

<https://www.halvorsen.blog>



OPC

with Practical Examples

Hans-Petter Halvorsen

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- What is OPC?
- OPC DA
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 - MATLAB + Industrial Communication Toolbox
 - Visual Studio/C# + Measurement Studio
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 - “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

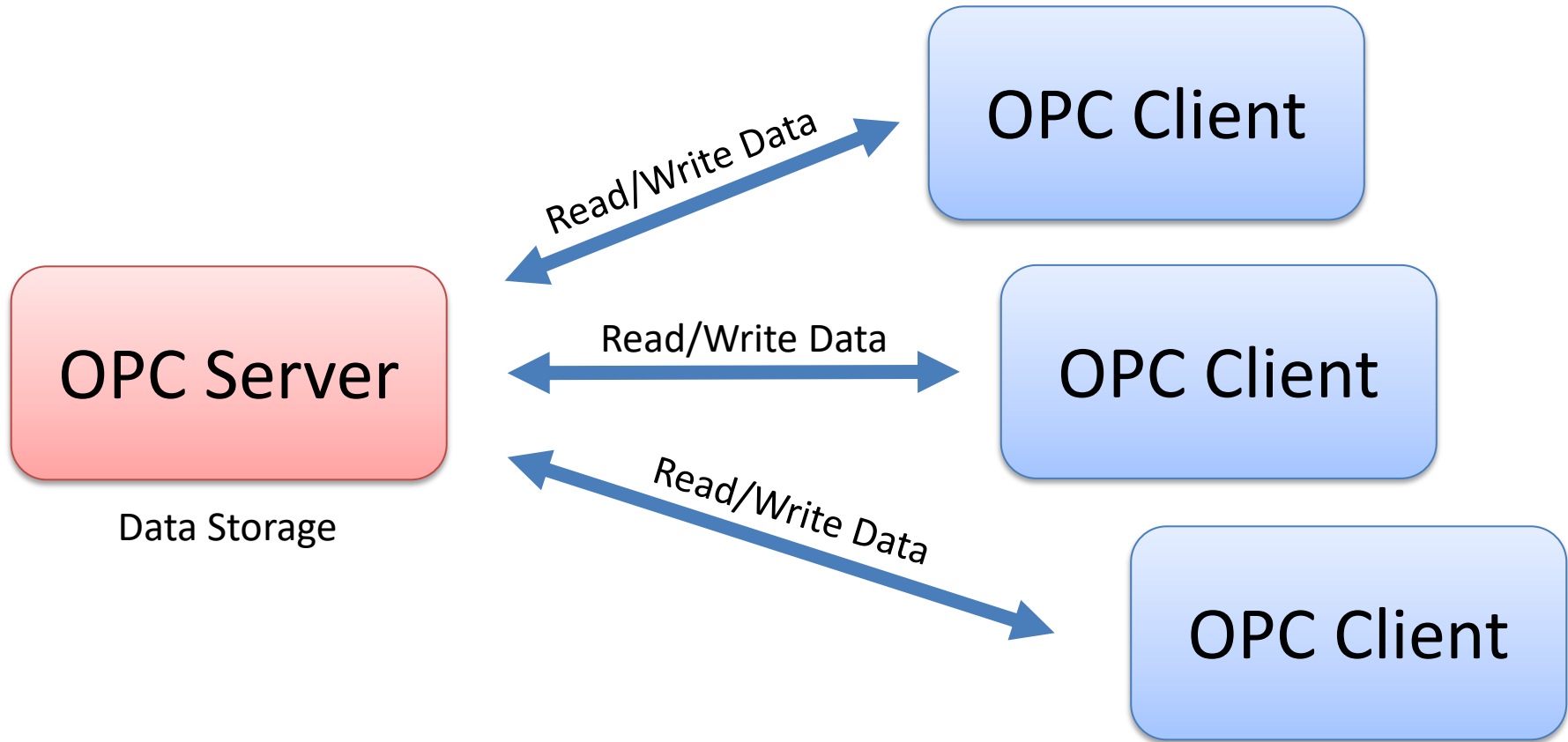


What is OPC?

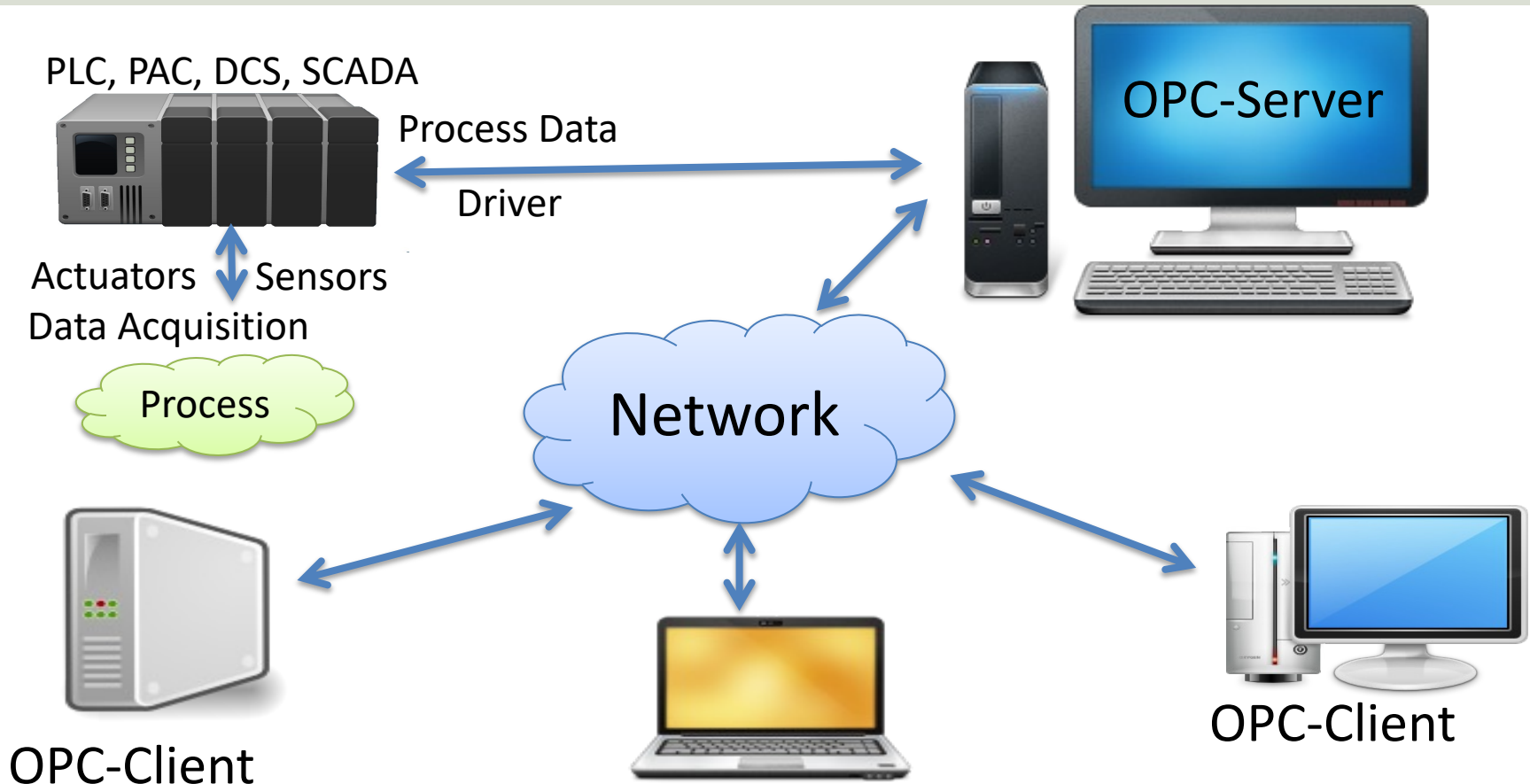
What is OPC?

- 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.

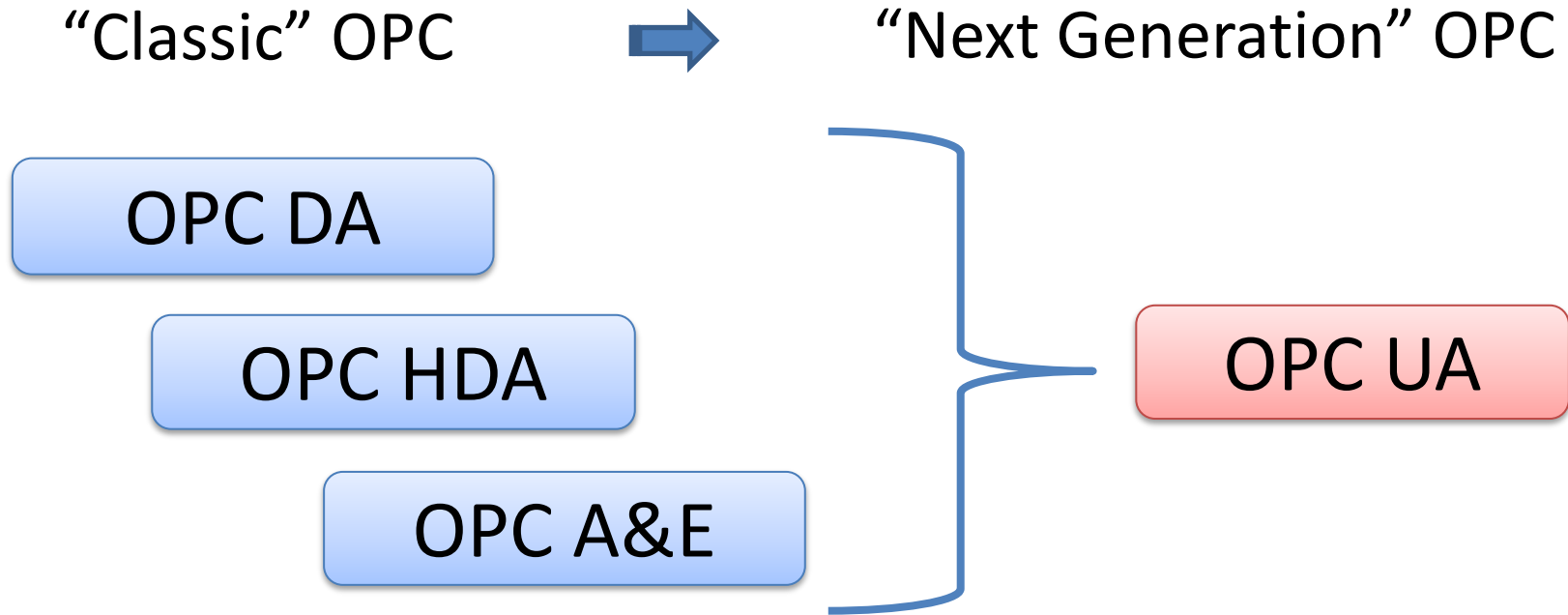
OPC Server and Clients



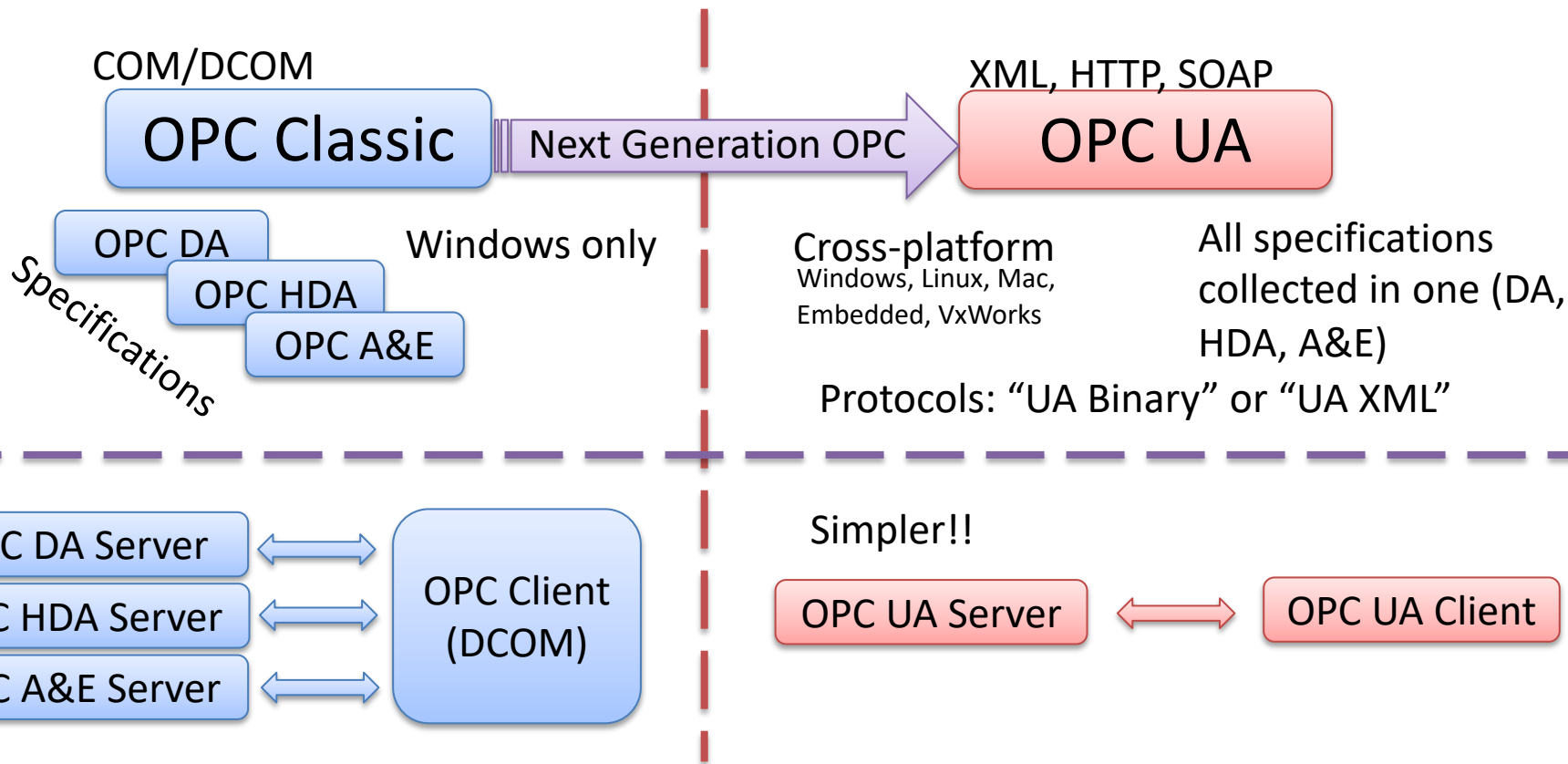
Typical OPC Scenario



OPC Specifications



Next Generation OPC

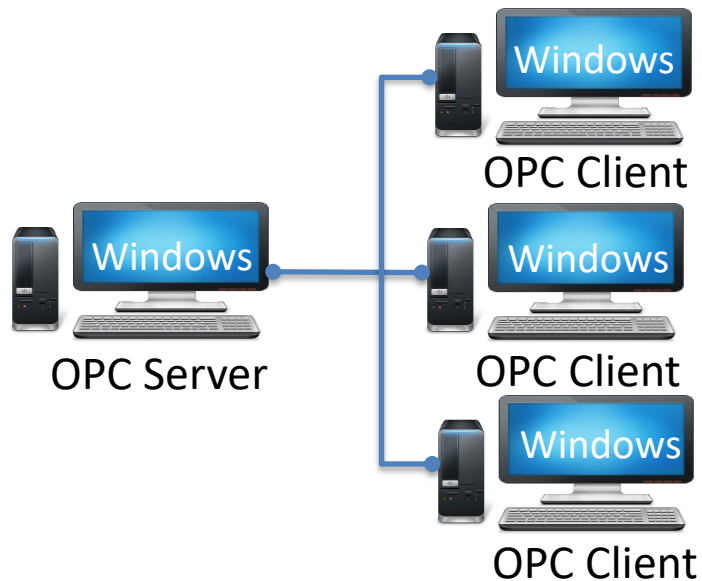


OPC UA

- 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

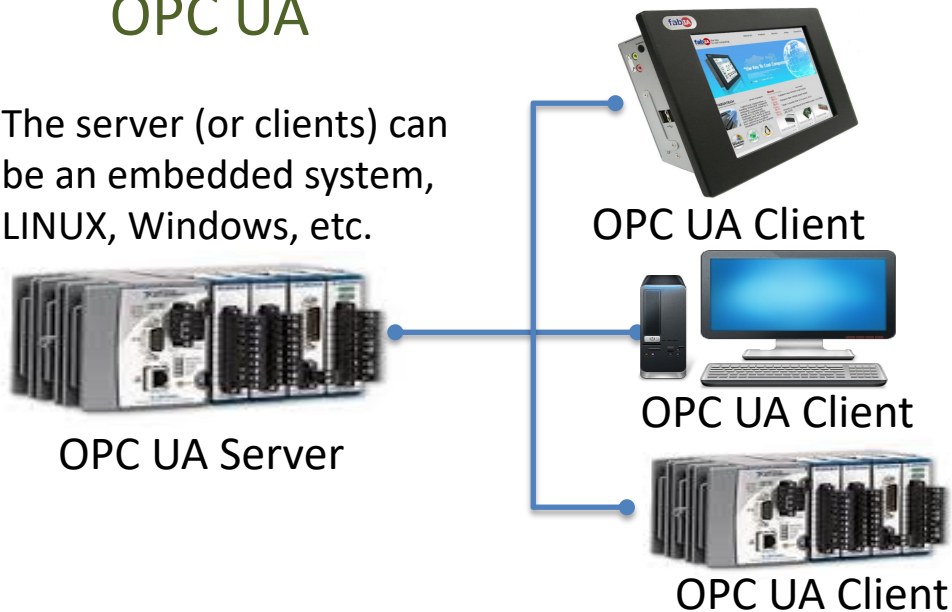
Classic OPC vs. OPC UA

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

Hans-Petter Halvorsen

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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

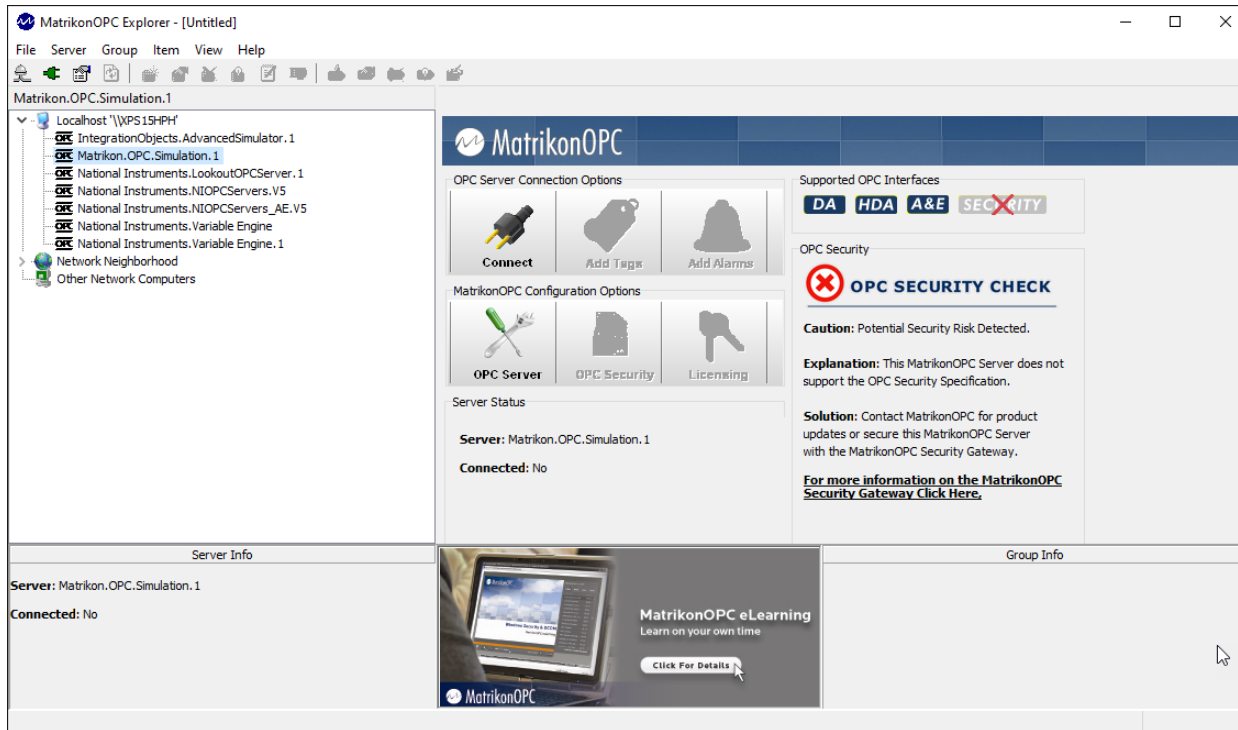
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MatrikonOPC Simulation Server

“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



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



“OPC Server Simulators”

by Integration Objects

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“OPC Server Simulators”

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.

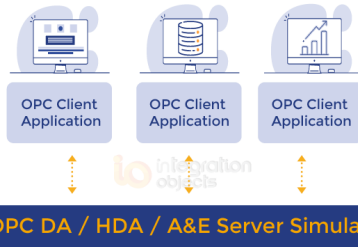
In particular, the OPC simulators package includes the advanced OPC simulator, which supports OPC DA and HDA specifications and allows you to:

- ✓ 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

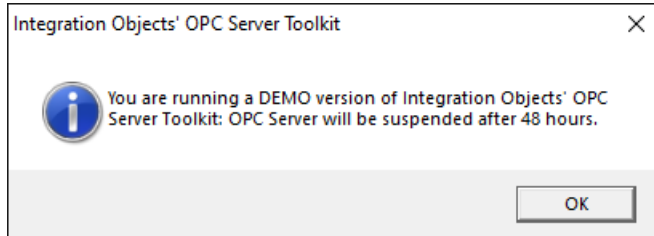
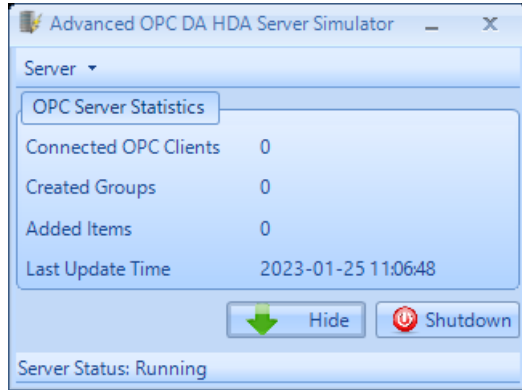


“OPC Server Simulators” by Integration Objects are free OPC server test tools. They allow end-users, developers and integrators to conduct tests with any third party OPC client software. The package consists of an OPC DA/HDA Server and an OPC A&E Server.

<https://integrationobjects.com/sioth-opc/sioth-opc-servers/opc-server-simulators/>

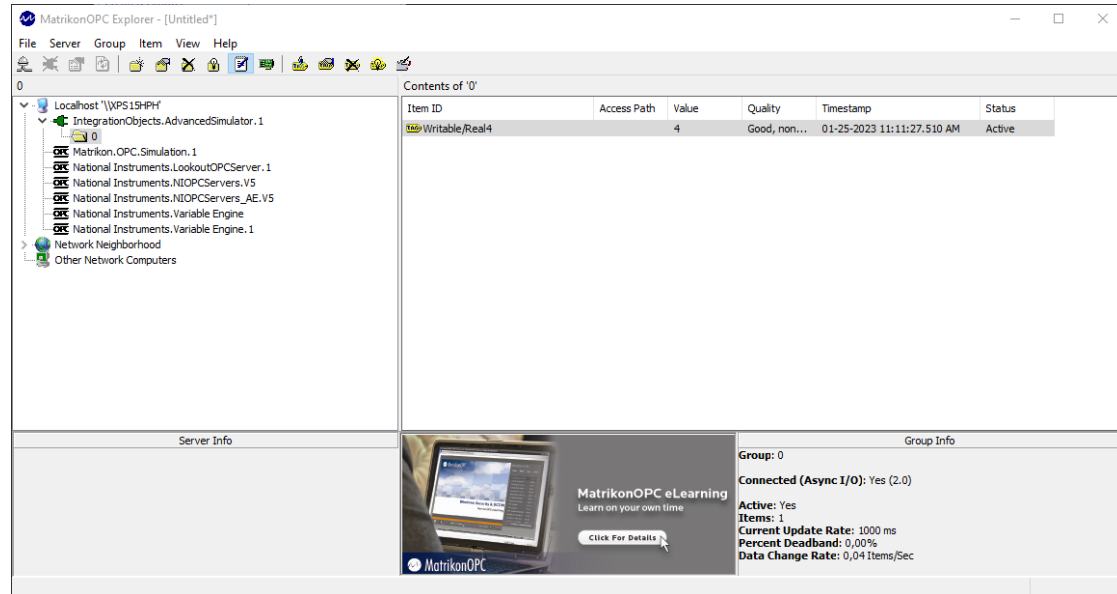
“OPC Server Simulators”

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



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

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





NI OPC Servers

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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

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OPC DA Programming Tools

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

- LabVIEW + DataSocket
- MATLAB + Industrial Communication Toolbox (supports both OPC DA and UA)
- Visual Studio/C# + Measurement Studio

Many other alternatives exists



LabVIEW + DataSocket

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OPC DA in LabVIEW

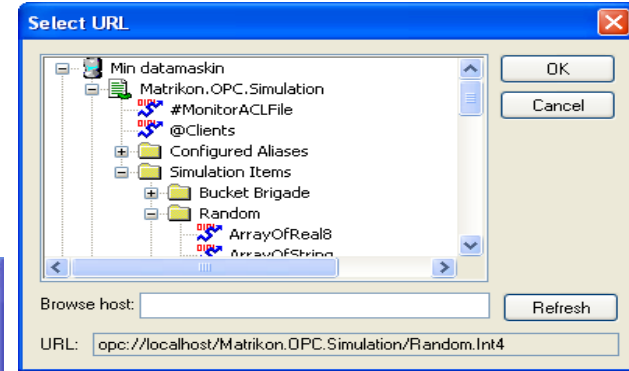
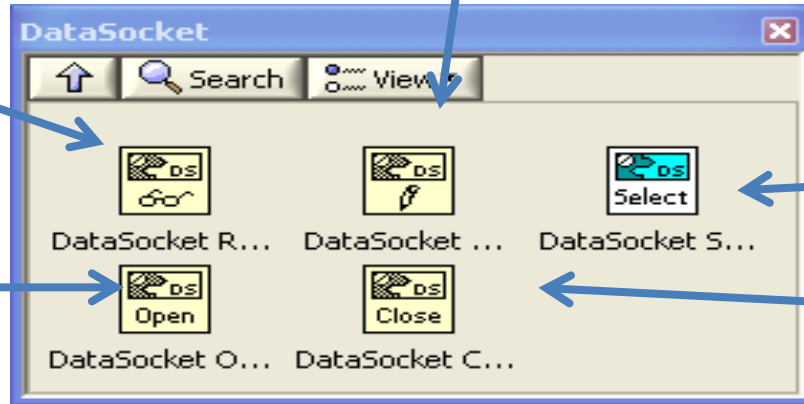
You can use LabVIEW as an OPC client by connecting to an OPC server through a DataSocket connection.

The **DataSocket** palette in LabVIEW:

Read Data from OPC

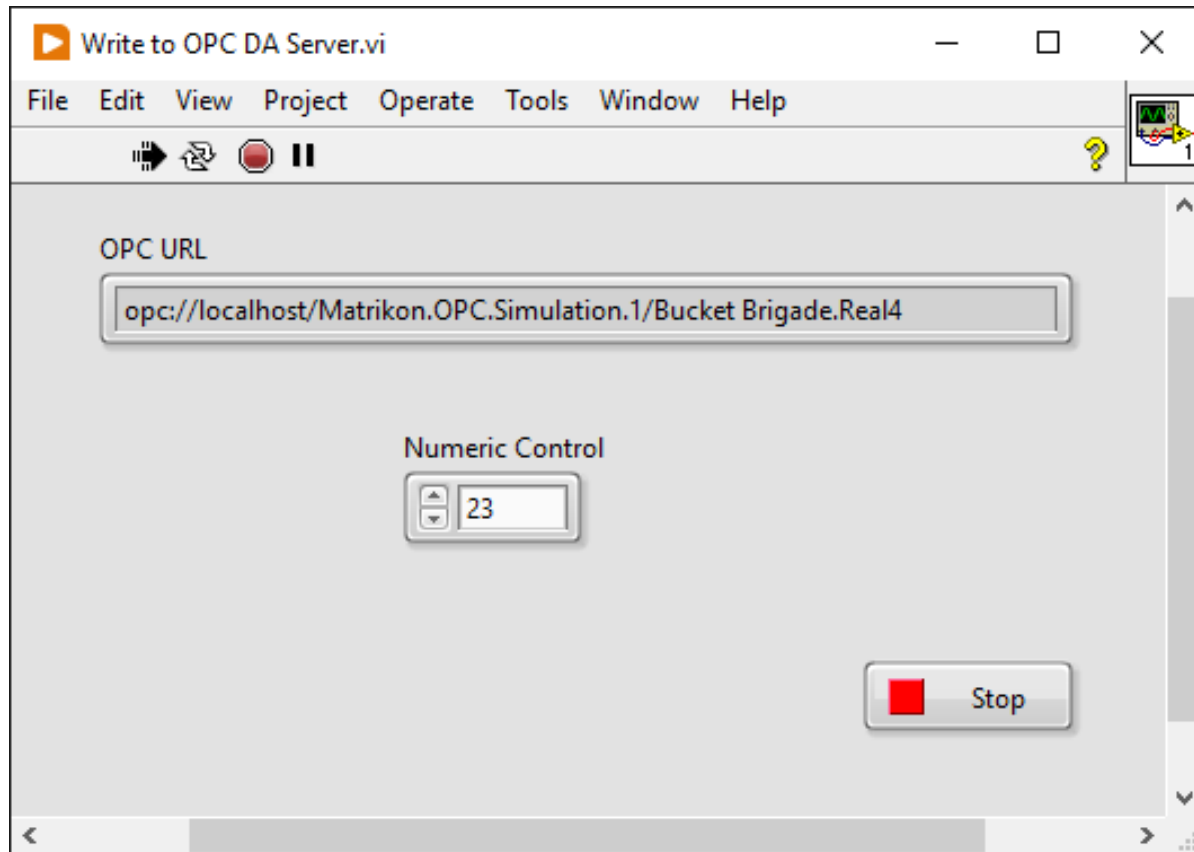
Open Connection
to OPC Server

Write Data to OPC

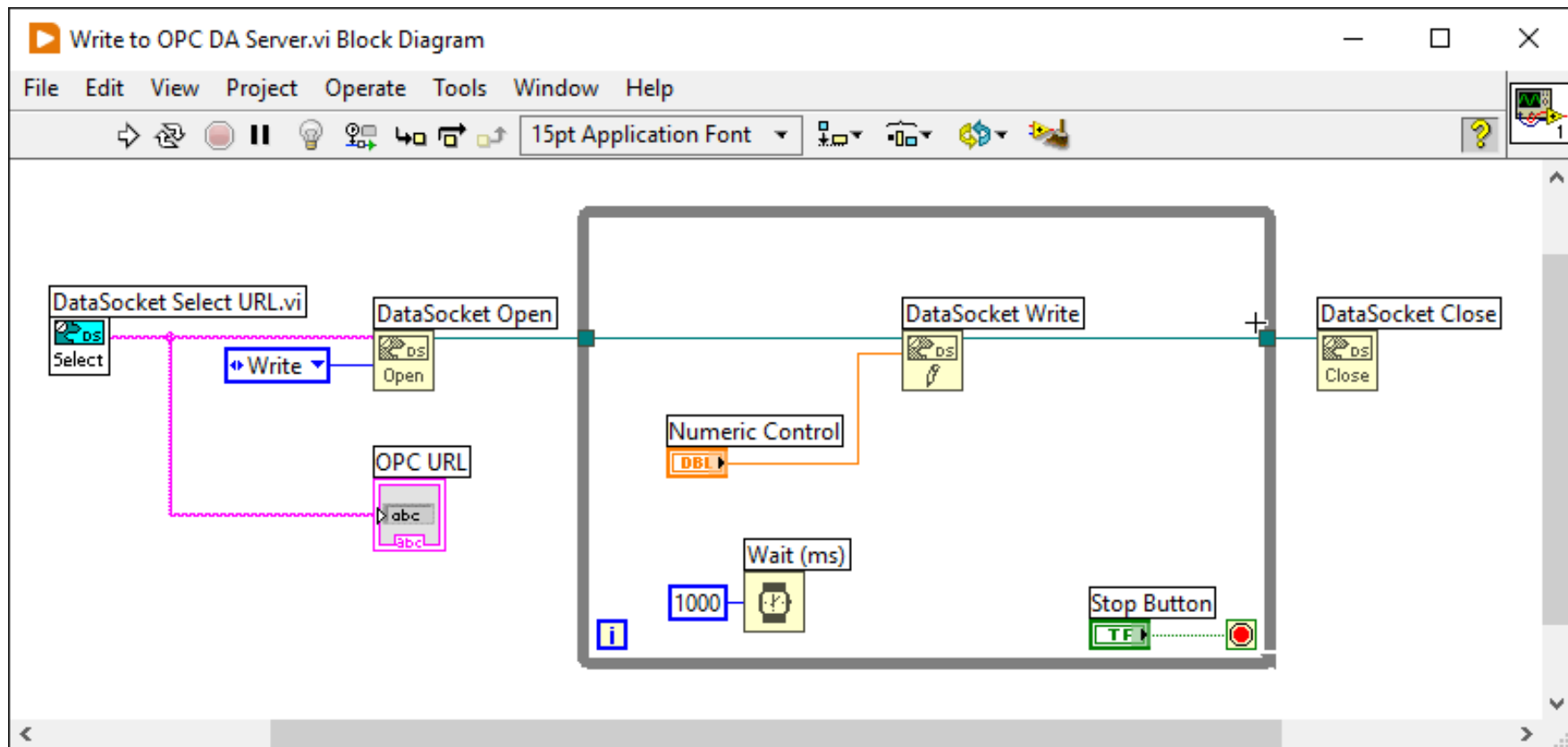


Note! Make sure to use **LabVIEW 32bit version** (even if you have 64bit operating system) because the DataSocket feature is only supported by the 32bit version of LabVIEW.

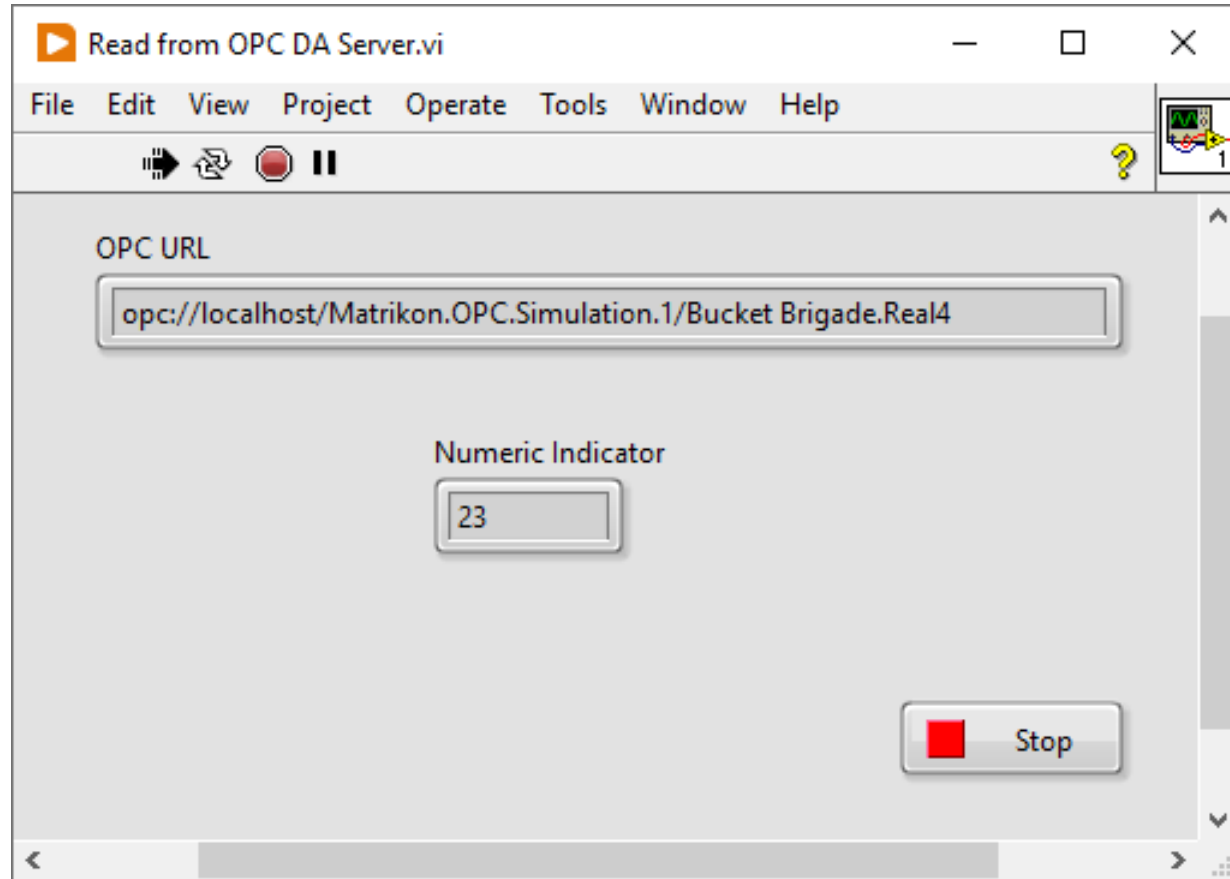
Write Data to OPC DA Server



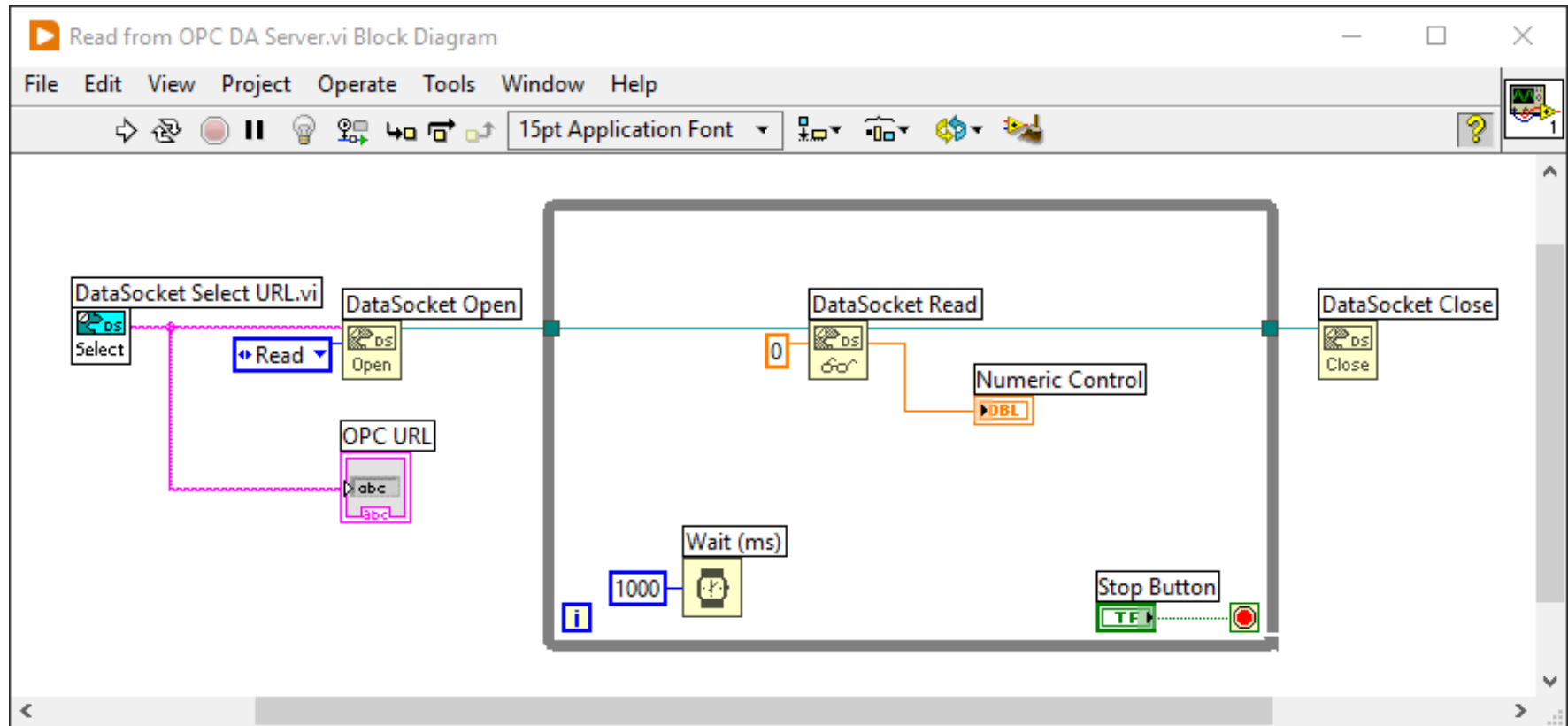
Write Data to OPC DA Server



Read Data from OPC DA Server



Read Data from OPC DA Server





MATLAB + Industrial Communication Toolbox

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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, both OPC DA and OPC UA (previously “OPC Toolbox”)
 - 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

```
'localhost',  
{'Matrikon.OPC.Simulation.1'},  
{'Matrikon OPC Server for Simulation and Testing'},  
{'DA2'},  
{'opcda('localhost', 'Matrikon.OPC.Simulation.1'}
```

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>


```
% Connect to OPC Server
```

```
da = opcda('localhost', 'Matrikon.OPC.Simulation.1');  
connect(da);
```

```
% Create Group
```

```
grp = addgroup(da, 'DemoGroup');
```

```
%Add Tags
```

```
ItmList = browsenamespace(da);  
itm = additem(grp, ItmList);
```

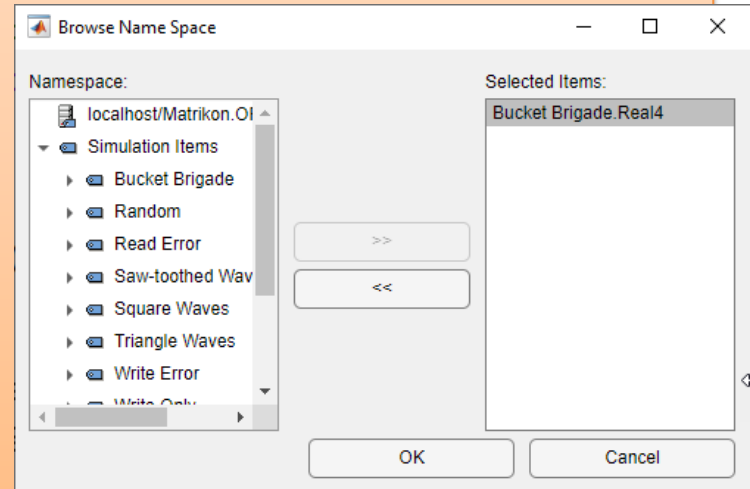
This Example makes it possible to select one or more OPC Tag from a pop-up window

```
% Retrieve Data
```

```
data = read(grp);  
opcdata = data.Value
```

```
%Clean Up
```

```
disconnect(da)  
delete(da)
```



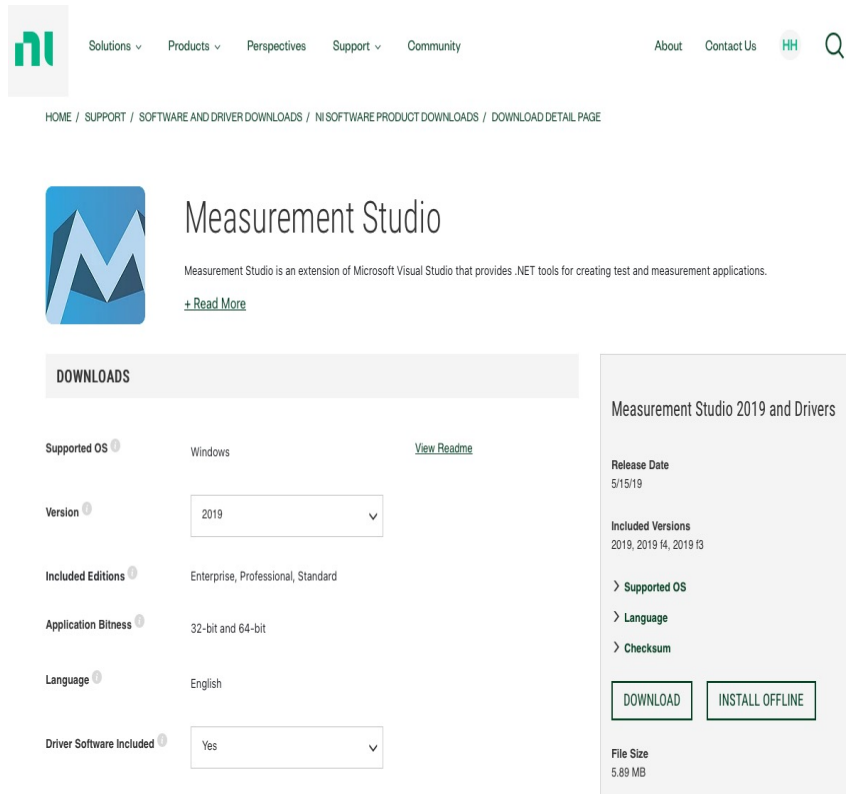


Visual Studio/C# + Measurement Studio

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Measurement Studio



The screenshot shows the NI Measurement Studio download page. At the top is the NI logo and navigation links: Solutions, Products, Perspectives, Support, and Community. Below this is a breadcrumb trail: HOME / SUPPORT / SOFTWARE AND DRIVER DOWNLOADS / NI SOFTWARE PRODUCT DOWNLOADS / DOWNLOAD DETAIL PAGE. The main heading is 'Measurement Studio' with a description: 'Measurement Studio is an extension of Microsoft Visual Studio that provides .NET tools for creating test and measurement applications.' There is a '+ Read More' link. Below the heading is a 'DOWNLOADS' section with filters for Supported OS (Windows), Version (2019), Included Editions (Enterprise, Professional, Standard), Application Bitness (32-bit and 64-bit), Language (English), and Driver Software Included (Yes). On the right, there is a section for 'Measurement Studio 2019 and Drivers' showing the Release Date (5/15/19), Included Versions (2019, 2019 14, 2019 13), and expandable sections for Supported OS, Language, and Checksum. At the bottom of this section are 'DOWNLOAD' and 'INSTALL OFFLINE' buttons, and the File Size (5.89 MB).

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Measurement Studio

Measurement Studio is an extension of Microsoft Visual Studio that provides .NET tools for creating test and measurement applications.

[+ Read More](#)

DOWNLOADS

Supported OS 1 Windows [View Readme](#)

Version 1 2019

Included Editions 1 Enterprise, Professional, Standard

Application Bitness 1 32-bit and 64-bit

Language 1 English

Driver Software Included 1 Yes

Measurement Studio 2019 and Drivers

Release Date
5/15/19

Included Versions
2019, 2019 14, 2019 13

> Supported OS

> Language

> Checksum

DOWNLOAD INSTALL OFFLINE

File Size
5.89 MB

- Measurement Studio (MS) is an Add-on package to Visual Studio created by NI (previously “National Instruments”)
- Same vendor as LabVIEW
- Makes it possible to communicate with an OPC DA Server from Visual Studio Code
- Uses the DataSocket Library (same as in LabVIEW)

NI Distributed System Manager

NI Distributed System Manager

File Actions View Help

Name	Value	Access
My Systems		
localhost		
OPCProcess		
OPC_IOServer		
#MonitorACLFile	true	Read/Write
@ClientCount	1	Read
@Clients		Read
Configured Aliases		
NI OPC Client Status		
Simulation Items		
Bucket Brigade		
Random		
Read Error		
Saw-toothed Waves		
Square Waves		
Triangle Waves		
Write Error		
Write Only		
Temperature	20	Read/Write
System		
Network Items		

Auto View

Location: \\localhost\OPCProcess\Temperature

Current Value:

20

New Value:

20

Set

☒ Show Trend

20.00
15.00
10.00
5.00
0.00

Data Type: Double
Timestamp: 2020-02-04 15:30:53
Quality: Good
Access Type: Read/Write

Help

Not Logged In

In order to configure the OPC Item to be used with Measurement Studio, we need to use NI Distributed System Manager

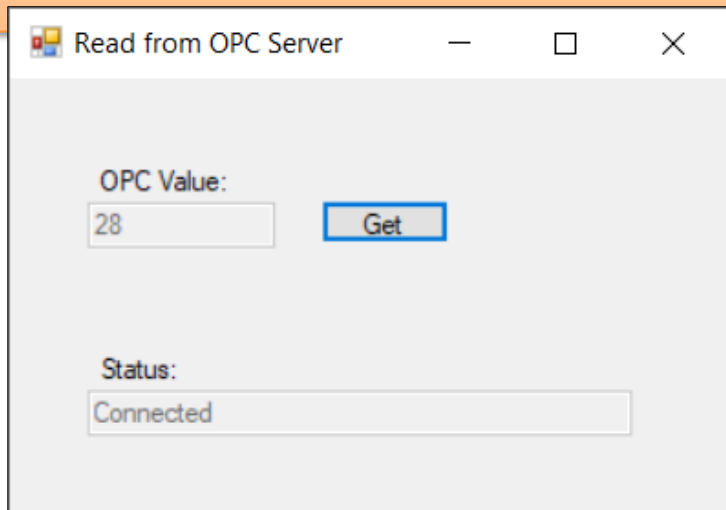
MS OPC Example

```
using NationalInstruments.NetworkVariable;
```

```
private NetworkVariableReader<double> _reader;  
private const string NetworkVariableLocation = @"\\localhost\OPCProcess\Temperature";  
  
public Form1()  
{  
    InitializeComponent();  
    ConnectOPCServer();  
}
```

MS OPC Read Example

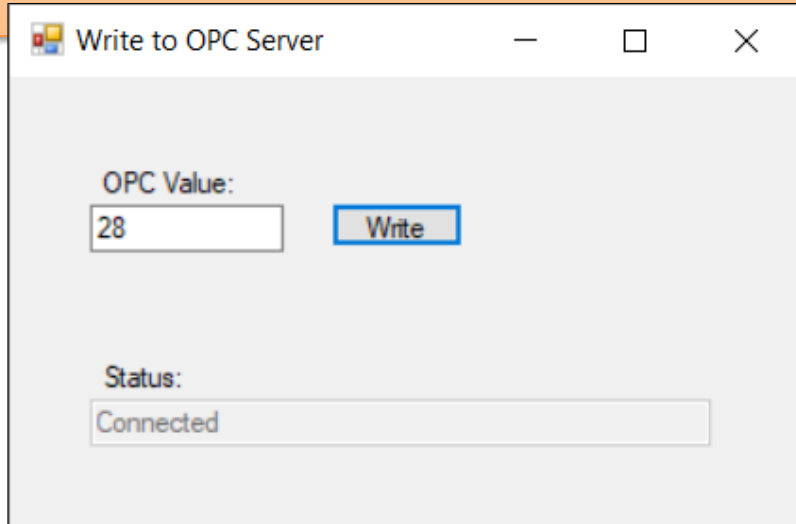
```
private void ConnectOPCServer()  
{  
    _reader = new NetworkVariableReader<double>(NetworkVariableLocation);  
  
    _reader.Connect();  
  
    txtStatus.Text = _reader.ConnectionStatus.ToString();  
}
```



```
private void btnGetData_Click(object sender, EventArgs e)  
{  
    NetworkVariableData<double> opcdData = null;  
    try  
    {  
        opcdData = _reader.ReadData();  
        txtOpcData.Text = opcdData.GetValue().ToString();  
    }  
    catch (TimeoutException)  
    {  
        MessageBox.Show("The read has timed out.", "Timeout");  
        return;  
    }  
}
```

MS OPC Write Example

```
private void ConnectOPCServer()  
{  
    _writer = new NetworkVariableWriter<double>(NetworkVariableLocation);  
  
    _writer.Connect();  
  
    txtStatus.Text = _writer.ConnectionStatus.ToString();  
}
```



```
private void btnWriteData_Click(object sender, EventArgs  
{  
    double temperature;  
    try  
    {  
        temperature = Convert.ToDouble(txtOpcData.Text);  
  
        _writer.WriteValue(temperature);  
    }  
    catch (TimeoutException)  
    {  
        MessageBox.Show("The read has timed out.", "Timeout");  
        return;  
    }  
}
```



OPC UA

Hans-Petter Halvorsen

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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

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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

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 OPC Tunneling

 OPC UA

- OPC UA Server Simulator – Full Edition
- OPC UA Server Toolkit
- OPC UA IoT Broker
- OPC UA Server for Databases
- OPC UA Client Toolkit
- OPC UA Server Simulator**
- OPC UA Proxy
- OPC UA Wrapper
- OPC UA Client

 OPC Data Archiving

 OPC Clients

 OPC Servers

 OPC Client Toolkits

 OPC Free Tools

 OPC Server Toolkits

OPC UA Server Simulator

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

 [Watch Demo Videos](#)

Simulate real-time and historical data using OPC UA Server Simulator!

Integration Objects' **OPC UA Server Simulator** is a free to use and distribute OPC Unified Architecture server utility. Indeed, you can use this OPC UA simulator to play the role of OPC UA servers and test your OPC UA Client applications.

This free OPC UA Server tool supports data access and historical access information models of OPC UA. Consequently, it provides simulated real-time and historical data. Moreover, users can configure their own tags and the data simulation via CSV files. OPC UA clients can monitor real-time data and explore history data from this simulator.



OPC UA Client OPC UA Client OPC UA Client

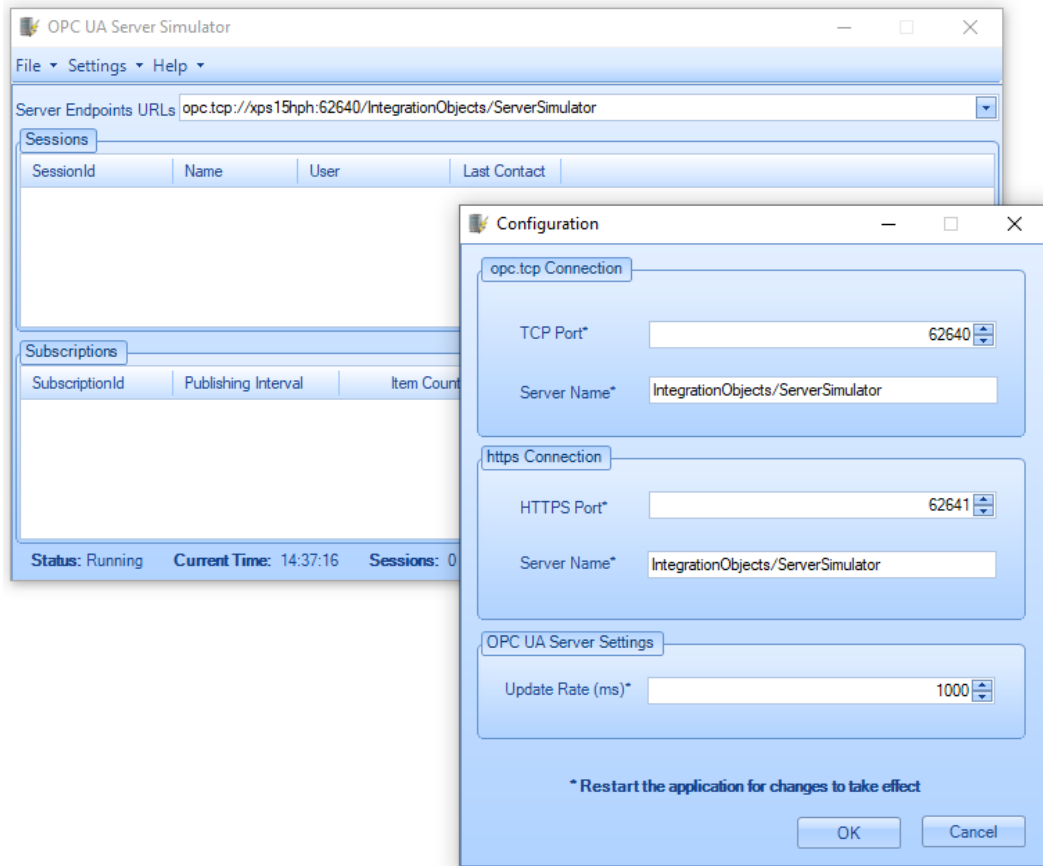
HTTP/UA TCP HTTP/UA TCP HTTP/UA TCP

OPC UA Server Simulator   

[Privacy & Cookies Policy](#)

<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 LOAL Acro Tean

A1 Tag Name

	A	B	C	D	E	F
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

AutoSave Off ValueSpace.csv

File Home Insert Draw Page Layout Formulas Data Review View Add-ins Help LOAL Acro Tean

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



“OPC UA Client”


Hans-Petter Halvorsen

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“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”



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OPC Client Toolkits

OPC Free Tools

OPC Server Toolkits

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.

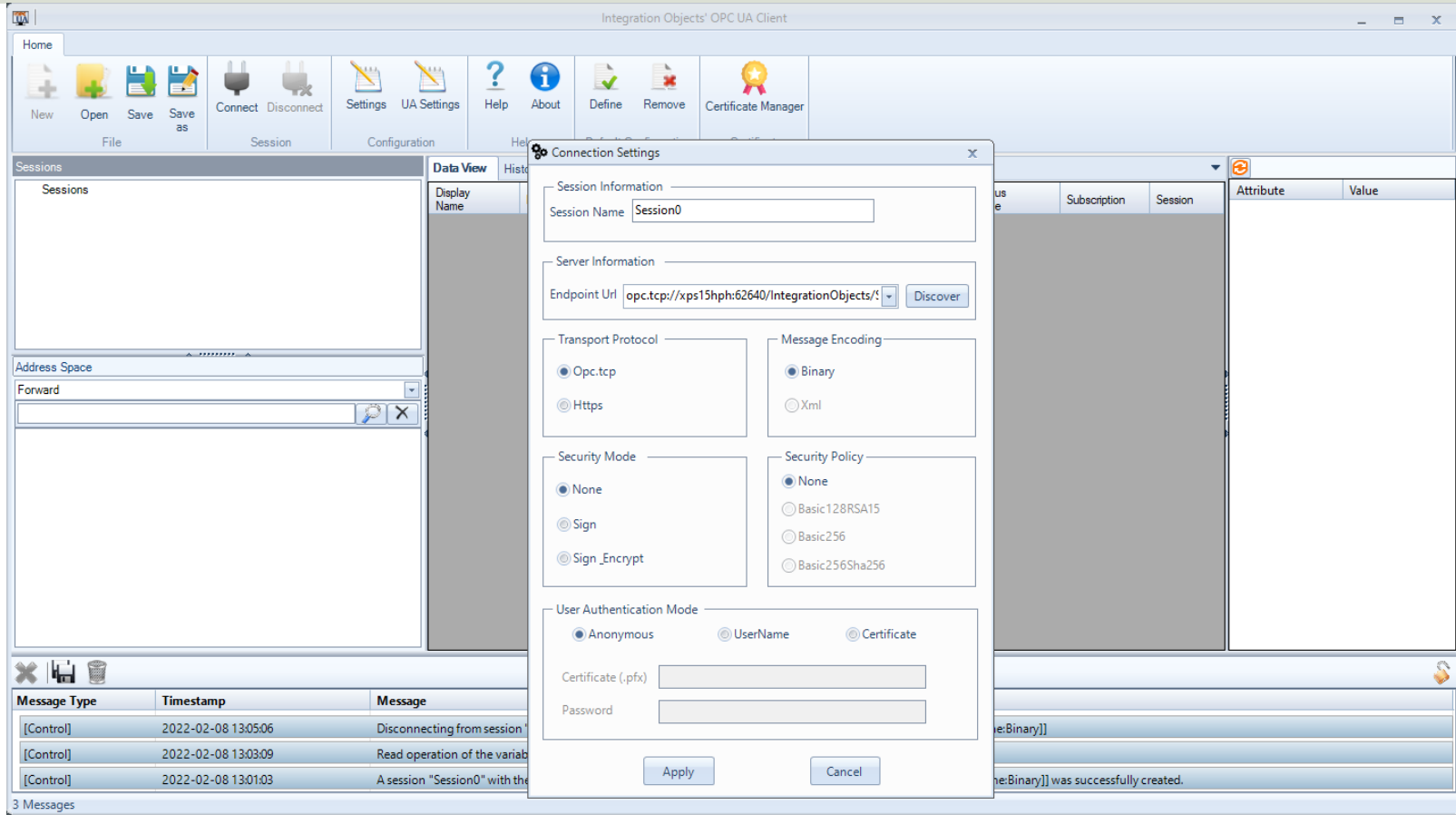
[View Tutorial Video of OPC UA Test Client & OPC UA Wrapper](#)



OPC UA Client

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

“OPC UA Client”



“OPC UA Client”

The screenshot displays the 'Integration Objects OPC UA Client' application. The interface includes a top toolbar with icons for File (New, Open, Save, Save as), Session (Connect, Disconnect), Configuration (Settings, UA Settings), Help (Help, About), Default Configuration (Define, Remove), and Certificate (Certificate Manager). Below the toolbar, the 'Sessions' pane on the left shows a tree view with 'Session0'. The 'Address Space' pane below it shows a 'Forward' view of 'Real Time Data' with a list of tags (Tag1 through Tag7). A context menu is open over 'Tag7', showing options: 'References and Attributes', 'Read' (highlighted), 'Write', 'History Update', and 'Monitor'. The main 'Data View' pane is currently empty. On the right, a table lists attributes for the selected node:

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

At the bottom, a 'Message' pane shows two log entries:

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.

The status bar at the very bottom indicates '2 Messages'.



OPC UA Programming Tools

Hans-Petter Halvorsen

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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

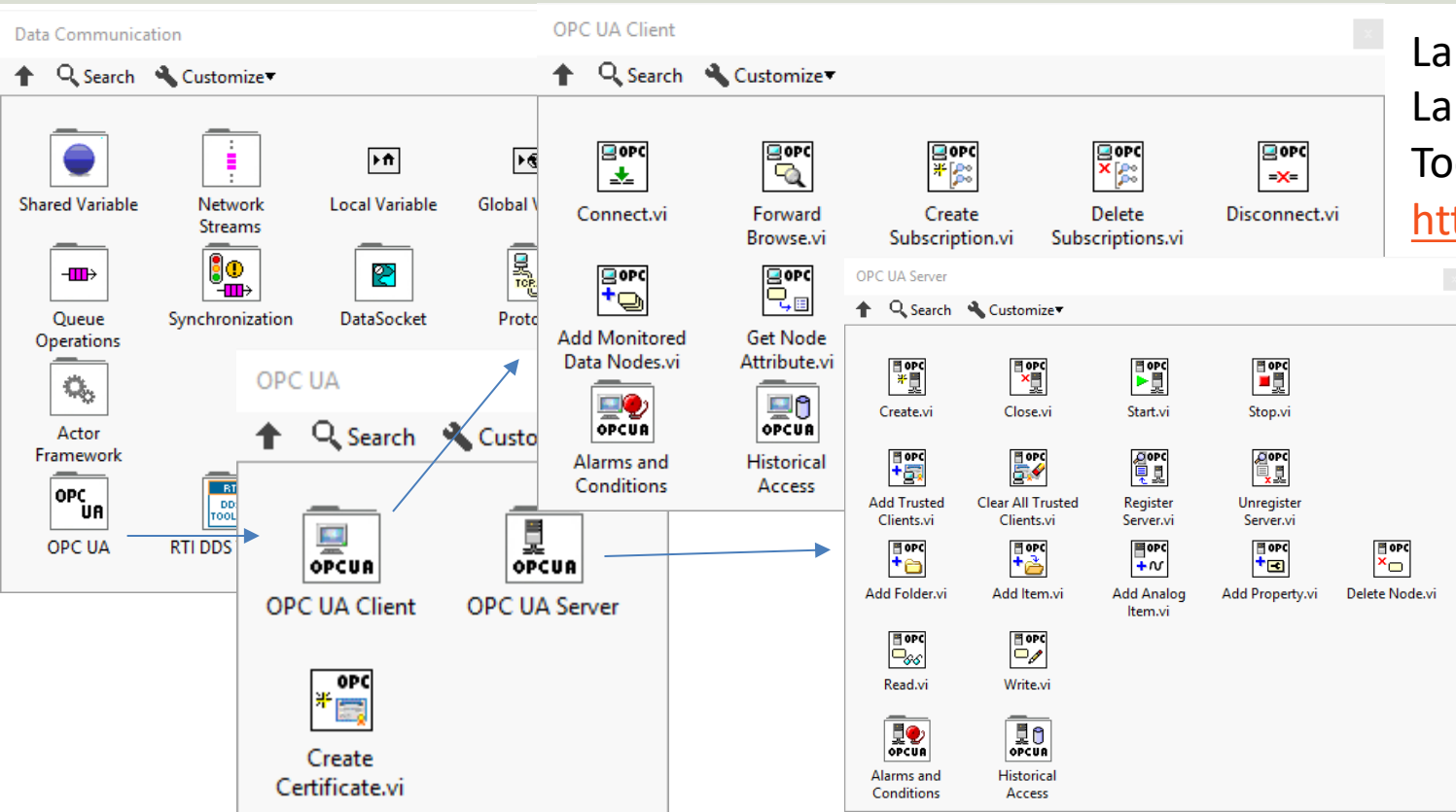


LabVIEW OPC UA Toolkit

Hans-Petter Halvorsen

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LabVIEW OPC UA Toolkit

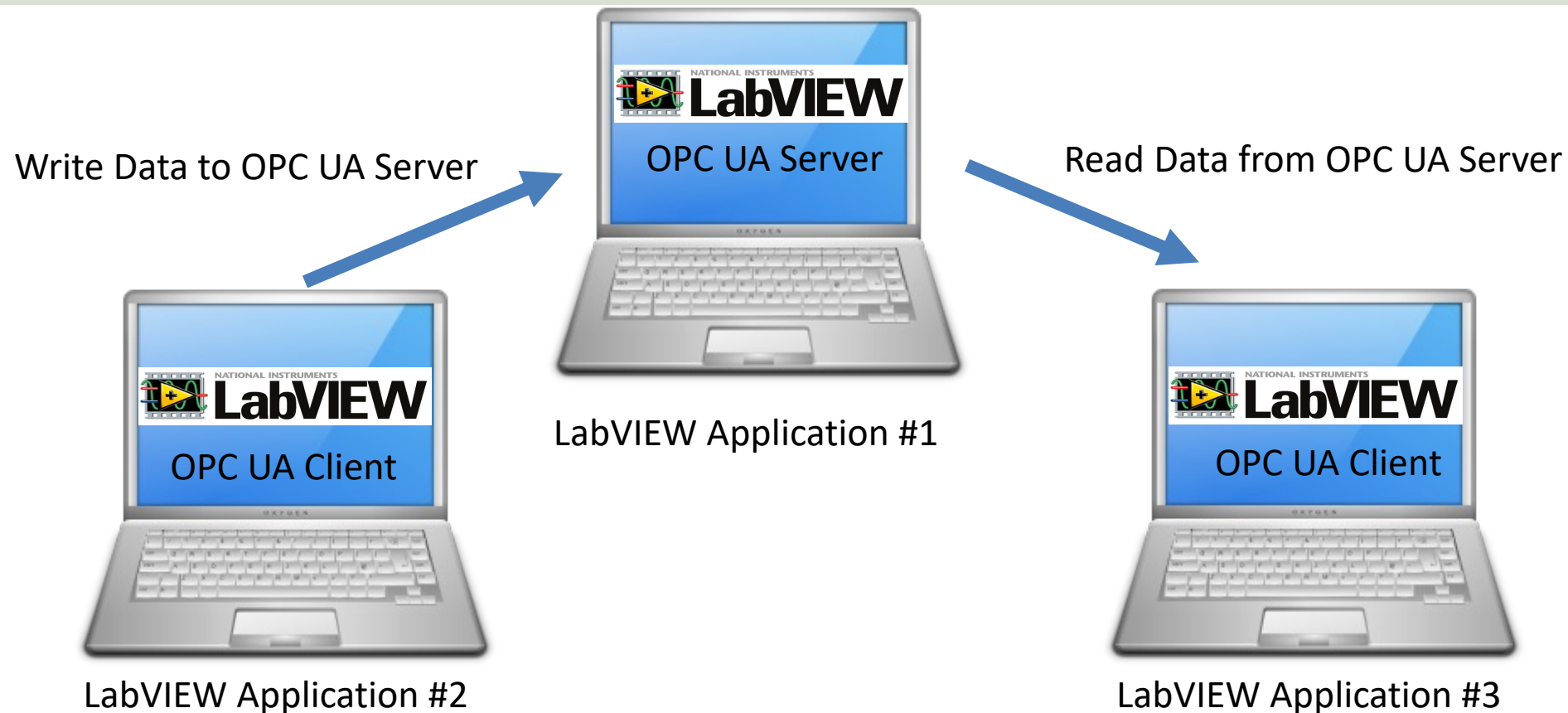


LabVIEW and the
LabVIEW OPC UA
Toolkit are made by NI

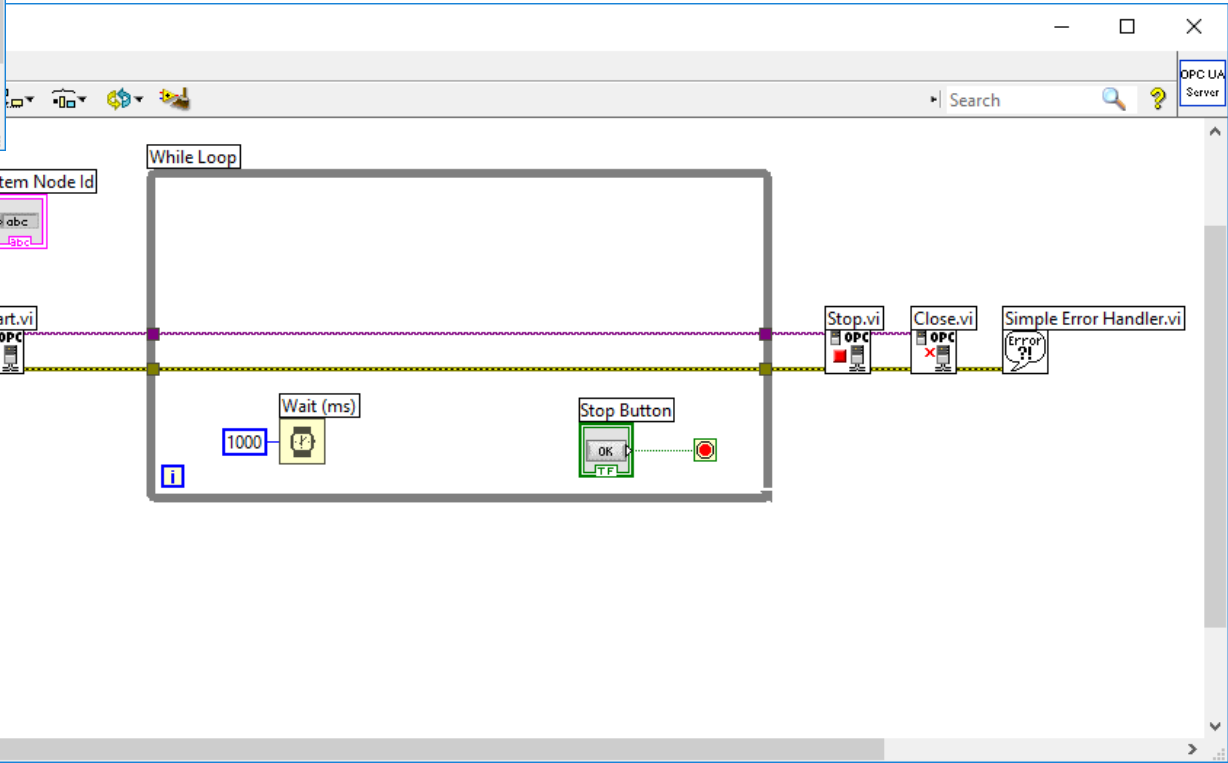
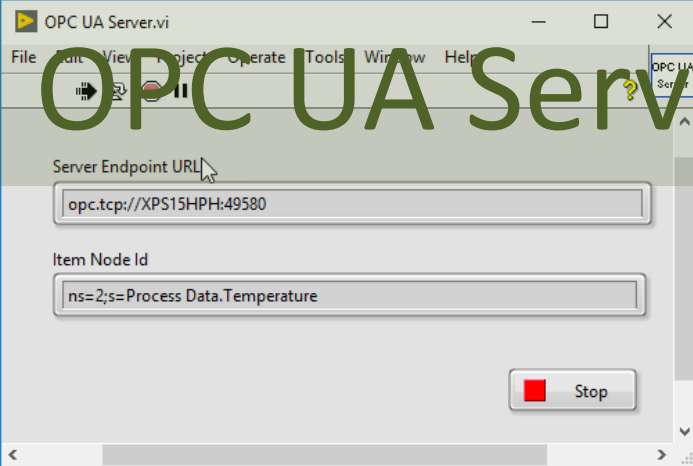
<https://www.ni.com>

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

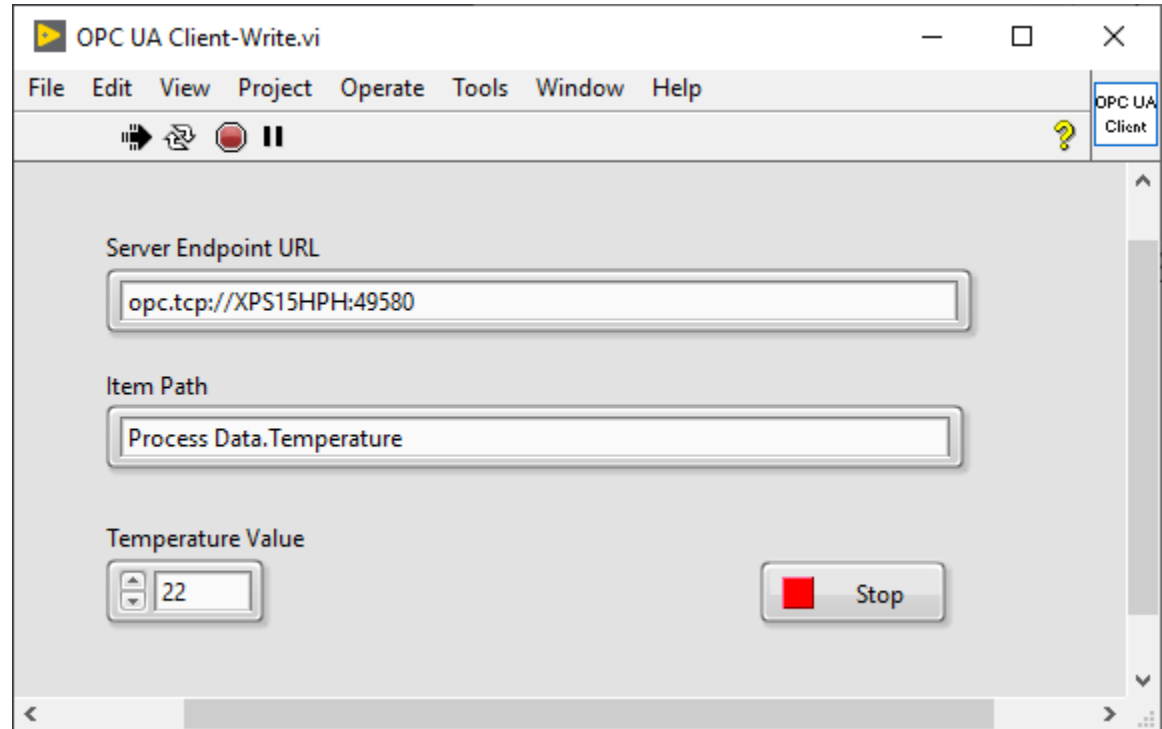
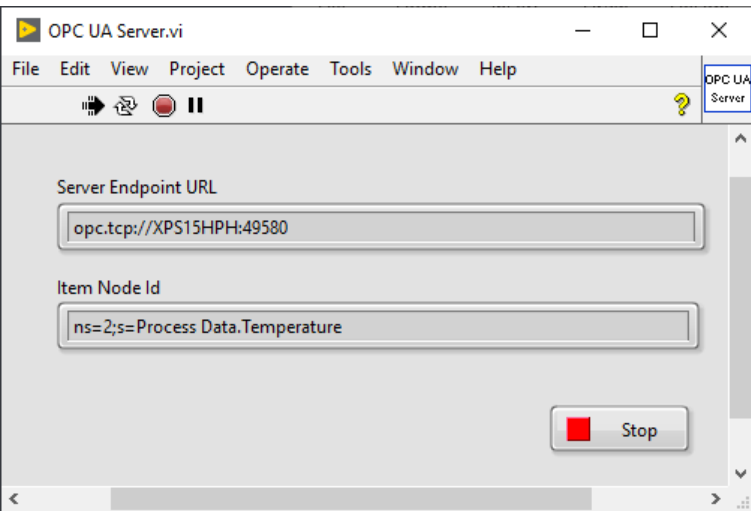
OPC UA in LabVIEW



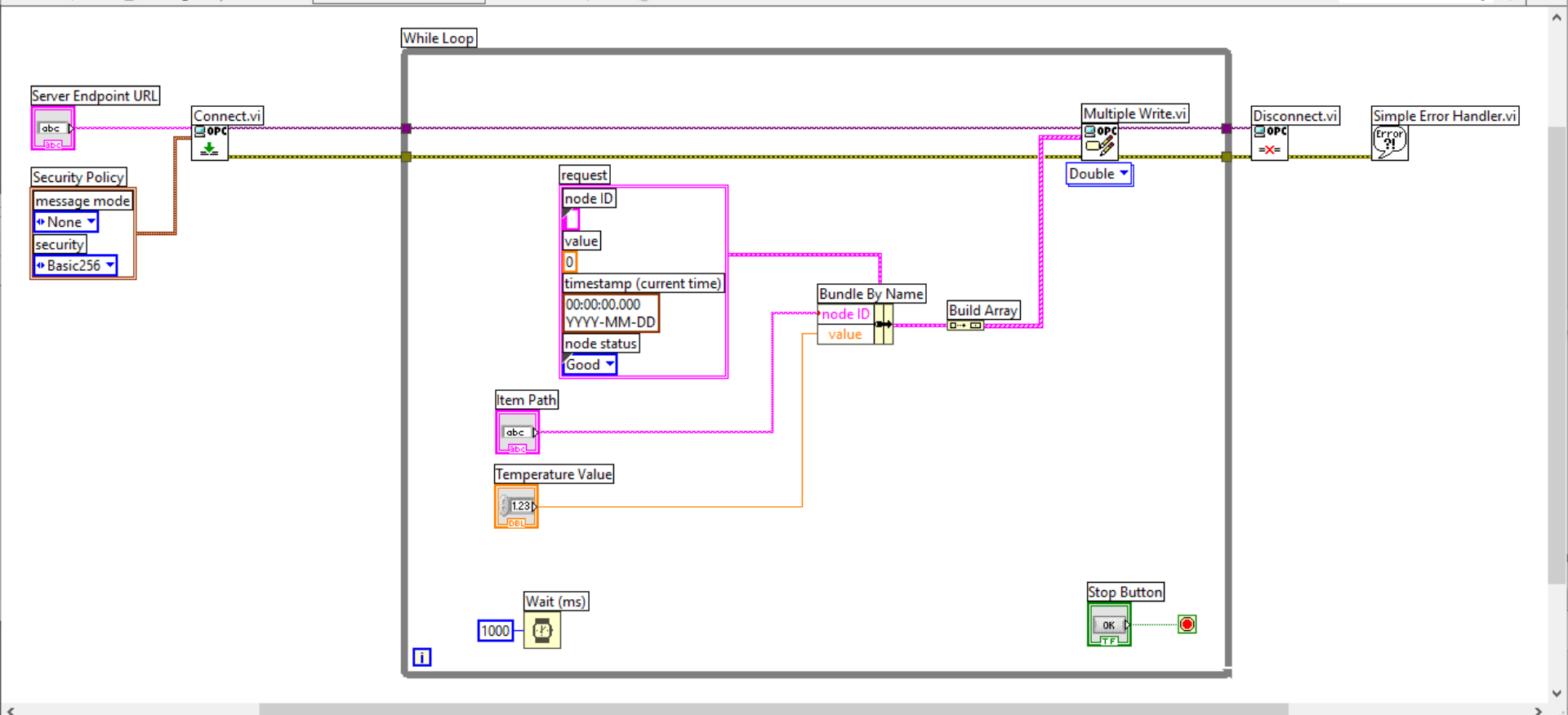
OPC UA Server Example in LabVIEW



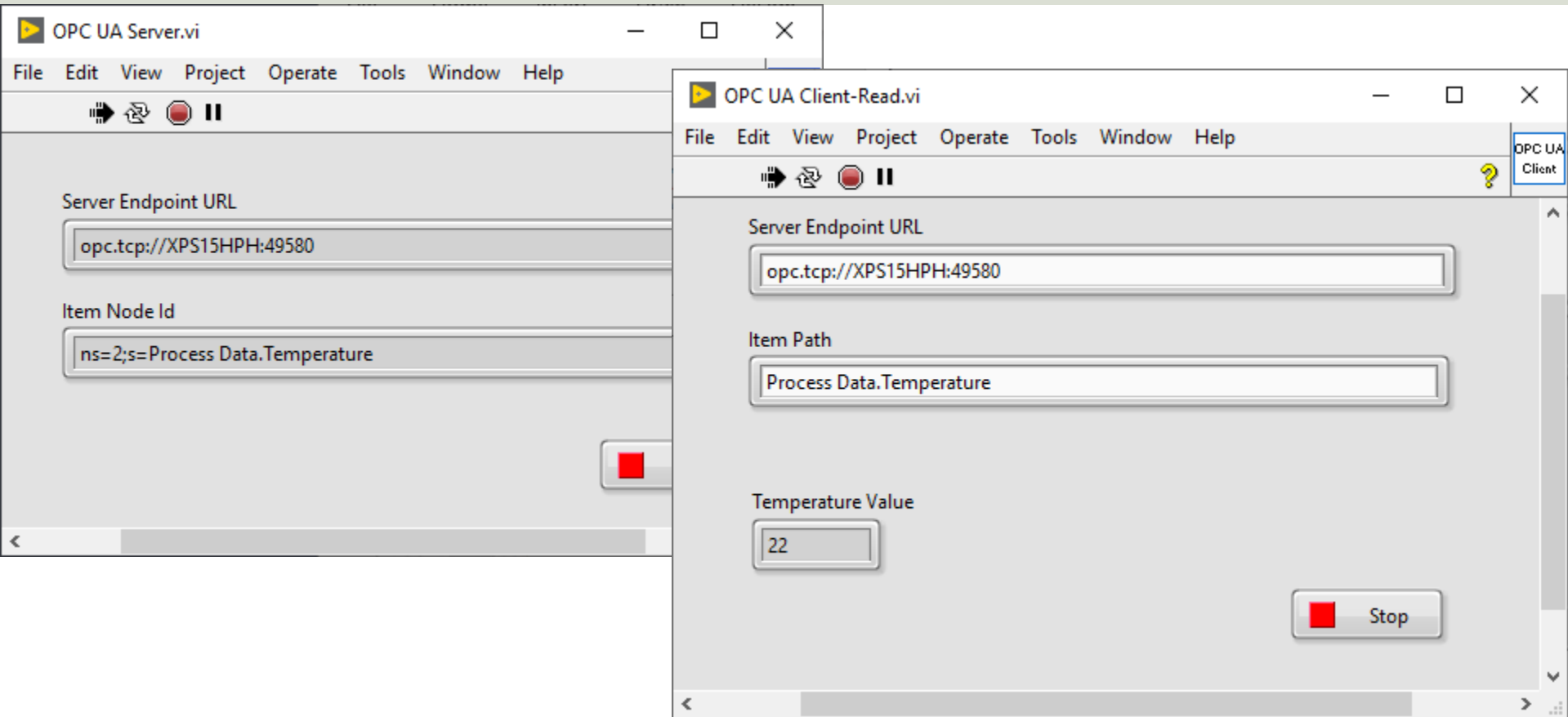
OPC UA Client Write Data



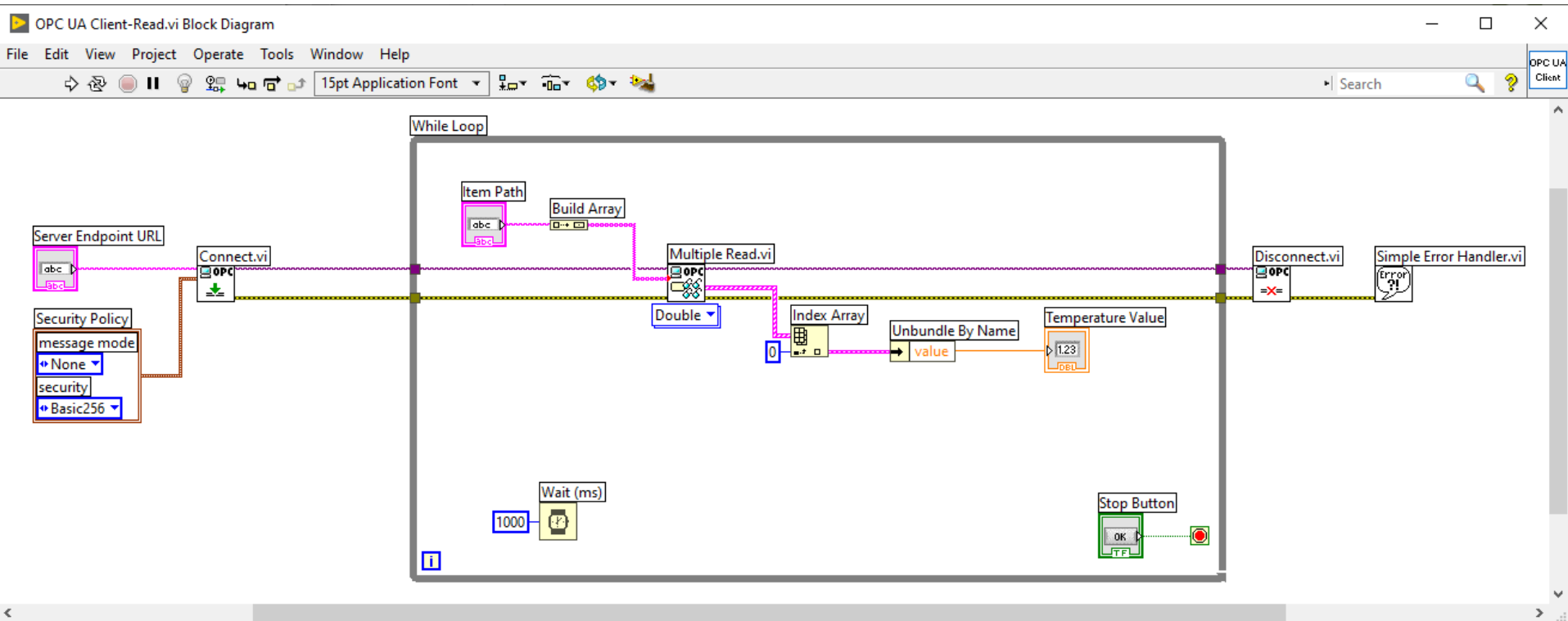
Using **OPC UA Toolkit** with LabVIEW 2017 or newer



OPC UA Client Read Data



Block Diagram





MATLAB Industrial Communication Toolbox

Hans-Petter Halvorsen

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OPC with MATLAB

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

Industrial Communication Toolbox

- The Industrial Communication Toolbox supports:
 - OPC DA
 - OPC HDA
 - OPC UA
- 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 = 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. 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”

Hans-Petter Halvorsen

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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>



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Products » 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

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 Package Manager: OPC UA Write

Browse Installed Updates

opc.ua x 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 '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 2

Visual Studio Project

The screenshot displays the Visual Studio IDE interface for a project named "OPC UA Write". The main window shows the code editor for "Form1.cs" in Design view. The code is as follows:

```
1 using Opc.UaFx.Client;
2
3 namespace OPC_UA_Write
4 {
5     3 references
6     public partial class Form1 : Form
7     {
8         1 reference
9         public Form1()
10         {
11             InitializeComponent();
12         }
13
14         1 reference
15         private void btnOpcWrite_Click(object sender, EventArgs e)
16         {
17             string opcUrl = "opc.tcp://localhost:62640/";
18             var tagName = "ns=2;s=Tag7";
19
20             var client = new OpcClient(opcUrl);
21             client.Connect();
22
23             double temperature;
24             temperature = Convert.ToDouble(txtOpcDataWrite.Text);
25
26             client.WriteNode(tagName, temperature);
27             client.Disconnect();
28         }
29     }
30 }
```

The Solution Explorer on the right shows the project structure:

- OPC UA Write
 - Dependencies
 - Form1.cs
 - Program.cs

The Error List at the bottom shows "0 Errors", "0 Warnings", and "0 Messages". The status bar at the bottom indicates "Ready" and "Add to Source Control".

System Overview

OPC UA Server Simulator

File Settings Help

Server Endpoints URLs <opc.tcp://xps19ph:62640/IntegrationObjects/ServerSimulator>

Sessions

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

Subscriptions

SubscriptionId	Publishing Interval	Item Count	Seq No
1	1000	1	4

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

OPC UA Write

8

Write

Integration Objects' OPC UA Client

Home

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

Sessions

Session0

Subscription0

Address Space

Forward

Tag3 Tag4 Tag5 Tag6 Tag7 Tag8

Message Type Timestamp Message

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

3 Messages

Data View History View Event View

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

Attribute Value

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
 - MATLAB + Industrial Communication Toolbox
 - Visual Studio/C# + Measurement Studio
- 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

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