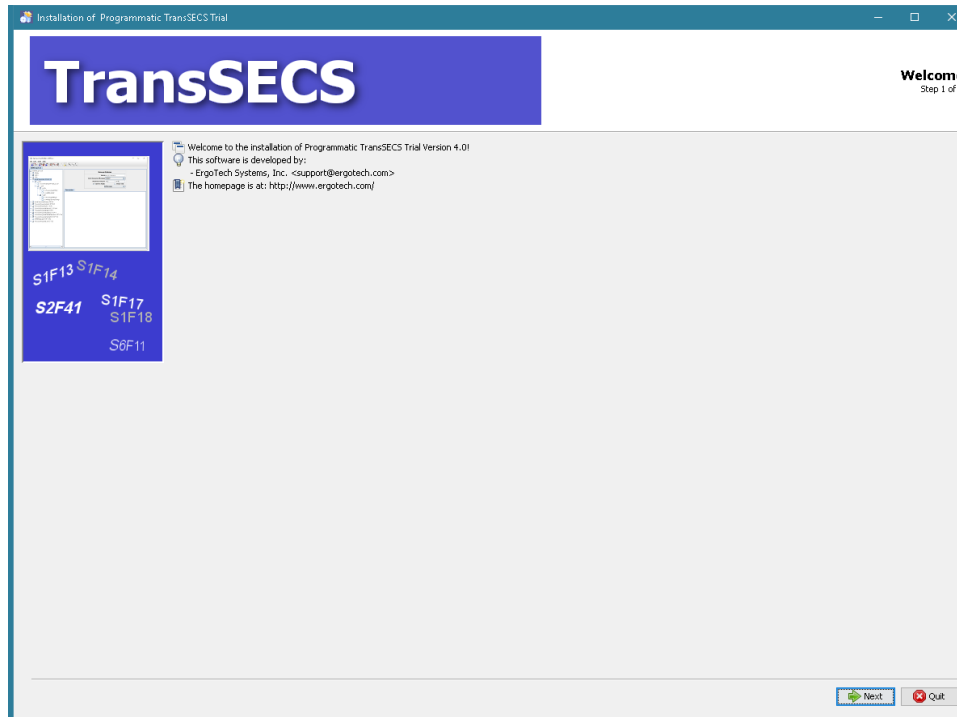# TransSECS for an OPCUA Server

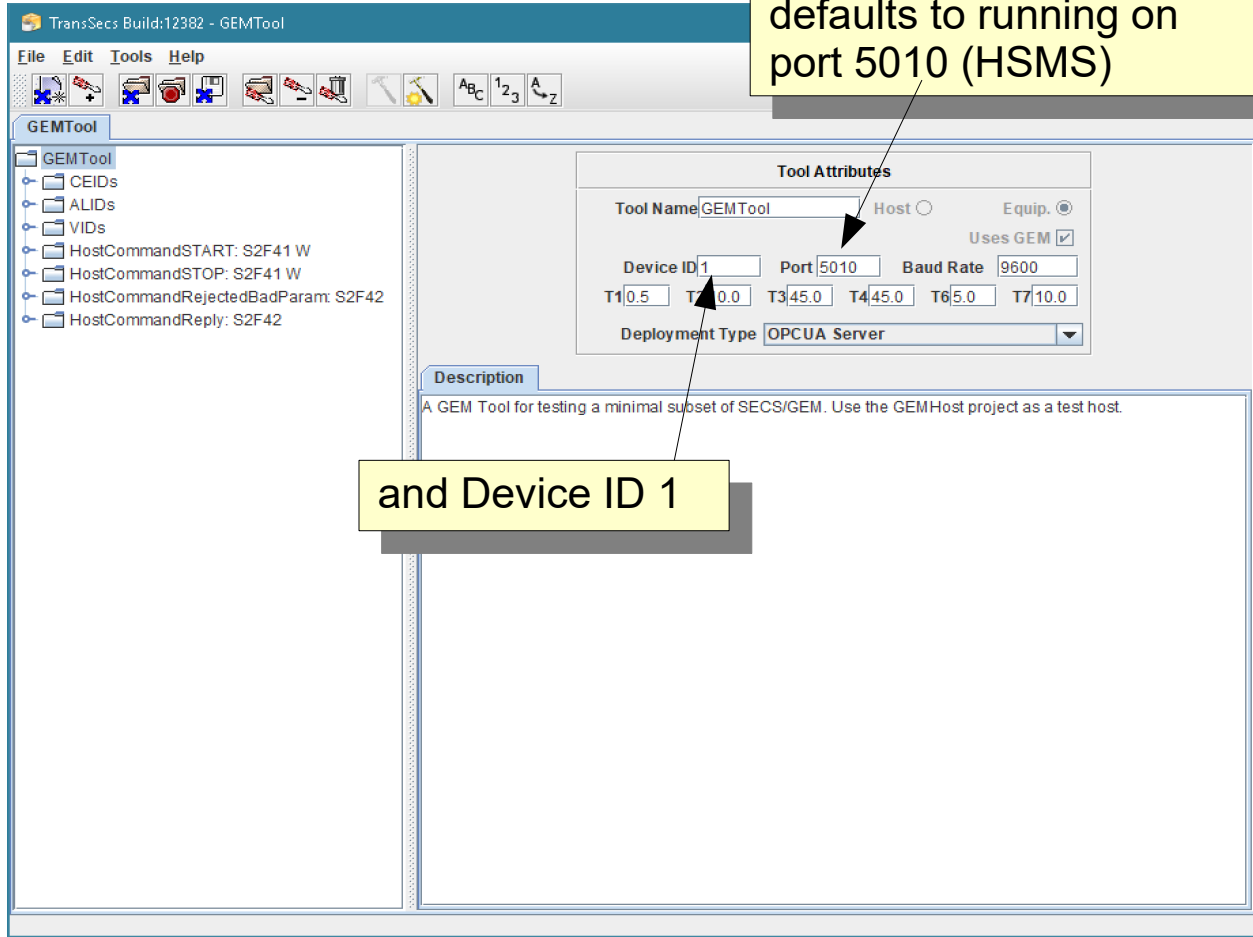Using Servers TransSECS to Create an OPCUA SECS/GEM Tool Interface

Installing TransSECS

Double click on the installer and click **Next** when prompted. Once installed, start the TransSECS Builder application (MIStudioSuite/TransSECS/Builder/TransSECS.exe)
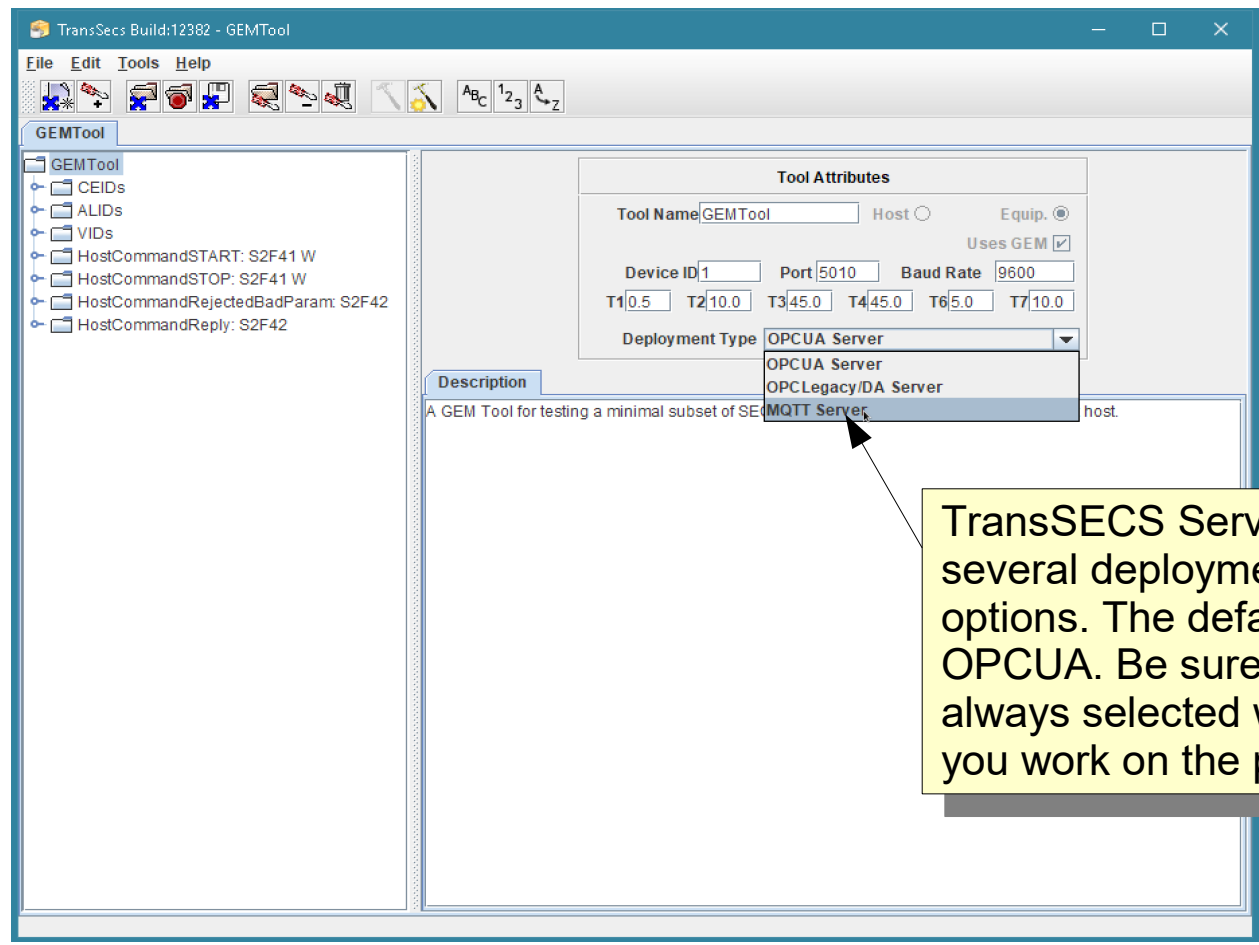
The example GEMTool will be loaded when you start the TransSECS Builder

The tool interface defaults to running on port 5010 (HSMS)

and Device ID 1

TransSecs Build:12382 - GEMTool

File Edit Tools Help

GEMTool

- GEMTool
  - CEIDs
  - ALIDs
  - VIDs
  - HostCommandSTART: S2F41 W
  - HostCommandSTOP: S2F41 W
  - HostCommandRejectedBadParam: S2F42
  - HostCommandReply: S2F42

Tool Attributes

Tool Name GEMTool   Host ○   Equip. ◉

Uses GEM ☑

Device ID 1   Port 5010   Baud Rate 9600

T1 0.5   T2 10.0   T3 45.0   T4 45.0   T6 5.0   T7 10.0

Deployment Type OPCUA Server

Description

A GEM Tool for testing a minimal subset of SECS/GEM. Use the GEMHost project as a test host.

Select the type of server for deployment

TransSECS Servers has several deployment options. The default is OPCUA. Be sure it is always selected while you work on the project.
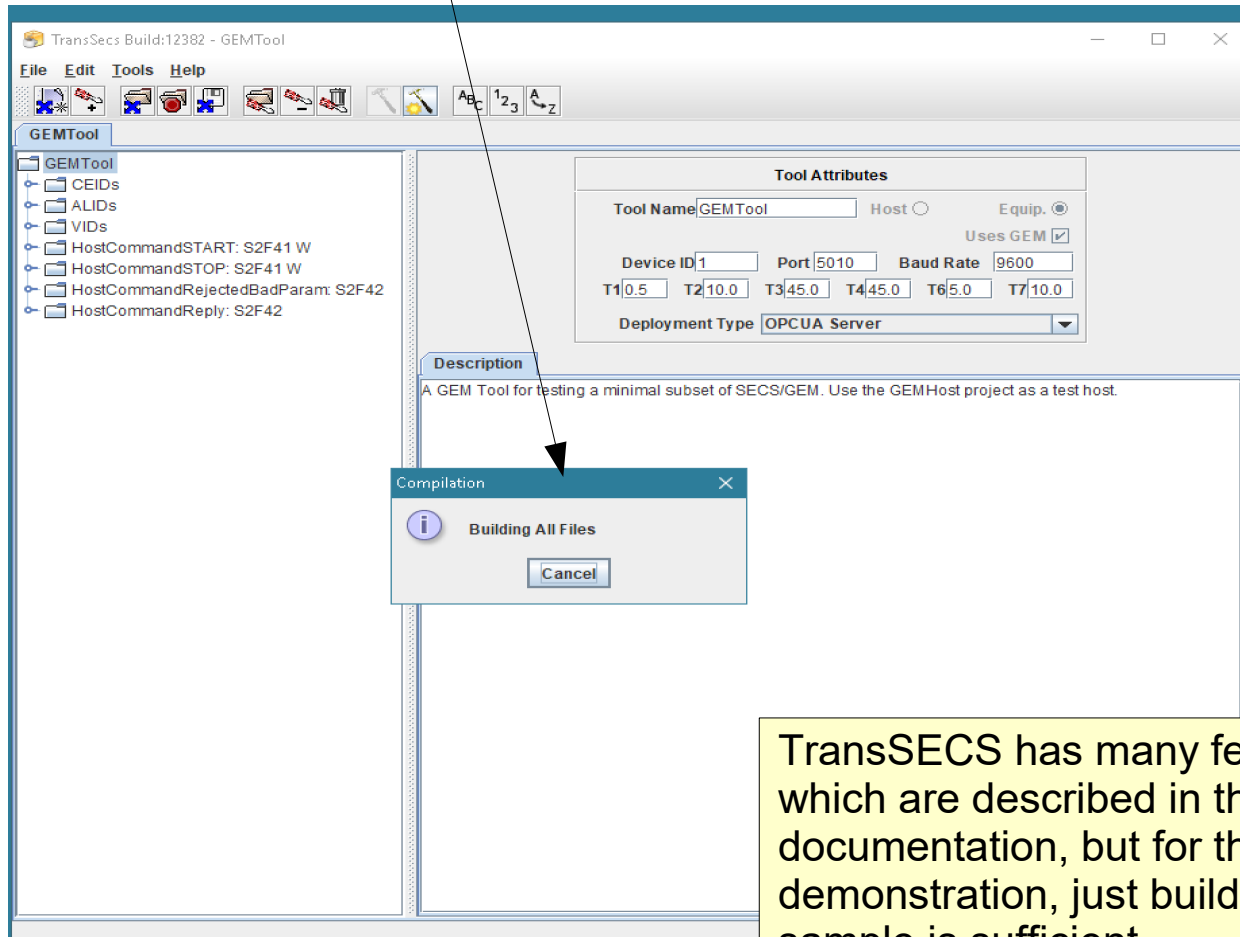
Press the Hammer/Star button to build the project
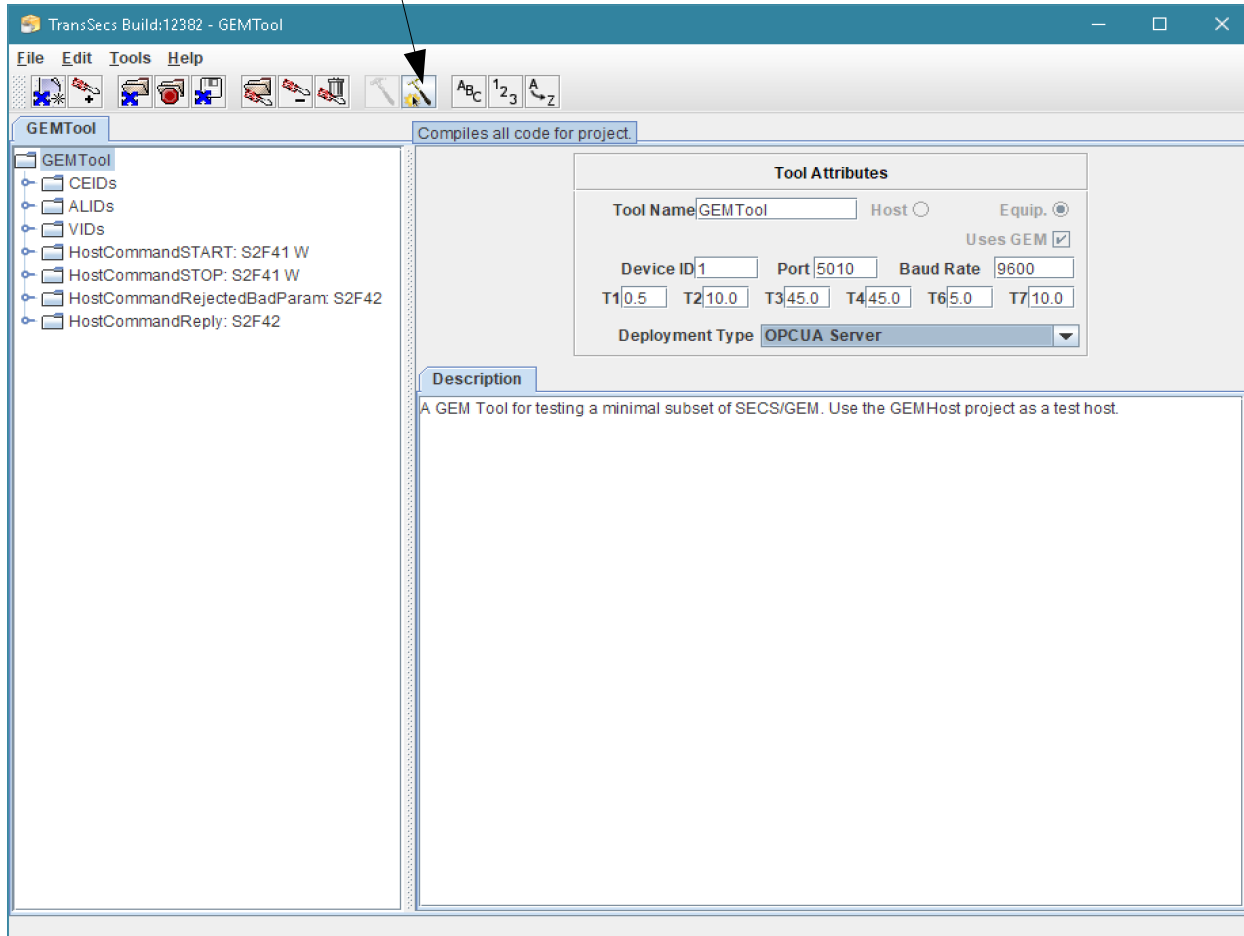
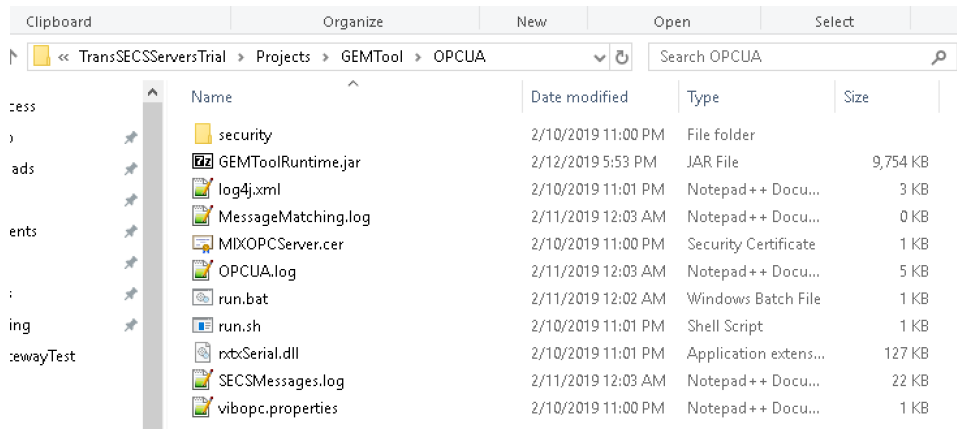When the "Compilation" popup closes the build is complete. This may take a minute or so.

TransSECS has many features which are described in the documentation, but for this demonstration, just building the sample is sufficient.

After the code is generated the server code for the tool will be in the Projects/GEMTool/OPCUA directory.

Clipboard	Organize	New	Open	Select	

« TransSECSServersTrial › Projects › GEMTool › OPCUA   ✓ ⟳   Search OPCUA 🔍

Name	Date modified	Type	Size
📁 security	2/10/2019 11:00 PM	File folder	
📦 GEMToolRuntime.jar	2/12/2019 5:53 PM	JAR File	9,754 KB
📄 log4j.xml	2/10/2019 11:01 PM	Notepad++ Docu...	3 KB
📄 MessageMatching.log	2/11/2019 12:03 AM	Notepad++ Docu...	0 KB
📄 MIXOPCServer.cer	2/10/2019 11:00 PM	Security Certificate	1 KB
📄 OPCUA.log	2/11/2019 12:03 AM	Notepad++ Docu...	5 KB
📄 run.bat	2/11/2019 12:02 AM	Windows Batch File	1 KB
📄 run.sh	2/10/2019 11:01 PM	Shell Script	1 KB
📄 rxtxSerial.dll	2/10/2019 11:01 PM	Application extens...	127 KB
📄 SECSMessages.log	2/11/2019 12:03 AM	Notepad++ Docu...	22 KB
📄 vibopc.properties	2/10/2019 11:00 PM	Notepad++ Docu...	1 KB

Everything you need to run on Windows is in this directory. For Linux systems you will need install rxtxSerial on the system and make appropriate changes to the run.sh file.
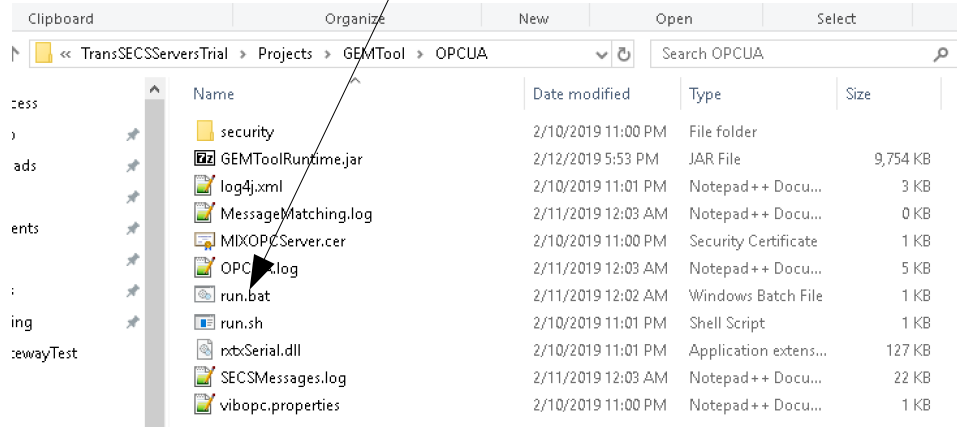
You may need to edit the path to the jre in run.bat if you move the deployment location.

Run the server with the run.bat file.

Run the SECS/GEM Interface as an OPCUA Server


```
C:\WINDOWS\system32\cmd.exe                                                                              —    □    ×

C:\Users\Public\ErgoTech\TransSECSServersTrial\Projects\GEMTool\OPCUA>java deploy.GEMTool.EquipmentController
Started tool GEMTool on port 5010 device id 1
2019-03-09 10:53:21.291 [createFolderNode( gemtool:gemtool]2019-03-09 10:53:21.291
2019-03-09 10:53:21.291 [createFolderNode( vids:gemtool/vids]2019-03-09 10:53:21.291
2019-03-09 10:53:21.306 [creatingNode( s5f1replybit:com.ergotech.secs.gem.GemECID periodic false]2019-03-09 10:53:21.306
2019-03-09 10:53:21.306 [createFolderNode( configuration:gemtool/configuration]2019-03-09 10:53:21.306
2019-03-09 10:53:21.306 [creatingNode( port:deploy.GEMTool.EquipmentController$1 periodic false]2019-03-09 10:53:21.306
2019-03-09 10:53:21.306 [creatingNode( deviceid:deploy.GEMTool.EquipmentController$1 periodic false]2019-03-09 10:53:21.306
2019-03-09 10:53:21.306 [creatingNode( passivet1:deploy.GEMTool.EquipmentController$1 periodic false]2019-03-09 10:53:21.306
2019-03-09 10:53:21.306 [creatingNode( passivet2:deploy.GEMTool.EquipmentController$1 periodic false]2019-03-09 10:53:21.306
2019-03-09 10:53:21.306 [creatingNode( passivet3:deploy.GEMTool.EquipmentController$1 periodic false]2019-03-09 10:53:21.306
2019-03-09 10:53:21.306 [creatingNode( passivet4:deploy.GEMTool.EquipmentController$1 periodic false]2019-03-09 10:53:21.306
2019-03-09 10:53:21.306 [creatingNode( passivet5:deploy.GEMTool.EquipmentController$1 periodic false]2019-03-09 10:53:21.306
2019-03-09 10:53:21.306 [creatingNode( passivet6:deploy.GEMTool.EquipmentController$1 periodic false]2019-03-09 10:53:21.306
2019-03-09 10:53:21.306 [creatingNode( passivet7:deploy.GEMTool.EquipmentController$1 periodic false]2019-03-09 10:53:21.306
2019-03-09 10:53:21.306 [creatingNode( passivet8:deploy.GEMTool.EquipmentController$1 periodic false]2019-03-09 10:53:21.306
2019-03-09 10:53:21.306 [creatingNode( baudrate:deploy.GEMTool.EquipmentController$1 periodic false]2019-03-09 10:53:21.306
2019-03-09 10:53:21.306 [creatingNode( persistencefilename:deploy.GEMTool.EquipmentController$1 periodic false]2019-03-09 10:53:21.306
2019-03-09 10:53:21.306 [createFolderNode( hostcommandstart:gemtool/hostcommandstart]2019-03-09 10:53:21.306
2019-03-09 10:53:21.322 [creatingNode( cpvalue:deploy.GEMTool.HostCommandSTART periodic false]2019-03-09 10:53:21.322
2019-03-09 10:53:21.322 [vib.utils.VIBOPC > setValueObject( PrimaryOutPort:0 ) setValueObject="RecipeName" )]2019-03-09 10:53:21.322
2019-03-09 10:53:21.322 [creatingNode( responsestatus:deploy.GEMTool.HostCommandSTART periodic false]2019-03-09 10:53:21.322
2019-03-09 10:53:21.322 [creatingNode( errorstatus:deploy.GEMTool.HostCommandSTART periodic false]2019-03-09 10:53:21.322
2019-03-09 10:53:21.322 [creatingNode( command:deploy.GEMTool.HostCommandSTART periodic false]2019-03-09 10:53:21.322
2019-03-09 10:53:21.322 [vib.utils.VIBOPC > setValueObject( PrimaryOutPort:3 ) setValueObject="START" )]2019-03-09 10:53:21.322
2019-03-09 10:53:21.322 [creatingNode( goodstatus:deploy.GEMTool.HostCommandSTART periodic false]2019-03-09 10:53:21.322
2019-03-09 10:53:21.322 [creatingNode( spoolfulltime:com.ergotech.secs.gem.GemSVID periodic false]2019-03-09 10:53:21.322
2019-03-09 10:53:21.322 [vib.utils.VIBOPC > setValueObject( PrimaryOutPort:0 ) setValueObject="0" )]2019-03-09 10:53:21.322
2019-03-09 10:53:21.322 [creatingNode( spoolcounttotal:com.ergotech.secs.g
2019-03-09 10:53:21.322 [vib.utils.VIBOPC > setValueObject( PrimaryOutPort
2019-03-09 10:53:21.337 [creatingNode( clock:com.ergotech.secs.gem.GemCLO                                              21.337
2019-03-09 10:53:21.337 [vib.utils.VIBOPC > setValueObject( PrimaryOutPort
```

When you run the generated run.bat, the tool's SECS/GEM will be running on Port 5010 and Device ID 1 as an OPCUA server.

Run the SECS/GEM Interface as an OPCUA Server


```
C:\WINDOWS\system32\cmd.exe                                                                    —   □   ×

C:\Users\Public\ErgoTech\TransSECSServersTrial\Projects\GEMTool\OPCUA>java deploy.GEMTool.EquipmentController
Started tool GEMTool on port 5010 device id 1
2019-03-09 10:53:21.291 [createFolderNode( gemtool:gemtool]2019-03-09 10:53:21.291
2019-03-09 10:53:21.291 [createFolderNode( vids:gemtool/vids]2019-03-09 10:53:21.291
2019-03-09 10:53:21.306 [creatingNode( s5f1replybit:com.ergotech.secs.gem.GemECID periodic false]2019-03-09 10:53:21.306
2019-03-09 10:53:21.306 [createFolderNode( configuration:gemtool/configuration]2019-03-09 10:53:21.306
2019-03-09 10:53:21.306 [creatingNode( port:deploy.GEMTool.EquipmentController$1 periodic false]2019-03-09 10:53:21.306
2019-03-09 10:53:21.306 [creatingNode( deviceid:deploy.GEMTool.EquipmentController$1 periodic false]2019-03-09 10:53:21.306
2019-03-09 10:53:21.306 [creatingNode( passivet1:deploy.GEMTool.EquipmentController$1 periodic false]2019-03-09 10:53:21.306
2019-03-09 10:53:21.306 [creatingNode( passivet2:deploy.GEMTool.EquipmentController$1 periodic false]2019-03-09 10:53:21.306
2019-03-09 10:53:21.306 [creatingNode( passivet3:deploy.GEMTool.EquipmentController$1 periodic false]2019-03-09 10:53:21.306
2019-03-09 10:53:21.306 [creatingNode( passivet4:deploy.GEMTool.EquipmentController$1 periodic false]2019-03-09 10:53:21.306
2019-03-09 10:53:21.306 [creatingNode( passivet5:deploy.GEMTool.EquipmentController$1 periodic false]2019-03-09 10:53:21.306
2019-03-09 10:53:21.306 [creatingNode( passivet6:deploy.GEMTool.EquipmentController$1 periodic false]2019-03-09 10:53:21.306
2019-03-09 10:53:21.306 [creatingNode( passivet7:deploy.GEMTool.EquipmentController$1 periodic false]2019-03-09 10:53:21.306
2019-03-09 10:53:21.306 [creatingNode( passivet8:deploy.GEMTool.EquipmentController$1 periodic false]2019-03-09 10:53:21.306
2019-03-09 10:53:21.306 [creatingNode( baudrate:deploy.GEMTool.EquipmentController$1 periodic false]2019-03-09 10:53:21.306
2019-03-09 10:53:21.306 [creatingNode( persistencefilename:deploy.GEMTool.EquipmentController$1 periodic false]2019-03-09 10:53:21.306
2019-03-09 10:53:21.306 [createFolderNode( hostcommandstart:gemtool/hostcommandstart]2019-03-09 10:53:21.306
2019-03-09 10:53:21.322 [creatingNode( cpvalue:deploy.GEMTool.HostCommandSTART periodic false]2019-03-09 10:53:21.322
2019-03-09 10:53:21.322 [vib.utils.VIBOPC > setValueObject( PrimaryOutPort:0 ) setValueObject="RecipeName" )]2019-03-09 10:53:21.322
2019-03-09 10:53:21.322 [creatingNode( responsestatus:deploy.GEMTool.HostCommandSTART periodic false]2019-03-09 10:53:21.322
2019-03-09 10:53:21.322 [creatingNode( errorstatus:deploy.GEMTool.HostCommandSTART periodic false]2019-03-09 10:53:21.322
2019-03-09 10:53:21.322 [creatingNode( command:deploy.GEMTool.HostCommandSTART periodic false]2019-03-09 10:53:21.322
2019-03-09 10:53:21.322 [vib.utils.VIBOPC > setValueObject( PrimaryOutPort:3 ) setValueObject="START" )]2019-03-09 10:53:21.322
2019-03-09 10:53:21.322 [creatingNode( goodstatus:deploy.GEMTool.HostCommandSTART periodic false]2019-03-09 10:53:21.322
2019-03-09 10:53:21.322 [creatingNode( spoolfulltime:com.ergotech.secs.gem.GemSVID periodic false]2019-03-09 10:53:21.322
2019-03-09 10:53:21.322 [vib.utils.VIBOPC > setValueObject( PrimaryOutPort:0 ) setValueObject="0" )]2019-03-09 10:53:21.322
2019-03-09 10:53:21.322 [creatingNode( spoolcounttotal:com.ergotech.secs.gem.GemSVID periodic false]2019-03-09 10:53:21.322
2019-03-09 10:53:21.322 [vib.utils.VIBOPC > setValueOb
2019-03-09 10:53:21.337 [creatingNode( clock:com.ergot
2019-03-09 10:53:21.337 [vib.utils.VIBOPC > setValueOb
```
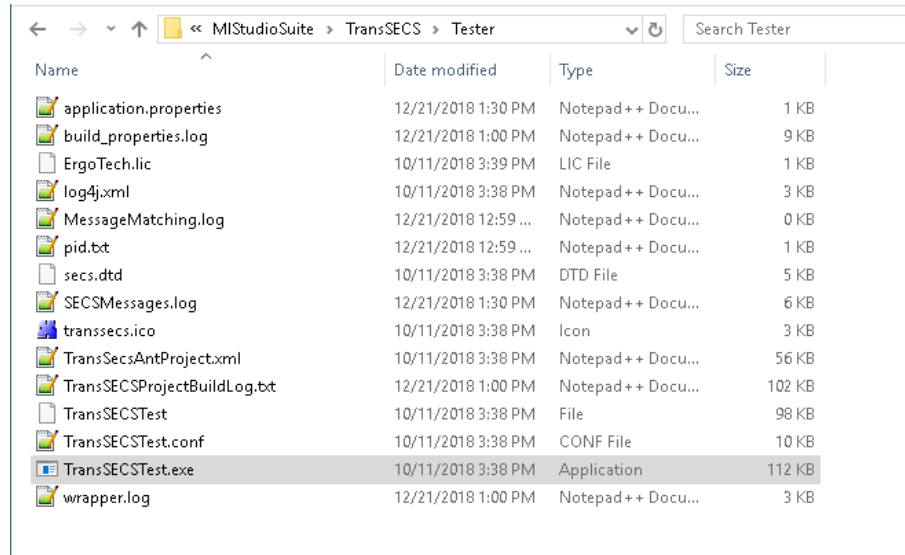
The SECS/GEM OPCUA Server endpoint URL is
opc.tcp://127.0.0.1:12686/MIXOPCServer

Test the SECS/GEM Interface with TransSECS GEMHost using TransSECSTest.exe

Name	Date modified	Type	Size
application.properties	12/21/2018 1:30 PM	Notepad++ Docu...	1 KB
build_properties.log	12/21/2018 1:00 PM	Notepad++ Docu...	9 KB
ErgoTech.lic	10/11/2018 3:39 PM	LIC File	1 KB
log4j.xml	10/11/2018 3:38 PM	Notepad++ Docu...	3 KB
MessageMatching.log	12/21/2018 12:59 ...	Notepad++ Docu...	0 KB
pid.txt	12/21/2018 12:59 ...	Notepad++ Docu...	1 KB
secs.dtd	10/11/2018 3:38 PM	DTD File	5 KB
SECSMessages.log	12/21/2018 1:30 PM	Notepad++ Docu...	6 KB
transsecs.ico	10/11/2018 3:38 PM	Icon	3 KB
TransSecsAntProject.xml	10/11/2018 3:38 PM	Notepad++ Docu...	56 KB
TransSECSProjectBuildLog.txt	12/21/2018 1:00 PM	Notepad++ Docu...	102 KB
TransSECSTest	10/11/2018 3:38 PM	File	98 KB
TransSECSTest.conf	10/11/2018 3:38 PM	CONF File	10 KB
TransSECSTest.exe	10/11/2018 3:38 PM	Application	112 KB
wrapper.log	12/21/2018 1:00 PM	Notepad++ Docu...	3 KB

Search Tester — MIStudioSuite > TransSECS > Tester

This starts TransSECS with the GEMHost project which runs as a Host to test the tool interface.

Note: If the ExtendedHost is loaded when TransSECSTest is started, use the File menu to load the GEMHost project.

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Run TransSECS as a test host

Set to LIVE mode before building the GEMHost project
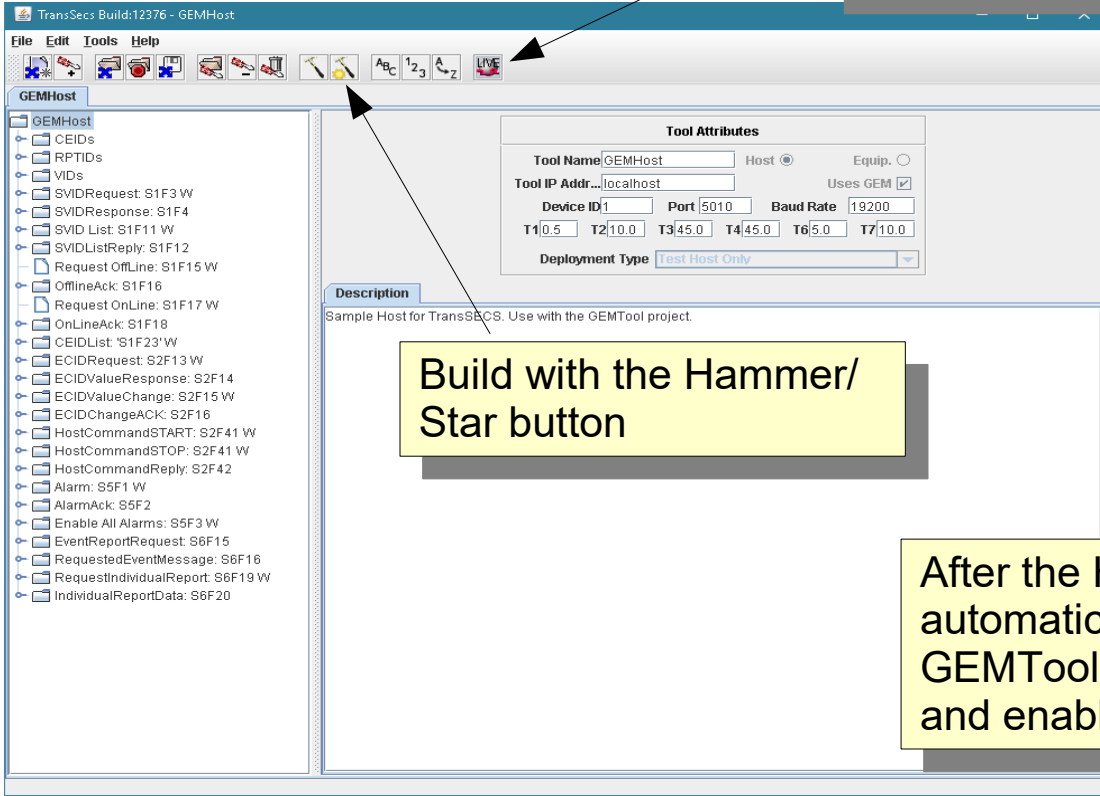
Build with the Hammer/ Star button

After the Host is built it will run and automatically connect to the GEMTool and set up event reports and enable alarms

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Run TransSECS Test as a host

This arrow shows that the host is running
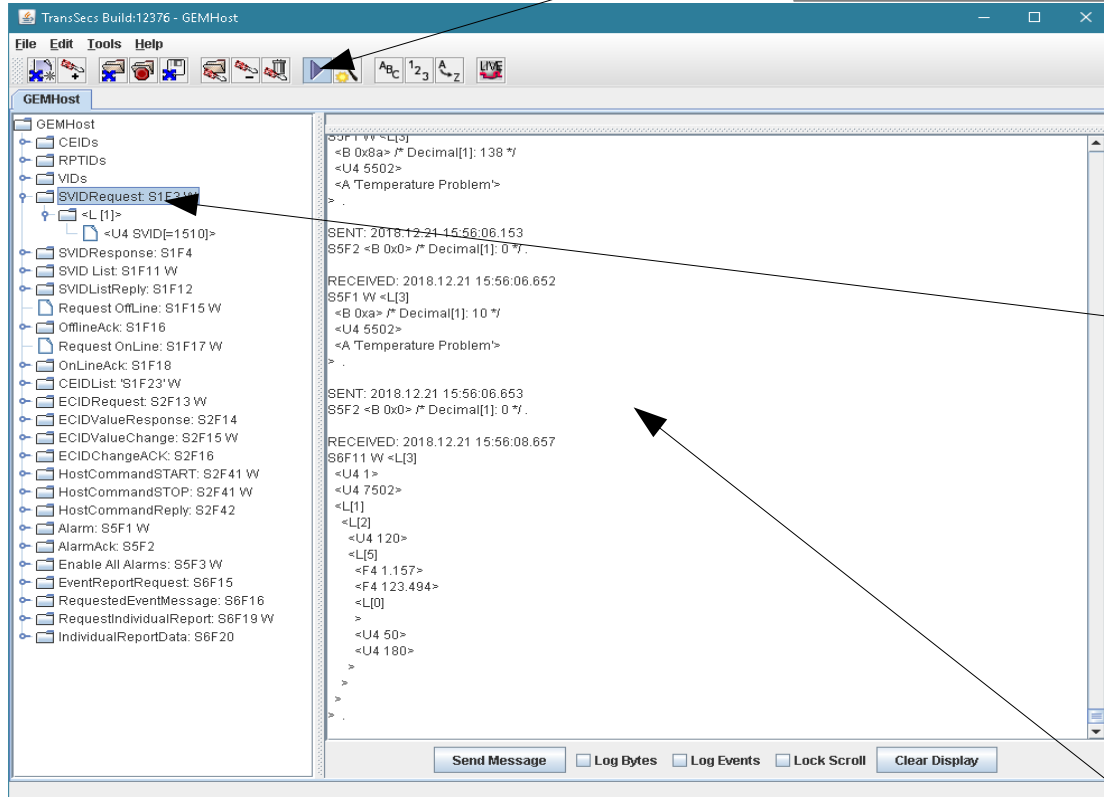
Select a primary (outgoing) message and Press "Send Message" button to send it

Messages sent and received will be shown in the Messages panel (when a message is selected)

Send an S1F3 test message to the tool

Select the S1F3 Message.

Change the SVID you want to request
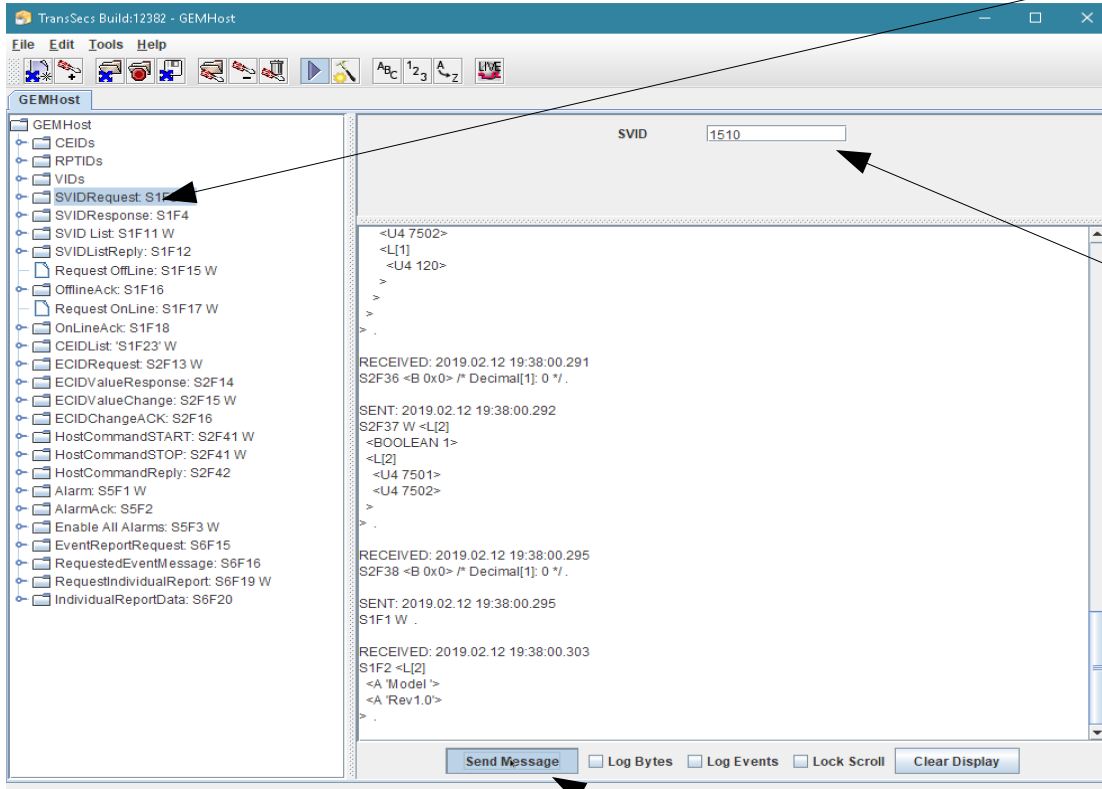
Press the Send Message button to send the message to the tool

The sent message and its reply will appear in the Message Panel
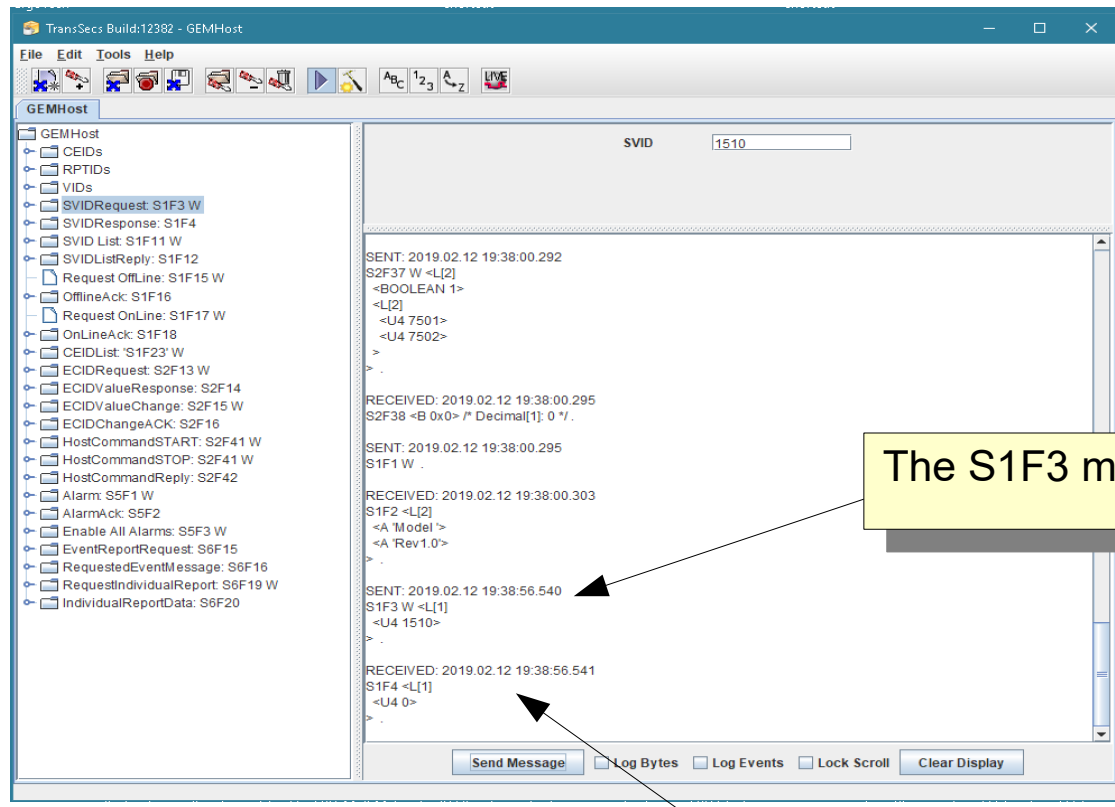
The S1F3 message

The S1F4 reply

Test an OPCUA Client Connection
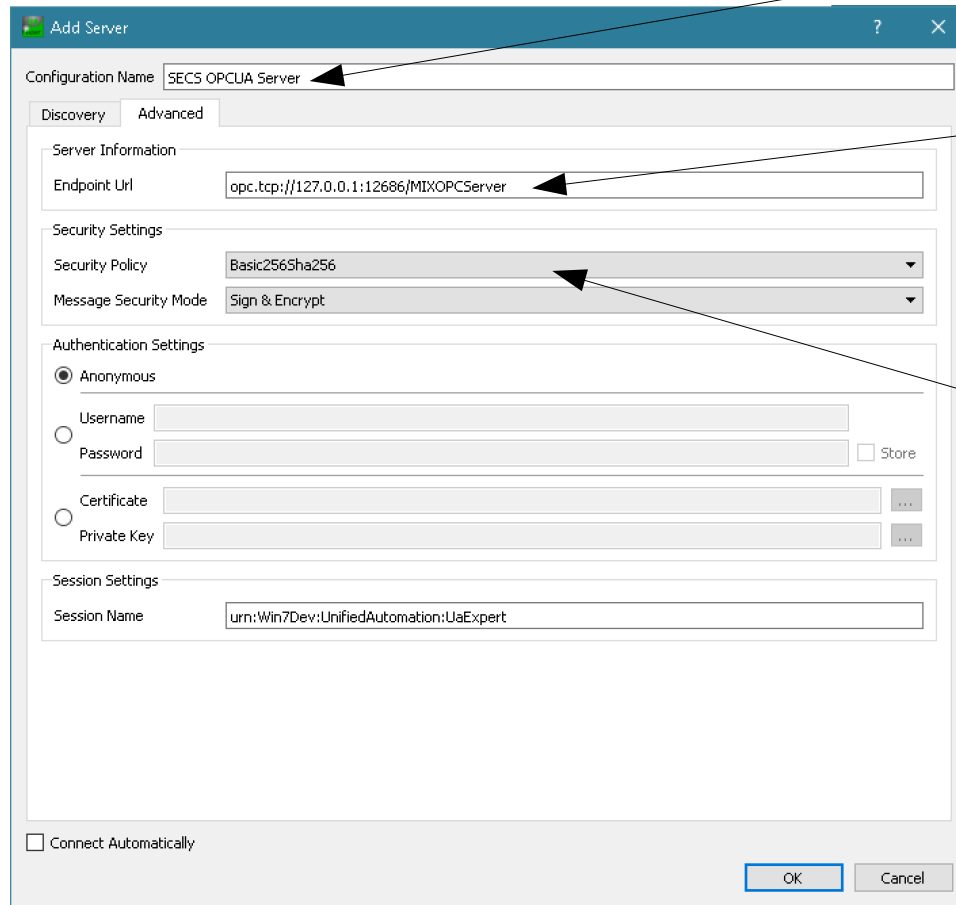
This example will use the UAExpert Reference Client to test the OPCUA SECS/GEM Server.

https://www.unified-automation.com/products/development-tools/uaexpert.html

The steps are basically the same for any OPCUA Client:

1) Run the OPCUA Client

2) configure a connection to the SECS/GEM OPCUA Server

3) connect to the SECS/GEM OPCUA Server

4) resolve security certificate issues

Start UAExpert and Add a new OPCUA Server

Right Click on the Servers node to add a new OPCUA server connection

Configure the Server in UAExpert

Name the OPCUA Server connection

Enter the Endpoint URL for the SECS/GEM OPCUA Server

Select the Security Policy and Message Security Mode. All choices, including NONE is valid for the SECS/GEM OPCUA Server.

Add Server

Configuration Name SECS OPCUA Server

Discovery | Advanced

Server Information

Endpoint Url opc.tcp://127.0.0.1:12686/MIXOPCServer

Security Settings

Security Policy Basic256Sha256

Message Security Mode Sign & Encrypt

Authentication Settings

○ Anonymous

○ Username
   Password ☐ Store

○ Certificate
   Private Key

Session Settings

Session Name urn:Win7Dev:UnifiedAutomation:UaExpert

☐ Connect Automatically

OK   Cancel

Connect to the OPCUA Server

Right Click on the newly added server to select "Connect"

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OPCUA Certificates

OPCUA requires certificates for authentication. Note: No certificate is required for the security policy NONE and message security mode NONE in the client setup.
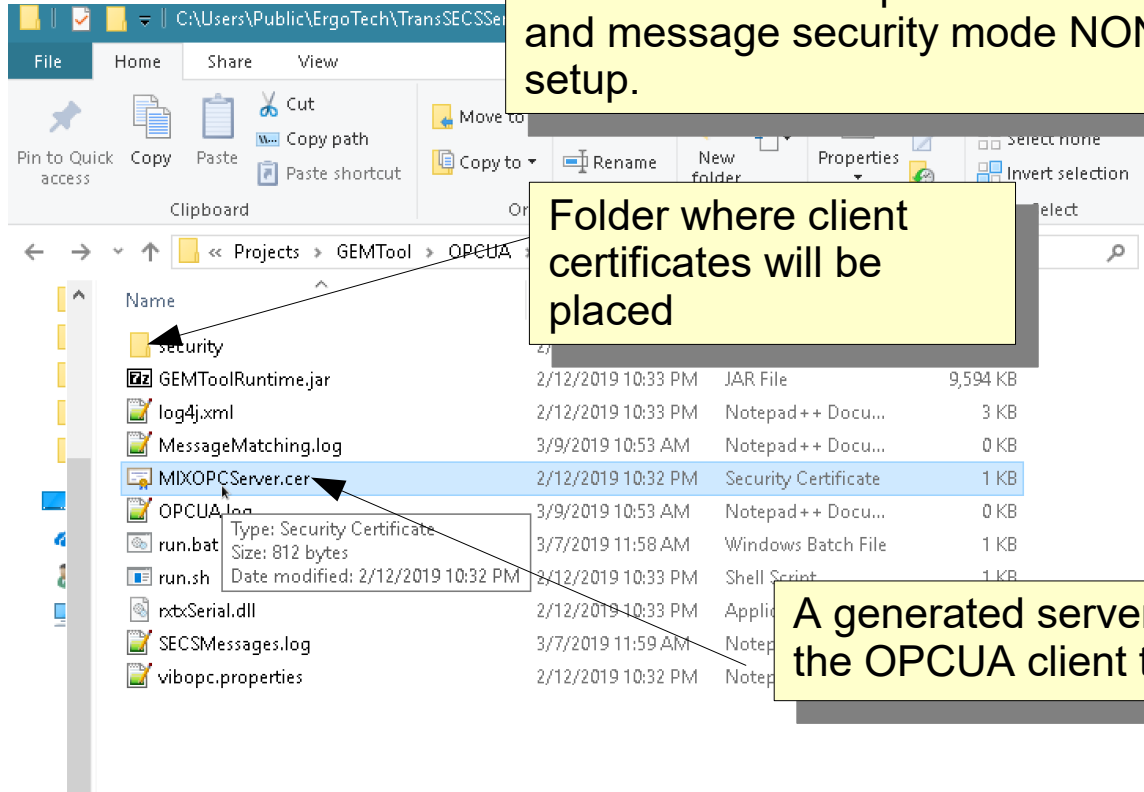
Folder where client certificates will be placed

A generated server certificate for the OPCUA client to import.

UAExpert Certificate Exchange

During the first connection to the OPCUA Server the server's security certificate will be imported by UAExpert.

The certificate has been imported but is not trusted.

For UAExpert, this certificate can be trusted by using the "Trust Server Certificate" button. For other clients, read the documentation for a similar procedure to install and trust the certificate.

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UAExpert Certificate Exchange

UAExpert Certificate Exchange

There is one more certificate related step before the server connection can be made. The client has given the server its own certificate but it is not yet trusted by the SECS/GEM OPCUA Server.

Unified Automation UaExpert - The OPC Unified Architecture Client - transsecs

File   View   Server   Document   Settings   Help

Project
- Project
  - Servers
    - SECS OPCUA Server
  - Documents
    - Data Access View

Data Access View

#	Server	Node

Address Space

References

Forward ▼

Reference	Target DisplayName

Security checks failed.

Log
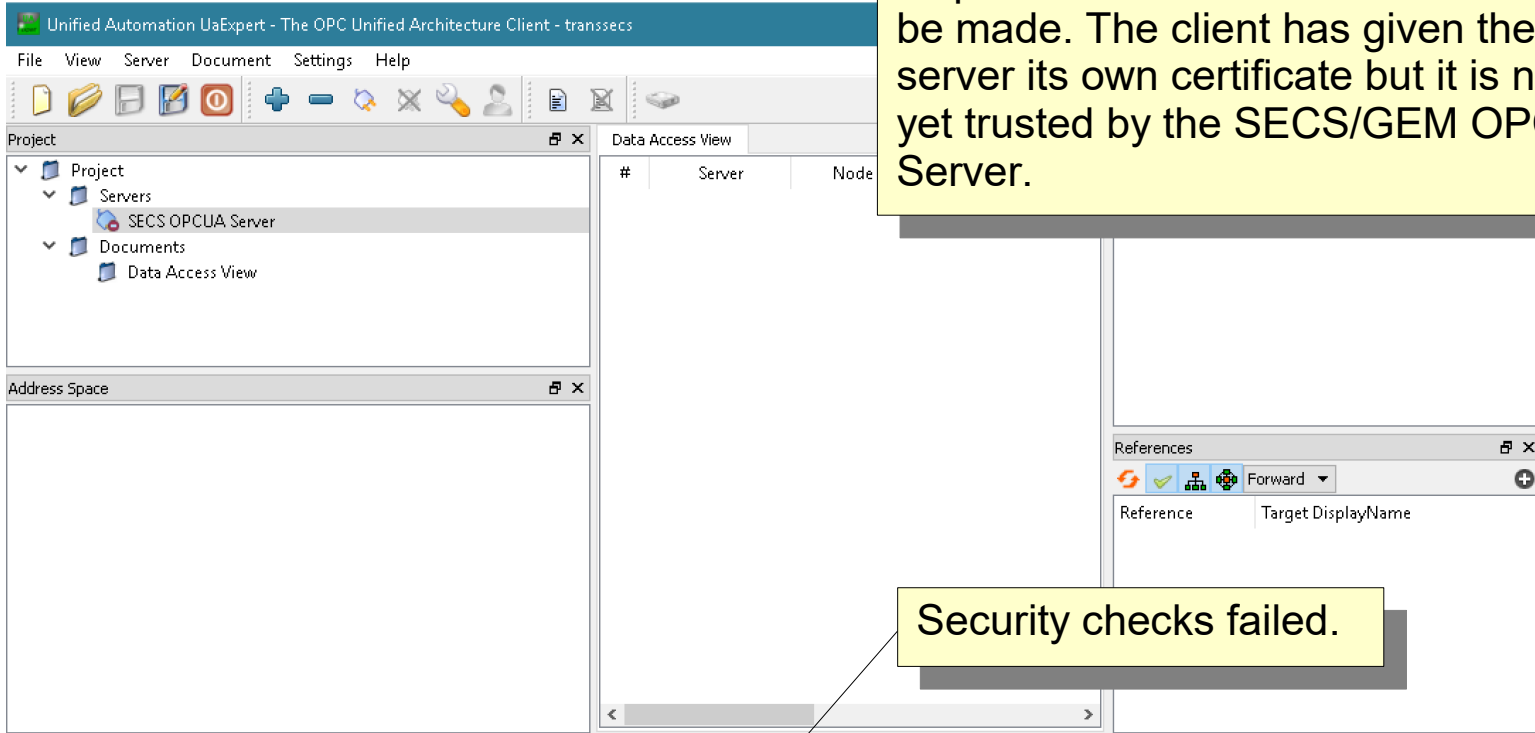
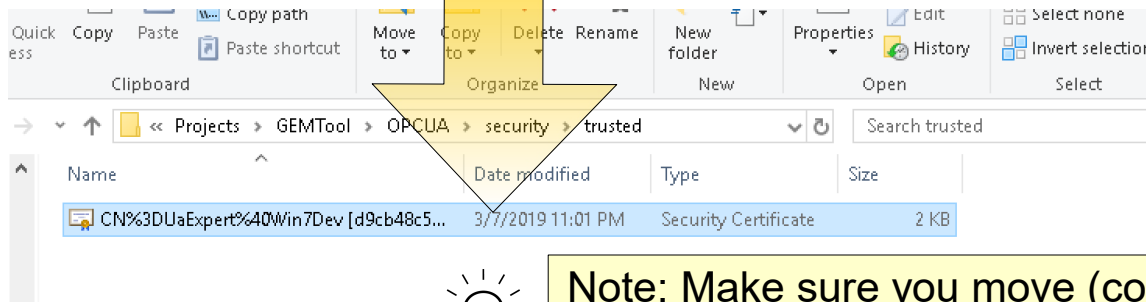| Timestamp	Source	Server	Message
3/7/2019 5:35:57.407 PM	Server Node	SECS OPCUA Server	Connecting failed with error 'BadSecurityChecksFailed'
3/7/2019 5:35:57.390 PM	Server Node	SECS OPCUA Server	Error 'BadSecurityChecksFailed' was returned during OpenSecureChannel
3/7/2019 5:35:57.390 PM	General		[uastack] OpcUa_TcpConnection_ProcessResponse: Reason: security checks failed
3/7/2019 5:35:57.390 PM	General		[uastack] OpcUa_TcpConnection_ProcessResponse: Status 0x80130000!
3/7/2019 5:35:57.390 PM	General		[uastack] OpcUa_TcpConnection_ProcessResponse: Error Message!
3/7/2019 5:35:57.344 PM	Server Node	SECS OPCUA Server	Used UserTokenType: Anonymous
3/7/2019 5:35:57.344 PM	Server Node	SECS OPCUA Server	ApplicationUri: 'urn:ergotech:mix:server'
3/7/2019 5:35:57.344 PM	Server Node	SECS OPCUA Server	Security policy: 'http://opcfoundation.org/UA/SecurityPolicy#Basic256Sha256'
3/7/2019 5:35:57.344 PM	Server Node	SECS OPCUA Server	Endpoint: 'opc.tcp://127.0.0.1:12686/MIXOPCServer'

OPCUA Certificate Exchange

The UAExpert client certificate has been installed in the OPCUA server directory as "rejected" because it needs approval to be trusted. Browse to the OPCUA server security "rejected" folder to find this certificate.
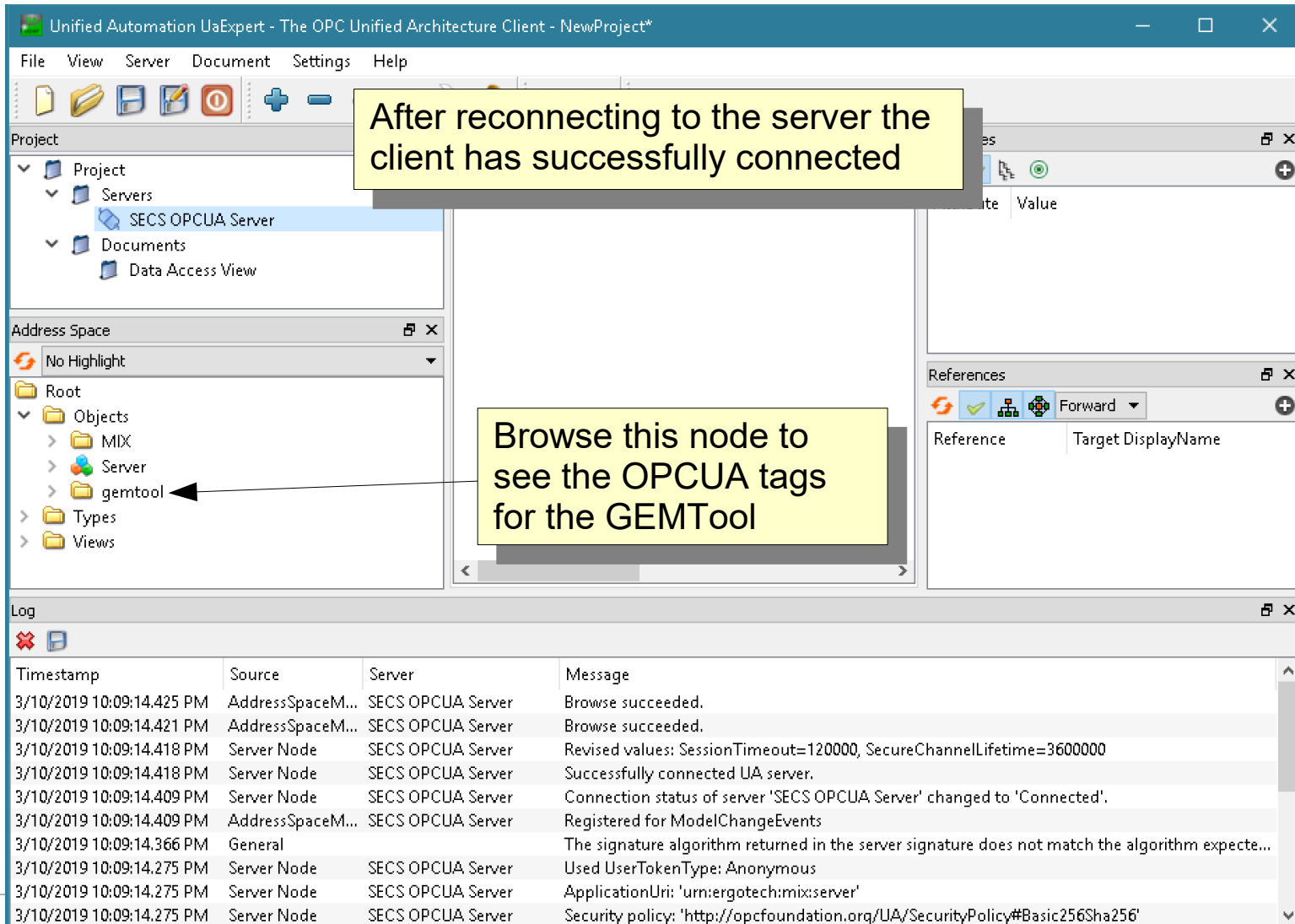
Send	Share with

« GEMTool › OPCUA › security › rejected   Search rejected

Name

CN%3DUaExpert%40Win7Dev [d9cb48c5a685011528f6c0a5da169d626b145b57].der   3/10/2...
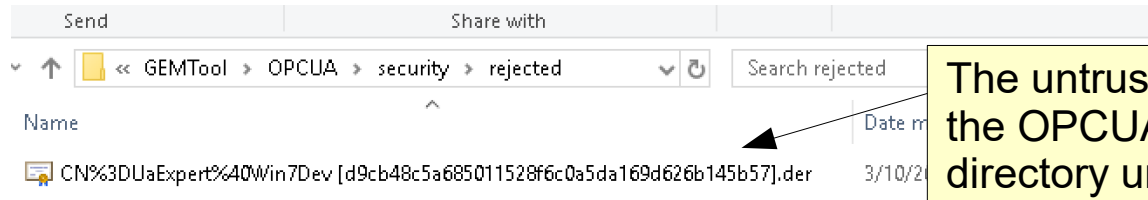
The untrusted client certificate is in the OPCUA server "security" directory under "rejected"

Move this certificate to the "trusted" subdirectory of the OPCUA server security folder.

Quick access Copy Paste Copy path Paste shortcut | Move to Copy to Delete Rename | New folder | Properties Edit History | Select none Invert selection

Clipboard   Organize   New   Open   Select

« Projects › GEMTool › OPCUA › security › trusted   Search trusted

Name	Date modified	Type	Size
CN%3DUaExpert%40Win7Dev [d9cb48c5...	3/7/2019 11:01 PM	Security Certificate	2 KB

Note: Make sure you move (copy/delete) the certificate from the rejected, do not leave the certificate in "rejected"

UAExpert Successful Connection

Unified Automation UaExpert - The OPC Unified Architecture Client - NewProject*

File   View   Server   Document   Settings   Help

Project
- Project
  - Servers
    - SECS OPCUA Server
  - Documents
    - Data Access View

Address Space

No Highlight

- Root
  - Objects
    - MIX
    - Server
    - gemtool
  - Types
  - Views

References

Forward

Reference	Target DisplayName

> After reconnecting to the server the client has successfully connected

> Browse this node to see the OPCUA tags for the GEMTool

Log

Timestamp	Source	Server	Message
3/10/2019 10:09:14.425 PM	AddressSpaceM...	SECS OPCUA Server	Browse succeeded.
3/10/2019 10:09:14.421 PM	AddressSpaceM...	SECS OPCUA Server	Browse succeeded.
3/10/2019 10:09:14.418 PM	Server Node	SECS OPCUA Server	Revised values: SessionTimeout=120000, SecureChannelLifetime=3600000
3/10/2019 10:09:14.418 PM	Server Node	SECS OPCUA Server	Successfully connected UA server.
3/10/2019 10:09:14.409 PM	Server Node	SECS OPCUA Server	Connection status of server 'SECS OPCUA Server' changed to 'Connected'.
3/10/2019 10:09:14.409 PM	AddressSpaceM...	SECS OPCUA Server	Registered for ModelChangeEvents
3/10/2019 10:09:14.366 PM	General		The signature algorithm returned in the server signature does not match the algorithm expecte...
3/10/2019 10:09:14.275 PM	Server Node	SECS OPCUA Server	Used UserTokenType: Anonymous
3/10/2019 10:09:14.275 PM	Server Node	SECS OPCUA Server	ApplicationUri: 'urn:ergotech:mix:server'
3/10/2019 10:09:14.275 PM	Server Node	SECS OPCUA Server	Security policy: 'http://opcfoundation.org/UA/SecurityPolicy#Basic256Sha256'

ErgoTech Systems, Inc.

OPCUA Client Test

One of the more important client connections for a tool interface are to the VIDs in the OCPUA Server.

Unified Automation UaExpert - The OPC Unified Architecture Client - NewProject*

File   View   Server   Document   Settings   Help

Project
- Project
  - Servers
    - SECS OPCUA Server
  - Documents
    - Data Access View

Data Access View

#	Display Name	Value	Datatype
1	localremotestate	true	Boolean
2	onlineofflinestate	true	Boolean

Attributes

Attribute	Value
NodeId	NodeId
	...ool.vids.o

Two significant VIDs have been added to the UAExpert client view, the OnlineOfflineState and LocalRemoteState.

Address Space

No Highlight

- eventsenabled
- gasflow
- lastcontrolstate
- localremotestate
- maxspoolsize
- maxspooltransmit
- mdln
- onlineofflinestate

OnlineOfflineState and LocalRemoteState need to both be boolean true for the fab Host to connect to the tool as Online-Remote. The tool should start out with both false for safety reasons. These should be connected to your HMI client as buttons or switches for operator control.

...lineofflinestate succeeded
...calremotestate succeeded
...ded : RevisedSamplingInterval=250, R...

...ingInterval=250, QueueSize=1, Discard...

3/11/2019 9:53:39.136 AM   Attribute Plugin   SECS OPCUA Server   Read attributes of node 'NS2|String|gemtool.vids.onlineofflinestate' succeeded [ret = Good].

OPCUA Client Test

Change a value in the OPCUA Client and test that this VID is changed in the SECS/GEM interface.

wafercount has been added and its value changed to 15 in the OPCUA client.

Test the WaferCount Value in the Host

Select the S1F3 message in the GEMHost and change the SVID to 1510 for the Wafer Count

Press the Send Message button and see the S1F3 Sent

The S1F4 received from the GEMTool with the value "15" which was set in the OPCUA Client

Test Sending a Message From the Client

To prepare to send the reply message to the Host, add the "sendMessage" tag from the hostcommandreply message so that it is ready to use

Test Sending a Message From the Client

Send a Host command from the GEMHost to the GEMTool so that the tool may send a response message using the OPCUA sendMessage tag

Select the Host Command "STOP" message for testing
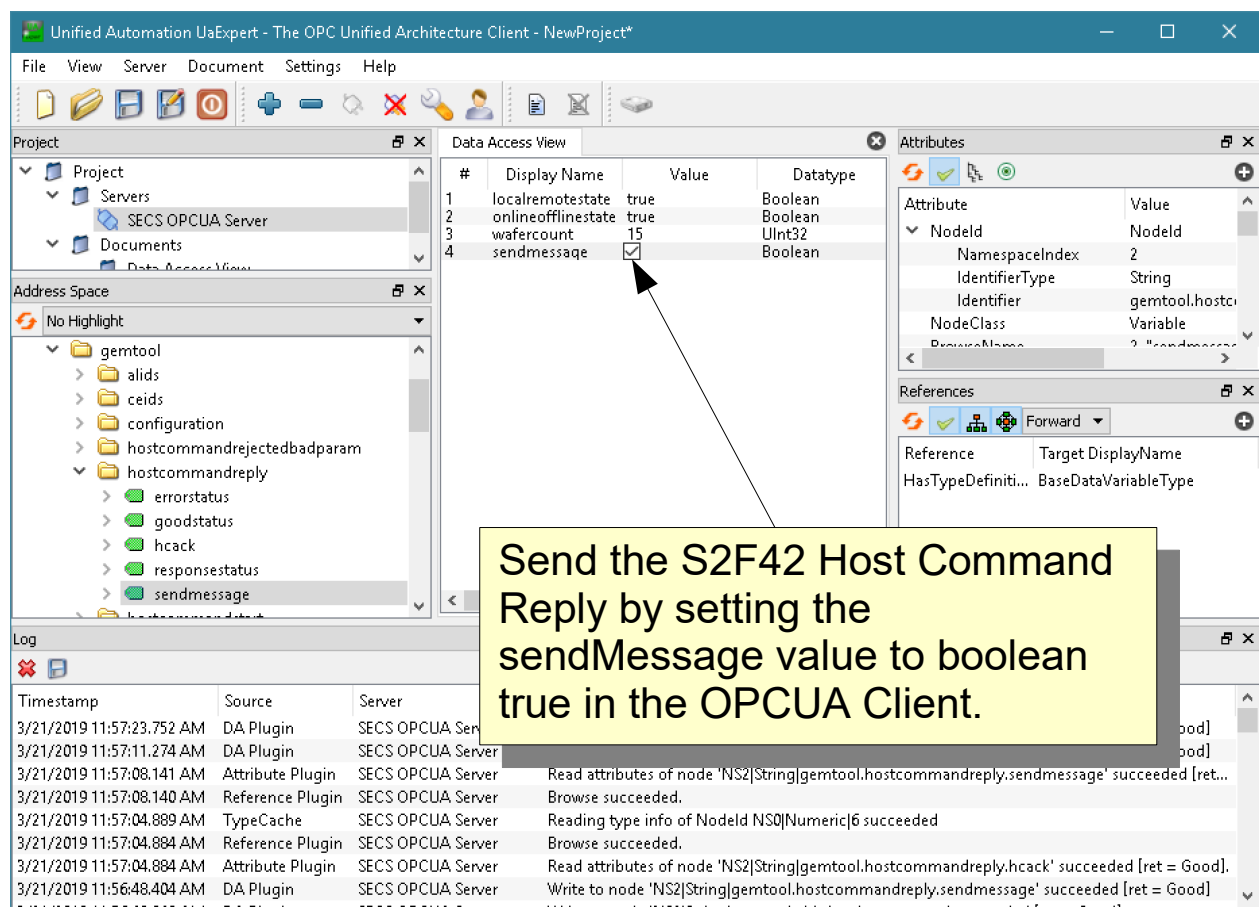
Press the Send Message Button to send the command to the tool

Host Command was sent to the GEMTool

Quickly send the reply from the OPCUA Client before the T3 timeout

Test Sending a Message From the Client

Send the S2F42 Host Command Reply by setting the sendMessage value to boolean true in the OPCUA Client.

Test Sending a Message From the Client

Host Command reply was received from the GEMTool

Notes on OPCUA Servers:
JSON List Formats

List elements are JSON formatted, such as { "values": [ ] }

For example, the recipe list for an S7F20 might look like:

 { "values": ["recipe1","recipe2", "recipe3", "recipe4"] }

There are more things you can do with the JSON format for the lists, including making lists of lists and specifying the SECS format for the data in the list.

Notes on OPCUA Servers: JSON List Formats

If a specific type is required, it can be specified if needed. For example for the recipe list, the data is ASCII, type 20:

{ "values": ["recipe1","recipe2", "recipe3", "recipe4"], type:"20" }

type is defined by the SECS Standard:

00 - List
10 - Binary (can be an array)
11 - Boolean
20 - String
30 - 8 byte floating point
34 - 4 byte floating point

40, 41, 42, 44 - 8, 1,2,4 byte signed integers
50, 51, 52, 54 - 4 byte signed integer

Notes on OPCUA Servers: JSON List Formats

Each element of the array can have a different type in this format (this might be useful in some message replies with different data types):

```
{"values":[
        {"value":"1.2", "type":"34"},
        {"value":"Test", "type":"20"},
        {"value":[5,6,7,8], "type":"10"},
        {"value":1, "type":"10"}
    ]}
```

Notes on Tool OPCUA Servers: Triggering Events with DVVALs

Events can be triggered with a list of DVVALS, so if you need to do this you can define the list, then use this as the trigger input to the CEID. If you are using DVVALs in your project you would associate the DVVALS when you define your CEID.

DVVALS as a JSON String sent to the trigger of a CEID:

```
{ "values":[
    { dvid:WaferCount, dvval:15  },
    { dvid:23456,  dvval:\"Hello World\"  }
 ] }
```

You can specify any VID with either its name (for example WaferCount), or its vid number (for example 23456) as the above example demonstrates.

Notes on OPCUA Servers: Host Commands

If you publish the whole host command, the structure is a list (with the host command), then the list elements for the parameters for the command.

It may look something like:

```
 { "values": [  { "value":"PP-SELECT", type:"20 } } { "values":
[  { "values": [ LOTID ] , type:"20 } { "values":
[  { "value":"CHAMBER", type:"20 } } { "value":"1", type:"51 } } ]  }
{ "values": [ PPID ] , type:"20 } ]  } ]  }
```

Notes on OPCUA Servers: vibopc.properties

The vibopc.properties file has some settings which control some aspects of the OPCUA runtime. This file is located in the OPCUA deployment directory.

VIBOPC.NoMethodSupport

This defaults to false. If set to true opcua methods are generated for operations such as sending messages. Some OPCUA clients do not support methods.

VIBOPC.UnderscoreCreatePaths

This defaults to true. This allows you to define vid names with underscores which will generate a tree structure for the vids. For example a vid "robot_xaxis" will generate a tag structure /toolname/vids/robot/xaxis".

That's it.

Now you're ready to program your OPCUA Client application to complete integration of the SECS/GEM interface. You should update your tool data values (SVIDs) as they change and can trigger alarms (ALIDs) and events (CEIDs) and send and receive messages as needed. You may need to handle host commands and send the host command replies from your OPCUA client using the sendMessage tags. More host command message handling can be added, and also there are options for manually handling recipe messages, or you can set up simple automatic recipe handling.