

Whitepaper



# Five Steps to Success with OPC Certification

An OPC Compliance & Certification Quick Start Guide

*OPC Foundation*

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# Executive Summary

## Purpose of this document

This document is a starting point for vendors seeking official OPC Certification for their OPC-based products. The OPC Foundation has condensed the required information into a series of five steps. More information is available on the OPC Foundation website at <http://www.opcfoundation.org/certification>

This paper covers the preparation steps recommended by the OPC Foundation for the successful certification of an OPC Client and/or Server product in a sanctioned Test Lab.

## Audience for this document

This document contains technical information and is intended for software developers and QA personnel.

## OPC Foundation Membership

This document is primarily intended for members of the OPC Foundation. Most of the referenced materials herein require corporate membership. Information concerning membership is online at [opcfoundation.org/join](http://opcfoundation.org/join)

## How this paper is structured

OPC products that can be certified are either Clients or Servers (or both), and are either Unified Architecture or OPC Classic (or both). These 4 possibilities are covered in this document and are separated by technology first, and then with the Client and Server shown side-by-side for comparative purposes.

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# OPC Certification

## 1. What is Certification?

The OPC Foundation offers a complete certification program for its members. This program is defined by the [Compliance Working Group](#) who define the certification guidelines, the tests that must be conducted, the criteria for passing, the tools used for testing, and the rules that an official sanctioned Test Lab must follow.

A product seeking certification must be sent to a sanctioned Test Lab for official testing. Each product must pass a series of tests for • compliance to the specifications • interoperability with other products • robustness and recovery • resource efficiency • and usability.

Products are certified by the OPC Foundation Test Lab for three years and receive a unique certified serial number, an official certificate, rights to display the Certified logo, and are listed on the website at [opcfoundation.org/certified-products](http://opcfoundation.org/certified-products). Products must be re-certified with new major releases, after the expiration period, or when OPC interface alterations may affect compliance or interoperability.

The OPC Foundation recommends the use of CERTIFIED products only as they meet or exceed the high standards defined by the Certification Program.

## 2. Tools needed

Login to the OPC Foundation website ([opcfoundation.org](http://opcfoundation.org)) and download the following tools for testing your product(s). These tools are the same as those used by sanctioned OPC Test Labs:

Tool	Download Location	
<b>Test Case Documentation</b>	<a href="#">UA Server</a>	<a href="#">COM DA Server</a>
	<a href="#">UA Client</a>	<a href="#">COM DA Client</a>
<b>Compliance Test Tools</b>	<a href="#">UA Client/Server</a>	<a href="#">COM Servers</a>
		<a href="#">COM Clients</a>
	Tutorials available in each of the download pages	

### 3. Configuring Your Product for Testing

Now that you have the required test tools and test-case documentation you are ready to prepare your product for testing. The Certification test labs provide general configuration recommendations for a variety of products.

Documents exist for configuring your [OPC Server](#) and [OPC Client](#) which will help you prepare your product for thorough testing.

## 4. Testing

Currently, the Certification Test Labs will test OPC UA products, and OPC Classic Data Access 2.05a & 3.0 products.

### Step 1: Compliance Testing

Products must be compliant to the OPC Specifications. Vendors can validate compliance using the OPC Foundation provided test-tools. To download the Compliance test-tools (see 2. *Tools needed* on page 4).

- **OPC Servers:** Install the application compliance test tool(s) and follow the tutorial(s).
- **OPC Clients:**
  - **UA:** Install the UA CTT and then follow the client tutorial.
  - **Classic DA:** Install the OPC Analyzer and follow the analyzer tutorial.

Servers must pass the compliance test tool(s) and must provide the output file to the Test Lab when scheduling testing. UA and Classic DA Clients must pass error-injection tests that are listed in the Test Case Documentation showing the Test Case description and the Expected Result (see 2. *Tools needed* on page 4).

[Tutorials and Videos](#) for using the UA CTT are available to help you maximize your testing.

All CTT test-scripts are covered in the accompanying Test-Case specifications. Both the tool and documentation are grouped by *Conformance Unit* to help you correlate scripts to test-cases etc.

This is how the Test Case documentation looks:

Conformance Units

Welcome

Overview

Introduction

Environment Documentation

**Compliance Testing**

Service Sets

Address Space Model

Attribute Services

Attribute Client Read Basic

Attribute Client Read with proper Encoding

Attribute Client Write Basic

Attribute Client Write Quality & TimeStamp

Auditing

Base Information

Data Access

Data Access Client Basic

Data Access Client Deadband

Data Access Client SemanticChange

Clients shall use bulk operations whenever possible to reduce the number of Service Invocations.

Attribute Client Read Basic - 54 Test Cases

Test Case Id	Test Type	Keywords	Test Case Description	Expected Result
001	Lab		Monitor method call and analyze passed parameters for correctness and adherence to the specifications. Reading a single item.	Client correctly receives and processes the results correctly while also checking quality codes.
002	Lab		Read a single valid node, while requesting data with a MaxAge set to 0.	Verify the call is made correctly with the results being processed correctly by the client.
003	Lab		If client allows end-user to specify a MaxAge, then end-user specifies a value of say 5 seconds while reading one valid node.	Verify client correctly specifies the end-user supplied value to the server into the correct number of msec.
004	Lab		If client allows end-user to specify a MaxAge, attempt to enter MaxAge < 0	Client is expected to send a valid MaxAge. Note: Client may override the MaxAge with a default value. Likewise, it may simply reject the user-input and not issue the Read.

Clients should show Expected Result behavior in order to pass the certification.

## Step 2: Robustness & Recovery Testing

OPC products must be able to gracefully handle and recover from network interruptions etc.

- **OPC Servers:** must handle when a device (PLC etc.) and/or OPC Client become unavailable.
- **OPC Clients:** must handle when an OPC Servers becomes unavailable.

Certification Test Labs use virtualization for each test environment and are able to programmatically toggle the network availability of a computer using a batch file (see Appendix 1 – Product Submission Checklist on page 12).

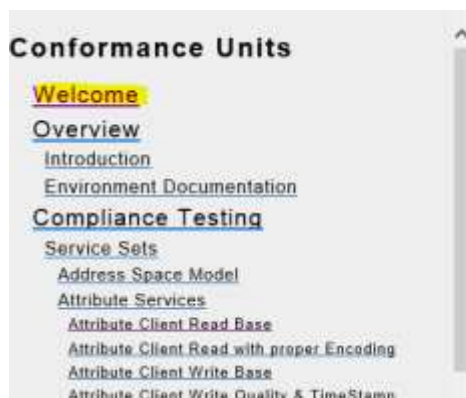
**OPC Servers** are tested with multiple data-sources (PLCs, typically) and multiple OPC Clients (5, typically). Device recovery is tested by systematically removing a device (or devices) for different time-periods. During this time we look for event notifications in the application log and the quality of the items, e.g. Good, Bad, or Uncertain etc. The same test is conducted on Client connections by disconnecting the computer where a given OPC Client resides.

Test cases used by the Test Lab are available in the test-case documentation (see 2. *Tools needed* on page 4). Simply locate the *Robustness and Recovery Testing* section of the documentation; it is linked to in the main page and is visible in the main navigation.

**OPC Clients** are tested with multiple OPC Server connections. A test lab will systematically disconnect an OPC Server (or Servers) by disconnecting the OPC Server computer from the network for varying amounts of time. During this time we look for event notifications in the log or on-screen, and verify the Client reconnects properly.

In all cases, a Server and Client must handle the error by not crashing, by providing sufficient information to the end-user, and to recover the connection at the earliest possibility when connectivity returns.

Test cases used by the Test Lab available in the test-case documentation (see 2. *Tools needed* on page 4). Simply locate the *Robustness and Recovery Testing* section of the documentation; it is linked to in the main page and is visible in the main navigation.



Welcome to the online documentation for Certification Testing. All tests used in Certification Test Labs are in this documentation.

### Get Started!

Use the navigation on the left to choose a *Conformance Unit* which contains the tests.

Alternatively, select a certification category to begin your certification preparation:

- [Interoperability Testing](#)
- [Robustness & Recovery Testing](#)
- [Usability Testing](#)
- [Compliance Testing](#)

Products submitted for certification tested are expected to pass all tests in all categories above.

Got questions? contact [compliance@opcfoundation.org](mailto:compliance@opcfoundation.org)

## Step 3: Interoperability (IOP) Testing

The ability to successfully connect and interoperate with products from other vendors is the primary objective of OPC technology, and is in the scope of certification testing. A Test Lab will use a minimum of five products from different vendors to connect to your product and will conduct the same tests as conducted at an IOP workshop.

IOP testing will vary for each product tested because of functionality differences per product. Generally speaking, the following tests are conducted: • connect • browsing and filtering the items in the address-space • reading/writing to items of varying data types • reading/writing to arrays • subscriptions • generating, receiving, and handling events etc.

Many vendors offer free evaluation versions of their products that you can download for testing purposes.

All tests are documented in the test-case documentation (see 2. *Tools needed* on page 4). Simply locate the *Interoperability Testing* section of the documentation; it is linked to in the main page and is visible in the main navigation.

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Got questions? contact [compliance@opcfoundation.org](mailto:compliance@opcfoundation.org)



## Step 4: Resource Efficiency Testing

A 36-hour resource-efficiency test will combine stress-testing with robustness and recovery testing. The goal is to ensure reliability, recovery, and resource-efficiency (no memory-leaks etc.) Charts that are generated which reveal growth generally lead to a test failure.

[Resource Efficiency Test](#) document is available to walk you through the steps to perform the resource efficiency test on your product.

**An OPC Server** test requires multiple data-sources (PLCs, typically) and multiple OPC Clients (five, by minimum). Each Client must consume a minimum of 1000 items covering all devices. One device and one OPC Client will have intermittent network access (2-minutes connected, 2 minutes disconnected) for the duration of the test.

**An OPC Client** test requires multiple OPC Server connections with each containing a large number of items (1000 or more) per OPC Server connection. One OPC Server connection will experience intermittent network access (2-minutes connected, 2-minutes disconnected) for the duration of the test.

**Windows Performance Monitor** is used to gather important metrics including • CPU usage • CPU usage of the Process • Memory usage of the Process • Threads used by the Process • Handles used by the Process • Disk space used by the Process etc.

## Step 5: Usability Testing

The end-user experience will be measured by how easy and usable an application is. The Lab Certification includes usability testing to conduct tests to find areas where a product can be improved. A product cannot fail certification testing because of usability, but a Lab may advise on areas of improvement.

Look for the usability tests in the test-case documentation and verify that your product meets or exceeds the expectations defined (see 2. *Tools needed* on page 4). Simply locate the *Usability* section at the bottom of the main navigation.

## Avoiding Common Problems

Avoid making common mistakes found in other products:

OPC Servers	OPC Clients
<ul style="list-style-type: none"><li>• Not passing the CTT</li><li>• Bad Quality data not reported when a device is unavailable/unplugged.</li><li>• Unified Architecture:<ul style="list-style-type: none"><li>○ ServerShutdown not implemented</li></ul></li></ul>	<ul style="list-style-type: none"><li>• Not displaying sufficient error information</li><li>• Improper handling of error injection scripts</li><li>• Failing to recover from lost OPC Server connections.</li></ul>
<b>* Resource Leaks during 36h Testing *</b>	

## 5. Scheduling Official Testing

You are now ready to schedule your official certification testing: [opcfoundation.org/schedule-testing](http://opcfoundation.org/schedule-testing)

Please prepare to submit the following materials to the Test Lab:

- A copy of your OPC Server/Client product.
- A license to allow the product to work without interruption or limitation.
- A sample configuration (described in *3. Configuring Your Product for Testing* on page 5)
- A technical contact, for help and support.
- If submitting an OPC Server then the following are required:
  - A copy of the CTT results.
  - Data-sources (e.g. PLCs) used to acquire data.

## 6. Being Certified

Once the lab has officially certified your product:

- You will receive an official certificate<sup>2</sup>
- You will receive the CERTIFIED logos<sup>3</sup> in high and resolution
- You will receive numerous test result reports
- Listed on [opcfoundation.org/certified-products](http://opcfoundation.org/certified-products)
- Recommended by the OPC Foundation.



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Certified products meet or exceed the high standards of the OPC Foundation Certification Program, and will result in happier customers and fewer technical support problems.

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<sup>2</sup> Embossed with the official OPC Test Lab seal and sent via regular mail.

<sup>3</sup> Subject to the agreement of the Logo License Agreement.

# Appendix 1 – Product Submission Checklist

Please use the following checklist when preparing your product for testing.

- **Product:** please provide either (a) download link (b) installer on CD (c) VMWare image
- **License:** we need fully-operational product with a lifetime of at least 1-year.
- **Configuration:** prepared in accordance with the product configuration guidelines.
- **Instructions:** for setup and/or configuration
- **CTT Results:** the output of the CTT (*this applies to OPC Servers only*):
  - **UA:** results.xml, and also send your Configuration (\*.CTT.XML) (*please ZIP both*)
  - **Classic:** \*.ENC (*please ZIP*)

If submitting an embedded product, then please include:

- **Power:** cables and/or adaptors as necessary
- **Cables:** for communication, e.g. USB, RS232 etc.
- **Drivers:** for Windows or Linux, as necessary
- **Configuration:** sample address space etc.
- **Software:** for controlling/configuring the device, or flashing the firmware etc.
- **Instructions:** for setup and configuration
- **Address:** shipping address label, if the product is to be returned after testing

In addition, please also provide:

- **Technical Contact:** who can answer technical questions and provide remote assistance.

# Annex: Network Adapter Toggle Batch File

The following Batch file will toggle the ENABLED state of the “Local Area Connection” network adapter in a Windows environment.

Copy and paste the following text into a file called “NIC.BAT”:

```
@echo off
SET DTIME=120
cls
echo Delay time is: %DTIME%
echo Network Connection Enabler/Disabler started at: %date% %time%

:start
echo Disabling network adapter at %time%
netsh interface set interface "Local Area Connection" DISABLED

timeout /t %DTIME%
echo Enabling network adapter at %date% %time%
netsh interface set interface "Local Area Connection" ENABLED

choice /c:yn /m "Repeat network adapter recycle (y/n)?" /t %DTIME% /d y
echo %ERRORLEVEL%
IF ERRORLEVEL 2 GOTO end
IF ERRORLEVEL 1 GOTO start

:end
echo.
echo Network adapter recycle complete at %date% %time%
```

Simply run the batch file with administrator/elevated permissions.

You can modify the value of DTIME to change the frequency of the network adapter availability from the suggested length of 120 seconds.



**Contact Information:**

OPC Foundation

16101 N. 82<sup>nd</sup> Street, Suite 3B

Scottsdale, AZ 85260

USA

Tel: 480-483-6644

Fax: 480-483-1830

Email: [compliance@opcfoundation.org](mailto:compliance@opcfoundation.org)



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## Revision History

Version	Date	Author	Change
1	Feb 1, 2013	NP/DT	Initial version.
2	Feb 21, 2013	NP/DT	Hyperlink corrections. Replace 2 DOCX applications with form. Added “Appendix 1 – Product Submission Checklist”.
3	Feb 24, 2014	NP	Hyperlink corrections for new website.
4	Oct-3, 2014	NP/DT	Added instructions for locating test-cases for compliance, interoperability, robustness, and usability testing. Screenshots added.