Contents

1. Author and Contact Information

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- Contact for any questions/updates/support on using the demo and extending it.

2. Prerequisites

- **Windows Binary**
  - Windows 10 or later (Built using Windows SDK Version: **10.0.26100**).
  - Download from the following link: Windows_SDK_Dowload
  - Download **Visual Studio 2022 Redistributable**: VC-Redist_Download
- **Docker Image:**
  - **Ensure** that Docker is installed and running.
- **OPC UA Test Client:** Download and install any OPC UA Client. **Example**: UaExpert_Download

3. Installation of Application Files

- Download the following files in the **Installation Directory: OPC_UA_IJT_Server_Simulator**.
  - **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
  - **Optional Files**
    - server_configuration.json
    - simulated_data.json
    - Dockerfile

4. Running the application

- **Common Steps**
  - **Go** to the **"OPC_UA_IJT_Server_Simulator"** directory.
  - The **EndpointUrl** of the OPC UA Server would be:
    - **opc.tcp://localhost:40451** or **opc.tcp://YourComputerName:40451**.
- **Windows Binary**
  - 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.
- **Docker Image**
  - **Run** the following commands which will run the simulator in a docker container:
    - docker build -t opcua_ijt_demo_application .
    - docker run --rm -p 40451:40451 opcua_ijt_demo_application

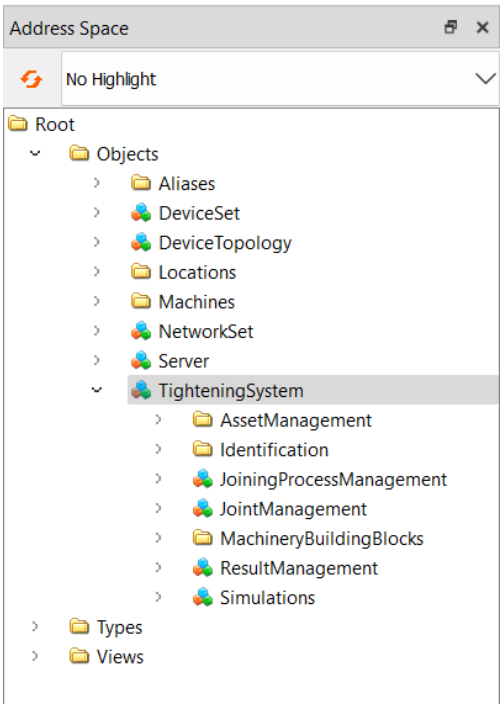
5. Information

- 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/

6. Access data from OPC UA Client

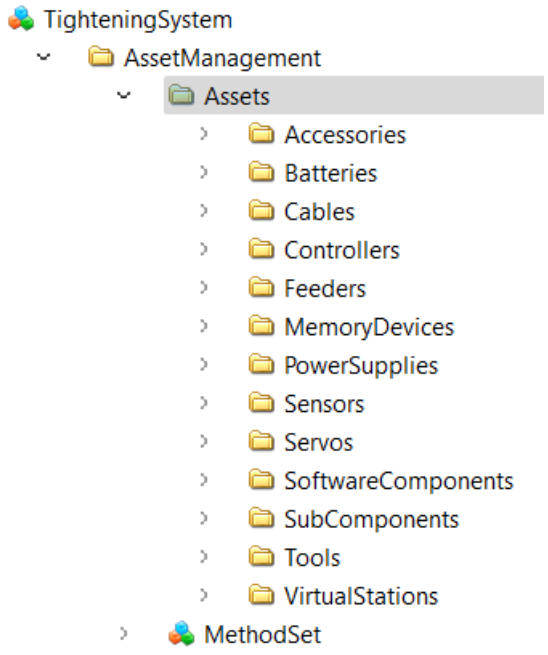
- Launch the OPC UA Client and connect to the given **EndpointUrl**.
- It will show the primary entry point: **TighteningSystem.**
- **All** the **Nodes** shown below are as per the **Companion Specification.**
- The **Simulations** node is the Application Node.

7. Tightening System Entry Point - AddressSpace View

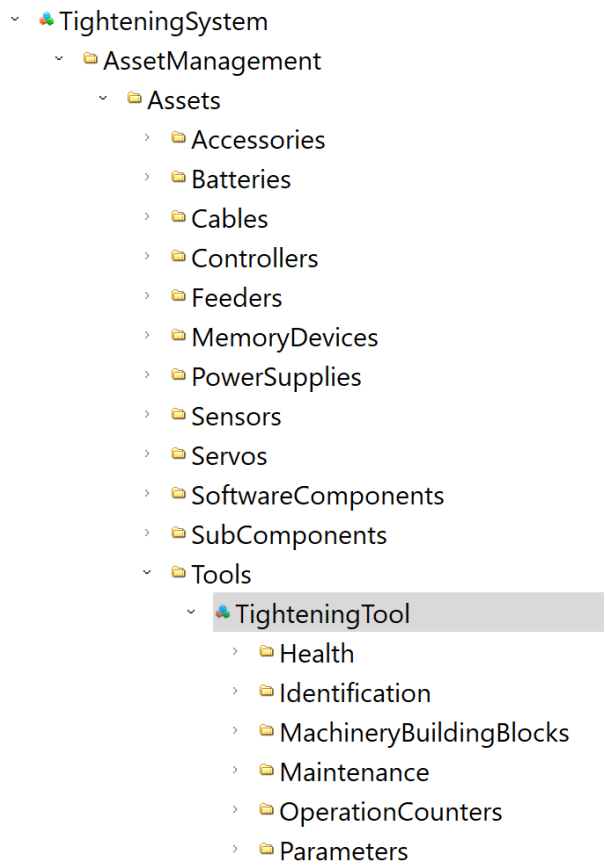


8. Asset Simulation

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

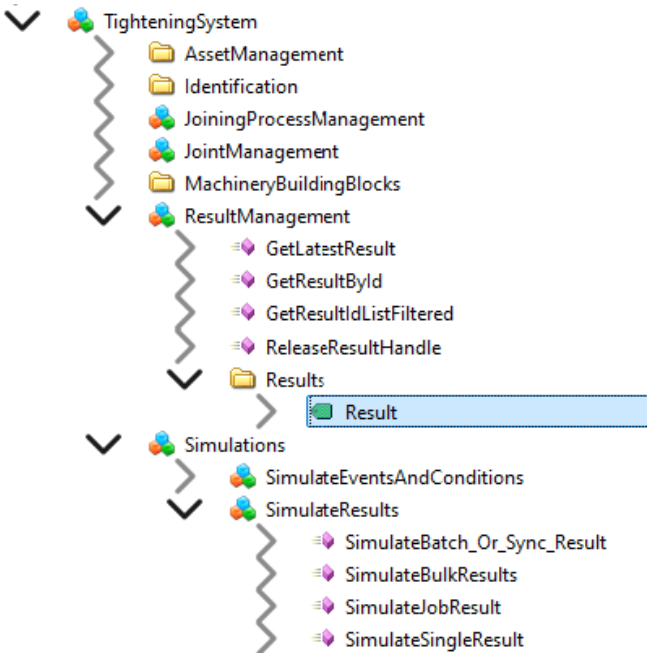


Example Asset Address Space View



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.**

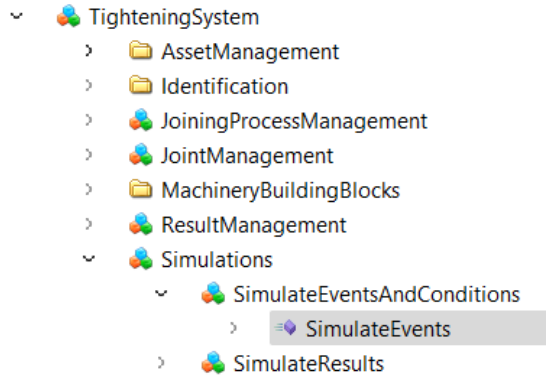
Example Result Data Access View

#	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

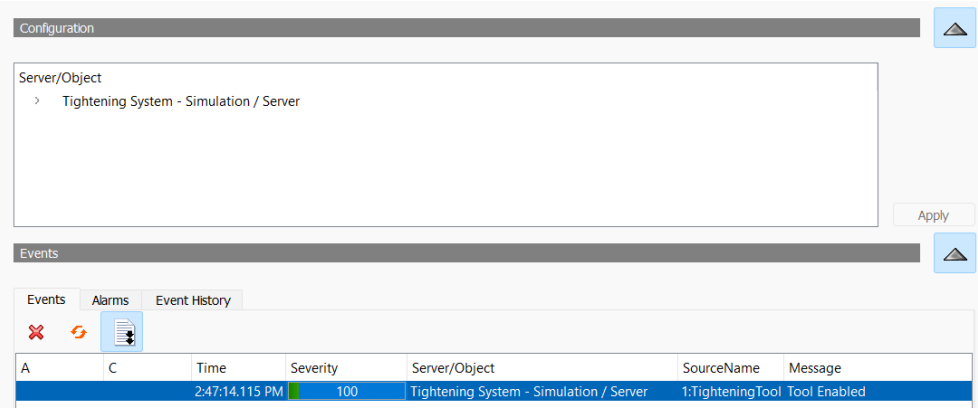
10. Event Simulation

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

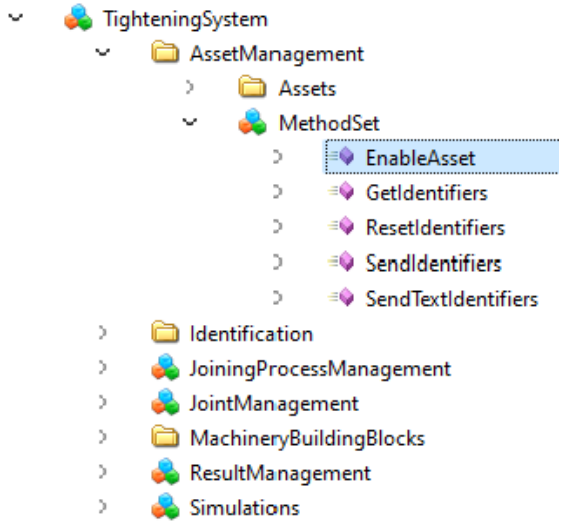


3:JoiningSystemEventContent/3:AssociatedEntities	Array of ExtensionObject
[0]	EntityDataType
Name	ProductInstanceUri
Description	ProductInstanceUri of the Asset
EntityId	www.atlascopco.com/wsqp082020
EntityOriginId	Null
IsExternal	True
EntityType	4
3:JoiningSystemEventContent/3:EventCode	0
3:JoiningSystemEventContent/3:EventText	"en", "Tool Enabled"
3:JoiningSystemEventContent/3:JoiningTechnology	"en", "Tightening"
3:JoiningSystemEventContent/3:ReportedValues	Array of ExtensionObject
ConditionClassId	NodeId
NamespaceIndex	0
IdentifierType	Numeric
Identifier	11166 [SystemConditionClassType]
ConditionClassName	"en", "SystemConditionClassType"
ConditionSubClassId	Array of NodeId
[0]	NodeId
NamespaceIndex	3
IdentifierType	Numeric
Identifier	1024
ConditionSubClassName	Array of LocalizedText
[0]	"en", "AssetEnabledConditionClassType"
EventId	len=1, 0x39

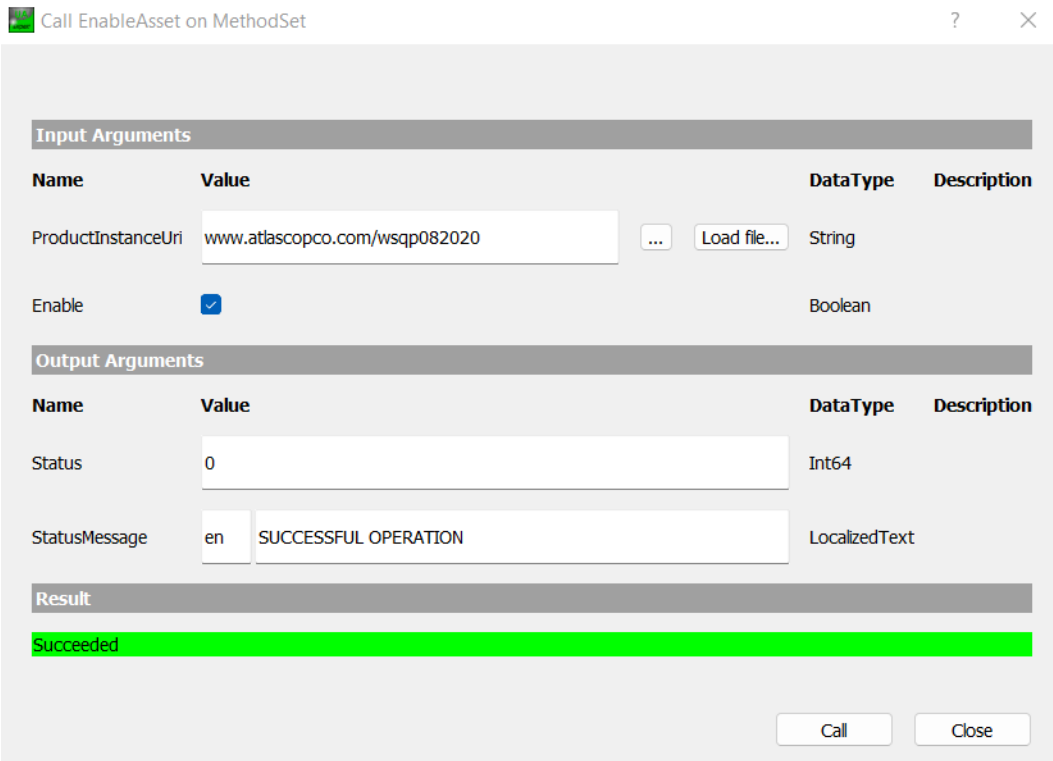
11. Command Simulation

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.

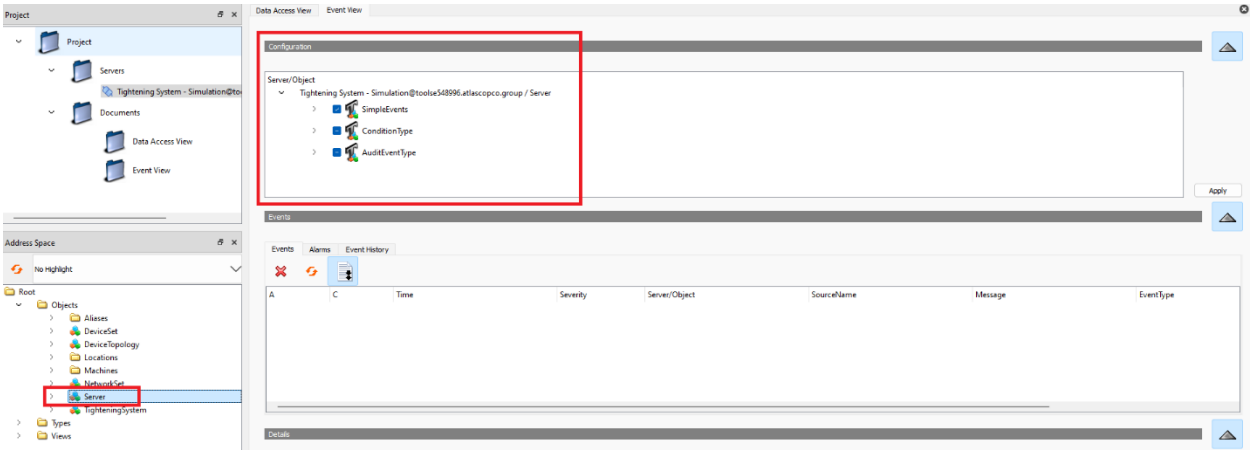


Example Command View



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.