

SIEMENS



Application description • 05/2015

Configuration of the ION SIMATIC S7 PN for a SIMATIC 400 Station

CMS X-Tools / V 04.02 SP2 / CPU 416-3 PN/DP

Warranty and liability

Note

The Application Examples are not binding and do not claim to be complete regarding the circuits shown, equipping and any eventuality. The Application Examples do not represent customer-specific solutions. They are only intended to provide support for typical applications. You are responsible for ensuring that the described products are used correctly. These application examples do not relieve you of the responsibility to use safe practices in application, installation, operation and maintenance. When using these Application Examples, you recognize that we cannot be made liable for any damage/claims beyond the liability clause described. We reserve the right to make changes to these Application Examples at any time without prior notice. If there are any deviations between the recommendations provided in these application examples and other Siemens publications – e.g. Catalogs – the contents of the other documents have priority.

We do not accept any liability for the information contained in this document.

Any claims against us – based on whatever legal reason – resulting from the use of the examples, information, programs, engineering and performance data etc., described in this Application Example shall be excluded. Such an exclusion shall not apply in the case of mandatory liability, e.g. under the German Product Liability Act (“Produkthaftungsgesetz”), in case of intent, gross negligence, or injury of life, body or health, guarantee for the quality of a product, fraudulent concealment of a deficiency or breach of a condition which goes to the root of the contract (“wesentliche Vertragspflichten”). The damages for a breach of a substantial contractual obligation are, however, limited to the foreseeable damage, typical for the type of contract, except in the event of intent or gross negligence or injury to life, body or health. The above provisions do not imply a change of the burden of proof to your detriment.

Any form of duplication or distribution of these Application Examples or excerpts hereof is prohibited without the expressed consent of the Siemens AG.

Security information

Siemens provides products and solutions with industrial security functions that support the secure operation of plants, solutions, machines, equipment and/or networks. They are important components in a holistic industrial security concept. With this in mind, Siemens' products and solutions undergo continuous development. Siemens recommends strongly that you regularly check for product updates.

For the secure operation of Siemens products and solutions, it is necessary to take suitable preventive action (e.g. cell protection concept) and integrate each component into a holistic, state-of-the-art industrial security concept. Third-party products that may be in use should also be considered. For more information about industrial security, visit <http://www.siemens.com/industrialsecurity>.

To stay informed about product updates as they occur, sign up for a product-specific newsletter. For more information, visit <http://support.industry.siemens.com>.

Table of contents

	Warranty and liability	2
1	Preface	4
1.1	Overview	4
1.2	Basic Knowledge required	4
1.3	Required Software.....	4
1.4	Required Hardware	5
1.5	Scope of delivery	5
1.6	Further Information	5
1.7	Terms	5
2	Configuration and Programming.....	6
2.1	SIMATIC Manager.....	6
2.1.1	Retrieve the Library	6
2.1.2	Hardware Configuration.....	6
2.1.3	Copy the Software Blocks.....	8
2.1.4	Initialization.....	8
2.1.5	Cyclic Data Transmission in Interrupt OB3x	9
2.1.6	Download the Hardware Configuration and Software Blocks.....	11
2.2	X-Tools.....	11
2.2.1	Configuration of the Windows Firewall.....	11
2.2.2	Main Management System	14
2.2.3	Device Management System.....	14
2.2.4	Visualization of the Online Data.....	19
3	Contact Information.....	20
4	History	20

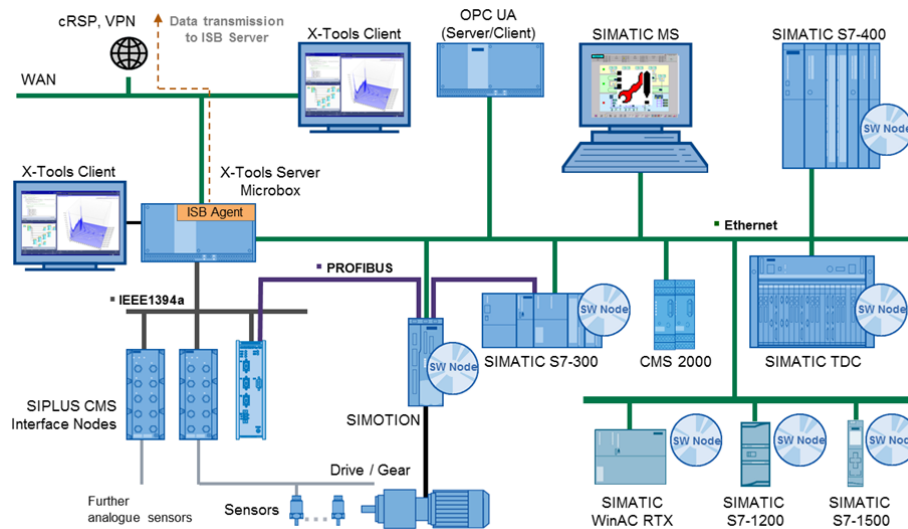
1 Preface

1.1 Overview

The ION SIMATIC S7 PN is a software component which is used in order to acquire data from a SIMATIC controller with integrated PROFINET module. The acquired data can be analyzed and stored in X-Tools.

This application description provides an example of the configuration in X-Tools and in the SIMATIC Manager for the CPU 416-3 PN/DP. The configuration steps for the usage of the ION SIMATIC S7 PN with different CPUs are similar.

Figure 1-1: CMS X-Tools -Architecture



© Siemens AG 2015 All rights reserved

1.2 Basic Knowledge required

In order to understand this application description, general knowledge of automation technology and software packages CMS X-Tools (in the following, X-Tools) and STEP 7 is required.

In addition, you must be familiar with network technology (UDP/IP) and with using computers with Windows.

1.3 Required Software

This document is valid for the following software:

- CMS X-Tools ION SIMATIC S7 PN V 01.03
- CMS X-Tools Professional V 04.02 SP2
- SIMATIC Manager V 05.05 SP3

The usage of different software versions can lead to variations of the steps described below.

1.4 Required Hardware

- CPU 416-3 PN/DP
- Engineering System with SIMATIC Manager and X-Tools

NOTE The X-Tools Client and Server can also be installed at different systems.

1.5 Scope of delivery

Following files are delivered:

- SIMATIC Project empty: **S7400_and_SW_ION_empty.zip**
- SIMATIC Project completed: **S7400_and_SW_ION_complet.zip**
- X-Tools Project location: **X_Tools_File_Location.zip**
- SIMATIC Library : **CMS_X-Tools_ION_SIMATIC_S7_PN_V_01.03.zip**

1.6 Further Information

A detailed description of all features is not subject of this document. Further information can be found in:

- CMS X-Tools - User Manual - ION SIMATIC S7 PN
- CMS X-Tools - User Manual 01 - 07

1.7 Terms

The following terms are used in this document:

Definition	Description
DB	Data Block
OB	Organization Block
FB	Function Block
ION	I/O-Node
UIK	Universal Identification Key
SW	Software

2 Configuration and Programming

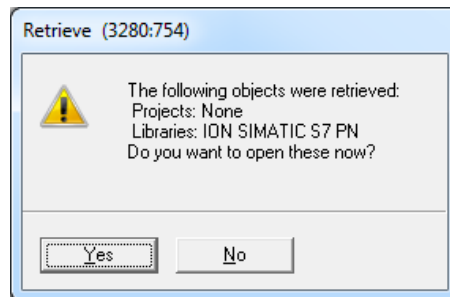
2.1 SIMATIC Manager

2.1.1 Retrieve the Library

Insert the product-CD “CMS X-Tools” into the drive of your PC. Start the SIMATIC Manager and open via **File>Retrieve...** the dialog for retrieving projects and libraries. Choose the path to your CD-drive and open the archive file “CMS X-Tools ION SIMATIC S7 PN V 01.03.zip” from the product CD. Finally choose the target directory and the storage path for the **ION SIMATIC S7 PN** library and confirm with OK.

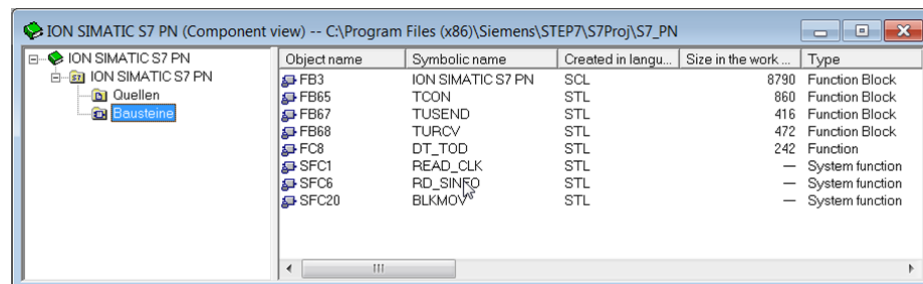
When the process of retrieving is completed, click on “Yes” in the shown dialog to open the library:

Figure 2-1: Retrieve Dialog



The library is installed properly.

Figure 2-2: ION SIMATIC S7 PN Library

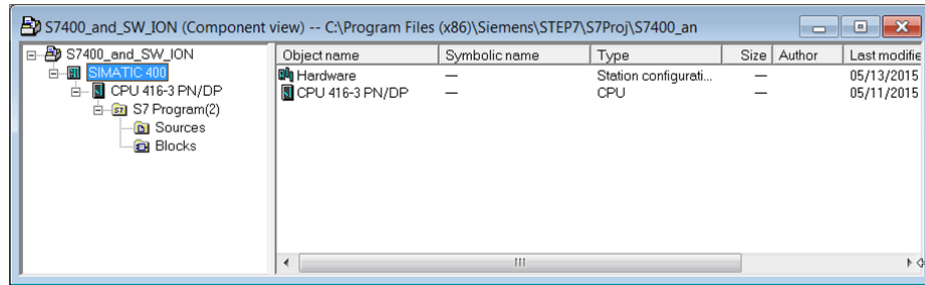


2.1.2 Hardware Configuration

Create a new S7 project or open your already existing project. Figure 2-3 shows the example project which is provided by this application description.

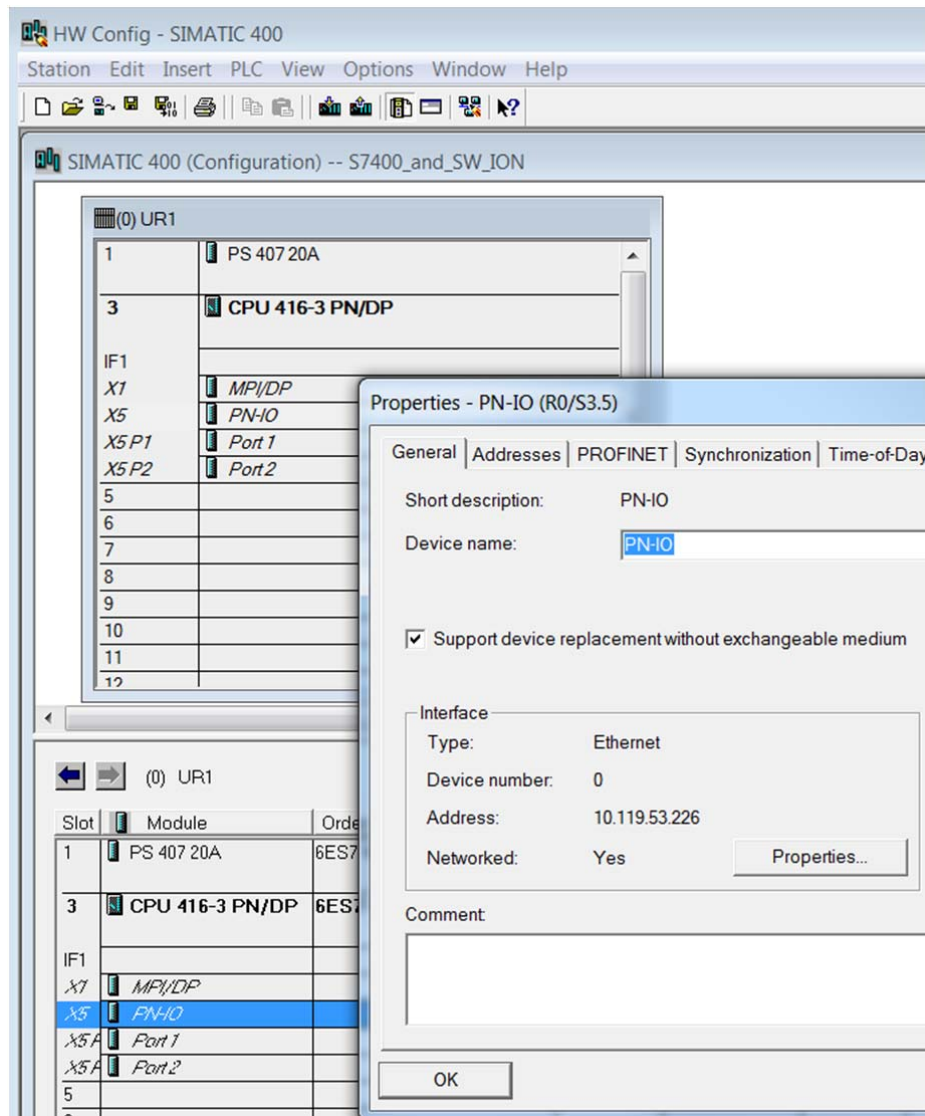
2 Configuration and Programming

Figure 2-3: S7 Example Project



Open the Hardware Configuration and ensure that the settings of the PN-IO Module fit to your network settings. You will need the IP-address of the PN-IO Module for the X-Tools configurations later.

Figure 2-4: Properties of the PN-IO Module

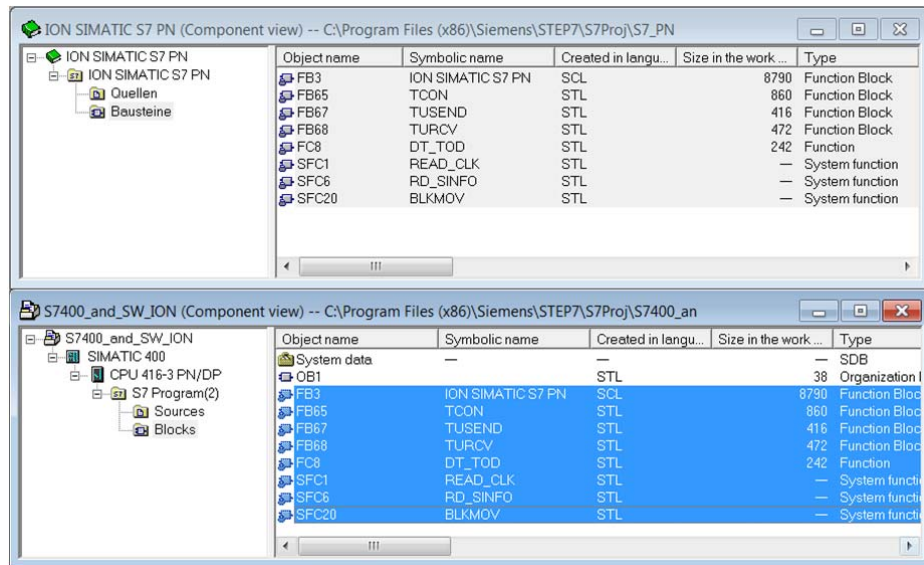


2.1.3 Copy the Software Blocks

Copy all the SW Blocks from the ION SIMATIC S7 PN Library to your project. The blocks FB65, FB67, FB68, FC8, SFC1, SFC6 and SFC20 originate from the "Standard Library".

NOTICE Rename FB3 before copying it, if your project already contains a FB3!

Figure 2-5: Project with copied SW Blocks



© Siemens AG 2015 All rights reserved

2.1.4 Initialization

The FB3 must be initialized in the corresponding Startup Organization Blocks (OB100, OB101 and OB102). The initialization is necessary for all possible startup cases of the CPU which depend on the specific application and settings. An example for the implementation of the OB100 is shown in the following part.

Open the OB100 block and type "CALL FB3,DBxy" and press enter. Choose for DBxy any free DB in your project. Figure 2-6 shows the call with DB31 for example.

Figure 2-6: Initialization in OB100

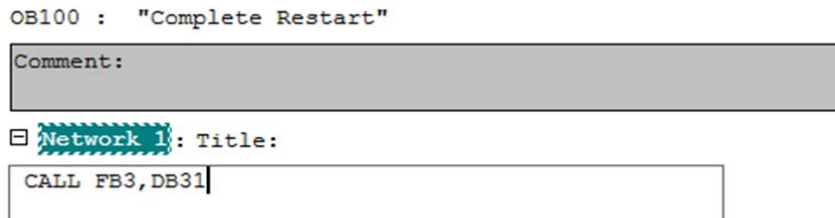
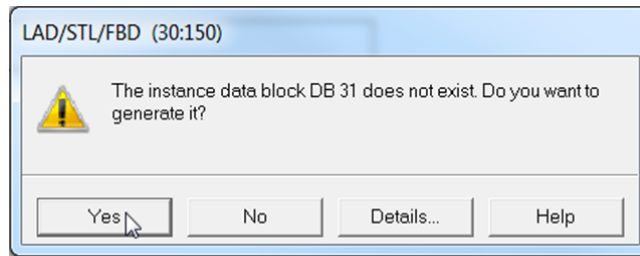


Figure 2-7: Generating Instance Data Block Dialog



Apply the upcoming dialog as shown in Figure 2-7 with "Yes". The instance data block is generated automatically. After that all inputs and outputs of FB3 will appear in the editor.

Set input "COM_RST" to "TRUE". This is necessary in order to generate an initialization event for FB3.

The type of the S7 CPU is identified by the input "DEV_ID". Set "DEV_ID" to "B#16#5" for the CPU 416-3 PN/DP.

Save and close OB100 subsequently.

Figure 2-8: FB3 with its Inputs and Outputs

OB100 : "Complete Restart"

```

Comment:
Network 1: Title:
CALL "ION SIMATIC S7 PN" , DB31  FB3
  COM_RST      :=TRUE
  CYCLE_T      :=
  COMMAND_ID   :=
  DATA_ID     :=
  COMMAND_PORT :=
  DATA_PORT   :=
  DEV_ID       :=B#16#5
  CURRENT_CHANNELS:=
  CHANNEL      :=
  UIK0         :=
  UIK1         :=
  UIK2         :=
  UIK3         :=
  UIK4         :=
  UIK5         :=
  UIK6         :=
  UIK7         :=
  TIME_BASE    :=
  STATUS_CMD_TCON :=
  STATUS_DATA_TCON:=
  
```

2.1.5 Cyclic Data Transmission in Interrupt OB3x

FB3 must be called in OB3x for the cyclic data transmission. It is recommended to use a cycle time between 10ms and 100ms. OB36 (50ms cycle time per default) is used in this example.

Create a temporary variable in OB36 as array of DWord as shown in Figure 2-9.

Figure 2-9: Temporary Variable for Data Transmission

Contents Of: 'Environment\Interface\TEMP'		Name	Data Type	Address	Comment
Interface	TEMP	OB36_START_INF	Byte	1.0	16#37 (OB 36 has started)
		OB36_PRIORITY	Byte	2.0	Priority of OB Execution
		OB36_OS_NUMBR	Byte	3.0	36 (Organization block 36, OB36)
		OB36_RESERVED_1	Byte	4.0	Reserved for system
		OB36_RESERVED_2	Byte	5.0	Reserved for system
		OB36_PHS_OFFSET	Int	6.0	Phase offset (integer, milliseconds)
		OB36_RESERVED_3	Int	8.0	Reserved for system
		OB36_EXC_FREQ	Int	10.0	Frequency of execution (msec)
		OB36_DATE_TIME	Date And Time	12.0	Date and time OB36 started
		data_to_transmit	Array[0..177] Of DWord	20.0	
		data_to_transmit			

Fill this variable with content in order to verify the correct transmission to X-Tools later. In this example we use a counter and a constant as shown in Figure 2-10.

Figure 2-10: Filling "data_to_transmit" with content

```

Network 1: Increment MD10
L   "Counter_Calls_of_OB36"   MD10
L   1
+D
T   "Counter_Calls_of_OB36"   MD10

Network 2: Fill "data_to_transmit"
L   "Counter_Calls_of_OB36"   MD10
T   #data_to_transmit[0]      #data_to_transmit[0]

L   DW#16#A
T   #data_to_transmit[1]      #data_to_transmit[1]
    
```

NOTE This is just an example. This variable should normally be filled with real process values which shall be send to X-Tools.

Call now FB3 with its instance data block DB31 and fill the inputs as shown in Figure 2-11 and save OB36. Further information about the inputs of FB3 can be found in the documents mentioned in chapter 1.6.

Figure 2-11: Calling FB3 in OB36.

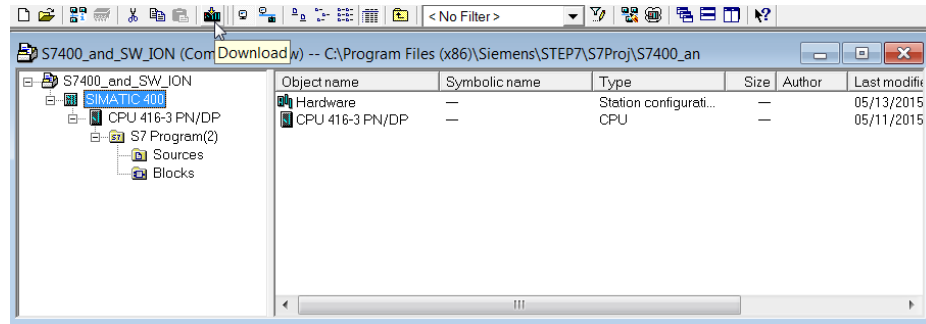
```

Network 3: Title:
CALL "ION SIMATIC S7 PN" , DB31      FB3
COM_RST      :=FALSE
CYCLE_T      :=#OB36_EXC_FREQ        #OB36_EXC_FREQ
COMMAND_ID   :=31
DATA_ID      :=32
COMMAND_PORT :=W#16#7D0
DATA_PORT    :=W#16#7D1
DEV_ID       :=B#16#5
CURRENT_CHANNELS:=178
CHANNEL      :=#data_to_transmit     #data_to_transmit
UIK0         :=B#16#22
UIK1         :=B#16#67
UIK2         :=B#16#42
UIK3         :=B#16#0
UIK4         :=B#16#0
UIK5         :=B#16#0
UIK6         :=B#16#0
UIK7         :=B#16#1
TIME_BASE    :=B#16#1
STATUS_CMD_TCON :=
STATUS_DATA_TCON:=
    
```

2.1.6 Download the Hardware Configuration and Software Blocks

Download the Hardware Configuration and the Software Blocks to the SIMATIC 400 Station and restart the CPU if necessary.

Figure 2-12: Downloading the Configuration and all Blocks



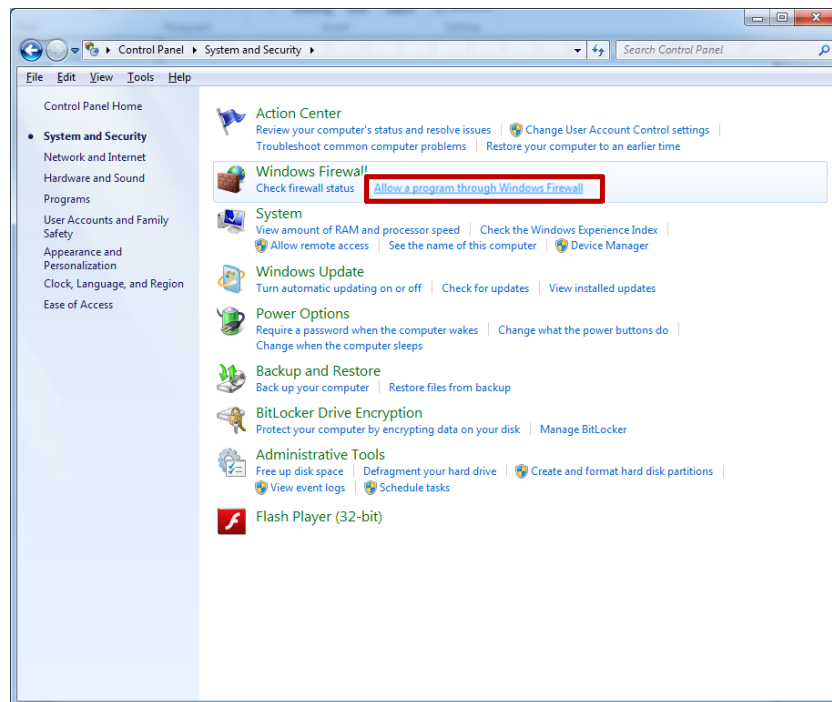
2.2 X-Tools

2.2.1 Configuration of the Windows Firewall

If the firewall does not allow X-Tools, then the communication cannot start between the automation system and X-Tools. Please verify the configuration as follows.

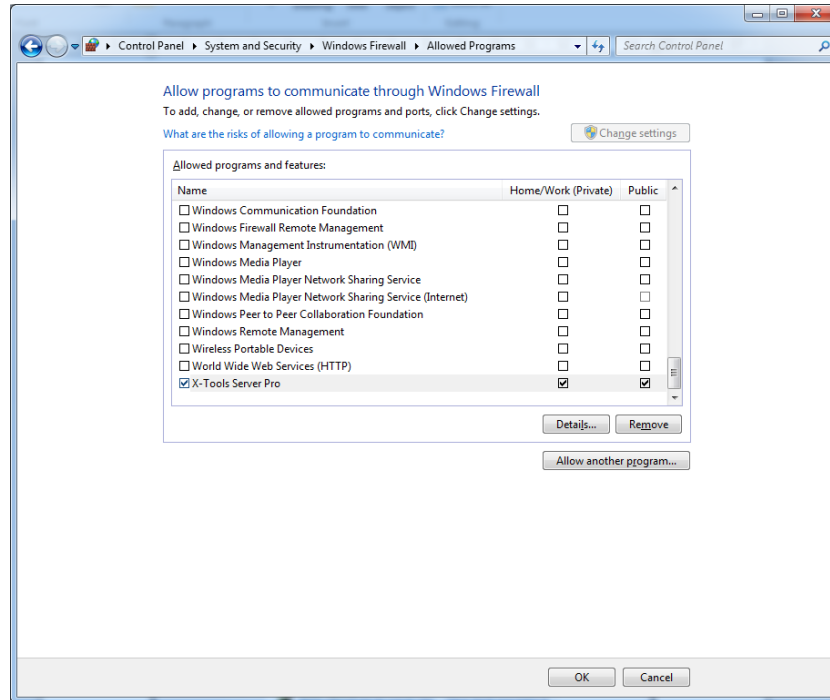
1. Open "Allow a program through Windows Firewall" from the "Control Panel\System and Security" window:

Figure 2-13: Control Panel\System and Security Window



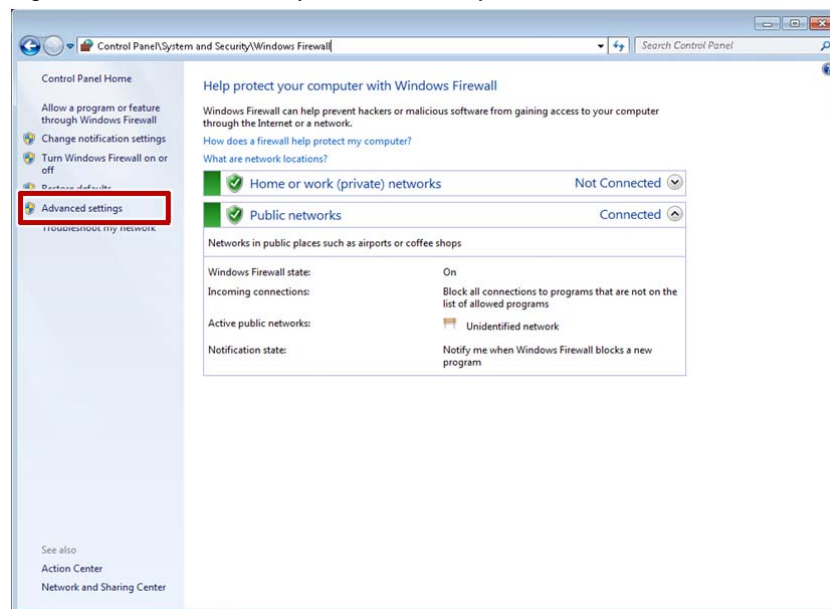
2. Add "X-Tools Server Pro.exe" in the list of exception in order to allow X-Tools through Windows Firewall for public and Home/Work(Private) Networks:

Figure 2-14: Allow X-Tools to communicate through Windows Firewall



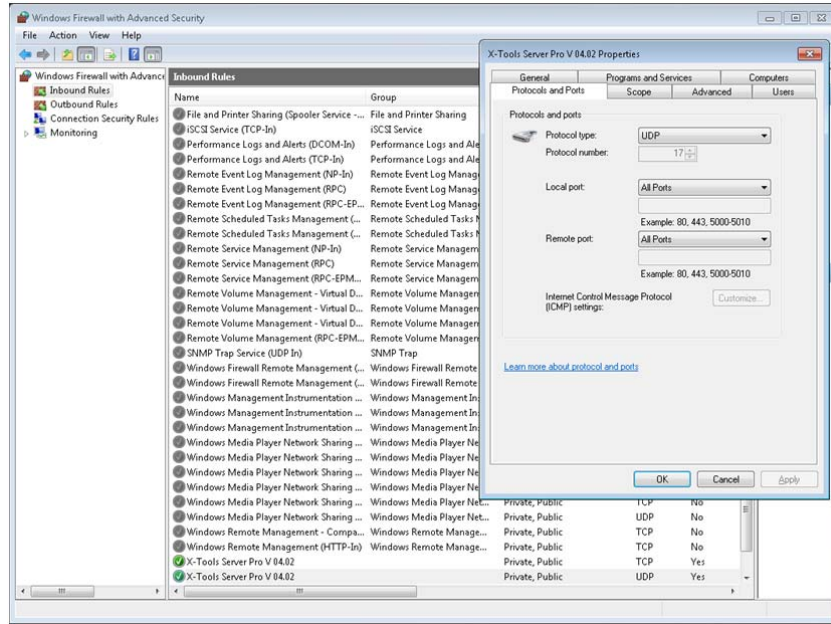
3. Open the "Advanced settings" from the "Control Panel\System and Security\Windows Firewall" window:

Figure 2-15: Control Panel\System and Security\Windows Firewall Window



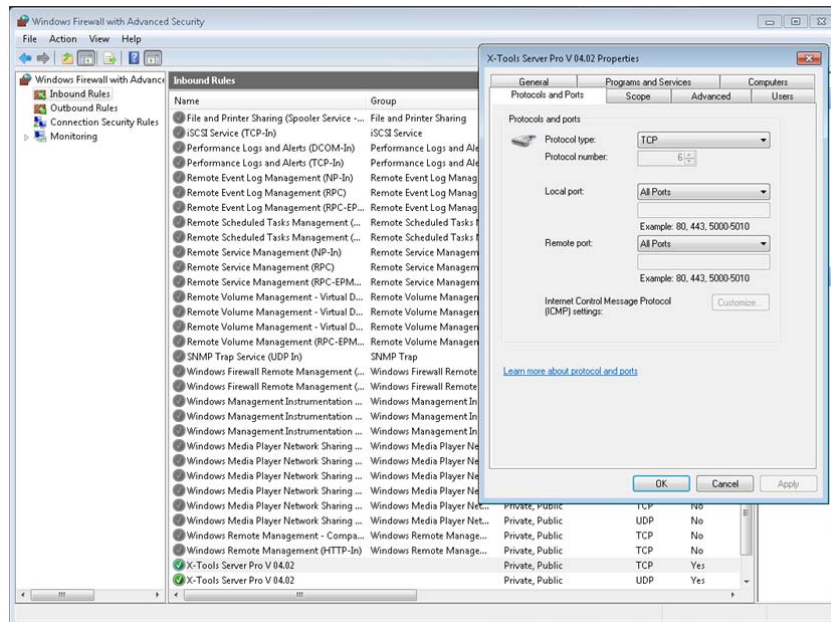
4. Ensure that all ports which are used by X-Tools are allowed for the private and public group for protocol type UDP:

Figure 2-16: Allow Ports in Windows Firewall with Advanced Security for UDP



5. Ensure that all ports which are used by X-Tools are allowed for the private and public group for protocol type TCP:

Figure 2-17: Allow Ports in Windows Firewall with Advanced Security for TCP

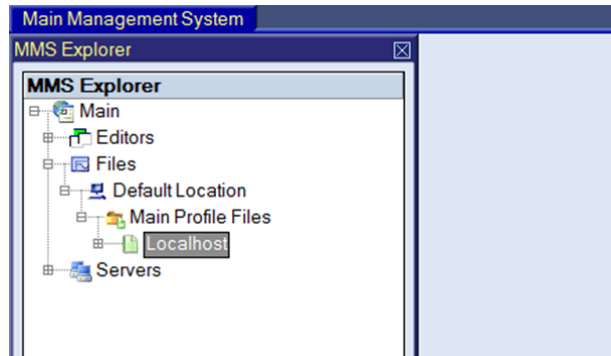


NOTE If it is not possible to allow all ports (e.g. due to security reasons), allow all ports which are used by X-Tools separately.

2.2.2 Main Management System

Open the X-Tools Client and start the corresponding Main Profile in the Main Management System in order to connect to the X-Tools Server.

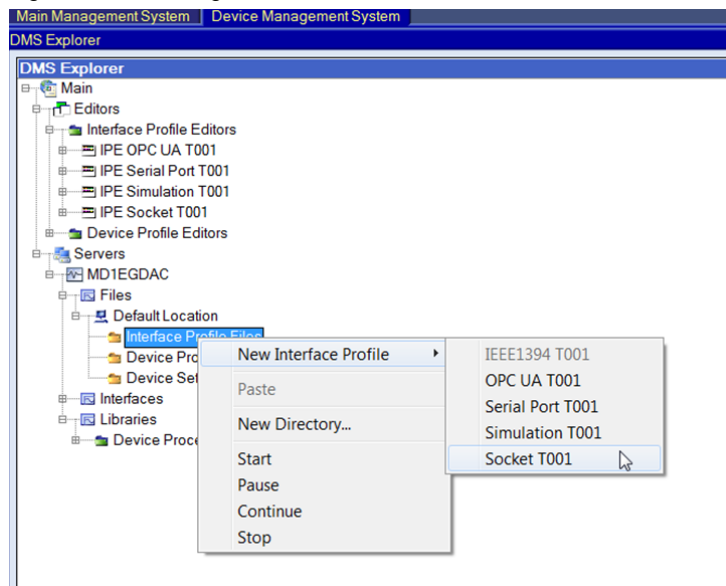
Figure 2-18: Starting Main Profile



2.2.3 Device Management System

1. Switch to the Device Management System and create a new Interface Profile from type Socket T001 by using the context menu as shown in Figure 2-19.

Figure 2-19: Creating Interface Profile



2 Configuration and Programming

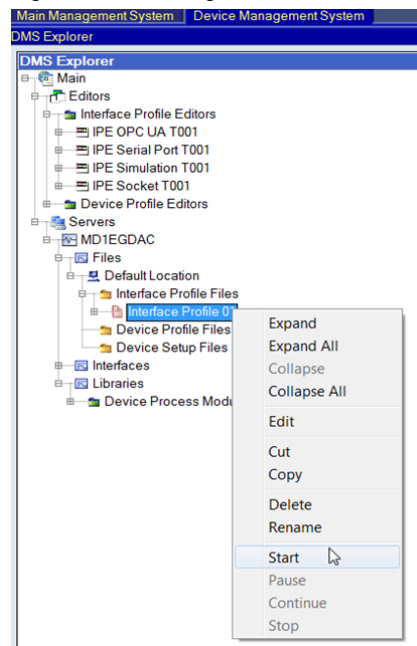
2. Create a new connection in this interface profile. Enter the IP-Address of the CPU 416-3 PN/DP PN-IO Module and also the Command Port and the Data Port which were used as inputs of FB3 in OB36. Choose UDP as connection type and ensure that the checkbox "Enabled" is set. Save the edited interface profile and start it as shown in Figure 2-21.

Figure 2-20: Editing the Interface Profile

Interface Profile Settings		
No.	Parameter	Value
1	Target Name	MD1EGDAC
2	Storage Path	Default Location
3	Creation Date	N/A
4	Modification Date	N/A
5	Target Interface Name	Socket T001
6	Profile Description	
7	Company Name	
8	Author Name	

Connections						
No.	Enabled	IP Address	Command Port	Data Port	Connection Type	Time Domain
1	<input checked="" type="checkbox"/>	10.119.53.226	2000	2001	UDP	Unique
2	<input type="checkbox"/>	0.0.0.0				

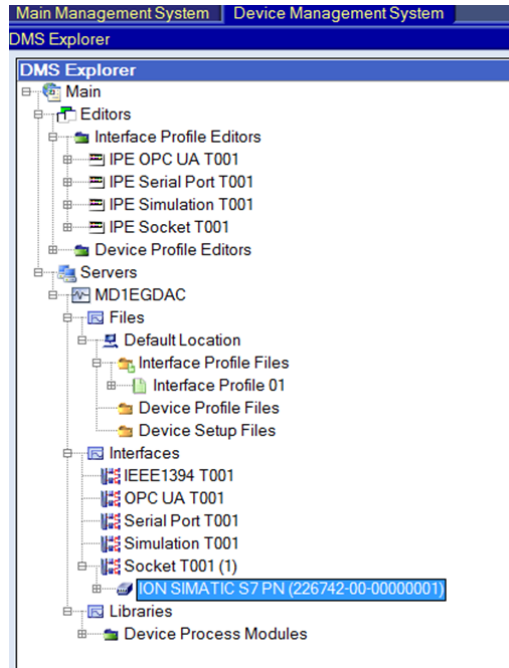
Figure 2-21: Starting the Interface Profile



2 Configuration and Programming

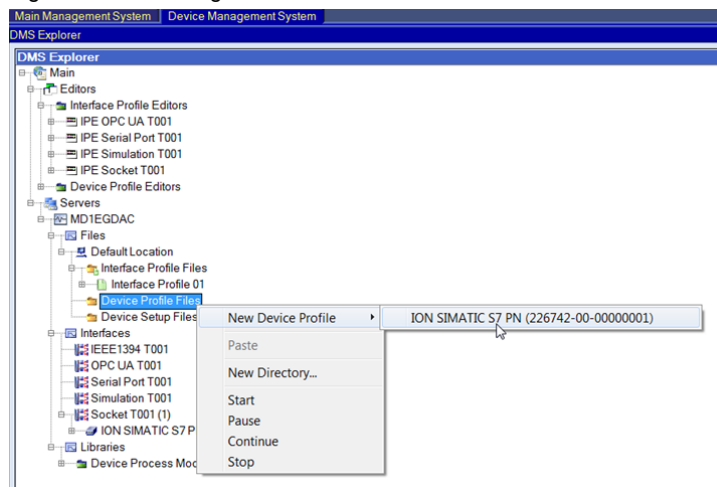
3. If the interface profile has started successfully it will get a green icon and the ION SIMATIC S7 PN appears in the directory Interfaces>Socket T001:

Figure 2-22: ION SIMATIC S7 PN appears after Starting the Interface Profile



4. Create a new Device Profile for the ION SIMATIC S7 PN by using the context menu:

Figure 2-23: Creating Device Profile



2 Configuration and Programming

5. Edit the Message Channel Content of the Device Profile. Use the crosshair cursor in order to set the beginning of each channel. The necessary Device Profile for this example is shown in Figure 2-25.

Figure 2-24: Editing the Device Profile

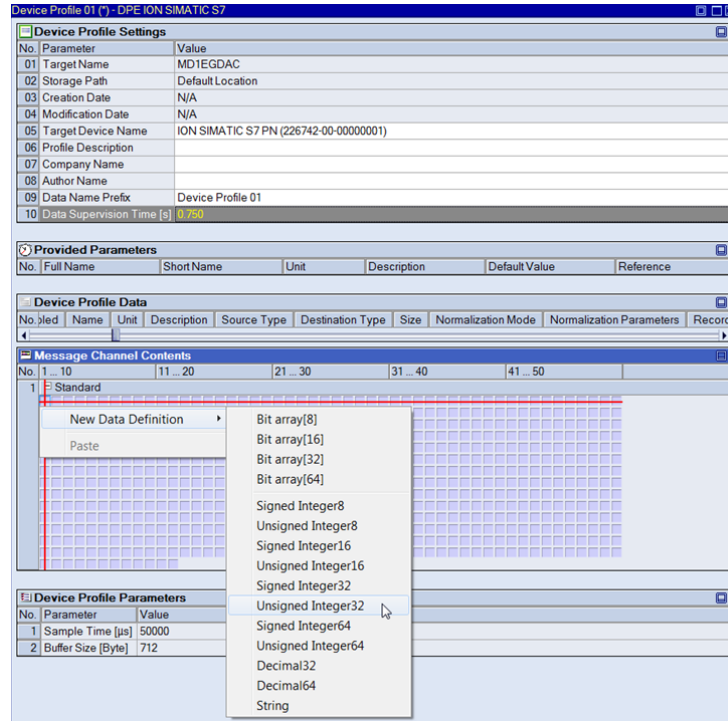
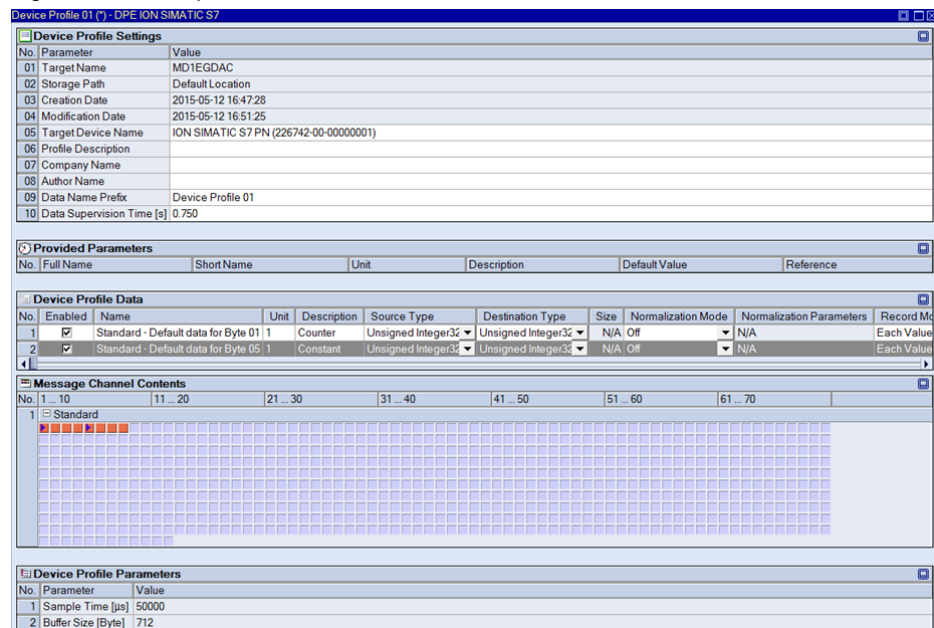
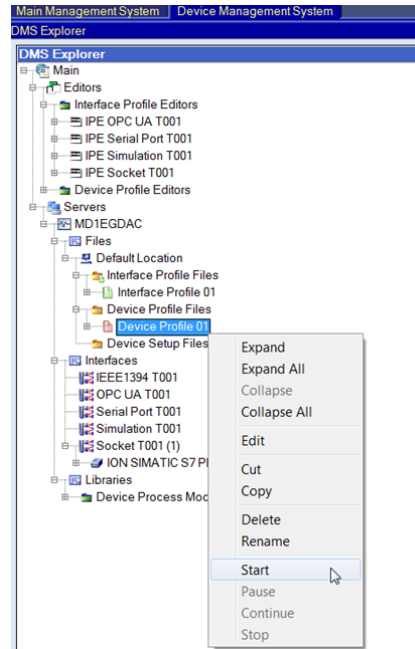


Figure 2-25: Example Device Profile



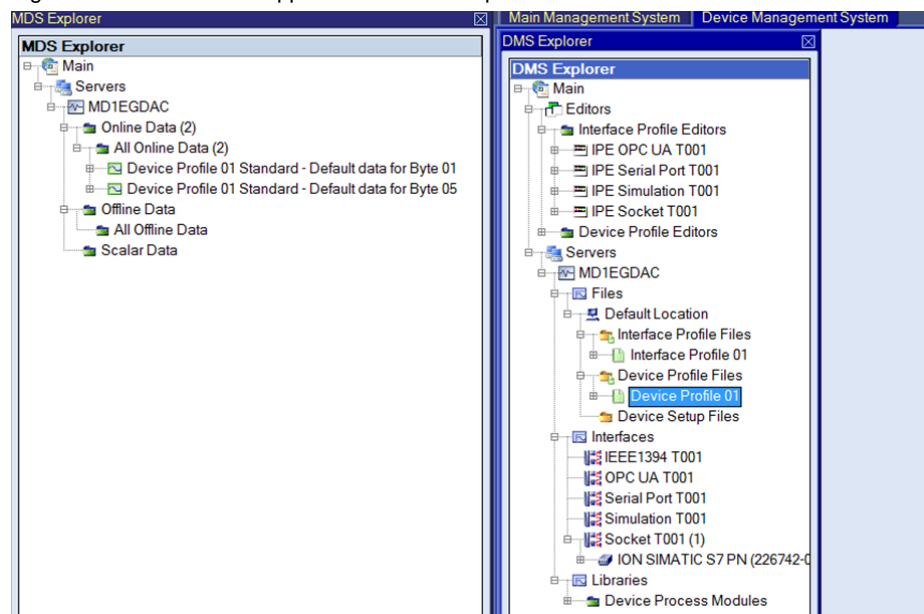
6. Save the Device Profile and start it in the Device Management System by using the context menu:

Figure 2-26: Starting the Device Profile



7. The Online Data of the ION SIMATIC S7 PN appear in the MDS Explorer when the Device Profile is started successfully.

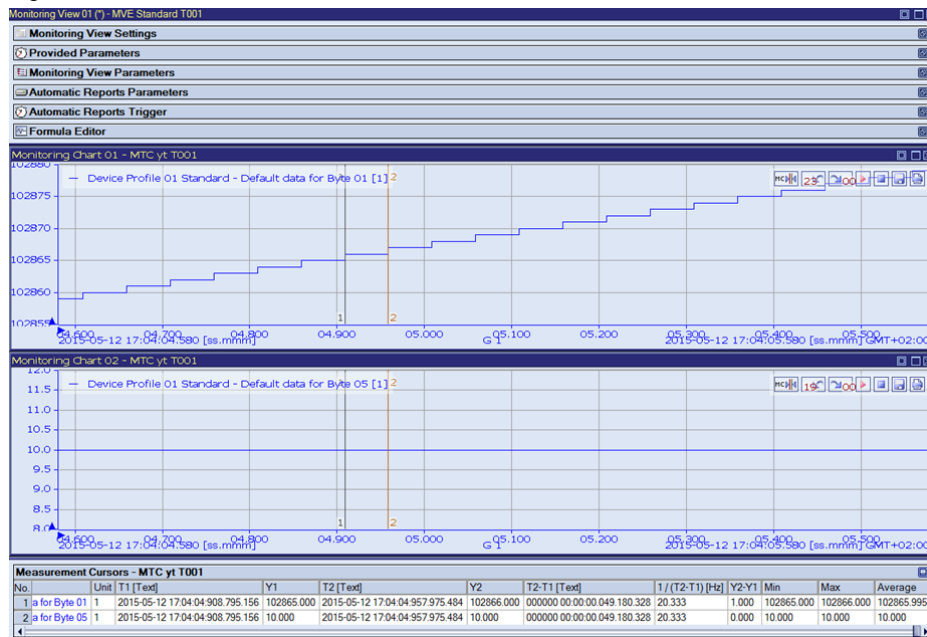
Figure 2-27: Online Data appear in the MDS Explorer



2.2.4 Visualization of the Online Data

Visualize the incoming data from the ION SIMATIC S7 PN in the Monitoring System. X-Tools receives a value which increases each 50ms and a second constant value of 10. These are the data which are transmitted by the OB36 of the S7 CPU.

Figure 2-28: Visualization of the Online Data



3 Contact Information

Should you have any questions concerning the software application, please refer to the Industry Sector Technical Support.

Department

Siemens AG
Industry Sector

Phone

+49 (0) 911 895 7222 (Monday to Friday, 09:00 am to 05:00 pm CET/CEST)

Fax

+49 (0) 911 895 7223

Internet

<https://support.industry.siemens.com/cs/>

Thank you for using one of the above mentioned contacts to ensure your inquiry is registered and can be processed.

4 History

Version	Date	Modifications
V1.0	05/2015	First version