

OPC Day Finland



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OPC UA Product Certification

UA Profiles and Certification

OPC UA = Toolbox of Features

- ▶ How to scale?
 - UA Services function and features?
 - Compatibility and compliance?
 - Security and protocol variations?
 - Information Models and domain extensions?
- ▶ Grouping sets of functions that logical belong together:
 - Full Featured Profiles
 - Profiles and Facets
 - Conformance Units
- ▶ Exposing information about features in Address Space

OPC Profiles – Scale for Embedded

▶ Conformance Unit

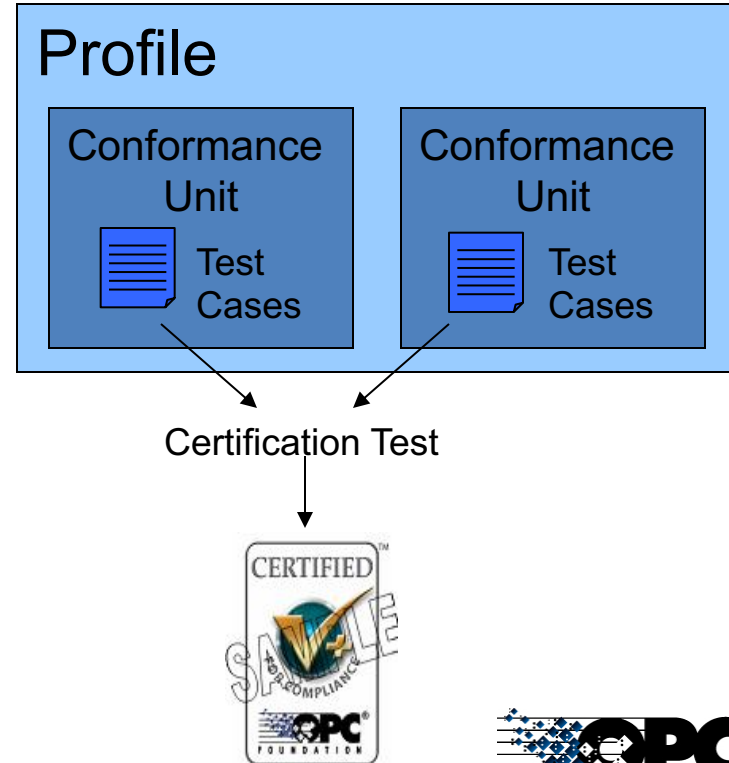
- Represents specific feature
- Defines a list of test cases for the feature

▶ Profile

- Named grouping of features
- Full Featured
Combination of Profiles and Conformance Units that can be used stand alone
- Facet
Profile that can be used only in combination with other Profiles

▶ Certification Test

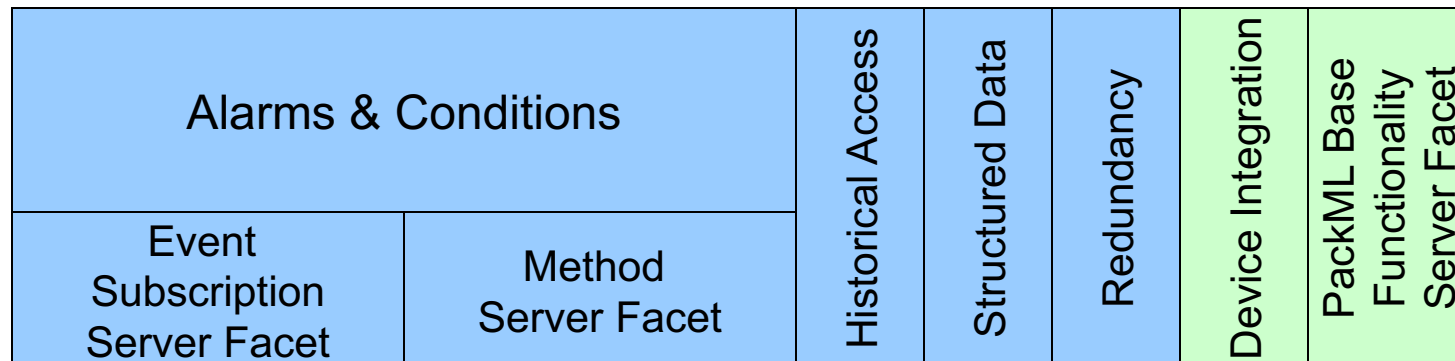
- Vendor defines list of supported Profiles
- Certification Test executes test cases
- End users can rely on tested Profiles



Example: OPC UA Server Profiles

**Pub/Sub Profiles
under construction**

Facets building on top of Full Featured Profile



Standard UA Server

min. 50 Sessions

min. 5 Subscript.

min. 500 Items

Embedded UA Server Profile

Protocol UA TCP

Security

Address Space

Read/Write/Subscribe

Full Featured Profile

Overview: Profiles for Pub/Sub

► Full Featured Profiles

- UDP UADP Cyclic Fixed Profile
- UDP UADP Dynamic Profile
- UDP UADP Flexible Layout Profile
- MQTT UADP Profile
- AMQP UADP Profile
- MQTT JSON Profile
- AMQP JSON Profile

► Facets

- Information Model Facet
- Message Security Facet
- Parameter Configuration Facet
- Component Configuration Facet

OPC Foundation Website

<https://www.opcfoundation.org/profilereporting>

OPC UA Profiles

Following are the currently defined profiles, arranged according to their application category.

Server Category

Facets

- Core Characteristics
- Data Access
- Event Access
- Alarm & Condition
- Generic Features
- Redundancy
- Historical Access
- Aggregates
- Programs Model
- Query

FullFeatured

- Nano Embedded Device 2017 Server Profile
- Micro Embedded Device 2017 Server Profile
- Embedded 2017 UA Server Profile
- Standard 2017 UA Server Profile**
- Enhanced DataChange Subscription 2017
- User Token – X509 Certificate Server Facet
- Embedded 2017 UA Server Profile
- Global Discovery Server 2017 Profile
- Global Discovery and Certificate Mgmt 2017

Client Category

Facets

- Core Characteristics
- Data Access

"Standard 2017 UA Server Profile" Profile

Description	This Profile is a FullFeatured Profile that defines a minimum set of functionality required for PC based OPC UA servers. Compared to the embedded profiles, the Profile requires higher limits for Sessions, Subscriptions and Monitored Items. It also requires support of diagnostic information. This profile supersedes the "Standard UA Server Profile".
URI	http://opcfoundation.org/UA-Profile/Server/StandardUA2017

This page lists the conformance units of the selected profile with their name and description.

Conformance units that are inherited via included Profiles are not listed by default. Use the following radio buttons to change this default behaviour.

- ☐ Show only explicitly included conformance units
- ☒ Show also conformance units from included profiles
- ☐ Show all existing conformance units
- [Show relationship of Conformance Units with Units and Profiles for Clients / Servers](#)

Address Space Model

Include	Name	Opt.	Description	From Profile	Test Cases
<input checked="" type="checkbox"/>	Address Space Base	<input type="checkbox"/>	Support the NodeClasses with their Attributes and References as defined in Part 3. This includes for instance: Object, ObjectType, Variable, VariableType, References and DataType.	Core 2017 Server Facet	Open
<input checked="" type="checkbox"/>	Address Space Dictionary Entries	<input checked="" type="checkbox"/>	Support external dictionaries by relating OPC UA Nodes to dictionary entries using the HasDictionaryEntry ReferenceType.	Core 2017 Server Facet	Open
<input checked="" type="checkbox"/>	Address Space Atomicity	<input type="checkbox"/>	Support setting the NonatomicRead and NonatomicWrite flags in the AccessLevelEx Attribute for Variable Nodes to indicate whether Read or Write operations can be performed in atomic manner. If the flags are set to '1', atomicity cannot be assured.	Core 2017 Server Facet	Open
<input checked="" type="checkbox"/>	Address Space Full Array Only	<input type="checkbox"/>	Support setting the WriteFullArrayOnly flag in the AccessLevelEx Attribute for Variable Nodes of non-scalar data types to indicate whether write operations for an array can be performed with an IndexRange.	Core 2017 Server Facet	Open

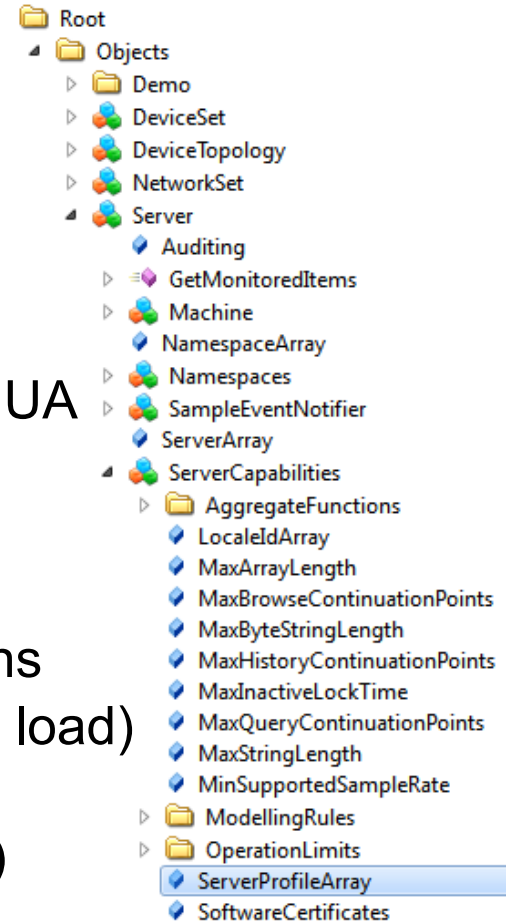
Server Capabilities

▶ ServerProfileArray

- Exposed in AddressSpace (ServerObject)
- List of UA-Profile URLs
- Examples:
<http://opcfoundation.org/UA-Profile/Server/StandardUA>
<http://opcfoundation.org/UA-Profile/Server/Methods>

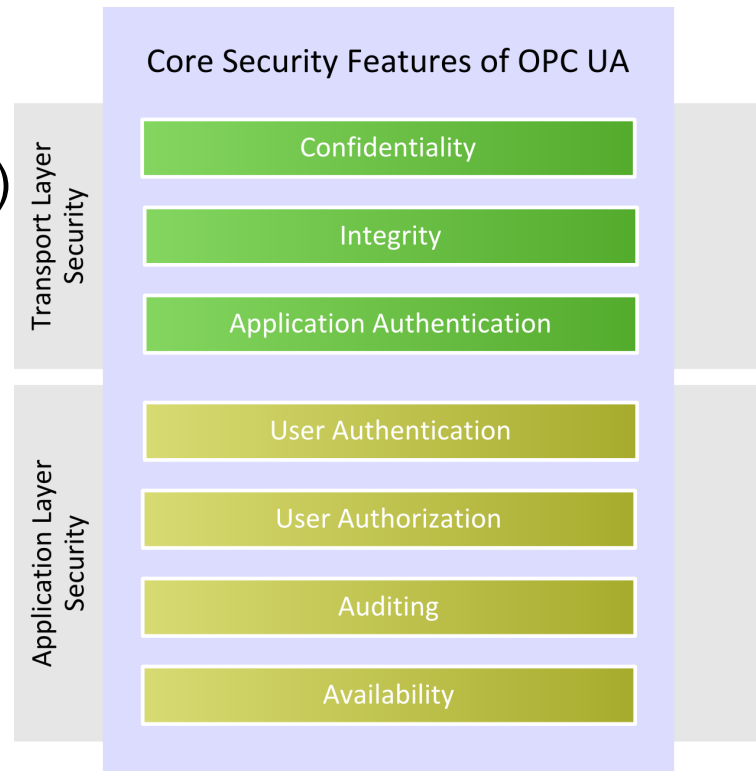
▶ OperationLimits

- Quantity limitation in UA-Server for certain operations
- Protect against resource exhaustion (memory, CPU load)
- Avoid long lasting operations (responsiveness)
- Informational, Client must adopt to limits (call again)



Build-In Security Concept

- ▶ Layered Security Architecture
 - Encrypt/Sign (transport/message)
 - Access protection (application specific)
 - Authentication of Applications
 - Authentication of Users
 - User/Role based Authorization
 - Auditing of relevant operations
 - Availability
- ▶ Based on established Standards
 - AES, RSA, SHA, ECC
 - X509: 256+ Bit, 2048+ Key Length



[graphic: copyright Unified Automation GmbH]

OPC UA Security Policies - Concept

- ▶ Security Policy specifies combination of
 - Used cryptographic algorithm
 - Used signature algorithm
 - Used key derivation algorithm
- ▶ UA Server announces which SecurityPolicies are supported
 - UA Client selects the SecurityPolicy it wishes to use
- ▶ UA Publisher associates SecurityPolicy with DataSet
 - UA Subscribers must utilize this same SecurityPolicy

Security Policies - Transport

- ▶ URI uniquely defines **SecurityPolicy**
 - #None (lowest security needs, disable)
 - #Basic128Rsa15 (deprecated)
 - #Basic256 (deprecated)
 - #Aes128_Sha256_RsaOaep (average security needs)
 - #Basic256Sha256 (high security needs)
 - #Aes256_Sha256_RsaPss (high security needs)
 - #PubSub-Aes128-CTR (average security needs)
 - #PubSub-Aes256-CTR (high security needs)

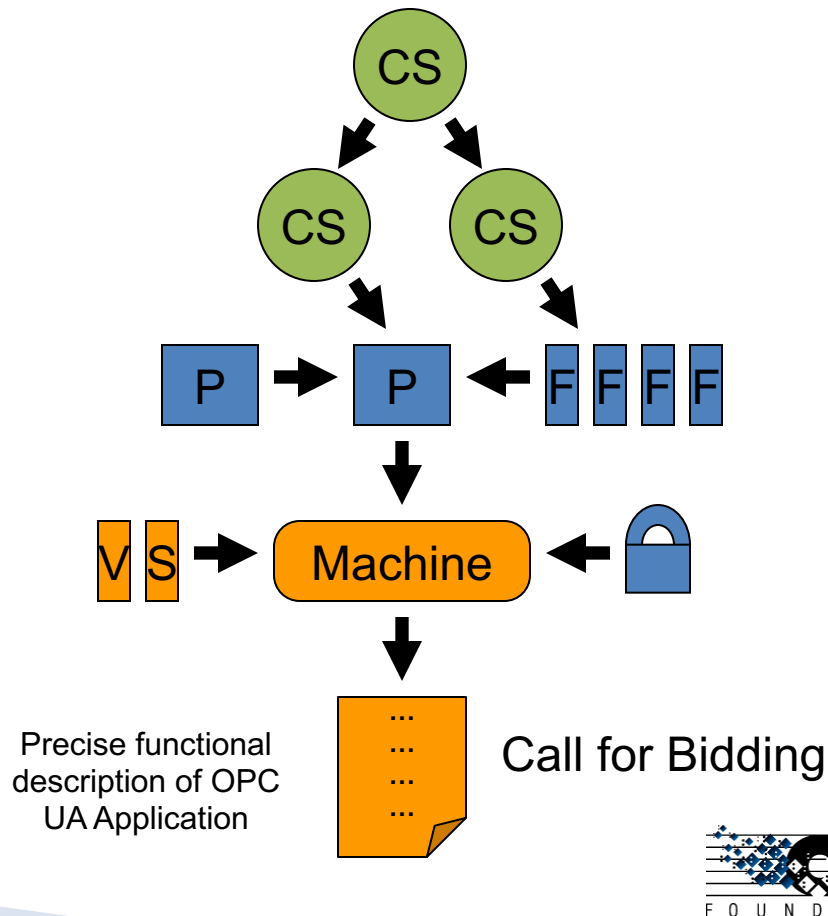
OPC Foundation may add new and deprecate weak policies over time !

Token Policies - Authorization

- ▶ URI uniquely defines **UserToken**
 - #Anonymous (everybody, no user authorization)
 - #UserNamePassword (user/pwd with appl. specific validation)
 - #X509Certificate (X509 user certificates to identify users)
 - #IssuedToken (encrypted Kerberos token for user identity)
 - #IssuedTokenWindows (encrypted Windows-Kerberos token)
 - #JsonWebToken (JSON Web Token required in OAuth2)

Requirements – Call for Bidding

- ▶ Companion Specification
 - ▶ VDMA Robotics Specification
 - ▶ AIM RFID Specification
 - ▶ PLCopen UA Functions Blocks
- ▶ OPC UA Core Specification
 - ▶ Full Featured Profiles
 - ▶ Additional Facets
 - ▶ Security Profiles
- ▶ Quantity Measures
 - ▶ Data Volume
 - ▶ Speed



Issues without certification

- ▶ Different quality standards
- ▶ Different understanding of requirements
- ▶ Low quality in UA core functionalities
- ▶ Everybody can claim support for a specification

- ▶ Those issues remain with self-certification as
 - Test applications can be tricked
 - Interpretation of the results may vary
 - Automatic testing can't cover all test cases

OPC Certification

Compliance

- ... to OPC UA Core Specifications
- ... to Companion Specifications

Interoperability

- With products of other vendors'

Robustness

- Recovery from disaster

Efficiency

- CPU, Memory and bandwidth

Usability

- Good user-experience

OPC Certification

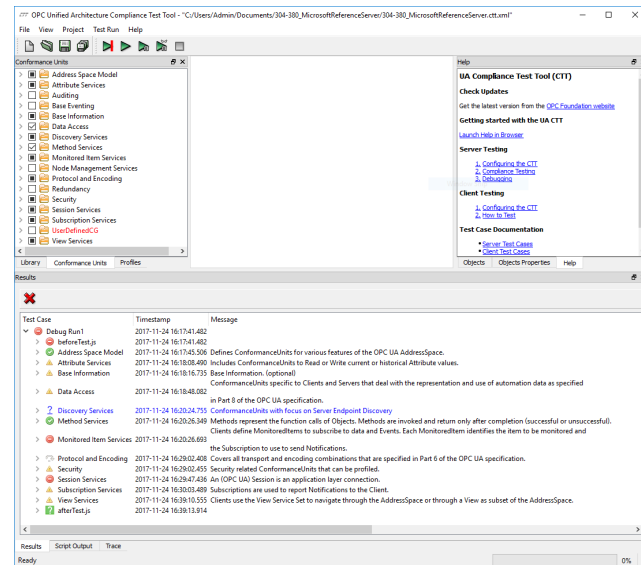
Compliance

- ... to OPC UA Core Specification
- ... to Companion Specifications

- Test all REQUIRED functionality
- Test all OPTIONAL functionality
- Conduct **test-to-pass** and **test-to-fail** use-cases
- Validate behavior for multi-step processes
- Servers handle & respond to invalid Client requests
- Clients handle & report invalid Server responses

Compliance Test Tool (CTT)

- ▶ Validates OPC UA Services
- ▶ Validates AddressSpace
- ▶ Validates Security
- ▶ > 1000 Test Scripts
- ▶ Extendable by users
 - Adding settings
 - Adding test scripts
- ▶ Available to all members of the OPC Foundation (including logo members)



OPC Certification

Compliance

- ... to OPC UA Core Specification
- ... to Companion Specifications

Interoperability

- With products of other vendors'

- All products are tested against 5 products from other vendors
- All OPC UA services are tested
- All DataTypes are tested
- SecurityPolicies are tested
- IdentityTokens are tested

Usability

- Good user-experience

OPC Certification

Compliance

- ... to OPC UA Core Specification
- ... to Companion Specifications

Interoperability

- With products of other vendors'

Robustness

- Recovery from disaster

- Handling lost communication
- Test communications recovery
- Problems are self-contained
- Quality codes are reported correctly
- Audit events log sufficient data
- End-user has access to critical information

OPC Certification

- Place the product under some “load”
- Connect to 5 products from other vendors
- Force intermitted communication to one device
- Force intermitted communication to one partner
- Measure CPU, RAM, Threads, Handles

(and more) for 36-hours

Efficiency

- CPU, Memory and bandwidth

Usability

- Good user-experience

OPC Certification

- Record how products are delivered
- Validate product documentation accuracy
- Verify product uses OPC correctly (as-intended)
- Verify product behaves as an end-user would expect
- Ensure the end-user experience will be positive!

Efficiency

- CPU, Memory and bandwidth

Usability

- Good user-experience

Certified “Marks”



Certified Products



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ALGORITHMS DO THE WORK FOR YOU



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Products » Technip FMC UCS Server

Technip FMC UCS Server



Member: TechnipFMC

Product website: fmcenergysystems.com/en/AutomationControl/Products...

This product enables TechnipFMC's UCOS control system to interface with OPC UA clients by acting as a Data Gateway on the UCOS side, and as UA Server for external network devices. It's certified to support the MDIS profile v1.01.

V1.03 Attended IOP Workshops

Certified Profile: Embedded UA Server

Additional Facets: Method Server Facet
Data Access Server Facet

Security Policies: SecurityPolicy - Basic256Sha256
SecurityPolicy - Basic256

User Identity Tokens: User Token - Anonymous Facet
User Token - Username
Password Server Facet
User Token - X509 Certificate
Server Facet

Companion Facets: MDIS Solution Server Profile
MDIS Instrument Out Model
Server Facet
MDIS Discrete Out Model Server
Facet
MDIS Digital Out Model Facet
MDIS Redundancy
MDIS ExtensionObject



Certificate Number: 1812CE00B2

Certification Date: 12/10/2018

Expiration: 12/31/2021

CTT Version: 1.03.341.380



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BECOME A MEMBER

Newest Members

Hireawiz
KEB Automation KG
Monokot
XISOM Inc.
Seidenader Maschinenbau
GmbH

Certified Products

Technip FMC UCS Server
SCADA system SIMATIC WinCC
Open Architecture
uaToolkit Embedded
DeviceGateway

Twitter Timeline

Opening ceremony for the new IoT and AI Lab from @Microsoft in Shanghai - Sam DeKey from @OPCFoundation China Intro...
<https://t.co/c0c2h81NLjd>

Chicago @automationworld: Bryan Griffin from @FMMIorg preaches operational excellence leveraging open standards inc...
<https://t.co/jx2Jl5nJ9>

meeting of @LN40 testbed for @VDMOnline #opcua based companion specs at University Ravensburg-Weingarten in hist...
<https://t.co/WenKycXe9>



Certified Products

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Products » ANSI C Based OPC UA Server SDK/Toolkit

ANSI C Based OPC UA Server SDK/Toolkit

Member: United Automation GmbH

Product website: www.united-automation.com/products/ua-server-sdk/.

The SDK/Toolkit simplifies the UA data API, implements common UA functionality needed in most or all UA applications, provides basic functionality and helper functions, implements the security handling and provides samples for common use cases.

The application provides or consumes information via OPC UA. This layer contains the application specific logic and a mapping to OPC UA using the OPC SDKs.

The ANSI C OPC UA Server SDK provides an ANSI C library used to develop OPC UA Servers providing a standard interface to vendor specific systems. The OPC UA Server is usually used to describe the available information from a vendor system and to provide access to the data for external systems in a standard way.

The ANSI C OPC UA SDK is a compact OPC UA SDK designed for embedded devices which provides the basic infrastructure to create an OPC UA Server.

Supported OPC UA services

- FindObjects, GetObjects
- CreateSession, ActivateSession, CloseSession
- Browse, BrowseNext, TranslateBrowsePathsToNodeIds
- RegisterNodes, UnregisterNodes
- Read, Write
- HistoryRead, HistoryUpdate
- Call
- CreateSubscription, ModifySubscription, DeleteSubscription
- CreateMonitoredItems, ModifyMonitoredItems, DeleteMonitoredItems
- Publish, Republish
- SetFilteringOptions, SetMonitoringMode, SetTriggering

Supported Features and Profiles

- Data Access
- Events
- Methods
- Alarms & Conditions
- Historical Access
- Complex Types

As facilities cannot be certified directly, the certification process has been made using an application (OPC UA/ANSI C Demo Server) that comes with the ANSI C OPC UA SDK and has been created using the SDK.

Certified Products

- Technop PMC UCS Server
- SCADA system SIMATIC HMI/CC
- Open Architecture
- ua4all Embedded DeviceGateway

Twitter Timeline

Don't miss the OPC UA Server Tool Asia July 24-25 in Shanghai & Shenzhen (China, Nagoya (Japan), Seoul (Korea)).

<https://t.co/2uYp1y>

SDT members registered already! Don't miss the upcoming OPC UA Day Automation Europe hosted by @ehsanger in !!

<https://t.co/2uYp1y>

Opening ceremony for the new IIT and IIT-Lab from @IITBombay in Shanghai - See Delay from @IITBombay China news. <https://t.co/2uYp1y>

Attended IOP Workshops

- 2009: OPC UA North American IOP Workshop
- 2009: OPC UA European IOP Workshop
- 2010: OPC UA European IOP Workshop
- 2011: OPC UA European IOP Workshop
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- 2014: OPC UA European IOP Workshop
- 2015: OPC UA European IOP Workshop
- 2016: OPC UA North American IOP Workshop
- 2017: OPC UA European IOP Workshop
- 2019: OPC UA North American IOP Workshop

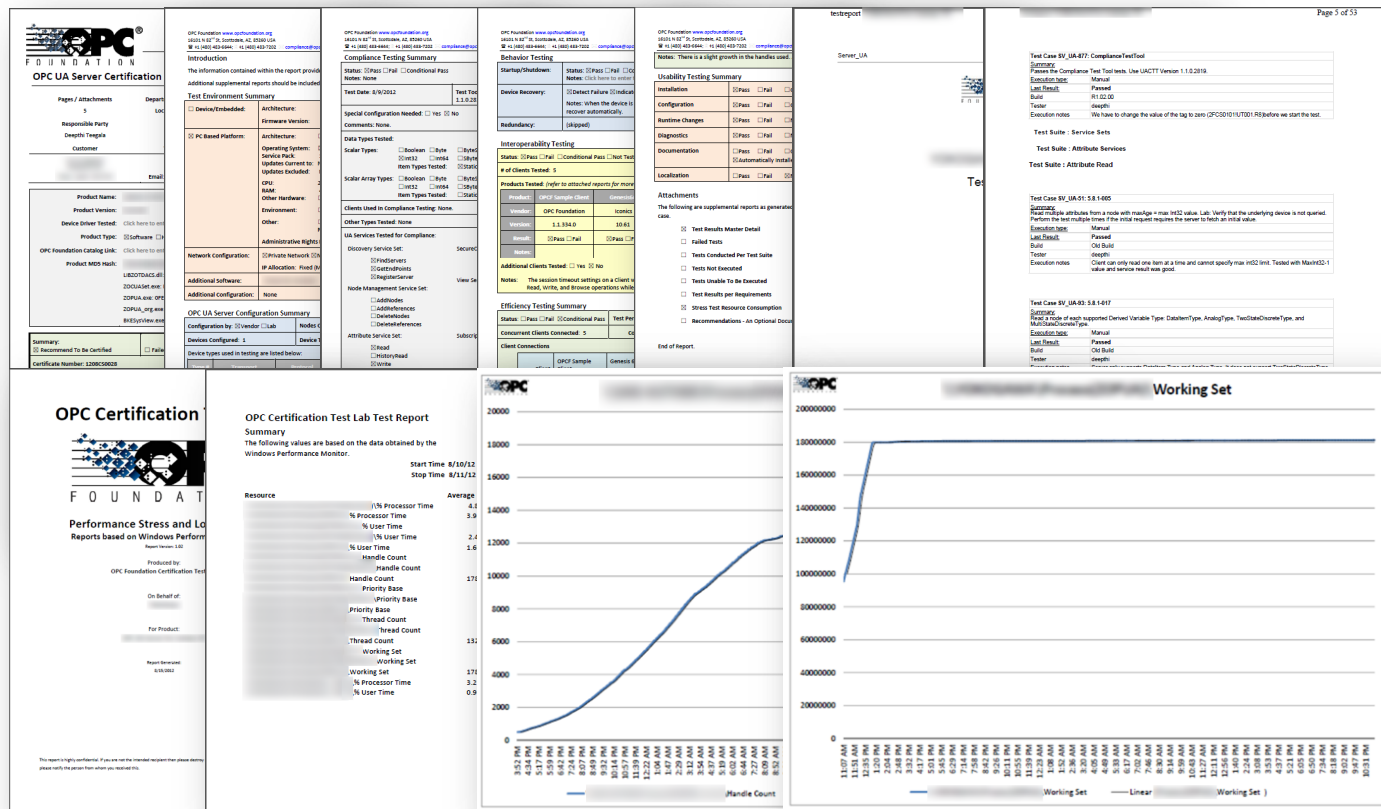
V1.03 (1712CE009C)

V1.02 (1405CS004C)

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- 2009: OPC UA North American IOP Workshop
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- 2015: OPC UA European IOP Workshop
- 2016: OPC UA North American IOP Workshop
- 2017: OPC UA European IOP Workshop
- 2019: OPC UA North American IOP Workshop

Certification Test Reports



Thank you for your attention !



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