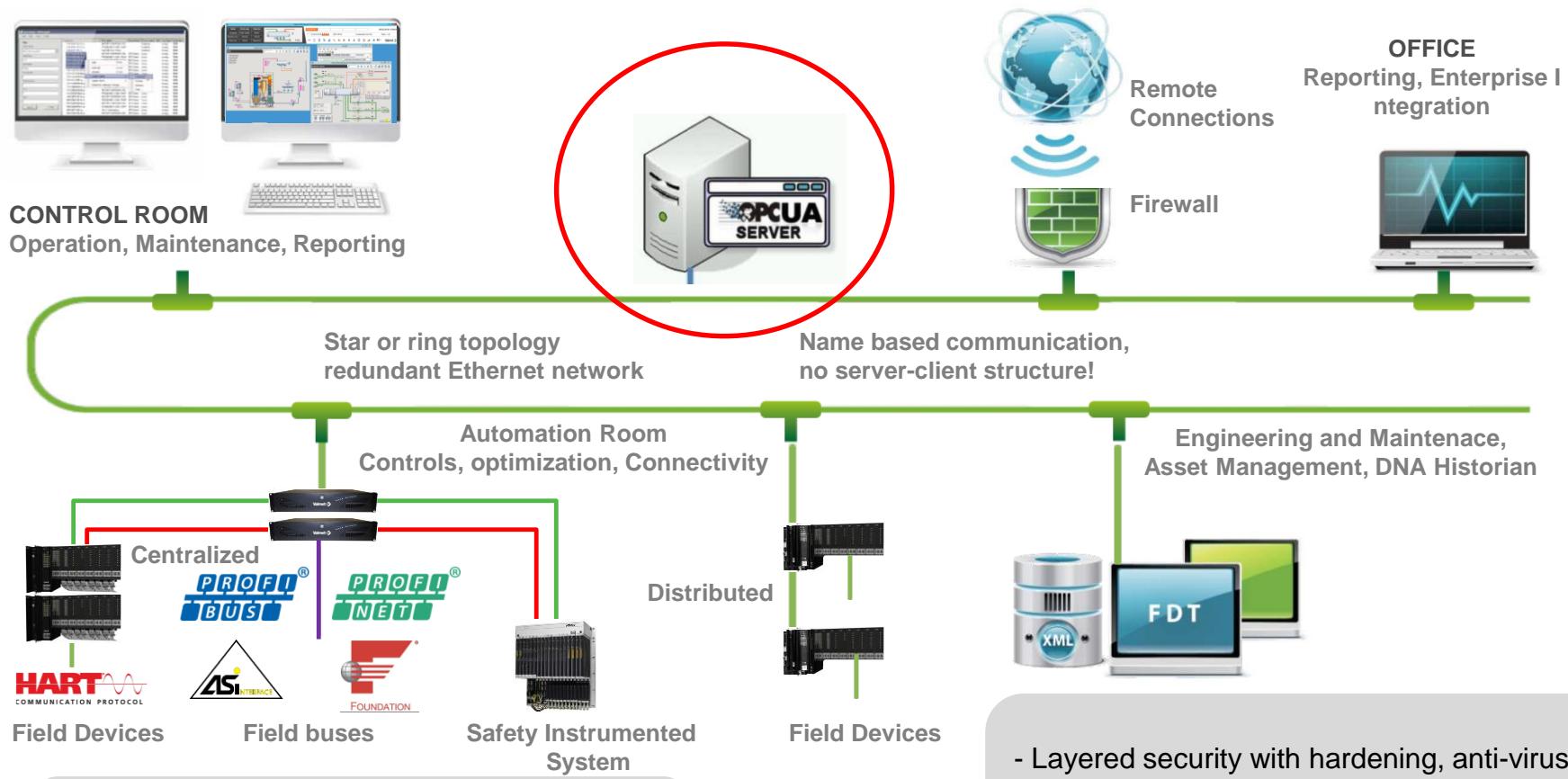


# Valmet DNA OPC UA Server & Client

# Valmet DNA OPC UA Server Overview



- Layered security with hardening, anti-virus and DMZ solutions
- Efficient Engineering tools
- Advanced history functions and reports

# Valmet DNA OPC UA Server

- OPC UA Server software in Windows WS or Linux
  - Support for Data Access, Alarms & Events (A&E) and History Access (HA)
  - No configuration needed
  - Capacity : several thousands per server – 5000 tested, max 10000
  - Performance : subscription based ~1sec

# DNA OPC UA Components & licenses

- Components
  - DNA OPC UA Server software
    - DNA-OPCUA-Server
    - DNA-OPCUA-Client
    - DNA-OPCUA-AutoConfig
    - DNA-OPCUA-Discovery
  - Diagnostic templates: Server, Session, Subscription
- Licenses:
  - Start
  - Capacity
    - UaVariables (subscription based)
  - Features (on/off):
    - Historical Access (HA)
    - Alarms & Events (AE)

# DNA OPC UA Server

- Provides full Valmet DNA address space:
  - Configuration can be done manually (node + type + DNA tag)
  - Automatic scan will lookup and create all ports into OPC UA Server
- Security can be configured:
  - User & passwd
  - Certificates
- UA Expert used to test & show server address space, views and call server methods (execute them)

# DNA OPC UA Server – Server Diagnostics

Integrated into Valmet DNA, can be used with other OPC UA Servers

Valmet DNA Operate D1U1/Demo process/D1UA OPC UA Server diagnostics

## D1UA OPC UA Server diagnostics

OPC UA Server	State	Running=0	Seconds till shutdown	0	Current time	18-09-10 12:14:43	D1UA
			Shutdown reason		Start time	18-09-10 12:03:22	
<b>Version information</b>							
ProductUri	DNA-NodeOPCUA	Architecture	Windows_NT				
ManufacturerName	Valmet Automation	Bytes read	1724969				
ProductName	NODEOPCUA-SERVER	Bytes written	2302052				
SoftwareVersion	0.4.5	Connections	2 bytes		Transactions	5615	
BuildNumber	1.1.0-snapshot.580	CPU count	4				
BuildDate	Thu Sep 06 2018 16:13:40	Memory used	29				
		Memory free/total	9180127232 /13018132480				
<b>Diagnostics</b>	<b>ON</b>	<b>Capabilities</b>			<b>OperationLimits</b>		
ServerViewCount	0	MinSupportedSampleRate	100	MaxNodesPerRead	1000		
CurrentSessionCount	2	MaxBrowseContinuationPoints	0	MaxNodesPerHistoryDataRead	0		
CumulatedSessionCount	2	MaxQueryContinuationPoints	0	MaxNodesPerHistoryReadEvents	0		
SecurityRejectedSessionCount	0	MaxHistoryContinuationPoints	0	MaxNodesPerWrite	1000		
RejectedSessionCount	0	MaxArrayLength	0	MaxNodesPerHistoryUpdateDate	0		
SessionTimeoutCount	0	MaxStringLength	0	MaxNodesPerHistoryUpdateEvents	0		
SessionAbortCount	0			MaxNodesPerMethodCall	0		
PublishingIntervalCount	0			MaxNodesPerBrowse	2000		
CurrentSubscriptionCount	4			MaxNodesPerRegisterNodes	0		
CumulatedSubscriptionCount	4			MaxNodesPerTranslateBrowsePathsToNodeIds	0		
SecurityRejectedRequestsCount	0			MaxNodesPerNodeManagement	0		
RejectedRequestCount	0			MaxMonitoredItemsPerCall	1000		
Sessions	1 2 3 4 5 6 7 8 9 10	Subscriptions	1 2 3 4 5 6 7 8 9 10				

# DNA OPC UA Server – Session Diagnostics

As many as open sessions

The screenshot shows a software interface titled "Valmet DNA Operate D1U1/Demo process/D1UA OPC UA Server session diagno...". The main title bar includes standard window controls (minimize, maximize, close) and a magnifying glass icon. Below the title bar, the window has a dark header bar with the text "D1UA OPC UA Server session diagnostic" and "SESSION0". To the right of the header are several icons: a left arrow, a right arrow, an up arrow, a down arrow, a circular arrow, a magnifying glass, a camera, a gear, and a square.

The main content area is titled "OPC UA Server Session Diagnostics" and "D1UA". It contains two sections: "Session information" and "Diagnostics counters".

**Session information**

SessionId	52F43077-FE69-D6E3-1D26-FCFB2636AD18	Connection time	18-09-10 12:04:18
SessionName	Client4DNA1	Last contact time	18-09-10 12:15:45
ApplicationUri	urn:TREVBRUN:Node-OPCUA-Se	ActualSessionTimeout	60000
ProductUri	NodeOPCUA-Client	Current Subscriptions	1
ApplicationName	NodeOPCUA-Client	Current Items	0
ApplicationType	CLIENT	Publish queue	5
		Unauthorized requests	0

**Diagnostics counters**

	Total	Errors
Requests	5180	0
Reads	1814	0
Writes	0	0
Calls	1	0
CreateItems	0	0
DeleteItems	0	0
CreateSubscriptions	1	0
Publish	3359	0
DeleteSubscriptions	0	0
Browse	0	0
BrowsePaths to NodeIds	0	0

# DNA OPC UA Server – Subscription Diagnostics

As many as open subscriptions

The screenshot shows a software interface titled "Valmet DNA Operate D1U1/Demo process/D1UA OPC UA Server subscription di...". The main title bar includes standard window controls (minimize, maximize, close) and a search bar with the placeholder "ER\_SUBS0". Below the title bar, a toolbar contains icons for various operations like refresh, search, and navigation.

The main content area is titled "D1UA OPC UA Server subscription diag" and "OPC UA Server Subscription Diagnostics". It displays two sections: "Subscription information" and "Diagnostics counters".

**Subscription information**

SessionId	52F43077-FE69-D6E3-1D26-FCFB2636AD18
SubscriptionId	271743
Publishing Interval	100
MaxKeepAliveCount	2
MaxLifeTimeCount	1000
MaxNotificationsPerPublish	65000

**Diagnostics counters**

Publish Requests	0
Event Notifications	0
Notifications	0
MonitoredItems	0
Next Sequence Number	1

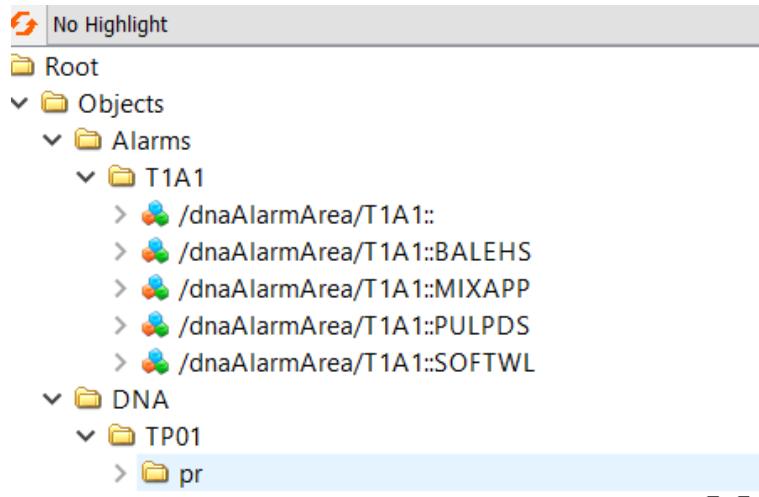
# OPC UA DNA objects

Timestamp from DNA (UTC time)

- Basic types
  - ana -> Float + Quality
  - bin -> Uns16 + Quality
  - ints > Int16 + Quality
  - intl -> INt32 + Quality
  - binev -> Uns16 + SourceTimestamp + Quality (timestamp from the IO-channel)
- Function blocks supported
  - Am, bin, mtrX, mgvX, pid, etc.
- Table types supported
  - 1 / 2 / 3 dimensions
  - QCS profile data & Condition monitoring vibration data
- Diagnostic types
  - Dhart, dpbus, etc.

# DNA Alarms

- Automatic DNA ALS -> OPC UA event mapping
- DNAalarmLimit
- DNAdiscreteAlarm
- State synchronized
- Alarm can be “acknowledged” by OPC UA client
- Alarms are in alarm hierarchy
- Timestamp from DNA



# DNA Alarms

## Controller pid control disturbance

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

File View Server Document Settings Help

Project

- Project
- Servers
  - DNA-NodeOPCUA - None - None (uatcp-uasc-uabinary)
- Documents
  - Data Access View
  - Event View

Address Space

No Highlight

Root

Objects

- Alarms
  - T1A1
    - /dnaAlarmArea/T1A1:
    - /dnaAlarmArea/T1A1::BALEHS
    - /dnaAlarmArea/T1A1::MIXAPP
    - /dnaAlarmArea/T1A1::PULPDS
    - /dnaAlarmArea/T1A1::SOFTWL
- DNA
  - TP01
    - pr
      - 220CTM
      - 220E-001
      - 220E-001.B
      - 220E-001.D
      - 220E-001.REF
      - 220E-001BY
      - 220E-002
      - 220E-002.B
      - 220E-002.D
      - 220E-002.REF
      - 220E-002BY
      - 220E-003
      - 220E-003.B
      - 220F-003.D

Events

Events Alarms Event History

A	C	Time	Severity	Server/Object	SourceName	Message	EventType	Active
⚠		22.39.35	900	DNA-Node...	270ES11-005C	Breaker Open	DNAAdiscret...	Active
✓		22.39.35	700	DNA-Node...	284LI-002	Acknowledge	DNALimitAl...	Active
✓		22.39.35	500	DNA-Node...	TEST-AM	Acknowledge	DNALimitAl...	Active
⚠		22.39.35	700	DNA-Node...	TM2-BWRL opr	Cntrl disturb.	DNAAdiscret...	Active
✓		22.39.35	700	DNA-Node...	TM2-CRC1 opr	Acknowledge	DNAAdiscret...	Active
⚠		22.39.35	700	DNA-Node...	TM2-ODFF opr	Cntrl disturb.	DNAAdiscret...	Active
⚠		22.39.35	700	DNA-Node...	TM2-ODRL opr	Cntrl disturb.	DNAAdiscret...	Active

Details

Name	Value
AckedState/Id	False
ActiveState	"" "Active"
ActiveState/Id	True
BranchId	Nodeld
NamespaceIndex	0
IdentifierType	Numeric
Identifier	0

Attributes

Attribute	Value
Nodeld	Nodeld
NamespaceIndex	1
IdentifierType	String
Identifier	T1A1
NodeClass	Object
BrowseName	"T1A1"
DisplayName	"T1A1"
Description	"DNA Alarm server"
WriteMask	0
UserWriteMask	0

References

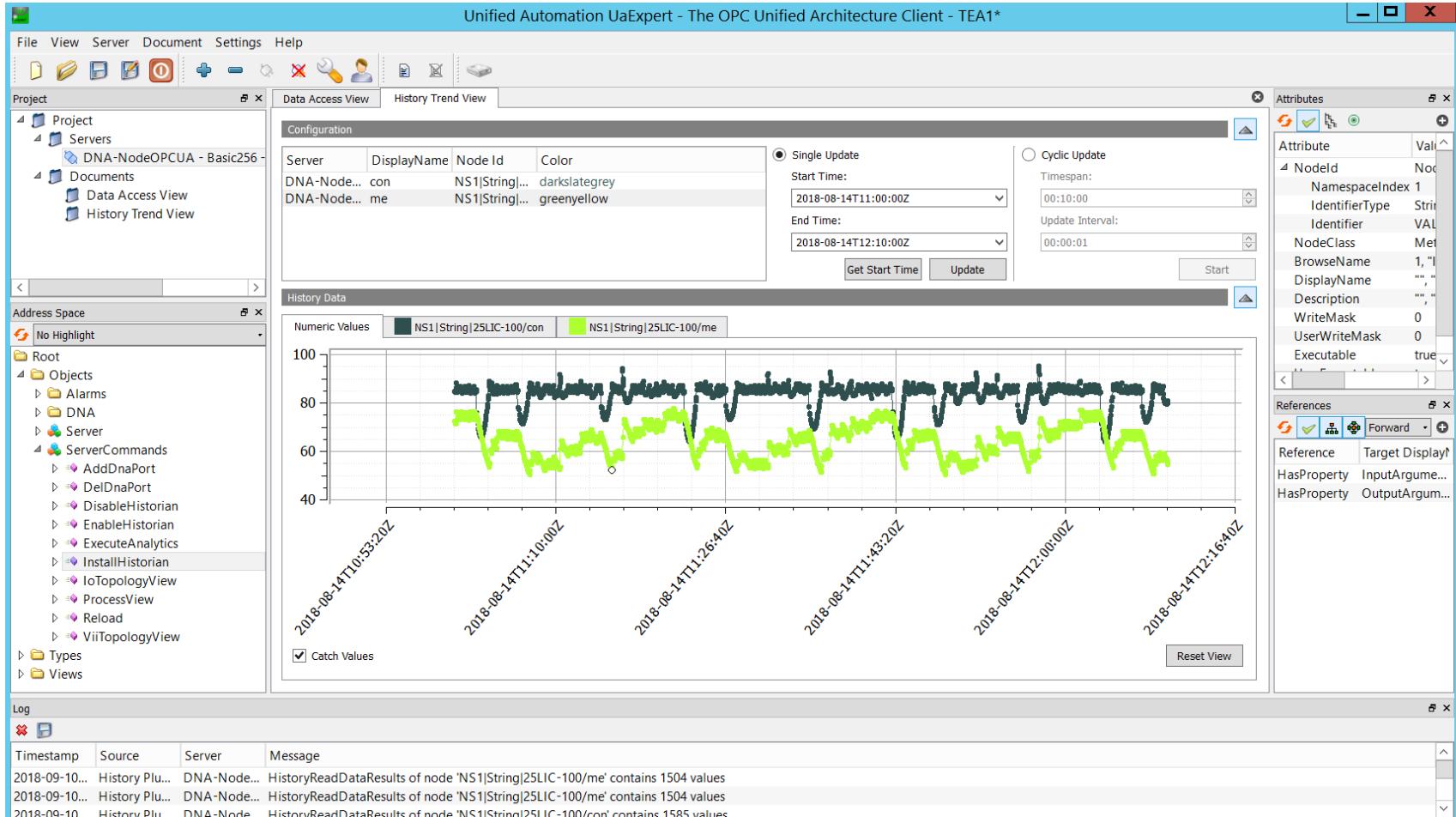
Reference	Target DisplayName
HasTypeDe...	FolderType
HasCompo...	/dnaAlarmArea/T1A1::SOFTWL
HasNotifier	/dnaAlarmArea/T1A1::SOFTWL
HasCompo...	/dnaAlarmArea/T1A1::PULPDS
HasNotifier	/dnaAlarmArea/T1A1::PULPDS
HasCompo...	/dnaAlarmArea/T1A1::BALEHS
HasCompo...	/dnaAlarmArea/T1A1::
HasNotifier	/dnaAlarmArea/T1A1::
HasCompo...	/dnaAlarmArea/T1A1::MIXAPP
HasNotifier	/dnaAlarmArea/T1A1::MIXAPP
HasCompo...	/dnaAlarmArea/T1A1::HOOD
HasNotifier	/dnaAlarmArea/T1A1::HOOD
HasCompo...	/dnaAlarmArea/T1A1::TM
HasNotifier	/dnaAlarmArea/T1A1::TM
HasCompo...	/dnaAlarmArea/T1A1::DRIVES
HasNotifier	/dnaAlarmArea/T1A1::DRIVES
HasCompo...	/dnaAlarmArea/T1A1::ETREAT
HasNotifier	/dnaAlarmArea/T1A1::ETREAT

Log

Timestamp	Source	Server	Message
17.5.2017 22...	TypeCache	DNA-Node...	Reading type info of Nodeld NS1 Numeric 1006 succeeded
17.5.2017 22...	TypeCache	DNA-Node...	Reading type info of Nodeld NS1 Numeric 1005 succeeded
17.5.2017 22...	TypeCache	DNA-Node...	Reading type info of Nodeld NS1 Numeric 1001 succeeded

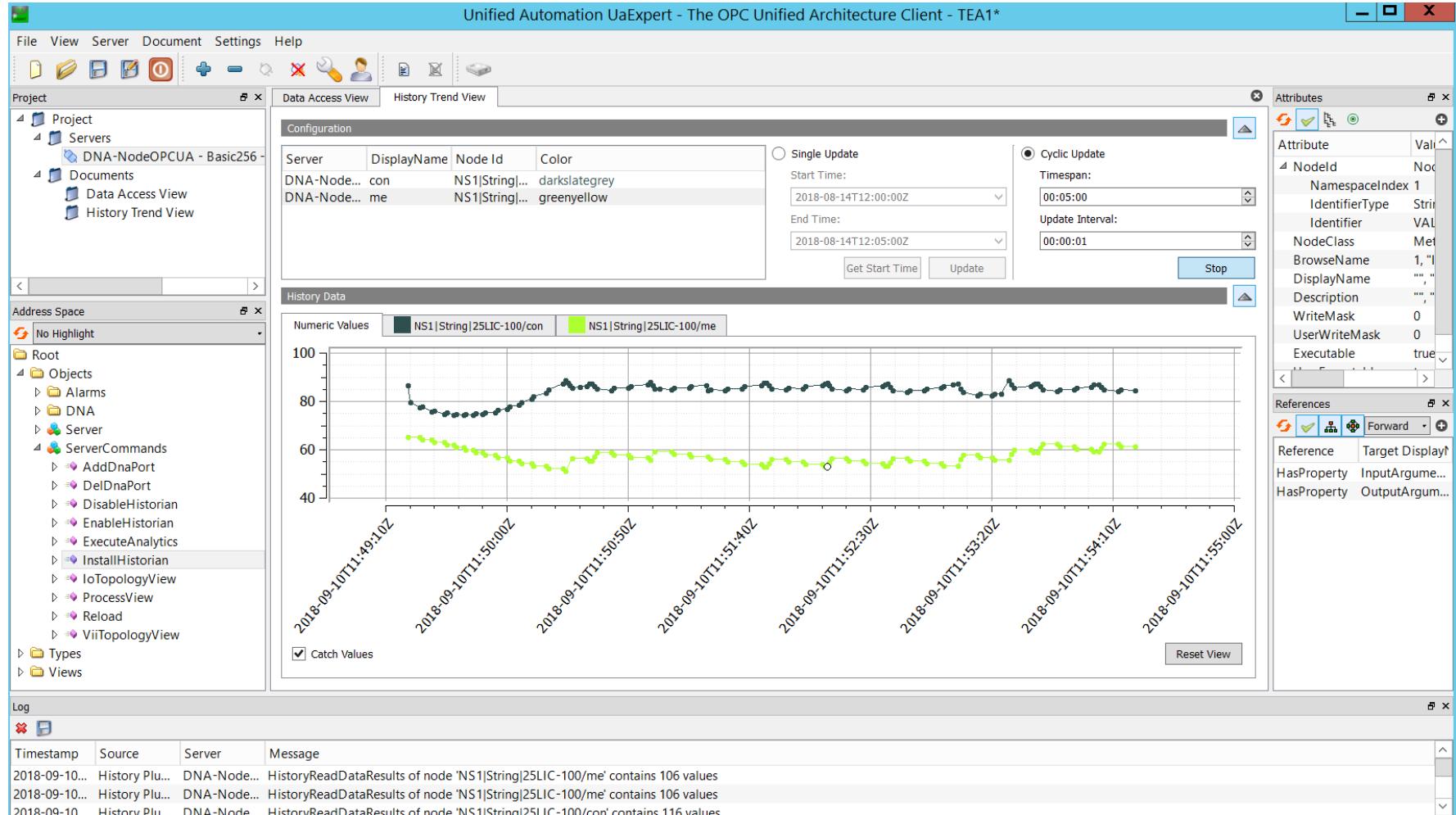
# DNA INFO

## Access to historical data through OPC UA



# DNA INFO

## Access to historical data through OPC UA



# DNA OPC UA Server methods

Can be used to update address space and other new features

The screenshot shows the Unified Automation UaExpert software interface. The main window has a title bar "Unified Automation UaExpert - The OPC Unified Architecture Client - TEA1". The menu bar includes File, View, Server, Document, Settings, and Help. The toolbar contains various icons for file operations and navigation.

The left sidebar displays the "Project" tree, which includes "Servers" (with "DNA-NodeOPCUA - Basic256" selected), "Documents" (with "Data Access View" and "History Trend View" selected), and "Address Space". The "Address Space" section shows a tree structure under "Root" with categories like "Objects", "Server", and "ServerCommands".

The central area contains three tabs: "Data Access View", "History Trend View", and "Attributes". The "Data Access View" tab is active, showing a table with the following data:

#	Server	Node Id	Display Name	Value	Datatype	Source Timestamp	Server Timestamp	Status
1	DNA-Node...	NS1[String]TABLETEST_AN...	elem	Double clic...	Float	2018-09-10T09:20:14.905Z	2018-09-10T09:20:14.905Z	Good
2	DNA-Node...	NS1[String]TABLETEST_AN...	elem	{0,0,0,0,0,0}	Float	2018-09-10T09:20:14.795Z	2018-09-10T09:20:14.795Z	Good
3	DNA-Node...	NS1[String]TABLETEST_AN...	elem	{0,0,0,0,0,0}	Float	2018-09-10T09:20:14.795Z	2018-09-10T09:20:14.795Z	Good
4	DNA-Node...	NS1[String]TABLETEST_BI...	elem	(48,48,48,48,	UInt16	2018-09-10T09:20:14.907Z	2018-09-10T09:20:14.907Z	Good
5	DNA-Node...	NS1[String]25LIC-100/con	con	72.127	Float	2018-09-10T09:20:40.466Z	2018-09-10T09:20:40.466Z	Good
6	DNA-Node...	NS1[String]25LIC-100/me	me	58.4801	Float	2018-09-10T09:20:40.050Z	2018-09-10T09:20:40.050Z	Good
7	DNA-Node...	NS1[String]25LIC-100/isp	isp	2	Int16	2018-09-10T09:20:14.860Z	2018-09-10T09:20:14.860Z	Good (0)

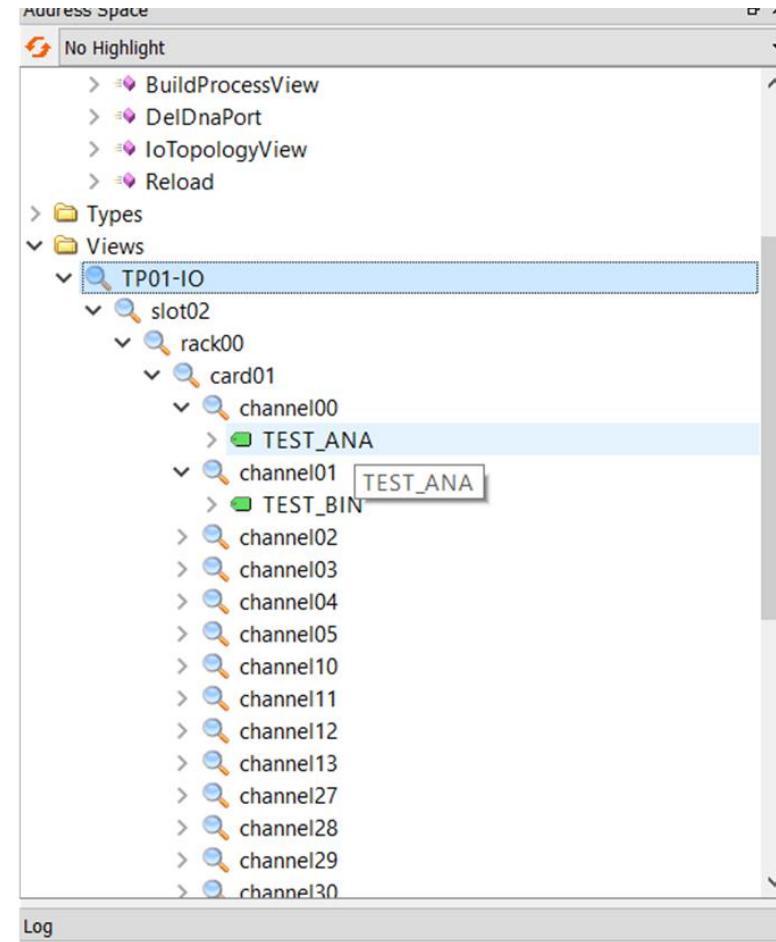
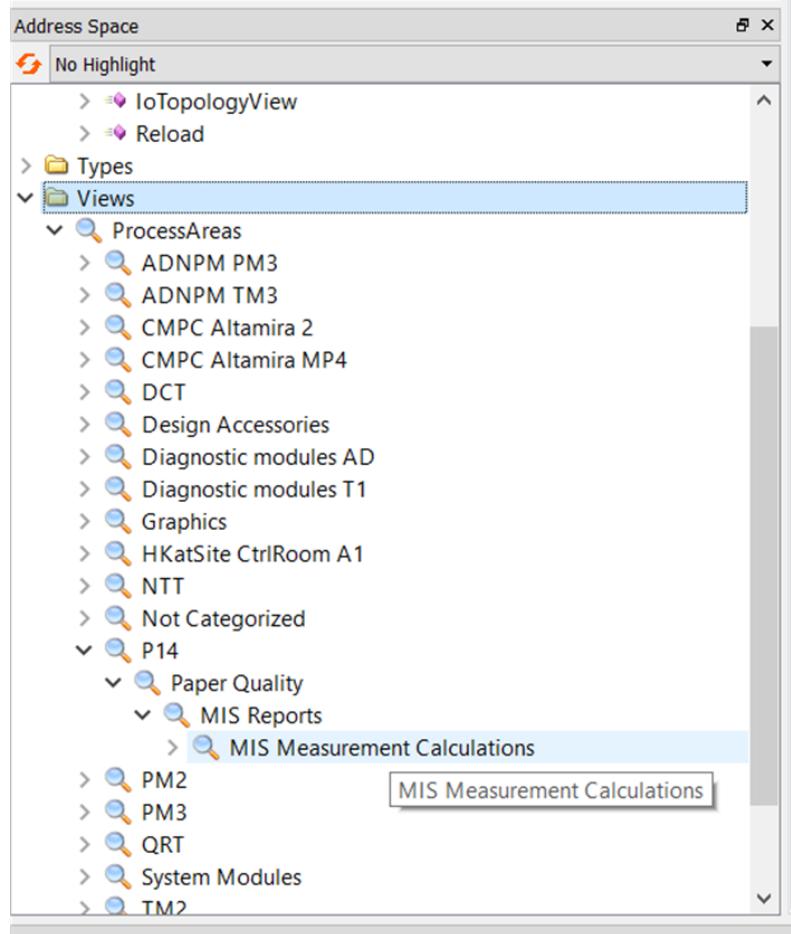
The "Attributes" tab shows an empty table with columns "Attribute" and "Value". The "References" tab also shows an empty table with columns "Reference" and "Target Display".

The bottom section contains a "Log" table with columns "Timestamp", "Source", "Server", and "Message". The log entries are:

Timestamp	Source	Server	Message
2018-09-10...	AddressSpa...	DNA-Node...	Browse succeeded.
2018-09-10...	TypeCache	DNA-Node...	Reading type info of NodeId NS1[String]25LIC-100/isp succeeded
2018-09-10	TypeCache	DNA-Node...	Reading type info of NodeId NS1[String]25LIC-100/me succeeded

# OPC UA - Views

## Process Areas and IO-Topology



# DNA – OPC UA Client

# Valmet DNA OPC UA Client

- OPC UA Client is software in Windows WS or Linux
  - Support for Data Access and OPC A&E
  - Capacity : several thousands per server -TBD
  - Performance : With DNA ~1500/sec, depends on the other side server PLC / Smaller CPU & memory, slower performance

# DNA OPC UA Client

Communicate with 3<sup>rd</sup> party OPC UA Server

- Configuration:
  - OPC UA Server variable address + type
  - DNA tag + type
- Read -> Write
- Parameters for tuning communication and logging in client\_cpu.json
- Call server / object methods
  - Method parameters can be introduced as variables, read from DNA

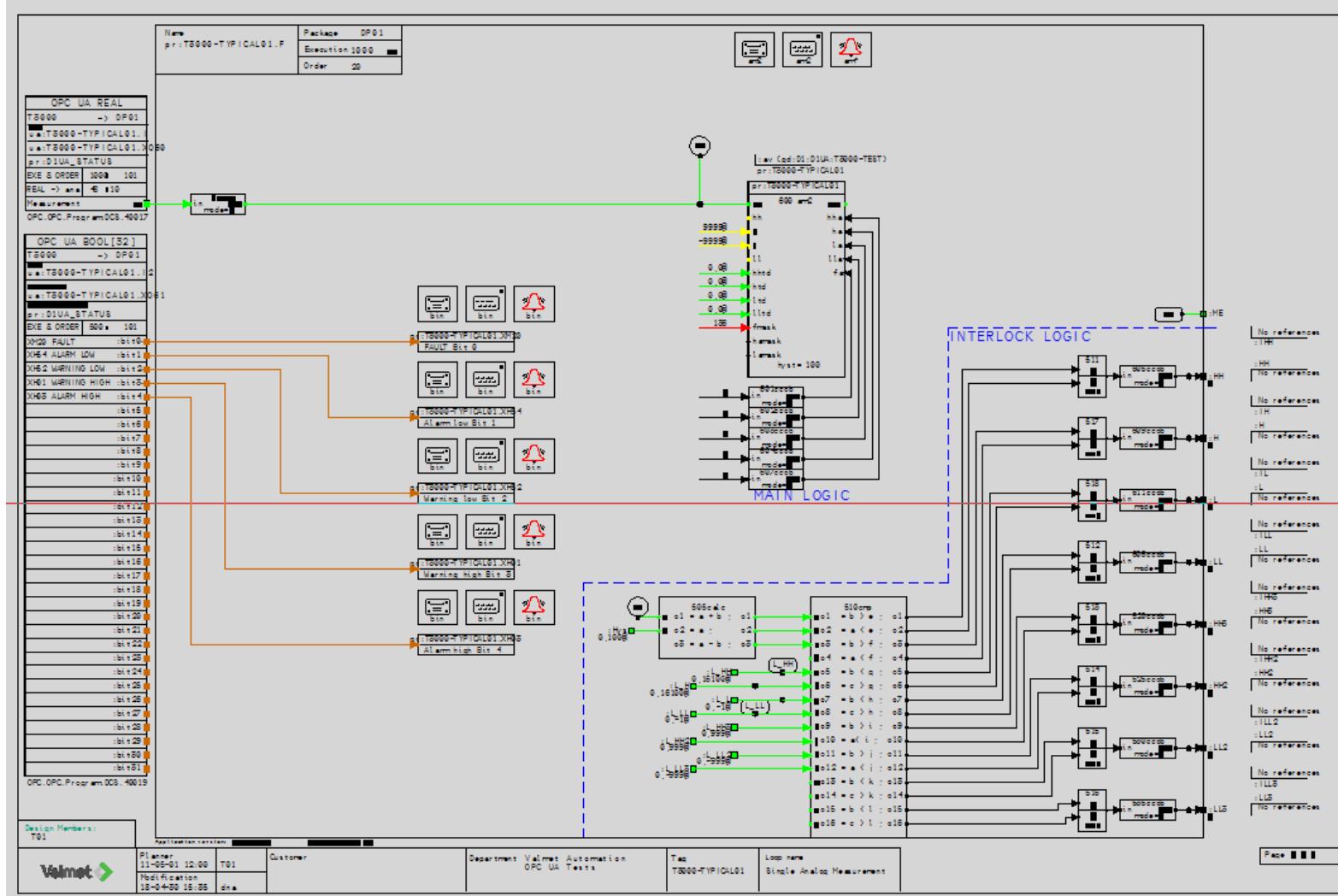
# DNA OPC UA Client

## Configuration file example

- ReadName1 Type1 WriteName2 Type2
- // Server CurrentTime
- ns=0;i=2258 UtcTime ua:D1UA-STATUS.TIME binev // Watchdog if client if not updated do set fail bits
- // Typical 01, Single Analog Measurement
- ns=2;s="OPC.OPC.Program.DCS.40017" Float ua:T3000-TYPICAL01.XQ60 ana // Value
- ns=2;s="OPC.OPC.Program.DCS.40019" Boolean[16] ua:T3000-TYPICAL01.XQ61 bin\_5 // Status
- // End of example

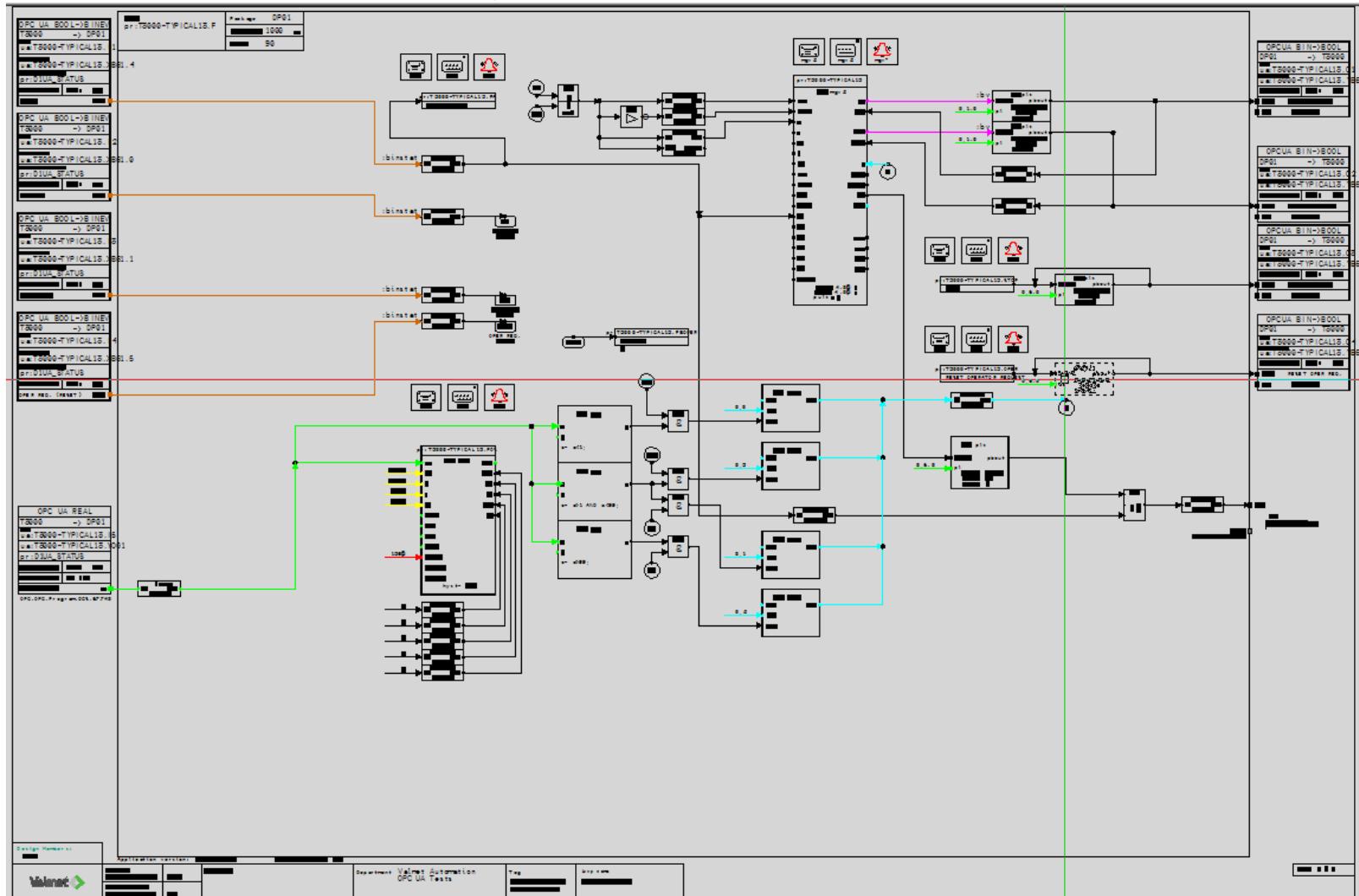
# DNA OPC UA Client – DNA application

## FbCAD with OPC UA IO-symbols: Analog measurement



# DNA OPC UA Client – DNA application

FbCAD with OPC UA IO-symbols: Valve actuator





# Other OPC UA stuff

# OPC UA - Test Server

## FAT application testing without actual PLC

Unified Automation UaExpert - The OPC Unified Architecture Client - Siemens-T3000\_Test\_Server

File View Server Document Settings Help

Project Data Access View Image Viewer Server Diagnostics View Attributes References Log

Address Space No Highlight Root Objects Server Simulate SimulateAll SimulateMeasurement SimulateMotor StopSimulations TestFolder ua:OPCUA-TEST.XA61 ua:OPCUA-TEST.XB54 ua:OPCUA-TEST.XQ51 ua:T3000-TYPICAL01.XQ60 ua:T3000-TYPICAL01.XQ61 ua:T3000-TYPICAL02.XQ11 ua:T3000-TYPICAL02.XQ12 ua:T3000-TYPICAL02.XQ13 ua:T3000-TYPICAL02.XQ60 ua:T3000-TYPICAL02.XQ61 ua:T3000-TYPICAL03.XQ61 ua:T3000-TYPICAL04.XQ61 ua:T3000-TYPICAL05.XB61 ua:T3000-TYPICAL05.YB61

Data Access View

#	Server	ode I	Display Name	Value	Datatype	urce Timestar	Time
1	FreeOpcUa Test_S...	NS...	ua:OPCUA-TEST.XA61	{false,false,false,false,fal...	Boolean	13.02.46	13....
2	FreeOpcUa Test_S...	NS...	ua:T3000-TYPICAL01.XQ60	-0.92683	Float	13.05.14	13....
3	FreeOpcUa Test_S...	NS...	ua:T3000-TYPICAL02.XQ61	{false,false,false,false,fal...	Boolean	13.02.46	13....

Attributes

Attribute	Value
NodeID	Nodeld Namespacelndex 2 IdentifierType String Identifier SimulateAll NodeClass Method BrowseName 2, "SimulateAll" DisplayName "", "SimulateAll" Description "", "SimulateAll" WriteMask 0 UserWriteMask 0 Executable true UserExecutable true

References

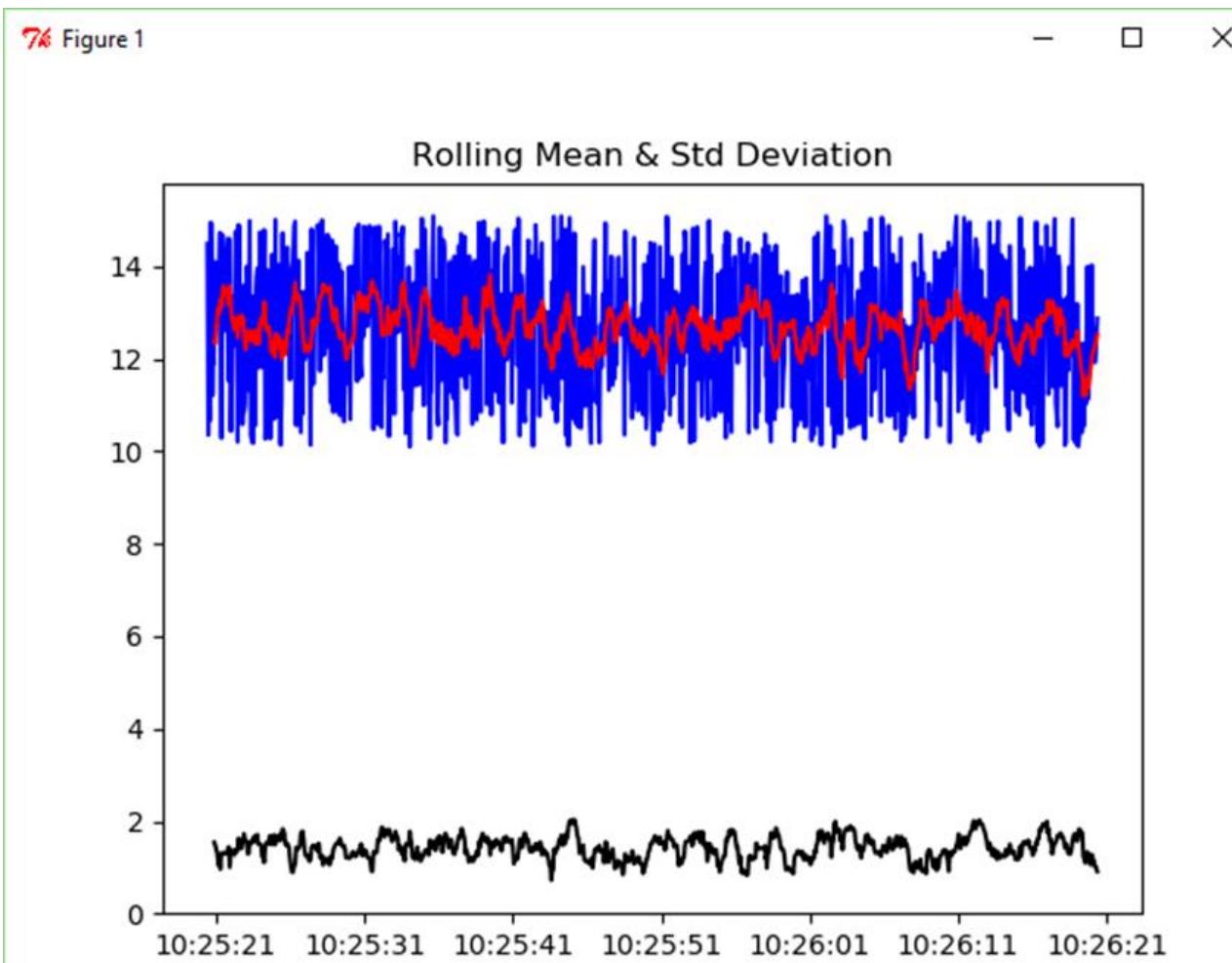
Reference	Target DisplayName
-----------	--------------------

Log

Timestamp	Source	Server	Message
11.11.2018 1...	Method Plu...	FreeOpcU...	<-- QascMethodPlugin::sltMethodCall()
11.11.2018 1...	Method Plu...	FreeOpcU...	The number of received output arguments (1) does not match the number of specified output arguments (0)
11.11.2018 1...	Method Plu...	FreeOpcU...	Call succeeded

# OPC UA – Edge level Machine Learning

Analysis through OPC UA HA



# Valmet ADI Server – Smart Consistency meter

Prototype to provide data through OPC UA

The screenshot shows the Unified Automation UaExpert application window. The main area displays the Data Access View, which lists 10 nodes from a server named "Valmet Analyzer". The columns include #, Server, Node Id, DisplayName, Value, and Datatype. The Address Space pane on the left shows a hierarchical tree of objects under "DeviceSet", including "SmartConsistencyAnalyzer" and "DeviceTopology". The Log pane at the bottom shows a timestamped log of events related to address space browsing.

#	Server	Node Id	Display Name	Value	Datatype
1	Valmet Analyzer - ...	NS1[Numeric]1026	SerialNumber	1234567890	String
2	Valmet Analyzer - ...	NS1[Numeric]1032	SoftwareRevision	1.0.0.123	String
3	Valmet Analyzer - ...	NS1[Numeric]1029	Model	ADI - POC	String
4	Valmet Analyzer - ...	NS1[Numeric]1027	RevisionCounter	1	String
5	Valmet Analyzer - ...	NS1[Numeric]1028	Manufacturer	Valmet Automation	String
6	Valmet Analyzer - ...	NS1[Numeric]1033	HardwareRevision	1.2-arm	String
7	Valmet Analyzer - ...	NS1[Numeric]1031	DeviceRevision	1.1	String
8	Valmet Analyzer - ...	NS1[Numeric]1030	DeviceManual	<a href="http://www.valmet.com/">http://www.valmet.com/</a>	String
9	Valmet Analyzer - ...	NS1[String]TotalSolids	MyParameter	0.0627134791095	Double
10	Valmet Analyzer - ...	NS1[String]LocalTime	LocalTime	2018-11-11T11:00:10.125Z	String

**Data Access View**

**Address Space**

**Log**

