

# ***CEM-538M***

*HomePNA3.1 Coax MDU Master Bridge*



## ***User's Guide***

*Version 1.9  
Nov. 2007*

# FCC STATEMENT

This device complies with **Part 15** of the FCC Rules.

Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference, and
- (2) This device must accept any interference received, including interference that may cause undesired operation.

**NOTE:** This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help

VCCI & CE...

**CAUTION:** Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

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# INTRODUCTION

This chapter describes the features of your HomePNA3.1 over Coax to Ethernet Master (Management) Bridge -- CEM-538M. Refer to "HomePNA3.1 over Coax" as HCNA from this point.

## Features

- ◆ One HCNA Port for Driving HomePNA3.1 Signal into Existing Coaxial Cable
- ◆ One TV/Antenna Port for TV Set Connection or for TV Signal from VHF/UHF Antenna/CATV
- ◆ Two Fast Ethernet Port with Auto-Detect MDIX Function(Auto Crossover) and Auto-Negotiating Half/Full Duplex 10M/100M for Expansion or Link to FTTx/xDSL Modem
- ◆ One Reset Button
- ◆ Priority Queue based QoS Support for 802.1p, IP TOS, UDP/TCP Protocols
- ◆ Supports up to 31 EP (Endpoint, as CES-532D Slave Unit) Concurrent Connections
- ◆ Built-in Diagnostic Function for Individual EP Connection
- ◆ Built-in Web Server and Telnet Server to Support Remote Configuration via Web Browser or Telnet Protocol
- ◆ Supports Remote HTTP/TFTP Upgrade Function for System Firmware and HCNA Driver
- ◆ Supports HCNA Driver Upgrade On-line for Connected EPs
- ◆ Supports SNMP Function

## Glossary

- ◆ HCNA      HomePNA3.1 over coaxial cable
- ◆ MDU      Multiple Dwelling Unit
- ◆ Coax      Coaxial cable
- ◆ SyncMode      HCNA device operates in Synchronous mode
- ◆ AsyncMode      HCNA device operates in Asynchronous mode
- ◆ Master      Master HCNA device in one coax network
- ◆ Slave      Slave HCNA device in one coax network
- ◆ EP      Endpoint, equivalent to Slave HCNA device, as CET-338 or CES-532D
- ◆ Smart EP      Smart Endpoint, as CES-532D. CEM-538M could configure Smart EP's Ethernet properties.
- ◆ QoS      Quality of Service
- ◆ M/C      Fiber-Optic Ethernet Media Converter
- ◆ Mixer      Coax device sums two or more signals into one
- ◆ Splitter      Coax device divides a signal into two or more smaller and approximately equal signals.
- ◆ Combiner      Coax device adds several discrete signal inputs to one and has high isolation between inputs
- ◆ Duplexer      Coax device separates 2 signals within the same band
- ◆ Diplexer      Coax device separates 2 signals in different bands
- ◆ Tap      Coax device uses for matching impedance or connecting subscriber drops
- ◆ dB      Decibel, to express either a gain or loss power ration(log) after the signal has been transmitted

## INSTALLATION

This chapter describes the installation procedure for your bridge.

### Packing List

Your package should come with the equipment listed below,

- ◆ One Main Unit (HCNA to Ethernet Master Bridge) CEM-538M
- ◆ One DC 5V Power Adaptor
- ◆ One F-Type Coaxial Cable (RG-59U)
- ◆ One RJ-45 Ethernet Cable (CAT-5)

### Rear Panel

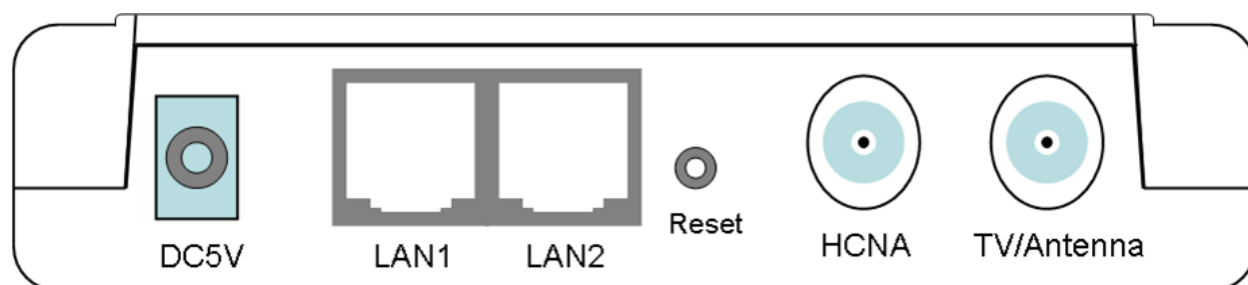


Figure 1: Rear Panel of CEM-538M

### Connectors

1. **DC5V**: Connect to the power adapter plug.
2. **LAN1/LAN2**: Two fast Ethernet ports to connect Switch/FTTx/xDSL Modem for Internet access.
3. **Reset**: While CEM-538M is turned on, press and release this button will reboot CEM-538M. Press it for lasting 5 seconds will restore all settings to factory default. For example, the IP address will restore to default '192.168.1.1'.
4. **HCNA**: Attach to existing coaxial cable and use it as the networking backbone in one or more MDUs. CEM-538M is the HCNA **Master** device and controls the other **Slave** HCNA devices (refer to Endpoint or **EP**, as CES-532D) on the same coax network. Refer "[Connecting the Cables](#)" for more details.
5. **TV/Antenna**: Connect to TV Set. Or connect to VHF/UHF antenna or CATV to bypass TV signal to HCNA port.

### LED Indicators

1. **Power**: Lighting up when power on.
2. **LAN1**: Lighting up when LAN1 port is active, and flashing when there is any data traffic.
3. **LAN2**: Lighting up when LAN2 port is active, and flashing when there is any data traffic.
4. **Link/Act**: Lighting up when HCNA port is active, and flashing when there is any data traffic.
5. **SyncMode**: Lighting up when HCNA port is working in HCNA **Synchronous MAC** mode.
6. **Diagnosis**: Lighting up when CEM-538M is diagnosing EP.

**NOTE:** HCNA always adopt the **Synchronous MAC** protocol layer in coax system in order to coordinate all the transmissions and eliminate any collisions. The SyncMode led should be always on after power on.



## Connecting the Cables

To establish a new coax networking system by CEM-538M, reroute the CATV/Antenna signal source over coax toward CEM-538M 'TV/Antenna' port and connect CEM-538M 'HCNA' port to the original coax entrance to building. CEM-538M works as a **Combiner** for TV and HCNA signal. In each Dwelling Unit, use the HCNA **EP** to extract the TV signal and Ethernet packets. See [Figure 2](#) for the detail cabling in one MDU,

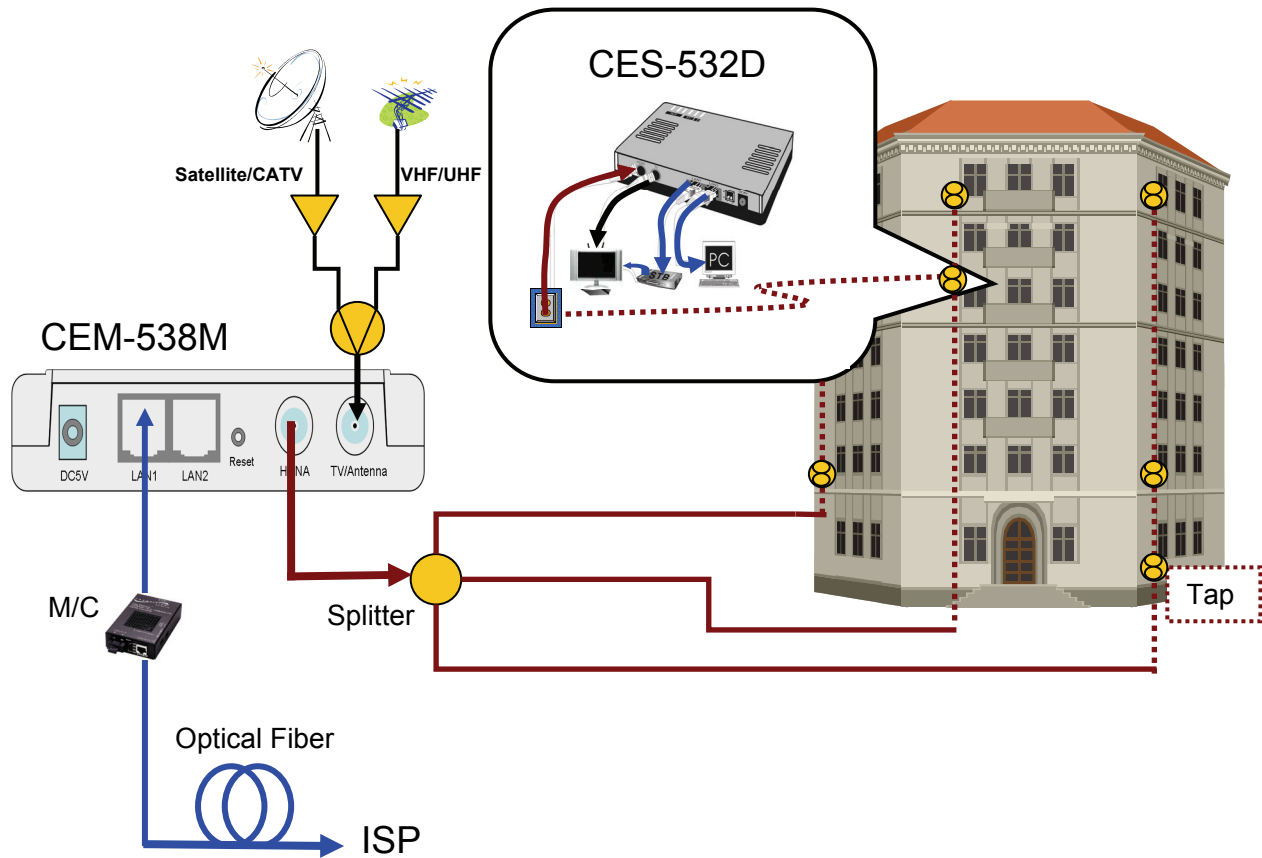


Figure 2: Detail cabling of CEM-538M

You can also use other Combiner or Mixer-Splitter with CEM-538M to build the same system, see the following [Figure 3](#) for different cabling,

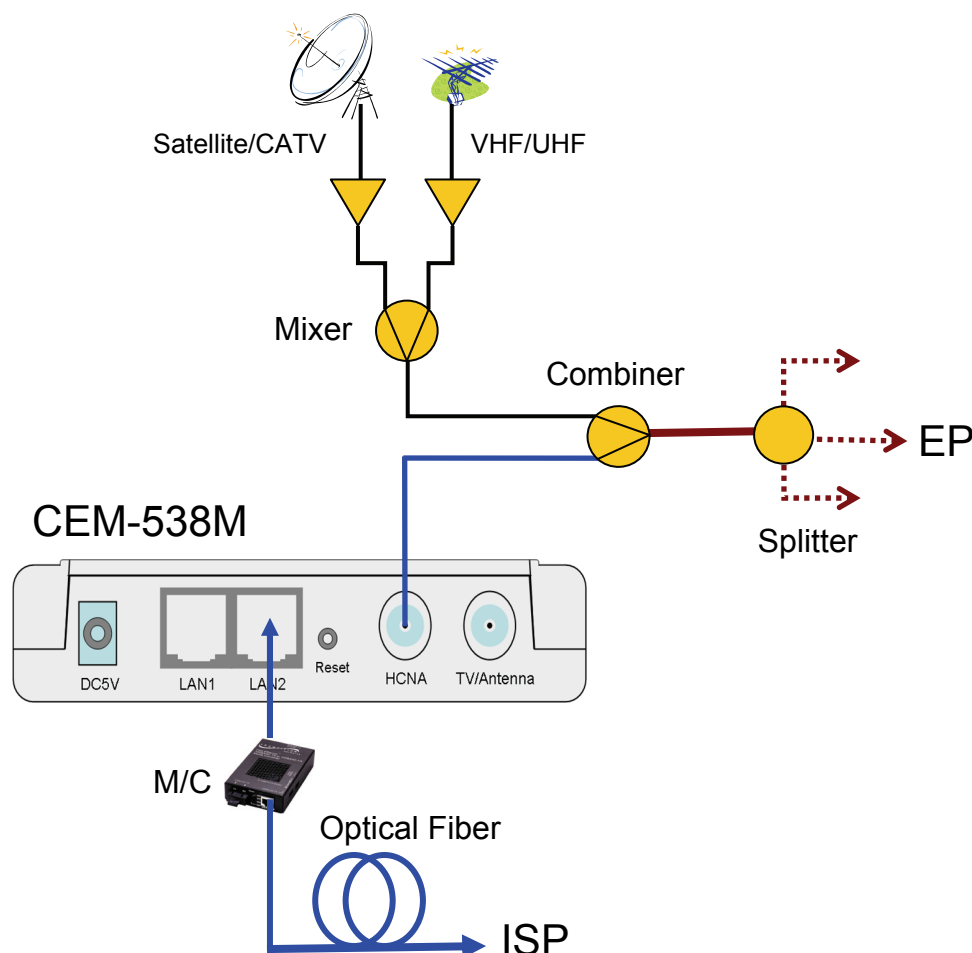


Figure 3: Different Cabling of CEM-538M

**NOTE:** After power up CEM-538M, the led 'SynMode' will always be glowing, and led 'Link/Act' will light up for at least one EP is detected on the HCNA network. A dimmed led 'Link/Act' shows no EP attached to the HCNA network.

**NOTE:** The minimum attenuation between Master and EP is 12dB. EP is usually connected to the coaxial cable via a **Tap** device that provides enough attenuation (contributes more than 20dB). If you intend to connect the Master and EP directly for test purpose, please add the attenuator that exceeds 12dB to the coaxial cable.

## Verification

After you have finished the installation, you should be able to access CEM-538M through **Ethernet** link or through **HCNA** link (via Host PC behind EP) to verify the installation is completed. (See next Chapter for details).

## CONFIGURATION

This chapter describes the configuration procedure for your bridge.

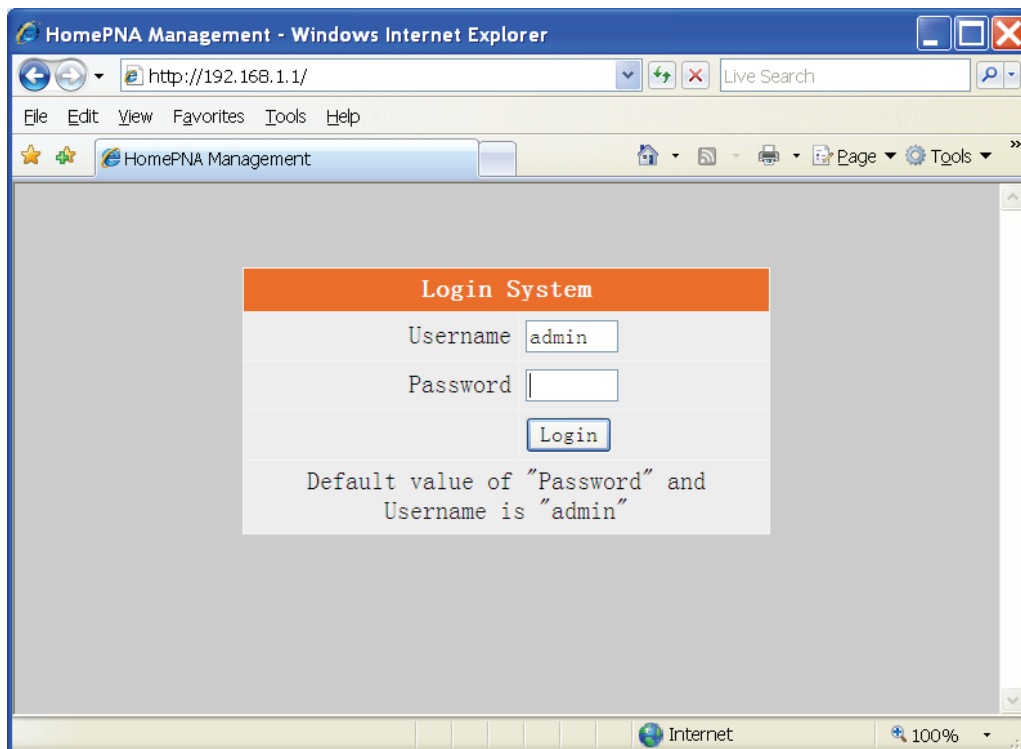
### Configuration Methods

To access and configure your bridge, choose one of the following methods:

- ◆ Use Web Browser
- ◆ Use Telnet Program
- ◆ Use SNMP Manager or MIB Browser

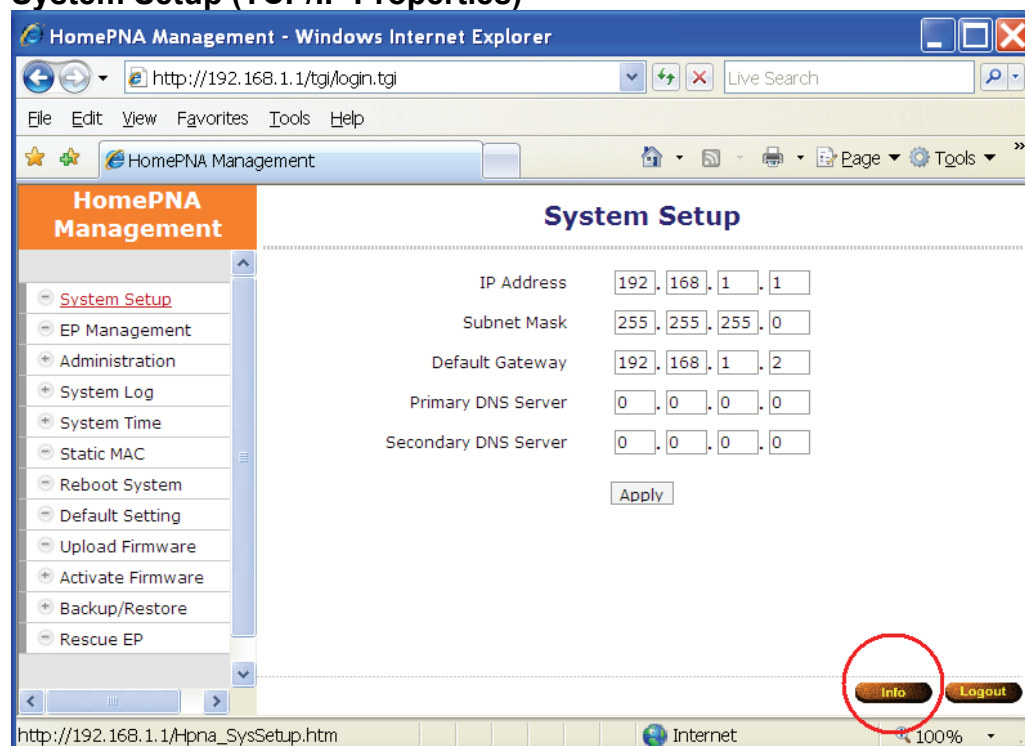
### Use Web Browser

Web browser is the easiest tool to configure the bridge. The factory default IP address of CEM-538M is '192.168.1.1' and the default subnet mask is '255.255.255.0'. To access the bridge with default IP, your PC should be within the same IP network as the bridge CEM-538M. That is, your PC's IP address should be as "192.168.1.xxx". For instance, you may connect your PC with the bridge directly by one Ethernet cable between your PC's Ethernet adapter and bridge's port LAN1. Also configures your PC's TCP/IP setting to fixed IP as "192.168.1.xxx", subnet mask as "255.255.255.0", disable DHCP option. Make your PC and the bridge within the same "192.168.1.xxx" network. Type in **192.168.1.1** in your browser's website navigating field, as the following,



The bridge will prompt you a window for password authorization. The factory default **Username** is '**admin**', also **Password** is '**admin**'. Please change it to a more secured password after you login successfully. Here shows the main configuration menus on the browser,

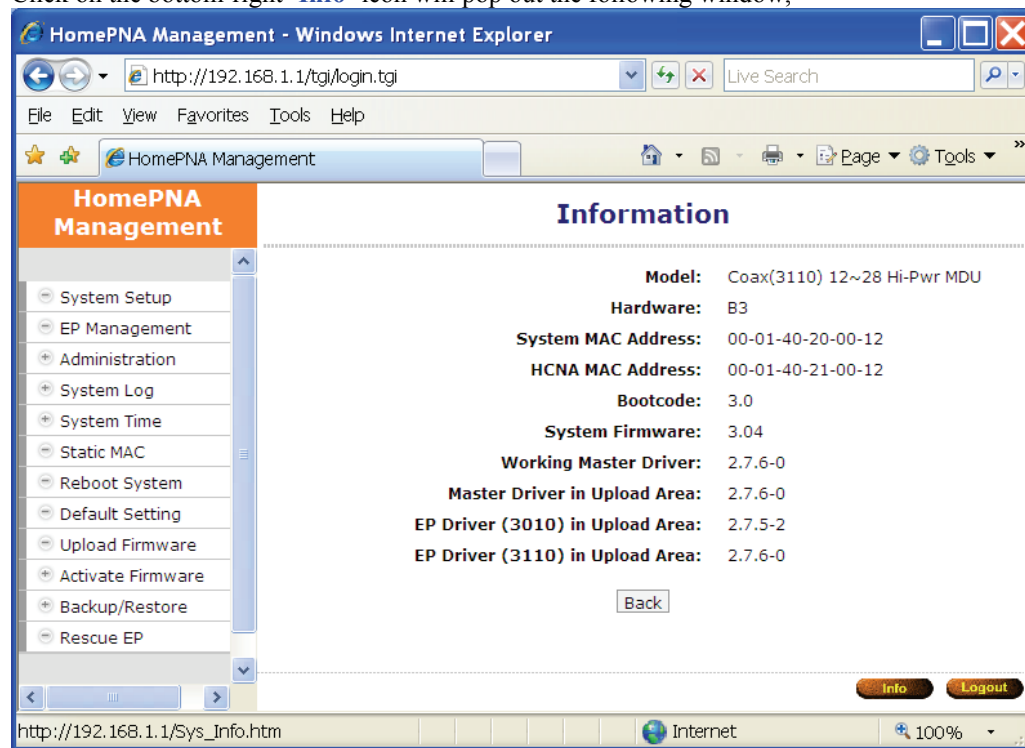
## System Setup (TCP/IP Properties)



The main window contains the left sub-window for the items to be configured, and the right sub-window displays the contents for the selected item. Click your mouse on the item in the left window will pop out the corresponding item-window in the right side. Click on the 'Apply' button (or 'OK' button in some screens) will submit your new setting into the bridge and will take effect immediately.

## System Assets (Information)

Click on the bottom-right 'Info' icon will pop out the following window,



## EP (User) Management

Refer the following [Figure 4](#) as the example for generic EP management. Each EP is identified by its built-in **HCNA MAC** address. The HCNA device resides at CEM-538M is regarded as the **Master** (Local) device, and is used to

manage other connected **Slave** EPs. The HCNA MAC exists only in HCNA (coax) domain, and is unaware for any EP end-user. System manager use system **IP** address and **Ethernet MAC** address to access CEM-538M. Each CEM-538M device should be stamped with both Ethernet MAC and HCNA MAC for identification.

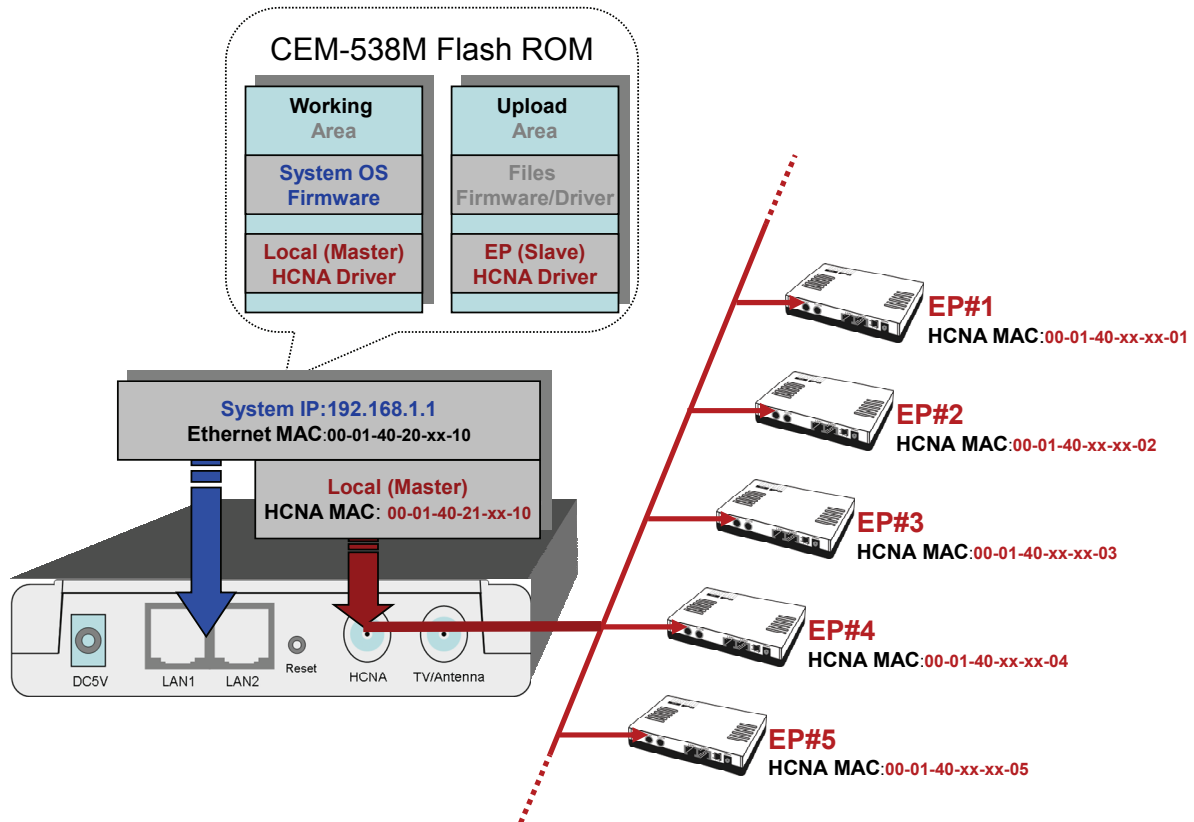


Figure 4: EP Management Architecture

### Firmware/Driver Files

CEM-538M flash ROM is capable of storing the following files:

1. System bootcode (OS bootloader)
2. System firmware (OS)
3. Local (Master) HCNA driver for chipset 3110 (resides at CEM-538M)
4. EP (Slave) HCNA drivers for chipset 3010 (resides at EP like CET-338)
5. Smart EP (Slave) HCNA drivers for chipset 3110 (resides at Smart EP like CES-532D).
6. HCNA physical connection diagnosis utility

To upgrade any one of them, you need to follow the 2-stage procedure. First to '**Upload**' the file onto CEM-538M **Upload Area**, then do the real upgrade by '**Activate**' it on demand -- the file will move into **Working Area** for running. Refer the following section entitled "[Example to Upload then Activate System Firmware and HCNA Driver](#)" for more details.

### EP

Open 'EP Management' window, click on '**Refresh**' button first to scan all connected EPs. For example,

HomePNA Management - Windows Internet Explorer

http://192.168.1.1/tgi/login.tgi

HomePNA Management

EP Management

Driver in Upload Area, Master : 2.7.6-0, EP (3010) : 2.7.5-2, EP (3110) : 2.7.6-0  
On-line EP : 5 Off-line EP : 2

Sel	Link	MAC	F/W	Model	Note	Config	Test
<input type="checkbox"/>		00-01-40-21-00-12	2.7.6-0	Coax(3110) 12~28 Hi-Pwr MDU	Local	HPNA Ether	Test
<input type="checkbox"/>		00-01-40-05-00-01	2.7.5-2	Coax(3010) 12~28 Hi-Pwr MDU-EP		HPNA Ether	Test
<input type="checkbox"/>		00-01-40-05-00-64	2.7.5-2	Coax(3010) 12~28 Hi-Pwr MDU-EP		HPNA Ether	Test
<input type="checkbox"/>		00-01-40-1f-02-ca	2.7.5-4	Coax(3110) 12~28 Hi-Pwr MDU-EP Smart		HPNA Ether	Test
<input type="checkbox"/>		00-01-40-1f-02-cc	2.7.5-4	Coax(3110) 12~28 Hi-Pwr MDU-EP Smart		HPNA Ether	Test
<input type="checkbox"/>		00-01-40-1f-02-cd	2.7.5-4	Coax(3110) 12~28 Hi-Pwr MDU-EP Smart		HPNA Ether	Test
<input type="checkbox"/>		00-01-40-1f-02-d6	NA	NA		HPNA Ether	Test
<input type="checkbox"/>		00-01-40-1f-03-15	NA	NA		HPNA Ether	Test

Refresh Upgrade Logout

Each row represents for one EP, here we have one Master (Local) HCNA device (on the top) and 7 extra Slave EP devices shown on the window. The first two are EPs based on 3010, follows three Smart EPs based on 3110 (or called Configurable EPs), and the last two EPs that are powered off.

### Smart EP

Denote an EP whose Ethernet properties are configurable. Based on 3110 chipset, with built-in simple management function, its Ethernet settings can be configured by CEM-538M. Refer "[Master/EP Ethernet Properties](#)". In contrast to Smart EP, EP based on 3010 chipset will not be denoted as '**Smart**' and is not configurable in its Ethernet properties.

For each shown column,

**Sel** : click on '**Sel**' button will select all listed on-line EPs at once for EP HCNA driver upgrade, or just designate the EP one by one for EP HCNA driver upgrade. The top row is the Master device (denoted '**Local**' in field **Note**).

**Link** : light for HCNA device current connection status.

**Green**: EP is active -- on-line. For Master device, green always.

**Gray**: EP is not active -- off-line, either user powers it off or cabling has trouble. ('NA' means value Not Applicable/Available since setting value in this field is stored inside EP and the EP is unreachable now.)

**MAC** : HCNA MAC address.

**F/W** : the current queried **working** (running) HCNA driver version

**Model** : the current queried **working** HCNA model name

**Note** : used to denote EP end-user, for recording username or address or specific message. Mark '**Local**' for Master HCNA device.

**Config** : configure Master's/Smart EP's both HomePNA and Ethernet properties or EP's sole HomePNA properties.

**Del** : Delete the off-line EP's profile, to save the EP properties profile space of CEM-538M.

**Test** : run the built-in diagnostic functions. Refer "[Diagnosis](#)" for more details.

Click on each device's '**HPNA**' button can open the window to configure its HomePNA properties. Click on '**Ether**' button to configure its Ethernet properties—only Master and Smart EP support this Ether-configure function. Click on '**Test**' button can diagnose the noise of HCNA itself and the physical connection quality between Master and EP.

### Properties Profile – Stored the Settings

CEM-538M will query and store the **setting** values of individual on-line EP into its nonvolatile memory automatically, include HomePNA properties and Ethernet properties as a profile. And it shows the monitored EP status: green light in '**Link**' field means EP is '**ON**', gray light otherwise. While EP is off-line and doesn't need any service, you may delete its obsolete profile manually to save CEM-538M storage space. CEM-538M could keep up to 32 profiles, and serve up to 1 master plus 31 on-line EPs concurrently.

### Master HomePNA Properties (HPNA)

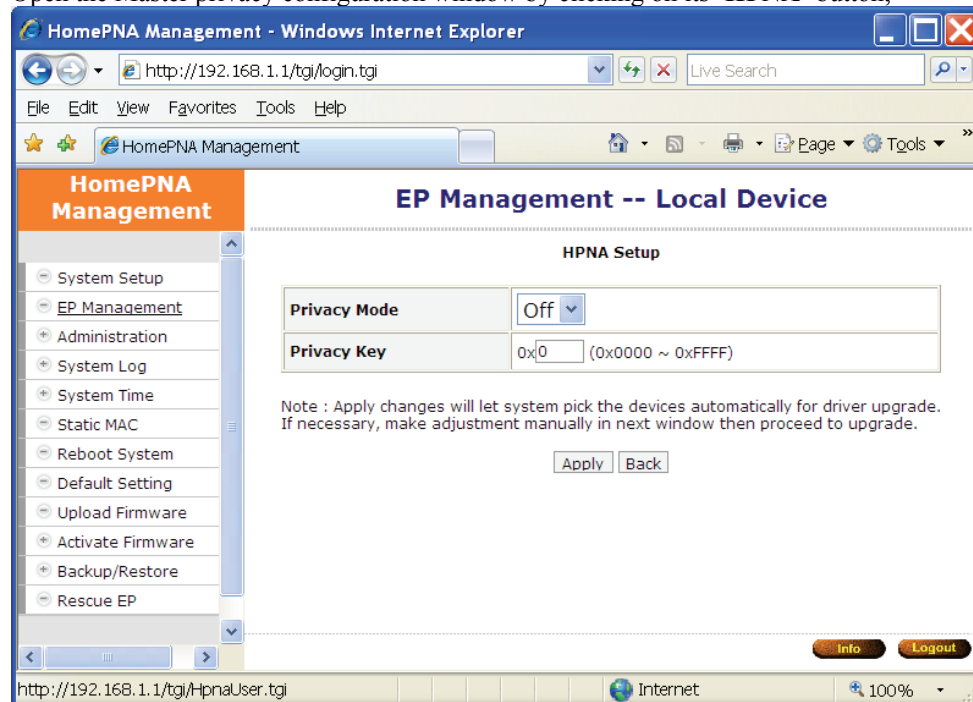
#### Security Mode

The communication between EPs is isolated intentionally. EP cannot talk to each other. It is the default security mode and unchangeable.

#### Privacy Mode

Privacy prevents unauthorized EP from accessing the HCNA network controlled by **Master** HCNA device. While '**Privacy Mode**' is '**ON**', Master will serve the EP only if its '**Privacy Key**' matches with the Master's. The '**Privacy Key**' acts like EP's password granted by Master.

Open the Master privacy configuration window by clicking on its '**HPNA**' button,



The '**Privacy Mode**' value for Master (Local device):

**Off:** It allows all EPs to transmit and receive packets through CEM-538M. Regardless of the '**Privacy Key**' values setting in Master device.

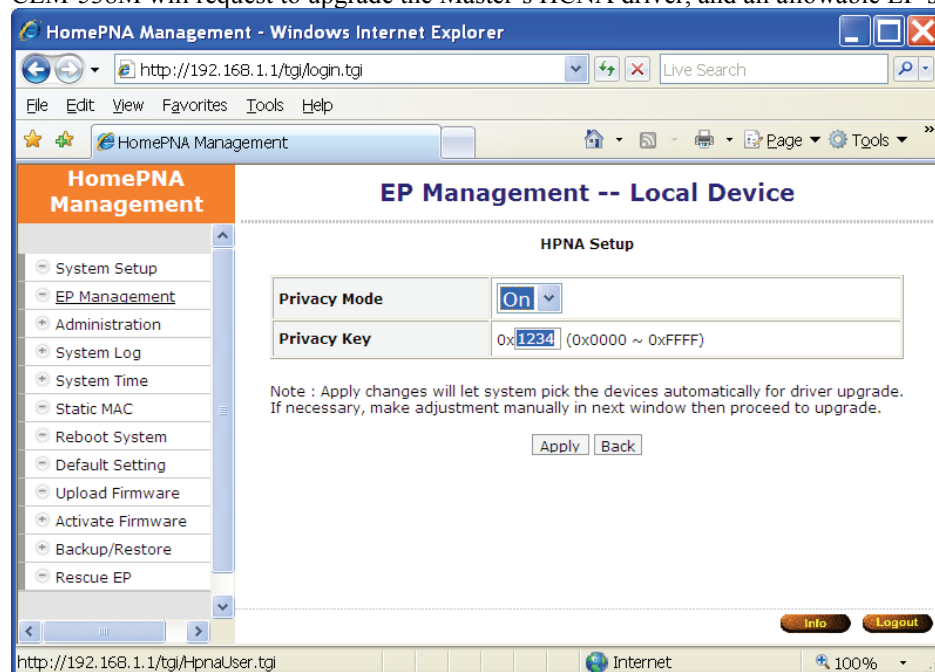
**On:** CEM-538M will communicate with EPs if they own the same '**Privacy Key**' while the '**Privacy Mode**' is turned '**ON**'. There should be only one key exists in one coax networking system. EP with unmatched key will not be allowed to transmit any packets through CEM-538M if '**Privacy Mode**' is '**ON**'.



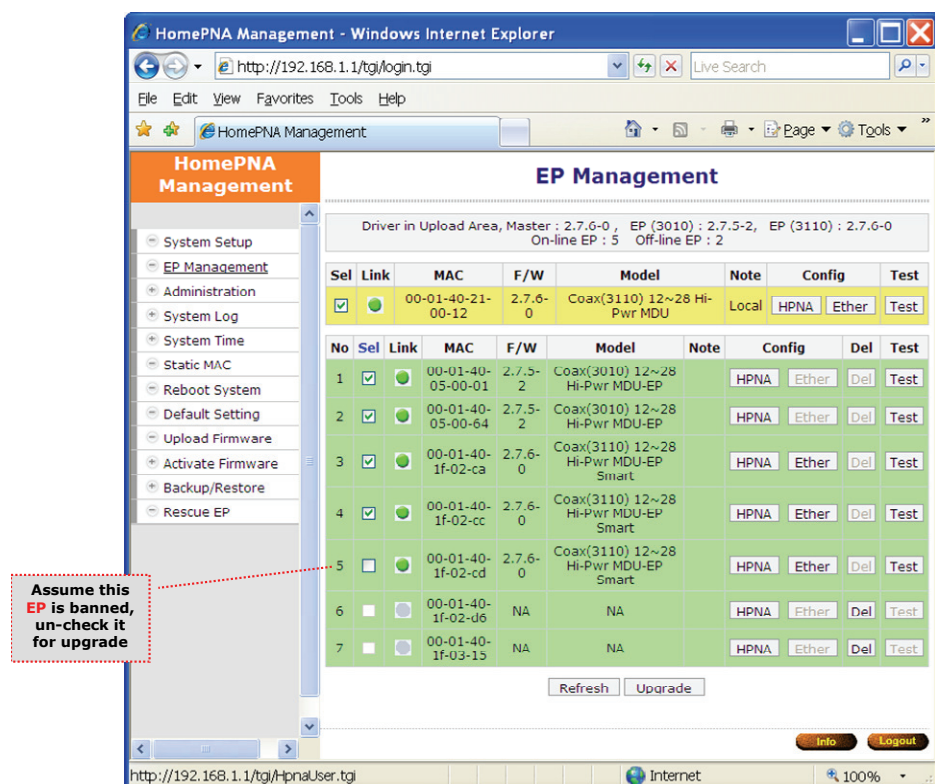
The factory default mode is 'Off' and key is '0x0' (states in hexadecimal). Once you activate the 'Privacy Mode' and set up the 'Privacy Key' in CEM-538M (the **setting** values), you need to upgrade Master and all allowable EPs' HCNA driver with the new values (replace the running **working** values with the new **setting** ones) before any connected EP can access the network controlled by CEM-538M.

### Privacy Mode Usage Example

For example, first activate the 'Privacy Mode' by apply the 'ON' setting and change the 'Privacy Key' to '0x1234'. CEM-538M will request to upgrade the Master's HCNA driver, and all allowable EP's HCNA driver.

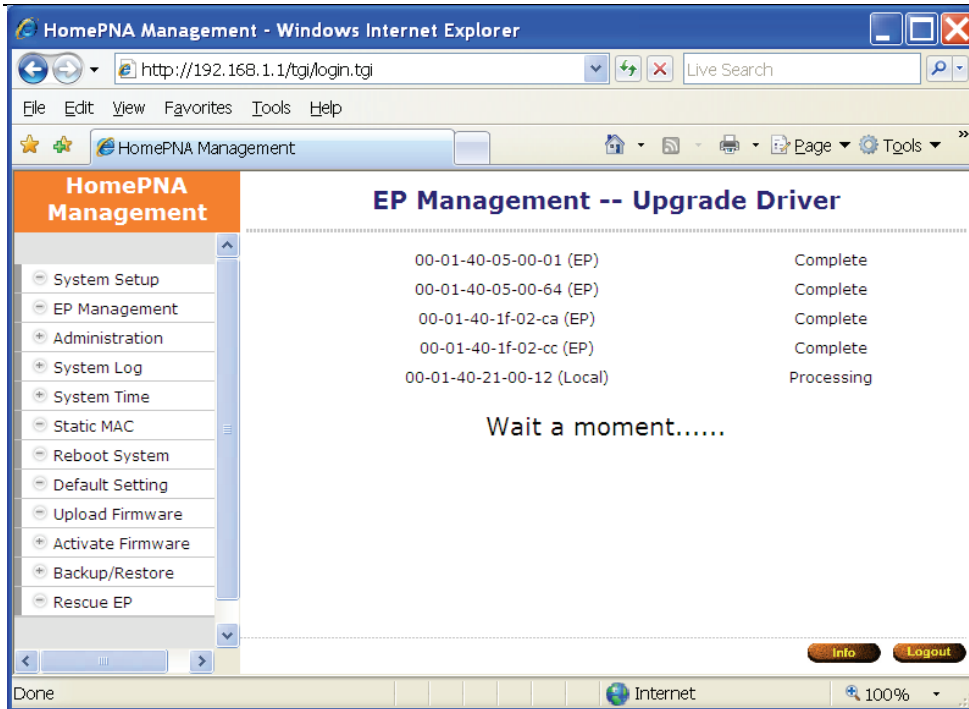


Click the 'Apply' button will change the Master row background color to yellow (refer 'Profile Status'), and pick all allowable EPs automatically for driver upgrade. You may change the select and proceed to upgrade, as we uncheck one EP, then do the upgrade for Master (Local) and 4 on-line EPs,

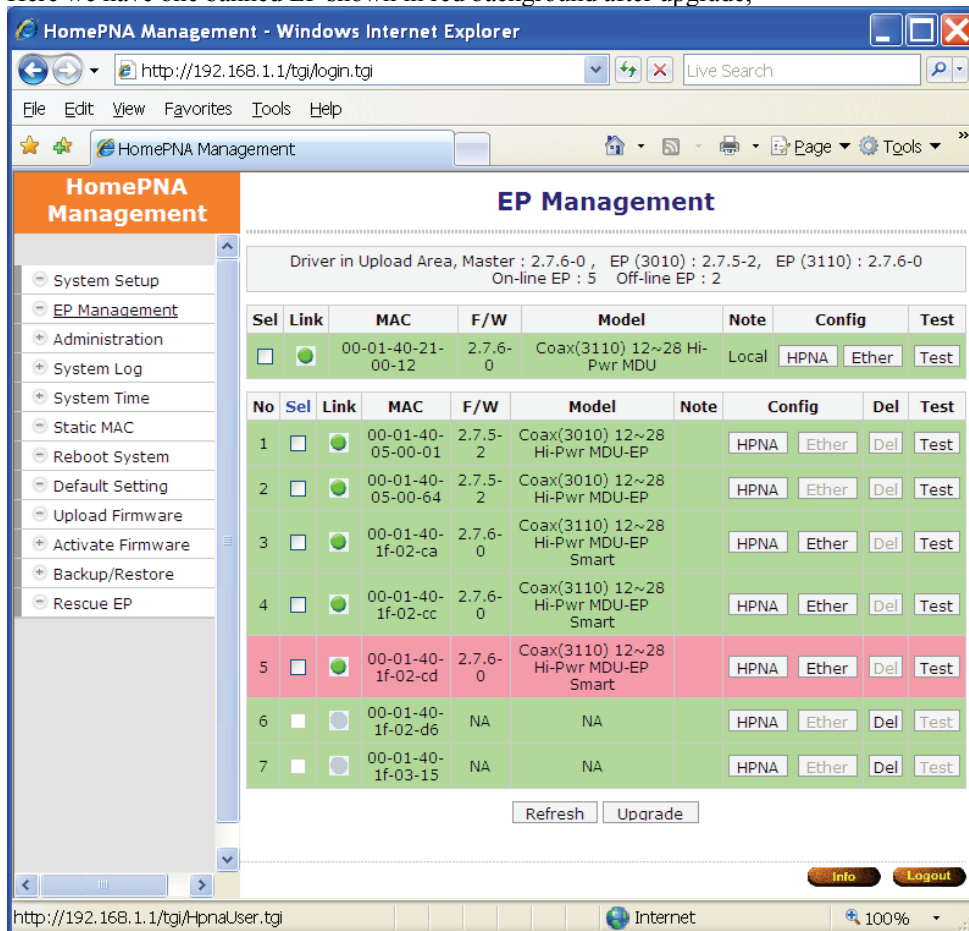


Click 'Upgrade' button,

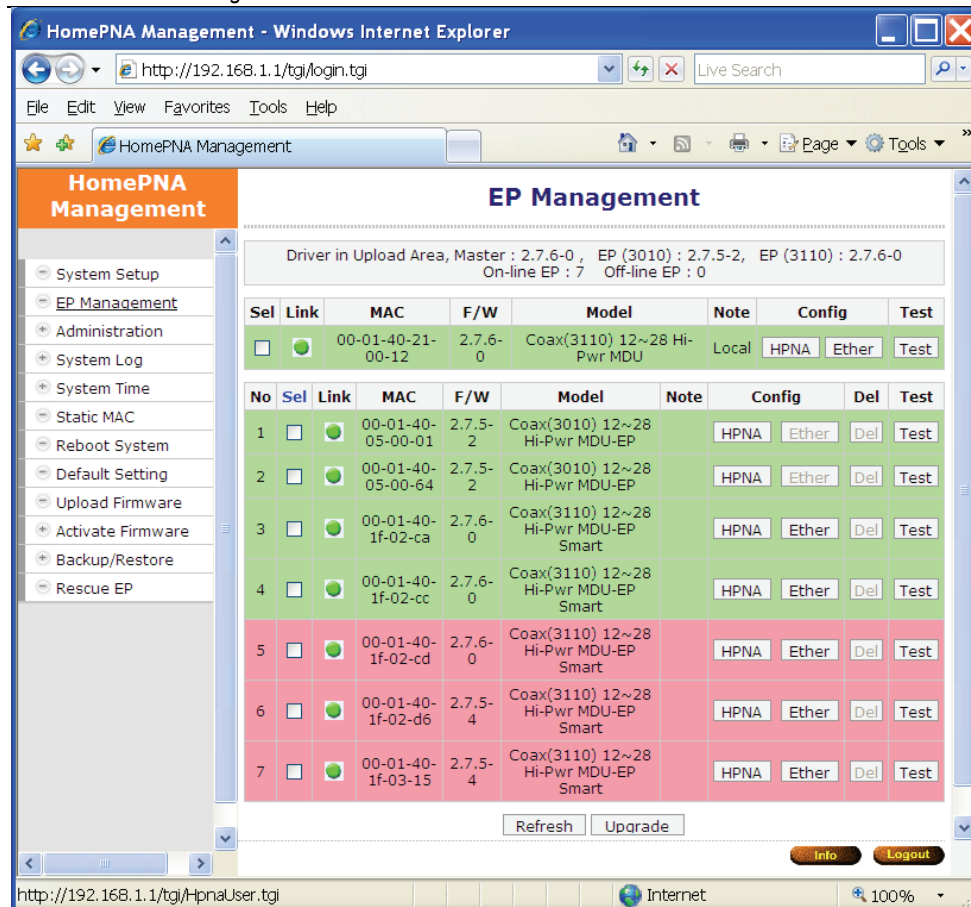




Here we have one banned EP shown in red background after upgrade,



Then power on the 2 extra off-line EPs, they will also be banned since their 'Privacy Mode/Key' (as default 'OFF'/'0x0') doesn't match with the Master's (now key is 'ON'/'0x1234' ).



EPs are classified by the shown background color, green for allowed EP, red for banned EP.

### Privacy Mode/Key Summary

EP can't communicate with each other regardless of the settings of 'Privacy Mode' and 'Privacy Key'. EP could access the coax network controlled by CEM-538M only if EP has the right 'Privacy Mode' and 'Privacy Key'. Please refer the following diagram for more details,

EP Privacy Mode \ Master Privacy Mode	On	Off
On	<div>✓ (Key match)</div> <div>✗ (Key not match)</div>	✗
Off	✗	<div>✓ (factory default)</div>

✓: EP can access the network

✗: EP can't access the network

Upgrade the EP's HCNA driver is the only way to change the EP's 'Privacy Mode' and 'Privacy Key'—by applying the setting values of the Master HCNA device to selected EPs.

### Profile Status for Master and EP

Each listed device status can also be classified by the shown background color:

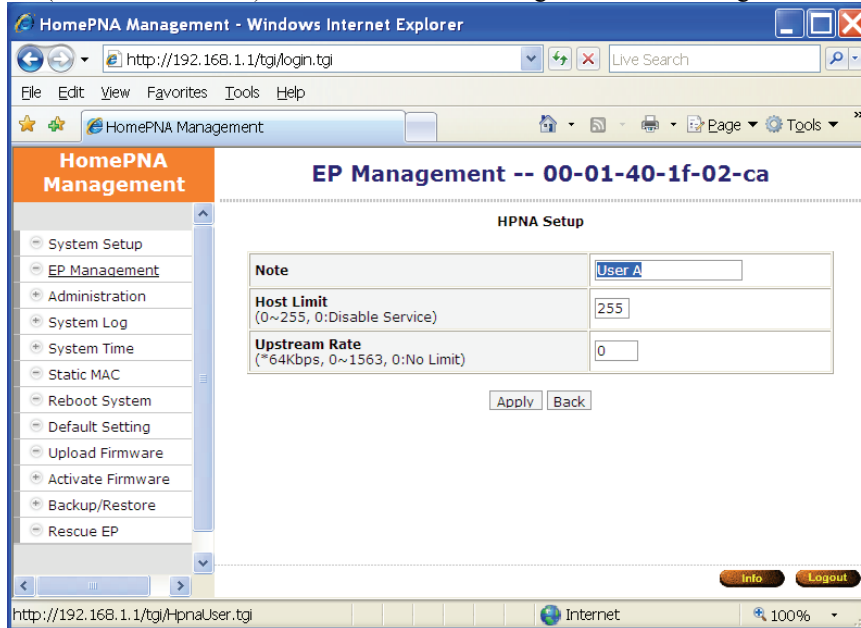
**Green:** For Master, the 'Privacy Mode/Key' working values in device is consistent with the profile stored setting values in CEM-538M. For EP, it can access the network.

**Yellow:** For Master, it has inconsistent '**Privacy Mode/Key**' settings. You may upgrade the Master's driver to synchronize its **working** values. (to replace the running **working** values with the **setting** ones).

**Red:** For banned EP, either '**Privacy Mode/Key**' in EP is not matched or the '**Host Limit**' value in EP is 0. CEM-538M will refuse to serve this EP.

### EP HomePNA Properties (HPNA)

EP (either Smart or not) conforms to the following HomePNA settings stored in CEM-538M Master,



#### Note

Footnote to the EP (user).

#### Host Limit

Specify the maximum allowable host (as PC) number attached on this EP:

**0:** Service is disabled, none host is allowed

**1~255:** The factory default value is 255 for unrestricted.

#### Upstream Rate

Limit the maximum allowable **upstream** bandwidth (value multiplied by 64Kbps) of one EP. It is a HomePNA upstream traffic throttle enforced by EP built-in HCNA driver (Regard as Software bandwidth control, works for HCNA port in the upstream direction).

**0:** unlimited

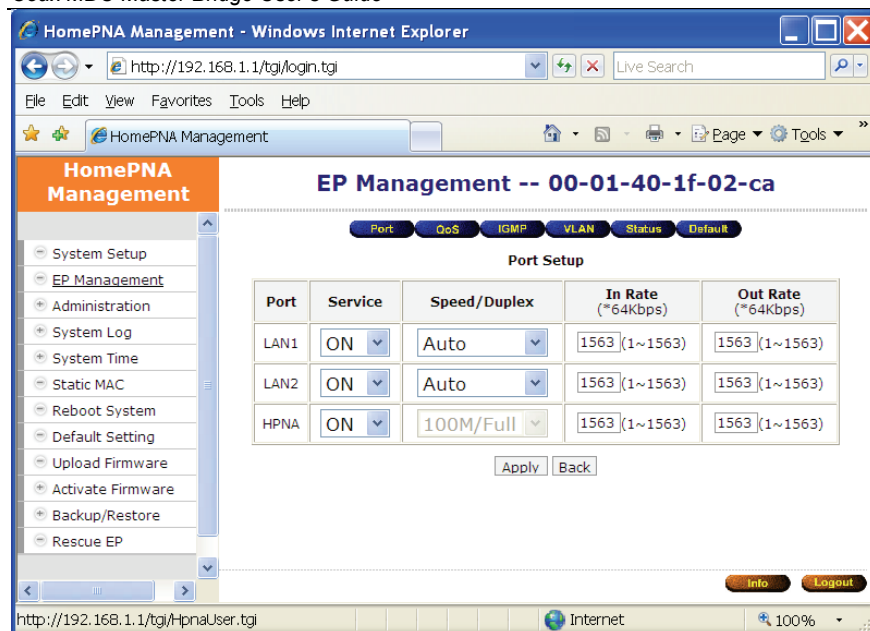
**1~1563:** \*64Kbps for the maximum upstream rate.

### Master/Smart EP Ethernet Properties (Ether)

The Ethernet properties of Master device and Smart EP device are configurable. For those EPs equipped with the fixed Ethernet properties are remarked as un-configurable EPs – usually based on 3010 chipset.

#### Port Setup

To configure built-in Ethernet switch port properties, include speed, flow control, and maximum In/Out rate (bandwidth control) of port LAN1/LAN2/HCNA.

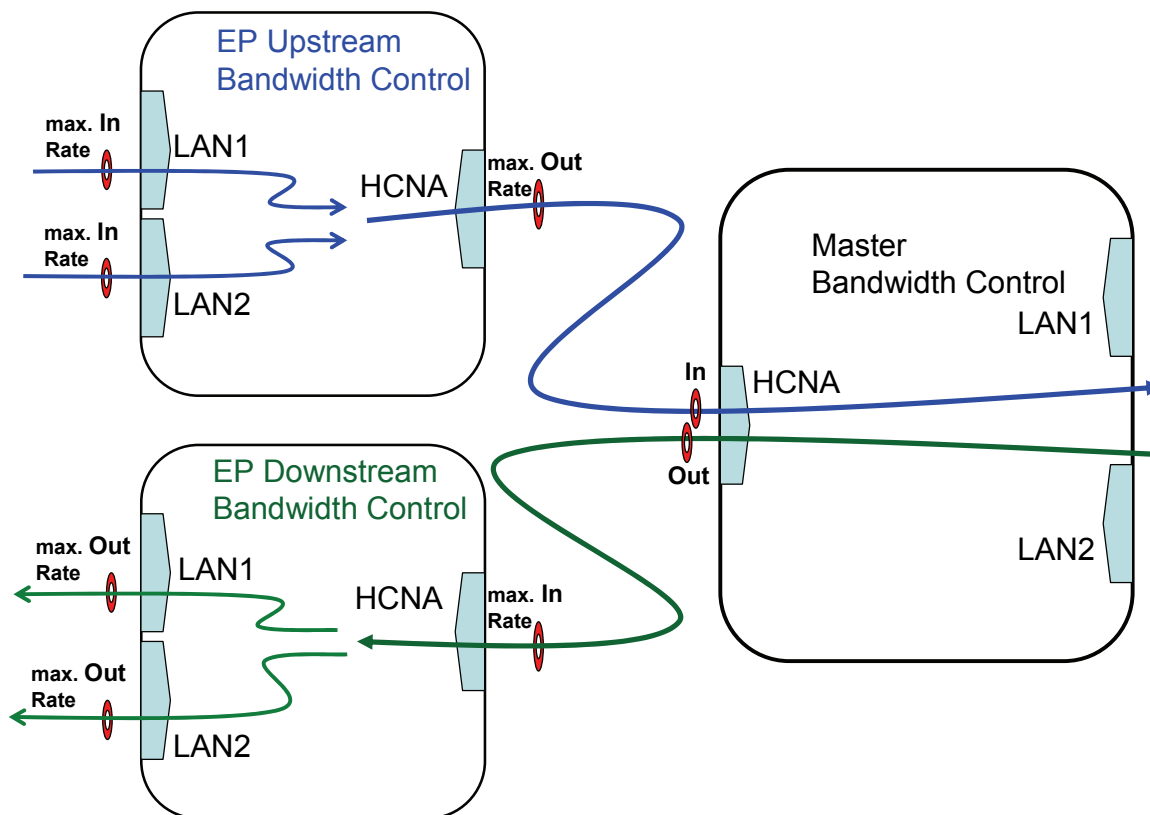


### Service and Speed/Duplex

Change 'Service' to enable or disable the port. This setting open or close the related Ethernet switch port in EP. Default setting in field 'Speed/Duplex' is 'Auto' states for auto-negotiation.

### Bandwidth Control

Consider port HCNA as the network backbone and refer the following diagram to set up bandwidth control parameters in EP's Ethernet switch (Regards as Hardware bandwidth control, works for both upstream and downstream). The maximum allowed rate should be the setting value multiplied by 64Kbps. If maximum rate exceeds 100Mbps (as the value 1563), there will be no bandwidth control at all.



### QoS Setup

Total 4 prioritized queues are provided for Ethernet packets, denoted as **Queue0** (lowest priority), **Queue1**, **Queue2** and **Queue3** (highest priority). You may assign the different packet dropping ratio and service weight for different queue. Refer Chapter “[ADVANCED FEATURES](#)” for more CEM-538M [QoS](#) mechanism details.

For example, according to the following setting diagram we classify TCP/UDP packet with port ‘1234’ or ‘80’ (decimal) as the highest priority packet goes to Queue3, port ‘23’ goes to Queue2 and port ‘161’ goes to Queue1. Queue3 will not discard any packet (Drop Ratio 0%), and packets in Queue3 is transmitted 4 times faster than packets in Queue0 according to their ‘**Service Weight**’. Packets in Queue0/Queue1/Queue2 will be discarded according to their ‘**Drop Ratio**’ in case of any congestion.

Queue	Service Weight	Drop Ratio
0 (Lowest)	1	75%
1	2 (1~15)	50%
2	3 (1~15)	25%
3	4 (1~15)	0%

Port	Queue
1234	Queue 3
80	Queue 3
23	Queue 2
161	Queue 1
0	Queue 0
0	Queue 0

### IGMP v2 Snooping Setup

Support IGMP V2/V1 snooping only. Shut it if IGMP V3 is adopted in the network.

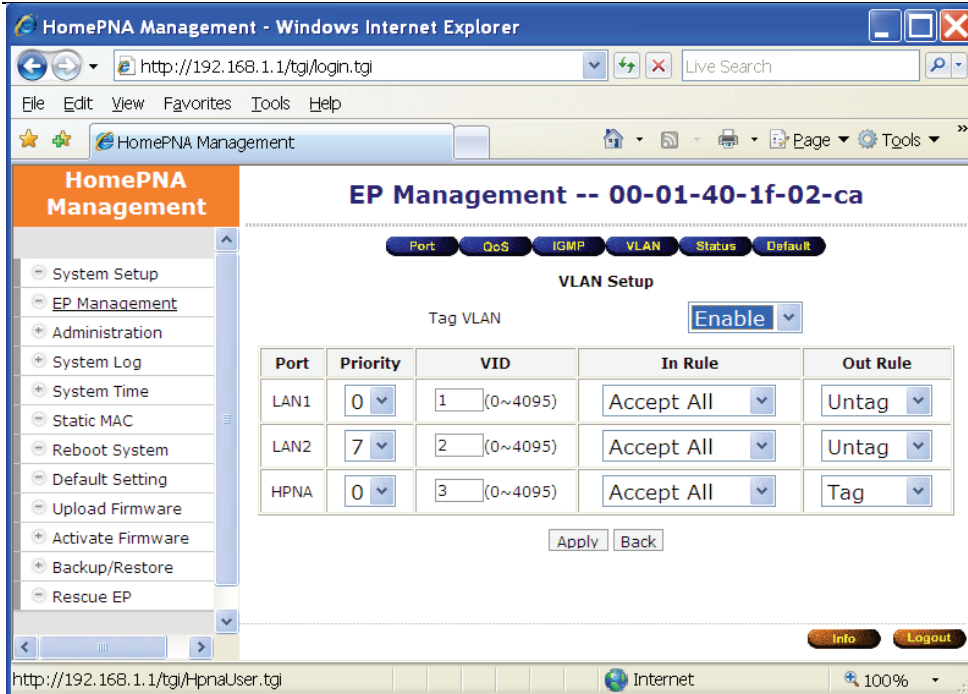
### Tag VLAN Setup

Enable the 802.1Q Tag VLAN function and set up the values in field ‘**VID**’ and ‘**Priority**’. VID range is 1~4095 and Priority is 0~7.

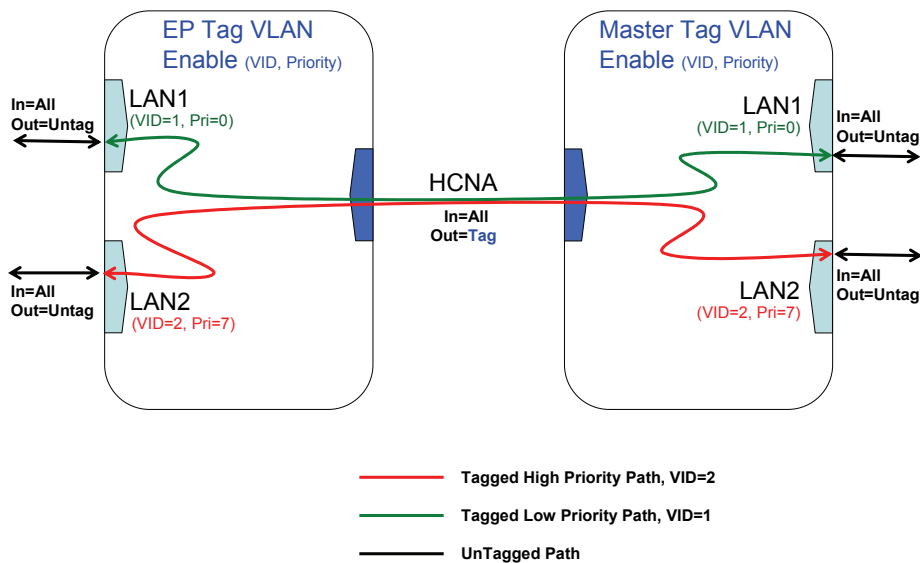
Regard port HCNA as the network trunk. Once Tag VLAN is enabled, by default port LAN1 and port HCNA are set to the same VLAN; also port LAN2 and port HCNA are within the same VLAN. Port LAN1 and port LAN2 are not within the same VLAN if assigned with different VID.

Take the following VLAN setting diagrams for example.

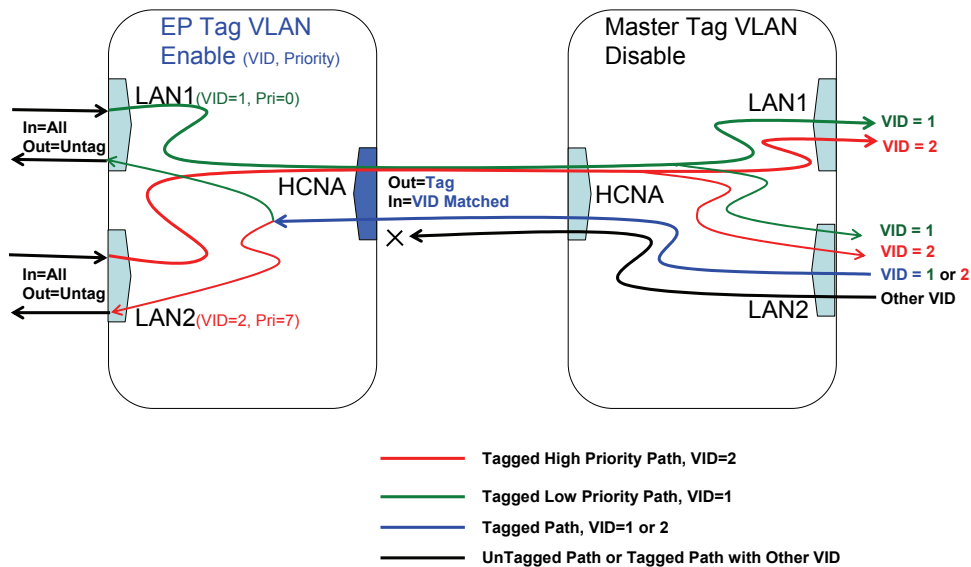
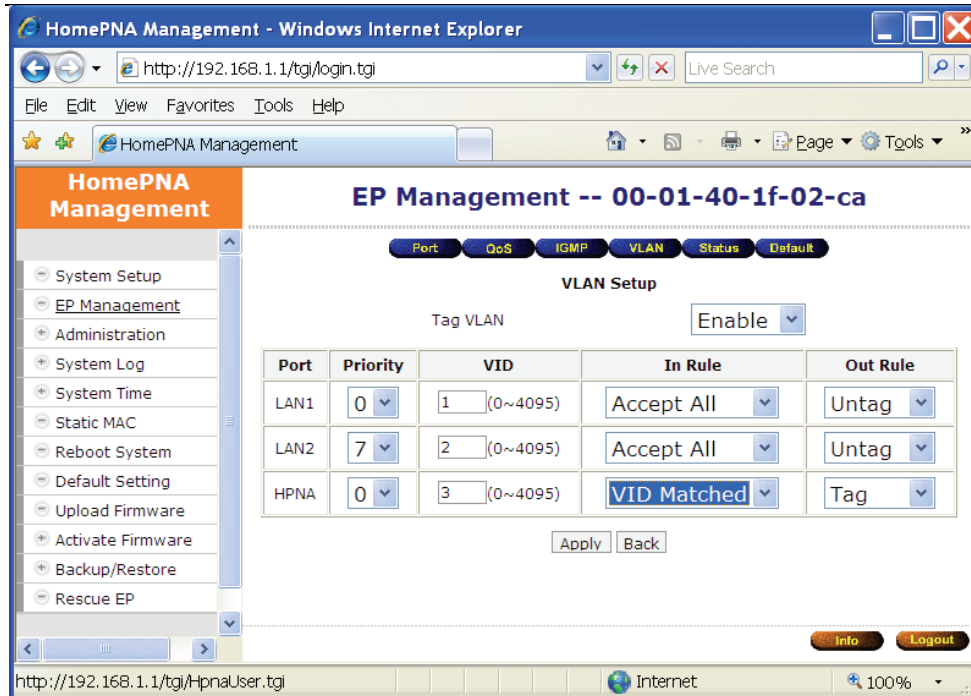
First example, just enable Tag VLAN in both Master and EP ‘**VLAN**’ settings,



The following diagram denotes the path for tagged packets according to the above settings,



Second example, enable Tag VLAN in EP only, and keep Master Tag VLAN disabled as default, accompanied the following packet path diagram.



### Status and Statistics

Show port LAN1/LAN2/HCNA Ethernet switch port link status and port statistics.

### Reset to Default

Works for EP only, to reset all Ethernet settings/configurations of EP to factory default, including 'Port Setup', 'QoS Setup', 'IGMP v2 Snooping Setup', and 'Tag VLAN Setup'.

### Delete the Obsolete EP Profile

For the off-line EP only, the light in **Link** field in gray, click on the 'Del' button will delete the EP profile.

### Diagnosis

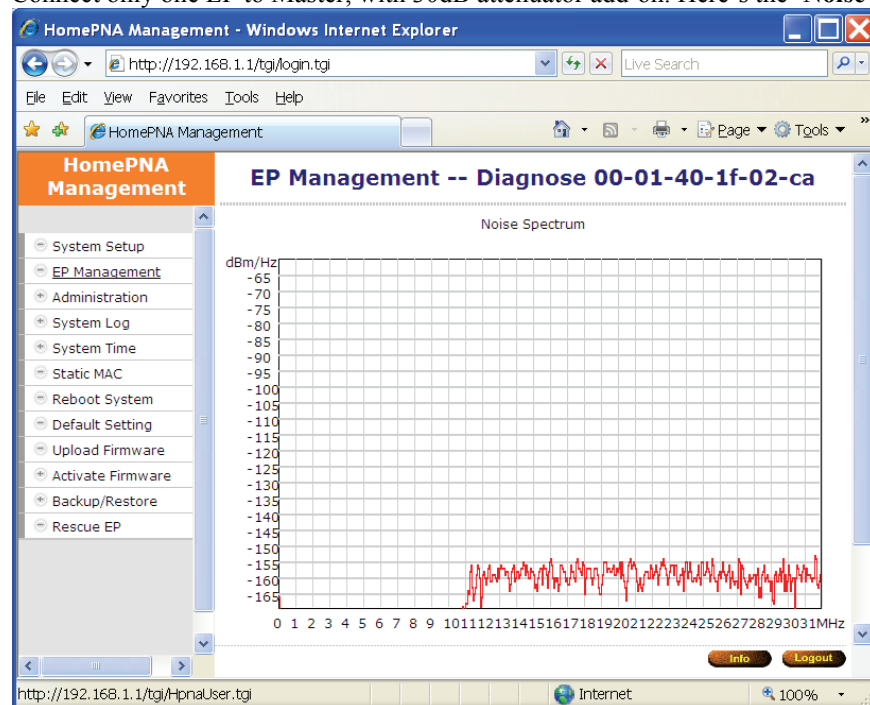
Click on 'Test' button to run the built-in diagnostic tools.

## Device Noise in Master and EP

'Noise Test' measures each individual device HCNA interface noise level (noise floor). For example, use a Master alone with 75Ω terminator, here shows the Master noise frequency spectrum diagram after test,



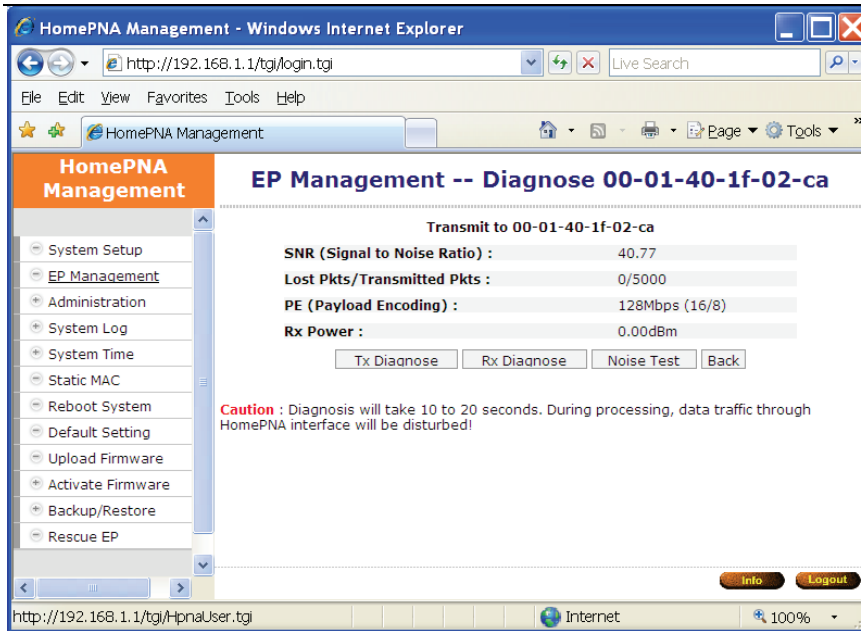
Connect only one EP to Master, with 30dB attenuator add-on. Here's the 'Noise Test' result of the connected EP,



## Physical Connection between Master and EP

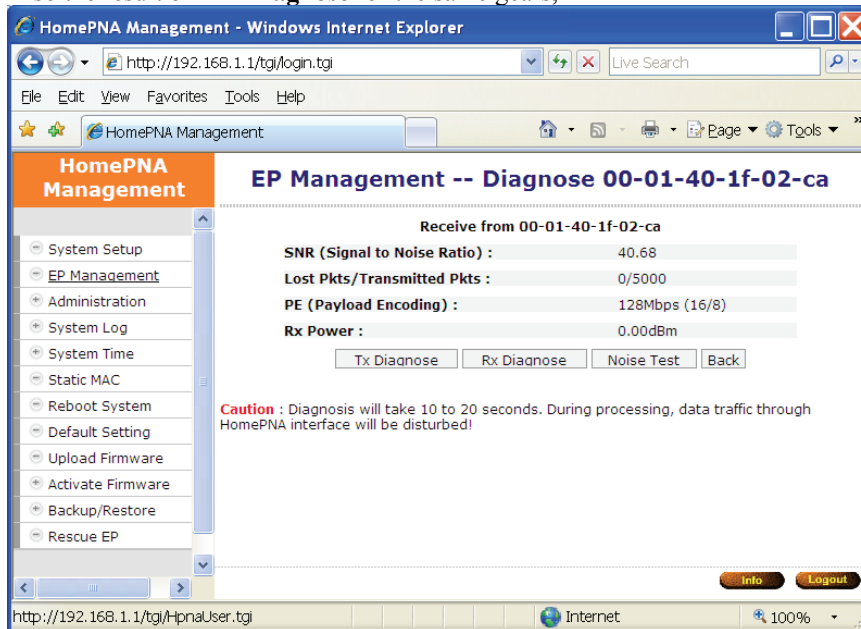
Connect only one EP to Master, with 30dB attenuator add-on. Here's the result by clicking on 'Tx Diagnose' button to perform a Cert test between CEM-538M and connected EP,





This diagnosis runs the downstream test from CEM-538M toward EP.

Also the result of 'Rx Diagnose' of the same gears,



This diagnosis runs the upstream test from EP to CEM-538M.

The shown factors 'SNR', 'Lost Pkts', 'PE' and 'RX Power' are obtained during communication diagnosis between the tested EP device and Master device.

**SNR:** Normally between 38dB~42dB.

**Lost Pkts:** Denominator is the total number of transmitted packets in one test run. Numerator is the number of lost packets in one test run.

**PE:** 112Mbps/128Mbps/144Mbps (best connection carrier speed, in bits per second) for normal connection. CEM-538M will adopt lower carrier speed automatically for connection path with high attenuation (lower SNR).

**Rx Power:** measured signal power

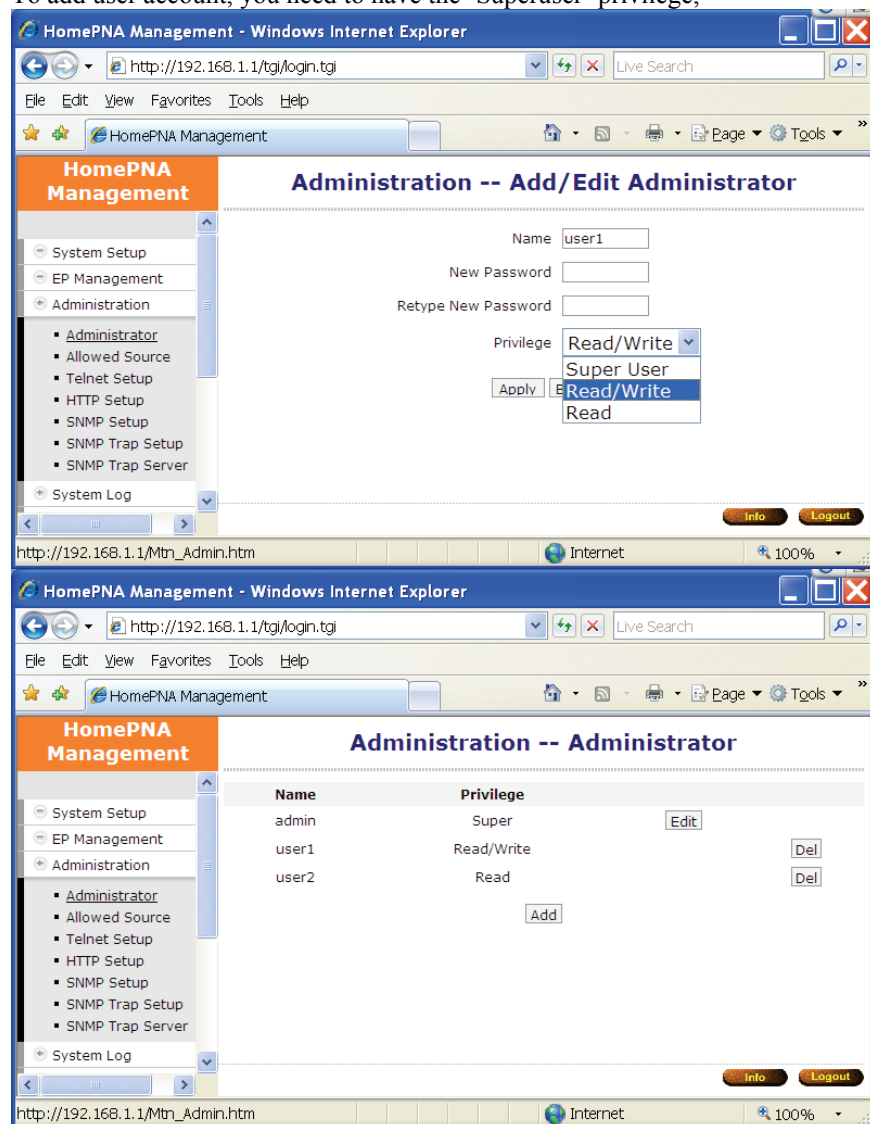
## Administration

The settings include the Administrator account, the allowable Host with specified source IP, and the protocols like HTTP/TELNET/ICMP/SNMP in CEM-538M management. Set up the criteria for management packets toward CEM-538M. Irrelevant for data packets pass through CEM-538M toward EP.

## Administrator

For each account, 3 level of privilege is provided: Superuser, Read, and ReadWrite. The unchangeable username 'admin' always have the 'Superuser' rights.

To add user account, you need to have the 'Superuser' privilege,



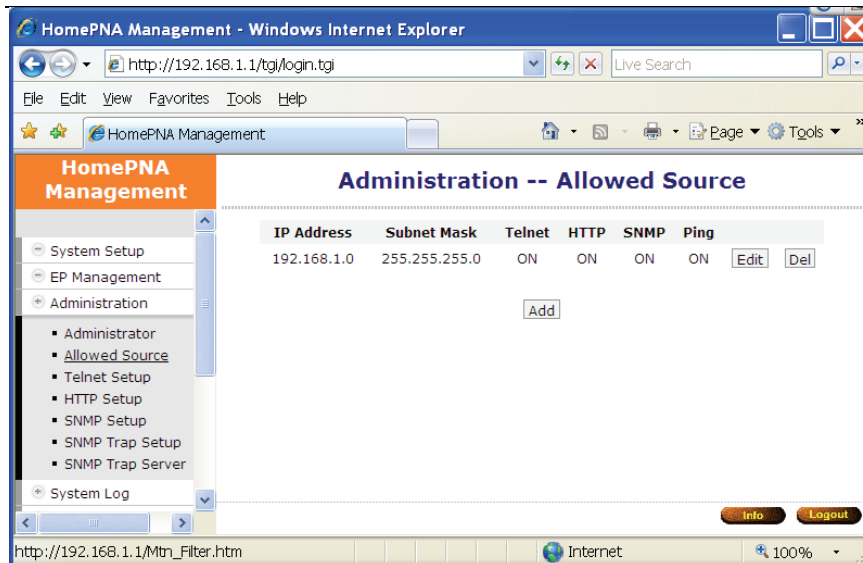
## Allowed Source

Factory default filter set for the 'IP address' is '0.0.0.0' and the 'Subnet Mask' is '0.0.0.0' in 'Allowed Source' setting. If the incoming packet fulfills the following criterion, CEM-538M will accept the management packet, else discard it.

$$(\text{Incoming Source IP Address} \& \text{Subnet Mask}) = (\text{IP Address} \& \text{Subnet Mask})$$

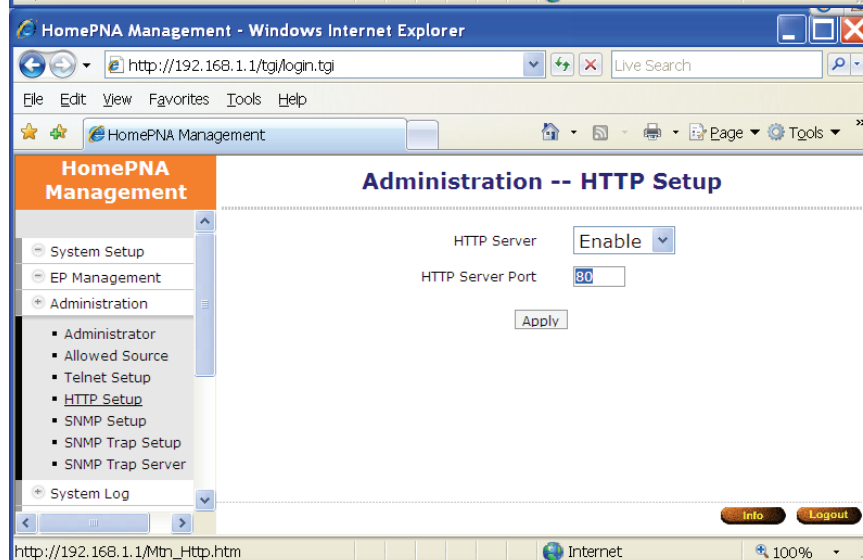
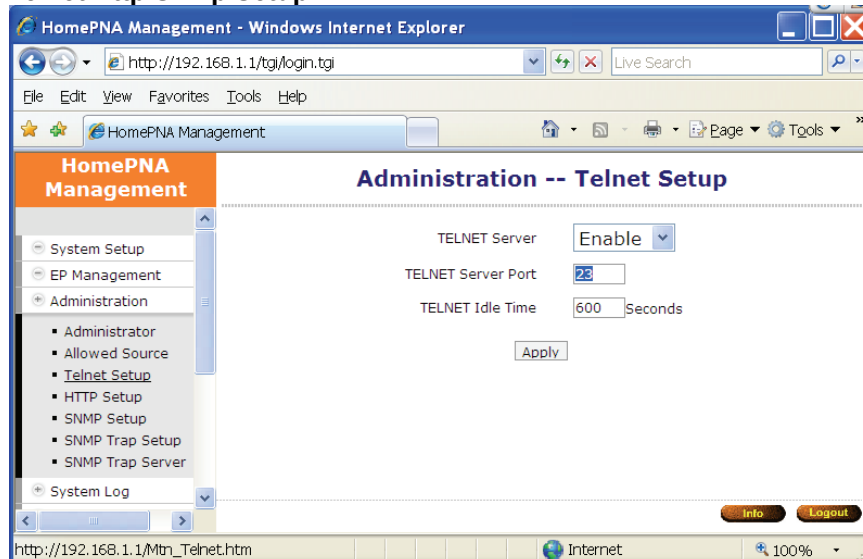
For the factory default setting, it will accept all incoming packets.

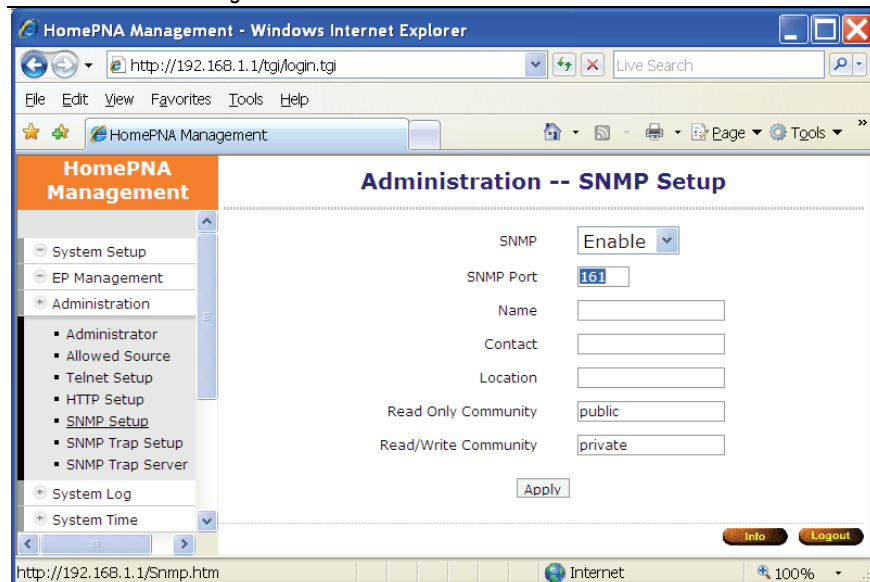
For example, the following filter set permits all Hosts with IP address '192.168.1.xxx' to access and configure CEM-538M,



For each programmed filter set, you can further specify if the protocol Telnet/Http/Snmp/Ping is enabled or not. Be careful not to block your current IP from accessing CEM-538M remotely; else you have to press the Reset Button locally and restart from factory default settings.

### Telnet/Http/Snmp Setup





Specify that if the built-in Telnet server, Web server, and Snmp agent is enabled or not and assign the port number for the service.

## System Log

By designating the **Syslog** server IP on CEM-538M, CEM-538M will emit Unix-like **Syslog** events toward each server. Please refer RFC-3164 for **Syslog** 'Severity', used to denote the log level – digit '0' to '7' for different severity level:

0: EMERGENCY – log only severe events

1: ALERT

2: CRITICAL

3: ERROR

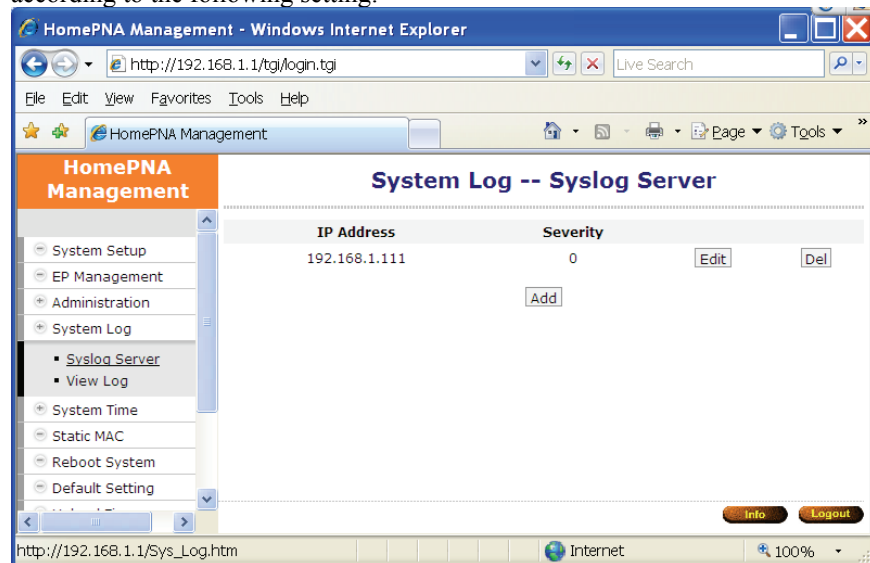
4: WARNING

5: NOTICE

6: INFO

7: DEBUG – log everything

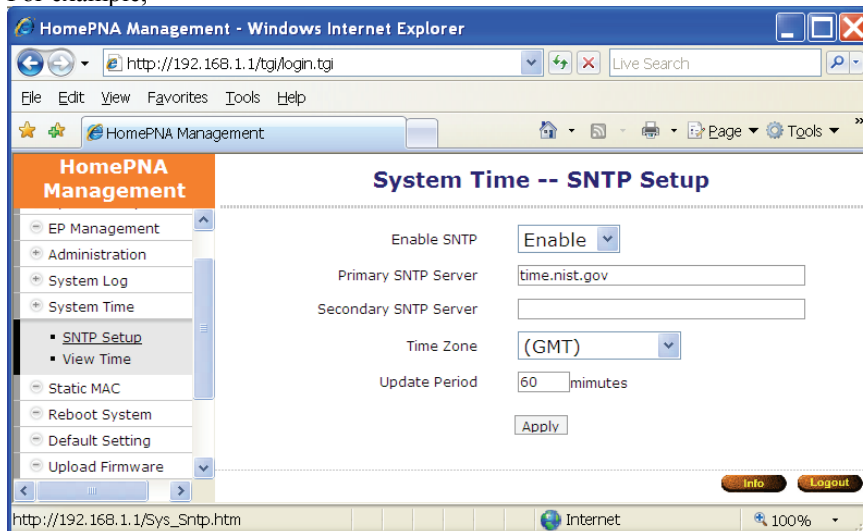
For example, CEM-538M will emit only 'EMERGENCY' event to Server with IP address '192.168.1.111' according to the following setting.



## System Time

In order to provide correct timestamp for **Syslog** event, CEM-538M supports SNTP protocol and you may assign the suitable SNTP servers to CEM-538M.

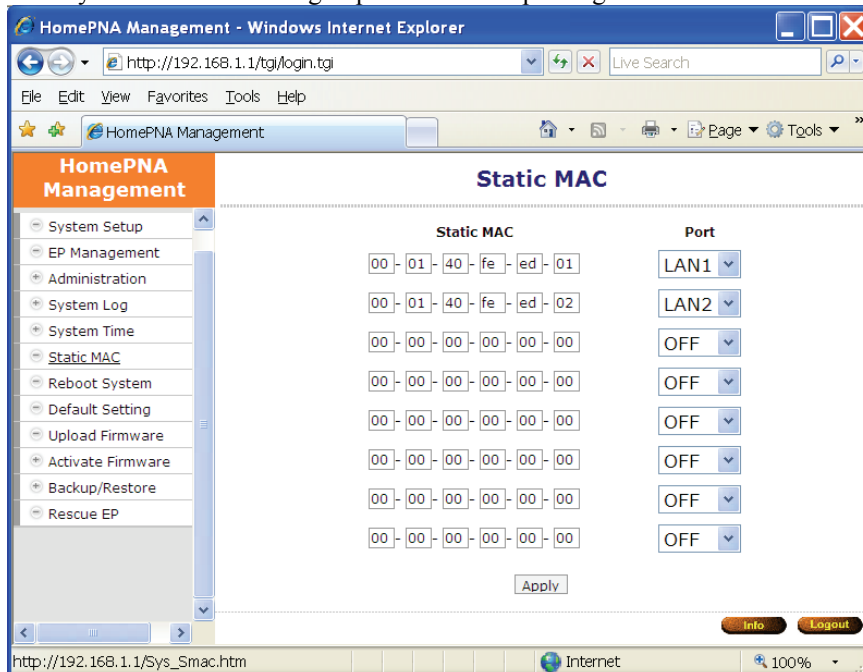
For example,



To access your listed SNTP server by its domain name instead of IP address, the 'DNS Server' and 'Default Gateway' in 'System Setup' window need to be set up correctly. In order for CEM-538M to access the SNTP server by its domain name.

## Static MAC

It may be necessary to bind and secure the server/gateway MAC addresses to port LAN1/LAN2 of CEM-538M for security. Static MAC is using to prevent MAC-spoofing-attack in Ethernet network. For example,



We bind MAC address 00-01-40-fe-ed-01 to port LAN1 and MAC address 00-01-40-fe-ed-02 to port LAN2,

## Reboot System

Reboot Master CEM-538M only. EP untainted.

## Default Setting

Restore all settings of CEM-538M to factory default, including username/password, IP address, privacy mode/key, etc. Press 'Reset' button locally for lasting 5 seconds works alike. CEM-538M will reboot afterward.

## Upload Firmware

Upload 'Bootcode' / 'System firmware' / 'Master driver (3110)' / 'EP driver (3010 or 3110)' / 'Diagnosis utility' onto CEM-538M 'Upload Area'. Not functional yet, wait to 'Activate Firmware' or to 'Upgrade' driver. Refer the following "[Example to Upload then Activate System Firmware and HCNA Driver](#)" for more details.

## Activate Firmware

To do the real upgrade for 'Bootcode' or 'System Firmware', make the previous uploaded image functional. Refer the following "[Example to Upload then Activate System Firmware and HCNA Driver](#)" for more details.

## Backup/Restore Configuration

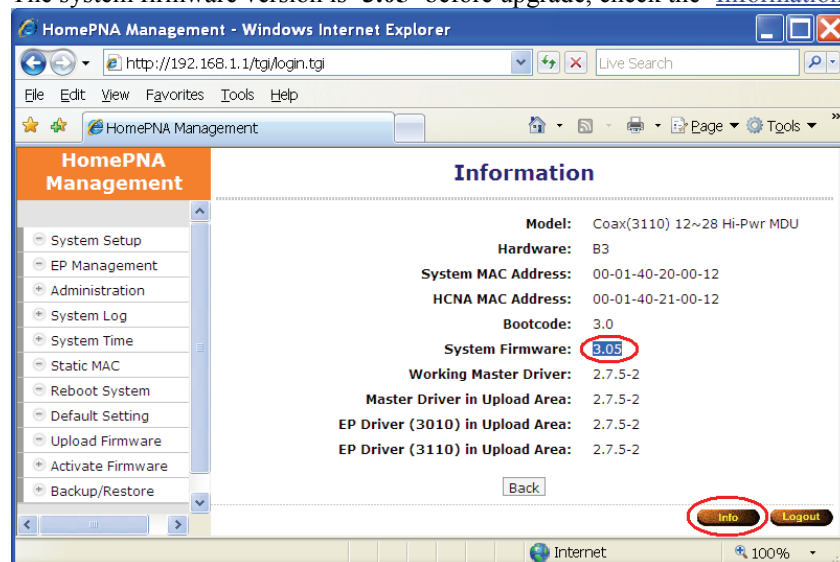
Use to backup current configuration into a file with filename extension '.shc'. Or to restore the CEM-538M configuration from the previous saved file.

## Example to Upload then Activate System Firmware and HCNA Driver

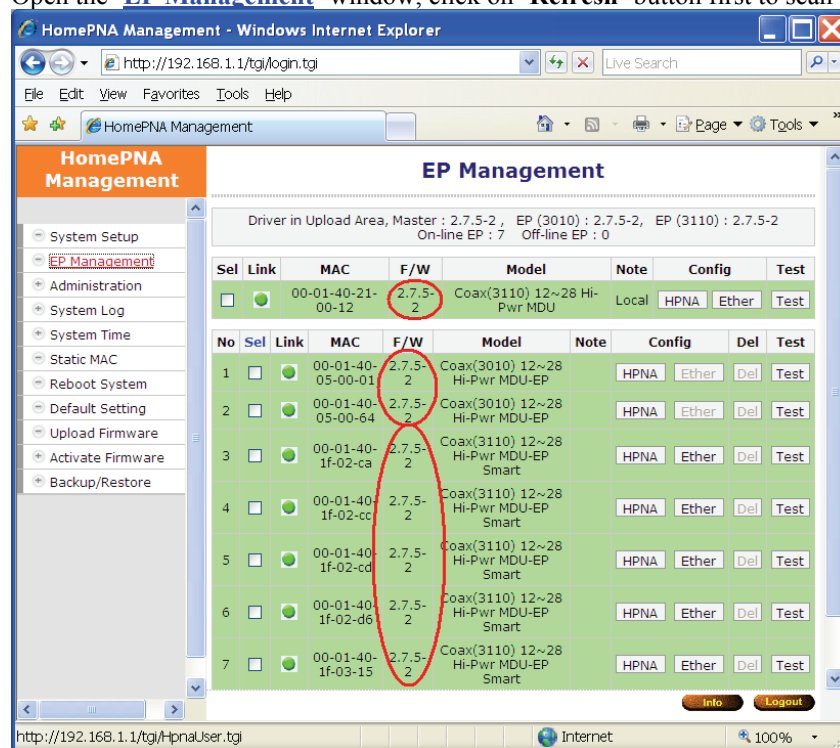
It is a 2-stage file upgrade procedure, first to upload the selected file onto CEM-538M flash ROM 'Upload Area', then to 'Activate' it. A coax network system with one CEM-538M and seven connected EPs—include two 3010 EPs and five 3110 Smart EPs, will be used as an example to demonstrate the upgrade details.

### Current System Firmware and HCNA Driver Version

The system firmware version is '3.05' before upgrade, check the 'Information' window,



Open the 'EP Management' window, click on 'Refresh' button first to scan all connected EPs,



In the example, the onboard Master (denoted 'Local') device driver version is '2.7.5-2'. The two 3010 EP's device driver version is '2.7.5-2', and the five 3110 Smart EP's driver version is also '2.7.5-2'. It is possible that these three type HCNA devices could be equipped with different driver versions and cooperate inside one working coax network.

### New System Firmware and HCNA Driver Files

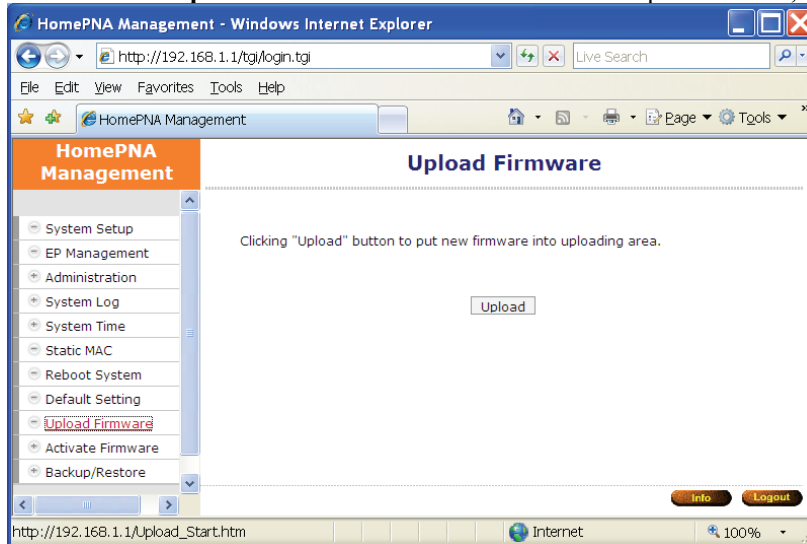
In this example, preparing the following binary files to upgrade the CEM-538M and the seven connected EPs,

- ◆ CEM538M\_Sysfw\_V3.06.bin → CEM-538M system firmware version '3.06'
- ◆ CEM538M\_Driver\_V2.7.5-3.bin → HCNA device driver version '2.7.5-3', include Master(Local) driver version '2.7.5-3', 3010 EP(as CET-338) driver version '2.7.5-3', and 3110 Smart EP(as CES-532D) driver version '2.7.5-3'

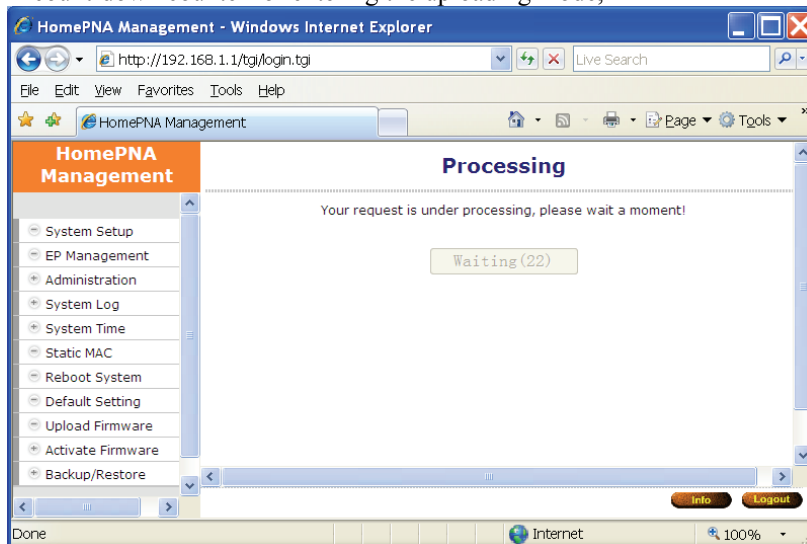
### System Firmware

#### Upload the New System Firmware

Start from the 'Upload Firmware' window and click on 'Upload' button,

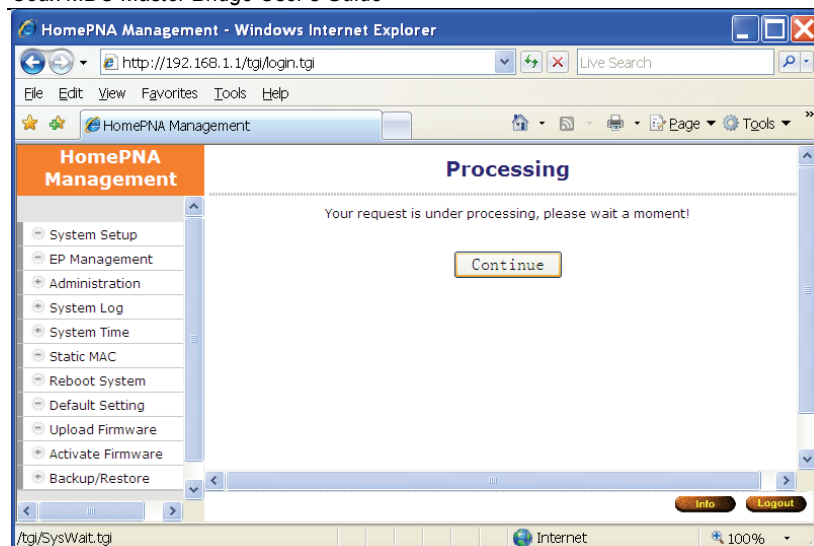


A count-down counter for entering the uploading mode,

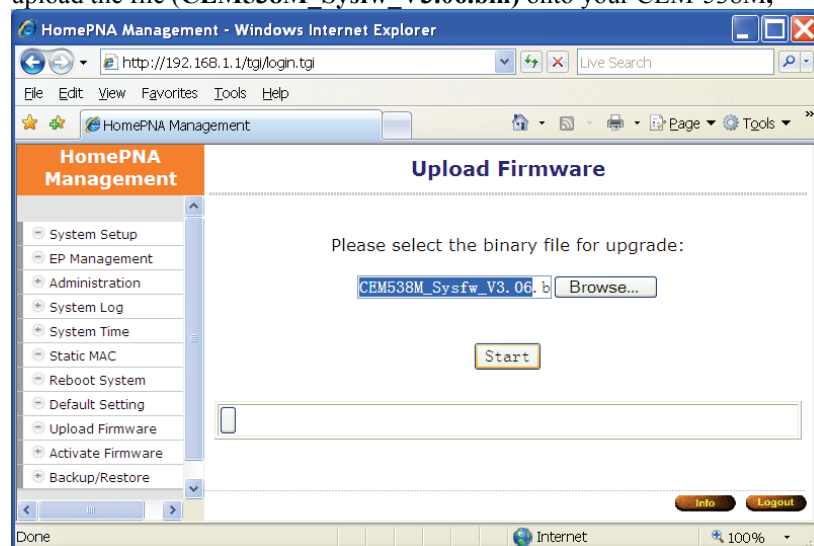


Click 'Continue' button to proceed,

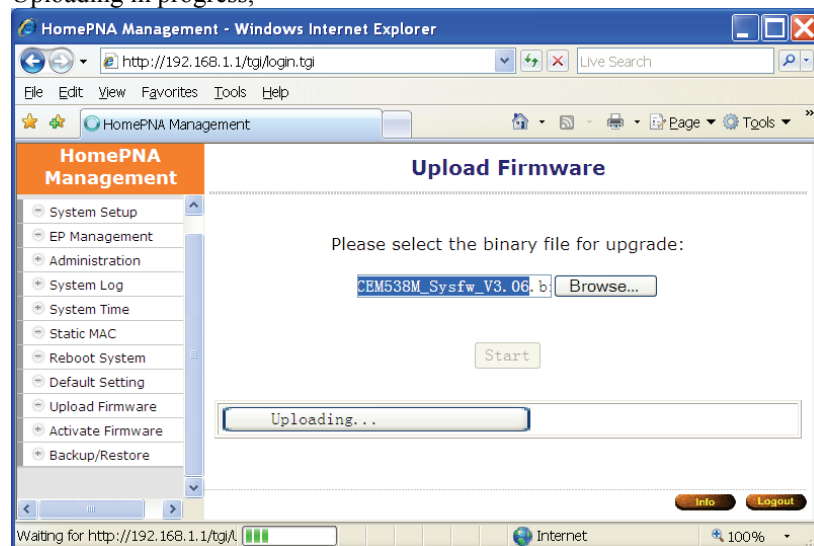




Click '**Browse**' button to locate where the new system firmware resides at your PC, then click '**Start**' button to upload the file (CEM538M\_Sysfw\_V3.06.bin) onto your CEM-538M,

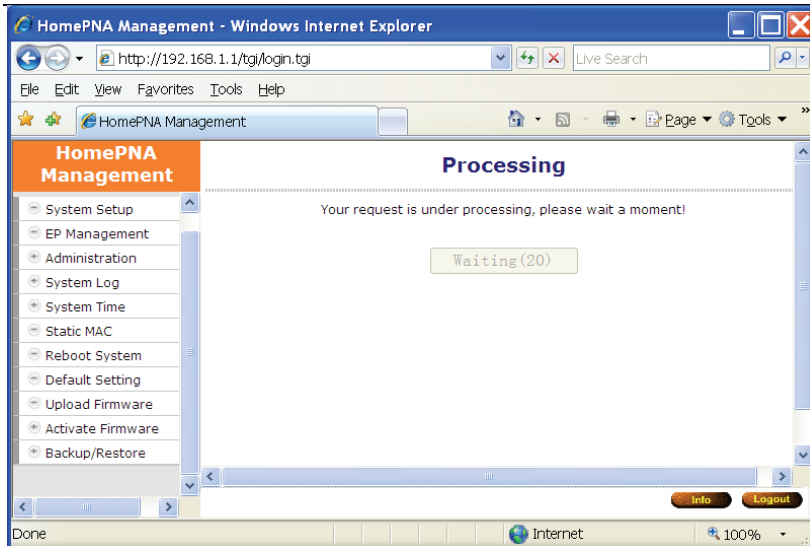


Uploading in progress,

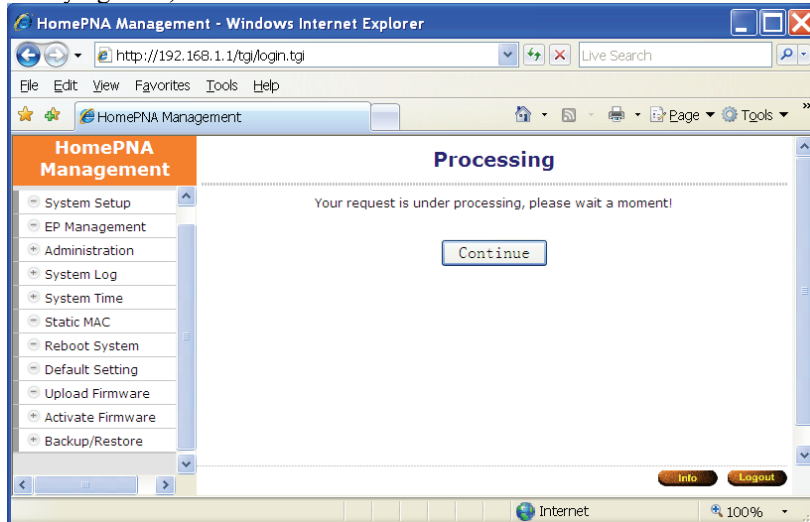


Another count-down counter to verify the integrity of uploaded file,

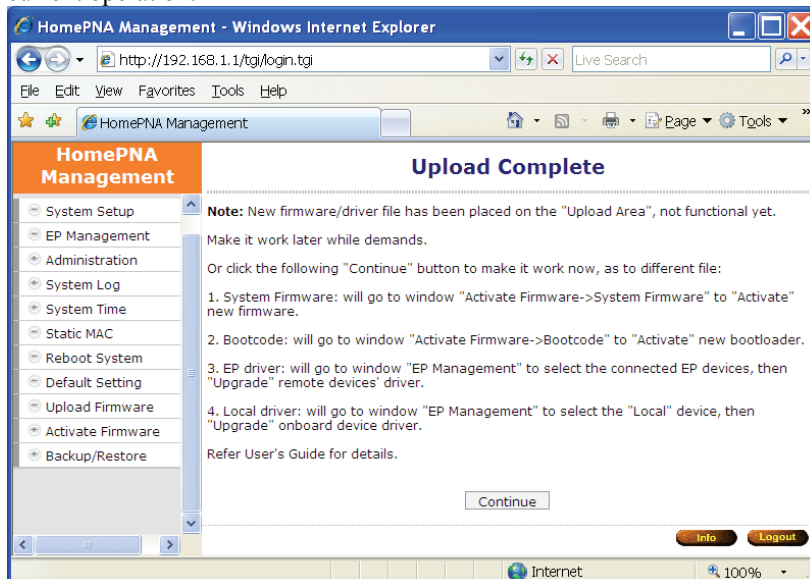




Verifying is ok, click 'Continue' button.

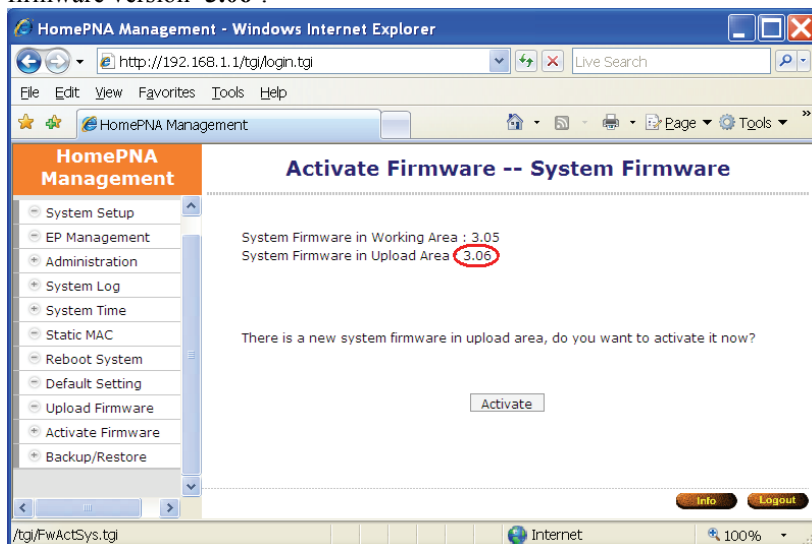


You may activate the new system firmware right away, or wait for the proper scheduled time in order not to disturb current operation.

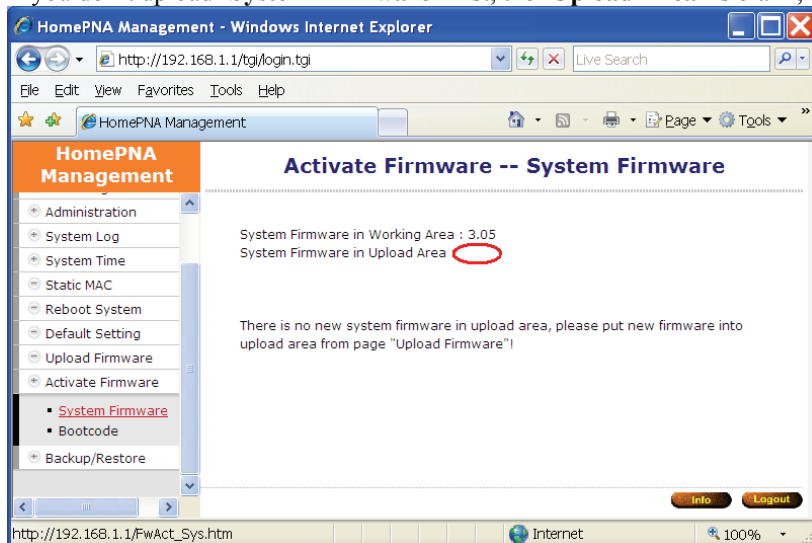


**Check the New System Firmware in 'Upload Area'**

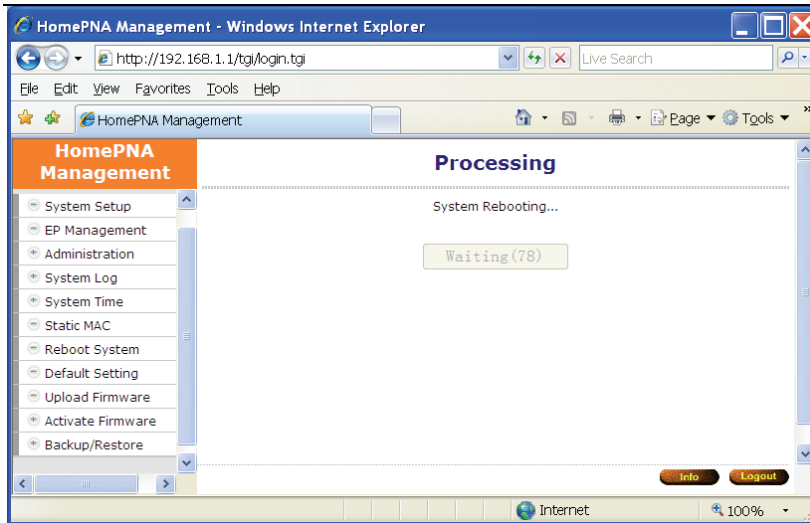
After the successful uploading, you may check the uploaded 'System Firmware' does exist in 'Upload Area'. By opening the 'System Firmware' window in the 'Activate Firmware' function item, here shows the new system firmware version '3.06'.



If you don't upload 'System Firmware' first, the 'Upload Area' is blank,

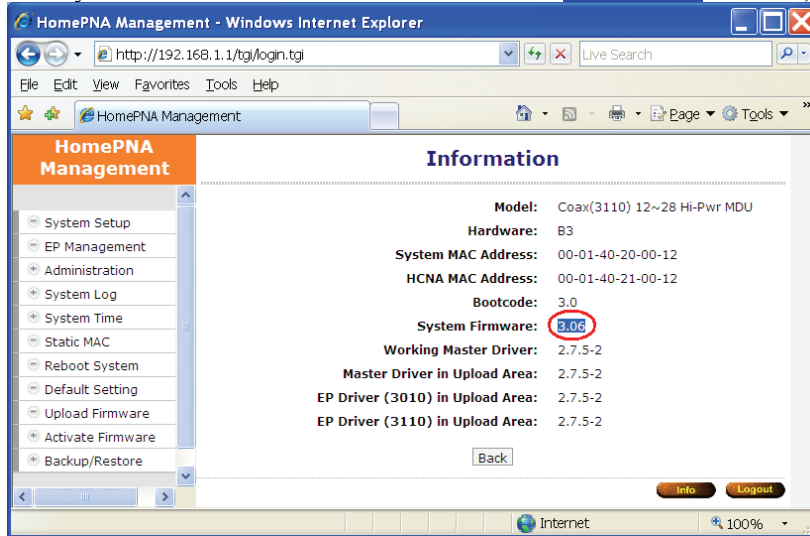
**Activate the New System Firmware**

Click 'Activate' button in the 'System Firmware' window will do the real upgrade and replace the old 'System Firmware' (OS),



A progress counter for upgrade CEM-538M system firmware, CEM-538M will reboot after upgrade has completed,

New system firmware version '3.06' shown on the 'Information' window,

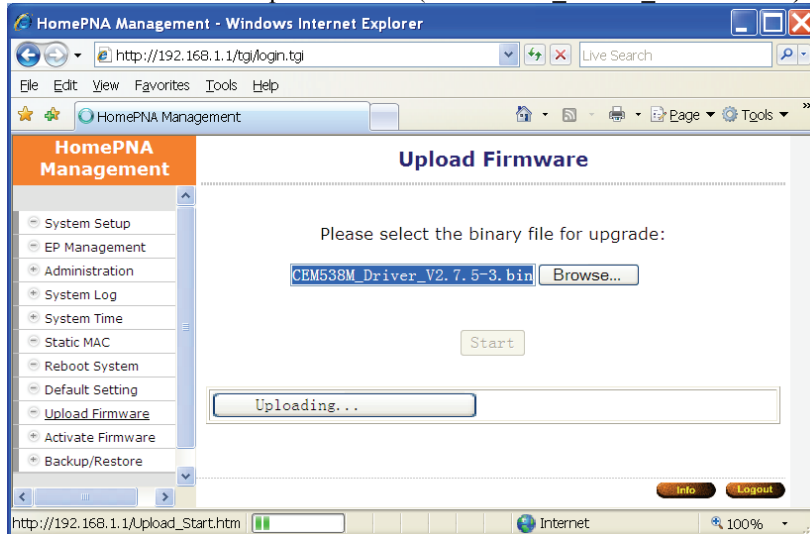


## HCNA Driver

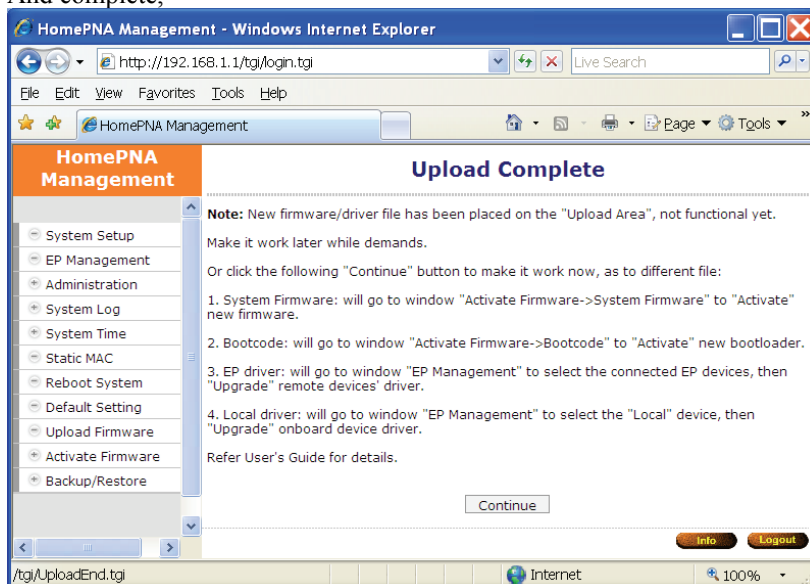
### Upload the New Master/EP HCNA Driver

Follow the similar procedures as to upload new system firmware, start from the 'Upload Firmware' window...

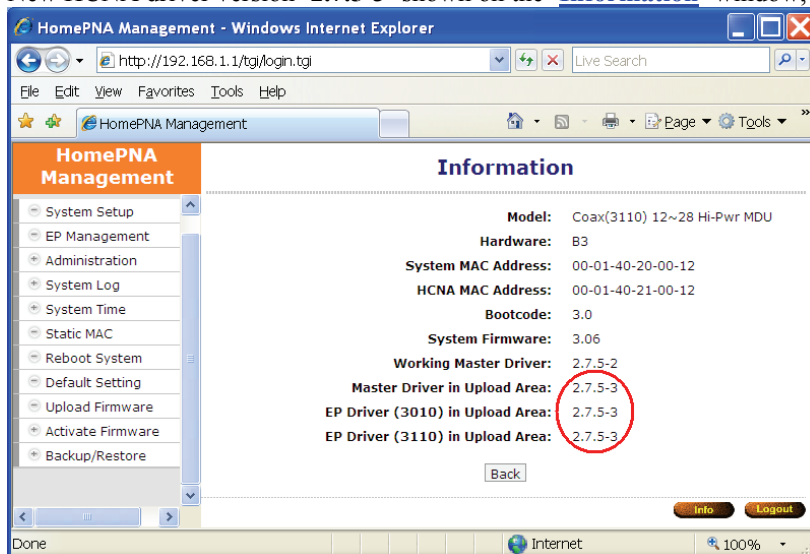
Click 'Start' button to upload the file (CEM538M\_Driver\_V2.7.5-3.bin) onto your CEM-538M,



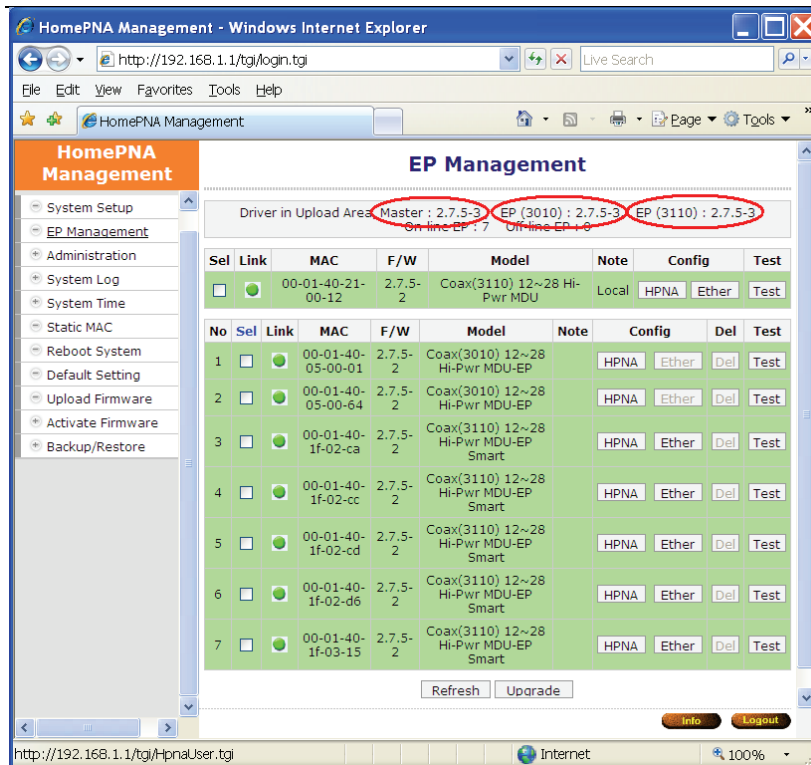
And complete,



New HCNA driver version '2.7.5-3' shown on the '[Information](#)' window,

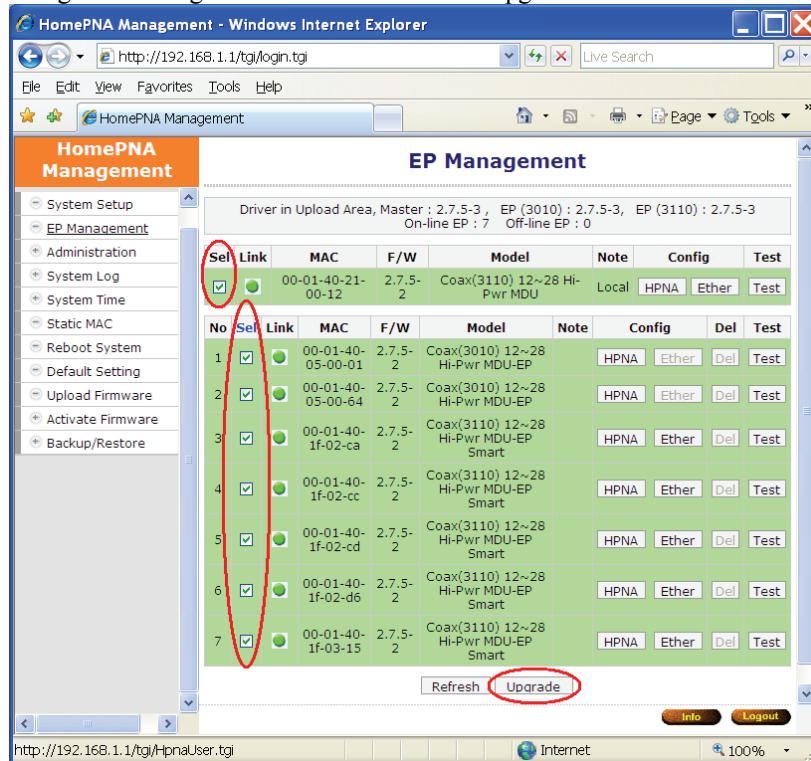


Also shown on '[EP Management](#)' window ('Upload Area'),

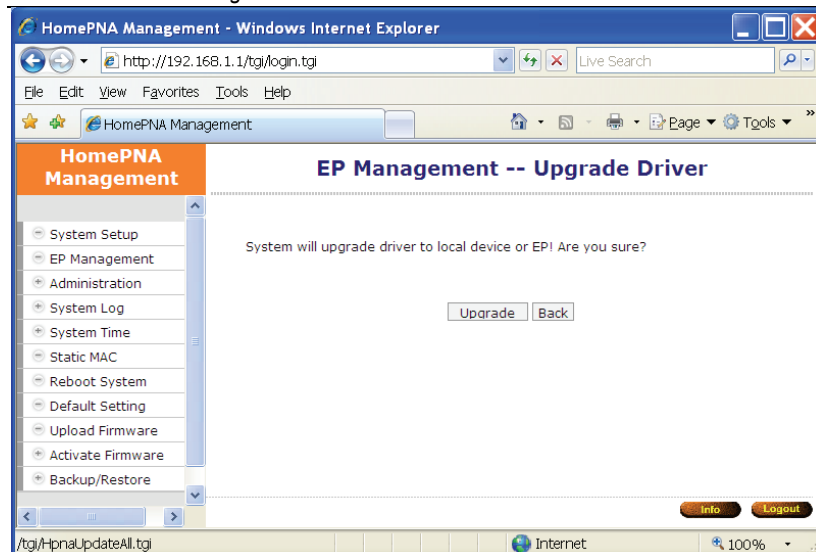


### Upgrade the New HCNA Driver

Designate the targeted Master/EPs for driver upgrade from version '2.7.5-2' to '2.7.5-3',

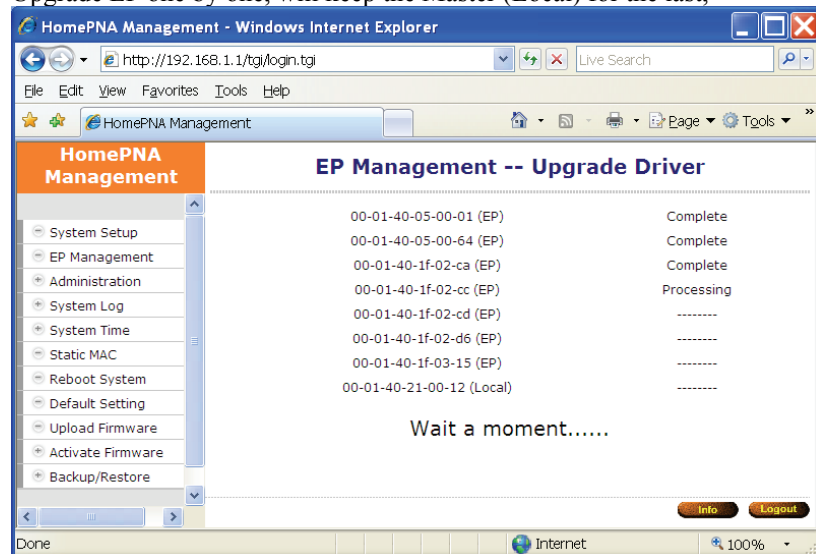


Click 'Upgrade' button to proceed,



Then 'Upgrade' button again to confirm,

Upgrade EP one by one, will keep the Master (Local) for the last,



#### Master/EP runs the New HCNA Driver

The 'EP Management' window that queries the properties from each HCNA device,

HomePNA Management - Windows Internet Explorer

http://192.168.1.1/tgi/login.tgi

HomePNA Management

### EP Management

Driver in Upload Area, Master : 2.7.5-3, EP (3010) : 2.7.5-3, EP (3110) : 2.7.5-3  
On-line EP : 7, Off-line EP : 0

Sel	Link	MAC	F/W	Model	Note	Config	Test
<input type="checkbox"/>		00-01-40-21-00-12	2.7.5-3	Coax(3110) 12~28 Hi-Pwr MDU	Local	HPNA	Ether Test

No	Sel	Link	MAC	F/W	Model	Note	Config	Del	Test
1	<input type="checkbox"/>		00-01-40-05-00-01	2.7.5-3	Coax(3010) 12~28 Hi-Pwr MDU-EP		HPNA	Ether	Del Test
2	<input type="checkbox"/>		00-01-40-05-00-64	2.7.5-3	Coax(3010) 12~28 Hi-Pwr MDU-EP		HPNA	Ether	Del Test
3	<input type="checkbox"/>		00-01-40-1f-02-ca	2.7.5-3	Coax(3110) 12~28 Hi-Pwr MDU-EP Smart		HPNA	Ether	Del Test
4	<input type="checkbox"/>		00-01-40-1f-02-cc	2.7.5-3	Coax(3110) 12~28 Hi-Pwr MDU-EP Smart		HPNA	Ether	Del Test
5	<input type="checkbox"/>		00-01-40-1f-02-cd	2.7.5-3	Coax(3110) 12~28 Hi-Pwr MDU-EP Smart		HPNA	Ether	Del Test
6	<input type="checkbox"/>		00-01-40-1f-02-d6	2.7.5-3	Coax(3110) 12~28 Hi-Pwr MDU-EP Smart		HPNA	Ether	Del Test
7	<input type="checkbox"/>		00-01-40-1f-03-15	2.7.5-3	Coax(3110) 12~28 Hi-Pwr MDU-EP Smart		HPNA	Ether	Del Test

Refresh Upgrade

http://192.168.1.1/tgi/HPnaUser.tgi

Indicate the new driver version '2.7.5-3' is working.

### System Firmware and HCNA Driver Version after Upgrade

As shown on the 'Information' window for summary.

HomePNA Management - Windows Internet Explorer

http://192.168.1.1/tgi/login.tgi

HomePNA Management

### Information

Model: Coax(3110) 12~28 Hi-Pwr MDU

Hardware: B3

System MAC Address: 00-01-40-20-00-12

HCNA MAC Address: 00-01-40-21-00-12

Bootcode: 3.0

System Firmware: 3.06

Working Master Driver: 2.7.5-3

Master Driver in Upload Area: 2.7.5-3

EP Driver (3010) in Upload Area: 2.7.5-3

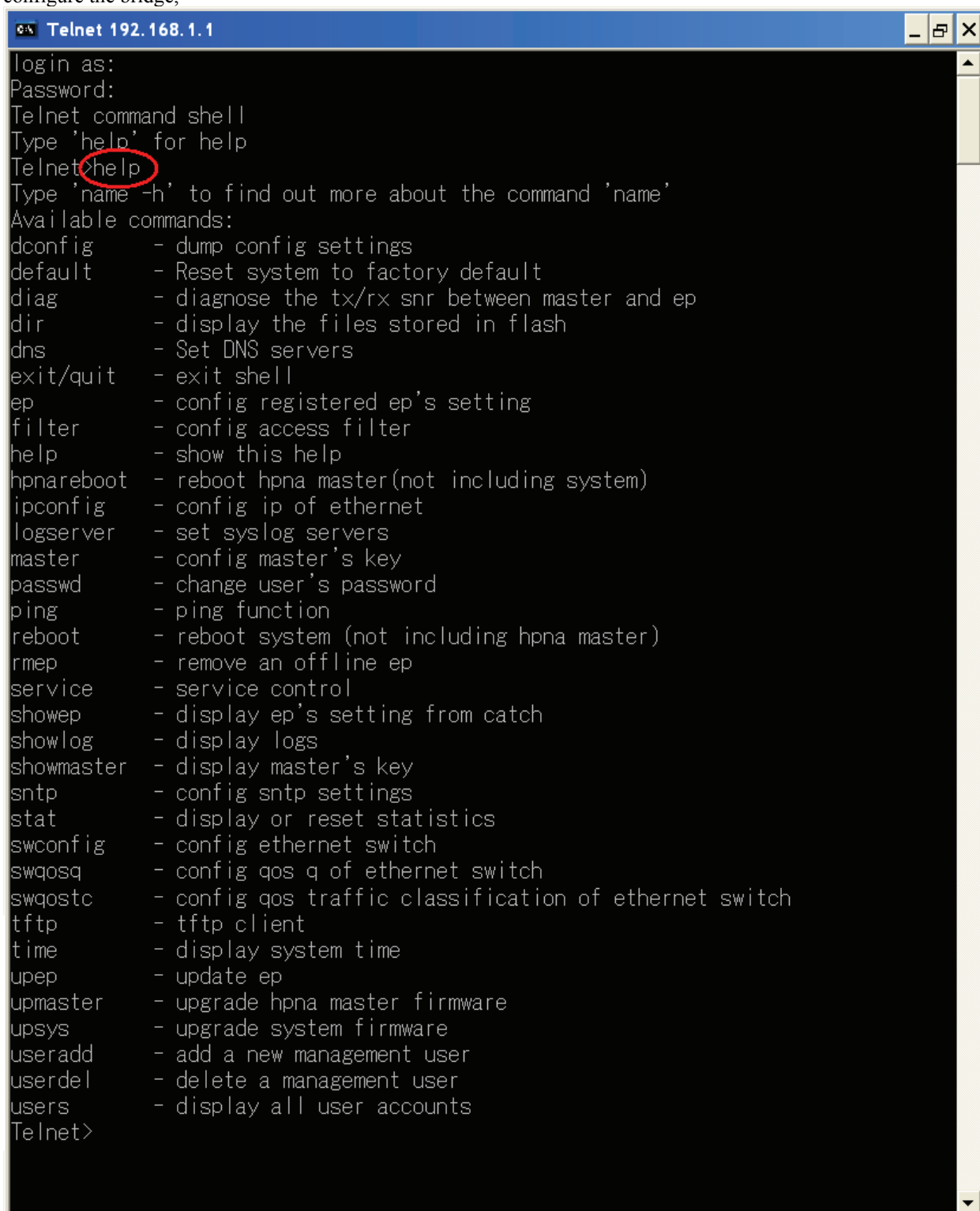
EP Driver (3110) in Upload Area: 2.7.5-3

Back

Info Logout

## Use Telnet

Any popular Telnet client could use to configure the bridge remotely. For example, run Windows built-in Telnet to configure the bridge,

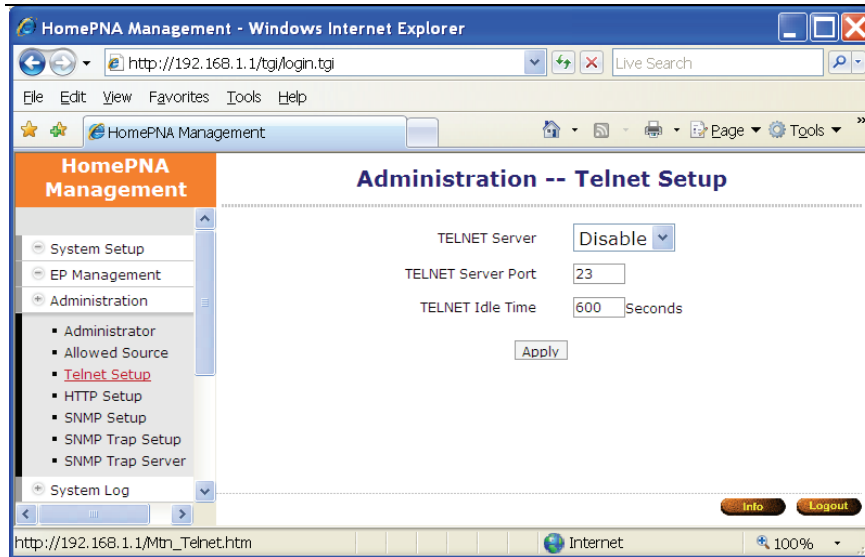


```
Telnet 192.168.1.1
login as:
Password:
Telnet command shell
Type 'help' for help
Telnet>help
Type 'name -h' to find out more about the command 'name'
Available commands:
dconfig      - dump config settings
default      - Reset system to factory default
diag         - diagnose the tx/rx snr between master and ep
dir          - display the files stored in flash
dns          - Set DNS servers
exit/quit    - exit shell
ep           - config registered ep's setting
filter       - config access filter
help         - show this help
hpnaareboot  - reboot hpna master(not including system)
ipconfig     - config ip of ethernet
logserver    - set syslog servers
master       - config master's key
passwd       - change user's password
ping         - ping function
reboot       - reboot system (not including hpna master)
rmep         - remove an offline ep
service      - service control
showep       - display ep's setting from catch
showlog      - display logs
showmaster   - display master's key
snmp         - config snmp settings
stat         - display or reset statistics
swconfig     - config ethernet switch
swqosq       - config qos q of ethernet switch
swqostc      - config qos traffic classification of ethernet switch
tftp         - tftp client
time         - display system time
upep         - update ep
upmaster     - upgrade hpna master firmware
upsys        - upgrade system firmware
useradd      - add a new management user
userdel      - delete a management user
users        - display all user accounts
Telnet>
```

Input any command with '-h' argument will show you the usage, as '**dconfig -h**' will explain the function and usage of command '**dconfig**'.

For security consideration, please disable the '**Telnet Server**' if the bridge is not to be configured via Telnet.





Note that Telnet connection will be terminated automatically if the telnet client doesn't input any command for 5 minutes; i.e. the console idle timer is 10 minutes (600 Sec).

## Command Sets for Telnet Console

The following table lists all commands for Telnet console. The third column '**Description**' explains what happen when you run the '**Commands**' in the first column and also explains the versatile options of the second column '**Arguments**'.

Some common formats for arguments are:

- <mac>** MAC address, format in '**nn-nn-nn-nn-nn-nn** where **nn=00~FF**'. As '00-01-40-13-03-36'.
- <ip>** IPv4 address, format in '**nnn.nnn.nnn.nnn** where **n=0~9**'. As '192.168.1.1'. Also applicable for **<mask>**, **<default gateway>**
- <interface>** Network interface name, '**eth0**' for LAN1/LAN2 interface, '**hpna0**' for HCNA interface.
- <fid>** Flash ROM file id represented different firmware/driver, '**n** where **n=0~12**',
  - 'n=0': System bootcode (bootloader)
  - 'n=1': System firmware (OS)
  - 'n=2': Master HCNA driver (3110)
  - 'n=3': 3010 EP HCNA driver
  - 'n=5': 3110 EP HCNA driver
  - 'n=10': 3010 EP diagnosis utility
  - 'n=11': 3110 EP diagnosis utility

Only lowercase letter can be accepted. Typing commands followed by pressing 'ENTER' will execute the command. Run any command with '**-h**' argument will show you the usage

Commands	Arguments [ ] is optional	Description
<b>dconfig</b>		Dump all configurations/settings.
<b>default</b>		Reset all settings to factory default, except Password.
<b>diag</b>	-t <mac> -r <mac>	On-line EP connection diagnosis. -t: downstream SNR diagnosis(from Master to EP) -r: upstream SNR diagnosis(from EP to Master) <mac>: EP MAC <mac> to be diagnosed

<b>dir</b>		Show detail file information resides in flash ROM. Include 'Working Area' and 'Upload Area', refer <a href="#">Figure 4</a> . The listed filenames are, 'bootcode': boot loader 'sysfw4m': system firmware 'G1C28H21M': Master HCNA driver 'G0C28H20Ep': 3010 EP HCNA driver 'G1C28H21Ep': 3110 EP HCNA driver 'diagsw': 3010 diagnosis utility file 'diagsw1': 3110 diagnosis utility file Accompanying with file id, file version, file date, and file size.
<b>dns</b>	<code>[-s &lt;pri/sec&gt; &lt;ip&gt;]</code>	Display or set up DNS server setting. -s <a href="#">pri</a> <ip>: set up Primary DNS server's IP -s <a href="#">sec</a> <ip>: set up Secondary DNS server's IP
<b>exit</b>		Close the Telnet console.
<b>quit</b>		Close the Telnet console.
<b>ep</b>	<code>[-c &lt;hostcnt&gt;] [-n &lt;note&gt;] [-u &lt;uprate index&gt;] &lt;mac&gt;</code>	Set up the EP <a href="#">Properties Profile</a> related setting values. <hostcnt>: EP <a href="#">Host Limit</a> setting value (0~255), default <b>255</b> <note>: EP <a href="#">Note</a> setting value <uprate index>: EP <a href="#">Upstream Rate</a> setting value ( 0~1563, *64Kbps), default <b>0</b> for unlimited <mac>: designated EP MAC to configure
<b>ephpnareboot (Smart EP)</b>	<code>-m &lt;mac&gt;</code>	Reset remote Smart EP device
<b>epstat (Smart EP)</b>	<code>-m &lt;mac&gt; [-r]</code>	Display remote Smart EP port statistics for port LAN1/LAN2/HCNA. -r: reset all port statistics counter to 0
<b>epswc (Smart EP)</b>	<code>-m &lt;mac&gt; [-t] [-u] [-r] [-d] [-p &lt;lan1/lan2/hpna&gt; [-l &lt;up/down&gt;] [-s &lt;auto /10h /10f /100h /100f&gt;] [-f &lt;on/off&gt;]]</code>	Display or set up remote Smart EP built-in switch Ethernet properties -t: display EP switch settings -u: display EP switch/port status -r: reset EP switch -d: reset EP switch's eeprom settings to factory default -p: configure EP port LAN1/LAN2/HCNA -l: link, <up/down>: force current port to link up or down, i.e. enable/disable current port -s: current port Ethernet mode setting, <auto>: auto-negotiation mode <10h/10f/100h/100f>: 10/100Mbps, half/full-duplex mode -f: current port Ethernet flow-control setting, <on/off>: turn on /off flow control
<b>epswigmp epswqosq epswqosrate epswqostc epswtagvlan (Smart EP)</b>	<code>-m &lt;mac&gt;</code>	Refer <a href="#">swigmp</a> , <a href="#">swqosq</a> , <a href="#">swqosrate</a> , <a href="#">swqostc</a> , <a href="#">swtagvlan</a> for the same functionality, but operate on remote Smart EP with designated MAC address <mac>
<b>filter</b>	<code>[-s &lt;set&gt; [-c &lt;act/deact&gt;] [-a &lt;ip&gt; -m &lt;mask&gt;] [-t &lt;allow/deny&gt;] [-w &lt;allow/deny&gt;] [-n &lt;allow/deny&gt;] [-p &lt;allow/deny&gt;]]</code>	Display or set up the filter rule set, refer the section " <a href="#">Allow Source</a> " for IP <ip> and Subnet Mask setup <mask>. <set>: filter set index, total 16 set (0~15) <act/deact>: activate or de-activate the rule set <allow/deny>: allow or deny the protocol -t: telnet -w: http/web -n: snmp -p: reply to ICMP ping
<b>help</b>		Display all commands with brief description

<b>hpnareboot</b>		Reset Master HCNA device'
<b>ipconfig</b>	<code>[-a &lt;ip&gt; -m &lt;mask&gt; -g &lt;default gateway&gt;]</code>	Display or set up system IP network, include IP address <code>&lt;ip&gt;</code> , subnet mask <code>&lt;mask&gt;</code> , and default gateway <code>&lt;default gateway&gt;</code> .
<b>logserver</b>	<code>[ -s &lt;set&gt; [ -c &lt;act/deact&gt;] [ -a &lt;ip&gt; -v &lt;severity&gt; ] ]</code>	Display or set up Unix-like <b>Syslog</b> servers(max 5 set) <code>&lt;set&gt;</code> : server index, at most 5 servers (0~4) <code>&lt;act/deact&gt;</code> : activate or de-activate the server with IP address <code>&lt;ip&gt;</code> <code>&lt;severity&gt;</code> : select the severity level, refer section " <a href="#">System Log</a> ", default level <a href="#">6 (info)</a>
<b>master</b>	<code>-k &lt;on/off/key(0x...)&gt;</code>	Set up Master HCNA device <a href="#">Privacy Mode</a> setting values. Use command ' <a href="#">upmaster</a> ' to take effect on Master device. (replace the working values with the setting ones) Use command ' <a href="#">upeg</a> ' to upgrade EP with the new 'Privacy Mode/Key'. <code>&lt;on/off&gt;</code> : set 'Privacy Mode' to ON or OFF, default <b>OFF</b> <code>&lt;key(0xnnnn)&gt;</code> , n is 0~F: 4-digit 'Privacy Key' in hexadecimal, default <b>0x0</b>
<b>passwd</b>	<code>[name] -o &lt;oldpasswd&gt; -n &lt;newpasswd&gt;</code>	Change user's password, user can update its own password. Only superuser has the privilege to rewrite other's password, <code>[name]</code> : user's account name, default to current login name if not supplied <code>&lt;oldpasswd&gt;</code> : old password, superuser can bypass this parameter <code>&lt;newpasswd&gt;</code> : new password
<b>ping</b>	<code>[ -n &lt;count&gt;] [ -w &lt;timeout&gt;] [ -l &lt;pktlen&gt;] address</code>	ICMP ping function, <code>&lt;count&gt;</code> : number of ping requests(max 65535) <code>&lt;timeout&gt;</code> : expiry timer in each reply(1~60 sec) <code>&lt;pktlen&gt;</code> : sent packet length(64~1500) address: target IP address
<b>reboot</b>		Reboot system
<b>rmep</b>	<code>&lt;mac&gt;</code>	Remove designated EP <a href="#">Properties Profile</a> . <code>&lt;mac&gt;</code> : EP MAC <code>&lt;mac&gt;</code> to be removed
<b>service</b>	<code>[ -s &lt;telnet/http&gt; [ -c &lt;on/off&gt;] [ -p &lt;port&gt;] [ -t &lt;idle&gt; ] ]</code>	Display or set up Telnet and Http service. <code>&lt;telnet/http&gt;</code> : configure Telnet or Http <code>&lt;on/off&gt;</code> : enable or disable this service <code>&lt;port&gt;</code> : TCP port number (0~65535) <code>&lt;idle&gt;</code> : expiry timer to logoff automatically (0~32767 sec) default <b>300</b> seconds
<b>showep</b>	<code>[ -f] [ -n &lt;note&gt;] [ -m &lt;mac&gt;]</code>	Display EP connection status and properties, and check if it matches the stored <a href="#">Properties Profile</a> in CEM-538M. -f: force to re-scan all connected EPs -n: display EP with matched <code>&lt;note&gt;</code> -m: display EP with MAC address <code>&lt;mac&gt;</code>
<b>showlog</b>		Display the (Syslog) logged messages.
<b>showmaster</b>		Display Master HCNA information, include driver version, properties(Privacy Mode, Privacy Key)
<b>snmp</b>	<code>[ -c &lt;act/deact&gt; [ -p &lt;port&gt;] [ -n &lt;name&gt;] [ -t &lt;contact&gt;] [ -l &lt;location&gt;] [ -r &lt;rcomm&gt;] [ -w &lt;wcomm&gt;]</code>	Display or set up basic SNMP system configuration. <code>&lt;act/deact&gt;</code> : activate(enable) or de-activate(disable) SNMP agent <code>&lt;port&gt;</code> : SNMP UDP port number (0~65535), default <b>161</b> <code>&lt;name&gt;</code> : SNMP system name <code>&lt;contact&gt;</code> : SNMP system contact information <code>&lt;location&gt;</code> : SNMP system location information <code>&lt;rcomm&gt;</code> : SNMP system read-only community name, default 'public' <code>&lt;wcomm&gt;</code> : SNMP system read-write community name, default 'private'

<b>snmptrapserver</b>	[-s <set> [-c <act/deact>] [-p <port>] [-a <ip>] [-m <community>] ]	Display or set up SNMP trap server(s) configuration. <set>: trap server index, at most 5 servers (0~4) <act/deact>: activate or de-activate trap server IP <ip> <port>: SNMP trap UDP port number (0~65535), default 162 <ip>: trap server IP address <community>: trap server community name, default 'public'
<b>snmptrapsetup</b>	[-l <on/off>] [-u <on/off>] [-s <on/off>] [-d <on/off>]	Enable or disable specified trap type, <on/off>: turn on or turn off this trap type, default is on -l: logon/logoff trap -u: upload/upgrade firmware/driver trap -s: EP on-line status changed trap -d: EP diagnosis trap
<b>sntp</b>	[-c <act/deact>] [-r <refresh time>] [-z <time zone>] [-s <set> -a address]	Display or set up SNTP configuration for <a href="#">System Time</a> . <act/deact>: activate or de-activate SNTP service for system time <refresh time>: query SNTP server period, default 60 minutes <time zone>: '+hh:mm' or '-hh:mm' to GMT time, hh for hours and mm for minutes, default '+00:00' <set>: 2 registered SNTP server set(0~1) address: SNTP server host name or IP address in current set
<b>stat</b>	[-r]	Display port statistics for port LAN1/LAN2/HCNA. -r: reset all port statistics counter to 0
<b>swconfig</b>	[-p <lan1/lan2> [-s <auto /10h /10f /100h /100f>] ]	Display or set up Ethernet port LAN1/LAN2 properties <lan1/lan2>: configure LAN1 or LAN2 port <auto>: auto-negotiation mode <10h/10f/100h/100f>: 10/100Mbps, half/full-duplex mode
<b>swigmp</b>	[-c <on/off>] [-t <QueryInterval (4~510, even number)>]]	Display or set up IGMP v2 snooping configuration <on/off>: enable or disable built-in IGMP v2 snooping function, default is off <Query Interval>: expiry timer to age learned Multicast MAC if no IGMP query frame received from the router, default is 248 seconds (range from 4 to 510 in even)
<b>swqos</b>	[-q <queue> [-w <weight>] [-d <discard mode>]]	Display or set up the QoS configuration, include priority queue, service weight and discard ratio while congestion, refer <a href="#">Priority</a> for more. <queue>: select queue index (0~3) to configure, as q0(lowest priority)/q1/q2/q3(highest priority) <weight>: assign the queue with service weight(1~15), default 1 for q0, 2 for q1, 3 for q2 and 4 for q3 <discard mode>: choose the discard mode(0~3) for queue utilization, default 0 for 0%. 1 for 25%, 2 for 50% and 3 for 75%. refer <a href="#">Priority</a> for more.
<b>swqosrate</b>	[-p <lan1/lan2> [-d <tx/rx>] [-c <on/off>] [-r <N (1~1563 rate=N*64kbps)>] ]	Display or set up the LAN1/LAN2 maximum rate. refer <a href="#">Bandwidth Control</a> for more. <lan1/lan2>: configure LAN1 or LAN2 port <tx/rx>: direction, incoming(rx) or outgoing(tx) <on/off>: enable or disable control on this direction <N>: the setup max rate (multiply value by 64kbps). Range from 0 to 1563, bandwidth control is invalid if N >= 1563
<b>swqostc</b>	[-s <set> [-c <act/deact>] [-p <port> -q <queue>] ]	Display or set up the QoS configuration for TCP/UDP traffic classification, to assign higher priority for total 8 different TCP/UDP protocols <set>: rule set index, at most 8 set (0~7) <act/deact>: activate or de-activate this set <port>: TCP/UDP port number (0~65535), <queue>: select queue index (0~3) for this rule set, as q0(lowest priority)/q1/q2/q3(highest priority)
<b>swsmac</b>	[-m <mac>]	Display or set up the static MAC entry, total 8 entries of MAC

	<code>[-c &lt;lan1/lan2/off/del&gt;]</code>	addresses can be setup, refer <a href="#">Static MAC</a> <code>&lt;mac&gt;</code> : max 8 entries <code>&lt;lan1/lan2&gt;</code> : bind the current MAC entry to LAN1 or LAN2 port, i.e. enable this MAC entry as static MAC <code>&lt;off&gt;</code> : disable this MAC entry, neither bind to LAN1 nor LAN2 <code>&lt;del&gt;</code> : remove the current MAC entry, invalid this MAC entry to default 00-00-00-00-00-00
<b>swtagvlan</b>	<code>[-c &lt;on/off&gt;]</code> <code>[-p &lt;lan1/lan2/hpna&gt;]</code> <code>[-r &lt;priority(0~7)&gt;]</code> <code>[-v &lt;vid(0~4095)&gt;]</code> <code>[-i &lt;all/tag&gt;]</code> <code>[-o &lt;untag/tag/bypass &gt;]]</code>	Display or set up the LAN1/LAN2/HCNA Tag VLAN. refer <a href="#">Tag VLAN Setup</a> for more. <code>&lt;lan1/lan2/hpna&gt;</code> : configure LAN1 or LAN2 or HCNA port <code>&lt;priority&gt;</code> : 802.1p value, 0~7 <code>&lt;vid&gt;</code> : 802.1Q VID, 0~4096 <code>&lt;all/tag&gt;</code> : ingress rule -- accept all incoming packets or accept incoming tagged packets only, reject other incoming packets. <code>&lt;untag/tag/bypass&gt;</code> : egress rule: un-tag or tag or bypass the outgoing packet -c: enable Tag VLAN mode or not -p: the port in Tag VLAN mode -r: 802.1p in Tag VLAN mode -v: VID of 802.1Q in Tag VLAN mode -l: ingress rule for the port in Tag VLAN mode -o: egress rule for the port in Tag VLAN mode
<b>tftp</b>	<code>-s &lt;ip&gt;</code> <code>-c &lt;get/put&gt;</code> <code>-f &lt;file&gt;</code>	Run TFTP client to get file (upload file onto CEM-538M) or to put file (retrieve file from CEM-538M) from TFTP server IP <code>&lt;ip&gt;</code> . <code>&lt;get/put&gt;</code> : run TFTP command 'get' or 'put' <code>&lt;file&gt;</code> : filename
<b>time</b>		Display current System Time.
<b>updep</b>	<code>[-a]</code> <code>[-m &lt;mac&gt;]</code> <code>[-n &lt;note&gt;]</code>	Upgrade EP HCNA driver (stored in Upload Area), this operation also synchronize EP with EP <a href="#">Properties Profile</a> stored in CEM-538M, -a: upgrade all on-line EP at once -m: upgrade the EP with matched MAC <code>&lt;mac&gt;</code> -n: upgrade (matched MAC <code>&lt;mac&gt;</code> ) EP 'Note' property <code>&lt;note&gt;</code>
<b>upmaster</b>		Upgrade Master HCNA driver (stored in Upload Area), this operation also synchronize Master HCNA device with its setting values in <a href="#">Properties Profile</a> .
<b>upsys</b>		Upgrade the uploaded system firmware (stored in Upload Area), then reboot.
<b>useradd</b>	<code>name</code> <code>-p &lt;password&gt;</code> <code>-r &lt;ro/rw&gt;</code>	Create new management user account. name: user name -p: login password -r: 'ro' for user has read-only privilege, 'rw' for user has read-write privilege
<b>userdel</b>	<code>name</code>	Delete the management user account by name. name: user name
<b>users</b>		Display all user accounts.

## Use SNMP

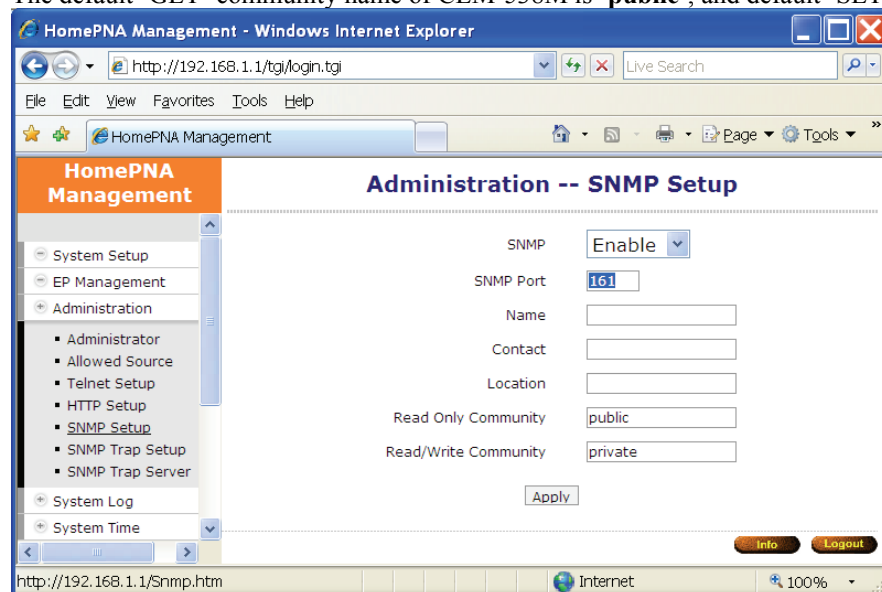
The **SNMP Agent** resides in CEM-538M will handle requests from remote **SNMP Manager**. The CEM-538M SNMP agent supports standard SNMP community-based operations (SNMP V1/V2c) as 'SET', 'GET' and 'TRAP'.

You need to specify the correct **Read-Only Community Name** into bridge before any SNMP 'GET' operation can work. Also set up the **Read/Write Community Name** for SNMP 'SET' operation. 'SET' operation can modify the setting within CEM-538M. While 'Get' is read-only operation used to report the requested SNMP data to SNMP manager.

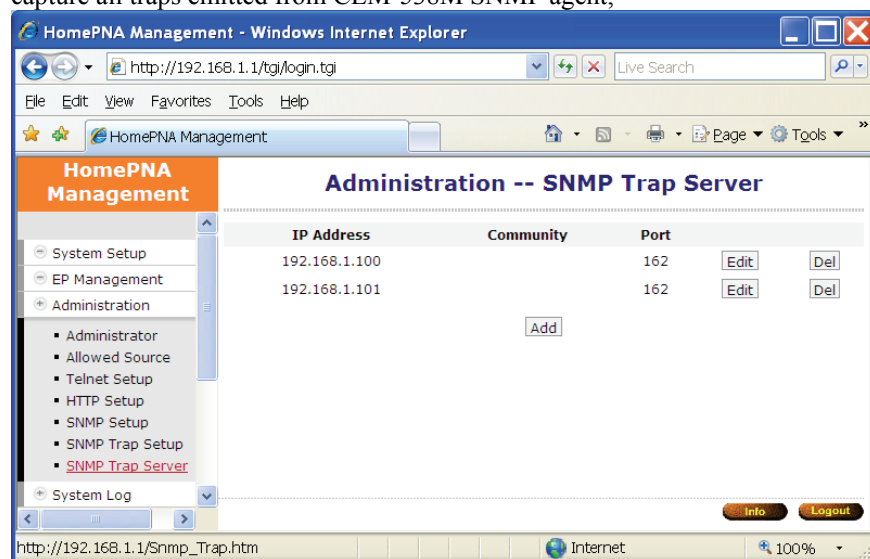
You may need the accompanying proprietary **MIB file** for some popular SNMP/MIB manager software to manage the bridge system. The CEM-538M bridge system may also be integrated into your original SNMP management system by this MIB file.

Each SNMP manager will assign the name of the community it belongs to in its 'GET', 'SET' and 'TRAP' operations. The community name could be unique to allow set of SNMP managers to access one SNMP agent, any operation with mismatched community name will be rejected by agent. For security consideration, you should either change the factory default community name or disable SNMP function in CEM-538M.

The default 'GET' community name of CEM-538M is '**public**', and default 'SET' community name is '**private**'.



For the following example, the two '**TRAP Server**' with IP address '**192.168.1.100**' and '**192.168.1.101**' will capture all traps emitted from CEM-538M SNMP agent,





## ADVANCED FEATURES

This chapter describes the advanced features offered by your bridge.

### QoS

Quality of Service is enforced by assigning each incoming packet with a predefined priority value. Packet with higher priority should be processed as soon as possible (fast in, fast out). In shortage of buffers, some low priority packets should be discarded to smooth the high priority traffic flow. Higher priority traffic will have higher data rate and lower possibility of being discarded.

The numbering priority value ranges from 0 to 7, and 7 represents the highest priority level. CEM-538M supports priority scheme as 802.1p, IP TOS and TCP/UDP protocol.

### Priority in Upstream and Downstream

There are 4 priority queues for packet. Packet with priority value 0 or 1 goes to the same queue, denoted as **Queue0**. **Queue1** has priority value 2 and 3, **Queue2** has priority value 4 and 5, and **Queue3** has priority value 6 and 7. Totally 4 levels of service are provided. **Queue3** need to have higher “**Service Weight**”, i.e. packets reside in **Queue3** will be send out faster. Packets in **Queue0** should have larger ‘**Drop Ratio**’ in congestion situation since it is classified as less important.

Refer the following table for the detail mechanism to discard packets early according to their priority to prevent resource blocked by the low priority. For example, if ‘**Drop Ratio**’ of **Queue0** is set to 75%, then CEM-538M will discard 50% of incoming packets toward **Queue0** if **Queue0** is one **fourth full**(Queue Utilization 25%). And will discard 75% of incoming packets toward **Queue0** if **Queue0** is **half full**(Queue Utilization 50%).

Drop Ratio Queue Utilization	0%	25%	50%	75%
25%	0%	0%	25%	50%
50%	0%	25%	50%	75%

### 802.1p

Tagged packet has the 3-bit (value 0~7) 802.1p field is used for priority mapping. The default priority mapping scheme is usually suitable and should work for most applications--for example, to map 802.1p value 7 to priority 7, to map value 0 to priority 0, and so on. It will take effect in both downstream and upstream.

### IP TOS

The bit7 to bit5 of TOS byte in IP packet is treated as TOS precedence value (0~7). By default, CEM-538M uses the precedence value to map the priority queue. Please refer RFC-1349.

### TCP/UDP Port Number

Different TCP or UDP port number usually states for different protocol. You may raise the priority for important application with specified TCP or UDP port number. In CEM-538M, you can assign higher priority for total 8 different TCP/UDP protocols.

# SPECIFICATIONS

## NETWORK INTERFACE

- HomePNA3.1 over Coax(HCNA) Compliant
- IEEE 802.3u 100Mbps Fast Ethernet
- IEEE 802.3 10Mbps Ethernet
- IEEE 802.3x Flow Control
- 10/100Mbps Auto-Negotiation Support
- MDI/MDX Auto-Detection Support

## NETWORK MANAGEMENT

- Remote Management by HTTP / TELNET / SNMP Protocols
- Firmware and HCNA Driver are Upgradeable via HTTP or TFTP
- Enable/Disable Endpoint Service
- Subscriber Host (PC) Number Control in Endpoint
- Diagnosis of HCNA Interface
- Bandwidth Control
- 802.1Q Tag VLAN Support
- IGMP v2 Snooping Control
- Ethernet Statistics and Status

## QUALITY OF SERVICE

- Priority Based on 802.1p, IP TOS and TCP/UDP Port
- Based on HomePNA Parameterized QoS

## TRANSMISSION POWER AND SPECTRUM

- 8 +/- 1dBm
- 12~28MHz



## **TRANSMISSION SPEED AND RANGE**

- Up to 144Mbps
- Min Attenuation to Endpoint: 12dB
- Max Attenuation to Endpoint: 50dB (-176dBm/Hz Noise Floor)

## **CONNECTORS**

- Ethernet LAN Port: 2 Ports, RJ45 Jack
- HCNA Port: 1 F-Type Port to HCNA Coax Network
- TV/Antenna Port: 1 F-Type Port to TV Set or from CATV/Antenna

## **LED INDICATOR**

- Power
- Ethernet LAN Link/Activity per Port
- HCNA Link/Activity
- HCNA SyncMode
- HCNA Endpoint Diagnosis

## **TERMINAL DEVICES(Endpoint)**

- Cooperate with HCNA Ethernet Bridge Endpoint (as CES-532D)
- Support up to 31 Endpoints

## **POWER REQUIREMENT**

- 5V DC Input
- Power Consumption: < 6 Watts

## **ENVIRONMENTAL CONDITION**

- Operation: 0 °C ~ 55 °C (32 °F ~ 131 °F)
- Storage: -10°C ~ 70 °C (14 °F ~ 158 °F)
- Humidity: 10% ~ 95% Non-condensing

## **PHYSICALS**

- Dimensions: 160(W) x 116(D) x 30(H) mm
- Weight: 260g