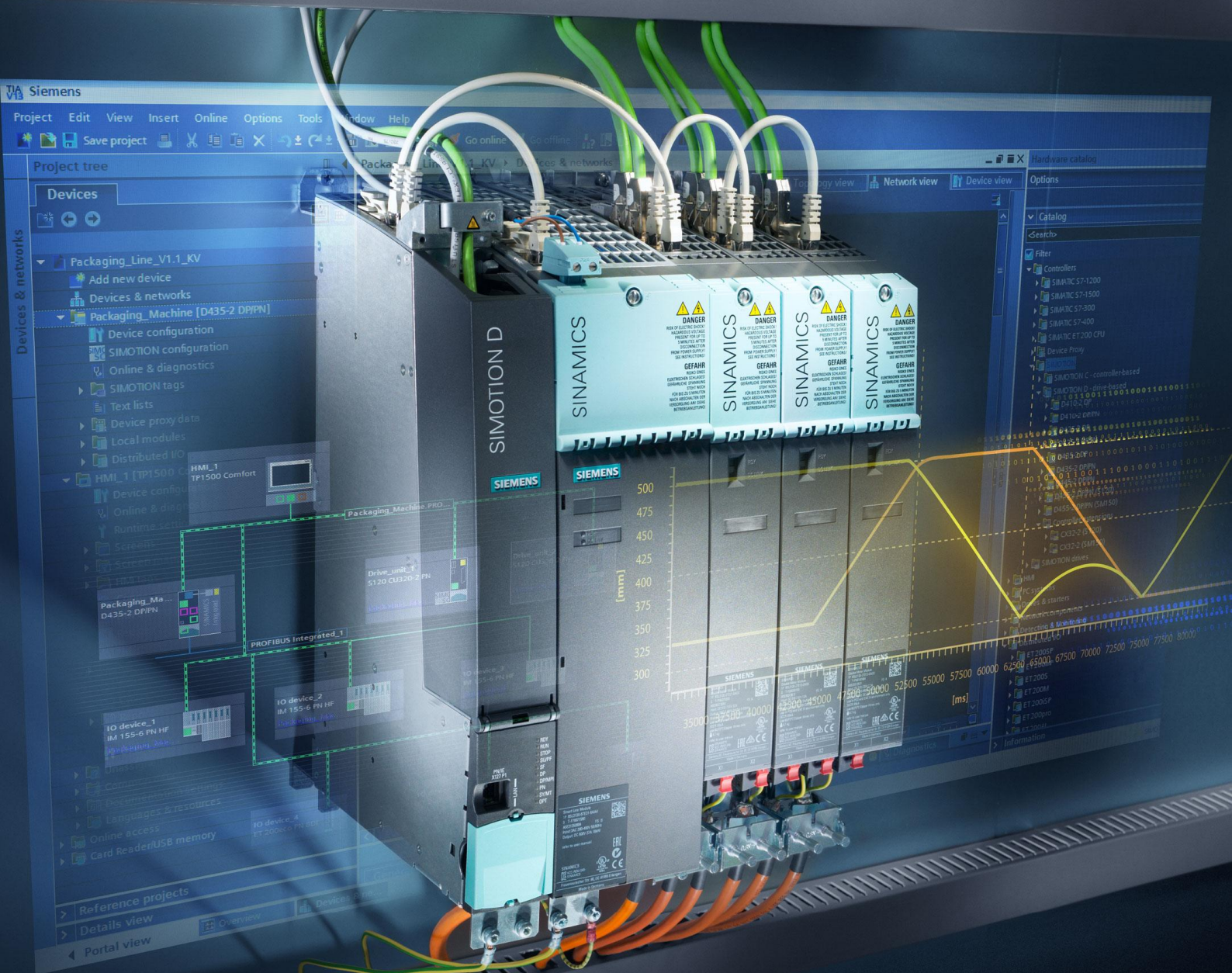


SIEMENS

Ingenuity for life



SIMOTION V5.1

What's new?

New functions in SIMOTION V5.1

What's new in SIMOTION V5.1?

What's new in SIMOTION V5.1?	2
1 Overview	3
2 SIMOTION and TIA Portal	4
2.1 SIMOTION SCOUT TIA V5.1	4
3 SIMOTION SCOUT Classic	5
3.1 SIMOTION SCOUT V5.1	5
4 Languages and editors	6
4.1 Extensions for object-oriented programming (OOP)	6
5 SIMOTION SCOUT general	11
6 SIMOSIM integrated simulation	13
7 SIMOTION SCOUT scripting	14
8 CamTool	14
9 Motion control functions	15
9.1 Axis	15
9.2 Synchronous operation	15
10 Drive connection	15
11 Diagnostics and service with SIMOTION IT	16
12 SIMOTION easyProject ProjectGenerator	17
13 SIMOTION Utilities & Applications	18
14 Catalog PM 21 / Industry Mall	19

1 Overview

SIMOTION V5.1 was released in August 2017.

The most important new functions are:

- SIMOTION in TIA Portal V14 SP1 with SCOUT TIA V5.1
- Support of the Windows 10 operating system for SCOUT and SCOUT TIA
- SIMOSIM simulation
- Extensions for object-oriented programming (OOP)

SIMOTION at a glance

We have compiled an overview page from our range of information about SIMOTION with the most important information on frequently asked topics - which can be opened with only one click.

Whether beginner or experienced SIMOTION user – the most important downloads, manuals, tutorials, FAQs, application examples, etc. can be found at

<https://support.industry.siemens.com/cs/ww/en/view/109480700>

New functions in SIMOTION V5.1

2 SIMOTION and TIA Portal

2.1 SIMOTION SCOUT TIA V5.1

Supported TIA Portal version

TIA Portal V14 SP1

Supported operating systems for SCOUT TIA

- Windows 7 SP1 Professional/Ultimate/Enterprise 64-bit
- Windows 8.1 Professional/Enterprise 64-bit
- Windows 10 Pro/Enterprise 64-bit - NEW

The project format does not change between TIA Portal V14 / SCOUT TIA V4.5 and TIA Portal V14 SP1 / SCOUT TIA V5.1. Therefore, no conversions are required.

The project format remains TIA Portal V14 / SCOUT TIA V4.5. This means that projects that have been created with TIA Portal V14 and SCOUT TIA V4.5 can also be edited with TIA Portal V14 SP1 and SCOUT TIA V5.1 without having to be converted, and vice versa.

If new functions are used or devices inserted with RT version V5.1, the project becomes a TIA Portal V14 SP1 project and then can no longer be opened with TIA Portal V14.

PROFINET variant management

This enables modular machine configurations to be handled locally without having to use an engineering tool.

(Optional machine modules and topology changes)

TIA Portal Openness and SCOUT scripting

When SCOUT TIA is installed, the well-known Scripting interface is available within the context of TIA Portal Openness.

A DLL installed with SCOUT TIA maps the SCOUT classes with their methods and properties in TIA Portal Openness. The programming of an Openness application with access to SCOUT TIA objects is performed entirely in .NET.

Within an Openness application, access to the Scripting interface is via a service.

A corresponding application example can be found in the Utilities & Applications.

A SIMOTION project comprises the hardware and the SIMOTION configuration (simply called software (programs, TOs, etc.) in the following). The hardware is configured in TIA Portal, the software in SCOUT TIA. This also applies accordingly to the scripting: Openness from TIA Portal is used for the hardware, and the well-known Scripting model from SCOUT is used for the software.

A TIA Portal project must always be opened first in order to script a project.

TIA Portal Openness has been officially released with TIA Portal V14 SP1. Thus, it is now also possible to create the SIMOTION hardware in TIA Portal (creating devices, setting properties, etc.).

New functions in SIMOTION V5.1

The scripting on the SIMOTION side remains unaffected and can still be executed with SCOUT resources.

3 SIMOTION SCOUT Classic

3.1 SIMOTION SCOUT V5.1

Supported operating systems

- Windows 7 SP1 Professional/Ultimate/Enterprise (32-bit and 64-bit)
- Windows 10 Pro/Enterprise 64-bit - NEW

The project format does not change between SCOUT V4.5 and V5.1. Therefore, no conversions are required.

The project format remains V4.5. This means that projects that have been created with SCOUT V4.5 can also be edited with SCOUT V5.1 without having to be converted, and vice versa.

Devices with Runtime version V5.1 are not displayed in the project navigator in SCOUT V4.5. A message appears in the detail view that the project contains unknown objects.

4 Languages and editors

4.1 Extensions for object-oriented programming (OOP)

In addition to the core topics relating to object-oriented programming that have already been described, further new constructs that are useful mechanisms for facilitating the modularization and structuring of software are available with the new SIMOTION software version V5.1.

I/O references

The previous connection of the I/O components to function blocks or classes was complex and extensive.

To make the use of I/Os possible in modules without losing the independence, we can deploy the construct "partially specified, directly represented variables" defined in the IEC standard. It allows us to declare internal variables neutrally (without an address) in the declaration of function blocks and classes with input and/or output variables, and to use them in the program code.

It is only when the instance is defined that it becomes necessary to combine the neutral variables with the actual I/O addresses. Since the instance of the function block or class is initialized with the actual I/Os, direct I/O access at a code position within the modules can be implemented as a library-capable solution.

Where I/O references are declared in the form described above, it is essential to link them to I/O variables. This rule can become a particular burden when it comes to implementing modular machine concepts in which certain sensors or actuators are installed only as optional equipment. It is precisely for this kind of application that SIMOTION has made provision for declaring I/O references that have no compulsory link to an I/O variable.

New functions in SIMOTION V5.1

```

8  FUNCTION_BLOCK myFB
9  VAR PUBLIC
10     myInput1 AT %I*:WORD;
11  END_VAR
12  VAR PRIVATE OVERRIDE
13     myOutput1 AT %Q*:WORD;
14  END_VAR
15     myOutput1:=myInput1;
16  END_FUNCTION_BLOCK

17
18
19  PROGRAM P1
20
21     VAR //only possible if compile settings correct
22         myFbInst1 : myFB := (myInput1 := InputVar1, myOutput1 := OutputVar1);
23         myFbInst2 : myFB := (myInput1 := InputVar2, myOutput1 := OutputVar2);
24     END_VAR
25
26     //Program body
27
28     myFbInst1();
29     myFbInst2();
30
31  END_PROGRAM

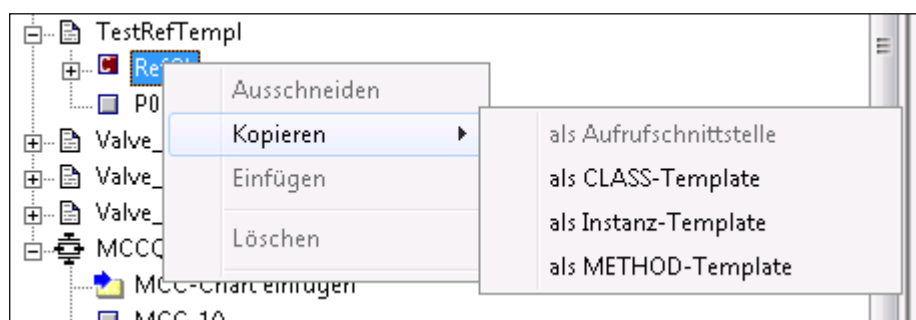
```

Example of an FB with I/O references

Instance template

Because of the implementation of the I/O references according to the IEC standard, it is essential that they are linked to the actual I/O during the definition of each instance of an FB or a class with such I/O references. If the FB or the class is stored in a know-how-protected source, the user cannot determine the identifiers of the I/O reference variables.

For this reason, SCOUT provides the new function as an instance template in the project navigator.



Instance template context menu

If the Instance template has been selected in the context menu, the template with the required variables to be initialized can be inserted in the program at the required insertion point in the editor.

```

18  VAR
19     Object1:RefCL:=(*required initialization*)(myRefIN := _device.In01,myRefOUT := _device.Out01);
20     Object2:RefCL:=(*required initialization*)(myRefIN := _device.<BYTE>,myRefOUT := _device.<BYTE>);
21  END_VAR

```

Instance template context menu

New functions in SIMOTION V5.1

The correct input or output variables must then be added by the programmer. The information provided also shows which data type is required. The required I/O variables must of course be available in the SIMOTION address list.

After specifying the instance and the FB/class type in the ST editor, the user can start the Autocomplete function and the editor adds the information. If the cursor is placed on the type of the class/FB, a tooltip also provides information on the variables to be initialized.

Namespaces

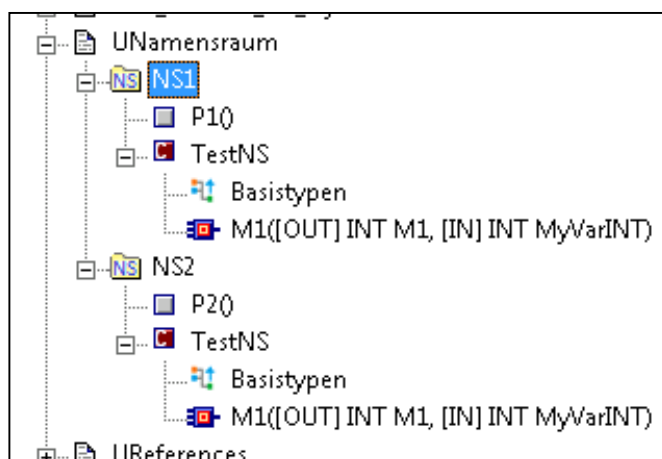
If it is necessary, however, to group various classes and function blocks (such as for the provision of libraries, for example), user-defined namespaces (namespace according to IEC61131-3) are required.

The following elements can be defined for SIMOTION in a user-defined namespace:

- User-defined data types (via keyword TYPE)
- Functions, function blocks and classes
- Interfaces
- Global constants and variables
- Further user-defined namespaces

Namespaces can be used to combine functionally interrelated elements. They thus offer a range of different structuring options, particularly for creating libraries. Namespaces can also be used to implement machine modules in the application.

While namespaces are very useful for structuring the software, one of their main advantages is that they also help to prevent name collisions in the global scope. This is a particularly helpful feature when software needs to be extended because it prevents collisions between identifiers which can lead to errors.



Namespace in the project navigator

New functions in SIMOTION V5.1

General reference

Virtually every programming language has mechanisms that allow the programmer to implement references to any data in the computer's memory without creating a copy of it. These mechanisms are known as a "pointer" or "reference".

References can be applied type-correctly to any data element. The type-correct access is a very important feature, particularly with respect to control systems in which runtime errors must always be prevented. The restriction laid down by the IEC that references must not point to temporary data elements further reduces the risk that they will be used incorrectly. It is therefore possible to completely eliminate those runtime errors caused by problems that are difficult to find.

The type of a reference is defined with the keyword `REF_TO <TypeName>` (e.g. `myRefVar : REF_TO INT;`). The standard function `REF()` is used to create a reference (e.g. `myRefVar := REF(A);`).

Like other variables, references may also be assigned to one another. This is usually performed with the `?=` operator. This assignment is also available in LAD/FBD and MCC in V5.1.

It is thus possible to assign a reference to a derived class to a reference to a base class. This rule can also be used in version 4.5 even before the introduction of general references.

Access to the data behind a reference is enabled by the caret or roof operator (e.g. `myIntVar := myRefVar^`). In this way, flexible data can be manipulated with the aid of references.

References constitute a powerful tool for efficient programming and can also assist with the structuring of the software. When working with class references in particular, the programmer will discover a number of possibilities (similar to those provided by interfaces) for separating software components.

Object browser

For further details, see Section 5, SIMOTION SCOUT general

New functions in SIMOTION V5.1

Further references

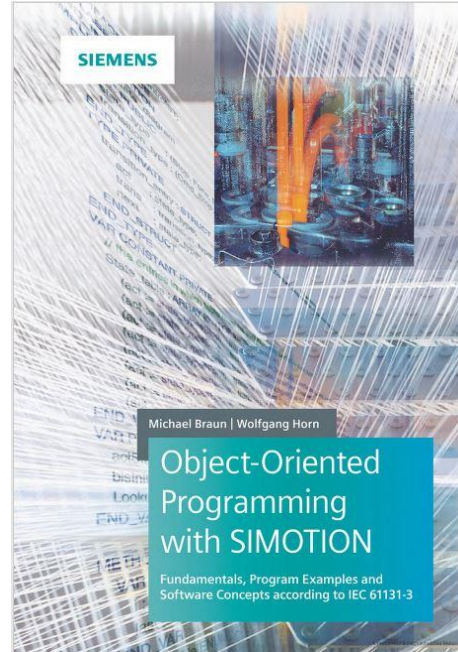
Object-oriented Programming with SIMOTION



German:

Print ISBN 978-3-89578-455-2

ePDF ISBN 978-3-89578-946-5



English:

Print ISBN 978-3-89578-456-9

ePDF ISBN 978-3-89578-947-2

New functions in SIMOTION V5.1

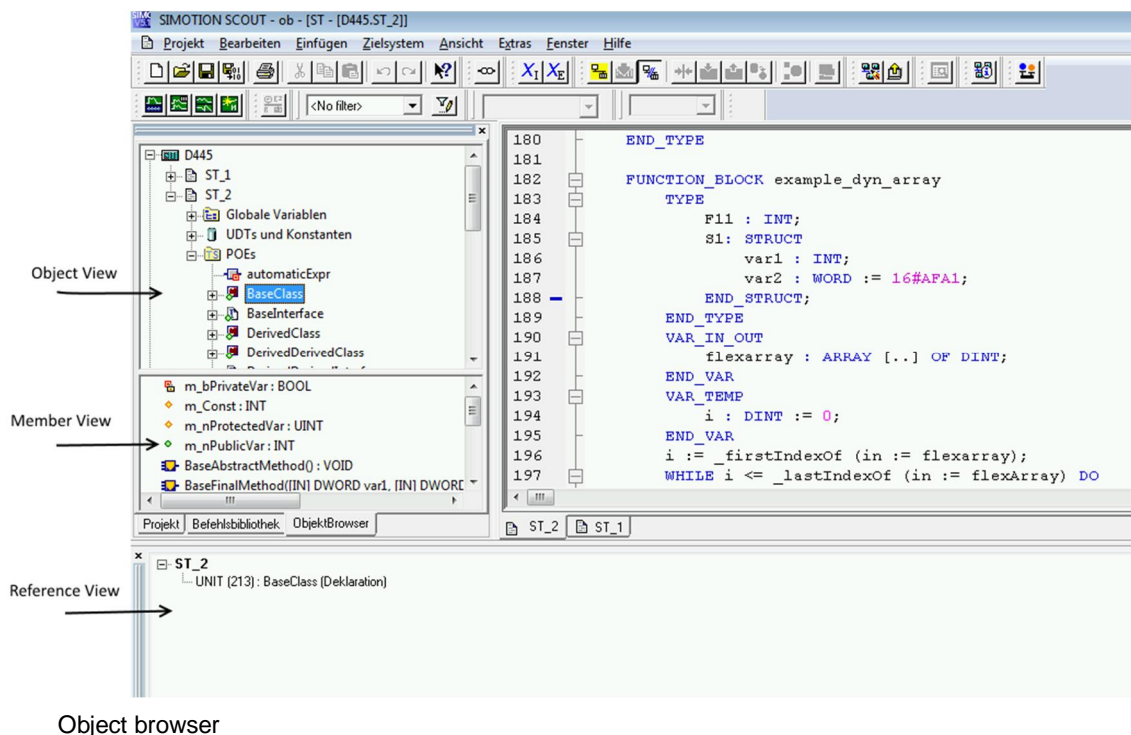
5 SIMOTION SCOUT general

Object browser

The object browser, in an additional tab in the project navigator, enables a simple analysis of the control program. Navigation is performed via the class structures contained therein or via the places where classes and methods are used.

The object browser is not limited to OOP. All conventional programming constructs such as functions and function blocks are also supported. The places of use are also specified here and can be selected in the respective views of the browser or the reference view by double-clicking.

The object browser is therefore a significant help when creating the control application. It provides an additional view of the application, which is oriented toward the programming constructs, and therefore overcomes the limits of the distribution of the user program to individual sources, particularly with regard to the navigation via the program elements.

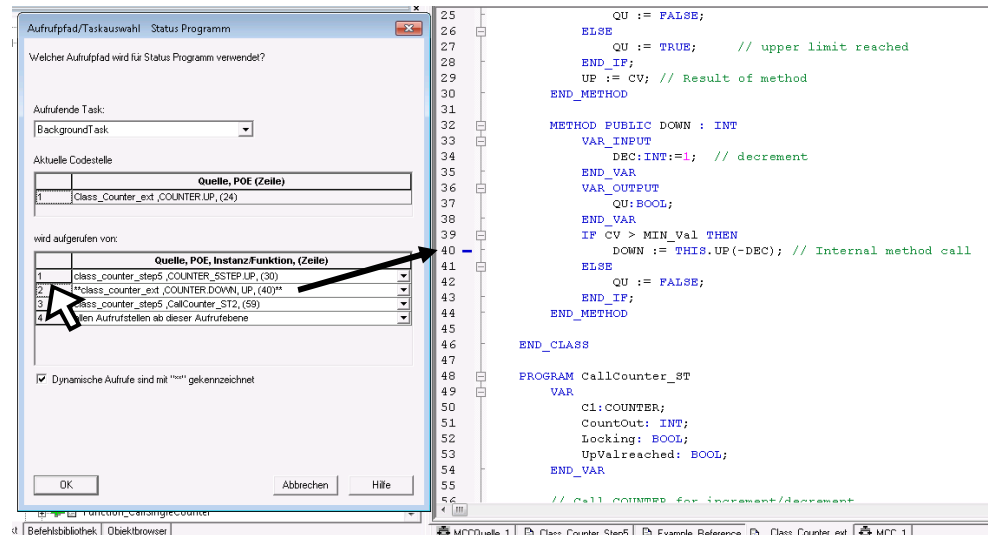


Extension of the debug functions

The support of the user for program tests with "Program status" and "Breakpoints" has been extended. For the monitoring of the program execution with data that is available several times (instances), the user can set the precise monitoring function with the required data via the call stack. The call path is set via the corresponding list boxes in the dialog.

New functions in SIMOTION V5.1

For a better overview, the user can now open the source with the selected code position by double-clicking the line number in the call stack dialog. In this way, a very simple check for the selected call path is possible because SCOUT provides this function in every line.



Call stack with selection of the code position

This function is available to the user for the programming languages ST, LAD/FBD and MCC. In the graphic programming languages, SCOUT of course opens the appropriate network for LAD/FBD or the relevant command box in MCC.

New functions in SIMOTION V5.1

6 SIMOSIM integrated simulation

In V5.1, a runtime simulation (SIMOSIM) is integrated in the engineering (SCOUT / SCOUT TIA) for testing the application software without connected SIMOTION hardware. The simulation can be started from SCOUT for all configured SIMOTION D4x5. Online access must be set, as for a real hardware, on the X127 interface. An online connection is then established in SCOUT for the virtual device. The configuration with TOs and programs can then be loaded and tested. The axis and path TOs run automatically in simulation mode. I/O modules that are not available can be controlled from SCOUT.



SIMOSIM

Supported functions:

- All axis TOs
- Path TOs
- Execution system
- All program test functions (status, breakpoints, traces, watch tables)
- Axis control panel
- Path control panel
- Connection with HMI systems is possible
- Integrated Web server
- OPC UA communication
- Direct access to the virtual CF card

New functions in SIMOTION V5.1

Restrictions:

- Only one simulation at one time
- Simultaneous access to SIMOSIM and real hardware is not possible
- Scanning of the I/O diagnostics information (DP/PROFINET slaves)
- Data changes in non-existing I/O (e.g. SetNameOf Station)
- Data communication with SINAMICS as it is not present
- Measurements of execution times or utilization
- TControl not supported
- Download of technology packages not possible

7 SIMOTION SCOUT scripting

Handling of subfolders in programs and libraries via scripting

The following new methods are available for this purpose:

- create/remove/rename folder
- insert/remove units into/from folder
- import/export units into/from folder
- find objects in folder
- move folder with content

Handling the settings of TO units via scripting

The units of TOs can be configured OFFLINE via scripting (read/write).

8 CamTool

Import/export of cam profiles

The CamTool option package has been extended by corresponding import/export functionality for cam profiles via csv file (analogous to CamEdit).

In this way, a data exchange on the basis of the CSV format is possible with the Mechatronic Concept Designer (MCD).

Interpolating several cam sections

A set operation has been introduced in CamTool in order to interpolate all interpolation curves either with CamTool or by the target device.

9 Motion control functions

9.1 Axis

Torque limiting with active position-related monitoring

With active torque limiting, previously the position-related monitoring was deactivated. As of V5.1, the position-related monitoring remains active even with active torque limiting. New configuration data has been introduced for this purpose (accessible via the expert list):

TypeOfAxis.ServoMonitoring.motionMonitoringWhenTorqueLimiting

The activation achieves that the position monitoring, the positioning monitoring and/or the following error monitoring remain active when the torque limiting is activated.

9.2 Synchronous operation

Distributed synchronous operation with controllers with different RT versions

Cross-project distributed synchronous operation with proxy objects (external master value / external synchronous operation) is possible with different runtime versions of the SIMOTION controllers (SIMOTION I-device) since V4.5.

As of SCOUT V5.1, it is now also possible to configure a distributed synchronous operation with different runtime versions in one SCOUT project. Proxy objects are also used in this case.

10 Drive connection

SINAMICS V4.8

SIMOTION D4xx-2 V5.1 firmware contains SINAMICS Integrated V4.8. The connection of SINAMICS CUs with V4.8 to SIMOTION is supported.

The STARTER functionality integrated in SIMOTION SCOUT V5.1 is based on STARTER V4.5 SP1 including the correction with regard to missing SINAMICS S120 Booksize C/D type Motor Modules with SINAMICS V4.8.

(6SL3120-1TE21-8AC0, 6SL3120-2TE21-8AD0, 6SL3120-1TE23-0AD0)

For details, see also

<https://support.industry.siemens.com/cs/ww/en/view/109480497>

11 Diagnostics and service with SIMOTION IT

Encryption of SIMOTION Web server / OPC UA

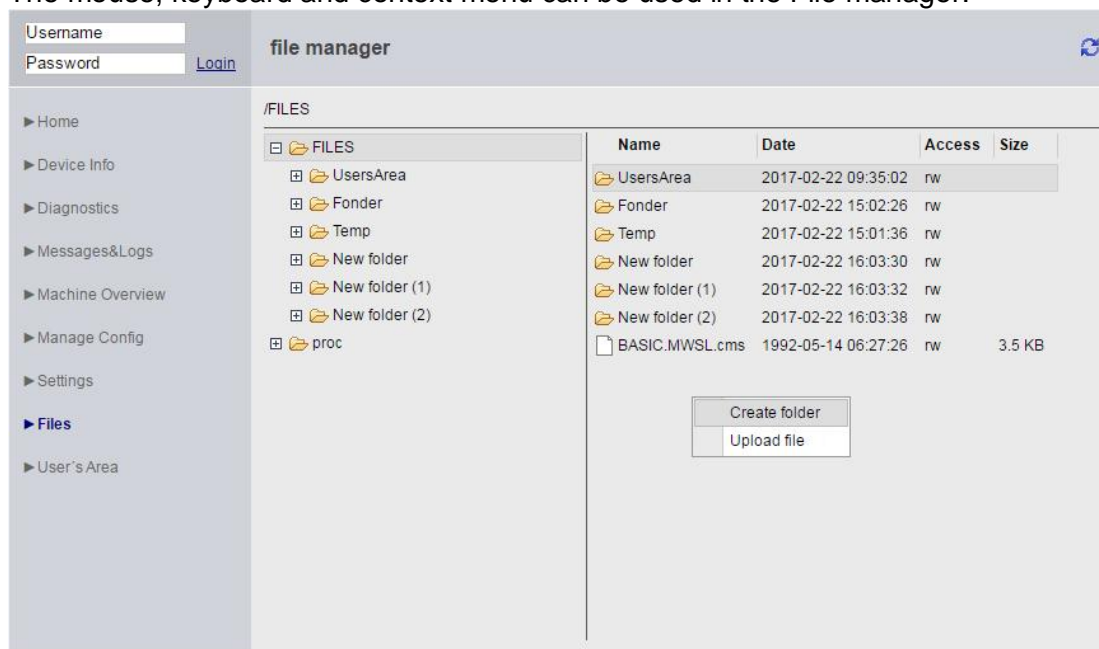
The codes used for the HTTPS communication are now generated with an SHA2 Hash. If the required server certificates are not available, they are generated by the Web server. Users are provided with Default Root certificates that are also generated with SHA2.

Only the TLS encryption protocol as of 1.2 is permitted for the HTTPS connection.

File manager

A new File manager has been created on the SIMOTION IT Web page under the main menu item "Files" which displays the accessible directories of the memory card or the PROC file system.

The mouse, keyboard and context menu can be used in the File manager.



For security reasons, the File manager replaces the previous implementation and provides a JavaScript interface for the browse/read/write access to the files and directories of the user Web pages.

12 SIMOTION easyProject ProjectGenerator

Basic functionalities required in practically every application as well as technological functions can be integrated quickly and easily in a new or even an existing project with the aid of SIMOTION easyProject ProjectGenerator.

The ProjectGenerator currently cannot be used with SCOUT TIA.

The SIMOTION easyProject ProjectGenerator V1.4.3 is contained on the Utilities & Applications DVD (SCOUT V5.1 delivery).

The version of the ProjectGenerator that can be executed directly from the DVD has been removed. Please unpack the ZIP file with the ProjectGenerator contents on to the hard drive of your PC.

Function extensions of version V1.4.3:

- Support of SIMOTION V5.1:
 - New export of SIMOTION V5.1 devices, technology objects, etc.
 - Upgrade of the device-dependent libraries ("V5.1 checkmark")
- Included standard applications

The latest versions of the included standard applications are supplied with this product version:

 - SIMOTION:
 - Axis Function Block (LMCBasic library) V1.3.4
 - Cam Creation (LCamHdl library) V1.3.3 (*updated*)
 - Carton Packer (LCarton library) V1.1.1
 - TCP/IP Communication (LCOM library) V1.2.6
 - Converting Module V1.0.2 (*updated*)
 - DPV1 Services (LDPV1 library) V4.2.9 (*updated*)
 - DRIVE-CLiQ Topology Viewer V1.0.3
 - Intelligent Belt V2 (LIBeltV2 library) V1.0.7 (*updated*)
 - Machine Data Acquisition V1.1.1
 - Machine Energy Acquisition V1.0.3
 - Message Handling (LMsgHdl library) V1.3.1 (*updated*)
 - Modular Machine (LMoMa library) V1.2.4 (*updated*)
 - OMAC V3.0 (LPMLV30 library) V1.3.3
 - Interface Generator for OMAC PackTags V1.0.0
 - Packaging Library LPac V2.1.5 (LPac library) (*new*)
 - Startup Check (pStartupCheck program) V1.1.5
 - Weihenstephan Standards for Process Data Acquisition – Server (LWeihenstephan library) V1.1.2
 - SIMATIC:
 - TCP/IP Communication (LCOM library) V1.2.6
 - OMAC V3.0 (LPMLV30 library) V1.3.3
 - Interface Generator for OMAC PackTags V1.0.0
 - Weihenstephan Standards for Process Data Acquisition – Server (LWeihStd library) V1.2.3
 - Weihenstephan Client (LWeihCli library) V1.3.2

13 SIMOTION Utilities & Applications

The free-of-charge SIMOTION Utilities & Applications provide important background information about SIMOTION, tools, special functions, blocks and sample projects as well as ready-to-use standard applications for demonstration purposes or use in your projects. You can also find detailed information here about scripting and many sample scripts that further facilitate working with SIMOTION.

New contents of the SIMOTION Utilities & Applications V5.1

General:

- Update of all projects to TIAP V14 SP1 / SCOUT TIA V5.1 incl. latest SIMOTION/SINAMICS FW version

Applications:

- Update of SIMOTION easyProject ProjectGenerator to V1.4.3 (See Section 12 SIMOTION easyProject ProjectGenerator)
- Update of individual standard applications contained in the ProjectGenerator
- The application has been removed from the publically accessible applications in SIOS, and a link added to the SIOS entry → Prevention of the use of obsolete versions

FAQs:

- The documentation and application examples have been removed from the publically accessible FAQs in SIOS, and a link added to the SIOS entry → Prevention of the use of obsolete versions
- New FAQ for TO references

Scripts:

- Update of ProjectBackup script
- Update of SinamicsVersionOverview script
- Notes and example of Scripting within the context of TIA Openness

SIMOTION IT:

- New JavaScript module: Login Manager for user-defined Web pages

OOP:

- Motion classes: Classes that can be used for drive, position and following axes. Additional classes for output cams and measuring inputs.

New functions in SIMOTION V5.1

14 Catalog PM 21 / Industry Mall

In Catalog PM 21 - 2017, the contents are described with reference to SIMOTION V4.5.
PM 21 - 2017 download via Information and Download Center
<https://www.siemens.com/industry/infocenter> (PM 21 filter)

The latest contents with regard to SIMOTION V5.1 can be found in the Industry Mall.
(Catalog and ordering system for Automation and Drives)
at
Automation → Automation Systems → SIMOTION Motion Control System
<https://www.siemens.com/industrymall>

New functions in SIMOTION V5.1

Siemens AG
Digital Factory Division
Factory Automation
Production Machines
DF FA PMA SP 1
Frauenauracher Str. 80
D-91056 Erlangen, Germany
Fax: +49-9131-98-1297
mailto:
tech.team.motioncontrol@siemens.com