

<https://www.halvorsen.blog>

OPC

with Practical Examples

Hans-Petter Halvorsen



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- OPC DA
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 - OPC UA Demo/Test Software
 - “OPC UA Server Simulator” from Integration Objects
 - “OPC UA Client” from Integration Objects
 - OPC UA Programming Tools
 - LabVIEW + LabVIEW OPC UA Toolkit
 - MATLAB + Industrial Communication Toolbox
 - Visual Studio/C# + “OPC UA .NET SDK” from Traeger

Introduction

- In this Tutorial we give an overview of OPC with some Practical Examples.
- We use different OPC Software and different types of Programming Languages and Tools.

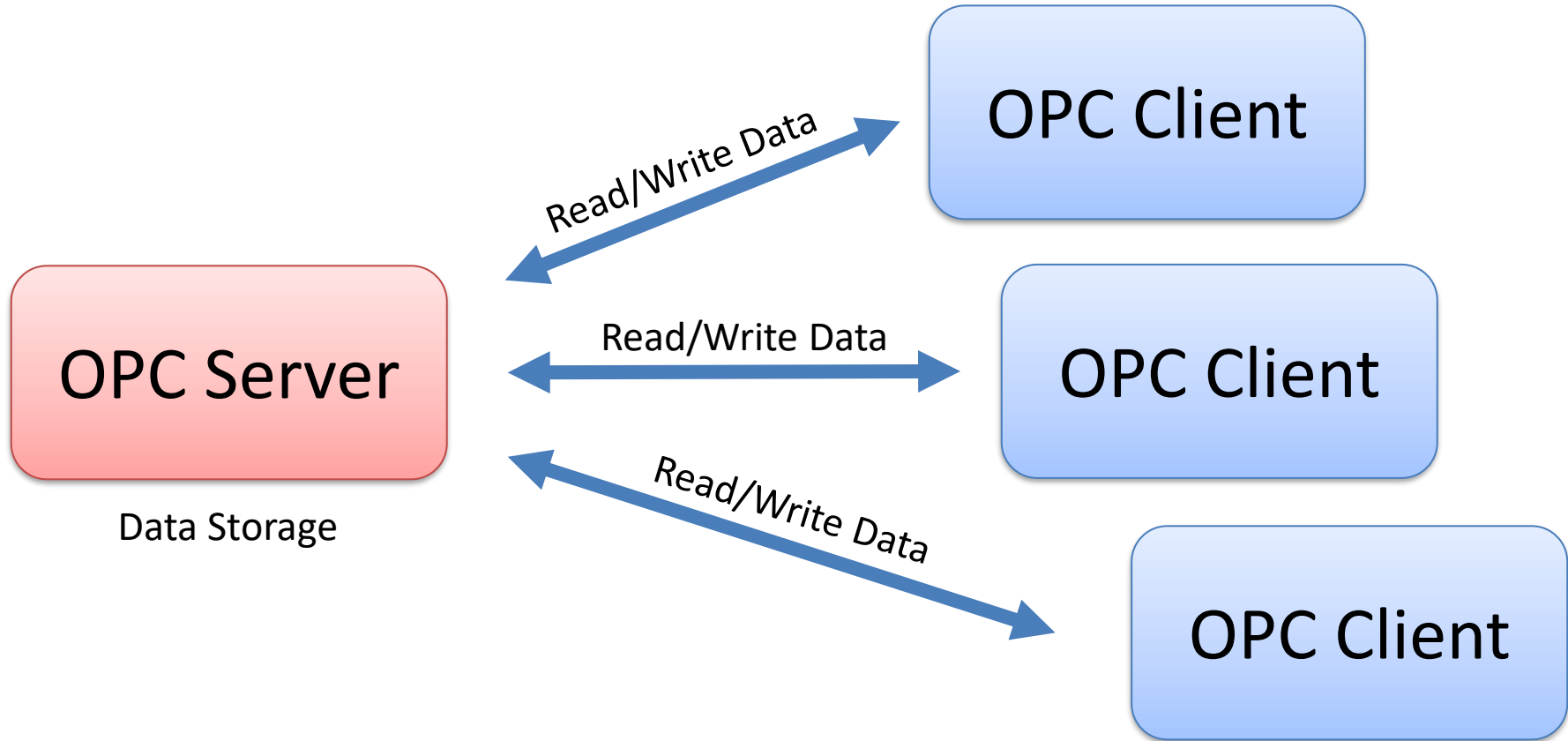


What is OPC?

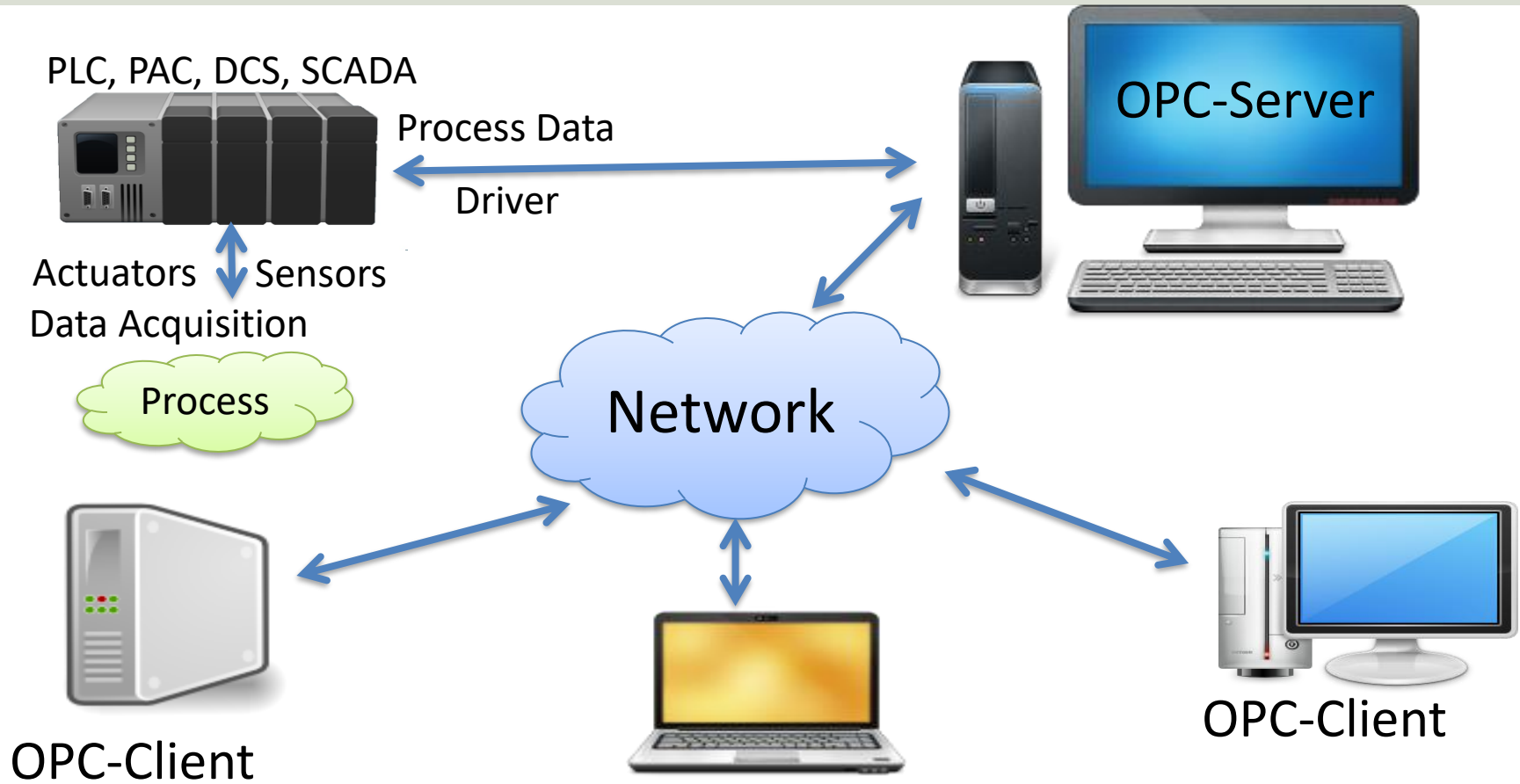
What is OPC?

- OPC is a standard that defines the communication of data between devices from different manufactures
- OPC requires an **OPC Server** that communicates with one or more **OPC Clients**
- OPC allows “plug-and-play”, gives benefits as reduces installation time and the opportunity to choose products from different manufactures
- We have different OPC standards:
 - “Real-time” data (OPC DA),
 - Historical data (OPC HDA)
 - Alarm & Events data (OPC A&E)
 - etc.

OPC Server and Clients



Typical OPC Scenario



OPC Specifications

“Classic” OPC

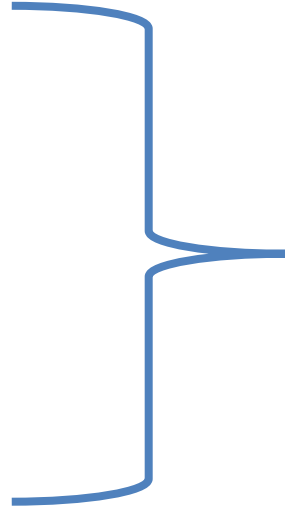


“Next Generation” OPC

OPC DA

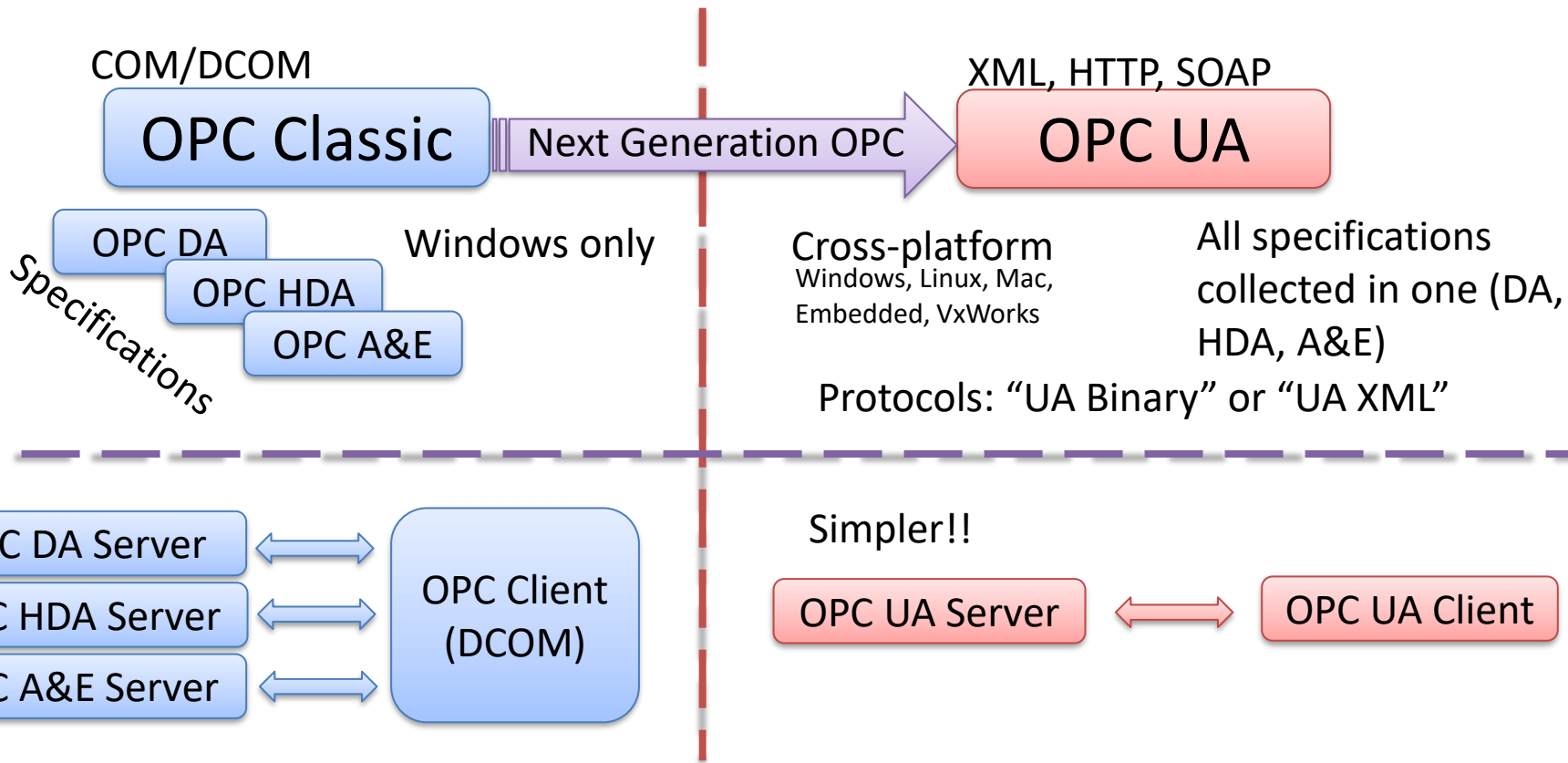
OPC HDA

OPC A&E



OPC UA

Next Generation OPC

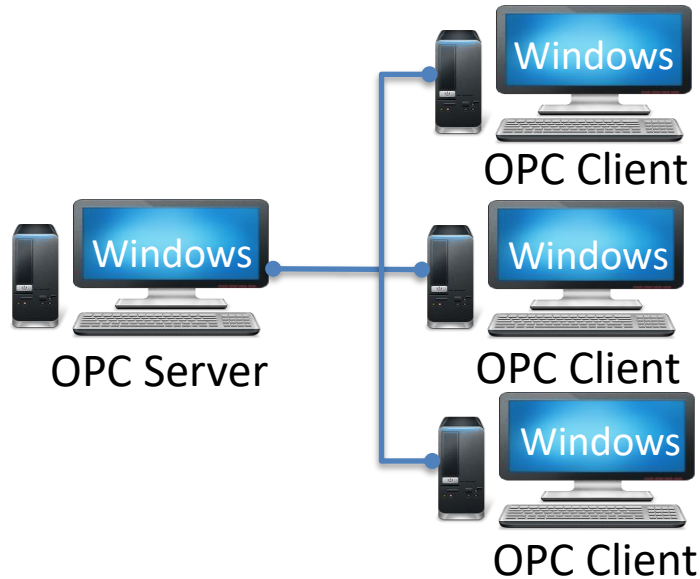


OPC UA

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

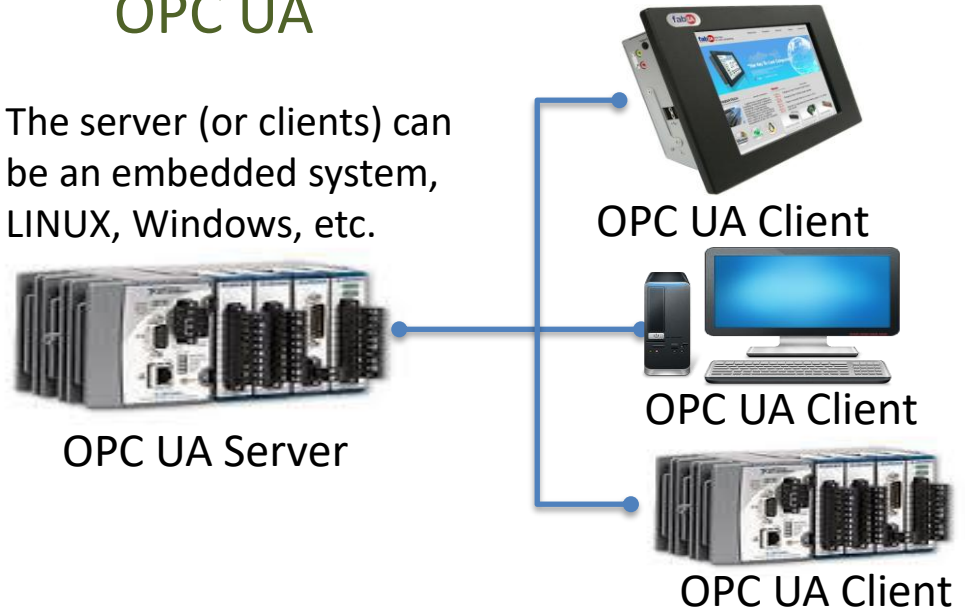
Classic OPC vs. OPC UA

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/>



OPC DA



OPC DA Servers

OPC DA Servers

- “MatrikonOPC Simulation Server” by Matrikon
- “OPC Server Simulators” by Integration Objects
- “NI OPC Servers” by NI

There exists hundreds of different OPC DA Servers, but those mentioned here can be used for free for demo and test purposes



MatrikonOPC Simulation Server

Hans-Petter Halvorsen

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MatrikonOPC Simulation Server

“MatrikonOPC Simulation Server” is free and can be used for testing and development of OPC DA solutions.

In the software package there is an OPC Test Client called “**MatrikonOPC Explorer**” which you can use to test communication with the OPC DA Server

The screenshot displays the MatrikonOPC Explorer application window. The title bar reads "MatrikonOPC Explorer - [Untitled]". The menu bar includes "File", "Server", "Group", "Item", "View", and "Help". The left-hand pane shows a tree view of the local host "Localhost \\WPS15HPH" with various OPC servers listed, including "Matrikon.OPC.Simulation.1". The main area is titled "MatrikonOPC" and contains several sections: "OPC Server Connection Options" with buttons for "Connect", "Add Tags", and "Add Alarms"; "MatrikonOPC Configuration Options" with buttons for "OPC Server", "OPC Security", and "Licensing"; "Server Status" showing "Server: Matrikon.OPC.Simulation.1" and "Connected: No"; "Supported OPC Interfaces" with buttons for "DA", "HDA", "A&E", and "SECURITY" (the latter is crossed out with a red X); "OPC Security" with a red X icon and the text "OPC SECURITY CHECK"; and a "Caution: Potential Security Risk Detected." message. Below this, an "Explanation" states: "This MatrikonOPC Server does not support the OPC Security Specification." and a "Solution" suggests contacting MatrikonOPC for updates or security. A link for "For more information on the MatrikonOPC Security Gateway" is provided. At the bottom, there is a "Server Info" section showing "Server: Matrikon.OPC.Simulation.1" and "Connected: No", and a "Group Info" section. A banner for "MatrikonOPC eLearning" is visible at the bottom of the main area.

<https://www.matrikonopc.com/products/opc-drivers/opc-simulation-server.aspx>

MatrikonOPC Simulation Server



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Logout

PORTAL

OPC Simulation Server Download



MatrikonOPC Simulation is free for non-production use and can be distributed openly. It is a fully functioning application without restriction.

MatrikonOPC Simulation Server is a free utility used to help test and troubleshoot OPC applications (clients) and connections. Testing applications on "live" OPC servers may result in loss of actual production data. The MatrikonOPC Simulation Server creates an simulated environment so that in the event of a problem, no real process data is lost.

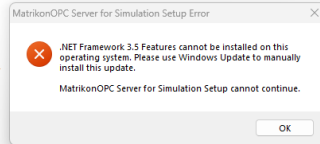
BONUS APPLICATION: MatrikonOPC Explorer. When you download MatrikonOPC Simulation Server, you also get the world's most widely used OPC Client application for testing and configuring OPC connections.

v 1.9.0.9629

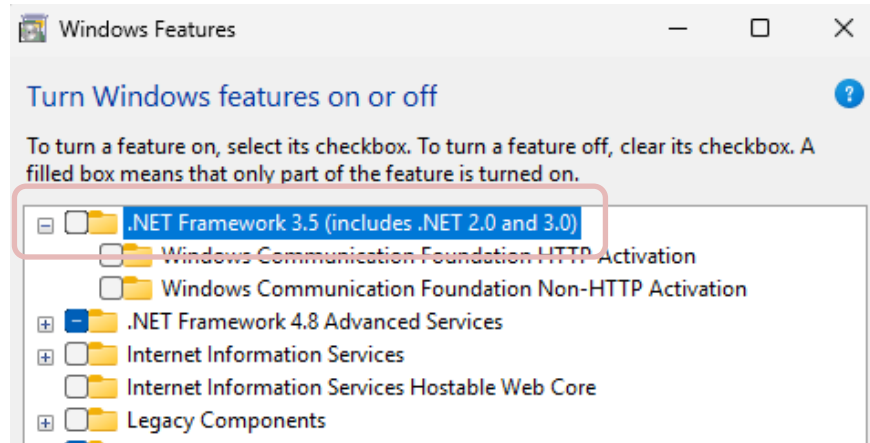
Connectivity issues? Matrikon OPC workshops can help! [More info](#)

Document Details:
Server (16.3MB - EXE)
Author: MatrikonOPC

Description:
MatrikonOPC Simulation Server - A free utility that provides simulated data for the purposes of testing, developing and configuring applications, OPC clients and connections.



If you have a newer PC, you may need to manually install .NET Framework. You can use "Windows Features" or just google and download from Internet.



<https://www.matrikonopc.com/products/opc-drivers/opc-simulation-server.aspx>



“OPC Server Simulators”

by Integration Objects

Hans-Petter Halvorsen

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“OPC Server Simulators”

- System overview
- OPC UA
- OPC Tunneling
- OPC Data Archiving
- OPC Servers
 - OPC Server Simulators – Full Edition
 - OPC Server for SNMP
 - OPC Server for Wonderware Historian
 - OPC HDA Server for OLEDB
 - OPC HDA Server for ODBC
 - OPC HDA Server for MySQL
 - OPC DA Server for Wonderware Historian
 - OPC DA Server for OLEDB
 - OPC DA Server for ODBC
 - OPC DA Server for MySQL
 - OPC DA Server for MS Access
 - OPC DA Server for Oracle
 - OPC DA Server for Microsoft SQL Server
 - OPC Server for ODBC
 - OPC Server for MySQL
 - OPC Driver for Databases
 - OPC Server for Modbus
 - OPC Server Enterprise

OPC Server Simulators

Easily simulate data and alarms using the OPC Server Simulators!

OPC Server Simulators are free OPC server test tools. They allow end-users, developers and integrators to conduct tests with any third party OPC client software. In fact, this plug and play OPC product offers you simulated real-time data, alarms and events messages as well as historical raw and processed data.

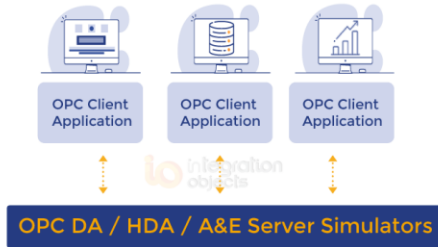
In particular, the OPC simulators package includes the advanced OPC simulator, which supports OPC DA and HDA specifications and allows you to:

- Configure your own tags and customize the OPC Server address space,
- Specify your OPC data set simply by using CSV files.

Consequently, the advanced OPC simulator is very useful for history data playback purposes.

Ask for more information

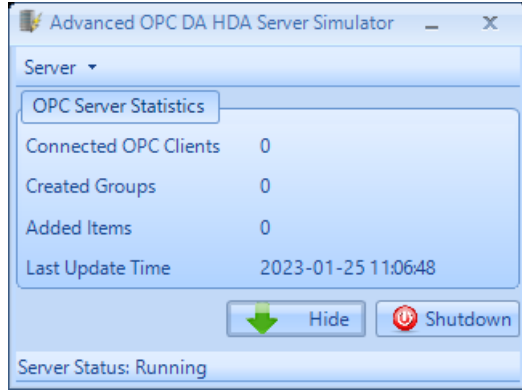
Download



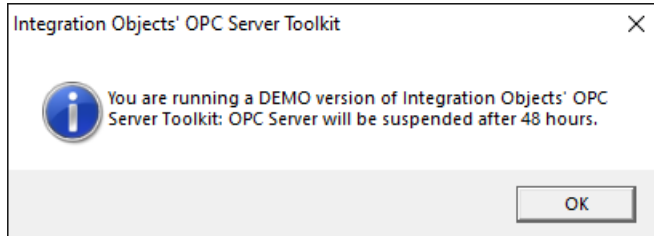
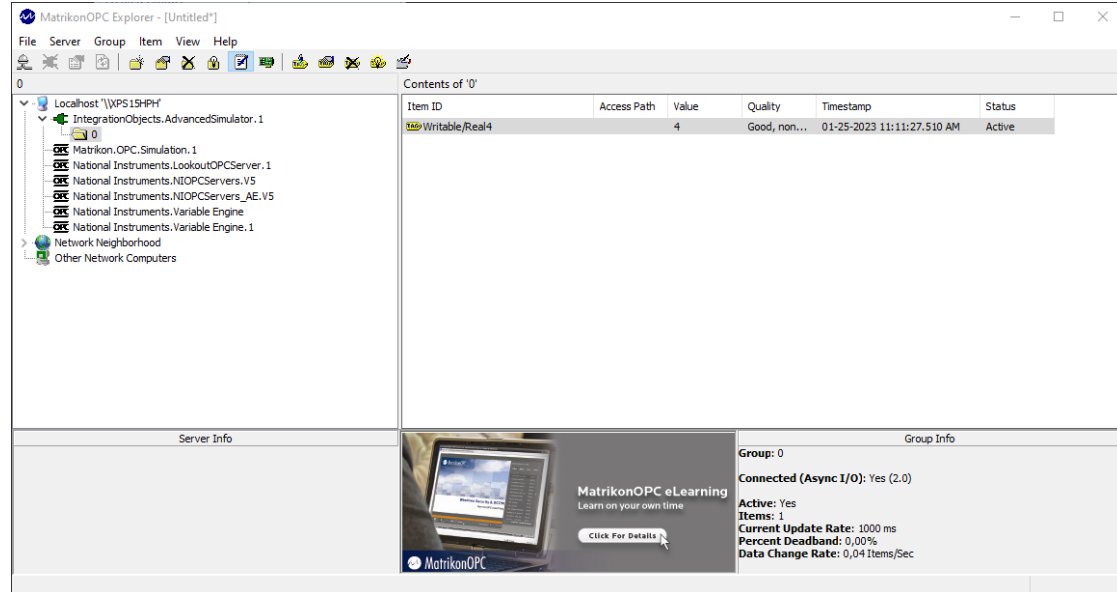
“OPC Server Simulators” by Integration Objects are free OPC server test tools. They allow end-users, developers and integrators to conduct tests with any third party OPC client software. The package consists of an OPC DA/HDA Server and an OPC A&E Server.

“OPC Server Simulators”

In the “OPC Server Simulators” software package there is a OPC server called “Advanced OPC DA HDA Server Simulator”



Here we have connected to the server using the “MatrikonOPC Explorer”:



The demo version runs for 48 hours before you need to restart it



NI OPC Servers

NI OPC Servers



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OPC Servers

OPC Servers provide a single, consistent interface to communicate with multiple devices through the OPC standard.

OPC Servers is a software add-on for LabVIEW that converts proprietary industrial protocols to the open OPC Classic and OPC Unified Architecture (UA) protocols. This conversion to OPC enables LabVIEW applications to communicate with many different programmable logic controllers (PLCs) and third-party devices through the OPC UA Client that is included with the LabVIEW OPC UA Toolkit, providing a single platform for delivering high-performance measurements and control to industrial systems.

[- Read Less](#)

DOWNLOADS

Supported OS ⓘ	Windows	View Readme
Version ⓘ	2016	
Included Editions ⓘ	Full	
Application Bitness ⓘ	32-bit and 64-bit	
Language ⓘ	English, French, German, Japanese, Korean, Simplified Chinese	

OPC Servers 2016

Release Date
5/14/19

Included Versions
2016

> Supported OS

> Language

> Checksum

DOWNLOAD

INSTALL OFFLINE

File Size
5.89 MB

A Demo version of “NI OPC Servers” is included with “LabVIEW DSC Module” or “LabVIEW Real-Time module” (so you may already have it installed on your PC). It can also be downloaded separately.

<https://www.ni.com/en-no/support/downloads/software-products/download.opc-servers.html>



OPC DA Programming Tools

OPC DA Programming Tools

Software and Programming Tools that can be used for communicating with OPC DA Servers:

- LabVIEW + DataSocket
- (Many other alternatives exists)



LabVIEW + DataSocket

OPC DA in LabVIEW

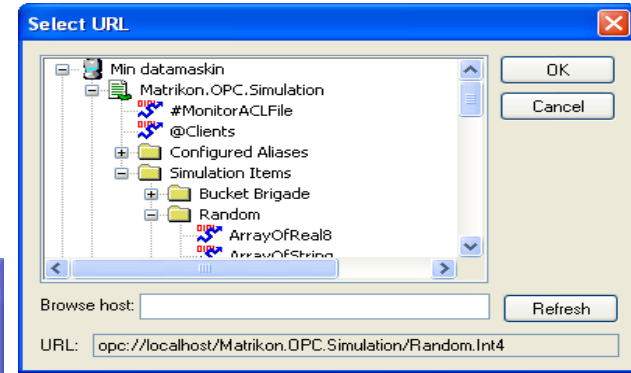
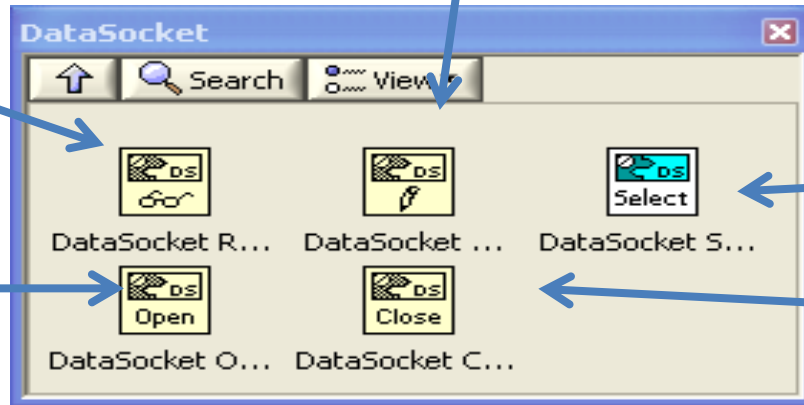
You can use LabVIEW as an OPC client by connecting to an OPC server through a DataSocket connection.

The **DataSocket** palette in LabVIEW:

Read Data from OPC

Open Connection to OPC Server

Write Data to OPC

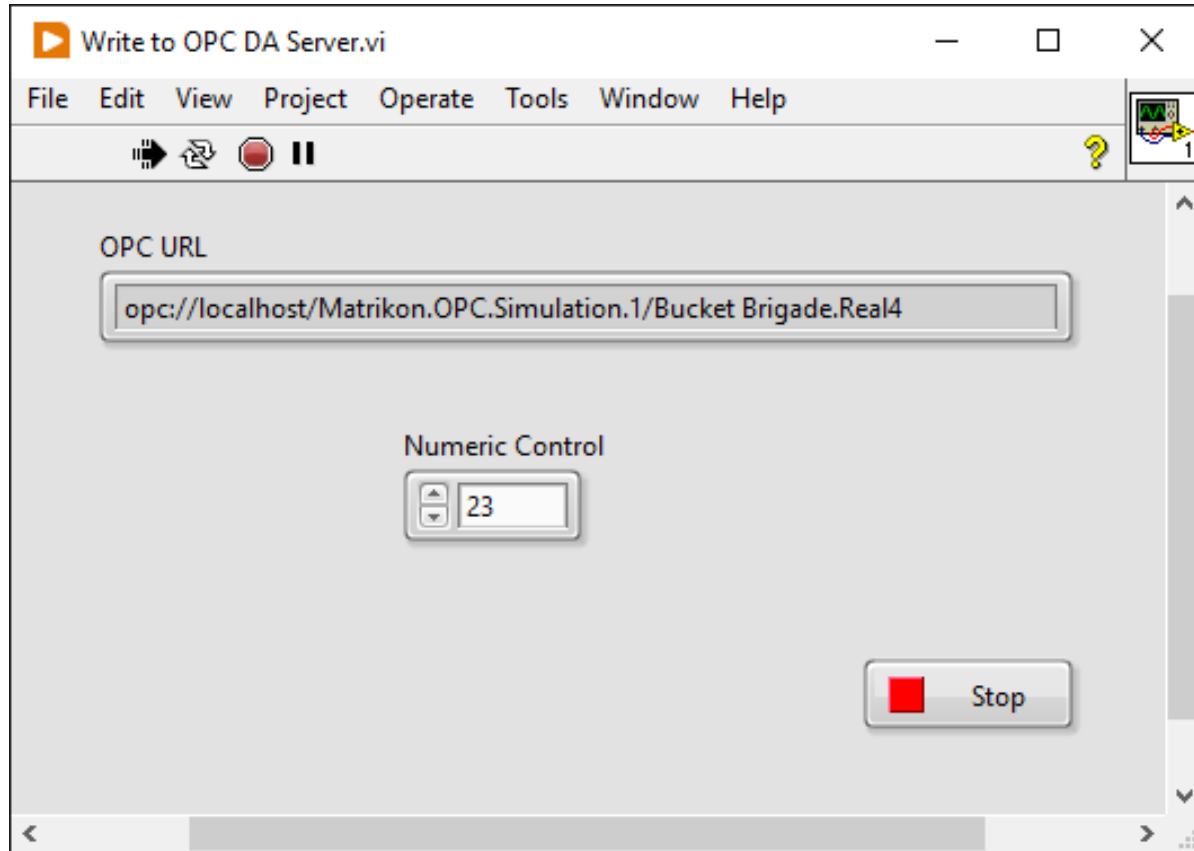


Browse OPC Servers and OPC Items

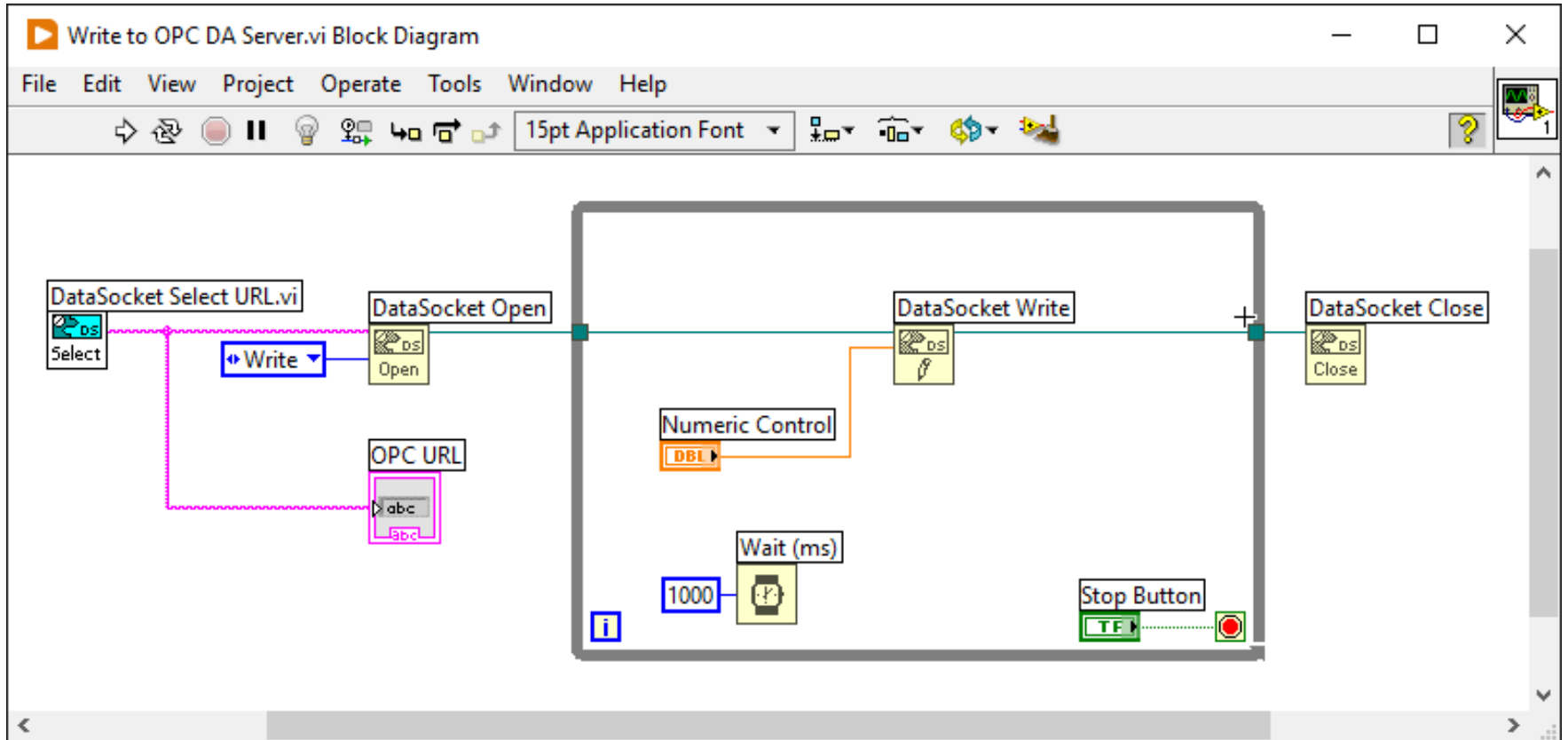
Close Connection to OPC Server

Note! Make sure to use **LabVIEW 32bit version** (even if you have 64bit operating system) because the DataSocket feature is only supported by the 32bit version of LabVIEW.

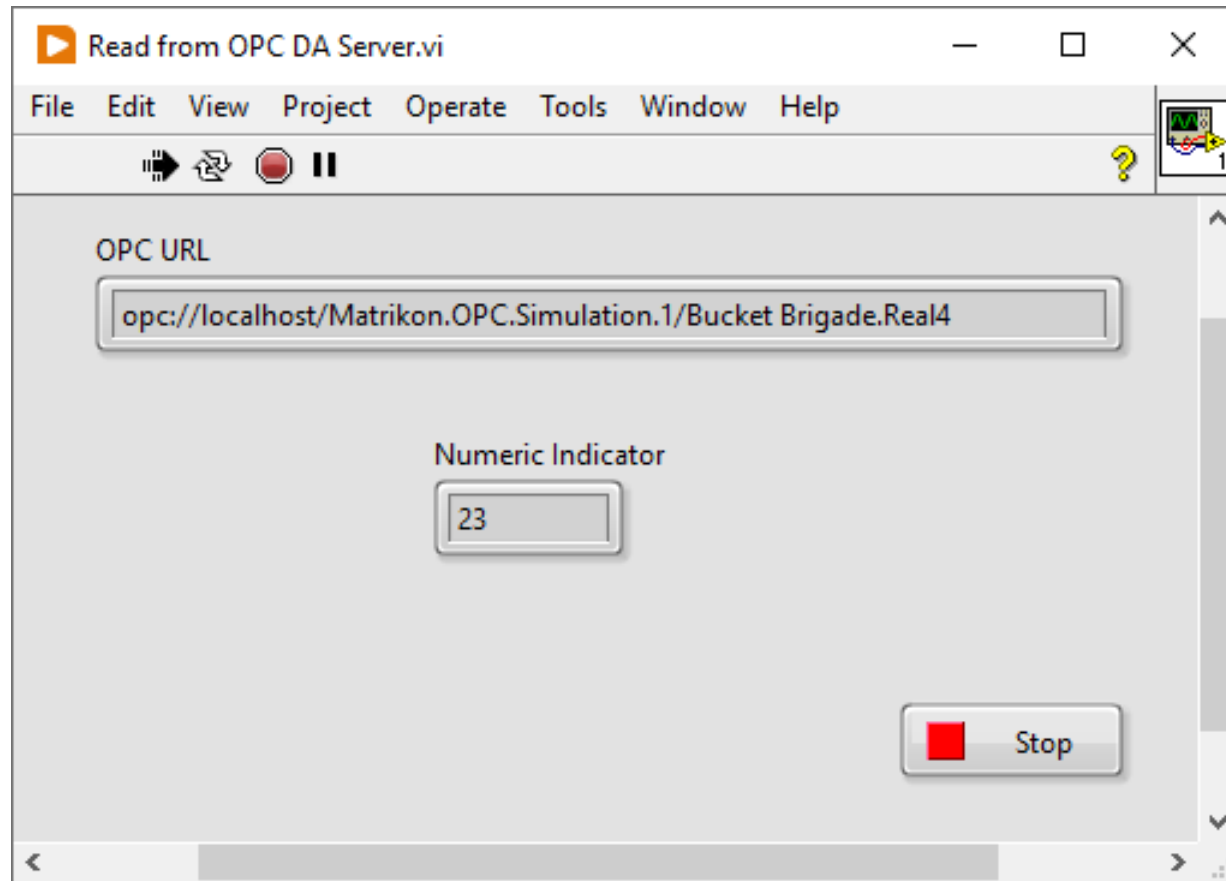
Write Data to OPC DA Server



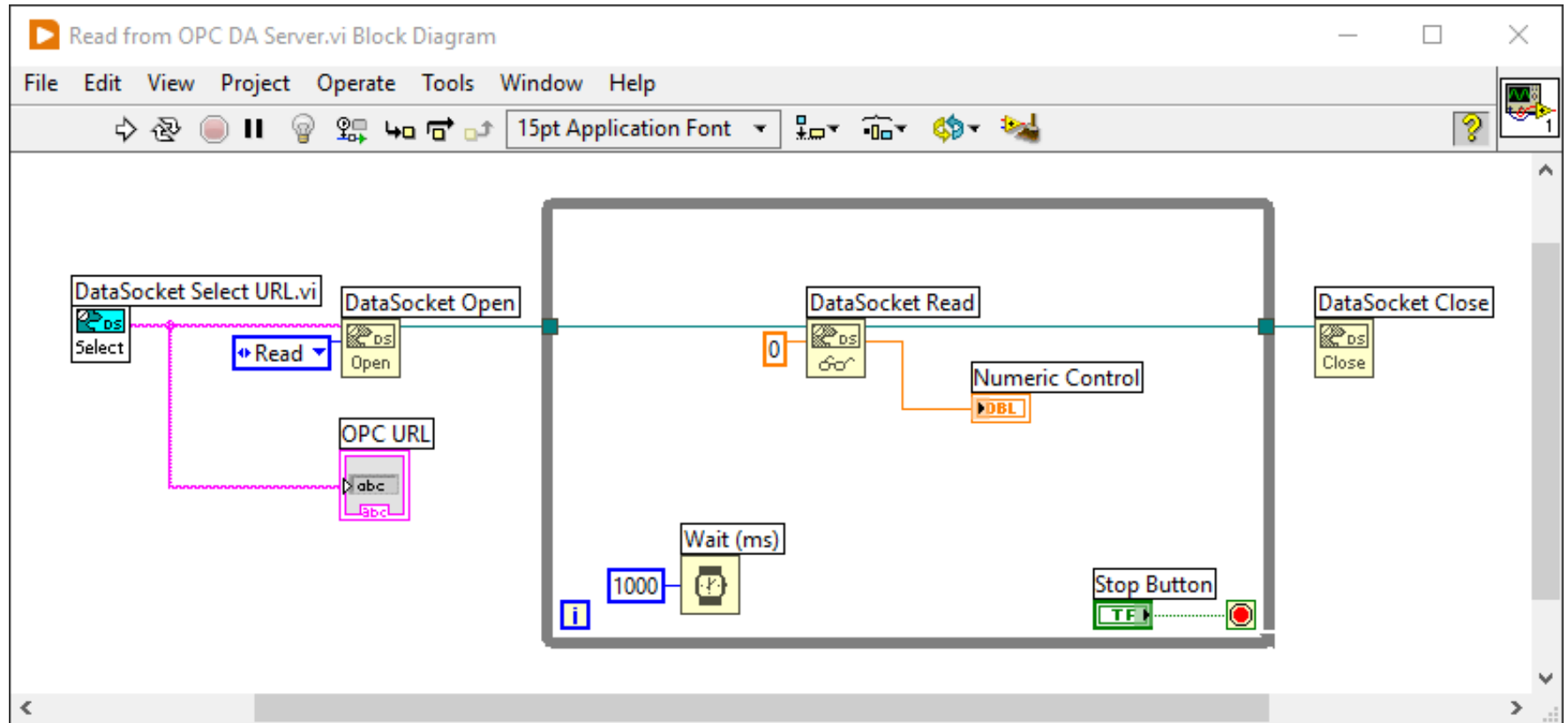
Write Data to OPC DA Server



Read Data from OPC DA Server



Read Data from OPC DA Server





MATLAB + Industrial Communication Toolbox

Hans-Petter Halvorsen

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OPC with MATLAB

- In order to use OPC with MATLAB you can use the “**Industrial Communication Toolbox**”.
- The “Industrial Communication Toolbox” supports the following Protocols:
 - OPC (Only OPC UA in the latest release)
 - MQTT
 - Modbus
- **Note!** “Industrial Communication Toolbox” is a new Toolbox that is included in “MATLAB R2022a” and newer versions

Industrial Communication Toolbox

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Industrial Communication Toolbox

Exchange data over OPC UA, Modbus, MQTT, and other industrial protocols

Get a free trial View pricing

Industrial Communication Toolbox™ provides access to live and historical industrial plant data directly from MATLAB® and Simulink®. You can read, write, and log OPC Unified Architecture (UA) data from devices such as distributed control systems, supervisory control and data acquisition systems, and programmable logic controllers. You can also access plant and manufacturing data directly from OSIsoft® PI servers, and use this data for process monitoring, process improvement, and predictive maintenance applications.

You can work with data from live servers and data historians that conform to the OPC UA, OPC Data Access (DA), and OPC Classic Historical Data Access (HDA) standards. When communicating over OPC UA, you can securely connect to OPC UA servers using a variety of security modes, encryption algorithms, and user authentication methods.

Show more

MATLAB and the Industrial Communication Toolbox are made by MathWorks

<https://mathworks.com>

<https://mathworks.com/products/industrial-communication.html>



OPC UA

OPC UA Servers

- “OPC UA Server Simulator”
 - “**OPC UA Server Simulator**” from “Integration Objects” is an OPC UA Demo/Test Server which you can download and use for free
- “LabVIEW OPC UA Server”
 - With “**LabVIEW OPC UA Toolkit**” you can create your own OPC UA Server
- Lots of other alternatives ...



OPC UA

Demo/Test Software

OPC UA Demo/Test Software

- OPC UA Server
 - E.g., “**OPC UA Server Simulator**” from “Integration Objects”, which is an OPC UA Demo/Test Server which you can download and use for free
- OPC UA Client
 - E.g., “**OPC UA Client**” from “Integration Objects”, which is a free client tool that supports the main OPC Unified Architecture information models.



OPC UA Server Simulator

Hans-Petter Halvorsen

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OPC UA Server Simulator

The screenshot shows the product page for the OPC UA Server Simulator. At the top, there is a navigation bar with the Integration Objects logo and links for Digital Transformation, OPC Products, Services, Training, Company, Partners, Downloads, and Contact Us. Below the navigation bar, the breadcrumb trail reads: Home / OPC Products / OPC UA / OPC UA Server Simulator.

The main content area features a sidebar on the left with a list of products. The 'OPC UA Server Simulator' item is highlighted in orange. The main heading is 'OPC UA Server Simulator', followed by 'Download' and 'User Guide' buttons. A 'Watch Demo Videos' section is also present.

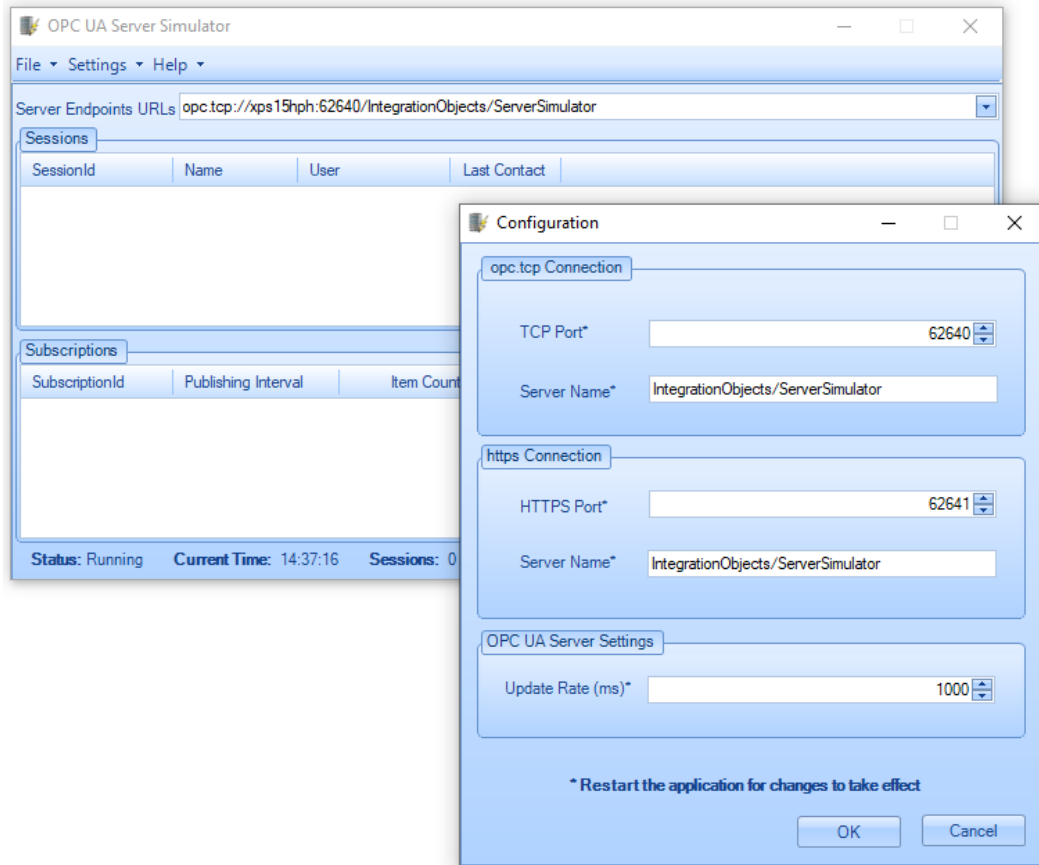
The text on the page describes the simulator as a free-to-use and distribute OPC Unified Architecture server utility that simulates real-time and historical data. It mentions that the simulator supports data access and historical access information models of OPC UA and can be configured to simulate data from CSV files.

A diagram at the bottom illustrates the architecture: three 'OPC UA Client' icons are shown at the top, each connected by a dashed double-headed arrow labeled 'HTTP/UA TCP' to a central 'OPC UA Server Simulator' box at the bottom. The simulator box contains three 'CSV' file icons, indicating that it can simulate data from these files.

At the bottom right of the page, there is a 'Privacy & Cookies Policy' link.

<https://integrationobjects.com/sioth-opc/sioth-opc-unified-architecture/opc-ua-server-simulator/>

OPC UA Server Simulator



For the OPC UA Part we will use the “OPC UA Server Simulator”, which is an OPC UA Demo/Test Server which you can download and use for free

OPC UA Server Simulator

The “OPC UA Server Simulator” uses 2 CSV simulation files:

- “**AddressSpace.csv**” used to build the address space of the OPC UA Server.
- “**ValueSpace.csv**” used to simulate the data values of the OPC UA items.
- Those two files are located at the following path:
X:\Program Files (x86)\Integration Objects\Integration Objects' OPC UA Server Simulator\OPC UA Server Simulator\DATA

AutoSave Off AddressSpace.csv

File Home Insert Draw Page Layout Formulas Data Review View Add-Ins Help LOA Acro Team

A1 Tag Name

	A	B	C	D	E	F	G	H	I
1	Tag Name	Data Type	AccessRights	Simulated					
2	Tag1	IO_Int16	RW	FALSE					
3	Tag2	IO_Int32	RW	FALSE					
4	Tag3	IO_Int64	RW	FALSE					
5	Tag4	IO_UInt16	RW	FALSE					
6	Tag5	IO_UInt32	RW	FALSE					
7	Tag6	IO_UInt64	RW	FALSE					
8	Tag7	IO_Double	RW	FALSE					
9	Tag8	IO_String	RW	FALSE					
10	Tag9	IO_Byte	RW	FALSE					
11	Tag10	IO_Boolean	RW	FALSE					
12	Tag11	IO_Int16	R	TRUE					
13	Tag12	IO_Int32	R	TRUE					
14	Tag13	IO_Int64	R	TRUE					
15	Tag14	IO_UInt16	R	TRUE					
16	Tag15	IO_UInt32	R	TRUE					
17	Tag16	IO_UInt64	R	TRUE					
18	Tag17	IO_Double	R	TRUE					
19	Tag18	IO_String	R	TRUE					
20	Tag19	IO_Byte	R	TRUE					
21	Tag20	IO_Boolean	R	TRUE					
22									

AddressSpace

Ready Accessibility: Unavailable 100%

AutoSave Off ValueSpace.csv

File Home Insert Draw Page Layout Formulas Data Review View Add-Ins Help LOA Acro Team

A1 Tag11

	A	B	C	D	E	F	G	H	I
1	Tag11		Tag12		Tag13				
2	11 good		56 good		47 good				
3	12 good		32 good		14 good				
4	13 good		28 good		85 good				
5	14 good		14 good		125 good				
6	15 good		15 good		24 good				
7	16 good		57 good		69 good				
8	17 good		65 good		36 good				
9	18 good		18 good		18 good				
10	19 good		48 good		84 good				
11	20 good		36 good		64 good				
12									
13									
14									

ValueSpace

Ready Accessibility: Unavailable 100%



“OPC UA Client”

“OPC UA Client”

- “OPC UA Client” is a free OPC client tool that supports the main OPC Unified Architecture information models.
- These models are Data Access, Alarms & Conditions, and Historical Data Access
- Handy to use to test OPC communication
- <https://integrationobjects.com/sioth-opc/sioth-opc-unified-architecture/opc-ua-client/>

“OPC UA Client”

The screenshot shows the product page for the OPC UA Client. The page features a dark blue navigation bar at the top with the company logo and various menu items. A sidebar on the left contains a list of product categories, with 'OPC UA Client' highlighted in orange. The main content area includes a title 'OPC UA Client', three orange buttons for 'Download', 'User Guide', and 'Quick User Guide', and a paragraph of introductory text. Below this, there are two bulleted lists: one detailing the capabilities of the client and another listing the features of the OPC UA Explorer. A video link is provided for a tutorial. At the bottom, there is a graphic showing a computer monitor displaying the OPC UA Client interface, with arrows indicating its connection to OPC UA servers via TCP. A 'Privacy & Cookies Policy' link is visible in the bottom right corner.

Welcome Halvorsen Hans-Petter [Ask Us a Question](#) [EN](#)

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Home / OPC Products / OPC UA / OPC UA Client

OPC UA Client

[Download](#) [User Guide](#) [Quick User Guide](#)

Download free OPC UA Client and start your OPC UA tests now!

OPC UA Client is a free client tool that supports the main OPC Unified Architecture information models. These models are Data Access, Alarms & Conditions, and Historical Data Access. In fact, it offers the capability to:

- ▶ Discover local and remote OPC UA servers
- ▶ Establish secure communication channels
- ▶ Browse the address space of any OPC UA compliant server
- ▶ Monitor real-time data and alarms & conditions
- ▶ Explore and update history data

Moreover, this OPC UA explorer allows you to generate its self-signed Application Instance Certificate in order to provide application level security and secure the connections with OPC UA servers.

[View Tutorial Video of OPC UA Test Client & OPC UA Wrapper](#)

OPC UA Client

RSI/UA TCP

Integration Objects

Privacy & Cookies Policy

<https://integrationobjects.com/sioth-opc/sioth-opc-unified-architecture/opc-ua-client/>

“OPC UA Client”

The screenshot displays the OPC UA Client software interface. The main window is titled "Integration Objects' OPC UA Client" and features a ribbon menu with tabs for Home, File, Session, Configuration, Help, and Certificate Manager. The ribbon includes icons for New, Open, Save, Save as, Connect, Disconnect, Settings, UA Settings, Help, About, Define, Remove, and Certificate Manager.

The "Connection Settings" dialog box is open, showing the following configuration options:

- Session Information:** Session Name: Session0
- Server Information:** Endpoint Uri: opc.tcp://xps15hph:62640/IntegrationObjects/! Discover
- Transport Protocol:** Opc.tcp, Https
- Message Encoding:** Binary, Xml
- Security Mode:** None, Sign, Sign_Encrypt
- Security Policy:** None, Basic128RSA15, Basic256, Basic256Sha256
- User Authentication Mode:** Anonymous, UserName, Certificate
- Certificate (.pfx): [Empty field]
- Password: [Empty field]

The background interface shows a "Sessions" list, an "Address Space" view, and a "Forward" view. A message log at the bottom displays the following data:

Message Type	Timestamp	Message
[Control]	2022-02-08 13:05:06	Disconnecting from session
[Control]	2022-02-08 13:03:09	Read operation of the variab
[Control]	2022-02-08 13:01:03	A session "Session0" with the

3 Messages

“OPC UA Client”

Integration Objects' OPC UA Client

Home

New Open Save Save as Connect Disconnect Settings UA Settings Help About Define Remove Certificate Manager

File Session Configuration Help Default Configuration Certificate

Sessions

Sessions
Session0

Address Space

Forward

Real Time Data

- Tag1
- Tag2
- Tag3
- Tag4
- Tag5
- Tag6
- Tag7
- Tag
- Tag
- Tag

References and Attributes

- Read
- Write
- History Update
- Monitor

Display Name	Node Id	Value	Data Type	Server Timestamp	Source Timestamp	Status Code	Subscription	Session
--------------	---------	-------	-----------	------------------	------------------	-------------	--------------	---------

Attribute	Value
NodeId	ns=2;s=Historical...
NodeClass	Object
BrowseName	2:Historicaldata
DisplayName	Historical Data
Description	
WriteMask	0
UserWriteMask	0
EventNotifier	Subscribe

Message Type	Timestamp	Message
[Control]	2022-02-08 13:03:09	Read operation of the variable [ns=2;s=Tag7] succeeded.
[Control]	2022-02-08 13:01:03	A session "Session0" with the Endpoint [opc.tcp://xps15hph:62640/IntegrationObjects/ServerSimulator - [None:None:Binary]] was successfully created.

2 Messages



OPC UA Programming Tools

OPC UA Programming Tools

Software and Programming Tools that can be used for communicating with OPC UA Servers:

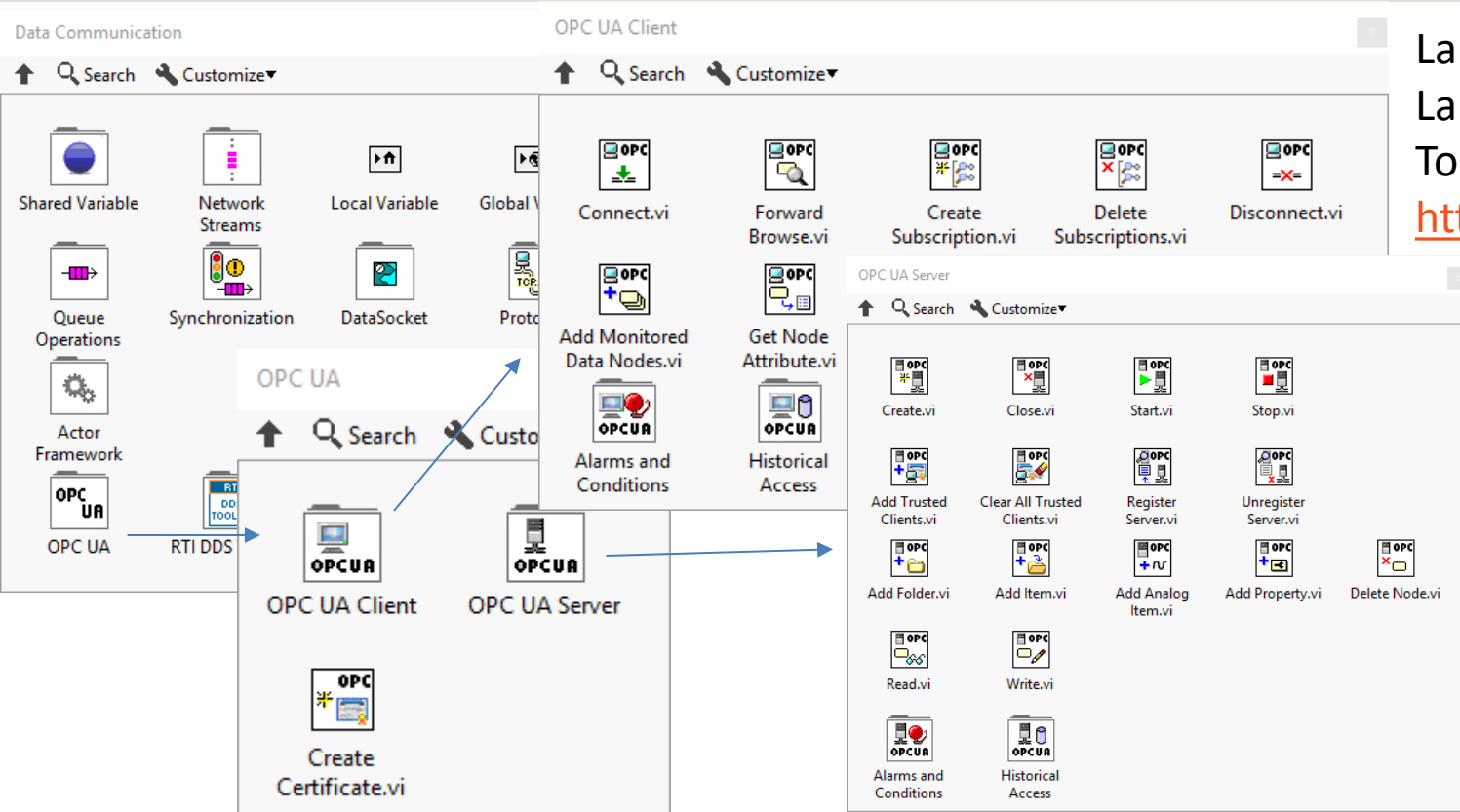
- LabVIEW + LabVIEW OPC UA Toolkit
- MATLAB + Industrial Communication Toolkit (supports both OPC DA and UA)
- Visual Studio/C# + “OPC UA .NET SDK”

Many other alternatives exists



LabVIEW OPC UA Toolkit

LabVIEW OPC UA Toolkit

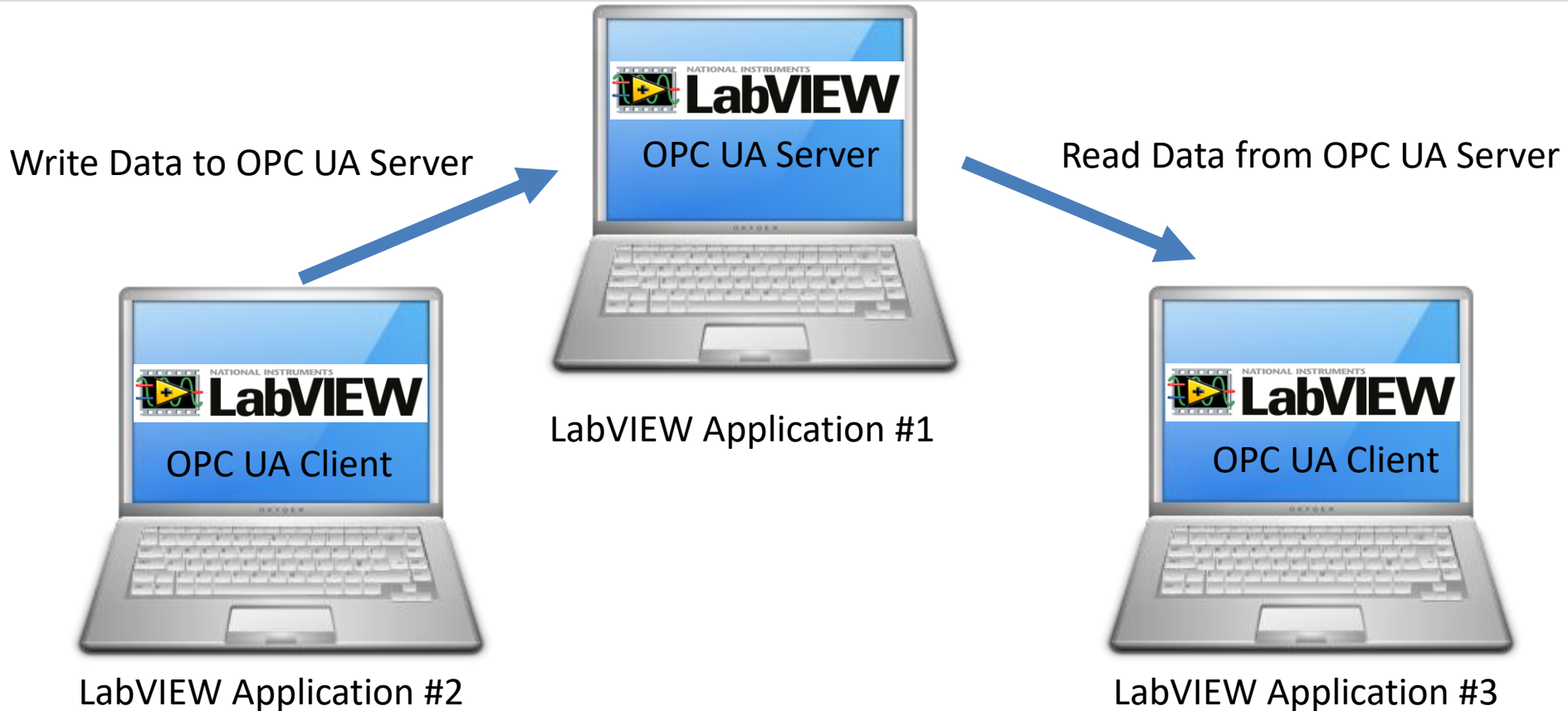


LabVIEW and the
LabVIEW OPC UA
Toolkit are made by NI

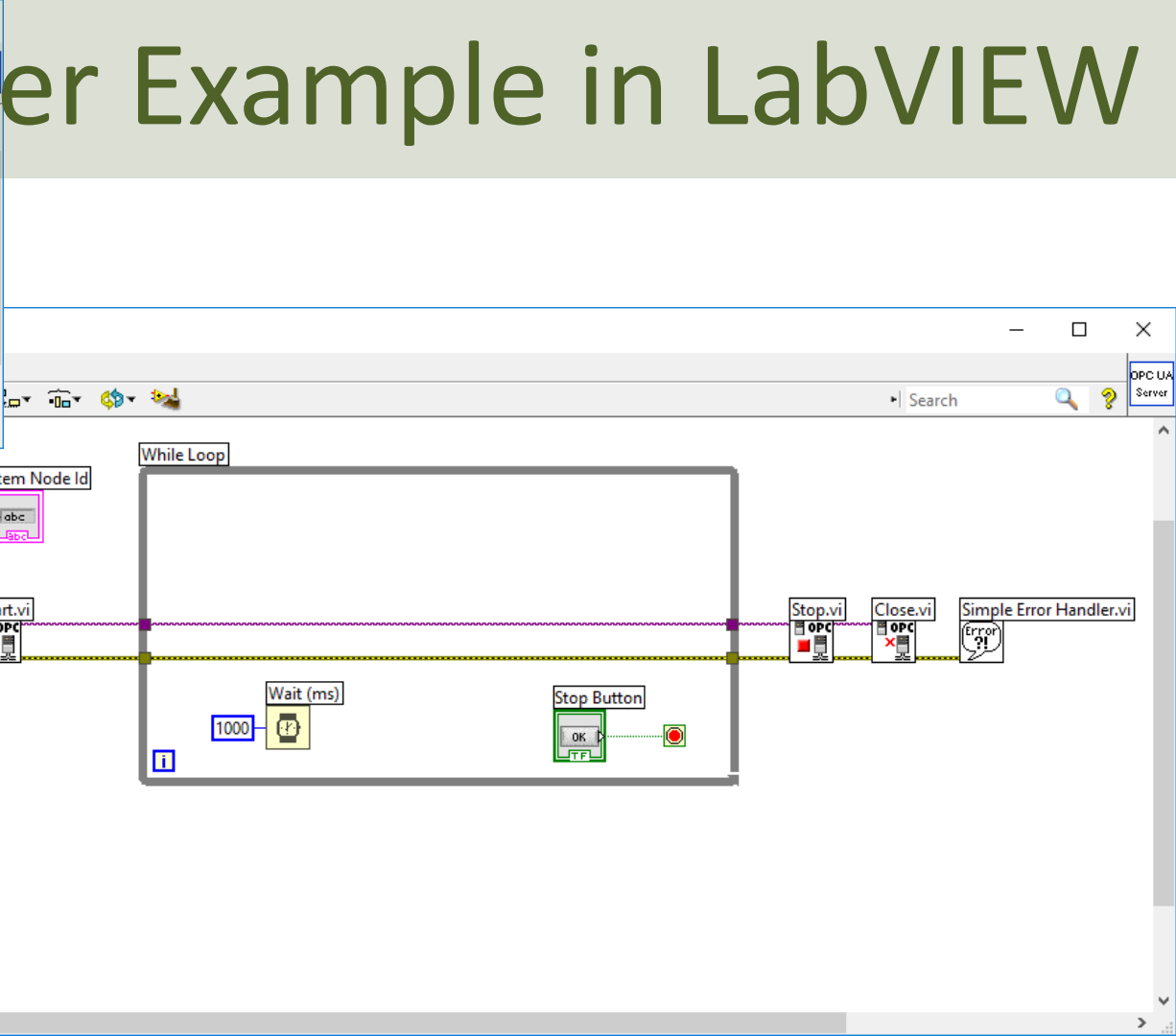
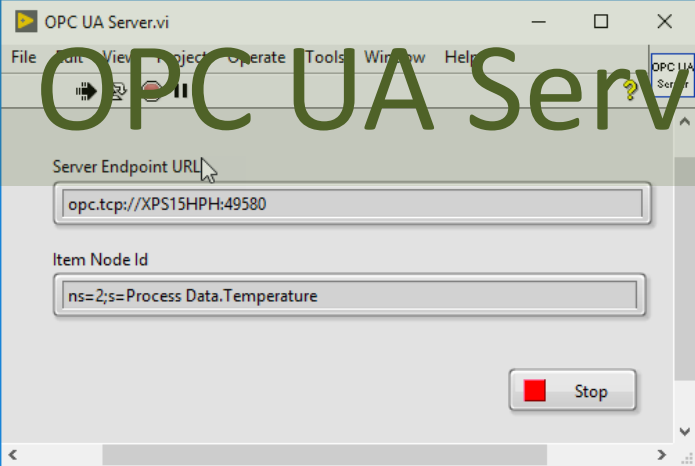
<https://www.ni.com>

<https://www.ni.com/en-no/support/downloads/software-products/download.labview-opc-ua-toolkit.html>

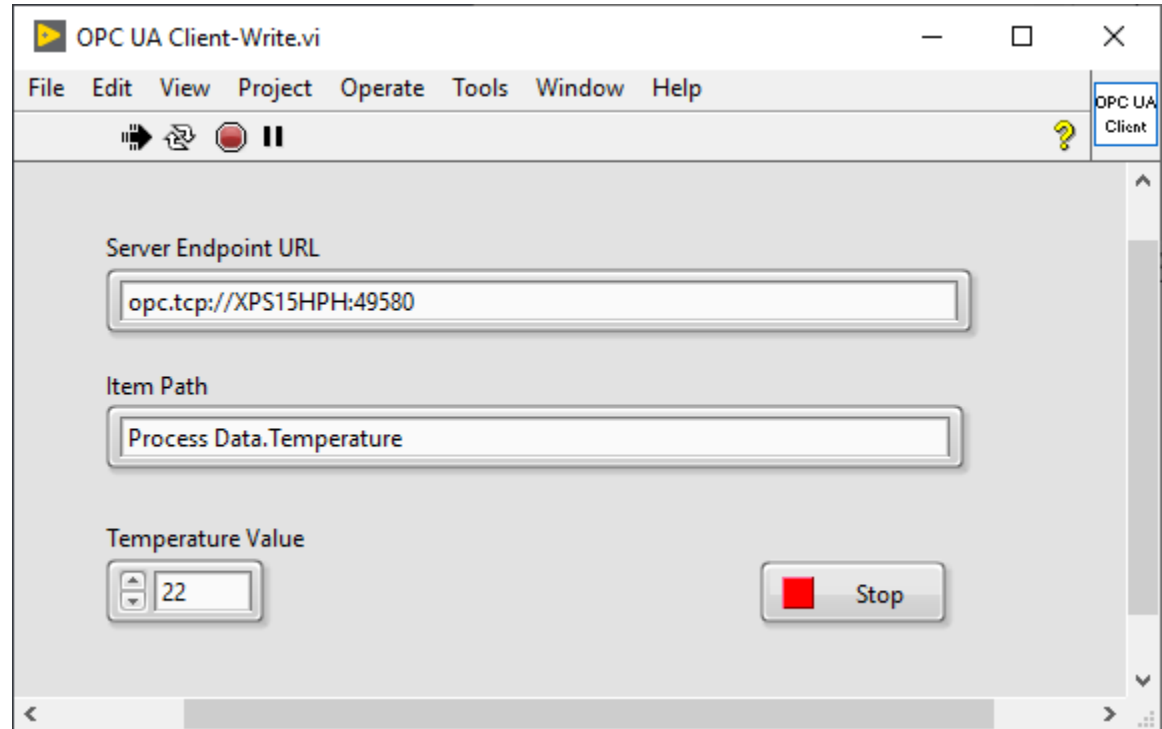
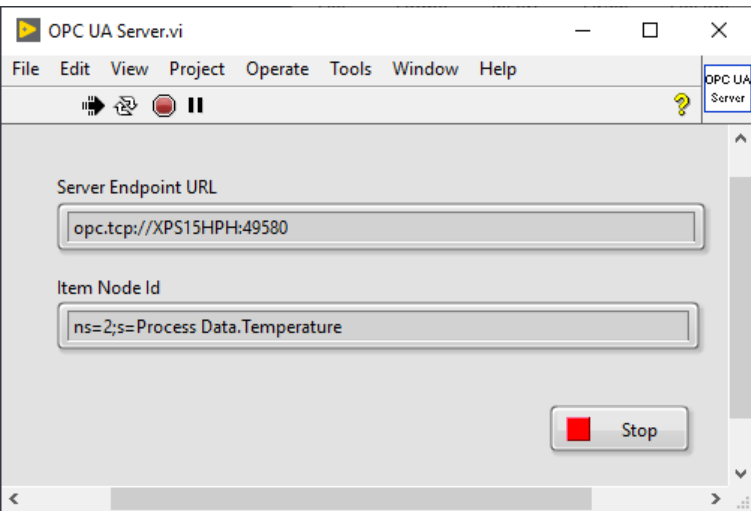
OPC UA in LabVIEW



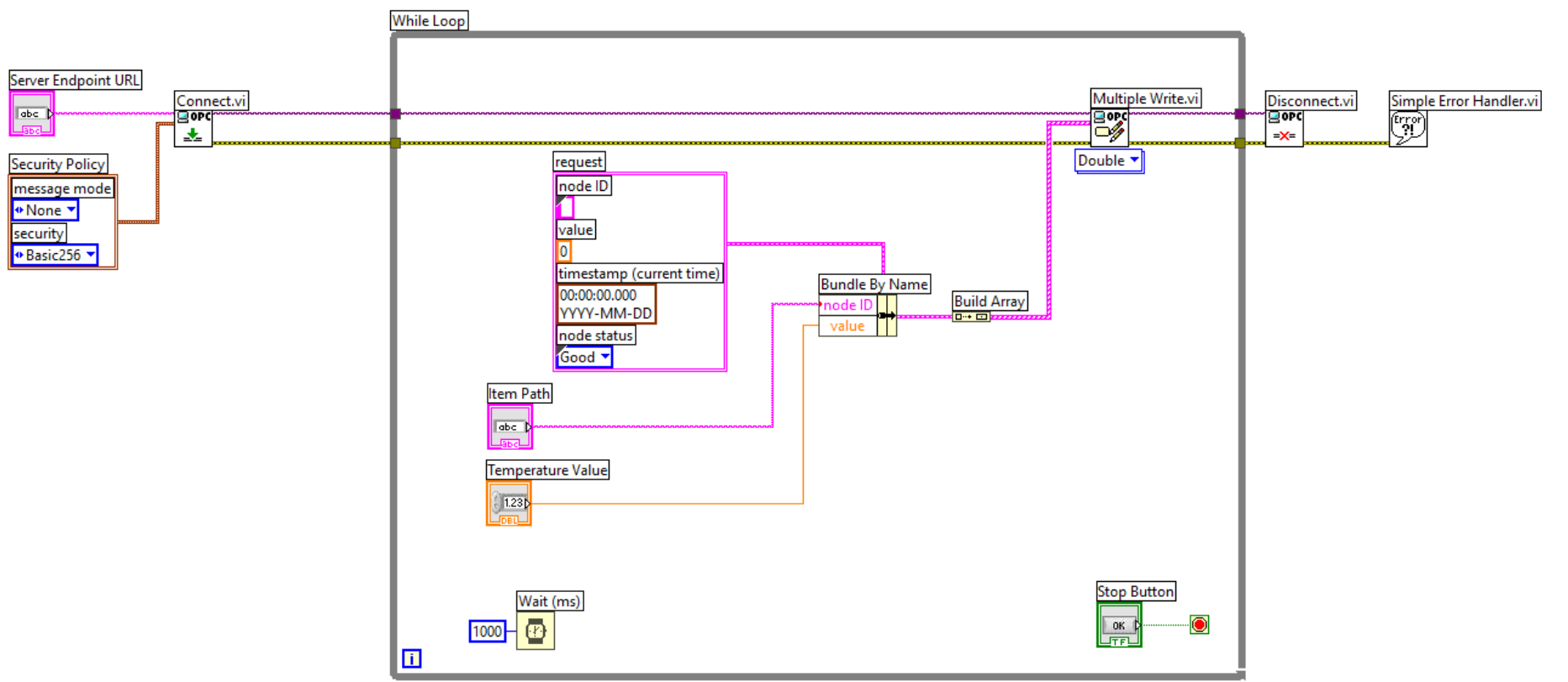
OPC UA Server Example in LabVIEW



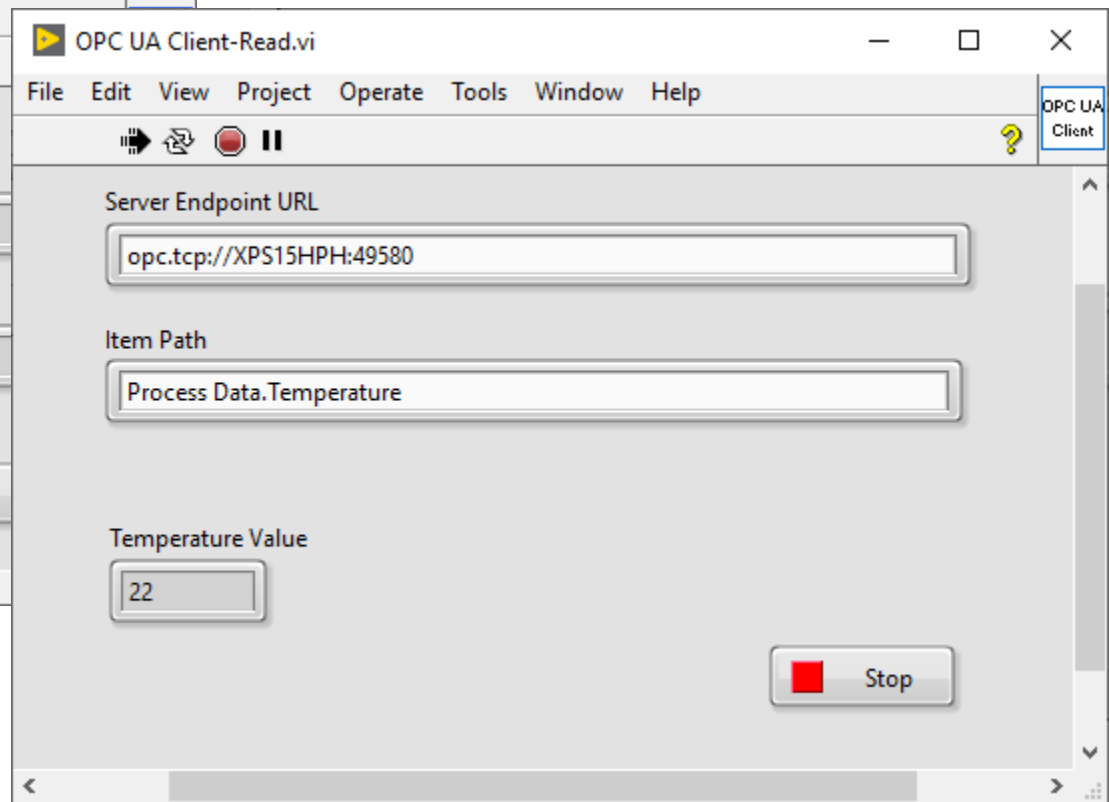
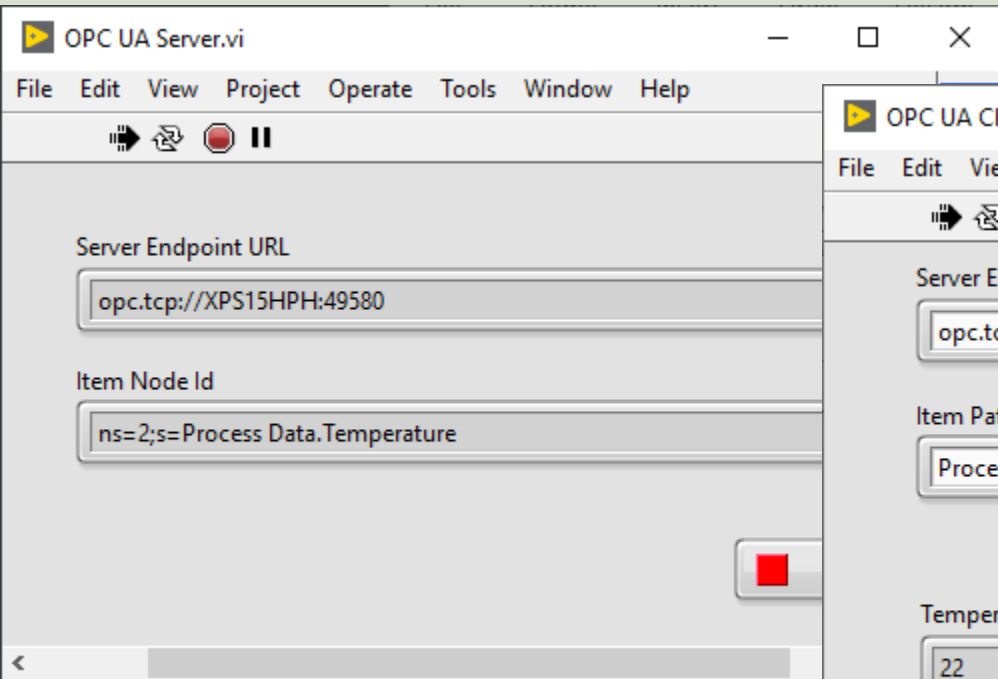
OPC UA Client Write Data



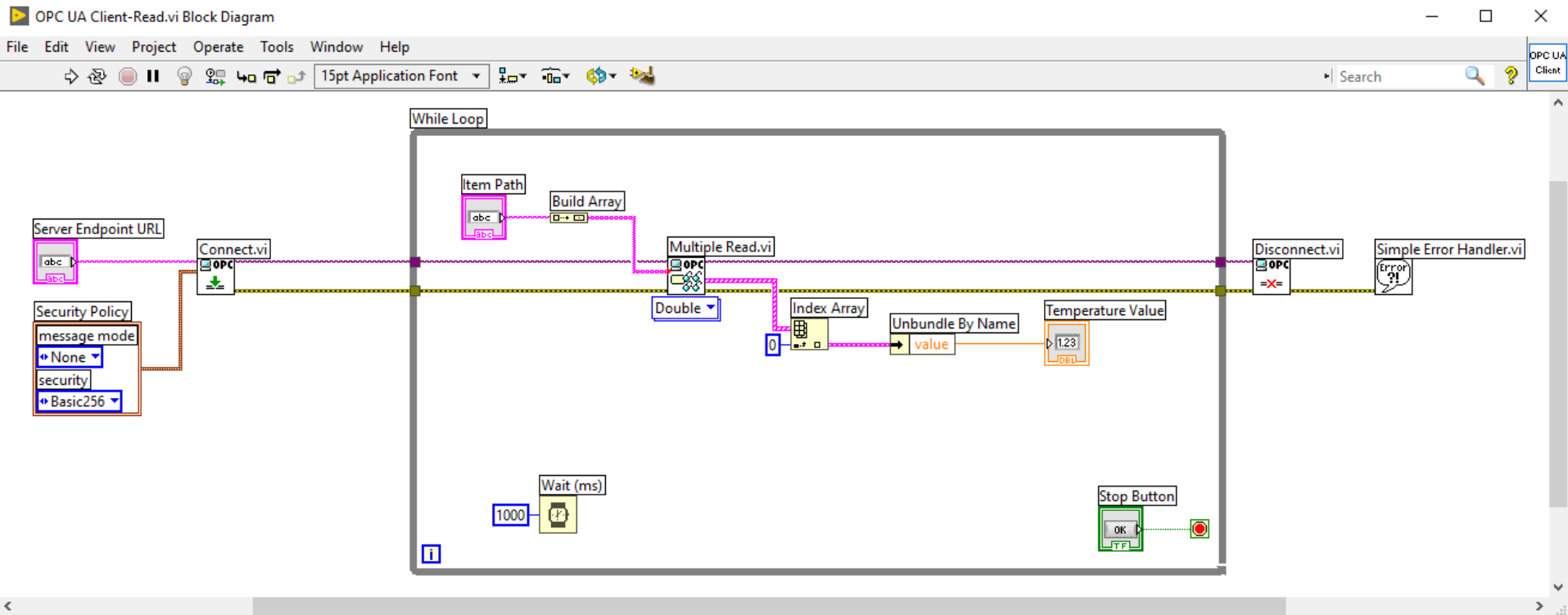
Using **OPC UA Toolkit** with LabVIEW 2017 or newer



OPC UA Client Read Data



Block Diagram





MATLAB Industrial Communication Toolbox

Hans-Petter Halvorsen

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OPC with MATLAB

- To use OPC with MATLAB you can use the **“Industrial Communication Toolbox”**.
- The “Industrial Communication Toolbox” supports the following Protocols:
 - OPC (Only OPC UA in the latest release)
 - MQTT
 - Modbus
- “Industrial Communication Toolbox” is a new Toolbox that is included in “MATLAB R2022a” and newer versions

Industrial Communication Toolbox

- The Industrial Communication Toolbox supports the following protocols:
 - OPC (Only OPC UA in the latest release)
 - Modbus
 - MQTT
- Resources:
 - <https://mathworks.com/products/industrial-communication.html>
 - <https://mathworks.com/help/icommm/data-reading-and-writing.html>

OPC UA – Read Data

1. Locate Your OPC UA Server

```
serverList = opcua.serverinfo('localhost')
```

2. Create an OPC UA Client

```
uaClient = opcua('localhost', port)
```

3. Connect to the Server

```
connect(uaClient)
```

4. Browse OPC UA Server Namespace

```
serverNodes = browseNamespace(uaClient)
```

5. Read Current Values from the OPC UA Server

```
[val,ts,qual] = readValue(uaClient,serverNodes)
```

6. Disconnect

```
disconnect(uaClient)
```

OPC UA – Read Data

```
clear, clc
```

```
uaClient = opcua('localhost', 62640)
```

```
connect(uaClient)
```

```
serverNodes = browseNamespace(uaClient)
```

```
[val,ts,qual] = readValue(uaClient,serverNodes)
```

```
disconnect(uaClient);
```

OPC UA – Read Data 2

```
clear, clc
```

```
uaClient = opcua('localhost', 62640)
```

```
connect(uaClient)
```

```
topNodes = uaClient.Namespace
```

```
serverChildren = topNodes(4).Children
```

```
findNode = findNodeByName(topNodes, 'Tag7', '-once')
```

```
opcNode = opcuanode(2, 'Tag7', uaClient) ←
```

```
[value, timestamp, quality] = readValue(uaClient, opcNode)
```

```
disconnect(uaClient);
```

Read Data

Here you don't need to select the Tag from the "Browse Name Space" window every time

OPC UA – Write Data

1. Locate Your OPC UA Server

```
serverList = opcuaserverinfo('localhost')
```

2. Create an OPC UA Client

```
uaClient = opcua('localhost', port)
```

3. Connect to the Server

```
connect(uaClient)
```

4. Browse OPC UA Server Namespace

```
serverNodes = browseNamespace(uaClient)
```

5. Write Current Values to the OPC UA Server

```
newValue = 22.5
```

```
writeValue(uaClient, serverNodes, newValue);
```

6. Disconnect

```
disconnect(uaClient)
```

OPC UA – Write Data

```
clear, clc

uaClient = opcua('localhost', 62640)

connect(uaClient)

serverNodes = browseNamespace(uaClient)

newValue = 21.7;
writeValue(uaClient, serverNodes, newValue); ←

[value, timestamp, quality] = readValue(uaClient, serverNodes)

disconnect(uaClient);
```



Visual Studio/C# + “OPC UA .NET SDK”

OPC UA with Visual Studio/C#

- Lots of Packages and Libraries do exist for creating both OPC UA Clients and OPC UA Servers in Visual Studio/C#
- Most of them are payment based
- Many of those can be evaluated for a trial period or used forever with some restrictions
- In this Tutorial, “OPC UA .NET SDK” will be used
 - It can be used in “Evaluation Mode” for Test and Demo purposes

“OPC UA .NET SDK”

- The “OPC UA .NET SDK” comes with an evaluation license which can be used unlimited where each application runs for 30 minutes
- It comes in a **NuGet** Package you can install and use in your Visual Studio Project
- <https://opcfoundation.org/products/view/opc-ua-net-sdk-for-client-and-server>

OPC UA .NET SDK for Client and Server



Member: Traeger Industry Components GmbH

Product website: opcua.traeger.de

OPC UA Client & Server in C# / VB.NET quick and easy.

Introduction: <https://opcua.traeger.de/>

Development: <https://docs.traeger.de/en/software/sdk/opc-ua/net/>

NuGet Package: <https://www.nuget.org/packages/OpC.UaFx.Advanced/>

Samples: <https://github.com/Traeger-GmbH/opcu-net-samples/>

Description

The OPC UA .NET SDK allows rapid and easy development of Client and / or Server applications using .NET. With a few lines of code you can realize your application in minutes. The SDK is provided for .NET Standard 2.0+, .NET Core 3+ and .NET Framework 4.6+. Therefore the SDK supports Windows, Linux, macOS, Android, iOS and Unity. No installation required, just download the ZIP or NuGet package and get started.

Features

- OPC UA with DA, AE, HDA and more
- OPC UA Companion Specifications
- OPC Classic (with just a different URI)

NuGet Package

The screenshot shows the Visual Studio IDE with the NuGet Package Manager window open. The main window title is 'OPC UA Write'. The NuGet Package Manager window has tabs for 'Browse', 'Installed', and 'Updates'. The search box contains 'opc.ua'. The package source is set to 'nuget.org'. The package list shows several results, with 'Opc.UaFx.Client' by Traeger.de highlighted in a red box. The details pane for 'Opc.UaFx.Client' shows version 2.30.0, the latest stable version, and an 'Install' button. The description states it is an OPC UA Client SDK supporting OPC DA, AE, and HDA for quick and easy development using .NET Framework and .NET Standard. It also mentions that it is implemented using Microsoft's Framework Design Guidelines by Traeger in Germany/Bavaria with over 30 years of experience in industrial communication. A 'NEW!' section provides a link to GitHub for samples and a download link to the SDK documentation. The Solution Explorer on the right shows the project structure for 'OPC UA Write', including 'Form1.cs', 'Form1.Designer.cs', 'Form1.resx', and 'Program.cs'. The Properties window is also visible at the bottom right.

File Edit View Project Build Debug Test Analyze Tools Extensions Window Help Search (Ctrl+Q) OPC UA Write Sign in - □ × Live Share

Toolbox Search Toolbox General There are no usable controls in this group. Drag an item onto this text to add it to the toolbox.

NuGet:...UA Write Form1.cs [Design] Browse Installed Updates NuGet Package Manager: OPC UA Write

opc.ua Include prerelease Package source: nuget.org

Opc.UaFx.Client by Traeger.de, 96,3K downloads 2.30.0
OPC UA Client SDK supporting OPC DA, AE and HDA for quick & easy OPC UA Client development using .NET F...

opc.ua.pubsub.dotnet.binary by Siemens AG, 1.0.34
The opc-ua-pubsub-dotnet binary is a library which implements OPC UA PubSub encoding and decoding in...

opc.ua.pubsub.dotnet.client by Siemens AG, 1.0.34
The opc-ua-pubsub-dotnet client is a library which implements OPC UA PubSub communication via MQTT...

OPCFoundation.NetStandard.Opc.Ua.C 1.4.371.50
OPC UA Core Class Library

OPCFoundation.NetStandard.Opc.Ua 1.4.371.50
This package contains the OPC UA reference implementation and is targeting the .NET Standar...

OPCFoundation.NetStandard.Opc.Ua.C 1.4.371.50
OPC UA Configuration Class Library

OPCFoundation.NetStandard.Opc.Ua.C 1.4.371.50
OPC UA Client Class Library

OPCFoundation.NetStandard.Opc.Ua.S 1.4.371.50
OPC UA Security X509 Certificates Class Library

OPCFoundation.NetStandard.Opc.Ua.S 1.4.371.50
OPC UA Server Class Library

Version: Latest stable Install

Options

Description
OPC UA Client SDK supporting OPC DA, AE and HDA for quick & easy OPC UA Client development using .NET Framework and .NET Standard. Simple & familiar .NET API, portability, features, patterns, samples and technical support. Unlimited free evaluation & royalty free licensing. Designed and implemented using Microsoft's Framework Design Guidelines by Traeger in Germany/Bavaria with over 30 years of experience in industrial communication.

NEW!
Samples available at <https://github.com/Traeger-GmbH/opcuanet-samples>

OPC Watch
Download: <https://docs.traeger.de/en/software/sdk/opc-ua/net#download>
Usage: Browse, read, write, subscribe nodes or generate code for user defined types from server

Solution Explorer Search Solution Explorer (Ctrl+...) Solution Explorer 'OPC UA Write' (1 of 1) OPC UA Write Dependencies Form1.cs Form1.Designer.cs Form1.resx Program.cs

Solution Explorer Team Explorer Properties

Ready Add to Source Control

Visual Studio Project

The screenshot displays the Visual Studio IDE with the following components:

- Menu Bar:** File, Edit, View, Project, Build, Debug, Test, Analyze, Tools, Extensions, Window, Help.
- Search Bar:** Search (Ctrl+Q) with the text "OPC UA Write".
- Toolbox:** Search Toolbox, General. A message states: "There are no usable controls in this group. Drag an item onto this text to add it to the toolbox."
- Code Editor:** Shows the code for `Form1.cs` in the `OPC_UA_Write` namespace. The `using` statement `using Opc.UaFx.Client;` is highlighted with a red box. The code includes a `public partial class Form1 : Form` with methods `public Form1()`, `InitializeComponent()`, and `private void btnOpcWrite_Click(object sender, EventArgs e)`. The `Click` method contains logic to connect to an OPC UA server, write a temperature value, and disconnect.
- Solution Explorer:** Shows the project structure for "OPC UA Write", including `Dependencies`, `Form1.cs`, and `Program.cs`.
- Properties Window:** Currently empty.
- Error List:** Shows 0 Errors, 0 Warnings, and 0 Messages. The table below is empty.

Code	Description	Project	File	L...
------	-------------	---------	------	------

Ready

↑ Add to Source Control

System Overview

OPC UA Server Simulator

File Settings Help

Server Endpoints URLs <opc.tcp://xps15ph:62640/IntegrationObjects/ServerSimulator>

SessionId	Name	User	Last Contact
Session0	Anonymous	ns=3;i=1213231879	14:11:25

SubscriptionId	Publishing Interval	Item Count	Seq No
1	1000	1	4

Status: Running Current Time: 14:11:27 Sessions: 1 Subscriptions: 1 Items: 1

Integration Objects' OPC UA Client

Home

New Open Save Save as Connect Disconnect Settings UA Settings Help About Define Remove Certificate Manager

Sessions

- Sessions
 - Session0
 - Subscription0

Address Space

Forward

- Tag3
- Tag4
- Tag5
- Tag7
- Tag8

Display Name	Node Id	Value	Data Type	Server Timestamp	Source Timestamp	Status	Subscription	Session	Attribute	Value
Tag7	ns=2;s=Tag7	8	Double	24-01-2023 ...	24-01-2...	Good	Subscription0	Session0		

Message Type	Timestamp	Message
[Control]	2023-01-24 14:07:12	Cre
[Control]	2023-01-24 14:07:12	An

3 Messages

OPC UA Write

8

Write

OPC UA Read

8

Read

OPC UA Write

```
private void btnOpcWrite_Click(object sender, EventArgs e)
{
    string opcUrl = "opc.tcp://localhost:62640/";
    var tagName = "ns=2;s=Tag7";

    var client = new OpcClient(opcUrl);
    client.Connect();

    double temperature;
    temperature = Convert.ToDouble(txtOpcDataWrite.Text);

    client.WriteNode(tagName, temperature);

    client.Disconnect();
}
```

OPC UA Read

```
private void btnOpcRead_Click(object sender, EventArgs e)
{
    string opcUrl = "opc.tcp://localhost:62640/";
    var tagName = "ns=2;s=Tag7";

    var client = new OpcClient(opcUrl);
    client.Connect();

    var temperature = client.ReadNode(tagName);
    txtOpcDataRead.Text = temperature.ToString();

    client.Disconnect();
}
```

Improved Example

OPC UA Write Client

Server URL:

Node Id:

Sensor Value:

TimeStamp:

Logging Started and Connected to OPC Server

OPC UA Write C# App

OPC UA Read Client

Server URL:

Node Id:

OPC Value:

Connected to OPC Server

OPC UA Read C# App

Summary

- What is OPC?
- OPC DA
 - OPC DA Servers
 - MatrikonOPC Simulation Server
 - “OPC Server Simulators” from Integration Objects
 - NI OPC Servers
 - OPC DA Programming Tools
 - LabVIEW + DataSocket
- OPC UA
 - OPC UA Demo/Test Software
 - “OPC UA Server Simulator” from Integration Objects
 - “OPC UA Client” from Integration Objects
 - OPC UA Programming Tools
 - LabVIEW + LabVIEW OPC UA Toolkit
 - MATLAB + Industrial Communication Toolbox
 - Visual Studio/C# + “OPC UA .NET SDK” from Traeger

- For all these Programming Languages and Packages, I have made separate Tutorials where I go through the development of the Applications and the Code in more details.
- For new Applications OPC UA is recommended.

Hans-Petter Halvorsen

University of South-Eastern Norway

www.usn.no

E-mail: hans.p.halvorsen@usn.no

Web: <https://www.halvorsen.blog>

