Digitize business processes successfully

Accelerate digital transformation with the X4 BPMS low code platform

X4 BPM

SoftProject

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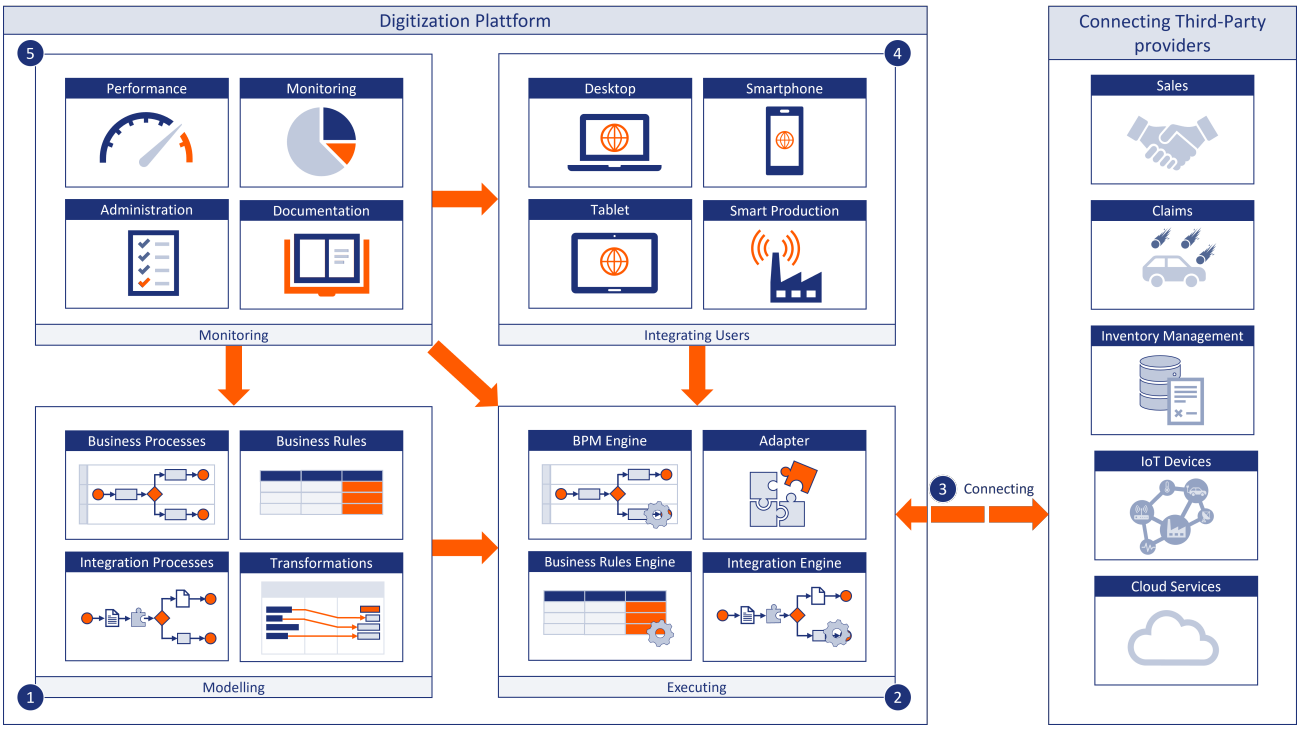
About the X4 BPMS

Digitalization requires a holistic approach, which presupposes that also the used solution has to reflect that. X4 BPMS supports you as a central platform in solving these challenges. The focus is on modeling, implementing and monitoring your business processes. Therefore, the X4 BPMS contains all necessary tools and is compatible with a variety of interfaces and formats. That helps to avoid isolated information silos and media breaks that inhibit productivity, and accelerate digitization at the same time.

Implementing business processes without programming effort enables a large number of users to enter into the management of business processes. That's important, since employees of the specialist department usually know best what is important in the respective business processes. Therefore, you should rely on the X4 BPMS as a platform whose tools reduce complexity to such an extent that business processes can be analyzed, optimized, modeled, as well as controlled and documented even without programming knowledge. All tools support integrated, graphical process modeling and implementation and generate processes that are executed by the X4 BPMS with high performance.

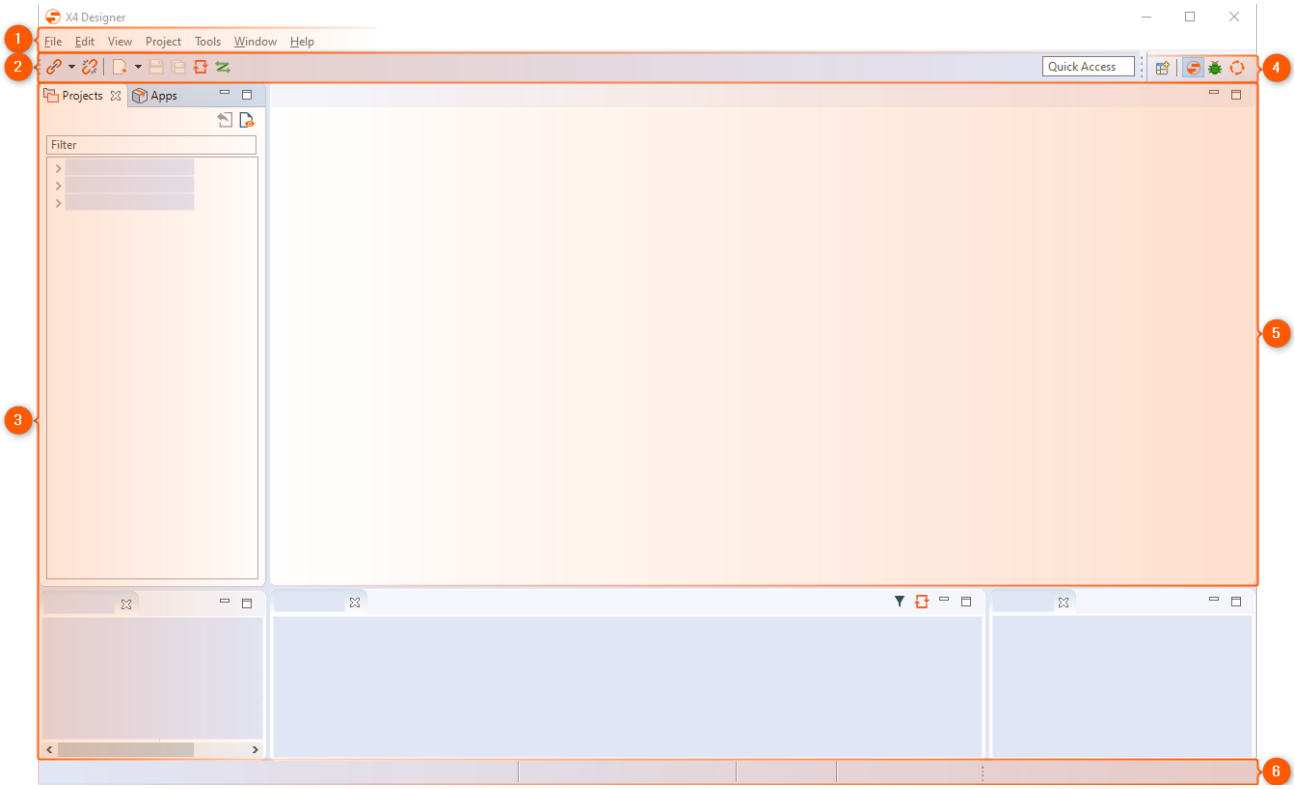
- **X4 Designer:** Modelling processes and rules graphically
- **X4 Server:** Simulating and executing processes and rules
- **X4 Adapter:** Integrating third-party systems into processes
- **X4 Activities**: Providing web apps for employees and customers



Target audience of this documentation

This document is intended for all users who want to capture, model and optimize their business processes with the X4 BPMS. With its modelling tool, X4 Designer, the X4 BPMS offers the internationally established standard BPMN 2.0 (Business Process Model and Notation). Moreover, the documentation explains the basic principles of modeling business processes with the X4 BPMS and how to use the X4 Designer and its various tools.

1 Interface



1	**Menu bar**	The menu bar allows to open various functions and editors of the X4 Designer.
2	**Toolbar**	The toolbar offers different functions and display options. Some symbols are only active, if the corresponding function is available for the selected or opened element, see also Toolbar.
3	**Views**	Views can be arranged individually via drag-and-drop.
4	**Perspectives**	Switch between X4 Designer and BPMN Designer perspective.
5	**Editors and workspace**	Processes and files are opened here for editing in tabs.
6	**Status bar**	The status bar displays the connected server, the logged-in user and the version.

1.1 Toolbar

Various functions and display options can be called up via the toolbar. Some icons are only active if the relevant function is available for the selected or opened element.

	Connect	Connect to the server
	Disconnect	Disconnect from the server
	New	Add new element The insert option varies depending on where you are in the tree structure in the Repository Navigator.
	Save	Save changes in the currently opened window
	Save all	Save all changes
	Repository Refresh	Perform server-side update
/	*Attach/Detach Debug*	Attach debugger to server instance / Detach debugger from server instance
	Start Debugging	Start Debugger
	Undo	Undo last editing step
	Redo	Restore undone step
	Cut	Cut selection
	Copy	Copy selection
	Paste	Paste selection
	Start Debugging	Call up options for process execution • `Start Debugging`: debug process (show and fix errors) • `Start Without Debugging`: Execute process directly • `Debug/Run Options`: Open Run/Debug settings in X4 Designer
	Suspend	Stop debugging process
	Resume	Continue debugging process
	Stop Debugging	Terminate debugging

	Step Into	Execute process step (display steps of the subprocess)
	Step Over	Execute process step (without displaying steps of the subprocess)
	Step Return	Jump out of subprocess
	Toggle Breakpoint	Set or remove breakpoint for marked element
	Clear all Breakpoints	Delete all breakpoints in this process
	Quick Watch	Open Quick Watch view to view placeholders, dynamic parameters and context variables with their values during debugging.
	Output	Open Output view to view the result of each process step during debugging.
	Zoom Out	Zoom out view
100%	*Zoom*	Select zoom level
	Zoom In	Zoom view
	Snap to grid	Display grid and align elements to grid
	Show Process Quality Index	Display Process Quality Index

1.2 Context Menu

Context menu for process components

When you right-click a process component in the X4 Designer's editor area, you have access to different features – depending on the component type and the:

Add Component	Add new process component

Layout	Align selected process components • `Align Horizontal`: Align the process components horizontally • `Align Vertical`: Align the process components vertically • `Distribute Horizontal`: Distribute the process components horizontally • `Distribute Vertical`: Distribute the process components vertically
Select All	Select all process components
Copy Process Diagram to Clipboard	Copy the process diagram
Edit Label...	Edit the process component's label
Undo ...	Undo the last editor action
Redo ...	Redo a previously undone editor action
Copy	Copy a selected process action
Cut	Cut selected process action
Set ... document	Replace a marked process component with another repository element
Edit ...	Edit a selected process component (module components and documents only)
Toggle Breakpoint	Set a debug breakpoint for the selected process action
Delete	Delete a selected process component from the process diagram
Validate	Check the subprocess' validity (subprocesses only)
Preview	Open process component in a separate editor tab (Module components and documents only)
Show input schema	Display input schema assigned to the sub-process, if available
Show output schema	Display output schema assigned to the sub-process, if available
Select in Repository Navigator	Show process component in the **Repository Navigator**
View Call Hierarchy	Display the processes using the selected process component
Refresh	Reload a selected process component from the repository (Module components and documents only)
Bring to Front	Bring a selected symbol to the foreground of the diagram

Bring Forward	Bring a selected symbol one level up towards foreground
Send Backward	Bring a selected symbol one level down towards background
Send to Back	Bring a selected symbol to the background of the diagram
Properties	Display process component properties in the Properties view
Schema Declaration ...	Specify schema declaration for the process

Context menu in the Projects view

You can open the context menu by right-clicking on an element within the **Projects** view.

New	Create new elements (processes, directories, adapters, etc.) in the repository
Open / Open with	Open the selected element (process, folder, adapter etc.) with the default editor or a specific editor
Save As Template	Saves the selected element as template
Copy full path to Clipboard undCopy XStore URL to Clipboard	Copy the path of the selected element to the clipboard (as relative folder path or as `xstore://` URL)
Cut, Copy and Paste	Cut, copy, or pastes the selected element(s)
Delete	Delete selected element from the repository (irreversible)
Refactor/Rename	Rename an element (and change references, if desired)
Exclude from Project	Exclude the resource from the project ⓘ • The file will remain in the file system, but is no longer part of the project and is grayed out. • The usual operations such as opening, editing, copying, deleting, etc. of excluded files are disabled.
Include to Project	Include an excluded resource to the project
Repair References	Repair incorrect repository resource paths in process diagrams
Validate	Check the selected process's validity
View Call Hierarchy	Display the processes that use the selected elements
Start Without Debugging	Run process directly
Import	Import resource to the repository
Export	Export project or resource
Clean-Up Project	Select and delete unused files from the repository

1.3 Perspectives

A perspective is a defined arrangement of views and the editor area. The arrangement of the views can be defined by drag-and-drop.

X4 Designer	The X4 Designer perspective is the default perspective.
Debug	The Debug perspective is an optimized perspective to debug business and technical processes.
BPMN Designer	The BPMN Designer perspective is an optimized perspective to model business processes.

1.3.1 Switching perspectives

In X4 Designer, you can switch between perspectives. The arrangement of the views is kept.

- To change the perspective, click on the icon of the desired perspective in the upper right corner.

1.3.2 Reseting perspectives

1. To reset a perspective, switch to the perspective.
2. Select **Window > Reset Window Layout** in the menu bar.

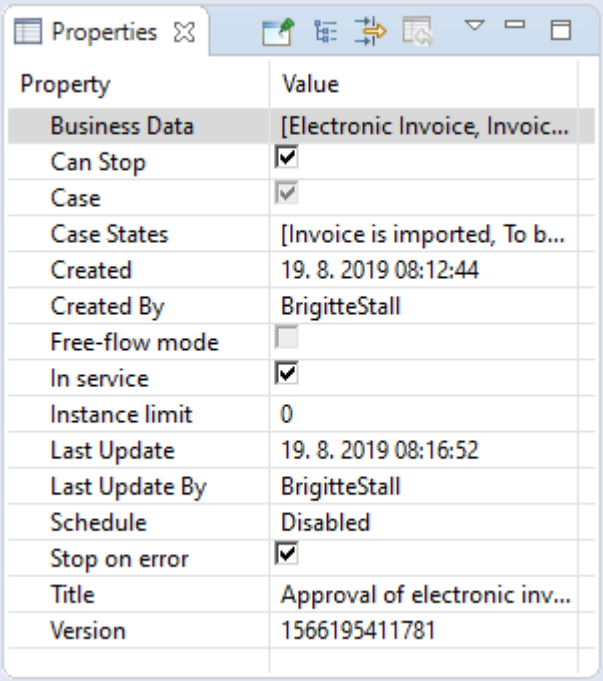
1.4 Views

Projects	The Projects view displays a tree structure of the connected repository with various elements such as projects, folders and files. The context menu can be opened by right-clicking on an element in the Projects view. The available options change depending on where in the tree structure the context menu is called. The **Filter** text field above the project tree can be used to search for files within the connected repository. Placeholder like * or ? are not possible. The following actions can be performed using various buttons: • *Jump from active Editor to Repository Navigator*: Highlight opened file in the editor within the Repository Navigator. • *Show or hide all files*: Show and hide contents of the file system. Files excluded from the project are grayed out.
Apps	The Apps view displays all X4 Apps that are used to bundle projects.

Properties

In the Properties view, the properties of selected process modules and of opened processes can be displayed and edited:

- The left column displays the property name, the right column contains the corresponding values.
- A title and a description can be stored for each process. These are displayed in the generated documentation.
- To edit properties of an opened process, click on an empty area on the workplace.



The most common properties are displayed by default, however, additional settings can be made using the Properties view toolbar:

- *Pin to Selection*: Pin displayed properties in the Properties view
- *Show Categories*: Show properties sorted by categories
- *Show Advanced Properties*: Show advanced properties
- *Restore Default Value*: Restore to default value
- *View Menu*: Open additional options

Run/Debug Console

If a process is checked for errors or simulated, debug information is displayed in the Run/Debug Console view for each executed process step. Error messages are highlighted in red, successful status messages are green.

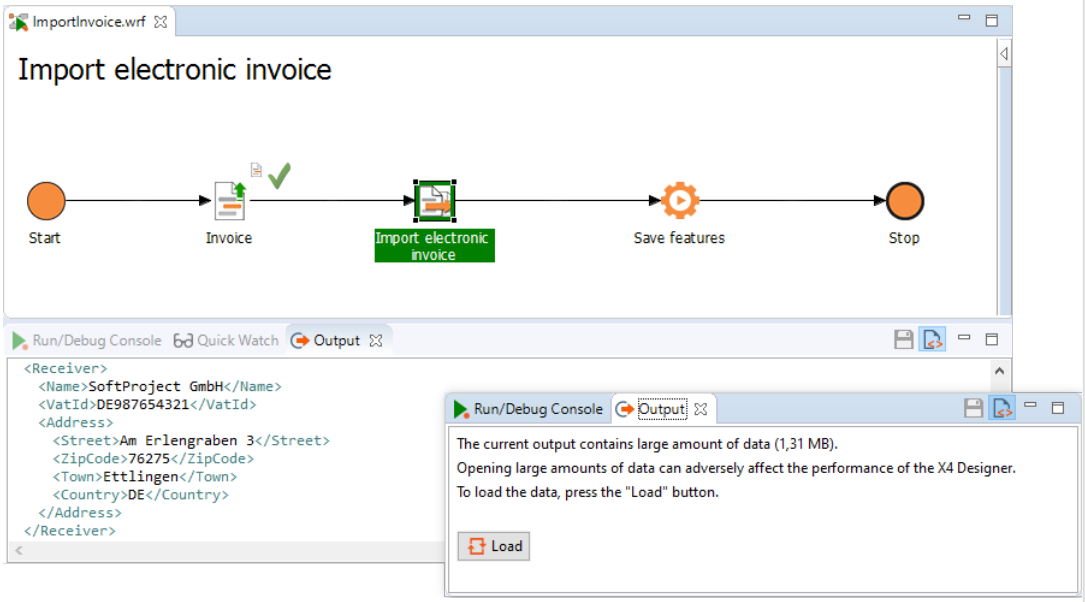
When a process step outputs an intermediate result, it is stored in a temporary file during debugging, which you can view using the corresponding reference (e. g. `file://1376054979039/`).

The Run/Debug Console view can be accessed from the **View > Run/Debug Console** menu.

Output

The Output view allows to view the intermediate results of each debug step.

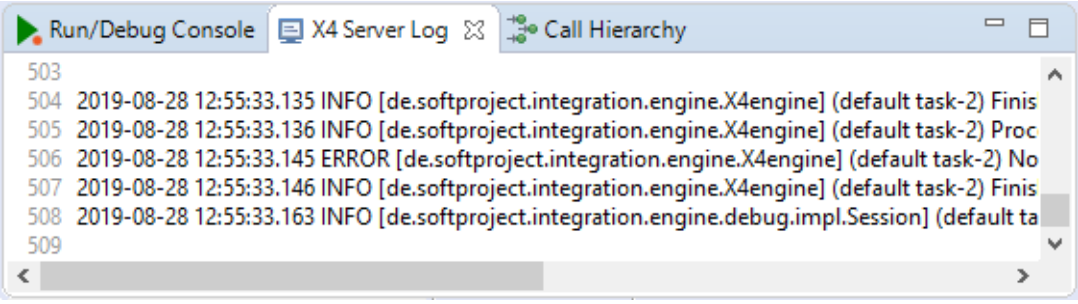
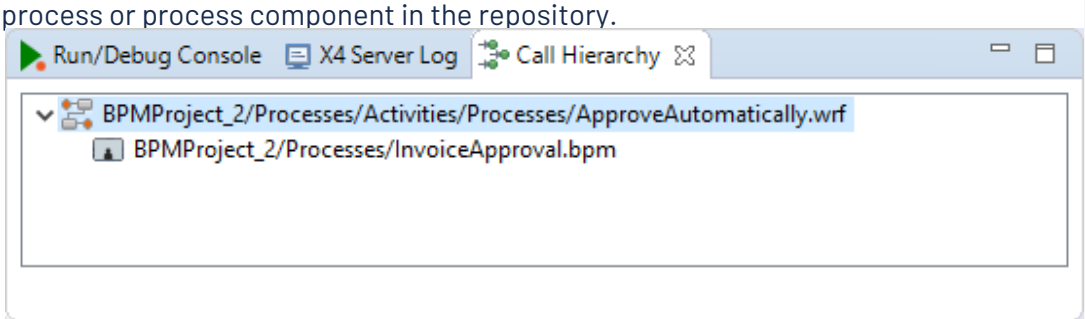
> If the result of the debug step contains content greater than 1 MB, a warning is displayed and the result can be downloaded via a button.
> Large amounts of data can affect the performance of the X4 Designer.

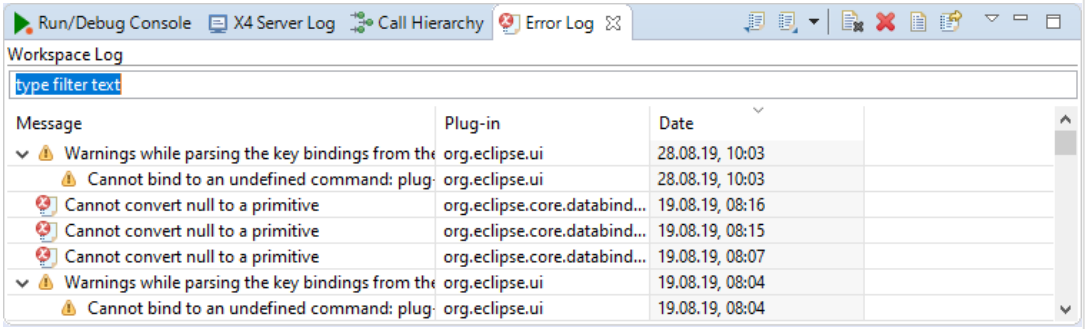


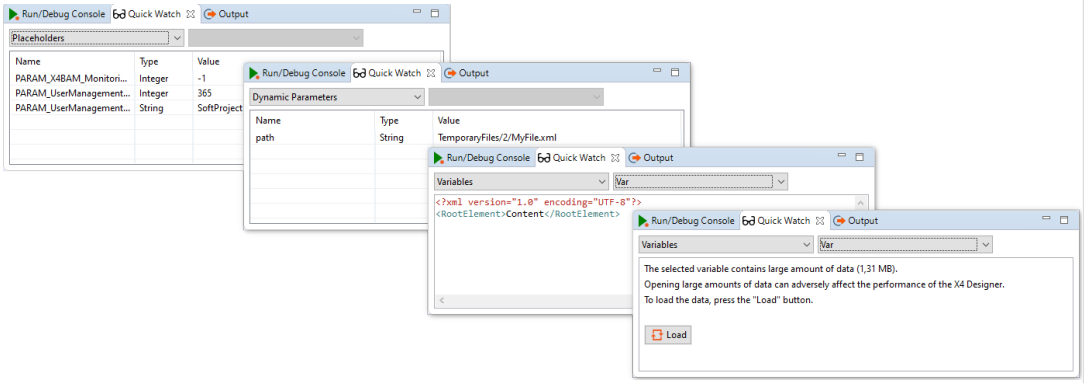
The following additional actions can be performed via the toolbar:

- *Find content:* Find data in the **Output** view
- *Copy all content*: Copy all data from the **Output** view to the clipboard
- *Copy selected content*: Copy selected data from the **Output** view to the clipboard
- *Save content of output view*: Save the data form the output view
- *Format the content of the output view*: Format the data form the output view

The Output view can be opened during debugging via the menu **Debug > Output** or using the Output icon in the toolbar.

X4 Server Log	The X4 server log view allows to track the server status and especially errors in the X4 Server log from within the X4 Designer.  The Server Log view can be accessed via the **View > X4 Server Log** menu.
Call Hierarchy	The Call Hierarchy view allows to display all repository elements using a certain process or process component in the repository.  Right-click on the desired element in the Repository Navigator to bring up a context menu. **View Call Hierarchy** then displays a list of all repository items that contain at least one reference to the selected item.

Error Log	The Error Log view allows to view errors that occurred in the X4 Designer.  The following additional actions can be performed via the toolbar: • *Export Log*: Export Error Log and save it as `.log` file • *Import Log*: Import Error Log (`.log`) • *Clear Log Viewer*: Clear Error Log • *Delete Log*: Delete Error Log permanently • *Open Log*: Open log file (`.log`) in X4 Designer • *Restore Log*: Restore Error Log • *View Menu*: Open additional options The Error Log can be opened via the menu **View > Error Log**.
Problems	In the Problems view, all errors and warnings are listed. The filter can be used to customize the displayed list.
Debug sessions	The Debug sessions view lists all active debug sessions. In the Debug sessions view, double-click the desired process to switch to the debug session. Active debug sessions are marked in gray. New debug sessions connected to the server are highlighted in orange.
Breakpoints	In the Breakpoints view, all set breakpoints are listed. In the Breakpoints view, breakpoints can be activated, deactivated and deleted. Additionally, all breakpoints can be skipped without deleting the breakpoints.

Quick Watch	In the Quick Watch view, placeholders, dynamic parameters and context variables can be viewed with their values during debugging. Selected variables are updated after each debug step. ⚠ If the result of the debug step contains content greater than 1 MB, a warning is displayed and the result can be downloaded via a button. Large amounts of data can affect the performance of the X4 Designer.  ℹ The Quick Watch view can be accessed during debugging via the **Debug > Quick Watch** menu or via the Quick Watch icon in the toolbar.
Outline	In the Outline view, the complete process diagram is displayed as an image. By clicking on the individual areas of the illustration, it is easy to navigate through the process, even if it is larger than the size of the Designer window. ℹ The Outline view can be opened via the menu **View > Outline**.
Base64	Base64 encode or decode strings
Digest	Generate hash value for strings
Regex	Apply regular expression (*Regex*) to a string to test the expression or to directly replace the string according to a pattern
URLCodec	URL encode or decode strings

1.4.1 Open views

⚠ No other views can be opened in the **BPMN Designer** perspective, all relevant views are open by default.

- Select the desired view from the **View** menu in the menu bar.

1.5 Editors

In X4 Designer, processes and files are opened in tabs for viewing and editing. The used editor depends on the opened file type.

Editor	Usage	Description
BPMN Editor	.bpm .pld	With the BPMN Editor you can model business processes according to the notation standard BPMN 2.0.
Process Editor	.wrf	With the Process Editor you can graphically model Technical Processes.
Mapping Editor	.xsl .rep	With the Mapping Editor you can create and edit XSL mappings in a graphical view.
XML Editor	.xml .xhtml	With the XML Editor you can create and edit well-formed XML documents.
XSD Editor	.xsd	
JSON Editor	.json	With the JSON Editor you can edit JSON documents directly in the X4 Designer.
Database Editor	.stm	With the Database Editor you can define SQL queries for database connection modules to retrieve data from a relational database.

1.5.1 BPMN Editor

The BPMN Editor allows you to model Business Processes in compliance to the notation standard BPMN 2.0. The editor is similar to the Process Editor within X4 Designer regarding layout and functionality, but differs regarding the process components and symbols in the process diagram. The BPMN Editor allows you to link your modeled Business Processes directly to Technical Processes. Without switching the development environment, you can model your Business Processes and Technical Processes, and test and execute them on the X4 Server.

Since BPMN processes can contain non-automatable actions, e. g. human workflows, BPMN processes aren't necessarily executable by the X4 Server. BPMN processes may contain technical processes as subprocess tasks, and can be executed.

> The *free-flow* mode additionally allows to use the BPMN Editor as plain BPMN drawing tool with an extended BPMN palette where the run/debug functionality is disabled.

1.5.2 Database Editor

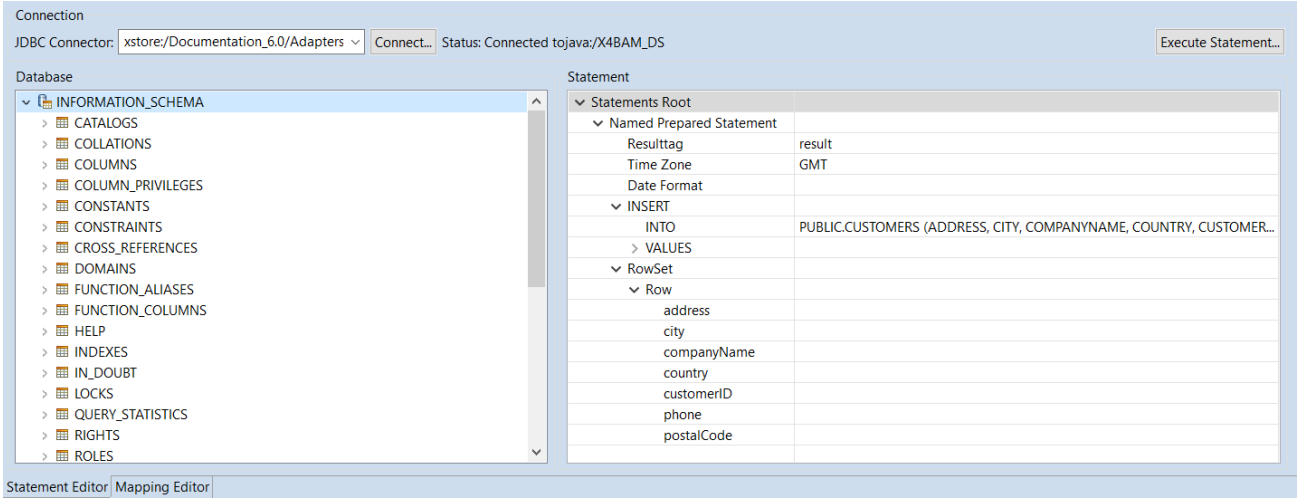
The Database Editor allows to define SQL queries for database connection components in order to retrieve data from a relational database. The logical separation of the process components SQL statement and database connection allows these components to be used flexibly and multiple times within the X4 Designer.

> ⓘ To open the Database Editor create a new SQL statement file (`.stm`) or open an already existing SQL statement file.

The Database Editor's structure

The Database Editor provides two different tools:

- **Statement Editor**: Allows to connect to a database and displays the structure of the connected database. This structure can be used to create an SQL statement for the database.
- **Mapping Editor**: Allows to define a mapping for elements of an input XML document to the named parameters of the statement previously created with the Statement Editor. This mapping is subsequently used to create an XSL mapping, which generates a dynamically created input for the JDBC Connector using a suitable input XML document.



1.5.2.1 Statement Editor

The Statement Editor is divided into the following areas:

Connection area	Within this area a connection to a database can be established by means of a JDBC Connector. • **JDBC Connector**: xstore URL to a JDBC Connector • **Connect**: Connect to the database The connection status is displayed under **Status**. • **Execute Statement**: Execute sql statement
Database area	The database's structure is displayed here after establishing the connection. The following icons are used to visualize the structure: • Database schema • Database table • Primary key • Primary key/ Foreign key • Foreign key

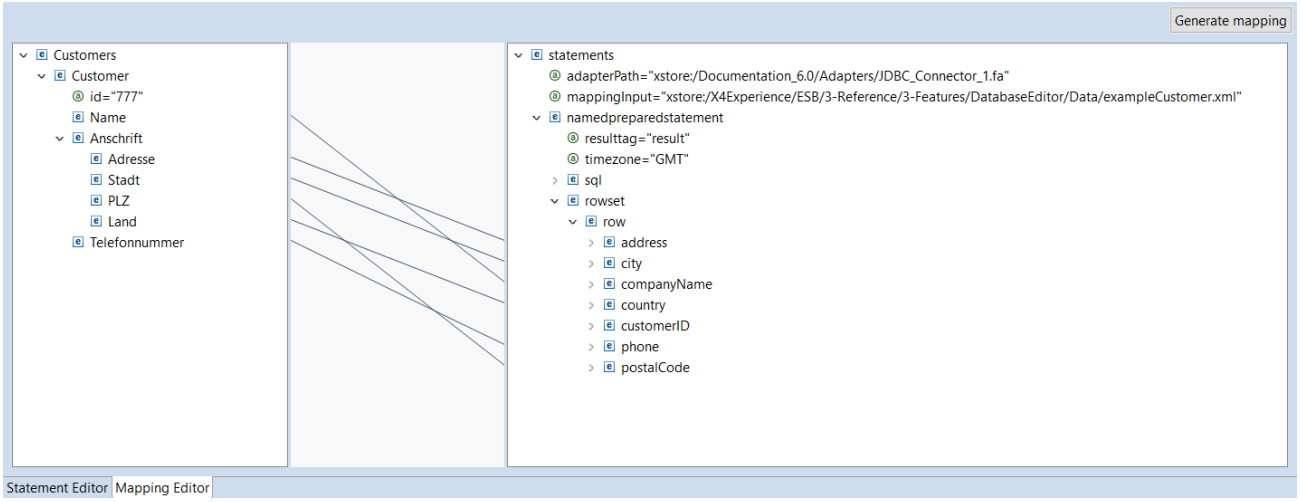
Statement area	Here, different statements can be created for the connected database via the context menu: • **New Named Prepared Statement**: Create a new Named Prepared Statement in `Statements Root` • **Edit Named Prepared Statement**: Edit `Named Prepared Statement` • **New RowSet**: Create new `RowSet`. Only one `RowSet` can exist within a Named Prepared Statements. It is generated automatically when creating the Named Prepared Statement. A new `RowSet` can only be created, if the existing one has been deleted. • **New Row**: Add a new row within a `RowSet` • **New Named Parameter Value**: Add a new Named Paramerter value within a row • **Edit Named Parameter**: Edit Named Parameter • **New SELECT Statement**: Create new `SELECT` statement • **Edit SELECT**: Edit `SELECT` instruction • **Edit FROM**: Edit `FROM` within a `SELECT` statement • **New INSERT Statement**: Create new `INSERT` statement • **Edit INTO**: Edit `INTO` instruction • **New VALUE Entry**: Create new `VALUE` entry • **Edit VALUE**: Edit `VALUE` • **New UPDATE Statement**: Create new `UPDATE` statement • **Edit UPDATE**: Edit `UPDATE` instruction • **New SET Entry**: Create new `SET` entry • **Edit SET Entry**: Edit `SET` entry • **New DELETE Statement**: Create new `DELETE` statement • **Edit FROM**: Edit `FROM` instruction • **Edit WHERE**: Edit `WHERE` condition • **New Column**: Add new column within an `INSERT` or `SELECT` instruction • **New Table**: Insert new table within an `UPDATE` or `SELECT` instruction • **Delete**: Delete element For further information on how to create and edit statements, see section Statement für eine verbundene Datenbank erstellen. ***Drag&Drop actions*** The following Drag&Drop actions can be performed within the Statement area:

SQL statement	Database element	Statement element	Action
SELECT	Column	SELECT	Add the column to be selected. If the table corresponding to the added column is not already entered within FROM, it will be entered automatically.
	Table	FROM	Add the table from which is to be selected.
UPDATE	Column	SET Entry	Set the column as entry. If the table corresponding to the added column is not already entered within UPDATE, it will be entered automatically.
	Table	UPDATE	Set the table to be updated.
INSERT	Table	INTO	Set the table into which is to be written. If there is already a table, it will be replaced. Already set columns will be deleted thereby.
	Column	INTO	Set the column into which is to be written. This is only possible, if the column originates from the set table.
DELETE	Table	FROM	Set the table to be deleted. If there is already a table, it will be replaced.

1.5.2.2 Mapping Editor

The Mapping Editor allows to define a mapping for elements of an input XML document to the named parameters of the statement previously created with the Statement Editor. This mapping is subsequently used to create an XSL mapping, which generates a dynamically created input for the JDBC Connector using a suitable input XML document.

The Mapping Editor is divided into the following areas:



Source area	The Source area is on the Mapping Editor's left side. The input XML file can be displayed here and assigned by drag & drop. The context menu provides the following options: • **Collapse**: Collapse a node's child nodes • **Expand**: Expand the child nodes of the selected node • **Remove Input**: Remove assigned input XML document
Linking area	The Linking area is located in the Mapping Editor's middle column. It visualizes the `xsl:value-of` connections between an element in the source document and a Named Parameter in the statement as line.
Statements area	The Statements area is located on the Mapping Editor's right side. The complete structure of the statement file is displayed here. Moreover, elements of an input XML file can be mapped to the child elements of a `Row` element.

1.5.3 JSON Editor

The JSON Editor allows JSON documents to be edited directly within the X4 Designer.

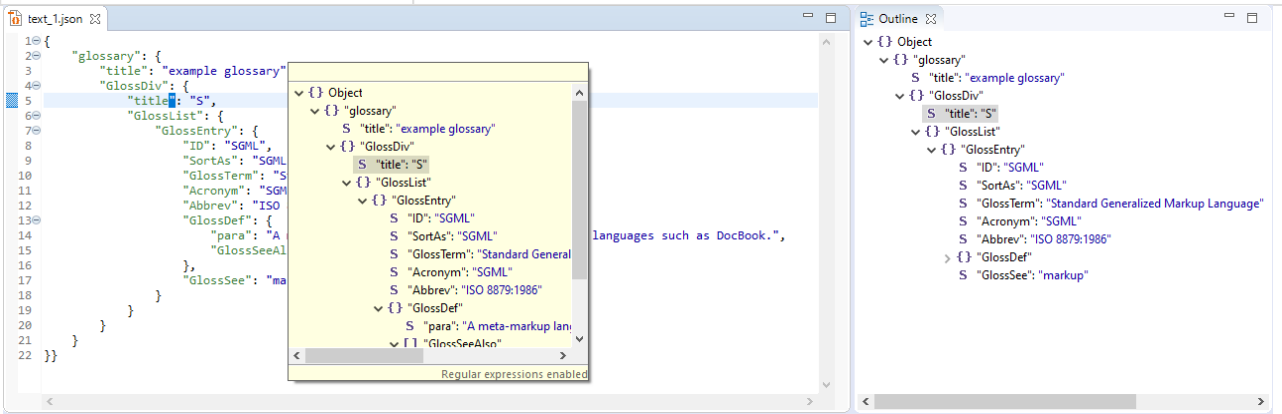
> ⓘ To open the JSON Editor either create a new JSON Document or open an already existing document.

The Outline view displays the structure of the opened JSON document. Moreover, you can also use the context menu **Quick Outline** or the key combination `CTRL+O` to open the Quick Outline view and to search for keys and values within the JSON document.

Shortcuts

`CTRL+O`	Open the Quick Outline view

CTRL+Shift+F	Format the JSON code



The formatting of the JSON code and the colors for syntax highlighting can be changed under **Tools > Options > JSON Editor**, see also Configuring the JSON Editor.

1.5.4 Mapping Editor

The Mapping Editor allows to create and edit XSL mappings in a graphical interface. Using XSLT you can transform an XML data structure into another XML data structure or into an XSL-FO document. The Mapping Editor supports you with a graphical interface and with an automatic stylesheet and XPath validation when creating or editing XSL mappings.

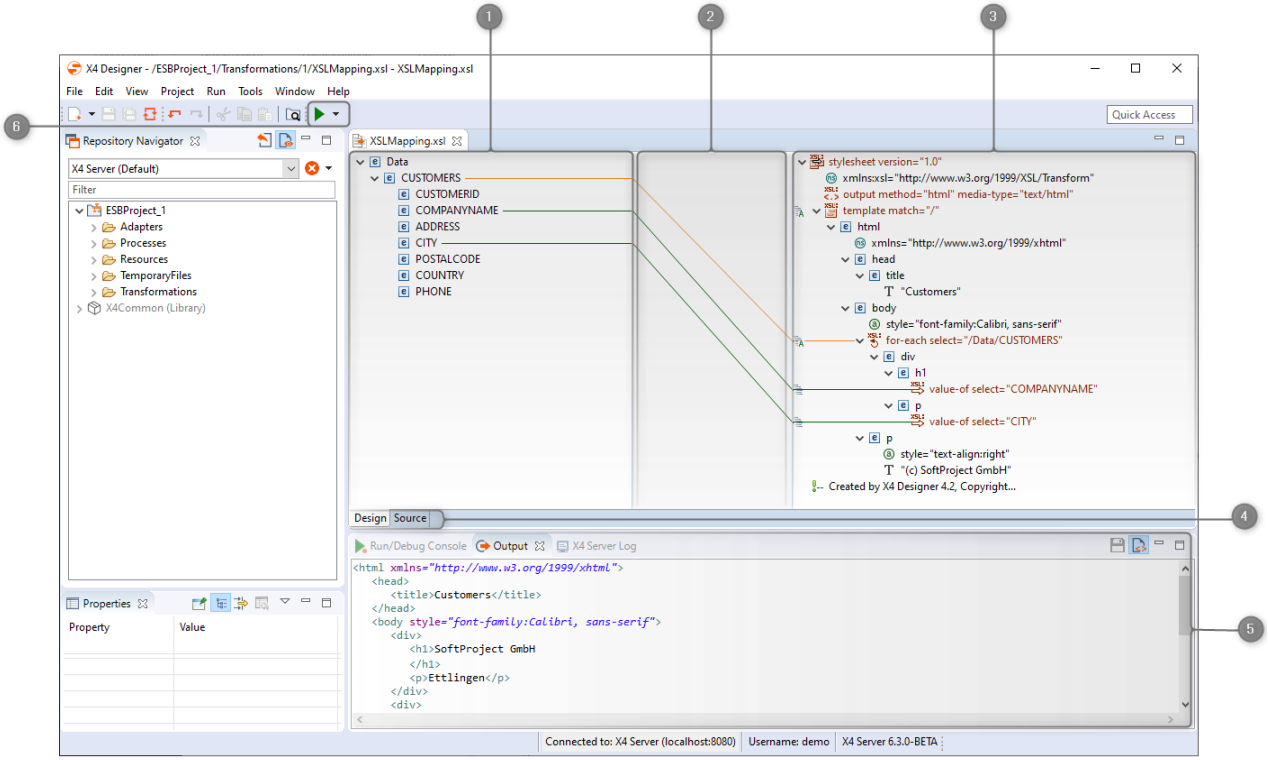
An XSL mapping involves three documents:

- XML source document (or an XML schema to provide the input structure)
- XSLT stylesheet (created with the *Mapping Editor*)
- Result document (in most cases: XML)

To open the Mapping Editor, create a new mapping or open an already existing XSL mapping.

The Mapping Editor's structure

The Mapping Editor is divided into the following areas:



1	**Source pane**	The source document to be transformed or an XML Schema file (`.xsd`) is displayed here. Using the context menu you can edit selected nodes as follows: • **Copy XPath for this element to Clipboard**: Copy XPath expression of the selected element to the clipboard and use it elsewhere • **Assign Input**: Assign input XML document • **Remove Input**: Remove assigned input XML document
2	**Linking pane**	The Linking pane displays lines that visualize the relationships between source and stylesheet nodes. ⓘ The chapter Tastenkombinationen im Mapping Editor gives you an overview of the most important key combinations helping you to work with XSL stylesheets.

3	**Stylesheet pane**	The Stylesheet pane is where you edit the stylesheet. It displays the XSL stylesheet in an editable tree with specialized features for editing XSLT stylesheets.
		
		The different parts of the styleheet are displayed with symbols and collored highlightings in the tree view:
		
		• Nodes that contain XSLT instructions are colored brown and have a corresponding icon e. g. for-each select="Data/Customers"
		• If a node contains an XPath expression, it is indicated by the XPath icon on the left side. You can click on this icon to edit the XPath expression.
		• Virtual nodes (incurred nodes from an assigned XML document or XML schema that do not yet explicitly exist in the XSLT stylesheet) are greyed out.
		
		Using the context menu in the stylesheet pane you can edit selected nodes as follows:
		
		• **Edit XSL Element**: Edit selected XSL element
		• **Rename**: Rename the node
		• **Element**: Insert an element
		• **Attribute**: Insert attribute
		• **Edit**: (In case of processing instructions and namespace declarations) Edit node content
		• **XSL Element**: Insert XSL element
		  • `as Child`: as child node
		  • `Before`: as node before the selected node
		  • `After`: as node after the selected node
		• **Add other nodes**: Add other nodes (`Namespace`, `Text`, `Comment`, `Processing Instruction`)
		• **Add here**: (In case of virtual nodes) Convert a virtual node into a real node
		• **Add X4 Processing Instructions**: Insert X4-specific processing instructions to set Dynamic Parameters.
		  • `Condition State` for status information
		  • `Log Info` for log messages
		  • `Dynamic Parameter` to set dynamic values
		  • `No Result` for empty mapping outputs
		• **Add X4 Placeholder**: Insert X4-specific placeholders
		• **Add Parent**: Insert a parent element (superordinate element)
		• **Cut/Copy/Paste**: Cut, copy, or paste selection
		• **Delete:** Delete the selected node
		• **Expand/Collapse**: Expand or collapse the child nodes of the selected node
		• **Assign Virtual Nodes**: Insert virtual nodes from an XML document or schema
		• **Remove Virtual Node**: Delete virtual nodes from an XML document or schema

		The **XSL Element Creation Wizard** allows to create XSL mappings quickly and easily. The wizard offers the complete range of XSLT 2.0 elements and enables to create them easily via the context menu. Within the wizard, you can specify whether the new element is to be created before, after or as a child of the selected element. Features like auto-completion, or the display of all available and allowed XSL elements enable faster work. Moreover, the wizard allows to set and to edit the attributes of the XSL element. Required attributes are set automatically, optional attributes can be selected and filled as needed. For attributes that have multiple options to choose from, a drop-down list with all available values is provided.
4	**Source and Design view**	You can switch between two different views within the Mapping Editor: • **Design** : The editor displays the XSLT stylesheet as a tree in a three column view. Here you can graphically map nodes of the source document/schema to the XSLT stylesheet nodes by drawing connection lines. • **Source** : In this source code view you can edit the XSLT stylesheet directly in an XML editor
5	**Output**	The result of locally run XSL mappings is displayed in the Output view. The following additional actions can be performed via the toolbar: • *Save content of output view*: Save the data form the output view • *Format the content of the output view*: Format the data form the output view
6	**Run transformation**	Via **Run Transformation** you can run the XSL mapping locally and display the transformation result in the output view (5).

1.5.4.1 Keyboard shortcuts within the Mapping Editor

Useful shortcuts for working with XSL stylesheets within the graphical view of Mapping Editor

Drag&Drop Actions

Reference a value to a target node using `xsl:value-of`	Drag a node from the source document to the target node
Reference multiple values into a target node using `xsl:value-of`	Keep the **Alt** key pressed and drag all desired nodes from the source document to the target node Result: An `xsl:value-of` element will be created whose `select` attribute contains all referenced nodes. In a next step, this list of nodes can be correlated by using an XPath function like `concat( )` or logical operators. *Example:* `<xsl:value-of select="Element1Element2">`
Copy a node using `xsl:copy-of`	Keep the **Ctrl** key pressed, and drag a node from the source document to the target node
Create a for-each loop for a node using `xsl:for-each`	Keep the **Shift** key pressed, and drag a node from the source document to the target node

	Function	Shortcut
Basic functions	Edit element	`Enter`
	Run XSL transformation	`F9`
	Insert element	`Ins`
	Insert attribute	`Alt+Ins`
	Insert text	`Ctrl+Ins`
	Insert surrounding parent element	`Ctrl+Shift+Ins`
	Rename a element	`Alt+Shift+R`
	Remove selected node	`Del`
	Format/indent the code (in Source view)	`Ctrl+Shift+F`
Copying nodes	Insert selected node as preceding sibling	`Ctrl+ Alt+Up`
	Insert selected node as following sibling	`Ctrl+ Alt+Down`
	Insert selected node as preceding parent	`Ctrl+Alt+Left`
Moving nodes	Move selected node up	`Alt+Up`
	Move selected node down	`Alt+Down`
	Move to parent element (pull up)	`Alt+Shift+Left`
Navigating trough the stylesheet tree	Go to parent node	`Ctrl+Shift+Left`
	Go to next node	`Ctrl+Shift+Down`

	Go to previous node	`Ctrl+Shift+Up`
	Select connected nodes in the source pane and stylesheet pane	`Shift+Ins`
	Restore last selection	`Alt+Shift+Down`

1.5.5 Process Editor

With the Process Editor, Technical Processes can be modeled graphically. For each Technical Process and for the individual process modules, you can also define how they should be executed.

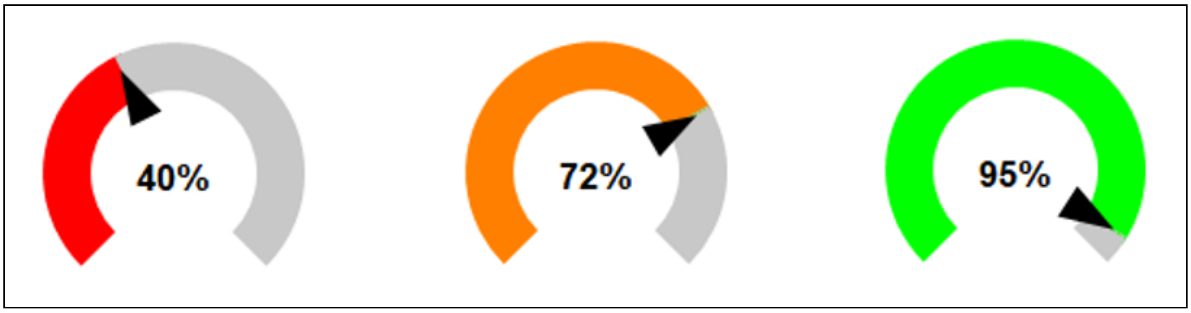
With the Process Editor you can:

- establish connections between different back-end systems,
- transform data in real time,
- implement business rules in the modeled process and
- debug modeled processes and execute them on the X4 server.

1.5.5.1 Process Quality Index

> ⓘ The Process Quality Index is an experimental feature. The functionality is currently still limited and is being developed continuously.

The Process Quality Index is a graphical tool that indicates how well an ESB process has been modeled in terms of standards compliance and clarity.



Rating of the criteria

Criteria	Condition	Rating
Number of elements	**100%** → **< 15** elements **75%** → **< 20** elements **50%** → **< 25** elements **25%** → **< 30** elements **0%** → **>= 30** elements	45%

Criteria	Condition	Rating
Number of stop elements	**100%** → **< 3** elements **75%** → **< 4** elements **50%** → **< 5** elements **25%** → **< 6** elements **0%** → **>= 6** elements	15%
Labels of the elements are not empty	**true** → **100%** **false** → **0%**	10%
Process title was set (not the name of process file)	**true** → **100%** **false** → **0%**	5%
Labels of the elements were adjusted (not filename)	**true** → **100%** **false** → **0%**	5%
No elements on the right side of stop elements	**true** → **100%** **false** → **0%**	5%
No elements on the left side of start elements	**true** → **100%** **false** → **0%**	5%
No overlapping elements	**true** → **100%** **false** → **0%**	5%
Flow Direction Index		5%
Maximum		**100%**

1.5.5.2 Keyboard shortcuts within the Process Editor

All shortcuts of the Process Editor in an overview.

	Function	Shortcut or action
Running and debugging processes	Execute process	`F9`
	Debug process (and eventually abort active debug session)	`F4`
	Execute and show a single process action (also in subprocesses) while debugging	`F5`
	Execute a process action (without showing subprocess actions) while debugging	`F6`
	Jump back from the subprocess to the main process while debugging	`F7`
	Pause debugging	`Ctrl + F8`
	Resume paused debugging	`F8`
	Cancel debugging	`Ctrl + F2`
Inserting process components and transitions	Insert process component from the repository between two connected components	Insert a file from the repository onto the transition via drag&drop; When the line expands, drop the symbol.
	Move process component while keeping the transition	Press `Alt` while moving the process component on the workplace.
	Delete process component while keeping the transition	`Alt + Del.`
	Replace process component by another repository file	Drag and drop a repository file on the process component to be replaced.
	Insert process component behind an unconnected component, and automatically create a transition	Select the unconnected process component, press `Shift`, and drag the repository file behind the selected process component.
Editing elements	Select all workplace elements	`Strg+A`
	Cut out process component	`Strg+X`
	Copy process component	`Strg+C`
	Paste process component	`Strg+V`
	Delete process component	`Del`
	Undo last action	`Ctrl+Z`
	Redo last action	`Ctrl+Y`
	Edit process component	Double-click the symbol
	Close editor	`Ctrl+W`
	Save modified element	`Ctrl+S`

	Rename repository file	`F2`
	Move repository file	Move the file into the target folder via drag&drop
	Reload	`F5`
Changing views	Zoom out of the process diagram	`Ctrl+-`
	Zoom into the process diagram	`Ctrl++`

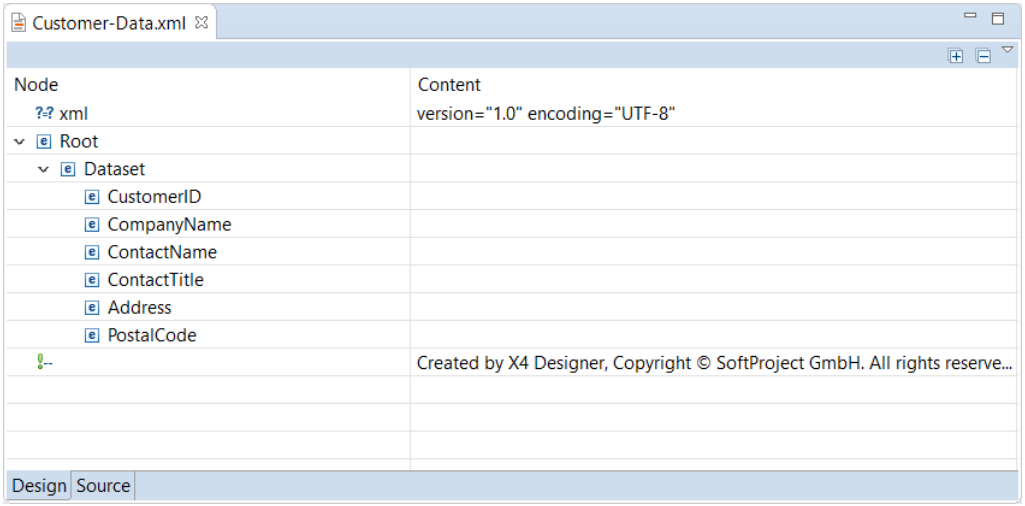
1.5.6 XML Editor

Using the XML Editor you can create and edit well-formed XML documents.

> To open the XML Editor create a new XML file or open an already existing file.

The XML Editor's structure

There are two views available for the processig of XML documents, the **Design** view and the **Source** view. You can switch between these to views by using the tabs at the Editor's lower edge.



Design view	The **Design** view displays the tree structure of the opened XML document as a table. In the left column, you find the different nodes, which can be expanded, if child nodes exist. In the right column, the node values are displayed. The context menu provides the following functions: • **Remove:** Remove selected node • **Add DTD Information:** Add a DTD (Document Type Definition) structure information • **Edit Namespaces:** Edit the node's namespaces • **Add Attribute:** Add new XML attribute • **Add Child:** Add child node (element, processing instruction etc.) • **Add Before:** Add node before the selected node • **Add After:** Add node behind the selected node
Source view	In the XML Editor's **Source** view you can edit the XML document's source code. The editor supports you with the following functions: • Syntax highlighting: Different node types are hinghlighted with colors. • Check well-formed: XML documents are checked, if they are well-formed when saving. • Syntax completion: The editor suggests elements when you want to insert new nodes • Pretty-Print: Format the XML documents with indents and line breaks to be more readable via the menu **Source > Format**.

2 BPMN Process components and their use

At the right edge of the drawing area there is a toolbar, the palette. It contains process module symbols that you can drag and drop into the drawing area.
Available process components for modeling Business Processes (`.bpm`)

2.1 Events

When creating a new Business Process, a start and an end event are already inserted into the process diagram by default. In addition, further event elements can be dragged from the palette into the process diagram and used during process modeling. The available elements are explained in more detail below.

2.1.1 Start

`Start`: Defines a Business Process's start event according to BPMN 2.0, and allows differentiating between various event types.

Properties

Case Management	
`Case State`	Case state to be set with this element **Possible values:** Any already defined case state value; You can manage available case states by clicking , see Managing Case States.
Technical	
`Label`	Label of the symbol within the process diagram
`Event`	Event type **Possible values:** • *`None Start`*: General start event (Default) • *`Error Start`*: Start event in case of an error • *`Message Start`*: Message-based start event • *`Multiple Start`*: Multiple start event • *`Conditional Start`*: Start event based on a business rule • *`Signal Start`*: Start event that follows a signal • *`Timer Start`*: Time-triggered start event • *`Escalation Start`*: Start event based on an escalation • *`Compensation Start`*: Start event based on a compensation • *`Parallel Multiple Start`*: Multiple parallel start event

Setting case states using Start Events

Start Events allow you to set a case state while executing the Business Process. The property `Case Management > Case State` configures all case states that are available throughout the Business Process. To set a case state, perform the following steps:

1. Select the start element, and switch to the **Properties** view.
2. Select in property `Case Management > Case State` a predefined case state, e.g. *`IN PROGRESS`*.

   > If the property `Case State` doesn't provide an option yet, no case state has been defined for the business process. To manage case states, click property `Case State` and open the case state management by clicking the button, see Managing Case States.

   When executing the Business Process, the case state will now be updated. The case state change is indicated by a corresponding label for the event.

> As an alternative, the case state can also be set dynamically using Technical Processes. The Case Management adapter is provided for this purpose.

2.1.2 Intermediate

`Intermediate`: Defines an intermediate event of a Business Process according to BPMN 2.0 and allows to set a case state using the property `Case State`, see Managing Case States.

Properties

Case Management	
`Case State`	Case state to be set with this element **Possible values:** Any already defined case state value; You can manage available case states by clicking , see Managing Case States.
Technical	
`Document`	Path to the corresponding process within the X4 Repository
`Label`	Label of the symbol within the process diagram

`Event`	Event type **Possible values:** • `None Intermediate`: General intermediate event (Default) • `Message Intermediate (Catch)`: Incoming message intermediate event • `Message Intermediate (Throw)`: Outgoing message intermediate event • `Cancel Intermediate`: Cancel intermediate event • `Compensation Intermediate (Catch)`: Incoming compensation intermediate event • `Compensation Intermediate (Throw)`: Outgoing compensation intermediate event • `Error Intermediate`: Error intermediate event • `Escalation Intermediate (Catch)`: Incoming escalation intermediate event • `Escalation Intermediate (Throw)`: Outgoing escalation intermediate event • `Multiple Intermediate (Catch)`: Incoming multiple intermediate event • `Multiple Intermediate (Throw)`: Outgoing multiple intermediate event • `Conditional Intermediate`: Business rule intermediate event • `Signal Intermediate (Catch)`: Incoming signal intermediate event • `Signal Intermediate (Throw)`: Outgoing signal intermediate event • `Parallel Multiple Intermediate`: Multiple parallel intermediate event • `Link Intermediate (Catch)`: Incoming link intermediate event • `Link Intermediate (Throw)`: Outgoing link intermediate event

Setting case states using Intermediate Events

Intermediate Events allow you to set a case state while executing the Business Process. The property `Case Management > Case State` configures all case states that are available throughout the Business Process. To set a case state, perform the following steps:

1. Drag an Intermediate event from the Palette to the workplace.
2. Select the event element, and switch to the **Properties** view.
3. Select in property `Case Management > Case State` a predefined case state, e.g. *`IN PROGRESS`*.

> ⓘ If property `Case State` doesn't provide an option yet, no case state has been defined for the Business Process. To manage case states, click property `Case State` and open the case state management by clicking the
>
> button, see Managing Case States.

When executing the Business Process, the case state will now be updated. The case state change is indicated by a corresponding label for the event.

> As an alternative, the case state can also be set dynamically using Technical Processes. The Case Management adapter is provided for this purpose.

2.1.3 Timer-based Intermediate

`Timer-based Intermediate`: Defines a timer-based intermediate event in a Business Process according to BPMN 2.0 allows to set a case state using the property `Case State`, see Managing Case States.

Properties

Case Management	
`Case State`	Case state to be set with this element **Possible values:** Any already defined case state value; You can manage available case states by clicking , see Managing Case States.
Technical	
`Duration`	Waiting time until the event occurs **Possible values:** • Any duration specifying days, hours, minutes, seconds and milliseconds • *`9999d 23h 59m 59s 999ms`*: Maximum waiting time • *`0d 0h 0m 0s 0ms`*: No waiting time (Default) As an alternative you can define an end date using `Until`. To open the waiting time configuration click on or double-click the event within the process diagram.
`Label`	Label of the symbol within the process diagram

2.1.3.1 Setting a Timer-based Intermediate Event

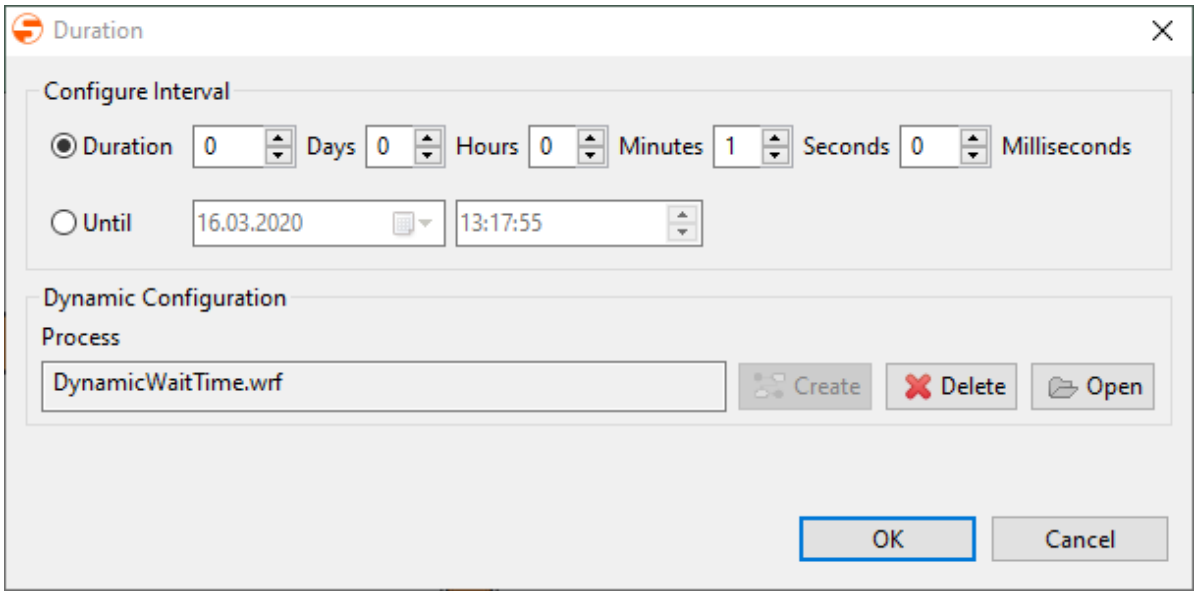
1. Drag a Timer-based Intermediate Event from the Palette to the process diagram
2. Select the event component and switch to the **Properties** view.
3. Select in property `Case State` a predefined case state, e.g. *`IN PROGRESS`*.

> If property `Case State` doesn't provide an option yet, no case state has been defined for the Business Process. To manage case states, click property `Case State` and open the case state management by clicking the button, see Managing Case States.

When executing the Business Process, the case state will now be updated. The case state change is indicated by a corresponding label for the event.

> As an alternative, the case state can also be set dynamically using Technical Processes. The Case Management adapter is provided for this purpose.

4. Open the waiting time configuration by clicking the button next to the property **Duration** or by double-clicking the event within the process diagram.



5. Configure desired waiting time by specifying days, hours, minutes, seconds and milliseconds.

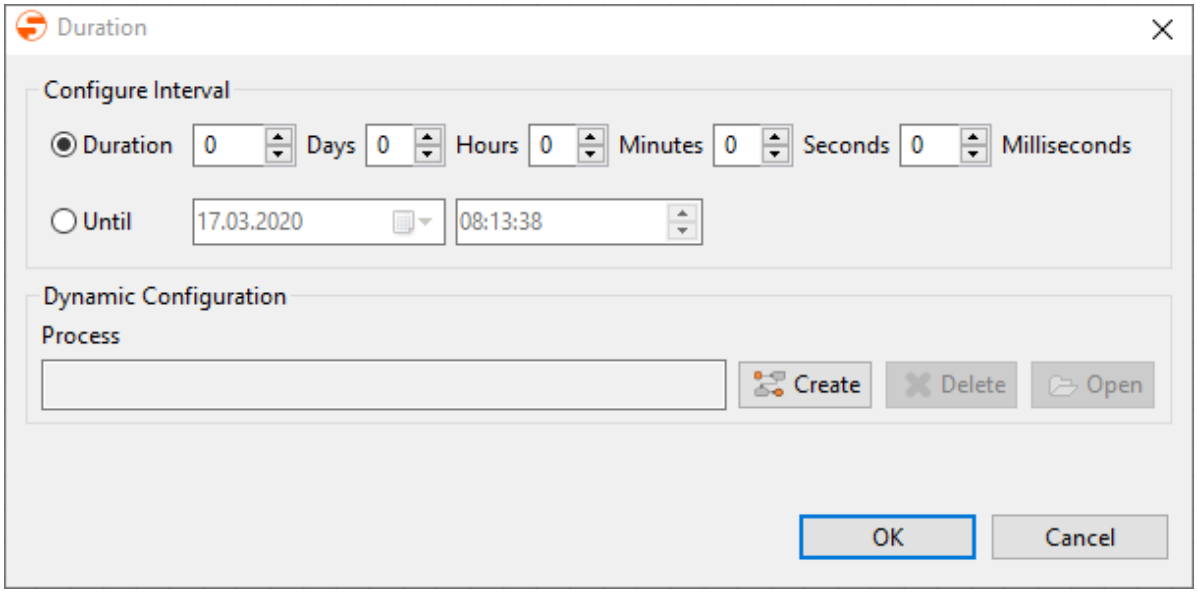
> As an alternative you can define an end date using `Until`.

6. Save the configuration with **OK**.

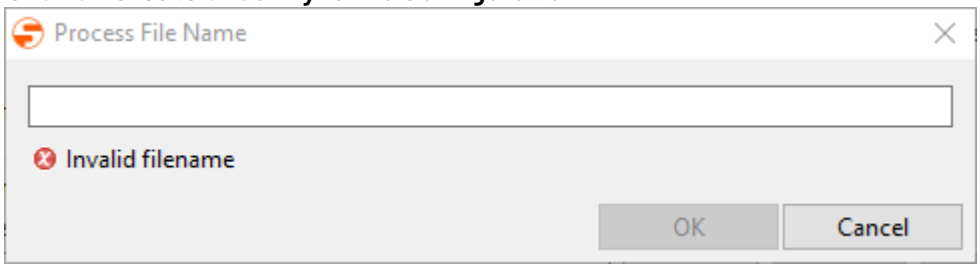
2.1.3.2 Setting Timer-based Intermediate Event Dynamically

Timer-based events can also be configured dynamically using Technical Processes and a corresponding mapping. The corresponding Technical Process is created and managed via the timer-based intermediate event. It is created directly under the corresponding Business Process and cannot be moved.

1. Open the waiting time configuration by clicking the button next to the property **Duration** or by double-clicking the event within the process diagram.



2. Click on **Create** under **Dynamic Configuration**.



3. Enter the process name and confirm by clicking **OK**.
   The process will be created directly below the Business Process and can be edited here.

   The Technical Process has to provide the following target structure:

Sample structure: Duration

```
<?xml version="1.0" encoding="UTF-8"?>
<timerBasedConfiguration>
    <durationDay>0</durationDay>
    <durationHour>0</durationHour>
    <durationMinute>0</durationMinute>
    <durationSecond>10</durationSecond>
    <durationMillis>0</durationMillis>
</timerBasedConfiguration>
```

Sample structure: Time stamp

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<timerBasedConfiguration>
    <untilTimestamp>2020-03-17T17:00:00</untilTimestamp>
</timerBasedConfiguration>
```

2.1.4 Non-Interrupting Intermediate Event

`Non-interrupting intermediate event`: Defines any non-interrupting intermediate event within a Business Process according to BPMN 2.0 and allows to differentiate between several event types. In contrast to intermediate events, non-interrupt Intermediate events do not interrupt the processing of the bearer activity; the path initiated by the event is activated and executes parallelly.

> *Non-Interrupting Intermediate Events* are only available within the BPMN Editor's so called Free-flow mode. The Free-flow mode can be enabled when creating new BPM processes and offers an extended palette. Unlike in default mode, the run/debug function is disabled in free-flow mode. Moreover, the mode cannot be changed afterwards.

Properties

`Document`	Path to the corresponding process within the X4 Repository
`Label`	Label of the symbol within the process diagram

`Event`	Event type **Possible values:** • *`Non-Interrupting Message Intermediate (Catch)`*: Incoming non-interrupting message intermediate event • *`Non-Interrupting Message Intermediate (Throw)`*: Outgoing non-interrupting message intermediate event • *`Non-Interrupting EscalationIntermediate (Catch)`*: Incoming non-interrupting escalation intermediate event • *`Non-Interrupting EscalationIntermediate (Throw)`*: Outgoing non-interrupting escalation intermediate event • *`Non-Interrupting Multiple Intermediate (Catch)`*: Incoming non-interrupting multiple intermediate event • *`Non-Interrupting Multiple Intermediate (Throw)`*: Outgoing non-interrupting multiple intermediate event • *`Non-Interrupting Conditional Intermediate`*: Non-interrupting business rule intermediate event • *`Non-Interrupting Signal Intermediate (Catch)`*: Incoming non-interrupting signal intermediate event • *`Non-Interrupting Signal Intermediate (Throw)`*: Outgoing non-interrupting signal intermediate event • *`Non-Interrupting Timer Intermediate`*: Time-triggered non-interrupting intermediate event • *`Non-Interrupting Parallel Multiple Intermediate`*: Multiple non-interrupting parallel intermediate event

2.1.5 End

`End`: Defines a Business Process's end event according to BPMN 2.0.

Properties

Case Management	
`Case State`	Case state to be set with this element **Possible values:** Any already defined case state value; You can manage available case states by clicking , see Managing Case States.
Technical	
`Label`	Label of the symbol within the process diagram

`Event`	Event type **Possible values:** • `None End`: General end event (Default) • `Terminate End`: Cancelling end event (for all process instances) • `Message End`: Message-based end event • `Cancel End`: Cancelling end event (of the current process instance) • `Compensation End`: Compensation end event • `Error End`: End event when an error occurs • `Escalation End`: Escalation end event • `Multiple End`: Multiple end event • `Signal End`: End event that follows a signal

Setting case states using End Events

End Events allow you to set a case state while executing the Business Process. The property `Case Management > Case State` configures all case states that are available throughout the Business Process. To set a case state, perform the following steps:

1. Select the end element, and switch to the **Properties** view.
2. Select in property `Case Management > Case State` a predefined case state, e.g. *`IN PROGRESS`*.

   > If the property `Case State` doesn't provide an option yet, no case state has been defined for the Business Process. To manage case states, click property `Case State` and open the case state management by clicking the
   >
   > button, see Managing Case States.

   When executing the Business Process, the case state will now be updated. The case state change is indicated by a corresponding label for the event.

> As an alternative, the case state can also be set dynamically using Technical Processes. The Case Management adapter is provided for this purpose.

2.2 Activities

2.2.1 Activity

`Activity`: Defines an activity within a Business Process according to BPMN 2.0. The activity type and its execution behaviour is defined by the corresponding properties respectively by a marker. Activity components allow to link Technical Processes or other Business Processes as subprocesses from the X4 Repository.

Properties

Business	
`Ad hoc`	Marking as ad hoc activity using the symbol ~
`Compensation`	Marking as kompensating activity by the symbol
`Activity type`	Marking of the activity type *Available activity types:* • `None`: General activity, without further marking (default) • `Send`: Send • `Receive`: Receive • `Manual`: Manual activity • `Service`: Service (process) • `Script`: Script
`Execution type`	Marking of the execution behaviour *Available execution behaviour markers:* • `Single`: Single execution (default) • `Loop`: Loop • `Parallel Multi-Instance`: Parallel multiple execution • `Sequential Multi-Instance`: Sequencial multiple execution
Technical	
`Document`	Path to the linked process within the X4 Repository (set by the X4 Designer). If a component symbol is placed from the palette via drag&drop to the workplace, it is only an empty process component without any reference to a repository file.
`Label`	Label of the symbol within the process diagram

> The marking (subprocess) is set automatically as soon as a Business Process (`*.bpm`) is linked.

2.2.2 Human Task

`Human Task`: Human Tasks can be used to visualize human activity. When the Business Process is automated, these Human Tasks are linked to executable `.humantask` files.

Human tasks (`.humantask`) allow to configure the Task Management web app and thus the interaction with tasks performed by humans. These tasks are modeled as case management processes, see Case Management – Realize Tasks and Workflows. *Properties*

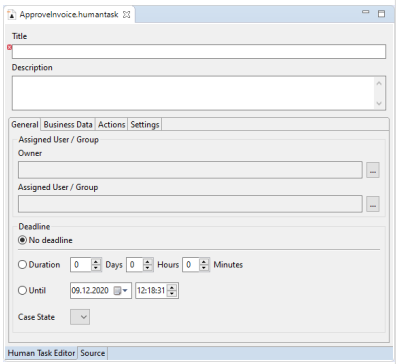
`Label`	Label of the symbol within the process diagram

2.2.2.1 Creating and using Human Tasks

In order to better visualize human interactions in Business Processes, human task activities can be used when modeling processes. These can then be linked to a human task file (`.humantask`) in which the configuration of the task is made.

Human Tasks (`.humantask`) are created below the Business Process via the context menu **New > Human task** or via the toolbar **> Add Human task**. After the creation, the Human Task is opened in the X4 Designer and can be parameterized as follows:

- `Title`: Title of the task in the Task Management Web App
- `Description`: Optional description of the task
- *General* tab: define owner, assigned user or group and deadline for processing



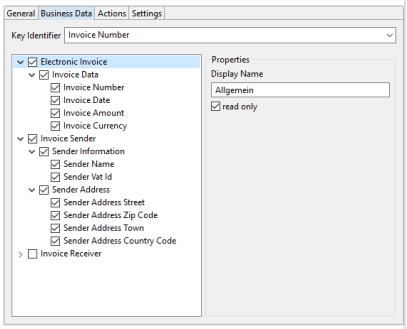
- `Owner`: owner of the task
- `Assigned User/Group`: Assigned user or group of the task.

  > ⓘ The involved users and groups are created and managed in Keycloak.

- `Deadline`: Deadline for resolving the task with the following options:
  - `No deadline`: No deadline
  - `Duration`: Deadline duration in days, hours and minutes
  - `Until`: Date and time at which the task must be resolved
  - `Case State`: Case state to be executed automatically, if the human task's deadline was reached.

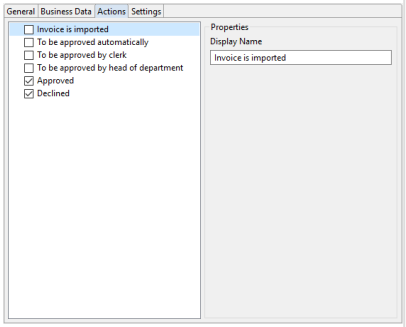
    > ⓘ If a human task with a deadline is executed, the process is automatically resumed with the configured case state after the specified deadline was reached. In this case, the human task is automatically closed and displayed within the Task Management Web AppTask Management Web App's navigator node **Verfallen** (expired). All human tasks that have exceeded the deadline and have been closed automatically are displayed here.
    >
    > If no case state was set, the process won't be continued automatically.

- Tab *Business Data*: Define information to be displayed within the Task Management Web App



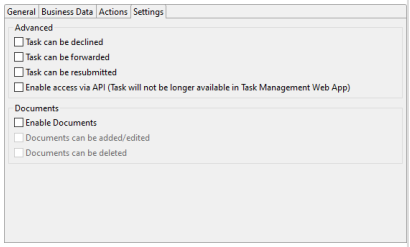
- `Key Identifier`: Case feature as key identifier within the Task Management Web App
- Categories, feature groups and features are displayed in a tree structure and can be selected in order to be visible within the Task Management web app
  ⓘ Categories are displayed as tabs within the Ta sk Management web app.
- `Display Name`: Display name of the selected category, feature group or feature
- `read only`: Mark selected category, feature group and feature as read-only

- Tab *Actions*: Define actions to be performed within the Task Management Web App



- In `Actions` the case states to be set by the corresponding user within the Task Management Web App can be defined
- `Display Name`: Display name of the selected case states within the Task Management Web App

- Tab *Settings*: Advanced settings for case processing



Under **Advanced** you can allow declining and forwarding of tasks and enable accessing human tasks via interface, see also *Accessing Human Tasks via ReST API*.

- `Task can be declined`: Allow declining tasks
- `Task can be forwarded`: Allow forwarding tasks
- `Task can be resubmitted`: Allow resubmitting tasks
- `Enable access via API`: Allow accessing the task via interface

> The Task Management adapter allows to define additional actions for a human task.

Under **Documents**, you can allow adding, editing and deleting documents related to a case.

- `Enable Documents`: Allow processing documents
- `Documents can be added/edited`: Allow adding and editing documents
- `Documents can be deleted`: Allow deleting documents

> **Execution on the X4 Server**
> If a Business Process runs on a human task during execution, the execution of the process is stopped and the human task is generated. The process waits for the necessary human interaction within the Task Management Web App and continues execution as soon as the human task is completed.

2.2.2.2 Parameterizing Human Tasks Dynamically via Technical Processes

Human tasks can not only be configured via the human task files, but also dynamically via Technical Processes.

The following human task settings can be overridden in the Technical Process:

- `Owner`
- `Assignee`
- `Deadline`

The Technical Process for parameterizing the human task is created directly under the corresponding human task via the context menu **New > Technical Process** and cannot be moved.

The input and output document for the process is structured as follows:

Structure of the input and output document

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<HumanTask>
    <Owner>OwnerName</Owner>
    <Assignee>
        <name>AsigneeName</name>
        <type>user|group</type>
    </Assignee>

    <!-- Deadline types (NoDeadline, DurationDeadline, UntilDeadline)-->
    <NoDeadline />

    <DurationDeadline>
        <Days>7</Days>
        <Hours>4</Hours>
        <Minutes>45</Minutes>
    </DurationDeadline>

    <UntilDeadline>2019-04-18T14:30:49+02:00</UntilDeadline>
</HumanTask>
```

2.2.2.3 Accessing Human Tasks via ReST API

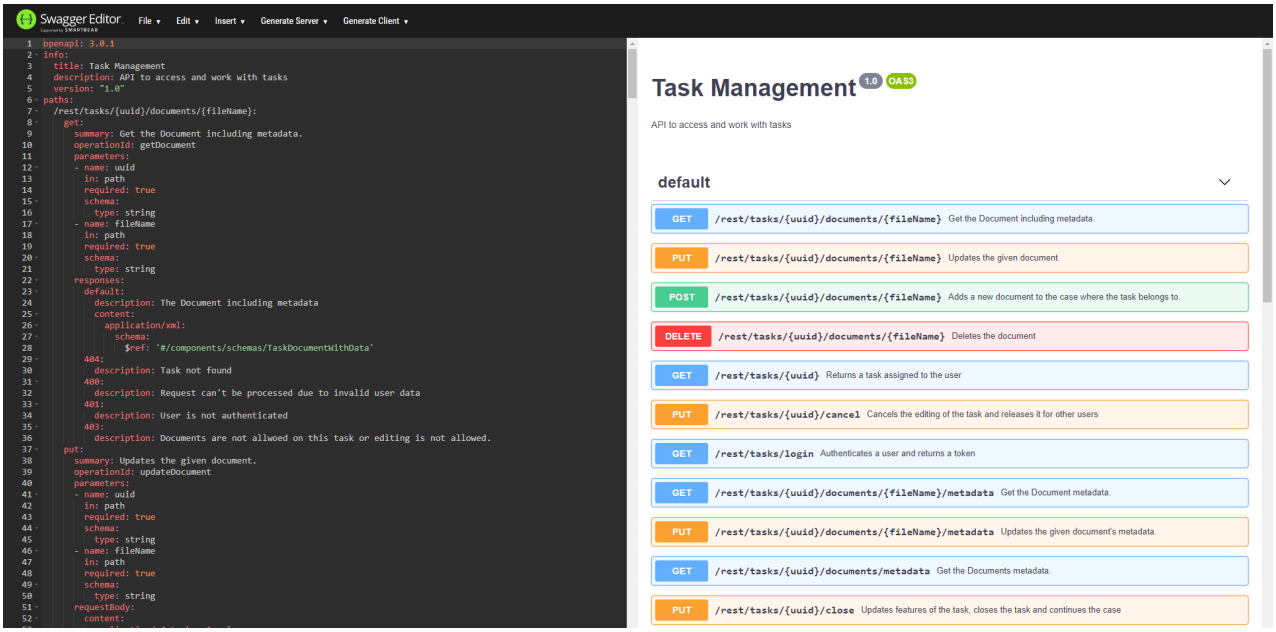
Instead of the *Task Management Web App*, also other applications can be used to display and edit human tasks. The implementation is done via ReST interface, which offers all functionalities also available in the *Task Management Web App*.

> ⚠ Access to the human task via the ReST interface can be enabled separately for each `.humantask` file.

To enable the connection via the ReST interface, the following settings must be made:

1. Open the human task.
2. Open the tab **Settings**.
3. Under **Advanced** select the option `Enable access via API`.
   Accessing human tasks is now only possible via the interface.

> Documentation of the ReST interface can be found at http://localhost:8080/X4/X4Api/.



2.2.2.4 Authenticate via ReST interface

To authenticate via the ReST interface, use the "Basic" HTTP authentication scheme or an X4 token.

Depending on the used authentication scheme, the HTTP request header has to be as follows:

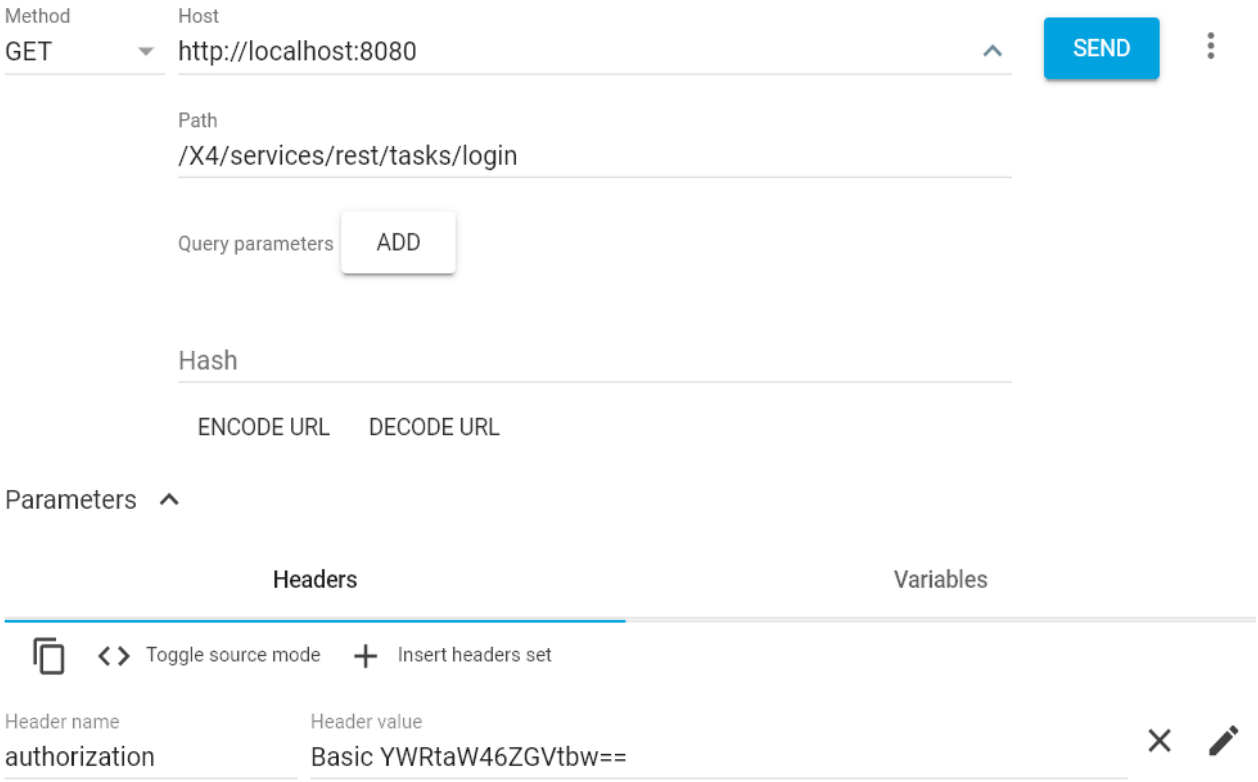
"Basic" HTTP authentication scheme

	Parameters	Value
ReST Request	`Method`	`GET`
	`Host`	`X4-Server:Port`
	`Path`	`/X4/services/rest/tasks/login`
ReST Request Header	`Header name`	`Authorization`
	`Header value`	`Basic <Username:Password>` Username:Password is set as a base64 encoded string.

You will receive an X4 token (JSON Web Token) that you can use for further ReST requests.

Example Header

```
authorization: Basic YWRtaW46ZGVtbw==
```



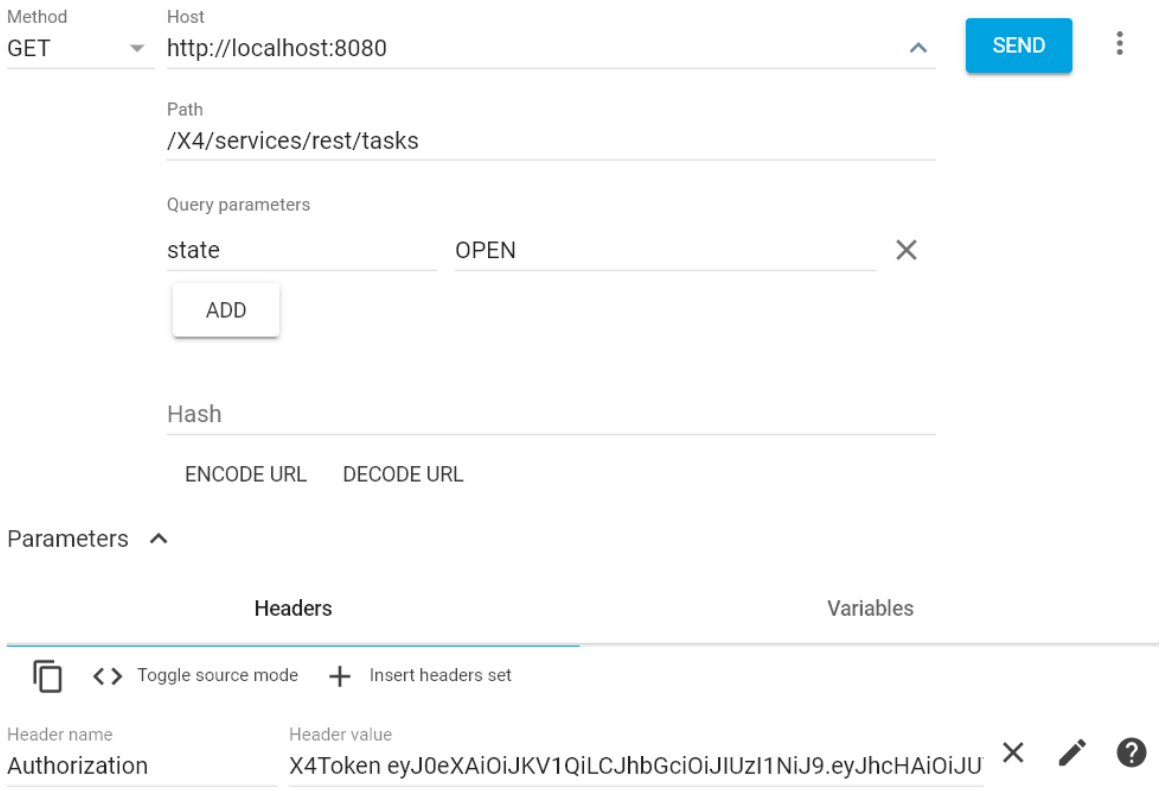
X4-Token

For further ReST requests, the ReST request header has to be as follows:

	Parameters	Value
ReST Request Header	`Header name`	`Authorization`
	`Header value`	`X4Token <X4-Token>`

Example Header

```
authorization: X4Token J0eXAiOiJKV1QiLCJhbGciOiJIUzI1NiJ9...
```



2.2.3 Rule

`Rule`: The rule component allows to depict rules for decisions within a Business Process. The rules to be applied are defined within decision tables (`.rule`) according to DMN 1.1. The rules can be automatically checked and the results will be passed to the Business Process for further processing.

> DMN is a standard for modeling decisions within Business Processes. The standard DMN also defines the Simple Expression Language (S-FEEL), a formal expression language for defining a decision logic.
> DMN 1.1 with S-FEEL is available online under https://www.omg.org/spec/DMN/1.1/.

Properties

`Label`	Label of the symbol within the process diagram

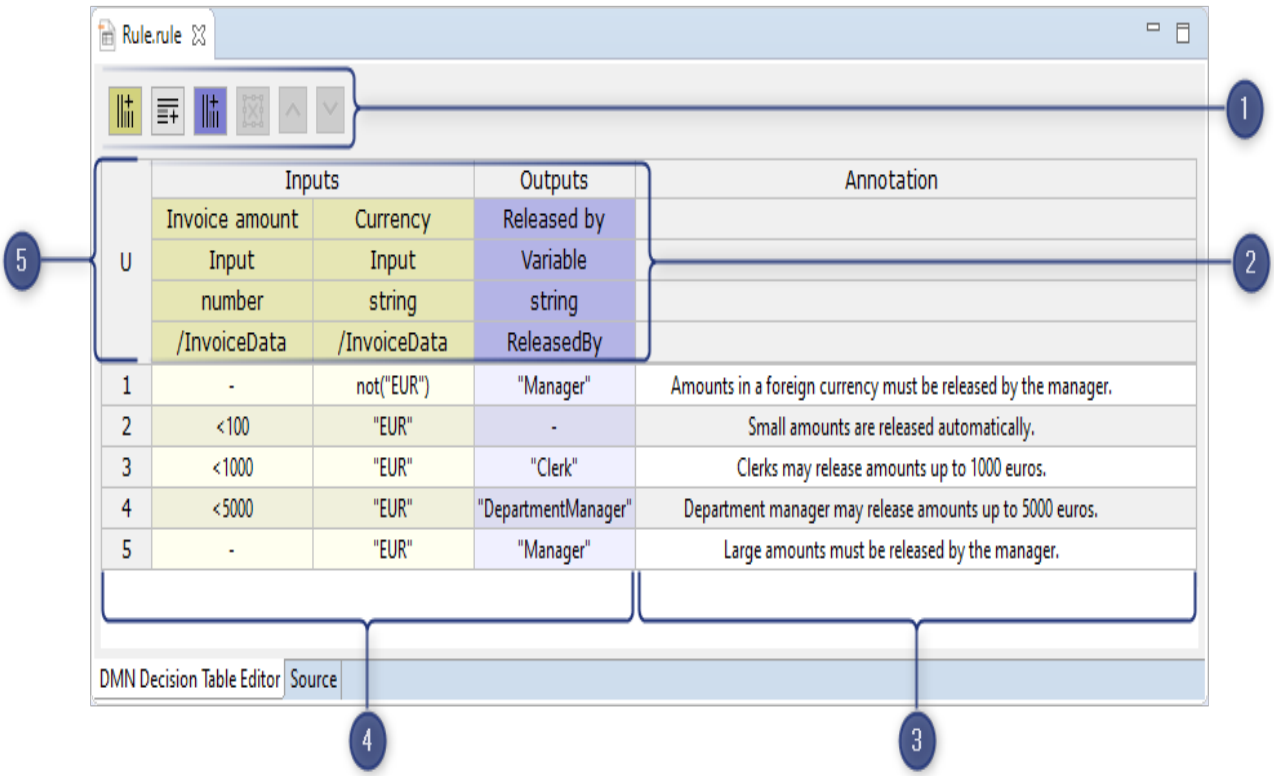
2.2.3.1 Creating and Defining Rules

- Default values of type Integer and Decimal cannot be empty.
- For the types Integer and Decimal it is not possible to check if the value is empty.

To better depict rules for decisions in Business Processes, rule modules can be used when modeling Business Processes. These can then be linked to a decision table (`.rule`) in which the rules are defined.

> **Combining decision tables**
> Any number of decision tables can be combined in a Business Process. Output values of one table thus become input values of the following tables. Thus, complex decision trees with corresponding branches can be modeled.

Decision tables (`.rule`) are created below the Business Process via the context menu **New > Rules** or via the toolbar > **Add rules**. After the creation, the decision table is opened in X4 Designer.



No.	Element	Description
1	Toolbar	Functions for editing decision tables, depending on context and selection

No.	Element	Description
2	Header area	Settings for defining input and output, whereby several inputs and outputs are possible. The following cells are available to define the input and output: 1. Free text field for the column name 2. Input or output source • **Input / Output**: Input from the BPMN process respectively output to be passed to the BPMN process • **Placeholder:** Selection of a placeholder (only available for input) • **Variable:** Value stored in a variable • **Case State**: Selection of a status • **Case Feature**: Selection of case data

- Data type of the input or output (`string`, `number`, `boolean`)
- Input path as free text field or selection (depending on the input source) respectively name of the output or variable as free text field or selection (depending on output destination)

3

Annotation

Comment field that is not displayed in the output

4

Rules

Rules determining how inputs are to be transformed into outputs.

Rules are defined per line in the decision table, whereby the row order determines the check order. A rule has at least one column for processing the input values (Input) and at least one decision result (Output).

Rules in the decision table are entered in the **S-FEEL notation.** This allows the decision logic to be described in natural language "business-friendly". As a formal markup language with fixed semantics, grammar and defined rules, it allows at the same time the interpretation and execution of values. S-FEEL can interpret strings, numbers, simple arithmetic operations and simple comparison tests.

Please note:

- Set strings in quotation marks, e.g. *`"Head of department"`*.
- For decimal numbers, use a dot as separator, e.g. *`5.1`*.
- If the value of a cell within the input column is not relevant for a rule, enter according to S-FEEL a – (minus sign) into the cell.
- A decision table can contain a fallback rule that always applies. For this purpose, all cells of the input columns of a fallback rule contain a – (minus sign).
  Whether a fallback rule makes sense and where it should be in the check sequence depends on the hit policy and the use case.

5

Hit policy

Setting regarding the displayed results. It determines how many rules of a decision table can apply and how the results are output.

Rules can be defined in a way that the number and selection of results violates the Hit Policy. In this case, the rules or the hit policy must be corrected depending on the application.

Significance	Possible hit policy violation
U (Unique): Only one rule can match and exactly one result is output.	• No applicable rule • Multiple applicable rules
F (First): One or several rules may apply, but only the first result is output. Consider the check order!	No applicable rule
A (Any): One or several rules with the same result may apply, but only one result is output.	• No applicable rule • Multiple applicable rules with different results
C (Collect): All applicable results are output without a fixed output sequence.	No applicable rule

The finished BPMN process with the decision table can be validated and checked for errors within the X4 Designer and executed on the X4 Server.
Decision tables can lead to three results:

Icon	Description
	The **Rule** component returns one or several results. The intermediate result can be opened.
0	The **Rule** component does not return any results. Possible causes: • None of the defined rules apply to the input. • The rules are incorrect, e.g. spelling error. • The hit policy is not suitable.
	The **Rule** component returns an error because the decision table does not conform to S-FEEL. A report with an explanation of the error can be opened.

2.2.3.2 S-FEEL Expressions for Defining Rules

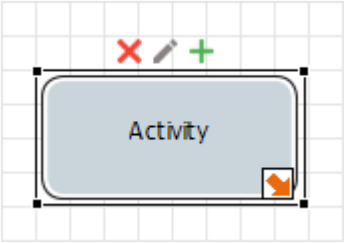
	Operator / Expression	Description
Comparison	`10`	Checks whether the input value corresponds to the specified value, e.g. *`10`*
	• `v:[Variablename]` • `f:[Featurename]` • `p:[Placeholdername]` • `c:[CaseState]`	Performs a check based on a variable, feature, custom placeholder, or case state By pressing the shortcut `Ctrl` + `Space` all currently available variables, features, custom placeholders and case states are displayed in a drop-down list.
	`<`	Checks whether the input value is smaller than the specified value, e.g. *`< 10`*
	`<=`	Checks whether the input value is less than or equal to the specified value, e.g. *`<= 10`*
	`>`	Checks whether the input value is greater than the specified value, e.g. `> 10`
	`>=`	Checks whether the input value is greater than or equal to the specified value, e.g. *`>= 10`*
	`not()`	Checks whether the input value is not less than or equal to the specified value, e.g. *`not(<=10)`*
Interval	`[1..10]`	Checks whether the input value is greater than or equal to the start value and less than or equal to the end value.
	`(1..10]`	Checks whether the input value is greater than the start value and less than or equal to the end value.
	`[1..10)`	Checks whether the input value is greater than or equal to the start value and less than the end value.
	`(1..10)`	Checks whether the input value is greater than the start value and less than the end value.
Disjunction	`3,5,7`	Checks whether the input value is 3,5 or 7.

	`<2,>10`	Checks whether the input value is less than 2 or more than 10.
	`10,[20..30]`	Checks whether the input value is either 10 or between 20 and 30.
	`"Meier", "Müller, "Weber"`	Checks whether the input value is either Meier, Müller or Weber.

> An extensive reference to the syntax of the S-FEEL notation can be found in the current specification for DMN 1.1 (Chapter 9) of the Object Management Group under https://www.omg.org/spec/DMN/1.1.

2.3 Sequence Flow

`Sequence Flow`: Connects events, gateways, and activities of a Business Process, and defines a sequence of process actions by the sequence flow's arrow direction.

> As soon as you move the mouse over Events, Gateways or Activities, an arrow appears at the bottom right edge of the element. Click and drag the arrow to create a sequence flow line.
>
> 
>

Properties

`Label`	Free text area to set a label to the sequence flow (for a clearer layout or documentation purposes)
`Log4J Log`	Enable logging via *Log4j* at this position in the process using current input data; To enable Log4j logging, select the property, and click . **Possible values:** • *`Disabled`*: No Log4j action has been defined (default) • *`Enabled`*: A Log4j action has been defined

`BAM Log`	Enable logging via *X4 BAM* at this point in the process with the current input data; To enable BAM logging, highlight the property and click on . **Possible values:** • *`Disabled`*: No BAM Logging action has been defined (default) • *`Enabled`*: BAM Logging action has been defined
`Save Point`	Set Save Point at this point of the process to persist the complete state of the process engine with the processed data and state information when executing a process instance in the file system. The process instance can be restarted from the last saved Save Point via *X4 BAM*. **Possible values:** • *`No Savepoint`*: No Save Point has been defined (default). • *`Save and Continue`*: Create Save Point and directly continue process execution • *`Save and Stop`*: Create Save Point and stop the execution of the process instance • *`Delete`*: Delete current Save Point
`Priority`	For forks (`Parallel Gateways (Forking)`) and branches (`Exclusive Gateways (Forking)`): Position in the execution order (priority) **Possible values:** • Any positive integer • *`1`*: Highest priority (default)
`Condition`	For condition blocks: Execution condition stored by the **Condition Manager**.

2.4 Gateways

Within Business Processes (process diagrams with file extension `.bpm`) you can use the following gateways according to BPMN 2.0:

2.4.1 Parallel Gateways

	`Parallel Gateway (Forking)`	Defines a parallel gateway for logical AND branching according to BPMN 2.0.
	`Parallel Gateway (Synchronizing)`	Defines a synchronizing gateway for parallel sequence flows according to BPMN 2.0.

> ⓘ If sequence flows are modeled "parallely" with Parallel gateways, this doesn't mean they are executed simutaneously, but that they are equivalent. Within the property `Priority`, you can define the actual execution order of parallel sequence flows, see Sequence flow.

Properties

`Label`	Free text area to set a label to the branching, respectively the joining (for a clear layout or documentation purposes)

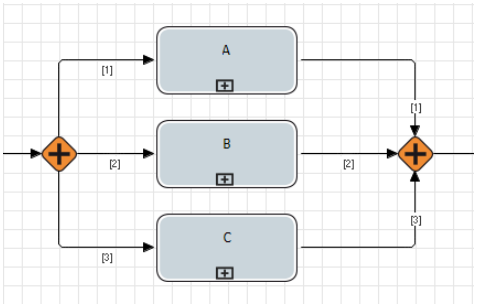
Using parallel gateways

1. Drag a *Parallel Gateway (Forking)* element from the **Palette** to the process diagram via drag&drop.
2. Create a *sequence flow* line for each execution branch to the *Parallel Gateway (Forking)* element.
   All execution branches are executed independently and use the same input.
3. If necessary, change the property `Priority` of a selected *sequence flow* line to change the execution order of the branches.

   > ⓘ In executable processes the execution branch with the lowest `Priority` number will be executed first.

4. Drag a *Parallel Gateway (Synchronizing)* element from the **Palette** into the process diagram.
5. Connect the *sequence flow* lines of the execution branches with the *Parallel Gateway (Synchronizing)* element.
   In executable processes, the output documents of the last executed process component in the fork will be handed over to the next process steps.

Example: Parallel gateway (forking) with 3 parallel, priorized branches and a Parallel gateway (join)



2.4.2 Inclusive Gateways

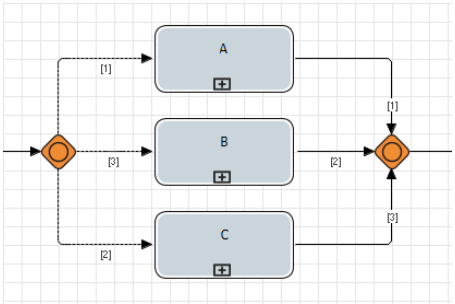
	`Inclusive Gateway (Forking)`	Defines a data-based inclusive gateway for logical OR branching according to BPMN 2.0
	`Inclusive Gateway (Synchronizing)`	Defines a synchronizing gateway to join exclusive databased sequence flows

> In practice, constructs with Inclusive gateways often make little sense. Thus, BPM experts recommend to avoid these elements, and to use a combination of Exclusive and Parallel gateways instead.

Properties

`Label`	Free text area to set a label to the branching, respectively the joining (for a clear layout or documentation purposes)
`Condition`	Execution condition (is set by the **Condition editor** automatically) for the forking; Double-click on the transition line to define conditions or click on to open the **Condition editor**.

Example: Inclusive gateway (forking) with 3 exclusive branches and a synchronizing Inclusive gateway (synchronizing):



2.4.3 Exclusive Gateways

`Exclusive Gateway (Forking)`	Defines a gateway for exclusive forkings according to BPMN 2.0
`Exclusive Gateway (Synchronizing)`	Defines a synchronizing gateway for parallel sequence flows according to BPMN 2.0

Properties

`Label`	Free text area to set a label for the exclusive forking, respectively the synchronizing (for a clearer layout or documentation purposes)
`Condition`	Execution condition of the forking (is set by the **Condition editor** automatically); Double-click on the transition line to define conditions or click on to open the **Condition editor**.

Using Exclusive Gateways

1. Drag an *Exclusive Gateway (Forking)* element from the **Palette** to the process diagram via drag&drop.
2. For each execution branch, create a *sequence flow* line beginning from the *Exclusive Gateway (Forking)*.
   All execution branches use the same input.

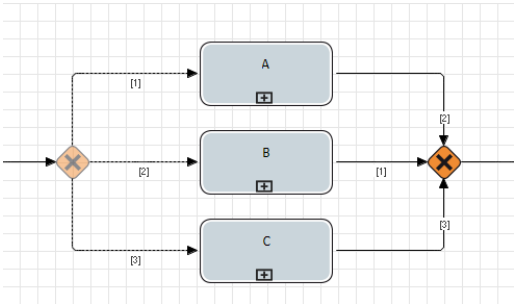
3. Double-click the *Exclusive Gateway (Forking)* element to define the conditions for the single execution branches.
   The **Condition Editor** will be opened. Here, you can define a condition for each selected *sequence flow* line, see Creating conditions.
4. If necessary, change the property `Priority` of a selected *sequence flow* line to change the execution order of the branches.

   > When executed, the Business Process's execution branch with lowest `Priority` numb er will be executed first.

5. Drag an *Exclusive Gateway (Synchronizing)* element from the **Palette** into the process diagram at the point where more than one execution branches shall be joined.
6. Connect the *sequence flow* lines of the execution branches with the *Exclusive Gateway (Synchronizing)* element.
   When the Business Process is executed, the output document of the last executed process component in the fork will be handed over to the next process steps, just like in Technical Processes.

> Since BPMN-compliant Business Process do not provide `Variable` components, context variables can only be evaluated if they were defined within a Technical Process and those Technical Processes are linked to the Business Process as activities. In the Business Process, context variables can be evaluated that were initialized within linked Technical Process, but not within the Technical Processes' subprocesses.

Example: Exclusive gateway (forking) with 3 exclusive forks and synchronizing exclusive gateways (synchronizing)



2.5 Artefacts

Within a Business Process (process diagrams with the file extension `.bpm`) you can use the following artefacts according to BPMN 2.0:

2.5.1 Message flow

`Message Flow`: If several pools are used to model a collaboration between different parties, the information interchange between the pools is marked with a message flow component.

> ⚠ Please note that message flows can only be used to visualize logical coherences!
> When executing the Business Process on the X4 Server, only process components are interpreted as data and control flow elements that have been connected with sequence flow lines, see Sequence Flow.

Properties

`Label`	Free text area to label the message flow (useful to layout/ document the process diagram)
`Line Routing`	Line routing **Possible values:** • *`Angled`*: Angled line • *`Straight`*: Straight line (Default)
`Line Type`	Line style **Possible values:** • *`Dash line`*: Dashed line (Default) • *`Solid line`*: Solid line • *`Dot line`*: Dotted line
`Line Color`	Message flow color; To change the color select the property and click . **Possible values:** • *`RGB(RRR,GGG,BBB)`*: 24 bit RGB color code (can be selected with an color picker dialog) • *`RGB(0,0,0)`*: Black (Default)

`Line Source Decorator` and `Line Target Decorator`	Symbol for the beginning and the end of the line **Possible values:** • *`Circle`*: Circle/ellipse (Default) • *`Empty arrow`*: Empty arrow • *`Association arrow`*: Open arrow • *`Arrow`*: Filled arrow • *`Inverted arrow`*: Inverted arrow • *`Diamond`* : Filled rhombus • *`Empty diamond`*: Empty rhombus • *`Plain`* : No symbol

2.5.2 Association

`Association`: Logical connection between process components (events, gateways or activities) and artefacts (such as pools, data objects, annotations or groups) or other drawing elements within a Business Process.

> Please note that association lines can only be used to visualize logical coherences!
> When executing the Business Process on the X4 Server, only process components are interpreted as data and control flow elements that have been connected with sequence flow lines, see Sequence Flow.

Properties

`Label`	Free text area to label the association (useful to layout/ document the process diagram)
`Line Routing`	Line routing **Possible values:** • *`Angled`*: Angled line • *`Straight`*: Straight line (Default)
`Line Type`	Line style **Possible values:** • *`Dash line`*: Dashed line (Default) • *`Solid line`*: Solid line • *`Dot line`*: Dotted line

`Line Color`	Association color; To change the color select the property and click . **Possible values:** • *`RGB(RRR,GGG,BBB)`*: 24 bit RGB color code (can be selected with an color picker dialog) • *`RGB(0,0,0)`*: Black (Default)
`Line Source Decorator` and `Line Target Decorator`	Symbol for the beginning and the end of the line **Possible values:** • *`Circle`*: Circle/ellipse (Default) • *`Empty arrow`*: Empty arrow • *`Association arrow`*: Open arrow • *`Arrow`*: Filled arrow • *`Inverted arrow`*: Inverted arrow • *`Diamond`* : Filled rhombus • *`Empty diamond`*: Empty rhombus • *`Plain`* : No symbol

2.5.3 Pool/Lane

`Pool/Lane`: Structures a Business Process into responsibilities and roles according to BPMN 2.0. Lanes are defined within one or multiple pools and represent the activities' responsibility. Pools represent participating organizations, systems etc. A pool can contain any number of lanes.

Properties

`Pool Name`	Free text name of the pool (if a pool is selected)
`Lane Name`	Free text name of the lane (if a lane is selected)
`Line Color`	Line color of the pool or the selected lane; To change the color, select the property and click . **Possible values:** • *`RGB(RRR,GGG,BBB)`*: 24 bit RGB color code (can be selected via a color picker dialog) • *`RGB(0,0,0)`*: Black (default)

`Line Width`	Line width of the pool or of the selected lane in pixels **Possible values:** • Any positive integer number • *1*: Line with 1 pixel width (Default)
`Fill Color`	Fill color of the pool or a selected lane; To change the color select the property and click . **Possible values:** • *RGB(RRR,GGG,BBB)*: 24 bit RGB color code (can be selected via a color picker dialog) • *RGB(255, 255, 255)*: White (default)

Using Pools/Lanes in Business Processes

Pools outline involved organizations, systems etc. and may contain multiple lanes. In the pool/lane layout, the chronological progress is visualized mostly from upper left to lower right.

1. Insert and edit a pool:
   - Drag the *Pool* symbol

     from the **Palette** to the workplace via drag&drop.
   - Scale the pool by clicking and holding the corner handles.
   - Change the text label of a pool: In the **Properties** view enter another text in `Pool Name`.
   - Change the formatting: Select the property `Fill Color` or `Line Color` in the **Properties** view, and click

     to open a color palette.
2. Add and edit a lane:
   - Right-click on a pool, and select **Add Lane** from the context menu.
   - Change the text label of a lane: In the **Properties** view enter another text in `Pool Name`.
   - Change the formatting: Select the property `Fill Color` or `Line Color` in the **Properties** view, and click

     to open a color palette.

2.5.4 Data object

`Data Object`: Includes any data object, e. g. a file from the X4 Repository.

Properties

`Document`	Path to the linked document within the Repository.
`Label`	Label of the symbol within the process diagram
`Operation`	Defines, if the file is to be read or written **Possible values:** • *`Read`*: Read the document into the process, and output content to the next process action (default) • *`Write`*: Write the document with the data received from the preceding process action

2.5.5 Data store

`Data Store`: Is used to visualize a database that is used.

> Please note that data stores are exclusively used for the visualization of logical connections!

Properties

`Document`	Path to the linked document within the Repository
`Label`	Label of the symbol within the process diagram
`Operation`	Defines, if the file is to be read or written **Possible values:** • *`Read`*: Read the document into the process, and output content to the next process action (default) • *`Write`*: Write the document with the data received from the preceding process action

2.5.6 Annotation

`Annotation`: Inserts a free annotation whose text can be edited and formatted via double-click in a corresponding dialog.

> You can link an annotation with a process component by using an association line.

Properties

`Hyperlink`	Linking defined for the annotation. To create a link enter a valid URL. You can open the linked URL with `Ctrl` + `click`.
`Text`	Text of the annotation; To change and format the text select the property and click ? Unknown Attachment
`Fill Color`	Fill color of the annotation; To change the color select the property and click . **Possible values:** • *`RGB(RRR,GGG,BBB)`*: 24 bit RGB color code (can be selected via a color picker dialog) • *`RGB(255, 255, 255)`*: White (default)
`Transparent`	Set annotation as transparent. By enabling this property the property `Fill Color` will be ignored.

2.5.7 Group

`Group`: Groups process elements visually in order to show their coherence.

Properties

`Line Color`	Line color of the group; To change the color select the property and click ? Unknown Attachment **Possible values:** • *`RGB(RRR,GGG,BBB)`*: 24 bit RGB color code (can be selected with an color picker dialog) • *`RGB(160,160,160)`*: Grey (default)
`Line Width`	Line width of the group element **Possible values:** • Any positive integer number • *`2`*: Dashed line with 2 pixel width (default)

2.6 Drawing

Which drawing elements can be used for all process types.:

2.6.1 Connection

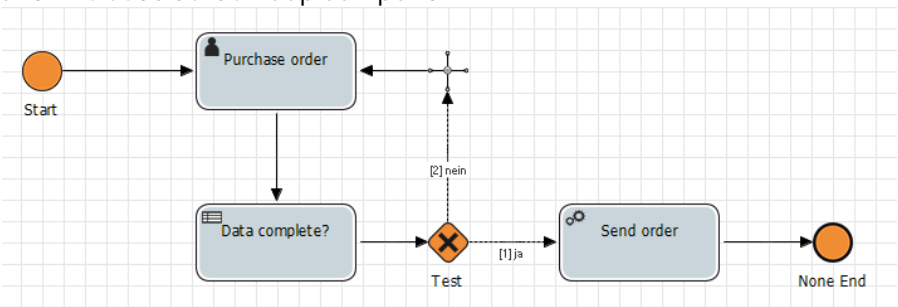
`Connection`: Passes the input and the execution state of the preceding process action without modification. It marks the execution branch explicitly for the X4 Server. Within a loop this component marks the return to the first loop component. It connects a `Condition` component with a `Stop` component, or helps to change a transition line's position.

Properties

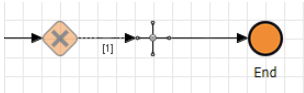
`Label`	Text label of the symbol in the process diagram (can also be edited by pressing **F2**)

Examples

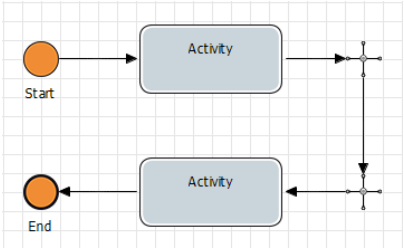
- *Connection between condition and the last loop component*: Within loops, a `Connection` component is used as last loop component.



- *Connection between condition and stop*: Between a `Condition` component and a `Stop` component, a `Connection` component is used.



- *Connection to position the transition line*: Transition lines are normally positioned automatically. To change the positioning explicitly a connection can be used.



2.6.2 Connector

`Connector`: Creates a logical connection between elements

> Connector lines can only be used to visualize logical coherences!
> When executing the Business Process via the X4 Server, only process components are interpreted as data and control flow elements that have been connected with Sequence Flows in Business Processes, and those components that are connected with Transitions in Technical Processes.

Properties

`Label`	Free text area to label the connector line (useful to layout/ document the process diagram)
`Line Routing`	Line routing **Possible values:** • *`Angled`*: Angled line • *`Straight`*: Straight line (Default)
`Line Type`	Line style **Possible values:** • *`Dash line`*: Dashed line (Default) • *`Solid line`*: Solid line • *`Dot line`*: Dotted line
`Line Color`	Connector line color; To change the color select the property and click ? Unknown Attachment . **Possible values:** • *`RGB(RRR,GGG,BBB)`*: 24 bit RGB color code (can be selected with a color picker dialog) • *`RGB(0,0,0)`*: Black (Default)

`Line Source Decorator` and `Line Target Decorator`	Symbol for the beginning of the line **Possible values:** • *`Circle`*: Circle (Default) • *`Empty arrow`*: Empty arrow • *`Association arrow`*: Open arrow • *`Arrow`*: Filled arrow • *`Inverted arrow`*: Inverted arrow • *`Diamond`*: Filled rhombus • *`Empty diamond`*: Empty rhombus • *`Plain`*: No symbol

2.6.3 Rectangle and Ellipse

`Rectangle`	Draws a rectangle
`Ellipse`	Draws an ellipse

Properties

`Line Color`	Border color of the drawing element; To change the color select the property and click . **Possible values:** • *`RGB(RRR,GGG,BBB)`*: 24 bit RGB color code (can be selected with a color picker dialog) • *`RGB(0,0,0)`*: Black (Default)
`Line Width`	Width of the drawing element's border **Possible values:** • Any positive integer number • *`1`*: 1 Border with 1 pixel width (Default)
`Hide Line`	Hide border of the drawing element

`Fill Color`	Fill color of the drawing element; To change the color select the property and click . **Possible values:** • *`RGB(RRR,GGG,BBB)`*: 24 bit RGB color code (can be selected with a color picker dialog) • *`RGB(255,255,255)`*: White (Default)
`Transparent`	Set drawing element as transparent. By enabling this property the property `Fill Color` will be ignored.

2.6.4 Textbox

Abc `Textbox`: Inserts a text box, whose content can be edited and formated in a dialog by double-clicking the box.

Properties

`Hyperlink`	Linking defined for the textbox. To create a link enter a valid URL. You can open the linked URL with `Ctrl` + `click`.
`Text`	Content of the text box; To edit and format the text select the property and click .
`Rotation`	Rotation of the text box in degree **Possible values:** • *`0`*: No rotation (Default) • *`90`*: Rotate by 90° • *`180`*: Rotate by 180° • *`270`*: Rotate by 270°
`Fill Color`	Fill color of the text box; To change the color select the property and click . **Possible values:** • *`RGB(RRR,GGG,BBB)`*: 24 bit RGB color code (can be selected via a color picker dialog) • *`RGB(255, 255, 255)`*: White (default)

`Transparent`	Set text box as transparent. By enabling this property the property `Fill Color` will be ignored.

2.6.5 Polygon

`Polygon`: Draws a polygon with multiple corner marks

Properties

`Line Color`	Border color of the drawing element; To change the color select the property and click ? Unknown Attachment . **Possible values:** • *`RGB(RRR,GGG,BBB)`*: 24 bit RGB color code (can be selected via a color picker dialog) • *`RGB(0,0,0)`*: Black (Default)
`Line Width`	Width of the drawing element's border **Possible values:** • Any positive integer number • *`1`*: Border with 1 pixel width (Default)
`Fill Color`	Fill color of the drawing element; To change the color select the property and click . **Possible values:** • *`RGB(RRR,GGG,BBB)`*: 24 bit RGB color code (can be selected with a color picker dialog) • *`RGB(255,255,255)`*: White (Default)
`Transparent`	Transparent fill (do not use a fill color); By enabling this property the property `Fill Color` will be ignored.

2.6.6 Polyline and Line

`Polyline`	Draws a line with multiple way points
`Line`	Draws a straight line

Properties

`Line Color`	Border color of the drawing element; To change the color select the property and click ? Unknown Attachment . **Possible values:** • *`RGB(RRR,GGG,BBB)`*: 24 bit RGB color code (can be selected with a color picker dialog) • *`RGB(0,0,0)`*: Black (Default)
`Line Width`	Width of the drawing element's border **Possible values:** • Any positive integer number • *`1`*: Border with 1 pixel width (Default)

2.6.7 Image

`Image`: Inserts an image frame that allows to include a `.gif`, `.jpg`, `.png`, or a `.bmp` image file.

> ⓘ The inserted image will be stored within the process.

Properties

`Line Color`	Border color of the image frame; To change the color select the property and click ? Unknown Attachment . **Possible values:** • *`RGB(RRR,GGG,BBB)`*: 24 bit RGB color code (can be selected with a color picker dialog) • *`RGB(0,0,0)`*: Black (Default
`Line Width`	Width of the drawing element's border **Possible values:** • Any positive integer number • *`1`*: Border with 1 pixel width (Default)
`Image File`	Path to the linked image file

3 Working with BPM Projects

The X4 Repository is organized in projects. Projects have a file system structure and can contain any folders, processes, process components and other files.

3.1 The Structure of BPM Projects

BPM projects have a predefined and unchangeable folder structure, which is created automatically when a new BPM project is created.

> ⓘ The automatically created folders and subfolders cannot be deleted, moved or renamed.

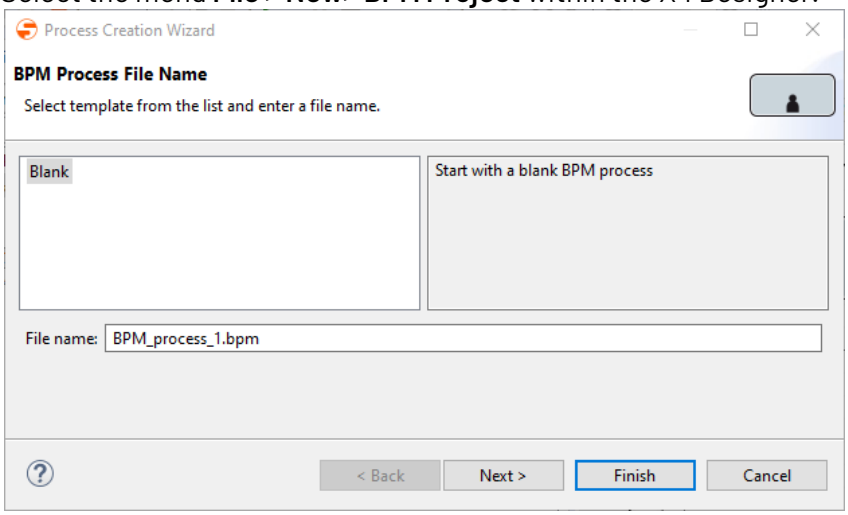
`Project`	At top level of a BPM project process landscapes (`.pld`) can be created.
`Processes`	Within the `Processes` folder any number of BPM processes (`.bpm`) can be created. Here is also the `Activities` folder with his predefined structure.
`Activities`	The `Activities` folder contains the following subfolders, which can contain only predefined filed: • `Adapters`: Here only folders and adapter files (`.fa` and `.tra`) can be created • `DomainModel`: Here any number of `.domainmodel` files can be created in which the business case data is defined • `Processes`: Here you can store technical processes (`.wrf`) in order to link them to your activities • `Resources`: Folders, resources such as images, text and XML documents and other files can be stored here. • `TemproraryFiles`: Temporarily used files are stored here. • `Transformations`: Transformations (`.xsl`) and reports (`.rep`) are stored here.
`Resources`	Folders, resources such as images, text and XML documents and other files can be stored here.

3.2 Creating BPM Projects

There are different options to create BPM projects:

- Via **New BPM Project** on the X4 Designer Welcome page
- Via the context menu **New > BPM Project** within the Repository Navigator
- Via the menu **File > New > BPM Project**

1. Select the menu **File > New> BPM Project** within the X4 Designer.



2. Select an empty project template or an already existing template.
3. Enter the project's name in **Project name**.
4. Click **Finish** to create the project.
   An empty BPM project with the predefined structure is created within the Repository Navigator.

> The various elements of a BPM project can now be created via the context menu. The available options change depending on where in the tree structure the context menu is opened.

3.3 Templates

In X4 Designer, you can choose from several templates when creating a project.

3.3.1 ESB Project

Category	Template	Description
Basics	ESB Introduction	This project contains a brief introduction to Technical Process modeling.
	XSLT Introduction	This project contains a brief introduction to creating XML data transformations.
Database	Create Data	This project contains an example of creating data in a database using the JDBC Connector adapter.
	Delete Data	This project contains an example of deleting data from a database using the JDBC Connector adapter.
	Read Data	This project contains an example of reading data from a database using the JDBC Connector adapter.
	Update Data	This project contains an example of updating data in a database using the JDBC Connector adapter.

E-Mail	Send e-mails with the POP/SMTP adapter	This project contains an example of sending e-mail using the POP/SMTP adapter.

3.3.2 BPM Project

Category	Template	Description
Basics	BPMN Introduction	This project contains a brief introduction to Business Process modeling.
Demos	Approve electronic invoice	This demo includes an approval process for electronic invoices. It includes Business Processes, Business Rules (DMN) and Human Tasks.

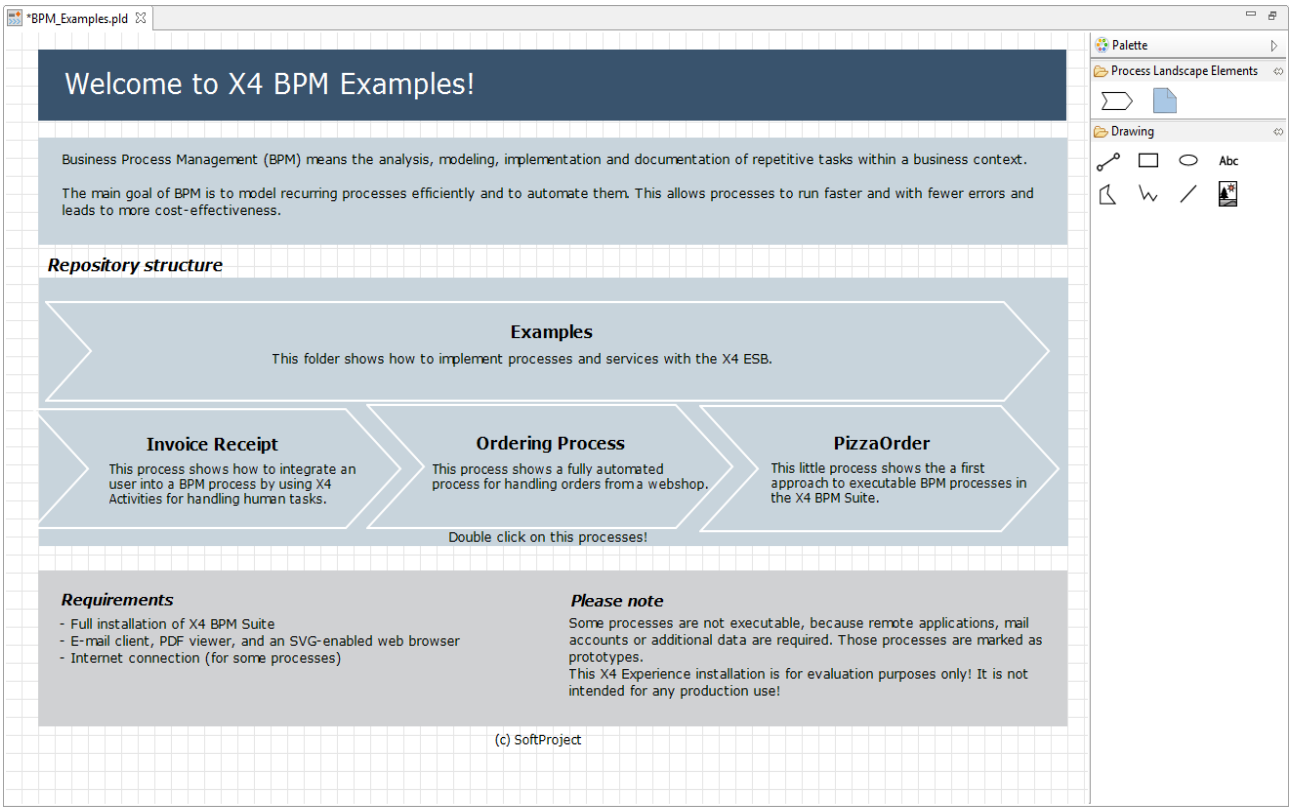
3.3.3 Web App Project

Category	Template	Description
Components	Calendar Component	This Web App is an example of a Calendar Component with appointments.
	Grid Component	This Web App is an example of displaying data in tabular form in the Grid Component.
Controls	How to use Controls	This project contains examples of how to use the most common Controls in X4 Web Apps.
	TextBlock	This project contains examples of how to use the TextBlock control in X4 Web Apps.
Demos	Manage your customer data	In this demo you can manage your customers, their address data as well as contact persons.
	Report a street lighting malfunction	In this demo, a customer can report a malfunction in the street lighting system. The data is stored in a database.
Layouts	How to use layouts	This project contains examples of using layouts in X4 Web Apps.
Properties	Data Context	This project contains an example of how to use properties of the same context in several components.

3.4 Modelling Process Landscapes

Process Landscapes enable to provide a clear presentation of process landscapes within the X4 Designer and to link processes and other documents.
Process landscapes allow to plot all relevant processes and to document their logical connection in a compact way. Thus, a process landscape provides a bird's eye view on management processes, value chains, and support processes and provides a basis for quality management.

Process landscapes are created at the highest level of a BPM project. Each BPM project may only contain one process landscape with the project name as name, e.g. `Demoproject.pld`. Process landscapes are not executable, but provide an overview of Business Processes that can be linked using `Block Arrow` elements. In addition, with `Data Objects` you can link any other repository file.

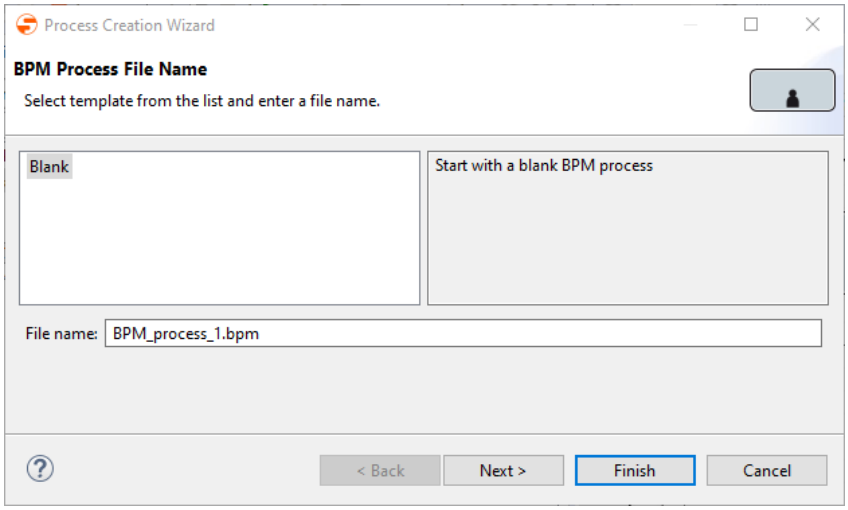


3.5 Creating a Business Process

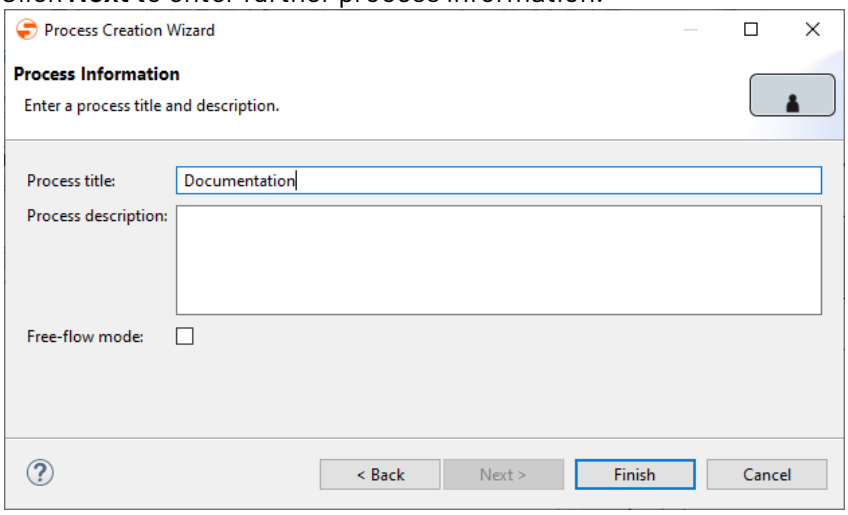
The BPMN Designer enables to model Business Processes according to BPMN 2.0.
To create an executable Business Process, you can drag empty process components from the palette or repository files to the workplace, and configure the corresponding properties in the **Properties** vie w.

> ⓘ The *Free-flow* mode additionally allows to use the BPMN Designer as plain BPMN drawing tool with an extended BPMN palette where the run/debug functionality is disabled.

1. Create a new business process within the **Processes** folder e.g. via the context menu **New > Business Process**.



2. Select an empty project template or an already existing template.
3. Enter the Business Process name within **File name**.
   Blanks and umlaut characters are not allowed in file names!
4. Click **Next** to enter further process information.



5. Enter a process title within **Process title**.
   The process title will be displayed in the Business Process and can be changed with the property `Title` and hidden or shown with the property `Show Title` within the Properties view.
6. If required, enter a process description within **Process description**.
7. If required, enable the free-flow mode for business processes under **Free-flow mode** and use the BPMN Designer as plain BPMN drawing tool with an extended BPM palette.
   The run/debug functionality is disabled in the free-flow mode.
8. Click **Finish** to create the business process.
   An empty Business Process will be saved in the repository with the file extension `.bpm`, and will be opened in the BPMN Designer.
9. Model the Business Process as desired:
   - Create *Sequence Flow* connection lines :

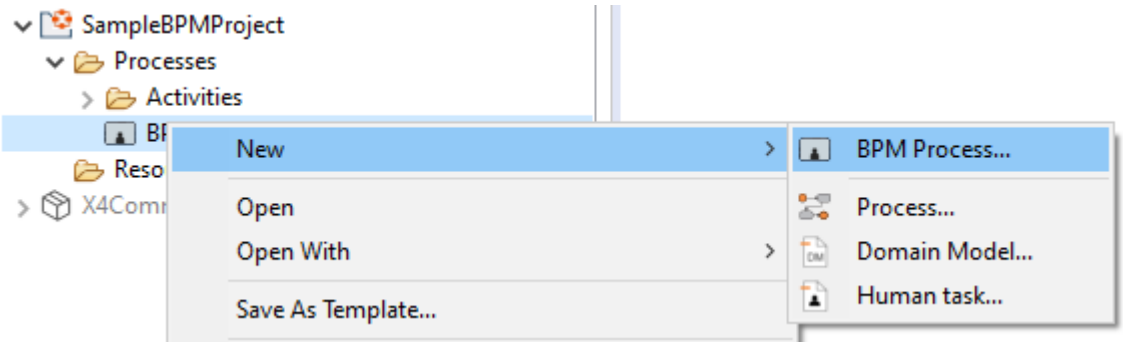
    - Move the mouse cursor over the `Start` component to display a small triangle.
    - Click on the triangle, and drag it to the target component to create a sequence flow.
- Insert elements from the **Palette** or from the **Repository Navigator** to the sequence flow via drag&drop.
    - Insert `Pools` and `Swimlanes`, see Pool/Lane.
    - Insert `Event` elements, see Events.
    - Insert `Parallel Gateway` elements or `Exclusive Gateway` elements, see Gateways

> **Tipp**
> An integrated process validator allows the process to be checked for validity via the menu **Project > Validate Project**.
> If you link repository files in your business process, and configure all properties in the **Properties** view correspondingly, you are able to execute the business process by clicking ▶. Excepted are processes in *Free-flow* mode.

3.5.1 Use of private files within Business Processes

If process resources are only to be used within a Business Process, they can be created directly within a parent process. This means that they can only be used in the process context and cannot be called up from other Business Processes.

In general, the same resources can be created within a single Business Process as within a BPM project - be it further Business Processes (`.bpm`), Technical Processes (`.wrf`), human tasks (`.humantask`), rules (`.rule`) or domain models (`.domainmodel`).

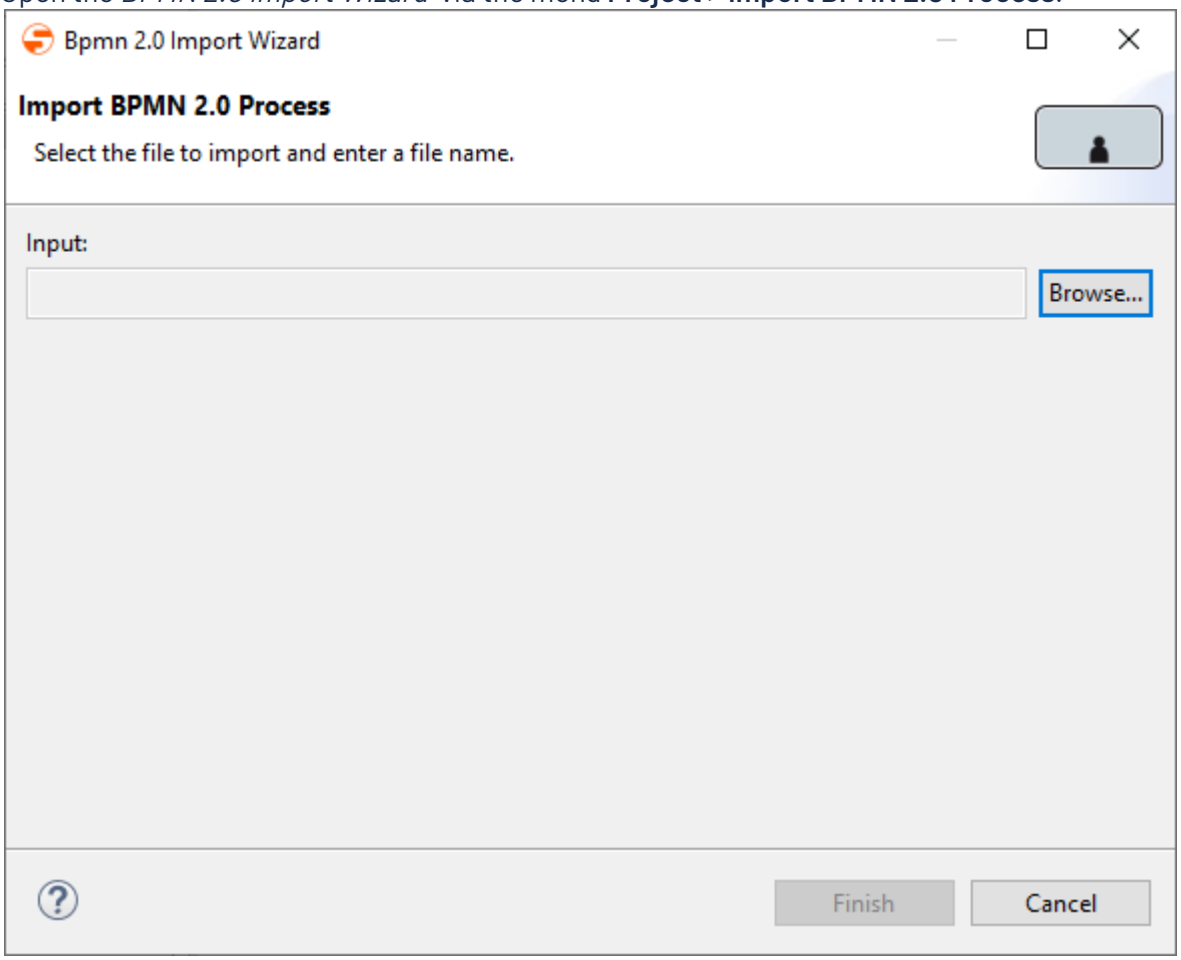


> The resources to be used can be created both via the context menu **New > *<resource name>*** and via the toolbar **> Add *<resource name>***.
> The created resources can then be parameterised as usual and incorporated into the process diagram via drag & drop from the repository, see also Human Task, Rule, Managing Case States.

3.6 Importing Business Processes in BPMN or XML Format

The *BPMN 2.0 Import Wizard* allows to import process diagrams in `.xml` or `.bpmn` format from third party modelling tools as new Business Processes into the X4 Repository.

1. Open the *BPMN 2.0 Import Wizard* via the menu **Project > Import BPMN 2.0 Process**.



2. Click **Browse** to select the desired file.

   > You can filter for the file via the `.xml` (default) or `.bpmn` extension.

3. Select the file and confirm the dialog.
   The file is now selected within the Wizard.
4. Click **Finish** to import the file.
   The file has been imported and is displayed as Business Process in the Repository Navigator.

3.7 Properties of Business Processes (.bpm)

Business Processes (`.bpm`) are modelled graphically using the BPMN Editor and can be executed on the X4 Server , if all modules are parameterized and linked correctly with repository files.

> You can edit the properties of a Business Process in the **Properties** view by clicking on a free area of the BPMN Editor's workspace.
> The most common properties are displayed by default, however, additional settings can be made using the Properties view toolbar:
>
> - *Show Categories*: Show properties sorted by categories
> - *Show Advanced Properties*: Show advanced properties

Properties

Documentation	
`Created`	Creation date of the process
`Created by`	Creator of the process
`Last Update`	Date of the last change
`Last Update by`	Name of the last editor
`Title`	Free text field for the process title
`Version`	Project version If no version is set, the time stamp is taken as version.
Technical	
`Can Stop`	Business Process may be stopped during execution This property is not inherited by subprocesses. **Possible values:** • *`True`*: For standard processes (default) • *`False`*: For critical processes that need to be completed
`Free-flow mode`	Defines if the *free-flow mode* is enabled. This unlocks the extended BPMN palette to use the BPMN Editor as a pure BPMN drawing tool. • This option can be enabled when creating a Business Process and cannot be changed afterwards. • The run/debug functionality for the current Business Process is disabled in Free-flow mode.

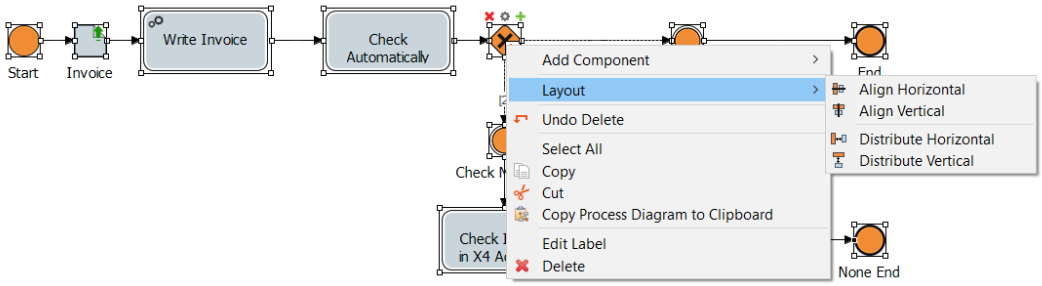
`In service`	Set process active or inactive. If inactive processes are executed, they receive the process ID *-1*. Subprocesses (processes called from other processes) can always be executed independently of this property. **Possible values:** • *`True`*: Process can be executed (default) • *`False`*: Process cannot be executed (only called as subprocess)
`Instance limit`	Maximum number of instances of this process that can be executed at the same time. **Please note!** `Instance limit` is ignored, if the process is executed as subprocess.
`Schedule`	Time scheduling tool enabling the scheduled execution of processes on the X4 Server without X4 Designer; To schedule a process, select this property, and click . **Possible values:** • *`Disabled`*: No schedule is defined (default) • *`Enabled`*: A schedule for this process is defined
`Stop on error`	Stop the process execution if an error occurs **Possible values:** • *`True`*: Stop execution if an error occurs (default) • *`False`*: Continue erroneous execution (if possible)
`Schema Declaration`	Define schema for input and output of the process

3.8 Aligning process components

Process components can be aligned easily via context menu entry **Layout**. This allows you to generate a clean and structured model quickly and easily.

To align process components, select the required components and open the context menu by right-clicking. Then select **Layout** and the desired option. The following options are available:

- `Align Horizontal`: Align the process components horizontally
- `Align Vertical`: Align the process components vertically
- `Distribute Horizontal`: Distribute the process components horizontally
- `Distribute Vertical`: Distribute the process components vertically

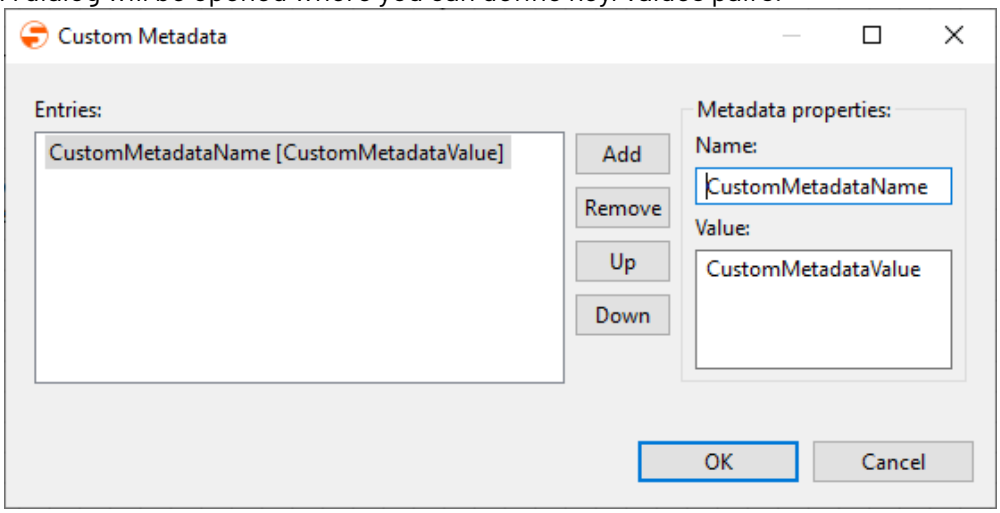


> For the options `Align Horizontal` and `Align Vertical` at least two process components must be selected, for the options `Distribute Horizontal` and `Distribute Vertical` at least three.

3.9 Adding Process Metadata

You can add metadata to the process definition of a Business Process or Technical Process, e.g. for documentation purposes.

1. In the Process Designer, click on an empty spot in the drawing area to display the process diagram's properties in the **Properties** view.
2. Select property `Metadata` > `Manage Metadata`, and click ? Unknown Attachment .
   A dialog will be opened where you can define key/values pairs.



3. Enter the metadata properties:
   - In **Name**, enter the metadata name, e.g. *`Version`*.
   - In **Value**, enter the corresponding metadata value, e.g. *`1.1`*.
4. To change the sequence of a selected metadata entry, click **Up** or **Down**.
5. Click **OK** to save the metadata.
   The metadata have now been added and are displayed in the *Properties* view. The metadata will be saved in the XML storage format of the process definition file.

> ⓘ The **Remove** button allows you to delete selected metadata from the list.

3.10 Import projects

Here you will learn how to import projects and other resources from the local file system into the repository.

3.10.1 Import via drag and drop

From the file system (e.g. from the desktop or *Windows Explorer*), you can import one or more marked files into the Repository Navigator and thus into the currently connected repository via drag and drop. If a file with the same name already exists at the destination, you will be prompted to enter a new name.

> ⓘ **Note:**
>
> - Folder structures are not supported during import, use the corresponding wizard for this.
> - For larger file transfers (over 1 MB in total), a confirmation dialogue will be displayed as there may be delays in the transfer as well as memory problems.
> - Imported files that contain special or space characters or umlauts in the file name must be renamed before you can open them in X4 Designer.
> - Projects have a predefined structure so that the inserted files can only be stored in the respective predefined folder, see also The Structure of ESB Projects

3.10.2 Using the Import Wizard for files and projects

> ⓘ **Note**
>
> - Projects have a predefined structure so that the files to be imported can only be stored in the respective predefined folder, see also The Structure of ESB Projects
> - Projects can only be imported at the top level and in the predefined project structure, see also The Structure of ESB Projects

1. In the menu, click **Project > Import**.
   The **Resource Import Wizard** is opened.
2. Select resource.
   - Select the file to be imported (`*.zip`) or the project to be imported via **Browse** and enter the corresponding name in **New project/file name**.
3. Click **Finish**.

3.11 Export projects

Here you will learn how to export projects and other resources from the repository to the file system.

3.11.1 Using the Export Wizard for files and projects

Note

- Projects can only be exported if the top project level is selected.

1. In the menu, click **Project > Export**.
   The **Resource Export Wizard** is opened.
2. Select destination folder.
3. Click **Save**.

4 Case Management

With Case Management in X4 Designer, you can model case-related processes including business data, case states, and case-related tasks.

Define business data and case states directly in the Business Processes - this way, you do not only model the process flow, but also define a process data model at the same time, which allows you to model complex processes, e.g. specific approval processes or processes that pass through various states.

Define categories, groups and features to model your business data. Business data, such as invoice numbers, can be entered directly in the process at runtime and business rules can be defined based on them.

Define various case states directly when modeling the Business Processes. The defined states can be evaluated or set in the created BPMN diagrams via event elements, decision tables, gateway elements or human tasks.

4.1 Implementing processes and workflows

Typically, people can be integrated into Business Processes via tasks. When modelling Business Processes, this is done using a Human Task component.

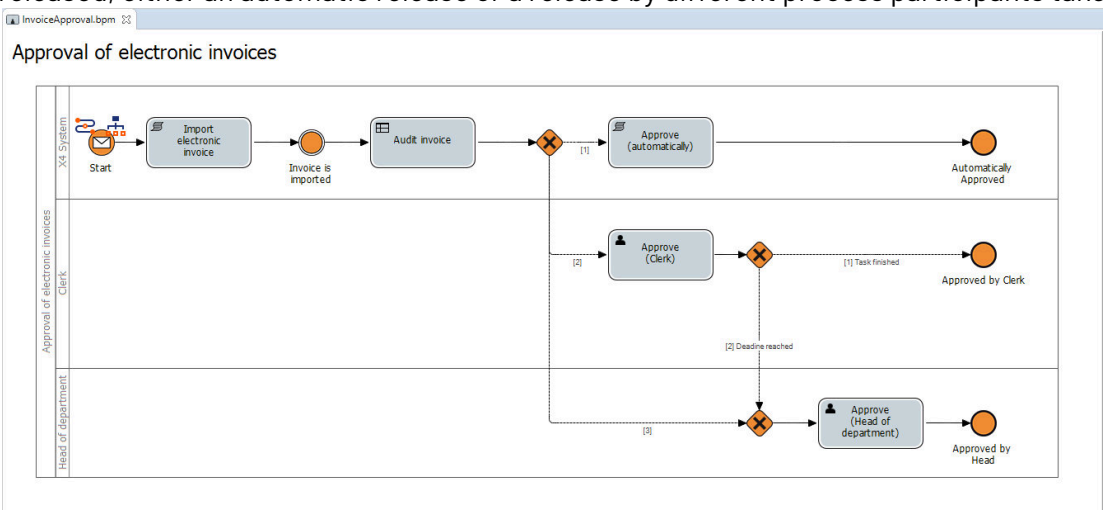
If a Business Process runs on a human task during execution, the execution of the Business Process is stopped and the human task is generated. The process waits for the necessary human interaction within the Task Management Web App and continues execution as soon as the human task is completed.

> ⓘ With version 7.0 of X4 BPMS, the way processes and workflows are realized with Case Management has been changed. When you upgrade from a 6.x to a 7.0 version, existing processes are automatically migrated.

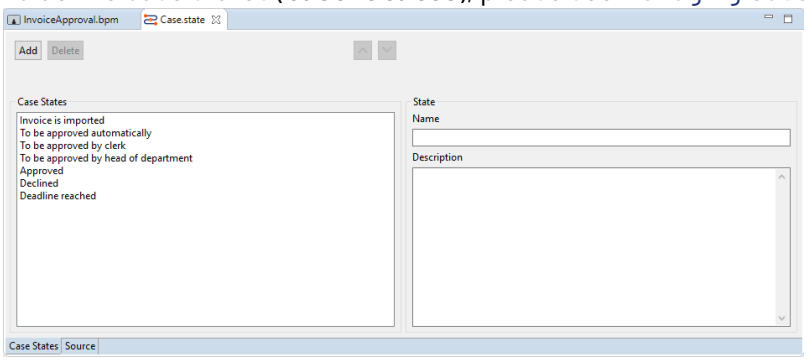
The following example illustrates the typical implementation with the X4 BPMS.

1. Model the Business Process as desired.
   The example shows a release process in which, depending on the amount of money to be

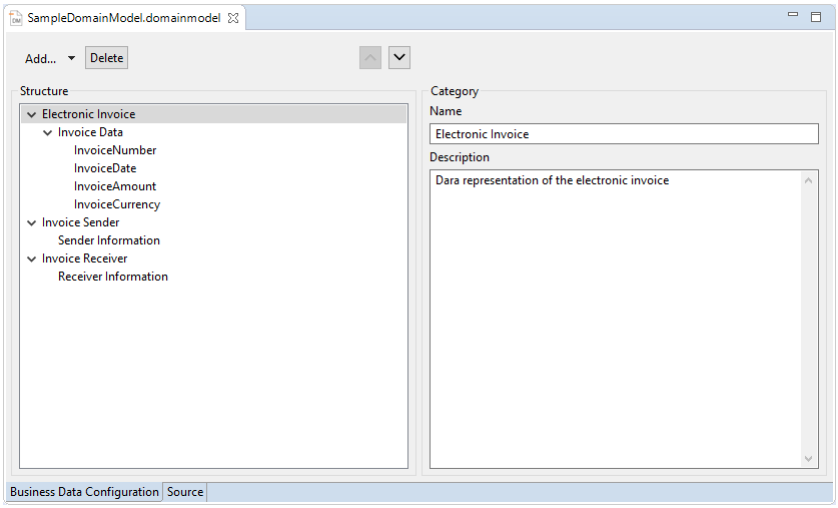
released, either an automatic release or a release by different process participants takes place.



2. Define the corresponding case states and business data:
   - To define case states (`Case States`), please see Managing Case States.



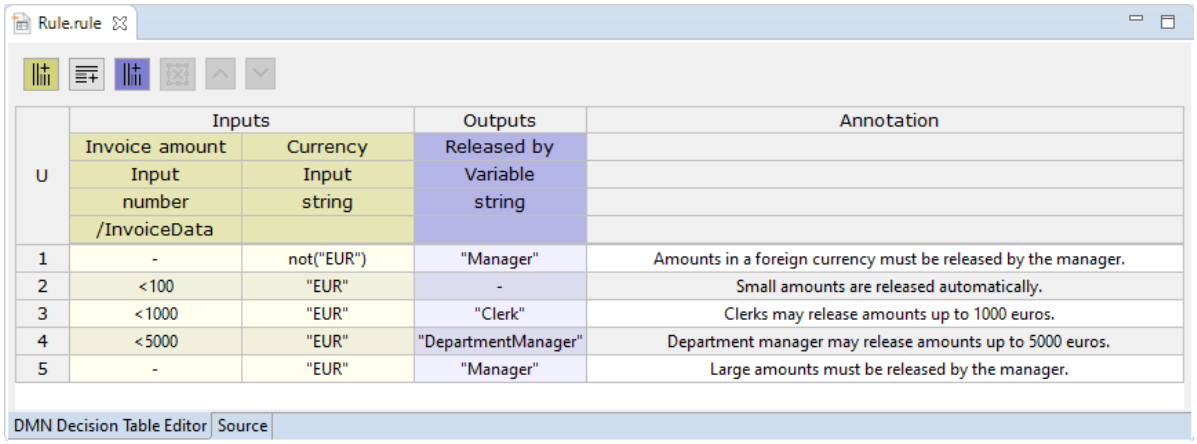
   - To define business data (`Business Data`), please see Managing the Business Data Structure



3. The data is read via an activity. The activity is linked to a technical process that reads the data and outputs all features via the Case Management adapter.
4. The process state is set via an Intermediate.
   The event's property `Case State` provides all defined case states.

5. Decision tables (`.rule`) are used to store the rules to assign the task to the appropriate person depending on the amount. The input specifies where the data to be checked comes from. Via **Case Feature** the previously defined features (see Managing Case States) are specified.

> Decision tables can also be used to evaluate variables, features, custom placeholders or status values (Case State). To do this, `Ctrl` + `space bar` in the rule area can be used to call up all currently available variables (v*:variable name*), features (*f:feature name*), custom placeholders (*p:placeholder name*) and operation status values (*c:CaseState*) in a selection list.

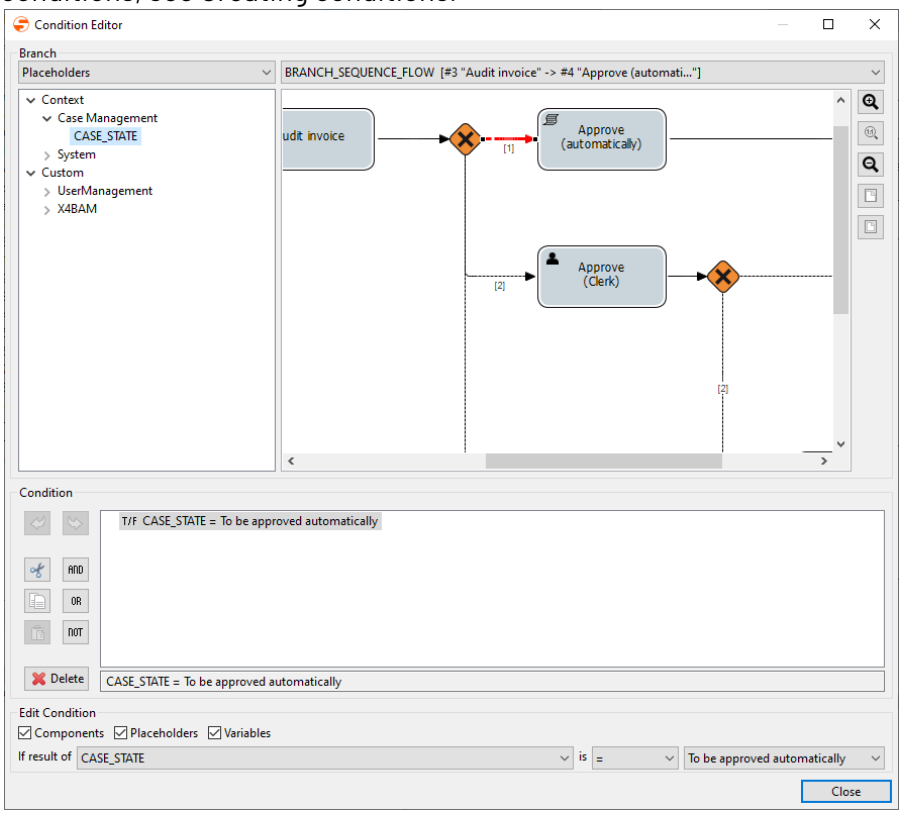


Rule.rule

U	Inputs		Outputs	Annotation
	Invoice amount	Currency	Released by	
	Input	Input	Variable	
	number	string	string	
	/InvoiceData			
1	-	not("EUR")	"Manager"	Amounts in a foreign currency must be released by the manager.
2	<100	"EUR"	-	Small amounts are released automatically.
3	<1000	"EUR"	"Clerk"	Clerks may release amounts up to 1000 euros.
4	<5000	"EUR"	"DepartmentManager"	Department manager may release amounts up to 5000 euros.
5	-	"EUR"	"Manager"	Large amounts must be released by the manager.

DMN Decision Table Editor | Source

6. A condition component is used to map the various execution branches. The *Condition Editor* allows to use the case states of the currentBusiness Process as evaluation criteria for the conditions, see Creating conditions.



7. Configure the corresponding Human Task for each branch and the appearance of the Task Management Web App.
8. Save and execute the process.
9. Open the *Task Management Web App* via the menu **Tools > X4 Task Management**.
10. Log in to the *Task Management Web App*.
    The tasks to be edited are displayed within the application.

    > ⓘ The rule module evaluates which user is allowed to edit a process.

11. Edit the tasks.

    > ⓘ Which editing functions are available depends on the configuration in the Human Task.

4.2 Managing Case States

To implement cases with X4 BPM, it is required to define a data structure for the business case within the Business Process. In domain model files (`.domainmodel`) you can define business data structure in a three-staged hierarchy to the process definition, including descriptions.

4.2.1 Structure of Business Case Data

A case's business data is structured in categories, groups, and features:

- *Categories* group business data on the highest level containing feature groups. Each category has a name, a position within the tree and an optional description.
- *Groups* aggregate business data features of the same category. Each group has a name, a position within the tree and an optional description.
- *Features* are specific business data properties, e.g. an order date within a feature group. Each feature has a name, a position within the tree and an optional description, a data type, and an optional default value.

Available data types for features are:

- `String`: String
- `Integer`: Integers
- `Decimal`: Decimals
- `Boolean`: Boolean values
- `DateTime`: Date and time

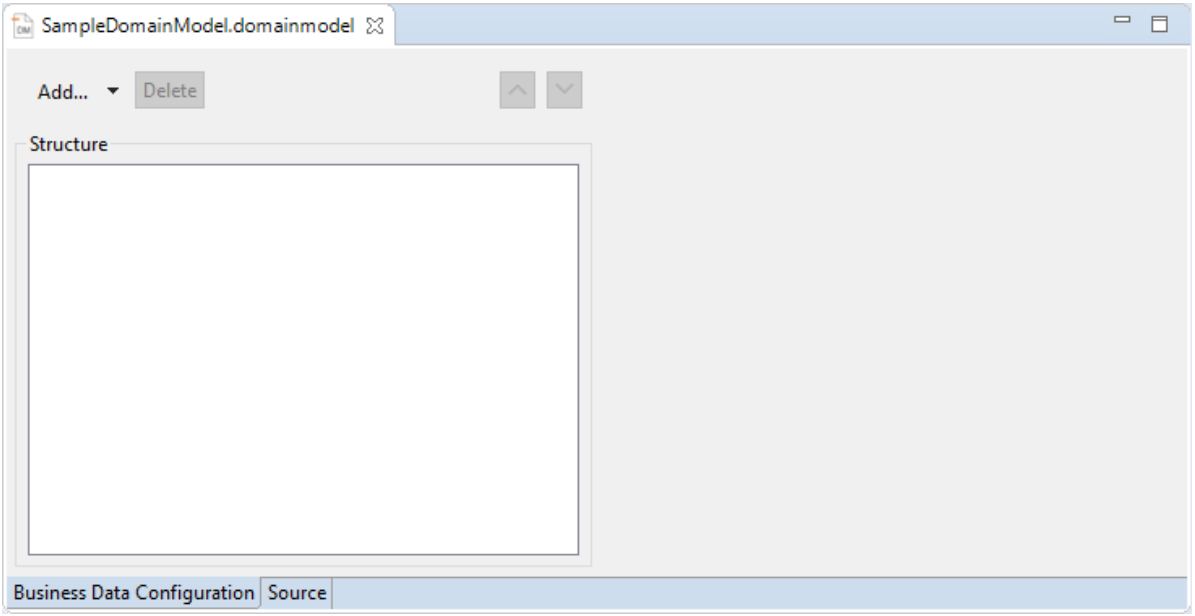
4.2.2 Defining Business Case Data

Business case data can be defined both for individual business processes and for the entire project or several business processes.

1. Right-click the `.bpm` file in the Repository Navigator view.
2. Select **New > Domain Model** in the context menu.

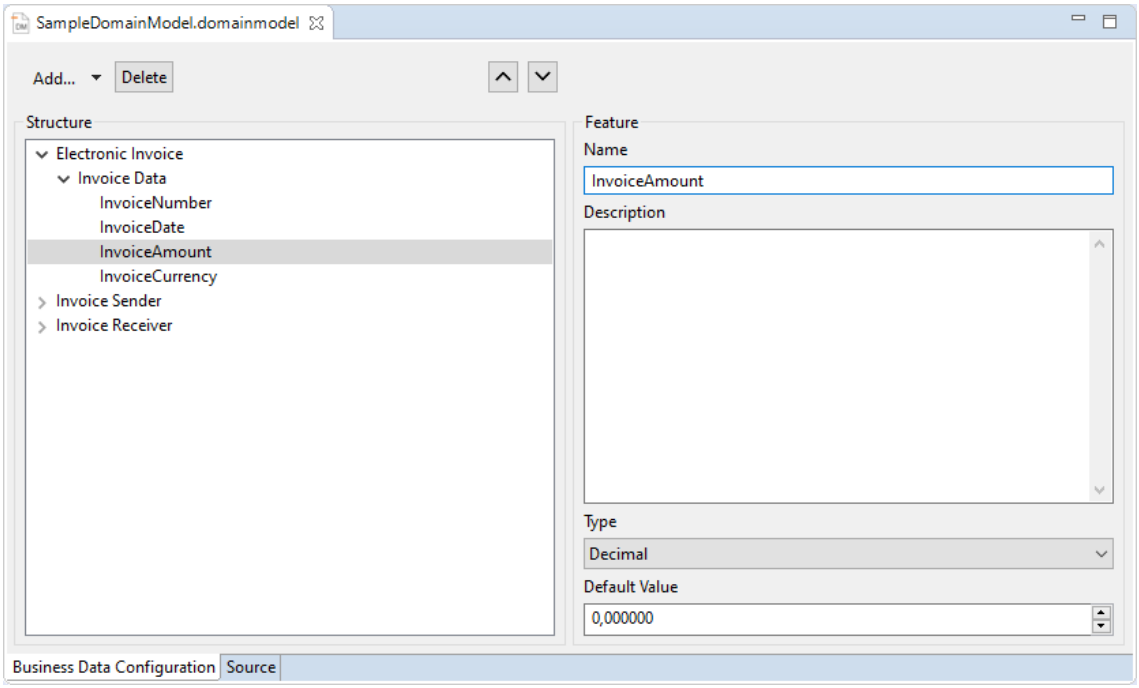
- If the business case data applies to several Business Processes, the corresponding `.domainmodel` file is created within the repository folder **Activities > DomainModel**.
- If the business case data applies only to one specific Business Process, the corresponding `.domainmodel` file is created directly below the Business Process. After saving, the .domainmodel file is automatically attached to the `Start` component.

The file is now created and opened in X4 Designer.



3. Define the business data structure and its descriptions.
   - To create a new feature *category*, click **Add** or select **Add > Category**. Then enter a category name (**Name**) and a corresponding description (**Description**).
   - To define a feature *group*, click **Add** when a category is selected or select **Add > Group**. Then enter a group name (**Name**) and a corresponding description (**Description**).
   - To define a *feature*, click **Add** when a group is selected or select **Add > Feature**. Then enter a feature name (**Name**), a corresponding description (**Description**), a data type (**Type**) and a default value for the feature (**Default Value**).

     Example:



- To change the sequence of a selected structure element, click ^ or v
- The **Delete** button allows you to remove a selected entry from the tree.

4. Click the icon in the toolbar to save.
5. Drag the `.domainmodel` file to the desired Business Process.

> `.domainmodel` files created below the Business Process are automatically attached to the `Start` component. The business data are therefore available in the process and the related Human Tasks.

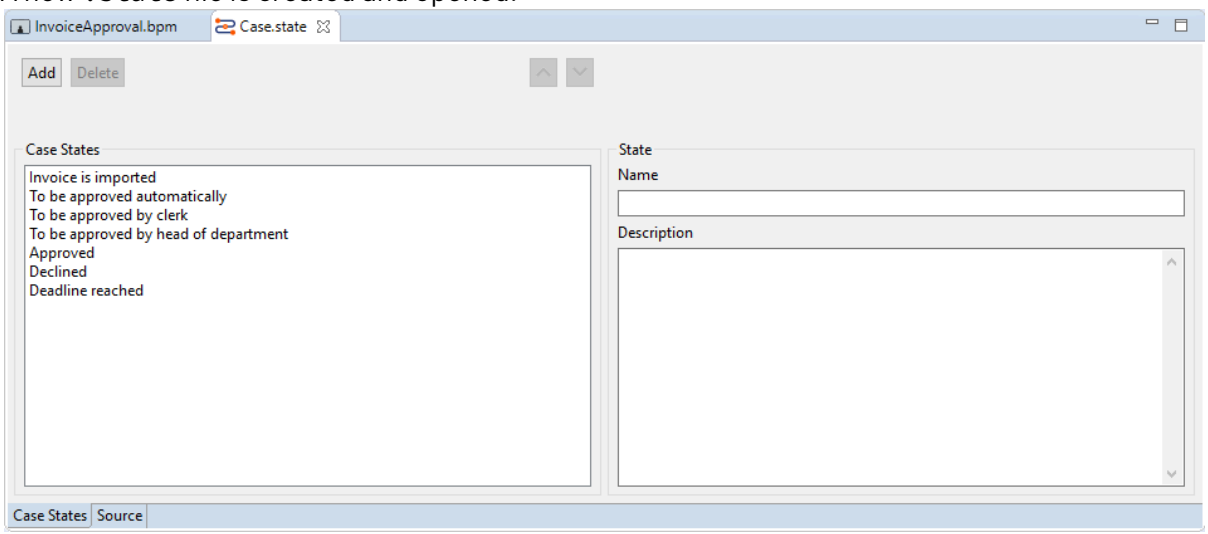
4.3 Managing Case States

To map processes with X4 BPM, it is necessary to define the required case states of the Business Process. Case states and state descriptions are defined in a separate file (`.state`).

4.3.1 Add case states

1. Right-click the `.bpm` file in the Repository Navigator view.

2. Select **New > Case States** in the context menu.
   A new `.state` file is created and opened.



3. Click **Add** to define a new state:
   - In **Name**, enter the name of the state, e.g. *Approved*.
   - In **Description**, enter an associated description (optional).
4. To change the order of a selected state value, click on ^ or v.
5. Save file.

> Use the **Delete** button to delete a selected state value.

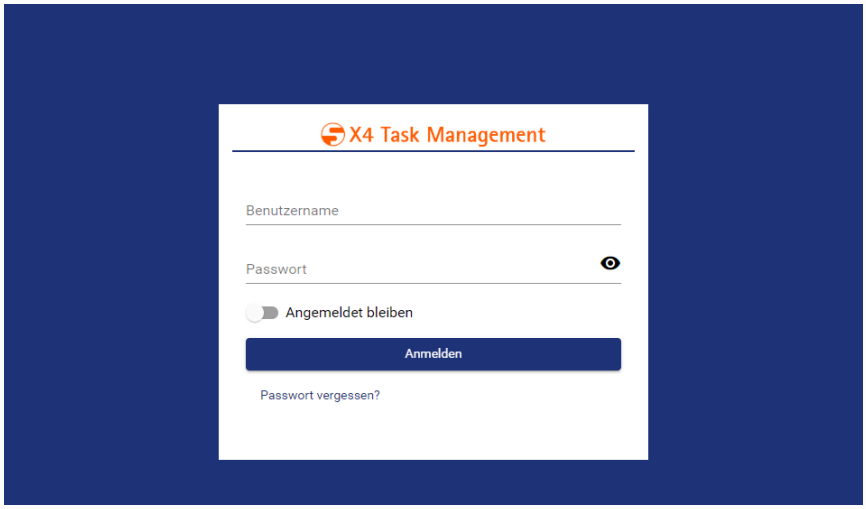
> **Set case state with intermediate events**
> You can also set the state of an operation that is to be processed at runtime of the current Business Process with Intermediate Events. Therefore, all process-wide defined process state values are available for selection in the `Case Management > Case State` property of the Intermediate Event.

4.4 Task Management Web App

Human Tasks allow integrating people into Business Processes. The *Task Management Web App* provides the user interface for processing the defined tasks.

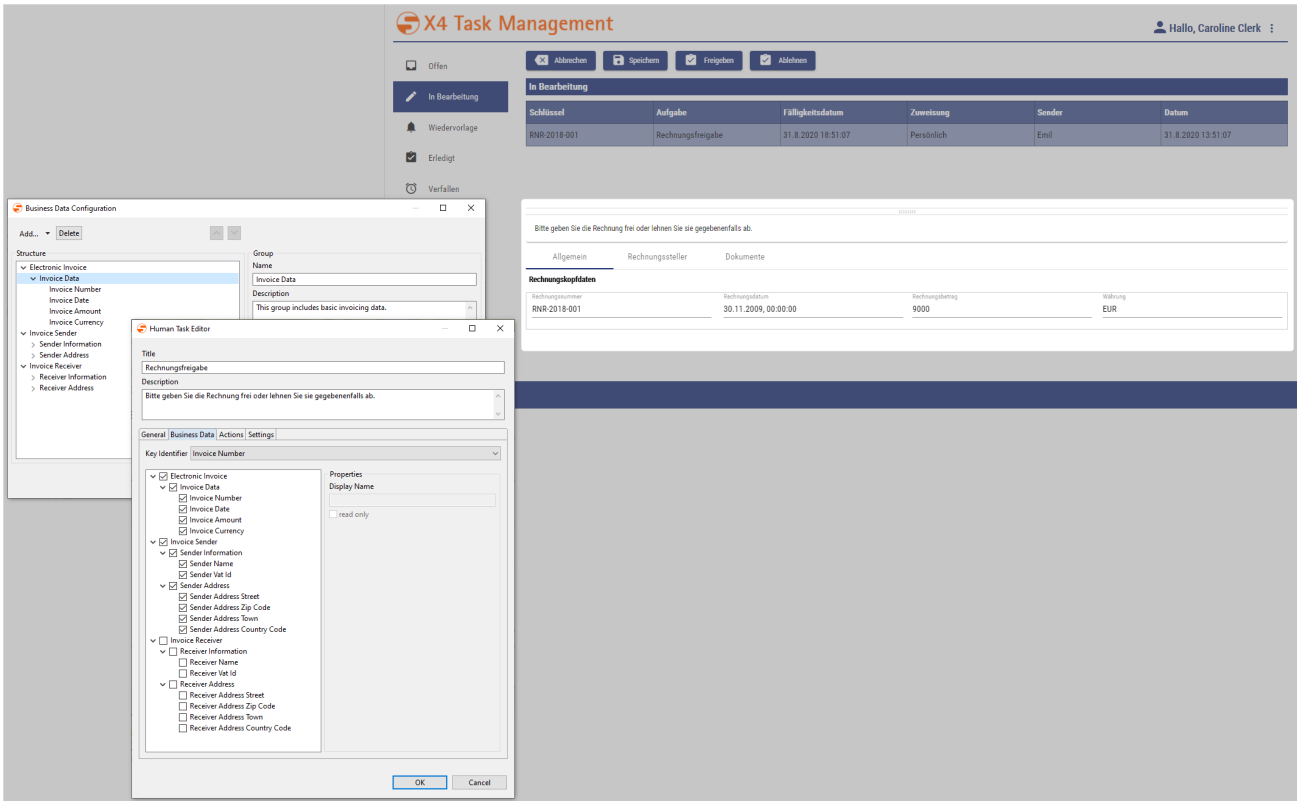
The *Task Management Web App* already has a predefined structure and predefined functions. However, further settings can be made within the corresponding Business Process and via various settings within the *Human Task Editor*.

The *Task Management Web App* can be opened via the menu **Tools > X4 Task Management**. The default access data is `demo/demo`.



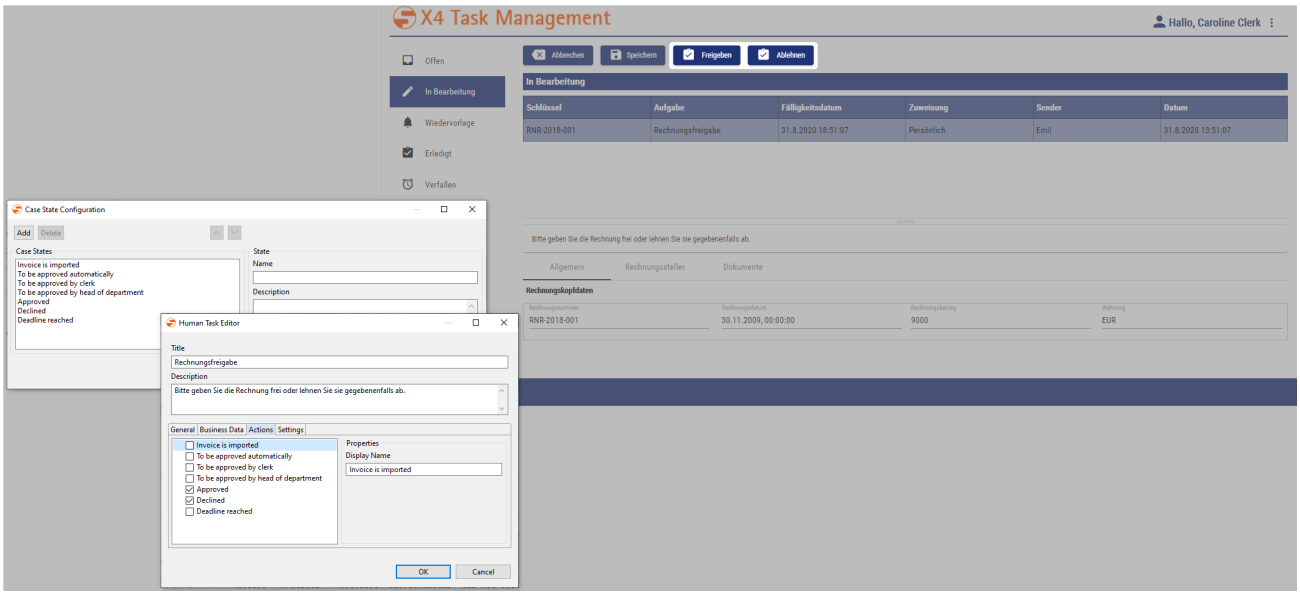
4.4.1 Defining and Displaying Business Case Data

Business case data is defined via the Business Process property `Business Data`, see Managing Case States. Which of the defined business data is actually displayed in the *Task Management Web App* for the user logged in is specified within the *Human Task Editor's* tab **Business Data**.



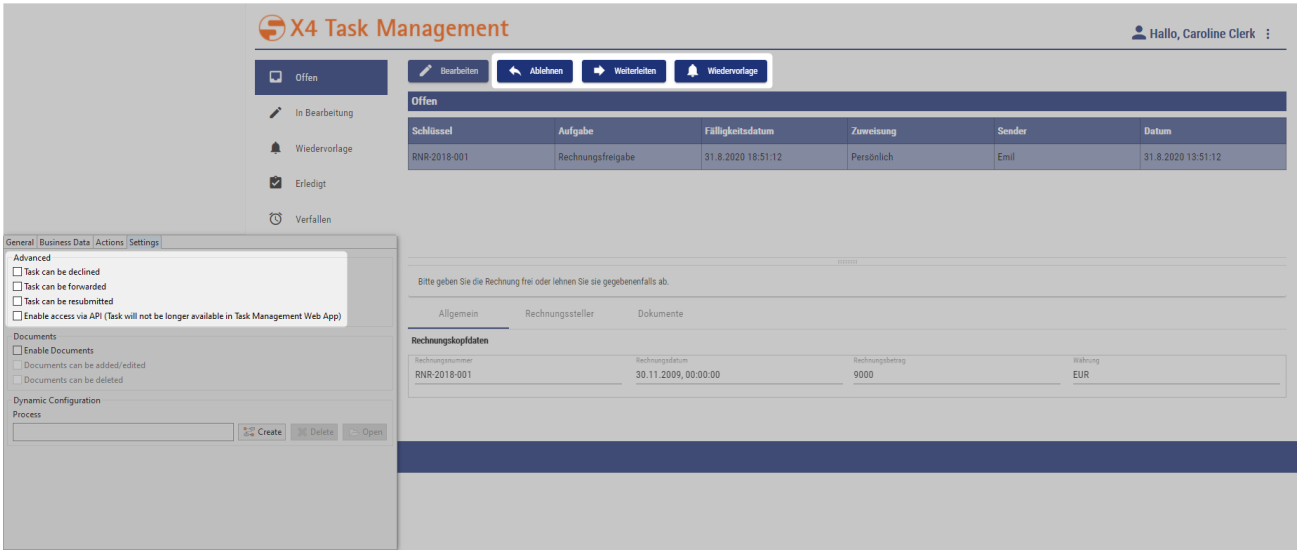
4.4.2 Defining and Setting Case States

Case states are defined via the Business Process property `Case States`, see Managing Case States. Which of the defined states a user can actually set for his tasks within the *Task Management Web App* is specified within the *Human Task Editor's* tab **Actions.**



4.4.3 Declining, Forwarding and Resubmitting Tasks

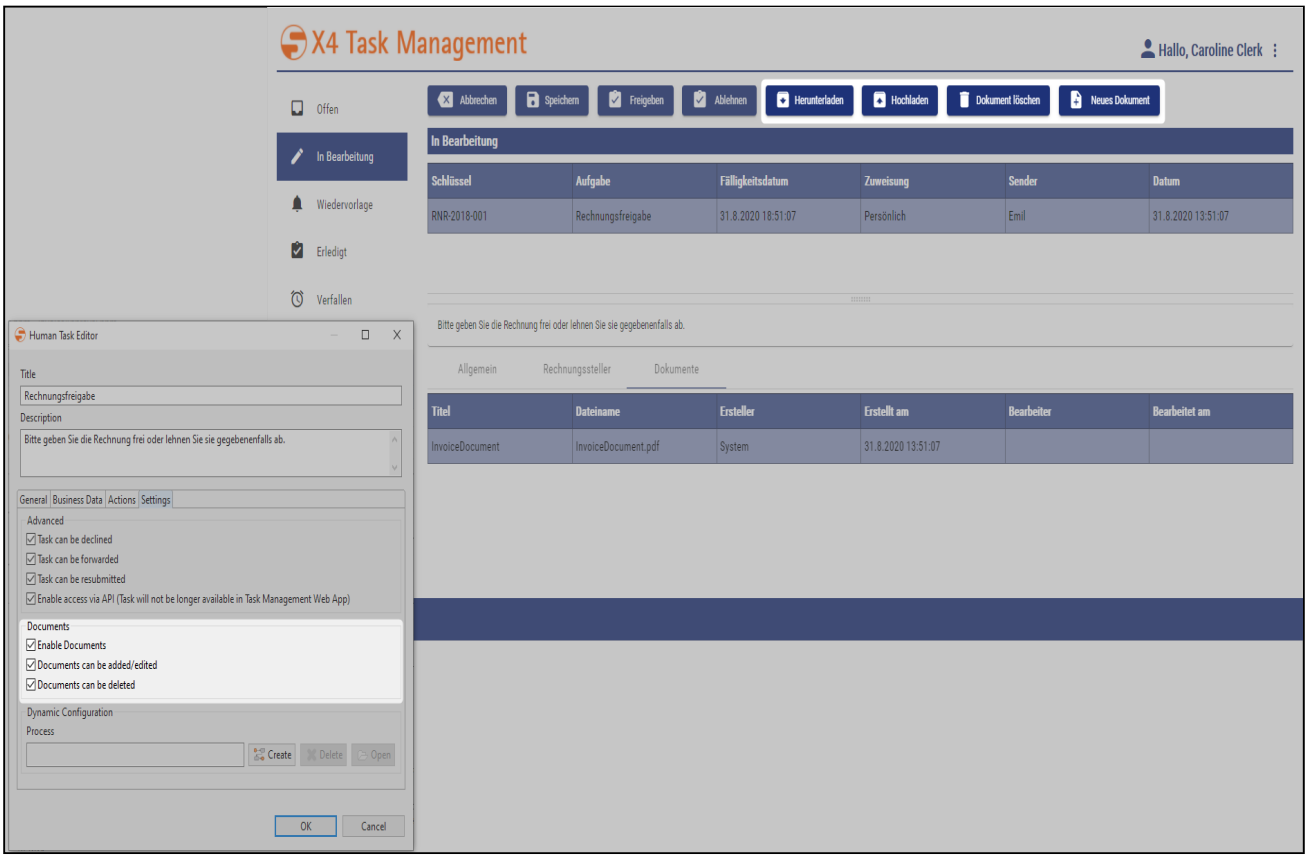
Whether a user should be able to decline, forward or resubmit tasks is specified within the *Human Task Editor's* tab **Settings**, see also Human Task.



4.4.4 Displaying and Editing Documents

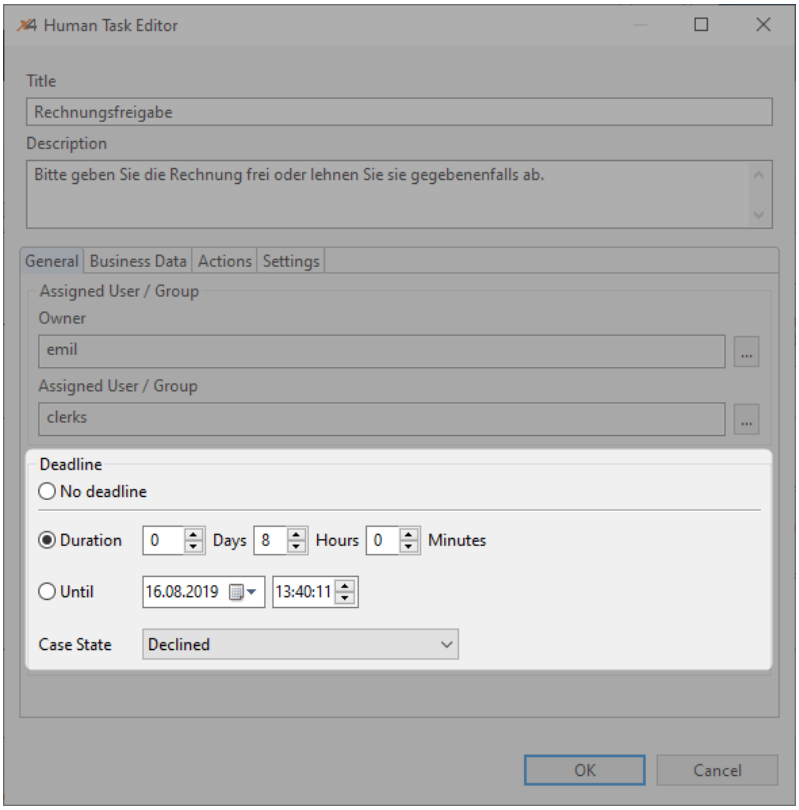
Whether documents can be displayed and processed in the *Task Management Web App* is specified within the *Human Task Editor's* tab **Settings**, see also Human Task.

- Option `Enable Documents` displays the tab **Dokumente** and the button **Herunterladen** (download) within the *Task Management Web App*.
- Option `Documents can be added/edited` allows editing (button **Hochladen)** and adding (button **Neues Dokument**) documents.

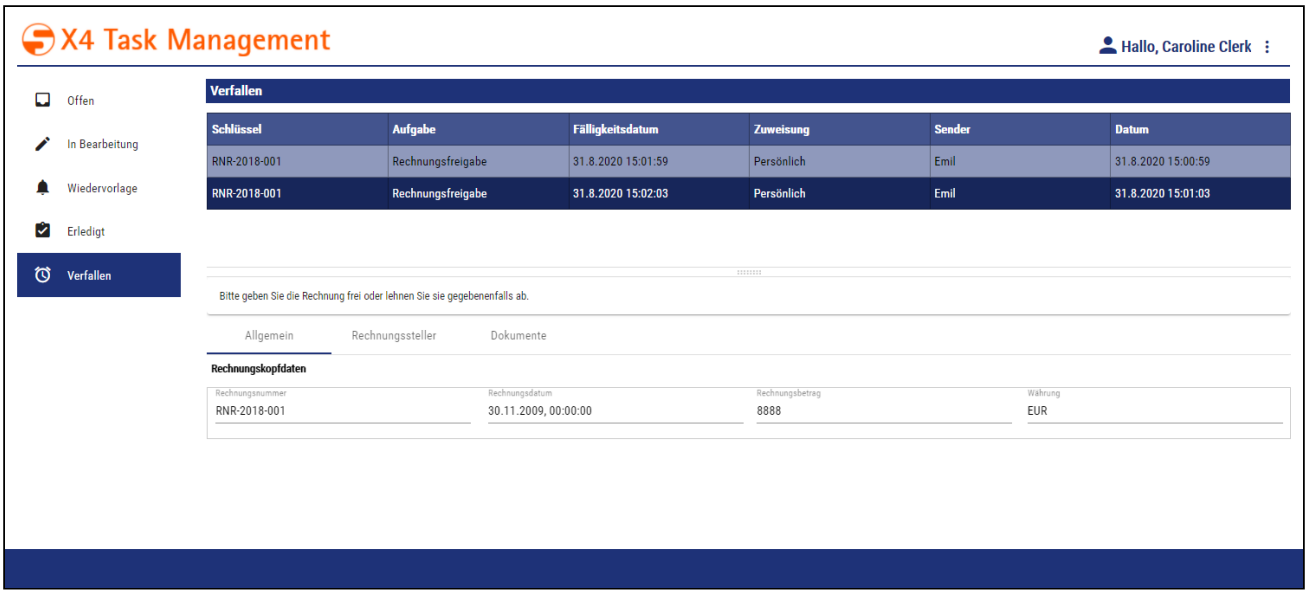


4.4.5 Deadline Management for Human Tasks

For each human task a deadline can be defined, which is specified within the *Human Task Editor* under **General > Deadline**. In addition to a duration (`Duration`), an exact time limit (`Until`) with a date and time specification can be defined. Moreover, a `case state` can be specified, which is automatically executed when the task deadline has been reached.

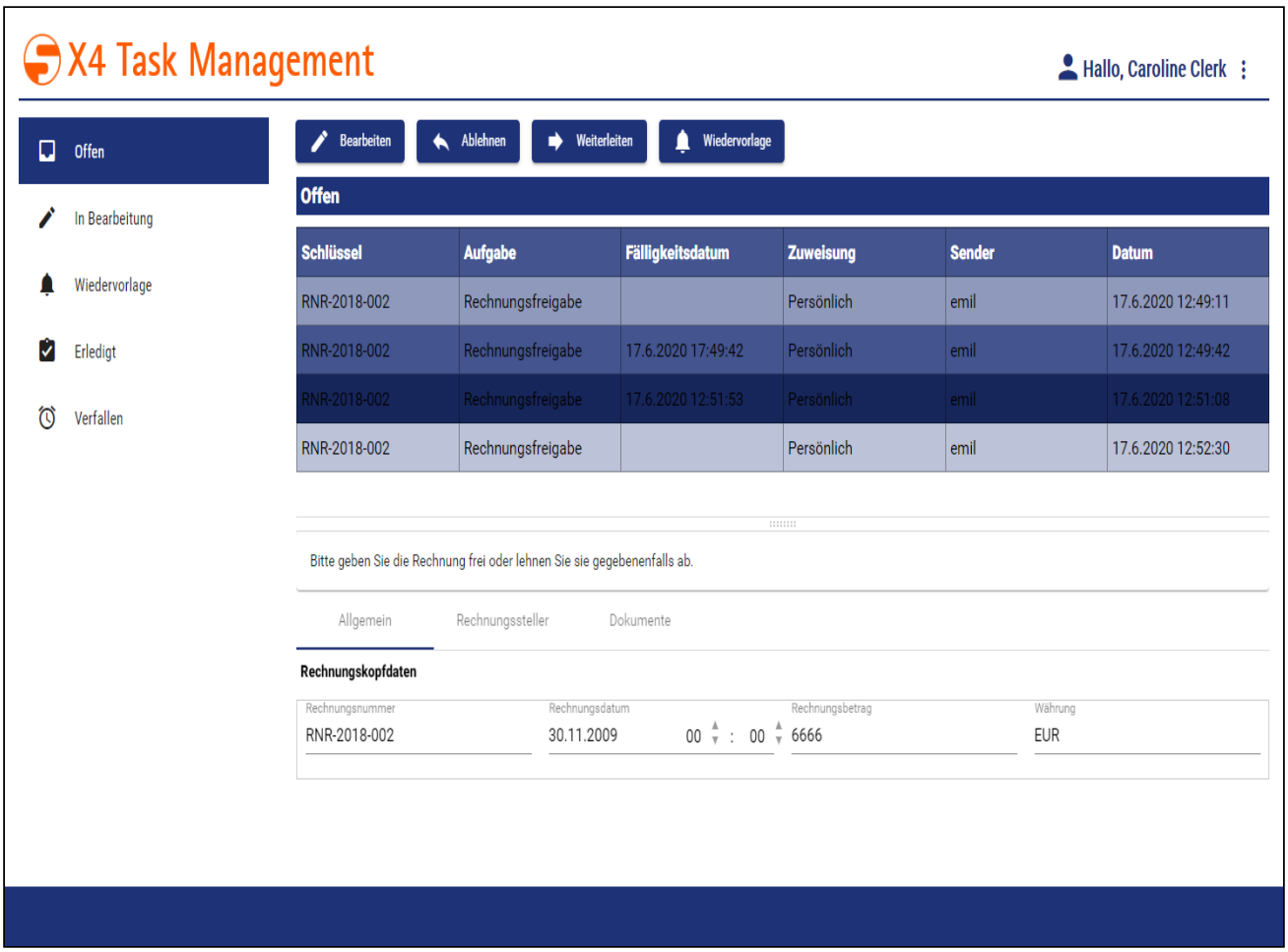


If a human task's deadline was reached before it could be processed and the process was automatically resumed with the configured case state, the human task is automatically closed and displayed within the *Task Management* web app's navigator node **Verfallen** (expired). All human tasks that have exceeded the deadline and have been closed automatically are displayed here.



In order to better recognize processes with a deadline in the Task Management web app, they are highlighted in different colors:

- ■: The due date of the human task was exceeded and the task was automatically closed and moved to the navigator node **Verfallen** (expired).
- ■: The human task is due on the same day.
- ■: The due date for processing the human task is > 24 hours.



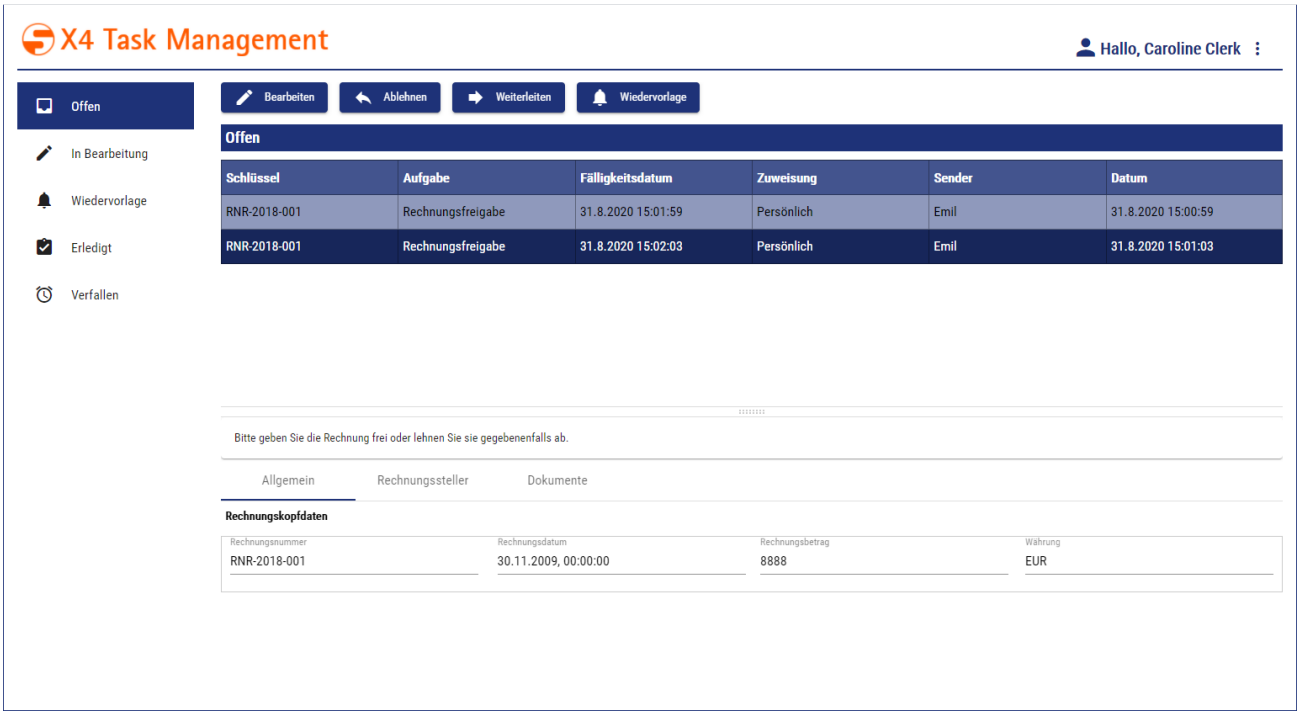
4.4.6 Editing Tasks in the Task Management Web App

There are various processing options for tasks that have been assigned to a process participant. These options are explained in the following.

> ⓘ The Task Management Web App is currently only available in German. Thus, the following editing options are described by means of the German interface.

4.4.6.1 Editing Tasks

After logging in to the Task Management Web App, all open tasks are displayed in an overview (menu `Offen`). By selecting a task in the task list, its details are displayed on several tabs.



To edit a task proceed as follows:

1. Select the task to be edited within the task list of the overview (menu `Offen`).
2. Click on **Bearbeiten**.
3. Select the desired editing option:
   - `Freigeben`: Release task
   - `Ablehnen`: Decline task
   - `Herunterladen`: Download document
   - `Hochladen`: Replace existing document
   - `Dokument löschen`: Delete document
   - `Neues Dokument`: Upload new document

4.4.6.2 Releasing Tasks

To release a task proceed as follows:

1. Select the task to be released within the task list of the overview (menu `Offen`).
2. Click on **Bearbeiten** to open the editing view.
3. Click on **Freigeben**.
   The task is now moved to the menu entry `Erledigt`.

4.4.6.3 Declining Tasks

To decline a task proceed as follows:

1. Select the task to be released within the task list of the overview (menu `Offen`).
2. Click on **Ablehnen**.

> ⓘ As an alternative, the task can be declined in the editing view. To do this, first click **Bearbeiten** and then **Ablehnen.**

The tasks is now sent back to the task owner (`Owner`).

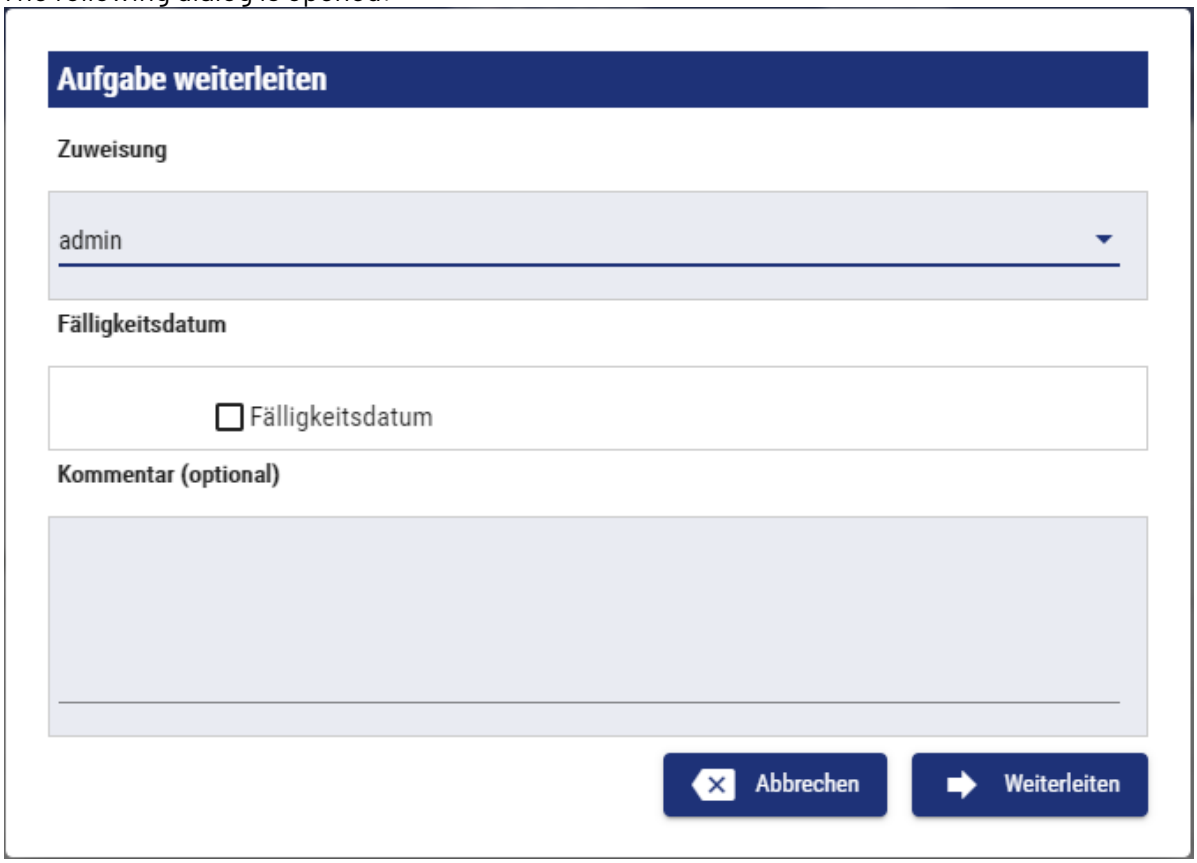
4.4.6.4 Forwarding Tasks

To forward a task proceed as follows:

1. Select the task to be forwarded within the task list of the overview (menu `Offen`).
2. Click on **Weiterleiten**.
   The following dialog is opened:

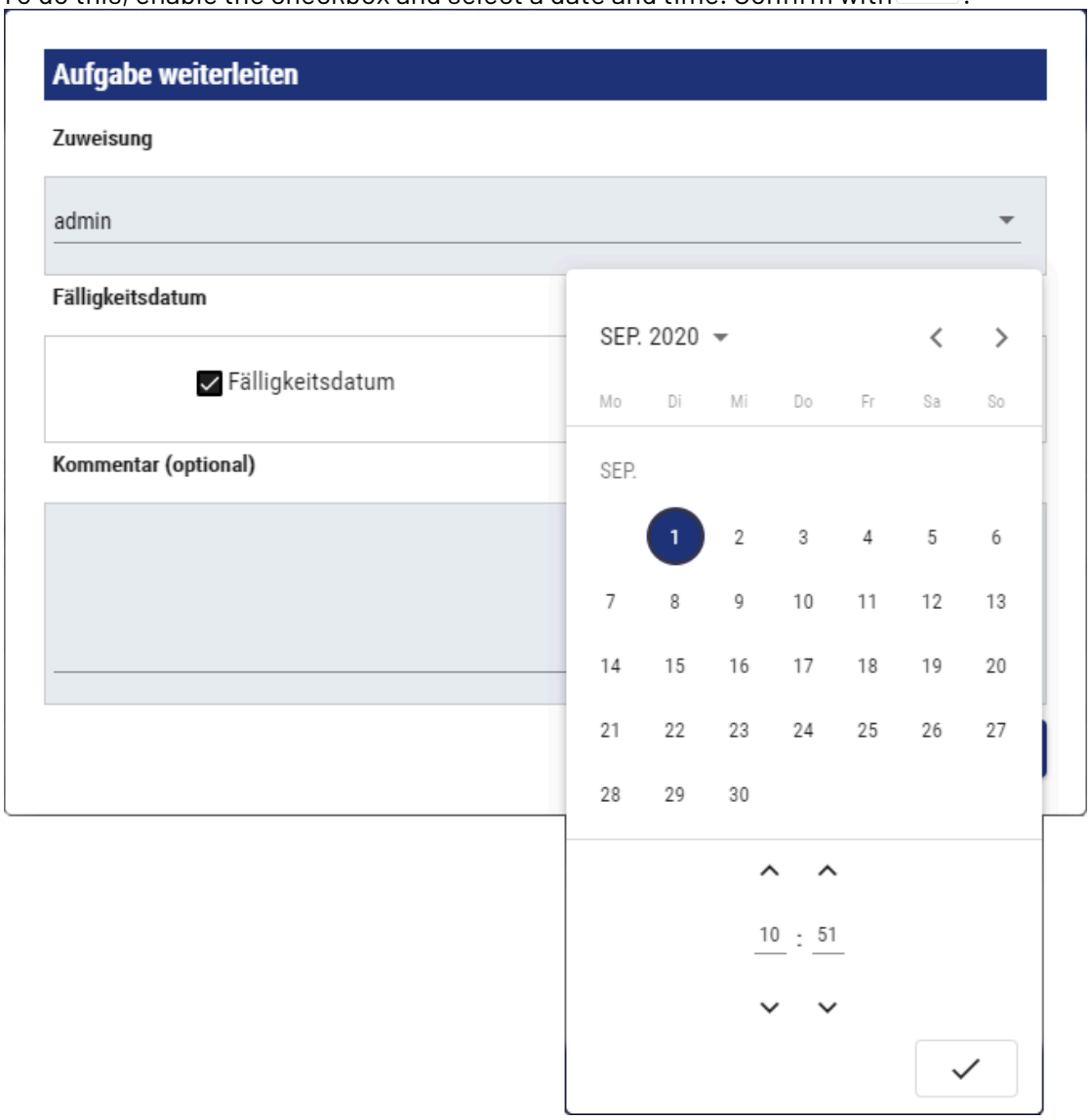
1. Specify the assignment type:
   - `Persönlich`: The task will be forwarded to a single user
   - `Team`: The task will be forwarded to a group

2. Click on **Weiter**.
   The following dialog is opened:



3. Specify the forwarding details:
   - Select the corresponding user or group under **Zuweisung**

- If required, define a deadline in **Fälligkeitsdatum**
  To do this, enable the checkbox and select a date and time. Confirm with ✓.



- If required, enter a comment in **Kommentar.**

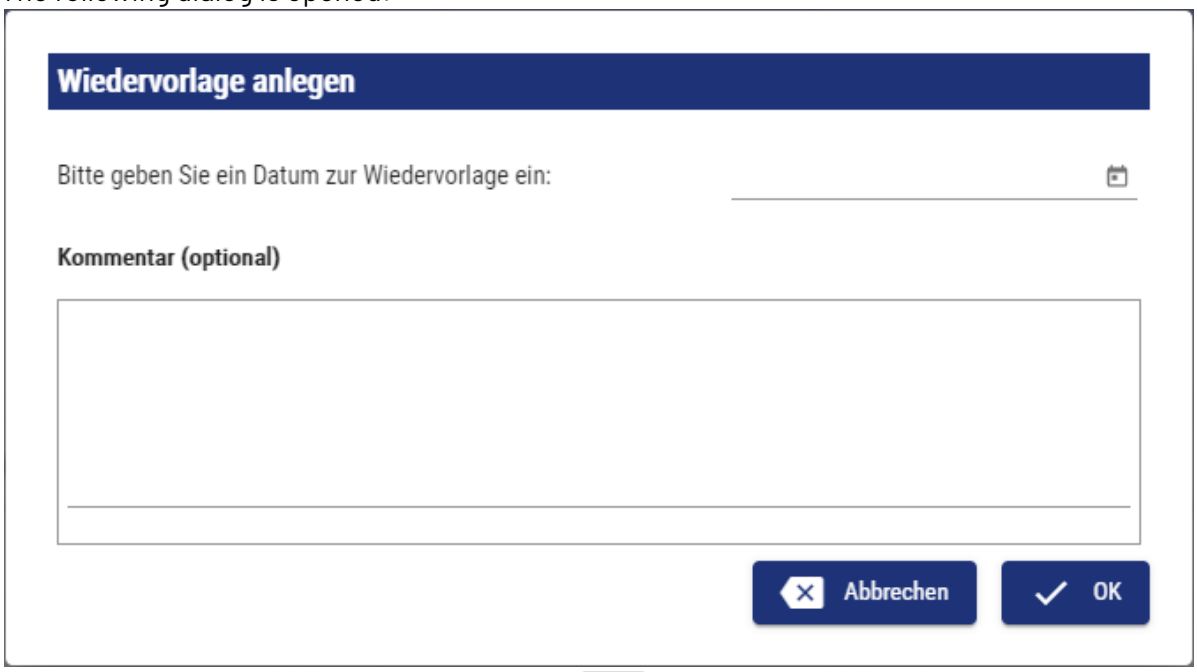
4. Click on **Weiterleiten**.
   The task is forwarded to the specified user or group.

4.4.6.5 Resubmitting Tasks

To resubmit a task proceed as follows:

1. Select the task to be resubmitted within the task list of the overview (menu `Offen`).

2. Click on **Wiedervorlge**.
   The following dialog is opened:



3. Enter the desired date and time. Confirm with ✓.
4. If required, enter a comment in **Kommentar.**
5. Click on **OK**.
   The task is now moved to the menu entry `Wiedervorlage`.

4.4.6.6 Displaying and Editing Documents

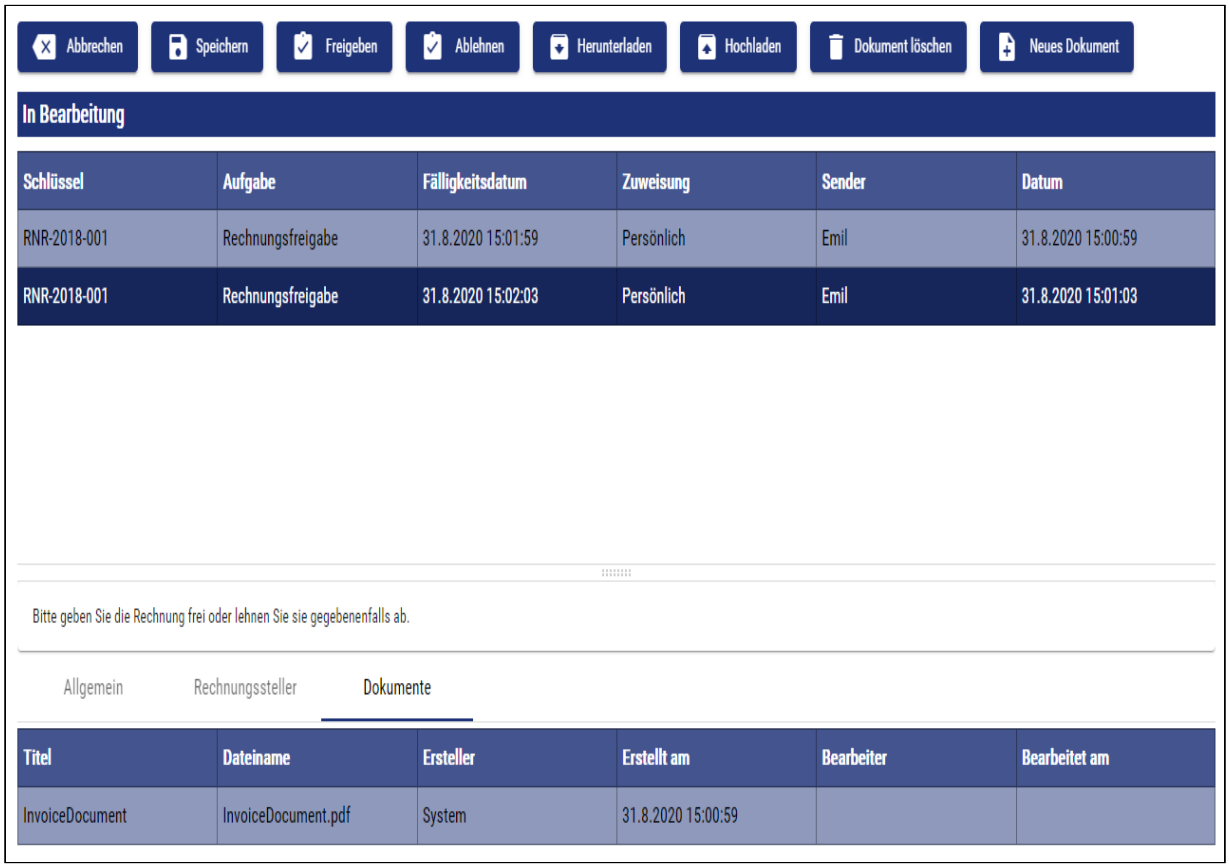
To edit documents attached to a task proceed as follows:

1. Select the task to be edited within the task list of the overview (menu `Offen`).

   > ⓘ If the task is already being processed, select the corresponding task under the menu entry `In Bearbeitung`.

2. Click on **Bearbeiten**.

3. Select the tab **Dokumente** within the task's detail view.

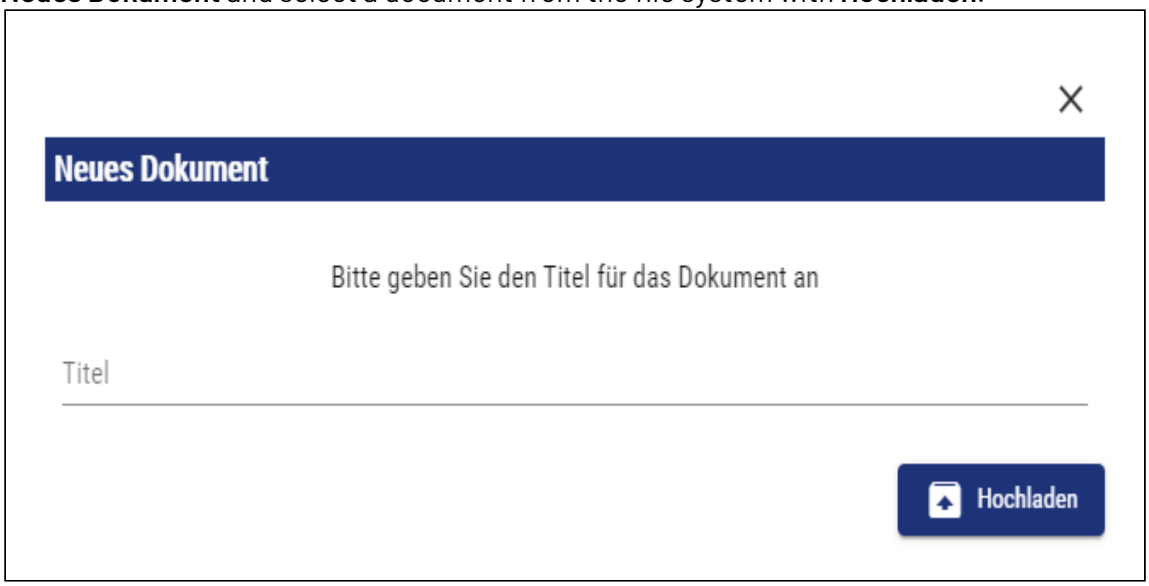


The different editing options are now displayed as buttons:

- Click `Herunterladen` to download the document.
- Click `Hochladen` to upload a new document from the file system and replace the existing document.
- Click `Dokument löschen` to permanently delete the document.

> ⚠ Deleting a document cannot be undone. Only delete documents if you are sure that you no longer need them.

- Click `Neues Dokument` to upload a new document. To do this, enter a title in the dialog **Neues Dokument** and select a document from the file system with **Hochladen**.



5 Scheduler

The scheduler interface provides an overview of all processes for which a scheduled execution has been defined. In addition, the interface also offers the possibility to configure new time-controlled executions as well as to edit or delete already existing configurations.

When defining schedules, a differentiation is made between the following execution options:

- **Startup**: Execution of a process at server startup
- **CRON**: Execution of a process according to certain cron patterns

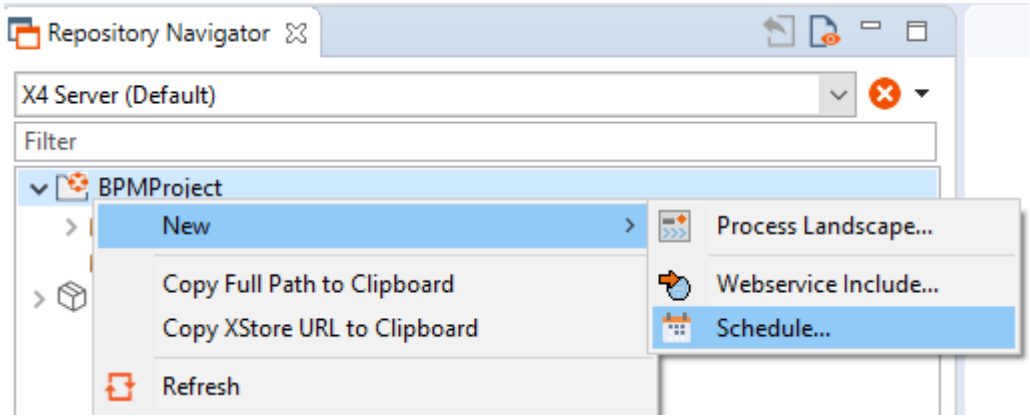
The main functions of the *scheduler* are:

- Overview of existing schedules
- Create/edit any number of execution points and intervals per process

5.1 Create scheduler

- The scheduler can only be created in **BPM** and **ESB** projects.
- Only one scheduler can be created in a project.

1. In the Repository Navigator view, right-click a project.
2. In the context menu select **New> Schedule**



.The scheduler is created and opened.

For further information please visit the section

5.2 Execute scheduled processes

The following execution options can be distinguished for the scheduled execution of X4 processes:

- Execution of a process at server startup
- Execution of a process according to certain cron patterns

Cron patterns allow you to execute processes at specific times on specific days, for example, every Friday, at 12 noon.

5.2.1 Create new scheduled execution

To create a scheduled execution, proceed as follows:

1. In the scheduler `.schedule` click the desired execution option.
   a. Cron to execute processes according to specific cron patterns.
   b. Startup to execute processes at server startup.
2. Set the desired configuration.

   For the configuration options of the different types of execution, see:

3. Click **Save** to save the execution.

For documentation on the ReST interface, see http://localhost:8080/X4/X4Api/.

5.2.2 Server start

New configurations for executions at server startup can be created using the **Startup** button. A number of options and parameters are available. These are explained in more detail below.

Options

Name	Freely selectable name for execution
Process	Path to the process in the `X4DB` *Example*: `Processes/Activities/Processes/Process.wrf` Click **Browse...** to select a process. • The process must be in the same project as the scheduler. • The process must not be a sub-process of another process.
Active	Activates the scheduler
Start date	Sets the start date of the scheduler in `jjjj-mm-tt hh:mm:ss` format *Example:* `2021-06-01 13:00:00`

End date	Sets the end date of the scheduler in `jjjj-mm-tt hh:mm:ss` format *Example:* `2022-08-01 23:00:00` The end date must be in the future.

Parameters

In the **Parameters** section you can define any number of parameters for the run configuration.

	Add row
	Remove row
Key	Name of the parameter (any string, ideally `NCName`).
Value	Optional parameter value

5.2.3 Cron

New configurations for executions at server startup can be created via the **Cron** button. A number of options and parameters are available for this. These are explained in more detail below.

Options

Name	Freely selectable name for execution
Process	Path to the process in the `X4DB` *Example*: `Processes/Activities/Processes/Process.wrf` Click **Browse...** or **drag and drop** a process into the field to select a process. • The process must be in the same project as the scheduler. • The process must not be a sub-process of another process.
Active	Activates the scheduler

Generate Cron expression	Generates a Cron expression **Possible values:** • `Minutes` • `Hourly` • `Daily` • `Weekly` • `Monthly` • `Yearly` ⓘ In the Source tab you can edit the Cron expression manually. Generating a cron expression is not possible if the cron expression was edited manually.

Parameters

In the **Parameters** section you can define any number of parameters for the run configuration.

	Add row
	Remove row
Key	Name of the parameter (any string, ideally `NCName`).
Value	Optional parameter value

6 Profiling

In a profiling file (`.profiling`), you can define whether processes within your project should be logged at runtime. In the profiling file, you can define exactly which processes are included or excluded from logging.

The pofiling file only needs to be created if you want to exclude specific processes from profiling.

6.1 Create profiling file

⚠ Only one `.profiling` file can be created in a project.

1. In the **Projects** view, right-click a project.
2. Select **New > Profiling** in the context menu.
   The profiling configuration file is created and opened.

6.2 Configure profiling

The root element of the profiling file is `<Profiling>`. The element can contain individual processes of the project that should be explicitly covered or excluded from logging.

The `<Profiling>` element can have the following attribute:

Attribute	Description
`active`	Defines whether logging of processes is enabled or disabled. **Possible values:** • *`true`*: Logging of the processes is enabled. (default) • *`false`*: Logging of the processes is disabled.

The `<Profiling>` element contains the `<Processes>` child element, which may contain the following attribute:

Attribute	Description
`filterType`	Defines whether the stored processes should be included or excluded from logging. **Possible values:** • *`include`*: The stored processes are explicitly covered by the logging. • *`exclude`*: The stored processes are explicitly excluded from logging.

The `<Processes>` element may contain `<Process>` child elements if one or more processes are to be explicitly covered or excluded from logging.

The `Process` element contains the following attribute:

Attribute	Description
`path`	*Required*. Contains the path to the Technical Process to be captured or excluded. **Possible values:** Repository path to a Technical Process (e.g. `Processes/Process.wrf`)

6.3 Example of profiling configuration file

In the following example, the Technical Processes `Process_B.wrf` and `Process_C.wrf` are excluded from logging.

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<Profiling>
    <Processes filterType="exclude">
        <Process path="Processes/Process_B.wrf"/>
        <Process path="Processes/Process_C.wrf"/>
    </Processes>
</Profiling>
```