



RC3016 Remote CMTS Configuration

**Quick Reference
Guide**

Revision A

ACT RC3016 Remote CMTS Web Management

Quick Reference Guide

ACT Document Number: ACT RC3016 Remote CMTS Quick Reference Guide

User Guide Revision A

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This document is produced to assist professional and properly trained personnel with installation and maintenance issues for the product. The capabilities, system requirements and/or compatibility with third-party products described herein are subject to change without notice.

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Revision History

Revision	Date	Reason for Change
A	10/23/2016	Initial release

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1 Overview

1.1 Product Overview

RC3016 REMOTE CMTS strictly conforms to the requirement of C-DOCSIS standard. Offers 16 downstream bonded channels(up to 800Mbps) and 8 upstream bonded channels (up to 240Mbps) , fully compatible with DOCSIS2.0 and DOCSIS3.0.

Main Features:

- Outdoor type, IP6 waterproof design, working temperature: -25 °C to +75 °C
- Offers max. 8 upstream channels and 16 downstream channels
- Upstream frequency is 5 MHz to 65 MHz, downstream frequency is 87 MHz to 1002 MHz
- 2 RF out, max. output level is up to 104 dBμV.
- Supports IPQAM module inside

1.2 Suitable Users

This manual is suitable for following personnel:

- Network planning engineer
- Technical supporter and maintainer
- Network administrator

1.3 Terminology

Terminology/Abbreviation	Explanation
CMTS	Cable Modem Terminal Systems, used to control Cable Modem
CM	Cable Modem
STB	Set top Box
CPE	Customer Premise Equipment

2 Configuration & Management

2.1 Operation

2.1.1 Web Login

Web page support both Chinese and English, users can choose the needed one from language column.

RC3016 REMOTE CMTS offer 2 ports:

LAN 1: for business, mainly for data communication with uplink device. Also can be used to manage or configure miniCMTS. Default management IP: 10.7.2.200, also can set management IP as DHCP mode.

LAN 2: for management, manage and configure miniCMTS. Management IP: 192.168.2.200, mainly for on-site debug.

Visit Management IP via Browser, the following page would pop out, Chrome or Firefox browser is recommended.

Default user name: admin; password: admin.



The screenshot shows a web browser window titled "Welcome To Mini-Cmts Setting Page". The main content area has a light blue header with the text "USER LOGIN" and a small icon of three people. Below this, there are three input fields: "Lang:" with "English" selected, "User:" with "admin" entered, and "Passwd:" with "*****" entered. To the left of these fields is a small graphic of a colorful cube. At the bottom of the form are two buttons: "Login" and "Cancel". The footer of the page reads "Lancable Copyright © 2008-2017".

Fig.1 web login

2.1.2 Brief introduction of WEB page

After login, the following web page would pop out.



Fig.2 main interface of web page

1. Navigation Bar: users can check all function areas, arranged in a tree-like structure;
2. Panel: users can check network traffic, port status, and check upstream & downstream data quickly.
3. Device & operation: check system information, hardware and software status, import or export configuration, version upgrade etc.
4. Terminal information: show CM information
5. Terminal statics: calculate CM, CPE quantity

2.2 Frequency Configuration

2.2.1 Upstream Frequency

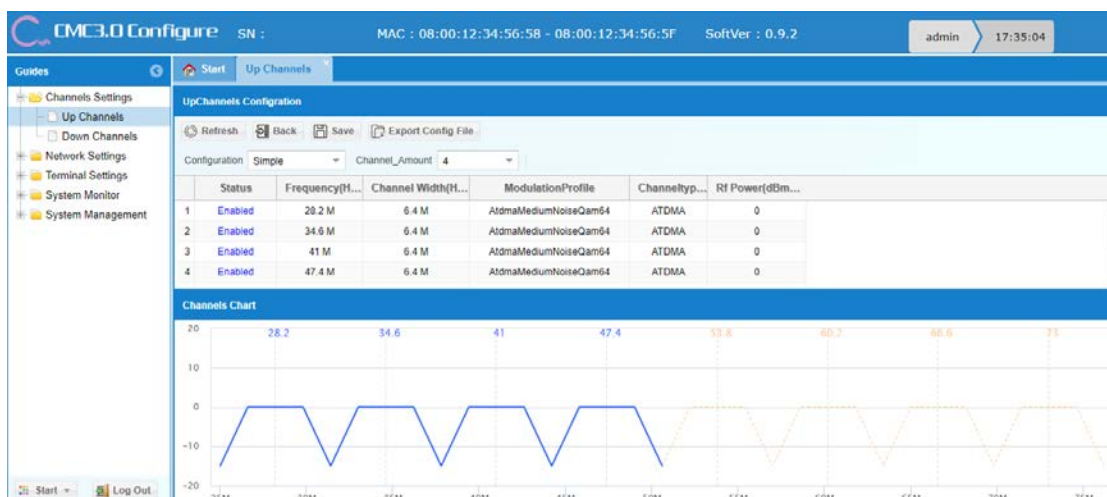


Fig.3 upstream configuration

Items	Description
Enable / Disable	Frequency status
Frequency	Center frequency. Upstream frequency is 5 MHz to 65 MHz, which is calculated by edge, so the range of center frequency should take the half of bandwidth into consideration.
Bandwidth	Offer 1.6, 3.2, 6.4 MHz for choice
Channel Profile	Modulation: supports QPSK, QAM16, QAM32, QAM64, and QAM256. Anti-noise mode: Low, Medium, High, which express the ambient noise.
Channel Mode	SCDMA or ATDMA
Port Level	The capable of receiving level of CMTS Upstream is determined by internal level and attenuation inside. Internal attenuation is related to model of device.

2.2.2 Downstream Frequency

Open downstream frequency configuration page via left navigation bar or middle panel. As fig.4

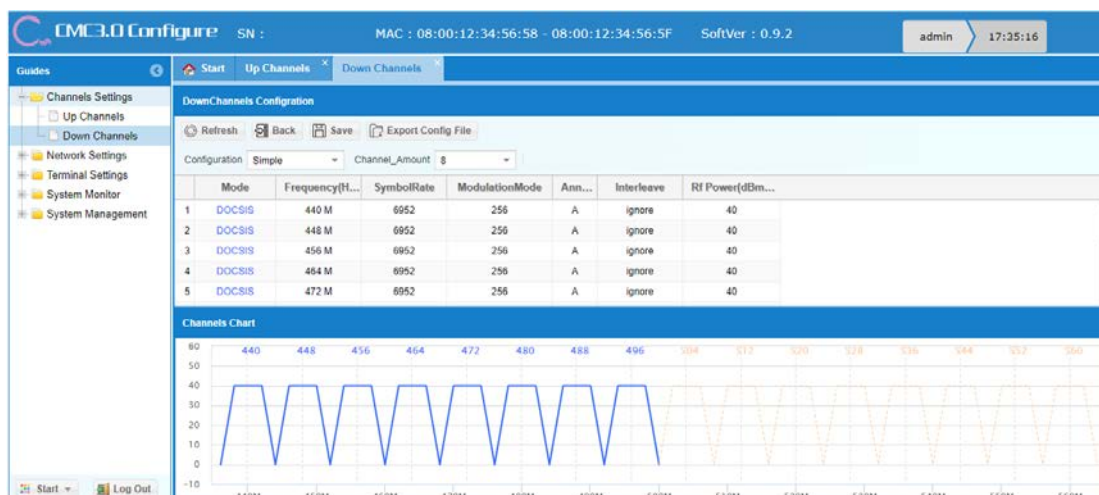


Fig.4 downstream configuration

Items	Descriptions
Mode	DOCSIS / IPQAM / CLOE
TS	Serial number when working at IPQAM mode
Frequency	Center frequency of downstream
Symbol Rate	Disable to modify under DOCSIS mode; 6875, 6900 or 6952 can be chosen under IPQAM mode
Modulation	QAM64, QAM256, QAM1024
Annex	Annex A/ Annex B
Port Level	It's the physics level of external device port after splitter
Channel Amount	Used to set enable frequency
Configuration Mode	Simple: the later frequency would be calculated automatically based on the first frequency parameters Advanced: set all frequency independently
Channel Amount	Means current enable frequency, Max: 16 while Min: 0

Configuration Mode	Simple: it will modify the configuration of IPQAM and DOCSIS simultaneously. If modify modulation mode, it will be the same modulation. Advanced: When modify the configuration of IPQAM, it won't affect corresponding data of DOCSIS mode.
Frequency Configuration Chart	Green: frequency for IPQAM Blue: frequency for DOCSIS Red: disable frequency

2.3 Network Management

2.3.1 Management IP

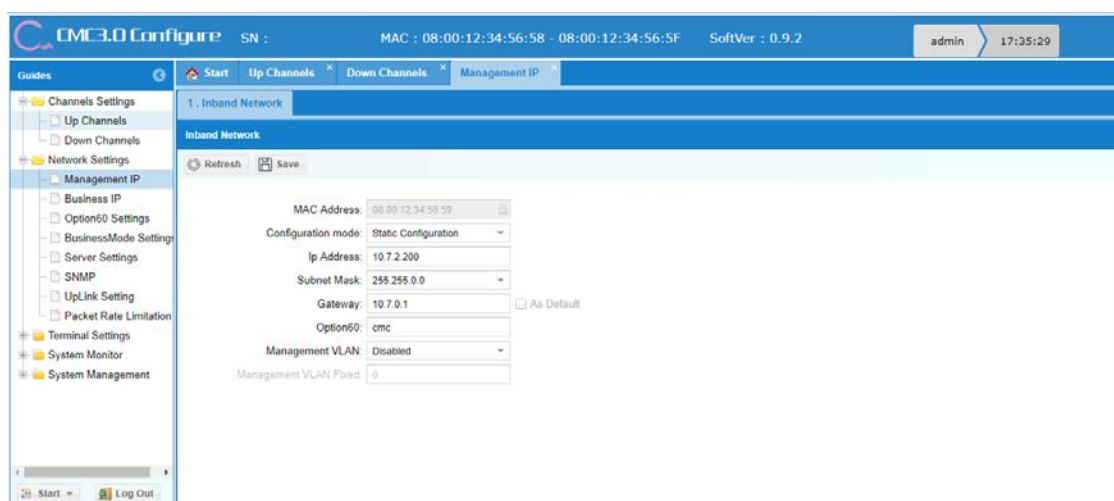


Fig.5 Management IP

Items	Descriptions
MAC Address	MAC address of miniCMTS, read only
Configuration Mode	Manually or DHCP
IP Address	It's management IP
Subnet Mask	It's subnet mask of management IP
Gateway	Default gateway of management IP
Option 60	When using DHCP, option 60 would show cmc by default
Management VLAN	Disable or fixed value
Save	Save setting but won't take effect immediately
Save and Active	Save setting and take effect immediately, web page would change to new login page of management IP

When using DHCP to get management IP, as fig.6. In [network status] column at right side, it will show management IP address, subnet mask, gateway and DHCP server IP.

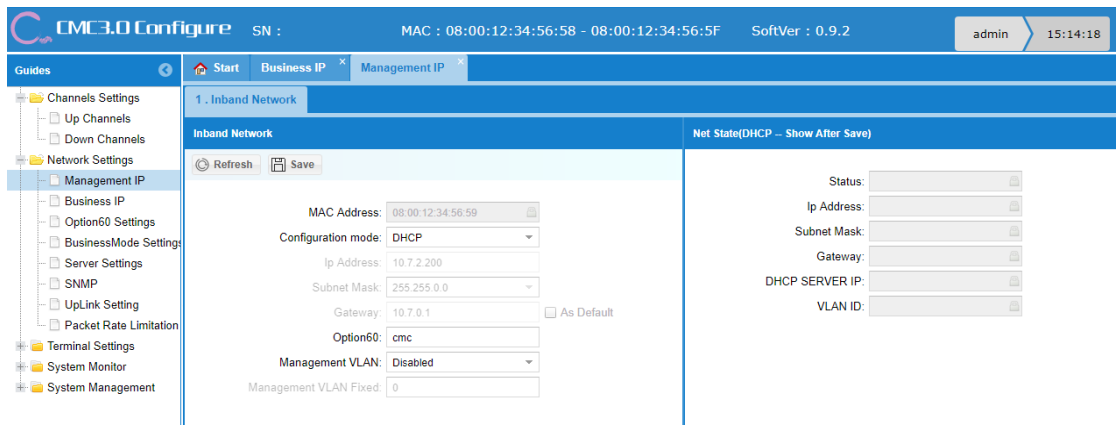


Fig.6 use DHCP to get management IP

Status description:

【Booting】 initialization

【Request】 means miniCMTS has sent DHCP request

【Bound】 bound already, miniCMTS has got address and start using

【Renew】 miniCMTS request the address server to extend the address lease time

【Rebind】 rebinding, if no response after Renew, miniCMTS would send Rebind to all server to ask the assigned address

2.3.2 Business IP

Usually Business IP is used as relay addresses during DHCP relay. No need to set business IP if never do DHCP relay.

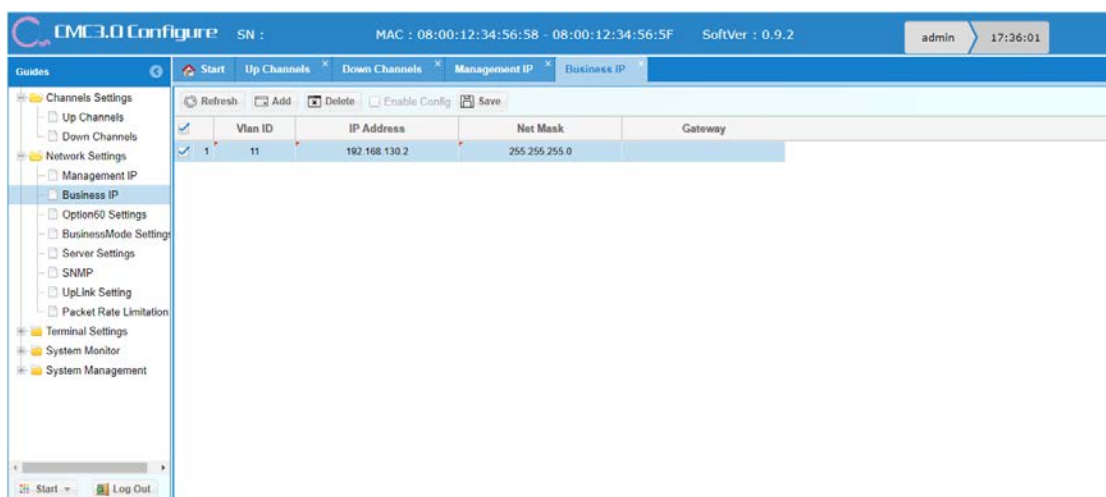


Fig.7 business IP

Items	Descriptions
VLAN ID	VLAN value of business IP, if do not fill, means without VLAN
IP address	Business IP address
Net mask	Subnet mask of business IP
Gateway	Optional, gateway of business IP

2.3.3 Option 60 Settings

Option60 concept: in DHCP protocol, it defines an “option” character field, which is mainly used to extend DHCP protocol. Option 60 (Vendor class identifier) is a choice field with code 60. It can be used to tag the type of end device. According to different type of end device, users can choose corresponding gateway. In that case, manufacturers can add their own tag in this character field field to distinguish different end device.

Users can configure different option 60 for diverse CPE in this page. The upside part (default option 60) has been defined in advance and the downside part can be defined by users. In business mode, the chosen option 60 is defined in this page.

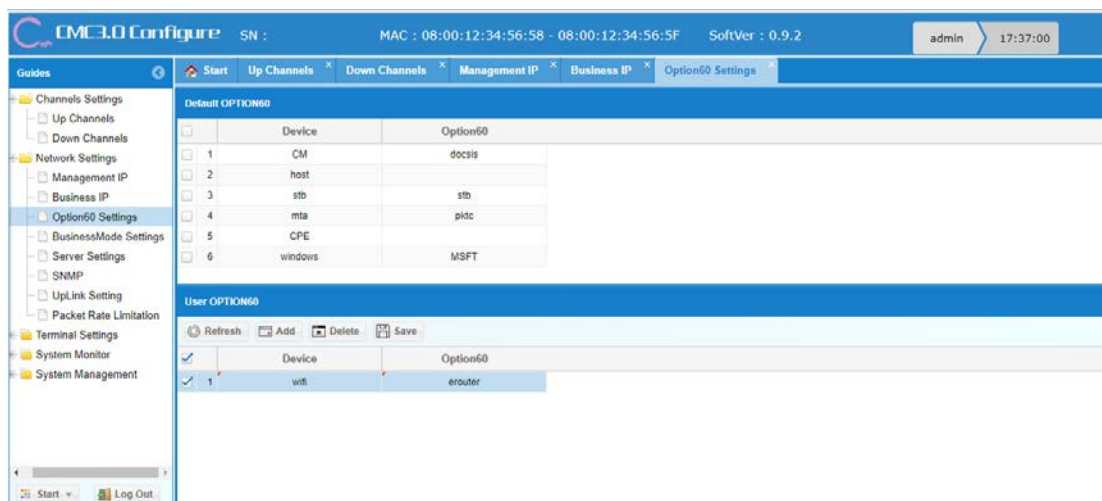


Fig.8 option 60 setting

Items	Description
Device	Character string for device definition, English word is required
Option60	Corresponding option 60 character filed, miniCMTS would identify different device according to these character string.
CM etc.	CM: docsis stb: stb mta: pktc Windows: MSFT host: none CPE: none
Add	Define option 60 field for device, for example, tv: letv
Delete	Delete the selected character field

Refresh

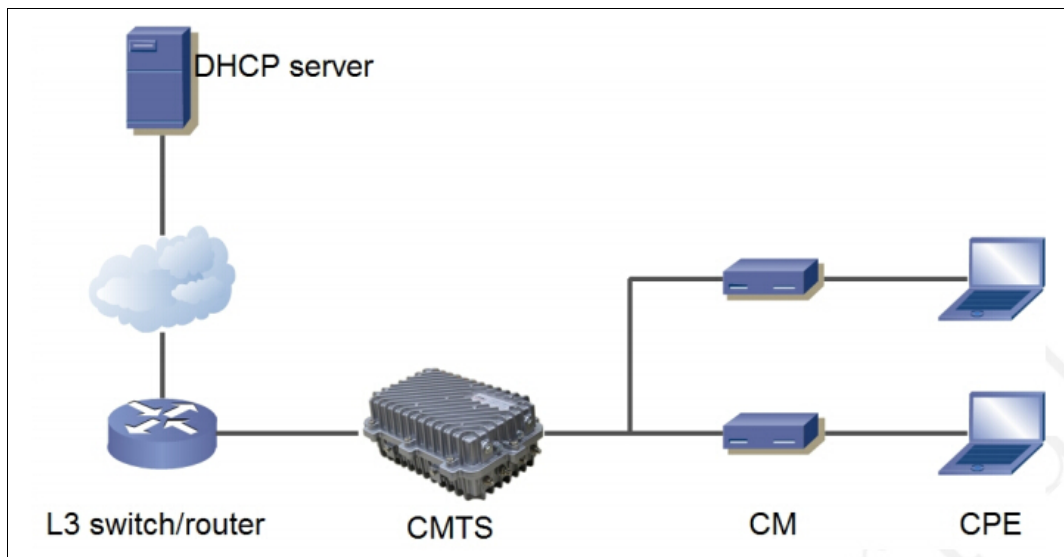
Refresh setting

Save

Save current setting

2.3.4 Business Model

Business model, also called network model, its setting depends on customer's layout of IP segment of CM & CPE, VLAN. and DHCP relay is done by miniCMTS or uplink layer 3 device.



IP procurement procedures:

DHCP getting IP, all source port and destination port of DHCP are 67 and 68.

73	38.332294000	0.0.0.0	255.255.255.255	DHCP	586 DHCP Discover - Transaction ID 0x783cd2dd
74	38.332602000	10.7.0.136	255.255.255.255	DHCP	325 DHCP Offer - Transaction ID 0x783cd2dd
76	38.441753000	0.0.0.0	255.255.255.255	DHCP	598 DHCP Request - Transaction ID 0x783cd2dd
77	38.442111000	10.7.0.136	255.255.255.255	DHCP	325 DHCP ACK - Transaction ID 0x783cd2dd
82	40.774927000	10.7.0.204	10.7.0.136	TFTP	73 Read Request, File: class.cfg, Transfer type: octet, blksize\000=1448\000
83	40.776973000	10.7.0.136	10.7.0.204	TFTP	558 Data Packet, Block: 1
84	40.784875000	10.7.0.204	10.7.0.136	TFTP	60 Acknowledgement, Block: 1
85	40.785217000	10.7.0.136	10.7.0.204	TFTP	163 Data Packet, Block: 2 (last)
86	40.792101000	10.7.0.204	10.7.0.136	TFTP	60 Acknowledgement, Block: 2

STEP 1: CM send DHCP discover package, tell server MAC and type, as follows: its MOTO3.0CM and MAC is E4: 83: 99: 1D: 23: 3E.

```
⊕ Bootp flags: 0x0000 (Unicast)
  Client IP address: 0.0.0.0 (0.0.0.0)
  Your (client) IP address: 0.0.0.0 (0.0.0.0)
  Next server IP address: 0.0.0.0 (0.0.0.0)
  Relay agent IP address: 0.0.0.0 (0.0.0.0)
  Client MAC address: Motorola_1d:23:3e (e4:83:99:1d:23:3e)
  Client hardware address padding: 00000000000000000000
  Server host name not given
  Boot file name not given
  Magic cookie: DHCP
⊕ Option: (53) DHCP Message Type
⊖ Option: (60) Vendor class identifier
  Length: 10
  Vendor class identifier: docsis3.0:
  vendor-class-data: "docsis3.0:"
```

STEP 2: DHCP server return a DHCP offer, users can get following data:

- a. Assigned IP: 10.7.0.204
- b. DHCP server IP: 10.7.0.136
- c. Configuration file name: class.cfg

```
⊕ Bootp flags: 0x0000 (Unicast)
  Client IP address: 0.0.0.0 (0.0.0.0)
  Your (client) IP address: 10.7.0.204 (10.7.0.204)
  Next server IP address: 10.7.0.136 (10.7.0.136)
  Relay agent IP address: 0.0.0.0 (0.0.0.0)
  Client MAC address: Motorola_1d:23:3e (e4:83:99:1d:23:3e)
  Client hardware address padding: 00000000000000000000
  Server host name: dell-98aaffa38a
  Boot file name: class.cfg
  Magic cookie: DHCP
```

STEP 3: CM send DHCP request package to DHCP, in the option character filed (50/54), it will add selected DHCP server IP and needed IP address, which can be understood CM is confirming IP address with DHCP.

```
⊖ Option: (50) Requested IP Address
  Length: 4
  Requested IP Address: 10.7.0.204 (10.7.0.204)
⊖ Option: (54) DHCP Server Identifier
  Length: 4
  DHCP Server Identifier: 10.7.0.136 (10.7.0.136)
```

STEP 4: DHCP server confirm assigned IP and its lease time. It requires to apply IP again when the lease time is expired. Refer to following picture: from DHCP ACK, 10.7.0.204 need to be re-applied after 4 hours.

```

Option: (1) Subnet Mask
  Length: 4
  Subnet Mask: 255.255.0.0 (255.255.0.0)
Option: (3) Router
  Length: 4
  Router: 10.7.0.1 (10.7.0.1)
Option: (51) IP Address Lease Time
  Length: 4
  IP Address Lease Time: (360000s) 4 days, 4 hours
Option: (17) Root Path
  Length: 13
  Root Path: D:\CMStartup
Option: (54) DHCP Server Identifier
  Length: 4
  DHCP Server Identifier: 10.7.0.136 (10.7.0.136)
    
```

STEP 5: whole IP getting procedure is completed.

Configuration release and active procedures:

STEP 1: CM send TFTP (read request) package actively, and state dispatched configuration file, the port is 69, as showing as follows: class.cfg is corresponding to DHCP.

```

Frame 82: 73 bytes on wire (584 bits), 73 bytes captured (584 bits) on interface 0
Ethernet II, Src: Motorola_1d:23:3e (e4:83:99:1d:23:3e), Dst: Dell_e7:b4:09 (d4:be:d9:e7:b4:09)
Internet Protocol Version 4, Src: 10.7.0.204 (10.7.0.204), Dst: 10.7.0.136 (10.7.0.136)
User Datagram Protocol, Src Port: esp-lm (3383), Dst Port: tftp (69)
  Source port: esp-lm (3383)
  Destination port: tftp (69)
  Length: 39
  Checksum: 0x80bc [validation disabled]
Trivial File Transfer Protocol
  [Source File: class.cfg]
  Opcode: Read Request (1)
  Source File: class.cfg
  Type: octet
  Option: blksize\000 = 1448\000
    
```

STEP 2: TFTP server release configuration via TFTP(Data packet);

STEP 3: CM confirm the accomplishment of data release with TFTP server, (from TFTP server to CM);

STEP 4: CM would forward the gotten configuration file to miniCMTS;

STEP 5: miniCMTS would realize different business configuration according to received file.

Here are some concepts related to business model, we assume that users have a better understanding of these concepts.

- **VLAN:** Virtual Local Area Network, compliant with IEEE 802.1p and 802.1Q.
Only VLAN ID setting in the current business model is effective,
VLAN priority is reserved for future extensions
- **DHCP relay:** Send DHCP package of CM & CPE to DHCP server under different network segment. There are two important items of option 60 and option 82 in the GIADDR character filed of DHCP package.
- **GIADDR:** when layer 3 device is used as relay, GIADDR is gateway IP;

When miniCMTS is used as relay, GIADDR is business IP of miniCMTS.

- **option 60:** used to distinguish device type
- **option 82:** used for traceability, tag CPE belongs to which CM.
- **Bundle:** clarify CM according to different business type or different operator. Business, IP and VLAN of CPE depend on the clarification of CM. such a classification of CM and associated CPE, called a bundle.
- **PPPOE:** PPP over Ethernet, can be used for CPE access.

Features of several business model:

None business model: miniCMTS has no VLAN and never to be as DHCP relay. All data pass through via layer 2, including the data with VLAN and without VLAN. miniCMTS would add VLAN for upstream and strip VLAN for downstream according to current setting after applying business model.

Single bundle model: uplink layer 3 device would be as DHCP relay, miniCMTS would dispatch different VLAN according to option 60 character field of DHCP package of CM and CPE.

Multi bundle model: uplink layer 3 device would be as DHCP relay, miniCMTS would assign IP to CM according to DHCP server so as to confirm CM belongs to which bundle, and confirm corresponding VLAN.

DHCP relay model: miniCMTS would be as DHCP relay. miniCMTS would dispatch different VLAN according to option 60 character field of DHCP package of CM and CPE. It requires business IP to be as DHCP relay.

The definition of some parameters of those business model are same, as below:

Items	Descriptions
Bundle Enable	miniCMTS would pass through all data when never use business model
Static IP	can't access in network if users set IP privately when enable this function
CPE Aged Enable	After enable this function, CPE MAC address would be aged in a certain time. Default aged time is 300s
Add option82	Make DHCP server can understand CPE belongs to which CM, it will add option 82 when using DHCP relay.

...	Device Class	OPTION60	DHCP Server List(",")	VLAN ID	VLAN Prio...
-----	--------------	----------	-----------------------	---------	--------------

Items	Descriptions
Add bundle	Add a business group
Delete bundle	Delete the selected business group

Add terminal	Add terminal in the selected business group
Delete terminal	Delete the selected terminal in a business group
Device name	The character string to define device
Option60	Define option60, associate with device name
DHCP server (for relay model)	DHCP server IP under DHCP relay model
VLAN ID	VLAN for CPE
VLAN priority	Priority of CPE VLAN

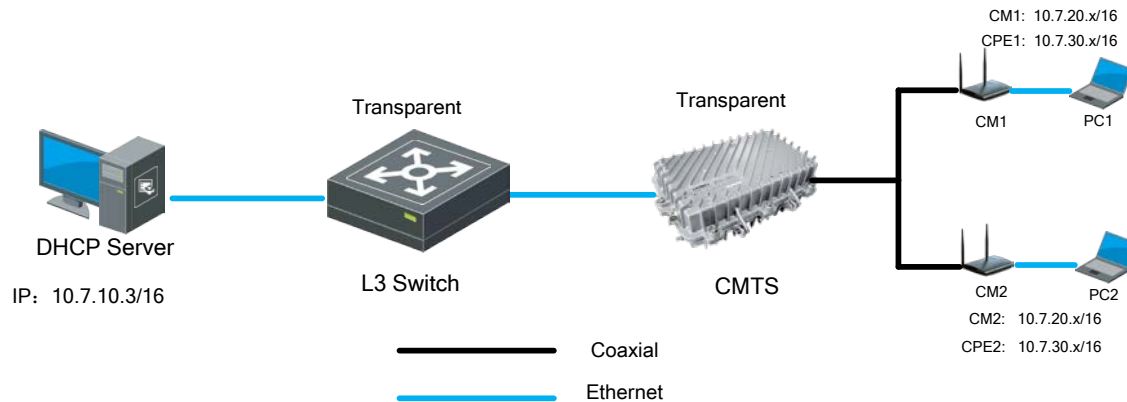
Items	Descriptions
Default VLAN ID	VLAN for CM when without DHCP and PPPOE
Default VLAN priority	
MAC VLAN	VLAN for CM according to its MAC
MAC VLAN priority	
PPPOE VLAN ID	VLAN for CPE when under PPPOE
PPPOE VLAN priority	
Match IP (for multi-bundle model)	IP address of CM in Bundle
Mask length (for multi-bundle model)	Subnet mask of CM IP network segment in Bundle

2.3.4.1 Networking configuration model: None business model

Overview:

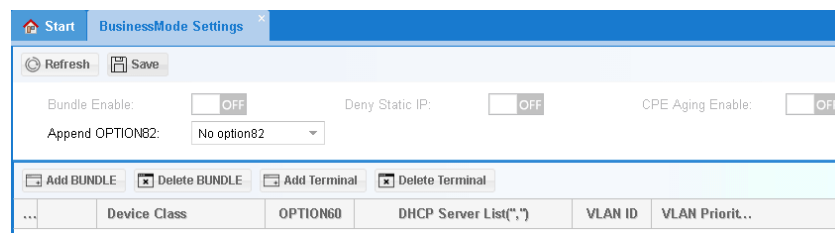
None business model is the simplest networking model, miniCMTS passthrough.

Networking example:



Configuration example:

Off “business model” option in the setting interface



Configuration instruction:

Under None business model, the network configuration is as below:

Devices	Descriptions
DHCP server	Assign different network segment to different CPE according to option 60. Based on option 82 of CPE, assign different network segment to CPE according to registered business type of CM
Layer 3 device	Passthrough
CMTS	None business model Either with or without Management VLAN If requires CPE can be traceable, users can add option 82.
CM	Without VLAN, 1 or more network segment is accepted.
CPE	Without VLAN, 1 or more network segment is accepted.

2.3.4.2 Networking configuration model: Single bundle model

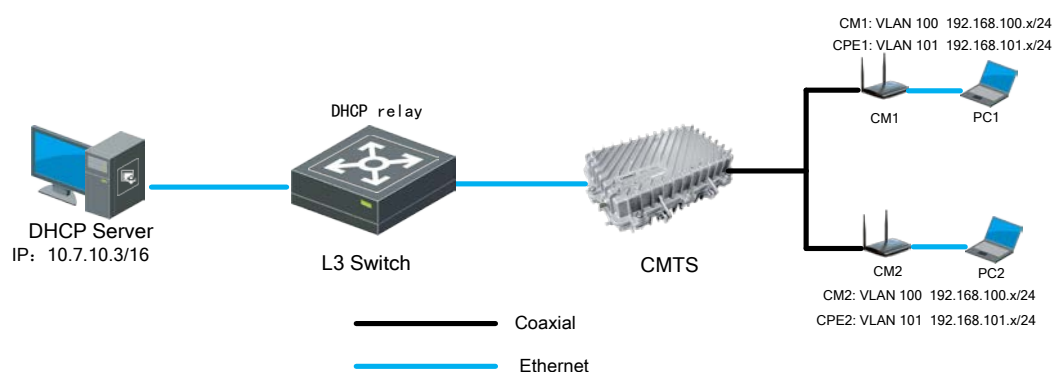
Overviews:

Under single bundle model, miniCMTS never to be as DHCP relay while uplink layer 3 device would be as DHCP relay. miniCMTS would assign different VLAN to different device type according to option 60 character in DHCP package. A typical application: all CM has same VLAN and all CPE with another VLAN, DHCP server can know which CM that CPE belongs to according to option 82 character in DHCP package of CPE, and assign different IP for different business.

Function explanation:

1. CM data (option character field is docsis) would take on VLAN (such as: 100) after pass by miniCMTS.
2. CPE or other device (option character filed is other or none), after miniCMTS, it will take on corresponding VLAN (such as 101) ;
3. Default VLAN should be applied at fist online. If default VLAN has been set, use default VLAN.
4. PPPOE VLAN would execute VLAN mapping to PPPOE packets separately.

Networking example:



Configuration instructions:

Under single bundle model, network configuration is as follows:

Devices	Descriptions
DHCP server	<p>According to option 60 of CPE, assign different network segment to different type of CPE</p> <p>According to option 82 of CPE, assign different network segment to CPE in accordance with registered business type of CM.</p>
Layer 3 device	<p>Enable DHCP relay, but never set relay for corresponding VLAN of VLAN1 or PVID.</p>
CMTS	<p>Set as trunk port generally, users can set PVID or not</p> <p>Single Bundle model, one VLAN would correspond to a network segment or more network segment.</p> <p>Usually users need to set management VLAN; or set PVID of layer 3 device as management VLAN if never set management VLAN.</p> <p>If require CPE can be traceable, users can add option 82.</p>
CM	<p>VLAN is assigned by miniCMTS, all CM are under same VLAN. One or more network segments can be accepted.</p>
CPE	<p>VLAN is assigned by miniCMTS, all CPE are under same VLAN, or assign more VLAN according to option 60. One or more VLAN can be accepted.</p>

Configuration example:

- Refer to device type (option 60 setting) for configuration
- Single bundle business model configuration

Login—navigation bar—network setting—business model setting

1. Data preparation

Device	IP	VLAN	Description
CM	192.168.100.x	100	
CPE	192.168.101.x	101	Business network segment
CMTS	10.15.x.x	15	Management IP
Layer 3 device	10.15.0.1	15	Management gateway
	192.168.100.1	100	CM gateway
	192.168.101.1	101	Business gateway
DHCP server	10.7.10.3		DHCP server

2. Configuration steps:

- Enable the option of business model
- Click “add bundle”, fill in VLAN ID in the column of bundle attributes at right side. The current value is 100.
- Click “add terminal”, choose device type and add corresponding VLAN ID, the current value is 101.
- Configuration data for uplink layer 3 device, please refer to the part of “data preparation”
- DHCP server configuration, please refer to the part of “data preparation”.
- Result Verification:

CM can get address of 192.168.100.x

PC can get address of 192.168.101.x

2.3.4.3 Networking Configuration Model: Multi-Bundle Model

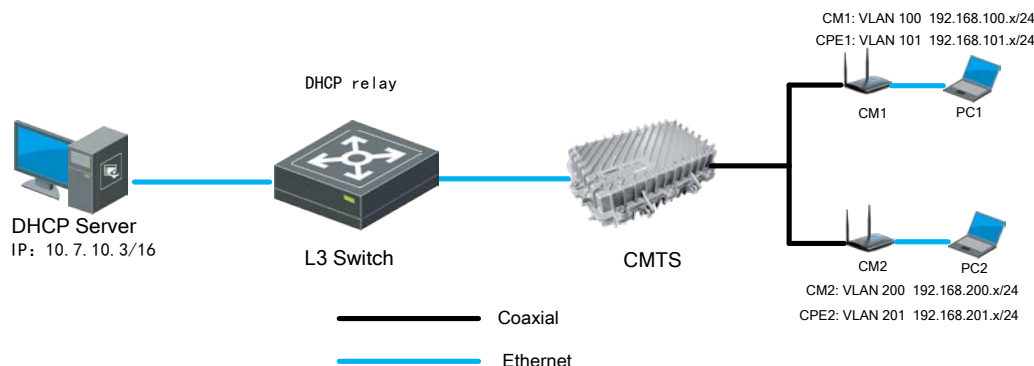
Overviews:

Multi-bundle model, assign different VLAN to CM and its CPE, and then make grouping. Under multi-bundle model, miniCMTS never to be as DHCP relay, uplink layer 3 device would be as DHCP relay. According to IP segment of CM assigned by DHCP server, miniCMTS would confirm which bundle that CM belongs to. CM decides the bundle of its CPE and confirm corresponding VLAN.

Function explanation:

1. Different bundle configuration(different network composed of segment IP/mask) would map to different VLA(bind MAC and IP on server to distinguish CM segment)
2. Other terminals (CPE/STB or others in the downlink of CM) can map to different VLAN according to their option 60 character filed. (for example: stb character filed mapping to 211)
3. Select a certain bundle, users can set default VLAN and PPPOE VLAN
4. The usage of default VLAN and PPPOE VLAN is same with OPTION 60 model. But, only valid for current bundle.

Networking example:



Configuration instruction:

1. Under Multi-bundle model, the network configuration is as follows

Devices	Descriptions
DHCP server	According to registered business type of CM, Assign different network segment to CM. CPE assign different network segment according to GIADDR.
Layer 3 device	Open DHCP relay, but never set relay for corresponding VLAN of VLAN1 or PVID. Set as trunk port generally, users can set PVID of port or not The CM and CPE of each bundle has different VLAN
CMTS	Bundle model, one VLAN corresponds to one network segment. Usually it requires to set management VLAN.

	Users also can set port PVID of layer 3 device as management VLAN
	If requires CPE can be traceable, users can add option 82, but the effect is not as strong as Single bundle.
	Assign different VLAN to CM and CPE of each bundle
CM	VLAN is assigned by miniCMTS, multi network segment is accepted.
CPE	VLAN is assigned by miniCMTS, each bundle has one or more VLAN. Multi VLAN is distinguished by option 60.

Configuration example:

- a. Configure terminal type
- b. Multi-bundle model configuration

Login——navigation bar——network management——business model setting

1. Data preparation

Devices	IP	VLAN	Descriptions
CM	192.168.100.x	100	First type of business CM
	192.168.200.x	200	Second type of business CM
CPE	192.168.101.x	101	Fist type of business PC segment
	192.168.201.x	201	Second type of business PC segment
CMTS	192.168.300.7	300	Management IP
Layer 3 device	192.168.300.1	300	Management gateway
	192.168.100.1	100	First type of business CM gateway
	192.168.101.1	101	First type of business PC gateway
	192.168.200.1	200	Second type of business CM gateway
	192.168.201.1	201	Second type of business PC gateway
DHCP server	10.7.10.3		Assign IP address to each device

2. Detailed configuration steps:

- a. Configure option 60, refer to chapter 2.3.3.
- b. Bundle model configuration is as below, refer to single bundle model for procedures.

Configure first bundle:

Note: users need to fill in corresponding segment in the column of match IP

The screenshot shows the 'BusinessMode Settings' window. At the top, there are controls for 'Bundle Enable' (set to ON), 'Deny Static IP' (OFF), and 'CPE Aged Enable' (OFF). Below these are 'Add BUNDLE', 'Delete BUNDLE', 'Add Terminal', and 'Delete Terminal' buttons. A table lists bundles: Bundle 1 (selected), Bundle 2, and Bundle 2.1. The right panel shows 'BUNDLE Attributes' for the selected bundle, including Default VLAN (VLAN ID: 100, Priority: 0), MAC VLAN (VLAN ID: 0, Priority: 0), PPPOE VLAN (VLAN ID: 0, Priority: 0), Match IP (192.168.100.2), Mask Length (24), and DHCP Server List (192.168.100.1).

...	Device Class	OPTION60	DHCP Server List(",")	VLAN ID	VLAN Prio...
1	Bundle			101	0
2	Bundle				
2.1	CPE			201	0

Configure second bundle:

Note: users need to fill in corresponding segment in the column of match IP

The screenshot shows the 'BusinessMode Settings' window with Bundle 2 selected. The 'BUNDLE Attributes' panel on the right shows: Default VLAN (VLAN ID: 200, Priority: 0), MAC VLAN (VLAN ID: 0, Priority: 0), PPPOE VLAN (VLAN ID: 0, Priority: 0), Match IP (192.168.200.2), Mask Length (24), and DHCP Server List (192.168.200.1).

...	Device Class	OPTION60	DHCP Server List(",")	VLAN ID	VLAN Prio...
1	Bundle			101	0
2	Bundle				
2.1	CPE			201	0

- Configure DHCP relay and its corresponding gateway in uplink layer 3 switch.
- DHCP server configuration
- Results verification:

bundle1:

CM can get address of 192.168.100.x.

PC can get address of 192.168.101.x

bundle2:

CM can get address of 192.168.200.x

PC can get address of 192.168.201.x

2.3.4.4 Network configuration model: DHCP relay model

Overviews:

DHCP(Dynamic Host Configuration Protocol) Relay is used to realize the packet forwarding between DHCP client and DHCP server in the different network segment, so that different client in different network segment can get IP address dynamically from same DHCP server.

Principle:

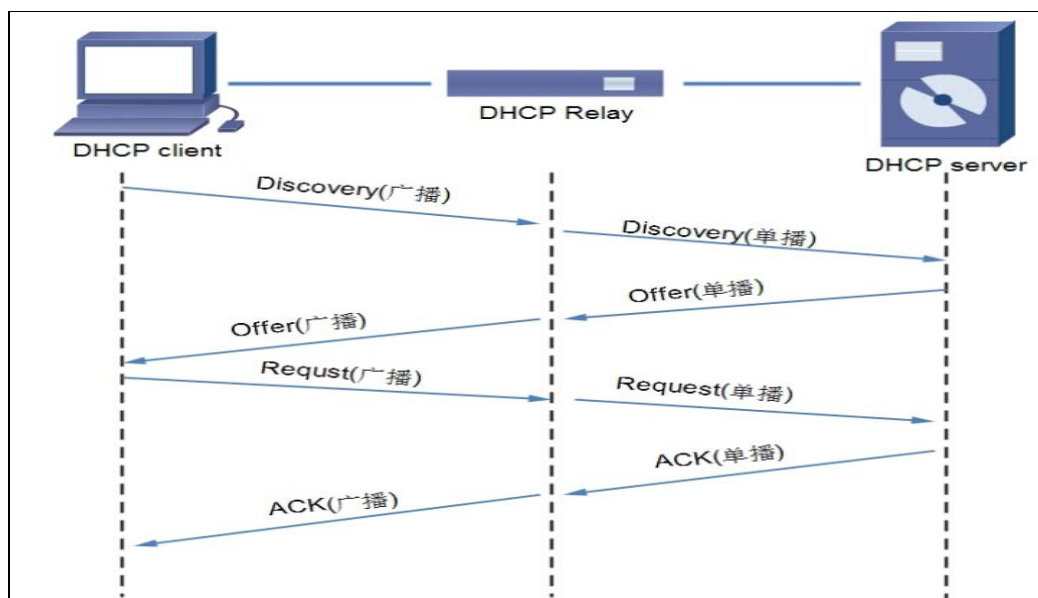
1. DHCP L2 principle

Option 82 function means miniCMTS can add or strip option 82 option when receiving DHCP packet, and then forward packet. The process of DHCP L2 is as follows:

- In the stage of initialization, DHCP client send DHCP request packet by broadcast.
- DHCP relay would add Option 82 after receiving packet, then forward request packet to DHCP server.
- DHCP server register the information of Option 82 after receiving packet (or maybe assign IP address according to Option data), then return packet which has included DHCP configuration and Option 82 data to DHCP relay.
- After receiving packet from DHCP server, DHCP relay would strip Option 82 and just forward packet with DHCP configuration to DHCP client.

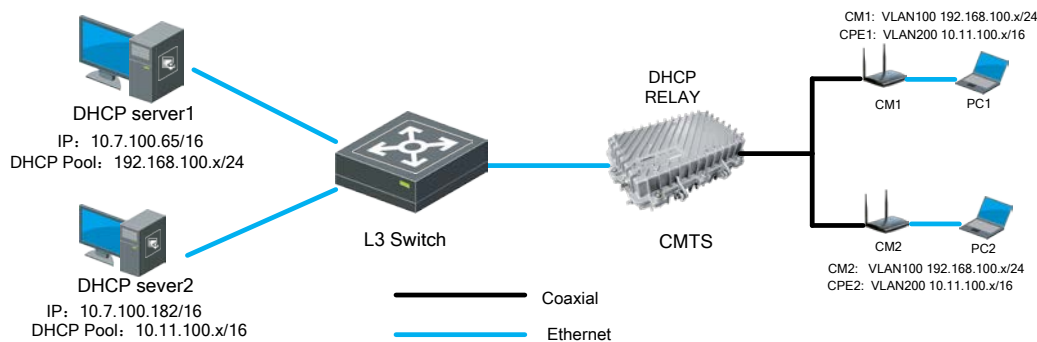
2. DHCP L3 principle

Sketch map of DHCP Relay process is as below:



- DHCP client broadcast DHCP Discovery packet in local network, DHCP relay would transfer Broadcast packet into unicast packet after receiving packet from client, and then send to DHCP server.
- DHCP server reply unicast "Offer" to DHCP relay, DHCP relay transfer unicast to Broadcast, and then send back to DHCP client.
- DHCP client send packet of "Request" to apply IP address, DHCP relay transfer Broadcast packet into unicast packet after receiving packet from client, and then send to DHCP server.
- DHCP server reply unicast packet of "Ack" to DHCP relay, DHCP relay transfer unicast into broadcast packet, and then send to DHCP client. Usually DHCP relay would choose corresponding DHCP server according to different Option 60.

Networking example:



Configuration explanation:

1. Background

Configuration items description

Items	Descriptions
Server address	Address of DHCP server
Relay address	miniCMTS would choose automatically from business IP.

Network device description

Devices	Descriptions
DHCP server	According to GIADDR, CPE assign different network segment
Layer 3 device	Close DHCP relay Usually set as trunk port, and users can choose to set port PVID or not All CM have same VLAN, CPE can have one or more VLAN.
CMTS	Relay model, one VLAN corresponds to one network segment. Usually it requires to set management VLAN. Users can also choose not to set management VLAN, but set port PVID of layer 3 device as management VLAN. Add option 82 always

	CM have same VLAN, while CPE can have different VLAN with different network segment according to option 60.
CM	VLAN is assigned by miniCMTS, one VLAN, one network segment
CPE	VLAN is assigned by miniCMTS, each bundle has one or more VLAN, use option 60 to distinguish multiple VLAN.

Configuration example:

- Refer to chapter 2.3.3 for option 60 setting
- Refer to chapter of business IP for its setting.
- DHCP Relay configuration

Login > navigation bar->network management->business model setting

2. Data preparation

Devices	IP	VLAN	Descriptions
CM	192.168.100.x	100	
CPE	10.11.100.x	200	PC
CMTS	192.168.15.2	15	Management IP
	192.168.100.2	100	CM relay
	10.11.100.2	200	PC relay
Layer 3 device	192.168.15.1	15	Management gateway
	192.168.100.1	100	CM gateway
	10.11.0.1	200	PC gateway
DHCP server	10.7.100.65		Assign IP address to CM register, IP address pool: 192.168.100.x/24
	10.7.100.182		Assign IP address to PC, PC address pool: 10.11.100.x/16

3. Detailed configuration steps

- Refer to chapter 2.3.3 for option 60 setting
- Refer to chapter of business IP for its setting.

Start

Business IP

Refresh

Add

Delete

Enable Config

Save

		Vlan ID	IP Address	Net Mask	Gateway
<input type="checkbox"/>	1	100	192.168.100.2	255.255.255.0	192.168.100.1
<input checked="" type="checkbox"/>	2	200	10.11.100.2	255.255.0.0	10.11.0.1

- Enable business model, and configure DHCP Relay, as below.

The screenshot shows the 'BusinessMode Settings' window. At the top, there are tabs for 'Start', 'Business IP', and 'BusinessMode Settings'. Below the tabs are buttons for 'Refresh' and 'Save'. The main configuration area includes:

- Bundle Enable:** A toggle switch set to 'ON'.
- Deny Static IP:** A toggle switch set to 'OFF'.
- CPE Aged Enable:** A toggle switch set to 'OFF'.
- Append OPTION82:** A dropdown menu showing 'Append option82'.

 Below these are buttons for 'Add BUNDLE', 'Delete BUNDLE', 'Add Terminal', and 'Delete Terminal'. A table lists the configured bundles:

...	Device Class	OPTION60	DHCP Server List(",")	VLAN ID	VLAN Prio...
1	Bundle				
1.1	CPE		10.7.100.182	0	0

 On the right side, the 'BUNDLE Attributes' panel is visible, showing settings for:

- Default VLAN:** VLAN ID: 100, Priority: 0.
- MAC VLAN:** VLAN ID: 0, Priority: 0.
- PPPOE VLAN:** VLAN ID: 0, Priority: 0.
- Match IP:** 0.0.0.0
- Mask Length:** 32
- DHCP Server List(","):** 10.7.100.65

- d. Refer to “data preparation” for setting parameters of layer 3 device
- e. Refer to part of DHCP setting for DHCP server configuration
- f. Results verification:

CM can get address of 192.168.100.x, DHCP relay address is 192.168.100.2

PC can get address of 10.11.100.x, DHCP relay address is 10.11.100.2

2.3.5 Server Settings

The screenshot shows the 'Server Settings' window. The left sidebar contains a tree view with categories like 'Channels Settings', 'Network Settings', 'Terminal Settings', 'System Monitor', and 'System Management'. The main area is divided into two sections:

- Time Sync Settings:** Includes 'Refresh' and 'Save' buttons. It has fields for 'Server IP 1', 'Server IP 2', and 'Time Zone' (set to GMT+8). There are dropdowns for 'Server Type1' and 'Server Type2'. A tip states: 'Tip: If NMS self to be a timeserver, please choose RFC868'.
- SysLog Server Settings:** Includes a 'Save' button and a 'Server Addr List' field.

【Time Sync setting】: Time server IP

【Server type】: RFC868 and NTP for choice

【Time Zone】: GMT+8 by default, consider different areas with different time zone.

【SysLog server】: upload logging to server

2.3.6 SNMP Settings

CMC3.0 Configure SN : MAC : 08:00:12:34:56:58 - 08:00:12:34:56:5F SoftVer : 0.9.2 admin 17:38:40

Guides: Channels Settings, Up Channels, Down Channels, Network Settings, Management IP, Business IP, Option60 Settings, BusinessMode Settings, Server Settings, **SNMP**, UpLink Setting, Packet Rate Limitation, Terminal Settings, System Monitor, System Management

CMC Community

Refresh Add Delete Save

RO Community: public RW Community: private Version: v2c

Trap Address Setting

IP	PORT	Version	Trap Community

CM Community

RO Community: public

RW Community: private

Start Log Out

【CMC community】: network management system read and write the data of miniCMTS;

【CM community】:

1. CMTS manage CM, read and write CM data;
2. SNMPv1 : the first formal version of simple network management protocol, define in RFC1157.
3. SNMPv2C: Community-Based SNMPv2 management structure, an experimental protocol defined in RFC1901.

2.3.7 Uplink Settings

Conduct filtering setting to business port of miniCMTS.

CMC3.0 Configure SN : MAC : 08:00:12:34:56:58 - 08:00:12:34:56:5F SoftVer : 0.9.2 admin 17:38:58

Guides: Channels Settings, Up Channels, Down Channels, Network Settings, Management IP, Business IP, Option60 Settings, BusinessMode Settings, Server Settings, SNMP, **Uplink Setting**, Packet Rate Limitation, Terminal Settings, System Monitor, System Management

Uplink Setting

Refresh Save

tag: 0

Example: 100-110,300-310,500

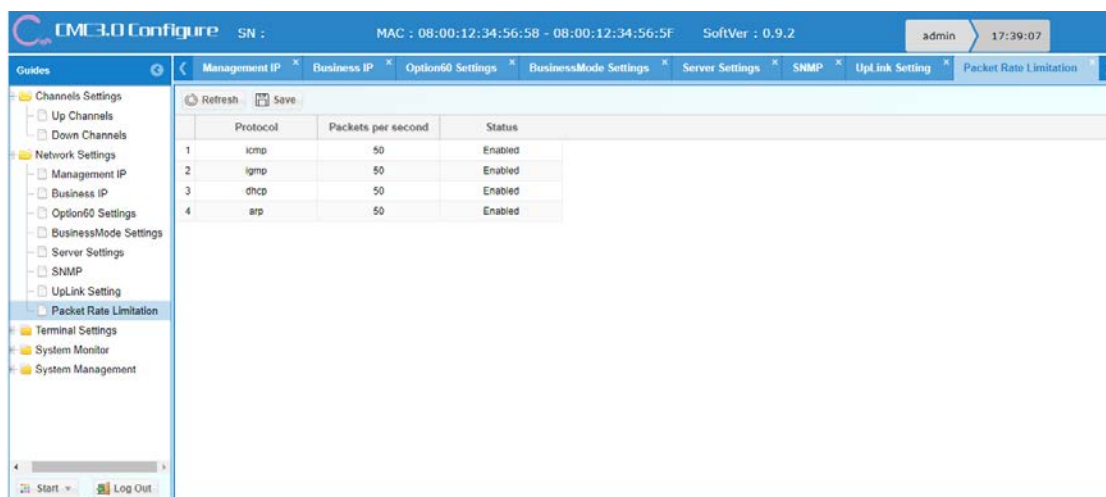
Ingress filter: Disable

Start Log Out

Items	Descriptions
Tag	Namely VLAN
Enable ingress filter	Only open a single network port filtering
Save	Save current setting

2.3.8 Anti-DoS Attack

miniCMTS support to detect the packet number of ARP/DHCP/IGMP/ICMP sent by CM users. When these packets are sent over a certain threshold per second, miniCMTS would think this CM user exists DoS attack (users attack maliciously or computer is infected by viruses), and will discard the over-threshold protocol packets from this CM user.



Items	Descriptions
Protocol	4 kinds of attack protocol: ARP/DHCP/IGMP/ICMP
Threshold value	Allowable packet number per second when open Anti-DoS attack, Max: 255, Mini: 0
Status	Two status: enabled and disabled Enabled: open corresponding anti-DoS attack Disabled: means close
Save	Save current setting
Refresh	Check the saved information

2.4 Terminal Settings

2.4.1 CM List

CMC3.0 Configure

SN :

MAC : 08:00:12:34:56:58 - 08:00:12:34:56:5F

SoftVer : 0.9.2

admin

10:02:04

Guides

Start

CM List

Channels Settings

Up Channels

Down Channels

Network Settings

Management IP

Business IP

Option60 Settings

BusinessMode Setti

Server Settings

SNMP

UpLink Setting

Packet Rate Limitati

Terminal Settings

CM List

CPE List

Load Balance

Shared Secret

System Monitor

CMC Status

Sys Logs

Snooping

CM details

CM Config Info

Restart

Clear Modem History

MAC Filter

Refresh

		MAC Addr	IP Addr	conn...	docsis v...	Soft Version	Up Power(dbmv)	Up SNR(db)	Down Power(dbmv)	Down
<input type="checkbox"/>	1	1	FCE892A1D62F	192.168.100...	Online	Docsis20	N/A	N/A	0.0	0.0

4

Start

Log Out

Displaying 1 - 1

Items

SID

MAC Address

IP Address

Connection

Docsis Version

Software Version

Up Power

Up SNR

Down Power

Down SNR

Up Cumulative Number of Bytes

Down Cumulative Number of Bytes

Offline Counts

Offline Time

Upstream Frequency of CM

Downstream Frequency of CM

CM Basic Info

Restart

History Cleanup

Moving Frequency

MAC Filter

Refresh Power

Descriptions

CM ID assigned by miniCMTS

MAC of CM

IP address of CM

Several status of Online or offline etc

DOCSIS version of CM, 2.0 or 3.0, it will show 1.0 if CM never complete register

Software version of CM

Power of one or more upstream frequency

SNR of one or more upstream frequency

Power of of one or more downstream frequency

SNR of of one or more downstream frequency

Total bytes of CM upstream

Total bytes of CM downstream

Number of CM offline

Latest offline time of CM

All working upstream frequency of CM

All working downstream frequency of CM

Check the detailed information of selected CM

Make the selected CM or all CM offline and online again forcibly

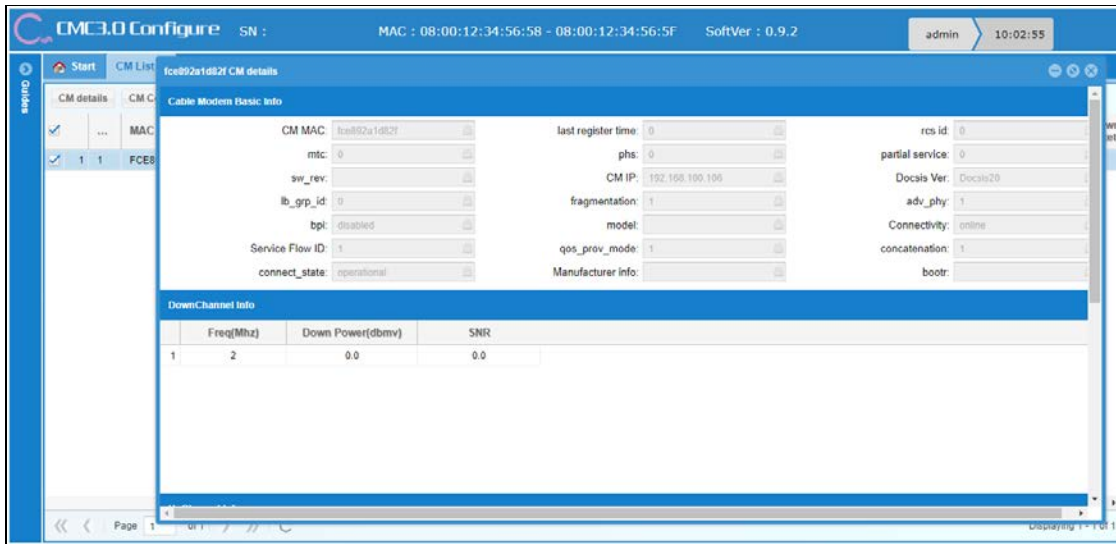
Clean up offline records of CM

Change up or down frequency of CM

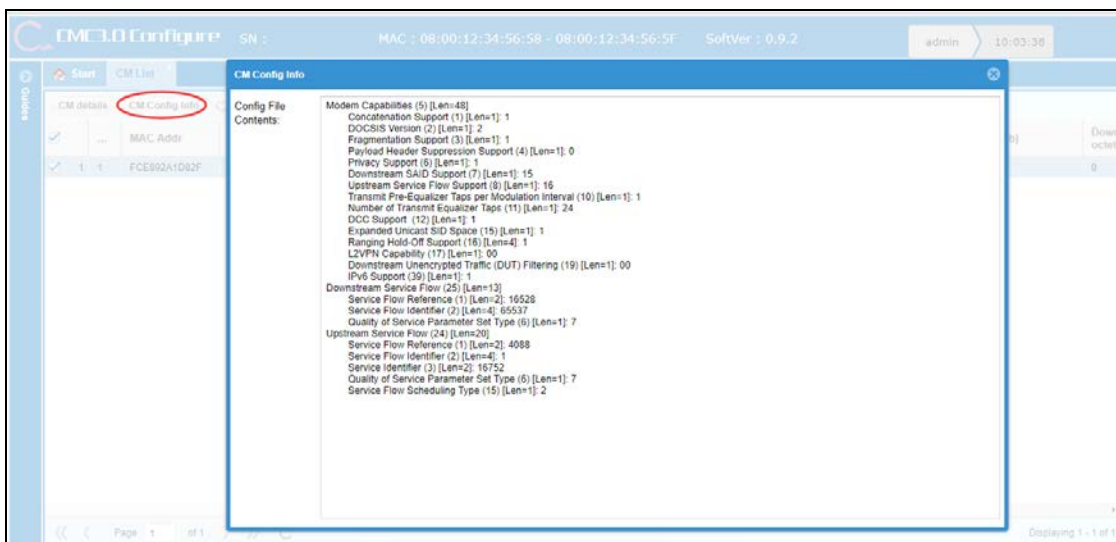
Filter according to MAC address so as to find device conveniently

Refresh the up&down power data of selected CM

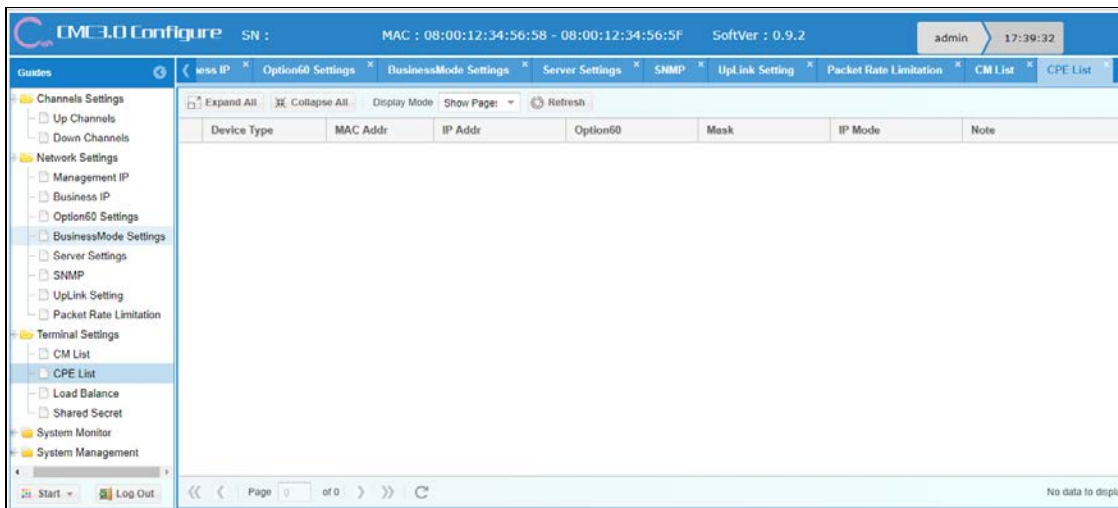
Select the needed CM, click "cable modem basic info" to view related information.



Select needed CM, click "CM Config Info" to view related configuration file



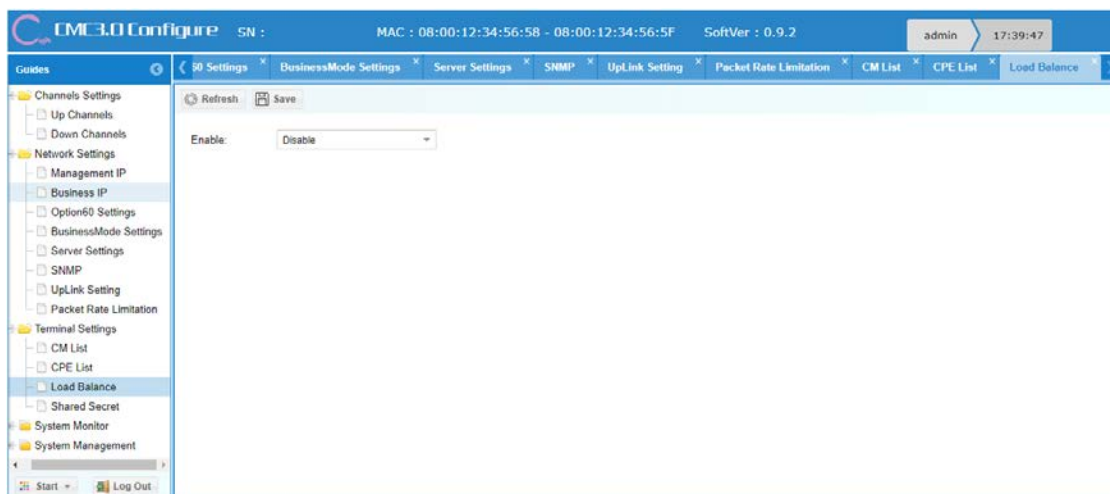
2.4.2 CPE list



Items	Descriptions
Device Type	CM or CPE
MAC Address	MAC address of CM or CPE
IP Address	IP address of CM or CPE
Option60	DHCP option60
Mask	
IP Mode	
Note	
Aged	MAC is aged or not
Expand All	Expand all CM
Collapse All	Collapse all CM
Display Mode	Show pages or show all

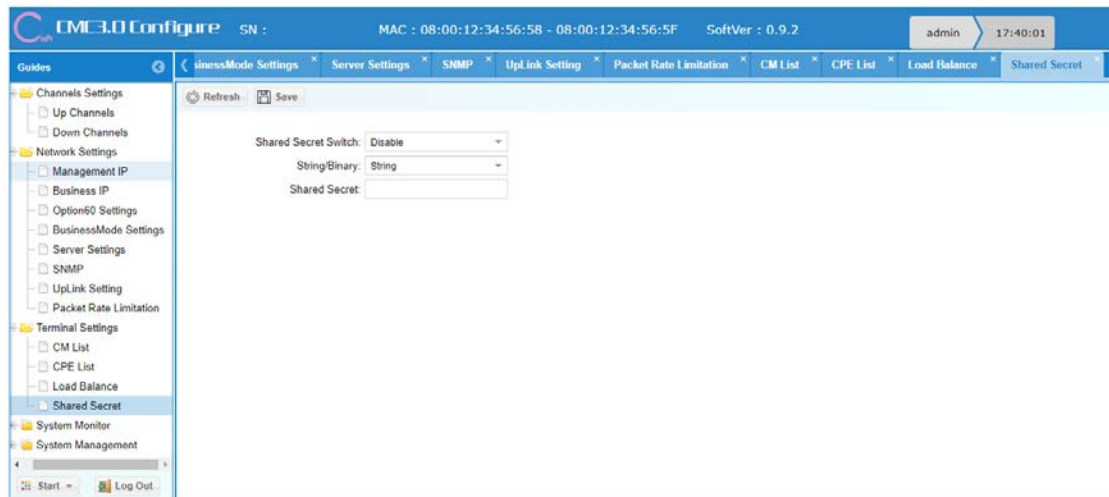
2.4.3 Load Balance

Enable or disable load balance function.



2.4.4 Shared Secret

Protect configuration file from modification maliciously and validate configuration file.



2.5 System Monitor

2.5.1 CMC Status (Hardware Status)

It includes 4 parts: performance, temperature, power status and running time.



Items

Hardware status
CPU temperature
Running time
Cumulative time

Descriptions

Display current footprint of CPU, memory, flash memory
Display current temperature of CPU chip
Time from latest start up to current stage
Time from first running to current stage

2.5.2 System Logs

The system logs can execute record, classification, management to all system information, it helps network to monitor device status and diagnose faults greatly.

	Time	LogLevel	LogType	LogContent
1	1970-01-01 00:00:57	Minor	notice	WAN1 interface is physical up.
2	1970-01-01 00:00:57	Minor	notice	Set WAN1 interface' IP address to be 10...
3	1970-01-01 00:00:57	Minor	notice	WAN8 interface is physical up.
4	1970-01-01 00:00:57	Minor	notice	Set WAN8 interface' IP address to be 19...
5	1970-01-01 00:01:00	Critical	informational	Access authority with address allocated ...
6	1970-01-01 00:01:05	Minor	critical	CPU occupation is approached the thres...
7	1970-01-01 00:02:36	Minor	critical	CPU occupation is approached the thres...

Items	Descriptions
Time	Show the recording time of this log
Log level	Show the severity level of this log
Log type	Refer to following table
Log content	Show detailed content of this log
Severity level of log and debug	

Severity level	Value	Descriptions
Emergency	0	Grievous mistake, need to solve immediately
Alert	1	Need to take action to solve immediately
Critical	2	Key mistake, need to take action as soon as possible
Error	3	Need to pay attention but not key mistake
Warning	4	some function is affected by system running mistake
Notice	5	Need to pay attention slightly
Informational	6	No need to pay attention to it
Debug	7	Information occurred during debug process

Severity level of Alert information

Severity level	Value	Descriptions
Critical	0	Emergency
Major	1	Important
Minor	2	Subordinate
Warning	3	Warn
Cleared	5	Alert recovery
Indeterminate	6	Uncertain information

2.5.3 Snooping

miniCMTS provide debug tool for system administrator to help users checking problem rapidly.

DateTime	Type	Packet Type	Source MAC	Source IP	Target MAC	Target IP	option60	vlan
1970-01-01 08:28:25	dhcp_snoop	ACK	3C970E28E41B	192.168.100.3	FFFFFFFFFFFF	255.255.255.255	docsis	0
1970-01-01 08:28:25	dhcp_snoop	REQUEST	FCE892A1D82F	0.0.0.0	FFFFFFFFFFFF	255.255.255.255	docsis	0
1970-01-01 08:28:23	dhcp_snoop	OFFER	3C970E28E41B	192.168.100.3	FFFFFFFFFFFF	255.255.255.255	docsis	0
1970-01-01 08:28:23	dhcp_snoop	DISCOVER	FCE892A1D82F	0.0.0.0	FFFFFFFFFFFF	255.255.255.255	docsis	0
1970-01-01 08:25:03	dhcp_snoop	DISCOVER	FCE892A1D82F	0.0.0.0	FFFFFFFFFFFF	255.255.255.255	docsis	0
1970-01-01 08:23:58	dhcp_snoop	DISCOVER	FCE892A1D82F	0.0.0.0	FFFFFFFFFFFF	255.255.255.255	docsis	0
1970-01-01 08:23:25	dhcp_snoop	DISCOVER	FCE892A1D82F	0.0.0.0	FFFFFFFFFFFF	255.255.255.255	docsis	0
1970-01-01 08:23:08	dhcp_snoop	DISCOVER	FCE892A1D82F	0.0.0.0	FFFFFFFFFFFF	255.255.255.255	docsis	0
1970-01-01 08:22:59	dhcp_snoop	DISCOVER	FCE892A1D82F	0.0.0.0	FFFFFFFFFFFF	255.255.255.255	docsis	0
1970-01-01 08:22:54	dhcp_snoop	DISCOVER	FCE892A1D82F	0.0.0.0	FFFFFFFFFFFF	255.255.255.255	docsis	0
1970-01-01 08:19:38	dhcp_snoop	DISCOVER	FCE892A1D82F	0.0.0.0	FFFFFFFFFFFF	255.255.255.255	docsis	0
1970-01-01 08:18:34	dhcp_snoop	DISCOVER	FCE892A1D82F	0.0.0.0	FFFFFFFFFFFF	255.255.255.255	docsis	0
1970-01-01 08:18:02	dhcp_snoop	DISCOVER	FCE892A1D82F	0.0.0.0	FFFFFFFFFFFF	255.255.255.255	docsis	0
1970-01-01 08:17:46	dhcp_snoop	DISCOVER	FCE892A1D82F	0.0.0.0	FFFFFFFFFFFF	255.255.255.255	docsis	0
1970-01-01 08:17:38	dhcp_snoop	DISCOVER	FCE892A1D82F	0.0.0.0	FFFFFFFFFFFF	255.255.255.255	docsis	0
1970-01-01 08:17:34	dhcp_snoop	DISCOVER	FCE892A1D82F	0.0.0.0	FFFFFFFFFFFF	255.255.255.255	docsis	0

Function: Detect the process of CM online and CPE getting IP address or PPPOE in WEB page, namely check interactive data packet of DHCP and PPPOE.

2.6 System Management

2.6.1 System Upgrade

miniCMTS support to upgrade system file via Web, please contact Lancable to get related support if need.

Name	Type	Size	Percent	Status
Inner Software Version: CMCUC-MMW100-R1103				
Created Date: #1367 SMP Wed Sep 6 15:25:22 CST 2017 -- Wed Sep 6 15:25:34 2017				
Warning Please backup the current configuration file before upgrading. Don't turn off the power.				

Items

System version
Add file
Start upgrading

Descriptions

Main program version number of CPU management, extension name: .bin
Choose the uploaded file, only one file can be uploaded every time.
Start upgrading process

2.6.2 System Users

It is used to limit visitor access and identity of web login to protect the configuration of miniCMTS. At present, it just support to modify password.

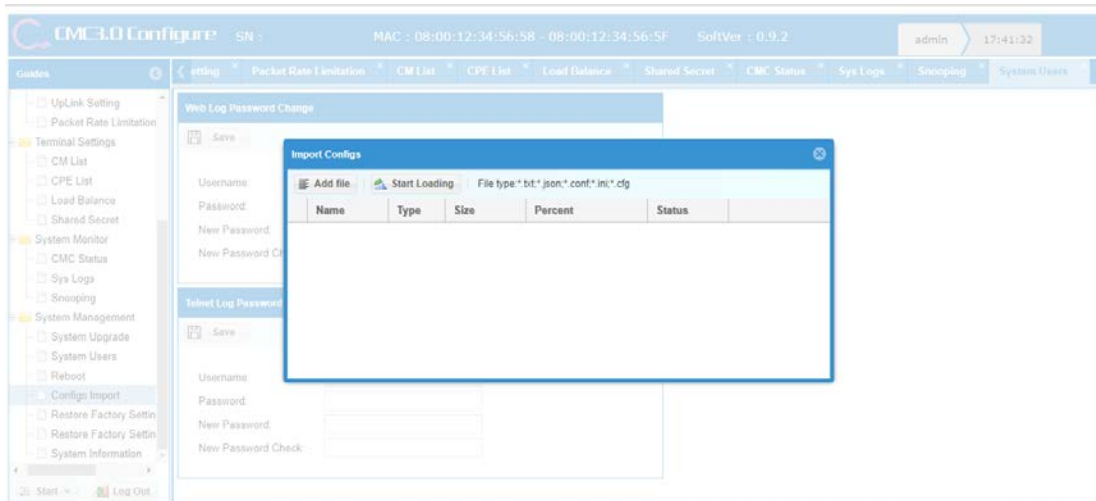
Items	Descriptions
Username	Only support admin
Password	Old password
New password	First input
New password check	Second input
Save	Save current setting

2.6.3 Reboot

Users can restart miniCMTS here, it will go back to login page automatically. Please save current setting before reboot, otherwise, the setting would be lost.

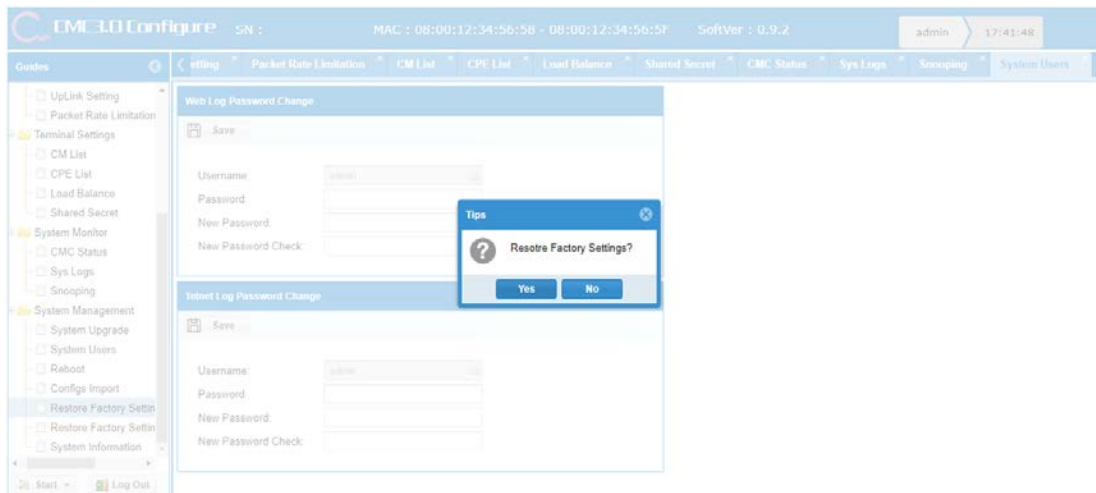
2.6.4 Configs Import

Import previous configuration file into miniCMTS so that the unit can go back to the status of that time.

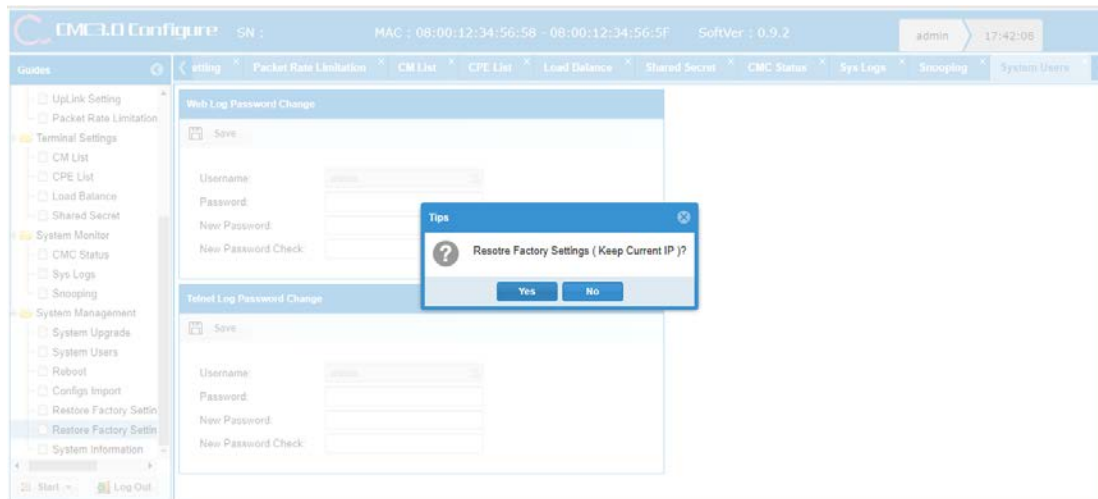


2.6.5 Restore Factory Settings

miniCMTS can be restored to factory settings, all settings would be cleared.

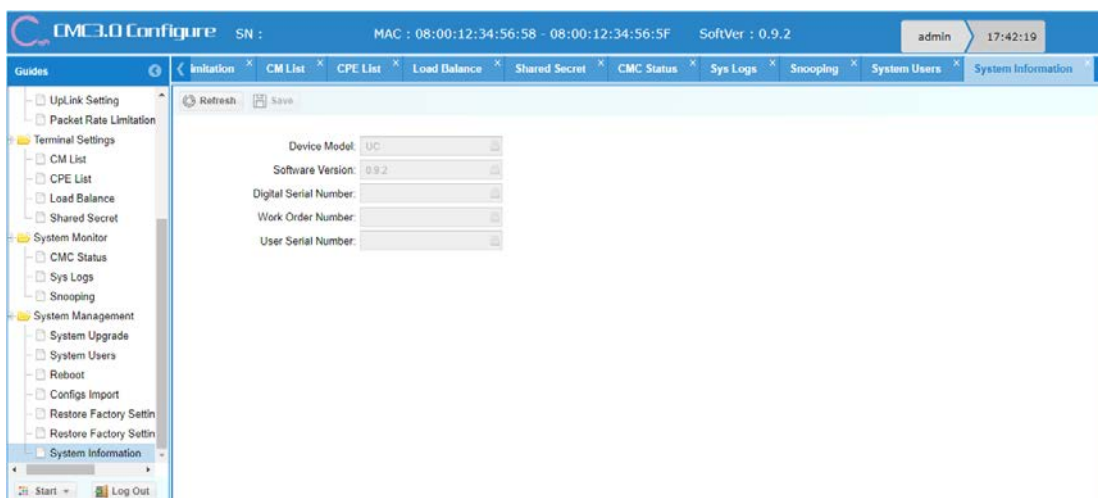


miniCMTS can be restored to factory settings via following page, all settings would be cleared except current management IP.



2.6.6 System Information

Users can view device model, software version and related warranty information.





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Ver. ACT_RC3016_CMTS_QRG_V1b_Oct_2016