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LabVIEW OPC UA

UA – Unified Architecture

Hans-Petter Halvorsen

Contents

- What is OPC UA?
  - Short Introduction
- OPC UA Examples in LabVIEW
  - OPC UA Server
  - OPC UA Clients (Write/Read)

Software – LabVIEW 2016 or earlier

You need the following Software

- LabVIEW (LabVIEW Professional Development System 32-Bit: English)
- LabVIEW DSC Module or the LabVIEW Real-Time Module

All LabVIEW Software can be downloaded from: www.ni.com/download

Software – LabVIEW 2017 or newer

You need the following Software

- LabVIEW (LabVIEW Professional Development System 32-Bit: English)
- LabVIEW OPC UA Toolkit

Note! The **LabVIEW OPC UA Toolkit** contains the OPC UA API that was formerly part of the LabVIEW Datalogging and Supervisory Control (DSC) Module and the LabVIEW Real-Time Module.
From the 2017 release, the LabVIEW OPC UA Toolkit becomes a standalone product. The LabVIEW DSC Module and the LabVIEW Real-Time Module no longer contain the OPC UA API

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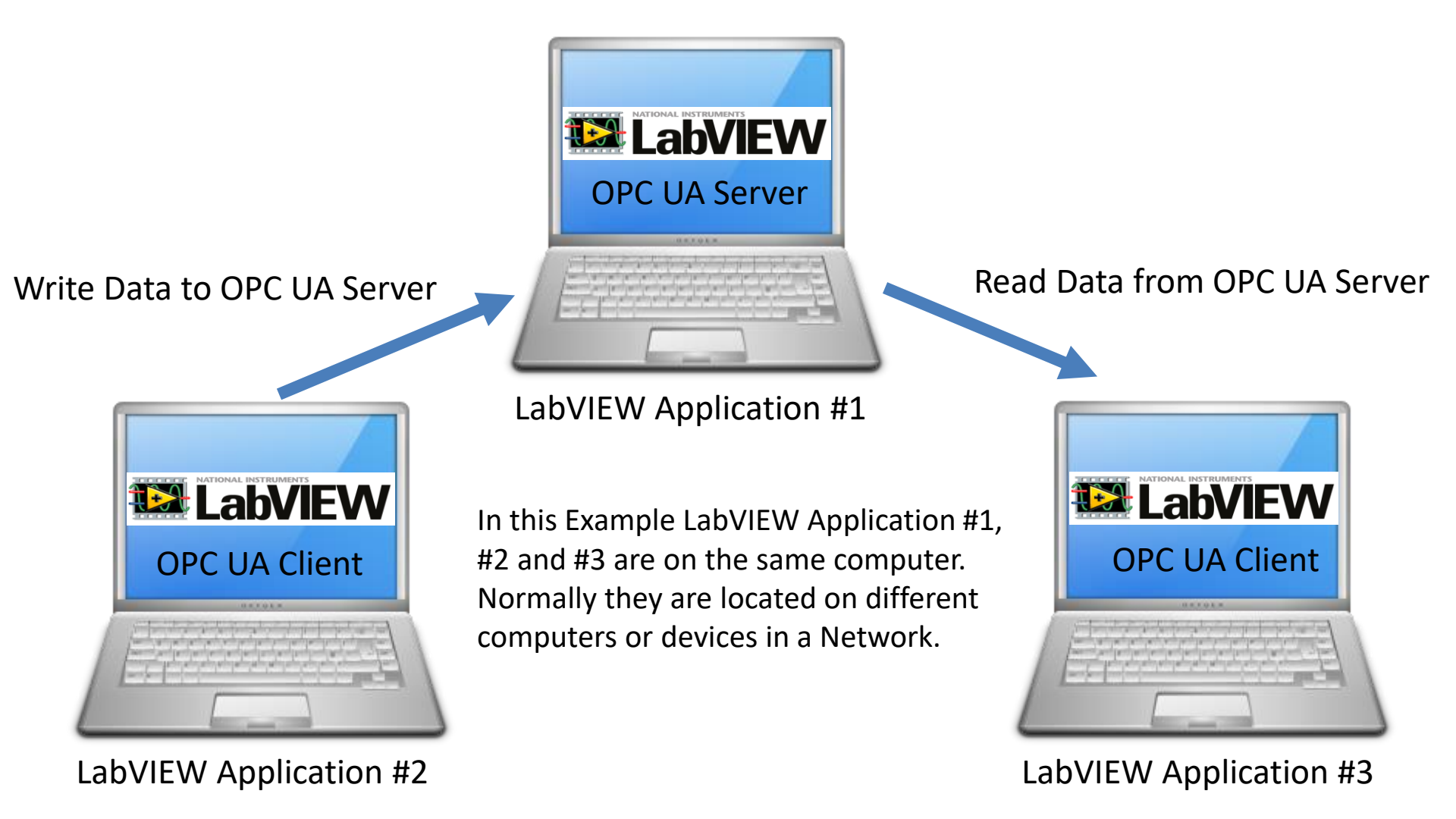
OPC UA Server
Write Data to OPC UA Server
Read Data from OPC UA Server
LabVIEW Application #1
OPC UA Client
OPC UA Client
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LabVIEW Application #2
LabVIEW Application #3

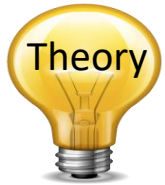
What is OPC UA?

Hans-Petter Halvorsen, M.Sc.

OPC UA

- UA – Unified Architecture
- The Next Generation OPC
- Based on Modern Software/Network Architecture (No DCOM problems!)

Next Generation OPC



COM/DCOM

OPC Classic

Next Generation OPC

XML, HTTP, SOAP

OPC UA

OPC DA

OPC HDA

OPC A&E

Specifications

Windows only

Cross-platform

Windows, Linux, Mac, Embedded, VxWorks

All specifications collected in one (DA, HDA, A&E)

Protocols: “UA Binary” or “UA XML”

OPC DA Server

OPC HDA Server

OPC A&E Server

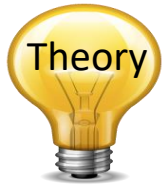
OPC Client (DCOM)

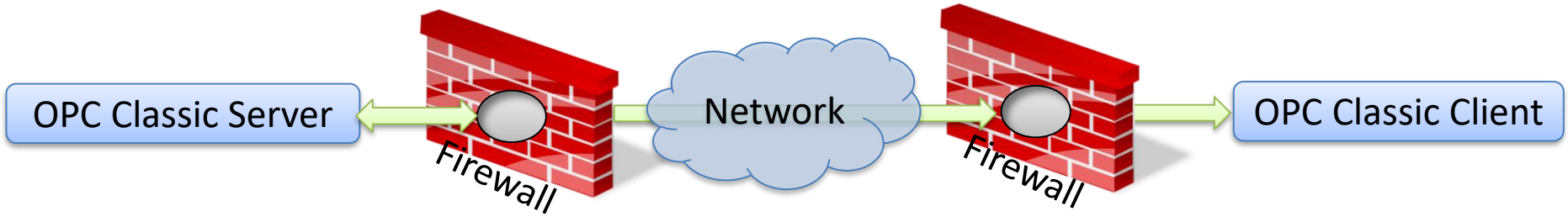
Simpler!!

OPC UA Server

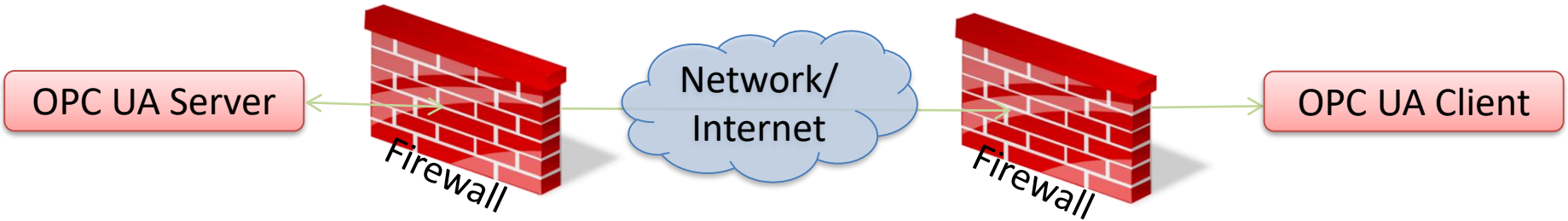
OPC UA Client

Next Generation OPC



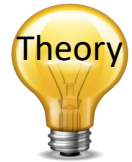


To open DCOM through firewalls demanded a large hole in the firewall!
Impossible to route over Internet!

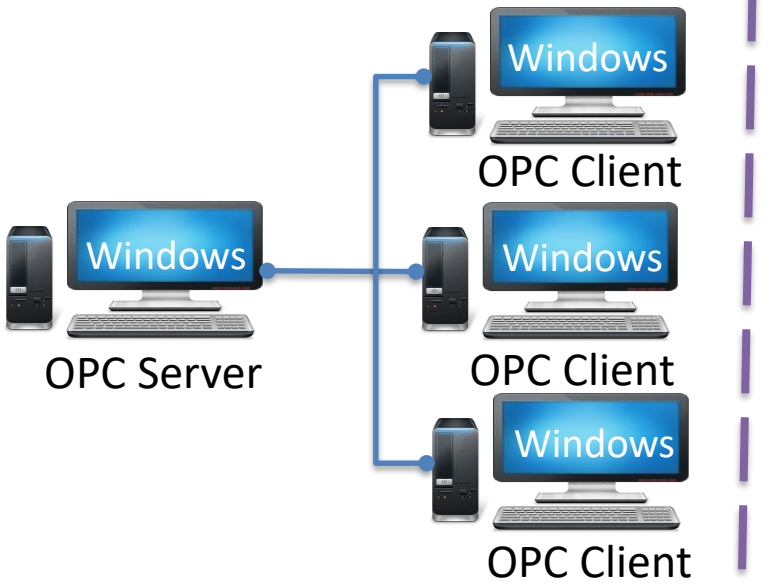


No hole in firewall (UA XML) or just a simple needle stick (UA Binary) is necessary
Easy to route over Internet!

Classic OPC vs. OPC UA

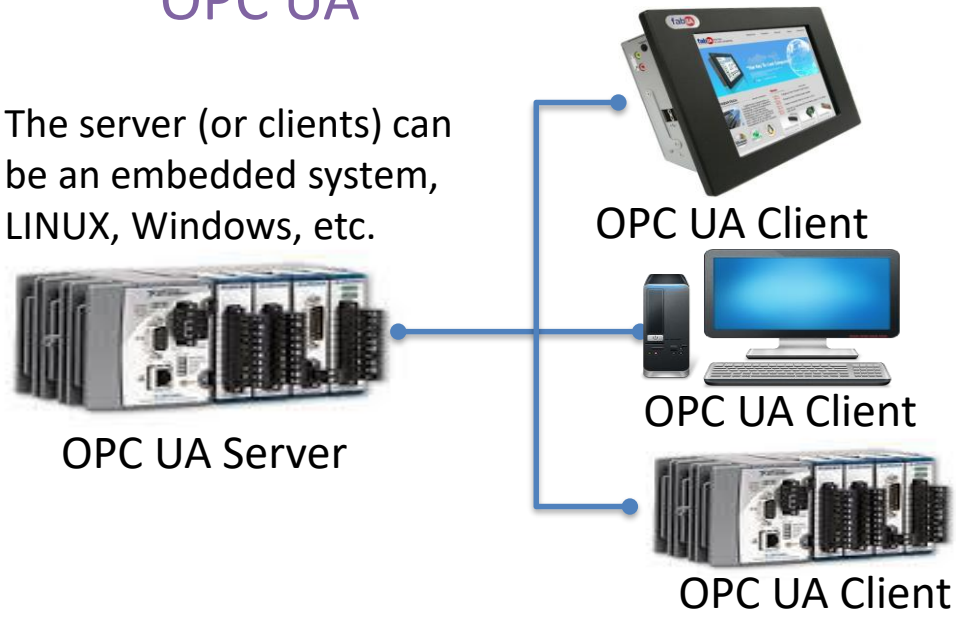


Classic OPC (DCOM)



OPC UA

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



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

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

http://www.halvorsen.blog

OPC UA in LabVIEW

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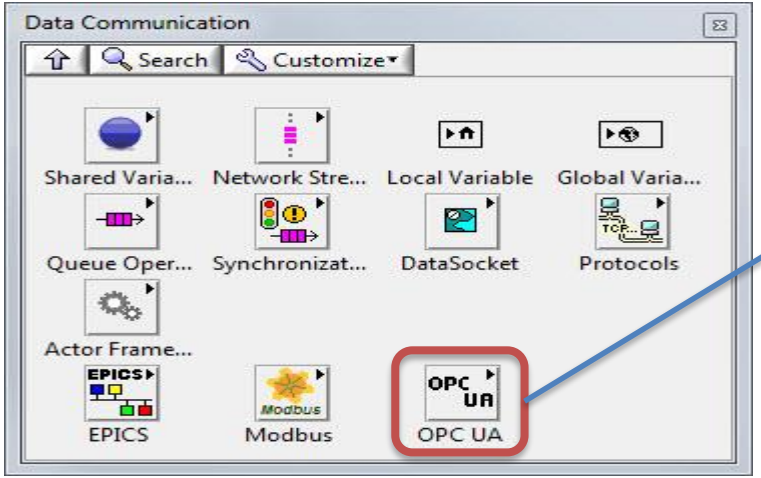
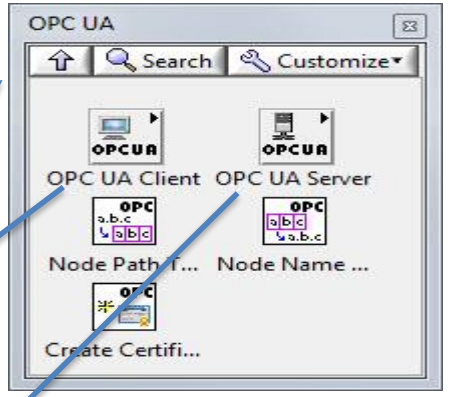
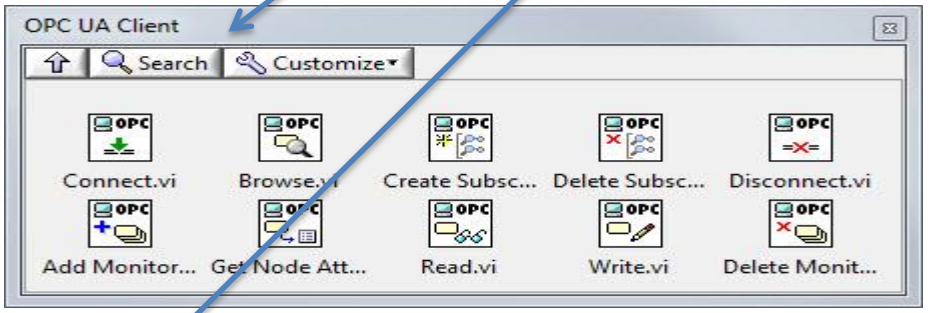
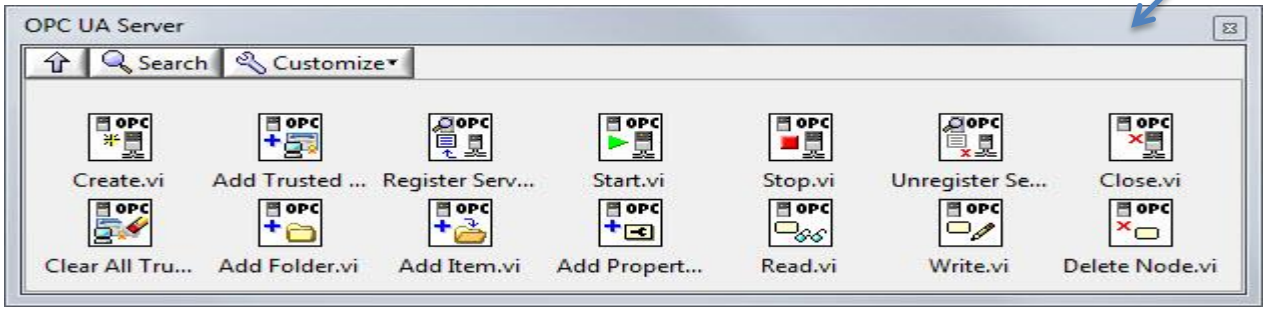
OPC UA in LabVIEW

http://zone.ni.com/reference/en-XX/help/371618J-01/TOC9.htm









DSC – Datalogging and Supervisory Control

Note! You need to install the “**LabVIEW DSC Module**” or the “**LabVIEW Real-Time Module**”

OPC UA Server

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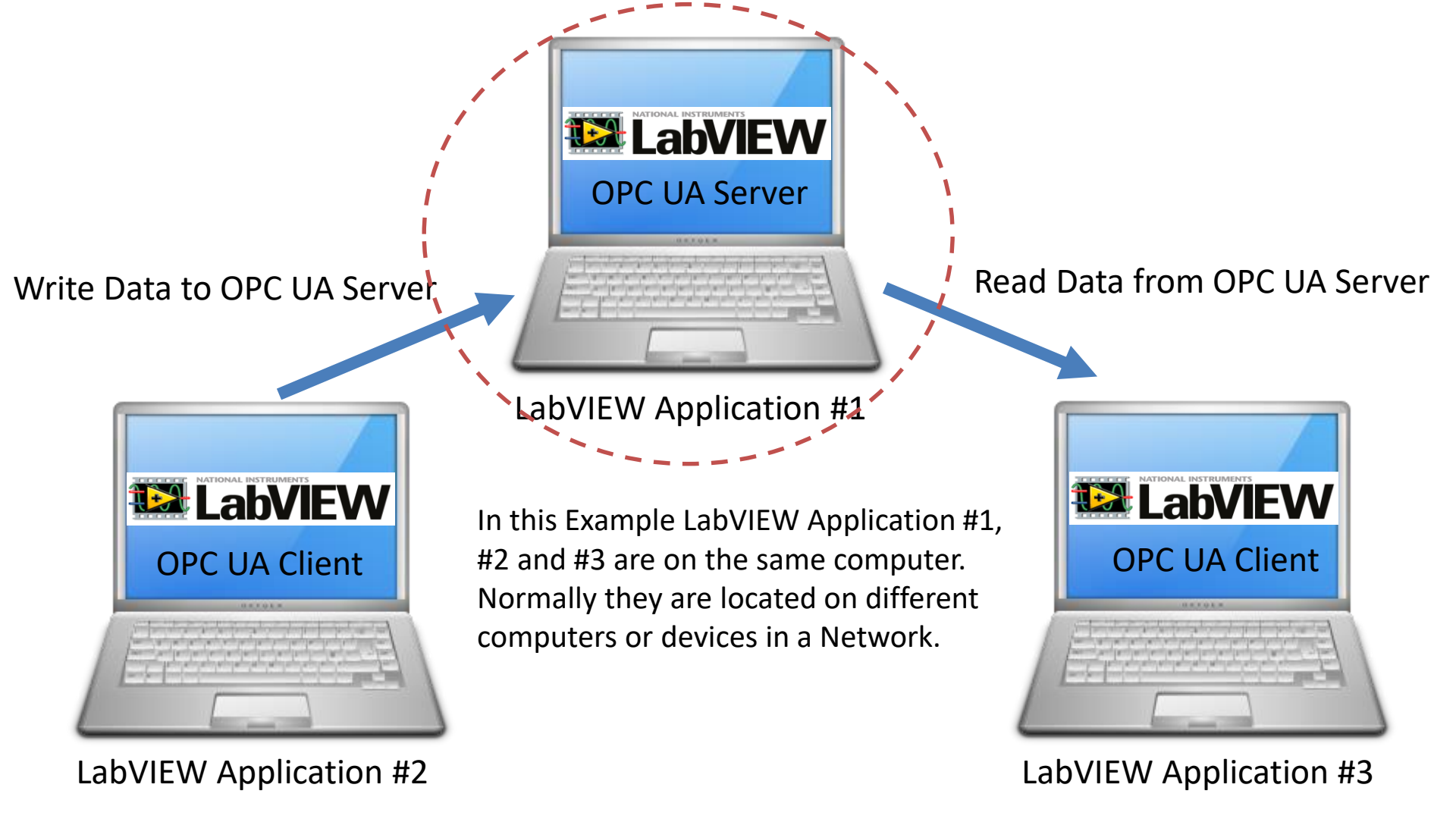
Write Data to OPC UA Server
NATIONAL INSTRUMENTS
LabVIEW
OPC UA Server
Read Data from OPC UA Server
LabVIEW Application #1
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LabVIEW
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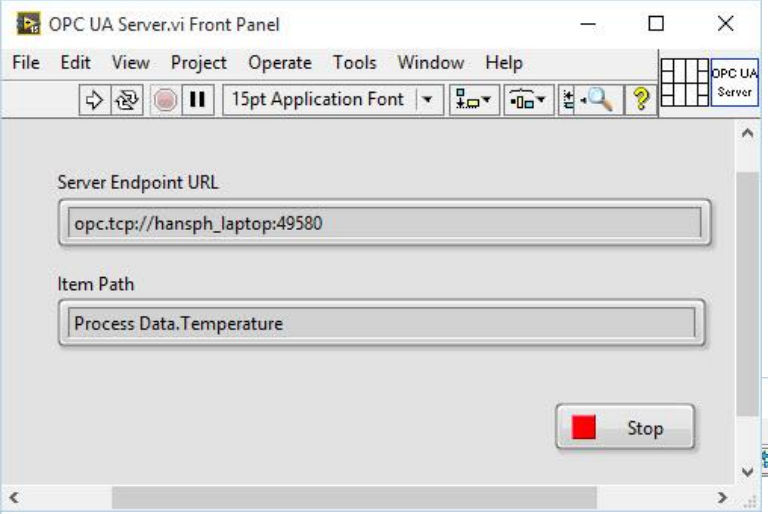
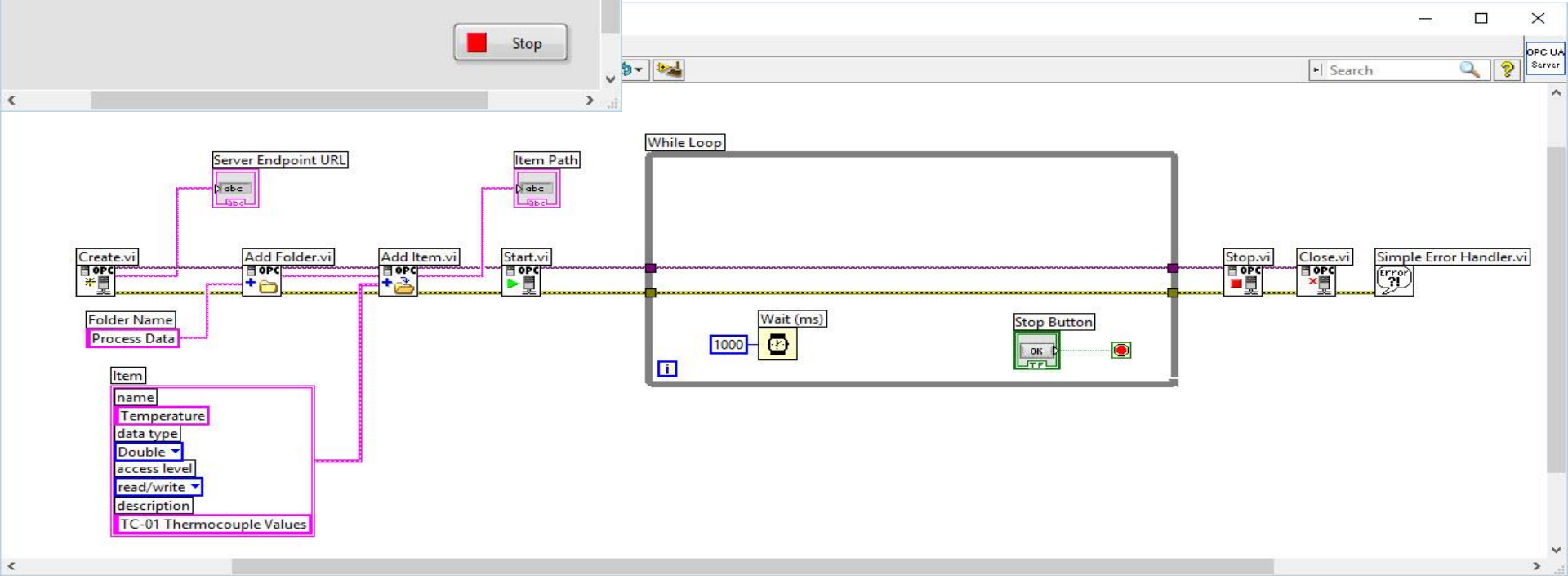
LabVIEW Application #3

OPC UA **Server** Example in LabVIEW





Lets Create the Example from Scratch

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OPC UA Clients

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Software – LabVIEW 2017 or newer

- **Note!** When creating OPC Clients: The VIs **Write.vi** and **Read.vi** that was previously used in LabVIEW 2016 has been replaced with **Multiple Write.vi** and **Multiple Read.vi**.
- This means: In LabVIEW 2017 it is recommended to use **Multiple Write.vi** and **Multiple Read.vi** instead of Write.vi and Read.vi for new applications.
- But if you open previous code in LabVIEW 2017, it will still work, because the old Write.vi and Read.vi are still included, but hidden in the palette in LabVIEW.
- You will find the obsolete Write and Read VIs here:
  C:\Program Files (x86)\National Instruments\LabVIEW 2017\vi.lib\OPCUA\client\internal\

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OPC UA Client – Write

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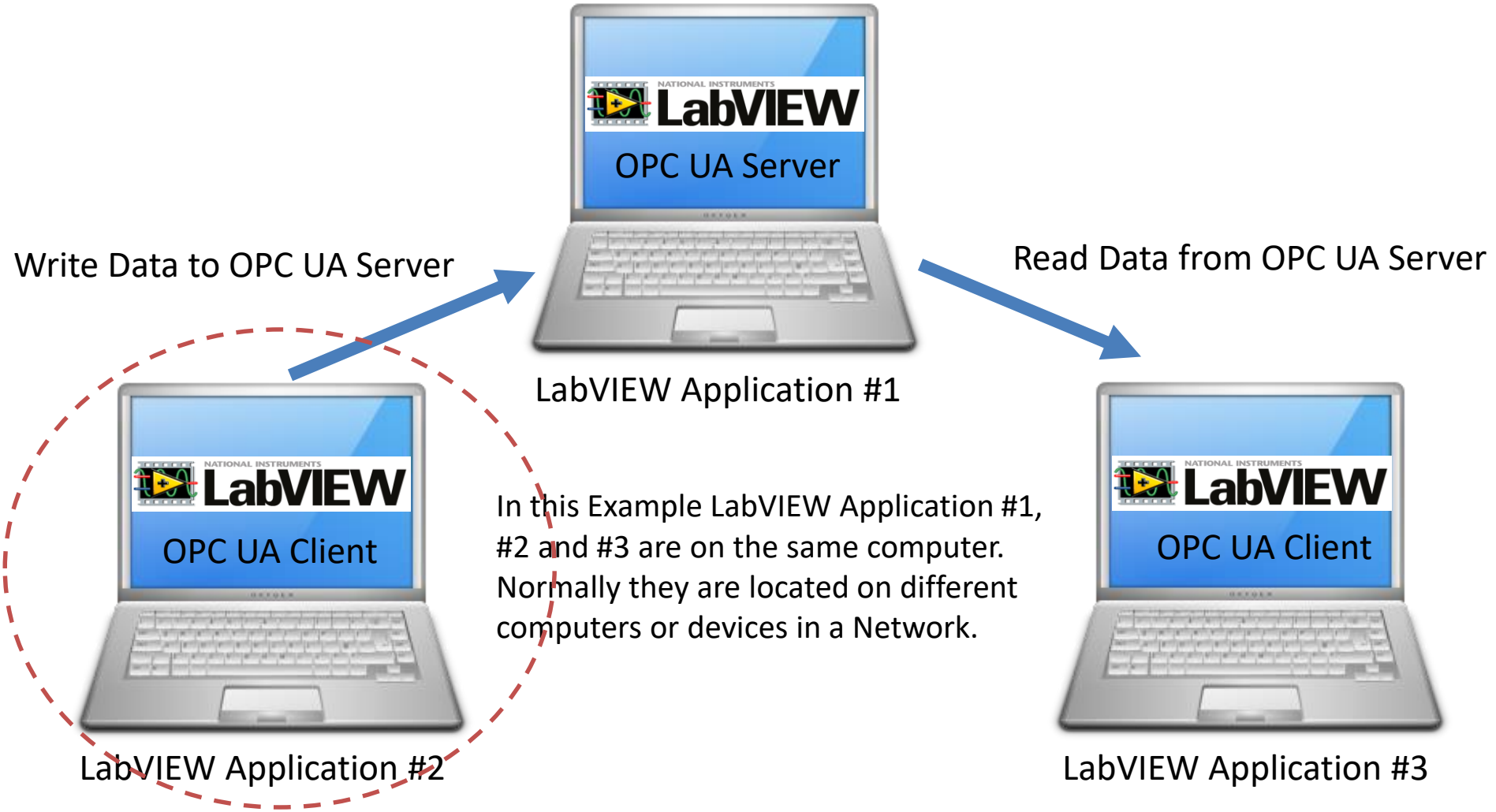
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LabVIEW Application #2
NATIONAL INSTRUMENTS
LabVIEW
OPC UA Client
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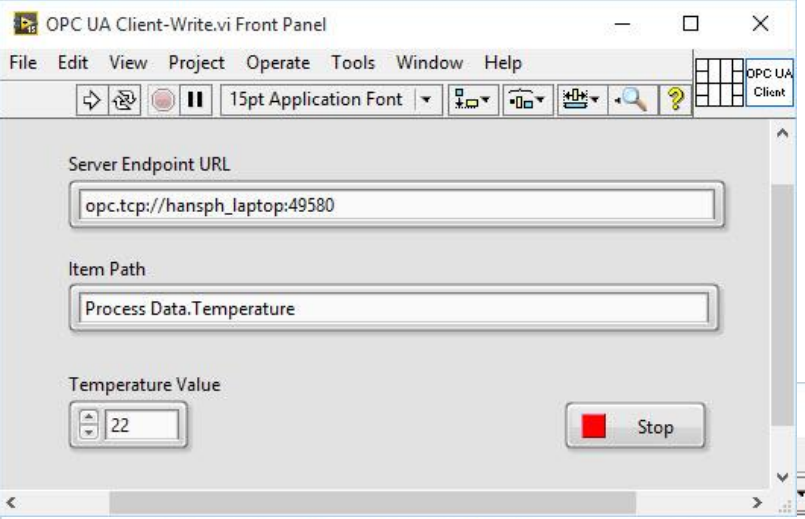
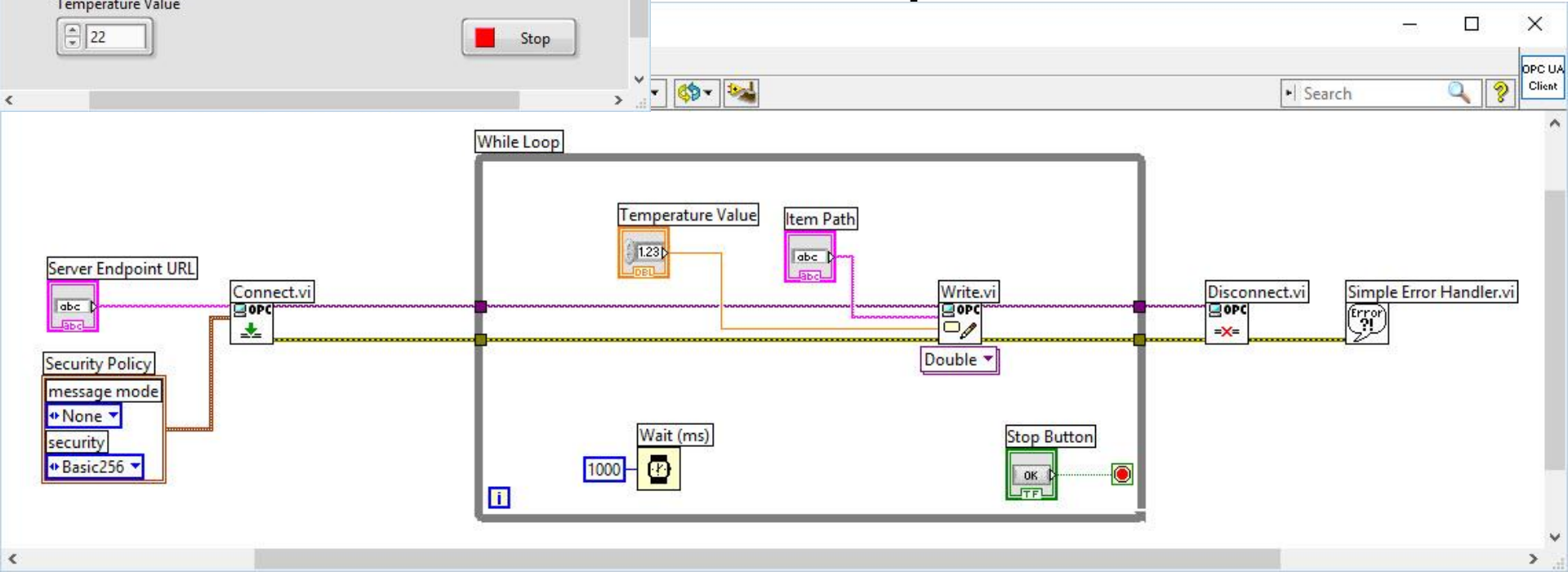
OPC UA **Client** (Write Values) Example in LabVIEW





Lets Create the Example from Scratch

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OPC UA Client – Write

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

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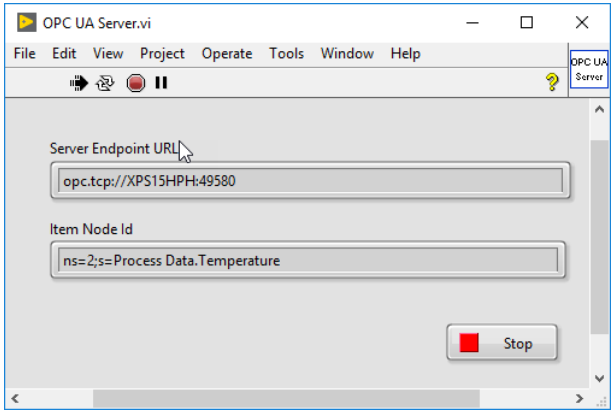
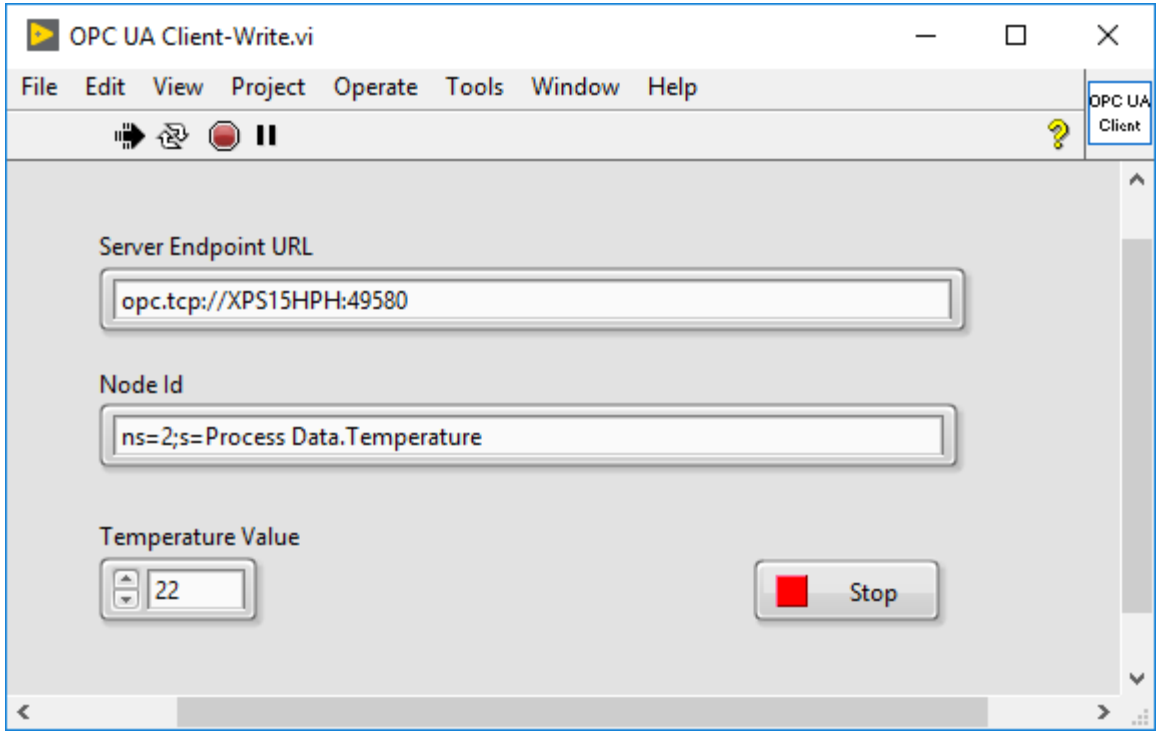
OPC UA Client Write Data





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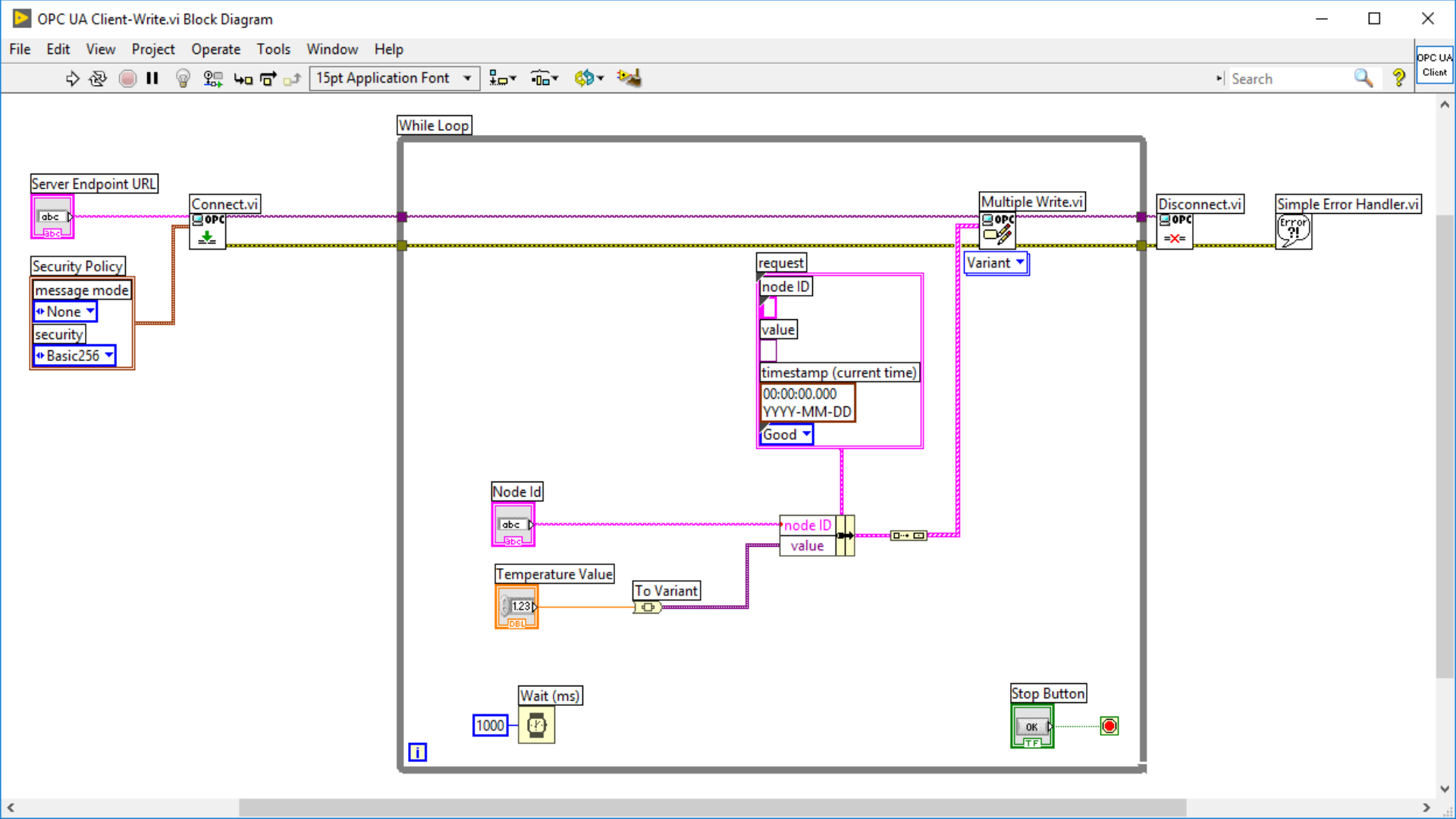
OPC UA Client-Write.vi Block Diagram
File Edit View Project Operate Tools Window Help
15pt Application Font
Search
OPC UA Client
While Loop
Server Endpoint URL
Connect.vi
Security Policy
message mode
None
security
Basic256
Multiple Write.vi
Disconnect.vi
Simple Error Handler.vi
request
node ID
value
timestamp (current time)
00:00:00.000
YYYY-MM-DD
Good
Variant
Node Id
node ID
value
Temperature Value
To Variant
Wait (ms)
1000
Stop Button
OK

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OPC UA Client - Read

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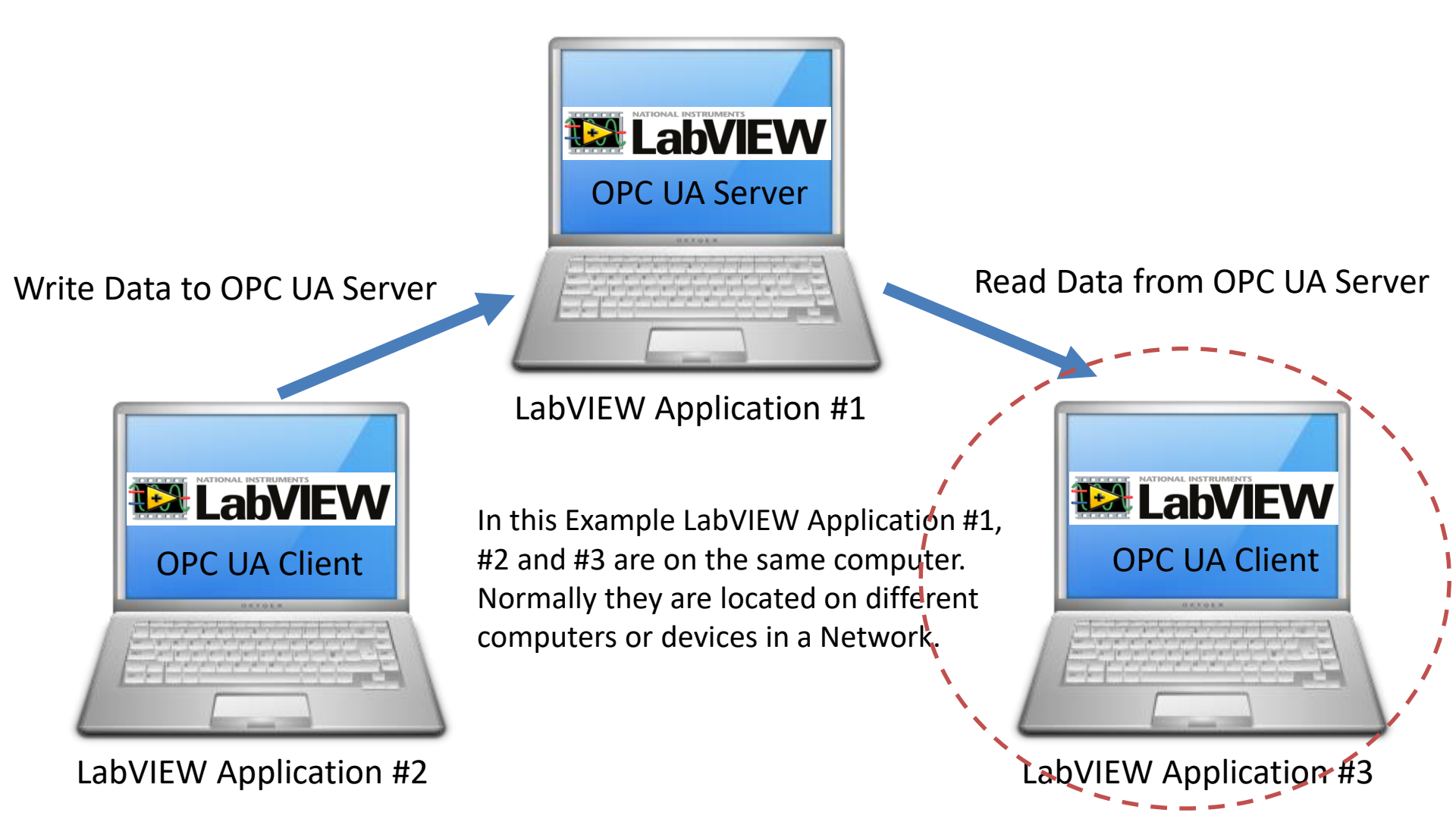
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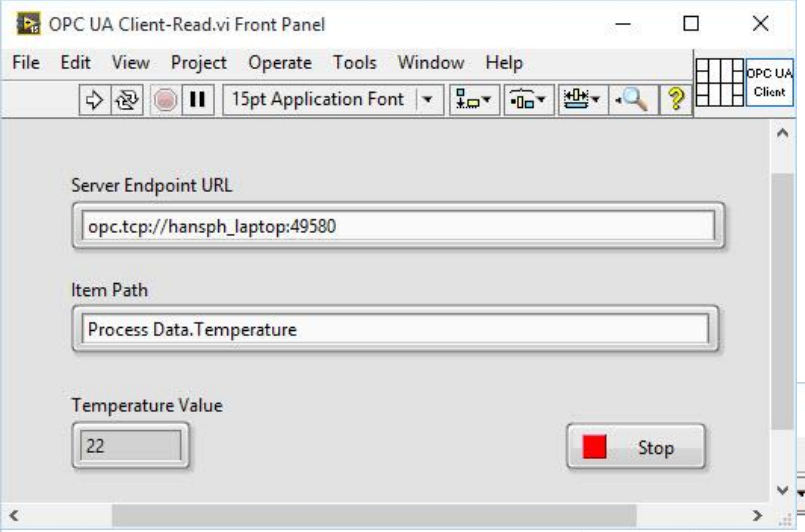
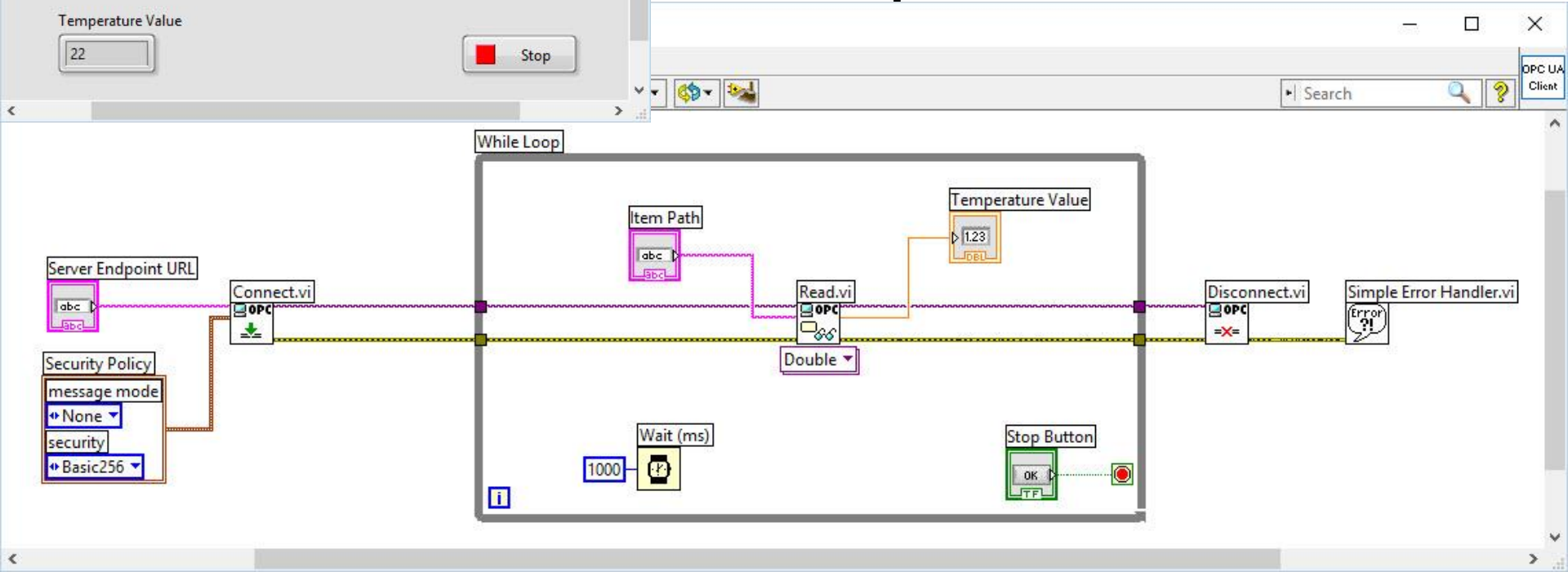
OPC UA **Client**
(Read Values)
Example in LabVIEW





Lets Create the Example from Scratch

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OPC UA Client – Read

Using OPC UA Toolkit with LabVIEW 2017 or newer

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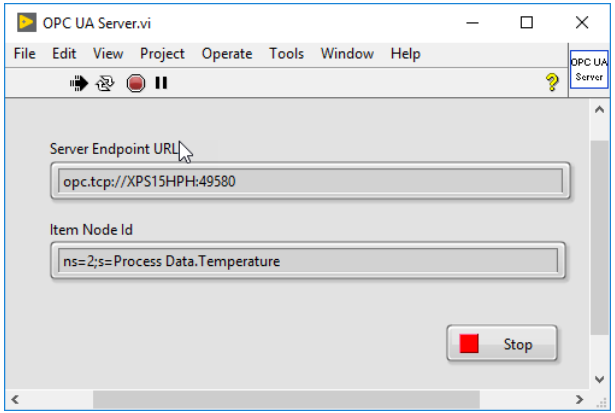
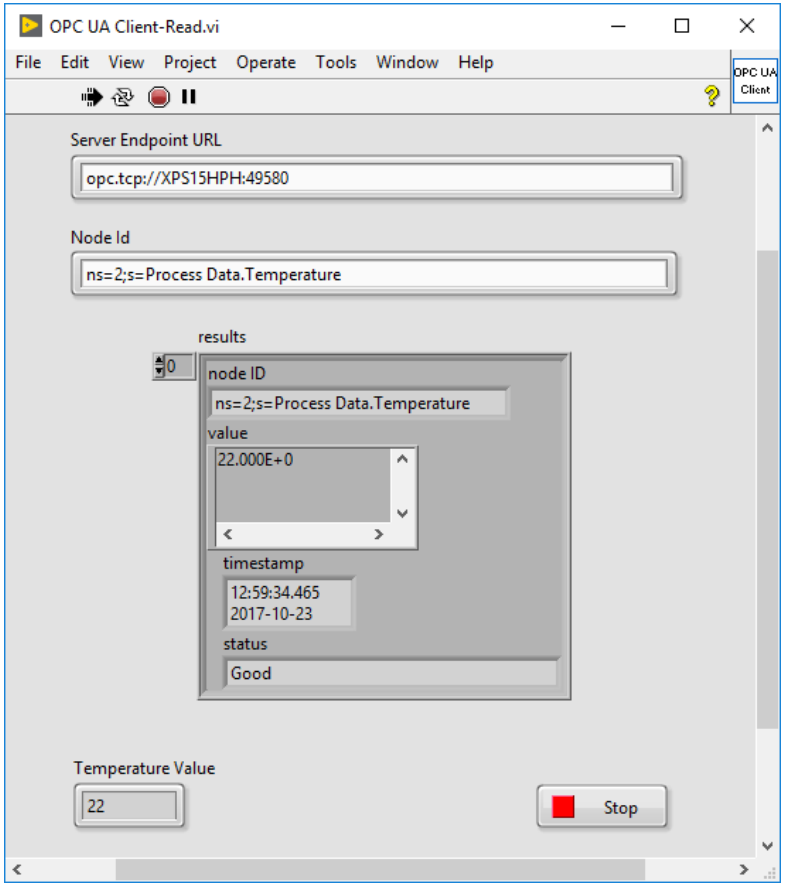
OPC UA Client Read Data





Using **OPC UA Toolkit**
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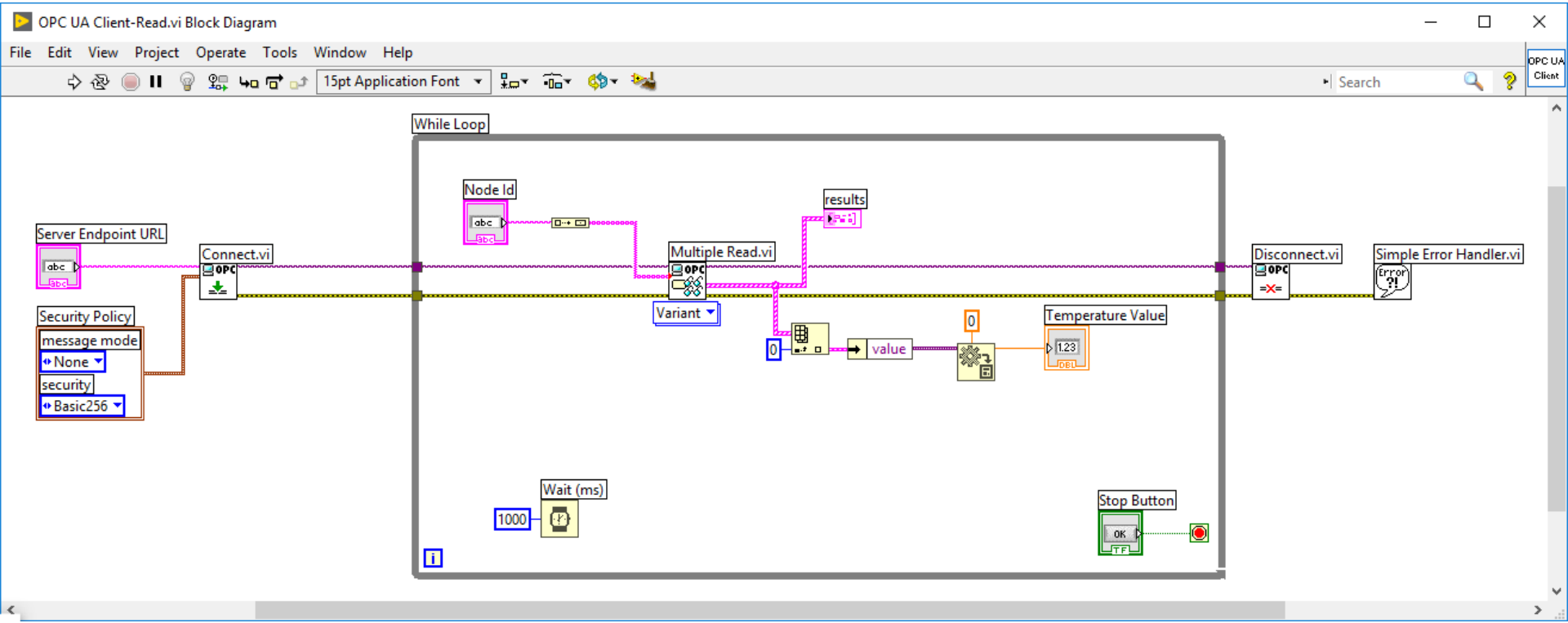
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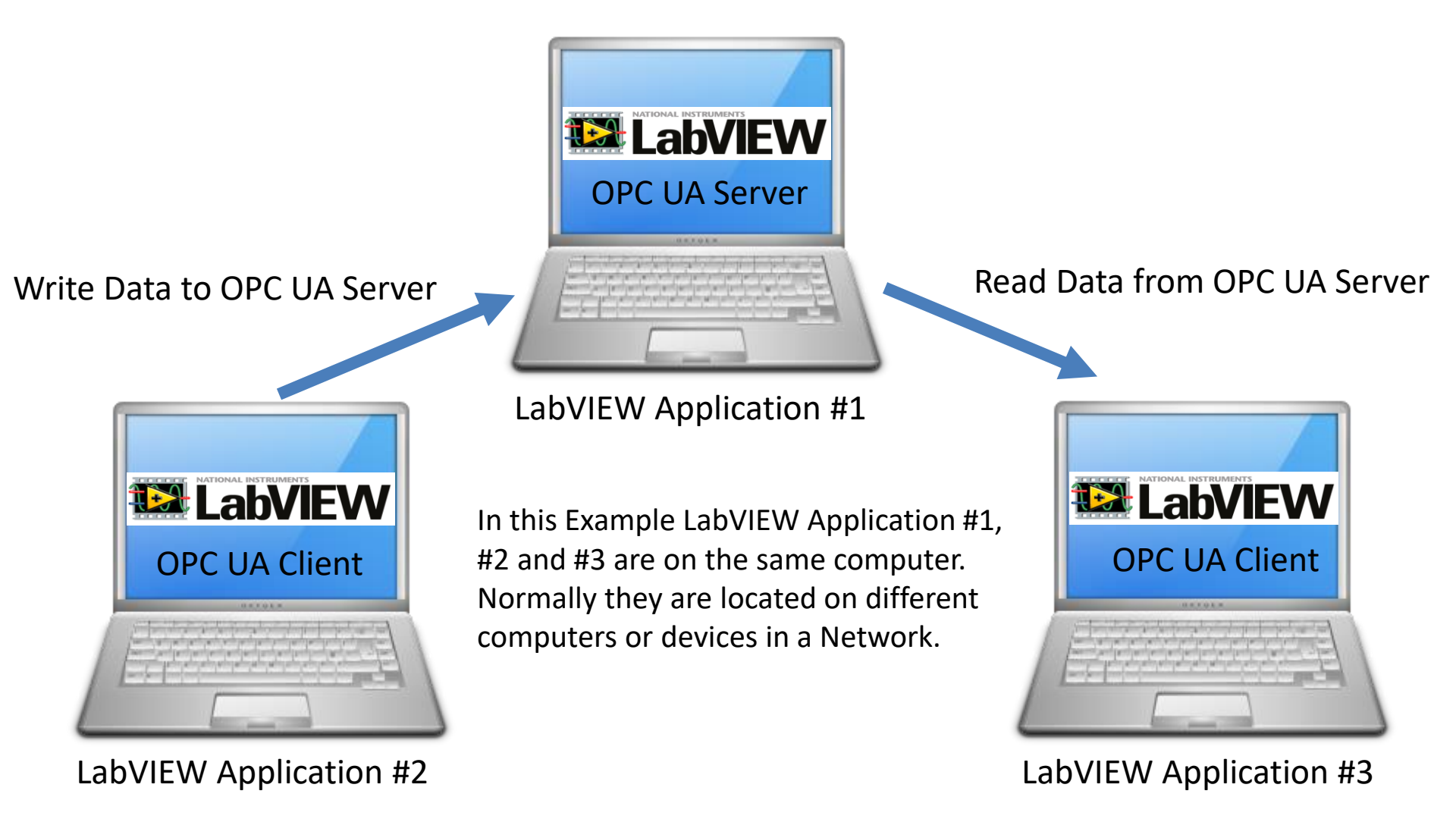
Disconnect.vi
Simple Error Handler.vi
Security Policy
message mode
None
security
Basic256
Variant
0
value
Temperature Value
Wait (ms)
1000
Stop Button
OK
TF
i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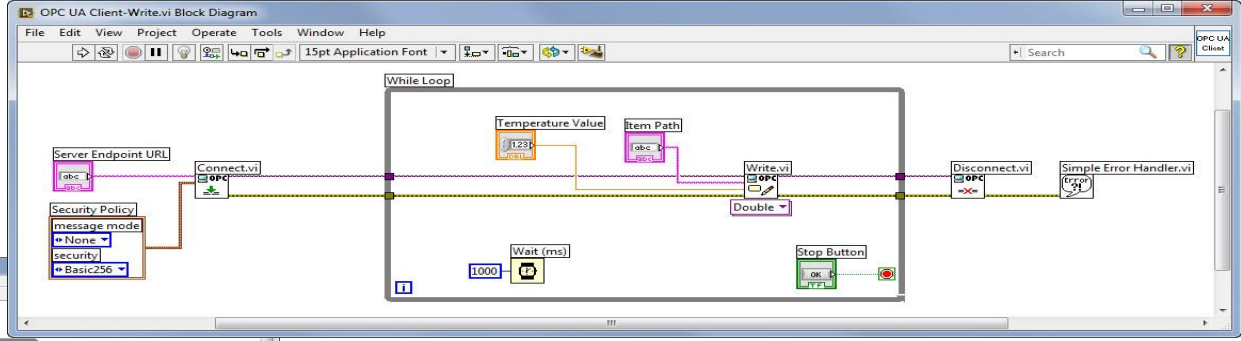
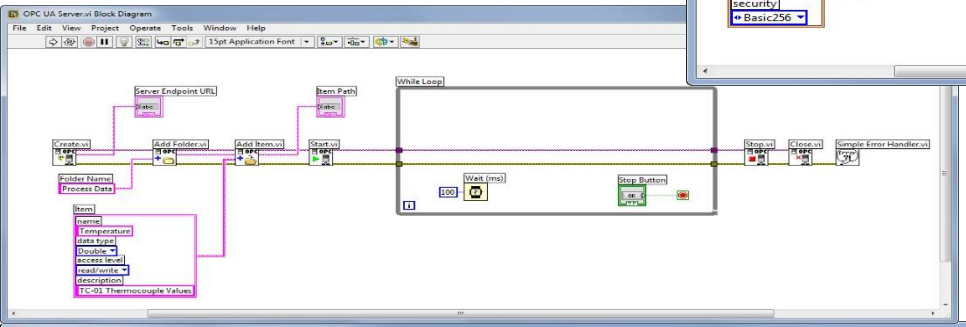
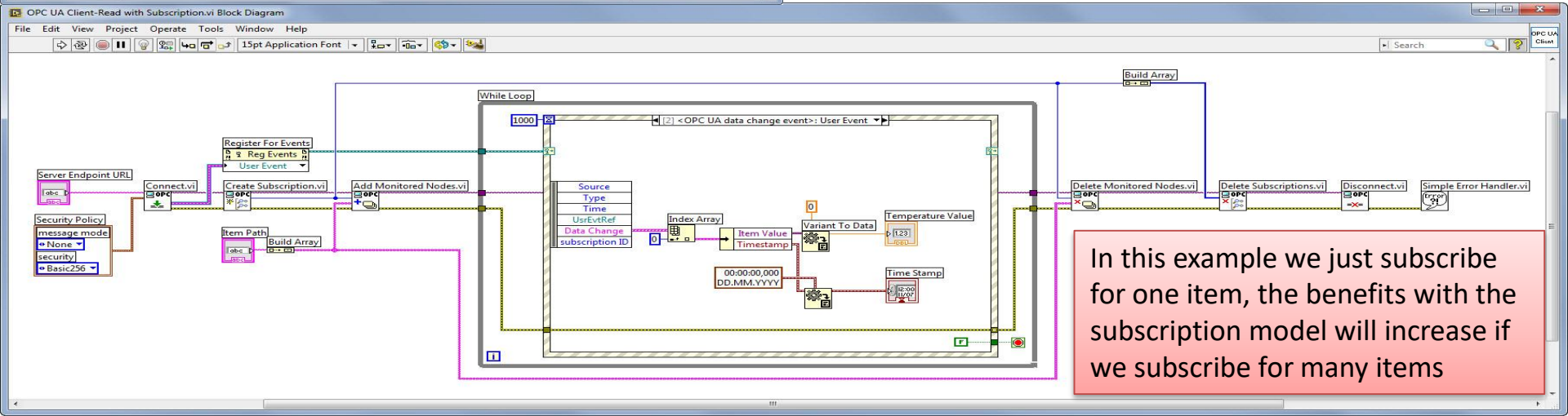
Lets run the OPC UA Server and OPC UA Clients at the same time

OPC UA Client with **Subscription**





This is a more complex example where you read data on the client only when the value on the server is changed



In this example we just subscribe for one item, the benefits with the subscription model will increase if we subscribe for many items

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