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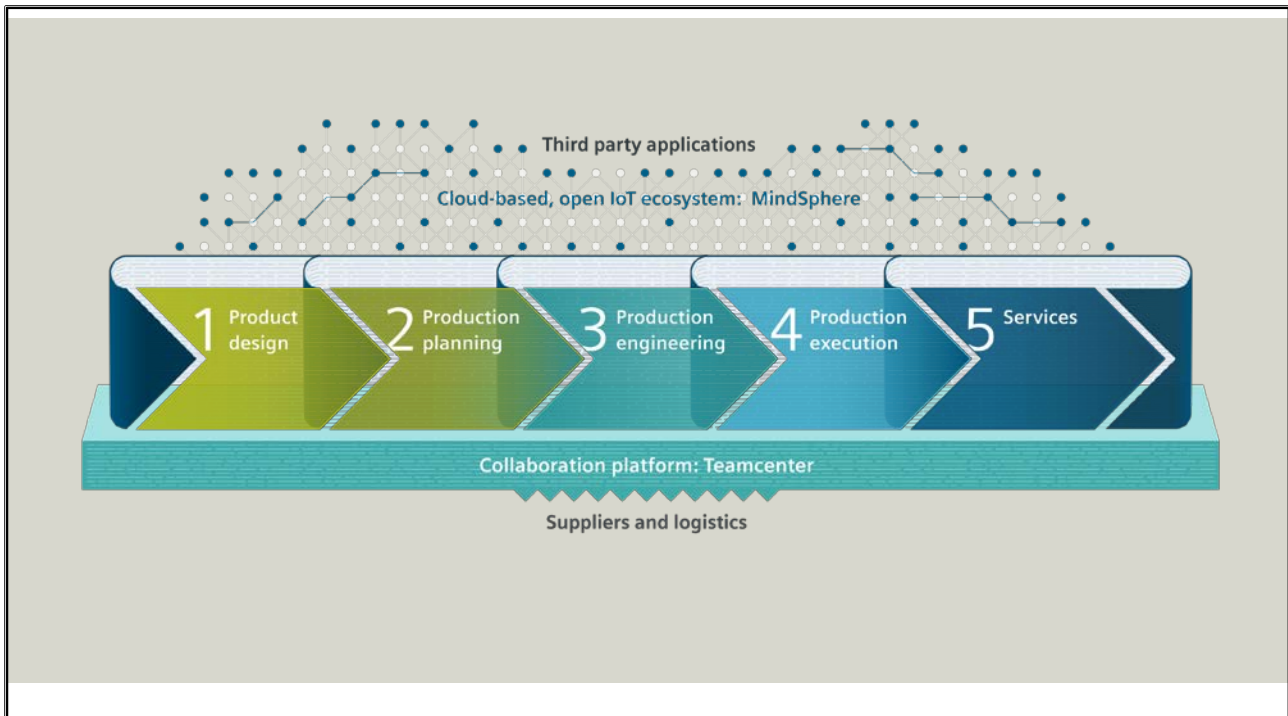
3. Engineering Software TIA Portal

At the end of the chapter the participant will ...



- ... have an overview of the scope of the engineering framework
- ... be familiar with the engineering products and their range of products
- ... be familiar with the operator interface of the framework
- ... be able to upload a program existing online

3.1. Product Lifecycle Management



Product- Lifecycle

Products and processes are becoming more and more complex. Siemens offers solutions for the Product Lifecycle Management (PLM) for all areas from concept development right up to the end of product life and which make it possible to successfully develop products, produce them and bring them to market.

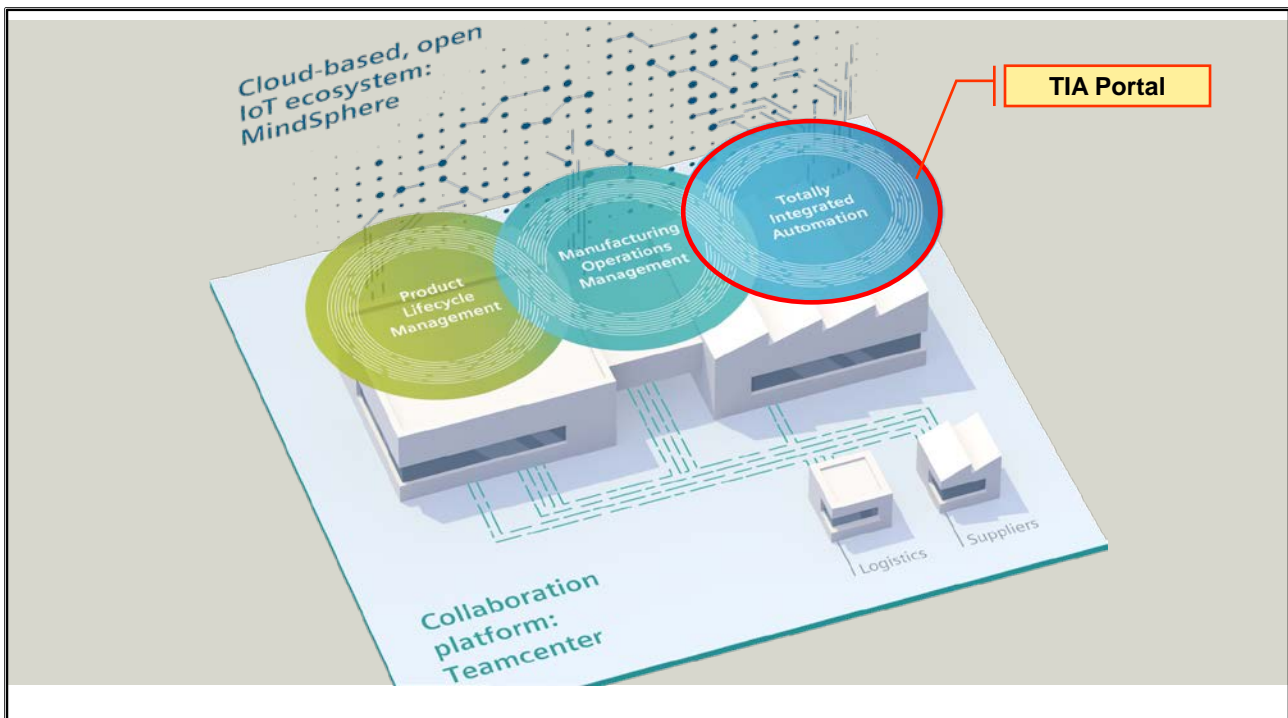
Siemens' holistic approach is to transform a traditional value-added chain into an integrated product and production lifecycle - starting with the product design, through the production planning, the manufacturing technology right up to production and services.

Only a fully digitalized business model can offer the strength and flexibility to accelerate processes and to optimize production processes.

This also includes a common data storage and data management system. With "Teamcenter", Siemens offers the industry-leading platform for interplay in all steps of the value-added chain – the "data backbone".

In the holistic value-added chain, the cloud-based open IoT-ecosystem "MindSphere" can be found.

3.2. Digital Enterprise Suite -> Answer to Industry 4.0



TIA Portal – your gateway to automation in the Digital Enterprise

The Totally Integrated Automation Portal (TIA Portal) provides you with unrestricted access to our complete range of digitalized automation services, from digital planning and integrated engineering to transparent operation.

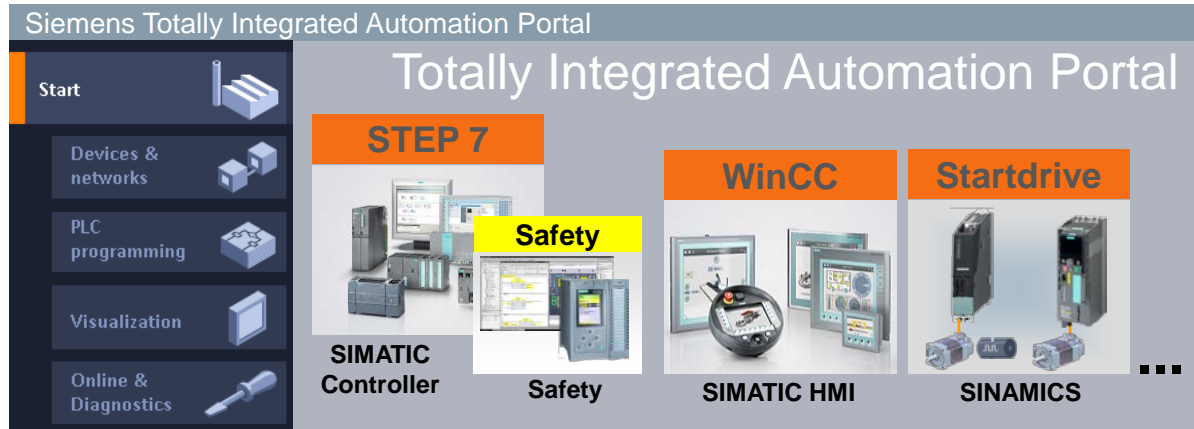
The new version shortens your time to market, for example by means of simulation tools, increases the productivity of your plant through additional diagnostics and energy management functions, and offers you broader flexibility by connecting to the management level. The new options benefit system integrators and machine builders as well as plant operators.

The TIA Portal is thus your perfect gateway to automation in the Digital Enterprise. As part of the Digital Enterprise Suite along with PLM and MES, it complements the comprehensive range of offerings from Siemens for companies on their path to Industry 4.0.

3.3. TIA Portal - Central Engineering Framework

The **Totally Integrated Automation Portal** is the **Engineering Framework** that is, it forms the framework for a consistent engineering for...

- ...programming automation systems
- ...visualizing processes



Stand-alone software packages are limited because they lack consistency and integration.

It takes a common working environment - that is, an **engineering framework** - to achieve full integration and consistency of individual products.

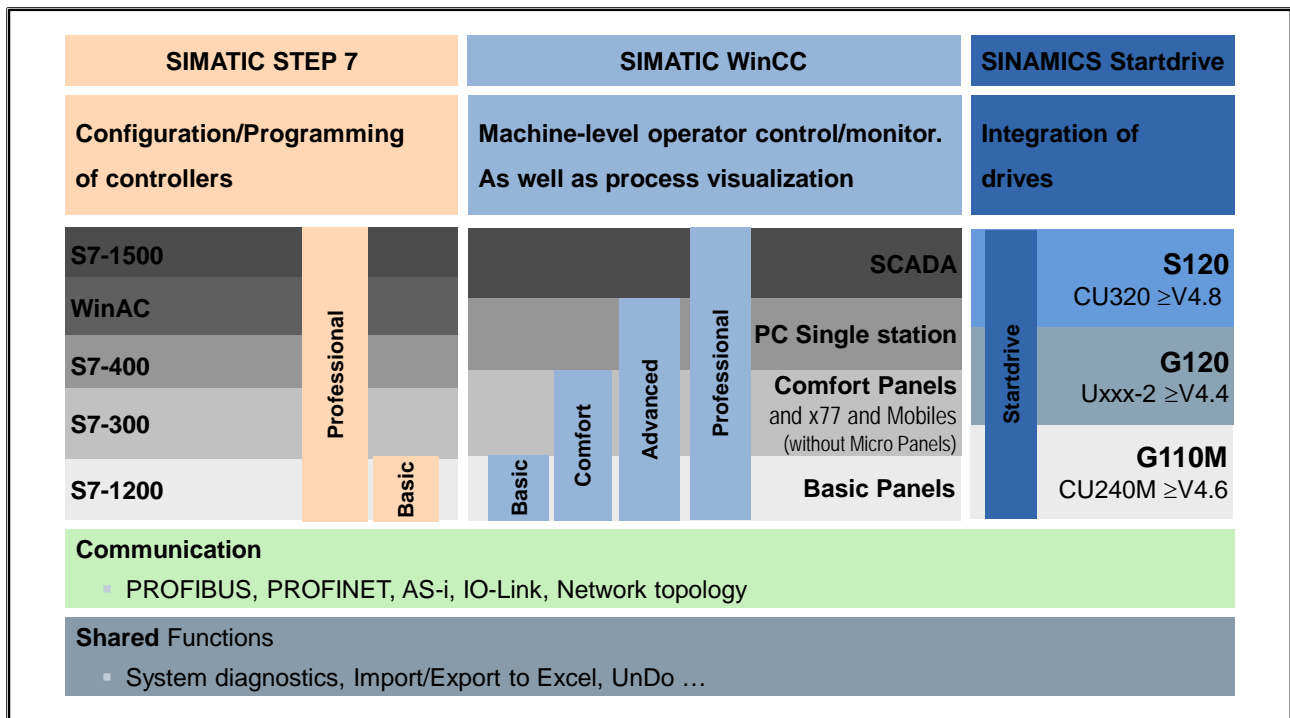
Advantages of a Central Engineering Framework

- Uniform operator control concept for all automation tasks with common services (for example configuration, communication, diagnostics)
- Automatic data and project consistency
- Powerful libraries covering all automation objects

The Most Important Engineering Products are:

- SIMATIC STEP 7
for PLC programming
- SIMATIC Safety
for programming fail-safe PLCs
- SIMATIC HMI
for configuring process visualization
- SINAMICS Startdrive
for parameterizing drives

3.4. Scope of the Products

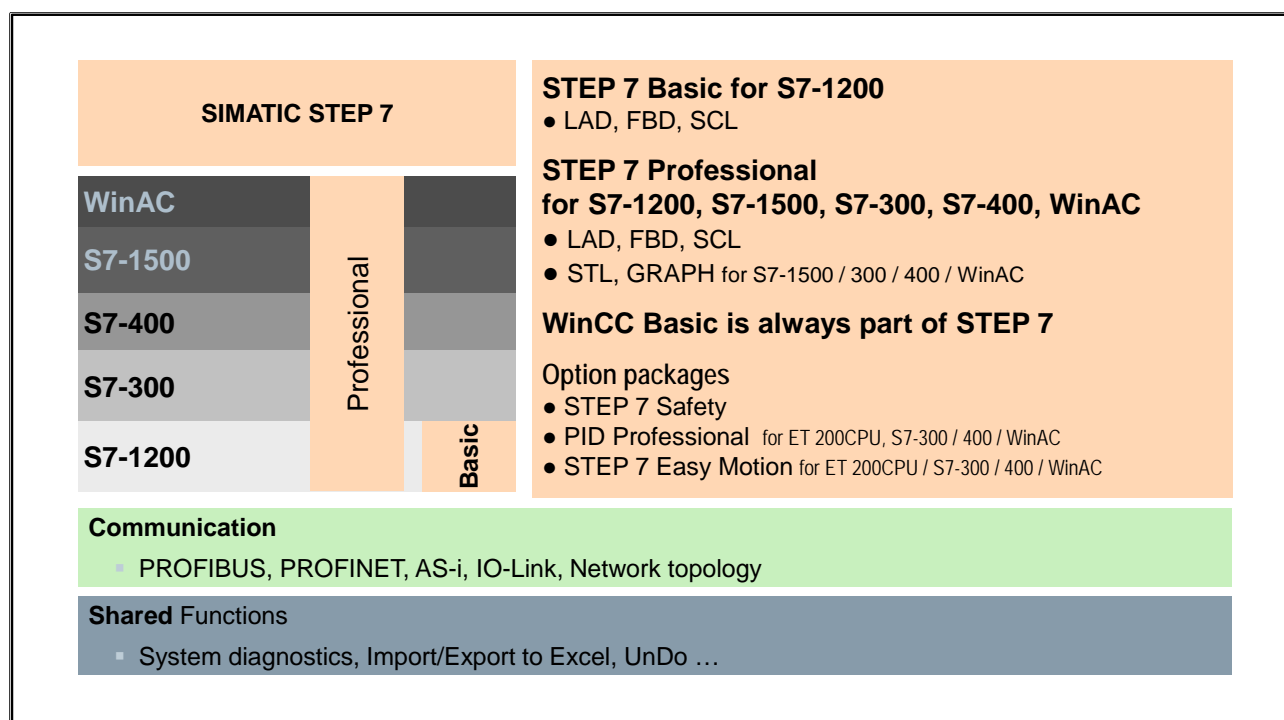


TIA Portal

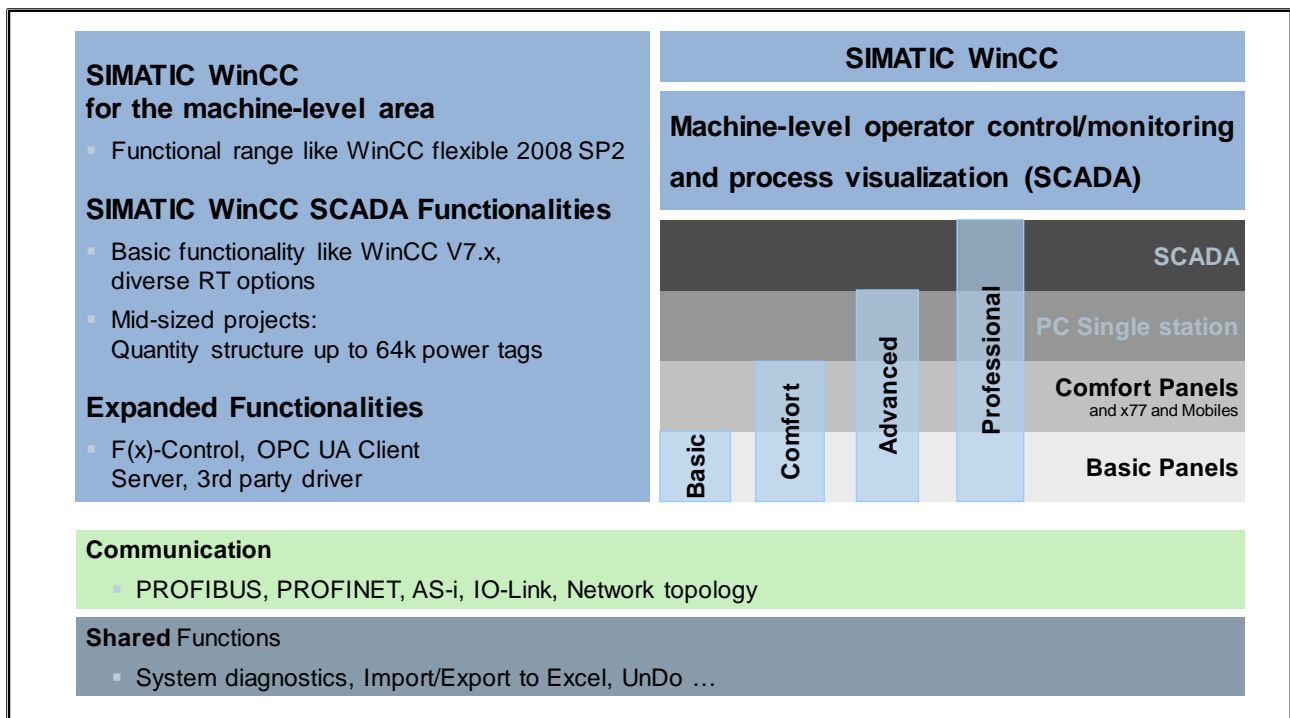
The Totally Integrated Automation Portal constitutes the working environment for an integrated engineering with SIMATIC STEP 7 and SIMATIC WinCC.

- Central engineering framework
- Automatic data and project consistency
- Uniform operator control concept for all automation tasks
- Powerful libraries covering all automation objects

3.4.1. STEP 7 Range of Products



3.4.2. WinCC Range of Products



3.4.3. Startdrive Range of Products and Licensing

SINAMICS Startdrive	
Integration of drives	
Startdrive	S120 CU320 \geq V4.8
	G120 CUxxx and CUxxxX-2 \geq V4.4
	G110M CU240M \geq V4.6

Functions:

- Parameterize drive
- Commission drive
- Test drive

Supported product lines :


- SINAMICS S120
- SINAMICS G120-series
- SINAMICS G110M




Communication

- PROFIBUS, PROFINET, AS-i, IO-Link, Network topology

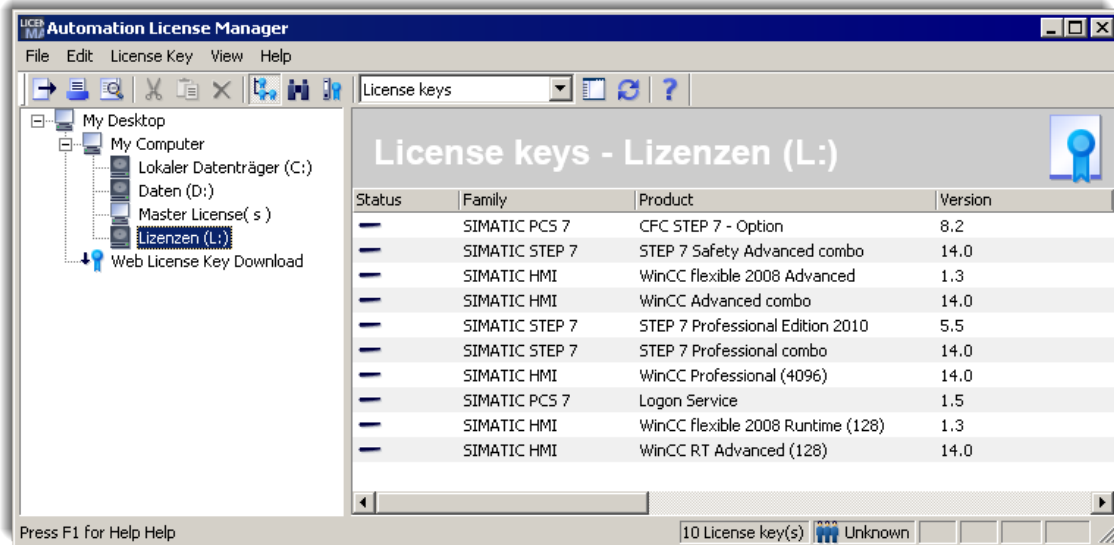
Shared Functions

- System diagnostics, Import/Export to Excel, UnDo ...

 **No additional license required**

  **STEP 7 Professional** 

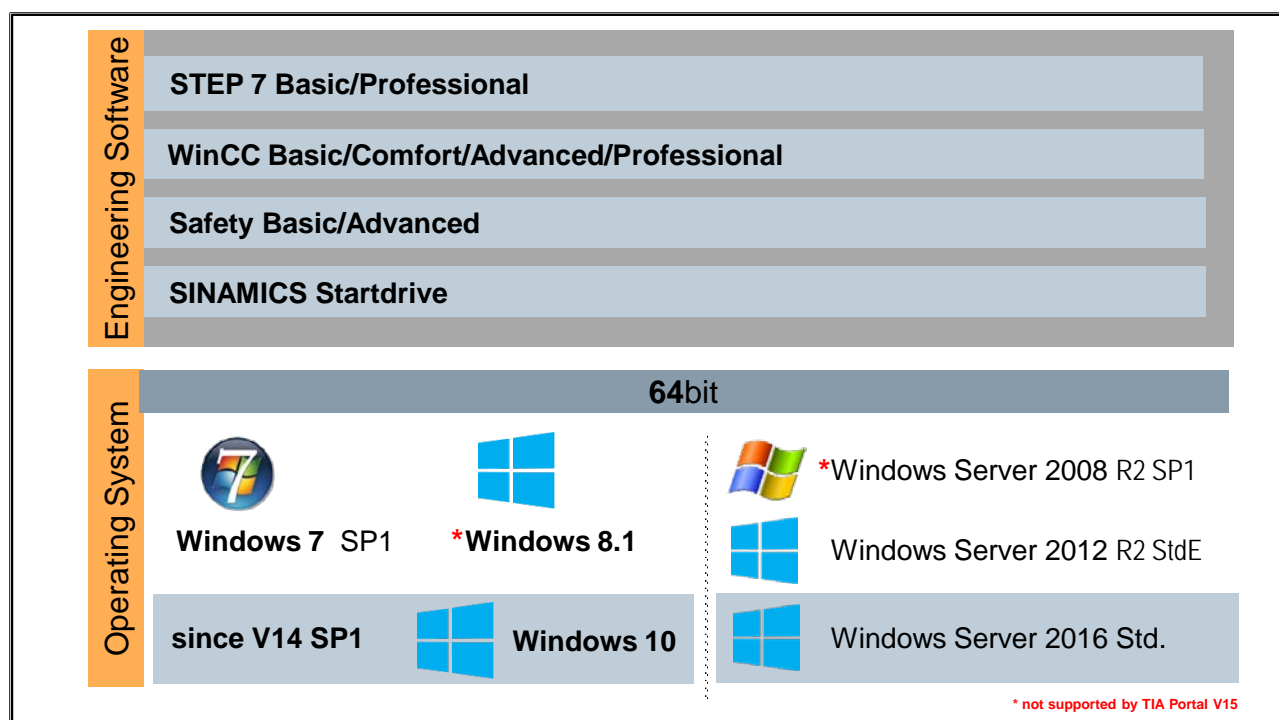
3.5. Automation License Manager



The software for managing, controlling as well as the acquisition of new licenses.

The Automation License Manager is part of the SIMATIC Software Installation and organizes the licensing of the SIMATIC software.

3.5.1. Operating Systems for PC/PGs



3.5.2. Virtualization (Released Software)

Released Virtualization Software	Released TIA Portal V14 Versions
VMware Player 12.5.5	✓ STEP 7 Basic/Professional V15
VMware Workstation 12.5.5	✓ WinCC Basic/Comfort/Advanced V15 WinCC Professional V15
VMware vSphere Hypervisor (ESXi) 6.5	✓ SINAMICS Startdrive V15 STEP 7 Safety Basic/Advanced V15
Microsoft Hyper-V Server 2016	✓ WinCC Runtime Advanced V15
	✓ WinCC Runtime Professional V15
Guest Operating Systems (virtual machine)	
<ul style="list-style-type: none"> Windows 7 SP1 64-Bit (Prof. / Ultimate / Enterprise) Windows 8.1 64-Bit (Professional / Enterprise) Windows 10 64-Bit (Professional / Enterprise) Windows Server 2008 RS2 SP1 Windows Server 2012 RS and Windows Server 2016 	

3.5.3. Side-by-Side Installation



TIA Portal V15, V14 and V13 can be installed on one and the same PG/PC

V14 and V15 requires 64bit system

The **Compatibility Tool** is available as an aid for checking parallel installations, see:

TIA Portal Information Center >
Tools & Apps > Configurators

or

under the Entry ID: 64847781
in the Online Support

Compatibility Tool for Automation and Drives

With the help of the Compatibility Tool, you can check the compatibility of the various SIMATIC software versions, either through the TIA Portal Information Center or on the Support pages (<https://support.industry.siemens.com>) under the Entry ID: 64847781.

3.6. TIA Portal: Portal View and Project View

Project View

- Hierarchical project structuring
- All editors, parameters and data accessible

Portal View

- Task-oriented
- Fast project entry

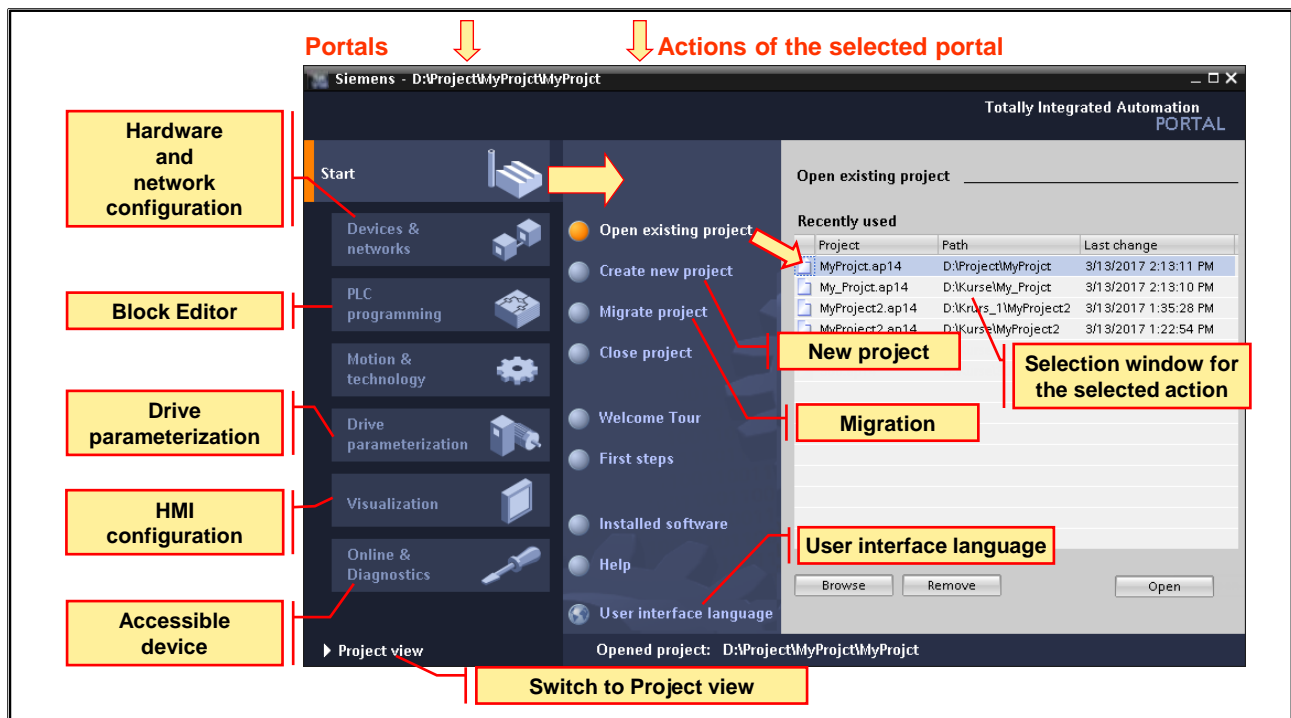
Portal View

- Task-oriented mode of working
- Fast project entry with user guidance

Project View

- Hierarchical structuring of the project
- The necessary editors open according to the task in hand
- All editors, parameters and data are found in one view

3.6.1. Portal View



Layout of the Portal View:

- Portals for the different tasks
- Actions for the selected portal
- Selection window for the selected action

Portals

Access to devices, components and their connections

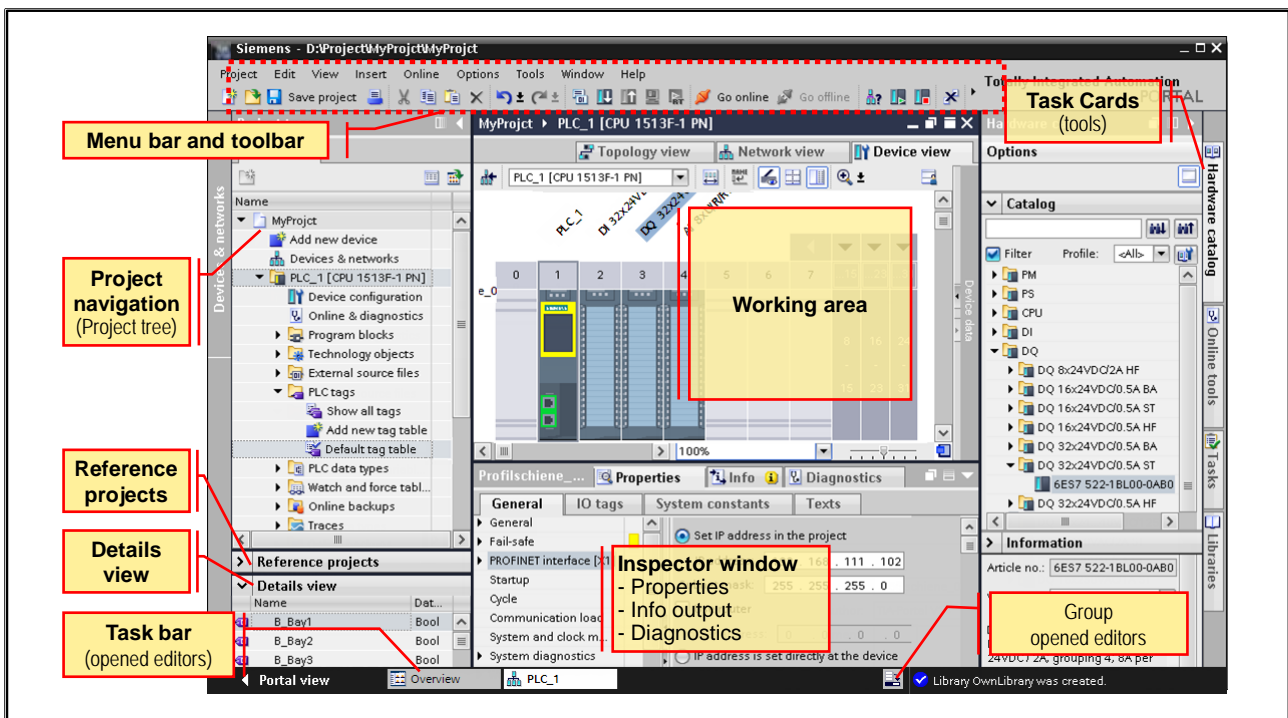
Actions

Depending on the selected portal, actions are available here that can be executed in the selected portal. Context-sensitive help is available in every portal.

Selection Window

The selection window is available in all portals. The content of the window adapts to your current selection.

3.6.2. Project View



Project Navigation (Tree)

The Project tree contains all components and project data of an automation solution. All components can be opened from there.

Working Area

The objects opened for editing are displayed in the working area. These objects include, for example hardware components, blocks, PLC tag tables, screens of HMI devices etc. If several objects are open at the same time, they are displayed in the task bar as tabs (individually or grouped according to editors).

Task Cards

These provide tools for configuring/programming. The content of the Task Cards depends on the object displayed in the working area.

Inspector Window

Additional information on a selected object or on executed actions is displayed in the Inspector window. The available properties of the selected objects can also be edited here (for example, properties of screens, screen objects, tags).

The Inspector window displays all system messages from the engineering, for example, those resulting from generating a project. This window should always be checked for any errors and warnings after a generation is completed.

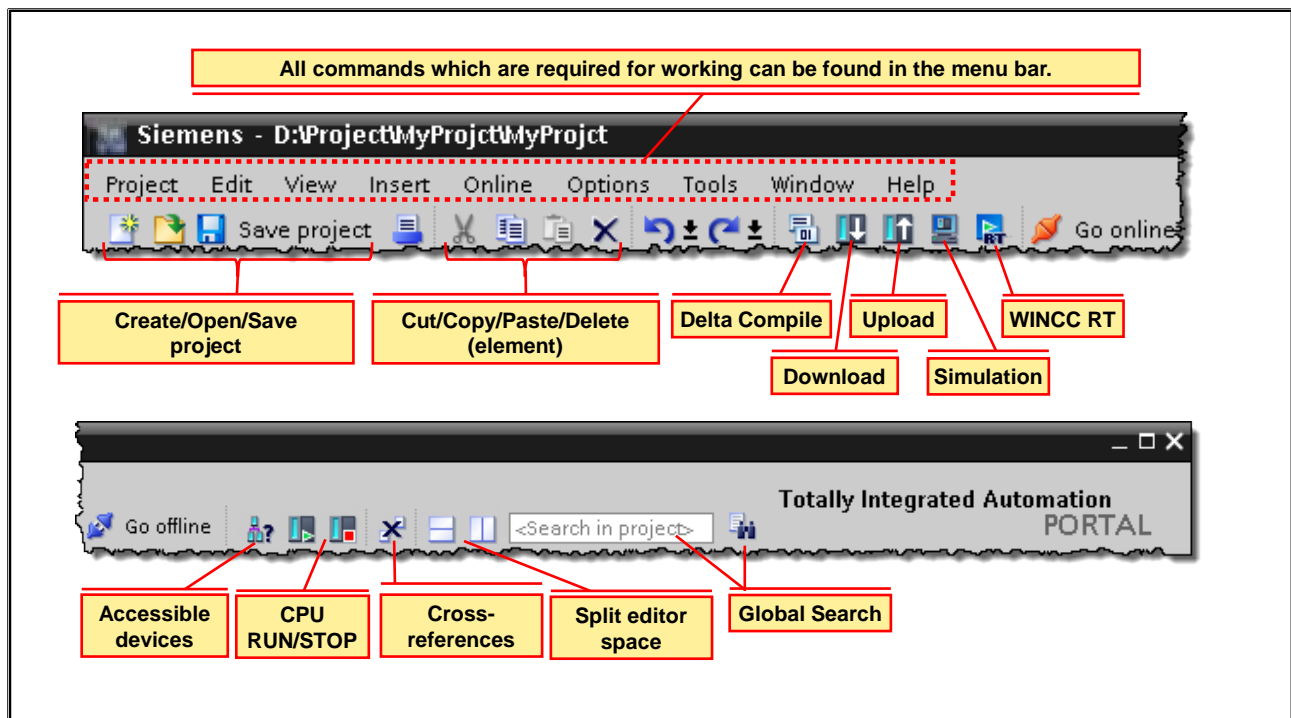
Details View

The Details view contains a help window. In it, the elements of the configuration object selected in the Project tree are displayed. These can be used in the active working area (by dragging them to the working area using drag & drop).

Reference Projects

Reference projects are write-protected projects which can be used for comparison or as a template.

3.6.3. Menu Bar and Toolbar



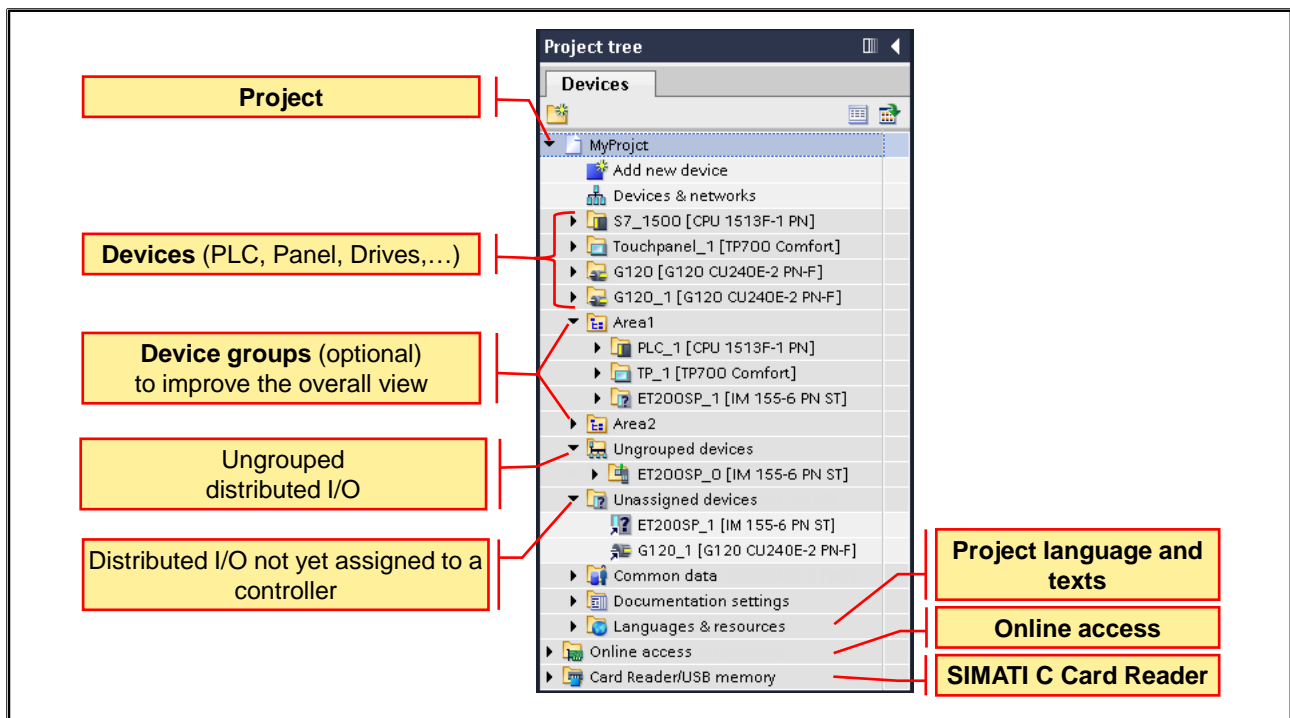
Menu Bar

The menu bar contains all commands required for your work.

Toolbar

The toolbar provides buttons for frequently required commands. That way, you can access these commands faster.

3.6.4. Project Tree (First Level)



The "Project tree" window provides access to all components and project data. All components and all available objects of a project appear in the Project tree in a tree structure and can be opened from there by double-clicking on them.

The following actions can be carried out:

- adding new components (controllers, HMI devices etc.)
- editing existing components
- querying and modifying properties of existing components
- diagnosing accessible components

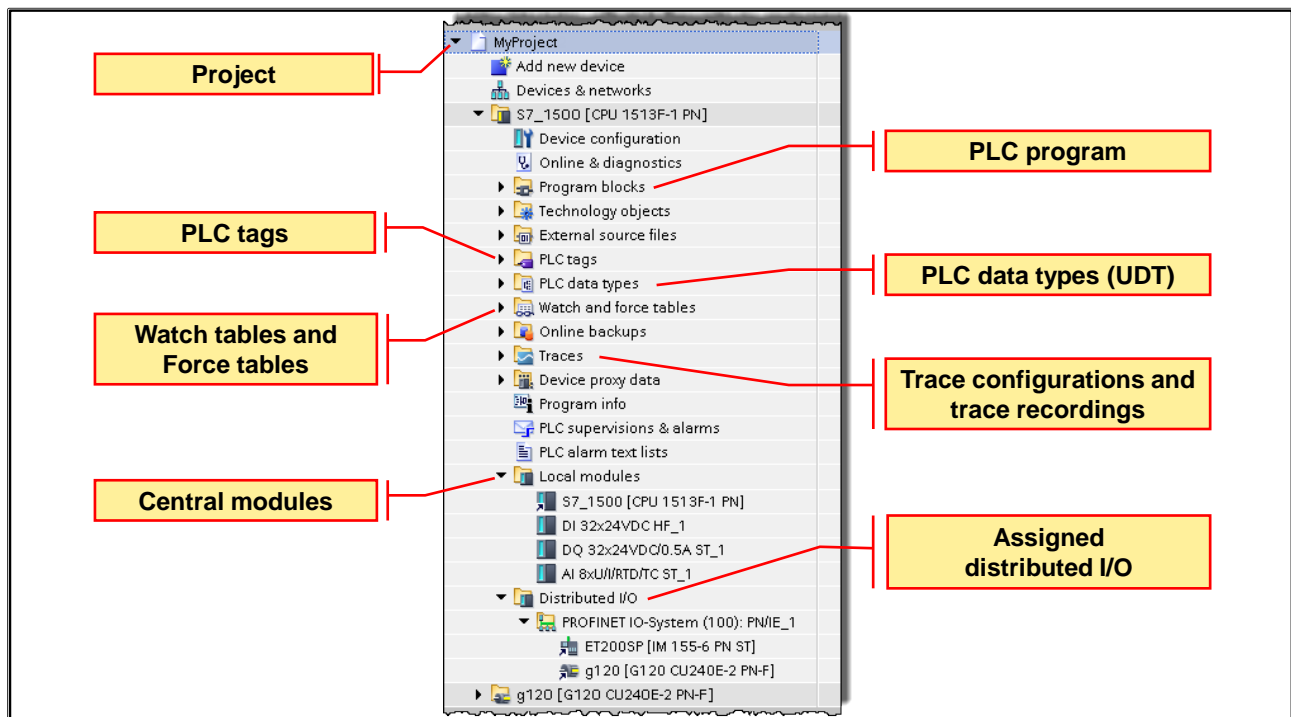
To improve clarity, objects (entire stations) can be grouped together.

Newly inserted distributed I/Os are stored in the folder "Ungrouped devices" and can be moved to the groups which you have created yourself.

A link to a distributed I/O is found in the folder "Unassigned devices" until it is assigned to a controller or master.

The folders "Common data", "Documentation settings" and "Languages & resources" refer to the project; the folders "Online access" and "Card Reader/USB memory" are project independent.

3.6.4.1. Project Tree (Second Level)








For a better overall view, blocks can be arranged in block groups which you create yourself. This grouping merely serves the overview of the program and has no impact on the execution of the program. This information is not loaded into the CPU.

All central modules are stored in the folder "Local modules".

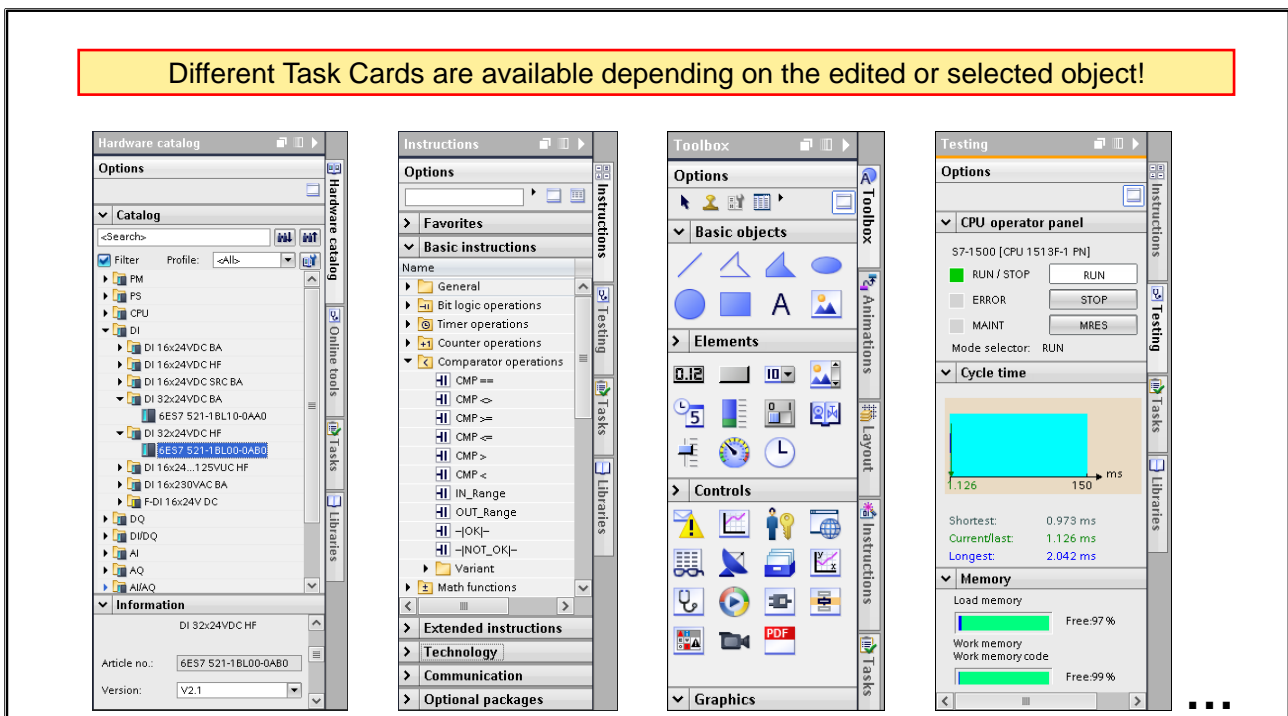
If a device or slave was assigned to a controller or master, the device can be found in the folder "Distributed I/O" of the relevant controller/master.

Hiding/Showing a Structure Section

An underlying structure is indicated by the black triangle . By clicking on the triangle, the underlying structure level can be shown  →  or hidden again  → .

3.6.5. Task Cards

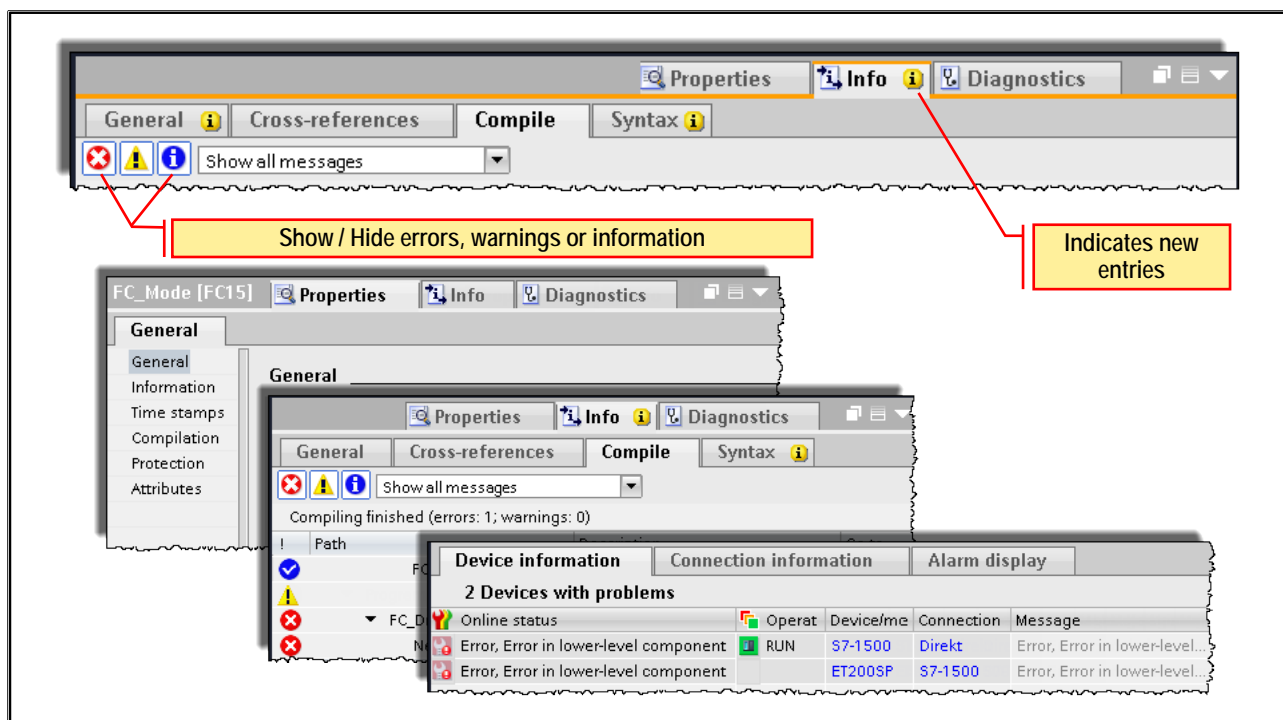
Different Task Cards are available depending on the edited or selected object!



Which task cards are available depends on the products that have been installed and on the object currently being edited or open in the working area. If not all Task Cards are visible, the Task Card-bar can be shifted using the cursor buttons at the bottom right.

- Hardware Catalog**
 Here, all the available hardware components such as CPUs, modules etc. can be selected.
- Instructions**
 Instructions for programming blocks;
 Code templates and function list wizard for script programming (VBS as well as C scripts with WinCC Professional)
- Toolbox**
 Configurable screen objects (graphics, display and operator control objects) in different panes (basic objects, elements, controls - optional customized controls, graphics)
- Online Tools**
 If there is an online connection established, diagnostics and online information can be called, such as, the current cycle time of the CPU and the configuration of the load and work memory of the CPU. As well, the CPU can be switched to the STOP and RUN mode.
- Animations**
 Templates for making screen objects dynamic in different panes (movements, display, tag link for making dynamic)
- Layout**
 Tools for adapting the presentation when designing screens during configuration of HMI devices (zoom, level assignment, grid alignment, objects outside the area)
- Tasks**
 Here, classic editor functions are available such as finding and replacing tags, instructions etc.
- Libraries**
 Management of the local project library and global libraries


3.6.6. Inspector Window



Additional information on a selected object or on actions to be executed is displayed in the Inspector window. The Inspector window consists of the following tabs:

→ can be selected by clicking the tabs

 This symbol in the tab indicates new entries.

 If errors are displayed, you can jump to the error location or into the associated editor by double-clicking on the error information.

"Properties" Area

This tab displays the properties of the object selected in the working area and editable properties can be changed.

"Info" Area

This is the output area of the engineering. This tab displays further information for the object selected. In addition to this, messages relating to executed actions, for example, compilation and download of blocks to the CPU are output.

"General" tab → general status output

"Cross-references" tab → display of the current locations at which the selected object is used

"Compile" tab → status display of compilation progress

"Syntax" tab → status display for invalid programming commands

"Diagnostics" Area

This tab displays information on system diagnostics and configured alarm events

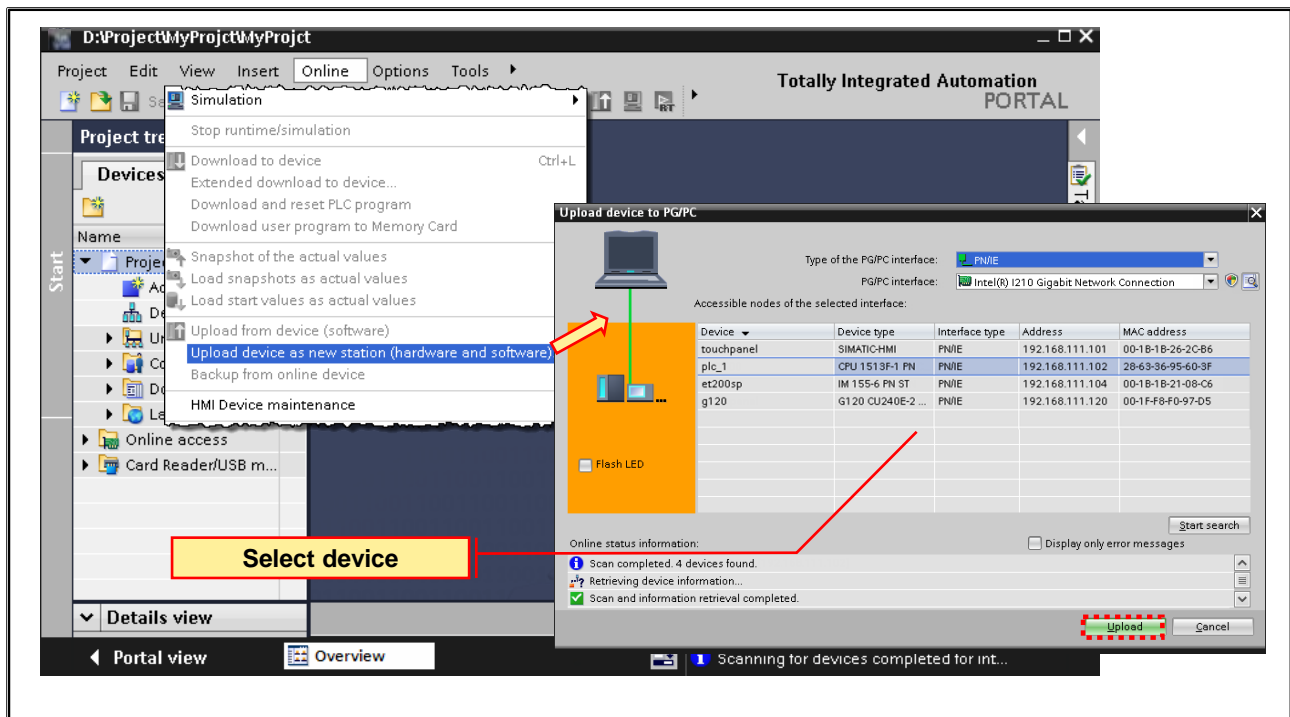
"Device information" tab → Information about the state of the devices

"Connection information" tab → detailed diagnostics of connections

"Alarm display" tab → Display of currently pending CPU alarms

"Monitor value" tab → Monitoring of structures in a block

3.7. Uploading a Device as a New Station into the Project (1) (Uploading the Entire Online Project in the Offline Project)



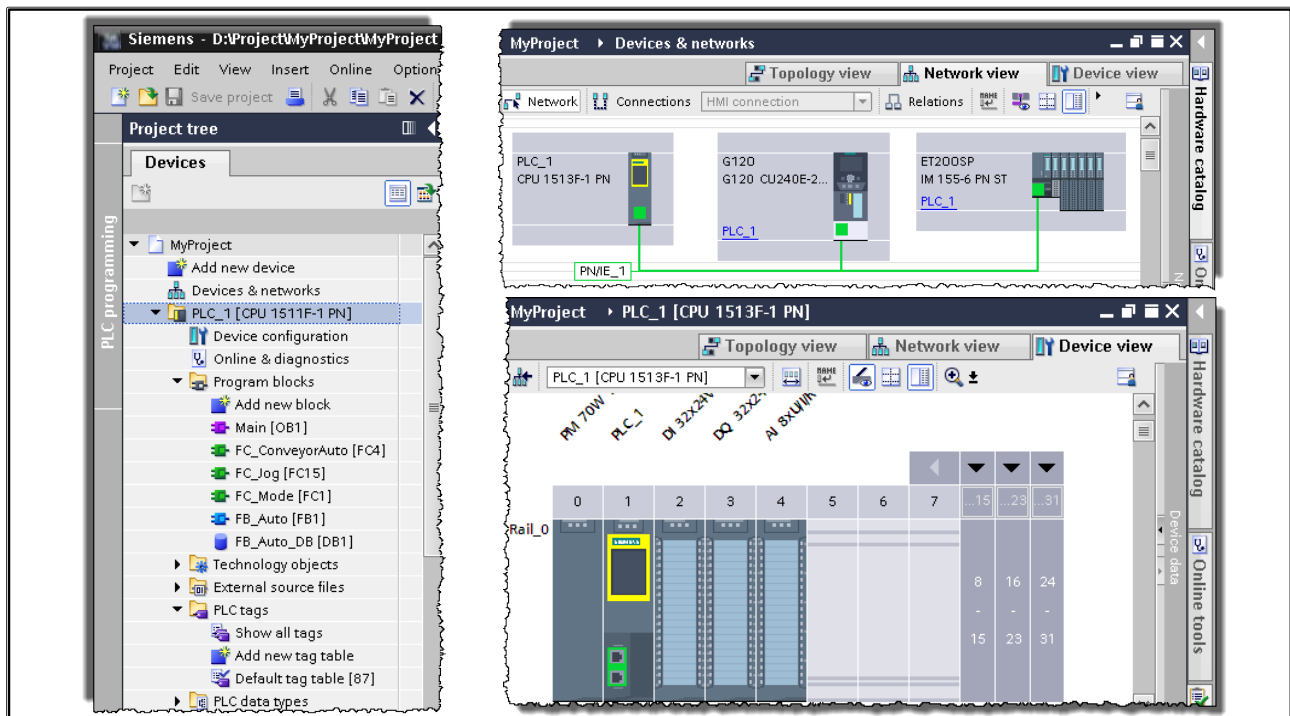
An already existing configuration of an S7 station can be read-out by means of the function "Upload device as new station".

This is then necessary when the appropriate offline station **doesn't** exist on the PG. After reading out the S7 station, the hardware as well as the program can be adjusted or modified, saved and downloaded into the CPU.

Requirement:

An IP address has been assigned to an interface of the station or the station has already been configured.

3.7.1. Uploading a Device as a New Station into the Project (2) (Uploading the Entire Online Project in the Offline Project)



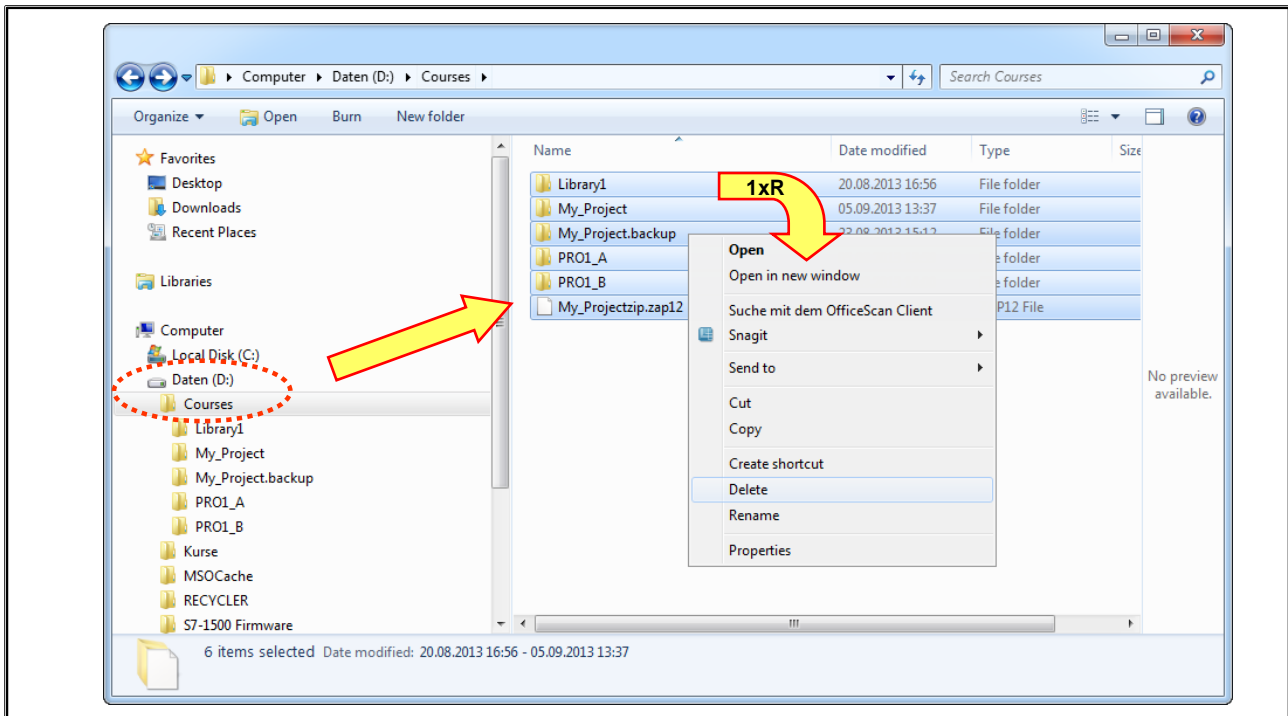
Station with Configuration:

If the station is already configured, then the entire station (central and distributed hardware with parameter assignments, the entire program with comments and symbols) is available to the user offline for further processing after the device is uploaded.

Station without Configuration:

If the CPU was only assigned an IP address without further configuration, only the actual configuration of the central hardware is available to the user after the upload.

3.8. Exercise 1: Deleting Old Projects



Task

You are to delete the TIA Portal projects on the PG.

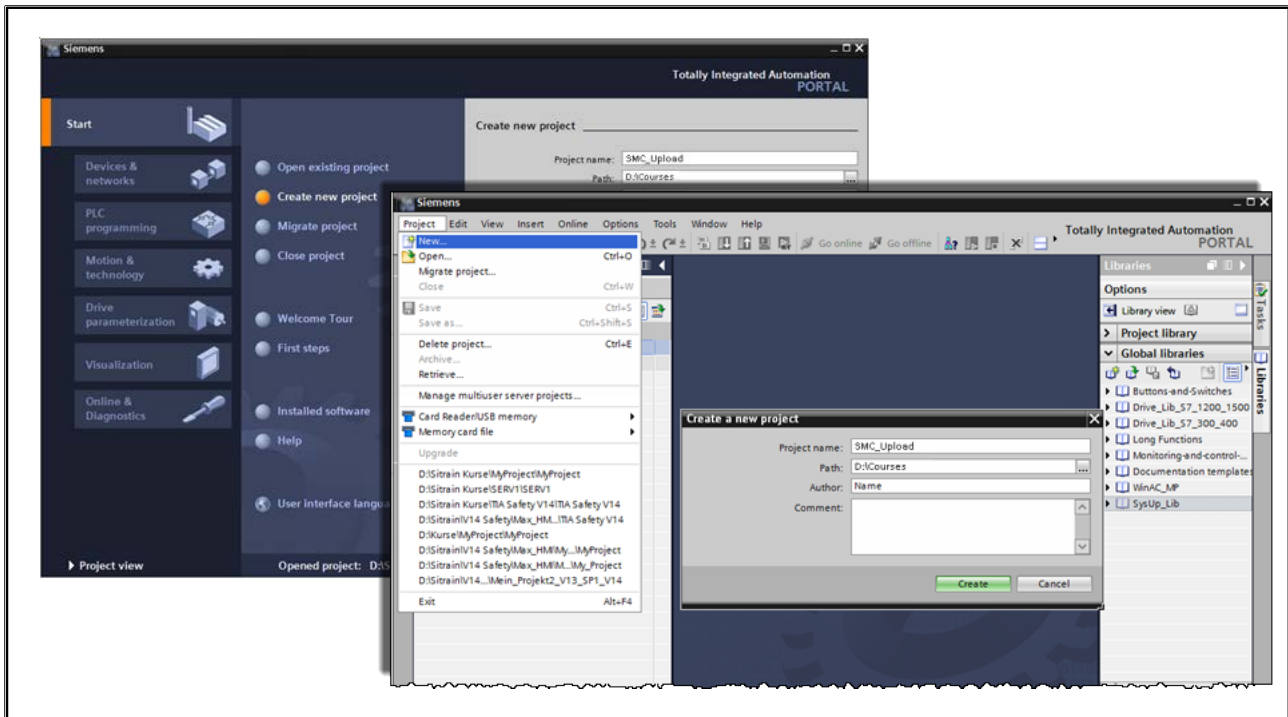
What to Do

1. Start the Windows Explorer.
2. In the directory D:\Courses, delete all projects.

Note

Projects that are to be deleted must be closed!

3.8.1. Exercise 2: Creating a Project



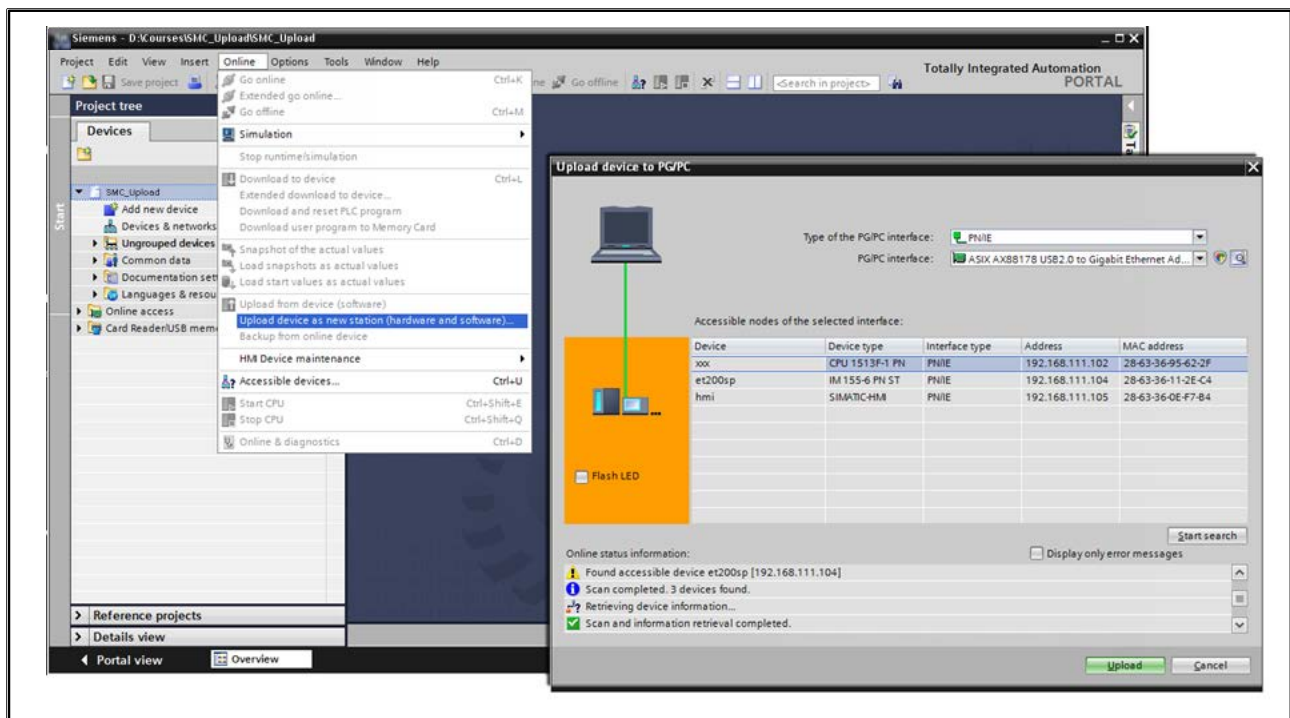
Task:

You are to create a new TIA Portal project.

What to Do:

1. Open the TIA Portal.
2. Create a new project with the name "SMC_Upload" in the folder D:\Courses.
 Portal view > Start > Create new project
 or
 Project view > Project > New
 or
 via the "New" button in the toolbar of the Project view.

3.8.2. Exercise 3: Uploading Devices as a New Station



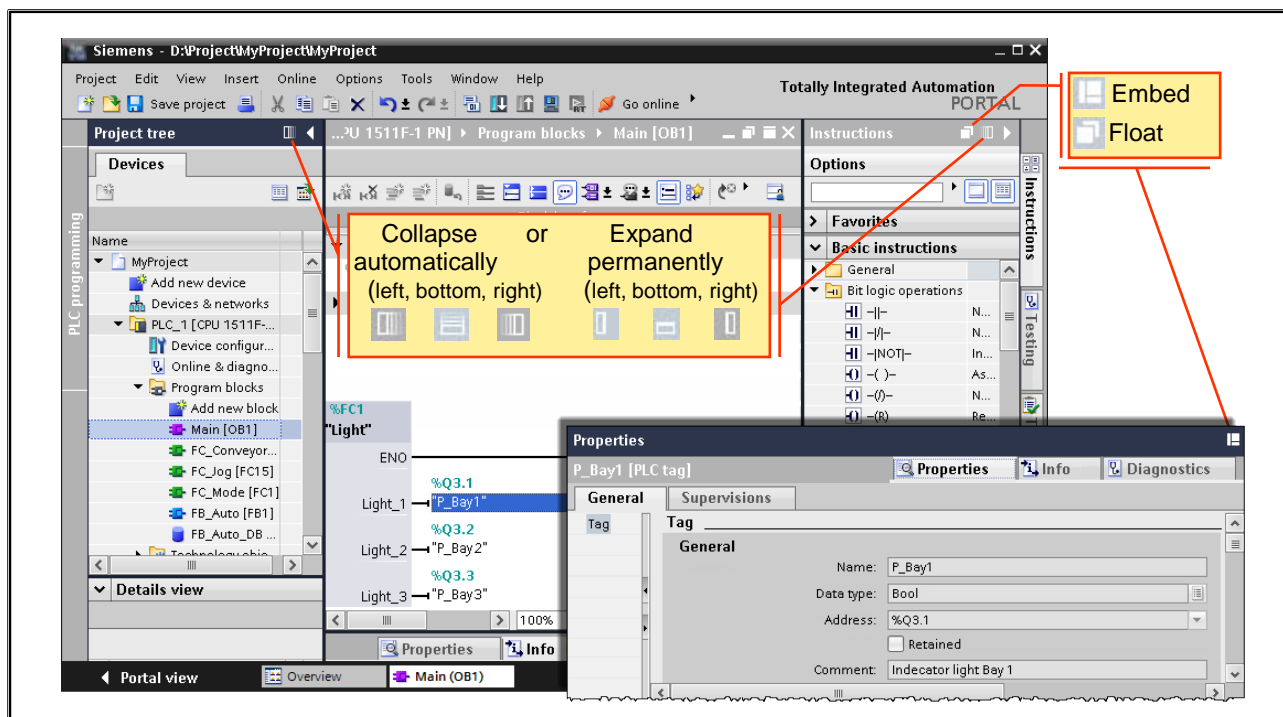
Task:

You are to upload the current program which is located on the CPU as a new station in the project which you created.

What to Do:

1. Select the project name in the Project tree,
2. Open the menu Online > "Upload device as new station (hardware and software)..."
3. Select the type of interface with which your PG is connected to the CPU. (PN/IE for PROFINET)
4. Select the PG/PC interface with which your PG is connected to the CPU.
5. Start the search via the button "Start search"
6. Choose the S7-1500 device and start the device upload.
7. Save the project and become familiar with the program.

3.9. Window Arrangement



The positions and characteristics of windows can be configured individually. You can hide windows that are seldom required in order to enlarge the surface of the working area. The current configuration of the engineering user interface is saved in the user profile of Windows. On saving the project, the positions and characteristics of windows are automatically saved with it.

Window Arrangement Options

- When the window is 'Expand permanently'
 - fixed location and fixed size on user interface
 - position at left, bottom or right outside of the working area is possible
 - always open, reduces the working area
- When the window is 'Collapse automatically'
 - hidden at edge of user interface
 - position at left, bottom or right is possible, superimposed on working area when open
 - default status = window closed, and tab displayed at edge of the user interface
 - mouse click on the tab opens the window
 - closed automatically the next time there is a click outside the window area
- 'Float' window!! **Makes sense if a 2nd monitor is used!!**
 - can be positioned anywhere on the user interface
 - permanently covers the user interface area underneath it

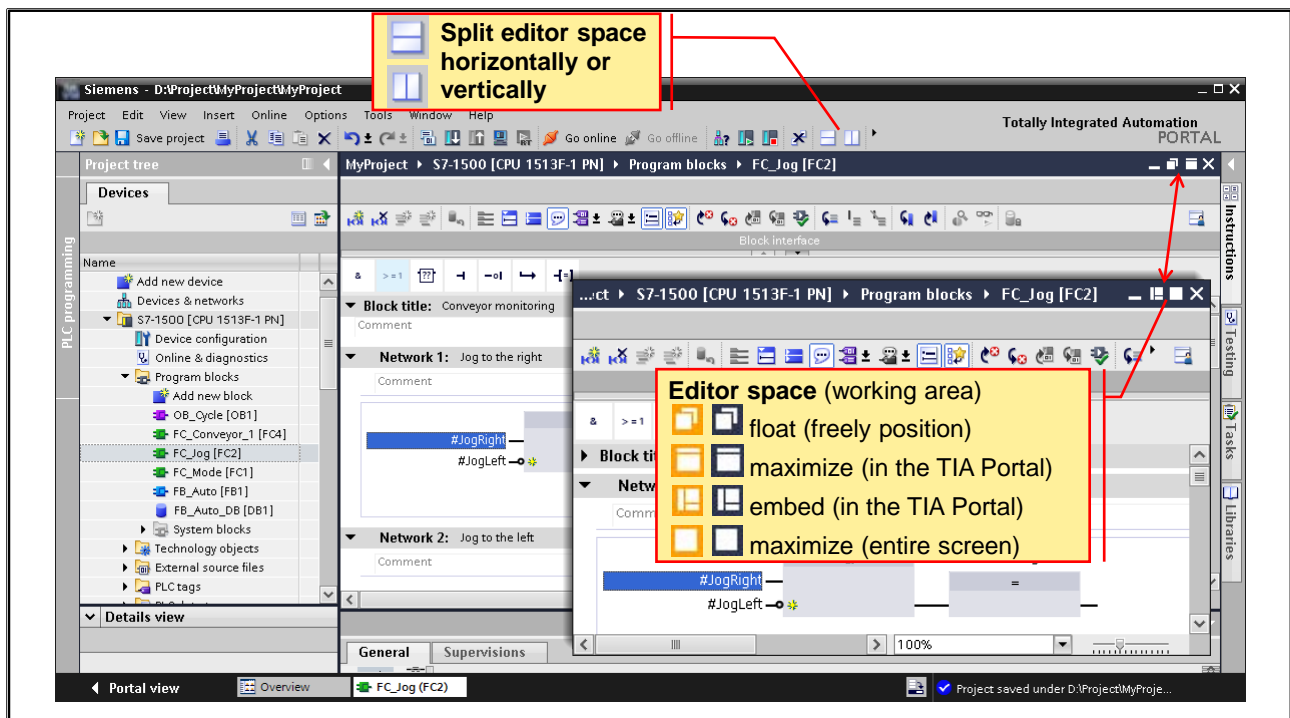
By clicking the functions in the window title bar you can switch between the modes "float" and "embed" or "collapse automatically" and "expand permanently".









In addition, the windows can be expanded and collapsed via the buttons .

Hidden windows are opened by clicking on the tab and closed again by clicking outside the window area.

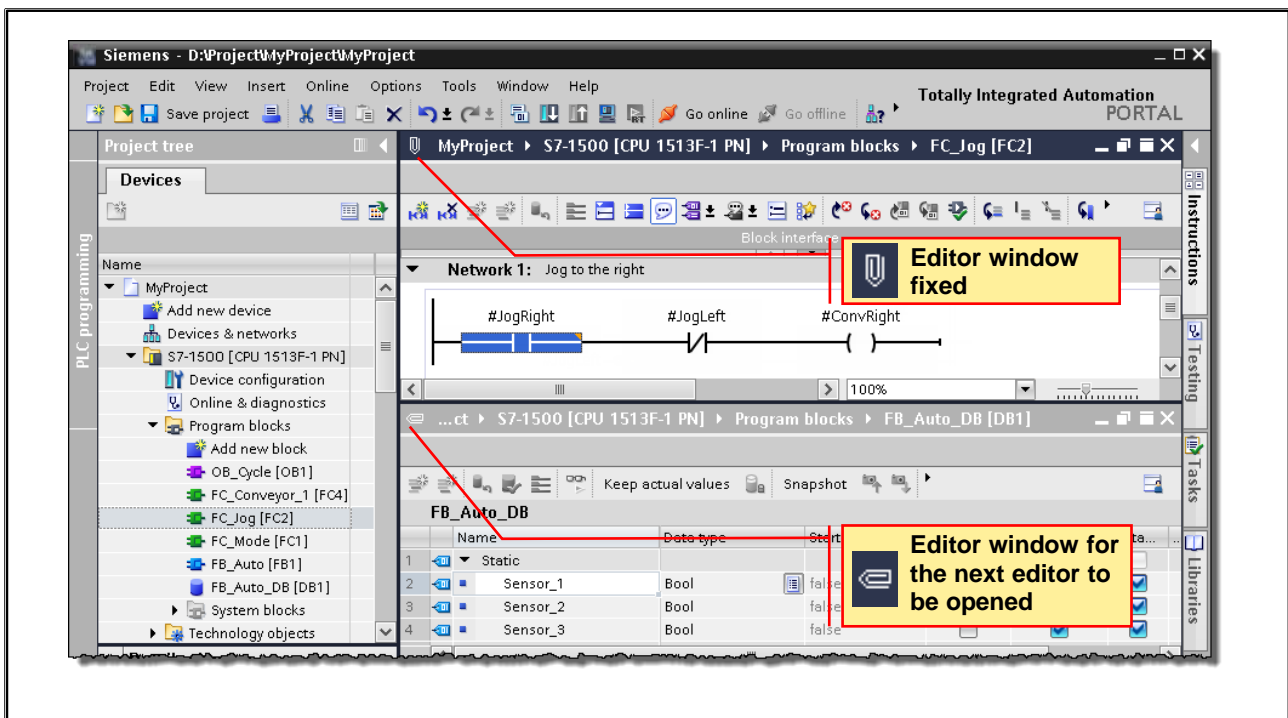
3.9.1. Splitting and Arrangement of the Working Area



The windows of the editor space (working area) can be arranged as follows:

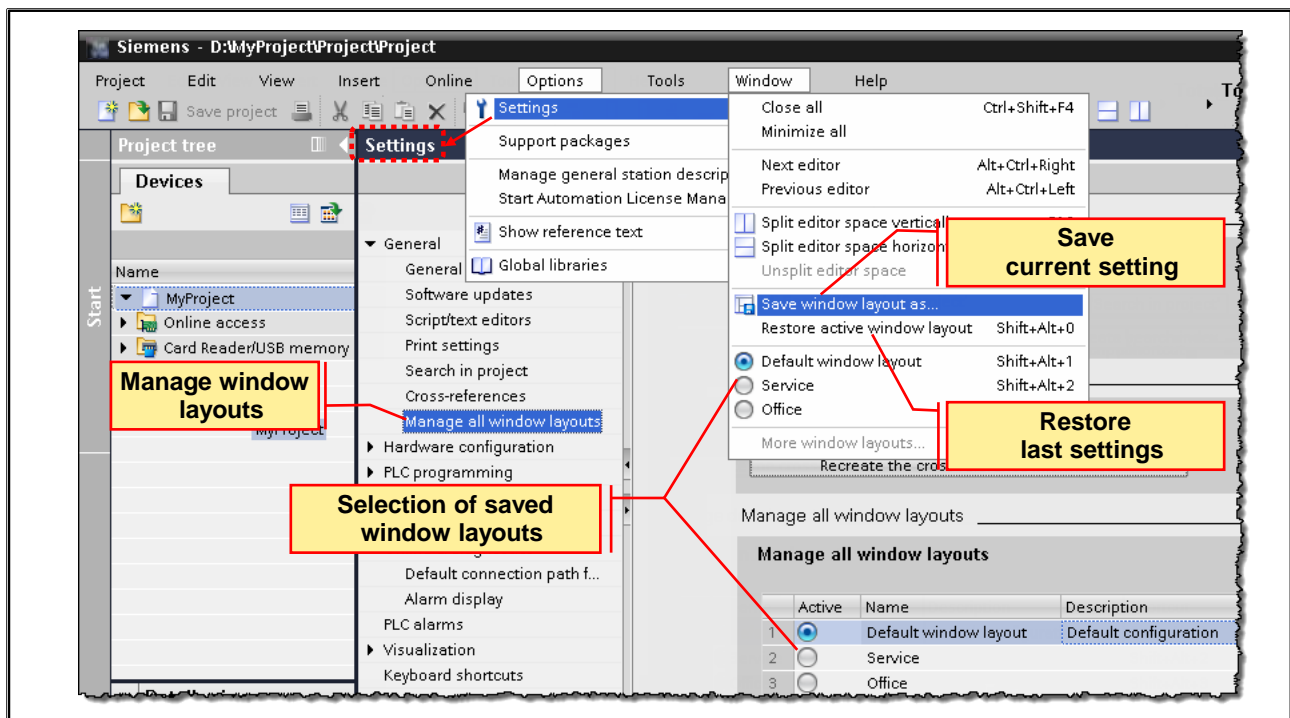
- 
 Maximize (full size) a working area to cover the entire screen (color depending on View online/offline)
- 
 Maximize a working area in the TIA Portal (Project tree, Task Card and Inspector window are minimized) (color depending on View online/offline)
- 
 Float or release a window from the working area (color depending on View online/offline)
- 
 Embed a window in the working area once again (color depending on View online/offline)
- 
 Split the editor space (working area) horizontally into two windows
- 
 Split the editor space (working area) vertically into two windows

3.9.2. Keeping the Editor Window in the Foreground (when Editor Space is Split)



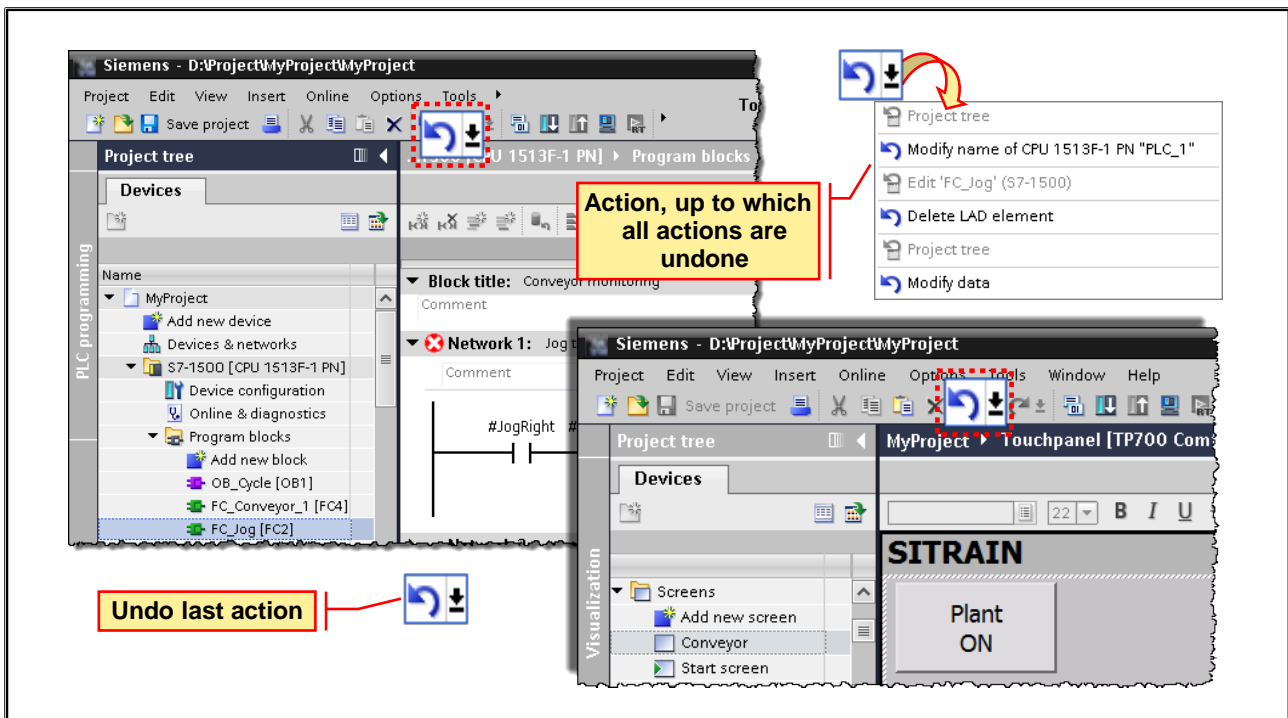
If you work with a split editor space (working area), one of the two working areas can be fixed (attached) by clicking on the "paper-clip" (paper-clip is vertical) so that when you open a further editor, this first one always remains fixed in the foreground and the newly opened one always becomes the second visible editor.

3.9.3. Save / Manage / Use Window Layouts



The different window arrangements of the user interface can be saved and then restored.

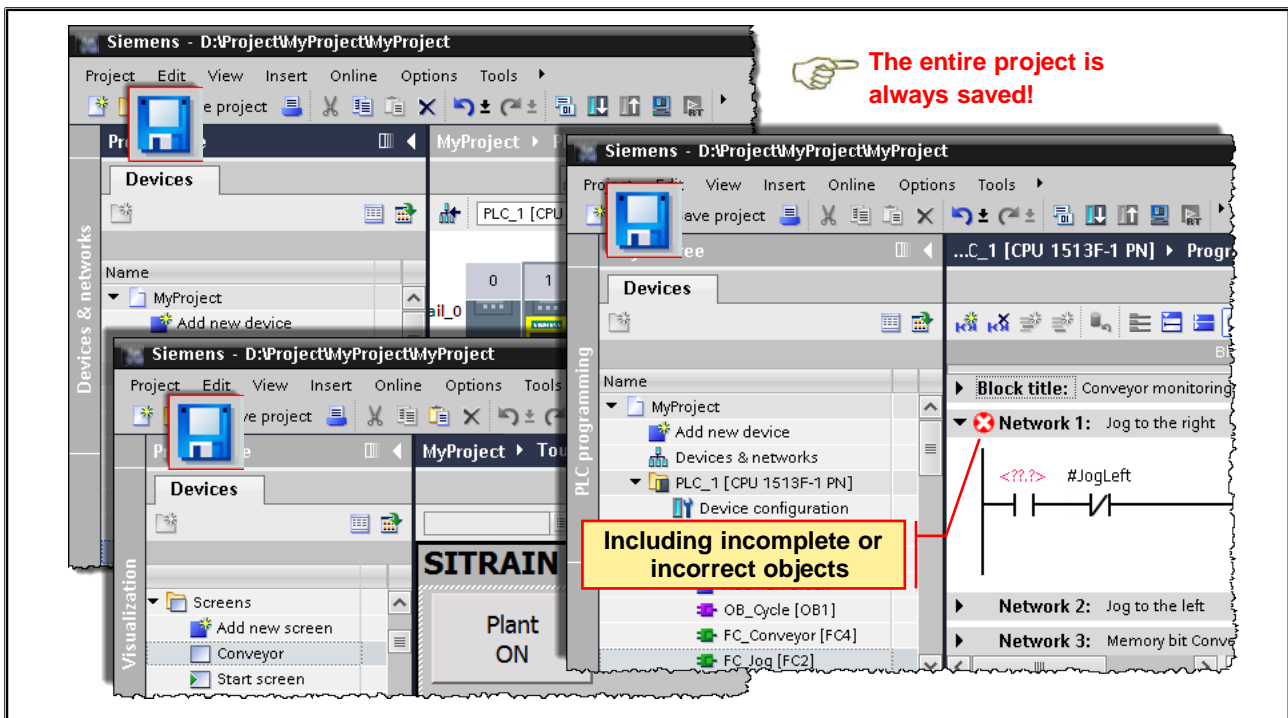
3.10. Undo and Redo



Undo Concept of the TIA Portal

The drop-down menu shows the user in which editor the "Undo" function is executed. Closed editors are then automatically opened. Since all actions are only undone up to the selected action, the consistency of the project is ensured.

3.11. Saving a Project

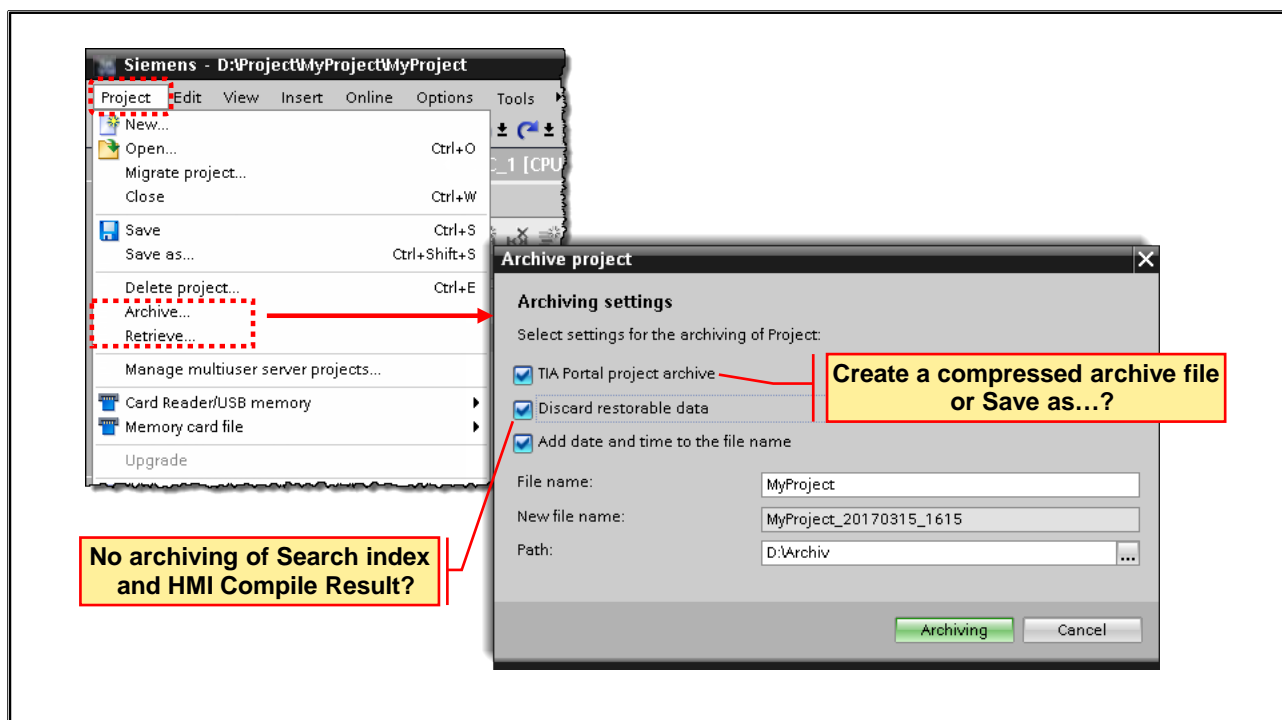


Save

Regardless of the object that is open in the working area, it is **always the entire project** in the current state that is saved when the Save icon is pressed, even if some objects of the project are still incomplete or faulty [incorrect] (for example, syntax faulty blocks or symbols which have not yet been assigned an absolute operand in the global symbol list).

If the project is closed without saving, all changes made or objects created during the session are discarded.

3.11.1. Archiving / Retrieving a Project



Archiving

The current state of the project can be archived at any time.

When you archive projects, you can choose the following:

- **TIA Portal project archive**
The project is minimized (all files are reduced to their essential components) and then stored compressed in a project archive (file with the ending zapXX).
If this item is not selected, the project is saved under the given name and path as an independent project. (Save as... without closing current project)
- **Discard restorable data**
Search index and the HMI Compile Result are not archived.
- **Add date and time to the file name**
The current date and time is added to the selected archive name.

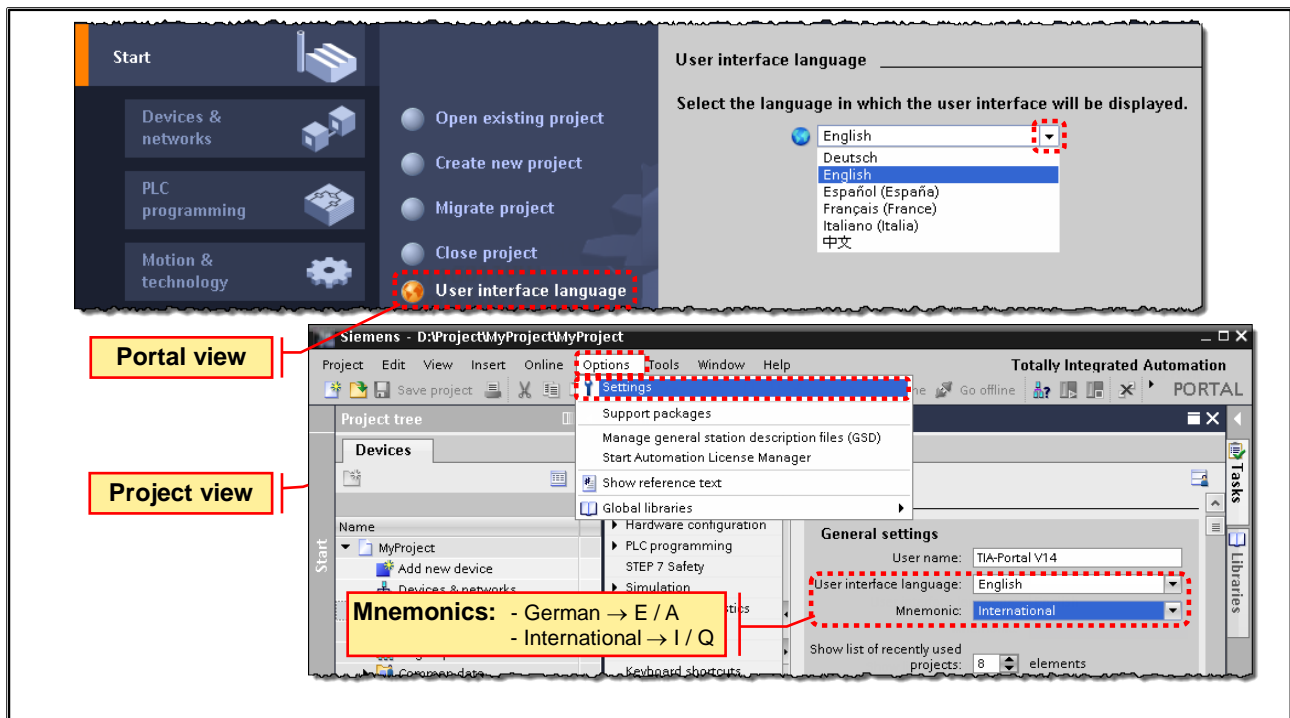
Note

The most recently saved version of the project is archived. If the last changes to the project are also to be included in the archive, the project must be saved before archiving.

Retrieving

Only project archives (file with the ending zapXX) can be retrieved, that is, unzipped.

3.12. TIA Portal - Settings: User Interface Language

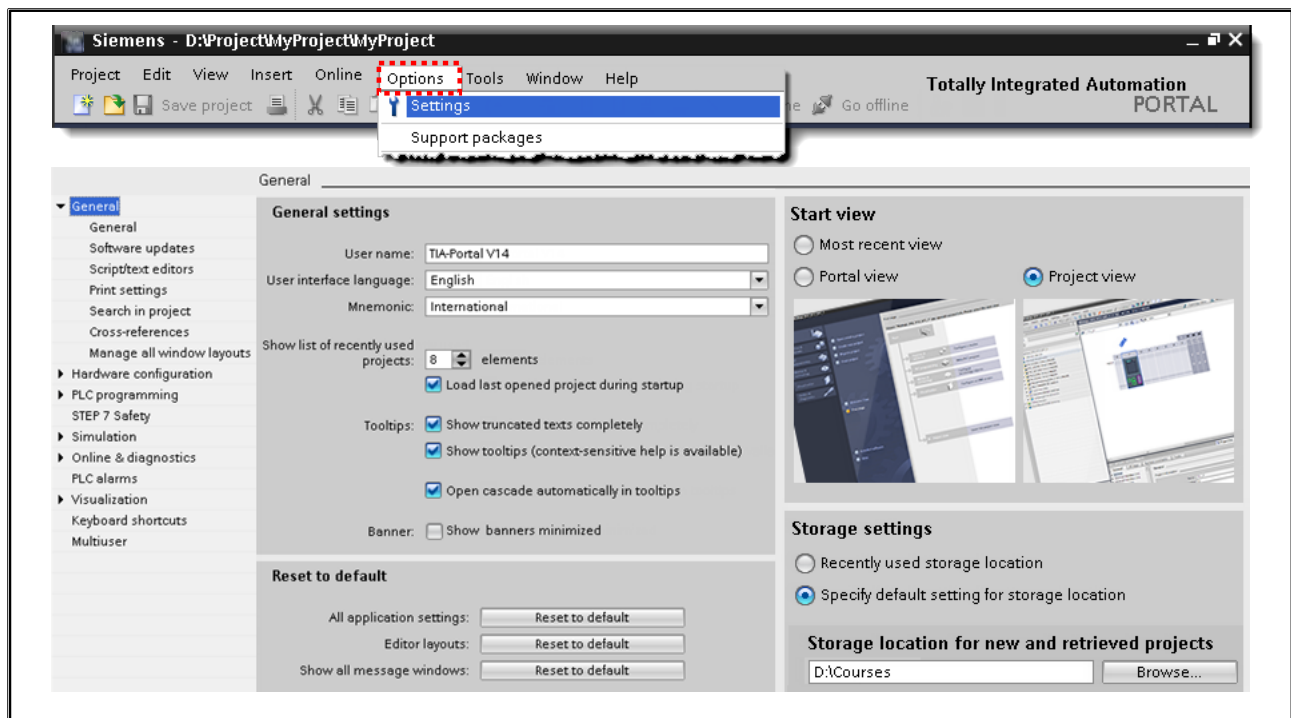


Available User Interface Languages

The user interface language of the TIA Portal can be changed during running operation. The following languages are available:

- German
- English
- French
- Spanish
- Italian
- Russian
- Korean
- Japanese
- Chinese (simplified)

3.12.1. TIA Portal - Settings: Language, Storage Location, Layout



Language

The user interface language of the TIA Portal can be changed at any time without needing to restart. The TIA Portal always starts in the language in which it was last used.

Storage Settings

Storage location for projects:

Storage location of newly created projects and their project libraries

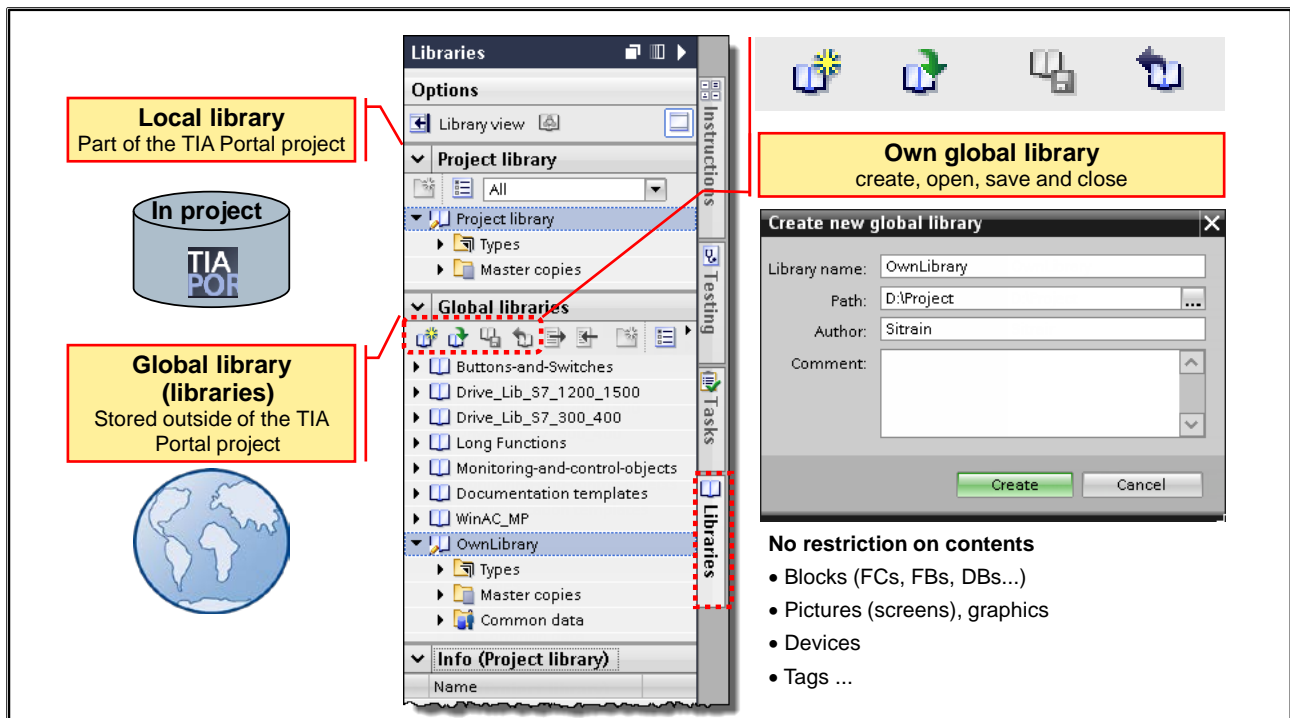
Storage location for libraries:

Storage location for global libraries

Layout

If the layout is reset, the original window layout arrangement of the TIA Portal is restored.

3.13. Libraries



Project Library

Each project has its own library. Here, objects can be stored that are to be reused within the project. This project library is always opened, saved, and closed together with the current project.

Global Libraries

Global libraries are stored independently of the projects and are used to store objects that are to be used and reused in different projects.

The area of the global libraries also contains libraries supplied with the TIA Portal that, for example, contain ready-made functions and function blocks.

Library Objects

A library is a collection of any project objects, such as, blocks, devices, PLC data types, watch tables, screens, graphics, faceplates....

Uses of Global Libraries

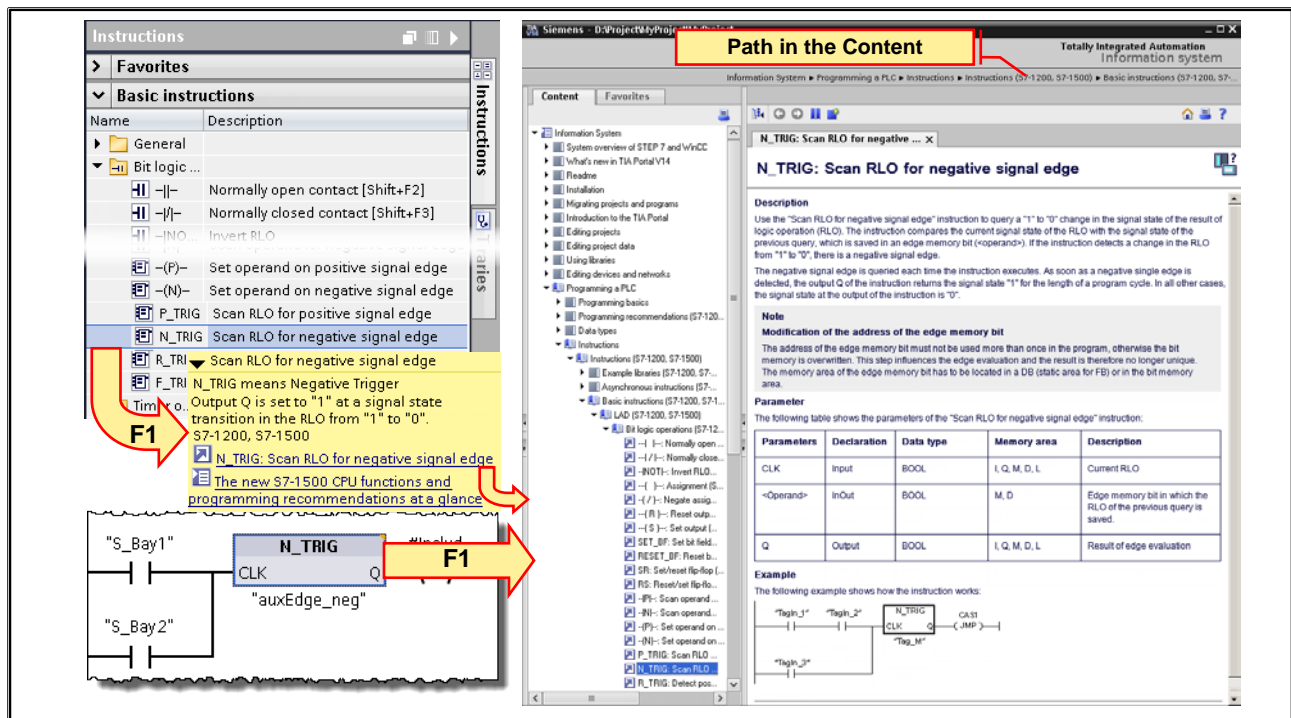
Library objects can either be used as a master copy or as an instance.

- Objects from the **Master copies** folder are copied to the project when used. If subsequent changes are made to this master copy, these changes are not made to the copies in the project.
- Objects from the **Types** folder are copied to the Types folder of the project library when they are used and an instance (location of use) is created in the project. These objects are then stored in the local project library. The object itself is not used in the project, rather only a reference to it.

You will find more information about libraries in the section Programming Guideline Libraries:

"TIA Portal Information Center" > Documentation > Manuals > Control Technology
or in the Online Support under the Entry ID: 90885040

3.14. Help



Wide-ranging help functions are available for solving your tasks; these describe basic concepts, actions and functions.

- **Tooltip** for information on the user interface elements, for example, instructions, input boxes, buttons and symbols
Some tooltips provide cascades with more precise information.



Operating instructions: Step-by-step approach for implementing a task



Example: Practice-oriented application example with solution of an automation task



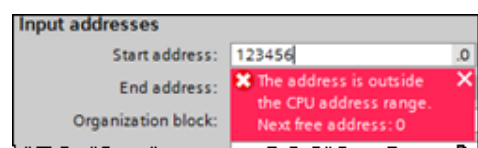
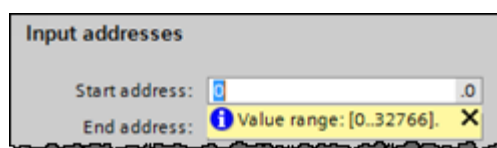
Factual information: Background information about the functions of the TIA Portal



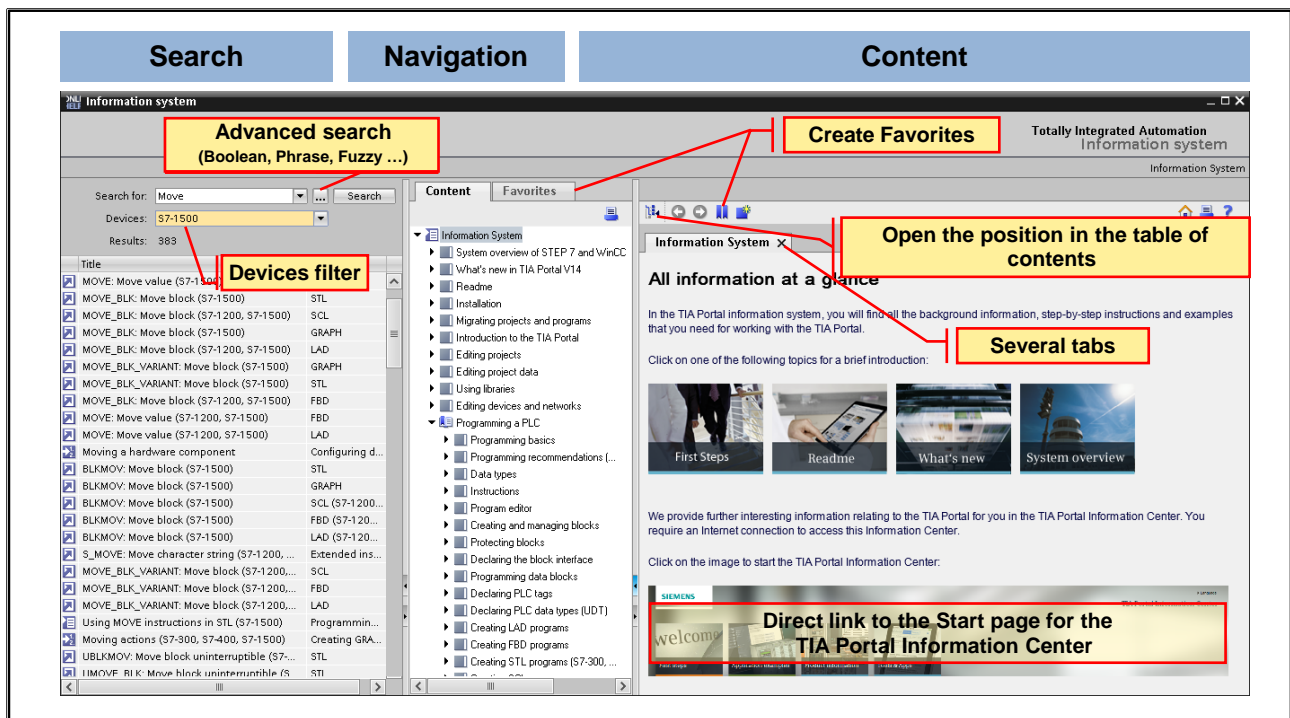
Reference: Detailed reference information about instructions and objects

These are activated by clicking (Information system is opened)

- Help on the current context
For example, on menu commands by pressing the <F1> key.
- In the input boxes (for example, in the Properties in the Inspector window), the roll-out provides information about the permitted value ranges and data types for the input.



3.14.1. Help (Information System)

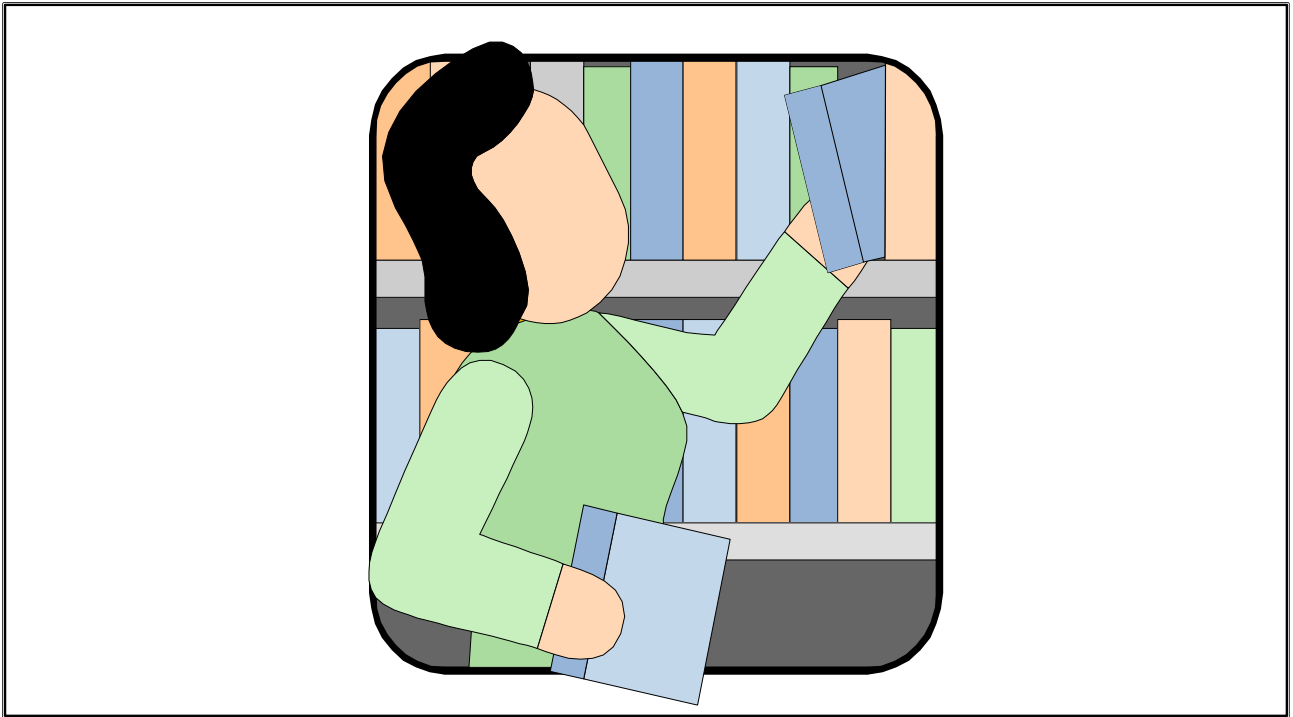


Contents of the Help Functions

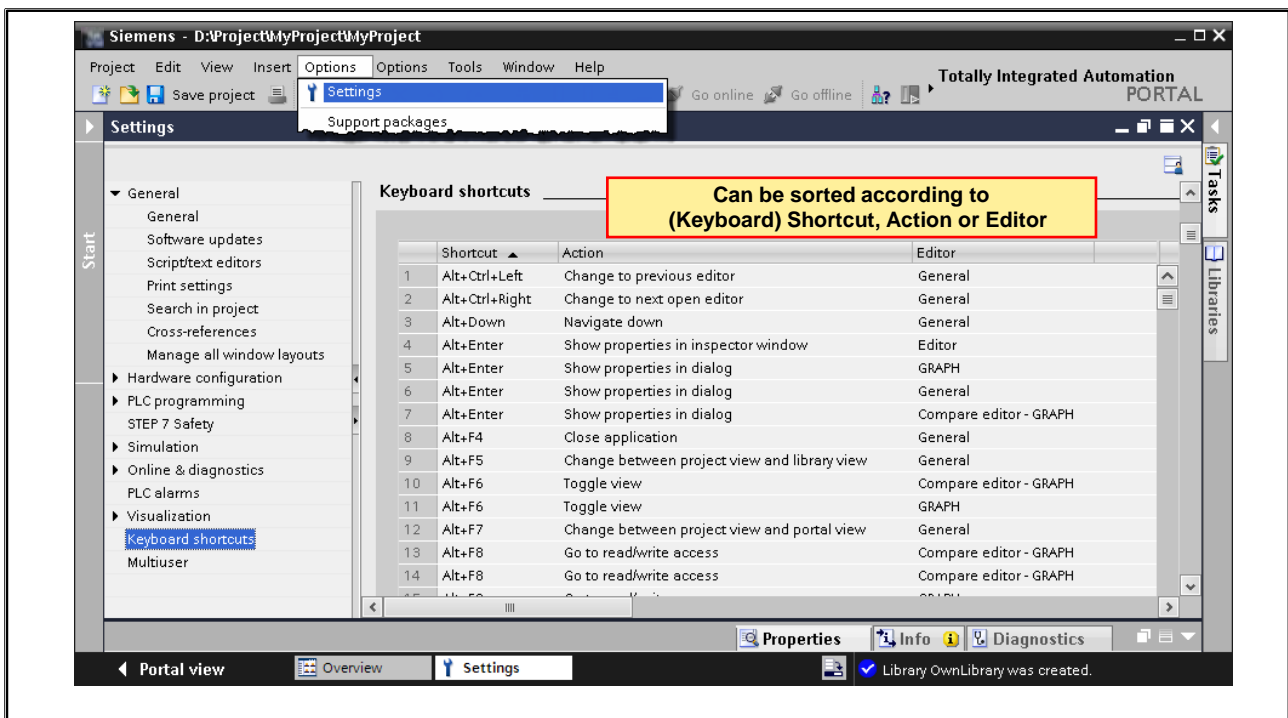
- **Search area**
In the Search area, you can perform a full-text search across all help topics.
- **Navigation area**
In the Navigation area, you find the (table of) Content and the Favorites.
- **Contents area**
The help pages are displayed in the Content area. You can open several tabs in order to simultaneously display different help pages.

You can show and hide the individual areas using the arrows on the window splitters. In that way, you can close the Search area as well as the Navigation area in order to enlarge the Contents area if required.

3.15. Additional Information

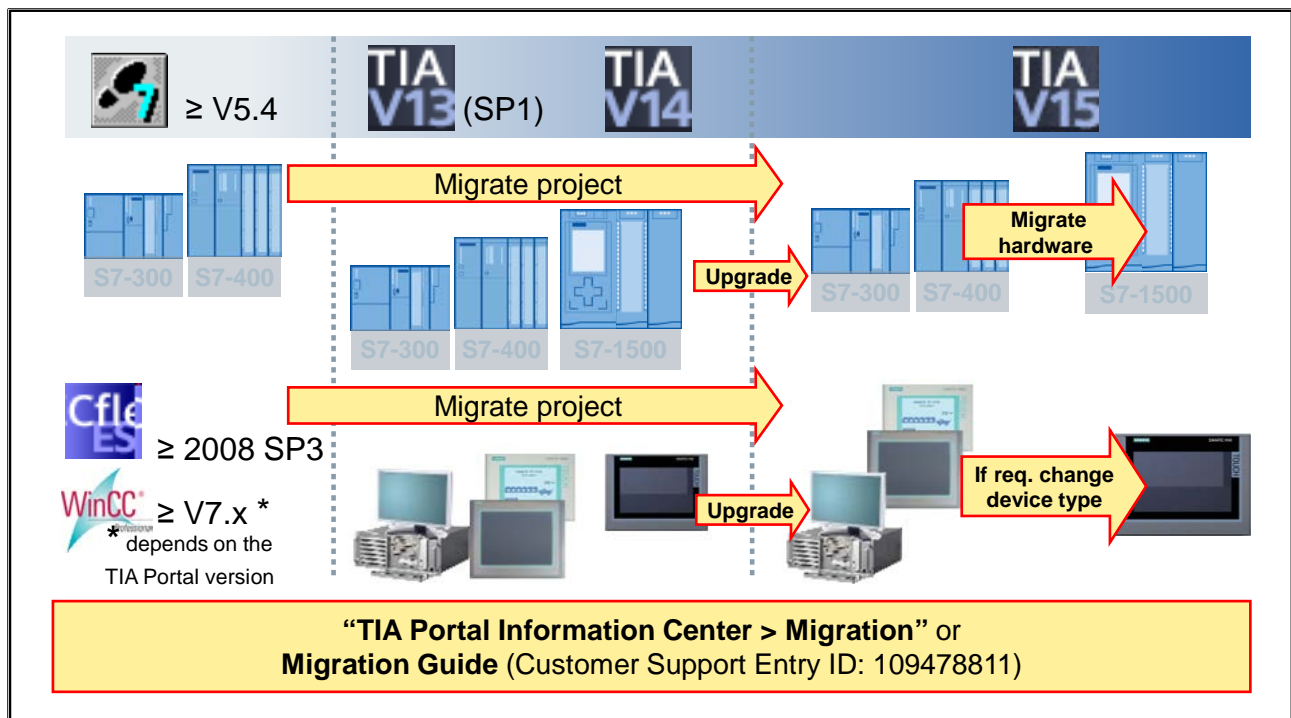


3.15.1. Keyboard Shortcuts of the TIA Portal



The keyboard shortcuts can be displayed through the menu item Options > Settings. The view can be sorted according to (Keyboard) Shortcut, Action and Editor.

3.15.2. Project Migration



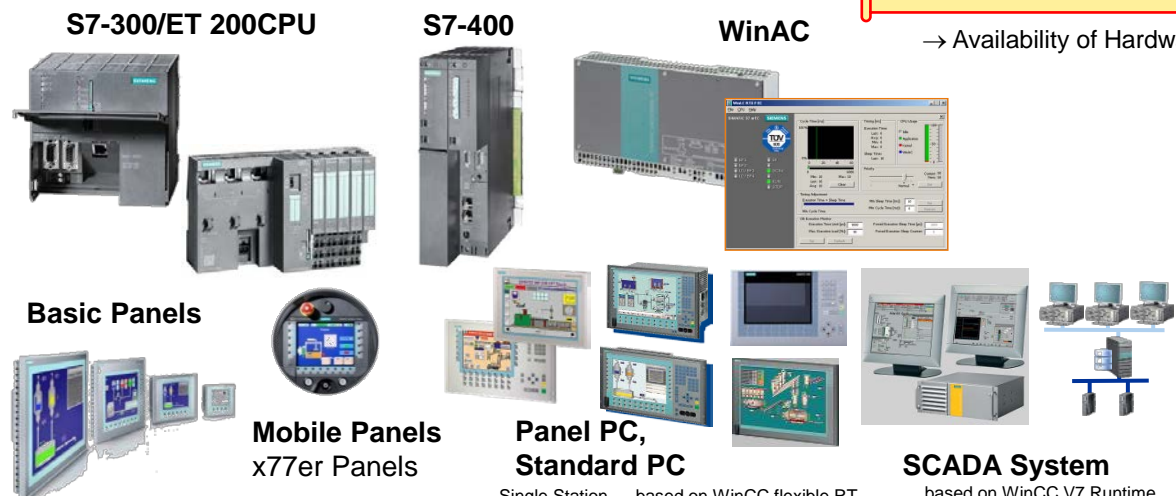
What does Migration Actually Mean?

- Switch or change of a system / a technology
- **"Step-by-step"** modernization of the installed basis and adaptation to modern technology...

Why Migration? – Motivation for Migration

- Investment protection
- Switch to the latest engineering
- Basis for future retrofits/renovations
- Products with higher performance
- Innovative products
- Long-term availability of products
- Reduced product time-to-market
- Lower operating costs

3.15.2.1. Migration of STEP 7 V5.x – Projects: Supported Hardware



S7-300/ET 200CPU

S7-400

WinAC

Basic Panels

Mobile Panels
x77er Panels

Panel PC, Standard PC
Single Station ... based on WinCC flexible RT

SCADA System
... based on WinCC V7 Runtime

Effective date 1.10.2007

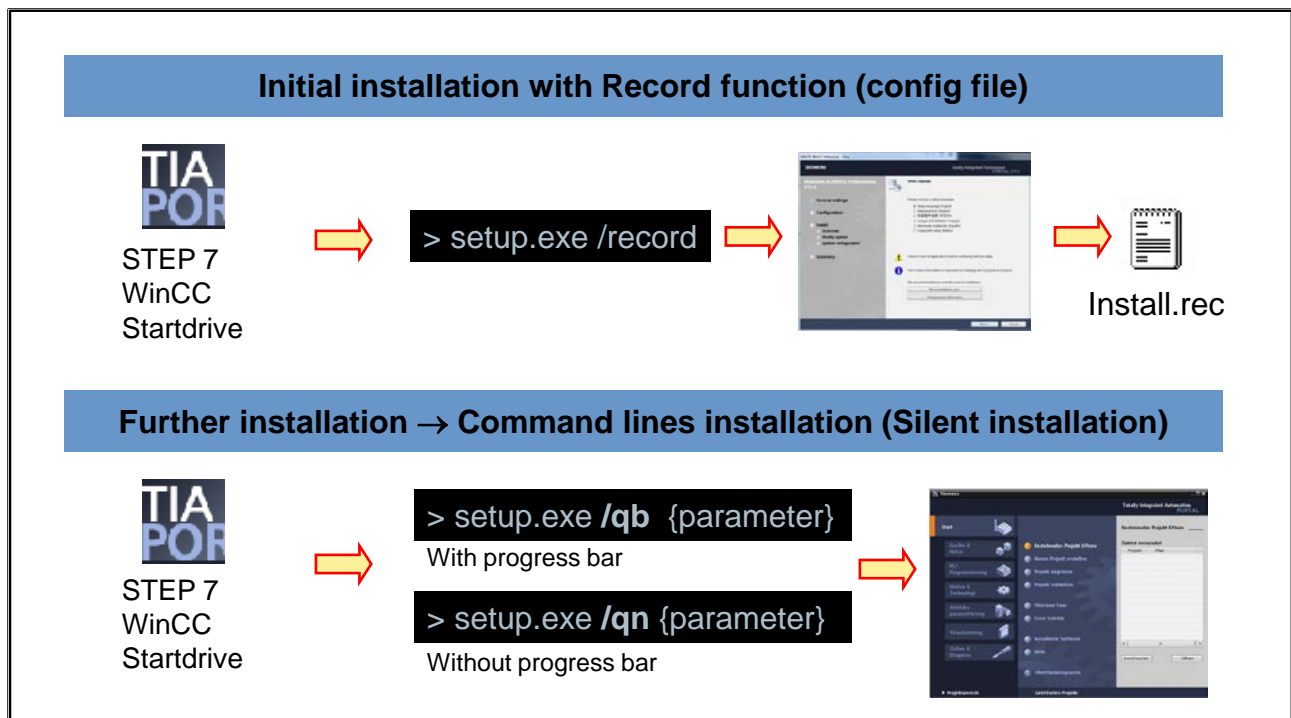
→ Availability of Hardware

Possible check before migration with the help of the tool: **"READINESS CHECK"**
 (TIA Portal Information Center > Tools & Apps > Planning and Configuration
 or Entry ID: 60162195 in the Online Support)

With this hardware, the hardware configuration can also be migrated. Otherwise, only the software can be migrated and must be adjusted to the supported hardware.

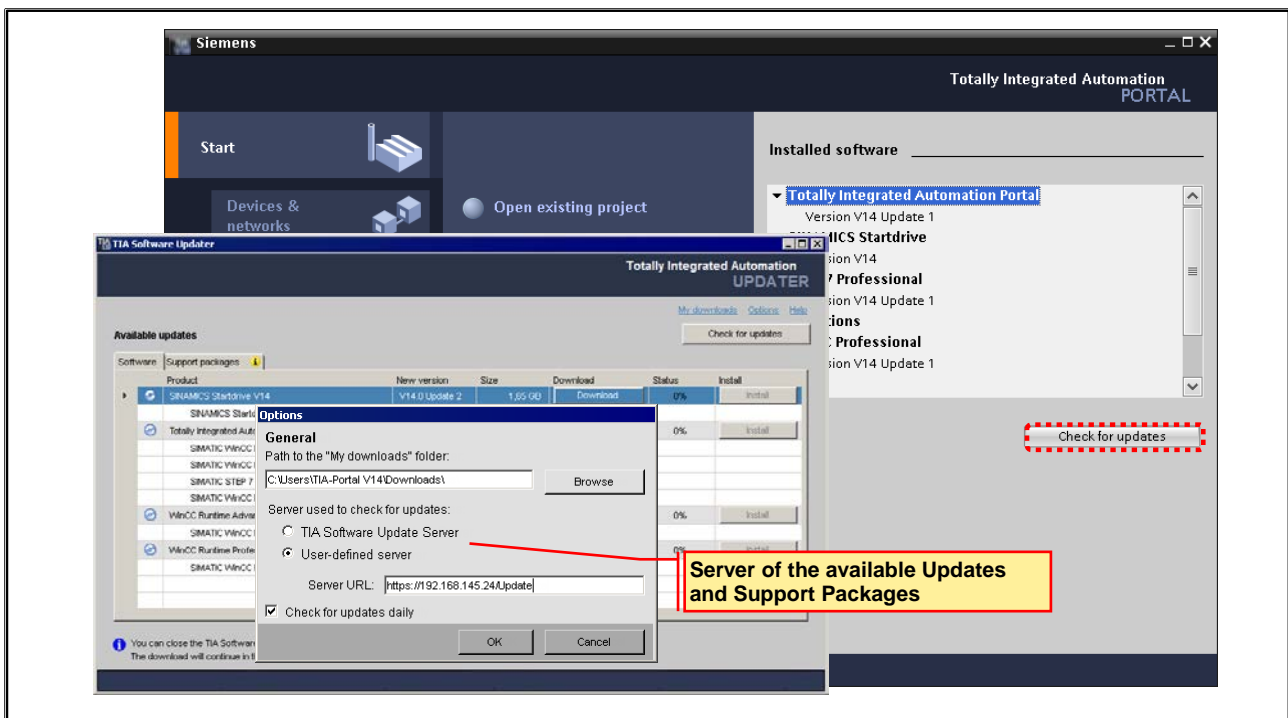
To check whether the hardware is supported by TIA Portal, it is possible to check this in advance. For this, you can use the "READINESS CHECK" tool which is available for download on the Support Pages (<https://support.industry.siemens.com>) under the Entry ID: **60162195** or via the "TIA Portal Information Center".

3.15.3. Installation with Record Function in the Setup



With the command "setup.exe /record", an installation file is created during installation. With the help of this file, exactly the same installation can be carried out on other computers. For this, the installation file must be saved on the computer on which the installation is to be carried out and the installation must be started with the command setup.exe /qb {parameter} or setup.exe /qn {parameter}. {parameter} corresponds exactly to the path in which the installation file was saved. The installation is executed without further settings having to be made.

3.15.4. Update Tool



Update Tool

You can search for updates in the dialog "Installed software".

- Start via: Portal view: Start > Installed software > Check for updates
Project view: Help > Installed software > Check for updates
- Checks and informs about possible updates of installed software
- Download of updates
- Pause / Continue downloads
- Installation of Updates

Options:









- **Location for Download Files**

Server used to check for updates.

You can choose either the TIA Automation Software Update Server or a user-defined server on which the updates are provided by an Administrator.



























- **Check for updates daily**

3.15.5. STEP 7 Licensing

	Engineering System (ES)	
	S7-1200 (LAD, FBD, SCL)	S7-300 / S7-400 / S7-1500 / WinAC (LAD, FBD, STL, SCL, S7-GGRAPH, PLCSIM)
STEP 7 Basic	 Single license 	---
STEP 7 Professional	 Floating license 	
	 Upgrade license  + 	generates Combo license → STEP 7 V5.4 (and higher) and → STEP 7 V1x Professional  parallel installation possible
SIMATIC Startdrive	No license required	

To program the controllers, only one license (engineering license) is required in the engineering. The program does not require any further licenses on the CPU (runtime license).

3.15.6. WinCC Licensing

	Engineering System (ES)	Runtime (RT)
WinCC Basic	--- (Component of STEP 7)  Floating license 	--- (Component of the Panels)
WinCC Comfort	 Floating license   Upgrade license  +  generates Combo license → WinCC flexible 2008 Standard and → WinCC Comfort  parallel installation possible	--- (Component of the Panels)
WinCC Advanced	 Floating license   Upgrade license  +  generates Combo license → WinCC flexible 2008 Advanced and → WinCC Advanced  parallel installation possible	 Single license   Upgrade license  → 
WinCC Professional	 Floating license   Upgrade license not available, since another license model exists for WinCC V7 (and higher)  Parallel installation WinCC V7 with WinCC Professional currently not yet possible	 Single license   Upgrade license not available, since another license model exists for WinCC V7 (and higher)