Contents

Author and Contact Information

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

Prerequisites

- Windows 10 or later (Built using Windows SDK Version: 10.0.22000)
- 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

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

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/

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**.
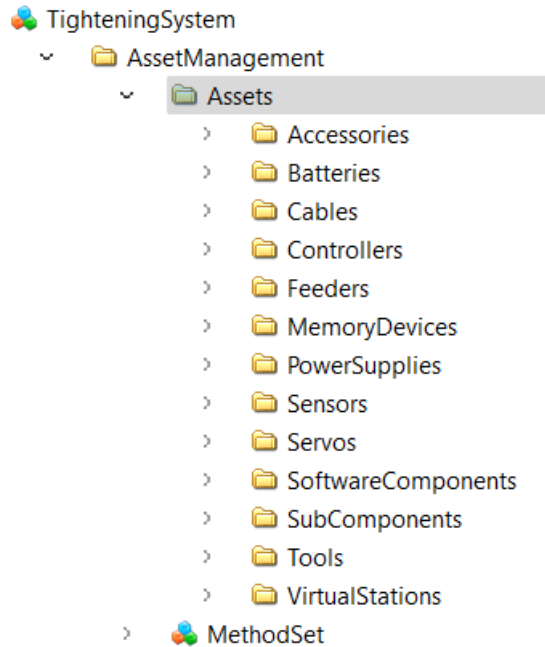
Access data from OPC UA Client

- 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.

Tightening System Entry Point - AddressSpace View
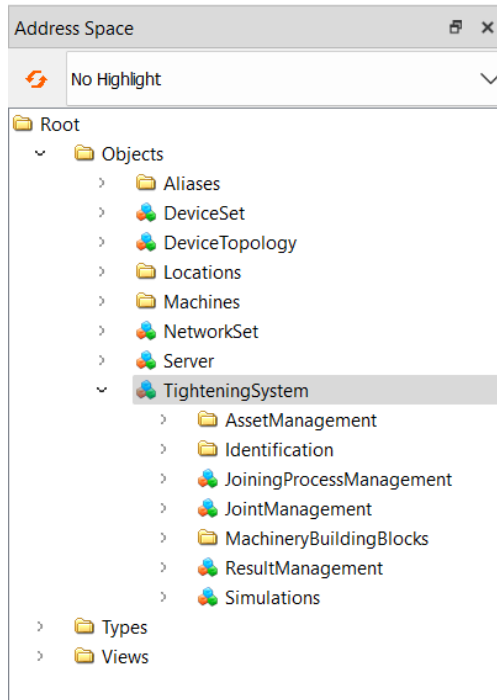
Asset Simulation

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

- TighteningSystem
  - AssetManagement
    - Assets
      - Accessories
      - Batteries
      - Cables
      - Controllers
      - Feeders
      - MemoryDevices
      - PowerSupplies
      - Sensors
      - Servos
      - SoftwareComponents
      - SubComponents
      - Tools
      - VirtualStations
    - MethodSet

Example Asset Address Space View

- TighteningSystem
  - AssetManagement
    - Assets
      - Accessories
      - Batteries
      - Cables
      - Controllers
      - Feeders
      - MemoryDevices
      - PowerSupplies
      - Sensors
      - Servos
      - SoftwareComponents
      - SubComponents
      - Tools
        - TighteningTool
          - Health
          - Identification
          - MachineryBuildingBlocks
          - Maintenance
          - OperationCounters
          - Parameters
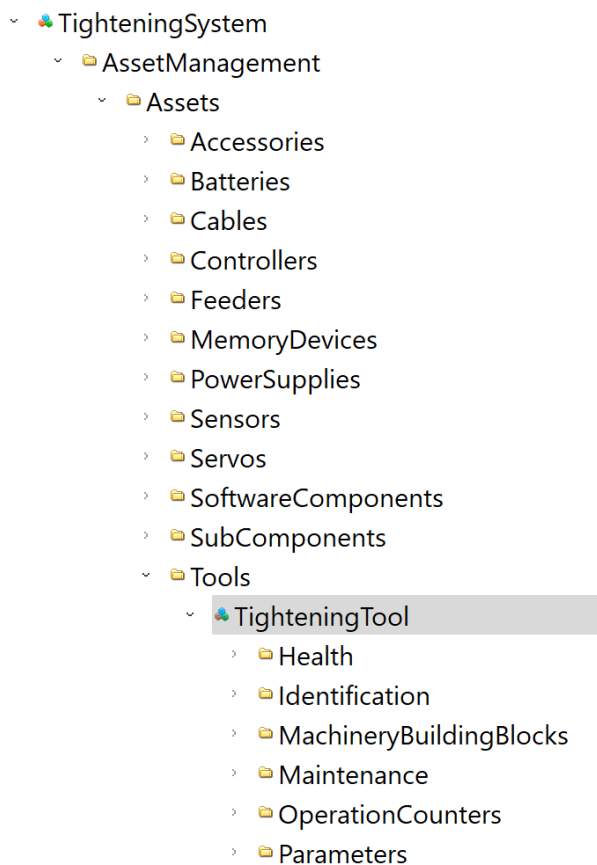
Result Simulation

- **Result Access Options:**
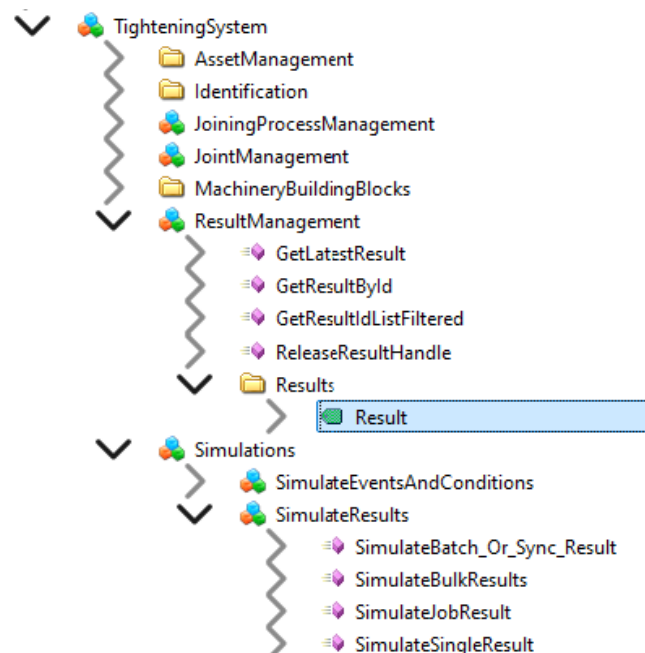 - Subscribe to the **Result variable** shown below.
  - Subscribe to **events** by subscribing to the **Server** node in the Event View.
- **Simulation Options**
  - Use the following **three methods** to simulate different types of **Results**. A new **Result** is generated upon the execution of the 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.**
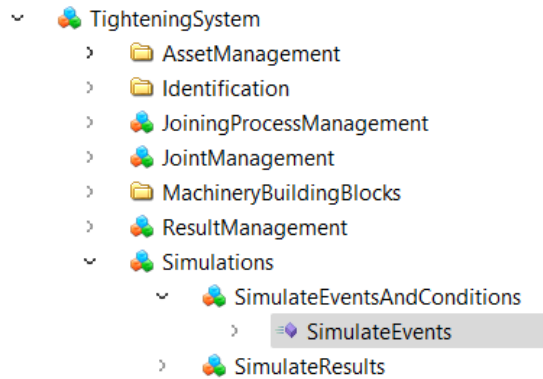
Example Result Data Access View

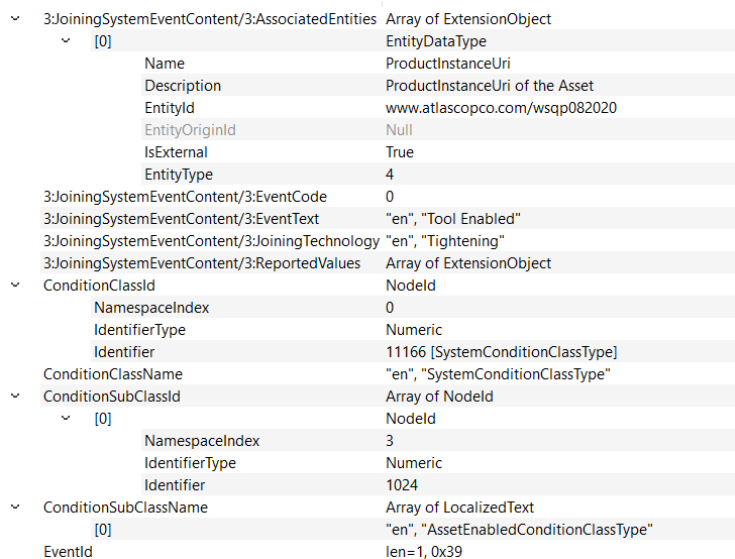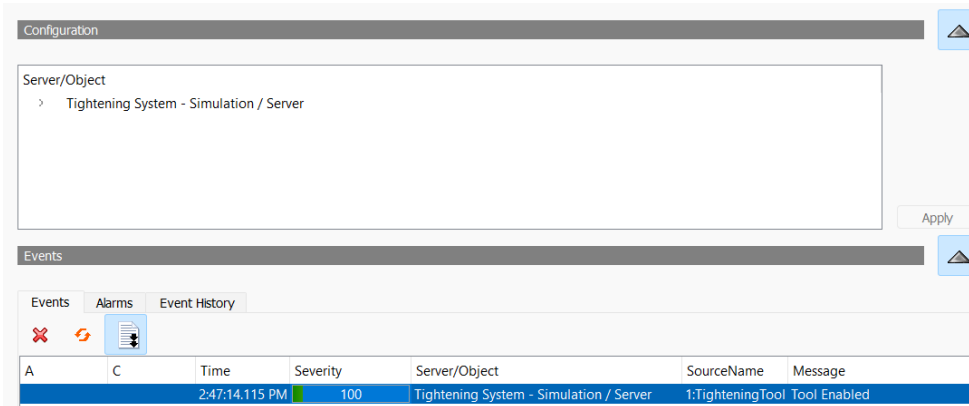| #	Display Name	Value	Datatype
1	Result	Double click to display value	ExtensionObject
2	ResultContent	Double click to display value	Variant
3	ResultMetaData	Double click to display value	ExtensionObject
4	AssemblyType	1	Byte
5	AssociatedEntities	Double click to display value	ExtensionObject
6	Classification	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

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.
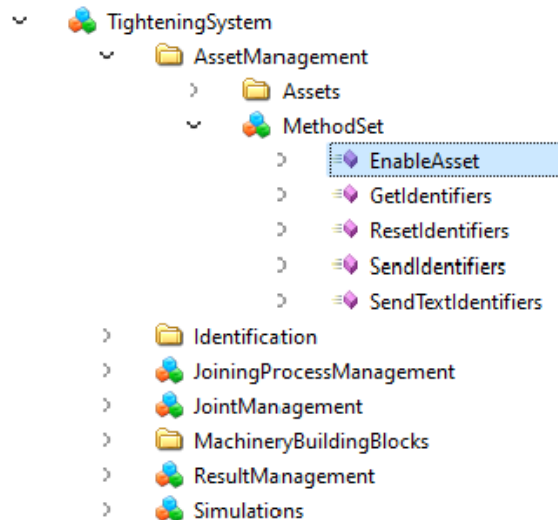
- ⌄ 🔶 TighteningSystem
  - ❯ 📁 AssetManagement
  - ❯ 📁 Identification
  - ❯ 🔶 JoiningProcessManagement
  - ❯ 🔶 JointManagement
  - ❯ 📁 MachineryBuildingBlocks
  - ❯ 🔶 ResultManagement
  - ⌄ 🔶 Simulations
    - ⌄ 🔶 SimulateEventsAndConditions
      - ❯ 🔷 SimulateEvents
    - ❯ 🔶 SimulateResults

Example Events View

Configuration	▲

Server/Object
  ❯ Tightening System - Simulation / Server

Apply

Events	▲

Events | Alarms | Event History

❌ 🔄 📋

A	C	Time	Severity	Server/Object	SourceName	Message
		2:47:14.115 PM	100	Tightening System - Simulation / Server	1:TighteningTool	Tool Enabled

⌄ 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

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