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About This User Manual

General

Any security measures described in this User Manual, for example, for user access, password security, network security, firewalls, virus protection, etc., represent possible steps that a user of an 800xA System may want to consider based on a risk assessment for a particular application and installation. This risk assessment, as well as the proper implementation, configuration, installation, operation, administration, and maintenance of all relevant security related equipment, software, and procedures, are the responsibility of the user of the 800xA System.

This manual covers configuration issues (completely) for Compact Control Builder Users and (partly) for 800xA Users. Therefore, if you run OPC Servers in an 800xA system, only the first part of this manual concerns you, which means exactly up to and including Section 3. Hence, if you wish to run OPC Servers with Compact Control Builder, you are advised to studying the complete manual.

Since the behavior of the OPC Server is different depending on a Compact Control Builder or 800xA situation, a preset of separate installation instructions can be found in the manual Getting Started¹ (Compact Control Builder), or System Installation² (800xA) respectively.

Section 1, Introduction, introduces OPC Server for AC 800M and what should be considered before installing and configuring the product.

Section 2, Start-up and Configuration gives a description on how to set up the system and start the OPC Server Configuration Panel for the first time and configure the settings from there.

2. System 800xA Automated Installation (2PAA111692*) provides installation instructions for 800xA Users.
Section 3, **OPC Server Operation** deals with subjects applicable for both parts of OPC Server for AC 800M. The different parts of OPC Server is described in Section 4 and Section 5.

Section 4, **Data Access** describes the OPC Data Access Server.

Section 5, **Alarm and Event** describes the OPC Alarm and Event Server.

**Appendix A, Running the OPC Server and OPC Client on Different Computers**

This product meets the requirements specified in EMC Directive 89/336/EEC and in Low Voltage Directive 72/23/EEC.

**Document Conventions**

Microsoft Windows conventions are normally used for the standard presentation of material when entering text, key sequences, prompts, messages, menu items, screen elements, etc.

**Feature Pack**

The Feature Pack content (including text, tables, and figures) included in this User Manual is distinguished from the existing content using the following two separators:

```
Feature Pack Functionality

<Feature Pack Content>
```

Feature Pack functionality included in an existing table is indicated using a table footnote (*):

*Feature Pack Functionality

Feature Pack functionality in an existing figure is indicated using callouts.

Unless noted, all other information in this User Manual applies to 800xA Systems with or without a Feature Pack installed.
Warning, Caution, Information, and Tip Icons

This publication includes Warning, Caution, and Information where appropriate to point out safety related or other important information. It also includes Tip to point out useful hints to the reader. The corresponding symbols should be interpreted as follows:

- **Electrical warning icon** indicates the presence of a hazard which could result in electrical shock.

- **Warning icon** indicates the presence of a hazard which could result in personal injury.

- **Caution icon** indicates important information or warning related to the concept discussed in the text. It might indicate the presence of a hazard which could result in corruption of software or damage to equipment/property.

- **Information icon** alerts the reader to pertinent facts and conditions.

- **Tip icon** indicates advice on, for example, how to design your project or how to use a certain function

Although Warning hazards are related to personal injury, and Caution hazards are associated with equipment or property damage, it should be understood that operation of damaged equipment could, under certain operational conditions, result in degraded process performance leading to personal injury or death. Therefore, fully comply with all Warning and Caution notices.

Terminology

A complete and comprehensive list of Terms is included in the IndustrialIT Extended Automation System 800xA, Engineering Concepts instruction (3BDS100972*). The listing included in Engineering Concepts includes terms and definitions that apply to the 800xA system where the usage is different from commonly accepted industry standard definitions and definitions given in standard
dictionaries such as *Webster’s Dictionary of Computer Terms*. Terms that uniquely apply to this instruction may be included here as part of this document.

<table>
<thead>
<tr>
<th>Term/Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AE</td>
<td>Alarm and Event</td>
</tr>
<tr>
<td>COM</td>
<td>Component Object Model, which is the Microsoft binary standard, defines how objects can interact.</td>
</tr>
<tr>
<td>DA</td>
<td>Data Access</td>
</tr>
<tr>
<td>DCOM</td>
<td>Distributed Component Object Model is an extension of COM. It defines how objects can interact over a network. COM and DCOM are available on most Windows platforms and on several Unix platforms.</td>
</tr>
<tr>
<td>MMS</td>
<td>Manufacturing Message Specification</td>
</tr>
<tr>
<td>POU</td>
<td>Program Organization Unit</td>
</tr>
<tr>
<td>RNRP</td>
<td>Redundant Network Routing Protocol</td>
</tr>
</tbody>
</table>

**Related Documentation**

A complete list of all documents applicable to the 800xA Industrial IT Extended Automation System is provided in Released User Documents, 3BUA000263*. This document lists applicable Release Notes and User Instructions. It is provided in PDF format and is included on the Release Notes/Documentation media provided with your system. Released User Documents are updated with each release and a new file is provided that contains all user documents applicable for that release with their applicable document number. Whenever a reference to a specific instruction is made, the instruction number is included in the reference.
Section 1 Introduction

What is OPC Server for AC 800M?

The OPC Server for AC 800M is used for reading run-time data and/or alarms and events from controllers via an OPC interface.

When running with a third part OPC client in an 800xA, it is important to only connect to the 800xA System OPC interface. Thus you must **not** connect to the OPC Server for AC 800M. It is only the 800xA System OPC interface that is adequate enough to handle security issues, band width, performances etc in this type of 800xA configurations with a third part client.

The **OPC Server for AC 800M** consists of the following parts:

**OPC Data Access Server**

The OPC Data Access Server provides data from controllers programmed with Control Builder through an OPC Data Access 2.0 and 1.0A interface. For more information, see Section 4, Data Access.

**OPC Alarm and Event Server**

The OPC Alarm and Event Server generates a stream of information, mostly event notifications, and distributes them to the Alarm and Event clients. OPC Alarm and Event 1.02 standard is supported. For more information, see Section 5, Alarm and Event.
The following basic rules apply to system configuration and OPC servers:

- One OPC server can receive data or event notifications from multiple control systems,
- A maximum of three OPC servers are allowed to subscribe to Data Access and/or Alarm and Event from one controller,
- A control system can send data or event notifications to multiple subscribing OPC servers,
- Multiple OPC clients can subscribe to data or event notifications from the same OPC server.
- A maximum of five third-party OPC clients are allowed to subscribe to Data Access and/or Alarm and Event from one OPC server,
• A maximum of four Ethernet links (two redundant) are supported via Ethernet cards.

• A third-party OPC client should, if possible, be installed on the same PC as the OPC server. Otherwise, there is a potential risk that communication will not restart after a communication failure (only for Compact Control Builder Users).

For details regarding the maximum number of supported controllers from which the OPC server subscribes data, refer to *Compact Control Builder AC 800M Product Guide (3BSE041586)*.

**Network Considerations**

All PCs must have the same primary network as the OPC Server in order to be able to communicate with this network.

If a Control Builder on PC A has network addresses 172.16.67.41 and 10.46.41.241, and OPC Server on PC B has the addresses 172.16.67.42 and 10.46.41.242, both PCs must have the 172.16 network as their primary network.

The primary network is the network defined as the first network in the network setup.

The OPC server needs access to certain files in order to connect to a controller. These files are stored by the Control Builder that performed the last download. The OPC server can locate these files automatically after a new download.

See *File Management* on page 16.
Communication Considerations

Communication handling has the lowest priority in a controller. It is therefore important to consider the load on a controller’s CPU if the communication handling is vital to the application. Running close to 100% total load will result in poor capacity and response times for peer-to-peer and OPC Server for AC 800M communication. It is hence recommended that the peak total load on the CPU is kept below 100%.

OPC Server for AC 800M Functions

File Management

The behavior of the OPC Server is different depending on a Compact Control Builder or 800xA situation, because the file management is different. Study the illustrations below in Figure 2 and Figure 3 to learn the different OPC Server behaviors.
• **Control Builder Professional (800xA)**

Control Builder M Professional can only be run in integrated mode, where all data is stored in the Aspect Directory database. See also Define System on page 28.

![Diagram of Aspect Directory and file management in Control Builder Professional](image)

**Figure 2. File Management in Control Builder Professional.**

• **Compact Control Builder**

An OPC Server has all its data stored in a project folder located on a File Server.

![Diagram of file management in Compact Control Builder](image)

**Figure 3. File Management in Compact Control Builder.**
Save Cold Retain Values

Save Cold Retain Values is a function in OPC Server for AC 800M that cyclically saves variable values with the attribute cold retain. For more information, see Define System on page 28.

COM and DCOM

COM (Component Object Model) is Microsoft’s binary standard, defining how objects can interact. An object can, for example, be a data structure, a system module or a whole program.

DCOM (Distributed Component Object Model) is an extension of COM. It defines how objects can interact over a network.

If the OPC server is to be run on one PC and the OPC client is to be run on another, DCOM settings must be configured. However, DCOM should only be used if absolutely needed due to the risk for lost connection (see Lost Connection Between OPC Client and OPC Server on page 68).

For more information on DCOM Settings, see Appendix A, Running the OPC Server and OPC Client on Different Computers.

Clock Synchronization

OPC Server for AC 800M contains a function for clock synchronization. If enabled, the OPC server will time synchronize all connected controllers at a certain interval (also, see Clock Synchronization on page 27).

This type of clock synchronization should only be used if there is no clock master synchronization throughout the controller network. The clock master could be an AC 800M controller, but also another type of controller, for example an AC 400 controller.

Intended User

The three beginning sections in this manual covers configuration issues and should be studied by both 800xA and Compact Control Builder Users. However, the remaining sections with start from Section 4, Data Access, only concern Compact Control Builder Users and can therefore be ignored by 800xA Users.
Section 2  Start-up and Configuration

This section will give you start-up information and basic information regarding how to configure the OPC Server for AC 800M.

Configuration

Start the **OPC Server Configuration Panel** for specification of controllers to be connected.

To open the **OPC Server Configuration Panel**:

**ABB Start Menu > ABB Industrial IT > OPC Server for AC 800M.**

To open the **OPC Server Configuration Panel** in Compact Control Builder:

**ABB Start Menu > ABB Compact Product Suite > OPC Server for AC 800M > OPC Server for AC 800M**

**OPC Server for AC 800M** automatically starts when the PC is rebooted. However, this can be changed through **Control Panel (> System and Security) > Administrative Tools > Services**. Here, right-click **ABB OPC Server for AC 800M** and select **Properties**. Under the **Startup type** drop-down menu, three options are available – Automatic, Manual, and Disabled. Choose the required option.

**OPC Server Configuration Panel**

The **OPC Server Configuration Panel** is used to specify the controller(s) to be connected to the OPC Server. When connected, the OPC Server has access to all relevant data in the controller(s). The panel has two controller specification tabs, one for Data Access and one for Alarms and Events.
The OPC Server normally reads the domain files, (created by Control Builder) when the Connect-button is pushed. If the OPC Server for some reason cannot find the files, (after you pushed the Connect-button) you can locate them via a Browse-dialog. However, to select the domain files during online mode (red error icon) double-click the red error icon to open the Browse dialog.

There are three common reasons the OPC Server cannot find the domain files:

1. Wrong Service Account, (no privileges to access aspect directory or Shared network disk) 800xA or Compact Control Builder respectively.
2. Wrong System connection (800xA only), see Define System on page 28.
3. Wrong path to Shared Network disk (Compact Control Builder only).

**OPC Server Online Help**

There is an extended online help function for *OPC Server for AC 800M*, which can be accessed by clicking **Help > Contents...**
Connecting Controllers

Connect Controllers to OPC Data Access Server

To connect controllers to the OPC Data Access Server, click the Data Access tab and follow the steps below:

1. In the Controller Identity entry field, enter the IP address for an available controller.

2. Click Connect to connect the controller. The controller IP address will now appear in the Connected Controllers list.

   Each of the controllers connected has an icon indicating the current status of the connection to the controller.

To add more controllers, repeat the procedure above.

If a controller containing a distributed application (an application that exists in more than one controller) is connected, all variables in the application is accessible even if they are owned by another controller. To access the hardware configuration of the other controller, explicitly connect to that controller.

Connect Controllers to OPC Alarm and Event Server

The OPC Alarm and Event Server gets data from controllers via subscription. When adding the subscriptions of Alarm and event to a controller, the address of the OPC Server will be stored in the controller. All Event Notifications from the controller will be pushed to the OPC Server.

To connect controllers to the OPC Alarm and Event Server, click the Alarm and Event tab and follow the steps below:

1. In the Controller Identity entry field, enter the IP address for an available controller.

2. Click Connect to connect the controller. The controller IP address will now appear in the Connected Controllers list.

   Each of the controllers connected has an icon indicating the current status of the connection to the controller.

To add more controllers, repeat the procedure above.
Disconnect Controller

When disconnecting a controller, data in that controller is no longer available to clients of the OPC Server.

To disconnect a controller, select the controller from the **Connected Controllers** list and click **Disconnect**.

Alarm and Event Settings

The following system variables presented in Figure 5, are set to default values and can be changed from the AE Settings dialog. (Settings > AE Settings...).

![AE Settings dialog box](image-url)

*Figure 5. AE Settings dialog box*
Client Queue Size

Every OPC Alarm and Event client has a queue in the OPC Server to buffer event notifications. This number specifies the maximum number of items in every queue. Each queue has the same limitations. The default value is 2000, the minimum value is 1500 and maximum value is 5000.

Maximum Number of Alarms

The OPC Server contains a list of all alarms that are not idle (all condition states except the idle state 2) in the connected controllers. This means that you should use the *Max number of Alarm* variable to setup 'The number of alarms that can possible be active at the same time'.

Do not confuse this with your total amount of alarms in the system!

The maximum number of alarms defines the maximum number of alarms in the list, the default value is 5000.

On list overflow, the oldest alarm is deleted and a system simple event is generated to announce the overflow.

In some cases, in conjunction with large projects, the default value has proven to be too low. It is then recommended to increase the setting from 5000 to, for example, 7500.

Other system variables part from those presented here in the **AE Settings** dialog box, can be configured in the **System Variables** dialog box (*Settings > System Variables*). See **Setting System Variables** on page 61.
Setting Cache Update Rate

The OPC Server should always have its update rate set twice as fast as the OPC client(s) update rate.

The cache update rate controls how often the OPC Data Access Server updates its internal cache with data from a certain controller. The cache update rate limits the update rate an OPC client can have on an OPC group. To ensure that subscribing OPC clients can access changed values at their requested update rate, the time (value) for cache update rate should be set shorter than the fastest OPC group update rate. To set the update rate, open the Update Rate dialog box by selecting Settings > Update Rate... from the OPC Server Configuration Panel.

![Update Rate Dialog]

*Figure 6. Update Rate Dialog*

Settings > Update Rate is only available from the OPC Data Access Server, i.e. when the Data Access tab is selected.
To distinguish between fast and slow update rates there are five categories for simple values (integer, real, bool) and a separate category for strings. The values in the **Requested** column determines the update rate of the internal cache in the OPC server, i.e. how often items in each category are read from the controller. When **OPC Server for AC 800M** is started, the values are set to default values.

The values in the **Actual** column shows the current update rate. This value will vary around the **Requested** value depending on the load. A zero value in this column means that there is no MMS communication for that category at the moment.

The requested update rates must be given in ascending order, starting at the **High** category. The lowest permitted update rate value for any category is 50 ms.

The requests regarding variables from the clients include an update rate. The OPC server for AC 800M selects the nearest faster defined group. Default for graphics is 1s and therefore the default group is set to 500ms. If the request contains 3s and there is a group defined for example, 2800ms and this group is nearest below 3s the subscription will be placed in this group.

The OPC server for AC 800M is trying to optimize the number of MMS messages so one variable should only be communicated in one message, and that is the group with the fastest update rate. For example, if two different clients, history (3s) and picture (1s), asks for the same variable the 500ms update rate will be used, that is, the nearest group faster than 1s.

The OPC server is also optimizing the recalculation of the MMS telegrams. For example, there is already a 3s variable update for a specific variable and there is a new request for the same variable with 1s update rate then there will be two different MMS telegrams, one with 3s and one with 1s cyclic update, because it is complicated to move a variable to another group. For a new MMS configuration the content will be optimized so that the variable only will be communicated through one communication telegram.

If any groups has been added, the update rate cannot be changed. The update rate configuration should therefore be made at start-up of the **OPC Server for AC 800M**, before any groups been added.
Example

An OPC client creates an OPC group with an update rate of 1000 ms. This means that items added to this OPC group will be reported to the OPC client once every second. In the OPC server, the MMS communication for this group is put in the **High** category, which means that items in this category will be read from the controller every 500 ms.
Clock Synchronization

*OPC Server for AC 800M* contains a function for clock synchronization. If enabled, the OPC server will synchronize time in all connected controllers, at a certain interval.

This type of clock synchronization should only be used if there is no clock master synchronization throughout the controller network. Such a clock master could be an AC 800M controller, but also another type of controller, for example an AC400 controller.

To clock synchronize from the *OPC Server Configuration Panel*, open the Time Synchronization dialog box by selecting **Settings > Time Synchronization...**

![Time Synchronization dialog](image)

**Figure 7. Time Synchronization dialog**

1. Check the **Enable** check box and set the interval time (one hour is default) in the entry fields for **Hours:** and **Minutes:**. Minimum interval time is one minute and maximum is 24 hours.

2. Click **OK**.

Only controllers with the CPU parameter **CS Protocol Type** set to **MMS** will be synchronized. If the CPU parameter is not set to **MMS**, clock synchronization will be configured from Control Builder.

The accuracy of the time synchronization cannot be guaranteed, due to the fact that it relies on MMS communication. For more information about Clock Synchronization, see the *OPC Server* online help or the Control Builder online help.
Define System

This subsection only describes issues for 800xA and can therefore be ignored by Compact Control Builder Users.

To select a system and get configuration data and later on saving cold retain values, open the System dialog box by selecting *Settings > System Connection...* from the *OPC Server Configuration Panel*.

![System Dialog]

*Figure 8. System Dialog*

Save Cold Retain Values

Each time Control Builder enters Offline mode, cold retain values are normally saved. However, there may be long time going between different times of saving these cold retain values, and in case of a power failure more recent cold retain values might be available if using the Save Cold Retain Values function in *OPC Server for AC 800M*.

You can configure the Offset. The Offset is added to the configured cycle time for the first cold retain save after activation.

'Save cold retain values' is a function in the OPC Server for cyclically saving variable values that have been declared with the attribute cold retain.
Saving cold retain values

From the OPC Server Configuration Panel, open the Save cold retain values dialog box by selecting **Tools > Save cold retain values**...

![Save cold retain values dialog](image)

*Figure 9. Save cold retain values dialog.*

To set automatically saved cold retain values, select the option “Automatically”, and set an interval time (recommended every 720 minutes).

In order to retain these Automatic Cold Retain Values settings, "Save configuration" must be performed.

To configure offset time for the set interval, set an offset time (recommended value is 0 minutes).

By setting offset time, you can reduce controller load while running redundant OPC Servers. In a redundant configuration, one of the OPC Servers should have offset time set to zero and the other as 360. This setting avoids the situation where two OPC servers fetch cold retain values from the controllers at the same time.
Access Rights

Access right is a setting that aims for protecting the OPC Server configuration panel from unauthorized changes described with start from Connect Controllers to OPC Alarm and Event Server on page 21.

With Access right enabled, all dialog entries will be dimmed, thus locked for unauthorized changes. Please note that only an administrator can disable Access Right and restoring the menu options given from the OPC Server configuration panel.

⚠️ Make sure you have administrator privileges before you enable the Access Right.

To enable Access rights, open the Access Right dialog box by selecting Settings > Access Right... from the OPC Server Configuration Panel.

![Access Rights dialog]

Figure 10. Access Rights dialog

Save Configuration

By clicking File > Save Configuration the current configuration settings of the OPC server is saved to a file containing one section for each part of the OPC server. The default extension of the file is .cfg and it is by default saved in the Files folder of the OPC server’s working directory.
Automatic Load of OPC Server Configuration

Autoload an OPC Server configuration at start-up can easily be enabled from OPC Server Configuration Panel.

![Autoload Configuration dialog](image)

The **Enable Autoload Configuration** check box is disabled by default.

1. Open the **Settings > Autoload Configuration Settings...** menu.
2. Check the **Enable Autoload Configuration** check box.
3. Enter the name of the configuration file with full path either by typing it or browsing to it by clicking the **...** button.
4. Click **Apply** to put in effect.
Section 3  OPC Server Operation

General

This section cover information about *OPC Server for AC 800M* that are not specific for the Data Access part or the Alarm and Event part of the OPC Server.

Here you find what is written into the session log, as well as what happens if power failure occur. Some information regarding performance, indication of status and maintenance will also be given.

Session Log

Messages concerning the system are logged in the session log. Types of messages include direct printouts from code or system events. The session log can be opened from *OPC Server Configuration Panel*. 
Data Access Printouts to Session Log

The following printouts originate from the OPC Data Access Server.

*Table 1. Printouts from Data Access into session log*

<table>
<thead>
<tr>
<th>Printout</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>OPC server started</td>
<td>OPC Server has been started</td>
</tr>
<tr>
<td>OPC server stopped</td>
<td>OPC Server has been stopped</td>
</tr>
<tr>
<td>COM: Waiting for active components</td>
<td>Attempt to shut down OPC Server with OPC clients still connected; followed by a three second delay</td>
</tr>
<tr>
<td>OPC: The server had active components when it was shutdown!</td>
<td>OPC Server was shut down with OPC clients still connected (see previous comment)</td>
</tr>
<tr>
<td>OPC Data Access: Connected to controller: &lt;IP-address&gt;</td>
<td>Controller is connected to OPC Data Access Server</td>
</tr>
<tr>
<td>OPC Data Access: Connected to controller: &lt;IP-address&gt;, warning: no contact</td>
<td>Controller with no contact to OPC Data Access Server has been connected</td>
</tr>
<tr>
<td>OPC Data Access: Disconnected from controller: &lt;IP-address&gt;</td>
<td>Controller has been disconnected from OPC Data Access Server</td>
</tr>
<tr>
<td>OPC Data Access: Contact lost with controller &lt;IP-address&gt;</td>
<td>Connection between controller and OPC data Access Server has been lost</td>
</tr>
<tr>
<td>OPC Data Access: Contact again with controller &lt;IP-address&gt;</td>
<td>Connection between controller and OPC Data Access Server has been re-established</td>
</tr>
<tr>
<td>Autoloading configuration...</td>
<td>Autoload configuration in progress</td>
</tr>
<tr>
<td>Autoload configuration finished</td>
<td>Autoload configuration is complete</td>
</tr>
<tr>
<td>Autoload configuration failed</td>
<td>Autoload configuration has failed</td>
</tr>
<tr>
<td>No FTP server available</td>
<td>FTP server is not available</td>
</tr>
</tbody>
</table>
Table 1. Printouts from Data Access into session log (Continued)

<table>
<thead>
<tr>
<th>Printout</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saving cold retain files for application <code>&lt;ApplicationName&gt;</code> failed</td>
<td>Saving of cold retain values for the application has failed</td>
</tr>
<tr>
<td>Sending cold retain files for application <code>&lt;ApplicationName&gt;</code> failed</td>
<td>Sending of cold retain values for the application has failed</td>
</tr>
</tbody>
</table>

**Alarm and Event Code Printouts to Session Log**

The following printouts originate from the Alarm and Event part of the code in *OPC Server for AC 800M*.

Table 2. Printouts from code into session log

<table>
<thead>
<tr>
<th>Type(1)</th>
<th>Printout</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>OPCAE-~SaveSub. M_OnEventQ is not empty. Size=xxxx</td>
<td>The saved subscription was not empty when deleted. Can occur at timeout</td>
</tr>
<tr>
<td>I</td>
<td>OPCAE – Start of subscription. OPC client ID=yyyy</td>
<td>When an OPC client starts a subscription. One of the three texts is also printed as well, depending on if saved subscription is enabled</td>
</tr>
<tr>
<td></td>
<td>1. Restore events from SaveSub</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. SaveSub not found. No events restored</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. SaveSub not enabled</td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>OPCAE – End of subscription. OPC client ID=yyyy</td>
<td>When an OPC client ends a subscription. One of the 3 texts is also printed as well, depending on if saved subscription is enabled</td>
</tr>
<tr>
<td></td>
<td>1. Events are stored in SaveSub</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. SaveSub not created. No events are stored</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. SaveSub not enabled</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>OPCAE – After save in SaveSub. M_OnEventQ is not empty</td>
<td>System error</td>
</tr>
</tbody>
</table>
### Table 2. Printouts from code into session log (Continued)

<table>
<thead>
<tr>
<th>Type(1)</th>
<th>Printout</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>E</td>
<td>OPCA E – COPCEventSubscriptionMgt. SystemEventSeverity not found</td>
<td>System error</td>
</tr>
<tr>
<td>E</td>
<td>OPCA E – COPCEventSubscriptionMgt. SystemEventClass not found</td>
<td>System error</td>
</tr>
<tr>
<td>E</td>
<td>OPCA E – RemovedSubscribingSystem.m_NrOfSubscribedSystems=xx</td>
<td>System error</td>
</tr>
<tr>
<td>E</td>
<td>OPCA E – EventType not supported</td>
<td>System error</td>
</tr>
<tr>
<td>E</td>
<td>OPCA E – SaveSub. Error when deleting SaveSub</td>
<td>System error</td>
</tr>
</tbody>
</table>

(1) Type of message tells if it is information (I) or error (E).
System Events to Session Log

System simple events, as well as system condition related events (i.e. system alarm that is going on and off) are also written to the session log. It is possible to filter which system events that should go to the controller log. This is controlled from the system variable SystemEventsToSessionLog (see Setting System Variables on page 61 and OPC Server for AC 800M Online Help).

The following system simple events and system condition related events may be issued by OPC Alarm and Event Server and written to the session log:

*Table 3. System events to session log*

<table>
<thead>
<tr>
<th>Type</th>
<th>Printout</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Event</td>
<td>(6000) Alarm not unique</td>
<td>Generated when OPCAE server discover there are two alarms with the same</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SourceName/ConditionName combination defined in two different controllers</td>
</tr>
<tr>
<td>Event</td>
<td>(6001) Alarm Handler overflow.</td>
<td>Generated when an alarm item in the Alarm Handler must be detected</td>
</tr>
<tr>
<td></td>
<td>MaxNoOfAlarms exceeded.</td>
<td>because of overflow. The size of the Alarm Handler is limited by system</td>
</tr>
<tr>
<td></td>
<td></td>
<td>variable MaxNoOfAlarms</td>
</tr>
<tr>
<td>Event</td>
<td>(6003) Overflow in queue to OPC</td>
<td>Generated when there is an overflow in the queue to OPC client</td>
</tr>
<tr>
<td></td>
<td>client</td>
<td></td>
</tr>
<tr>
<td>Event</td>
<td>(1011) Alarm definition failed for</td>
<td>The alarm definition in the 1131 application code failed. This message</td>
</tr>
<tr>
<td></td>
<td>&lt;SourceName&gt; &lt;ConditionName&gt;</td>
<td>is concatenated with SourceName and ConditionName of alarm</td>
</tr>
</tbody>
</table>
Table 3. System events to session log (Continued)

<table>
<thead>
<tr>
<th>Type</th>
<th>Printout</th>
<th>Comment</th>
</tr>
</thead>
</table>
| Alarm | (5500) Connection error to DA subscribed controller | Each subscribed controller from OPC Data Access Server have one system alarm. These system alarms are:  
• activated when an error occurs on this connection  
• inactivated when all errors are corrected or disappeared |
| Alarm | (6500) Connection error to AE subscribed controller | Each subscribed controller from OPC Data Access Server have one system alarm (see description above) |
Power Failure

The OPC server runs as a service, and can be configured so that configurations are automatically loaded at startup. Groups and items always have to be re-configured after startup.

When an OPC client is stopped abruptly, it is detected by the OPC server, which stop making callbacks. After COM timeout, all memory allocated for the specific client, is released.

See also OPC Data Access Server Behavior at Power Fail on page 42, and OPC Alarm and Event Server Behavior at Power Fail on page 60 for more information.

Error Handling

In addition to standard OPC error handling, serious errors are logged as a log file. Errors are also presented in the OPC Server Configuration Panel.

Performance

For specific performance information regarding OPC Data Access Server and OPC Alarm and Event Server, see subsection Performance of respective section.
General

The OPC Data Access Server provides data from controllers programmed with Control Builder M through an OPC Data Access 2.0 and 1.0A interface. The program ID is: ABB.AC800MC_OpcDaServer.3

In order to receive data from the controller, it has to be connected to the OPC Server Configuration Panel. During compilation, Control Builder saves information about applications, hardware configuration and access variables to files. They are the .cdoXml,.rrsXml domain files for each application and the .ctdXml domain files for each controller. To connect to a specific controller, the OPC Data Access Server is dependent on these domain files. The OPC Server fetch the domain files automatically, when needed. See also File Management on page 16 or OPC Server Configuration Panel on page 19.

Controller and application names must be unique throughout the connected controllers. The OPC Server is not able to provide data for duplicate names. See also Address Space on page 47.

The OPC Sever keeps its name references even when the communication to the controller is lost, consider the following scenario:

Two SoftControllers and which both are configured in the OPC Server. An application is downloaded to the first SoftController, hence the OPC Server provides good data for it. If the Soft Controller will be terminated, the OPC Server will consider this as loss of communication, hence provides bad data.

When the application is downloaded to the second SoftController, the OPC Server will still provide bad data for the application!

The explanation is that the OPC Server has references to two applications with the same name, therefore good data will not be provided until the first SoftController is restarted (the OPC Server sees this as regained communication). Once the first
SoftController has been restarted the OPC Server will remove the reference of the former application. Good data will be provided for the application in the second SoftController.

**Fast Initial Update**

When an OPC client adds an item to a group with reasonably long update rate for example, 30 seconds the OPC server updates the new item with an initial value to the client.

When a new item is added the OPC Server starts to cyclically check if a value has arrived from the controller at each 100 ms, independently of the group update rate determined by the client. As soon as the value has arrived, it sets the quality to good and updates the client. This means that the client does not have to wait until the next regular group update, (another 30 seconds) before it can receive the new added item with good quality.

**OPC Data Access Server Behavior at Power Fail**

**OPC Server Power Failure**

The OPC server runs as a service, and can be configured so that configurations are automatically loaded at startup. Groups and items always have to be re-configured after startup. See *Online Help for OPC server, Autoload Configuration Settings*.

**OPC Client Power Failure**

When an OPC client is stopped abruptly, it is detected by the OPC server, which stop making callbacks. After DCOM time-out, all memory allocated for the specific client, is released.

**DCOM Time-out**

Callbacks to the client are made on separate threads. Therefore the OPC server never fails when DCOM problems occur. After DCOM time-out, all objects are released according to standard COM.
Error Handling

In addition to standard OPC error handling, serious errors are logged as a log file. Errors are also presented in the *OPC Server Configuration Panel* by double-clicking the icon 😞. This brings up error information.
What Data Can Be Accessed?

Through the OPC Data Access Server different kinds of runtime-data can be accessed from:

- Applications
- Controllers
- Hardware units

Applications

The Applications branch contains the applications running in the controllers connected to the OPC Data Access Server. You can access variables and function block and control module parameters.

Controllers

The Controllers branch contains the connected controllers to the OPC Data Access Server. Each controller can access hardware variables and access variables.

For each controller, there are four items that reflects the connection between *OPC Server for AC 800M* and the controller:

- **HWState**
  - 0 = StateOK
  - 1 = StateError

- **HWStateChangeTime**
  - Time for last change of HWState

- **ErrorsAndWarnings**
  - 0 = StatusOK
  - 1 = CommunicationError
  - 2 = FilesMissing

- **LatchedErrorsAndWarnings**
  - 0 = StatusOK
  - 1 = CommunicationError
  - 2 = FilesMissing
Hardware Variables

You can access attributes in I/O channels and status channels of hardware units. All attributes are read-only. Each channel has a default attribute that is sent when the channel is accessed without specifying an attribute. When you browse the address space, you cannot view the attributes of channels.

Mapping of OPC

Mapping IO Channel Status to OPC Quality

When an OPC client subscribes to an item, that is an I/O channel, a Value, or an I/O Value component of a structured variable of I/O data type (BoolIO, RealIO, DIntIO, DWordIO), the quality of the item will be determined by the corresponding Status component. When the client subscribes to such an item, the OPC server also subscription internally to the Status component (inside the I/O data type) and uses its value to calculate the quality when the client is updated with a new value.

The quality for all other items is decided by the MMS communication against the controller. As long as the OPC server receives value updates from the controller the quality is set to good. Since this functionality, with subscribing to the Status component, means that extra variables will be communicated between the OPC server and the controller, it will increase the load and might affect performance. However, if you do not need this functionality, set the system variable OPCGetQualityFromStatus to false (true by default). In that case item quality is determined by the status of the MMS communication.

Interfaces Supported

All non optional interfaces are supported in accordance to the OPC Data Access specification 2.0. Also, IOPCBrowseServerAddressSpace, and IPersistFile are supported. The following services are not supported.

- Public groups
- Deadband
- EU information on OPCITEMATTRIBUTES
States of Status

The OPC Data Access Server can be in one of the following states:

- **OPCDA_STATUS_RUNNING**
  At least one controller connected and communication is working

- **OPCDA_STATUS_NOCONFIG**
  No controllers are connected or no communication is working to the controller(s) connected.

If no connection is detected when *OPC Server for AC 800M* is started, the state is OPCDA_STATUS_NOCONFIG. When connecting to a controller, the *OPC Server for AC 800M* goes into the OPCDA_STATUS_RUNNING state. If connection is lost to all controllers, the OPC Server re-enters the OPCDA_STATUS_NOCONFIG state.

OPC Data Access Overview

In the OPC Server, a server object is created for each OPC client connected. When an OPC group is created in the OPC client, a group object is created in the server object.

To each OPC group, items (such as variables) are added and update rate is set for the OPC group.

Data access is created by defining OPC groups to which you add items. An item is a data source reference identified by an ItemID. An item has a value, quality and timestamp associated. Item values can be read and written synchronously and asynchronously, or subscribed. You can choose to read a value from the internal cache of the server or directly from the device. The most efficient service when retrieving data is subscription.

For information regarding asynchronous operations, see Limitations Regarding Asynchronous Operations on page 51.
Address Space

The address space for the OPC Server is built just like the tree structure in the Project Explorer of Control Builder M. The top level contains two branches, Applications and Controllers. Controller and application names must be unique throughout the connected controllers. Item names are identified by the full path with dot notation, for example Applications.MyApplication.MyProgram.MyDint.

OPC Variables

Variables can be accessed anywhere in the POU structure. Control module and function block parameters can also be accessed. Variables with the attributes Constant can only be read and variables with the attribute Hidden cannot be seen at all. An item is always of simple datatype.

You can reach access variables, which have been declared accessed from remote systems, in the connected controllers. Access variables can be of simple data types or structured data types.

Table 4. Data Types that are mapped

<table>
<thead>
<tr>
<th>IEC 61131-3 data type</th>
<th>Variant type</th>
</tr>
</thead>
<tbody>
<tr>
<td>int</td>
<td>VT_I2</td>
</tr>
<tr>
<td>dint</td>
<td>VT_I4</td>
</tr>
<tr>
<td>uint</td>
<td>VT_UI2</td>
</tr>
<tr>
<td>real</td>
<td>VT_R4</td>
</tr>
<tr>
<td>word</td>
<td>VT_UI2</td>
</tr>
<tr>
<td>dword</td>
<td>VT_UI4</td>
</tr>
<tr>
<td>bool</td>
<td>VT_BOOL</td>
</tr>
<tr>
<td>string</td>
<td>VT_BSTR</td>
</tr>
<tr>
<td>date_and_time</td>
<td>VT_DATE</td>
</tr>
<tr>
<td>time</td>
<td>VT_R8 (mapped to ms)</td>
</tr>
</tbody>
</table>
**Table 5. Variable Item Properties**

<table>
<thead>
<tr>
<th>ID</th>
<th>Data type of returned VARIANT</th>
<th>Description</th>
<th>Type of property</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>VT_I2</td>
<td>Item canonical data type (VARIANT type of the item value)</td>
<td>Standard OPC property</td>
</tr>
<tr>
<td>2</td>
<td>&lt;varies&gt;</td>
<td>Item value (current value)</td>
<td>Standard OPC property</td>
</tr>
<tr>
<td>3</td>
<td>VT_I2</td>
<td>Item quality (current quality)</td>
<td>Standard OPC property</td>
</tr>
<tr>
<td>4</td>
<td>VT_DATE</td>
<td>Item timestamp (current timestamp)</td>
<td>Standard OPC property</td>
</tr>
<tr>
<td>5</td>
<td>VT_I4</td>
<td>Item access rights (readable/writable)</td>
<td>Standard OPC property</td>
</tr>
<tr>
<td>6</td>
<td>VT_R4</td>
<td>Server scan rate (time between cache updates)</td>
<td>Standard OPC property</td>
</tr>
<tr>
<td>5000</td>
<td>VT_BSTR</td>
<td>Item type name (IEC 61131-3 data type)</td>
<td>Server specific property</td>
</tr>
<tr>
<td>5002</td>
<td>VT_BSTR</td>
<td>Item Attribute (retain, cold retain)</td>
<td>Server specific property</td>
</tr>
<tr>
<td>5005</td>
<td>VT_BSTR</td>
<td>Item category (parameter or variable)</td>
<td>Server specific property</td>
</tr>
<tr>
<td>5006</td>
<td>VT_BSTR</td>
<td>Parameter direction (in, out or in/out)</td>
<td>Server specific property</td>
</tr>
<tr>
<td>5007</td>
<td>VT_BSTR</td>
<td>Path (Path to corresponding POU variable)</td>
<td>Server specific property</td>
</tr>
</tbody>
</table>
Item Quality

An item can have one of the following states of quality:

- Good.
- Uncertain.
- Bad.

For example, a non-working item have the status OPC_QUALITY_BAD.

For quality **Good**, the following substatus is issued:

- OPC_QUALITY_LOCAL_OVERRIDE
  This status is issued for I/O channels or items of I/O data type connected to an I/O channel. The value has been Forced.

For quality **Uncertain**, the following substatus is issued:

- OPC_QUALITY_LAST_USABLE_VALUE
  This status is issued if the OPC Server does not read from the controller in the same pace as it is supposed to update the OPC client.

- OPC_QUALITY_ENGINEERING_UNITS_EXCEEDED
  Used for I/O channels or items of I/O data type connected to an I/O channel. The value is outside the limits defined for this parameter.

For quality **Bad**, either of the following substatuses are issued:

- OPC_QUALITY_CONFIG_ERROR
  This status is issued if some problem with the configuration for example, the item in question has been deleted in the controller.

- OPC_QUALITY_LAST_KNOWN_VALUE
  This status is issued if the OPC Server has no contact with the controller when it is time to update the OPC client with a new value, consequently the OPC Server is giving the OPC client the last known value.

- OPC_QUALITY_COMM_FAILURE
  This status is issued if communications have failed. There is no last known value available.
### Writing

Writing can either be done synchronously or asynchronously. If done synchronously, the OPC Server is occupied while writing to an controller is performed and updating of other clients are not possible. If writing is done asynchronously, the OPC Server is able to update other clients while writing to the controller.

The OPC server allows a maximum of 50 simultaneous write calls to the same OPC group. If there is a 51st write call before the first write call is finished, the OPC server will return an error code to the client on the 51st call.

If an OPC client gets status OK, this means the value was successfully written to the controller.

### Performance

**OPC Server for AC 800M** performance varies, considering the number of controllers being used, what type of controller being used, and the number of clients.

For more details about performance of OPC Server for AC 800M, refer to *Compact Control Builder AC 800M Product Guide (3BSE041586*)*. 

- **OPC_QUALITY_OUT_OF_SERVICE**
  
  Is issued if the active state of the item or the group containing the item is InActive.

- **OPC_QUALITY_UNIT_ERROR**
  
  Used for I/O channels or items of I/O data type connected to I/O channels. A device failure has been detected. I/O value will be frozen to the last known value.

- **OPC_QUALITY_CHANNEL_ERROR**
  
  Used for I/O channels or items of I/O data type connected to an I/O channels. A channel error has been detected. The I/O value will be frozen to the last known value.
**Time Stamping**

Time Stamping of Data Access is done in OPC Server.

**Limitations Regarding Asynchronous Operations**

The OPC Server has a limitation regarding the number of asynchronous operations it can handle per OPC Group. The following operations are limited to a maximum of 50 uncompleted operations per type:

- IAsyncIO:Read,
- IAsyncIO:Write,
- IAsyncIORefresh,
- IAsyncIO2:Read,
- IAsyncIO2:Write,
- IAsyncIO2:Refresh.

Note that there can be 50 outstanding calls for each of these at the same time in one OPC Group.

If the client continues to call these methods before the OPC Server answers, the OPC Server returns the error CONNECT_E_ADVISELIMIT. This error indicates that the limit is reached. The client should then wait for one of the uncompleted operations of the same type to finish, before trying again.

There is no limit to the number of OPC Items that can be handled in each operation. This means that a client should try to use fewer operations with more OPC items per operation, in order to avoid problems. For instance, if 20 Items are to be written, it is better to send them all in one IAsyncIO2:Write operation, and not use 20 operations with one item in each.
Section 5  Alarm and Event

General

From the OPC Alarm and Event Server, a stream of information is generated which is distributed to the Alarm and Event clients. This information consists mostly of event notifications and such a client can be an event viewer, Alarm/Event Manager, or a logging system. Clients, on the other hand, can send acknowledgements of alarms and requests to the server.

The combination of SourceName/ConditionName of all alarms defined in the connected controllers must be globally unique. A system event is generated if two alarms with the same combination are detected, see also System Events to Session Log on page 37.

OPC Server for AC 800M provides an additional service to the OPC standard via the variable StandardEnableSource. However, if you wish to disable this service see the AE Settings dialog box under Setting System Variables on page 61.

OPC Alarm and Event Server

The MMS OPC Alarm and Event Server maps the MMS based Alarm and Event communication to the COM/DCOM based OPC Alarm and Event communication. The Alarm and Event Server handles events from many controllers and forwards them to several OPC Alarm and Event clients.

It is possible to have several servers in parallel on different systems. It is also possible that many clients subscribe to the same OPC Server, and that the OPC Server itself subscribes to many controllers.
Interfaces Supported

The Alarm and Event part of *OPC Server for AC 800M* supports the OPC Alarm and Events 1.02 standard. The program ID is: ABB.AC800MC_OpcAeServer.3

The interface contains methods (functions) to acknowledge, enable, and disable alarm conditions, as well as methods (functions) for subscription of events.

OPC clients can also query the Alarm and Event server for information such as condition names used, available vendor specific attributes, etc.

The list of objects with respective interfaces is as follows:

- OPCEventServer object
- OPCEventAreaBrowser object
- OPCEventSubscription object.

**OPCEventServer Object**

*Table 6. Methods of IOPCCommon*

<table>
<thead>
<tr>
<th>Method</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>GetErrorString (dwError, ppString)</td>
<td>Implemented</td>
</tr>
<tr>
<td>GetLocaleID (pdwLcid)</td>
<td>Implemented</td>
</tr>
<tr>
<td>QueryAvailableLocaleIDs (pdwCount, pdwLcid)</td>
<td>Implemented</td>
</tr>
<tr>
<td>SetClientName (szName)</td>
<td>Implemented</td>
</tr>
<tr>
<td>SetLocaleID (dwLcid)</td>
<td>Implemented</td>
</tr>
</tbody>
</table>
### Table 7. Methods of IOPCEventServer

<table>
<thead>
<tr>
<th>Method</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>AckCondition (dwCount, szAcknowledgerID, szComment, pszSource, pszConditionName, pftActiveTime, pdwCookie, ppErrors)</td>
<td>Implemented</td>
</tr>
<tr>
<td>CreateAreaBrowser (riid, ppUnk)</td>
<td>Not implemented</td>
</tr>
<tr>
<td>CreateEventSubscription (bActive, dwBufferTime, dwMaxSize, hClientSubscription, riid, ppUnk, pdwRevisedBufferTime, pdwRevisedMaxSize)</td>
<td>Implemented</td>
</tr>
<tr>
<td>DisableConditionByArea (dwNumAreas, pszAreas)</td>
<td>Not implemented</td>
</tr>
<tr>
<td>DisableConditionBySource (dwNumSources, pszSources)</td>
<td>Implemented</td>
</tr>
<tr>
<td>EnableConditionByArea (dwNumAreas, pszAreas)</td>
<td>Not implemented</td>
</tr>
<tr>
<td>EnableConditionBySource (dwNumSources, pszSources)</td>
<td>Implemented</td>
</tr>
<tr>
<td>GetConditionState (szSource, szConditionName, ppConditionState)</td>
<td>Not implemented</td>
</tr>
<tr>
<td>GetStatus (ppEventServerStatus)</td>
<td>Implemented</td>
</tr>
<tr>
<td>QueryAvailableFilters (pdwFilterMask)</td>
<td>Implemented</td>
</tr>
<tr>
<td>QueryConditionNames (dwEventCategory, pdwCount, ppszConditionNames)</td>
<td>Implemented</td>
</tr>
<tr>
<td>QueryEventAttributes (dwEventCategory, pdwCount, ppdwAttrIDs, ppszAttrDescs, ppvtAttrTypes)</td>
<td>Implemented</td>
</tr>
<tr>
<td>QueryEventCategories (dwEventType, pdwCount, ppdwEventCategories, ppEventCategoryDescs)</td>
<td>Implemented</td>
</tr>
<tr>
<td>QuerySourceConditions (szSource, pdwCount, ppszConditionNames)</td>
<td>Implemented</td>
</tr>
</tbody>
</table>
### Table 7. Methods of IOPCEventServer (Continued)

<table>
<thead>
<tr>
<th>Method</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>QuerySubConditionNames (szConditionName, pdwCount, ppszSubConditionNames)</td>
<td>Implemented</td>
</tr>
<tr>
<td>TranslateToItemIds (szSource, dwEventCategory, szConditionName, szSubConditionName, dwCount, pdwAssocAttrIDs, ppszAttrItemIDs, ppszNodeNames, pCLSIDs)</td>
<td>Not implemented</td>
</tr>
</tbody>
</table>

### Table 8. Methods of IOPCConnectionPointContainer

<table>
<thead>
<tr>
<th>Method</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>EnumConnectionPoints (ppEnum)</td>
<td>Implemented</td>
</tr>
<tr>
<td>FindConnectionPoint (riid, ppCP)</td>
<td>Implemented</td>
</tr>
</tbody>
</table>

### OPCEventAreaBrowser Object

### Table 9. Methods of IOPCEventAreaBrowser

<table>
<thead>
<tr>
<th>Method</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>BrowseOPCAreas (dwBrowseFilterType, szFilterCriteria, ppIEnumString)</td>
<td>Not implemented</td>
</tr>
<tr>
<td>ChangeBrowsePosition (dwBrowseDirection, szString)</td>
<td>Not implemented</td>
</tr>
<tr>
<td>GetQualifiedAreaName (szAreaName, pszQualifiedAreaName)</td>
<td>Not implemented</td>
</tr>
<tr>
<td>GetQualifiedSourceName (szSourceName, pszQualifiedSourceName)</td>
<td>Not implemented</td>
</tr>
</tbody>
</table>
**OPCEventSubscription Object**

*Table 10. Methods of IOPCEventSubscriptionMgt*

<table>
<thead>
<tr>
<th>Method</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>CancelRefresh (dwConnection)</td>
<td>Implemented</td>
</tr>
<tr>
<td>GetFilter (pdwEventType, pdwNumCategories, ppdwEventCategories, pdwLowSeverity, pdwHighSeverity, pdwNumAreas, ppszAreaList, pdwNumSources, ppszSourceList)</td>
<td>Implemented</td>
</tr>
<tr>
<td>GetReturnedAttributes (dwEventCategory, pdwCount, pdwAttributeIDs)</td>
<td>Implemented</td>
</tr>
<tr>
<td>GetState (ppActive, pdwBufferTime, pdwMaxSize, phClientSubscription)</td>
<td>Implemented</td>
</tr>
<tr>
<td>Refresh (dwConnection)</td>
<td>Implemented</td>
</tr>
<tr>
<td>SelectReturnedAttributes (dwEventCategory, dwCount, dwAttributeIDs)</td>
<td>Implemented</td>
</tr>
<tr>
<td>SetFilter (dwEventType, dwNumCategories, pdwEventCategories, dwLowSeverity, dwHighSeverity, dwNumAreas, pszAreaList, dwNumSources, pszSourceList)</td>
<td>Implemented</td>
</tr>
<tr>
<td>SetState (bActive, dwBufferTime, dwMaxSize, hClientSubscription, pdwRevisedBufferTime, pdwRevisedMaxSize)</td>
<td>Implemented</td>
</tr>
</tbody>
</table>

*Table 11. Methods of IOPCConnectionPointContainer*

<table>
<thead>
<tr>
<th>Method</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>EnumConnectionPoints (ppEnum)</td>
<td>Implemented</td>
</tr>
<tr>
<td>FindConnectionPoint (riid, ppCP)</td>
<td>Implemented</td>
</tr>
</tbody>
</table>
The OPC Alarm and Event Server has the following states:

- **OPCAE_STATUS_RUNNING**
- **OPCAE_STATUS_FAILED** (not used for the moment)
- **OPCAE_STATUS_NOCONFIG**
- **OPCAE_STATUS_SUSPENDED**

The following applies to OPC Server for AC 800M:

- When the OPC Server is started, the status is set to **OPCAE_STATUS_NOCONFIG**.
- When connected to at least one controller, the OPC Server status is always **OPCAE_STATUS_RUNNING**.
- If all controllers are removed from the panel, the OPC Server status returns to **OPCAE_STATUS_NOCONFIG**.
- The system variable *SetFailedAtNoConn* is used to control the behavior when all connections to controllers are lost (for information on how to set this variable, see [Setting System Variables](#) on page 61):
  - The default value of *SetFailedAtNoConn* is True.
  - With *SetFailedAtNoConn* set to True:
    - If the system variable is set to true, the OPC server status will be set to **OPCAE_STATUS_SUSPENDED**, if there is no connection to any of the subscribed controllers. When any connections is restored, the OPC Server status returns to **OPCAE_STATUS_RUNNING**.
  - With *SetFailedAtNoConn* set to False:
    - The status check of the OPC Server status is disabled and the OPC status will report **OPCAE_STATUS_RUNNING**. If the OPC server is started or re-started with *SetFailedAtNoConn* set to false, then the OPC Server will report the status **OPCAE_STATUS_NOCONFIG**.
Buffer Queues

There is a queue in the Alarm and Event Server for every connected Alarm and Event client (see Figure 12). All data that passes the OPC Server, for example event notifications and acknowledges will be queued. The maximum size of the queues can be configured through the configuration interface. The data in these queues is only held in the primary memory and is lost when the OPC Server shuts down or when a power failure occurs. It is possible to have a second OPC Server in parallel to increase the data security.

Figure 12. Alarm buffer queues
Note

The Alarm and Events Server has the following limitations.

• Tracking-related events (events generated from operator interactions) are not supported.
• The optional Quality information is not supported.
• The optional SubConditions are not supported. That means that our conditions always only have one SubCondition (Single state conditions).
• The optional Area concept from OPC alarm and event is not supported.

OPC Alarm and Event Server Behavior at Power Fail

If the power fails on the OPC Alarm and Event Server, all events received but not yet sent to respective OPC client, are lost.

When the OPC Server has recovered from power fail, all alarms that are not in idle state is updated in the alarm handler. This means that recreation of alarm lists after power fail is done. As mentioned in previous paragraph, it is not possible to recreate condition related or simple events sent from controllers to the OPC Server before the power fail occurred.
**OPC Alarm and Event Clients**

The OPC Alarm and Event clients are able to perform different tasks, such as filtering out event notifications based on event category.

**Setting System Variables**

This dialog (see Figure 13) helps you to set system variables other than those given in Alarm and Event Setting dialog. See Alarm and Event Settings on page 22.

- StandardEnableSource
- SendDisabledAE

System variables are set in the System Variables dialog box which can be opened by selecting **Settings > System Variables...** from the **OPC Server Configuration Panel**.

![System Variables Dialog](image)

*Figure 13. System Variables Dialog*
Setting System Variables

Section 5  Alarm and Event

Setting Variables in System Variables Dialog Box

StandardEnableSource

If this choice is selected, the OPC Alarm and Event interface supports standard Enable/Disable by source. This means that all alarms in one object by source are enabled or disabled at the same time.

If this choice is not selected, it is possible to enable or disable single alarms in one object by source.

SendDisabledAE

If this choice is selected, disabled alarms (conditions) are also sent to the OPC Alarm and Event client on refresh.

If this choice is not selected, no disabled alarms (conditions) are sent to the OPC Alarm and Event client on refresh.

If you wish to disconnect the additional service from the OPC Server, thus not sending disabled alarms while refresh then set the variables StandardEnableSource = true and SendDisabledAE = false.

For more information about system variables, see the OPC Server for AC 800M Online Help.

All the other system variables available, are presented in the AE Settings dialog box, (Settings > AE Settings...). See Alarm and Event Settings on page 22.
Filtering of Event Notifications

It is possible for OPC clients to filter out event notification based on event category. The OPC standard makes it possible to send vendor-specific information in event notifications. An event notification belongs to a certain event category.

There are six event categories defined within the OPC Alarm and Event Server.

*Table 12. Event categories defined in the OPC server*

<table>
<thead>
<tr>
<th>Event category</th>
<th>Vendor specific attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process Simple Event</td>
<td>Class, SourceGUID</td>
</tr>
<tr>
<td>Process Condition Event</td>
<td>Class, SourceGUID, AutoDisabled</td>
</tr>
<tr>
<td>System Simple Event</td>
<td>Class, SourceGUID</td>
</tr>
<tr>
<td>System Condition Event</td>
<td>Class, SourceGUID, AutoDisabled</td>
</tr>
<tr>
<td>OPC_SERVER_ERROR</td>
<td>NeedsRefresh</td>
</tr>
<tr>
<td>Process Data To Simple Event</td>
<td>XMLData, EventCode, RecipePath, Class, SourceGUID</td>
</tr>
</tbody>
</table>

The Process Simple Event and the Process Condition Event categories are used for simple events respective condition-related events generated from applications.

The categories System Simple Event and System Condition Event are used for system simple events and system alarms.

The OPC_SERVER_ERROR category is a simple event used to tell the OPC client about refresh.

The last category, Process Data To Simple Event, is a simple event generated from an application containing extra user defined data.
The vendor specific attributes are:

- **Class** – Used to group alarms of the process
- **SourceGUID** – An unique identifier given to each source to make it easier for the OPC client to identify the source of an alarm
- **AutoDisabled** – An attribute that indicates if an alarm is in the AutoDisabled state
- **NeedsRefresh** – Information to the OPC client from the OPC server telling that it is time for refresh
- **XMLData** – String containing user defined data
- **EventCode** – Determines batch event type
- **RecipePath** – Path to recipe

**Refreshing OPC Clients**

The OPC Server needs to refresh the OPC clients in the following situations:

- After adding a new subscription or deleting a subscription to a controller.
- After a communication error to a controller and when the communication is OK again.
- After overflow in the event subscriptions queue in the controller (the controller setting "AE Event subscription queue size") and when the queue again is filled to less than 75%.
- Five minutes after an alarm was added or removed from the controller, for example after application download.
- After overflow in the list of all alarms that are not idle (the OPC Server setting MaxNoOfAlarms) and when that list again is filled to less than 90%.
- After overflow in queue to OPC client (the OPC Server setting Queue Size) and when the queue is filled less than 75% again.

Before refresh of the OPC clients, the OPC Server refreshes itself first on all alarms that are not in an idle state. When the OPC Server is ready with its update, the refresh of OPC clients start. However, there is a delay of 30 seconds to avoid too many refreshes.
Performance

Response time to OPC clients will slow down considerably if more than 10 OPC clients are connected to the OPC server.

Sending alarms to OPC server is done with the limitations of MMS traffic, but are time stamped correctly.
Appendix A  Running the OPC Server and OPC Client on Different Computers

If you are going to run the OPC server on one PC and the OPC client on another PC, the settings required for DCOM must be performed on the OPC Server PC.

DCOM should however only be used if absolutely needed, due to the risk for lost connection as described in *Lost Connection Between OPC Client and OPC Server* on page 68.

**Firewall Settings for OPC Server**

To establish a DCOM connection between OPC Server and OPC Client, both running on Windows 8.1, the Windows Firewall settings need to be modified on the OPC Server as described below:

1. Go to **Control Panel (> System and Security) > Administrative Tools > Windows Firewall**.
2. Click **Advanced Settings** to open the Windows Firewall with Advanced Security window.
3. Click **Inbound Rules**.
4. Click **New Rule**.
5. Use the **New Inbound Rule Wizard** to select and add the following programs (already installed on the PC) to allow the connection:
   - **OpcEnum** available in Windows\System 32 folder
   - **AC800MC_OpcServer** available in Program Files (x86)\ABB Industrial IT\Control IT\OPC Server for AC 800M\Bin folder.
These new Inbound Rules ensure that a proper connection is established between OPC Server and OPC Client.

**Lost Connection Between OPC Client and OPC Server**

Various problems may occur if an OPC Client, running on another PC than the OPC Server, is stopped abruptly (if, for example, the network between the OPC Client and Server is disconnected).
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