SIEMENS

SIMATIC WinCC V7.2

OPC Unified Architecture

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OPC - Standardize on technology not the product – break the barriers

OPC History - success story

DDE (Windows 3)
1990

1996

2009

Benefits of OPC

- Open connectivity
- Plug-and-Play
- Interfaces available from multiple vendors
- Easy to use
- Reduces your project costs!

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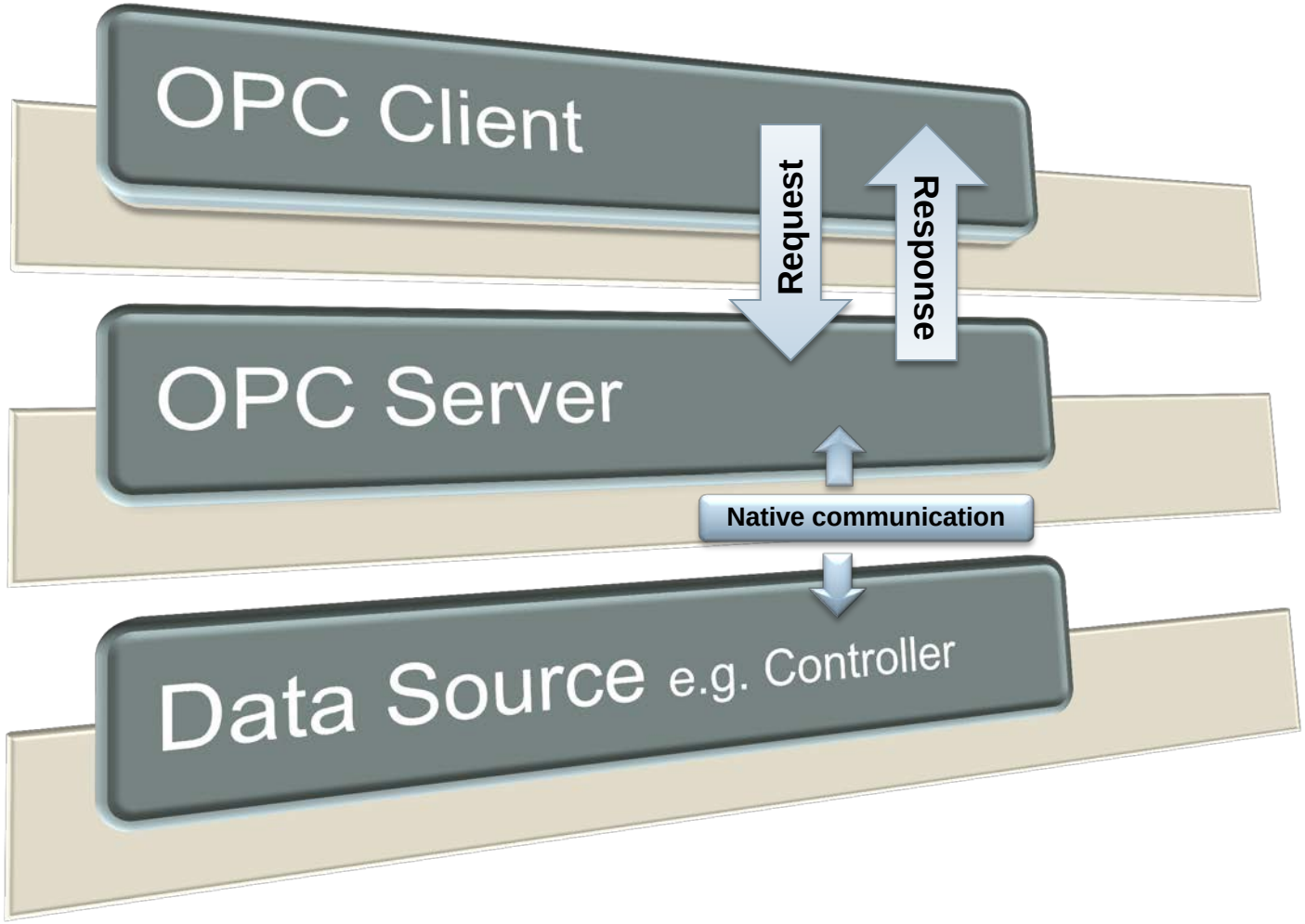
How does OPC works



OPC Client

- Initialize the OPC communication
- Reading/ writing requirements

OPC

- Communication on basis of COM/DCOM, SOAP/HTTP or UA Binary

OPC Server

- Carry out the Client requirements
- Cyclical / change controlled

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OPC Unified Architecture Principles

OPC UA is designed to deliver a true Universal Connectivity based on a secure and simple platform to address Enterprise level challenges

- OPC UA integrates existing OPC specifications DA, A&E, HDA, etc. in one specification

Unified Access

Platform Independence

- OPC UA is designed to be independent of the platform.
- Access via Firewalls and across the Internet

Reliability

- OPC UA implements a configurable timeouts, error detection, and communication failure recovery.

Security

- OPC UA is Secure-by-default, encryption enabled, uses advanced certificate handling and authentication

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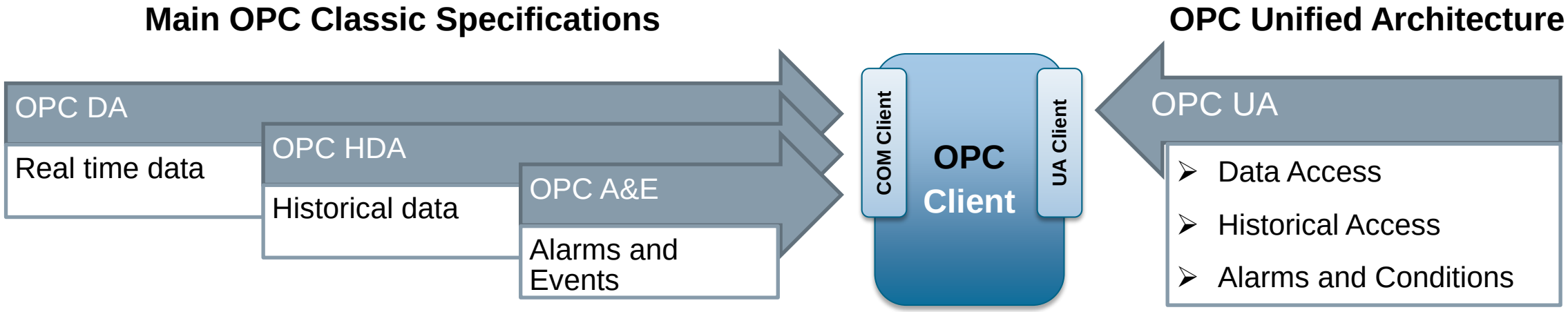
OPC UA Principles: Unified Access

Unified Access

OPC UA integrates existing OPC specifications DA, A&E, HDA, etc. in one specification.
This reduces system integration costs by providing a common architecture for accessing information.



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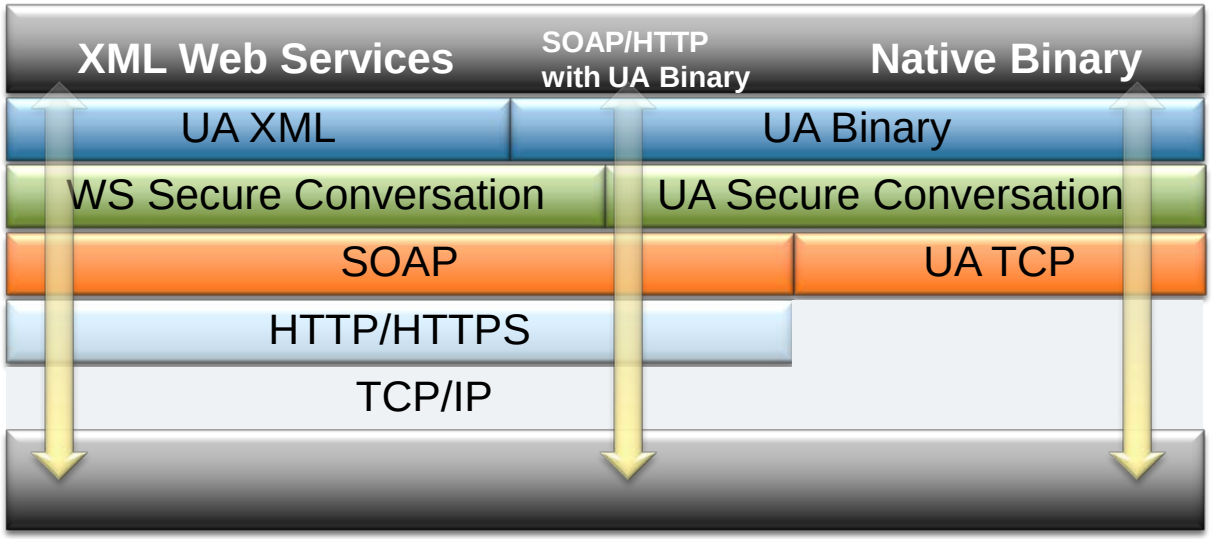
OPC UA Principles: Platform Independence & Access via Firewalls and across the Internet

Platform Independence

OPC UA is designed to be independent of the platform.

Using SOAP/XML over HTTP, OPC UA can be deployed on Linux, Windows XP Embedded, VxWorks, Mac, Windows 7 and Classical Windows platforms.



Access via Firewalls and across the Internet

OPC UA uses message based security which means messages can be relayed through HTTP, UA TCP port or any other single port available.

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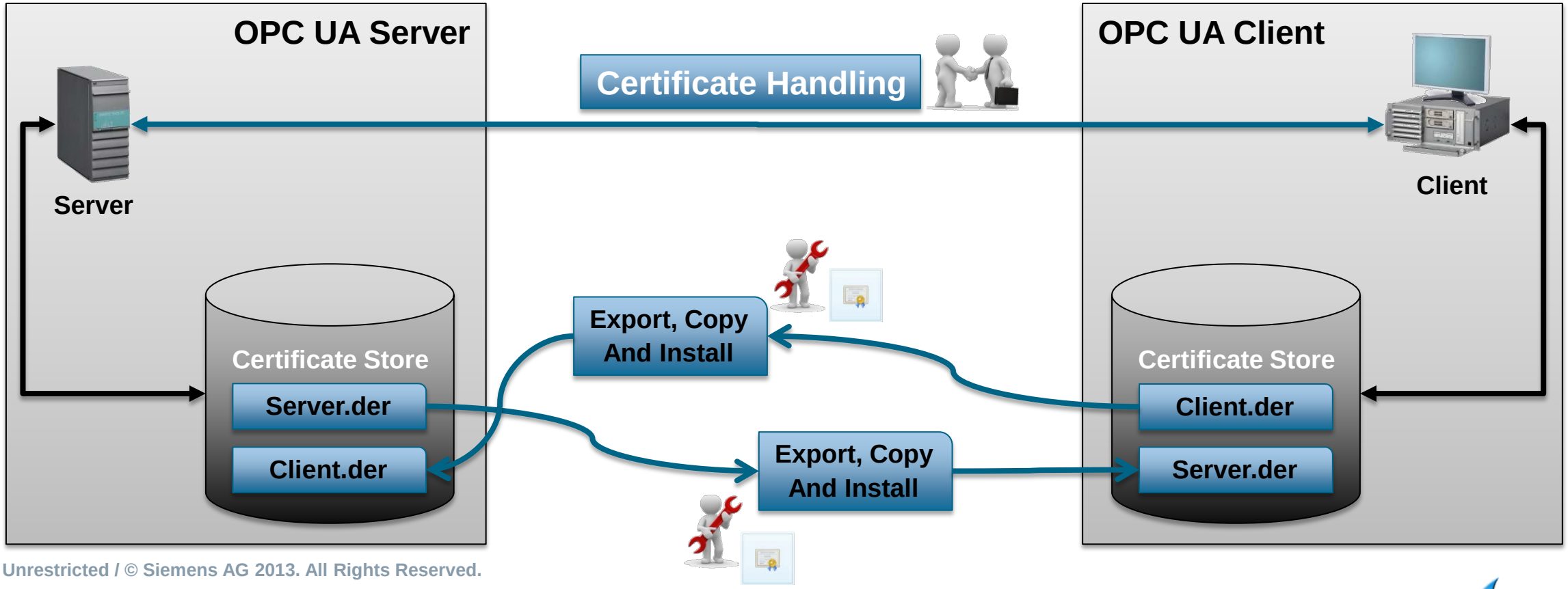
OPC UA Principles: Security

Security

OPC UA is Secure-by-default, encryption enabled (to encode the data transfer), uses advanced certificate handling and authentication.



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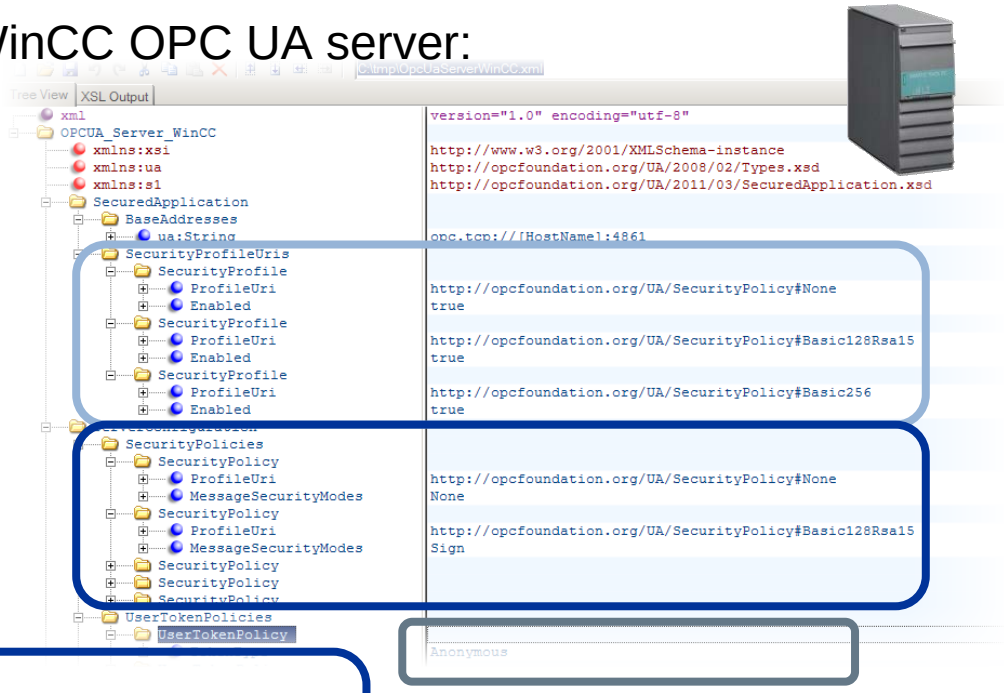
OPC UA Principles: Security in WinCC

The following table lists the security settings supported by the WinCC OPC UA server:

Security Policy	Message Security Mode		
None[1]	None		
Basic128Rsa15[2]	None[4]	Sign[5]	SignAndEncrypt[6]
Basic256[3]	None[4]	Sign[5]	SignAndEncrypt[6]



Settings of the WinCC OPC UA server

Security Policy

1. The certificate exchange is switched off.
   Every OPC UA client can log on to the WinCC OPC UA server.
2. Certificate exchange with depth of encryption of 128 bit.
3. Certificate exchange with depth of encryption of 256 bit.

Message Security Mode

4. Unsecured exchange of data packages between client and server after a certificate check.
5. The data packages are signed with the certificates, but not encoded
6. The data packages are signed with the certificates and encoded

Authentication

For user account identification of an OPC UA client,
the WinCC OPC UA server supports the methods "Anonymous" and "Windows user name / Password".

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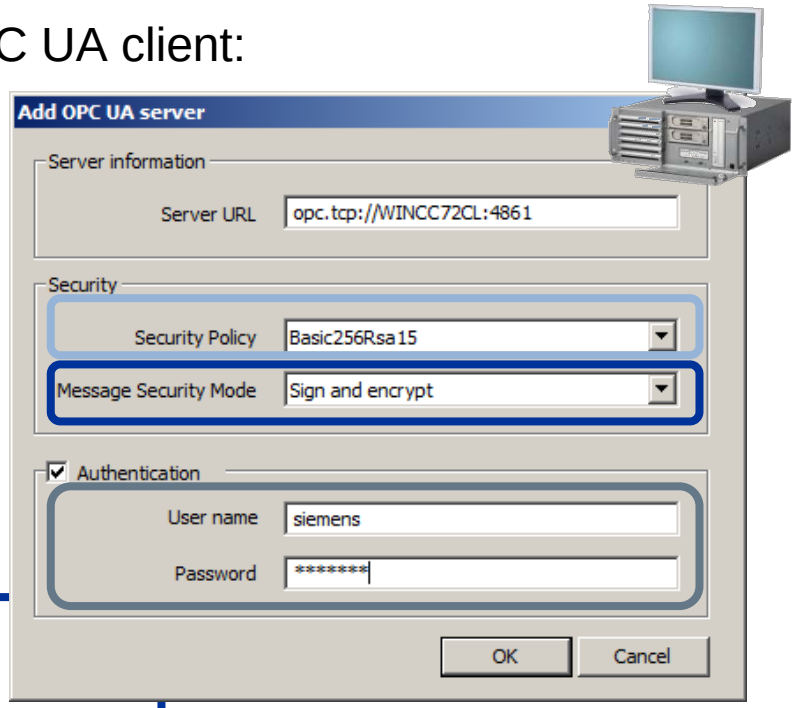
OPC UA Principles: Security in WinCC

The following table lists the security settings supported by the WinCC OPC UA client:

Security Policy	Message Security Mode		
None	None		
Basic	None	Sign	SignAndEncrypt



Settings of the WinCC OPC UA client

Security Policy

- The certificate exchange is switched off.
- Certificate exchange with depth of encryption of Basic128/-192/-256, Basic128Rsa15/-192Rsa15/-256Rsa15 or Basic256Sha256.

Message Security Mode

- Unsecured exchange of data packages between client and server after a certificate check.
- The data packages are signed with the certificates, but not encoded
- The data packages are signed with the certificates and encoded

Authentication

For user account identification of an OPC UA client,
the WinCC OPC UA server supports the methods "Anonymous" and "Windows user name / Password".

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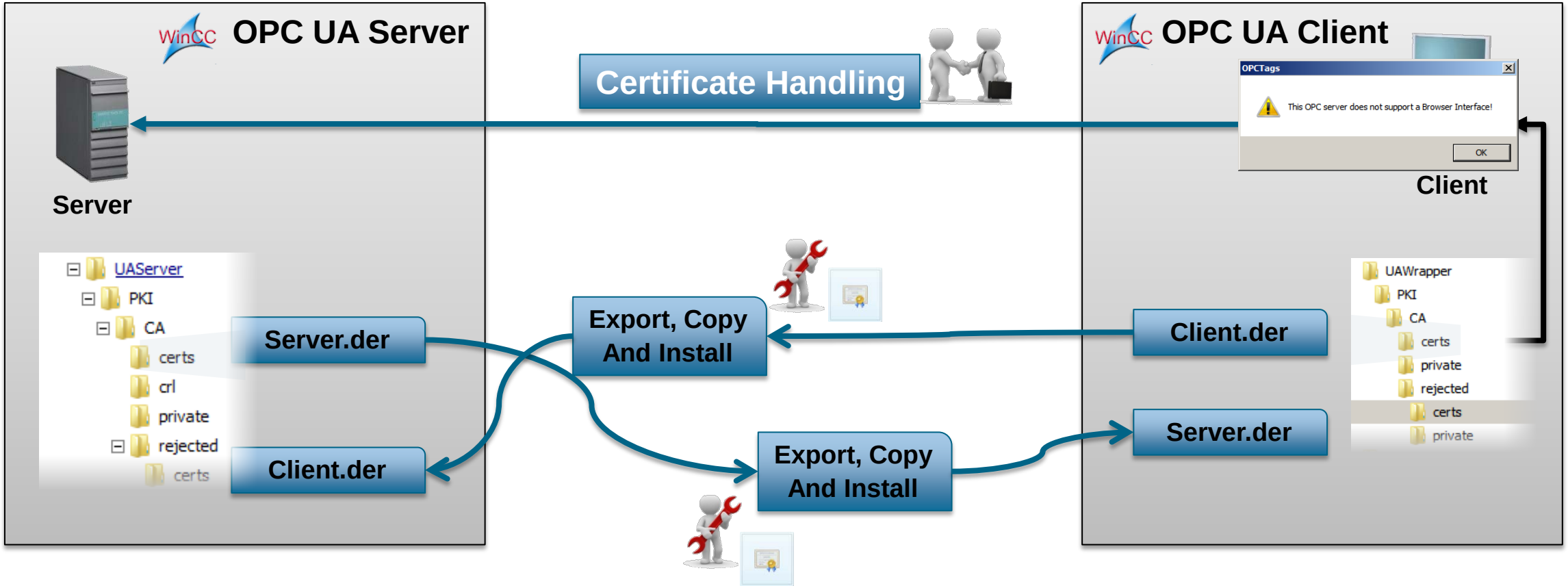
OPC UA Principles: Security in WinCC

Live Demo

Certificate store of the WinCC OPC UA server:
"<WinCC installation folder>\OPC\UAServer\PKI"

Certificate store of the WinCC OPC UA client:
"<WinCC installation folder>\OPC\UAWrapper\PKI"



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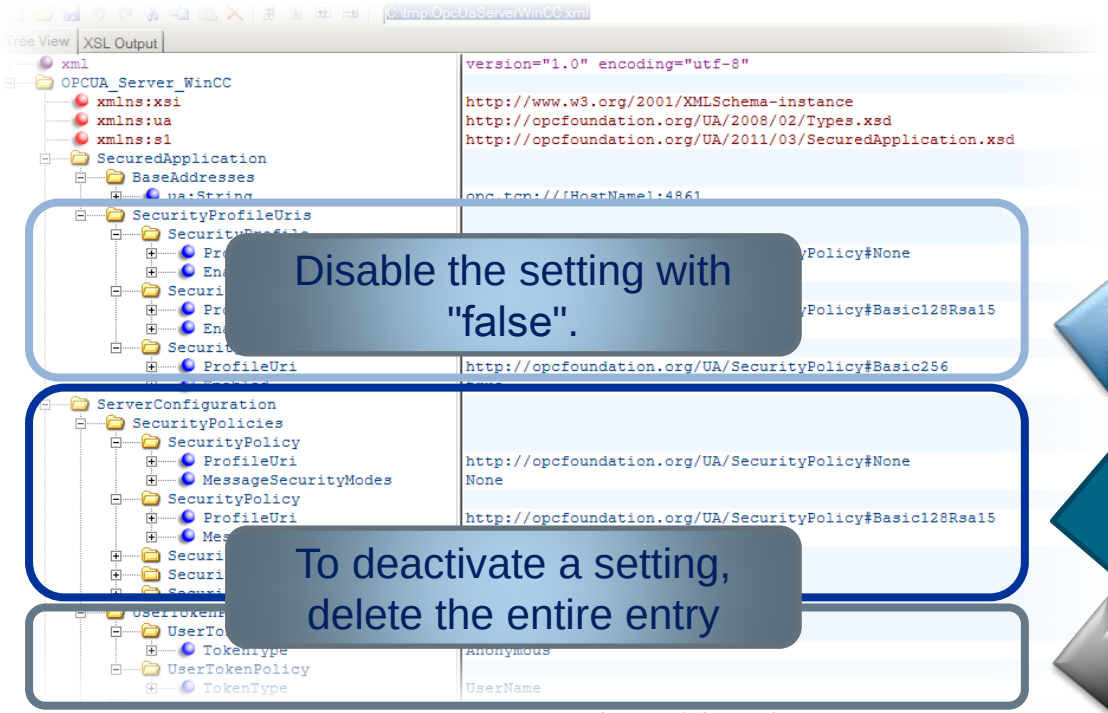
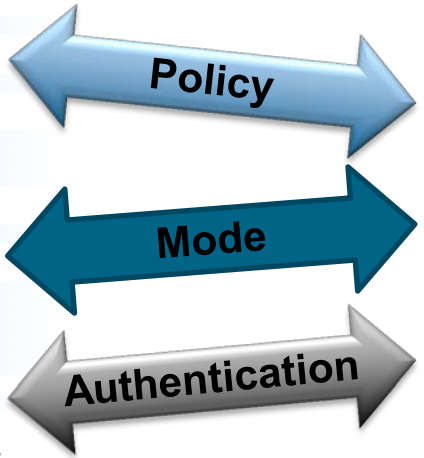
OPC UA Principles: Security in WinCC

WinCC UA Server

- Open the configuration file
  (<WinCC project folder>OPC\UAServer\OPCUAServerWinCC.xml)
- Specify security settings

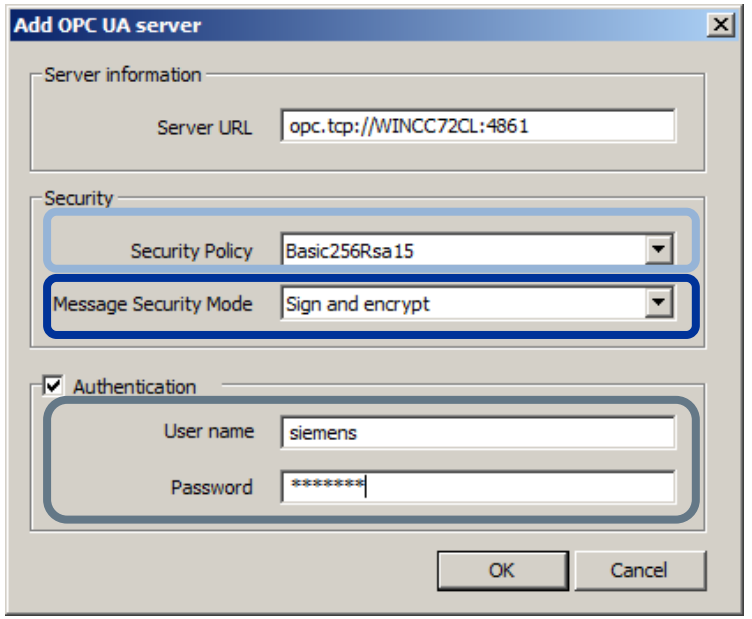


Settings of the WinCC OPC UA server



WinCC UA Client

- Add the OPC communication driver
- Use the WinCC OPC Item Manager to configure the connections (system parameter)
- Enter the URL of the WinCC OPC UA server in the OPC UA server dialog
- Set up the security settings



Settings of the WinCC OPC UA client

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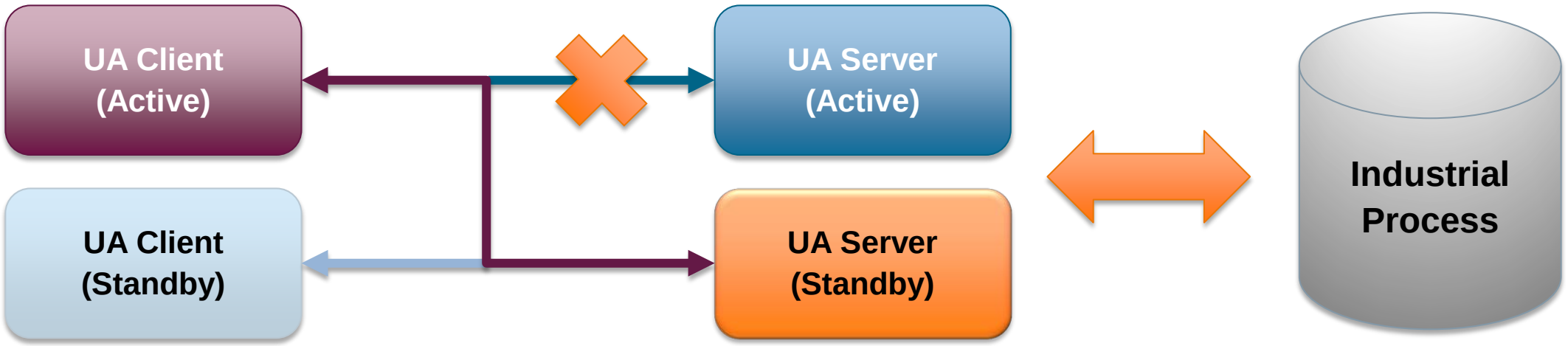
OPC UA Principles: Reliability

Reliability

OPC UA implements configurable timeouts, error detection and communication failure recovery.
OPC UA allows redundancy between applications from different vendors to be deployed.



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OPC Unified Architecture in WinCC

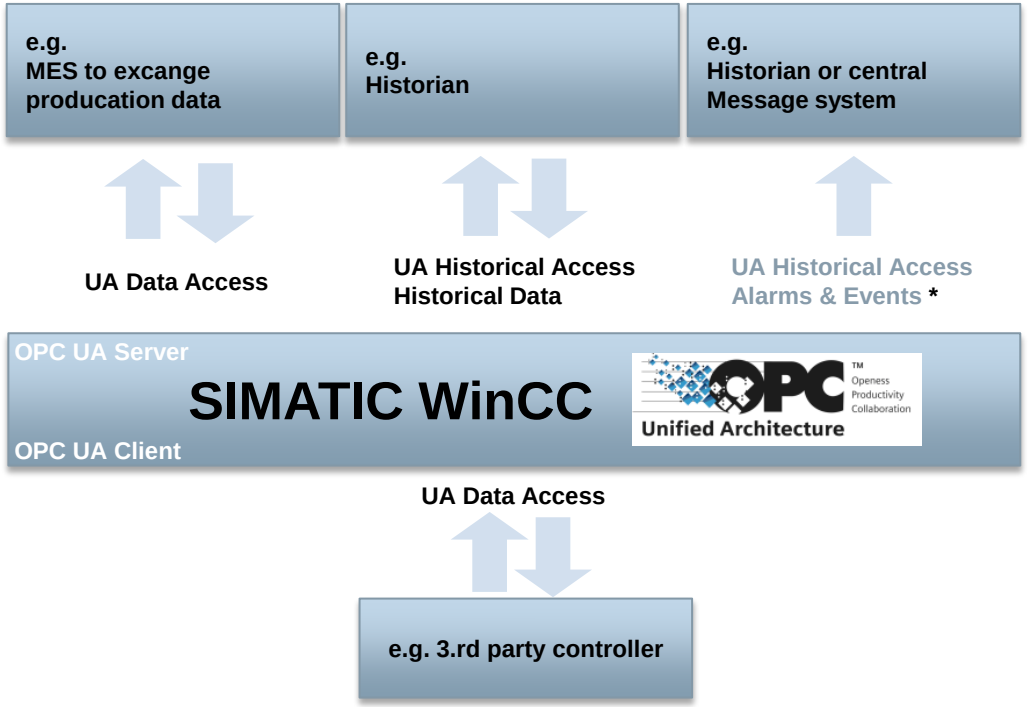
OPC UA is designed to deliver a true Universal Connectivity based on a secure and simple platform to address Enterprise level challenges

OPC UA Principles:

- Unified Access
- Platform Independence
- Access via Firewalls and across the Internet
- Reliability
- Security

- **WinCC OPC UA Server**
  for OPC UA Data Access
  and OPC UA Historical Access *
  ➢ Part of the WinCC ConnectivityPack

- **WinCC OPC UA Client**
  for data access as WinCC Channel



*) OPC UA Historical Access supports Historical Data.
Alarms & Events are not supported.

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WinCC OPC UA Server

The WinCC OPC UA Server provides the following values:

- **Process values**
- **Values from tag archives**

Basic information to the WinCC OPC UA Server

- WinCC OPC UA server is installed as Windows service and started automatically.
- WinCC OPC UA server supports the "UA-TCP UA-SC UA Binary" communication profile.
  The used port number is adjustable (configuration file "OPCUAServerWinCC.xml“)
- You access the WinCC OPC UA server via the following URL:
  opc.tcp://[HostName]:[Port]
- For authorization between WinCC OPC UA server and OPC UA client certificates are exchanged.
  In addition, you can encode the data transfer.

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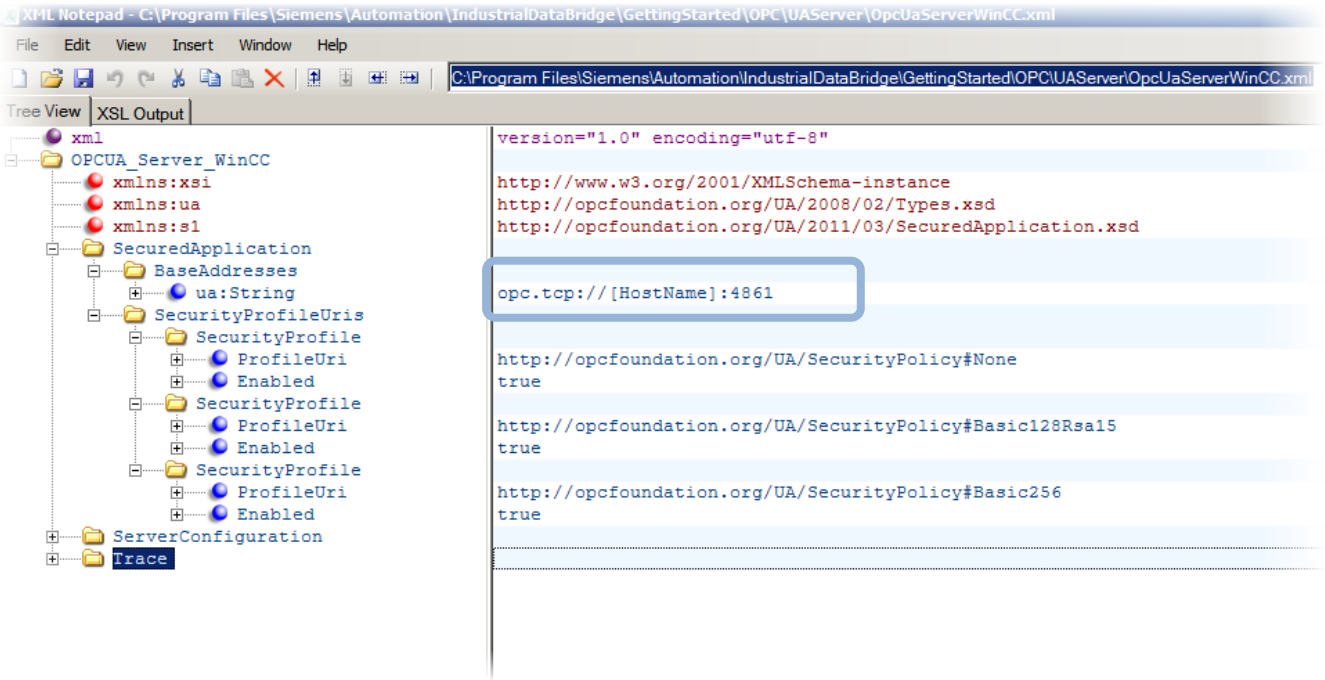
WinCC OPC UA Server - Configuration of the Server in detail

1. Open the configuration file (<WinCC project folder>OPC\UAServer\OPCUAServerWinCC.xml)
2. Change the port number of the WinCC OPC UA server
3. Specify security settings
   - Enable the setting with "true".
   - Disable the setting with "false".
4. Specify user identification
5. Configure optimized WinCC archive write access
6. Change the trace level



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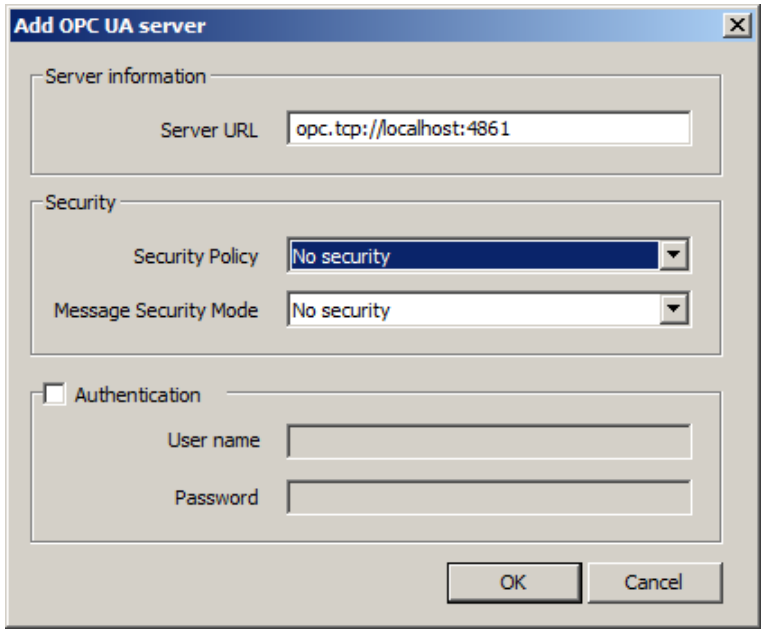
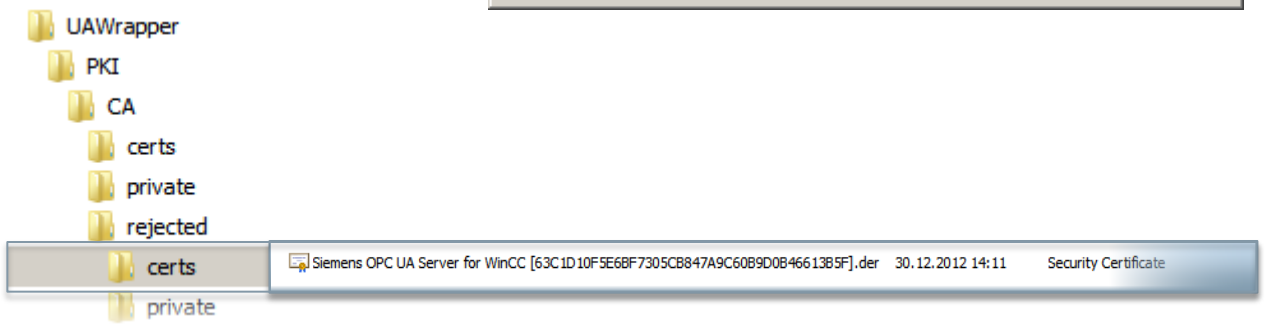
WinCC OPC UA Client

The WinCC OPC UA client enables data access to any OPC UA server in accordance with the OPC Unified Architecture specification

Configuration of an OPC connection:

1. Add the OPC communication driver
2. Use the WinCC OPC Item Manager to configure the connections (system parameter)
3. Enter the URL of the WinCC OPC UA server in the OPC UA server dialog
   - Set up the security settings
4. Click "Browse Server“ → An error dialog opens
   - The "rejected" folder containing the rejected server certificate
5. Move the server certificate from the "rejected" folder to the "certs" folder





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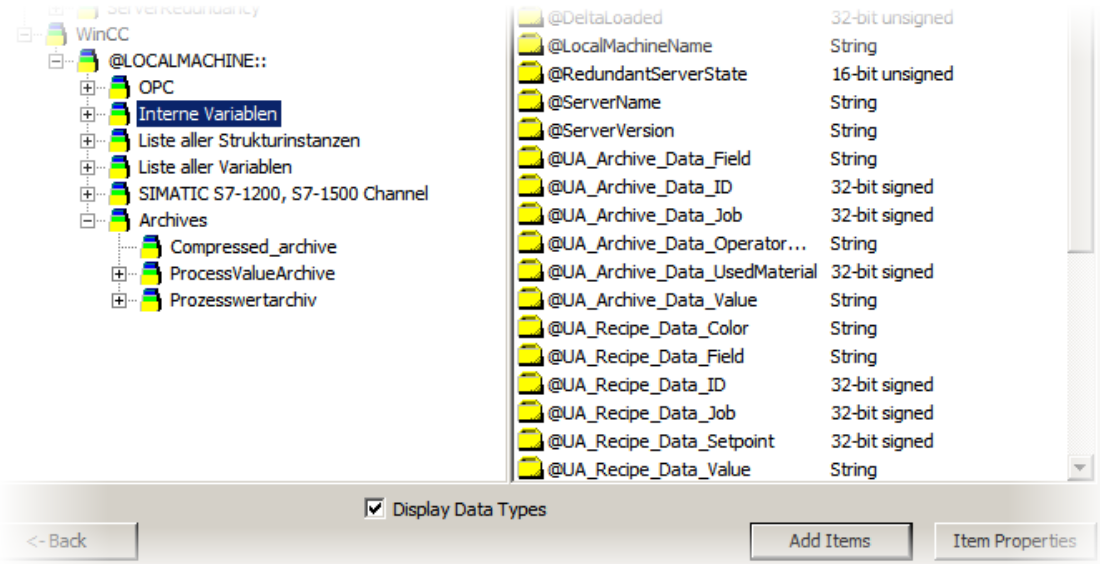
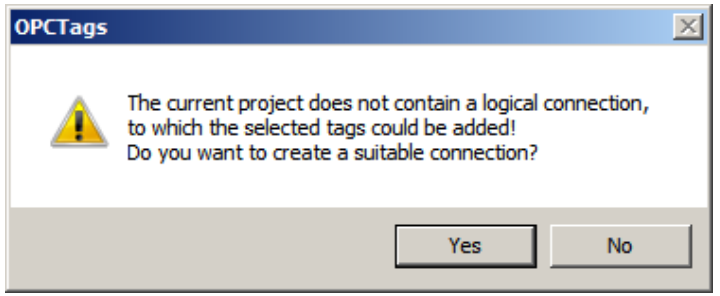
WinCC OPC UA Client

Configuration of OPC tags:

1. Click "Browse Server". The "Filter criteria" dialog is opened.
2. Select the tag to be mapped in the "opc.tcp:// ..." dialog, e.g. "OPC_UA_Server_Tag". Click "Add Items".



- A message will be output if this connection is not available
- Enter the connection name "OPCUAServer



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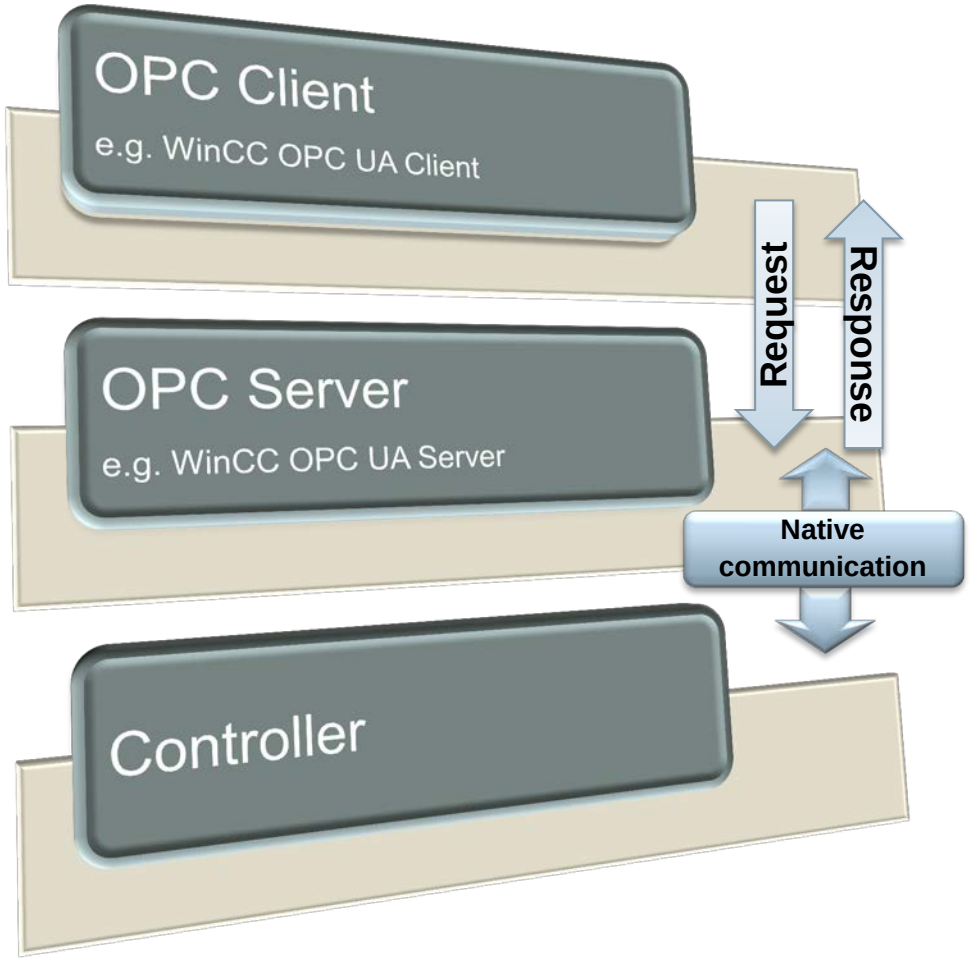
WinCC OPC UA – Data Access

Live Demo



OPC DA in general

- OPC UA – Data Access: standardizes access method to real-time data
- OPC UA – Data Access decouples the implementation of the device, e.g. a controller from its data items
- Every item includes information on: Value, Quality code and timestamp

OPC DA usage

- Used only for real-time data
- Typical queries:
  - What is the process value of “tank level 1” now?
  - What is the setpoint of “motor 1” now?
- Only allows the transmission of the latest values

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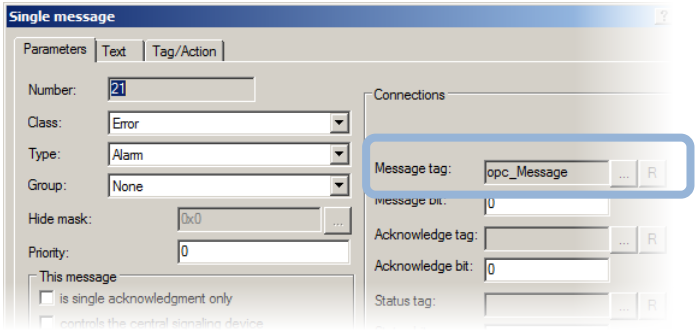
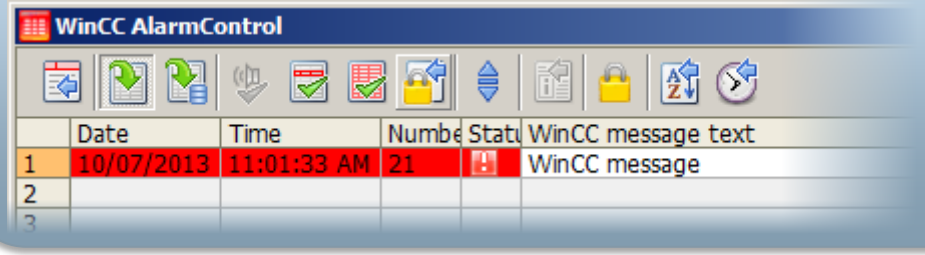
WinCC OPC UA – Data Access – using the timestamp from the OPC tag

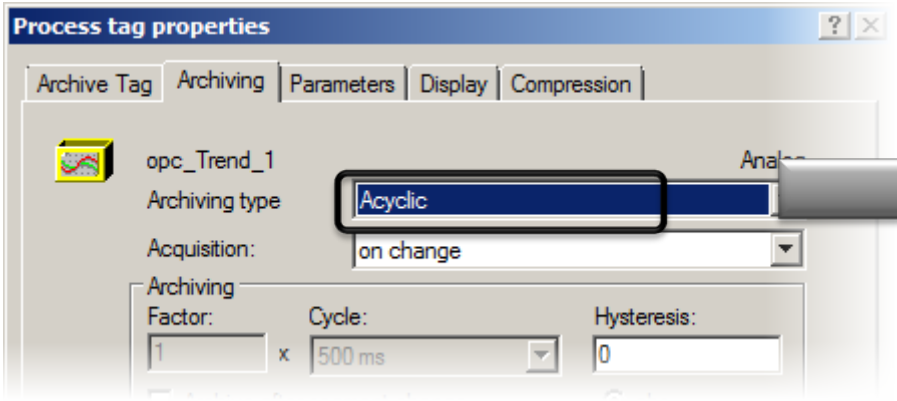
Timestamp of the OPC tag is used for the message



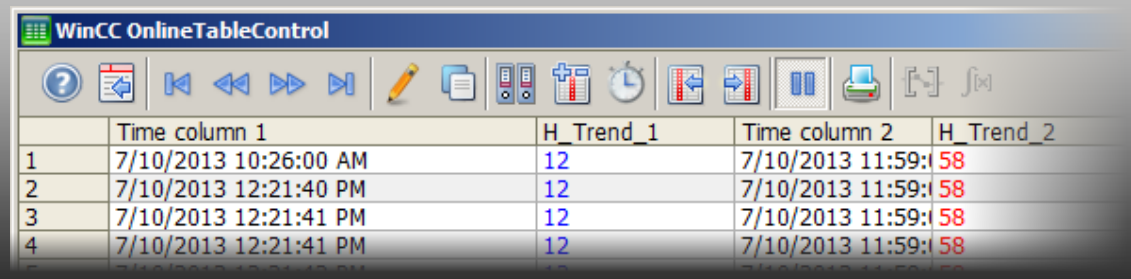
Result: time stamp is used for the message



Timestamp of the OPC tag is used to store the trend if you use the archiving mode “Acyclic”



Result: time stamp is used for the trend



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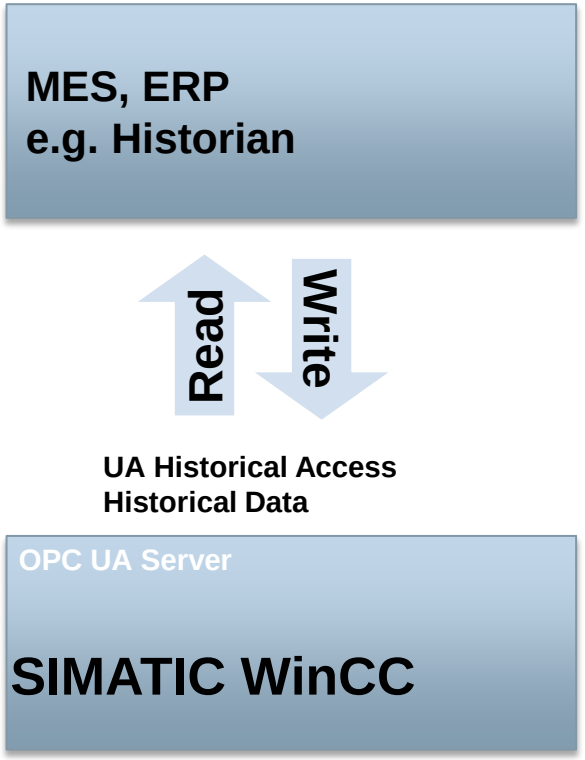
WinCC OPC UA – Historical Access

Live Demo



OPC Historical Access in general

- OPC Historical Access:
  standardized access method to analyze archive data
- Standard method to write historical values

OPC Historical Access usage

- Used only for historical data
- Typical queries:
  - What is the historical value of “tank level 1” for the last hour?
  - Insert a new value for the “tank level 1” to the archive.
- Standard method
  - to read historical values out of the WinCC tag logging archive
  - write historical values into WinCC tag logging archive

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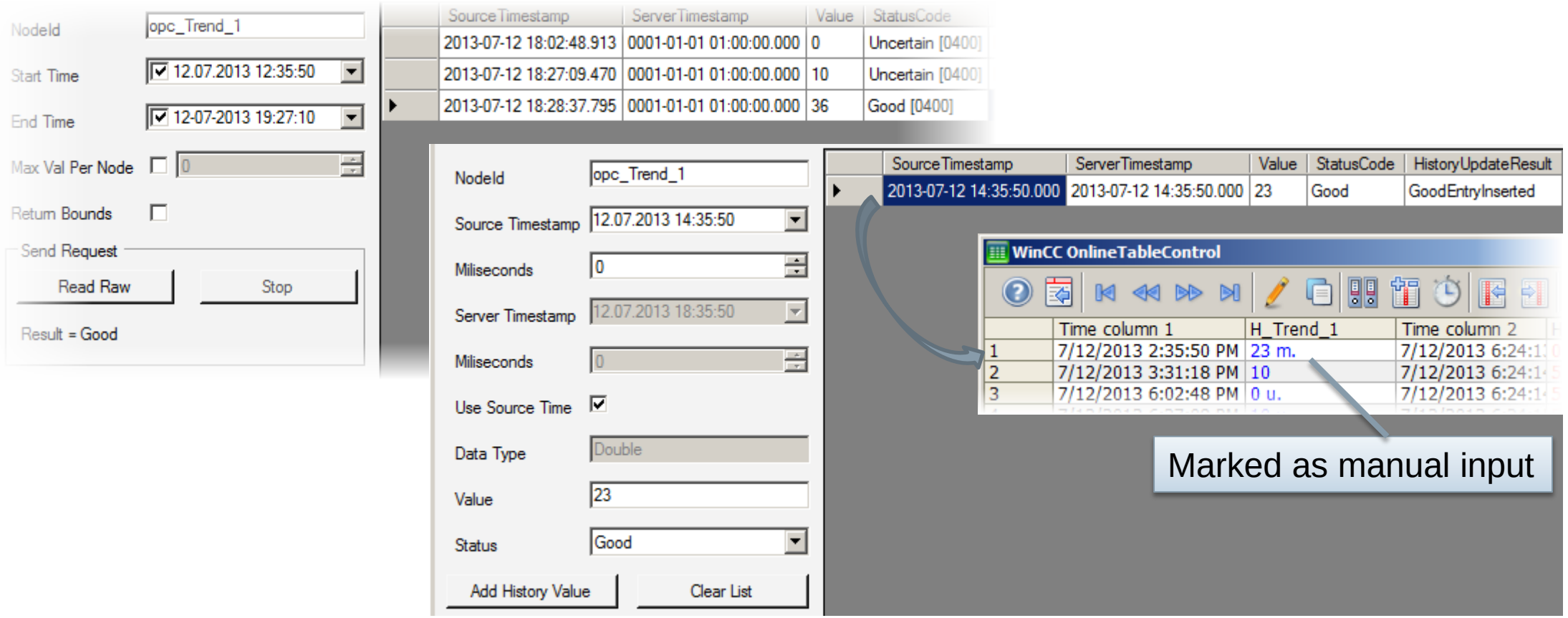
WinCC OPC UA – Historical Access

WinCC OPC UA – Historical Access - Read - write access to the WinCC Tag Logging Archive



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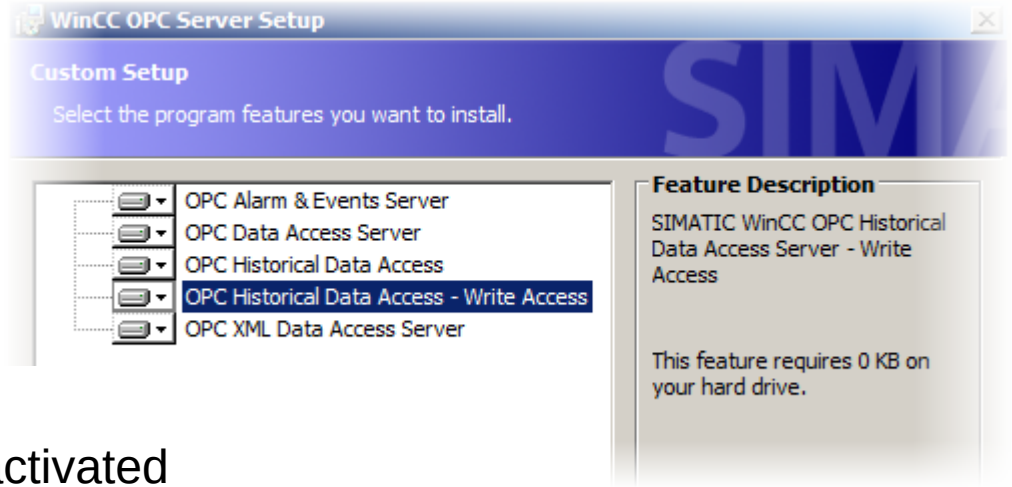
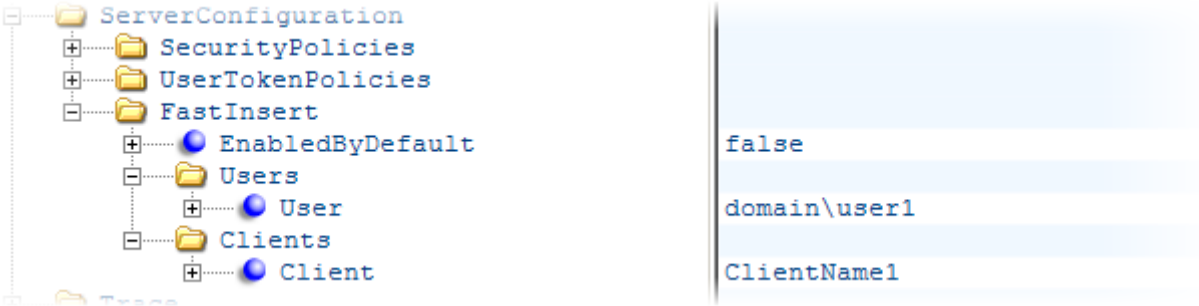
WinCC OPC UA – Historical Access

To write historical data into the WinCC archive by the help of OPC UA
→ Installation of the components is necessary



Configuring optimized WinCC archive write access
→ By default the optimized WinCC archive write access is activated

To limited the write access specify
a Windows users under <Users>
or specify a OPC UA client under <Clients>
which have the rights to write
data into the WinCC database.



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Thank you for your attention!

Jürgen Bohrer

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