u-create

Studio

Weidmüller

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1.03	05-2015	Create safety application	New chapter	hasl
1.04	11-2018	Long-term diagnostics; Loading additional files on the device	New chapter; several updates	swb, raud

Table of contents

1 Introduction

u-create studio is a tool suite for automation tasks.

Information

This product includes software developed by the Eclipse™ Project (http://www.eclipse.org).

This product also contains software that was developed by third parties.

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A directory with the Open-Source software terms of a licence contained in this product can be opened via the About dialog of the tool.

1.1 Preconditions

This document contains information for persons with the following skills:

Target group	Prerequisite knowledge and abilities
Project engineer	Basic technical training (technical college, engineer training or corresponding professional experience). Knowledge about: ● Current valid safety regulations, ● method of operation of a PLC and ● the application.

Target group	Prerequisite knowledge and abilities
Programmers	Basic technical training (technical college, engineer training or corresponding professional experience). Knowledge about: ● Current valid safety regulations, ● method of operation of a PLC and ● programming of a safe PLC.
Start-up operator	Basic technical training (technical college, engineer training or corresponding professional experience). Knowledge about: ● Current valid safety regulations, ● fundamental validation concepts according to EN ISO 13849, ● method of operation of the machine or system, ● fundamental functions of the application, ● system analysis and troubleshooting and ● setting options on the operating devices.
Service technician	Basic technical training (technical college, engineer training or corresponding professional experience). Knowledge about: ● Method of operation of a PLC, ● current valid safety regulations, ● method of operation of the machine or system, ● diagnostic options and ● systematic fault analysis and remedial action.

1.1.1 Required Hardware

Standard Windows® PC.

1.1.2 Required Software

- Windows 10®

1.2 Intend use

This product was developed for the configuration, programming, and diagnostics of the Weidmüller system and thus is used for the realization of automation solutions.

1.3 Information about this document

This manual is an integral part of the product. It is to be retained over the entire life cycle of the product and should be forwarded to any subsequent owners or users of the product. For end users, necessary safety notes and

information must be integrated in the instruction manual for end users in the specific national language by the mechanical engineer or the system provider.

This documentation must be legible and available to the specified persons and must be read and understood by them.

1.3.1 Contents of the document

Description of the:

- u-create studio user interface,
- Creation of projects using templates,
- Configuring devices
- Diagnostic options

1.3.2 Not included in this document

- Programming of control or operating devices,
- Configuration of panels or operating devices in the control,
- Working with additional tools for the control programming,
- Detailed description of the bus systems,
- Programming of C and C++ programs.

1.4 Additional documentation

The following documents are referenced several times below.

Designation	Target group
Delivered System Manual	• Project engineer • Electrician • Programmer • Start-up operator • Service technician

For basic knowledge about the Ethernet-based fieldbus EtherCAT, we recommend the following sources:

- EtherCAT Technology Group (ETG): http://www.ethercat.org

2 Safety notes

2.1 Representation

At various points in this manual, you will see notes and precautionary warnings regarding possible hazards. The symbols used have the following meaning:

DANGER!

indicates an imminently hazardous situation, which will result in death or serious bodily injury if the corresponding precautions are not taken.

WARNING!

indicates a potentially hazardous situation, which can result in death or serious bodily injury if the corresponding precautions are not taken.

CAUTION!

means that if the corresponding safety measures are not taken, a potentially hazardous situation can occur that may result in slight bodily injury.

Caution

means that damage to property can occur if the corresponding safety measures are not taken.

ESD

This symbol reminds you of the possible consequences of touching electrostatically sensitive components.

Safety information

Describes important safety-related requirements or informs about essential safety-related correlations.

Information

Identifies practical tips and useful information. No information that warns about potentially dangerous or harmful functions is contained.

3 Installing u-create studio

Please note the system manual and the manual controllers u-control.

4 User interface

This chapter describes the user interface of the u-create studio.

4.1 Operation

Standard functions under Windows® such as drag & drop, copy & paste, individual adaptation of the user interface by docking, pinning of windows and menu bars are known by nearly all PC users and can be easily learned by simply trying them out.

They are therefore not described in more detail in this document. We refer to the literature provided on the Internet about the listed topics.

General operating information

As with almost all Windows tools:

- Double-clicking on a created object will open it.
- Right-clicking the mouse will open a context menu.
- Some context menus are not always available and written in gray. When certain conditions are fulfilled these menus turn active.

4.2 General view

The following graphic shows the standard view (perspective) of u-create studio. The arrangement of the windows can, however, be changed according to your individual requirements.

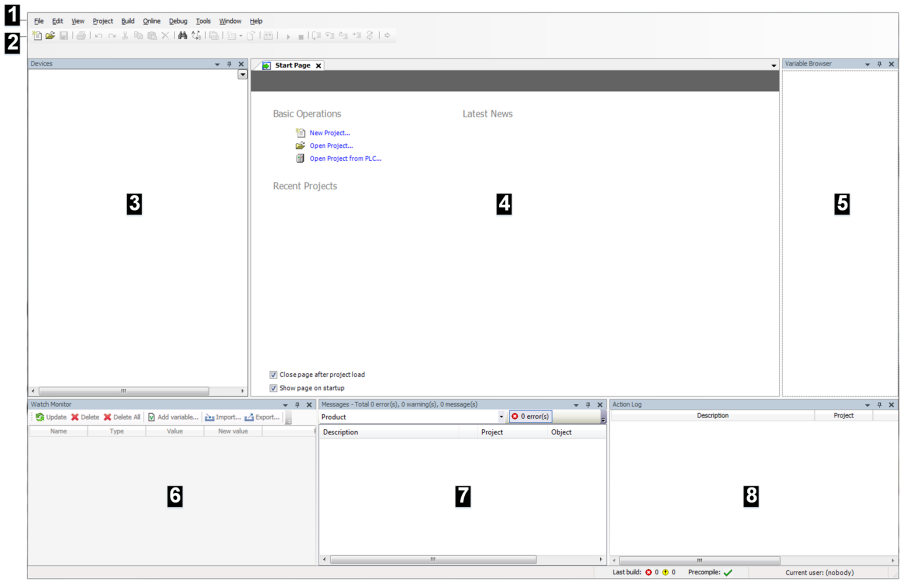

Fig. 4-1: u-create studio User interface

1 ... Menu	2 ... Tool bar
3 ... Project tree	4 ... Work area

5 ... Variables browser	6 ... Watch Monitor
7 ... Message window	8 ... Action Log

4.2.1 Menus and toolbar

The useable commands in u-create studio can be activated from the menu bar, the tool bar or from context menus.

Only u-create studio-specific commands are described here. For the benefit of a better overview, the explanation of generally known standard commands will be dispensed with.

The following tables show an overview about the u-create studio-specific menus.

Menu "File"

Menu command	Shortcut	Meaning
File - New project...	Strg+N	Create new project.
File - Open project...	Strg+O	Open existing project.
File - Save project	Strg+S	Save current project and generate configuration files.
File - Project Archive - Extract archive	-	Extract a project archive including the devices used.
File - Project Archive - Save archive	-	Save project archive

Menu "Project"

Menu command	Shortcut	Meaning
Project - Set active application	-	Select the application which should be loaded to the control.
Project - Export	-	Export entire project
Project - Import	-	Import a file

Menu "Tools"

Menu command	Shortcut	Meaning
Tools - Device repository	-	Install and uninstall device description files.
Tools - Scripting - Execute Script File...	-	Execute Python Scripts to configure devices
Tools - Scripting - Enable Script Tracing	-	Check configuration of the devices made by Python Scripts

Tool bar

The toolbar also contains the following standard icons, such as for example for the creation, opening or saving of projects.

4.2.2 Project tree

The project tree shows the current project and the devices contained in the project. Double-clicking on an entry opens the associated work area or the associated editor.

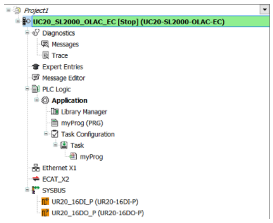

Fig. 4-2: Project tree

The elements in the project tree are depicted in a logical sequence (e.g. add-on capable modules under bus system, bus system under CPU, etc.) and can only be inserted in the specified sequence. Double-clicking on the desired element opens the matching configuration in the work area. By clicking on an already selected hardware component in the project tree, you can modify the name of the device.

Context menus in the project tree

Depending on which element is selected, the project tree contains different commands in the associated context menu (accessed by right-clicking on an entry in the project tree).

4.2.3 Work area

In this area, the configuration of the device selected in the project tree is displayed and editable.

4.2.4 Variable Browser

Is used for displaying embedding system variables of IEC application into the project. The variables are shown in the variable browser with its directory structure, as soon as there is a connection and login to control. The shown variables can be used in the watch monitor.

4.2.5 Watch Monitor

Variable from variable browser can be analysed here (name, type, value, predefined value, path, comment).

4.2.6 Messages

Errors, warnings and messages are displayed here.

4.2.7 Action Log

In the "Action Log" are the actions from the user and the implicit actions from the system logged. This can be used to get an overview of the actions.

5 Create project

In addition to the required steps for creating a project, this chapter also describes additional, important functions for the project administration (exporting/ importing project, managing device description files).

In general, a complete configuration requires the following essential steps:

1) Create new project (Empty or pre-defined Template)
2) Insert devices (+ shift, copy and delete)
3) Configure devices
4) Mapping endpoints
5) Insert existing symbol files
6) Create IEC application

5.1 Create new project

In order to create a configuration of devices, a project must be created.

To create an empty project, proceed as follows:

1) Start u-create studio and call up **File ► New project** via the main menu.

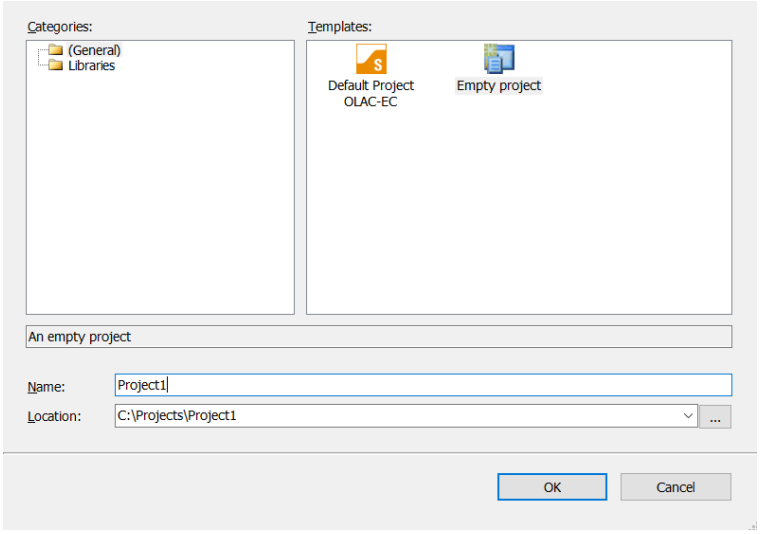

Fig. 5-3: Project creation window

2) In the creation window select category "General" and as template "empty project". The number of chooseable categories and templates may vary. Enter a project name (e.g.: `Projekt1`) and specify a storage location.
3) Confirm your entries with **OK.**

The project was created and appears in the project tree.

5.2 Insert devices

In order to create a configuration, the required devices must be inserted into the project tree.

Actions for inserting devices

The following actions are available for inserting devices:

Action	Description
Add device	The new device will be subordinated to the selected device.
Insert device	The new device will be inserted after the selected device, on the same level.

Information

f a device is added into the project tree an instance of the function block of the respective device type will be created automatically. The device name will access the instance.

To insert a device, proceed as follows:

1) In the project tree select the node of an interface at which a new device is to be appended and select in the context menu **Add Device**
2) The opened dialog contains the possible devices for selection (depending on the selected element in the project tree). Select the desired device and add it to the project via **Add Device** or double- click.

The device is inserted at the corresponding position into the project tree.

Information

The "Add Device" window can remain open while you navigate in the project tree. The list of devices changes according to the selection without having to reopen the window. This permits assembling the project quickly and easily.

Shift, copy devices

The arrangement of the elements in the project tree can be modified by cutting, copying, pasting and by Drag&Drop. The elements can only be arranged in the appropriate logical order.

Delete device from the project tree

To remove a device from the project, select it in the project tree and click in the context menu on **delete**.

Information

*If you delete a device, all subordinate objects are also removed. This action can be undone with **Edit - Undo**.*

Update device

Devices can be updated to a newer version or to a different type. Similar to **Add Device** is **Update Device** in the context menu.

Information

When changing the type of the device all settings will be lost and the sub-devices can be preserved only in certain cases. This also applies to devices with small differences.

5.3 Configure devices

The inserted devices can be configured depending on the setings. For further information see "Configuration of devices".

5.4 Insert existing symbol files

If symbol files are already existing (e.g. from u-create studio C++ or manually created files) those can be inserted into u-create studio.

This happens via right mouse-click on the control in the project tree and selecting **Add object ► Symbol file...**. The path of the desired symbol file is inserted in the opened window. Via Add the symbol file is added to the project.

This can be repeated for several symbol files.

When generating the project all variables of inserted symbol files or symbol configurations within the project are written into a single symbol file. This file is then available for e.g. the visualization application.

5.5 Mapping endpoints

Each device with endpoints features the tab **I/O Mapping** in the configuration window.

System variables of the IEC application can be mapped in this tab to HW endpoints (assuming a suitable data type). Therefore variables are allocated for the desired inputs and outputs which will be created automatically after saving. This variables can be used in the IEC application.

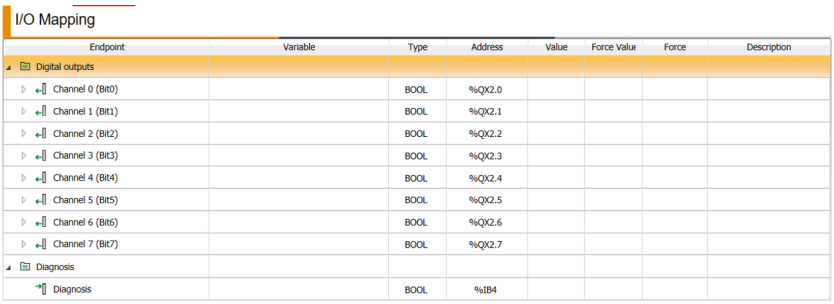

Fig. 5-4: I/O Mapping

Depending on the type of I/O module, channel-specific features can be activated, deactivated and parameterized separately for each channel using drop-down menus or text input fields.

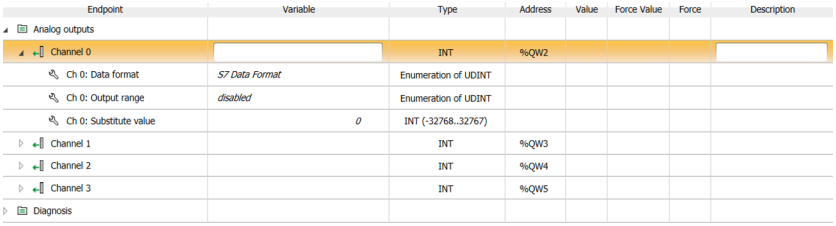

Fig. 5-5: Additional settings or DIs

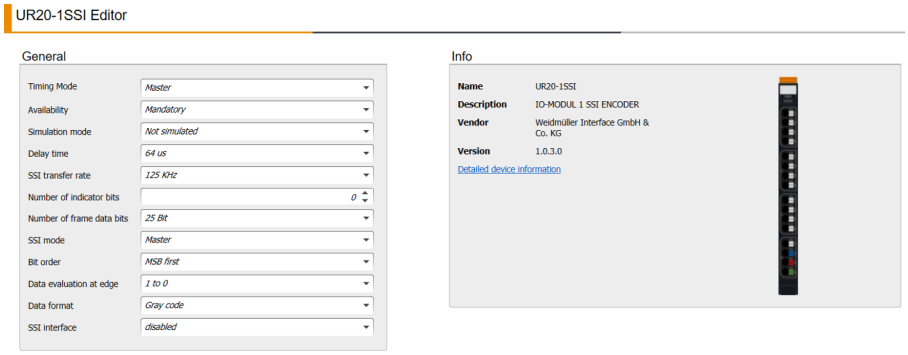

Fig. 5-6: Features checkbox in IO Mapping

Some modules have parameters that are not channel-bound, e.g. the 1SSI module.

The tab also offers the option to permanently override its endpoints for the runtime (forcing). For that, you can enter the desired value in the column "Force Value" and then activate the column "Force" with the help of the slider. As long as the value is activated with the slider, the endpoint maintains the set value.

Information

The values in the "Value" column are the values that the IEC application assigns to the endpoints.

5.5.1 Printing endpoint mapping

The mapping of the endpoint can be printed for easier wiring. To do so, the print function must be used via **File - Print**.

6 Loading project on control

With u-create studio the project can be downloaded to a control. For the online option, you need to establish a connection to the running control first.

6.1 Establishing Connection PC - Control

Double-click on the node of the control in the project tree to open the editor with the configuration of the control. There is also an individual "Communication Settings". A connection to the control can be created there.

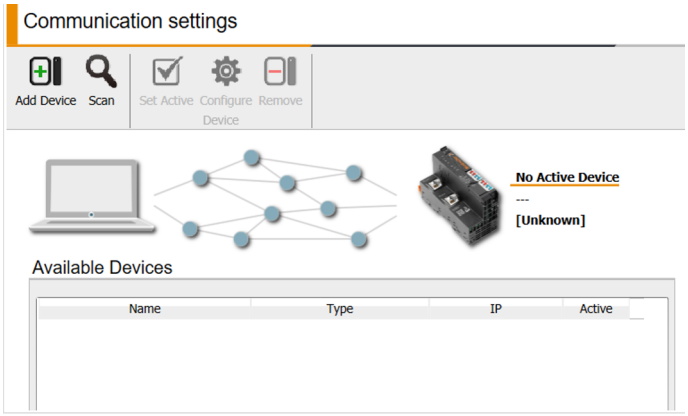

Fig. 6-7: Communication settings

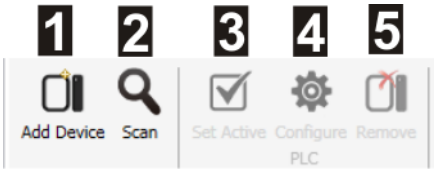

Fig. 6-8: Tool bar of the communication settings

1 ... Add new device	2 ... Search network
3 ... Make device active	4 ... Configure device
5 ... Remove device	

Direct connection PC - control

To establish a connection the PC must be plugged into the control.

Proceed as follows:

1) Click on "Scan" on the tool bar to start the automatic search run which searches the network for devices. Found controls are added to the area "Available Controls".

2) Upon completion of the search run you can select the searched control in the tree and activate it in the project via the tool bar with the help of "Set Active". This establishes the connection to the control and the status of the control is already indicated in the project tree. Alternatively, you can also set a found control to active by double-clicking on it.

If the desired control was not found during scan, it can be added by **Add Device** and then activated like mentioned before.

When connecting to the control the devices configured in u-create studio may not accord with the real hardware.

Via **Device manipulation** in the context menu of the control the following manipulations can be done:

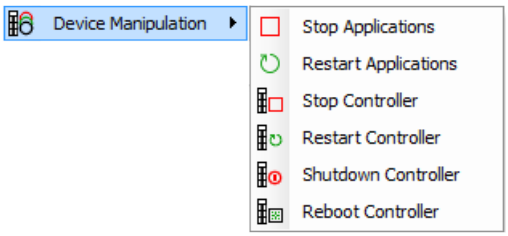

Fig. 6-9: Device manipulation example

Manipulation	Description
Stop Application	Stops applications (IEC) on the control
Restart Applications	Restarts applications (IEC) on the control
Stop Controller	Stops control process
Restart Controller	Restarts control process
Reconfigure Controller	
Shutdown Controller	Shutdown control
Reboot Controller	Restart control with operating system

Those manipulation possibilities are dynamic and depend on the current operating state of the control.

Furthermore the main operating state are displayed in colors and textual in the project tree if a connection is established. Thereby the following state are possible:

Color	Text	Description
Blue	INIT or OsReady	Control in start-up or Operating system started (application has not been started)
Green	RUN	Control is running
Red	EXCEPTION	Error

To exit the error state of the control the context menu of it has to be opened in the project tree and the control process must be stopped via **Device manipulation - Stop Controller**. Then the application must be deleted with **Device manipulation - Delete Application**. After successfully deleting the application the control process can be restarted via **Device manipulation - Start Controller** and a new application can be downloaded to the control.

Change selected control

If a connection to a different control should be established this can be done in u-create studio in the communication settings.

Proceed as follows:

1) Open the settings via double click on control in the project tree.
2) Change to tab **Communication settings** and select the control in the list.
3) Open the configuration dialog via click on **Configuration**.

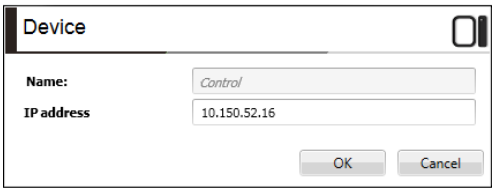

Fig. 6-10: Change IP- address

4) Enter IP address of the desired new control and confirm with OK.

A connection to the new control is established.

6.2 Logging in on the Control

To use diagnostic features or to update the OnlineChange capable application parts, you must execute a login.

The configured devices inu-create studio must be the same like real devices. If this is not the case the login attempt can be canceled.

For a login proceed as follows:

1) Click in the **Online - Login** menu or alternatively on the respective button in the toolbar.
2) The Login dialogue requires the entry of a user name and password (default: Administrator/tobechanged). This user data can be encrypted and saved by selecting the option "Save Settings" so the login data does not need to be entered again.

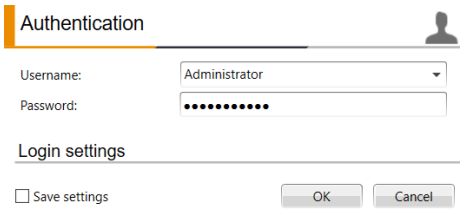

Fig. 6-11: Authentication during Login

3) After the login you will automatically be given the option to execute an OnlineChange.

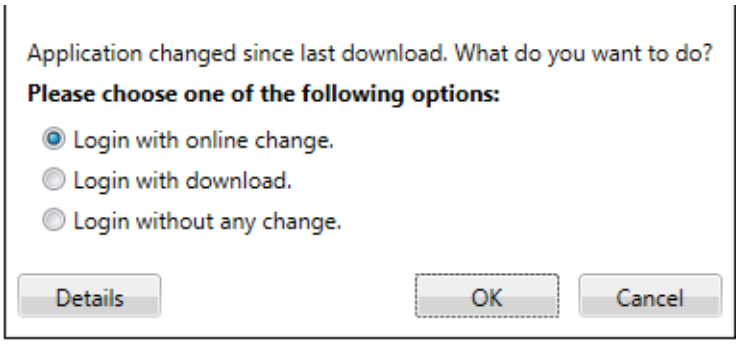

Fig. 6-12: OnlineChange if parts of project are capable

After a login and OnlineChange of the application to control is done, information of application (e.g. values of variables) are available in u-create studio. Furthermore different manipulations of application during runtime are possible (e.g. force of variable values in watch monitor).

6.3 Download to Device

To download the whole project to the device the command **Online ► Download and Login to Device** or **Selective Download to Device** can be used. The **Online ► Login** does only changes for OnlineChange capable project parts.

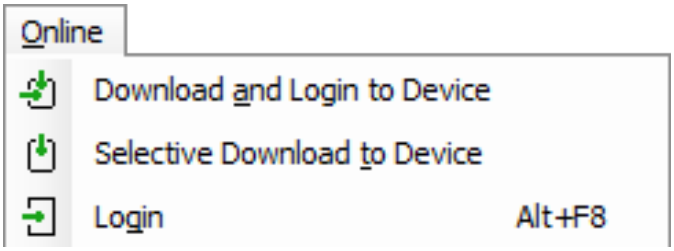

Fig. 6-13: Download options

At **Download and Login to Device** the whole project will be automatically downloaded to the device and a login will be performed. In this process all builds and generate processes will be executed to get the latest version of all project parts to the device. This option is only available in specific systems.

At **Selective Download to Device** a dialog will show the elements of the project from which the parts for download can be selected.

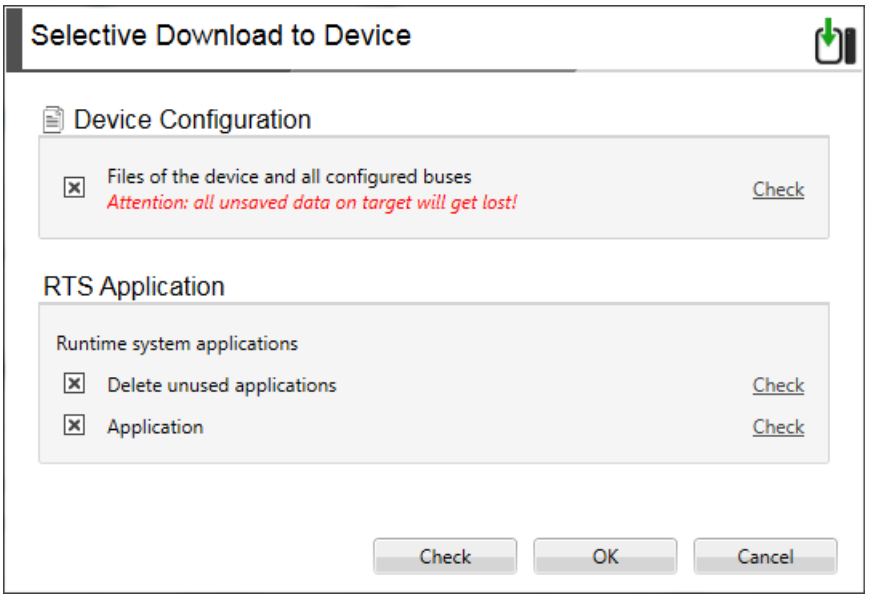

Fig. 6-14: Selective Download

After the selective download no login will be performed.

6.4 Loading additional files to device

It is possible to load additional files (e.g. further configuration files) onto the device. For this purpose, a specific directory structure must be created in the project directory in which the additional files can be stored.

The directory structure must look like this:

```
Project // Directory in which the u-create studio project is stored
    MyProject.project // u-create studio project
    MyProject // Directory has the same name as the u-create studio project
        MyDevice // Directory has the same name as the master device
            AddFilesForExecutableSystem
                appldisk
                masterdisk // optional directory
                workspace // optional directory
```

Files that should be considered when downloading to the device are stored in the directory `appldisk`. The files stored here can be downloaded to the device via selective download. The files are then also located in the `appldisk` directory on the device. Alternatively, the files can also be stored in one

of the two optional directories `masterdisk` or `workspace`. After a selective download, the files are also located in the `masterdisk` or `workspace` directory on the device.

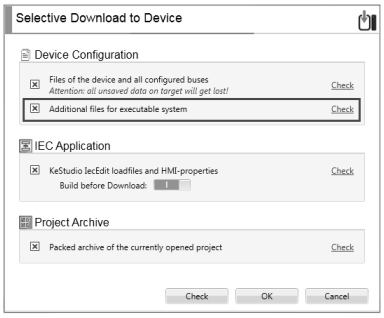

Fig. 6-15: Selective download

7 Open project from device

A project archive that was downloaded during download can be uploaded and opened with **File ► Open Project from Device ...**. In the following dialog the device from which the archive should be loaded can be selected.

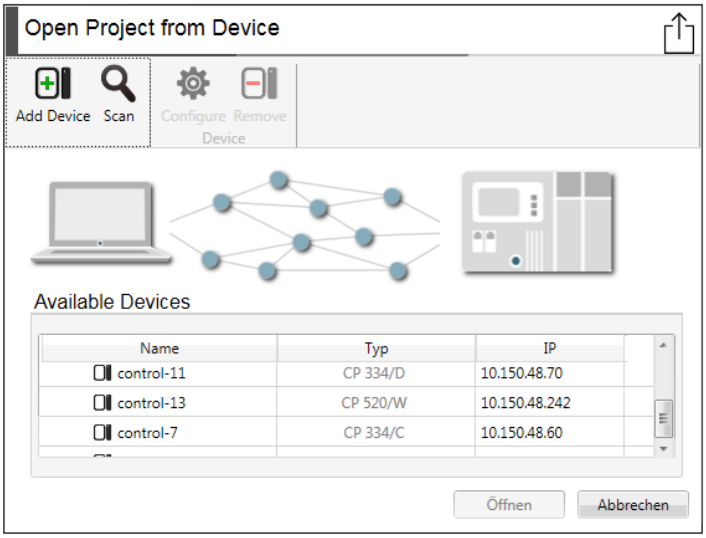

Fig. 7-16: Open project from device

The desired device can be selected from the result list of a device scan or added directly with "Add Device". After pressing the button "Open" the username and password must be entered.

8 Export and import projects

Parts of the project or the entire project can be exported and reimported into a file. This allows you to reuse already created configurations and exchange these between two projects or backup projects.

Export project

To export part of a project or an entire project, proceed as follows:

1) In the menu, select **Project - Export...**. A selection dialog opens.

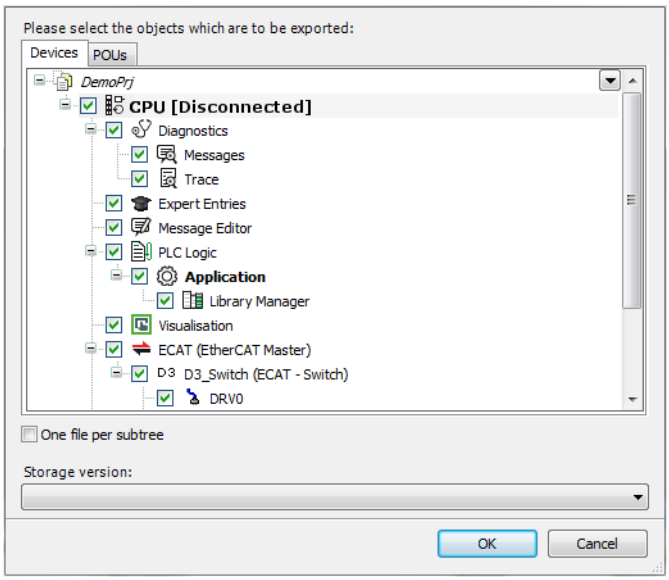

Fig. 8-17: Selection dialog

2) Select the parts to be exported.
3) Confirm your input with **OK**.
4) Now select a file name and a location and save it.

The desired configuration was exported successfully as a file.

Import project

To import a backup configuration, proceed as follows:

1) Open the menu on **Project - Import...** and select the desired file.
2) In the opened window "Import" you can now select the items to be imported.

The imported selection is added below the node that is currently selected in the project tree.

8.1 Create project template

u-create studio offers the possibility to save existing projects as templates for further projects. Templates are stored i `<Installation directory>\...\ Templates`.

A template consists of the following files:

File	Description
`<TemplateName>.project`	Project file copied from an existing project
`<TemplateName>.template`	XML file with text for template name, ... in different languages.

To create a template, proceed as follows:

1) Open or create a project that will be used as a template later. Devices can be added and parameters can be configured here too.
2) Save the project.
3) Close u-create studio.
4) Copy the saved project file `<name>.project` from the project folder of the sample directory and rename it to `<TemplateName>. project`.
5) Copy file ..`\EmptyProject.template` (in the same directory), rename the copy to `<TemplateName>.template`.
6) Open the just created `<TemplateName>.template` file with a text editor (such as Notepad). This file is an XML file that contains texts for the template in different languages. It consists of the following three main components:

Explanation of the XML tags

XML tag	Description
<Name>	Name of the template
<Description>	Description of the template, appears as information while creating a project
<DefaultFileName>	The prefix for names of new projects

Each component contains XML tags with the text in different languages:

Explanation of the XML tags

XML tag	Description
<DefaultString>	English text
<LocalizedString culture='de'>	Text in another language, the language is always specified in `culture` . In this case, it is de for German

Adapt the contents of the XML tags as needed. The > and < symbols must not be used in the text.

7) Save the file.
8) Start u-create studio.

The template is now available to create a new project.

9 Managing packages

Furthermore, it is possible to manage device description files as well as plug-ins that are available in the u-create studio by installing or uninstalling packages via the Package Manager. A package includes several device description files and library files and offers the advantage that complete system configurations can be installed in one step.

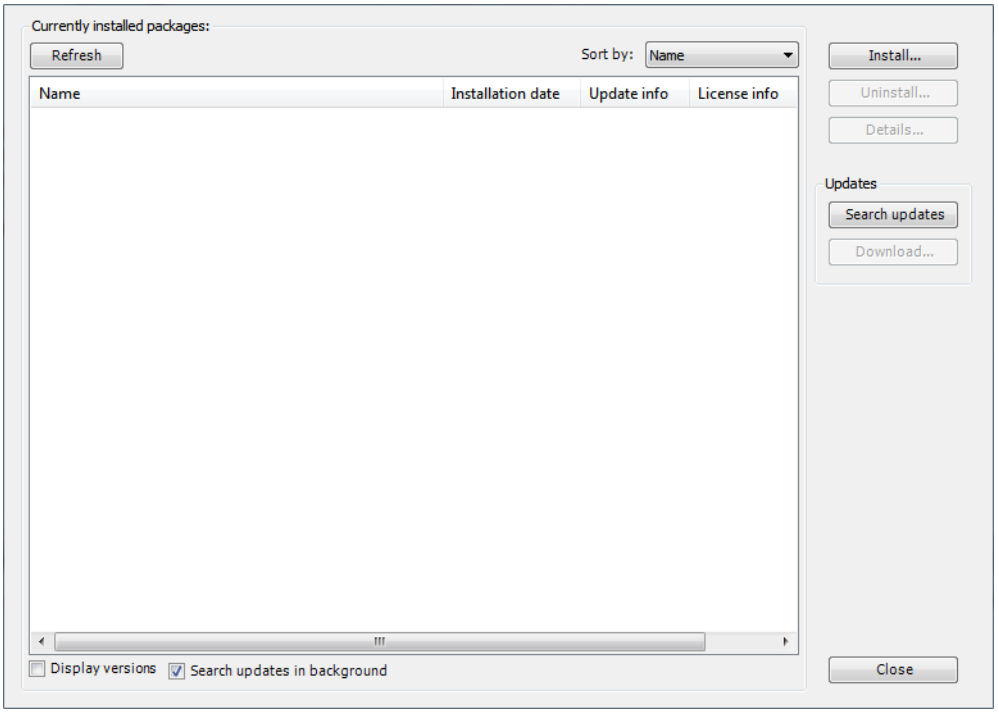

Fig. 9-18: Package Manager

The package manager can be opened in the menu via **Tools - Package Manager**.

ÜThe packages can be installed via the button **Installieren**and can be uninstalled via the button **Deinstallieren**. The file extension of such a package file is `.package`.

10 Create and execute the simulation of a control

It is possible to create and execute a simulation of the control using u-create studio.

The simulation service must be installed and started. This is usually done automatically by the general setup.

In order to be able to simulate a project, the device in the device tree must first be changed to the simulation device. The device description file must be exchanged to the simulation device ([device name]-Simulation) using "Update device".

Information

Before downloading to the real device, the device description file must be exchanged to the one corresponding to the real hardware. Otherwise the device will run into an error condition after download!

10.1 Create simulation

To create the simulation, open the context menu of the PLC and select the menu item **Create Simulation** or select the menu item **Manage Simulations** in the toolbar.

This opens a dialog in which the following configurations can be carried out.

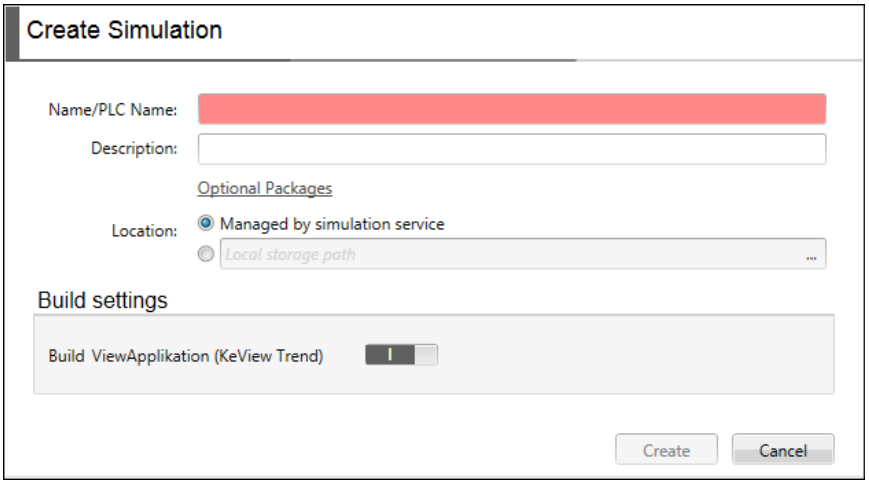

Fig. 10-19: Dialog for the creation of a simulation

Name	Beschreibung
Name/PLC Name	This name will be used to identify a simulation for start and stop. The name must be unique and the dialog will assist by showing an information if a name is already in use. This name will also be used in the communication settings to set the simulation active.

Name	Beschreibung
Description	An additional information that can help when managing simulations.
Optional Packages	The optional PLC packages which should be used can be selected in the following dialog.
Location	• Managed by simulation service: with this option the created simulation will be stored in a directory on the machine where the service is hosted. • Local storage path: a local path can be set where the new simulation will be stored. Nevertheless a local simulation service is necessary to run a local simulation. A local simulation will only be visible in the u-create studio in **Manage Simulations** if the simulation is running.
Build settings	Depending on the used devices and features in the project will be the build settings available.

The simulation will be created via **Create**.

10.2 Execute simulation

The button **Manage Simulations** in the toolbar opens the following dialog.

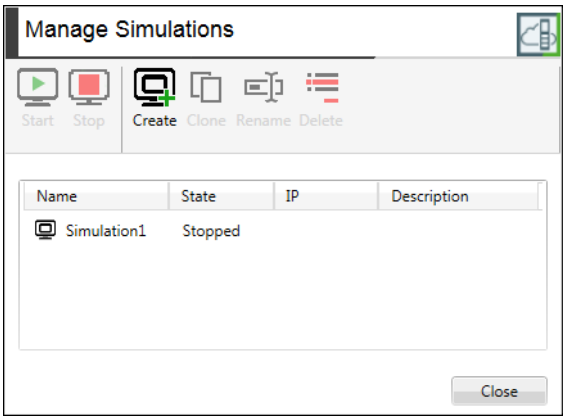

Fig. 10-20: Dialog for managing simulations

The list in that dialog shows all simulations from the simulation service. The buttons in the ribbon can be used for the following actions.

Name	Beschreibung
Start	Starts the selected simulation. This simulation is then available in the communication settings.
Stop	Stops a running simulation.
Create	Opens the dialog for simulation creation.
Clone	Creates a copy of the selected simulation.
Rename	Changes the name of the simulation. This name will also be used for the PLC name which is visible in the communication settings.

Name	Beschreibung
Remove	Deletes a simulation.

10.3 Execute local simulation

To execute a local simulation the **.exe** file in the simulation directory must be executed.

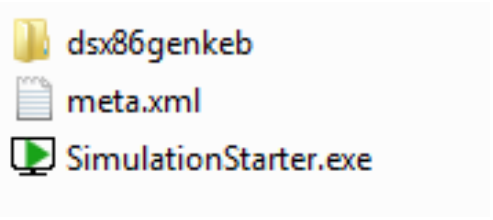

Fig. 10-21: Directory of a local simulation

A window will be opened with the informations of the simulation. If the simulation contains a visualisation, it is started automatically. In the following image the dialog with the informations of the simulation is visible with the visualisation in the background.

Fig. 10-22: Local simulation with visualisation

If the visualisation window gets closed, it can be started again by clicking the link in the bottem left corner.

10.4 Execute simulation from flash

With u-create studio it is possible to run a flash as a simulation. A simulation similar to the local one is started. All changes which will be done in the running simulation will be done directly on the flash.

To run a flash as a simulation **Tools ► Simulation ► Start simulation from flash** needs to be selected. In the dialog the flash drive can be selected and the simulation started.

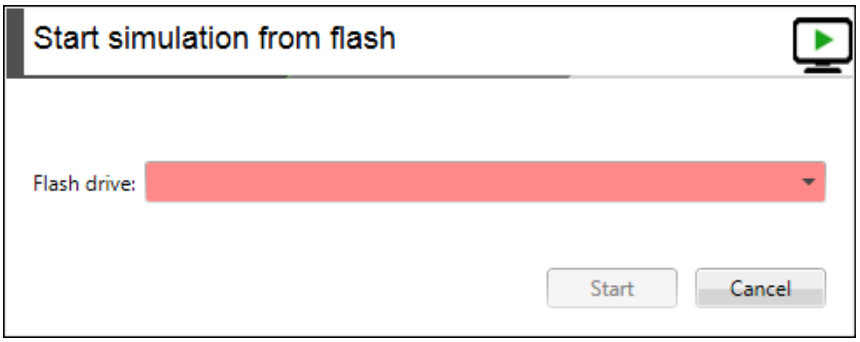

Fig. 10-23: Start simulation from flash

11 Update software

u-create studio provides to execute an update of the software directly via the tool.

Therefore a log in on the control must happen. Then the control settings are opened via double-click on the control node in the project tree.

Via "Software update" on the area "Info" can be checked if there is new software available. If this is the case this is shown in a dialog and a software update can be executed.

Add/Remove software

Furthermore additional Linux packages can be installed or removed on the control via "Add/Remove optional features" in the area info. Thereby the software selected in the dialog will be installed and the software which is not selected will be removed if installed on the control.

12 Load firmware on device

There is the possibility to install the firmware on a device (e.g. control) via a removable disk. Thereby, the whole control operating system, the runtime system and the application is stored on the removable disk and can be installed on any number of devices.

Therefore the following configuration settings have to be inserted in u-create studio in the menu **Tools ► Optionen...** under **Software Service**:

Name	Value
Update Server	localhost
System	System version which should be installed on the control or the active static operating panel

To create a removable disk disk it must be plugged into the PC. Then **Create Target** has to be selected in the context menu of the device in the project tree and the following dialog opens:

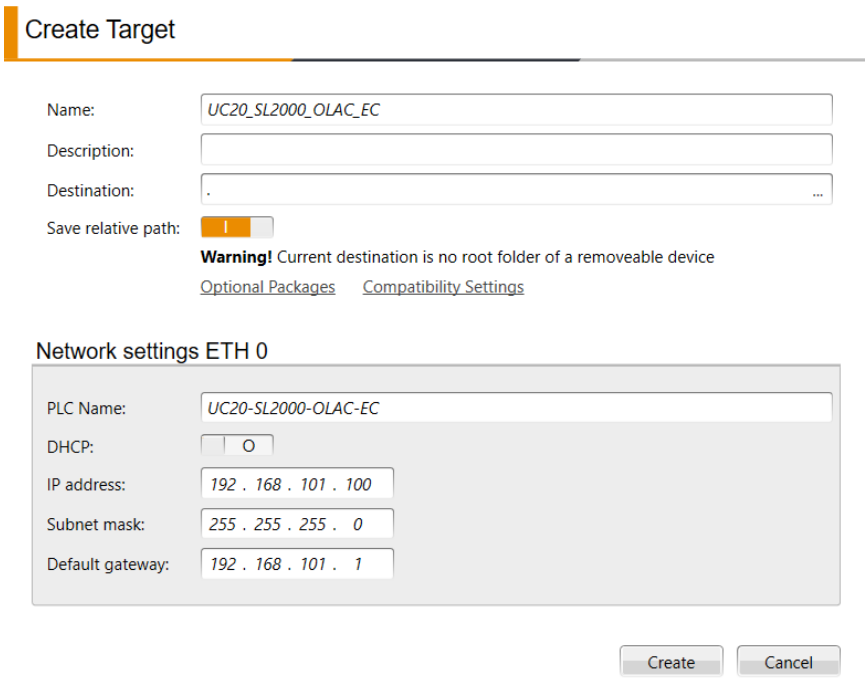

Fig. 12-24: Dialog - Create Target

Name	Description
Name:	Name of the control
Description:	Individual description

Name	Description
Destination:	Selection of the removable disk or any folder. If no removable disk is selected, a warning will be shown and the content is saved in the selected directory. If a removable disk is selected, it is checked whether the removable disk is a valid Service Medium. If it is no valid Sevice Medium, a warning is shown and the removable disk can be made valid or bootable via clicking on "Prepare Service Medium (Administrator privileges required)".
Save relative path:	If this option is activated, the path will be stored relative to the project
PLC Name:	Name of the control or the active static operating panel
DHCP:	Use of a DHCP server
IP address:	IP address of the control or the active static operating panel
Subnet mask:	Subnet mask
Default gateway:	Gateway

Optional packages can be used to select additional software components (e.g. OPC-UA). By checking the box for the desired package and OK it will be saved on the removable disk and is available for installation.

A further dialog is opened via **Compatibility settings**, in which a range of serial numbers can be set using "Add". This means that the firmware on the removable disk can only be installed on the devices whose serial numbers lie within this range. This prevents accidental installation on the wrong device.

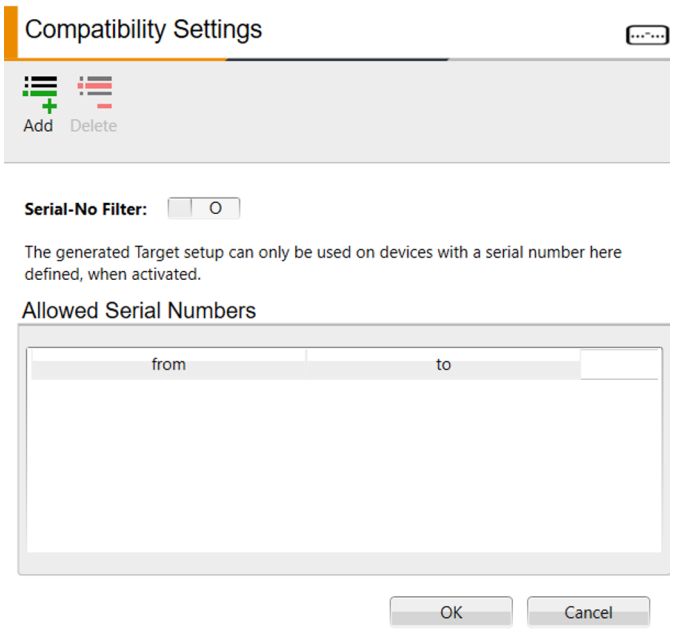

Fig. 12-25: Dialog - Compatibility settings

After all settings are made, the software can be stored on the removable disk via "Create" (dialog "Create target"). Therefore, the removable disk is available for the installation of the firmware on the desired devices.

13 Manage devices

u-create studio provides the possibility to manage devices on a removable storage device, to change network settings of devices. Furthermore, all settings of the removable storage device can be deleted and the removable storage device can be formatted, so that it can be used as conventional removable storage device again and is not bootable any more.

Therefore **Tools ► Manage Targets** must be selected in the menu bar. The following dialog is opened:

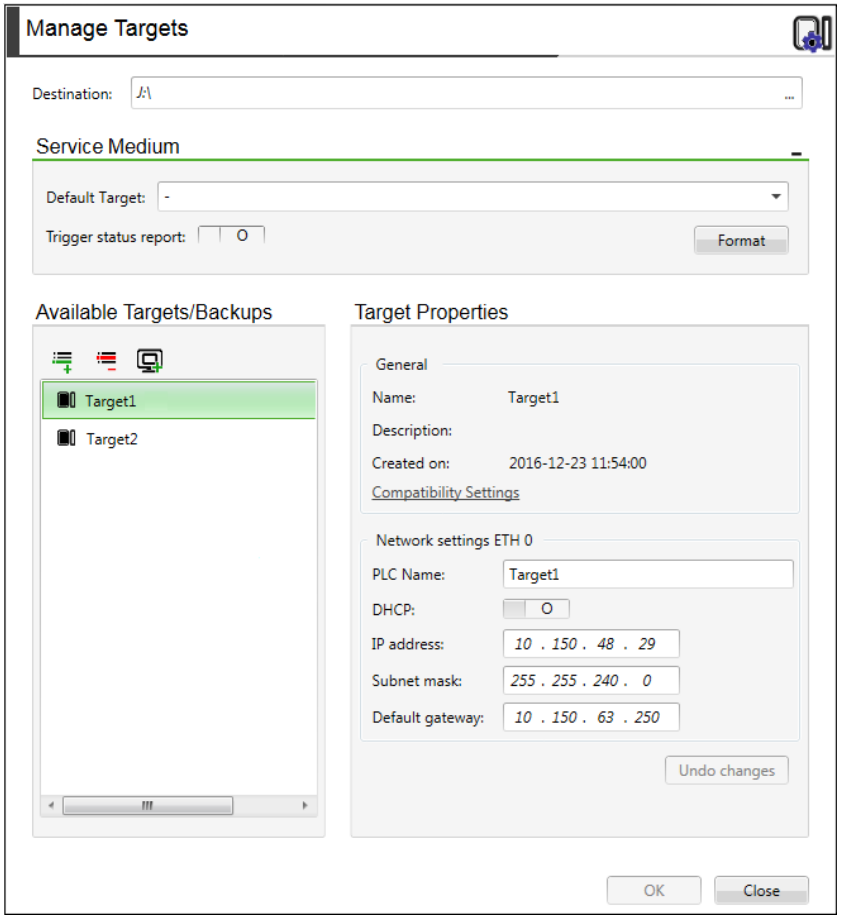

Fig. 13-26: Manage devices

Name	Value
Destination	Selecting the removable storage device
Relative path	If this option is activated, the path will be inserted relative to the project
Trigger status report	Function not available

Area Service Stick Sertings

In this area a device can be selected as default device for a restore at devices with a 7 segment display. In addition, in this area all device configurations of the selected USB stick can be deleted and the stick can be formatted newly.

Name	Value
Default target	Selecting a device which should be default when restoring a backup on a device with a 7 segment display
Format	Delete and newly format the USB stick

Available Targets/Backups

In this area devices on the USB stick can be deleted, added or a device from the USB stick can be simulated.

Name	Value
	Porting a device configuration from the PC to the USB stick
	Delete selected device on the USB stick
	Function not available

Device Properties

This area contains information about the device selected in **Available Targets/Backups**. Furthermore, network settings can be changed for the selected device.

Name	Value
Name	Name
Description	Optional description of the device
Created on	Creation date of the device
Compatibility settings	Open the compatibility settings (see Create target USB stick)
PLC Name	Name of the device
DHCP	Use of a DHCP server
IP address	IP address of the device
Subnet mask	Subnetmask
Default gateway	Gateway
Undo changes	Reset all changes

14 Prepare Service Medium

u-create studio offers the option to prepare a removable disk for the backup of a control or to restore the saved backup on a control. To do so, a removable disk with a memory of at least 2 GB is needed, which is plugged into the PC.

Use the menu item **Tools - Prepare Service Medium** to open a dialogue in which you have to select a removable disk.

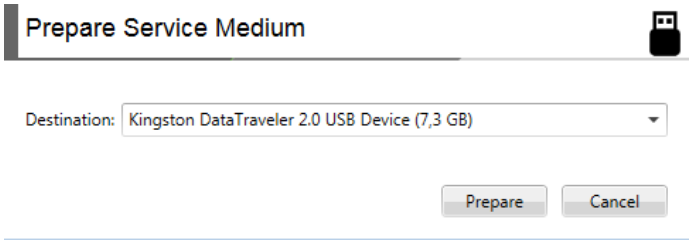

Fig. 14-27: Prepare Service Medium

Information

The removable disk must never be pulled out during the writing process! It is recommended to execute the command "Eject Device" under Windows before removing the removable disk.

The backup or restore can be performed via "DevAdmin".

15 Configuration

The following chapters describe the configuration options in the system.

15.1 Configuration of the message system

The message system is used to inform the user about processes in the control, which either can no longer guarantee a correct function or signal important status changes in the control process.

The message editor is opened in the project tree via **Message Editor**.

15.1.1 Message Editor

Proprietary messages can be created and edited in this editor. These messages can be displayed in the message monitor.

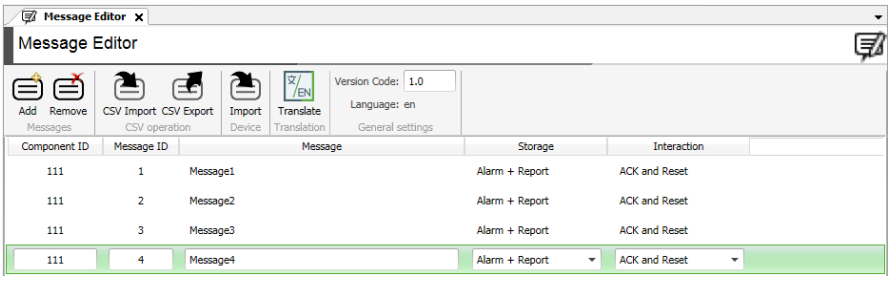

Fig. 15-28: Message Editor

Messages can be created via "Add" or deleted via "Remove". When creating a new message, a component ID and message ID are allocated automatically, which can be manually changed later. Each message is identified by a unique combination of component ID and message ID, therefore, each combination must only exist exactly once.

The behavior of the messages is specified via the two pulldown menus "Storage" and "Interaction".

Information

- Only component IDs between 100 and 999 may be created.
- Only Message IDs equal 1 or greater may be created.

Component ID

Unique number for a functional component from the control application. This number is entered when the message is created and must be stated when calling `SetMessage` in the application program.

Message ID

Unique number for a message. This number must be indicated when calling `SetMessage`. Since the same message with the same message text but different parameters can be called multiple times in the application program, it must be identified there in a unique manner by an instance number.

Message text

The message text entered here is attached to the message when it is called by `SetMessage`. Message texts can include placeholders in order to use them to indicate current values applicable at the time of the function call. Placeholders are intended for the instance number and for parameters within the message text.

The format specification can be inserted into the text in any manner. It always starts with a '%' sign and needs to end with an empty space.

Storage

Setting	Meaning
Alarm + Report	Category Alarm and Report
Alarm only	Category Alarm, message can be acknowledged
Report only	Category report
None	No categorization, message is not displayed on the message monitor

Interaction

Setting	Meaning
ACK and Reset	The message is only deleted if it has been acknowledged and reset.
ACK or Reset	The message is deleted if it either has been acknowledged or reset.
Acknowledge	Message is deleted by acknowledging it. Typical for messages, that the operator must see and take into consideration. The acknowledgment can take place from the application program `(QuitMessage)`.
Inactive	The message is inactive and is not displayed in the alarm mask. From remote message is only entered in the info log.
Reset	Message is deleted via resetting. Typical for messages, which are only processed by the application and that are not seen by the user or must not be acknowledged (e.g. entries in the report buffers and thereby display in full the info log). The resetting of the message takes place at the function `ResetMessage`.

The following graphic indicates the status model of the messages including the possible status transfers depending on the configured treatment options.

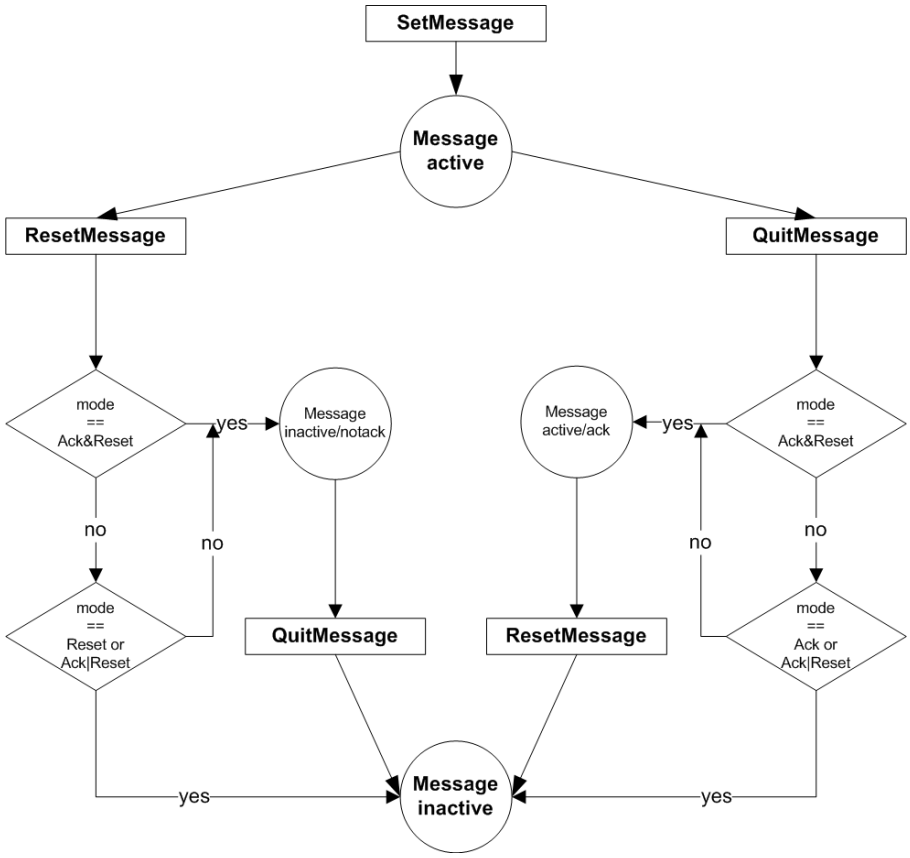

Fig. 15-29: Status model for the messages

15.1.2 Export/import message texts

Via "CSV Export", the currently displayed messages can be saved in a separate file. Via "Version Code", the file can be given a version ID. Via "CSV Import", already created messages can be imported into the current project.

Messages from the device can be imported into the project by using "Import". Hereby only messages of the applikation will be imported. Messages of the base system will not be imported.

Information

At "CSV Export" the parameter "Storage" and "Interaction" will not be exported. Therefore they can not be restored at a later "CSV Import".

Information

*Under **Project ► Projects Settings ► Language Settings** the language of the displayed messages can be switched.*

15.1.3 Translate messages

The created, currently displayed messages can be translated into another language. To do so, a proprietary program (Translator) is pulled up with "Translate". For more information about the operation: See online help of the translator program.

15.2 Configuration of modbus server

To communicate with the modbus server on the control the following configuration entries must be set via "Expert Entries" directly on the node control:

```
[ModBus]
    enableRTU = 0

    [ModBus.RTU]
    SIO_NAME = "/dev/ttyS1"
    BAUDRATE = 19200
    PARITY = "N"
    DATABITS = 8
    NRSTOPBITS = 2
    SERIAL_MODE = 0 // RS232 = 0; RS485 = 1

    [ModBus.TCP]
    IP = "127.0.0.1" // IP address of control
    PORT = 502
```

The IEC variables, which are shared with the modbus server must be released first. After that they can be registered at the modus server via the "Expert Entries" configuration. The following entries must be added:

```
[ModBusReg]
    MaximumModBusAddress = 100 // max. Anzahl an Variablen

    [ModBusReg.Adr:1]
        Factor = 1.0
        Variablenname = "APPL.Application.GVL.var1"
        WritePermission = 0

    [ModBusReg.Adr:2]
        Factor = 1.0
        Variablenname = "APPL.Application.GVL.var2"
        WritePermission = 1
    ...

    [ModBusReg.Adr3:1:200] //Array: [<startindex>:<endindex>]
        Factor = 1.0
        Variablenname = "APPL.Application.GVL.var_array1" //Array1 1:200
        WritePermission = 0
    ...
```

Information

To call released variables via Modbus server the server must be restarted. This must be done mandatorily in the application via function "MODUS_Restart()" of the library "K_Modbusbase".

15.3 Configuration of EtherCAT devices

In principle, EtherCAT devices can be configured as "EtherCAT Master" or "EtherCAT Slave". Several EtherCAT Slave devices can be connected to a EtherCAT Master (e.g. the control functions as master and can be connected with slaves).

15.3.1 Configuring EtherCAT Master

Open the configuration window by double-clicking on the EtherCAT node.

The EtherCAT Master configuration window consists of the following tabs:

- EtherCAT Master
- Status

Tab "EtherCAT Master"

The general master configuration can be carried out here.

Element	Meaning
Timing mode	• Cycle time: Insert a cycle time in µs. • Task: Select a configured task
Activate cross-communication	Activates cross-communication between drives and encoder box.
Cross-communication cycletime	Cycletime of the cross-communication between drives and encoder box.
Simulation mode	The bus master can be set to "Simulated" to be able to carry out tests without physical slaves. All slaves are then automatically set to "Simulated".

The area Info shows information about the manufacturer and the device. The remaining parameters of an EtherCAT Master can be found in the area "Advanced" in a tree structure. These parameters do not need to be switched for normal operation.

Tab "Status"

Various analysis parameters are shown here, which provide information about the EtherCAT bus of a running control.

ECAT

Element	Meaning
Status	Status information
Cycle time	Current cycle time
Number of slaves	Number of connected slaves
Min. early start offset	Minimum of the send times of the "early"-frame relative to the systick
Max. early start offset	Maximum of the send times of the "early"-frame relative to the systick
Min. start offset	Minimum of the send times of the "normal"-frame relative to the systick

Element	Meaning
Max. start offset	Maximum of the send times of the "normal"-frame relative to the systick
Max. start time	DMA statistics: the maximum time before the first data is available (graphical representation available by clicking the button)
Max. read time	DMA statistics: the maximum time of an DMA transaction (graphical representation available by clicking the button)

Bus statistics

Element	Meaning
Bus analysis	With the two buttons "Start/Stop" and "Reset" the bus analysis can be controlled. As the result of the bus analysis the following parameter can show values.
Lost frames	Number of lost frames (graphical representation available by clicking the button)
Early update jitter	Maximum undercut of the cycle time when sending "early"-frames
Update jitter	Maximum overstep of the cycle time when sending "normal"-frames
Utilization	Average utilization of the communication medium in %
Cyclic Utilization	Average utilization of the communication medium by cyclic communication in %
DC deviation	Deviation of the DC system time (all slaves) (graphical representation available by clicking the button)
Min. DC deviation	Minimum deviation of the DC system time (all slaves)
Max. DC deviation	Maximum deviation of the DC system time (all slaves)

In the list "Bus messages" are the messages regarding the bus since the last start of the PLC listed. This makes it easier to find messages for diagnostic purposes.

15.3.2 Possible data failures on EtherCAT Bus

By usage of a control with a hardware EtherCAT controller it has to be taken care of a correct configuration of the EtherCAT controller. Otherwise error messages due to timing problems can occur.

On controls with hardware EtherCAT controller the EtherCAT interfaces are marked with "ECAT[x]". On controls without hardware EtherCAT controller a standard network interface (Ethernet[x]) is configured for EtherCAT.

The EtherCAT controller takes care of the following areas of responsibility:

- Arranging EtherCAT data packages
- Sending and receiving EtherCAT data packages on the bus

EtherCAT master and EtherCAT controller have a common area in the RAM for data transfer. There the EtherCAT master saves the data to send and gets the data to receive. The EtherCAT controller has (as usual for network controller) direct access to the common RAM area (**D**irect **M**emory **A**ccess) and transfers the data immediately to the EtherCAT bus (RAM transfer). So a data stream between RAM and EtherCAT bus is created.

The following parameter in the area "Advanced" under "Advanced parameter" have influence on the correct operation of the EtherCAT controller:

Parameter	Description
DMA duration (dmaTime)	Time which is available for RAM transfer
Offset of standard frame (startOffset)	Point in time where the normal process data in the RAM are ready for collection
Offset of early frame (earlyStartOffset)	Point in time where the data for "fast control" in the RAM are ready for collection

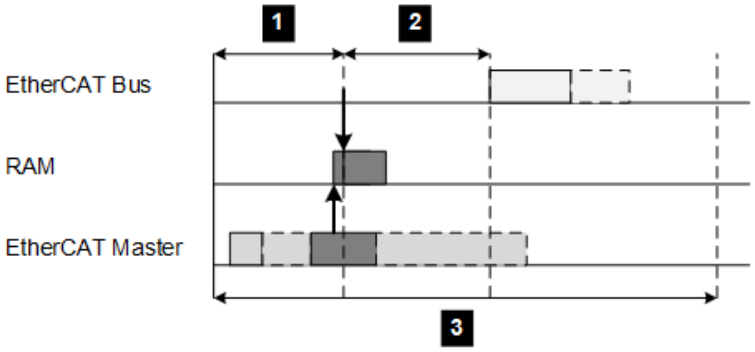

Fig. 15-30: Timing diagram

1 ... Offset of standard frame	2 ... DMA duration
3 ... EtherCAT cycle time	

The following conditions apply:

- The write operation of the EtherCAT master in the RAM buffer must be carried out before the first read operation of the EtherCAT bus from the RAM buffer.
- The read operation must be completed within the configured DMA duration. By default a time value of 50 µs is configured to establish the data stream between RAM and EtherCAT bus (RAM transfer). In rare cases some dynamic influencing factors (e.g. CPU load, RAM load, ...) can lead to a transfer time exceeding the configured time.

Regardless of the current cycle, the following formula must be taken into account:

```
(Offset of standard frame + DMA duration + Frame runtime) <
EtherCAT cycle time
```

15.3.2.1 Telegram losses

If a telegram loss is detected on the EtherCAT bus, a message is reported. Depending on the value of the configuration parameter `frameLossTolerance`, this message is reported either as an error or as a warning.

The message is reported as a warning if the number of telegram losses in the last ten transmissions has not exceeded the telegram loss tolerance configurable by the configuration parameter `frameLossTolerance`. If several telegrams are transmitted per bus cycle, all telegrams are included for the tolerance limit, i.e. if, for example, five telegrams are transmitted per bus cycle, the tolerance limit is reset after two successfully transmitted bus cycles.

The error status of the end points affected by the process data is not changed. The process data of the affected end points are not updated in this cycle.

```
WARNING Ackn (6353/72), ECAT: At least one Ethernet frame was
lost in the EtherCAT segment.
```

If it occurs repeatedly with exceeding of the tolerance limit, the message is sent as an error.

```
ERROR Ackn (6353/2), ECAT: At least one Ethernet frame was
lost in the EtherCAT segment.
```

The error status of the end points affected by the process data are only set invalid if the cyclic command present in the affected telegram is not transmitted several times in succession and the telegram losses tolerance has been exceeded.

15.3.2.2 Timing problems

If a timing problem is detected on the EtherCAT bus, a message about the time violation occurs. Possible causes are:

- 'DMA': The configured DMA duration (dmaTime) was exceeded. Not all data could be read from the RAM buffer within the specified time.
- 'SW normal': The time required for the update in the control context was higher than the offset of the standard frame (startOffset). No data could be written into the RAM buffer.
- 'SW early': The time required for the update (especially the application code for fast control) in the control context was higher than the offset of the early frame (earlyStartOffset).

The cause of the time violation is visible as a parameter in the error text.

If a timing violation occurs, all further telegrams whose transmission was scheduled for this cycle after the affected telegram are also invalid. The resulting failure of several telegrams in one cycle is counted as one timing violation.

If no timing violation has occurred within the last ten EtherCAT bus cycles, the message is reported as a warning. The error status of the end points affected by the process data is not changed. The process data of the affected end points is not updated in this cycle.

```
WARNING Ackn (6353/73), ECAT: Timing violation occurred (DMA)
WARNING Ackn (6353/73) ECAT: Timing violation occurred (SW normal)
WARNING Ackn (6353/73) ECAT: Timing violation occurred (SW early)
```

If timing violations occur repeatedly within ten EtherCAT bus cycles, the message is sent as an error and the error status of the end points affected by the process data is set invalid.

```
ERROR Ackn (6353/55), ECAT: Timing violation occurred (DMA)
ERROR Ackn (6353/55) ECAT: Timing violation occurred (SW normal)
ERROR Ackn (6353/55) ECAT: Timing violation occurred (SW early)
```

Error handling "DMA"

In case of a DMA error, the following steps can be taken to determine the optimum setting for the `dmaTime` parameter:

1) Set `dmaTime` to a value twice of the current value (e.g. 100 µs).
2) Under **Diagnostics ► Cyclic DMA statistics** activate DMA statistics by setting the checkmark.
3) Operate the system some time with high load.
4) Connect or trigger a status report.

The DMA statistics must be evaluated to calculate the correct settings. The recorded DMA statistics can be found online in the "Status" tab of the EtherCAT bus or in the status report in the "IoStaRep.log" file in the "PLC" folder.

The parameter `dmaTime` must be set at least 10 µs greater than the value of "Max. start time" of DMA statistics (tab "Status") or the value of "Maximum time" in area "Cyclic DMA read statistics" of the status report.

Error handling "SW normal"

The parameter `startOffset` must be configured greater than the value of the parameter "Max. start offset" in the "Bus information" section of the "Status" tab or value of "Max systick delay" in area EtherCAT master" in the file "IoStaRep.log" of the status report.

Information

If the value is greater than the configured bus cycle time, the cycle time must be adapted correspondingly.

Error handling "SW early"

The parameter `earlyStartOffset` is only relevant if a fast control is operated. In this case, the value must be greater than the value of the parameter "Max. early start offset" in the "Bus information" area of the "Status" tab or value of "Max systick delay (early)" in area EtherCAT master" in the file "IoStaRep.log" of the status report.

Information

If the value is greater than the configured bus cycle time, the cycle time must be adapted correspondingly.

15.3.2.3 Consequence

An increment of these times has the following consequences:

- Reduction of the amount of data which can be transmitted on the bus, because the time available for transmission is reduced.
- Reduction of the time between "reading inputs" and "writing outputs" at a configured "fast control".
- Possibly necessary higher bus cycle time.

15.3.3 Configuring EtherCAT Slave

A new EtherCAT slave is attached to the existing EtherCAT Master node.

To do so, proceed as follows:

1) In the project tree at the node of the EtherCAT Master open the context menu of a port (**DRV0** or **OUT0**) and select **Add Device**.
2) In the open dialogue "Add Device" select an EtherCAT slave device and click on **Add Device**.
3) Double-click on the newly inserted EtherCAT slave device in the project tree.

An EtherCAT slave device has been inserted and the configuration window opens. Depending on the insterted device, the configuration possibilities in this window differ.

The configuration window for EtherCAT slave devices consists of the following tabs:

- Basic Configuration: This tab displays the name of the device type and allows the configuration of the basic settings.
- I/O Mapping: IEC variables can be mapped to endpoints. See also "Mapping Endpoints".
- FMMU/Sync: Under this, the settings for "Fieldbus Memory Management Unit" and "Sync Manager" can be carried out.
- Start Parameters: Start parameters are set with the slave for each boot.
- Status: Shows information about the status of the slave device.

The following tabs are only visible when the expert settings have been activated:

- Expert Mode Process Data: Expert settings for the cyclical process data.

Tab "Basic Configuration"

Like for all configuration windows, the structure for EtherCAT slave devices is split into three parts "General", "Info", and "Advanced". For normal operation parameter of part "Advanced" need not to be changed. Furthermore, the area "General" is also split into the areas "Device Identification", "Distributed Clock" and "Sync".

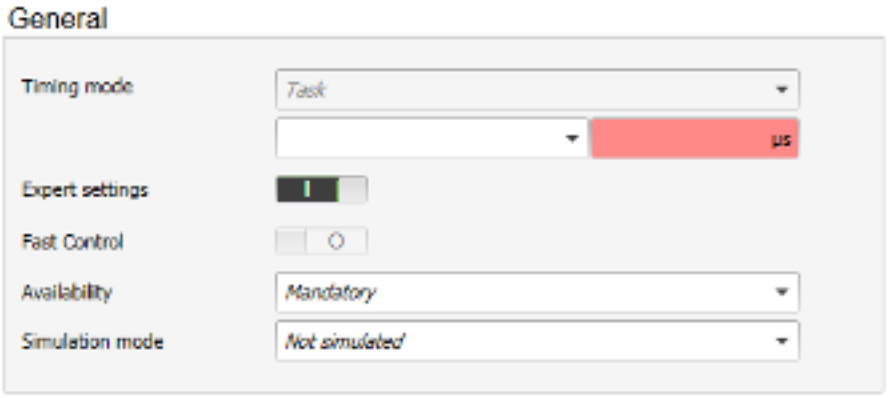

Fig. 15-31: Part "General"

General

Element	Meaning
Timing mode	• Cycle Time: Insert a cycle time in µs. The value must be a multiple of the masters cycle time. • Master: Cycle time of the master is adopted. • Task: Selection of a configured Task • Reduction: Regarding to the cycle time of the master, those of the configuring device will be slowed by the selected factor.
Fast Control	Activates fast control for in-/outputs of the module
Expert Settings	Activates expert settings. If activated, further tabs ("Expert Prozess Data") are available.
Availability	EtherCAT slave devices can be configured so that they do not always have to be physically present in order to be able to perform tests. The following selection options are available for that: • Mandatory: The availability of the device is mandatory • Optional: In the setting, the operation with and without existing slave devices possible, while the device is actually controlled if it is present.
Simulation mode	• Not simulated: Device is connected and controlled. • Simulated (slave not plugged in): The interfaces to slave devices are controlled in the simulation. • Simulated with hardware (slave plugged in): In this case, the slave device is not controlled even though it is present. This allows to still perform tests with a complete structure without the risk to control the connected devices.

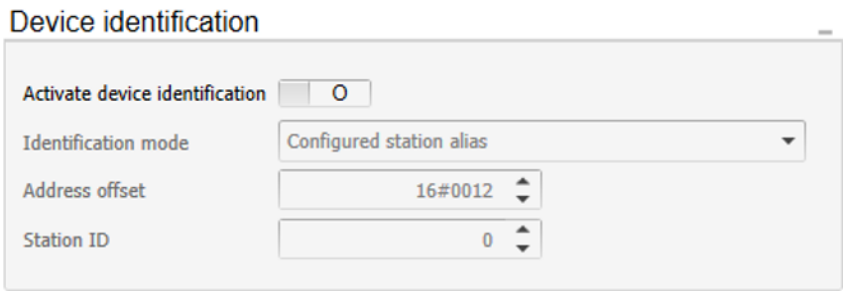

Fig. 15-32: Part "Device identification"

Device identification

Element	Meaning
Activate Device Identification	This activates the function and releases the necessary parameters.
Identification Mode	Assign identification ID to slave so that the EtherCAT master knows the order of the added devices (will not be written on slave). The following options are available for selection: • Configured Station Alias: To identify the device the configured Stations ID is used. • Requesting ID mechanism: Identification ID is configured at the device (e.g. via DIP switch).The address offset 134 is used here. • User-defined Address Offset: Any address offset can be indicated here. Which setting needs to be carried out here, can be found in the documentation of the EtherCAT slave device.
Address Offset	Is only configurable if the identification mode "User-defined Address Offset" is used.
Station ID	Station Alias of the EtherCAT slave device for unique localization of the device on the EtherCAT bus (0: Position of the device on the bus will not be checked).

For certain use cases it is necessary to assign an additional address - the "Device identification value" - to an EtherCAT slave device. This address can either be configured at the device via DIP switch or it can be written as "Station Alias" to the EEPROM of the device. This is to localize the devices on the bus. The assigning of this address is necessary for the following use cases:

- Use of several similar EtherCAT slave devices on the bus whereat the order of this devices is important for the function of the system. During the bus scan it can be recognized if devices are interchanged.

  Use of several similar EtherCAT slave devices on the bus whereat at least one of the devices is optional. During bus scan it is recognized on which position which optional device is connected or not connected. So the correct order of the devices is maintained.

The Station Alias for an EtherCAT slave device can be configured via u-create studio.

Information

Some EtherCAT slave devices (without EEPROM) do not support to save the Station Alias.

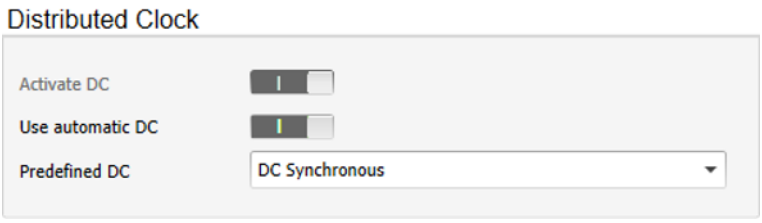

Fig. 15-33: Part "Distributed Clock"

Distributed Clock

Element	Meaning
Activate DC	With this you can set whether Distributed Clock is to be used.
Use Automatic DC	When using this option, the "Sync 1" is automatically calculated by the system. Therefore, in this case the settings for "Sync 1" also deactivated in the "Sync" area.
Pre-defined DC	The selection is determined through the ESI file of the slave. Additional information can therefore be found in the documentation of the slave device.

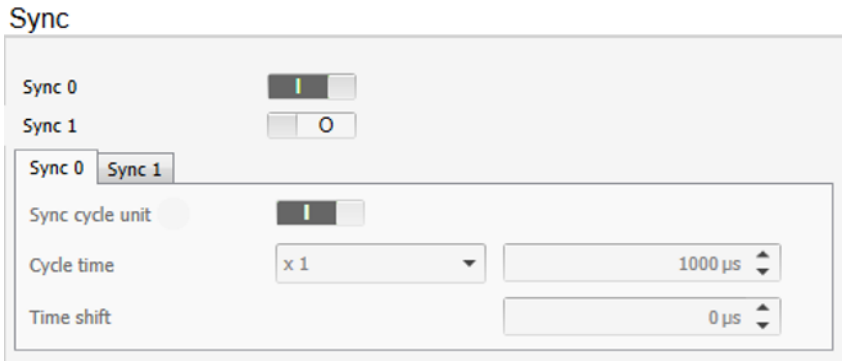

Fig. 15-34: Part "Sync"

Sync

Element	Meaning
Sync 0 / Sync 1	This allows to activate the two Sync separately. However, if the option "Use Automatic DC" is activated, the parameters of "Sync 1" can no longer be configured manually. How the two Sync are to be used can be found in the documentation of the EtherCAT slave device manufacturer.
Sync Cycle Unit	Here, you can select between a specific cycle time and a multiple of the slave cycle time for the configuration.

Element	Meaning
Cycle Time	Cycle time in µs or multiple of slave cycle time, depending on the configured Sync cycle unit.
Time Delay	Indicates the time between the Sync impulse of control and the Sync 0/1 point in time on the device.

Tab "I/O Mapping"

In this tab the endpoints can be mapped to a device (see chap. "Mapping endpoints").

The tab I/O Mapping is opened via the configuration window of a module and offers the option to permanently override its endpoints for the runtime (forcing).

Therefore, you can enter the desired value in the column "Force Value" and then activate the column "Force" with the help of the slider. As long as the value is activated with the slider, the endpoint maintains the set value.

Information

The values in the "Value" column are the values that the IEC application assigns to the endpoints.

Tab "FMMU/Sync"

Detailed information about the topic "Fieldbus Memory Management Unit" and "Sync Manager" can be found in the official EtherCAT documentation.

Tab "Start Parameters"

Detailed information about the topic "Start Parameters" can be found in the official EtherCAT documentation.

Tab "Status"

On the tab "Status" you can see the information of the EtherCAT slave device concerning the runtime.

Element	Meaning
Status	Information whether everything is OK or whether there are pending errors.
E2PROM Name	Device name
E2PROM Version	Device version
Serial Number	Serial number
Order Number	Order number
Device Number	Device type number
Print Number	Print number

Element	Meaning
Firmware Version	Firmware Version
Hardware Revision	Hardware Revision
First operation date	Delivery time
Operation time	Operating hour count
ECAT state	State of the slave
Active ECAT transition	Active ECAT transition
AL status code	AL status code for transition
AL status code description	AL status code description

In the list "Device messages" are the messages of the device since the last start up listed.

Tab "Expert Mode Process Data"

Detailed information about the topic "Process Data" can be found in the official EtherCAT documentation.

Tab "EoE Settings"

When the EtherCAT slave offers Ethernet over EtherCAT (EoE), the necessary settings can be carried out here.

Since no MAC addresses are necessary for the EtherCAT protocol but for Ethernet they are, a Virtual MAC ID must be set for a slave.

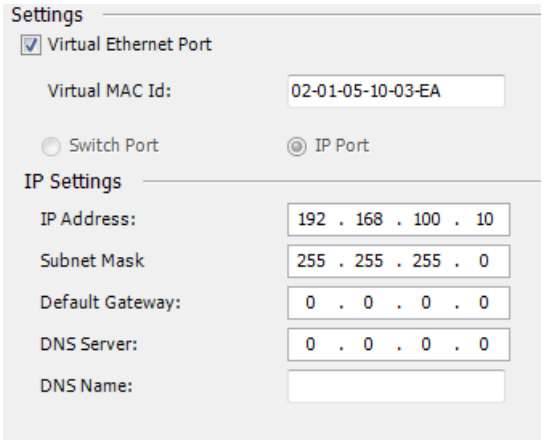

Fig. 15-35: EoE Settings

IP Settings

Designation	Meaning
IP Address	Indication of the IP address for the visualisation communication

Designation	Meaning
Subnet mask	the corresponding subnet mask
Default Gateway	the standard gateway
DNS Server	Address of a DNS (Domain Name System) server
DNS Name	Name of a DNS (Domain Name System) server

15.4 Configuration of CAN devices

In principle, CAN devices can be configured as "CAN Master" or "CAN Slave". Several CAN Slave devices can be connected to a CAN Master (e.g. the control functions as master and can be connected with slaves).

15.4.1 Configuring CAN bus

Tab "Basic Configuration"

Via double-clicking a CAN bus the configuration window opens, which is devided into several parts. The part "General" is structured as follows:

Fig. 15-36: Part "General"

Element	Meaning
Timing Mode	• Cycle Time: Insert a cycle time in µs. The value must be a multiple of the masters cycle time. • Task: Selection of a configured Task • Reduction: Regarding to the cycle time of the master, those of the configuring device will be slowed by the selected factor.
Simulation mode	• Not simulated: Device is connected and controlled. • Simulated: In this case, the device is not controlled even though it is present. This allows to still perform tests with a complete structure without the risk to control the connected devices.
Baudrate	Baudrate in kBaud for data transmission on the bus.

Information

Minimum cycle time of the CAN bus is 4000 µs. (e.g. EtherCAT cycle time: 1000 µs, 4 times reduced CAN bus cycle time: 4000 µs).

The part "Info" shows information about the manufacturer and the device.

In the part "Advanced" you can find further parameters of the CAN bus in a tree structure. For normal operation this parameters need not to be changed.

Tab "Status"

Various analysis parameters are shown here, which provide information about the CAN bus of a running control.

Element	Meaning
Status	Status information
Message Send Count	Number of sent data
Message Receive Count	Number of received data
Bad Send Count	Number of defective sent data
Bad Receive Count	Number of defective received data
Baudrate	Baudrate (kBaud)
Message Filter Count	Number of filtered data
Tx Error Level	Tx-error counter (Transmit)
Rx Error Level	Rx-error counter (Receive)
Bus Status	Bus status
Sent Data Bytes	Sent data bytes
Received Data Bytes	Received data bytes
Error Frame Count	Number of error frames
Error Warning Count	Number of warnings
Error Passive Count	Number of error passive
Bus Off Count	Number of bus offs
Data Overrun Count	Number of data overruns

15.4.2 Configuring CAN Master

To configure the device as CAN Master (Adding the function CANopen Master), proceed as follows:

1) Open the context menu of a CAN interface and select ► **Add device ....**

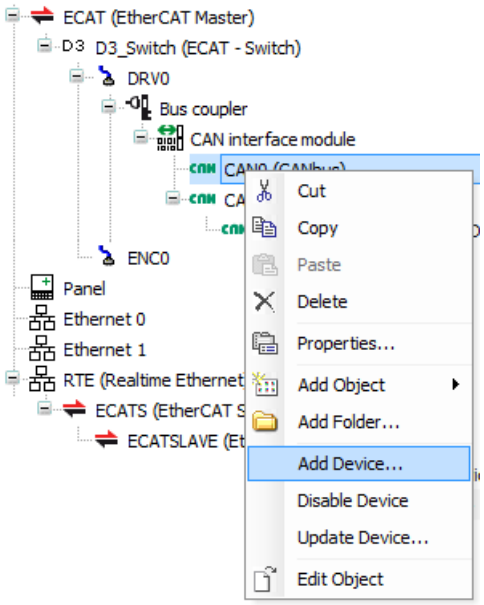

Fig. 15-37: Add CAN Master

2) Select category ► **"CANopenManager"**, device ► **" CANopenMaster"** in the open dialog and confirm with "Add device".

The CAN Master node is assigned to the CAN interface of the device.

Double-clicking the CAN node opens the configuration dialog.

Tab "CANopen Master"

In this tab the general master configuration can be carried out.

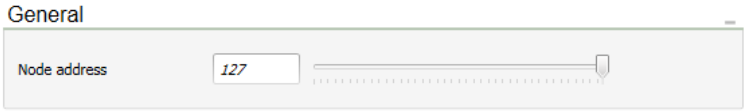

Fig. 15-38: CAN Master configuration dialog

Element	Meaning
Node address	Selecting a unique node address of the pre-defined node area. It serves to ensure, that the configured device is the same as the physical device.

The part "Info" shows information about the manufacturer and the device.

In the part "Advanced" you can find further parameters of the CAN Master in a tree structure. For normal operation this parameters need not to be changed.

15.4.3 Configuring CAN Slave

15.4.3.1 Configuring CAN Slave device

A new CAN Slave is attached to the existing CAN Master node.

To do so, proceed as follows:

1) Open the context menu of the CAN Master in the project tree and select **Add Device**.
2) Select a CAN Slave device in the open dialog and confirm with **Add Device**.

A CAN Slave device has been inserted.

Double-clicking the CAN Slave device in the project tree opens the configuration dialog. The configurationpossibilities in this window depends on the device inserted.

The configuration window for CAN Slave devices consists of the following tabs:

- Basic Configuration: This tab displays the name of the device type and allows the configuration of the basic settings.
- I/O Mapping: IEC variables can be mapped to endpoints. See also "Mapping Endpoints".
- Service Data Objects: Configuration of SDOs (Service data objects).
- PDO Mapping: Mapping of send and receive PDOs (process data objects).
- Status: Shows information about the status of the slave device.

The following tabs are only visible when the expert settings have been activated:

- Receive PDO Mapping: List of all PDOs, which can be received.
- Send PDO Mapping: List of all PDOs, which can be sent.

Tab "Basic Configuration"

This tab is structured into the parts "General", "Info", "NMT", "Heartbeat", "Node Guarding" and "Advanced".

The part "Info" shows information about the manufacturer and the device.

The part "Endpoint configuration" is only visible if the CAN slave has inputs and outputs.

If NMT mode is set to "System", the parts "NMT" and "Hearbeat" appear.

By activating "Expert settings", the part "Node Guarding" appears, in which the node guarding can be configured.

For normal operation the parameters of the area "Advanced" need not to be changed.

General

Basic settings can be configured in the part "General".

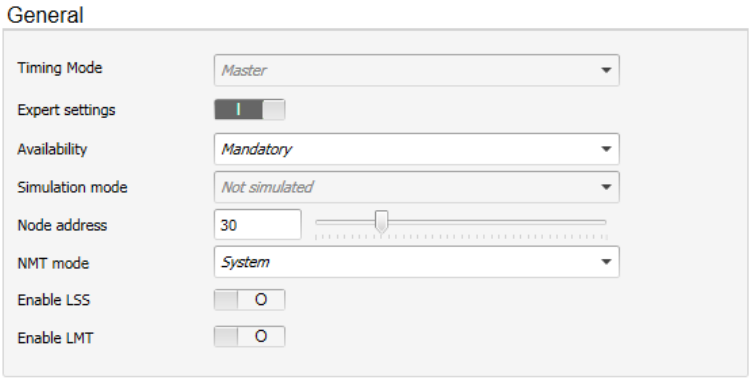

Fig. 15-39: Part "General"

Element	Meaning
Timing Mode	Cycle time of the Slaves. Only for selected Slaves a cycle time differently to the Master can be configured (e.g. BL210).
Expert settings	Activate expert settings for additional configuration.
Availability	CAN Slave devices can be configured so that they do not always have to be physically present in order to be able to perform tests. The following selection options are available for that: ● Mandatory: The availability of the device is mandatory. ● Optional: In this setting, the operation with and without existing slave devices possible, while the device is actually controlled if it is present.
Simulation mode	● Simulated (slave not plugged in): The interfaces to slave devices are controlled in the simulation. ● Simulated (slave plugged in): In this case, the slave device is not controlled even though it is present. This allows to still perform tests with a complete structure without the risk to control the connected devices.
Node address	Selecting a unique node address of the pre-defined node area. It serves to ensure, that the configured device is the same as the physical device.
NMT mode	Control of the status transmission via system or application. Via activating system, the parts NMT and Heartbeat appear.
Enable LSS	Expert settings for configuration of the node-ID via LSS.
Enable LMT	Expert settings for configuration of the node-ID via LMT.

Configure Endpoints and PDOs

The part "Configure Endpoints and PDOs" is only visible, if the CAN slave has in-/outputs.

By pressing **Configure Endpoints** the following configuration dialog opens, which consists of the tabs "Input" and "Output".

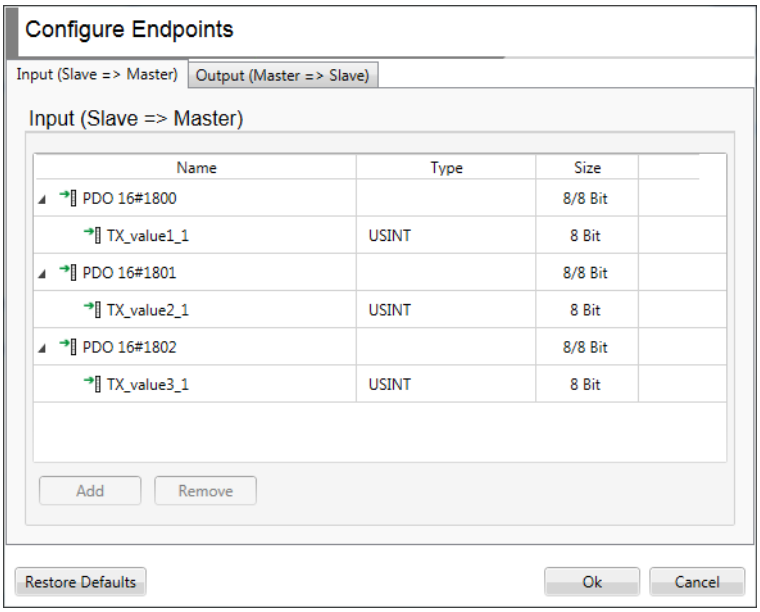

Fig. 15-40: Configuration dialog "Endpoint configuration"

In this tab it is possible to separate the memory range of a PDO to several inputs and outputs. So the data of the PDO can be processed in different ways and can be used at the I/O mapping separately.

In the respective tab all configured PDOs with the inputs and outputs are listed. For each inputs or output an unique name as well as the data type can be configured. Depending on the size of the PDO inputs and outputs can be added via **Add**. Via **Remove** inputs or outputs can be removed.

Via **Restore defaults** the configured inputs and outputs can be reset. This step is irreversible.

By pressing **Configure PDOs** the following configuration dialog opens:

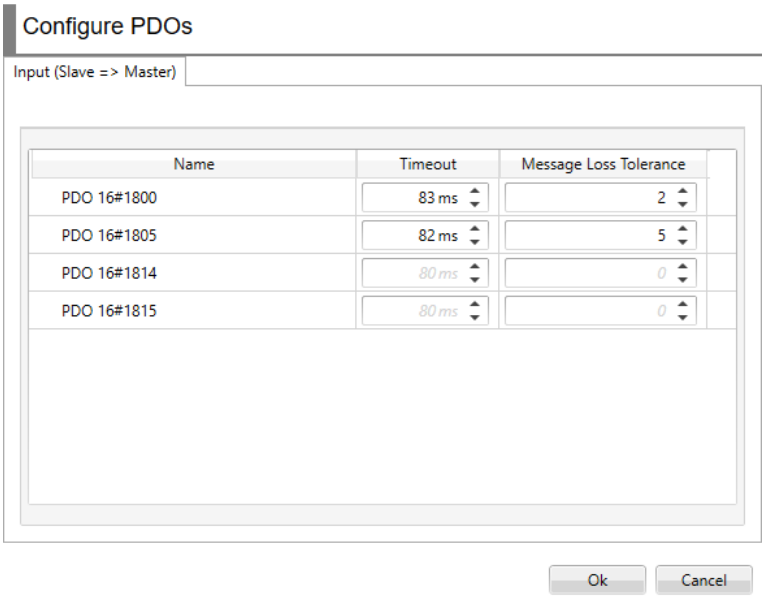

Fig. 15-41: Configuration dialog "PDO configuration"

In this dialog it is possible to configure the parameters **Timeout** and **Message Loss Tolerance** for each PDO that is transmitted from the slave to the master.

The parameter Timeout defines the allowed time from the start of the device until the master receives the first PDO. If this time is exceeded an error is triggered. The default value is tem times the cycle time of the device.

The parameter Message Loss Tolerance defines the allowed number of consecutive lost PDOs. If this number is exceeded an error is triggered. The default value is 0.

NMT

Control of the state can be configured in the part "NMT" (network management).

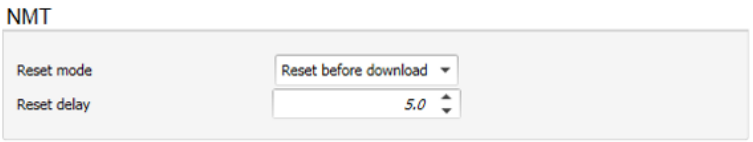

Fig. 15-42: Part "NMT"

Element	Meaning
Reset mode	Time, if the reset of the node should be executed
Reset delay	Duration of waiting time after restarting a node

Heartbeat

Sending heartbeats can be configured in the part "Heartbeat". By selecting "Heartbeat Consuming" the monitoring of heartbeats can be configured in the window which opens.

Information

Activating the hearbeat function is only possible, if node guarding is not activated.

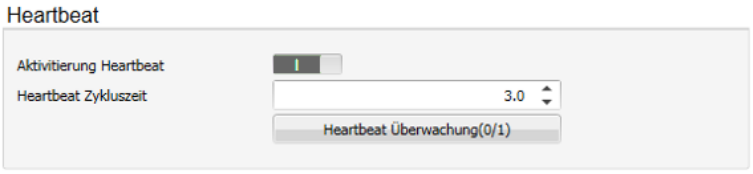

Fig. 15-43: Part "Heartbeat"

Element	Meaning
Activate Heartbeat	Activating heartbeat function
Heartbeat cycle time	Interval between consecutive heartbeats (in s)

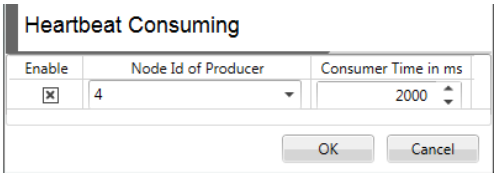

Fig. 15-44: Configuration dialog hearbeat monitoring

Element	Meaning
Enable	Activates the consuming of the node address.
Node ID of Producer	Unique identification of the heartbeat producer on the bus.
Consumer Times	Interval between consecutive heartbeats (in ms).

Node Guarding

Node guarding can be configured in the part "Node Guarding".

Information

Activating node guarding is only possible, if the hearbeat function is not activated.

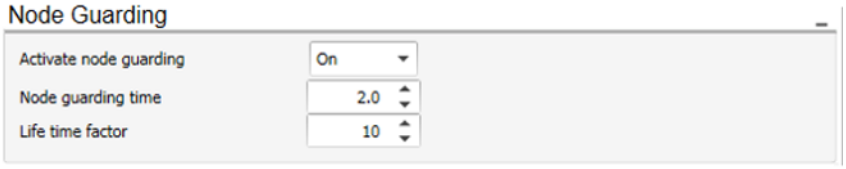

Fig. 15-45: Part "Node Guarding"

Element	Meaning
Activate node guarding	Activating cyclic node guarding of the slave. Is only possible, if heartbeat is not activated.
Node guarding time	Time, with which the node guarding of this device should be executed. Must be an integer multiple of the CAN- and PDO-cycle time of the device.
Life time factor	If the factor is unequal 0, the slaves checks the master for failures.

Tab "I/O Mapping"

In this tab the endpoints can be mapped to a device (see chap. "Mapping endpoints").

The tab I/O Mapping is opened via the configuration window of a module and offers the option to permanently override its endpoints for the runtime (forcing).

For that, you can enter the desired value in the column "Force Value" and then activate the column "Force" with the help of the slider. As long as the value is activated with the slider, the endpoint maintains the set value.

Information

The values in the "Value" column are the values that the IEC application assigns to the endpoints.

Tab "Service Data Objects"

In the tab "Service Data Objects" automatically generated SDOs can be configured and SDOs can be created manually.

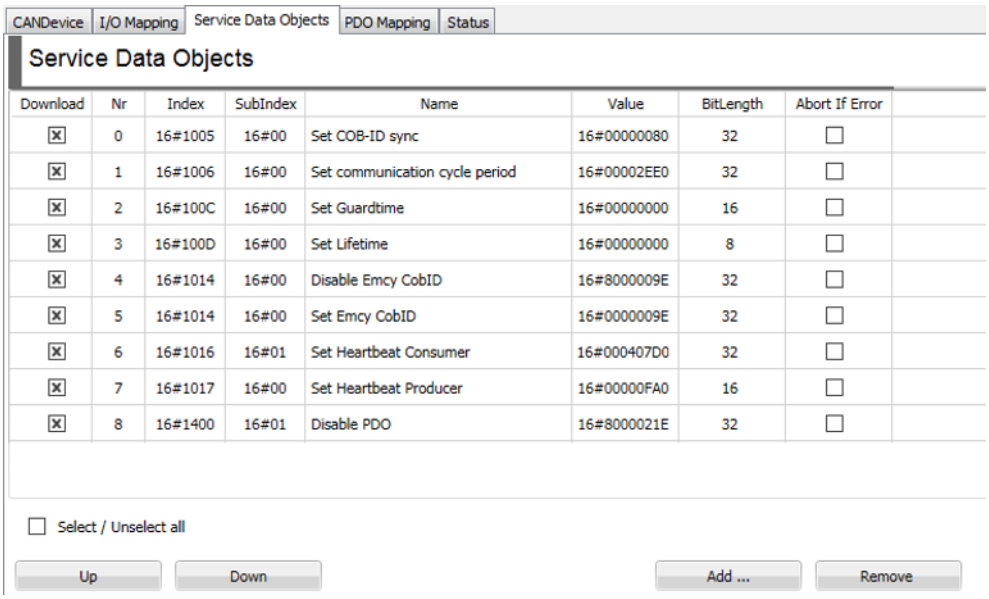

Fig. 15-46: Service data objects

The configured SDO will only be transmitted, if "Download" is selected. If "Abort if Error" is selected, the initialization of the slave will be aborted in case of a defective SDO.

Via "Add" new SDOs can be created and the manually created SDOs can be deleted via "Remove". Manually created objects can be sorted with "Up" and "Down" to change the transmission sequence.

Tab "PDO Mapping"

Mapping for send and receive PDOs is defined in the tab "PDO Mapping", which means the assignment of inputs and outputs (object directory entries) to a PDO for data exchange in the CAN bus.

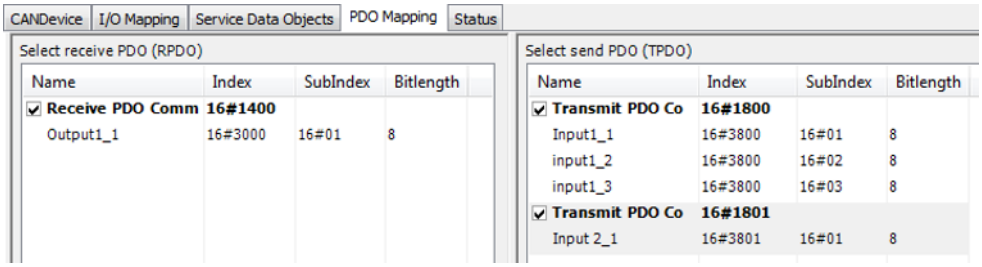

Fig. 15-47: PDO Mapping

Mapping for send and receive PDOs is defined in the tab "PDO Mapping", which means the assignment of inputs and outputs (object directory entries) to a PDO for data exchange in the CAN bus.

PDOs can be individually activated or deactivated, which prevents sending / receiving. Only PDOs which are activated in PDO Mapping are shown in the tab "I/O Mapping" where they can be assigned to variables.

Tab "Status"

In the tab "Status" you can see the information of the CAN Slave device concerning the runtime.

Element	Meaning
Status	Status information
E2PROM Name	Device name
E2PROM Version	Device version
Hardware Revision	Hardware revision
Function Variant	Information re. design
Print Number	Print number
Firmware Version	Firmware version
Serial Number	Serial number
Order Number	Order number
Device Number	Device type number
IBN Time	Delivery time
Run Time	Operating hour count

15.4.3.2 Configuring control as CAN Slave

To configure a control as CAN Slave (Adding the function CANopen Local device), proceed as follows:

1) Open the context menu of the CAN interface and select ► **Add Device**
2) Select category ► **"Local Device / ► CANopen Local Device"**in the dialog and confirm with "Add device".

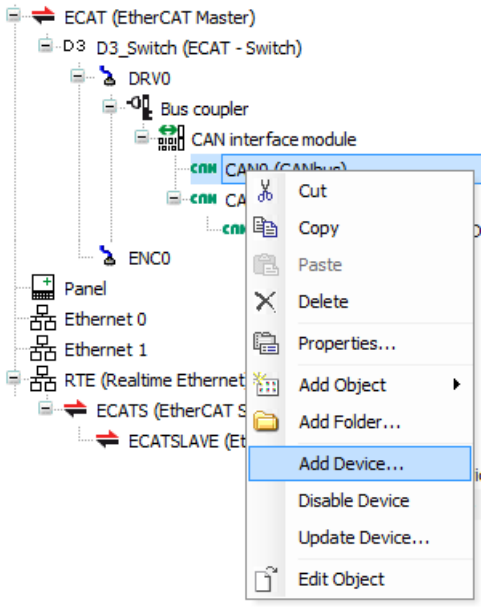

Fig. 15-48: Insert CAN Slave

Information

The device itself is called "local device", if it serves as master and is also configured as slave.

Via double-clicking local device the configuration window opens, which consits of the following tabs:

- Basic Configuration: This tab displays the name "Local Device" and allows the configuration of the basic settings.
- I/O Mapping: IEC variables can be mapped to endpoints. See also "Mapping Endpoints".
- Object Editor: Configuration of in-/outputs and SDO parameters.
- Status: Shows the status of the slave device.

Tab "Basic Configuration"

This tab is structured into the parts "General", "Info", "Generate Description File" and "Advanced".

For normal operation, parameters of part "Advanced" need not to be changed.

The part "Info" shows information about the manufacturer and the device.

General

Fig. 15-49: Part "General"

Element	Meaning
Availability	If the device is used as slave it can be configured so that the master not always have to be physically present in order to be able to perform tests. The following selection options are available for that: ● Mandatory: The availability of the master is mandatory: ● Optional: In this setting, the operation with and without existing master device possible, while the device is actually controlled if it is present.
Node address	Selecting a unique node address of the pre-defined node area. It serves to ensure, that the configured device is the same as the physical device.

Device Identification

Fig. 15-50: Part "Device Identification"

Element	Meaning
Device Type	Profile of the device
Device Name	Name of the device at the bus
Product code	Identification code of the device
Revision number	Version of the device

Generate description file

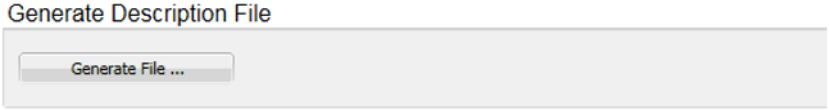

Fig. 15-51: Part "Generate Description File"

To use the device as CAN Slave, all parameters have to be completely configured. Via pressing "Generate file ..." a EDS-description file is generated, which can be saved separately.

Information

The device description file must be installed manuallly so that the device is available for use.

Tab "I/O Mapping"

In this tab the endpoints can be mapped to a device (see chap. "Mapping endpoints").

The tab I/O Mapping is opened via the configuration window of a module and offers the option to permanently override its endpoints for the runtime (forcing).

For that, you can enter the desired value in the column "Force Value" and then activate the column "Force" with the help of the slider. As long as the value is activated with the slider, the endpoint maintains the set value.

Information

The values in the "Value" column are the values that the IEC application assigns to the endpoints.

Tab "Object Editor"

On the tab "Object Editor" in- / outputs and SDO parameters can be configured.

Add input / output

It is possible to add in- and outputs in the tab "Object Editor". Therefore the button "Add" must be pressed. The following dialog appears:

Fig. 15-52: Configuration dialog add I/O

Element	Meaning
Typ	Define, if an input (master receives data from slave) or output (master sends data to slave) should be created.

Element	Meaning
Name	Insert unique name.
Count	Select required length of the in-/output, length is limited.
Data Type	Select data type.
Force new PDO	Activate to use a separate PDO for the in-/output.

It is shown how many inputs (Tx) or outputs (Rx) are already configured.

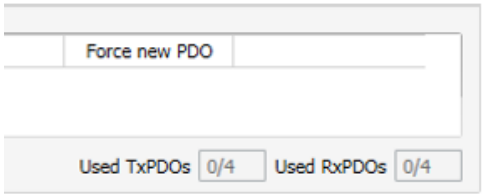

Fig. 15-53: Number of used PDOs

Created inputs and outputs parameters can be deleted via "Remove".

Add SDO parameters

It is possible to add SDO parameters in the tab "Object Editor". Therefore the button "Add" must be pressed. The following dialog appears:

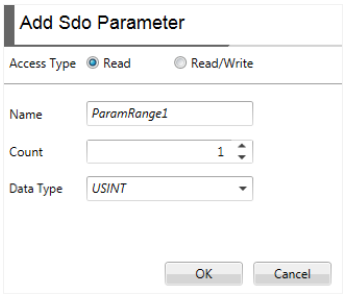

Fig. 15-54: Number of used PDOs

Element	Meaning
Typ	Define if the parameter is readonly or writeable.
Name	Insert unique name.
Count	Select required length of the SDO parameter, length is limited.
Type	Select data type.

Created SDO parameters can be deleted via "Remove".

16 Diagnosis

In this chapter, the diagnostic options with u-create studio are described. A diagnosis is only possible after logging into the control, since otherwise no parameters/values are read from the control.

In the project tree the status of the devices and busses is indicated with a corresponding icon.

Icon	Meaning
	Device or entire device node has no errors.
	Device is optional and not connected.
	An error has occurred in the device affected.
	One or more devices in this node have an error
	Device is simulated (Simulation mode = simulated)
	An error has occured on an added device

Each individual control can be assigned its own diagnostic node with included message monitor.

16.1 Message monitor

The pending alarms and messages for all the existing devices in the project are displayed in the message monitor.

Double-clicking on **Diagnostics - Messages** in the project tree opens the message monitor.

Messages of the respective category can be filtered via the "Alarm" or "Report" buttons. (This categorization takes place during the setting up of a message in the message editor.) If both categories should be shown ("Alarm" and "Report" both active) alarms are always shown first from latest to oldest and then reports are shown from latest to oldest.

The messages view updates automatically by default. The automatic update can be deactivated by activating "Manual". After that, an update of the messages can be triggered manually via "Update".

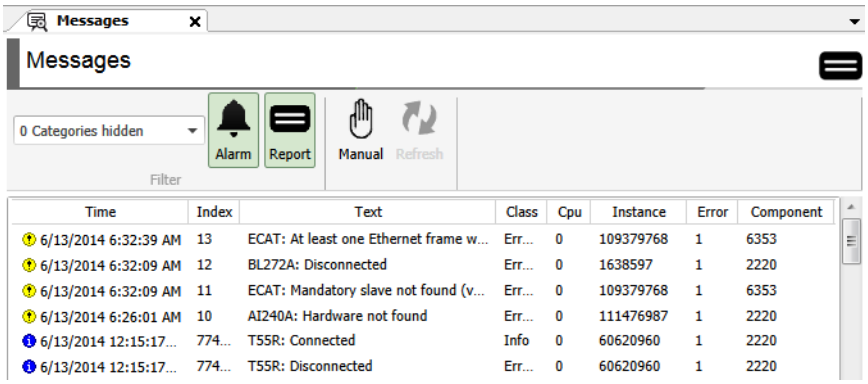

Fig. 16-55: Message monitor

"Alarm" messages can be acknowledged via the context menu. Multiple selections are possible.

16.2 Variable Browser

The variable browser displays the system variables of the IEC application. Variables are only displayed if you are connected with the control and if you are logged in. The variables are displayed in the variables browser, including their directory structure.

The structure consists of the base node APPL, which contains the released variables and SYS, which contains data of the system configuration (e.g. **SYS - CAT - IO - ONBOARD** for hardware information, **SYS - PERF** for information about load of the CPU and the tasks, ...).

Right-clicking a node structure in the variable browser and pressing **Update** updates the entire structure.

The variables can then be viewed in the watch monitor.

16.3 Watchmonitor

The watch monitor can be opened via **View - WatchMonitor** and it is used to view and dynamically override variables for the runtime (force).

Variables can be inserted via Drag&Drop from the variable browser or via "Add Variable ...". To do so, u-create studio must be connected with the control and must be registered.

Name	Description
Update	Update the selected variable
Delete	Delete the selected variable
Delete all	Delete all variables in the watch monitor
Add variable ...	Add a variable
Import	Import a variable list
Export	Export the currently insert variable in a variable list

Name	Description
Set all default values	Write values that were entered in the column "Predefined Value" on the variable in the control

16.4 Trace

In the Tracemonitor the Trace of the control will be shown in an easy readable way. It can be opened by double click on **Diagnostics - Trace**.

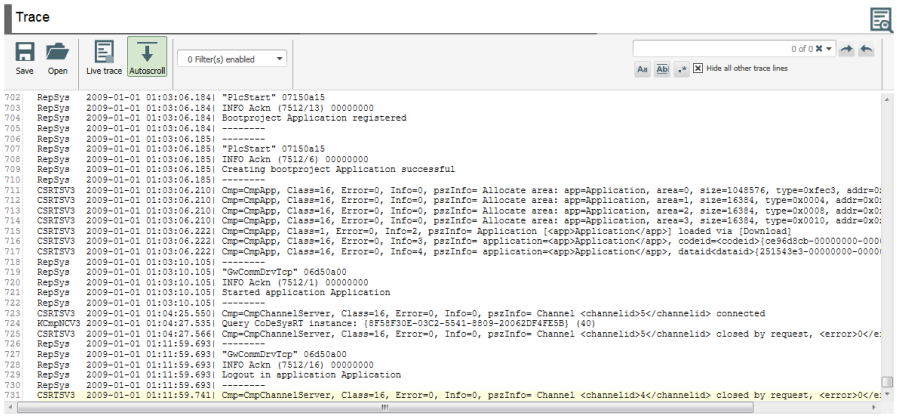

Fig. 16-56: Trace

The trace can either be watched live from the control or a previously saved can be opened by clicking "Open". For the live viewing is a login to the control required.

If "Autoscroll" is activated during "Live trace" allways the newest message will be shown. This "Autoscroll" feature will automatically be deactivated when clicking in the text area or manually by clicking the button.

For elements that can occur frequently filters can be defined in **Tools - Options - Trace** which can be activated or deactivated in Tracemonitor as desired.

The search box on the top can be used to search for specific text. The usual options like "Whole word" or "Match case", and also regular expressions, can be used. If "Live trace" is activated then the search function is not available.

For better readability in **Tools - Options - Trace** colors can be defined and also rules for marking of one or more lines which contains a specific text.

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