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LabVIEW OPC UA

Hans-Petter Halvorsen



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- OPC UA in LabVIEW
 - OPC UA Server Example
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 - OPC UA Read Client Example

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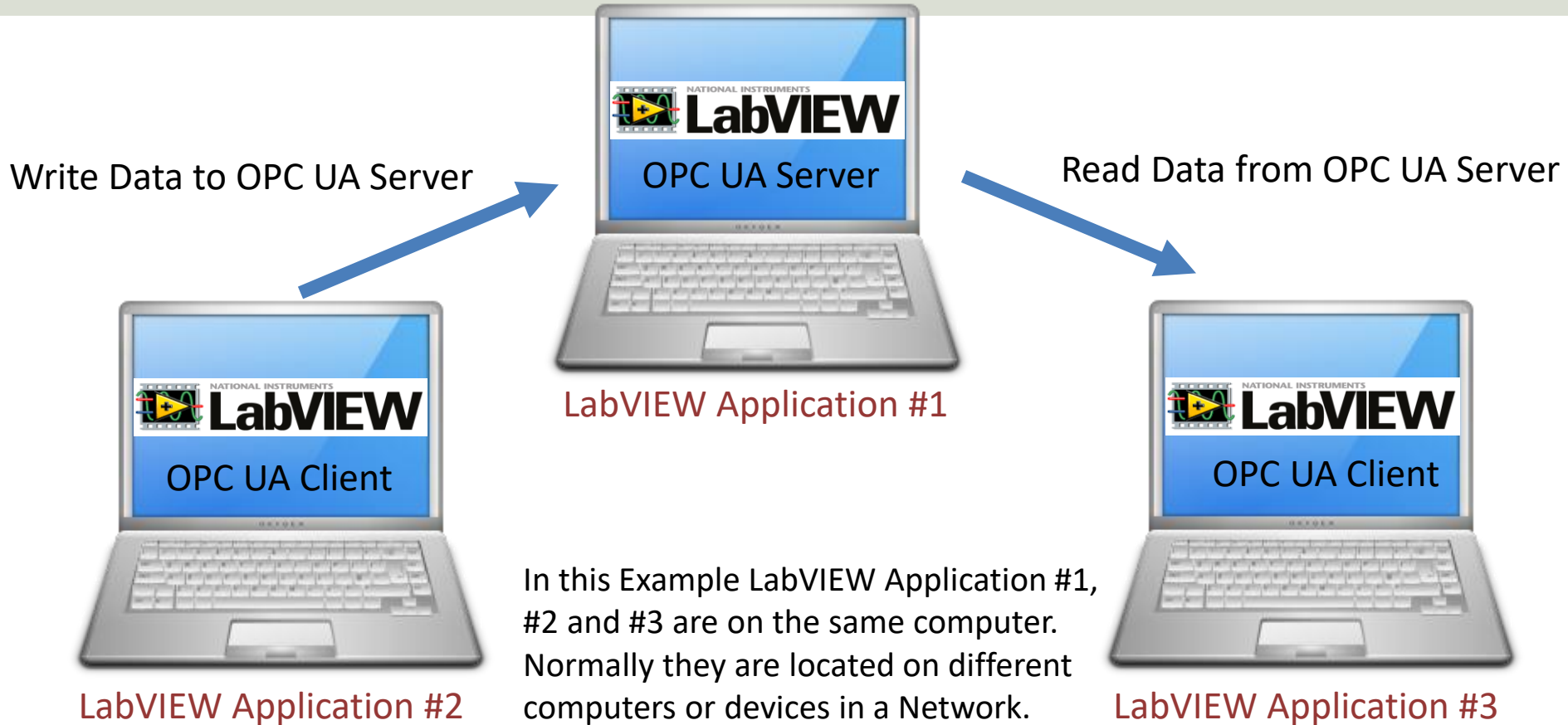
Introduction



Hans-Petter Halvorsen

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We will create the following Examples



LabVIEW OPC UA Toolkit

You need the following Software:

- LabVIEW
- LabVIEW OPC UA Toolkit

All LabVIEW Software can be downloaded from:

www.ni.com/download

You can also use the **NI Package Manager** to download software. NI Package Manager is installed as part of the standard LabVIEW Installation.

NI Package Manager

The screenshot shows the NI Package Manager interface. On the left is a navigation sidebar with categories: Programming Environments, Application Software, Add-Ons, Drivers, Utilities, Software Suites, Tools Network, and DataPlugins. The main area has tabs for 'INSTALLED' (62) and 'UPDATES' (5). A search bar at the top right contains 'LabVIEW OPC UA Toolkit' and shows '2 results'. Below the search bar, the 'LabVIEW OPC UA Toolkit' is listed with a yellow icon and a brief description: 'Product information: The LabVIEW OPC UA Toolkit provides support for creating OPC UA Clients and Servers in LabVIEW.'

This screenshot shows the detailed view of the 'LabVIEW OPC UA Toolkit' in the NI Package Manager. The left sidebar is the same as in the previous screenshot. The main area shows the product name 'LabVIEW OPC UA Toolkit' with a yellow icon. Below the icon, there are fields for 'Version' (2025 Q4), 'Bitness' (32-bit, 64-bit), and 'Language' (English; Japanese; Simplified Chinese). A red 'REMOVE' button is visible. Below these fields are tabs for 'Overview', 'Details', and 'Support'. The 'Overview' tab is selected, displaying the following text:

The LabVIEW OPC UA Toolkit is a software add-on for LabVIEW. It contains the OPC UA API that integrates secure and reliable communications. You can use this toolkit to create OPC UA clients, servers, and security management. In addition to the Data Access facet of the OPC UA Specifications, the LabVIEW OPC UA Toolkit offers support for the Historical Access and Alarms & Condition facets. You can choose from a development license or a deployment license, which you can use to distribute developed code.

The toolkit works with both Windows and NI Linux Real-Time OSs. The registered trademark Linux® is used pursuant to a sublicense from LMI, the exclusive licensee of Linus Torvalds, owner of the mark on a worldwide basis.

Install LabVIEW OPC UA Toolkit

NI Licence Manager

NI License Manager 2025 Q4

Product Summary | **Local Licenses** | Network Licenses | Activate Software | Computer Information | Refresh | Deactivate

Views | General | Actions

Some licenses have built-in grace periods that allow you to use software past the end of the subscription term. See current billing information and software expiration dates by signing in to your account on ni.com. [View My Account](#)

Filter

License	Status	Expiration	Serial Number
LabVIEW 2025 Q3			
Application			
Development System	Licensed		
Base Development System	Unlicensed ⓘ		
Continuous Integration System	Unlicensed ⓘ		
Debug Deployment System	Unlicensed ⓘ		
Full Development System	Licensed	October 10, 2026	
Professional Development System	Evaluation Available ⓘ		
OPC UA Toolkit	Licensed		
OPC UA Deployment	Unlicensed ⓘ		
OPC UA Toolkit	Licensed	October 10, 2026	
Add-ons			
Application Builder	Licensed		
NI DCT 2024 Q1			
Application			
LabVIEW Database C	Licensed		
NI RGT 2024 Q1			
Application			
LabVIEW Report Gen	Licensed		
NI UTF 2025 Q1			
Add-ons			
LabVIEW Unit Test Toolkit	Licensed		

If you don't have a valid licence:
Right-click and select Activate and
enter the licence number.

What is OPC and OPC UA?

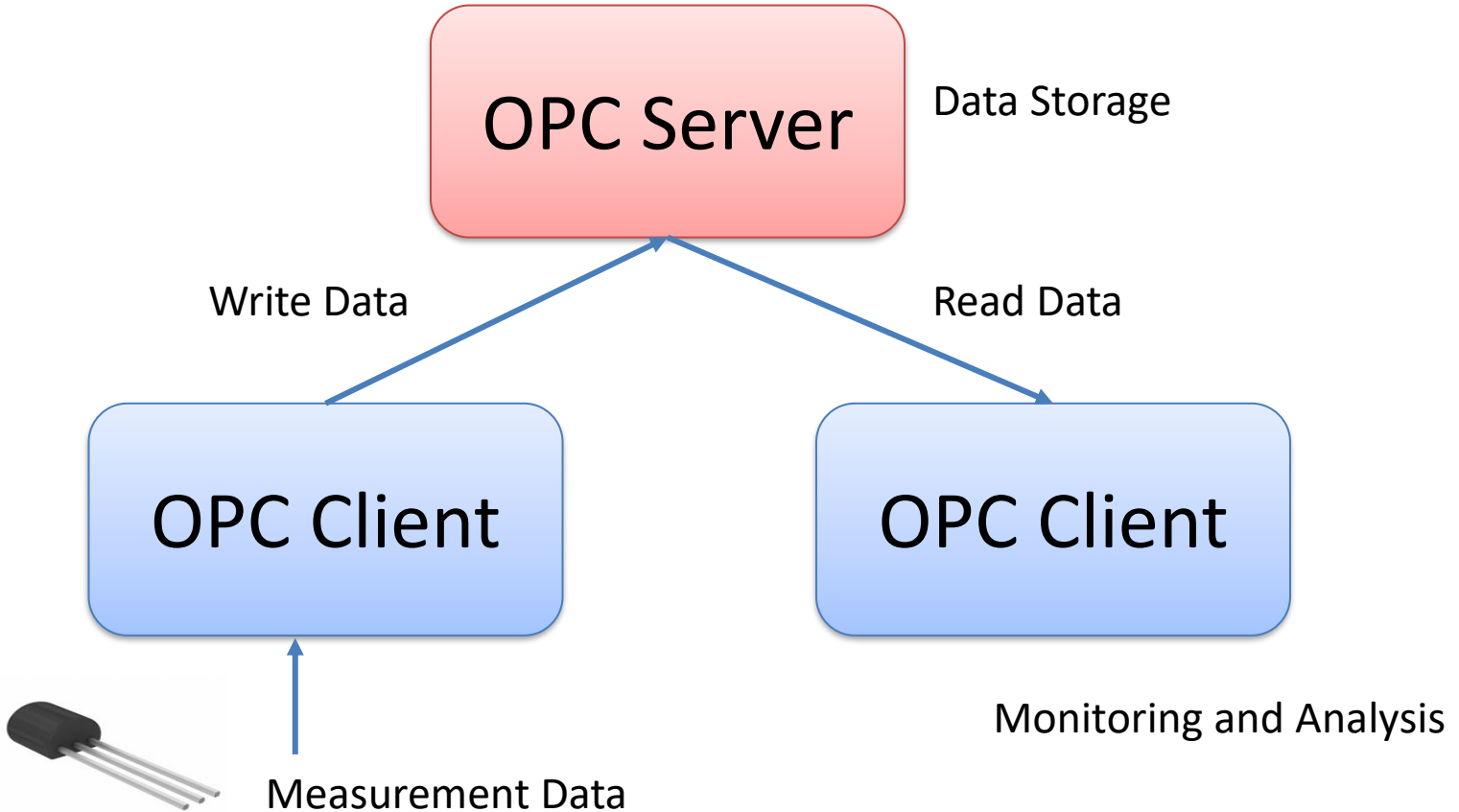


Hans-Petter Halvorsen

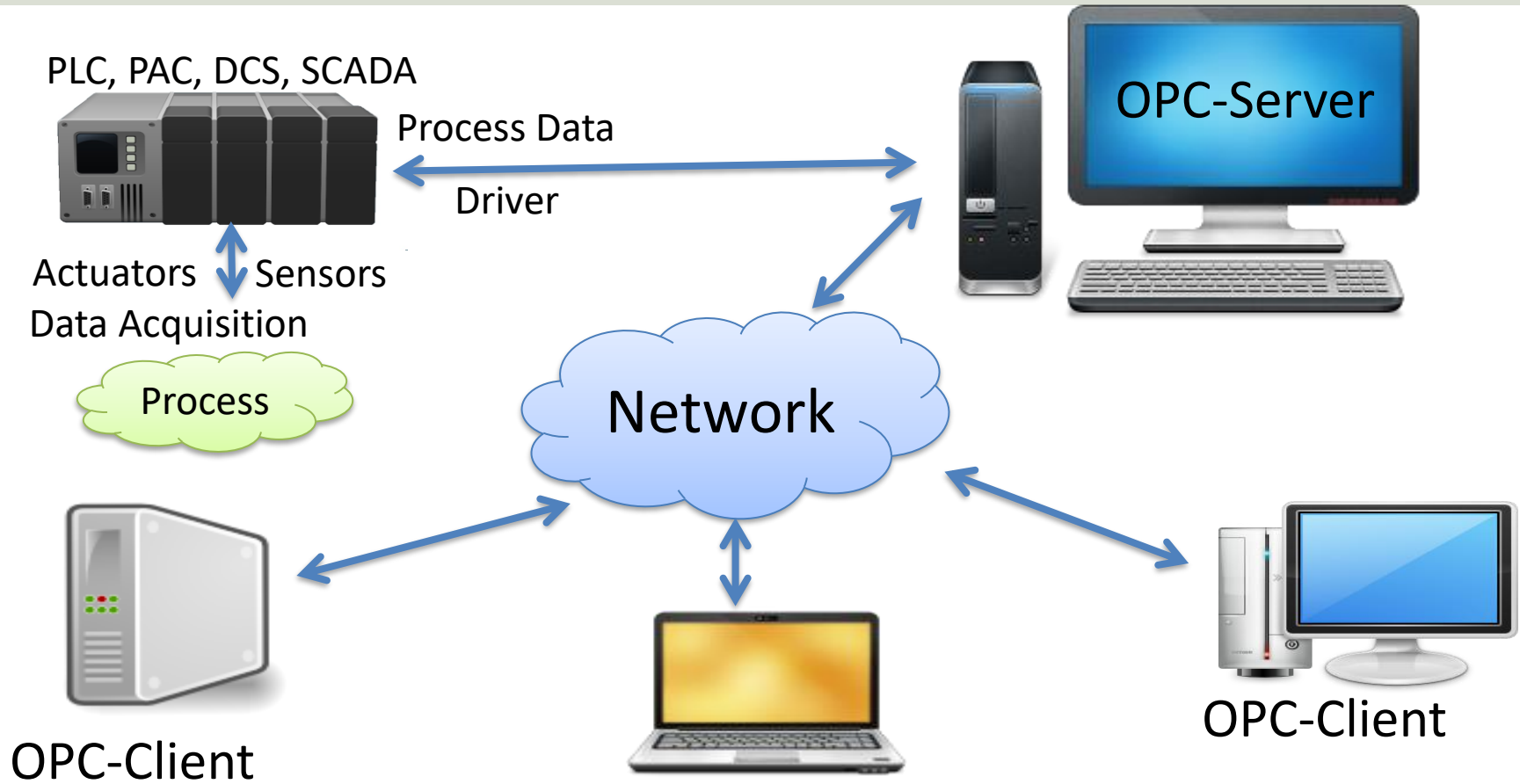
What is OPC?

- A standard that defines the communication of data between devices from different manufactures
- Requires an **OPC server** that communicates with the **OPC clients**
- OPC allows “plug-and-play”, gives benefits as reduces installation time and the opportunity to choose products from different manufactures
- Different standards: “Real-time” data (**OPC DA**), Historical data (**OPC HDA**), Alarm & Event data (**OPC AE**), etc.

OPC Server and Client(s)



Typical OPC Scenario



OPC Specifications

“Classic” OPC

“Next Generation” OPC

OPC DA

OPC HDA

OPC A&E



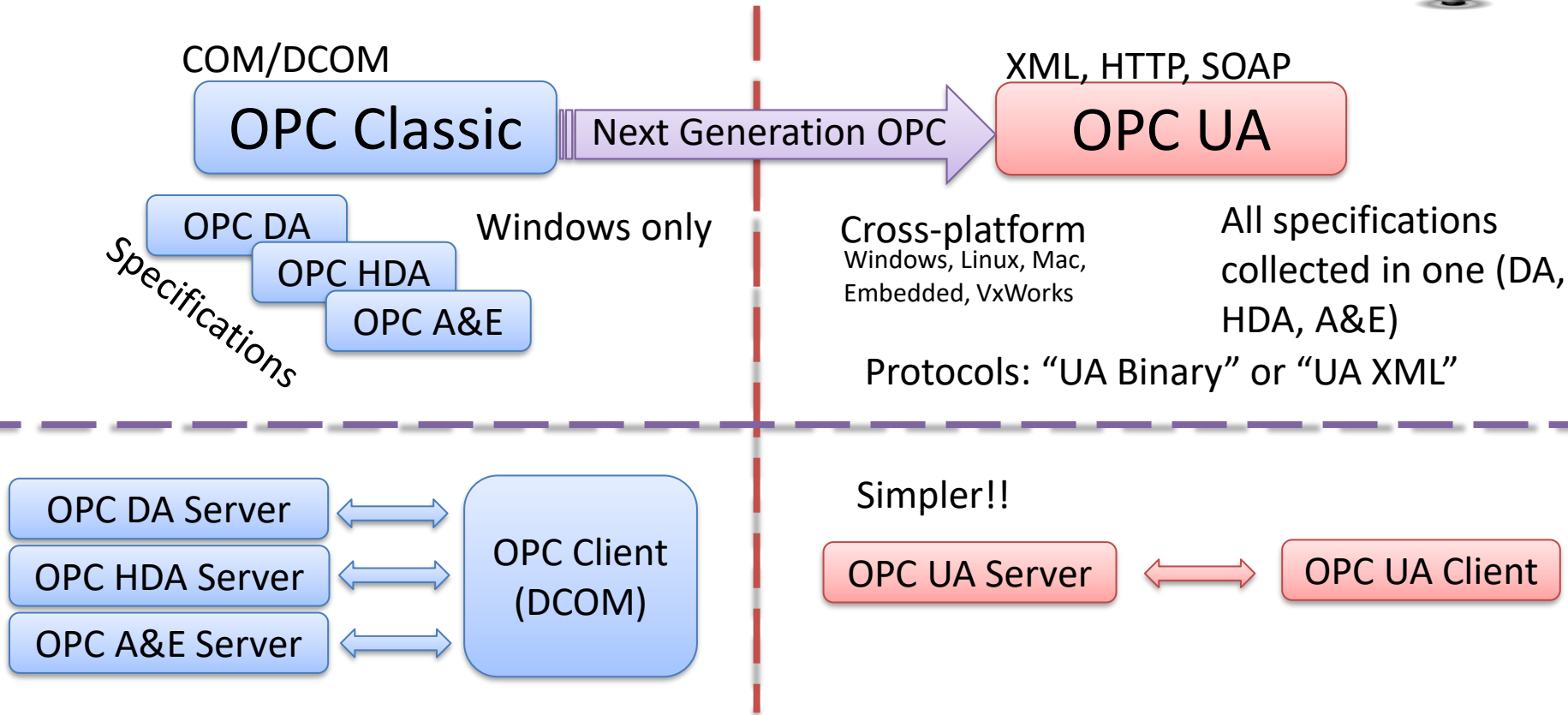
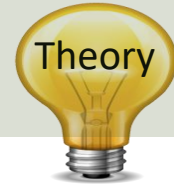
OPC UA

... (Many others)

OPC UA

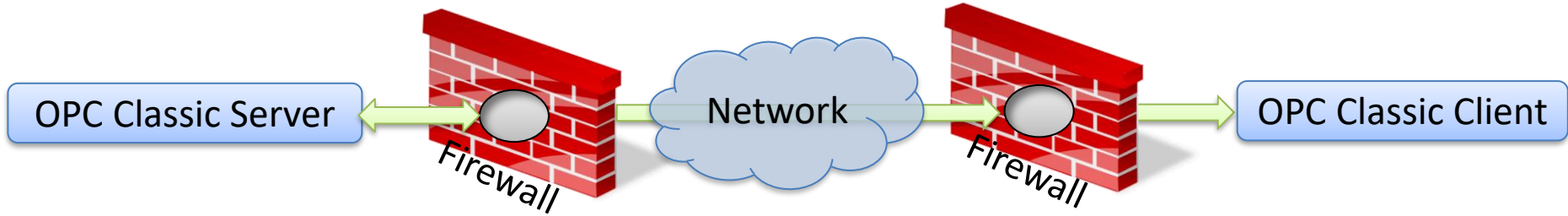
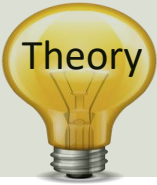
- UA – Unified Architecture.
- The Next Generation OPC.
- Cross Platform. “Classic” OPC works only for Windows.
- Based on Modern Software/Network Architecture (No DCOM problems!).
- It makes it easier to transmit and receive data in a modern data network/Internet.

Next Generation OPC

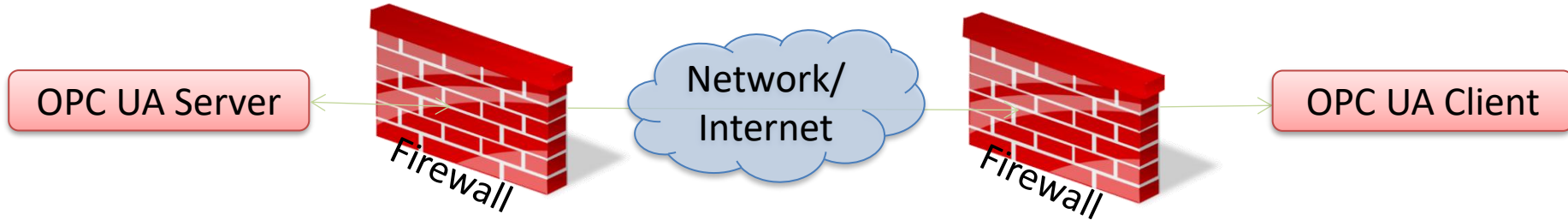


Next Generation OPC

Theory

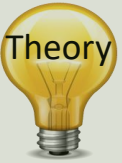


To open DCOM through firewalls demanded a large hole in the firewall!
Impossible to route over Internet!

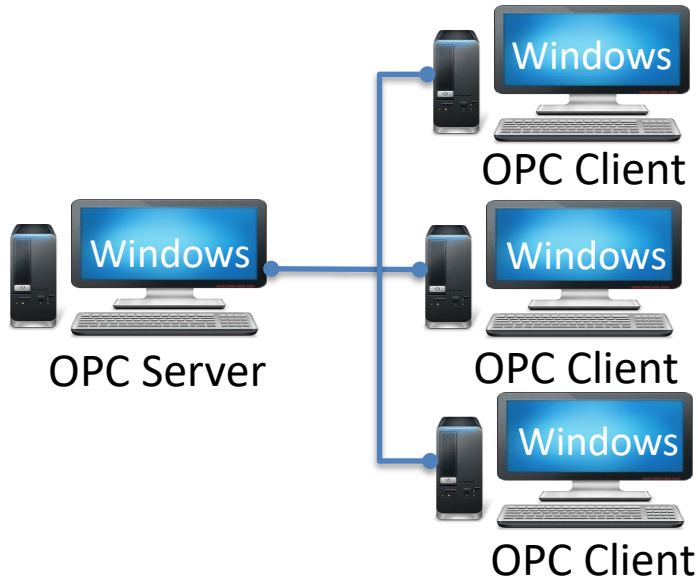


No hole in firewall (UA XML) or just a simple needle stick (UA Binary) is necessary
Easy to route over Internet!

Classic OPC vs. OPC UA

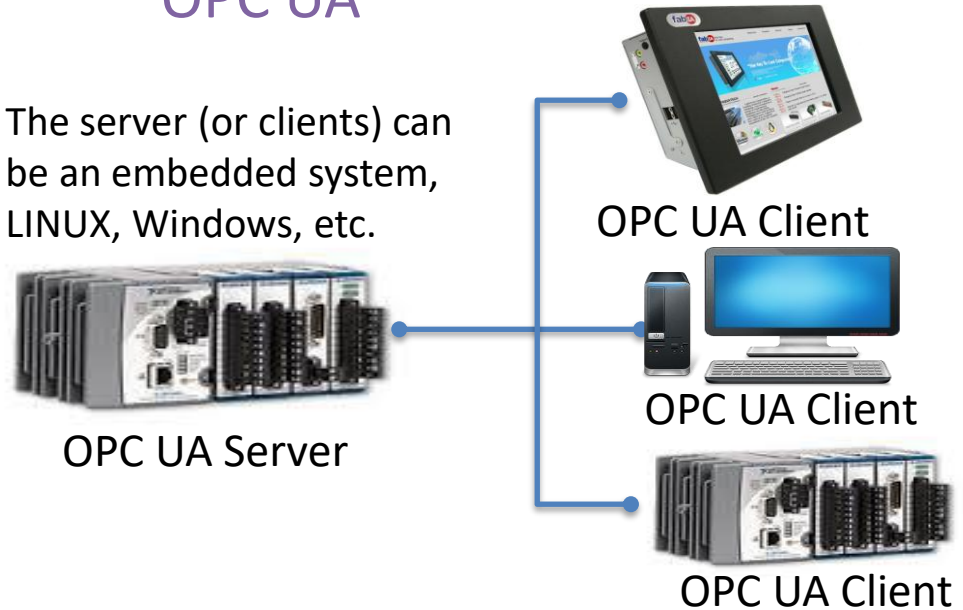


Classic OPC (DCOM)



OPC UA

The server (or clients) can be an embedded system, LINUX, Windows, etc.



Classic OPC requires a Microsoft Windows operating system to implement COM/DCOM server functionality. By utilizing SOA and Web Services, OPC UA is a platform-independent system that eliminates the previous dependency on a Windows operating system. By utilizing SOAP/XML over HTTP, OPC UA can deploy on a variety of embedded systems regardless of whether the system is a general purpose operating system, such as Windows, or a deterministic real-time operating system.

<http://www.ni.com/white-paper/13843/en/>

<https://www.halvorsen.blog>

OPC UA in LabVIEW



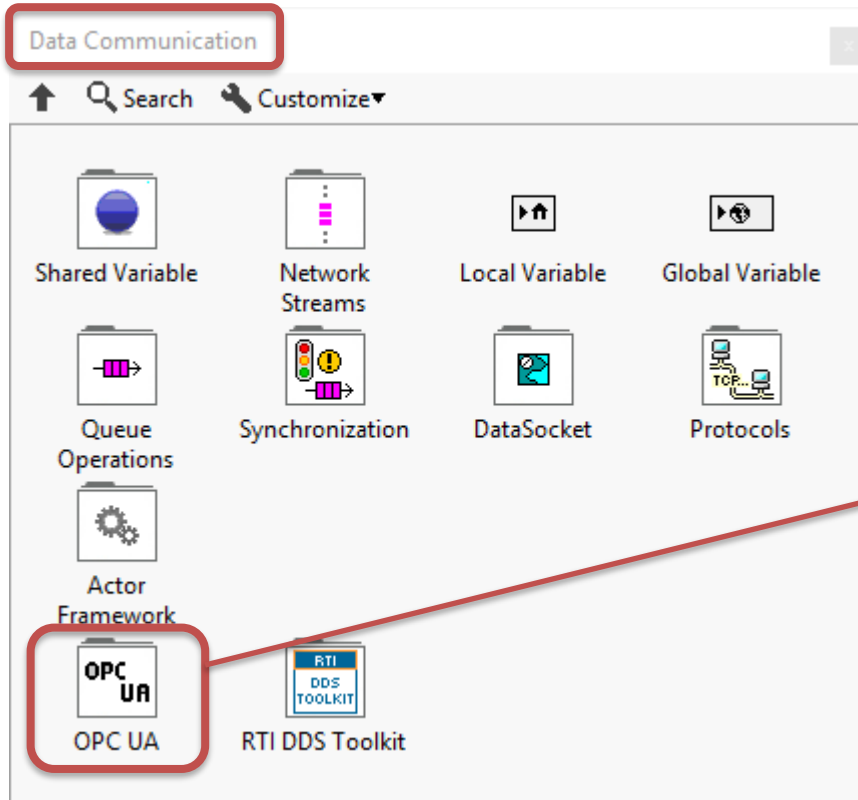
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OPC UA Toolkit in LabVIEW

Data Communication

↑ Search Customize



Shared Variable Network Streams Local Variable Global Variable

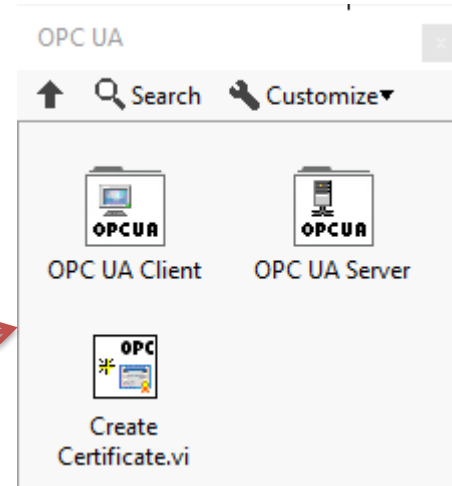
Queue Operations Synchronization DataSocket Protocols

Actor Framework

OPC UA RTI DDS Toolkit

OPC UA

↑ Search Customize



OPC UA Client OPC UA Server

OPC
Create Certificate.vi

NI Licence Manager

NI License Manager 2025 Q4

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Application Builder	Licensed		
NI DCT 2024 Q1			
Application			
LabVIEW Database C...	Licensed		
NI RGT 2024 Q1			
Application			
LabVIEW Report Gen...	Licensed		
NI UTF 2025 Q1			
Add-ons			
LabVIEW Unit Test Toolkit	Licensed		

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OPC UA Server Palette



Create.vi



Close.vi



Start.vi



Stop.vi

Add Trusted
Clients.viClear All Trusted
Clients.viRegister
Server.viUnregister
Server.vi

Add Folder.vi



Add Item.vi

Add Analog
Item.vi

Add Property.vi



Delete Node.vi



Read.vi



Write.vi

Alarms and
ConditionsHistorical
Access

OPC UA Client Palette



↑ Search

Customize ▾



Connect.vi



Forward
Browse.vi



Create
Subscription.vi



Delete
Subscriptions.vi



Disconnect.vi



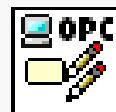
Add Monitored
Data Nodes.vi



Get Node
Attribute.vi



Multiple Read.vi



Multiple Write.vi



Delete
Monitored ...



Alarms and
Conditions



Historical
Access

LabVIEW OPC UA Toolkit User Manual

The screenshot shows a web browser window displaying the LabVIEW OPC UA Toolkit User Manual page titled "Creating an OPC UA Server and an OPC UA Client". The browser address bar shows the URL: [ni.com/docs/en-US/bundle/labview-opc-ua-toolkit/page/creating-an-opc-ua-server-and-an-opc-ua-clien.html](https://www.ni.com/docs/en-US/bundle/labview-opc-ua-toolkit/page/creating-an-opc-ua-server-and-an-opc-ua-clien.html). The page features a "Table of Contents" sidebar on the left, a main content area, and a "Download PDF" button in the top right corner.

Table of Contents

- New Features and Changes
- Updates and Changes for LabVIEW OPC UA Toolkit Extended Support Versions
- OPC UA Toolkit
 - Related Documentation
 - Protecting OPC UA Data Items
 - Connections between an OPC UA Server and an OPC UA Client (OPC UA Toolkit)
 - Creating an OPC UA Server and an OPC UA Client**
 - Part 1: Creating an OPC UA Server
 - Part 2: Using an OPC UA Server
 - Part 3: Establishing Connections between an OPC UA Server and an OPC UA Client
 - Part 4: Using an OPC UA Client

Creating an OPC UA Server and an OPC UA Client

Updated 2025-10-28 | 1 minute(s) read | # LabVIEW OPC UA Toolkit # User Manual

This tutorial introduces you to the basics of creating an OPC UA server and an OPC UA client by using the OPC UA VIs. This tutorial consists of the following parts:

1. Part 1: Creating an OPC UA Server
2. Part 2: Using an OPC UA Server
3. Part 3: Establishing Connections between an OPC UA Server and an OPC UA Client
4. Part 4: Using an OPC UA Client

Parent topic: OPC UA Toolkit

Was this information helpful?

Previous [Connections between an OPC UA Server and an OPC UA Client \(OPC UA Toolkit\)](#) **Next** [Part 1: Creating an OPC UA Server](#)

Official LabVIEW OPC UA Toolkit documentation:

<https://www.ni.com/docs/en-US/bundle/labview-opc-ua-toolkit/page/creating-an-opc-ua-server-and-an-opc-ua-clien.html>

<https://www.halvorsen.blog>

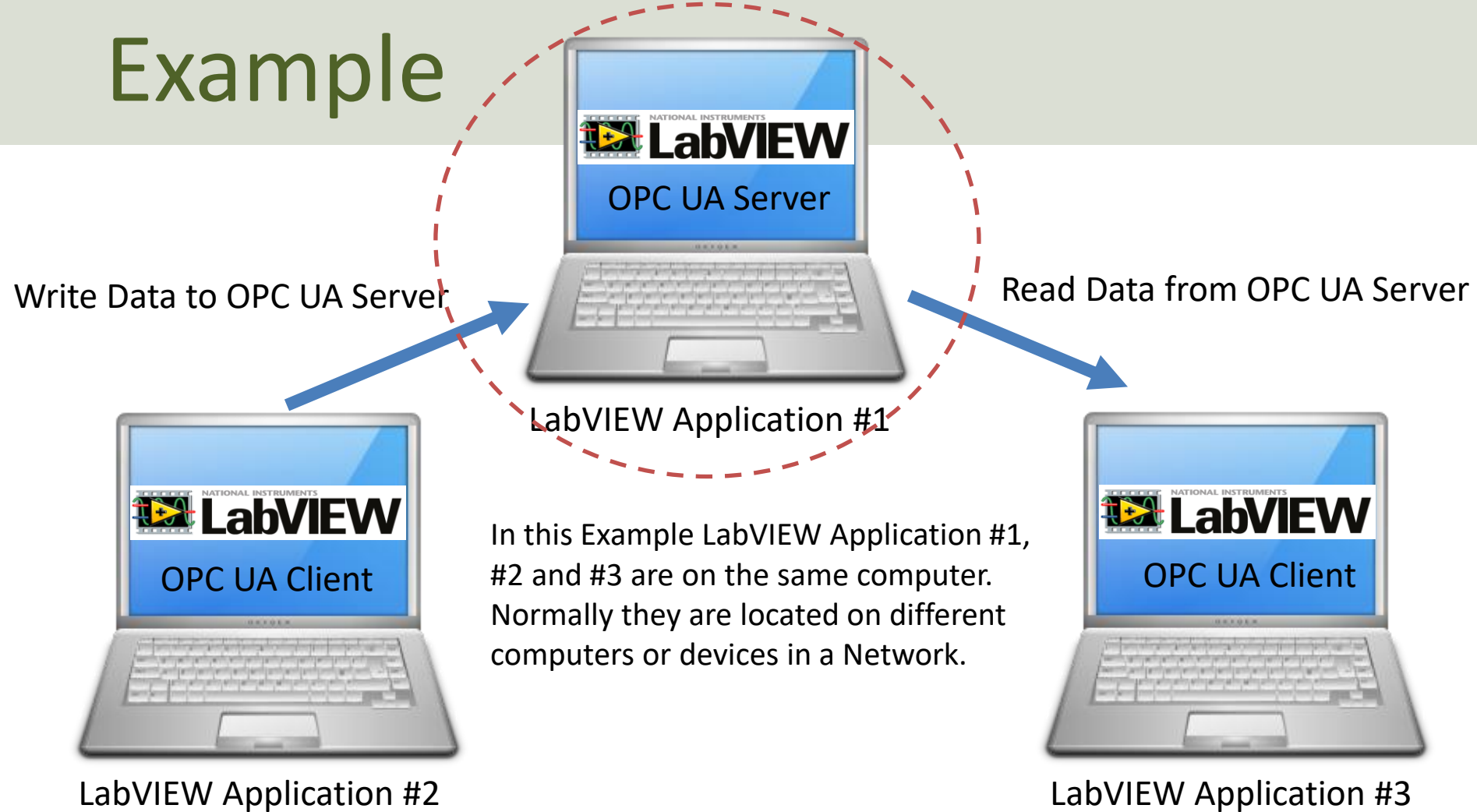
OPC UA Server



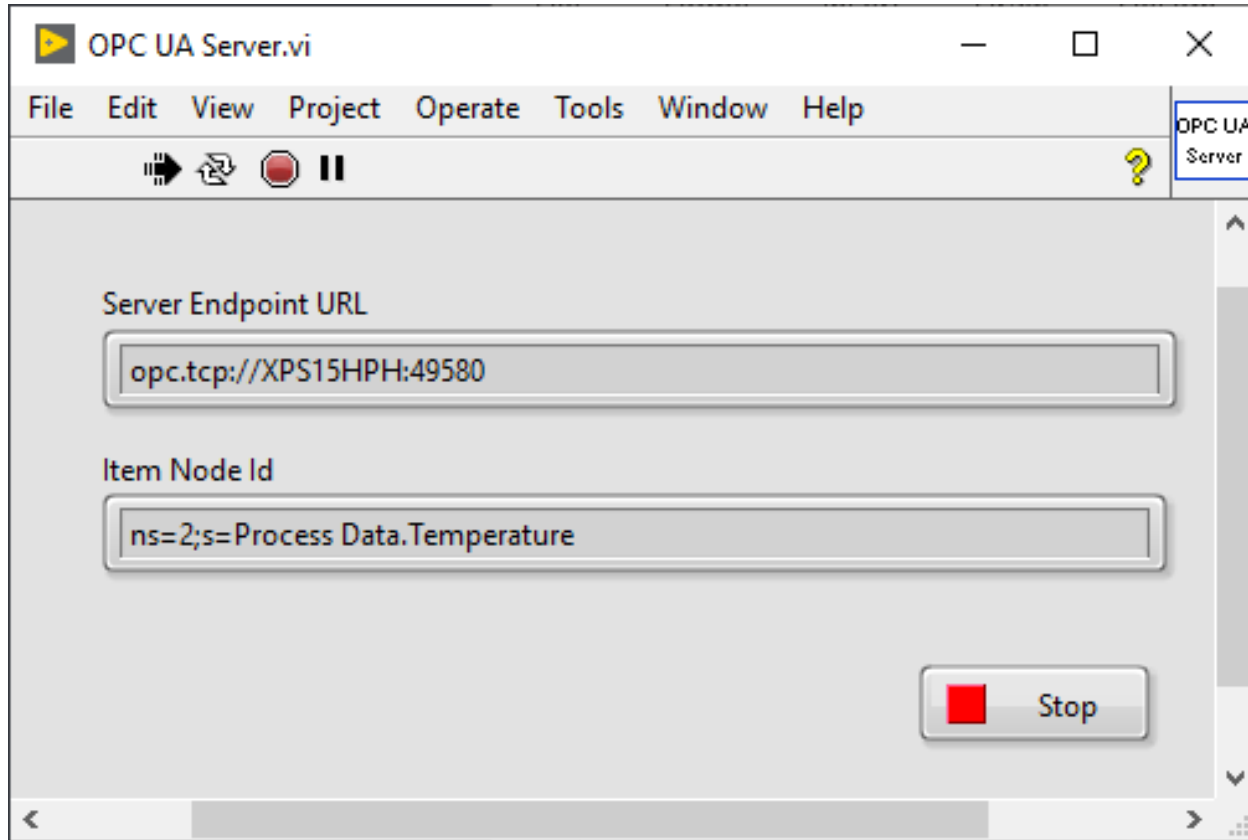
Hans-Petter Halvorsen

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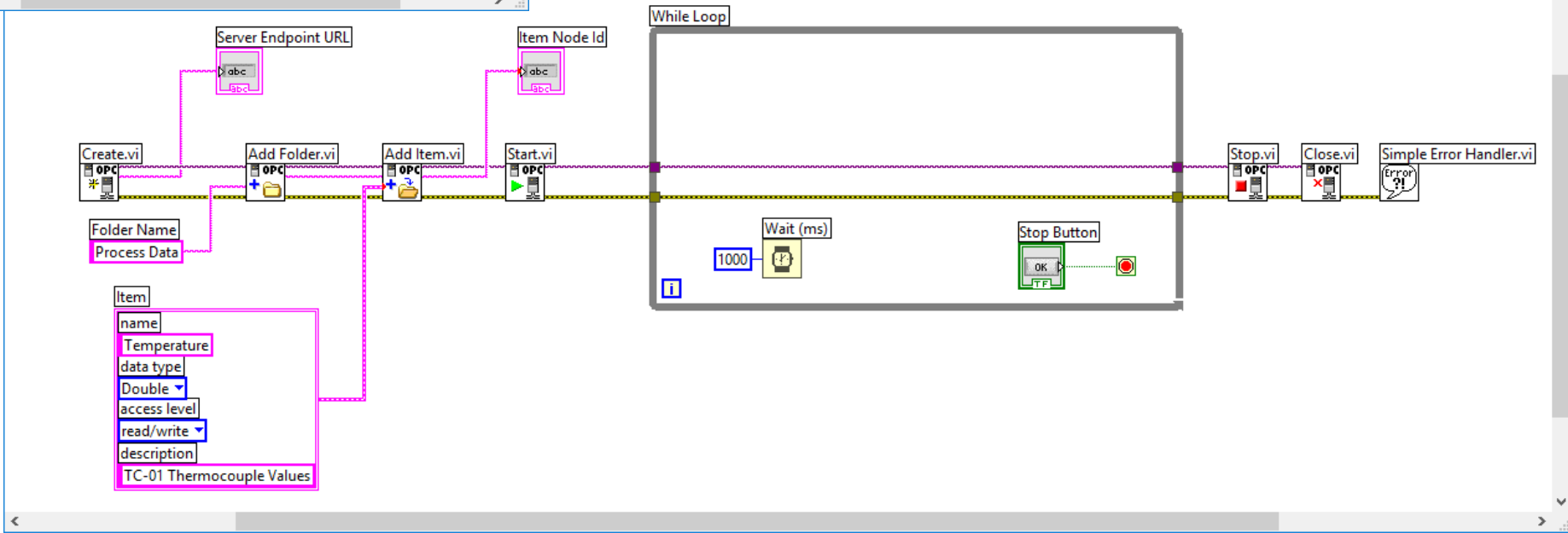
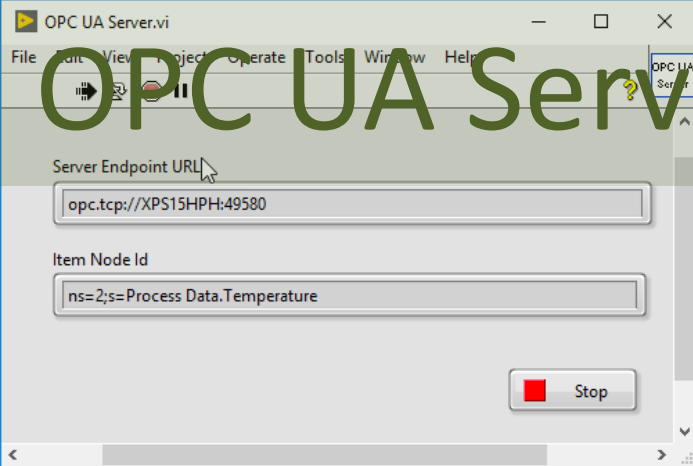
Example



OPC UA Server Example in LabVIEW



OPC UA Server Example in LabVIEW

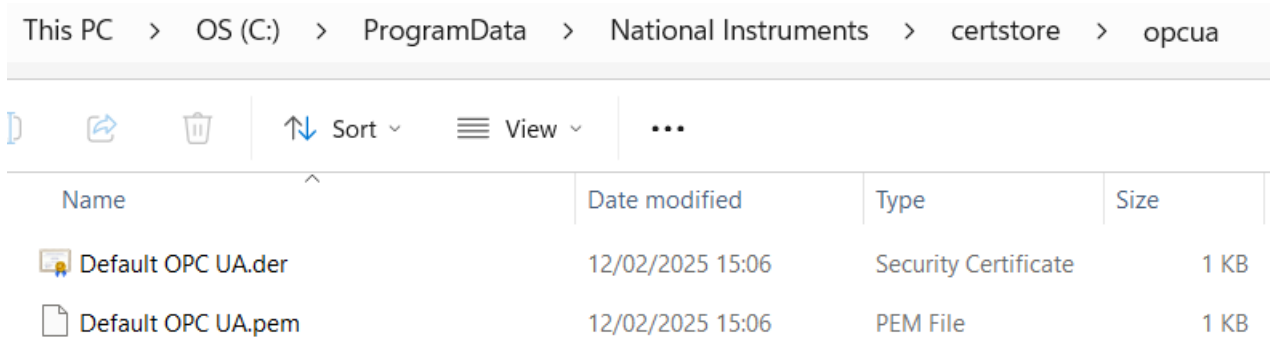


Certificate Issues?

If you get some errors related to the certificate, make sure that you have write access to the folder where the certificates are located.

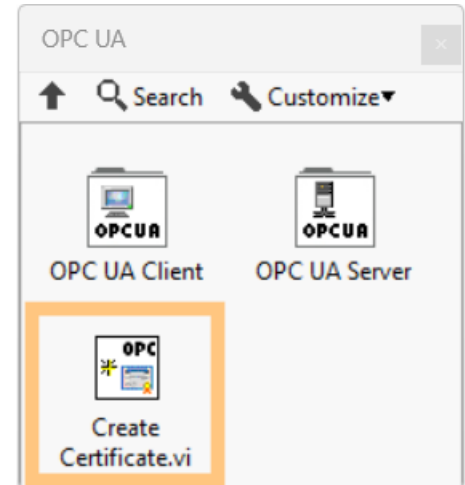
The certificate files are stored in this location:

C:\ProgramData\National Instruments\certstore\opcua



Name	Date modified	Type	Size
Default OPC UA.der	12/02/2025 15:06	Security Certificate	1 KB
Default OPC UA.pem	12/02/2025 15:06	PEM File	1 KB

You can also use “Create Certificate.vi” to create new certificates:



Certificate Issues?



OPC UA toolkit: Failed to create certificate files because access is denied. Please check whei

AI-modus Alle Videoer Bilder Kortvideoer Nyheter Nett Mer ▾ Verktøy ▾

◆ AI-oversikt

This error usually occurs because the OPC UA application lacks permission to create/write files in the security directory, or because a mismatched pair of certificate files (public/private) already exists. To resolve it, delete existing, mismatched `.der` (public) and `.pem` (private) files in the certificate store—typically `C:\ProgramData\National Instruments\certstore\opcua\`—and ensure the user running the service has write permissions to that directory. [🔗](#)

Steps to Fix Access Denied Error:

- **Check File Permissions (Windows):** Navigate to `C:\ProgramData\National Instruments\certstore\opcua\` (or the specific app folder), right-click, choose Properties, and ensure your user account has "Write" and "Modify" permissions.
- **Delete Mismatched Files:** If only one file (e.g., `.der`) exists without its pair (`.pem`), the toolkit may fail to regenerate them. Delete the partial files to force regeneration.
- **Run as Administrator:** If the OPC UA server is running as a console application, run it as Administrator.
- **Check Certificate Location:** Ensure both the public `.der` and private `.pem` keys are in the same folder.
- **Renew Certificates:** If using LabVIEW, use the [Create Certificate VI](#) to force regeneration of the files. [🔗](#)

OPC UA Clients



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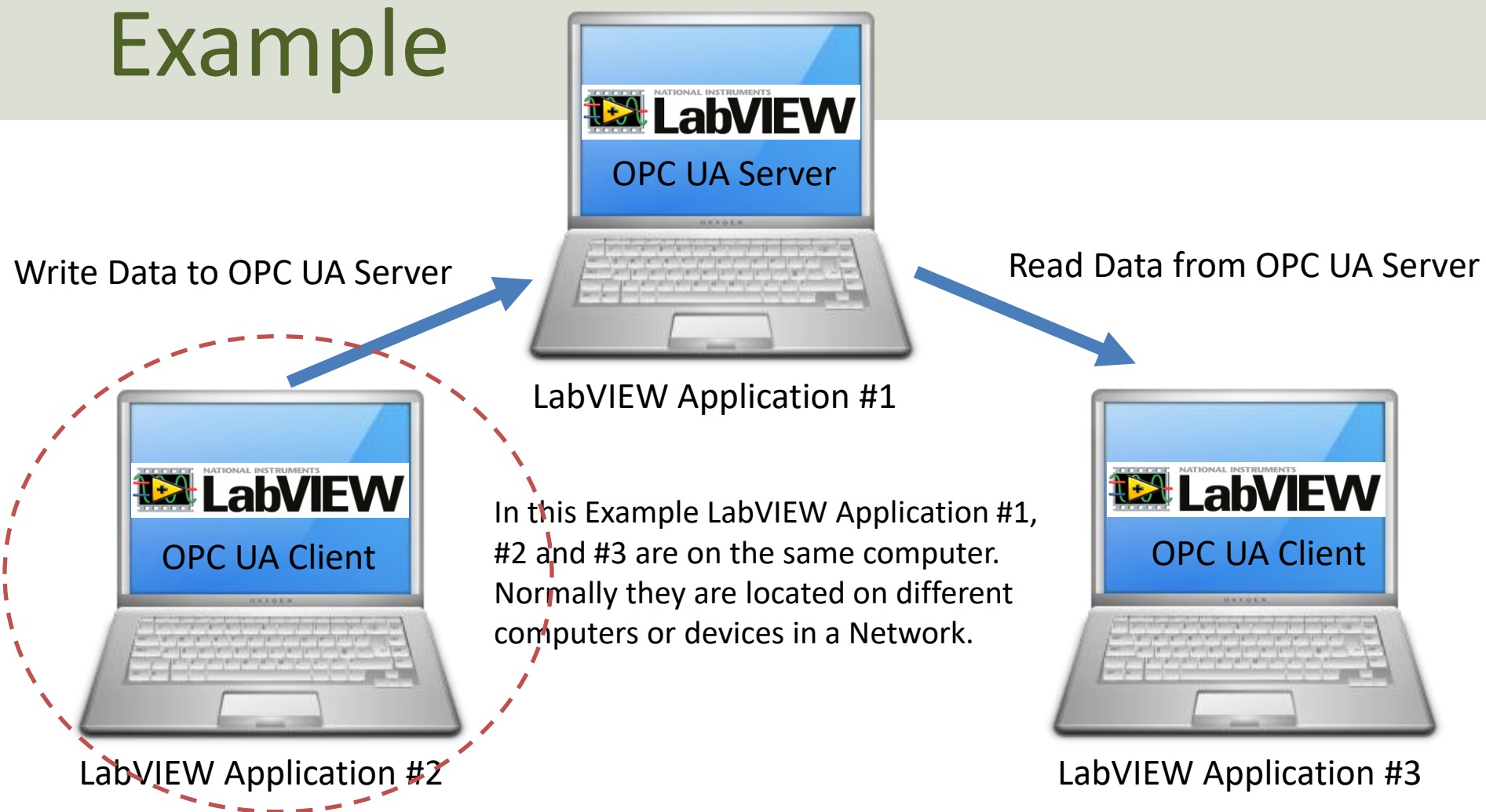
OPC UA Client Write



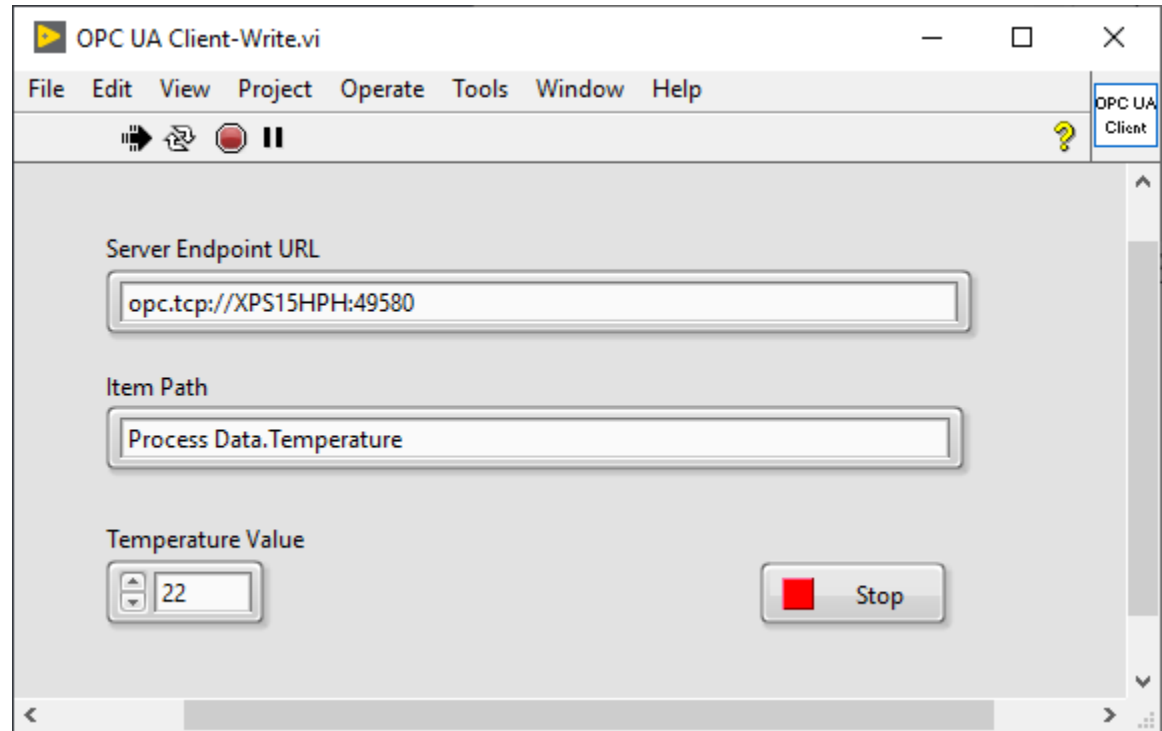
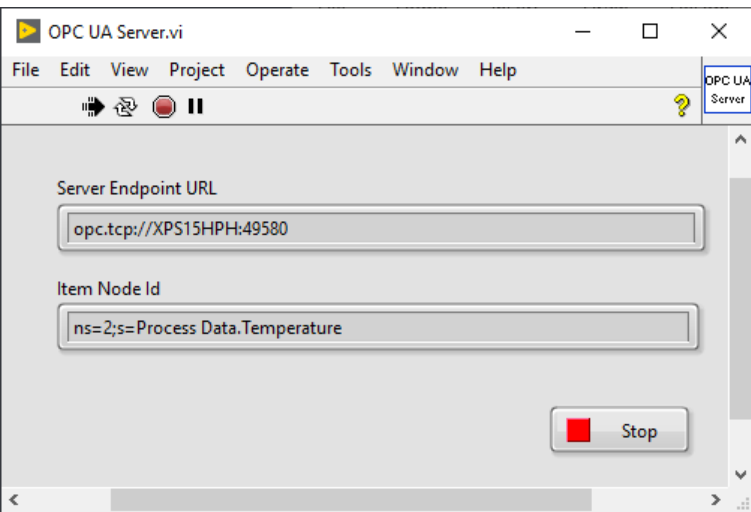
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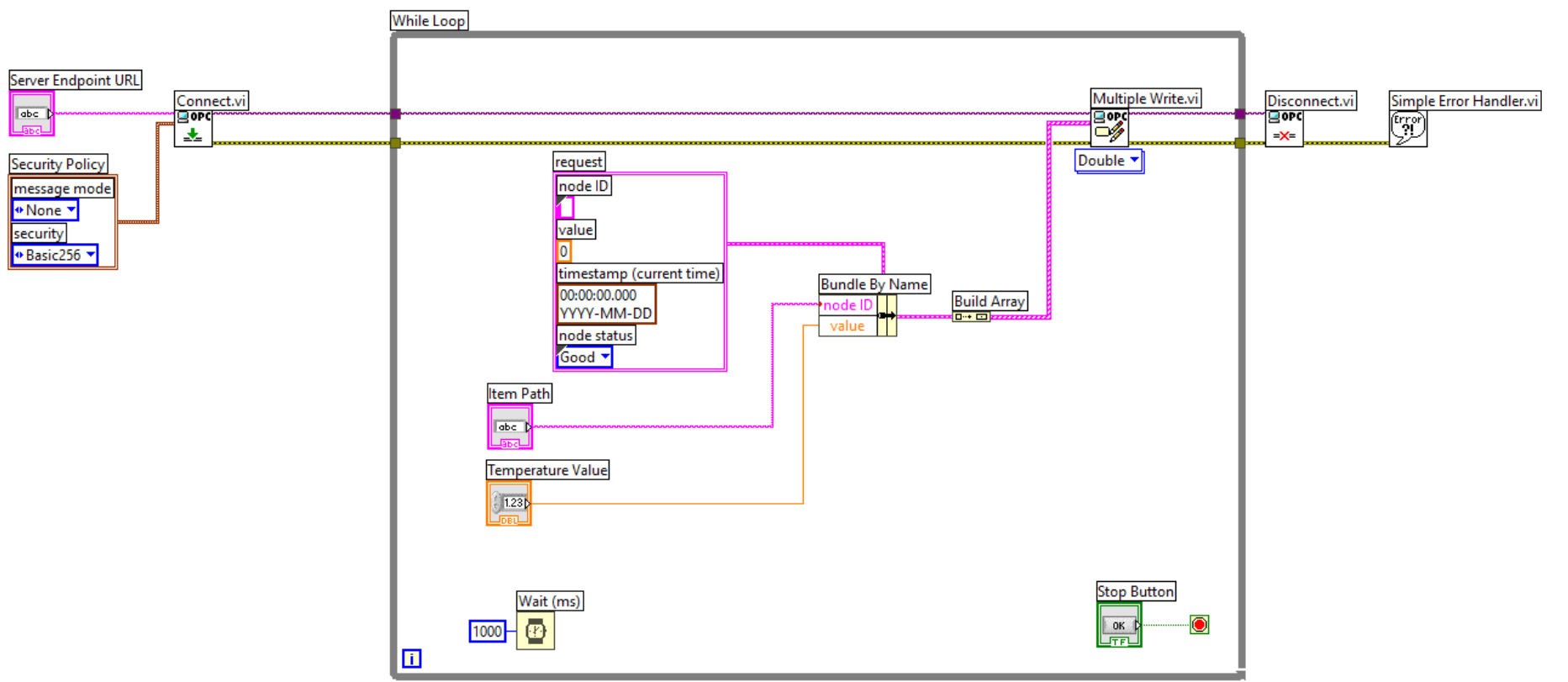
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Example



OPC UA Client Write Data





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OPC UA Client Read



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Example



LabVIEW Application #1

Read Data from OPC UA Server



Write Data to OPC UA Server



LabVIEW Application #2

In this Example LabVIEW Application #1, #2 and #3 are on the same computer. Normally they are located on different computers or devices in a Network.



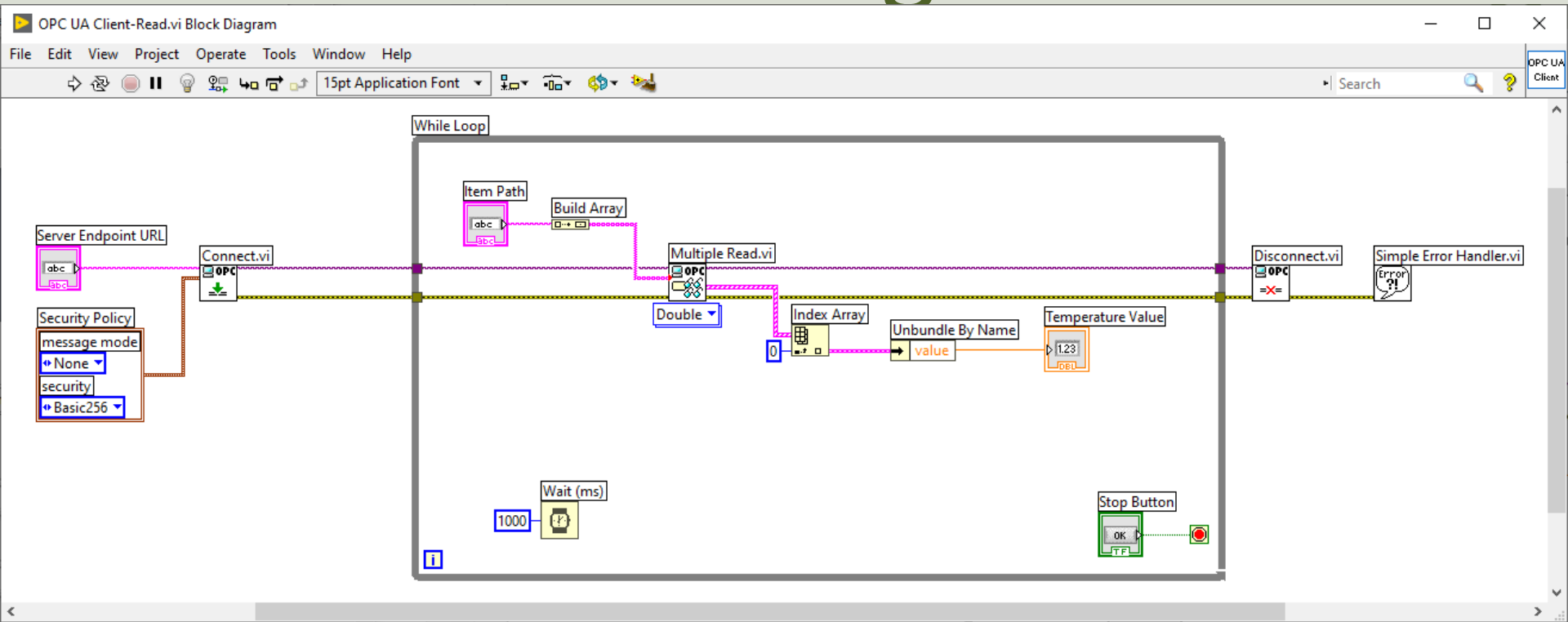
LabVIEW Application #3

OPC UA Client Read Data

The image shows two LabVIEW windows side-by-side. The left window, titled "OPC UA Server.vi", has a menu bar with "File", "Edit", "View", "Project", "Operate", "Tools", "Window", and "Help". Below the menu bar are icons for Run, Copy, Stop, and Pause. The main area contains two text input fields: "Server Endpoint URL" with the value "opc.tcp://XPS15HPH:49580" and "Item Node Id" with the value "ns=2;s=Process Data.Temperature". A red square button is visible at the bottom right of the window.

The right window, titled "OPC UA Client-Read.vi", also has a menu bar with "File", "Edit", "View", "Project", "Operate", "Tools", "Window", and "Help". Below the menu bar are icons for Run, Copy, Stop, and Pause, along with a help icon. The main area contains three text input fields: "Server Endpoint URL" with the value "opc.tcp://XPS15HPH:49580", "Item Path" with the value "Process Data.Temperature", and "Temperature Value" with the value "22". A red square button labeled "Stop" is located at the bottom right of the window.

Block Diagram



OPC UA in LabVIEW



LabVIEW Application #1

Read Data from OPC UA Server



LabVIEW Application #3

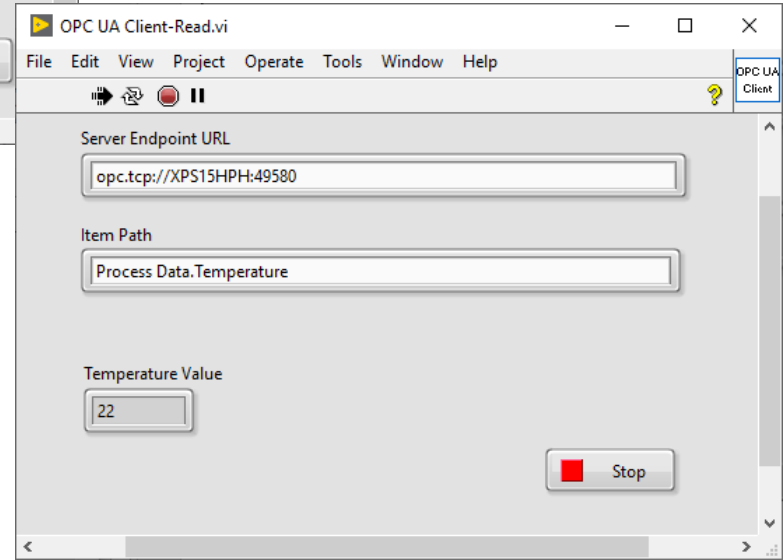
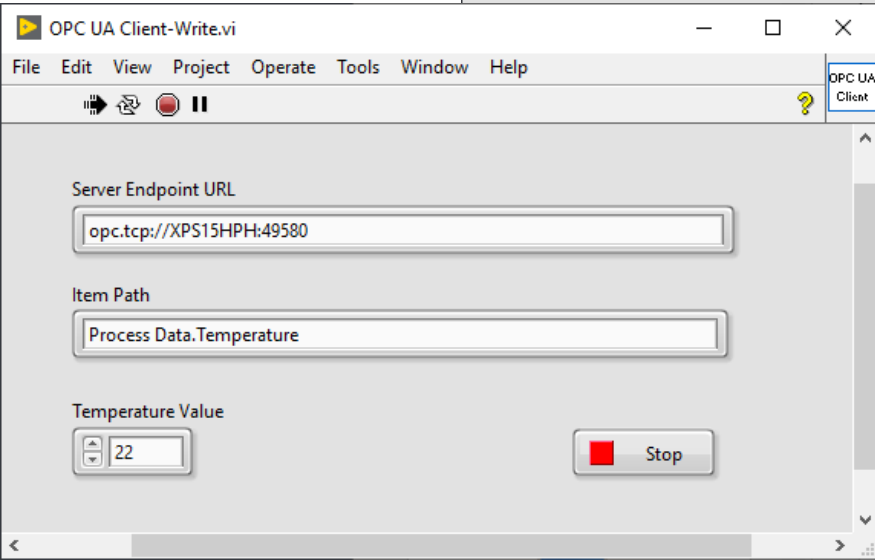
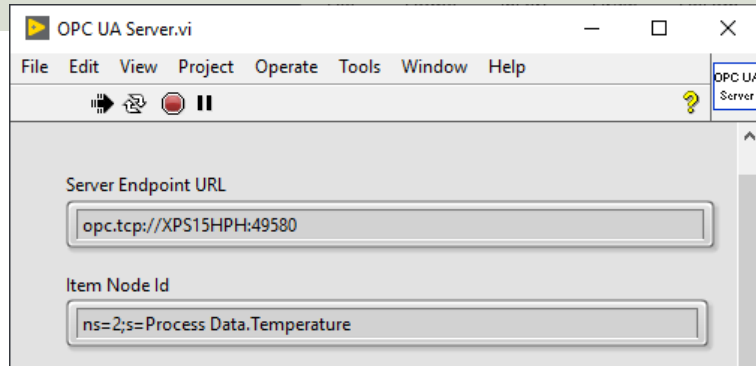
Write Data to OPC UA Server



LabVIEW Application #2

In this Example LabVIEW Application #1, #2 and #3 are on the same computer. Normally they are located on different computers or devices in a Network.

OPC UA in LabVIEW



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