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
- **IJT CS Reference:**
  - OPC_40450_Joining_Base
  - OPC_40451_Tightening

3. Installation of Application Files

- Download the following files in the **Installation Directory: OPC_UA_IJT_Server_Simulator**.
  - **opcua_ijt_demo_application.exe**
  - Contains **multiple** NodeSet files in XML format as below:
    - Opc.Ua.XXX.NodeSet2.xml
  - **Optional Files**
    - **Multiple JSON files** for **simulation**
      - server_configuration.json
      - simulated_asset_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

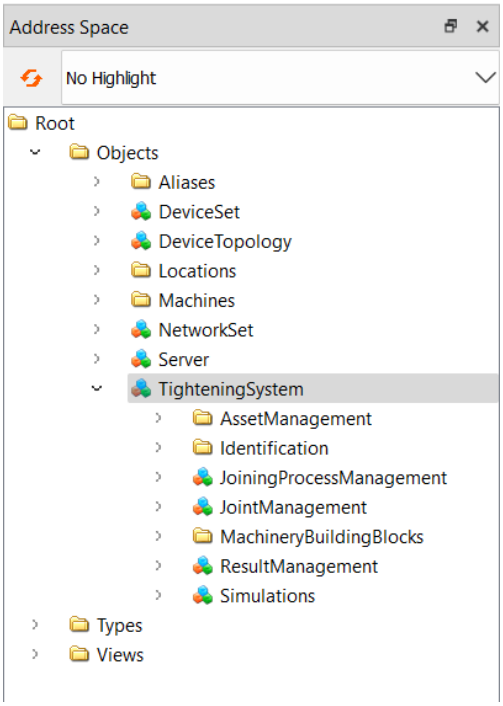
5. Access data from OPC UA Client

- 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.

6. Validate if the Client Supports Required OPC UA Features

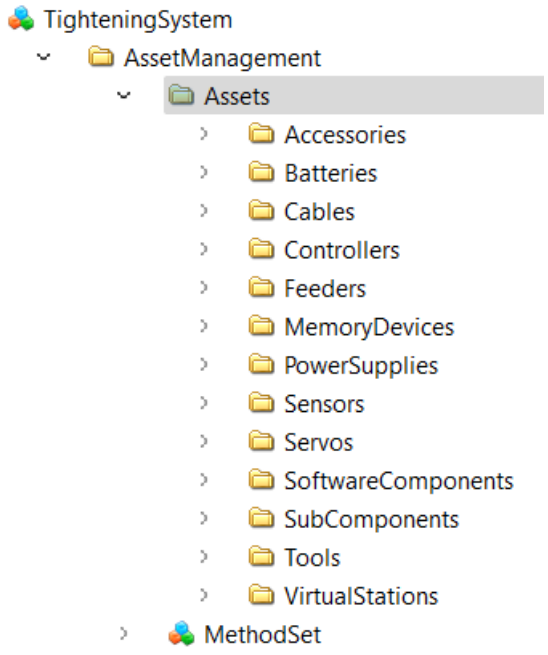
- OPC UA Client **shall support** OPC UA **Extension** Objects (Custom Structure Types) to **consume** the data as per the OPC UA IJT Standard.
- The quick test to validate if the Client application supports **extension** objects is to subscribe to **Result variable** or **Result Event** and visualize if the data is readable from the Client.
- Refer to **upcoming** sections on how to **subscribe** to **Result** variable or **Result** Event.

7. Tightening System Entry Point - AddressSpace View

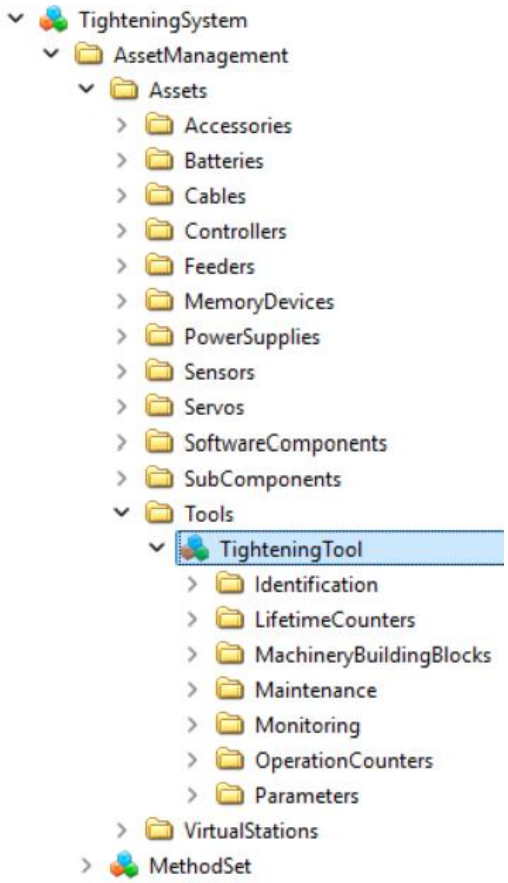


8. Asset Data

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



Example Asset Address Space View

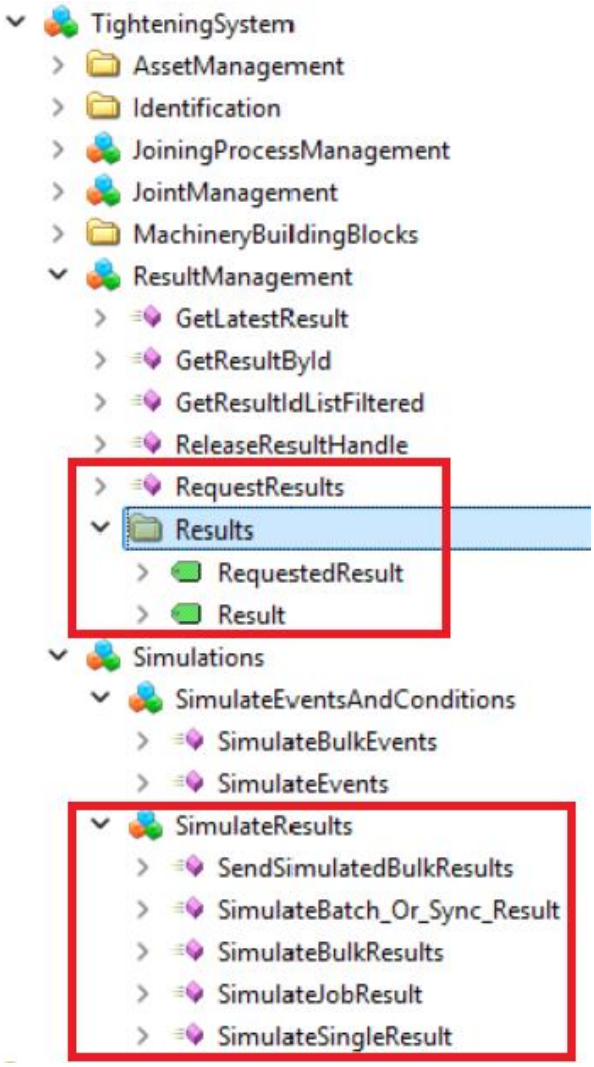


9. Result Data

- **Result Access Options:**
  - Subscribe to the **Result** or **RequestedResult variable** shown below.
    - **Result** Variable is intended for getting **live** results.
    - **RequestedResult** Variable is intended for getting **historical** results.
  - 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**.
    - **SendSimulatedBulkResults**
      - **To send already generated bulk results without recreating.**
    - **SimulateBatch_or_Sync_Result**
      - To generate Batch Result.
    - **SimulateBulkResults**
      - To generate several live Results.
    - **SimulateJobResult**
      - To generate a Job Result.
    - **SimulateSingleResult**
      - To generate a single live Result.
  - The **simulated** data is similar to the examples **defined** in the **Annexure** sections of the Companion Specification.

10. Result, RequestedResult Variable and Result Simulation Methods

Subscribe to Result variable as shown below.



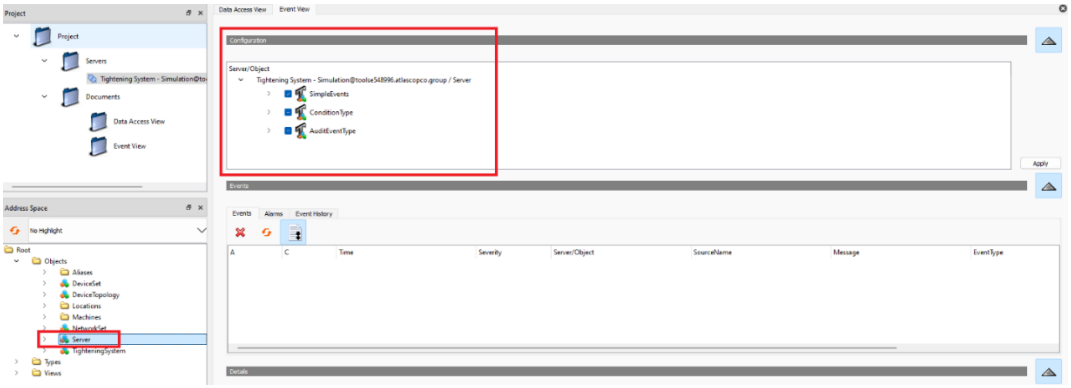
11. Result Data Access View – Subscribed Result Variable Data Example

The outcome of the **Result variable subscription** is shown below.

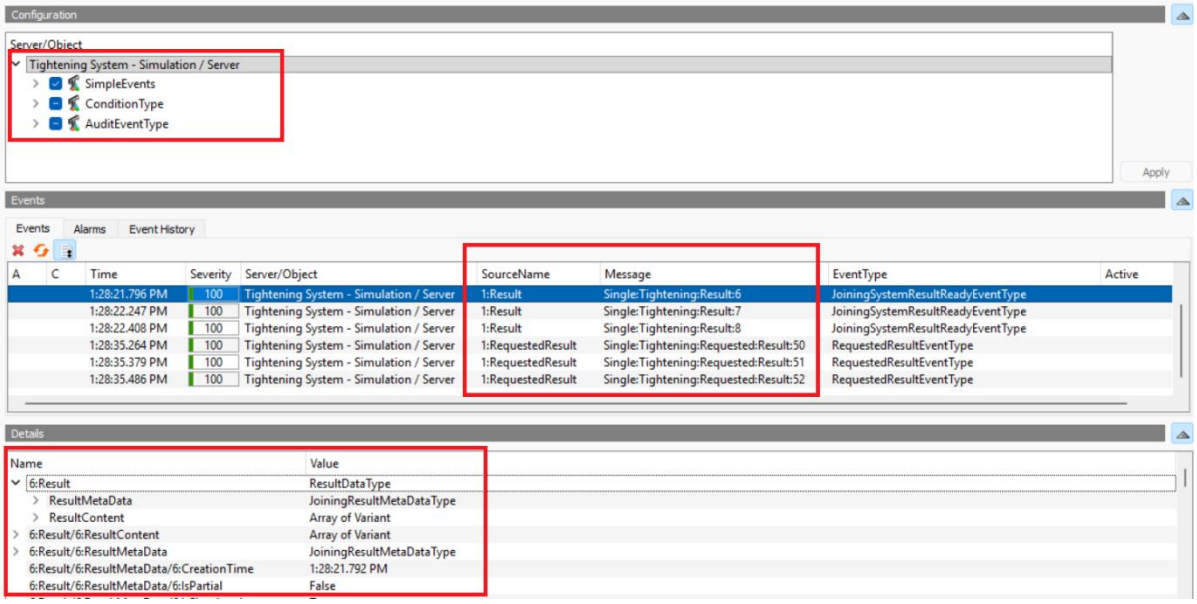
#	Display Name	Value	Datatype	Source Timestamp
1	Result	Double click to display value	ExtensionObject	8:35:14.750 PM
2	ResultContent	Double click to display value	Variant	8:35:14.752 PM
3	ResultMetaData	Double click to display value	ExtensionObject	8:35:14.753 PM
4	AssemblyType	1	Byte	8:35:14.753 PM
5	AssociatedEntities	Double click to display value	ExtensionObject	8:35:14.753 PM
6	Classification	1	Byte	8:35:14.753 PM
7	CreationTime	2025-10-09T18:35:04.654Z	DateTime	8:35:14.753 PM
8	Description	"en", "Single:Tightening:Result:2"	LocalizedText	8:35:14.753 PM
9	ExtendedMetaData	Double click to display value	ExtensionObject	8:35:14.753 PM
10	InterventionType	0	Byte	8:35:14.753 PM
11	IsGeneratedOffline	false	Boolean	8:35:14.753 PM
12	IsPartial	false	Boolean	8:35:14.753 PM
13	IsSimulated	true	Boolean	8:35:14.753 PM
14	JoiningTechnology	"en", "Tightening"	LocalizedText	8:35:14.753 PM
15	Name	Single:Tightening:Result:2	String	8:35:14.753 PM
16	OperationMode	2	Byte	8:35:14.753 PM
17	ProcessingTimes	Double click to display value	ExtensionObject	8:35:14.753 PM
18	ResultCounters	Double click to display value	ExtensionObject	8:35:14.753 PM
19	ResultEvaluation	1 (OK)	Int32	8:35:14.753 PM
20	ResultEvaluationCode	0	Int64	8:35:14.753 PM
21	ResultEvaluationDetails	"en", "OK TIGHTENING"	LocalizedText	8:35:14.753 PM
22	ResultId	15EC5500-CBA9-F648-A323-30BA63754435	String	8:35:14.753 PM
23	ResultState	1	Int32	8:35:14.753 PM
24	SequenceNumber	2	UInt64	8:35:14.753 PM

12. Subscribe to Result Events or Other 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.



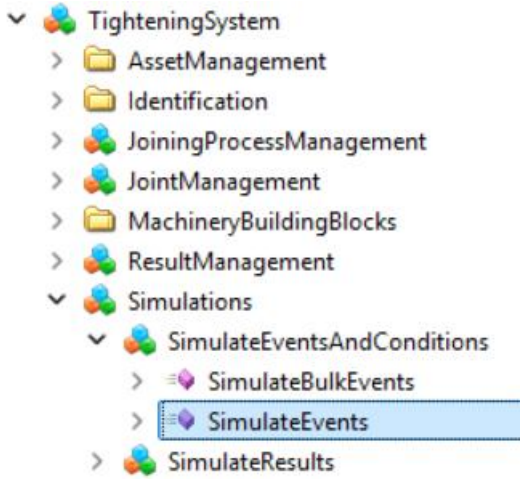
- Select the "**Simple Event**" **checkbox** and it shall **show** as checked: ✓
- Generate a **new Result**, and the Result will be listed in the **Events Window** as shown below.



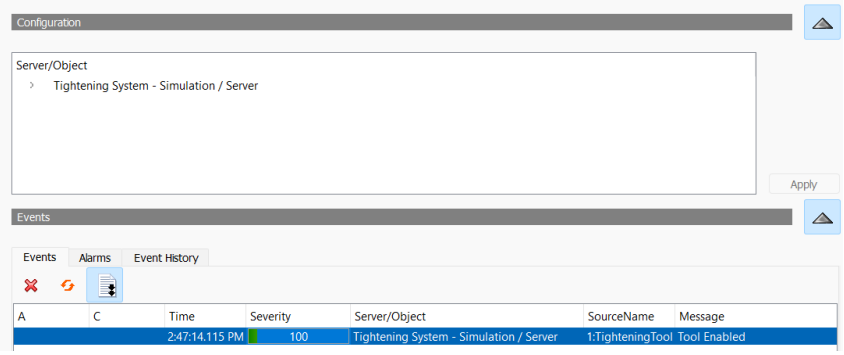
13. Event Data

Invoke the **SimulateEvents** or **SimulateBulkEvents method** as shown below to **generate 50+** different type of events.

Note: The **content** of the Events would be similar to any type of event from a joining system.



Example Events View

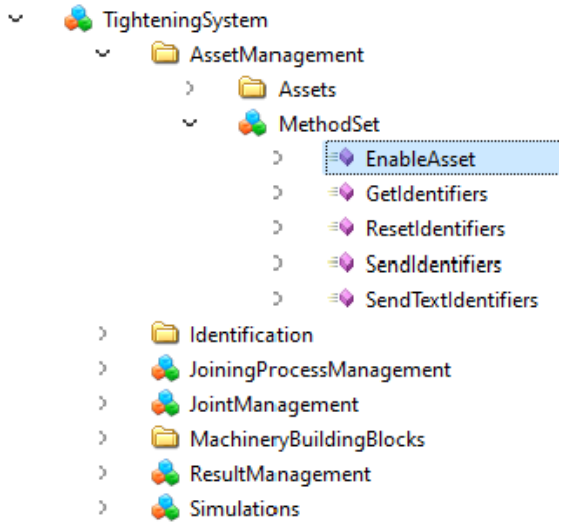


3:JoiningSystemEventContent/3:AssociatedEntities	Array of ExtensionObject
[0]	EntityDataType
Name	ProductInstanceUri
Description	ProductInstanceUri of the Asset
EntityId	www.atlascopco.com/wsqp082020
EntityOriginId	Null
IsExternal	True
EntityType	4
3:JoiningSystemEventContent/3:EventCode	0
3:JoiningSystemEventContent/3:EventText	"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

14. Commands Example

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