

GOOSE MONITOR

USER GUIDE

Revision 1



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CHAPTER 1: INTRODUCTION

SISCO's GOOSE Monitor provides an intuitive visualization of GOOSE/R-GOOSE publish/subscribe relationships. It combines that with real-time data from both the publisher and subscriber to help the engineer quickly identify where problems are occurring so that they can focus their efforts on the specific devices involved.

Instead of wading through a list of captured packets from network analysis tools, the engineer can quickly see with a glance at the GOOSE Monitor where the problems are and get to work on getting them solved. Detailed data from both the subscribing and publishing device is presented to minimize the time needed to find the root cause of any problems. When things are running perfectly, it is also quick and easy to see when things are running perfectly by viewing the GOOSE Monitor.

GOOSE Monitor Terminology

The following terms are used throughout this document:

Term	Description
ACSI Services	ACSI services is the way IEC 61850 refers to MMS services.
IED	Intelligent Electronic Device as described in IEC61850.
GOOSE	This stands for G eneric O bject O riented S ubstation E vent
GOOSE Interface	This OPC Server provides the interface between devices and applications on the network using the IEC 61850 GOOSE protocols.
LGOS	LGOS is a logical node for supervising GOOSE subscription status.
SCL	Substation Configuration Language https://en.wikipedia.org/wiki/Substation_Configuration_Language
UTC	Universal Coordinated Time https://en.wikipedia.org/wiki/Coordinated_Universal_Time

Table 1: GOOSE Monitor Terminology

Chapter Descriptions

The User Guide documents the GOOSE Monitor product. It is presented in the following sections:

- Chapter 1, Introduction provides a brief overview to the GOOSE Monitor product.
- Chapter 2, [Installation](#) describes how to install the GOOSE Monitor.
- Chapter 3, [Configuration](#) provides a description of how to initially setup the GOOSE Monitor as well as creating a new configuration. It also describes how to use filters.
- Chapter 4, [Functionality](#) illustrates the general functionality and usage of the GOOSE Monitor product.
- Appendix A, [Log Viewer](#) explains how to configure and use logging for GOOSE Blaster.

CHAPTER 2: INSTALLATION

The following section provides instructions for installing the GOOSE Monitor.

System Requirements

- The current GOOSE Monitor was tested on Windows Server 2008 R2 with Service Pack 1 and Windows 10 Version 1803.
- The GOOSE Monitor also requires an application called WinPcap V4.1.2. If it is not already installed, it can be downloaded from the following web address: <http://www.winpcap.org/install/default.htm>

GOOSE Monitor Installation

Follow the steps shown below to install the GOOSE Monitor.

1. Download the product (in zip format) from the SISCO download center.
2. Unzip the product to a temporary directory.
3. Open Windows Explorer, right-click on **setup.exe** (application) and **Run as Administrator**.
4. Follow the instructions on the screen to complete the GOOSE Monitor installation.

Software Directory Structure

The following directory structure should now exist on the computer:

\Program Files\SISCO\GOOSE Monitor\	GOOSE Monitor Program
\Program Files\SISCO\Log Viewer	SISCO Log Viewer Program
\ProgramData\SISCO\GOOSE Monitor\Config	GOOSE Monitor Log and Configuration files
\ProgramData\SISCO\GOOSE Monitor\Documentation	GOOSE Monitor documentation
\ProgramData\SISCO\Installation Log	Installation Log files
\ProgramData\SISCO\Log Viewer\Config	Log Viewer configuration xml files
\ProgramData\SISCO\Log Viewer\Documentation	Log Viewer documentation file
C:\Windows\System32	<WINSYSDIR>

CHAPTER 3: CONFIGURATION

Initial Configuration

Below are descriptions of what needs to be configured initially.

Ethernet Configuration

Before the GOOSE Monitor can be used, at least one Ethernet adapter must be selected. If there is only one Ethernet adapter in your system, it will be selected automatically. If there is more than one Ethernet adapter, or the selected Ethernet adapter(s) are no longer present, you will be prompted to select one or more on start up.

If you wish to change the selected Ethernet adapter(s) click the main menu item **Tools→Ethernet Configuration...** to display the Ethernet Adapter Configuration dialog. From this dialog, select the Ethernet Adapter to be used and click the **OK** button. Select the **IP Address** if there is more than one IP assigned to the Ethernet Adapter.

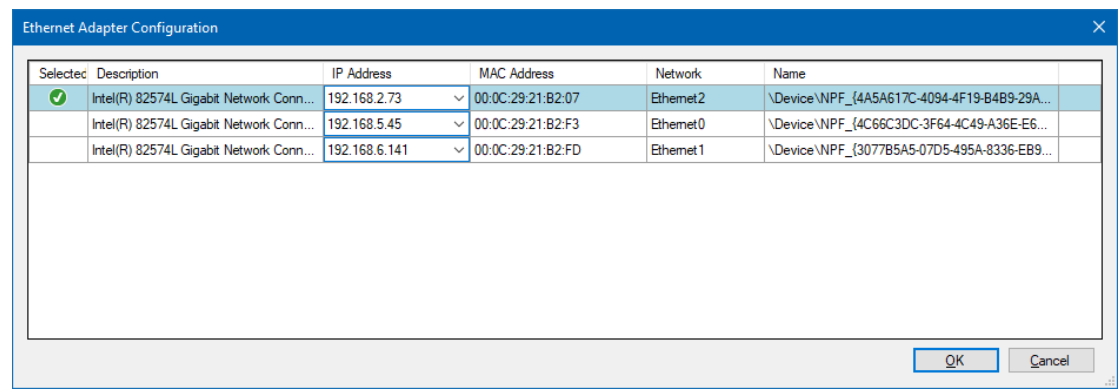


Figure 1: Ethernet Adapter Configuration screen

Display Options

To change the Display Options for the GOOSE Monitor, click on the main menu item **Tools→Options→Display...** This will bring up the color options used for nodes and edges in the [IED Diagram](#).

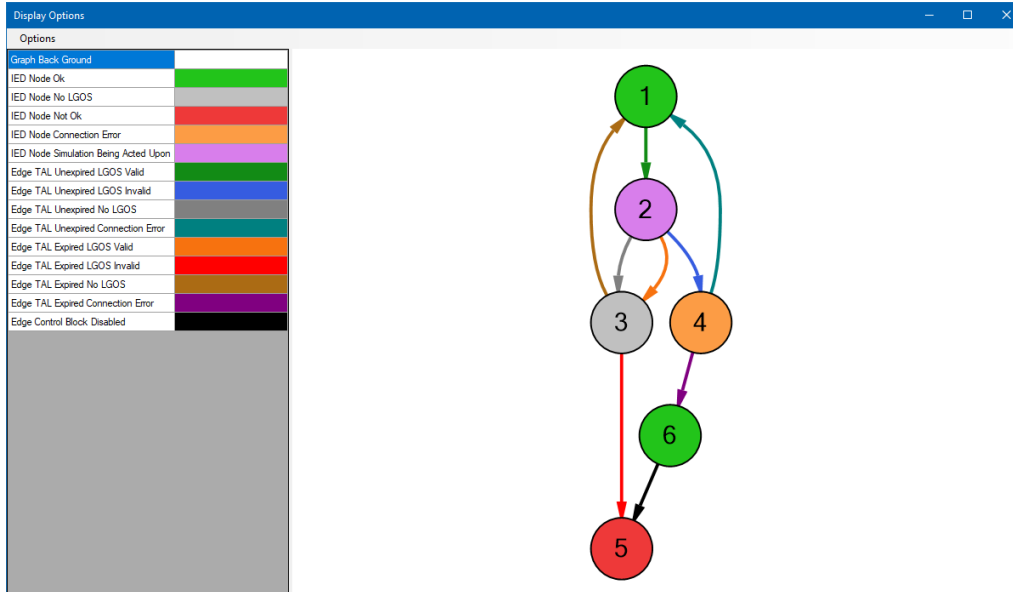


Figure 2: Display Options screen

Double click on any row in the left-hand grid to edit the color for that item. A **Color Dialog** will be displayed allowing you to customize the color for the selected state. When you are finished customizing your colors, close the **Display Options** window.

General Options

To change the General Options for the GOOSE Monitor, click on the main menu item **Tools→Options→Display...**

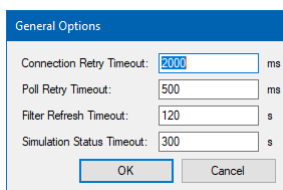


Figure 3: General Options screen

This will bring up the **General Options** dialog. This can be used to update the following parameters:

Connection Retry Timeout

The connection retry timeout specifies how long between connect attempts to an IED that the GOOSE Monitor will wait if it gets a connection error.

Poll Retry Timeout

The Poll Retry Timeout is how long the GOOSE Monitor will wait for a response to its attempt to read the state of the LGOS subscription status object (**LGOS.ST.St.stVAL**) before sending another request. There is also a timeout on a read request sent to the publishing IED to see if the GoControlBlock (GoCB) is enabled or not. If the GoCB is not enabled, it means that the device is not publishing the GOOSE Messages and therefore is the reason why a subscribing IED would not be receiving the messages. That data is displayed in the diagram with a color code for an edge where the GoCB is disabled.

Filter Refresh Timeout

Timeout for checking for changes to the filter results and repainting the IED Diagram and the list of IEDs in the filter.

Simulation Status Timeout

Timeout for expiring the receiving or sending a simulation status of an IED. This is used for testing.

Creating a New Configuration

To create a new **GOOSE Monitor** configuration, click the main menu item **File→New...** to display the **New Configuration** dialog screen.

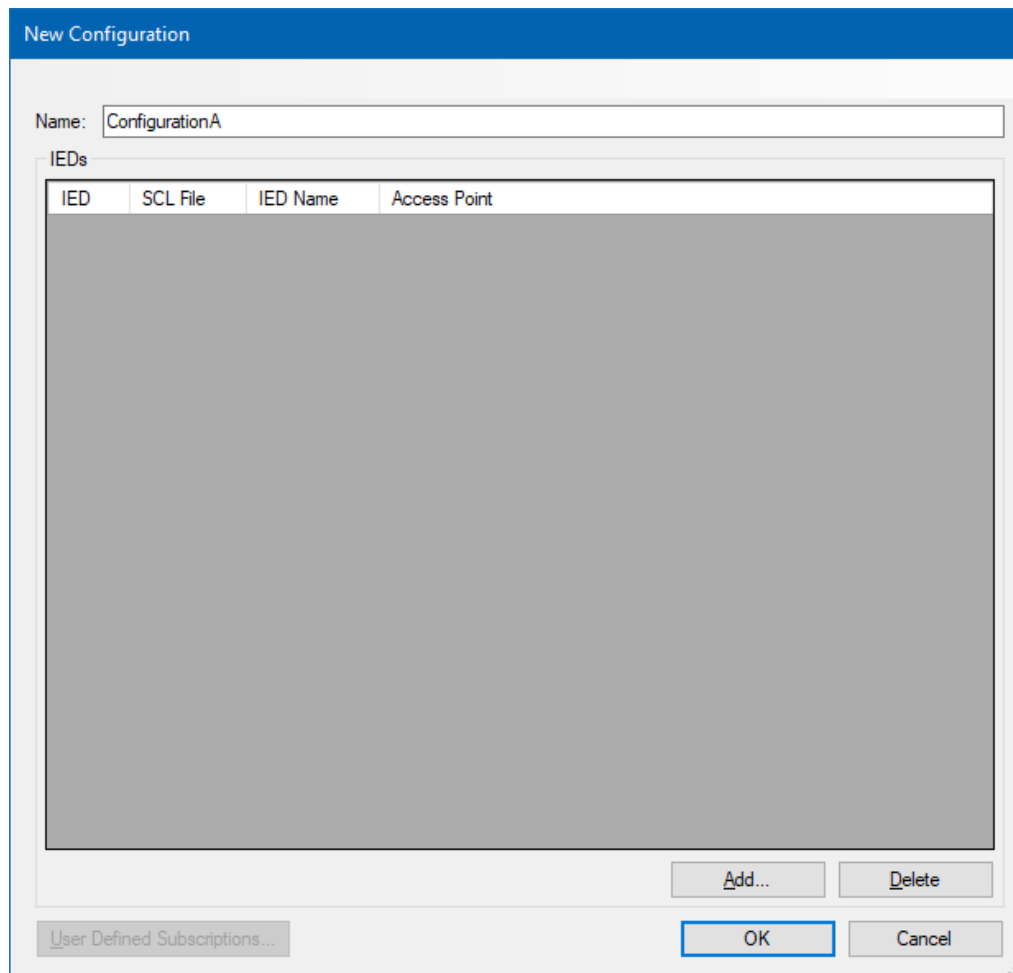


Figure 4: New Configuration screen

Using the **New Configuration** dialog, enter the **Name** of the new configuration.

Add IEDs to the configuration by clicking the **Add...** button at the lower right corner and selecting one or more SCL files.

Select the IEDs to add and click the **OK** button.

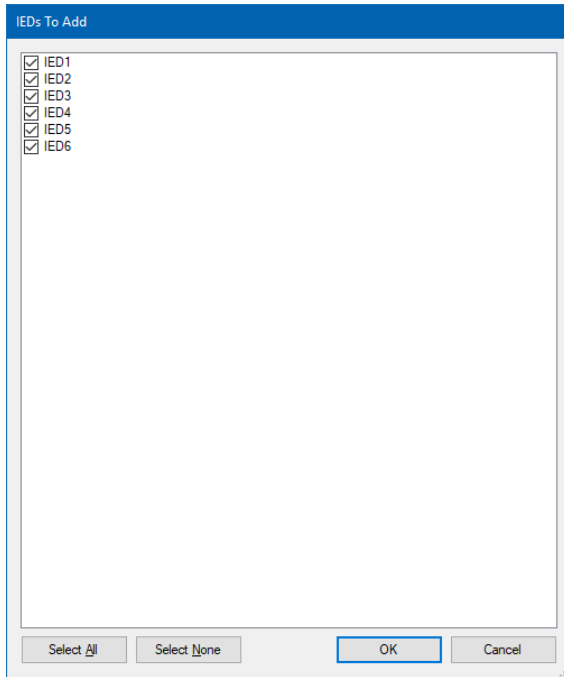


Figure 5: IEDs To Add screen

Click the **OK** button on the New Configuration dialog to create the new configuration. You will be prompted if you wish to load the newly created configuration after it has been created.

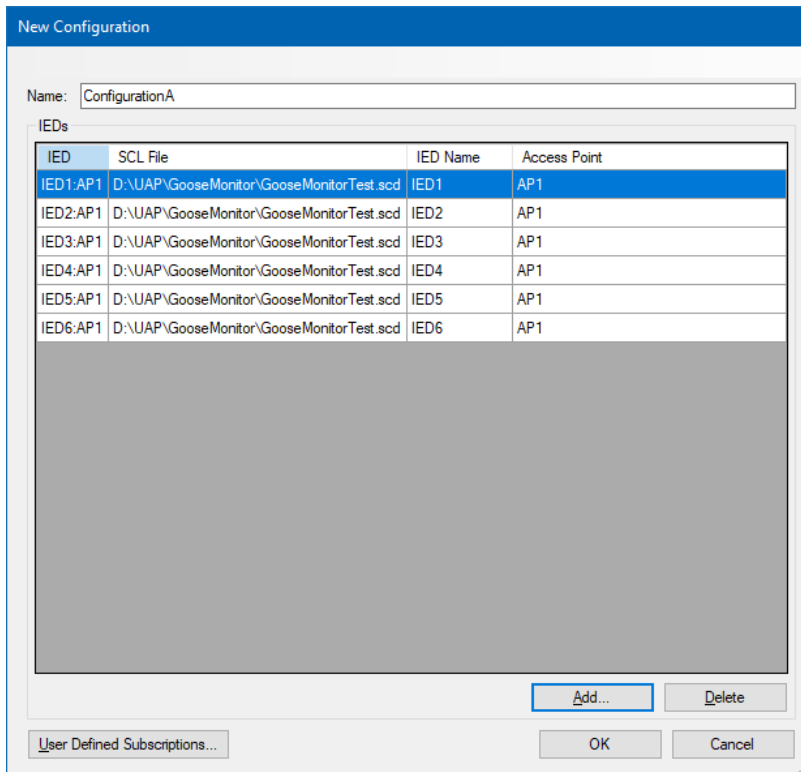


Figure 6: Screen showing newly created configuration

Add User Defined Subscriptions

From the New Configuration dialog, **User Defined Subscriptions**.

Click the **User Defined Subscriptions...** button to display the User Defined Subscriptions dialog.

Click the **Import...** button to import a User Defined Subscriptions XLSX file.

An example of the file format of the User Defined Subscriptions is shown below:

```
#Subscribing IED      #Publisher Reference (LGOS.InRef.SetSrcRef)
IED1    IED31Device3/LLN0.gocbBrkrDemo
IED1    IED41Device4/LLN0.gocbBrkrDemo
IED2    IED11Device1/LLN0.gocbBrkrDemo
IED3    IED21Device2/LLN0.gocbBrkrDemo
IED3    IED21Device2/LLN0.gocbInitFault
IED4    IED21Device2/LLN0.gocbBrkrDemo
IED5    IED31Device3/LLN0.gocbBrkrDemo
IED5    IED61Device6/LLN0.gocbBrkrDemo
IED6    IED41Device4/LLN0.gocbBrkrDemo
```

```
# Use this format to remove a subscription from the configuration
Remove:IED1    IED41Device4/LLN0.gocbBrkrDemo
```

Load Existing Configuration

To load an existing GOOSE Monitor configuration, click the main menu **File→Open→<Name of Configuration>**.

Filters

Filters are used to modify how a subset of IEDs are viewed.

Click the **Filter** button to modify filters or click the main menu item **Tools→Filter...** to enable, disable, add, modify or delete filters.

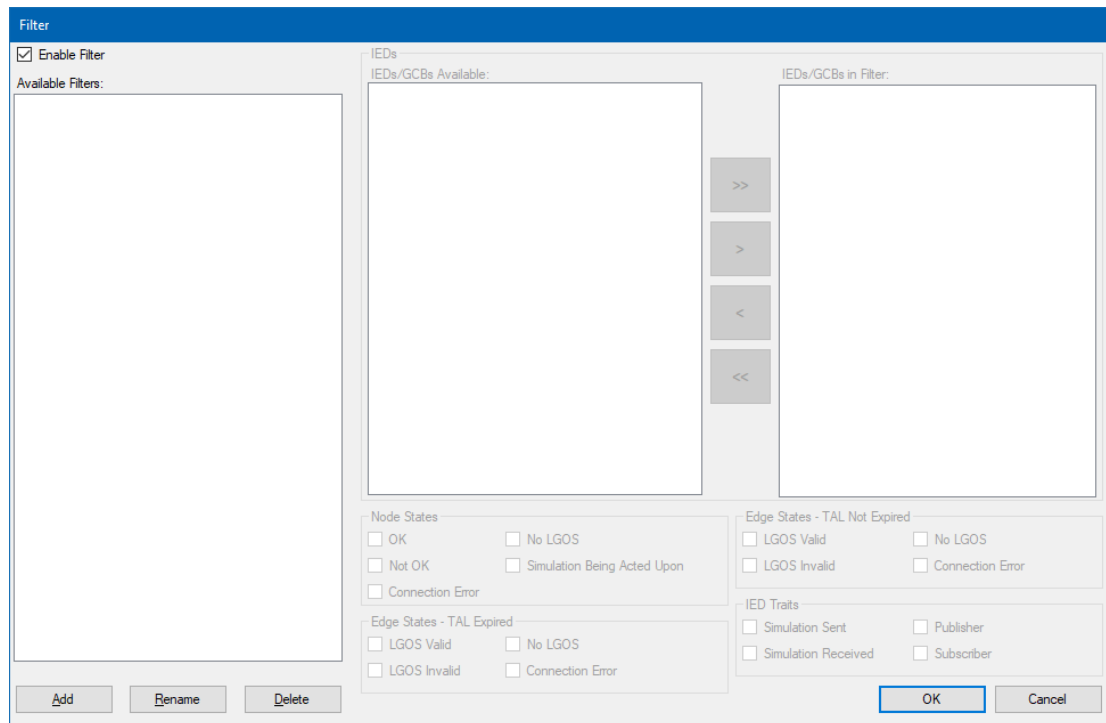


Figure 7: Filter screen

To enable filters, click the **Enable Filter** checkbox. If no filters currently exist, you will need to create at least one. If one exists, click it from the **Available Filters** list to select it and click the **OK** button.

Adding a Filter

To add a filter, click the Add button on the Filter dialog. This will display the Add Filter dialog. Type in a name for the filter and click the **OK** button.

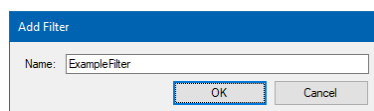


Figure 8: Add Filter screen

Configuring a Filter

Once the filter has been created, the filter must be configured.

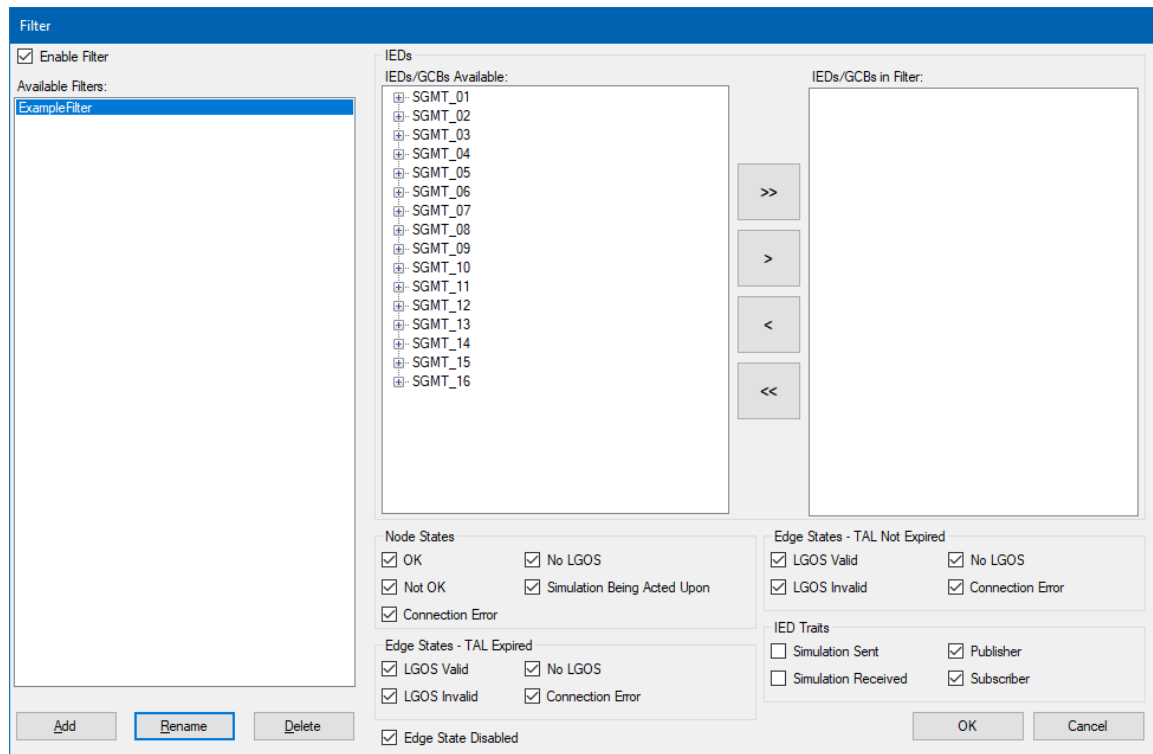


Figure 9: How to Configure a Filter screen

To **add an entire IED** to the filter, click on it in the **IEDs/GCBs Available** list and click the right arrow (>) button.

To **add all the IEDs** to the filter, click on the double right arrow (>>) button.

To **remove all the IEDs selected** from the filter, click the double left arrow (<<) button.

To **remove a specific IED** from the filter, click on it in the IEDs/GCBs in Filter list and click on the left arrow (<) button.

To **add a specific GOOSE Control Block**, expand the IED in the **IEDs/GCBs Available** list and click on the specific GOOSE Control Block to add, then click the right arrow (>) button.

To **remove a specific GOOSE Control Block**, expand the IED in the IEDs/GCBs in Filter list. Click on the specific GOOSE Control Block to remove, then click the left arrow (<) button.

Select the **Node States**, **Edge States** and **IED Traits** to include in the filter by checking the appropriate check boxes.

Node States

IED Nodes states represent the subscription status of the IED. Checking a node state will include all the IED nodes that have this state in the IED Diagram and list of IEDs in the GOOSE Monitor main window. Below is the list of node states.

OK

All GOOSE subscribed by the IED are being received successfully.

Not OK

Not all GOOSE subscribed by the IED are being received successfully.

No LGOS

LGOS is not supported by the IED.

Connection Error

The IED is unable to be connected to.

Simulation Being Acted Upon

The IED is acting upon simulated data.

Edge States

Edges are the lines between IED nodes that represent a single subscription. These have states that represent the status of a GOOSE publication. Checking an edge state will include all edges that have this state in the IED Diagram. Below are descriptions for checkboxes on Edge States.

Edge States - TAL Expired

LGOS Valid

TimeAllowed to Live is expired for the GOOSE publication and all related LGOS are valid.

LGOS Invalid

TimeAllowed to Live is expired for the GOOSE publication but some or all related LGOS are invalid.

No LGOS

TimeAllowed to Live is expired and LGOS is not supported by the subscribing IED.

Connection Error

TimeAllowed to Live is expired and a connection to the IED is unable to be created

Edge States Disabled

The GOOSE Control Block has been disabled.

Edge States – TAL Unexpired

LGOS Valid

TimeAllowed to Live is unexpired for the GOOSE publication and all related LGOS are valid.

LGOS Invalid

TimeAllowed to Live is unexpired for the GOOSE publication but some or all related LGOS are invalid.

No LGOS

TimeAllowed to Live is unexpired and LGOS is not supported by the subscribing IED.

Connection Error

TimeAllowed to Live is unexpired and the subscribing IED is unable to be connected to.

IED Traits

IEDs can publish GOOSE data, subscribe to GOOSE data along with send simulated data as well as receive simulated data. These are all traits that can be filtered on. Checking an IED trait will include the IED in the IED Diagram and list of IEDs in the main GOOSE Monitor window.

Publisher

The IED publishes GOOSE data.

Subscriber

The IED subscribes to GOOSE data.

Simulation Sent

The IED has recently sent simulated data before the Simulation Status Timeout has expired.

Simulation Received

The IED has recently received simulated data before the Simulation Status Timeout has expired.

CHAPTER 4: FUNCTIONALITY

To bring up the GOOSE Monitor, click on **Start→Programs→GOOSE Monitor→GOOSE Monitor**. The GOOSE Monitor Main Window is made up of the following sections:

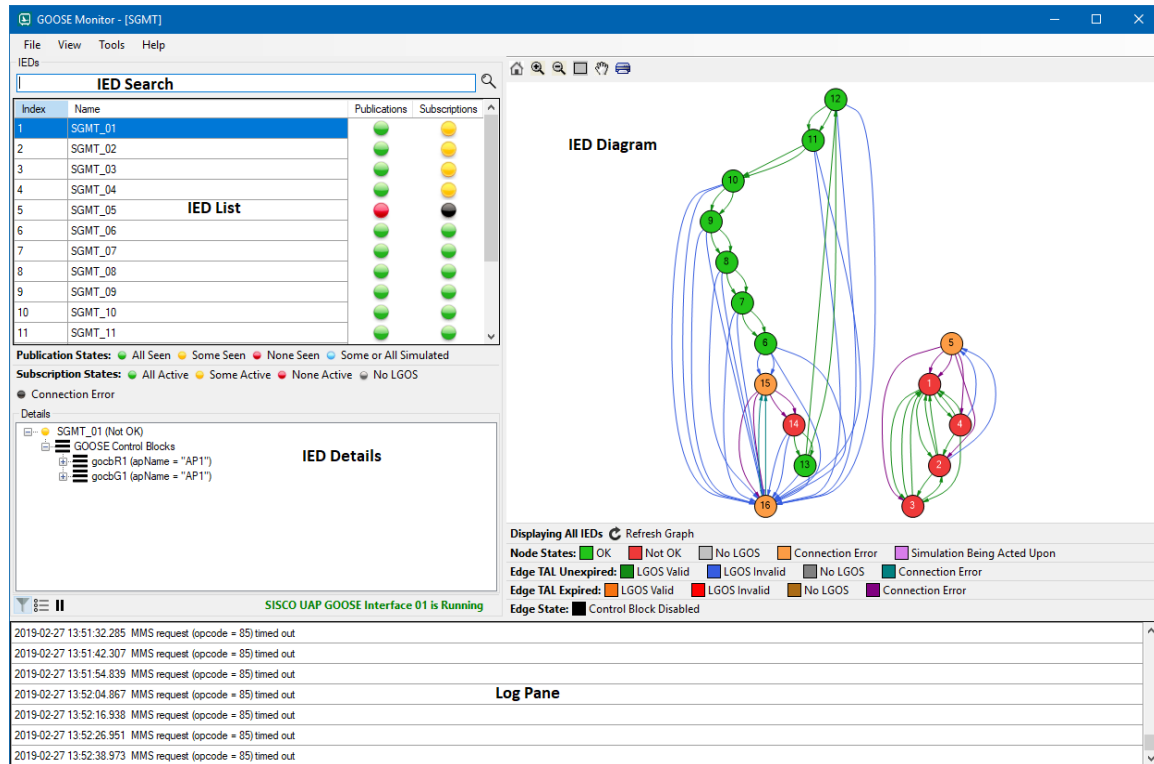


Figure 10: GOOSE Monitor Main Window

Screen Section Descriptions

Below are descriptions of the screen sections.

IED Diagram

This section displays a visual representation of IEDs and the GOOSE publications/subscriptions that flow between them. If a Filter is enabled, then the IEDs that conform to the filter will be displayed. If no Filter is enabled, then all the IEDs in the configuration are displayed. IEDs are represented by colored circle nodes. The colors of the nodes represent a state that the IED is currently in. The following are the states an IED node can be in:

OK

All GOOSE subscribed by the IED are being received successfully

Not OK

Not all GOOSE subscribed by the IED are being received successfully

No LGOS

LGOS is not supported by the IED.

Connection Error

The IED is unable to be connected to.

Simulation Being Acted Upon

The IED is acting upon simulated data.

Publications from an IED to another IED are represented by a single line (edge) with an arrow pointing at the IED subscribing. These lines are color coded as well and include the following states:

Edge TAL Unexpired**LGOS Valid**

TimeAllowed to Live is unexpired for the GOOSE publication and all related LGOS are valid.

LGOS Invalid

TimeAllowed to Live is unexpired for the GOOSE publication but some or all related LGOS are invalid.

No LGOS

TimeAllowed to Live is unexpired and LGOS is not supported by the subscribing IED.

Connection Error

TimeAllowed to Live is unexpired and the subscribing IED is unable to be connected to.

Edge TAL Expired**LGOS Valid**

TimeAllowed to Live is expired for the GOOSE publication and all related LGOS are valid.

LGOS Invalid

TimeAllowed to Live is expired for the GOOSE publication but some or all related LGOS are invalid.

No LGOS

TimeAllowed to Live is expired and LGOS is not supported by the subscribing IED.

Connection Error

TimeAllowed to Live is expired and a connection to the IED is unable to be created.

Edge State

Control Block Disabled

Control block is disabled.

IED List

Displays a list of IEDs. If a Filter is enabled, then the IEDs that conform to the filter will be displayed. If no Filter is enabled, then all the IEDs in the configuration are displayed. Clicking on an IED in the list will highlight it and display its relevant details below in the IED Details.

IED Search

Any IED name that has matching text with the contents of the search box will be displayed. The list is updated dynamically as the user types in text.

IED Details

The IED Details pane displays relevant information related to the IED selected in the IED List. The following information is displayed within it:

GOOSE Control Block

- Subscribing IEDs
- Access Point
 - IP
 - IP-SUBNET
 - IP-GATEWAY
 - OSI-PSEL
 - OSI-TSEL
 - OSI-SSEL
 - OSI-AP-Title
 - OSI-AE-Qualifier
 - APPID
 - VLAN-ID
 - VLAN-PRIORITY
 - IPv6ClassOfTraffic
 - IP
- Control Block Info
 - Type
 - AppID
 - ConfRev
 - DatSet
 - Desc
- Header
 - Packet Header
 - DstMacAddress
 - SrcMacAddress
 - DstIpAddress
 - SrcIpAddress
 - ClassOfTraffic
 - VlanId
 - VlanPriority
 - AppId
 - TQual
 - APDU Header
 - DatSet
 - Gold
 - GoCbRef
 - T
 - StNum
 - SqNum

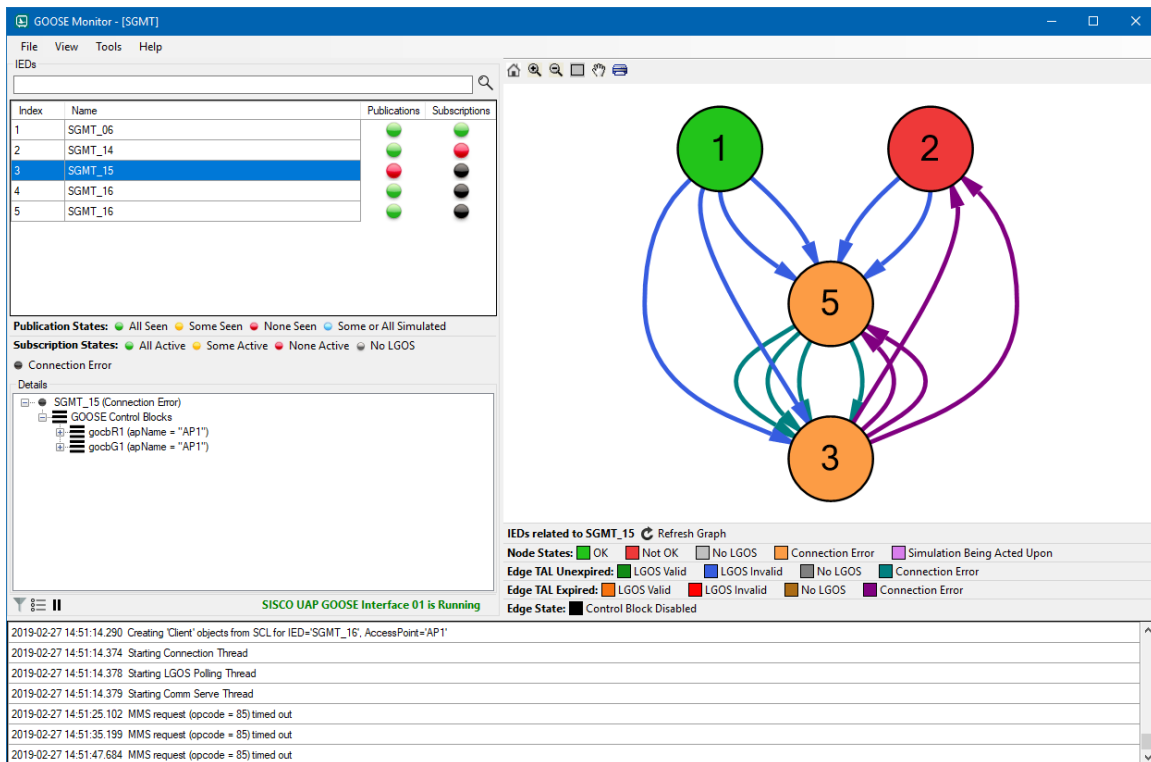
- TimeAllowedToLive
- Simulation
- ConfRev
- NdsCom
- ProtocolVersion
- Data Set

Log Pane

The log pane at the bottom of the screen displays the logging of the GOOSE Monitor. This can be collapsed by clicking the main menu item **View→Log Pane**.

Beep Mode

Beep mode only displays all the IEDs related to a single IED based on those that subscribe from it and those that publish to it. This is used to help diagnose issues that may be affecting an IED. To enter Beep Mode right-click on an IED in the IED List and select **Beep Mode** or right-click on an IED in the IED Diagram and click **Beep Mode**.



APPENDIX A: LOG VIEWER

The Log Viewer can be used to view logging from multiple applications on a single screen. It can also be setup on a remote machine to capture logging from multiple applications. In addition, it can be used to modify the current log parameter settings. When the **Edit Log Parameter** screen is exited for a specific application that application will receive a request to reload logging parameters. This allows modifying log parameters while the application is running.

To capture logging for applications running on the same computer as the Log Viewer, no additional configuration has to be done. The log viewer will automatically detect the applications and start capturing their logging.

To capture logging for applications running on a different computer, the Log Viewer will have to be configured to look for the applications.

Starting the Log Viewer

To start the **Log Viewer** run **Start→Programs→SISCO→Log Viewer→Log Viewer**

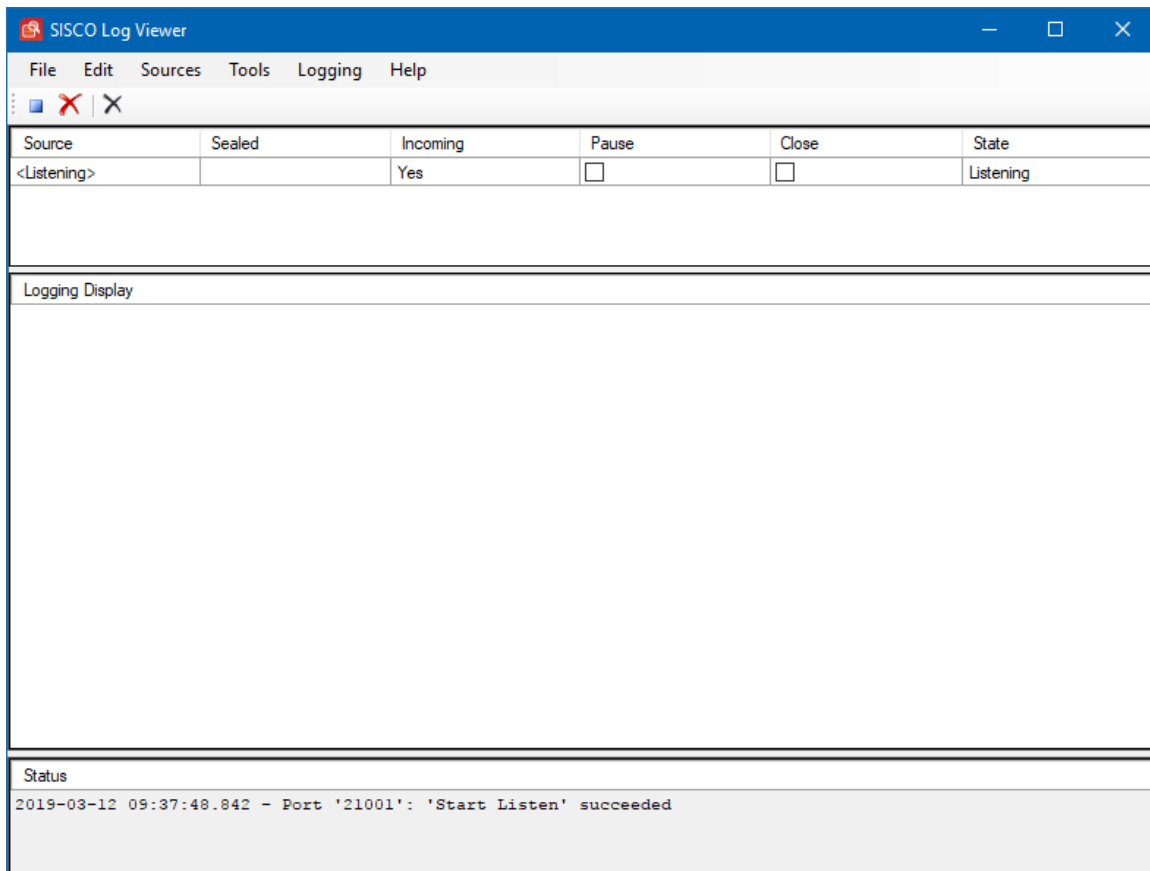


Figure 11: Log Viewer main screen

Log Configuration Editor

To configure the **Log Configuration Editor** run **Start→Program Files→SISCO→Log Viewer→Log Configuration Editor**

The screenshot shows the 'SISCO Log Configuration Editor II' window with the title bar indicating the file path: C:\ProgramData\SISCO\UAP\Config\GooseMonitorLogCfg.xml. The window has a menu bar with 'File' and 'Help'. Below the menu bar are three tabs: 'Log Control', 'Log Masks', and 'Filtered Logging'. The 'Log Control' tab is active, displaying two main sections: 'Log Common' and 'Log File Attributes'.

Log Common

- Log Elapsed Time: ☐

Log File Attributes

- Enable: ☒
- Name:
- Size: bytes
- Destroy Old File: ☐
- Hard Flush: ☐

Log IPC Attributes

- Application ID:
- Max Queue Count:
- Enable Listen: ☐
- Listen Port:
- Num of Listen Ports:
- Max Listen Conns:
- Enable Calling: ☒
- Calling Port:
- Calling IP:
- Calling Backoff Time: msec
- Enable Smart Mode: ☒
- Edit LogCfg File: ☒
- Seal Mode:
- Seal Time Window: secs

At the bottom right of the window are 'Save' and 'Cancel' buttons.

Figure 12: Log Configuration Editor

Log Control

If **Log Control** is clicked on, the following is displayed:

SISCO Log Configuration Editor II - C:\ProgramData\SISCO\UAP\Config\GooseMonitorLogCfg.xml

File Help

Log Control Log Masks Filtered Logging

Log Common

Log Elapsed Time: ☐

Log File Attributes

Enable: ☒

Name:

Size: bytes

Destroy Old File: ☐

Hard Flush: ☐

Log IPC Attributes

Application ID:

Max Queue Count:

Enable Listen: ☐

Listen Port:

Num of Listen Ports:

Max Listen Conns:

Enable Calling: ☒

Calling Port:

Calling IP:

Calling Backoff Time: msecs

Enable Smart Mode: ☐

Edit LogCfg File: ☒

Seal Mode:

Seal Time Window: secs

Save Cancel

Figure 13: Log Control screen

The following are descriptions of each configurable parameter:

Log Common

Log Elapsed Time

If checked, displays logged timestamps with high resolution. If not checked, displays logged timestamps with standard format

Log File Attributes

Enable

If checked, causes logging to the specified log file. If not checked, no log file will be created.

Destroy Old File

If checked, causes the previously existing log file to be deleted. If not checked, the new logging will be appended to the previously-existing log file.

Hard Flush

If checked, causes a close and open of the log file each time a message is logged. If not checked, the log file is not closed and opened each time a message is logged.

Name

Contains a string of ASCII characters. The size can be from 1 to 256 characters. The default is **LogFile.log**.

File Size

The maximum size to which the log file can grow. The default is 1,000,000 bytes. The maximum is 2,147,483,647 bytes.

Log IPC Attributes

Application ID

Contains a string of ASCII characters that identifies a connection to the Log Viewer. It is the name of the application connecting to the Log Viewer and will appear in the Log Viewer display as the **IPC AppID** when the first message is logged by a source or application. The size can be from 1 to 256 characters. The default is **Application ID**.

Enable Calling

If checked, it allows other sites to monitor logging locally. This is easy to set, but some security issues may arise from having it always enabled. If not selected, other sites are prohibited from monitoring logging locally.

Calling Port

This is the port number the remote site may use to monitor logging locally. The range is application-specific and will be as follows:

Default listen port numbers:

LogViewer	21001
GOOSEMonitor	21078

Calling IP

Indicates the IP address of the remote site allowed to monitor logging locally. Default is "127.0.0.1".

Enable Listen

If checked, allows a **Listen** to be posted on the local IP address of a listen port. If not checked, a connection that would allow monitoring of logging would be prohibited. Default is not checked, for security reasons.

Listen Port

The port number logging may be monitored on for TCP ports, and dynamic or private ports.

Num of Listen Ports

The range of ports to be used for listening.

For example: Entering '3' for the **Num of Listen Ports** and 21001' for **Listen Port** would mean that 21001, 21002, and 21003 would be available. However, only one port can be used by an application. This allows for multiple applications to share a range of ports and be able to use the first available port number. Default is 1.

Max Listen Conns

This is the maximum number of connections allowed per port. For example: Entering '10' means up to 10 Log Viewers can connect. Default is 10.

Enable Smart Mode

If checked, enables bi-directional flow or enhanced capabilities for the Log Viewer. If not checked, enables a less-intelligent mode. For example, Telnet might be used instead of the Log Viewer.

Max Que Count

This is the number of log messages kept on the queue, in the form of external buffering on a TCP socket. Default is 10.

Application Log Control and Log Mask Information

Each application has a separate log configuration file and associated log file. The Log Viewer should be used to configure the log masks and to view logging. The log viewer will automatically show all the applications currently running on the machine.

Access Log Configuration

From the **Log Viewer**, right-click on the application and select **Edit Log Cfg File**. This will start the **Log Configuration Editor** and open the log configuration file for the selected application. The **Log Configuration Editor** may also be used to browse for the appropriate configuration file.

Log Configuration Files

The log configuration files located in the **\ProgramData\SISCO\GOOSE Monitor\Config** subdirectories are shown below:

LOG Configuration File	Application
GooseMonitorLogCfg.xml	GOOSE Monitor

Table 2: GOOSE Monitor Log Configuration Files

GOOSE Monitor Log Control

GOOSE Monitor Log Masks

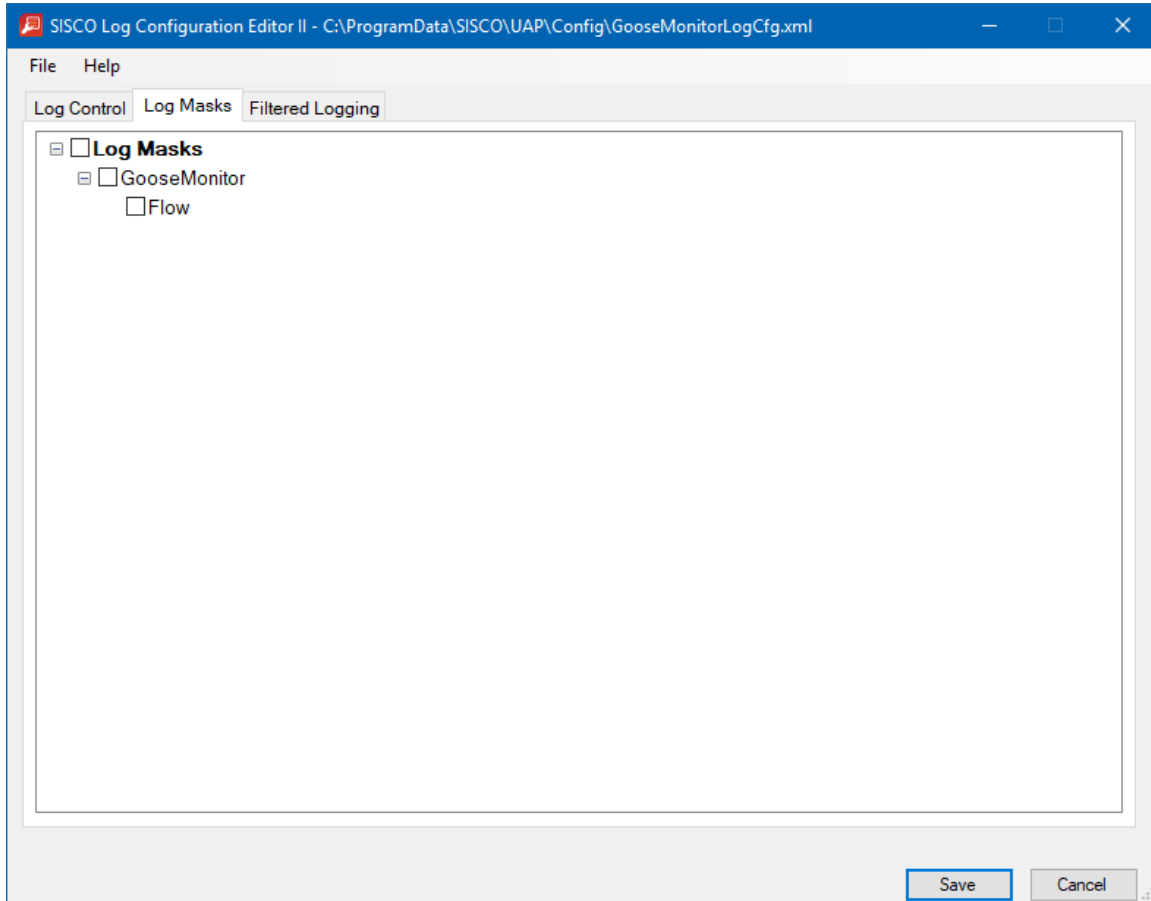


Figure 14: GOOSE Monitor Log Masks screen