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1. Author and Contact Information

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 - Technical Editor of VDMA OPC UA Industrial Joining Technologies Working Group.
- Contact for any questions/updates/support on using the demo and extending it.

2. Prerequisites

- Windows 10 or later (Built using Windows SDK Version: **10.0.26100**)
 - Download from the following link: <https://developer.microsoft.com/en-us/windows/downloads/windows-sdk/>
- Download **Visual Studio 2022 Redistributable** (Platform Toolset: Visual Studio 2022 (v143) for x64)
- <https://learn.microsoft.com/en-us/cpp/windows/latest-supported-vc-redist?view=msvc-170>
- Download and install any OPC UA Client.
 - **Example:** <https://www.unified-automation.com/downloads/opc-ua-clients.html>

3. Installation of Application Files

- Download and copy the following files in the **same directory (Installation Directory)**.
 - opcua_ijt_demo_application.exe
 - Opc.Ua.AMB.NodeSet2.xml
 - Opc.Ua.Di.NodeSet2.xml
 - Opc.Ua.Ijt.Base.NodeSet2.xml
 - Opc.Ua.Ijt.Tightening.NodeSet2.xml
 - Opc.Ua.Machinery.NodeSet2.xml
 - Opc.Ua.Machinery.Result.NodeSet2.xml
 - Opc.Ua.NodeSet2.xml
 - Opc.Ua.Ijt.Tightening.Server.xml

4. Information

- This OPC UA Server Simulator exposes Assets, Results, Events, and Commands as per the following Companion Specifications:
 - <https://reference.opcfoundation.org/IJT/Base/v100/docs/>
 - <https://reference.opcfoundation.org/IJT/Tightening/v200/docs/>

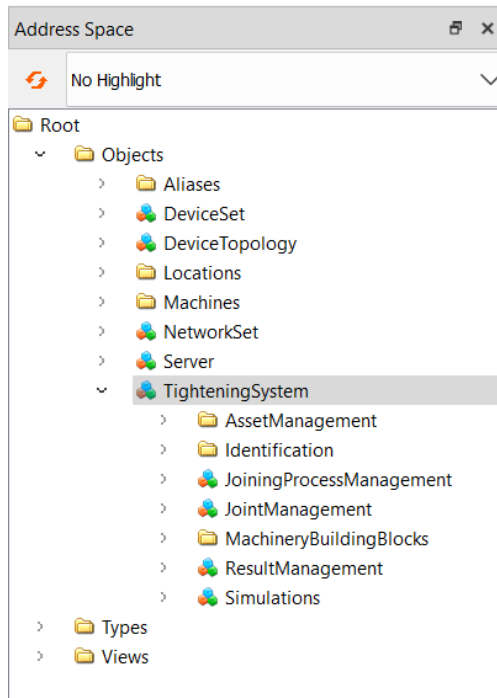
5. Running the application

- Ensure that the user has **Read/Write access** to the **Installation Directory**.
- Launch the binary file (**opcua_ijt_demo_application.exe**).
 - Run as Administrator or at least with **Read/Write** access.
- The **EndpointUrl** of the OPC UA Server is:
 - **opc.tcp://localhost:40451** or
 - **opc.tcp://YourComputerName:40451**.

6. Access data from OPC UA Client

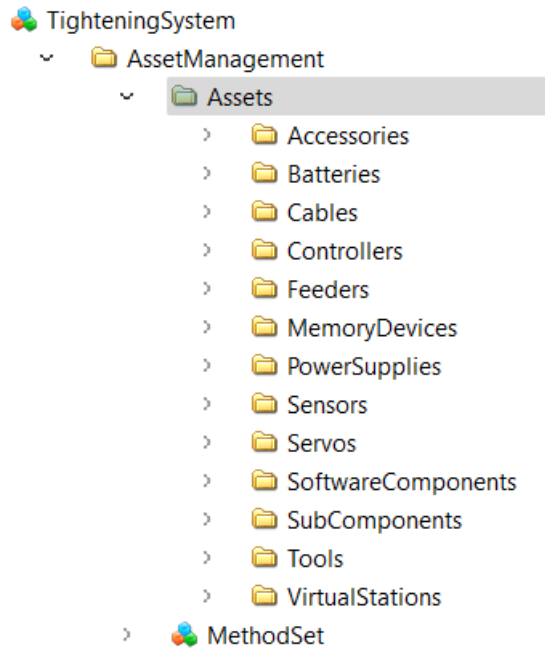
- Launch the OPC UA Client and connect to the given **EndpointUrl**.
- It will show the primary entry point: **TighteningSystem**.
- **All** the **Nodes** shown below are as per the **Companion Specification**.
- The **Simulations** node is the Application Node.

7. Tightening System Entry Point - AddressSpace View

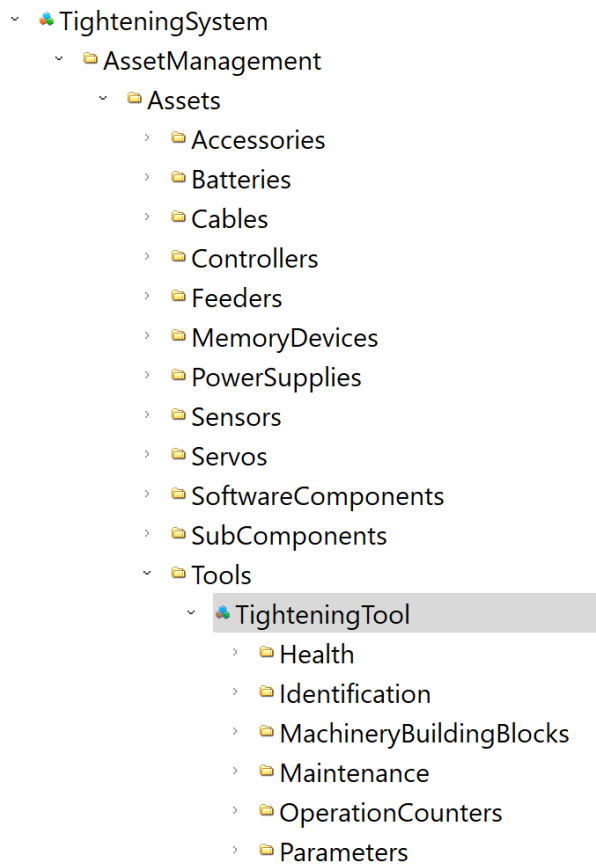


8. Asset Simulation

Browse the respective Asset Nodes from the address space and subscribe/read the respective data.

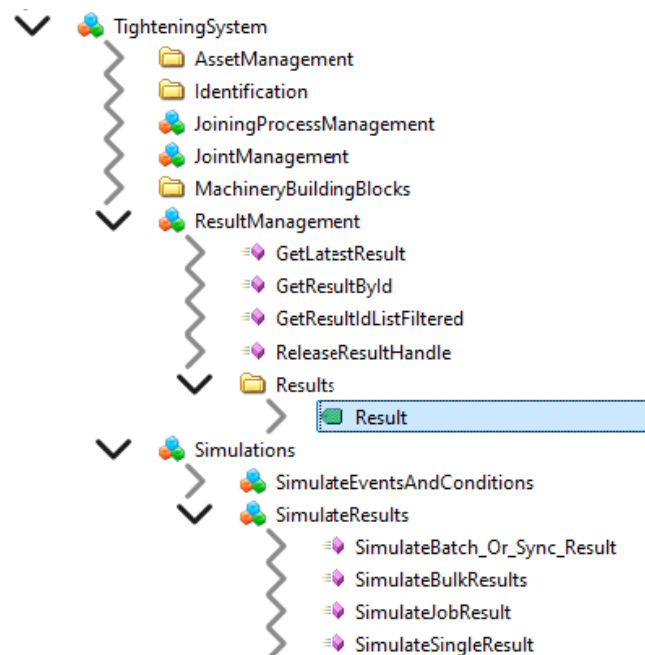


Example Asset Address Space View



9. Result Simulation

- **Result Access Options:**
 - Subscribe to the **Result variable** shown below.
 - Subscribe to **events** by subscribing to the **Server** node in the Event View.
- **Simulation Options**
 - Use the following **three methods** to simulate different types of **Results**. A new **Result** is generated upon the execution of the following **methods**.
 - SimulateBatch_or_Sync_Result
 - SimulateJobResult
 - SimulateSingleResult
 - SimulateBulkResults
 - The simulated data is similar to the examples defined in the Annexure sections of the Companion Specification.



- To generate a new Result, execute the **SimulateSingleResult method** shown above.
- The outcome can be visualized in the **Data Access View** or **Event View** if the respective **Result variable or Event is subscribed**.

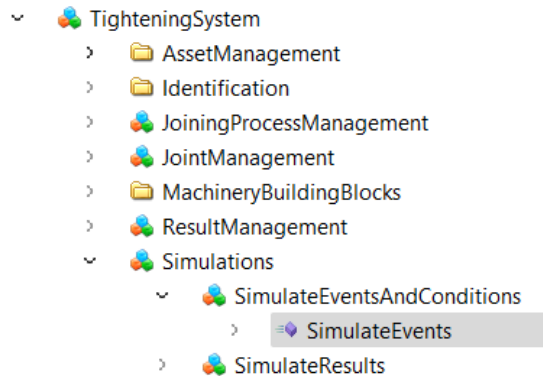
Example Result Data Access View

#	Display Name	Value	Datatype
1	Result	Double click to display value	ExtensionObject
2	ResultContent	Double click to display value	Variant
3	ResultMetaData	Double click to display value	ExtensionObject
4	AssemblyType	1	Byte
5	AssociatedEntities	Double click to display value	ExtensionObject
6	Classification	1	Byte
7	CreationTime	2024-04-29T12:08:28.103Z	DateTime
8	Description	"en", "SINGLE TIGHTENING RESULT"	LocalizedText
9	InterventionType	0	Byte
10	IsGeneratedOffline	false	Boolean
11	IsPartial	false	Boolean
12	IsSimulated	true	Boolean
13	JoiningTechnology	"en", "Tightening"	LocalizedText
14	Name	Single Result	String
15	OperationMode	2	Byte
16	ProcessingTimes	Double click to display value	ExtensionObject

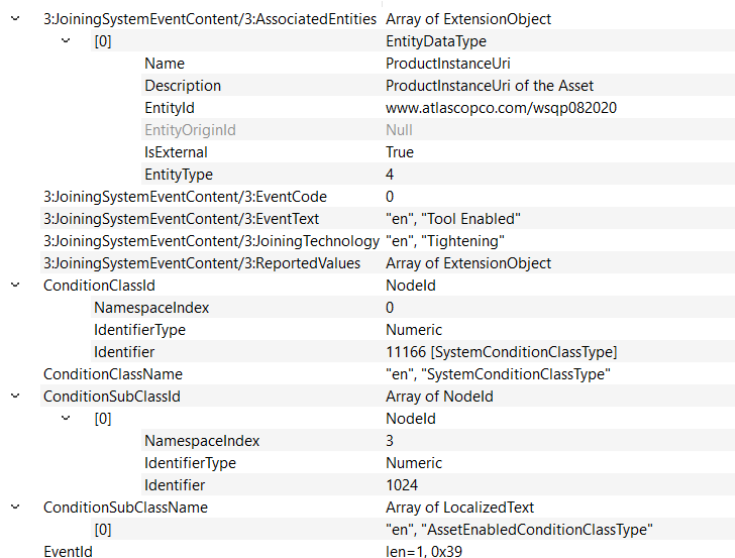
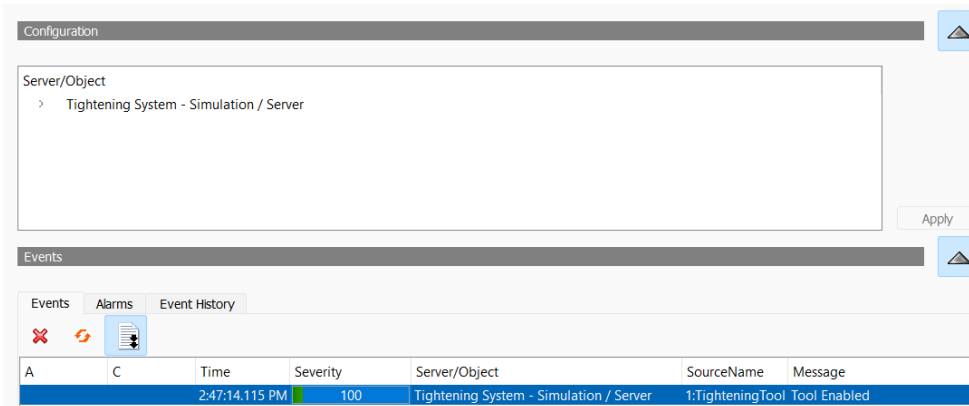
10. Event Simulation

Only a few events are added to the simulator. Execute the **SimulateEvents** method as shown below to generate a few types of events.

Note: Additional types of events will be added to the simulator in the future. The **content** of the Events would be similar to any type of event from a joining system.



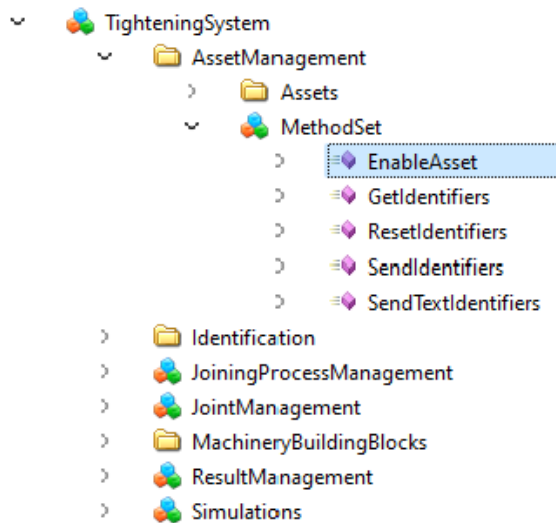
Example Events View



11. Command Simulation

An example simulation of **EnableAsset** is provided. It takes the input of the ProductInstanceUri of the Tool.

Few error cases can be simulated when the input argument is empty or invalid. A respective error is shown in the output arguments.



Example Command View

Call EnableAsset on MethodSet

Input Arguments			
Name	Value	DataType	Description
ProductInstanceUri	<input type="text" value="www.atlascopco.com/wsqp082020"/> ... <input data-bbox="878 1245 967 1266" type="button" value="Load file..."/>	String	
Enable	<input checked="" type="checkbox"/>	Boolean	

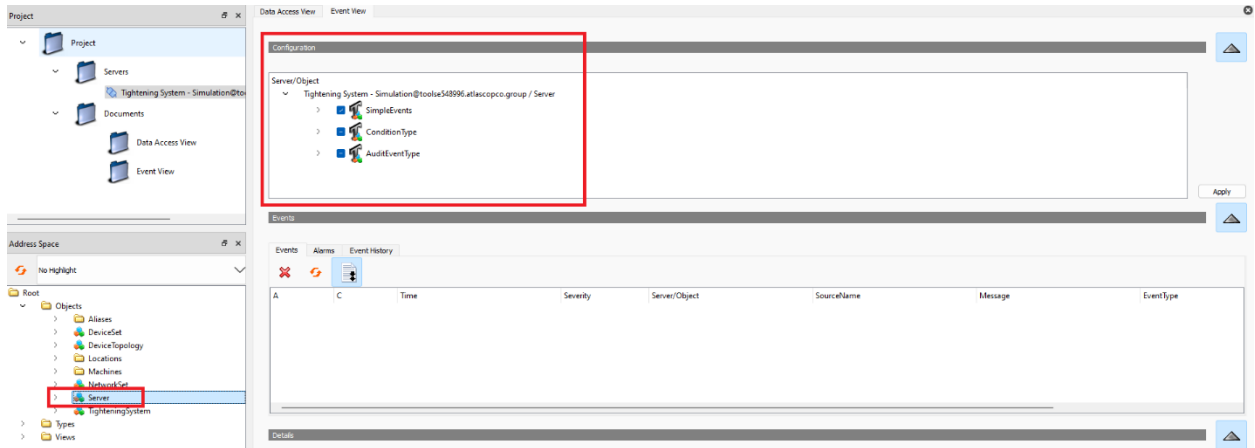
Output Arguments			
Name	Value	DataType	Description
Status	<input type="text" value="0"/>	Int64	
StatusMessage	<div>en <input type="text" value="SUCCESSFUL OPERATION"/></div>	LocalizedText	

Result

Succeeded

12. How to Subscribe to Events

- Connect to the OPC UA Server using UaExpert or any other OPC UA Client.
- Subscribe to “Server” Object. In UaExpert, Drag and Drop the “Server” Object in the following **Configuration Window** as shown below.



- Select the “Simple Event” checkbox and it should show as checked: ✓
- Generate a new Result, and the Result will be listed in the **Events Window** as shown below.

