



OIR Support for Analog and Digital Modem Network Modules

This document describes the (OIR) online insertion and removal, also referred to as hot swapping, of analog and digital modem network modules installed in the Cisco 3660 router.

The analog modem network modules that can use these features are:

- NM-8AM
- NM-16AM

The digital modem network modules that can use these features are:

- NM-6DM
- NM-12DM
- NM-18DM
- NM-24DM
- NM-30DM

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Feature Overview

This document describes the following:

- Hot Swap (OIR) Feature, page 2
- Hot Addition Feature, page 2
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Hot Swap (OIR) Feature

This feature enables you to replace one network module with another network module of the same kind without affecting system operation. For example, an NM-12DM can be replaced only by another NM-12DM, and not by an NM-6DM.

Hot swap functionality allows the system to determine when a change occurs in the unit's physical configuration, followed by a reallocation of the unit's resources to allow all interfaces to function adequately. This feature allows interfaces on the network module to be reconfigured while other interfaces on the router remain unchanged. The interrupt routine must ensure that the interrupt line has reached a stable state.

**Note**

Hot swapping of WAN or voice interface cards is not supported, but you can hot swap a network module with a WAN or voice interface card installed in it.

The software does the administrative work involved in handling the removal and insertion of the network module. When the network module is removed, the hardware subsystem shuts down the PCI bridge chip to the network module thereby ensuring against bus errors on the secondary PCI bus. A hardware interrupt is then sent to the software subsystem.

The software reconfigures the network module interfaces. When a network module is inserted, it is analyzed and initialized so that the end user can configure it properly. The initialization routines used during OIR are the same as those called when the router is booted. System resources, also handled by software, are allocated to the new interface. When a network module is removed, the resources associated with the empty slot must either be freed or altered to indicate the change in its status.

If a network module is reinserted into the same slot it was removed from, or if an identical network module is inserted in its place, many of the control blocks from the previous installation will be reused. This is necessary due to the implementation by Cisco IOS software of certain control blocks, and has the benefit of saving the configuration from the previously installed network module.

Hot Addition Feature

This feature allows a new network module to be inserted into an empty router slot without having to shut down the system.

When the new network module is inserted, the system calls the same initialization routines that were called during power up. The network module is automatically configured and verified, but all interfaces are left in the shutdown state.

Hot Deletion Feature

This feature allows a network module to be removed from the router without having to shut down the system and interrupt operation of the other installed network modules.

When a network module is removed, all allocated resources must be returned, and control blocks are freed. Some of these control blocks are not returned to the pool of free buffers, but are queued and retained in the event that an identical network module is reinstalled in the slot. The active configuration file deletes all information associated with the removed network module.

Benefits

- Router operation is not interrupted while the analog and digital modem network modules are hot swapped, added, and deleted.
- In a hot swap operation, the configuration of the previously installed network module is saved.
- In a hot deletion operation, system resources are automatically freed for use by other system components.

Restrictions

These are restrictions to the features described in this document:

- In hot swap operations, a network module can only be replaced by a similar one. For example, an NM-12DM can be replaced only by another NM-12DM, and not by an NM-6DM.
- In hot swap operations, the T1/E1 controller should first be disabled before the network module is swapped.
- In hot addition operations, the new network module will be functional only if the router has adequate memory (I/O memory) to support its operation.

The minimum amount of I/O memory required for the hot swap or hot addition features to work on the Cisco 3660 router is calculated by:

$I/O \text{ memory size} = 6 \text{ slots} * (\text{network module that uses maximum I/O memory in private pools}) + (\text{size of the fallback pool}) + (\text{size of the public buffer pool}) + (2 \text{ onboard Fast Ethernet ports}) + \text{AIM slots} + \text{TDM}$

- The default SNMP (Simple Network Management Protocol) queue length is set to 10. The length may need to be increased in order to capture the entire SNMP information during a network module hot swap operation. For example, if you plan to hot swap a 16-port analog modem network module, configure the following command in global configuration mode:

```
Router (config)# snmp queue-length 16
```

Related Documents

- *Cisco 3600 Series Hardware Installation Guide*
- *Cisco Network Modules Hardware Installation Guide*
- *Software Configuration Guide for Cisco 3600 Series and Cisco 2600 Series Routers*

Supported Platform

- Cisco 3660 router

Supported Standards, MIBs, and RFCs

No new or modified standards, MIBs, and RFCs are supported by this feature.

Prerequisites

Prerequisites for this feature to work on a system with an analog modem network module:

- Cisco 3660 router
- One of the following analog modem network modules: NM-8AM, NM-16AM

Prerequisites for this feature to work on a system with a digital modem network module:

- Cisco 3660 router
- One of the following digital modem network modules: NM-6DM, NM-12DM, NM-18DM, NM-24DM, NM-30DM
- PRI or BRI network module to provide an ISDN connection (digital modem network modules do not provide network interfaces of their own, but handle analog calls passing through other router interfaces)
- Ethernet connection to the LAN (provided by a network module or an onboard Ethernet port on the Cisco 3660 chassis)

**Note**

The PRI module (Cisco product number NM-1CT1, NM-2CT1, NM-1CT1-CSU, NM-2CT1-CSU, NM-1CE1B, NM-2CE1B, NM-1CE1U, or NM-2CE1U) must be revision level -03.

The BRI S/T module with Cisco part number NM-4B-S/T or NM-8B-S/T must be revision level -03, and the BRI U module with Cisco product number NM-4B-U or NM-8B-U must be revision level -06.

Configuration Tasks

The OIR feature does not need external configuration. It is disabled during system boot and initialization. After the system is initialized, the processor interrupt for the OIR feature is also enabled.

See the following sections for configuration tasks necessary for the online insertion and removal of analog and digital modem network modules in a Cisco 3660 router. Each task in the list indicates if the task is optional or required.

- Disabling the T1/E1 Controller, page 4
- Enabling the T1/E1 Controller, page 5

Disabling the T1/E1 Controller

Before the network module is physically removed from the router, shut down its T1 or E1 controller.

	Command	Purpose
Step 1	Router (config)# controller t1 slot/port	Enter controller configuration mode and specify the location of the controller associated with the analog or digital modem network module that will be hot swapped. The <i>slot</i> value indicates the router slot position of the installed network module. Depending on the router, enter a slot value from 0 to 3. The <i>port</i> value indicates the T1 or E1 link that you are configuring. Cisco IOS software creates the interfaces automatically when a module is installed.
Step 2	Router(config-controller)# shutdown	This command shuts down the interfaces on the controller.
Step 3	Router# Router(config-controller)# exit	Returns to the global configuration mode.
Step 4	Router# Router(config)# exit	Returns to the privileged EXEC mode.

Verifying that the T1/E1 Controller is Disabled

To verify that the T1/E1 controller is disabled:

- Step 1** Enter the **show controller slot/port** command, in privileged EXEC mode, to verify the status of the controller. Important information appears in bold.

```
Router# show controllers t1
```

```
T1 4/1 is administratively down.
```

```
No alarms detected.
```

```
Framing is ESF, Line Code is AMI, Clock Source is Line
```

```
Data in current interval (0 seconds elapsed):
```

```
 0 Line Code Violations, 0 Path Code Violations 0 Slip Secs, 0 Fr Loss Secs,
```

```
 0 Line Err Secs, 0 Degraded Mins 0 Errored Secs, 0 Bursty Err Secs,
```

```
 0 Severely Err Secs, 0 Unavail Secs
```

```
Total Data (last 79 15 minute intervals)
```

```
 0 Line Code Violations, 0 Path Code Violations 0 Slip Secs, 0 Fr Loss Secs,
```

```
 0 Line Err Secs, 0 Degraded Mins 0 Errored Secs, 0 Bursty Err Secs,
```

```
 0 Severely Err Secs, 0 Unavail Secs
```

Enabling the T1/E1 Controller

After the network module has been hot swapped, enable its T1/E1 controller.

Step 1	Router (config)# controller t1 slot/port	Enter controller configuration mode and specify the location of the controller associated with the analog or digital modem network module that will be hot swapped. The <i>slot</i> value indicates the router slot position of the installed network module. Depending on the router, enter a slot value from 0 to 3. The <i>port</i> value indicates the T1 or E1 link that you are configuring. Cisco IOS software creates the interfaces automatically when a module is installed.
Step 2	Router(config-controller)# no shutdown	This command enables the interfaces on the controller.
Step 3	Router# Router(config-controller)# exit	Returns to the global configuration mode.
Step 4	Router# Router(config)# exit	Returns to the privileged EXEC mode.

Verifying that the T1/E1 Controller is Enabled

To verify that the T1/E1 controller is enabled:

- Step 1** Enter the privileged EXEC **show controller slot/port** command to verify the status of the controller. Important information appears in bold.

```
Router# show controllers t1
```

```
T1 4/1 is up.
```

```
No alarms detected.
```

```
Framing is ESF, Line Code is AMI, Clock Source is Line
```

```
Data in current interval (0 seconds elapsed):
```

```
 0 Line Code Violations, 0 Path Code Violations 0 Slip Secs, 0 Fr Loss Secs,
```

```
 0 Line Err Secs, 0 Degraded Mins 0 Errored Secs, 0 Bursty Err Secs,
```

```
 0 Severely Err Secs, 0 Unavail Secs
```

```
Total Data (last 79 15 minute intervals)
```

```
 0 Line Code Violations, 0 Path Code Violations 0 Slip Secs, 0 Fr Loss Secs,
```

```
 0 Line Err Secs, 0 Degraded Mins 0 Errored Secs, 0 Bursty Err Secs,
```

```
 0 Severely Err Secs, 0 Unavail Secs
```

Configuration Examples

This section provides configuration examples for the different components in your system.

Configuring the Analog Modem Network Module

If your system contains an analog modem network module, you must configure the group asynchronous interface and the line.

Configuring the Group Asynchronous Interface

```
interface Group-Async1
 ip address negotiated
 no ip directed-broadcast
 encapsulation ppp
 dialer in-band
 dialer idle-timeout 512 either
 dialer-group 1
 async default routing
 async mode dedicated
 no peer default ip address
 no fair-queue
 no cdp enable
 ppp authentication chap
 group-range 97 112
 hold-queue 10 in
```

Configuring the Dialer List

```
dialer-list 1 protocol ip permit
```

Configuring the Line

```
line 97 112
 exec-timeout 0 0
 autoselect ppp
 script dialer dial
 login local
 modem InOut
 transport input all
 stopbits 1
 flowcontrol hardware
```

Configuring the Digital Modem Network Module

If your system contains a digital modem network module, you must configure the T1/E1 controller, ISDN D-channel, group asynchronous interface, dialer interface, dialer list, and the line.

Configuring the T1/E1 Controller

```
controller T1 1/0
 framing esf
 linecode b8zs
 pri-group timeslots 1-24
```

Configuring the ISDN D-Channel

```
interface Serial1/0:23
 no ip address
 no ip directed-broadcast
 isdn switch-type primary-5ess
 isdn incoming-voice modem
 no fair-queue
 no cdp enable
```

Configuring the Group Asynchronous Interface

```
interface Group-Async1
  no ip address
  no ip directed-broadcast
  encapsulation ppp
  load-interval 30
  dialer in-band
  dialer pool-member 1
  async mode dedicated
  no fair-queue
  no cdp enable
  ppp authentication chap
  group-range 97 120
```

Configuring the Dialer Interface

```
interface Dialer1
  ip address 199.0.1.2 255.255.255.0
  no ip redirects
  no ip directed-broadcast
  no ip proxy-arp
  encapsulation ppp
  load-interval 30
  dialer remote-name d1
  dialer pool 1
  dialer idle-timeout 7200 either
  dialer-group 1
  no fair-queue
  pulse-time 0
  no cdp enable
```

Configuring the Dialer List

```
dialer-list 1 protocol ip permit
```

Configuring the Line

```
line 97 120
  exec-timeout 0 0
  modem InOut
  transport input all
```

Command Reference

There are no new or changed commands.

Glossary

CCO—Cisco Connection Online; Cisco Systems' primary, real-time support channel.

Hot swap—Removal and immediate replacement of a system component that does not affect other components in an operational system.

IOS—Internetworking Operating System; Cisco’s networking software code base.

LAN—Local Area Network.

NM—Network module.

OIR—Online insertion and removal; removal or addition of a system component that does not affect other components in an operational system.

PCI—Peripheral Component Interconnect; bus interface used in the Cisco 3660 router.

SNMP—Simple Network Management Protocol; provides a means to monitor and control network devices, and to manage configurations, statistics collection, performance, and security.

WIC—WAN interface card.