

<https://www.halvorsen.blog>

UaExpert OPC UA Client

Hans-Petter Halvorsen



UaExpert

- UaExpert is an OPC UA Client from Unified Automation
- Homepage:
<https://www.unified-automation.com>
- Download UaExpert:
<https://www.unified-automation.com/downloads/opc-ua-clients.html>

UaExpert

Unified Automation UaExpert - The OPC Unified Architecture Client - NewProject*

File View Server Document Settings Help

Project Data Access View

#	Server	Node Id	Display Name	Value	Datatype	Source Timestamp	Server Timestamp
1	LabVIEW OPC U...	NS2 String ...	Temperature	26	Double	01:00:00.000	14:25:23.235
2	Python OPC UA...	NS2 Numeric 2	Temperature	20	Int64	01:00:00.000	01:00:00.000
3	OPC UA Server ...	NS2 String Tag7	Tag7	22	Double	14:39:03.638	14:39:03.639

Attributes

Attribute Value

- NodeId ns=2;s=Tag7
 - NamespaceIndex 2
 - IdentifierType String
 - Identifier Tag7
 - NodeClass Variable
 - BrowseName 2, "Tag7"
 - DisplayName "en", "Tag7"
 - Description Invalid Datatype: Ex
 - Value
 - SourceTimestamp 2023-12-05 14:39:03
 - SourcePicoSeconds 0
 - ServerTimestamp 2023-12-05 14:39:12
 - ServerPicoSeconds 0
 - StatusCode Good (0x00000000)

References

Reference Target DisplayName

- HasTypeDefiniti... BaseDataVariableType

Log

Timestamp	Source	Server	Message
2023-12-05 14:3...	DA Plugin		QascDaModel:dropMimeData
2023-12-05 14:3...	DA Plugin	OPC UA Server ...	No subscription available for ServerId 2
2023-12-05 14:3...	DA Plugin	OPC UA Server ...	Creating new subscription: ClientHandle=3, PublishingEnable=1, LifeTimeCount=2400, MaxKeepAliveCount=10, Priority=0, PublishingInterval=500, MaxNotificationsPerPublish=0
2023-12-05 14:3...	DA Plugin	OPC UA Server ...	CreateSubscription succeeded [ret = Good]
2023-12-05 14:3...	DA Plugin	OPC UA Server ...	Revised values: LifeTimeCount=2400, MaxKeepAliveCount=10, Priority=0, PublishingInterval=500, SubscriptionId=3
2023-12-05 14:3...	DA Plugin	OPC UA Server ...	Created subscription for ServerId 2
2023-12-05 14:3...	DA Plugin	OPC UA Server ...	Item [NS2 String Tag7]: SamplingInterval=250, QueueSize=1, DiscardOldest=1, ClientHandle=7
2023-12-05 14:3...	DA Plugin	OPC UA Server ...	CreateMonitoredItems succeeded [ret = Good]
2023-12-05 14:3...	DA Plugin	OPC UA Server ...	Item [NS2 String Tag7] succeeded : RevisedSamplingInterval=250, RevisedQueueSize=1, MonitoredItemId=3 [ret = Good]
2023-12-05 14:3...	Attribute Plugin	OPC UA Server ...	Read attributes of node 'NS2 String Tag7' succeeded [ret = Good].

Demonstration and Testing

UaExpert OPC UA Client will be demonstrated and tested with different OPC UA Servers:

- **LabVIEW OPC UA Server** made from scratch with LabVIEW and LabVIEW OPC UA Toolkit
- **OPC UA Server Simulator** from Integration Objects
- **Python OPC UA Server** made from scratch using Python and “opcua” Python package/library

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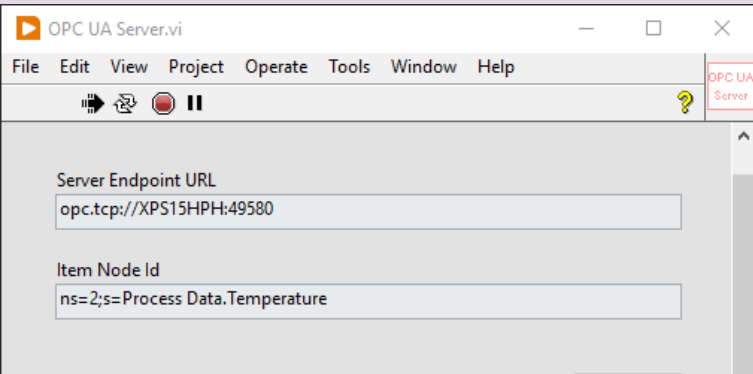
Testing with LabVIEW OPC UA Server



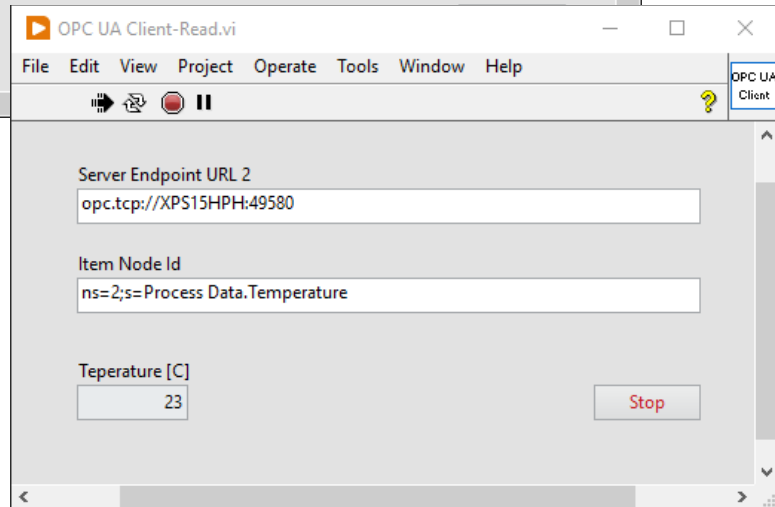
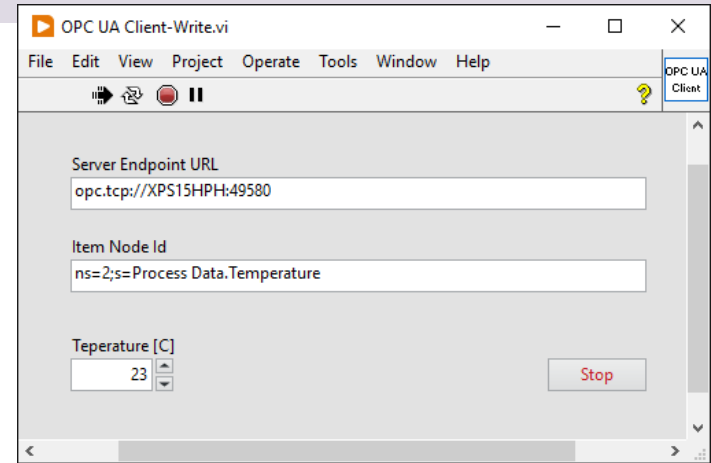
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LabVIEW OPC UA

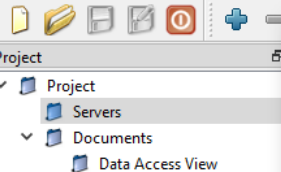


The LabVIEW OPC UA Server and Clients are made with **LabVIEW OPC UA Toolkit**



How to make these OPC UA Applications with LabVIEW OPC UA Toolkit:

<https://youtu.be/AoneC2cSzto>



Add Server ? X

Configuration Name: LabVIEW OPC UA Server

PKI Store: Default

Discovery | **Advanced**

Server Information

Endpoint Url:

Reverse Connect:

Security Settings

Security Policy:

Message Security Mode:

Authentication Settings

Anonymous

Username: Store

Password:

Certificate: ...

Private Key: ...

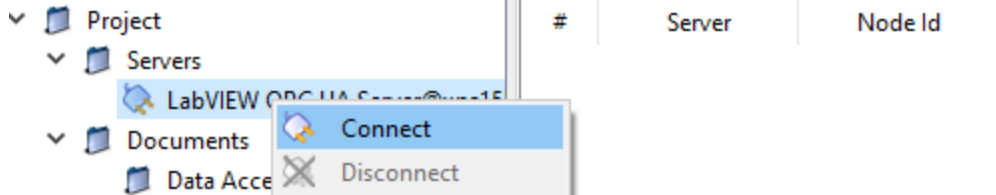
Session Settings

Session Name:

Connect Automatically

OK Cancel

Add Server



- Connect
- Disconnect
- Properties...
- Change User...
- Remove

timestamp	Source	Server
2024-02-06 10:0...	UaExpert	
2024-02-06 10:0...	UaExpert	
2024-02-06 10:0...	UaExpert	
2024-02-06 10:0...	UaExpert	
2024-02-06 10:0...	UaExpert	

See Tag Data

The screenshot displays the Unified Automation UaExpert interface. The main window is titled "Data Access View" and shows a table of tag data. The table has columns for #, Server, Node Id, Display Name, Value, Datatype, Source Timestamp, and Server Timestamp. The first row shows a tag with ID 1, server "LabVIEW OPC U...", node ID "NS2[String]...", display name "Temperature", and a value of 23. The value "23" is highlighted with a red box. A blue arrow points from the "Temperature" tag in the "Address Space" tree to the "Value" column in the table. The text "Double-Click to change Value" is overlaid on the table, and "Drag and Drop" is overlaid on the arrow.

#	Server	Node Id	Display Name	Value	Datatype	Source Timestamp	Server Timestamp
1	LabVIEW OPC U...	NS2[String]...	Temperature	23	Double	01:00:00.000	10:31:23.347

Attributes

Attribute	Value
NodeId	ns=2;s=Proc
NamespaceIndex	2
IdentifierType	String
Identifier	Process Data
NodeClass	Variable
BrowseName	0, "Temperat
DisplayName	"" , "Tempera
Description	"" , "TC-01 Th

References

Reference	Target DisplayName
HasTypeDefiniti...	BaseDataVariableType

Log

Timestamp	Source	Server	Message
2024-02-06 10:3...	AddressSpaceM...	LabVIEW OPC U...	QascAddressSpaceModel::mimeData
2024-02-06 10:3...	DA Plugin	LabVIEW OPC U...	QascDaModel::dropMimeData
2024-02-06 10:3...	DA Plugin	LabVIEW OPC U...	No subscription available for ServerId 0
2024-02-06 10:3...	DA Plugin	LabVIEW OPC U...	Creating new subscription: ClientHandle=0, PublishingEnable=1, LifeTimeCount=2400, MaxKeepAliveCount=10, Priority=0, PublishingInterval=500, MaxNotificationsPerPublish=0
2024-02-06 10:3...	DA Plugin	LabVIEW OPC U...	CreateSubscription succeeded [ret = Good]
2024-02-06 10:3...	DA Plugin	LabVIEW OPC U...	Revised values: LifeTimeCount=2400, MaxKeepAliveCount=10, Priority=0, PublishingInterval=500, SubscriptionId=2802218209
2024-02-06 10:3...	DA Plugin	LabVIEW OPC U...	Created subscription for ServerId 0
2024-02-06 10:3...	DA Plugin	LabVIEW OPC U...	Item [NS2[String]Process Data.Temperature]: SamplingInterval=250, QueueSize=1, DiscardOldest=1, ClientHandle=1
2024-02-06 10:3...	DA Plugin	LabVIEW OPC U...	CreateMonitoredItems succeeded [ret = Good]
2024-02-06 10:3...	DA Plugin	LabVIEW OPC U...	Item [NS2[String]Process Data.Temperature] succeeded : RevisedSamplingInterval=250, RevisedQueueSize=1, MonitoredItemId=1 [ret = Good]

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Testing with OPC UA Server Simulator

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OPC UA Server Simulator

OPC UA Server Simulator from Integration Objects

The screenshot shows the OPC UA Server Simulator interface. At the top, the title bar reads "OPC UA Server Simulator" and the menu bar includes "File", "Settings", and "Help". Below the menu bar, the "Server Endpoints URLs" field contains the text "opc.tcp://xps15hph:62640/IntegrationObjects/ServerSimulator".

The "Sessions" section contains a table with the following data:

SessionId	Name	User	Last Contact
Session i=0	Anonymous	ns=3;i=42539296	10:50:43
urn:XPS15HPP:Nati...	Anonymous	ns=3;i=42539352	10:50:43

The "Subscriptions" section contains a table with the following data:

SubscriptionId	Publishing Interval	Item Count	Seq No
1	100	1	1
2	500	1	4

At the bottom of the window, the status bar displays: "Status: Running", "Current Time: 10:50:43", "Sessions: 2", "Subscriptions: 2", and "Items: 2".

OPC UA Client from Integration Objects

The screenshot shows the OPC UA Client interface. The title bar reads "Integration Objects' OPC UA Client". The menu bar includes "File", "Session", "Configuration", "Help", "Default Configuration", and "Certificate".

The "Data View" section displays a table with the following data:

Display Name	Node Id	Value	Data Type	Server Timestamp	Source Timestamp	Status Code	Subscription	Session
Tag7	ns=2;s=Tag7	24	Double	06-02-2024 10...	06-02-20...	Good	Subscription0	Session0

The "Attribute Value" section displays a table with the following data:

Attribute	Value
NodeId	ns=2;s=Tag7
NodeClass	Variable
BrowseName	2:Tag7
DisplayName	Tag7
Description	
WriteMask	1
UserWriteMask	1
Value	24
Data Type	Double
ValueRank	Any
ArrayDimensions	
AccessLevel	Readable Writea...
UserAccessLevel	Readable Writea...
MinimumSampli...	Continuous
Historizing	False

The "Address Space" section shows a tree view of the OPC UA address space, including "Session0 | Root", "Objects", "Server", "Historical Data", "Methods", and "Real Time Data". The "Real Time Data" section is expanded to show "Tag1" through "Tag9", with "Tag7" selected.

The "Message Log" section at the bottom displays the following messages:

Message Type	Timestamp	Message
[Control]	2024-02-06 10:54:32	Create Monitored Item [ns=2;s=Tag7] succeeded.
[Control]	2024-02-06 10:54:32	A new subscription with the following properties: [Display Name: Subscription0, Publishing Interval: 1000, Keep Alive Count: 10, Lifetime Count: 1000, Max Notifications Per Publish: 0, Priority: 255, PublishingEnabled: True] was successfully created.

At the bottom of the window, the status bar displays: "4 Messages".

Overview of OPC UA Server Simulator:

<https://youtu.be/OIVwtlvXads>

LabVIEW OPC UA Client

OPC UA Server Simulator

File Settings Help

Server Endpoints URLs `opc.tcp://xps15hph:62640/IntegrationObjects/ServerSimulator`

Sessions

SessionId	Name	User	Last Contact
Session i=0	Anonymous	ns=3;i=42539296	10:50:43
urn:XPS15HPH:Nati...	Anonymous	ns=3;i=42539352	10:50:43

Subscriptions

SubscriptionId	Publishing Interval	Item Count	Seq No
1	100	1	1
2	500	1	4

Status: Running Current Time: 10:50:43 Sessions: 2 Subscriptions: 2 Items: 2

OPC UA Client-Read.vi

File Edit View Project Operate Tools Window Help

Server Endpoint URL 2
`opc.tcp://xps15hph:62640/IntegrationObjects/ServerSimulator`

Item Node Id
`ns=2;s=Tag7`

Temperature [C]
24

Stop

UaExpert

The screenshot displays the UaExpert software interface. The main window is titled "Unified Automation UaExpert - The OPC Unified Architecture Client - NewProject*". The interface includes a menu bar (File, View, Server, Document, Settings, Help) and a toolbar with various icons for file operations and server management.

The "Project" pane on the left shows a tree view with the following structure:

- Project
 - Servers
 - LabVIEW OPC UA Server
 - OPC UA Server Simulator
 - Documents
 - Data Access View

The "Data Access View" pane in the center displays a table with the following data:

#	Server	Node Id	Display Name	Value	Datatype
1	OPC UA Server Simulator	NS2[String]Tag7	Tag7	24	Double

The "Address Space" pane on the left shows a tree view with the following structure:

- No Highlight
 - Tag3
 - Tag4
 - Tag5
 - Tag6
 - Tag7
 - Tag8
 - Tag9

The "Attributes" pane on the right shows a tree view with the following structure:

- Attribute
 - NodeId
 - NamespaceIndex
 - Identifier Type
 - Identifier
 - NodeClass
 - BrowseName
 - DisplayName
 - Description

The "References" pane on the right shows a table with the following data:

Reference	Target Display
HasTypeDefiniti...	BaseDataVariat

The "Log" pane at the bottom shows a table with the following data:

Timestamp	Source	Server	Message
2024-02-06 10:4...	DA Plugin	OPC UA Server ...	No subscription available for ServerId 1
2024-02-06 10:4...	DA Plugin	OPC UA Server ...	Creating new subscription: ClientHandle=1, PublishingEnable=1, LifeTimeCount=2400, MaxKeepAliveCount=10, Priority=0, PublishingInterval=500, ...
2024-02-06 10:4...	DA Plugin	OPC UA Server ...	CreateSubscription succeeded [ret = Good]
2024-02-06 10:4...	DA Plugin	OPC UA Server ...	Revised values: LifeTimeCount=2400, MaxKeepAliveCount=10, Priority=0, PublishingInterval=500, SubscriptionId=2
2024-02-06 10:4...	DA Plugin	OPC UA Server ...	Created subscription for ServerId 1
2024-02-06 10:4...	DA Plugin	OPC UA Server ...	Item [NS2[String]Tag7]: SamplingInterval=250, QueueSize=1, DiscardOldest=1, ClientHandle=3
2024-02-06 10:4...	DA Plugin	OPC UA Server ...	CreateMonitoredItems succeeded [ret = Good]
2024-02-06 10:4...	DA Plugin	OPC UA Server ...	Item [NS2[String]Tag7] succeeded : RevisedSamplingInterval=250, RevisedQueueSize=1, MonitoredItemId=2 [ret = Good]
2024-02-06 10:4...	DA Plugin	OPC UA Server ...	Write to node 'NS2[String]Tag7' succeeded [ret = Good]
2024-02-06 10:4...	DA Plugin	OPC UA Server ...	Write to node 'NS2[String]Tag7' succeeded [ret = Good]

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Testing with Python OPC UA Server



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Python OPC UA Server

```
Thonny - C:\Users\hansha\OneDrive\Video Creation\Video Projects\OPC\UaExpert\OPC UA Client\Software\Python\opcua_server_ex.py @ 6:1
Edit View Run Tools Help
opcua_server_ex.py opcu_client_write_ex.py opcu_client_read_ex.py
2 import time
3 from datetime import datetime
4
5 server = Server()
6 server_url = "opc.tcp://127.0.0.1:1234"
7 server.set_endpoint(server_url)
8
9 name = "opcuapython"
10 namespace = server.register_namespace(name)
11 node = server.get_objects_node()
12 param = node.add_object(namespace, "Sensors")
13 var = param.add_variable(namespace, "Temperature", 0.0)
14 var.set_writable()
15
16 server.start()
17 print("OPC UA Server Started")
18 print("Press Ctrl-C to Stop Program")
19
20 try:
21     while True:
22         now = datetime.now()
23         current_time = now.strftime("%H:%M:%S")
24         print("OPC UA Server Running", current_time)
25         value = var.get_value()

```

```
OPC UA Server Running 13:46:42
Current Value: 22.0
Local Python 3 • Thonny's Python
```

Python OPC UA Server made from scratch using Python and “opcua” Python package/library

```

import time
from datetime import datetime

server = Server()
server_url = "opc.tcp://127.0.0.1:1234"
server.set_endpoint(server_url)

name = "opcuapython"
namespace = server.register_namespace(name)
node = server.get_objects_node()
param = node.add_object(namespace, "Sensors")
var = param.add_variable(namespace, "Temperature", 0.0)
var.set_writable()

server.start()
print("OPC UA Server Started")
print("Press Ctrl-C to Stop Program")

try:
    while True:
        now = datetime.now()
        current_time = now.strftime("%H:%M:%S")
        print("OPC UA Server Running", current_time)
        value = var.get_value()

```

OPC UA Server Running 13:46:42
Current Value: 22.0

Unified Automation UaExpert - The OPC Unified Architecture Client - NewProject

File View Server Document Settings Help

Project: Servers > LabVIEW OPC UA Server > OPC UA Server Simulator > Python OPC UA Server > Documents > Data Access View

Address Space: No Highlight > Root > Objects > Sensors > Temperature

#	Server	Node Id	Display Name	Value	Datatype	Source
1	Python OPC UA Server	NS2 Numeric2	Temperature	22	Double	01:00:00

Attributes: NamespaceIndex, IdentifierType, Identifier, NodeClass, BrowseName, DisplayName, Description, Value, SourceTimestamp

References: Reference, Target DisplayName, HasTypeDefinition, BaseDataVariable

Integration Objects' OPC UA Client

Home: New, Open, Save, Connect, Disconnect, Settings, UA Settings, Help, About, Define, Remove, Certificate Manager

Sessions: Session0, Subscription0

Display Name	Node Id	Value	Data Type	Server Timestamp	Source Timestamp	Status Code	Subscription	Session
Tem	ns=2;i=2	22	Double	01-01-0001	01-01-0001	Good	Subscription0	Session0

Address Space: Forward > Session0 | Root > Objects > Server > Sensors > Temperature

Attribute	Value
NodeId	ns=2;i=2
NodeClass	Variable
BrowseName	2:Temperature
DisplayName	Temperature
Description	Temperature
WriteMask	0
UserWriteMask	0
Value	0
DataType	Double
ValueRank	Scalar
ArrayDimensions	System.UInt32[]
AccessLevel	Readable Writable
UserAccessLevel	Readable Writable
MinimumSamplingInterval	Continuous
Historizing	False

Message Log:

Message Type	Timestamp	Message
[Control]	2024-02-06 13:4447	Write operation of the variable [ns=2;i=2] succeeded.
[Control]	2024-02-06 13:4431	Write operation of the variable [ns=2;i=2] succeeded.
[Control]	2024-02-06 13:4425	Create Monitored Item [ns=2;i=2] succeeded.

OPC UA Client-Read.vi

File Edit View Project Operate Tools Window Help

Server Endpoint URL 2
opc.tcp://127.0.0.1:1234

Item Node Id
ns=2;i=2

Temperature [C]
22

Stop

.NET based SDK for OPC UA Client/Server

- Unified Automation also offers different SDKs for creating OPC UA Servers and OPC UA Clients
- .NET based OPC UA Client/Server SDK can be used to create OPC UA Servers and OPC UA Clients in Visual Studio and C#
- <https://www.unified-automation.com/products/server-sdk/net-ua-server-sdk.html>

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