Practical Example

SCL, Client/Server, GOOSE and SV

Practical session 1	Installation of 61850 Test Suite
Practical session 2	Configure SCL file in SCL forge
Practical session 3	Connecting to Server from SCL Forge
Practical session 4	Connecting to Client from SCL Forge
Practical session 5	Simulation of Data on Server and Polling on Client side
Practical session 6	Sending GOOSE messages between Anvil and Hammer on a local machine
Practical session 7	Sending Sample Values (SV) between Anvil and Hammer on a local machine

Installation of 61850 Test Suite

Objective:

To install 61850 Test suite software. This software is provided by Triangle MicroWorks (TMW)

IGNORE THIS SECTION IF YOU WILL BE USING THE REMOTE LABS! The software will have been installed on the remote lab PC already. Simply skip ahead to Practical 2.

Requirements:

PC running Windows 7, XP SP2, or Server 2008 Download the software from <u>http://www.trianglemicroworks.com/</u> It is a trial version and expires in 21 days. **Procedure:**

Step 1: Right click on the setup file and click on "Run as administrator".

5/4/2013 10:43 AM Application
Open
🛞 Run as administrator
Troubleshoot compatibility Scan with AVG
👫 TortoiseSVN
 Add to archive Add to "IEC61850TestSuiteInstall

Step 2: Click on "Next" to continue.

🗰 TMW IEC 61850 Test Suite - InstallAware Wizard						
Welcome to TMW IEC 61850 Test Suite Version 3.5.15.166608 Setup						
 Collecting information Preparing installation Installing Finalizing installation 	Welcome to the InstallAware Wizard for TMW IEC 61850 Test Suite Setup. The InstallAware Wizard will install TMW IEC 61850 Test Suite on this computer. Please dick Next to continue.					
InstallAware	Next > Cancel					
	Concer					

Step 3: Accept the license agreement and click on "Next".



Step 4: Select the destination folder for the program to install and click on "Next". By default the software will be installed in C:\Program Files\... You can change the destination folder path if you wish to.

M TMW IEC 61850 Test Suite - Install Destination Folder	ware Wizard	
 Collecting information Preparing installation Installing Finalizing installation 	Elease select the destination folder for the application.	E T
InstallAware	Space Required: Available Disk Space: Remaining Disk Space:	44,917 KB 2,882 MB 2,838 MB
	< Back Next >	Cancel

Step 5: Select the features that you want to install and click on "Next".



Make sure that Anvil, Hammer and SCL forge are checked.

Iron is not required, as we don't use it in the practicals.

Step 6: Click on "Next" to start the installation process.





Step 7: Click on "Finish".



The software has successfully installed on your PC. You will see the Anvil, Hammer, SCL forge and Iron (if installed) icons on the desktop.



Configure SCL file in SCL forge

Objective:

To configure a device using ICD files. SCL helps in doing this.

Description:

The purpose of the XML based Substation Configuration description language (SCL) as defined in IEC 61850 is the interoperable exchange of engineering data for distributed substation automation (SA) system. The data exchange will be between engineering tools of different manufacturers at well-defined stages in a general engineering process.

The SCL Forge facilitates editing and creating Substation Configuration Language (SCL) files.

Procedure: (Connect to Remote Lab 8 or 9 using your student portal to access the tools)

Step 1: Click on the SCL forge icon to open SCL forge.



Step 2: To open an SCL file, click on Open icon or go to File \rightarrow Open.



SCL files are in .icd, .iid, .cid, .scl and .scd format.

Where ICD stands for IED Capability Description, SSD - System Specification Description, SCD - System Configuration Description, CID - Configured IED Description

Note:

Usually, the Sample SCL files will be in the following paths, in your PC, if the software is installed in default destination path:

- C:\Program Files\Triangle MicroWorks\TMW IEC 61850 Test Suite\resources
- C:\Documents and Settings\All Users\Documents\Triangle MicroWorks\IEC 61850 Suite

<mark>50 S</mark> CL Forge - Triangle Micro	oWorks, Inc.		
<mark>೫</mark> Open			×
. 🕒 🗢 Triangle M	1icroWorks 👻 IEC 61850 Suite 👻	👻 🚱 Search IEC 618	350 Suite 🗵 🔎
Organize 🔻 New folder			III 🔹 🚺 😧
★ Favorites ■ Desktop	Documents library IEC 61850 Suite	Arran	ige by: Folder 🔻
Becent Places	Name *	Date modified	Туре
Libraries Libraries Documents Music Pictures Videos Videos Music Computer Network	Anvil SCL Forge TMWSample.icd TMWSampleTase2	8/3/2013 11:02 AM 8/3/2013 11:10 AM 1/31/2013 6:36 PM 1/25/2013 12:42 AM	File folder File folder ICD File XML Document
File r	aame:	All Supported	Files (*.xml, *.icd, 💌

<mark>೫</mark> SCL Forge - Triangle MicroWorks, Inc.		
File Options Tools View Windows	Help	
🖻 🖬 📣 % 🚰 🗟 🗦 💎 👘		
TMWSample.icd	- ×	Properties - BayControllerQ
Name	M/0 🔺	
🛨 Top Level Element		🗆 Misc
🛨 Header		Description
🕒 Communication		LDInst Q
😑 BayController		
🛨 Services		
Server		
BayControllerQ		
EPHD1		
Edition 2		
Output		
1 12:42:10.0272 :		
2 12:42:10.0272 :		
3 12:42:10.0272 :	P (2, 1) = =	
4 12:42:10.0272 : Validating file 5 12:42:10 0003 : File bas success	fully b	rs\Public\Documents\Irlangle Microworks\IEC
6	U	een varraaren abarust tue seuena
•		
Description - BayControllerQ		

Step 3:

Click on the configuration icon to configure the SCL file.



A pop up window opens with the configuration details. Set the details and click on "Ok".

<mark>5 S</mark> CL Forge -	Triangle M	licroWork	cs, Inc.	
File Options	Tools	View	Windows	Help
📴 🛃 🎒 🛤	% 🚰	ò 🍃	7	
TMW5ar	nple.icd			× Properties - BayControllerQ
Name	Configurat	ion.		
 	Applica	ition		 Instance Data Functional Constraint: ST, MX, CO, SP, CF, D Trace
BayControlle				Errors False
				Select trace message Exception, Error, Trace
- AP - Serve - B: +				
+ +				Errors
+				Mirror all error messages to log file
			OK	Cancel
±	I IMMXU1 SAV1TVTR SAV4TCTD	1		

Note: Additional nodes, data objects and data attributes can be added to the SCL file but the file cannot be saved as the trial version limits the feature of saving SCL files.

Connecting to Server from SCL Forge

Objective:

To connect to the Server (Anvil) through SCL forge.

Description:

The Anvil provides a Test Server in order to exercise Client implementations.

Procedure:

Step 1:

In SCL forge window, click on Tools →Start Test Server. This opens Client (Anvil).

SCL Forge - Tri	angle MicroWorks, Inc.
File Options	Tools View Windows Help
💕 🛃 🎒 🎮 🖞	Convert Edition 1 File to Edition 2
TMWSam	Compare To es - BayControllerQ
Name	Start Test Server
🛨 Top Level Elem	Connect to Server
🛨 Header	Description
🛃 Communication	LDInst Q
📃 BayController	
🛨 Services	
🖃 AP	

Step 2:

(If using the trial version) A pop up window opens asking for a "…request a Quotation for the 61850 Test Suite." Click on "No". Otherwise simply click OK on the licence notice. Or move the window to the side, to continue the exercise.



(If windows asks for network or firewall permission, allow and retry the previous step.) Then a Start Server window, containing server settings, opens. Click on "Start Server".

⊡- TMWSample		Name	TMWSample
RFC1006		Ethernet Adaptors	
Security		GOOSE Adapter	Realtek PCIe GBE Fam
		GOOSE Loopback	False
		Sampled Value Adapter	
		Sampled Value Loopbac	False
		File Services	
		Allow Directory Listing	True
		Allow File Delete	True
		Allow File Download	True
		Allow File Upload	True
		File Services Root Direc	C:\Program Files (x86)
		Misc	
		UniqueID	{ebf7a24b-e1eb-44bd-92eb
		Server Specific	
		AE Invoke ID	10
		AE Qualifier	12
		AP Invoka ID	10
	N S	ame erver name	

If the server does not start, and gives an error saying the port is in use, simply close the new "Anvil" window, and follow the steps from step 1 again, but **before** clicking "Start Server", change the **Port** in the following window, and then click Start Server:

Start Server		×
Server Settings:		
⊡ TV wsample	Advanced	
RFC1006	Local P Addess 0.0.0.0 Maxmum SDU size 65535	
	Server's Listening Port N 3782	
:		
	Server's Listening Port Number	
	Port number to listen on. Defaults to 102 x 3782	? if using
	1.5.	
	Start Server Cancel	

👼 Anvil - Triangle Micro	Works, Inc.					_ 🗆 🗙
File Options Tools	View InSigh	t Windows H	elp			
📴 🖪 🗛 🌾 😭 🚺	🧾 Start 61850 S	ierver 🛛 🏟 💎]
📕 TMWSample:Bay	Controller	→ ×	P	operties - LL	.N0	ųΧ
Name	Value	Туре		1 2↓ ©		
🖃 BayControllerQ				Misc		
🛨 LLNO				Extends	True	
🛃 LPHD1				IEDType		
🛃 QA1CSWI1				LNClass	LLNO	
QA1XCBR1				LNPrefix		
🛃 QA1CILO1						
🛃 QB1CSWI2						
🕣 QB1XSWI2						
🛨 QB1CILO2						
🕣 QC1CSWI3						
🕣 QC1XSWI3						
🕣 QC1CILO3						
∃ T1MMXU1						
SAV1TVTR1						
■ SAV1TCTR1						
🛃 LTRK1						
0 clients are connected						
0.11						
Output	CL Monaica	2007.4				ΨX
2 10:10:45.0041 : 5	CL VERSION:	2007:4				
3 16:10:43.0053 : 1	ED Version:	2007:A				
4						
5 16:10:43.0154 : 9	erver is rea	ady				
6						

Set the required settings like Ethernet Adapter, Name of the server etc.

If "Start Server" window doesn't pop up, in the Anvil window click on "Start 61850 Server" drop down.

🙀 Anvil - Triangle MicroWorks, Inc.		
File Options Tools View InSight Windows Help		
📂 🎒 👬 🎉 🚰 📴 🔋 🕄 Start 61850 Server 👻		
·	Properties	Ψ×
	2↓ □	

It displays the available SCL configured files. Click on the one which you used to configure SCL.

🚮 Anvi	l - Triangle	e Micro'	Works,	Inc.												_ [ĸ
File	Options	Tools	View	InSight	Windows	Help)											
6	M 🎇 🛛	8	📳 Start	t 61850 Ser	ver 🕶										_			
			T	TMW Demo[C:\Users\Public\Documents\Triangle MicroWorks\IEC 61850 Suite\TMWSample.icd]											д >	<		
			TMWSample[C:\Users\Public\Documents\Triangle MicroWorks\IEC 61850 Suite\TMWSample.icd]															
			Create New															

Alternate method:

In Anvil Window, click on "Configuration" icon. This opens the Anvil configuration pop-up window and it shows the already available Servers and their details.



Anvil Configuration								
Application	Ξ	Basic	▲					
- Insight		SCL File	C:\Users\Public\Doc					
⊡ ·· Servers		IED to Emulate	BayController					
. TMW Demo		Name	TMW Demo					
	Ξ	Ethernet Adaptors						
		GOOSE Adapter	Realtek PCIe GBE F—					
		GOOSE Loopback	False					
		Sampled Value Adapt						
		Sampled Value Loopt	False					
	Ξ	File Services						
		Allow Directory Listing	True					
		Allow File Delete	True 🗸					
	Name Server name							
OK Cancel								

Configure a new server, by right clicking on "Server" and then on "Add IEC 61850 Server".

蒳 Anvil	- Triang	le Micro\	¥orks,	Inc.			
File	Options	Tools	View	InSight	Windows	Help	
🔁 🕘 I	M 🎉	😭 👔	📳 Starl	: 61850 Ser	ver 🕶		
Anvil Co	nfigurat	ion					
- Appl	ication						
- Insig	iht Ioro						
En Sein	Ad	d IEC 618	50 Serve	er			
÷.	Ad	d TMW Sa	mple Se	cure Server			
1							
			אר	1	Cancel	1	
			JIK]			1

After adding the Server, on the right side pane, select the SCL file (Same SCL file, opened in SCL forge). Then, click OK.

Anvil Configuration			_ 🗆 🗙		
Application	Ξ	Rasic	<u>•</u>		
- Insight		SCL File	C:\Users\Public\Do		
É- Servers		IED to Emulate	BayController		
		Name	TMW Demo		
		Ethernet Adaptors			
		GOOSE Adapter	Realtek PCIe GBE F		
		GOOSE Loopback	False		
		Sampled Value Adapt			
		Sampled Value Loopt	False		
		File Services			
		Allow Directory Listing	True		
		Allow File Delete	True 👻		
	SCL File Path to IEC 61850 SCL file				
OK		Car			

Now we started the Server, by clicking on "Start 61850 Server". Select the server you want to start from the list.



The started server will be shown in the Anvil window:

ன Anvil - Triangle MicroW	orks, Inc.				_ 🗆 ×
File Options Tools	View InSight	Windows Help			
📴 🖪 🗛 🌾 💽 🛛	Start 61850 Ser	ver 🕶 🏟 🤿]
🛛 👍 TMW Demo:BayCon	troller [→ X F	Properties - BayControllerQ	ųΧ
Name	Value	Туре			
🖃 BayControllerQ					
🔳 LLNO					
🔳 LPHD1					
QA1CSWI1					
QA1XCBR1					
QA1CIL01					
■ QB1CSWI2					
G QB1XSWI2					
GB1CIL02					
QC1CSWI3					
I QC1XSWI3					
🔳 QC1CILO3					
∃ T1MMXU1					
SAV1TVTR1					
G SAV1TCTR1					
🗄 LTRK1					
0 clients are connected					
Output					φ×
+ - 10.00.00 0070 . C		J			▲
5 10:52:28.0379 : 50 6 10:33:27 0084 · 50	erver 15 rea 1 Version:	ау 2007-л			
7	LE VEISION:	L007.M			
8 10:33:27.0096 : I	ED Version: :	2007:A			
9					
10 10:33:27.0100 : S	erver is rea	dy			
11					_

Connecting to Client from SCL Forge

Objective:

To connect to the client (Hammer)

Description:

The Hammer provides a Test Client in order to validate Server implementations

Procedure:

Step 1:

Open SCL forge window. Click on Tools \rightarrow Connect to Server, to connect to a Client. The client (Hammer) window opens.

😹 SCL Forge - Triangle MicroWorks, Inc. 📃 🗖 🗙											
File Options	Tools	View Windows Help									
💕 🛃 🎒 🛤 1	•	Convert Edition 1 File to Edition 2									
TMWSam		Compare To	•	ų ×							
Name		Start Test Server									
Top Level Elem Connect to Server											
Header			•								
🛃 Communication											

A "Default Ethernet Adaptor" pop window **might** open. Select the Ethernet card to be used from the drop down and click on OK. (**INTEL Gigabit connection**)

Default Ethernet Adaptor								
Please choose the default Ethernet card. This is used for GOOSE messages and Sampled Values.								
Realtek PCIe GBE Family Controller								
ОК								

Step 2:

In Hammer window, click on "configuration" icon. A Hammer configuration pop-up window opens.



Hammer Configuration	
Application Insight Clients - Connection to Servers TMW Demo RFC1006 Security MMS	
ОК	Cancel

Step 3:

Right click on "Client- Connections to Servers" and then on "Add IEC 61850 connection".



Step 4:

You can change the Server connection details like IP address, SCL file etc. Be sure to check the PORT is the same as the one you specified in the Server in the previous Practical (102 OR 3782)! After you are done, click on OK.

Hammer Configuration			
Application	Ξ	Basic	▲
Insight		IP Address	127.0.0.1
🗄 - Clients - Connection to Servers		SCL File	C:\Users\Public\[
i⊟∾ TMW Demo		IED to Load	BayController
RFC1006		Name	New Server Conn
Security		Browsed Edition	Edition_1
MMS		Port	102
■- New Server Connections		Client Specific	
RFC1006		AE Invoke ID	10
- Security		AE Qualifier	12
MMS		AP Invoke ID	10
		Application ID	1,1,999,1 🗸
	S P	CL File ath to IEC 61850 S	CL file
OK		Cance	1

Step 5:

Click on "Connect" icon in tool bar, to connect to Server. Connect to the IP on which the Server is running.

🔏 Ham	<i>M</i> Hammer - Triangle MicroWork <i>s</i> , Inc.										
File	Options	Tools	View	InSight Windows Help							
6	a m	% 🚰	👔 🍬	Connect -							
•				TMW Demo[127.0.0.1]							
				New Server Connections[127.0.0.1]							
				Create New							

🔏 Hammer - Triangle MicroWorks, Inc. 📃 🚺	
File Options Tools View InSight Windows Help	
📴 🛃 🎒 🙀 🎇 😭 👔 🔊 Connect 🗸 🖬 🧶 🔝 🗐 - 🖉 - 🎒 - 💙	1
New Server Connections:Ba V Properties - BayControllerQ	ųχ
Name Value Type	
BayControllerQ	
ILLNO	
QA1CSWI1	
QA1XCBR1	
QA1CIL01	
QB1CSWI2	
GB1XSWI2	
QC1CSWI3	
QC1XSWI3	
QC1CIL03	
T1MMXU1 T1MXU1 T1MXU1	
SAV1TVTR1	
SAV1TCTR1	
LTRK1	
Ready	
Output	
34 19:12:15.0401 : New Server Connections: Refre	
35 19:12:15.0401 : New Server Connections: ReadR	
36 19:12:15.0401 : New Server Connections: Refre	
37 19:12:15.0417 : New Server Connections: ReadR	
38 19:12:15.0417 : New Server Connections: Refre	

Simulation of Data on Server and Polling on Client side

Objective:

To simulate the data on the Server (Anvil).

Description:

<u>Simulation:</u>

The Simulation Pane allows a Server to randomly change data which causes data change events which in turn may activate Reports, Logging, and/or GOOSE messages.

Procedure:

Step 1:

In Anvil window, click on "Show/Hide Simulation Pane"

í A nv	🝻 Anvil - Triangle MicroWorks, Inc.											
File	Options	Tools	View	InSight	Windows	Help						
🖻 🖨	н %	2	🤳 Start	61850 Se	rver 👻 👼	7						
	TMW Der	no:BayC	ontrolle	r [Sho	w/Hide Simulation Pane						
Name					Value		Туре					

Step 2:

To Start/Stop the simulation, press the Start button. Once the simulation is running the text on the button will change to "Stop". The data change interval is controlled by the "Change Data Every (Milliseconds)" field.

Simulation - TMW Demo:BayController	[TMWSample.icd]					џ	X
	Start	Change Data Every (Milliseconds): 5000]				
😑 🔽 BayControllerQ	Name	Value	Туре	Step	Simulation Min	Simulation Max	^
E LLNO	LLN0.Mod.stVal	on	Enum	1	1	5	
E LPHD1	LLN0.Mod.g	[01000000000]	Quality	N/A	N/A	N/A	
	LLN0.Mod.t	08/13/2013_08:37:14.732,[00000000]	Timesta	N/A	N/A	N/A	
	LLN0.Beh.stVal	on	Enum	1	1	5	
	LLN0.Beh.g	[110000000000]	Quality	N/A	N/A	N/A	
	LLN0.Beh.t	08/13/2013_08:37:14.732,[00000000]	Timesta	N/A	N/A	N/A	
	LLN0.Health.stVal	Ok	Enum	1	1	3	
	LLN0.Health.g	[100000000000]	Quality	N/A	N/A	N/A	
GC1XSWI3	LLN0.Health.t	08/13/2013_08:37:14.732,[00000000]	Timesta	N/A	N/A	N/A	
	LPHD1.PhyHealth.stVal	Ok	Enum	1	1	3	
E T1MMXU1	LPHD1.PhyHealth.q	[000000000000]	Quality	N/A	N/A	N/A	
SAV1TVTR1	LPHD1.PhyHealth.t	08/13/2013_08:37:14.732,[00000000]	Timesta	N/A	N/A	N/A	
SAV1TCTR1	QA1CSWI1.Mod.stVal	on	Enum	1	1	5	
LTRK1	QA1CSWI1.Mod.q	[00000000000]	Quality	N/A	N/A	N/A	
	QA1CSWI1.Mod.t	08/13/2013_08:37:14.732,[00000000]	Timesta	N/A	N/A	N/A	
	QA1CSWI1.Beh.stVal	on	Enum	1	1	5	
	QA1CSWI1.Beh.q	[00000000000]	Quality	N/A	N/A	N/A	
	QA1CSWI1.Beh.t	08/13/2013_08:37:14.732,[00000000]	Timesta	N/A	N/A	N/A	
	QA1CSWI1.Health.stVal	Ok	Enum	1	1	3	
	QA1CSWI1.Health.g	[000000000000]	Quality	N/A	N/A	N/A	
	QA1CSWI1.Health.t	08/13/2013_08:37:14.732,[00000000]	Timesta	N/A	N/A	N/A	
	QA1CSWI1.Pos.origin.o	not-supported	Enum	1	0	8	
	QA1CSWI1.Pos.stVal	intermediate-state	Dbpos	N/A	N/A	N/A	
	QA1CSWI1.Pos.q	[000000000000]	Quality	N/A	N/A	N/A	
	QA1CSWI1.Pos.t	08/13/2013_08:37:14.733,[00000000]	Timesta	N/A	N/A	N/A	~

The columns shown in the right panel are as follows:

Name – Shows the name of the Data Attribute proceeded by the Functional Constraint Value – Current value

Type – Type of the value

Step – Upon each data change this is the value that is added to the current value. Current value is stepped until Simulation Max or Simulation Min is reached it is then seeded with a random value between Simulation Max and Simulation Min and restarted.

Simulation Min – Minimum value Simulation Max – Maximum value

Step, Simulation Min and Simulation Max can be changed by double clicking on the value.

Description:

Polling:

Any Data Object or its children can be read on a polled basis.

Procedure:

Step 1:

In Hammer, right click on any data object and select "Start Polling"

File Options Tools View InSigh	t Windows Help		
📴 🚽 🥔 🛤 🛠 🚰 💽 🕓 🔍	🛂 🎵 🧐 🚰 🔊 Con	nect 🕶 🖾 🥥	🗟 🖂 🕒 - 🌾 🌓 - 🔻
👢 NewClient [127.0.0.1]	Server Connections [1	•	
Name	Value		Туре
QB1CILO2			
QB1CSWI2			
■ QB1XSWI2			
QC1CILO3			
QC1CSWI3			
■ QC1XSWI3			
T1MMXU1			
Data Sets			
Report Control			
Log Control			
+ Phv			
			Struct
			Struct
f mog	110.00	<u>0</u>	FL DAT32
q	Read	0001	Quality
t I	Charles Balling	45,000000001	Timestamp
🖃 units	Start Polling		Struct
Mod			
🛨 Health			
🛨 Beh			
 NamPlt 			
Ready			

Step 2:

Enter polling period and click Ok.

Polling Period	X
Poll every 10	seconds
ОК	Cancel

To stop polling right click on the item being polled and select Stop Polling.

🚜 Har	nmer	- Tr	iangle	Micro\	Nork	s, In	с.
File	Optio	ns	Tools	View	InS	ight	Windo
📂 🖬	8	H)	% 🔗		🧏 Co	nnect	- 51
	New S	erve	er Conn	ections	[1		
Name				Val	ue	Туре	;
😑 Bay	Controll	erQ					
🛨 l	LNO						
🛨 l	PHD1						
🛨 l	_TRK1						
- E (QA1CIL	01					
(QA1CS\	<i>N</i> I1					
	Data	Sets	:				
	Rep	ort Co	ontrol				
	Log	Contr	ol				
_	Log						
	± Pos ∓ Mod		Expar	nd All Ch	ildren		
	🗄 Heal	i	Collap	se All Cl	hildrer	n	
6	🗄 Beh		Read				
	Nam Nam		Write				
							_
	3B1CSV		Select	t			
	JB1XS\		Opera	ate			
	QC1CIL	¢	Cance	el			
((ACTOS/ ACTXS/	9	Stop I	Polling			
(■)	SAV1T0	TR1					

Step 3:

Click on Data Monitor icon to see the polled nodes.

The Data Monitor Pane is used by the IEC 61850 Client to view the currently active Control Blocks and any Polled Data. It is possible to miss a data change because by default the user interface redraws every second. The model does not store a history rather it is real time data that could be updated from many different source.



Data Monitor - New Server Connections [127.0.0.1]			
- New Server Connections [127.0.0.1]	Name	Value	Туре
i Polled Nodes	f	174.000	FLOAT32
E- Polled Nodes E-BayControllerQ/T1MMXU1.A.phsA.cVa	f	174.000	FLOAT32

When polling starts, the client receives data from the server for the polled node.

Sending GOOSE messages between Anvil and Hammer on a local machine

Objective:

To send GOOSE messages between the Server and Client.

Description:

GOOSE (Generic Object Oriented Substation Event) service included in the IEC 61850 protocol set enables fast interdevice communication with time critical real time communication over wide-band communication links.

A device is sending information per multicast. Only the IEDs that have subscribed for this information receive the message. A GOOSE message of an IED can therefore be received and processed by several units at the same time

Procedure:

Step 1: Close both the server and the client. In anvil, start **the default TMW Demo** server. In Hammer connect to the default TMW Demo. Ensure the following:

• Hammer and Anvil both have the same adapter set as the GOOSE adapter in the Configuration. (INTEL Gigabit connection)





• Anvil's GOOSE Loopback value must be FALSE, while Hammer's must be TRUE.

藧 Anvil - Trian	igle MicroWorks, Inc.	
Eile Options	Tools <u>V</u> iew InSight	Windows <u>H</u> elp
🔁 🖪 🛤 🎊 (😤 [🔋 Start 61850 Serve	er 👻 🙀
🖉 🖶 TMW Den	no:BayController [X Simulation - TMW Demo:BayController [TMW]
Name		
🖃 BayControllerQ	Anvil Configuration	
🛨 LLNO	···· Application	🗆 Basic 🔨
🛨 LPHD1	- Insight	SCL File C:\Documents and S
QA1CSWI1	Servers	IED to Emulate BayController
QA1XCBR1	⊞ TMW Demo	Name TMW Demo
QA1CIL01		Ethernet Adaptors
➡ QB1CSWI2		GUUSE Adapter Realtek RTL8139/8
⊕ QB1XSWI2		Sampled Value Adap Realitek DTI 9129 /9:
		Sampled Value Loopl False
⊕ QC1CSWI3 □ □		
		Allow Directory Listing True
		Allow File Delete True 🗸
		COOCE Laashaah
		Enabled Goose loopback which allows goose to
		operate on one machine
	0	K Cancel



If any settings changes are made, Anvil and Hammer must be closed and re-opened for them to take effect.

Step 2:

Start the simulation in Anvil.

Step 3:

GOOSE Control is included within LLN0 node.

In Hammer, right click on the GOOSE Control blocks and select Subscribe (You might have to right-click and select 'Enable' first). If you experience trouble with connecting GOOSE, try to right-click the control tag, and select "Read" to load some values. If there are still issues, stop the simulation in Anvil, and then in hammer click "disable", wait and click "enable" again. Then subscribe on the tags in Hammer, and go back to Anvil to start the simulation.

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File Options Too	ols Vi	ew InS	iight	Windows	Help		
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📃 BayControllerQ							
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GOOSE Contr	ol						
	Ехрап	id All Child	Iren				
e gobi	Collap	se All Chil	dren				≡
Sampled Settings	Read						
+ Mod	Disabl	e					
Health	Subsc	ribe					-
NamPlt							

Step 4: To see the Goose messages, in the tool bar, click on GOOSE Messages icon.

🔏 Hammer - Trian	gle Mi	croWo	rks, Ir	IC.								
File Options To	ols Vi	iew I	nSight	Windo	ws Help							
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_									vew herve	r Lonnec	nons 1177	
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Control Block	ID	Time	Sequ	State	Data Set	Time S	Test	NDS	Vlan ApplD	Vlan VID	Vlan Pri	ayControllerQ
avControllerQ/LLN0\$G0\$gcb	tmwStat	30	0	12303	BayControllerQ/L	08/13/	False	1	8192	546	4	a QA1CSWI1
ayControllerQ/LLN0\$G0\$gcb	tmwStat	30	0	12304	BayControllerQ/L	08/13/	False	1	8192	546	4	🖃 Pos
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ayControllerQ/LLN0\$G0\$gcb	tmwStat	30	0	12307	BayControllerQ/L	08/13/	False	1	8192	546	4	ordant []
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avControllerQ/LLN0\$G0\$gcb	tmwStat	30	0	12309	BayControllerQ/L	08/13/	False	1	8192	546	4	stvar [[10]]
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	unwordt kenuChak	20	0	12321	BayControllerQ/L	00/13/	False	1	0102	540	4	stval [raise]
ayController@/LENU\$GU\$gCD	tinw3tat heruChrt	20	0	12322	BayControllerQ/L	00/13/	False	1	0132	040 E4C	4	q [[U00000000000]]
ayconiroller@/LLNU\$GU\$gCD	unwotat	30	0	12323	BayControllerQ/L	08/13/	False	1	0132	046	4	t [08/13/2013_11:43:5:
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ayControllerU/LLN0\$G0\$gcb	tmwStat	30	0	12327	BayControllerQ/L	08/13/	False	1	8192	546	4	
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	-		_									

Visual display of Values between Anvil and Hammer on a local machine

Objective:

To send Sampled Values (SV) between Client and Server.

Procedure:

Step 1:

Set the adapter (must use same adapter for SV and GOOSE) for and loopback settings as you did for GOOSE.

Anvil Configurat	ion			×
···· Application	0	Basic		~
Insight	~	SCL File	C:\Documents and Settings\All Users\Documents	
Servers	*	IED to Emulate	BayController	1
🛓 TMW Demo	*	Name	TMW Demo	≣
🛨 🛛 template		Ethernet Adaptors		
	~	GOOSE Adapter	Realtek RTL8139/810x Family Fast Ethernet NIC	-
		GOOSE Loopback	False	
		Sampled Value Adapter	Realtek RTL8139/810x Family Fast Ethernet NIC	
		Sampled Value Loopback	False	
	Ð	File Services		
	~	Allow Directory Listing	True	
	~	Allow File Delete	True	¥
< <u> </u>	E	thernet Adaptors		
		OK	Cancel	.:



Step 2: In Anvil, make sure the simulation is running.

👍 TMWSample [TMWSar	nple.i	• ×	Simulation - TMWSample [TMWSample.icd]					φ×
Name	Value	Туре	Stop Interval (ms): 1000	Filters				
BayControllerQ			Eu RauControllar0					
LENU			a it bycontoine	Name	value	Type	step	_
LPHD1				T1MMXU1.A.phsA.cVal.mag.f	249.000	FLOAT.	. 0.5	- L
QAICSWIT				T1MMXU1.A.phsA.q	[000000000000]	Quality	N/A	
				T1MMXU1.A.phsA.t	03/10/2014_07:1.	. Timest.	N/A	
QATCILOT				T1MMXU1.A.phsB.cVal.mag.f	249.000	FLOAT.	. 0.5	
QBICSWI2				T1MMXU1.A.phsB.q	[000000000000]	Quality	N/A	
U QB1XSWI2				T1MMXU1.A.phsB.t	03/10/2014_07:1.	. Timest.	N/A	
M QBICILO2				T1MMXU1.A.phsC.cVal.mag.f	236.000	FLOAT.	. 0.5	
				T1MMXU1.A.phsC.q	[000000000000]	Quality	N/A	
QCIXSWI3				T1MMXU1.A.phsC.t	03/10/2014_07:1.	. Timest.	N/A	
				T1MMXU1.PhV.phsA.cVal.mag.f	250.000	FLOAT.	. 0.5	
I TMMXUT				T1MMXU1.PhV.phsA.q	[000000000000]	Quality	N/A	
				T1MMXU1.PhV.phsA.t	03/10/2014_07:1.	. Timest.	N/A	
				T1MMXU1.PhV.phsB.cVal.mag.f	242.000	FLOAT.	. 0.5	
				T1MMXU1.PhV.phsB.q	[000000000000]	Quality	N/A	
				T1MMXU1.PhV.phsB.t	03/10/2014_07:1.	. Timest.	N/A	
				T1MMXU1.PhV.phsC.cVal.mag.f	250.000	FLOAT.	. 0.5	
				T1MMXU1.PhV.phsC.range	high	Enum	1	
				T1MMXU1.PhV.phsC.q	[000000000000]	Quality	N/A	
				T1MMXU1.PhV.phsC.t	03/10/2014_07:1.	. Timest.	N/A	
				T1MMXU1.A.phsA.cVal.mag.f	249.000	FLOAT.	. 0.5	
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				T1MMXU1.A.phsA.t	03/10/2014_07:1.	. Timest.	N/A	
				T1MMXU1.A.phsB.cVal.mag.f	249.000	FLOAT.	. 0.5	-
								•
1 clients are connected			Properties - T1MMXU1 💮 Simulation - TMWSa	mple [TMWSample.icd]				
Output								Ψ×
126 15:13:42.837 : 0	Called AE Invoke ID: 10							-
127 15:13:42.837 : **	Client Connected***********************************	*						
128 15:13:42.837 : 0	lient AE INVOKE ID 10							
130 15:13:42.837 : 0	lient AP Invoke ID 10							
131 15:13:42.837 ; (Client App Title 1.1.999.1							
132 15:13:42.837 : 0	lient P Sel 00 00 00 01							
133 15:13:42.837 : 0	lient 5 Sel 00 01							

Step 3:

In order to view some of the values graphically: In Hammer, ensure the following value is being polled.

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📕 TMW Demo [127.0.0.1]			•	×
Name	Value		Туре	*
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QB1CSWI2				
QB1XSWI2				
QC1CILO3				
QC1CSWI3				
QC1XSWI3				
T1MMXU1				
Data Sets				
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q	[00000000000000000000000000000000000000	Theorem 1		-11
t	03/10/2014_07:13:42.64 🕥	Stop Po	lling	-11
🛨 units			Struct	Ш
🛨 phsB				
🛨 phsC				
+ Mod				
🛨 Health				
+ Beh				
H NamPlt				Ψ.
Ready				

In Hammer, click on InSight \rightarrow New. A new Insight window will open.

Step 4: Click on the InSight Graphic Object Palette button and "continue".

🙀 Hammer - Triangle MicroWorks, Inc		
File Options Tools View In	Sight Windows Help	
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TMW Demo [127.0.0.1]		- ×
Name	Value InSight Graphic Object Palette	Туре 🖍
QB1CILO2		
QB1CSWI2		
QB1XSWI2		
QC1CILO3		
QC1CSWI3		
QC1XSWI3		
T1MMXU1		
Data Sets		
Report Control		
Log Control		
Log		
- A		
phsA		=
- cVal		Struct -
🖃 mag		Struct
f	382.000	FLOA
q	[00000000000]	Quality
t	03/10/2014_07:13:42.645,[00000000]	Times
+ units		Struct
+) phsB		
+ phsC		
+ Mod		
Health		
H Beh		
I A NamPlt	<u> </u>	
Ready		

Scroll down to the LCD Matrix object, and drag it to the InSight window created earlier.



Step 5: Close the Palette window, and drag the SV value being polled earlier (A.phsA.cVal.mag.f) onto the InSight LCD Matrix. (Make sure the value is being polled, or else no values will change.)

File Options Tools View	InSight Windows Help	_		
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🐻 TMW Demo [127.0.0.1]		InSight: InSight-0.tgf		
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QB1CSWI2				
QB1XSWI2				
QC1CILO3				
QC1CSWI3				
QC1XSWI3				
T1MMXU1				
Data Sets				
Report Control				
Log Control				
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🕥 f	608.500	FLOA	E 3	
q	[000000000000]	Quality		
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			83	
Mod				
Health				
🛨 Beh			6	
NamPlt			Type:TmwHmiControls.TMW Net LCDMatrix.0 Left:18 Top:20 Width:391 Height:85	

The value in the display should change; simulating the values being sent from the server.

		0 000000 00000 0 000000 00000 0 000000 00000 0 000000	