


Effectively Manage and Control the Hybrid Fiber-Coaxial Network with Cisco Cable Manager



Cisco Cable Manager provides a graphical, client-server application that simplifies the monitoring and troubleshooting of a hybrid fiber-coaxial (HFC) cable network. Cisco Cable Manager lets operators easily manage Cisco cable modem termination system (CMTS) products, as well as Cisco and third-party cable modems that are compliant with Data-over-Cable Service Interface Specifications (DOCSIS) or EuroDOCSIS. Based on the highly scalable Cisco Element Management Framework (Cisco EMF), Cisco Cable Manager integrates CiscoView, Cisco Cable Troubleshooter, and Cisco DOCSIS CPE Configurator into its product offering.

Introduction

Today, demand for advanced cable services is changing the landscape of the cable market. “Always-on” broadband cable allows consumers to change the way they communicate. Cable service providers can deploy with confidence new applications such as voice over IP (VoIP) and virtual private networks (VPNs).

With the introduction of new markets comes the challenge of managing the cable infrastructure that delivers these services. Effective network management requires monitoring and managing all aspects of the infrastructure, including the ability to build a composite view of components that make up the service.

Cable service providers need tools to deploy, maintain, troubleshoot, and monitor HFC network equipment. Tools must offer flexibility to support a rapidly changing environment where network configuration can change quickly to incorporate newer technology. The management framework must scale as the network grows. Network reliability is a central concern. Tools must deliver comprehensive yet easy-to-understand information that allows operators to detect and solve network problems quickly. Proactive network management is needed to ensure that problems do not escalate into more serious outages affecting the availability and performance of critical services.

Product Description

Cisco Cable Manager is a graphical, client-server application that supports proactive surveillance and maintenance of the HFC network. Together, with the bundled applications, Cisco Cable Manager allows operators to perform:

- Fault management—Detect and isolate faults with Cisco EMF Event Manager features, CiscoView chassis and cable modem views, and diagnostic capabilities
- Configuration management—Track network and system configuration information with topology tree views, forms-based CMTS configuration, and software image download capability to cable modems



- Performance management—Maintain overall performance of the network at an acceptable level with metrics, including options to specify polling groups and generate tabular and graphical historical performance reports
- Security management—Control access to network resources, including device- and task-based partitioning

Cisco Cable Manager bundles:

- CiscoView Version 4.2, which displays component views of Cisco CMTS and cable modem products, as well as DOCSIS- or EuroDOCSIS-compliant cable modems.
- Cisco Cable Troubleshooter Release 1.3, which pinpoints radio frequency (RF) issues to automate analysis and interpretation of the Cisco patent-pending “flap list” maintained in Cisco CMTS products. The flap list helps isolate problems between the cable plant, such as ingress noise or incorrect power levels, and specific RF customer premises equipment (CPE) devices.
- Cisco DOCSIS CPE Configurator Version 3.2, which automates the creation or editing of a DOCSIS or EuroDOCSIS cable modem configuration file.

Cisco EMF Version 3.1 serves as the foundation for the Cisco Cable Manager. Cisco EMF provides common interfaces and element management services across Cisco service provider products. This flexible, modular model lets cable operators install a mix of element managers today to meet current business needs yet accommodate future growth. Service providers can more rapidly deploy new element managers to manage new services.

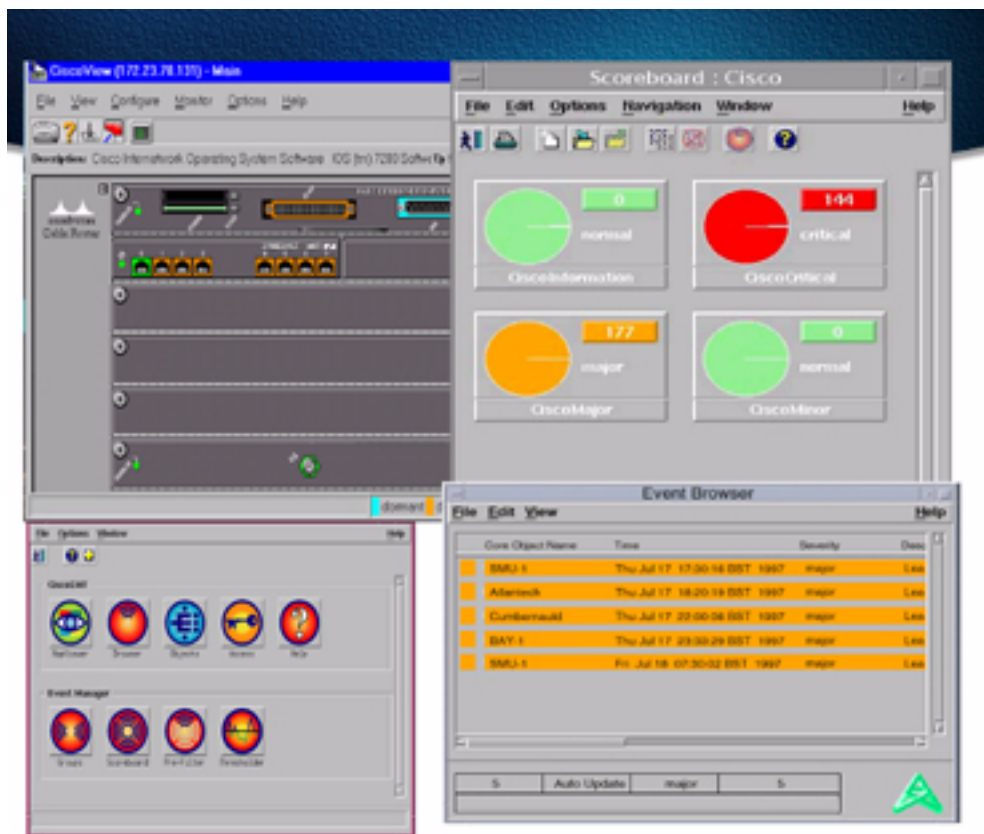
Element managers are the applications that manage specific types of network devices. Element managers interact with users through graphical user interfaces (GUIs) and contain references to other managers in the set. Cisco EMF components include: Object Manager, Event Manager, Event Browser, Threshold Manager, Alarm Scoreboard, and Performance Manager. Cisco Cable Manager offers a Tools Launch Pad option to open CiscoView, Cisco Cable Troubleshooter, and Cisco DOCSIS CPE Configurator bundled applications.

Using Cisco Cable Manager, operators can build a model of the cable network using an object-oriented paradigm (Figure 1). An object is a building block within Cisco Cable Manager to model network elements. An object represents the element to be managed. Several objects can manage a network element. Each object within Cisco Cable Manager is a member of an associated object class. Objects exist within one or more hierarchical relationships, or containment trees. Cisco Cable Manager offers:

- Object-oriented modeling to identify and represent resources within the managed space
- Auto-discovery topology to automatically detect, model, and maintain an active inventory of managed objects
- Monitoring to determine changes in topology or state
- Interpretative intelligence to aid personnel in identifying and determining the “root cause” of problems



Figure 1 Cisco Cable Manager Desktop with Application and Event Manager Windows



Cisco Cable Manager offers a client-server architecture:

- The client-server application provides:
 - Real-time cable network surveillance
 - Batch configuration of Cisco CMTS products (See “Release Definition”)
 - Automated cable modem software image download capability
 - Performance reports for capacity planning
 - Troubleshooting and diagnostics
- The server is Solaris-based (Sun Ultra 60 or Sun Enterprise 250). The server communicates with network devices via Simple Network Management Protocol (SNMP) and Telnet.



Table 1 Cisco Cable Manager Release Product Features

Feature	Benefit
Management of 100,000 cable modems on a single server with capability to poll 400,000 to 500,000 objects every 15 minutes	<ul style="list-style-type: none"> • Scales to support high subscriber penetrations • Protects investment because operators can grow the network and management system
Customizable polling groups and polling intervals	<ul style="list-style-type: none"> • Optimizes Cisco Cable Manager and DOCSIS system performance to meet current and future network scaling needs
Auto discovery and topology tree views that automatically display devices on the network and support physical and logical topology representations	<ul style="list-style-type: none"> • Automates and simplifies network setup • Provides increased understanding of the network's functioning status • Ensures complete and accurate network topology and status views
Component views	<ul style="list-style-type: none"> • Enables performance monitoring of CMTS line cards or cable modem interface ports
Real-time snapshot alarm views that display color-coded alarms for each node in a tree based on severity	<ul style="list-style-type: none"> • Allows operators to quickly identify and prioritize faults
Advanced alarm management that supports alarm filtering, clearing, and SNMP trap-forwarding capabilities	<ul style="list-style-type: none"> • Allows proactive monitoring and system management to speed problem resolution • Supports threshold-based alarm generation to allow users to specify thresholds and have the system report automatically when these thresholds are exceeded • Offers flexible event notification such as e-mail message generation through user-customizable scripts
Diagnostics such as flap-list interpretation and "ping" connectivity tests at the IP and Media Access Control (MAC) layers between the Cisco CMTS and cable modems	<ul style="list-style-type: none"> • Identifies RF CPE devices experiencing connectivity problems • Helps operators isolate problems to the RF CPE device or the cable plant
Predefined and customizable reports in tabular and graphical formats that can be run on demand	<ul style="list-style-type: none"> • Enables trend analysis to easily monitor performance over time • Eases device management, allowing operators to obtain CMTS or cable modem utilization statistics, IP statistics, or RF statistics, to aid capacity and network planning • Promotes early detection of potential problems
Inventory reports that detail the number of Cisco CMTS line cards interfacing to the cable plant and LAN and WAN interfaces; includes hardware and software revisions for all inventoried components	<ul style="list-style-type: none"> • Facilitates inventory management • Simplifies maintenance, identifying Cisco IOS® Software releases to facilitate future software upgrades if desired
Cisco cable modem software images that can be downloaded on-demand	<ul style="list-style-type: none"> • Automates image distribution to a cable modem or set of cable modems associated with a specific upstream channel
Cisco DOCSIS CPE Configurator	<ul style="list-style-type: none"> • Simplifies creation or editing of a cable modem configuration file
User authentication and user-group partitioning	<ul style="list-style-type: none"> • Protects access to the system
Online, context-sensitive help	<ul style="list-style-type: none"> • Reduces operator training time • Increases product usability



Release Definition

New Features Beginning with Cisco Cable Manager 2.0 include:

- Scalability to support 100,000 cable modems or CPE devices per Cisco Cable Manager server and 400,000 to 500,000 SNMP attributes per 15 minutes
- Security to support task- and device-based partitioning of user groups
- Performance reporting enhancements that provide multiple statistics in a single graphical display
- Fault-management enhancements that support formula-based and user-configurable alarm thresholds
- Additional polling capabilities:
 - Enabling or disabling polling groups
 - Stopping and starting polling on one or multiple CMTSs and cable modems
 - Customizing polling interval/timer
- More robust Object Store database

Cisco Device Management Support

Cisco Cable Manager Release 2.0 adds domain management of:

- Cisco uBR7200 Series Universal Broadband Router
- Cisco uBR905 Cable Access Router
- Cisco CVA122 Cable Voice Adapter

Cisco Cable Manager Release 2.1 adds domain management of:

- Cisco uBR7100 Series Universal Broadband Router
- Cisco uBR10012 Universal Broadband Router
- Cisco CVA122E Cable Voice Adapter
- Cisco uBR925 Cable Access Router

Applications

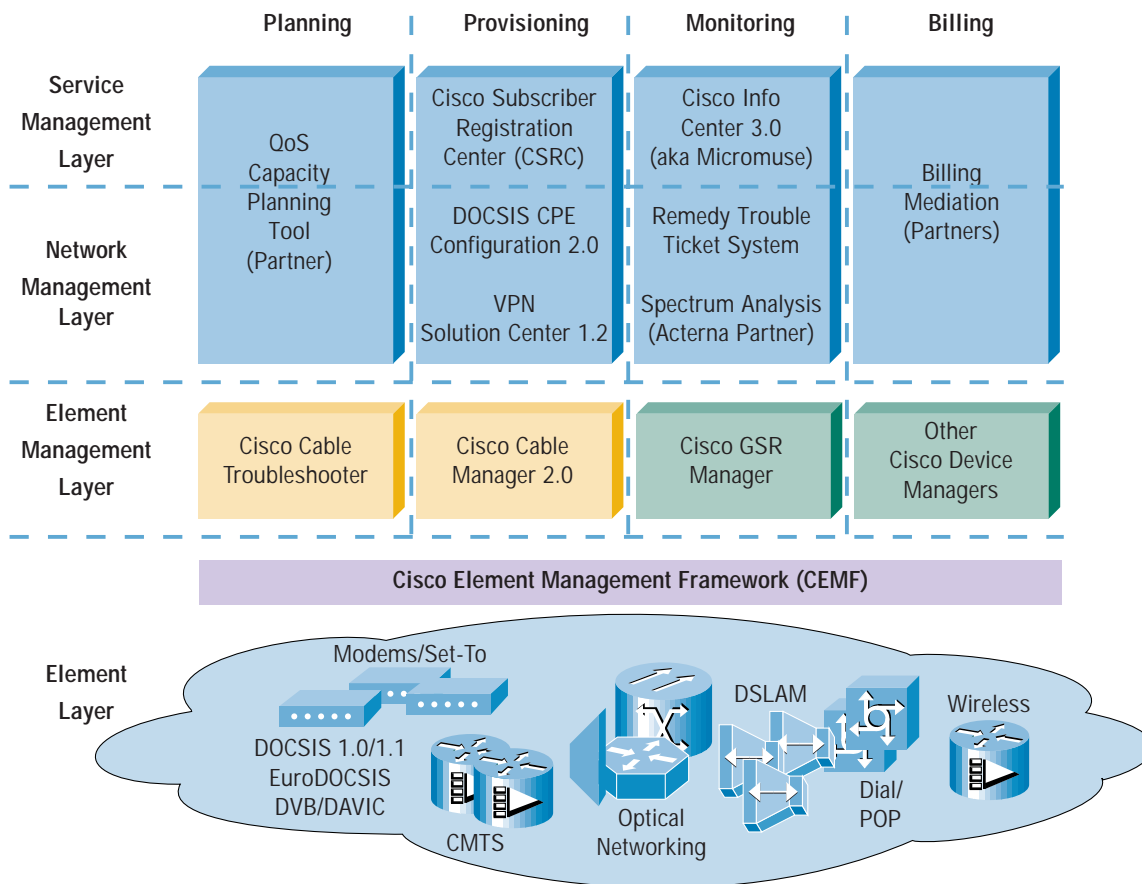
- Network operations center (NOC)—Cisco Cable Manager is an ideal solution for central or regional NOC personnel to monitor the network. Real-time status and alarm views enable technicians to detect, prioritize, isolate, and resolve faults appropriately. Automated device configuration tools and historical trend reports enable technicians to optimize network utilization over time.
- Headend or remote site—Technicians working at a headend or remote site can connect to the Cisco Cable Manager server and use a laptop computer to run the application. By viewing the same status and alarm information as NOC technicians, field technicians can speed problem resolution and better maintain network devices.
- Customer service representative location—Cisco Cable Manager provides an easy-to-use customer care tool to monitor the health of the HFC cable network. Customer service representatives can more effectively communicate and identify problems to customers.



Cisco Management Architecture Solution

Cisco Cable Manager is part of an end-to-end Cisco management architecture solution that supports advanced multiservice cable networks (Figure 2). This solution includes the Cisco Subscriber Registration Center, as well as third-party monitoring and billing tools.

Figure 2 Cisco Cable Management Solutions Architecture





Features and Benefits in More Detail

Reduced Maintenance and Operations Costs through Central Control

Cisco Cable Manager automates monitoring of both data and RF components network-wide. The product integrates management of all Cisco CMTS and cable modem products, as well as DOCSIS- and EuroDOCSIS-compliant third-party RF CPE devices. With comprehensive, centralized control of all Cisco network equipment, operators are able to improve network reliability and reduce maintenance and operational costs. Auto discovery of cable network elements ensures complete and accurate network topology and status views.

Cisco Cable Manager integrates the CiscoView application, which provides dynamic status, monitoring, and configuration information on Cisco CMTS or cable modem products (Figures 3 and 4). CiscoView enables real-time fault and performance monitoring of cards, interfaces, and ports for selected devices. CiscoView displays a physical view of the device, with color-coding of modules and ports for at-a-glance status. Monitoring capabilities display performance and other statistics. Configuration capabilities allow comprehensive changes to devices if requisite security privileges are granted.

Figure 3 CiscoView CMTS Chassis View

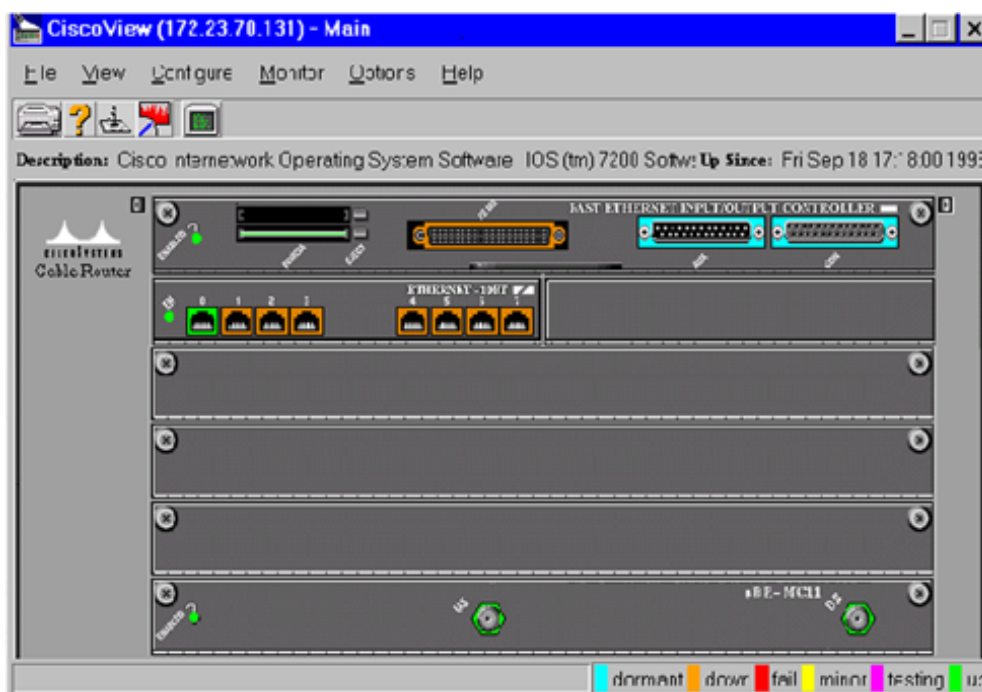
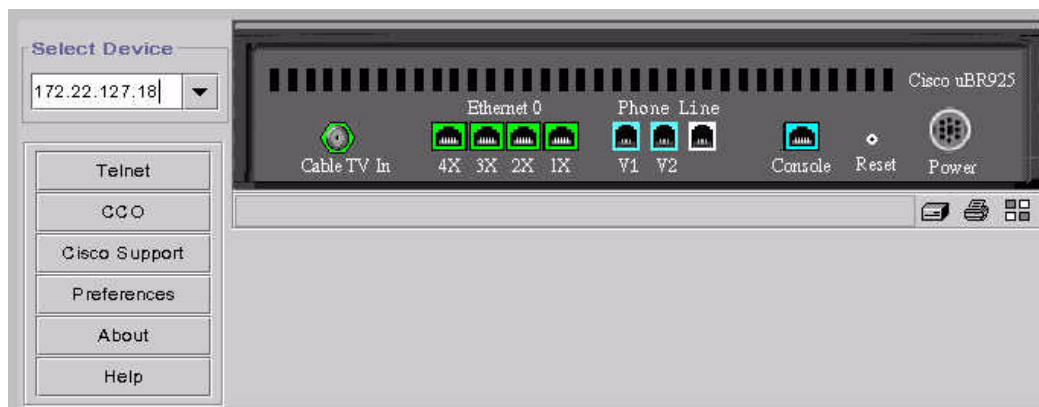


Figure 4 CiscoView Cable Modem View





Comprehensive Fault Management for Increased Reliability

A rich suite of fault-management features in Cisco Cable Manager enables proactive surveillance of network status. Figure 5 provides a snapshot of the network alarm status.

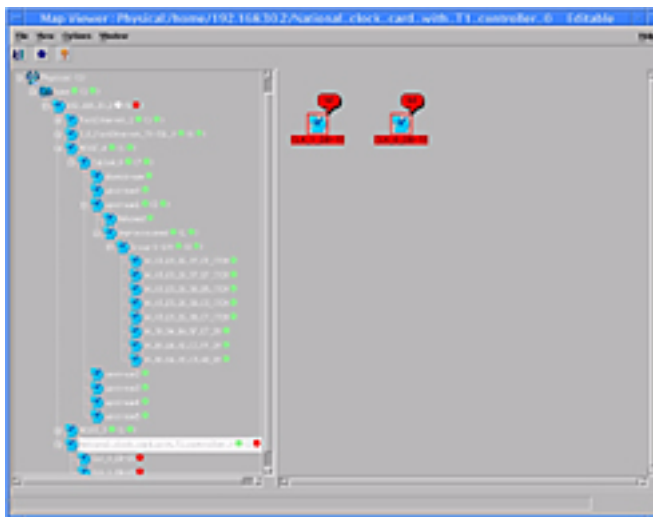
Real-time fault alerts generated by cable components can be displayed, cleared, and color-coded based on severity. Cisco Cable Manager includes flexible options that support event filtering, as well as customizable event notifications that speed problem isolation and resolution.

Each node in the tree and each event are color-coded to indicate the severity of a propagated alarm. Cisco Cable Manager supports alarm filtering, clearing, and SNMP trap-forwarding capabilities. Flexible event notification is available through user-customizable scripts: for example, generating an e-mail message or a page.

Additional alarms can be generated when user-defined utilization and error threshold levels are exceeded. This allows proactive monitoring of potential problems. User-defined threshold levels may be based on raw SNMP attributes or on derived rate-based thresholds.

In addition, for quicker fault isolation, Cisco Cable Manager supports “ping” connectivity tests at the IP and MAC layers between the Cisco CMTS and the cable modem. Cisco Cable Manager offers template-based CMTS configuration to adjust parameters. Easy-to-use forms-based templates enable users to retrieve or set multiple parameters for the Cisco CMTS.

Figure 5 Cable Network Topology, Providing a Real-Time Snapshot of the Network Alarm Status





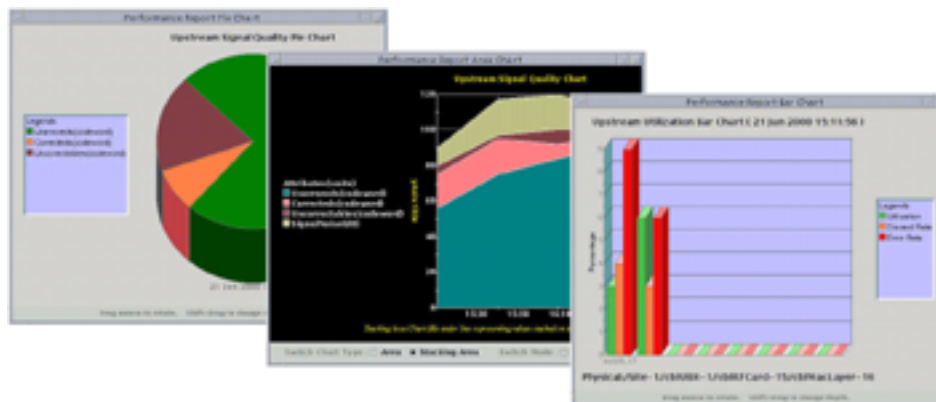
Optimized Network Capacity and Growth through Comprehensive Reports

Cisco Cable Manager provides predefined reports in tabular and graphical format. Reports can be run on demand, providing CMTS and cable modem statistics, IP statistics, and RF statistics. Available reports include:

- CMTS MAC Statistics Report
- CMTS MAC Throughput Report
- CMTS Port Adapter Throughput Report for backbone interfaces
- CMTS Downstream Utilization Report
- CMTS Upstream Signal Quality Report
- CMTS Upstream Utilization Report
- Cable Modem Inventory Report
- Cable Modem Usage Report
- Cable Modem CPE Report
- Cable Modem Signal Quality Reports

Reports enable operators to monitor network utilization and performance over time. Multiple statistics are available in a single graph. Reports enable trend analysis and aid in early detection of problems. Inventory reports help identify current network capacity, providing summary and detailed information on cable modems registered per CMTS line card, as well as the number of LAN and WAN interfaces. Reports display the installed Cisco IOS Software version for the Cisco CMTS, as well as hardware and software revisions for all inventoried line cards. Reports can be customized.

Figure 6 Historical Performance Reports





Cable Modem Software Image Download and Configuration File Generation

The Cisco Cable Manager software download utility automates software image distribution to a set of cable modems associated with a specific upstream channel. The download procedure can be performed on demand.

In addition, Cisco Cable Manager bundles the Cisco DOCSIS CPE Configurator application. This application hides the complexity of creating a DOCSIS or EuroDOCSIS cable modem configuration file. The product presents a user-friendly interface that collects the information needed to generate a file.

User Authentication

Access to the management system is controlled with user login names and passwords. Access is partitioned by user-group types. Cisco Cable Manager security access levels include:

- Read-only; typically given to customer service representatives
- Read-write; typically given to NOC personnel
- Read-write-admin (RW-Admin); reserved for system administrators to create/delete different levels of users and assign privileges.

System Requirements

Small Deployment Server Hardware (<20,000 cable modems)

For small deployments, use the Sun Ultra 60 configured as follows:

- 1 x 9 GB internal disk for Cisco Cable Manager and one for the Cisco EMF translation log
- 1 x 18 GB disk for storage and the Cisco EMF database
- 1 GB memory
- 2 x 450 MHz processors
- 2 GB swap
- CD-ROM drive
- IP and SNMP connectivity to the managed devices

Large Deployment Server Hardware (20,000 to 100,000 cable modems)

For large deployments, use the Sun Enterprise 250 configured as follows:

- 1 x 9 GB 10,000 rpm disk for Cisco Cable Manager
- 1 x 9 GB disk for the translation log
- 1 x 18 GB disk for the Cisco EMF database configured as rawfs
- 2 GB memory
- 2 x 400 MHz processors
- 3.5 GB total swap
- CD-ROM drive
- IP and SNMP connectivity to the managed devices

Client Hardware

The Cisco Cable Manager server supports up to five simultaneous users. If more than five simultaneous user sessions are required, up to five additional users may be added as Cisco Cable Manager clients.

Cisco Cable Manager client requirements are:

- Sun Ultra 5 with Solaris 2.6
- 512 MB of RAM
- 2-GB hard drive
- CD-ROM drive
- IP connectivity to the Cisco Cable Manager server and SNMP connectivity to the managed devices if CiscoView is run locally on the client machine

Requirements to Remotely Access Cisco Cable Manager

Users can run Cisco Cable Manager remotely using *rlogin*, *telnet*, or *rsh* through a ReflectionX or Exceed session on a UNIX workstation or PC.

UNIX Workstation Requirements

- Sun Ultra 5
- 256 MB of RAM
- 1-GB hard drive
- IP connection to Cisco Cable Manager server or client

PC Requirements

- Windows NT 4.0 or Windows 95
- Pentium I or II, 200-MHz processor
- 64 MB of RAM
- Exceed 6.1 or ReflectionX
- IP connection to Cisco Cable Manager server or client

Supported Network Elements

- Cisco CMTS Products—Cisco uBR10012 Universal Broadband Router, Cisco uBR7200 Series, and Cisco uBR7100 Series running the following minimum Cisco IOS Software releases:
 - Cisco uBR10012 requires Cisco IOS Release 12.2(2)XF or later
 - Cisco uBR7200 Series requires Cisco IOS Release 11.3NA or later for Telnet and version 12.1EC or later for SNMP
 - Cisco uBR7100 Series requires Cisco IOS Release 12.1(5)EC1 minimum for DOCSIS models and Cisco IOS Release 12.1(7)EC minimum for EuroDOCSIS models
- Cisco CPE products—Cisco CVA120 Series Cable Voice Adapter, Cisco uBR900 Series Cable Access Router
- DOCSIS- and EuroDOCSIS-compliant cable modems and set-top boxes

Cisco Service and Support

Service and support for Cisco Cable Manager is available through the Cisco Software Application Services program. These services provide 24-hour technical assistance, full access to the information and support resources on the Cisco.com Web site, and software maintenance updates within a single release. Available as an option are advanced Software Application Support Plus Upgrades, which include proactive shipment of all minor (update) and major (upgrade) product releases.

Related Information

For more information about:

- Cisco Cable Manager, refer to:
www.cisco.com/cable/products/cable_manager.html
- Cisco Broadband Troubleshooter, refer to:
www.cisco.com/cable/products/troubleshooter.html
- CiscoView, refer to:
www.cisco.com/warp/public/cc/pd/wr2k/view/prodlit/index.shtml
- Cisco DOCSIS CPE Configurator, refer to:
<http://www.cisco.com/support/toolkit/CableModem/>
- Cisco Element Management Framework, refer to:
www.cisco.com/warp/public/779/servpro/operate/csm/nemnsw/cemf/prodlit/index.shtml
- Cisco Subscriber Registration Center, refer to:
www.cisco.com/warp/public/779/servpro/operate/csm/nemnsw/csrc/prodlit/



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