Technical Guides

AC500

Scalable PLC for Individual Automation

How to use OPC Server

![Diagram of CoDeSys Programming, OPC Configurator, and PLCs]

CoDeSys Programming

OPC Configurator

OPC Server

CoDeSys Gateway server

Visualization 1

Visualization 2

OPC Client 1

OPC Client 2

COM / DCOM

Local or TCP/IP

Serial, TCP/IP

PLC 1

PLC x

c:\ProgramData\Gateway Files\ *.sdb

 tempor. folder

*.sdb

*.sym

Login

Upload

Sym. files for projects on PLC 1 and/or PLC x

Optional

Login

Login

Optional

*.sdb

*.sdb

*.sdb

*.sdb
Content

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1.1 For customers domiciled outside Germany/
Für Kunden mit Sitz außerhalb Deutschlands

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not apply in the case of intention or gross negligence. The present declaration shall be governed by and
construed in accordance with the laws of Switzerland under exclusion of its conflict of laws rules and of the

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oder den in dieser Datei enthaltenen Dateien wird ausgeschlossen. Der Haftungsausschluß gilt jedoch nicht
in Fällen des Vorsatzes, der groben Fahrlässigkeit, bei Ansprüchen nach dem Produkthaftungsgesetz, im
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system showing a possible kind of operation of it. These are only examples of the programming features and
in no way working solutions. No warranty can be accepted.
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control system. In case of a partial or complete adoption of programming samples no resulting claims may be
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breach of an essential contractual obligation. In case of breach of an essential contractual obligation the
liability will, however, be limited to compensation for the foreseeable damage, that is typical for this type of
contract in as far as no other exceptions are listed under sentence 2 of this subparagraph is present at the
same time. An amendment of the burden of proof to the disadvantage of the user shall not be associated
with this.
German substantive law shall apply excluding the UN Convention on the International Sale of Goods."
## 2 Introduction

This note describes the use of server OPC V2 and V3 in the practice.

### 2.1 Documents reference

The following documents include useful information and instruction of OPC:

<table>
<thead>
<tr>
<th>File name</th>
<th>Comment</th>
<th>Where to find</th>
</tr>
</thead>
<tbody>
<tr>
<td>REF1 OPC_V3_how_to_use_E.pdf, OPC_V3_how_to_use_D.pdf</td>
<td>OPC V3</td>
<td>C:\Program Files\ABB\CoDeSys OPC Server 3 AE</td>
</tr>
<tr>
<td>REF2 AeConfigurator_UserGuide.pdf</td>
<td>OPC V3</td>
<td>C:\Program Files\ABB\CoDeSys OPC Server 3 AE</td>
</tr>
<tr>
<td>REF3 ReadMe.rtf, ReleaseNotesOPCV3 AE for HA</td>
<td>OPC V3</td>
<td>Installation ABB DM Suit 1.0.: PLC - AC500\OPC Server\OPC-ServerV3.xAE</td>
</tr>
<tr>
<td>REF4</td>
<td>OPC V3</td>
<td>Installation ABB DM Suit 1.0.: PLC - AC500\OPC Server\OPC-ServerV3.xAE</td>
</tr>
<tr>
<td>REF5 Online Help of PS501</td>
<td>general</td>
<td>Online Help of PS501</td>
</tr>
<tr>
<td>REF6 OPC_20_how_to_use_E.pdf, OPC_20_how_to_use_D.pdf</td>
<td>OPC V2</td>
<td>C:\Program Files\3S Software\CoDeSys\OPC</td>
</tr>
<tr>
<td>REF7 HA_OPC_Example.pdf</td>
<td>OPC V3, HA</td>
<td>Installation CD PS501: ?? \CD_AC500\Projects\Examples\High_Availability_OPCV3</td>
</tr>
<tr>
<td>REF8 First Steps with DigiVis500 and CoDeSys OPC Server 3.pdf</td>
<td>OPC V3, DigiVis500</td>
<td>Installation CD DigiVis500 SP2: \DigiVis500 SP2\Tutorial</td>
</tr>
</tbody>
</table>

Additional documents are in chapter Hints.
2.2 Work flow

2.2.1 Consideration and Preparation

Choose the suitable OPC Server for the target OPC client

Are current OPC versions installed?

No

Install it from the current CBP version (ABB DM Suit version)

Yes

CoDeSys Settings

See Hints, When using OPC server V2 or V3

See Hints, OPC Server versions and OPC tools

See Hints, Installation OPC Server
2.2.2 Commission OPC server

CoDeSys Settings

Define OPC items separately in Global Variables

Configure Symbol file

CPU FW V2 and download file to PLC?

Yes

Active „Download symbol file“

No

Build, download and flash program

OPC Configuration

In REF7 and REF8 there are examples about how to commission OPC communication step by step.

See REF5 See Hints, Configure symbol file

See Hints, Create and Download symbol file

Check *.sym file in project folder. Check the date of *sdb in /Gateway

See Hints, Create and Download symbol file

Build, download and flash program

Check *.sym file in project folder. Check the date of *sdb in /Gateway
OPC Configuration

Configure OPC server
Check OPC function

OPC 3 and need AlarmEvent?

Yes

Configure AlarmEvent
Check larmEvents

No

Adjustment to target OPC client

- See Hints, Configure OPC Server
- See REF5 for detailed instruction

See REF2
See Hints
Check AlarmEvents
2.2.3 Adjustment to target OPC client

Adjustment to target OPC client

Assign OPC server program to user

Register OPC server as system service for user

Test with target OPC client

End

See REF 4
See Hints, Configure User account for OPC server
3 Hints

3.1 When using OPC server V2 or V3

<table>
<thead>
<tr>
<th>Required functions of the OPC Client</th>
<th>OPC Server V2</th>
<th>OPC Server V3</th>
<th>Hints</th>
</tr>
</thead>
<tbody>
<tr>
<td>Support Win XP, Win 7 32Bit, Win7 64Bit, Windows Server 2003, Windows Server 2008</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>OPC client runs as service</td>
<td>-</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Support Alarm/Event</td>
<td>-</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Support AC500 HA</td>
<td>-</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>OPC-Performance</td>
<td>-</td>
<td>faster</td>
<td></td>
</tr>
</tbody>
</table>

Comparison with OPC Server V2 to V3: Transmission rate

| Support VB, VBA OPC clients (Automation Interface, Automation Wrapper) | X | X |       |

OPC Server V3 supports also VBA OPC Clients, but OPC Server V2 must be installed also because of a otherwise missing DLL

| Resources friendly to old OPC clients, which support only the old OPC DA 1.0a (Async I/O 1.0a) groups. | X | X |       |

See Hints, Behaviour OPC Server V3 via Interface IOPCAsyncIO

| Simulation without AC500 | - | X |       |

If several OPC clients are used at the same time, they must run in the same session.
See Hints, Session isolation

3.2 OPC Server versions and OPC tools

<table>
<thead>
<tr>
<th>OPC Server V2</th>
<th>CBP V2.3.0</th>
<th>CBP V2.2.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>CoDeSysOPC.exe</td>
<td>V2.3.13.11</td>
<td>V2.3.13.8</td>
</tr>
<tr>
<td>OPCConfig.exe</td>
<td>V2.3.13.11</td>
<td>V2.3.13.7</td>
</tr>
<tr>
<td>OPCConfig_e.exe</td>
<td>V2.3.13.11</td>
<td>V2.3.13.7</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>OPC Server V3</th>
<th>CBP V2.3.0</th>
<th>CBP V2.2.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>WinCoDeSysOPC.exe</td>
<td>V3.5.2.0</td>
<td>V3.4.4.10</td>
</tr>
<tr>
<td>OPCConfig.exe</td>
<td>V3.5.2.0RC ??</td>
<td>V3.4.4.10</td>
</tr>
<tr>
<td>AEConfiguration.exe</td>
<td>V1.0.0.3</td>
<td>V1.0.0.3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CoDeSys gateway server</th>
<th>CBP V2.3.0</th>
<th>CBP V2.2.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gateway.exe</td>
<td>V2.3.9.28</td>
<td>V.3.9.9.24</td>
</tr>
</tbody>
</table>

3.3 Default folder and contents

3.3.1 Win7 64Bit, Windows Server 2008 64Bit

<table>
<thead>
<tr>
<th>OPC Server V2</th>
<th>Win7 64Bit, Windows Server 2008 64Bit ??</th>
</tr>
</thead>
<tbody>
<tr>
<td>CoDeSysOPC.exe</td>
<td>c:\Program Files (x86)\3S Software\CoDeSysOPC\</td>
</tr>
<tr>
<td>OPCConfig.exe</td>
<td></td>
</tr>
<tr>
<td>OPCConfig_e.exe</td>
<td></td>
</tr>
</tbody>
</table>
### OPC Server V3

<table>
<thead>
<tr>
<th>Win7 64Bit, Windows Server 2008 64Bit ??</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>OPC CoDeSysOPC.exe</strong></td>
</tr>
<tr>
<td><strong>OPCConfig.exe</strong></td>
</tr>
<tr>
<td><strong>AEConfiguration.exe</strong></td>
</tr>
<tr>
<td><strong>CoDeSys_OPC_Server_V3_User_Guide.pdf</strong></td>
</tr>
<tr>
<td><strong>CoDeSys_OPC_Server_V3_Benutzerhandbuch.pdf</strong></td>
</tr>
<tr>
<td><strong>AeConfigurator_UserGuide.pdf</strong></td>
</tr>
<tr>
<td><strong>OPCServer.ini</strong></td>
</tr>
<tr>
<td><strong>OPCServerA.ini</strong></td>
</tr>
<tr>
<td><strong>OPCServer.log</strong></td>
</tr>
<tr>
<td>**Symbol file <em>.SDB, <em>.SYM</em></em></td>
</tr>
<tr>
<td>*<em>Symbol file <em>.SDB</em></em></td>
</tr>
<tr>
<td><strong>Gateway.exe</strong></td>
</tr>
</tbody>
</table>

### OPC Server V2

<table>
<thead>
<tr>
<th>Win7 32Bit, Windows Server 2008 32Bit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CoDeSysOPC.exe</strong></td>
</tr>
<tr>
<td><strong>OPCConfig.exe</strong></td>
</tr>
<tr>
<td><strong>OPCConfig_e.exe</strong></td>
</tr>
<tr>
<td><strong>OPC_20_how_to_use_D.pdf</strong></td>
</tr>
<tr>
<td><strong>OPC_20_how_to_use_E.pdf</strong></td>
</tr>
<tr>
<td><strong>CoDeSysOPC.ini</strong></td>
</tr>
<tr>
<td><strong>OPCServer.log</strong></td>
</tr>
<tr>
<td>**Symbol file <em>.SDB, <em>.SYM</em></em></td>
</tr>
<tr>
<td>*<em>Symbol file <em>.SDB</em></em></td>
</tr>
<tr>
<td><strong>Gateway.exe</strong></td>
</tr>
</tbody>
</table>

### OPC Server V3

<table>
<thead>
<tr>
<th>Win7 32Bit, Windows Server 2008 32Bit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>WinCoDeSysOPC.exe</strong></td>
</tr>
<tr>
<td><strong>OPCConfig.exe</strong></td>
</tr>
<tr>
<td><strong>AEConfiguration.exe</strong></td>
</tr>
<tr>
<td><strong>CoDeSys_OPC_Server_V3_User_Guide.pdf</strong></td>
</tr>
<tr>
<td><strong>CoDeSys_OPC_Server_V3_Benutzerhandbuch.pdf</strong></td>
</tr>
<tr>
<td><strong>AeConfigurator_UserGuide.pdf</strong></td>
</tr>
<tr>
<td><strong>OPCServer.ini</strong></td>
</tr>
<tr>
<td><strong>OPCServerA.ini</strong></td>
</tr>
<tr>
<td><strong>OPCServer.log</strong></td>
</tr>
<tr>
<td>**Symbol file <em>.SDB, <em>.SYM</em></em></td>
</tr>
<tr>
<td>*<em>Symbol file <em>.SDB</em></em></td>
</tr>
<tr>
<td><strong>Gateway.exe</strong></td>
</tr>
</tbody>
</table>

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Application Example - 11 -

AC500/Issue: 10.2013
### 3.3.1 WinXP 32Bit, Windows Server 2003 32Bit

<table>
<thead>
<tr>
<th>OPC Server V2</th>
<th>Win7 32Bit, Windows Server 2003 32Bit</th>
</tr>
</thead>
<tbody>
<tr>
<td>CoDeSysOPC.exe</td>
<td>c:\Program Files\3S Software\CoDeSysOPC\</td>
</tr>
<tr>
<td>OPCConfig.exe</td>
<td></td>
</tr>
<tr>
<td>OPCConfig_e.exe</td>
<td></td>
</tr>
<tr>
<td>OPC_20_how_to_use_D.pdf</td>
<td></td>
</tr>
<tr>
<td>OPC_20_how_to_use_E.pdf</td>
<td></td>
</tr>
<tr>
<td>CoDeSysOPC.ini</td>
<td></td>
</tr>
<tr>
<td>OPCServer.log</td>
<td></td>
</tr>
<tr>
<td>Symbol file &quot;*.SDB, *.SYM&quot;</td>
<td>CBP open, after Project build or rebuild all: in the project folder</td>
</tr>
<tr>
<td>Symbol file &quot;*.SDB&quot;</td>
<td>after login in AC500: c:\WINDOWS\Gateway Files\</td>
</tr>
<tr>
<td></td>
<td>after start CoDeSys OPC Server c:\WINDOWS\Gateway Files\Upload\</td>
</tr>
<tr>
<td>Gateway.exe</td>
<td>c:\Windows\System32\Gateway.exe</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>OPC Server V3</th>
<th>Win7 32Bit, Windows Server 2008 32Bit</th>
</tr>
</thead>
<tbody>
<tr>
<td>WinCoDeSysOPC.exe</td>
<td>c:\Program Files\3S CoDeSys\CoDeSys OPC Server 3\</td>
</tr>
<tr>
<td>OPCConfig.exe</td>
<td></td>
</tr>
<tr>
<td>AEConfiguration.exe</td>
<td></td>
</tr>
<tr>
<td>CoDeSys_OPC_Server_V3_User_Guide.pdf</td>
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<tr>
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</tr>
<tr>
<td>Symbol file &quot;*.SDB&quot;</td>
<td>after login in AC500: c:\WINDOWS\Gateway Files\</td>
</tr>
<tr>
<td></td>
<td>after start CoDeSys OPC Server c:\WINDOWS\Gateway Files\Upload\</td>
</tr>
<tr>
<td>Gateway.exe</td>
<td>c:\Windows\System32\Gateway.exe</td>
</tr>
</tbody>
</table>

---

**NOTICE**

If you can not find the folder c:\ProgramData\ you have to set the Control Panel\All Control Panel Items\Folder Option to "Show hidden files, folders and drives".
3.4 Installation OPC Server

Here is described how the server OPC V2 and V3 (without CBP V2.3.0) are installed.

Before you can do this, you must close all OPC clients, the ABB OPC Tunnel and the gateway (CoDeSys gateway server) on your PC. Check this with the Windows Task-Manager.

The processes of
- Gateway.exe
- CoDeSysOPC.exe
- WinCoDeSysOPC.exe
- OCTsvc.exe
must have disappeared.

If not:
- End the processes with the Windows Task-Manager.
- Stop the ABB OPC Tunnel Windows Component Service, Services (local).

3.4.1 OPC Server V2 and CoDeSys gateway server

Install the OPC server V2 directly from the folder on the CBP V2.3.0 (ABB DM Suit 1.0.). With this the OPC server V2 and the current gateway.exe are installed and registered.
3.4.2 OPC Server V3

Install the OPC server V3 directly from the folder on the CBP V2.3.0 (ABB DM Suit 1.0.). With this the OPC server V3 is installed and registered.

NOTICE

The gateway (CoDeSys gateway server) is not installed or renews with the installation of the server OPC V3. You can install the gateway about the installation of the server OPC V2 (see above). Servers OPC V2 and V3 can be installed in parallel.

3.4.3 Manual Registration and Unregistration

During the installation with CBP V2.3.0 (ABB DM Suit 1.0.) all needed files are installed for OPC and the OPC Server is registered automatically as user application.

Further on there is the possibility to register resp. to uninstall the OPC Server manually either as COM Server (user application) or as service.

TIP

Register the OPC server in the registry as interactive software with command:

For OPC 3: WinCoDeSysOPC/RegServer
For OPC 2: CoDeSysOPC/RegServer

Register the OPC server as system service with command:

For OPC 3: WinCoDeSysOPC/Service

Unregister the OPC server from registry and from service entry with command:

For OPC 3: WinCoDeSysOPC/UnRegServer
For OPC 2: CoDeSysOPC/UnRegServer

Please see REF1 chapter 3 (OPC 3) and REF6 chapter 2.2 (OPC 2) for details.
3.4.3.1 Example Register OPC server V3 as system service

**CAUTION!**
Close all programs, processes and services which access the OPC server before do the following work.
Before registering the OPC server as system service, it must be unregistered first.

1. Start the Command Prompt with command “cmd” in the Start→Run... window.

2. Go to the CoDeSysOPC V2 installation folder.
3. Unregister the OPC server with WinCoDeSysOPC/UnRegServer.
4. Register the OPC server as system service with WinCoDeSysOPC/Service

3.4.4 OPC clients for tests

Copy the OPC clients for tests into a folder on the PC. The OPC clients work without installation.
3.5 CoDeSys Settings

Refer to REF5 Online help chapter OPC for details.

3.6 Symbol file

3.6.1 Configure symbol file

Symbol includes the items (variables) which exchanges with PLC, this is needed for OPC communication. After build the project, two symbol files will be generated under the project (.pro) folder. One is .sdb, another is .sym.

File .sdb is a binary file and is needed by OPC server indeed. File .sym has the same content but in text, which can be understood by human. It can be used to check if it is generated correctly.

Please refer to REF5 Online help for how to configure CoDeSys for symbol file.

Start of the Symbol configuration with Project, Options, checkbox "Dump symbol entries" must be enabled, Configure symbol file …
Sometimes the symbol file looks different than really configured, e.g. more symbols than expected. In such case please follow the steps to create a clean symbol file:

1. Go to Project → Options → Symbol configuration → Configure symbol file...
2. Uncheck all the options in Symbol file configuration, and confirm with OK and OK again (2 times OK).
3. Go to Project → Options → Symbol configuration → Configure symbol file… again, first choose the variables which should be communicated as symbol:
4. Then check the following options:

5. Confirm it with two times OK again and you can rebuild the project.

3.6.2 Create and download symbol file

For CPU with FW V1:
If PLC hardware is available, please use "login / download program" to copy the .sdb file automatically into Gateway folder, e.g. "C:\WINNT\Gateway Files".
If there is no PLC, the .sdb file should be copied into Gateway folder by hand.
When OPC server is started, the .sdb file will be copied to e.g. "C:\WINNT\Gateway Files\Upload" for Gateway communication.

For CPU with FW V2:
Following option can be chosen to download the .sdb file also to PLC.
When OPC server is started, the .sdb file will be copied from PLC (if available) or from Gateway folder to "C:\WINNT\Gateway Files\Upload" for Gateway communication.

**NOTICE**
Do not configure the program as a cyclic program, please use a task configuration. Call the PLC Browser and have a look to the task time (command “tsk in the command line). For example the program has a cycle time of 40ms, use a task time of 50 or 60ms. So the CPU has time to answer the OPC request from the OPC Server between the tasks.

### 3.7 Configure OPC Server

#### 3.7.1 Configure OPC Server V2

Start 3S Software/Communication/CoDeSysOPC Configurator

![Image of OPC Configurator interface](image)

Update Rate may not be 0 (ms)! The default value of 200 ms is suitable value of many applications. The adjustment for the Update Rate depends on the number of symbols (variables). For a big number of symbols it can be better to increase the update rate.

![Image of OPC Configurator settings](image)

If *.sdb in the Gateway Files on PC, the project name must be identical with project name in CoDeSys. The extension is not necessary.

If *.sdb on AC500 V2.x, the project name is not required (can be empty).
The checkboxes “Active”, “Motorola Byteorder” and “No Login-Service” must be checked.

The checkbox “Enable logging” allows a later diagnosis.

Setup Connection: Click on Connection, Click on Edit, choose a channel of the Channel list (normally the channel which is used for programming) or click new

Define Name and click to TCP/IP

Double click to value field after Address (192.168.0.10). Fill in Address and end with Return

Previous settings of gateway channels are only visible, after the first time the connection has been built up.

See Ref 5: CoDeSys, Help, Contents, System Technology, OPC, Use of the CoDeSys OPC server, Configuration of the OPC server with OPCconfig.exe

If more than one PLC, then repeat for the other PLCs

Save the configuration in Menu „File“ and then „Exit“. 
3.7.2 Configure OPC Server V3

Start 3S CoDeSys/CoDeSysOPC Server V3/OPC Configurator

The current configuration of the OPCServer.ini is shown.

If the configuration is needed furthermore, store it under a new name.

NOTICE

Update Rate may not be 0 (ms)! The default value of 200 ms is a suitable value for many applications. The adjustment for the Update Rate depends on the number of symbols (variables). For a big number of symbols it would be better to increase the update rate.
If the *.sdb files should be loaded from the “Gateway Files” directory on PC, the project name must be identical with project name in CoDeSys. The extension is not necessary.

If the symbol information should be loaded from AC500 V2.x, the project name is not required (can be empty).

The checkboxes “Active”, “Motorola Byteorder” and “No Login-Service” must be checked.

The checkbox “Enable logging” allows a later diagnosis.

Setup Connection: Click on Connection, Click on Edit, choose a channel of the Channel list (normally the channel which is used for programming) or click new

If more than one PLC, then repeat for the other PLCs
Previous settings of gateway channels are only visible, after the first time the connection has been built up.

See Ref 5: CoDeSys, Help, Contents, System Technology, OPC, Use of the CoDeSys OPC server, Configuration of the OPC server with OPCconfig.exe

Save as

Confirm Save As with “Yes”

Exit
3.7.1 Check OPC function with AC500

For check OPC function without AC500, see Examples, Test OPC Function without AC500

It is urgently recommended to check the function of the previous configuration steps.

3.7.1.1 Check OPC Server V2

Start MobileOPCEXplorer.exe, Connect CoDeSys.OPC.02, Add Group, Add Items, select Available Items in ‘Server CoDeSys.OPC.02’, Add to Tag List, Close the Item browser...

If anything is right, then is CoDeSys.OPC.02 is connected, is running and the Quality of the items is good.

With the Matrikon is it possible to read / write the values of the items.
3.7.1.2 Check OPC Server V3

Start MobileOPCExplorer.exe, Connect CoDeSys.OPC.DA, Add Group, Add Items, select Available Items in ‘Server CoDeSys.OPC.DA’, Add to Tag List, Close the Item browser…

If anything is right, then is CoDeSys.OPC.02 is connected, is running and the Quality of the items is good.

3.7.1.3 Check Processes with Windows Task Manager

Correct configuration: All processes run with the same User Name and with the same Session ID.
### 3.8 Configure AlarmEvents

Refer to REF2 AeConfigurator_UserGuide.pdf for details.

#### 3.8.1.1 Check AlarmEvents

The function of the AlarmEvents can be also checked with MatrikonOPC Explorer.

The alarm events can be simulated by writing the value of the Items.
3.9 Configure User account for OPC server

Please refer to REF3, REF4 ReadMe.rtf ReleaseNotesOPCV3 AE for HA

NOTICE

3.9.1 OPC Server V3 on Windows Server 2003 / 2008

When running the OPC Server V3 on Windows Server 2003 / 2008 multiple sessions need to be supported. Therefore the installation of the OPC server as service running with a dedicated user account is recommended.

Configuration Steps

- Create specific user, no administrator account is required
- Register V3 OPC Server as service
- Configure V3 OPC Server as service

Create Specific User

![Create Specific User](image_url)
Register OPC Server as Service

Register the OPC Server executable as service from the command line, see documentation for details

Configure the OPC Server Service

At Computer Management -> Service & Applications -> Service open the properties of the CoDeSysOPCDAService
Complete the Service Configuration

Check Users and Session during Test Cases

Check the Session ID and User Name of
- Gateway.exe,
- WinCoDeSysOPC.exe, and
- OPC Client
on different test cases like multi session with terminal service sessions
3.10 Gateway communication not possible if gateway port is used by other application

The CoDeSys Gateway Server used TCP port 1210 for communication. The gateway communication is not possible if gateway port is used by other application. It must be ensured that the required Gateway ports (1210 and 1211??) are not occupied by different processes. Otherwise the gateway communication can not be established.

Possible applications that also use port 1210 and/or 1211 are:
- Java update client??
- ABB 800xA System

If there are problems to establish gateway communication check the usage of port 1210 (via any port scanning tool, e.g. SysInternals) and close the application which uses this port.

By use of 800XA it is sometimes easier to change the port number of the gateway. In this example is the port number of the gateway changed from 1210 to a free port (for example 51000).

To do this open the registry editor (Start/execute and type regedit)

![Registry Editor Screenshot]

Change the registry key like in the screenshots from 1210 to 51000. After that must be restarted the server gateway (all applications close, task manager, processes gateway.exe close).
The port number of Gateway communication parameter must be also changed from standard port number 1210 to 51000 (in this example). The CoDeSys OPC Server Configuration (OPCConfig.exe) must be renewed to enter this change in the OPCServer.ini.
3.11 OPC server does not load the symbol file from AC500

OPC with symbol file on AC500 does not function. Indeed, the OPC server is shown, but no OPC variables are to be found.

TIP

If the OPC server does not load the symbol file (.sdb) from AC500 PLC (FW V2) to PC, the reason can be that the Programming Software 907AC1131 is installed.

Please check the registry item:

```
"HKEY_LOCAL_MACHINE\SOFTWARE\3S-Smart Software Solution GmbH\Gateway Server\Config\EnableSymbolFileUpload".
```

If this item is inside, the symbol file will not be loaded from AC500 PLC to PC. For Control Builder Plus this item must be deleted but for AC1131 this item must be available. To check this:

1. In Windows, go to Start → Run, type “regedit”:

![Regedit](image)

2. In Registry Editor, find the folder “Config”:
   - For AC500 FW V2 the item “EnableSymbolFileUpload” must be deleted.
   - For AC1131 this item must be available.
3.12 Behavior of the OPC Server V3 with DigiVis500

Setup:
- Windows 7, Professional 32 bit, SP1
- DigiVis500_SP1

With DigiVis500 installation the ABB OPC Tunnel is installed and registered automatically as service (session 0) with “Startup type: Automatic”. „Automatic“ means ABB OPC Tunnel will start as soon as the Windows system starts up.

With the start of the ABB OPC Tunnel (OCTsvc.exe), the OPCServer (WinCoDeSysOPC.exe) and also the CoDeSys gateway server (Gateway.exe) are started in session 0.

**NOTICE**
Communication of CBP or CoDeSys (session 1) with AC500 is not possible more. They need the Gateway.exe in session 1, but the CoDeSys gateway server is not able to run in multi sessions.

To use CBP or CoDeSys, the OPC tunnel service must be stopped. This can be done in Component Service, Service (local), ABB OPC Tunnel with the "Start", "Stop" buttons.

Windows Task Manager

BUBMAIN.EXE is DigiVis 500 Operation

**TIP**
An example of a working setup on one PC with CBP into a virtual machine is described in "Examples, OPC Client as a Windows service with CBP on the same PC".
3.13 Session isolation

Situation
In Windows® XP, services and user applications ran together in session 0. With Windows Server 2003, Windows Server 2008, Windows 7 services are alone in session 0. User applications run in session 1 (2 and so on).

Services:
A Windows service is a computer program that operates in the background. Windows services can be configured to start when the operating system is started or can be started manually and run in the background as long as Windows is running. They can operate when a user is not logged on.

Services are:
Windows operating systems include numerous services. OPC client like S+ OPC scanner PGIM, Aspen CIM-IO Manager, ICONICS, .. can also installed as service.

User applications are:
Microsoft Word, Notepad, MatrikonExplorer, ControlBuilderPlus.exe and Codesys.exe

The Problem
Service and user application are isolated in their session. They can not communicate with each other directly.
OPC Server uses, like the CBP and CoDeSys, the CoDeSys gateway server (gateway.exe) for the communication with the AC500 and starts the gateway in their session. That creates undefined behavior, if the OPC Server runs as a service. The CoDeSys gateway server is not able to run in multi sessions.

Resolutions
- Install all OPC clients and OPC Server, which use the CoDeSys gateway server, in the same session.
- The OPC Server as a service (session 0) may not be connected at the same time (in parallel) with an OPC server as a user application or CBP or CoDeSys (all in session 1) with the AC500. If this function is necessary, different PC or virtual machines must be used.
- Use tools like OPC tunnel. In a DigiVis 500 setup context the OPC server must not be registered as service. The OPC tunnel itself starts the OPC server within its service.

See also
http://msdn.microsoft.com/en-us/windows7trainingcourse_sessionisolation_unit
3.14 Behavior OPC Server V3 via Interface IOPCAsyncIO

Using of an OPC client (1) with the older OPC standard Interface IOPCAsyncIO (OPC DA V1.0a) creates a higher communication load on the OPC client, because the OPC-Server sends also the unchanged items in every scan cycle to the client.

Test setup:

Reason:
If OPC Items are registered via Interface IOPCAsyncIO (OPC DA V1.0a), the OPC Server sends mostly with each ready cycle a data change event, including also unchanged values. The change detection is correct when using the interface IOPCAsyncIO2 (OPC DA V2).

Workaround:
- Use the interface IOPCAsyncIO2 (OPC DA V2).
- If the OPC client does not support IOPCAsyncIO2 interface, then use the OPC Server V2. The OPC Server does not show this behavior.

OPC client (1): Visualisation software inVISU PMS (Fa. epro GmbH) uses an older standard OPC with the interface IID_IAAdviseSink than data sink.
4 Examples

4.1 Test OPC Function without AC500

The example shows, how the OPC server V2/V3 can be tested/simulated without available AC500. See attachment: OPC_Test1.zip

4.1.1 AC500 project

Collect all OPC variables in a separate Global variable list.
Configuration of the symbol files: <Project> <Options> <Symbol configuration>
the option “Dump symbol entries” must be selected. Then <Configure symbol file>

Empty symbol file: Remark all Checkboxes, OK, OK
and push „Configure Symbols“ once more

Mark the OPC_Variables and the Checkboxes.
OK
OK
In the project folder is the folder "OPC_test1__AC500_PM573_ETH__OPC_test1". It contains symbol files *.SYM and *.SDB with the time of the "Rebuild all". The items in the file *.SYM can be checked with Notepad. The binary file *.SDB contains the items for the OPC server. With <Online> <Login> will it copied in the gateway files directory and optionally on the AC500.
The folder “OPC_test1__AC500_PM573_ETH__OPC_test1” is a temporary folder, if the CBP project is opened. For the simulation of the server OPC it is copied *.SDB by hand.

4.1.2 Configure OPC Server V3

<Edit> <Append PLC>
Keep the default values.
Project name with the directory name has to be specified. Connection settings is not necessary for the simulation.

4.1.3 Configure OPC Server V2
Only the project name may be specified.

4.1.4 Check OPC Server with MatrikonOPCExplorer

OPC Server V3: Connect CoDeSys.OPC.DA, Add Group, Add Items, select Available Tags, Add to Tag List...
The OPC Server V3 (CoDeSys.OPC.DA) is connected, running and the Quality is good. One OPC client can read / write the values of the items.

Similar configuration how above. The OPC Server V2 (CoDeSys.OPC.02) is connected, running and the configured items are found. But the Quality is bad. One OPC client can not read / write the values of the items.
4.1.1 Check Processes with Windows Task Manager

Correct configuration: All processes run with the same User Name and with the same Session ID.

4.1.2 Summary

**NOTICE**

The correct function of OPC Server V2 and V3 can be checked without AC500. With OPC Server V3 with the configuration SIMULATION the Project name with the directory name has to be specified. The values of the items can be read and write by one OPC client.

With OPC Server V2, as well as with OPC Server V3 in configuration GATEWAY, only the project name may be specified. The configured items are found, but the Quality is bad. The values of the items can not be read and not write by one OPC client.

Refer to REF5 Online help chapter OPC for details.

4.2 How can one demonstrate DigiVis500 without AC500?

4.2.1 PC configuration

Windows 7 Professional, 32 Bit
OPC Server V3 version from CBP V2.2

4.2.2 DigiVis500 configuration

The DigiVis500 does not work with the local IP 127.0.0.1 (OPC-S shows an error "Invalid computer name"). So I configured PC with a fixed IP 19.168.9.253.
4.2.3 Changing the OPCconfig to Simulation mode

According to CoDeSys_CoDeSys_OPCCServer_V3_User_Guide.doc: 6.3.2 SIMULATION
In the OPC server INI file, a simulation access by Gateway V2.3 connection is configured by selecting
the interface SIMULATION and by setting the name of the symbol file in Project name. The symbol file
is automatically generated by a build command of a CoDeSys V2.3 project when in Options -> symbol
configuration the corresponding options are set. The symbol file is stored in the same directory as the
project file and has the extension SDB. If the symbol file is stored in the OPC server directory, then
the directory name has not to be specified. But it can also be copied to any location, then under
Project name the directory name has to be specified.

In this example is the *.sdb located on c:\ProgramData\Gateway Files\AC500.sdb

4.2.4 Checking with MatrikonExplorer and DigiVis500
4.3 OPC Client as a Windows service with CBP on the same PC

The example describes as DigiVis500 and CBP can be simultaneously used on a personal computer without disturbing itself (Motivation: see "Behavior of the OPC Server V3 with DigiVis500").

- DigiVis500 and OPC server V3 are installed on the host system.
- CBP, with an optional server OPC for test of the communication OPC, are installed on one virtual machine.

4.3.1 Host system

The host system contains of:

- Oracle VM Virtual Box version 4.2.18 (freeware)
- Operation System: Windows 7, Professional 32 bit, SP1
- Digivis500 Version 1.0SP2 US
  - Graphics Builder Version 1.0.7780 SP2
  - Operations Version 1.0 SP2 (7780)
  - OPC Tunnel, Softing OPC Easy Connect – OEM ABB DigiVis500 V 1.44.0.1707
- OPC Server V3 (from CBP V2.3.0, see “OPC Server versions and OPC Toolos”)
  - WinCoDeSysOPC.exe V3.5.2.0
  - OPCConfig.exe V3.5.2.0RC ??
  - AEConfiguration.exe V1.0.0.3
- CoDeSys gateway server, Gateway.exe V2.3.9.28

4.3.1.1 PC configuration

Network settings
4.3.1.2 DigiVis500 configuration

The DigiVis500 does not work with the local IP 127.0.0.1 (OPC-S shows an error "Invalid computer name"). So I configured PC with a fixed IP 19.168.9.253.
With DigiVis500 installation the ABB OPC Tunnel is installed and registered automatically as service (session 0) with “Startup type: Automatic”. „Automatic“ means ABB OPC Tunnel will start as soon as the Windows system starts up.

With the start of the ABB OPC Tunnel (OCTsvc.exe), the OPCServer (WinCoDeSysOPC.exe) and also the CoDeSys gateway server (Gateway.exe) are started in session 0.

So I configured PC with a fixed IP 19.168.9.253.

After loading of the Graphics Builder configuration into the Operation, the Operation is running with actual OPC values.
All relevant processes

- OPC Tunnel
- Gateway.exe
- WinCoDeSysOPC.exe

are running in the same session.

4.3.2 Guest system

The guest system contains of:

- Oracle VM Virtual Box version 4.2.18 (freeware)
- PS501 Control Builder Plus 2.2.0 (see “OPC Server versions and OPC Tools”)
  - CoDeSys gateway server, Gateway.exe V.3.9.9.24
  - OPC Server V3, WinCoDeSysOPC.exe V3.4.4.10
  - OPCConfig.exe V3.4.4.10
Network setting: Using the Ethernet adapter of the host as network bridge.
The programming and testing can be made within the VM without restrictions.

The OPC configuration can be made and testing with a OPC test client, e.g. MatrikonOPCEXplorer.
All relevant processes

- CoDeSys.exe
- Gateway.exe
- MobileMatrikonExplorer.exe
- WinCoDeSysOPC.exe

are running in the same session.

4.4 How do you create an OPC client with Microsoft Excel?

See www.abb.com/plc Application Example, OPC

This application example consists of two parts:

- AC500_to_OPC_Excel_Client.pro: AC500eCo project with symbol and CoDeSysOPC
- OPC_Excel_Client.xls: MS Excel sheet with VBA program

Block diagram
Worksheet “Control panel” for the communication with the OPC-Server.

Worksheet “Overview” for visualization.

**NOTICE**

This works also with OPC Server V3 but because of a missing DLL the OPC Server V2 must be installed also (Will be fixed in later Releases as V2.3)
4.5 OPC Server V3 with S+

Test with ABB PS Mannheim, 2012. Communication via OPC with AC500 in “ABB Kinderferienhaus Schapbach”.

**Setup:**
- Windows Server 2008 64 Bit
- S+
- OPC Server V3

![Diagram of OPC Server V3 with S+ Architecture](image)

**Procedure**
- Install OPC-Server V3 from folder CBP. After the installation OPC server runs in session ID: 1
- Test with Testclients, as Softing or Matrikon OPC, if the dates are able to be called up.
- The S+ OPC-Scanner runs as a service. Configure OPC Server V3 according to Hints, Configure User account for OPC server. The OPC server runs then in session ID: 0
Create a new project and take a look of your symbol file. The project must be opened to see this file.
Copy your *.sdb file to the following folder: C:\Windows\Gateway Files

Open the OPCConfig. The Project name **must** be the same name as the symbol file. Please activate all three check boxes.
Set the connection to the PLC.

Save the current OPCServer.ini in the following folder:
C:\Programme (x86)/ABB/CoDeSys OPC Server 3 AE.

Check the OPC connection with an OPC client e.g. Matrikon.
5 Appendix

5.1 Comparison with OPC Server V2 to V3: Transmission rate

Some figures about OPC Server transmission rates of a special test setup of HHZ:
- PC Lenovo T430, Windows 7, 64Bit
  - OPC client (OPC Systemtest Teststand, LabView 8.6 application)
  - OPC Server V2 und V3
- AC500 PM592 (task freewheeling and t=2 ms shown similar values)
- OPC client application: 100 cycles (write item, read item, compare value, increment value)

<table>
<thead>
<tr>
<th>Item Byte</th>
<th>Connect [ms]</th>
<th>Mean value [ms]</th>
<th>Max. value [ms]</th>
<th>Disconnect [ms]</th>
</tr>
</thead>
<tbody>
<tr>
<td>OPC Server V2: write cycle</td>
<td>2</td>
<td>2,374</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>OPC Server V2: read cycle</td>
<td>2</td>
<td>127,2</td>
<td>133</td>
<td>0</td>
</tr>
<tr>
<td>OPC Server V3: write cycle</td>
<td>2</td>
<td>1,838</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>OPC Server V3: read cycle</td>
<td>2</td>
<td>96,888</td>
<td>99</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Item real (8 Byte)</th>
<th>Connect [ms]</th>
<th>Mean value [ms]</th>
<th>Max. value [ms]</th>
<th>Disconnect [ms]</th>
</tr>
</thead>
<tbody>
<tr>
<td>OPC Server V2: write cycle</td>
<td>1</td>
<td>2,333</td>
<td>4</td>
<td>0</td>
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<tr>
<td>OPC Server V2: read cycle</td>
<td>1</td>
<td>127,152</td>
<td>133</td>
<td>0</td>
</tr>
<tr>
<td>OPC Server V3: write cycle</td>
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<td>1,616</td>
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<td>1</td>
</tr>
<tr>
<td>OPC Server V3: read cycle</td>
<td>1</td>
<td>97,1414</td>
<td>99</td>
<td>1</td>
</tr>
</tbody>
</table>

5.2 Performance Comparison with OPC Server V3 and different TCPIP drivers:

Measured on a Lenovo Thinkpad with Core-I5, Windows 7-64, 8GB RAM using a minimum OPC-Client (console application) written in C# with use of OpcNetApi-Library.

V2.3 project with 5 AC500 PLCs

<table>
<thead>
<tr>
<th>TCPIP DRIVER NAME</th>
<th>Buffer size setting in opcserver.ini</th>
<th>Average CPU Load (PM591)</th>
<th>Throughput Cyclic items per second at OPCClient</th>
</tr>
</thead>
<tbody>
<tr>
<td>3S TCPIP</td>
<td>0</td>
<td>16%</td>
<td>8500</td>
</tr>
<tr>
<td>ABB TCP/IP Level 2 AC</td>
<td>1000</td>
<td>19%</td>
<td>2886</td>
</tr>
<tr>
<td>ABB TCP/IP Level 2 AC</td>
<td>5000</td>
<td>19%</td>
<td>4770</td>
</tr>
<tr>
<td>ABB TCP/IP Level 2 AC</td>
<td>7000</td>
<td>19%</td>
<td>5202</td>
</tr>
</tbody>
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