ASCENT Communication Technology

C3000 D3
DOSCIS 3.0
CMTS

User Guide

Revision C

ACT 1RU C3000 DOSCIS 3.0 CMTS User Guide

ACT Document Number: C3000 CMTS UG Revision C

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Revision History

Revision	Date	Reason for Change
A	08/01/2013	Initial Release
B	05/02/2014	Section Updates
C	10/30/2020	Section Updates

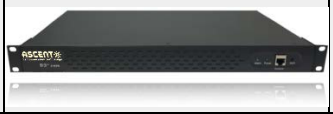
Packaging Instructions

Thank you for buying and using the D3-C cable modem termination system (CMTS) equipment series developed and manufactured by Ascent Communication Technology Co., Ltd. In order to ensure your equipment works steadily for a long life cycle, please read this user guide before using.

Warning: In the process of equipment operation, it is strictly forbidden to plug the coaxial cable of the CMTS equipment. Otherwise, the user itself shall be liable for the caused equipment damages.

- Complete Packaging List of this Device

When you open the packaging carton of the CMTS equipment, please confirm your CMTS equipment is complete and intact. If there is any appearance defect or parts shortage, please contact your distributor as soon as possible.

No.	Name	Content Description	Photo	Quantity
1	Device	C3000 CMTS		1
2	Power cable			1
3	Twisted pair cable			1
4	Serial port cable	RJ45-RS232		1

About This Guide

This guide describes how to install, configure, operate, and troubleshoot the Ascent D3-C series CMTS in a DOCSIS®-based cable environment.

Audience

This manual is intended for cable service providers and system integrators. Users of this guide must be familiar with the following:

Basic packet forwarding/switching protocols, including Ethernet bridging and TCP/IP.
Hybrid fiber/coax (HFC) cable networks for cable deployment.

Conventions

This guide uses multiple fonts and symbols to distinguish the interface display text and user selection and input text:

Highlights	**Description**	**Use Case**
Boldface	Commands and key words are typed in boldface word by word.	**D3**>exit
Italic	The parameters to be replaced by the actual values as indicated in the command	Ping *[IP address]*
Brackets	Parameters in CLI command: the parameters included in square brackets [] are the optional parameters, and the ones contained in braces {} are essential parameters.	Ping *[IP address]*
IP Address	IP address: the IP address is entered in the format of dotted decimal notation.	192.168.0.254
Mac Address	MAC address is Hexadecimal value, separated by ":" or ".".	00:a0:73:1e:3f:89
Tab	Automatic command completion	

Convention		**Usage**
	**Note**	A **Note** provides additional information that might be helpful or overlooked.
	**Caution**	A **Caution** alerts you to a situation that requires extra attention, to avoid injury to yourself or the equipment.
	**Warning**	A **Warning** alerts you to the presence of dangerous voltage.

Related Documentation

For further information about DOCSIS®, please refer to www.cablelabs.com. This site provides technical specifications to public, including:

- Radio Frequency Interface (RFI) Specification

  This specification defines how data is transmitted over cable.

- Operations Support System Interface (OSSI) Specification

  This specification defines how DOCSIS® components can be managed by cable operators.

- Baseline Privacy Interface (BPI) Specification

  This specification defines data transmission encryption.

- Computer to Modem Communications Interface (CMCI) Specification.

  This specification defines PC/cable modem communications

Contents

Chapter 1 About C3000

1.1 Summary

The C3000 is an indoor 1U chassis device in the D3-C series CMTS. It is specially designed for applications deployed in the front-end equipment room and has high coverage efficiency.

It provides high bandwidth internet access with high QOS control capability. It is designed to provide video services that require low latency and high throughput, such as IPTV and VOD, under heavy internet access requirements.

The C3000 has 1GE/10GE SFP/SFP+ optical ports and RJ45 electrical port. It has a built-in DHCP/ TFTP/TOD server, no additional accessory equipment, easy installation, simple configuration, and high cost performance.

1.2 About D3-C Series

The D3-C series are the third generation of Ascent DOCSIS 3.0 CMTS platform. There are various product forms build for indoor, outdoor (D-node), mini front-end and modular type to meet various deployment scenarios.

Compared with its predecessor, the D3-C series are equipped with the latest MAC/PHY chips and an upgrade, more powerful Broadcom multi-core network processor. D3-C series have doubled the data rate, while maintaining all features from its predecessor. It can support 1000 cable modems online simultaneously. Bundled with 32 QAM channels for downstream (sharing one RF port), the data rate can reach up to 2Gbps. The downstream can be easily configured. It also supports multicast capabilities.

Bundled with 8 QPSK/QAM channels for upstream (sharing one RF port), the data rate can reach up to 320Mbps. It also provides the upstream spectrum analysis function.

D3-C can run in L3 or L2 mode. It has perfect QoS mechanism, built-in DHCP/TFTP/ToD servers, supports DHCP relay, and supports IPv6. It can be adapted to varieties of operation environment for different requirements.

There are three ways to manage the D3-C series: 1) Login through Telnet on the local machine with command line (CLI) for configuration management; 2) Embedded Web mode which can be remotely connected; 3) Network management software based on SNMP protocol which supports network management software from third parties.

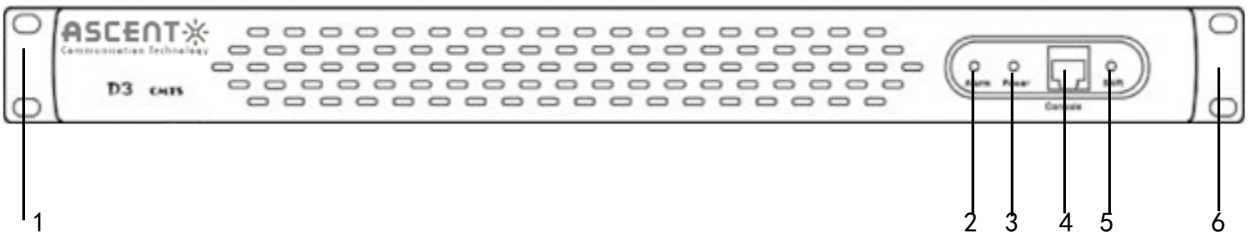
D3-C series are compatible with DOCSIS 3.0/2.0 standard cable modems, as well as cable modem built-in the set-top box, EMTA and other terminal equipment.

1.3 Features

- Compliant with DOCSIS3.0/Euro-DOCSIS3.0/C-DOCSIS standards.
- DS ×32, it can be easily configured to 64/256/1024QAM modulation mode with a maximum data rate of 2Gbps@1024QAM.
- US ×8, it can be easily configured to QPSK/3~8 order QAM modulation mode, with the maximum a data rate of 320Mbps@256QAM.The number of channel bundles can be easily changed to facilitate the operator's planning and utilization of frequency resources.
- Maximum 1000 cable modems simultaneous online.
- Supports layer 3 routing, static route, policy route, VLAN, L2VPN, ACL etc.
- Built-in DHCP/TFTP/TOD server, supports for DHCP relay, and multiple subnet subnets under CPE. Option 82/60 is supported.
- Both US and DS channels can achieve load balancing based on CM quantity (static) or traffic (dynamic) to ensure effective utilization of bandwidth resources.
- Supports IPv6, multicast, remote-query, Flap (DOCSIS signal quality jitters diagnosis), etc.
- The US/DS service classifiers are used to implement the service flow-based QoS mechanism to ensure the bandwidth and delay requirements of various services.
- Security: Support BPI+, CM authentication, anti-DOS attack, user isolation, IP source address check, and more.
- Upstream channel spectrum analysis.
- Three ways to manage: CLI, embedded web, SNMP.
- Support remote management and software upgrades.
- Suitable for deployment in remote sub-head-end, hotels, hospitals, etc.

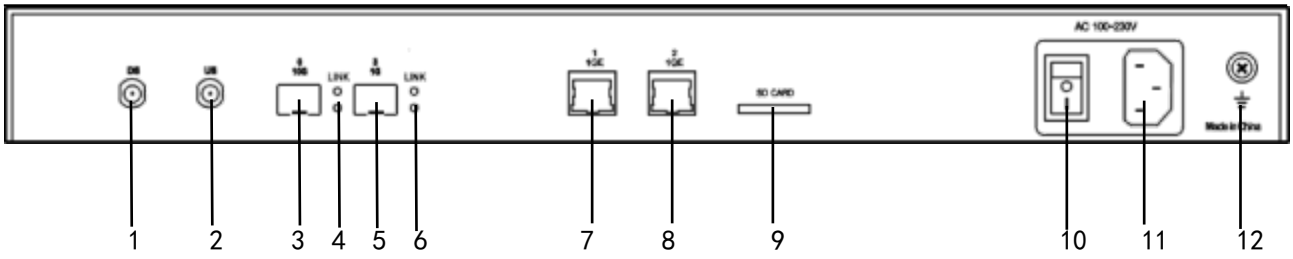
1.4 Device Appearance

1.4.1. Front Panel



1 Fixed bracket
2 Alarm LED
3 Power LED
4 Console port
5 Shift button (Serial port debugging switch)

1.4.2. Rear Panel



1	DS port	7	1000M Base -T
2	US port	8	1000M Base -T
3	10G SFP+	9	SD card
4	Link LED	10	Power Switch
5	1G SFP	11	Power supply socket
6	Link LED	12	GND

1.4.3. LED Displays

1.4.3.1. Power LED

ON: Power supply is in normal working condition.
OFF: Power supply is turn off.

1.4.3.2. Alarm LED

Blinking Slowly: means the CMTS is in internalization.
Blinking Fast: means alarm.

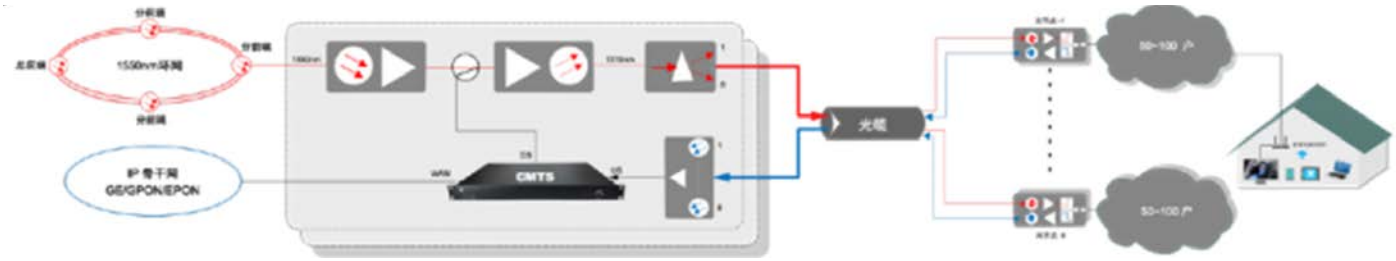
OFF: Off means normal.
ON: On for 3 seconds while powering up.

1.4.3.3. SFP LED

ON: Optical module is in normal working status.
The Red Light: Means the CMTS has detected SFP module.
The Green Light: Means SPF module is ready.

1.5 Application Scenario

1.5.1. In Headend



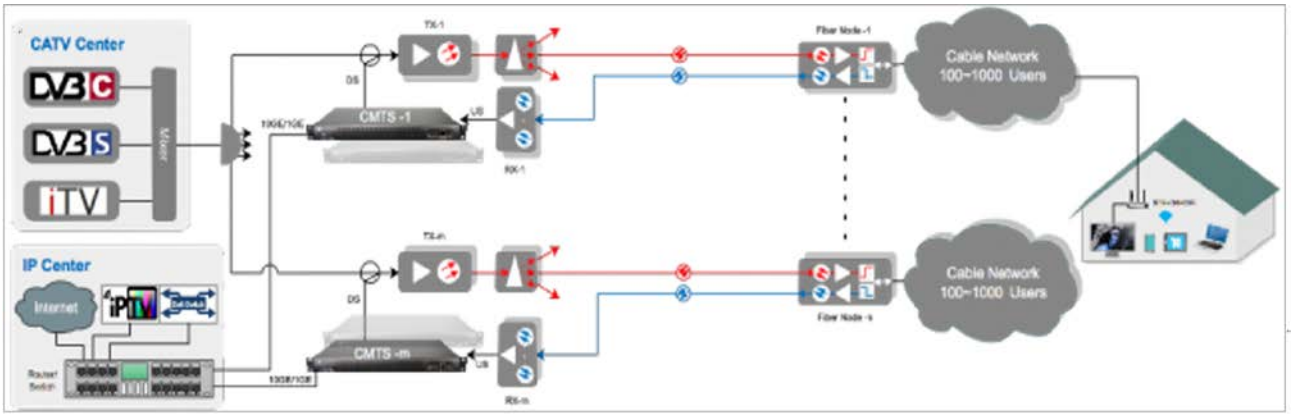
(1) Each optic transmitter(1310nm) will be connected to one CMTS , frequency resources can be reused.

(2) One CMTS can support up to 1000 terminals simultaneously, which roughly matches the number of TV users covered by one optical transmitter.

(3) Covers large number of end user with very low cost.

(4) Typical applications are in head-end of enterprises, hotels, hospitals, office buildings and resorts.

1.5.2. In Sub-headend



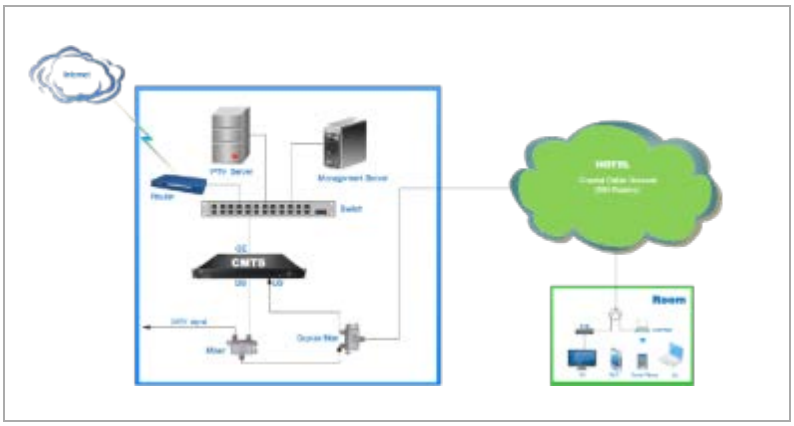
(1) Installed in the subheadend, each 1310nm optical transmitter corresponds to one CMTS, and the frequency resources can be reused.

(2) One CMTS supports up to 1000 terminals simultaneously, which roughly matches the number of TV users covered by one optical transmitter.

(3) Covers larger number of end user with very low cost and low risk. The original investment can be protected and utilized.

(4) It is recommended that the cable network between the fiber node and end user stay passive, try to use as few amplifiers as possible to simplify the network structure, hence it can be easily maintained.

1.5.3. In Hotel



(1) Utilize the hotel's original CATV system, no need for re-wiring and saving cost.

(2) High-speed transmission of internet access, VOD and other services can be realized while transmitting TV signals. (3) One CMTS can meet the needs of hotel applications with up to 500~1000 rooms.

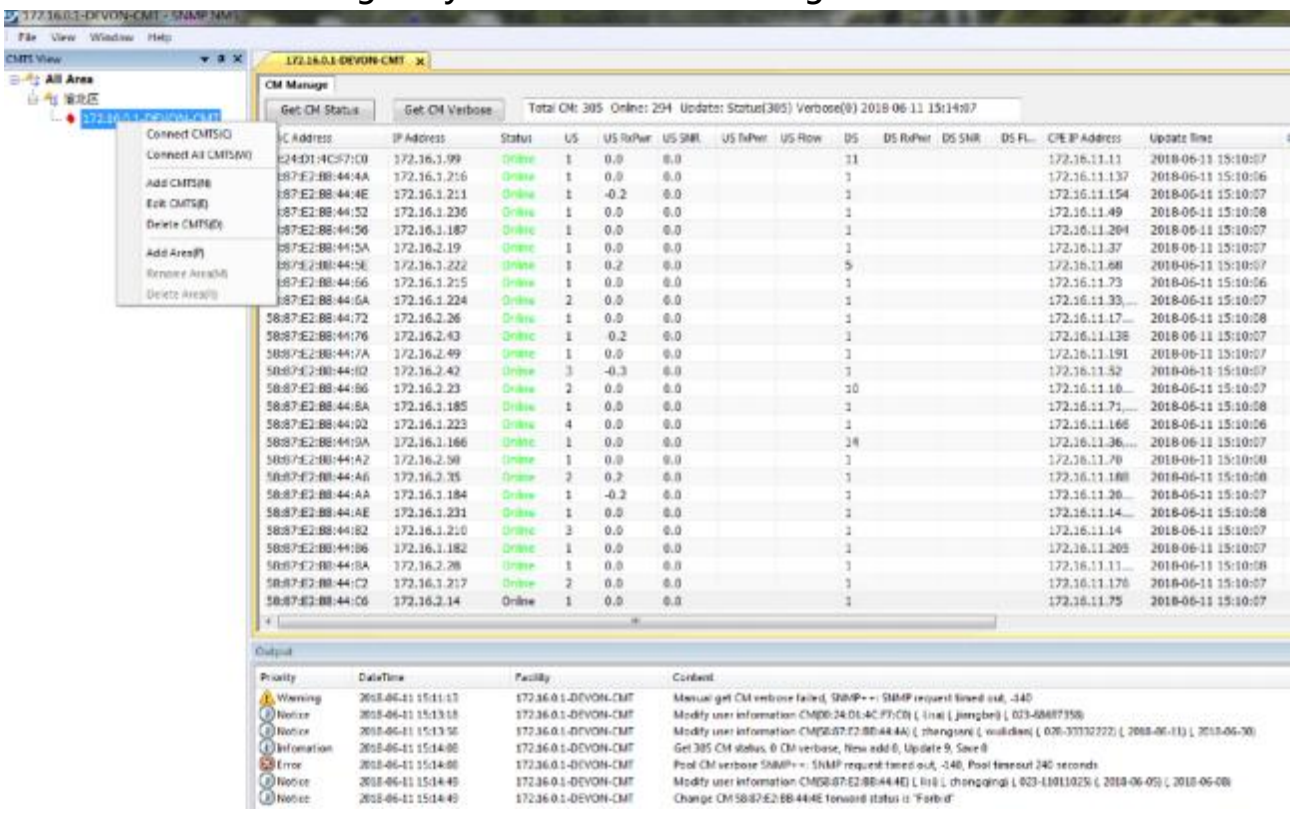
(3) One CMTS can meet the needs of hotel applications with up to 500~1000 rooms.

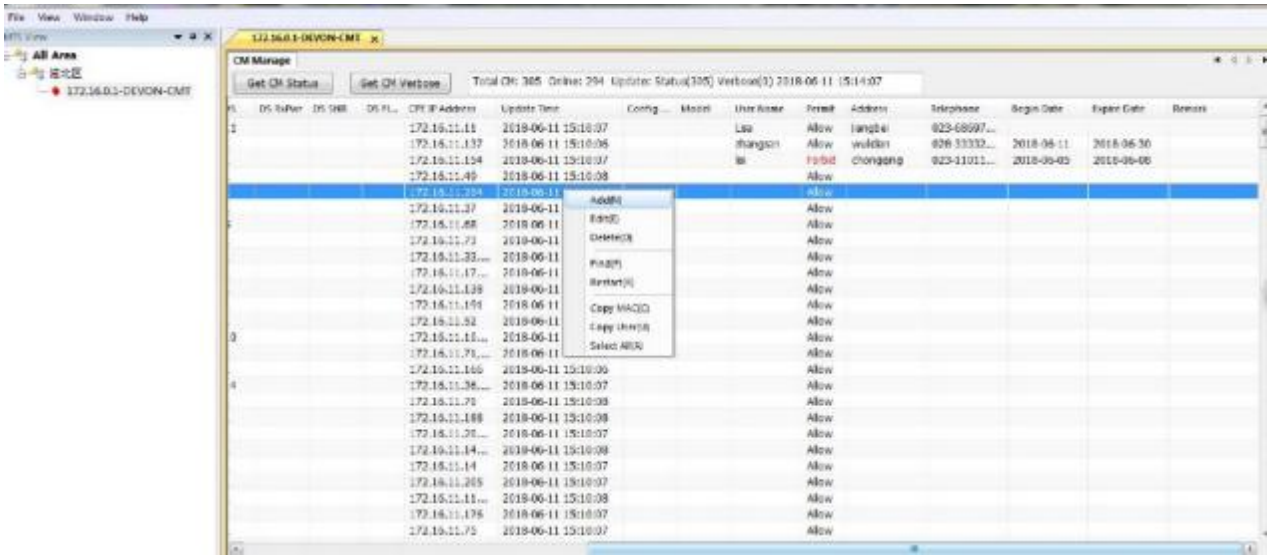
1.6 Configuration & management

1.6.1. Embedded Web

1.6.2. Login via Telnet and manage with CLI

1.6.3. Managed by SNMP Network Management Software





Chapter 2 Getting Started

2.1 Initial Knowledge of the product

2.1.1 Main Features

- Compliant with DOCSIS3.0; Compatible with DOCSIS3.1/3.0/2.0 CM.
- DS ×32, data rate up to 2Gbps; US × 10, data rate up to 400Mbps.
- Supports maximum 1000 cable modems online simultaneously.
- Supports L2/L3 mode, VLAN, L2VPN, ACL, IPv6, multicast, remote-query, Flap.
- Built-in DHCP/TFTP server, supports DHCP relay,
- Support dynamic and static Load balancing mechanic for both DS and US.
- Automatically updates configuration file.

2.1.2 Ports

Port	Description		Quantity
RF	DS	F type, Imperial	1
	US		1
WAN (Uplink)	Optical	10G: SFP+	1
		1G: SFP	1
	Electronical	1000M Base-T	2
Console	RJ-45		1

2.1.3 Management Modes

Management Mode	Description
CLI (Command Line Interface)	Console connected to the RS232 port of management PC
	Telnet connected through ethernet port
Embedded Web	Remote access the CMTS embedded web and directly operating in the UGI
NMS	SNMP-based NMS, available from third parties

2.1.4 Power Supply

AC 90~230V, 60/50Hz, Power consumption about 45W.

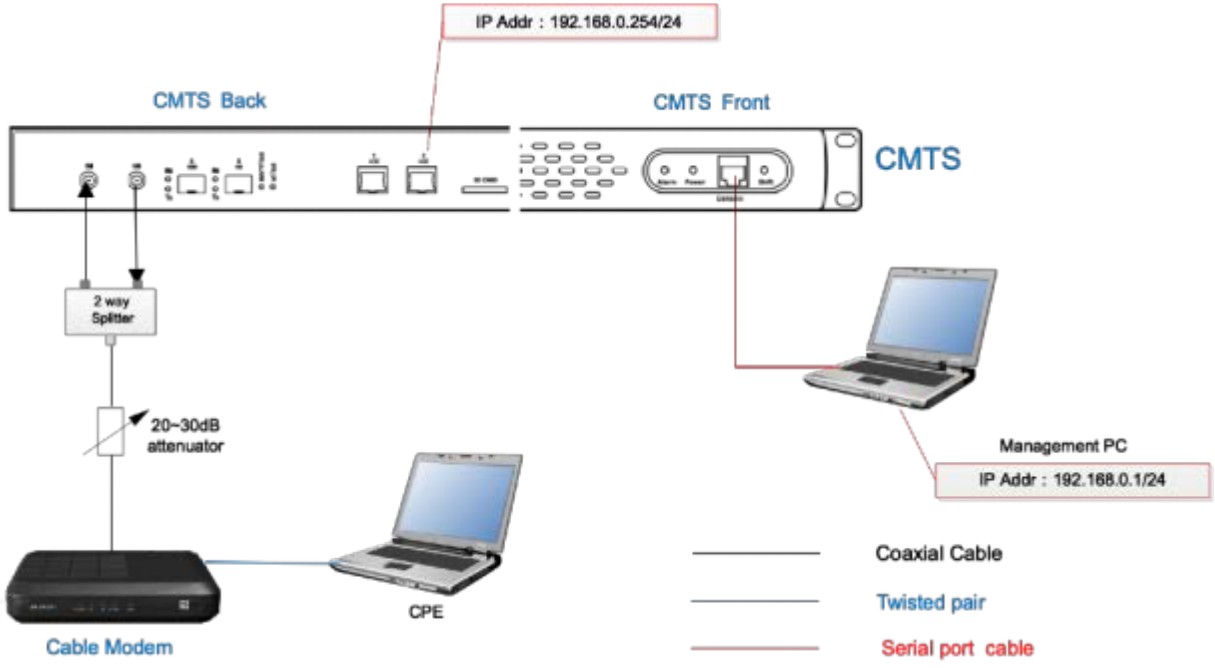
2.2 Testing the CMTS Device

Before connecting the device to the actual network, it is necessary to perform some simple tests on it.

Step 1 Preparation of related equipment and accessories

- PC *2, one for management, the other for CPE
- Cable modem *1
- 2 way splitter *1
- Attenuator 20~30dB
- Twisted pair cable *1
- Series port cable (RJ45-RS232) *1
- Coaxial cable with imperial F-type plug

Step 2 Connection Diagram



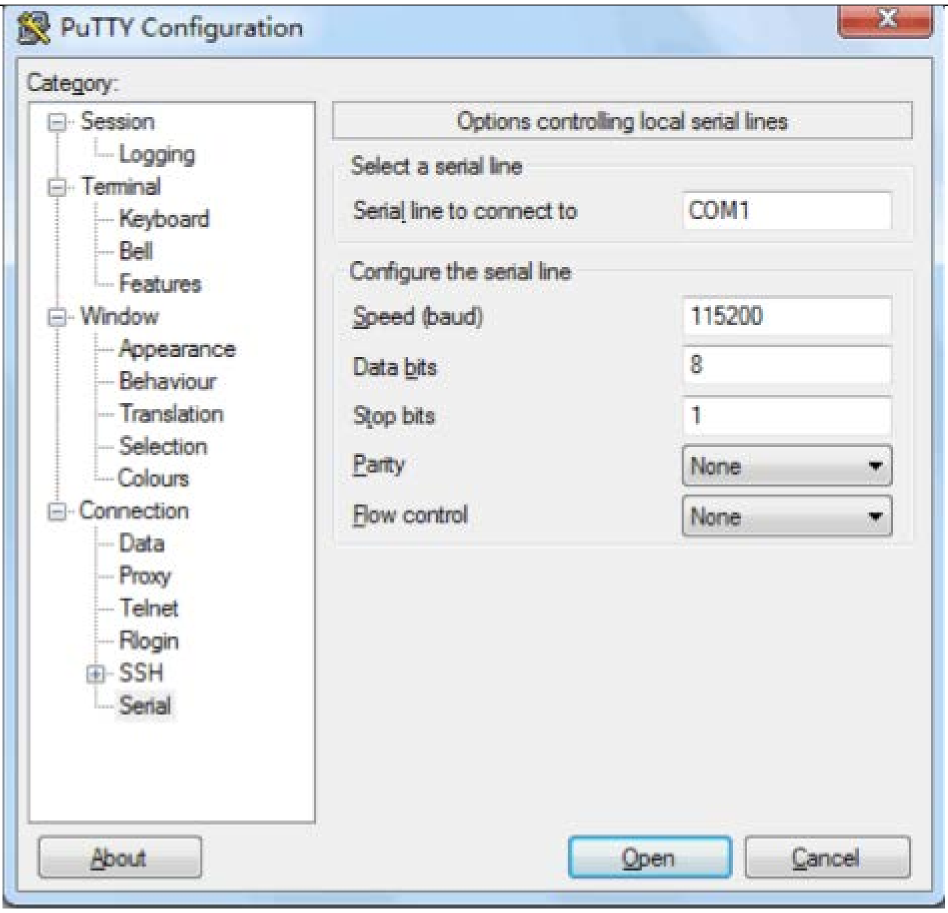
Step 3 Configure the Management PC

Turn on the power of all devices in the connection diagram. Configuration management PC serial port parameters.

Open the HyperTerminal of the management PC, with the configured parameters are below:

- Baud rate: 115200
- Data rate: 8bit
- Stop bits: 1
- Parity: none
- Flow control: none

Modify the IP address of management PC is 192.168.0.1/24.



Serial line to connect to: COM1

Speed (baud): 115200

Data bits: 8

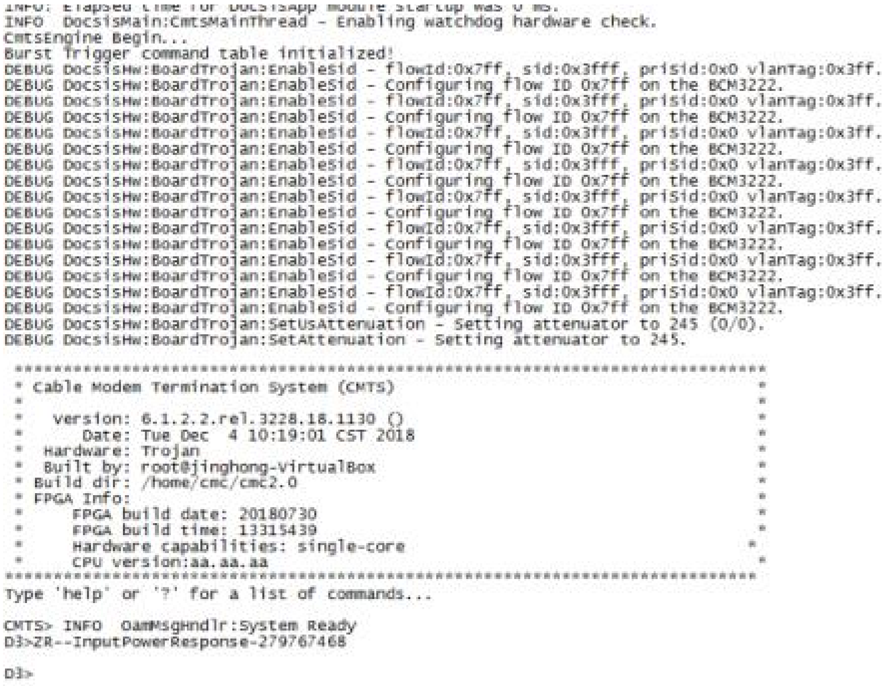
Stop bits: 1

Parity: None

Flow control: None

Step 4 Boot the CMTS device

Open the HyperTerminal of the management PC and start the CMTS device. When the PC screen displays “D3>”, it indicates that the device has completed the startup process. The startup process usually takes about 2 minutes.



```
INFO: Elapsed time for DocsisApp module startup was 0 ms.
INFO  DocsisMain:CmtsMainThread - Enabling watchdog hardware check.
CmtsEngine Begin...
Burst Trigger command table initialized!
DEBUG DocsisHw:BoardTrojan:EnableSid - flowId:0x7ff, sid:0x3fff, priSid:0x0 vlanTag:0x3ff.
DEBUG DocsisHw:BoardTrojan:EnableSid - Configuring flow ID 0x7ff on the BCM3222.
DEBUG DocsisHw:BoardTrojan:EnableSid - flowId:0x7ff, sid:0x3fff, priSid:0x0 vlanTag:0x3ff.
DEBUG DocsisHw:BoardTrojan:EnableSid - Configuring flow ID 0x7ff on the BCM3222.
DEBUG DocsisHw:BoardTrojan:EnableSid - flowId:0x7ff, sid:0x3fff, priSid:0x0 vlanTag:0x3ff.
DEBUG DocsisHw:BoardTrojan:EnableSid - Configuring flow ID 0x7ff on the BCM3222.
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DEBUG DocsisHw:BoardTrojan:EnableSid - Configuring flow ID 0x7ff on the BCM3222.
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DEBUG DocsisHw:BoardTrojan:EnableSid - Configuring flow ID 0x7ff on the BCM3222.
DEBUG DocsisHw:BoardTrojan:EnableSid - flowId:0x7ff, sid:0x3fff, priSid:0x0 vlanTag:0x3ff.
DEBUG DocsisHw:BoardTrojan:EnableSid - Configuring flow ID 0x7ff on the BCM3222.
DEBUG DocsisHw:BoardTrojan:EnableSid - flowId:0x7ff, sid:0x3fff, priSid:0x0 vlanTag:0x3ff.
DEBUG DocsisHw:BoardTrojan:EnableSid - Configuring flow ID 0x7ff on the BCM3222.
DEBUG DocsisHw:BoardTrojan:EnableSid - flowId:0x7ff, sid:0x3fff, priSid:0x0 vlanTag:0x3ff.
DEBUG DocsisHw:BoardTrojan:EnableSid - Configuring flow ID 0x7ff on the BCM3222.
DEBUG DocsisHw:BoardTrojan:SetUsAttenuation - Setting attenuator to 245 (0/0).
DEBUG DocsisHw:BoardTrojan:SetAttenuation - Setting attenuator to 245.

 ******************************************************************************
 * Cable Modem Termination System (CMTS)                                      *
 *                                                                            *
 *   version: 6.1.2.2.rel.3228.18.1130 ()                                     *
 *      Date: Tue Dec  4 10:19:01 CST 2018                                    *
 *  Hardware: Trojan                                                          *
 *  Built by: root@jinghong-VirtualBox                                        *
 * Build dir: /home/cmc/cmc2.0                                                *
 * FPGA Info:                                                                 *
 *     FPGA build date: 20180730                                              *
 *     FPGA build time: 13315439                                              *
 *     Hardware capabilities: single-core                                    *
 *     CPU version:aa.aa.aa                                                   *
******************************************************************************
Type 'help' or '?' for a list of commands...

CMTS> INFO  OamMsgHndlr:System Ready
D3>ZR--InputPowerResponse-279767468

D3>
```

Step 5 Check the Connectivity of the CMTS Network Port

Use the “ping” command on the HyperTerminal to check the network port connectivity of the CMTS. The default IP address of the CMTS is 192.168.0.254. The normal status as shown:

```
C:\WINDOWS\system32\cmd.exe
Microsoft Windows XP [版本 5.1.2600]
(C) 版权所有 1985-2001 Microsoft Corp.

C:\Documents and Settings\Administrator>

C:\Documents and Settings\Administrator>cd \

C:\>ping 192.168.0.254

Pinging 192.168.0.254 with 32 bytes of data:

Reply from 192.168.0.254: bytes=32 time=1ms TTL=128
Reply from 192.168.0.254: bytes=32 time<1ms TTL=128
Reply from 192.168.0.254: bytes=32 time<1ms TTL=128
Reply from 192.168.0.254: bytes=32 time<1ms TTL=128

Ping statistics for 192.168.0.254:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms

C:\>_
```

*Step 6 Configuring the IP Address of the External DHCP Server

- Configure the IP address of server-PC at 192.168.0.253/24
- Configure the scope option of DHCP server
- Start up the TFTP server and edit the configuration file of CM

**This step is optional, and the CMTS embedded server shall be used by default, which can be ignored. If it is necessary to use the external server, it shall be configured.)*

Step 7 Login CMTS

Confirm Step 5 is OK, CMD telnet 192.168.0.254. (or using console)

- User name: admin
- Password: admin

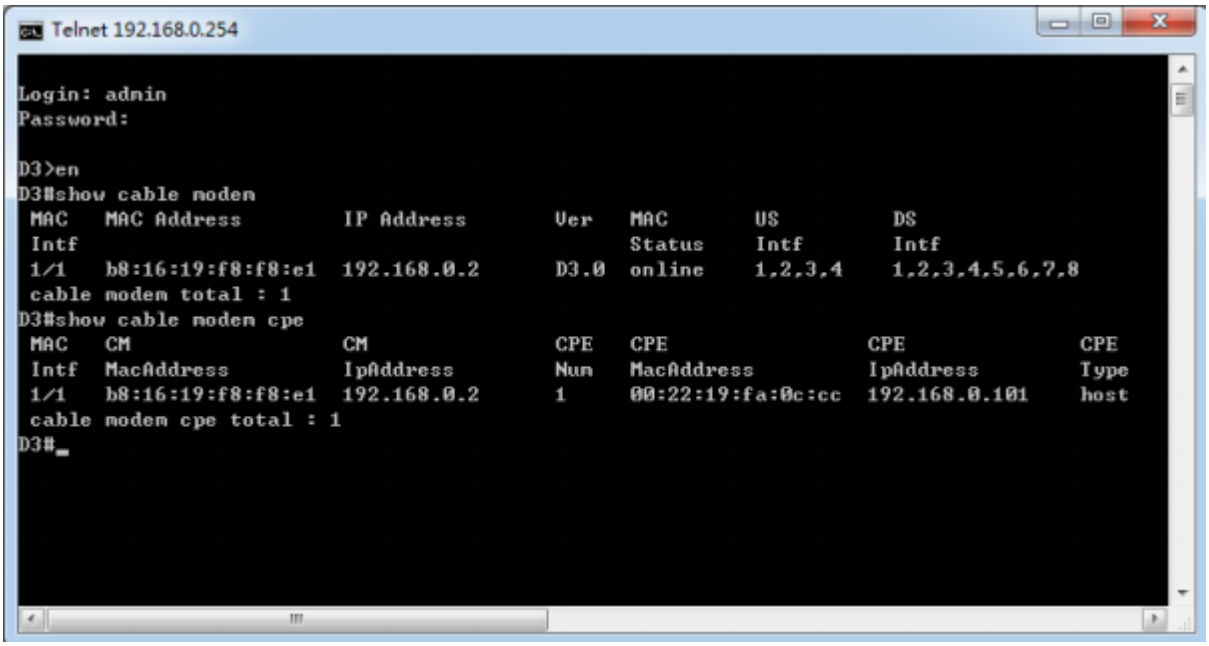
```
Telnet 192.168.0.254

Login: admin
Password:

D3>_
```

Step 8 Configure the Parameter of CM and CPE

The factory default configuration of CM and CPE can be normally accessed to the network.

• CM: 192.168.0.2~ 192.168.0.100
• CPE: 192.168.0.101~ 192.168.0.200

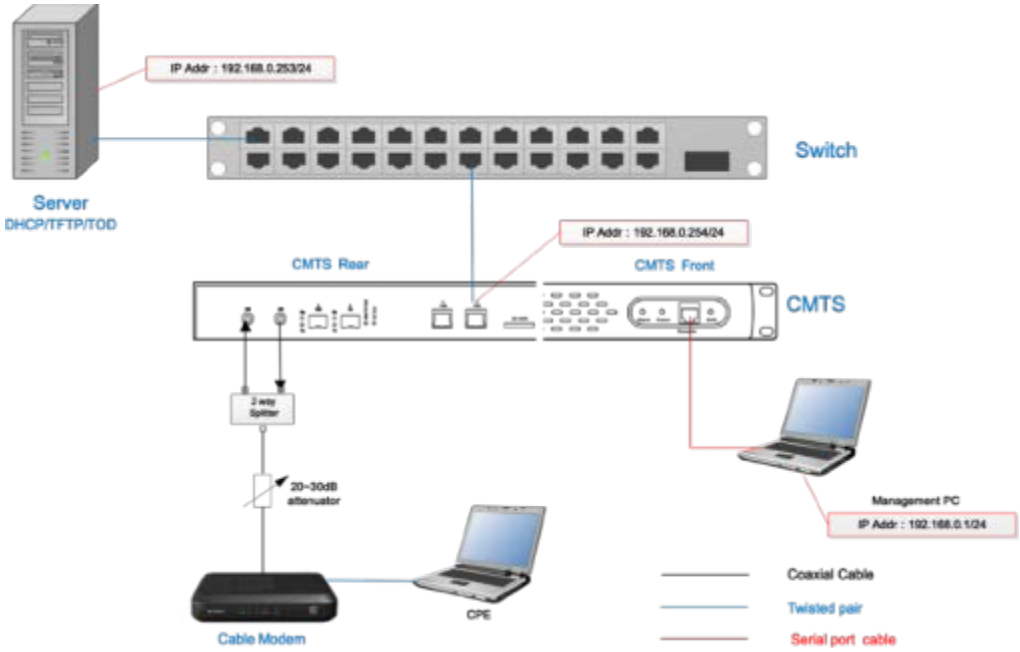
Use the "show" command to view the IP addresses assigned to the CM and CPE online, as shown below:



```
Telnet 192.168.0.254

Login: admin
Password:

D3>en
D3#show cable modem
 MAC    MAC Address        IP Address       Ver   MAC       US         DS
 Intf                                             Status    Intf       Intf
 1/1    b8:16:19:f8:f8:e1  192.168.0.2      D3.0  online    1,2,3,4    1,2,3,4,5,6,7,8
 cable modem total : 1
D3#show cable modem cpe
 MAC    CM                 CM               CPE   CPE                CPE              CPE
 Intf   MacAddress         IpAddress        Num   MacAddress         IpAddress        Type
 1/1    b8:16:19:f8:f8:e1  192.168.0.2      1     00:22:19:fa:0c:cc  192.168.0.101    host
 cable modem cpe total : 1
D3#_
```

*Step 9 Configure the External Server

Using an external server, verify Steps 6 is OK, modify CM/CPE DHCP server address to the external IP server through the command.



Note: the DHCP server can be configured with multiple IPs, and the terminal type can be designated, with the CMTS embedded server the priority. If it is necessary to use the external server,

the IP address of embedded DHCP server must be deleted first(See the IP-Bundle CLI Interpretation section).

2.2.1 Preparation of IP Network

It is required to prepare a 1000M Ethernet port for WAN interface of CMTS, either port or electrical port (RJ-45). Assign an IP address to CMTS.

2.2.2 Preparation of Server

DHCP/TFTP/NMS Server, etc.

2.2.3 Preparation for Power Supply Safety

The room or rack used for the CMTS installation must be grounded in line with national standards.

The AC power supply is 90~240V, 50/60Hz, and the supply connecting lines and sockets must be capable of withstanding the power higher than 150W.

2.2.4 Preparation of Cable, Connector and Connecting Cable

Connecting line	Description	Type of connector
Coaxial cable	SYWV-75-5, RG-59 or RG-6	Type F
Internet cable	Twisted-pair cable	RJ-45
Fiber optic jumper	Used in the optical fiber connection	SC/APC
Serial port line	Connect CMTS panel, Console Interface, RJ-45 Joint, Random distribution	RJ-45 Interface/RS232 plug

2.3 Installation of fixing device

Install CMTS equipment onto the rack that is well earthed, and fix it by screws firmly.

The grounding pile behind the C3000 must be connected to the grounding plate of the rack by the copper conductor.

Chapter 3 Getting Start

3.1 Preparing the Installation

3.1.1. Preparing HFC Network

3.1.1.1. Main Parameters

The HFC network must have the ability of bidirectional transmission. The return frequency range is 5~65MHz, or 5~42MHz, or 5~85MHz; and the forward frequency range is 88~860MHz (or 1000MHz), or 54~857MHz (or 1000MHz).

In the forward direction, before the signal gets into the optical transmitter, an interface shall be reserved for the entry of CMTS downstream signal. Through adjusting the downstream output level of CMTS, the digital television signal (QAM) at the mixed output port shall be consistent with the downstream signal level of CMTS. At the end (terminal) of the HFC transmission, the downstream signal level shall be within -15~+15dBmV (no higher than 30dBmV), carrier to noise ratio (C/N) shall be not less than 30.5dBc.

In the return path direction, the receiving level at the CMTS upstream port is 0dBmV by default. We recommend that the return path loss design should be between 30 and 40dB to ensure the signal and noise entering the CMTS upstream port is balanced.

The design, construction, debugging and maintenance of HFC bi-directional transmission network shall comply with the relevant industry technical standards, such as Technical Specifications of HFC Network Physical Upstream Transmission Path (GY/T 180 - 2001), Technical Specification of CATV Broadcasting System (GY/T 106-1999), etc.

3.1.1.2. Planning the Frequency

In the forward direction of HFC, the most basic requirement for CMTS to arrange the frequency is that the DS frequency must not overlap with the transmitted TV signal frequency. Since the C3000 downstream is bundled with 32 channels, 32 channels witch frequency consecutive should be planned. If you don't need to bundle so many channels, you can shutdown a part of those channels. Only the remaining channels are occupied by the CMTS, and those shutdown channels can be scheduled for other uses.

The frequency range of the HFC return patch is 5~65/85MHz. We strongly recommend that the entire upstream spectrum be tested and analyzed before the return signal is connected to the CMTS to observe the return noise and interference signal distribution. To set the US frequency of the CMTS, it should be avoided those bands where the noise interference signal amplitude is higher to ensure that the US transmission has a high CNR. Under normal circumstances, frequencies below 20MHz are more severely affected by short- wave signals, especially at night. Therefore, we recommend not to set the US frequency below 20MHz.

3.1.2. Preparing IP Network

It is required to prepare a 1GbE or 10GbE Ethernet port for uplink interface of CMTS, either SFP/SFP+ optical port or electrical port (1000M Base-T). Assign an IP address to the CMTS.

3.1.3. Preparing the Server

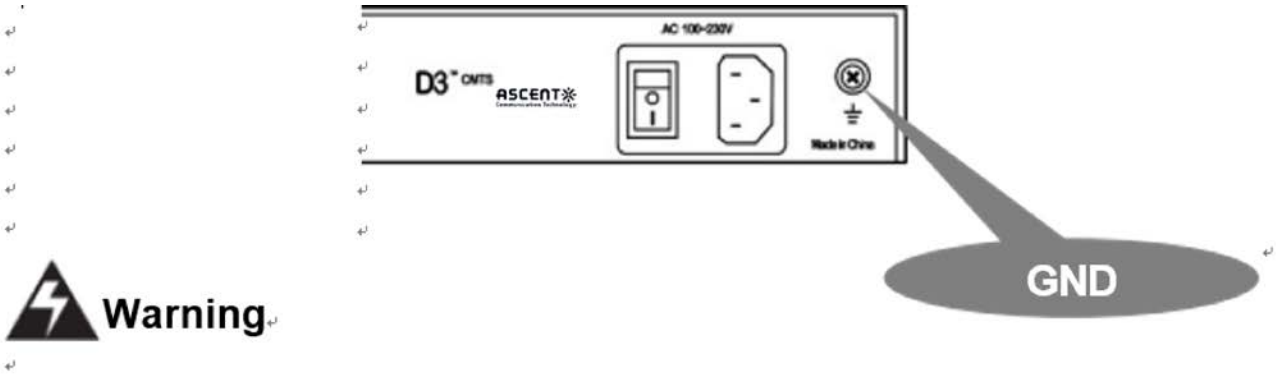
The CMTS has a built-in DHCP/TFTP server that can be used in small-scale network environments without additional equipment. Of course, it can also be configured to run in an external server mode in a large-scale network environment.

3.1.4. Get Ready for Connecting Cable

Connecting Cable	Description	Type of Connector
Coaxial cable	SYWV-75-5, RG-59 or RG-6	Type F
Twisted-pair cable		RJ-45
Fiber optic jumper	Used in the optical fiber connection	SC/APC
Serial port cable	Used for debugging and testing	RS232-RJ45

3.2 Mounting the CMTS

Mounting CMTS device onto the rack that is well earthed, and fix it by screws firmly. The grounding pile behind the C3000 must be connected to the grounding plate of the rack by the copper conductor.



3.3 Access to Network

After the testing and finishing relevant configurations of CMTS parameters, the CMTS can be accessed to the actual network. There are two types of access ports:

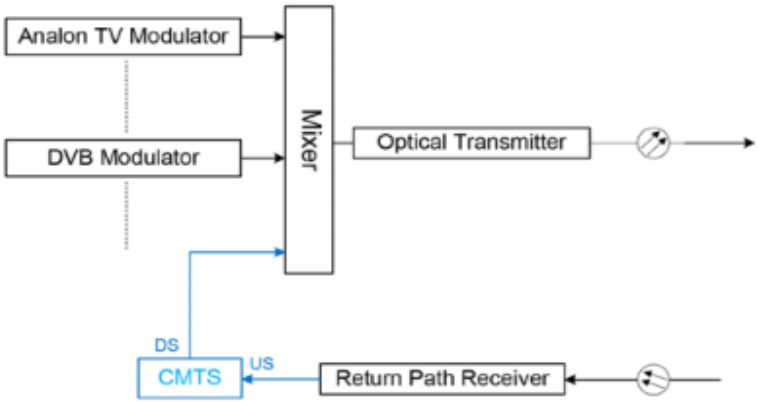
The RF port: connecting to the HFC network.

IP network ports: connecting to the uplink-bridge (include SFP/SFP+/GE).

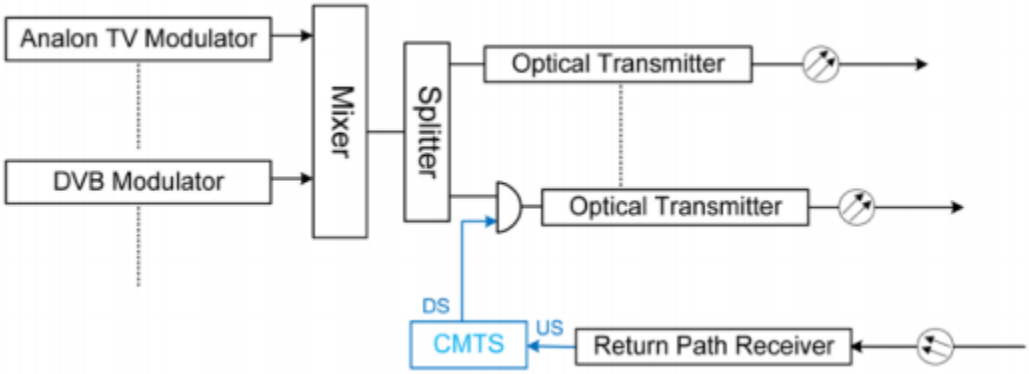
3.3.1. Connecting to the HFC Network

According to the different CMTS installation locations, there are several access methods as follows:

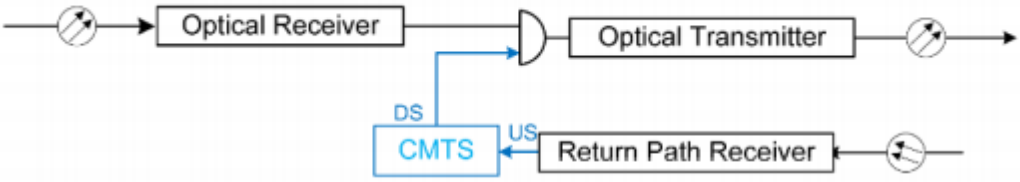
3.3.1.1 In Headend of Small-scale HFC



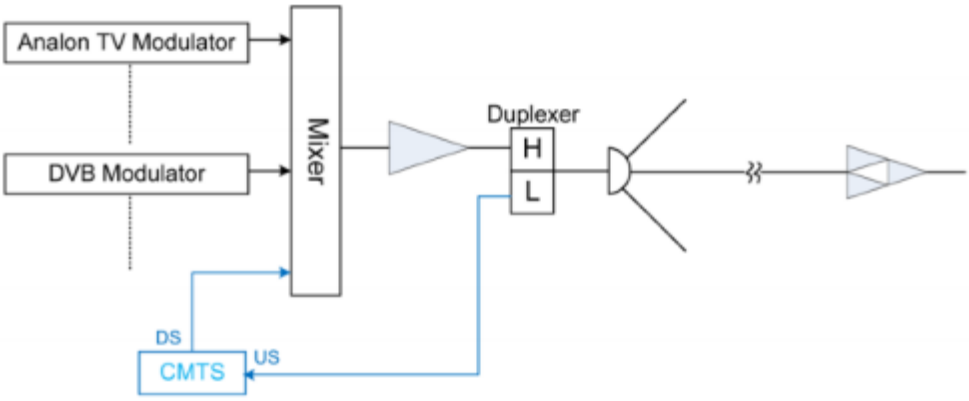
3.3.1.2 In Headend of Large-scale HFC



3.3.1.3 In CATV Sub-Headend room



3.3.1.4 In Pure Coaxial Cable Network (For example, hotels, hospitals, etc.)



3.3.2. Connecting to the IP Network

There are four WAN ports of C3000, SPF /SFP+/2*GBE port, Corresponding to SFP Gigabit, SFP+ 10G, 2 Gigabit GE and can be flexibly chosen according to the type of IP network port available in the room. The default port is GBE, and SFP optical transceiver module shall be purchased by the customer separately according to the actual needs.

Chapter 4 Managing CMTS with CLI

4.1 Summary

4.1.1 About the CLI Operation Grades

The D3 Series CMTS offers three levels of operation, including **view** mode, **Privileged** mode and **super admin** mode. All configurations can only be set at the super admin mode. The view mode can only be used for operation viewing. By the command "enable", it can be switched to Privileged mode, which needs to be confirmed by password. By the CLI, the setting of the CMTS network parameters, RF parameters and Ascent's unique functions can be completed, and the information about the system operation, CM and CPE can be checked.

4.1.2 How to Use CLI

4.1.2.1 Conventions

Convention	Description
Boldface	Commands and key words are typed in boldface word by word.
[ ]	A parameter enclosed in [square] brackets is optional.
{key1|key2|....}	Alternative, mutually exclusive, key words are grouped in braces and separated by vertical bars.
< >	In commands, indicate a paremeter to be replaced with an actual value.
String	A nonquoted set of charaters. Do not use quotation marks around the string or the string will include the quotation marks.
MAC Address	MAC address is Hexadecimal value, separated by ":" or ".", such as xx.xx.xx.xx.xx.xx yy:yy:yy:yy:yy:yy aaaa.bbbb.cccc
IP Address	the IP address is typed in the format of dotted decimal notation, eg.192.168.0.1.
Tab	Automatically command key word completion and prompt next suboption.

4.1.2.2 Quickly View the System Version

Connect the console port and configure its parameters, the default baud rate of console port is 115200, 8, N, 1. Activate the CMTS system.

Use the "show version" command to view the system firmware version, the system hardware version and the current running configuration parameters.

4.2 Managing CMTS with CLI

Ascent CMTS can be managed and configured via Command Line Interface (CLI).

First, login CMTS via telnet, ssh, serial port.

4.2.1 Entering the Privileged EXEC Mode

Mode Privileged EXEC mode

Description Three operation level modes are supported by Ascent CMTS:

View mode / **Privileged EXEC** mode / **supper admin** mode

When operator login the CMTS, it defaults in view mode, only supports system checking and debugging. By entering the Privileged EXEC mode or supper admin mode, users can set the CMTS system configurations. Passwords are required when access Privileged EXEC mode. The factory default password is "admin".

Command	**enable**
Syntax	enable
Parameter	
Example	Enters the Privileged EXEC mode with password, under "D3>" prompt D3>**enable** password:**admin** D3#

4.2.2 Exiting to Lower Level Mode

Mode All modes

Description Use the **exit/quit** command to a lower level mode.

Command	**exit/quit**
Syntax	exit
Parameter	
Example	Exit Privileged EXEC mode under "D3#" prompt. D3#**exit** D3>

4.2.3 Modifying Privileged EXEC Mode Password

Mode Privileged EXEC mode

Description To modify the Privileged EXEC mode access password in Privileged EXEC mode, it is required to verify the current password first. The Privileged EXEC mode password is system shared secret among all the users.

Command	**Password**
Syntax	password

Parameter	
Example	Modify Privileged EXEC mode access password in Privileged EXEC mode by entering the current password first. D3#**password** Current Password:****** New Password:***** Confirm Password:*****

4.2.4 Setting CMTS Host Name

Mode Privileged EXEC mode

Description The CMTS host name is not only acted as the command line interface prompt, but also as the user host name when sending loggings to logging server.

Command	**hostname**	
Syntax	hostname <*string*>	
Parameter	<string>	New host name
Example	Modifies CMTS host name in Privileged EXEC mode. D3# **hostname***Ascent-cmts* Ascent-cmts#	

4.2.5 Command Alias

Mode Privileged EXEC mode

Description Use user-defined short string to replace complete command string.

Command	**alias**	
Syntax	[**no**] alias <*string1*> <*string2*>	
Parameter	<string1>	Command alias, indicates user-defined string.
	<string2>	The actual executed complete command.
Example 1	Define alias “scm” to replace complete command show cable modem . D3#**alias** *scm* **show cable modem** D3#**scm** MAC Intf MAC Address IP Address Ver MAC Status US Intf DS Intf Prim Sid Num CPEs BPI Enb On/Off Time 1/1 78:96:84:f9:2a:1c 0.0.0.0 N/A init(d) 1 4 1 0 N 1-1 0:1	
Example 2	Delete user-defined alias scm D3#**no alias** *scm*	

4.2.6 Configuring CMTS Uplink-bridge

Mode Privileged EXEC mode

Description Ascent CMTS generally has several physical uplink ports:

SFP(GE3). SFP+(GE0),GE-1. GE-2. The default 4 ports are on the uplink-bridge.

• GE3: SFP

• GE0: SFP+

• GE1: 1000M Base-T

• GE2: 1000M Base-T

Under the uplink-bridge interface, the IP address, ACL rules bonding, VLAN and VLAN-bundles can be configured.

Execute the following commands to configure the bridge

gige	Binds GIGE port to bridge
ip address	Sets bridge interface IP address
access-rule	Applies ACL rules to bridge
vlan	Applies VLAN to bridge
vlan-bundle	Applies VLAN-bundles to bridge
ip-mgt-vlan	Sets nework management IP address VLAN

4.2.6.1 Interface Uplink-bridge

Command 1	**interface uplink-bridge**	
Description	Create, enter and remove a uplink-bridge. Please note that the default bridge 0 can not be removed.	
Syntax	[**no**] interface uplink-bridge <num>	
Parameter	<num>	Bridge number range is 0 to 3, and the default bridge is 0.
Example1	Enter or create a uplink-bridge 0. D3(config)# **interface uplink-bridge 0** D3(config-if-uplink-br 0)#	
Example2	Remove bridge 1. D3(config-if-uplink-br 1)# **no interface uplink-bridge 1** D3(config)#	

4.2.6.2 Gige

Command 2	**gige**	
Description	Use the **gige** command to bind a GIGE port to a bridge.	
Syntax	gige <0-7>|<0,1,2,...>	
Parameter	<0-7>|<0,1,2,...>	GIGE port number, the number range can be referred on panel labels. Multiple ports can be assigned to a same bridge, the ports can be indicated by a range “-”, or by "," for individual ports.
Example1	Bind gige 0 to bridge 0. D3(config-if-uplink-br 0)# **gige 0**	
Example2	Bind ports of gige 0,1,2 to bridge 0. D3(config-if-uplink-br 0)# **gige 0-2**	

4.2.6.3 IP Address

Command 3	**ip address**	
Description	Use the **ip address** command to manually set the bridge IP address, or automatically obtain IP address from DHCP server and specific VLAN (optional) in this process.	
Syntax	[**no**] ip address {<ip_address><ip_mask> [secondary]|dhcp [vlan <num>]}	
Parameter	<ip_address>	Manually sets IP address.
	<ip_mask>	Manually sets IP address mask.
	[secondary]	[secondary]
	dhcp	dhcp
	[vlan <num>]	Automatically obtains specific VLAN, which is optional.
	<num>	Indicates VLAN ID, its available range is 2 to 4095.
Example1	Set IP address 192.168.0.254/24. D3(config-if-uplink-br 0)#**ip address 192.168.0.254 255.255.255.0**	
Example2	Set IP address 192.168.1.254/24 as secondary address. D3(config-if-uplink-br 0)#**ip address 192.168.1.254 255.255.255.0 secondary**	
Example3	Set automatically obtaining IP address. D3(config-if-uplink-br 0)# **ip address dhcp**	
Example4	Set automatically obtaining IP address and specify vlan 100. D3(config-if-uplink-br 0)# **ip address dhcp vlan 100**	
Example5	Remove IP address assignment 192.168.0.254/24. D3(config-if-uplink-br 0)#**no ip address 192.168.0.254 255.255.255.0**	

4.2.6.4 Access-rule

Command 4	**access-rule**	
Description	Use the **access-rule** command to cancel or apply one ACL rule to bridge.	
Syntax	[**no**] access-rule <num>	
Parameter	<num> Indicates ACL rule ID	Indicates ACL rule ID
Example1	Apply rule ACL1 to bridge 0. D3(config-if-uplink-br 0)# **access-rule 1**	
Example2	Cancel rule ACL1 to bridge 0. D3(config-if-uplink-br 0)# **no access-rule 1**	

4.2.6.5 VLAN

Command 5	**vlan**	
Description	Use the **vlan** command to cancel or apply one vlan or vlan range to bridge, the VLAN range is separated by“-”.	
Syntax	[**no**] vlan <2-4095>	
Parameter	<2-4095>	Indicates VLAN ID, VLAN range is separated by“-”

Example1	Apply vlan ID 100 to bridge 0. D3(config-if-uplink-br 0)# **vlan 100**
Example2	Apply vlan range 200-300 to bridge 0. D3(config-if-uplink-br 0)# **vlan 200-300**
Example3	Cancel vlan range 200-300 to bridge 0. D3(config-if-uplink-br 0)#**no vlan 200-300**

4.2.6.6 VLAN-Bundle

Command 6	**vlan-bundle**	
Description	Use the **VLAN-bundle** command to enable or disable VLAN-bundle, cancel or apply one VLAN-bundle to bridge.	
Syntax	[**no**] vlan-bundle {enable|<num>}	
Parameter	enable	Enables VLAN-bundle
	<num>	Indicates vlan-bundle ID, legal range is 0 to 10
Example1	Enable vlan-bundle. D3(config-if-uplink-br 0)# **vlan-bundle enable**	
Example2	Disable vlan-bundle. D3(config-if-uplink-br 0)# **no vlan-bundle enable**	
Example3	Apply vlan-bundle 1 to bridge 0. D3(config-if-uplink-br 0)# **vlan-bundle 1**	
Example4	Cancel applying vlan-bundle 1 to bridge 0. D3(config-if-uplink-br 0)# **no vlan-bundle 1**	

4.2.6.7 IP-mgt-VLAN

Command 7	**ip-mgt-vlan**	
Description	Use the **ip-mgt-vlan** command to cancel or set management IPVLAN, this Vlan is used to manage users' network and its IP should either be a bridge interface address or an subnet interface address of IP-Bundle.	
Syntax	[no] ip-mgt-vlan <num> <ip_address>	
Parameter	<num>	Indicates VLAN ID, whose range is 2~4095.
	<ip_address>	Indicates management IP address
Example1	Set management IP 192.168.0.254 VLAN 200. D3(config-if-uplink-br 0)# **ip-mgt-vlan 200 192.168.0.254**	
Example2	Cancel management IP 192.168.0.254 VLAN 200. D3(config-if-uplink-br 0)# **no ip-mgt-vlan 200 192.168.0.254**	

4.2.6.8 Show Interface Uplink-bridge

Command 8	**show interface uplink-bridge**

Description	Use the **show interface uplink-bridge** command to list bridge configuration and specified bridge statistics.	
Syntax	show interface uplink-bridge [<num>] [statistics]	
Parameter	[<num>]	Optional, indicates bridge ID, All bridges will be listed by default.
	[statistics]	Indicates list bridge interface statistics.

Example1	List bridge 0 configuration.
	D3> **show interface uplink-bridge 0**
	`interface uplink-bridge 0`
	` gige 0`
	` mac address a6:6c:62:32:1d:62`
	` vlan-bundle enable`
	` ip address 192.168.0.251 255.255.255.0`
	` ip address 192.168.18.250 255.255.255.0 secondary`
	` vlan 3450`
	` vlan 3451`
	` vlan 3452`
	` vlan 3453`
	` vlan-bundle 1`
	` vlan-bundle 2`
	` vlan-bundle 3`
	` access-rule 1`
	` access-rule 2`
	` access-rule 3`	

Example2	List bridge 0 interface statistics.
	D3> **show interface uplink-bridge 0 statistics**
	`uplink-bridge : 0`
	`Gige : 0`
	`Mac address : a6:6c:62:32:1d:62`
	`Link status : 1000M`
	`TX packets : 325`
	`TX bytes : 176495`
	`TX errors : 0`
	`TX dropped : 0`
	`RX packets : 64505`
	`RX bytes : 65033745`
	`RX muticast : 4646`
	`RX length errors : 0`
	`RX fifo errors : 0`
	`RX crc errors : 0`
	`RX dropped : 0`
	`Collisions : 0`	

4.2.7 Configuring CMTS MAC Domain

Mode Privileged EXEC mode

Description Each MAC domain is fixed bonded with 8 upstream channels and 32 downstream channels, and the channels cannot be split.

Commands available in a MAC domain interface:

cable alias	Sets MAC domain alias
cable baseline privacy	Enables or disables baseline privacy
cable downstream	Sets downstream channel parameter
cable upstream	Sets upstream channel parameter
cable load-balance	Sets channel load balancing parameter
access-rule	Applies ACL rule to MAC domain
data-backoff	Sets upstream data-backoff
maplead	Sets upstream MAP lead interval
mini-slot-size	Sets upstream channel mini-slot size

ranging-backoff	Sets upstream ranging-backoff
uplink-bridge	Binds MAC domain to specified bridge
ip bundle	Applies IP-bundle to MAC domain
cable ip-provisioning-mode	Sets cable modem IP mode
cable modem	Sets CM parameter
cable cm-status max-event-holdoff	Sets CM status hold off time
mdd interval	Sest MAC domain MDD interval

4.2.7.1 Interface DOCSIS-MAC

Command 1	**interface docsis-mac**	
Description	Use the **interface docsis-mac** command to enter or create a DOCSIS MAC domain.	
Syntax	interface docsis-mac <x/y>	
Parameter	<x/y>	x indicates slot ID, y indicates RF module ID. For outdoor type and 1U chassis type, it's 1/1 by default. For high-density type and Remote-MAC model, refer to the labels on the rear panel.
Example	Enter or create a DOCSIS MAC domain 1/1 D3(config)# **interface docsis-mac 1/1** D3 (config-if-docsis-mac 1/1)#	

4.2.7.2 Cable Alias

Command 2	**cable alias**	
Description	Use the **cable alias** command to remove or set MAC domain alias.	
Syntax	[**no**] cable alias <string>	
Parameter	<string>	Indicates MAC domain alias.
Example1	Set DOCSIS MAC domain 1/1 alias Ascent-cmc D3 (config-if-docsis-mac 1/1)# **cable alias***Ascent-cmc*	
Example2	Remove DOCSIS MAC domain 1/1 alias D3(config-if-docsis-mac 1/1)# **no cable alias**	

4.2.7.3 Cable Baseline Privacy

Command 3	**cable baseline privacy**
Description	Use the **cable baseline privacy** command to enable or disable baseline privacy.
Syntax	[**no**] cable baseline privacy
Parameter	
Example1	Enable baseline privacy. D3 (config-if-docsis-mac 1/1)# **cable baseline privacy**
Example2	Disable baseline privacy. D3(config-if-docsis-mac 1/1)# **no cable baseline privacy**

4.2.7.4 Cable Downstream Parameter

Command 4	**cable downstream**				
Description	Use the **cable downstream** command to configure downstream parameters.				
Syntax	cable downstream <1-32|1,2,3...> {key } {value}				
Parameter	{key}{ value}	{key}	Explain	{ value}	Explain
		annex	DS standard	A	C-DOCSI Euro-DOCSIS
				B	N.A- DOCSIS
		frequency	Central frequency	<num>	88~1002MHz
		status	Channel status	docsis	Enables data channel
				shutdown	Disables channel
		modulation	Modulation mode	QAM64	
				QAM256	
				QAM1024	
		interleaver	Interleave depth	0~14	I128-1~I1-128
		power-level	DS Output level	<num>	20~60 dBmV
Example1	Set all downstream Annex in Euro DOCSIS. D3 (config-if-docsis-mac 1/1)# **cable downstream 0 annex a**				
Example2	Set all channel frequency starting from 387Mhz and increasing by 8Mhz. D3(config-if-docsis-mac 1/1)# **cable downstream 0 frequency 387000**				
Example3	Disable downstream 9-16. D3 (config-if-docsis-mac 1/1)# **cable downstream 9-16 status shutdown**				
Example4	Set downstream channels of 2,5,7 output level 40dBmV D3 (config-if-docsis-mac 1/1)# cable downstream 2,5,7 power-level 40 Note: The configured MAC domain downstream parameters won't be effective immediately, you would also need the **application** command to activate specified MAC domain downstream parameters. (Refer to "Application Command" for more details)				

4.2.7.5 Cable Upstream Parameter

Command 5	**cable upstream**
Description	Use the **cable upstream** command to set upstream parameters.
Syntax	cable upstream <1-10|1,2,3...> {key } {value}

Parameter	<1-10|1,2,3...>	Indicates upstream channel ID, whose range is indicated by "-", specified channels are separated by",". A range and specified channels cannot be shown at the same time. 0 indicates all channels.When the channel ID is 0, the channel frequency increases by its start frequency according to channel bandwidth.	
	{key}{ value}	{key}	{ value}
		bandwidth	Indicates channel bandwidth, allowable values are 200,400,800,1600,3200,6400KHz.
		frequency	Channel frequency range is 5~ 65MHz.
		docsis-30-enhanced - mode	docsis 3.0 enhanced mode
		profile	Indicates channel modaulation
		power-level	Channel input level range is -13 to 23 dB
		status	Indicates channel status.
		spectrum-rule	Indicate channel spectrum rule. Users can specify dynamic hopping rules.
		type	Indicate channel types, such as ATDMA, SCDMA.
Example1	Set all upstream bandwidth 3.2Mhz D3 (config-if-docsis-mac 1/1)# **cable upstream 0 bandwidth 3200**		
Example2	Set upstream start frequency 30Mhz, increase with channel bandwidth. D3(config-if-docsis-mac 1/1)# **cable upstream 0 frequency 30000**		
Example3	Disable upstream channel 3, 4. D3(config-if-docsis-mac 1/1)# **cable upstream 3,4 status disable** Note: The configured MAC domain upstream parameters won't be effective immediately, You would also need the **application** command to activate specified MAC domain downstream parameters. (Refer to "Application Command "for more details)		

4.2.7.6 Cable IP-provisioning-mode

Command 6	**cable ip-provisioning-mode**	
Description	Use the **cable ip-provisioning-mode** command to set cable modem IP mode	
Syntax	cable ip-provisioning-mode {apm|dpm|ipv4|ipv6}	
Parameter	apm	Indicates alternative mode (IPV4 or IPV6)
	dpm	Indicates Double IP mode (support both IPV4 and IPV6)
	ipv4	Indicates IPV4 mode, which is the default IP mode.
	ipv6	Indicates IPV6 mode.
Example	Set CM IP mode in DPM mode D3 (config-if-docsis-mac 1/1)# **cable ip-provisioning-mode dpm**	

4.2.7.7 Data-backoff

Command 7	data-backoff	
Description	Set upstream data back-off.	
Syntax	data-backoff <num1> <num2>	
Parameter	<num1>	Indicates data-backoff start, the range is 0 to15
	<num2>	Indicates data-backoff end, the range is 0 to15
Example	Set upstream data-backoff start in 2, end in 10 D3 (config-if-docsis-mac 1/1)# **data-backoff 2 10**	

4.2.7.8 Ranging-backoff

Command 8	ranging-backoff	
Description	Use the **ranging-backoff** command to set upstream ranging back-off.	
Syntax	ranging-backoff <num1> <num2>	
Parameter	<num1>	Indicates ranging-backoff start, the range is 0 to 15.
	<num2>	Indicates ranging-backoff end, the range is 0 to15.
Example	Set upstream ranging-backoff start in 3, end in 8. D3 (config-if-docsis-mac 1/1)# **data-backoff 3 8**	

4.2.7.9 Mapled

Command 9	maplead	
Description	Use the **maplead** command to set upstream bandwidth assignment MAP lead time. This parameter will influence upstream bandwidth assignment and dispatch, so be aware of this modification!	
Syntax	maplead <num>	
Parameter	<num>	Indicates maplead time, its range is 0 to 30 millisecond.
Example	Set upstream banwidth assignment maplead time 10 millisecons. D3 (config-if-docsis-mac 1/1)# **maplead 10**	

4.2.7.10 Mini-slot-size

Command 10	mini-slot-size	
Description	Use the **mini-slot-size** command to set upstream min-slot size. This parameter will influence upstream bandwidth assignment and dispatch, so be aware of this modification!	
Syntax	mini-slot-size <num>	
Parameter	<num>	Indicates min-slot size, its range is 0 to 512.
Example	Set upstream min-slot size 32 D3 (config-if-docsis-mac 1/1)# **mini-slot-size 32**	

4.2.7.11 Uplink-bridge

Command 11	uplink-bridge

Description	Use the **uplink-bridge** command to set the current MAC domain uplink interface, and bind a bridge. Device with single bridge will be bond to bridge 0 by default.	
Syntax	uplink-bridge <num>	
Parameter	<num>	Indicates bridge ID, not GIGE port.
Example	Set bridge 0 as the uplink interface of MAC 1/1. D3 (config-if-docsis-mac 1/1)# **uplink-bridge 0**	

4.2.7.12 IP Bundle

Command 12	**ip bundle**	
Description	Use the **ip bundle** command to cancel or apply IP bundle to a MAC domain.	
Syntax	[**no**] ip bundle <num>|<x.y>	
Parameter	<num>|<x.y>	Indicates IP-Bundle ID.
Example1	Apply IP bundle 1 to MAC 1/1. D3 (config-if-docsis-mac 1/1)# **ip bundle 1**	
Example2	Cancel IP-Bundle 1 to MAC 1/1. D3 (config-if-docsis-mac 1/1)# **no ip bundle 1**	

4.2.7.13 Cable modem maximum-number

Command 13	**cable modem maximum-number**	
Description	Use the **cable modem maximum-number** command to set the maximum number of cable modems of a MAC domain.	
Syntax	cable modem maximum-number <num>	
Parameter	<num>	Indicates maximum number of cable modems, legal value is from 1 to 500.
Example	Set MAC domain 1/1 CM maximum number 200 D3 (config-if-docsis-mac 1/1)# **cable modem maximum-number 200**	

4.2.7.14 Cable modem next-scan-frequency

Command 14	**cable modem next-scan-frequency**	
Description	Specify CM next downstream scan frequency when the CM number exceeds the threshold of current MAC domain.	
Syntax	cable modem next-scan-frequency <num>	
Parameter	<num>	Indicates downstream frequency, legal range is 88000 to 1002000 KHz
Example	Specify the next downstream scan frequency 387000Khz, when the CM number exceeds the threshold of the current MAC domain. D3 (config-if-docsis-mac 1/1)# **cable modem next-scan-frequency 387000**	

4.2.7.15 Cable cm-status max-event-holdoff

Command 15	**cable cm-status max-event-holdoff**
Description	Use the **cable cm-status max-event-holdoff** command to set MAC domain CM status holdoff time, each unit is in 20 milliseconds. The legal value is from 1 to 65535(Refer to "docsis3.0 standard 6.4.28.11 CM-STATUS Event Control" for more

	details).	
Syntax	cable cm-status max-event-holdoff <num>	
Parameter	<num>	Legal range is 1 to 65535
Example	Set MAC domain CM status holdoff time 1 second (1 second=20 milliseconds * 50 units) D3 (config-if-docsis-mac 1/1)# **cable cm-status max-event-holdoff 50**	

4.2.7.16 Mdd Interval

Command 16	**mdd interval**	
Description	Use the **mdd interval** command to set MAC domain MDD interval.	
Syntax	mdd interval <num>	
Parameter	<num>	Legal values range is from 500 to 2000 ms. 1500 ms by default.
Example	Set MAC domain MDD interval value is 1000 ms. D3 (config-if-docsis-mac 1/1)# **mdd interval 1000**	

4.2.7.17 Application

Command 17	**application**	
Description	Use the **application** command to apply MAC domain upstream and downstream configurations.	
Syntax	application docsis-mac <X/Y> { downstream-config| upstream-config }	
Parameter	<X/Y>	x indicates slot ID, y indicates RF module ID. For outdoor type and 1U chassis type, it's 1/1 by default. For high-density type and Remote-MAC model, refer to the labels on the rear panel.
	downstream-config	Applies downstream configuration,takes effect immediately
	upstream-config	Applies upstream configuration, takes effect immediately
Example1	Apply MAC 1/1 downstream configuration. D3 (config)# **application docsis-mac 1/1 downstream-config**	
Example2	Apply MAC 1/1 upstream configuration. D3 (config)# **application docsis-mac 1/1 upstream-config**	

4.2.8 Load Balancing

Mode Privileged EXEC mode

Description Each MAC domain holds a separated load balancing configuration. There are two methods to perform load balancing: static load balancing intended to keep Minimum bandwidth, and dynamic load balancing based on channel utilization. By default, the CMTS performs dynamic load balancing method.

During the initialization, CMTS equally distributes CM to register to activated upstream and downstream channels. Once the channel utilization reaches specified threshold, CMTS performs dynamic load balancing operations.

By checking assignment and thresholds utilization on channels periodically, and means of DCC and DBC, the CMTS moves CM channels refer to channel utilization, instead of balancing bandwidth in data transmitting.

As CMTS supporting load balancing group configuration, it allows specified upstream, downstream and CMs to be assigned to balancing groups, to realize load balancing based on CM types. Users need to enter a specific MAC domain to configure MAC domain load balancing in Privileged EXEC mode.

To perform load balancing configuration command by entering specific MAC address interface first:

cable load-balance {key}{value}	Sets load balancing thresholds and groups

Example

Enter MAC domain 1/1

D3(config)# interface docsis-mac 1/1

D3 (config-if-docsis-mac 1/1)#

4.2.8.1 Cable Load-balance Difference

Command 1	**cable load-balance difference**	
Description	Use the **cable load-balance difference** command to set essential condition to trigger dynamic load balancing--the utilization difference threshold.	
Syntax	cable load-balance difference <num>	
Parameter	<num>	Indicates channel utilization difference thresholds by percentage: 1 to 100.
Example	Set dynamic load balancing utilization difference threshold percentage 30%. D3 (config-if-docsis-mac 1/1)# **cable load-balance difference 30**	

4.2.8.2 Cable Load-balance Overload

Command 2	**cable load-balance overload**	
Description	Use the **cable load-balance overload** command to set essential condition to trigger dynamic load balancing--channel utilization threshold.	
Syntax	cable load-balance overload<num>	
Parameter	<num>	Indicates channel utilization threshold by percentage: 1 to 100.
Example	Set dynamic load balancing utilization threshold percentage 70%. D3 (config-if-docsis-mac 1/1)# **cable load-balance overload 70**	

4.2.8.3 Cable Load-balance Method

Command 3	cable load-balance method
Description	Use **cable load-balance method** to enable or disable load balancing, or set load balancing method in a MAC domain.
Syntax	cable load-balance method { disable| dynamic| static}
Parameter	disable Indicates disables load balancing feature dynamic Indicates dynamic load balancing by channel utilization. static Indicates static load balancing based on CM in Minimun bandwidth.
Example	Set load-balance method dynamic. D3 (config-if-docsis-mac 1/1)# **cable load-balance method dynamic**

4.2.8.9 Cable Load-balance Hold-time

Command 4	cable load-balance hold-time	
Description	Use the **cable load-balance hold-time** command to set a same CM's minimum hold time for twice load balancing.	
Syntax	cable load-balance hold-time <num>	
Parameter	<num>	Indicates hold time, the legal range is 60s to 3600s
Example	Set CM laod balancing hold time 120s. D3 (config-if-docsis-mac 1/1)# **cable load-balance hold-time 120**	

4.2.8.5 Cable-balance Modem-move-number

Command 5	cable load-balance modem-move-number	
Description	Use the **cable load-balance modem-move-number** command to set the maximum CM number to be moved in one load-balance hold-time	
Syntax	cable load-balance modem-move-number <num>	
Parameter	<num>	Indicates CM number, the legal range is 1 to 128.
Example	Set the maximum CM number to be moved in one load-balance hold-time 24 D3 (config-if-docsis-mac 1/1)# **cable load-balance modem-move-number 24**	

4.2.8.6 Cable Load-balance Period

Command 6	cable load-balance period	
Description	Use the **cable load-balance period** command to set load balance checking period.	
Syntax	cable load-balance period <num>	
Parameter	<num>	Indicates load balancing checking period, the legal range is 60s to 3600s
Example	Set load balancing period 120s. D3 (config-if-docsis-mac 1/1)# **cable load-balance period 120**	

4.2.8.7 Cable Load-balance Ranging-override

Command 7	cable load-balance ranging-override
Description	Use the **cable load-balance ranging-override** command to enable or disable ranging override.

Syntax	cable load-balance ranging-override { enable|disable }	
Parameter	{ enable|disable }	Enables or disables ranging-override. When enabled,CMs will register among different channels based on the ranging response priority.
Example	Enable ranging-override. D3 (config-if-docsis-mac 1/1)# **cable load-balance ranging-override enable**	

4.2.8.8 Cable Load-balance Init-tech

Command 8	**cable load-balance init-tech**	
Description	Use the **cable load-balance init-tech** command to set DBC/DCC initialization technology mode.	
Syntax	cable load-balance init-tech { dcc-atdma | dcc-scdma | dbc-atdma | dbc-scdma } { broadcast-ranging | direct | period-ranging | reinitialize-mac | unicast-ranging }	
Parameter	dcc-atdma	Indicates use DCC in ATDMA mode
	dcc- scdma	Indicates use DCC in SCDMA mode
	dbc-atdma	Indicates use DBC in ATDMA mode
	dbc- scdma	Indicates use DBC in SCDMA mode
	broadcast-ranging	Indicates broadcast initialization technology (init-tech 1)
	direct	Directly moves to new channel(init-tech 4) only in ATDMA mode
	period-ranging	Indicates periodically ranging (init-tech 2)
	reinitialize-mac	Indicates reinitialize MAC(init-tech 0)
	unicast-ranging	Indicates unicast ranging (init-tech 3)
Example	Configure DCC directly move to new channel in ATDMA mode D3 (config-if-docsis-mac 1/1)# **cable load-balance init-tech dcc-atdma direct**	

4.2.8.9 Cable Load-balance Exclude Modem

Command 9	**cable load-balance exclude modem**	
Description	Use the **cable load-balance exclude modem** command to cancel or set exclude modems from load balance control.	
Syntax	[**no**] cable load-balance exclude modem { mac-oui <oui_address> | range-macs <mac_address> <mac_address> | single-mac <mac_address> }	
Parameter	mac-oui <oui_address>range-macs	Excludes CMs with specific MAC address or MAC OUI address

	<mac_address> <mac_address>	Excludes CM MAC range, start MAC address and end MAC address.
	single-mac <mac_address>	Excludes single CM MAC address
Example1	Set exclude CMs with MAC OUI address of 11:22:33.from load balancing. D3 (config-if-docsis-mac 1/1)# **cable load-balance exclude modem mac-oui 11:22:33**	
Example2	Cancel exclude CMs with MAC OUI address of 11:22:33. from load balancing. D3 (config-if-docsis-mac 1/1)# **no cable load-balance exclude modem mac-oui 11:22:33**	

4.2.8.10 Cable Load-balance Group

Command 10	**cable load-balance group**	
Description	Use the "cable load-balance group" command to remove or create a load-balance group	
Syntax	[no] cable load-balance group <num>	
Parameter	<num>	Indicates load-balance group ID, legal range is 1 to 255
Example1	Create load-balance group1, the prompt turns into form of x/y.z , z indicates load-balance group ID. D3 (config-if-docsis-mac 1/1)# **cable load-balance group 1** D3 (config-if-docsis-mac 1/1.1)#	
Example2	Remove load-balance group1. D3 (config-if-docsis-mac 1/1)# **no cable load-balance group 1** **The following parameters can be set in load-balance group configuration interface:**	
	downstream	Removes or adds a downstream channel to load-balance group
	upstream	Removes or adds a upstream channel to load-balance group
	cable-modem	Removes or adds a CM to load-balance group
	method	Sets load balancing mode for a load-balance group

4.2.8.11 Downstream

Command 11	**downstream**	
Description	Use the **downstream** command to remove or add a downstream channel to load-balance group	
Syntax	[**no**] downstream <1-32>|<1,2,3,...>	
Parameter	<1-32>|<1,2,3,...>	Indicates downstream channel ID, to assign a channel range by"-", specific channels separated by ",". A channel range and specific channels cannot be assigned at the same time.
Example1	Add downstream channels 1,2,3 to load-balance group D3 (config-if-docsis-mac 1/1.1)# **downstream 1-3**	
Example2	Remove downstream channel 2 from load-balance group D3 (config-if-docsis-mac 1/1.1)# **no downstream 2**	

4.2.8.12 Upstream

Command 12	upstream	
Description	Use the **upstream** command to remove or add upstream to load-balance group.	
Syntax	[**no**] upstream<1-10>|<1,2,3,...>	
Parameter	<1-10>| <1,2,3,...> .	Indicate downstream channel ID, to assign a channel range by"-", specific channels separated by ",". A channel range and specific channels cannot be assigned at the same time
Example1	Add upstream channel 1,2 to load-balance group D3 (config-if-docsis-mac 1/1.1)# **upstream 1,2**	
Example2	Remove upstream channel 2 from load-balance group D3 (config-if-docsis-mac 1/1.1)# **no upstream 2**	

4.2.8.13 Cable-modem

Command 13	cable-modem	
Description	Use the **cable-modem** command to remove or add CM to load-balance group	
Syntax	[**no**] cable-modem{ mac-oui <oui_address>|range-macs <mac_address> <mac_address>| single-mac <mac_address>}	
Parameter	mac-oui <oui_address>	Excludes CMs with specified MAC address or MAC OUI address
	range-macs <mac_address> <mac_address>	Excludes a CM MAC range, start MAC address and end MAC address
	single-mac <mac_address>	Excludes an single CM MAC address
Example1	Add single CM MAC address 11:22:33:44:55:66 to load-balance group D3 (config-if-docsis-mac 1/1.1)# **cable-modem single-mac 11:22:33:44:55:66**	
Example2	Remove CM MAC address OUI 11:22:33 from load-balance group D3 (config-if-docsis-mac 1/1.1)# **no cable-modem mac-oui 11:22:33** The configured MAC domain load-balance parameters takes effective immediately by default. You can use the **application** command to activate specified MAC load-balance parameters. (Refer to "Application Command "for more details)	

4.2.8.14 Application

Command 14	application	
Description	Use the **application** command to apply given load-balance parameters in specified MAC domain	
Syntax	application docsis-mac <X/Y> load-balance {config|group <num> config |exclude- modem config}	
	<X/Y>	x indicates slot ID, y indicates RF module ID. For outdoor type and 1U chassis type the default value is 1/1. For high density type and Remote-MAC type, refer to the labels on the rear panel.

Parameter	config	Applies all load-balance configurations including dynamic load-balance parameters, load-balance groups, excluded cable modems in load-balance group
	group <num> config	Applies specified load-balance group configurations. <num>indicates group ID.
	exclude-modem config	Applies excluded cable modem configurations in load- balance group
Example1	Apply all load-balance configurations to MAC domain 1/1 D3(config)#**application docsis-mac 1/1 load-balance config**	
Example2	Apply specified load-balance group1 configurations to MAC domain 1/1 D3(config)# **application docsis-mac 1/1 load-balance group 1 config**	
Example3	Apply given excluded cable modem configurations in load-balance group to MAC domain 1/1 D3(config)# **application docsis-mac 1/1 load-balance exclude-modem config**	

4.2.9 Configuring Upstream Dynamic Frequency Hopping Rules

Mode Privileged EXEC mode

Description Upstream channel spectrum management is supported by CMTS default. With pre-defined spectrum rules, signal quality of US channels can be adjusted dynamically. SNR, FEC threshold on US channels will be detected periodically to trigger frequency hopping, then a optimal destination frequency will be produced by real-time calculation on FFT. The dynamic adjustment of US channel frequency follows 3 priority modes, including adjustment of frequency, bandwidth and modulation. When signal quality fails, only one action of re-modulation or back-off will be performed by priority sequence.

The following commands can be performed in spectrum rule management interface:

action	Sets frequency hopping action priority
channel-width	Sets upstream channel bandwidth adjustment range
correctable-fec	Sets correctable FEC threshold
frequency	Sets frequency hopping range
profile	Sets upstream SNR threshold and modulation mode
uncorrectable-fec	Set uncorrectable FEC threshold

4.2.9.1 Spectrum Rule

Command 1	**spectrum rule <num>**	
Description	Use the **spectrum rule** command to delete, create or enter a spectrum rule.	
Syntax	[**no**] spectrum rule <num>	
Parameter	<num>	Legal range is 1 to 40, Max.40 rules supported

Example1	Create spectrum rule 1 D3(config)# **spectrum rule 1** D3 (config-spec-rule 1)#
Example2	Delete spectrum rule 1 D3(config)#**no spectrum rule 1**

4.2.9.2 Ac0on

Command 2	**action**	
Description	Use the **action** command to set frequency hopping mode priority. only one action of re- modulation or back-off will be performed by priority sequence and frequency hopping threshold. Three modes are available in any combinations.	
Syntax	action { channel-width| frequency| modulation}	
Parameter	{channel-width| frequency| modulation}	channel-width: priority in modulate channel bandwidth frequency: priority in modulate channel frequency modulation: priority in modulate channel modulation
Example	Set mode priority as frequency, bandwidth and modulation, so that CMTS will optimize the channel by: adjusting frequency to optimal frequency in the first period; Decreasing channel bandwidth based on the current bandwidth and frequency hopping bandwidth in the second period, in case the first period adjustment failed to get satisfied signal quality;Switching among modulation modes till all modes are run out, in case both first and second period adjustment failed to get satisfied signal quality. In any period, once the channel gets satisfied signal quality, and SNR is greater than the fall-back threshold (default value is + 3bd), CMTS will perform fall-back according to last action. D3 (config-spec-rule 1)#**action frequency channel-width modulation**	

4.2.9.3 Correctable-fec Threshold

Command 3	**correctable-fec threshold**	
Description	Use the **correctable-fec threshold** command to set frequency hopping FEC threshold-- channel data correction percentage. The CMTS will detect channel signal quality periodically. Once channel data correction percentage is greater than the threshold, frequency hopping will be triggered. This value is optional, effective when it is between 0 to 100.	
Syntax	correctable-fec threshold <num>	
Parameter	<num>	FEC Channel correction percentage range is 0 to 100.
Example	Set channel correctable threshold percentage 10%. D3 (config-spec-rule 1)#**correctable-fec threshold 10**	

4.2.9.4 Uncorrectable-fec Threshold

Command 4	**uncorrectable-fec threshold**

Description	Use the **uncorrectable-fec threshold** command to to set frequency hopping FEC threshold-- uncorrectable channel data percentage. The CMTS will detect channel signal quality periodically. Once channel data uncorrection percentage is greater than the threshold, frequency hopping will be triggered. This value is optional, effective when it is between 0 to 100.	
Syntax	uncorrectable-fec threshold <num>	
Parameter	<num>	FEC Channel uncorrectable data percentage rang is 0 to100.
Example	Set channel uncorrectable data percentage threshold 5%. D3 (config-spec-rule 1)# **uncorrectable -fec threshold 5**	

4.2.9.5 Channel-width

Command 5	**channel-width**	
Description	Use the **channel-width** command to set the channel width range adjusted by frequency hopping. By default, the CMTS adjusts channel from high bandwidth to low bandwidth, and the opposite goes for back-off action. When a channel width adjustment is triggered, the CMTS will calculate for bandwidth adjust feasibility based on the bandwidth, frequency of both current and adjacent channels. The channel bandwidth range is from 1.6Mhz to 6.4Mhz.	
Syntax	channel-width<num1> <num2>	
Parameter	<num1>	Indicates start channel width, it is usually the high bandwidth.
	<num2>	Indicates end channel width, it is usually the low bandwidth.
Example	Set channel bandwidth adjustment range from 3.2Mhz and 1.6Mhz D3 (config-spec-rule 1)# **channel-width 3200 1600**	

4.2.9.6 Frequency

Command 6	**frequency**	
Description	Use the **frequency** command to set adjustable frequency band range. If it is set as an single frequency, the CMTS will regards it as one frequency band. Multiple frequency bands can be set for CMTS to select a optimal one based on FFT calculation.	
Syntax	frequency {band <num1> <num2>|<num>}	
Parameter	Band <num1> <num2>	Sets a frequency band range, num1 indicates the left frequency band edge, num2 indicates the right frequency band edge.
	<num>	Sets a specific frequency
Example1	Set one frequency band range from 35 to 45Mhz. D3 (config-spec-rule 1)# **frequency band 35000 45000**	
Example2	Set one specific frequency 55Mhz. D3 (config-spec-rule 1)# **frequency 55000**	

4.2.9.7 Profile

Command 7	**profile**	
Description	Use the **profile** to set modulation mode and SNR threshold while switching channel modulation. The low SNR threshold corresponds to low modulation mode. If channel SNR is lower than the current threshold, the CMTS will adjust the channel to a threshold- corresponding modulation mode. If channel SNR is higher than the current back-off threshold, the CMTS will perform back-off with the highest modulation mode that the current SNR matches in profile configuration group.	
Syntax	profile <pid> snr-threshold <num1> [<num2>]	
Parameter	<pid>	Modulation mode number is 0 to 16.
	< num1>	Indicates SNR threshold, which is a integral number multiple of 10.
	[<num2>]	Indicates back-off SNR threshold, which is a integral number multiple of 10. Optional, the default value is num1+3bd.
Example1	Adjust modulation mode from ATDMA to QPSK when SNR is lower than 20db. D3(config-spec-rule 1)#**profile 10 snr-threshold 200**	
Example2	Adjust modulation mode from ATDMA to 16QAM when SNR is lower than 26db. D3(config-spec-rule 1)#**profile 11 snr-threshold 260**	
Example3	Adjust modulation mode from ATDMA to 64QAM when SNR is lower than 30db, perform back-off when SNR is higher than 35db. D3(config-spec-rule 1)#**profile 12 snr-threshold 300 350**	

Example4	Show the current spectrum rule.
	D3(config)#**show spectrum rule 1**
	`spectrum rule 1`
	` frequency band 35000 45000`
	` frequency 55000`
	` profile 10 snr-threshold 200`
	` profile 11 snr-threshold 260`
	` profile 12 snr-threshold 300 350`
	` channel-width 3200 1600`
	` action frequency channel-width modulation`
	` correctable-fec threshold 10`
	` uncorrectable-fec threshold 5`
	The configured spectrum rules must be applied to the upstream channel to take effect. One spectrum rule can be shared by multiple upstream channels.(Refer to Configuring CMTS MAC domain for more details)	

Example5	Apply spectrum rule1 to MAC1/1 upstream channel 1 D3(config)#**interface docsis-mac 1/1** D3(config-if-docsis-mac 1/1)#**cable upstream 1 spectrum-rule 1**	

4.2.10 Configuring IP bundle

Mode Privileged EXEC mode

Description IP bundle is used to group IP subnet . A fixed IP bundle is required for each MAN domain. The IP bundle contains parameters of cable helper, IP address, DHCP relay giaddr and srcaddr. An IP bundle consists of primary bundle and its only or multiple subnet bundle(s). Both the primary bundle and its subnet bundle(s) will be included when user apply the IP bundle to a MAC domain.

4.2.10.1 Interface ip-bundle

Command 1	**interface ip-bundle**	
Description	Use the **interface ip-bundle** command to remove or create a IP bundle.	
Syntax	[**no**] interface ip-bundle <num>|<X.Y>	
Parameter	<num>	Indicates primary bundle ID, range is 0~128
	<X.Y>	Indicates subnet bundle ID.X indicates primary bundle ID, Y indicates subnet bundle ID.
Example1	Create a primary ip bundle 0. D3(config)#**interface ip-bundle 0** D3(config-ip-bundle 0)#	
Example2	Remove ip bundle 0. D3(config)#**no interface ip-bundle 0**	

4.2.10.2 IP address

ommand 2	**ip address**	
Description	Use the **ip address** command to remove or set primary IP address and secondary address of a IP bundle.	
Syntax	[**no**] ip address <ip_address> <ip_mask> [secondary]	
Parameter	<ip_address>bundle.	Indicates IP address of IP
	<ip_mask>	Indicates mask address of IP bundle.
	[secondary]	Indicates secondary address, optional.
Example1	Set primary ip address of ip bundle 172.16.0.1/24 D3(config-ip-bundle 0)# **ip address 172.16.0.1 255.255.255.0**	
Example2	Set secondary ip address of ip bundle as: 172.17.0.1/24 D3(config-ip-bundle 0)# **ip address 172.17.0.1 255.255.255.0 secondary**	

4.2.10.3 Cable –dhcp giaddr

Command 3	**cable dhcp-giaddr**	
Description	Use the **cable dhcp-giaddr** command to remove or set giaddr address of DHCP relay specified device class, which is essential if DHCP relay is enabled.	
Syntax	[**no**] cable dhcp-giaddr { <ip_address> {cable-modem|host|mta|<string>}|primary}	
Parameter	<ip_address>	Indicates specified giaddr address.
	cable-modem|host|mta|<string>}	Indicates specified CPE class, replaces <string> with the name of CPE class.
	[primary	Indicates giaddr primary mode. The giaddr addresses of all CPEs class are replaces by the primary IP address of IP bundle.

Example1	Set cable modem giaddr address 172.16.0.1 D3(config-ip-bundle 0)# **cable dhcp-giaddr 172.16.0.1 cable-modem**
Example2	Set host giaddr address 172.17.0.1 D3(config-ip-bundle 0)# **cable dhcp-giaddr 172.17.0.1 host**

4.2.10.4 Cable dhcp-sraddr

Command 4	**cable dhcp-sraddr**	
Description	Use the **cable dhcp-sraddr** command to remove or set source IP address of DHCP relay specified class, which can be bridge IP address or IP address of IP bundle.It is essential if DHCP relay is enabled.	
Syntax	[**no**] cable dhcp-sraddr { <ip_address> cable-modem|host|mta|<string> }	
Parameter	<ip_address>	Indicates specified DHCP relay source IP address
	cable-modem|host|mta|<string>}	Indicates specified CPE class, replaces <string> with the name of CPE class.
Example	Set cable modem DHCP relay source IP address 172.16.0.1 D3(config-ip-bundle 0)# **cable dhcp-srcddr 172.16.0.1 cable-modem**	

4.2.10.5 Cable helper-address

Command 5	**cable helper-address**	
Description	Use the **cable helper-address** command to remove or set DHCP server address. Multiple server addresses can be assigned classified by the CPE classes. The CPE classes will be identified by the CMTS, then assigned to specified servers via DHCP relay. It is essential if DHCP relay is enabled. **Note：When DHCP server address is specified as the IP address of CMTS bridge interface, the embedded DHCP server will be enabled, the requested DHCP packets of CPEs won't be sent to bridge uplink interface.**	
Syntax	[**no**] cable helper-address { <ip_address> cable-modem|host|mta|<string> }	
Parameter	<ip_address>	Indicates specified DHCP server address
	cable-modem|host|mta|<string>}	Indicates specified CPE class, replaces <string> with the name of CPEclass.
Example1	Set cable modem DHCP server ip address 192.168.0.253 D3(config-ip-bundle 0)# **cable helper-address 192.168.0.253 cable-modem**	
Example2	Set cable modem DHCP Standby server ip address 192.168.0.252 D3(config-ip-bundle 0)#**cable helper-address 192.168.0.253 cable-modem**	

4.2.10.6 DHCP insert option82

Command 6	**dhcp insert option82**
Description	Use the **dhcp insert option82** command to cancel or enable option 82 in DHCP relay. After setting, the CMTS forwards DHCP relay packets with inserted option82, whose value will be filled with cable modem MAC address.

Syntax	[**no**] dhcp insert option82
Parameter	
Example	Insert option82 into DHCP relay. D3(config-ip-bundle 0)# **dhcp insert option82**

4.2.10.7 Show interface ip-bundle

Command 7	**show interface ip-bundle**	
Description	Use the **show interface ip-bundle** command to list the current IP bundle configurations.	
Syntax	show interface ip-bundle [<num>|<X.Y>]	
Parameter	[<num>|<X.Y>]	Indicates IP bundle ID , which is optional.

Example1	List all IP bundle information.
	D3(config-ip-bundle 0)# **show interface ip-bundle**
	`interface ip-bundle 0`
	` no cable dhcp-giaddr primary`
	` dhcp insert option82`
	` cable dhcp-giaddr 172.16.0.1 cable-modem`
	` cable dhcp-giaddr 172.17.0.1 host`
	` cable dhcp-sraddr 172.16.0.1 cable-modem`
	` cable dhcp-sraddr 172.17.0.1 host`
	` cable helper-address 192.168.0.252 cable-modem`
	` cable helper-address 192.168.0.253 cable-modem`
	` cable helper-address 192.168.0.252 host`
	` cable helper-address 192.168.0.253 host`
	` ip address 172.16.0.1 255.255.255.0`
	` ip address 172.17.0.1 255.255.255.0 secondary`
	The CMTS allows user to configure IP Bundle sub interfaces, the CPEs can obtain multiple subnets. The DHCP relay of CPEs will identify IP of the CM to assign different subnet DHCP relays accordingly.
	Configure IP Bundle sub-interfaces to assign the multiple subnets to CM and CPE. The following example shows how to assign 2 subnets to both CM and CPE
	*CM CPE in subnet 192.168.251.22 255.255.255.252 will assign subnets of 10.59.224.126 255.255.255.192.
	* CM CPE in subnet 10.121.208.62 255.255.255.192 will assign subnets of 10.59.224.62 255.255.255.192
	interface ip-bundle 1
	*insert option 82
	dhcp insert option-82
	fill CM DHCP relay giaddr with 192.168.251.22
	cable dhcp-giaddr 192.168.251.22 cable-modem
	fill CPE DHCP relay giaddr with 10.59.224.126
	cable dhcp-giaddr 10.59.224.126 host
	CM DHCP server IP 192.168.6.15, CPE DHCP server IP 192.168.37.1	

4.2.11 Configuring CPE Class

Mode Privileged EXEC mode

Description CPE class is defined as a group of categorized customer premises equipment. The CMTS identifies the same CPE's DHCP OPTION60 parameter string as a class group, one CPE class can be fuzzy matched by multiple option 60 strings. CPE class is used for

DHCP relay and terminal equipment enquiry.

4.2.11.1 CPE-class

Command 1	**cpe-class**	
Description	Use the **cpe-class** command to delete or create a CPE class.	
Syntax	[**no**] cpe-class <string>	
Parameter	<string>	Indicates CPE class name, special charactersars won't be supported.
Example1	Create a CPE class stb. D3(config)#**cpe-class** *stb* D3(config-cpe-class stb)#	
Example2	Delete a CPE class stb D3(config)#**no cpe-class** *stb*	

4.2.11.2 DHCP Option60

Command 2	dhcp option60	
Description	Use the **dhcp option60** command to remove or add CPE class option60 string.	
Syntax	[**no**] dhcp option60 <string>	
Parameter	<string>	Indicates option 60 string.
Example1	Add option 60 string "jhstb"to CPE class stb D3(config-cpe-class stb)# **dhcp option60***jhstb*	
Example2	Remove option 60 string "jhstb" from CPE class stb D3(config-cpe-class stb)# **no dhcp option60***jhstb*	
Example3	Enquiry the current CPE class configuration D3(config)# **show cpe-class** cpe-class "stb" dhcp option60 "jhstb"	

4.2.12 Configuring VLAN

Mode Privileged EXEC mode

Description The CMTS system supports VLAN by default, including IP VLAN, interface VLAN. For 1U chassis type and outdoor type with single CMC module (with single uplink bridge), VLAN can be directly applied to uplink bridge 0.

The following commands can be performed in VLAN configuration interface:

keep tag	Sets tag mode.
ip address	Sets VLAN IP address.

4.2.12.1 Interface vlan

Command 1	interface vlan
Description	Use the **interface vlan** command to delete, create or enter an VLAN interface. Available VLAN ID range is 2~4095, the CMTS allows users to create or delete an

	VLAN range.	
Syntax	[**no**] interface vlan <2-4095>	
Parameter	<2-4095>	Indicates VLAN ID, its range indicated by "-".
Example1	Create VLAN range from 2 to 100 D3(config)# **interface vlan 2-100** D3(config-if-vlan 2-100)#	
Example2	Delete VLAN range from 20 to 50 D3(config)# **no interface vlan 20-50**	

4.2.12.2 Keep tag

Command 2	**keep tag**
Description	Use the **keep tag** command to set VLAN tag mode. By default, the CMTS will insert Vlan Tag into data transmitted to uplink, strip VLAN tag received from uplink to RF. The CMTS allows user to configure to keep the Vlan tag in data packets to RF.
Syntax	[**no**] keep tag
Parameter	
Example	Set CMTS keep tag while forwarding VLAN packets. D3(config-if-vlan 2)#**keep tag**

4.2.12.3 IP Address

Command 3	ip address	
Description	Use the **ip address** command to remove or set IP address of VLAN interface. The CMTS will forward packets with tag to uplink interface based on the matched rules of source IP address network number.	
Syntax	[**no**] ip address <ip_address> <ip_mask> [secondary]	
Parameter	<ip_address>	Indicates IP address or network number.
	<ip_mask>	Indicates Mask of IP address.
	[secondary]	Indicates Secondary address, optional.
Example1	Set 192.168.1.0/24 and 192.168.2.0/24 IP network VLAN tag 2 D3(config-if-vlan 2)# **ip address 192.168.1.0 255.255.255.0** D3(config-if-vlan 2)# **ip address 192.168.2.0 255.255.255.0 secondary** The created VLANs will not take effect immediately in multiple bridges mode. Users need to apply VLAN to a uplink bridge, a VLAN can be applied to multiple up-link bridges. In single bridge mode, the CMTS will apply configured VLAN directly to bridge 0 (Refer to CMTS uplink bridge configuration for more details).	
Example2	Apply VLAN 2 to bridge 0 D3(config)# **interface uplink-bridge 0** D3(config-if-uplink-br 0)#**vlan 2**	

Example3	Apply VLAN 20~50 to bridge 0 D3(config)# **interface uplink-bridge 0** D3(config-if-uplink-br 0)#**vlan 20-50**

4.2.13 Configuring VLAN bundles

Mode Privileged EXEC mode

Description The VLAN bundle interface is used to set VLAN into groups for various CPEs (CM, STB) in a DOCSIS MAC domain. One CM VLAN ID is required for each VLAN bundle, any CMs and its CPEs in this VLAN ID will be considered as one VLAN Bundle Group.

The CMTS will insert the specific VLAN tag to all CM CPEs in CM's VLAN bundle group when forwarding data packets.

VLAN bundle consists of primary bundle and secondary bundle. For CM has not acquired an IP, the VLAN tag of primary bundle group will be inserted into the packets to the CM.

For CM has acquired a IP, CMTS will analyze returned data packets to decide the bundle source, and insert the corresponding VLAN tag after matching CM CPEs. After CM has acquired a IP, CMTS will analyze returned data packets to decide the bundle source, and insert the corresponding VLAN tag.

4.2.13.1 Interface VLAN-bundle

Command 1	interface vlan-bundle	
Description	Use the **interface vlan-bundle** command to delete or create VLAN bundle interface.	
Syntax	[**no**] interface vlan-bundle <num> [secondary]	
Parameter	<num>	Indicates bundle ID, its range is 0~10.
	[secondary]	Indicates Secondary bundle .The default is primary bundle.
Example	Create primary vlan bundle 1. D3(config)#**interface vlan-bundle 1** D3(config-if-vlan-bundle 1)#	

4.2.13.2 VLAN

Command 2	vlan	
Description	Use the **vlan** command to remove or add an subnet VLAN.	
Syntax	[no] vlan <num> { cable-modem|host|mta|<string>}	
Parameter	<num>	Indicates vlan tag , whose range is 2~4095.
	{ cable-modem|host|mta|<string>}	Indicates specified CPE type, including CM, HOST, MTA, CPE class.

Example1	The following example shows how to configure a CM VLAN 100, HOST VLAN 200, MTA VLAN 00. In this example , the CMTS will forward all CM data packets with VLAN 100 tag by default, forward all CM host data packets with inserted VLAN 200 tag and forward all CM MTA data packets with inserted VLAN 300 tag. D3(config-if-vlan-bundle 1)# **vlan 100 cable-modem** D3(config-if-vlan-bundle 1)# **vlan 200 host** D3(config-if-vlan-bundle 1)# **vlan 300 mta**
Example2	The following example shows how to configure VLAN secondary bundle, CM VLAN 1001, HOST VLAN 2001, CM subnet IP 192.168.0.100 255.255.255.0. In this example, all the CM hosts will forward data packets with vlan 2001 tag when the CM obtains 192.168.0.100 255.255.255.0 subnet IP or when the server responsing CM VLAN is 1001. *Create VLAN secondary bundle 2 *D3(config)#**interface vlan-bundle 2 secondary** D3(config-if-vlan-bundle 2)# * Configure CM vlan 1001* D3(config-if-vlan-bundle 2)# **vlan 1001 cable-modem** * Configure CM HOST vlan 2001* D3(config-if-vlan-bundle 2)# **vlan 2001 host** * Configure CM subnet IP 192.168.0.0 255.255.255.0* D3(config-if-vlan-bundle 2)#**ip address 192.168.0.0 255.255.255.0** The above example aims at showing a CM configured with two VLANs, specified by the server as VLAN 100 by default, the CM hosts will insert vlan 2001 tag when CM obtains 192.168.0.0/24 subnet IP or the server responsing VLAN is 1001. *Note: The VLAN-bundle and IP-bundle cannot be enabled at the same time, you can just enable one of them. Users need to apply VLAN bundle to bridge interface, and enable vlan bundle feature before it takes effect. For single bridge devices will directly apply VLAN bundle to bridge 0(Refer to configuring bridge), the specified VLAN ID by Vlan Bundle must be in VLAN interface (Refer to configuring interface VLAN).

4.2.14 Configuring Routing

Mode Privileged EXEC mode

Description The system follows static routing by default. The CMTS lookup routing table according to destination network to forward data packets.

Command	route	
Description	Use the **route** command to remove or add static routing.	
Syntax	[**no**] route {host <ip_address>|net <ip_address> <ip_mask>} gateway <ip_address> [uplink-bridge <num>]	
	host <ip_address>	Indicates IP addreee ofdestination host

Parameter	net <ip_address> <ip_mask>	Indicates IP address and mask of destination network
	gateway <ip_address>	Indicates IP address of getway
	[uplink-bridge <num>]	Indicates routing table uplink bridge, which is optional, bridge 0 as default.
Example1	Set default route gateway 192.168.0.1 of bridge 0 D3(config)#**route net 0.0.0.0 0.0.0.0 gateway 192.168.0.1**	
Example2	Set gateway 192.168.0.2 for bridge 0 sending to destination host 192.168.2.254 D3(config)#**route host 192.168.2.254 gateway 192.168.0.2**	

4.2.15 Verifying Source Address

Mode Privileged EXEC mode

Description Source address verification is a process that matching upstream data packets source IP and source MAC with the address assigned by DHCP. Source address verification can prevent illegal transmission from any IP manually modified by end users (subscribers), it is enabled by default. Yet manually bond static IP for specific CPEs are allowed by editing CM configuration profile. (Refer to DOCSIS3.0 specification C.1.1.18.1.7 Source Address Verification (SAV) Authorization Encoding)

Command	cable source-verify
Description	Use the **cable source-verify** command to enable or disable source address verification.
Syntax	[**no**] cable source-verify
Parameter	
Example1	Enable source address verification. D3(config)#**cable source-verify**
Example2	Disable source address verification. D3(config)#**no cable source-verify**

4.2.16 Configuring Access Control List (ACL)

Mode Privileged EXEC mode

Description ACL is a mechanism based on port access control. It will deny or permit some data packets to access specified port, be inserted with VLAN and forwarded. ACL rules are globally shared, effective when applied to specified port(s).

4.2.16.1 ACL Rule

Command 1	acl rule	
Description	Use the **acl rule** command to remove or add one ACL rule. If the rule is already existed, this command will lead to rule edit mode.	
Syntax	[**no**] acl rule <num>	
Parameter	<num>	Indicates rule ID,whose range is 1~255.

Example	Create ACL rule 1 D3(config)#**acl rule 1** D3(config-acl-rule 1)#

4.2.16.2 Permit and permit-host

Command 2	permit and permit-host		
Description	Use the **permit** command to grant the access to data packets conform to the rule. Use **permit- host** command to specially restrict data packets to the CMTS host.		
Syntax	permit {key1}{key2} {mac_address} [ip_address] [port] Permit-host {key1}{key2} {mac_address} [ip_address] [port]		
Parameter	{key1}		Indicates Ethernet frame type.
		all	Indicates all Ethernet frames.
		arp	Indicates ARP packets.
		ip	Indicates IP packets.
		ipv6	Indicates IPV6 packets.
		pppoe-discovery	Indicates PPPOE-discovery packets.
		pppoe-session	Indicates PPPOE-session packets.
		<HEX>	Indicates specific packets in Hexadecimal.
	{key2}		Indicates IP protocol.
		all	Indicates all protocol packets.
		dhcp	Indicates DHCP packets.
		ftp	Indicates FTP packets.
		http	Indicates HTTP packets.
		icmp	Indicates ICMP packets.
		igmp	Indicates IGMP packets.
		tftp	Indicates TFTP packets.
		telnet	Indicates Telnet packets.
		tcp	Indicates TCP packets.
		udp	Indicates UDP packets.
		<num>	Indicates specific protocol number.
	{mac_address}		MAC address matching, including source MAC and destination MAC.
		any	Indicates any MAC address.
		<mac_address>	Indicates specific MAC address.
	[ip_address]		Indicates IP address matching, including source IP and destination IP, optional.
		any	Indicates any IP address.
		<ip_address>	Indicates specific IP address.
			Port matching, including source port and destination port, optional

	[port]	any	Indicates any interface.
		<num>	Indicates specific interface.

4.2.16.3 Deny and deny-host

Command 3	deny and deny-host		
Description	Use the **deny** command to deny the access to data packets conform to the rule. Use the **deny- host** command to specially restrict data packets to the CMTS host.		
Syntax	deny {key1}{key2} {mac_address} [ip_address] [port] Deny-host {key1}{key2} {mac_address} [ip_address] [port]		
Parameter	{key1}		Indicates Ethernet frame type.
		all	Indicates all Ethernet frames.
		arp	Indicates ARP packets.
		ip	Indicates IP packets.
		ipv6	Indicates IPV6 packets.
		pppoe-discovery	Indicates PPPOE-discovery packets.
		pppoe-session	Indicates PPPOE-session packets.
		<HEX>	Indicates specific packets in Hexadecimal.
	{key2}		Indicates IP protocol.
		all	Indicates all protocol packets.
		dhcp	Indicates DHCP packets.
		ftp	Indicates FTP packets.
		http	Indicatse HTTP packets.
		icmp	Indicates ICMP packets.
		igmp	Indicates IGMP packets.
		tftp	Indicates TFTP packets.
		telnet	Indicates Telnet packets.
		tcp	Indicates TCP packets.
		udp	Indicates UDP packets.
		<num>	Indicates specific protocol number.
			Indicates MAC address matching, including source MAC and destination MAC.
	{mac_address}	any	Indicates any MAC address.
		<mac_address>	Indicates specific MAC address.
	[ip_address]		Indicates IP address matching, including source IP and destination IP, optional.
		any	Indicates any IP address.
		<ip_address>	Indicates specific IP address.

			Indicates port matching, including source port and destination port, optional.
	[port]	any	Indicates any port.
		<num>	Indicates specific port number.

4.2.16.4 VLAN

Command 4	vlan		
Description	Use the **vlan** command to insert data packets to VLAN. The CMTS forwards the packets with inserted VLAN tag if it conforms to the ACL.		
Syntax	vlan <num> {key1}{key2} {mac_address} [ip_address] [port]		
Parameter	<num>	vlan ID	
	{key1}		Indicates Ethernet frame type.
		all	Indicates all Ethernet frames.
		arp	Indicates ARP packets.
		ip	Indicates IP packets.
		ipv6	Indicates IPV6 packets.
		pppoe-discovery	Indicates PPPOE-discovery packets.
		pppoe-session	Indicates PPPOE-session packets.
		<HEX>	Indicates specific packets in Hexadecimal.
	{key2}		Indicates IP protocol.
		all	Indicates all protocol packets.
		dhcp	Indicates DHCP packets.
		ftp	Indicates FTP packets.
		http	Indicates HTTP packets.
		icmp	Indicates ICMP packets.
		igmp	Indicates IGMP packets.
		tftp	Indicates TFTP packets.
		telnet	Indicates Telnet packets.
		tcp	Indicates TCP packets.
		udp	Indicate UDP packets.
		<num>	Indicates specific protocol number.
	{mac_address}		Indicates MAC address matching, including source MAC and destination MAC.
		any	Indicates any MAC address.
		<mac_address>	Indicates specific MAC address
			Indicates IP address matching, including source IP and destination IP, which is optional.

	[ip_address]	any	Indicates any IP address.
		<ip_address>	Indicates specific IP address.
	[port]		Indicates interface matching, including source interface and destination interface, optional.
		any	Indicates any interface.
		<num>	Indicates specific interface number.

4.2.16.5 Priority

Command 5	priority	
Description	Use the **priority** command to set ACL rules priority.	
Syntax	priority <num>	
Parameter	<num>	The rule priority level is from 0 to7.
	The new created ACL rule will not take effect immediately until it is applied to uplink bridge or MAC domain. (Refer to configuring CMTS uplink bridge and MAC domain for more details)	

4.2.17 System Firewall

Mode Privileged EXEC mode

Description Firewall can be enabled and disabled. Users can prevent data flooding by setting the Max. throughout threshold for specified downstream data packet type and upstream data packet type.

4.2.17.1 Firewall

Command 1	firewall	
Description	Use the **firewall** command to enable and disable system firewall, and set data flooding threshold.	
Syntax	[**no**] firewall {inbound|outbound} {arp|dhcp|icmp|igmp|broadcast} <num> |{shutdown}	
Parameter	inbound	Indicates downstream data packets.
	outbound	Indicates upstream data packets.
	arp|dhcp|icmp|igmp|broadcast	Indicates data packets type.
	<num>	Indicates data flooding threshold.
	shutdown	Indicates disable firewall.
Example1	Enable firewall D3(config)#**no firewall shutdown**	

Example2	Set the ARP outbound threshold per CM is 10 per second. D3(config)#**firewall outbound arp 10**
Example3	Set the boradcast inbound threshold is 100 per second. D3(config)#**firewall inbound broadcast 100**

4.2.18 Configuring Embedded DHCP Server Scope

Mode Privileged EXEC mode

Description The CMTS system supports simple built-in DHCP service and TFTP service. when the helper-address of IP bundle is equal with uplink-bridge interface IP address, the CMTS built- in DHCP scope will assign IP address to CPE instead. Two scopes can be set by default: CM scope and CPE scope.

4.2.18.1 Embedded-dhcp-scope.

Command 1	embedded-dhcp-scope	
Description	Use the **embedded-dhcp-scope** command to delete, create or enter DHCP scope option configuration interface.	
Syntax	[**no**] embedded-dhcp-scope {cable-modem|host}	
Parameter	cable-modem	Indicates CM scope.
	host	Indicates CPE scope.
Example	Create CM scope. D3(config)#**embedded-dhcp-scope cable-modem** D3(config-embedded-dhcp cable-modem)#	

4.2.18.2 Start-IP

Command2	start-ip	
Description	Use the **start-ip** command to set the scope address range and its start address.	
Syntax	start-ip <ip_address>	
Parameter	<ip_address>	Indicates the start address of one address pool
Example	Set the start address of address pool: 192.168.0.2. D3(config-embedded-dhcp cable-modem)#**start-ip 192.168.0.2**	

4.2.18.3 End-IP

Command 3	end-ip	
Description	Use the **end-ip** command to set the scope address range and its end address.	
Syntax	end-ip <ip_address>	
Parameter	<ip_address>	Indicate the end address od one address pool.
Example	Set the end address of address pool: 192.168.0.100 D3(config-embedded-dhcp cable-modem)#**end-ip 192.168.0.100**	

4.2.18.4 Netmask

Command 4	netmask	
Description	Use the **netmask** command to set the mask of scope address pool.	
Syntax	netmask <ip_address>	
Parameter	<ip_address>	Indicates the mask of address pool.
Example	Set the mask of scope address pool is 255.255.255.0. D3(config-embedded-dhcp cable-modem)#**netmask 255.255.255.0**	

4.2.18.5 Gatway

Command 5	gateway	
Description	Use the **gateway** command to set the mask of scope address pool.	
Syntax	gateway<ip_address>	
Parameter	<ip_address>	Indicates the gateway address of address pool.
Example	Set the gateway address of address pool is 192.168.0.1. D3(config-embedded-dhcp cable-modem)# **gateway 192.168.0.1**	

4.2.18.6 Boot-server

Command 6	boot-server	
Description	Use the **boot-server** command to set scope TFTP server IP and boot file name.	
Syntax	boot-server <ip_address> <string>	
Parameter	<ip_address>	Indicates TFTP server IP.
	<string>	Indicates boot file name or the CM configuration file.
Example	The following example shows how to set TFTP server as the CMTS bridge interface IP, enable the embedded TFTP service , download the configuration file cm.bin. D3(config-embedded-dhcp cable-modem)# **boot-server 192.168.0.254 cm.bin**	

4.2.18.7 DNS

Command 7	dns	
Description	Use the **dns** command to set the DNS server IP of scope.	
Syntax	dns <ip_address1> <ip_address2>	
Parameter	<ip_address1>	Indicates DNS host server IP.
	<ip_address2>	Indicates DNS backup server IP, optional.

Example	Set scope option DNS host server address 61.128.128.68. D3(config-embedded-dhcp cable-modem)# **dns 61.128.128.68**

4.2.18.8 Lease-time

Command 8	lease-time	
Description	Use the **lease-time** command to set the lease time for scope address.	
Syntax	lease-time <num>	
Parameter	<num >	The lease time range is 1 ~65535 seconds.
Example	Set lease time of scope address is 7200 seconds. D3(config-embedded-dhcp cable-modem)# **lease-time 7200**	

4.2.18.9 Show embedded-dhcp-scope

Command 9	show embedded-dhcp-scope	
Description	Use the **show embedded-dhcp-scope** command to show present embedded DHCP scope configuration parameters.	
Syntax	show embedded-dhcp-scope {cmc|cable-modem|host}	
Parameter	cmc|cable-modem|host	Indicates scope name.
Example	Show embedded DHCP CM scope parameters. D3(config-embedded-dhcp cable-modem)#show embedded-dhcp-scope cable-modem embedded-dhcp-scope "cable-modem" start-ip : 192.168.0.2 end-ip : 192.168.0.100 netmask : 255.255.255.0 gateway : 192.168.0.1 lease-time : 7200 dns : 61.128.128.68 boot-server : 192.168.0.254 cm.bin	

4.2.19 Configuring SNMP

Mode Privileged EXEC mode

Description The CMTS supports SNMP V1, SNMP V2, SNMP V3, trap and MIB base.

Command	snmp	
Description	Use the **snmp** command to delete or set SNMP Community and Trap host IP address.	
Syntax	[**no**] snmp { community <string> {trap-host <ip_address> v1|v2} ro|rw}	
Parameter	<string>	Indicates SNMP community password.
	ro	Indicates Read-only access.
	rw	Indicates Read and Write access.
	<ip_address>	Indicates TRAP server IP address.
	v1|v2	Indicates TRAP protocol version.
Example1	Set Read-only access password is “public” for SNMP community. D3#**snmp community public ro**	

Example2	Set IP address 192.168.0.253, version v2 for SNMP Trap server. D3#**snmp trap-host 192.168.0.253 v2**

4.2.20 Configuring Cable Modem

Mode Privileged EXEC mode

Description The CMTS supports remote query and control of CMs, including CM subnet-isolation, CM permit mode, CM upstream and downstream capacity, CM remote reboot, disable data forwarding, and CM remote status query.

4.2.20.1 Cable modem permit-mode

Command 1	cable modem permit-mode	
Description	Use the **cable modem permit-mode** command to set CM permit mode.	
Syntax	cable modem permit-mode { disable-forwarding | enable-forwarding }	
Parameter	disable-forwarding	CMs don't access the network except for specific permitted ones.
	enable-forwarding	CMs can access the network except for specific forbidden ones.
Example	Set CMs can access the network, except for specific forbidden ones. D3(config)#**cable modem permit-mode enable-forwarding**	

4.2.20.2 Cable modem subnet-isolation

Command 2	cable modem subnet-isolation
Description	Use the **cable modem subnet-isolation** command to enable or disable subnet-isolation for the CMs connected to a same RF port. When enabled, the CPEs in same network segment can't forward ARP if they are on the same RF port.
Syntax	[**no**] cable modem subnet-isolation
Example	Enable subnet-isolation to disable ARP forwarding. D3(config)# **cable modem subnet-isolation**

4.2.20.3 Cable modem remote-query

Command 3	cable modem remote-query	
Description	Use the **cable modem remote-query** command to set the interval period of remote query to CM parameters and SNMP read-access password. Following SNMP protocal, the CMTS will obtain MIB nodes' data specified by CM periodically, the data include upstream and downstream channels signal quality (SQ). The SNMP read-access password should be consistent with given read-access passwords in the CM configuration file (Default password is public).	
Syntax	cable modem remote-query {interval community-string <string> } <num>	
	<num>	Remote query interval period is 600~1800 seconds, default 600 seconds.

Parameter	<string>	Indicates remote query SNMP read-access password. The default password is public.
Example1	Set remote query intervalperiod is 900 seconds. D3(config)#**cable modem remote-query interval 900**	
Example2	Set remote query interval SNMP Community is admin. D3(config)#**cable modem remote-query community-string** *admin*	

4.2.20.4 Cable modem reset

Command 4	cable modem reset
Description	Use the **cable modem reset** command to manually reset all present CMs that connecting to the CMTS.
Syntax	cable modem reset
Parameter	
Example	Resets all CMs. D3(config)#**cable modem reset**

4.2.20.5 Cable modem <ip_address>|<mac_address>

Command 5	cable modem <ip_address>|<mac_address>	
Description	Use the **cable modem** <ip_address>|<mac_address> command to set parameters of specified CM IP address or MAC address. The available parameters include: reset CM, disable CM data forwarding,set data rate, and remote query check of specified CM.	
Syntax	[**no**] cable modem {<ip_address>|<mac_address>} {disable-forwarding|reset|rate <num1> <num2>|remote-query check}	
Parameter	<ip_address>|<mac_address>	Indicates the CM IP address or MAC address.
	disable-forwarding	Disable data forwarding for the specified CM.
	<num1>	Indicates the downstream capacity in Kbps. Legal range is 0~800Mbps (1Mbps =1024Kbps). If the value is 0, the downstream rate is the one specified by CM configuration file, otherwise the rate will be replaced by defined value.
	<num2>I	ndicates the upstream capacity in Kbps. Legal range is 0~160Mbps (1Mbps =1024Kbps). If the value is 0, t the downstream rate is the one specified by CM configuration file, otherwise the rate will be replaced by defined value.
Example1	Allow CM 192.168.0.2 to register, but no data forwarding. D3(config)#**cable modem 192.168.0.2 disable-forwarding**	
Example2	Cancel CM 192.168.0.2 disable data forwarding. D3(config)#**no cable modem 192.168.0.2 disable-forwarding**	
Example3	Reset specified CM 192.168.0.2. D3(config)# **cable modem 192.168.0.2 reset**	

Example4	Check the remote query parameters of CM 192.168.0.2 D3(config)#**cable modem 192.168.0.2 remote-query check**
Example5	Set downstream rate 10 Mbps (10240Kbps), and upstream rate 6 Mbps (6144Kbps) for CM 192.168.0.2. D3(config)#**cable modem 192.168.0.2 rate 10240 6144**

4.2.20.6 Cable modem mac-oui|range-macs

Command 6	cable modem mac-oui|range-macs	
Description	Use the **cable modem mac-oui|range-macs** command to set MAC address OUI and the access of MAC addresses.	
Syntax	[**no**] cable modem {mac-oui <oui_address>|range-macs <mac_address_start> <mac_address_end> }disable-forwarding	
Parameter	mac-oui <oui_address>	Indicates specific CM MAC address OUI
	range-macs <mac_address_start> <mac_address_end>	Indicates specific MAC address range, including start address and end address.
	disable-forwarding	Indicates disable specific CM data forwrding
Example1	Disable data forwarding from CMs with MAC OUI as 11:22:33. D3(config)#**cable modem mac-oui 11:22:33 disable-forwarding**	
Example2	Enable data forwarding from CMs with MAC OUI as 11:22:33. D3(config)#**no cable modem mac-oui 11:22:33 disable-forwarding**	
Example3	Disable data forwarding from CMs with MAC address range: 0002.5e00.0001~0002.5e00.00ff D3(config)#**cable modem range-macs 0002.5e00.0001 0002.5e00.00ff disable- forwardin**g	

4.2.21 NTP Time Service

Mode Privileged EXEC mode

Description Network time synchronization protocol based on UTC is supported. The CMTS will obtain the current time from time server based on NTP, and update it according to user defined time zone offset. When the NTP server IP is set, CMTS will update the time every 60 seconds until it is successfully updated, and synchronize the time every hour thereafter, and synchronize the time hourly.

Command	ntp	
Descriptio n	Use the **ntp** command to remove or set network time server IP address, or manually synchronize the time.	
Syntax	[**no**] ntp server { <ip_address> <num>| sync}	
Parameter	<ip_address> <num>	Indicates time server IP address and time zone offset in minutes. The time zone offset is from -720 to 780 minutes.
	sync	Indicates manually update time for synchronization

Example1	Set the time server IP address is 202.120.2.101, the time zone offset is Beijing time UTC+8 (480 minutes) . D3#**ntp server 202.120.2.101 480**
Example2	Manually update the time. D3#**ntp server sync**

4.2.22 Logging service

Mode Privileged EXEC mode

Description The CMTS supports services of local logging storage, network logging and sending loggings to logging server via UDP protocol.

Refer to RFC3146, the logging codes are defined as follow:

Code	Note
16	Indicates system login logging.
17	Indicates CLI operation logging.
18	Indicates WEB operation logging.
19	Indicates SNMP operation logging.
20	Indicates OAM traffic logging.
21	Indicates CM logging.
22	Indicates CMC logging.

Command	log-host	
Description	Use the **log-host** command to remove or set network logging server IP. By default, the CMTS will store loggings only on local disk. When a logging server IP is set, the CMTS will automatically sync the loggings to logging server.	
Syntax	[no] log-host <ip_address>	
Parameter	<ip_address>	Indicates IP address of logging server.
Example	Set network logging server IP address is 192.168.0.253. D3#**log-host 192.168.0.253**	

4.2.23 Configuring CMTS shared secret

Mode Privileged EXEC mode

Description The CMTS supports CM configuration files verification. The CMTS verifies CM register legality via MIC, forbids illegal TFTP to download CM configuration files. With shared secret set and TFTP verification enabled, the CMTS will verify secret of registered CMs. The CMTS will support plain text and automatically performs MD5 encryption If only setting the shared secret.

4.2.23.1 Cable shared-secret

Command 1	cable shared-secret

Description	Use the **cable shared-secret** command to delete or set the shared secret. The string of shared secret should be no more than 32 characters long, and be identical to the CMTS MIC secret of CM configuration file.	
Syntax	[**no**] cable shared-secret <string>	
Parameter	<string>	Indicates shared secret, no more than 32 characters.
Example	Set shared secret is Ascentsecret. D3(config)# **cable shared-secret** *Ascentsecret*	

4.2.23.2 Cable TFTP enforce

Command 2	cable tftp enforce
Description	Use the **cable tftp enforce** command to disable or enable TFTP enforce and match the valdity of shared secret.
Syntax	[**no**] cable tftp enforce
Parameter	
Example	Enable TFTP enforce. D3(config)# **cable tftp enforce**

4.2.24 Setting Cable Flap List Parameters

Mode Privileged EXEC mode

Description The FLAP LIST is used to detect CM problems in the RF network. Users can set the CM thresholds of aging time, power level adjustment and reinitialize ranging interval to determine the unstable factors in the RF network. The default value of aging time is 1440 minutes, registration interval is 180 seconds, the power level adjustment is 3dB.

Using the **show cable modem flap-list** command to check CM flapping status in the RF network, including ins, hit, miss, crc, p-adj, flap and the last flapping time. Therein:

Ins: Increase a count if the CM registers again when it's in interval threshold range.

Hit: Increase a count if the CMTS have received the CM periodic ranging signal successfully.

Miss: Increase a count if the CMTS offered the CM unicast ranging opportunity but failed to receive the CM unicast ranging request.

CRC: indicate times of CM upstream data packets that failed CRC checking.

P-adj: Increase a count if the adjustment to CM upstream power level value has exceeded the threshold. **Flap**:Increase one count for any of which happens:

- ins increase by 1
- p-adj increase by 1
- miss increase by 6.

Command	cable flap-list	
Description	Use the **cable flap-list** command to set flap list threshold.	
Syntax	cable flap-list {aging|insertion-time|power-adjust threshold} <num>	
	aging	Indicates flap list record aging time, the flap list will be reset and re- calculate every aging time. Valid range : 30~43200

Parameter		minutes.
	insertion-time	The interval threshold of CM changes its status from online to ranging initializing. Valid range: 60~600 seconds
	power-adjust threshold	Indicate sthe threshold of power level adjustment. Valid range: 3~ 10dB
	<num>	Indicates the exact threshold value.
Example1	Set flap aging time is 60 minutes. D3(config)# **cable flap-list aging 60**	
Example2	Set the flap reinitial ranging threshold is 300 seconds. D3(config)# **cable flap-list insertion-time 300**	
Example3	Set the flap threshold of power level adjustment is 5db. D3(config)# **cable flap-list power-adjust threshold 5**	

4.2.25 Configuring L2VPN

Mode Privileged EXEC mode

Description The CMTS will match L2VPN according to the CM upstream service flow and classifier, data packets which conform to the rule will be inserted with VLAN tag and forwarded to uplink interface. L2VPN service is disabled by default.

Command	cable l2-vpn-service dot1q
Description	Use the **cable l2-vpn-service dot1q** command to disable or enable L2VPN service.
Syntax	[**no**] cable l2-vpn-service dot1q
Example	Enable CMTS L2VPN service. D3(config)# **cable l2-vpn-service dot1q**

4.2.26 Upgrading System Firmware

Mode Privileged EXEC mode

Description The CMTS firmware upgrade includes router module upgrade and CMC module firmware upgrade. The upgrade file shall be uploaded to local disk (directory of: /card0/ftp) of CMTS via FTP.

The default username and password are:

user name: admin

password: Ascentcable.

To ensure a normal function of CMTS, the system requires various of files, please refer to the upgrade instructions for file details.

Command	upgrade-firmware
Description	It takes about 2 minutes to upgrade the CMC firmware. Please trun off downstream channels to ensure an safe upgrade process.
Syntax	upgrade-firmware [docsis-mac|cmts-system] <X/Y> <string>

Parameter	<x/y>	x indicates slot ID, y indicates RF module ID. For 1 U and outdoor type, x/y is default forced as 1/1. For high density type and Remote-MAC type, refer to the labels on the rear panel.
	<string>	Indicates local firmware file name.
Example	Uprade the firmware of CMC board 1/1 with local file: CmcApp.bin D3(config)# **upgrade-firmware docsis-mac 1/1** *CmcApp.bin*	

4.2.27 Resetting Factory Default Configuration

Mode Privileged EXEC mode

Description The CMTS can be reset to factory by CLI, including the configurations and user's password. Note that all the current configurations will wiped out, and reset to factory defaults, please use the command with caution.

Command	system reset	
Description	Use the system reset command to reset CMTS to factory defaults, or reset the users' password.	
Syntax	system reset {config a|b} | password	
Parameter	a|b	a indicates reset to Euro DOCSIS standard for downstream channels b indicates reset to North America DOCSIS standard for downstream channels
Example	Reset CMTS to factory default in Euro DOCSIS standard. D3(config)# **system reset config a**	

4.2.28 Managing the System Users

Mode Privileged EXEC mode

Description The CMTS supports 5 users to log into the system simultaneously

4.2.28.1 Adduser

Command 1	adduser	
Description	Use the **adduser** command to add a CMTS system user with an intial password required.	
Syntax	adduser <string>	
Parameter	<string>	Indicates user name
Example	Add a system user named guest and set its password is admin. D3(config)# **adduser** *guest* New Password:***** Confirm Password:*****	

4.2.28.2 Deluser

Command 2	deluser
Description	Use the **deluser** command to delete a CMTS system user.
Syntax	deluser <string>

Parameter	<string>	Indicates user name
Example	Delete system user named guest. D3(config)**# deluser** *guest*	

4.2.28.2 User password

Command 3	user password	
Description	Use the **user password** command to change the password of a system user, the original password is required.	
Syntax	user password <string>	
Parameter	<string>	Indicates user name.
Example	Change the password of user named guest. D3(config)# **user password** *guest* Old Password:****** New Password:***** Confirm Password:*****	

4.2.28.4 Show user

Command 4	show user	
Description	Use the **show user** command to display all system users or the current logged-in users.	
Syntax	show user [current]	
Parameter	[current]	Indicates display the current logged-in user.
Example	Displays all system user. D3(config)# **show user**	

4.2.29 Copying Configurations

Mode Privileged EXEC mode

Description Copying the current running configurations to CMTS startup configuration.

Command	**copy**
Description	Use the **copy** command to copy the current running configurations to CMTS startup configuration.
Syntax	copy running-config startup-config
Example	D3(config)#**copy running-config startup-config**

4.3 Managing the CMTS

4.3.1 Checking CMTS Running Status, Parameters, Connected CPE Information

Mode Privileged EXEC mode

Description Use the **show** command to display the current CMTS running configuration and connected CPE information.

4.3.1.1 Show Alias

Command 1	show alias	
Description	Use the **show alias** to display user-defined command alias	
Syntax	show alias [<string>]	
Parameter	[<string>]	Indicates alias
Example	Display all user-defined command alias. D3> **show alias**	

4.3.1.2 Show ACL

Command 2	show acl	
Description	Use the **show acl** commamd to display ACL rule and control.	
Syntax	show {acl rule [<num>]} |{ control}	
Parameter	[<num>]	Indicates rule ID.
	control	Indicates ACL control.
Example1	Check ACL control. D3> **show acl control**	
Example2	Display all ACL rules. D3> **show acl rule**	

4.3.1.3 Show ARP

Command 3	show arp	
Description	Use the **show arp** command to display arp information.	
Syntax	show arp [<ip_address >]	
Parameter	[<ip_address >]	Show ARP information of specified IP.
Example	Display all arp information. D3> **show arp**	

```
Ip-Address          Mac-Address         Port            Status    Active
192.16.0.58         78:96:84:f9:2a:1c   docsis-mac 1/1  dhcp      Y
192.168.0.200       00:ed:54:d3:86:df   gige0           capture   N
192.168.2.101       00:10:18:de:ad:0a   docsis-mac 1/1  capture   N
192.168.18.1        3c:e5:a6:be:5c:5e   gige0           capture   Y
192.168.18.28       90:e6:ba:02:cc:0b   gige0           capture   N
192.168.18.43       74:d0:2b:e9:ee:96   gige0           capture   N
192.168.18.100      00:ed:54:d3:86:df   gige0           capture   N
192.168.18.200      00:ed:54:d3:86:df   gige0           capture   N
192.168.216.89      00:02:5e:00:04:33   gige0           capture   Y
```

4.3.1.4 Show cable flap-list config

Command 4	show cable flap-list config
Description	Use the **show cable flap-list config** command to display cable flap configurations.
Syntax	show cable flap-list config
Parameter	

Example	Display cable flap configurations.
	D3> **show cable flap-list config**
	`cable flap-list aging 1440`
	`cable flap-list insertion-time 180`
	`cable flap-list power-adjust threshold 3`

4.3.1.5 Show cable l2-vpn-service dot1q

Command 5	show cable l2-vpn-service dot1q
Description	Use the **show cable l2-vpn-service dot1q** command to check L2VPN status.
Syntax	show cable l2-vpn-service dot1q
Parameter	
Example	Checks L2VPN status. D3>**show cable l2-vpn-service dot1q** **no cable l2-vpn-service dot1q**

4.3.1.6 Show cable shared-secret

Command 6	show cable shared-secret
Description	Use the **show cable shared-secret** command to check shared secret,which will be shown as a MD5 encrypted string.
Syntax	show cable shared-secret
Parameter	

Example	Show CMTS shared secret.
	`D3>show cable shared-secret`
	`cable shared-secret cc47624519e8e033e284e68d84427c84`

4.3.1.7 Show cable TFTP enforce

Command 7	show cable tftp enforce
Description	Use the **show cable tftp enforce** commamd to check the validity of CM Configuration files verified by CMTS TFTP.
Syntax	show cable tftp enforce
Parameter	

Example	Show the validity of CM Configuration files verified by CMTS TFTP.
	`D3>show cable tftp enforce`
	`cable tftp enforce`

4.3.1.8 Show cable modem

Command 8	show cable modem	
Description	Use the **show cable mode**m command to display registered cable modems information.	
Syntax	show cable modem [keys]	
	[keys] contain a series of filtered parameters	
	<cr>	Shows all CMs by default.

Parameter	| <string>	Searches filter by MAC address.
	cpe	Shows all CPE devices, can be filtered with <string>.
	flap-list	Checks CM Flap-list statistics.
	init	Shows initialization status.
	online	Shows online CMs.
	offline	Shows offline CMs.
	permit-mode	Checks CM access control mode and access assignment based on CM MAC address.
	remote-query	Checks CM remote query signal quality.
	recycle	Checks recycling state of history record of offline CMs.
	subnet-isolation	Checks CM subnet-isolation control status.
	summary	Checks CM channel summary.
	spec-rate	Display CM specified bandwidth configuration.
	version	Shows CMs of specified DOCSIS version.
	<ip_address>	Shows CM of specified IP address.
	<mac_address>	Shows CM of specified MAC address.
Example1	Check all CM status.	
Example2	Check all CM flap statistics.	

```
D3>show cable modem
MAC   MAC Address        IP Address      Ver   MAC      US      DS                          Prim  Num  BPI  On/Off
Intf                                           Status   Intf    Intf                        Sid   CPEs Enb  Time
1/1   78:96:84:f9:2a:1c  192.16.0.58     N/A   Init(i)  1       1                           1     0    N    1-1 0:0
cable modem total : 1
```

```
D3>show cable modem flap-list
MAC   CM                 Ins    Hit    Miss   CRC    P-Adj  Flap                Time
Intf  MacAddress
1/1   78:96:84:f9:2a:1c  0      441    190    0      0      0          1970-1-1 0:0:0
cable modem cpe total : 1
```

When checking CM of specified IP or MAC address, parameters are available in the following table: **Syntax** show cable modem < ip_address >|< mac_address > [keys]

Parameter [keys] Check specified CM

<cr>	Indicates CM basic information.
cpe	Indicates CPEdevice information.
classifiers	Indicates CM upstream and downstream service flow classifying rules.
flap-list	Indicates CM flap statistics.
multicast-authorization	Indicates CM multicast authorization control.
multicast-session	Indicates CM multicast session.
service-flow	Indicate sCM upstream and downstream service flow parameters.
remote-query	CM remote query signal quality.
sav	Indicates CM's CPE source address authorization.
verbose	Indicates CM detailed information.
vpn	Indicates VPN parameters of CM upstream service flow.

4.3.1.9 Show clock

Command 9	show clock
Description	Use the **show clock** command to check CMTS system time, start time and running time.
Syntax	show clock
Parameter	

Example	Check CMTS system time.
	`D3>show clock`
	`Current Time : Thu Jan 1 01:17:03 1970`
	`Start Time : Thu Jan 1 00:00:26 1970`
	`Run Time : 0 days 1h:16m:37s`

4.3.1.10 Show CPE-Class

Command 10	show cpe-class	
Description	Use the **show cpe-class** command to check the user-defined CPE type and option 60 parameter definition.	
Syntax	show cpe-class [<string>]	
Parameter	[<string>]	Indicates specified CPE type.

Example	Check all cpe-class.
	`D3>show cpe-class`
	`cpe-class "stb"`
	`dhcp option60 "cqcctv"`	

4.3.1.11 Show cpuinfo

Command 11	show cpuinfo
Description	Use the **show cpuinfo** command to check the usage status of CMTS CPU, Memory, and Disk.
Syntax	show cpuinfo
Parameter	

Example	Check CMTS system sources.
	`D3>show cpuinfo`
	`Disk: 7.40G tatol, 0.33G used,7.07G free`
	`Mem: 687872K tatol, 240832K used,447040K free,640K buff,143168K cached`
	`CPU: 0.1% usr,0.3% sys,0.0% nic,99.6% idle,0.0% io,0.0% irq,0.0% sirq`
	`Load average: 1.00 1.01 1.05 1/64 162`

4.3.1.12 Show embedded-dhcp-scope

Command 12	show embedded-dhcp-scope	
Description	Use the show **embedded-dhcp-scope** command to check embedded DHCP server scope.	
Syntax	show embedded-dhcp-scope [cmc|cable-modem|host]	
Parameter	[cmc|cable-modem|host]	Indicates specified class scope, which is optional.

Example	Check all embedded DHCP server scope parameters.
	`D3>show embedded-dhcp-scope`
	`embedded-dhcp-scope "cable-modem"`
	`start-ip : 192.168.0.2`
	`end-ip : 192.168.0.100`
	`netmask : 255.255.255.0`
	`gateway : 192.168.0.1`
	`lease-time : 7200`
	`dns : 192.168.0.254`
	`boot-server : 192.168.0.254 cm.bin`
	`tod-server : 192.168.0.254`

4.3.1.13 Show firewall

Command 13	show firewall
Description	Use the **show firewall** command to check CMTS firewall parameters.
Syntax	show firewall
Parameter	

Example	Check CMTS firewall.
	`D3>show firewall`
	`firewall shutdown`
	`firewall outbound arp 5`
	`firewall outbound dhcp 5`
	`firewall outbound icmp 10`
	`firewall outbound igmp 5`
	`firewall outbound broadcast 5`
	`firewall inbound arp 100`
	`firewall inbound dhcp 100`
	`firewall inbound icmp 1000`
	`firewall inbound igmp 50`
	`firewall inbound broadcast 50`

4.3.1.14 Show hop-period

Command 14	show hop-period
Description	Use the **show hop-period** command to check spectrum hopping period.
Syntax	show hop-period
Parameter	

Example	Check hopping period.
	`D3>show hop-period`
	`hop period 180`

4.3.1.15 Show interface

Command 15	show interface	
Description	Use the **show interface** command to check the CMTS interfaces.	
Syntax	show interface docsis-mac| uplink-bridge| ip-bundle| ipqam| vlan| vlan-bundle [keys]	
Parameter	docsis-mac [<X/Y>]	Indicates information of all CMC or specified CMC.
	uplink-bridge [<num>]	Indicates all or specified uplink bridge information.
	ip-bundle <num>|<x.y>]	Indicates all or specified IP bundle.
	ipqam <X/Y>	Indicates specified CMC IPQAM configuration.

	vlan [<num>]	Indicates information of all or specified VLAN interface(s).
	vlan-bundle [<num>]	Indicate information of all or specified VLAN-bundle(s).
Example1	Check MAC domains' basic information of all CMC . D3>show interface docsis-mac IF MAC-Addr IP-Addr IP/OAM active Version Alias 1/1 00:10:18:de:ad:0a 192.168.2.101 Y/Y X.v4.4.0.rel.3218.15.1211	
Example2	Check basic information of all bridges. D3>show interface uplink-bridge interface uplink-bridge 0 gige 0,2 mac address 00:02:5e:ff:ee:00 no vlan-bundle enable ip address 192.168.0.254 255.255.255.0	

4.3.1.16 Show logging

Command 16	show logging
Description	Use the **show logging** command to check system logging.
Syntax	show logging
Parameter	
Example	Check system logging. D3>show logging Thu Jan 1 00:01:58 1970 clear syslog history Thu Jan 1 00:00:55 1970 cmts system start Thu Jan 1 00:00:52 1970 cmts system start Thu Jan 1 00:00:52 1970 cmts system start Thu Jan 1 00:07:20 1970 cmts system start Thu Jan 1 00:16:32 1970 cmts system start Thu Jan 1 00:25:35 1970 user:admin from 192.168.18.254 telnet login Thu Jan 1 00:26:32 1970 user:admin from 192.168.18.254 telnet logout Thu Jan 1 00:00:53 1970 cmts system start Thu Jan 1 00:00:55 1970 cmts system start Thu Jan 1 00:00:55 1970 cmts system start Thu Jan 1 00:00:55 1970 cmts system start Thu Jan 1 00:10:46 1970 user:console reboot system by cmd Thu Jan 1 00:00:52 1970 cmts system start Thu Jan 1 00:00:52 1970 cmts system start Thu Jan 1 00:41:19 1970 cmts system start Thu Jan 1 00:44:51 1970 user:console reboot system by cmd Thu Jan 1 00:00:52 1970 cmts system start Thu Jan 1 00:02:57 1970 user:admin from 192.168.18.254 telnet login Thu Jan 1 00:03:44 1970 user:admin from 192.168.18.254 telnet logout Thu Jan 1 00:01:02 1970 cmts system start Thu Jan 1 02:48:10 1970 user:admin from 192.168.18.254 telnet login	

4.3.1.17 Show multicast

Command 17	show multicast	
Description	Use the **show multicast** command to check multicast.	
Syntax	show multicast [docsis-mac <X/Y>]|[group-address <ip_address>]	
Parameter	docsis-mac <X/Y>	Indicates specified CMC MAC domain.
	group-address <ip_address>	Indicates specified multicast address.
Example	Check all multicast. D3>**show multicast**	

4.3.1.18 Show ntp-server

Command 18	show ntp-server
Description	Use the show ntp-server command to check NTP server configuration.
Syntax	show ntp-server

Parameter	
Example	Check NTP server configuration. D3>show ntp-server ntp server 0.0.0.0 480

4.3.1.19 Show route

Command 19	show route
Description	Use the **show route** command to check static routing table.
Syntax	show route
Parameter	
Example	Check static routing table. D3(config)#show route route net 0.0.0.0 0.0.0.0 gateway 192.168.0.1 uplink-bridge 0 Kernel IP routing table Destination Gateway Genmask Flags Metric Ref Use Iface default 192.168.0.1 0.0.0.0 UG 0 0 0 br0 192.168.0.0 * 255.255.255.0 U 0 0 0 br0 192.168.2.0_ * 255.255.255.0 U 0 0 0 br0

4.3.1.20 Show running-config

Command 20	show running-config
Description	Use the **show running-config** command to check system running configurations.
Syntax	show running-config
Parameter	
Example	Check system runningc onfigurations. D3(config)#show running-config ! hostname D3 no cable sid-recycle timeout 1440 startup-config local no cable l2-vpn-service dot1q cable tftp enforce cable shared-secret cc47624519e8e033e284e68d84427c84 no dhcp unicast-response hop period 180 ! cable modem remote-query interval 600 cable modem remote-query community-string public ! …

4.3.1.21 Show SNMP

Command 21	show snmp	
Description	Use the **show snmp** command to check system SNMP configuration.	
Syntax	show snmp community| trap	
Parameter	community	Indicates SNMP community
	trap	Indicates SNMP trap server

Example	Check SNMP community.
	`D3(config)#show snmp community`
	`snmp community private rw`
	`snmp community public ro`	

4.3.1.22 Show spectrum

Command 22	show spectrum	
Description	Use the **show spectrum** command to check upstream spectrum hopping configuration.	
Syntax	show spectrum rule [<num>]| hop-history	
Parameter	rule [<num>]	Indicates all or specified spectrum hopping rules.
	hop-history	Indicates hopping history logging.
Example		

4.3.1.23 Show system-power

Command 23	show system-power
Description	Use the **show system-power** command to check power supply status.
Syntax	show system-power
Parameter	

Example	Check power supply status.
	`D3(config)#show system-power`
	`system voltage(V) : 12.072`
	`system current(A) : 2.466`
	`system power(W) : 29.770`

4.3.1.24 Show timeout

Command 24	show timeout
Description	Use the **show timeout** command to check the timeout of telnet and http login CMTS.
Syntax	show timeout

4.3.1.25 Show temperature

Command 25	show temperature
Description	Use the **show temperature** command to check the temperature of each CMTS module.
Syntax	show temperature

Parameter	
Example	Check temperature status. D3>show temperature cmc ds module(.C) : 58 cmc us module(.C) : 62 cmc mac module(.C) : 53 cmts cpu module(.C) : 50

4.3.1.26 Show user

Command 26	show user
Description	Use the **show user** command to check the system users or the current logged in users.
Syntax	show user [current]

4.3.1.27 Show version

Command 27	show version
Description	Use the **show version** command to check the versions of system hardware and fireware.
Syntax	show version
Parameter	
Example	D3>show version System Boot File Directory :/ Kernel Version :0.2-nae.f1 Router Firmware Version :R.v1.0.16.0106 CMTS Hardware Version :B.v3.02 CMC 1/1 Firmware Version :X.v4.4.0.rel.3218.15.1211

4.3.1.28 Show warning

Command 28	show warning
Description	Use the **show warning** command to check the logging of system warnings.
Syntax	show warning

4.3.2 Analyzing Debug and Capture

Mode Privileged EXEC mode

Description The CMTS supports debug of cable modem status, DHCP, frequency hopping, it allows to capture local outputs and generate local files, which support wire-shark analysis.

4.3.2.1 Debug

Command 1	debug	
Description	Use the **debug** command to check the system users or the current logged in users.	
Syntax	[**no**] debug {cable-modem [<mac_address>]}|{dhcp [<mac_address>]}|hop|ipqam	
Parameter	{cable-modem [<mac_address>]}	Debugs DOCSIS status of all or specified MAC address CMs.
	{dhcp [<mac_address>]}	Debugs the DHCP process of all CPEs or CPEs with specifed MAC address.When the MAC address is specified, the whole DHCP information including OPTION will be shown. Only one user is allowed to specify MAC address debug at the same time.
	hop	Debugs upstream channel frequency hopping logging.
	ipqam	Debugs errors of IPQAM settings.
Example1	Debug the complete DHCP information of CPEs with MAC address 78:96:84:f9:2a:1c. D3> **debug dhcp 78:96:84:f9:2a:1c**	
Example2	Disable debug D3> **no debug dhcp 78:96:84:f9:2a:1c**	

4.3.2.2 Capture

Command 2	capture
Description	The CMTS can capture packets filtered by VLAN, source MAC address or destination MAC address, source IP address or destination IP address, source interface or destination interface. The capatured packets can be serial port outputs, local saved files or a mirroring-interface.
Syntax	[**no**] capture {any|gige <num>|docsis-mac <X/Y>} {arp|ip|ipv6|pppoe-discovery|pppoe- session} {output [local-file|mirroring-port <num>]|[keys] }

Parameter	{any|gige <num>|docsis-mac <X/Y>}	any indicates any port; gige <num> indicates specified gige port; docsis-mac <X/Y> indicates specified MAC domain.
	{arp|ip|ipv6 |pppoe-discovery |pppoe-session}	Indicates specified packet types, including ARP-packet, IP-packet, IPV6-packet, PPPOE–discovery or PPPOE- session.
	{output [local-file|mirroring-port <num>]}	Indicates output method, serial port output by default. local-file indicates the saved local file named cmts_capture.pcap mirroring-port <num> indicates the specified mirroring port.
	[keys]	Optional, including MAC address, IP address, port, VLAN.
Example1	Capture IP packet serial port outputs of any interface. D3> **capture any ip output**	
Example2	Stop capture. D3> **no capture**	

Chapter 5 Managing CMTS with Embedded Web

5.1 Summary

5.1.1 Supported Web Browsers

The web interface of Ascent CMTS is supported in web browsers of IE 11, Chrome 33 and any versions above. Thus latest Chrome browser are recommend for Windows XP users to operate the web interface.

5.1.2 Preparation

The default IP address of CMTS is 192.168.0.254, sub-net mask is 255.255.255.0. Make sure your web interface terminal (PC) is connected to CMTS, use “ping” to check if CMTS is reachable.

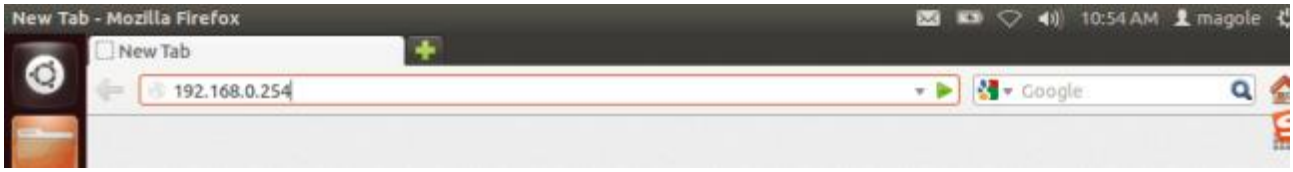
Example:

ping 192.168.0.254 (IP of CMTS)

```
root@magole-VirtualBox:/#
root@magole-VirtualBox:/#
root@magole-VirtualBox:/# ping 192.168.0.254
PING 192.168.0.254 (192.168.0.254) 56(84) bytes of data.
64 bytes from 192.168.0.254: icmp_req=1 ttl=128 time=0.394 ms
64 bytes from 192.168.0.254: icmp_req=2 ttl=128 time=0.276 ms
64 bytes from 192.168.0.254: icmp_req=3 ttl=128 time=0.305 ms
64 bytes from 192.168.0.254: icmp_req=4 ttl=128 time=0.029 ms
64 bytes from 192.168.0.254: icmp_req=5 ttl=128 time=0.330 ms
^C
--- 192.168.0.254 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 3997ms
rtt min/avg/max/mdev = 0.029/0.266/0.394/0.126 ms
root@magole-VirtualBox:/#
```

5.1.3 Log in to Web Interface

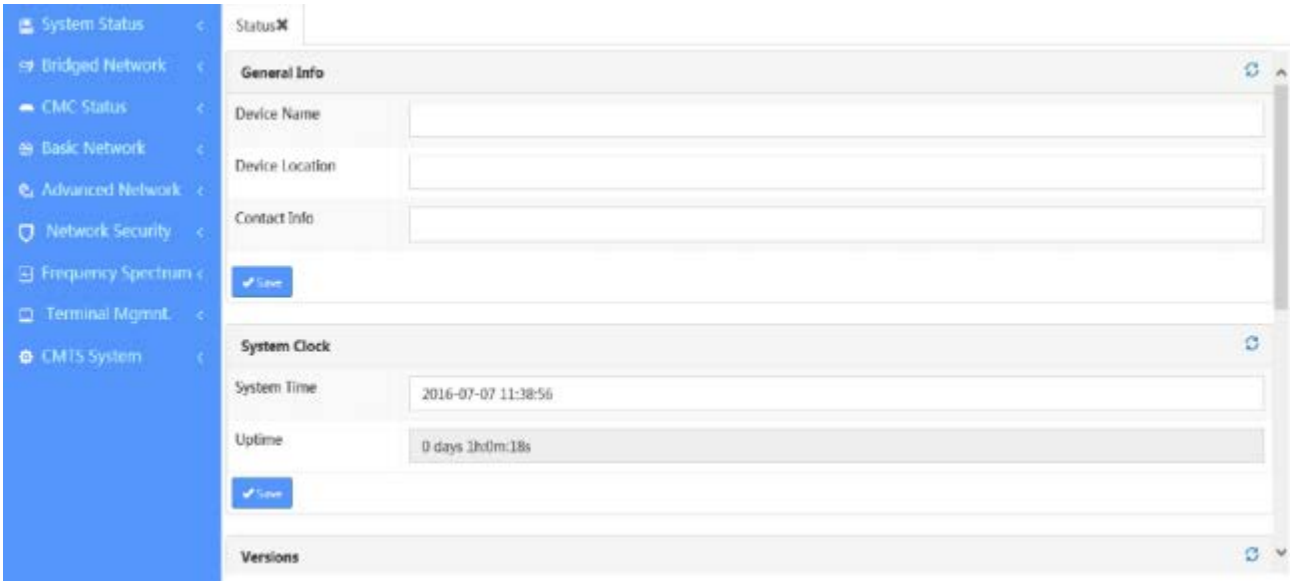
Enter the IP of CMTS in the address bar of your web browser (suggested IE, Version 8.0 or above)



The Login page:

Type user's name and password (default username: admin, default password: admin), select your language: Chinese/English, then hit login button.

Global view of Ascent CMTS web interface:



5.1.4 The Navigation Side Bar

5.1.4.1 Navigation menu instruction

	Second Manu	Comment
	Status	Shows current CMTS status.

System Status	Power	Shows the voltage, currency and power consumption.
	Temperatures	Shows temperatures of modules.
Bridged Network	IP Addresses	Network bridge settings.
	UpLink Interface	Wan port settings.
CMC Status	CMC 1	CMC board settings (See also 1.4.2).
Basic Network	Static Route	Static routing settings.
	Embedded DHCP Scope	Embedded DHCP settings.
	CPE CLASS Setting	CPE Class settings.
	ARP Table	Shows ARP table.
Advanced Network	IP-Bundle	IP Bundle settings.
	VLAN	VLAN settings.
	VLAN Bundle	VLAN Bundle settings.
	Multicast	Multicast mode and multicast sessions.
Network Security	Security Configuration	Global settings for network security.
	Firewall	System firewall settings.
	ACL Rules	Settings of access control based on ports.
Frequency Spectrum	Spectrum Rules	Settings of upstream frequency hopping rules.
	Hopping Log	Shows hopping history.
Terminal Mgmnt.	CM List	Shows cable modems.
	CPE List	Shows CPEs.
	CM Permission	Settings of CM permissions in accessing CMTS.
	CM Bandwidth	CM Upstream/downstream rate limit settings.
	Cable Modem Flap	Shows flap status in RF network.
CMTS System	Remote Query	CM remote query settings.
	Servers	Settings of CMTS host, logging, NTP servers.
	User Management	CMTS system users settings.
	Secret Key	Settings of SNMP community and MIC shared secret.
	Config.Management	Manage system configuration file.
	Firmware Upgrade	Upgrade system software.
	System Log	Shows system operation logging.

5.1.4.2 CMC menu instruction

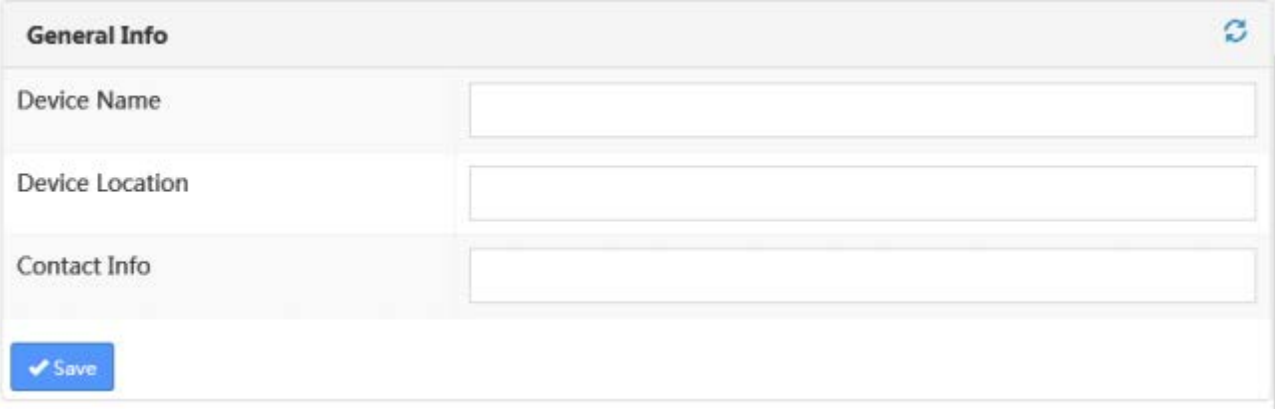
Secondary Menu	3rd-level menu	Comment
CMC1	CMC Status	Shows status of current CMC board.
	Network Config	Set network parameters of CMC.
	DOCSIS Config	Set DOCSIS parameters of CMC.
	Upstream Channels	CMC upstream settings.
	Downstream Channels	CMC downstream settings.
	Load Balance	Load balancing settings of CMC.
	Frequency Spectrum Analysis	Shows frequency spectrum on current CMC.
	IPQAM	IPQAM settings of CMC.
	SNR	Shows upstream SNR history of CMC.

5.1.4.3 Buttons

Button Icon	Comment
	Refresh the page or parameters.
	Add a new setting item.
	Remove the setting item.
	Finish editing and submit the setting item.
	Unfold or fold the item list.
	Search for matched item.
Add	Add a new page item.
Save	Finish editing and submit the configuration data, and a result shall be displayed. The new config data will be displayed in case of success; The error message or error code will be displayed in case of failure.
	This parameter is read-only. (Modification prohibited)
	Submission in progress, please wait...

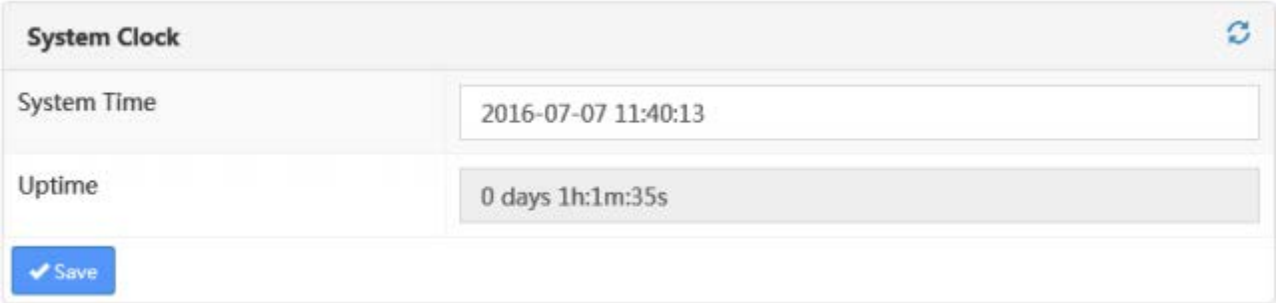
5.2 View the Status of the Device

5.2.1 General Information



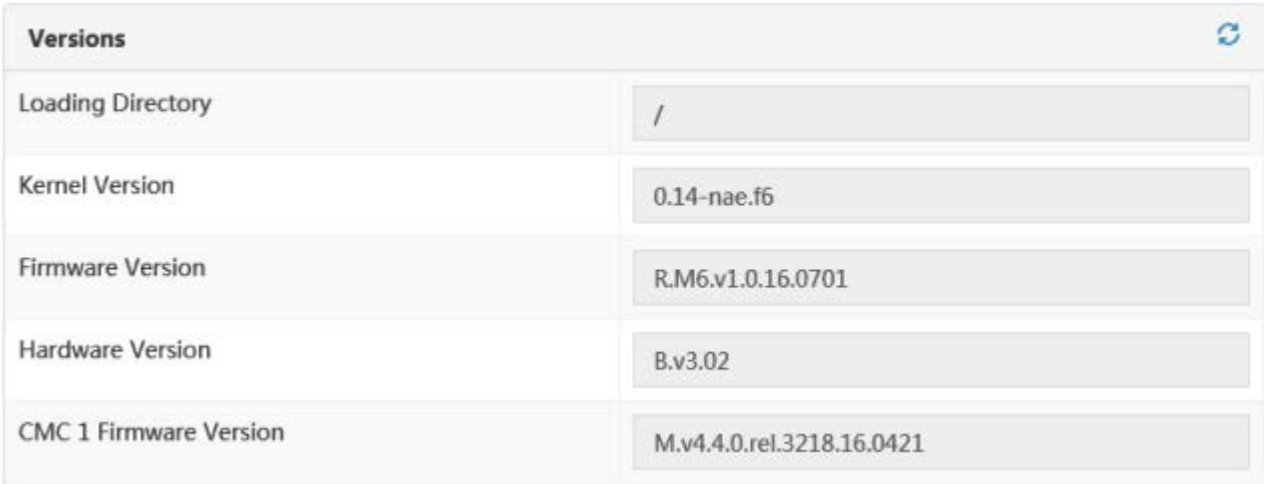
Title	Comment
Device Name	Set any name as user's preference.
Device Location	Comment the deployment location of this CMTS.
Contact Info	Leave any contact information.

5.2.2 System Clock



Title	Comment
System Time	Shows current system date and time.
Uptime	Shows the running time since start up.

5.2.3 Versions



Title	Comment
Loading Directory	The boot directory system load on.
Kernel Version	Kernel version of current operating system.
Firmware Version	Firmware version of router board.
Hardware Version	Hardware version of controller board.
CMC 1 Firmware Version	CMC board firmware version.

5.2.4 Power

It shows the input voltage, current and power consumption of current device and CMC board.

Status

Control Board

Voltage(V)	Current(A)	Power Consumption(W)
12.084	0.608	7.347

CMC Board ID	CMC Voltage(V)	CMC Current(A)	CMC Power(W)
1/1	12.016	1.978	23.767
2/1	12	1.905	22.871
3/1	12.008	1.908	22.911
4/1	12.004	1.913	22.975
5/1	11.992	1.918	23
6/1	12	1.92	23.04

5.2.5 Temperatures

It shows temperature reads of upstream/downstream sensors, CMC and CPU.

Temperatures

CPU Temp.(℃)	53

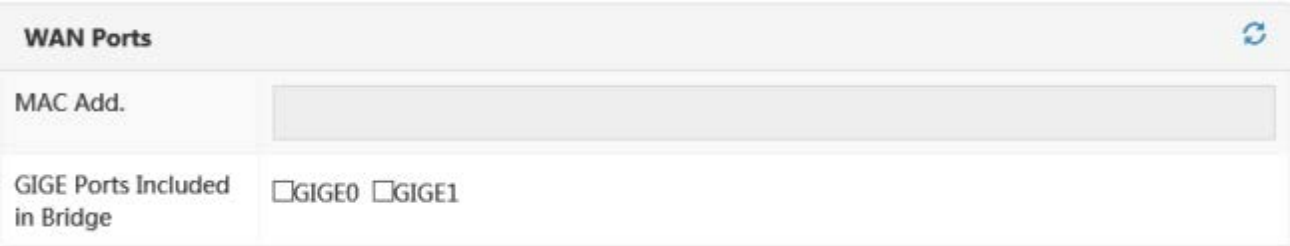
CMC Board ID	US sensor Temp.(℃)	DS sensor Temp.(℃)	MAC chip Temp.(℃)
1/1	64	64	49
2/1	62	62	46
3/1	63	63	44
4/1	63	63	45
5/1	62	62	45
6/1	61	61	44

5.3 Configuring Up-link

Ascent's CMTS devices usually have several physical uplink interfaces that are responsible for connecting to the IP network. In the 1U rock-mount CMTS and outdoor CMTS, there are four uplink ports: 10G-0, 1G-1, 1G-2, 1G-3.

A bridge is introduced to fulfill up-link connection, and the user can bind a specific port to it. IP address, ACL rules bonding, VLAN and VLAN-bundles can be configured under the uplink-bridge interface.

5.3.1 WAN port



Title	Comment
MAC Add.	It shows the MAC address of bridge.
GIGE Ports Included in Bridge	One or more GIGE ports can be bond to bridge.

5.3.2 IP Parameters

5.3.2.1 Bridge Primary IP

Title	Comment
DHCP	If checked, CMTS will retrieve primary IP from DHCP server dynamically. If unchecked, CMTS will retrieve IP statically, in the meantime, the “IP address” and “Subnet Mask”shall be appointed manually.
DHCP VLAN ID	VLAN bond in DHCP IP acquisition process.(Available only when “DHCP”is checked.)
IP Address	Static primary IP address.
Subnet Mask	Static primary subnet mask.
StartUp Config File	Where CMTS loads the config file from, alternatively local or DHCP.(Available only when “DHCP”is checked.)

5.3.2.2 VLAN

Title	Comment
Enable VLAN Config	If checked, the management of IPVLAN will be enabled.
VLAN ID	VLAN ID, 2~4095.
VLAN MAC Address	To set the MAC addresses of bridge interface, IP-bundle interface.
VLAN IP Address	To set the management IP address, which must be the IP of bridge interface, or IP-Bundle interface.

5.3.2.3 ACL Rules

Title	Comment
Add ACL Rule ID	To apply the ACL ID number(s) to the bridge.

5.4 CMC Management

Ascent Outdoor CMTS and 1U rock-mount CMTS support one DOCSIS MAC. Each MAC domain is fixed bonded with 8 upstream channels and 32 downstream channels, the channels cannot be split. Each MAC domain has its individual load balancing configuration.

5.4.1 CMC Status

Title	Comment
Initialization Status	It shows the process of CMC initialization.
Network Link Status	It shows the link status of CMC board to Controller board.
QAM Link Status	It shows the link status of CMC board to Controller board.
Board Mac Address	It shows the MAC address of CMC board.
Board IP Address	It shows the IP address of CMC board.
Board Firmware Version	It shows the firmware version of CMC board.

5.4.2 Network Configuring

Title	Comment
IP-BUNDLE ID	Set the IP-Bundle ID applied to MAC domain.
Max. Load of CMs	Set the maximum cable modem number connect to CMC.

IP-Provision-Mode	Available IP mode for Cable Modem: apm: Indicate alternative mode (IPV4 or IPV6) dpm: Indicate Double IP mode (support both IPV4 and IPV6) ipv4: Indicate IPV4 mode, IPV4 is the default IP mode ipv6: Indicate IPV6 mode

5.4.3 MAC Parameters

Title	Comment
CMC Board ID	It shows the ID of current CMC board.
MDD Interval Period (ms)	To set the interval period of MAC domain description transmitted on every downstream channel in the MAC domain.
Cable Baseline Privacy	To enable/disable the baseline privacy. If the baseline privacy is disabled in CMTS, the BPI in the CM will be ignored; If the baseline privacy is enabled in CMTS, and specified in the CM configuration file too, the CM BPI will be performed.
CM State Hold Time (Tick)	The status hold time of the cable modem before the status report transmitted.
CM Next DS Scan Frequency (KHz)	When the cable modem number is more than the threshold in a Mac domain, the cable modem will scan the next frequency.
Ranging-Backoff-Start	The backoff start window of upstream ranging competition.
Ranging-Backoff-End	The backoff end window of upstream ranging competition.
Data-Backoff-Start	The backoff start window of upstream transmitting request competition.
Data-Backoff-End	The backoff end window of upstream transmitting request competition.

5.4.4 RF Parameters

5.4.4.1 Upstream Channels

Upstream Channels

Channel ID	Status	Center Frequency (kHz)	Type	Bandwidth	Modulation	Power (dBmV)	D3.0 Enhanced Mode	Freq. Spectrum Rule
1	Enable	30000	ATDMA	3200kHz	ATDMA-MediumNoise/QPSK	0	Disable	
2	Enable	33200	ATDMA	3200kHz	ATDMA-MediumNoise/QPSK	0	Disable	
3	Enable	36400	ATDMA	3200kHz	ATDMA-MediumNoise/QPSK	0	Disable	
4	Enable	39600	ATDMA	3200kHz	ATDMA-	0	Disable	

Title	Comment
Channel ID	It shows the upstream channel ID.
Status	To set the current channel as enabled or disabled.
Central Frequency (kHz)	To set the Central Frequency, legal range 5000~65000 (kHz)
Type	To set the upstream channel as ATDMA or SCDMA.
Bandwidth	To set the upstream channel bandwidth as 200, 400, 800, 1600, 3200 or 6400 （kHz）
Modulation	To set the modulation mode of upstream channel.
Power (dBmV)	To set the channel receive power level, legal range -13~23 (dBmV)
D3.0 Enhanced Mode	If set as enabled, only DOCSIS 3.0 cable modems can register to the current channel.
Freq. Spectrum Rule	To set the frequency rule of upstream channel.
Fast Config	A fast config guide to set multi-channels.

Statistic information of upstream channels:

Title	Comment
SNR	It shows the SNR of current upstream channel.
Channel Capacity (Kbps)	It shows the maximum transmit rate of current upstream channel.
Real-time flow (Kbps)	It shows the real-time traffic rate of current upstream channel.
Utilization (%)	It shows the utilization of current upstream channel (Real-time Traffic/ Channel Capacity)

5.4.4.2 Downstream Channels

Downstream Channels

Channel ID	Status	Center Frequency (kHz)	DOCSIS Standard	Modulation	Interleave Depth	Power(dBmV)	Channel Capacity (Kbps)	Real-time Traffic (Kbps))	Utilization (%)
1	DOCSIS	387000	ANNEX A	64QAM		45	38440	384	1
2	DOCSIS	395000	ANNEX A	64QAM		45	38440	384	1
3	DOCSIS	403000	ANNEX A	64QAM		45	38440	384	1
4	DOCSIS	411000	ANNEX A	64QAM		45	38440	384	1
5	DOCSIS	419000	ANNEX A	64QAM		45	38440	384	1
6	DOCSIS	427000	ANNEX A	64QAM		45	38440	384	1

Title	Comment
Channel ID	It shows the downstream channel ID.
Status	To set the current channel as DOCSIS channel, IPQAM channel or disabled.
Central Frequency (kHz)	To set the central frequency of downstream channel, 88000~1002000 (KHz), the frequency will increase by 8MHz or 6MHz depending on its ANNEX version, the frequency span will not be more than 192MHz.
DOCSIS Standard	To set downstream channel standard as ANNEX A(Euro), or ANNEX B (North America); IPQAM6875 and IPQAM6900 are IPQAM with symbol rates in 6.875M and 6.9M.
Modulation	To set the downstream channel modulation as 64QAM, 256QAM or 1024QAM.
Interleave Depth	I128-1~I1-128, invalid in ANNEX A(Euro) DOCSIS standard.
Output Power Level (dBmV)	To set downstream output power level 10~60(dBmV).
Fast Config	A fast config guide to set multi-channels.

Statistic information of downstream channels:

Title	Comment
Channel Capacity (Kbps)	It shows the maximum transmit rate of current downstream channel.
Real-time Traffic (Kbps))	It shows the real-time traffic rate of current downstream channel.
Utilization (%)	It shows the utilization of current downstream channel (Real-time Traffic/Channel Capacity)

5.4.5 Load Balance

Each MAC domain holds a separated load balance configuration. There are 2 methods to perform CMTS load balance: static load balance intended to keep Mini-mun bandwidth,

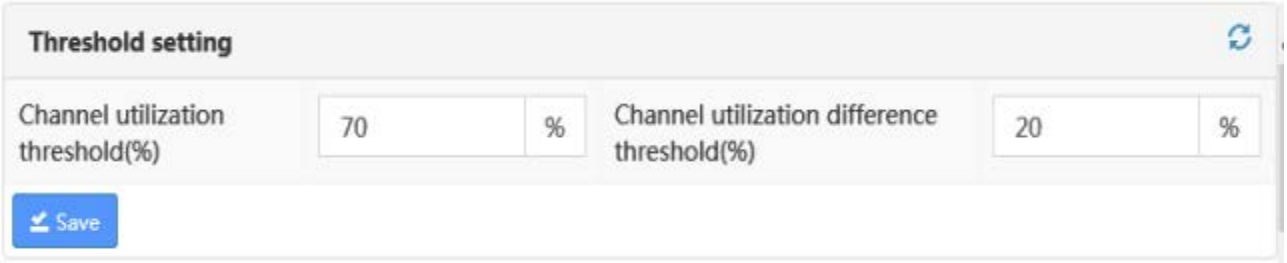
and dynamic load balance based on channel utilization. By default, the CMTS performs default load balance method.

During the initialization, CMTS equally distributes CM to register to activated upstream and downstream channels. Once the channel utilization reaches specified threshold, CMTS performs dynamic load balance operations.

By checking assignment and thresholds utilization on channels periodically, and means of DCC and DBC, the CMTS moves CM channels refer to channel utilization, instead of balances bandwidth in data transmitting.

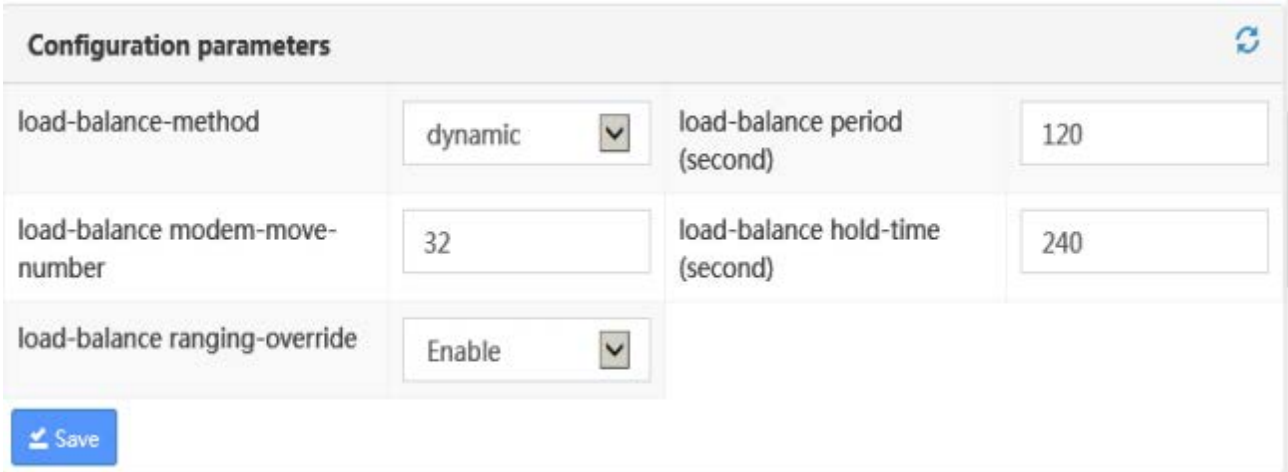
As CMTS supporting load balance group configuration, it allows specified upstream, downstream and CM to be assigned to balance groups, to realize load balance based on CM types.

Threshold setting:



Title	Comment
Channel utilization threshold	Load balance will be activated When the channel utilization is larger than the threshold set.
Channel utilization difference threshold(%)	Load balance will be activated When the channel utilization difference is larger than the threshold set.

Configuration parameters:



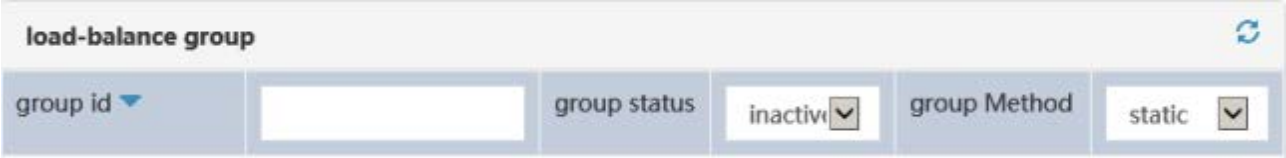
Title	Comment
Load-balance-method	To set the load balance performance as dynamic, static or disabled. Dynamic load balance will be performed based on utilization or utilization difference of channels. Static load balance will be performed based on the minimum cable modem number of keeping the bandwidth.
load-balance period(second)	To set the interval period of load balance being performed.

load-balance modem- move-number	To set the maximum number of cable modem being channel-moved in a load- balance period.
load-balance hold-time(second)	To set the minimum interval period of one cable modem being channel-moved.
load-balance ranging- override	To enable/disable the ranging override, if enabled, the cable modem will be allowed to register on different channels by ranging response results.

DBC/DCC initialization technology, is a ranging initialization process after channel-moving of a cable modem in the load-balance.

Title	Comment
DCC-ATDMA	To set the initialization tech of DCC in ATDMA mode.
DCC-SCDMA	To set the initialization tech of DCC in SCDMA mode.
DBC-ATDMA	To set the initialization tech of DBC in ATDMA mode.
DBC-SCDMA	To set the initialization tech of DBC in SCDMA mode, which include: broadcast-ranging; direct： Move to new channel directly, only available in ATDMA mode; period-ranging： perform the ranging periodically; reinitialize-mac; unicast-ranging.

Load-balance group:



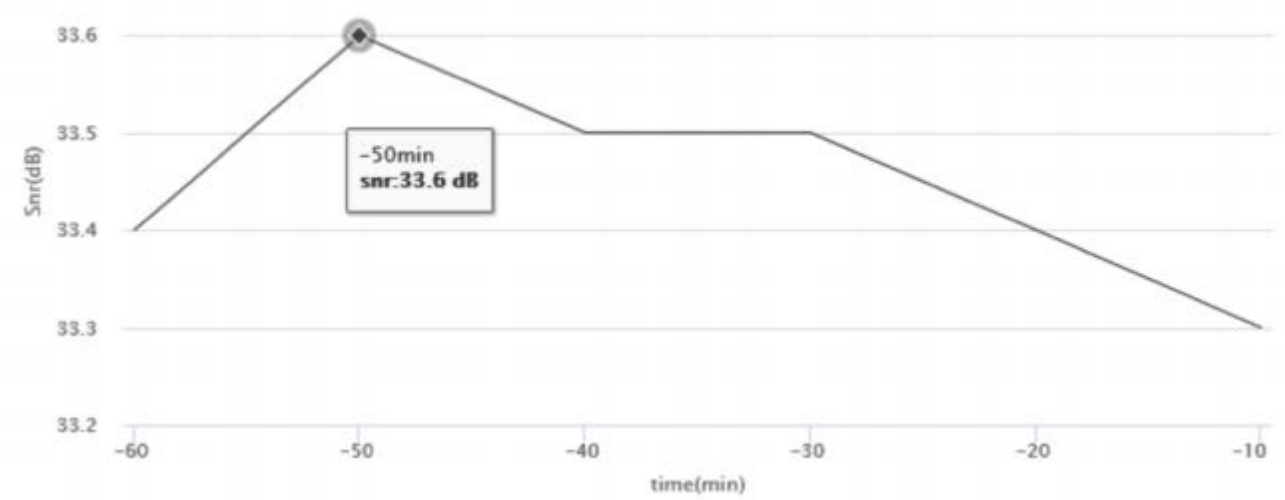
Title	Comment
group id	To set the ID of load balance group, 1~255.
group status	To set the load balance group as active/inactive.
group Method	To set the load balance mode as dynamic or static.
Upstream Channel	To select the upstream channels included in load balance group.
Downstream Channel	To select the downstream channels included in load balance group.
Group cm mac-addr rules	The cable modems' MAC addresses included in the load balance grou.

Group exclude cm mac-addr rules:

Title	Comment
MAC type	To exclude cable modems' MAC addresses to a load balance group by: Single-mac: to exclude a specific Mac address; Mac-oui: to exclude a specific type of Mac addresses; Range-mac: to exclude a range of Mac addresses.

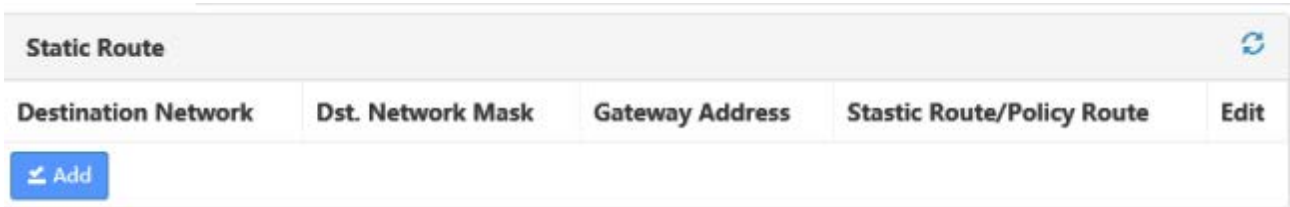
5.4.6 US S/N History

The SNR will be recordedfor every 10 minutes by default.



5.5. Basic Network Management

5.5.1 Static Route

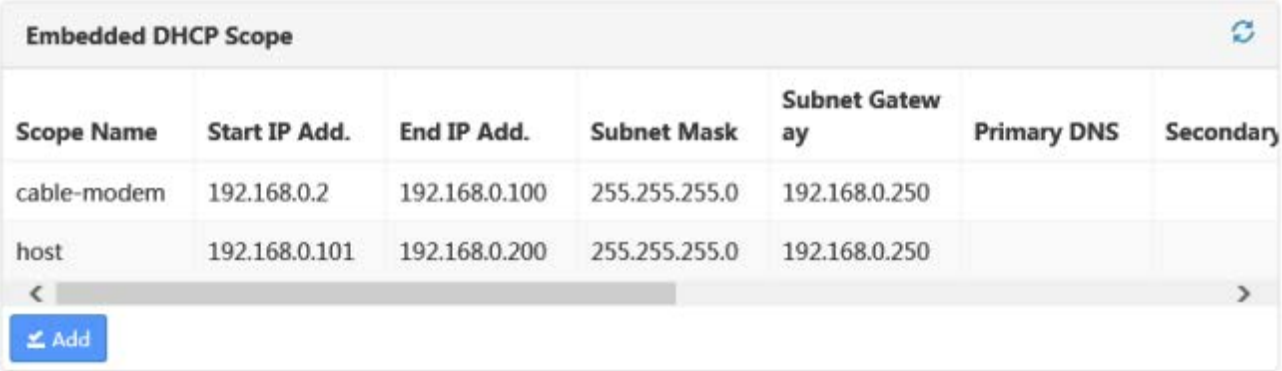


Title	Comment
Destination Network	To set the address of destination network or destination host.
Dst. Network Mask	To set the mask of destination network.
Gateway Address	To set the IP address of gateway.
Stastic Route/Policy Route	To set the route policy as static or policy.

5.5.2 Embedded DHCP Scope

The CMTS system supports simple embedded DHCP service and TFTP service. If the

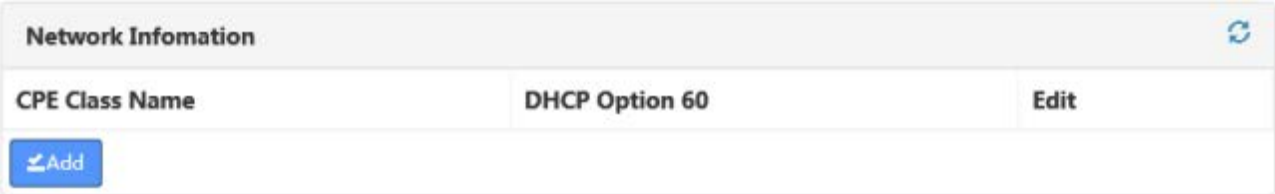
helper-address of IP bundle is associated with bridge interface IP address, the CMTS will intercept the DHCP packets to uplink interface, and the embedded DHCP scope will assign IP address to CPE instead.3 scopes can be set by default: CMC scope (high density type or Remote-MAC setting) , CM scope and CPE host scope.



Title	Comment
Scope Name	To set the DHCP scope name
Start IP Add.	To set the start IP of scope.
End IP Add.	To set the end IP of scope.
Subnet Mask	To set the mask of scope.
Subnet Gateway	To set the gateway of scope.
Primary DNS	To set the IP address of primary DNS server.
Secondary DNS	To set the IP address of Secondary DNS server.
TFTP Server	To set the IP address of TFTP server.
Boot File	The file name of cable modem configuration.
Log Server	To set the IP address of log server.
ToD Server	To set the IP address of time server.
Lease Time (s)	To set the lease time of IP address (1~65535 s).

5.5.3 CPE Class Setting

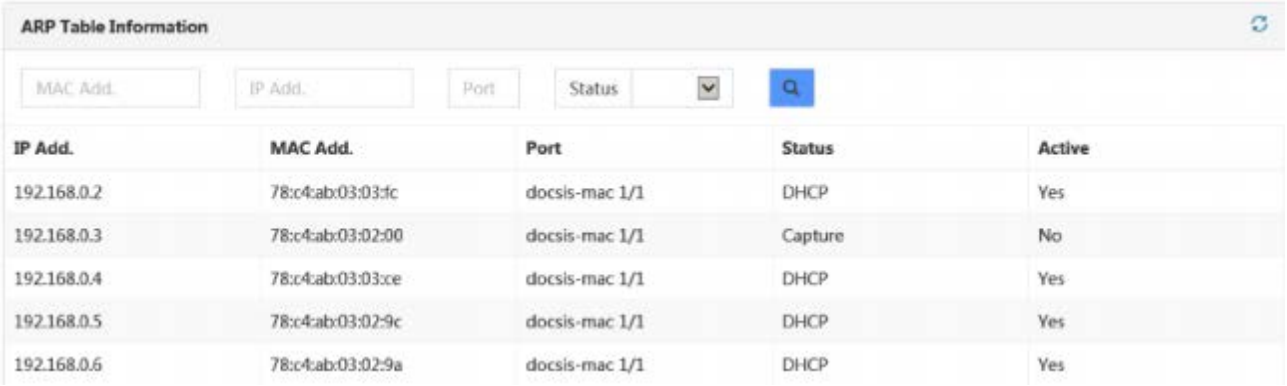
CPE class is defined as a group of categorized customer premises equipment. The CMTS identifies the same CPE's DHCP OPTION60 parameter string as a class group, one CPE class can be fuzzy matched by multiple option 60 strings. CPE class is used for DHCP relay and terminal equipment enquiry.



Title	Comment
CPE Class Name	To set the name for CPE Classes, the name can be consist of A~Z, 0~9, ",", ".", "/", ":", and "-".

DHCP Option 60	To set one or more DHCP Option 60 strings, the string can be consist of A~Z, 0~9,

5.5.4 ARP Table



IP Add.	MAC Add.	Port	Status	Active
192.168.0.2	78:c4:ab:03:03:fc	docsis-mac 1/1	DHCP	Yes
192.168.0.3	78:c4:ab:03:02:00	docsis-mac 1/1	Capture	No
192.168.0.4	78:c4:ab:03:03:ce	docsis-mac 1/1	DHCP	Yes
192.168.0.5	78:c4:ab:03:02:9c	docsis-mac 1/1	DHCP	Yes
192.168.0.6	78:c4:ab:03:02:9a	docsis-mac 1/1	DHCP	Yes

Title	Comment
IP Add.	It shows the IP address.
MAC Add.	It shows the MAC address.
Port	It shows the physical network port.
Status	It shows the source of current ARP entry.
Active	It shows the status of current ARP entry.

5.6 Advanced Network Management

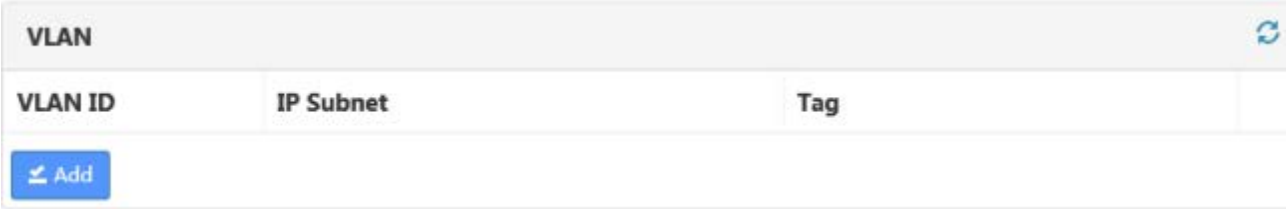
5.6.1 IP-Bundle

An IP bundle indicate one IP subnet group of which each MAC domain must have a fixed IP bundle. The IP bundle contains parameters of cable helper, IP address, DHCP relay giaddr and srcaddr. An IP bundle consists of primary bundle and its only or multiple subnet bundle(s). Both the primary bundle and its subnet bundle(s) will be included when user apply the IP bundle to a MAC domain.

Title	Comment
IP Bundle ID	To set the IP Bundle ID, 1~128. Both primary IP Bundle (X) and sub-net IP Bundle (X.Y) can be set, X for primary bundle ID,Y for sub net bundle ID.
DHCP Relay Primary Mode	If the primary mode is enabled, all the CPE Class giaddr will be filled by the primary IP address of IP Bundle interface.
DHCP Relay Option 82 Insertion	If the Option 82 is enabled, the option 82 string with cable modem MAC address will be inserted to the DHCP relay packets.
Primary IP Address	To set the primary IP address of IP Bundle interface.
Primary IP Subnet Mask	To set the subnet mask of primary IP of IP Bundle.
Secondary IP Address/Mask	To set the subnet mask of secondary IP of IP Bundle.
DHCP IP Add.	To set the IP address of DHCP server.
Relay IP Address	To set the CPE Class giaddr address for DHCP relay, it is essential when DHCP relay is enabled.
Relay Source IP Address	To set the CPE Class source IP address for DHCP relay.

5.6.2 VLAN

CMTS system supports VLAN by default, including IP VLAN, interface VLAN. For 1U chassis type and outdoor type with single CMC module (with single up-link bridge), VLAN can be directly applied to up-link bridge 0.



5.6.3 VLAN Bundle

VLAND Bundle is defined as a group of VLAN, which can be classified as primary bundle and secondary bundle. A VLAN bundle must include the cable modem IP subnet, and VLAN of one or more CPE Class. A VLAN bundle needs to be applied to bridge to take effect.

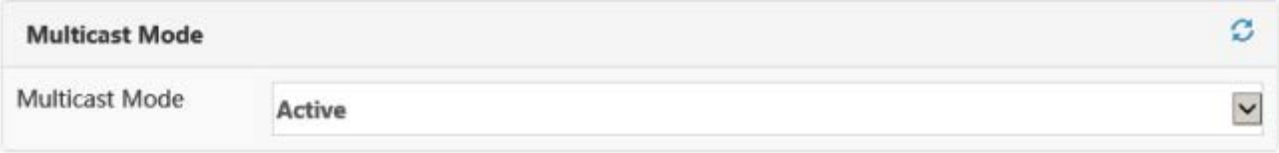
Title	Comment
VLAN Bundle ID	To set the VLAN bundle ID, 1~10.
VLAN Bundle Primary	Primary/Secondary VLAN Bundle To set the VLAN bundle as primary or secondary.
IP Address	To set the IP address of cable modem.
Netmask	To set the mask of cable modem.
Interface VLAN	To set the CPE VLAN.

5.6.4 Multicast

There are two ways to perform multicast on CMTS:

Active mode: IGMP join, IGMP quit and snooping to be performed by CMC board automatically, this is the default mode of CMTS.

Passive mode: IGMP will be performed by CMTS router board.



Title	Comment
Multicast Mode	To set the multicast mode as active or passive.

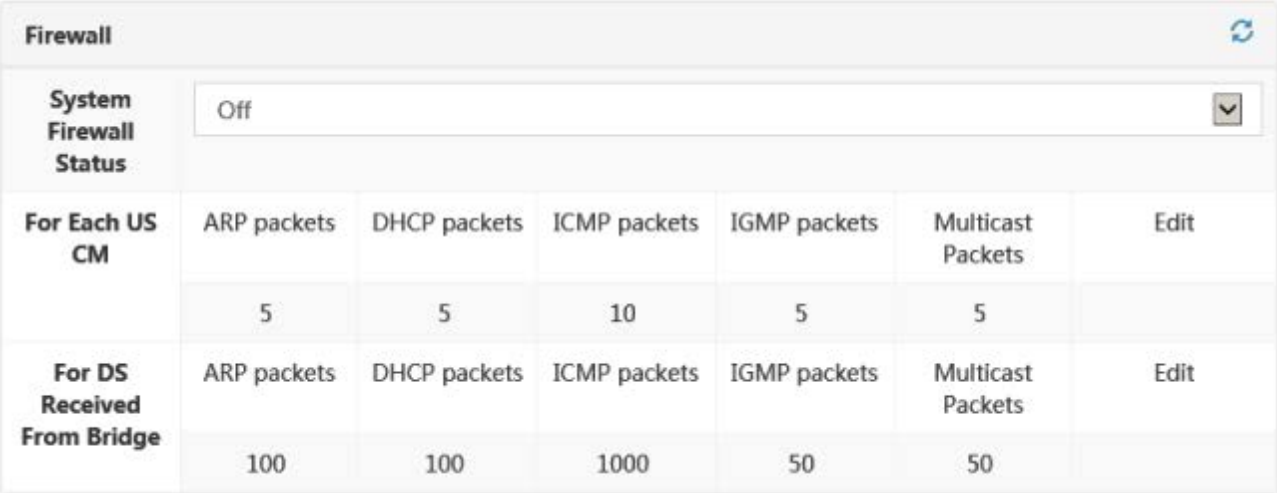
5.7 Network Security Management

5.7.1 Security Configuration

Title	Comment
IP source verification	Source address verification is a process that match upstream data packets sourced IP and MAC with the address assigned by DHCP. Source address verification can prevent illegal transmission from any IP manually modified by end users(subscribers), it is enabled by default. Yet manually bond static IP for specific CPEs are allowed by editing CM configuration profile.
DHCP unicast response	The DHCP server will respond with multicast packets by default, if DHCP unicast response is on, the DHCP server will respond with unicast packets instead.
L2VPN	CMTS will match L2VPN according to the CM upstream service flow and classifier, data packets which conform to the rule will be inserted with VLAN tag and forward to up-link interface. L2VPN service is disabled by default.
Subnet Access Control	Enable or disable subnet-isolation for the CMs connected to the same RF port. When enabled, the CPEs in different network segment can't forward ARP even if they are on the same RF port.

5.7.2 Firewall

Firewall can be enabled and disabled. Users can prevent data flooding by setting the Max. throughout threshold for specified downstream data packet type and upstream data packet type.

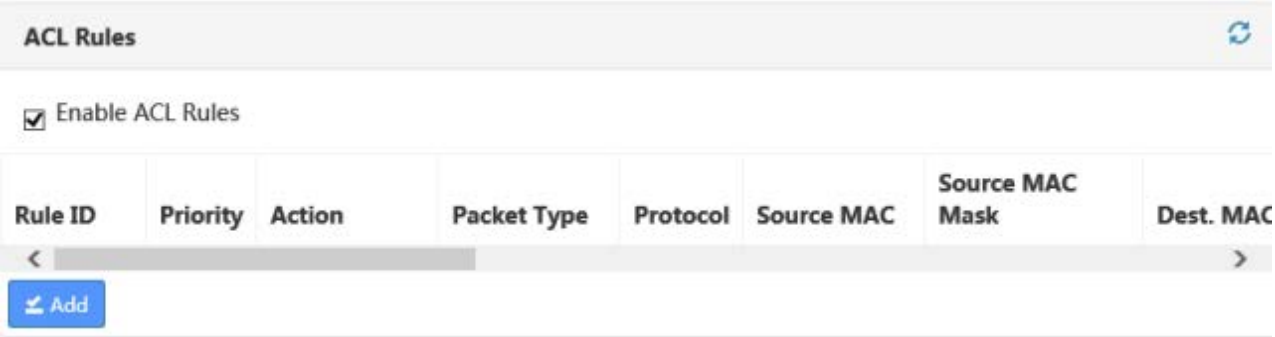


Title	Comment
System Firewall Status	To enable/disable the system firewall
For Each US CM	
ARP packets	To set the maximum upstream ARP packets of CM.
DHCP packets	To set the maximum upstream DHCP packets of CM.
ICMP packets	To set the maximum upstream ICMP packets of CM.
IGMP packets	To set the maximum upstream IGMP packets of CM.
Multicast Packets	To set the maximum upstream multicast packets of CM.

For DS Received From Bridge	
ARP packets	To set the maximum downstream ARP packets of CM.
DHCP packets	To set the maximum downstream DHCP packets of CM.
ICMP packets	To set the maximum downstream ICMP packets of CM.
IGMP packets	To set the maximum downstream IGMP packets of CM.
Multicast Packets	To set the maximum downstream multicast packets of CM.

5.7.3 ACL Rules

ACL (Access Control List) is a mechanism based on port access control, it will deny or allow data packets to access specified port, insert VLAN and be forwarded. ACL rules are shared globally, effective when applied to specified port(s).



Title	Comment
ACL control	
Enable ACL Rules	To set if enable ACL Rules to filter/modify the data packets get through CMTS.
ACL Rules	
Rule ID	To set the ACL rule ID, 1~255.
Priority	To set the priority of the ACL rule.
Action	permit/permit-host: Allow access for data packets in the rule list, use permit-host to specify the data packets to CMTS host as destination. deny/deny-host： Deny access for data packets in the rule list, use deny host to specify the data packets to CMTS host as destination. TagVlan for cable-pkt： Insert VLAN tag to the data packets in the rule list.
Packet Type	To specify the packet type.
Protocol	To specify the packet protocol.
Source MAC	To specify the source Mac.
Source MAC Mask	To match the source Mac address part which specified by source Mac mask.
Dest. MAC	To specify the destination Mac address.
Dest. MAC Mask	To match the destination Mac address part which specified by source Mac mask.
Source IP	To specify the source IP address.
Source IP Mask	To match the source IP address part which specified by source IP mask.

Dest. IP	To specify the destination IP address.
Dest. IP Mask	To match the destination IP address part which specified by destination IP mask.
Source Starting Port	To specify the source TCP/UDP start port.
Source Ending Port	To specify the source TCP/UDP end port.
Dest. Start Port	To specify the destination TCP/UDP start port.
Dest. End Port	To specify the destination TCP/UDP end port.

5.8 Frequency Spectrum Management

5.8.1 Spectrum Rules

The CMTS supports upstream channel spectrum management by default. With pre-defined spectrum rules, Signal quality of upstream channels can be adjusted dynamically. SNR, FEC threshold on US channels will be detected periodically to trigger frequency hopping, then a optimal destination frequency will be produced by real-time calculation on FFT. The dynamic adjustment of US channel frequencies follow 3 priority modes, including adjustments of frequency, bandwidth and modulation. When signal quality fails, only one action of re-modulation or back-off will be performed by priority sequence.

The spectrum rules will not take effect until they are applied to one or more upstream channels.

Title	Comment
Frequency Hopping Period (s)	To set the period of CMTS checking upstream SNR and FEC threshold.

Title	Comment
Freq.Hop End Bandwidth(KHz)	The end of bandwidth adjustment due to hopping. (Low bandwidth)

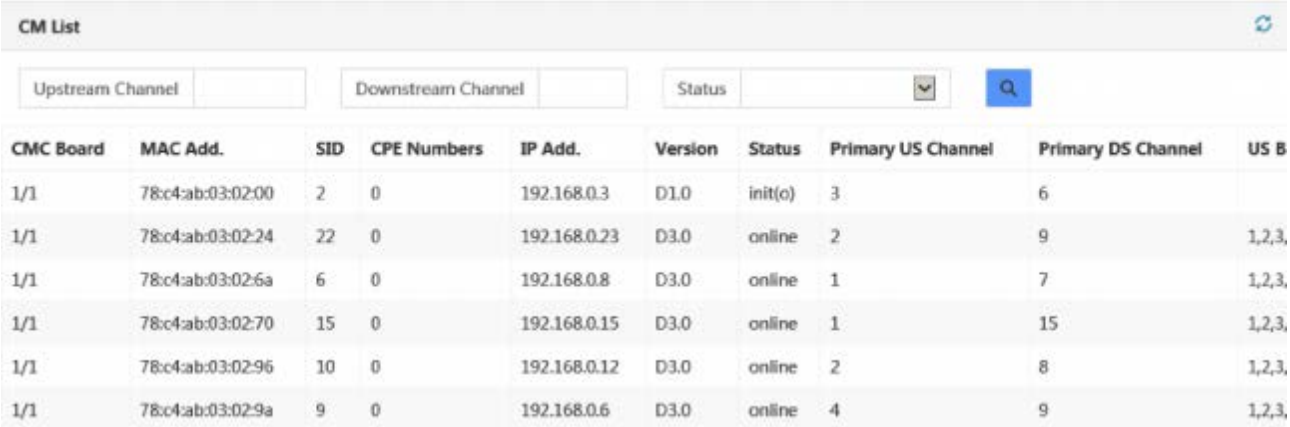
SNR Threshold: Profile	The modulation adjustment is highly depending on the SNR threshold, when the SNR is lower than the threshold (Freq.Hop start SNR), CMTS will adjust the modulation to the corresponding modulation method. When the SNR is higher than the threshold (Freq. Hop back SNR), CMTS will hop back to the highest modulation method depending on current SNR set in the profile.
Freq.Hop Start Bandwidth(KHz)	The start of bandwidth adjustment due to hopping. (High bandwidth) To set the channel width range adjusted by frequency hopping. By default, the CMTS adjusts channel from high bandwidth to low bandwidth, and the opposite goes for back-off action. When a channel width adjustment is triggered, CMTS will calculate for bandwidth adjust feasibility base on the bandwidth, frequency of both current and adjacent channels.
Freq. Band(KHz)	To set adjustable frequency band range.If it is set as an specific frequency, the CMTS will regards it as one frequency band. Multiple frequency bands can be set for CMTS to select a optimal one based on FFT calculation.
Correctable-fec(%)	To set frequency hopping FEC threshold-- channel data correction percentage. CMTS will detect channel signal quality periodically, Once channel data correction percentage is greater than the threshold, frequency hopping will be triggered.
Uncorrectable-fec(%)	To set frequency hopping FEC threshold-- uncorrectable channel data percentage. CMTS will detect channel signal quality periodically, Once channel data correction percentage is greater than the threshold, frequency hopping will be triggered.
Action	To set frequency hopping mode priority. only one action of re-modulation or back-off will be performed by priority sequence and frequency hopping threshold. Three modes are available in any combinations. Example: Set mode priority as: frequency, bandwidth, modulation so that CMTS will optimize the channel by: adjusting frequency to optimal frequency in the first period; Decreasing channel bandwidth based on current bandwidth and frequency hopping bandwidth in the second period, in case the first period adjustment failed to get satisfied signal quality;Switching among modulation modes till all modes are run out, in case both first and second period adjustment failed to get satisfied signal quality.In any period, once the channel gets satisfied signal quality, and SNR is greater than the fall-back threshold (default value is + 3bd), CMTS will perform fall-back according to last action.
Rule ID	To set the spectrum rule ID, 1~40.

5.8.2 Hopping Log

5.9 Terminal Management

5.9.1 CM List

The CM list provides the cable modem information, users can check specified cable modem info by refreshing the real-time CM list table and set filters.



CMC Board	MAC Add.	SID	CPE Numbers	IP Add.	Version	Status	Primary US Channel	Primary DS Channel	US B
1/1	78:c4:ab:03:02:00	2	0	192.168.0.3	D1.0	init(o)	3	6	
1/1	78:c4:ab:03:02:24	22	0	192.168.0.23	D3.0	online	2	9	1,2,3,
1/1	78:c4:ab:03:02:6a	6	0	192.168.0.8	D3.0	online	1	7	1,2,3,
1/1	78:c4:ab:03:02:70	15	0	192.168.0.15	D3.0	online	1	15	1,2,3,
1/1	78:c4:ab:03:02:96	10	0	192.168.0.12	D3.0	online	2	8	1,2,3,
1/1	78:c4:ab:03:02:9a	9	0	192.168.0.6	D3.0	online	4	9	1,2,3,

Title	Comment
CMC Board	It shows the hosting CMC board ID of the CM.
MAC Add.	It shows the Mac address of the CM.
SID	It shows the session ID of the CM.
CPE Numbers	It shows the CPE number of the CM hosted.
IP Add.	It shows the IP address of the CM.
Version	It shows the DOCSIS version of the CM.
Status	It shows the status of the CM.
Primary US Channel	It shows the primary upstream channel of the CM.
Primary DS Channel	It shows the downstream channel of the CM.
US Bonding Channel	It shows the upstream bond channels of the CM.
DS Bonding channel	It shows the downstream bond channels of the CM.
CMTS Rx Pwr	It shows the power level of the CM received in upstream.
US SNR	It shows the SNR of the CM received in upstream.

US Tx Pwr	It shows the power level of the CM transmitted in upstream.
DS SNR	It shows the SNR of the CM received in downstream.
DS Rx Pwr	It shows the power level of the CM received in downstream.
BPI Enb	It shows if BPI+ is enabled of the CM.

5.9.2 CPE List

The CPE list provides the Customer Premises Equipment information, users can check specified CPE info by refreshing the real-time CPE list table and set filters.

Title	Comment
CMC Board	It shows the CMC board ID of cable modem the CPE up-linked to.
CM MAC Add.	It shows the Mac address of cable modem the CPE up-linked to.
CM IP Add.	It shows the IP address of cable modem the CPE up-linked to.
CPE Number	It shows the CPE number of cable modem the current CPE up-linked to.
CPE MAC Add.	It shows the MAC address of the CPE.
CPE IP Add.	It shows the IP address of the CPE.
CPE Type	It shows the CPE class of the CPE.

5.9.3 CM Permission

The CM permission mode can be set as permit or deny by default:

Permit: If the CM permission is set as permit by default, only the cable modems in the CM permission table listed below can access the network.

Deny: If the CM permission is set as deny by default, only the cable modems in the CM permission table listed below cannot access the network.

CM Permission list shows the cable modem MAC list of the denied or permitted to access the network.

Title	Comment
CM MAC Add. Type	To set the type of Mac address which the permission will applied to, it can be an single Mac address, Mac OUI or a Mac range.
Start MAC	To set the Mac address or Mac OUI of a cable modem.
End MAC	End Mac must be specified when the CM MAC Addis selected as “Range Macs”.

5.9.4 CM Bandwidth Limit

The upstream/downstream bandwidth of cable modems can be limited.

Title	Comment
CM MAC Add.	To add the Mac address of a cable modem.
MAX. DS Rate	To set the maximum downstream rate of specified cable modem.
MAX. US Rate	To set the maximum upstream rate of specified cable modem.

5.9.5 CM Flap

FLAP LIST is used to detect CM problems in the RF network. Users can set the CM thresholds of aging time, power level adjustment and initial ranging interval to determine the unstable factors in the RF network. The default values of threshold of aging time is 1440 minutes, registration interval is 180 seconds, the power level adjustment is 3dB.

Title	Comment
Flap-list Aging	To set the aging of flap list, the flap list will be cleared and re-count after the aging time.
Insertion Interval(s)	To set the time interval of a cable modem transform from online to ranging initialization.
Power Adjust (dB)	To set the power adjust threshold in upstream ranging.

CMTS uses parameters to check CM flapping state in RF network, including ins, hit, miss, CRC, P-adj, flap and the last flapping time.

- **Ins:** Increase a count each time the CM changes its state from online to ranging initiating in a time of interval threshold.
- **Hit:** Increase a count if CMTS have received the CM periodic ranging signal successfully.

- **Miss:** Increase a count if CMTS offered the CM unicast ranging opportunity but failed to receive the CM unicast ranging request.
- **CRC:** indicate error packets of CM upstream data which failed CRC check.
- **P-adj:** Increase a count if the adjustment to CM upstream power level value has exceeded the threshold.
- **Flap:** Increase one count for any of which happens: “ins” increase by 1, “P-adj” increase by 1 or “miss” increase by 6.

CMC Board	CM MAC Address	Ins	Hit	Miss	CRC	P-Adj	Flap	Time
1/1	78:c4:ab:03:02:00	0	0	0	0	0	0	0-0-0 0:0:0
1/1	78:c4:ab:03:02:24	0	767	2	0	40	40	1970-1-1 0:44:45
1/1	78:c4:ab:03:02:6a	0	0	0	0	0	0	0-0-0 0:0:0
1/1	78:c4:ab:03:02:70	0	0	0	0	0	0	0-0-0 0:0:0

Title	Comment
CMC Board	It shows the CMC board ID of the cable modem.
CM MAC Address	It shows the MAC address of cable modem.
Ins	Increase a count each time the CM changes its state from online to ranging initiating in a time of interval threshold.
Hit	Increase a count if CMTS have received the CM periodly ranging signal successfully.
Miss	Increase a count if CMTS offered the CM unicast ranging opportunity but failed to receive the CM unicast ranging request.
CRC	indicat error packets of CM upstream data which failed CRC check.
P-Adj	Increase a count if the adjustment to CM upstream power level value has exceeded the threshold.
Flap	Increase one count for any of which happens: “ins” increase by 1, “p-adj” increase by 1 or “miss” increast by 6.
Time	It shows the time of latest flap occurred.

5.10 CMTS System

5.10.1 Remote Query

Set the interval period of remote query to CM parameters and SNMP read-access password. Following SNMP protocol, CMTS will obtain MIB nodes’ data specified by CM periodically, the data include upstream/downstream channels signal quality (SQ). The SNMP read-access password should be consistent with read-access passwords in the CM configuration file (Default password is “public”).

Title	Comment
Interval Period	To set the interval period of CMTS queries cable modems.
Remote-Query SNMP Community Name	To set the read password for CMTS queries cable modem by SNMP protocol.

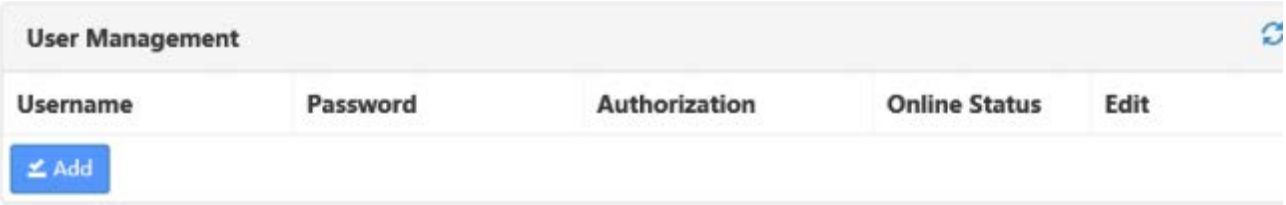
5.10.2 Servers

Network time synchronization protocol based on UTC is supported. CMTS will retrieve current time from time server based on NTP, and update it according to user defined time zone offset. When the NTP server IP is set, CMTS will update the time every 60 seconds until it is successfully updated, and synchronize the time hourly.

Title	Comment
CMTS Host Name	Set the host name of CMTS,it will be be shown in command line prompt and logging sent to log server.
Log Server IP	Set the log server IP address, the CMTS logging will write to local disk by default. If the log server IP is set, the logging will be sync to log server too.
NTP Server IP	Set the network time server IP address.
NTP Server Time Zone (UTC)	Set current time zone's offset from UTC. (-720 to 780 minutes)

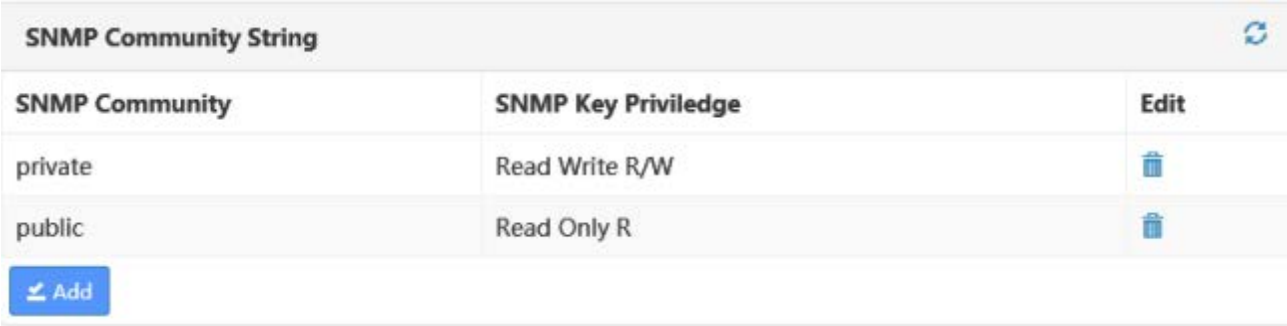
5.10.3 User Management

Title	Comment
Login Timeout (Min)	Set overtime of Telnet and Http login session.



Title	Comment
Username	Name of system user.
Password	Password of system user, essential when add new a user.
Authorization	The permission granted to current user.
Online Status	The login status of current users.

5.10.4 Secret Key



Title	Comment
SNMP Community String	SNMP Community, SNMP access password.
SNMP Key Privilege	Set SNMP Community as Read Only, or Read and Write.

Title	Comment

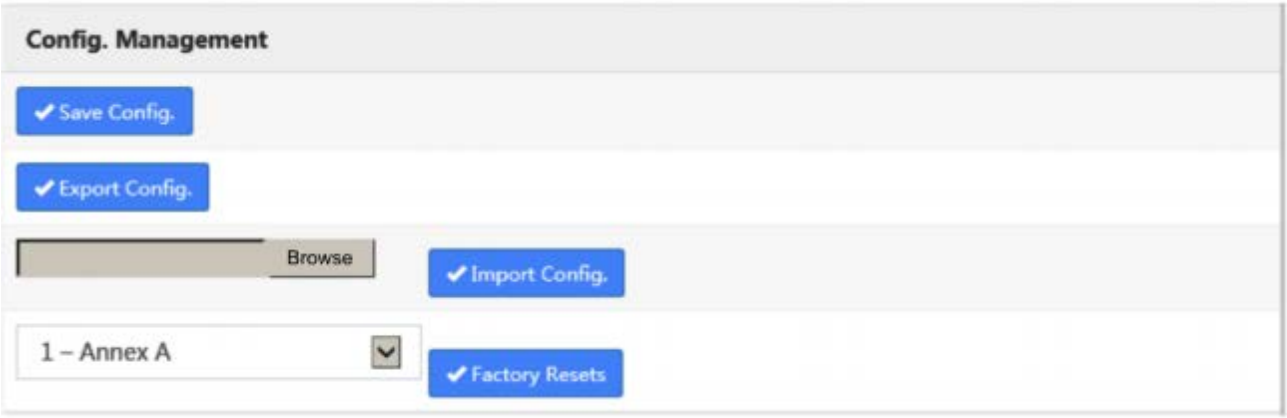
Trap Server IP	SNMP Trap server IP.
Trap Server Version	Trap protocol version.

The CMTS can validate cable modem configuration file, CMTS MIC verifies the registration to deny requests from cable modems with any illegal TFTP downloaded configuration file.

When a community string is set, and TFTP verification is enabled, CMTS will verify the community string in the CM registration process.

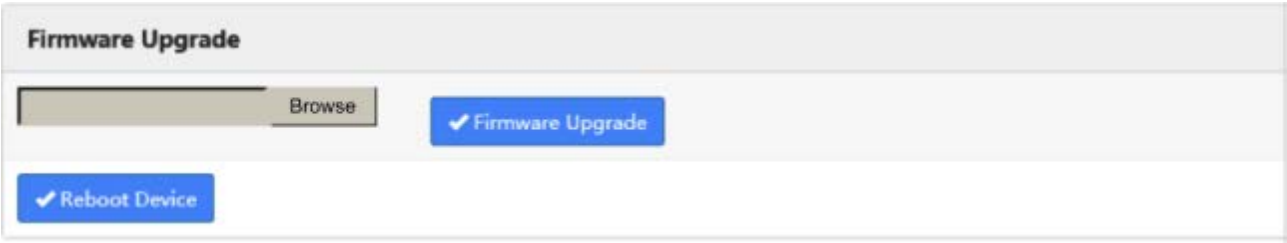
Title	Comment
TFTP Enforce	If checked, CMTS will verify CMTS MIC secret on the Cable Modems with Shared MIC secret.
MIC Shared Secret String	Shared MIC secret must be identical to CMTS MIC secret on the Cable Modems.

5.10.5 Config. Management



Title	Comment
Save Config.	Save current configurations as initialization load profile.
Export Config.	Download current configurations to local terminal.
Import Config.	Select and upload a configuration profile to cover current configurations.
Factory Resets	Restore all data to factory default.

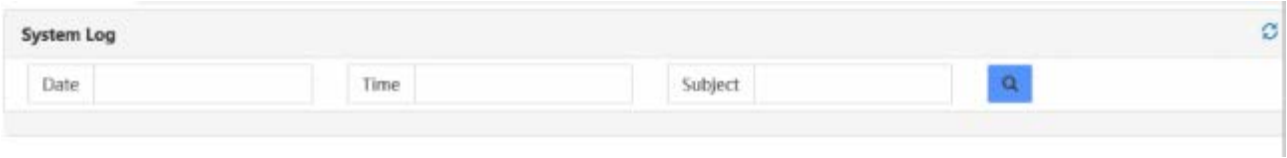
5.10.6 Firmware Upgrade



Title	Comment
Firmware Upgrade	Select the upgrade file, it will be uploaded to CMTS.
Reboot Device	Reboot CMTS

5.10.7 System Log

The CMTS allows you to check, filter (by date, time or keyword) corresponding logging.



Appendix 1: Specifications

		Down Stream		Up Stream			
		Euro-DOCSIS3.0	DOCSIS3.0				
Modulation Mode		64/256/1024QAM		256QAM/128QAM//64QAM/32QAM/16QAM/8QAM/ QPSK			
Frequency Range (MHz)		108 ~ 1002/1218		5 ~ 85/65			
Single Channel BW (MHz)		8	6	Single Channel BW (MHz)	6.4	3.2	1.6
Number of Bounding Channels		32		8			
Maxim Total Data Rate (Mbps)		2000	1600	320			
Single Channel Data Rate (Mbps)	64QAM	41	27	Single Channel Data Rate (Mbps)	256QAM*	40.96	20.48	10.24
					128QAM*	35.84	17.92	8.96
	256QAM	55	38		64QAM	30.72	15.36	7.68
					32QAM	25.60	12.80	6.40
	1024QAM*	69	53		16QAM	20.48	10.24	5.12
					8QAM	15.36	7.68	3.84
					QPSK	10.24	5.12	2.56
Output Level (dBmV)		20 ~ 45 Adjustable, 1dB Step		Receive Level (dBmV)		-13~+23		
Single Channel Symbol Rate (Msymps)	64QAM	6.952	5.056941	Single Channel Symbol Rate (Msymps)		5.12	2.56	1.28
	256QAM	6.952	5.360537					
	1024QAM*	6.952	5.360537					
Number of RF Port		1		1				
Reflection Loss (dB)		> 12		> 14				
Output Impedance (Ω)		75		Input Impedance (Ω)		75		
Management Method		1) Telnet Login，CLI Operate； 2) Network Management Software Based on SNMP； 3) Embedded Web, remote login						
Supported Protocols		Euro-DOCSIS/DOCSIS3.0/2.0，CDOCSIS，TCP/IP，ARP，L2VPN，ICMP，ACL，VLAN，Multicast，DHCP-rely，SNMP，etc.						
Physical Parameter							
WAN Port	Optical	1.25G SFP；10G SFP+		Power Supply	AC90~230V 50/60Hz		
	Electronic	1000M Base-T ×2		Consume Power	< 45W		
RF Port		F type socket ×2		Net Weight	3.0Kg		
Console Port		RJ45 socket ×1		Working Environment	Temp.-25~55℃; HUM<90%		
Status Display		LED		Size (L×W×H) (mm)	440×285×45		

* CM is required to support 1024QAM Ascent reserves the final explanations rights

Appendix 2: Factory Default Configurations

Serial port				
Serial port	Baud rate	Data bit	Parity	Stop bit
	115200	8	none	1

System user	
User name	Password
admin	admin

Uplink Bridge				
Bridge 0	IP address	Mask	Gateway	Port
	192.168.0.254	255.255.255.0	192.168.0.1	0,2

CMC						
Downstream	Status	Center	Standard	Modulation	Output Level	Interleave
1	DOCSIS	387	Annex A	64QAM	45	I12-17
2	DOCSIS	395	Annex A	64QAM	45	I12-17
3	DOCSIS	403	Annex A	64QAM	45	I12-17
4	DOCSIS	411	Annex A	64QAM	45	I12-17
5	DOCSIS	419	Annex A	64QAM	45	I12-17
6	DOCSIS	427	Annex A	64QAM	45	I12-17
7	DOCSIS	435	Annex A	64QAM	45	I12-17
8	DOCSIS	443	Annex A	64QAM	45	I12-17
9	DOCSIS	451	Annex A	64QAM	45	I12-17
10	DOCSIS	459	Annex A	64QAM	45	I12-17
11	DOCSIS	467	Annex A	64QAM	45	I12-17
12	DOCSIS	475	Annex A	64QAM	45	I12-17
13	DOCSIS	483	Annex A	64QAM	45	I12-17
14	DOCSIS	491	Annex A	64QAM	45	I12-17
15	DOCSIS	499	Annex A	64QAM	45	I12-17
16	DOCSIS	507	Annex A	64QAM	45	I12-17
17	DOCSIS	515	Annex A	64QAM	45	I12-17
18	DOCSIS	523	Annex A	64QAM	45	I12-17
19	DOCSIS	531	Annex A	64QAM	45	I12-17
20	DOCSIS	539	Annex A	64QAM	45	I12-17
21	DOCSIS	547	Annex A	64QAM	45	I12-17

22	DOCSIS	555	Annex A	64QAM	45	I12-17
23	DOCSIS	563	Annex A	64QAM	45	I12-17
24	DOCSIS	571	Annex A	64QAM	45	I12-17
25	DOCSIS	579	Annex A	64QAM	45	I12-17
26	DOCSIS	587	Annex A	64QAM	45	I12-17
27	DOCSIS	595	Annex A	64QAM	45	I12-17
28	DOCSIS	603	Annex A	64QAM	45	I12-17
29	DOCSIS	611	Annex A	64QAM	45	I12-17
30	DOCSIS	619	Annex A	64QAM	45	I12-17
31	DOCSIS	627	Annex A	64QAM	45	I12-17
32	DOCSIS	635	Annex A	64QAM	45	I12-17
Upstream Channel ID	Status	Center requency （MHz）	Bandwidth （MHz）	Type	Modulation	Input Level （dBmV）
1	enable	30.0	3.2	ATDMA	QPSK	0
2	enable	33.2	3.2	ATDMA	QPSK	0
3	enable	36.4	3.2	ATDMA	QPSK	0
4	enable	39.6	3.2	ATDMA	QPSK	0
5	enable	42.8	3.2	ATDMA	QPSK	0
6	enable	46.0	3.2	ATDMA	QPSK	0
7	enable	49.2	3.2	ATDMA	QPSK	0
8	enable	52.4	3.2	ATDMA	QPSK	0

Load balancing	
Mode	Dynamic load balancing
Period	120
Channel overflow （%）	70
Channel veriation （%）	20
CM hold-off （s）	240
Number of Max. moved CMs	32
Direct move while ranging response	Enable
INIT-TECH DCC-ATDMA	Broadcast ranging
INIT-TECH DCC-SCDMA	Broadcast ranging
INIT-TECH DBC-ATDMA	Broadcast ranging
INIT-TECH DBC-SCDMA	

SNMP	
Community	Access control
Public	Read-only
Private	Read-Write

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