Cisco Connected Grid Design Suite (CGDS) - Substation Workbench Monitor User Guide

Release 1.5

September, 2013

Cisco Systems, Inc.

www.cisco.com

Cisco has more than 200 offices worldwide.
Addresses, phone numbers, and fax numbers
are listed on the Cisco website at
www.cisco.com/go/offices.

Text Part Number: OL-29889-02

C O N T E N T S

Preface

This preface describes the purpose, audience, organization, and conventions that are used in the *Cisco Connected Grid Design Suite (CGDS) - Substation Workbench Monitor User Guide*, and provides information on the related documentation.

Purpose

This guide describes how to use and configure the Cisco Connected Grid Design Suite (CGDS) - Substation Workbench Monitor (CGDS Monitor).

Audience

This guide is intended for the users who use and configure the CGDS Monitor.

Organization

Chapter Number	Chapter Title	Description
Chapter 1	Getting Started	Provides an overview of the CGDS Monitor. It also describes how to log in, manage your password, and log out of the CGDS Monitor.
Chapter 2	Managing Users	Provides information on the user management tasks that administrators can perform in the CGDS Monitor, such as creating users and assigning the administrative privileges to them, changing the user password, modifying the user details, and deleting users from the application.
Chapter 3	Monitoring the Substation Network	Provides information on monitoring the integrated substation LAN.
Chapter 4	Configuring the CGDS Monitor Settings	Provides information on the configuration tasks that administrators can perform in the CGDS Monitor, such as defining a time-period for the value analysis, managing the packet captures, and configuring the alarm counts.

Document Conventions

Convention	Indication
bold font	Commands and keywords and user-entered text appear in **bold** font.
italic font	Document titles, new or emphasized terms, and arguments for which you supply values are in *italic* font.
[ ]	Elements in square brackets are optional.
{x	y	z }	Required alternative keywords are grouped in braces and separated by vertical bars.
[x	y	z]	Optional alternative keywords are grouped in brackets and separated by vertical bars.
string	A nonquoted set of characters. Do not use quotation marks around the string or the string will include the quotation marks.
`courier` font	Terminal sessions and information the system displays appear in `courier` font.
`courier bold` font	Command names and samples appear in **`Courier Bold`** font.

< >	Nonprinting characters such as passwords are in angle brackets.
Option > Option	Used to describe a series of menu options.

✎

Note Means *reader take note*. Notes contain helpful suggestions or references to materials not covered in the manual.

Related Documentation

- *Cisco Connected Grid Design Suite (CGDS) - Substation Workbench Release 1.5 Release Notes*
- *Cisco Connected Grid Design Suite (CGDS) - Substation Workbench Quick Start Guide*
- *Cisco Connected Grid Design Suite (CGDS) - Substation Workbench Installation and Configuration Guide*
- *Cisco Connected Grid Design Suite (CGDS) - Substation Workbench Designer User Guide*
- *Cisco Connected Grid Design Suite (CGDS) - Substation Workbench Troubleshooting Guide*

Obtaining Documentation and Submitting a Service Request

For information on obtaining documentation, submitting a service request, and gathering additional information, see *What's New in Cisco Product Documentation* at: http://www.cisco.com/en/US/docs/general/whatsnew/whatsnew.html.

Subscribe to *What's New in Cisco Product Documentation*, which lists all new and revised Cisco technical documentation, as an RSS feed and deliver content directly to your desktop using a reader application. The RSS feeds are a free service.

CHAPTER 1

Getting Started

The Cisco Connected Grid Design Suite (CGDS) - Substation Workbench Monitor (CGDS Monitor) is a monitoring module in the Cisco Connected Grid Design Suite (CGDS) - Substation Workbench.

This chapter provides an overview of the CGDS Monitor. It also describes how to log in, manage your password, and log out of the CGDS Monitor.

About the CGDS Monitor

Overview

The CGDS - Substation Workbench enables the substation engineers to dynamically design, deploy, and monitor the distributed and automated communications networks in a substation.

The CGDS - Substation Workbench comprises the following modules:

- Cisco Connected Grid Design Suite (CGDS) - Substation Workbench Designer (CGDS Designer)—Allows the substation engineers to develop, model, and validate the integrated substation LAN.

- CGDS Monitor—Allows the substation engineers to visualize, validate, and monitor the integrated substation LAN by analyzing configurations for the IP-enabled LAN devices, such as intelligent electronic devices (IEDs), switches, and so on.

  The substation engineers can visualize the communications network in relation to the automated substation, ensure that IEDs are connected and securely communicating with each other, identify where the IP-enabled devices are connected to the substation network, and so on.

Users

All of the users in the CGDS Monitor have the capabilities of monitoring the integrated substation LAN. For example, a substation engineer or operator can observe the behavior of a substation and its network by visualizing the network details.

Apart from these users, the admin users (administrators) can also access the application, and have the capabilities to perform the following tasks:

- Manage users, such as create users and assign the administrative privileges to them, change the user passwords, modify the user details, and delete the existing users from the application. For more information on the user management tasks, see Chapter 2, "Managing Users".

- Configure the CGDS Monitor settings, such as define a time-period for the value analysis reports, manage the packet captures, and specify the alarm counts. For more information on the configuration tasks, see Chapter 4, "Configuring the CGDS Monitor Settings".

- Monitor the integrated substation LAN. For more information on the monitoring tasks, see Chapter 3, "Monitoring the Substation Network".

Logging In

You can log in to the CGDS Monitor using one of the following web browsers:

- Mozilla Firefox Version 23
- Google Chrome Version 29
- Internet Explorer Versions 8, 9, and 10

Before logging in, ensure that you have the CGDS Monitor credentials. If you are an admin user, your default login credentials are emailed to your specified email address after the installation of the CGDS Monitor.

You can change your password after logging in to the application, if necessary. For more information on changing your password, see the "Changing Password" section on page 1-3.

To log in to the CGDS Monitor, perform the following steps:

Step 1 In the Address text box of a web browser, enter the CGDS Monitor URL (https://hostaddress/CGDS/), and click **Enter**.

The CGDS Monitor login page appears.

Step 2 In the Username and Password text boxes, enter the username and password for the CGDS Monitor.

If you cannot remember your password, contact your system administrator. A new system-generated password is sent to your specified email address. You can log in to the CGDS Monitor with the new password and change the password again, if necessary.

Step 3 If you want the CGDS Monitor to remember your username, select the **Remember username** check box.

The next time you log in to the CGDS Monitor, your username is automatically populated.

Step 4 Click **Login**.

The CGDS Monitor home page appears.

Figure 1-1   CGDS Monitor – Home Page
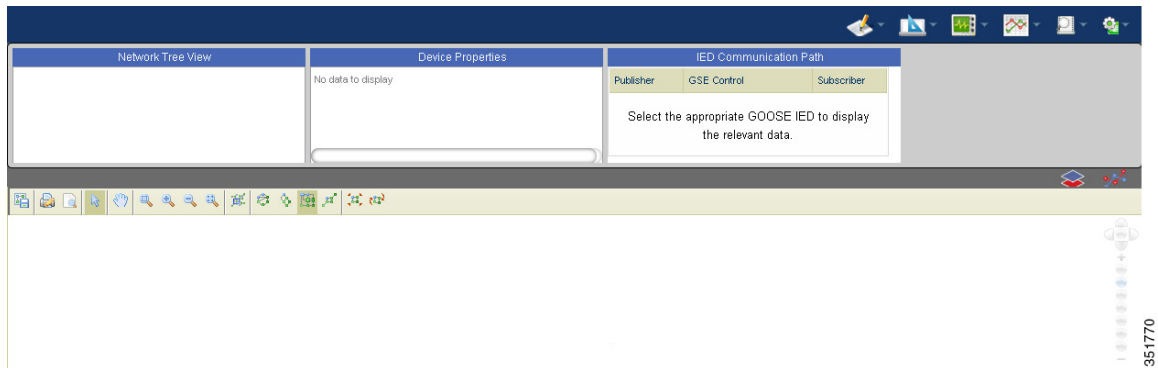
The CGDS Monitor application comprises the Import, Validate, Reports, Monitor, and AutoDiscovery menu options. If you have logged in as an administrator, you can additionally view and access the Settings menu option.

If you are unable to log in, contact your system administrator.

Changing Password

To change your CGDS Monitor password, perform the following steps:

Step 1   Log in to the CGDS Monitor.

For more information on logging in to the CGDS Monitor, see the "Logging In" section on page 1-2.

The CGDS Monitor home page appears.

Step 2   From the greeting menu at the top-right corner, click **Change Password**.

The Change Password dialog box appears.

Step 3   In the New Password and Re-Enter New Password text boxes, enter the new password.

Step 4   Click **Save**.

Your CGDS Monitor password is changed immediately.

Re-Logging In

After logging in to the CGDS Monitor, your session is timed out if you do not use it for a long time.

To start a new session after your session is timed out, in the CGDS Monitor login page, perform Step 1 through Step 4 and start a new session.

For more information on logging in to the CGDS Monitor, see the "Logging In" section on page 1-2 in Chapter 1, "Getting Started".

Logging Out

We recommended that you log out after completing every session to avoid unauthenticated and unauthorized access to the CGDS Monitor.

To log out of the CGDS Monitor, from the greeting menu at the top-right corner, click **Logout**. The CGDS Monitor login page appears, and a message appears that you have logged out of the CGDS Monitor.

CHAPTER **2**

Managing Users

This chapter provides information on the user management tasks that administrators can perform in the Cisco Connected Grid Design Suite (CGDS) - Substation Workbench Monitor (CGDS Monitor).

Administrators have the capabilities to create users for accessing the CGDS Monitor. In addition, administrators can modify and delete the user details.

- About User Management, page 2-1
- Managing Users, page 2-2

About User Management

When you install the CGDS Monitor, an admin user (administrator) is created by default. The admin user creates other users by adding them to the WSO2 Identity Server Management Console (Management Console) and by assigning the administrative privileges, if necessary. The users can log in to the CGDS Monitor and perform tasks based on the permissions that are assigned.

Apart from creating users, administrators can modify the following user details:

- User password—To reset the user password.
- Role—To assign the administrative privileges to users, or to remove the administrative privileges from them.
- User profile—To change the user details, such as username, email address, contact address, and so on.

In addition, administrators can delete the existing users from the application.

Managing Users

Creating Users

To create users, perform the following steps:

Step 1   Log in to the CGDS Monitor.

For more information on logging in to the CGDS Monitor, see the "Logging In" section on page 1-2 in Chapter 1, "Getting Started".

The CGDS Monitor home page appears.

Step 2   From the Settings menu, choose **User Management**.

The WSO2 Identity Server login page appears.

Step 3   In the Username and Password text boxes, enter the username and password for the Management Console.

The WSO2 Identity Server Home page appears.

Step 4   In the left pane, click **Configure** > **Users and Roles**.

The User Management page appears.

Step 5   Click **Users**.

The Users page appears.

Step 6   Click **Add New User** to launch the Add User wizard.

Step 7   Do the following:

 a.   In the Username text box of the Add User Name screen, enter the name of the user that you want to create.

 b.   If you want to specify a password for the user, select the **Define Password Here** radio button, and specify the user password.

 c.   If you want the user to specify the password, select the **Ask Password from User** radio button, and specify the user's email address.

 d.   Click **Next**.

   The 'Select roles of the user' screen appears.

 e.   To assign the administrative privileges to the user, select the **admin** check box, and click **Finish**.

A user is created with the specified privileges, and the username is listed in the Users page.

Editing and Deleting Users

To edit and delete the existing user details, perform the following steps:

Step 1   In the User Management page, click **Users**.

For more information on navigating to the User Management page, perform Step 1 through Step 4.

The Users page appears with a list of the existing users.

Step 2   To change the user password:

   a.   Next to the username for which you want to change the password, click **Change Password**.

       The Change Password page appears.

   b.   Enter the new password, and click **Change**.

Step 3   To assign or remove the administrative privileges, change the user's role as follows:

   a.   Next to the username for which you want to change the role, click **Roles**.

       The Roles page appears.

   b.   In the Unassigned Roles area, select the **admin** check box, and click **Update**.

Step 4   To change the user's profile details:

   a.   Next to the username for which you want to change the profile details, click **User Profile**.

       The User Profile page appears.

   b.   Modify the user's profile details, and click **Update**.

Step 5   To delete the user, next to the username that you want to delete, click **Delete**.

The selected user details are deleted from the application.

CHAPTER **3**

Monitoring the Substation Network

The Cisco Connected Grid Design Suite (CGDS) - Substation Workbench Monitor (CGDS Monitor) allows you to visualize, validate, and monitor the substation LAN before and after the installation in a substation.

- About Network Monitoring, page 3-1
- Discovering the Substation Topology Details, page 3-6
- Importing the Network Details, page 3-7
- Validating the Network Details, page 3-8
- Viewing the Network Details, page 3-10

About Network Monitoring

With the CGDS Monitor, you can visualize the communications network in relation to the automated substation by analyzing configurations for the IP-enabled LAN devices, such as intelligent electronic devices (IEDs), switches, and so on.

In addition, you can analyse the critical system problems and network performance degradation by recording the IED packet captures, viewing the alarm summary graph for the system alerts, and evaluating traffic in the substation network. Therefore, you can track anomalies and performance metrics, and notify staff of issues that require attention.

- Network Monitoring Task Details, page 3-1
- Substation Topology Diagram, page 3-4

Network Monitoring Task Details

You can visualize, validate, and monitor the integrated substation LAN by performing tasks that are listed in Table 3-1

Table 3-1   Network Monitoring – Task Details

Task	Description
1. Import the substation network details.	You need to import the following substation network details into the CGDS Monitor: • Substation topology details—Model of the substation network design (ring or star model) that visually demonstrates the exact relationship between the substation electrical equipment and the IP-based network devices. In the CGDS Monitor, these details are used for displaying the substation topology diagram. You can import these details by using one of the following methods: – Import the substation topology that is designed using the Cisco Connected Grid Design Suite - Substation Workbench Designer (CGDS Designer). For more information on designing a substation topology using the CGDS Designer, see the *Cisco Connected Grid Design Suite - Substation Workbench Designer User Guide*. – Import an XML file that is exported using the auto-discovery feature of the CGDS Monitor. You can perform an auto-discovery of the IP-enabled devices in an existing substation. For more information on performing an auto-discovery, see the "Discovering the Substation Topology Details" section on page 3-6. • Signal matrix—Details about multiple signals that are processed between the generic object oriented substation events (GOOSE) and distributed network protocol (DNP3) IEDs. These details are based on the substation configuration language (SCL) file, and are specified using the CGDS Designer. In the CGDS Monitor, these details are used for displaying the signal matrix details. • IED information—Details about the logical topology or the signals that are exchanged across the network. These details are specified using the CGDS Designer. In the CGDS Monitor, these details are used for displaying the IED's value analysis information. For more information on importing the substation network details, see the "Importing the Network Details" section on page 3-7.

Table 3-1   Network Monitoring – Task Details (continued)

Task	Description

2. Validate the substation network details.	After importing the substation network details, you can validate the following details:
	
	• IED connectivity—To ensure that all of the IEDs are connected and securely communicating with each other.
	
	The IED connection status appears as connected if the IED is securely connected, whereas the status appears as not connected if the IED is not connected. The IED may not be connected because of the following reasons:
	
	  – If you have imported the substation topology details from the CGDS Designer and the internet protocol (IP) address or media access control (MAC) address is not available for the IED.
	  – The IED is connected to an unreachable switch.
	  – If you have imported the substation topology details using the auto-discovery feature of the CGDS Monitor and the IED is connected to the unknown or unsupported devices.
	  – The IED is connected to more than one switch because of which there is a configuration error.
	
	• Switch connectivity—To ensure that all of the switches are reachable in the network. A switch may be unreachable because of the following reasons:
	
	  – The IP address is not reachable.
	  – The login name or password for the switch is incorrect.
	  – There is a network issue.
	  – The switch is unknown or unsupported.
	
	• VLAN information—To obtain the virtual local area network (VLAN) addresses and active ports for all of the available switches in a substation. The VLAN information may not be available if the switch is not reachable, unknown, or unsupported.
	
	For more information on validating the substation network details, see the "Validating the Network Details" section on page 3-8.

3. View the substation network details	After importing and validating the substation network details, you can now visualize and monitor the network by viewing the following details: • Substation topology diagram—Graphical view of all of the network devices in a substation. You can view detailed information about the device's host performance, value analysis, device properties, IED communications path, and response time analysis. • Signal matrix—Details about the IED connections and all of signal exchanges between them based on the SCL file. • Alarm summary—Graphical view of the system problems and network performance degradation in a substation. • Network traffic details—Graphical view that displays the encapsulation of the network traffic for a specific time-period (the default time-period is 15 minutes). • Packet captures—Details about the GOOSE and DNP3 messages that help in identifying the critical system problems. For more information on viewing the substation network details, see the "Viewing the Network Details" section on page 3-10.

Substation Topology Diagram

In the CGDS Monitor, you can view the substation topology diagram that allows you to analyse all of the network devices in a graphical view. You can click a device in the diagram, and view detailed information about each of the devices in the following panes:

- Network Tree View—Displays a tree view of all of the network devices in a substation.
- Device Properties—Displays detailed information about the specific device that you select in the substation topology diagram.
- IED Communication Path—Displays the communication path details of the specific GOOSE or DNP3 IED that you select in the substation topology diagram.

You can also choose the following views for displaying the diagram:

- Topological view—Displays a topology view of the network devices in a substation.
- Auto-bay view—Displays a large amount of network information for the devices that are attached at certain voltages.

The substation topology diagram allows you to analyse and monitor configurations for all of the network devices in your substation.

- Substation Topology Diagram – Icon Details, page 3-4
- Substation Topology Diagram – Toolbar Details, page 3-5

Substation Topology Diagram – Icon Details

Table 3-2   Substation Topology Diagram – Icon Details

Icon	Description
	A switch that is reachable in the network.
	A switch that is unreachable in the network.
	The IED that neither uses the GOOSE nor DNP3 messages. The unsupported IED that is logically connected appears with the value as "unknown".
	The IED that uses the DNP3 messages. The DNP3 IED that is physically connected with a switch appears with an IP address.
	The IED that uses the GOOSE messages. The GOOSE IED that is physically connected with a switch appears with a MAC address.

Substation Topology Diagram – Toolbar Details

Table 3-3   Substation Topology Diagram – Toolbar Details

Icon	Icon Name	Description
	Save As Image	To download and save the substation topology diagram as a PNG, JPEG, SVG, or PDF file.
	Print Setup	To adjust the print settings for the substation topology diagram image.
	Print Preview	To view how a printed page would appear, and adjust the print settings.
	Select	To select a specific device, and view the device details.
	Pan	To touch and drag the page, and view a part of a long page or diagram.
	Marquee Zoom	To enlarge a specific section of the substation topology diagram.
	Zoom In	To enlarge the view of the substation topology diagram, and clearly view detailed information.
	Zoom Out	To reduce the view of the substation topology diagram.
	Zoom Fit	To fit the substation topology diagram to the size of the window if you have zoomed in or zoomed out of the diagram.
	Overview	To display the entire substation topology diagram in a single view.
	Circular Layout	To display the substation topology diagram in a circular view.
	Hierarchal Layout	To display the substation topology diagram in an hierarchical view.
	Orthogonal Layout	To display the substation topology diagram in an orthogonal view.
	Symmetric Layout	To display the substation topology diagram in a symmetrical view.
	Global Layout	To revert the layout changes and display the substation topology diagram in the original view.
	Incremental Layout	To display the substation topology diagram in an interactive and incremental view.
	Auto-Bay View	To display a large amount of network information for the devices that are attached at certain voltages.
	Topological View	To display a topological view of the network devices in substation.

Discovering the Substation Topology Details

You can perform an auto-discovery of the IP-enabled devices in an existing substation. After the auto-discovery process is complete, a substation topology is automatically created in an XML file, which you can import into the CGDS Monitor.

To automatically discover the substation topology details, perform the following steps:

Step 1   Log in to the CGDS Monitor.

For more information on logging in to the CGDS Monitor, see the "Logging In" section on page 1-2 in Chapter 1, "Getting Started".

The CGDS Monitor home page appears.

Figure 3-1   CGDS Monitor – Home Page
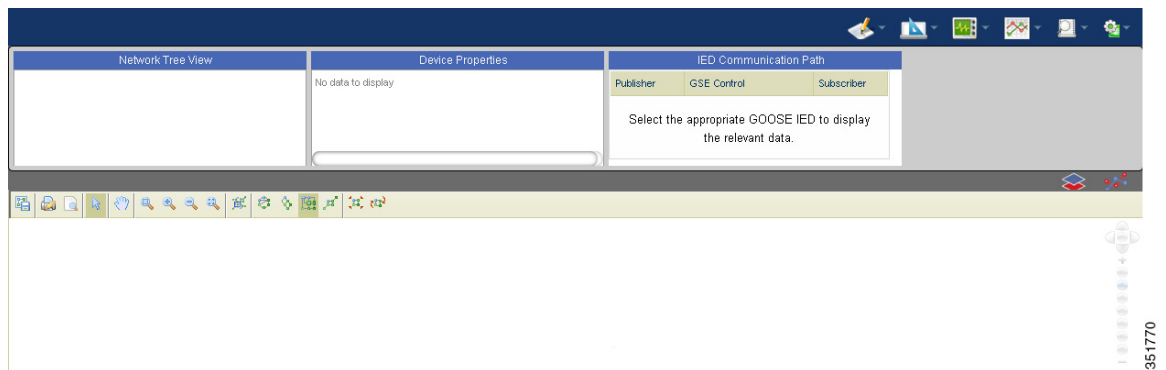
Step 2   To start the auto-discovery process, from the AutoDiscovery menu, choose **Start Auto Discovery**.

A message appears indicating that the auto-discovery process is started.

Step 3   To view the auto-discovery status, from the AutoDiscovery menu, choose **View Auto Discovery Status**.

The Auto Discovery dialog box appears with details about the status of the auto-discovery process.

Step 4   To view and download the discovered substation topology details, from the AutoDiscovery menu, choose **Download Auto Discovery Output**.

The generated XML file is downloaded to your local system.

You can use this file to import the discovered substation topology details into the CGDS Monitor. For more information on importing the discovered substation topology details into the CGDS Monitor, see the "Importing the Substation Topology Details" section on page 3-7.

Importing the Network Details

You need to import details about the substation topology, signal matrix, and IED information of the network devices.

- Importing the Substation Topology Details, page 3-7
- Importing the Signal Matrix Details, page 3-7
- Importing the IED Information Details, page 3-8

Importing the Substation Topology Details

To import the substation topology details, perform the following steps:

Step 1   Log in to the CGDS Monitor.

For more information on logging in to the CGDS Monitor, see the "Logging In" section on page 1-2 in Chapter 1, "Getting Started".

The CGDS Monitor home page (see Figure 3-1) appears.

Step 2   From the Import menu, choose **Import Substation Topology**.

The Import Substation Topology Data dialog box appears.

Step 3   Click **Browse** to browse for one of the following XML files:

- XML file that is created using the auto-discovery feature of the CGDS Monitor.

  For more information on the auto-discovery feature of the CGDS Monitor, see the "Discovering the Substation Topology Details" section on page 3-6.

- XML file that is created using the CGDS Designer.

  For more information on the CGDS Designer, see the *Cisco Connected Grid Design Suite - Substation Workbench Designer User Guide*.

Step 4   Click **Upload**.

The progress bar indicates the progress of the file import. After the file is imported into the CGDS Monitor, a substation topology diagram appears in the CGDS Monitor home page. For more information on viewing the substation topology details, see the "Viewing the Substation Topology Details" section on page 3-10.

Importing the Signal Matrix Details

To import the signal matrix details, perform the following steps:

Step 1   Log in to the CGDS Monitor.

For more information on logging in to the CGDS Monitor, see the "Logging In" section on page 1-2 in Chapter 1, "Getting Started".

The CGDS Monitor home page (see Figure 3-1) appears.

Step 2   From the Import menu, choose **Import Signal Matrix**.

The Import Signal Matrix Data dialog box appears.

Step 3   Click **Browse** to browse for the file, and click **Upload**.

The progress bar indicates the progress of the file import. After the file is imported into the CGDS Monitor, you can view the signal matrix details of the IED connections. For more information on viewing the signal matrix details, see the "Viewing the Signal Matrix Details" section on page 3-14.

Importing the IED Information Details

To import the IED information details, perform the following steps:

Step 1   Log in to the CGDS Monitor.

For more information on logging in to the CGDS Monitor, see the "Logging In" section on page 1-2 in Chapter 1, "Getting Started".

The CGDS Monitor home page (see Figure 3-1) appears.

Step 2   From the Import menu, choose **Import IED Information**.

The Import IED Information Data dialog box appears.

Step 3   Click **Browse** to browse for the file, and click **Upload**.

The progress bar indicates the progress of the file import. After the file is imported into the CGDS Monitor, you can view the IED information details. For more information on viewing the IED information details, see the "Viewing the IED Information Details" section on page 3-11.

Validating the Network Details

After importing the substation network details into the CGDS Monitor, you can validate the IED connections, switch connections, and VLAN information.

- Validating the IED Connectivity, page 3-8
- Validating the Switch Connectivity, page 3-9
- Validating the VLAN Information, page 3-10

Validating the IED Connectivity

To validate the IED connectivity, perform the following steps:

Step 1   Log in to the CGDS Monitor.

For more information on logging in to the CGDS Monitor, see the "Logging In" section on page 1-2 in Chapter 1, "Getting Started".

The CGDS Monitor home page (see Figure 3-1) appears.

Step 2   To start validating the IED connections, from the Validate menu, choose **Validate IED Connectivity > Start Test**.

A message appears with the status of the IED connectivity test.

Step 3   To view the IED connectivity details, from the Validate menu, choose **Validate IED Connectivity >
View Result**.

> **Note**   The Start Test and View Result options are disabled after you start the test. These options are
> automatically enabled after the validation process is complete.

The IED Connection Information dialog box appears with the following details:

- Latest running—Last time when the IED connectivity test was run.
- IED Name—Name of the IED.
- IED Port Index—Access point for the IED that is connected to a switch.
- IED Connection Status—Status about the IED connectivity as follows:
    - Connected—If the IED is securely connected or as expected.
    - Not Connected—If the IED is not connected. For more information on the IED connection
      status, see Table 3-1.
- IP Address—IP address for the DNP3 IED.
- MAC Address—MAC address for the GOOSE IED.

Validating the Switch Connectivity

To validate the switch connectivity, perform the following steps:

Step 1   Log in to the CGDS Monitor.

For more information on logging in to the CGDS Monitor, see the "Logging In" section on page 1-2 in
Chapter 1, "Getting Started".

The CGDS Monitor home page (see Figure 3-1) appears.

Step 2   To start the switch connectivity test, from the Validate menu, choose **Validate Switch Connectivity >
Start Test**.

A message appears with the status of the switch connectivity test.

Step 3   To view the switch connectivity details, from the Validate menu, choose **Validate Switch Connectivity
> View Result**.

> **Note**   The Start Test and View Result options are disabled after you start the test. These options are
> automatically enabled after the validation process is complete.

All of the switches in the network are validated, and the substation topology diagram is updated. In the
substation topology diagram, the reachable switches appear with the ![icon] icon, whereas the
unreachable switches appear with the ![icon] icon.

Validating the VLAN Information

To validate the VLAN information, perform the following steps:

Step 1   Log in to the CGDS Monitor.

For more information on logging in to the CGDS Monitor, see the "Logging In" section on page 1-2 in Chapter 1, "Getting Started".

The CGDS Monitor home page (see Figure 3-1) appears.

Step 2   From the Validate menu, choose **Validate VLAN Information**.

The VLAN Information dialog box appears with the following details:

- VLAN information for all of the supported and reachable switches.
- Default VLAN ID.
- Ports that are connected to the switches.

Viewing the Network Details

After importing and validating the substation network details, you can now visualize and monitor the network.

- Viewing the Substation Topology Details, page 3-10
- Viewing the IED Information Details, page 3-11
- Viewing the IED Information Details, page 3-11
- Viewing the Network Traffic Analysis, page 3-14
- Viewing the Signal Matrix Details, page 3-14
- Analyzing the IED Packet Captures, page 3-15

Viewing the Substation Topology Details

To view the substation topology diagram of all of the network devices, perform the following steps:

Step 1   Log in to the CGDS Monitor.

For more information on logging in to the CGDS Monitor, see the "Logging In" section on page 1-2 in Chapter 1, "Getting Started".

The CGDS Monitor home page (see Figure 3-1) appears.

Step 2   Import the network details into the CGDS Monitor.

For more information on importing the network details, see the "Importing the Network Details" section on page 3-7.

The substation topology diagram appears with a graphical view of all of the network devices. By default, the substation topology diagram appears in a topological view.

Step 3   To display the substation topology diagram in an auto-bay view, click the 🔷 icon.

To display the substation topology diagram in a topological view, click the ⬚ icon.

For more information on the icons that are used in the substation topology diagram, see Table 3-2.

Step 4   Validate the network.

For more information on validating the network, see the "Validating the Network Details" section on page 3-8.

The IED connections, switch connections, and VLAN information details are validated.

Step 5   Click a device in the substation topology diagram and view detailed information about the selected device in the Network Tree View, Device Properties, and IED Communication Path panes.

For more information on the Network Tree View, Device Properties, and IED Communication Path panes, see the "Substation Topology Diagram" section on page 3-4.

Step 6   To perform additional tasks in the substation topology diagram, such as downloading or printing the diagram, changing the layout of the diagram, or viewing specific sections of the diagram, use the toolbar options that are listed in Table 3-2.

Viewing the IED Information Details

- Viewing the GOOSE IED Details, page 3-11
- Viewing the DNP3 IED Details, page 3-12

Viewing the GOOSE IED Details

You can view the following details about the GOOSE IEDs:

- Host performance—Graphical analysis of the IED's network performance.
- Value analysis—Captures all of the signals and GOOSE messages that are received or sent by the IED.
- Information path—Path that captures the signals that are processed by the GOOSE IED to communicate with other connected IEDs.

To view details about the GOOSE IEDs, perform the following steps:

Step 1   In the substation topology diagram, select a GOOSE IED, which appears with the ⬚ icon.

For more information on displaying the substation topology diagram, see the "Viewing the Substation Topology Details" section on page 3-10.

The selected GOOSE IED details appear in the Network Tree View, Device Properties, and IED Communication Path panes in the CGDS Monitor home page.

For more information on the Network Tree View, Device Properties, and IED Communication Path panes, see the "Substation Topology Diagram" section on page 3-4.

Step 2   To view the IED's host performance, right-click the specific GOOSE IED, and click **Host Performance**.

The Host Performance dialog box appears with a graphical analysis of the network performance for the selected IED.

Step 3   To view the IED's value analysis details, right-click the specific GOOSE IED, and click **Value Analysis**.

The Value Analysis dialog box appears with the following details for the selected IED:

- Input details—Input signal details that are received by the selected IED:
  - Inputs
  - External Data Reference
  - Value
  - Internal Data Reference
- Output details—Output signal details that are sent by the selected IED:
  - GOOSE CBName
  - Output Data Reference
  - Value

Step 4   View the IED's information path details:

a.   Right-click the specific GOOSE IED, and click **Information Path**.

The information path details appear in the IED Communication Path pane.

You can clear the IED information path details from the IED Information Path pane for viewing the information path details of another IED.

b.   To clear the IED information path details from the IED Information Path pane, from the Validate menu, choose **Clear IED Information Path**.

The IED Information Path pane is cleared. You can now view the updated details for the selected IED.

Viewing the DNP3 IED Details

You can view the following details about the DNP3 IEDs:

- Host performance—Graphical analysis of the IED's network performance.
- Response time analysis—Graphical analysis of the performance details of the server that has the longest response time. The data appears in microseconds.

To view details about the DNP3 IEDs, perform the following steps:

Step 1   In the substation topology diagram, select a DNP3 IED, which appears with the [icon] icon.

For more information on displaying the substation topology diagram, see the "Viewing the Substation Topology Details" section on page 3-10.

The specific DNP3 IED details appear in the Network Tree View and Device Properties panes in the CGDS Monitor home page.

For more information on the Network Tree View and Device Properties panes, see the "Substation Topology Diagram" section on page 3-4.

Step 2   To view the IED's host performance, right-click the specific DNP3 IED, and click **Host Performance**.

The Host Performance dialog box appears with a graphical analysis of the network performance for the selected IED.

Step 3   To view the IED's response time analysis, right-click the specific DNP3 IED, and click **Response Time Analysis**.

The Response Time Analysis dialog box appears with the following details:

- Input details—Input signal details that are received by the selected IED:
    - Inputs
    - External Data Reference
    - Value
    - Internal Data Reference
- Output details—Output signal details that are sent by the selected IED:
    - GOOSE CBName
    - Output Data Reference
    - Value

Viewing the Alarm Summary

To view the alarm summary graph, perform the following steps:

Step 1   Log in to the CGDS Monitor.

For more information on logging in to the CGDS Monitor, see the "Logging In" section on page 1-2 in Chapter 1, "Getting Started".

The CGDS Monitor home page (see Figure 3-1) appears.

Step 2   Import the network details into the CGDS Monitor.

For more information on importing the network details, see the "Importing the Network Details" section on page 3-7.

The substation topology diagram appears with a graphical view of all of the network devices.

Step 3   Validate the network.

For more information on validating the network, see the "Validating the Network Details" section on page 3-8.

The IED connections, switch connections, and VLAN information details are validated.

Step 4   From the Reports menu, choose **View Alarm Summary**.

The Alarm Summary dialog box appears with the following details:

- Time filter—To filter the alarm summary details based on a specific time-period.
- Graphical representation of the alarm summary—To analyse the network performance degradation by viewing the number of alarm counts in the alarm summary graph.

Viewing the Network Traffic Analysis

To view the network traffic analysis graph, perform the following steps:

Step 1   Log in to the CGDS Monitor.

For more information on logging in to the CGDS Monitor, see the "Logging In" section on page 1-2 in Chapter 1, "Getting Started".

The CGDS Monitor home page (see Figure 3-1) appears.

Step 2   Import the network details into the CGDS Monitor.

For more information on importing the network details, see the "Importing the Network Details" section on page 3-7.

The substation topology diagram appears with a graphical view of all of the network devices.

Step 3   Validate the network.

For more information on validating the network, see the "Validating the Network Details" section on page 3-8.

The IED connections, switch connections, and VLAN information details are validated.

Step 4   From the Reports menu, choose **View Traffic Analysis**.

The Traffic Analysis dialog box appears with the following details:

- Time filter—To filter the network traffic details based on a specific time period.

- Graphical representation of the network traffic details—To analyse the network traffic type and volume by evaluating the traffic based on the specific encapsulation protocols or VLAN information.

Viewing the Signal Matrix Details

To view the signal matrix details, perform the following steps:

Step 1   Log in to the CGDS Monitor.

For more information on logging in to the CGDS Monitor, see the "Logging In" section on page 1-2 in Chapter 1, "Getting Started".

The CGDS Monitor home page (see Figure 3-1) appears.

Step 2   Import the network details into the CGDS Monitor.

For more information on importing the network details, see the "Importing the Network Details" section on page 3-7.

The substation topology diagram appears with a graphical view of all of the network devices.

Step 3   Validate the network.

For more information on validating the network, see the "Validating the Network Details" section on page 3-8.

The IED connections, switch connections, and VLAN information details are validated.

Step 4   From the Monitor menu, choose **View Signal Matrix**.

The Signal Matrix dialog box appears with the following details:

- IED Name—Name of the IED.

- Inputs—Input name.

- External Data Reference—IED reference point that sends the signal.

- Internal Data Reference—IED reference point that receives the signal.

Analyzing the IED Packet Captures

You can analyze the critical system problems and network performance degradation by recording the IED packet captures for the GOOSE and DNP3 messages that are sent across the network.

To analyse the IED packet captures, you need to first enable the IED packet capture by starting and stopping it. After the packet capture stops, you can view the packet capture details.

The administrator can configure the auto-stop period, so that the packet capture automatically stops after the configured time interval. For more information on configuring the auto-stop period, see the "Configuring the Auto-Stop Period" section on page 4-1 in Chapter 4, "Configuring the CGDS Monitor Settings".

To analyse the DNP3 and GOOSE packet captures, perform the following steps:

Step 1   Log in to the CGDS Monitor.

For more information on logging in to the CGDS Monitor, see the "Logging In" section on page 1-2 in Chapter 1, "Getting Started".

The CGDS Monitor home page (see Figure 3-1) appears.

Step 2   Import the network details into the CGDS Monitor.

For more information on importing the network details, see the "Importing the Network Details" section on page 3-7.

The substation topology diagram appears with a graphical view of all of the network devices.

Step 3   Validate the network.

For more information on validating the network, see the "Validating the Network Details" section on page 3-8.

The IED connections, switch connections, and VLAN information details are validated.

Step 4   Analyse the DNP3 packet captures:

a. To start the packet capture, from the Monitor menu, choose **DNP Analysis > Start Packet Capture**.

A message appears indicating that the packet capture is started.

✎

Note   The Start option is disabled if the number of users exceed the maximum allowed limit of the packet captures. To enable the Start option, contact your administrator.

b. To stop the packet capture, from the Monitor menu, choose **DNP Analysis > Stop Packet Capture**.

A message appears indicating that the packet capture is stopped.

> **Note** If the auto-stop option is configured by the administrator, the packet capture automatically stops after the configured time interval.

    c. To view the packet capture, from the Monitor menu, choose **DNP Analysis > View Packet Capture**.

    The Packet Capture dialog box appears with messages for the selected time-period.

Step 5 Analyse the GOOSE packet captures:

    a. To start the packet capture, from the Monitor menu, choose **GOOSE Analysis > Start Packet Capture**.

    A message appears indicating that the packet capture is started.

> **Note** The Start option is disabled if the number of users exceed the maximum allowed limit of the packet captures. To enable the Start option, contact your administrator.

    b. To stop the packet capture, from the Monitor menu, choose **GOOSE Analysis > Stop Packet Capture**.

    A message appears indicating that the packet capture is stopped.

> **Note** If the auto-stop option is configured by the administrator, the packet capture automatically stops after the configured time interval.

    c. To view the packet capture, from the Monitor menu, choose **GOOSE Analysis > View Packet Capture**.

    The Packet Capture dialog box appears with messages for the selected time-period.

CHAPTER 4

Configuring the CGDS Monitor Settings

This chapter provides information on the configuration tasks that administrators can perform in the Cisco Connected Grid Design Suite (CGDS) - Substation Workbench Monitor (CGDS Monitor).

Administrators have the capabilities to configure the CGDS Monitor settings, such as defining a time-period for the value analysis details, managing the packet captures, and specifying the alarm counts.

- Configuring the Auto-Stop Period, page 4-1
- Configuring the Value Analysis Period, page 4-2
- Deleting the Packet Captures, page 4-3
- Configuring the Alarm Counts, page 4-3

Configuring the Auto-Stop Period

You can configure the auto-stop time-period to automatically stop all of the generic object oriented substation events (GOOSE) and distributed network protocol (DNP3) messages.

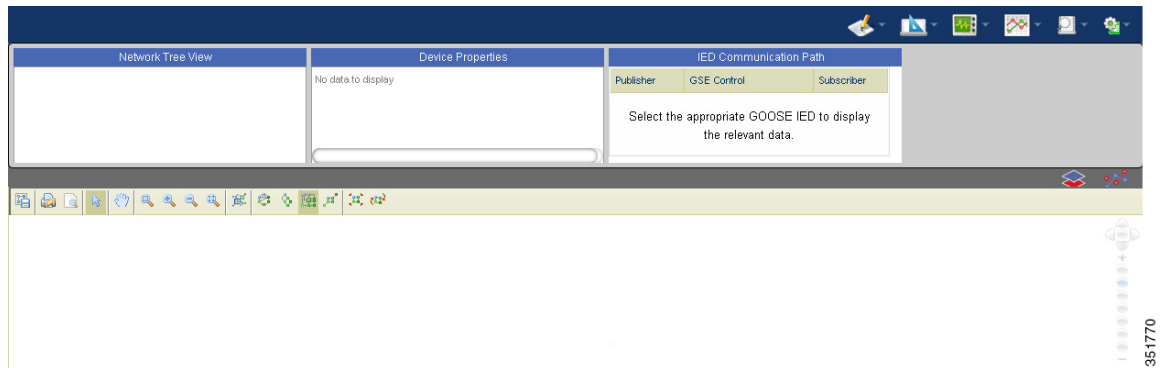To configure the auto-stop period, perform the following steps:

Step 1 Log in to the CGDS Monitor.

For more information on logging in to the CGDS Monitor, see the "Logging In" section on page 1-2 in Chapter 1, "Getting Started".

The CGDS Monitor home page appears.

Figure 4-1   *CGDS Monitor – Home Page*

Step 2 From the Settings menu, choose **Configure Auto Stop Period**.

The Configure Auto Stop Period dialog box appears.

Step 3 In the Period text box, specify the time-period in seconds, and click **Reset**.

A message appears indicating that the auto-stop time period is configured.

Configuring the Value Analysis Period

You can configure a time-period for displaying the value analysis report for the GOOSE IEDs.

To configure the value analysis time-period, perform the following steps:

Step 1 Log in to the CGDS Monitor.

For more information on logging in to the CGDS Monitor, see the "Logging In" section on page 1-2 in Chapter 1, "Getting Started".

The CGDS Monitor home page (see Figure 4-1) appears.

Step 2 From the Settings menu, choose **Configure Value Analysis Period**.

The Configure Value Analysis Period dialog box appears.

Step 3 In the Period text box, specify the time-period in minutes, and click **Reset**.

A message appears indicating that the value analysis time-period is configured.

Deleting the Packet Captures

You can view and delete one or more GOOSE and DNP3 sessions that all of the users have captured in a substation.

✎
Note   A maximum of eight users can concurrently capture the sessions in a substation. If the number of users exceeds the maximum allowed limit, no more users are allowed to capture the sessions until you delete the exceeding packet captures.

To delete the packet captures, perform the following steps:

Step 1   Log in to the CGDS Monitor.

For more information on logging in to the CGDS Monitor, see the in .

The CGDS Monitor home page (see) appears.

Step 2   From the Settings menu, choose **Delete Packet Capture**.

The Capture Sessions dialog box appears with the following details:

- Creator—User who captured the session.
- Capture Type—GOOSE or DNP3 packet capture.
- Name—Name of the packet capture.
- Status—Status of the packet capture as started or stopped.

Step 3   Select one or more sessions that you want to delete, and click **Delete Selected Session**.

A message appears indicating that the selected session is deleted from the CGDS Monitor.

Configuring the Alarm Counts

You can configure the rise and fall counts for the network traffic in a substation. The alarm summary graph is displayed based on these configured alarm counts.

To configure the alarm counts, perform the following steps:

Step 1   Log in to the CGDS Monitor.

For more information on logging in to the CGDS Monitor, see the in .

The CGDS Monitor home page (see) appears.

Step 2   From the Settings menu, choose **Configure Alarm**.

The Configure Alarm dialog box appears.

Step 3   Do the following:

- From the Protocol drop-down list, choose either **GOOSE** or **DNP3**.
- In the Detail area, specify the following details for the packets:

– Rising—Upper limit that is allowed in one second.

– Falling—Lower limit that is allowed in one second.

Step 4   Click **Reset**.

A message appears indicating that the alarm counts are configured.

GLOSSARY

A

admin user
Default user that is created when you install the Cisco Connected Grid Design Suite (CGDS) - Substation Workbench Monitor (CGDS Monitor). The admin user (administrator) creates other users and assigns the administrative privileges, if necessary.

I

Intelligent Electronic Device (IED)
Controllers of the power system equipment in a substation, such as circuit breakers, transformers, and so on.

IED information
Details about the logical topology or the signals that are exchanged across the network. These details are specified using the Cisco Connected Grid Design Suite - Substation Workbench Designer (CGDS Designer).

In the CGDS Monitor, these details are used for displaying the IED's value analysis information.

P

protocol messages
Details about the generic object oriented substation events (GOOSE) and distributed network protocol (DNP3) messages that help in identifying the critical system problems in a substation.

S

signal matrix
Details about multiple signals that are processed between the GOOSE and DNP3 IEDs. These details are based on the substation configuration language (SCL) file, and are specified using the CGDS Designer.

substation topology diagram
Graphical representation of all of the network devices in a substation. You can choose the following views for displaying the diagram:

- Topological view—Displays a topology view of the network devices in a substation.
- Auto-bay view—Displays a large amount of network information for the devices that are attached at certain voltages.

Send documentation feedback to cgds-docfeedback@cisco.com

U

user

Users access the CGDS Monitor to visualize, validate, and monitor the integrated substation LAN. For example, a substation engineer or operator can observe the behavior of a substation and its network by visualizing the network details. Apart from these users, the admin users can also access the CGDS Monitor.

V

Virtual Local Area Network (VLAN) information

Details about the VLAN addresses and active ports for all of the available switches in a substation. The VLAN information may not be available if the switch is not reachable, unknown, or unsupported.