Chapter 2

Flap-List Troubleshooting for the Cisco Cable Modem Termination System

Feature Overview

The flap list is a patented tool that is incorporated in the Cisco IOS software for the Cisco Cable Modem Termination System (CMTS) universal broadband routers for troubleshooting cable modem connectivity problems. The flap list tracks “flapping” cable modems—cable modems that have intermittent connectivity problems—that could indicate a problem with the cable modem or with the upstream or downstream portion of the cable plant.

The flap-list feature does not require any special polling or data transmissions but instead monitors the registration and station maintenance activity that is already performed over any network that conforms to Data-over-Cable Service Interface Specifications (DOCSIS). The CMTS, therefore, collects its flap-list data without creating additional packet overhead and without impacting network throughput and performance. It also supports any cable modem (CM) or set-top box (STB) that meets the DOCSIS standard.

Note

Although this is a Cisco proprietary CMTS feature, it is compatible with all DOCSIS-compliant cable modems. Unlike other monitoring methods that use the Simple Network Management Protocol (SNMP), the flap list uses zero bandwidth.

The flap-list feature tracks the following situations:

- Reinsertions—A reinsertion occurs when the cable modem re-registers more frequently than a user-specified insertion time. A pattern of reinsertions can indicate either potential problems in the downstream or that the cable modem is being improperly provisioned.

- Hits and Misses—A hit occurs when a cable modem successfully responds to the periodic ranging requests (MAC-layer “keepalive” messages) that the Cisco CMTS sends out, per the DOCSIS standard. A miss occurs when the cable modem does not respond to the request within the user-specified timeout period. A pattern of misses can indicate a potential problem in either the downstream or upstream path, or that a problem can be occurring in the registration process.

- Power Adjustments—DOCSIS cable modems can adjust their upstream transmission power levels to adjust to unstable cable plant signal levels, up to a maximum allowable power level. Repeated power adjustments usually indicate a problem with an amplifier in the upstream return path.
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Feature Overview

The flap-list feature is automatically enabled, but to use the flap list effectively, the cable system administrator typically does the following:

- Sets up a script to periodically poll the flap list, for example, every 15 minutes.
- Uses the resulting data to perform trend analysis to identify the cable modems that are consistently in the flap list.
- Queries the billing and administrative database for cable modem MAC address-to-street address translation and generates a report. The reports can be given to the customer service department or the cable plant’s operations and maintenance department. Using these reports, maintenance personnel can quickly discern how characteristic patterns of flapping cable modems, street addresses, and flap statistics indicate which amplifier or feeder lines are faulty. The reports also help to quickly discern whether problems exist in your downstream or upstream path and whether the problem is ingress noise or equipment related.

The flap list provides a quick way to quickly diagnose a number of possible problems. For example, if a subscriber reports a problem, but the flap list for the cable interface that is providing services to them shows little or no flap-list activity, the cable technician can assume that the Cisco CMTS and cable plant are communicating reliably. The problem, therefore, is probably in the subscriber's computer equipment or in the local connection to the cable modem.

Similarly, a cable technician can use the pattern of reinsertions, hits and misses, and power adjustments to quickly troubleshoot the following types of problems:

- If a subscriber’s cable modem shows a lot of flap-list activity, it is having communication problems.
- The top 10 percent most active cable modems in the flap list are most likely to have difficulties communicating with the headend.
- Cable modems with more than 50 power adjustments per day have a suspect upstream path.
- Cable modems with approximately the same number of hits and misses and with a lot of insertions have a suspect downstream path (for example, low level into the cable modem).
- All cable modems incrementing the insertion at the same time indicates a problem with the provisioning servers.
- Cable modems with high cyclic redundancy check (CRC) errors have bad upstream paths or in-home wiring problems.
- Correlating cable modems on the same physical upstream port with similar flap-list statistics can quickly resolve outside plant problems to a particular node or geography.

In addition, the cable network administrators can use the flap list to collect quality control and upstream performance data. Typically, the network operations center (NOC) saves the flap list to a database on a local computer on a daily basis, providing the ability to generate reports that track upstream performance and installation quality control, as well as to provide trend reports on cable plant problems.

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Tip

The system supports automatic power adjustments. The `show cable flap-list` and `show cable modem` commands indicate when the headend cable router has detected an unstable return path for a particular modem and has compensated with a power adjustment. An asterisk (*) appears in the power-adjustment field for a modem when a power adjustment has been made; an exclamation point (!) appears when the modem has reached its maximum power-transmit level and cannot increase its power level any further.
Cisco Cable Manager 2.0

The Cisco Cable Manager Release 2.0 (CCM) is a UNIX-based solution that manages routers and DOCSIS-compliant cable modems, generates performance reports, troubleshoots connectivity problems, views the network graphically, and edits DOCSIS configuration files. You can access the CCM locally from the CCM server console or remotely from a UNIX workstation or a PC. The CCM Release 2.0 is packaged with CiscoView, Cisco Cable Troubleshooter, Config Editor, and the DOCSIS Configuration Editor.

You can use the Cisco Cable Troubleshooter (CCT), a GUI-based application, to manage a hybrid fiber-coaxial (HFC) network and diagnose problems with the HFC. Radio frequency (RF) technicians can quickly isolate plant and provisioning problems and characterize upstream and downstream trouble patterns, including analyzing flapping modems. CCT is a standalone application you can install to work with the flap-list Cisco IOS software. CCT runs on both PCs and Solaris workstations.

For more information on the CCM and CCT, refer to the Cisco Cable Manager 2 web page on Cisco.com.

Related Documents

This document describes the flap list feature and is intended to be used with the following documents, which are available on Cisco.com and the Customer Documentation CD-ROM:

- Cisco uBR7100 Series Universal Broadband Router Hardware Installation Guide
- Cisco uBR7100 Series Universal Broadband Router Software Configuration Guide
- Cisco uBR7200 Series Universal Broadband Router Hardware Installation Guide
- Cisco uBR7200 Series Universal Broadband Router Software Configuration Guide
- Cisco uBR10012 Universal Broadband Router Hardware Installation Guide
- Cisco uBR10012 Universal Broadband Router Software Configuration Guide
- Cisco Broadband Cable Command Reference Guide

Benefits

The flap list is a tool to quickly troubleshoot your hybrid fiber-coaxial (HFC) network. Its proactive monitoring is more scalable and efficient than existing techniques such as polling cable modems using Simple Network Management Protocol (SNMP). Because it uses mechanisms that already exist in a DOCSIS network, it can be used with any DOCSIS-certified cable modem or set-top box.

The flap list provides a cable technician with both real-time and historical cable health statistics for quick, accurate problem isolation and network diagnosis. Using the flap list, a cable technician is able to do the following:

- Quickly learn how to characterize trouble patterns in the hybrid fiber-coaxial (HFC) network.
- Determine which amplifier or feeder line is faulty.
- Distinguish an upstream path problem from a downstream one.
- Isolate an ingress noise problem from a plant equipment problem.
Restrictions and Limitations

The flap-list feature can be used on any Cisco CMTS running a Cisco IOS Release 11.3 NA or later release. The flap list requires a two-way cable network and cannot be used with telco-return cable modems or telco-return set-top boxes.

See Table 2-1 for a list of the flap-list changes or features that have been added and the Cisco IOS software release in which it was introduced.

Table 2-1  Flap-List Changes and Cisco IOS Release

<table>
<thead>
<tr>
<th>Change or Feature</th>
<th>Cisco IOS Release Introduced</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flap-list tool introduced.</td>
<td>11.3.7NA</td>
</tr>
<tr>
<td>cable flap-list aging command—removed days parameter</td>
<td>12.0(4)XA</td>
</tr>
<tr>
<td>Automatic power adjustments added</td>
<td>12.0(7)XR2 and 12.1(1a)T1</td>
</tr>
<tr>
<td>ccsFlapClearAll attribute in ccsFlapTable</td>
<td>12.1(7)CX</td>
</tr>
</tbody>
</table>

Note

Since the cable flap list was originally developed, polling mechanisms have been enhanced to have an increased rate of 1/sec when polls are missed. Cable modems go offline faster than the frequency hop period. This can cause the frequency to stay fixed while cable modems go offline. To compensate for this, you can appropriately reduce the hop period to 10 seconds.

Supported Platforms

- Cisco uBR7100 series
- Cisco uBR7200 series
- Cisco uBR10012 router

Feature Navigator

Feature Navigator is a web-based tool that enables you to quickly determine which Cisco IOS software images support a specific set of features and which features are supported in a specific Cisco IOS image. To access Feature Navigator, you must have an account on Cisco.com. If you have forgotten or lost your account information, e-mail the Contact Database Administration group at cdbadmin@cisco.com. If you want to establish an account on Cisco.com, go to the User Registration web page and follow the directions to establish an account.

Feature Navigator is updated when major Cisco IOS software releases and technology releases occur. As of July 2002, Feature Navigator supports the following Cisco IOS release trains: 11.2, 11.2P, 11.3, 11.3T, 12.0, 12.0S, 12.0ST, 12.0T, 12.1, 12.1E, 12.1T, 12.2, 12.2T.

Access the Cisco IOS Feature Navigator on Cisco.com.
Supported Standards, MIBs, and RFCs

Standards

No new or modified standards are supported by this feature.

MIBs

- CISCO-CABLE-SPECTRUM-MIB
  To obtain lists of supported MIBs by platform and Cisco IOS release, and to download MIB modules, go to the Cisco Network Management Software web page (MIBs sections) on Cisco.com.

RFCs

No new or modified RFCs are supported by this feature.

Configuration Tasks

See the following sections for configuration tasks for the flap-list feature.

You can oversee cable modem status by monitoring the cable flap list. You can monitor the cable flap list by using the Cisco IOS software command-line interface (CLI) or the standard Simple Network Management Protocol (SNMP) application programming interface (API) to set the following configuration tasks. Each task is listed as either required or optional:

- Using CLI
  - Setting Cable Flap-List Insertion Time (optional)
  - Setting Cable Flap-List Power-Adjustment Threshold (optional)
  - Setting Cable Flap-List Miss Threshold (optional)
  - Setting Cable Flap-List Aging (optional)
  - Setting Cable Flap-List Size (optional)
  - Clearing Cable Flap List (optional)
  - Clearing Cable Flap List Counters (optional)
  - Enabling or Disabling Power Adjustment, page 2-8 (optional)
- Using SNMP
  Using any third-party SNMP MIB browser, you can query for flap-list statistics (cssFlapObjects) in the CISCO-CABLE-SPECTRUM-MIB, a proprietary extension to the DOCSIS MIBs.

Using CLI

You can use the CLI command `cable flap-list` to set certain configuration tasks for monitoring the flap list, such as setting insertion time, power-adjustment threshold, and miss threshold. These are optional tasks. If you want the default settings, you do not need to change any of the settings.

Note: For more information on the `cable flap-list` commands and for syntax descriptions, see the Cisco Broadband Cable Command Reference Guide on Cisco.com.
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Configuration Tasks

Setting Cable Flap-List Insertion Time

You can set the cable flap-list insertion time. When a cable modem makes an insertion request more frequently than the amount of insertion time defined by this command, the cable modem is placed in the flap list for activity recording.

To set the cable flap-list insertion time, use the following command in global configuration mode.

```
CMTS01(config)# cable flap-list insertion-time seconds
```

<table>
<thead>
<tr>
<th>Command</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>CMTS01(config)# cable flap-list insertion-time seconds</td>
<td>Specifies the insertion time in seconds. Any cable modem that makes an insertion request more frequently than this period of time is placed in the flap list. The valid range is from 60 to 86400 seconds. If you do not set a cable flap-list insertion time, the default is 180 seconds.</td>
</tr>
</tbody>
</table>

To verify cable flap-list insertion time, use the `show cable flap-list` command. To view an example, see the “Verifying Cable Flap-List Insertion Time” section on page 2-13.

Setting Cable Flap-List Power-Adjustment Threshold

You can specify the power-adjustment threshold that causes a flap-list event to be recorded. When the power adjustment of a cable modem meets or exceeds the threshold, the cable modem is placed in the flap list.

A power adjustment threshold of less than 2 dBmV might cause excessive flap-list event recording. Cisco recommends setting this threshold value to 3 dBmV or higher.

To set the power-adjustment threshold for flap-list events, use the following command in global configuration mode.

```
CMTS01(config)# cable flap-list power-adjust threshold dbmV
```

<table>
<thead>
<tr>
<th>Command</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>CMTS01(config)# cable flap-list power-adjust threshold dbmV</td>
<td>Specifies the minimum power adjustment that constitutes a flap-list event. The valid range is from 1 to 10 dBmV. If you do not specify a power-adjustment threshold, the default is 2 dB.</td>
</tr>
</tbody>
</table>

To verify the cable flap-list power-adjustment threshold, use the `show cable flap-list` command. To view an example, see the “Verifying Cable Flap-List Power-Adjustment Threshold” section on page 2-13.

Setting Cable Flap-List Miss Threshold

You can specify the miss threshold for recording a flap-list event. A miss is the number of times a cable modem does not acknowledge a MAC-layer keepalive message from the CMTS. An 8 percent miss rate is normal for the Cisco cable interface line cards. When the number of misses exceeds the threshold, the cable modem is placed in the flap list.

A high miss rate can indicate intermittent upstream problems, fiber laser clipping, or common-path distortion.

To set the miss threshold for recording a flap-list event, use the following command in global configuration mode.

```
CMTS01(config)# cable flap-list miss-threshold misses
```

<table>
<thead>
<tr>
<th>Command</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>CMTS01(config)# cable flap-list miss-threshold misses</td>
<td>Specifies the number of MAC layer keepalive misses that results in cable modems being placed in the flap list. If you do not specify a miss threshold, the default is 6.</td>
</tr>
</tbody>
</table>

To verify the cable flap-list miss threshold, use the `show cable flap-list` command. To view an example, see “Verifying Cable Flap-List Miss Threshold” section on page 2-13.
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Configuration Tasks

Setting Cable Flap-List Aging

You can specify how long to record and retain flapping activity on cable modems currently in the flap-list table. This value is known as flap-list aging. To set cable flap-list aging, use the following command in global configuration mode.

<table>
<thead>
<tr>
<th>Command</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>CMTS01(config)# cable flap-list aging</td>
<td>Specifies the age to record and retain flapping activity for the cable modems connected to the CMTS.</td>
</tr>
</tbody>
</table>

Note

The days parameter, that specifies the number of days to record and retain flapping activity for the cable modems, was removed from the cable flap-list aging command, effective with Cisco IOS Release 12.0(4)XA. The days range was from 1 to 60 days. The default was 10080 minutes (180 hours or 7 days).

To verify cable flap-list aging, use the show cable flap-list command. To view an example, see “Verifying Cable Flap-List Aging” section on page 2-13.

Setting Cable Flap-List Size

You can specify the maximum number of cable modems that can be listed in the cable flap-list tables. To specify the maximum number of cable modems that can be recorded in the flap list, use the following command in global configuration mode.

<table>
<thead>
<tr>
<th>Command</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>CMTS01(config)# cable flap-list size number</td>
<td>Specifies the maximum size of the flap list. The valid range is from 1 to 8192 cable modems. The default is 100 cable modems.</td>
</tr>
</tbody>
</table>

Tip

To verify cable flap-list size, use the show cable flap-list command. To view an example, see “Verifying Cable Flap-List Size” section on page 2-13.

Clearing Cable Flap List

To remove a single cable modem from the flap list or to remove all cable modems from the flap list, use one of the following commands in Privileged EXEC mode.

<table>
<thead>
<tr>
<th>Command</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>CMTS01# clear cable flap-list mac-addr</td>
<td>Clears the entries in the cable flap list for the cable modem with this MAC address.</td>
</tr>
<tr>
<td>CMTS01# clear cable flap-list all</td>
<td>Clears the entries for all cable modems in the flap list.</td>
</tr>
</tbody>
</table>

Clearing Cable Flap List Counters

To clear the flap-list counters for the CMTS, use the following command in Privileged EXEC mode.
Configuration Tasks

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Enabling or Disabling Power Adjustment

Cable modems are monitored on the flap list to see how often the cable modem’s power adjustment exceeded a set threshold value. As part of the configuration tasks, you will want to enable the power-adjustment capability and set this threshold.

To enable the power adjustment capability, use the following command in interface configuration mode:

```
Command
CMTS01(config-if)# cable upstream n
power-adjust [threshold [threshold #] | continue [tolerable value] | noise [% of power adjustment]]

Purpose
Enables the power-adjustment capability.

n specifies the upstream port number.

threshold # specifies the power-adjustment threshold. The threshold range is from 0 to 10 dB. The default is 1 dB.

tolerable value determines if the status of the RNG-RSP should be set to CONTINUE or SUCCESS. The range is from 2 to 15 dB. The default is 2 dB.

% of power adjustment specifies the percentage of power-adjustment packets required to switch from the regular power-adjustment method to the noise power-adjustment method. Range is from 10 to 100 percent.

To disable the power-adjustment capability, use the no cable upstream power-adjust command.
```

Caution
Default settings are adequate for system operation. Amplitude averaging is an automatic procedure. In general, Cisco does not recommend that you adjust values. Cisco does recommend, however, that you clean up your cable plant should you encounter flapping cable modems.

Note
In some instances, you might adjust certain values:

If CMs cannot complete ranging because they have reached maximum power levels, you might try to set the tolerable value CONTINUE field to a larger value than the default of 2 dB. Values larger than 10 dB on “C” versions of cable modem cards, or 5 dB on FPGA versions, are not recommended.

If the flap list shows CMs with a large number of power adjustments, but the CMs are not detected as “noisy,” you might try to decrease the percentage for “noisy.” If you think that too many CMs are unnecessarily detected as “noisy,” you might try to increase the percentage.

Command
CMTS01(config)# clear cable modem {mac-addr | ip-addr | all | oui string | reject} counters

Purpose
Clears the flap-list counters for a particular modem, for all modems, for modems that match the specified OUI string, or that are in the reject MAC state.
Setting Frequency Threshold to Affect Power Adjustment

To control power-adjustment methods by setting the frequency threshold, use the `cable upstream freq-adj averaging` command in interface configuration mode. To disable power adjustments, use the `no` form of this command.

```
Command                          Purpose
CMTS01(config-if)# cable upstream n freq-adj averaging % of frequency adjustment
```

- `n` specifies the upstream port number.
- `averaging` specifies that a percentage of frequency-adjustment packets is required to change the adjustment method from the regular power-adjustment method to the noise power-adjustment method.
- `% of frequency adjustment` specifies the percentage of frequency-adjustment packets required to switch from the regular power-adjustment method to the noise power-adjustment method. Valid range is from 10 to 100 percent.

To disable the power-adjustment capability, use the `no cable upstream freq-adj averaging` command.

The following example shows how to change the power adjustment method when the frequency adjustment packet count reaches 50 percent:

```
Router(config-if)# cable upstream 0 freq-adj averaging 50
```

Using SNMP

You can use standard SNMP application programming interface (API) to query for flap-list configuration attributes or statistics in the CISCO-CABLE-SPECTRUM-MIB.

<table>
<thead>
<tr>
<th>Table 2-2 Flap-List Configuration Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attribute</td>
</tr>
<tr>
<td>ccsFlapListMaxSize</td>
</tr>
<tr>
<td>ccsFlapListCurrentSize</td>
</tr>
<tr>
<td>ccsFlapAging</td>
</tr>
</tbody>
</table>
Configuration Examples

The following example sets the cable flap-list insertion time in seconds. Any cable modem that makes an insertion request more frequently than this period of time is placed in the flap list. The default is 180 seconds.

CMTS01# cable flap-list insertion-time 120

The following example specifies the power-adjustment threshold in dBmV. When the threshold is met or exceeded, the cable modem is placed in the flap list. The default is 2 dB.

CMTS01(config)# cable flap-list power-adjust threshold 3
The following example sets the cable modem’s miss threshold, which is the number of MAC-layer keepalive misses. When the number of misses exceeds the threshold, the cable modem is placed in the flap list. The default is 6.

CMTS01(config)# cable flap-list miss-threshold 4

The following example sets the flap-list age, which is the number of days to record and retain flapping activity for the cable modems in the flap list. The default is 7 days.

CMTS01(config)# cable flap-list aging 8

The following example specifies the flap-list size, which is the maximum number of cable modems that can be recorded in the flap list. The valid range is 1 to 8191 cable modems, with a default of 100 cable modems.

CMTS01(config)# cable flap-list 8191

The following examples clear or remove a single cable modem with a specified MAC address or all cable modems from the flap list:

CMTS01(config)# clear cable flap-list 0010.7b6b.5d1d
or
CMTS01(config)# clear cable flap-list all

The following example enables the power-adjustment capability to monitor how often the cable modem’s power adjustment exceeded a set threshold value. The default threshold number is 1 dB. See “Enabling or Disabling Power Adjustment” section on page 2-8 for descriptions of the syntax fields.

cable upstream C1/0 U1 power-adjust {threshold 2 | continue 5 | noise 50}

**Monitoring and Troubleshooting Flap Lists**

**Using CLI**

The cable flap list can be queried using the Cisco IOS CLI command `show cable flap-list` for information on cable flap-list insertion time, power-adjustment threshold, miss threshold, aging, or flap-list size.

`show cable flap-list`  
To display the cable flap list, use the `show cable flap-list` command in privileged EXEC mode.

`show cable flap-list [sort-flap | sort-time]`

You can optionally choose one of two methods to display the cable flap list:

- **sort-flap**
  
  Sorts by number of times the cable modem has flapped.

- **sort-time**
  
  Sorts by the most recent time the cable modem is detected to have flapped.

The following example sets the cable modem’s miss threshold, which is the number of MAC-layer keepalive misses. When the number of misses exceeds the threshold, the cable modem is placed in the flap list. The default is 6.

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cable upstream C1/0 U1 power-adjust {threshold 2 | continue 5 | noise 50}
Example Outputs

For a description of the fields in the sample outputs, see Table 2-3 on page 2-14, “Flap-List Output Field Descriptions.”

The following example shows the output of the show cable flap-list command:

```
router# show cable flap-list
MAC Address Upstream Ins Hit Miss CRC P-Adj Flap Time
0010.7bb3.fd19 Cable5/0/U1 0 2792 281 0 *45 58 Jul 27 16:54:50
0010.7bb3.fcfc Cable5/0/U1 0 19 4 0 !43 43 Jul 27 16:55:01
0010.7bb3.fddd Cable5/0/U1 0 19 4 0 *3 3 Jul 27 16:55:01
```

The following example shows the return for flap-list tables sorted by MAC address and by time:

```
router# show cable flap-list sort-flap
Mac Addr CableIF Ins Hit Miss CRC P-Adj Flap Time
.1eab.2c0b C6/0 U0 108 318 27 0 108 Sep 10 15:26:56
.1eb2.bb07 C6/0 U0 0 293 31 1 1 Sep 10 15:15:49
.7eb6.71cd C6/0 U0 1 288 32 0 1 Sep 10 15:12:13
.1eb2.bb8f C6/0 U0 1 295 30 0 1 Sep 10 15:11:44
```

Following is a sample output of the show cable flap-list command on a Cisco uBR7100 series. In this example, a high flap rate indicates that the cable modem is power adjusting frequently. This can indicate a problem with an amplifier. The flap-rate number reveals the number of times the CMTS instructed the cable modem to adjust the transmit power more than 3 dB.

```
uBR7100# show cable flap-list
Mac Addr CableIF Ins Hit Miss CRC P-Adj Flap Time
0010.9500.461f C1/0 U1 56 18857 887 0 116 Jun 1 14:09:12
0010.9500.466e C1/0 U1 38 18686 2935 0 80 Jun 2 19:03:57
0010.9500.38ec C1/0 U2 63 18932 1040 0 138 Jun 2 23:50:53
0010.9500.4474 C1/0 U2 65 18913 1053 0 137 Jun 2 09:30:09
0010.9500.4672 C1/0 U2 56 18990 2327 0 124 Jun 2 10:44:14
0010.9500.38f0 C1/0 U2 50 18964 2083 0 111 Jun 2 20:46:56
0010.9500.4671 C1/0 U2 43 18755 3212 1 89 Jun 1 19:36:20
0010.9500.38eb C1/0 U0 57 36133 1608 0 126 Jun 2 20:04:58
0010.9500.3ce2 C1/0 U0 44 35315 1907 0 99 Jun 2 16:42:47
0010.9500.38f6 C1/0 U3 50 19016 2511 0 104 Jun 2 07:46:31
0010.9500.4671 C1/0 U3 43 18755 3212 1 89 Jun 1 19:36:20
0010.9500.38e8 C1/0 U0 57 36133 1608 0 126 Jun 2 20:04:58
0010.9500.33e2 C1/0 U0 44 35315 1907 0 99 Jun 2 16:42:47
0010.9500.38df C1/0 U2 0 13213 246 0 1 5 Jun 3 04:15:30
0010.9500.4674 C1/0 U2 56 36037 2379 0 4 121 Jun 3 00:34:12
0010.9500.4677 C1/0 U2 40 35781 2381 0 4 91 Jun 2 12:14:38
0010.9500.4614 C1/0 U2 40 21810 2362 0 502 586 Jun 2 21:43:02
0010.9500.3be9 C1/0 U2 63 22862 969 0 0 128 Jun 1 14:09:03
0010.9500.4609 C1/0 U2 55 22723 2127 0 0 112 Jun 1 14:08:02
0010.9500.3cb8 C1/0 U2 49 22607 1378 0 0 102 Jun 1 14:08:58
0010.9500.46d0 C1/0 U3 46 22477 2967 0 2 96 Jun 2 17:03:48
0010.9500.3cba C1/0 U3 39 22343 3058 0 0 81 Jun 1 14:13:16
0010.9500.3cb4 C1/0 U3 38 22238 2936 0 0 79 Jun 1 14:09:26
0010.9500.4612 C1/0 U3 38 22306 2928 0 0 79 Jun 1 14:09:29
```

The following examples show that you can use the show cable flap-list command to verify that you set cable flap-list insertion time, power-adjustment threshold, miss threshold, aging, or flap-list size properly when you used the cable flap-list command.
## Chapter 2  Flap-List Troubleshooting for the Cisco Cable Modem Termination System

### Monitoring and Troubleshooting Flap Lists

#### Verifying Cable Flap-List Insertion Time
To verify cable flap-list insertion time, enter the `show cable flap-list` command:

```
CMTS01# show cable flap-list
Mac Addr    CableIF    Ins    Hit   Miss    CRC  P-Adj   Flap    Time
0010.7b6b.5d1d C1/0 U0  0  688   169   0    0    3 Nov 5 12:28:50
0010.7b6b.5e15 C1/0 U0  1  707   185   0    0    5 Nov 5 12:29:52
0010.7b6b.5e27 C1/0 U0  1  707   198   0    0    5 Nov 5 12:29:55
0010.7b6b.5d29 C1/0 U0  1  709   205   0    0    5 Nov 5 12:29:52
0010.7b6b.5e2b C1/0 U0  1  710   204   0    0    7 Nov 5 12:30:16
```

#### Verifying Cable Flap-List Power-Adjustment Threshold
To verify the cable flap-list power-adjustment threshold, enter the `show cable flap-list` command:

```
CMTS01# show cable flap-list
Mac Addr    CableIF    Ins    Hit   Miss    CRC  P-Adj   Flap    Time
0010.7b6b.5d1d C1/0 U0  0  688   169   0    0    3 Nov 5 12:28:50
0010.7b6b.5e15 C1/0 U0  1  707   185   0    0    5 Nov 5 12:29:52
0010.7b6b.5e27 C1/0 U0  1  707   198   0    0    5 Nov 5 12:29:55
0010.7b6b.5d29 C1/0 U0  1  709   205   0    0    5 Nov 5 12:29:52
0010.7b6b.5e2b C1/0 U0  1  710   204   0    0    7 Nov 5 12:30:16
```

#### Verifying Cable Flap-List Miss Threshold
To verify the cable flap-list miss threshold, enter the `show cable flap-list` command:

```
CMTS01# show cable flap-list
Mac Addr    CableIF    Ins    Hit   Miss    CRC  P-Adj   Flap    Time
0010.7b6b.5d1d C1/0 U0  0  688   169   0    0    3 Nov 5 12:28:50
0010.7b6b.5e15 C1/0 U0  1  707   185   0    0    5 Nov 5 12:29:52
0010.7b6b.5e27 C1/0 U0  1  707   198   0    0    5 Nov 5 12:29:55
0010.7b6b.5d29 C1/0 U0  1  709   205   0    0    5 Nov 5 12:29:52
0010.7b6b.5e2b C1/0 U0  1  710   204   0    0    7 Nov 5 12:30:16
```

#### Verifying Cable Flap-List Aging
Verify cable flap-list aging by checking to see how long the flap list has been configured and which cable modems have been on the list. Use the `show cable flap-list` command:

```
CMTS01# show cable flap-list
Mac Addr    CableIF    Ins    Hit   Miss    CRC  P-Adj   Flap    Time
0010.7b6b.5d1d C1/0 U0  0  688   169   0    0    3 Nov 5 12:28:50
0010.7b6b.5e15 C1/0 U0  1  707   185   0    0    5 Nov 5 12:29:52
0010.7b6b.5e27 C1/0 U0  1  707   198   0    0    5 Nov 5 12:29:55
0010.7b6b.5d29 C1/0 U0  1  709   205   0    0    5 Nov 5 12:29:52
0010.7b6b.5e2b C1/0 U0  1  710   204   0    0    7 Nov 5 12:30:16
```

#### Verifying Cable Flap-List Size
To verify the cable flap-list size, which is the maximum number of cable modems that can be recorded in the flap list, enter the `show cable flap-list` command. Count the number of CableIFs listed.

```
CMTS01# show cable flap-list
Mac Addr    CableIF    Ins    Hit   Miss    CRC  P-Adj   Flap    Time
0010.7b6b.5d1d C1/0 U0  0  688   169   0    0    3 Nov 5 12:28:50
0010.7b6b.5e15 C1/0 U0  1  707   185   0    0    5 Nov 5 12:29:52
0010.7b6b.5e27 C1/0 U0  1  707   198   0    0    5 Nov 5 12:29:55
0010.7b6b.5d29 C1/0 U0  1  709   205   0    0    5 Nov 5 12:29:52
0010.7b6b.5e2b C1/0 U0  1  710   204   0    0    7 Nov 5 12:30:16
```

---

**Cisco Cable Modem Termination System Feature Guide**
Flap List Output Field Descriptions

Table 2-3 contains a description of each field in the sample outputs.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mac Addr</td>
<td>MAC-layer address of a cable modem. The first six digits indicate the vendor ID of the cable modem manufacturer, followed by six digits indicating a unique host address. Each cable modem’s MAC address is unique.</td>
</tr>
<tr>
<td>CableIF</td>
<td>The physical upstream interface on the CMTS. It denotes the cable modem card slot number, the downstream port number on the RF line card, and the upstream port number on the same cable modem card. The flap-list data can be sorted based on the upstream port number, which is useful when isolating reverse path problems unique to certain combining groups.</td>
</tr>
</tbody>
</table>
| Ins | Link insertion is the process whereby a modem performs an initial maintenance procedure to establish a link with the CMTS. The Ins column is the flapping modem’s insertion count and indicates the number of times the RF link was abnormally reestablished into the network. A high Ins number can indicate intermittent downstream synchronization loss, or Dynamic Host Configuration Protocol (DHCP) or modem registration problems. An abnormality is detected when the time between initial link establishment and a reestablishment was less than the threshold parameter configured for the cable flap-list insertion-time command. Normal modem activity uses the following sequence:  
  • Initial link insertion is followed by a keepalive loop (called station maintenance) between the CMTS and cable modem.  
  • Power on  
  • Initial maintenance  
  • Station maintenance  
  • Power off  
When the link is broken, initial maintenance is repeated to reestablish the link.  
  • Initial maintenance @ Time T1  
  • Station maintenance  
  • Initial maintenance @ Time T2  
The Ins and Flap counters in the flap list are incremented whenever T2 – T1 < \( N \) where \( N \) is the insertion-time parameter configured in the cable flap-list insertion-time command. This count may indicate intermittent downstream synchronization loss or DHCP or modem registration problems. In the latter case, the Ins count tends to track the Flap count. If the downstream is unstable (levels move outside the modem’s range occasionally), you get insertions. If the modem cannot provision correctly, you get many insertions.  
DOCSIS cable modems operate in a persistent manner. When the link is broken, the cable modem tries to reestablish it automatically until it is powered off. Many modem users like to connect their modems to a surge protector, which also supplies power to their PC. If a user powers off the modem after usage, this is not treated as a flap. If link reestablishment happens too frequently, the modem usually has a registration problem. This is important to know. When looking at the show cable flap-list command output, examine the Ins count. Check to see if the Ins column is the same order of magnitude as the flap count. |
Chapter 2 Flap-List Troubleshooting for the Cisco Cable Modem Termination System

Monitoring and Troubleshooting Flap Lists

Hit and Miss

A hit is the number of times the modem responds to MAC-layer keepalive messages. A miss is the number of times the modem misses the MAC-layer keepalive message. An 8 percent miss rate is normal for the Cisco uBR-MC11 card.

The Hit and Miss columns are keepalive polling statistics between the CMTS and the cable modem. The station maintenance process occurs for every modem approximately every 25 seconds. When the CMTS receives a response from the modem, the event is counted as a hit. If the CMTS does not receive a response from the cable modem, the event is counted as a miss.

A cable modem fails to respond either because of noise or if it is down. Modems that log only misses and zero hits are assumed to be powered off. If noise caused a poll to be missed, then the transition from miss to hit is detected as a flap condition. The poll rate is increased to 1 per second whenever the modem misses a poll. This is used to accelerate the offline state detection and decrease station maintenance overhead.

Misses are not desirable, because they usually indicate a return path problem; however, having a small number of misses is normal. After 16 misses, the modem is assumed to have powered off and the link is broken.

The flap count is incremented if there are \( M \) consecutive misses, where \( M \) is configured in the cable flap miss-threshold command. The parameter value ranges from 1 to 12, with a default of 6.

Ideally, the hit count should be much greater than the miss count. If a modem has a hit count much less than its miss count, then registration is failing. Noisy links cause the miss or hit ratio to deviate from a nominal 10 percent or less. High miss counts can indicate:

- Intermittent upstream possibly due to noise
- Laser clipping
- Common-path distortion
- Ingress or interference
- Too much or too little upstream attenuation

Hit and miss analysis could be done after the Ins count stops incrementing. In general, if the hit and miss counts are about the same order of magnitude, and the CRC count is low or nonexistent, then the upstream is experiencing noise.

If the miss count is greater, then the modem is probably experiencing common-path distortion and is dropping out frequently or not completing registration. Check grounding connections and if you see noise disappear after breaking a cable connection, but build back up again later, check the end-of-line terminators. You may be using a substandard frequency translator instead of a Digital Signal Processor. If the line is simply noisy, but not too noisy, you see an increase in the percentage of misses. If it is very noisy, then more than 80% of the ranging responses (RNG-RSP) are missed and the modem has many insertions.

Cyclic redundancy check (CRC)

The number of cyclic redundancy check (CRC) errors from this modem. CRC errors usually indicate downstream signal interruption or interference noise on a plant. Some CRC errors can be expected on the FPGA line cards. Many CRC errors mean that the plant technicians should be looking for poorly performing forward components. A low count can always be expected, but a high CRC number calls for some plant troubleshooting.

The CRC counter indicates:

- Intermittent upstream
- Laser clipping
- Common-path distortion
- Impulsive noise or interference
Chapter 2  Flap-List Troubleshooting for the Cisco Cable Modem Termination System

Monitoring and Troubleshooting Flap Lists

Table 2-3  Flap-List Output Field Descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
</table>
| P-Adj | The number of times the CMTS instructed the modem to adjust TX power more than 3 dB. * means the noise power-adjustment method is active for this modem. ! means the modem has reached its maximum transmit power. The station maintenance poll in the CMTS constantly adjusts the modem transmit power, frequency, and timing. The power-adjustment (P-Adj) column indicates the number of times the modem’s power adjustment exceeded the threshold value. The power adjustment threshold may be set using the `cable flap-list power-adjust threshold` command with a value range of 0 to 10 dB and a default value of 2 dB. Tuning this threshold is recommended to decrease irrelevant entries in the flap list. Power-adjustment values of 2 dB and below continuously increment the P-Adj counter. The modem transmitter step size is 1.5 dB, whereas the headend may command 0.25 dB step sizes. Power-adjustment flap strongly suggests upstream plant problems such as:  
- Amplifier degradation  
- Poor connections  
- Thermal sensitivity  
- Attenuation problem  
The P-Adj column is often watched as an indicator of plant stability. It may give a forewarning of a future plant outage. If the upstream path contains too much or too little loss, the modem is undergoing many power adjustments. |
| Flap  | The Flap counter indicates the number of times the modem has flapped, the sum of P-Adj and Ins values. This counter is incremented when one of the following events is detected:  
- Unusual modem insertion or re-registration attempts. The Flap and the Ins counters are incremented when the modem tries to reestablish the RF link with the CMTS within a period of time that is less than the user-configured insertion interval value.  
- Abnormal miss or hit ratio. The Flap counter is incremented when N consecutive misses are detected after a hit where N can be user-configured with a default value of 6.  
- Unusual power adjustment. The Flap and P-Adj counters are incremented when the modem’s upstream power is adjusted beyond a user-configured power level. |
| Time  | Time is the most recent time that the modem dropped the connection or flapped. The value is based on the clock configured on the local CMTS. If no time is configured, this value is based on the current uptime of the CMTS. When a cable modem meets one of the three flap-list criteria, the Flap counter is incremental and Time is set to the current time. |

Using SNMP

Using any third-party SNMP Management Information Base (MIB) browser, you can query the ccsFlapTable in the CISCO-CABLE-SPECTRUM-MIB, a proprietary extension to the DOCSIS MIBs. The ccsFlapTable contains an entry for each cable modem. The attributes in the table are similar to the statistics displayed by the `show cable flap-list` command. Each cable modem contains the attributes described in the table, `cssFlapTable Attributes`. 
For more information on the cssFlapTable, refer to the following URL:

### Table 2-4  cssFlapTable Attributes

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>cssFlapMacAddr</td>
<td>MacAddress</td>
<td>MAC address of the cable modem’s cable interface. Identifies a flap-list entry for a flapping cable modem.</td>
</tr>
<tr>
<td>ccsFlapUpstreamIfIndex</td>
<td>InterfaceIndex</td>
<td>Identifies the upstream being used by the flapping cable modem. Also identifies the MAC address of a flapping cable modem in decimal format. Convert the decimal number in the SNMP output to hexadecimal. A hexadecimal MAC address allows you, for example, to match the MAC address against the output listed in a <code>show cable modem</code> command.</td>
</tr>
<tr>
<td>ccsFlapDownstreamIfIndex</td>
<td>InterfaceIndex</td>
<td>Identifies the downstream being used by the flapping cable modem.</td>
</tr>
<tr>
<td>ccsFlapLastFlapTime</td>
<td>DateAndTime</td>
<td>Identifies the time stamp for the last time the cable modem flapped.</td>
</tr>
<tr>
<td>ccsFlapCreateTime</td>
<td>DateAndTime</td>
<td>Identifies the time stamp that this entry was added to the table.</td>
</tr>
<tr>
<td>ccsFlapRowStatus</td>
<td>RowStatus</td>
<td>Is used to control the status of each entry in the table.</td>
</tr>
<tr>
<td>ccsFlapInsertionFailNum</td>
<td>Unsigned32</td>
<td>Number of times a cable modem registered more frequently than expected, often due to not being able to get an IP address. When the cable modem cannot finish registration within the insertion time (ccsFlapInsertionTime), it resends the Initial Maintenance packet. When the CMTS receives the packet sooner than expected, the cable modem is a flapping modem.</td>
</tr>
<tr>
<td>ccsFlapHitNum</td>
<td>Unsigned32</td>
<td>Number of times the CMTS receives the ranging request from the cable modem. The CMTS issues a station maintenance transmit opportunity at a typical rate of once every 10 seconds and waits for a ranging request from the cable modem. When the CMTS receives a ranging request, the hit number is increased by 1.</td>
</tr>
<tr>
<td>ccsFlapMissNum</td>
<td>Unsigned32</td>
<td>Number of times the CMTS misses the ranging request from the cable modem. The CMTS issues a station maintenance packet every 10 seconds and waits for a ranging request from the cable modem. If the CMTS misses a ranging request within 25 msec, then the miss number is incremented.</td>
</tr>
<tr>
<td>ccsFlapCrcErrorNum</td>
<td>Unsigned32</td>
<td>Number of times the CMTS upstream receiver flagged a packet with a CRC error. A high value for ccsFlapCrcErrorNum indicates that the cable upstream may have a high noise level. The modem may not be flapping yet, but it may be a potential problem.</td>
</tr>
</tbody>
</table>
Chapter 2  Flap-List Troubleshooting for the Cisco Cable Modem Termination System

Monitoring and Troubleshooting Flap Lists

Table 2-4  cssFlapTable Attributes (continued)

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ccsFlapPowerAdjustmentNum</td>
<td>Unsigned32</td>
<td>Number of times the cable modem upstream transmit power is adjusted during station maintenance. When the adjustment is greater than the power-adjustment threshold, the number is incremented.</td>
</tr>
</tbody>
</table>
| ccsFlapTotalNum                  | Unsigned32 | Whenever the cable modem passes flap detection, the flap number is incremented. Flap detection constitutes the following three flap detectors, where the flap number is incremented:  
  • When ccsFlapInsertionFailNum is increased  
  • When the CMTS receives a miss followed by a hit  
  • When ccsFlapPowerAdjustmentNum is increased |
| ccsFlapResetNow                  | TruthValue | Setting this object to true(1) sets the following objects to zero: ccsFlapInsertionFailsNum, ccsFlapHitsNum, ccsFlapMissesNum, ccsFlapCrcErrorsNum, ccsFlapPowerAdjustmentsNum, ccsFlapTotalNum. |
| ccsFlapLastResetTime             | DateAndTime| The last time that all the statistical objects of this entry are started from zero.                                                            |

Troubleshooting Suggestions

This section describes:

• Troubleshooting tips on how to interpret different network conditions based on the flap-list statistics.
• A CMTS averaging algorithm to determine the optimum power level for a flapping cable modem.
• Using other related commands.

Troubleshooting Tips

This section includes suggestions on how to interpret different network conditions based on the flap-list statistics:

• **Condition 1:** Low miss or hit ratio (< 2 percent for a Cisco uBR-MC16 card), low insertion, low P-Adj, low flap counter, and old time stamp.
  **Analysis:** This exhibits an optimal network situation.

• **Condition 2:** High ratio of misses over hits (> 10 percent).
  **Analysis:** Hit and miss analysis should be done after the Ins count stops incrementing. In general, if the hit and miss counts are about the same order of magnitude, the upstream can be experiencing noise. If the miss count is greater, then the modem is probably dropping out frequently and not completing registration. The upstream or downstream might not be stable enough for reliable link establishment. Very low hits and miss counters and high insertion counters indicate provisioning problems.

• **Condition 3:** Relatively high power-adjustment counter.
  **Analysis:** Indicates that the power-adjustment threshold is probably set at default value of 2 dB. The modem transmitter step size is 1.5 dB, but the headend can command 0.25 dB step sizes. Tuning your power threshold to 6 dB is recommended to decrease irrelevant entries in the flap list. The power-adjustment threshold can be set using *cable flap power threshold <0-10 dB>* in the Cisco IOS global configuration mode. A properly operating HFC network with short amplifier cascades can use a 2 to 3 dB threshold.
Chapter 2 Flap-List Troubleshooting for the Cisco Cable Modem Termination System

Monitoring and Troubleshooting Flap Lists

- **Condition 4:** High P-Adj and CRC errors.
  **Analysis:** This condition can indicate that the fiber node is clipping the upstream return laser. Evaluate the modems with the highest CRC count first. If the modems are not going offline (Ins = 0), this is not noticed by subscribers. However, they could receive slower service due to dropped IP packets in the upstream. This condition also results in input errors on the Cisco uBR7100 series router cable interface.

- **Condition 5:** High insertion rate.
  **Analysis:** If link reestablishment happens too frequently, the modem is usually having a registration problem. This is indicated by a high Ins counter, which tracks the Flap counter.

### Performing Amplitude Averaging

The CMTS uses an averaging algorithm to determine the optimum power level for a cable modem with low carrier-to-noise ratio that is making excessive power adjustments—known as flapping. To avoid dropping flapping cable modems, the CMTS averages a configurable number of RNG-REQ messages before it makes power adjustments. By compensating for a potentially unstable return path, the CMTS maintains connectivity with affected cable modems. You can interpret these power adjustments, however, as indicating unstable return path connections.

The `show cable flap-list` and `show cable modem` commands are expanded to indicate to which paths the CMTS is making power adjustments and which modems have reached maximum transmit power settings. These conditions indicate unstable paths that should be serviced.

The following example shows the output of the `show cable flap-list` command:

```
Router# show cable flap-list

MAC Address Upstream Ins Hit Miss CRC P-Adj Flap Time
0010.7bb3.fd19 Cable1/0/U1 0 2792 281 0 *45 58 Jul 27 16:54:50
0010.7bb3.fcfc Cable1/0/U1 0 19 4 0 !43 43 Jul 27 16:55:01
0010.7bb3.fcdd Cable1/0/U1 0 19 4 0 *3 3 Jul 27 16:55:01
```

The asterisk (*) indicates that the CMTS is using the power-adjustment method on this modem. An exclamation point (!) indicates that the modem has reached maximum transmit power.

Output of the `show cable modem` command appears below:

```
Router# show cable modem

Interface Prim Online Sid State Timing Rec Offset Power QoS CPE IP address MAC address
Cable1/0/U0 1 online 2257 0.00 3 0 10.30.128.142 0090.8330.0217
Cable1/0/U0 2 online 2262 *-0.50 3 0 10.30.128.145 0090.8330.020f
Cable1/0/U0 3 online 2260 0.25 3 0 10.30.128.146 0090.8330.0211
Cable1/0/U0 4 online 2256 *0.75 3 0 10.30.128.143 0090.8330.0216
Cable1/0/U0 5 online 2265 *0.50 3 0 10.30.128.140 0090.8330.0214
Cable1/0/U0 6 online 2256 0.00 3 0 10.30.128.141 0090.8330.0215
Cable1/0/U0 7 online 4138 !-1.00 3 1 10.30.128.182 0050.7366.124d
Cable1/0/U0 8 online 4142 !-3.25 3 1 10.30.128.164 0050.7366.1245
Cable1/0/U0 9 online 4141 !-3.00 3 1 10.30.128.185 0050.7366.17e3
Cable1/0/U0 10 online 4142 !-2.75 3 0 10.30.128.181 0050.7366.17ab
Cable1/0/U0 11 online 4142 !-3.25 3 1 10.30.128.169 0050.7366.17ef
```

Similar to the `show cable flap-list` command display, the * symbol in the `show cable modem` command output indicates that the CMTS is using the power-adjustment method on this CM. The ! symbol indicates that the CM has reached maximum transmit power.
Using Other Related Commands

The following related Cisco IOS commands can be used to do maintenance on or display information about a cable modem.

- The following clears the counters for a cable modem (or all cable modems) in the station maintenance list:
  ```
  clear cable modem {mac-addr | ip-addr | all} counters
  ```

- The following displays the QoS, modem status, In and Out octets, IP and MAC addresses per SID:
  ```
  show int cable slot/port sid
  ```

- The following drops the modem’s RF link by removing a modem from the keepalive polling list. This forces the modem to reset. Note the warning below.
  ```
  clear cable-modem {mac-addr | ip-addr | all} reset
  ```

  **Tip**
  The `clear cable-modem all reset` command causes all modems to go offline and disrupt service for your users. It is best used in a test or nonproduction environment.

- The following uses a MAC-layer ping to determine if the cable modem is online. It uses smaller data units on the wire than a standard IP ping, resulting in lower overhead. This command works even if the IP layer in the modem is down or has not completed registration:
  ```
  ping DOCSIS cable-modem mac-addr | IP address
  ```

- The following displays the timing offset, receive power, and QoS values by cable interface, SID, and MAC address:
  ```
  show cable modem [ip-address | MAC-address]
  ```

- The following displays the current allocation table and frequency assignments:
  ```
  show cable spectrum-group [spectrum group number]
  ```

- The following displays maximum, average, and minimum percent of online time and offline time for a given SID on a given cable router interface:
  ```
  show int slot/port sid connectivity
  ```

- The following command displays input and output rates, input errors, CRC, frames, overruns, underruns, collisions, interface resets. High input errors in the CMTS retrieved from this query suggest noisy upstream. In older versions of the chassis, loose midplane and line card screws caused a similar problem:
  ```
  show interface slot/downstream-port
  ```

- The following command displays upstream packet discards, errors, error-free packets, correctable and uncorrectable errors, noise, and micro-reflection statistics.
  ```
  show interface slot/downstream-port upstream
  ```