



Overview of Cisco Media Gateway Controller Node Manager

Introduction

Cisco Media Gateway Controller Node Manager (CMNM) integrates the management interfaces and management functionality of the Cisco MGC node components into one comprehensive human interface and data repository. The Cisco MGC node consists of the Cisco MGC itself, one or more Cisco Signaling Link Terminals (Cisco SLTs) and the Catalyst 2900, Catalyst 5000, or Catalyst 5500 LAN switch. CMNM provides fault, configuration, and performance management for all components of the Cisco MGC node.

CMNM provides the element-specific management features for the Cisco MGC node. It blends the management framework features of the Cisco Element Management Framework (CEMF) with the individual interfaces and object structures of each managed element to produce an integrated management application.

Terms Used in This Document

The following terms are used in this document:

- **BAMS**—Billing and Measurements Server. The Billing and Measurements Server (BAMS) is a UNIX-based software application that accepts individual usage records generated by Cisco's Virtual Switch Controllers (VSCs), validates and correlates the records into a merged usage record, facilitates traffic-oriented statistical analysis, and generates Bellcore Automatic Message Accounting (AMA) Format (BAF) records on a per-call basis.
- **Cisco Element Management Framework (CEMF)**—The element management framework upon which CMNM is built.
- **Cisco MGC**—Cisco Media Gateway Controller. The Cisco Virtual Switch Controller (Cisco VSC) and the Cisco Signaling Controller (Cisco SC) are key to Cisco's voice domain solutions. The Cisco VSC and the Cisco SC are collectively called a Cisco Media Gateway Controller (Cisco MGC) node. The Cisco MGC node itself is comprised of a number of different devices: the Cisco MGC host, a LAN switch, and a Cisco Signaling Link Terminal (Cisco SLT).
- **Cisco MGC host**—A Sun host server running Cisco MGC software. For the Cisco SC2200 and the Cisco VSC3000, this is also called a Cisco MGC host.
- **Cisco MGC node**—A generic term encompassing both the Cisco SC node and the Cisco VSC node. The logical grouping of the active and standby Cisco MGC hosts, the control signaling network, and the Cisco SLTs.

- CiscoView—A graphical device management tool based on Simple Network Management Protocol (SNMP) that provides real-time views of networked Cisco Systems devices.
- CMM and VSPT—Cisco MGC Manager and Voice Services Provisioning Tool
You can use two different Cisco VSC3000 and Cisco SC2200 provisioning tools, depending on the network architecture you are running. If you are running the Cisco SS7 PRI Gateway Solution or the Cisco Tandem Offload Solution, you use VSPT. For all other architectures, you use CMM.
- Web Viewer—A web-based device management tool that facilitates managing the Cisco MGX 8260 media gateway.

Overview of the Cisco MGC Node Architecture

The Cisco Virtual Switch Controller (VSC) and the Cisco Signaling Controller (SC) (collectively referred to as the Cisco MGC) are key to Cisco's voice domain solutions.

The Cisco MGC node itself comprises the:

- Cisco MGC host—The Cisco MGC host is a suite of software running on a Sun Solaris server and is responsible for most of the Cisco MGC functionality, including (depending on the configuration) number analysis, routing, switching, and so on.
- Cisco Signaling Link Terminal (Cisco SLT)—The Cisco SLT is responsible for terminating SS7 signaling lines from the PSTN.
- LAN switch—The LAN switch acts as an Ethernet switch connecting the Cisco SLT and the Cisco MGC host to external equipment.
The standard Cisco MGC node design defines that a Cisco 2611 should be configured as the Cisco SLT and that a Catalyst 2900XL, 5500, or 5000 should be used as the LAN switch.
- BAMS—BAMS is used for optional third-party accounting and billing packages.

A Cisco MGC node is (optionally) fully redundant. This means that each Cisco Virtual Switch Controller or Cisco Signaling Controller may actually have multiples of each type of subcomponent. At any given time, one Cisco MGC host is considered active and the other standby. When the active Cisco MGC host goes down, the standby host becomes active. There is no concept of active or standby with the LAN switches or Cisco SLTs (both are active at all times).

Key Features of CMNM

The most common form of a CEMF installation includes plug-in modules referred to as Element Managers or Element Management Systems (EMS). In the Cisco MGC node architecture, CMNM is a CEMF-based EMS that is responsible for managing the Cisco MGC node. CMNM adds custom graphical user interface (GUI) windows and modeling behavior to the standard CEMF system to allow the management of specific types of network elements. For more information about the Element Managers installed with CMNM, see Table 2-11 in the “Verifying Element Managers” section on page 2-11.

CMNM uses CEMF to manage the following components of the Cisco MGC node:

- Cisco MGC
- Cisco SLT
- LAN Switch (Catalyst 2900, 5000, and 5500 only)
- BAMS

The key features of CMNM are:

- Performance monitoring

CMNM collects and displays performance information from the Cisco MGC node, allowing you to monitor the health and performance of the network. CMNM collects performance information from all the components of the Cisco MGC node.

You can:

- Graph and display the performance information
- View performance data associated with a given object and graph that data over time
- Configure the objects being polled and the frequency of the polling
- Export the performance data for use by other applications

For more information on performance monitoring, see Chapter 7, “Using Polling to Monitor Network Performance.”

- Fault management

CMNM provides fault management of the Cisco MGC node, including the Cisco MGC host, the Cisco MGX 8260, the Cisco SLT, and the LAN switch. You see the traps generated by these elements in the CMNM system.

When the Cisco MGC host detects a problem with one of its logical connections, it generates a trap. CMNM receives these traps and delegates them to the object that represents that logical connection. For example, if CMNM receives a trap that the link to a media gateway is down, CMNM delegates that trap to the object that represents the media gateway link. You can acknowledge and clear alarms and forward traps.

CMNM periodically polls each managed object to ensure that the device is still reachable using SNMP. If the device is not reachable, an annotation appears on the map display, an alarm is generated, and the object is placed in an errored state. After the object loses connectivity, CMNM continues to poll the object until it can be reached. Once connectivity is reestablished, the alarm is cleared, the annotation on the map viewer is removed, and the object is returned to the normal state.

For more information on fault management, see Chapter 8, “Managing Traps and Events.”

- Security

CMNM supports role-based access to its management functions. The administrator defines user groups and assigns users to these groups. CMNM supports control of administrative state variables for Cisco MGC node resources. For more information on access control, see Chapter 5, “Setting Up CMNM Security.”

- Billing and Measurements

Third-party accounting and billing packages are supported directly on the Billing and Measurements Server (BAMS), a component of the Cisco MGC node.

- Configuration

You can launch the following configuration tools from CMNM:

- Cisco MGC Manager (CMM), a generic Cisco MGC host configuration tool used in all network architectures except those using the Voice Services Provisioning Tool.
- CiscoView, which allows you to configure the Cisco SLT (Cisco 2611) and the LAN switch (Catalyst 2900, 5000, and 5500) devices.
- Voice Services Provisioning Tool, a Cisco MGC host configuration tool used in the Cisco SS7 PRI Gateway Solution and the Cisco Tandem Offload Solution. For all other architectures, use CMM.

- Web Viewer, the tool used to view and configure the Cisco MGX 8260.
- Troubleshooting
 - CMNM provides CDR Viewer, Log Viewer, Trace Viewer, and Translation Verification Viewer for diagnostic and troubleshooting information.

Overview of CEMF

CMNM is based on the Cisco Element Management Framework (CEMF), a carrier-class network management framework. This framework was designed to address the challenges of developing and deploying robust, large-scale, multivendor, multitechnology management solutions.

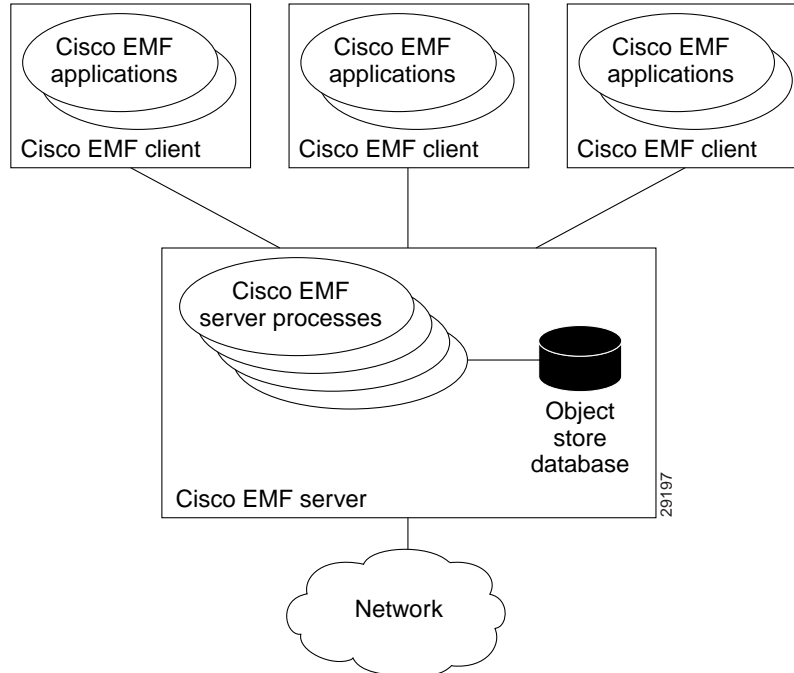
CEMF has been designed to overcome the limitations of traditional enterprise network management solutions, particularly in the broadband access market, and also in other network management applications where the aforementioned characteristics are important. CEMF is used to quickly develop and deploy element, network, and service-level applications in technologies ranging from Digital Subscriber Line (DSL), used for high-speed Internet access; cable modems; and Voice over IP to complex ATM/IP routing multiservice switches.

CEMF Components

CEMF consists of:

- A series of applications that form a front-end GUI to process input
- A series of back-end server processes that maintain a model of the network and carry out the actual interfacing to the network elements (see Figure 1-1)

Figure 1-1 CEMF Processes



CEMF comes with the following set of applications:

- Launchpad
- Map Viewer
- Auto Discovery
- Access Manager
- Event Browser
- Object Group Manager
- Performance Manager
- Deployment Wizard
- Event Manager
- Netscape Help Browser

How CEMF Models the Network

CEMF keeps a model of the managed network within its database. This model is used to keep track of the current state of the various network elements and various abstractions of this network.

The CEMF model of the network uses the following components:

- Objects—Each element managed by CEMF is modeled as an object.

An object can represent:

- Some part of the network, such as a router or a switch

- An abstraction of the network, such as a site or a region
- Some of the services provided by the network, such as a permanent virtual connection (PVC)
- Something (or someone) that interacts with the network, such as a subscriber or a customer
- Object classes—Each object within CEMF has an associated object class. Each class of object simply indicates a different kind of element. Examples of classes are routers, line cards, sites, and so on. Each class of object has different data stored against it and displays different behavior.

In the Map Viewer application, the class of the object is indicated with a different icon used within the Map View browser.

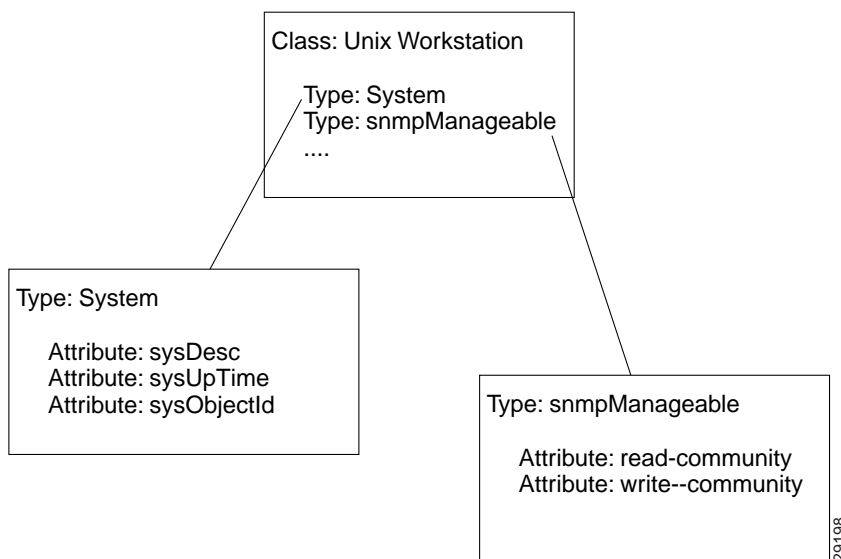
The use of classes also allows powerful queries to be carried out based upon the kind of object. Examples of this type of query could be: show all events in the system from cable modems or create a group of router objects.

- Object types and attributes—Each object has a number of attributes that can be accessed. An attribute is a piece of information either stored against the object or accessible from the object through some network protocol. Examples of attributes are IP address, interface table, upstream power, and so on.

These attributes are associated with the object according to the granularity of object types. A type is simply a collection of related attributes and each class usually has a number of types. An object's class defines which types and, therefore, which attributes it is allowed to have and which types it has by default.

An example of the association between classes and types is shown in Figure 1-2.

Figure 1-2 Example of Object Types and Attributes



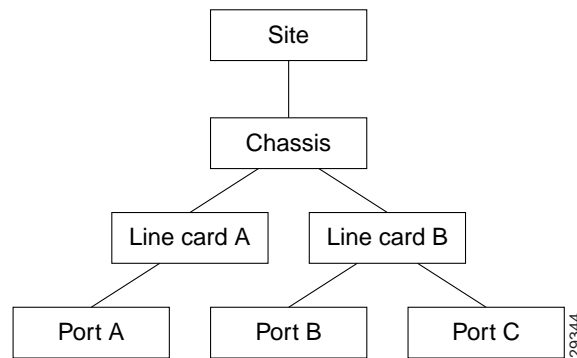
In Figure 1-2, a UnixWorkstation class is specified. This class of object includes two types: System and snmpManageable. The System type includes the sysDesc, sysUpTime, and sysObjectId attributes. The snmpManageable type includes the read-community and write-community attributes.

- Views—A view is a collection of objects in a hierarchical relationship. Each object can have a number of parents and children.

You can access CEMF objects by navigating through one of the views to find the object. Each view represents a different way of containing and grouping the objects. The standard views provided are the Physical view and the Network view. CMNM adds additional views onto the standard set supplied by CEMF.

- Network view—Used to represent the network devices within their relevant networks and subnets. This view is used by the Auto Discovery subsystem of CEMF to calculate which devices have already been added to the system so that it does not try to discover the same device multiple times.
- Physical view—Used to show the actual physical location of an element. An example of a physical containment relationship is shown in Figure 1-3.

Figure 1-3 Example of a Physical View



- *.xxx*Containment view—Where *.xxx* represents an object class. For example, the *sltContainment* view represents the Cisco SLTs. These containment views are useful for looking at information about a set of similar devices.
- Object groups—An object group is simply a collection of objects which are related in some way. They may all be the same type of equipment or all belong to the same customer.
Object groups can be built either manually or by building a query. Object groups are accessible through the Object Group Manager application.

How CMNM Models the Cisco MGC Node

This section provides information about how CMNM models:

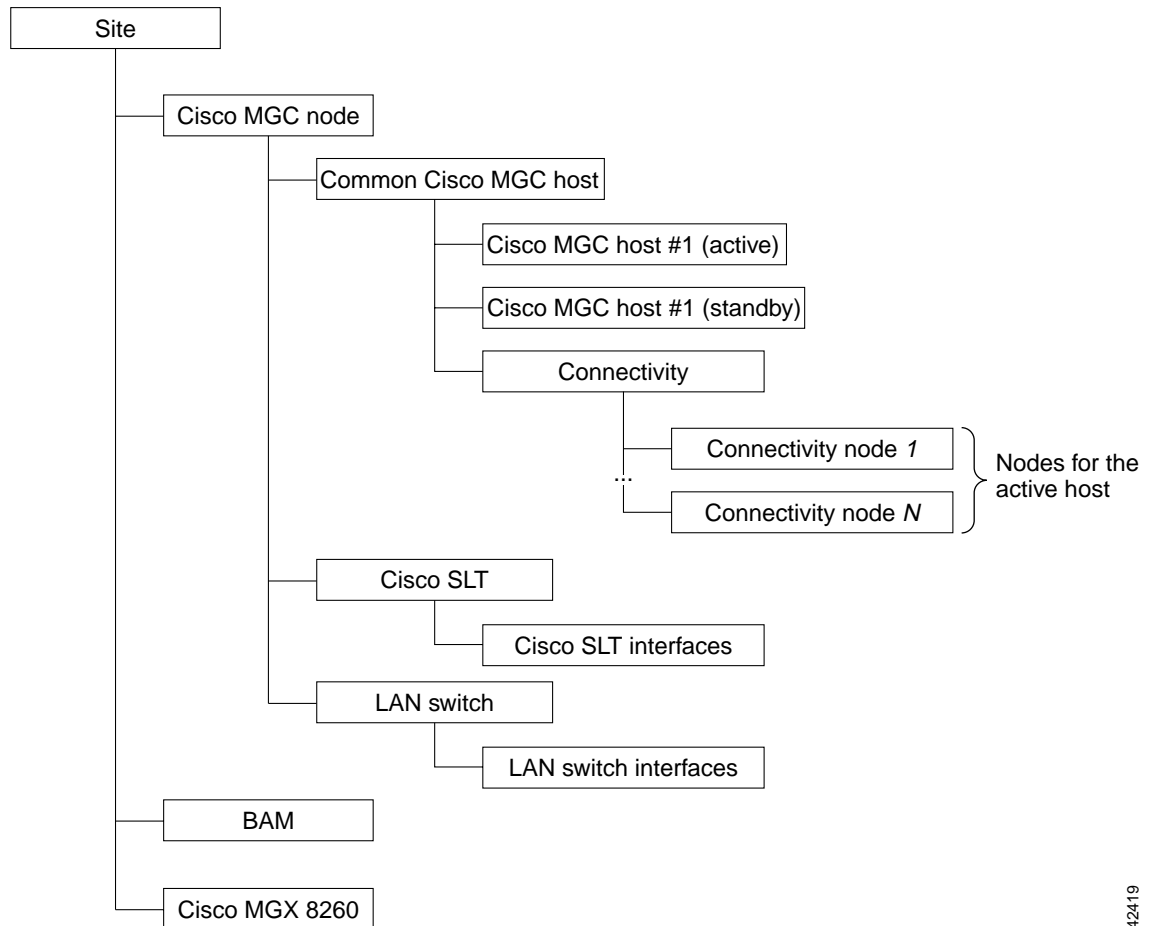
- Network interfaces
- Cisco MGC host connectivity network

Network Interfaces

In CMNM, the network interfaces for the Cisco MGC host, BAMS, Cisco SLT, LAN switch, and Cisco MGX 8260 are modeled. These include all Ethernet interfaces and, on the Cisco SLT, all time-division multiplexing (TDM) and serial interfaces.

Figure 1-4 shows a graphical view of the model.

Figure 1-4 Cisco MGC Node Model



42419

Cisco MGC Host Connectivity Network

CMNM displays the status of the Cisco MGC host connectivity network on the Map Viewer interface. This includes showing the status of the logical connections from the active Cisco MGC host to the:

- Interfaces (Ethernet, TDM)
- Signal transfer points (STPs)
- Destination point code (SS7 Routes)
- Connected Cisco MGCs
- TCAP nodes
- Media gateways
- Cisco SLT and LAN switches

When the common Cisco MGC host object is first deployed, the CEMF object database is populated with nodes that represent the logical connections from the active Cisco MGC host to the external devices. CMNM then monitors the status of these connections and, when necessary, informs you of any loss of connectivity.

As new connections are deployed, the connectivity network is updated to reflect the current configuration and network status of the active Cisco MGC host.

CMNM monitors the status of the connectivity network by processing and decoding traps from the active Cisco MGC host. Upon receipt of an appropriate trap, CMNM maps the trap to the node representing the logical connection. An alarm associated with the node is displayed.

The logical connections from the active Cisco MGC host are shown as subnodes under the common Cisco MGC host object. If the standby Cisco MGC host is not processing calls, only the network connectivity of the active host is shown.

CMNM communicates to the Cisco MGC host using:

- Simple Network Management Protocol (SNMP)—SNMP is used for receiving alarm information.
- File Transfer Protocol (FTP)—FTP is used for bulk file transfer of performance statistics.
- Man-Machine Language (MML)—MML (the TL1-based interface on the Cisco MGC host) is used to retrieve the Cisco MGC host configuration information needed to manage the node.

Cisco MGC Host Connectivity Objects

The Cisco MGC host software defines over 20 different types of network connectivity component types. CMNM queries the configuration of the active Cisco MGC host and represents them in the display.

The hierarchical structure or relationship of the components is based on the configuration defined by the active Cisco MGC host. This configuration can vary from installation to installation. CMNM, however, is able to handle any type of configuration that may be present on the host.

CMNM defines a class representing each network connectivity element type. For example, there is a class for an IP link, point code, and external node. The attributes associated with each class exactly match the attributes of the MML command used to provision the object.

The classes used to represent the connectivity network in CMNM are described in Table 1-1.

Table 1-1 *Classes Representing Connectivity Network*

MML Type	Name	Description
apc	Adjacent point code	Defines an SS7 STP or external switch through which the Cisco MGC connects to external switches and other Service Switching Points (SSPs).
c7iplnk	C7 IP link	Identifies a link between a Cisco SLT's IP address and port and the SS7 network.
card	Card	Network card or adapter that is operating in the Cisco MGC.
eisuppath	EISUP path	Signaling service or signaling path to an externally located Cisco MGC.
enetif	Ethernet interface	Physical line interface between a Cisco MGC Ethernet network card/adapter and the physical Ethernet network.
extnode	External node	Cisco MGW with which the Cisco MGC communicates.
faspath	FAS path	Service or signaling path to a particular destination using either ISDN-PRI or DPNSS.
ipfaspath	IP FAS path	Transport service or signaling path from a gateway to a Cisco MGC.

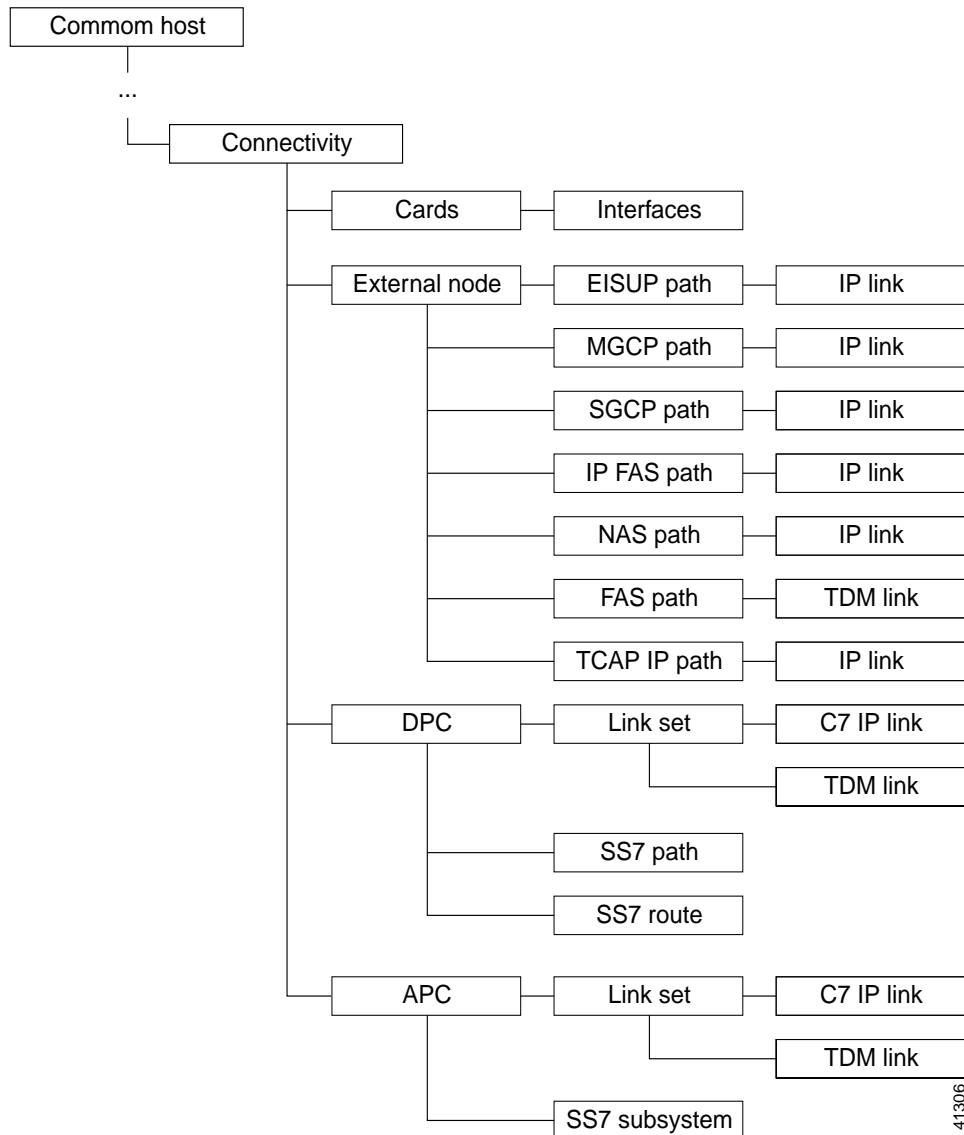
Table 1-1 *Classes Representing Connectivity Network*

iplnk	IP link	IP connection between a Cisco MGC's Ethernet interface and a Cisco MGW.
lnkset	Linkset	Group of all communication links that connect from the Cisco MGC to an adjacent STP.
mgcpath	MGCP path	Signaling service or signaling path to a trunking gateway.
naspath	NAS path	Q.931 protocol path between the Cisco MGC and the Cisco MGW.
ptcode	Point code	An SS7 network address that identifies an SS7 network node.
sgcpath	SGCP path	Protocol path between the Cisco MGC and the Cisco MGW.
ss7path	SS7 path	Specifies the protocol variant and the path that the Cisco MGC uses to communicate with a remote switch (SSP) sending bearer traffic to the Cisco MGWs.
ss7route	SS7 route	Path, by way of a linkset, from the Cisco MGC to another Cisco MGC or TDM switch.
ss7subsys	SS7 subsystem	Logical entity that mates two Signal Transfer Points (STPs).
tcapipath	TCAP IP path	Signaling service path to an STP or SCP.
tdmif	TDM interface	Physical line interface between a Cisco MGC TDM network card/adaptor and the physical TDM network.
tdmlnk	TDM link	Communications link between a TDM interface card on the Cisco MGC and TDM hardware element.

Containment Hierarchy of the Connectivity Network

When CMNM retrieves the current configuration from the active Cisco MGC host, it establishes the containment hierarchy of the connectivity network. A hierarchical model example is shown in Figure 1-5.

Figure 1-5 Hierarchical Model Example



In the MML file, the destination point code (DPC) component represents a TDM switch. Likewise, the adjacent point code (APC) component represents an STP.

The external node component in the MML file represents one of a number of different elements. These include:

- Media gateways
- Connected Cisco Media Gateway Controllers
- SS7 Service Control Points

Viewing the Network Connectivity Map

To view the Network Connectivity Map:

- Step 1** From the CEMF Launchpad, click **Viewer**.
- Step 2** In the Physical view, navigate to the Cisco MGC host, expand its tree, then click the **Connectivity** icon. You see a map of the network and object connections as shown in Figure 1-6.

Figure 1-6 Map Viewer Screen—Connectivity

