



# OPC & MES DAY FINLAND 2014

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# Interoperability with different implementation languages

## Presentation structure

- Interoperability evaluation with different hardware platforms, operating systems and implementation languages
  - Application examples
- Prototyping OPC UA information model for legacy integration
  - Data models

# OPC UA Interoperability

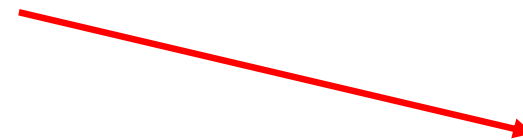
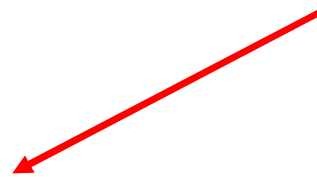
## Evaluation with different operating systems

- Target hardware & Operating system:
  - BeagleBone Black (ARM), Ubuntu 13.04 Linux
    - OPC UA Stack pure javascript
  - Lenovo ThinkPad (Intel), Windows 7
    - OPC UA Stack C#
    - OPC UA Java
  - Samsung Note 10.1 (ARM), Android 4.2
    - OPC UA Java
  - Vuzix M100 (ARM), Android 4.0.2
    - OPC UA Java
  - Beckhoff PLC (Intel), Windows CE
    - OPC UA Ansi C
  - Wapice WRM (ARM), Linux
    - OPC UA Ansi C

# OPC UA client in node-red

Bluetooth LE sensor integrated with OPC UA client (javascript)

- TI Sensortag measuring
  - Advertises information
- OPC UA client writing data to OPC UA server



OPC UA  
server

# Node-red

## Visual flow + event based messaging

Node-RED

home | blog | documentation | flows | github

## Node-RED

A visual tool for wiring the Internet of Things

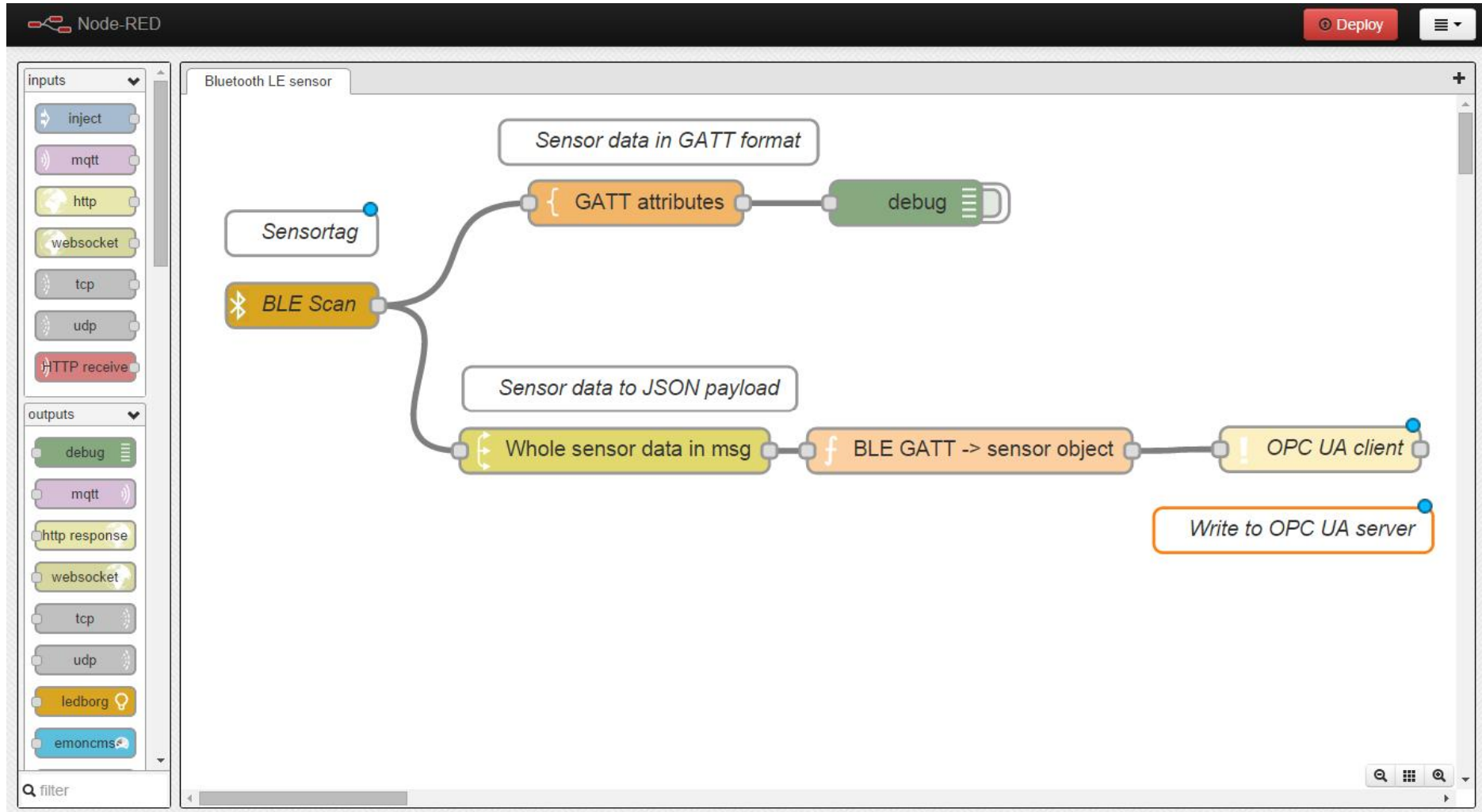
Node-RED is a tool for wiring together hardware devices, APIs and online services in new and interesting ways.

[Download v0.9.0](#)

[Need help? Try the Getting Started guide](#)

# OPC UA client in node-red

Bluetooth LE sensor integrated with OPC UA client (javascript)



# Node-red node parameters => efficient reuse

The screenshot displays the Node-RED interface with a configuration dialog for a 'BLE Scan' node. The dialog, titled 'Edit sensorTag node', includes the following parameters:

- Name: BLE Scan
- Topic: sensorTag
- UUID: 34b1f7d13ce4
- Sensors (checked/unchecked):
  - Temperature:
  - Humidity:
  - Pressure:
  - Magnetometer:
  - Accelerometer:
  - Gyroscope:
  - Keys:

The background flow consists of the following nodes: 'Sensortag', 'BLE Scan', 'sensor object', 'OPC UA client', and 'Write to OPC UA server'.

# Node-red OPC UA client parameters

The screenshot shows the Node-RED interface with a flow titled "Bluetooth LE sensor". The flow consists of the following nodes:

- BLE Scan** (input node)
- GATT attributes** (function node)
- debug** (output node)
- OPC UA client** (output node)
- Write to OPC UA server** (output node)

The **OPC UA client** node is currently being edited. The "Edit opcuaclient node" dialog box shows the following configuration:

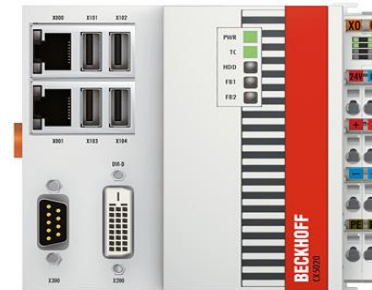
- Endpoint:** `opc.tcp://arm:4120/UA/SampleServer`
- Item:** `Sensortag`
- Name:** `OPC UA client`

The flow is connected to a **Sensortag** node and a **sensor object** node. The **Write to OPC UA server** node is also connected to the **OPC UA client** node.



# Other OPC UA components

- UA Expert: Used in Windows7 to browse address spaces
- Samsung Note 10.1 : Prosys OPC UA client
- Beckhoff PLC: OPC UA server



- Vuzix M100 Smart glasses (User interface)
  - Youtube video Cyberman: [https://www.youtube.com/watch?v=jHFCork\\_R1Q](https://www.youtube.com/watch?v=jHFCork_R1Q)
  - Concept test platform



# OPC UA Information model

## Prototyping legacy integration

- Test 1, generate OPC UA information model from existing types
  - Transformation from internal encoding to OPC UA encoding
- Test 2, instead of using codegen information model build on run-time
  - More generic
- Test 3, use of Event objects in information model
  - Parameters read from existing runtime system
- Next targets:
  - Inheritance
  - Test architecture
  - Scalability & performance
- NOTE: Implementation based on Prosys java SDK v2.0.2

# MetsoDNA magnetic valve function block

## MetsoDNA type mgv

The screenshot displays the MetsoDNA software interface. On the left, the 'Address Space' tree shows a hierarchy starting with 'mgv', followed by sub-entries like 'Off', 'On', 'S', 'Wdd', 'a', 'aftfc', 'amc', 'dlc', 'e1', 'e2', 'e3', 'e4', 'e5', 'e6', 'foff', 'foffe', 'fon', 'fone', 'l', 'ld', 'ldc', 'm', and 'tp'. The main window shows a table of variables with columns for '#', 'Server', 'Node Id', 'Display Name', 'Value', 'Datatype', and 'urce'. The table lists 33 variables, all with a value of 0. The 'Attributes' panel on the right shows details for the selected variable 'mgv/2wd', including its namespace index (3), identifier type (String), and current value (0).

#	Server	Node Id	Display Name	Value	Datatype	urce
1	Unified Aut...	NS3 String mqv/2:puls	puls	0	Byte	8:48:...
2	Unified Aut...	NS3 String mqv/2:a	a	0	UInt16	8:48:...
3	Unified Aut...	NS3 String mqv/2:aftfc	aftfc	0	Byte	8:48:...
4	Unified Aut...	NS3 String mqv/2:amc	amc	0	UInt16	8:48:...
5	Unified Aut...	NS3 String mqv/2:dlc	dlc	0	UInt16	8:48:...
6	Unified Aut...	NS3 String mqv/2:e1	e1	0	UInt16	8:48:...
7	Unified Aut...	NS3 String mqv/2:e3	e3	0	UInt16	8:48:...
8	Unified Aut...	NS3 String mqv/2:e2	e2	0	UInt16	8:48:...
9	Unified Aut...	NS3 String mqv/2:e4	e4	0	UInt16	8:48:...
10	Unified Aut...	NS3 String mqv/2:e5	e5	0	UInt16	8:48:...
11	Unified Aut...	NS3 String mqv/2:e6	e6	0	UInt16	8:48:...
12	Unified Aut...	NS3 String mqv/2:foff	foff	0	UInt16	8:48:...
13	Unified Aut...	NS3 String mqv/2:foffe	foffe	0	UInt16	8:48:...
14	Unified Aut...	NS3 String mqv/2:fone	fone	0	UInt16	8:48:...
15	Unified Aut...	NS3 String mqv/2:fon	fon	0	UInt16	8:48:...
16	Unified Aut...	NS3 String mqv/2:l	l	0	UInt16	8:48:...
17	Unified Aut...	NS3 String mqv/2:ldc	ldc	0	UInt16	8:48:...
18	Unified Aut...	NS3 String mqv/2:ld	ld	0	UInt16	8:48:...
19	Unified Aut...	NS3 String mqv/2:m	m	0	UInt16	8:48:...
20	Unified Aut...	NS3 String mqv/2:ma	ma	0	UInt16	8:48:...
21	Unified Aut...	NS3 String mqv/2:mac	mac	0	UInt16	8:48:...
22	Unified Aut...	NS3 String mqv/2:offb	offb	0	UInt16	8:48:...
23	Unified Aut...	NS3 String mqv/2:onb	onb	0	UInt16	8:48:...
24	Unified Aut...	NS3 String mqv/2:roff	roff	0	UInt16	8:48:...
25	Unified Aut...	NS3 String mqv/2:ron	ron	0	UInt16	8:48:...
26	Unified Aut...	NS3 String mqv/2:safe	safe	false	Boolean	8:48:...
27	Unified Aut...	NS3 String mqv/2:soff	soff	0	UInt16	8:48:...
28	Unified Aut...	NS3 String mqv/2:soffu	soffu	false	Boolean	8:48:...
29	Unified Aut...	NS3 String mqv/2:son	son	0	UInt16	8:48:...
30	Unified Aut...	NS3 String mqv/2:sonu	sonu	false	Boolean	8:48:...
31	Unified Aut...	NS3 String mqv/2:toff	toff	0	Float	8:48:...
32	Unified Aut...	NS3 String mqv/2:ton	ton	0	Float	8:48:...
33	Unified Aut...	NS3 String mqv/2:tp	tp	0	Float	8:48:...

# MetsoDNA analog measurement function block

## Event objects

The screenshot displays the MetsoDNA software interface. The main window shows a table of event objects with the following columns: #, Server, Node Id, Display Name, Value, Datatype, Source Timestamp, and Server Timestamp. A red box highlights rows 1 through 9. The 'Attributes' panel on the right shows the details for the selected object, including NodeId, NamespaceIndex, IdentifierType, Identifier, NodeClass, BrowseName, DisplayName, Description, WriteMask, UserWriteMask, Value, and DataType.

#	Server	Node Id	Display Name	Value	Datatype	Source Timestamp	Server Timestamp
1	Unified Aut...	NS3 String am/2:Alarm/0:HighHighLimit	HighHighLi...	100	Double	30.9.2014 10:45:16.051	30.9.2014 10:45:16.051
2	Unified Aut...	NS3 String am/2:Alarm/0:HighHighState/0:Id	Id	false	Boolean	30.9.2014 10:45:13.323	30.9.2014 10:45:13.323
3	Unified Aut...	NS3 String am/2:Alarm/0:HighLimit	HighLimit	85	Double	30.9.2014 10:45:16.051	30.9.2014 10:45:16.051
4	Unified Aut...	NS3 String am/2:Alarm/0:HighState/0:Id	Id	false	Boolean	30.9.2014 10:45:13.323	30.9.2014 10:45:13.323
5	Unified Aut...	NS3 String am/2:Alarm/0:LowLowLimit	LowLowLimit	0	Double	30.9.2014 10:45:09.051	30.9.2014 10:45:09.051
6	Unified Aut...	NS3 String am/2:Alarm/0:LowLimit	LowLimit	10	Double	30.9.2014 10:45:16.051	30.9.2014 10:45:16.051
7	Unified Aut...	NS3 String am/2:Alarm/0:LowLowState/0:Id	Id	false	Boolean	30.9.2014 10:45:13.323	30.9.2014 10:45:13.323
8	Unified Aut...	NS3 String am/2:Alarm/0:LowState/0:Id	Id	true	Boolean	30.9.2014 10:45:16.052	30.9.2014 10:45:16.052
9	Unified Aut...	NS3 String am/2:Alarm/0:Severity	Severity	500	UInt16	30.9.2014 10:45:16.053	30.9.2014 10:45:16.053
10	Unified Aut...	NS3 String am/2:Av/2:a	a	8	Float	30.9.2014 10:45:16.052	30.9.2014 10:45:16.052
11	Unified Aut...	NS3 String am/2:Out/2:a	a	55	Float	30.9.2014 10:45:16.051	30.9.2014 10:46:00.051

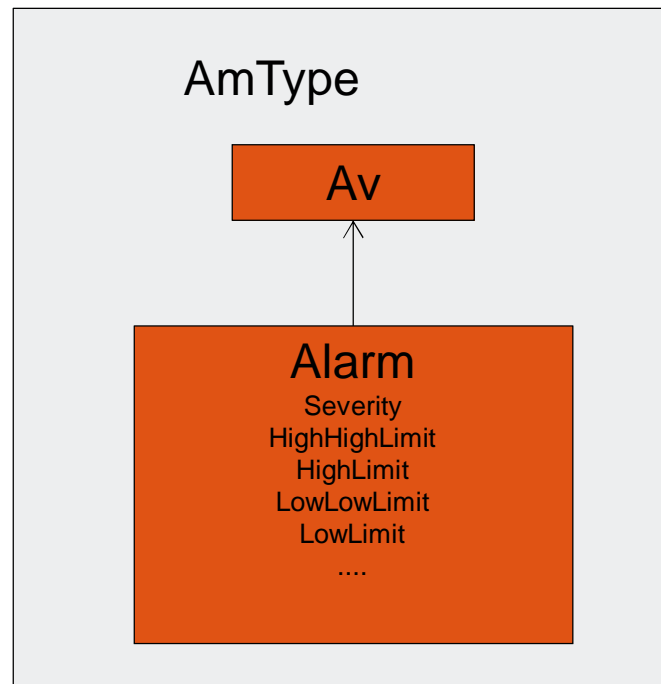
The 'Attributes' panel shows the following details for the selected object:

- Attribute: Value
- NodeId: NodeId
- NamespaceIndex: 3
- IdentifierType: String
- Identifier: am/2:Out/2:a
- NodeClass: Variable
- BrowseName: 2, "a"
- DisplayName: "", "a"
- Description: "", ""
- WriteMask: 0
- UserWriteMask: 0
- Value: SourceTimestamp: 30.9.2014 10:45:16.051, ServerTimestamp: 30.9.2014 10:46:00.051, SourcePicoSeconds: 0, ServerPicoSeconds: 0, Value: 55
- DataType: Float
- NamespaceIndex: 0
- IdentifierType: Numeric

# Integrated Alarm management

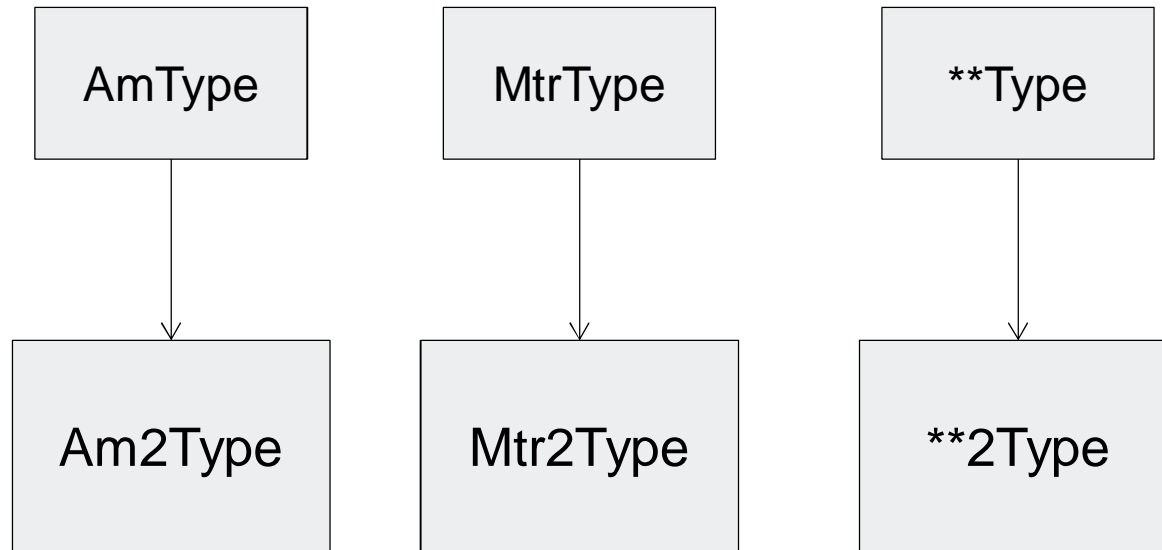
## Prototype principle, under testing

- Non Exclusive Limit Alarm is added in the OPC UA Object Type
- Alarm limits are from DNA configuration: hh, h, l, ll
- Alarm is triggered by DNA alarm event output: hha,ha,la,lla
- Example



# Inheritance in OPC UA Object Type

Basic MetsoDNA type, extended types inherited



# Type created in Ua Modeler

## Example for AmType and Am2Type

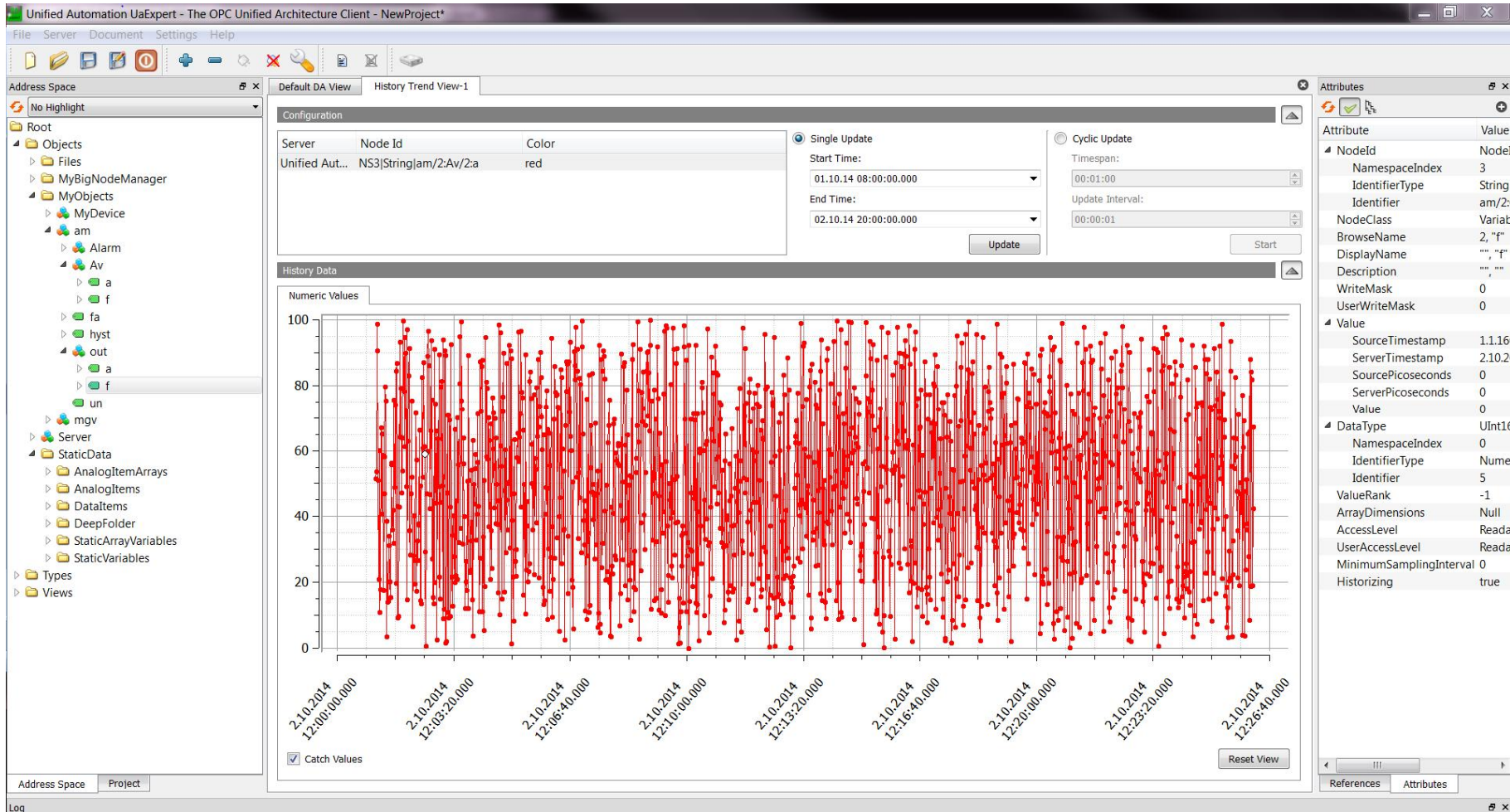
The screenshot shows the Ua Modeler interface with the following components:

- Project Explorer:** Shows a project named 'dna' with a folder 'Models' containing 'Opc.Ua.NodeSet2.ua', 'dna.ua', 'am.ua', 'mtrua', and 'mvg2.ua'. There is also an 'Ansi C Server 1.4' component.
- Information Model:** Shows a tree structure under 'AnalogMeasurementFunctionBlockType' with sub-items: 'Alarm', 'AnalogMeasurementFunctionBlock2Type', 'adu', 'fmask', 'hamask', 'harm', 'hatd', 'Hhtd', 'Htd', 'Iamask', 'Iarm', 'Iatd', 'Ltd', 'Ltd', 'Av', and 'fa'.
- Properties Panel:** Shows the configuration for the selected type 'Am2Type'.
  - Parent: (empty)
  - Type: (empty)
  - NodeClass: Object Type
  - Namespace: 1: http://www.metso.com/ua/dna/
  - Name: Am2Type
  - IsAbstract:
  - Override: (button)
  - Additional Attributes: (empty)
  - NodeId: Numeric, 1009
  - DisplayName: AnalogMeasurementFunctionBlock2Type
  - BrowseName: 1 Am2Type
  - Description: (empty)
- Children Table:** A table listing the children of the type.

NodeClass	Name	TypeDefinitio	ModellingRul	Data Type		
Variable	adu	BaseDataVa...	Mandatory	UInt16	+	×
Variable	fmask	BaseDataVa...	Mandatory	UInt16	+	×
Variable	hamask	BaseDataVa...	Mandatory	UInt16	+	×
Variable	harm	BaseDataVa...	Mandatory	Boolean	+	×
Variable	hatd	BaseDataVa...	Mandatory	Float	+	×
Object	Hhtd	AnaType	Mandatory		+	×
Object	Htd	AnaType	Mandatory		+	×
Variable	Iamask	BaseDataVa...	Mandatory	UInt16	+	×
- References:** A table for defining references.

Reference Type	Target	
< Select Reference Type >	< Select Target >	×
- Buttons:** 'Add Subtype', 'OK', and 'Cancel' buttons are visible at the bottom.

# History trend from UA Expert





# Questions / comments ?



[www.metso.com](http://www.metso.com)

