Overview

The CGM software works in conjunction with the Cisco Element Management Framework (Cisco EMF) software to provide element management for Cisco 12000 series routers. Element management tasks can include equipment provisioning, fault monitoring, interface configuration, and gathering and displaying interface performance statistics.

This chapter covers the following information:

- New for Release 2.0.1
- CGM Objects and Interfaces
- Physical Objects
- Logical Objects
- Views
- CGM Object States

New for Release 2.0.1

Release 2.0.1 of the Cisco CGM software provides the following additional features:

- Support for 8 Port OC-3 POS card (Scepter)
- Support for 3 port GE card (Trident)
- Engine type warning and PIRC support for Layer 3 QoS
- Seamless installation & migration from 2.0 to 2.0.1
- Support for IOS releases 12.0(10)S to 12.0(14)S.
- Support for the shutdown variant of the temperature notification defined in the CISCO-ENVMON-MIB.
- Enhanced scalability\performance support

CGM Objects and Interfaces

CGM manages two types of objects, as follows:

- Physical—Represents tangible components and devices such as the chassis (hardware frame), line cards, and interfaces

- Logical—Represents intangible, more abstract features, such as ATM connections and Layer 3 Quality of Service (QoS) objects

Fault, Configuration, Accounting, Performance, and Security (FCAPS) windows are accessible on both physical and logical CGM objects, in the form of FCAPS menu options that appear when you right-click on any object in CGM. FCAPS functionality provides you with a complete management interface for all features of the Cisco 12000 GSR.

The CGM Objects and Interfaces section covers the following areas:

- Physical Objects

- Cisco 12000 GSR Chassis

- Supporting Modules

- Line Cards

- Physical Interfaces and Technologies

- Logical Objects

Physical Objects

Table 1-1 lists all physical objects created in CGM and the management functions performed on each object.

Table 1-1   Physical Objects and Management Functions

CGM Physical Object	Management Functions
Shelf—This object represents the physical shelf that holds the chassis.	No management can be performed on a shelf.
Chassis—The hardware frame of the Cisco 12000 GSR, which houses all subchassis objects (modules).	Command Log Configuration Configuration Backup\Restore Configuration Editor Fault Management Initiate Telnet Service Inventory IOS Image Download Launch Web Console Management Information SNMP Management System Log APS Status
GRP (Gigabit Route Processor)—There can be only one or two GRPs in a Cisco 12000 GSR chassis. The primary GRP is the CPU or "brains" of the Cisco 12000 GSR. The second GRP is redundant.	Configuration Fault Management Inventory Performance
Line Cards—There are various types of line cards within a Cisco 12000 GSR chassis (such as ATM, Ethernet, POS, and DS3). Each of these line cards hold a given number of physical interfaces (ports).	Configuration Fault Management Inventory

Table 1-1   Physical Objects and Management Functions

CGM Physical Object	Management Functions
Physical Interfaces—Each line card has at least one, if not multiple, physical interfaces (ports). The type of physical interface is equivalent to the type of line card the interface resides on. Each different physical interface can support multiple technologies (for details, refer to "Physical Interfaces and Technologies.") The line card type determines what specific technologies are on the interfaces.	Configuration Fault Management Performance Profile Status
Supporting Modules—Additional subchassis cards and modules: the switch fabric card (SFC), clock scheduler card (CSC), AC or DC power supply module, blower module, and fan tray module.	Configuration Fault Management Inventory

The physical objects and interfaces in the preceding table can be traced as follows:

- The shelf contains the chassis;

- The chassis contains the GRPs, supporting modules, and all line cards;

- The line cards contain the physical interfaces.

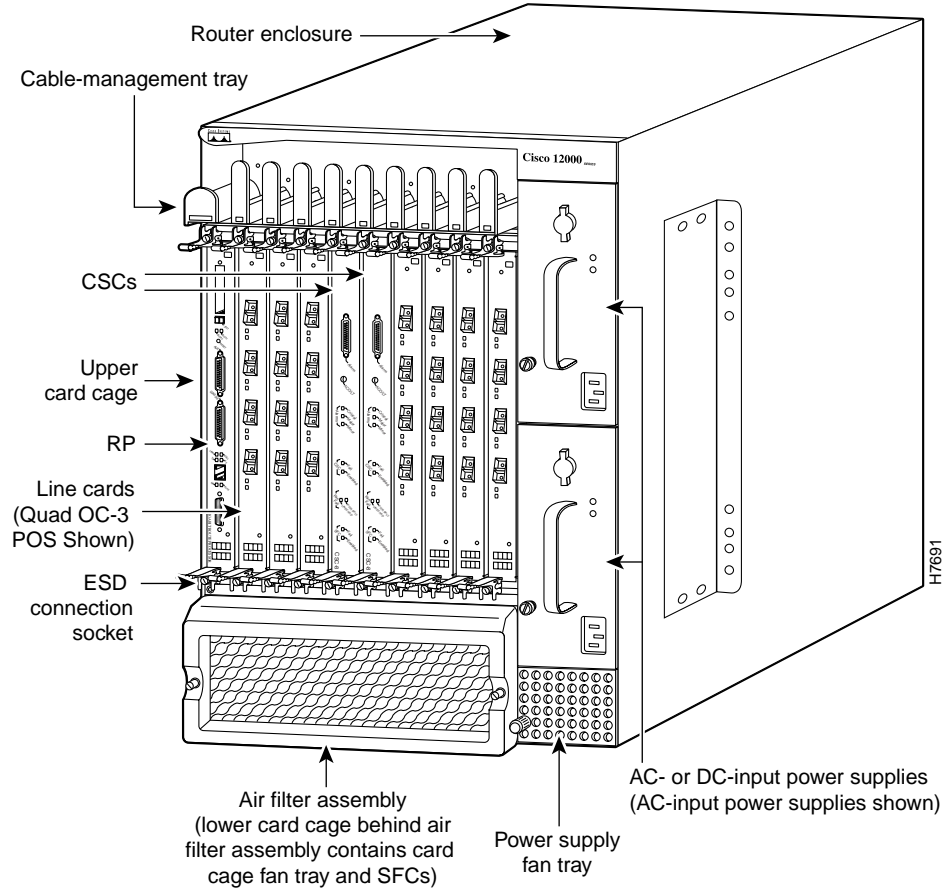For more details on hierarchies within Cisco EMF and CGM, refer to "Views."

Tips   Physical objects contained within a chassis are often referred to as subchassis objects or modules.

Cisco 12000 GSR Chassis

Figure 1-1, Figure 1-2, and Figure 1-3 provide examples of each Cisco 12000 GSR chassis and the physical objects within each chassis.
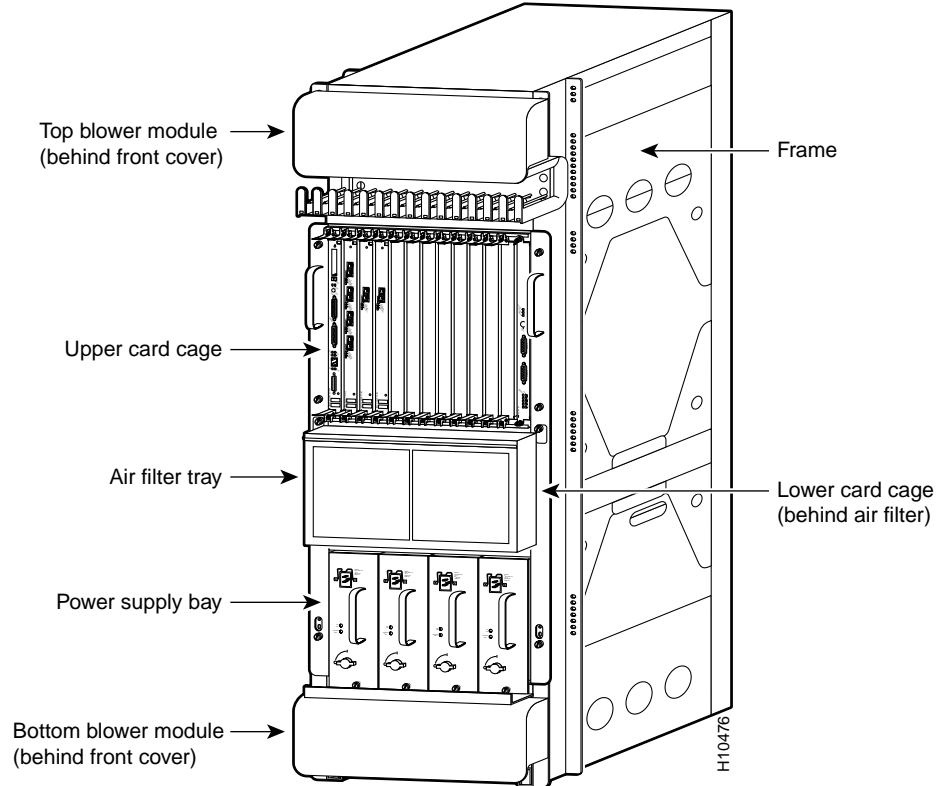
Figure 1-1   Cisco 12008 Chassis

The Cisco 12008 chassis supports the following components:

- Cable management tray (includes brackets at top and sockets at bottom)
- 2 CSCs (one is optional for redundancy)
- 2 GRPs (one is optional for redundancy)
- Max 7 line cards (within upper card cage)
- Air filter assembly (includes lower card cage, which houses the card cage fan tray and up to 3 SFCs)
- Power supply fan tray
- AC or DC power supply modules

Figure 1-2   Cisco 12012 Chassis

Top blower module
(behind front cover)

Frame

Upper card cage

Air filter tray

Lower card cage
(behind air filter)

Power supply bay

Bottom blower module
(behind front cover)

H10476

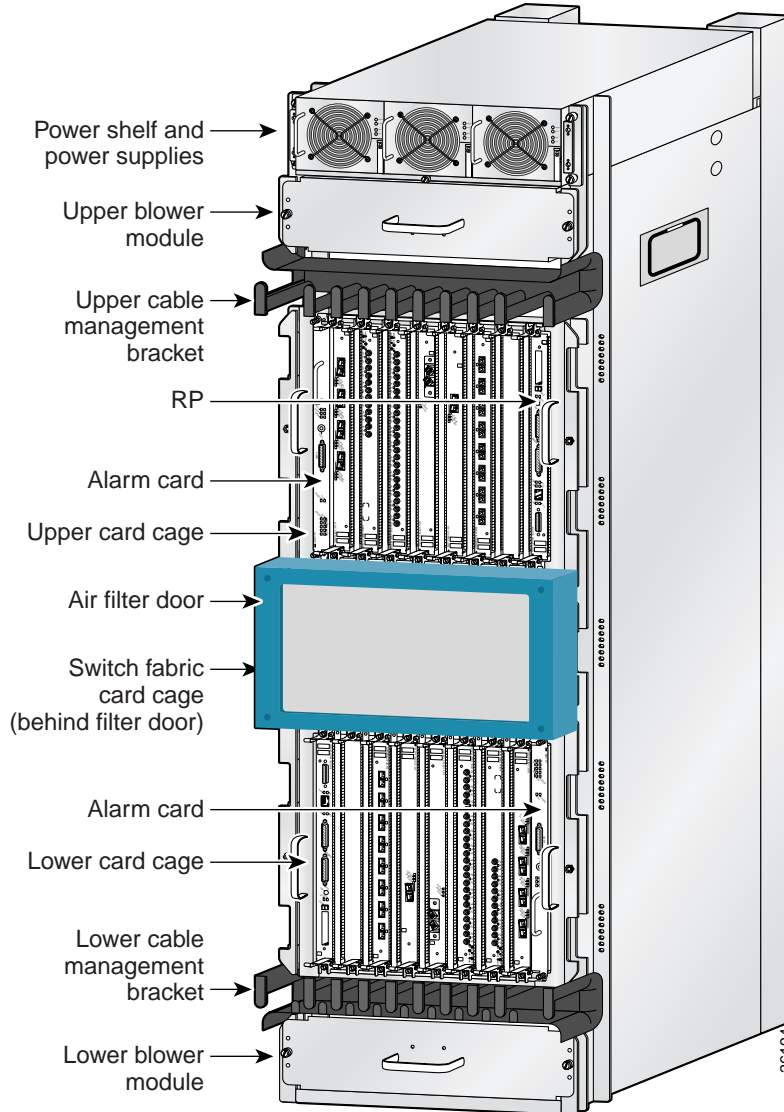The Cisco 12012 chassis supports the following components:

- Blower modules at top and bottom for cooling
- Upper card cage, containing the following:
  - Cable management tray (includes brackets at top and sockets at bottom)
  - 1 non-configurable alarm card in far right slot
  - 2 GRPs (one is optional for redundancy)
  - Up to 11 line cards
- Air filter tray—Behind is the lower card cage, which houses the following:
  - 2 CSCs (one is optional for redundancy)
  - Up to 3 SFCs
- Power supply bay, supports either 4 AC power modules or 2 dual-width DC power modules

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Caution   Do not mix power supplies in the Cisco 12012 GSR. In multiple power supply system configurations, all power supplies must be of the same type (4 AC-input power supplies or 2 DC-input power supplies).

Figure 1-3   Cisco 12016 Chassis

The Cisco 12016 chassis supports the following components:

- Power shelf and power supplies—Contains either 3 AC (shown) or 4 DC power modules
- Upper and lower blower modules
- Upper and lower cable management brackets
- Upper card cage, which contains the following:
    - 1 Non-configurable alarm card in far left slot
    - 1 GRP in far right slot
    - Up to 7 line cards
- Air filter door—Behind it is the switch fabric card cage, which contains the following:
    - 2 CSCs (one is optional for redundancy)
    - 3 SFCs

- Lower card cage, which contains the following:

    – 1 Non-configurable alarm card in far right slot

    – 1 Optional GRP in far left slot

    – Up to 8 line cards

Supporting Modules

There are five types of supporting modules within Cisco 12000 GSR chassis. Some modules only apply to certain Cisco 12000 GSRs.

- CSC (Clock Scheduler Card)—CSCs handle requests from line cards, issue grants to access the switch fabric cards, and provide a reference clock to all the cards in the system to synchronize data transfer across the crossbar. Each Cisco 12000 GSR chassis must have at least one CSC.

- SFC (Switch Fabric Card)—SFCs receive the scheduling information and clocking reference from the CSC cards and perform the switching functions.

- AC or DC Power Supply Module—Cisco 12000 GSRs can be ordered with either AC or DC power supply modules, having anywhere from one to four AC or DC-input power supplies, depending upon the specific Cisco 12000 GSR.

- Blower Module—Cisco 12012 and 12016 GSRs contain two blower modules, which circulate cooling air through the card cages in the chassis.

- Fan Tray—Cisco 12008 GSR contains a fan tray, which circulates cooling air through the card cage in the chassis.

Tips   All supporting modules except for the CSC do not appear in the CGM view. To see these objects, and to launch any management menus for these objects, you need to be in the Physical view.

Line Cards

There are four types of line cards supported within CGM, as follows:

- DS-3 (Digital Signal, Level 3)—CGM supports DS-3 6 port line cards.

- POS (packet-over-SONET)—CGM supports OC-3 4 port, OC-12 1 port or 4 port, and OC-48 1 port line cards.

- ATM (Asynchronous Transfer Mode)—CGM supports OC-3 4 port or OC-12 1 port line cards.

- Ethernet (Fast or Gigabit)—Fast Ethernet supports data transfer rates of 100 Mbps. Gigabit Ethernet supports data transfer rates of 1000 Mbps (or 1 Gigabit).

Each of these line cards have respectively named physical interfaces (or ports). For example, the ATM line card has ATM physical interfaces, the POS line card has POS physical interfaces, and so on. Each physical interface type can support multiple layered technologies.

Physical Interfaces and Technologies

Physical interfaces are modeled as an object below the parent line card.

As mentioned before, the type of line card characterizes the type of physical interface; for example, an ATM line card will only support ATM interfaces. However, there can be multiple technologies supported on that physical interface. For example, ATM physical interfaces can support the following technologies:

- Internet Protocol (IP)
- ATM
- SONET
- Generic

Note   Note that the CGM software handles both SDH and SONET in the same manner. The Cisco 12000 GSR hardware supports both SDH and SONET. For a comparison chart of SONET and SDH speeds, refer to Appendix A, "SONET/SDH Conversion Chart."

Tips   The technologies supported by an interface are exposed within FCAPS-based management windows. It is important to understand the relationship of physical interfaces to technologies in order to properly manage an interface.

Table 1-2 outlines each physical interface and the technologies it supports. Also included are the different FCAPS-based windows that are applicable to each physical interface and technology. For example, if you want to configure an ATM interface, look in the table under ATM, and you will notice that four technologies apply: Generic, ATM, SONET, and IP. This means that you should open the configuration windows for these four technologies and configure the fields within in order to completely configure an ATM interface.

Table 1-2   Physical Interfaces, Related Technologies and Windows

Physical Interfaces	Technologies Supported and Related Windows
DS-3	Generic—Configuration, Status, Performance DS-3—Status, Performance IP—Configuration, Profile
POS	Generic—Configuration, Status, Performance SONET—Status, Performance POS—Configuration, Profile IP—Configuration, Profile
ATM	Generic—Configuration, Status, Performance ATM—Status, Configuration, Profile, Fault SONET—Status, Performance IP—Configuration, Profile
Ethernet	Generic—Configuration, Status, Performance Ethernet—Performance, Configuration IP—Configuration, Profile

Logical Objects

There are two types of logical objects:

- Layer 3 QoS—Weighted Random Early Detection (WRED) or Committed Access Rate (CAR) objects, such as Class of Service (CoS) Queue Groups, CAR policies, and CAR access lists. WRED and CAR objects can be applied to all physical interfaces.
- ATM connections—Permanent Virtual Circuits (PVCs) or Switched Virtual Circuits (SVCs) can be applied to ATM interfaces.

Table 1-3 describes the management functions for Layer 3 QoS logical objects, and Table 1-4 describes the management functions for ATM logical objects.

Table 1-3   Layer 3 QoS Logical Objects

Logical Object	Management Functions
WRED: CoS queue groups CAR: CAR policies CAR access lists	Create, configure, apply, modify, and delete WRED and CAR objects.

*Table 1-4   ATM Logical Objects*

Logical Object	Management Functions You Can Perform
PVC SVC	Upload, create, configure, manage, and delete on main or sub-interfaces. Status information can be collected and displayed for PVC objects only.

Views

CGM views can be accessed by clicking on the Viewer icon in the Cisco EMF launchpad. These views appear in the frame at left when you open the Viewer.

CGM views (see following) model hierarchical relationships between objects, both physical and logical. Objects are organized into different views and can exist in multiple views simultaneously by reference. Each object can have a number of parent and child objects. You can access CGM objects by navigating through one of the views to find the object. You can navigate through views by expanding text. Click on the + sign next to any object to expand text. A - sign next to an object indicates there is no more text to expand. Each view represents a different way of containing and grouping objects.

CGM adds specific views to the standard views supplied by Cisco EMF. The standard Cisco EMF views are the Physical, Network, and Generic Object views (for further information on these views, refer to the *Cisco EMF User Guide*.)

Figure 1-4   CGM Views
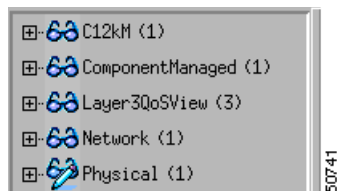
The number in parenthesis next to a view indicates how many top-level objects are contained within the view. For example, in the figure above, the CGM view contains 2 top-level objects; the Component Managed view contains 2 top-level objects; the Layer 3 QoS view contains 3 top-level objects; and so on.

Use the CGM view for most management functions, because it is the only view which provides a chassis map.

The Views section covers the following areas:

• CGM View

• Component Managed View

• Layer 3 QoS View

• Network View

• Physical View

• Generic Objects View

CGM View

The CGM view provides chassis maps, which are graphical representations of the chassis and its contents. You can access management menus on objects within chassis maps. To display a chassis map, simply click on the shelf object for the chassis you want to view.

Figure 1-5   CGM View Hierarchy
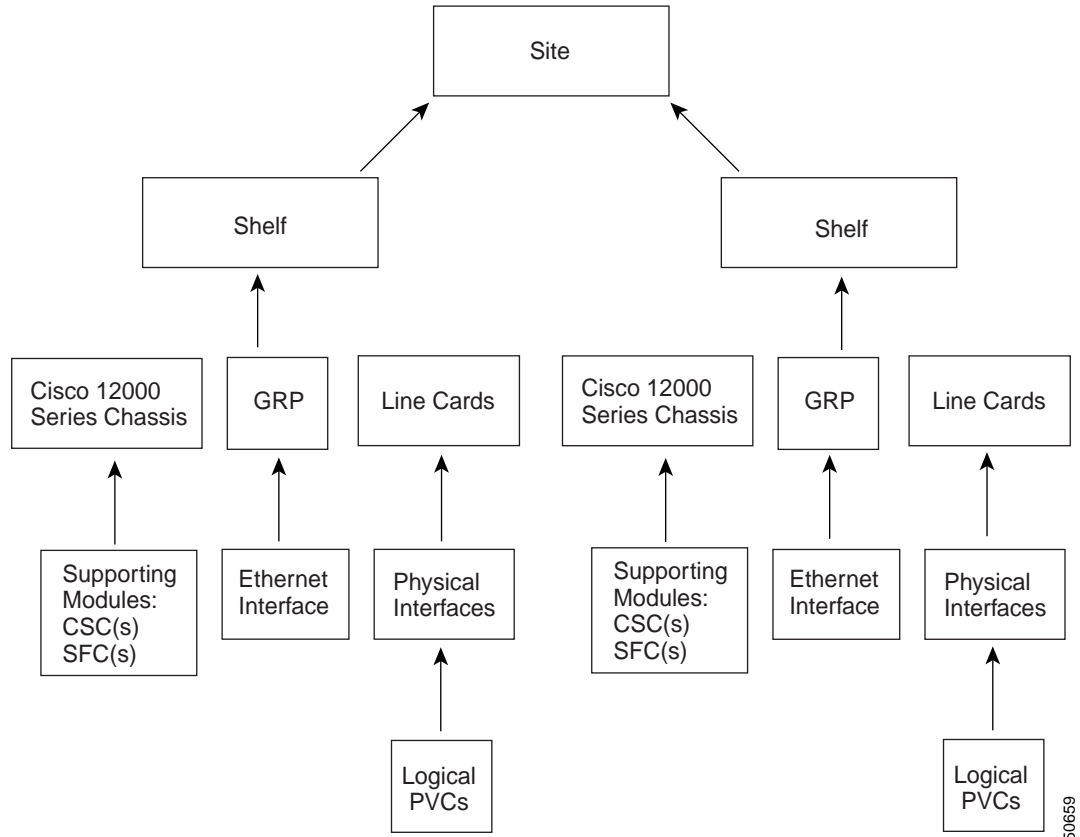
Component Managed View

The Component Managed view contains all objects within the Cisco EMF system. For example, say you have two types of element management software installed in Cisco EMF: Cisco Digital Subscriber Line Manager (CDM) and the CGM software. Information for both CDM and CGM is displayed within the Component Managed view.

It is not recommended to work within this view, unless you have multiple EMS (element management software) installed.

The Component Managed view and Physical view have the same basic hierarchy structure, as shown in Figure 1-6.

Figure 1-6   Hierarchy of Component Managed and Physical Views
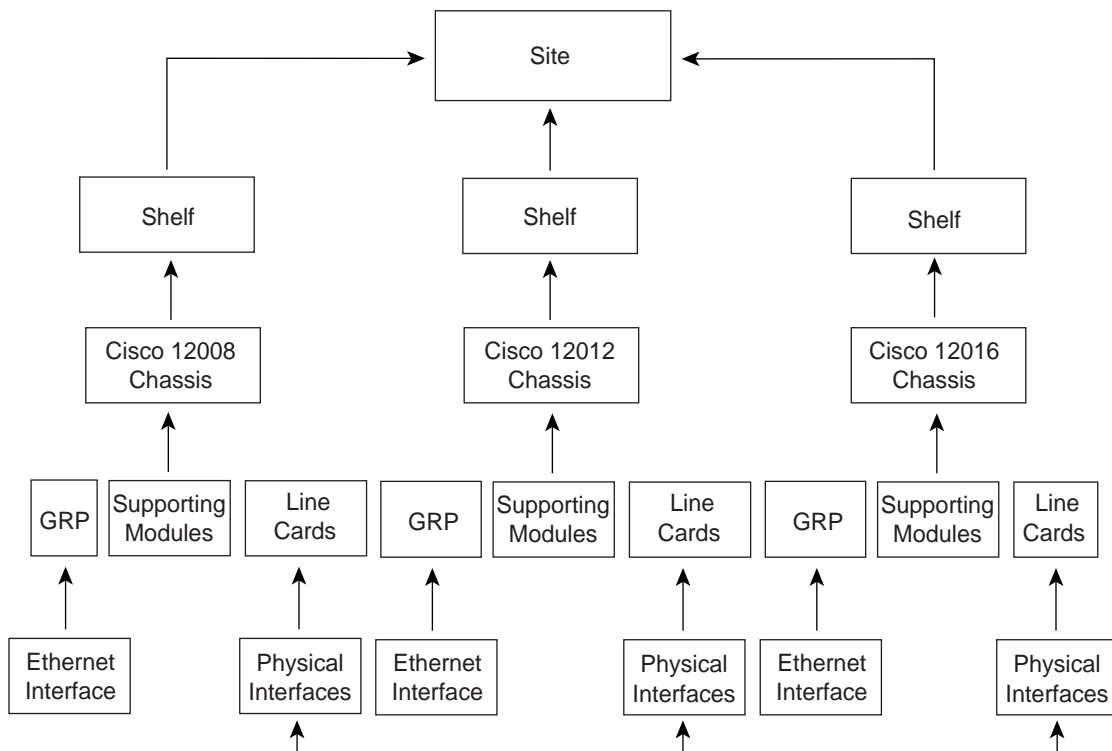
Layer 3 QoS View

This view displays only Layer 3 QoS objects within CGM, such as the following:

- Access Lists
- CAR objects
- WRED objects

You can work within this view to create and configure Access Lists or CAR or WRED objects by accessing the respective CGM menus. All of these objects are then listed within this view.

Network View

This view displays all network devices within their relevant networks and subnets. The auto-discovery system of Cisco EMF uses this view to calculate which devices have already been added to the system so that it does not try to discover the same device multiple times. For details on auto-discovery, refer to "Auto Discovery."

Physical View

Objects in the Physical view are ordered according to their relative physical location. The relationships defined in this view are physical containment relationships, meaning that each object is defined according to which object it is contained within. For example: a shelf is located under a site; a chassis is contained under a shelf; and GRPs, line cards, and supporting modules are contained within a chassis.

Refer to Figure 1-6 for an overview of the structure of the Physical view.

Generic Objects View

The Generic Objects view contains all deployed Cisco EMF generic objects. such as Sites, Regions, and Bays. This view is primarily used to find any Cisco EMF generic objects. This view also contains all Simple Network Management Protocol (SNMP) objects, such as SNMP agents and SNMP proxied objects.

CGM Object States

CGM object states reflect the life cycle of an object. Whatever stage the object is in at any given time is reflected in the state type. The state of an object can change frequently, depending upon what actions are being performed on the object. All objects in CGM have a state assigned to them by CGM, which appears at the bottom left corner of each FCAPS window for a selected object. The two most common object states follow:

- Normal
- Decommissioned

For example, you deploy a line card in CGM. The initial state of the line card is decommissioned. You then commission the line card to begin active management (for details on how to commission a module, refer to "Commissioning or Decommissioning a Module.") When you commission the line card, it goes through two transitory states: discovery, then commissioning. The commissioning process determines which state to move the object into (typically Normal). This example reflects the basic process of deploying and commissioning an object.

Certain states ripple down to any objects below. For example, if you decommission a chassis, all subchassis objects are also decommissioned. If you enable performance logging on a line card, all interfaces on the line card are also enabled.

By default, FCAPS windows refresh at a rate dependent upon the type of window. For example, inventory windows are refreshed at a lower rate than performance windows. The average refresh rate is every 30 seconds.

The CGM Object States section covers the following areas:

- Normal State
- Decommissioned State
- Additional Object States

Normal State

The normal state indicates that an object is operational. When an object enters the normal state, CGM performs heartbeat polling on the object every 5 minutes to determine whether it is present or not and to determine the current state of the object.

Decommissioned State

The decommissioned state indicates that an object is not managed. When you manually deploy an object, it is normally placed into a decommissioned state.

Tips Initially deployed objects are decommissioned to leave you with the option of managing the object or not. If you want to manage the object, you need to commission the object.

The following actions occur on a decommissioned object:

- Active management stops
- All sub objects are also decommissioned

Decommission buttons are located in chassis, module, and interface configuration windows. When you decommission an object, any children of that object also change their state to decommissioned. For example, if you decommission a chassis, all objects within that chassis (GRP card, line cards, interfaces, connections) are decommissioned as well. If you decommission a line card, all interfaces and connections on that line card are decommissioned as well, and so on.

Additional Object States

Additional object states that CGM can apply to objects follow:

Errored

If the operational status of a module goes down, it moves into the errored state. In the errored state, performance polling (if activated) is stopped; however, heartbeat polling (which polls an object every 5 minutes to verify its existence and current state) continues, until the device responds positively to a heartbeat request. When the module is contactable again, it responds positively to heartbeat requests, and then moves back into the previously held state.

Performance Logging On

Enabling performance logging on an object in the Normal state moves the object into the performance logging on state. This means that performance data is collected on the object and can be viewed in the Performance windows or the Performance Manager windows. Performance logging collects data only for GRPs and interfaces. You can enable performance logging on a global scale or on an individual object basis. Enabling global performance logging puts all subchassis objects into a performance logging on state. However, remember that only GRPs and interfaces actually collect performance data. (For more information on global performance logging, refer to "Starting or Stopping Global Performance Logging.")

Performance logging occurs every 15 minutes. This means that when you enable performance logging or global performance logging initially on an object, it takes 15 minutes for the data to be collected and displayed in CGM performance menus.

Heartbeat polling is performed on an object in the performance logging on state. If the object moves into the errored state, it is returned to the performance logging on state when the error is rectified. For example, if a line card is in the performance logging on state and it goes down, it moves into the errored state. When heartbeat polling finds that the line card is back up, it restores the line card to the performance logging on state.

Lost Comms

The lost comms (lost communications) state indicates that the object is not contactable. CGM can apply this state to a chassis, module, or interface. During this state, heartbeat polling is performed on the object. When the object becomes contactable again, it moves out of the lost comms state. For example, say an ATM line card in CGM was predeployed. When you perform device synchronization (commissioning a chassis), the ATM line card is not yet physically present in the hardware. In this situation, CGM places the ATM line card into a lost comms state, where it continues to poll for the presence of the line card. When the ATM line card is inserted into the chassis, CGM detects its presence and moves the line card out of the lost comms state and into a respective state (typically normal).

Lost Comms No Poll

The lost comms (lost communications) no poll state occurs when a device (GSR) cannot be contacted. When CGM loses connectivity with a device, the representative chassis object remains in the lost comms state, so that heartbeat polling continues on the chassis. However, all modules and interfaces within that chassis move into a lost comms no poll state. There is no point in polling modules and interfaces within a device that is not contactable. If the connection with the device is down, all modules and interfaces will be down. When the device becomes contactable again, the chassis, modules, and interfaces are moved out of the lost comms no poll state.

Discovery Lost Comms

The discovery lost comms state is quite similar to the lost comms no poll state; however, this state only occurs during subchassis discovery.

For example, if you commission a chassis (which begins the process of subchassis discovery), and a line card is discovered with a faulty connection, the line card is placed into the discovery lost comms state. When connectivity is established with the corresponding object in the device, subchassis discovery is resumed, and the object moves out of the discovery lost comms state.

Mismatched

The mismatched state occurs when a mismatch is found between what is in the hardware and what is deployed in CGM.

For example, say you are expecting an ATM OC-3 line card. So you predeploy and perform offline configuration in CGM to prepare for that type of line card. Now, when the line card becomes available and is placed into the chassis, it is not an ATM OC-3 line card, but a POS OC-3 line card. So when CGM detects the new line card, it finds a mismatch. The line card gets placed into the mismatch state, and a major alarm is raised against the line card.

To rectify a mismatch problem, first you must assess the source of the problem. If the operator was at fault and predeployed an incorrect line card, the operator should delete the predeployed line card and predeploy the correct line card. If the person who inserted the line card is at fault and they inserted the wrong type of line card into the chassis, the line card should be removed. When you remove a line card, CGM moves that line card into a lost comms state. Insert the correct line card. CGM finds the new line card and downloads the correct pre-deployment and offline configuration information, then places the line card into its respective state (typically normal).

Mismatch can also occur on a chassis. If, during predeployment of a chassis, an incorrect IP address is entered, this problem will be discovered by CGM. The chassis predeployment can be performed normally; however, when the chassis is physically present, and the commissioning process is initiated, starting subchassis discovery, CGM realizes the mismatch. A major alarm is raised against the chassis. To rectify this problem, you can either delete the predeployed chassis and deploy the correct one, or simply fix the IP address by re-entering the correct one in the chassis Management Information window.

Transient Object States

Certain states in CGM are temporary and exist only for a short time while a process is being performed. The following states are transient:

- Download—Temporary state that is assigned to objects in CGM when an Cisco IOS Download is being performed.

- Reset—Temporary state that is assigned to objects in CGM during Cisco IOS Download, when the device is rebooted for the new image to take effect.

- Discovery—Temporary state that is assigned to objects in CGM during subchassis discovery. Objects are being discovered at this stage.

- Commissioning—Temporary state that is assigned to objects in CGM during subchassis discovery. During this stage, CGM is determining which state to move each object into.