



## Concepts

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This chapter describes Cisco 12000 Manager (C12kM) concepts and covers the following information:

- [C12kM Objects and Interfaces](#)
- [Views](#)
- [C12kM Object States](#)

## C12kM Objects and Interfaces

C12kM manages both physical and logical 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, Layer 3 Quality of Service (QoS) objects and VLAN sub-interfaces

Fault, Configuration, Accounting, Performance, and Security (FCAPS) windows are accessible on both physical and logical C12kM objects, in the form of FCAPS menu options that appear when you right-click on any object in C12kM. FCAPS functionality provides a complete management interface to features of the Cisco 12000 series internet router.

This section covers the following areas:

- [Physical Objects](#)
- [Cisco 12000 Series Internet Router Chassis](#)
- [Supporting Modules](#)
- [Line Cards](#)
- [Physical Interfaces and Technologies](#)
- [Logical Objects](#)

## Physical Objects

Table 2-1 lists all physical objects created in C12kM and the management functions that can be performed on each object.

**Table 2-1 Physical Objects and Management Functions**

C12kM 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 series internet router, 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 RPR Configuration RPR Status
GRP (Gigabit Route Processor)—There can be up to two GRPs in a chassis. The primary GRP is the CPU or “brains” of the Cisco 12000 series internet router. The secondary GRP is redundant.	Configuration Fault Management Inventory Performance
Line Cards—There are various types of line cards within a chassis (for example, ATM, Ethernet, SRP, POS, E3 and DS3). Each of these line cards holds a given number of physical interfaces (ports).	Configuration Fault Management Inventory
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 physical interface can support multiple technologies (for details, refer to <a href="#">“Physical Interfaces and Technologies” section on page 2-6</a> ) The line card type determines what specific technologies are supported by an interface.	Profile Configuration Fault Management Performance 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 displayed in Table 2-1 are 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.

Refer to the [“Views” section on page 2-9](#) for further details on hierarchies within Cisco EMF and C12kM.

**Tip**

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

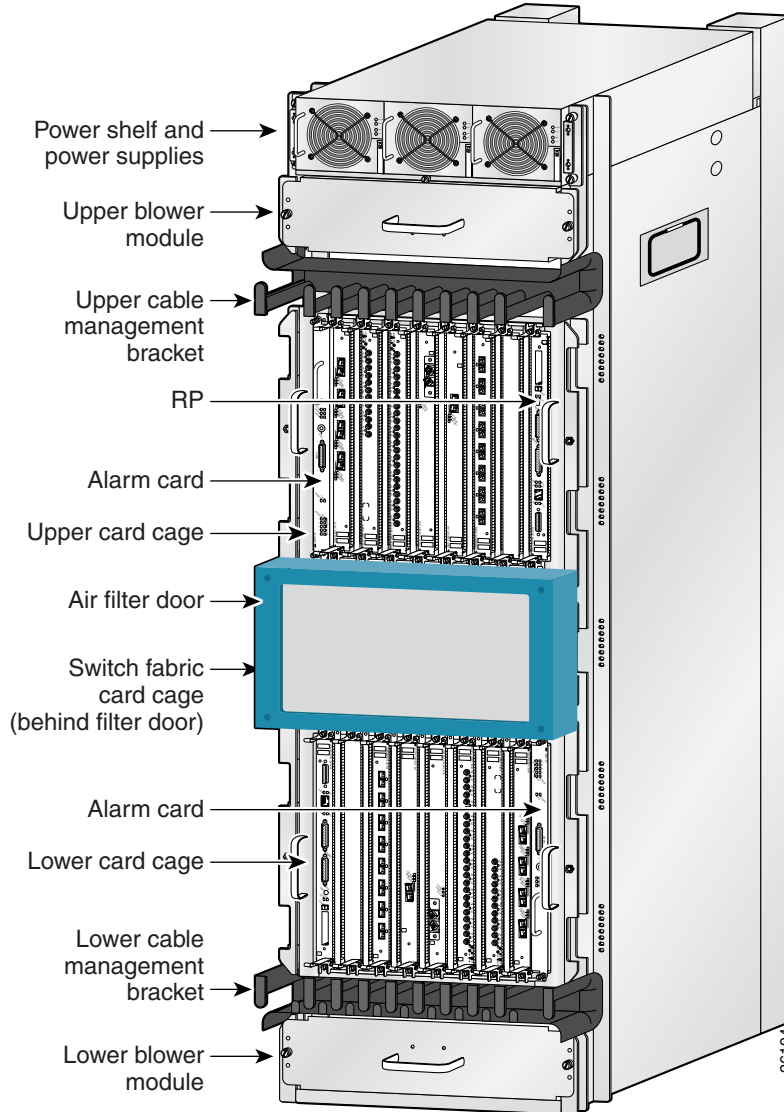
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## Cisco 12000 Series Internet Router Chassis

The C12kM application supports seven Cisco 12000 series internet router models: the Cisco 12008, Cisco 12012, Cisco 12016, Cisco 12404, Cisco 12406, Cisco 12410, and Cisco 12416.

[Figure 2-1](#) displays a Cisco 12016 internet router chassis as an example, and identifies the modules and sub-modules that you would find:

Figure 2-1 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

C12kM supports five types of supporting modules within a Cisco 12000 series internet router chassis. Some modules only apply to certain chassis types.

- 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 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—Chassis 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 chassis.
- Blower Module—The Cisco 12012 and 12016 internet routers contain two blower modules, which circulate cooling air through the card cages in the chassis.
- Fan Tray—The Cisco 12008 internet router contains a fan tray, which circulates cooling air through the card cage in the chassis.



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**Note** C12kM considers the AC/DC Power Supply Module, Blower Module and Fan tray module together as a Generic Module.

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## Line Cards

C12kM supports the following line card types:

- ATM (Asynchronous Transfer Mode)—C12kM supports OC-3 4 port and OC-12 1 and 4 port line cards
- POS (packet-over-SONET)—C12kM supports OC-3 4 port, OC-3 8 port, OC-3 16 port, OC-12 1 port and 4 port, Enhanced OC-12 4 port, OC-48 1 port, Enhanced OC-48 4 port, OC-192 1 port, ISE OC-48 1 port, ISE OC-3 16 port and OC-12 4 port line cards
- Ethernet (Fast or Gigabit)—C12kM supports 8 port Fast Ethernet that supports data transfer rates of 100 Mbps. Also, C12kM supports single port, 3 port and 10 port Gigabit Ethernet that supports data transfer rates of 1000 Mbps (or 1 Gigabit)
- SRP (Spatial Reuse Protocol)—C12kM supports OC-12 1 port and OC-48 1 port line cards.
- DS-3 (Digital Signal, Level 3)—C12kM supports DS-3, 6 and 12 port line cards
- E3 (Electrical Interface)—C12kM supports E3, 6 and 12 port line cards
- NGRP Linecard

The interfaces on each line card are named according to the lowest supported protocol layer, for example, interfaces on an ATM line card in slot 2 are named: SONET-2-0, SONET-2-1, and interfaces on a POS card in slot 3 would have names SONET-3-0, SONET-3-1. Manual deployment is supported for all the linecards except the SRP linecard.

## Physical Interfaces and Technologies

Physical interfaces are modeled as objects below the parent line card. Some generic properties are supported by all the interfaces. 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:

- Internet Protocol (IP)
- ATM
- SONET



### Note

C12kM handles both SDH and SONET in the same manner. The Cisco 12000 series internet routers support both SDH and SONET. For a comparison chart of SONET and SDH speeds, refer to [Appendix A, “SONET/SDH Conversion Chart.”](#)



### Tip

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 2-2](#) 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 2-2** *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

**Table 2-2 Physical Interfaces, Related Technologies and Windows (continued)**

Physical Interfaces	Technologies Supported and Related Windows
Ethernet	Generic—Configuration, Status, Performance Ethernet—Performance, Configuration IP—Configuration, Profile
SRP	Generic—Configuration, Status, Performance SRP—Configuration, Status, Topology SRP Side—Profile, Configuration, IPS Status, Performance IP—Configuration

## Logical Objects

C12kM supports three logical object types:

- Layer 3 QoS—Weighted Random Early Detection (WRED) or Committed Access Rate (CAR) objects, such as Class of Service (CoS) Queue Groups, WRED ToFab policies, CAR policies, and CAR access lists. WRED ToFab 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.
- VLAN—Domain, VLAN, sub-interface objects. VLAN sub-interfaces can be configured on Ethernet interfaces.

[Table 2-3](#) describes the management functions for Layer 3 QoS logical objects.

**Table 2-3 Layer 3 QoS Logical Objects**

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

[Table 2-4](#) describes the management functions for ATM logical objects.

**Table 2-4 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.

[Table 2-5](#) describes the management functions for VLAN objects.

**Table 2-5 VLAN Objects**

<b>Logical Object</b>	<b>Management Functions You Can Perform</b>
Domain, VLAN VLAN sub-interfaces	Create and delete on Domain objects. Create, configure, manage, and delete on VLAN and sub-interfaces.

# Views

C12kM views can be accessed by clicking on the Viewer icon in the Cisco EMF launchpad. These views appear in the frame at the left of the window when you open the Map Viewer window (see [Figure 2-2 on page 2-10](#)).

C12kM views 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 C12kM 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.

C12kM adds specific views to the standard views supplied by Cisco EMF. The standard Cisco EMF views are the Physical and Network views (for further information on these views, refer to the *Cisco Element Management Framework User Guide Release 3.2 (78-12536-01)*).

The number in parenthesis next to a view indicates how many top-level objects are contained within the view.

The Views section covers the following areas:

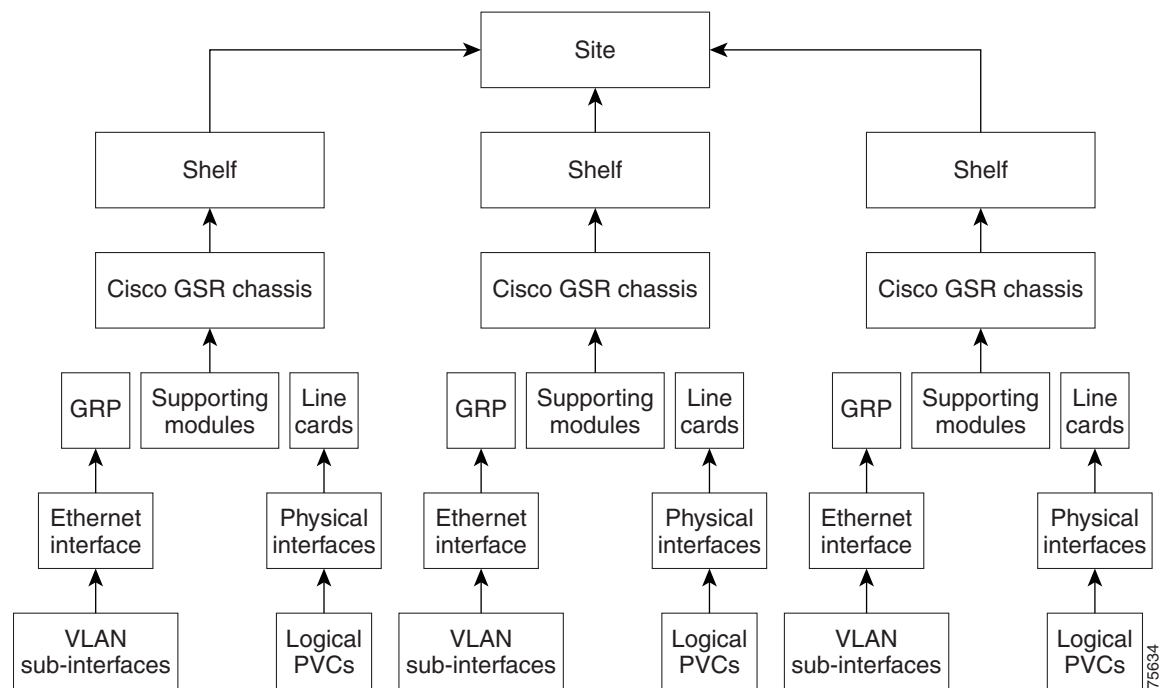
- [Component Managed View](#)
- [Layer 3 QoS View](#)
- [Network View](#)
- [Physical View](#)
- [VLAN View](#)

## Component Managed View

The Component Managed view displays all objects within the Cisco EMF system. For example, say you have two types of element management applications installed in Cisco EMF: Cisco Digital Subscriber Line Manager (CDM) and the C12kM application. Information for both CDM and C12kM is displayed within the Component Managed view.

The Component Managed view and Physical view have the same basic hierarchy structure, as shown in Figure 2-2.

**Figure 2-2 Hierarchy of Component Managed and Physical Views**



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## Layer 3 QoS View

The Layer 3 QoS view displays only Layer 3 QoS objects within C12kM, 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 C12kM menus.

## 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 [“IP Auto Discovery of the Cisco Chassis” section on page 3-19](#).

## 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 2-2](#) for an overview of the structure of the Physical view.

## VLAN View

The VLAN view displays the VLAN objects in C12kM. The VLAN view can contain one or more domains. A domain is a user-defined grouping of the VLAN objects. This grouping may be done on a customer name basis, on logical groupings like 'Accounting Vlans' or it could be any other user maintained VLAN grouping. There can be multiple domains in the VLAN view and each domain can contain multiple VLAN objects. The same VLAN id can be duplicated across different domains. Each VLAN object can have multiple sub-interface objects.



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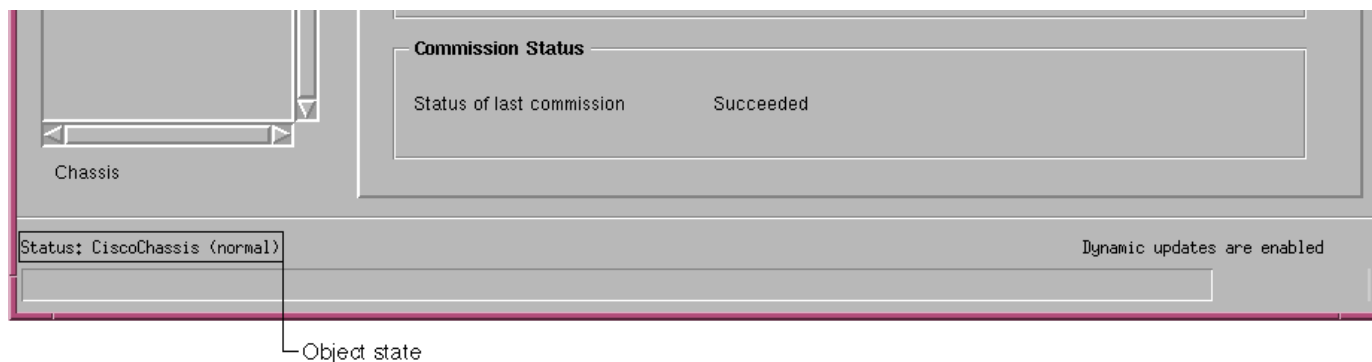
**Note** The sub-interface objects are shown only under the VLAN objects. Only Ethernet sub-interfaces are displayed.

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## C12kM Object States

C12kM 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 C12kM have a state assigned to them which appears at the bottom left corner of each FCAPS window for a selected object (see [Figure 2-3](#)).

Figure 2-3 C12kM Object States



The two most common object states are Normal and Decommissioned. For example, when you deploy a line card in C12kM, the initial state of the line card is decommissioned. You can then commission the line card to begin active management (for details on how to commission a module, refer to the [“Commissioning a Selected Module” section on page 5-4](#)). When you commission the line card, it passes 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 transitioned to performance logging.

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 following sections describe the possible states that an object may be in and provides a description of these states.

## Normal State

The normal state indicates that an object is operational. When any physical object enters the normal state, C12kM 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.



### Tip

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, Interface and VLAN 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 also decommissioned. If you decommission a line card, all interfaces and connections on that line card are decommissioned, and so on.

## 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, interfaces and VLAN sub-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 the [“Starting Global Performance Logging”](#) section on page 4-9.

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 C12kM 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. C12kM 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 C12kM 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, C12kM 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, C12kM detects its presence and moves the line card out of the lost comms state and into its respective state (typically normal).

## Lost Comms Poll

A C12kM object in the lost comms poll state signifies that the EM is polling the object even though the object has lost communication with the device. This state machine state is meant for all the interfaces. When C12kM loses connectivity with the device or a module is removed from the chassis then, all or specific interfaces move into the lost comms poll state.

## Lost Comms No Poll

The lost comms (lost communications) no poll state occurs when the Cisco 12000 series internet router cannot be contacted. When C12kM 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 is moved out of lost comms state and the 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 if a pre-deployed line card is not present then, the line card is moved into the discovery lost comms state. When the linecard is re-inserted 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 C12kM. For example, say you are expecting an ATM OC-3 line card. So you predeploy and perform offline configuration in C12kM 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 C12kM 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, C12kM moves the line card into a lost comms state. Insert the correct line card. C12kM 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 C12kM. The chassis predeployment can be performed normally; however, when the chassis is physically present, and the commissioning process is initiated, starting subchassis discovery, C12kM 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 fix the IP address by re-entering the correct one in the chassis Management Information window.

## Transient Object States

Certain states in C12kM are temporary or transient, that is, they 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 C12kM when a Cisco IOS Download is being performed.
- **Reset**—Temporary state that is assigned to objects in C12kM 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 C12kM during subchassis discovery. Objects are being discovered at this stage.
- **Commissioning**—Temporary state that is assigned to objects in C12kM during subchassis discovery. During this stage, C12kM is determining which state to move each object into.
- **Performance Polling**—An object can enter into the performance polling state only if it is initially in the normal state. This is a temporary state that is assigned to an object in C12kM when the performance polling is started on the object. During this state, the object collects performance data every 15 minutes for modules and interface objects.
- **Synchronization**—This temporary state is applicable only for chassis. During this state, the EM synchronizes with its ATM connection information with the device.

