Application example • 05/2016

SIMATIC NET OPC Server Implementation

PDI HMI@F&B

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1 Overview of a plant wide automation concept for Food and Beverage Industry

In the Food and Beverage Industry there is substantial room for improvement, to increase the efficiency and effectiveness of existing and planned new production lines.

An essential contribution to this will provide the integrated linking of production lines and machines from the inbound of raw material to production, packaging up to the outgoing goods, as well as the consistent recording of production parameters like quantities, machine time, etc. These data can be analyzed at management systems and sustainable measures for improvement can be initiated.

Today this partly causes big efforts, because machines and components of different manufacturers have to be linked and the collected data has to be synchronized. Therefore a plant wide integration concept for line integration from Siemens AG includes the machine level, supervisory systems up to MES (Manufacturing Execution System) from incoming goods across food processing and food packaging areas to outgoing goods and storage.

This concept contains different modules such as Line Monitoring, Line Control and Line HMI (Human Machine Interface). One of such modules is the machine interface, which is described herein.

Brief architecture description

The following picture gives an overview about the communication between line HMI and machines. PDI interface module provides several interfaces Data Blocks (DB) for SIMATIC PLCs and SIMOTION programs (PR) and the corresponding WinCC structures.

Based on requirement, OEM can choose and implement the interface at the machine level controller and WinCC can access the machine data via structured tags. Using WinCC faceplates the machine information is visualized.

Figure 1-1 Communication topology
2 General requirements

Prerequisite

PDI V2 must be implemented in all unit controllers and controllers must have Ethernet connectivity to SIMATIC NET OPC Server.

Hardware and Software requirements

- Software SIMATIC NET V12 SP2 which is released with WinCC V 7.3.
- SIMATIC NET V12 SP2 should be installed on WinCC Server.

Layout overview of a Line HMI

Figure 2-1 S88 levels

In the picture above a schematic structure of a PDI Line HMI project is shown. The green colored symbols are available as a PDI Line HMI template, and can be used with or without modifications. The usage of the HMI templates is described in detail in further chapters.
3 SIMATIC NET OPC Server Configuration

3.1 Configuration of OPC symbol file for SIMATIC PLCs

There are predefined SIMATIC NET OPC Symbol files available for S7-300, S7-400, S7-1200 and S7-1500 PLCs which can be downloaded from the Siemens Industry Online Support:

Line HMI Library for TIA in the Food & Beverage Industry

ATI files are named “S7<PLC type 1>_S7<PLC type 2>_<PDI name>.ATI” and work only for PLC type 1 and PLC type 2 because of PLC type’s specific settings in the variable’s runtime name. The symbol file is structured hierarchically and has a structure similar to PDI data blocks.

3.1.1 Modification of OPC symbol files

The predefined SIMATIC NET OPC Symbol files need to be adapted to PLC’s IP address and DB number and to the project’s hierarchy names. The ATI files can only be opened with Symbol editor which is automatically installed with SIMATIC NET.

For modification of IP address each variable’s Runtime name need to be adapted. This can be done manually as shown below.

Figure 3-1 Modification of IP address in ATI file

For modification of DB number each variable’s Runtime name need to be adapted. This can be done manually as shown below.

Figure 3-2 Modification of DB number in ATI file
For modification of project's hierarchy the below shown structure of Plant, Area, Line and Unit need to be adapted. This can be done manually as shown below.

Figure 3-3 Modification of plant hierarchy in ATI file

Alternatively the OPC Symbol file can be exported as csv file and modified in Microsoft® Excel or Notepad and reimported again.

Figure 3-4 Export/Import OPC Symbol file
3.2 Configuration of OPC symbol file for SIMOTION controllers

3.2.1 Generate OPC export from SIMOTION Scout engineering

For SIMOTION the OPC symbol file is generated from SIMOTION Scout engineering. There are several steps necessary to perform the OPC export successfully.

1. Create a new watch table as shown below.

2. Name the watch table.
3. Mark and copy the PDI in “PROGRAMS”.

4. Paste to new watch table.

Figure 3-7 Copy PDI in “PROGRAMS” and paste to watch table

5. Redo for all PDIs which should be exported.

6. Click on menu “Options” and choose the command “Export OPC data”.

Figure 3-8 Menu “Options” and “Export OPC data”
7. Select Data for Export settings as shown below (1) and click on “OK”.
8. Browse path for target directory (2) and click on “OK”.
9. Select “TCP/IP” for Protocol and select the Interface which is connected to SIMATIC NET OPC Server (3) and click on “OK”.
10. Click on “No” for no gateway (4).

11. See OPC data export status display for successful export.

Figure 3-9 Export parameter

Figure 3-10 OPC data export status display
12. The exported files need to be copied to SIMATIC NET OPC Server.

13. Open the STI file with symbol editor on SIMATIC NET OPC Server and save it again as ATI file.

14. The file “OPC_AE.xml” need to be copied to “C:\ProgramData\Siemens\SIMATIC.NET\opc2\binS7\simotion\xml\OPC_AE.xml” on SIMATIC NET OPC Server.

15. When several “OPC_AE.xml” files exist from different SIMOTION controllers then these files need to be merged using SIMOTION OPC File Manager on SIMATIC NET OPC Server.

16. Click on “add” to select OPC_AE.xml of all SIMOTION controller’s OPC export.

17. Click on “Create output file” to merge all OPC_AE.xml to one file which is stored in the Destination path. Do not change Destination path folder.

Figure 3-11 Simotion OPC File Manager
3.3 Merging of OPC symbol files

The OPC symbol files need to be merged to one file for use in SIMATIC NET OPC Server. The OPC symbol file can be exported as csv file.

1. Export all OPC symbol files as csv file
2. Open Symbol Editor and import all csv files step by step

Figure 3-12 Export/Import OPC Symbol file

3. Open Symbol Editor and import all csv files step by step.

Figure 3-13 Merged OPC file

4. Save the ATI file with specific name e.g. the plant name.
3.4 Implementation of OPC symbol files

The merged OPC symbol file needs to be implemented in SIMATIC NET OPC Server.

1. Open “Communication Settings” and select “Shut down OPC Servers” (1).
2. Click on “Stop” (2) to shut down OPC Servers and wait until box appears (3), then click on “OK”.

![SIMATIC NET Communication settings - Shut down OPC Servers](image)

3. Select the entry “Symbols” (4) in folder „OPC settings“.
4. Double click in line below “Active symbol files” (5).
5. At “File name” click on “…“ button (6) on the right and select merged symbol file.
6. Click at “Additional settings for SIMOTION“ and select SIMOTION module.
7. Select the network access point (7) which is connected to the SIMOTION controllers and click on “Apply” button.

![Communication settings](image)
8. Select the folder “Access points” (8).
9. Select for “CP_PN_1” (9) the network access point (10) which is connected to the SIMATIC PLCs and click on “Apply” button.

Figure 3-16 SIMATIC NET Communication settings – Access point “CP_PN_1”
10. For connection and quality check open SIMATIC NET’s “OPC Scout V10”.
11. Expand the folder “OPC_SimaticNET > \SYM” (11).
12. Browse to specific variables, select them and drag and drop them to DA view window below (12).
13. Click on “Monitoring ON” (13) and check quality of variables.

Figure 3-17
# 4 Abbreviations

Table 4-1: Abbreviations

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<thead>
<tr>
<th>Abbreviation</th>
<th>Explanation</th>
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<tbody>
<tr>
<td>DB</td>
<td>Data Block</td>
</tr>
<tr>
<td>F&amp;B</td>
<td>Food and Beverage</td>
</tr>
<tr>
<td>EM</td>
<td>Energy Management</td>
</tr>
<tr>
<td>FPT</td>
<td>Face</td>
</tr>
<tr>
<td>HMI</td>
<td>Human Machine Interface</td>
</tr>
<tr>
<td>IF</td>
<td>Interface</td>
</tr>
<tr>
<td>KPI</td>
<td>Key Performance Indicator</td>
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<tr>
<td>LM</td>
<td>Line Monitoring</td>
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<tr>
<td>LMS</td>
<td>Line Monitoring System</td>
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<tr>
<td>OMAC</td>
<td>Open Modular Architecture Controls</td>
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<tr>
<td>OPL</td>
<td>Optimized Packaging Line</td>
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<tr>
<td>PLC</td>
<td>Programmable Logic Controller</td>
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<tr>
<td>PDI</td>
<td>Plant Data Interface</td>
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<td>Plant Communication Concept</td>
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5 Related literature

Table 5-1

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<tr>
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6 History

Table 6-1

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<td>First version</td>
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