linux Deb media files**, this step has sub-steps where you can define scripts to run before and after installation or uninstallation by the rpm executable. The available hooks are:

- Pre-install script
- Post-install script
- Pre-uninstall script
- Post-uninstall script

Please see http://www.rpm.org for more information.

You can select one of:

- **No custom fragment**

  No custom script fragment will be inserted.
- **Custom fragment from file**

  Specify a file from which the custom script will be read. If you enter a relative file, the file will be interpreted relative to the project file.
- **Direct entry**

  Enter your custom script fragment in the text area below.

B.6.4.3 Media File Wizard: Data Files

In this step of the media file wizard [p. 329] you define where the installer data should be placed.

Typically, installers are single files that contain all data that they install on the user's request. There are three common use cases where this is not the case:

- **CD/DVD installers with large data files**

  If your application relies on large amounts of data, it is often distributed on a CD or DVD. In that case, you typically ship a number of external data files that you do not wish to package inside the installer. The installer should start up quickly and the data files should not be extracted from the installer in order to save time. The user might decide to install only certain components, so some data files might not be needed at all. If they are included in the installer executable, all this data would have to be read from disk.
- **Installers with large optional components**

  Some applications have large optional components that are not relevant for the typical user. To reduce download size for the majority, the optional component should be downloadable on demand.
- **Net installers**

  Some application are highly modular, so it is not feasible to build a set of installers for typical use cases. A net installer lets the user select the desired components and downloads them on demand. The download size of the net installer is small since no parts of the application are contained in the installer itself.

To accommodate the above use cases, install4j offers three different ways to handle the installer data files:

- **Included in media file**

  All data files are included in the installer so you can ship it as a single download.
- **External**

  This mode covers the "CD/DVD installers with large data files" use case.

  All data files are placed in a directory next to your installer that has the name of your installer with the extension **.dat**. For example, if your media file name is `hello_4_0` (resulting in a Windows installer executable `hello_4_0.exe`), the directory containing the external data files is named `hello_4_0.dat`. You have to ship this directory in the same relative location on your CD or DVD.

  The number of data files depends the definition of your installation components. The data files are generated in such a way that

  - the files for an installation component are contained in one or more data files
  - there are no files in those data files that do not belong to this installation component

  If components do not overlap, there's a one-to-one correspondence between data files and installation components.
- **Downloadable**

  This mode covers the "Installers with large optional components" and "Net installers" use cases. It can only be used if you define installation components [p. 117] .

  Data files are generated just like for the "External" mode, but only for installation components that have been **marked as downloadable** in the installation component definition [p. 117] .

If no installation components are marked as "downloadable", this mode will behave like the "Included in media file" mode. For a "net installer", all installation components are "downloadable".

For this mode, you have to enter a **HTTP download URL**, so the installer knows from where it should download the data files at runtime if the user requests downloadable components. The URL must begin with http:// or https:// and point to a directory where you place the data files. For example, if the data file `hello_windows_4_0.000` is downloadable and the download URL is `https://www.test.com/components`, the data file must be uploaded to the web server, so that the installer can download the data file from the URL `https://www.test.com/components/hello_windows_4_0.000`.

Any data files that you leave in the data file directory next to the installer will not be downloaded. This means that if you test your installer directory from the location where it was generated, the installer finds all data files in the data file directory and does not try to download them.

B.6.4.4 Media File Wizard: Bundled JRE

In this step of the media file wizard [p. 329] you define if an how a JRE should be bundled with the installer.

If you choose to bundle a JRE by selecting the "`bundle the following JRE`" radio button, you have to choose a JRE from the drop down list below it. If you select "manual entry" in the drop down list, a text field will appear where you can enter a file name with compiler variables. If you enter a relative file name, it will first be checked whether that file exists relative to the install4j project file. If not, it will be searched in `$INSTALL4J_HOME/jres`and `{user home directory}/.install4j7/jres`. The existence of this bundle file will be checked only at compile time, not by the wizard.

You can download additional JREs with the JRE download wizard [p. 348] . Click **[JRE download wizard]** to download the JREs you need. The drop down list will be updated after the download has finished.

If you wish to bundle a JRE that is not available from ej-technologies' download server or that has custom modifications (like an installation of the `javax.comm` API), please see the JRE bundle creation wizard [p. 349] on how to create your own JRE bundle.

Further options and runtime behavior are different for installers and archives:

- **Installers:**

  The `Bundle type` section allows you to choose between the two JRE bundling modes offered by install4j:

  - **Static bundle**

    The selected JRE will be **distributed in your media file**. install4j will automatically adjust the JRE search sequence [p. 89] of all generated launchers and include the bundled JRE as the first choice.

    A statically bundled JRE will always be distributed inside the installation root directory [p. 103] , on Windows and Linux/Unix in the directory `jre` and on macOS in `[content directory]/.install4j/jre.bundle`. The content directory is available from the installer runtime variable `sys.contentDir`. and resolves to the installation directory for folder media file types and `Contents/Resources/app` for archive media file types. The actual location of the JRE installation directory is available from the installer runtime variable `sys.preferredJre` after the "Install files" action has run.

    When you update your application and include a static JRE bundle again, the old JRE bundle will be deleted prior to installation, so that any files left over from the old JRE cannot interfere with the new JRE.

  - **Dynamic bundle**

    A dynamic bundle is **downloaded on demand**. If the user already has a suitable JRE installed, that JRE will be used. If there is no such JRE available on the target machine, the installer will download the dynamically bundled JRE from the URL that you specify in the text fields below.

    To enable the download on demand, you have to locate the corresponding `.tar.gz` bundle archive in the `jres` subdirectory of your install4j installation and place it on a server so that the `HTTP download URL` will point to the bundle archive. The URL has to be of the form `https://www.myserver.com/somewhere/windows-x86-1.8.0_121.tar.gz`.

    If the installer determines that there is no suitable JRE present, it will ask the user whether the JRE should be downloaded. If the `Start download without user confirmation,`

`if necessary` check box has been selected, that confirmation is skipped and the download starts immediately.

- On Windows, a progress bar with download speed and estimated duration will be displayed during the download.
- On Unix-like systems, the progress will be shown in the terminal. Adding an FTP download URL will increase the chance that the download will work on Unix-like systems behind restrictive firewalls.

If the download fails or is aborted by the user, the download URL will be displayed together with instructions on where to place the downloaded bundle archive.

You can **override the default JRE search** in a Microsoft Windows installer executable by passing the argument `-manual` to the installer executable. The installer will then report that no JRE could be found and offer you to locate one in your file system. If you have set up a dynamic JRE bundle, it will also offer you to download one. This is a good way to test if your download URL is correct.

The check box `install as a shared JRE` determines whether the bundled JRE should be private for the application or whether other applications distributed with install4j can share this JRE. The following scenarios are covered by this approach:

- If you distribute several applications with dynamically bundled JREs, installing as a shared JRE is advisable, since the user will have to wait for the download only once.
- If you have a main application and several add-on applications, it makes sense to statically bundle the JRE with the main application and install it as a shared JRE, so the add-on applications can be distributed without JRE.

Note: installers generated by install4j will never install a JRE on the system path or make Windows registry changes. The term "shared installation" only applies to applications distributed with install4j. Other applications will not be able to use such a JRE.

- **Archives:**

  install4j will automatically adjust the JRE search sequence [p. 89] of all generated launchers and include the bundled JRE as the first choice. The JRE will always be distributed in the directory `jre` right below the installation root directory [p. 103] .

B.6.4.5 Media File Wizard: Customize Project Defaults

In this step of the media file wizard [p. 329] you can customize a number of project settings on a per-media file basis. Customizable settings are displayed in sub-steps that can be selected with the **[Choose customization category]** button or by clicking into the index on the left side.

The customization categories are:

- **Compiler variables**

  Compiler variables [p. 28] that are defined on the Compiler Variables tab [p. 97] can be overridden on a per-media file basis. For example, this would be useful to adjust the native library directories [p. 138] in a launcher definition.
  The variable table shows 4 columns:

  - **Override marker**

    If you have overridden a variable by editing the value column, the first column will display a marker to indicate that that variable has been overridden. In that case, the reset button column will display a button to restore the original value.
  - **Variable name**

    Shows the name of the variable.
  - **Variable value**

    Shows the value of the variable. This column is editable. To override the variable, double-click on the desired cell in this column and edit the value. The override marker column and the reset button column will then show that the variable has been overridden.
  - **Reset button**

    If a variable has been overridden, this column shows a **[Reset]** button that allows you to restore the original value as defined on the Compiler Variables tab [p. 97] .

  Overriding compiler variables on a per-media file basis is also possible from the command line [p. 353] and from the ant task [p. 357] .
- **Media file name**

  The file name pattern defined in the Media File Options tab [p. 93] determines the actual name of the media file. If you want to override that pattern, you can enter an individual name here. To enter an individual name, select the `custom name` radio button and enter a file name in the text field below it.
- **Principal language**

  By default, the language used by an installer is governed by the setting on the Languages [p. 91] tab. If you would like to generate installers with fixed languages, you leave those settings at their default values and override the principal language and custom localization file here.

  You can change the principal language for all media files or on a per-media file basis from the command line [p. 353] or from the ant task [p. 357] by defining the variable `LANGUAGE_ID` with the 2-letter ISO code of the desired language (see https://www.w3.org/WAI/ER/IG/ert/iso639.htm).
- **Exclude components**

  Here, you can select components that should **not** be distributed by selecting their attached check boxes. This is useful if you have installation components that do not work with specific media files, such as a Windows-only extension, for example.

- **Include downloadable components**

  Sometimes, you want to create media files where installation components are included, that have been marked as downloadable [p. 117] for the entire project. This screens list all downloadable installation components as a flat list. All selected components are included in this media file. For example, this is useful if you want to offer a net installer and a full offline installer where some components should remain downloaded. For the media file of the full offline installer, you can mark all required components as included on this step.

- **Exclude files**

  This step is useful to tailor your distribution to platform-specific needs. The distribution tree is shown in **expanded form** and shows all files. This is unlike the distribution tree in the Files step [p. 103] which shows the **definition** of the distribution tree.

  Each file and subdirectory has a check box attached. If you select that check box, the entry will **not** be distributed. Selections of subdirectories are recursive. If you select a subdirectory, its contents are hidden from the tree since they will be excluded anyway.

- **Exclude launchers**

  This step is complementary to the "Exclude files" screen where launchers are not shown. Each launcher has a check box attached. If you select that check box, the launcher will **not** be generated.

- **Exclude installer elements**

  If you some installer applications, screens or actions should not be included with this media file, you can exclude those elements by selecting their attached check boxes in the tree of installer elements. Note that for more complex cases you can also skip screens by entering a condition property for screens [p. 163] and actions [p. 177] .

  https://www.ej-technologies.com/download/install4j/changelog.html For archives, only custom installer applications are shown, since installer and uninstaller are not present for archives.

- **Auto-update options**

  In this step you can override project-level settings [p. 316] for the creation of the update descriptor file `updates.xml`. If you add a files with comments, they will either override the files in the project-level configuration, or - if there is no project-level comment - set a comment for this media file only. The files with comments must be encoded in **UTF-8**. If you define attributes, they will override attributes with the same name in the project-level configuration or add new attributes for this media file only. Minimum and maximum updatable versions can also be overridden.

  If you discontinue certain media files, you will probably still want to add entries into the update descriptor file `updates.xml`, so that auto-updaters of installed applications that were installed by a discontinued media file can still download a new version. In that case, you can enter the IDs of the discontinued media files. For each ID, an update descriptor entry that mirrors that of the current media file will be added to the update descriptor. Auto-updaters from discontinued media files will then be redirected to download the current media file.

B.6.4.6 Media File Wizard: 32-bit Or 64-bit (Windows Only)

This step of the media file wizard [p. 329] is specific to Windows media file types.

On Windows, a native executable can be either a 32-bit or a 64-bit executable. If you need a 64-bit JRE for your application you can choose to generate 64-bit installers and launchers for a media file.

Note that it is not possible to create launchers that work with both 64-bit and 32-bit JREs. Since the launcher starts the JVM with the JNI interface by loading the JVM DLL, the architecture has to be the same. If you target both 32-bit and 64-bit JREs and operating systems, you have to generate different media files for them.

On a 64-bit Windows, there are separate system directories for 32-bit and 64-bit applications. If you enable the 64-bit executable mode in this step, those system directories will be appropriate for 64-bit applications, e.g. `c:\Program Files` instead of `c:\Program Files (x86)`.

B.6.4.7 Media File Wizard: Executable Processing

In this step of the media file wizard [p. 329] you can optionally configure an external command that is run for each generated executable.

The install4j compiler can invoke a post-processor for each executable that is generated. This includes

- generated launchers
- the installer
- the uninstaller

In the post processor text field you can use the `$EXECUTABLE` variable to reference the executable that is currently being post-processed. The working directory of the executed process is the directory your config is located in so you can use relative file names for key or certificate files. If the signing command cannot replace the executable directly, but rather needs a separate output file, use the `$OUTFILE` variable. It will receive a temporary output file name that will be moved back to the processed executable by install4j after the post processor has completed.

Prior to install4j 5.1, this facility was use for code signing, which is now implemented directly in install4j and can be configured on the code signing tab [p. 95] of the general settings section.

B.6.4.8 Media File Wizard: Launcher (macOS Single Bundle Only)

This step of the media file wizard [p. 329] is specific to single bundle media file types for macOS.

A macOS single bundle media file supports a single launcher only. Please choose a launcher from the drop-down list of defined launchers. Only GUI launchers are shown.

Note: external launchers are not supported for single bundles and are not shown in the list of launchers.

B.6.4.9 Media File Wizard: 64-bit Settings (macOS Only)

This step of the media file wizard [p. 329] is specific to macOS media file types.

Since macOS 10.6 (Snow Leopard), the default JRE is a 64-bit JRE. Prior to 10.6, 32-bit JREs were the default. If your application loads native 32-bit libraries, it will not be able to run with a 64-bit JRE. In that case, you have to deselect the "Allow 64-bit JREs" option in order to force the launcher to select a 32-bit JRE.

B.6.4.10 Media File Wizard: Additional Files In DMG (macOS Only)

This step of the media file wizard [p. 329] is specific to macOS media file types.

By default, the disk image created by install4j contains

- the installer for the installer media file types
- the application bundle of the selected GUI launcher for single bundle archives
- the distribution tree for folder archives

To add more files to the DMG, specify them on this screen. There are two types of files that can be created:

- **Regular files**

  You select the file from your local file system and specify the name under which is should be written to the DMG. The name can be a composite path, like `.background/image.png`. In this example the screen `.background` will be created and since it starts with a dot, it is hidden in the Finder.
- **Symbolic links**

  You enter the target of the symbolic link (like `/Applications`) and the name of the link. Quotes around the name are stripped, so you can specify an empty name as a single space in quotes (" "). An empty name is appropriate for a link to the `/Applications` directory.

You can use this feature for adding a `README.txt` file to the DMG or for adding files that will be used for styling the Finder window that is shown when the DMG is mounted. For more information about DMG styling, read the corresponding help topic [p. 61] .

B.6.4.11 Media File Wizard: DMG Options (macOS Only)

This step of the media file wizard [p. 329] is specific to macOS media file types.

For **installers media file types**, you can configure the following properties:

- **Volume name**

  When the user double-clicks on the DMG in the Finder, it is mounted and displayed in a new window. Other Finder windows will show the volume name of the DMG in their side bars and a link to the mounted DMG will be shown on the desktop. This name should be shorter than the installer name, so by default it is set to the short name of the project.

- **Installer name**

  The name of the installer in the DMG is what the user sees when the DMG is mounted. Note that this is not the file name of the DMG, that name is is defined by the general media file settings [p. 93] and possibly by the overridden media file name [p. 338] for the current media file.

  Since the installer is an application bundle, the name of the installer is localizable, just like the names of launchers [p. 134] and installer applications. To use the localization feature, specify an i18n variable for the installer file name. The actual file name is evaluated in the context of the principal language, and for each additional language a localized version is written to the corresponding localization files in the installer application bundle. If the locale of the user matches one of the additional languages, that name will be displayed in the Finder instead of the real file name.

- **Compression**

  While DMGs for archive media file types are compressed by default, most files that are part of the installer are already compressed and the benefit of an additional compression of the entire DMG is small. On the flip-side, a compressed DMG takes longer to open. That is why DMGs for installer media file types are not compressed by default. If you add large uncompressed files on the custom code and resources step [p. 312] , you may want to enable compression.

For **archive media file types**, the "Installer name" and "Compression" settings are not available.

B.7 Step 6: Build

B.7.1 Step 6: Build The Project

In the **Build step**, all defined media files [p. 326] are generated. There are three different build modes:

- **Regular build**

  Build the media files and place them in the media file output directory [p. 93] .

- **Dry run**

  Build the media files in the temporary directory only. This mode allows you to check whether your configuration is ok while not making any changes to your file system.

- **Test installer**

  This build mode is intended for testing changes that you make in the installer configuration [p. 145] , such as adding, removing or modifying screens, actions and form components.

  The action looks for the first media file in the media step [p. 326] that can be run on the current platform and has an installer media file type [p. 327] . The media file must be already built, otherwise the action will terminate with an error message.

  All scripts are recompiled and the installer configuration files are regenerated. The installed files are taken from the full build of the media file. If you change the definition of the distribution tree [p. 104] and expect to see these changes in the installer, you have to rebuild the media file with a regular build.

  At the end, the installer is started, so you can try out your changes immediately. With respect to a full build, the compilation time is reduced substantially to a couple of seconds, while a full build can take several minutes, depending on the amount of files that are included and the selected type of compression.

When a build or a test build is started, important status messages are displayed in the text area labeled `build output`. A progress bar appears in the status bar of install4j's main menu which indicates what percentage of the total build has been completed so far. The build process is asynchronous, so you can change to other steps while it is running. The status bar will inform you when the build process has finished.

With the `Build selection` section you can choose which media files should actually be built. This can be useful for testing purposes, or if you have defined media files that should not be built by default.

With the standard setting, all media files will be built. If you select the radio button `build selected`, only the media files that are selected in the adjacent list will be built.

These settings are persistent and are saved in your project file, however, when you build from the command line, your build selection will be ignored unless you specify a special parameter. Please see the help on the command line compiler options [p. 354] for further details.

Also, have a look at the available build options [p. 346] .

B.7.2 Build Options

The following options are available for the build process [p. 346] :

- **Enable extra verbose output**

  If this option is checked, much more information than usual will be printed in the build output text area. This can be useful for getting more information about the reason of a build failure.
- **Do not delete temporary directory**

  If this option is checked, the temporary directory where install4j creates the project is not deleted after completion or failure. This can be useful for trouble shooting.
- **Disable LZMA and Pack200 compression**

  If this option is checked and either LZMA or Pack200 compression have been enabled for this project on the media file options tab [p. 93] , these compressions will be disabled for the build. This is useful during testing, since without LZMA and Pack200 compression, the build will complete much faster.
- **Disable code signing**

  If this option is checked and code signing is configured on the code signing [p. 95] , code signing will be disabled for the build. This is useful during testing to avoid entry of key store passwords.
- **Create additional debug installer**

  If this option is checked, directories with debug installers will be created in the media file output directory that allow you to execute the installer as well as the uninstaller with a plain Java invocation from the command line as well as from your IDE. Please see the API documentation [p. 81] for more information.

B.8 JRE Download Wizard

The JRE download wizard lets you download JREs from ej-technologies' servers for easy bundling with your applications. For more information on JRE bundles and on how they are used by install4j, please see the corresponding help topic [p. 41] .

The JRE download wizard is started by

- clicking on the toolbar button of the main window.
- clicking on **[JRE download wizard]** in the Bundled JRE [p. 336] step of the media file wizard [p. 329] .

The JRE download wizard leads you step by step through the process of connecting to the server, choosing the desired JREs and downloading them to your local disk.

The "Connection" step allows you to configure a proxy, with an optional proxy authentication. Note that the password will not be saved in the install4j configuration, you will have to reenter it each time you run the JRE download wizard.

ej-technologies offers JREs for a number of common platforms. The Windows JREs whose names end with `_us_only` do not include support for non-English locales.
If you wish to bundle a JRE that is not available from ej-technologies' download server or that has custom modifications (like an installation of the `javax.comm` API), please see the JRE bundle creation wizard [p. 349] on how to create your own JRE bundle.

B.9 JRE Bundle Wizard

With the JRE bundle wizard you can create JRE bundles for install4j from any JRE installation on your disk. For more information on JRE bundles and on how they are used by install4j, please see the corresponding help topic [p. 41] .

Please check first, if one of the JREs provided by ej-technologies' JRE download server [p. 348] fits your needs.

Note that JRE bundles can only be created on the platform where they are intended to run. For example, it is not possible to create a Linux JRE bundle on Windows. You have to install install4j on a Linux machine and run the JRE bundle creation process there.

The JRE bundle wizard is started by choosing `Project->Create a JRE Bundle` from install4j's main menu. The JRE bundle wizard leads you step by step through the process of choosing the desired JRE and creating an install4j bundle from it:

- **Select JRE**

  In the "Select JRE" step of the wizard you select the Java home directory of the JRE. It is possible to select a JDK, however, after a confirmation dialog the bundle will be created from the included JRE.
- **Output directory**

  By default, the JRE bundle file is saved to the `jres` directory in your install4j installation directory. If that directory is not writable, the `.install4j7/jres` directory in your home directory is used. Bundles in the default directory will be suggested by the IDE.

  You can also save your bundle to any other directory and use the **Manual entry** option in the Bundled JRE step [p. 336] of the media wizard to select the bundle file.
- **Bundle file name**

  The file name of the bundle is auto-generated and is used by the install4j IDE to suggest suitable JRE bundles in theBundled JRE step [p. 336] of the media wizard. You can customize the following components of the file name:

  - **Java version**

    Enter the version of the JRE. This is useful if you would like to use a version without patch level information, such as `9.0`.
  - **Custom ID**

    This should be short identifier that will be presented in the IDE in order to differentiate multiple bundles with the same architecture and Java version.

  The version and the custom ID are used to construct the name of the bundle file. The format of the name is important for the IDE to recognize the file as a bundle and determine its scope.

To automate the JRE bundle creation, you can use the command line utility `createbundle[.exe]` in the `bin` directory of your install4j installation. The bundle creation tool is invoked as follows:

```
createbundle [OPTIONS] [JRE home directory]
```

The available options are:

- **-h or --help**

  Displays a quick help for all available options.

- **-o or --output**

  The directory where the bundle file will be created. If you do not specify this option, the default bundle directory of install4j will be used.

- **-v or --version**

  The version string for the JRE. If you do not specify this option, the JRE will be queried for the version, for example "9.0.3". If you want to use a shorter version number like "9.0", you can use this option.

- **-i or --id**

  The custom ID of the JRE as described above. If you do not specify this option, it will be set to the empty string. This is only required if you have multiple bundles with the same architecture and Java version. This id becomes part of the name of the bundle file.

- **-u or --unpacked**

  If this flag is specified, the JAR files are not packed with the Pack200 algorithm. This makes the JRE bundles substantially larger. Unpacked JRE bundles are required for single bundle archives on macOS, where signature requirements prevent any modifications in the installed application bundle.

Creating a JRE bundle from your ant script (read about ant at ant.apache.org) is easy. Just use the `createbundle` task that is provided in `$INSTALL4J_HOME/bin/ant.jar` and set the `javahome` parameter to the JRE that you want to create a bundle for.

To make the `createbundle` task available to ant, you must first insert a `taskdef` element that tells ant where to find the task definition. Here is an example of using the task in an ant build file:

```
<taskdef name="createbundle"
         classname="com.install4j.CreateBundleTask"
         classpath="C:\Program Files\install4j\bin\ant.jar"/>

<target name="media">
  <createbundle javahome="c:\Program Files\Java\jre6"/>
</target>
```

The `taskdef` definition must occur only once per ant-build file and can appear anywhere on the top level below the `project` element.

Note: it is **not possible** to copy the `ant.jar` archive to the `lib` folder of your ant distribution. You have to reference a full installation of install4j in the task definition.

The `createbundle` task supports the following parameters:

Attribute	Description	Required
javahome	The home directory of the JRE that should be bundled	Yes
outputDirectory	The output directory	Corresponds to the `--output` command line option described above.
version	Corresponds to the `--version` command line option described above.	No

Attribute	Description	Required
id	Corresponds to the `--id` command line option described above.	No
unpacked	Corresponds to the `--unpacked` command line option described above.	No

Example:

```
<createbundle javahome="/usr/lib/jvm/jre-9.0.4/jre"
              output="/home/build/projects/myproject/jrebundles"
              version="9.0"
              id="j3d"
/>
```

B.10 Preferences Dialog

The preferences dialog is displayed by clicking `Project->Preferences` in install4j's main menu.

The preferences dialog has two panels:

- **Appearance**

  Here, you can select a look and feel for the install4j IDE. This does not affect generated installers, they always use the native look and feel. The newly selected look and feel will be used when install4j is started the next time.

- **Miscellaneous**

  In the `Startup` section of this tab you can specify that install4j should load the last edited project at startup. If this option is not selected, install4j starts with a blank screen. If you specify a project file at the command line, that project will be loaded in any case.

  In the `Browser section` section of this tab, the browser start command for your preferred browser can be adjusted. Use `$URL` as a variable for the URL to be displayed. This setting is important for generating project reports [p. 7] . If you leave the text box empty, install4j will use the system defaults on Windows and macOS and try to invoke `netscape` on Linux and Solaris.

B.11 Command Line Compiler

B.11.1 Command Line Compiler

install4j's command line compiler `install4jc[.exe]` can be found in the `bin` directory of your install4j installation. It operates on project files with extension `.install4j` that have been produced with the install4j IDE. (`install4j[.exe]`). The install4j command line compiler is invoked as follows:

```
install4jc [OPTIONS] [config file]
```

The available options are described here [p. 354] . A quick help for all options is printed to the terminal when invoking

```
install4jc --help
```

In order to facilitate usage of install4jc with automated build processes, the destination directory [p. 93] for the media files and the application version [p. 88] can be overridden with command line options [p. 354] . Furthermore you can achieve internationalization and powerful customizations with compiler variables [p. 28] . As a last resort, since the file format of install4j's config files is xml-based, you can achieve arbitrary customizations by replacing tokens (see the ant integration help page [p. 357] for an example) or by applying XSLT stylesheets to the config file.

B.11.2 Options For The Install4j Command Line Compiler

The install4j command line compiler [p. 353] has the following options:

- **-h or --help**

  Displays a quick help for all available options.

- **-V or --version**

  Displays the version of install4j in the following format:

  ```
  install4j version 2.0, built on 2003-10-15
  ```

- **-v or --verbose**

  Enables verbose mode. In verbose mode, install4j prints out information about internal processes. If you experience problems with install4j, please make sure to include the verbose terminal output with your bug report.

- **-q or --quiet**

  Enables quiet mode. In quiet mode, no terminal output short of a fatal error will be printed.

- **-t or --test**

  Enables test mode. In test mode, no media files will be generated in the media file directory.

- **-i or --incremental**

  Enables incremental test execution. A test installer [p. 346] for the current platform is updated with the latest screens, actions and form components and executed immediately. Because the files are taken from a previously built media file, the compilation is very fast.

- **-g or --debug**

  Create additional debug installers for each media file. For each built media file, a directory that is named like the media file will be created in the media file output directory.

- **-p or --preserve**

  Do not delete the temporary directory that the compiler uses for staging all files and launchers.

- **-n or --faster**

  Disable LZMA and Pack200 compression. If you have enabled LZMA or Pack200 compression on the media file options tab [p. 93] , this allows you to create development builds much faster, since LZMA and Pack200 are expensive compression algorithms.

- **-u or --disable-signing**

  Disable code signing. If you have configured code signing [p. 95] , this allows you to skip code signing for a build. In that case you do not have to enter the passwords for the key stores.

- **-j or --disable-bundling**

  Disable JRE bundling. If you have configured JRE bundles [p. 95] for any media files, those bundles will not be used and the installer will be built without a contained JRE. This speeds up the build and the installation.

- **--win-keystore-password**

  Set the Windows keystore password for the private key that is configured for code signing [p. 95] . If code signing is enabled for Windows media files and this option is not set, the command line compiler will prompt you for the password.

- **--mac-keystore-password**

  Set the macOS keystore password for the private key that is configured for code signing [p. 95] . If code signing is enabled for macOS media files and this option is not set, the command line compiler will prompt you for the password.

- **-L or --license=KEY**

  Update the license key on the command line and exit. This is useful if you have installed install4j on a headless system and cannot start the GUI. `KEY` must be replaced with your license key. If you use floating licenses, replace `KEY` with `FLOAT:server` where "server" is the host name or IP address where the floating license server is installed. For floating licenses, you can choose the requested edition by passing `--windows-edition` or `--multi-platform-edition`.

- **-r STRING or --release=STRING**

  Override the application version defined in the General Settings step [p. 88] . `STRING` must be replaced with the desired version number. Version number components can be alphanumeric and should be separated by dots, dashes or underscores.

- **-d STRING or --destination=STRING**

  Override the output directory for the generated media files. `STRING` must be replaced with the desired directory. If the directory contains spaces, you must enclose STRING in quotation marks.

- **-s or --build-selected**

  Only build the media files which have been selected in the install4j IDE. By default, all media files are built regardless of the selection in the Build step [p. 346] .

- **-b LIST or --build-ids=LIST**

  Only build the media files with the specified IDs. `LIST` must be replaced with a comma separated list of numeric IDs. The IDs for media files can be shown in the install4j IDE by choosing `Project->Show IDs` from the main menu. Examples would be:

  ```
  -b 2,5,9
  --build-ids=2,5,9
  ```

- **-m or --media-types=T[,T]**

  Only build media files of the specified type. `T` must be replaced with a media file type recognized by install4j. To see the list of supported media types, execute `install4jc --list-media-types`. Examples would be:

  ```
  -m win32,macos,macosFolder
  --media-types=win32,macos,macosFolder
  ```

- **-D NAME=VALUE[,NAME=VALUE]**

  Override a compiler variable [p. 28] with a different value. You can override multiple variables by specifying a comma separated list of name value pairs. `NAME` must be the name of a variable that has been defined on the Compiler Variables tab [p. 97] of the General Settings step [p. 87] . The value can be empty.

  To override a variable for a specific media file definition only, you can prefix `NAME` with `ID:` to specify the ID of the media file. The IDs for media files can be shown in the install4j IDE by choosing `Project->Show IDs` from the main menu.
  Examples would be:

  ```
  -D MYVARIABLE=15,OTHERVARIABLE=
  "-D MYVARIABLE=15,OTHERVARIABLE=test,8:MEDIASETTITLE=my title"
  ```

  A special system variable that you can override from the command line is `sys.languageId`. `sys.languageId` must be set to the ISO code of the language displayed in the Language selection dialog [p. 99] and determines the principal installer language [p. 91] for the project or the media file.

- **-f or --var-file**

  Load variable definitions from a file. This option can be used together with the `-D` option, which takes precedence if a variable occurs twice. The file can contain

  - **variable definitions**

    One variable definition per line of the form `NAME=VALUE`.
  - **blank lines**

    blank lines will be ignored.
  - **comments**

    lines that start with # will be ignored.

  The file is assumed to be encoded in the UTF-8 format. Should you require a different encoding you can prefix the filename with `CHARSET:`, where CHARSET is replaced with the name of the encoding.

  Instead of a single variable file you can also specify a list of files separated by semicolons. The optional charset prefix must be specified for each file separately.
  Examples would be:

  ```
  -f varfile.txt
  --var-file=ISO-8859-3:varfile.txt
  --var-file=one.txt;two.txt
  --var-file=ISO-8859-3:one.txt;ISO-8859-1:two.txt
  ```

- **-M or --list-media-types**

  Prints out a lists of supported media types for the `--media-types` option and quits.

B.11.3 Using Install4j With Ant

Integrating install4j with your ant script (read about ant at ant.apache.org) is easy. Just use the `install4j` task that is provided in `$INSTALL4J_HOME/bin/ant.jar` and set the `projectfile` parameter to the install4j project file that you want to build.

To make the `install4j` task available to ant, you must first insert a `taskdef` element that tells ant where to find the task definition. Here is an example of using the task in an ant build file:

```
<taskdef name="install4j"
         classname="com.install4j.Install4JTask"
         classpath="C:\Program Files\install4j\bin\ant.jar"/>

<target name="media">
  <install4j projectfile="myapp.install4j"/>
</target>
```

On macOS, the `ant.jar` file is inside the application bundle, for the default application directory the full path is `/Applications/install4j.app/Contents/Resources/app/bin/ant.jar`

The `taskdef` definition must occur only once per ant-build file and can appear anywhere on the top level below the `project` element.

Note: it is **not possible** to copy the `ant.jar` archive to the `lib` folder of your ant distribution. You have to reference a full installation of install4j in the task definition.

The `install4j` task supports the following parameters:

Attribute	Description	Required
projectfile	The install4j project file that should be build.	Yes
verbose	Corresponds to the `--verbose` command line option [p. 354] . Either `true` or `false`.	No, verbose and quiet cannot **both** be `true`
quiet	Corresponds to the `--quiet` command line option [p. 354] . Either `true` or `false`.	
license	Corresponds to the `--license` command line option [p. 354] . If the license has not been configured yet, you can set the license key with this attribute.	Yes
test	Corresponds to the `--test` command line option [p. 354] . Either `true` or `false`.	No, test and incremental cannot **both** be `true`
incremental	Corresponds to the `--incremental` command line option [p. 354] . Either `true` or `false`.	
debug	Corresponds to the `--debug` command line option [p. 354] . Either `true` or `false`.	No
preserve	Corresponds to the `--preserve` command line option [p. 354] . Either `true` or `false`.	No
faster	Corresponds to the `--faster` command line option [p. 354] . Either `true` or `false`.	No

Attribute	Description	Required
disableSigning	Corresponds to the `--disable-signing` command line option [p. 354] . Either `true` or `false`.	No
winKeystorePassword	Corresponds to the `--win-keystore-password` command line option [p. 354] .	No
macKeystorePassword	Corresponds to the `--mac-keystore-password` command line option [p. 354] .	No
release	Corresponds to the `--release` command line option [p. 354] . Enter a version number like "`3.1.2`". Version number components can be alphanumeric and should be separated by dots, dashes or underscores.	No
destination	Corresponds to the `--destination` command line option [p. 354] . Enter a directory where the generated media files should be placed.	No
buildselected	Corresponds to the `--build-selected` command line option [p. 354] . Either `true` or `false`.	No
buildids	Corresponds to the `--build-ids` command line option [p. 354] . Enter a list of media file ids. The IDs for media files can be shown in the install4j IDE by choosing `Project->Show IDs` from the main menu.	No
mediatypes	Corresponds to the `--media-types` command line option [p. 354] . Enter a list of media types. To see the list of supported media types, execute `install4jc --list-media-types`.	No

Contained elements:

- The `install4j` task can contain `variable` elements. These elements override compiler variables [p. 28] in the project and correspond to the `-D` command line option [p. 354] . Definitions with `variable` elements take precedence before definitions in the variable file referenced by the `variablefile` parameter.

  The `variable` element supports the following parameters:

Attribute	Description	Required
name	The name of the variable. This must be the name of a variable that has been defined on the Compiler Variables tab [p. 97] of the General Settings step [p. 87] .	Yes
value	The value for the variable. The value may be empty.	Yes

Attribute	Description	Required
mediafileid	The ID of the media file for which the variable should be overridden. The IDs for media files can be shown in the install4j IDE by choosing `Project->Show IDs` from the main menu.	No

Example:

```
<install4j projectfile="myapp.install4j">
  <variable name="MYVARIABLE" value="15"/>
  <variable name="OTHERVARIABLE" value="test" mediafileid="8"/>
</install4j>
```

- The `install4j` task can contain `variablefile` elements. These elements read text files containing compiler variables definitions. They correspond to the `--var-file` command line option [p. 354]

  The `variablefile` element supports the following parameters:

Attribute	Description	Required
file	The path of the variable file.	Yes

- The `install4j` task can contain `vmparameter` elements. These elements set VM parameters for the install4j command line compiler process.

  The `vmparameter` element supports the following parameters:

Attribute	Description	Required
value	The value of the VM parameter.	Yes

  Example for setting an HTTP proxy (an internet connection is required for Windows code signing):

```
<install4j projectfile="myapp.install4j" winKeystorePassword="Kajjs7sgLg22">
  <vmparameter value="-DproxySet=true"/>
  <vmparameter value="-DproxyHost=myproxy"/>
  <vmparameter value="-DproxyPort=1234"/>
  <vmparameter value="-DproxyAuth=true"/>
  <vmparameter value="-DproxyAuthUser=buildServer"/>
  <vmparameter value="-DproxyAuthPassword=iq4zexwb8et"/>
</install4j>
```

The "hello" sample project includes an ant build script that shows how to setup the install4j task. To install the sample projects, invoke `Project->Open Sample Project` from the install4j IDE. When you do this for the first time, the sample projects are copied to the "Documents" folder in your home directory.

In the `samples/hello` directory, execute

```
ant media
```

to start the build. If you have not defined install4jHomeDir in `build.xml`, the build will fail with a corresponding error message.

B.11.4 Using Install4j With Gradle

You can start the install4j compiler from gradle with the install4j gradle plugin. To make the gradle plugin available to your build script, you have to add the ej-technologies repository to the class path of the build script and declare a dependency of the build script on the install4j plugin:

```
buildscript {
    repositories {
        maven {
            url 'https://maven.ej-technologies.com/repository'
        }
    }
    dependencies {
         classpath group: 'com.install4j', name: 'install4j-gradle', version: '6.0'
    }
}
```

Then you can apply the install4j plugin to your build script:

```
apply plugin: 'install4j'
```

The plugin has two parts: The global configuration with the top-level `install4j {...}` configuration block and tasks of type `com.install4j.gradle.Install4jTask`.

The global configuration block must specify the install4j installation directory:

```
install4j {
      installDir = file('/path/to/install4j_home')
}
```

On macOS, the installation directory is inside the application bundle, for the default application directory the full path is `/Applications/install4j.app/Contents/Resources/app`

In addition, the global configuration block can set defaults for the `install4j` tasks.

The `install4j` task supports the following parameters:

Attribute	Description	Required	Global
projectFile	The install4j project file that should be build.	Yes	No
variableFiles	Corresponds to the `--var-file` command line option [p. 354] . Specify the list of variable files with variable definitions.	No	No
variables	A map of variable definitions. These definitions override compiler variables [p. 28] in the project and correspond to the `-D` command line option [p. 354] . Definitions with `variable` elements take precedence before definitions in the variable file referenced by the `variableFiles` parameter. The names of the variables must have been defined on the Compiler Variables tab [p. 97] of the General Settings step [p. 87] . The values can be of any type, `toString()` will be called on each value to convert the	No	No

Attribute	Description	Required	Global
	value to a `java.lang.String`. For example: `[variableOne: 'One', variableTwo: 2]`.		
release	Corresponds to the `--release` command line option [p. 354] . Enter a version number like "`3.1.2`". Version number components can be alphanumeric and should be separated by dots, dashes or underscores.	No	No
destination	Corresponds to the `--destination` command line option [p. 354] . Enter a directory where the generated media files should be placed.	No	No
buildIds	Corresponds to the `--build-ids` command line option [p. 354] . Enter a list of media file ids. The IDs for media files can be shown in the install4j IDE by choosing `Project->Show IDs` from the main menu. For example: `[12, 24, 36]`.	No	No
verbose	Corresponds to the `--verbose` command line option [p. 354] . Either `true` or `false`.	No, verbose and quiet cannot **both** be `true`	Yes
quiet	Corresponds to the `--quiet` command line option [p. 354] . Either `true` or `false`.		Yes
license	Corresponds to the `--license`command line option [p. 354] . If the license has not been configured yet, you can set the license key with this attribute.	Yes	
test	Corresponds to the `--test` command line option [p. 354] . Either `true` or `false`.	No, test and incremental cannot **both** be `true`	Yes
incremental	Corresponds to the `--incremental` command line option [p. 354] . Either `true` or `false`.		Yes
debug	Corresponds to the `--debug` command line option [p. 354] . Either `true` or `false`.	No	Yes

Attribute	Description	Required	Global
preserve	Corresponds to the `--preserve` command line option [p. 354] . Either `true` or `false`.	No	Yes
faster	Corresponds to the `--faster` command line option [p. 354] . Either `true` or `false`.	No	Yes
disableSigning	Corresponds to the `--disable-signing` command line option [p. 354] . Either `true` or `false`.	No	Yes
disableBundling	Corresponds to the `--disable-bundling` command line option [p. 354] . Either `true` or `false`.	No	Yes
winKeystorePassword	Corresponds to the `--win-keystore-password` command line option [p. 354] .	No	Yes
macKeystorePassword	Corresponds to the `--mac-keystore-password` command line option [p. 354] .	No	Yes
buildSelected	Corresponds to the `--build-selected` command line option [p. 354] . Either `true` or `false`.	No	Yes
mediaTypes	Corresponds to the `--media-types` command line option [p. 354] . Enter a list of media types. To see the list of supported media types, execute `install4jc --list-media-types`.	No	Yes
vmParameters	A list of VM parameters for the install4j command line compiler process. For example: `['-DproxySet=true', '-DproxyHost=myproxy', '-DproxyPort=1234', '-DproxyAuth=true', '-DproxyAuthUser=buildServer', '-DproxyAuthPassword=iq4zexwb8et']` sets an HTTP proxy that is required for code signing.	No	Yes

The "Global" column shows if a parameter can also be specified in the global `install4j {...}` configuration block. Definitions in the task override global definitions.

Simple example:

```
install4j {
    installDir = file('/opt/install4j')
}
task media(type: com.install4j.gradle.Install4jTask) {
```

```
      projectFile = file('myProject.install4j')
  }
```

Larger example:

```
  if (!hasProperty('install4jHomeDir')) {
      File propertiesFile =
file("${System.getProperty('user.home')}/.gradle/gradle.properties")
      throw new RuntimeException("Specify install4jHomeDir in $propertiesFile")
  }

  boolean dev = hasProperty('dev')

  install4j {
      installDir = file(install4jHomeDir)
      faster = dev
      disableSigning = dev
      winKeystorePassword = 'supersecretWin'
      macKeystorePassword = 'supersecretMac'

      if (dev) {
          mediaTypes = ['windows']
      }
  }

  task media(type: com.install4j.gradle.Install4jTask) {
      dependsOn 'dist' // example task that prepares the distribution for install4j

      projectFile = 'myProject.install4j'
      variables = [majorVersion: version.substring(0, 1), build: 1234]
      variableFiles = ['var1.txt', 'var2.txt']
  }
```

The "hello" sample project includes a gradle build script that shows how to setup the install4j task. To install the sample projects, invoke `Project->Open Sample Project` from the install4j IDE. When you do this for the first time, the sample projects are copied to the "Documents" folder in your home directory.

In the `samples/hello` directory, execute

```
    gradle media
```

to start the build. If you have not defined install4jHomeDir in `gradle.properties` next to `build.gradle`, the build will fail with a corresponding error message.

B.11.5 Using Install4j With Maven

You can start the install4j compiler from maven with the install4j maven plugin. The maven plugin is developed by Sonatype. Please see the external project site for more information. The source code is available on github.

B.11.6 Using Relative Resource Paths

If you would like to use relative paths for splash screen images, icon files, directories and other external resources, (e.g. for automated build processes in distributed environments) you can choose "`make all paths relative when saving project file`" on the Project Options tab [p. 98] of the General Settings step [p. 87] .

Note: relative paths are always interpreted relative to the location of the project file.

B.12 Launcher API

B.12.1 Controlling The Splash Screen From Your Application

If you have enabled a splash screen [p. 129] for a launcher, you will want to hide it once the application startup is finished. The splash will be hidden automatically as soon as your application opens the first window.

However, you might want to hide the splash screen programmatically or update the contents of the status text line on the splash screen during the startup phase to provide more extensive feedback to your users.

With the install4j launcher client API you can

- **Hide the splash screen programatically**

  Invoke the static method `com.install4j.api.launcher.SplashScreen.hide()` as soon as you wish to hide the splash screen.
- **Update the status text line**

  Invoke the static method `com.install4j.api.launcher.SplashScreen.writeMessage(String message)` to change the text in the status line.

install4j's launcher client API is automatically available to an application deployed with install4j. For compiling your application, you need to add `i4jruntime.jar` to the classpath. `i4jruntime.jar` can be found in the `resource` directory of your install4j installation.

B.12.2 Receiving Startup Events In Single Instance Mode

If you have enabled the single instance mode [p. 123] for your executable, the application can only be started once. For a GUI application, the existing application window is brought to front when a user executes the launcher another time.

However, you might want to receive notifications about multiple startups together with the command line parameters. If you have associated you executable with a file extension, you will likely want to handle multiple invocations in the same instance of your application. Alternatively, you might want to perform some action when another startup occurs.

With the install4j launcher client API you can write a class that implements the `com.install4j.api.launcher.StartupNotification.Listener` interface and register it with `com.install4j.api.launcher.StartupNotification.registerStartupListener(Listener startupListener)`. Your implementation of `startupPerformed(String parameters)` of the `Listener` interface will then be notified if another startup occurs.

install4j's launcher client API is automatically available to an application deployed with install4j. For compiling your application, you need to add `i4jruntime.jar` to the classpath. `i4jruntime.jar` can be found in the `resource` directory of your install4j installation.