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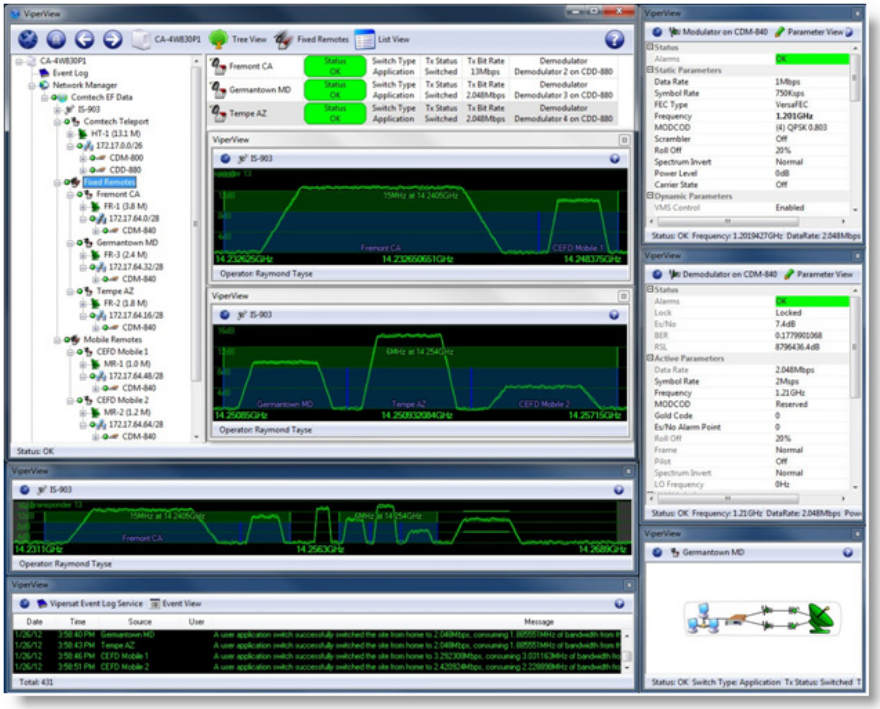
Vipersat
VMS v3.14.x

VIPERSAT Management System
User Guide

MN/22156 Revision 14

VMS v3.14.x

VIPERSAT Management System



User Guide

Part Number MN/22156
Document Revision 14

Software version 3.14.x

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COMTECH EF DATA

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Document Revision History

Revision	Date	Description
0	7/03/07	**Initial Release**. *Note*: This new document part number, MN/22156, supersedes the previous VMS User Guide part number, 22156. **New functionality in v3.5.x:** VMS N:1 Redundancy; Site Distribution Lists; CDM-700 Out-of-Band Driver; CDD-564IF InBand Driver.
1	10/15/07	**New functionality in v3.6.0:** Roaming (SOTM), ROSS; Global Map View.
2	2/08/08	**New functionality in v3.6.2:** VMS Virtual Network Operator (VNO).
3	8/30/08	**New functionality in v3.6.3:** SLM-5650A Inband/OOB Driver; OBCM; CDM-570/570L Out-of-Band Driver; Satellite Advanced Switching for SOTM and Antenna Mesh Compensation Factor; Basic Guaranteed Bandwidth and CIR.
4	2/24/09	**New functionality in v3.6.4:** Event Log Filtering and VMS Event Conduit Service; VMS Redundancy Status and Auto Synchronize; Up/Down Converter Naming.
5	5/26/09	**New functionality in v3.7.1:** Guaranteed Bandwidth; Enhanced Switching; Integrated Circuit Scheduler. Not formally released.
6	10/30/09	**New functionality in v3.7.2:** Point-to-Point Switching; Remote Site Wizard; Application Image Manager; Application Policies Priority; Event Relay Server; Satellite Reservations Status; Antenna Visibility; Multi-Band LNB Roaming Support.
7	5/05/10	**New functionality in v3.7.3:** Database Protection and Hardening; SHOD/ Mesh Data Rate Limits; Independent Forward and Return Path Settings for Reservations and Advanced Switching ModCods; Site Reservation Control; Automatic Network Registration.
8	3/26/12	**New functionality in v3.8.1:** Support for Advanced VSAT Series800—CDM-800 Gateway Router, CDM-840 Remote Router, CDD-880 Multi-Receiver Router—providing Monitor and Control with *d*SCPC; External parameter change log event.
9	6/21/12	**New functionality in v3.9.1/3.9.2:** Support for Out-of-Band (non-Vipersat) modems; Enhanced Application Policies; Enhanced Remote Site Wizard; Enhanced SNMP Modem Manager: Polling parameters, Declare Modem parameters, and CDM-625 driver.
10	10/16/12	**New functionality in v3.10.1:** SNMP module Northbound Interface (NBI) to external network management systems.

Revision	Date	Description
11	3/15/13	**New functionality in v3.11.x:** Dual-level User Account Control; ROSS driver enhancement; SOTM Roaming support for Advanced VSAT Series800; CDM-750 driver with OOB Switching; Northbound Interface with caching for CDM-570/L, CDD-56X/L, and SLM-5650/A.
12	3/05/14	**New functionality in v3.12.x:** Bandwidth Exclusion Zones, Carrier Presence Switching; Operations Monitor, ViperView Multi-Select, Antenna View Drag-and-Drop, Active Demodulator Blocking, Codecast Image Upgrade, Bandwidth View Animation options, Dual Speed Status Update Timer, Event Log Auto Scroll control, CDM-760 SNMP driver for OOB switching; RESTful Interface for NMS.
13	8/15/16	**New functionality & device drivers in 3.13.x:** NetVue Interface, CDM-570A, CDD-564A, Heights, HTO/HTX, HRX & Hx device drivers with VersaFEC 2 support. Carrier Preservation, Hub Redundancy Enhancements. Heights Roaming support.
14	12/29/16	**New functionality in 3.14.x:** Inband & OOB dynamic CnC switching. Device driver CDM-625A, CDM-570A VersaFEC 2 support.

Table of Contents

General

VMS Installation

VMS Configuration

Configuring Network Modems

Configuring ROSS Units

VMS Services

Out-of-Band Units

VMS Cross Banding

Antenna Visibility

Redundancy

SNMP Traps

Automatic Switching

Northbound Interface

VMS Client Users

Glossary

Index

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List of Figures

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List of Tables

Appendix F Tables

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1

GENERAL

How to Use This Manual

This manual documents the features and functions of the Vipersat Management System (VMS), and guides the user in how to install, configure, and operate this product in a Vipersat network.

NOC administrators and operators responsible for the configuration and maintenance of the Vipersat network, as well as earth station engineers, are the intended audience for this document.

Manual Organization

This User Guide is organized into the following sections:

Chapter 1— General

Contains VMS product description, customer support information, and manual conventions and references.

Chapter 2 - VMS Installation

Covers the steps for installing the VMS software applications on a host server, in both stand-alone and redundant configurations, and on a client PC.

Chapter 3 — VMS Configuration

Covers the Quick Configuration procedure as well as detailed steps for full System Configuration in building the Vipersat network.

Chapter 4 — Configuring Network Modems

Describes how VMS is used to configure modem/routers in the Vipersat network. The use of Parameter Editor and its application to the Series800 modem/router is presented.

Chapter 5 — Configuring ROSS Units

Describes how VMS is used to configure ROSS units in the Vipersat network. Device management in ViperView and the use of Parameter Editor for device configuration is presented.

Chapter 6 — VMS Services

Describes the various service managers that comprise VMS and how ViperView is used to monitor and control the Vipersat network.

Chapter 7 — Out-of-Band Units

Describes the methods for integrating Out-of-Band modem units into a VMS-controlled satellite network.

Appendix A — VMS Cross Banding

An explanation of how VMS accommodates applications involving satellite cross strapping and cross banding.

Appendix B — Antenna Visibility

An explanation of how to use the VMS antenna visibility function to control the frequency spectrum used in VMS switching.

Appendix C — Redundancy

Describes the optional redundancy services available for VMS—N:1 Server redundancy and N:M Hub Modem redundancy.

Appendix D — SNMP Traps

Describes the use of SNMP traps by VMS.

Appendix E — Automatic Switching

Reference on how the VMS monitors and automatically responds to changing load and traffic type, as well as ToS and QoS requirements in the network. This includes the features that provide *load switching* (response to network traffic load) functions, *application switching* (response to network traffic type) functions, *Entry Channel Mode switching* functions, and *carrier presence switching* functions.

Appendix F — Northbound Interface

Reference on the SNMP module Northbound Interface service for external network management systems.

Appendix G — VMS Client Users

Describes dual-level user account control and presents procedures for configuring security and account policies between the VMS Server and VMS Client workstations.

Appendix H — Glossary

A glossary of terms that pertain to Vipersat satellite network technology.

Conventions and References

The following conventions are utilized in this manual to assist the reader:

Note: Provides important information relevant to the accompanying text.

Tip: Provides complementary information that facilitates the associated actions or instructions.

Caution: Explanatory text that notifies the reader of possible consequences of an action.

Warning: Explanatory text that notifies the reader of potential harm as the result of an action.

The following documents are referenced in this manual, and provide supplementary information for the reader:

- *CDM-570/570L Modem Installation and Operation Manual* (Part Number MN/CDM570L.IOM)
- *Vipersat CDM-570/570L User Guide* (Part Number MN/22125)
- *CDD-562L/-564 Demodulator with IP Module Installation and Operation Manual* (Part Number MN/CDD562L-564.IOM)
- *Vipersat CDD-56X Series User Guide* (Part Number MN/22137)
- *CDM-570A/570AL Modem Installation and Operation Manual* (Part Number MN-CDM570A)
- *CDD-564AL Demodulator Installation and Operation Manual* (Part Number MN-CDD564A)
- *CDM-600/600L Installation and Operation Manual* (Part Number MN/CDM600L.IOM)
- *CDM-625 Installation and Operation Manual* (Part Number MN-CDM625)
- *CDM-625A Installation and Operation Manual* (Part Number MN-CDM625A)
- *CDM-800 Installation and Operation Manual* (Part Number MN-CDM800)
- *CDM-840 Installation and Operation Manual* (Part Number MN-CDM840)
- *CDM-880 Installation and Operation Manual* (Part Number MN-CDM880)
- *Heights Installation and Operation Manual* (Part Number MN-HEIGHTS-HUB)
- *Heights Remote Installation and Operation Manual* (Part Number MN-HEIGHTS-SPOKE)
- *NetVue User Guide* (Part Number MN-NETVUE)
- *SLM-5650A Installation and Operation Manual* (Part Number MN-0000031)
- *Vipersat SLM-5650A User Guide* (Part Number MN-0000035)
- *ROSS Getting Started Guide* (Part Number MN/13070)
- *Roaming Configuration Editor User Guide* (Part Number MN-RCE)
- *Vload Utility User Guide* (Part Number MN/22117)

- *Vipersat CDM-570/L, CDD-56X Parameter Editor User Guide* (Part Number MN-0000038)
- *Vipersat SLM-5650/A Parameter Editor User Guide* (Part Number MN-0000041)

Product Description

Introduction

The Vipersat Management System (VMS) is a server and client based network management system that gathers and processes information it receives from the modem/routers that comprise a Vipersat satellite network. The modem's internal microprocessor-based input/output (I/O) controller measures, captures, and transmits real-time network operating parameters to the VMS via either PLDM (Path Loss Data Message) or SUM (Status Update Message) packets, depending on the type of modem/router.

The VMS receives, stores, and processes these messages and uses the data to update and display current network status information, and to manage bandwidth resources and switching operations. The network data is then displayed by the VMS in an easy-to-interpret, real-time graphic presentation. The result is a comprehensive, intuitive operator's network Management and Control tool for quick, responsive network control.

The VMS is customized at setup for each satellite network it controls, recognizing the unique bandwidth resources and limitations associated with each network. The VMS has trigger points set defining the upper and lower limits for usage, type of service, and other network parameters defining bandwidth resource allocations for each traffic type. These triggers, or set-points, are easily modified at any time by a qualified operator whenever network resource allocations need to be reconfigured.

As the VMS receives a switching request from a network modem, it uses sophisticated algorithms to evaluate the request against available network resources and network policies before sending a switch command back to the requesting modem to make a switch to a given frequency and bit rate. If the switch request is denied—because of lack of available network resources, for example—the modem will not make the switch until the necessary resources become available.

The Vipersat satellite network modems detect, monitor and, when commanded by the VMS, physically or logically make network changes. The VMS collects, analyzes, and displays data, and commands the Vipersat modems to make these network changes. Refer to each modem/router's *User Guide* for more details on each device's role in the satellite network.

NOTE

Note: The Vipersat External Switching Protocol (VESP) is available to equipment manufactures, making it possible for them to smoothly integrate their products into a VMS controlled satellite network. Contact a Vipersat representative for details.

The VMS **ViperView** display (figure 1-1) gives the operator a complete view of a network's configuration, the health of all network components, and current bandwidth usage. The ViperView display is flexible and can be modified by the operator at any time, as described in this *User Guide,* to optimize network Management and Control.

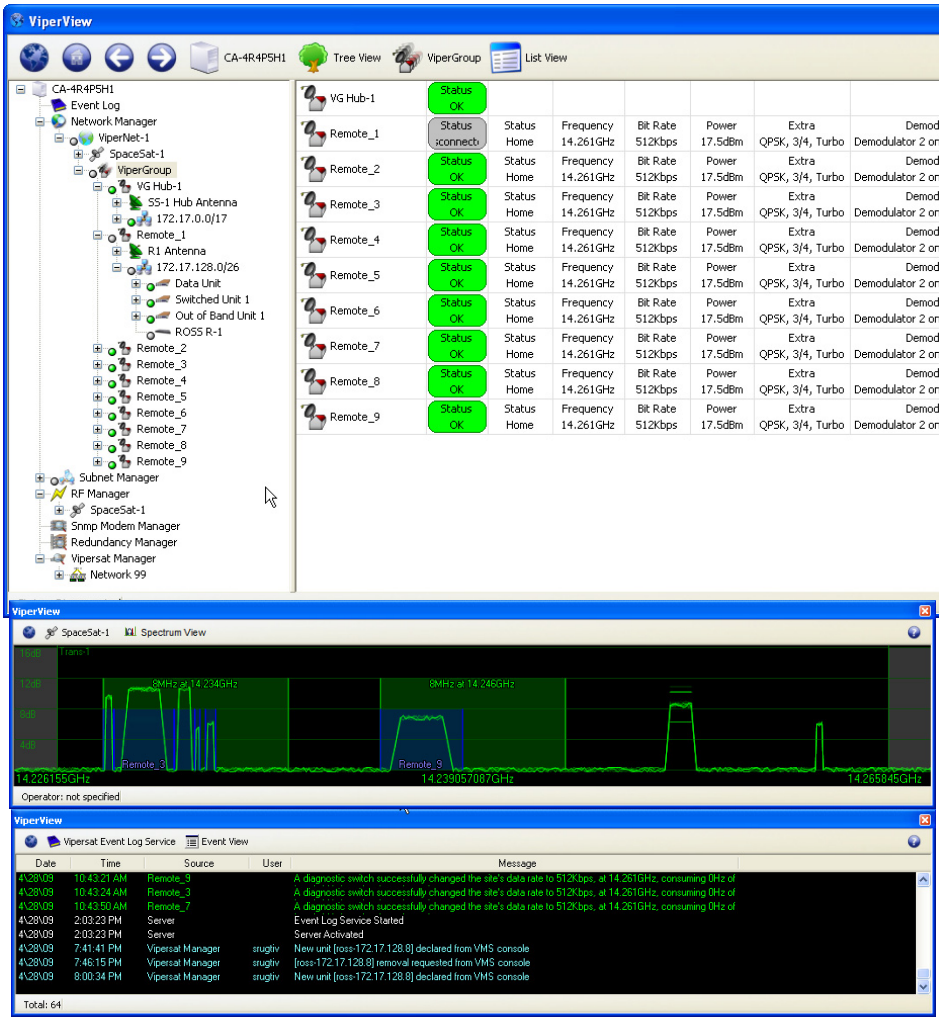

Figure 1-1 VMS ViperView display

Vipersat uses IP connections between network nodes, supporting UDP connectivity. The Vipersat modem/router consists of a satellite modem with an imbedded microprocessor router, which is the interface between LAN traffic and the satellite links that connect Remote stations to the Hub.

The VMS has a client/server architecture, as shown in figure 1-2, with rack servers communicating with remote client PC's. The client/server model has a number of advantages. The server maintains all databases in a central location accessible to all clients. Thus, all network status updates and performance data is stored in a single place, processed by the VMS running on the central server, and the results are available to all clients across the network.

Through its client/server architecture, the VMS supports centralized management, control, and distribution of data, alarms, and events. The VMS also simultaneously supports multiple clients, NetVue network management, and complete visibility of the entire network operation.

VMS Features

The VMS network management software has the following features:

- System Configuration
- Network Status Displays (automatic and manual)
- Dynamic Bandwidth Management
- Guaranteed Bandwidth Reservations
- Switching Operations, including:
  - Meshing
  - Single Hop On Demand (SHOD)
  - Point-to-Point Switching
  - Carrier in Carrier Switching
  - Advanced Modulation/Code Switching
  - Out-of-Band Switching
- Diagnostics Monitor and Control (automatic and manual)
- Alarm Processing
- Run Authorization via USB Crypto-Key
- Optional Management Security
- Optional VMS and Critical Hardware Redundancy
- Statistics Gathering (automatic and manual)
- Report Generation
- Network Administrator Mode
- Remote Access via Local LAN or Internet/Intranet

- Dual-level User Account Authorization
- Interfaces to external NMS:
  - RESTInterface, NetVue
  - Northbound Interface SNMP
  - Event Log Relay Server

VMS Operation & Architecture

A Vipersat network provides Internet Protocol (IP) connections between network nodes and supporting UDP and Multicast protocols. Vipersat satellite networks rely on Vipersat modem/routers to provide the interface between LAN traffic and the satellite links that connect Remote stations to the Hub.

The VMS **Client** (ViperView) and **Server** (Vipersat Object Service) architecture (figure 1-2) supports centralized management, control, and distribution of data, alarms, and events. Network units, such as a Vipersat modem/router, while functioning as a modulator/demodulator, also detect, analyze, and report details on network operation to the VMS. The VMS collects, stores, analyzes, and acts on this information to intelligently control network operation to optimize bandwidth utilization and overall network performance.

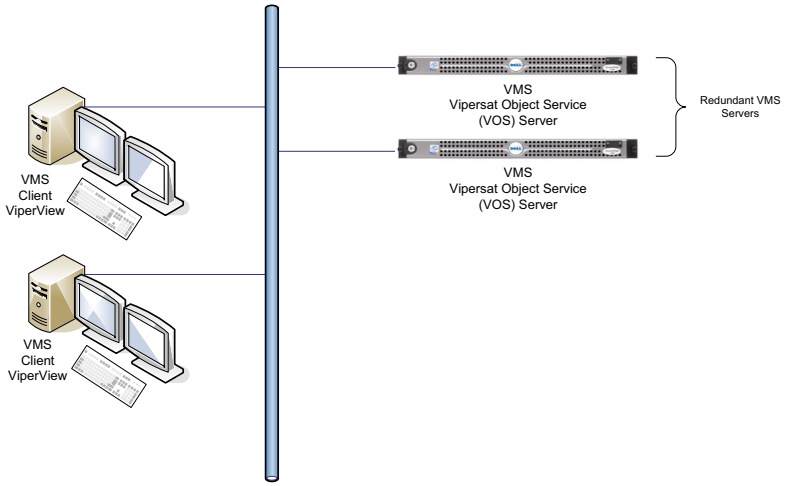

Figure 1-2 ViperView Client / Server (VOS) Relationship

The VMS management and monitoring system uses an intuitive graphic display, as illustrated in figure 1-1. The VMS makes visible the entire network's operation and performance. All network status and performance data is collected, processed, and stored at the server. Any client workstation can retrieve information from the VMS server's single, central database.

The VMS network management system displays the following information gathered from the network modem/routers:

- System configuration
- Transmission configurations

- Satellite link Status
- QoS displayed as E_bN_0 values for each circuit
- Switching times and connection type and duration for each circuit
- Network alarms showing health of network hardware IP and RF connections
- Bandwidth resource allocations
- Modem, RF equipment, and VSAT station management

The network map displays an integrated view of the entire network including all nets, subnets, equipment, and equipment interconnections. The user can double-click on an icon to display its status information and/or sub-components. Right-clicking on an icon displays a drop-down menu allowing the operator to issue commands, change configurations, or change the unit's state, as applicable.

The colors associated with each icon, as shown in the display illustrated in figure 1-1, reflect the current status condition of the network component or its sub-components:

- **Green** = Okay
- **Red** = Alarm
- **Gray** = Disconnected (offline) as the result of missing three consecutive PLDMs and not responding to the recovery process

All devices, networks, and carriers displayed by ViperView share the same color scheme for indicating their health in the network, giving the operator real-time at-a-glance network health status.

The VMS provides operator notification in the event of network alarms. This notification can be in the form of both visual and audible alerts. The VMS also maintains a log of all network activity, making use of analysis and network trouble-shooting information readily available.

New in this Revision

v3.14.0 Release

Carrier In Carrier Switching

The switching engine has undergone a major change in bandwidth management and carrier placement. Normally each end of the link transmits within a single slot requiring separate bandwidth for both carriers. This new switching enhancement can now take advantage of DoubleTalk Carrier-In-Carrier technology in the modem allowing both carriers to occupy a single slot within the bandwidth pools.

Dynamic switching can detect the CnC type request and automatically allocate a point-to-point paired connection applying the required settings.

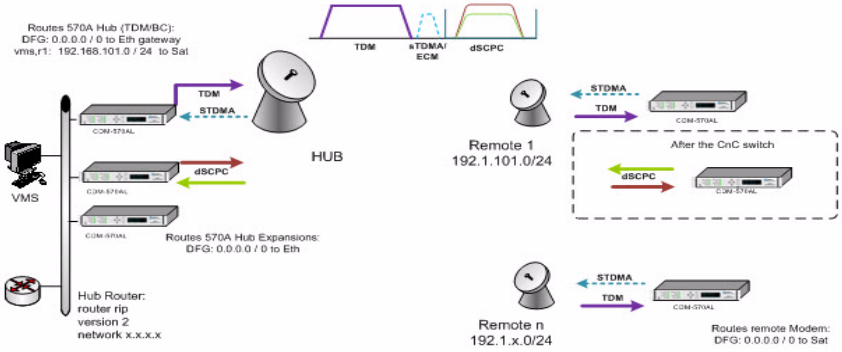

Figure 1-3 Diagram of Basic Connection

CDM-625A Device Driver

A new Vipersat SNMP device driver has been added to the VMS to support Out-of-Band switching services for the CDM-625A modem/router. Also with the bandwidth carrier enhancements OOB modems that support CnC technology can also take advantage of the new switching feature.

Contact Information

Customer Support

Contact Comtech EF Data Customer Support for information or assistance with product support, service, or training on any product.

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Reader Comments / Corrections

If the reader would like to submit any comments or corrections regarding this manual and its contents, please forward them to a Comtech Customer Support representative. All input is appreciated.

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2

VMS INSTALLATION

General

For specifications for the minimum recommended hardware and software platform configuration to host the VMS, please refer to the *VMS Release Notes* for the version of software that will be installed. Both Server and Client configurations are provided.

The VMS software is installed using an Installation Wizard. Depending on the desired setup, installation can be performed with the full set of files (both client and server), client-only files, or server-only files. The Wizard guides the installer through the installation process and provides all necessary information to complete typical, compact, and custom installations.

The same procedure for installation of the VMS on a server is used for both stand-alone and redundant configurations.

Caution: Installing VMS on non-recommended hardware or operating system will void the support warranty. Also, VMS must be installed on a dedicated server to retain support warranty.

Caution: Vipersat strongly recommends against running any kind of anti-virus program on the VMS server. Instead, all Microsoft Windows Updates should be installed as they become available. However, the Automatic Updates function in Microsoft Windows must be properly set to avoid possible disruption of the VMS and the Vipersat network. Please see the information below.

VMS Server - MS Windows Update Setting

The Microsoft Windows Update feature provides a selection of configuration settings. The default setting, Automatic, will automatically download and install Windows updates. Typically, this process includes an automatic reboot of the server to implement the updates.

A VMS server with the default setting and an active connection to the Internet is susceptible to experiencing an automatic reboot that may adversely impact Vipersat network functions.

Vipersat therefore strongly recommends that the Windows Update configuration NOT be set to Automatic. This feature should be set to either of the two selections below:

- *Check for updates, but let me choose whether to download and install them*
- *Download updates, but let me choose whether to install them*

1. Access the Windows Update configuration window from the **Start Menu** by choosing ***Windows Update*** from either the **All Programs** menu or the **Control Panel**.

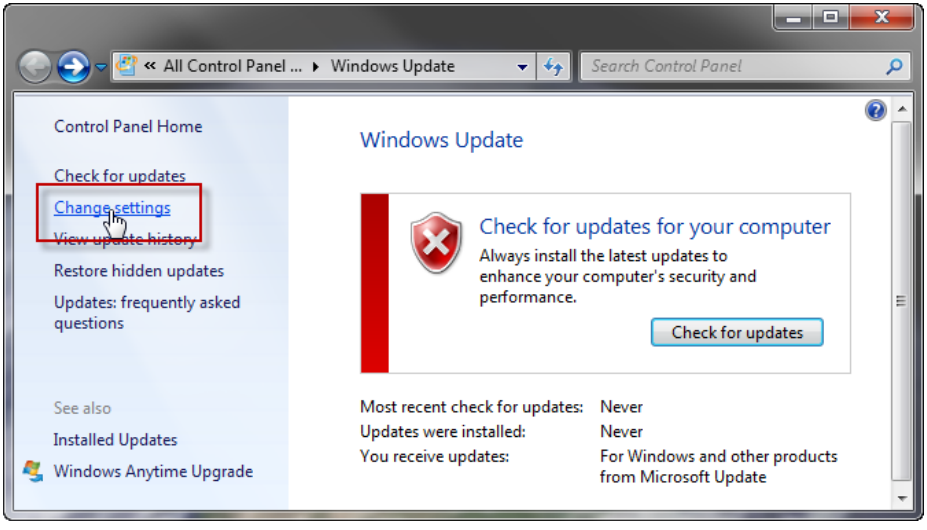

Figure 2-1 Windows Update window

2. From the left panel menu, select **Change Settings**. The window shown in figure 2-2 will appear.

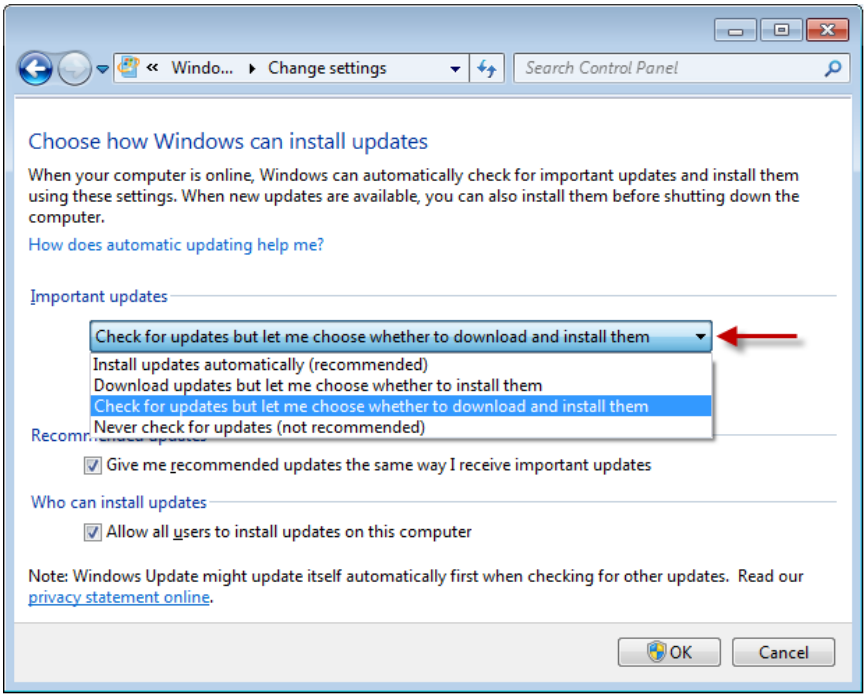

Figure 2-2 Windows Update, Change Settings window

3. Select the update setting from the drop-down menu, then click **OK**.

Types of Installation

The VMS can be installed in three different configurations:

1. On a single VMS server; Vipersat Management System Service.
2. On two or more (N:1) VMS servers in the optional fault-tolerant, redundant configuration; Vipersat Management System Service.
3. On a client workstation; ViperView User Interface.

Server installations can be performed as either:

- **Clean Installation** - An installation on a server that has not previously operated as a VMS server, or that has had its hard drive re-formatted. With no existing network database, a full network configuration (*Chapter 3, "VMS Configuration"*) must be performed following installation.

- **Upgrade Installation** - An installation on a server that has previously been installed as a VMS server in a Vipersat network, operating with a previous version of VMS. An existing v3.7 or later network database will be automatically converted during installation.

Warning: When upgrading from v3.6.x, the existing network database is incompatible and will NOT be automatically converted during installation. Contact a service representative prior to attempting this type of upgrade. He/she will guide the operator in the necessary transition process to prevent loss of network configuration.

Note: It is NOT RECOMMENDED to run ViperView on the same machine as the VOS. Therefore, installing and running the VMS Client software component on a workstation that is separate from the VMS server is preferred.

Note: Upgrade installations require a file (.vku) update for the Vipersat USB Crypto-Key to be compatible with the new version of VMS software. An incompatibility will prevent the VMS from running on the server. See sub-sections “Prepare for Crypto-Key Updating (Upgrade)” on page 2-9, and “Update USB Crypto-Key (Upgrade)” on page 2-15 for update instructions.

Redundant Server Upgrade

For a redundant VMS configuration, perform the upgrade on the Standby server first. This will allow the installation of the new software and database creation to be verified without losing VMS service. If successful, continue the upgrade by doing the following:

- Deactivate the Active (Primary) server.
- Activate the Standby (Secondary) server.
- Perform upgrade installation on the now deactivated server.

This method provides a seamless upgrade with no VMS downtime.

The installation instructions in the following section include special instructions for each of these various installation types.

Caution: Failure to note and follow the instructions for the intended network configuration may cause the VMS installation to fail or to operate erratically.

Prepare Server for VMS Installation

The Vipersat Management System Server software should be installed on a high-performance, industry-standard computer running the Microsoft Windows Server 2012 or later operating system.

If not already done, perform the following tasks before proceeding with installation of VMS on the server:

- Limit DEP (Data Execution Prevention) — *see following section*.
- Create a user account in the Active Directory (example: VMS).
- Add the VMS user to the DCOM Limits.
- Reboot the server before continuing with the VMS installation.

Limit DEP (Data Execution Prevention)

DEP (Data Execution Prevention) is a service, available on some CPUs, which will actively block a virus or program which it determines acts like a virus. Without limiting the action of the DEP feature to essential Windows programs and services, this procedure will prevent DEP from blocking the actions associated with VMS.

Use the following procedure to make certain that this feature is limited to essential Windows programs only.

1. From the server's **Start** menu, open the **System** control panel located at Start > Control Panel > System, as shown in figure 2-3.

2. Click on **Advanced system settings** to display the **System Properties** dialog page shown in figure 2-4.

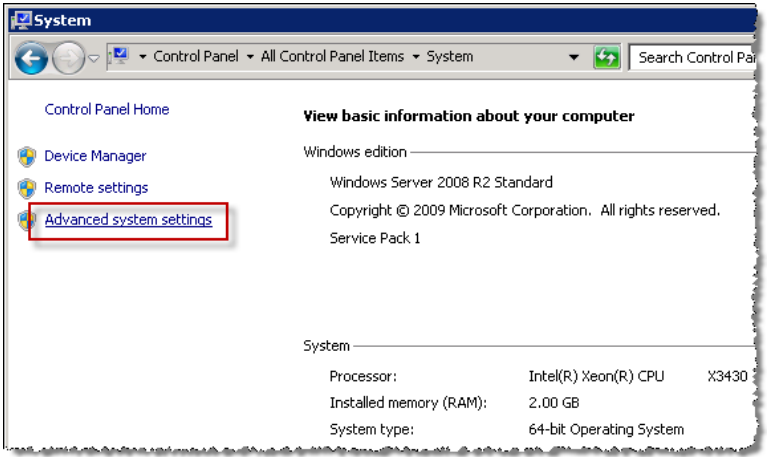

Figure 2-3 System Control Panel

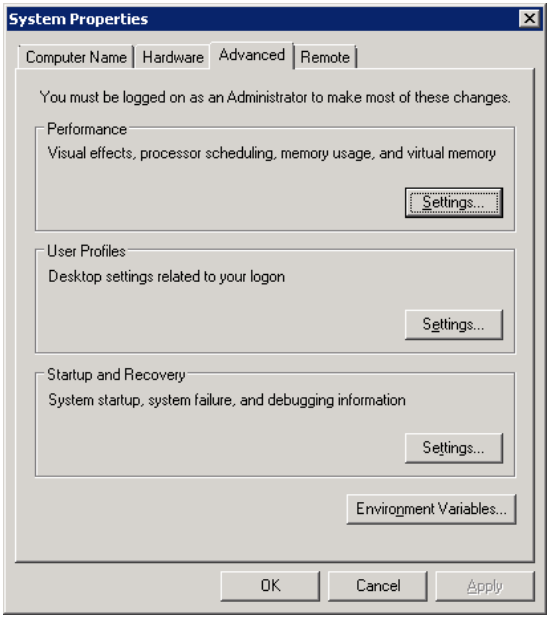

Figure 2-4 System Properties—Advanced tab

3. In the **Performance** box on the **Advanced** tab, click the **Settings** button, then click the **Data Execution Prevention** tab to display the dialog shown in figure 2-5.

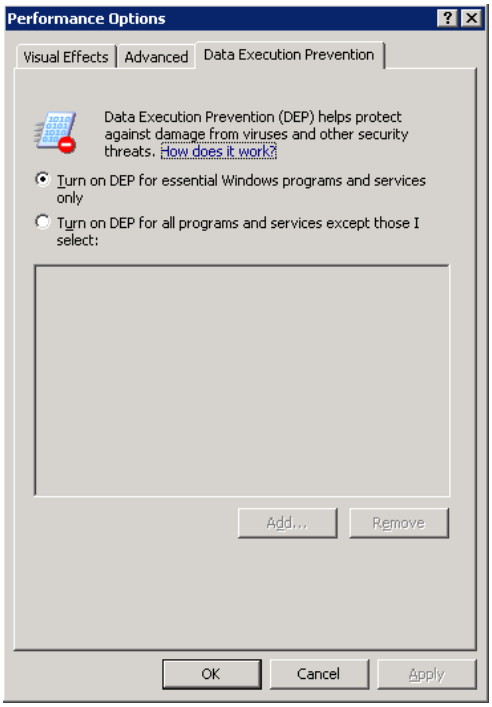

Figure 2-5 DEP tab

4. Select the **Turn on DEP for essential Windows Programs and services only** radio button. If the CPU processor does not support DEP, this radio button will be greyed out and unavailable.

5. Click the **OK** button to complete this procedure.

This action limits DEP to protecting only essential Windows programs without interfering with any other applications.

Back Up VMS Database (Upgrade)

For VMS upgrades, it is recommended that the current VMS database be backed up prior to installing the new version of VMS. This precaution will allow for the current database to be restored in the event that the new install fails.

NOTE

Note: This database backup can only be restored on the current VMS version. It is not compatible with the new VMS version.

Should the new VMS installation fail, the fall-back procedure would be to re-install the previous version of VMS, then restore the database with the backup.

A successful installation of the new VMS will result in a new database. This new database should immediately be backed up, and any previous database backups should be removed from the server to avoid compatibility issues.

1. Right-click on the VMS Server icon and select **Backup** from the drop-down menu (figure 2-6).

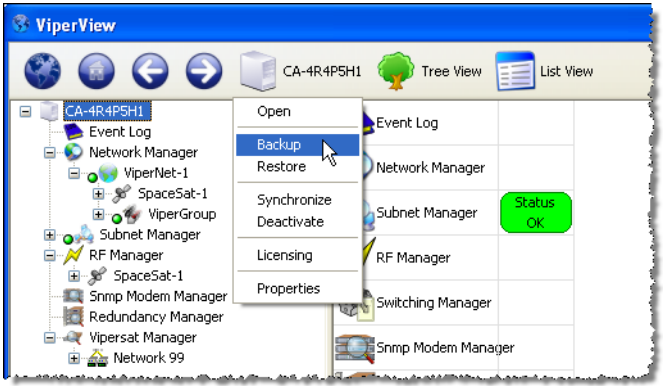

Figure 2-6 Backup Command, VMS Server

2. Enter the **Name** for the backup file and select the directory location for saving the file from the **Save As** dialog window that opens (figure 2-7).

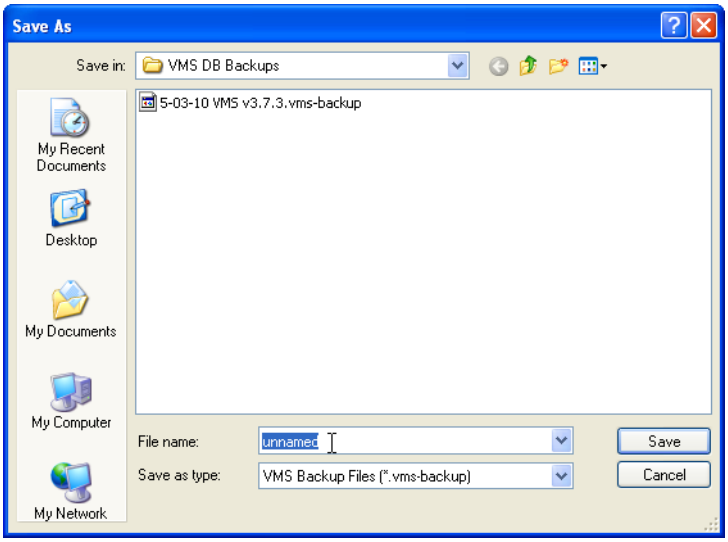

Figure 2-7 VMS Backup Save As dialog

Prepare for Crypto-Key Updating (Upgrade)

Each time the VMS software is upgraded to a new version, the Vipersat USB Crypto-Key must be updated in order for the VMS to run on the server. An update utility, **vms-key-update.exe**, is used for this purpose and is obtained by contacting Vipersat CTAC (*"Contact Information"*). The following information will be required:

- Key Serial Number
- Key Licensing

Both of these items can be obtained from ViperView using the following method:

1. Click on the Server icon in the menu bar and select **Properties**, as shown in figure 2-8.

2. The serial number is listed in the Properties dialog that opens. Record this number, or capture it as a screen shot graphic, then close the window.

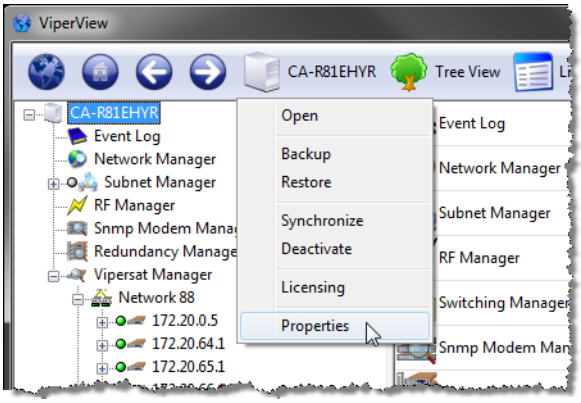

Figure 2-8 Server Menu, ViperView

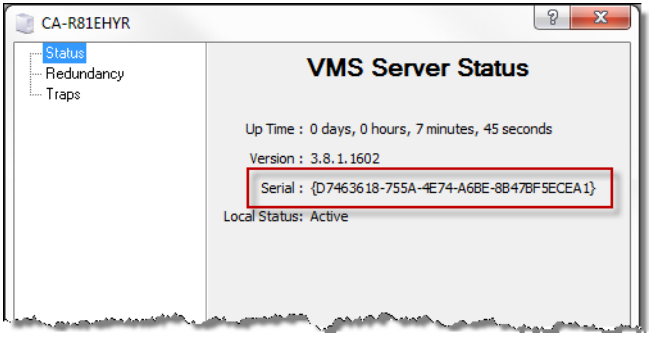

Figure 2-9 Serial Number, Server Properties dialog

3. Again click on the Server icon, and select **Licensing**.

The Licensing Information dialog that opens (figure 2-10) contains a listing of the Authorized Services associated with this key.

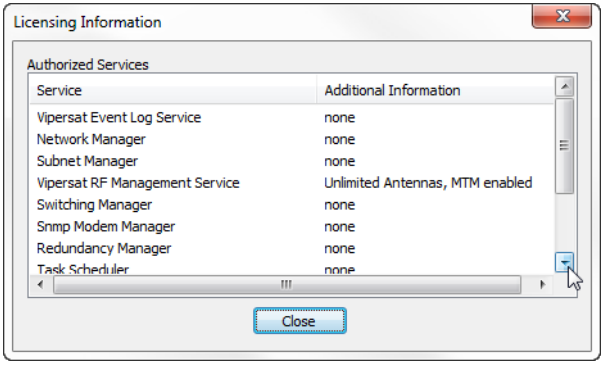

Figure 2-10 Licensing Information, Crypto-Key

4. Perform a screen capture and save the graphic file. The licensing list may extend beyond the window view, as shown in the example above; if this is the case, use the scroll bar and capture a second screen.

Do not perform the key update at this time. The procedure will be executed in a later sub-section (“Update USB Crypto-Key (Upgrade)” on page 2-15).

Stop Previous VMS Version (Upgrade)

If there is an earlier version of VMS installed and running on the server, use the following procedure to stop VMS before proceeding with the new installation.

For VMS installation on a server that does NOT have a previous version of VMS installed, skip this section and proceed to the section “VMS Server Installation” on page 2-16.

Caution: If a prior version of VMS is installed and running on the server, you must first stop, then uninstall, this prior version as described in this and the following procedure.

1. Right-click in the Windows status bar and select **Start Task Manager** from the pop-up menu. The Windows Task Manager window will appear.

2. From the **Processes** tab, scroll down the list to find the three VMS processes that are running—*VConMgr.exe*, *ViperView.exe*, and *VOS.exe*, as shown in figure 2-11.

***Note**: The "Show processes from all users" check box at the bottom of the window must be selected in order for the VOS.exe process to appear in the list.*

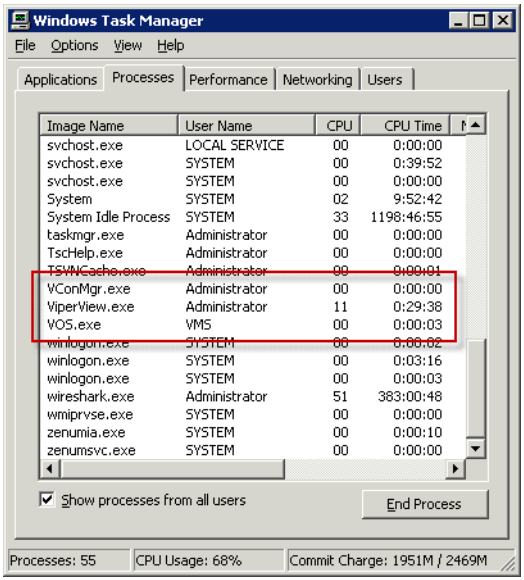

Figure 2-11 Windows Task Manager, Processes tab

3. Select each process and click on the **End Process** button. A Task Manager Warning dialog will appear (figure 2-12)—click on the **Yes** button to terminate the process.

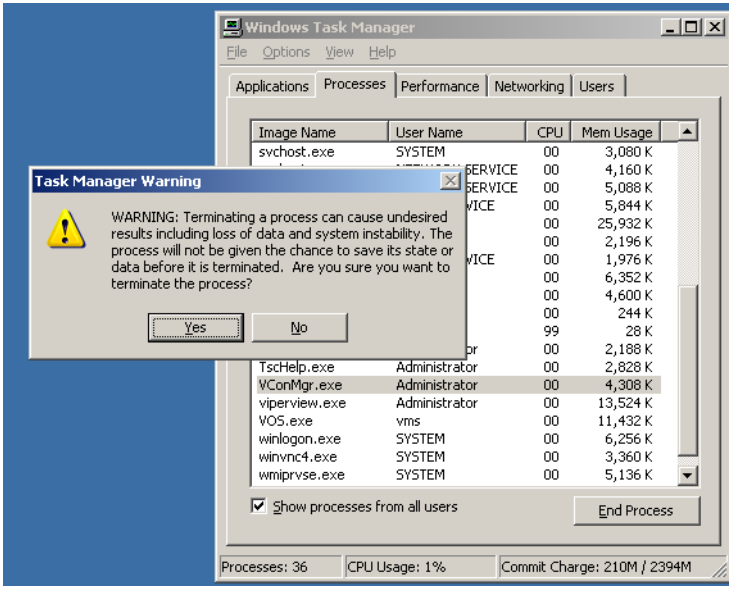

Figure 2-12 Task Manager Warning dialog

4. After each of the three processes have been terminated, close the Task Manager window then re-open it to confirm that the processes are no longer running.

5. Once the Vipersat Management System service has been stopped, uninstall the previous version of VMS from the server as described in the following section.

Uninstall Previous VMS Version (Upgrade)

1. Uninstall the previous version of VMS by selecting **Programs and Features** from the server's **Control Panel**, as shown in figure 2-13.

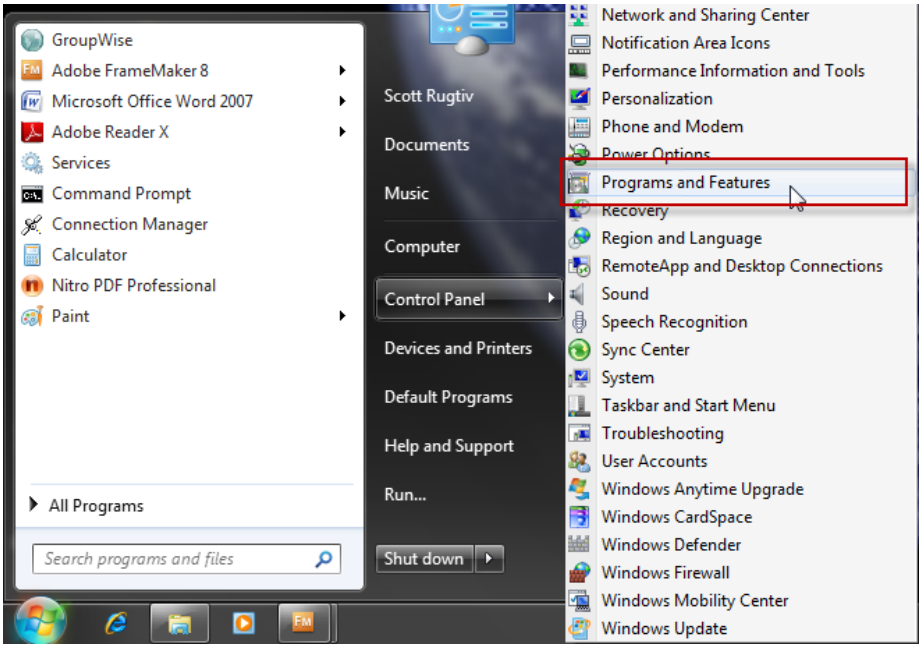

Figure 2-13 Programs and Features Control Panel

2. Select **Vipersat Management System** and click the **Uninstall** button (figure 2-14).

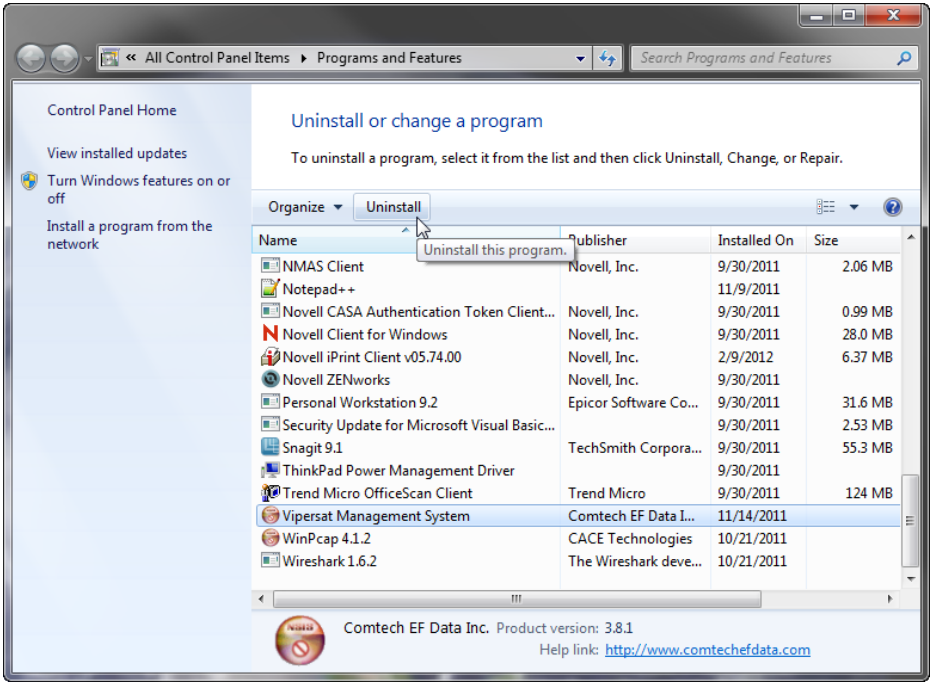

Figure 2-14 VMS, Uninstall Program

3. Perform an uninstall of any Driver Packs that have been installed since the last VMS installation.

4. Close the **Programs and Features** window.

Update USB Crypto-Key (Upgrade)

Execute the procedure for updating the Vipersat USB Crypto-Key that was provided by Vipersat CTAC {refer to the section "Prepare for Crypto-Key Updating (Upgrade)" on page 2-9} prior to performing the VMS Server installation procedure in the following section.

CTAC will provide both the **vipersat.vku** update file and the **vms-key-update.exe** update utility.

If this procedure has not yet been provided, contact *"Contact Information"* and update the Key before continuing with installation.

VMS Server Installation

Note: If this is a clean installation, ensure that the Vipersat USB Crypto-Key is not plugged in at this time. The installation process will install the drivers necessary for the key. The key will be inserted later when the VMS is ready to be started (“Verify Server Installation” on page 2-27).

Note: For VMS Redundancy Server configurations, after installing VMS on each of the servers as described in this section, refer to *Appendix C, “Redundancy”*, for detailed instructions for configuring the redundant servers.

1. Locate the file **VMS 3.x.x Core Setup.exe** in the VMS distribution file set (available from www.comtechefdata.com, or from *“Contact Information”*)and double-click it to start the VMS Installer.

2. After starting the VMS installer, the **Vipersat Management System Setup Wizard** welcome screen, shown in figure 2-15, is displayed. Click the **Next** button to continue.

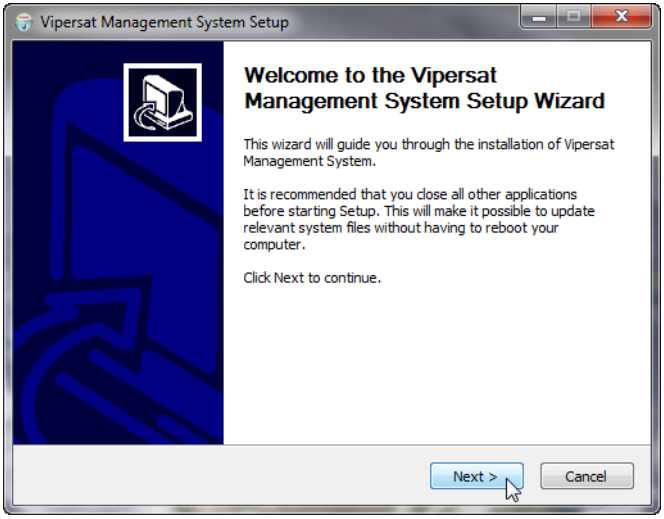

Figure 2-15 Setup Wizard Welcome screen

3. On the **License Agreement** screen, shown in figure 2-16, click the **I Agree** button to proceed.

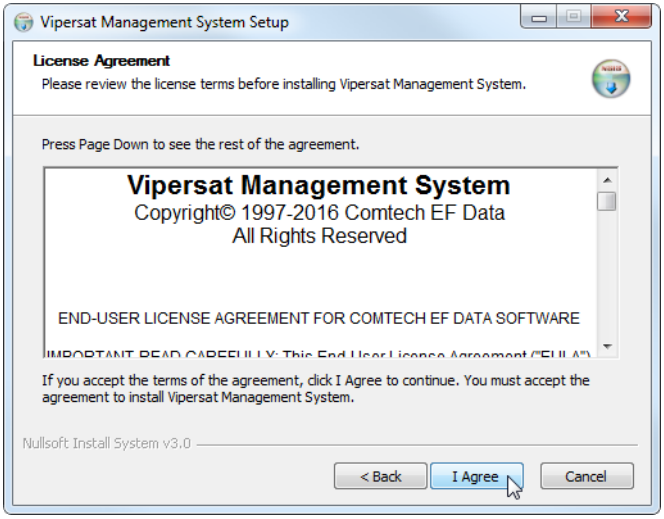

Figure 2-16 License Agreement screen

4. The VMS software is comprised of two main components, the Server component and the Client component. From the **Installation Type** screen shown in figure 2-17, select the radio button for the type of installation you will be making. For a VMS Server installation, select either *Full Install* or *Server Install*. (The *Client Install* selection is for a VMS Client workstation installation.)

   - **Full Install** - This type of installation installs both components, and allows a local user to operate VMS locally on the server and also remotely. This installation type requires a USB key to operate VMS.
   - **Server Install** - This type of installation only installs the Server component, and allows the VMS server to be operated through a remote connection by a client—the VMS can not be operated from the local server. This installation type requires a USB key to operate VMS.
   - **Client Install** - This type of installation only installs the Client component, and is used to install the VMS client on a workstation that will be used to connect remotely to servers on the same LAN that are running the VMS. This installation type does not require a USB key to operate VMS.
   - **Install VC ++ Redistributable** - New releases of 3.13.x or greater require a onetime supporting library update if updating from 3.12.x or older. As part of the installation process there is an option to "Install VC ++ Redistributable" files.

Caution: It is very important that this onetime machine (system) update is accomplished before running 3.13.x or greater. After update any subsequent releases will not require this selection. Note during this update the installation process will take a longer time than normal. Also, if it is unknown if this update was already applied, it will not harm the system if reapplied.

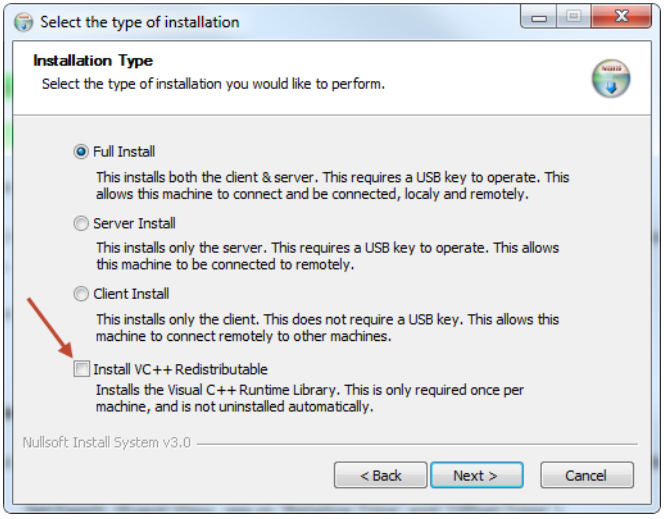

Figure 2-17 Installation Type screen

5. Click the **Next** button to proceed to the VMS Setup screen.

6. The Service Configuration defaults with all three boxes checked as shown in figure 2-18. This is the recommended configuration.

Note: Operating with recommended server hardware provides hard disk caching technology which eliminates the requirement to select “Disable Flush to Disk”.

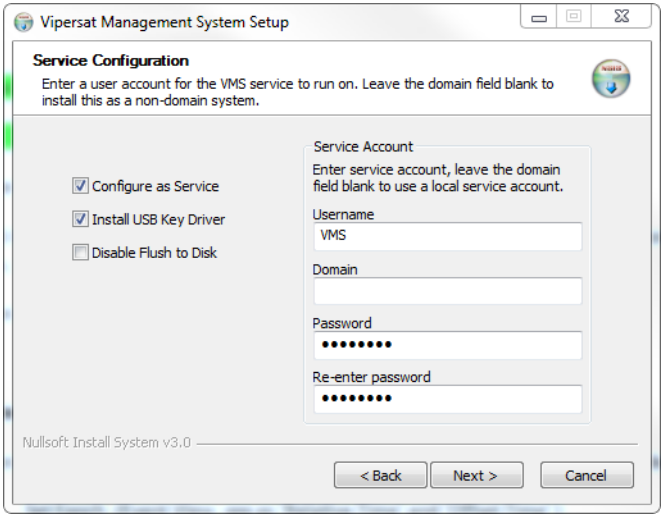

Figure 2-18 Service Configuration dialog

7. The **Username** for the account is auto-filled with the default entry (VMS). It is recommended not to change this setting, unless it is necessary to match the user account that was created previously (see "Prepare Server for VMS Installation" on page 2-5).

   Note: If this is an upgrade, use the same name as before.

8. If the VMS server is to operate in a Domain, enter the domain name in the Domain field exactly as the domain is named.

Caution: Failure to have an exact match between the assigned domain name and the domain name entered in this dialog will cause VMS to fail, requiring re-installation.

9. The **Password** field is auto-filled with the default password, V1persat. Enter a new password, if desired, to change the default setting. *This password must match the password associated with the VMS user account*.

   Note: If this is an upgrade of a domain account, enter the password associated with this account.

10. Click the **Next** button when this dialog is complete.

11. The **Choose Components** dialog appears, as shown in figure 2-19. All services are selected by default for a typical VMS installation. It is recom-

mended that these settings not be changed, except for non-standard installations.

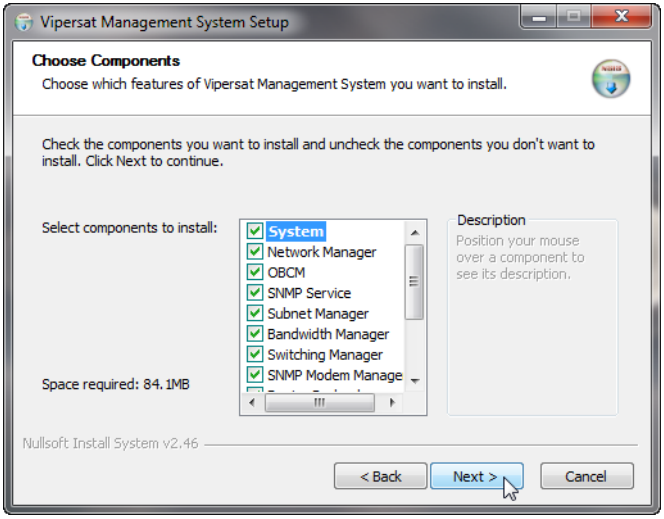

Figure 2-19 Choose Components dialog

12. Click the **Next** button to proceed.

13. In the **Choose Install Location** dialog shown in figure 2-20, it is recommended that the default file location be used. Click the **Next** button to continue.

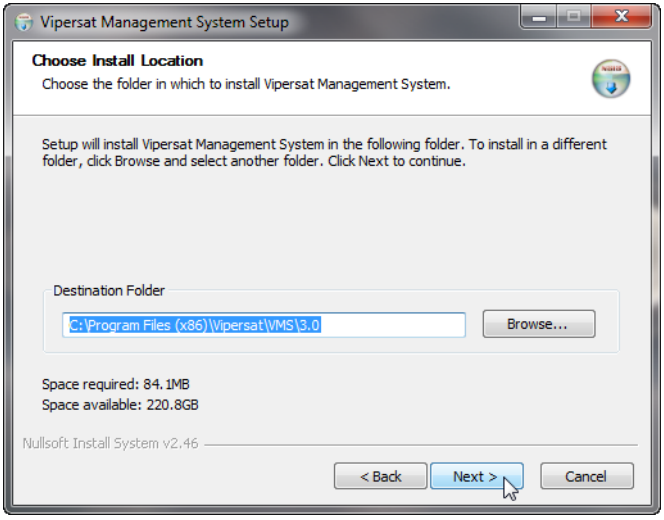

Figure 2-20 Choose Install Location dialog

14. From the **Choose Start Menu Folder** dialog shown in figure 2-21, accept the default folder name, VMS 3.x, and click the **Install** button to start the installation process.

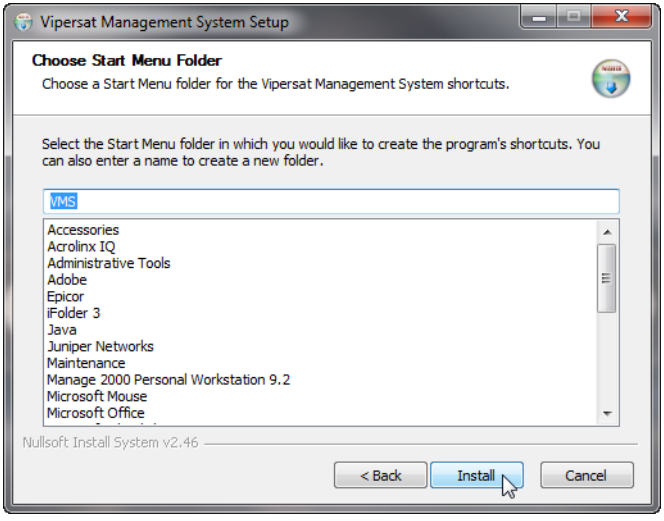

Figure 2-21 Choose Start Menu Folder dialog

15. The installation process will begin and a green progress bar will display.

The installation process will continue and, when completed, the screen shown in figure 2-22 will be displayed. Click the **Next** button.

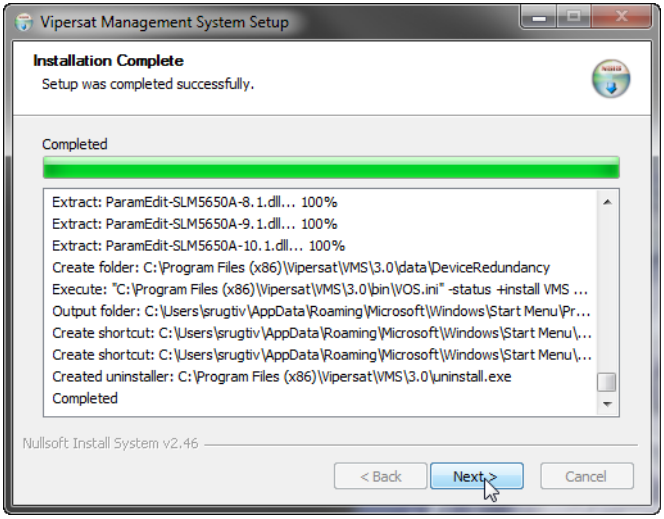

Figure 2-22 Installation Complete screen

16. Click the **Finish** button to exit the VMS Setup Wizard.

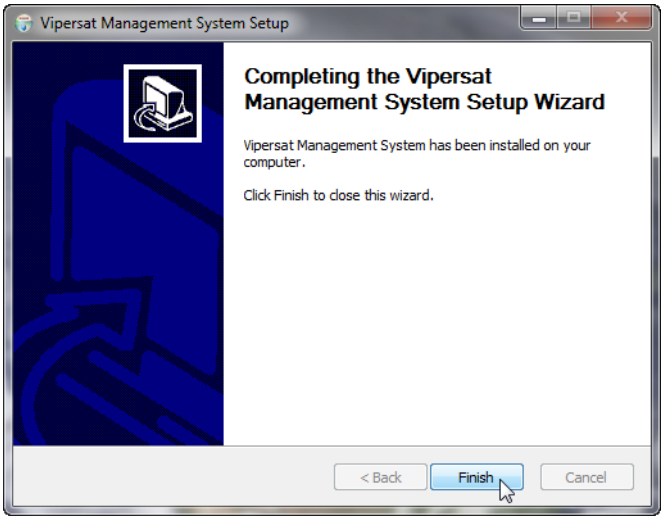

Figure 2-23 VMS Setup Wizard Finish dialog

Management Security Installation — Option

NOTE

Note: The Management Security feature is not provided with standard VMS installations, and is available only upon request and through an authorized agent.

This feature is applicable only with encryption-capable modems.

This use of a specially programmed Crypto-Key is required.

Management Security is an optional software module for the VMS that protects the M&C messages that pass between network modems and the VMS over exposed LAN/WAN segments within the network.

1. Execute the **VMS Management Encryption Option Setup.exe** application. This will open the Setup Wizard that will install the AES.dll file into the appropriate program file directory.

2. Complete the wizard setup to finish the installation.

This completes the installation of the VMS Management Security Option.

NOTE

Note: If this is a stand-alone installation on a workgroup server, or an upgrade installation, move on to the section “Verify Server Installation” on page 2-27.

If this is an installation on a new or completely rebuilt Domain Controller, continue with the following section, “Set Com Security for VMS”.

Set Com Security for VMS

1. From the Windows **Start** menu, select **Settings** and open up the **Control Panel**, as shown in figure 2-24 below.

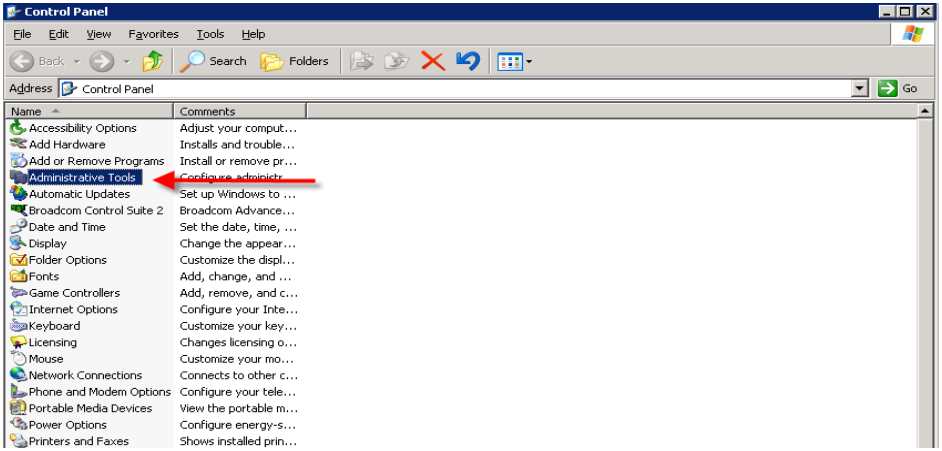

Figure 2-24 Control Panel

2. Select **Administrative Tools** and then **Component Services**, as shown in figure 2-25.

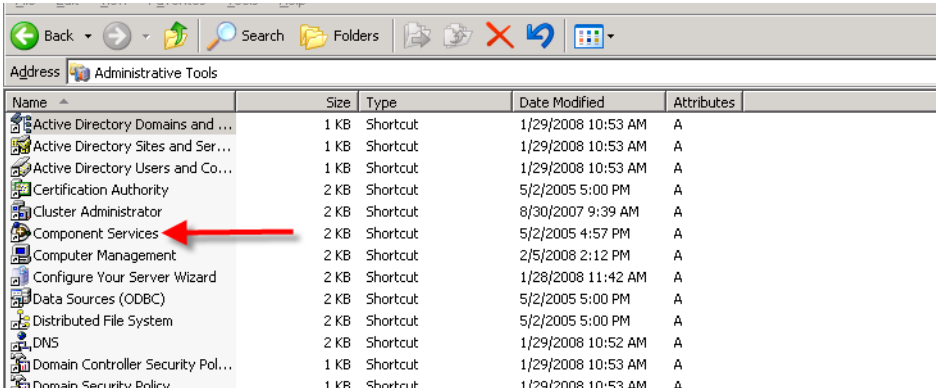

Figure 2-25 Administrative Tools

3. Expand the Component Services tree until “My Computer” appears. Right-click on My Computer and select **Properties**, as shown in figure 2-26.

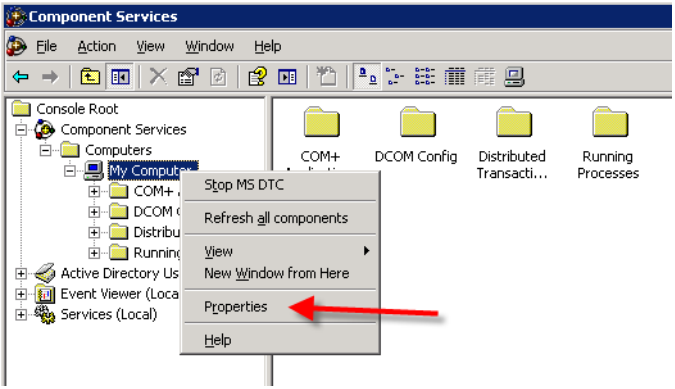

Figure 2-26 Component Services, My Computer Menu

4. Select the **COM Security** tab, then the **Edit Limits** button under *Launch and Activation Permissions*, as shown below in figure 2-27.

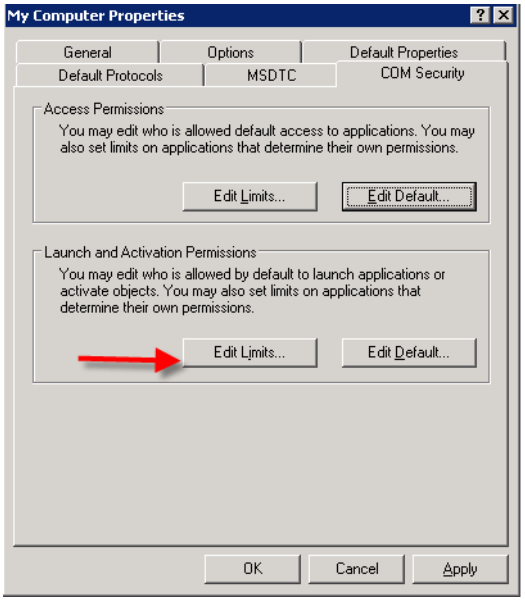

Figure 2-27 Com Security, Edit Limits

5. In the Launch Permissions window, select **Add** as shown in figure 2-28.

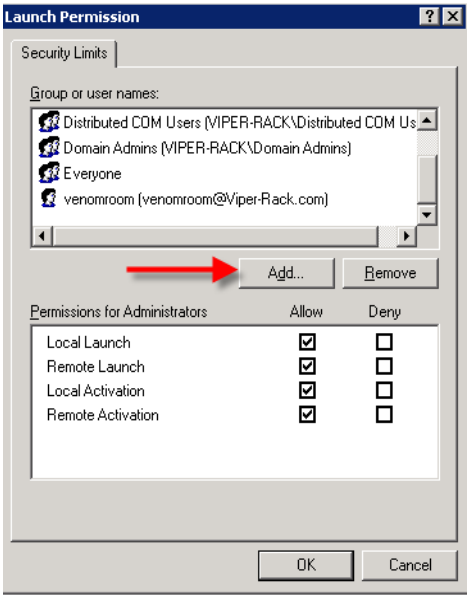

Figure 2-28 Launch Permissions

6. Ensure that the Location selection is the domain, then type "VMS" in the object names box and click the **Check Names** button. If the location is correct, the object name will be found and displayed underlined, as shown by the example in figure 2-29.

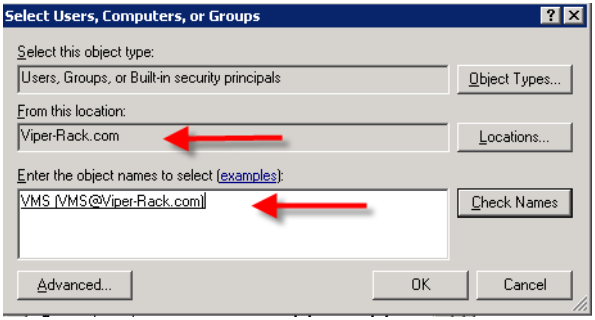

Figure 2-29 Select Users

7. Click on **OK**. The Launch Permissions window will display the new user highlighted. Check all of the **Allow** boxes as shown in figure 2-30, then click the **OK** button.

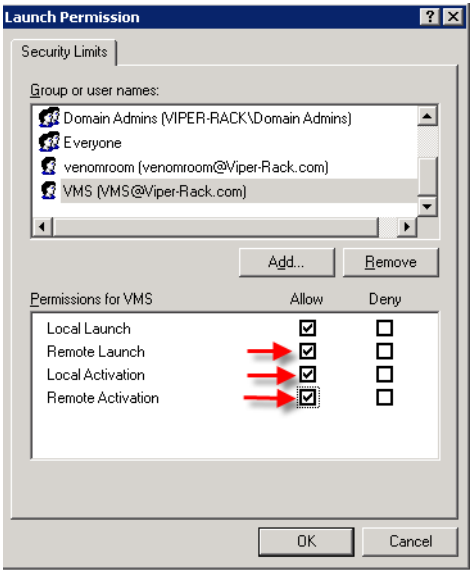

Figure 2-30 Launch Permissions with New User

This concludes setting the Component Securities on the Domain Controller.

Verify Server Installation

This verification process utilizes the ViperView Client, and thus can only be executed using just the server when a *Full Install* has been performed. For a *Server Install*, verification of successful installation requires the use of a Client workstation (see "Verify Client Installation" on page 2-34).

1. Insert the Vipersat Crypto-Key into an available USB port on the VMS server. This key is required to run the Vipersat Management System Service (VOS).

2. Open the Services window on the server by selecting **Services** from the Start > Administrative Tools menu.

Figure 2-31 Services, Administrative Tools menu

3. Select **Vipersat Management System** from the Services list as shown in figure 2-32, then click on **Start** the service.

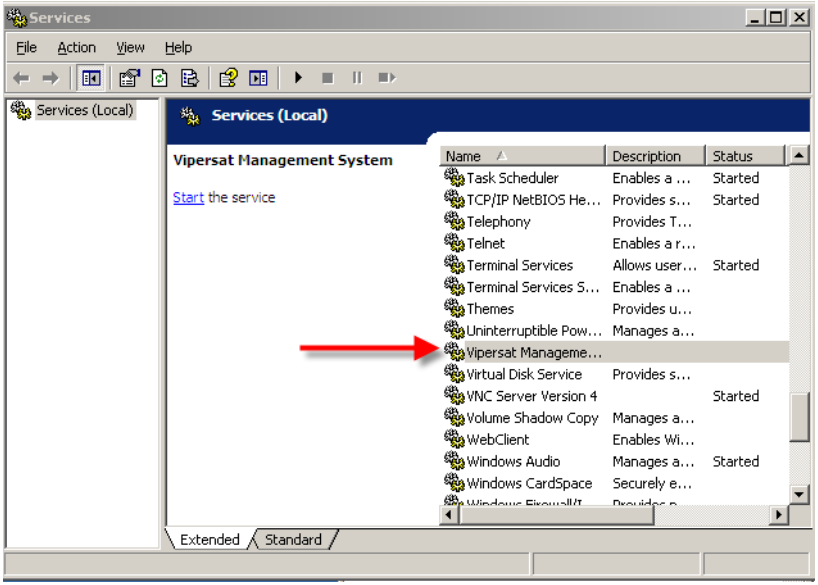

Figure 2-32 Vipersat Management System Service

This will start the VOS (Vipersat Object Service) process. VOS.exe will appear in the Processes tab of the *Windows Task Manager*.

NOTE

Note: The Vipersat Crypto-Key must be connected to the server's USB port. Otherwise, the attempt to start VMS will fail.

If the Start attempt fails, proceed to "VMS Service Start Failure" on page 2-30.

4. Open the **Connection Manager** from the path Start > Programs > VMS > Connection Manager.

The **Connect** dialog will appear.

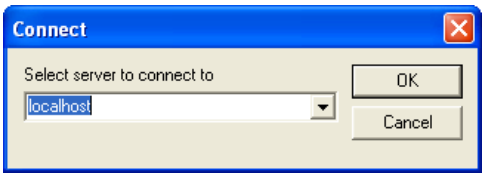

Figure 2-33 Server Connect dialog

5. When using the server, accept "localhost" and click on the **OK** button. When using a client machine, enter the server IP address.

The **ViperView** window will appear, as shown in figure 2-34.

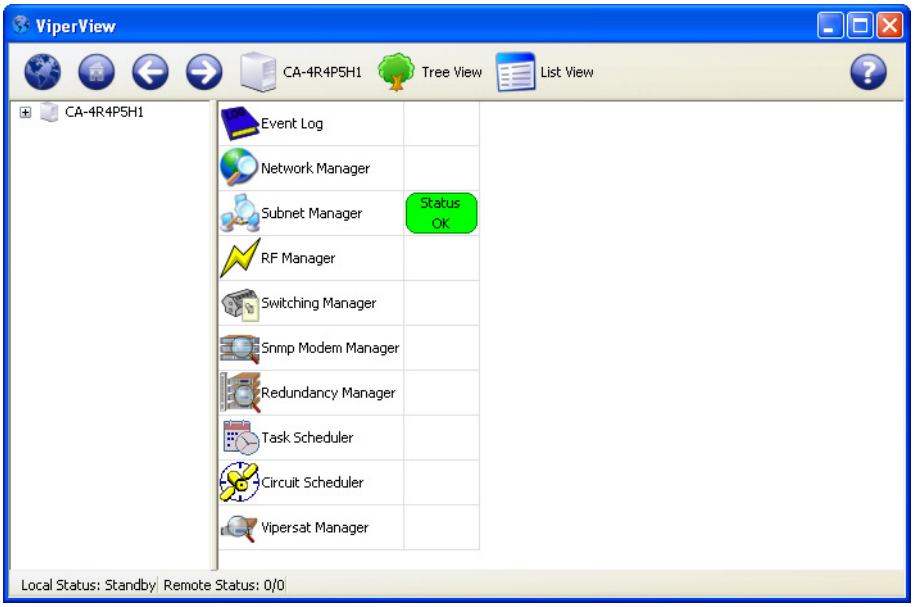

Figure 2-34 Successful Installation, ViperView

To verify the version of VMS that is installed, click on the on the far right of the ViperView menu bar and select **About**.

For upgrade installations only, activate the server processes and verify that the network database configuration is accurately displayed.

VMS Service Start Failure

Should the attempt to start the VMS service fail, verify whether or not the Crypto-Key is the cause of the failure.

1. Open the Windows **Event Viewer**.
   [Start > Settings > Control Panel > Administrative Tools > Event Viewer]

2. Select **Applications** and look through the list for the appearance of an Error Type for Vipersat Management System, as shown in figure 2-35.

3. Double-click the event to open the **Properties** dialog (figure 2-36).

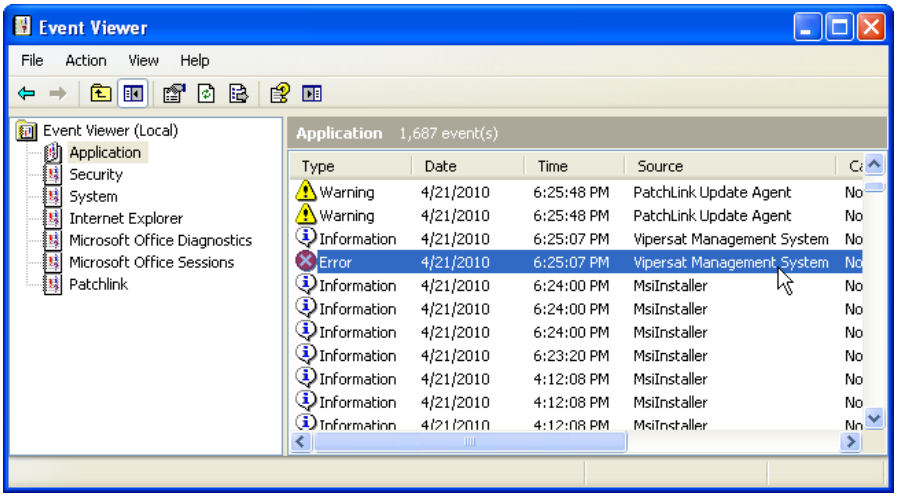

Figure 2-35 Application Error, Event Viewer

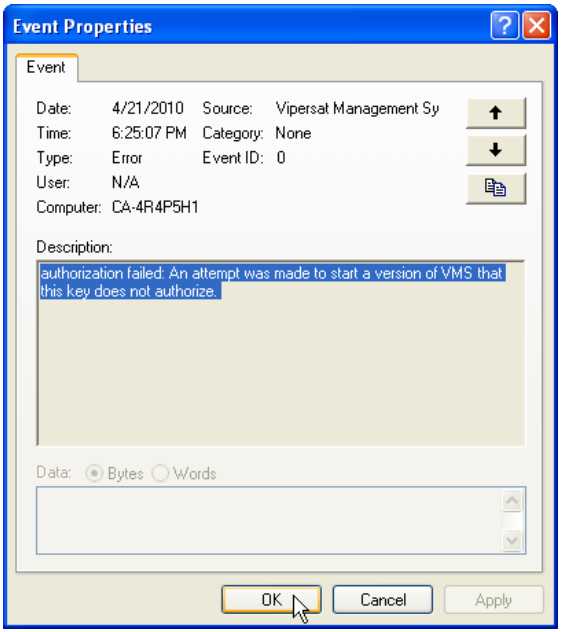

Figure 2-36 Event Properties window

If the USB key is the source of the problem, contact the network administrator or Comtech Vipersat Network Products CTAC (*"Contact Information"*). They can provide either the necessary key file (.vku) update or replacement.

If the key is not the cause of the Start failure, repeat the installation procedure and try again. If still no success, contact Customer Support.

This completes the VMS Server installation procedure.

- For *VMS Stand-alone Server configurations*, proceed to *Chapter 3, "VMS Configuration"*, to configure the VMS database for the satellite network.
- For *VMS Redundancy Server configurations*, proceed to *Appendix C, "Redundancy"*, for instructions on configuring redundant servers.

VMS Client Installation

The Vipersat Management System Client software should be installed on a high-performance, industry-standard workstation computer running Microsoft Windows XP Professional or Windows 7 Professional, with current Service Pack. For specifications for the minimum recommended VMS platform configuration, please refer to the *VMS Release Notes* for the version of software that will be installed.

NOTE

Note: Dual monitors are recommended for greater viewing of multiple windows.

The VMS Client software is installed using the same installation disk used for the Server installation. The Installation Wizard will prompt the user for Full Install, Server Install, or Client Install. Selection of the Client will only install the necessary files without prompting for USB key and password. This type of installation only installs the Client component on a workstation that will be used to connect remotely to the server(s) on the same LAN that are running the VMS. This installation type does not require a USB key to operate the software.

NOTE

Note: The installation does not require the USB Crypto-Key as there are no services running on the client workstation. This machine will require network connections and proper security configurations to connect to the active VMS sever.

NOTE

Note: The install must be done from an account with Administrator Privileges.

For the VMS Client installation, follow the same procedure used for the Server installation provided in the section “VMS Server Installation” on page 2-16. However, in step 4., select the radial button **Client Install**, as shown below in figure 2-37.

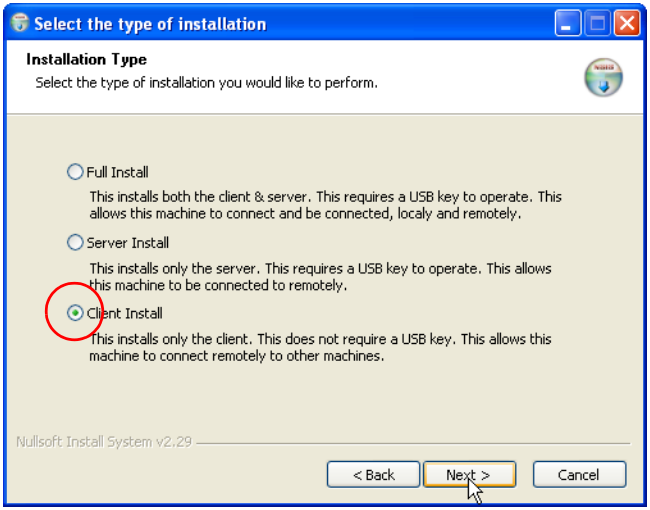

Figure 2-37 Client Installation Type

Once the installation wizard is finished, return here to continue with the following section.

Create Client Accounts

It is necessary to configure the appropriate security settings for the Client workstation to gain network access privileges to the VMS server.

Follow the procedure in *Appendix G, "VMS Client Users"* for setting up client user accounts.

Verify Client Installation

After installation, verify that the VMS Client installation was successful by running the program. The VMS Server must be running VOS, the Vipersat Management System service (see "Verify Server Installation" on page 2-27 for the necessary steps to start the VMS service).

1. Open the **Connection Manager** using the path Start > Programs > VMS > Connection Manager.

2. At the connection prompt in the **Connect** dialog, enter the IP address of the VMS Server and click on the **OK** button (figure 2-38).

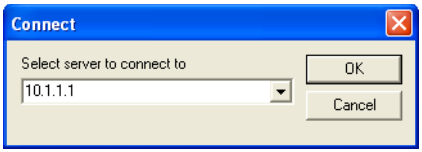

Figure 2-38 Connect dialog

3. The **ViperView** window will appear, as shown in figure 2-39.

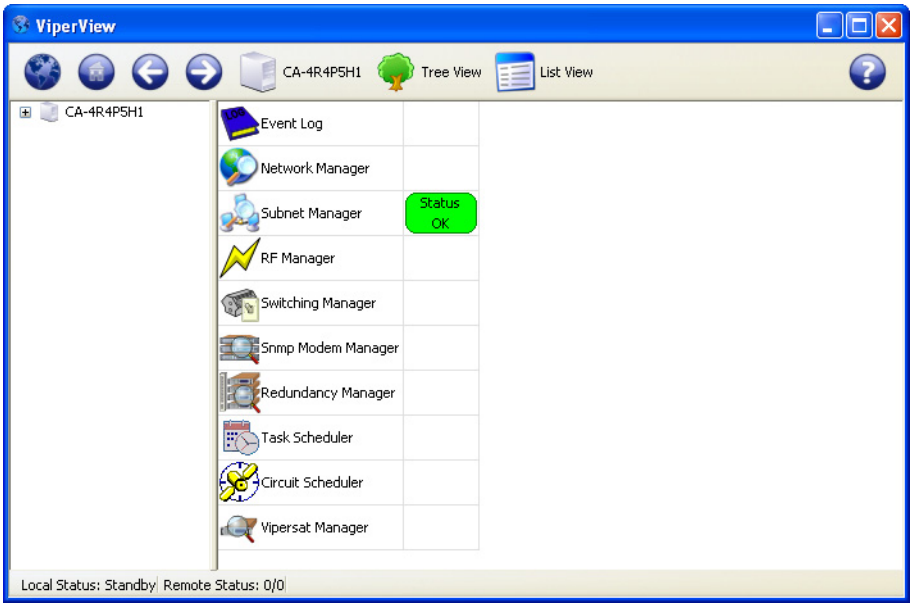

Figure 2-39 ViperView window, VMS Client

To verify the version of VMS that is installed, click on the on the far right of the ViperView menu bar and select **About**.

This completes the VMS Client installation procedure.

3

VMS CONFIGURATION

General

The VMS configuration procedure assumes that the user is experienced with the VMS and/or has attended the System Operator training course, and gives summary instructions for configuring an installed VMS. If difficulties are experienced during configuration, contact Comtech EF Data's ESC for assistance.

This procedure must be executed in the order that is presented to ensure proper setup and configuration. After file installation and network hardware is in place and operational, the equipment should be communicating with the network management system. That is, the VMS has IP access to each unit either through a LAN or satellite connection.

Once the VMS is installed, started up, and the initial Vipersat Manager configuration is completed, the VMS immediately starts gathering and storing information from the units which make up the network.

NOTE

Note: For a *Redundant VMS Server* configuration, perform the VMS configuration procedure on the **Active** server only. When completed, perform a server synchronization to synchronize the server databases.

Before proceeding with configuring the network using VMS, the *Administrator's Network Plan* and the following network information should be available, for reference.

- A list of all equipment used in the network, broken down by site.
- A schematic or other documentation of the network's topology.
- A Physical site map where each piece of equipment is located.

- IP addresses assigned to all network hardware.
- Documentation assigning IP address numbers and subnet masks to each site in the network, the multicast address(s) to be used, and the IP address of the VMS server's connection to the network.
- The functions each piece of equipment is to perform in the network (Hub, Remote, Expansion unit, etc.) and the equipment type (CDM-570/570L, CDD-564/564L, CDM-570A/570AL, CDM-625A, SLM-5650A, ROSS, HEIGHTS, etc.).
- All frequencies and frequency allocations to be used by each site and each piece of equipment, and available pool frequencies.
- Types of traffic expected to be handled by each site and corresponding bandwidth allocations to accommodate the expected traffic volume and type.
- A list of the VMS licensing options that have been purchased. Details can be found on the Purchase Order, or a Vipersat representative can provide detailed information on licensing options and pricing for the VMS-managed network.
- A list of network modem equipment and the FAST features associated with each. This information can be obtained either via Telnet from the Main>Administration>Feature Configuration screen, or with Vload and the use of the Parameter Editor (Features tab).

The following sections describe configuring the VMS to the network topology, traffic type, and bandwidth requirements for the network. This information can then be compared to the physical network configuration displayed by the VMS, once it has completed its network analysis and displays the results, as shown in the network example, figure 3-1.

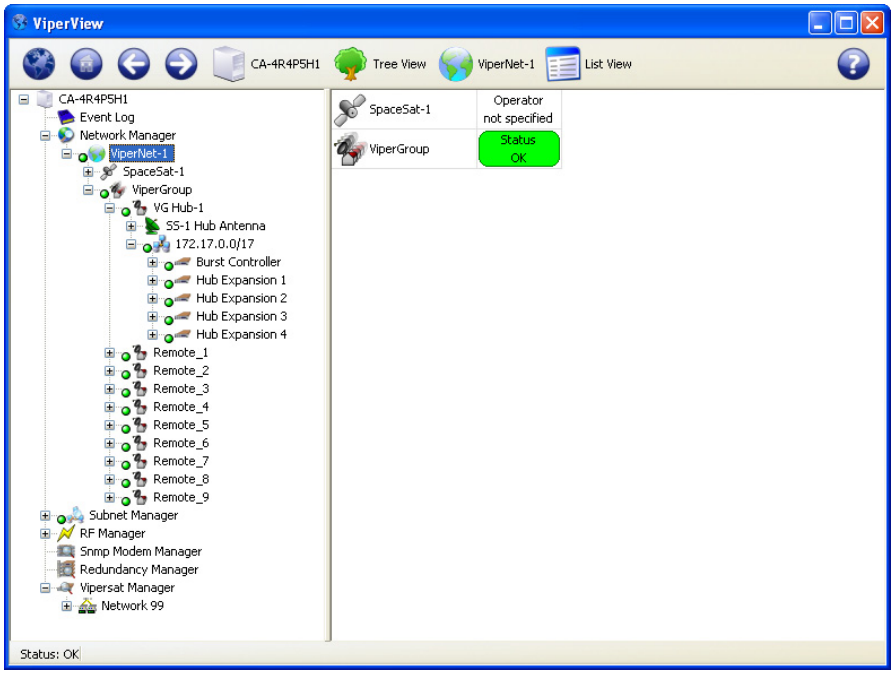

Figure 3-1 Network Configuration example

By comparing the planned network configuration with the actual network configuration, any missing nodes or potential trouble spots can be quickly identified. The tools described in this chapter can then be used to modify and optimize the network's configuration and operation.

NOTE

Note: An Out-of-Band network unit is displayed in the same manner as other elements in the network.

Configuration Alerts

The VMS performs a check of the configuration settings that are input by the user. If a setting is found to be in conflict, an alert message is generated to inform the user that an adjustment is necessary. When a conflicting parameter setting is entered into a dialog, an alert icon will appear next to the field in question. Clicking on the icon will display a pop-up info-tip that explains the conflict. The alert icon is also displayed in front of the menu item associated with that dialog.

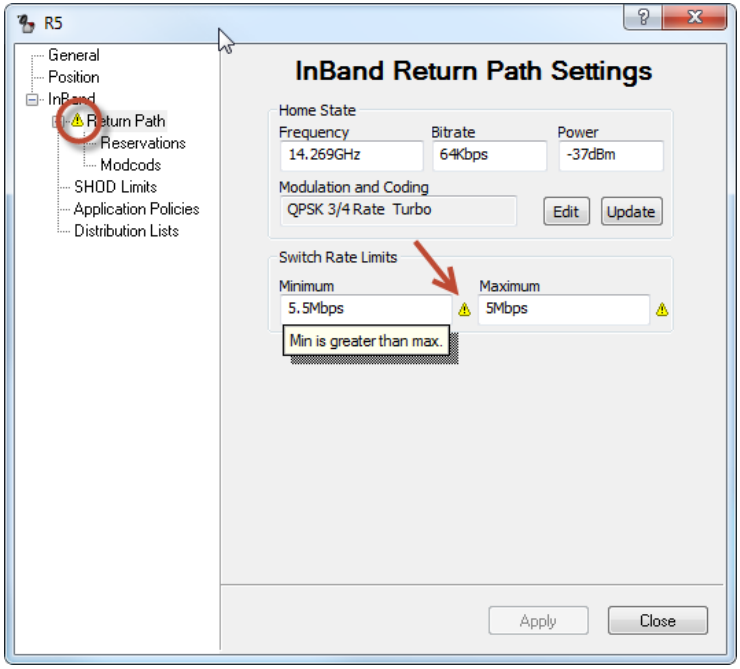

Figure 3-2 Alert, Parameter Conflict

Edit the setting to eliminate the conflict. Note that, once the setting is corrected, the alert icons will remain visible until another action is executed, such as selecting another menu item or exiting the dialog.

Hardware Configuration

NOTE

Note: For VMS compatibility, see the product *Release Notes* for specific versions of each modem type that is supported.

Once all of the needed information is obtained, configuration can begin. Before making the physical installation of hardware into a network, each modem/router must be pre-configured using either Telnet (CLI) or HTTP. Refer to the modem/router's documentation for details.

Comtech EF Data ships all modem/routers with FAST Codes pre-configured. The modem/routers are always configured at the factory as type Remote, with the Default Gateway pointed toward the Satellite, and with STDMA disabled.

At this point, VMS cannot discover the node. The operator can either use Telnet (CLI) or HTTP to set up these parameters as shown in the example CDM-570/570L CLI interface shown in figure 3-3, or flash a configuration file using VLoad.

As a minimum, the following items in the modem/router will have to be configured before it will be able to communicate with the VMS following installation in the network:

- Network ID
- Receive Multicast Address
- Managing IP address is set through reception of VMS announcement multicast message that is sent continuously on timed intervals.

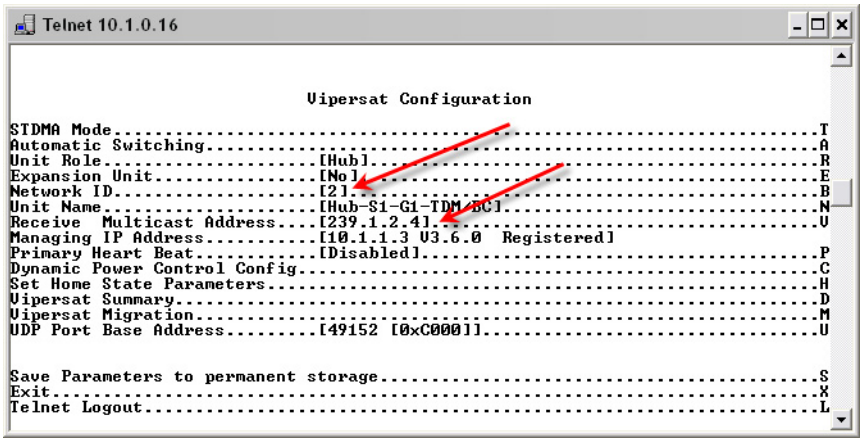

Figure 3-3 CDM-570/570L Telnet Vipersat Configuration

Once the modem/routers have the minumum required configuration and an installer successfully points the antenna at the satellite and establishes a receive link, the operator at the Hub site can push frequencies, bit rates, and FEC code rates to the units at remote sites using the VMS. The frequencies can be anywhere in the customer's frequency pool, allowing a thin-route SCPC connection to be established with the satellite network's modems.

For example, once communication is established, the Hub operator can set up the unit for STDMA using the instructions found in each modem manual. After a reset, the unit will come back online operating in STDMA mode with the desired configuration.

Once communication is established between VMS and all network devices, the network is ready to be configured.

VMS Quick Configuration Guide

This section is provided as a high-level guide for configuration of the VMS, and is intended for use by administrators and operators who are experienced with the configuration process. This material serves as a reference for what to do, and in what order.

For less experienced users, and for the comprehensive how-to configuration procedures, proceed to the section "VMS Initial Startup Procedure" on page 3-10. Hyperlinks to these how-to procedures are provided to the right of the main configuration topics listed below.

A. Start VMS & ViperView [page 3-10]

1. **Start** the Vipersat Management System service on the VMS Server.
2. **Connect** to the VMS Server from the VMS Client workstation to open ViperView.

B. Configure Vipersat Manager [page 3-12]

1. Set the **Management** and **Local VMS** addresses.
2. Set the communications **Time-outs**.
3. **Activate** the Server processes.
4. Configure the server for **Auto Activate**.
5. Observe the **registration** of network units with the VMS and the population of the Vipersat Manager and the Subnet Manager.

   Verify with the *Administrator's Network Plan*.
6. For missing units, use the **Scan Network** command to assist VMS registration.

C. Configure RF Manager [page 3-25]

1. Create the network **Satellite**(s).
2. Create the satellite **Transponder**(s).
3. Create the bandwidth **Pools** for the satellite(s).

4. For Hub(s) and initial Remote(s):
   - Create the network **Antennas**
   - Create the antenna **Up Converters** and **Down Converters**
   - **Bind** the Mods and Demods to the Converters for these sites

D. Configure Network Manager [page 3-44]

1. Create the **Network**(s).
2. Drag-and-drop the **Satellite**(s) from RF Manager to the network(s).
3. *Optional*: Create the **Groups** for the network(s).
4. Create the **Sites** for the network or group—Hub(s) and initial Remote(s).
5. Drag-and-drop the site **Antennas** into the sites.
6. Drag-and-drop the site **Subnets** into the sites.

Set Carrier Flags [page 3-49]

1. Set the **STDMA** flag on the network Burst Controller.
2. Set the flags for the Allocatable Mods and Demods:
   - P2P Switching Modulators at the Hub
   - SCPC Switching Demodulators at the Hub
   - Mesh Demodulators at the Remotes

Mask Rx Unlock Alarms [page 3-53]

Select **Mask Unlock Alarm** for all network units that function as either a Burst Controller (not necessary for SLM-5650/A) or an Expansion unit.

Configure InBand Management [page 3-57]

1. Set the **InBand** flag for each Remote site.
2. Configure the **InBand Settings** and **Home State**.
   - InBand Transmit Settings
   - InBand Receive Settings
3. Set the **InBand Bandwidth Reservations**.
4. Set the **InBand Policies** for the Network level, Group level, and Site level.
   - InBand Policy Flags

- InBand Application Policies
- Define InBand Distribution Lists

Perform Switching Function Verification [page 3-86]

Create Additional Remote Sites with Remote Site Wizard [page 3-91]

Configure Advanced Switching [page 3-73]

E. Configure Redundancy [page 3-103]

Configure N:M Hub Device Redundancy

Configure VMS Redundancy

F. Configure SOTM [page 3-104]

1. Set the **Dynamic** parameter for the mobile remote(s).
2. Select the **ROSS** unit for the remote(s).
3. Create the **Routes** for Hub TDM outbound units.
4. Configure the **QOS Rules** for Hub TDM.

G. Configure Encryption [page 3-109]

Management Security Option

This feature option is NOT included with the standard VMS package, and is only available upon request from an authorized agent.

1. Enable **Management** and/or **Switching** encryption for the VMS server.
2. Enter the **Encryption Key**.

Modem TRANSEC Setting (SLM-5650A only)

Specify the number of **FIPS Blocks per Frame** for the modem.

VMS Initial Startup Procedure

Configure Server Connection

Start the Vipersat Management System service on the VMS Server and open the Connection Manager on the VMS Client.

1. On the VMS Server, select **Vipersat Management System** from Windows Services and **Start** the service, if it is not already running.

   Starting the service is described in Chapter 2, *VMS Installation*, in the section "Verify Server Installation" on page 2-27.

   Note: It is recommended that this service be configured for **Automatic** Startup.

2. On the VMS Client workstation, open the **Connection Manager**, using either the Desktop shortcut, or from the path Start > Programs > VMS > Connection Manager.

   Although the Connection Manager can be opened on the VMS Server, it is **NOT RECOMMENDED** to run ViperView on the same machine as the VOS.

3. The Connection Manager will prompt for the Server with which to connect (figure 3-4). Enter the **IP address** of the active VMS Server and click the **OK** button.

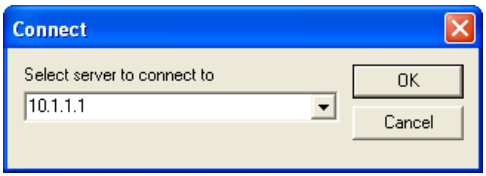

Figure 3-4 Connect to Server dialog

The **ViperView** window will open, as shown in figure 3-5.

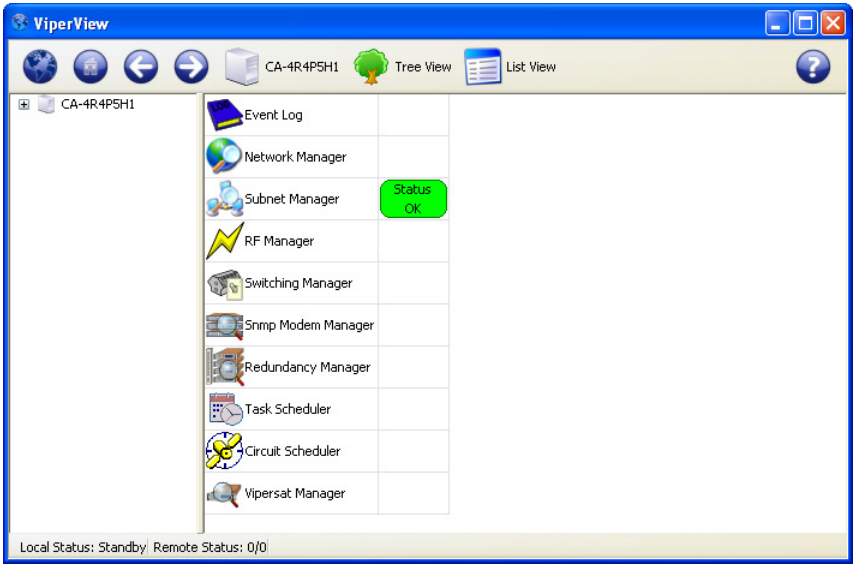

Figure 3-5 Initial ViperView Window

Vipersat Manager Configuration

In this section, Vipersat Manager is used to configure the necessary addresses and timeout parameters. Once the server is activated, this will allow the VMS to establish communications with, and register, the nodes in the network.

1. Expand the VMS server tree view in the left ViperView window panel. Right-click on **Vipersat Manager** (located at the bottom of the tree list) and select **Properties** from the drop-down menu, figure 3-6. The Vipersat Manager window will open.

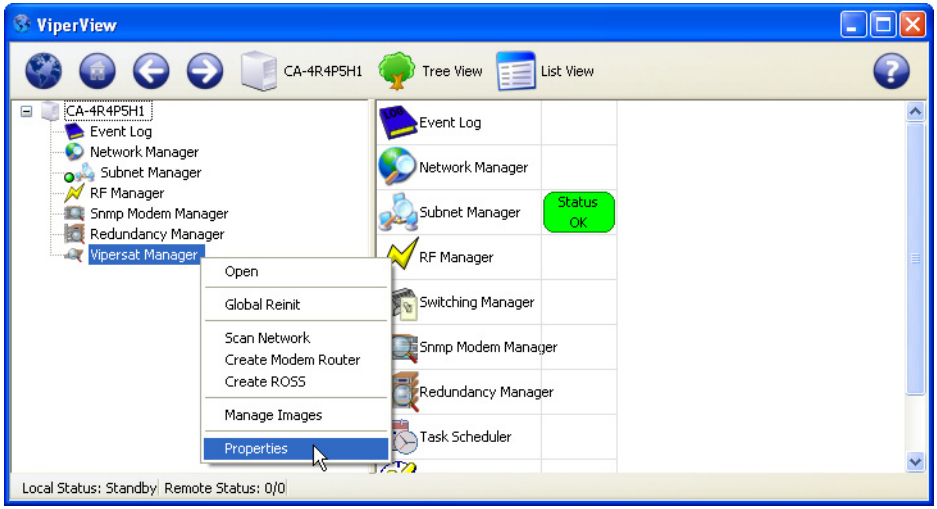

Figure 3-6 Vipersat Manager Properties menu command

2. In the **General** dialog shown in figure 3-7, make sure that the **Management Multicast** address of the VMS matches the Receive Multicast Address for each modem in the network that is controlled by this VMS. This address is used to propagate managing multi-command messages from the VMS to all receiving IP network modems.

3. The **Management Interface** address will default to 0.0.0.0 on new installations and must be changed to reflect the IP address of the NIC that connects the VMS server to the Vipersat Hub LAN. This address configuration is necessary because of multiple LAN ports on the server.

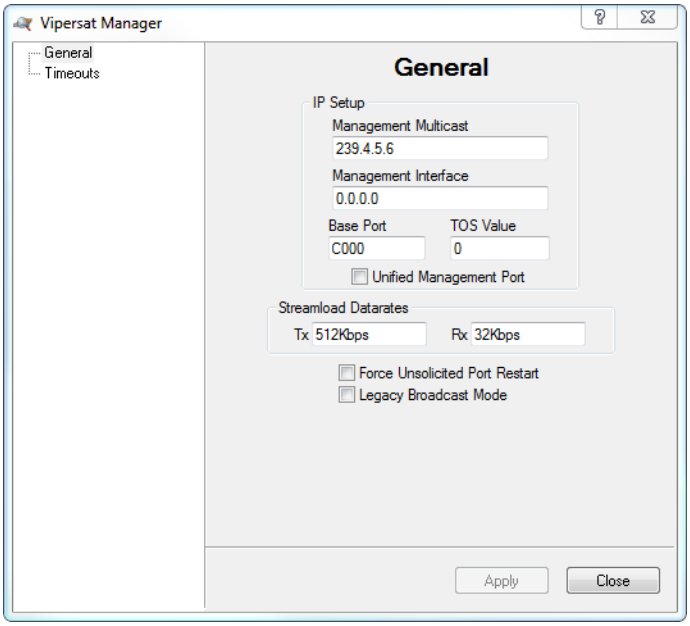

Figure 3-7 Vipersat Manager, General dialog

4. The **Base Port** sets the starting IP port addressing for all VMS messages. Changing this address base will affect the entire network requiring configuration changes to all modems. Leave this setting at default **C000** to avoid unnecessary configuration changes. Altering this setting is ONLY necessary if network port addressing is in contention.

5. The **TOS** (Type Of Service) **Value** provides prioritization of VMS messages in cases where the forwarding router is congested or overloaded. The value typically is set to Class Selector 6 or “192” for priority queuing to ensure management/signaling messages are granted the highest passage level.

6. The **Streamload Data Rate** values determine the amount of bandwidth required to GET and PUT modem configuration files. Set the rates not to exceed the network transmission bandwidths, forward and return channel rates. These values are typically set low as the file transferred is small and requires little overhead. Default settings are usually acceptable.

7. The **Force Unsolicited Port Restart** check box provides the option to reset the UDP port used by the VMS server for receiving status update messages sent by the network modems. This action is recommended whenever the Local VMS Address or base port setting is changed, especially for servers that have multiple NICs.

Activate the check box, then click on the **Apply** button to execute the restart.

8. The **Legacy Broadcast Mode** check box need only be activated for networks that consist of modems using the following firmware versions:
   - CDM-570/570L—v1.5.3 and earlier
   - CDD-564/564L—v1.5.3 and earlier
   - SLM-5650A—v1.3.1 and earlier

   This feature provides support for the previous method of sending the active management IP address message using a multi-command packet that requires acknowledgement. This multicast message updates the **Managing IP Address** field in all listening modems. The message interval is defaulted to send an update every 15 seconds. *See Timeouts dialog for timer interval setting.*

   If all modems are running more recent firmware, then only the unacknowledged message type is used and this box can be left unchecked.

9. Select the **Timeouts** dialog shown in figure 3-8. The default timer settings are adjustable to accommodate communications that require additional time because of network congestion.

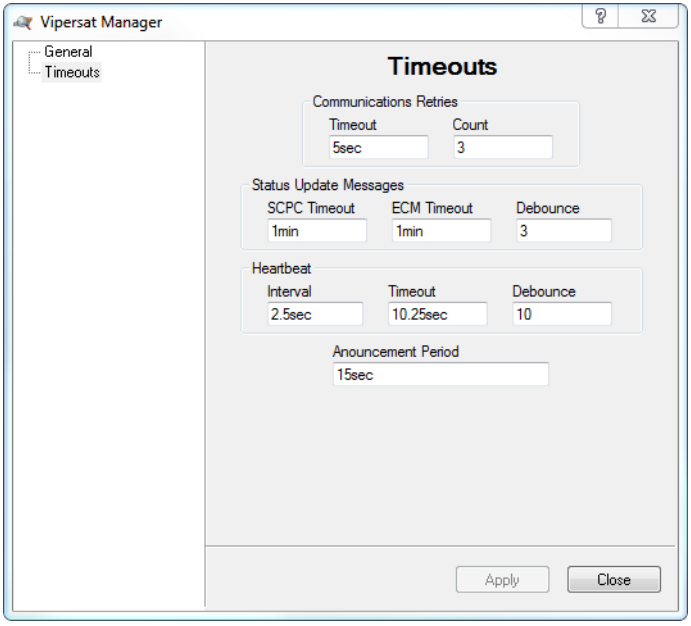

Figure 3-8 Vipersat Manager, Timeouts dialog

10. The **Communications** timer values set timeouts for command messages. The **Retry Timeout** is the wait between messages which works in conjunction with **Retry Count**. A retry count of 3 and a timeout of 5 seconds would set the message failure at a total timeout of 15 seconds with 3 attempts to command the modem.

    If communication latencies are greater than default settings (command communication failures), increase the **Retry Timeout** value.

11. The **Status Update Messages** (SUMs) values set the dual timeouts and debounce for Remotes that are either in SCPC mode or ECM.
    - The **SCPC Timeout** parameter is the time interval between the sending of SUMs to the VMS by Remotes that are in SCPC mode.
    - The **ECM Timeout** is the time interval between the sending of SUMs to the VMS by Remotes that are in Entry Channel Mode.
    - The **Debounce** is a counter setting for the number of consecutive time intervals that can pass without the VMS receiving a SUM for a particular Remote unit before a switch failure occurs for that Remote.

    Generally, the *SCPC Timeout* is set to a relatively short interval to provide timely responses to switch requests, such as due to variations in load for Load Switching applications.

    For networks that support large numbers of Remotes that are often operating in ECM—such as those in “Wait” mode, for example—, a longer interval setting for *ECM Timeout* will reduce contention for shared bandwidth usage.

12. The **Heartbeat** timer settings include the Interval, Timeout and Debounce values for Hub device redundancy messaging.
    - The **Interval** parameter updates the modem to send it’s heartbeat message to the VMS at the set rate.
    - The **Timeout** is how long the VMS will wait before determining communications failure and commanding a device redundancy switchover.
    - The **Debounce** is a counter setting for the number of consecutive alarmed messages the VMS will receive from a particular Hub unit before a redundancy switch is triggered. This parameter setting is useful for reducing or eliminating unnecessary redundancy triggers due to spurious alarms.

13. The **Announcement Period** is the interval at which the VMS will multicast its management IP address to all listening modems within the network. This ensures, for example, that remotes that are not online during a redundancy switch will pick up the new managing address when they come back online.

The default value (15 sec) enables the VMS to send the update message on a 15 second interval to establish the current managing address in all modems set to receive the message.

14. Click the **Apply** button to save these settings for the Vipersat Manager Properties, then **Close** the window.

Activate Server Processes

In ViperView, click on the Server icon on the top menu bar and select **Activate** from the drop-down menu (figure 3-9) to manually initialize the VMS server processes.

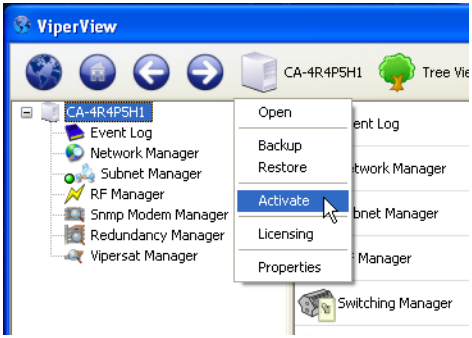

Figure 3-9 Server Processes, Manual Activation

The windows task bar will pop-up a text bubble indicating the activation.

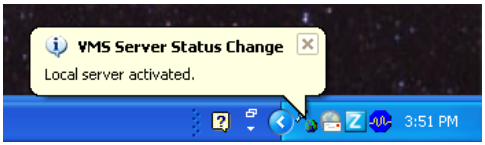

Figure 3-10 Activated Server Notification

Open Event Log

At this point, it is helpful to open the Event Log window for observing VMS events as they occur during the configuration process. Right-click on the **Event Log** icon and select **Open**.

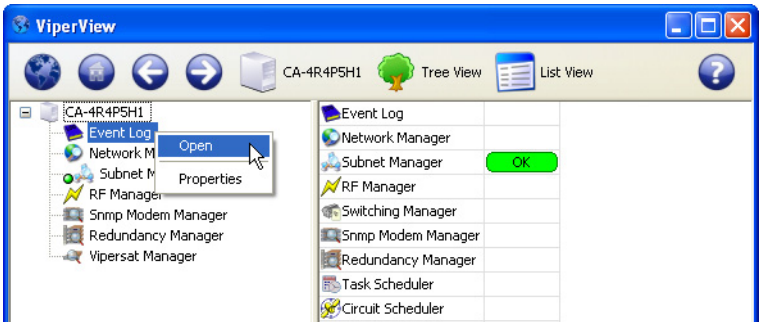

Figure 3-11 Event Log, Open

Resize and position the Event View window as desired for optimal viewing on the monitor.

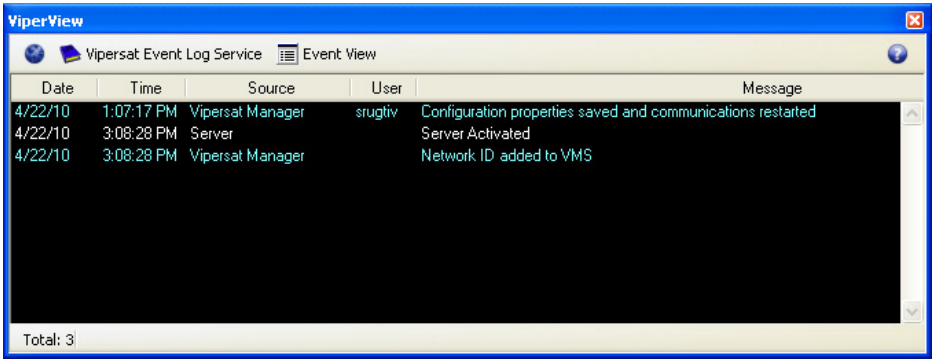

Figure 3-12 Event View Window

More detailed information regarding the Event Log is provided in Chapter 3, *"VMS Configuration"*.

Configure Event Relay Server

This procedure configures the Event Relay function for network systems that will utilize external client software to receive VMS event information via TCP connection.

1. Open the Event Log **Properties** dialog.

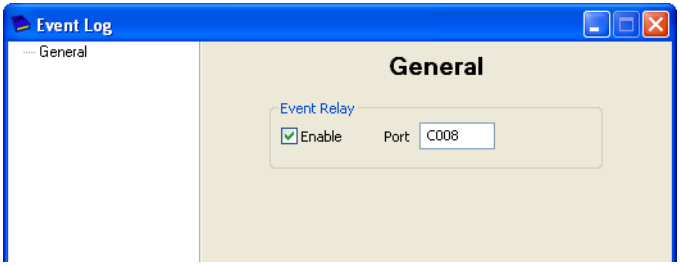

Figure 3-13 Event Log Properties dialog

2. **Enable** (default) this function for use.

3. Set the **Port** number to be used (defaults to C008).

4. For changes, click the **Apply** button, then Close the window.

Configure Auto Activate

1. Click on the Server icon on the top menu bar and select **Properties** from the drop-down menu.

2. Select the **Redundancy** dialog, then check the box for **Auto Activate** as shown in figure 3-14. This will automatically activate the server processes whenever the Vipersat Management System service is started.

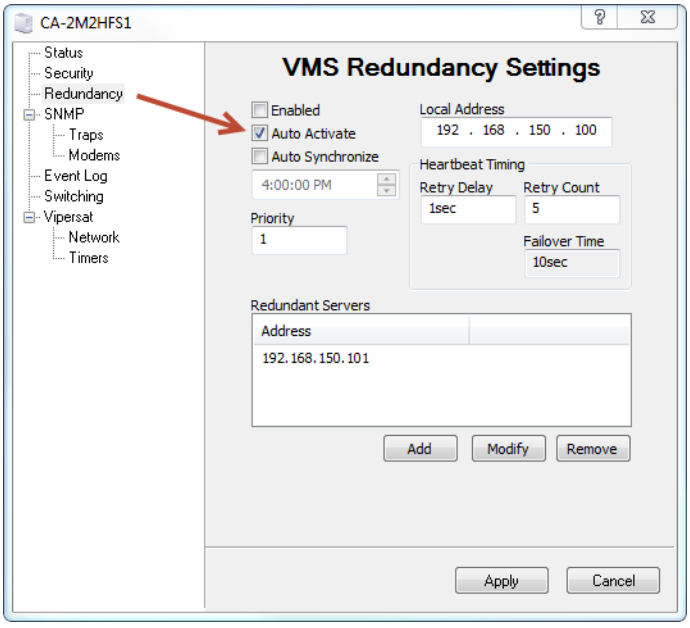

Figure 3-14 Server Properties, Auto Activate

The other parameters in this dialog pertain only to redundant server configurations which will be addressed later (see “VMS Redundancy” on page 3-103).

3. Click the **Apply** button to save this setting for the Server Properties, then **Close** the window.

Auto-Discovery Process

Once Vipersat Manager is configured and the server is activated, communications between the VMS and live network units at Hub and Remote sites is established, and the auto-discovery process begins. As Hub and Remote units are identified, their appearance can be observed in ViperView under the Subnet Manager and the Vipersat Manager by expanding the tree view, as shown in figure 3-15.

Expand the tree view to display the list. If necessary, widen the left ViperView window panel by repositioning the vertical divider to the right.

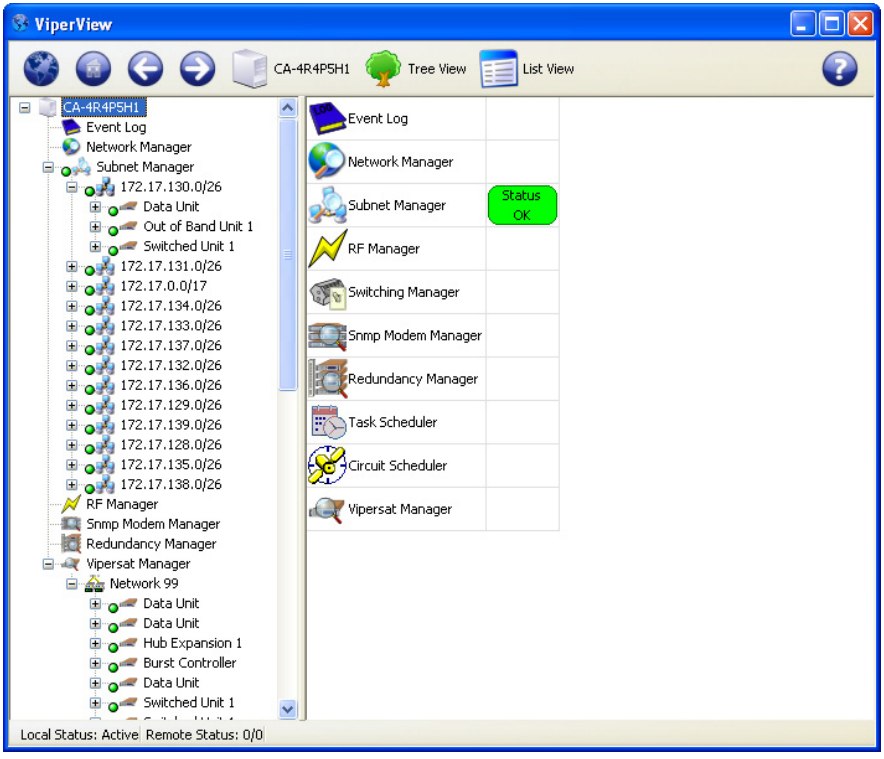

Figure 3-15 Registration of Network Units

Note that, as units are registered with the VMS, the Network ID parameter from each unit is automatically detected and used to create a corresponding network icon under the Vipersat Manager in which the units are registered and grouped. This action is recorded in the Event Log (figure 3-12).

Also observe the appearance of new events in the Event View window that indicate unit registration with the VMS (figure 3-16).

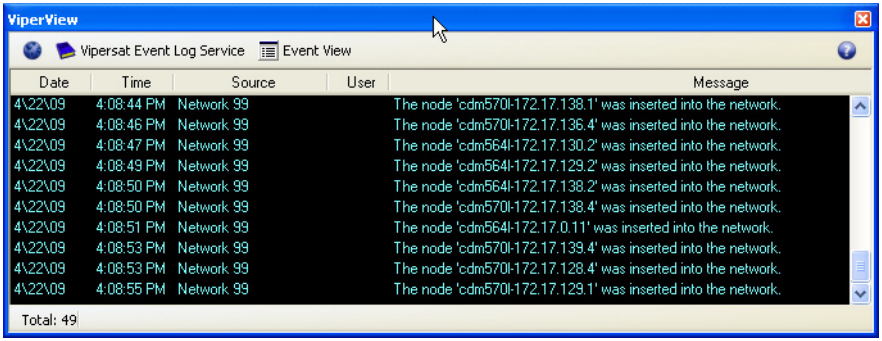

Figure 3-16 Event Log, Node Inserted into Network

Subnet Manager configuration is done automatically by the VMS. The operator should verify that each subnet has all of the expected elements populated in that subnet.

Once all of the management addresses are correct and communicating, the Subnet Manager will start to populate with the modem IP subnets. If some or all units are not populating, the managing VMS address (configured in each modem during the automatic registration) may not be correct.

After the subnet list population is complete, the VMS stores all listed subnets, and any reference to nodes within each subnet, in the VMS database.

NOTE

Note: All Vipersat modems that have IP communications with the VMS will have their subnet address added to the VMS database.

Match up the units displayed in ViperView with the *Administrator's Network Plan* to verify that all devices have registered with the VMS. Allow sufficient time for registrations to occur; this will vary depending on the size of the network.

Tip: During the initial discovery/registration process, units and their subnets are displayed in the order that they are registered. Restarting the VMS Service will allow the *Subnet Manager* to display its elements sorted by IP address. The *Vipersat Manager* will display the elements belonging to each Network sorted by modem/unit type, then by IP address within each type.

If any devices or subnets are missing from view, perform the following command to assist the VMS in registering the unit(s).

- Scan Network — Right-click on the Vipersat Manager and select **Scan Network**.

For all units that remain missing from ViperView, do the following:

- Secure a connection to the unit through either Telnet or the Web interface to verify whether the unit is registered with the managing VMS or not.

Be certain that all of the known units in the network have been discovered before proceeding.

Backup Database

It is suggested that, once it has been verified that all known devices are present in the VMS database, a VMS backup be performed. Then, in the event that difficulties are encountered during the configuration process, the database can be restored to this point.

For the DB restoration procedure, see "Database Backup and Restore" on page 6-26.

1. Click on the VMS Server icon in the top tool bar and select **Backup** from the drop-down menu, figure 3-17.

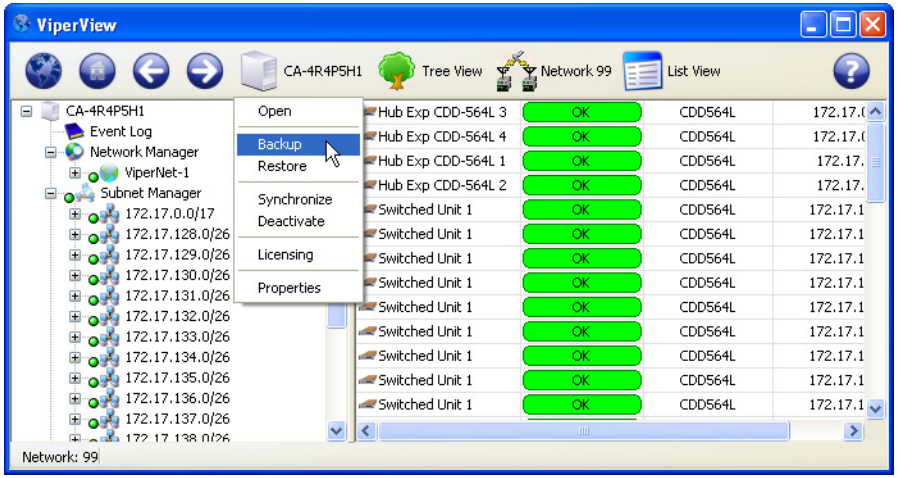

Figure 3-17 Backup VMS Database command

The Windows *Save As* dialog will appear.

2. Name the backup file and save to the desired directory.

Client User Authentication

Administration of client user authorization for read/write privileges allows two levels of VMS access:

- **Read and Write** – Full access to all VMS features and functions with write authorization. Typically assigned to administrator-level operators who are authorized to perform system setup and maintenance, configuration changes, manual/diagnostic switching, etc.
- **Read Only** – Access restricted to viewing network settings and status. Typically assigned to users who will use the VMS for monitoring purposes.

Configuration of client user authentication should be performed by the network administrator. By default, write authorization is disabled, and all users are provided read and write privileges. To change the VMS Security setting, use the following procedure.

1. Click on the VMS Server icon in the top tool bar and select **Properties** from the drop-down menu, figure 3-18.

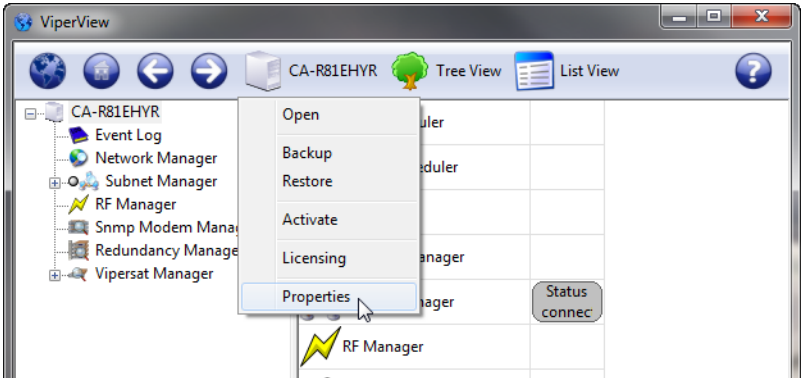

Figure 3-18 VMS Server Properties menu command

2. Select the **Security** dialog, as shown in figure 3-19.

   By default, write authorization for client users is *disabled*, and those users who are to have write access privileges must be entered into the Authorized Writers list.

3. To add a user to the authorized list, enter their domain and user account name in the entry field using the format **domain\user**, then click the **Add** button.

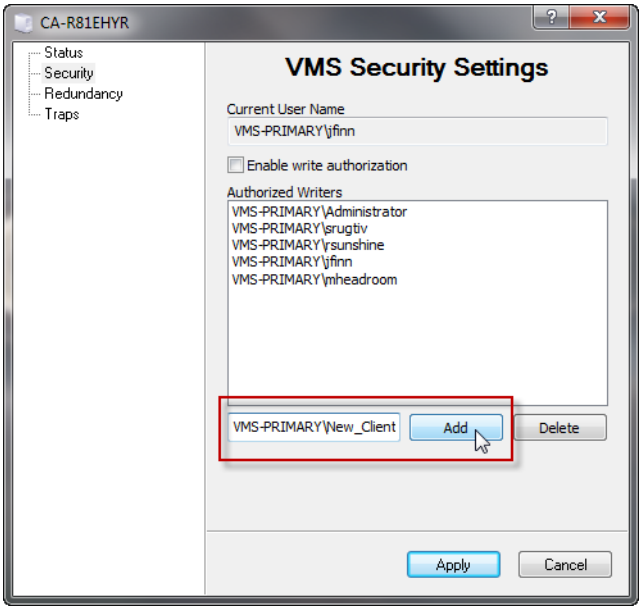

Figure 3-19 Server Properties, VMS Security Settings

4. When all user entries are completed, click to activate the check box to **Enable write authorization**, then click on the **Apply** button.

   This restricts write privileges to just those client users that are in the Authorized Writers list. All other users are limited to read-only access.

5. Alternatively, to disable write authorization and allow write privileges to *all client users*, click to de-activate the check box, then click **Apply**.

RF Manager Configuration

RF Manager configuration consists of creating the network satellite(s) with associated transponders and bandwidth pools, and the site antennas with associated Up converters and Down converters that the Vipersat network nodes will be using.

Create Satellite(s)

The first step is to create the satellite(s) for the network with the appropriate RF characteristics. Transponders are then defined, followed by the creation of bandwidth pools to accommodate SCPC carriers.

1. Right-click on the RF Manager and select **Create Satellite** from the drop-down menu (figure 3-20).

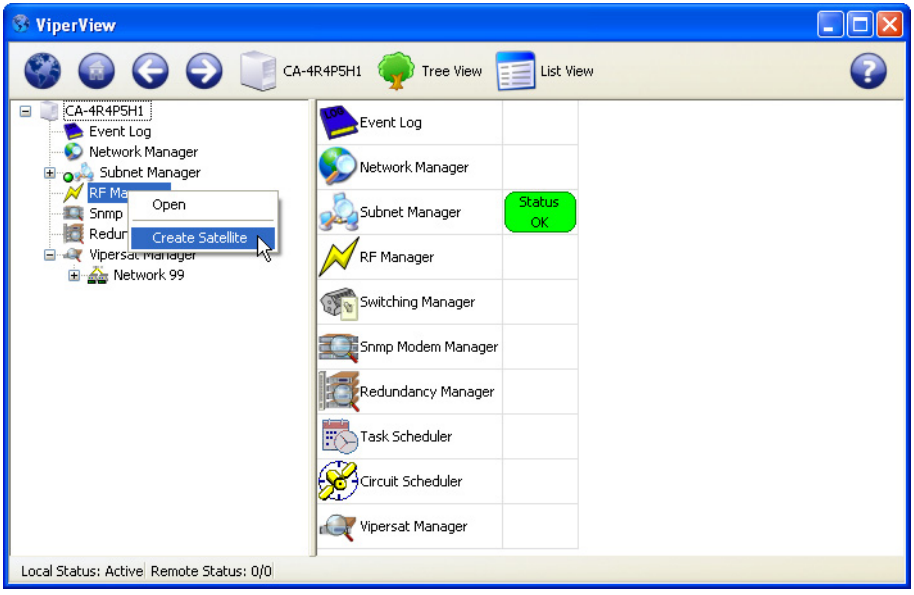

Figure 3-20 Create Satellite menu command

2. Enter the satellite **Name** and the **Center** and **Translation Frequency** settings in the Create Satellite dialog (figure 3-21).

   Check with the service provider if these settings are unknown.

   The default values (14.25 GHz and 2.3 GHz) are provided for Ku-Band applications.

3. An **Orbital Position** can be associated with this satellite by entering the longitudinal coordinate in degrees (decimal format), designated for **E**(ast) or **W**(est).

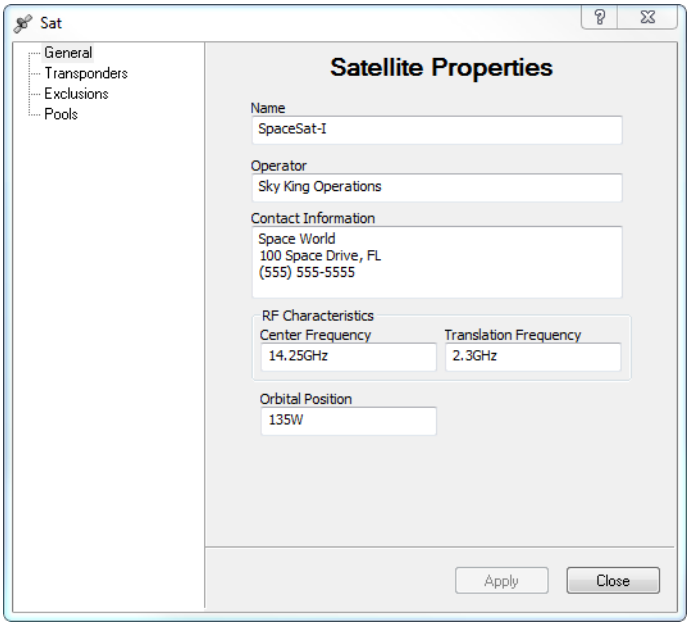

Figure 3-21 Create Satellite dialog

4. Optional information can be entered for the satellite **Operator** and **Contact Information**.

5. Click on **OK**. The newly created satellite will appear under the RF Manager in the ViperView window (see figure 3-22).

6. Repeat the previous steps to create additional satellites, as required.

Create Transponder(s)

The next step is to create the transponder(s) in the newly created satellite. Each transponder is defined with specified Frequency Range parameters.

1. Right-click on the Satellite icon that this transponder will be associated with and select **Create Transponder** from the drop-down menu (figure 3-22).

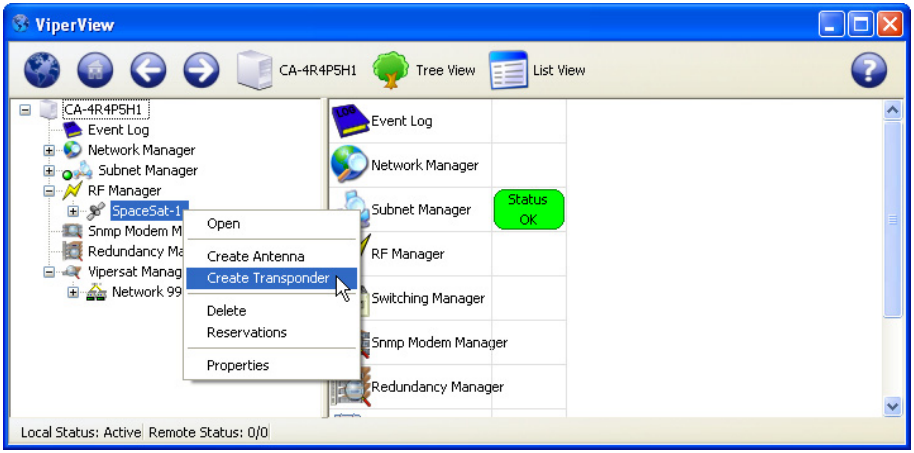

Figure 3-22 Create Transponder menu command

2. Enter the transponder **Name**, **Center Frequency**, and **Bandwidth Span** in the Create Transponder dialog (figure 3-23).

Frequency range settings can be specified using upper and lower limits by clicking the **View as Base/Top** checkbox.

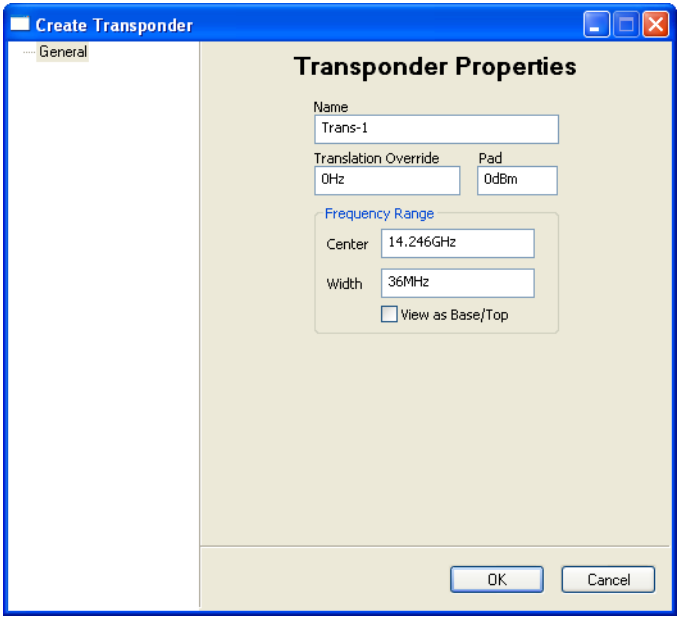

Figure 3-23 Create Transponder dialog

Leave the Pad and Translation Override entries at the default values, if unknown.

The Pad value sets the gain variation between transponders for automatic switching power calculations.

The Translation Override parameter is used for specific applications and represents a frequency offset for cross-banded transponders (refer to *Appendix A, "VMS Cross Banding"* for more information).

3. Click on **OK**.

4. Repeat the previous steps to create multiple transponders, as required.

Open Spectrum View

At this point, it is helpful to open the Satellite Spectrum window for observing usage of the transponder space segments during the configuration process. Right-click on the Satellite icon in the VMS server tree view list and select **Open**.

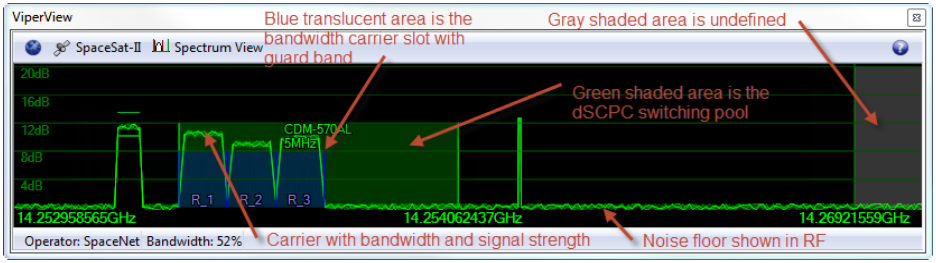

Figure 3-24 Satellite Transponder Spectrum View

Resize and position this window as desired for optimal viewing on the monitor. Use the following mouse techniques for adjusting the view:

- Focus the transponder width for optimal viewing by double-clicking in the window.
- Enlarge the view by rolling the scroll wheel downward.
  This displays a *narrower* frequency range.
- Diminish the view by rolling the scroll wheel upward.
  This displays a *wider* frequency range.
- Pan horizontally by click-holding the scroll wheel and mousing left or right.

The visible frequency range is indicated by the frequency values displayed in the lower left and lower right corners of the window. The dark area represents the frequency range of the transponder that was created in the previous section, and is labeled with the transponder name in the upper left corner. The gray areas are undefined satellite spectrum. The horizontal wavy green line in the lower portion of the window represents the noise floor.

NOTE

Note: The mouse pointer horizontal position within the window is displayed as a frequency value at the bottom center of the window. Also, all carrier levels represent S/N in Es/No.

NOTE

Note: Carriers displayed within the blue translucent slot show the characteristics of roll-off filtering from the top 3dB point on down and the skirts may appear to be outside the slot and overlapping. This is not an issue only a visual representation on carrier placement with roll-off percentages, fixed 25%.

Create Bandwidth Pools

The next step is to create the bandwidth pools that define the available spectrum for allocating to dSCPC carriers.

1. Right-click on the Satellite icon and select **Properties** from the drop-down menu.

2. In the Satellite Properties window, select the **Pools** dialog, then click the **Create** button and specify the Pool Label, Range settings, as shown in figure 3-25. The newly created pool is **Enabled** by default.

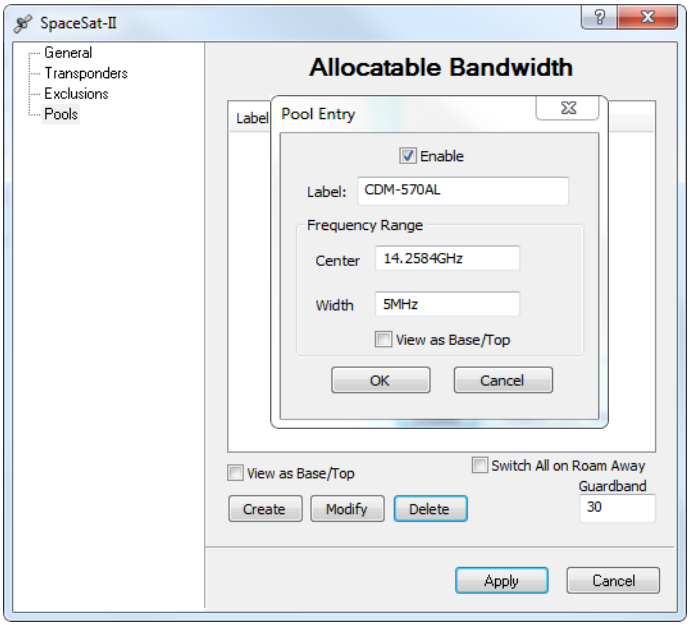

Figure 3-25 Create Pool dialog

3. Click **OK** to enter the new pool in the Allocatable Bandwidth table.

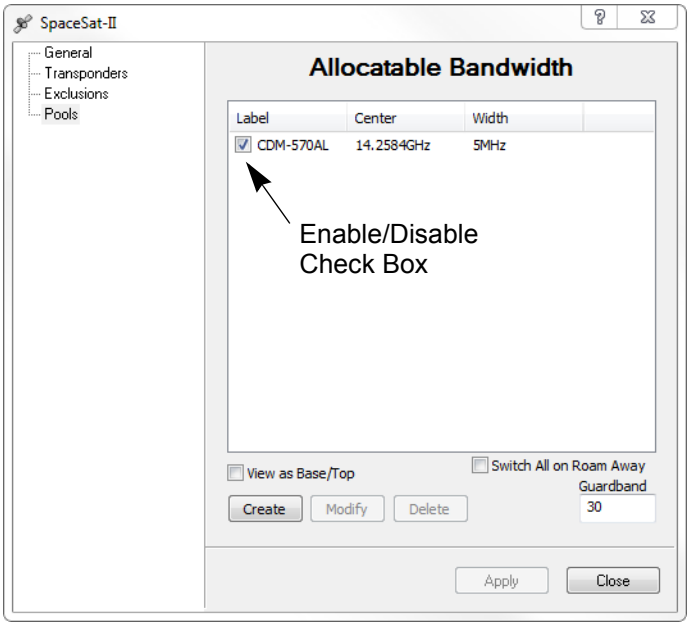

Figure 3-26 Satellite Pools dialog

4. Repeat the above steps to create additional pools, as required.

5. Enter the desired **Guardband** for the carriers that will be allocated bandwidth slots in the defined Pools. This value is entered as a percentage of the carrier bandwidth, and is divided equally for the left and right sides of the carrier.

   For example, using the default Guardband setting of 30, a carrier using 3.3 MHz will be assigned to a 4.29 MHz slot, providing a guard band of 495 kHz on each side of the carrier.

6. If this satellite will be used for roaming/SOTM and Carrier Presence Switching applications, activate the **Switch All on Roam Away** feature. Refer to the section *"Carrier Presence Switching"* on page E-36 for additional information on this feature and its configuration.

7. Click **Apply** to save the settings, then Close the window.

The newly created pool(s) are displayed in the Spectrum View as shaded green areas, shown in figure 3-27.

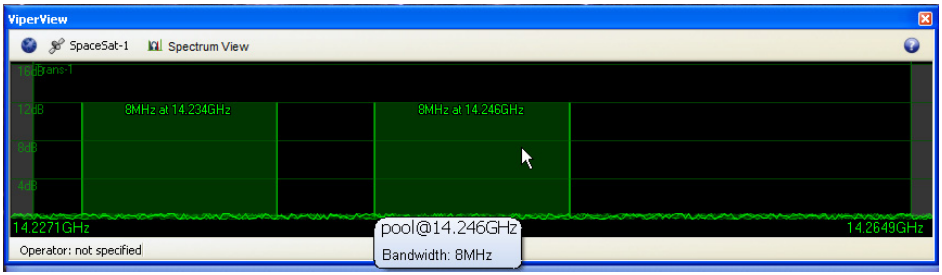

Figure 3-27 Bandwidth Pools, Spectrum View

Bandwidth Pool Management

Pool management provides the ability to enable/disable a pool during normal operation. By default the newly created pools are **Enabled** allowing bandwidth allocations. Alternatively each pool segment can be **Disabled** while carrier placements are active. The disabling of a pool blocks any new carriers from entering and any carriers remaining will stay until the next allocation.

Disabled pools are displayed in the spectrum view with darkened green area.

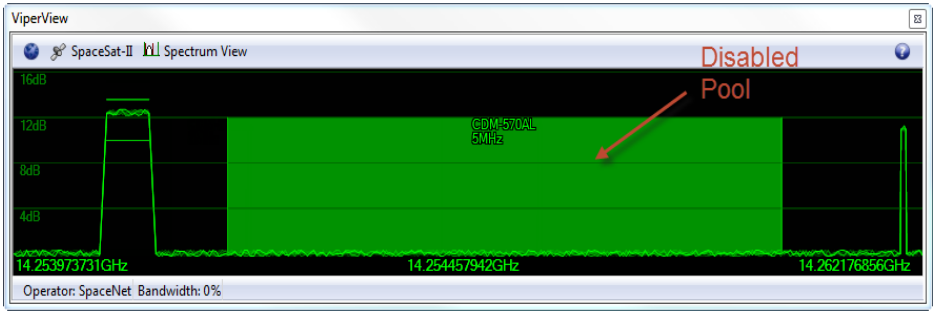

Figure 3-28 Disabled Pool, Spectrum View

NOTE

Note: When disabling a pool there **MUST** be other pooled bandwidth available or the system will error (No available bandwidth).

Bandwidth Pool Protection

The bandwidth allocation engine has built-in protection that blocks the removal or reduction of pool segments containing any active allocations. With this protection in place there is a series of extra steps required to modify or remove active pools.

Warning: Previous versions of VMS allowed deletion of bandwidth pool segments without any checks potentially leaving assigned carriers temporarily in limbo and possible database corruption.

Bandwidth Pool Deletion/Modification

The recommended method is to use **Exclusion** zones to reduce the size, fragment or eliminate an existing pool. Exclusion mapping deploys a method that when aligned over a pool with active carriers the manager will automatically move existing carriers contained within the exclusion bandwidth range. ***This assumes that sufficient additional bandwidth is available.***

Inserting an exclusion zone and selecting **Apply** the VMS will reassign carriers that are occupying bandwidth within that zone to available bandwidth. If there is no available bandwidth the **Apply** will error (No available bandwidth). Once correctly implemented the exclusion will prevent any new carriers from entering that restricted segment of bandwidth allowing the modification or deletion of the pool segment.

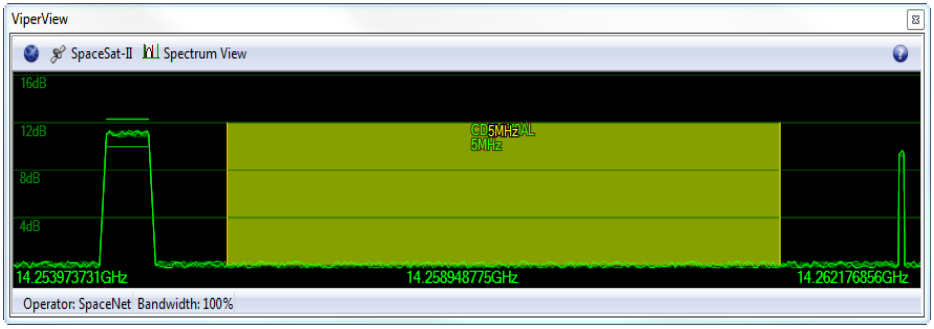

Figure 3-29 Exclusion Zone, Spectrum View

Caution: Sites with active reservations MUST have pooled bandwidth equal to or greater than assigned reservation bandwidth or the system will error.

Bandwidth Exclusion Zones

For network applications where portions of satellite bandwidth are to be reserved for use by externally managed carriers or bandwidth pool segments requiring modification, **Exclusion** zones can be implemented. Dynamic carriers are not allowed to utilize these segments of bandwidth, even in regions where a zone overlays an existing pool.

Although this masking of dSCPC bandwidth pools is typically performed manually it is possible to remotely automate. (see “Space Segment Exclusions” on page 6-44).

Manual operation is performed via Satellite Properties **Exclusions** dialog window (figure 3-30).

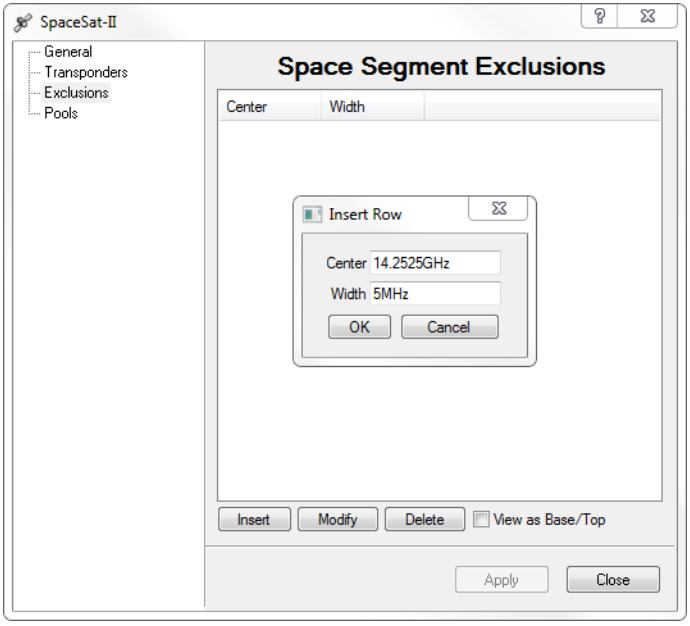

Figure 3-30 Space Segment Exclusions dialog

For each exclusion zone, **Insert** an entry into the table by entering a center frequency and width or defining the **Base** and **Top** frequencies when view as Base/Top is selected.

Once the segment has been declared, it will by displayed in the Spectrum View as a shaded yellow region, figure 3-31.

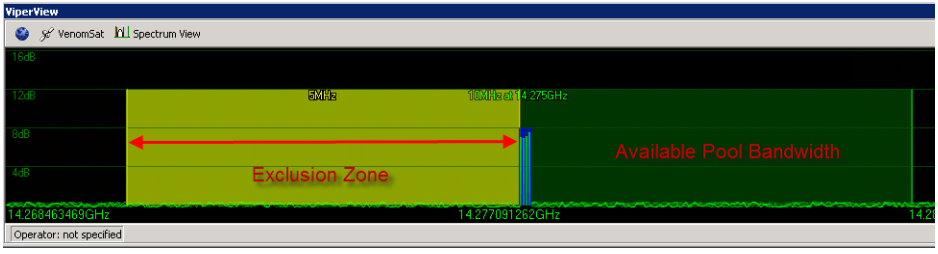

Figure 3-31 Exclusion Zone, Spectrum View

Spectrum View Animation

There are controls for the Satellite Spectrum view to help increase response time when displaying this window during a ViperView session. The animation of carriers in the display typically requires increased bandwidth on the remote connection to the VMS server, which could cause a slower response time in ViperView. The operator has the ability to adjust the refresh rate of the RF display—setting it to *Fast*, *Slow*, or *Off*—so that this effect is minimized. An *Automatic* setting option disables animation during Remote Desktop (RDP) connections and provides Fast refresh for direct ViperView access.

Click on the Spectrum View button in the menu bar at the top of the window to display the Animation drop-down menu. Select the desired refresh option.

Spectrum View Scale

There are controls for Satellite Spectrum View scale to help change the S/N level for carriers that are greater than 16dB Es/No in signal strength.

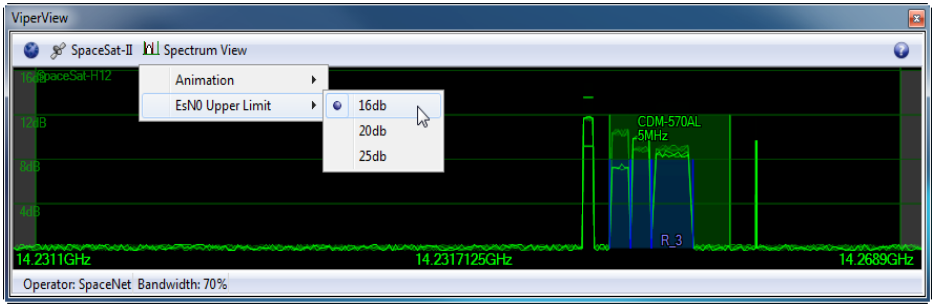

Figure 3-32 Es/No Scale Limit, Spectrum View

Click on the Spectrum View button in the menu bar at the top of the window to display the Es/No Upper Limit drop-down menu. Select the desired scale level.

Additionally the bottom on the Spectrum View displays the total percentage of pooled bandwidth in use with this transponder.

Create Site Level RF Chain

Here, the Hub antenna(s) with associated converters and the initial Remote antenna(s) with associated converters will be created. The binding of the unit modulators and demodulators to their designated converters will then be performed. Later in the configuration process (Network Manager Configura-

tion), the Vipersat *Remote Site Wizard* feature will be used to create the RF chain for the other Remotes.

Create Antennas

The following steps cover creation of the network antennas. Each antenna is a site container for upconversion/downconversion and modem devices. First create the Hub antenna(s), followed by the initial Remote antenna(s), as described below.

1. Right-click on the Satellite icon and select **Create Antenna** from the drop-down menu.

2. In the General dialog of the Create Antenna window (figure 3-33), enter the **Name** to be used for identifying this antenna. Entering the **Operator** and **Contact Information** is optional.

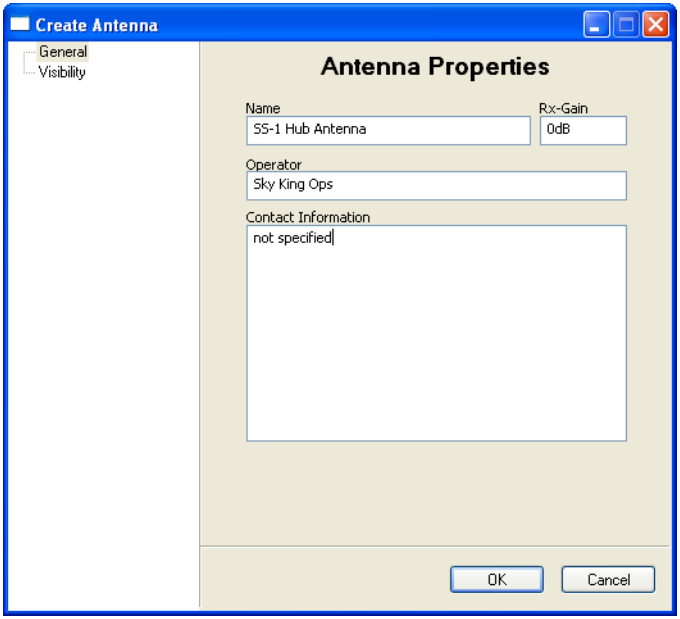

Figure 3-33 Create Antenna dialog

3. Set the Antenna **Receive-Gain** for the Mesh Compensation Factor.

Warning: If gain is set on <u>any</u> antenna, it must be set on <u>all</u> antennas that belong to the same satellite. This includes all Hub and Remote antennas. Failure to do so will result in a network imbalance that may cause the satellite to overdrive a site that is set incorrectly.

Refer to link budgets and antenna manufacture specifications for gain settings. If meshing is not required, leave Rx-Gain at the default setting of 0 dB.

This feature applies a power delta between any meshed Remote sites. The Hub is used as the reference value when calculating a power delta value between Remotes with smaller antennas. This is accomplished through comparing its receive gain to the gain differences between Remotes.

During a mesh switch setup, the VMS compares the delta values and modifies the power adjustments at each Remote site to compensate for differences in receive gain. If DPC is enabled, the system will then further fine tune power to the targeted configuration values.

If multiple Remotes are involved in a SHOD connection, the VMS uses the lowest Remote gain value for compensation control.

4. Select the Visibility dialog to configure the **Antenna Visibility** range, as shown in figure 3-34.

Caution: Unless specific limitations are required for the antenna range, the recommended (default) settings are 500 GHz center frequency and 1 THz bandwidth (or, the equivalent, 0 Hz Base and 1 THz Top). Refer to *Appendix B, "Antenna Visibility"*, for more information on this feature.

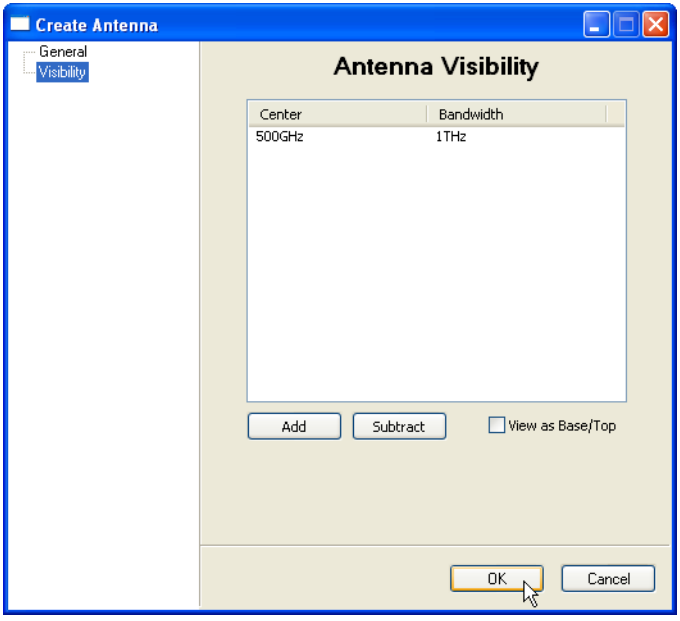

Figure 3-34 Antenna Visibility, Default Settings

5. Click on the **OK** button to complete the antenna creation.

   The new antenna will appear under the satellite in the ViperView window.

6. Repeat the previous steps to create additional antennas.

Create Antenna Devices

The following steps cover the creation of the antenna Up converters and Down converters.

1. Right-click on an Antenna icon and select **Create Up Converter** (figure 3-35).

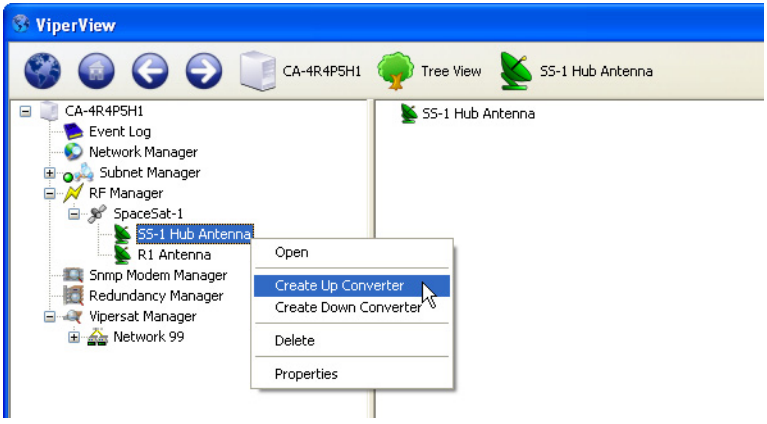

Figure 3-35 Create Up Converter menu command

2. The dialog box shown below (figure 3-36) will open. Specify a **Name** for this device.

   It is important to ensure that the Up Converter **Frequency** setting is correct, as this is a very common source of error which breaks the switching engine.

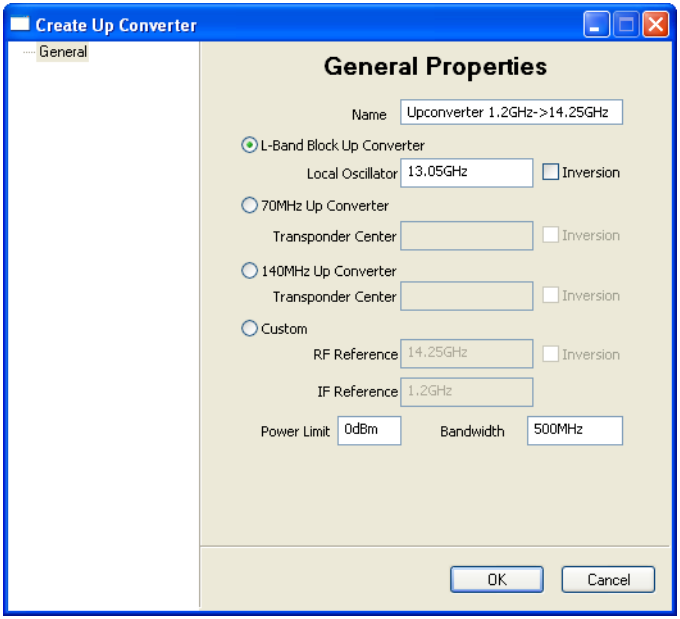

Figure 3-36 Create Up Converter dialog

Also, check the **Bandwidth** and **Power Limit** settings. If the RF hardware does not exactly match the satellite parameters, the Bandwidth setting may have to be changed.

Contact the Vipersat Network Product Group CTAC for further information.

3. Click on **OK** to enter this device as the Up converter for this antenna.

4. Right-click on the Antenna icon again and select **Create Down Converter**.

5. The dialog box shown below (figure 3-37) will open. Specify a **Name** for this device.

Ensure that the Frequency setting here also is correct.

6. Click on **OK** to enter this device as the Down converter for this antenna.

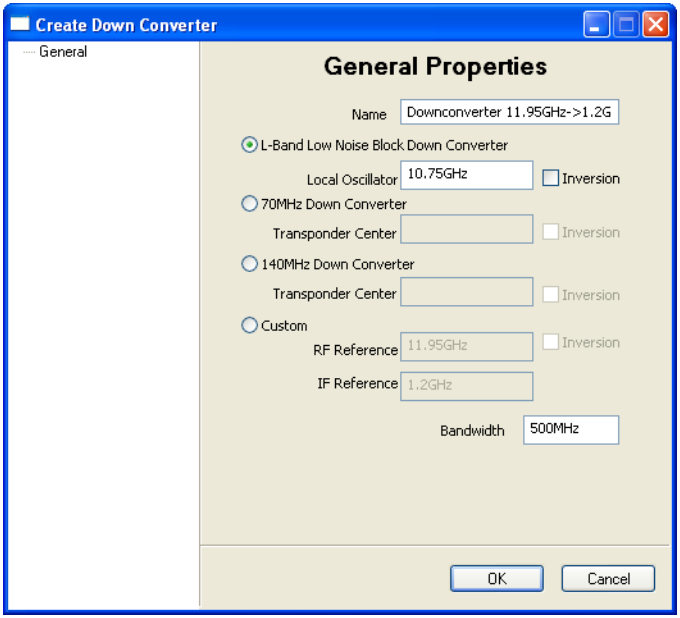

Figure 3-37 Create Down Converter dialog

7. Notice that the newly created Up and Down Converters appear in the Antenna View (figure 3-38).

Click to select the antenna in the left window panel, then click on the [+] in front of the antenna in the right window panel to expand the view and display the converters.

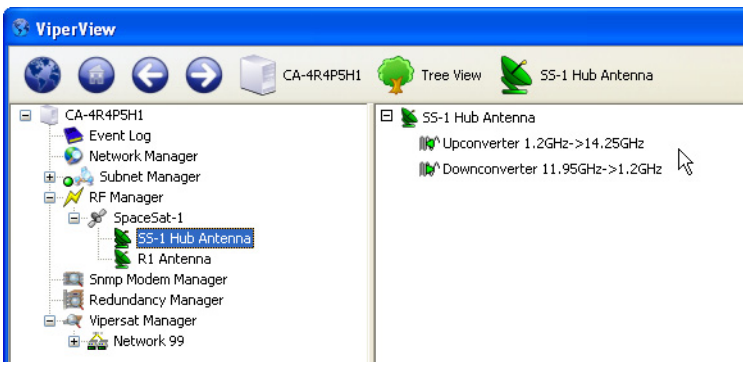

Figure 3-38 Converter Icons in Antenna View

8. Repeat the create converters process for all antennas.

Bind Modulators and Demodulators to Converters

The following procedure associates the Modulator for each unit at a site with the Up converter for that site's antenna, and associates the Demodulator(s) with the Down converter. This portion of the configuration is performed using the RF Manager in conjunction with either the Subnet Manager or the Vipersat Manager.

The method illustrated below uses the RF Manager with the Subnet Manager.

1. From the RF Manager tree view list in the left window panel, select the first site antenna for configuration (the Hub Antenna is used in this example).

   The antenna and its converters are displayed in the right window panel (figure 3-38).

2. Expand the Subnet Manager tree down to the Modulator and Demodulator level for the first modem unit that will utilize this Antenna (here, the Hub Burst Controller).

3. Click-hold on the Modulator device icon in the left panel, drag it to the right panel and drop it onto the Up Converter (figure 3-39).

   The device appears under the Converter as shown in figure 3-40.

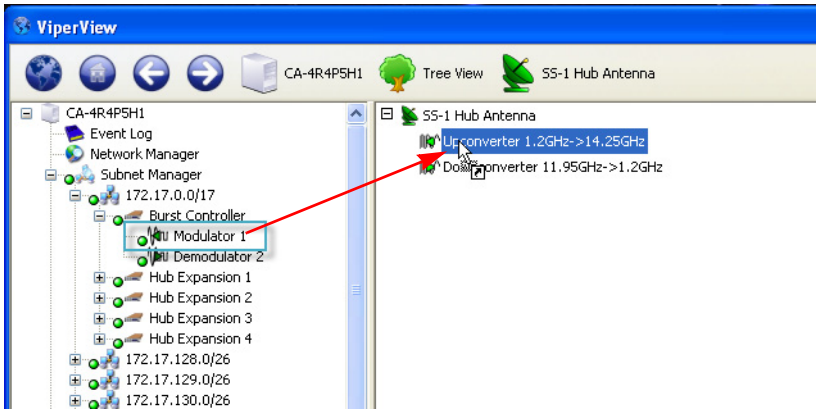

Figure 3-39 Binding Modulator to Up Converter

4. Click-hold on the Demodulator device icon, then drag-and-drop it onto the Down Converter.

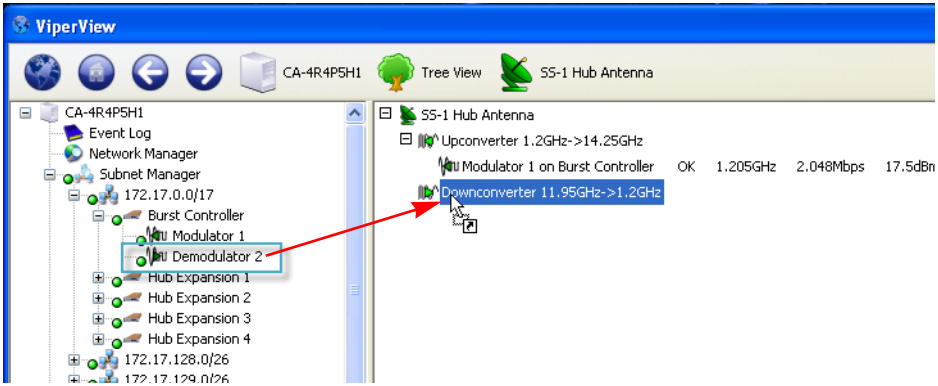

Figure 3-40 Binding Demodulator to Down Converter

As soon as the Hub BC binding is complete, the STDMA and the TDM carriers will appear in the Spectrum view. Note that the TDM carrier is displayed in red due to the fact that a power value has not yet been reported from a receiving Remote. The STDMA carrier appearance will vary between green and red, as the accuracy of the Eb/No values received by the BC may fluctuate due to the rapid locking/unlocking behavior.

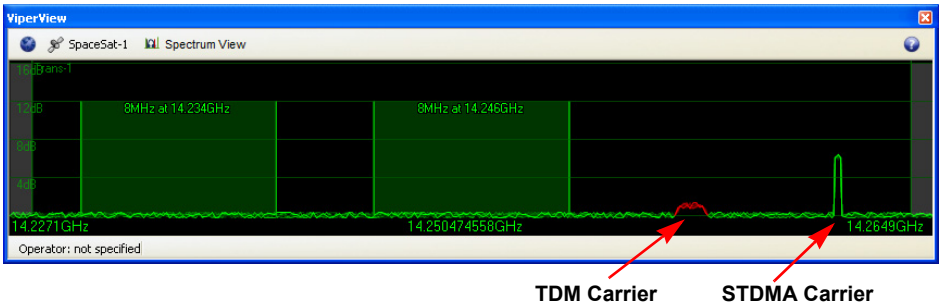

Figure 3-41 STDMA and TDM Carrier Appearance

5. Repeat the above steps for each additional unit at this site.

Now that the binding procedure for the first unit has been completed with the understanding of the relationship between the modem devices and the converters, perform all subsequent bindings by simply dragging the modem unit and dropping it directly onto the antenna. This abbreviated method will automatically bind the mods and demods with the up converters and down converters.

6. Select the next site antenna and perform the binding procedure for the units at that site.

Once at least one Remote site binding is completed, the TDM carrier display will change to green (figure 3-42).

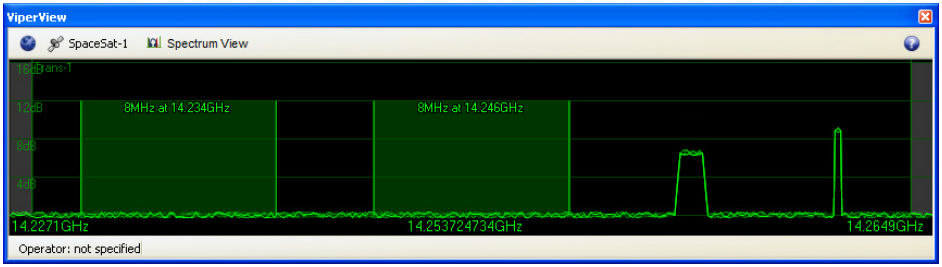

Figure 3-42 TDM Carrier Appearance Change

7. Continue the binding process until all site devices have been bound to their respective antenna's converters.

Network Manager Configuration

The remainder of the VMS configuration will involve the Network Manager, which will serve as the primary source within ViperView for managing network functions. The networks, and their associated elements, that are created in the Network Manager are *virtual*, and thus can be added and removed without affecting the actual networks upon which they are based. The source locations of the elements that are displayed in Network Manager originate from within the other VMS service managers.

A powerful feature that is provided for building the Remote sites is the *Remote Site Wizard*. Using this tool, a new Remote site can be configured very rapidly based on an existing reference site. The reference site and its associated settings serve as a template from which the new site will be built. In this way, a large number of remote sites can be easily generated.

In the first portion of this section, the method for creating and configuring sites using a manual procedure is covered. Although this method can be used for all network/group sites, it is recommended that only the Hub site(s) and the initial Remote site(s) be built this way. The remaining Remote sites should be generated using the automated method as described in the sub-section “Remote Site Wizard” on page 3-91.

Caution: Be aware that the two RF element types in Network Manager—satellites and antennas—can be taken out of Network Manager using two distinctly different methods:

- Using the **Delete** command – This deletes the element from Network Manager as well as from RF Manager, where it originated.
- Using the **Remove** command – This removes the element from Network Manager only.

Network Build Procedure

Create Network(s)

1. From the tree view list, right-click on the Network Manager icon and select **Create Network** (figure 3-43).

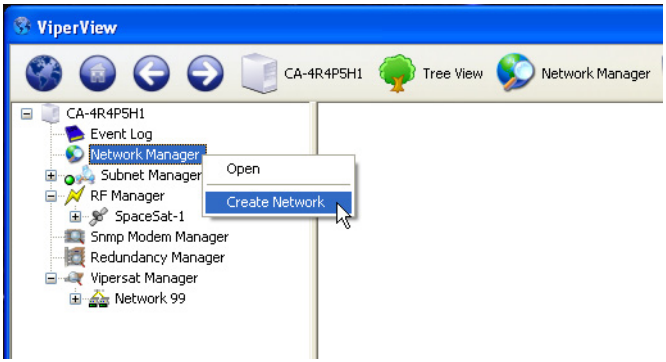

Figure 3-43 Create Network menu command

2. In the Create Network dialog that opens (figure 3-44), enter a **Network Name** and click **OK**.

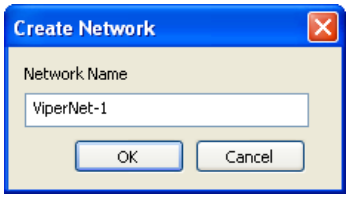

Figure 3-44 Create Network dialog

3. Expand the Network Manager view to expose the new Network container icon.

4. Repeat the above steps to create additional network containers, as required by the *Administrator's Network Plan*.

Create Groups

Group containers are optional and are used to help organize very large network structures, providing an intermediate level between the Network and its Site containers. For networks that will not utilize this feature, proceed to the following section, *Add Network/Group Satellite(s)*.

1. Select **Create Group** from the Network drop-down menu, as shown in figure 3-45.

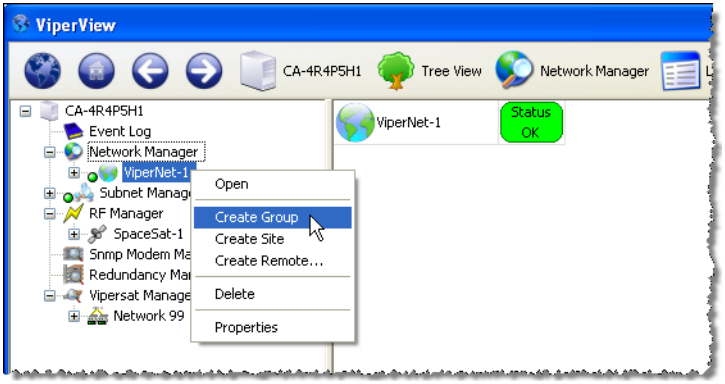

Figure 3-45 Create Group menu command

2. Enter a **Group Name** in the Create Group dialog, then click **OK**.

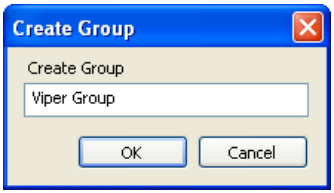

Figure 3-46 Create Group dialog

3. Repeat the above steps to create additional group containers, as required.

Add Network/Group Satellite(s)

Satellites can be associated with either a Network or a Group by dragging from RF Manager and dropping onto either element container. A satellite that is placed at the Network level will be available to all Groups and Sites under that network. A satellite that is placed at a Group level will only be available to the Sites under that group.

Note that once a satellite is dropped onto an element, it can not then be dragged out of that element and dropped onto another element, say from a Network to a Group. The satellite must be removed from the first element, then dragged from the RF Manager (the originating container) and dropped onto the other element.

1. Locate the satellite for this network/group in RF Manager, click-hold and drag-and-drop it onto the network/group icon as shown in figure 3-47.

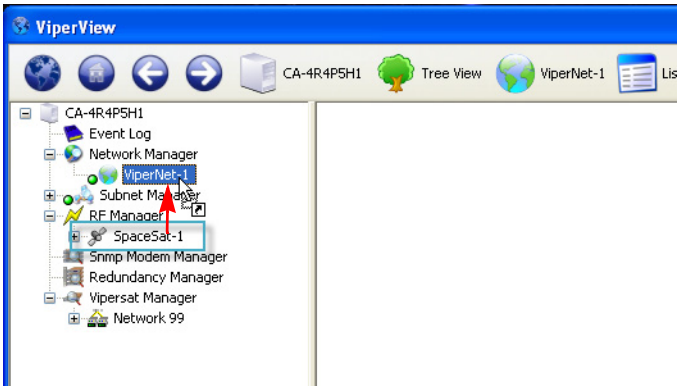

Figure 3-47 Drag Satellite to Network

2. If there are multiple satellites and/or networks/groups, repeat this drag-and-drop process as required.

3. Expand the network/group tree view to expose the satellite appearance(s).

Create Sites

Site containers are used to hold the antenna and subnet for a Hub or Remote site. This procedure follows the manual method for creating the Hub site(s) and the initial Remote site(s).

1. Select **Create Site** from the Network (or from the Group, if the site is to be a member of an existing group) drop-down menu, as shown in figure 3-48.

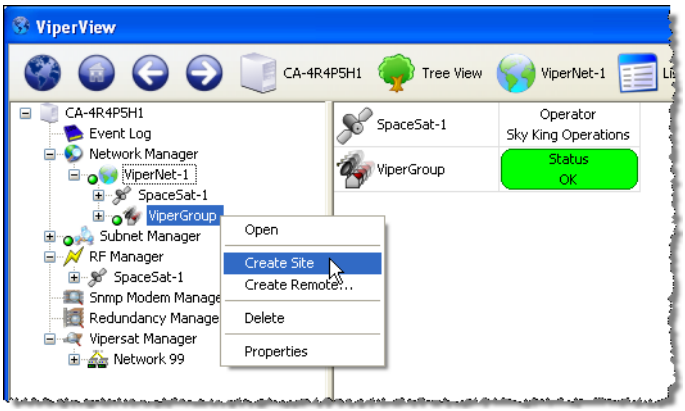

Figure 3-48 Create Site menu command

2. Enter a **Site Name** in the Create Site dialog, then click **OK**.

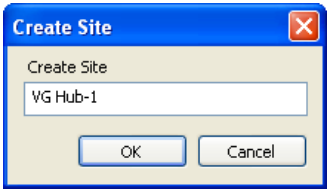

Figure 3-49 Create Site dialog

3. Repeat the above steps to create all necessary Hub and Remote site containers for this network.

NOTE

Note: It is recommended that, for each network, at least one Remote site container be created and configured as documented in the following sections. The remaining Remote sites can then be built as described in "Remote Site Wizard" on page 3-91.

Add Site Devices

1. Select the site antenna from the RF Manager satellite list, click-hold and drag-and-drop it onto the appropriate site (figure 3-50).

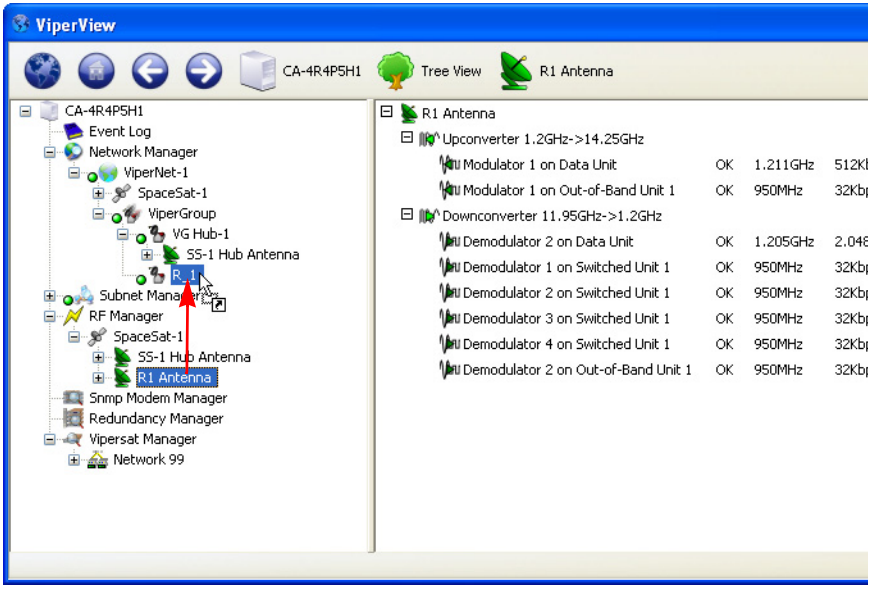

Figure 3-50 Drag Antenna onto Site

Alternative Method: Drag the antenna from under the satellite appearance in Network Manager.

2. Repeat this process for all antennas and sites.

3. Select the site subnet from the Subnet Manager list, click-hold and drag-and-drop it onto the appropriate site (figure 3-51).

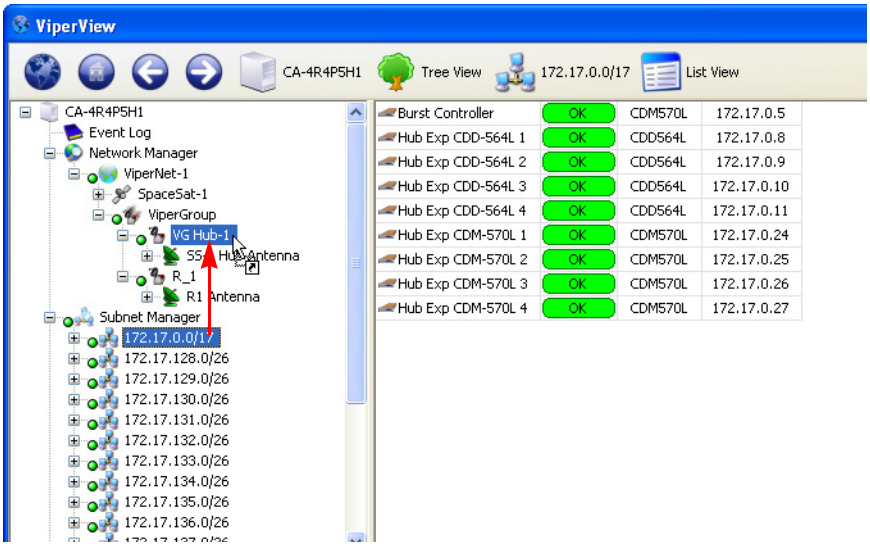

Figure 3-51 Drag Subnet onto Site

4. Repeat this process for all subnets and sites.

Set Carrier Flags

Carrier flags provide carrier type information to the system switching function. Each modem device (Modulator and Demodulator) is represented to the switching function as a transmission mode type (None, SCPC, or STDMA). These carrier flags set up the database for a starting point or home state condition. Additionally, there are flags to indicate availability of units for the switching resource manager.

Set STDMA Flag

It is important for the operator to set the STDMA flag on the network burst controller(s). The VMS sets the flags for the other network devices automatically.

1. Right-click on the BC demodulator and select **Properties** from the drop-down menu (figure 3-52).

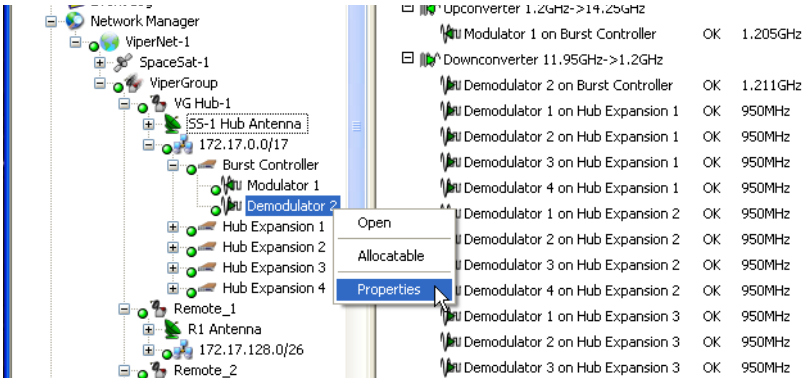

Figure 3-52 Hub BC Demodulator Properties menu command

2. The dialog appearance with the correct setting is shown in the figures below.
   - For a *CDM-570/570L Burst Controller*, select the **Modem** dialog, then select the **STDMA** radio button, figure 3-53.
   - For an *SLM-5650A Burst Controller*, select the **Burst Controller** check box, figure 3-54.

     Note for SLM-5650A Hub BC redundancy configurations: Do **NOT** select the Burst Controller check box on *redundant units*. This flag is unnecessary and may cause network communication problems. Should a failover occur, the redundant unit will be automatically configured exactly as the online unit, and this flag will be set correctly at that time.

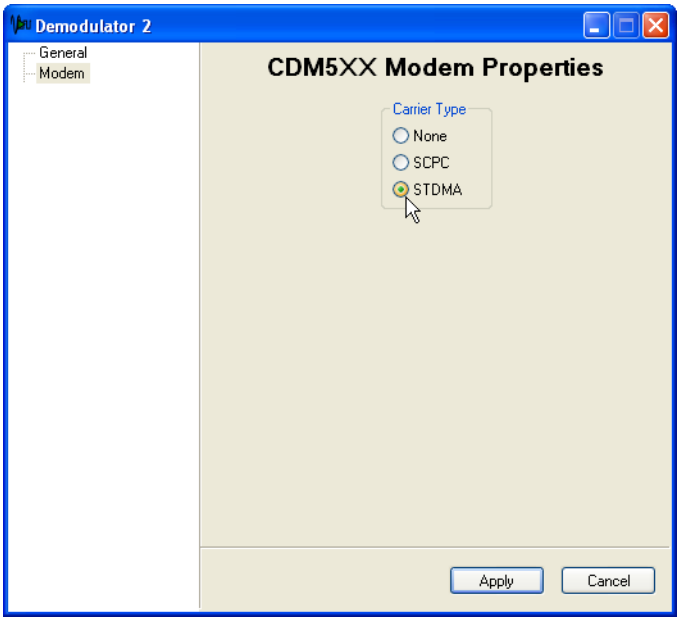

Figure 3-53 Carrier Flag Setting, Burst Controller—CDM-570/570L

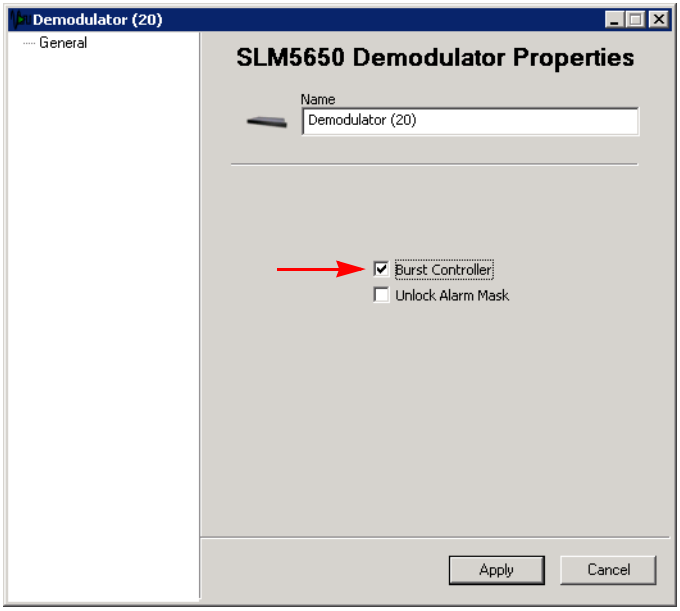

Figure 3-54 Carrier Flag Setting, Burst Controller—SLM-5650A

3. Click on the **Apply** button, then Close the window.

Set Mod and Demod Allocatable Flags

To make switching modulators and demodulators at the Hub and mesh demodulators at the Remotes available to the VMS for switching functions, the Allocatable flag for these devices must be set.

1. Expand the Network Manager tree to expose the Hub Antenna and select it.

2. In the right window panel, right-click on each allocatable modulator/demodulator and select **Allocatable** from the drop-down menu, as shown in figure 3-55.

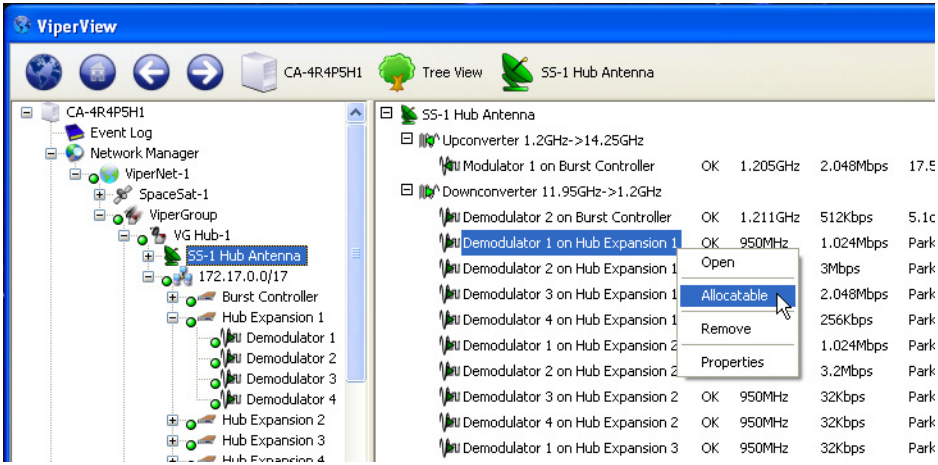

Figure 3-55 Allocatable Flag, Expansion Demod

Tip: The *Multi-Select* feature can be used to set the Allocatable flag for multiple devices at one time. Use the standard **Ctrl-click** and **Shift-click** key-mouse combinations to make the desired selections.

3. Repeat the previous steps for each network Antenna (Hub and Remote) that supports allocatable modulators and/or demodulators.

Before a mod/demod is made allocatable, its status appears as *Blocked*. The status changes to *Available* after the device is made allocatable. Note that it may be necessary to perform a Refresh command in order for the status to be updated. Click on the Antenna View icon in the Menu Bar and select **Refresh** (figure 3-56).

Note that a device that has been made Available can be changed back to Blocked. And, even a device that is presently active/allocated can be preset to blocked so that it will be flagged as non-allocatable as soon as it changes state from Active to Inactive.

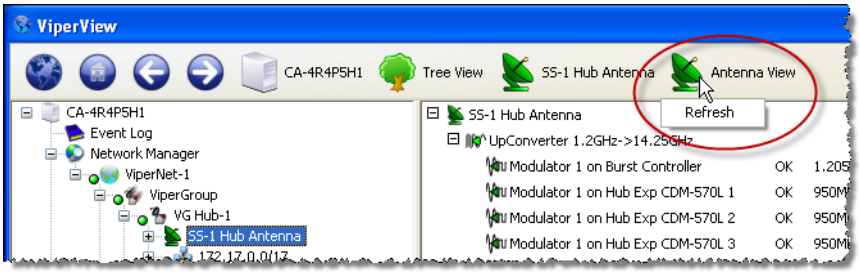

Figure 3-56 Antenna View Refresh

Mask Rx Unlock Alarms

Setting the Alarm Masks

The network alarm function must operate properly to ensure that, when an alarm condition is triggered, the generated alarm alerts the operator to an actual problem. If there are spurious alarms, or alarms which have no operational meaning, the operator may become desensitized and critical network failures can be missed. This section addresses masking alarms that represent normal network conditions. The VMS allows the masking of these nuisance alarms so that system operators can manage the network pro-actively and respond quickly to alarm indicators.

In a Vipersat network, there are burst controllers that are locking and unlocking multiple times per second, and expansion units whose normal parked or quiescent state is to be unlocked. Perform the following procedure for all network units that function as either a Burst Controller or an Expansion unit.

NOTE

Note: On SLM-5650A units, masking is automatically configured in the VMS when the modem is set to **Hub** type and configured as a **Burst Controller** (Selective TDMA is enabled).

1. From the *Tree View*, select the unit and open the Properties window.

   For CDM-570/570L and CDD-56X units, right-click on the unit icon and select **Properties** from the drop-down menu (figure 3-57).

   For SLM-5650A units, right-click on the modulator/demodulator icon and select **Properties** from the drop-down menu (figure 3-58).

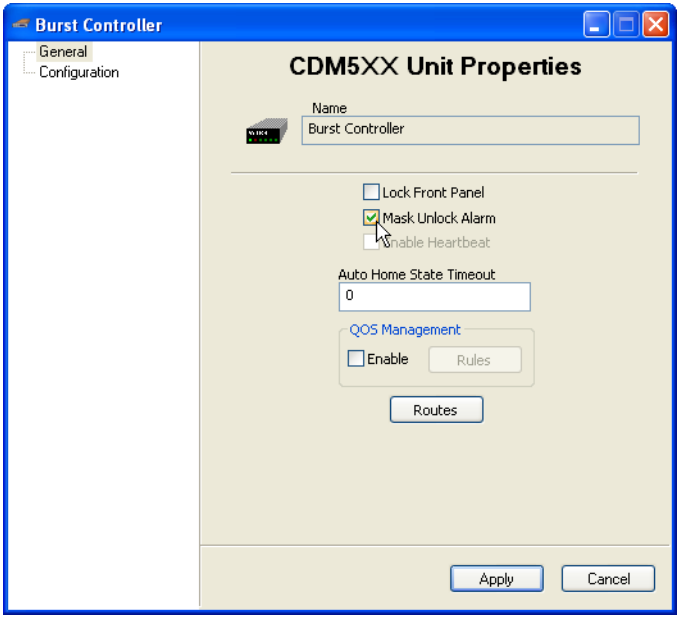

Figure 3-57 Mask Unlock Alarm, CDM-570/570L, CDD-56X

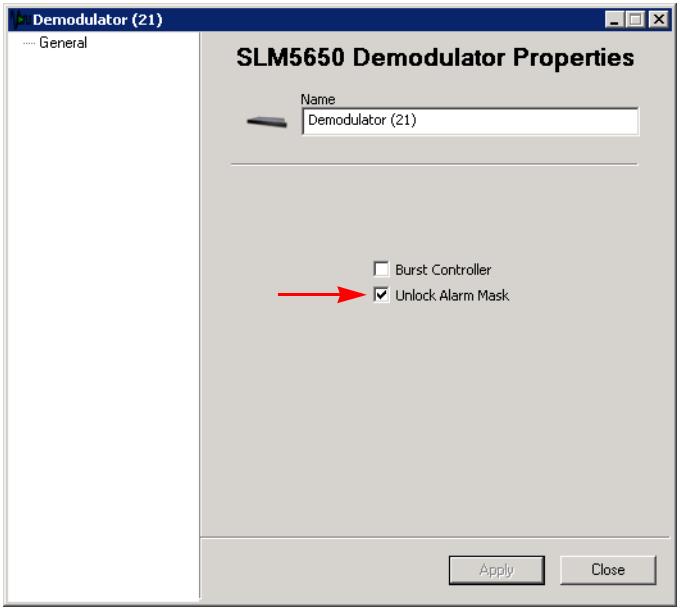

Figure 3-58 Mask Unlock Alarm, SLM-5650A

2. In the General dialog, select **Mask Unlock Alarm**, then click on **Apply** and Close the window.

3. In the following sequence, right-click on the unit icon again and select:
   - **Force Registration**
   - then, **Soft Reset**

   This will activate the flag in the modem and clear any latched alarms.

Tip: Again, the *Multi-Select* feature can be used to perform common operations on multiple units/devices at a time.

Auto Home State

A critical feature of Vipersat Networks is the modem Home State. Since the topology of the network is changing on the fly, it is necessary to ensure that Remote units will recover from a communications outage in a known state. If a Remote loses power, its home state parameters will cause it to boot up into its burst configuration, awaiting maps from the Hub. Knowing this, the VMS can free up assets (switched demodulators and bandwidth) if it loses communications with a Remote for a settable period of time. This is the Auto Home State concept.

The recovery cycle is automatic when the Auto Home State parameter is enabled in the Remote unit.

The Auto Home State parameter is preset for four (4) minutes (default). To change this setting, perform the following steps on each Remote data unit.

Do *not* perform this procedure on an Expansion unit, *nor* on a Hub unit.

1. From the *Tree View*, right-click on the Remote data unit and open the **Properties** window(figure 3-59 or figure 3-60).

2. In the General dialog, enter a time (in minutes) for the **Auto Home State** to take effect, then click on **Apply** and Close the window.

   The default value is 4 minutes. A value of **0** disables Auto Home State.

Caution: A Timeout of no less than 4 minutes is recommended; values less than 4 minutes may create undesirable recovery effects.

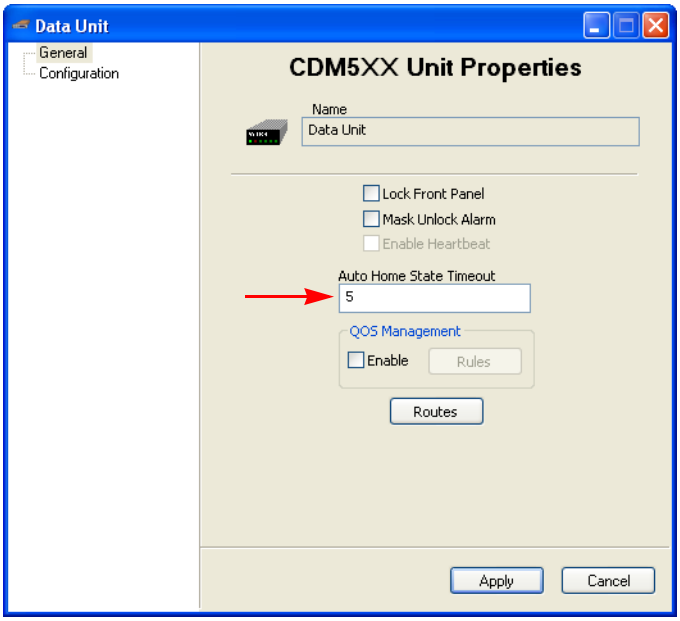

Figure 3-59 Auto Home State Timeout, CDM-570/570L

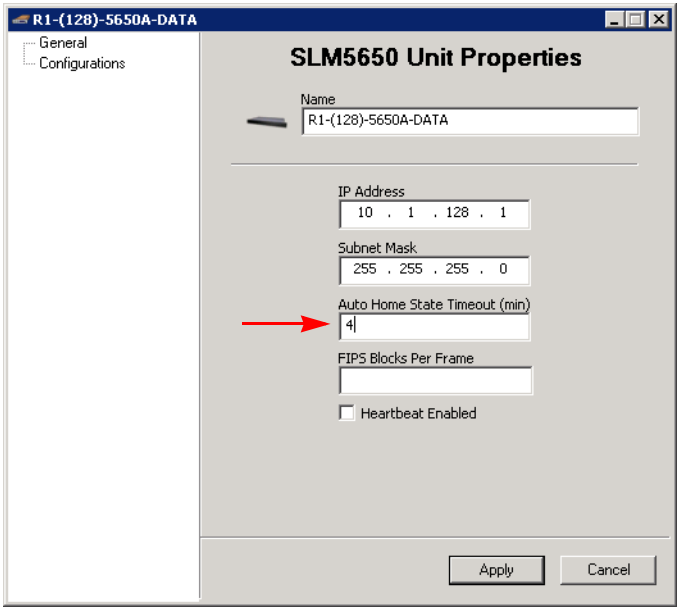

Figure 3-60 Auto Home State Timeout, SLM-5650A

3. Right-click on the unit icon again and select **Force Registration**.

This will force the parameter set in the modem. VMS will then set the parameter every time it registers the unit.

InBand Management Configuration

Dynamic carrier management is configured and controlled under the Network Manager, consolidating all operations per satellite within a specific network. Enabling InBand management activates VMS functionality for dynamic assignment of carriers, bandwidth pool management, and switching policies on a per Remote basis. InBand management is only configured for Remote sites, never for Hub sites.

Caution: Never set InBand management for a Hub site.

As described previously, all Remote sites in the network can be configured manually. However, the recommended practice is to manually create and configure one (or more) site(s) that will serve as a reference template for the remaining Remotes when using the Site Wizard tool.

The sequence for configuring InBand management is as follows:

- Activate InBand management, Tx and/or Rx
- Configure Home State and Switch Rate Limits
- Set Bandwidth Reservations
- Set Advanced Switching parameters—Data Rate and ModCods
- Set SHOD Limits
- Set Application Policies
- Define Distribution Lists

Set InBand Management

For each Remote site in the network that will require dynamic control of their carriers (nodes which are part of the switched network), perform the following procedure.

1. Right-click on the site and open the site's Properties window, then select the **InBand General Settings** dialog (figure 3-61).

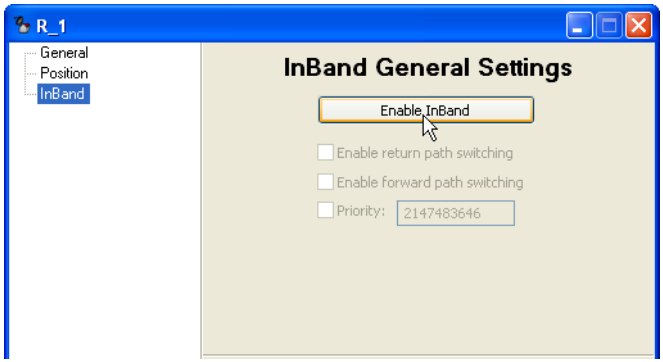

Figure 3-61 InBand General Settings dialog

2. Click on the **Enable InBand** button to activate the InBand parameter fields.

3. **Enable** the type of switching that this site will perform.

   return path switching — allows dynamic SCPC switching for establishing a Tx carrier from this Remote to the Hub. (Requires an expansion demodulator at the Hub.)

   RPS also allows this Remote to execute SHOD/mesh applications. (Requires an expansion demodulator at the receiving Remote(s), as well as one at the Hub.)

   forward path switching — allows dynamic SCPC switching for establishing a dedicated Tx carrier from the Hub to this Remote. (Requires an allocatable modulator at the Hub.)

   FPS must be enabled for a Remote that will perform Point-to-Point (P2P) switching with the Hub.

4. If required, activate and specify the **Priority** for this site.

   Priority levels can be assigned to sites as well as application policies. Resource allocation preference is based on the highest priority among contending sites and/or policies. Note that a *lower* number corresponds to a *higher* priority level. Priority **1** is the highest level (priority **0** equates to *No priority*). This setting defaults to the lowest level (2,147,483,646).

   The site priority level determines the likelihood that:

   - The requested bandwidth will be allocated, should there be contention with other Remote(s).
   - A carrier that is assigned to this site will get resized based on bandwidth availability. Sites with higher priority levels are more likely to retain

their requested bandwidth during periods of bandwidth contention than those sites that have lower priority levels.

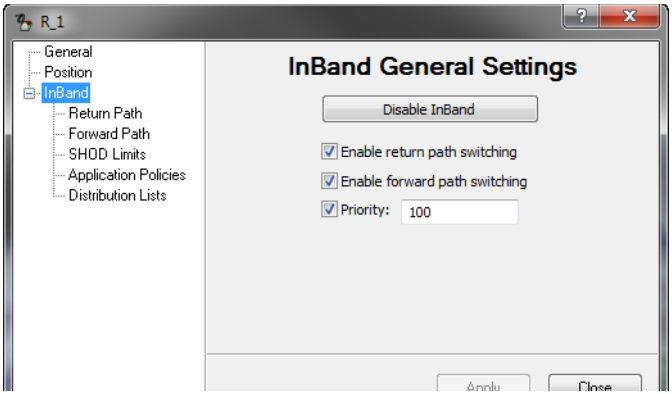

Figure 3-62 InBand Switching Enabled

5. If *return path switching* has been enabled, select the **Return Path** (Tx settings) dialog (figure 3-63) for configuration of the transmit Home State.

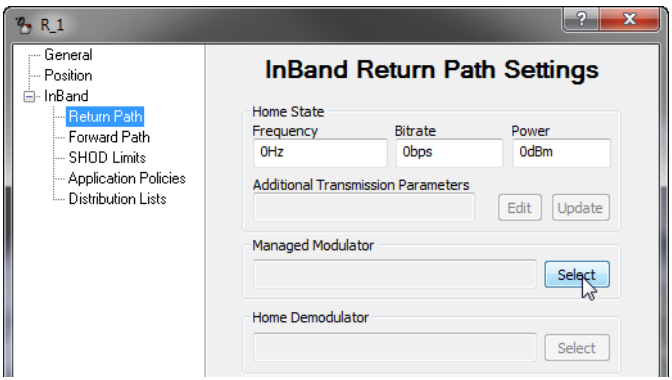

Figure 3-63 InBand Return Path Settings dialog

6. Select the *Remote modulator* for this site by clicking on the **Select** button for **Managed Modulator**.

7. In the Select Object window that opens, double-click on the **Antenna** icon for this Remote site to view the associated mods (figure 3-64).

8. Select the **Modulator** for this site's data modem (identified by modem type and IP address) and click **OK** to enter it into the Return Path Settings dialog.

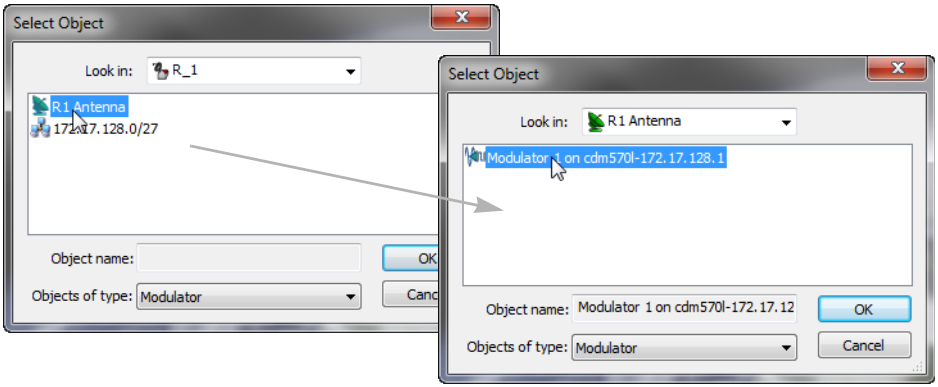

Figure 3-64 Select Remote Modulator

9. Next, select the *Hub demodulator* for this site by clicking on the **Select** button for **Home Demodulator**.

10. In the Select Object window that opens, double-click on the **Antenna** icon for the Hub site to view the associated demods (figure 3-65).

11. Select the **Demodulator** for this site's Hub Controller and click **OK** to enter it into the Return Path Settings dialog.

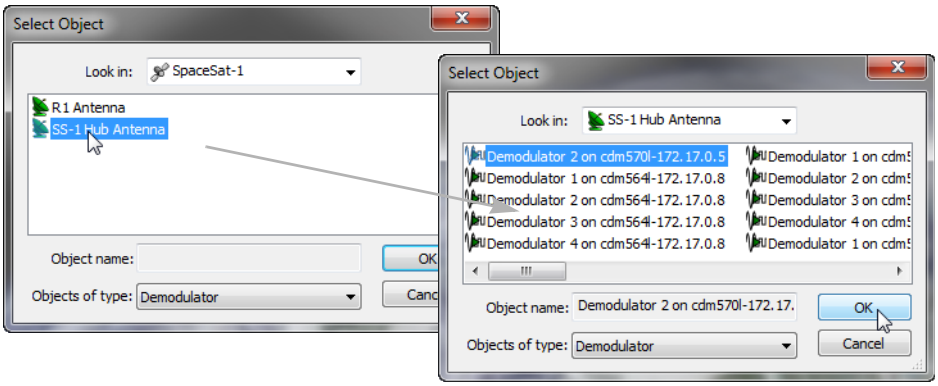

Figure 3-65 Select Uplink Demodulator

NOTE

Note: As soon as the Home Demodulator is chosen, a yellow alert icon appears next to the *Additional Transmission Parameters* field in the Home State box, as well as the *Return Path Settings* menu item. Clicking on the icon reveals a message warning that the current parameters for this field (none) are not valid for the Home Device that has been selected.

This can be corrected by using the **Edit** button, if the settings for the selected device are known. However, the **Update** button will pull the correct settings for this field, as well as for the other Home State fields.

12. In the Home State box, click on the **Update** button, then click **Yes** to confirm the settings (figure 3-66).

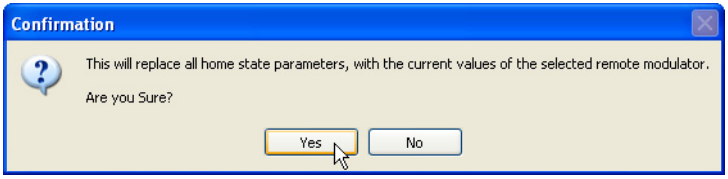

Figure 3-66 Confirmation, Home State Changes

The Frequency, Bitrate, Power, and Additional Transmission Parameters fields should populate with the values pulled from the chosen remote modulator, as shown in figure 3-67.

If the fields do not populate, communications with the Remote are impaired and will have to be restored before the site can be successfully InBanded for the return path.

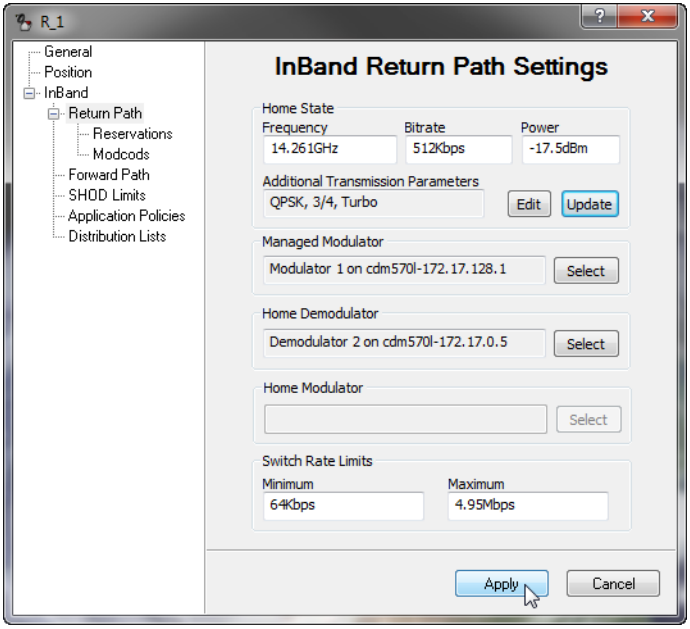

Figure 3-67 InBand Return Path Home State, Populated

13. If necessary, modify the **Minimum** and **Maximum** Transmit **Switch Rate Limits** for this site. These values set the transmission data rate range for governing the remote to operate within the budgeted switching constraints.

    Units must be included in the entry—use bps, kbps, or Mbps.
    The default values are 64 kbps and 4.95 Mbps, respectively.

If forward path (P2P) switching is not enabled for this Remote and it will be used in a roaming application, continue with the next step.
Otherwise, continue with the procedure after step 16.

14. Select the *Hub modulator* for this site by clicking on the **Select** button for **Home Modulator**.

15. In the Select Object window that opens, double-click on the **Antenna** icon for the Hub site to view the associated mods (figure 3-68).

16. Select the **Modulator** for this site's TDM (typically the Hub Controller, unless another modem is designated for the TDM) and click **OK** to enter it into the Return Path Settings dialog.

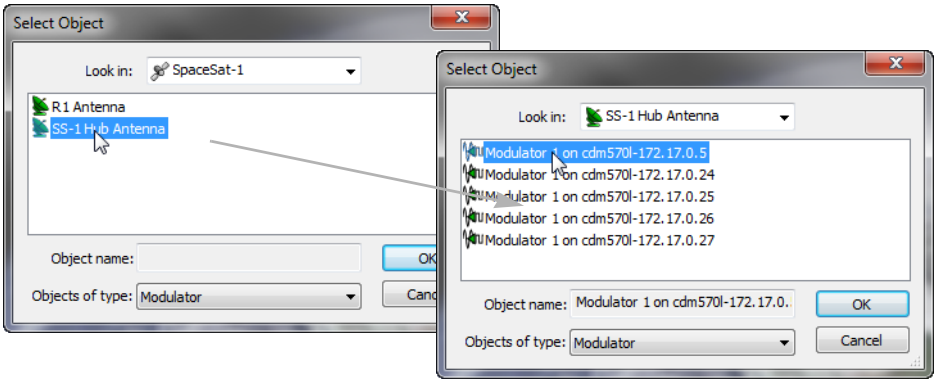

Figure 3-68 Select Downlink Modulator

At this point, the necessary fields in the InBand Return Path Settings dialog are populated, as shown in figure 3-69.

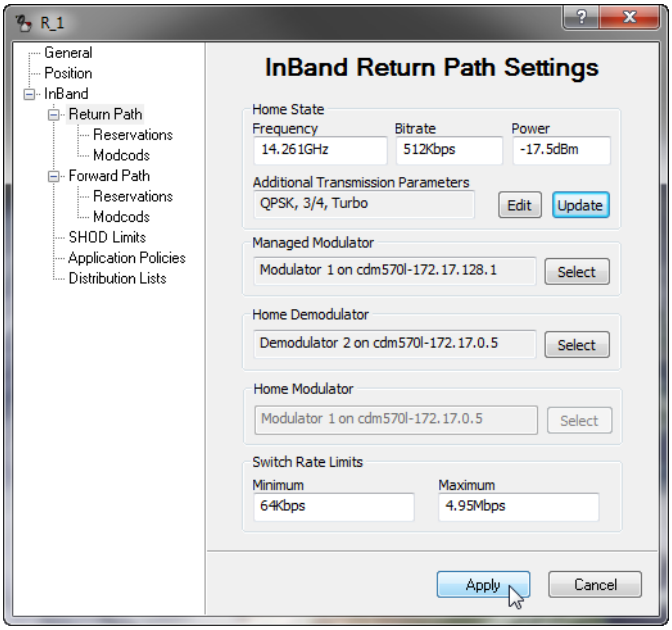

Figure 3-69 InBand Return Path Settings dialog, Populated

If this Remote has forward path (P2P or P2P/CnC) switching enabled, continue with the next step.
If **not**, proceed to step 27.

17. Select the **Forward Path** (Rx settings) dialog (figure 3-70) for configuration of the receive Home State.

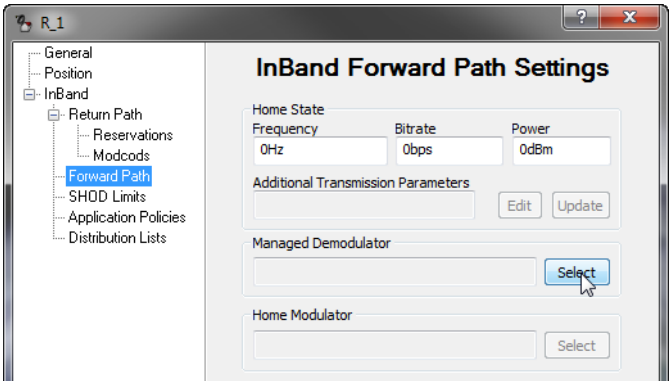

Figure 3-70 InBand Forward Path Settings dialog

18. Select the *Remote demodulator* for this site by clicking on the **Select** button for **Managed Demodulator**.

19. In the Select Object window that opens, double-click on the **Antenna** icon for this Remote site to view the associated demods (figure 3-71).

20. Select the **Demodulator** for this site's data modem and click **OK** to enter it into the Forward Path Settings dialog.

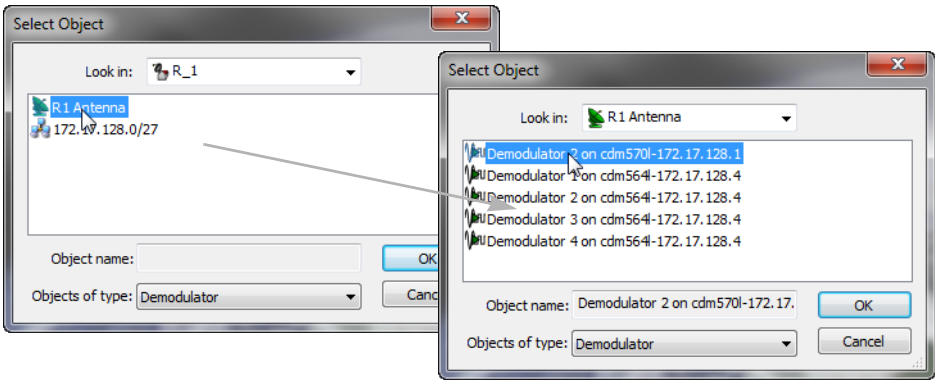

Figure 3-71 Select Remote Demodulator

21. Next, select the *Hub modulator* for this site by clicking on the **Select** button for **Home Modulator**.

22. In the Select Object window that opens, double-click on the **Antenna** icon for the Hub site to view the associated mods (figure 3-72).

23. Select the **Modulator** for this site's TDM (typically the Hub Controller, unless another modem is designated for the TDM) and click **OK** to enter it into the Forward Path Settings dialog.

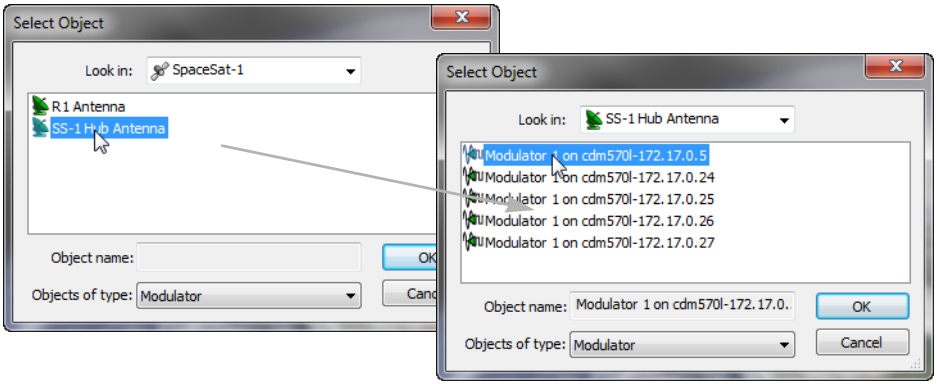

Figure 3-72 Select Downlink Modulator

24. In the Home State box, click on the **Update** button, then click **Yes** to confirm the settings.

The Frequency, Bitrate, Power, and Additional Transmission Parameters fields should populate with the values pulled from the chosen Hub modulator, as shown in figure 3-73.

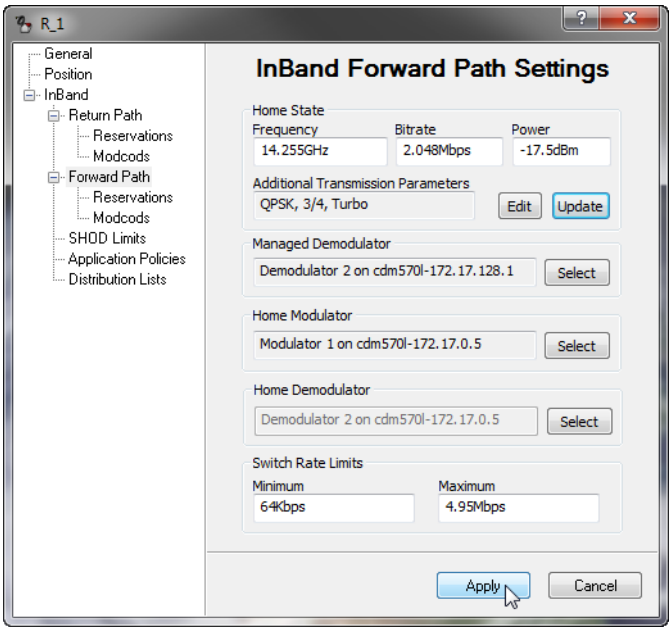

Figure 3-73 InBand Forward Path Settings dialog, Populated

If the fields do not populate, communications with the Hub are impaired and will have to be restored before the site can be successfully InBanded for the forward path.

NOTE

Note: The value that appears in the **Power** field corresponds to the Hub TDM setting. Because this setting is determined based on ensuring a link with the weakest Remote in the group, the value may be excessive for what this Remote requires. It is recommended that this value be adjusted per Remote as necessary to provide sufficient power under clear sky conditions.

25. The choice to select the Home Demodulator device is presented. However, note that this field is automatically filled with the selection made when the Return Path Settings were configured.

26. Set the **Minimum** and **Maximum** Receive **Switch Rate Limits** for this site. These values set the transmission data rate range for governing the remote to operate within the budgeted switching constraints

Units must be included in the entry—use bps, kbps, or Mbps.
The default values are 64 kbps and 4.95 Mbps, respectively.

27. Click on **Apply** to establish these new parameter settings in the VMS, then Close the window.

Repeat the above InBand procedure for all applicable Remotes.

Set InBand Reservations for Guaranteed Bandwidth

The InBand Bandwidth Reservation ensures that the Remote is always guaranteed bandwidth up to the rate that is specified. Beyond that, the Remote will only be granted additional bandwidth when it is available. Should system conditions occur that require some Remotes' data rates be reduced due to a shortage of bandwidth resources, those Remotes that own pre-allocated reservations will never be reduced below their guaranteed rate.

Reservations can be configured independently for the Transmit modulator and the Receive demodulator of a Remote data unit. Perform the following procedure for setting the InBand Tx Bandwidth (when return path switching is enabled) and/or the InBand Rx Bandwidth (when point-to-point forward path switching is enabled).

1. Open the Properties for the Remote site and select the **InBand Return Path Reservations** menu item.

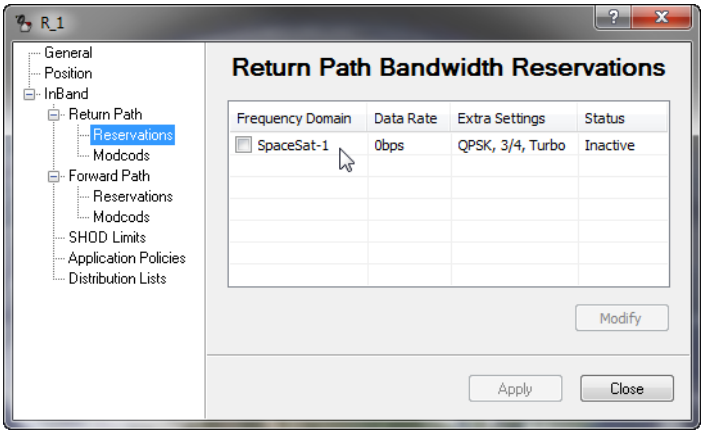

Figure 3-74 InBand Return Path Bandwidth Reservations dialog

Setting a data rate in this dialog will reserve a segment of bandwidth for the Remote ensuring that, at last resort (no additional bandwidth available), the Remote will be dropped to the rate specified here—its CIR—until excess bandwidth is once again available to be allocated.

Caution: Before enabling ANY Remote for Bandwidth Reservation, a Bandwidth Pool MUST have been created to allow the system to set guaranteed rates. See “Create Bandwidth Pools” on page 3-29.

Caution: Before enabling ANY Remote for Bandwidth Reservation, Hub expansion demodulators MUST have been made Allocatable to allow the system to set guaranteed rates (see “Set Mod and Demod Allocatable Flags” on page 3-52). To ensure that all reservations will be met, there must be a Hub expansion demodulator for each Remote site that has a CIR.

2. Click to highlight the satellite table entry, then click on the **Modify** button to open the Edit Reservation dialog (figure 3-75).

   Specify the desired data rate for guaranteed bandwidth as follows:

   For *Standard Reservation* setting, enter the value for the site’s guaranteed rate as the **Ideal Rate**, making sure that the value entered does not exceed the *maximum switch rate* (InBand Bandwidth Policy setting). Do not activate the Minimum Rate parameter.

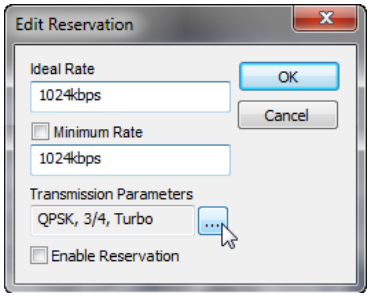

Figure 3-75 Edit Reservation dialog

For *Carrier Presence Switching* applications, enter the value for the site's oversubscription rate as the **Ideal Rate**, and activate the **Minimum Rate** parameter and enter the guaranteed rate. Refer to the section *"Carrier Presence Switching"* on page E-36 for additional information on this feature and its configuration.

Note that the default setting is **0** bps. Units must be included in the entry—use bps, kbps, or Mbps.

3. Select the Transmission Parameters **Extra (...)** button to set FEC & Modulation required for this CIR.

Clicking on a parameter will display the pull-down menu for that item. Set the parameters as required, then click on **OK**.

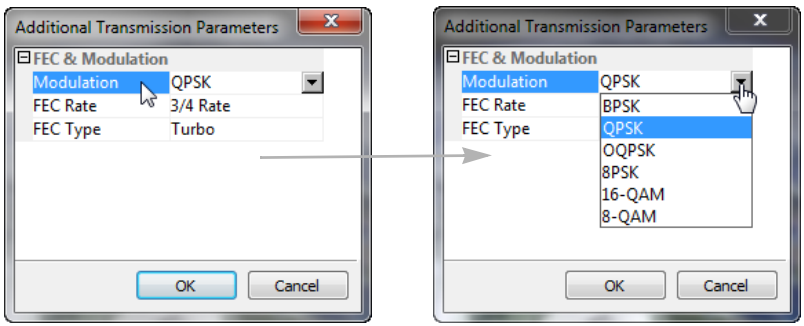

Figure 3-76 Edit, Additional Transmission Parameters

4. Click in the **Enable Reservation** check box to select this bandwidth reservation for the satellite, then click **OK**.

5. Click on **Apply** to define the guaranteed rate for this Remote.

Observe the **Status** of this reservation that is displayed in the far right column of the table; the Inactive label should change to Active, indicating that the reservation was accepted, as shown in figure 3-77.

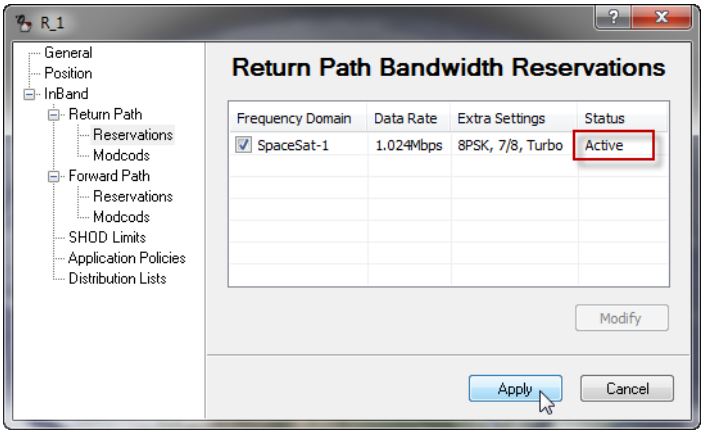

Figure 3-77 Bandwidth Reservation Applied

If the attempt was not accepted, the label Unavailable will be displayed, followed by information explaining the error—insufficient bandwidth available, or insufficient hardware (expansion demod) available.

6. Should an error occur with this reservation, correct the mis-configuration that caused the error, then re-apply the reservation.

Note that the reservation can be Activated or Inactivated as desired by checking or unchecking the satellite and clicking **Apply**.

7. If forward path switching is enabled for this Remote, repeat steps 1 through 6 for configuring the **InBand Rx Reservations**.

8. Close the Properties window for this Remote.

9. Open the **Satellite Reservations** window to view the currently assigned (per individual remote, and total) and available bandwidth for reservations on this satellite (figure 3-78 and figure 3-79).

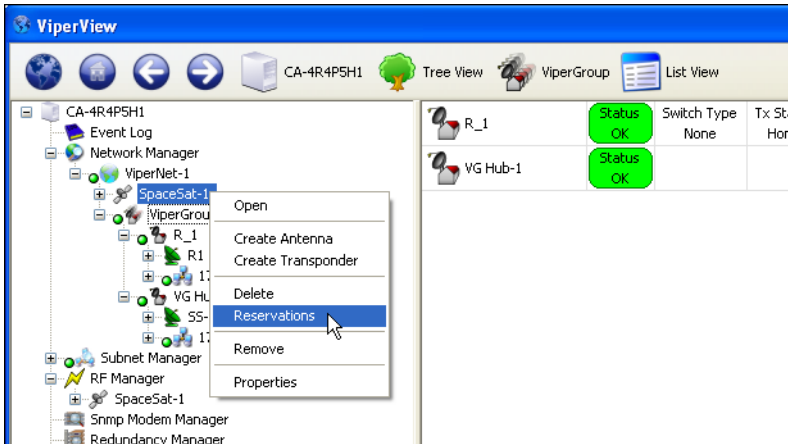

Figure 3-78 Satellite Reservations menu command

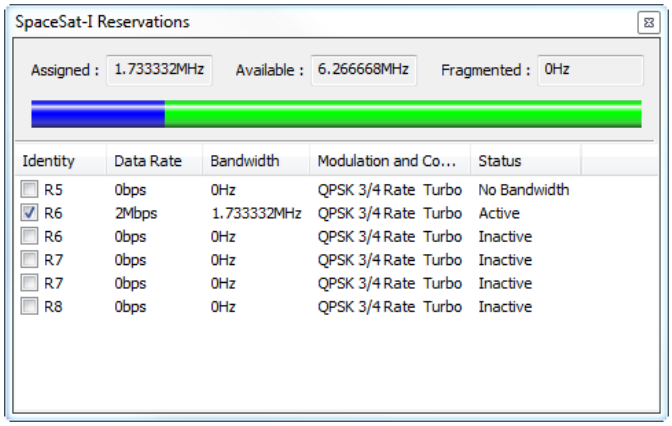

Figure 3-79 Satellite Reservations window

This window displays a table containing entries for each Remote site (both Return Path and Forward Path, if so enabled) that has been assigned a CIR, and displays the following information:

- **Reservation Enable/Disable** — check box toggle. Status column display reflects this setting, either Active or Inactive.
- **Assigned, or Pre-Allocated, Bandwidth** — currently reserved for granting CIR when called for by the list of Remote sites presented in the table. This segment is displayed as a numerical frequency value, and is represented as the *dark blue* section of the bandwidth color bar. The Data Rate, Bandwidth, and Extra (mod/code) parameters for each site are also provided in the table.

- **Available Bandwidth** — currently unreserved and available for pre-allocation to Remote sites. This segment is displayed as a numerical frequency value, and is represented as the *light green* section (combined) of the bandwidth color bar. The largest continuous/ unfragmented block of available bandwidth is represented by the *light green* section that is not underlined with *dark green*.
- **Fragmented Bandwidth** — additional available bandwidth remaining that is separate from the largest continuous block. This segment is displayed as a numerical frequency value, and is represented as the *light green* section of the bandwidth color bar that is underlined with *dark green*.

The divisions shown in the color bar will vary depending on a number of factors, including the quantity and size(s) of the bandwidth pool(s), and the amount of pre-allocated bandwidth.

When Site reservations are assigned for both Tx and Rx (Point-to-Point), the first listing for a Remote represents the Tx bandwidth and the second listing is the Rx bandwidth.

From this window, individual reservations can be enabled/disabled via the check box in the Identity column. Reservation settings (Data Rate, Bandwidth, and Extra) can be edited by double-clicking on a table entry.

Note that the Satellite Reservations window can be left open to assist the user/operator in the reservation assignment process for other Remotes.

10. Continue to select Remotes as required and configure them for guaranteed bandwidth until either all resources are exhausted or network requirements are achieved.

11. To remove a bandwidth reservation for a Remote, click to uncheck the satellite check box in the site Reservations page, then click **Apply**.

Hub Allocatable Modulator & Demodulator Compatibility

Compatibility issues with allocatable mods and demods at the Hub may arise when implementing the Guaranteed Bandwidth feature in networks that include multiple modem types. When combining modem types, careful network design is essential to ensure that a compatible Hub mod/demod is available for establishing an SCPC link with a Remote. The following factors must be considered:

- **Transmission Rate** — The device must be capable of handling the data rate that will be allocated between the Remote and the Hub (e.g., SLM-5650A versus CDM-570/L or CDD-56X).

- **FAST Codes** — The modem/routers must have the appropriate FAST codes to ensure compatible functionality.
- **Encryption** — A Remote set for using TRANSEC requires the Hub device to use TRANSEC also.

Considerations for Using Guaranteed Bandwidth with Advanced Switching

Care should be taken when assigning Bandwidth Reservations to a Remote that also uses Advanced Switching (refer to "Set InBand Modulation and Coding" on page 3-73). The VMS does not guarantee a bit rate, *per se*. Rather, a bandwidth reservation (frequency value) is assigned. This is why the option for editing FEC and Modulation settings is provided in the Reservations dialog for a remote site.

The VMS attempts to assign the most efficient bandwidth utilization in an advanced switching environment. If Advanced Switching is configured for a Remote, a switch request that crosses the threshold where the higher-order modulation actually becomes more bandwidth efficient will result in a step up to the higher-order modulation at the lowest bit rate that exceeds the request.

For example, a site currently operating at QPSK 3/4 that generates a switch request for 192 kbps will be switched up to 256 kbps at 8PSK 7/8, provided this modulation code rate was specified in the Advanced Switching table entry for this switch point. This scenario is illustrated using the following equations:

QPSK 3/4 @192 kbps @1.3 spacing:

Allocated Bandwidth = 192 x (1/2) x (1/.75) x 1.3 = 166.4 kHz

8PSK 7/8 @256 kbps @1.3 spacing:

Allocated Bandwidth = 256 x (1/3) x (1/.875) x 1.3 = 126.781 kHz

However, when a bandwidth reservation is added to this scenario, the end result may differ. If the reservation specifies 192 kbps at QPSK 3/4, the VMS will perform the same calculation as shown in the first equation above and the reserved bandwidth will be 166.4 kHz. Since this falls within the range at which the VMS would step up to 8PSK, the bit rate available with an allocated bandwidth of 166.4 kHz would be provided, which is 336 kbps.

Thus, when a guarantee is set within the threshold range of advanced switching, unexpected results may result. In this example, the result is that the guaranteed data rate that is provided by the VMS (336 kbps) is actually greater than the expected CIR that was entered as the bandwidth reservation (192 kbps). In addition, the advanced switching performance will also differ, resulting in a higher data rate as well as higher bandwidth usage.

Effect of RF Changes on Reservations

Caution: The operator must be aware that changes made to bandwidth resources in the RF configuration *after* reservations have been defined may require re-evaluating these reservations and resetting pre-allocated bandwidth.

Reducing or moving a bandwidth pool, for example, may result in a failed attempt to grant the bandwidth necessary to meet a site's CIR requirement. Such a failure would cause the site to become unavailable for switching until reservations for that site are reset.

Any sites that become unavailable must be reset on an individual basis. However, for those sites with reservations that have not been made unavailable, resetting the reservations for one of those sites will result in all of them being reset. To reset site reservations, perform the following steps:

1. Open the Properties for the Remote site and select the **InBand Reservations** dialog.

2. Click on the check box to de-select the satellite for this bandwidth reservation, then click again to re-select the satellite.

3. Click on **Apply**, then Close the window.

   The VMS will reset the pre-allocated resources for this Remote, as well as all other Remotes with guaranteed bandwidth settings that are still available.

Set InBand Modulation and Coding

Advanced Switching Overview

With the VMS Advanced Switching feature, the operator has the option of configuring multiple levels of modulation types and FEC code rates within the dynamic SCPC operation. Thus, more efficient bandwidth utilization can be realized.

An advanced switching table can be constructed for a remote modulator where specified modulation types and FEC code rates are paired with set data rates. Each data rate is associated with a Mod/Code and, as the system achieves the set rate, the transmission is modified to the new higher- or lower-order modulation setting specified for that rate. For each table entry, the VMS calculates an optimized switching threshold that the system uses to assign the most efficient bandwidth in an advanced switching environment.

As a switch request is processed, it is compared to the Advanced Switching table. If the requested data rate crosses a threshold where the higher-order modulation actually becomes more bandwidth efficient, the switch request will go up to the higher-order modulation at the lowest bit rate that exceeds the request. Thus, it is possible that a *higher* bit rate can be granted while actually utilizing *less* bandwidth resources.

For example, a site currently operating at QPSK 3/4 that generates a switch request for 192 kbps will be switched up to 256 kbps at 8PSK 7/8, provided this modulation and code rate was specified in the Advanced Switching table entry for this switch point.

The following equations illustrate this scenario:

QPSK 3/4 @192 kbps @1.3 spacing:

Allocated Bandwidth = 192 x (1/2) x (1/.75) x 1.3 = 166.4 kHz

8PSK 7/8 @256 kbps @1.3 spacing:

Allocated Bandwidth = 256 x (1/3) x (1/.875) x 1.3 = 126.781 kHz

Roaming with Advanced Switching

A roaming remote (SOTM) can take advantage of the Advanced Switching function when transitioning from one satellite beam to another. Switching tables for a remote can be configured on a per satellite region basis and, upon entering into a new service area, the remote forwards the designated table for that area to the VMS. This dynamically updates the modulator transmission settings on each transition.

Refer to the *ROSS User Guide* for additional details on the configuration and use of the Advanced Switching feature in a roaming application.

NOTE

Note: Site link power budgets must be in compliance to operate higher-order modulation/code rates.

When using Guaranteed Bandwidth in conjunction with Advanced Switching, there are important considerations which should be taken into account when performing the configuration of these features. Refer to the section *"Considerations for Using Guaranteed Bandwidth with Advanced Switching"* on page 3-72.

ModCods Configuration

Advanced Switching ModCods can be configured for Transmit (when return path switching is enabled) and/or Receive (when forward path switching is enabled) for a Remote site.

When utilizing the Advanced Switching feature with a Remote that *operates in P2P mode*, the mod/code switching table must be constructed for both the Return Path (modulator/transmit) and the Forward Path (demodulator/receive) of the Remote data modem. Note that only the Remote modem requires configuration; a Hub expansion modulator is selected for the forward path switch, and a Hub expansion demodulator is selected for the return path switch.

NOTE

Note: *For networks using the CDM-840 Advanced VSAT series modem*, the ModCods configuration differs from the general method and is presented immediately following the procedure below.

1. Open the Properties dialog for the Remote site and select **ModCods** from the tree menu (figure 3-80).

2. Click on the **Insert** button to create a new Advanced Switch table entry, and enter the requested **Bit Rate** for the switch.

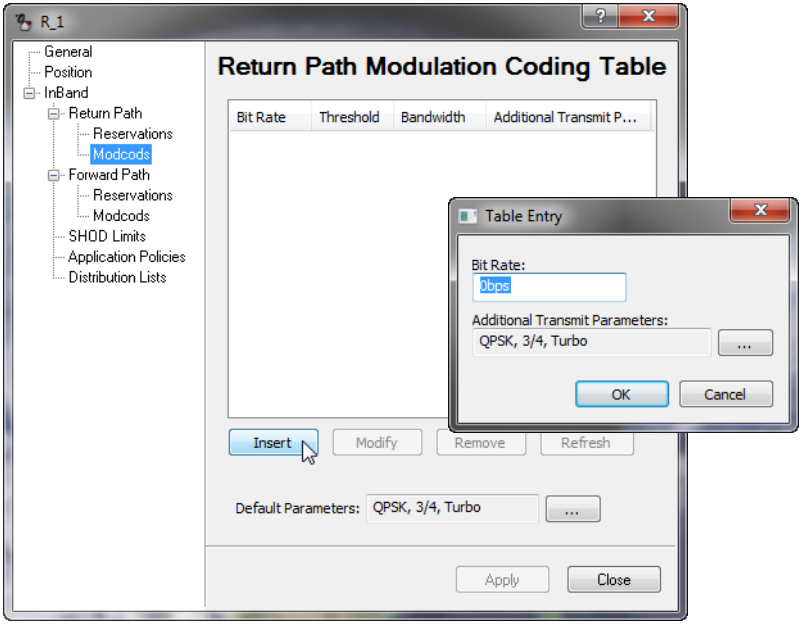

Figure 3-80 Advanced Switching dialog

3. To use new Mod/Code parameters (different from the default settings) for this switch, click on the **Additional Transmit Parameters (...)** button.

   This will open the dialog for entering the desired Modulation and FEC values for this entry (figure 3-81).

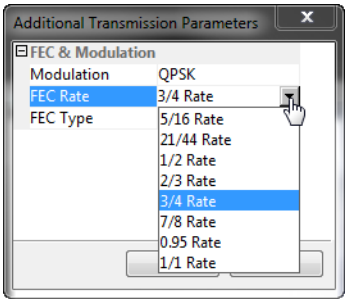

Figure 3-81 FEC & Modulation Parameters

4. Click on **OK** to record this entry in the table.

5. Repeat this process to create additional entries for this site, as required.

6. Entries can be revised by selecting the entry and using either the **Modify** button or the **Remove** button, as shown in figure 3-82.

Advanced VSAT Networks

Use this procedure to configure ModCods *for a CDM-840 Remote*.

For ACM to work properly in a dSCPC environment, it is recommended that the initial switch from the ECM channel be made at the Max ModCod calculated per the site link budget. If environmental conditions prevent the link from closing at the Max, the modem will adjust to the appropriate ModCod as a function of ACM.

1. From the Return Path Modulation Coding Table page, click the Selection [...] button for the **Default Parameters** field.

2. Select the ModCod that was set as the Maximum in the CDM-840 modem for this Remote site and then click **OK**.

   Refer to the section *"Devices | Mod" on page 4-58* for more information.

3. Ensure that there are no table entries listed on the page. Remove any entries that are displayed.

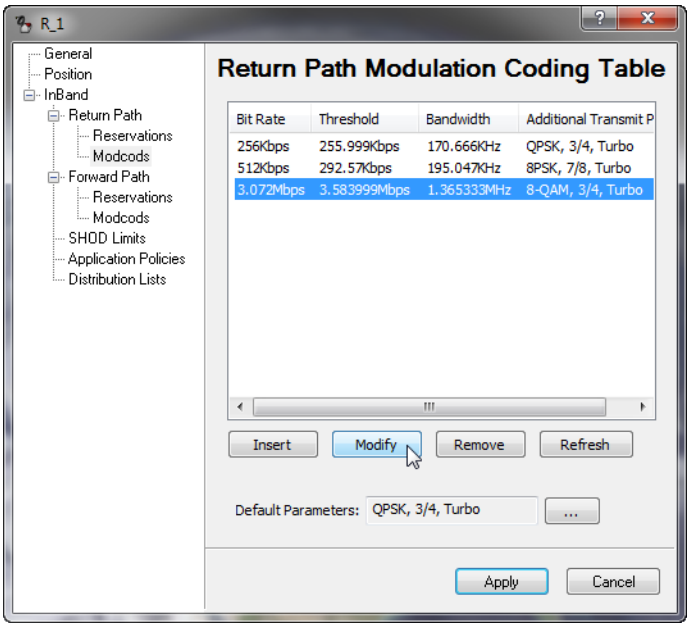

Figure 3-82 Revisions to AS Table Entries

Set SHOD Limits

The VMS Single Hop On Demand (SHOD) operates in environments where variations in geographical location and Remote site hardware (antenna, power amplifier, etc.) can create link power inconsistencies when referenced to the Hub. Budgetary calculations may provide adequate link performance to the Hub, but will differ when establishing mesh connections to one or multiple Remote sites.

InBand management provides the SHOD Bit Rate Limit feature that can be used when configuring a Remote site that will be utilized in SHOD/Mesh applications. Use of this feature may be required to accommodate for varying link factors, such as disparity in antenna sizes and/or BUC specifications, which affect transmit power limitations.

For example, a given data rate that is achievable when establishing a link with the Hub may not be achievable when meshing with another Remote, due to differences in the respective link margins. The differences could be significant enough to prevent reliable communications for some mesh connections.

Both Transmit and Receive settings are presented for specifying minimum and maximum bit rates:

- The Tx setting defines the range limits for this Remote's modulator when this Remote is sending to another Remote or Remotes.
- The Rx setting defines the range limits for any Remote's modulator when this Remote is receiving from that Remote.
- When a Remote with a defined Tx limit is transmitting to a Remote with a defined Rx limit, the lesser of the two SHOD limit values will govern the transmission rate.

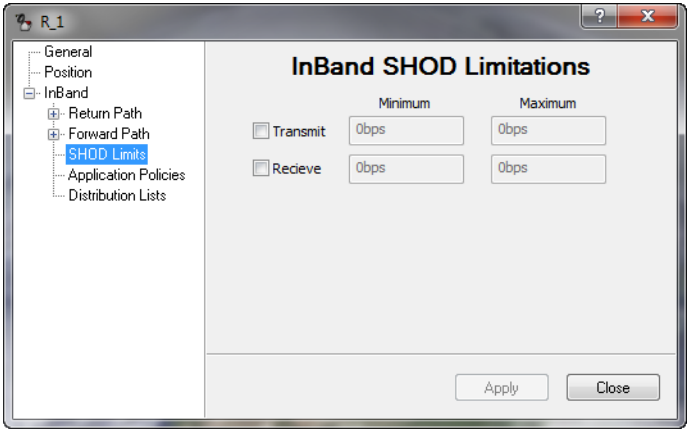

Figure 3-83 InBand SHOD Limitations dialog

NOTE

Note: These SHOD limitations may reduce and restrict application performance to the Hub during mesh connection allocations. There will be no provisions to block or notify applications that require greater bandwidth during mesh reductions.

To configure SHOD limitations:

1. Click in the **Transmit** and/or **Receive** check box(es) to activate the data rate fields.
2. Enter the desired bit rates and click **Apply**.

Set InBand Application Policies

The establishment of Application Policies provides the rules and parameters that are utilized for application switching operations in the Vipersat network. Application switching is only available to those Remotes that have policy definitions associated with them, either directly (local policy) or via inheritance (from network and/or group).

Vipersat network InBand Application Policy settings can be established at three hierarchical levels within the Network Manager:

- The Network Level
- The Group Level
- The Site Level

This capability provides operators the ability to segregate application policies between these three levels in the network. Policies for one network, group, or site can be different from policies for another network, group, or site. Network policies are inherited by the groups and sites that belong to that network, and Group policies are inherited by the sites that belong to that group. Locally created Site policies apply only to that site.

Start by building policies at the Network level, then set the policies at the Group and/or Site levels.

1. Open the Network Properties and select the **InBand Application Policies** dialog, as shown in figure 3-84.

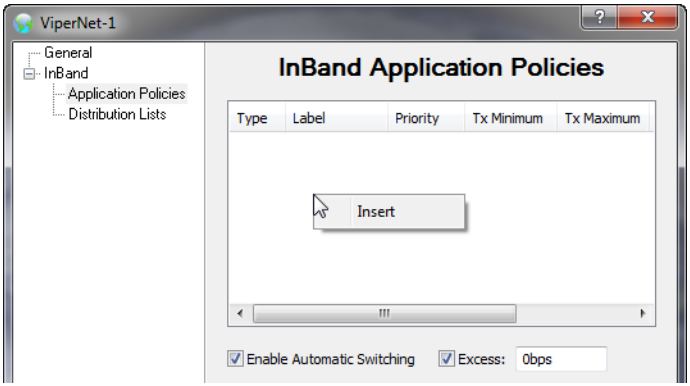

Figure 3-84 InBand Application Policies dialog, Network

2. To add a policy, right-click in the table space and select **Insert**.

3. Enter the Type value, Label, Priority, and Bitrate limits for this policy (figure 3-85), then click **OK** to enter this policy in the table.

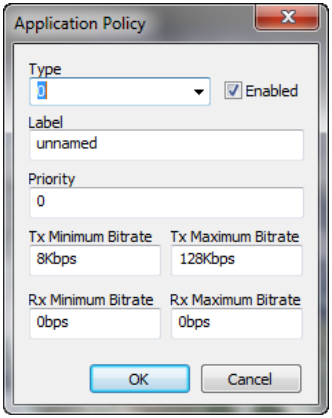

Figure 3-85 Application Policy Settings

Application Policy **Type** numbers have the following convention:

0 — ECM Load Switching
1 — Scheduled Switching and VFS
2 — Voice
3 — Video
4-62 Reserved for the System
63 — ECM version 2 entry switch, system defined
64–252 — User Defined

253 — Used for Carrier-In Carrier, Paired Point-to-Point switch and is an immobile dSCPC carrier.

254 — Uninteruptable Switch / Immobile Carrier (such as for video; used to ensure that additional applications will not generate a switch, thus preventing video glitches)

Priority levels can be assigned to application policies as well as to sites. Resource allocation preference is based on the highest priority among contending sites and/or policies. Note that a *lower* number corresponds to a *higher* priority level. Priority **1** is the highest level. Priority **0** (default) equates to *No priority*.

The policy priority level determines the likelihood that:

- The requested bandwidth will be allocated, should there be contention with other policies.
- A carrier that is assigned to this policy will get resized based on bandwidth availability. Policies with higher priority levels are more likely to retain their requested bandwidth during periods of bandwidth contention than those policies that have lower priority levels.

Both Tx and Rx **Bit rate** parameters are presented, for accommodation of P2P configurations.

NOTE

Note: Note that the Rx settings default to the rate of **0 bps**. For P2P sites, take care to set these values appropriately to avoid undesirable results.

Setting the Rx values at the default rate will result in no carrier for the forward path, unless an Excess bit rate is specified (see step 6.).

4. Repeat this process of adding policies to build the policy table (figure 3-86).

It is recommended that a type 64 policy be defined at the Network level for general usage by all Remote sites. This policy would then, for example, be available for the Application Sessions feature which uses type 64 in its default settings.

5. By default, **Automatic Switching** is enabled for the network. However, this function can be disabled with the check box in the lower portion of the page.

6. An **Excess** bit rate can be specified here as well. This additional rate will be applied to all application switching and adds an extra margin of bandwidth to the carrier.

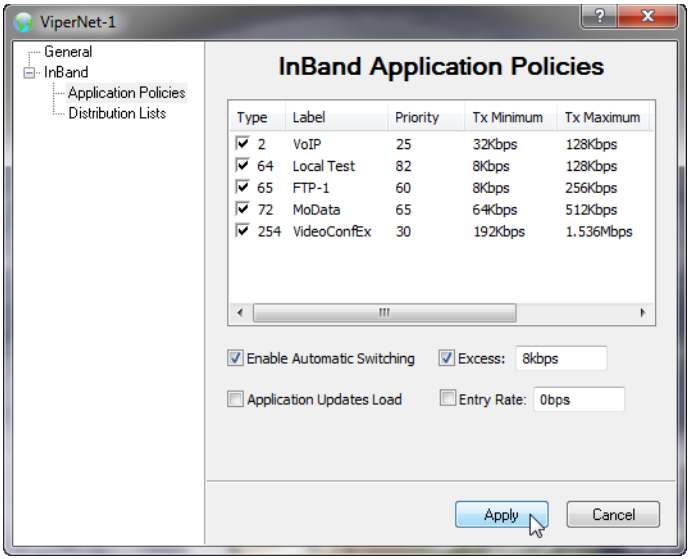

Figure 3-86 Application Policies Table, Network

7. The option to enable **Application Updates Load** is presented. This feature, when enabled, immediately updates the existing load with the specified application data rate. When not enabled, the requested data rate is presented as additional load, and is subject to the behavior of the load, including any associated delays.

   Using this feature is recommended for sites that typically run at or above the minimum specified data rate. However, for sites that are frequently idle, enabling this feature may result in undesirable behavior, such as the allocation of excess bandwidth combined with excessive switch events.

   Thus, the operator should select this feature on a site by site basis rather than apply it universally to the entire network. If the majority of the sites in the network will benefit from this feature, enable it here at the network level and then disable it at the group/site level for those sites that won't benefit.

8. The option to enable and specify the **Entry Rate** is presented. By default, the initial data rate for a Remote unit to switch from STDMA into *d*SCPC is the minimum switch rate setting. This parameter allows a rate that is greater than the *minimum switch rate limit* to be requested for entry into the SCPC pool. This rate must not exceed the *maximum switch rate limit*, however.

   This is not a guaranteed rate and will be granted based on resource availability.

   When used in conjunction with Reservations, the Entry Rate is a key parameter in Carrier Presence Switching applications (see *"Carrier Presence Switching"* on page E-36 for additional information).

9. Click on **Apply** to save these policy entries.

Repeat the above procedure to build *Group* policies, if required.

Inherited Policies

If policies were created for the network to which this group/site belongs, those policies will appear under the group/site as well (inherited).

At the group/site level, the operator can modify policy settings for this group/site that are inherited from the network/group policies.

Minimum, *Maximum* and *Excess Bit Rates* can be either left at 0 bps, which will cause this InBanded site to use the network settings, or set to the desired values for local control.

The check boxes have 3 states:

- **Clear** — The policy or switch type is not enabled (*Inherited–Disabled*)

- **Clear with Check** — The policy or switch type is enabled and can be edited (*Inherited–Editable*)
- **Gray with Check** — The policy or switch type is enabled and cannot be edited (*Inherited–Fixed*)

To edit an inherited policy, the check box must be set as **Clear with Check**. Then, the bit rates can be changed to the desired values for this group/site by clicking on the policy, then clicking on the parameter to be changed and entering a new value.

Local Policies

In addition to modifying existing inherited policies, local policies specific to a Remote site can be created, modified, and removed.

1. Open the Properties for an InBanded Remote site and select the InBand Application Policies dialog, figure 3-87.

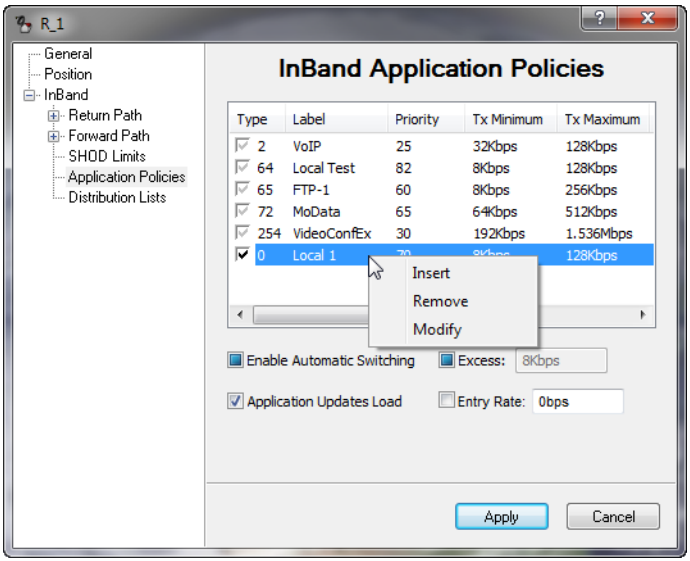

Figure 3-87 Application Policies dialog, Remote Site

2. Right-click in the open table space to **Insert** a new policy just for this site.

3. To edit a local policy, the check box must be set as follows:
   - **Clear** – the Label can be changed
   - **Checked** – the Label and Bit Rates can be changed

Then, the parameters can be modified as required for this group/site by clicking on the policy, then clicking on the parameter to be changed and entering a new name or value.

4. To remove an existing local policy, right-click on the policy table entry and select **Remove**.

   Note that only locally created policies can be removed, not inherited policies.

5. To modify the settings for Automatic Switching, Excess, Application Updates Load, and/or Entry Rate, click in the check box(es) to toggle between:

   - **Blue** – Inherited
   - **Clear** – Not enabled (*Inherited–disabled*)
   - **Clear with Check** – Locally enabled

6. Click on **Apply** to save these policy entries.

Define InBand Distribution Lists

Distribution Lists allow the operator to set up a list of sites to be included in a switch under defined circumstances, such as meshing based on an ECM switch, multicast transmission from a remote to a group of remotes, or the setup of monitor remotes. This feature can be used to tune expansion demodulators at a list of sites for upstream switched services, to provide for point-to-multipoint distribution on an InBand service connection. This is very advantageous in applications such as:

- **Video Transmissions** – can direct a multicast video stream to multiple target sites using just one session / one carrier as opposed to having to establish individual sessions for each target site.
- **File Transfers** – distribute file data from corporate home office to multiple field offices using a single carrier session.

The Remotes that are members of the Distribution List group (SHOD/Mesh) can enter and/or exit the session at any time; after it starts and before it terminates.

As with Application Policies, Distribution Lists can be established at the Network, Group, and Site levels. However, in the majority of applications, these lists are defined at the remote site level. Note that the InBand Policy flag must

be set for an element in order for the *Distribution Lists* dialog to appear under the Properties for that element.

1. To declare a Distribution List, right-click on the white table area in the dialog, then click on the **Insert** button that appears (figure 3-88).

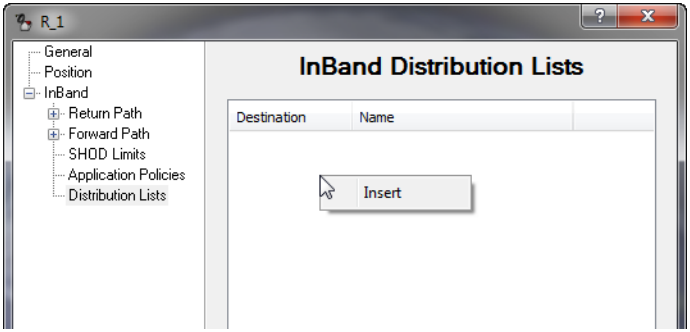

Figure 3-88 InBand Distribution Lists, Remote Site

The **Distribution List** dialog (figure 3-89) provides a **Target** address box and a **Label** name box, and allows the operator to add/remove subnet **Destinations** to the list.

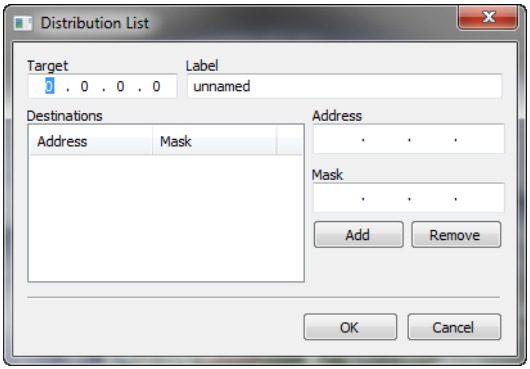

Figure 3-89 Distribution List dialog

2. Enter either a Target multicast or unicast address, or leave the address as all zeros, depending on the purpose for the list.

   For example, if the target is left as 0.0.0.0, ANY application switch for this site will cause the list to be activated.

3. Enter a Label to identify this list.

4. Enter the Address and Mask for the subnet to be added to this list, then click on the **Add** button.

5. Repeat the previous step to add multiple subnets.

   To prevent a routing loop from occurring, do NOT add the subnet for the remote site that owns this list.

6. When all desired subnets have been added, click **OK** to enter this list in the Distribution Lists table.

7. Repeat steps 1 through 6 to define additional lists.

8. A list entry is enabled/disabled with the use of the check box.

9. Click on **Apply** to save these list table entries.

Switching Function Verification

Once the InBand management configuration for a Remote is completed, the VMS switching functions will become active. At this point, manual switch commands can be used to verify that the switching function is operable. The following procedure will demonstrate a manual application switch operation from STDMA mode to SCPC mode utilizing a bandwidth slot assigned by the VMS from one of the pools that were created in the RF Manager configuration procedure.

1. Right-click on an InBanded Remote site in the Network Manager and select **Application Sessions** from the drop-down menu (figure 3-90).

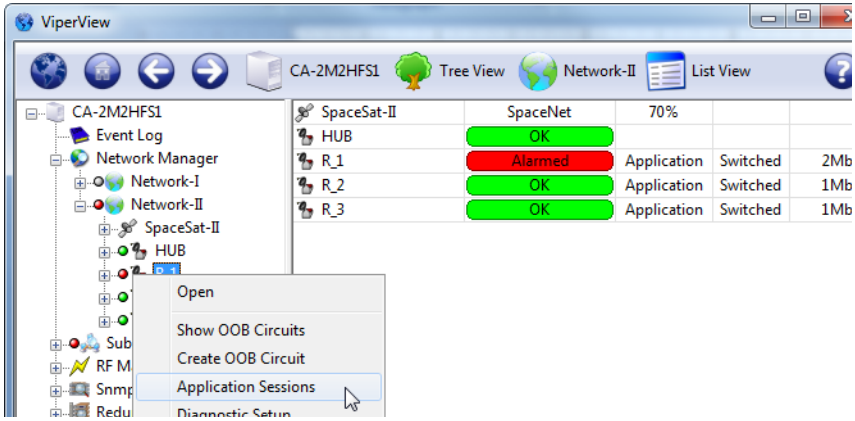

Figure 3-90 Application Sessions menu command

The InBand Sessions dialog will open, allowing a transmit **Data rate** and switch **Type** to be specified. The default data rate is 0 bps. This setting corresponds to the Tx Maximum; the resulting rate will be the lesser value between the Policy setting and the Site setting.

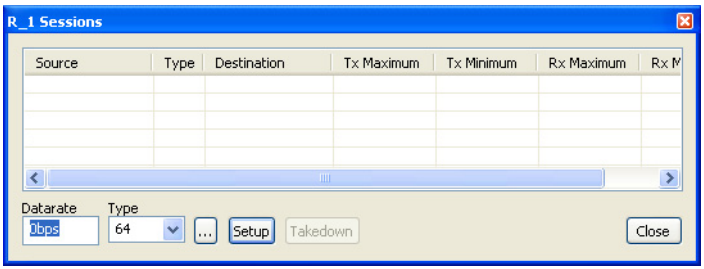

Figure 3-91 InBand Sessions dialog

2. Accept the default rate, select a valid switch type, and click on **Setup** to initiate an SCPC switch.

Note that the Type default is **64**; however, if Type 64 is not defined for this Remote, the switch attempt will fail, as shown in figure 3-92. Use the pull-down menu to view and select a valid policy for this Remote.

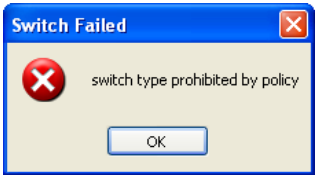

Figure 3-92 Switch Failed message

Note also that more switch options are available by clicking on the ellipses (**...**) button to open the **InBand Application Session** dialog
Refer to the section "Operator Switch Request" on page 6-36 for more information on using the Application Sessions feature.

The InBand Sessions table will record the new entry and the **Executing Switch** message will be temporarily displayed while the switch request is processed (figure 3-93).

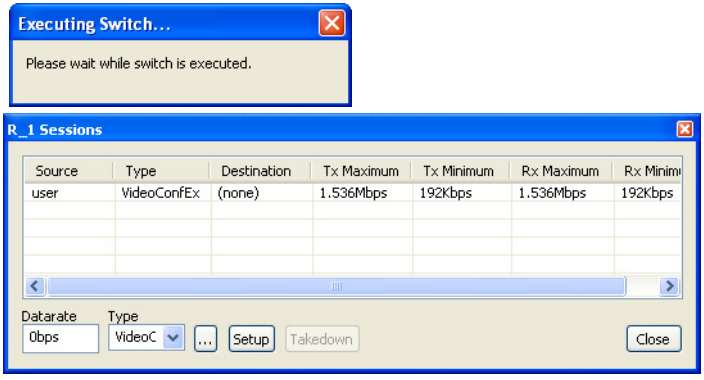

Figure 3-93 Manual Switch Execution

3. Click on the Group (or the Network, if no Group exists) to display the new site status for this Remote, figure 3-94. Note that the **Status** has changed from *None* to *Application*, and from *Home* to *Switched*. Also, the STDMA demod changed to the SCPC expansion demod.

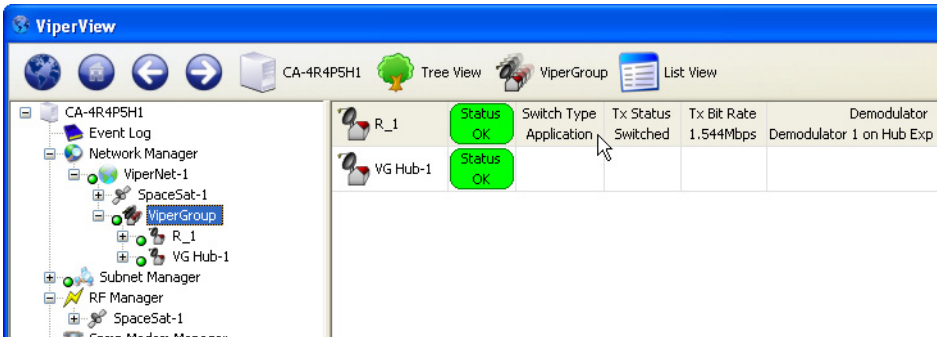

Figure 3-94 Remote Status in Group View

Tip: Turn on **Item Labels** using the command located under *List View* in the top menu bar.

If the switch attempt fails, then there is a network configuration error. The most likely reasons are:

- Invalid Policy Type
- Improper InBanding Configuration
- Incorrect Converter Frequency Settings
- Converters not Bound
- Incorrect Transponder and/or Bandwidth Pool Definition

Review the configuration procedure to identify and correct the mistake. If unable to resolve the situation, contact Comtech Vipersat Networks Customer Support for assistance (see *"Contact Information" on page 1-13*).

4. Observe the change in the Spectrum View (figure 3-95); a blue shaded area will appear representing the slot assigned by the VMS for the switch. Upon receipt of the next PLDM (Path Loss Data Message), the carrier(s) will appear showing the current E_bN_0 and bandwidth.

For P2P switching, two separate carriers (Tx and Rx) will appear for that site, as shown in this example.

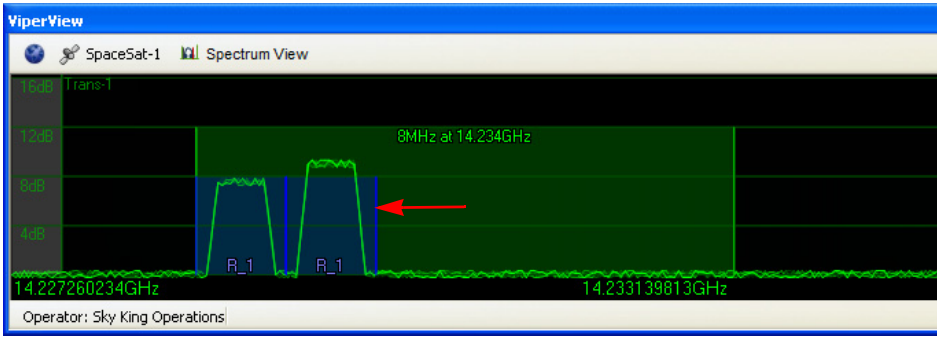

Figure 3-95 Switched Carrier, Spectrum View

5. Also, note the new entry in the Event View stating that the application switch was successful with the new data rate and frequency (figure 3-96).

For a Remote site that is configured for P2P switching, two entries will appear in the Event View: the first entry relates to the Remote modulator's Tx rate, and the following entry relates to the Remote demodulator's Rx rate.

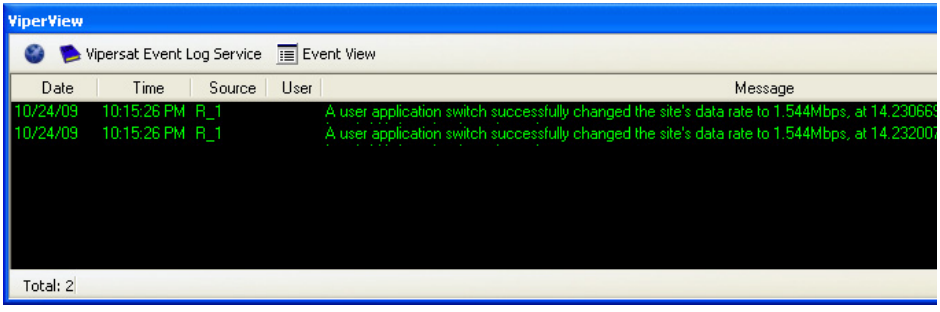

Figure 3-96 Switch Event, Event Log

6. From the *Tree View*, click on the Hub antenna under the Network Manager to display the Hub devices in the right window panel.

From this view, the operator can see the switched modulator and demodulator that the VMS selected for this session, the carrier frequency in L-Band, the bit rate, the current E_bN_0, and the identity of the Remote site (figure 3-97).

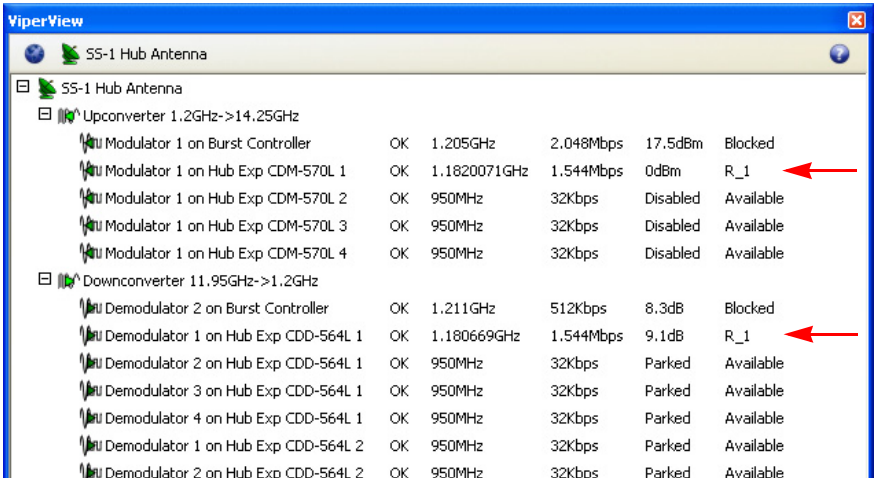

Figure 3-97 Switched Carrier, Hub Antenna View

7. End the session by selecting its appearance in the Application Sessions window and clicking on the **Takedown** button.

NOTE

Note: After reaching this point and all indications are as noted above, the Vipersat Manager, the RF Manager, and the Network Manager have been configured successfully. All frequencies and conversions are correct. To test the policies, it will be necessary to set up an application such as VoIP.

NOTE

Note: Additional (or all) Remote sites can be created and InBanded using the manual method described up to this point. However, it is recommended that, once the initial Remote site has been configured and can be used as a template reference, the remaining Remote sites be generated by utilizing the *Remote Site Wizard* feature as described below.

Remote Site Wizard

Creating and populating a Remote site with the use of the Remote Site Wizard tool greatly simplifies the process by directing the user with a scripted set of dialogs. And, by selecting an existing Remote site as a reference, a pre-defined default template is provided that automates the operation, allowing additional Remote sites to be generated rapidly.

Note: The procedure presented here utilizes the *reference site* feature. Although this is optional and a Remote site can be created without this step, the template approach is one of the most powerful features of the Site Wizard tool. Without it, additional operator/user input is required for configuration.

Caution: When specifying a Reference Site, be aware of the following restrictions:

Do not specify a reference site that utilizes a different *Network* and/or *Satellite* than the new site that is being created.

Although the reference site does not have to be in the same *Group* as the site that is being created, be aware that none of the reference site's inherited application policies will be copied to the new site in this situation.

1. Select **Create Remote...** from the Network (or from the Group, if the site is to be a member of an existing group within the network) drop-down menu, as shown in figure 3-98.

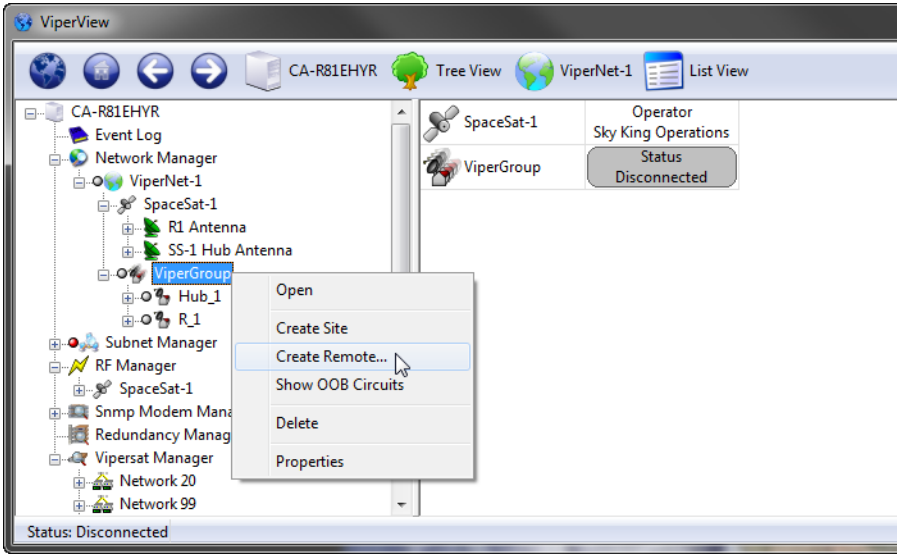

Figure 3-98 Create Remote... menu command

The **Remote Site Required Information** dialog will open, displaying a green pointer that guides the user to the fields which require input (figure 3-99).

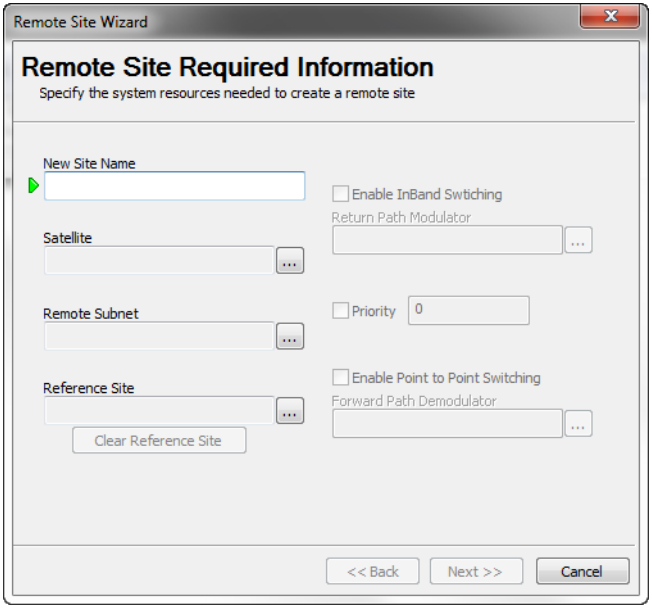

Figure 3-99 Remote Site Required Information, Create Remote...

2. Enter the **New Site Name**.

3. Select the **Satellite** to be used by this site (figure 3-100).

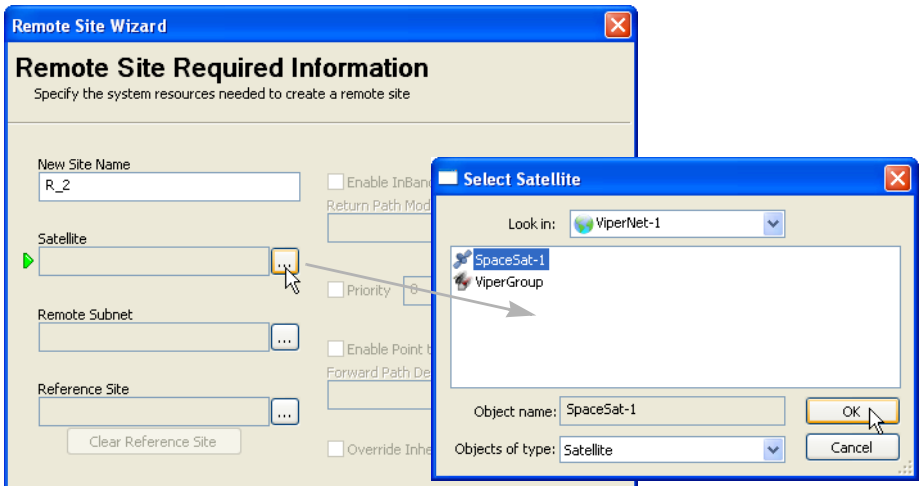

Figure 3-100 Select Satellite, Remote Site

4. Select the **Remote Subnet** for this site (figure 3-101).

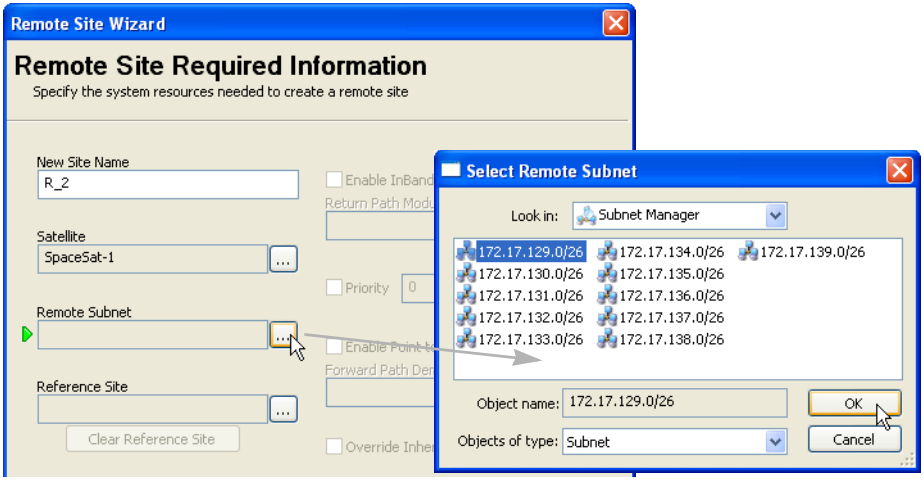

Figure 3-101 Select Remote Subnet

5. Select the **Reference Site** to be used as the template for building this Remote site (figure 3-102).

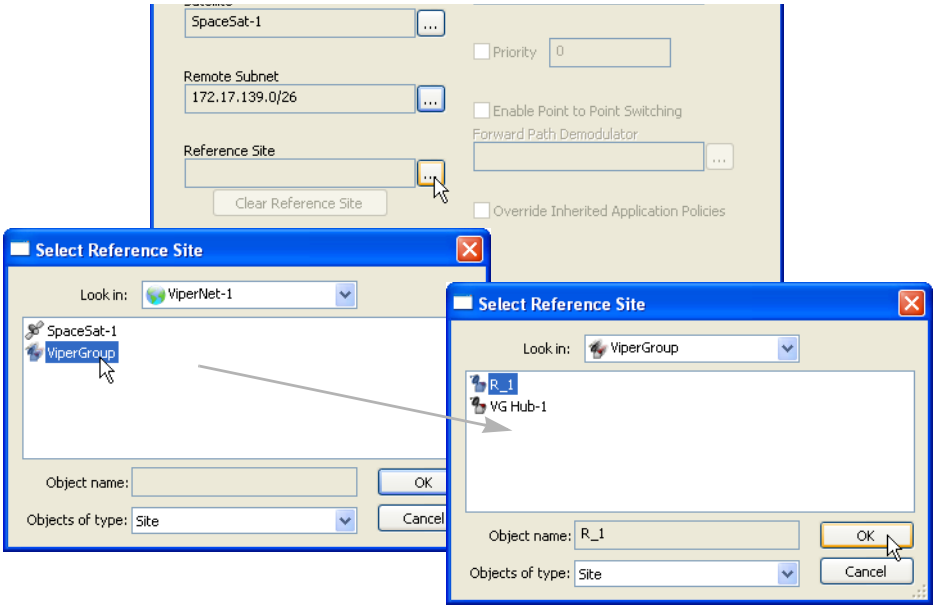

Figure 3-102 Select Reference Site

6. To InBand this site, **Enable InBand Switching**, then select the **Return Path Modulator** for this unit (figure 3-103). Continue with the next step.

If this site will *Not be InBanded*, proceed to step 9.

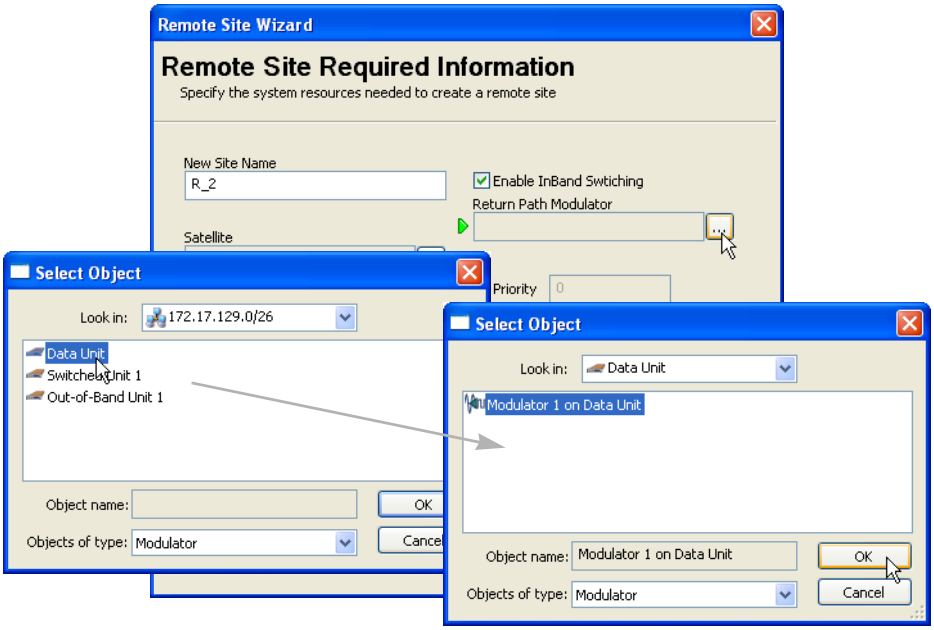

Figure 3-103 Select Return Path Modulator, InBand Switching

7. If required, set the **Priority** to be assigned to this site.

Note that a *lower* number corresponds to a *higher* priority level. The default value (0) equates to *No priority*.

8. To configure this site for **Point-to-Point Switching**, **Enable** the check box and then select the **Forward Path Demodulator** (the demod for this Remote data unit) to be used for this feature (figure 3-104).

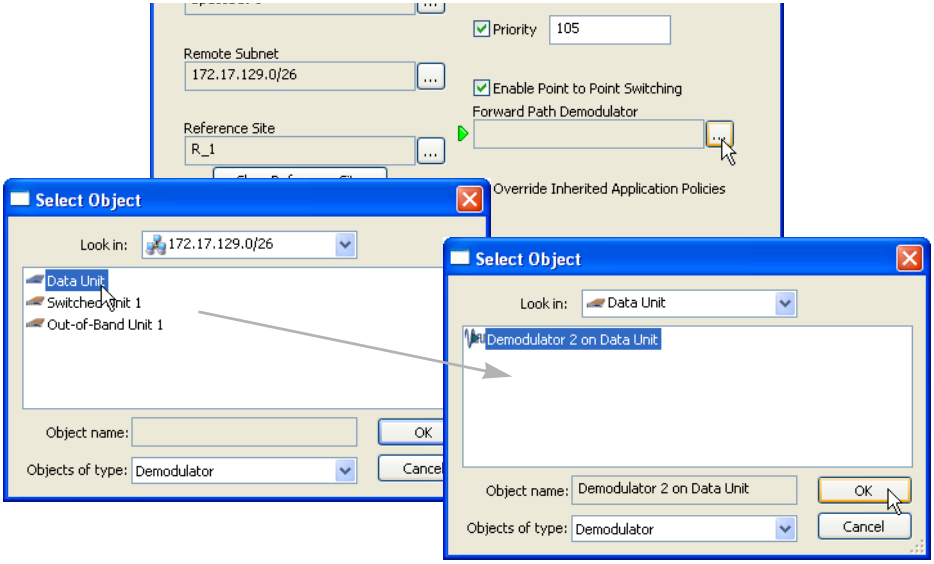

Figure 3-104 Select Forward Path Demodulator, P2P Switching

9. Click the **Next** button to proceed to the dialog for configuring the **Site RF Profile** (figure 3-105).

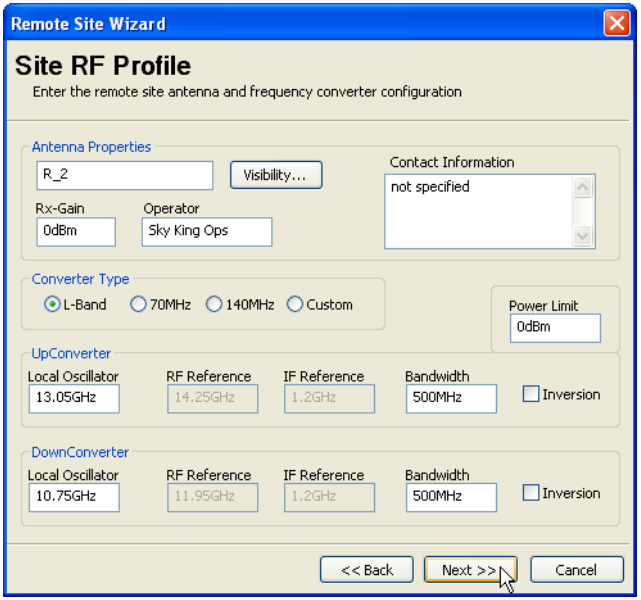

Figure 3-105 Site RF Profile, Create Remote...

NOTE

Note: When a reference site has been specified, the template of that site's parameters will auto-fill these next dialogs, requiring modifications only to particular settings that differ for this new site.

10. Review the RF settings and edit this dialog if necessary, then click the **Next** button.

For *InBanded* sites, the **Return Path Home State Configuration** dialog will appear (figure 3-106). Continue with the next step.

For sites that are *not InBanded*, the **Ready To Create** window will appear (figure 3-112). Proceed to step 17.

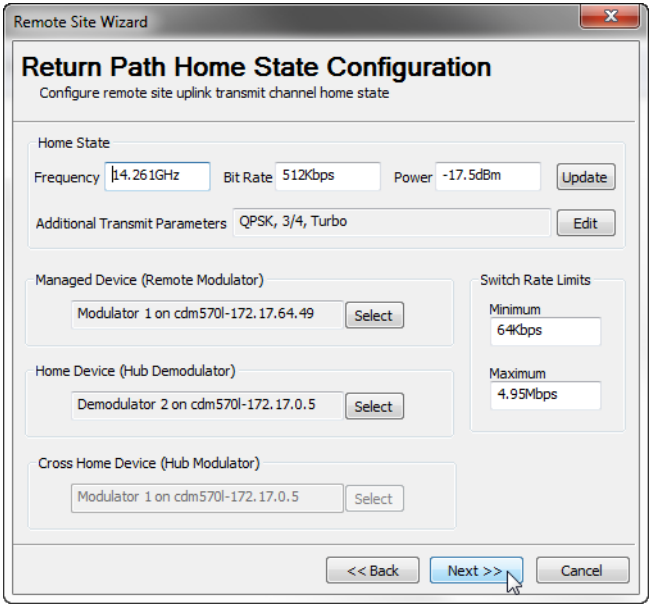

Figure 3-106 Return Path Home State Configuration, InBand

11. Again, this dialog is auto-filled from the reference site. Review and edit as necessary, then click **Next**.

For *Point-to-Point* sites, the **Forward Path Home State Configuration** dialog will appear (figure 3-107). Continue with the next step.

Otherwise, the **Return Channel Bandwidth** dialog will appear (figure 3-108). Proceed to step 13.

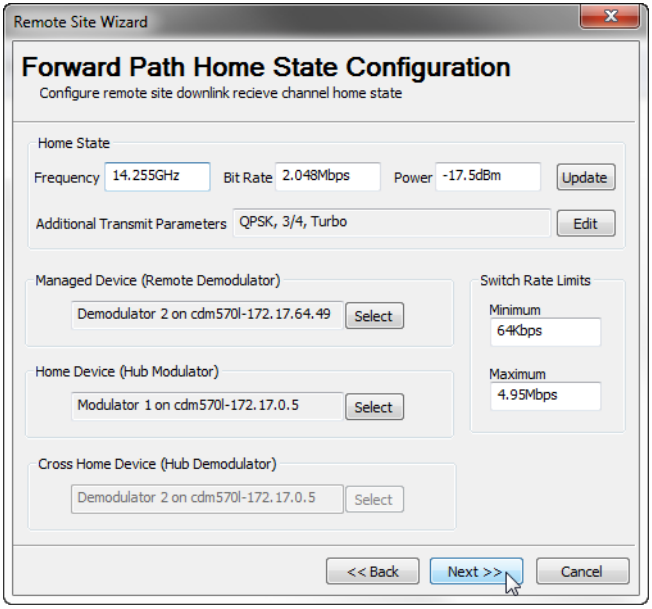

Figure 3-107 Forward Path Home State Configuration, P2P

12. Review and edit any fields as necessary, then click **Next**.

The **Return Channel Bandwidth** dialog will appear (figure 3-108), allowing guaranteed bandwidth reservations for this site to be specified.

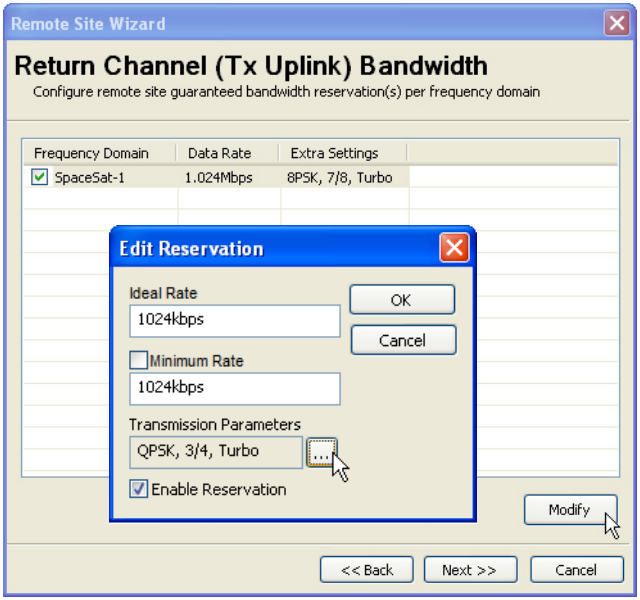

Figure 3-108 Return Channel Bandwidth, Create Remote...

13. By default, the guaranteed bandwidth reservations will match that of the reference site. Configure the reservations as required for this site, then click **Next**.

For *Point-to-Point* sites, the **Forward Channel Bandwidth** dialog will appear. Configure as required, then click **Next**.

The **Demodulator Settings** dialog will appear (figure 3-109), allowing the desired Demods at this Remote site to be flagged as allocatable.

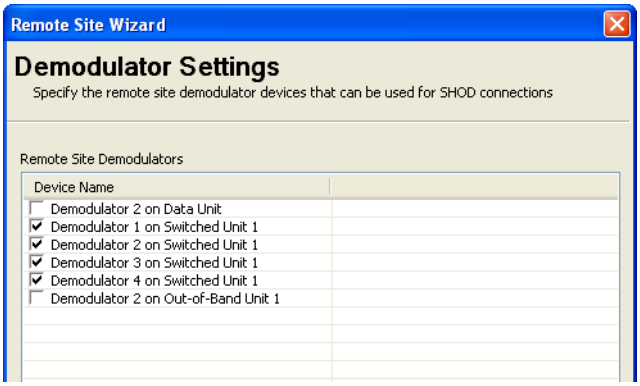

Figure 3-109 Demodulator Settings, Create Remote...

14. Specify any Demods to be used for SHOD/mesh connections, then click **Next**.

The next dialog to appear will be **Site Application Policy and Distribution List** (figure 3-110). Continue with the next step.

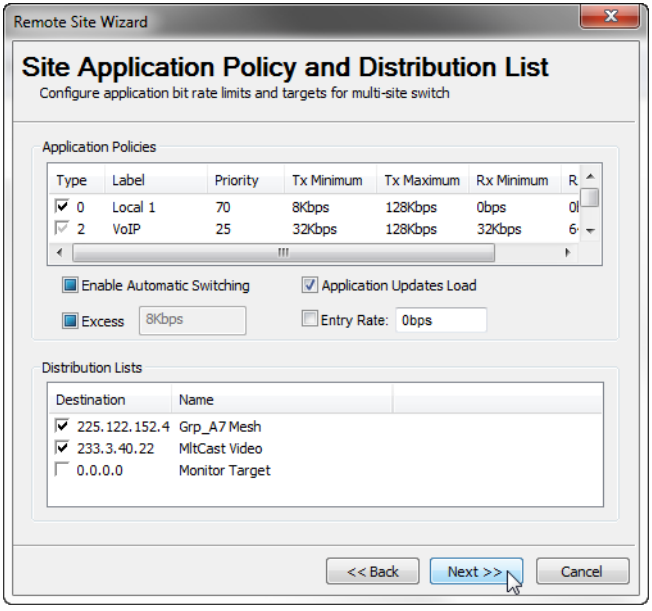

Figure 3-110 Site Application Policy and Distribution List, Create Remote...

15. Here, the user can modify any inherited policies or lists, or insert new local ones. Notice that the Local policies for the reference site will appear here also.

Configure as required, then click **Next**.

The **Return Path ModCod Table** dialog will appear (figure 3-111).

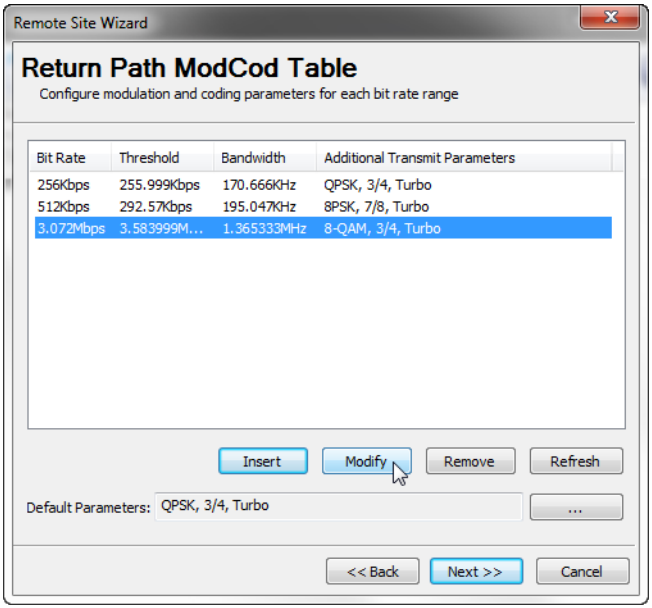

Figure 3-111 Return Path ModCod Table, Create Remote...

16. Here, the user can modify/remove reference site entries that are displayed, and/or insert new ones. Configure the modcods as required for this site, then click **Next**.

For *Point-to-Point* sites, the **Forward Path ModCod Table** dialog will appear. Configure as required.

Proceed to the Site Wizard **Ready to Create** summary page (figure 3-112) by clicking **Next**.

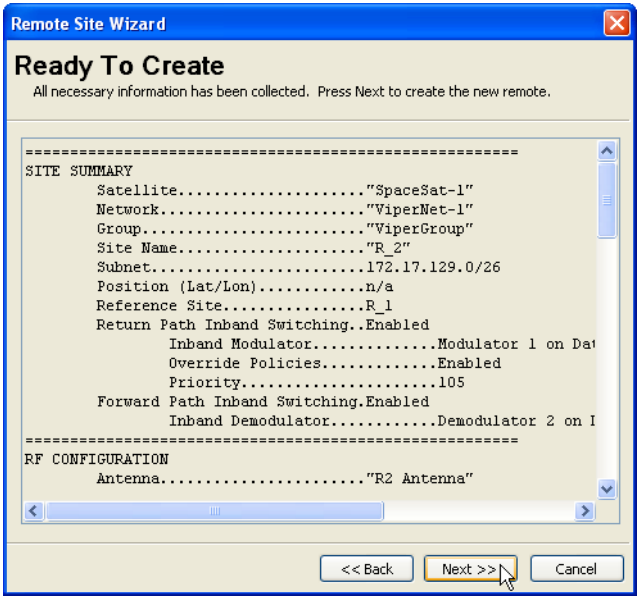

Figure 3-112 Ready to Create, Site Summary

17. With the **Ready To Create** summary page, the proposed configuration parameters for this site can be reviewed and, if necessary, the user can step **Back** to make changes prior to finalizing the creation process. After confirming the settings, click **Next** to create the new site.

If all settings are determined by the system to be acceptable, the **Site Creation Complete** window will appear (figure 3-113) with a *Site Creation Succeeded* message.

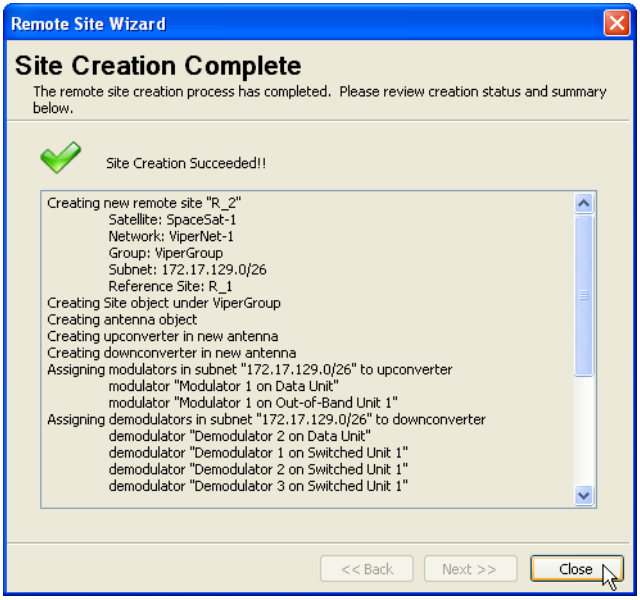

Figure 3-113 Site Creation Complete, Succeeded

Should some aspect of the proposed configuration not be accepted by the system, an error message will be displayed indicating that a reconfiguration is required before the site creation can be completed successfully.

Repeat the *Create Remote Site* procedure to generate additional network/group remote sites, as required.

Redundancy Configuration

N:M Device Redundancy

If device redundancy for hub primary modems is desired, it should be configured at this point. Complete instructions for configuring this feature can be found in *Appendix C, "Redundancy"*.

VMS Redundancy

If VMS server redundancy is desired, it should be configured at this point. Complete instructions for configuring this feature can be found in *Appendix C, "Redundancy"*.

SOTM Configuration

This section applies only to those networks with mobile platforms, such as a maritime environment, which are referred to as roaming or SOTM (Satcom On-The-Move). The VMS incorporates automated features to seamlessly handle configuration changes inherent to a mobile environment. If a platform transitions to a new satellite, the VMS will automatically move the associated antenna, update the Inband Home State, and remove and rewrite the appropriate routes in the old and new TDM outbounds. QOS rules applying to the TDM outbound for the remote site will be moved as well. If the transition involves moving to a different hub, the modems will generate RIPv2 updates to the edge routers providing a path to the Internet.

1. Select the site from the ViperView Network list.

2. Right-click on a mobile Remote site and open the **Properties** window. Select **Position** from the tree menu to display the Position Properties dialog (figure 3-114).

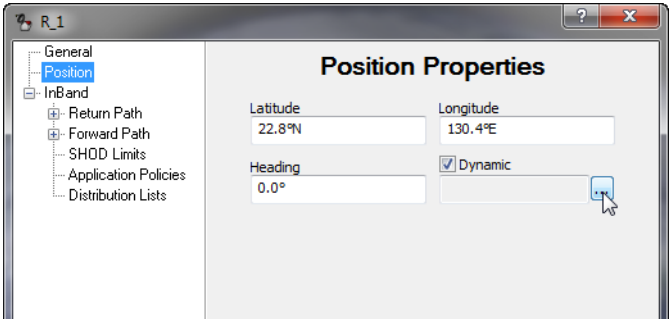

Figure 3-114 Enable Dynamic Function for SOTM Remote

3. Check the **Dynamic** box and select the browse button beneath it. This will open a dialog box in which the site antenna and subnet should appear (figure 3-115).

   Note that, if the subnet icon was not copied into this site as described in *Network Manager Configuration*, it will not appear here.

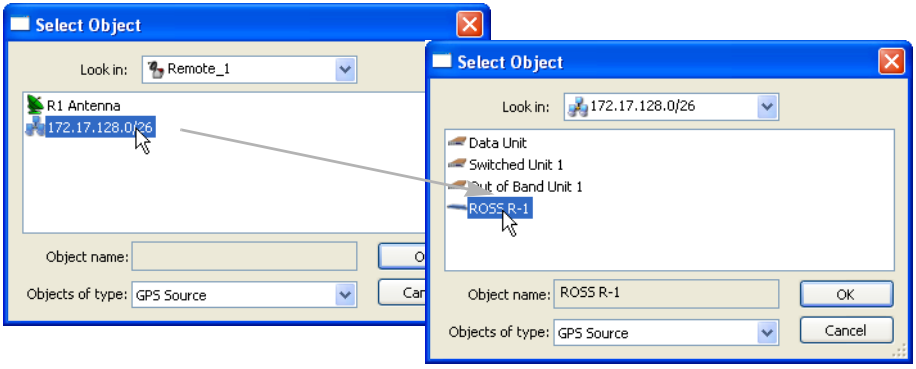

Figure 3-115 Selecting ROSS Unit for SOTM

4. Double-click on the **Subnet** to display the subnet components.

5. Select the **ROSS** unit and click **OK**.

6. The selected ROSS unit will appear in the remote's Properties dialog. Click **Apply** and Close the window.

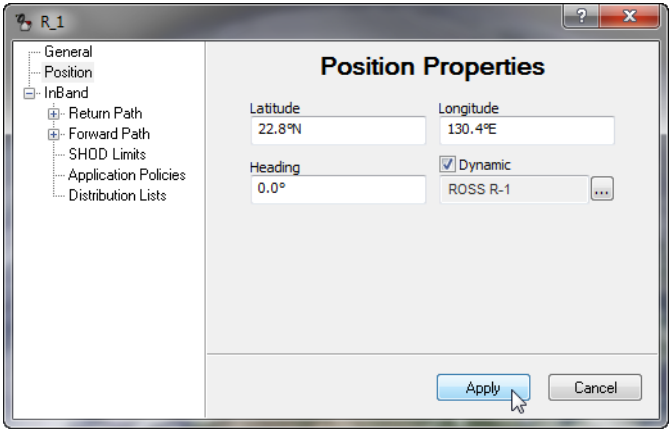

Figure 3-116 SOTM Remote Configured

At this point, the Remote site icon will snap to a location on the globe based on the GPS reading that the ROSS is receiving from the antenna.

7. Repeat the above procedure for all mobile remote sites.

The next step will be to set up the VMS to push the routes to the TDM outbounds. This step is necessary if there is more than one satellite–or satellite beam–being used in the network, or if multiple TDM outbounds are being used and the mobile sites will transition between them.

It will no longer be necessary to put static routes in the TDM modems. If any static routes exist, either telnet/console into the box(es) or use the Parameter Editor from the VMS and delete them. The only routes left in the TDM outbounds should be the Default Gateway to the edge router and any non-mobile remotes in the network (if desired, these routes can also be entered as *dynamic* VMS routes).

8. Right-click on the Hub modem unit that represents the first TDM outbound and select the **Properties** page.

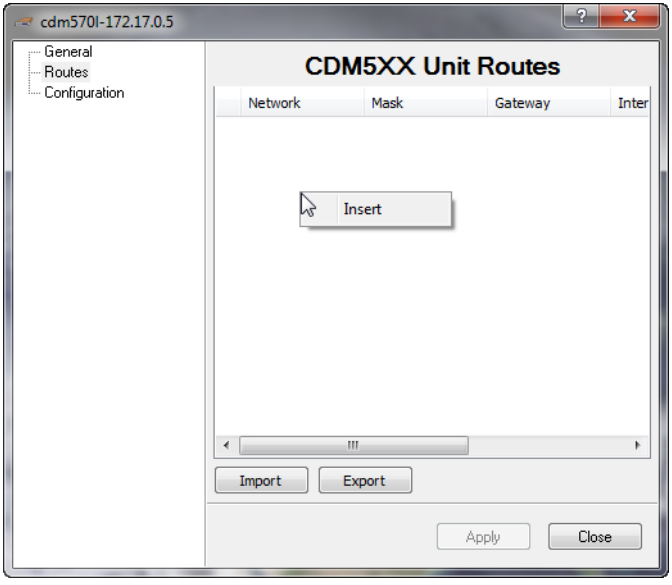

Figure 3-117 TDM Properties, Routes

9. Select **Routes** from the tree menu to display the Routes table (figure 3-117).

Right-click in the window and select **Insert**.

A new route is added to the Route List. The operator can then edit the route settings, including the *Network* address, the *Mask*, the *Gateway*, and the *Interface* (next hop). For remotes, select **Satellite** as the interface.

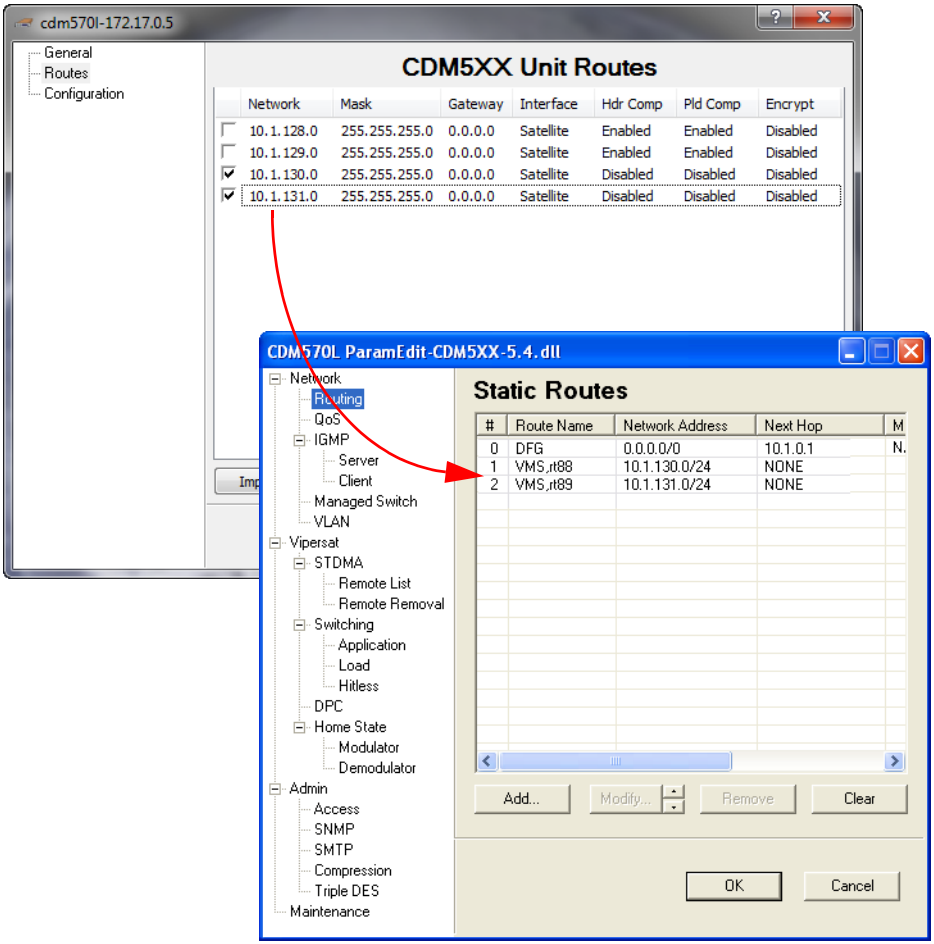

Figure 3-118 Dynamic Routing Entry, CDM-570/570L

10. Push the new route to the modem with a **Force Registration**. The modem will generate a RIPv2 update to the router identified as its default gateway.

This can be verified by right-clicking on the modem, selecting **Configure**, then opening the **Routing** dialog as shown in figure 3-118.

11. Repeat this route procedure for each TDM outbound modem.

If Quality of Service rules apply, configure them now. Typically, QOS rules in the TDM will be configured for Min/Max priority. This gives each remote a CIR (min rule) in the TDM outbound and a burstable rate (max rule). Since the number of rules per modem is limited to 32, these rules should be moved to the

currently active TDM outbound. Configure QOS rules for the remotes that use this modem as their “home” TDM.

12. Right-click on the Hub unit with the first TDM outbound and open the **Properties** page.

13. Enable QOS Management by checking the box, then click on the **Rules** button (figure 3-119).

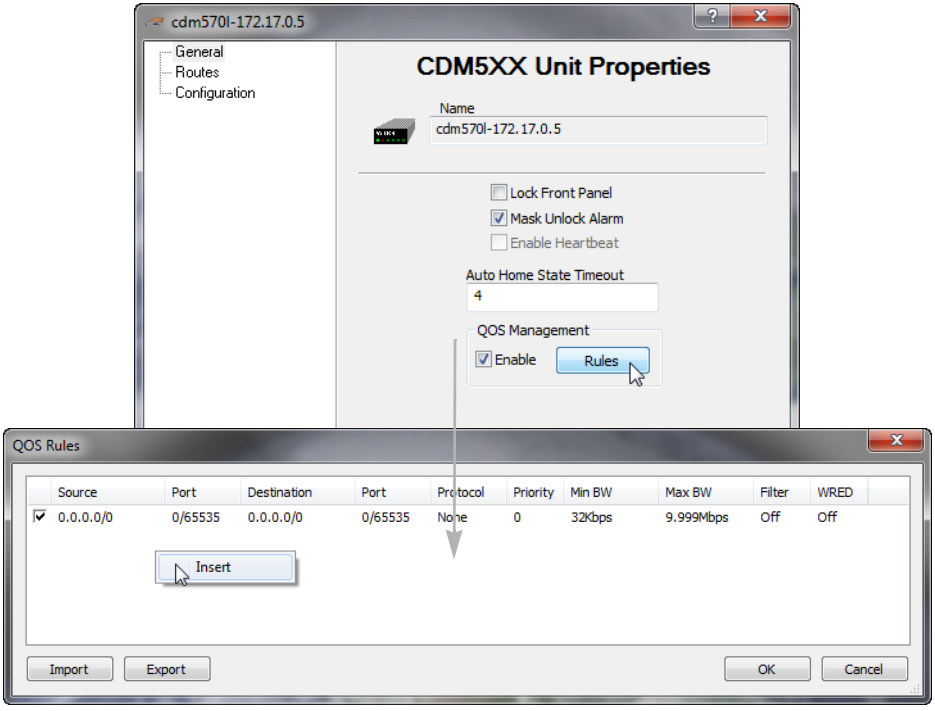

Figure 3-119 QOS Rules Configuration, CDM-570/570L

14. Right-click in the QOS Rules window to **Insert** a rule, then edit the rule settings that will apply to the remote.

When the remote transitions to a new TDM outbound, these rules will transition with it.

15. Apply these settings to save this configuration for the Hub TDM unit.

Encryption Configuration

Management Security Option

NOTE

Note: The Management Security feature is not provided with standard VMS installations, and is available only upon request and through an authorized agent.

This feature requires the use of a specially programmed Crypto-Key.

Management Security is an optional software module for the VMS that protects the M&C messages that pass between SLM-5650A modems and the VMS over exposed LAN/WAN segments within the network. Encryption key management operates through manual key distribution, with M&C keys entered in the VMS and at each modem associated with the VMS.

A Switching encryption option for VESP is included in this security feature as well.

Encryption is based on the FIPS approved Advanced Encryption Standard (AES), a block cipher algorithm, using a 128-bit fixed block size and 256-bit keys.

1. Open the Properties window for the VMS Server and select the **Encryption** dialog, as shown in figure 3-120.

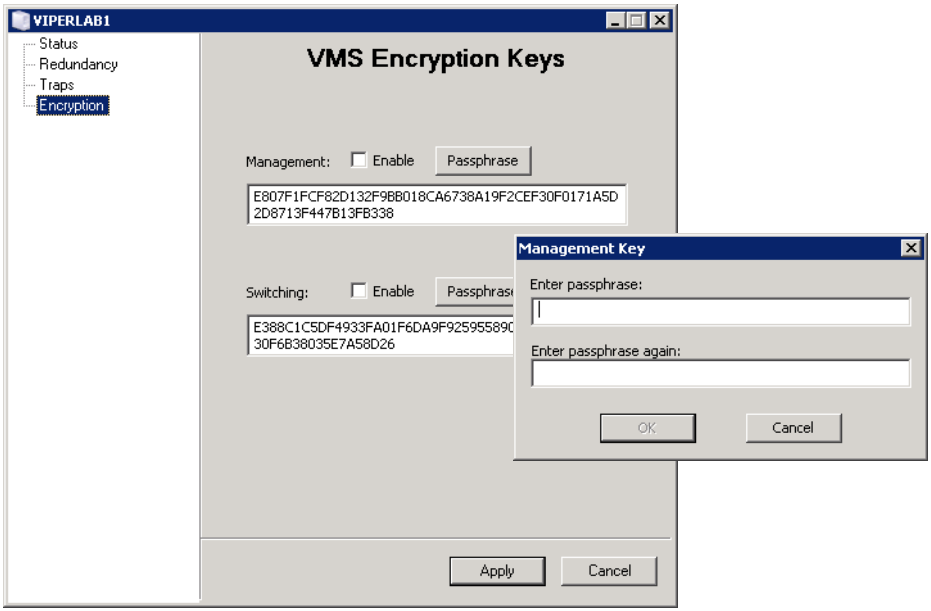

Figure 3-120 VMS Server Properties, General dialog

Here, Management and/or Switching encryption can be **Enabled**.

NOTE

Note: Take care with the sequence that is followed for enabling/activating the encryption feature. To minimize disruptions to network operations, enabling encryption in the VMS should be performed only after modem encryption has been enabled.

Refer to the *Vipersat SLM-5650A User Guide* for information on setting the Management Security feature in the modem.

2. Set the encryption key(s) by either entering a 64 character ASCII hex string (as depicted in the figure), or clicking on the **Passphrase** button and entering a passphrase in the pop-up dialog.

An MD5 cryptographic hash function translates the passphrase into a 128-bit hash value.

Note that the key entered here for Management must match the key that is entered for each modem that has encryption enabled.

The key for Switching is entered here only, and is automatically passed on to the modem by the VMS for VESP operations.

3. Click on **Apply** then Close the window.

Modem TRANSEC Setting

(*Applies to only Vipersat networks that use SLM-5650A modems*)

When using Transmission Security encryption, the VMS modem setting must be configured to match the setting used in the SLM-5650A modem itself. Perform the following procedure for each modem to be configured for encryption.

1. Open the **Properties** window for the SLM-5650A modem (figure 3-121).

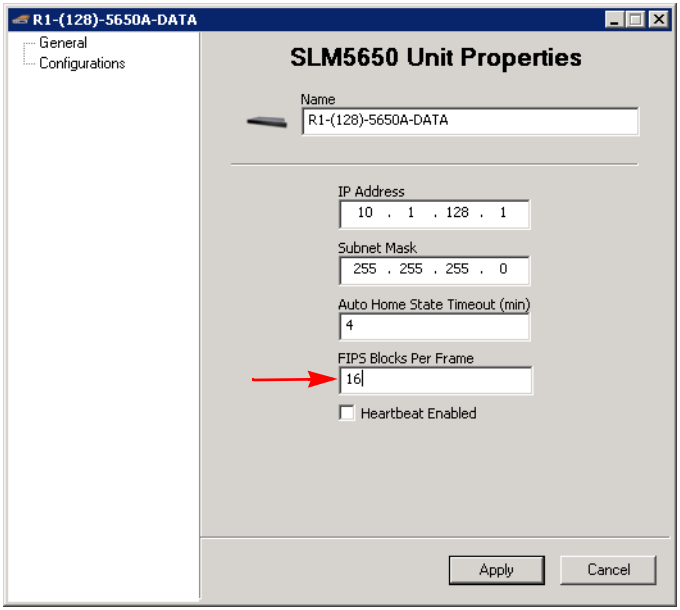

Figure 3-121 Properties Window, SLM-5650A Modem

2. Enter the number of blocks used for encryption in the **FIPS Blocks Per Frame** parameter field.

   In the SLM-5650A modem, this parameter is specified on the Admin/Config page as the Encryption Frame Length in 16 Byte Blocks.

3. Click on **Apply** then Close the window.

This concludes the VMS Configuration.

4

CONFIGURING NETWORK MODEMS

General

This chapter describes using VMS to configure Vipersat network modems. Configuration of modem parameter files is accomplished using the Parameter Editor. The Parameter Editor, as used from the VMS, performs the same functions as the Parameter Editor accessed via Vipersat's VLoad utility. The uses of the Parameter Editor in VMS and VLoad differ, however, in the way the edited parameters are stored and applied.

For example, once a modem/router parameter has been changed by the VMS (online editing), clicking the OK button on the edit screen causes the change to be implemented immediately in the modem. The same change made using VLoad (offline editing) will not be implemented in the modem until the modified parameter file is uploaded or "put" to the subject modem/router.

Several parameter modifications can also be made from the *Parameter View* interface within ViperView (figure 4-1) by clicking on a setting and editing it. Note that the number of settings presented here is not as comprehensive as what is provided within the Parameter Editor.

Alternatively, parameter changes may be made directly to the modem using either a console, Telnet, or HTTP connection, rather than using the VMS. Refer to the modem's documentation for details on configuring modem equipment using one of these methods. The VMS will generate a log event to inform the operator/user that one or more parameters for that modem have been changed by an external source—another VMS client, or via the WSI, for example—since the last parameter change by this user account.

The settings of any Vipersat network modem/router can be configured or modified using the VMS. Right-clicking on a device icon in ViperView will display a drop-down menu showing the options that can be exercised for the device, as shown in figure 4-1.

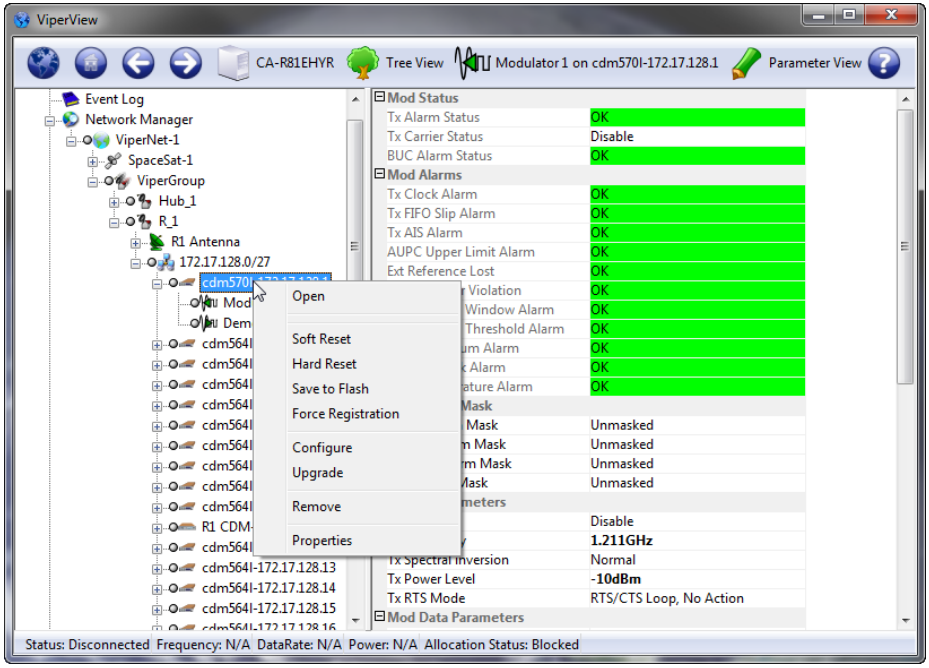

Figure 4-1 Parameter View and Modem Command Menu

The following describes the actions for each item/command on the drop-down menu.

- **Open** – This item causes the selected modem/router to pop open a separate window displaying the device parameters for the unit.
- **Soft Reset** – This command causes the selected modem/router to perform a refresh of all latched alarms, clearing all internal table entries.
- **Hard Reset** – This command causes the modem/router to do a complete process reset. Performing a hard reset is similar to power cycling the unit.
- **Save to Flash** – This item will save all volatile configurations to the modem/router's flash memory. Anytime an operator makes a change to communication and operating parameters, it is necessary to save the changed information/configuration.

NOTE

Note: Save to Flash saves information in the selected modem/router, not in the VMS database.

- **Force Registration** – A modem/router is normally automatically registered on the network as part of the initial setup process. If this process fails, this command will force a registration attempt.
- **Configure –** This item will open the Parameter Editor, allowing configuration changes to the unit. *See subsection "Using Parameter Editor" on page 4-5*.

NOTE

Note: Many of the parameters interact with each other. Before making a change to a parameter setting, carefully read the instructions and observe any notes documenting parameter interaction.

- **Upgrade** – This command is used to upload an application image file to upgrade the firmware for the unit.
- **Remove –** This command deletes the device container from the VMS configuration database, removing it from selected view.
- **Properties –** This command allows access to the **General Properties** and the **Stored Configurations** for the selected unit.

Hardware/Software Configuration

Refer to the user documentation for each modem/router in the satellite network for details on the physical installation of the device. The hardware documentation also has detailed information on using the unit's front panel controls, a Telnet connection and the command line interface, or an HTTP connection and the web server interface for directly configuring the target modem/router.

A modem/router, when managed by the VMS as part of a communications network, has its performance automatically controlled as the VMS monitors its role and function in the network. The VMS commands the modem to modify its configuration, as needed, to optimize network performance.

In addition, the modem portion of each modem/router in a network can be controlled manually. Each modem/router will have its own unique user interface and connection methods. Check the modem/router documentation for details.

NOTE

Note: Not all modem functions may be controlled by the VMS. Refer to the device's user documentation for instructions for using functions not available through the VMS.

Table 4-1 Modem/Router Manual Control Options (CDM-570/L, CDM-570A/AL)

User Interface	Connection	Modem Functions	IP Functions
Front Panel	Local - Keypad	ALL	IP Address/Subnet Mask only
Serial Remote Control	Local - Serial RS-232 Remote Control Port	ALL	IP Address/Subnet Mask only
Serial Command	Line Interface (CLI) Local - Serial RS-232 via Console Port	ALL	ALL
Telnet	Local or Remote - Ethernet via 10/100 BaseT Traffic interface	ALL	ALL
Web Server	Local or Remote - Ethernet via 10/100 BaseT Traffic interface	ALL	ALL
SNMP	Local or Remote - Ethernet via 10/100 BaseT Traffic interface	ALL	ALL

Using Parameter Editor

Introduction

The use of the Parameter Editor from the VMS is presented here for the Advanced VSAT Series 8xx modems. Configuration of modem parameter files for supporting products can be performed using the VMS.

Because Parameter Editor modem configuration for the CDM-570/L, the CDD-56x series, and the SLM-5650/A is available via both the VMS and the VLoad utility, user documentation relating to these models is provided separately as follows:

- *Vipersat CDM-570/L, CDD-56X Parameter Editor User Guide* (Part Number MN-0000038)
- *Vipersat SLM-5650/A Parameter Editor User Guide* (Part Number MN-0000041)

The Parameter Editor provides a simple graphical user interface (GUI) for making configuration changes to modem/routers used in a Vipersat satellite network. Accessible from the VMS, the Parameter Editor operates on the param files that store the operating parameters for network terminals. This user guide documents the Parameter Editor as it applies to the Advanced VSAT Series 8xx satellite modems (CDM-800, CDM-840, CDD-880).

Once a modem's configuration has been changed using the VMS, the change is immediately applied to the modem and a change event is generated in the *Event Log* (see *Chapter 4, "Configuring Network Modems"*).

NOTE

Note: Many of the parameters will interact with other parameters. Carefully read the instructions before making changes to a unit's configuration settings.

Parameter modifications may also be made directly to the modem/router using an HTTP connection and the web server interface (WSI). Refer to the modem/router's documentation for details on making equipment parameter modifications directly at the unit.

Tracking Parameter Changes

When making configuration changes to network units, it is recommended that the Event Log window be displayed in ViperView so that the change events can be observed as they are recorded. This applies to changes made locally as well as externally, such as by another operator/user. A log event will be generated to inform the local operator/user that one or more parameters for a modem unit

have been changed by an external source—another VMS client, or via the WSI, for example—since the last parameter change by this user account.

See "Event Log" on page 6-11 for more information.

Parameter Editor Features

The Parameter Editor software has the following features:

- Simple yet comprehensive graphical user interface.
- Integrated with the VMS.
- Context sensitive for device type as well as for unit role (Hub/Remote).
- Configuration alert error checking on range value parameters.
- Integrated help with parameter information.

Fully integrated with the VMS, the Parameter Editor is called upon when a modem configuration command is executed in the ViperView user interface. An example of the editor for the CDM-800 modem is shown in figure 4-2, below.

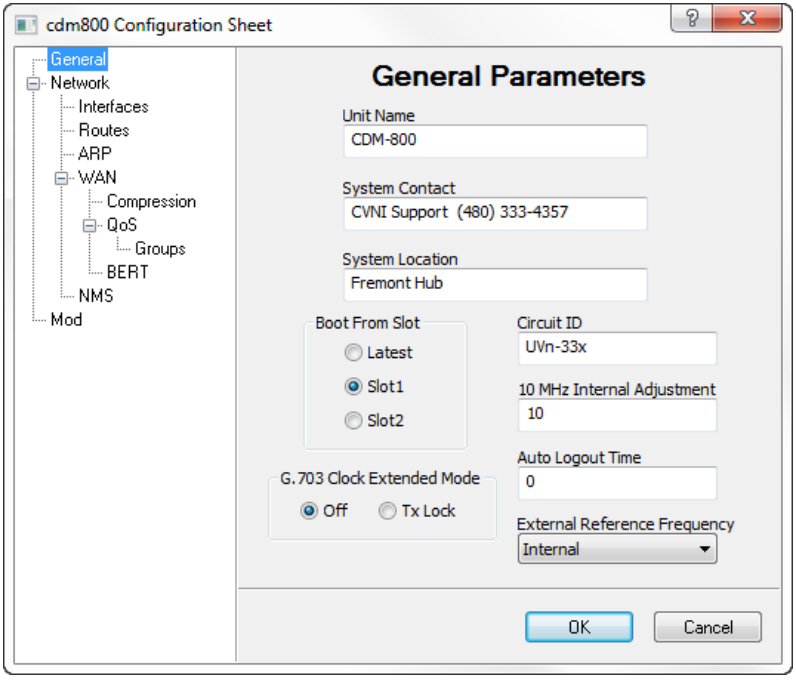

Figure 4-2 Parameter Editor, CDM-800 Example

Selection from the tree menu in the left panel of the window displays the applicable parameters in the right panel, using a combination of text fields, pull-down menus, check boxes, and radio buttons.

Information Help

Information on a parameter is available via the integrated help feature. The user clicks on the**?** (question mark) button in the upper right of the Title bar, then clicks on the desired parameter label or field. A text pop-up appears containing a description of the parameter. An example is shown in figure 4-3, below.

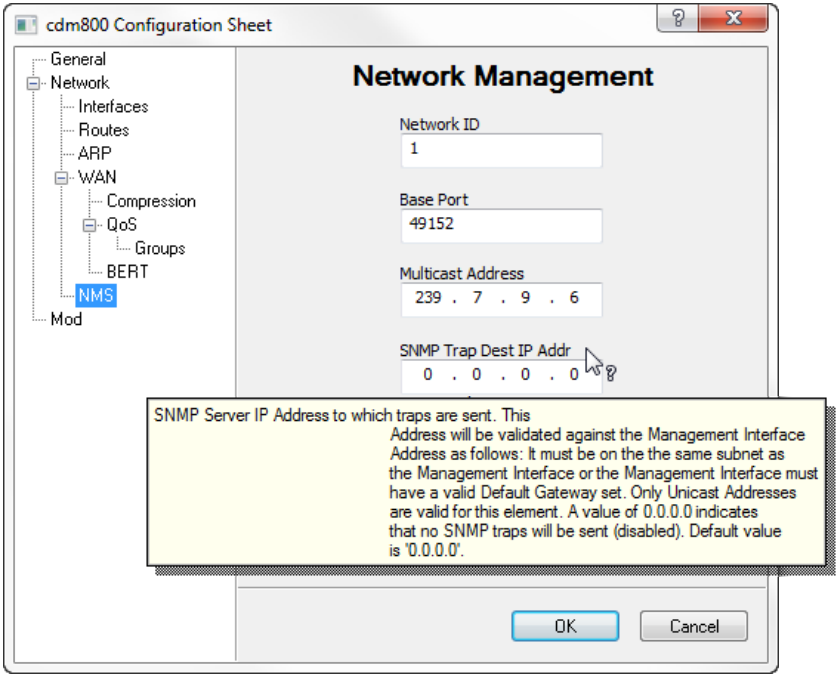

Figure 4-3 Information Help Feature Example

Configuration Changes

When changes are made to a modem unit configuration with Parameter Editor, these changes are saved by clicking on the **OK** button at the bottom of the Editor window. Alternatively, these changes are ignored by either clicking on the **Cancel** button or closing the Editor window.

Caution: Clicking the OK button saves *all of the data* from *all of the menu category dialogs* simultaneously to the modem unit Param file. The

OK and Cancel buttons do not apply to any single dialog, but apply to all dialogs in the Parameter Editor.

Because the Parameter Editor closes after a save operation, it is recommended that all desired changes be input prior to clicking on the OK button.

Parameter Editor Tree Menu

The Parameter Editor (ParamEdit) displays the editable parameter categories for each network modem/router in the form of a tree menu. The tree appearance will vary depending on the Series 8xx modem type.

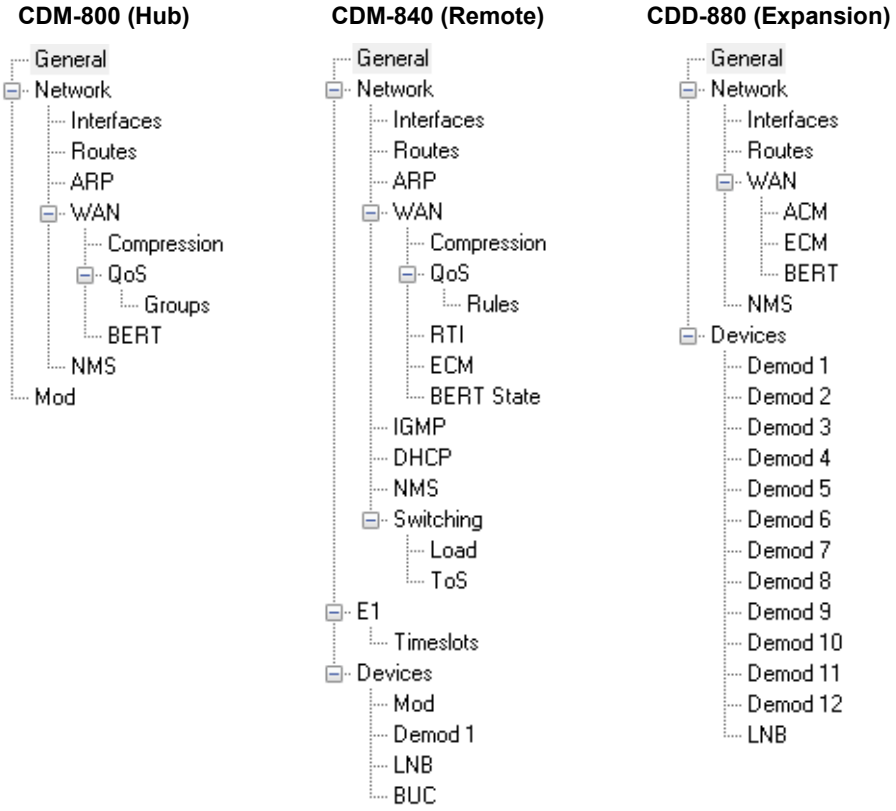

Figure 4-4 Tree Menus, Series 8xx Modems

From the VMS *ViperView* user interface, ParamEdit is accessed by selecting the modem **Configure** command (figure 4-5).

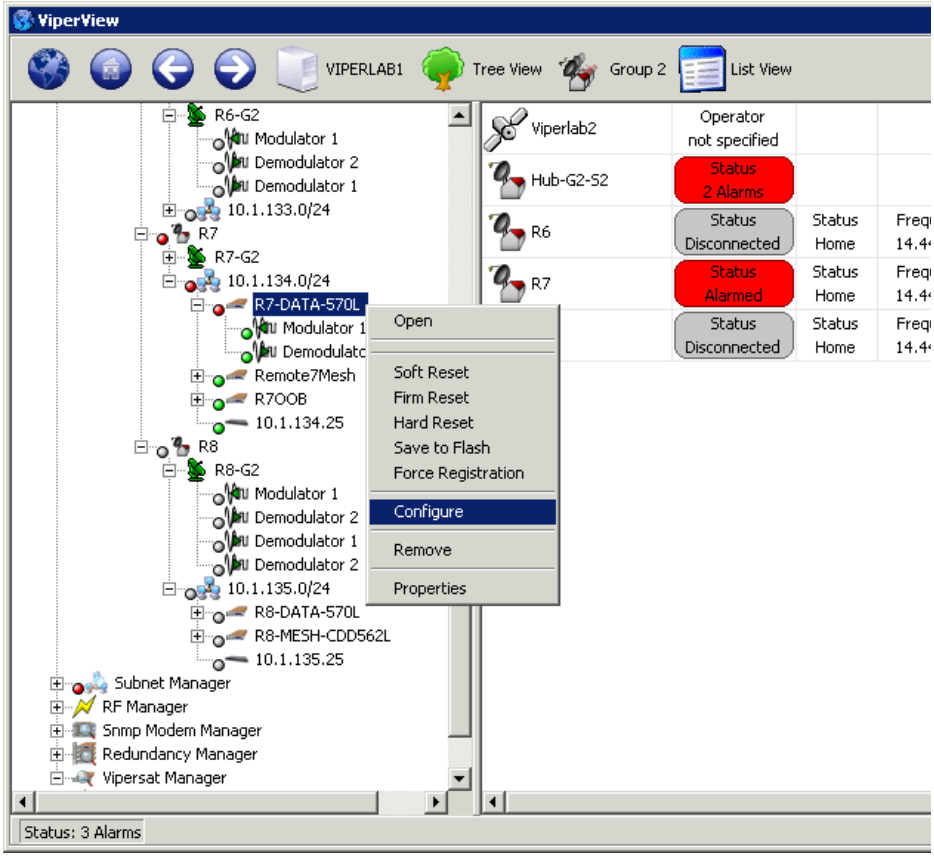

Figure 4-5 Modem Configure Command, ViperView

The following sections describe each of the tree menu items and their associated configuration parameters and settings.

General

Clicking on the **General** menu item displays the General Parameters dialog shown in figure 4-6.

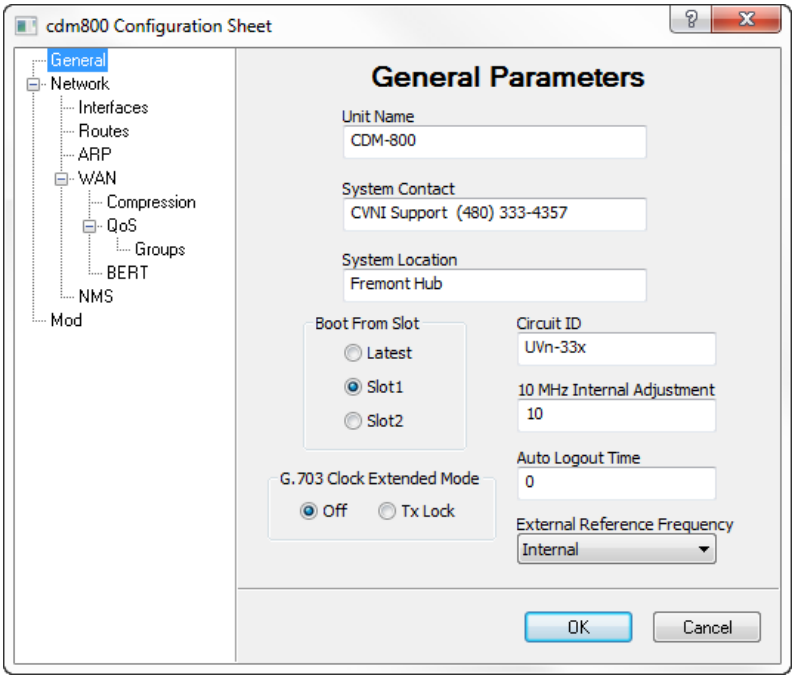

Figure 4-6 General Parameters dialog, CDM-800

Unit Name

Enter any name (4 to 16 characters) for the node which serves to identify this Vipersat unit on the network. Defaults to modem type (CDM-800, CDM-840, or CDD-880).

Valid characters: Space ( ) * + - , . / 0 thru 9 and Aa thru Zz.

System Contact

Optional contact information can be entered (1 to 63 characters), such as for technical support; e-mail, telephone, etc.

Valid characters: Space ( ) * + - , . / 0 thru 9 and Aa thru Zz.

System Location

Optional location information can be entered (1 to 63 characters) here for reference.

Valid characters: Space ( ) * + - , . / 0 thru 9 and Aa thru Zz.

Boot From Slot

The **Boot From Slot** radio button selection designates the firmware image to be loaded for operation upon power-up or soft reboot.

The **Latest** designation selects the firmware that was most recently installed in the modem.

G.703 Clock Extended Mode

This parameter field appears for CDM-800 and CDM-840 units.

NOTE

Note: If the G.703 Clock Extension feature (FAST code) has not been purchased for this modem/router, the G.703 Clock Extended Mode parameter will not be displayed.

A high-stability G.703 timing reference for synchronization, such as for cellular IP backhaul applications, can be provided with the G.703 Clock Extended Mode parameter. This feature provides the transport of this timing reference to the distant end of the satellite link, regardless of the actual data rate of that link. The internal clock generator is locked to an externally applied G.703 (T1 or E1) signal that is perfectly reproduced at the other end of the link.

Selecting **Tx Lock** will lock the modem transmit to the G.703 timing signal.

Circuit ID

This parameter field appears for CDM-800 and CDM-840 units.

A user-defined **Circuit ID** string (4 to 32 characters) can be entered here. This identifier will appear in the parameter view area of ViperView for a selected unit.

Valid characters: Space ( ) * + - , . / 0 thru 9 and Aa thru Zz.

10 MHz Internal Adjustment

This setting provides fine adjustment of the Internal 10 MHz reference from the high-stability frequency reference module in the unit.

The default value is 0. Range is -999 to 999 kHz.

Auto Logout Time

Administrative security is provided with the **Auto Logout Time** parameter, specifying the allowable idle time during a Web Server Interface (WSI) session with this modem unit before the session is automatically terminated. This provides a security measure for safeguarding access to a previously logged-in unit.

Valid range is 0 to 15 minutes; 0 (default) *disables* the Auto Logout.

External Reference Frequency

This parameter field appears for CDM-800 units only.

This parameter sets the reference frequency for the CDM-800 modem to be either Internal or External. The appearance of this signal is at the **Reference In/ Out** connector on the rear panel of the unit.

Select the desired setting from the pull-down menu, as shown in figure 4-7.

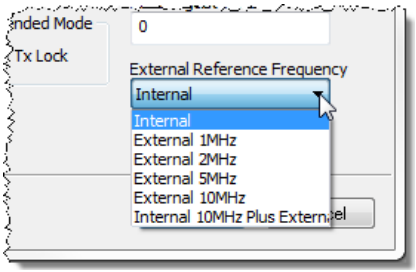

Figure 4-7 External Reference Frequency Pull-Down Menu, CDM-800

Base Frequency

This parameter field appears for CDD-880 units only.

The Multi-Receiver Router is capable of accepting receive frequencies that fall within a 70 MHz range. Specifying a **Base Frequency** establishes the lower limit of this range for the router. The individual demodulators are then able to receive frequencies that range from this base level up to a maximum of 70 MHz above that level.

Note that the center frequency of a carrier must fall a minimum of 50% of the bandwidth above this setting.

The valid range for this parameter setting is 950-2080 MHz.

Caution: Changing the Base Rx Frequency for a unit will result in the frequencies for existing carriers on that unit to become invalid, causing them to unlock.

Rx Constellation Select

This parameter field appears for CDD-880 units only.

NOTE **Note:** This parameter is not functional in the current release.

Network

The parameter settings that pertain to the network (WAN and LAN) are presented in several submenu items described below.

Network | Interfaces

Clicking on the **Interfaces** menu item displays the Network Interfaces dialog shown in figure 4-8.

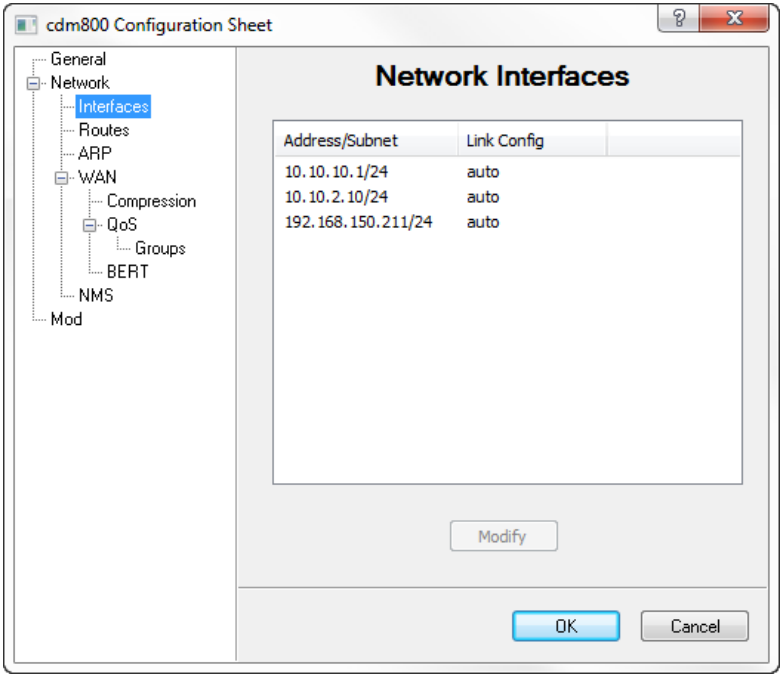

Figure 4-8 Network Interfaces dialog, CDM-800

This dialog is used to configure the IP Addressing and Link Configuration settings for the Ethernet communication ports that are on the rear panel of the Series 8xx units. These ports consist of the following interfaces:

- **GE** (10/100/1000 BaseT Gigabit Ethernet) interface(s).
  This interface serves as the Customer Traffic port.
  There is one GE port on the CDM-840 and the CDD-880, and two GE ports (GE1 and GE2) on the CDM-800.
- **FE** (10/100 BaseT Fast Ethernet) interface.
  This interface serves as the Management (M&C) port for the VMS.

The figure above represents the dialog for a CDM-800. In this example, the interfaces appear in the order GE1, GE2, FE.

To modify the interface settings, select a table listing and click on the **Modify** button.

Set the **IP Address** and **Subnet Mask** (valid range is 8-30).
Note that if the GE address/mask is set incorrectly, a traffic Ethernet alarm will be generated in the VMS.

Using the pull-down menu, select the desired **Link Configuration** setting for line speed and duplex. Note that the recommended setting is **Auto**.

Network | Routes

Because satellite networks are often used as extensions for access to services such as the Internet or the PSTN, they lend themselves quite readily to private addressing. For example, to provide Internet access to the satellite network, only the Hub requires a public IP address in order for the entire satellite network that is controlled by the Hub to have access to the Internet backbone. Utilizing Network Address Translation (NAT), the administrator can effectively address the network using a minimum number of static route statements.

Example:

The IP address 172.16.0.0 is the private address network number for class B networks. If there is a router at the Hub with a connection to the Internet, the operator can define the local network as a class B. If the operator splits the Class B in half and points the upper half toward the satellite there will be over 16,000 usable addresses at the Hub as well as at the Remotes.

By putting the one route statement “Remotes 172.16.128.0/17 WAN to LAN” in the Hub modem, and by using the route statement “GW 0.0.0.0/0 LAN to WAN” at each of the Remote modems, the network will successfully route packets. The Remotes can then be subnetted as class C networks or below. Additional routers at the Remotes can be added for

unusually large sites, allowing an additional layer of NAT without requiring any more explicit routing within the Vipersat Modem Routers.

The Series 8xx satellite modems are basically two-port routers, with one port to the LAN (Ethernet) and the other to the WAN (satellite network). Therefore, very little dynamic decision making is necessary, and most routing is done using static routes. These routes can be entered to route IP traffic either over the satellite or to another device on the local network.

Route definitions vary depending on which of the three units in the product series is being configured. Each of these unit types perform a unique role:

- The *CDM-800* is a Hub unit that serves as a forwarding router, and requires explicit route definitions for each of its Remote units (satellite WAN), as well as a default gateway to the Ethernet LAN. For WAN traffic, GSE labeling is applied and the data is forwarded per the table entries.
- The *CDD-880* is a Hub unit that receives traffic off the WAN and forwards all packets to its default gateway (to LAN).
- The *CDM-840* serves as the Remote modem unit that filters received satellite WAN transmissions based on GSE labeling and routes packets destined for the Ethernet LAN. LAN traffic received from its subnet is forwarded using the lone default route to the WAN.

Default gateways are defined as the route of last resort. Typically, the IP address of the next hop router in the network is specified here.

Refer to the *CDX-8XX Installation and Operation Manual* for additional information on entering routes.

Creating the Static Routes

The following procedure outlines the basic route structure that the target Series 8xx unit will require for its role in the network.

One of the key routes that must be created is a default gateway address for routing the data traffic that is received by the unit.

In a *Hub* configuration, the default route will typically point to a router on the same LAN as the Hub unit. In the example shown in the below figure, that router is specified as the Next Hop address 10.1.0.1.

In a *Remote* configuration, the default route will typically point to the satellite modem (WAN) used for communications back to the Hub.

For a Hub unit that is providing the DVB-S2 TDM outbound to the Remotes, static routes must also be created for the following:

- The ECM TAP multicast address (M&C).
- The VMS multicast address (M&C).
- Route statements defining satellite communications with the Remote units; one for traffic and one for management, per Remote. An option for reducing the number of routes required is to enter a single route using a supernet address that will handle satellite communications with all of the remote subnets.

1. From the tree menu, select **Routes** to open the Routing Table dialog. All current static routes are displayed in the table listing.

   The static routing configuration for a typical Hub CDM-800 unit is shown in figure 4-9 and figure 4-10.

   Routing for a typical CDM-840 is shown in figure 4-11.

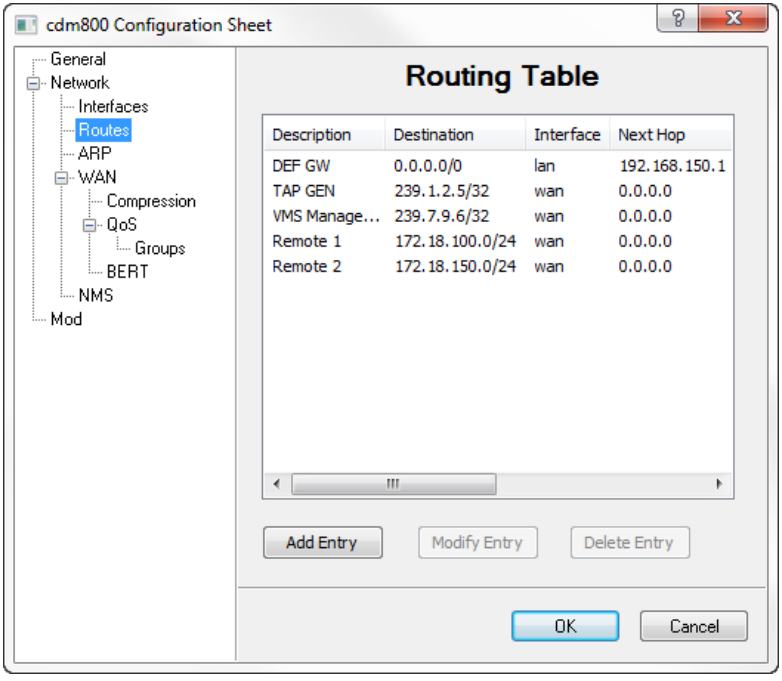

Figure 4-9 Hub Routing Table dialog, CDM-800

Use the horizontal scroll bar to view additional table columns (figure 4-10).

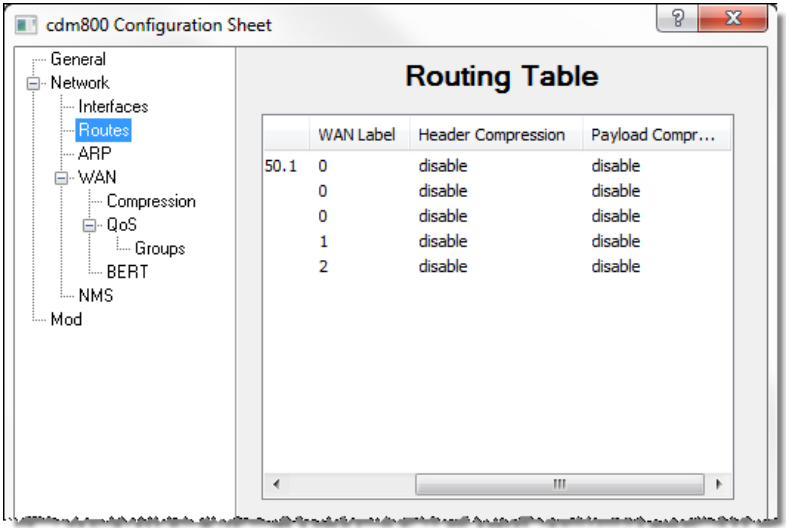

Figure 4-10 Additional Routing Table Columns

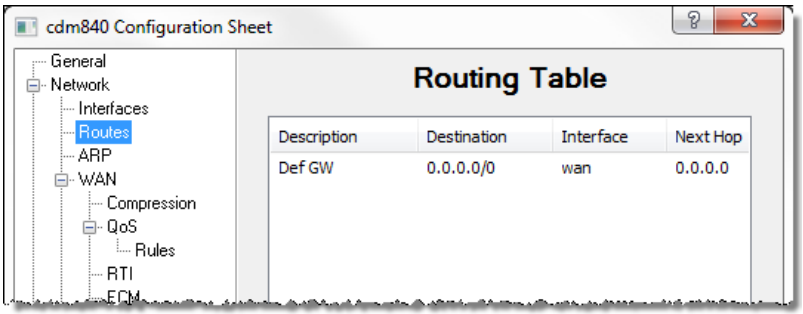

Figure 4-11 Default Route for Remote, CDM-840

2. Click on the **Add Entry** button at the bottom of the dialog to create a new static route for this unit (figure 4-12).

   Note that, depending on the type of Series 8xx unit that is being configured, the parameters displayed in the Route Properties dialog will vary.

   - The *WAN Label* parameter only appears for the CDM-800.
   - For the CDD-880, only the *LAN* interface is applicable, and *Compression* does not apply to this unit.

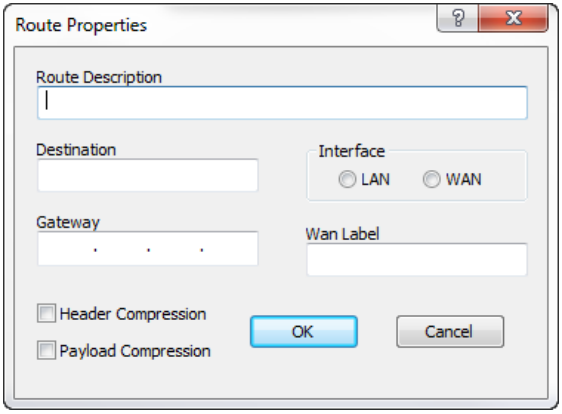

Figure 4-12 Route Properties dialog, CDM-800

3. Enter the following:

- The name for the route in the **Route Description** field (1 to 80 characters).

  Valid characters: Space ( ) * + - , . / 0 thru 9 and Aa thru Zz.

- The **Destination** network IP address and the number of bits in the subnet mask (xxx.xxx.xxx.xxx/yy).

- The route **Interface** port (LAN or WAN). *Note that the CDD-880 offers a LAN interface only*.

- The **Next Hop** IP address for *to LAN* routes. This address must be on the local subnet.
  The system administrator can supply this information, if necessary. Note that no entry is needed for *to WAN* routes.

- The **WAN Label** value for passing traffic to a defined Remote destination. This parameter appears for the CDM-800 modem only, and provides support for WAN filtering in the CDM-840 receiver.

  For non-broadcast addressing, the valid range for this value is from **1** to **2047**.

  For broadcast to all Remotes (multicast addressing), the label is automatically set to **0** (zero); this allows all packets to pass.

  ***Note**: This label must match the label defined in the CDM-840 Remote that corresponds to this route; if not, the packets will be dropped. See the section "Network | WAN" on page 4-22.*

- The selection of **Header** and/or **Payload Compression** is optional on a per route basis for units that have a modulator (CDM-800, CDM-840).

Refer to section “Network | WAN | Compression” on page 4-23 for details on these settings.

In a Hub role for example, create the default gateway route and enter the name of the route (e.g., **Default GW**), enter **0.0.0.0/0** for the destination IP address and the mask, select **LAN** for Ethernet interface, then enter the **IP address** (e.g., 192.168.150.1) of the appropriate router or modem for the next hop.

4. Click on the **OK** button to add the new route to the table.

When an existing route from the table is selected, the **Modify Entry** and **Delete Entry** buttons become active. The Modify Route dialog allows edits to be made to the fields as described above.

Tip: Table appearances in Parameter Editor offer an alternative method of editing existing entries. Clicking twice on an entry enables the user to make revisions directly from the table, as shown in the example below (figure 4-13).

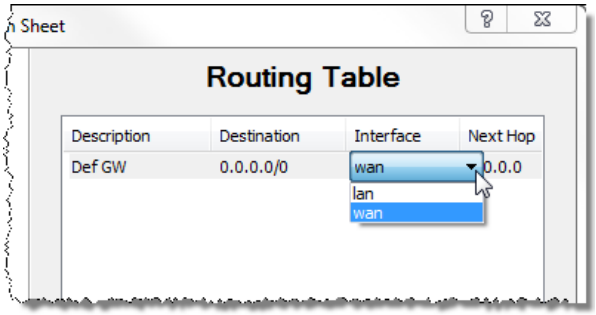

Figure 4-13 Editing Table Entries, Alternative Method

5. When all routes have been defined, click on **OK** to save the settings.

Network | ARP

This menu item appears for CDM-800 and CDM-840 units.

Address Resolution Protocol (ARP) is a low-level protocol used to map IP addresses (Network Layer) to physical MAC addresses (Link Layer) contained on the Ethernet hardware of routers and workstations.

Click on the Network **ARP** menu item to set the address resolution protocol translations (figure 4-14). Here, an ARP mapping table can be created and

modified. Note that both static and dynamic ARP table entries appear in this dialog.

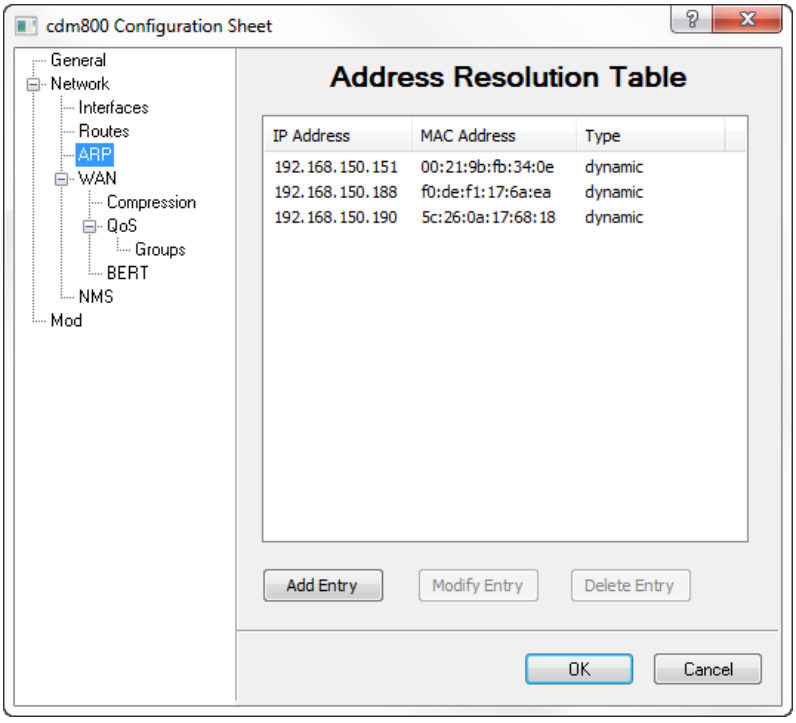

Figure 4-14 Network ARP dialog, CDM-800

Click on the **Add Entry** button to create and add an entry to the table.

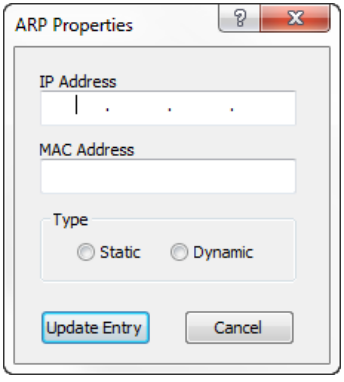

Figure 4-15 ARP Properties dialog

When an existing table entry is selected, the **Modify Entry** and **Delete Entry** buttons become active.

Network | WAN

This menu item is active for CDM-840 units only.

Clicking on the **WAN** menu item displays the Wide Area Network dialog shown in figure 4-16.

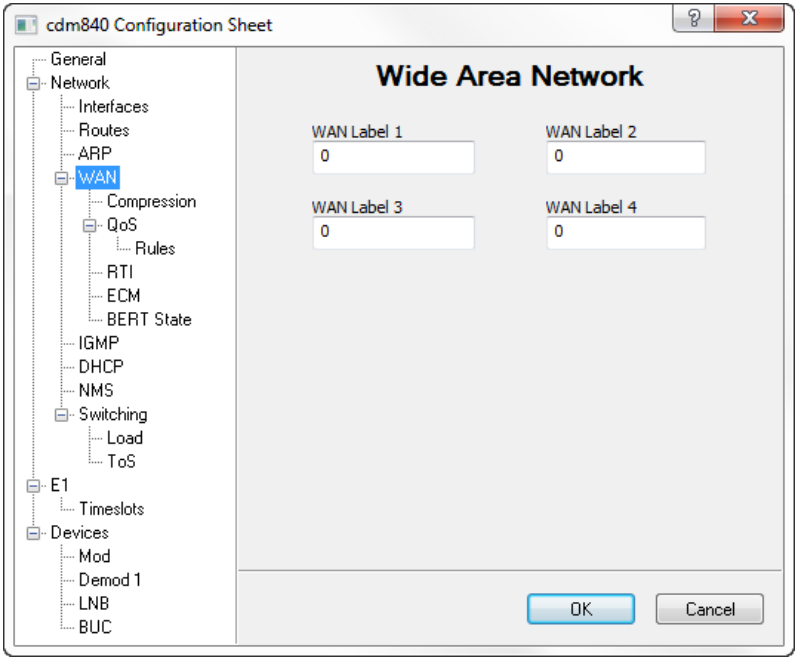

Figure 4-16 Wide Area Network dialog, CDM-840

Up to four receive WAN labels can be defined for the Remote modem/router, the values of which must match those that are attributed to the routes defined in the Hub CDM-800 that use this unit (see the section “Creating the Static Routes” on page 4-16). This parameter is used for packet filtering.

Valid range is 0-2047. Default value is **0** (accept all packets).

Network | WAN | Compression

This menu item appears for CDM-800 and CDM-840 units.

NOTE

Note: If the Compression feature (FAST code) has not been purchased for this modem/router, the Compression menu item will not be displayed.

Clicking on the **Compression** menu item displays the Refresh Rates dialog shown in figure 4-17.

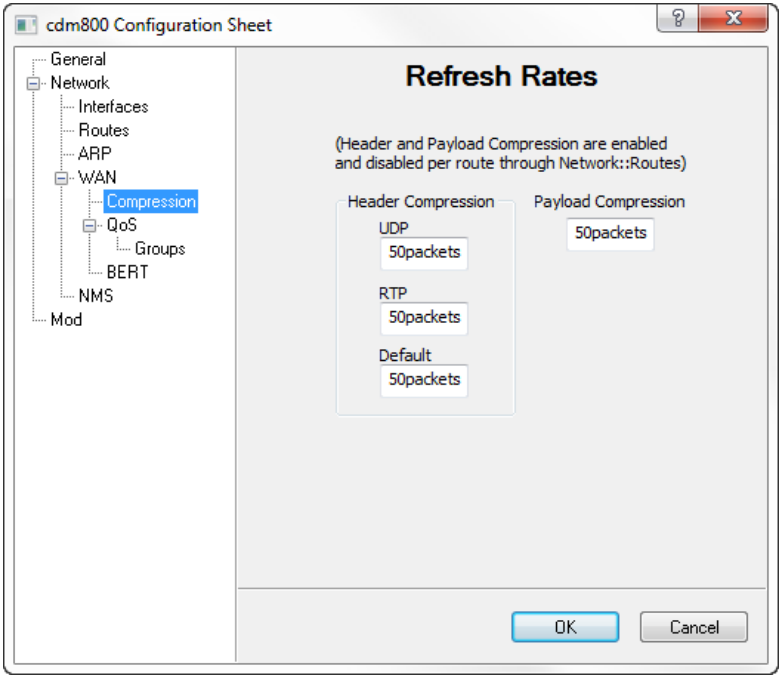

Figure 4-17 Compression Refresh Rates dialog, CDM-800

Compression settings for the modem are specified here in the number of packets. Header compression and Payload compression are enabled/disabled on a *per route* basis, as described in the section "Creating the Static Routes" on page 4-16.

This feature only applies to units that have modulators. The parameters are not applicable to CDD-880 units or to Expansion units, since all demodulators will automatically detect compressed packets that are received and perform decompression.

Series 8xx Satellite Framing

Generic Stream Encapsulation (GSE) is a data link layer protocol that provides the means to carry packet oriented protocols, such as IP, on top of uni-directional physical layers like DVB-S2. Packets transmitted by the CDM-800 use an Enhanced GSE framing.

The CDM-840 modems transmit with VersaFEC physical layer and frame the packets using *StreamLine Encapsulation* (SLE).

Header Compression

When compression is enabled, some of the initial traffic sent between two devices will not be received over the satellite until a full header is transmitted (based on the **Refresh** rate). If a ping is sent over the satellite, it will time out until the full header packet is sent. The header compression refresh rate can be reduced to minimize the amount of traffic lost when traffic is first sent between two devices. Separate refresh rates for UDP flows, RTP flows, and all other flows can be specified.

The default refresh values (50 packets) reflect the recommended settings for a typical modem/router used in a VMS network. However, the refresh rates can be decreased for poor satellite link conditions, or they can be increased to reduce overhead even further. The valid range is 1 to 600 packet(s).

Payload Compression

Only traffic past the headers is effected by payload compression. Payload is considered everything inside the Streamline Encapsulation satellite frame. Therefore, IP headers could be compressed as well. Payload compression is an optional feature of the modem and has the following functions:

- All modems used in a VMS network operate in router mode requiring that payload compression be set on a *per route* basis.
- The compression algorithm is applied to all data (SLE header excluded).
- Compression statistics are fed back to QoS in order to maximize WAN utilization while optimizing priority, jitter and latency.
- The modem runs 1024 simultaneous compression sessions to maximize compression across multiple distinct traffic flows.
- Compression algorithm is not applied to RTP streams because this traffic is already compressed and would only *increase* the satellite bandwidth if compressed again.

Receive payload compression is auto-sensed by a bit carried in packet headers and the modem unit will perform decompression. This function is always available if the payload compression FAST code option has been purchased.

Network | WAN | QoS

This menu item appears for CDM-800 and CDM-840 units.

NOTE

Note: If the Quality of Service feature (FAST code) has not been purchased for this modem, the QoS menu item will not be displayed.

The QoS menu item is not displayed for receive-only network units such as the CDD-880 Multi-Receiver Router.

The modulation and coding (ModCod) for the Hub DVB-S2 outbound carrier groups is specified from the QoS Groups dialog for the CDM-800, even when the QoS function for the network group is disabled. *See "Network | WAN | QoS | Groups" on page 4-28.*

Quality of Service is an optional modem/router feature. The optional QoS capabilities available in each modem/router may be utilized whenever a modem will be handling high-priority traffic, such as video or voice.

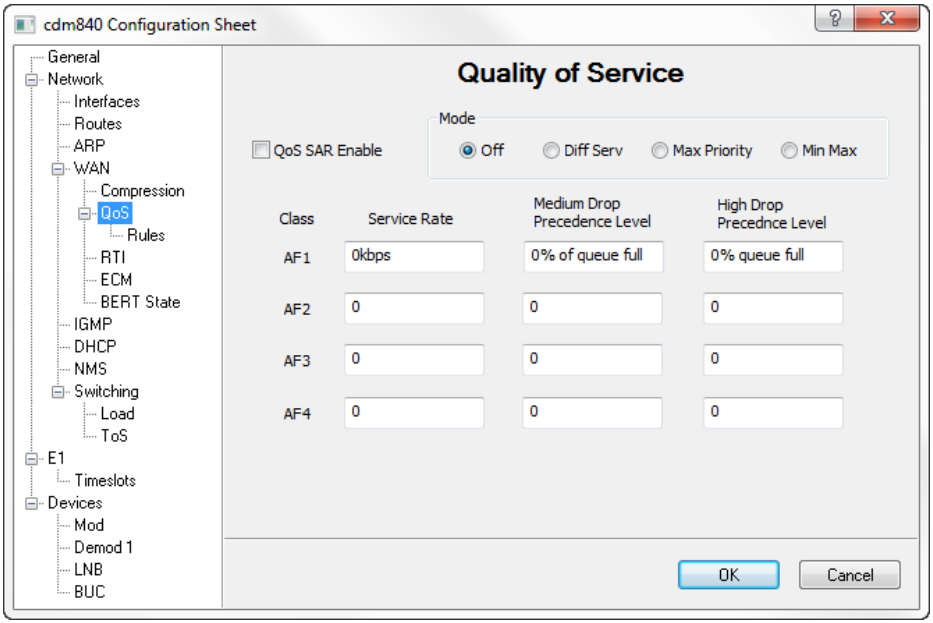

Figure 4-18 Quality of Service dialog, CDM-840

Selecting the **QoS** (Quality of Service) menu item displays the dialog shown in figure 4-18. The user may select one of four **Modes** of QoS operation:

- **Off** – QoS function is disabled (default).

- **DiffServ**– QoS rules based on Differentiated Services settings. This mode is described in the following section.
- **Max/Priority** – QoS rules based on maximum bandwidth and priority. This mode is described under the Rules section, in the subsections *"Priority" on page 4-33* and *"Minimum & Maximum Bandwidth" on page 4-34.*
- **Min/Max** – QoS rules based on minimum and maximum bandwidth. This mode is described under the Rules section, in the subsection *"Minimum & Maximum Bandwidth" on page 4-34.*

Packet Segmentation and Reassembly (**SAR**) is an option that can be enabled for QoS on the CDM-840 Remote unit. This feature reduces the packet size, providing two advantages:

- packets are routed more quickly through the network
- compliance with specified packet size restrictions for a given path

SAR is an adaptive process; it will trigger only if the packet latency exceeds the threshold value (default is 20 msec). At lower data rates, SAR improves the jitter and latency performance for high priority packets. Latency value is calculated based on the satellite transmission bandwidth. The minimum segment size is limited to 480 bytes—excluding satellite HDLC header information—in order to avoid satellite overhead and consumption of CPU cycles.

DiffServ QoS Mode

Selecting the **DiffServ** Mode radio button makes the target unit fully compliant with the Differentiated Services QoS standards.

Ideally, each node in the path should be DiffServ compatible, but it is not necessary. DiffServ Code Points (DSCP) can be set by traffic source or by edge routers. *Comtech CDM-IP modems do not set the DiffServ Code Points; rather, they prioritize traffic*.

Some implementations of DiffServ will prioritize traffic by Class Selector assignment. This is defined in the DSCP within the IP header. The first 3 bits of the DSCP define the Class Selector Precedence (or Priority), as shown in table 4-2.

Table 4-2 DiffServ Code Points (DSCP)

Class Selector	DSCP	Modem/Router Priority
Default (CS0)	000 000	8
Precedence 1	001 000	7

Table 4-2 DiffServ Code Points (DSCP)

Class Selector	DSCP	Modem/Router Priority
Precedence 2	010 000	6
Precedence 3	011 000	5
Precedence 4	100 000	4
Precedence 5	101 000	3
Precedence 6	110 000	2
Precedence 7	111 000	1

The modem/router will prioritize the traffic based upon the DSCP Class Selector Precedence.

NOTE

Note: All traffic that does not have the DSCP Class Selector Precedence defined (000 000) will be placed in the Default Queue and have a Precedence of 0.

Assured Forwarding DSCP

Another implementation of DiffServ uses all 6 bits of the DSCP to define Assured Forwarding, as shown in table 4-3.

Table 4-3 Assured Forwarding, DSCP

DiffServ Type	Class Selector	DSCP	Modem/Router Priority
Assured Forwarding – Class 1	Precedence 1	001 xx0	7
Assured Forwarding – Class 2	Precedence 1	010 xx0	7
Assured Forwarding – Class 3	Precedence 1	011 xx0	7
Assured Forwarding – Class 4	Precedence 1	100 xx0	7

The **Service Rate** setting (kbps) is the minimum bandwidth for the transmit data rate.

Assured Forwarding DiffServ defines four service levels (Class 1 through Class 4) and also uses the last three bits of the DSCP to define the drop probability or **Drop Precedence Level**: Low (010), Medium (100), or High (110). The Drop Precedence determines which packets will most likely be dropped during periods of over congestion, similar to Weighted Random Early Detection (WRED).

As a result, each of the four AF service levels also have three Drop Precedence levels for which the modem/router provides 12 separate queues.

An IP packet that best conforms to the flow criteria is assigned a Low drop precedence, and thus has a higher probability of delivery during congestion than a packet with a Medium (less conformance) or High (non-conformance) drop precedence. The Low drop precedence level is preset to 100% of full to prevent these packets from being dropped prior to the queue reaching its capacity.

Because the Low Drop Precedence Level is not editable, this parameter is not displayed in the configuration dialog. Percentage full settings for the queue depth are configurable for Medium and High Drop Precedence Levels.

Specify the Precedence Levels for **Medium Drop** (20-90, % full) and **High Drop** (10-80, % full). Ensure that the setting for Medium *is greater than* the setting for High.

Typically, DiffServ is implemented using exclusively Class Selector DSCP or exclusively Expedited and Assured Forwarding DSCP. The Series 8xx class is fully DiffServ compliant and will work with either DiffServ implementation or with a combination of both.

Network | WAN | QoS | Groups

This menu item appears for CDM-800 units.

Selecting the **Groups** menu item opens the dialog for the QoS Groups listing (figure 4-19).

Through the Group QoS feature, Variable Coding and Modulation (VCM) can be implemented for the outbound carrier transmitted from the Hub to each of the Remote sites. Configuration of this feature provides variable orders of ModCods within the same carrier.

Lower-order ModCods can be assigned to meet the availability requirements of those sites that have a lower EIRP:

- located on the outer area of the satellite footprint
- having higher incidence of rain fade
- using smaller antenna dish

Higher-order ModCods can be assigned to sites with a higher EIRP:

- located on the inner contours of the beam
- having lower incidence of rain fade
- using larger antenna dish

A QoS group is defined as a set of Remotes for which each has the same ability to receive the Hub outbound carrier. This means that whenever a packet

matches a particular route, the ModCod specified for the group to which the Remote belongs is immediately known and is applied.

The determination of what ModCod should be assigned to a group is by the link budget calculations; a combination of distance from the satellite, the satellite's G/T performance, dish size, and environmental conditions. The grouping should be based on an equal distribution or fairness within the assigned group. Depending on the use of IP addressing plans, the groups may be governed by the customer.

Each group is assigned a ModCod that is the maximum ModCod that the packets can go out in, but the packets could go out in a lower ModCod when the VMS determines—through its optimized scheduler algorithm—a better utilization of the bandwidth and oversubscription conditions.

This shifting of ModCod assignments at the Hub requires that the ModCod selection for the CDM-840 Remote demodulator be set for **Auto**. See the section “Devices | Demod” on page 4-64.

A maximum of six unique ModCods can be specified for use by a CDM-800 for the TDM outbound carrier. The same ModCod can be assigned to multiple groups.

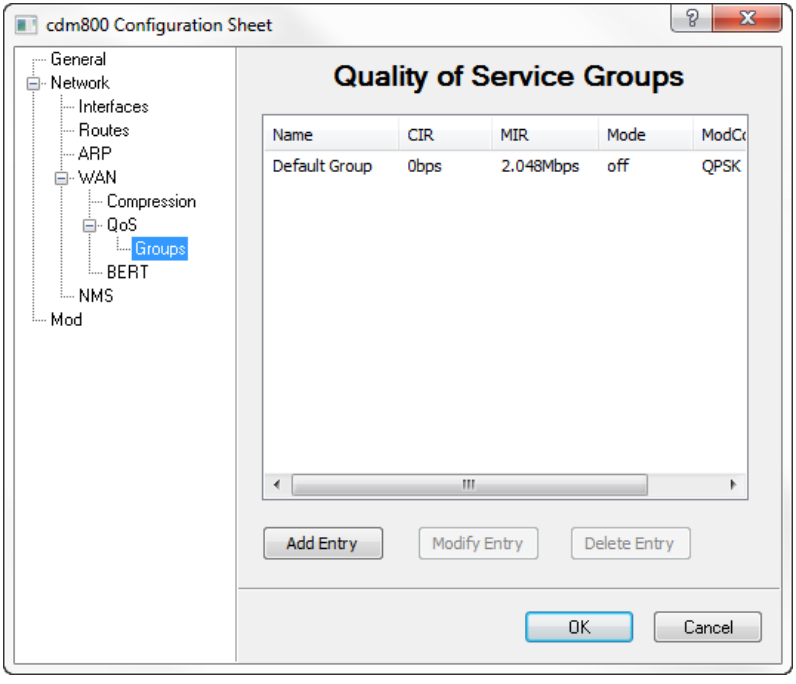

Figure 4-19 Quality of Service Groups dialog

The mapping of packet to QoS group is based upon the subnets that are manually entered on a per-QoS Group basis. If the packet doesn't match a group, it will fall back to the “Default” group.

Existing QoS Group entries can be either modified or deleted.

Click the **Add Entry** button to open the QoS Group Properties dialog and create a new group (figure 4-20).

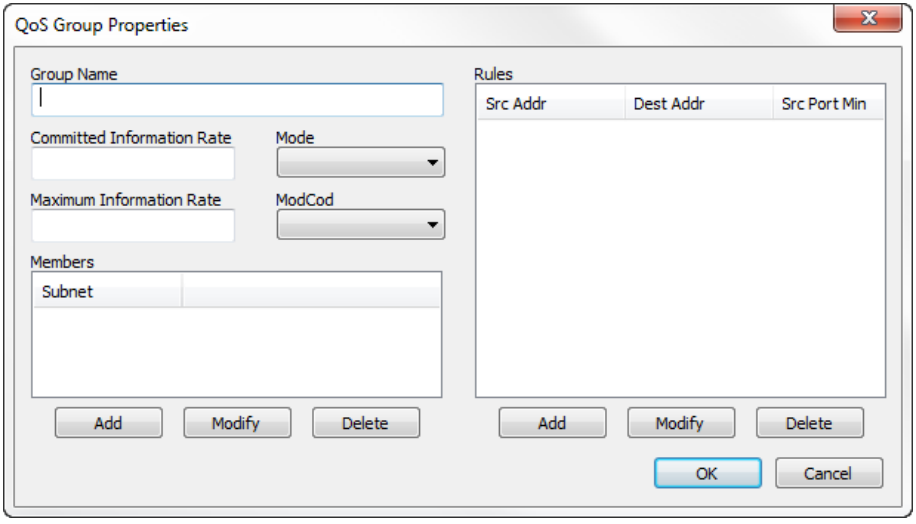

Figure 4-20 QoS Group Properties dialog

Group Name

Enter the designated name (1 to 20 characters) for the group.

Valid characters: Space ( ) * + - , . / 0 thru 9 and Aa thru Zz.

Committed Information Rate

Enter the *minimum* data rate (kbps) that is to be provided for the traffic flow for a member of this group.

Maximum Information Rate

Enter the *maximum* data rate (kbps) that will be allowed for the traffic flow for a member of this group.

Mode

Select the mode of QoS operation to be used for this group from the pull-down menu: Off, DiffServ, Max/Priority, or Min/Max.

ModCod

Select the ModCod to be used for this group from the pull-down menu.

If only one group is defined (*Default Group*), the selection for this parameter will also appear for the ModCod setting in the Mod dialog (*see "ModCod" on page 4-60*).

Members

The mapping of packets to QoS group is based on the subnet addresses that are defined here. If a packet doesn't match any of the defined groups, it will be assigned to the "Default" group.

Specify the Remote site(s) that will be included in the group.
Click the **Add** button and enter the subnet address and number of bits.

Existing members can be selected from the list and either modified or deleted.

Rules

The Rules table that appears on the right side of the group properties dialog lists the QoS rules to be applied for this group. These rules govern QoS for traffic transmitted to the Remotes on the DVB-S2 TDM outbound carrier.

This feature is relevant for QoS modes **Max/Priority** and **Min/Max** bandwidth. When *DiffServ* mode is utilized, the rules are predefined and do not need to be created here.

The QoS mode that is chosen will determine the settable parameters for defining QoS rules for the CDM-840 Remotes. While developing the QoS Rules to be applied to the unit, the type of traffic the modem is expected to handle must be considered.

QoS Rules can be assigned to up to 32 different types of flows defined by the user. Flows can be defined by any combination of Protocol (FTP, UDP, RTP, etc.), Source/Destination IP (specific or range), and/or Layer 3 Source/Destination Port.

QoS Rule Hierarchy

It is quite possible to have traffic that meets the definitions of several QoS Rules. All traffic will be classified into the first QoS Rule that is a match, or fall into the Default Rule. The most specific QoS Rule will always be first. For example, a QoS Rule that identifies a Source and Destination IP Address will be

assigned ahead of a rule that just defines RTP protocol. QoS Rules that have the same amount of variables defined are sorted as follows:

1. By Protocol.

   Protocol Priority:

   a. VOCE – Voice Real Time Protocol
   b. VDEO – Video Real Time Protocol
   c. RTPS – Real Time Protocol Signalling
   d. RTP – All Real Time Protocols
   e. FTP – File Transfer Protocol
   f. HTTP – Hypertext Transfer Protocol
   g. TELN – Telnet Protocol
   h. SMTP – Simple Mail Transfer Protocol
   i. SNMP – Simple Network Management Protocol
   j. SQL – Structured Query Language Protocol
   k. ORCL – ORACLE Protocol
   l. CTRX – CITRIX Protocol
   m. SAP – Service Announcement Protocol
   n. UDP – User Datagram Protocol
   o. TCP – Transmission Control Protocol
   p. ICMP – Internet Control Message Protocol
   q. IP – All Internet Protocol
   r. N-IP – All Non-Internet Protocol

2. By Source IP Address or Subnet.

3. By Destination IP Address or Subnet.

4. By Source Port (lowest port number first).

5. By Destination Port (lowest port number first).

The modem/router will sort each QoS rule as they are added, and the QoS Rules Table will be updated to reflect the order with which rules are matched.

To add a new rule, click on the **Add** button below the table to open the **QoS Rule Properties** dialog (figure 4-21).

Existing rule entries can be selected and *Modified* or *Deleted*.

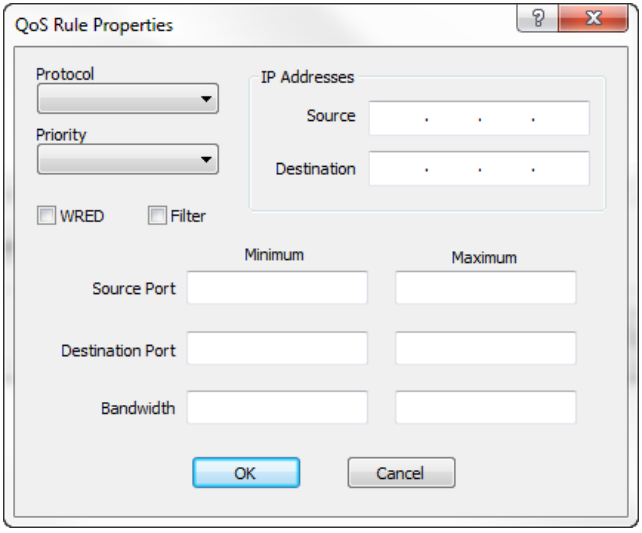

Figure 4-21 QoS Rule Properties dialog, CDM-800

Protocol

Clicking the **Protocol** drop-down menu displays the available protocols. Select the appropriate protocol from the list, as required.

When selecting a protocol for a QoS Rule, be aware that the modem/router allows a very broad selection (such as IP) or a very specific protocol. For example, RTP traffic can consist of UDP portion (for voice or video) and a TCP portion (for RTP signaling). These could have separate QoS Rules created or all be included in a single Rule by selecting RTP as the protocol.

Priority

This field is active for *Max/Priority* mode only.

A Priority level from 1 (highest) to 8 (lowest) is assigned for each flow using the **Priority** field. The modem/router classifies each packet that is to be forwarded over the satellite using the priority assigned for the selected Protocol.

Any packet that does not meet a QoS Rule is assigned to the Default Rule and will be assigned a Priority of 9. Priority 1 packets will be forwarded immediately, Priority 2 packets will be forwarded as soon as there are no priority 1

packets in the queue, and so on. Any latency-critical traffic, such as VoIP/RTP should always be assigned Priority 1.

WRED

Selecting the **WRED** (Weighted Random Early Detection) check box enables this function in the modem/router. WRED allows for more graceful dropping of packets, as QoS queues get full.

Without WRED, output buffers fill during periods of congestion. When the buffers are full, all additional packets are dropped. Typically, packets are dropped based upon a simple tail drop algorithm applied to packets as they were being added to the QoS queues. This can result in large numbers of contiguous packets being dropped all at once, which causes many protocols such as RTP and TCP to ungracefully degrade performance in an over-consumed or bursty scenario.

WRED applies a randomization, which means that the percentage change to dropped packets increases as the queue becomes full, and minimizes the chances of global synchronization. Thus, WRED allows the transmission line to be used fully at all times.

Enable Filtering

QoS allows specific flows to be designated as “filtered,” so the modem/router will discard traffic that the user does not want to forward over a satellite link. Selecting the **Filter** check box enables filtering.

IP Addressing

Specific Source and Destination IP Addresses can be specified for a rule, if desired.

Source and Destination Ports

Selecting Source and Destination Ports should only be done if the user is aware of the port used by the desired protocol or application. There are well known ports for various protocols, but often only command messages use these specific ports and data is transferred through a negotiated port.

Either specific port numbers or a range of ports can be entered using the **Source Port** and **Destination Port** Minimum and Maximum fields. The valid port range is 0 to 65535.

Minimum & Maximum Bandwidth

Minimum and Maximum Bandwidth values can be assigned to a flow to restrict the bandwidths that any particular flow will utilize.

Note that, for *Max/Priority* mode rules, no minimum bandwidth restriction is applied (0 bps) and can not be edited. For *Min/Max* mode rules, a minimum value can be assigned to the flow that allows a committed information rate (CIR) to be applied to a user-defined class of traffic.

Tip: Once the QoS rules are defined, each type of traffic flow should be isolated and sent to verify that it is being sent using the intended QoS rule.

Using the QoS Queue Statistics feature in the modem unit's WSI, the traffic flows for all of the defined QoS rules can be monitored. Statistics displayed include the packet rate, drop rate, transmit rate, and active flows.

Network | WAN | QoS | Rules

This menu item appears for CDM-840 units.

The QoS rules for the CDM-840 govern QoS for traffic transmitted over the return path from the Remote to the Hub.

This feature is relevant for QoS modes **Max/Priority** and **Min/Max** bandwidth. When *DiffServ* mode is utilized, the rules are predefined and do not need to be created here.

See the previous subsection (*defining QoS rules for the CDM-800*) for the details about QoS rules and the descriptions of the rule parameter settings.

Click on the **Rules** menu item to open the Quality of Service Rules Table dialog (figure 4-22). The table lists the QoS rules to be applied for this Remote.

Click on the **Add Entry** button to open the QoS Rule Properties dialog (figure 4-23) and create a new rule. Select an existing rule from the table to either Modify it or Delete it.

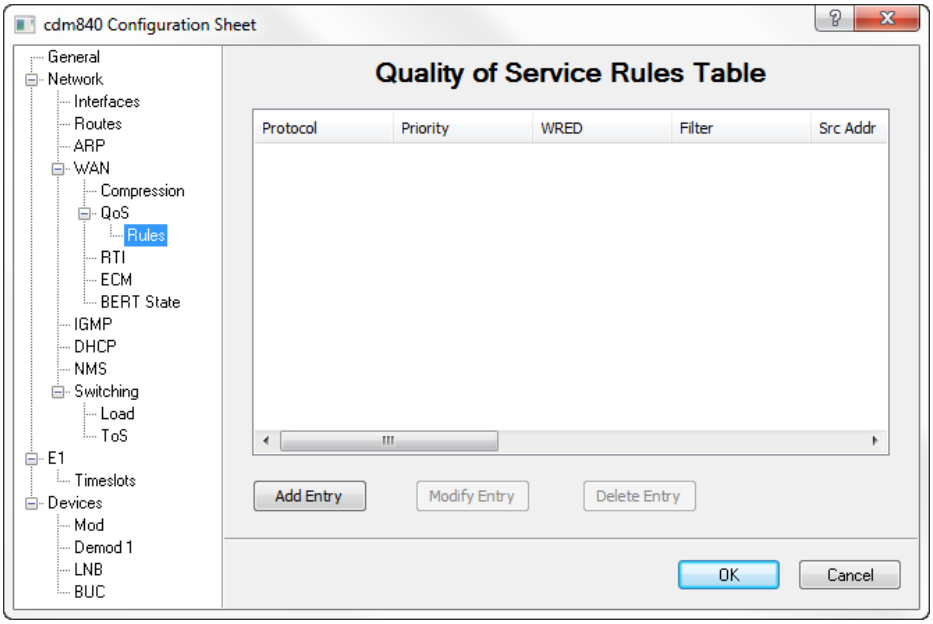

Figure 4-22 Quality of Service Rules Table dialog, CDM-840

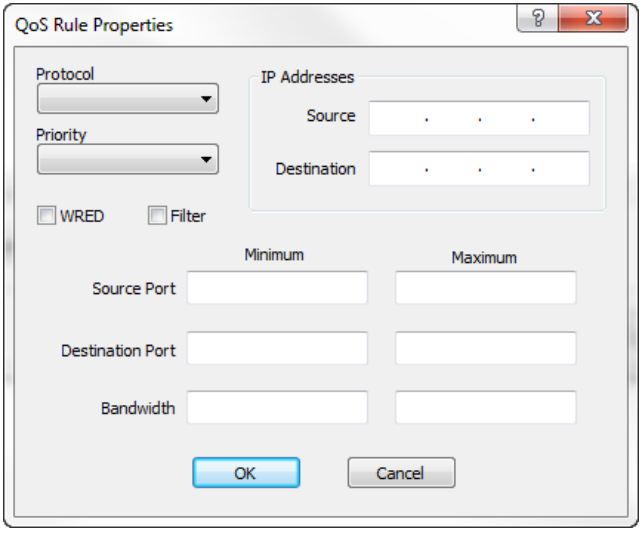

Figure 4-23 QoS Rule Properties dialog, CDM-840

Network | WAN | RTI

This menu item appears for CDM-840 units.

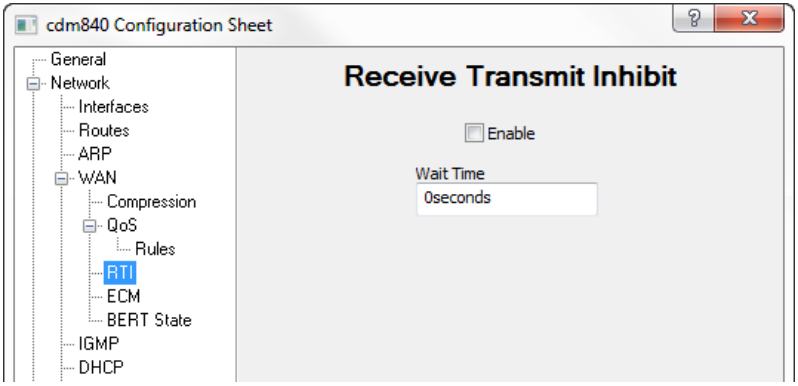

Figure 4-24 Receive Transmit Inhibit dialog, CDM-840

The CDM-840 Remote unit can be configured to stop transmitting during periods when it no longer is receiving a signal from the Hub (i.e., the demodulator becomes unlocked). When the Receive Transmit Inhibit is enabled, the specified **Wait Time** will determine how long after Hub transmissions are no longer received before the Remote transmitter will become muted.

Valid range is 1–10 seconds. Default is 0.

Network | WAN | ACM

This menu item appears for CDD-880 units.

NOTE

Note: All VersaFEC ACM requires the correct firmware to be installed in both the CDM-840 Remote Router and the CDD-880 Multi-Receiver Router (version 1.3.1 or higher), and the appropriate FAST code for the maximum operating symbol rate.

Adaptive Coding and Modulation (ACM) turns fade margin into increased link capacity by automatically adapting the forward error correction (FEC) code rate and modulation type to maximize data throughput over the satellite link, even during adverse conditions (e.g., noise, rain fade). The link signal-to-noise ratio (SNR) or E_s/N_0 is the input that drives the adaptation.

ACM in the CDM-840 Remote is utilized in the VersaFEC return path to a Hub CDD-880, and is currently for *IP traffic only*.

The relationship between data bit rate, symbol rate, and ModCods is expressed in the simple equation:

Bit rate = Symbol rate * Modulation order * Code rate

To ensure that the bandwidth allocated for a particular link is never exceeded, the symbol rate (and power) must remain constant. Therefore, this equation demonstrates that the bit rate increases with a higher ModCod, and decreases with a lower ModCod.

Note that the Link Adaptation configuration for the CDM-840 Remote unit is done from the **VersaFEC Modulator** dialog (figure 4-25). See section "Devices | Mod" on page 4-58 for more information on setting the ACM parameters for the Remote unit.

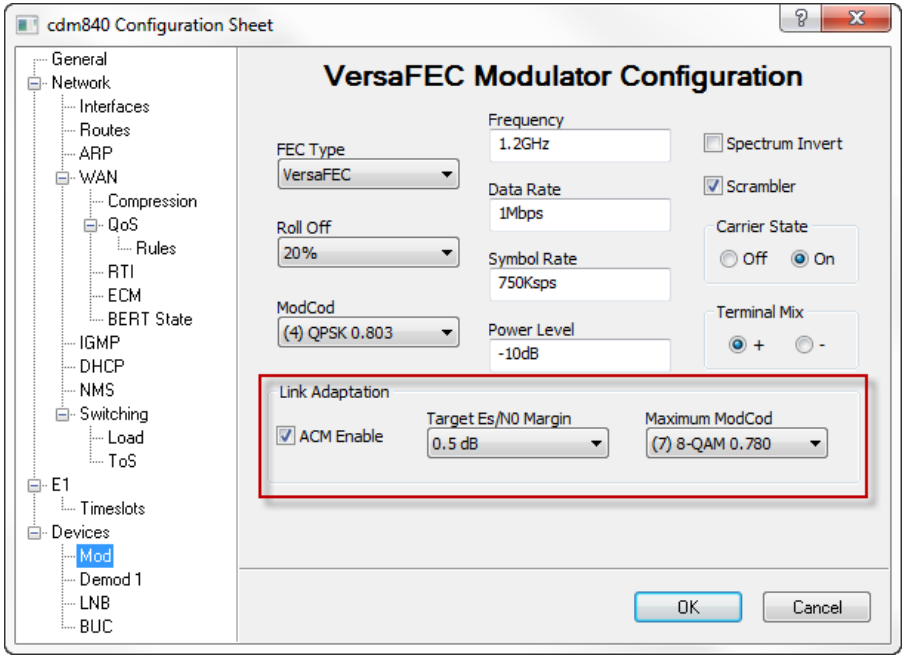

Figure 4-25 Link Adaptation Configuration, CDM-840

Clicking on the **ACM** menu item for the CDD-880 displays the Link Adaptation dialog shown in figure 4-26.

A table listing the Demods (maximum of 12) for the router provides the means to *Enable* or *Disable* ACM for each one individually. Select the desired Demod and click the **Modify** button to change the current setting.

In a *VMS managed network*, the IP Address of the Remote is automatically assigned based on dynamic switching operations (*d*SCPC). When a demod has been assigned to receive communications from a CDM-840 transmitter due to a dynamic switch, the Remote IP Address field will display the address of the

CDM-840 preceded by **VS:**.
{Only in a *static (non-VMS) network* must the address be input by the user.}

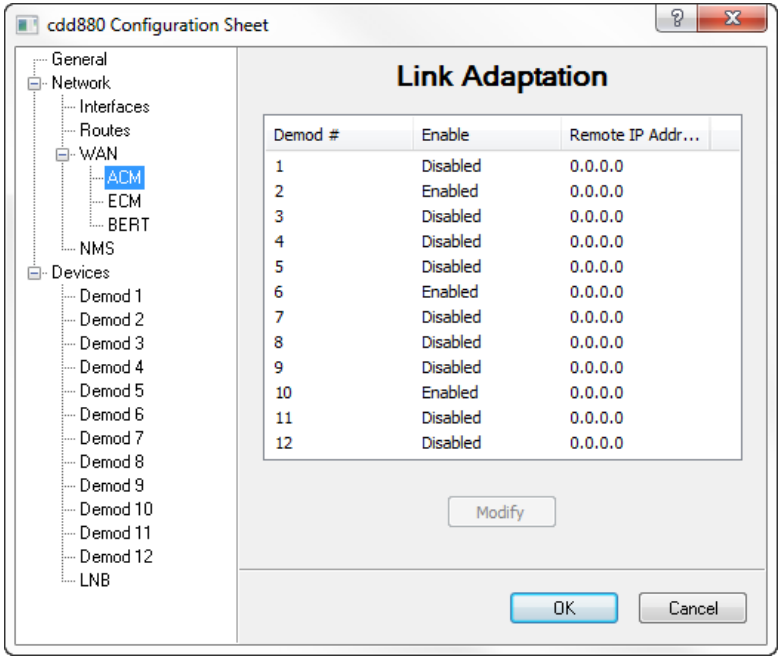

Figure 4-26 ACM Link Adaptation dialog, CDD-880

Network | WAN | ECM

This menu item appears for CDM-840 and CDD-880 units.

The **Entry Channel** mode provides Remotes in the group with a shared channel in which they can gain initial access to the network. While Remotes are in ECM, only management traffic is passed; customer data is not transmitted. Since very small data rates are required in this configuration, a large number of Remotes can share the cycle. As soon as the Hub receives an ACK from the Remote, it initiates an immediate switch to SCPC mode based on the policy set for that Remote. Note that the switch occurs as soon as the Hub receives an ACK even though there may not be traffic at that time. The persistence of the link will be determined by the unit's flag settings.

When Enabling Entry Channel for the CDD-880 to function as the Hub Channel Controller (HCC), corresponding Remote modems must be configured with Load switching *Enabled*. Note that the settings for Step Up and Step Down

Threshold values should be adjusted as necessary for the application. Refer to the section “Network | Switching” on page 4-51.

Entry Channel mode is designed to allow the Remote units to be able to make on-demand connections when required. In the event of a power outage, Entry Channel provides a bandwidth-efficient method for Remotes with low latency requirements to re-enter the network once power is restored. Additional information can be found in the section *“Entry Channel Mode Switching” on page E-25*.

Configuring Hub ECM

The HCC is a dedicated Hub demodulator on a CDD-880 that has been designated as an ECM controller. Only one Entry Channel is supported for each CDD-880, and is limited to Demod 1.

Configure the HCC by clicking on the **ECM** menu item for the designated CDD-880 (figure 4-27) and then clicking the **Enable** check box.

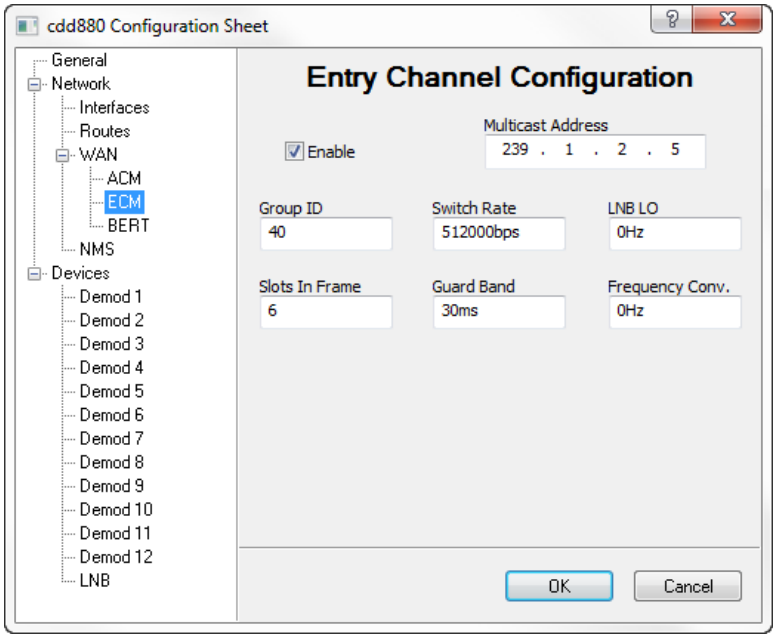

Figure 4-27 Entry Channel Configuration dialog, CDD-880

Multicast Address

This parameter is used to define the IP address for the Multicast of the Transmission Announcement Protocol (TAP) message that is sent out by the

HCC to all of the associated Remotes in that group. This address must be the same for all members of the group. The TAP is a proprietary message sent from the Hub to all Remotes, at regular intervals, specifying the relative start time and duration for each terminal to transmit.

Group ID

The ECM **Group ID** number defines a group of equipment (both Hub and Remote units) that will respond to the output of a single Hub channel controller. This group is addressable within a network which, in turn, is defined by the Network ID number assigned to the modem/routers.

Allocation of bandwidth is shared among the Remotes in an ECM group. Depending on the number of Remotes in a network, a Hub may have multiple controllers, each with its own set of Remotes. This is accomplished by assigning a unique Group ID number to each controller and its associated Remotes.

Valid range is 0 to 255.

Switch Rate

The Switch Rate specifies the initial data rate for the Remotes in the group when they are switched from ECM to *d*SCPC.

Default is 64 kbps. Valid range is 0, 16 to 16000 kbps.

NOTE

Note: Setting this parameter to **0** (zero) will result in all Remotes in the group remaining in the wait list; *no switch to dSCPC will occur automatically, and no data traffic will be passed*. A diagnostic (manual) switch, however, can be invoked to place a Remote into SCPC mode.

Slots In Frame

This parameter defines the number of time slots per cycle available for assignment to the Remotes in queue that are to be switched from ECM into *d*SCPC. These are the Remotes that are tagged for **Online** mode. By design, ECM works on a contention basis, with the number of slots being some fraction of the total number of Remotes. In order for this ratio to be optimized, a Vipersat calculator is available to determine this setting.

Valid range is 1 to 1000.

Tip: Contact a Comtech Vipersat Networks representative for a copy of the latest *Vipersat ECM Calculator*.

Guard Band

This parameter displays the current length of the Slot Guard Band in milliseconds for the Remotes in the group. The Slot Guard Band is the amount of time between the point when one Remote completes transmitting data and the point when the next Remote in the cycle begins transmitting. This prevents the Remote from overrunning the next terminal in the cycle. The setting for this parameter should be obtained using the *Vipersat ECM Calculator*. Typically, a value of **30 ms** is sufficient.

To modify this parameter on a Hub unit, enter a value from 0–1000 in the **Guard Band** field. The value represents time in milliseconds (ms).

Caution: The following two parameter settings—*LNB LO* and *Frequency Conversion*—are very critical for determining RF frequency translations between Hub and Remote offsets or data spectral inversions. Take care in setting these correctly.

LNB LO

Important: Enter the correct LNB Local Oscillator frequency (MHz) that this Hub unit will be receiving.

Frequency Conversion

Important: Enter the correct satellite Frequency Conversion value (MHz) for this Hub unit.

Configuring Remote ECM

Configure the ECM Remote(s) by clicking on the **ECM** menu item for the CDM-840 (figure 4-28).

Mode

Each Remote can be set to a designated mode of operation in ECM:

- **Disable** – the ECM function for this Remote is disabled.
- **Offline** – the Remote will not transmit.
  This mode may be chosen for radio silence applications.
- **Wait** – the Remote will register with the controller and remain in the ECM wait queue without assignment for switching into *d*SCPC mode. This mode may be chosen by operators who wish to manually control when a Remote is to be switched and utilize bandwidth from the pool.

- **Online** – the Remote will register with the controller and request *d*SCPC bandwidth for switching.

In order for a Remote to pass data traffic, the ECM Mode *must be set to Online*.

Tip: For purposes of commissioning the terminal with a continuous carrier, the Entry Channel mode can be set temporarily to Disable. Once this process is completed, set the Remote back to the desired mode.

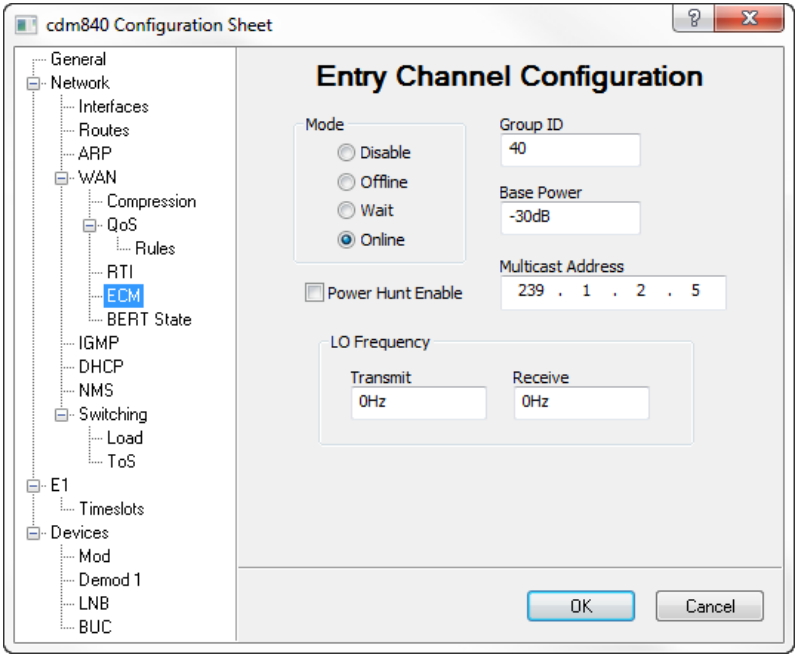

Figure 4-28 Entry Channel Configuration, CDM-840

Group ID

The ECM **Group ID** number defines a group of equipment (both Hub and Remote units) that will respond to the output of a single Hub channel controller. This group is addressable within a network which, in turn, is defined by the Network ID number assigned to the modem/routers.

Allocation of bandwidth is shared among the Remotes in an ECM group. Depending on the number of Remotes in a network, a Hub may have multiple controllers, each with its own set of Remotes. This is accomplished by assigning a unique Group ID number to each controller and its associated Remotes.

Set the Group ID for this Remote to match that of the associated HCC (CDD-880). Valid range is 0 to 255.

Base Power

The Base Power is the power level that is used by the Remote modem to transmit the Aloha ECM signal to the Hub, prior to the switch to *d*SCPC mode. This level is determined for the modem from the site link budget calculations, and must be calibrated with the satellite provider.

Valid range is -40.0 to 0.0 dBm.

Power Hunt Enable

Power Hunt is a transmission power control feature for the Remote modulator that functions while the Remote is in Entry Channel mode. This parameter provides compensation for instances when the initial (baseline) power value is insufficient or during periods of impaired transmission, and assists in maintaining return link integrity.

When a predetermined number of consecutive burst acknowledgements from the Remote are missed at the Hub, the power output is increased in 1 dB increments, up to a maximum of 3 dB. The value specified for the Power Hunt parameter (range is 0-3) determines the maximum power increase for this Remote.

The Power Hunt function is disabled when the Remote switches from ECM to SCPC mode. Should the Remote revert back to ECM from SCPC mode, the function is once again enabled.

Multicast Address

This parameter is used to define the IP address for the Multicast of the Transmission Announcement Protocol (TAP) message that is sent out by the HCC to all of the associated Remotes in that group. This address must be the same for all members of the group. The TAP is a proprietary message sent from the Hub to all Remotes, at regular intervals, specifying the relative start time and duration for each terminal to transmit.

Set the Multicast Address for this Remote to match that of the associated HCC (CDD-880).

LO Frequency

Caution: The parameter setting for *LO Frequency* is very critical for determining RF frequency translations between Hub and Remote offsets or data spectral inversions. Take care in setting this correctly.

Set the Transmit and the Receive local oscillator frequencies (MHz) for the ODU as specified in the Network Plan.

Network | WAN | BERT

A Bit Error Rate Test (BERT) can be executed for Series 8xx units from the BERT menu item (figure 4-29). This feature is useful when commissioning the terminal and for troubleshooting line/link integrity issues.

Caution: The use of this feature will disrupt both management and data traffic over the link. A technician should be on site to restore communications after the testing is concluded.

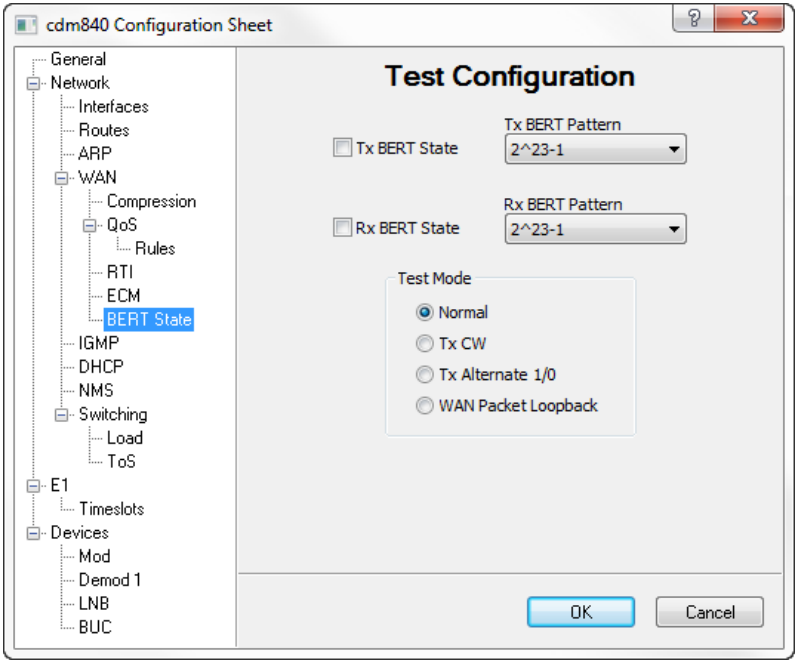

Figure 4-29 BERT dialog, CDM-840

The appearance of this dialog will vary depending on the type of modem/router, as described below. The example figure depicts the Test Configuration dialog for a CDM-840.

State

The State check box is used to toggle the BERT **On** and **Off**.

On the CDM-800, this setting applies only to *transmit* due to its lone transmitter. Similarly, on the CDD-880 this setting only applies to the demodulator *receive*. The CDM-840 provides both a Tx and a Rx setting.

Demod Select

This parameter appears for CDD-880 units only.

Specify the demodulator for this unit that will be utilized for the test.

Pattern

A choice of two pseudo-random test patterns are available, **2^23-1** or **2047**.

The first pattern, 2^{23}-1, is primarily intended for error and jitter measurements at bit rates of 34,368 kbps and 139,264 kbps (equipment operating at the primary rate and above). A maximum of 22 consecutive zeros and 23 consecutive ones are generated; pattern length is 8,388,607 bits.

The second pattern, 2047 (2^{11}-1), is primarily intended for error measurements at bit rates of 64 kbps and N*64 kbps (error performance at bit rates below the primary rate). A maximum of 10 consecutive zeros and 11 consecutive ones are generated; pattern length is 2,047 bits.

Test Mode

This parameter appears for CDM-800 and CDM-840 units.

Select the desired mode of test:

- **Normal** – BERT is Off.
  This is the setting for normal terminal operation.
- **Tx CW** – transmits a continuous unmodulated wave.
  Satellite provider can check for problems with cross-polarization, power, etc. with a clean and calibrated signal.
- **Tx Alternate 1/0** – transmits continuous stream of alternating ones and zeros.
- **WAN Packet Loopback** – available for CDM-840 only.
  Loopback test for the WAN transmit and receive interfaces.

Network | IGMP

This menu item appears for CDM-840 units only.

NOTE

Note: If the IGMP feature (FAST code) has not been purchased for this modem, the IGMP menu item will not be displayed.

Selecting one of the IGMP (Internet Group Management Protocol) **Version** radio buttons (V1, V2, V3) in the IGMP dialog shown in figure 4-30 enables the receive portion of a modem unit to use the modem as an IGMP server. The transmit portion of the terminal utilizes the modem as an IGMP client. The IGMP feature configures the unit to report an interest to join a Multicast group on an IGMP server. IGMP is used to regulate multicast traffic on a LAN segment to prevent information of no interest from consuming bandwidth on the LAN.

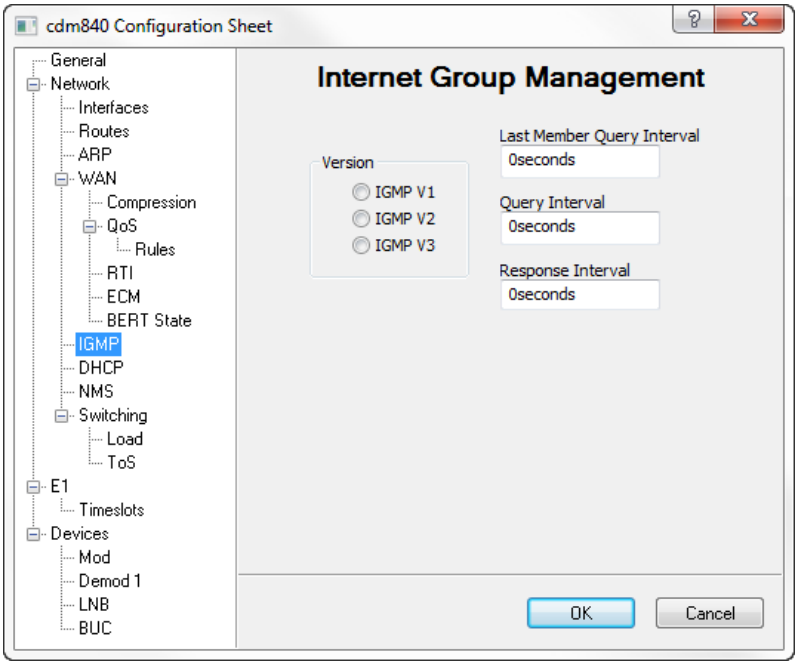

Figure 4-30 Internet Group Management dialog, CDM-840

Last Member Query Interval

This parameter is the maximum response time (delay), in seconds, that is allowed for a multicast client to answer on a group-specific query.

Query Interval

The IGMP protocol requests that a server periodically publish to users on the LAN the multicast IP Addresses that it can service. The IGMP Query Interval

defines the time interval (in seconds) between each of these queries for membership.

The interval must be equal to or greater than the maximum response time, defined by the Response Interval.

Response Interval

The IGMP Response Interval defines the time interval (in seconds) that the unit should wait before it assumes that no parties are interested in the content published via an IGMP query. This is the maximum response time (delay) that is allowed for a multicast client to answer on a general query.

This option is expressed in seconds and the maximum response time that is accepted by the unit is equal to the **Query Interval**.

Network | DHCP

This menu item appears for CDM-840 units only.

Click on the **DHCP** menu item to configure the Dynamic Host Relay feature on the Remote modem/router (figure 4-31).

This feature enables the Remote unit to pass/relay DHCP functionality between the WAN and the traffic subnet of the LAN; typically, a PC on the LAN side of the unit requiring dynamic IP address assignment from a host server on the WAN side.

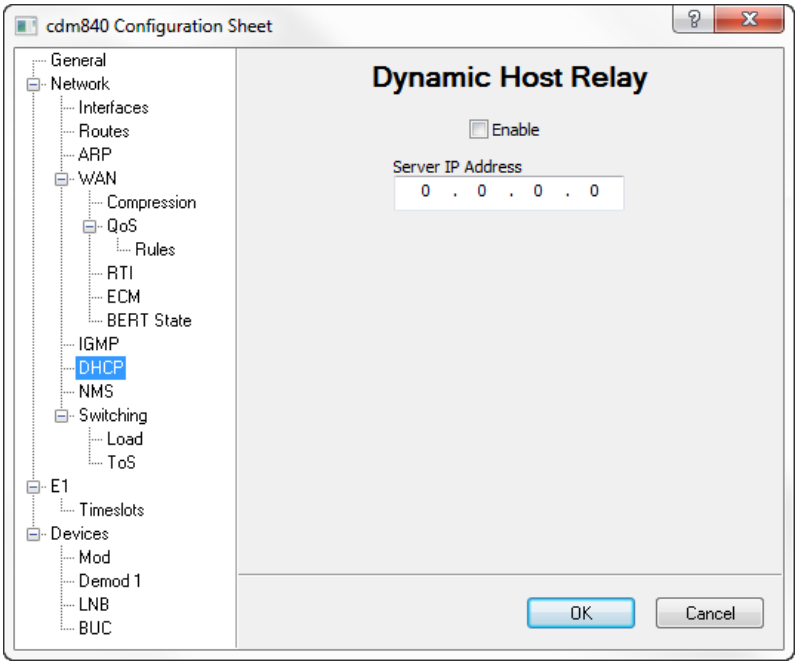

Figure 4-31 Dynamic Host Relay dialog, CDM-840

To activate the Dynamic Host Relay feature for this unit, click in the **Enable** check box and specify the IP address of the DHCP server.

Network | NMS

Click on the NMS menu item to configure the Network Management parameters for the modem/router (figure 4-32).

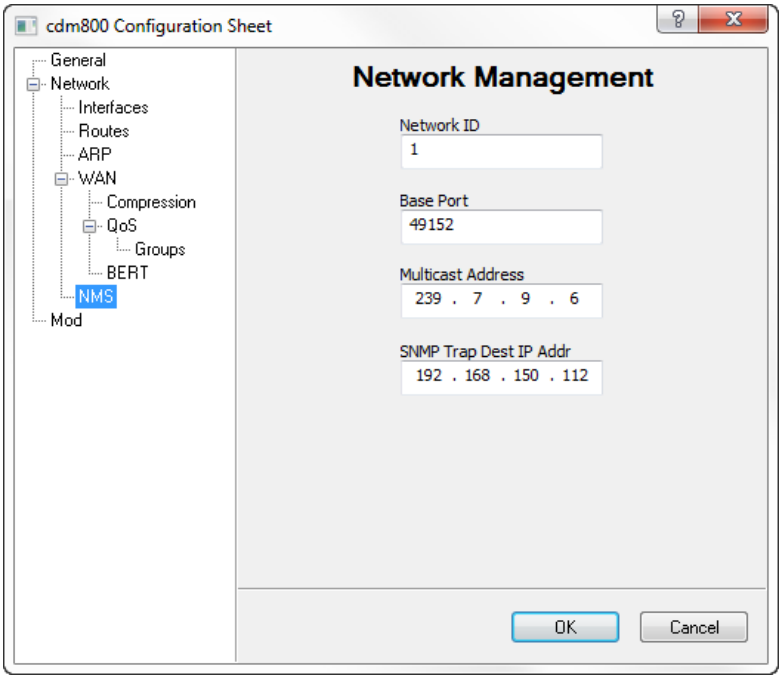

Figure 4-32 Network Management dialog, CDM-800

Network ID

The **Network ID** designation defines to which Vipersat network the modem/ router belongs. All devices in a common network will have the same network ID.

The network ID is used by the VMS to identify Vipersat units within a network and allows the VMS to manage multiple networks, each with its own unique network ID number.

Valid range is 1 to 254.

Base Port

The **Base Port** is the management port used by the VMS to send and receive management UDP packets (see section *"Vipersat Manager Configuration" on page 3-12*).

The Base Port sets the starting IP port addressing for all VMS messages. Changing this address base will affect the entire network, requiring configuration changes to all modems. Leave this setting at default **C000**(hex)/**49152**(decimal) to avoid unnecessary configuration changes. Altering this setting is ONLY necessary if network port addressing is in contention.

Valid range is 49152 to 65534.

Multicast Address

The Multicast Address is the management multicast IP address assigned to all modem units in the Vipersat network that are managed by the VMS. This address must match the VMS Transmit Multicast Address (see section *"Vipersat Manager Configuration" on page 3-12*).

When the modem unit receives a multicast from the VMS server, it receives maintenance and control packets, including the server's IP address. The unit responds to the VMS server with a unicast containing its current configuration data, including the unit's IP address. When the VMS receives the unicast response, it registers the unit on the network.

SNMP Trap Destination IP Address

Enter the IP address of the SNMP manager/server that the trap messages are to be sent to. Note that this address must be on the same subnet as the management interface address, or the management interface must have a valid default gateway defined. Only unicast addresses are valid for this parameter.

The default value, 0.0.0.0, disables this function (no traps sent).

Network | Switching

This menu item appears for CDM-840 units only.

NOTE

Note: If the Dynamic SCPC feature (FAST code) has not been purchased for this modem/router, the Switching menu item will not be displayed.

Once a Remote unit is switched from Entry Channel Mode into dSCPC mode, additional switching can be initiated by the Remote, based on either changes in Load and/or application of ToS (Type of Service).

Network | Switching | Load

This menu item appears for CDM-840 units only.

Load switching is an automatic switching function where the system detects variations in data rate and will switch the SCPC carrier based on bandwidth requirements. This additional switching as a result of load variation is determined by the parameter settings that are made here (figure 4-33).

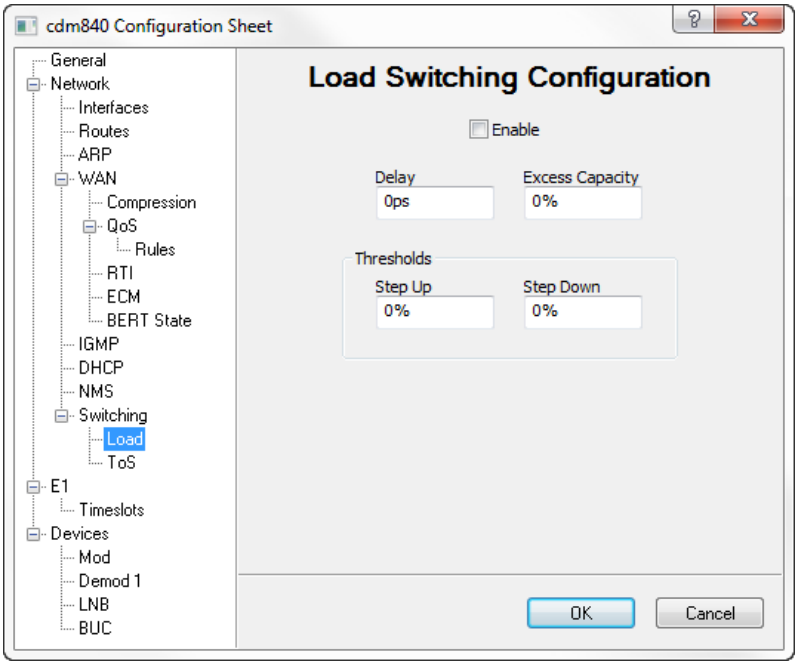

Figure 4-33 Load Switching dialog, CDM-840

Click in the **Enable** check box to activate this feature.

Delay

The Step **Delay** feature provides a switching delay period to ensure that a premature switch up or down in the SCPC rate does not occur due to a temporary rise or fall in traffic.

Valid range is 1–50 seconds. Default is 0 seconds.

Excess Capacity

During each SCPC Step Up/Down switch, the Excess Capacity data rate value (%) entered here is added to the new SCPC data rate. This excess is added each time an SCPC Step switch occurs. This setting makes additional bandwidth available for when the demand arises while minimizing Step switching events.

Valid range is 0–100%. Default is 0%.

Step Up Threshold

The **Step Up Threshold** establishes the percentage of bandwidth use that will trigger a switch Up from the present SCPC rate to a higher rate to ensure that there is sufficient bandwidth available for current conditions.

Valid range is 65–100%. A typical setting for this parameter is 95%. Note that this value must be *greater* than the value specified for the SCPC *Step Down Threshold*.

Step Down Threshold

The **Step Down Threshold** establishes the percentage of bandwidth use that will trigger a switch Down from the present SCPC rate to a lower rate to ensure efficient bandwidth usage for current conditions.

Valid range is 1–95%. A typical setting for this parameter is 65%. Note that this value must be *less* than the value specified for the SCPC *Step Up Threshold*.

Network | Switching | ToS

This menu item appears for CDM-840 units only.

This menu item appears under Switching, and is used to define and make modifications to the ToS switching rules.

Type of Service (ToS) is defined by an eight bit field within an IP packet header that is used to set up per-hop-based QoS rules for prioritizing packets. Because the ToS field remains untouched by most encryption methods, ToS switching provides an alternative means of SCPC switching when encryption prevents the detection of SIP and H.323 protocols.

ToS detection occurs in the Remote modem which only looks at traffic that is passed in the LAN-to-WAN (Remote to Hub) direction. Once the ToS switch detection feature is enabled, the Remote modem will send a switch request to the VMS when a packet stamped with the ToS is detected. The request contains the destination IP address of the ToS stamped packet, the desired SCPC rate, and the VMS Switch Type (policy #). If available hardware and bandwidth exist, the VMS will establish the SCPC carrier automatically.

Click in the **Enable** check box to activate this feature (figure 4-34).

Enter the maximum number of sessions per ToS identifier. Note that there is an overall limit of 127 active sessions in the system.

ToS switch rules are configured by defining table entries. This is done with the Add Entry, Modify Entry, and Delete Entry buttons.

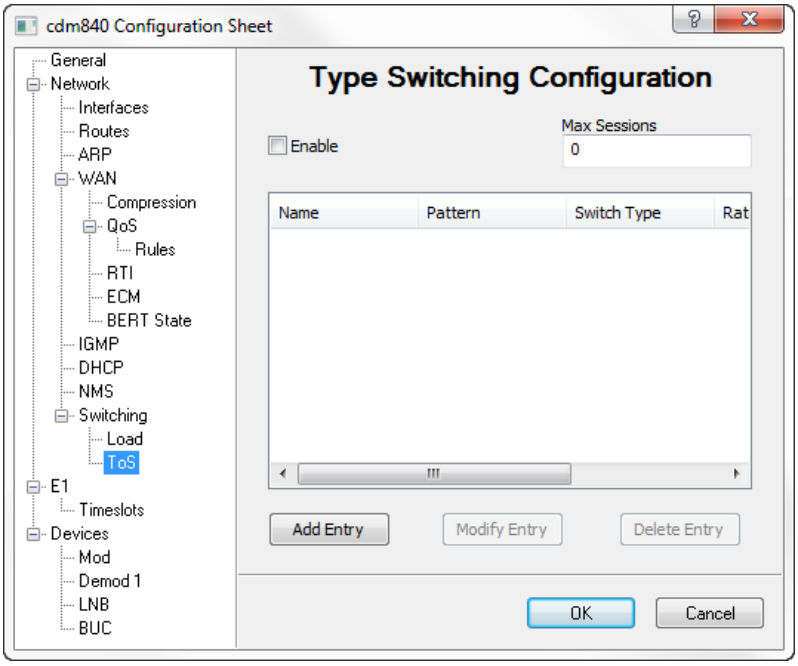

Figure 4-34 ToS Switching dialog, CDM-840

Clicking the **Add Entry** button opens the ToS Rule Configuration dialog shown in figure 4-35.

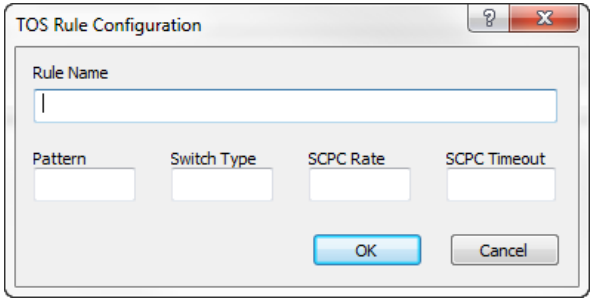

Figure 4-35 ToS Rule dialog, CDM-840

- **Name**– Enter a user-defined text label (1 to 15 characters) for identifying this switch rule.

  Valid characters: Space ( ) * + - , . / 0 thru 9 and Aa thru Zz.

- **Pattern**– Enter an integer value in the range of 1 to 63 for the ToS field identifier number to match. Entering a value of **0** will result in no switch.

- **Switch Type** – Enter an integer value in the range of 64 to 254 at the prompt to inform the VMS what switching policy to use. Entering a value of **0** will result in no switch.
- **SCPC Rate** – Enter the desired data rate for switching on this service type. Valid entries are from 0 to 155000000 bps. This setting will override the VMS set policy value.
- **SCPC Timeout** – This timer monitors the defined packet flow. Once data stops for the duration of the timer setting, the link state will be restored to the Home State condition for this Remote. Valid entries are from 1 to 60 seconds.

After field entry, clicking the **OK** button will update the ToS Switch Rules table with the new configuration. Note that the Add Type of Service Rule dialog remains open after adding a rule so that additional rules can be added easily. Click the **Cancel** button to return to the ToS dialog.

When one or more rules that appear in the table list are selected, the **Modify Entry** and **Delete Entry** buttons become active.

E1

This menu item appears for CDM-840 units only.

NOTE

Note: If the E1 feature (FAST code) has not been purchased for this modem/ router, the E1 menu item will not be displayed.

Because the G.703 interface is not utilized in a Vipersat satellite network, E1 feature configuration is not relevant for the purposes of this document. For information on parameter settings for E1 applications, refer to the CDM-840 Remote Router Manual, P/N MN-CDM840.

The E1 dialogs presented here, *E1 Configuration* and *Timeslot Configuration*, are provided for reference only.

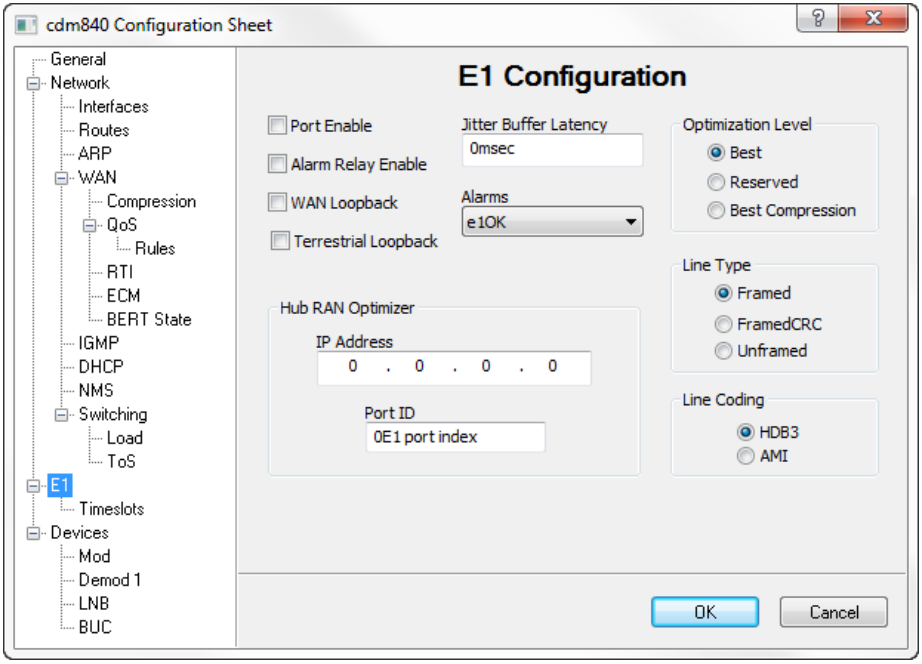

Figure 4-36 E1 dialog, CDM-840

E1 | Timeslots

This menu item appears for CDM-840 units only.

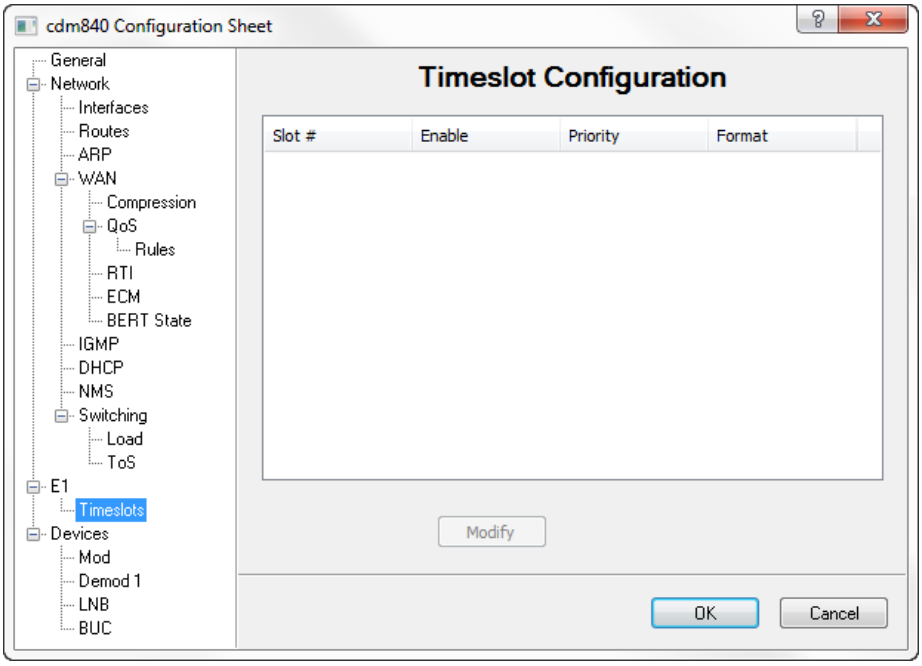

Figure 4-37 E1 Timeslots dialog, CDM-840

Devices

The Devices menu provides access for configuring the parameter sets for the following Series 8xx modem/router devices:

- Modulator
- Demodulator(s)
- LNB
- BUC

Devices | Mod

This menu item appears for CDM-800 and CDM-840 units.

Clicking on the Mod menu item for the CDM-800 Hub unit opens the DVB Modulator Configuration dialog shown in figure 4-38. The transmitter settings for the DVB-S2 TDM outbound are presented here.

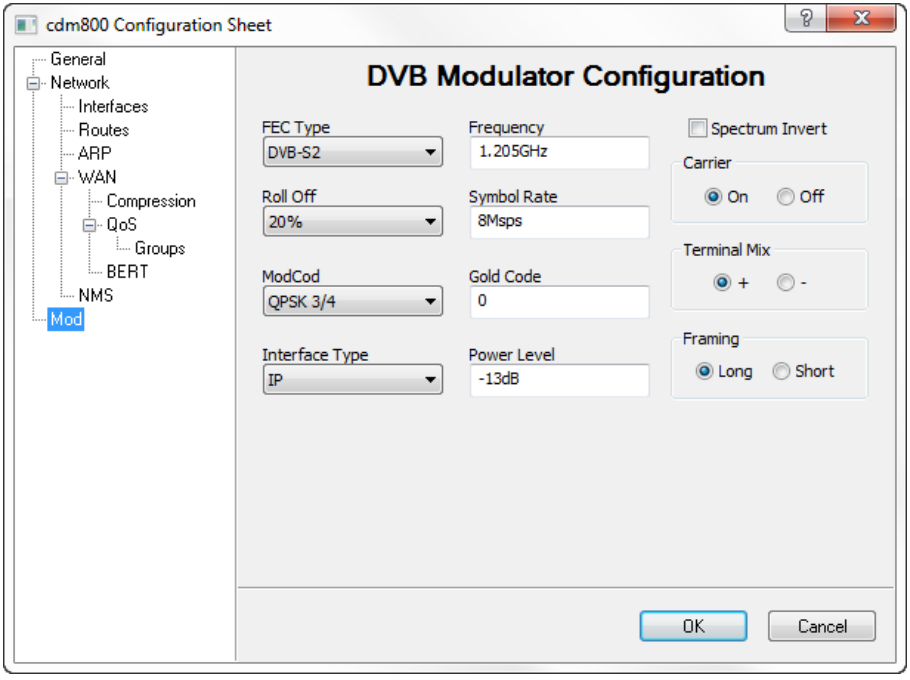

Figure 4-38 DVB Modulator dialog, CDM-800

For the CDM-840 Remote unit, the transmitter configuration settings are presented for the VersaFEC return path (figure 4-39).

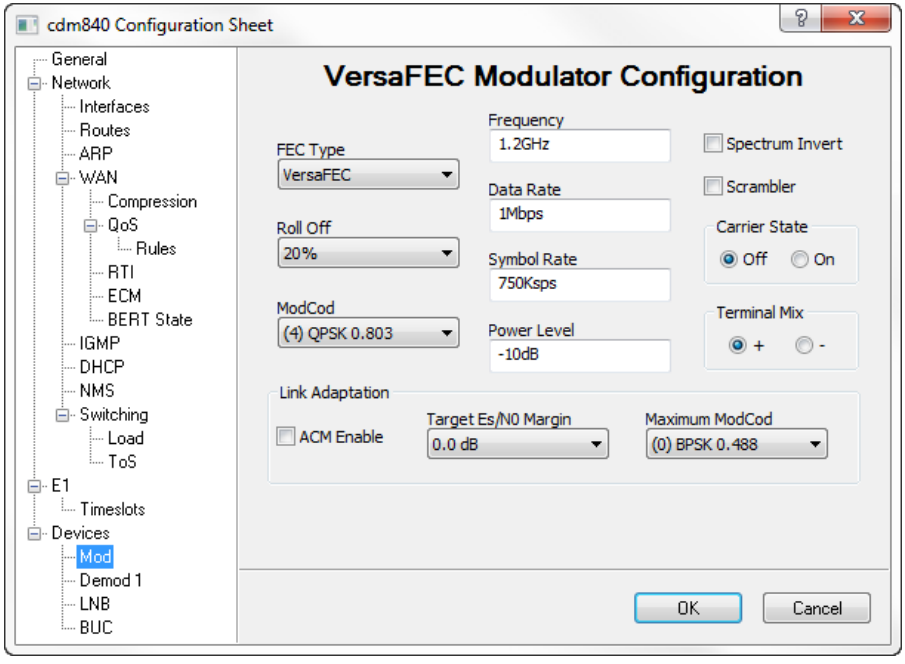

Figure 4-39 VersaFEC Modulator dialog, CDM-840

In order to gain entry in the network and register with the VMS, the CDM-840 Remote modulator requires minimal configuration by the operator due to the fact that many of the transmit parameters are automatically set according to the TAP message that is received from the HCC. Only the following parameters have to be set manually, as determined by the site link budget:

- Tx Scrambler, Roll Off, and Spectrum Invert
- Power Level
- Carrier State – Must be set to **On** for modem to transmit

Once the Remote is successfully registered, the modulator parameter settings are managed by the VMS, except for:

- FEC Type – This is fixed at *VersaFEC*
- Tx Scrambler, Roll Off, and Spectrum Invert

FEC Type

The FEC Type setting is fixed at **DVB-S2** for the Hub unit, and **VersaFEC** for the Remote unit.

Roll Off

This parameter represents the Tx α (alpha) filter roll-off factor that dictates how fast the spectral edges of the carrier are attenuated beyond the 3 dB bandwidth. A lower value corresponds to a faster attenuation and thus less broadening of the power spectrum density, and less satellite bandwidth required.

Can be set to 20% (default), 25%, or 35%.

ModCod

For the CDM-800, the ModCod is automatically selected; it is determined from the QoS Group configuration (see the section "Network | WAN | QoS | Groups" on page 4-28).

For the CDM-840, the ModCod is auto-configured in ACM mode when Link Adaptation is Enabled. When ACM is not enabled, set this parameter manually.

Frequency

For the CDM-800, enter the center Frequency for the TDM outbound carrier.

- L-Band: 950.000–2150.000 MHz
- IF: 50.000–180.000 MHz

For the CDM-840, the Frequency is automatically managed by the VMS once the unit has registered with the active server.

Symbol Rate

For the CDM-800, set the Symbol Rate.
Valid range is 1000.000–62000.000 ksps.

For the CDM-840, the Symbol Rate is automatically managed by the VMS once the unit has registered with the active server.

Data Rate

This parameter appears for CDM-840 units only.

The Data Rate is auto-configured in ACM mode when Link Adaptation is Enabled. When ACM is not enabled, set this parameter manually.

Valid range is 16–16000 kbps.

Gold Code

This parameter appears for CDM-800 units only.

Caution: Changing this parameter setting with the Parameter Editor will disrupt both management and data traffic over the link, and communications with the Remotes will be lost. A technician will have to be deployed to each Remote site to restore communications by setting the gold code for the demodulator to match (see *"Devices | Demod" on page 4-64*).

To minimize disruption of communications between Hub and Remotes when changing this parameter, utilize the "Alternate" configuration feature that is available through the WSI. Refer to the modem *Operation Manual* for details.

The Gold Code is the physical layer spreading sequence number, or spreading factor to be applied (for instances of low power), and can be set from 0 to 262141 chips/bit. Default is 0.

Power Level

Set the transmit Power Level based on the site link budget calculations. Valid range is:

- L-Band: -5.0 to -40.0 dBm
- IF: -5.0 to -25.0 dBm

For the CDM-840, the Power Level is automatically managed by the VMS once the unit has registered with the active server.

Spectrum Invert

Select Spectrum Invert if required for this site. Default is disabled.

This setting allows for adjustment of the orientation of the signal bandwidth with respect to the carrier frequency. This adjustment can be used to prevent the transmitted frequency (combined modulated and fundamental) from potentially causing interference with adjacent bands. Typically, the spectrum inversion setting of the modem will match that of the BUC.

Scrambler

This parameter appears for CDM-840 units only.

The transmit Scrambler can be set for the Remote if required. Default is disabled.

Note: Enabling this parameter for the Remote transmit requires that it also be enabled for the Hub receiver (CDD-880) to perform descrambling (see *"Devices | Demod" on page 4-64*).

Enabling this parameter will randomize the data stream to be transmitted, resulting in the following:

- Elimination of long ‘0’-only and ‘1’-only sequences.
- Creating energy dispersal of the carrier signal to realize coding gain for the receiver, such as when there is no traffic being passed and power is concentrated in a narrow frequency band.

Carrier State

Set the Carrier State to **On** to enable the modulator to transmit. Default is **Off**.

For the CDM-840, the Carrier State is automatically managed by the VMS once the unit has registered with the active server.

Terminal Mix

Set the Terminal Mix to [+] or [–], as required for the site.

- [+] indicates a high side, inverting mix (default)
- [–] indicates a low side, non-inverting mix

Framing

This parameter appears for CDM-800 units only.

Specify the DVB-S2 transmit frame length to be used, Long (normal) or Short block.

Note that the following ModCods are not supported for Short Framing: QPSK 1/2, QPSK 9/10, 8-APSK 9/10, 16-APSK 9/10, and 32-APSK 9/10.

Interface Type

This parameter appears for CDM-800 units only.

The Interface Type is fixed at **IP**.

Link Adaptation

This parameter appears for CDM-840 units only.

NOTE

Note: All VersaFEC ACM requires the correct firmware to be installed in both the CDM-840 Remote Router and the CDD-880 Multi-Receiver Router (version 1.3.2 or higher), and the appropriate FAST code for the maximum operating symbol rate.

ACM Link Adaptation can be enabled for the VersaFEC return path between the CDM-840 modulator and the CDD-880 demodulator (see section *"Network | WAN | ACM" on page 4-37*).

Click in the **ACM Enable** check box to activate the feature.

Select the desired **Target Es/N0 Margin** (0.0–4.5 dB) from the drop-down menu.

Because the switch points for the ACM feature can determine whether or not ModCod oscillations occur, this is a *very important* parameter. Increasing these switch points is recommended, for example, in an environment that will experience fading. Adding sufficient margin will help to maintain demod lock and adequate link quality.

Set the **Maximum ModCod**, based on the site link budget calculations.

Important*: After setting the Maximum ModCod parameter for the CDM-840, this same setting must be entered for the Remote Site for this unit*:

- Under the ViperView Network Manager, right-click on the Remote Site in the tree view and select **Properties**.
- Select the InBand Return Path ModCods menu item, as shown in figure 4-40, and set the **Default Parameters** to match the ACM Maximum ModCod for the unit.

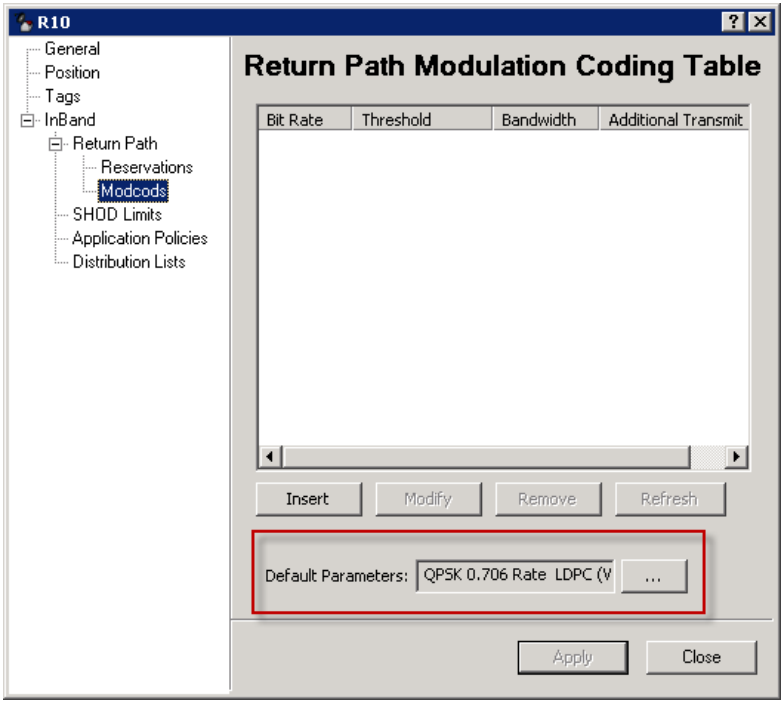

Figure 4-40 Return Path ModCod, Remote Site Properties

Devices | Demod

This menu item appears for CDM-840 and CDD-880 units.

For the *CDM-840 Remote unit*, clicking on the **Demod 1** menu item opens the DVB Demodulator Configuration dialog shown in figure 4-41. The Remote receiver settings for the TDM outbound from the Hub are presented here.

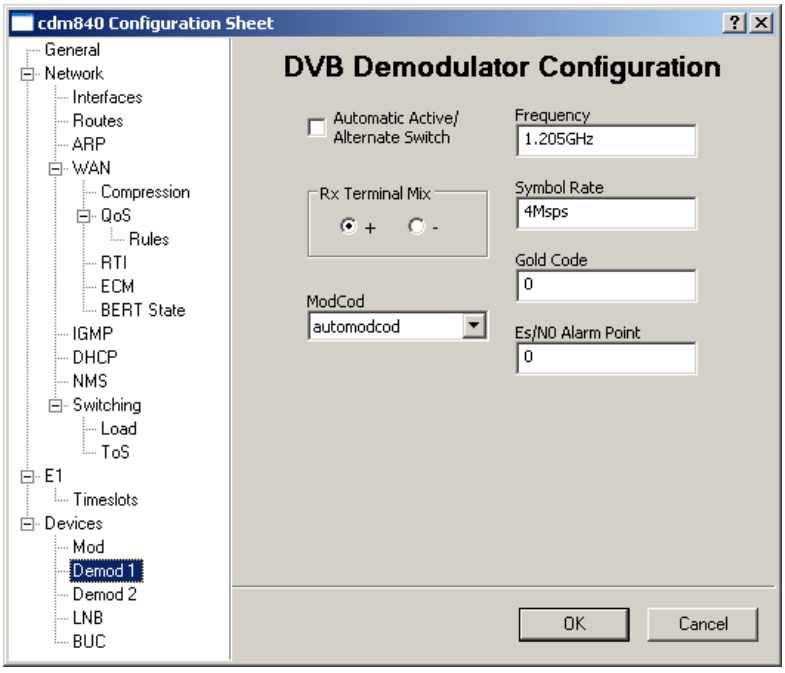

Figure 4-41 DVB Demodulator dialog, CDM-840

The essential parameter settings are as follows:

Configure the **Frequency** and **Symbol Rate** settings to match the DVB-S2 outbound carrier transmitted by the Hub CDM-800.

To effectively utilize the optimization algorithm of the VMS, the CDM-840 Demodulator **ModCod** must be set to “Auto”.

Additional parameters for the Remote demod are described below.

Automatic Active / Alternate Switch

This parameter is enabled for Remotes that belong to a network with two TDM outbounds at the Hub, providing redundancy of this carrier. Should the Active TDM be lost, the Remote will automatically search for the Alternate TDM and lock to that carrier to re-establish communications with the Hub. The receive configuration for this second carrier is set using the Demod 2 dialog. Note that the “Demod 2” designation represents a *virtual* demod; there is only a single physical demodulator for the CDM-840 Remote.

When this feature is enabled, click on the **Demod 2** menu item and configure the settings according to the receive requirements for the second/alternate TDM. This configuration will be used should a TDM switch occur.

Rx Terminal Mix

The Terminal Mix polarity for the received signal can be set per site requirements:

- [+] indicates a high side, inverting mix (default)
- [–] indicates a low side, non-inverting mix

Gold Code

Caution: Changing this parameter setting will disrupt both management and data traffic over the link, and communications with the Hub will be lost. A technician will have to restore communications by setting the gold code for the CDM-800 modulator to match (see *"Devices | Mod" on page 4-58*).

To minimize disruption of communications between Hub and Remotes when changing this parameter, utilize the "Alternate" configuration feature that is available through the WSI. Refer to the modem *Operation Manual* for details.

The Gold Code is the physical layer spreading sequence number, or spreading factor to be applied (for instances of low power), and can be set from 0 to 262141 chips/bit. Default is 0.

Es/N0 Alarm Point

The receive E_s/N_0 level that will generate an alarm condition for this Remote can be set with this parameter.

Valid range is -3.0–32.0 dB. Default is 0.

For the *CDD-880 Hub unit*, clicking on the **Demod 1** menu item presents the receiver configuration settings for the VersaFEC return path from the Remote (figure 4-42). This unit can have up to 12 individual demodulators.

The essential parameter settings are as follows:

Click the **Enable** check box to enable the demodulator for network use.

Specify the receive **Frequency**.

Specify either the **Data Rate** (for VersaFEC receive) or the **Symbol Rate** (for VersaFEC ACM receive).

Select the **ModCod** for this demod to receive.

Define the **Circuit ID** (4–32 characters). This identifier will appear in the Parameter View area of ViperView.

Valid characters: Space ( ) * + - , . / 0 thru 9 and Aa thru Zz.

For the CDD-880 that is serving as the HCC, identify the circuit for Demod 1 as ECM TAP.

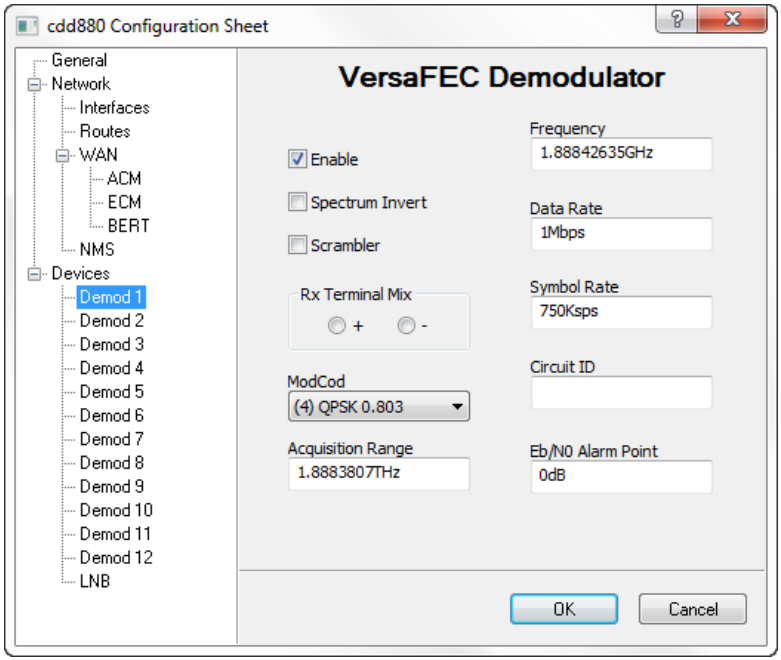

Figure 4-42 VersaFEC Demodulator dialog, CDD-880

Additional parameters for the Hub demods are described below.

Spectrum Invert

Select Spectrum Invert if required for this demod. Default is disabled.

This setting allows for adjustment of the orientation of the signal bandwidth with respect to the carrier frequency. Typically, the spectrum inversion setting of the demod will match that of the LNB.

Scrambler

The receive Scrambler (descrambling) can be set for the Hub demod if required. Default is disabled.

NOTE

Note: Enabling this parameter for the Hub receive requires that it also be enabled for the Remote transmitter (CDM-840) to perform scrambling (see *"Devices | Mod" on page 4-58*).

Enabling this parameter will recover the randomized data stream transmitted from a Remote that has the Scrambler feature enabled. This function creates energy dispersal of the carrier signal to realize coding gain for the receiver, such as when there is no traffic being passed and power is concentrated in a narrow frequency band.

Rx Terminal Mix

The Terminal Mix polarity for the received signal can be set per site requirements:

- [+] indicates a high side, inverting mix (default)
- [–] indicates a low side, non-inverting mix

Acquisition Range

The frequency Acquisition Range (to acquire signal lock) for the Hub demod can be specified with this setting. The maximum range depends on the symbol rate. Default is 10 kHz.

Eb/N0 Alarm Point

The receive E_b/N_0 level that will generate an alarm condition for this Hub demod can be set with this parameter.

Valid range is 0.1–16.0 dB. Default is 0 (disabled).

Devices | LNB

This menu item appears for CDM-840 units only.

Click on the **LNB** menu item to configure the Remote Downconverter settings (figure 4-43).

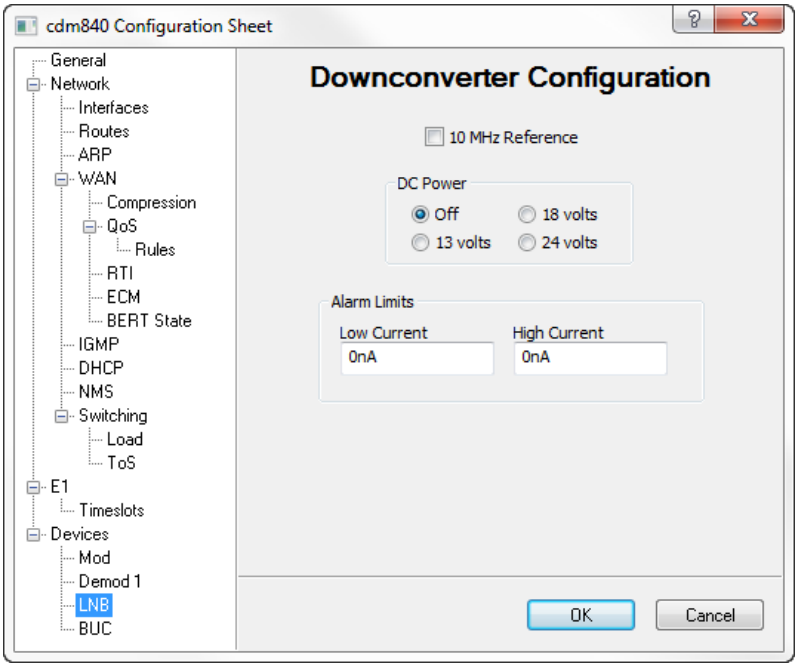

Figure 4-43 Block Down Converter dialog, CDM-840

The **10 MHz Reference** setting provides the option of having the Remote unit supply an external reference for the LNB LO.

If this unit will be providing power for the LNB, select the appropriate **DC Power** voltage, then set the Low and High Current threshold **Alarm Limits** (0–500 mA).

Devices | BUC

This menu item appears for CDM-840 units only.

Click on the **BUC** menu item to configure the Remote Upconverter settings (figure 4-44).

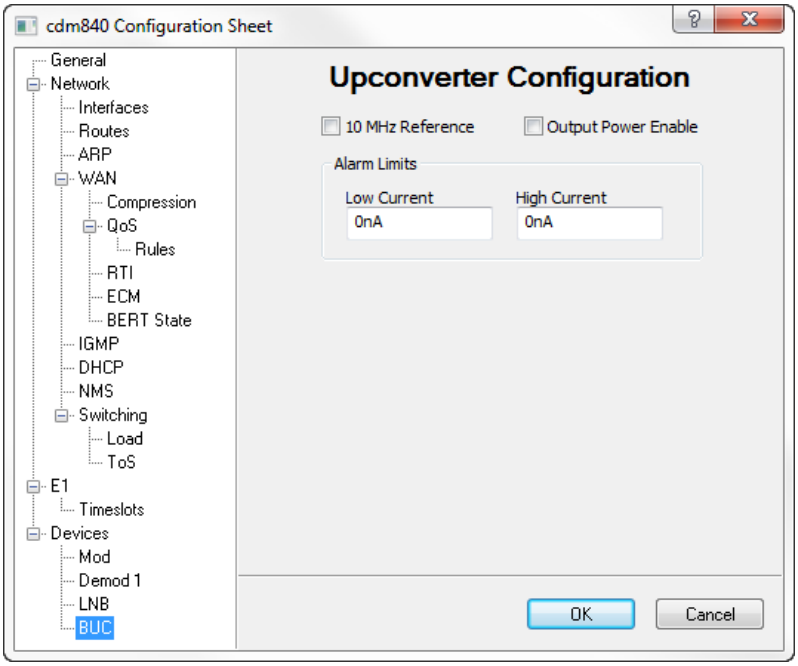

Figure 4-44 Block Up Converter dialog, CDM-840

The **10 MHz Reference** setting provides the option of having the Remote unit supply an external reference for the BUC LO to maintain the correct transmit frequency.

If this unit will be providing power for the BUC, select **Output Power Enable**, then set the Low and High Current threshold **Alarm Limits** (0–4000 mA).

5

CONFIGURING ROSS UNITS

General

This chapter describes using VMS to configure Vipersat ROSS units. Configuration of ROSS parameter files is accomplished using the Parameter Editor. The Parameter Editor, as used from the VMS, performs the same functions as the Parameter Editor accessed via Vipersat's VLoad utility. The uses of the Parameter Editor in VMS and VLoad differ, however, in the way the edited parameters are stored and applied.

For example, once a parameter has been changed by the VMS (online editing), clicking the OK button on the edit screen causes the change to be implemented immediately in the unit. The same change made using VLoad (offline editing) will not be implemented in the unit until the modified parameter file is uploaded or "put" to the subject ROSS.

Alternatively, parameter changes may be made directly to the ROSS using either a local serial console connection or Telnet connection, rather than using the VMS. Refer to the ROSS user documentation for details on configuring the equipment using one of these methods. The VMS will generate a log event to inform the operator/user that one or more parameters for that unit have been changed by an external source—another VMS client, or via Telnet, for example—since the last parameter change by this user account.

Status and Control

ROSS Status View

The status information for any Vipersat network ROSS can be displayed in the right panel from the *Status View* interface within ViperView (figure 5-2) by clicking on the ROSS unit appearance in the left panel. To display the current status, select the **Refresh** command from the Status View menu.

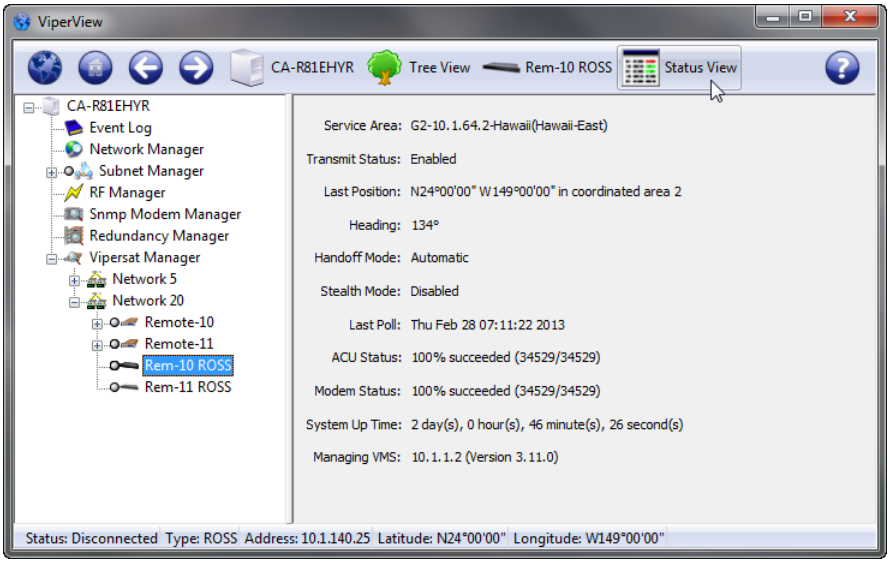

Figure 5-1 ROSS Status View, ViperView

The following status information is provided:

- **Service Area** – Identifies the existing service area for this ROSS.
- **Transmit Status** – Indicates whether the transmit is Enabled or Disabled. When the status is enabled, the ROSS is in a valid service area and the communication poll status of the associated modem and the ACU are successful. When the status is disabled, the modulator transmit carrier is muted, regardless of any other controls.
- **Last position** – Identifies the latitude and longitude coordinates, in decimal degrees, that were retrieved from the most recent ACU poll. If the reported position is within a coordinated area, the coordinated area ID will be displayed adjacent to the coordinates. ROSS polls the ACU for position on a five second interval. This value is updated by the Refresh command.

- **Heading** – Identifies the position retrieved from the most recent ACU poll. This value is expressed in decimal degrees. ROSS polls the ACU for position on a five second interval.
- **Handoff Mode** – The ROSS Handoff Mode is defaulted to automatic mode (satellite handoff is triggered by vessel position within Service Areas) on startup. If Force Manual Mode is invoked, Automatic Handoff mode is disabled. Automatic Handoff mode can also be enabled or disabled. When Automatic Handoff mode is disabled, the modem will continue to transmit except if it enters a coordinated area with a transmit flag set to disabled. On power up Automatic Mode is always enabled.
- **Stealth Mode** – If enabled, ROSS will omit any location information in the Satellite Location Identification Protocol (SLIP) message. Some modes of operation require location of vessels to remain unidentified from network operators. This mode can be enabled or disabled from the Tracking menu item under ROSS Configuration (*Parameter Editor*).
- **Last Poll** – Indicates the last poll time at which the ROSS queried the modem and ACU for status display updates, approximately every five seconds.
- **ACU Status** – Indicates the number of failed or successful poll attempts from start of ROSS server or from last Reset. A percentage is calculated from the count differences between failed or succeeded attempts. If failed attempts are equal 100%, check communications between ROSS and ACU.
  Note that if status is indicating failed the modulator transmission is muted.
- **Modem Status** – Indicates the number of failed or successful poll attempts from start of ROSS server or from last Reset. A percentage is calculated from the count differences between failed or succeeded attempts. If failed attempts are equal 100%, check communications between ROSS and modem.
  Note if status is indicating failed the modulator transmission is muted.
- **System Up Time** – Indicates the elapsed operating time of the ROSS server since last boot time.
- **Managing VMS** – The active managing VMS sends an address announcement multicast message on timed intervals containing its source IP address. This address is used by all listening units that match the multicast address within the specified network. After reception of the active managing VMS announcement multicast message, the ROSS processes the information and sets the VMS destination IP address wherein to send unsolicited information. This address may change if there is server alteration either through redundancy switchovers or administration of new IP address network plan.

Additional status information is displayed in the bottom window panel, including device connection status, device type, and unit IP address.

ROSS Control Menu

The control settings of any Vipersat network ROSS can be configured or modified using the VMS. Right-clicking on a device icon in ViperView will display a drop-down menu showing the options that can be exercised for the device, as shown in figure 5-2.

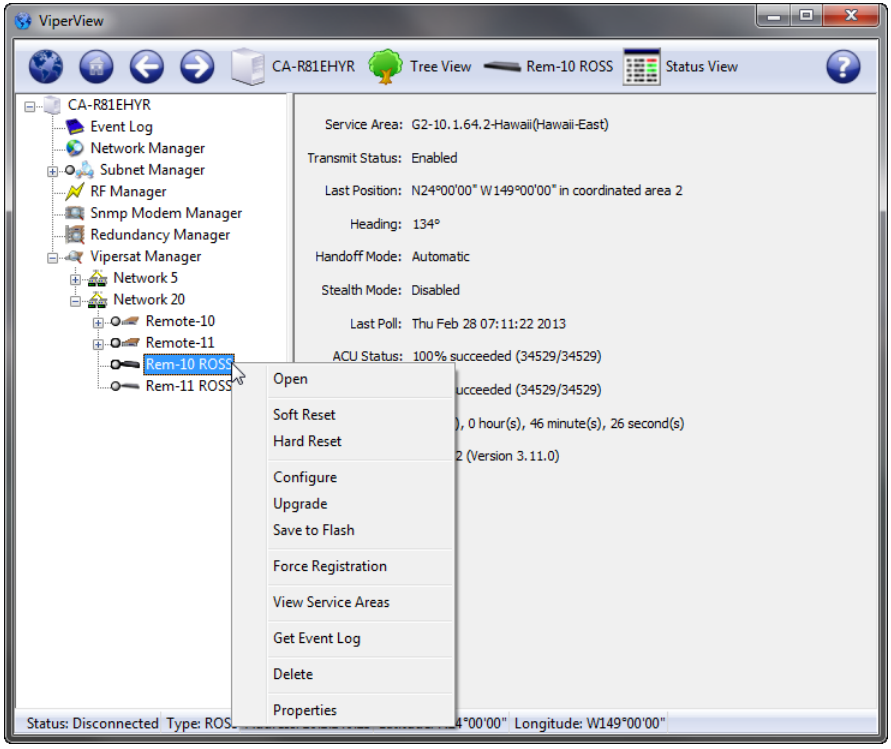

Figure 5-2 ROSS Command Menu

The following describes the actions for each item/command on the ROSS drop-down menu.

Open

This command opens a separate ViperView window displaying the Status View for the unit.

Soft Reset

This command causes the selected ROSS to perform a reinitialization of all currently configured active settings.

Hard Reset

This command causes the ROSS to do a complete process reset. Performing a hard reset is similar to power cycling the unit.

Configure

This item will open the Parameter Editor, allowing configuration changes to the unit. *Refer to subsection "Using Parameter Editor" on page 5-10*.

NOTE

Note: Many of the parameters interact with each other. Before making a change to a parameter setting, carefully read the instructions and observe any notes documenting parameter interaction.

Upgrade

This command is used to upload an application image file to upgrade the firmware for the unit.

Save to Flash

This item will save all volatile configurations to the device's flash memory. Anytime an operator makes a change to communication and operating parameters, it is necessary to save the changed information/configuration.

NOTE

Note: Save to Flash saves information in the selected device, not in the VMS database.

Force Registration

A ROSS is normally automatically registered on the network as part of the initial setup process. If this process fails, this command will force a registration attempt.

View Service Areas

This menu item provides a list of available service areas (figure 5-3) that were configured using the ROSS Configuration Editor. Each listed SA is assigned an ID displaying satellite orbital set position, Transmit polarity and targeted carrier formation. The entry that has an asterisk (*) in the ID is the detected service area which is currently serving the roaming Remote.

Manual Handoff from Service Area

The Service Area handoff command is useful when it becomes necessary to test or force the modem to a different satellite. To Force a Handoff of a selected service area, select a service area from the list and click on the **View Area Bounds** button. A dialog listing the Service Bounds contained in the SA is displayed (figure 5-4).

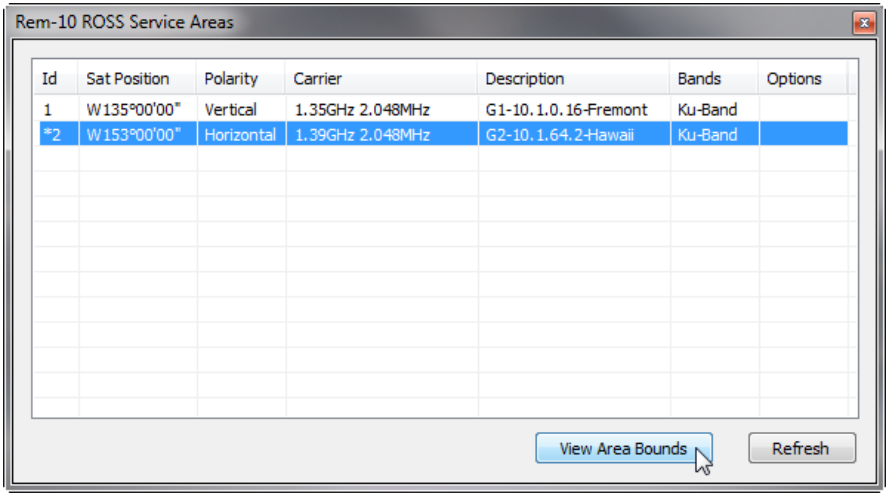

Figure 5-3 ROSS Service Areas List

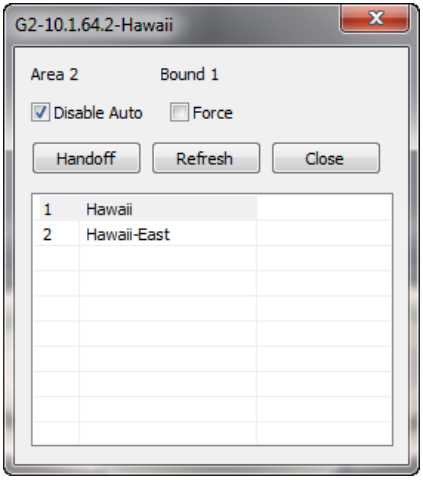

Figure 5-4 Service Bounds dialog

Select the desired Service Bound from the displayed list. Next, set the handoff mode to be used:

- If the SA selected for handoff is outside the currently detected area, set the mode for *Force Manual* handoff by enabling the **Disable Auto** and **Force** check boxes.
- If the SA selected for handoff is within the currently detected area, set the mode for *Force* handoff by enabling the **Force** check box.

Click on the **Handoff** button to initiate the manual handoff operation.

After making a selection, the ROSS will override the current location, pushing the selected SA configurations to the modem and the ACU.

To restore handoff operations to Automatic mode, uncheck the Disable Auto option.

The complete definition and configuration of service areas are described in section 5.0, ROSS Configuration Editor, in the ROSS User Guide.

Get Event Log

Upon startup, the system records internal processes and events that are useful when troubleshooting failure conditions and improper operations. The Event Log records all ROSS events, sorting oldest to latest.

ross event log.csv

	A	B	C	D	E
29	Sun Feb 24 09:23:11 2013	Info	System	Started.	
30	Sun Feb 24 12:46:34 2013	Info	System	Network identifier was modified.	
31	Sun Feb 24 12:46:37 2013	Info	System	Network identifier was modified.	
32	Sun Feb 24 12:46:46 2013	Info	System	Network identifier was modified.	
33	Sun Feb 24 12:58:25 2013	Major	Modem	A timeout occured processing your request!	
34	Sun Feb 24 13:00:48 2013	Info	System	VMS multicast address was modified.	
35	Sun Feb 24 13:00:51 2013	Info	System	VMS multicast address was modified.	
36	Sun Feb 24 13:01:06 2013	Info	System	Registered with VMS	
37	Sun Feb 24 13:03:10 2013	Info	System	VMS multicast address was modified.	
38	Sun Feb 24 13:03:11 2013	Info	System	VMS multicast address was modified.	
39	Sun Feb 24 13:03:29 2013	Info	System	VMS multicast address was modified.	
40	Sun Feb 24 13:04:05 2013	Warning	System	Hard reset succeeded!	
41	Sun Feb 24 11:58:29 2013	Info	System	Started.	
42	Sun Feb 24 12:05:40 2013	Warning	System	Hard reset succeeded!	
43	Sun Feb 24 12:06:03 2013	Info	System	Started.	
44	Sun Feb 24 12:06:57 2013	Info	System	Network identifier was modified.	
45	Sun Feb 24 12:07:03 2013	Info	System	Network configuration was modified.	
46	Sun Feb 24 12:10:38 2013	Info	System	VMS multicast address was modified.	
47	Sun Feb 24 12:10:41 2013	Info	System	VMS multicast address was modified.	
48	Sun Feb 24 12:12:34 2013	Info	System	VMS multicast address was modified.	
49	Sun Feb 24 12:12:39 2013	Info	Config	Configuration saved.	

ross event log

Figure 5-5 ROSS Event Log

The Get Event Log command exports the log as an external file (.csv) that can be opened with an editor for viewing, as shown in figure 5-5.

Delete

This command deletes the device container from the VMS configuration database, removing it from selected view.

Properties

This menu item provides access to the **General Properties** and the **Stored Configurations** for the selected unit.

The ROSS General Properties dialog displays editable fields for Name, IP Address, and Subnet Mask.

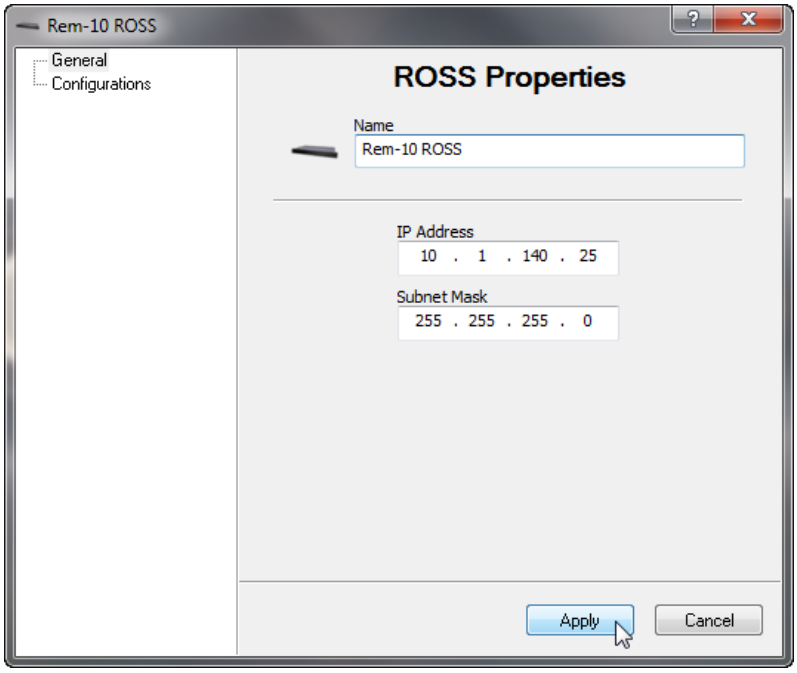

Figure 5-6 ROSS General Properties

The Stored Configurations dialog displays any ROSS parameter configurations that have been retrieved and saved. These configurations are available for use in backup, restore, import, export, and editing operations.

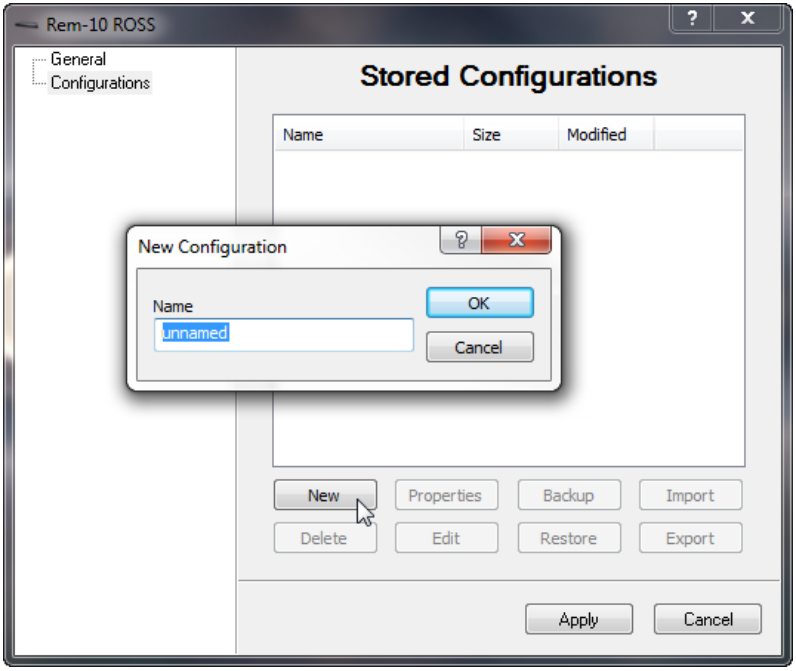

Figure 5-7 ROSS Stored Configurations

Hardware/Software Configuration

Refer to the user documentation for the ROSS for details on the physical installation of the device. The documentation has detailed information on using the unit's front panel controls, a serial console connection, and a Telnet connection and the command line interface for directly configuring the target ROSS.

A ROSS, when managed by the VMS as part of a communications network, has its role and function in the network monitored and managed. The VMS commands the ROSS to modify its configuration, as needed, to optimize network performance. In addition, the ROSS can be controlled manually.

NOTE

Note: Not all ROSS functions may be controlled by the VMS. Refer to the device's user documentation for instructions for using functions not available through the VMS.

Using Parameter Editor

Introduction

The use of the Parameter Editor from the VMS is presented here for the ROSS. For ROSS units running version 1.5.1 or later, configuration of ROSS parameter files using the Parameter Editor can be performed using the VMS. Additionally, access via the Vipersat VLoad utility is also currently offered.

The Parameter Editor provides a simple graphical user interface (GUI) for making configuration changes to devices used in a Vipersat satellite network. Accessible from the VMS, the Parameter Editor operates on the param files that store the operating parameters for network terminals.

Once a ROSS configuration has been changed using the VMS, the change is immediately applied to the unit and a change event is generated in the *Event Log* (see *Chapter 3, "VMS Configuration"*).

NOTE

Note: Many of the parameters will interact with other parameters. Carefully read the instructions before making changes to a unit's configuration settings.

Parameter modifications may also be made directly to the ROss using a Telnet connection and the CLI via Putty. Refer to the ROSS user documentation for details on making equipment parameter modifications directly at the unit.

Parameter Editor Features

The Parameter Editor software has the following features:

- Simple yet comprehensive graphical user interface.
- Integrated with the VMS.
- Context sensitive for device type as well as for unit role (Hub/Remote).
- Configuration alert error checking on range value parameters.
- Integrated help with parameter information.

Fully integrated with the VMS, the Parameter Editor is called upon when a ROSS configuration command is executed in the ViperView user interface. An example of the editor is shown in figure 5-8, below.

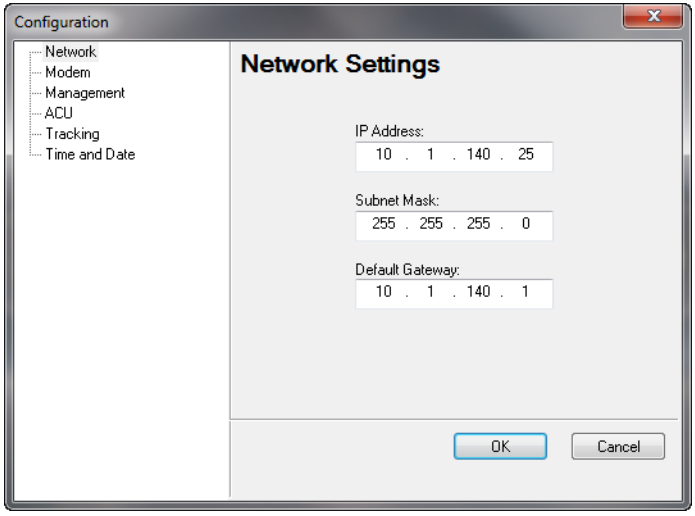

Figure 5-8 Parameter Editor, ROSS Example

Selection from the tree menu in the left panel of the window displays the applicable parameters in the right panel, using a combination of text fields, pull-down menus, check boxes, and radio buttons.

Configuration Changes

When changes are made to a unit configuration with Parameter Editor, these changes are saved by clicking on the **OK** button at the bottom of the Editor window. Alternatively, these changes are ignored by either clicking on the **Cancel** button or closing the Editor window.

Caution: Clicking the OK button saves *all of the data* from *all of the menu category dialogs* simultaneously to the ROSS unit Param file. The OK and Cancel buttons do not apply to any single dialog, but apply to all dialogs in the Parameter Editor.

Because the Parameter Editor closes after a save operation, it is recommended that all desired changes be input prior to clicking on the OK button.

From the VMS *ViperView* user interface, ParamEdit is accessed by selecting the ROSS **Configure** command (figure 5-2).

The following sections describe each of the tree menu items and their associated configuration parameters and settings.

Network Settings

Clicking on the **Network** menu item displays the Network Settings dialog shown in figure 5-9.

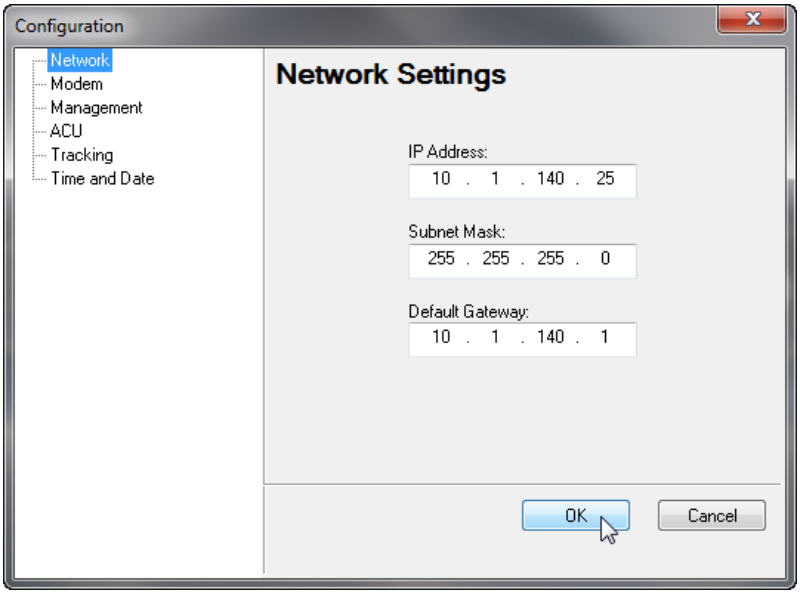

Figure 5-9 Network Settings dialog, ROSS

The network configuration is the ROSS system LAN interface properties setting the IP address, subnet mask, and local default gateway. After applying the network protocol stack will reinitialize with the new IP settings without rebooting.

Modem Settings

Clicking on the **Modem** menu item displays the Modem Settings dialog shown in figure 5-10.

This sets the IP address that ROSS will use to communicate with the locally attached Comtech modem. The modem IP address information is obtainable from the front panel of the modem; see specific user guide for menu operation. After selecting OK, the ROSS will initialize polling with inquires of modem SOTM mode—enabled/disabled—and set SAT ID number.

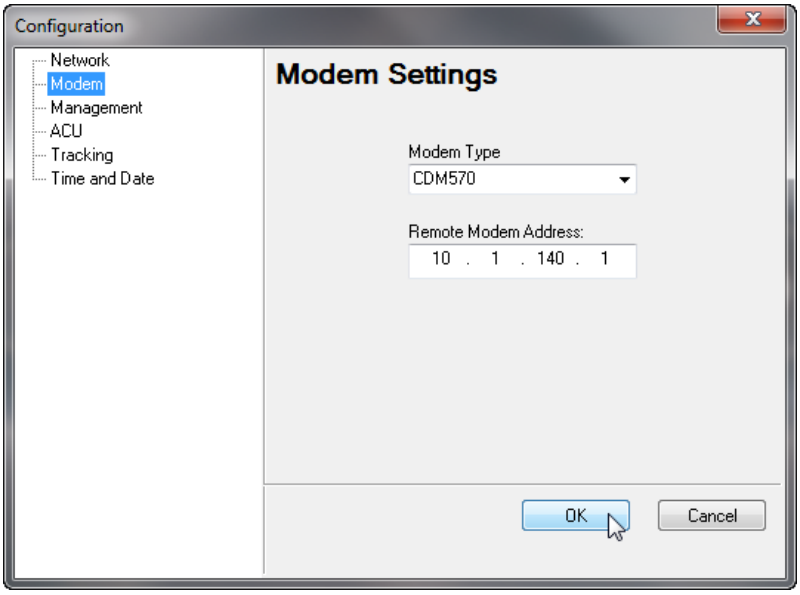

Figure 5-10 Modem Settings dialog, ROSS

Management Settings

Clicking on the **Management** menu item displays the Management Settings dialog shown in figure 5-11.

This dialog provides the settings for **Management Multicast Address** and the **Network ID** that this ROSS belongs to.

The Management Multicast Address sets the listening address of the active managing VMS.

The Network ID that is assigned to the unit defines which network within the managing VMS that the ROSS information will belong. All ROSS units used in a specified network will have the same network ID. This parameter is used by the VMS to identify units common to a network and allows the VMS to manage multiple networks, each with its own unique network ID number.

This value is configurable from 1 -255 and is assigned by the network operator.

Zero (0) is an invalid value for this parameter setting, and will result in no network assignment.

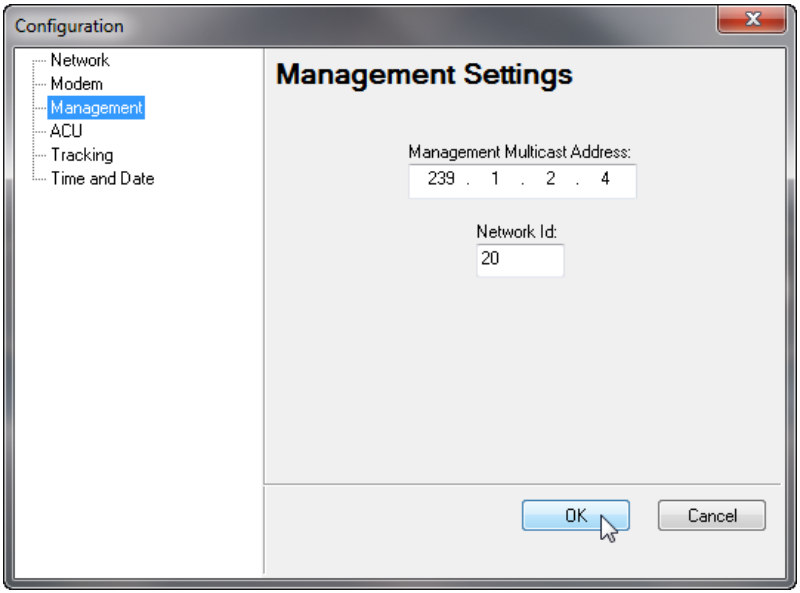

Figure 5-11 Management Settings dialog, ROSS

Antenna Control Unit Settings

Clicking on the **ACU** menu item displays the Antenna Control Unit Settings dialog shown in figure 5-12.

The ACU Configuration dialog allows the operator to set the ACU type and configuration options.

Every ACU vendor has their own proprietary communication protocols that provide for external devices to gain access to monitor and control settings.

The **ACU Type** allows the operator to select the appropriate model or manufacturer, indicating to the ROSS which device driver to initialize during boot-up. The ACU models supported by ROSS are listed in the pull-down menu.

Enter the **ACU Config** using the format for the specific ACU vendor.

Select the **Frequency Band** from the pull-down menu.

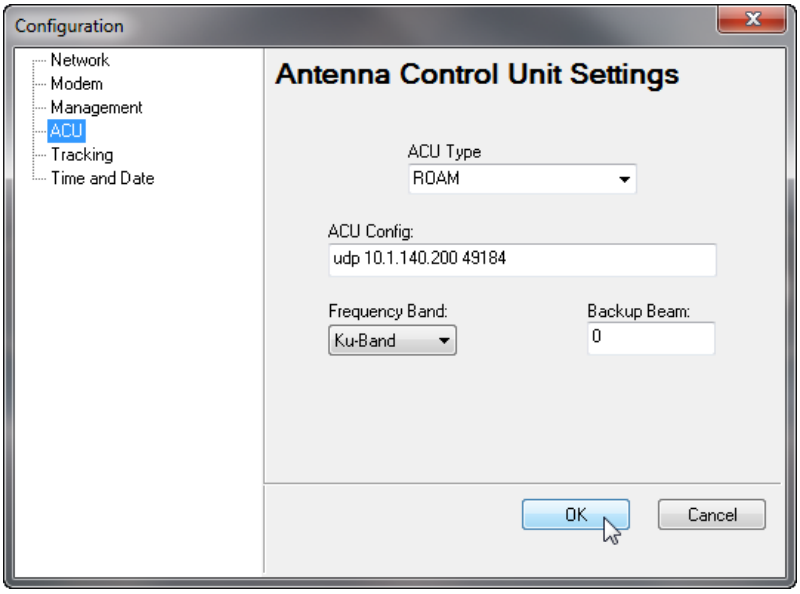

Figure 5-12 ACU Settings dialog, ROSS

Tracking Settings

Clicking on the **Tracking** menu item displays the Tracking Settings dialog shown in figure 5-13.

The **Shoreline Inhibit** sets the global shoreline threshold value. If a vessel's distance to the nearest shoreline is less than or equal to the threshold, and NOT inside an enabled coordinated area, ROSS will mute the satellite modem's transmitter.

The shoreline threshold can be disabled by setting to 0. The shoreline value is a decimal value representing kilometers.

For example, the FCC for the US shoreline is required to cease transmission at 200.0 kilometers from shore.

Stealth Mode, if enabled, will omit any location information in the Satellite Location Identification Protocol (SLIP) message. Some modes of operation require location of vessels to remain unidentified from network operators.

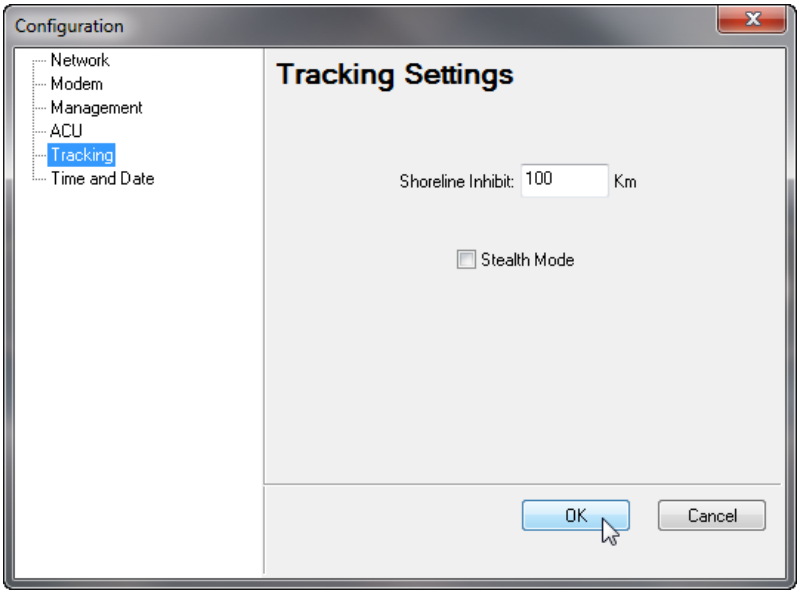

Figure 5-13 Tracking Settings dialog, ROSS

Time and Date Settings

Clicking on the **Time and Date** menu item displays the Time and Date Settings dialog shown in figure 5-14.

These parameters can be established using either the Manual Time and Date option, or specifying one or two Time Servers.

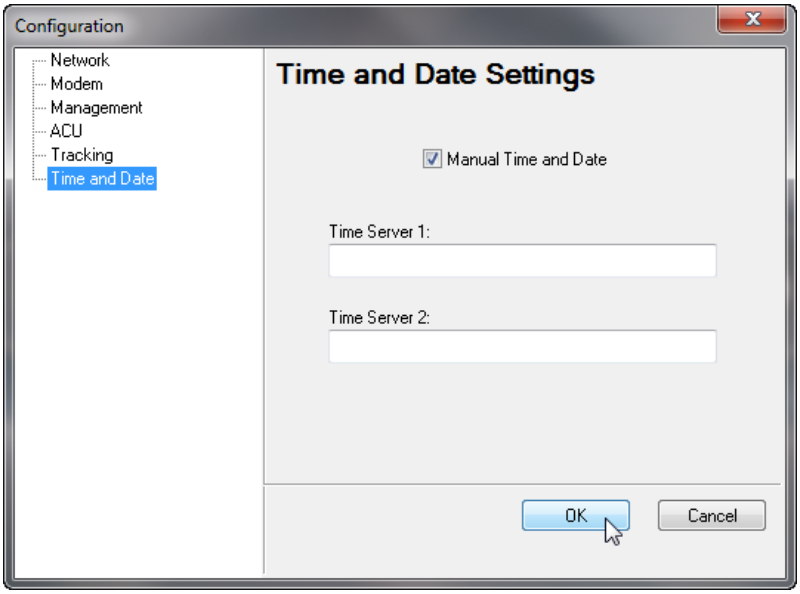

Figure 5-14 Time and Date Settings dialog, ROSS

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6

VMS SERVICES

General

This chapter covers using the various Services that make up the VMS, the satellite network management system with an intuitive, user-friendly, graphical user interface which displays:

- Monitor and Control functions that autonomously update network health and status
- Multiple networks managed from a single server
- Centralized network configurations
- Organized network layouts
- Automated equipment detection
- Intuitive drag-and-drop bandwidth management and configuration
- Roaming / Satcom-On-The-Move (SOTM)

The following sections describe the system services which, working together, form the VMS.

ViperView—Monitor and Control

ViperView and the VMS Services function to monitor and control network operations as well as to provide an interface for the administrator/operator to manage and perform modifications to the network.

Caution: In a redundant VMS configuration, when any changes are made to the VMS database, a **Synchronize** command should be executed (available by clicking on the Server icon, as shown in figure 6-1). This step is required to ensure that any changes made to the Active server are also made to the Standby server(s).

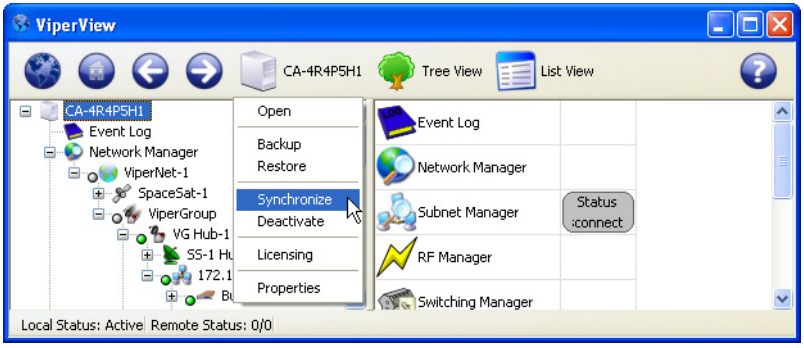

Figure 6-1 Synchronize Command

Multiple Views

VMS supports opening multiple ViperView window views, as shown on the sample screen in figure 6-2, allowing the operator to monitor several network services at once. These window views can be sized and positioned as desired.

The ViperView child windows are constantly updated by the VMS, giving the operator real-time views of the current status of the network.

To open a child window, right-click on the Service or device appearance in the Tree View and select the **Open** command.

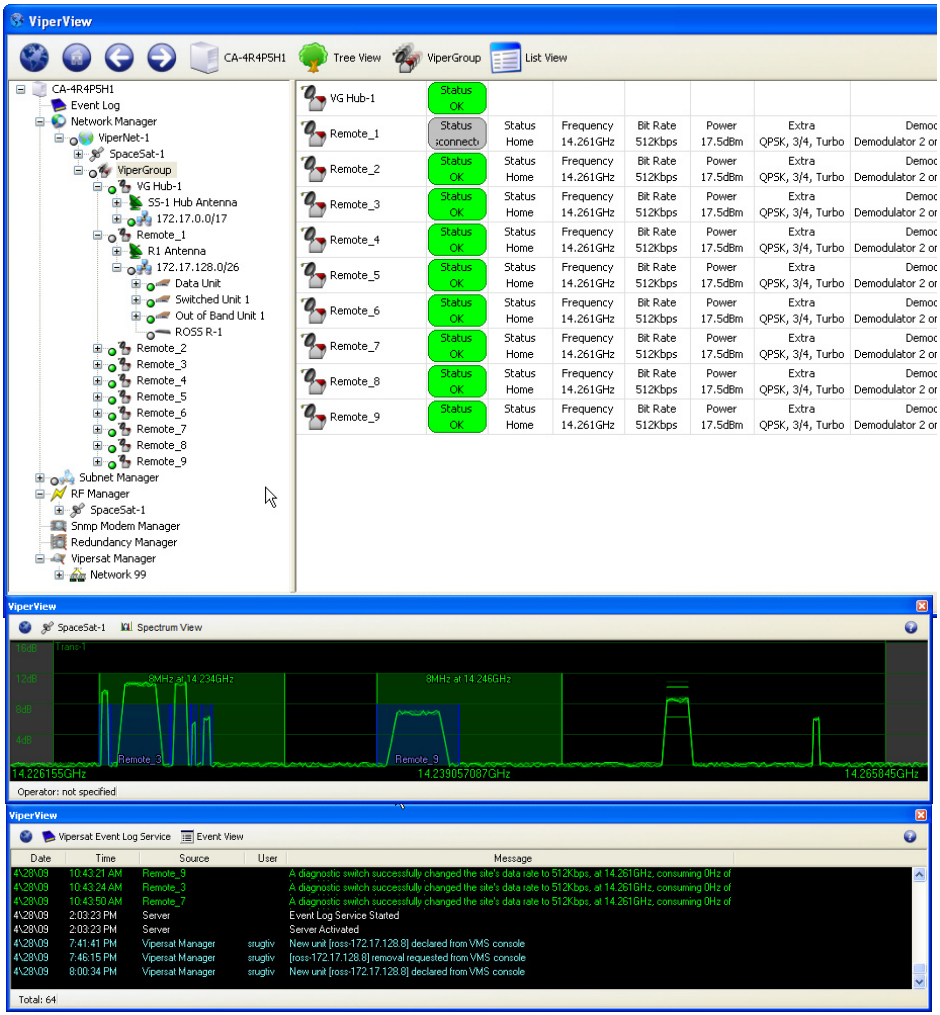

Figure 6-2 ViperView, Multiple Window Views

For example, the **Network Manager View** shown in figure 6-3 can be opened to display the current switch type, status and bit rate for both Tx and Rx, and the assigned Demods and Mods of all network remote members in a Group.

ViperView

ViperGroup | List View

R_1	Status OK	Switch Type Application	Tx Status Switched	Tx Bit Rate 512Kbps	Demodulator Demodulator 1 on Hub Exp CDD-564L 1	Rx Status Switched	Rx Bit Rate 64Kbps	Mo 1odulator 1 on
R_2	Status OK	Switch Type Application	Tx Status Switched	Tx Bit Rate 128Kbps	Demodulator Demodulator 1 on Hub Exp CDD-564L 2	Rx Status Home	Rx Bit Rate 2.048Mbps	Mo Modulator 1 c
R_3	Status OK	Switch Type Application	Tx Status Switched	Tx Bit Rate 1.536Mbps	Demodulator Demodulator 1 on Hub Exp CDD-564L 3	Rx Status Switched	Rx Bit Rate 1.536Mbps	Mo 1odulator 1 on
R_4	Status OK	Switch Type None	Tx Status Home	Tx Bit Rate 512Kbps	Demodulator Demodulator 2 on Burst Controller	Rx Status Home	Rx Bit Rate 2.048Mbps	Mo Modulator 1 c
R_5	Status OK	Switch Type None	Tx Status Home	Tx Bit Rate 512Kbps	Demodulator Demodulator 2 on Burst Controller	Rx Status Home	Rx Bit Rate 2.048Mbps	Mo Modulator 1 c
R_6	Status OK	Switch Type Application	Tx Status Switched	Tx Bit Rate 128Kbps	Demodulator Demodulator 1 on Hub Exp CDD-564L 4	Rx Status N/A	Rx Bit Rate 0bps	Mo (
R_7	Status OK	Switch Type None	Tx Status Home	Tx Bit Rate 512Kbps	Demodulator Demodulator 2 on Burst Controller	Rx Status N/A	Rx Bit Rate 0bps	Mo (
R_8	Status OK	Switch Type Application	Tx Status Switched	Tx Bit Rate 128Kbps	Demodulator Demodulator 2 on Hub Exp CDD-564L 1	Rx Status N/A	Rx Bit Rate 0bps	Mo (
R_9	Status OK	Switch Type None	Tx Status Home	Tx Bit Rate 512Kbps	Demodulator Demodulator 2 on Burst Controller	Rx Status N/A	Rx Bit Rate 0bps	Mo (
VG Hub-1	Status OK							

Status: OK

Figure 6-3 Network Manager, Group View

Similarly, the **Antenna View** displays the current status of a site's Modulators and Demodulators, as shown for the Hub site in figure 6-4.

ViperView

SS-1 Hub Antenna

SS-1 Hub Antenna					
Upconverter 1.2GHz->14.25GHz					
Modulator 1 on Burst Controller	OK	1.205GHz	2.048Mbps	17.5dBm	Blocked
Modulator 1 on Hub Exp CDM-570L 1	OK	1.1800277GHz	64Kbps	0dBm	R_1
Modulator 1 on Hub Exp CDM-570L 2	OK	1.1826069GHz	1.536Mbps	0dBm	R_3
Modulator 1 on Hub Exp CDM-570L 3	OK	950MHz	32Kbps	Disabled	Available
Modulator 1 on Hub Exp CDM-570L 4	OK	950MHz	32Kbps	Disabled	Available
Downconverter 11.95GHz->1.2GHz					
Demodulator 2 on Burst Controller	OK	1.211GHz	512Kbps	8.1dB	Blocked
Demodulator 1 on Hub Exp CDD-564L 1	OK	1.1802773GHz	512Kbps	7.7dB	R_1
Demodulator 2 on Hub Exp CDD-564L 1	OK	1.1834389GHz	128Kbps	11.1dB	R_8
Demodulator 3 on Hub Exp CDD-564L 1	OK	950MHz	32Kbps	Parked	Available
Demodulator 4 on Hub Exp CDD-564L 1	OK	950MHz	32Kbps	Parked	Available
Demodulator 1 on Hub Exp CDD-564L 2	OK	1.1805546GHz	128Kbps	5.1dB	R_2
Demodulator 2 on Hub Exp CDD-564L 2	OK	950MHz	32Kbps	Parked	Available
Demodulator 3 on Hub Exp CDD-564L 2	OK	950MHz	32Kbps	Parked	Available
Demodulator 4 on Hub Exp CDD-564L 2	OK	950MHz	32Kbps	Parked	Available
Demodulator 1 on Hub Exp CDD-564L 3	OK	1.1812757GHz	1.536Mbps	9.1dB	R_3
Demodulator 2 on Hub Exp CDD-564L 3	OK	950MHz	32Kbps	Parked	Available
Demodulator 3 on Hub Exp CDD-564L 3	OK	950MHz	32Kbps	Parked	Available
Demodulator 4 on Hub Exp CDD-564L 3	OK	950MHz	32Kbps	Parked	Available

Figure 6-4 Antenna View, Hub

NOTE

Note: The Antenna View shows L-Band frequencies.

Tip: Each List View within ViperView presents the option to turn **Item Labels** either On or Off via the command located under *List View* in the top menu bar. When set to Off, smaller element icons and the absence of table cell labels result in a more compact view.

The Network Manager Group View example shown in figure 6-3, is displayed with Item Labels turned *On*.

Use the Event Log to stay current on recent network activity, as shown in the **Event View** window shown in figure 6-5.

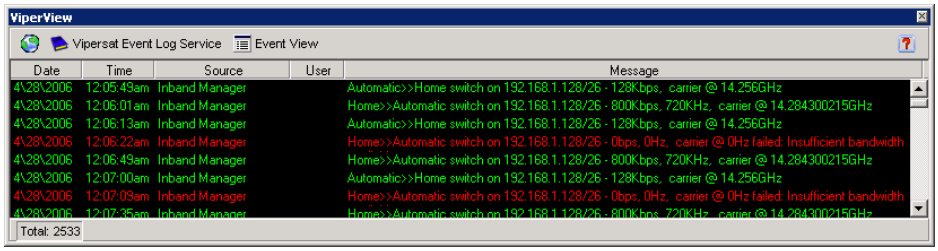

Figure 6-5 Event View

The Event View lists the details of network configuration changes, alarms, and switch events.

The **Spectrum View** displays a simulated spectrum analyzer, shown in figure 6-6, letting the operator monitor carriers and pools. The Spectrum View reports E_b/N_0, space segment usage, and pool slots assigned by the VMS.

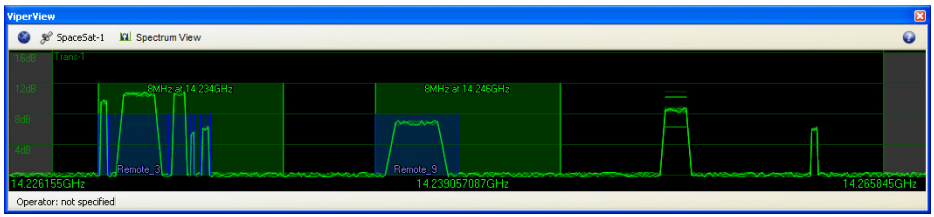

Figure 6-6 Spectrum View

The **Parameter View**, shown in figure 6-7, constantly supplies the operator with updated information for a selected unit. In addition, several parameter settings can be modified with this interface, providing an alternative method to the Parameter Editor.

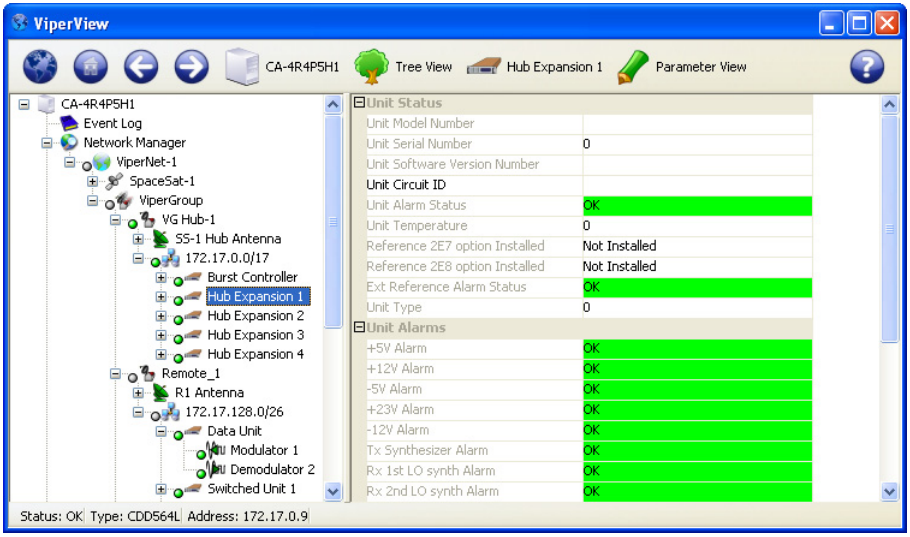

Figure 6-7 Parameter View

The **Parameter View** of a selected unit includes:

- Unit Status
- Unit Alarms
- Unit Config Store/Load
- Unit Events Log
- Unit Statistics Log
- Unit Reference
- Unit Ethernet

Right-clicking on a unit icon in the tree view displays the drop-down menu shown in figure 6-8. Use the commands from this menu to:

- **Open** a separate window for the unit's operating parameters
- Perform **Soft** and **Hard Resets**
- **Save to Flash**
- **Force Registration**
- **Remove**
- Manipulate modem/router parameters with the **Configure** and **Properties** commands

- **Upgrade** the unit firmware.

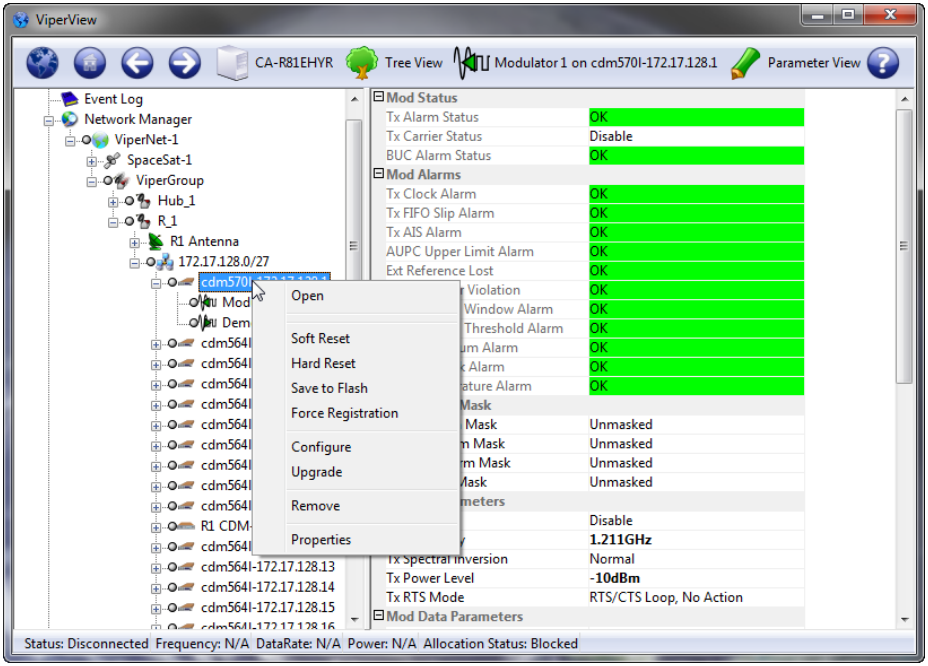

Figure 6-8 Unit Command Menu

Operations Monitor

Some of these commands, when executed on either a single unit or multiple units, require a period of time to complete. The **Operations Monitor** window will automatically open, providing a status of these processes for the user to track the progress until completion. With this feature, multiple commands can be executed sequentially without having to wait until a previous command has completed its process.

A window pane for each pending operation displays a description which can include the name of the associated unit or units, the initiation time and number of seconds since the operation started, and a progress message. A pending image upgrade, for example, indicates the number of packets transmitted so far, and the total number of packets. Upon completion, either a green or a red icon appears to indicate operation success or failure.

Error Detection

Using the **ViperView** screen, you can quickly see which sites in the network are showing an error condition and which have all of the equipment and software operating normally.

Green is used, as shown in figure 6-9, to show which sites, links, and equipment are operating normally. *Red*, on both the right window panel and for devices in the tree view in the left panel, indicates that there is an alarm condition. *Gray* indicates that the status is unknown—no multicast (PLDM) is being received.

Tip: The red error condition indicator associated with a site indicates that at least one of the devices in a site is reporting an alarm condition for a link.

Utilizing the many display options of ViperView, the entire Vipersat network can be quickly and easily scanned to determine the condition of each of the components in the network.

At the main screen level, there are a number of choices to examine, isolate, and remedy the error conditions. The tools available are easily reached from the ViperView display. In figure 6-9, the presence of alarms can be seen reflected in both the Network Manager service as well as the Subnet Manager service (selected in the figure).

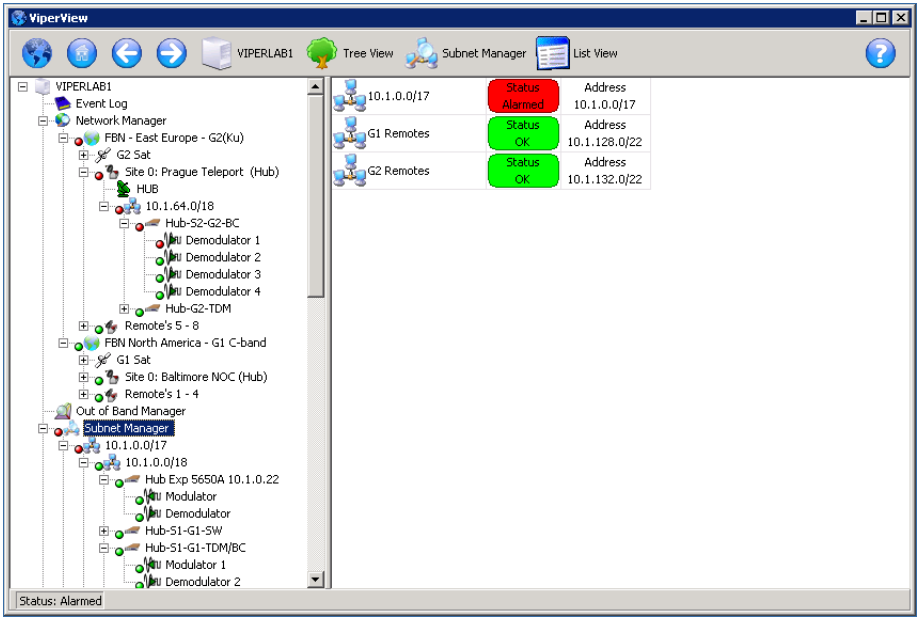

Figure 6-9 ViperView, Error Conditions

Using the Network Manager, right-clicking on a point in the network displays a drop-down menu which is specific to the selected point in the network. From this menu, the operator can perform any of the actions available on the list and instantly modify the parameters of that network element.

An example is shown in figure 6-10 for a Remote data unit that displays an alarm condition. Right-clicking on the modem and selecting **Configure** opens the Configuration dialog (CDM-570L) shown in figure 6-11. Here, the correct parameter settings can be verified and, if necessary, an image upgrade can be performed.

Another example, shown in figure 6-12, shows a Hub expansion demodulator in an alarm state due to reaching the maximum allocation failure count. Right-clicking on the demodulator allows the count to be **Reset** via the menu command that is presented.

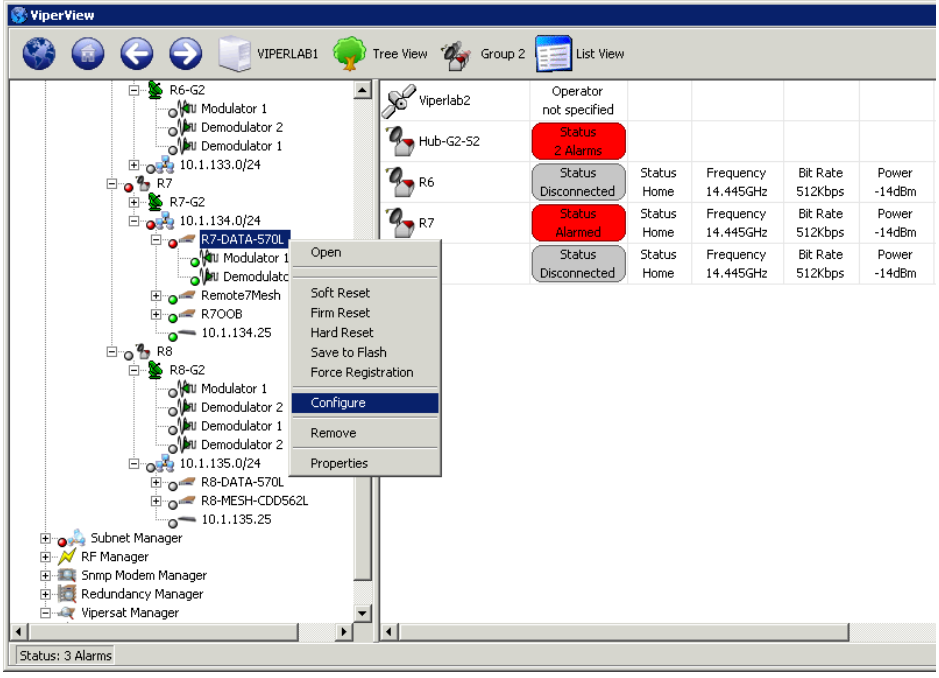

Figure 6-10 Modem Configure Command

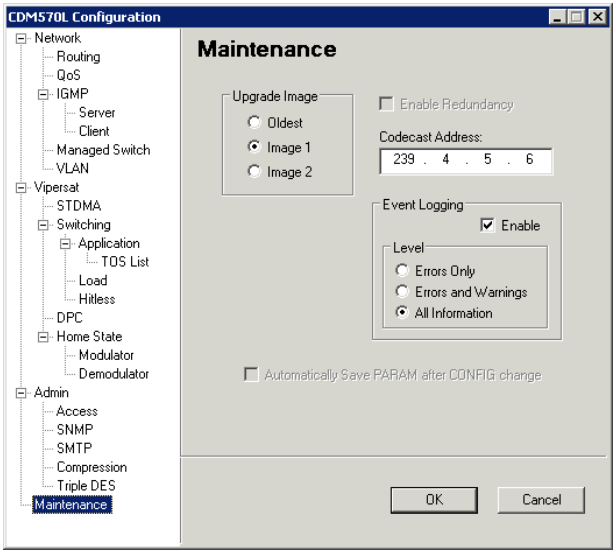

Figure 6-11 Modem Configuration dialog

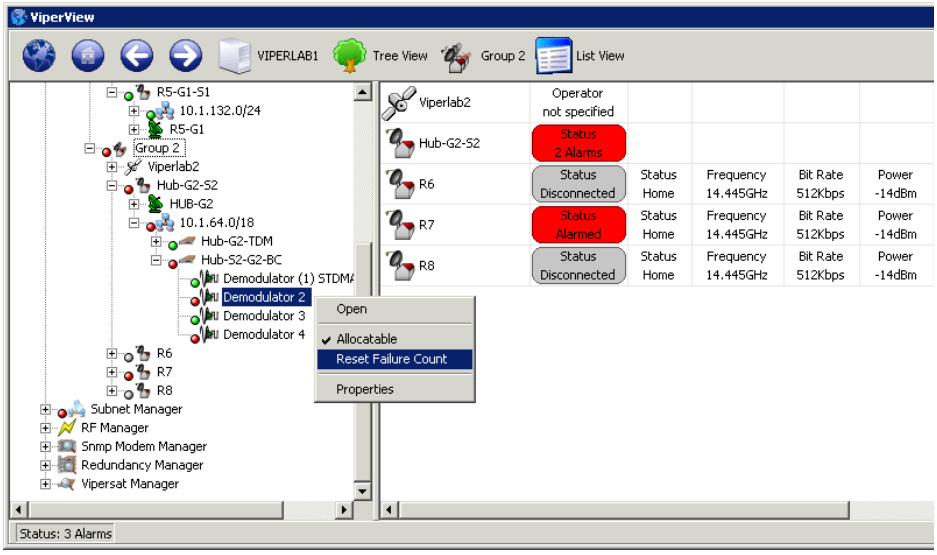

Figure 6-12 Reset Failure Count, Hub Demodulator

Event Log

The VMS **Event Log** displays a history of events occurring in the system and network. Anytime that there is a change in the current setting, status, resources, and configurations, the system outputs an event message displaying information about the event. The displayed information is part of a complete database file of recorded network activity used for notifying the operator of possible errors or failures.

With the use of this information, the system administrator can quickly locate, identify, repair, or replace the network element that is associated with the error/ failure.

Selecting the Event Log icon (directly below the Server icon) from the left panel of the ViperView window (figure 6-9) will display the Event Log view in the right panel. Alternatively, right-clicking on the icon allows the Event Log to be opened in a separate ViperView child window (figure 6-5).

The Log lists all activity reported to the server. This is a useful tool when determining the functioning of the network. Each event listed is categorized by the date, time, source, and user. A message describing the activity which created the event is also provided.

Each log entry is displayed using the standard VMS color scheme:

- **Green** – Event completed successfully
- **Red** – Event failed and caused an alarm
- **Grey** – The unit was not available
- **White** – Items which do not have a status associated with them
- **Yellow** – Administrative command
- **Blue** – Configuration change
- **Purple** – Corrupted entry
- **Pink** – Server event

Clicking on the **Event View** icon on the Object Bar, as shown in figure 6-13, displays a drop-down menu with seven commands:

- Clear
- Reset Filters
- Local Time
- Twelve Hour
- Twenty Four Hour

- Relative Time
- Offset Time
- Auto Scroll
- Filters...
- Export...
- Refresh

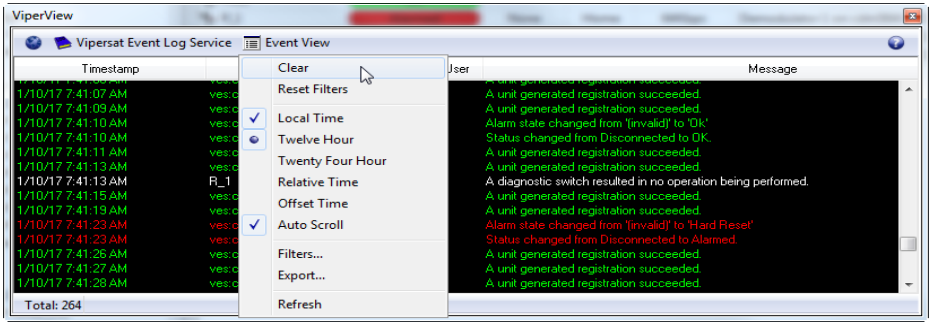

Figure 6-13 Event View Menu

Clear

Selecting **Clear** from the menu removes all log entries from the Event View display, and resets the Start Date/Time for recording new events to the present date and time. The removed entries are not deleted and remain in the vlog file.

Reset Filters

Selecting **Reset Filters** from the menu configures the Event Log filters to the default setting of displaying all events in this Event View window.

Local Time

Selecting **Local Time** adjusts the event to local system time based on set time zone.

Twelve Hour

Selecting the **Twelve Hour** clock setting will set 12 hour event time stamping.

Twenty Four Hour

Selecting the **Twelve Hour** clock setting will set 24 hour event time stamping.

Relative Time

Selecting **Relative Time** will change the time format to time since (between) last event.

Offset Time

The **Offset Time** allows a selection of any one event to be the starting time (0) reference point. **Offset Time** works in conjunction with **Set Epoch**, which is available by Right Clicking on an event in the list. See **Set Epoch** in **Direct Event Filtering**.

Auto Scroll

Selecting the **Auto Scroll** setting will toggle between On (checked) or Off (unchecked) for automatically scrolling the list so that the most recent event is visible in the display.

Filters...

By default, the Event Log View is set to display all recorded events.

Selecting the **Filters...** command from the menu opens the **Event Log View** dialog shown in figure 6-14. Here, the log entries appearance can be tailored to display a specified *Date/Time* range, events associated with selected *VMS Sources*, and/or specific *Types* of events.

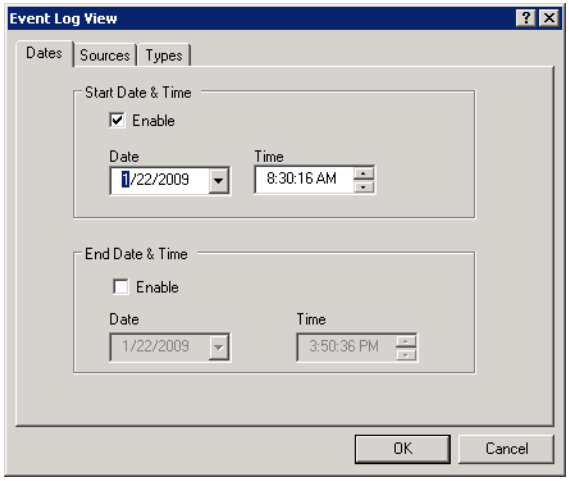

Figure 6-14 Event Log View, Dates tab

Caution: When using more than one Filters tab to create customized filtering, the resulting configuration is executed as an **AND** function, not as an OR function. Therefore, if an event does not match the conditions of the tab combination used, it will not be displayed.

Note: Customized filtering settings are not saved and only apply to the current Event Log window that is displayed, whether it is from the main Viperview window or a separately opened child window. Once the window is closed, re-opening the Event Log window will result in the display defaulting to show all events.

Dates Tab

The **Dates** tab can be selected for specifying the Date and Time to start and stop viewing events, as shown in figure 6-14.

Select the **Enable** check box to edit the current settings.

Sources Tab

The **Sources** tab (figure 6-15) can be selected for specifying a customized set of sources from the VMS Services tree from which all associated log events will be displayed.

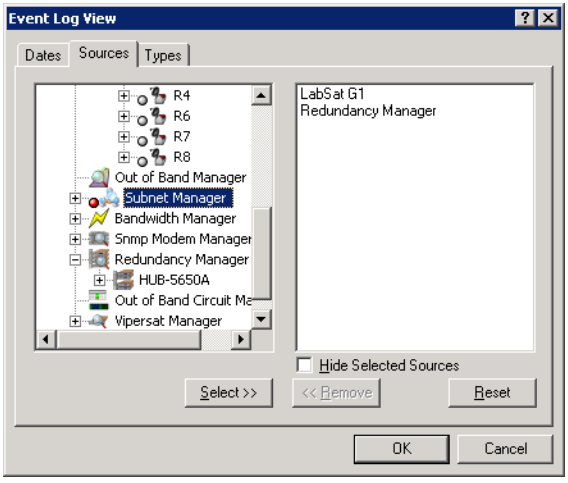

Figure 6-15 Event Log View, Sources tab

The VMS Server name appears in the left panel. Expand the tree to the level desired and click to highlight a source, then use the **Select** button to enter that source in the right panel. Repeat this process to create a cumulative customized source set.

Enabling the **Hide Selected Sources** check box will *prevent* these event sources from being displayed.

Types Tab

The **Types** tab can be selected for specifying a customized set of event types to be displayed.

Select the desired event types by clicking in the check boxes, as shown in figure 6-16.

Enabling the **Hide Selected Types** check box will *prevent* these event types from being displayed.

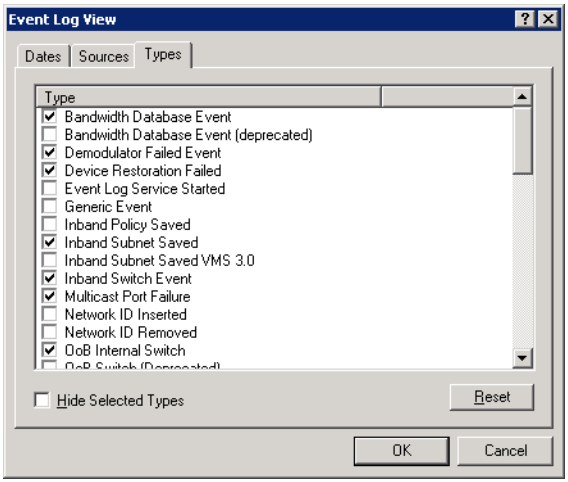

Figure 6-16 Event Log View, Types tab

Export...

Selecting the **Export** command will open a windows file **Save As** dialog, prompting the operator to enter a file name and location to save the event log. The file is exported as an *Extensible Markup Language* (XML) file, which is a simple and very flexible text format for import into most database applications.

Refresh

Selecting the **Refresh** command will update the event view with any pending events waiting in the event thread.

Tip: The event Type for an Event Log entry can be identified by double-clicking on the given event listing to open the **Event Details** dialog. An example is shown in figure 6-17, below.

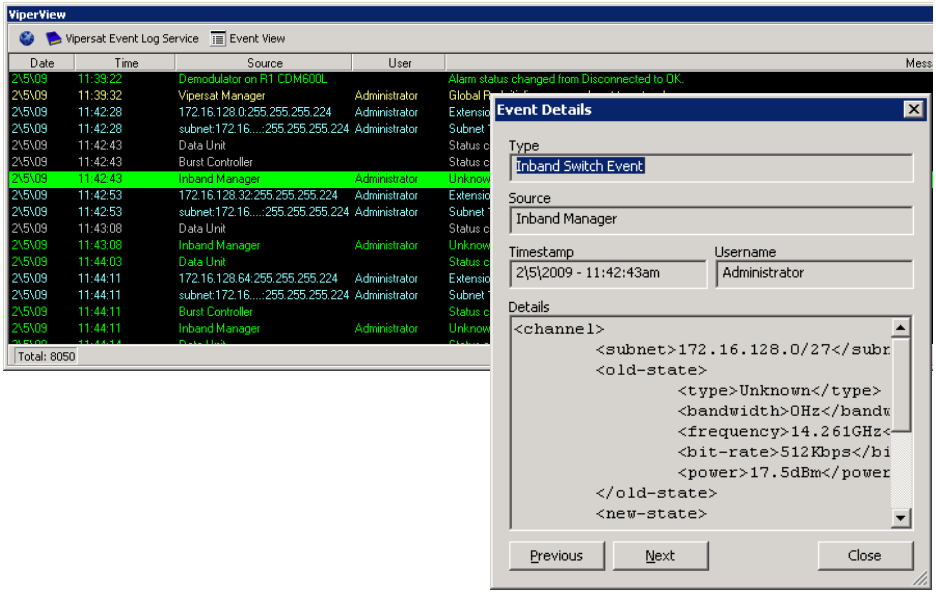

Figure 6-17 Event Details dialog

Once the desired filters have been defined, click on the **OK** button to execute the changes.

The parameters entered on the Dates, Sources, and Types tabs work together to provide customized Event Views of network activity.

Direct Event Filtering

The VMS Event Log also provides the means to configure event filtering directly from specific events.

Right-click on a logged event to display the drop-down menu shown in figure 6-18. The associated **Type** and/or **Source** for this event can be chosen to either *Show* or *Hide* this category in the Event View.

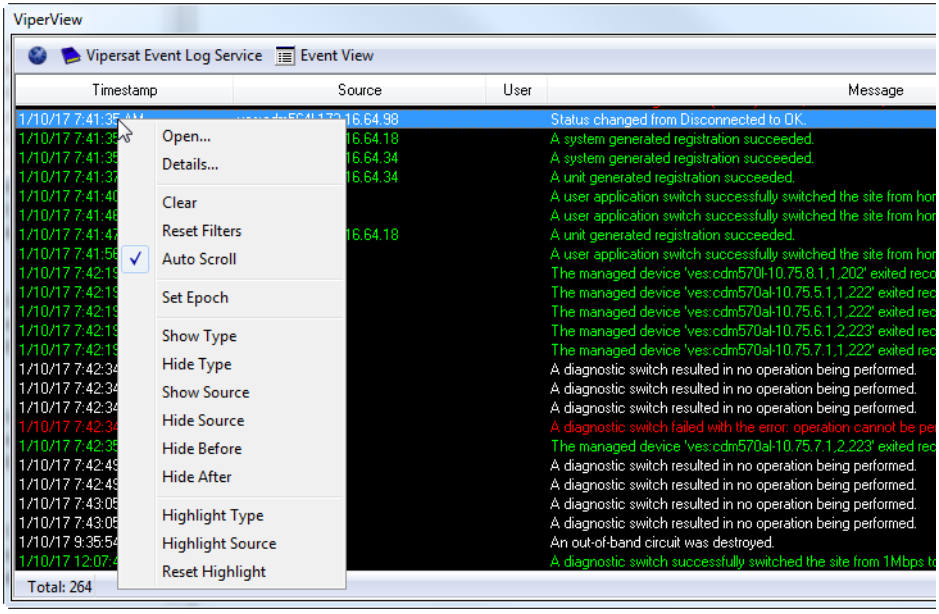

Figure 6-18 Menu, Selected Log Event

Select **Open...** from the menu to open the default ViperView window for the item in the Tree View (left panel) that corresponds to this event.

Selecting **Details...** will open the Event Details window for this event item.

Clear

Selecting **Clear** from the menu removes all log entries from the Event View display, and resets the Start Date/Time for recording new events to the present date and time. The removed entries are not deleted and remain in the vlog file.

Reset Filters

Selecting **Reset Filters** from the menu configures the Event Log filters to the default setting of displaying all events in this Event View window.

Auto Scroll

Selecting Auto Scroll will update the event view window each time a new event is received.

Set Epoch

With the selection of an event (Right Click) and selecting **Set Epoch** will set this event entry in the view as the starting time (0) reference point. All subsequent event times are relative to this timestamp event forward. As previously mentioned the **Offset Time** selection will change the list view to display all timestamps referenced from this point forward. To change timestamp, select another time format.

Show Type

Selecting an event from the list and selecting **Show Type** will update the list event view with event of this type.

Hide Type

Selecting an event from the list and selecting **Hide Type** will update the list event view removing this type of event.

Show Source

Selecting an event from the list and selecting **Show Source** will update the list event view only show events from this source.

Hide Source

Selecting an event from the list and selecting **Hide Source** will update the list event view removing this type of sourced event.

Hide Type

Selecting an event from the list and selecting **Hide Type** will update the list event view removing this type of event.

Hide Before

Selecting an event from the list and selecting **Hide Before** will update the list event view moving this event to the top of the window hiding all events before this one.

Hide After

Selecting an event from the list and selecting **Hide After** will update the list event view hiding all events after this one.

Highlight Type

Selecting an event from the list and selecting **Highlight Type** will update the list event view by highlighting all events of this type.

Highlight Source

Selecting an event from the list and selecting **Highlight Source** will update the list event view by highlighting all events with this source.

Reset Highlight

Selecting an event from the list and selecting **Reset Highlight** will update the list event view by clearing all highlighted events.

Event Relay Server

The VMS Event Relay Server allows external client software to interact directly with the Event Log service, utilizing text messages over a TCP connection. Events generated by the VMS can be passed through the TCP/XML interface to a client application on any platform and from any location in the IP network. The events are transmitted in standard XML format.

With no dependency on the Windows Event Viewer and API, the Event Relay Server is more efficient and more reliable than the Event Conduit Service (VMS v3.6.4) that it replaces. And, because this server is directly integrated with the VMS, there is no need to install any additional software.

The Event Relay is configured from the Event Log Properties **General** dialog, and is set to **Enabled** by default, as shown in figure 6-19.

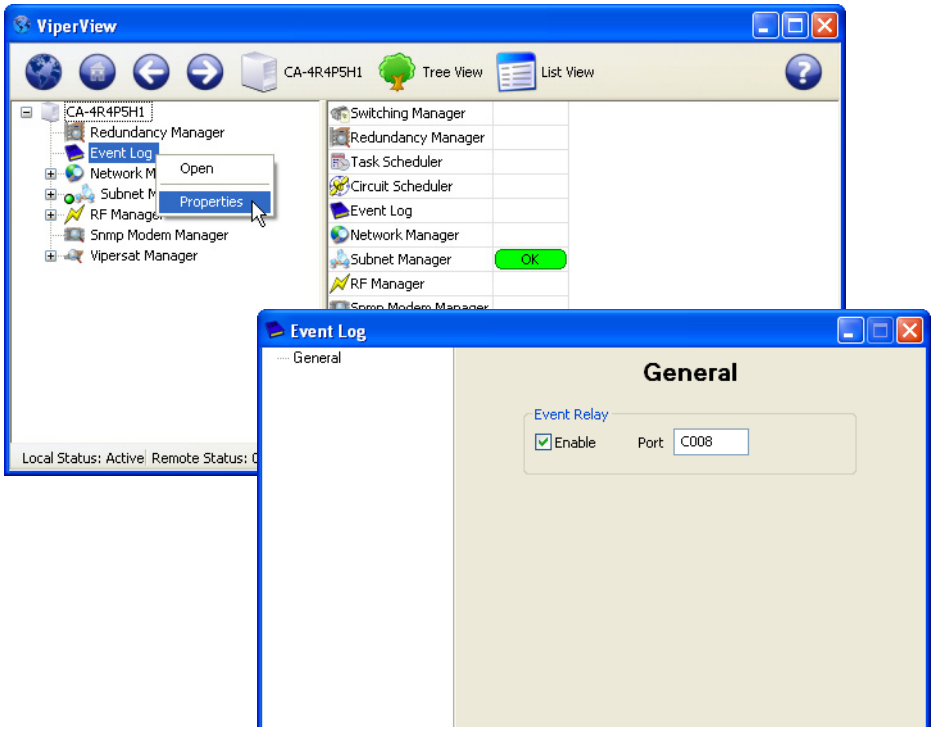

Figure 6-19 Event Relay Server Configuration

Alarm Masks

Alarm masks are a VMS tool that is used to limit false alarms generated by normal system operations.

Viewing/Setting Alarm Masks

Demodulators that are typically being locked and unlocked, such as switched demodulators/burst controllers, should have the Unlock Alarm masked. The setting of other alarm masks will depend on usage and whether or not a BUC is installed.

Alarms masks are viewed and set for the modem in the device view, as shown in figure 6-20 and figure 6-21.

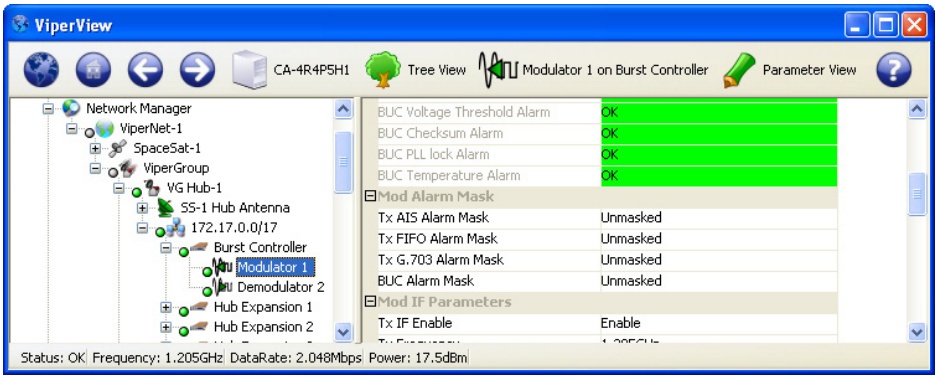

Figure 6-20 Modulator Alarm Masks

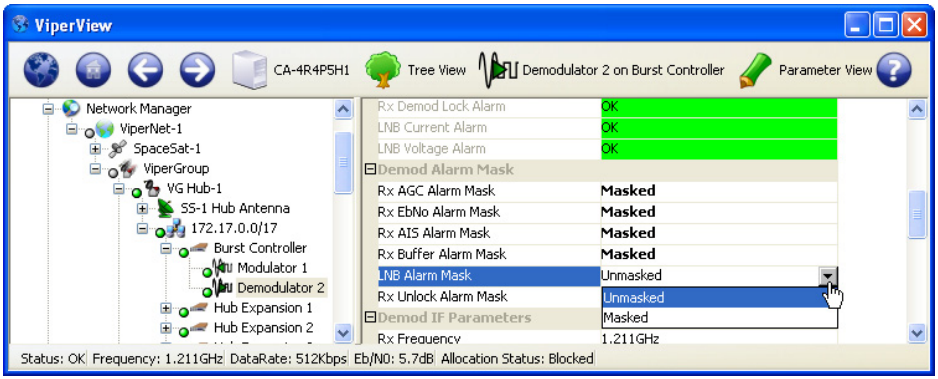

Figure 6-21 Demodulator Alarm Masks

To mask/unmask alarms for a device, select the device in the left panel tree view, then select an alarm from the Alarm Mask list in the right panel. Use the pull-down menu to select either **Unmasked** or **Masked**.

The alarm mask settings shown in table 6-1 are for a typical VMS network.

Table 6-1 Alarm Masking in a Typical Network

Device Type	Demodulator Lock Status	Demodulator Level Alarm	Demodulator Auto Gain Ctrl
TDM/ Burst Cont. Remote	X	X	X
Hub Expansion	X	X	X
Remote Expansion	X	X	X

Unlock Alarm Masks

InBand modem device **Mask Unlock Alarm** flags mask and set park states every time the modem registers with the VMS. These flags simplify and reduce the device item-by-item settings, making them persistent during active state. These flag settings are typically set on modems that are switched expansion units or hub burst demodulators. If these devices are not masked, many unwanted alarms will be generated in the system during normal operations due to their frequent locking/unlocking behavior.

Hub burst demodulators, when masked, only shut down their link status alarms that are typically part of the carrier lock/unlock, leaving all other internal alarms unmasked.

The hub and remote expansion demodulator carrier alarm mask is cleared each time it is switched to receive a return carrier from a remote. This unmasking of alarms remains until the demodulator is returned to a parked state (unlock), where it is re-masked to prevent unwanted network alarms.

If the modem is rebooted, the alarm masks are cleared until the next VMS registration.

NOTE

Note: It is not necessary to mask the SLM-5650A hub burst demodulator. If the alarm mask is set for this device type, the front panel carrier lock LED's WILL NOT illuminate.

See *"Mask Rx Unlock Alarms" on page 3-50* for details on how to set unlock alarm masks.

Diagnostic Switching

A manual switch control feature called Diagnostic Switch allows an operator to perform maintenance testing or commission an antenna. All VMS automatic switching and carrier recovery mechanisms are disabled when a site is placed in diagnostic mode.

Caution: Diagnostic switching should only be used during maintenance periods; all guarantees are disabled for the affected network during this process.

Diagnostic Setup

To execute a diagnostic switch, right-click on the Remote site in Network Manager and select **Diagnostic Setup** from the drop-down menu, as shown in figure 6-22.

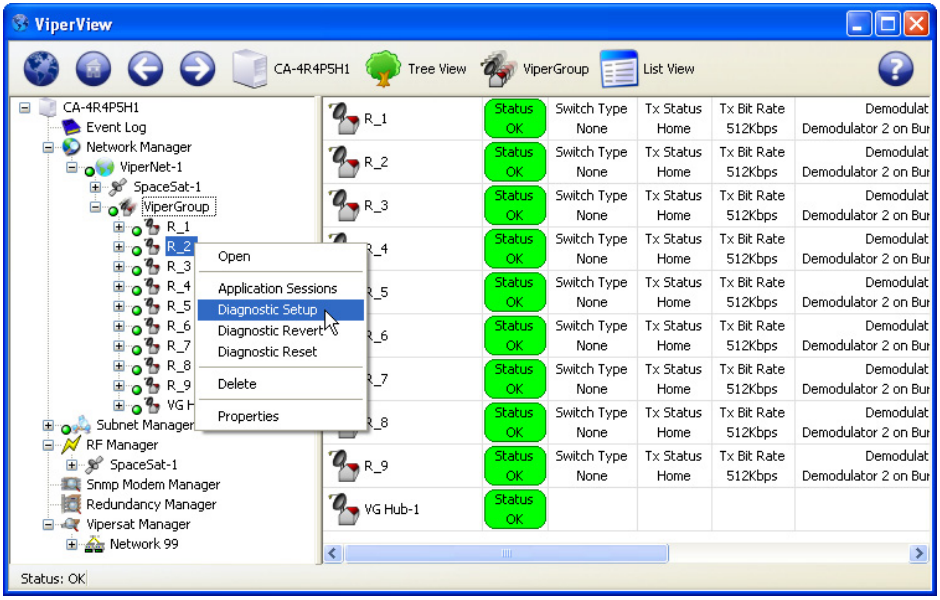

Figure 6-22 Diagnostic Setup command

A setup dialog will open for specifying the desired bit rate and transmission parameters for the SCPC switch (figure 6-23).

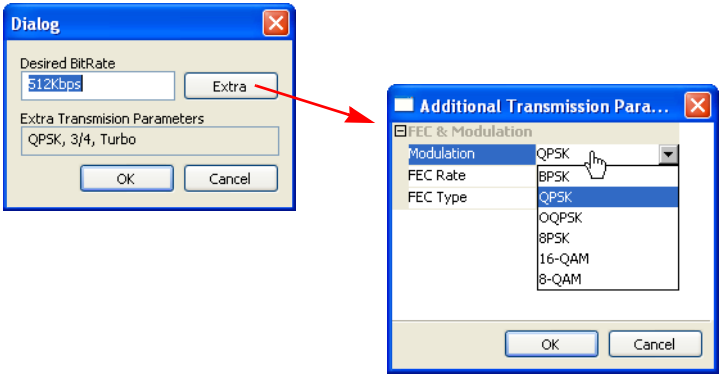

Figure 6-23 Diagnostic Setup dialogs

Click **OK** to initiate the switch. The **Executing Switch** message will be temporarily displayed while the switch request is processed.

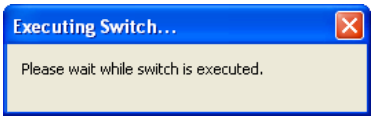

Figure 6-24 Executing Switch message

If successful, the new status for this remote will be displayed and the assigned carrier will appear in the spectrum view, as shown in figure 6-25 and figure 6-26.

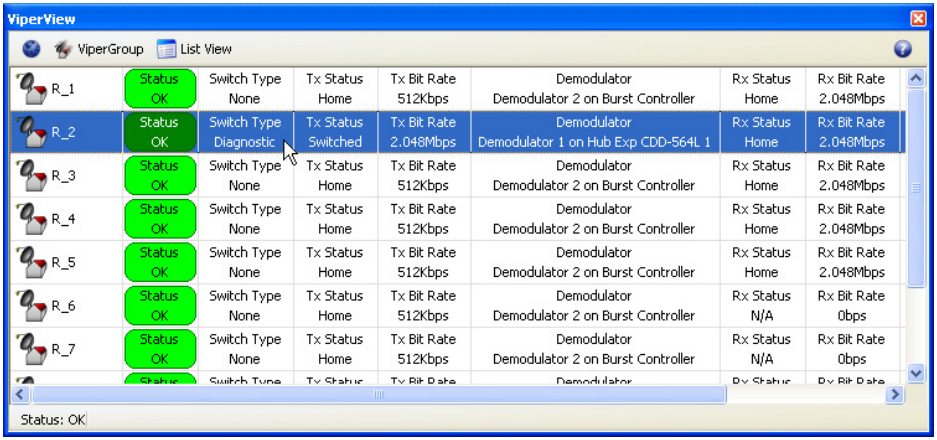

Figure 6-25 Remote Status, Diagnostic Switch

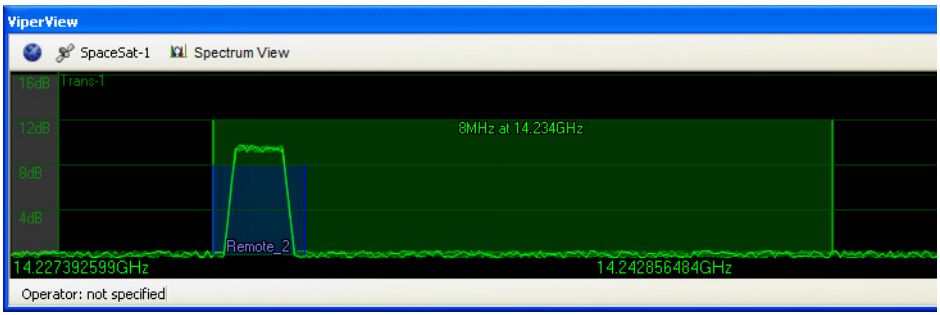

Figure 6-26 Carrier Appearance, Diagnostic Switch

If the diagnostic setup is not successful, a failed event will appear in the Event Log view.

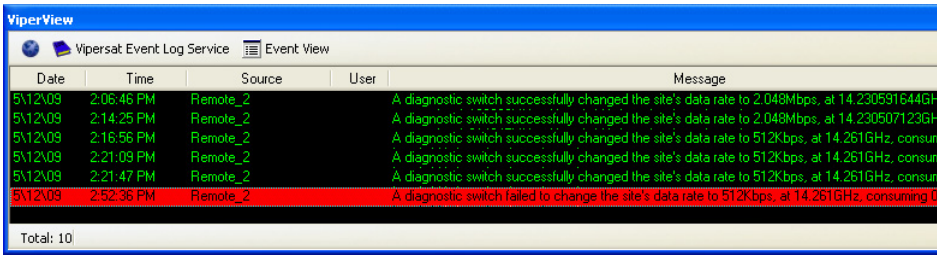

Figure 6-27 Failed Event, Diagnostic Switch

Diagnostic Revert

The **Diagnostic Revert** command returns the remote modem to its home state settings. This command is appropriate to use when SCPC transmission is no longer required, switching back to STDMA mode, or communications with the remote have been lost and it is *unknown* whether or not the modem is still transmitting. Unlike the Reset command (see below), the bandwidth slot is retained in case the modem communications are restored.

Diagnostic Reset

As with the Revert command (see above), the **Diagnostic Reset** command returns the remote modem to its home state settings. However, this command is appropriate to use when communications with the remote have been lost and it is *known* that the modem is not transmitting so as to prevent the occurrence of an interfering carrier. The bandwidth slot is freed for use by another network device.

Because of the possibility of an interfering carrier being created if the remote is still transmitting, selecting the Diagnostic Reset command displays the **reset uplink** warning shown in figure 6-28.

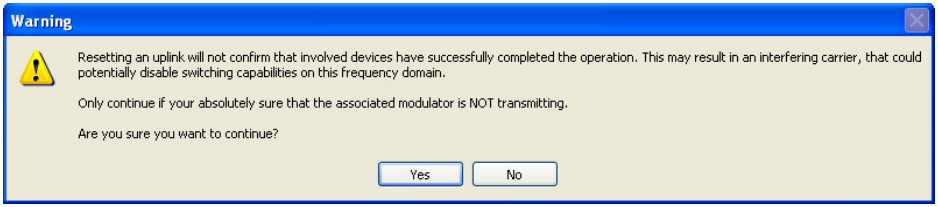

Figure 6-28 Reset Uplink warning

Caution: Read the Reset Uplink warning carefully, as performing this operation on an unknown transmitting unit may cause carrier interference on the operating network. It is safe to reset resources for a remote if it is known that the remote is not transmitting, powered down, or faulty.

Database Backup and Restore

It is recommended that periodic VMS database backups be performed on a regular basis. In addition, backups are necessary prior to installing a new version of VMS (upgrade) and whenever any significant changes are made to the network configuration. This precaution will allow for a current or recent database to be restored in the event that a failure—such as a file corruption—with the VMS occurs.

Backup Procedure

1. Right-click on the VMS Server icon in the ViperView main menu bar and select the **Backup** command from the drop-down menu (figure 6-29).

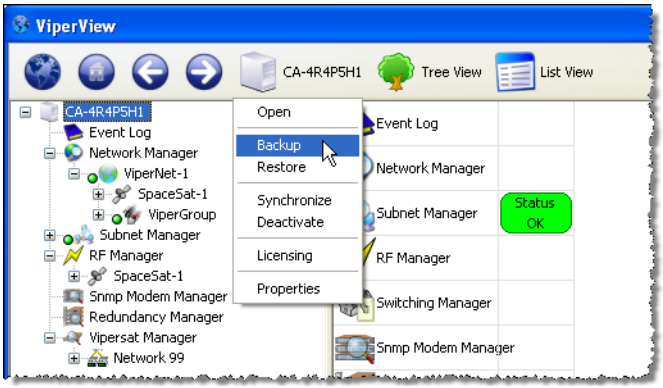

Figure 6-29 Backup Command, VMS Server Menu

2. Enter the **Name** for the backup file and select the directory location for saving the file from the **Save As** dialog window that opens (figure 6-30).

   It is recommended that the file name include the VMS *version* and the *date* of the backup.

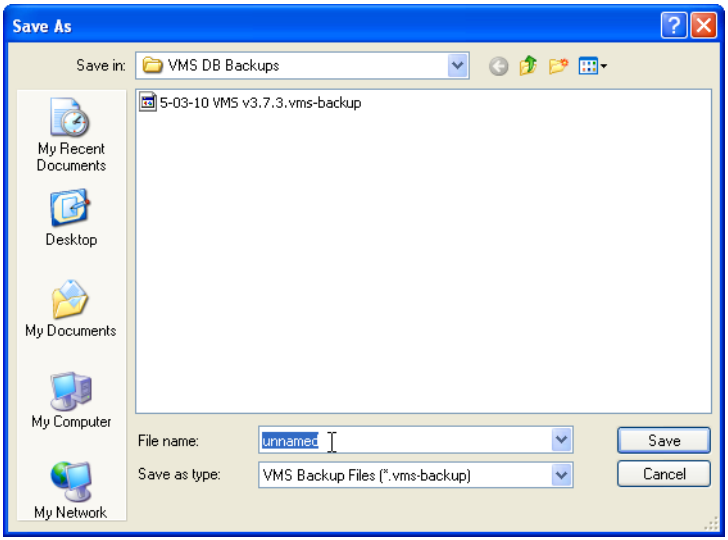

Figure 6-30 VMS Database Backup Save As dialog

Restore Procedure

NOTE

Note: The database backup can only be restored on the same VMS version. It is not compatible with a different VMS version.

1. Right-click on the VMS Server icon in the ViperView main menu bar and select the **Restore** command from the drop-down menu.

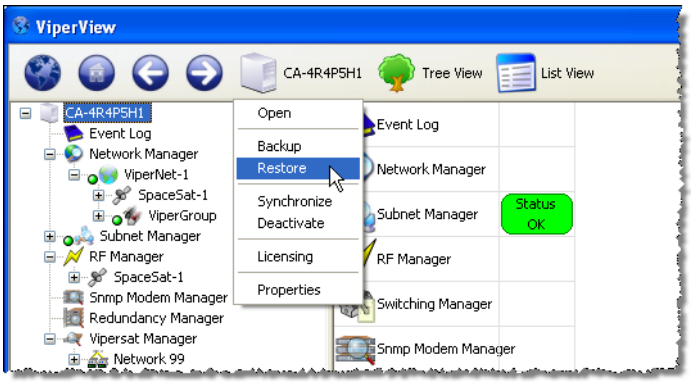

Figure 6-31 Restore Command, VMS Server Menu

2. Locate the backup file directory and select the desired database backup file for the currently running VMS version from the **Open** dialog.

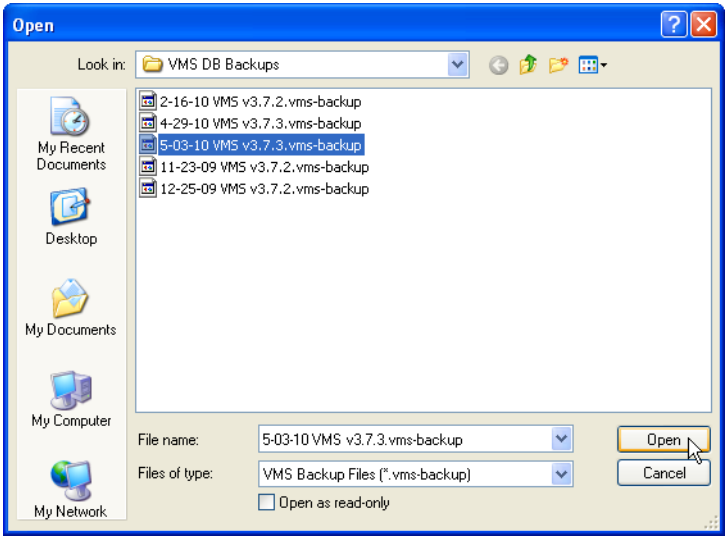

Figure 6-32 VMS Database Restore Open dialog

3. From the Tree View icon in the Viperview main menu bar, select the **Refresh** command.

4. Verify that the ViperView display is interactive and reflects network status correctly.

VMS Service Managers

When VMS is started on the server and ViperView is opened on the client workstation, the Server View, shown in figure 6-33, displays the installed VMS Service Managers. Included in this display are the Network Manager, the Subnet Manager, the RF Manager (formerly the Bandwidth Manager in previous versions), the Switching Manager, the SNMP Modem Manager, the Redundancy Manager, and the Vipersat Manager.

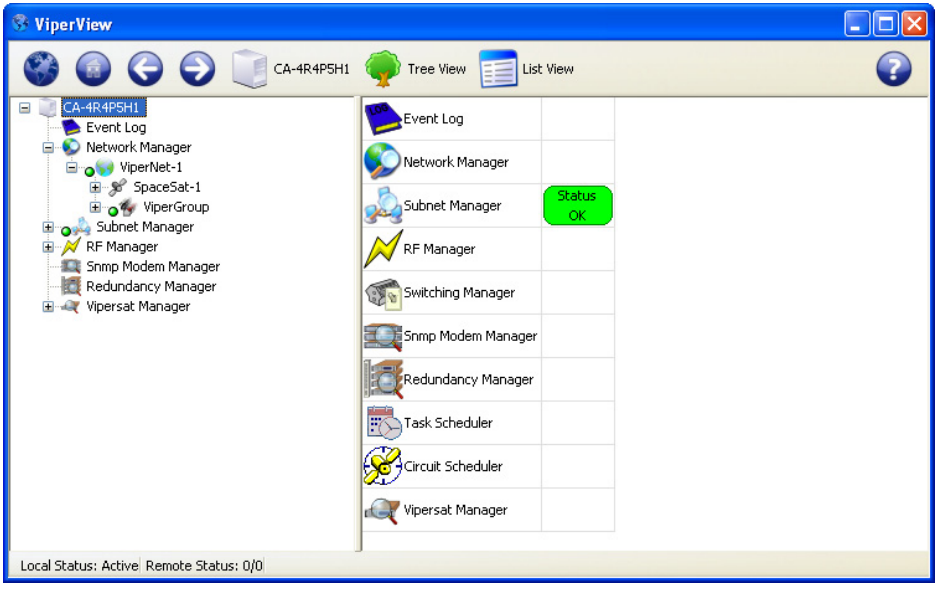

Figure 6-33 VMS Server View

Each of these services is discussed in the following sections.

Network Manager

The Network Manager is the heart of the VMS user interface, and serves as the primary source within ViperView for managing network functions. The networks, and their associated elements, that are created in the Network Manager are *virtual*, and thus can be added and removed without affecting the actual networks upon which they are based. The source locations of the elements that are displayed in Network Manager originate from within the other VMS service managers.

Operator networks are built and managed in the Network Manager by utilizing the Network, Group, and Site container structures. These hierarchical structures serve as a means of logically organizing all of the network elements for easy access. Configuration changes, InBanding of remotes, and switching and bandwidth policies are all controlled and monitored with this service manager.

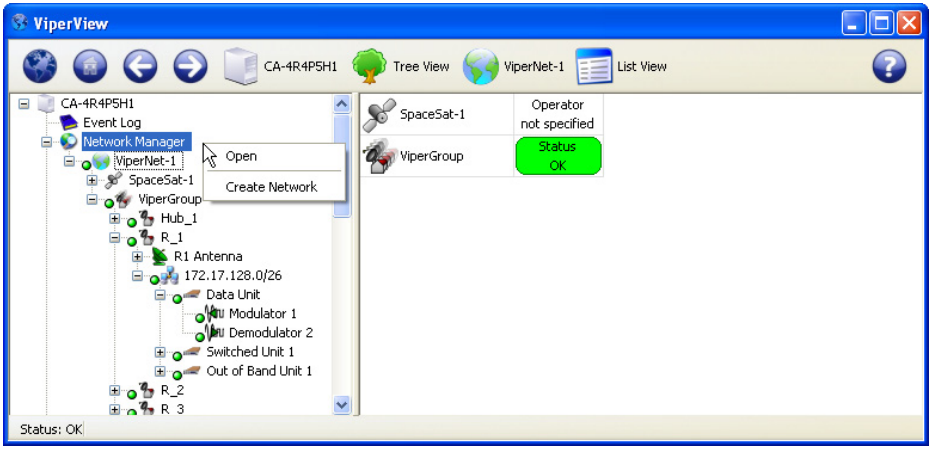

Figure 6-34 Network Manager, Drop-Down Menu

Each Network List View provides high level alarm and switched status. Also there is a bandwidth usage indicator that show a total percentage of pool(s) utilization in real-time.

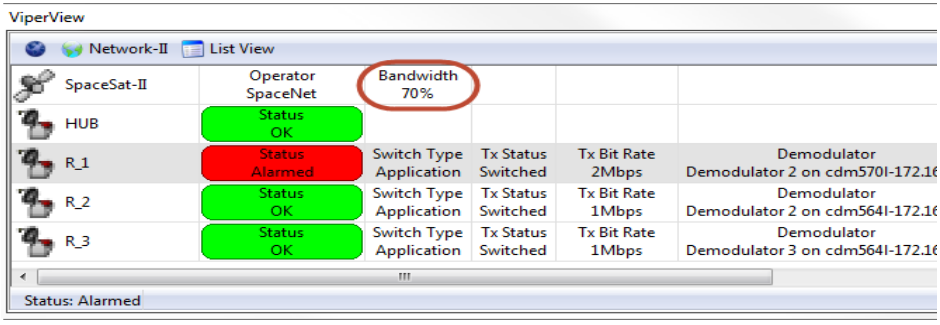

Figure 6-35 Network View, Pool Bandwidth Utilization

Site View

The Network Manager service in ViperView provides multiple displays that supply current status information for the network. The Site view is one such display, providing the status of each site component via a graphical representation of the interconnected devices, as shown in figure 6-36. Directing the mouse pointer to a component results in a status box pop-up. Additional status information for the site is provided in the window footer.

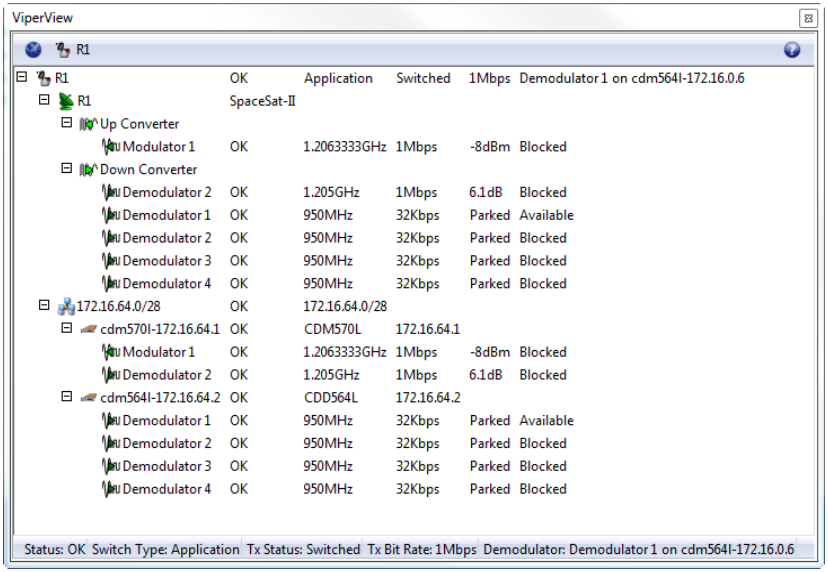

Figure 6-36 Network Manager, Remote Site View

InBand Management

InBand management allows Application Policies and Distribution Lists to be selected on a Network, Group, and Remote site-level basis and allows the system operator to enable and disable mesh, return path, and forward path (point-to-point) switching, or use policies/lists for selected remotes that differ from the network policies/lists. Bandwidth Reservations which provide a minimum guaranteed data rate (CIR) can also be established with this InBand feature. Each Remote site in the network that will require dynamic control of their carriers (nodes which are part of the switched network) must be InBanded.

Application Policies

From the Application Policies dialog that is accessible from the Network, Group, and Site Properties windows, the policies under which switching will occur in the Vipersat network can be defined. The policy settings that are

defined on a per network and/or per group basis are propagated down to all remotes in the system. Each remote will inherit the policies from the network/group to which it is associated, but the operator may choose to break the inherited settings and configure each site independently. Locally created Site policies apply only to that site.

Along with an application type setting, each policy can specify a priority setting and min/max data rate settings for both transmit and receive.

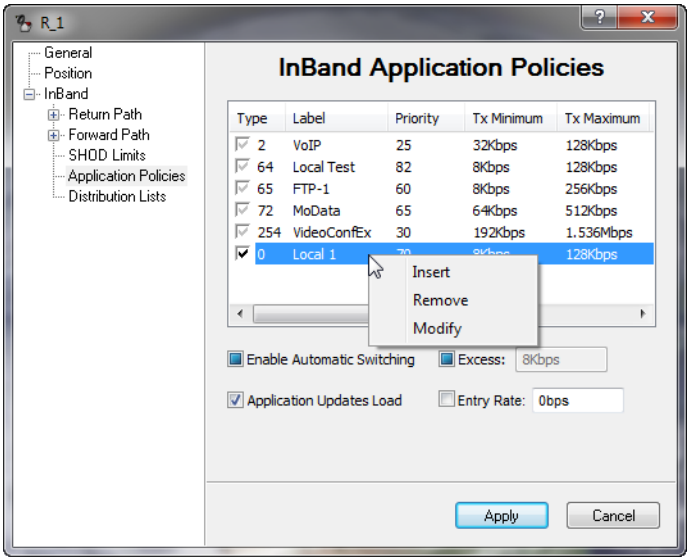

Figure 6-37 Application Policies, Remote Site

Distribution Lists

Distribution Lists are used to define multiple target subnets for point-to-multipoint distribution on an InBand service connection whenever an upstream switch to a specific destination IP address occurs, such as to a multicast address.

Distribution lists are typically created, modified, or disabled at the site level to accommodate specific site requirements. However, they can also be created at the group and network levels where they become inherited by the associated sites, just as with Application Policies.

In the Distribution Lists table, the user can **Insert**, **Modify**, and **Remove** lists, then either select or de-select these lists once entered through the use of the check boxes (figure 6-38).

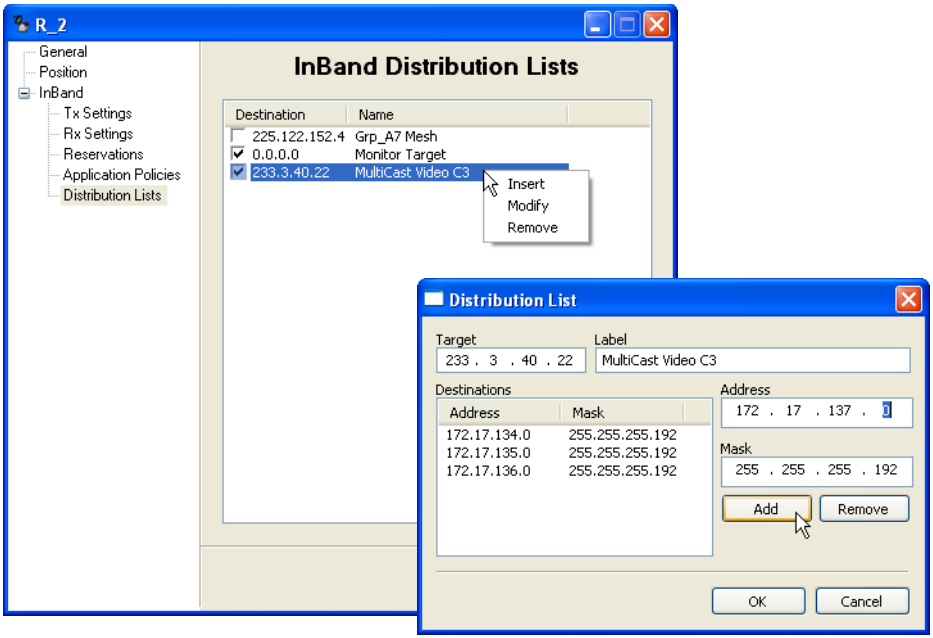

Figure 6-38 Distribution Lists, Remote Site

Guaranteed Bandwidth

The InBand Bandwidth Reservation ensures that the remote is always guaranteed bandwidth up to the rate that is specified, the committed information rate (CIR). Beyond that, the remote will only be granted additional bandwidth when it is available. This feature assures that, at minimum, all requests for SCPC bandwidth up to the CIR will be granted.

Setting a rate in the remote properties Reservations dialog (figure 6-39) will reserve a segment of bandwidth for the remote ensuring that, at last resort (no additional bandwidth available), the remote will be dropped to the rate specified here—its CIR—until excess bandwidth is once again available to be allocated.

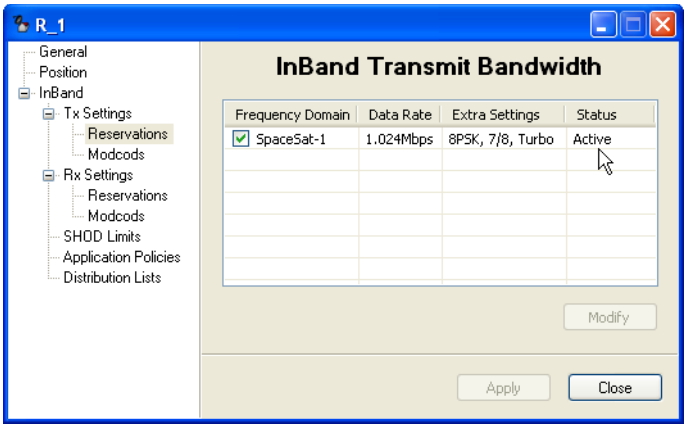

Figure 6-39 InBand Reservations Setting

Total bandwidth reservations for the satellite that is utilized by a network or group can be viewed by selecting **Reservations** from the satellite drop-down menu, as shown in figure 6-40 and figure 6-41.

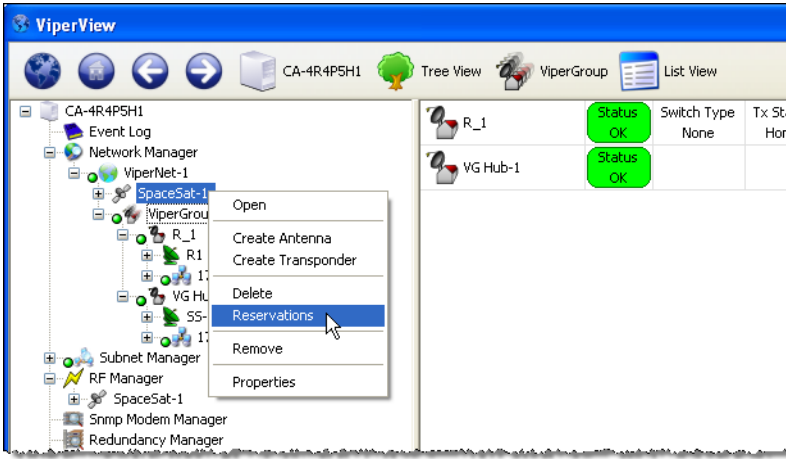

Figure 6-40 Satellite Reservations command

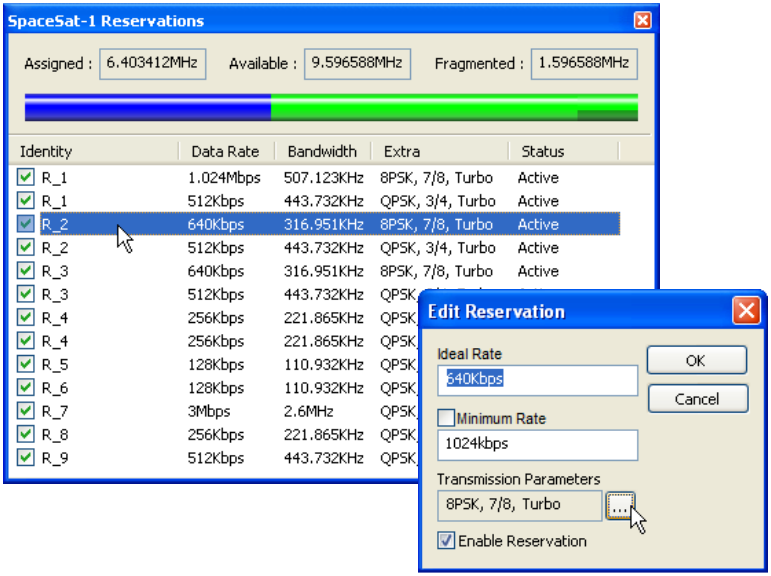

Figure 6-41 Satellite Bandwidth Reservations

The Satellite Reservations window displays a table containing entries for each Remote site (both Tx and Rx, if so enabled) that has been assigned a CIR, and displays the following information:

- **Reservation Enable/Disable** — check box toggle. Status column display reflects this setting, either *Active* or *Inactive*.
- **Assigned, or Pre-Allocated, Bandwidth** — currently reserved for granting CIR when called for by the list of Remote sites presented in the table. This segment is displayed as a numerical frequency value, and is represented as the *dark blue* section of the bandwidth color bar. The Data Rate, Bandwidth, and Extra (mod/code) parameters for each site is also provided in the table.
- **Available Bandwidth** — currently unreserved and available for pre-allocation to Remote sites. This segment is displayed as a numerical frequency value, and is represented as the *light green* section (combined) of the bandwidth color bar. The largest continuous/unfragmented block of available bandwidth is represented by the *light green* section that is not underlined with *dark green*.
- **Fragmented Bandwidth** — additional available bandwidth remaining that is separate from the largest continuous block. This segment is displayed as a numerical frequency value, and is represented as the *light green* section of the bandwidth color bar that is underlined with *dark green*.

The divisions shown in the color bar will vary depending on a number of factors, including the quantity and size(s) of the bandwidth pools, and the amount of pre-allocated bandwidth.

Individual reservations can be enabled/disabled via the check box in the Identity column. Reservation settings (Data Rate, Bandwidth, and Extra) can be edited directly from this window by double-clicking on a table entry, as shown in the figure.

Operator Switch Request

The Application Sessions switching control provides a means for the operator to view/change/remove any active InBand switch sessions for a site, as well as to manually set and execute a new application switch. The data rate, switch type, and distribution list selection can be specified with this feature, as illustrated in figure 6-42 and figure 6-43.

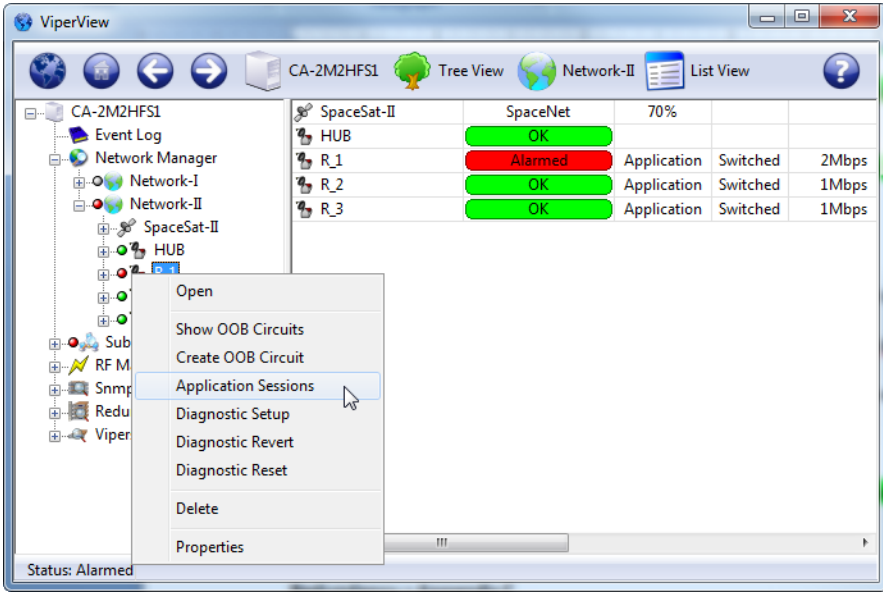

Figure 6-42 Application Sessions Command Window

A session can be established quickly using the main InBand Sessions window by specifying just the application type. The default data rate setting (0 bps) will result in an attempt to switch using the pre-defined maximum and minimum data rates specified by this application policy. Changing the default will force a switch request using this new value for the Tx maximum (the ideal rate).

More options can be chosen by clicking on the ellipsis (**...**) button. Here, the ideal and minimum data rates—for both Tx and Rx (P2P)—can be modified from the defaults, as long as they fall within the defined range of the policy. And, if a distribution list has been configured for use by this site, a destination can be chosen from this list.

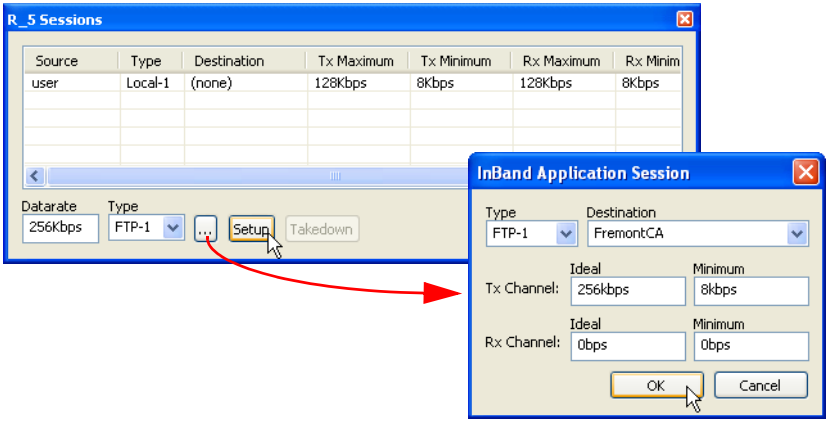

Figure 6-43 Application Session Setup

NOTE

Note: The Type default is 64; however, if Type 64 is not defined for this Remote, the switch attempt will fail and an alert will appear (figure 6-44). Use the Type pull-down menu to view and select a valid policy for this Remote.

Figure 6-44 Switch Failed, Invalid Policy Type

Once the desired parameters are set, the Setup button will initiate the switch request for the new SCPC carrier(s). The VMS will compare the requested application data rate to the maximum switch rate limit for this site; the resulting rate will be the lesser value between the Policy setting and the Site setting.

The new carrier(s) will appear in the Spectrum view, and the event is logged in the Event view.

Advanced Switching — ModCods

With the VMS Advanced Switching feature, the operator has the option of configuring multiple levels of modulation types and FEC code rates within the dynamic SCPC operation. Thus, more efficient bandwidth utilization can be realized.

An advanced switching table can be constructed for a remote modulator where specified modulation types and FEC code rates are paired with set data rates. Each data rate is associated with a Mod/Code and, as the system achieves the set rate, the transmission is modified to the new higher- or lower-order modulation setting specified for that rate. For each table entry, the VMS calculates an optimized switching threshold that the system uses to assign the most efficient bandwidth in an advanced switching environment.

As a switch request is processed, it is compared to the Advanced Switching table. If the requested data rate crosses a threshold where the higher-order modulation actually becomes more bandwidth efficient, the switch request will go up to the higher-order modulation at the lowest bit rate that exceeds the request. Thus, it is possible that a *higher* bit rate can be granted while actually utilizing *less* bandwidth resources.

For example, a site currently operating at QPSK 3/4 that generates a switch request for 192 kbps will be switched up to 256 kbps at 8PSK 7/8, provided this modulation and code rate was specified in the Advanced Switching table entry for this switch point, as shown in figure 6-45.

The following equations illustrate this scenario:

QPSK 3/4 @192 kbps @1.3 spacing:

Allocated Bandwidth = 192 x (1/2) x (1/.75) x 1.3 = 166.4 kHz

8PSK 7/8 @256 kbps @1.3 spacing:

Allocated Bandwidth = 256 x (1/3) x (1/.875) x 1.3 = 126.781 kHz

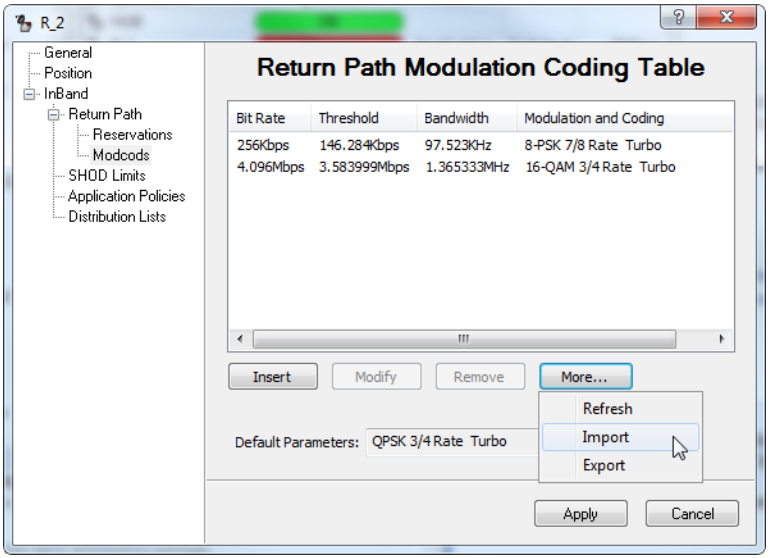

Figure 6-45 Advanced Switching Table for Remote (R_2)

Note that the calculated Bandwidth value for this table entry, 97.523 kHz, is for the carrier only. The bandwidth Slot that will be assigned for this carrier will include the additional guardband that is defined for the associated Pool. In this example, a guardband of 30% is used.

Additionally there is the option to Import or Export advanced switching list between sites.

An InBand switching session for the Remote site (R_2) can be generated using the Application Sessions feature, with a specified data rate of 192 kbps at QPSK 3/4 (figure 6-46).

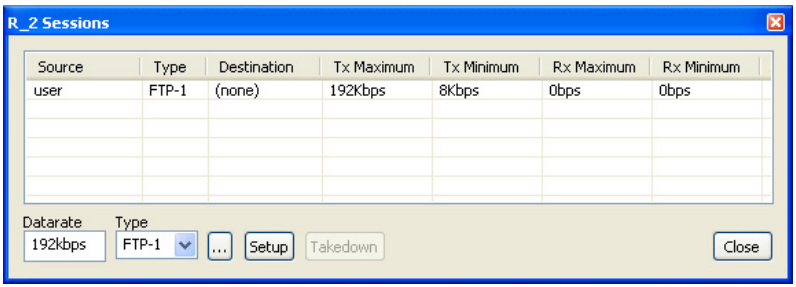

Figure 6-46 Manual Application Switch Session, R_2

Following the VMS switch, the site status for R_2 changes, indicating a new bit rate of 256 kbps at 8PSK 7/8 (figure 6-47).

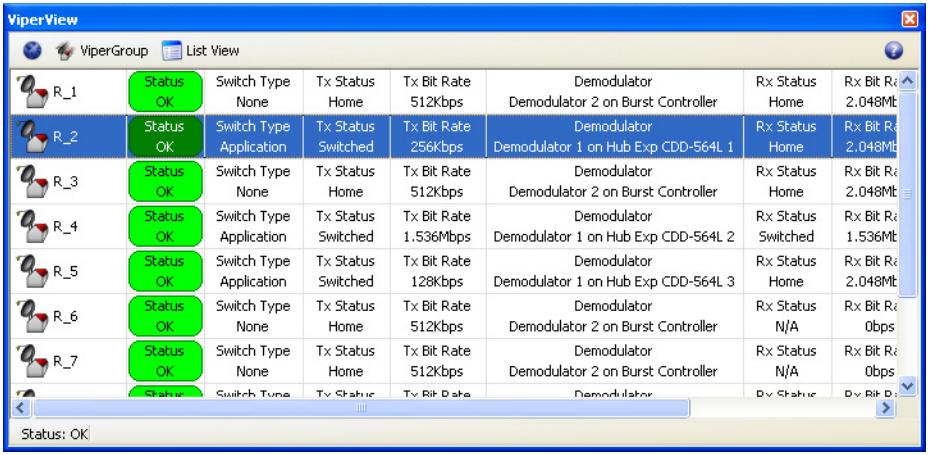

Figure 6-47 Updated Status View, R_2

The carrier appearance in the Spectrum view displays with an allocated bandwidth of 97.523 kHz (figure 6-48). When the guardband is added to this value, the assigned bandwidth slot becomes 126.781 kHz, just as was calculated in the example equation previously.

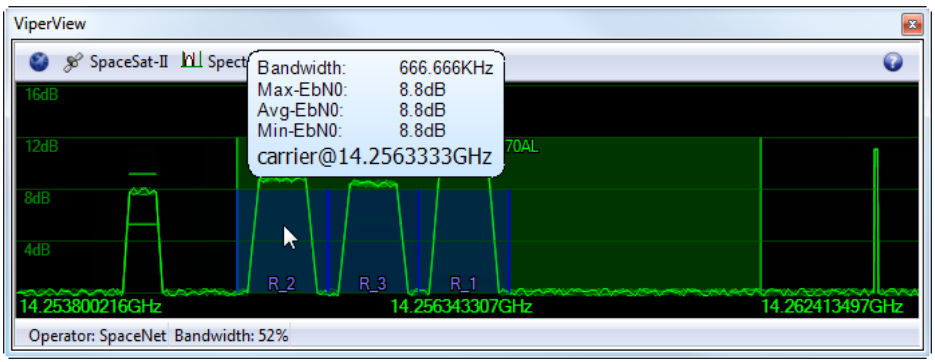

Figure 6-48 Allocated Carrier for Remote (R_2)

Roaming with Advanced Switching

A Roaming Remote (SOTM) can take advantage of the advanced switching function when transitioning from one satellite beam to another. Switching tables for a remote can be configured on a per satellite region basis and, upon entering into a new service area, the remote forwards the designated table for that area to the VMS. This dynamically updates the modulator transmission settings on each transition.

Refer to the *ROSS or Heights Remote Gateway user guides* for additional details on the configuration and use of the Advanced Switching feature in a roaming application.

Subnet Manager

All subnets for Hub sites and Remote sites are detected and displayed in the Subnet Manager, as well as the devices which are associated with these subnets. Upon VMS startup, the Subnet Manager sorts all of its elements by IP address. The subnets and devices can be exposed by expanding the tree view in the left window panel of ViperView. Clicking on the Subnet Manager displays the status and IP address of each subnet in the right window panel. Selecting a subnet will display a list of all of the modem/router units for that subnet, as well as their status, modem type, and address, as shown in figure 6-49.

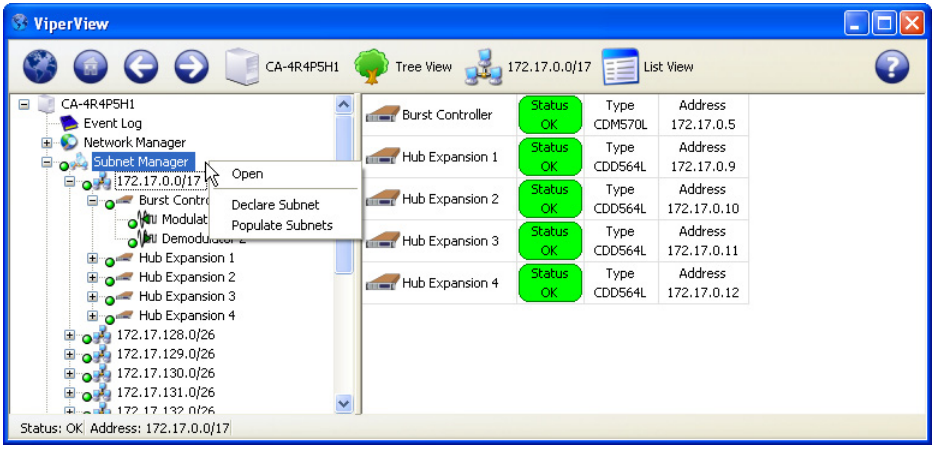

Figure 6-49 Subnet Manager, Drop-Down Menu

The Parameter view for site devices, such as modems and their modulators and demodulators, can be displayed by selecting them from the tree.

Because the subnets also appear in the Network Manager, which serves as the primary operator interface for managing and controlling the VMS network(s), nearly all subnet features and functions are accessed from there. However, an important distinction between the two is that, although subnets can be *Removed* from the Network Manager, they can be *Deleted* from the Subnet Manager. This is because the Subnet Manager is the original container for the subnets, and the Network Manager contains virtual network elements.

Declare Subnet

Through the auto-discovery process in the VMS, existing subnets are detected and displayed by the Subnet Manager. The ability to add non-existing (or future) subnets to the network is provided by the Declare Subnet command, accessed from the Subnet Manager drop-down menu (figure 6-49). The new subnet is defined by its IP Address and Mask, as shown in figure 6-50.

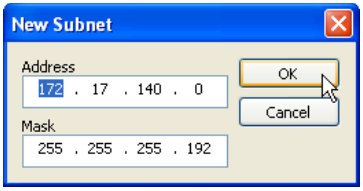

Figure 6-50 Declare New Subnet dialog

Once defined, the new subnet will appear as a new icon under the Subnet Manager.

Populate Subnets

The Populate Subnets command instructs the VMS to query the Vipersat Manager for any network units that belong to a subnet and ensure that they are placed in the appropriate subnet.

RF Manager

The RF Manager is the controlling VMS service for all network satellites and site antennas. This is where the satellites are created and defined, along with the associated transponders and bandwidth pools that provide the allocatable spectrum for STDMA and SCPC carriers. This is also where the site antennas are created and defined, along with their associated converters that provide the RF interface for the network modems.

Selecting an antenna from the RF Manager tree displays information relating to the associated Up converter and Down converter (figure 6-51).

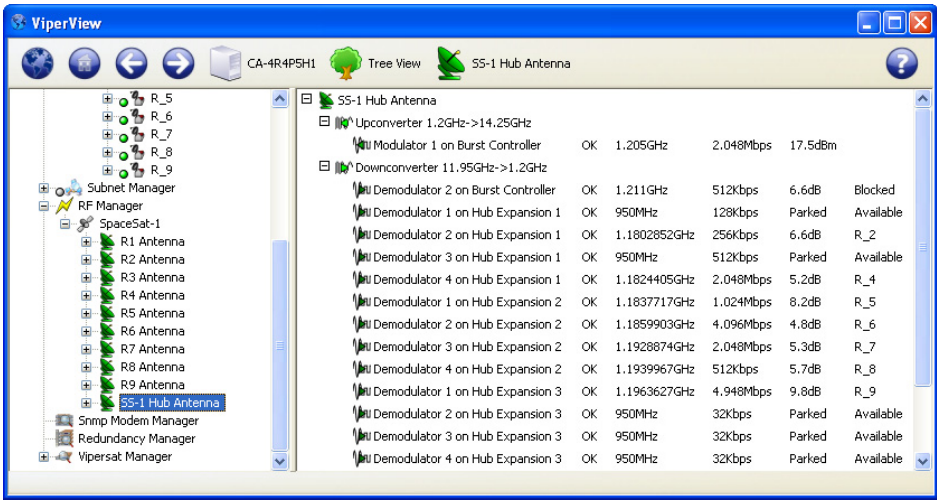

Figure 6-51 Antenna View, Hub Site

Once created and defined, the satellite(s) and the associated site antennas are copied into the Network Manager which provides the primary operator interface for these items. Opening a network satellite provides the Spectrum view which displays the transponder(s), pools, and the active carriers, as shown in figure 6-52. If Space Segment Exclusions (described below) have been defined, these zones also will appear in the display.

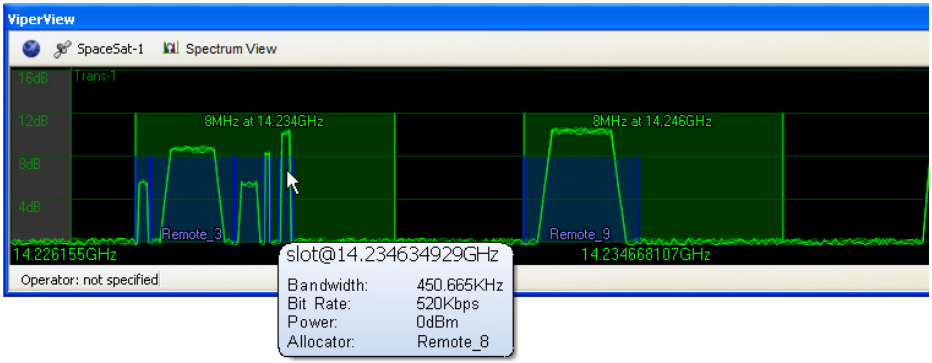

Figure 6-52 Satellite Spectrum View

Spectrum View Animation

Controls for the Satellite Spectrum view help increase response time when displaying this window during a ViperView session. The animation of carriers in the display typically requires increased bandwidth on the remote connection

to the VMS server, which could cause a slower response time in ViperView. The operator has the ability to adjust the refresh rate of the RF display—setting it to *Fast*, *Slow*, or *Off*—so that this effect is minimized. An *Automatic* setting option disables animation during Remote Desktop (RDP) connections and provides Fast refresh for direct ViperView access.

Clicking on the **Spectrum View** button in the menu bar at the top of the window displays the Animation drop-down menu from which the desired refresh option can be chosen.

Space Segment Exclusions

Dynamic SCPC bandwidth pools or portions of pools can be masked to allow access for externally managed carriers. These Exclusion zones are typically controlled by an external application (e.g., an NMS) communicating with the VMS through the RESTful interface, a Web Services API that adheres to the REST (Representational State Transfer) principles. Transactions are executed utilizing addressable HTTP URL request methods, such as:

- GET – request method that returns the current state of the element.
- PUT – request method that updates the state of the element.
- POST – request method that creates a new instance of the element type.
- DELETE – request method that deletes an element.

To Post a new Exclusion zone, the following information is required:

- VMS Host address and Port (IP address and port 8081).
- An Exclusion identifier (a unique integer value, starting at 1), used to control—*query* or *delete*—the Exclusion zone.
- The Satellite identifier – a unique number for the satellite defined in the registry key.
- The Base and Top frequencies (in Hz) for the zone.

Once an Exclusion zone has been posted, the VMS will move any dynamic carriers that are currently occupying slots in that zone either to bandwidth in available pools or, if no additional bandwidth can be allocated, home to the ECM channel.

Caution *should be exercised when implementing these zones to avoid undesirable disruptions to important carriers that are presently occupying this bandwidth*.

The operator should allow at least a ten minute window prior to setting up the external carrier(s) to ensure that the zone bandwidth has been cleared. This will accommodate a possible communications failure with the Remote associated

with the dynamic carrier, requiring the VMS to use the auto home state mechanism to free up the bandwidth slot.

The operator can confirm this process with a Status query. The response will be either “free”, indicating the bandwidth has been cleared, or “occupied”, indicating the VMS is still in the process of clearing the bandwidth.

An alternative method of creating Exclusion zones is by manually declaring them with the VMS RF Manager. Zones can be directly entered in the **Space Segment Exclusions** dialog of the Satellite Properties window, as shown in figure 6-53.

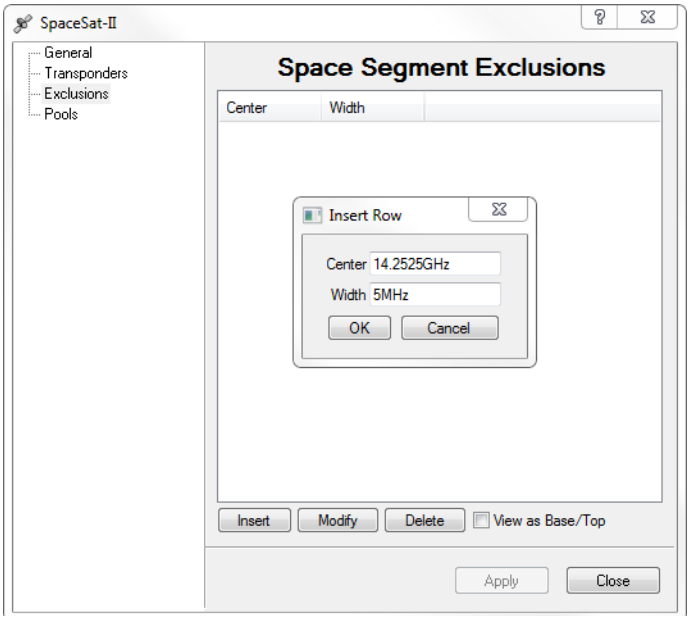

Figure 6-53 Space Segment Exclusions, Satellite Properties

Once the segment has been declared, it will by displayed in the Spectrum View as a shaded yellow region, figure 6-54.

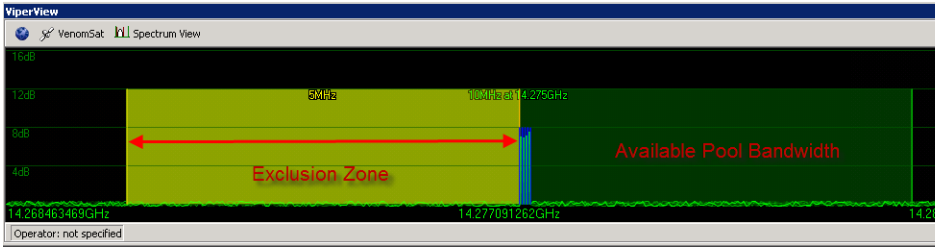

Figure 6-54 Exclusion Zone Overlay

Switching Manager

The Switching Manager is the switching engine in the VMS, and manages all switching functions for both InBand and Out-of-Band modem units. Although this manager appears in the list of VMS service managers, there are no usable interfaces for the operator.

SNMP Modem Manager

The SNMP Modem Manager is the controlling VMS service for all non-Vipersat (Out-of-Band) modems. Modem units that do not have a Vipersat Network driver—and thus can not be configured for InBand management—are unable to utilize IP routing functions to communicate with the VMS, and instead utilize SNMP for these communications and are managed by the SNMP Modem Manager when functioning in a Vipersat satellite network.

For additional information on the SNMP Modem Manager, refer to *Chapter 7, "Out-of-Band Units"*.

Redundancy Manager

The VMS Redundancy Manager is the controlling service for N:M Hub modem redundancy. This service provides for the protection of critical VMS network modems operating in the Hub mode, and enhances overall network reliability by backing up primary components with standby backup units. The N:M redundant architecture is software driven utilizing IP packet control.

A representative block diagram of Hub modem redundancy is shown in figure 6-55, below.

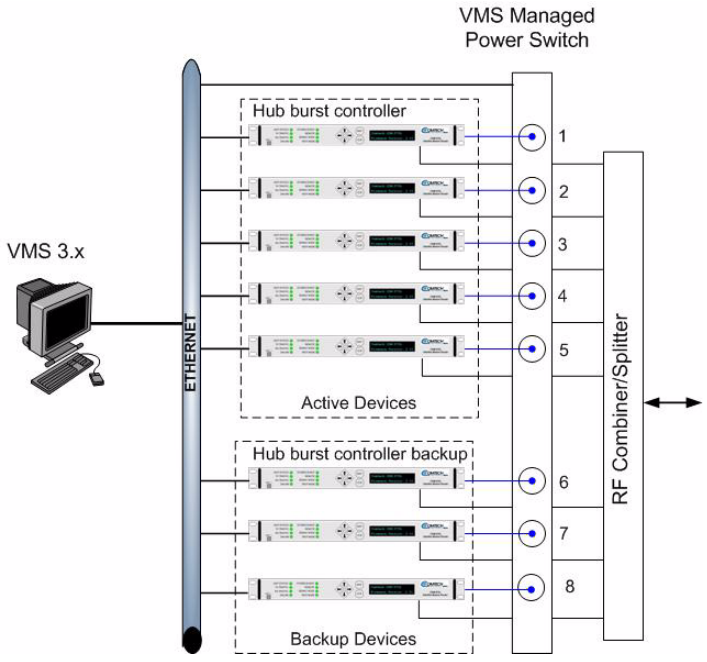

Figure 6-55 N:M Hub Modem Redundancy

For additional information on the Redundancy Manager and its usage, see *Appendix C, "Redundancy"*.

Vipersat Manager

The Vipersat Manager is used to set the management addresses, register the Network IDs, and define the communications timeout parameters for the networks that will be managed and controlled by the VMS. This service manager maintains the comprehensive list of all registered network units, along with their current health status—OK, Alarmed, or Disconnected. The units are identified and correlated with the network ID to which they are configured.

As new units are added and announce themselves to the network, the Vipersat Manager service processes and receives them. Once received, each unit is promoted to the Subnet Manager according to their addressing masks. Upon VMS startup, each network appearance under Vipersat Manager orders the units first by device type, then by IP address within the type.

The Network View under the Vipersat Manager displays all of the units sharing the same network number, as shown in figure 6-56. Networks are listed in order based on their Network ID.

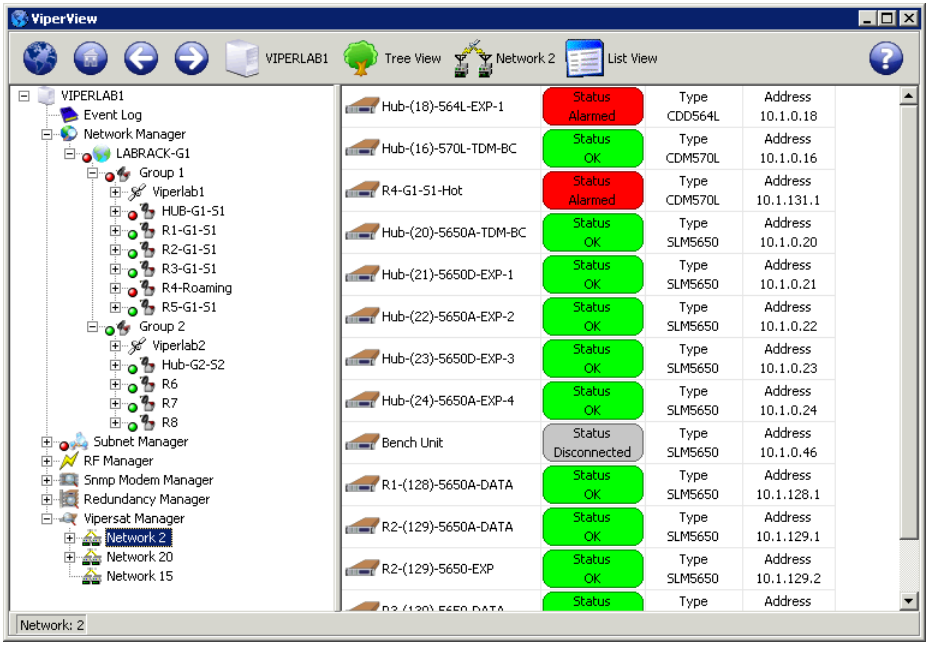

Figure 6-56 Vipersat Manager Network View

Global Reinit and Scan Network, commands to force the management system to poll for network device updates, are executed from the Vipersat Manager. Also, Vipersat network modem/routers and/or ROSS units can be created with this VMS service, allowing these units to be predefined prior to being placed into service in the network.

Application Image Manager

Firmware for Vipersat network modems can be upgraded using the Application Image Manager feature in the VMS. A library of binary (.bin) modem image files can be created, from which a firmware version can be selected and Put (transmitted) to a network unit, as illustrated in figure 6-57 through figure 6-60.

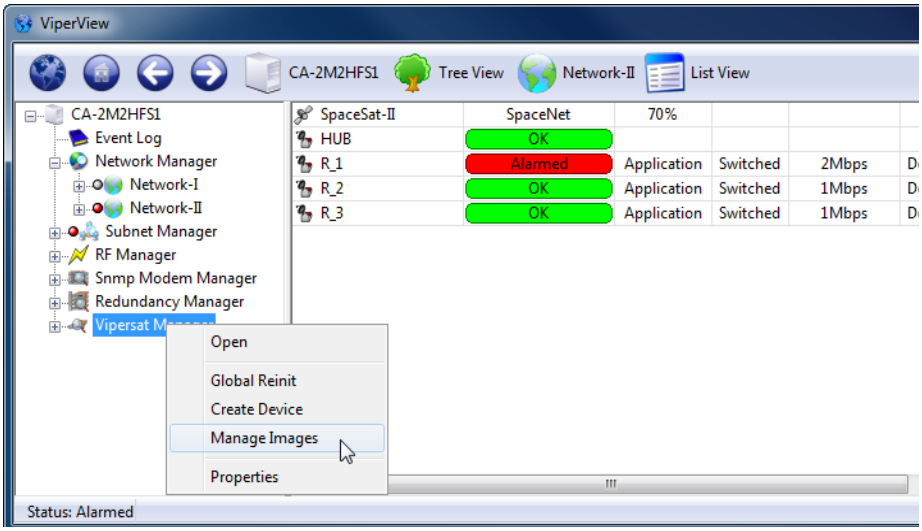

Figure 6-57 Manage Images Command Window

Selecting the **Manage Images** command from the Vipersat Manager menu will open the Image Manager window, where the image library is held.

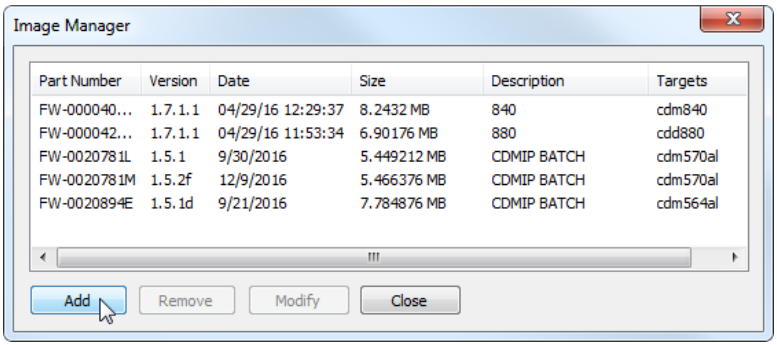

Figure 6-58 Image Manager, Library Setup

With Windows file selection, new images can be added to the list.

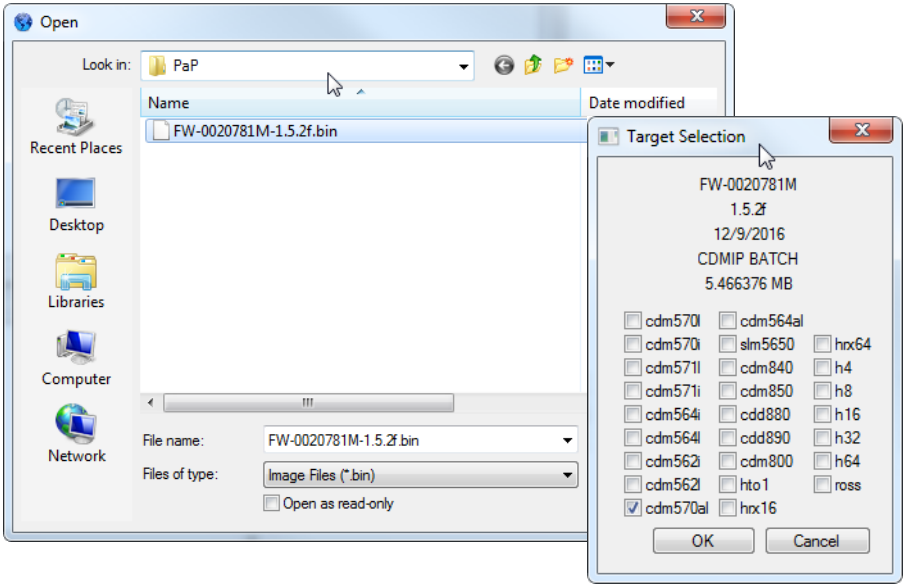

Figure 6-59 Image Manager, Add Selection

To upgrade the firmware image for a network unit, select the **Upgrade** command, then choose the required image from the library.

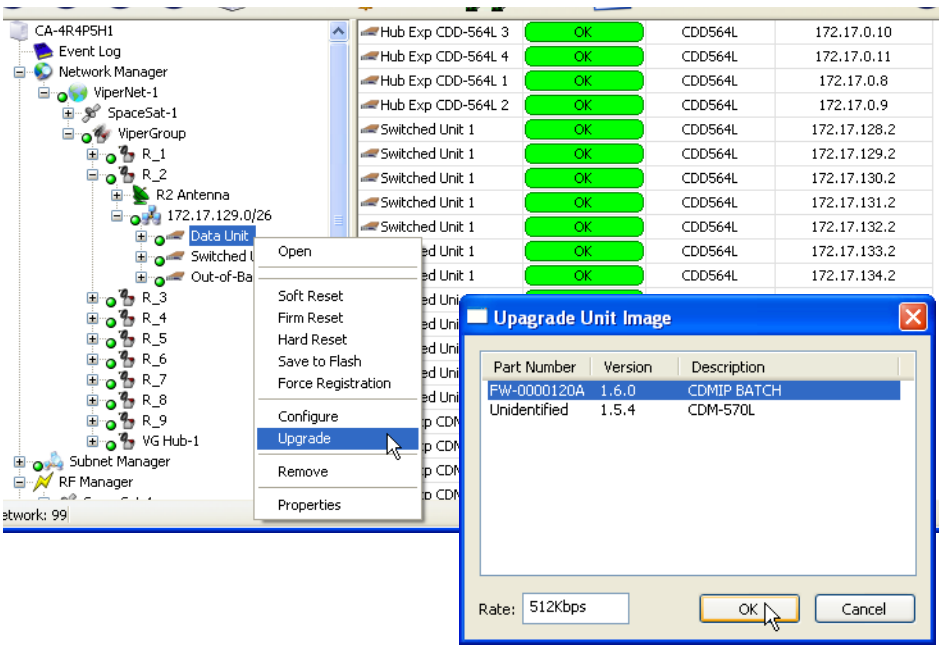

Figure 6-60 Upgrade Unit Image

To upgrade multiple units, use the *Multi-Select* feature (Ctrl-click, Shift-click) to select the desired units, then execute the Upgrade command. In this case, the mode of transfer can be specified:

- **Consecutive** – uses unicast method to upgrade each unit successively.
- **Concurrent** – uses unicast method to upgrade all units simultaneously.
- **Codecast** – uses multicast method to upgrade all units simultaneously. Note that this mode utilizes *Streamload 2* protocol, and is applicable to CDM-8XX series (version 1.5.2.x or greater), SLM-5650A, and ROSS units.

When the upgrade process begins, the progress of each of the targeted units is displayed by the Operations Monitor, which will display the image burning phase and report either successful completion (green) or failure (red). The operator can then safely reset the unit(s).

The monitor window also provides the option to terminate an upgrade attempt by presenting an **Abort** button.

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7

OUT-OF-BAND UNITS

General

Out-of-Band management and switching serves to control satellite modems that either utilize a primary data interface that is not IP based, or do not possess the Vipersat technology for InBand operation. All that is required is that the modem has an Ethernet IP interface that is routable via a default gateway, and that the SNMP MIB for the interface has a driver implemented in the VMS. Out-of-Band management provides switching capability for synchronous serial or bulk encrypted applications, and extends the family of modems that can be controlled by the VMS.

This chapter describes integrating Out-of-Band modem units into a VMS-controlled satellite network.

Overview

In a Vipersat network, Out-of-Band units typically use Simple Network Management Protocol (SNMP) for management and control by the VMS. These are modems that are supported by the VMS SNMP Modem Manager. It is possible to utilize modems that are supported by the VMS Vipersat Manager (referred to as Vipersat-enabled) as Out-of-Band units. However, because these modem types possess integrated Vipersat technology and offer a primary data interface that is IP based, they are more efficiently used as InBand units, and require only a single carrier out of a remote terminal.

Possible considerations for using Vipersat-enabled units for OOB include:

- Very simple configurations for applications that do not require automatic switching capability.

- The ModCod setting to be used for the channel can be specified, both when configuring the circuit and when conducting the switch setup.
- No restriction on the number of channels per circuit.

The SNMP Modem Manager is the controlling VMS service for all non-Vipersat Out-of-Band modems. Modem units that do not have a Vipersat Network driver—and thus can not be configured for InBand management—are unable to utilize IP routing functions to communicate with the VMS, and instead utilize SNMP for these communications and are managed by the SNMP Modem Manager when functioning in a Vipersat satellite network.

Configuration and setup of Out-of-Band units and circuits is relatively simple and straightforward due to the functional limitations of these units. Switching operations are conducted either manually or via schedule. Automatic switching is not available. Other features/functions that are not available include the following:

- Reservations for assigned bandwidth
- Advanced ModCod switching
- Home state, SHOD, Policies, Distribution lists
- Allocated devices (devices are assigned)
- Multicast (each device is controlled separately)
- Minimum/Maximum data rate per site limits

Out-of-Band Circuit Manager (OBCM)—the VMS service manager that enables Out-of-Band switching—works seamlessly with the InBand Manager. Priorities for both InBand and Out-of-Band sessions and bandwidth reservations for InBand are still honored. It is incumbent upon the operator to determine what types of circuits have higher priorities within his network.

Ethernet IP Interface

In order for the VMS to communicate with a satellite network modem, the modem must have an IP-addressable unit. Modems such as the CDM-700, SLM-5650(A), CDM-625(A), and CDM-570(A) have built-in Ethernet interfaces and do not require an external CiM adapter. An SNMP unit can use either the base modem or the NP card as the Ethernet interface for IP. In contrast, a Vipersat-enabled unit must use the NP card as the Ethernet interface. Refer to each modem unit's documentation for the procedure for assigning a valid IP address to the unit.

The CDM-600/L is a non-IP capable modem, and requires the use of the Comtech CiM-25 to provide the Ethernet IP interface. The CiM-25 is assigned a valid IP address using procedures described in the appropriate product documentation, as well as in the procedure below.

1. Connect the target CiM-25 unit to a PC workstation and assign a valid IP address for the network where the CiM-25 and its companion CDM-600L are to be installed.

2. Reconnect the CiM-25 to its companion CDM-600L, then connect the Ethernet LAN and apply power as required.

NOTE

Note: The CiM-25 must be plugged into an operating modem (except during setup) in order for it to operate reliably. A CiM-25 operating disconnected from a modem will exhibit erratic Ethernet communications. Refer to the CiM-25 manual for additional information.

Next, the modem must be declared in the VMS using the procedure provided in the following section.

SNMP Modem Manager

The SNMP Modem Manager is the controlling service for all non-Vipersat Out-of-Band modems. This service is the communications conduit between the modems and the VMS, and provides the modem parameter configuration interface for these units.

Right-clicking on the manager icon opens a menu with commands to Open the manager, Declare Modem, and view the manager Properties. The procedure for configuring SNMP modems is presented below.

Set SNMP Timing Intervals

1. To set the manager **Timing Intervals**, right-click on the SNMP Modem Manager to display the drop-down menu shown in figure 7-1.

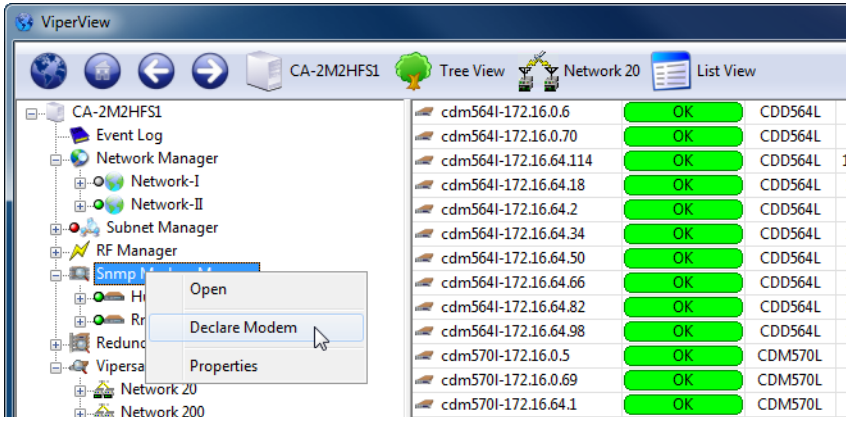


Figure 7-1 SNMP Modem Manager command menu

2. Select the **Properties** command to open the Properties page, shown below in figure 7-2.

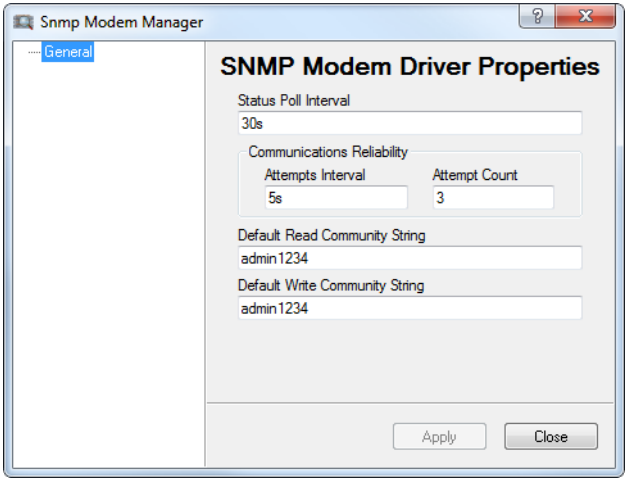


Figure 7-2 SNMP Modem Manager Properties

There are three settable parameters in the SNMP Modem Manager Properties—the Status Poll Interval, the SNMP Timeout, and the SNMP Attempts. They are described below.

- **Status Poll Interval** – The time, in minutes, between full status polls sent by the VMS to monitor the health (alarm states) and parameter settings for the modems.
- **SNMP Timeout** – The amount of time, in seconds, before the VMS will retry a poll or SNMP command after no reply.
- **SNMP Attempts** – The total number of attempts the VMS will make to communicate with a modem before reaching a fail state, at which point the VMS will set the modem status indicator to gray (unknown).

Configure SNMP Modem

The following procedure demonstrates using the SNMP Modem Manager to configure a CDM-600L modem, as an example.

1. Right-click on the SNMP Modem Manager and select the **Declare Modem** command from the drop-down menu.

   The **New SNMP Modem** dialog will open, figure 7-3.

2. From the **Unit Type** pull-down menu, select the model that corresponds to this modem. In this example, the CDM600L modem is selected.

Proper selection is important, as this will identify the correct SNMP MIB to be used for communications with the modem.

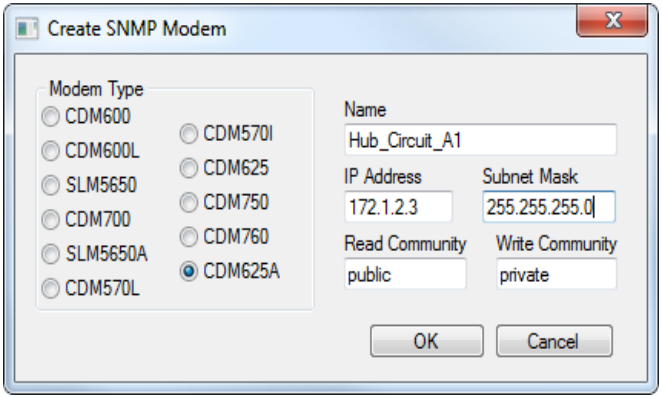


Figure 7-3 Create SNMP Modem dialog

3. Configure the parameter settings for the new modem:

a. Enter the assigned **IP Address** for this modem (in this case, the CiM-25 address).

b. Enter the **Subnet Mask** in the designated field.

c. Assign a name to the modem in the next field for reference purposes and for identification in ViperView.

d. Ensure the SNMP Community settings are correct.

For a CDM-600/L, the Read and Write Communities are **admin1234**.

For all other units, the Read Community is **Public** and the Write Community is **Private** (defaults)**.**

4. Click the **OK** button.

The unit will now appear listed in the SNMP Modem Manager. Select the manager to see the modem appearance in the right panel of the ViperView window.

5. To perform edits to a declared modem, right-click on the newly added unit and select **Properties** from the drop-down menu. The **Unit Properties** dialog will be displayed, as shown in figure 7-4.

If the modem is connected to a BUC, LNB, or other device, select the **Enable Radio Devices** check-box to have this configuration recognized by the VMS.

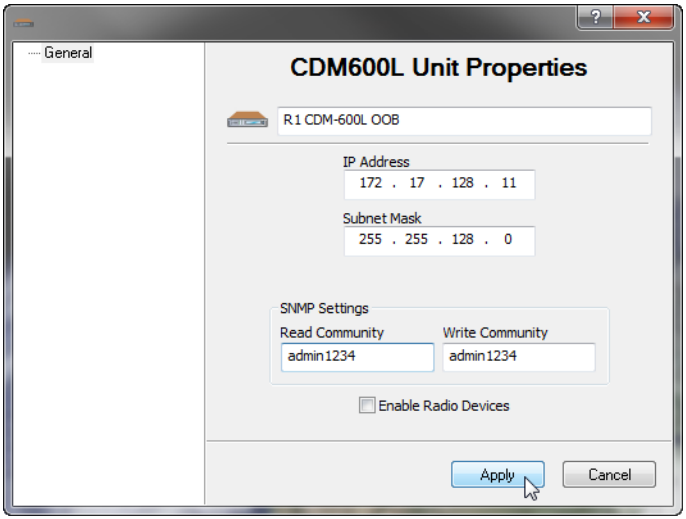


Figure 7-4 CDM-600L Unit Properties dialog

Note that, in this dialog, the **IP Address** field is a read-only display for the target modem. To change the address, the modem must be deleted from the SNMP Modem Manager, then declared anew.

6. Click on **Apply**, then Close the window.

Once the modem and its companion CiM-25 are configured and are connected to the network, the unit will appear in the correct subnet under the Subnet Manager as well as under the SNMP Modem Manager, as shown in figure 7-5. And, if the Network Manager has been configured to include the subnet, the new modem unit will appear there also (figure 7-6).

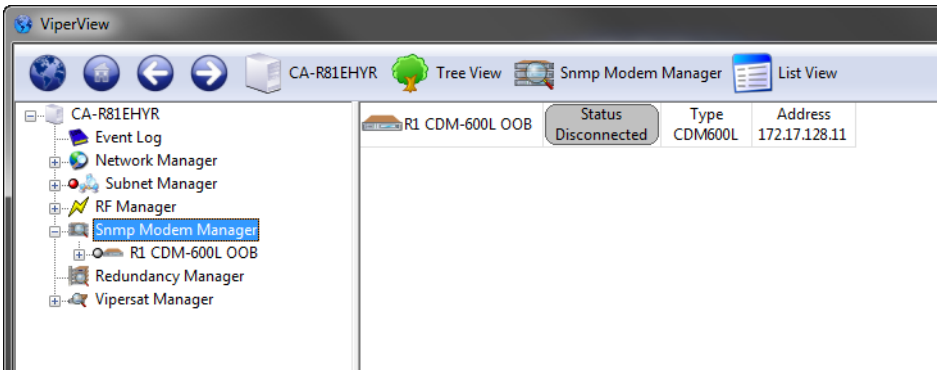


Figure 7-5 SNMP Modem Manager units

Parameter View

When a modem unit is selected from the tree list in the left ViperView window panel, the right window panel displays the **Parameter View**, shown in figure 7-6, that presents parameter setting information and options available for the unit. This applies to the Modem as well as the Modulator and/or Demodulator that are nested below it. Refer to each unit's documentation for detailed information on setting or changing any of the parameters listed here.

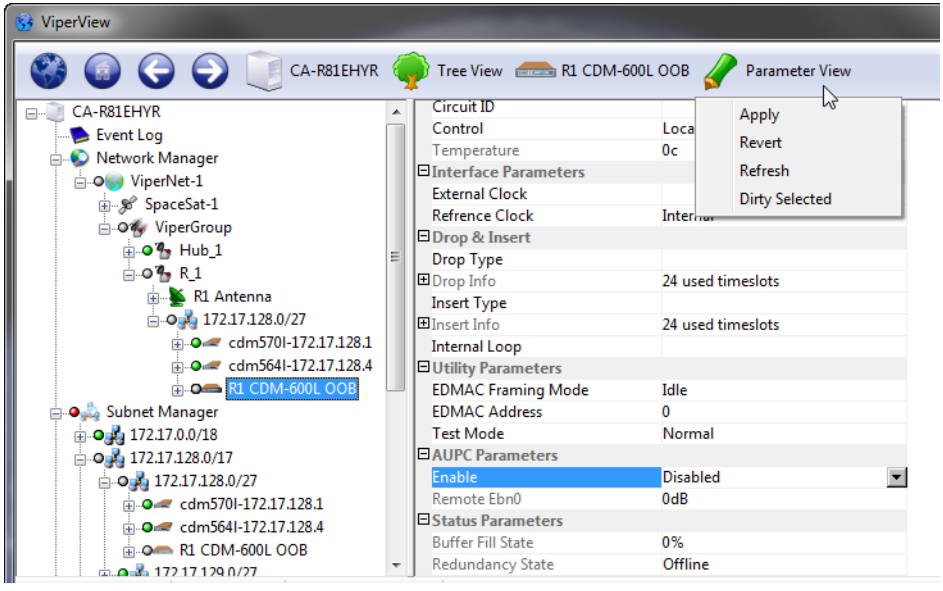


Figure 7-6 Parameter View, Drop-down Menu

A set of commands is presented in the Parameter View drop-down menu (figure 7-6):

- **Apply** – Clicking the **Apply** command writes any changes made to the unit's configuration in the **Parameter View** to the unit's active memory. In order to make the changes permanent, these changes must be saved to the unit's flash memory.
- **Revert** – To discard any changes and return the parameter(s) to the previous setting(s), click the **Revert** command to revert the setting(s) back to the original configuration.

NOTE

Note: If the changed parameter has been marked with the **Dirty Selected** command (see below), the **Revert** command will not function.

- **Refresh** – Clicking the **Refresh** command will read the current state of all parameters from the unit and update them in the Parameter View display.
- **Dirty Selected** – If a change has been made, selecting the changed item and then clicking the Dirty Selected command marks the item as changed and it will be changed in the unit's active memory.

Before continuing with this process, select the **Refresh** command on the drop-down menu. This will ensure that the most current information is available for the unit.

The **Parameter View** contains both information that is hard-coded in the unit and cannot be changed, as well as information that can be edited. This is useful for Out-of-Band units, allowing their configurations to be modified with the VMS.

Configuring the RF Chain

It is important to configure the SNMP Modem RF chain, thus enabling the carriers to be viewed and monitored with the VMS. The satellite and the antennas—together with their Up and Down converters—for the relevant sites should already be defined, as covered in the section *"RF Manager Configuration" on page 3-25*.

The following procedure associates the Modulator for each OOB unit at a site with the Up converter for that site's antenna, and associates the Demodulator with the Down converter. This configuration is performed using the RF Manager in conjunction with either the Subnet Manager or the SNMP Modem Manager.

The method illustrated below uses the RF Manager with the Subnet Manager.

1. From the RF Manager tree view list in the left window panel, select the first site Antenna for configuration (the Remote antenna is used in this example).

   The antenna and its converters are displayed in the right window panel (figure 7-7).

2. Expand the Subnet Manager tree down to the Modulator and Demodulator level for the OOB unit at the Remote site that will utilize this antenna.

3. Click-hold on the Modulator device icon in the left panel, drag it to the right panel and drop it onto the Up Converter.

   The device appears under the Converter as shown in figure 7-8.

4. Click-hold on the Demodulator device icon, then drag-and-drop it onto the Down Converter.

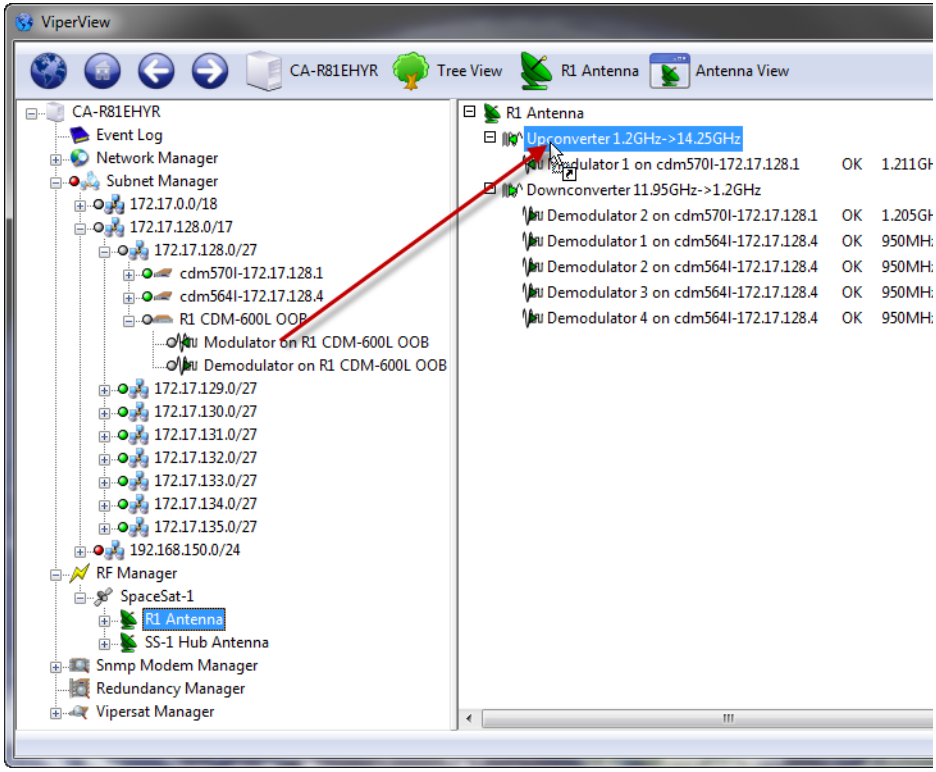


Figure 7-7 Binding Modulator to Up Converter, SNMP Modem

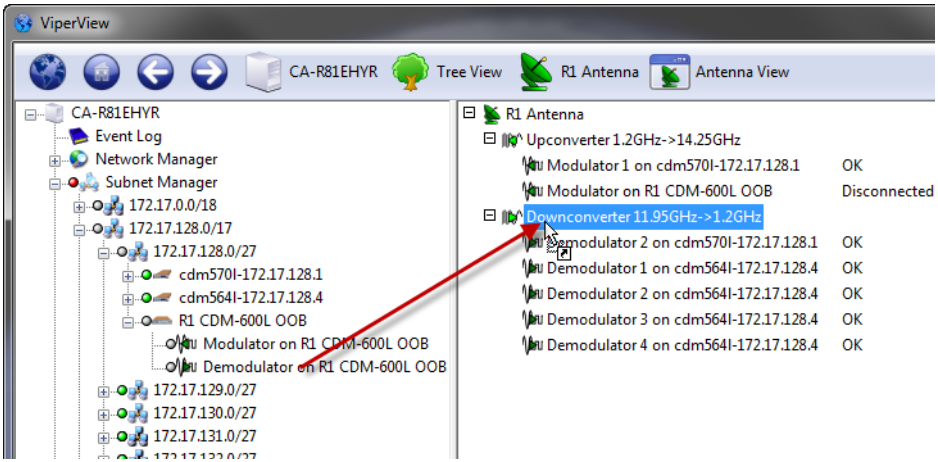


Figure 7-8 Binding Demodulator to Down Converter, SNMP Modem

5. Repeat the above steps for any additional OOB units at this site.

Now that the binding procedure for the first unit has been completed with the understanding of the relationship between the modem devices and the converters, perform all subsequent bindings by simply dragging the modem unit and dropping it directly onto the antenna. This abbreviated method will automatically bind the mods and demods with the up converters and down converters.

6. Select the next site antenna and perform the binding procedure for the mods and demods at that site.

7. Continue the binding process until all OOB devices have been bound to their respective antenna's converters. Be sure to include Hub OOB devices.

Switching Out-of-Band Modems

Overview

SNMP controlled modems are defined as Out-of-Band in the VMS. This means the traffic interface for these modems is not part of the IP infrastructure the Vipersat network belongs to.

SNMP modems use either a serial traffic interface such as V.35 or G.703 (CDM-600Ls), a bridged Gig-E interface (CDM-700s), or an IP interface which is isolated from the local area network native to the Vipersat network (CDM-570/L OOB modems in managed switch mode).

Out-of-Band circuits can be managed via an overlay Vipersat network—requiring two satellite modems at each Remote site, as shown in figure 7-9—or via any IP infrastructure that is available covering both ends of the satellite link.

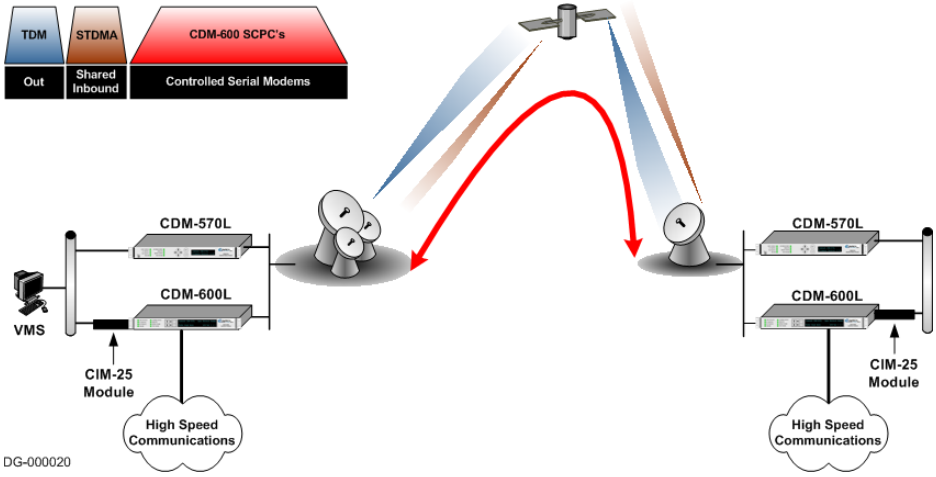


Figure 7-9 Vipersat Overlay Network example

The management and control commands from the VMS are transmitted and received InBand by the CDM-570L circuit. These commands are then routed by the CDM-570L over Ethernet to the CDM-600L modem. Since the management and control signals are handled by the CDM-570L within its allocated bandwidth and do not occupy any of the CDM-600L's bandwidth, these command circuits are considered Out-of-Band with respect to the CDM-600L circuit.

Out-of-Band Circuit Manager (OBCM)

General

OBCM is utilized for switching OOB units, whether they are SNMP units or Vipersat-enabled units.

Circuits are first created (using the OOB Circuit Wizard), then they are manually switched using the Setup command in ViperView.

There are three circuit types that can be designated:

- **Half Duplex** (Broadcast / Point-to-Multipoint) — used for applications where there is no return path or the return path is a low speed terrestrial link. Typical examples include broadcast video, distant learning, and data distribution.
- **Full Duplex** (Point-to-Point) — used for applications that are interactive, requiring two-way communications, but where the data transport is not routable IP. Ideal for disaster recovery, satellite news gathering mobile units with non-IP video equipment, and bulk-encrypted links with no IP header.
- **Custom** — provides the ability to define any circuit type, allowing the operator to specify individual channels in any manner that is required for the application.

Managed and Unmanaged Devices

Within the OBCM, modem *units* and their *devices* (modulators, demodulators) are designated as either Managed or Unmanaged (also known as Assigned). The unit/device that is selected as Managed determines what drivers will be used and what space segment is available for the circuit. The Unmanaged unit/device is assigned by the operator to complete the circuit. Care must be taken to assign an appropriate/like unit or device to ensure compatibility. Whether the selection is based on the *unit* or the *device* is a function of the type of circuit that is being created.

The Full Duplex circuit type uses units instead of devices. This is because this type requires that the managed modulator and demodulator both belong to the same modem unit, and the unmanaged modulator and demodulator at the other site also belong to the same modem unit. In contrast, the Half Duplex and Custom circuit types use devices for designation as managed or unmanaged.

An OOB circuit consists of one or more channels. A channel is defined as the connection between a modulator and at least one demodulator, consisting of the channel bit rate, priority and, when using Vipersat-enabled modems, an Extra setting that defines the ModCod. With SNMP controlled modems, the ModCod

must be preset from either the modem front panel, a console or Web session, or from the VMS Parameter View.

Every channel has one managed device, and it can never be re-used by another channel, neither for InBand nor OOB. However, unmanaged devices can be re-used in other channels. Note, however, that the risk in using unmanaged devices multiple times is that the operator can activate a channel where one or more of the unmanaged devices are already in use, and the VMS will take them from the active circuit.

There can be any number of channels defined for a custom circuit, as long as there are enough devices/units to support the channels.

A site is chosen as the "owner" of the circuit, and this site must contain the device(s) that is/are to be the managed device(s) for the channel(s) in the circuit. As a general rule, the owner must be the site that has the transmitting unit/device. One exception to this rule is the half duplex circuit that is set up between just two sites; in this case, either the transmitting site can be the owner (with the modulator as the managed device) or the receiving site can be the owner (with the demodulator as the managed device). Note that, for a full duplex circuit, either site can be chosen as the owner because there is just one unit at each site involved, and they both transmit as well as receive.

Configuring OOB Circuits

A powerful feature that is provided for building the OOB circuits is the *Out-of-Band Circuit Creation Wizard*. This tool presents a simple method for configuring any of the three circuit types.

OBCM User Interface

Circuit configuration is performed from the VMS using ViperView. The circuits can be viewed by hierarchy but must be created at a site, either Hub or Remote, as shown in figure 7-10, below.

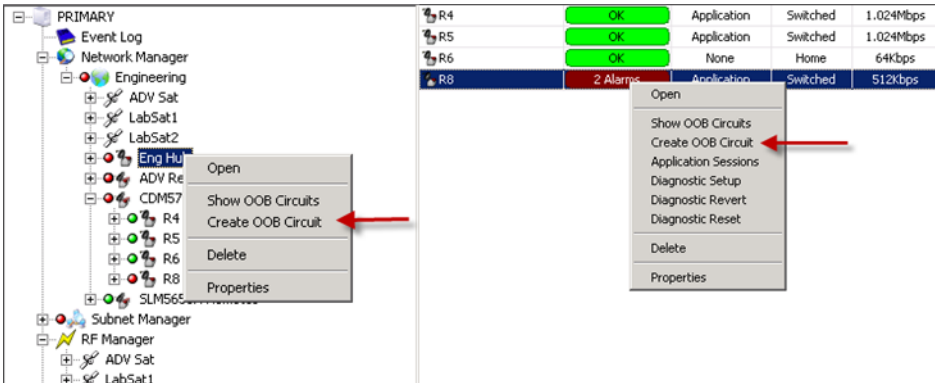


Figure 7-10 Create OOB Circuit, Hub and Remote commands

Because circuits are associated with sites, the Create OOB Circuit command is not available from the Group or Network level.

Full Duplex Circuit Configuration

Full duplex point-to-point circuits are defined by the *unit* (modem) and consist of 2 channels (mod to demod connections). Defining the circuit by unit ensures that it consists of 2 modems, rather than independent modulators and demodulators, which is typically required for synchronous serial circuits. It also makes it fairly simple to configure.

NOTE

Note: Note that this type of circuit is only possible when using modem units that support P2P functionality.

1. Right-click on the Remote site icon that will be utilizing the circuit and select **Create OOB Circuit** from the drop-down menu to open the Circuit Creation Wizard. The **Circuit Identification** dialog will appear, as shown in figure 7-11.

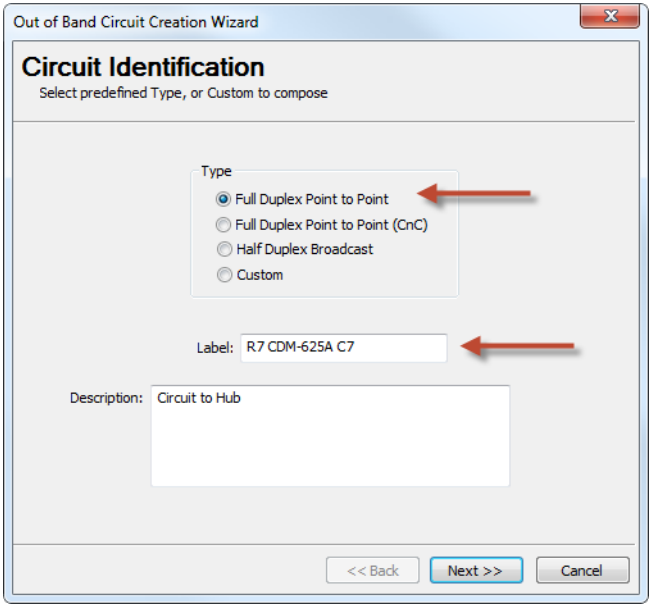


Figure 7-11 Circuit Identification, Full Duplex P2P

2. Select the **Full Duplex Point-to-Point** radio button in the Type box.

3. Enter a **Label** and a **Description** for this circuit.

   Description field text entry: use Ctrl+Enter to create a new line independent of text wrap.

4. Click the **Next** button to display the **Circuit Configuration** dialog (figure 7-12).

   The sequence for configuring this dialog is marked in red in the figure.

   As the vertical arrows indicate, the parameter fields on the left side of the dialog correspond to the return path from the *Managed* unit to the *Unmanaged* unit, and the fields on the right side correspond to the forward path in the opposite direction.

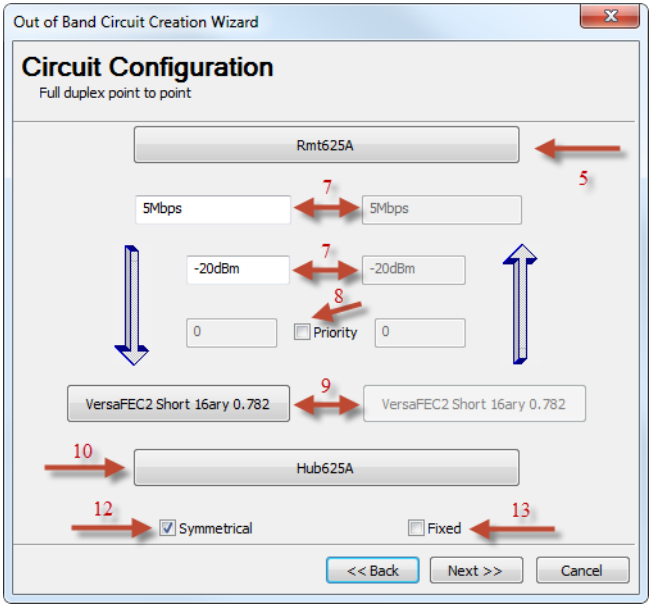


Figure 7-12 Circuit Configuration, Full Duplex P2P

5. Click on the **Managed Unit** bar to select the OOB modem for this site.

The Select Object window will open with the subnet for the Remote site.

6. Double-click on the subnet, then select the OOB modem unit that will be used for this circuit (figure 7-13) and click **OK**.

The Managed Unit bar will now be labeled with the name of the selected unit.

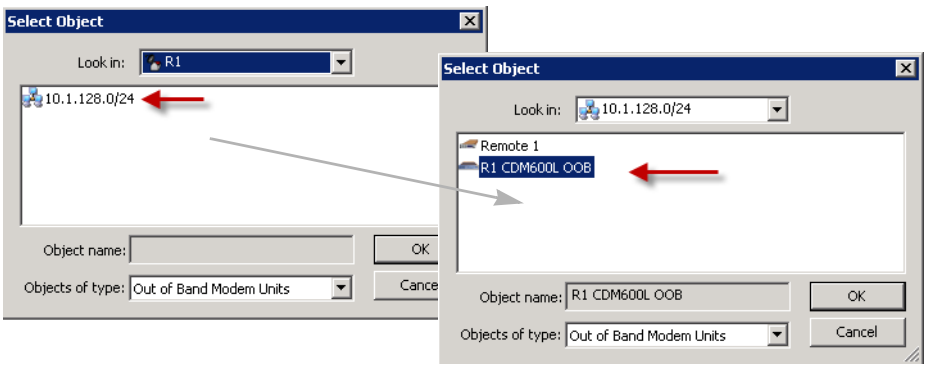


Figure 7-13 Select Managed Unit, Full Duplex P2P

7. Enter the channel **Bit Rate** and the reference **Power** level for the Managed unit (left side).

   The VMS uses the reference power setting as a basis for calculating the correct power level for the carrier when setting up a switch event.

8. If a priority setting is applicable for this unit, click on the **Priority** check box to activate this field (checked) and enter the required level.

   Note that a *lower* number corresponds to a *higher* priority level. The default value (0) equates to *No priority*.

9. For modem units that are *Vipersat-enabled* (not SNMP), the **Extra Settings** parameters are available for configuration. Set the **FEC** and **Modulation** as required.

10. Click on the **Unmanaged Unit** bar to select the modem that this site will be linking to.

    The Select Object window will open containing the top level components for the network, such as the satellite(s) and groups or sites.

11. Navigate through the Select Object window to select the corresponding modem unit that will be used for this circuit (figure 7-13) and click **OK**.

    Take care to ensure that the unit selected is the correct one. If groups are displayed, double-click on the group that holds the target site. Double-click on the target site to display the subnet list, then double-click on the subnet that holds the target modem.

    The Unmanaged Unit bar will now be labeled with the name of the selected unit.

12. By default, the channel **Bit Rate**, the reference **Power** level, the **Priority** (if applicable), and the **Extra Settings** (if applicable) for the Unmanaged unit (right side) mirror the settings that were entered for the Managed unit. To modify these settings, click on the **Symmetrical** check box to uncheck/deactivate this feature, then edit the field(s) as necessary.

13. Set the **Fixed** bit rate feature—either *Enabled* (checked) or *Disabled* (unchecked)—based on the application requirements.

    By default, this box is unchecked. In this state, the VMS will provide a best effort to allocate the requested bandwidth at switch set up; if the full bandwidth is not available, the circuit will be set up using a bit rate that falls between the requested rate and the site minimum. A diminished rate may be acceptable, such as for modem units that utilize Ethernet as the primary data interface, for example.

This box must be checked if the circuit requires an exact match to the requested bit rate in order to function correctly, such as with an E1 interface.

14. Click on the **Next** button (becomes active when configuration parameters have been set) to proceed to the wizard **Summary Page** (figure 7-14).

Carefully review all information on this page prior to proceeding. The **Back** button is available to retrace the configuration and make any changes that might be necessary before final circuit creation.

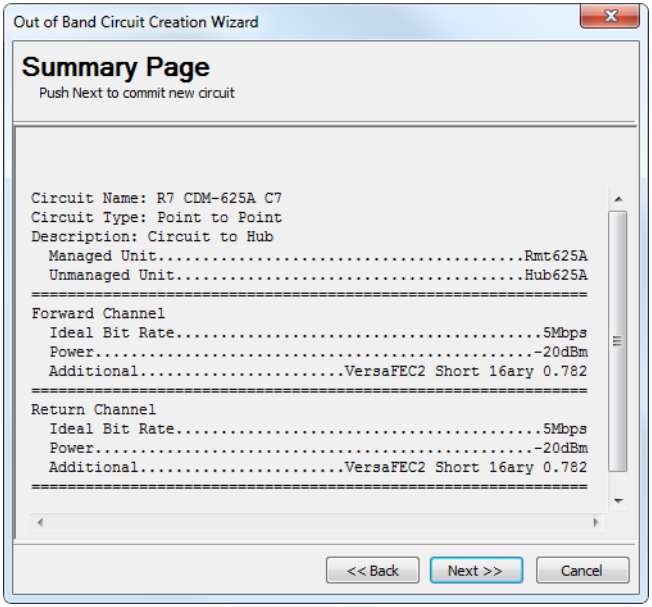


Figure 7-14 Summary Page, Full Duplex P2P

15. Click on the **Next** button to execute the creation of the circuit. The **Commit Page** will be displayed.

If the configuration is accepted by the wizard, the page will indicate that the *Circuit Creation Succeeded*, accompanied by a green check mark, as shown in figure 7-15. Click on the **Close** button to exit the wizard.

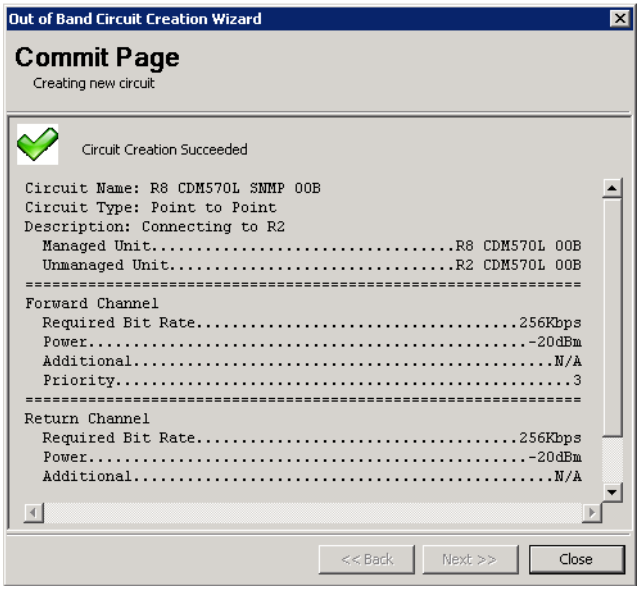


Figure 7-15 Commit Page, Full Duplex P2P

A red check mark will indicate if the *Circuit Creation Failed*. Note that a common configuration error that will cause this result is failing to associate the devices (modulator and demodulator) of the modem unit with the converters for the site antenna(s). Identify and correct the cause of the error, then rerun the circuit creation wizard.

NOTE

Note: Full Duplex Point to Point (CnC) follows the same procedure as Full Duplex Point to Point, however it is only configured as a symmetrical link. Unchecking Symmetrical will not have any affect. The rate, power and MODCOD on the left side is only used.

Half Duplex Circuit Configuration

Half Duplex broadcast circuits are defined by the *device* (modulator or demodulator) and consist of one channel or multiple channels. By design, the managed device will be the modulator and there will only be one modulator per circuit. The circuit must be created on the site with the modulator as it will be the source of all outgoing traffic.

1. Right-click on the site icon that will be the transmitting source for the broadcast and select **Create OOB Circuit** from the drop-down menu to open the Circuit Creation Wizard. The **Circuit Identification** dialog will appear, as shown in.figure 7-16.

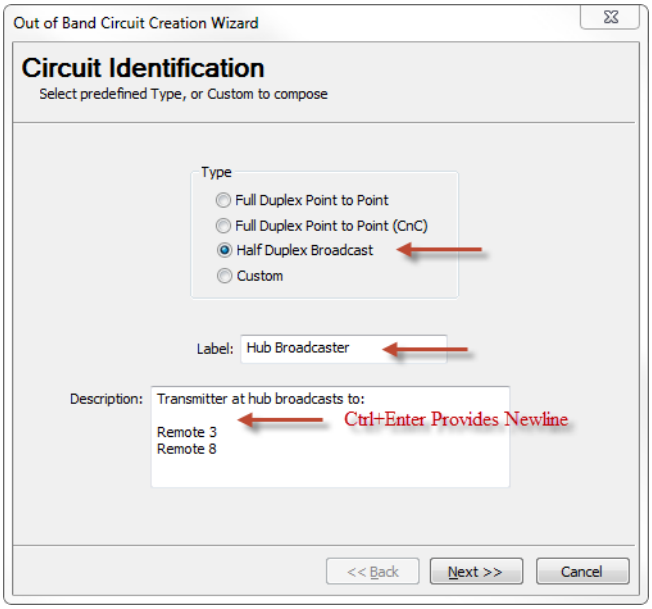


Figure 7-16 Circuit Identification, Half Duplex Broadcast

2. Select the **Half Duplex Broadcast** radio button in the Type box.

3. Enter a **Label** and a **Description** for this circuit.

   Description field text entry: use Ctrl+Enter to create a new line independent of text wrap.

4. Click the **Next** button to display the **Circuit Configuration** dialog (figure 7-17).

   The sequence for configuring this dialog is marked in red in the figure.

5. Click on the **Modulator** bar to select the modulator from this site that will perform as the transmitter for this circuit.

   The Select Object window will open with the antenna and subnet for this site.

6. Navigate through the Select Object window to select the target modulator (figure 7-18).

   Double-click on the subnet, then double-click on the appropriate OOB modem. Select the modulator and click **OK**.

The Modulator bar will now be labeled with the name of the selected modulator.

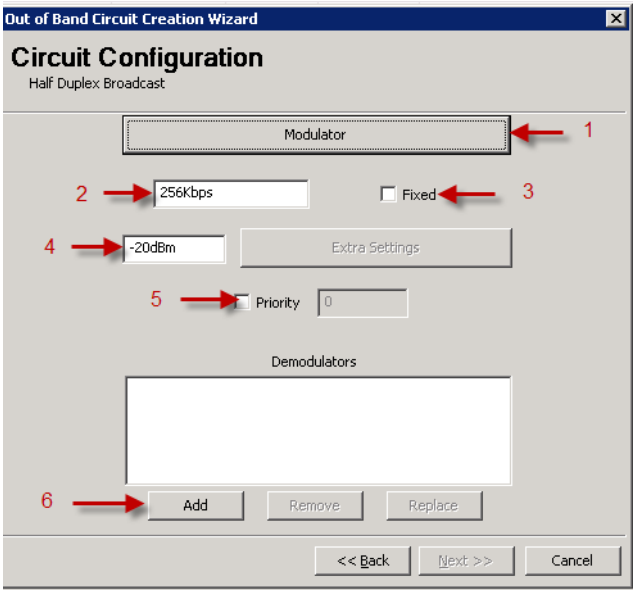


Figure 7-17 Circuit Configuration, Half Duplex Broadcast

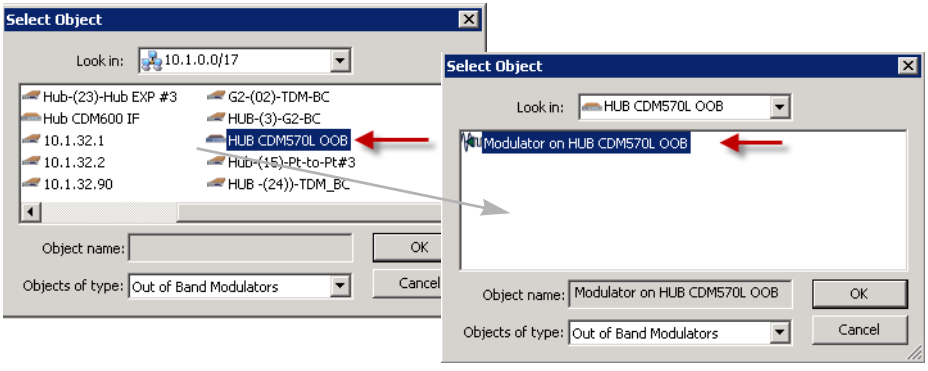


Figure 7-18 Select Modulator, Half Duplex Broadcast

7. Enter the channel **Bit Rate** for the broadcast.

8. Set the **Fixed** bit rate feature—either *Enabled* (checked) or *Disabled* (unchecked)—based on the application requirements.

By default, this box is unchecked. In this state, the VMS will provide a best effort to allocate the requested bandwidth at switch set up; if the full

bandwidth is not available, the circuit will be set up using a bit rate that falls between the requested rate and the site minimum. A diminished rate may be acceptable, such as for modem units that utilize Ethernet as the primary data interface, for example.

This box must be checked if the circuit requires an exact match to the requested bit rate in order to function correctly, such as with an E1 interface.

9. Enter the reference **Power** level for transmission.

The VMS uses the reference power setting as a basis for calculating the correct power level for the carrier when setting up a switch event. This value must be sufficient to close the link to the weakest receiving site.

10. For modem units that are *Vipersat-enabled* (not SNMP), the **Extra Settings** parameters are available for configuration. Set the **FEC** and **Modulation** as required.

11. If a priority setting is applicable for this circuit, click on the **Priority** check box to activate this field (checked) and enter the required level.

Note that a *lower* number corresponds to a *higher* priority level. The default value (0) equates to *No priority*.

12. Click on the Demodulators **Add** button to create the list of demodulators for the sites that will receive the transmitted broadcast.

The Select Object window will open containing the top level components for the network, such as the satellite(s) and groups or sites.

Note: Take care to ensure that the devices chosen here do not include the data demodulator for the site (device that receives the Hub TDM outbound).

13. Navigate through the Select Object window to choose the receiving demodulator (figure 7-19) and click **OK**.

Take care to ensure that the device selected is the correct one. If groups are displayed, double-click on the group that holds the target site. Double-click on the target site to display the subnet list, then double-click on the subnet that holds the target modem. Double-click on the OOB modem to display the associated devices.

The Demodulators box will now display the selected device, as shown in figure 7-20.

14. Repeat this selection process until all receiving demodulators have been chosen.

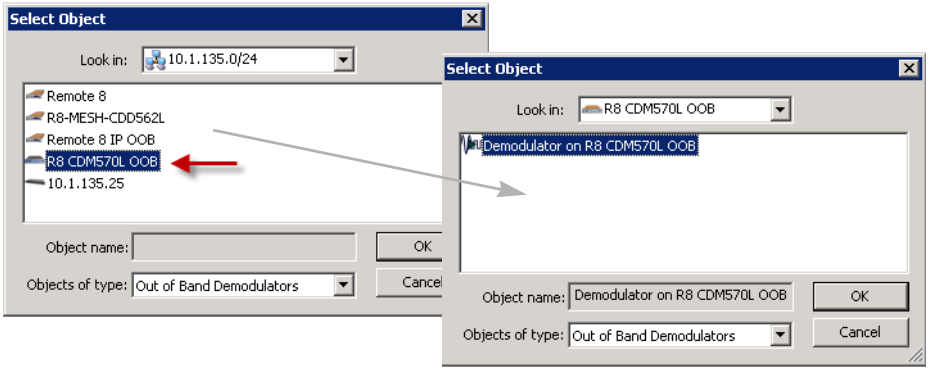


Figure 7-19 Select Demodulator, Half Duplex Broadcast

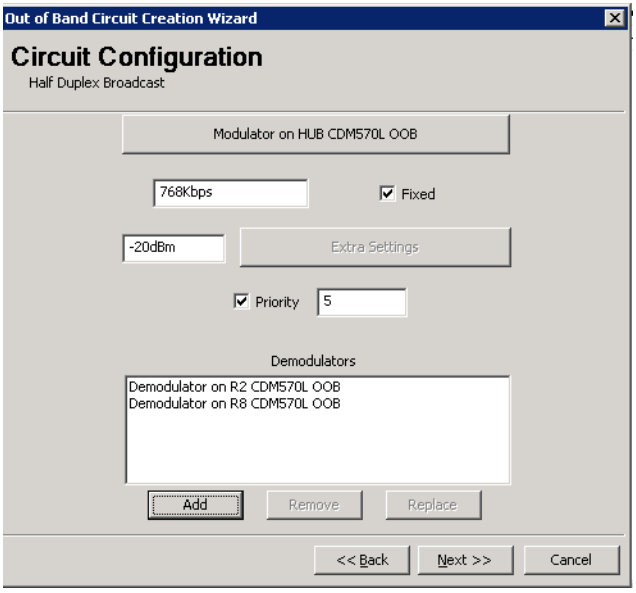


Figure 7-20 Circuit Configuration, Demodulators Added

15. Click on the **Next** button (becomes active when configuration parameters have been set) to proceed to the wizard **Summary Page** (figure 7-21).

Carefully review all information on this page prior to proceeding. The **Back** button is available to retrace the configuration and make any changes that might be necessary before final circuit creation.

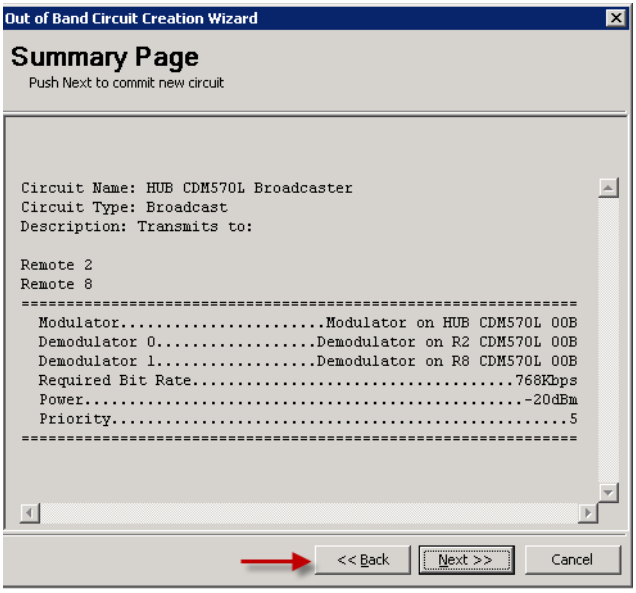


Figure 7-21 Summary Page, Half Duplex Broadcast

16. Click on the **Next** button to execute the creation of the circuit. The **Commit Page** will be displayed.

If the configuration is accepted by the wizard, the page will indicate that the *Circuit Creation Succeeded*, accompanied by a green check mark, as shown in figure 7-22. Click on the **Close** button to exit the wizard.

A red check mark will indicate if the *Circuit Creation Failed*. Note that a common configuration error that will cause this result is failing to associate the devices (modulator and demodulator) of the modem unit with the converters for the site antenna(s). Identify and correct the cause of the error, then rerun the circuit creation wizard.

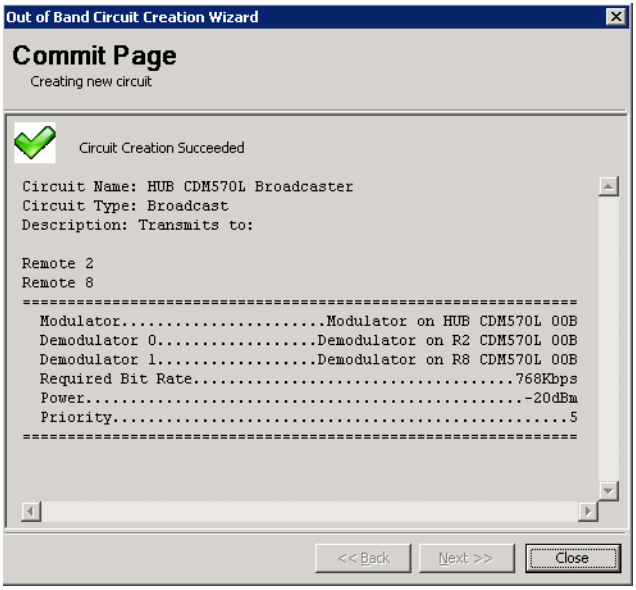


Figure 7-22 Commit Page, Half Duplex Broadcast

Custom Circuit Configuration

While Full Duplex point-to-point and Half Duplex broadcast should cover most Out-of-Band scenarios, the Custom circuit type addresses special cases. Although it can be used to configure typical point-to-point and broadcast circuits, it primarily provides a means for creating atypical circuit types. Illustrated below is an example of how to build a full duplex point-to-point combined with a half duplex broadcast in a single circuit.

The Custom circuit type utilizes managed devices and unmanaged/assigned devices, rather than units. Thus, the selection process requires navigating down to the device level to select a modulator and demodulator(s) for each channel that will belong to this circuit.

1. Right-click on the site icon that will be utilizing the circuit and select **Create OOB Circuit** from the drop-down menu to open the Circuit Creation Wizard. *The Hub site is used in this example*.

   The **Circuit Identification** dialog will appear, as shown in figure 7-23.

2. Select the **Custom** radio button in the Type box.

3. Enter a **Label** and a **Description** for this circuit.

Description field text entry: use Ctrl+Enter to create a new line independent of text wrap.

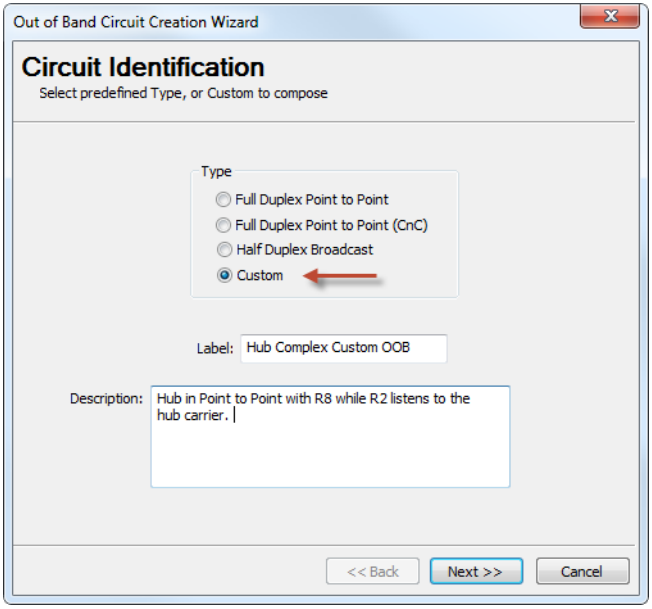


Figure 7-23 Circuit Identification, Custom

4. Click the **Next** button to display the **Circuit Configuration** dialog (figure 7-24).

   The sequence for configuring this dialog is marked in red in the figure.

5. Click on the **Managed Device** bar to select the first managed device (for the first channel). *In the example used here, this will be the broadcast modulator at the Hub*.

   The Select Object window will open with the antenna and subnet for this site.

6. Navigate through the Select Object window to select the target device:

   Double-click on the subnet, then double-click on the appropriate OOB modem. Select the device that is to be managed and click **OK**.

   The Managed Device bar will now be labeled with the name of the selected device (figure 7-25).

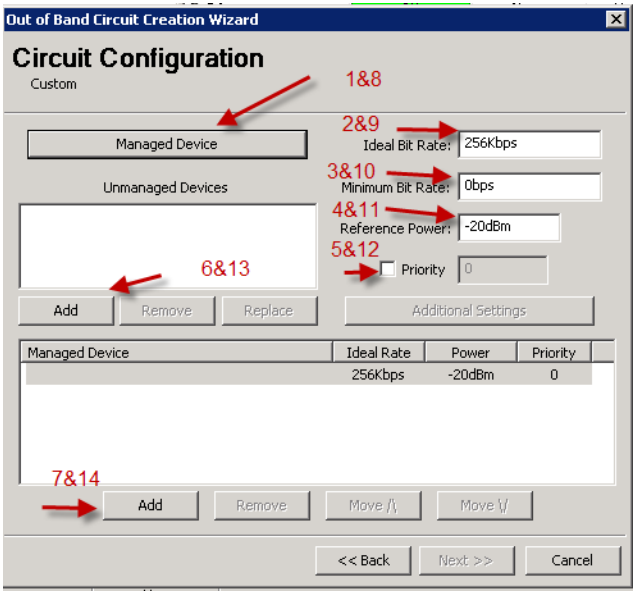


Figure 7-24 Circuit Configuration, Custom

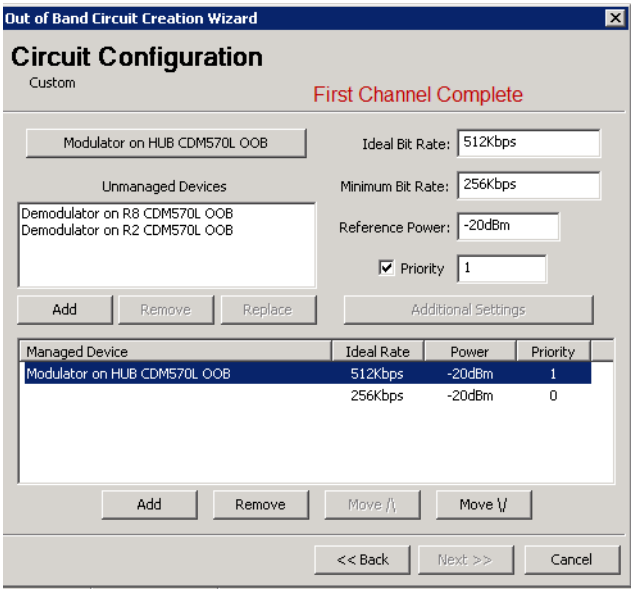


Figure 7-25 Custom Circuit, First Channel Completed

7. Enter the channel Bit Rates, **Ideal** and **Minimum**, and the reference **Power** level.

The VMS uses the reference power setting as a basis for calculating the correct power level for the carrier when setting up a switch event. This value must be sufficient to close the link to the weakest receiving site.

8. If a priority setting is applicable for this circuit, click on the **Priority** check box to activate this field (checked) and enter the required level.

Note that a *lower* number corresponds to a *higher* priority level. The default value (0) equates to *No priority*.

9. For modem units that are *Vipersat-enabled* (not SNMP), the **Extra Settings** parameters are available for configuration. Set the **FEC** and **Modulation** as required.

10. Click the **Add** button below the **Unmanaged Devices** box to select the target device(s) that will complete this channel. *In the example used here, this will be the demods for the two receiving sites*.

The Select Object window will open containing the top level components for the network, such as the satellite(s) and groups or sites.

11. Navigate through the Select Object window to select the corresponding device(s) that will be used for this channel (figure 7-25) and click **OK**.

Take care to ensure that each device selected is the correct one. If groups are displayed, double-click on the group that holds the target site. Double-click on the target site to display the subnet list, then double-click on the subnet that holds the target modem. Finally, double-click on the modem and select the appropriate device.

The Unmanaged Devices box will now list the selected device(s).

If this is the <u>only channel</u> required for the circuit that is being created, proceed to step 17.

If <u>more channels</u> remain to be defined for this circuit, continue with the next step. *For this example, a second channel will be defined for the P2P return path from Remote 8 back to the Hub*.

12. Click on the **Add** button in the lower section of the window.

The newly defined channel will be displayed in the channel table, showing the associated parameters in the Managed Device, Ideal Rate, Power, and Priority columns.

13. A second, incomplete channel appears directly below the first channel and should be highlighted. If not, click on it to highlight it.

Click on the **Managed Device** bar to select the next managed device (for the second channel). *In the example used here, this will be the demodulator at the Hub. It can be associated with the same modem from which the modulator was selected, or from another available unit.*

14. Again, navigate the Select Object window and select the target device, as shown in figure 7-26.

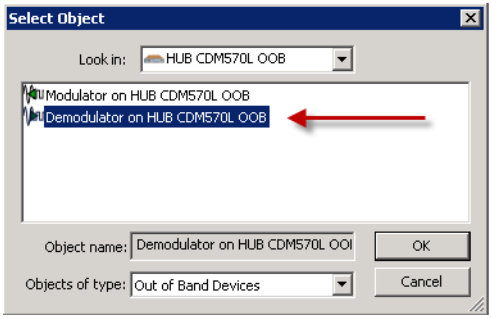


Figure 7-26 Select Return Path Demodulator, Custom

15. Enter the parameter settings for this channel:

- Ideal and Minimum Bit Rates
- Power required to establish the link
- Priority level (if applicable)
- FEC and Modulation (if applicable)

16. Add the Unmanaged Device(s) for this channel.

For this example, the Remote 8 OOB modulator.

If this is the last channel required for the circuit that is being created, continue with the next step.

If more channels remain to be defined for this circuit, repeat the procedure from step 12., above.

17. Click on the **Next** button (becomes active when configuration parameters have been set) to proceed to the wizard **Summary Page** (figure 7-28).

Carefully review all information on this page prior to proceeding. The **Back** button is available to retrace the configuration and make any changes that might be necessary before final circuit creation.

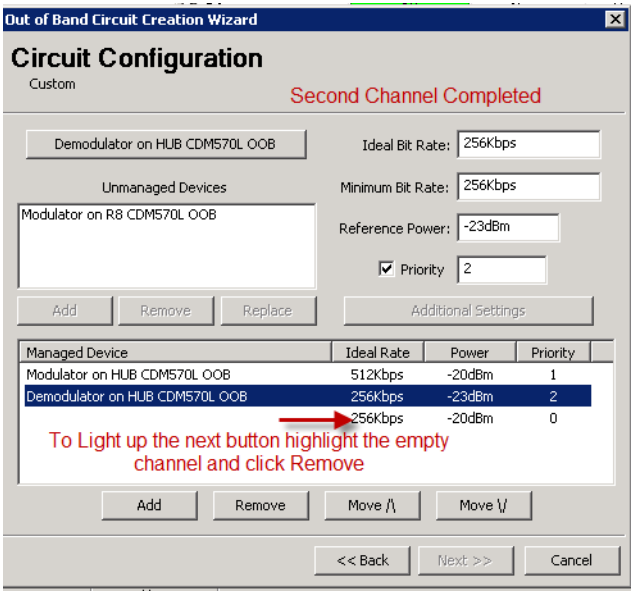


Figure 7-27 Custom Circuit, Second Channel Completed

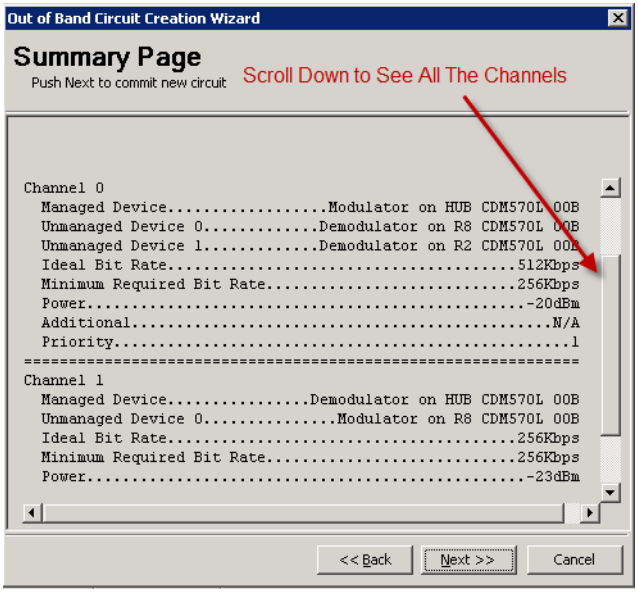


Figure 7-28 Summary Page, Custom P2P with Broadcast

18. Click on the **Next** button to execute the creation of the circuit. The **Commit Page** will be displayed.

If the configuration is accepted by the wizard, the page will indicate that the *Circuit Creation Succeeded*, accompanied by a green check mark. Click on the **Close** button to exit the wizard.

A red check mark will indicate if the *Circuit Creation Failed*. Note that a common configuration error that will cause this result is failing to associate the devices (modulator and demodulator) of the modem unit with the converters for the site antenna(s). Identify and correct the cause of the error, then rerun the circuit creation wizard.

OOB Circuit Operations

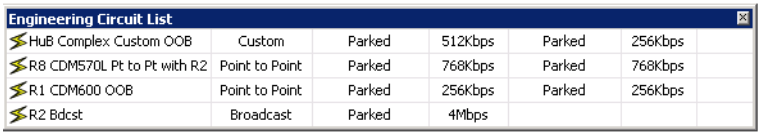
Once the circuits have been configured, there are 1 methods available for executing Setup and Takedown operations:

- ViperView

OOB switch events are recorded in the Event Log. Every switch—both setup and takedown—will log one event for the circuit plus an event for each channel associated with that circuit.

ViperView Circuit Operations

Using the ViperView interface, the operator can view the circuits and choose from several commands to execute the desired operation. Circuits can be viewed from the owning site (the site from which they were created) as well as from the group level and the network level. At the network level, all circuits defined within that network will appear. Right-click on either the site, group, or network icon and select **Show OOB Circuits** from the drop-down menu. The Circuit List window will open, as shown in figure 7-29.



Engineering Circuit List

HuB Complex Custom OOB	Custom	Parked	512Kbps	Parked	256Kbps
R8 CDM570L Pt to Pt with R2	Point to Point	Parked	768Kbps	Parked	768Kbps
R1 CDM600 OOB	Point to Point	Parked	256Kbps	Parked	256Kbps
R2 Bdcst	Broadcast	Parked	4Mbps		

Figure 7-29 Circuit List

Right-clicking on a circuit will display the operations command menu (figure 7-30).

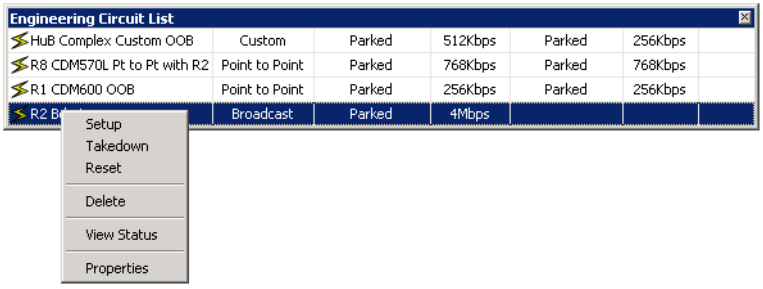


Figure 7-30 Circuit Operations Command Menu

Commands to Setup, Takedown, Reset, Delete, View the Status, and display the Properties for the circuit are provided. This menu is convenient for quickly executing a single command for a circuit. Another source that provides ready access to all of these commands together with a means of monitoring the status of a circuit is the Detailed Status window. From the drop-down circuit command menu, select View Status to open this window.

The Reset function is used to clear allocated bandwidth for a circuit when communications have been lost between the Hub and the Remote. For example, an SNG truck that leaves a site without first informing the Hub operator that transmission over the circuit has been terminated. This operation is similar to resetting an InBand link and should be used with caution.

The circuit Delete command is only allowed when the circuit is in a *parked state*.

Setup and Status Views

Examples of the Setup and Status windows for each circuit type are provided below.

Note that for SNMP modems, only the bit rate parameter can be modified in the Setup window. For Vipersat-enabled modems, the FEC and modulation can be modified as well (*Extra Settings/Additional Parameters*).

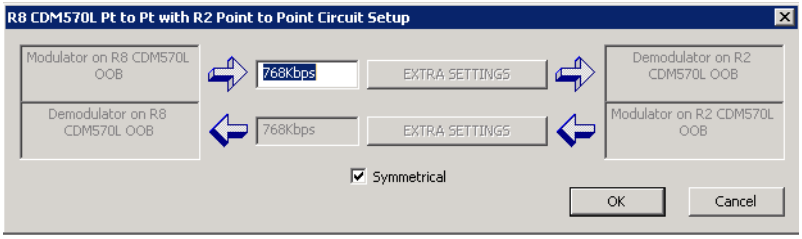


Figure 7-31 Point-to-Point Circuit Setup

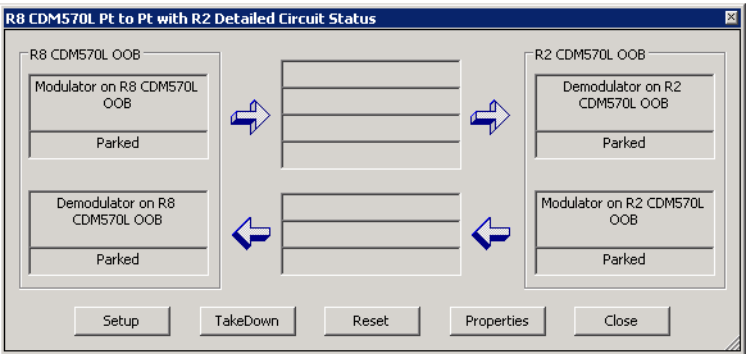


Figure 7-32 Point-to-Point Circuit Status

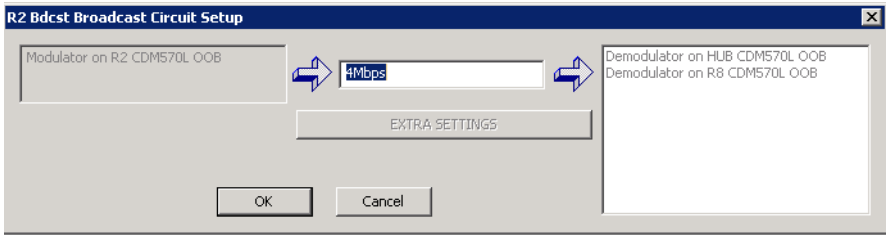


Figure 7-33 Broadcast Circuit Setup

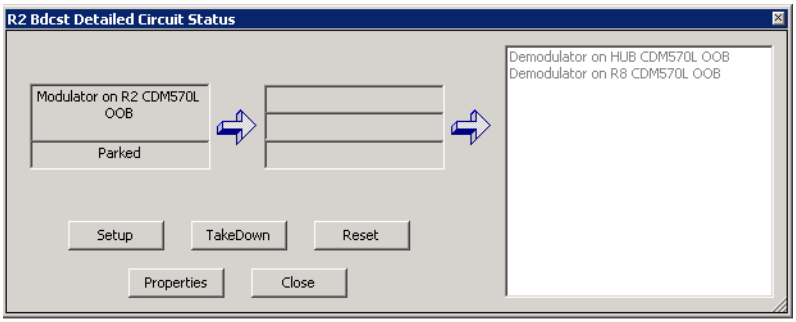


Figure 7-34 Broadcast Circuit Status

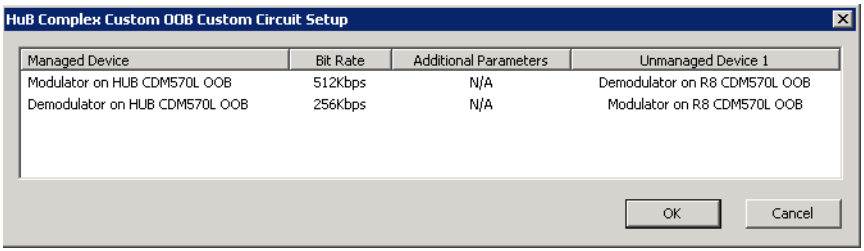


Figure 7-35 Custom Circuit Setup

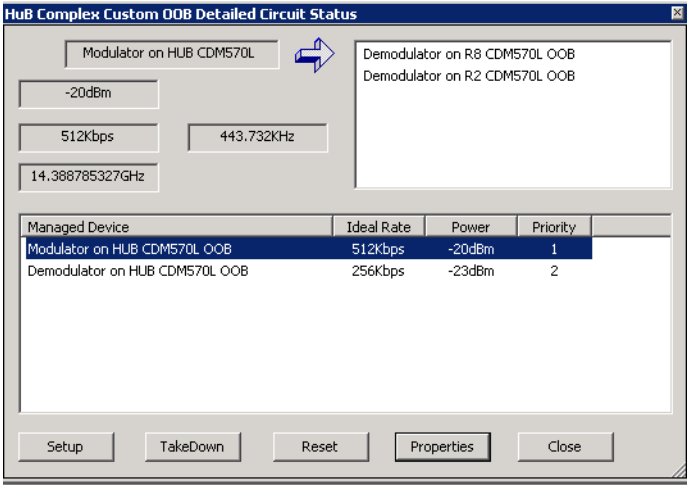


Figure 7-36 Custom Circuit Status, 1st Channel

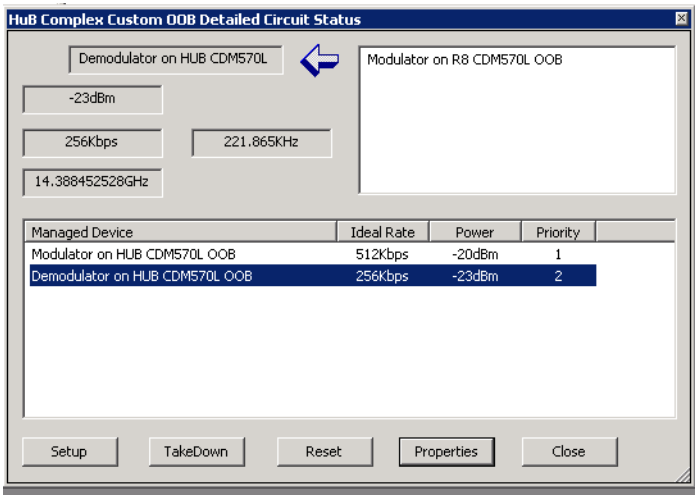


Figure 7-37 Custom Circuit Status, 2nd Channel

A

VMS Cross Banding

The VMS has the capability to accommodate applications involving satellite cross strapping and cross banding. The VMS is able to recognize, manage, and control satellite circuits which utilize more than one frequency. The typical satellite bands currently in use include:

- C-Band
  - Downlink 3.7 to 4.2GHz
  - Uplink 5.9 to 6.4GHz
  - 24 36MHz transponders
- Ku-Band
  - Downlink 11.7 to 12.2 GHz
  - Uplink 14.0 to 14.5 GHz (FSS)
  - 24 36MHz or 12 72MHz transponders
- Ka-Band
  - Downlink 17.7 – 21.2GHz
  - Uplink 27.5 – 31.0GHz

The VMS cross banding function allows VMS to manage and control the following satellite circuit configurations:

- Two remote terminals are in different antenna footprints on the same satellite where, for example, one antenna serves C-band users while another antenna serves Ku band users.

- The satellite has mapped the transponder from one antenna to a transponder on another antenna.
- The satellite serves as an RF inter-band relay which is also referred to as cross strapping

In the example shown in figure A-1 the C-band and Ku-band transponders 20 through 24 are cross banded.

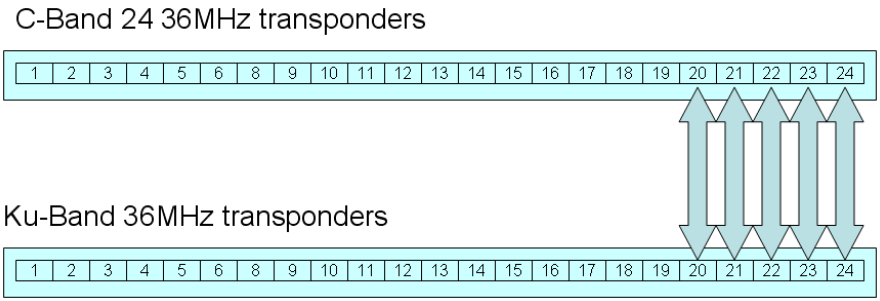


Figure A-1 Cross Banded Transponders, C-band & Ku-band

Vipersat Cross Banding Solution

Figure A-2 illustrates a schematic representation of a cross banded satellite network.

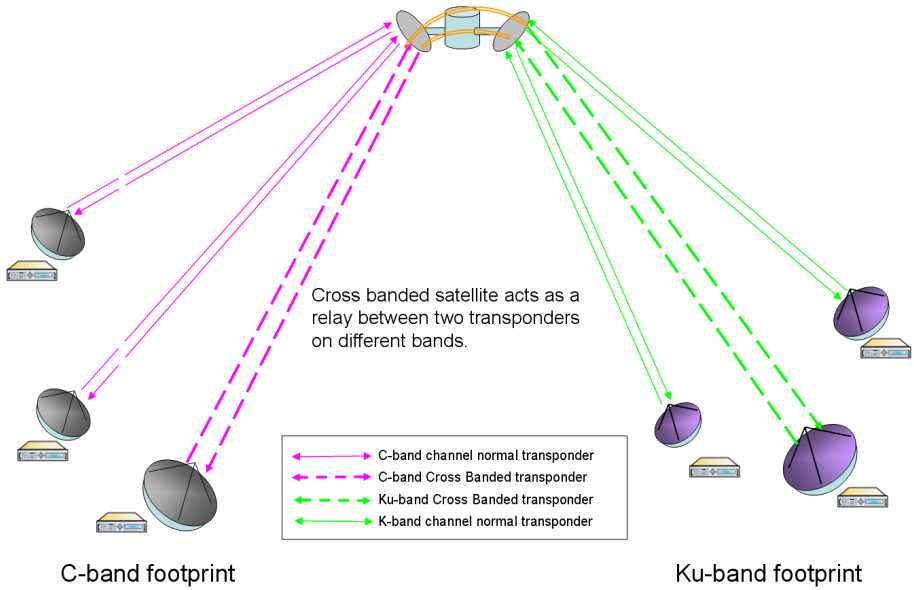


Figure A-2 A Cross Banded Satellite Network

The VMS does the following to allow a cross banded satellite network to be included in its management and control functions:

- VMS adds a translation override frequency to the transponder object which is used in place of the satellite's normal translation frequency
- The VMS bandwidth allocation logic then:
  - Selects demodulators first
  - Builds a collection of frequency limits based on available transponders
  - Selects modulators based on their intersecting limits

NOTE

Note: The VMS cross band function has no effect on non-cross banded configurations, and supports multiple transponders.

Figure A-3 shows a cross banded network configuration.

Space Segment Specifications
Using typical frequencies in C-Band.
C-Band, 36MHz segment, 2225MHz
Transponder 4C (cross banded to Ku #4)
UL: 6005MHz
DL: 3780MHz
Allocated Pool : 3MHz @ 6020MHz

Transponder 12
UL: 6165MHz
DL: 3940MHz
Allocated Pool: 2MHz @ 6166MHz

Ku-Band Transponder 4Ku (cross banded to C-band #4)
UL: 14080MHz
DL: 11780MHz
Allocated Pool: 3MHz @ 14095

Terminal Configuration
Hub Configuration (C-Band)
CDM570L (in-band, TDM/STDMA C-Band T4)
CDM570L (in-band, TDM/STDMA C-Band T12)
SLM5650 (out-of-band)
CDM564(L) (in-band expansion)

Remote 1 (C-Band)
CDM570L (in-band)

Remote 2 (Ku-cross banded)
CDM570L(inband, M&C)
SLM5650 (out-of-band)

Remote 3 (C-Band)
CDM570L (in-band)
CDM570L (expansion)

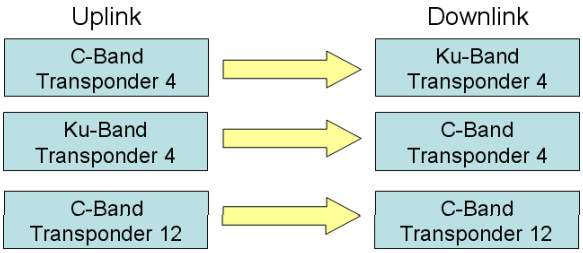


Figure A-3 VMS Cross Banded Network Configuration

In response to the network configuration shown in figure A-3 the VMS would:

1. Create Satellite - Set center frequency to 6.1375GHz and translation frequency to 2.225GHz

2. Create Transponder 4C (cross banded to Ku) - 6.005GHz, 36MHz

3. Perform a Translation Override = (6.005 – 11.78) = -5.775GHz

4. Create Pool, 3MHz at 6.020GHz

5. Create Transponder 12C - 6.165GHz, 36MHz

6. Create Pool 4, 2MHz at 6.166GHz

7. Create Transponder 4Ku - 14.155GHz, 36MHz

8. Perform a Translation Override = (14.08 – 3.78) = 10.30GHz

9. Create Pool 4, 3MHz at 14.170GHz

Figure A-4 illustrates the results of the VMS solution for managing and controlling the cross banded network described above.

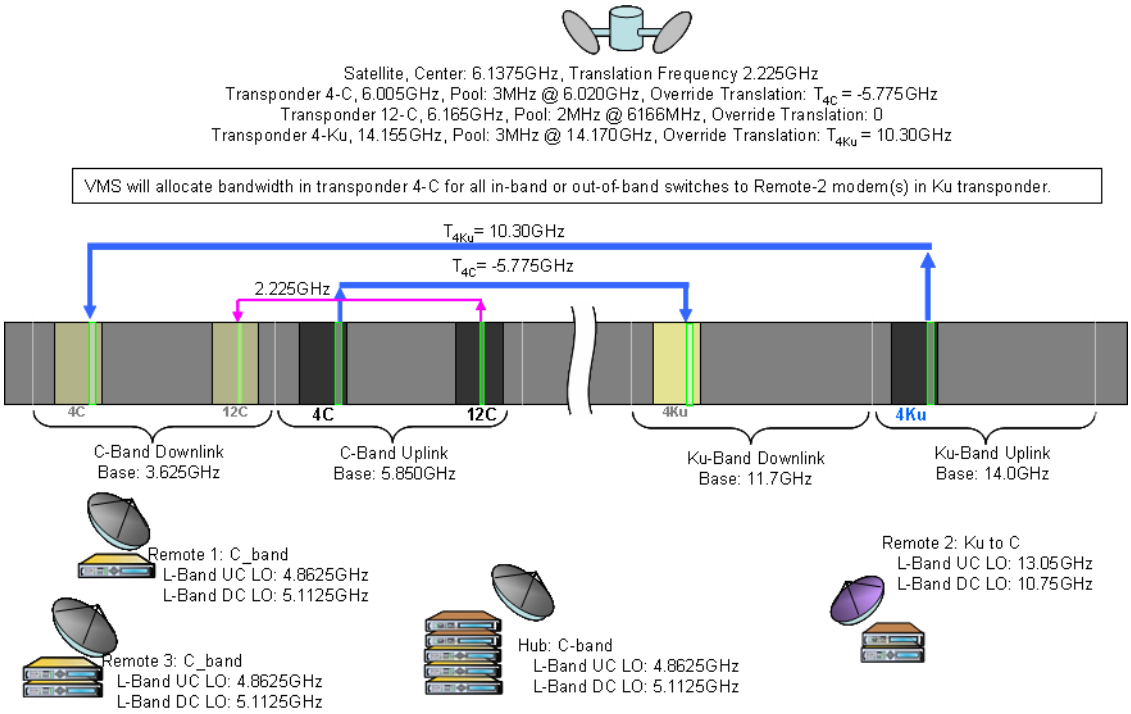


Figure A-4 VMS Cross Banded Network Solution

The VMS calculated Translation Override Frequency (TOF) is an integer value in Hertz that represents frequency offset of the cross banded transponders, mapping the modulator frequency to the demodulator frequency. When the TOF is set to a non-zero value, this value overrides the default satellite translation value and is calculated with respect to the Downlink (Rx) frequency.

The TOF value is positive if the cross banded downlink transponder frequency is lower than the Tx transponder band. The TOF value is negative if the cross banded downlink transponder frequency is higher than the Tx transponder band. Note that the VMS always subtracts the translation frequencies.

The figures below show the Create Transponder dialog for setting up VMS cross banding values. In this example, the cross banding is between C-band and Ku-band.

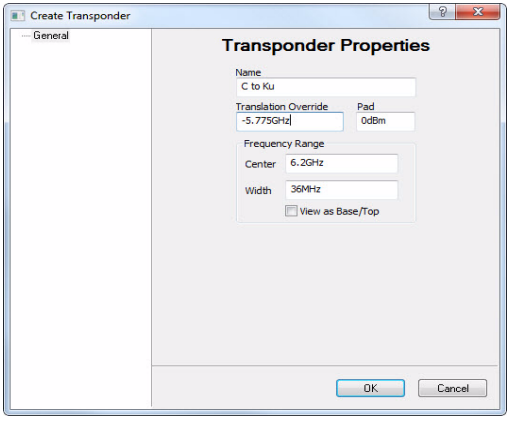


Figure A-5 Transponder dialog, C to Ku

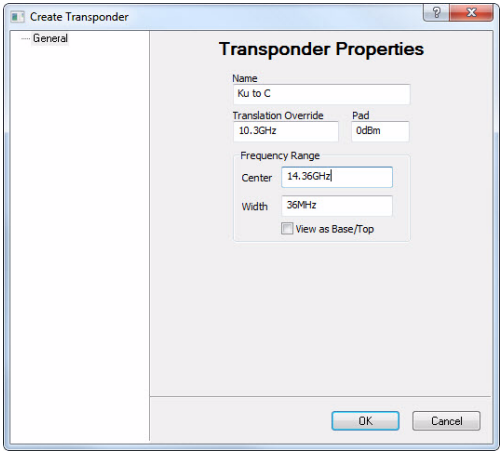


Figure A-6 Transponder dialog, Ku to C

To create a new transponder, right-click on the Satellite icon and choose **Create Transponder** from the pull-down menu that appears. On existing networks, right-click in the black portion of the satellite spectrum view, choose **Properties**, and the transponder window will open displaying the current settings. Alternatively, edits can be performed by displaying the antenna and transponder list.

In some instances, transponders may have different translation frequencies than others on the same band, thus requiring a translation override frequency configuration even without it being a cross banding or cross strapping application.

B

ANTENNA VISIBILITY

General

Antenna Visibility is a powerful tool in the VMS that allows an operator to control the spectrum used by the VMS switching engine. Simply stated, it allows the operator on a site by site basis to block portions of the satellite or transponder bandwidth from being used by the RF manager, even if a defined bandwidth pool exists within the blocked portion.

Antenna visibility can be used in a variety of ways. However, great care must be taken when implementing this powerful tool in a Vipersat satellite network, or unexpected results will occur.

Warning: Do Not use antenna visibility without a thorough understanding of the mechanics involved. It is highly recommended that an operator complete the Vipersat Advanced VMS training course that includes coverage of Antenna Visibility prior to configuring a live network with this feature.

Using Antenna Visibility

Antenna Visibility is accessed by right-clicking on the desired satellite antenna and selecting Properties. The antenna properties window will open. Click on the **Visibility** tab to display the antenna visibility window. The figure below shows the antenna visibility flag as defaulted by the VMS. The default values ensure that the entire spectrum is available so that there are no limitations in effect when this feature is not used.

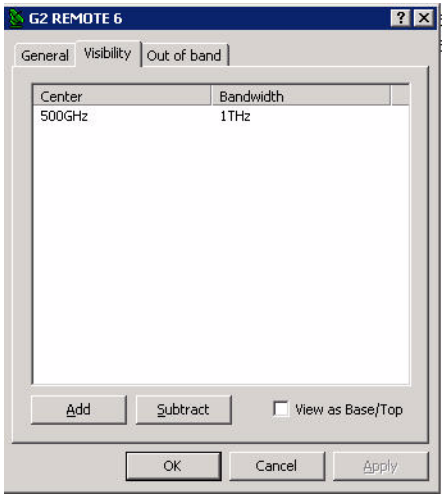


Figure B-1 Antenna Properties, Visibility Tab

An antenna with these settings is essentially clear for all satellite bands. Under most conditions, it is advisable to leave the visibility settings at the default values. Should a network application call for the use of antenna visibility, start by configuring the desired transmit and receive frequencies for the antenna to be able to use, as illustrated below using standard Ku-Band.

NOTE

Note: The VMS is not limited to any particular frequency band.

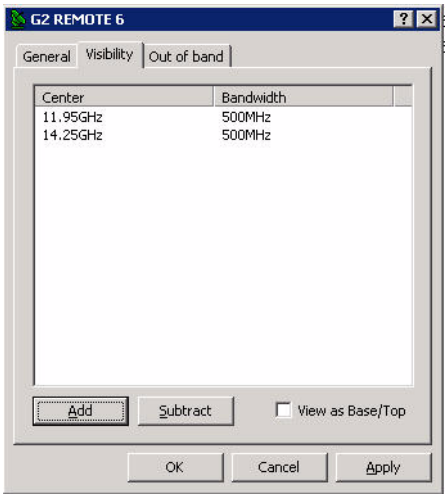


Figure B-2 Ku-band Visibility Ranges, Center/Bandwidth

The frequencies can be viewed, as above, with a center frequency and bandwidth, or as shown below with frequency ranges. Clicking in the **View as Base/Top** box will toggle between these two views.

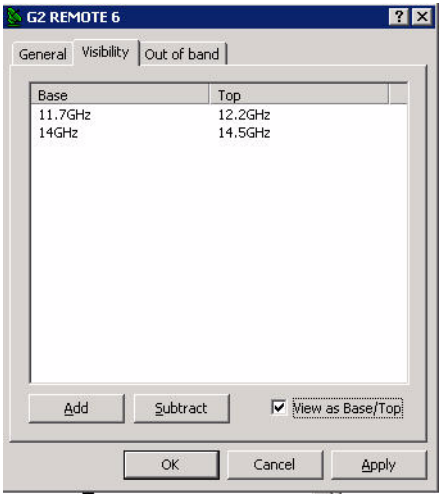


Figure B-3 Ku-band Visibility Ranges, Base/Top

The **Add** and **Subtract** buttons are used to modify the visibility by either adding or subtracting frequency ranges to/from the antenna. Clicking on either one of these buttons opens a **Frequency Range** dialog for specifying the new visibility range. Note that the appearance of this dialog reflects the appearance of the visi-

bility tab, showing either a center frequency with bandwidth, or a base frequency and top frequency. This appearance can be toggled using the **View as Base/Top** check box.

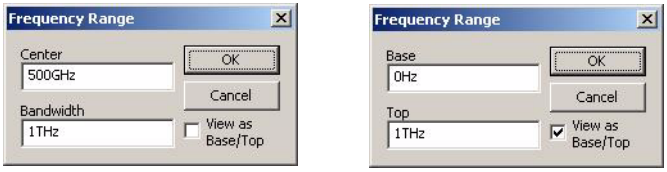


Figure B-4 Frequency Range dialogs

Enter the range of bandwidth to be added or subtracted and select **OK**.

Subtracting a frequency range from within visible bandwidth creates a visibility block, or mask, for that portion of the spectrum. To remove an existing visibility block and restore visibility for that bandwidth, select the two adjacent ranges and click **Add**. This will display the range of bandwidth blocked, as shown in the figure below. By selecting **OK**, the range will be added and the two ranges will become merged into one continuous range.

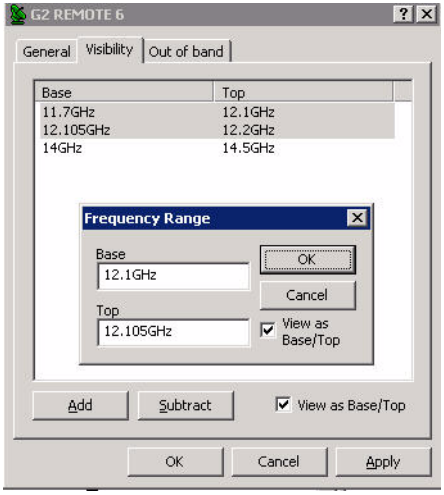


Figure B-5 Merging Visibility Ranges

Example — Blocking Spectrum Affected by Local Ground Frequency Interference

In the example shown here, Antenna Visibility is used to block off a portion of a bandwidth pool at a given remote site due to ground interference on the lower part of the transponder spectrum.

In this case, assume there is ground interference on the lower end of the transponder that overlaps into the bandwidth pool, as illustrated in the figure below.

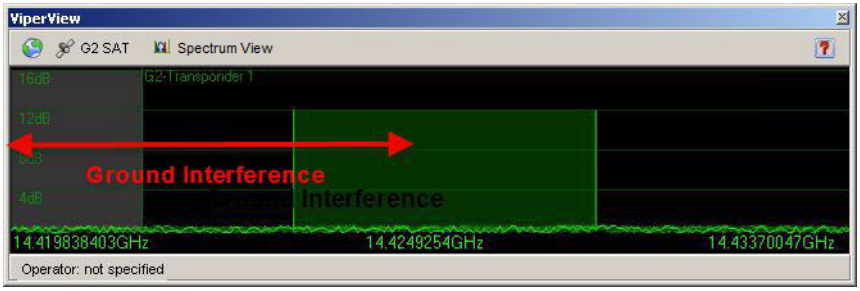


Figure B-6 VMS Bandwidth Pool with Ground Interference

Note that the satellite spectrum view provided by the VMS, as shown here, displays the transmit (uplink) carriers from the Hub and the remote sites. The corresponding receive (downlink) carriers are determined by the frequency offsets but are not visible.

This interference at the remote site may not affect the transmission path, but could prevent reception in the lower portion of the pool. With no antenna visibility block, the VMS would perform a switch with this remote, resulting in the carriers being placed as shown below. This places the corresponding receive carrier within the ground interference frequency range, and could cause a disruption in communications.

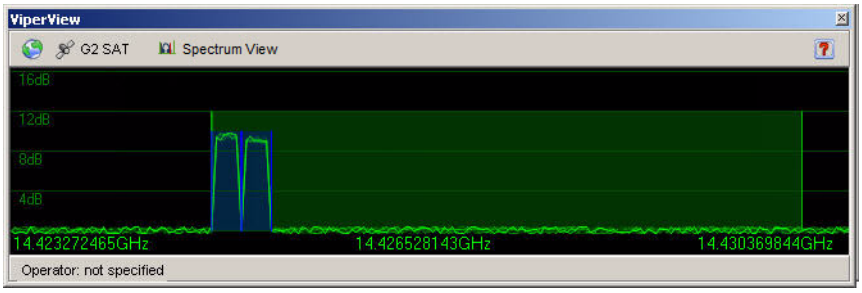


Figure B-7 Transmit Carriers, No Visibility Block

Using the visibility Subtract function, a new block for this area of interference can be created for the remote antenna, as shown in the figure below.

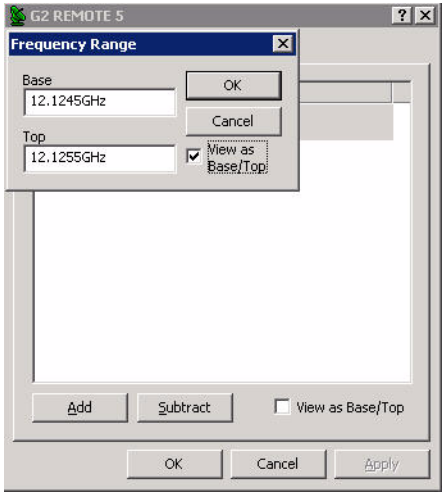


Figure B-8 Visibility Subtract dialog

The revised visibility map now shows a visibility block between 12.1245 GHz and 12.1255 GHz which represents the bottom 1 MHz portion of the pool experiencing ground interference.

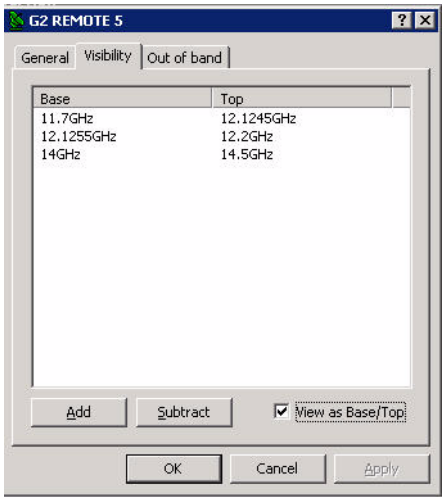


Figure B-9 Visibility Ranges with Blocks

This configuration results in the VMS switching as shown below. The receive carrier for the remote is now outside of the area of interference.

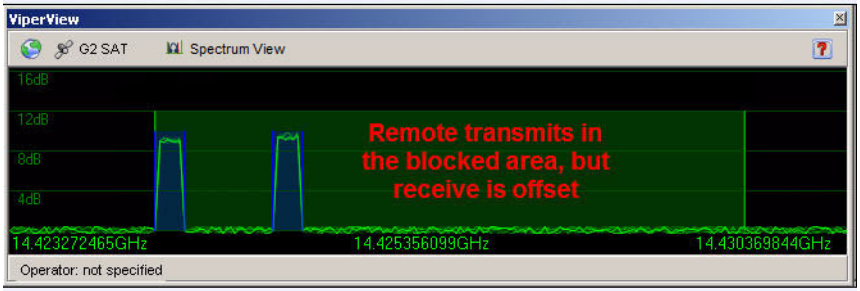


Figure B-10 Transmit Carriers Repositioned, Visibility Block

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C

REDUNDANCY

General

This appendix describes the optional redundancy services that protect critical Vipersat network equipment. The two main services offered are **VMS Redundancy** and **Hub Modem Redundancy**.

VMS Redundancy provides for N:1 redundant VMS server(s) (standby) co-located at the Hub alongside the active VMS server. This configuration provides for the automatic switch-over to a standby server in the event of a failure of the active server.

Hub Modem Redundancy provides for the operation of M:N multiple primary and multiple secondary modems installed at the Hub. If a protected device fails, its output is automatically removed from the satellite network. A replacement device, loaded with the failed device's configuration, is booted into service and its output is switched into the satellite network, replacing that of the failed device.

VMS Redundancy

Description

VMS redundancy (protection) increases the system availability of a Vipersat-enabled network by protecting the network from a VMS server failure. In the current release, N:1 redundancy is a monitored hot-standby configuration with N+1 VMS servers running in parallel.

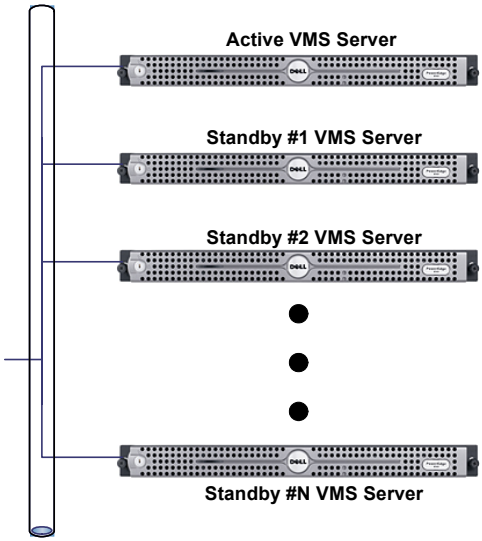


Figure C-1 Active and Standby VMS Servers, N:1 Redundancy

Each server can switch between two mutually exclusive modes of **active** or **standby**. The active/standby hierarchy is specified through the assignment of a priority level attribute. In the event that the active server fails, the backup server with the highest priority is hot-switched to assume control of the satellite network, replacing the failed server.

Note: The redundant VMS protection feature can only be activated with a valid license in the server(s) USB Crypto-Box key.

Redundant Hot-Standby

In a redundant configuration, the VMS servers run in parallel. The VMS database on the standby server(s) is continuously maintained, in real-time, as a mirror image of the VMS database running on the active server.

NOTE

Note: It is recommended that all servers be co-located at the same site and be connected to the same Ethernet LAN. The monitoring workstation should also be co-located. This is to eliminate reliability issues that may be associated with the terrestrial data-link communications between a geographically remote server and NOC units. A data-link failure may result in contention of automatic switch-over control and interruption of restoral processing.

Protection Switch-over

If the active server fails, the VMS protected by N:1 redundancy immediately switches to a standby server. The VMS running on the standby server picks up and executes the ongoing network management tasks until the failure in the active VMS server is resolved by human intervention.

Both the active and standby servers operate in a query-peer mode to determine which server is to be the active VMS server in the network.

If, for example, the active VMS server fails causing a protection switch, a standby VMS server assumes control of the network. While the standby server is actively managing the live network, a previously active server that is being restarted cannot assume the active server role without first checking for the presence of an active VMS server already managing the network. The process for initiating and managing the transitions between active to standby modes is described below.

Active to Standby Switch

This transition occurs whenever:

- An automatic switch-over is triggered by the failure detection mechanism due to active VMS failure, or
- A manual switch-over is invoked from the active console by, for example, taking down the active server for maintenance.

A switch-over from the currently active server back to the server with higher priority (once recovered) is NOT automatic. An operator must manually perform the switch at the active server’s console.

When a server with a higher priority is restarted, the VMS on the server detects an active peer on the network (a previous standby server) and automatically enters standby mode, and remains in standby mode until either an operator

manually switches the server back to active mode, or a failure occurs causing an automatic switch-over.

For instructions on performing a manual switch-over, refer to the section “Manual Switching” on page C-13.

Active Server Role

The active VMS server has the following specific privileges that differ from a standby server:

- There can be only **one** (1) VMS server actively managing the network.
- The active server is considered the default VMS server for configuration and network topology purposes.
- The active server's database is considered the master copy. The standby server(s) receives a copy of the master database from the active server as a part of its start-up process and automatic synchronization.
- The first VMS server to come on-line assumes the active mode provided that all redundant servers are online and no other server is operating in active mode.
- The active server is the only unit that may initiate a manual protection switch-over (a transition from active-to-standby mode or standby-to-active mode). This is a two-step event controlled by the operator/administrator: the Active server is first *Deactivated*, then a Standby server is *Activated*.

Standby Server Role

A VMS standby server has the following specific functions that differ from the active VMS server:

- Upon startup, a standby VMS enters a query-peer mode where it attempts to discover a peer VMS in active mode. The VMS enters a standby mode when an active VMS is discovered.
- A standby VMS server's default mode is standby. It can only enter active as a result of a protection switch, either automatic or manual.

Automatic VMS Activation

An Auto Activate function is available to resolve any activation conflicts in the event that all servers go offline temporarily. Once the servers return to online status, the server that was the last active will automatically reactivate and assume the active role.

Server Synchronization

Server synchronization is always executed by/from the active VMS server, and is performed to ensure that all standby servers receive any necessary updates due to changes in the master database that resides in the active server. Two types of server synchronization occur with a redundant VMS configuration, automatic and manual.

Automatic Synchronization

As the name implies, automatic synchronization occurs automatically by the active VMS and is performed whenever any changes occur that are associated with automatic system functions, such as automatic switching, device redundancy, etc. The active server maintains a memory cache that holds the updates until they can be pushed out to the standby servers by an automatic synchronization that occurs during the VMS heartbeat. The updates are tagged onto the heartbeat message that is sent by the active server to the standby servers.

Manual Synchronization

Manual synchronization, also referred to as “full synchronization”, must be performed by administrator/user command for any changes not related to automatic VMS functions, such as whenever any database configuration changes are made to the server. Should a standby server be restarted, when it rejoins the redundancy group, the sequence of updates may be lost and a manual synchronization is required to ensure that the standby receives the most current database from the active server.

Note that this operation can be automated on a 24-hour basis with the *Auto Synchronize* feature. See the section, “Auto Synchronize” on page C-10, for how to configure this feature.

During a full synchronization, the active VMS service is temporarily taken down to avoid any changes occurring during the synchronization process. The active server sends the contents of the temp file holding the entire database backup to each standby server via simultaneous unicasts. If, for any reason, there is a failure with this update process, a notification will appear in the windows log.

Server Contention

Server contention is a built-in protection mechanism for redundant VMS operation. A situation may occur where the active server briefly loses network connectivity—a network cable is unintentionally pulled, for example—before communications are restored. The first priority standby will become active due

to the lost heartbeat of the former active server. When the former active server returns, it will detect that there is another active server in operation, and will enter the contention state.

When this is sensed by the current active server, it also will enter the contention state. In such a situation, there is no way for the system to determine which server has the most current up-to-date database, and both servers will immediately de-activate to protect the current status of the network. A generated alarm, both visual and audible activated, will appear on each server. In addition, an SNMP trap will be generated.

In this condition, VMS services are still running, but no changes of state can be executed in the network until the condition is cleared. For instructions on clearing server contention, refer to the section “Clearing Server Contention” on page C-14.

Server Status

The VMS Connection Manager provides the status of the VMS and each of the servers in a redundancy group. The Connection Manager, when running, will display its icon in the Windows Task bar at the bottom right of the screen. When the mouse is positioned over this icon, a status pop-up appears displaying information on the VMS and the servers, as shown in figure C-2, below.

Figure C-2 Server Status Pop-Up

There are four possible server states:

- active
- standby
- contention
- disconnected

If no servers are connected, the status message will read “Vipersat Management System Disconnected”.

The server to which the console is currently connected (the local server) is identified by whatever was entered in the **Connect To** dialog; either its assigned name or its IP address (as appears in the first line of the example shown in

figure C-2). The next server status that is displayed is that of the local server, followed by any remote servers listed by their IP address.

Installing & Configuring VMS Server Redundancy

Installation of a redundant VMS server configuration in a VMS controlled network requires the following:

- Two or more dedicated servers and a client workstation.
- The servers and the workstation should be co-located (in the same physical location) and connected to the same Ethernet LAN.
- A dedicated IP address for each VMS server.
- A common domain for the redundant servers and the client workstation.

Starting a redundant VMS configuration requires bringing up the VMS servers and the workstation using the following procedure:

1. Install VMS on each of the servers following the instruction in *Chapter 1, "General"*.

2. Start the Vipersat Management System service and ViperView.

   Select **Vipersat Management System** from Windows Services and **Start** the service, if it is not already running.
   Note: It is recommended that this service be configured for **Automatic** Startup.

   Click **Connection Manager** on the path:
   Start > All Programs > VMS 3.x> Connection Manager

   The Connection Manager will prompt for the server to connect to. Select the server that is to be the initial Active server; typically, this is the server with the highest priority setting.

   The ViperView window will appear as shown in figure C-3.

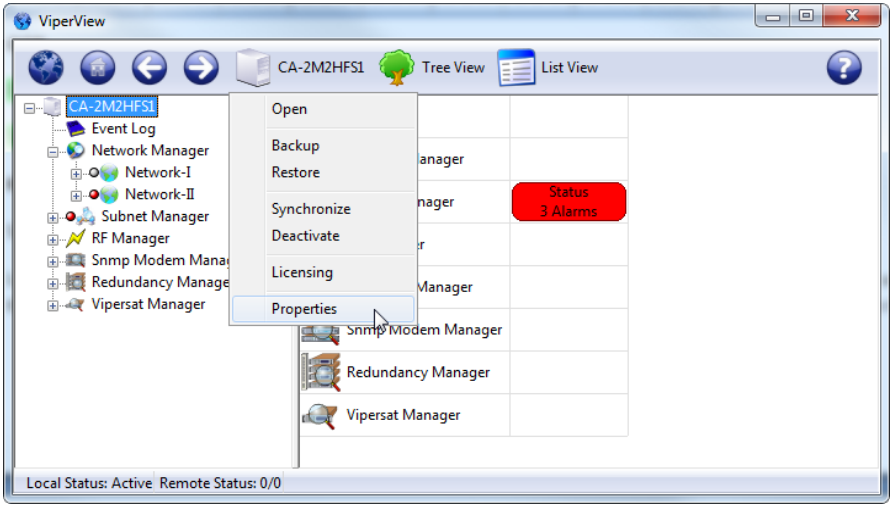


Figure C-3 ViperView, VMS Server Drop-down Menu

3. From the VMS Server drop-down menu, select the **Properties** command to display the VMS Server (VIPERLAB1 in this example) dialog window, shown in figure C-4.

The **Status** tab is displayed, providing the current status information for this server.

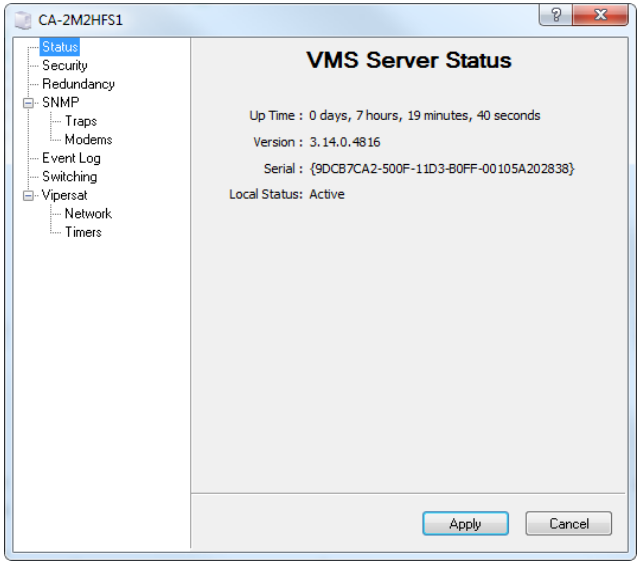


Figure C-4 VMS Server Properties, Status Tab

4. Click on the **Redundancy** tab to configure the redundancy settings for this server (figure C-5).

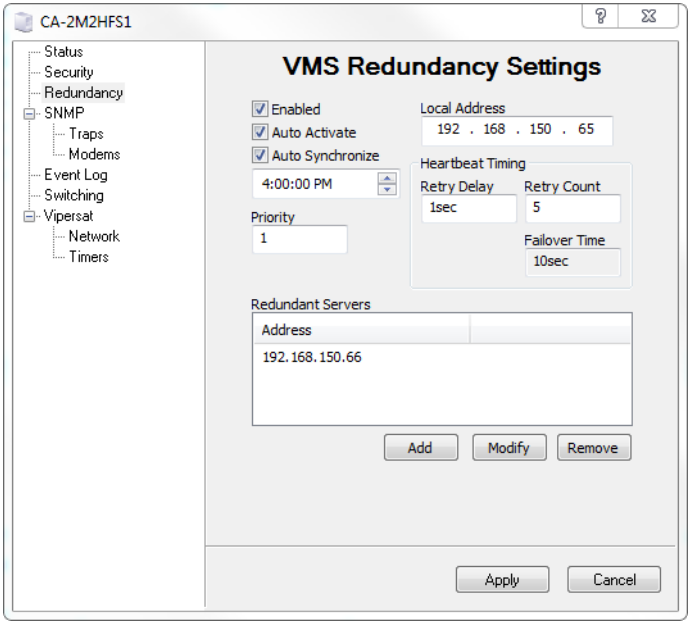


Figure C-5 VMS Server Properties, Redundancy Tab

Enabled

Clicking in the **Enabled** box selects/de-selects redundancy operation for this server. This setting must be enabled for each server that belongs to a redundancy group.

Auto Activate

Clicking in the **Auto Activate** box selects/de-selects this function. In the event that the redundant servers go offline temporarily, when the servers return to online status:

- with Auto Activate *selected*, the server that was the last active will automatically reactivate and resume the active role.
- with Auto Activate *de-selected*, a server will be activated only by an operator manually issuing an Activate command on one of the servers.

When choosing to use Auto Activate, each VMS server in the redundant group should be configured with the Auto Activate function selected.

Auto Synchronize

Clicking in the **Auto Synchronize** box selects/de-selects the periodic database synchronization operation for this server. It is recommended that this setting be enabled for each server that belongs to a redundancy group.

The daily time is generally set for when traffic is typically at a low level, such as early morning, for example.

Note that this feature provides a means of performing a full database synchronization *automatically*, that would otherwise have to be executed by the administrator/operator *manually*. Refer to the section, “Manual Synchronization” on page C-5, for more information.

Priority

The **Priority** setting identifies where this server ranks in the redundant server hierarchy for becoming active during a switch-over. The lower the number entered, the higher the priority.

Set the Priority to a unique number in the range 0 to 31.

Caution: No two servers in a redundancy group should ever be assigned the same priority; each server must have a unique number to prevent contention.

Local Address

The **Local Address** IP is configured when the server is utilizing more than one physical NIC, VMS will then properly use the appropriate interface to send/receive heartbeat messages to the other server(s). If only one NIC is used in the server then the **Local Address** can be left with default value of 0.0.0.0, otherwise the server's OS would use NIC configured with the lowest order IP address.

Heartbeat Timing

The Redundancy **Failover Time** is set by specifying the values for **Retry Delay** and **Retry Count**. The Failover Time is the amount of time that will pass prior to a switch-over to a Standby server following a failure in communications (heartbeat) with the Active server.

The Retry Delay represents how long the system waits before sending another heartbeat request. The Retry Count represents how many heartbeats are missed before the device is determined to be offline. Failover Time is calculated by taking twice the Retry Delay value and multiplying it by the Retry Count value.

Generally, it is recommended to use the following values:

- For networks *with up to 100 nodes* — Retry Delay = 500 ms, Retry Count = 10.
- For networks *with over 100 nodes* — Retry Delay = 500 ms, Retry Count = 20.

Redundant Servers

The **Redundant Servers** box lists, by IP address, the other VMS servers that are in the redundancy group with this server. Each VMS server in the group must own a list that includes all of the other servers in that group.

Use the **Add**, **Modify**, and **Remove** buttons to create and maintain the list.

5. Configure the SNMP traps for this server. This may be required for relaying server status information/alarms to a primary management system at the NOC, for example.

Click the **Traps** tab, shown in figure C-6, to display the existing SNMP Manager traps. Use the **Insert**, **Modify**, and **Remove** buttons to add new traps and modify or remove existing traps. Refer to *Appendix D, "SNMP Traps"*, for detailed information on the SNMP Manager.

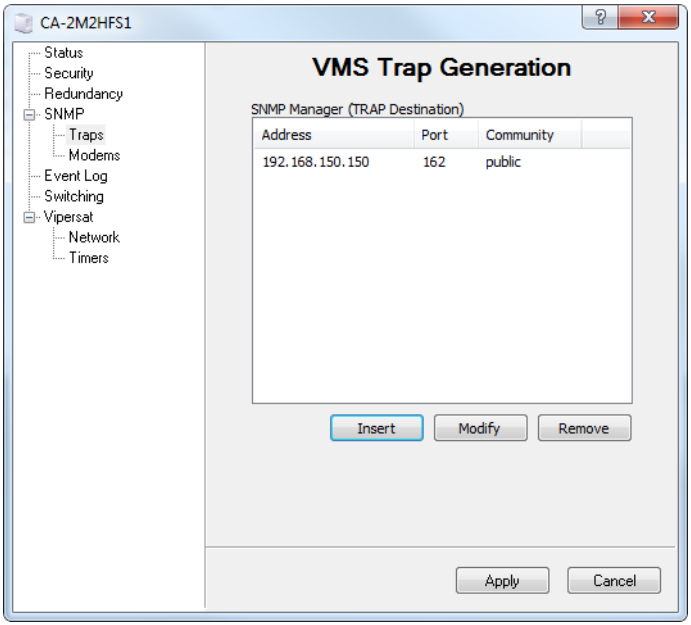


Figure C-6 VMS Server Properties, Traps Tab

6. When finished, click the **OK** button to save the server properties settings.

7. Repeat steps 2 through 6 for each VMS server in the redundancy group.

8. Place the VMS server with the highest redundancy priority into the *active* state:
   Connect the console to the server with the highest priority and select the **Activate** command from the VMS Server drop-down menu.

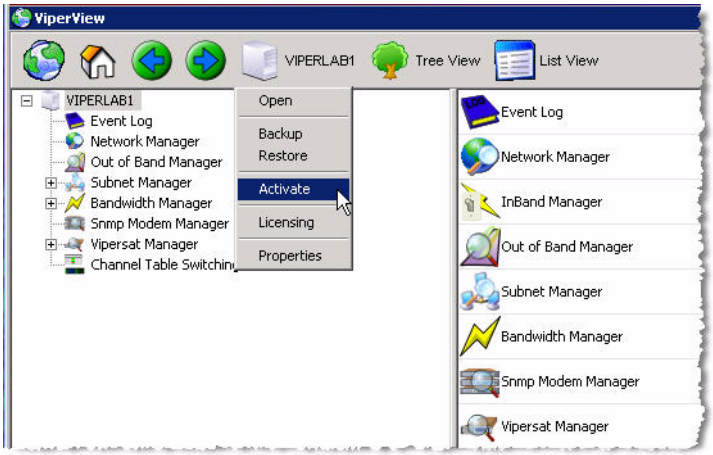


Figure C-7 Activate Command, VMS Server Menu

9. From the *Active* VMS server, select the **Synchronize** command from the Server drop-down menu to force the Standby server(s) to synchronize with the current status of the Active server.

   This manual synchronization command must be executed whenever a Standby server is started or comes back into the group, as well as whenever any database changes are made to a unit. A synchronization can only be executed from the Active server.

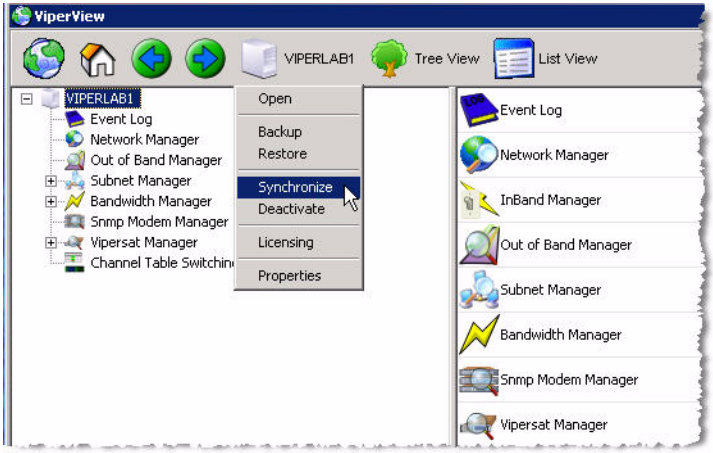


Figure C-8 Synchronize Command, VMS Server Menu

This concludes the procedure for installing and configuring the VMS redundancy servers.

- The next step is to configure the VMS database for the satellite network on the *Active* server. Refer to *Chapter 3, "VMS Configuration"*, for details on this procedure.
- Once the VMS configuration is completed on the Active server, perform a server synchronization to synch the Standby server database(s) with the Active server database.

Manual Switching

Manual switching can be used to designate a different server to be the active VMS server in the redundancy group.

1. From the currently active server, right-click on the server icon in Viperview to display the pull-down menu and select **Deactivate**.
2. From the standby server that will become the new active server, right-click on the server icon in Viperview and select **Activate**.
3. Verify the new server status using Connection Manager.

Clearing Server Contention

Should contention for active status between two VMS servers occur, use the following procedure to clear the condition.

1. From Viperview, right-click on the server icon and select **Clear Contention** from the pull-down menu that appears.

   A pop-up message will appear on the console indicating that the server will enter standby mode, and that the contention on the other server must also be cleared before this server status can be changed to active.

2. Repeat the previous step for the second server in contention.

3. Determine which server is to be made active (typically, the server with the highest priority) and select the **Activate** command.

   This server will become active and the other server will remain in standby mode.

M:N Hub Modem Redundancy

Description

The M:N Hub Modem Redundancy service provides for the protection of critical VMS network modems operating in Hub mode and enhances overall network reliability.

The M:N redundancy in VMS version 3.13.x or greater has the following characteristics:

- Protects Vipersat Hub modems from equipment failure
- Is a VMS controlled feature
- Does not require any external switching hardware
- Preserves the satellite network configuration and state information during hardware failure
- Is scalable and flexible to satisfy the unique requirements of each network

M:N redundancy increases reliability by backing up critical primary central hub components with standby backup units. In a traditional 1:1 or 1:N redundancy, switching is handled by combining transmission equipment into logical mechanical switching units. These software/hardware units then interconnect the primary transmission units I/O through a physical mechanical maze of relays and cable jungles. They also become the next point of failure in the reliability hierarchy.

The Vipersat solution relies less on a mechanical backup system architecture, decreasing the single point of failure. The Vipersat software-driven M:N redundant architecture is completely IP packet controlled with the only hardware item being an IP controlled electrical power switch.

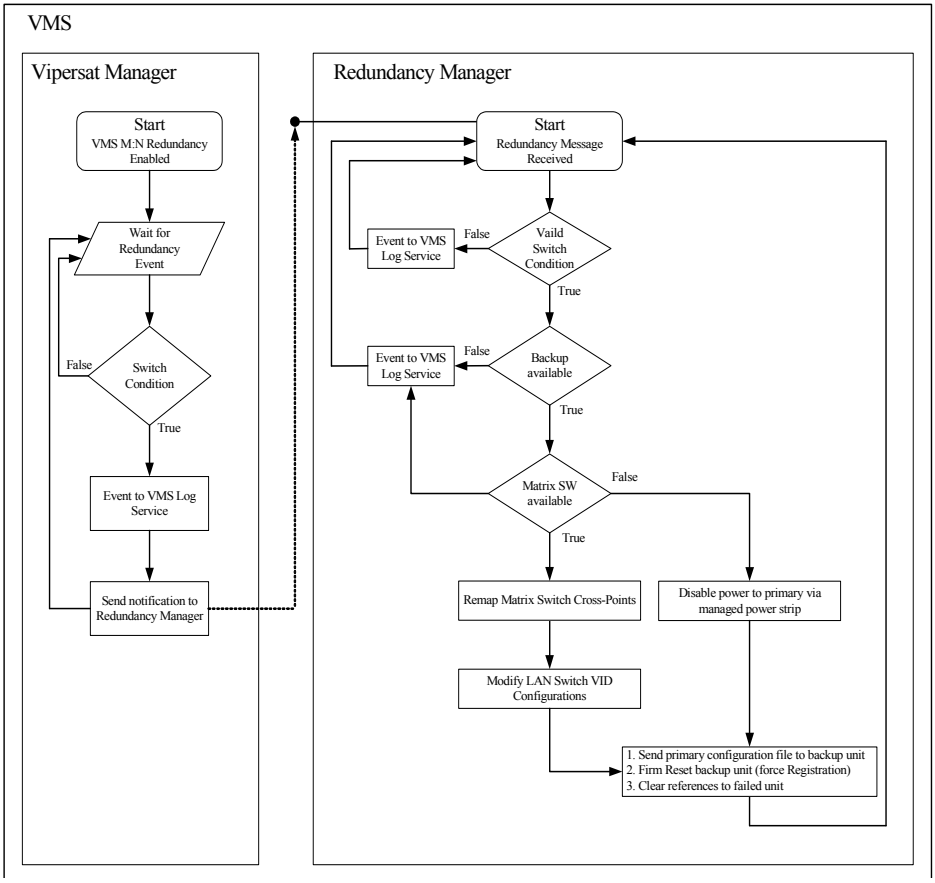


Figure C-9 M:N Redundancy Logic Diagram

The switching control mechanism is completely monitored and controlled by the host master processing VMS as shown in the logic diagram in figure C-9. The VMS parameter backup and restore function is used to copy each primary unit's configuration database information which is then stored in a lookup list.

The stored primary unit's parameter files are used to put the image of a failed primary unit's parameters into a standby spare unit. The spare units should always be in the parked configuration described in the section "Setting Unit to Parked Configuration Mode" on page C-37, powered on, and listening and responding to the local LAN network.

After the M:N redundancy has been installed, as described in the section "Installing M:N Redundancy" on page C-17, the VMS starts listening for heart-beat messages from each of the primary and backup spare units for health and fault code response as shown in the logic diagram in figure C-9. If any primary unit fails (has an alarm set, or fails to send a heartbeat within the Timeout

parameter setting in Vipersat Manager), the VMS will invoke the backup procedure by sending a copy of the failed unit's database to the next available standby spare.

The spare unit is selected in order of IP address. If the spare unit fails to respond or process, it is marked as unavailable by VMS and the VMS repeats the process by selecting the next available unit in the list. Also, as part of the copy command, a separate message is sent to the IP remote controlled AC power bus removing power to the primary failed unit, shutting it down. This ensures that there is no possible contention between the failed unit and the spare unit being brought online.

As the spare unit receives the database configuration file it immediately copies the image over the stored offline state parameters and issues a firm reset to reinitialize the newly stored information without rebooting. Once the firm reset completes (approximately 1 second for non-STDMA mode or approximately 5 seconds for a unit operating in STDMA mode) the unit will announce itself by broadcasting an ARP message updating local routing tables.

The failed primary unit is readily identified by its powered down state. Once the cause of failure is identified and repaired, the primary unit can be reinstated and put back online using the procedure in the section "Putting Failed Unit Back into Service" on page C-37.

Installing M:N Redundancy

The installation of M:N redundancy in a satellite network involves the physical installation, interconnection, and grouping of the primary and secondary modems and the logical grouping of managed units using the VMS Redundancy Manager.

Hub M:N Redundancy Requirements

The following requirements must be met before you can do a successful installation of VMS M:N redundancy.

- M:N Redundancy is only applicable to Hub devices that are not expansion units
- The VMS version must be 3.13.x or later
- VMS controlled modems must have identical firmware version installed.
- A Server Technology horizontal Sentry™ PowerTower XL IP remote power control is required

- The active device and the backup device must be connected to the same Ethernet LAN
- The active and backup devices must be connected to the same RF output connection
- The VMS, managed power strip, and hub modems must be on the same LAN segment
- All modems must share the same RF infrastructure, such as combiners and splitters

Once devices have been installed in the satellite network as described in the section “Installing M:N Redundancy” on page C-17, a group of identical, active, primary devices functioning in the satellite network under VMS control and another group of N devices, identical to the active devices in a spare device pool are created.

Tip: The logical grouping should correspond to the physical device grouping and their connections to remote managed power controls.

The devices in the primary group are devices which are active in the network. These devices can be performing any function in the network, except expansion units. All of the devices in the backup group are turned on, but have not been configured to perform any network function and are assigned a different IP addresses than the active devices. All devices in both the active and spare groups are connected to the VMS managed power switch as shown in figure C-10.

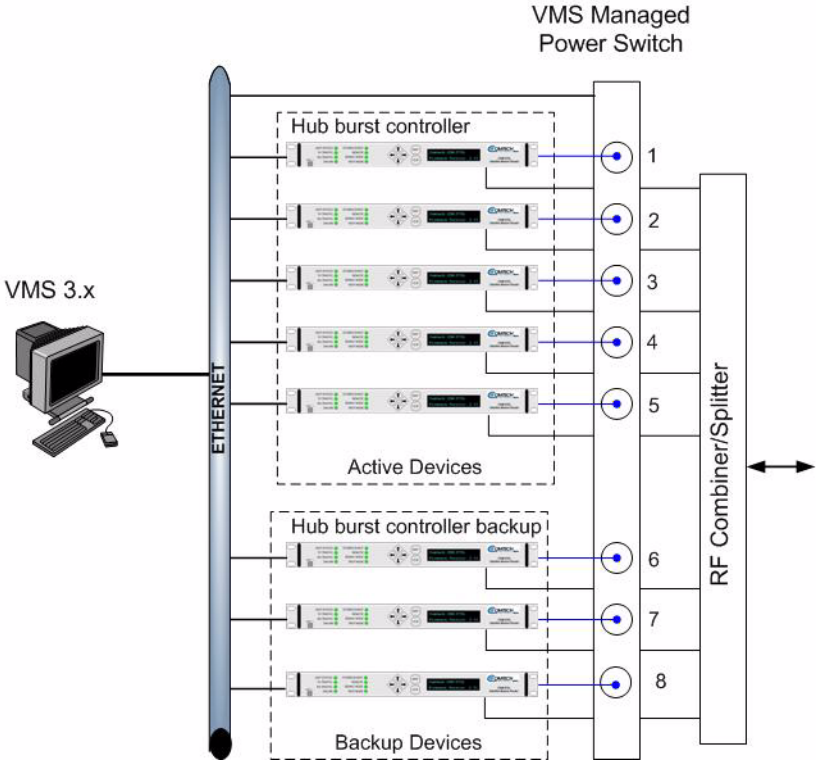


Figure C-10 M:N Block Diagram

Sample Installation

Figure C-11 shows a diagram of a sample installation of an M:N redundant VMS installation. As shown in figure C-11, the units in the primary and secondary groups share a common Ethernet LAN with the IP controlled power switch.

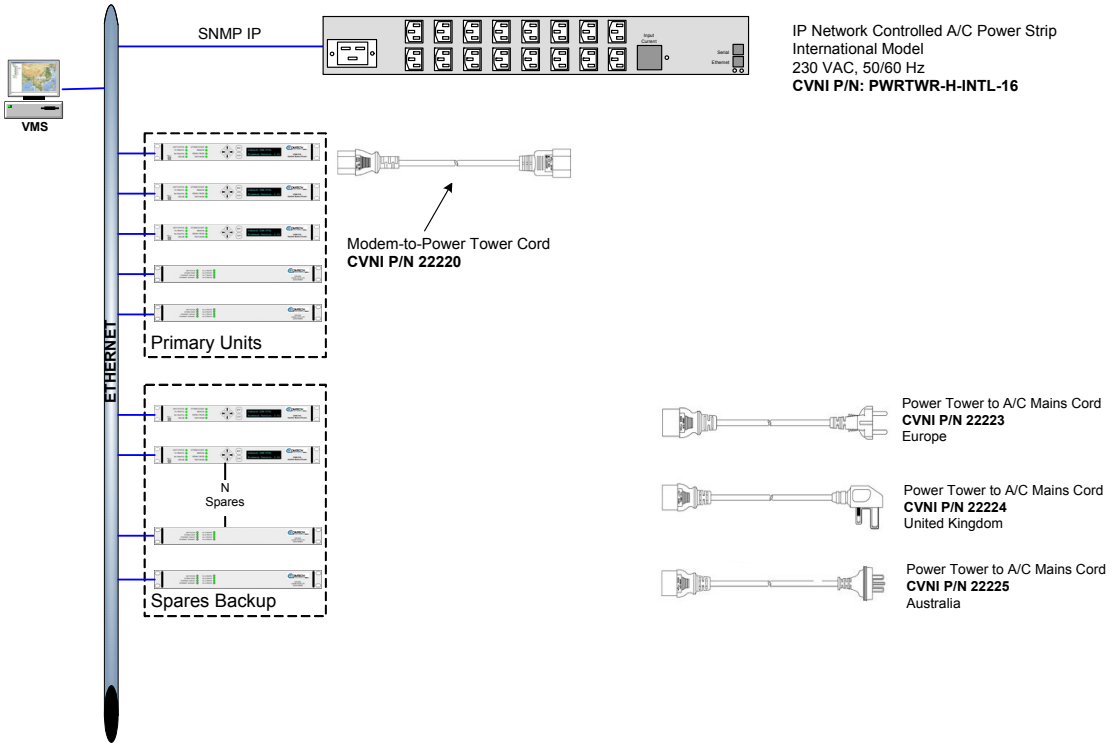


Figure C-11 Typical M:N Redundant Installation

The URL http://www.servertech.com/documents provides the *Power Tower XL/ XM Installation and Operation* manuals (in PDF form) for the network controlled power strip shown in figure C-11. Refer to these manuals for detailed information on this device.

NOTE

Note: All units in both the primary and secondary group must be identical, with exactly the same hardware configuration and accessories, and have identical firmware revision levels.

Use the following procedure to implement the optional M:N capability in a VMS network.

Setting Up M:N Redundancy

There are 3 hierarchal objects in M:N Redundancy, as shown in figure C-12. They are:

1. Redundancy Manager
2. Containers
3. Power Strips and Groups

Figure C-12 M:N Redundancy Hierarchy

Expanding the Redundancy Manager icon, shown in figure C-13, shows a typical M:N redundancy installation. Under the Redundancy Manager service icon are the icons for a container named Hub, in this example.

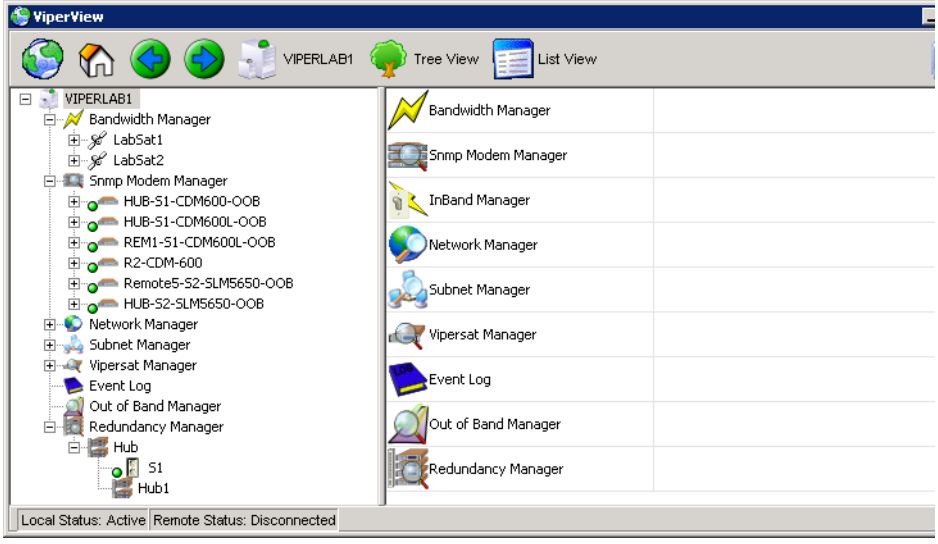


Figure C-13 Redunancy Manager Tree

Expanding the Hub icon shows additional icons such as the remote controllable switch labeled S1 in this example, and a group labeled Hub1.

Redundancy Manager

The Device Redundancy Manager is loaded as a service in ViperView. By right-clicking on it, as shown in figure C-14, the operator can enable device redundancy, create the main container for the site, and backup or restore the redundancy service.

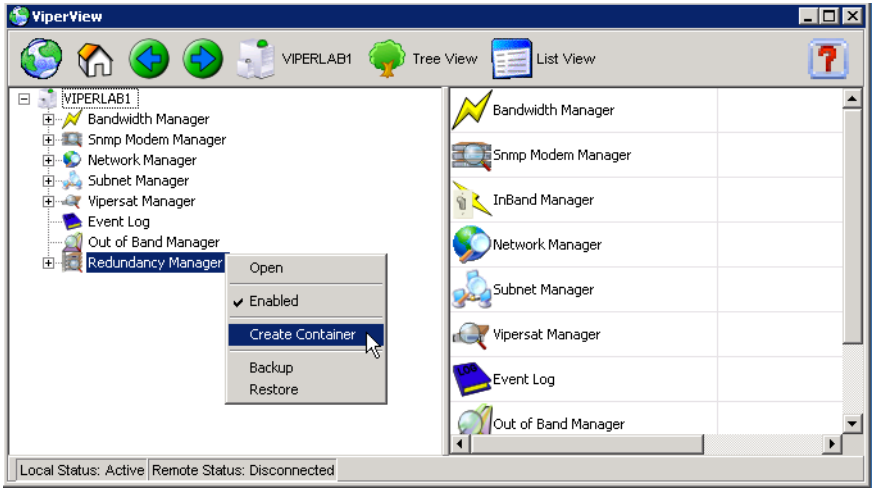


Figure C-14 Redundancy Manager Drop-down Menu

Create Container

Selecting **Create Container** from the drop-down menu in figure C-14, brings up the **Create New Redundancy Group** dialog shown in figure C-15. Clicking the OK button creates a container with the name assigned in this dialog.

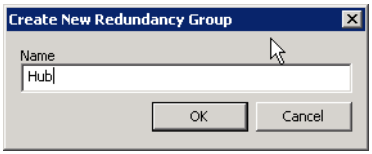


Figure C-15 Create Container dialog

Adding Strips and Groups

This top level container represents the main redundancy group. From it the operator can add Power strips and Sub-groups by right-clicking on the newly created Group icon and selecting from the drop-down menu shown in figure C-16.

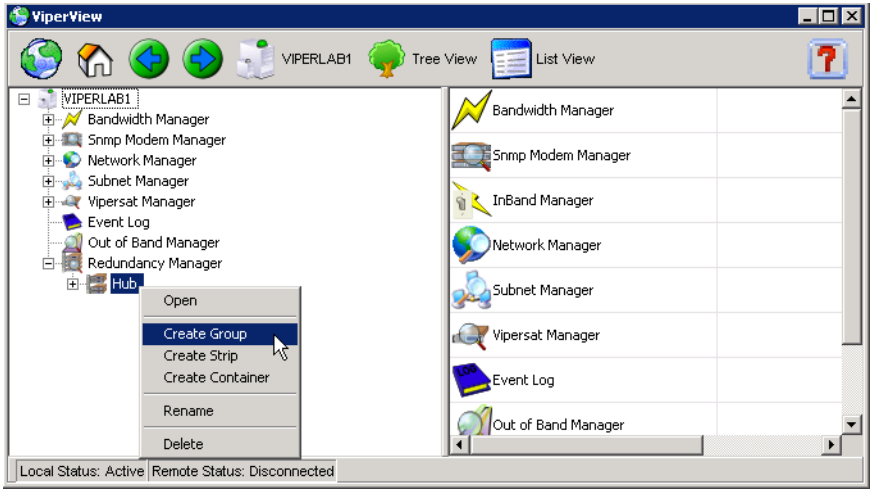


Figure C-16 Group Drop-down Menu

Power Strips

Selecting **Create Strip** from the drop-down menu shown in figure C-17, displays the New Power Strip dialog shown in figure C-18.

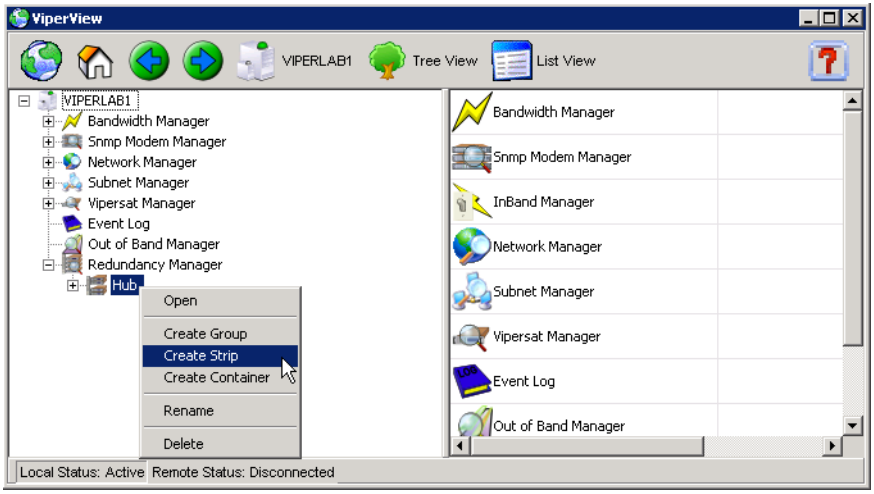


Figure C-17 Group Drop-down Menu

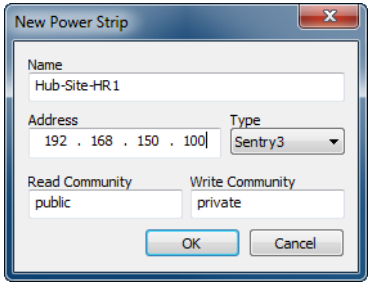


Figure C-18 New Power Strip dialog

The operator can name the strip (such as reference to a specific rack), enter the IP address, and select the type using the dialog in figure C-18. At this time VMS supports the Sentry 3 and 1 model of APC power strips. Vipersat recommends the Sentry 3. Leave the read and write communities public and private.

It will then be necessary to populate the strip with the primary and backup units. It is very important in this step to insure the association is made with the correct port. Populate the strip by dragging the unit from the subnet manager to the strip port as shown in figure C-19.

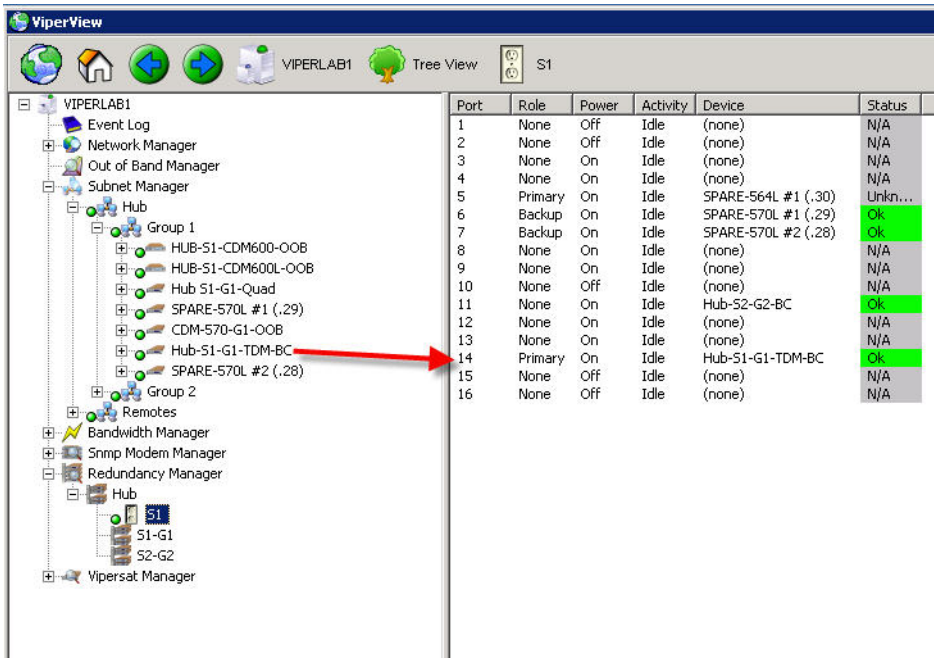


Figure C-19 Drag-and-Drop, Populating Power Strip

Redundancy Groups

After declaring the strip(s), right-click on the main redundancy group as shown in figure C-17 and select **Create Group** from the drop-down menu. This next group will represent the redundancy group for a given satellite or network.

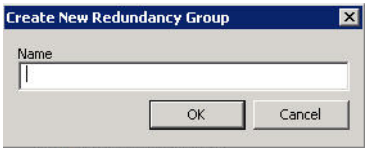


Figure C-20 Create Group dialog

Once the group is created, drag the port to the group sub-container as shown in figure C-21. Group sub-containers can have entries from multiple strips.

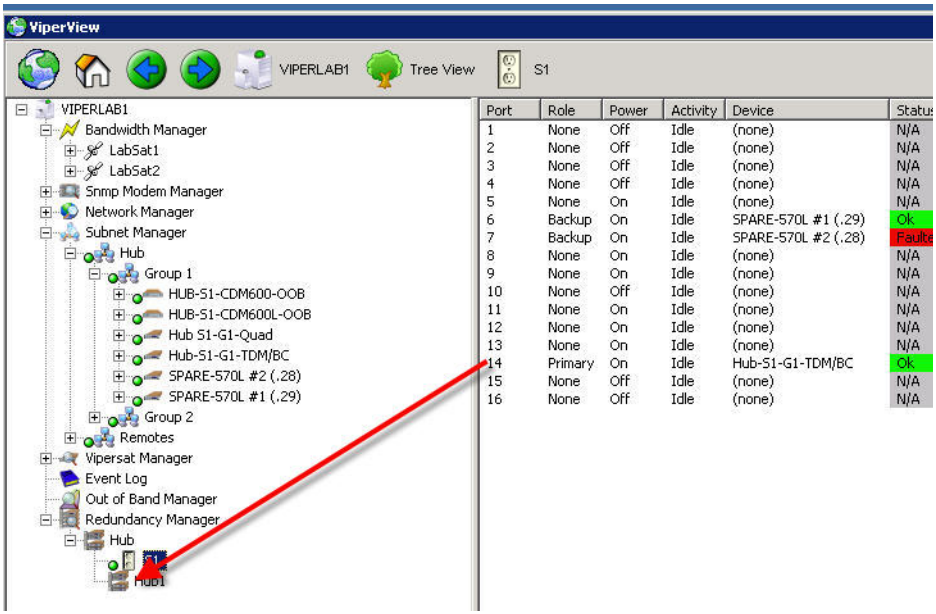


Figure C-21 Drag Port to Group Sub-container

Enabling Heartbeats

Next, enable heartbeats in the VMS and the devices.

From the Subnet Manager, right-click on the desired device and open the **Properties** page shown in figure C-22. Check the **Enable Heartbeat** box.

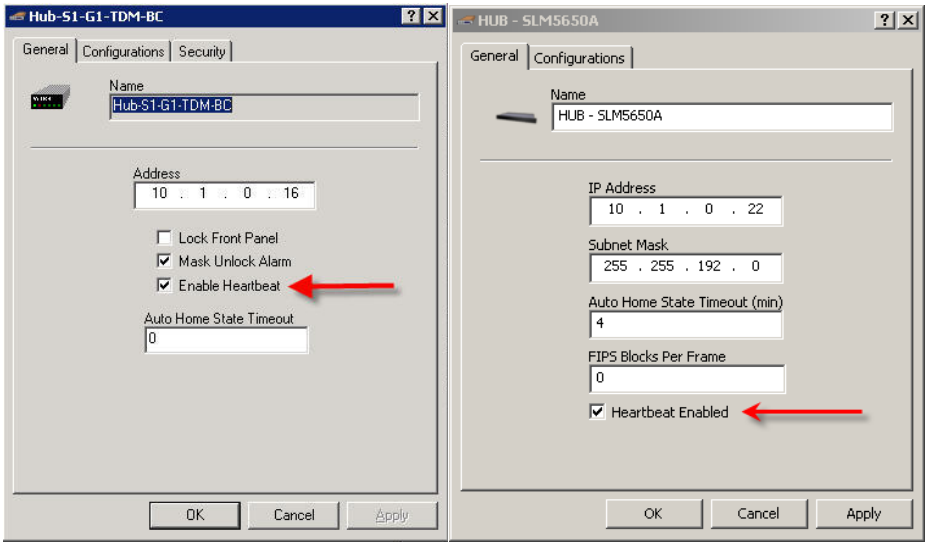


Figure C-22 Enable Hearbeat in VMS, CDM-570/570L (left), SLM-5650A (right)

Right-click on the device again and from the drop-down menu select **Configure**. On the **Vipersat** tab, shown in figure C-23, check the **Enable Heart Beat** box. Click the **OK** button to continue.

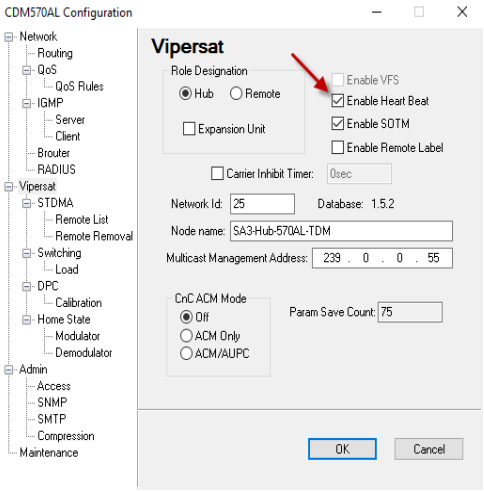


Figure C-23 Enable Heat Beat, CDM-570/570L Modem

Force registration on the device. On the next PLDM, the Status in the group window should turn green and change to OK.

Hub SLM-5650A Modem

Connect to the Hub modem using the Web interface, then select the **Vipersat** page as shown on figure C-24 and select **Enable** Heart Beat messaging.

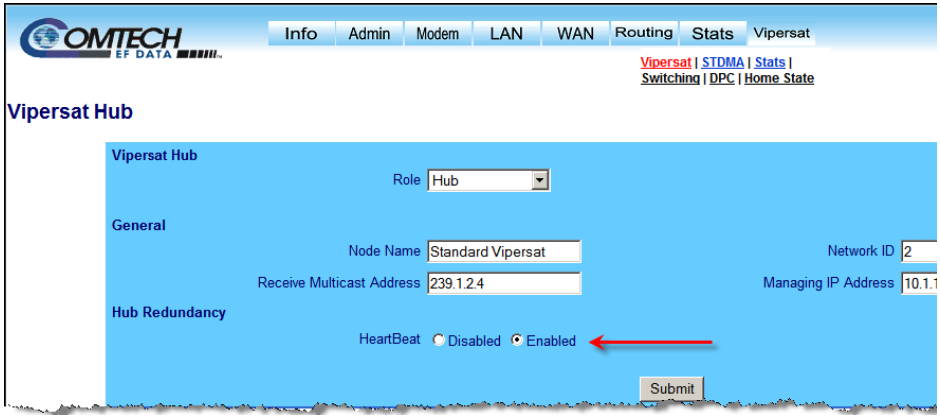


Figure C-24 Enable HeartBeat, SLM-5650A Hub Modem

Roles

Once the group sub-container is populated and heartbeats are enabled, roles can be defined for each of the ports by right-clicking on the device and selecting the appropriate role from the drop-down menu shown in figure C-34.

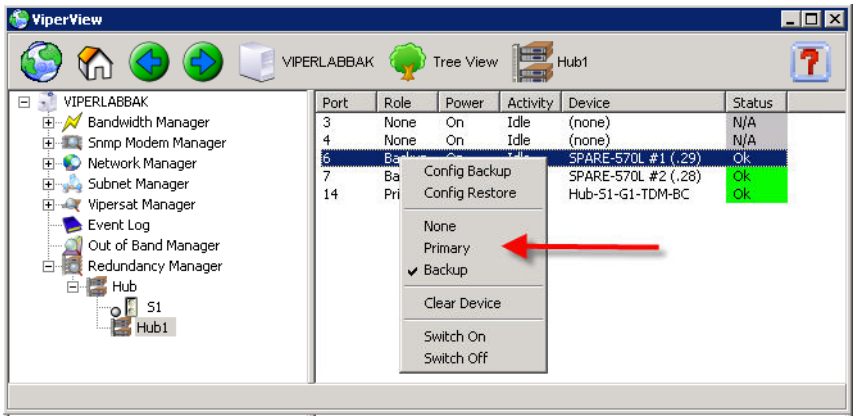


Figure C-25 Role Selection

Roles are either **None**, **Primary** or **Backup**. From this drop-down menu shown in figure C-34, the operator can also Backup the device configuration (a very important step after populating the group), restore the device configuration,

clear the device from the group or turn the port on or off. Before setting the roles ensure the Status for the device is Ok as shown in figure C-34.

There are four possible status indications:

1. **Ok** – Hearbeats are enabled in both VMS and the device, are being received by VMS and have no fault indications.

2. **Unknown** – Heartbeats are not enabled in VMS. May be enabled or not in the device.

3. **Faulted** – Hearbeats are enabled in VMS but not in the device or heartbeats are being received with a fault indication (non-zero status).

4. **N/A** – The port is not in use.

VMS will select only appropriate units from the list of backups. For example, only CDM570 backups will be used to backup a failed CDM570 even if there are CDD564 units designated as backup units earlier in the list.

Backup Configurations

At this point it is necessary to pull backup configuration files from each of the units. Clicking on the **Config Backup** command on the drop-down menu shown in figure C-26 stores these configuration files in the directory path: *C:\Program Files\Vipersat\VMS\3.0\bin\Device Redundancy.*

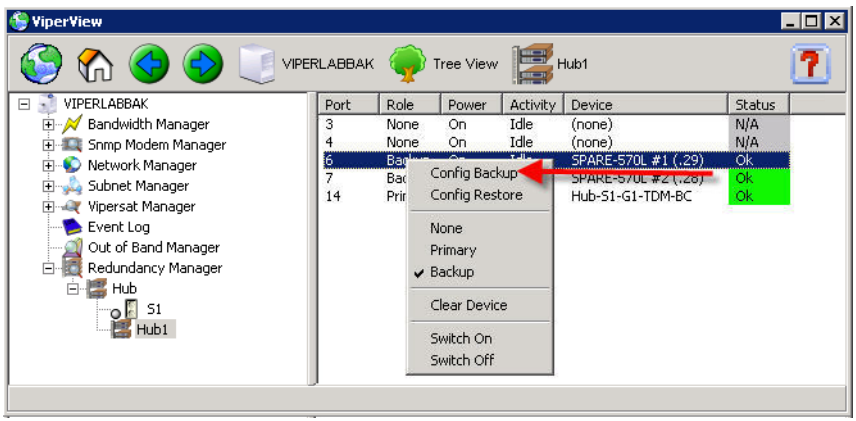


Figure C-26 Configuration Backup

System Restoration

Once VMS performs a unit restoration, the backup unit will take on all the characteristics of the original unit that failed, including its IP address. Unless the operator wishes to maintain the original rack profile, the failed unit can either be repaired or replaced and designated as a backup to the unit which is now functioning as the primary.

Should the operator desire to return to the original rack profile the following steps are mandatory and will require a system/segment outage!

Pre-Configuring Backup Files

The files created in the preceding step are used by VMS for automatic redundancy and are not available to the operator for restoring device units to their original role. It will be necessary to create these files so they will be available for this purpose.

Creating Backup Configuration Files

From the Subnet Manager, right-click on the target unit, open the **Properties** page and select the **Configuration** tab shown in figure C-27.

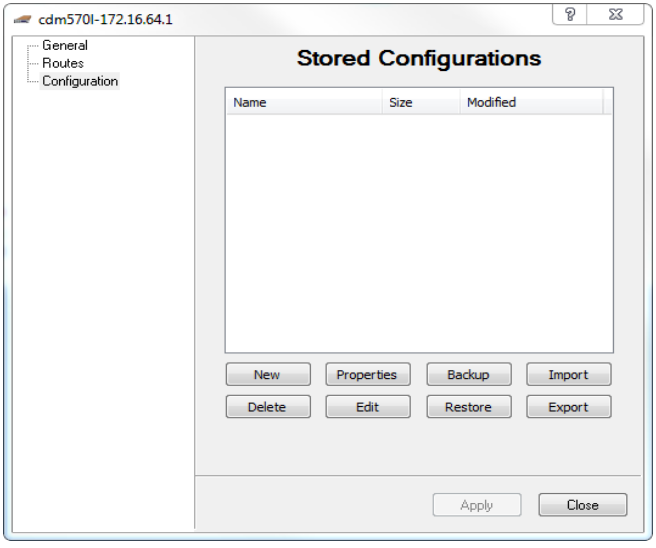


Figure C-27 Configuration tab

Click the **New** button, shown in figure C-28 which will open the **New Configuration** dialog shown in figure C-28.

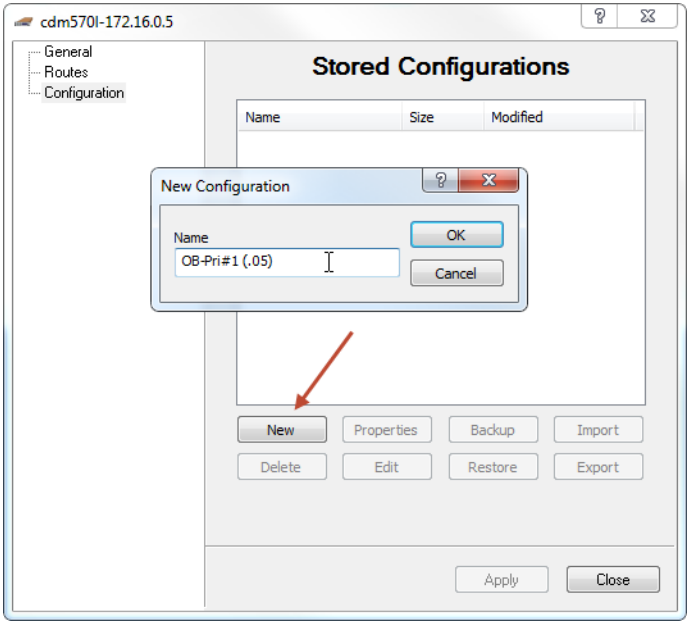


Figure C-28 New Configuration dialog

Give the configuration file an appropriate name in the **New Configuration** dialog in figure C-28 and click the **OK** button. Then highlight the file name as shown in figure C-29 and click the **Backup** button.

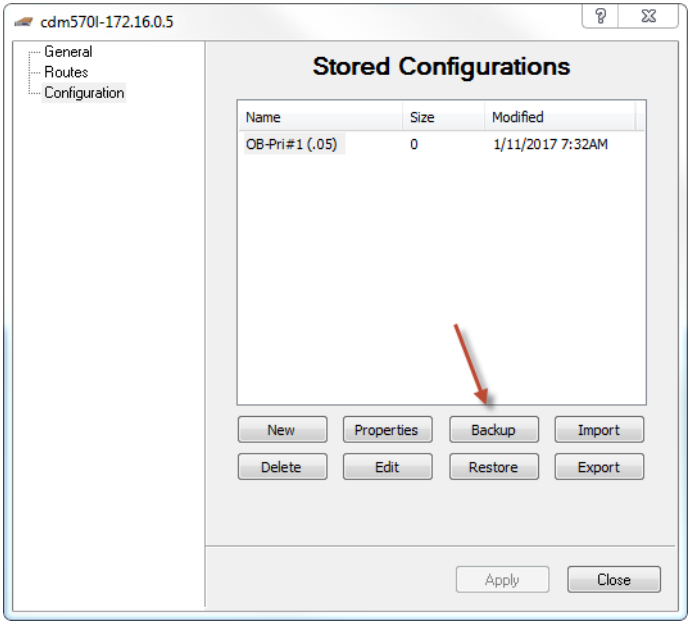


Figure C-29 Creating Backup Configuration File

By default the file will be saved in the location shown in figure C-30.

Figure C-30 Saved File Location

Automatic Configuration Backup Synchronization

Configuration synchronization detects any changes to primary hub device unit configurations automatically updating backup files. After the initial file is created and stored any subsequent changes to the device by the operator are automatically backed up.

During heartbeat processing notifications are sent from the hub device that provide information to the VMS that their unit configuration was just modified. With this indication the VMS will automatically update the redundant backup files for each device synchronizing any new configuration changes.

Supporting devices and versions:

- CDM-570/570A, v1.6.23, v2.6.23/v1.4.3 or greater
- CDD-564/564A, v1.6.23/v1.4.3 or greater
- HT0-1/HRX-450, v2.4.1 or greater
- HRX-16/64, v2.4.1 or greater

Storing Spare Configurations in Primary Units

Once these backup files have been created, it is necessary to add all possible spare units to the **Configurations** tab for each of the primary units. This is done by creating a new configuration file name, highlighting it, then clicking the **Import** button as shown in figure C-31 and importing the file from the directory shown in figure C-32.

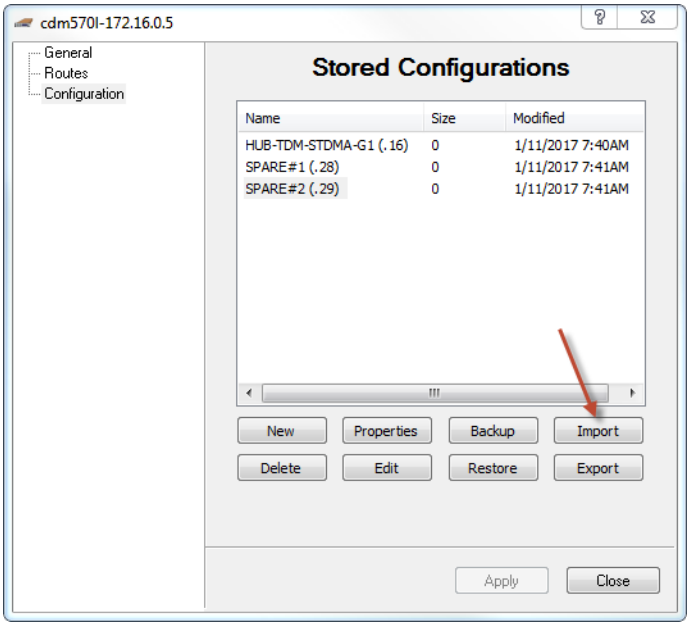


Figure C-31 Importing File

Select the appropriate file from the list:

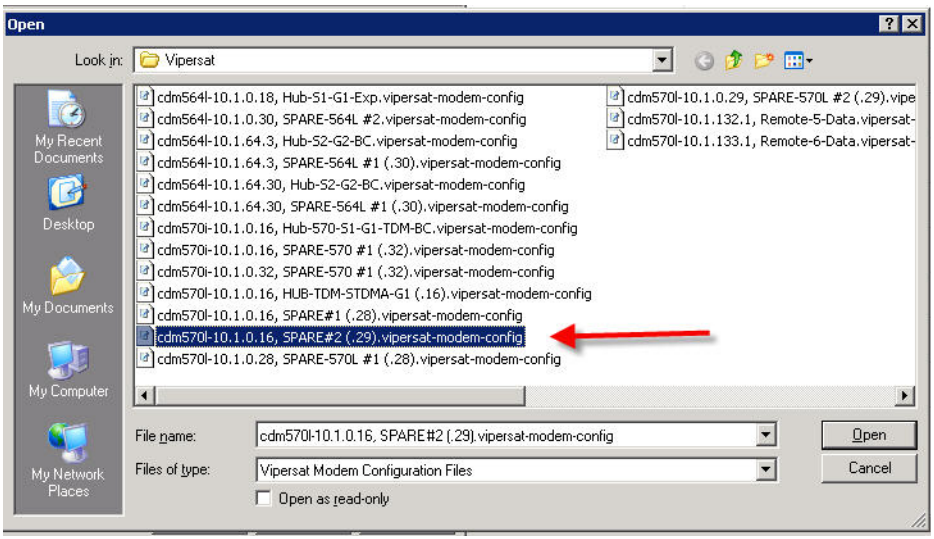


Figure C-32 Selecting File

Preparing Repaired/Replacement Unit

Pre-configure the repaired/replacement unit with the configuration of the primary unit being replaced. This step should be performed on a separate LAN segment from the satellite network to avoid conflicts. Vipersat strongly recommends using VLOAD to maintain backups of all network units. These backup files can be used for this purpose.

Install the replacement unit in the desired rack location and make all connections. The unit should be powered on, but insure the switch port is powered off.

Restoring Acting Primary Unit Spare Configuration

Since the backup unit assumed the identity of the failed primary unit during restoration, it will appear in the Subnet Manager as the original unit. Right-click on the unit and open the Properties page. Go to the Configuration tab and select the appropriate spare configuration imported in the preceding step. Be sure to select the proper configuration to avoid IP address conflicts.

Select Restore to load the configuration.

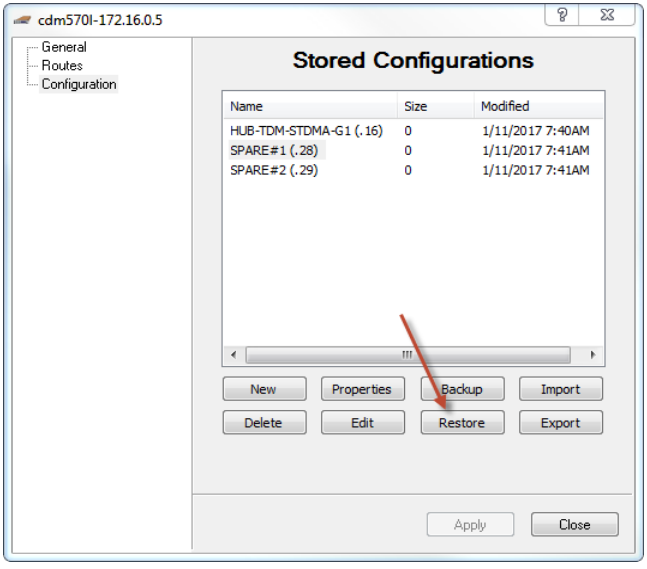


Figure C-33 Restoring Configuration

At this point, the network segment controlled by this primary unit will go down. Power up the new primary unit using the drop down menu on the strip, or in the sub-group. If the configuration is correct, the network segment will automatically come back up after the unit reboots.

Cleaning up

Once the network has been restored, it will be necessary to create new configuration backups from the drop-down menus and to reset the system roles. Insure the status is OK. (It may be necessary to reset heartbeat flags)

How M:N Redundancy Works

In the event of failure of any active device, a unit from the spare device pool is configured with the configuration of the failed device, including its IP address, and re-initialized without a hard reset. VMS switches off power to the failed device immediately after detecting failure to ensure the failed device will not conflict with its replacement device when the replacement device is booted into service.

NOTE

Note: Once a failed device has been detected, the total elapsed time to remove power, configure a device from the spare pool with the failed device's configuration, and place that device into service in the satellite network is generally less than 5 seconds.

Device Failure Detection

Each device protected by M:N redundancy in a satellite network transmits a packet, called a heartbeat, at timed intervals whenever M:N redundancy is enabled on the device. During registration, VMS establishes the heartbeat interval for each protected device. The heartbeat packet contains the following information:

- The unit's IP address
- The unit's health/fault status
- The unit's receive and transmit health or fault status

The VMS monitors and analyzes each received heartbeat packet for information for a switch trigger such as:

- No heartbeat is detected within the Timeout parameter setting in Vipersat Manager (default is 10.25 seconds).
- The unit transmits a fault status indicating the unit's health, or loss of transmit or receive capability for a period of 25 seconds (default).

The Switch-Over Process

The switch-over process involves both the Vipersat Manager and the Redundancy Manager.

Vipersat Manager

Activity in the Vipersat Manager starts when the VMS M:N redundancy capability is enabled, then proceeds as follows:

1. VMS monitors error messages and heartbeat packets from protected units for an event indicating that a redundancy switch is required.

2. When an event is detected that requires a redundancy switch, VMS sends a notification event to the VMS Log service.

3. VMS sends notification to the Redundancy Manager that a switch-over is required.

Redundancy Manager

The Redundancy Manager receives the switch-over request from VMS which starts the following process:

1. The Redundancy Manager checks that the VMS notification is a for a valid switch condition. If the condition is not valid, the Redundancy Manager sends its action to the VMS log service and returns to waiting for the next event notification.

2. If the notification is a valid switch condition, the Redundancy Manager checks to see if there is a backup unit available. If no unit is available, the Redundancy Manager send this information to the VMS Log Service and returns to waiting for the next event notification.

3. If there is a backup unit available, the Redundancy Manager sends a command to the remote managed power control unit to turn off power to the plug used by the failed primary unit.

4. The Redundancy Manager saves (puts) the redundant configuration and base modem parameters to the backup unit.

5. The Redundancy Manager commands a firm reset of the backup unit.

6. After the switch, the backup unit is configured as the original primary unit and joins the network performing the same functions as the failed primary unit.

7. When the unit switch-over is completed, the Redundancy Manager sends the event to the VMS Log service, completing the switch-over process.

8. The Redundancy Manager resumes waiting for the next event notification.

Putting Failed Unit Back into Service

This section describes the process of configuring a VMS controlled modem before connecting it to a VMS network as an M:N redundant backup unit.

Caution: A repaired failed unit will have the same IP address and function as its replacement unit which is currently online. Use the following procedure when returning the unit back into service as a backup. To avoid conflict with the online primary unit and possible loss or degradation of satellite network communications, use the following procedure.

Use the following procedure when putting a VMS controlled modem into service. The unit must have its IP address changed and its configuration modified to backup mode so that it can be connected to the network without conflicting with any ongoing communication or network control functions.

Warning: Do not apply power to the unmodified unit while it is still connected to the network. To do so may cause the network to behave unpredictably and possibly fail. A unit removed from service MUST be set to backup configuration before being placed back into service.

1. Disconnect the Ethernet connection between the unit and the LAN.

2. Remove all RF connections from the VMS controlled modem to the network.

Tip: To test a failed unit and then put it into backup configuration before putting it back into service, ideally it should be removed from the rack and the power cord removed from the unit's rear connector leaving the power cord connected to the remote managed power control unit.

Setting Unit to Parked Configuration Mode

All modem units that will be installed into an existing VMS network should be configured for parked mode to ensure that:

- The unit will be recognized and respond to VMS commands.
- The unit will not try to assume an active role in the network until it has been commanded to do so by the VMS.

Connect to the unit using the serial console port as described in the unit's documentation available for download at: http://www.comtechefdata.com/

NOTE

Note: The following configuration procedure is presented for a *CDM-570/L* modem/router. The same configuration steps would apply to other Vipersat modem types (e.g., SLM-5650A, Series800), but with some variation due to the user interface for the given modem type. Refer to the modem user manual for specific details.

1. Turn the unit **On**.

2. On the Administration > **Feature Configuration** page shown in figure C-34, enter the unit's features and unlock codes.

```
                    Feature Configuration

Ping Reply...............................[Enabled]...............................P
Telnet...................................[Enabled]...............................E
SNMP.....................................[Disabled]..............................N
IGMP.....................................[Disabled]..............................I
Downlink Route All Available Multicast..[Disabled]..............................M
Quality of Service (QoS).................[Enabled]...............................Q
Transmit 3xDES Encryption................[Per Route]..............................T
Receive 3xDES Decryption.................[Available]
Tx Header Compression....................[Per Route]..............................H
Rx Header Compression....................[Disabled]..............................K
Tx Payload Compression...................[Per Route]..............................C
Rx Payload Compression...................[Available]
FAST Feature Code.......................................................................Y
Vipersat Feature Codes...................[341:C32C-8360-7342:5.02]...............F
Vipersat Management......................[Enabled]
Vipersat STDMA...........................[Enabled]...............................A
Vipersat Auto Switching..................[Enabled]...............................W


Save Parameters to permanent storage....................................................S
Exit....................................................................................X
Telnet Logout...........................................................................L
```

Figure C-34 Feature Configuration page, CDM-570/570L

3. Disable STDMA.

4. On the **Administration** page shown in figure C-35, set the *Working Mode* to **Router - Vipersat**.

```
                    Administration

Name/Password Configuration.............................................................P
Access Lists............................................................................A
Feature Configuration...................................................................F
3xDES Configuration.....................................................................D
SMTP Configuration......................................................................M
SNMP Configuration......................................................................N
Working Mode.......................................[Router - Vipersat].........C
Easyconnect Multicast Option.......................[Disabled]..................E
Header comp refresh rate (in pkts) for UDP/RTP1....[50]........................H
Header comp refresh rate (in pkts) for UDP.........[50]........................U
Header comp refresh rate (in pkts) for all others..[50]........................O
Payload comp refresh rate (in pkts)................[50]........................Q
Telnet timeout.....................................[60]........................T


Save Parameters to permanent storage....................................................S
Exit....................................................................................X
Telnet Logout...........................................................................L
```

Figure C-35 Administration page, CDM-570/570L

5. Using the **Ethernet Interface** page shown in figure C-36, set the unit's *IP Address* to the IP address of the backup unit which replaced it. If you do not use this IP address, make certain that the IP address is on the Hub subnet and is not being used by any other active or backup unit.

```
                              Ethernet Interface

MAC Address...............[00-06-B0-00-0C-76]
Speed/Mode................[Auto]..............................................E
IP Address................[192.168.0.10]......................................I
Subnet Prefix Length......[ 24   ]............................................M
Link Status...............[Auto - Neg Done For 100-Full Mode -- Link UP]


Save Parameters to permanent storage.........................................S
Exit.........................................................................X
Telnet Logout................................................................L
```

Figure C-36 Ethernet Interface page, CDM-570/570L

6. On the **Vipersat Configuration** page shown in figure C-37, set the *Unit Role* to **Hub Expansion**.

7. This completes setting the unit to the Parked Configuration mode if it is a CDM-564L. It is possible the unit was being used to supply voltage to a LNB, which is described below.

```
                              Vipersat Configuration

STDMA Mode...................................................................T
Automatic Switching..........................................................A
Unit Role....................[Hub]...........................................R
Expansion Unit...............[No]............................................E
Network ID...................[45]............................................B
Unit Name....................[HUB-TDM/BC-GRP#1]..............................N
Receive  Multicast Address....[239.4.5.6]....................................V
Managing IP Address...........[192.168.0.56]..................................I
Primary Heart Beat............[Disabled]....................................P
Dynamic Power Control Config.................................................C
Set Home State Parameters....................................................H
Vipersat Summary.............................................................D


Save Parameters to permanent storage.........................................S
Exit.........................................................................X
Telnet Logout................................................................L
```

Figure C-37 Vipersat Configuration page, CDM-570/570L

8. On the Satellite Modem Configuration > Configuration > **Tx Configuration** page shown in figure C-38, disable the unit's transmit capability by changing the *Tx Carrier* to [**Off**].

```
                              Tx Configuration

Tx Frequency...........[1205.0000]..............................................Q
Tx Data Rate...........[1024.000]...............................................D
Tx Symbol Rate.........[0682.667]
Tx FEC.................[Turbo]...................................................T
Tx Code Rate...........[3/4].....................................................R
Tx Modulation..........[QPSK]....................................................M
Tx Spectrum Inversion..[Normal]..................................................U
Tx Data Inversion......[Normal]..................................................I
Tx Scrambling..........[On-Default]..............................................B
Tx Power Level.........[18.0].....................................................P
Tx Carrier.............[On].......................................................C
Tx Clock Source........[Internal]


Save Parameters to permanent storage............................................S
Exit............................................................................X
Telnet Logout...................................................................L
```

Figure C-38 Transmit Configuration page, CDM-570/570L

9. On the Satellite Modem Configuration > Configuration > **Rx Configuration** page shown in figure C-39, set the *Rx Frequency* to the **Low End** (50 or 950).

```
                              Rx Configuration

Rx Frequency...........[1206.0000]..............................................Q
Rx Data Rate...........[0128.000]...............................................D
Rx Symbol Rate.........[0085.333]
Rx FEC.................[Turbo]...................................................T
Rx Code Rate...........[3/4].....................................................R
Rx Demodulation........[QPSK]....................................................M
Rx Spectrum Inversion..[Normal]..................................................U
Rx Data Inversion......[Normal]..................................................I
Rx Descrambling........[On-Default]..............................................B
Rx Acquisition Range...[010]....................................................W
Eb/No Alarm Point......[02.0]....................................................P
Rx Buffer Size.........[Disabled]................................................F
Recenter Rx Buffer..............................................................C


Save Parameters to permanent storage............................................S
Exit............................................................................X
Telnet Logout...................................................................L
```

Figure C-39 Receive Configuration page, CDM-570/570L

10. On the Satellite Modem Configuration > Configuration > **Block Up Converter (BUC) Configuration** page, set the *BUC DC Power* to **Disabled**, as shown in figure C-40.

```
                    Block Up Converter (BUC) Configuration


BUC Address.........................[ 1    ]...................................A
BUC RF Output.......................[Disabled]..................................R
BUC DC Power........................[Disabled]..................................W
BUC 10 MHz Reference................[Disabled]..................................P
BUC Current Alarm Upper Limit (mA)..[ 3500 ]...................................H
BUC Current Alarm Lower Limit (mA)..[ 1000 ]...................................C
BUC LO Frequency (MHz)..............[00000-]...................................F


Save Parameters to permanent storage...........................................S
Exit...........................................................................X
Telnet Logout..................................................................L
```

Figure C-40 BUC Configuration, CDM-570/570L

11. On the Satellite Modem Configuration > Configuration > **Low Noise Block Converter (LNB) Configuration** page, disable the *LNB DC Supply Voltage* by setting it to [**Off**], as shown in figure C-41.

```
                    Low Noise Block Converter(LNB) Configuration


LNB DC Supply Voltage...............[Off]...........................................P
LNB 10MHz Reference.................[Off   ]........................................R
LNB Current Alarm Upper Limit (mA)..[ 600  ]...................................H
LNB Current Alarm Lower Limit (mA)..[ 10   ]...................................C
LNB LO Frequency (MHz)..............[00000+]...................................F


Save Parameters to permanent storage...........................................S
Exit...........................................................................X
Telnet Logout..................................................................L
```

Figure C-41 LNB Configuration, CDM-570/570L

12. This completes the process of setting the modem/router to parked configuration mode, and it is now ready to be put back into service.

13. If the repaired unit is to be connected to the same plug, it will automatically reinstate the unit as a member of the backup group. VMS identifies the unit by its MAC address so if, for any reason, the failed unit is replaced with another unit, you will have to go to VMS and drag the newly installed unit to the appropriate plug on the power strip to complete its installation.

Caution: Failure to follow the discipline of connecting the repaired unit to the correct plug on the remote controlled power strip will result in the unit not being able to be turned off if it fails while acting as the primary unit, resulting in the possibility of having two active units trying to operate in the same role and consequently crashing the network.

Carrier Preservation

The system components are evolving into higher performance and real estate reduction where units are increasing in the amount of carriers that a single rack unit can support. Focusing on the hub receive initially units only supported one return path demodulator. As technologies evolve the amount of receive channels in a single unit have increased in steps of (CDD-564) 4, (CDD-880) 12 and now (HRX-16) 48 demodulators.

This increase pushes the degree of a single outage where a HRX-16 on failure (device redundancy/reboot) will push up to 48 remotes back into entry channel on failure resulting in a large network outage, which will be greater than 4 minutes. Even with hub device redundancy feature a switchover will still result in a large network outage.

To reduce this return path outage Carrier Preservation was added to preserve dSCPC carriers during a hub receive unit failure with or without hub device redundancy.

Currently if the managed hub demodulator unit fails, redundant failover the unit coming online has lost the entire dynamic allocation configuration leaving all managed dSCPC returns associated in limbo until carrier recovery logic completes. If the redundancy manager initiates a failover the backup unit assumes the role of the primary unit that has failed. Within this process the remotes associated are also in limbo until the disconnect carrier recovery timers expire, which places a large group of remotes into entry channel contention.

Typically the remotes are unaware that the hub demodulator unit has changed or gone away, not until the remote receives a Revert command from the VMS. With the absences of the hub receive path the required remote SUM messages sent on 60 second intervals will timeout after approximately 3 minutes causing a disconnect which triggers recovery issuing a Revert. However during the 3 minute recovery window the remote carriers will remain at last dSCPC state.

To enhance this behavior the carrier preservation process removes the need to force active dSCPC carriers back through entry channel.

Current Performance:

- Reboot = ~190 seconds + Entry Channel
- Redundancy Switchover = ~204 seconds + Entry Channel

Taking advantage of this recovery window allows the system time to reconfigure the demodulator unit with remote carrier last state configurations.

The VMS is aware of all dSCPC allocations, which are temporarily stored carrier information.

Using this information the carrier preservation feature tracks all current allocations and on a registration request during a redundancy switchover of the backup unit the preservation task sends switch commands only to the hub unit reconfiguring the last carrier states. After demodulator reconfiguration the remotes will resume communications with only a minimal outage.

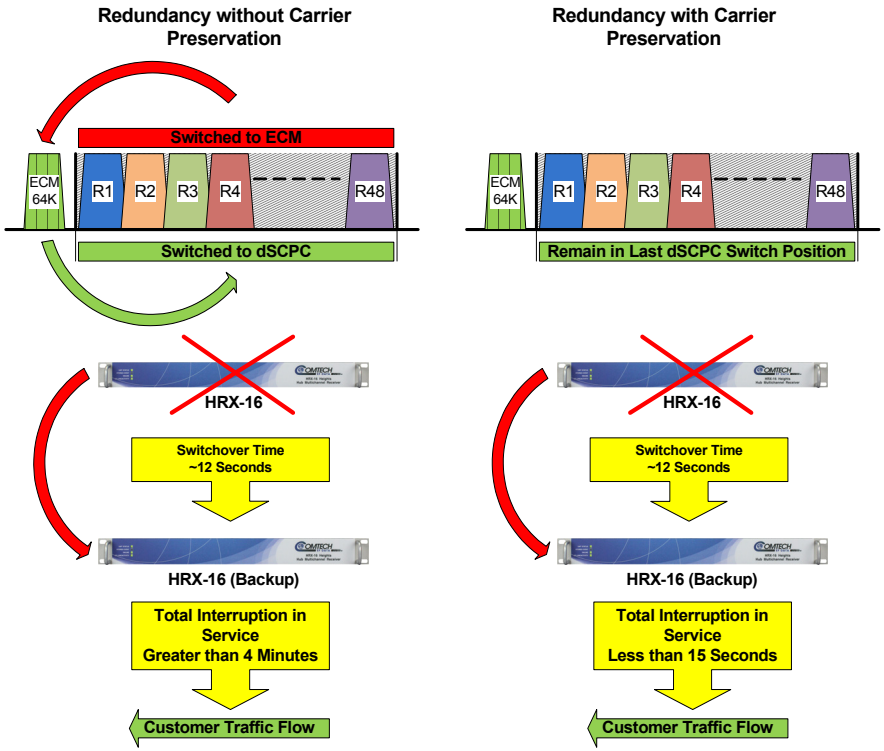


Figure C-42 Carrier Preservation Process

Performance Enhancements

- Reboot = ~60 seconds
- Redundancy = < 15 seconds

Currently Supported Units:

- CDD-564/564A
- CDM-570/570A
- CDD-880
- HRX-16/64

D

SNMP TRAPS

Introduction

This appendix describes the use of SNMP traps by the Vipersat Management System (VMS). SNMP traps enable the VMS to capture significant network events, then generate an SNMP message reporting the event. In a VMS controlled satellite system, this configuration has several advantages:

- The VMS system, using its existing network monitoring capability, acts as a central collection point for all changes to the satellite network status and provides a single source for SNMP events reported for the satellite network. Individual network devices are not required to generate SNMP traps thereby reducing network overhead bandwidth.
- The VMS collects network changes and status as they occur and as they are reported by the satellite network's modem/routers as part of the normal VMS management and control function.
- Only events defined by the Vipersat MIB are sent as SNMP traps. This reduces the requirement to have each device transmit an SNMP trap as its status changes thereby reducing network overhead bandwidth requirements.

NOTE

Note: Since VMS only collects and reports SNMP events from the satellite network and it is not the source of the event, you cannot query the VMS for additional information about an SNMP trapped event.

Using SNMP Traps

SNMP (Simple Network Management Protocol) along with the associated Vipersat Management Information Base (MIB), provides trap-directed notification of network changes.

VMS can be responsible for a large number of network parameters as defined in the Vipersat MIB. It is impractical for VMS to poll or request information from each device in a satellite network. Instead of each managed device generating its own SNMP traps, the VMS detects network status changes and when an event defined in the MIB occurs responds with a message called a trap.

After receiving a VMS generated trap, a high-level SNMP monitor can take action based on the trap type, and its parameters.

Using the VMS SNMP traps results in substantial savings of network bandwidth by eliminating the need for polling devices or having each device in the network generate its own SNMP traps. The primary purpose of and SNMP trap is high-order NMS notification.

SNMP Traps Available in VMS

The SNMP trap types available in VMS are:

- **Subnet Alarm Trap** - This trap is sent to the designated destinations whenever a subnet's alarm count or status in Subnet Manager is changed. This trap contains two values: 1) subnetLabel, 2) subnetAlarmCount
- **VMS Server Activated Trap** - This trap is sent to the designated destinations whenever a VMS server is activated (it's services are started). The IP address in the trap variable is the VMS server that has been activated. This trap contains one value: redundancyMode
- **VMS Active Server Failed** - This trap is sent by a VMS server operating in stand-by (non-active) mode whenever it has detected a failure of active server. A vmsServerActivatedTrap will follow when the stand-by is activated. This trap contains one value: redundancyMode
- **Redundant Device Restored Trap** - This trap is sent by VMS whenever the VMS Redundancy Manager has detected a failed device, has shut down the failed device, and has restored the failed unit with another device. This trap has four variables.

NOTE

Note: SNMP Traps relative to the operation of servers in an N:1 redundant configuration only apply to a network which has the optional N:1 redundant capability available, installed, and configured.

Configuring SNMP Traps

To configure SNMP traps, from ViperView, shown in figure D-1, right click on the server's icon and select the Properties command from the drop-down menu.

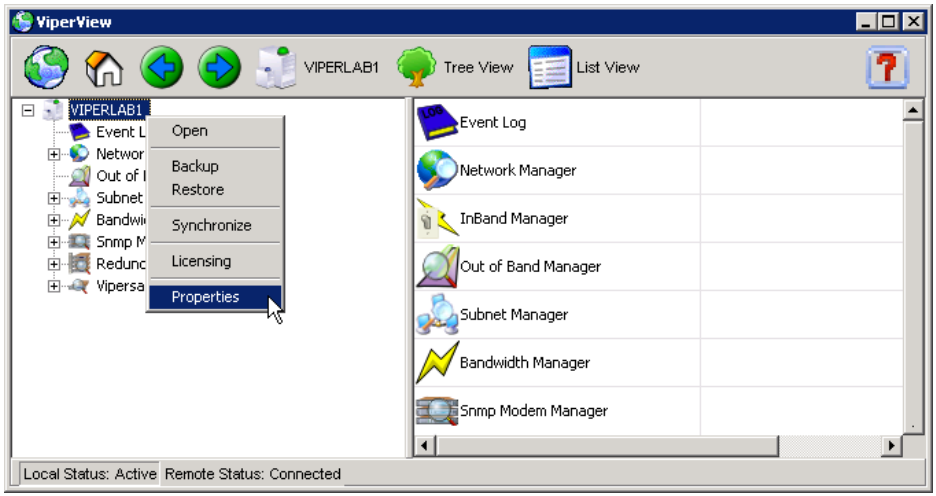


Figure D-1 Server Drop-Down Menu

Clicking the **Traps** tab on the server's properties screen displays the **Traps** dialog shown in figure D-3.

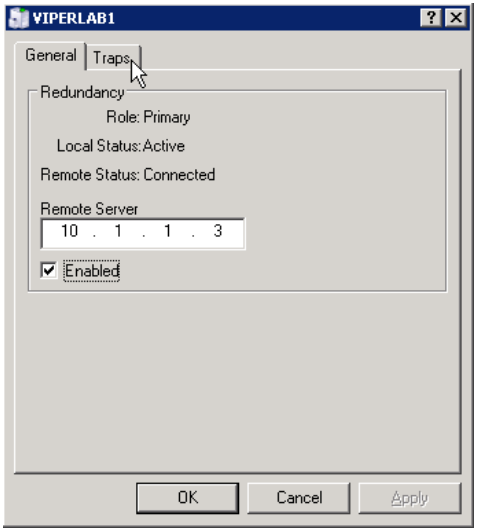


Figure D-2 Properties General Tab

Select the **Traps** tab to display the **SNMP Manager TRAP** dialog shown in figure D-3. You can enter the Trap's destination information consisting of:

- IP address of SNMP manager receiving trap
- Port number
- Community String

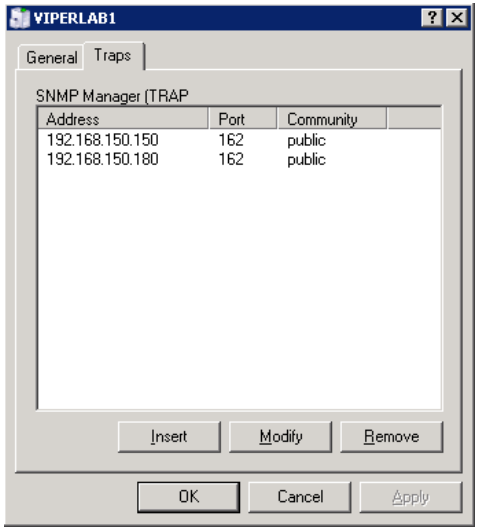


Figure D-3 Server Traps Tab

Insert

Clicking the **Insert** button displays the **Trap Destination** dialog shown in figure D-4 allowing you to enter the Trap's destination:

- IP Address
- Community String
- Port Number

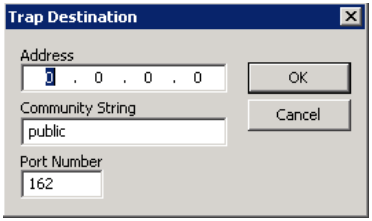


Figure D-4 Trap Desitination

Modify

Selecting an existing Trap Destination from the list as shown in figure D-3 then clicking the **Modify** button will display the destination as shown in figure D-4 allowing you to change the Trap destination as required.

Remove

Selecting a Trap Destination from the list shown in figure D-3 then clicking the **Remove** button will remove the Trap Destination.

Summary

You should keep in mind the following characteristics of an SNMP Trap.

- SNMP is not a “reliable” transport protocol. If the Trap message is lost due to network issues (congestion, noise, delays, etc.), the SNMP protocol will NOT retransmit the lost trap message.
- SNMP (v1&v2) is not a secure protocol. It is not difficult to eavesdrop or spoof messages. Isolating SNMP traffic from end-user channel is recommended.
- VMS will generate a trap message for each destination entered. Entering 10 trap destinations, for example, will generate 10 trap messages for each event.
- Only a VMS server in Active mode will generate trap messages. A redundant VMS server in stand-by mode will not generate or send a trap message until it is switched to Active mode for example the Primary server failure is detected.
- At this time there is no VMS SNMP agent in VMS. An SNMP Manager cannot poll VMS for status or configuration detail information.
- Current trap uses SNMP v1.

E

AUTOMATIC SWITCHING

General

Automatic switching is a feature of the VMS that allows dynamically changing the network configuration in response to changes in either network traffic loads (Load switching), traffic type (Application switching), or Type of Service (ToS switching) detecting stamped packets with Diffserv values. Entry Channel Mode switching and Carrier Presence switching are also covered here.

These switching types are presented in the following material which uses CDM-570/L, SLM-5650A, and Series800 modem units for purposes of illustration. For simplicity, these units shall be referred to as modem/routers.

The basic signal topology in a Vipersat network is TDM (Time Division Multiplex) outbound and Vipersat's proprietary STDMA (Selected Time Division Multiple Access) inbound. The STDMA slots can have their duration and bandwidth allotments varied, tailoring bandwidth allocation to meet the bursty traffic load of a typical data network.

When required, a network is switched from STDMA to SCPC. SCPC bandwidth is allocated from a bandwidth pool by the VMS to meet QoS or other requirements for the duration of a connection. When the SCPC connection is no longer required, the bandwidth is returned to the pool for use by another client.

This basic structure gives the VMS-controlled network its flexible, automated network utilization and optimization capability.

The VMS has the intelligence to interpret the constantly changing statistics gathered by the Vipersat modem/routers and uses this data to issue commands

back to these intelligent modem/routers, effectively managing the Vipersat network operation in real time, and optimizing each site's bandwidth usage to meet their QoS and cost requirements within their bandwidth allocation. The result is a stable satellite network connection that automatically responds to the customer's requirements while continuously monitoring and reacting to changing load, data type, and QoS requirements.

Hitless Switching

Unless inherent delays in configuring both ends of a satellite bandwidth link during dynamic switching are accounted for, transmitted data may be lost during the transition. The time for a switch command to be sent across the satellite link (~ 250 ms), the command processing time, as well as receiver acquisition time must be considered. The Vipersat **Hitless Switching** feature provides a means to coordinate timing and utilize buffering to eliminate these data outages.

The parameters for configuring the Hitless Switching feature for a CDM-570/570L are set from the screen shown in figure E-2. This screen is accessed from the STDMA/SCPC Auto Switching screen (see figure E-3 and figure E-5).

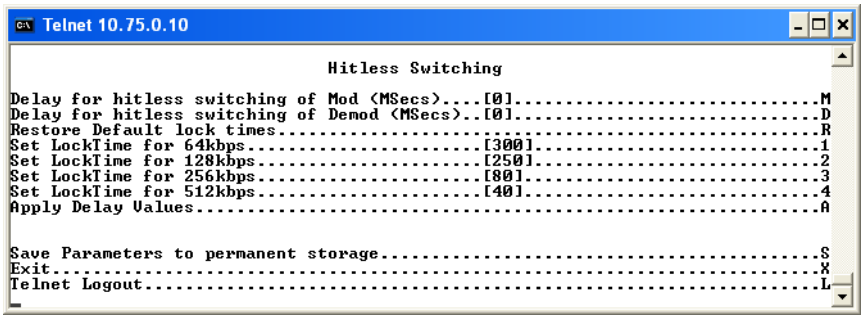


Figure E-2 Hitless Switching screen

- **Enable/Disable** – The Hitless Switching screen will initially display all lock times as -1, indicating that the feature is disabled. The *Restore Default Lock Times* command is used to enable this feature.
- **Delay for Mod** – This parameter allows the operator to insert additional delay to buffer more data after modulator transmission is ceased.
- **Delay for Demod** – This parameter allows the operator to insert additional delay to account for the tuning of the demodulator.
- **LockTimes** – LockTime settings for the four data rates displayed can be adjusted either up or down, but default settings based on satellite testing

should be used as a starting point. These defaults are stored in each modulator/demodulator unit and are restored by entering **R** at the command prompt.

Once restored, the lock time for each data rate can be modified by entering the corresponding number.

Load Switching

Overview

There are three primary functional components involved in the load switching process.

- **Hub Controller(s)**—These are the Hub units that provide the load switching detection mechanism for Remotes that are operating within the shared channel(s). Hub units that can serve as controllers include CDM-570/570A, CDD-56x/564A, CDD-880, and SLM-5650A.
- **Remote InBand Modem/Routers**—The Remote modem units provide the load switch detection mechanism when operating in dedicated SCPC return channel. These modems include CDM-570/570A, CDM-840, and SLM-5650A.
- **VMS**—The Vipersat Management System provides the switched capacity and resource control for each request generated by the components described above.

Load Switching is the mechanism by which the Vipersat network switches a Remote terminal based on traffic levels at the Remote. This mechanism controls both the switch from STDMA to SCPC mode as well as switches for SCPC capacity changes. The main components of load switching in a Vipersat system are the VMS (network management) and the Comtech modem/router. The VMS component receives switch requests from the modem/router, and based on policy settings and available resources, either grants or denies the request. Within the modem/router component, load switching is managed at either the Hub or the Remote, based on the current mode of operation. When a Remote is in STDMA mode, load switching requests for that Remote are managed by the Hub STDMA Controller. After a Remote has been switched to SCPC mode, it manages its own switching (or Step Up/Step Down) requests.

NOTE

Note: For Hub STDMA Controllers operating in either *GIR* (Guaranteed Information Rate) or *Entry Channel Mode*, typical load switching *is not* the mechanism that performs the transition from STDMA to SCPC mode due to traffic load. In GIR mode, the Remote is switched to SCPC as soon as the GIR threshold is reached. In Entry Channel mode, the Remote is switched to SCPC as soon as the Hub receives the first transmission from the Remote.

For both GIR and ECM, the event of switching from STDMA to SCPC can only occur if the SCPC Switch Rate parameter is *set to a value greater than 0* (zero).

The basic concept for all load switching is that a running average of current utilization is maintained, and when that utilization exceeds a preset threshold, a switch is initiated. The data rate for the switch is computed by determining the current bandwidth requirement of the Remote, and adding some percentage of excess margin.

The main difference between switching from STDMA to SCPC and adjusting within SCPC is that in STDMA mode, the current available bandwidth is constantly changing, while in SCPC mode, it is constant between switches. Furthermore, switches from STDMA to SCPC mode are always caused by the traffic level exceeding the switch rate threshold. Within SCPC mode, switches can be caused by traffic exceeding an upper threshold or dropping below a lower threshold. However, in both cases the new data rate is based on the actual traffic requirements adjusted up by the margin percentage. Also, based on policy settings in the VMS, if a Remote requests less than the specified threshold amount of bandwidth, the Remote is put back into STDMA mode. The exception to this is a Hub controller operating in ECM whose Remotes will remain in SCPC mode but drop down to the specified entry rate.

Bandwidth Allocation and Load Switching by the Hub STDMA Burst Controller

As part of normal STDMA processing, the Hub monitors the traffic levels from each of the Remotes for which it is allocating bandwidth. This is done using the STDMA ACK management message (table E-1) that is transmitted at the beginning of each burst from the Remote. The STDMA ACK contains two metrics that are used by the Hub:

- The number of bytes received for transmission (Queued Bytes) since the last cycle.
- The number of bytes currently waiting to be transmitted (Bytes In Queue).

These metrics are used by the Hub for three purposes:

- Determine the amount of STDMA bandwidth (slot size) to allocate in the next cycle.
- Provide statistics of the amount of activity at each Remote (Average Bytes Received).
- Determine if a Load switch is needed.

Table E-1 STDMA ACK Message

Data Type	Size in Bytes	Description	Unit of Measure	Notes
IP	4	IP Address of Remote	N/A	Used by Remote to identify itself
Unsigned	4	Queued Bytes	Bytes	Total number of bytes queued since last cycle (includes possible buffer overflow)
Unsigned	4	Bytes in Queue	Bytes	Number of bytes currently queued
Unsigned	1	Group Number	N/A	
Unsigned	1	Dropped Buffers	Packets	Number of packets dropped (due to limited bandwidth)

If there is adequate return path bandwidth available, the values of these two metrics will be the same. However, if there is not enough bandwidth to satisfy the traffic requirements of the Remote, or if the Remote has exceeded the maximum allocation, some data will be held for the next cycle. In this case, the number of Bytes in Queue will start to grow and will exceed the Queued Bytes. In other words, the Bytes in Queue is the sum of the data not yet transmitted plus the new data received.

If the condition is due to a short burst of data, the backlogged data will eventually be transmitted and the system will return to a sustainable rate. However, if the overload condition is due to long term increased activity, then the backlog condition will continue to grow and eventually trigger an SCPC switch. If the overload condition lasts long enough, buffer capacity will eventually be exceeded and some data may have to be discarded.

NOTE

Note: This is not necessarily bad, as it is often more effective to discard old data than transmit it after it has become ‘stale’.

The “Bytes in Queue” metric is used to determine the STDMA bandwidth allocated (slot size) for the next cycle; the goal being to keep the data backlog to zero. The Hub uses this metric to compute the slot size for each Remote in the next cycle as follows:

- **Fixed Mode –** All Remotes get the same slot size, regardless of need. This is the only mode that uses a static assignment of available bandwidth; the *Bytes in Queue* metric is not used here.

- **Dynamic Slot Mode –** The slot size for each Remote is computed based on the time (at the current data rate) needed to transmit all the "Bytes in Queue". If the result is less than the minimum slot size or more than the maximum slot size, the slot is adjusted accordingly.
- **Dynamic Cycle Mode –** Available bandwidth is allocated to Remotes proportionally, based on current need. The Bytes in Queue for each Remote is divided by the total Bytes in Queue for all Remotes to determine the percentage allocation of bandwidth for each Remote.
- **GIR (Guaranteed Information Rate) Mode –** Initially computed the same as Dynamic Cycle, except there is no maximum limit. After all Remotes have been assigned slots, the Burst Map is checked to see if the total cycle length exceeds one second. If not, then all requirements are satisfied and the Burst Map is complete. However, if the cycle is greater than one second, then the slots are adjusted proportionally so that all Remotes receive at least their guaranteed rate plus whatever excess is still available.

  In the current design, when the one second restriction is exceeded, Remotes without a specified GIR are reduced to the global minimum slot size and the remaining bandwidth is distributed amongst Remotes that have been assigned a GIR rate. This approach is based on the assumption that Remotes that have been assigned a GIR are paying a premium and should benefit from available excess bandwidth when needed.

  Note that the GIR allocations are restricted so that the assigned GIR totals cannot exceed available bandwidth. If this restriction is somehow violated, then it will not be possible to properly allocate bandwidth when the network is overloaded.
- **Entry Channel Mode –** This is the same as Dynamic Cycle, except that as soon as the Hub receives an STDMA ACK, it initiates a switch to SCPC mode based on the policy set for that Remote.

  Note that load switching is disabled for ECM Remotes while operating in STDMA mode.

The important thing to understand about "Bytes in Queue" is that any data that is not transmitted (i.e., does not fit) in the next slot will be reported again in the next STDMA ACK. Thus the "Bytes in Queue" is not necessarily an accurate measure of the actual traffic being passed through the Remote.

The "Queued Bytes" on the other hand, reflects only the data that was received in the last cycle and thus is never duplicated (not including TCP retransmissions). This is the metric that is used for computing average load and initiating a load switch as needed.

Load Switching—STDMA Hub

Before discussing how load switching is determined, it is necessary to explain the modem/router parameters that control the switch.

Hub Switching Parameters

The screens shown in figure E-3 (CDM-570/570A modem/router) and figure E-4 (SLM-5650A modem/router) are examples that show the entries in the Automatic Switching page at the Hub that are used to control load switching.

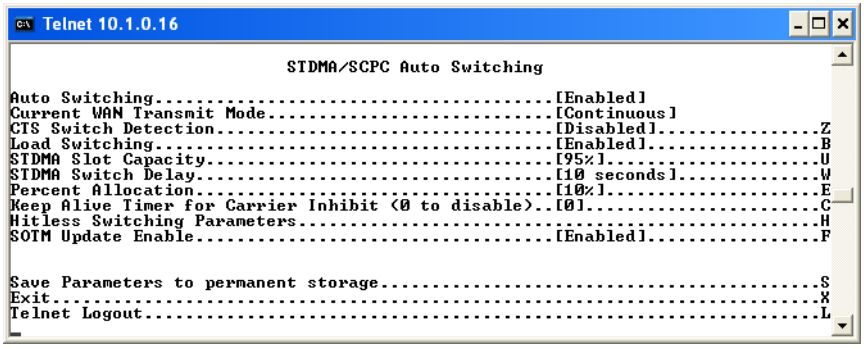


Figure E-3 Auto Switching Menu, CDM-570/570L Hub

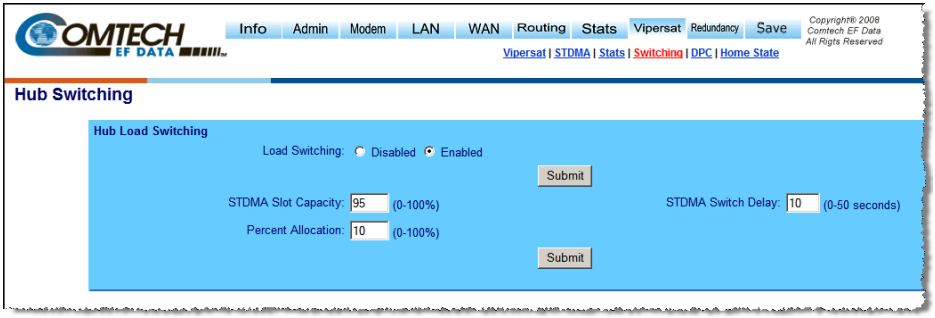


Figure E-4 Hub Load Switching Page, SLM-5650A

- **Auto Switching** – This is a Vipersat feature that is enabled in the CDM-570/570A**Features** menu. If Auto Switching is not enabled, Load Switching will be ignored. There is no automatic switching enable button in the SLM-5650A modem configuration menus; the operator enables each switching function individually.

- **Load Switching –** This is a type of Automatic Switching that is based on the amount of traffic at a Remote. If this feature is not enabled, then no Remote in this STDMA group will be switched based on load.
- **STDMA Slot Capacity –** This is a threshold value. When the amount of outbound traffic at a Remote exceeds this percentage of the current STDMA slot capacity, a load switch is initiated. It is important to understand that in most STDMA modes, the amount of bandwidth allocated to a Remote varies with need and thus from cycle to cycle. Thus the amount of traffic that constitutes X% will also vary from cycle to cycle.

  Note for Dynamic Cycle mode:
  Since Dynamic Cycle mode tends to provide no more bandwidth than is needed, Remotes will typically appear to be near 100% capacity whenever they are passing real traffic. Thus, in this mode, if the threshold is set too low, switches will occur unnecessarily.
- **STDMA Switch Delay –** This is a built-in latency that forces a Remote to maintain an average load over some number of seconds after reaching a switch condition before the switch is actually initiated. This prevents switches due to momentary traffic bursts.
- **Percent Allocation –** This is an excess amount of bandwidth that is allocated beyond the current traffic rate when the switch to SCPC is made. For example, if the current average traffic at the time of the switch is 60 kbps, and the **Percent Allocation** is 10%, then the allocation will be for 60k + 6k = 66 kbps.

  Note that, because the Hub always allocates bandwidth in 8 kbps blocks, the 66 kbps will be rounded up to 72 kbps in this example.

Hub Switching Process

Each time the Hub receives an STDMA ACK, it computes the average load for that Remote. This average is then compared to the bandwidth currently allocated to the Remote.

For example, if a Remote gets a 50 ms slot in an upstream that is running at 512000 bps, then it can transmit 0.050 * 512000 = 25600 bits = 3200 bytes. If the Queued Bytes was 3000, then for that cycle, the Remote was at 3000/3200 = 93.75% of capacity. If the current cycle time is exactly 1 second, then the effective data rate of the Remote is also 25600 bits per second. However, if the cycle time is only 500 milliseconds, then the effective data rate is actually 25600/.5 = 51200 bits per second. The effective data rate is important for calculating switch data rates.

If the average bandwidth used exceeds the threshold percentage of available bandwidth, then a flag is set indicating a switch is pending. At this point, the statistics are reset and the traffic load is then computed for the time period specified by the switch delay. At the end of this delay, if the threshold is still exceeded, a switch is initiated. The data rate specified for the switch is determined by taking the current load, as indicated by the bytes queued during the delay period, multiplying it by the percent allocation and rounding up to the next 8 kbps.

A key point is that in most of the STDMA modes, the bandwidth allocated to each Remote is constantly being adjusted to the needs of the network. As long as the network is running below capacity, most Remotes will get the bandwidth they need and a switch will not be required. Only when a Remote requires more bandwidth than is available in STDMA will a switch occur.

In Dynamic Cycle mode, each Remote will always appear to be running at near 100% capacity, even when there is actually excess bandwidth available. This is because in this mode, the Remotes are almost never given more bandwidth than they need. As a result, the algorithm for this mode uses a maximum allowed slot size rather than the actual allocated slot size to calculate the effective data rate. This results in a more accurate estimate of the available STDMA bandwidth.

Load Switching—Remote

Once a Remote has been switched from STDMA mode to SCPC mode, it checks its bandwidth requirements to see if a change is needed. A running average of the data traffic passing over the WAN is maintained as a percentage of the current data rate for the Remote. This average is accumulated for at least the specified delay (Step Up/Step Down) period. Then, once per second, the current utilization is checked against the Step Up and Step Down Thresholds. If the utilization is outside the up/down range, a request is generated to switch to the calculated rate. After the request is granted, the running average is reset and the cycle is repeated.

Remote Switching Parameters

The parameters for controlling the Step Up/Step Down switching process for a CDM-570/570L Remote are set in the page shown in figure E-5. An example of this page for an SLM-5650A Remote is shown in figure E-6.

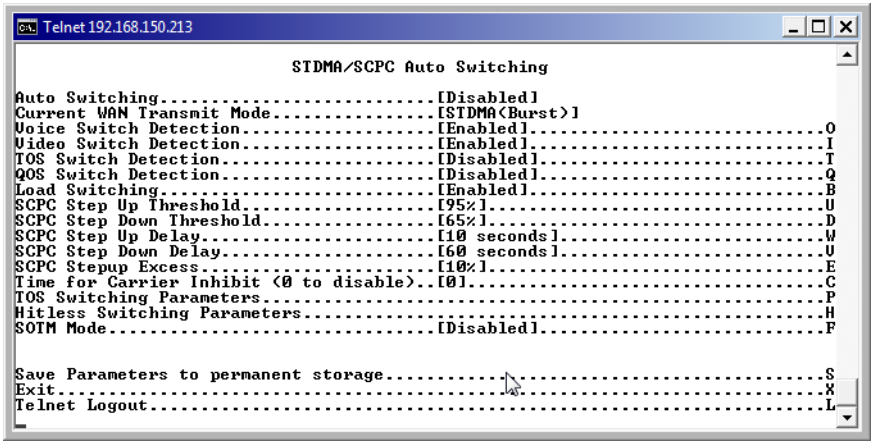


Figure E-5 Auto Switching Menu, CDM-570/570L Remote

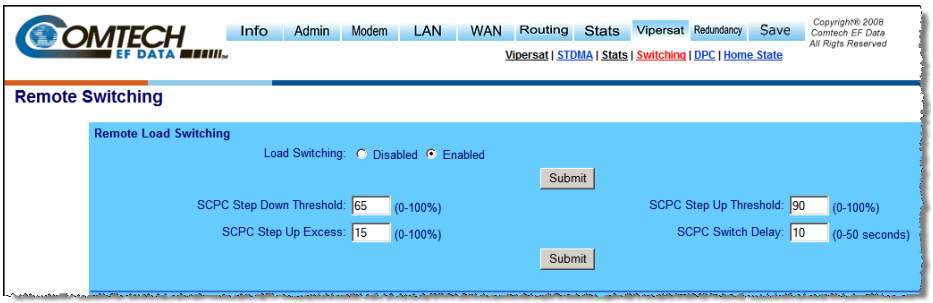


Figure E-6 Remote Load Switching Page, SLM-5650A

- **Auto Switching** – This is a Vipersat feature that is enabled in the CDM-570/570A **Features** menu. If Auto Switching is not enabled, Load Switching will be ignored. There is no automatic switching enable button in the SLM-5650A modem configuration menus; the operator enables each switching function individually.
- **Load Switching** – This is a type of Automatic Switching that is based on the amount of traffic at the Remote. If this feature is not enabled, then this Remote will not be switched based on load.
- **SCPC Step Up Threshold** – This is a window threshold that initiates a load switch to a higher data rate when the amount of traffic as measured within the transmit queue exceeds this setting. The value is specified as a percentage of the current data rate.

  Similar to the Hub parameter *STDMA Slot Capacity*.

- **SCPC Step Down Threshold –** Similar to the *Step Up Threshold*, except *Step Down* is used to trigger a switch to a lower data rate when the average traffic load falls below the set value.
- **SCPC Step Delay –** This is a built in latency that forces the Remote to maintain an average load for the specified period (seconds) that exceeds the switch threshold before a switch to a new data rate is actually initiated.

  Similar to the Hub parameter *STDMA Switch Delay*. However, the Remote offers two switch delay parameters once the unit has entered SCPC mode: a ***Step Up*** and a ***Step Down***. This provides the operator the option of specifying, for example, a shorter step up delay and a longer step down delay to ensure bandwidth requirements are quickly met and sustained while minimizing repeated switch events due to short-term fluctuations in the data rate.
- **SCPC Step Up Excess –** This is an additional amount of bandwidth that is allocated beyond the calculated traffic rate, and is added to each switch request.

  *Note that the value applies to both **Step Up** and **Step Down** switches, and is computed against the average traffic load at the time the switch is initiated.*

  For example, if the current average traffic at the time of the switch is 130 kbps, and the **Step Up Excess** is 10%, then the allocation will be for 130k + 13k = 143 kbps. And because bandwidth is always allocated in 8 kbps blocks, the rate will be rounded up to 144 kbps.

  Same as the Hub parameter *Percent Allocation*.

Determination for Switching

The following process is used to determine if bandwidth utilization warrants a change, and thus a switch to a new data rate.

The operator defines both a Step Up and Step Down threshold in terms of percent utilization, a bandwidth margin value, and a latency or averaging period. Once per second, the modem/router software determines the current percent utilization by dividing the bits transmitted by the current transmit data rate.

If the percent utilization exceeds the step up threshold or is less than the step down threshold for the entire latency period, then a Switch Request is sent to the VMS. The bandwidth requirement in the request is computed by taking the average percent utilization over the latency period and multiplying that by the current data rate to determine the actual data rate used over the measured interval. This number is multiplied by the margin value and rounded up to the nearest 8 kbps to determine the requested bandwidth.

Load Switch Example

An automatic load switching example, illustrated in the schematic diagram in figure E-7, illustrates how a network can respond to changes in traffic volume or load conditions. The network's capability and method of response to load changes is determined by the setting and capability of each of the components in the system, such as the transmitter power output, the antenna capabilities for each of the sites in the network, and the policies set in the VMS.

The elements for determining policies and their interactions are covered in this section.

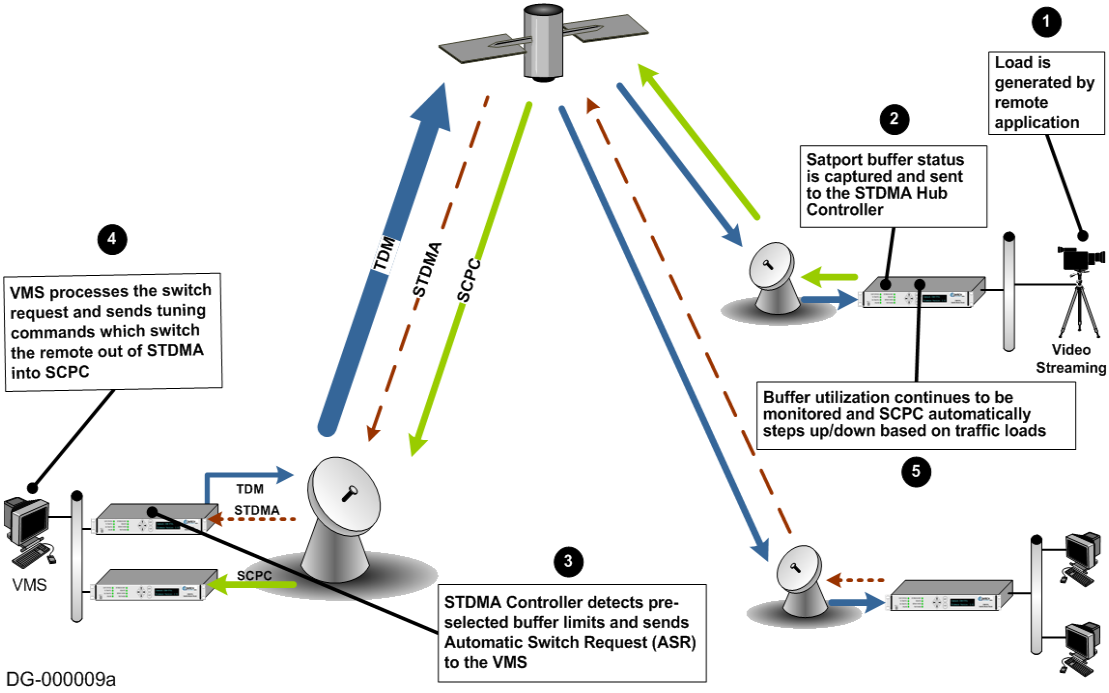


Figure E-7 Load Switching diagram

A load switch is illustrated in figure E-7 using the following process:

1. A load is generated by an application that is running at a Remote. In this example, the application is a video stream.
2. The data is connected to the Remote modem/router over an Ethernet link for transmission to the satellite. While the data-stream transmission is in progress, the Satport buffer status is captured and the Remote's buffer status is sent to the STDMA Hub Controller.

3. The STDMA Controller compares the Remote's pre-selected buffer limits with its buffer status and, if the buffer status exceeds the preselected limits, the STDMA Controller increases the time-slot allocated to that channel. If this brings the buffer status within established limits, no further changes are made.

4. If the buffer status continues to exceed the preselected limits, the STDMA Controller sends an ASR to the VMS.

5. The VMS processes the switch request by checking for available resources: first determining if there is a free demodulator, and then determining the channel space (bandwidth) requirements to accommodate the data flow requested by the STDMA Controller.

6. If the VMS finds available resources, it processes the switch request and sends tuning commands that switch the Remote out of STDMA and into SCPC mode.

The modem/router continuously monitors traffic flow volume. Whenever a preset upper or lower limit is exceeded, the modem/router sends a request to the VMS to change bandwidth by the amount needed to meet the new requirement. By this process, the bandwidth is continuously optimized in real time, precisely accommodating circuit traffic volume.

The ideal condition is for utilization of the channel to reach approximately 90%, thus optimizing the use of available bandwidth. The ability to actually accomplish this is limited by the currently available carrier bandwidth and, ultimately, the power output and antenna size available at the transmitting Remote site.

If the requested bandwidth is not available, the STDMA Controller will continue to receive buffer status reports from the Remote indicating that buffer flow is continuing, and the STDMA Controller will, in turn, continue to request additional bandwidth from the VMS. When bandwidth does become available, the VMS will perform the switch the next time that the STDMA Controller makes the request.

If the video data stream ends before the switch in bandwidth is completed, the channel is closed, the bandwidth which had been allocated is made available again to the pool, and no further action is taken.

Reduced Data Flow in Switched Mode (SCPC)

In the event the data flow is reduced—for example, a streaming file transfer terminates—the SCPC switched demodulator detects the reduced flow and notifies the VMS. The VMS will then send a switch command to reduce the size of the carrier bandwidth to the newly calculated requirement.

This entire process is automatic, following the policies established for the network. The network is dynamically modified, changing configuration to automatically respond to changes to the network's load.

The Home Threshold is the bit rate set to trigger a return to the home condition. This function is used when bandwidth has been allocated to meet load requirements, and then the load has been either removed or partially removed. The Home Threshold is used to determine whether the current bit rate has fallen below this preset level and, if so, the channel is switched back to its home condition (STDMA mode, for example).

Application Switching

NOTE

Note: This Application Switching section refers to functionality of the CDM-570/570A modem/router. Application Switching is not available for SLM-5650A modem/routers.

Application switching, illustrated in figure E-8, also is capable of changing bandwidth use, but the change is determined entirely by the type of application being requested, ignoring load requirements.

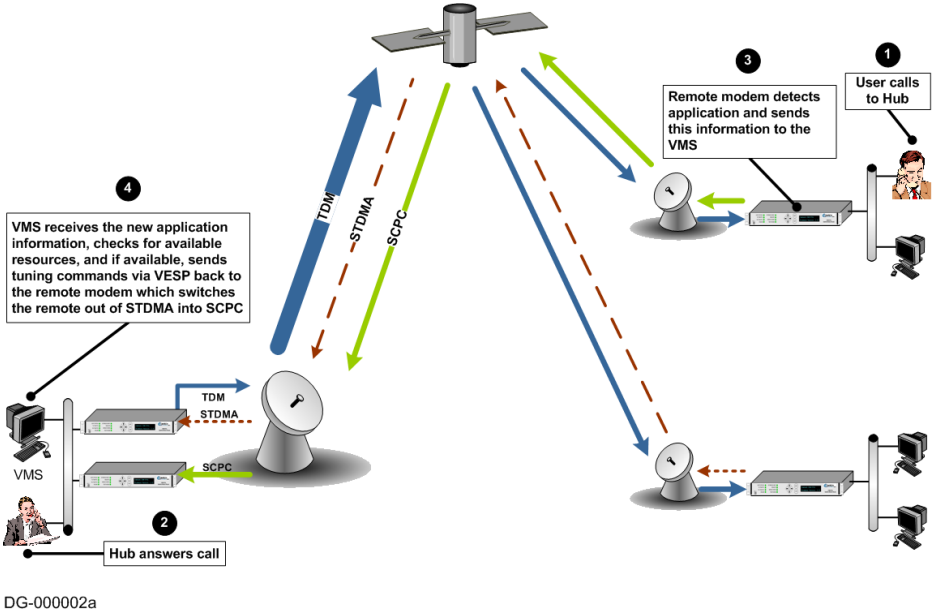


Figure E-8 Application Switching diagram

In a system configured for application switching, the Remote site modem/router looks for a packet in the data stream coming from the LAN that is configured using the H.323 stack protocol and containing an H.225 signaling protocol. In the diagram above, the signal is a voice call initiated at the Remote site.

The packet is examined to determine the port number, then, from the allocated port ranges, the modem/router determines the type of application being sent.

The modem/router sends a switch request to the VMS requesting a carrier for the application type. Typical applications include:

- Video
- Voice over IP (VoIP)

Each application type will have been assigned a bandwidth allocation when the policy for the Remote is established. The voice application, for example, might have had the bandwidth set in the policy to handle three simultaneous voice connections. When a VoIP protocol is detected in the H.225 signaling protocol, the modem/router requests the VMS to switch the bandwidth to accommodate three voice circuits.

The same process applies if the protocol detected is Video.

When *both* VoIP and Video are requested, the bandwidth required for the Video is used and the VoIP, which has priority, shares the SCPC with the Video.

Once the VMS receives the request to switch, it determines if there is a free demodulator and if there is bandwidth space available to handle the requested application. If the resources are available, the VMS then performs the switch.

Applications are streaming data. The Remote looks at the streaming data flow until it sees a break in the data exceeding 10 seconds. Once a break is detected the modem/router presumes that the application is terminated (or has malfunctioned), drops the carrier, and makes the bandwidth resources available for another service.

ToS Switching

ToS Background

The Type of Service (ToS) byte is an 8-bit field contained within the IP header portion of an IPv4 packet. This field provides a means of marking packets for traffic identification and classification purposes. Devices within the network can utilize the ToS value to classify traffic and apply per hop queuing and Quality of Service (QoS) for different types of traffic.

The first 3 bits of the ToS byte are referred to as IP precedence bits. The IP precedence bits and the next 3 bits combined are known as the Differentiated Services Code Point bits (DSCP). The 6 bits of DSCP allow for 63 discrete traffic identifiers. The DSCP field is the portion of the ToS byte that can be detected by the SLM-5650A modems and can be used for dSCPC switching within a Vipersat network. Figure E-9 provides a graphical representation of the ToS field within an IPv4 packet.

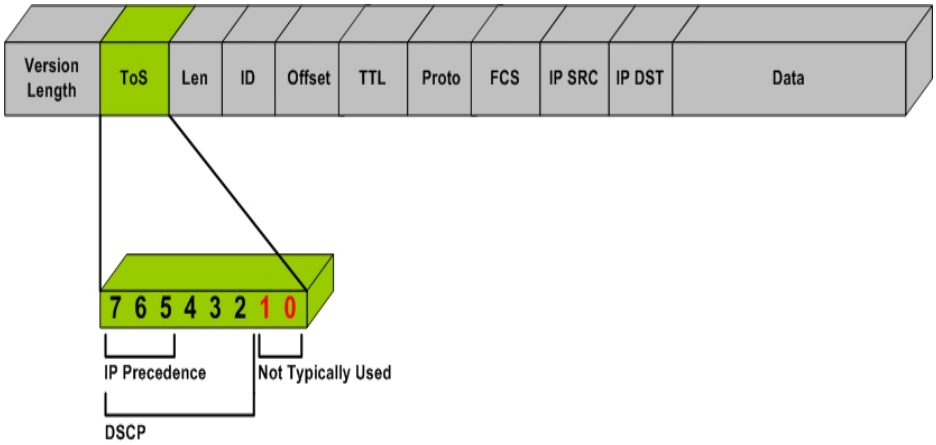


Figure E-9 ToS Field Location within the IP Header

The process of marking a packet with a ToS value is typically done in one of two places, either by the application device itself (e.g., VoIP phone), or by the packet marking capabilities of a network device such as a router.

Encrypted networks often pose additional limitations for prioritizing and classifying traffic. When encryption is applied to an IP packet, a majority of the information is no longer available for classification. Application layer protocols can no longer be detected by routers for classification purposes. In many encrypted environments the IP header, which includes the ToS value, typically remains in

the clear and often provides the only mechanism for identifying and prioritize traffic within the network.

The ToS switching feature in the SLM-5650A provides a reliable method for performing automatic dSCPC switching and is the preferred method for most encrypted environments that leave the IP header intact.

Detection of ToS Stamped Packets

The configuration and detection of ToS stamped packets occurs in the Network Processor (NP) card of the remote modem. In the remote modem, the user defines the ToS value to be detected and specifies the bandwidth to be requested, should that value be detected.

Once a packet with the ToS value is detected, the modem will send a switch request to the VMS. The VMS will then determine if policy settings, hardware, and bandwidth are available, before sending out tuning commands to reconfigure transmission communications.

Only IP traffic that is coming from the Ethernet port and is destined for the Satellite interface will trigger a switch. Traffic coming from the hub or another remote will not trigger a switch, regardless of the ToS value within the packets. This means that an application or remarking device located at the remote must be the source for stamping packets that are transmitted out of the remote site and over the satellite.

A tear down request is sent by the remote modem to the VMS if no more packets are detected with the ToS value after a user definable timeout occurs.

ToS switching can also be utilized in non-encrypted networks. One advantage for this is that each packet associated with the application will have ToS set, thus making ToS switching extremely reliable. A drawback, however, is that unless each application can set a different ToS value, granular resolution per application will be lost.

NOTE

Note: Only ToS stamped IP traffic that is coming from the Ethernet port of a remote modem and is destined for the Satellite (WAN) interface will trigger a switch request.

Configuration

The ToS switching feature can be configured within the SLM-5650A modem using either the CLI or the Web user interface. For simplicity, the Web interface (figure E-10) will be presented in this example.

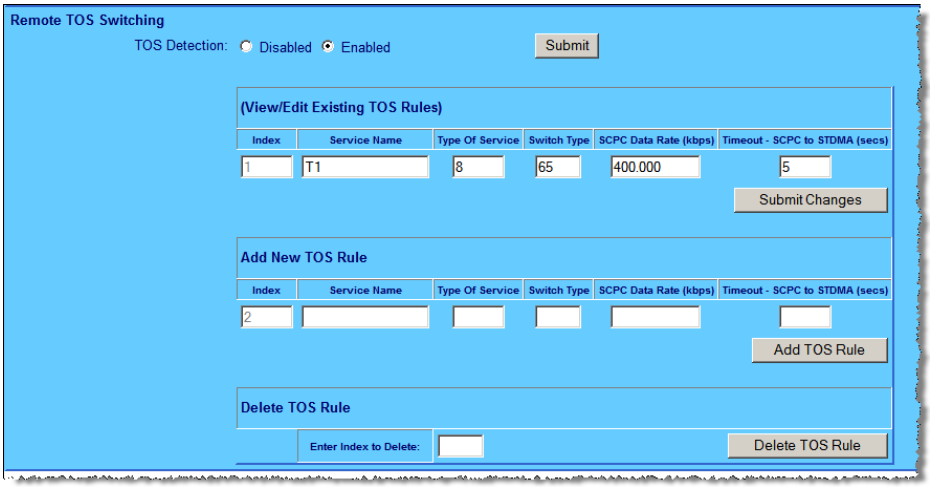


Figure E-10 Remote ToS Switching menu

The remote ToS switching is optioned by selecting 'Enable' or 'Disable'. In addition to the enable/disable control, the menu provides the ability to create a list of ToS Rules for which a switch will be initiated. In defining these fields, certain characteristics are created depicting what types of switch service connections are established. These fields are described in table E-2.

Table E-2 ToS Switching Settings

Field	Values	Description
Service Name	Text (15 char max)	A user defined ID association.
ToS ID	1 - 63	The ToS value for which a switch should occur. Note that 0 can not be used to set a ToS based switch.
Switch Type	64 - 254	The type of Vipersat switch which will occur for this ToS value.
SCPC Data Rate	kbps	The data rate for the switched SCPC link.
SCPC Timeout	seconds	The number of seconds of inactivity before the SCPC circuit will be torn down.

NOTE

Note: Load switching by the VMS is not affected by enabling ToS detection.

Example Implementations

ToS Switching Per Device

For applications that require an increase in SCPC bit rate for each application device, a separate ToS value must be assigned to each device individually. This provides granular switching for each device and also allows a mesh connection to be established for each device independently. Figure E-11 depicts a per device configuration example.

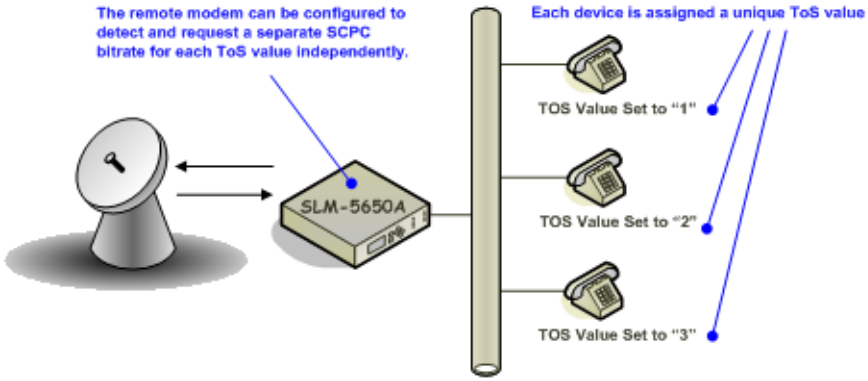


Figure E-11 Per Device ToS Switching Example

ToS Switching Per Traffic Type

For applications that only require a single SCPC bit rate, regardless of the number of active application devices, the same ToS value can be assigned to each device. This method does not provide granular switching for each device and a mesh connection will only be set up for the first device that sends packets with the designated ToS value. Figure E-12 depicts a per traffic type configuration example.

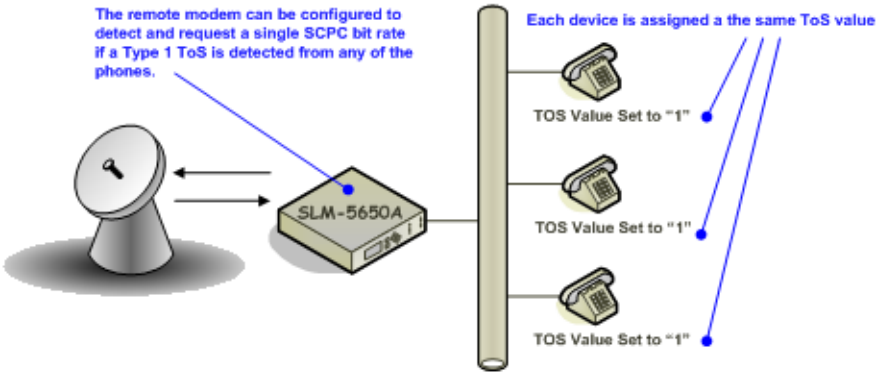


Figure E-12 Per Type ToS Switching Example

ToS Remarking

For situations where the application device is not capable of stamping a packet with a ToS value, or where the application traffic is generated by a variety of different hosts and protocols, ToS remarking should be considered. ToS remarking refers to a device, such as a router, that has the capability of re-stamping packets with a user defined ToS value. Devices that support remarking often allow users to assign a ToS value to packets that match certain source or destination IP addresses, port numbers, and/or protocols.

Example 1: A user wants to switch up whenever a host performs an FTP across the satellite. A device that supports remarking can be placed between the applications and the remote modem. The device can then be configured to stamp all traffic that utilized FTP port 21 with a particular ToS value. The remote modem can then be configured to detect this value and switch to a specific SCPC bit rate.

Example 2: A remote customer is using an IP based video encoder to transmit video over the satellite. The encoder does not have the option to assign a ToS value for prioritization. Again, a remarking device can be placed between the encoder and the remote modem and configured to assign a ToS value to all packets received from the encoder.

Figure E-13 provides an example of a router performing ToS remarking for VoIP phones.

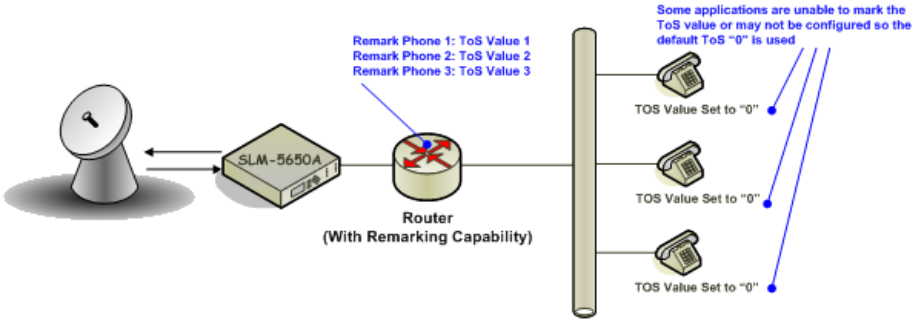


Figure E-13 ToS Remarking Application

ToS to DSCP Value Conversions

Application devices or remarking devices often have different ways of displaying or configuring the ToS or DSCP values used to mark packets. Some devices require the user to input the ToS value while others require input of the DSCP value. Depending on the manufacturer, these values may be displayed in binary, decimal, or hexadecimal formats.

The information below can be used to convert between various formats:

Convert from ToS to DSCP - Divide the ToS decimal value by 4

Example: Convert a ToS decimal value of 184 to DSCP

DSCP = 184/4

DSCP = 46

Converting ToS and DSCP to/from Binary - Figure E-14 provides an example of the conversion to and from binary and can also be used to convert to and from ToS and DHCP values.

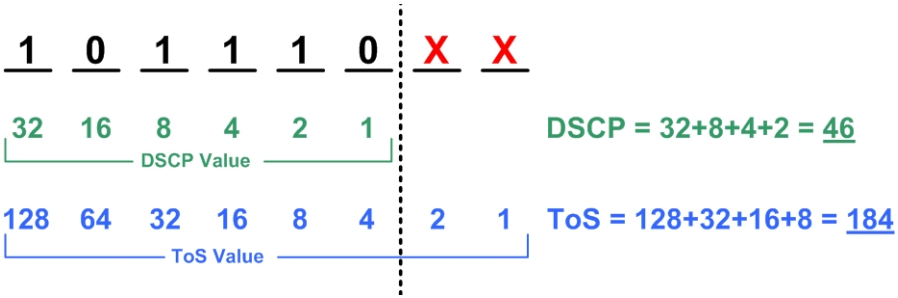


Figure E-14 ToS and DSCP Conversion Chart

Mesh Setup Based on ToS Detection

The detection of a ToS stamped packet by a remote modem can provide the means for setting up a Single Hop On Demand (SHOD) mesh connection from that remote to another remote within the network. *For these SHOD connections, it is assumed that each remote site that is part of the SHOD connection has, at minimum, one additional demodulator configured as a Remote Expansion.*

When a remote modem detects a packet that has been stamped with a ToS value that matches the user defined value, the modem will look at the destination IP address within the packet. The remote modem will then send a switch request to the VMS requesting the user defined bandwidth. The switch request also contains the address that the ToS stamped packet was destined for. The VMS processes the switch request and compares the destination address to the list of known subnets to determine if the destination belongs to another remote within the network. If the address does belong to another remote, the VMS will look for available hardware and bandwidth and then issue tuning commands to set up the connection. Each direction of the mesh is set up independently; i.e., the detection that occurs at remote 1 will establish a connection from remote 1 to the other remote involved. However, the other remote must perform detection for set up in the opposite direction.

Entry Channel Mode Switching

Entry Channel Mode (ECM) provides a method for Remotes requiring SCPC access channels to enter/re-enter the network, initially or after a power or other site outage.

Two versions of Entry Channel Mode switching are used in Vipersat networks. The version that is available for implementation in a Vipersat network will vary depending on the satellite modem model that is deployed in the network. *STDMA ECM* is currently available for CDM-570/570A and SLM-5650A modems. *Dynamic ECM* (ECMv2) is currently available for CDM-570/570A modems and the Advanced VSAT Series 800 modems that include the CDM-800, CDM-840, and CDD-880.

STDMA Entry Channel Mode

With STDMA Entry Channel Mode, the switch time will be variable based on the burst rate (bps) of the STDMA group, the number of Remotes with slots in the group, and where in the burst cycle the Remote is when it acknowledges receipt of the burst map.

Initial SCPC rates are settable for each Remote in the STDMA group(s). Upon detection of a burst map acknowledgement from a Remote, the STDMA burst controller will send a switch request to the VMS with the operator-specified initial SCPC rate. Upon determining that there is an available demodulator and sufficient pool bandwidth, the VMS will send a multi-command to remove the Remote from the STDMA group, tune it and the switched demodulator to the specified initial bit rate and selected pool frequency. The Remote will stay at this initial rate unless an application (such as VTC) or consistent load causes it to request additional bandwidth from the VMS.

The initial switch from Entry Channel Mode to SCPC mode is not driven by the presence or absence of customer traffic. Once in SCPC mode, the switched initial data rate becomes the new temporary home state. This temporary home state sets the low limit data load threshold, where the Remote will stop sending load switch request commands. ECM Remotes in SCPC mode do not require burst maps to maintain SCPC transmission.

NOTE

Note: Remotes operating in ECM toggle directly from STDMA to SCPC. The initial SCPC switch state is used instead of the modem's internal Home State.

After the ECM Remotes are processed into SCPC, the burst controller drops into sanity mode, sending a keep alive map to service Remotes which may have

their SCPC carrier inhibit flag set. The keep alive message is sent once every two seconds until re-entry is invoked.

Fail-Safe Operation

For Entry Channel Mode switching, it is useful to describe the fail-safe mechanism used for freeing pool bandwidth.

If the VMS loses communications with a switched Remote for more than three minutes, it will attempt to return the Remote to its home state. If the revert-to-home state command succeeds (restoring communications), Entry Channel Mode will cause the Remote to switch to its initial SCPC bit rate.

If the revert-to-home state command fails, the VMS will send a command to return the Remote and the Hub demodulator to the state where they were prior to losing communications, but leave the Remote enabled in the STDMA burst controller. This provides the Remote with 2 paths to rejoin the network:

1. If the outage was the result of a power loss at the site, the Remote will reboot in its home state (STDMA), then acknowledge the receipt of the first burst map, causing it to rejoin the network through ECM. The VMS will park the demodulator previously in use and free the bandwidth slot.
2. If the outage was due to an extended rain fade or other communications blockage with no loss of power, the Remote will rejoin the network via the previously assigned SCPC channel. When the VMS receives a PLDM, it will send a revert-to-home state command and free the bandwidth slot and burst demodulator. The Remote will then rejoin the network through ECM.

Since it is not possible to know which of the above scenarios caused the communications outage, the VMS will not free the bandwidth slot except through operator intervention.

Figure E-15 and figure E-16 diagram the time state differences and the process of recovery. Note that the times referenced in the diagrams are approximate.

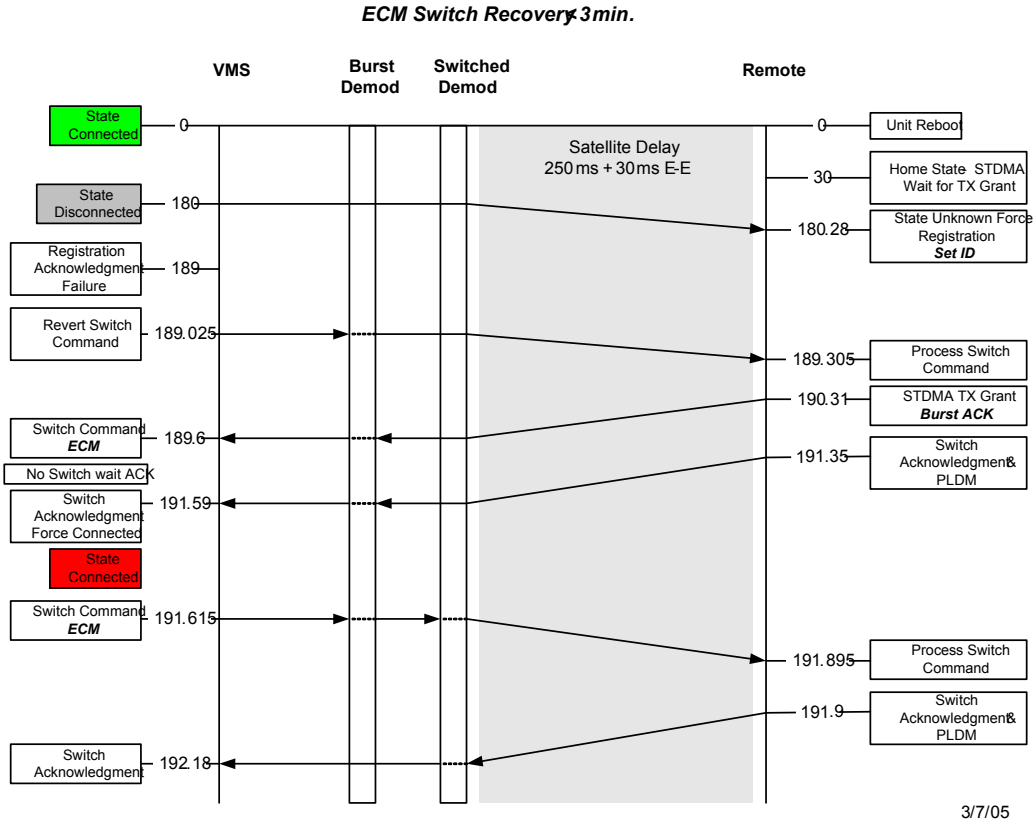


Figure E-15 ECM Switch Recovery: < 3 minutes

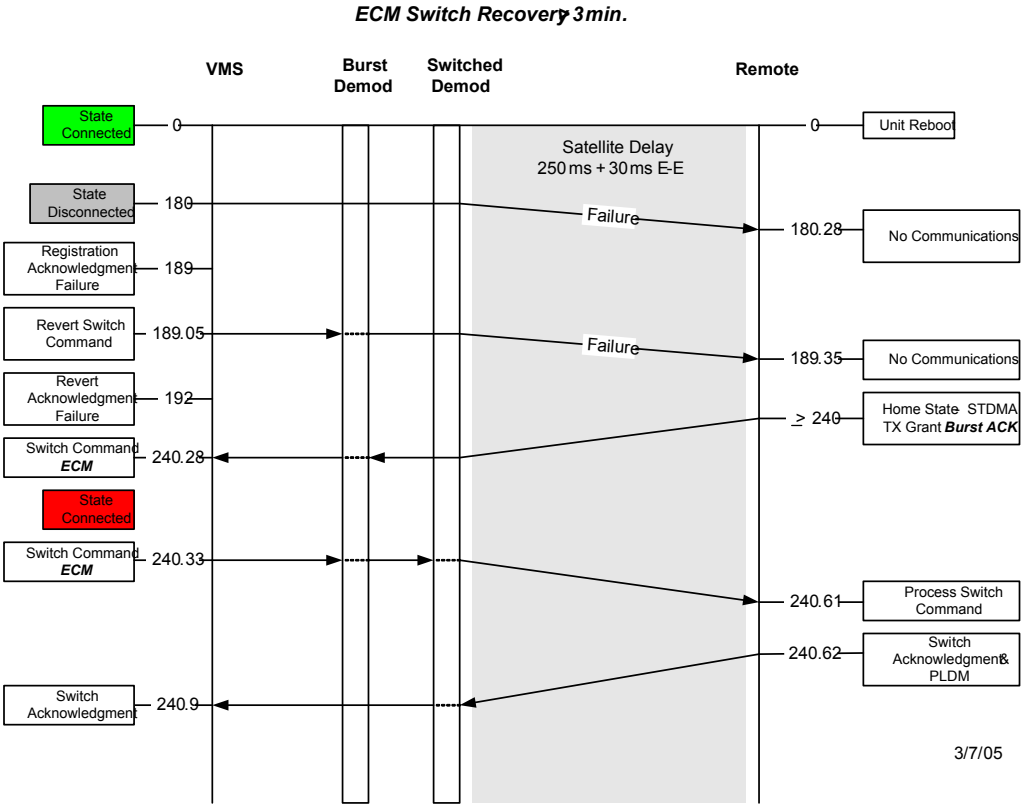


Figure E-16 ECM Switch Recovery: > 3 minutes

Using STDMA ECM

Entry Channel mode operates slightly differently from other STDMA modes due to the STDMA burst controller losing the ability to automatically control the modem unit once it is operating in SCPC mode.

Once the switch from ECM to SCPC has occurred in the modem, the unit no longer sends switch requests so VMS does not have a switch request to respond to switch the modem back to STDMA from SCPC mode. The operator will have to manually intervene to force a switch back into STDMA mode.

The following procedure illustrates this and demonstrates how to change the operation of a modem operating in SCPC mode back to STDMA mode.

Figure E-17 shows the STDMA page for the CDM-570/570A set up to run in Entry Channel mode.

NOTE

Note: Refer to the Vipersat SLM-5650A modem manual for Entry Channel configuration setup. The text referenced within is similar between the

CDM-570/570A and the SLM-5650A; the UI page appearances may differ, however.

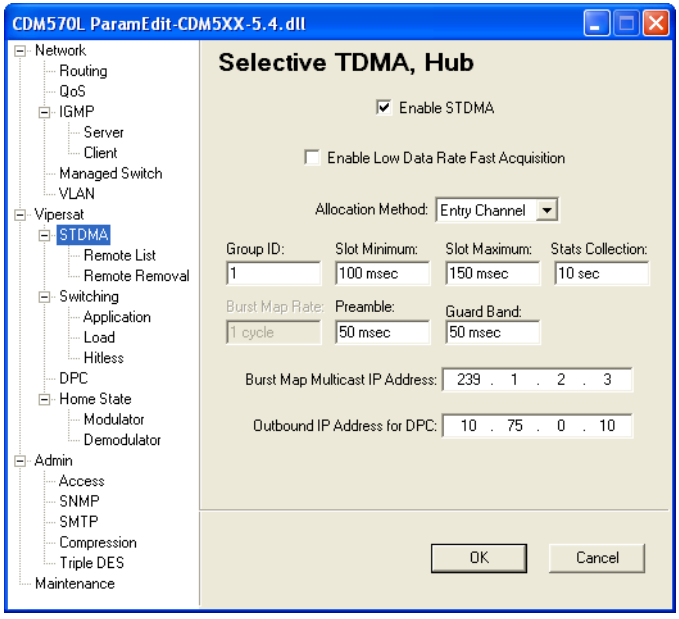


Figure E-17 STDMA Page with Entry Channel Mode, CDM-570/570A

Switching an ECM Remote from SCPC to STDMA

Use the following procedure to switch an ECM Remote operating in SCPC mode back to STDMA mode.

NOTE

Note: This switch must be performed manually.

1. Click the **Remote List** menu item on the **STDMA** page shown in figure E-17 above to display the **STDMA Remote List** shown in figure E-18.

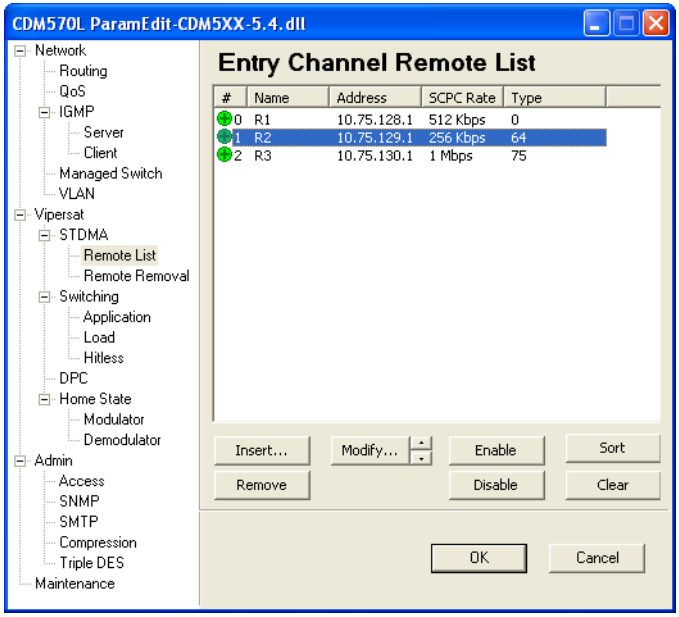


Figure E-18 ECM Remote List Page, CDM-570/570A

2. From the **STDMA Remote List**, select the Remote modem unit to be switched from running in SCPC to STDMA mode. Use the up and down arrows next to the Modify button to change the selected Remote.

3. Click the **Modify...** button to display the **Remote Entry** dialog shown in figure E-19.

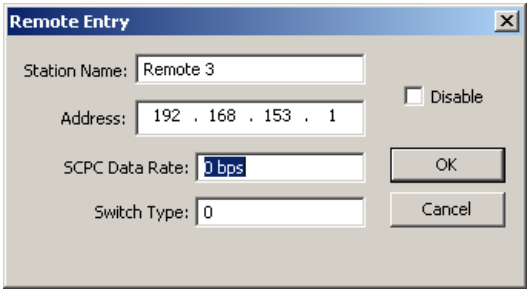


Figure E-19 Remote Bandwidth Entry, CDM-570/570L

4. To force a switch from ECM SCPC mode to STDMA mode, set the current value in the **SCPC Data Rate** dialog box to 0 (zero), then click the **OK** button.
Note that the 0 bps setting will cause the modem to remain in STDMA ECM

and not switch out to SCPC unless either an application switch occurs or a manual switch is invoked.

5. In VMS, right-click on the remote site as shown in figure E-20, then select the **Diagnostic Revert** command from the drop-down menu. The VMS will send the revert command to the target modem, causing it to revert to its STDMA home state.

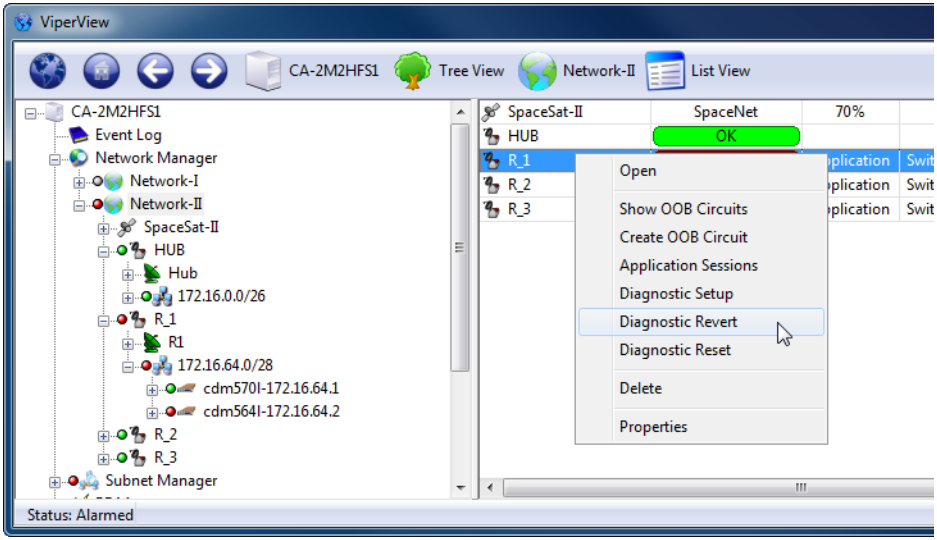


Figure E-20 Revert Uplink Carrier Command, VMS modem

NOTE

Note: If the remote site is offline or the remote may be in an unknown state, sending a **Diagnostic Reset** will issue a command to remote forcing home state configuration and the VMS will clear ALL allocations assio-iated.

This completes resetting the Remote modem to operate in the STDMA mode.

Dynamic Entry Channel Mode

Dynamic ECM (ECMv2) utilizes a modified slotted Aloha method for Remotes to establish registration in the network and obtain the means for switching into SCPC mode. Rather than sharing an STDMA burst map, as is the method with STDMA ECM, the Remotes rely on communicating with the Hub channel controller through the use of a multicast *Transmission Announcement Protocol* (TAP) message. This eliminates the restriction in the number of Remotes in an Entry Channel group that is inherent with the burst map method.

The TAP, broadcast periodically, supplies the Remotes with the transmit parameters that are required for transmitting back to the Hub. In addition, the TAP provides timing information in the form of slot parameters that define the required acquisition time of the receiver and the amount of time allowed for M&C packet transactions.

All Remotes will receive the TAP message from the Hub, but a Remote will only transmit back to the Hub if it is a member of the specified group. Upon receipt of the TAP, the Remote resets its timing and uses the provided slot information to determine the next transmit opportunity. This allows each Remote to transmit at a discrete time to minimize the chance of collision. When a transmission to the Hub is not received, the Remote uses a random back-off (next slot) algorithm to further reduce contention, and will try again until a Hub response is received.

Upon valid reception of the Remote's transmission, the Hub channel controller will place the Remote into queue for assignment of switching into a *d*SCPC channel. The Remote will be registered in the VMS, then await the availability of the hardware and bandwidth resources necessary for execution of the switch request. The TAP will continue to be received even after the Remote has been switched out into SCPC.

Only management traffic is allowed while a Remote is in ECM. No data traffic is transmitted until the Remote is switched out of ECM and is operating in *d*SCPC mode.

Hub Configuration

The Hub channel controller is a dedicated demodulator that has been selected as an ECM controller. The Entry Channel configuration settings of this demodulator (figure E-21) determine the channel parameters that are transmitted in the TAP message and include:

- ECM Enable
- Group ID
- TAP IP Multicast Address
- Preamble
- Guard Band
- LNB LO Frequency
- Satellite Frequency Conversion
- Total Slot Count

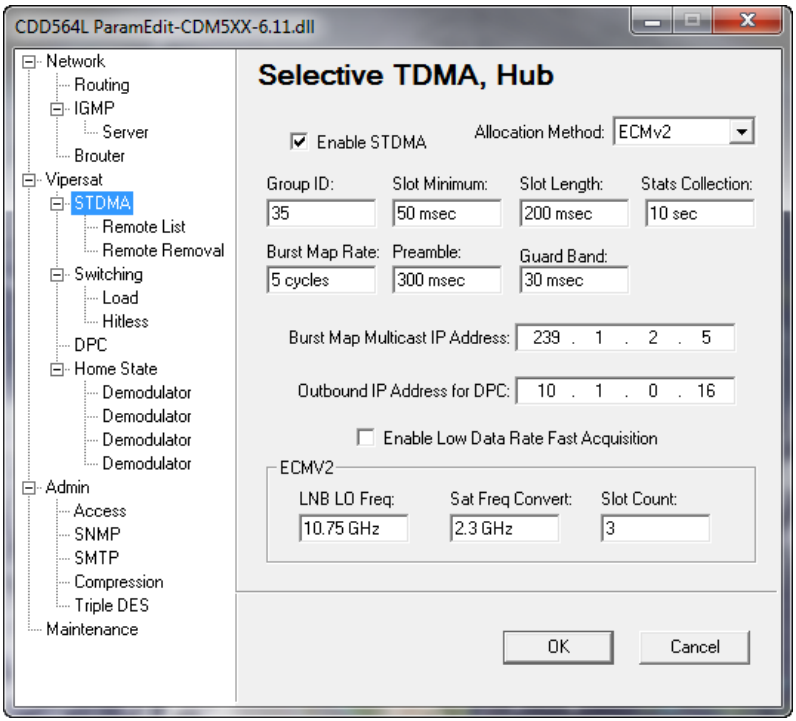


Figure E-21 Entry Channel Mode v2 Configuration, Hub

Remote Configuration

The demodulator (receive) configuration of each Remote in the group must be set appropriately in order to receive the TAP from the Hub. Because the TAP provides the necessary transmit parameters for the Remotes, manual modulator configuration by the operator is unnecessary. The Entry Channel configuration of the Remote (figure E-22) must include:

- ECMv2 Mode (Online, Wait, Offline)
- Group ID
- TAP IP Multicast Address
- BUC LO Frequency

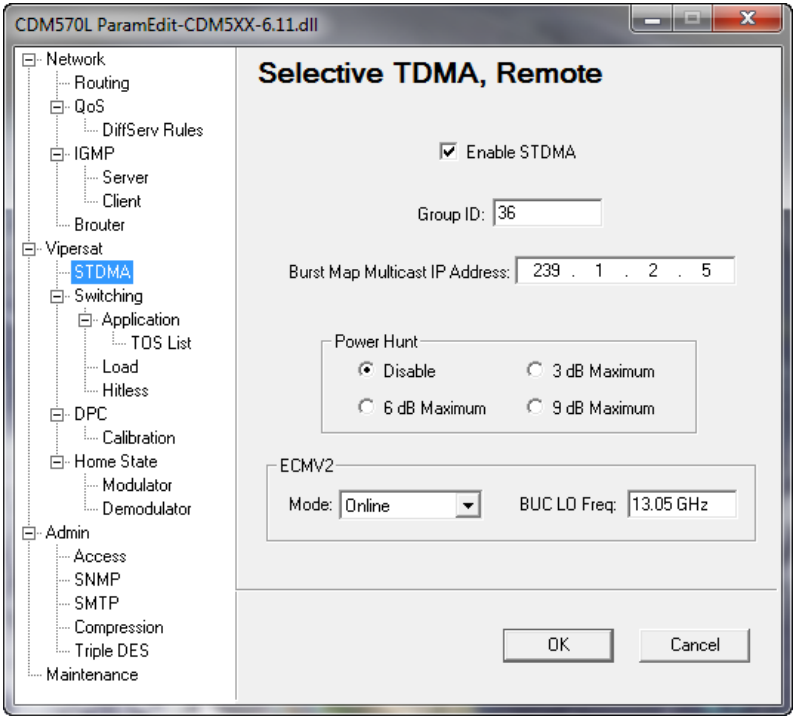


Figure E-22 Entry Channel Mode v2 Configuration, Remote

ECM Processing

A detailed representation of the sequence of steps that occur between the Hub units (the channel controller and a switched demodulator), the Remote unit, and the VMS during the ECM process is shown in figure E-23.

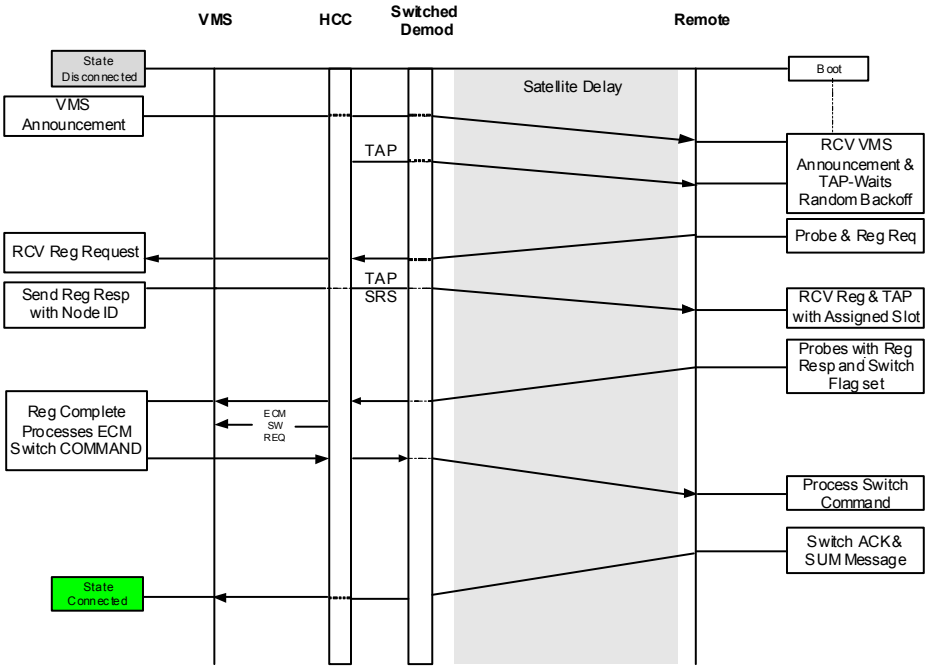


Figure E-23 ECMv2 Processing Diagram

Carrier Presence Switching

Overview

Carrier Presence Switching (CPS) allows the VMS to autonomously manipulate carriers through presence-based distributions within the satellite bandwidth pools. This switching type is determined by the presence or absence of carriers, executing bandwidth shifts governed by divisional carrier distribution and individual policy settings. CPS is a Hertz defined switching method in which a carrier may occupy a large segment of bandwidth even with little to no traffic load on the terminal.

Typically, the VMS does not resize or move carriers unless requested to do so. However, a Carrier Presence switch, when enabled, will change the position and allocation of active carriers due to the addition or removal of carriers. But in this scenario, the Remote is not initiating the switch with a request for additional bandwidth. The resizing and movement of carriers is equally distributed based on available bandwidth and utilizing site policies, while always observing guarantees.

Switching Parameters / Configuration

The Carrier Presence Switching feature is not simply enabled or disabled in the VMS; it requires a specific combination of parameter settings within the group(s) of Remotes to become operational. The following switching parameters must be configured as specified in order for CPS to become fully functional.

NOTE

Note: It is NOT recommended to enable automatic switching functions—*Load* and/or *Application*—for a group of Remotes that will be utilizing CPS; undesirable behavior will result.

Entry Rate — InBand Application Policies

Previous to version 12 of the VMS, site minimum and maximum rate settings were provided, with the minimum setting specifying the *d*SCPC entry rate from the shared access channel. The *Entry Rate* setting (figure E-24) now provides for more flexibility when entering into the bandwidth pool, where the first switch may be greater than the site minimum. This setting can be any value between the Switch Rate Min/Max Limits (figure E-25), which the system will attempt to honor, depending on available resources. Note that this is not necessarily a guaranteed rate.

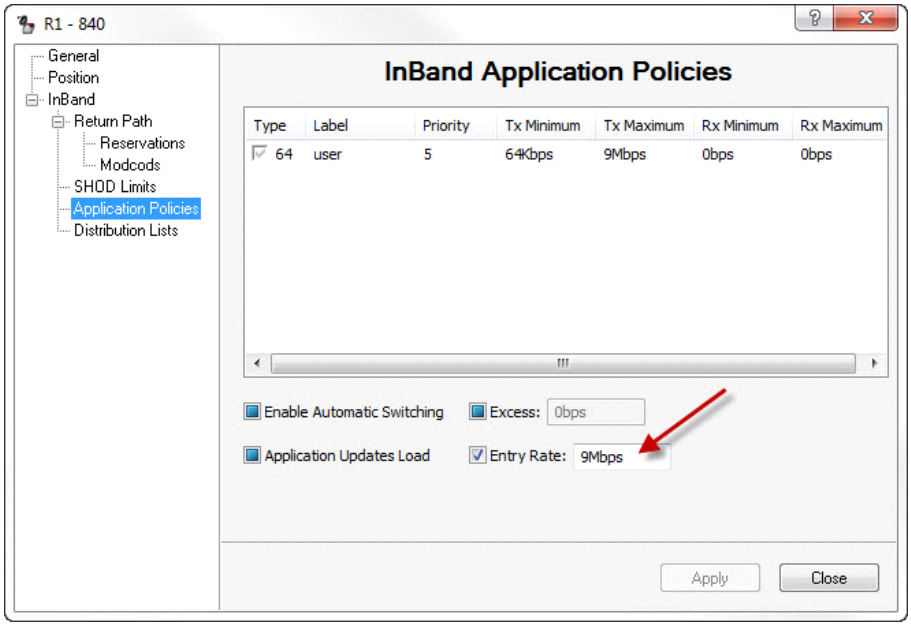


Figure E-24 Entry Rate, InBand Application Policies

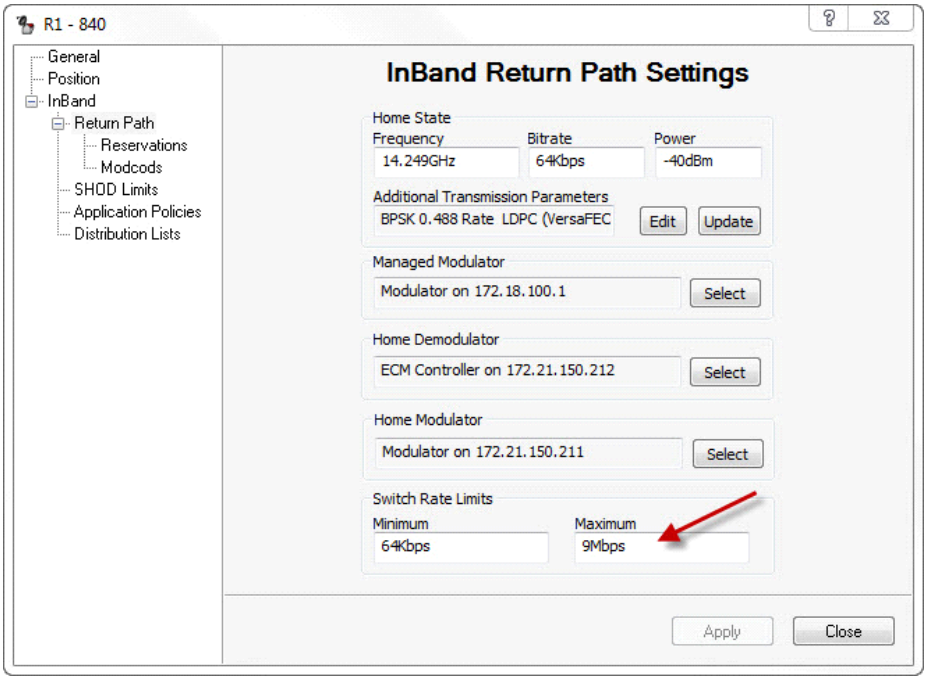


Figure E-25 Switch Rate Limits, InBand Return Path Settings

As a policy setting, the Entry Rate parameter is hierarchical. By default, it is inherited from the top of the Network tree Application Polices and branched to all associated Groups and Sites underneath. The operator has the option to leave the inherited setting or modify each group/site individually.

The Entry Rate is a key parameter for CPS when used in combination with Reservations.

Typically when setting up groups of Remotes for CPS, it is desired for each Remote to enter into *d*SCPC at a rate much greater than the guarantee, or even to be at the maximum rate. This initial switch out will attempt to allocate as much bandwidth as possible, which either will be granted or cause a redistribution of all other carriers. Either way, this is the best approach to optimize available bandwidth.

In the example illustrated in the above figures, the Remote will attempt to switch out at a maximum site limit using the oversubscription settings.

Ideal Rate & Minimum Rate — InBand Reservations

The *Minimum Rate* setting controls the behavior of the switching operation for a Remote unit. When this parameter is NOT enabled, the *Ideal Rate* is the site's guaranteed rate and there is no oversubscription within the bandwidth resource pools.

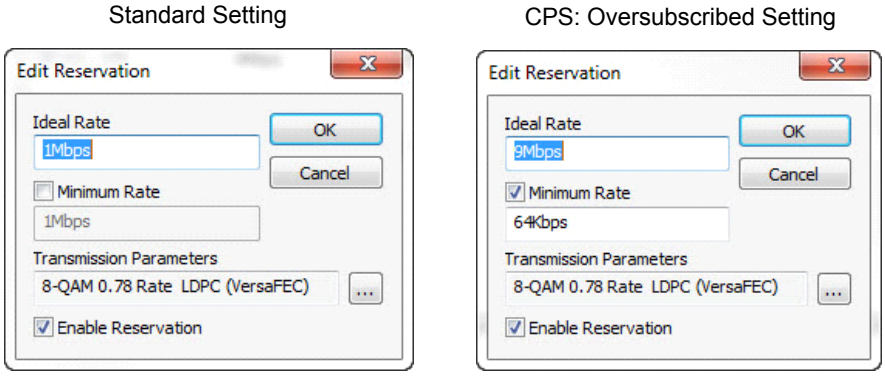


Figure E-26 InBand Reservations

For CPS to become functional for a group of Remotes, the Minimum Rate parameter must be enabled—selecting the check box and specifying the data rate—for each Remote.

The Ideal Rate then becomes the oversubscription (maximum) rate and the Minimum Rate becomes the guaranteed rate. This will assure carrier redistribution upon bandwidth availability.

With the settings shown in the example above, this particular Remote will attempt to occupy 9 Mbps in the available pool, but if bandwidth resources are limited, the carrier will have no less than 64 kbps.

In the example shown in figure E-27, a single Remote has attempted to occupy the 9 Mbps specified in an empty pool. However, because the pool capacity is less than this amount, the system has allocated all available bandwidth to the carrier.

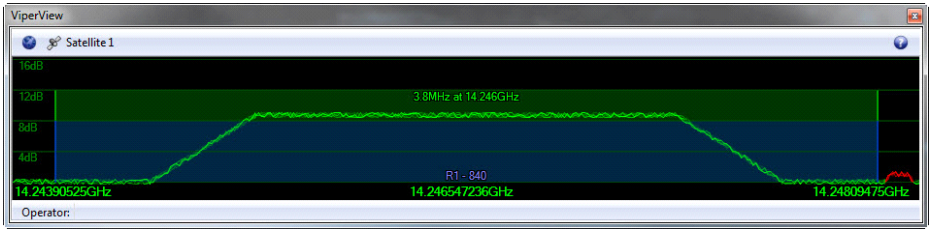


Figure E-27 Single Remote example

In figure E-28, a second Remote has also requested a 9 Mbps carrier from the same pool, and because this amount of bandwidth was not available, the system provided an equal split of bandwidth between the two Remotes.

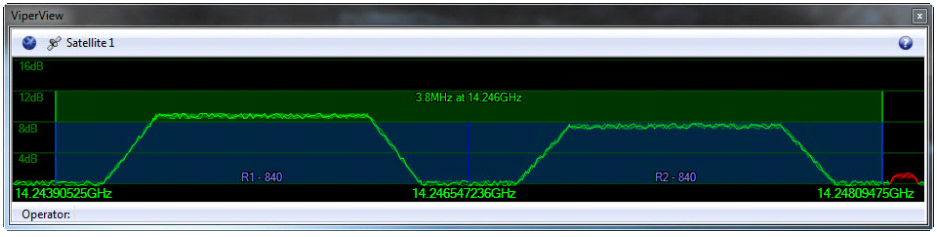


Figure E-28 Two Remotes example

NOTE

Note: Equal divisions are only possible if all Remotes are provisioned with the same rate policies, otherwise unequal splitting of bandwidth will occur for carrier assignment.

The next example (figure E-29) shows available bandwidth or an absence of a carrier where a Remote vessel has roamed away, leaving a vacancy within the pool.

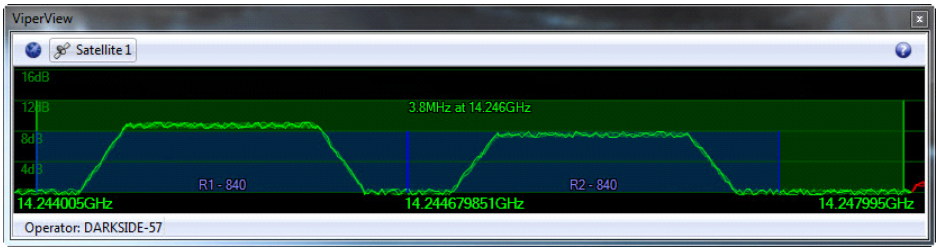


Figure E-29 Pool Vacancy example

The allocation of bandwidth will remain unchanged until a successful roam operation is performed with the Remote leaving the pool, or until another Remote enters. Bandwidth vacancy is only automatically reevaluated when the *Switch All on Roam Away* parameter is enabled and/or there are new entries to the pool.

When setting up CPS oversubscription reservation bandwidth, notice that the status bar will be completely blue (figure E-30), indicating that all available bandwidth is allocated for use. If all Ideal data rates for these Remotes are totalled, the sum may exceed the available by a very large percentage. This is the oversubscription aspect ratio that the system will attempt to fulfill.

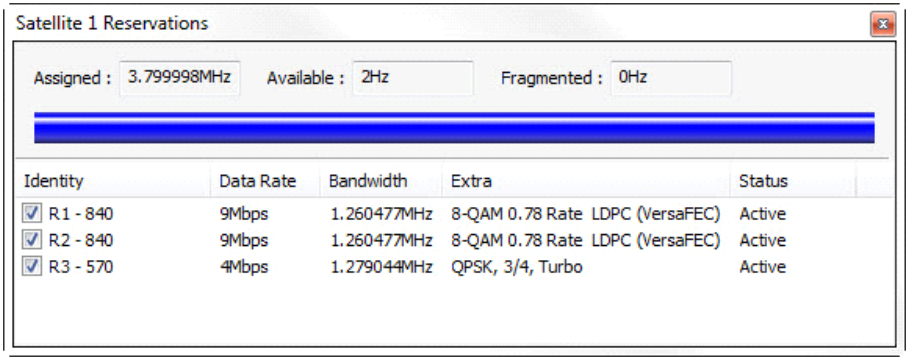


Figure E-30 Satellite Reservations

The Minimum Rate is NOT oversubscribed even in this CPS configuration, but it is not represented in the status bar. If the guarantees are oversubscribed, each Remote exceeding this amount will show a status of *Inactive* or during selection may indicate an *Error* (figure E-31). In either instance, the operator must readjust the configuration based on available resources.

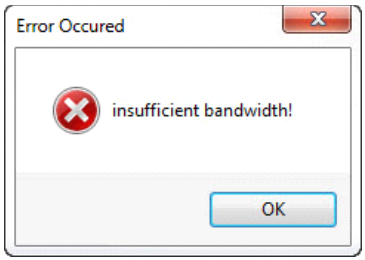


Figure E-31 Resource Error

Switch All on Roam Away — Satellite Pools

The only automation of CPS is through a successful roam where a vessel leaves a service area and enters another. When the *Switch All on Roam Away* parameter is enabled, the roaming operation forces the system to reevaluate the bandwidth distribution among the remaining Remotes and adjust all carriers to fully occupy the pool.

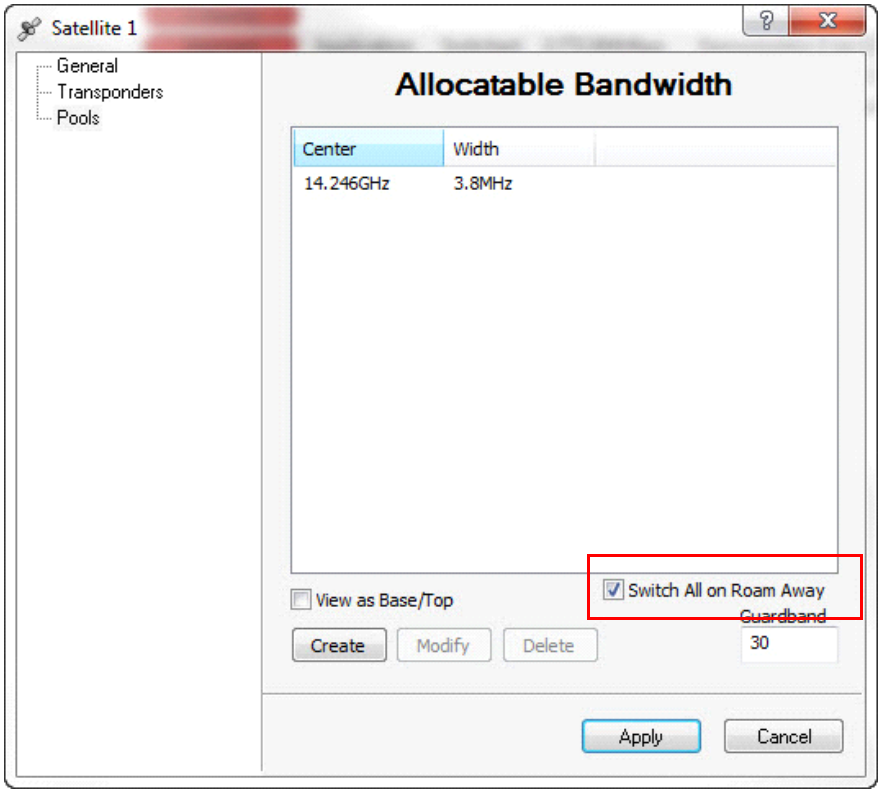


Figure E-32 Switch All on Roam Away, Allocatable Bandwidth

This parameter must be enabled on all satellites within the network when configuring CPS for roaming.

Switch All Active — Satellite Command

Remotes can leave the pool for various reasons, some of which may be unknown to the VMS—e.g., communications failures and vessels that move into port and shut down communication—and leave spectrum under utilized. In these cases, a manual operation is available to clean up the vacancies by redistributing the bandwidth to the remaining active Remotes. The *Switch All Active* command, accessed from the Satellite pull-down menu (figure E-33), will execute an attempt to reevaluate all active carriers within its resource allocations. When selected, the system will send command(s) to all carriers within the pool(s) to redistribute the bandwidth amongst all of them based on individual policy settings.

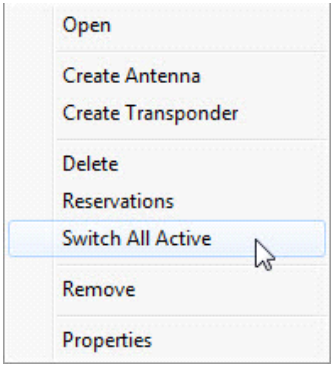


Figure E-33 Switch All Active command, Satellite Menu

Caution: Issuing this command will switch all active carriers at once. Disruption of service on some carriers may not be desirable during working hours. If so, this operation should be executed only during a scheduled maintenance period.

Point-to-Point Switching

In addition to dynamic SCPC (dSCPC) return channel capabilities the system provides a mode of operation that can pick from a pool of standby hub modulators and assign routing and carrier information establishing a separate forward path while still maintaining the return path dSCPC allocations. There are many applications that can benefit from this feature, e.g. disaster recovery, circuit restoral, video conferencing and mobility COMs on the pause requiring instantaneous dedicated bandwidth capacity.

Dynamic Switching Fundamentals

The basic network architecture is star topology utilizing a common outbound with separate multiple dSCPC returns. All of the remotes within the service connection of the outbound must share bandwidth resources relying on statistical multiplexing and queuing priorities to fairly divide and distribute outbound traffic amongst all receiving terminals.

The hub outbound transmission is the foundation from which all terminals receive their reference connection point. Without this reliable fixed frequency and bandwidth channel the terminals would not have a point origin losing management control, data access and the ability to return dynamic data connections. This places restrictions on the outbound whereby modifying any part of the carrier parameters becomes a major interruption of services during maintenance periods.

The autonomous operations on the remote return path provide carrier bandwidth flexibility without having to schedule any maintenance downtime to modify transmission. These dynamic allocations are managed through network control messaging that modify frequency and bandwidth on demand with a miniscule amount of interruption, typically measured as inter packet latency or jitter during each switch.

Remote transmission return path dynamics are designed to fulfill all request based on site policies and configurations. Bandwidth is distributed through requests beginning with initial entry and up to maximum terminal capacities. All remotes enter into dSCPC at an ER and may remain at that rate unless conditions change requiring greater capacity. Each remote may request up to their MIR (terminal maximum) if bandwidth is available.

- Entry Rate - ER is the minimum SCPC entry rate. That is, a site with a minimum SCPC rate gets at least the ER allocation all the time.
- Maximum Information Rate - MIR is a true peak rate. That is, a site operating at MIR could potentially occupy up to the entire pool segment capacity, if no other site requires it.

- Committed Information Rate - CIR is a high-priority rate that a given site will be assured if requested.

Return path dynamic control involves modifying the remote modulator and a hub demodulator. The signaling to request bandwidth changes are proprietary network management packets destine to the VMS switching engine or bandwidth manager. These packets are initiated from the remote based on triggers that are defined configurations as part of the remotes packet classifier. Through these settings the remote can detect particular traffic patterns sending Automatic Switch Request (ASR) messages to switching engine. The engine compares the ASR information against remote site policies to determine how to appropriately modify the remotes return transmission.

Remote Site Policies

Site policies govern the capabilities of the remote assuring that ASR does not exceed hardware or link budget limitations. The standard dSCPC policies only modifies the return path devices (remote modulator to hub demodulator) excluding any changes to the remote demodulator which is configured to operate on the hub outbound.

Leveraging the technology of the return path capability we've introduce Forward Path Switching or Point-to-Point. By adding forward path switching into the system, remote site policies introduce the option of managing hub modulators. This opens a new dimension in the dynamic switching capabilities allowing allocations to not only (remote modulator to hub demodulator) also (hub modulator to remote demodulator). If we combine these two methods (return and forward path switching) as a single autonomous operation a switch now represents a separate and dedicated link between hub-and-remote.

Point to Point Description

Definition of Point-to-Point mode: A method in which the remote is dynamically assigned a return and forward link dedicating a hub demodulator and modulator creating duplex SCPC operation.

Forward path technology requires different rules of arbitration than return carrier control. Return path dSCPC involves modifying the remote modulator and a hub demodulator, but not the remote demodulator which leaves a firm path in place from the outbound for management control.

When a forward path switch is applied there is a short duration of time where the remote drops the hub outbound and retunes to the assigned forward path. As mentioned previously the switch is one autonomous operation making this type of switching possible. In a case where a communication failure could occur during this operation the system has recovery processes in place to handle all situations, this is discussed in the Failure Handling selection.

A simplistic depiction of a P2P switch in figure E-34 shows Remote-1connected to a separate hub modulator and demodulator. Two carriers are assigned at a requested data rate and routing information is moved from the outbound to the forwarding modulator to complete the data circuit.

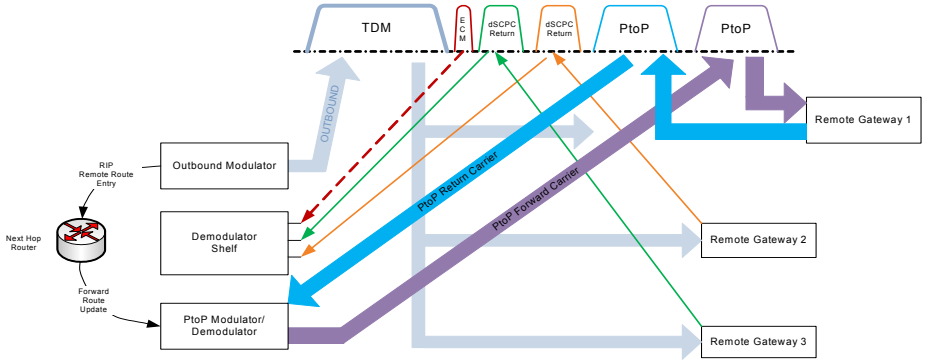


Figure E-34 Point to Point Switch

Operation

All remotes enter into the dSCPC bandwidth resource pools through separate command processing. Each phase requires different messaging to direct and modify return path carrier configurations. The initial phase requires that remote gateway is locked and receives a Transmission Announcement Protocol which is sent from a hub Entry Channel Controller (ECC). This network multicast message provides tuning information for all listening remotes allowing each to modify their transmission frequency, bandwidth and timing to contend for slices of shared bandwidth signaling that they wish to register and switch into dSCPC.

Remotes cannot switch to SCPC until they have properly registered with the VMS. After registration the remote again signals on its next transmission to the ECC indicating a switch to dSCPC. On behalf of that remote the ECC sends an ASR message to the VMS requiring a switch.

Once a remote has switched to dSCPC entry rate it remains within the bandwidth pool and may modify its return rate based on load or application requests. If remote site policies promote forward path switching it may request a PtoP setup.

Forward Path Switch

P2P switching is a transitional state from dSCPC and is driven by a particular type of request from the remote. While the remote is operating in dSCPC an application (traffic pattern or stamped packet) which is detected in the remote generates a specific type of ASR and is forwarded to the VMS, and if the ASR contains a particular policy setting the bandwidth manager will issue a P2P switch command.

The P2P command is broadcasted (multicast) locally to the hub LAN and over the outbound containing all hardware and transmission parameters required to establish a new forward and return path link. The remote processes the command adjusting both receive demodulator and transmit modulator, which are tuned to match a hub modulator and demodulator. Note hub modulator and demodulator don't have to occupy the same chassis.

The illustration in figure E-35 depicts a scenario where remotes are operating in dSCPC and one remote has switch to P2P.

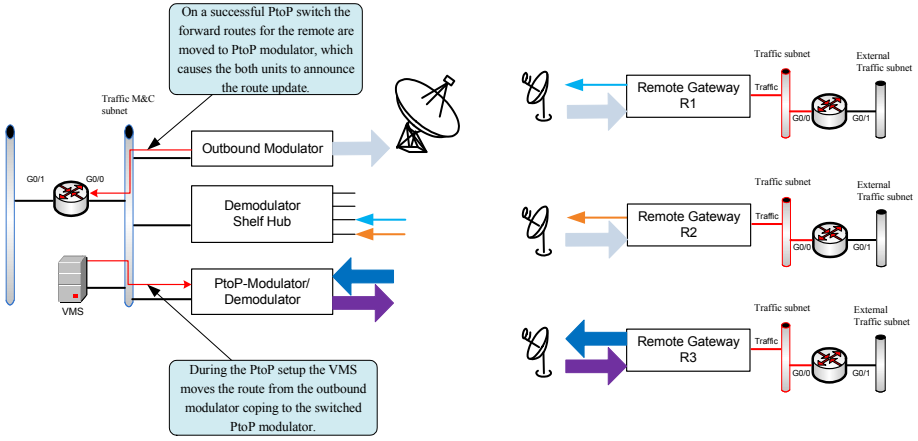


Figure E-35 Switch from dSCPC to P2P

Route Update

To complete the P2P switch it is necessary to move routing information associated with the assigned remote. Route updates are managed through dynamic route tables configured in the VMS under the outbound modulator proprieties. This route table configuration applies remote routing entries on demand, which are added to the hub outbound modulator on boot or registration. Any route that is not fixed, i.e. default local next hop gateway or routes not part of the dynamics are added to this list.

While processing a P2P switch request a separate route update message is sent to both hub outbound and assigned forward path modulator. The outbound removes the route entries and the assigned modulator adds associated entries. Each modulator announces (RIP) to the next hop router updating the route tables.

When the P2P is no longer required the remote can send an ASR releasing the forward path modulator dropping back to dSCPC switching. The route updates follow the same process but in the reverse order.

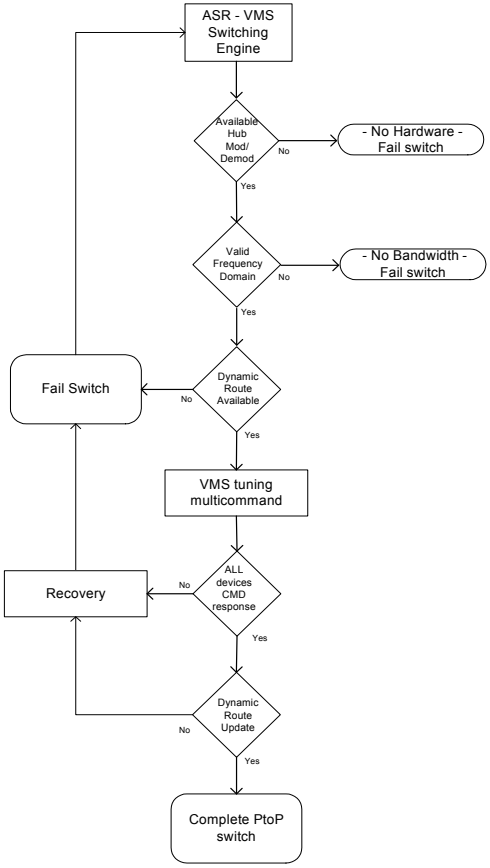
During this P2P switch state all normal features function as normal.

Caveats associated with P2P

Remotes operating in P2P have constrains that must be enforced to preserve link reliability. One of the main enforced rules is once the remote switches to P2P mode the two carriers must remain immobile. Moving or modifying the forward carrier is possible but risky because there is a potential that the hub to remote channel configuration is missed when applied and one or the other end of the link is out of sync breaking the M&C communication. If this should happen failure handling comes into affect which will reestablish communications.

NOTE

Note: Point-to-Point Switching only works in routed mode.



After receiving Automatic Switch Request the bandwidth manager will process message within the switching engine.

Step-1, checking for hardware availability. Both hub Modulator and Expansion Demodulator must be accessible. *Note the P2P switch does not require that both modulator and demodulator are in the same chassis. Split path hardware is acceptable.*

Step-2, determine if there is adequate bandwidth to fulfill the request, either asking or CIR, whichever comes first.

Step-3, determine if there are forward dynamic routes available in the outbound route list.

Step-4, Issue a multi-command switch to modify the remote transmit and receive configuring the hub modulator and demodulator for reception.

Step-5, Check that all units have sent their switch command responses validating that the P2P link is good.

Step-6, Update the P2P modulator forward route table with all listed routes for that site.

Step-7, Complete the switch process and await takedown or switch back to return path dSCPC switching.

Figure E-36 Point to Point Switch Flow

Failure Handling

Failures may occur while attempting to transition a set of carriers to a new layout. When they do, all carriers are pushed back to their original state prior to the switch. This is deemed a safe approach to returning the system to known state as the assumption is that if the devices received the initial tuning command and did in fact begin transmitting on the new frequency, they will have also received the cleanup tuning command returning to their original frequency. On the other hand, if they did not receive the initial tuning command, it does not matter if they receive the cleanup tuning command as they are already in their original state. In either case at the end of the failed switch, all devices are in a known state (their original state, as if the switch never occurred).

Upon executing the initial switch commands, one or more failed modulators can indicate failures in additional modulators due to possible bandwidth contention with the failing modulators(s). During cleanup of a failed switch, modulators that respond to the cleanup are not considered failed, where as modulators that still do not respond are considered failed. When a modulator is considered failed, it is put into recovery mode.

Upon entering recovery mode, all resources allocated to the modulator are marked as unavailable and its allocations are removed. The modulator remains in recovery mode until it can be successfully reverted (including an impending automatic home state operation). This successful revert will also have the effect of making the unavailable resources available for allocation again.

While a modulator is in recovery mode:

- All external requests for that modulator are immediately failed
- The system periodically attempts to revert the modulator
- The option for a solution to push all carriers to their reserved slots is disabled

As long as any modulator is in recovery mode, the entire allocation-space is considered in a recovery mode. While in this recovery mode, data-rate guarantees are not honored, since as long as there is an interfering carrier (the modulator(s) that have not been recovered); The pre-allocations are likely to be compromised.

In the case during a P2P switch and the remote demodulator is no longer locked to either the hub forward path or outbound the remote auto home state will be invoked forcing the remote back to a know state of ECM. From this point the remote will start receiving recovery messages while all hub related allocated resources are cleaned up.

Example Applications

There are many applications that can benefit from P2P switching mode some are more obvious than others like in figure E-37, which represents a terrestrial E1 link that is backed up through P2P switching.

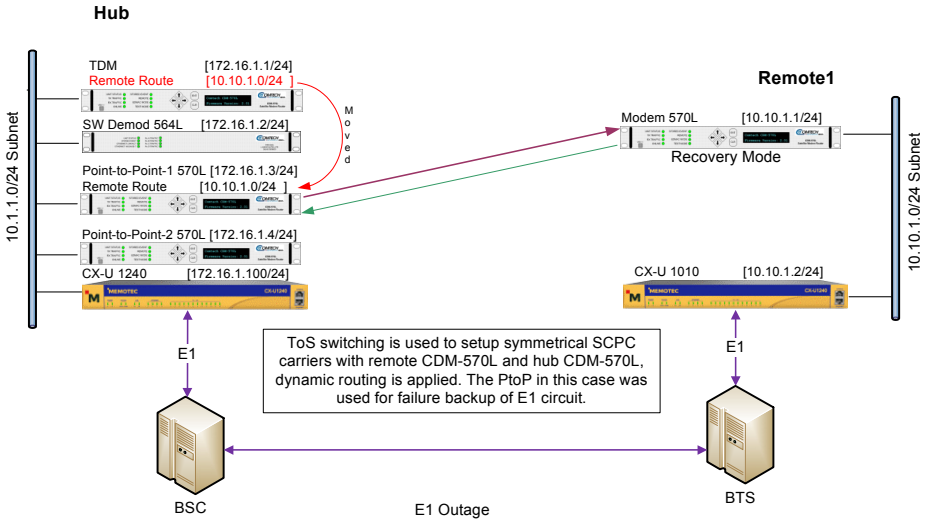


Figure E-37 Point to Point E1 Recovery

Mobility is another very good example that can provide unique capabilities to a mobile truck. As the mobile unit moves into location it can switch to dSCPC communication sending low resolution video data allowing the control center to monitor views. When monitoring indicates a need to switch to high speed video a command can switch the mobile to a P2P link.

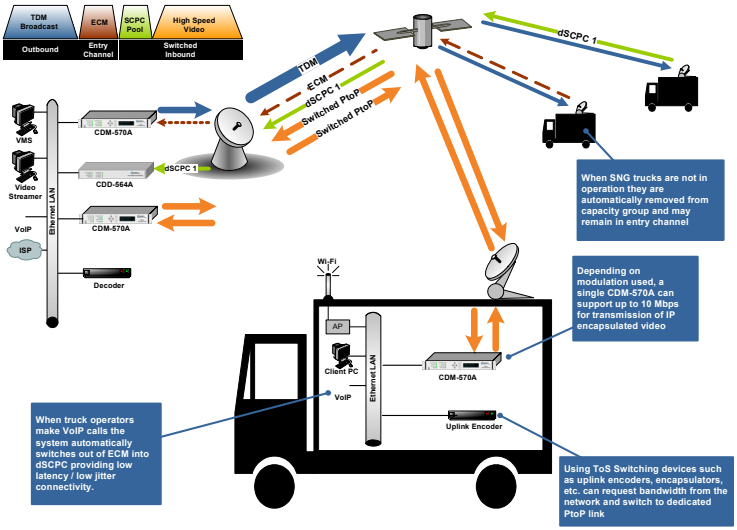


Figure E-38 Point to Point Mobility

Carrier in Carrier Switching

Carrier in Carrier takes advantage of Point to Point feature with the enhancement of new switching technology.

One of the main reasons to perform a CnC switch is to utilize the Carrier in Carrier function of Comtech CDM-570A modems allowing the return and forward path to be under the same allocation space segment automatically determined by VMS.

This section describes the requirements and configuration setup necessary to operate a Point to Point/Carrier in Carrier link.

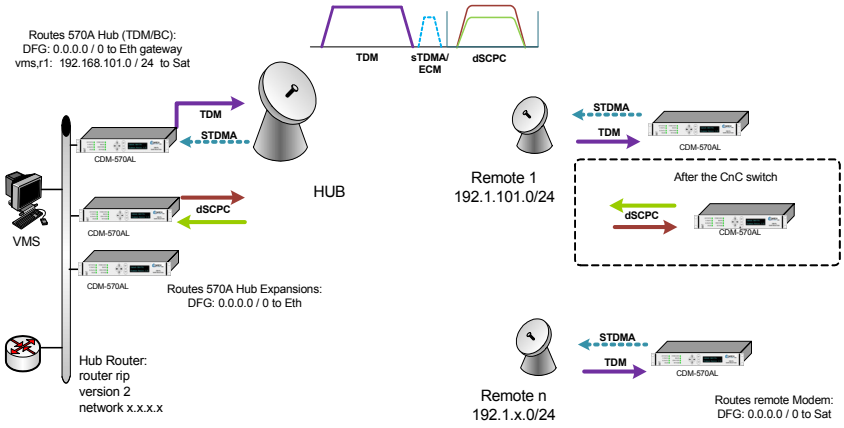


Figure E-39 Diagram of Basic Connection

Systems Requirements

- VMS v3.14.0 or greater
- Routers at Hub site with RIPv2 support
- CDM570A modems FAST code CnC enabled Running firmware versions: BM v1.5.2, and PaP v1.5.2 or greater

Configuration Checklist

There are few additional settings that are required to allow proper operation of this new feature. The following steps outline the basic parameters that makeup the non-dynamic controls that are not issued by the VMS commands.

Hub Configuration

- The TDM outbound will be transmitted by a CDM570AL, which the demodulator may also function as a burst controller.
- Dynamic routes will be needed to update the route when it is migrated to the expansion demodulators.
- SOTM enabled on all Hub modulators and Outbound IP address configured to match TDM IP.
- Burstmap multicast IP address has to be configured on Expansion modulators, or at least a LAN to SAT multicast route for the burstmap multicast IP to maintain the keep-alive counter for auto home state while in CnC operation.

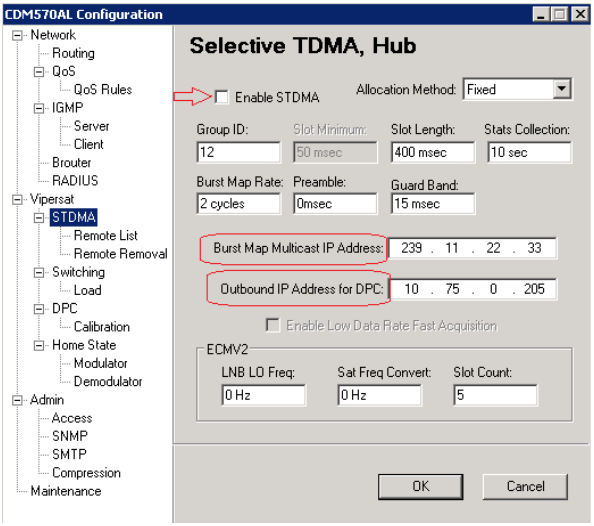


Figure E-40 Hub STDMA Parameters

- Expansion modems CnC configuration menu -> set Search Delay and Max Power level increase.
- Use of IESS-315 Scrambler is required in both (Tx/Rx) directions.
- Determine if ACM / AUPC will be required during CnC switches.

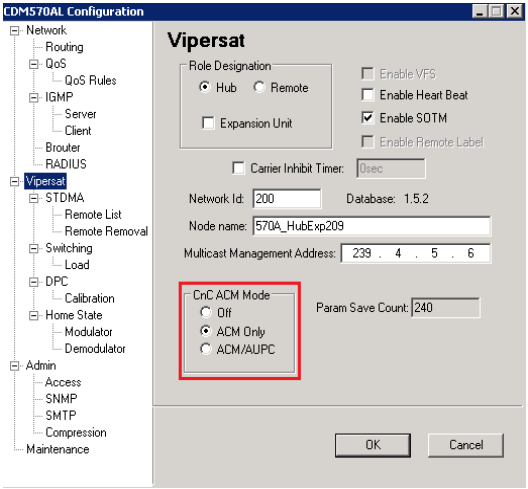


Figure E-41 CnC ACM Parameters

CnC ACM mode can also be configured from console or telnet at:

Main Menu > Vipersat Configuration > option “J” for CnC_ACM_Mode

Remote Configuration

- CDM570AL operating in Vipersat mode with STDMA enabled.
- Home state configuration set to receive TDM and transmit on STDMA/ ECM channel.
- CnC configuration menu -> set Search Delay and Max Power level increase.
- Determine if ACM / AUPC will be required during CnC switches.

To enable CnC in the modem, the CDM570AL has to be running in CDM-570A Mode compatibility.

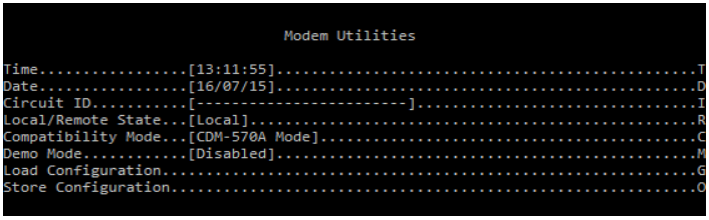


Figure E-42 Modem Compatibilty Mode

Modem CLI > Satellite Modem Configuration “M” > Configuration “C” > CnC Configuration “C”

```
                              CnC Configuration

CnC Mode.........................[Off]......................................M
CnC Freq Range/Offset............[010]......................................F
CnC Min/Max Search Delay..........[245 - 255]..................................D
CnC-APC Max Power Level Increase..[3.0]....................................P
CnC-APC Home State...............[Not Available.]...........................H
CnC-APC BER Reset.................................................................B
CnC-APC FER Reset.................................................................R
CnC-APC Activate..................................................................A
CnC-APC Suspend...................................................................U


Save Parameters to permanent storage.......................................S
Exit.......................................................................X
```

Figure E-43 CnC Configuration

For a Low-Fly back to back test environment the 'Search Delay' range must stay below 20ms. Once the modems are transmitting to the satellite the delay will have to be increased around the 250ms range, *see CDM570AL modem manual for further references.*

VMS Configuration

VMS has been updated with CnC support providing a newly modified multi-command to adjust modems involved in a paired switch to utilize this feature. The new command is triggered by an application switch type number 253, and when activated the system will tune hub/remote devices in Point-to-Point paired configuration allowing both carrier uplinks to occupy only a single slot of bandwidth.

NOTE

Note: Not all of the hub/remote CnC parameters are controlled by the switch command and must be preconfigured to operate correctly. Important, make sure that CnC static parameters match between hub remote or the link will fail setup.

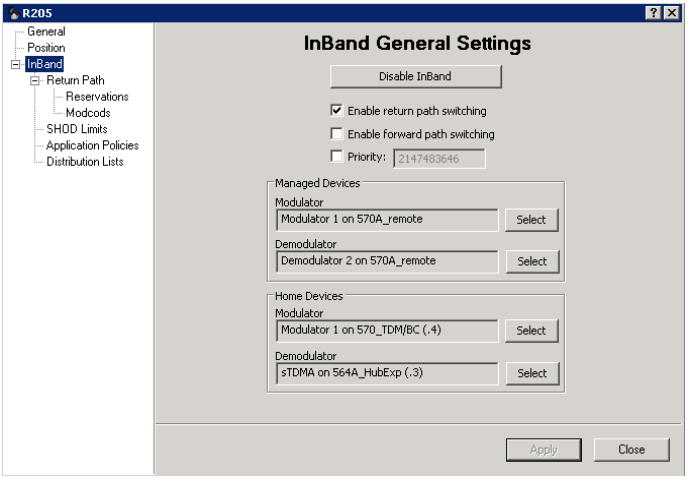


Figure E-44 Forward Path Managed Device

Forward Path switching can remain disabled. Nevertheless, it is necessary to initially enable it to set TDM outbound's home state parameter and then disable if desired, after the power has been configured. It recommended to leave Enabled.

A global or local application policy, with type 253, must be applied for the remote site, in order to trigger the CnC switch.

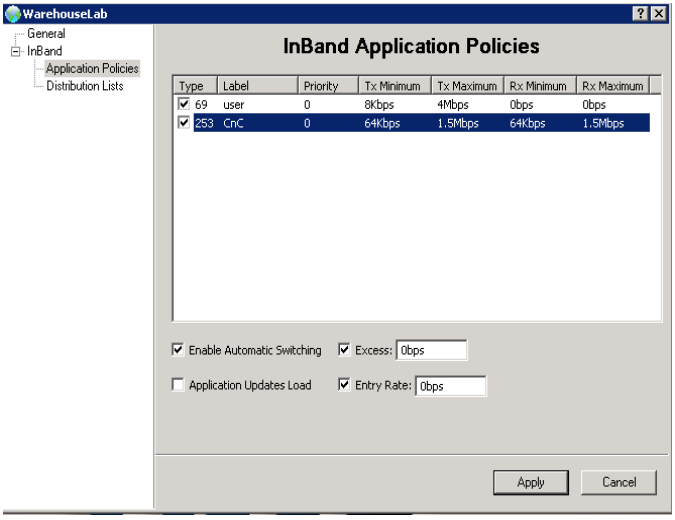


Figure E-45 CnC Inband Appliation Policies

Expansion demodulators are selected for allocation purposes. But the Hub antenna must have available modulators matching each of the CnC expansion modems.

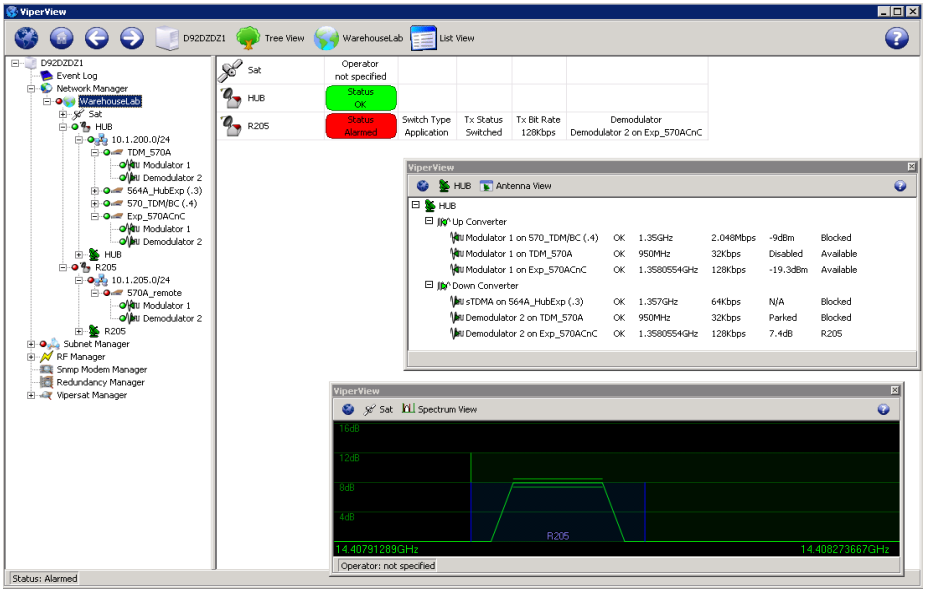


Figure E-46 Expansion Demod Allocation

Once the site has switched to a CnC dSCPC link, the VMS will update the satellite view, figure E-47 with the graphic representation of both carrier, and the horizontal bars represent the average Eb/No reported by each demod. User can right-click on the carrier to view a list of all devices involved with this bandwidth allocation.

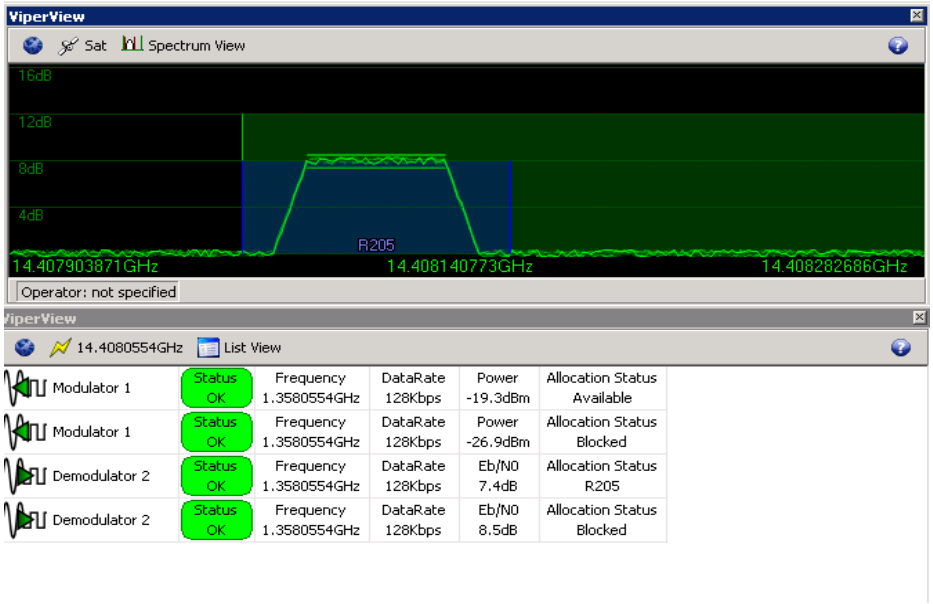


Figure E-47 CnC Switched View

Meshing, Single Hop on Demand

Meshing allows Remote Gateway's to communicate with another Remote Gateway location without double hopping traffic through the hub. This type of connection minimizes delay and often is used for very high quality voice and video conferencing applications.

Single satellite hop technology provides less delay, ensures higher quality voice communications and efficient use of the satellite space segment.

Single Hop On Demand (SHOD) switching technology offers IP packet circuit switching at the application level. SHOD provides significant and dynamic connectivity between latency connections without suffering the high costs associated with multiple carriers and/or 1:1 multi-receiver links.

Mechanisms

SHOD deploys automatic application protocol traffic detectors and dynamic filter routing tables that eliminate double packet re-transmission.

The environment consists of three types of control mechanisms:

System Master Control - (SMC)

HUB VMS Switching Bandwidth Manager

SMC maintains the associated remote mesh subscriber list and mesh filter routing database information. Synchronizes and distributes connection setup information for all active nodes while maintaining distributed satellite resources.

Automatic Switch Request - (ASR)

Remote Gateway packet classifiers detect control protocols using Type of Service (ToS) IP header and manages switched application services in real-time. Each Remote Gateway with the ToS switching enabled locates packets with matching set values sending the ASR message to the hub initiating a bandwidth circuit change.

Destination Packet Filter - (DPF)

The SMC applies an IP DPF packet filter dynamically to the corresponding hub demodulator for each active switched meshed circuit. Packets that are destined for the hub network are passed through normally. This filtering type eliminates double packets received at the remote destination and additionally removes unnecessary traffic on the broadcast (outbound) transmission.

Functional Description

The networks operate in star topology, where the Remote Gateway send data packets to the hub via the inbound transmissions. If the data is destined for another Remote Gateway the packets are retransmitted on the hub outbound carrier redistributing the data to the destined Remote Gateway. This method of re-broadcasting the data constitutes a double hop condition multiplying the latency x2 (approx. 560ms one way) and using more outbound capacity. Normal data applications do not have any problem with the additional latency. However, applications requiring minimal jitter and low latency, namely VoIP (voice) or IPVC (video) or any other real time protocol applications that cannot tolerate long latency connections, make double hop unacceptable.

The following figure E-48 shows a one way data path for a Remote to Remote communication without a mesh topology, making evident the Double Hop to the satellite.

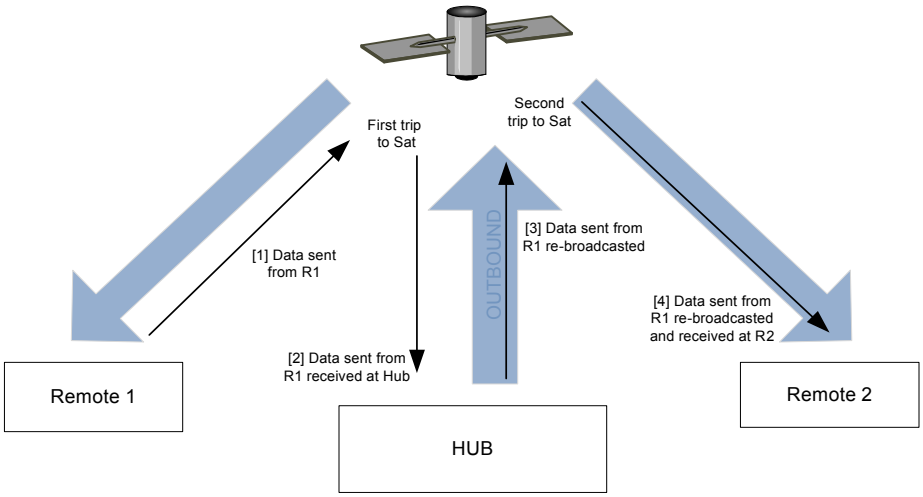


Figure E-48 Remote to Remote without Meshing

To mitigate the double hop condition the system incorporates mechanisms that automatically detect packets transmitted from one remote and are destined to another. As traffic passes through the Remote Gateway the packet classifier/ switch manager detects a switch sending an Automatic Switch Request (ASR) to the VMS signaling a change in capacity and if the ASR's traffic IP destination is for another Remote Gateway the request is then compared against site policies which tries to match the external subnet before issuing a command. If the policy check returns true the command will not only have the requesting Remote Gateway and hub Demodulator shelf configuration, but also the addition of the destine Demodulator shelf on another Remote Gateway site.

This problem is resolved by implementing an automatic mechanism that subtracts the additional hop without necessarily adding more transponder space. This is accomplished by adding software control and a second demodulator/ router at all remote sites supporting low latency application.

NOTE

Note: Demodulator/routers can be increased at each remote for additional circuit capacity.

The software is configured to detect, switch and filter communications from receiving low latency application messages on the hubs inbound star data demodulator/router connections. The received low latency application messages are only passed through the additional demodulator/router when double hop conditions exist. The additional demodulator/router receives control messages from the hub SMC whenever a call is placed between remotes tuning frequency, date rate.

Each demodulator/router is tuned to listen to the opposite remotes inbound carrier completing a single hop circuit. The figure E-49 represents a single hop example where Remote 1 is transmitting data to Remote 2 with SHOD enabled.

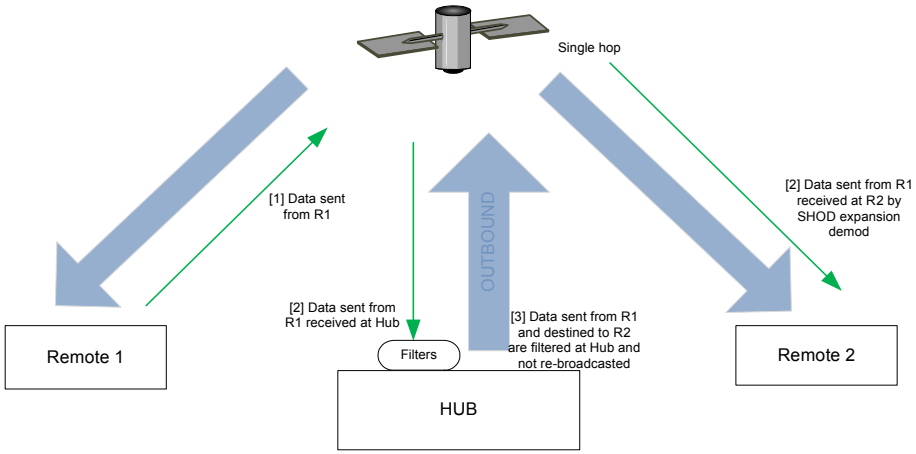
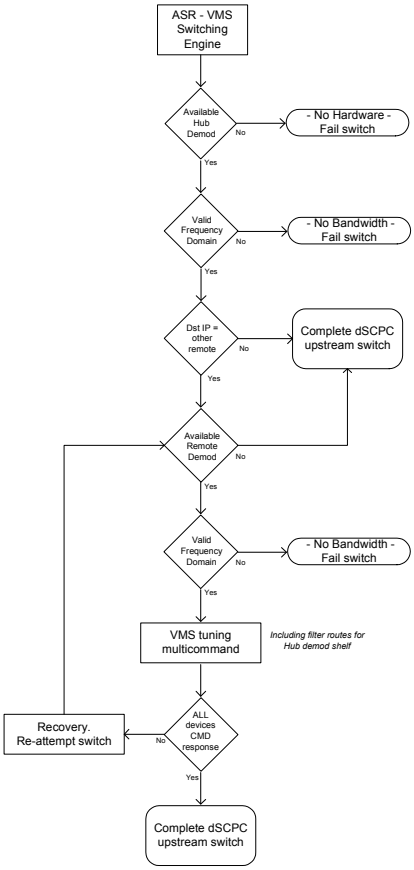


Figure E-49 Remote to Remote with SHOD

Mesh Setup Based on ToS application detection

The detection of a ToS stamped packet by a remote gateway modem can provide the means for setting up a Single Hop On Demand (SHOD) mesh connection from that remote to another remote within the network as described above.

For these SHOD connections, it is assumed that each remote site that is part of the SHOD connection has, at minimum, one additional demodulator configured as a Remote Expansion. When a remote modem detects a packet that has been stamped with a ToS value that matches the user defined value, the modem will look at the destination IP address within the packet. The remote modem will then send a switch request to the VMS requesting the user defined bandwidth. The switch request also contains the address that the ToS stamped packet was destined for. The VMS processes the switch request and compares the destination address to the list of known subnets to determine if the destination belongs to another remote within the network. If the address does belong to another remote, the VMS will look for available hardware and bandwidth and then issue tuning commands to set up the connection. Each direction of the mesh is set up independently; i.e., the detection that occurs at remote 1 will establish a connection from remote 1 to the other remote involved. However, the other remote must perform detection for set up in the opposite direction.



After receiving a switch request, the bandwidth manager will, process it within the switching engine by checking for hardware and bandwidth availability, secondly, if the destination IP of the request does not match any of the other remote sites among the same satellite domain then the return path switch is completed for a single remote upstream. If destination IP is matched to another remote site, then the switching engine will verify for expansion demodulator availability under the remote subnet.

The expansion demodulators at the remote site would require a valid frequency range to support the L-band tuning command. These start / stop frequency limits would normally match the values of the hub demodulator shelves.

Once the previous checks have been passed the bandwidth manager will proceed to issue the multicommand, a UDP packet including all involved devices in the switch, configuring necessary frequency, symbol rate, and modulation changes as well as adding the required filter routes for the hub demodulator shelf.

Finally, the bandwidth manager will consider switch completion upon success of receiving all devices confirmation messages, otherwise a new recovery process would re-try the switching steps.

Figure E-50 Mesh/SHOD Flow Diagram

Implementation Requirements

The figure E-51 depicts an example of a mixed SCPC network topology with two meshing capable sites and one star topology remote.

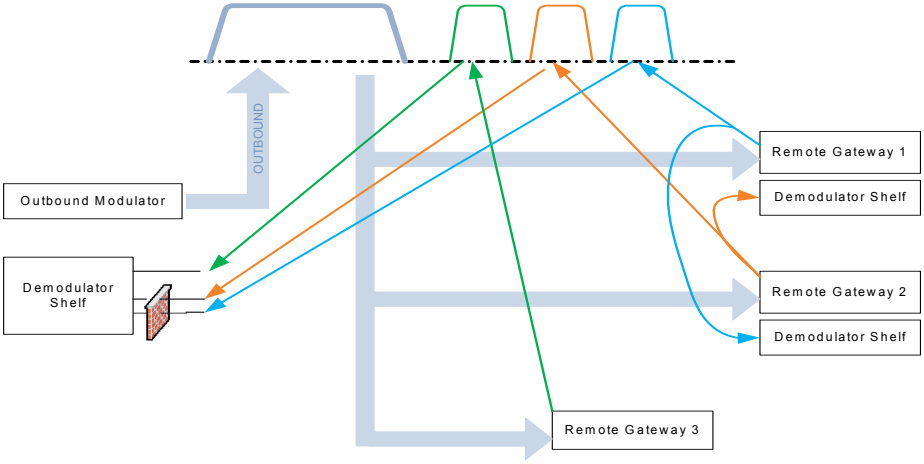


Figure E-51 Mixed dSCPC Mesh Network

- At least one expansion demodulator is required at each remote to support SHOD.
- VMS server at the Hub
- Link budget analysis

A half SHOD would be a connection where a Remote Gateway 1 is receiving the transmission from Remote Gateway 2 but not the other way. Therefore only one direction of the link would obtain single hop benefits, whereas the other return remains on a double hop.

Meshing Considerations

External Subnets

The VMS management system registers only the remote gateway's management subnet, therefore it is required to associate the remote's traffic subnet and any extra subnets behind that could be a potential destination to trigger a Mesh or SHOD. These parameters are set per remote site.

Below figure E-52 shows a sample configuration to demonstrate the routing requirements for the external subnets, keeping in mind that the Traffic subnet of the Remote Gateway is a external subnet for the VMS point of view. Proper traffic and management segregation should be maintained at all times, notice the Routing tables of the Demodulator shelves, redirecting default gateway data to the traffic interface and all management from other remotes/hub subnet to the corresponding Management Fast Ethernet ports.

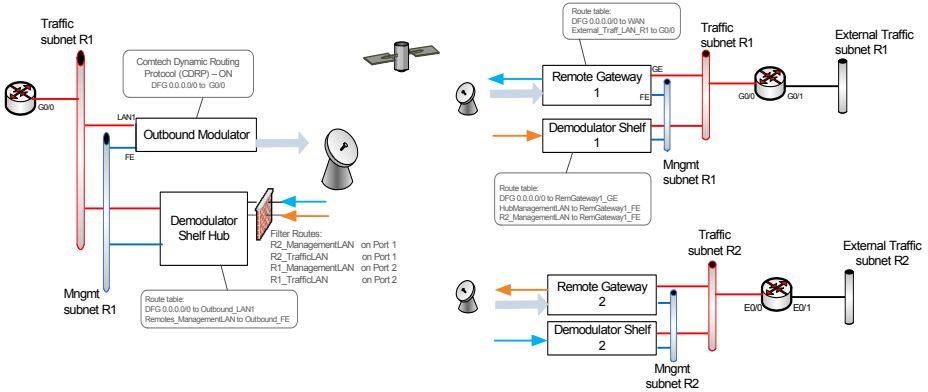


Figure E-52 Mesh/SHOD with External Subnets

Visibility

The newest Comtech's multiple demodulator shelves cover the whole L-band Frequency Range but due to the fact that numerous internal demods are multiplied and shared by the processor capabilities, is necessary to narrow down the range in the Global Demodulator Settings, e.g. to a 70 MHz segment for all demodulated carriers within that chassis. This is particularly important for any Hub and Remote Expansion demodulators in a meshed environment.

Distribution List

Distribution Lists allow the operator to set up a list of sites to be included in a switch under defined circumstances, such as meshing based on an ECM switch, multicast transmission from a remote to a group of remotes, or the setup of monitor remotes.

This feature can be used to tune expansion demodulators at a list of sites for upstream switched services, to provide for point-to-multipoint distribution on an InBand service connection.

This is very advantageous in applications such as:

- Video Transmissions - can direct a multicast video stream to multiple target sites using just one session / one carrier as opposed to having to establish individual sessions for each target site.
- File Transfers - distribute file data from corporate home office to multiple field offices using a single carrier session.

The Remotes that are members of the Distribution List group (SHOD/Mesh) can enter and/or exit the session at any time; after it starts and before it terminates.

Active Distribution List

In the event of a component failure within the distribution list, the system will recover upon total or partial remote site disconnection. When a remote expansion demodulator gets reset or disconnected it will boot back in parked state with all its demodulators disabled, but after registration with VMS, the system will automatically issue a new multicommand tuning the proper expansion demod(s) again to recover the meshed links.

Power Control and Calibration

The VMS SHOD/Mesh operates in environments where variations in geographical location and Remote site hardware (antenna, power amplifier, etc.) can create link power inconsistencies when referenced to the Hub. Budgetary calculations may provide adequate link performance to the Hub, but will differ when establishing mesh connections to one or multiple Remote sites.

The link budget is a calculation involving the gain and loss factors associated with the antennas, transmitters, transmission lines and propagation environment. It is used to determine the maximum distance at which a transmitter and receiver can successfully operate. In other words, a link budget takes into account the location (latitude and longitude), size of the satellite dish (1.0, 1.2, 2.4, etc), BUC size (2W, 3W, 6W) and modem for acceptable service level.

In the case of a meshed network the link budget has to be considered for each individual link in relation from the site that is transmitting to all of the potential other sites that can receive this signal.

The figure E-53 shows an example of a 2-remote meshed network antenna receive gain differences between one location and any others within the mesh connection.

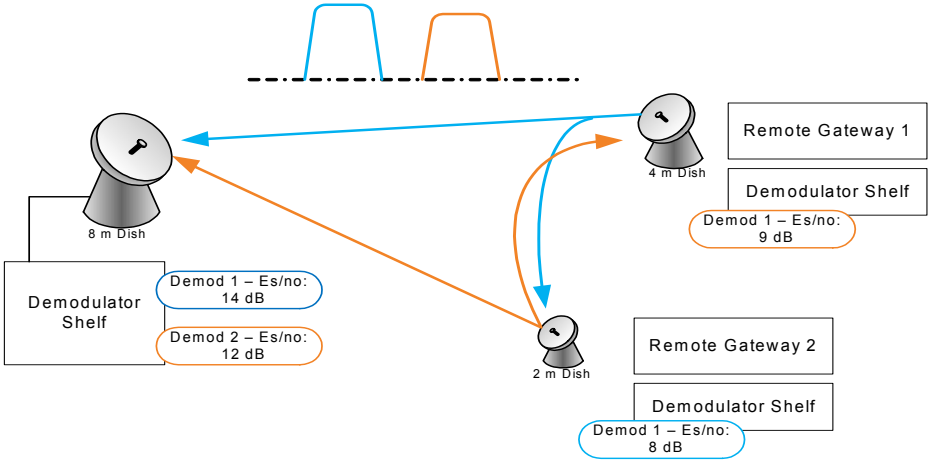


Figure E-53 EiRP Antenna Gain Variation

DPC

The CEFD demodulator shelves incorporate a mechanism to maintain or adjust ACM during degraded conditions. This control uses the Link Quality Receive Message (LQRM) which is generated for each individual demodulator available within the unit sending signal quality Es/No value to corresponding remote gateway modem. Messages are sent on timed intervals, 60sec normally or .5 sec if measured BER falls below defined thresholds or MODCOD is below maximum ACM MODCOD. The DPC function reuses this messaging to adjust power in conjunction with ACM control. The LQRM is used to adjust power during fade conditions, and also to determine power reference during the calibration period.

In a mesh environment each Remote Gateway would be receiving more than one LQRM, one for each demodulator receiving its transmitted carrier. The adaptive control loop will adjust power based on the lowest Es/No reported by all received LQRMs.

VMS has nothing to do with DPC, the modems will control their power based on the demods report, as explained above. The management system will be only a tool to monitor the power and to configure certain power related parameters.

Antenna Gain

The receive gain compensation factor applies a power delta between any meshed Remote sites. The Hub is used as the reference value when calculating a power delta value between Remotes with smaller antennas.

This is accomplished through comparing its receive gain to the gain differences between Remotes. During a mesh switch setup, the VMS compares the delta values and modifies the power adjustments at each Remote site to compensate for differences in receive gain. If DPC is enabled, the system will then further fine tune power to the targeted configuration values.

If multiple Remotes are involved in a SHOD connection, the VMS uses the lowest Remote gain value for compensation control.

NOTE

Note: That if the gain is set on any antenna, it must be set on all antennas that belong to the same satellite. This includes all Hub and Remote antennas. Failure to do so will result in a network imbalance that may cause the satellite to overdrive a site that is set incorrectly.

User can define this value based on link budget and antenna manufacturer gain specifications or more practically, performing a manual calibration after the sites have been commissioned under clear sky conditions and adjusting to maintain baseline parameters.

SHOD Limits

InBand management provides the SHOD Bit Rate Limit feature that can be used when configuring a remote site that will be utilized in SHOD/Mesh applications.

Use of this feature may be required to accommodate for varying link factors, such as disparity in antenna sizes and/or BUC specifications, which affect transmit power limitations. For example, a given data rate that is achievable when establishing a link with the hub may not be achievable when meshing with another Remote, due to differences in t he respective link margins. The differences could be significant enough to prevent reliable communications for some mesh connections.

Both Transmit and Receive settings are presented for specifying minimum and maximum bit rates:

- The transmit setting defines the range limits for this remote's modulator when this Remote is sending to another remote or remotes.
- The Rx setting defines the range limits for any Remote's modulator when this Remote is receiving from that Remote.
- When a Remote with a defined transmit limit is transmitting to a remote with a defined receive limit, the lesser of the two SHOD limit values will govern the transmission rate.

These SHOD limitations may reduce and restrict application performance to the Hub during mesh connection allocations. There will be no provisions to block or notify applications that require greater bandwidth during mesh reductions.

F

NORTHBOUND INTERFACE

General

The VMS SNMP module Northbound Interface (NBI) available in version 3.10 or greater provides two services to external network management systems. First, it allows an external NMS to query the VMS for certain operational status. Second, it can operate as a proxy to Comtech EF Data networking hardware, and fulfill certain requests with information collected via CEFD's proprietary management protocol, thus minimizing satellite bandwidth utilization for common queries.

Typically, all SNMP GET requests to a Remote are handled directly from the modem's built-in SNMP v1/v2c agent through satellite communication links. To support statistical reporting and control, these messages travel over each established link, sharing a small portion of the end user's bandwidth. Even though the total amount of link capacity per Remote is typically low, the aggregate bandwidth on both the outbound and all of the return links could potentially occupy much larger percentages, infringing on Service Level Agreement contracts. Considering the high cost of satellite space segments, which represent a large portion of the end customer's SLA, SNMP's requirement for bi-directional and Basic Encoding Rule (BER) formatted message exchange has at least one disadvantage: inefficient bandwidth resource usage which, as previously stated, is multiplied by the number of Remotes.

NBI Feature Description

In order to reduce the management overhead for typical device monitor queries, the new NBI feature of the VMS adds many advantages through caching techniques. Each of the devices (modems and gateway routers) in the network, by design, already report using an unsolicited message that contains the majority of the key parameters required by monitor systems. These Status Update Messages (SUM) are sent on 60 second intervals to the active VMS. These messages are encoded using a highly efficient “over the air” format that can reduce the data per variable to as little as 5 bits, as compared to a typical SNMP variable binding consuming hundreds of bits when considering the bi-directional nature of SNMP. Disregarding per packet overhead, a typical alarm query will require ~300 bits by SNMP, where as the worst case for a SUM would be 9 bits, and for no alarm states it’s 5 bits. That's a 30x to 60x saving overall, and that is only one example.

Per packet overhead is also significant. A round trip SNMP message will use around 128 bytes just for headers within the UDP payload, whereas the SUM message has a per packet overhead of around 30 bytes. The content of these SUM messages are parsed and processed to support the UI, system events, and key internal processes. Some of these collected values are stored in volatile memory while others are stored to non-volatile memory. In either case, an active VMS can fulfill all standard queries directly while reducing overhead significantly.

The nomenclature behind Northbound refers to an interface that conceptualizes lower level details; e.g., modems and the VMS. It interfaces to higher level layers (managers) which are normally drawn at the top of an architectural network overview. With that said, the feature is an exposed single interface that accepts SNMP messages—GET, GET NEXT, etc.—parses packet data, and redistributes to internals and network agents. This interface acts as a Proxy to incoming SNMP requests forwarding to the appropriate handlers, providing a single point of entry for one or more managers.

The Proxy cache currently accepts MIB OIDs as read only for Series800, CDM-570, CDD-56X, and SLM-5650/A, and processes a subset of variables using a proprietary CEFD caching mechanism. All other requests that fall outside of the scope of the local caching are directly forwarded to the end agent for standard processing.

The following diagram (figure F-1) depicts a simplistic overview of the module flow. Note that the Proxy function is integral to the core software libraries of the VMS.

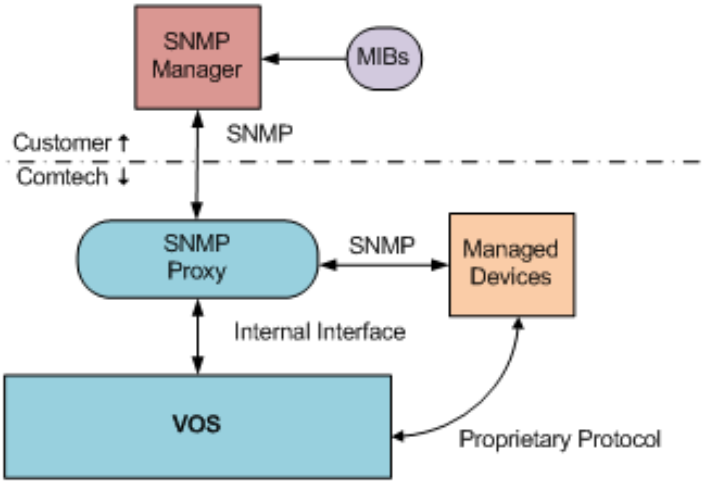


Figure F-1 SNMP Flow Diagram

Operational Status Queries

The VMS exposes certain operational status via SNMP to external agents. The status is exposed as a set of virtual SNMP entities identified via a unique community string. Branches of the defined MIBs are only valid on certain entities.

The following table describes the exposed entities, and what branch of the MIB they support.

Table F-4 Exposed Entities with MIB Branches

Entity	Description	Valid MIB Branches
system	Represents the VMS as a whole	vms.system.health.systemStatus
site	A site from the network manager	vms.system.health.objectStatus vms.switching.site
unit	Represents a modem as a whole	vms.system.health.objectStatus vms.switching.unit
modulator	Represents a single modulator subcomponent of a modem	vms.system.health.objectStatus vms.switching.managedDevice
demodulator	Represents a single demodulator subcomponent of a modem	vms.system.health.objectStatus vms.switching.managedDevice

Entity Identifiers

The unique identifier for the system entity is the community string “server”. The other identifiers are for the purpose of the SNMP agent, without format, and can only be obtained via queries to other entities. The exception is the unit which can also be referenced via the same community string used to perform a proxied request to the associated physical hardware.

As an example, the modulator identifier for the first modulator subcomponent of a modem with the IP address 172.18.100.1 can be obtained by querying the VMS for the “modulatorId” variable of the switching MIB, with an instance of 1 and a community string of “public@172.18.100.1”. The resulting octet string will be the entity identifier “moniker” to be used as the community when querying related MIB variables.

Hub Demodulator Eb/No

One of the main preferences is to correlate the Eb/No for the Hub demodulator of a switched Remote modulator, which can be obtained by querying the modem via the proxy for the “unitInbandReturnPathEbN0” variable in the switching MIB. This variable is designed to look like part of the Remote modem, when in reality the VMS intercepts the request and fills in the Eb/No of the currently allocated Hub demodulator. This allows for a very simple way of monitoring the quality of a dynamic link without the complexity of multiple queries involving different community strings.

For example, if the Remote data unit is a CDM-840 with an IP address of 172.18.100.1, the operator would use the VMS as a proxy by directing the SNMP requests to the VMS using a community string such as “public@172.18.100.1”. Along with querying the Remote modem for standard values like “cdm840TxFrequency” or “cdm840RxLock”, a request for “unitInbandReturnPathEbN0” can be included to get the Eb/No of the currently receiving Hub demodulator as well. This variable operates much like one of the cached modem parameters. To determine the value for this parameter, the VMS searches for an allocation associated with the specified unit's first modulator. If the modulator has an associated allocation, it queries the first allocated demodulator (which is always at the Hub) for its last known Eb/No value. If the modulator does not have an associated allocation, the value returned is null.

Tables Support

The current support for tables is limited. It is roughly equivalent to SNMP version 1. There is support for Get, Get Next, and Walk, but no support for GETBULK requests. The way to enumerate a table is to send Get Next or Table View.

Proxy Caching Support

When operating as a proxy on behalf of Comtech network equipment, the VMS will fulfill the requests for a subset of the MIB using data collected via proprietary protocols. When a request is made for one of these MIB variables, the VMS will report the last known value without forwarding the request to the end node. This data is collected at a frequency of at least once per minute.

To use the proxy/cache support, send SNMP queries for the modem to the VMS, and use a specially formatted community string to identify what device is being queried. The community string format is “community@ip-address”. For example, to target a device with the IP address of 172.16.128.1, using a read community of public, the community string sent to VMS would be “public@172.17.128.1”.

Operational Procedures

There are two sets of VMS MIB files that comprise the interface structure for internal caching parameters: VMS and Switching.

A list of objects available through this interface is presented below, and the following procedure will provide steps to exercise for a better understanding of functionality. Each parameter value queried will return results that can be compared to already available user interfaces as a sanity check and verification.

- Table of Remotes
- Alarm Status per Remote
- Link Statistics:
  - Eb/No
  - Frequency
  - Data Rate
  - FEC
  - Modulation
  - Offset (frequency)

Setup Procedure

1. Backup the current configurations.
2. Update all network components—the VMS, CDM-800, CDD-880, and CDM-840—to the latest builds.
3. Verify standard operations.
4. Install iReasoning, or use the supplied MIB browser.
5. Load all associated MIBs into the browser library.
6. Exercise each of the contractual parameters using SNMP command operations.
7. Set the proper Community String:

   Enter “server” in the Read Community field for System queries, as shown in figure F-2.

   Enter “public@IP Address” in the Read Community field for Unit queries, as shown in figure F-3.

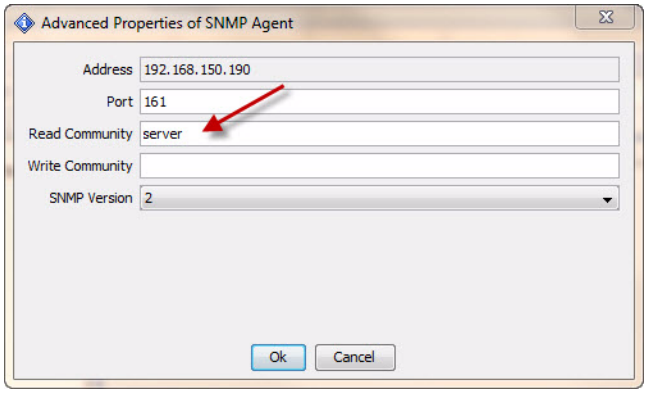


Figure F-2 Read Community for System Queries

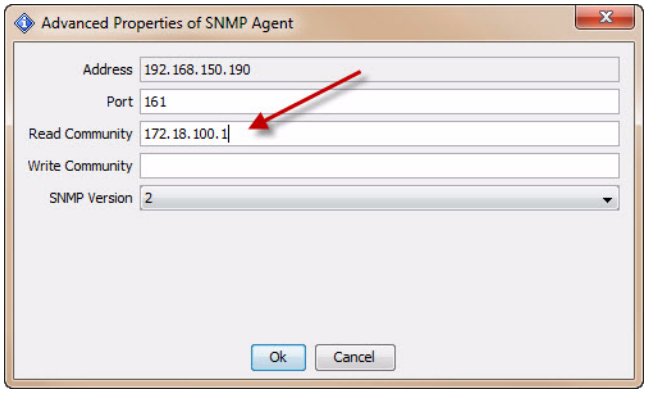


Figure F-3 Read Community for Unit Queries

Table of Remotes

The VMS provides a table of configured devices through the ipHardwareTable MIB branch. This allows a Northbound management entity to list the hardware configured in the VMS database. The hardware is identified by its IP address and type. To retrieve this table, the VMS must be targeted with a community string of “server”.

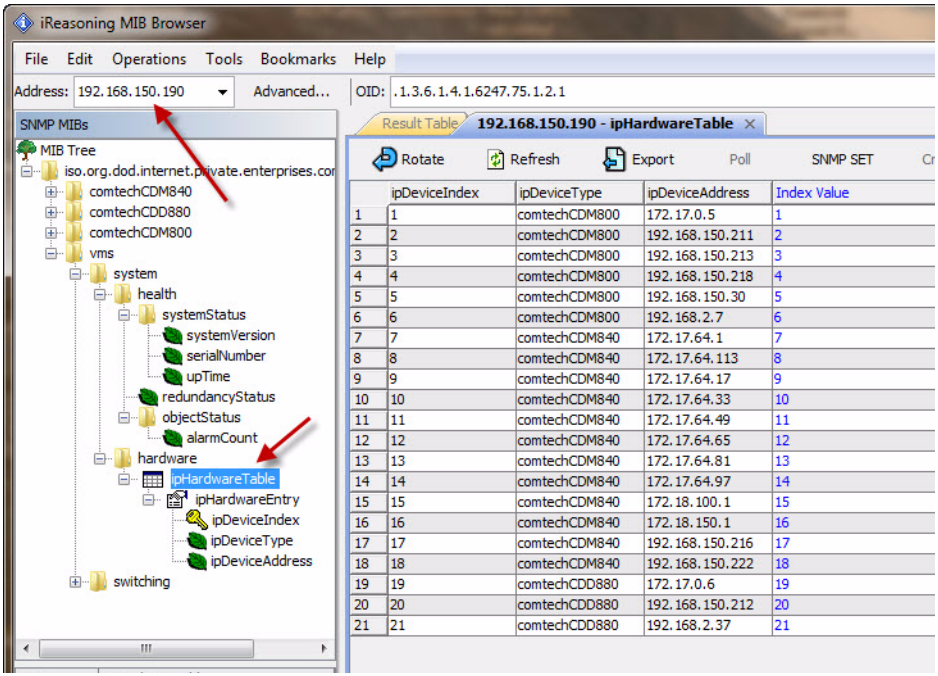


Figure F-4 Table of Remotes

The example above used a Tree View or table get to poll all instances within the table. Get Next will step/walk the table. This option is not like network discovery where a manager will poll through a range of addresses for any MIBII devices connected to a network populating map views. These are local database entries that were either previously discovered or manually declared to the VMS only. Other devices outside the VMS database will not be listed.

Alarm Status per Remote

Each of the structured devices forward SUM messages on interval containing not only parameter settings and status values, but also alarm information. What is presented through this call is an integer value representing a count of alarms set within the device, unit, modulator, demodulator, etc. To further evaluate the alarm information or type, the device's MIB would be used to query alarm lists.

To query individual unit alarm status, set the community read string to the IP address of the device. Select the **alarm Count** OID for the result.

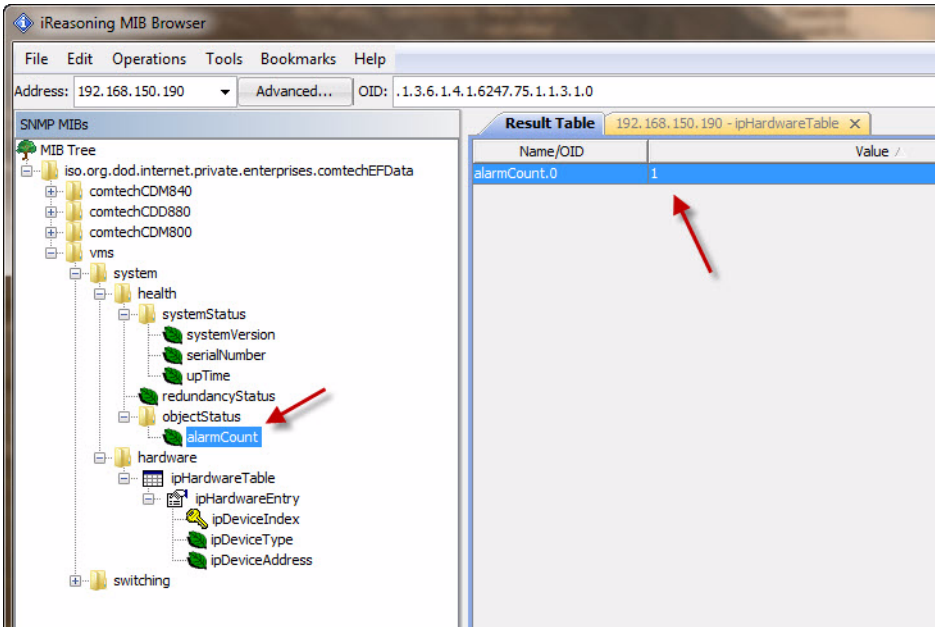


Figure F-5 Remote Alarm Count

Link Statistics

Hub Demodulator Eb/No

One of the main preferences is to correlate the Eb/No for the Hub demodulator of a switched Remote modulator. This can be obtained by querying the modem via the proxy for the "unitInbandReturnPathEbN0" variable in the switching MIB. This variable is designed to look like part of the Remote modem, when in reality the VMS intercepts the request and fills in the Eb/No of the currently allocated Hub demodulator.

This allows for a very simple way of monitoring the quality of a dynamic link without the complexity of multiple queries involving different community strings.

For example, if the Remote data unit is a CDM-840 with an IP address of 172.18.100.1, the operator would use the VMS as a proxy by directing the SNMP requests to the VMS using a community string such as “public@172.18.100.1”. Along with querying the Remote modem for standard values like “cdm840TxFrequency” or “cdm840RxLock”, a request for “unitInbandReturnPathEbN0” could be used to get the Eb/No of the currently

receiving Hub demodulator as well. This variable operates much like one of the cached modem parameters.

To determine the value for this parameter, the VMS searches for an allocation associated with the specified unit's modulator. If the modulator has an associated allocation, it queries the first allocated demodulator (which is always at the Hub) for its last known Eb/No value. If the module does not have an associated allocation, the value returned is null.

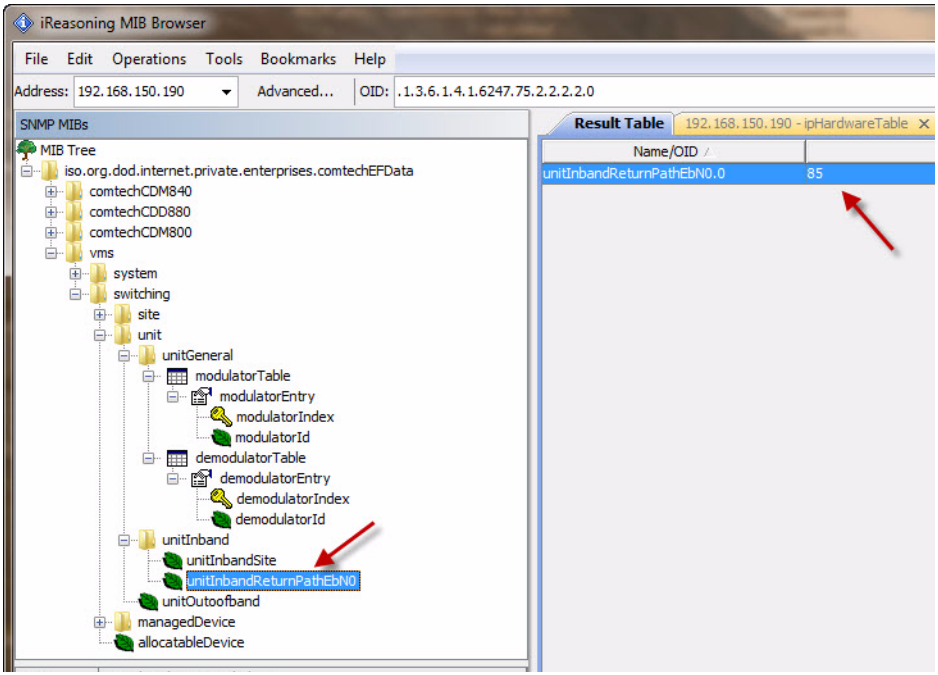


Figure F-6 Demodulator Eb/No Value

The example above shows a single instance of an In-banded Remote switched into dSCPC with the correlated Hub demodulator's signal link quality.

This next set of OID queries will further demonstrate caching through device MIB interception, where we step through the objects that represent the dynamic switch state. Note that, for VMS managed (switched) devices “CDM-840” and “CDD-880”, there is a separate set of objects that provide the current dynamic switched state, not to be confused with static state objects. All dynamic OIDs are labeled with “VS” which signifies *Vipersat Switched*. An example of this is shown below in figure F-7.

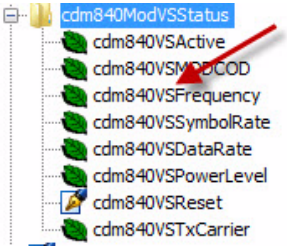


Figure F-7 Example VS OIDs

The example below shows a step through of CDM-840 dynamic parameters.

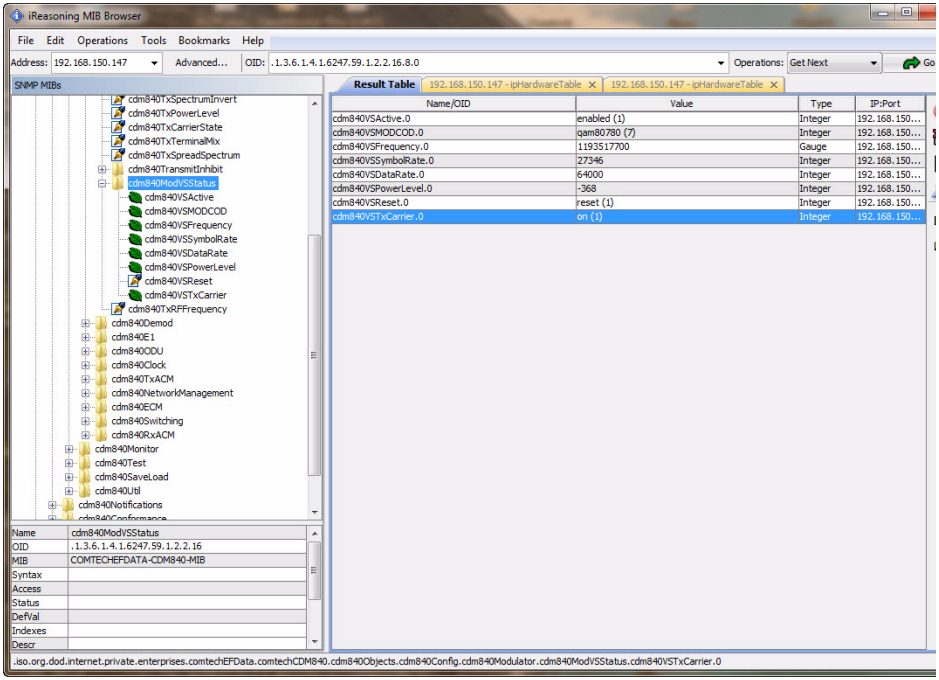


Figure F-8 Dynamic Parameters, CDM-840

Offset (Frequency)

The demodulator acquisition frequency offset is in two parts, one from the demodulator at the Remote receiver and the other from the coordinated or associated (switched) demodulator at the Hub. The outbound receiver offset is a pass-through not cached, whereby the proxy forwarder sends the request to the Remote agent.

The second Hub associated (switched) demodulator is known in the VMS switching engine, and is thus a cached value. To retrieve this information requires some finesse, as the association is not as straight forward as the Eb/No. The allocated device must first be learned through a series of steps and, once the association is known, the internal value can be polled.

Steps to Identify Device

1. Set Read Community string “public@IP Address” to the modulator device in question.

2. Query “modulatorId” OID to learn the entity identifier “moniker” ves:cdm840-172.18.100.1,1,0

3. Copy the moniker or octet string into the Read Community.

4. Next, query the “deviceAllocationAllocatedDeviceId” OID to identify the associated demodulator, ves:cdd880-192.168.150.212,2,0.
   Note the device # in the octet string (shown in red below).

   This is the instance that is part of the query:

   ves:cdd880-192.168.150.212,**2**,0

5. Write the learned demodulator IP Address (example, 192.168.150.212) into the Read Community.

6. Query the modem’s MIB “cdd880RxFrequencyOffset” with an instance from the learned (example #2) octet string.

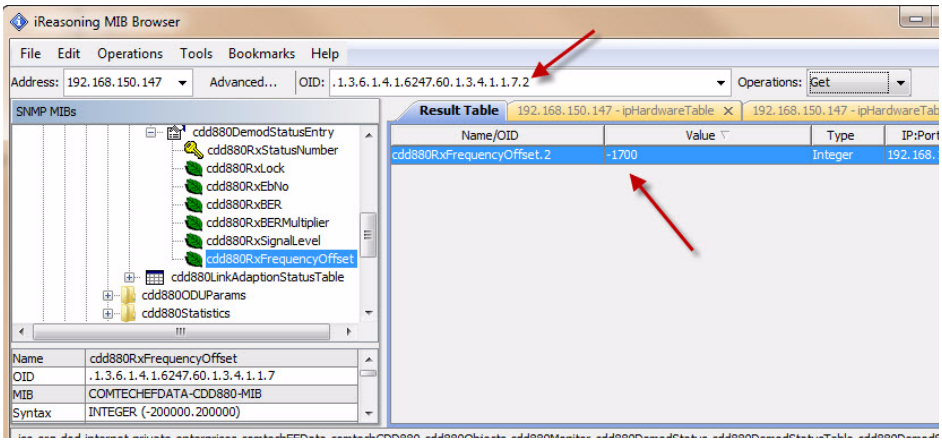


Figure F-9 Results of Learned Association

Caching Test Verification

Use one or all listed variables in the “Vipersat Management System SNMP Module” to exercise the caching capabilities, at customer's discretion.

Execute the following procedure:

1. Verify normal communications to Remote device using the VMS device parameter view, as shown below in figure F-10.

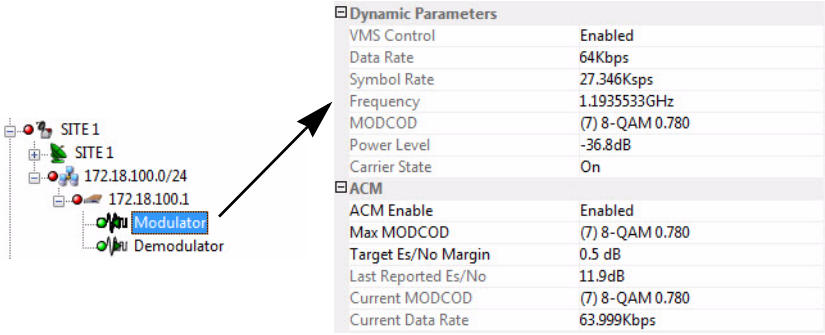


Figure F-10 Modulator Device Parameter View, VMS

2. Select the OID from the supported list.

3. Power off the Remote unit to disable it.

4. Query the selected OID.

NOTE

Note: During the time of communications failure, the caching will be valid for up to three minutes, with the connection state identified as “Disconnected”. After this period, the VMS will return a “Timeout” connection error.

This provides a simple method for determining whether caching is working correctly.

Cached MIB Variables

The specific MIB variables that are cached vary per supported modem, and potentially per revision of a specific modem. The following lists summarize what MIB variables are cached for supported modems at their latest release.

Cached 800 Series MIB Values

The following lists are cached MIB values supported through VMS unsolicited system updates.

CDM-800, Version 1.4.x

cdm800UnitAlarms
cdm800TrafficEthernetAlarms
cdm800TxAlarms
cdm800TxFrequency
cdm800TxDataRate
cdm800TxMODCOD
cdm800TxFECType
cdm800TxPowerLevel
cdm800TxCarrierState
cdm8005vPowerAlarm
cdm80012vPowerAlarm
cdm800TxSynthPLLLockAlarm
cdm800FPGALockAlarm
cdm800TXFPGALoadAlarm
cdm800PrimaryFPGALoadAlarm
cdm800ExtFPGALoadAlarm
cdm800NoExtRefAlarm
cdm800ExtRefLockAlarm
cdm800NoLinkGEAlarm
cdm800NoLinkEthAlarm
cdm800Tx10PLLLockAlarm
cdm800TxLMKPLLLockAlarm
cdm800FIFOSlipAlarm
cdm800S2DataLengthMismatchAlarm
cdm800ModCardAlarm
cdm800TempExceededAlarm
cdm800E1ExceedsMinus50PPMAlarm
cdm800E1ExceedsPlus50PPMAlarm
cdm800E1RefInactiveAlarm
cdm800HardResetAlarm
cdm800Tx130PLLLockAlarm
cdm800BUCCurrentAlarm
cdm800BUCVoltageAlarm
cdm800PTPConfigErrorAlarm
cdm800PTPErrorThreshAlarm
cdm800PTPSyncThreshAlarm
cdm800PTPFollowupThreshAlarm
cdm800PTPDelayResThreshAlarm
cdm800PTPMasterNotAcceptableAlarm
cdm800ctogNoLinkLANAlarm
cdm800ctogNoLinkExpansionAlarm
cdm800ctogFanSpeedAlarm
cdm800ctogCPUTempAlarm
cdm800ctogDriveFailureAlarm
cdm800ctogPowerSupplyAlarm
cdm800ctogHeartbeatTimeoutAlarm

CDM-840, Version 1.4.x

cdm840UnitAlarms
cdm840TrafficEthernetAlarms
cdm840TxAlarms
cdm840TxFrequency
cdm840TxSymbolRate
cdm840TxDataRate
cdm840TxMODCOD
cdm840TxFECType
cdm840TxPowerLevel
cdm840TxCarrierState
cdm840TxACMLastMsgEsNo
cdm840TxACMCurrentModcod
cdm840TxACMCurrentDataRate
cdm840VSActive
cdm840VSMODCOD
cdm840VSFrequency
cdm840VSSymbolRate
cdm840VSDataRate
cdm840VSPowerLevel
cdm840VSTxCarrier
cdm840RxAlarms
cdm840RxFrequency
cdm840RxSymbolRate
cdm840RxDataRate
cdm840RxMODCOD
cdm840RxLock
cdm840RxEsNo

CDD-880, Version 1.4.x

cdd880UnitAlarms
cdd880TrafficEthernetAlarms
cdd880BaseFrequency
cdd880RxAlarms
cdd880RxLock
cdd880RxEbNo
cdd880RxFrequency
cdd880RxSymbolRate
cdd880RxDataRate
cdd880RxMODCOD
cdd880RxEnable
cdd880LinkAdaptionStatusCurrentDataRate
cdd880LinkAdaptionStatusCurrentEsNo
cdd880LinkAdaptionStatusCurrentModCod
cdd880VSActive
cdd880VSMODCOD
cdd880VSFrequency
cdd880VSSymbolRate
cdd880VSDataRate
cdd880VSEnable

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G

VMS CLIENT USERS

General

VMS v3.11.x (and later) offers user authentication, with the ability to create remote clients with either *read-only* or *read-write* access to the VMS server.

Administration of client user authorization for read/write privileges allows two levels of VMS access:

- **Read and Write** – Full access to all VMS features and functions with write authorization. Typically assigned to administrator-level operators who are authorized to perform system setup and maintenance, configuration changes, manual/diagnostic switching, etc.
- **Read Only** – Access restricted to viewing network settings and status. Typically assigned to users who will use the VMS for monitoring purposes.

This appendix details the steps required to set up the security and account policies between the Server and the Client machines through MS Windows. The assumption is made that the VMS servers are configured as work-group machines rather than as active-directory domain controllers, since the majority of VMS installations are configured this way. If the VMS servers are set up as part of a domain, policy configurations will be performed under active directory rather than local settings.

Configuration of the server is performed first, followed by configuration of the client workstation(s). These procedures are presented below.

Server Configuration

Most of the required configuration is done on the server. If the VMS administrator creates a group and adds additional client users to that group, the security settings need only to be performed once for each VMS server (primary and backups). The following step by step instructions assume the administrator creates a group called “VMS Users”.

1. **Create the VMS user group**.

   Log into the VMS server as the administrator and browse to Administrative Tools\Computer Management\Local Users and Groups.

   Expand the *Local Users and Groups* tree, right-click on the Groups folder and select **New Group** from the drop-down menu, as shown in figure G-1.

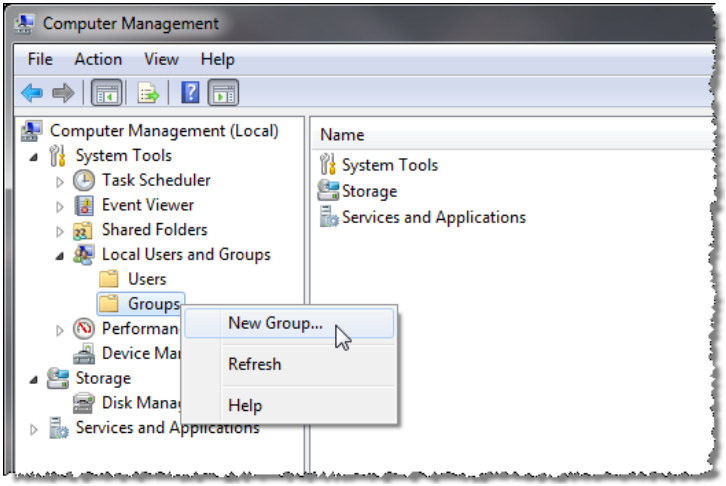

Figure G-1 Computer Management, Groups

In the New Group dialog, enter the group name “VMS Users” and click **Create** (figure G-2).

Close the window.

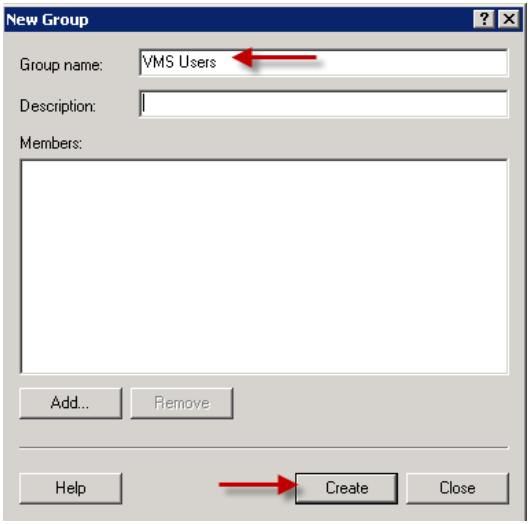

Figure G-2 Create VMS User Group

2. **Set the local network access security**.

   Browse to Administrative Tools\Local Security Policy.

   Expand the *Local Policies* folder and click on **Security Options** to open the settings view in the right panel (figure G-3).

   Scroll down to *Network access: Sharing and security model for local accounts*.

   If not already set to **Classic**, right-click on the security setting and open the **Properties** dialog to set it.

   Close the window.

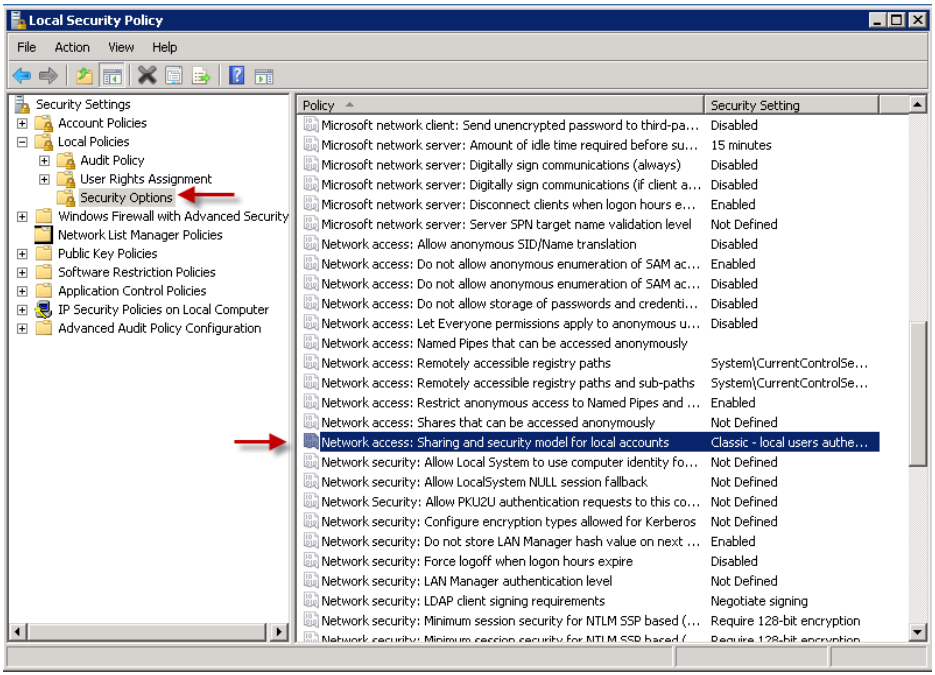

Figure G-3 Security Options Setting

3. Set the COM Security permissions.

Browse to Administrative Tools\Component Services.

Expand the tree view and right-click on **My Computer** (figure G-4).

Open the *Properties* page and select the **COM Security** tab (figure G-5). The two group settings, “Access Permissions” and “Launch and Activation Permissions”, require editing.

Click on the **Edit Limits** button in the *Access Permissions* panel.

The *Security Limits* dialog will open showing Groups and Users authorized by the current Limits for Local and Remote Access (figure G-6). Click on the **Add** button.

The Select Users or Groups window shown in figure G-7 will open. In the white area, type “VMS Users” and click on **Check Names**.

If typed correctly, the group will appear, preceded by the computer name. Click **OK**.

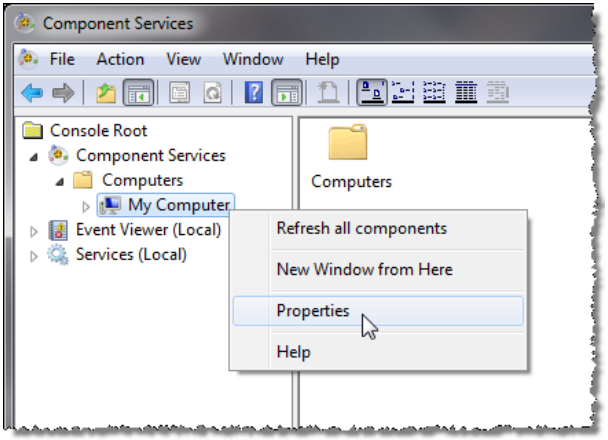

Figure G-4 Component Services, My Computer Properties

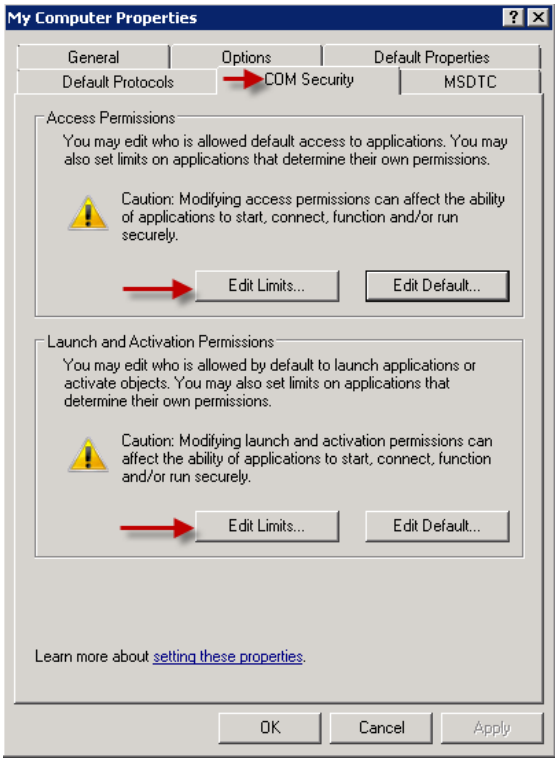

Figure G-5 COM Security Settings

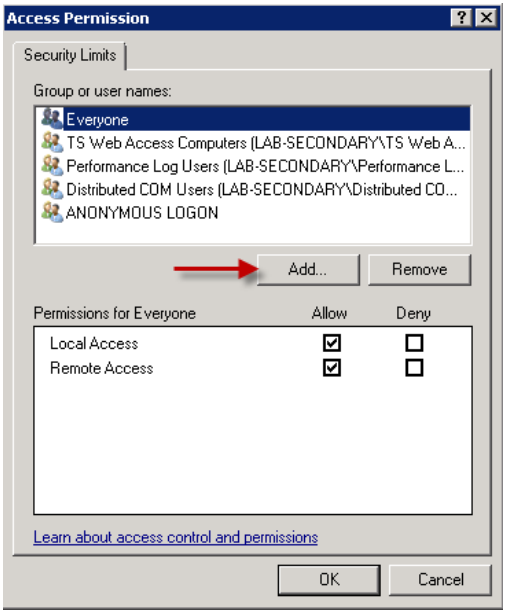

Figure G-6 Access Permission, Security Limits

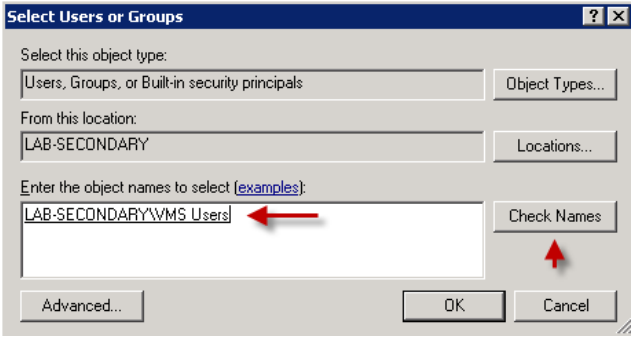

Figure G-7 Select Users or Groups

In the *Security Limits* dialog (figure G-8), highlight VMS Users and select **Allow** on Remote Access, then click **OK**.

Repeat the process to add the "VMS Users" group to *Launch and Activation Permissions* (figure G-9).

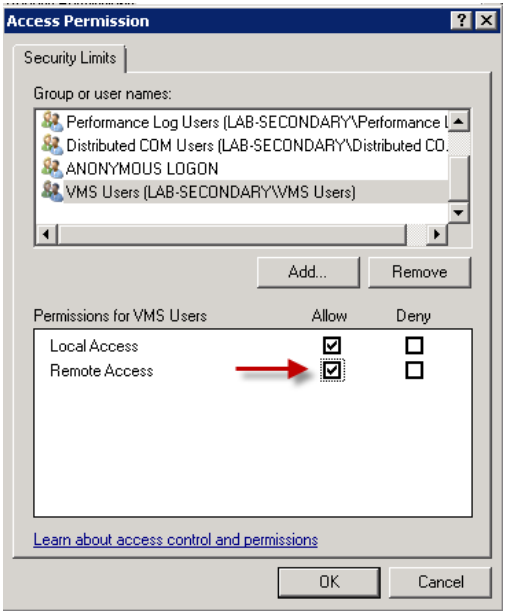

Figure G-8 Permissions for VMS Users

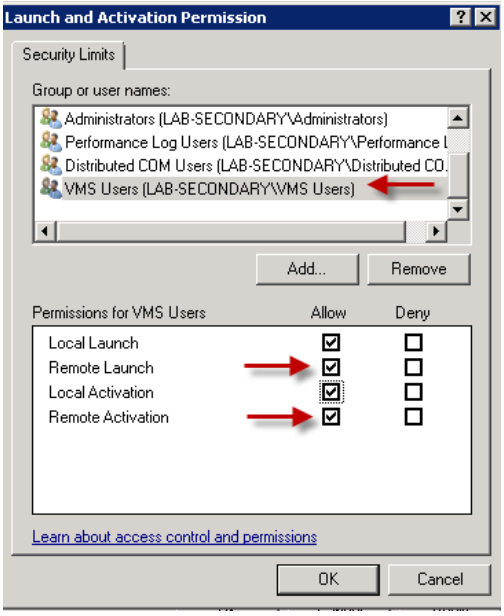

Figure G-9 Launch and Activation Permissions, Security Limits

4. Set the DCOM Security.

Return to the *Component Services* window and expand the **My Computer** tree view, then expand the **DCOM Config** directory, as shown in figure G-10.

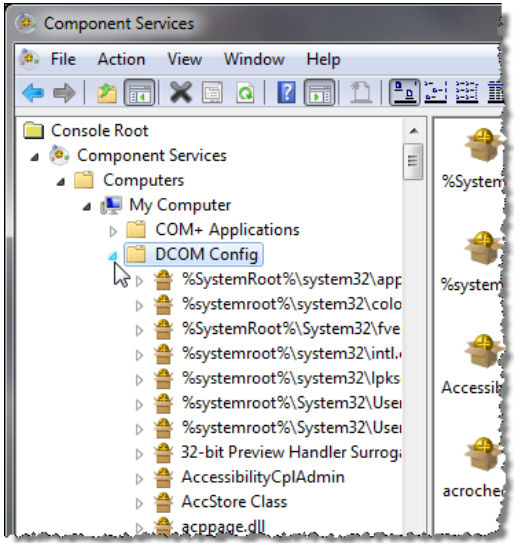

Figure G-10 Component Services, DCOM Config directory

Scroll to locate **Vipersat Management Server**, right-click and select **Properties** (figure G-11).

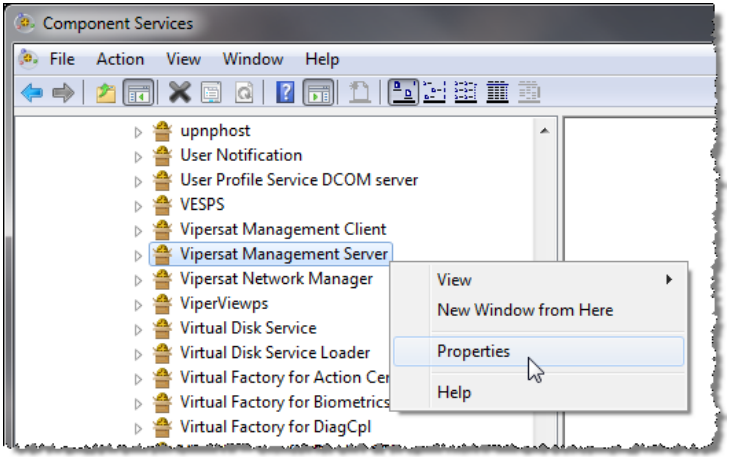

Figure G-11 DCOM Config, VMS Properties

Open the *Security* tab and ensure that the **Customize** radio buttons are selected, as shown in figure G-12.

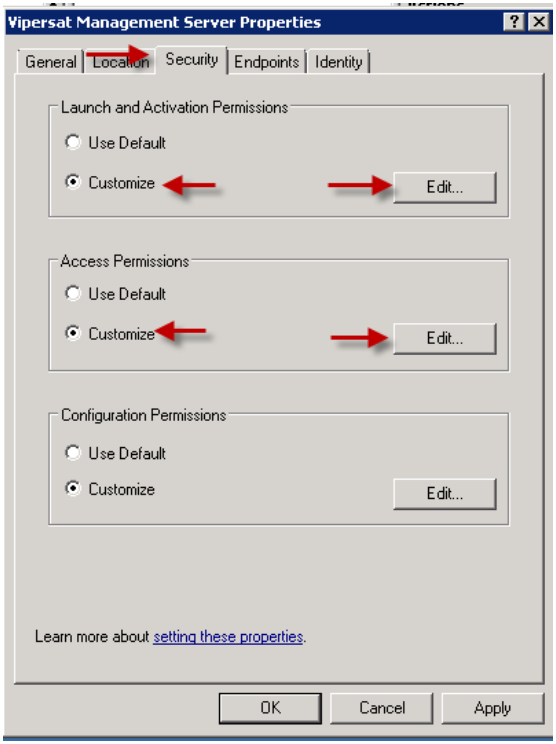

Figure G-12 VMS DCOM Security dialog

Edit the *Launch and Activation Permissions* to add the "VMS Users" group. Check all of the **Allow** boxes, as shown in figure G-13, and click **OK**.

Repeat this procedure for *Access Permissions* (figure G-14).

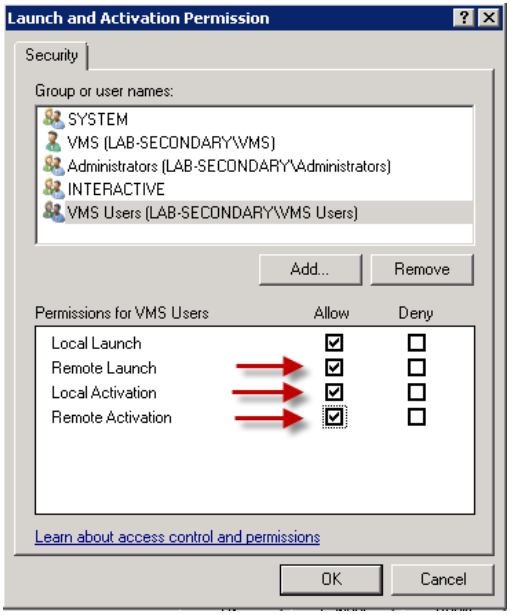

Figure G-13 VMS Security, Launch and Activation Permissions

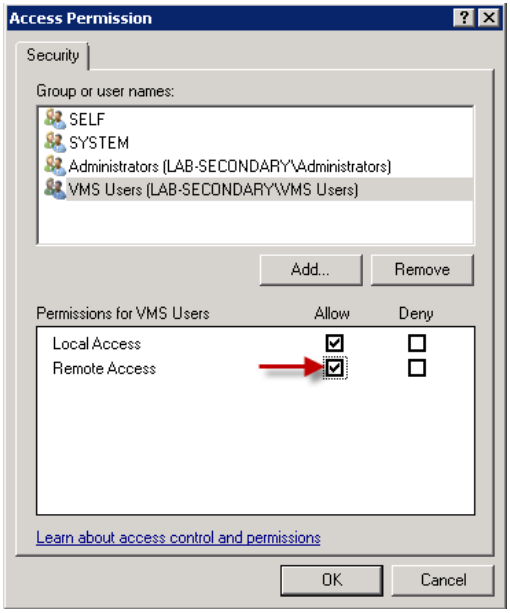

Figure G-14 VMS Security, Access Permissions

5. Create the VMS user.

Browse to Administrative Tools\Computer Management\Local Users and Groups.

Expand the *Local Users and Groups* tree, right-click on the Users folder and select **New User** from the drop-down menu, as shown in figure G-15.

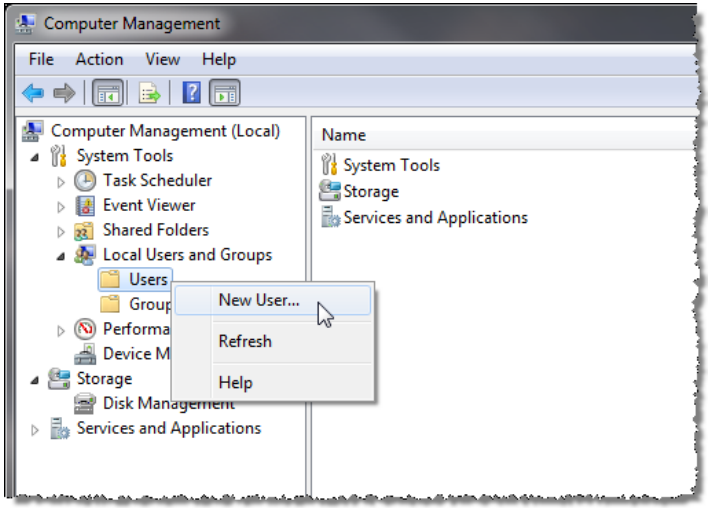

Figure G-15 Computer Management, Users

In the **New User** dialog (figure G-16), enter the user name and password of the client account.

De-select the *User must change password at next logon* checkbox, then check the next two boxes.

Click **Create**.

Repeat this process to create additional client users, as required.

Close the window.

In the *Computer Management* window, select the **Users** folder to display the users in the center panel.

Right-click on the newly created user and select **Properties** from the pull-down menu.

Select the **Member Of** tab, as shown in figure G-17.

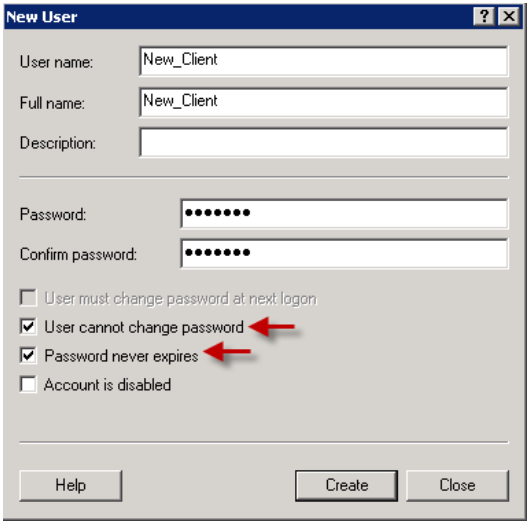

Figure G-16 Create new VMS Client User

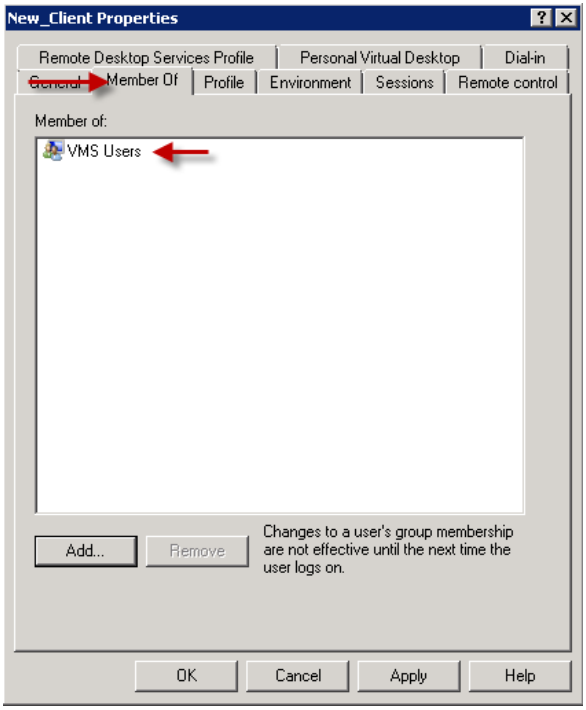

Figure G-17 New Client User Properties, Member Of tab

If any user group names appear in the list, select them and Remove them.

Click the **Add** button and add the “VMS Users” group name to the list, then click **OK**.

Repeat this process for all newly created users.

This concludes VMS user configuration on the server.

Proceed to the next section for VMS user configuration on the client workstation.

Client Configuration

Configuration of the client workstation is fairly simple. Always ensure that the User account created for remote access to the VMS is an exact match (username and password) as the one created on the VMS server. If the client machine already has a user account for login purposes it can be used to login to the server (the account created on the server must match this account). If the client machine is used by several persons (shift operators, for example), it is recommended that a separate login be created for each person. Each user account must be a member of the VMS Users group on the server.

1. **Create the VMS client user account**.

   Login to the client workstation with administrative privileges.

   Create an account that is an exact match of the account that was created previously on the VMS server (step 5 of *Server Configuration*).

2. **Perform a VMS Client Install on the client workstation** (figure G-18).

   [Refer to the section "VMS Client Installation" on page 2-33 for procedural details.]

   This type of install does not require a USB crypto key.

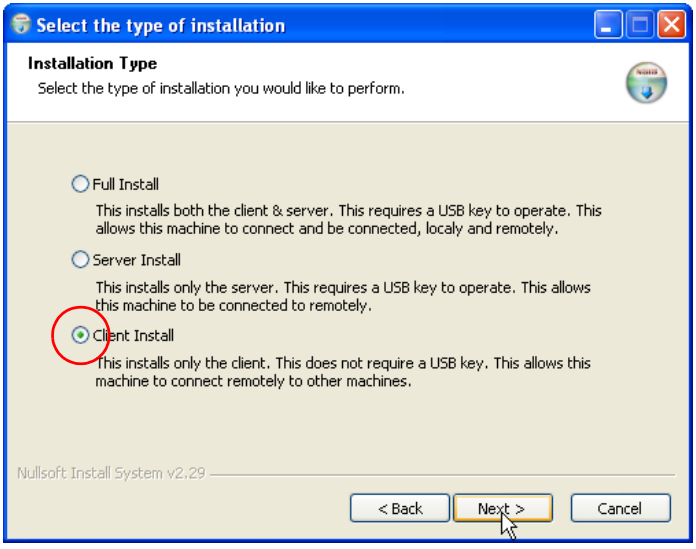

Figure G-18 Client Install, VMS Core Setup

3. Verify VMS client access.

[The VMS Server must be running VOS, the Vipersat Management System service (see “Verify Server Installation” on page 2-27 for the necessary steps to start the VMS service).]

On the client workstation, log out as administrator and log in as the new VMS client user.

Open the **Connection Manager** using the path Start > Programs > VMS > Connection Manager.

Enter the IP address of the VMS server in the *Connect* dialog, then click **OK** (figure G-19).

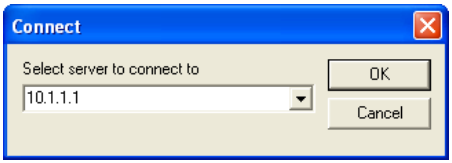

Figure G-19 Connect dialog

The main ViperView window will open, as shown in figure G-20.

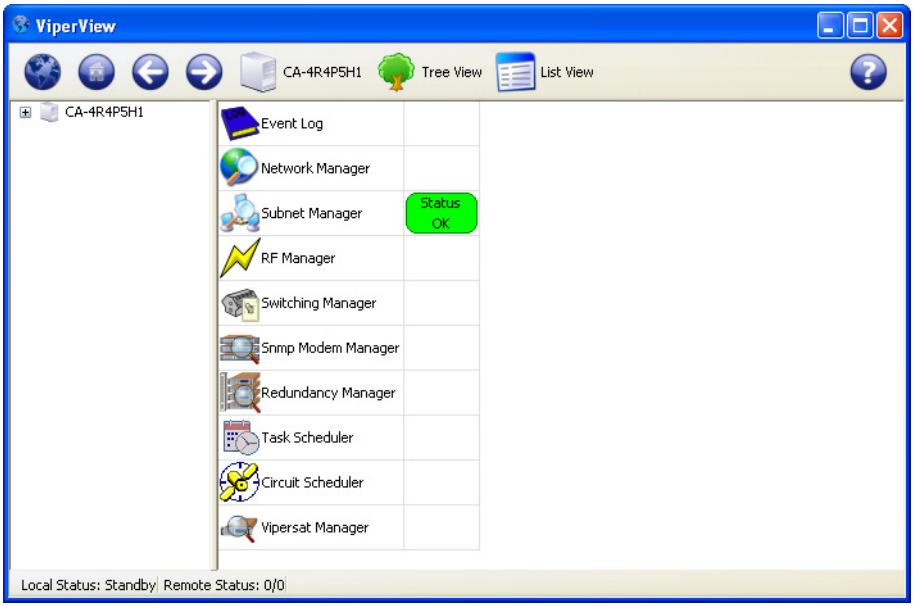

Figure G-20 ViperView window, VMS Client

NOTE

Note: If multi-layer login security is employed for this VMS, access may be *read-only*.

To enable this user for *read-write* privileges, refer to the procedure in section “Client User Authentication” on page 3-23.

This concludes VMS user configuration on the client workstation.

H

GLOSSARY

A

ACK A signal used in computing and other fields to indicate **ack**nowledgement, such as a packet message used in TCP to acknowledge the receipt of a packet.

ACM **A**daptive **C**oding and **M**odulation – A technique that optimizes throughput in a wireless data link by adapting the forward error correction code rate and the modulation order according to the noise conditions (or other impairments) on the link. A feature that is supported in CEFD modems such as the CDM-840 Remote Router.

ARP **A**ddress **R**esolution **P**rotocol – A protocol for a LAN device to determine the MAC address of a locally connected device given its IP address. See also MAC.

ASR **A**utomatic **S**witch **R**equest – A switch request message generated by older Vipersat modems (e.g., CDM-570/L) that is sent to the VMS to establish a new satellite link or adjust bandwidth between source and destination IP addresses.

B

Base Modem The main component in a satellite communications modem that consistes of a circuit board with the modem hardware and firmware and the associated interfaces.

BER **B**it **E**rror **R**ate (sometimes **R**atio) – A measure of the number of data bits received incorrectly compared to the total number of bits transmitted.

BPM **B**ridge **P**oint-to-**M**ultipoint – Routing mode option available in the SLM-5650A satellite modem.

bps **b**its **p**er **s**econd – A measure of the bit rate or transmission speed of a digital communication link. See also *kbps* and *Mbps*.

BPSK **B**inary **P**hase **S**hift **K**eying – Sometimes referred to as 2-PSK. A digital modulation technique in which the carrier is phase shifted +/-180 degrees (two phases). The simplest and most robust of all PSKs, but unsuitable for high data-rate applications when bandwidth is limited due to encoding just one bit per symbol. See also *QPSK* and *OQPSK*.

BUC **B**lock **U**p **C**onverter – An upconverter so called because it converts a whole band or "block" of frequencies to a higher band. The IF is converted to final transmit frequency for satellite communications. The BUC is part of the satellite ODU/transceiver.

C

C-band A frequency band commonly used for satellite communications (and sometimes terrestrial microwave). For terrestrial earth stations, the receive frequency band is 3.7–4.2 GHz and the transmit frequency band is 5.925–6.425 GHz. See also *Ku-band* and *L-band*.

CDD **C**omtech **D**ata **D**emodulator (CEFD model designator; e.g., CDD-564)

CDM **C**omtech **D**ata **M**odem (CEFD model designator; e.g., CDM-570)

CEFD **C**omtech **EF D**ata – Global leader in satellite bandwidth efficiency and link optimization, and supplier of advanced communication solutions. A subsidiary of Comtech Telecommunications Corporation.

CIR **C**ommitted **I**nformation **R**ate – A specified data rate up to which a remote terminal is always guaranteed to be granted service from reserved bandwidth in the shared pool.

CLI **C**haracter **L**ine **I**nterface – A mechanism for interacting with a computer operating system or software by typing commands to perform specific tasks.

Codecast A network coding based ad hoc multicast protocol well-suited for multimedia applications with low-loss, low-latency constraints. Because data is streamed with no verification, high delivery ratios are obtained with very low overhead.

CRC **C**yclic **R**edundancy **C**heck – A method of applying a checksum to a block of data to determine if any errors occurred during transmission over communications links.

CXR Carrier – A radio frequency transmission linking points and over which information may be carried.

D

DAMA **D**emand **A**ssigned **M**ultiple **A**ccess – A process whereby communications links are only activated when there is an actual demand.

dBm **D**eci**b**el referenced to 1 **m**illiwatt.

DES **D**ata **E**ncryption **S**tandard – A federal standard method for encrypting information for secure transmission. The Vipersat system offers 3xDES (Triple DES) for encrypting traffic.

DHCP **D**ynamic **H**ost **C**onfiguration **P**rotocol – An Internet protocol for automating the configuration of computers that use TCP/IP.

DLL **D**ynamic **L**ink **L**ibrary – The implementation of the shared library concept in the Microsoft Windows system.

DPC **D**ynamic **P**ower **C**ontrol

DSCP **D**ifferentiated **S**ervices **C**ode **P**oint – The 6-bit field in an IP packet header that is used for packet classification purposes and is the portion of ToS that is detected by Vipersat modems.

DVB **D**igital **V**ideo **B**roadcasting – A suite of internationally accepted open standards for digital television. DVB-S, DVB-S2, and DVB-RCS are the standards utilized by satellite services.

DVP **D**igital **V**oice **P**rocessor – Used in packet voice applications.

E

E_b/N_0 The ratio of $\mathbf{E_b}$ (energy per bit) and $\mathbf{N_0}$ (noise power spectral density per Hz). This is a normalized signal-to-noise ratio (SNR) measure, also known as the "SNR per bit". The bit error rate (BER) for digital data is a decreasing function of this ratio. E_b is the energy of an information bit measured in Joules or, equivalently, in Watts per Hertz.

E_s/N_0 The ratio of $\mathbf{E_s}$ (energy per symbol) and $\mathbf{N_0}$ (noise power spectral density per Hz). This is closely approximate to the carrier-to-noise ratio (C/N). E_s is the energy of a bit (not an information bit) measured in Joules or, equivalently, in Watts per Hertz. This measurement is typically used to quantify a DVB-S2 carrier.

ECM **E**ntry **C**hannel **M**ode – In a Vipersat network, ECM provides a quick and reliable method for Remotes requiring SCPC access channels to enter/re-enter the network initially or after a power or other site outage.

F

FAST Code **F**ully **A**ccessible **S**ystem **T**opology Code – Designation for feature code used by Comtech EF Data for their satellite modems. The FAST method makes it easy to quickly upgrade the feature options of a modem while it is running live in the network, either on site or remotely.

FDMA **F**requency **D**ivision **M**ultiple **A**ccess – A technique where multiple users can access a common resource (e.g. satellite) by each being allocated a distinct frequency for operation. See also *TDMA* and *STDMA*.

FEC **F**orward **E**rror **C**orrection – A process whereby data being transmitted over a communications link can have error correction bits added which may be used at the receiving end to determine/correct any transmission errors which may occur.

Flash Non-volatile computer memory that can be electrically erased and reprogrammed.

Forward Path Transmission path from the Hub site to a Remote site.

FTP **F**ile **T**ransfer **P**rotocol – An application for transferring computer files over the Internet. See also *TFTP*.

G

G.703 ITU-T standard for transmitting voice or data over digital carriers such as T1 and E1.

G.729 ITU standard for LD-CELP (Low Delay – Code Excited Linear Prediction) voice encoding at 8 kb/s.

GIR **G**uaranteed **I**nformation **R**ate

Group ID A number assigned to equipment which defines it as a member of a group when addressed by the VMS Hub Controller.

GUI **G**raphical **U**ser **I**nterface – A form of graphical shell or user interface to a computer operating system or software application.

H

H.323 A protocol standard for multimedia communications designed to support real-time transfer of audio (such as voice over IP) and video data over packet networks. Quality of Service is a key feature of H.323. An alternative to SIP.

HCC **H**ub **C**hannel **C**ontroller – A dedicated Hub demodulator that has been designated as the ECM (ECMv2) controller, and which provides the TAP multicast message to the Remotes.

HDLC **H**igh Level **D**ata **L**ink **C**ontrol – A standard defining how data may be transmitted down a synchronous serial link.

HPA **H**igh **P**ower **A**mplifier – The amplifier used in satellite communications to raise the transmit signal to the correct power level prior to transmission to satellite.

HTTP **H**yper **T**ext **T**ransfer **P**rotocol – The Internet standard for **W**orld **W**ide **W**eb (**WWW**) operation.

Hub The central site of a network which links to a number of satellite earth sites (Remotes).

I

ICMP **I**nternet **C**ontrol **M**essage **P**rotocol

IDU **Ind**oor **U**nit – In a VSAT system, the satellite modem is referred to as the IDU.

IF **I**ntermediate **F**requency – In satellite systems, IF frequencies are usually centered around 70/140 MHz (video/TV), or 1200 MHz (L-band).

IFL **I**ntra-**F**acility **L**ink – The coaxial cabling used to connect the satellite ODU to the IDU. Carries the inbound and the outbound signals, and the 24 VDC for the LNB.

IGMP **I**nternet **G**roup **M**anagement **P**rotocol – An IP communications protocol used by network hosts and adjacent routers to establish multicast group memberships.

Image A binary firmware file that provides the operational code for the processor(s) in a network unit.

IP **I**nternet **P**rotocol – A format for data packets used on networks accessing the Internet.

ISP **I**nternet **S**ervice **P**rovider – A company providing Internet access.

ITU **I**nternational **T**elecommunications **U**nion

K

kbps **k**ilo **b**its **p**er **s**econd – 1000 bits/second. A measure of the bit rate or transmission speed of a digital communication link. See also *bps* and *Mbps*.

Ku-band A frequency band used for satellite communications. For terrestrial earth stations, the receive frequency band is in the range 10.95–12.75 GHz and the transmit frequency band is 13.75–14.5 GHz. See also *C-band* and *L-band*.

L

L-band A frequency band commonly used as an IF for satellite systems using block up/down conversion. Typically 950–1450 MHz Rx, 1250–1750 MHz Tx. See also *C-band* and *Ku-band*.

LAN **L**ocal **A**rea **N**etwork

LLA **L**ow **L**atency **A**pplication

LNA **L**ow **N**oise **A**mplifier – An amplifier with very low noise temperature used as the first amplifier in the receive chain of a satellite system.

LNB **L**ow **N**oise **B**lock – A downconverter so called because it converts a whole band or “block” of frequencies to a lower band. The LNB (similar to an LNA) is part of the satellite ODU/transceiver.

LNC **L**ow **N**oise **C**onverter – A combined low noise amplifier and block downconverter, typically with an L-band IF.

LO **L**ocal **O**scillator – A component used in upconverters, downconverters, and transponders for frequency translation (heterodyne) of the carrier signal.

M

M&C **M**onitor **&** **C**ontrol

MAC **M**edia **A**ccess **C**ontrol – A protocol controlling access to the physical layer of an Ethernet network.

Mbps **M**ega **b**its **p**er **s**econd – 1 Million bits/second. A measure of the bit rate or transmission speed of a digital communication link. See also *bps* and *kbps*.

MIB **M**anaged **I**nformation **B**ase – A database used for managing the entities in a communications network. Typically associated with Simple Network Management Protocol (SNMP).

MIR **M**inimum **I**nformation **R**ate – A minimum level of service available to a remote terminal, ensuring the ability to enter a clear channel SCPC circuit or have a timeslot in STDMA.

Modem **Mod**ulator and **dem**odulator units combined.

Multicast Transmitting a single message simultaneously to multiple destinations (group) on the IP network.

Multi-command A command that allows multiple input choices in a single command execution.

N

NAT **N**etwork **A**ddress **T**ranslation – An Internet standard that enables a LAN to use one set of IP addresses for internal (private) traffic and a second set of addresses for external (public) traffic.

NBI **N**orth**b**ound **I**nterface – The SNMP interface offered by the VMS to extend services to an external network management system (NMS).

NIC **N**etwork **I**nterface **C**ontroller – The network interface for a PC/workstation that provides Ethernet connectivity. Depending on the computer, the NIC can either be built into the motherboard, or be an expansion card. Some computers (e.g., servers) have multiple NICs, each identified by a unique IP address.

NMS **N**etwork **M**anagement **S**ystem

NOC **N**etwork **O**perations **C**enter – The main control center for network operations. A NOC can interrogate, control, and log network activities for the satellite Hub as well as any Remote node.

NP **N**etwork **P**rocessor – Also referred to as the IP Module. An optional assembly for Comtech EF Data modems that provides the 10/100 BaseT Ethernet interface that is required when used in Vipersat networks.

O

ODU **O**ut**d**oor **U**nit – In a VSAT system, the RF components (transceiver) are usually installed outdoors on the antenna structure itself and are thus referred to as an ODU. The ODU typically includes the BUC and LNB, and is connected to the IDU/modem by the IFL cabling.

OQPSK **O**ffset **Q**uadrature **P**hase **S**hift **K**eying – A variant of phase-shift keying using four different values of the phase to transmit. Offsetting the bit timing limits the phase shift and yields lower amplitude fluctuations as compared to QPSK, and is sometimes preferred for communications systems. See also *QPSK* and *BPSK*.

OSPF **O**pen **S**hortest **P**ath **F**irst – An open standard interior gateway routing protocol used to determine the best route for delivering the packets within an IP network. OSPF routers use the *Shortest Path First* link state algorithm to calculate the shortest path to each node in the network. The Vipersat OSPF feature in the Comtech SLM-5650A modem/router provides for dynamic routing functionality.

P

PIR **P**eak **I**nformation **R**ate – The bandwidth available for use by any remote terminal on best effort basis, categorized through multilevel prioritization.

PLDM **P**ath **L**oss **D**ata **M**essage – A packet message that is sent by older Vipersat modems (e.g., CDM-570/L) to the VMS every sixty seconds, providing status update and operating parameter information.

PSK **P**hase **S**hift **K**eying – A digital modulation scheme that conveys data by changing the phase of a base reference signal, the carrier wave. Different PSKs are used, depending on the data rate required and the signal integrity. Examples are binary phase-shift keying (BPSK or 2-PSK) which uses two phases, and quadrature phase-shift keying (QPSK or 4-PSK) which uses four phases.

PSTN **P**ublic **S**witched **T**elephone **N**etwork – The world's public circuit-switched telephone network, digital and analog, and includes mobile as well as land-line voice and data communications.

PUM **P**eriodic **U**pdate **M**essage – A packet message that is sent by newer Vipersat modems (e.g., CDM-840) to the VMS every sixty seconds, providing either registration request or status update and operating parameter information (SUM).

Q

QAM **Q**uadrature **A**mplitude **M**odulation – A digital modulation technique in which the amplitude of two carrier waves is changed to represent the data signal. These two waves are 90 degrees out of phase with each other.

QoS **Q**uality **o**f **S**ervice

QPSK **Q**uadrature **P**hase **S**hift **K**eying – Sometimes referred to as 4-PSK, or 4-QAM. A modulation technique in which the carrier is phase shifted +/-90 or +/-180 degrees. With four phases, this modulation can encode two bits per symbol—twice the rate of BPSK. However, it also uses twice the power. See also *OQPSK* and *BPSK*.

R

Remote Satellite earth site that links to a central network site (Hub).

REST **RE**presentational **S**tate **T**ransfer – An architectural style of large-scale networked software that takes advantage of the technologies and protocols of the World Wide Web. REST describes how distributed data objects, or resources, can be defined and addressed, stressing the easy exchange of information and scalability.

RESTful The VMS RESTful interface is a Web Services API that adheres to the REST principles. This interface provides a high level control of VMS element structures via document-addressable URL's simplifying and standardizing on an external application interface, such as to/from a network management system (NMS).

Return Path Transmission path from a Remote site to the Hub site.

RF **R**adio **F**requency – A generic term for signals at frequencies above those used for baseband or IF.

RFC **R**equest **F**or **C**omment – The official publication channel for Internet standards (such as communication protocols) issued by the Internet Engineering Task Force (IETF).

RIP **R**outing **I**nformation **P**rotocol

ROSS **R**oaming **O**ceanic **S**atellite **S**erver – A satellite mobility controller that is a key component in the CEFD SOTM technology solution for marine vessels. Provides for transition of link communications between roaming remote terminal and satellite or Hub with minimal service interruption.

RS-232 A common electrical/physical standard issued by the IEEE used for point to point serial communications up to approximately 115 kb/s.

RTP **R**eal-time **T**ransport **P**rotocol – A standardized packet format for delivering real-time applications such as audio and video over the Internet. Frequently used in streaming media systems, videoconferencing, and VoIP.

Rx **R**eceive

S

SCPC **S**ingle **C**hannel **P**er **C**arrier – A satellite communications technique where an individual channel is transmitted to the designated carrier frequency. Some applications use SCPC instead of burst transmissions because they require guaranteed, unrestricted bandwidth.

SIP **S**ession **I**nitiation **P**rotocol – A general purpose protocol for multimedia communications, commonly used for voice over IP (VoIP) signaling. An alternative to the H.323 protocol.

SLM **S**atellite **L**ink **M**odem (CEFD model designator; e.g., SLM-5650A)

SNG **S**atellite **N**ews **G**athering – A satellite uplink van/truck with television crew on location conducting a live report for a newscast.

SNMP **S**imple **N**etwork **M**anagement **P**rotocol – A protocol defining how devices from different vendors may be managed using a common network management system.

SOTM **S**atCom-**O**n-**T**he-**M**ove – The ability of a mobile remote terminal to roam across satellite beams to preserve link integrity and to automatically connect from one satellite and/or hub to another in a global network.

Star Topology A network topology which, if drawn as a logical representation, resembles a star with a hub at the center.

STDMA **S**elective **T**ime **D**ivision **M**ultiple **A**ccess – A multiple access technique where users time-share access to a common channel with variable-sized time slots allocated on usage.

Streamload Protocol A proprietary Vipersat data streaming protocol.

SUM **S**tatus **U**pdate **M**essage – A packet message that is sent by newer Vipersat modems (e.g., SLM-5650A) to the VMS every sixty seconds, providing status update and operating parameter information.

T

TAP **T**ransmission **A**nnouncement **P**rotocol – A proprietary multicast message sent out by the HCC to all associated Remotes in the group, specifying the relative start time and duration for each terminal to transmit while in Entry Channel mode (ECMv2).

TCP/IP **T**ransmission **C**ontrol **P**rotocol / **I**nternet **P**rotocol – A standard for networking over unreliable transmission paths. See also *UDP*.

TDM **T**ime **D**ivision **M**ultiplexing – A method of multiplexing that provides the transmission of two or more signals on the same communication path or channel, but at different times by utilizing recurrent timeslots.

TDMA **T**ime **D**ivision **M**ultiple **A**ccess – A multiple access technique where users contend for access to a common channel on a time-shared basis. See also *FDMA* and *STDMA*.

TFTP **T**rivial **F**ile **T**ransfer **P**rotocol – A simple file transfer protocol used over reliable transmission paths. See also *FTP*.

ToS **T**ype **o**f **S**ervice

Tx **T**ransmit

U

UDP **U**ser **D**atagram **P**rotocol – A standard for networking over reliable transmission paths.

UDP Multicast A multicast transmission using the UDP protocol.

Unicast Transmitting information/data packets to a single destination on the IP network.

V

VCM **V**ariable **C**oding and **M**odulation – A technique that optimizes bandwidth utilization in a wireless data link by varying the forward error correction code rate and the modulation order within a single carrier. A feature of DVB-S2 that is supported in CEFD modems such as the CDM-800 Gateway Router.

VersaFEC Advanced forward error correction technology from CEFD that provides maximum coding gain with lowest possible latency to support latency-sensitive data applications, such as voice, video, and cellular backhaul.

VESP **V**ipersat **E**xternal **S**witching **P**rotocol – A switch-request protocol that allows external VPN equipment and Real-time proprietary applications to negotiate bandwidth requests between any two subnets on a Vipersat network. VESP is used by newer Vipersat modems (e.g., SLM-5650A) to send a switch request to the VMS to establish a new satellite link or adjust bandwidth for an existing link.

VFS **V**ipersat **F**ile **S**treamer – A file transfer application utilizing UDP and a proprietary Streamload protocol to transmit data across the Vipersat network.

ViperView The graphical user interface for the client component of the VMS that provides the means to configure, control, and monitor Vipersat satellite networks.

VLoad **V**ipersat **Load** Utility – A comprehensive tool for managing and distributing application, configuration, and identification information for the modem/routers in Vipersat satellite networks.

VMS **V**ipersat **M**anagement **S**ystem – A comprehensive M&C tool providing rapid and responsive control of Vipersat satellite networks. Comprised of client and server components.

VNO **V**irtual **N**etwork **O**perator – A provider of management services that does not own the telecommunication infrastructure. The Comtech Vipersat Network Products' VNO solution allows satellite space segment operators to selectively expose resources in their satellite network to other service providers, customers, or partners.

VoIP **V**oice **o**ver **IP** – The routing of voice communications over the Internet or through any IP-based network.

VOS **V**ipersat **O**bject **S**ervice – The main software service of the VMS application.

W

Wizard A specialized program which performs a specific function, such as installing an application.

WRED **W**eighted **R**andom **E**arly **D**etection – A queue management algorithm with congestion avoidance capabilities and packet classification (QoS) providing prioritization.

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Index

Numerics

A

B

C

D

E

F

G

H

N

O

P

Q

R

S

T

U

V

W