CEM-336

HomePNA3.0 Coax Master Bridge in MDU

User's Guide

Version 1.6
Sep 2006

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 HomePNA3.0 over **C**oax to **E**thernet **M**aster (**M**anagement) Bridge -- **CEM**-336. Refer to "HomePNA3.0 over Coax" as HCNA from this point.

Features

- One HCNA Port for Driving HomePNA3.0 Signal into Existing Coaxial Cable.
- One TV/Antenna Port for TV Set Connection or for Signal from TV VHF/UHF Antenna.
- Two Fast Ethernet Port with Auto-Detect MDIX Function(Auto Crossover) and Auto-Negotiating Half/Full Duplex 10M/100M for Expansion or Link to FTTH/xDSL Modem
- Priority Queue based QoS Support for 802.1p, IP TOS, UDP/TCP Protocols
- Supports up to 15 EPs(Endpoint, as CET-330 Slave Unit) Concurrent Connection
- 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 for Connected EPs
- Supports SNMP Function
- Equipped with Reset Button and DIP Switch for Versatile Configuration.

Glossary

- HCNA — HomePNA3.0 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
- 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

2

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-336
- One DC 5V Power Adaptor
- One F-Type Coaxial Cable (RG-59U)
- One RJ-45 Ethernet Cable (CAT-5)

Rear Panel

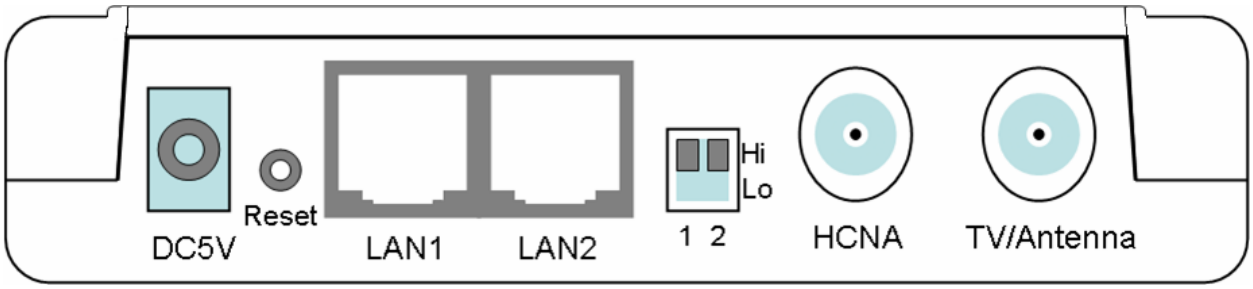


Figure 1: Rear panel of CEM-336

Connectors

1. **DC5V**: Connect to the power adapter plug.
2. **Reset**: While CEM-336 is up, press and release this button will reboot CEM-336. 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**'.
3. **LAN1/LAN2**: Two fast Ethernet ports to connect Switch/FTTH/xDSL Modem for Internet access.
4. DIP Switch **1 2**: Reserved for different operation mode.
5. **HCNA**: Attach to existing coaxial cable and use it as the networking backbone in one or more MDU. CEM-336 is the HCNA **Master** device and controls the other **Slave** HCNA devices (refer to Endpoint or **EP**, as CET-330) on the same coax network. Refer "Connecting the Cables" for more details.
6. **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. **LAN Link/Act-1**: Lighting up when LAN1 port is active, and flashing when there is any data traffic.
3. **LAN Link/Act-2**: Lighting up when LAN2 port is active, and flashing when there is any data traffic.
4. **HCNA Link/Act**: Lighting up when HCNA port is active, and flashing when there is any data traffic.
5. **HCNA SyncMode**: Lighting up when HCNA port is working in HCNA **Synchronous MAC** mode.
6. **HCNA Diag**: Lighting up when CEM-336 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.

Connecting the Cables

To establish a new coax networking system by CEM-336, reroute the CATV/Antenna signal source over coax toward CEM-336 '**TV/Antenna**' port and connect CEM-336 '**HCNA**' port to the original coax entrance to building. CEM-336 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,

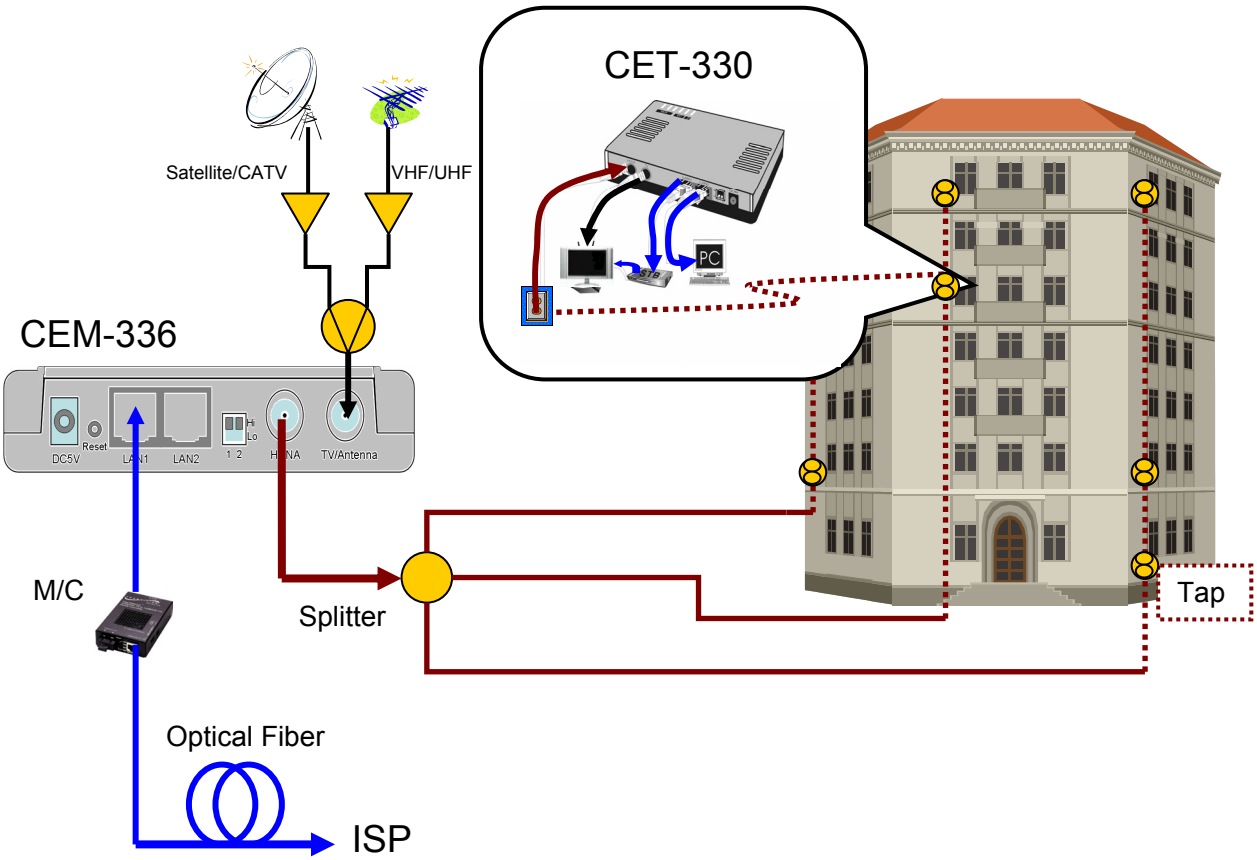


Figure 2: Detail cabling of CEM-336

You can also use other Combiner or Mixer-Splitter with CEM-336 to build the same system, see the following Figure 3 for different cabling,

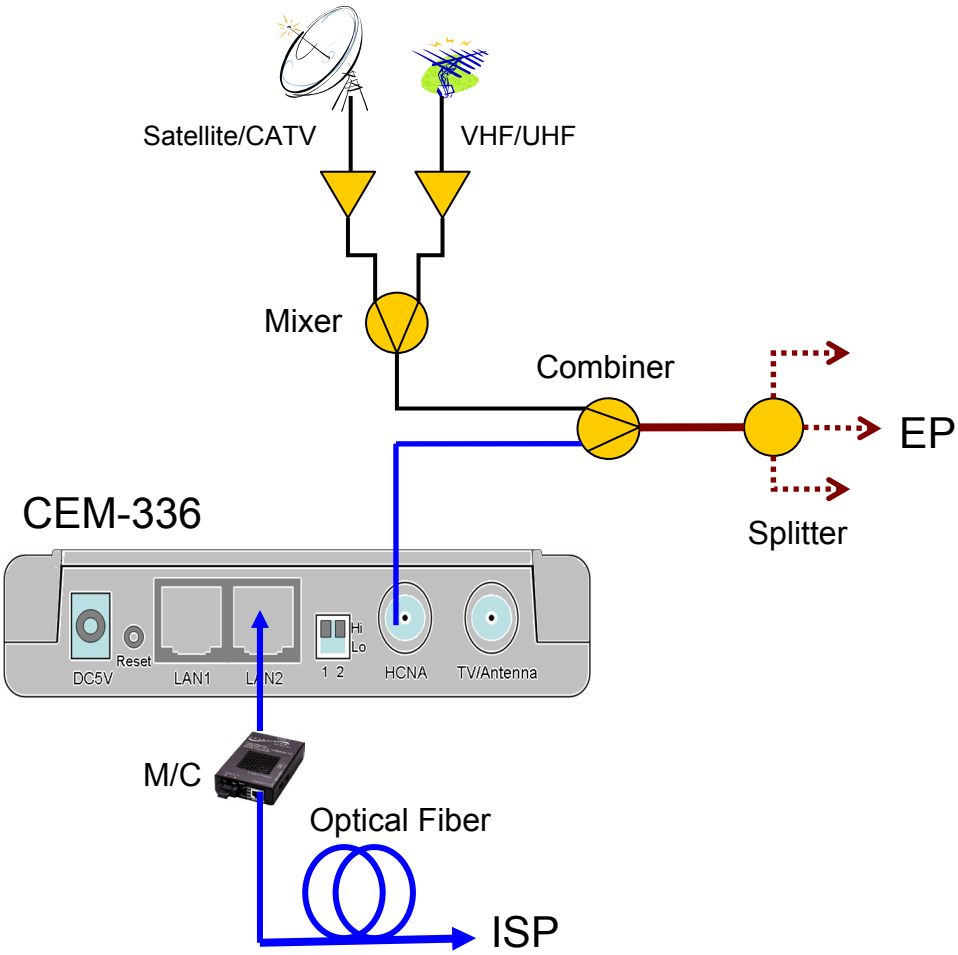


Figure 3: Different Cabling of CEM-336

NOTE: After power up CEM-336, the led '**HCNA SynMode**' will always be glowing, and led '**HCNA Link/Act**' will light up for at least one EP is detected on the HCNA network. A dimmed led '**HCNA Link/Act**' shows no EP attached to the HCNA network.

Verification

After you have finished the installation, you should be able to access CEM-336 through **Ethernet** link or through **HCNA** link (via Host PC behind EP) to verify the installation is completed. (See next Chapter for details).

3

CONFIGURATION

This chapter describes the configuration procedure for your bridge.

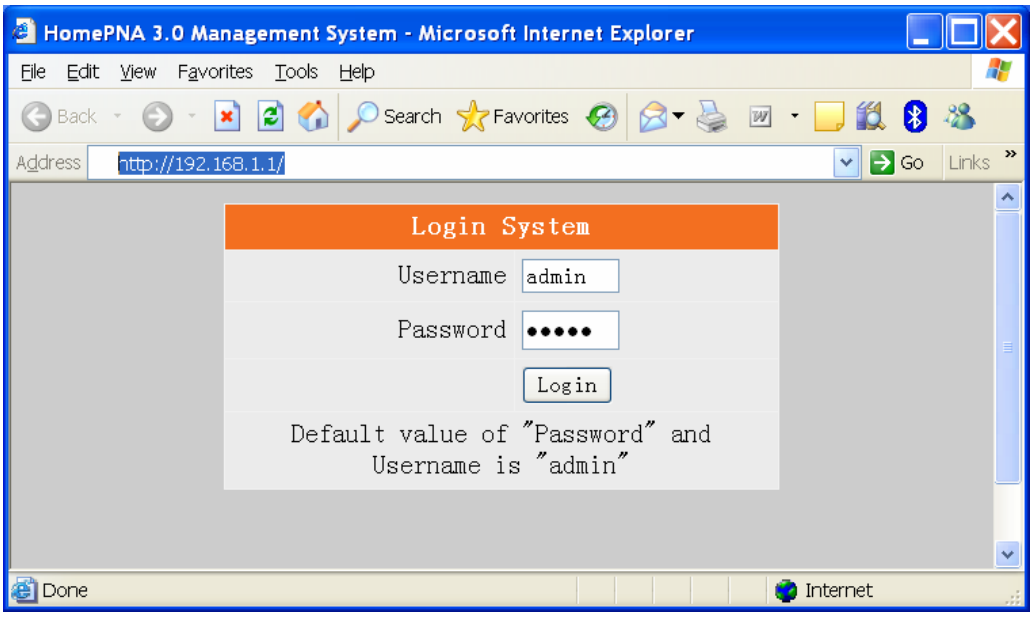
Configuration Methods

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

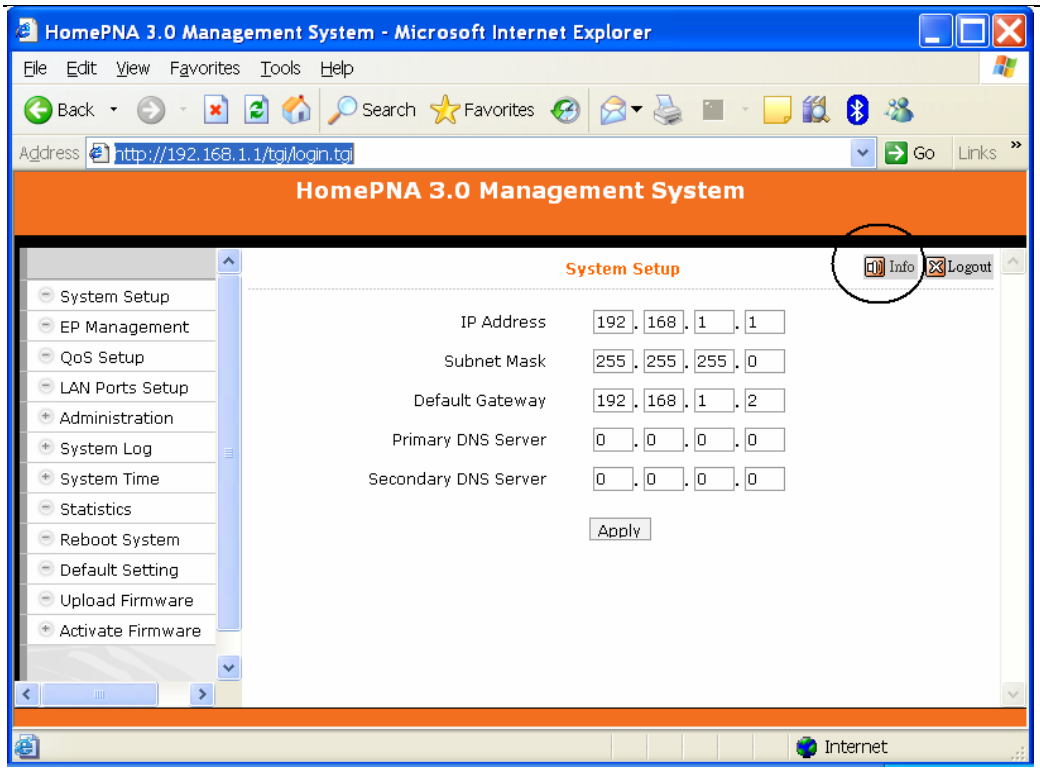
- Use Web Browser
- Use Telnet Program
- Use SNMP Manager or MIB Browser

Use Web Browser

Web browser is the easiest tool to configure the bridge. The factory default IP address of CEM-336 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-336. 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,



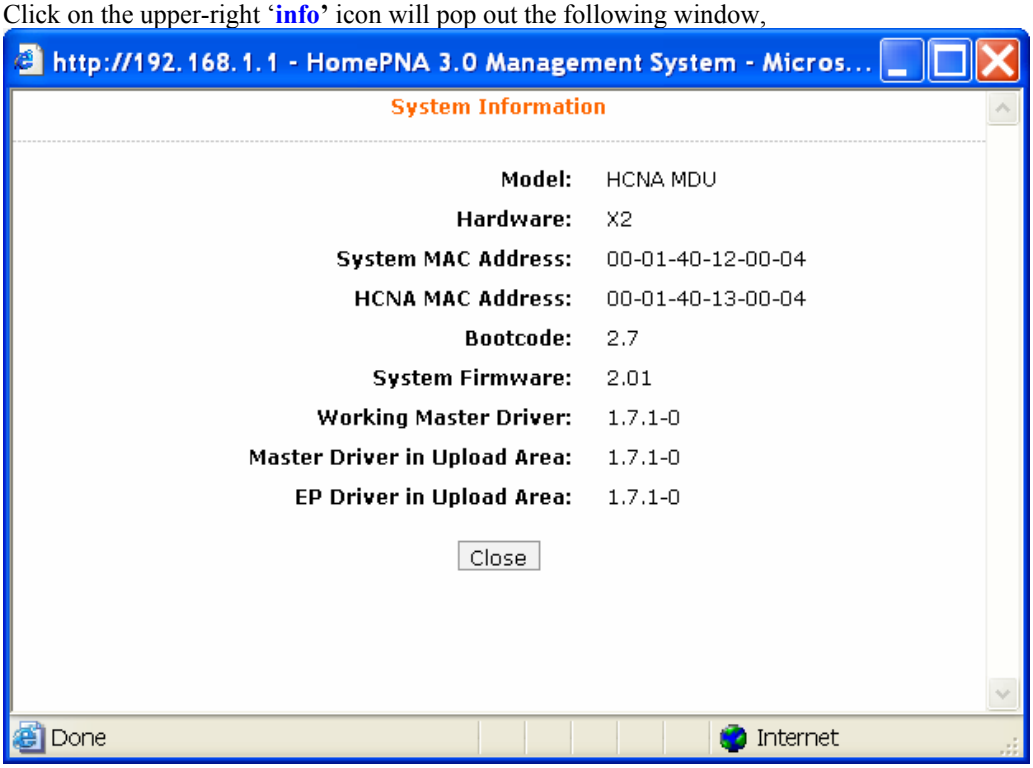
The bridge will prompt you a window for password authorization. The factory default **Password** for CEM-336 is '**admin**'. Please change it to a more secured password after you login successfully. Here shows the main configuration menus on the browser,



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 Information

Click on the upper-right '**info**' icon will pop out the following window,



Following describes the basic web configuration items,

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-336 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-336. Each CEM-336 device should be stamped with both Ethernet MAC and HCNA MAC for identification.

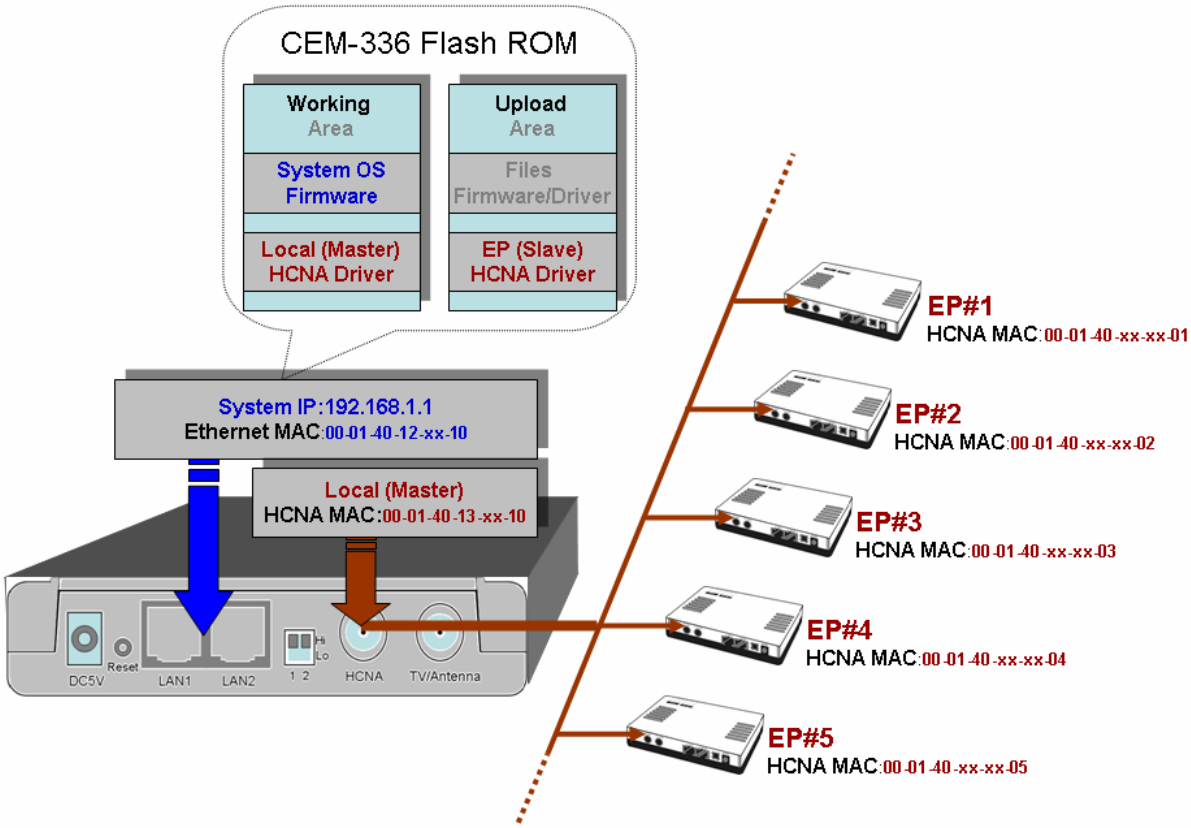
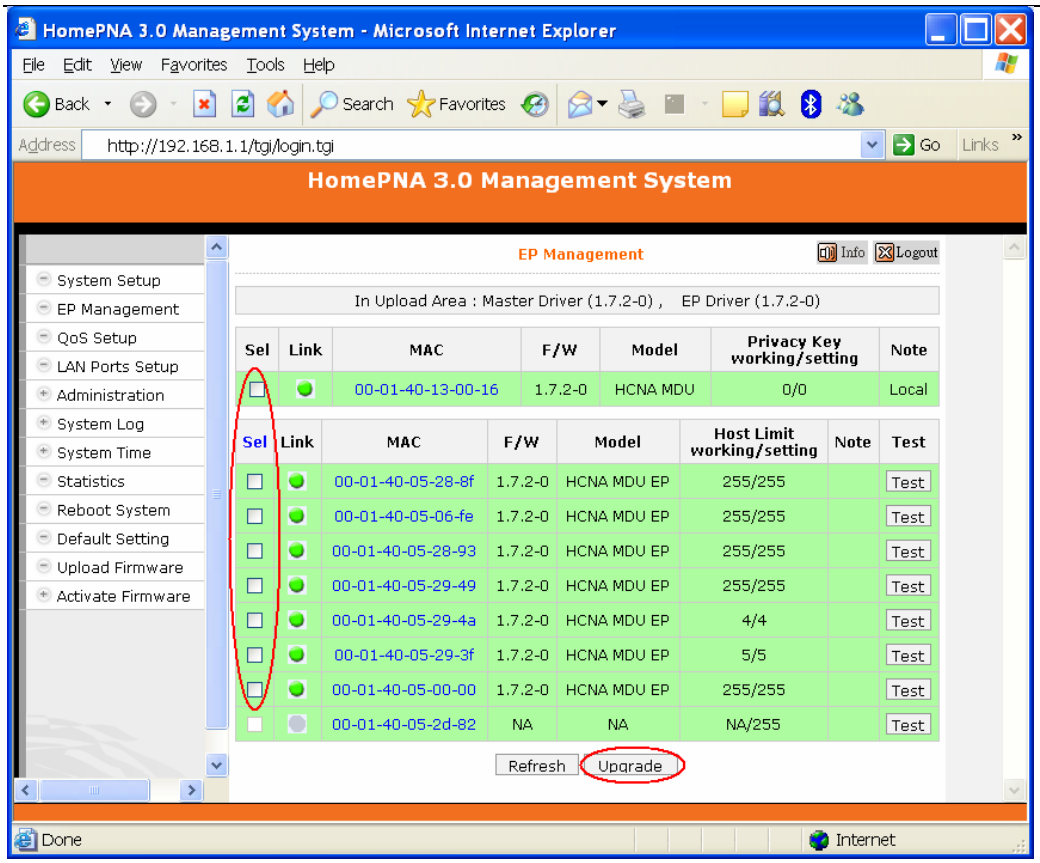


Figure 4: EP Management Architecture

CEM-336 flash ROM is capable of storing the following files:
1. System firmware (OS)
2. System bootcode (OS bootloader)
3. Local (Master) HCNA driver
4. EP (Slave) HCNA driver
5. HCNA link diagnosis utility

To upgrade any one of them, you need the 2-stage procedure. First to '**Upload**' the file onto CEM-336 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.

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



Each row represents for one EP, here we have one Master (Local) HCNA device (on the top) and 8 extra Slave EP devices shown on the window.

For each shown column,

Sel : click on '**Sel**' button will select all listed EPs at once for EP HCNA driver upgrade, or just designate the wanted 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(s) 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 **N**ot **A**pplicable/**A**vailable since this value is stored inside EP and the EP is unreachable now.)

MAC : HCNA MAC address.

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

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

Privacy Mode(Key): controlled by **Master** HCNA device. While '**Privacy Mode**' is '**ON**', Master will serve EP only if its '**Privacy Key**' is matched with the Master. Shown in format '**working** / **setting**'-- Denominator is the **setting** value (refer Properties) and Numerator is the current **working** value. working is the queried '**Privacy Mode(Key)**' from Master HCNA device, setting is the setup '**Privacy Mode(Key)**' that should program into Master HCNA device(not yet). You should force to upgrade the Master HCNA driver if these two values are not consistent – to replace the mismatched working value with the planned setting one.

Host Limit: work for **EP** HCNA device only, used to limit the maximum allowable number of Host (PC) attached to one EP. Shown In format '**working** / **setting**'-- Denominator is the **setting** value (refer Properties) and Numerator is the current **working** value. working is the queried '**Host Limit**' stored in on-line EP HCNA device, setting is the setup '**Host Limit**' that should program into EP HCNA device. You may upgrade the EP HCNA driver if it is not consistent – replace the mismatched working one with planned setting one.

Up Rate : work for **EP** HCNA device only, used to limit the maximum allowable **Upstream** bandwidth (value multiplied by 64Kbps) of one EP. Shown In format '**working** / **setting**'-- Denominator is the **setting** value (refer Properties) and Numerator is the current **working** value. working is the queried limited

rate stored in on-line EP HCNA device, setting is the setup rate that should program into EP HCNA device. You may upgrade the EP HCNA driver if it is not consistent – replace the mismatched working one with planned setting one.

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

Click on each device's **MAC address** can open the window to change its Properties (Parameters) **setting** values; please note that any modification will take effect after you upgrade the HCNA driver for the selected device. (to replace the running **working** values with **setting** ones, also refer 'Apply the Properties Profile to Working').

Click on '**Test**' button for the specified EP can diagnose the HCNA link between Master and EP.

Properties Profile – stored the setting value

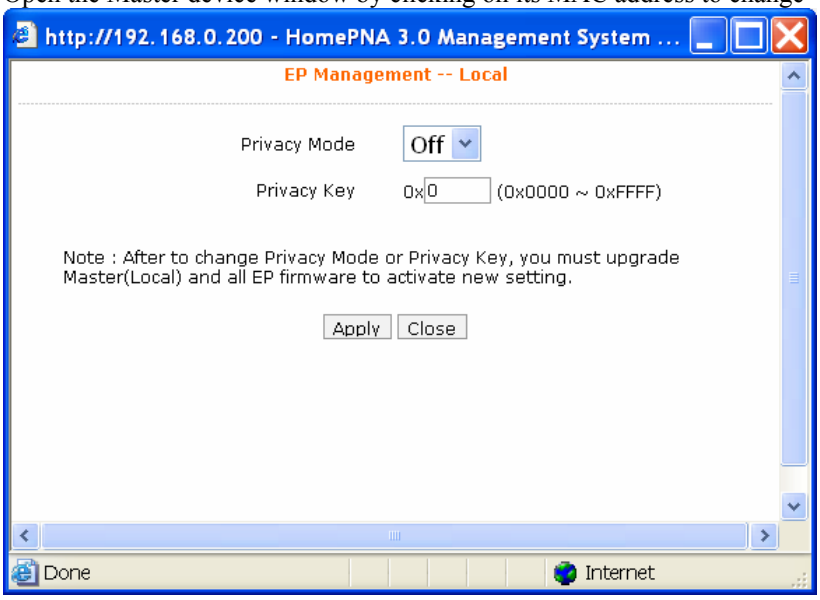
CEM-336 will query then store the **setting** values of individual on-line EP into its nonvolatile memory automatically, include '**MAC**', '**Note**', '**Host Limit**', '**Up Rate**'…, as a profile. And shows the EP status monitored by CEM-336: green light in '**Link**' field means EP is '**ON'**, gray light else. While EP is off-line and doesn't need any service, you may delete its profile manually to save CEM-336 storage space -- refer 'Delete the Obsolete EP Profile'. CEM-336 could keep up to 32 EP profiles, and serve 15 on-line EPs concurrently.

The properties (setting) profile of Master device is different from EP's, as denoted specifically in the parentheses that follows each **setting** property.

The detail of each **setting** property in the profile,

Privacy Mode and Privacy Key (for Master)

Open the Master device window by clicking on its MAC address to change **'Privacy Mode'** and '**Privacy Key**',



The **'Privacy Mode'** value for Master:

Off: The factory default value stored in Master, to allow all EPs to transmit and receive packets through CEM-336. Regardless of the '**Privacy Key**' values setting in Master device.

On: CEM-336 will communicate with EPs if they share 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-336 if **'Privacy Mode'** is **'ON'**.

The factory default mode is '**Off**' and key is 0x'**0**'(states in hexadecimal). Once you activate the **'Privacy Mode'** and setup the **'Privacy Key'** in CEM-336(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, also refer 'Apply the Properties Profile to Working') before any connected EP can access the network controlled by CEM-336.

Privacy Mode and Privacy Key (for EP)

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-336 only if EP has the right **'Privacy Mode'** and '**Privacy Key**'. Please refer the following diagram for more details,

Master **PrivacyMode** / EP **PrivacyMode**	**On**	**Off**
On	Ok If **PrivacyKey** Matched	Not
Off	Not	Ok

Ok: EP can access the network
Not: 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 EP -- refer 'Apply the Properties Profile to Working').

Profile Status (for Master and EP)

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

Green: all **working** values in EP consist with the profile stored **setting** values in CEM-336, include '**Privacy Mode(Key)'**.

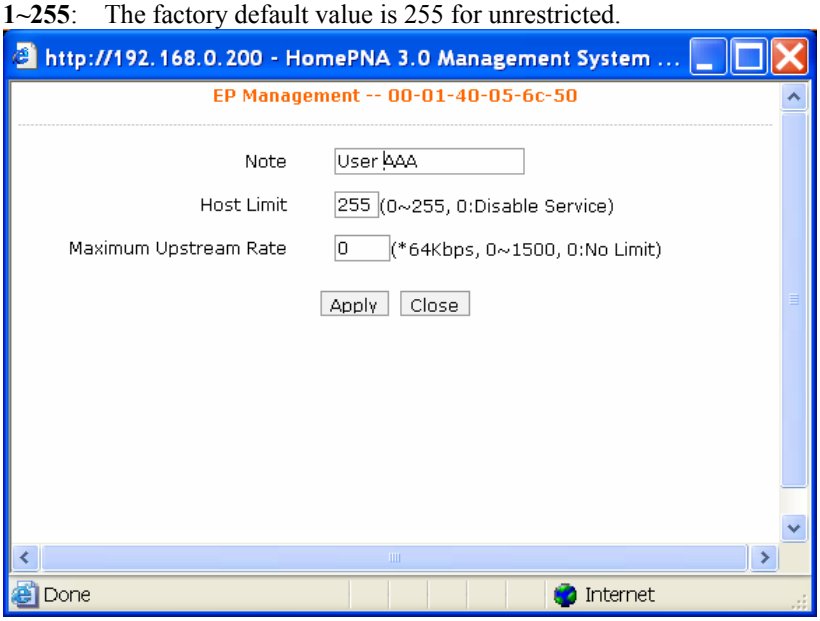
Yellow: Not all **working** values are consistent, but '**Privacy Mdoe(Key)'** in EP is matched. You may upgrade those EPs to synchronize their **working** values with Master device (to replace the running **working** values with the **setting** ones).

Red: the **working** value '**Privacy Mode(Key)'** in EP is not matched or the **working** value '**Host Limit**' in EP is 0. CEM-336 will reject to serve this EP.

Note, Host Limit, Upstream Bandwidth (for EP)

Open the EP properties window, item '**Host Limit**' specifies the maximum allowable host number attached on this EP:

0: Service is disabled, none host is allowed
1~255: The factory default value is 255 for unrestricted.



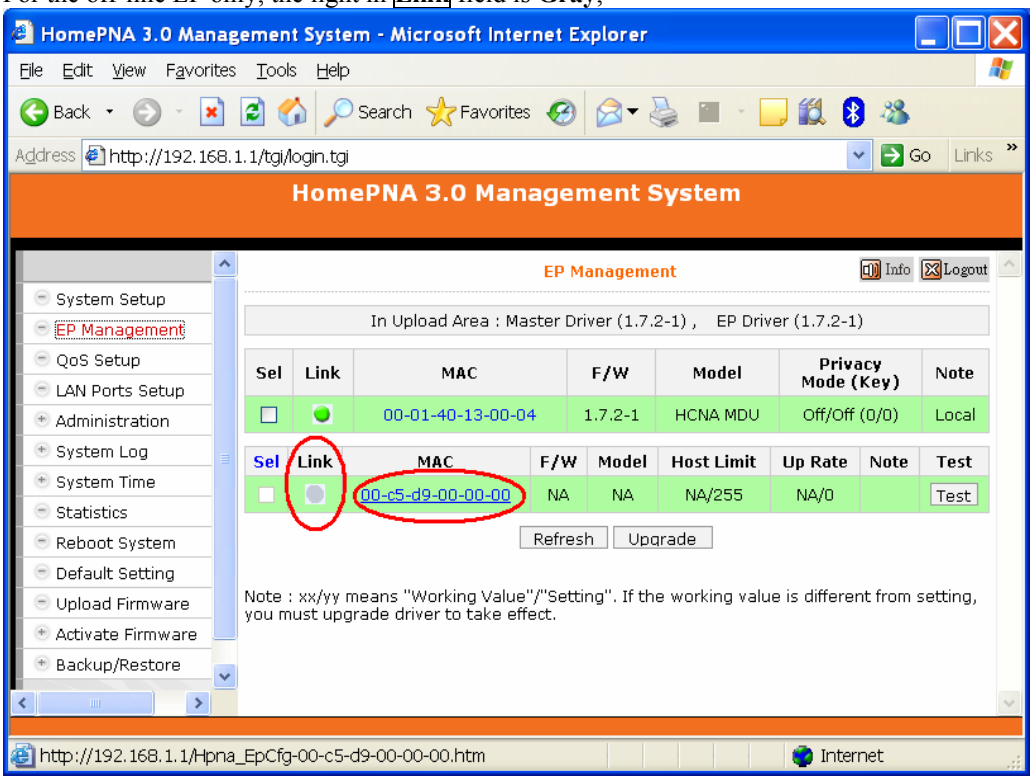
Apply the Properties Profile to Working

The modification of any Master or EP properties (setting) will be kept by CEM-336's nonvolatile memory, and will not take effect immediately. To make the modification work permanently, you need to upgrade the HCNA driver for the selected Master or EP device -- refer the upgrade procedure in the section entitled 'Upgrade Master with the

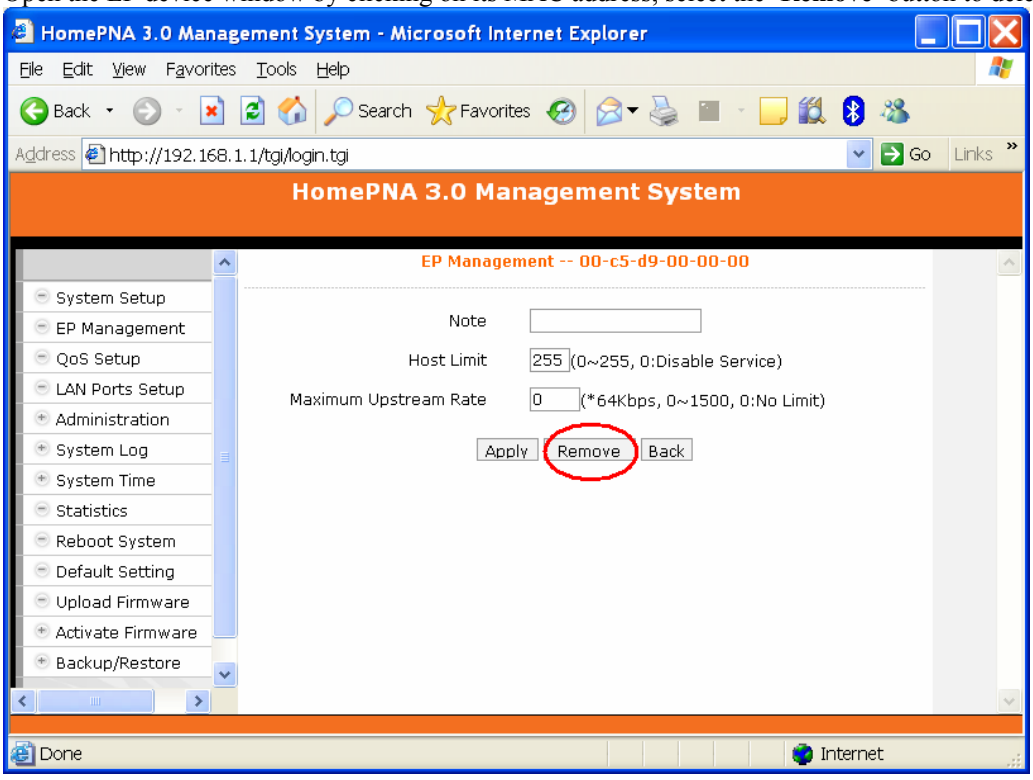
New Master HCNA Driver' for Master device and 'Upgrade EPs with the New EP HCNA Driver' for EP device. After HCNA driver upgrade, the selected device will reboot and run the new setting.

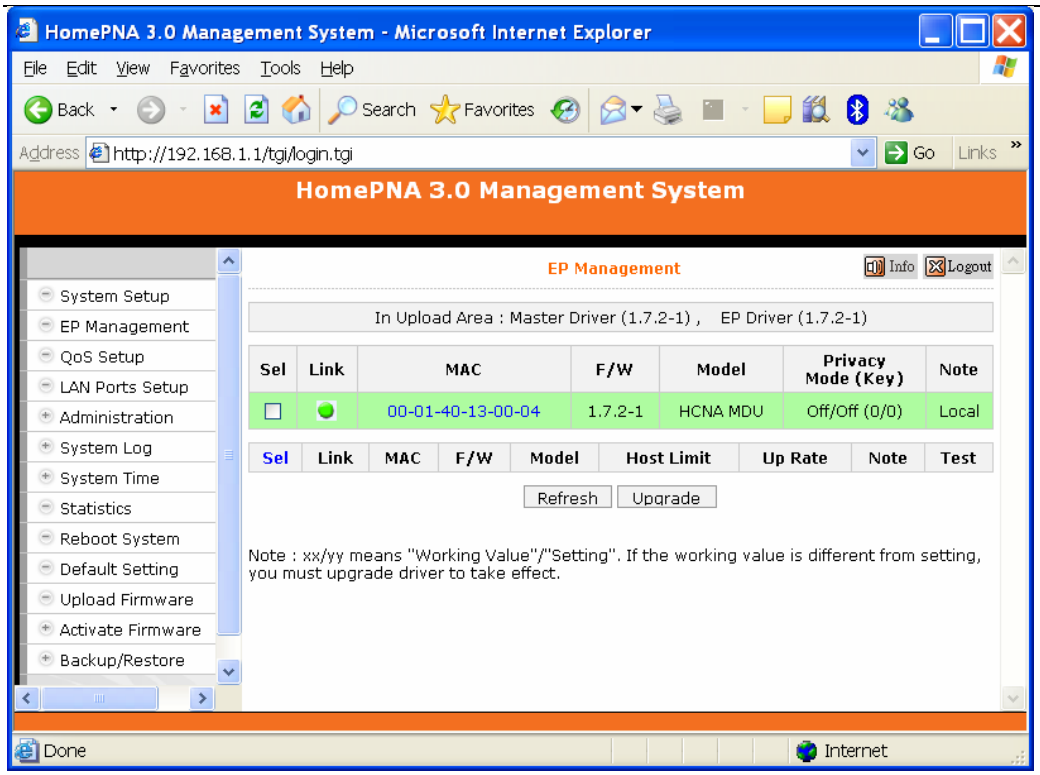
Delete the Obsolete EP Profile

For the off-line EP only, the light in **Link** field is **Gray**,



Open the EP device window by clicking on its MAC address, select the '**Remove**' button to delete this EP profile,

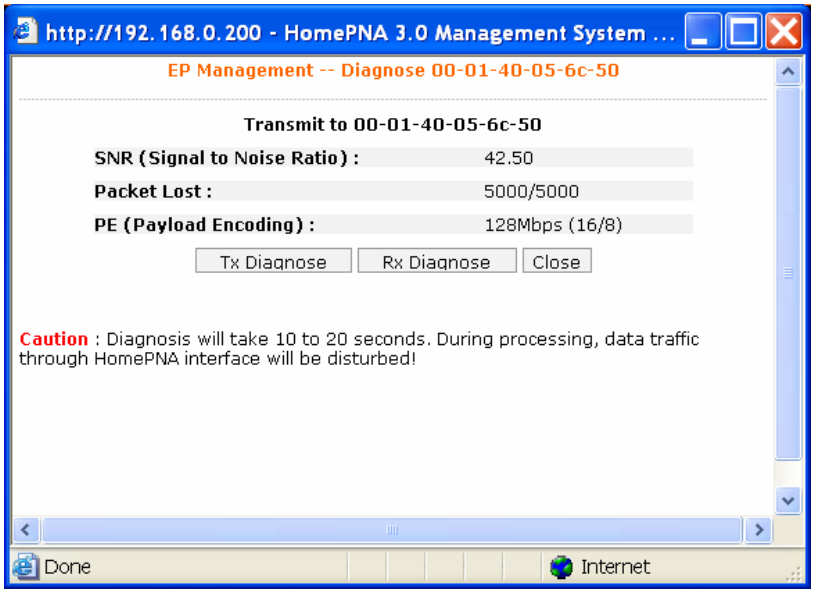




And the deleted EP profile has gone.

EP Diagnosis

Open '**Test**' window for Tx (downstream packets from CEM-336 toward EP) or Rx (upstream packets from EP to CEM-336) diagnosis. Include '**SNR**', '**Packet Lost**' and '**PE**' obtained during communication between the selected EP device and CEM-336 Master device.



SNR: Normally between 36dB~42dB.

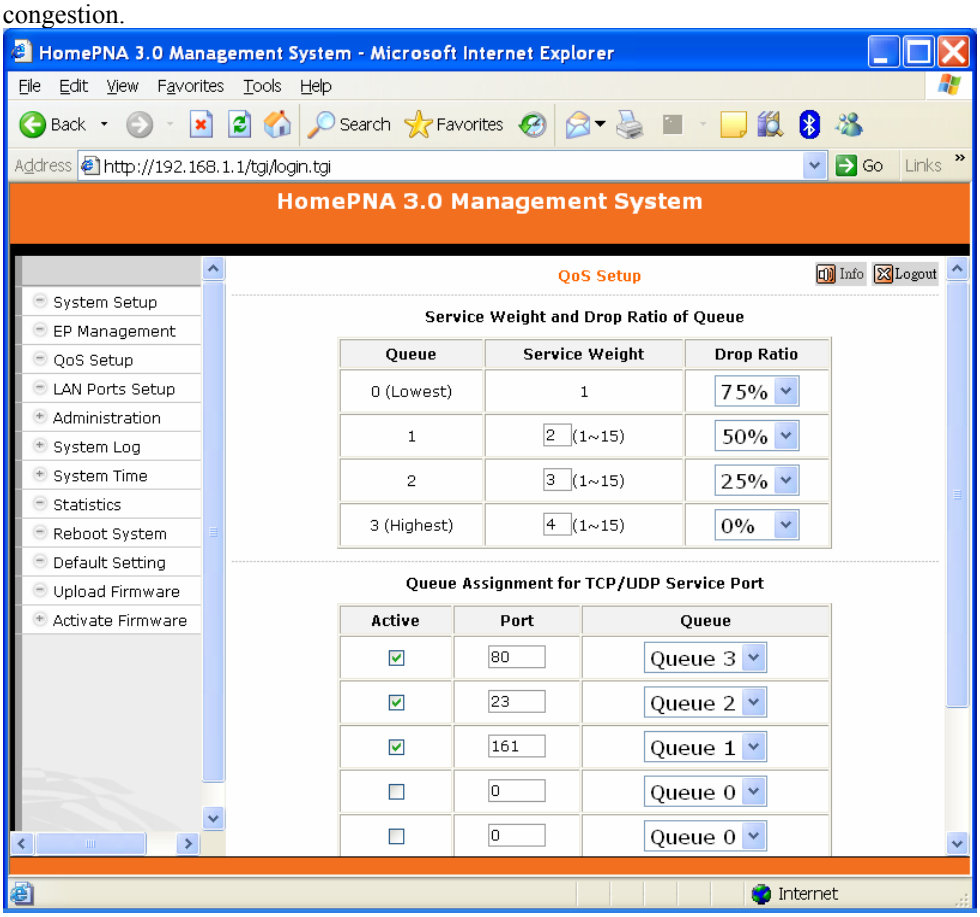
Packet Lost: Denominator is the total number of transmitted packets. Numerator is the number of received packets. Denominator minus Numerator is the sum of lost packets.

PE: 128Mbps (best connection carrier speed, in bits per second) for normal connection. CEM-336 will adopt lower carrier speed automatically for connection path with high attenuation (lower SNR).

QoS Setup

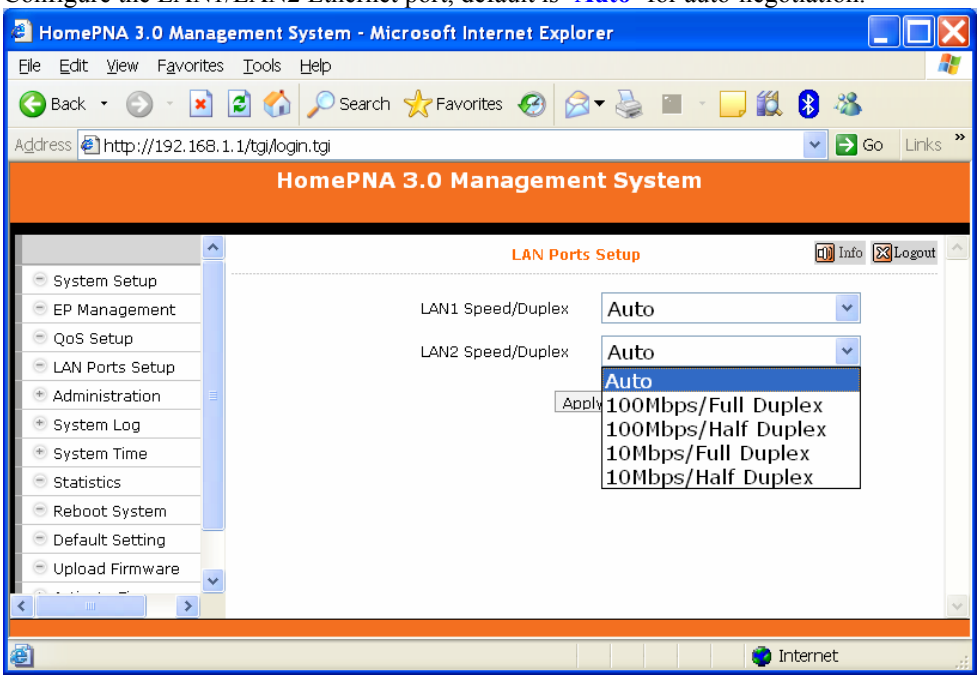
Total 4 prioritized queues are provided, denoted as **Queue0** (lowest priority), **Queue1**, **Queue2** and **Queue3** (highest priority). You may assign the different packet dropping ratio and service weight for different queue. Refer Chapter "ADVANCED FEATURES" for more CEM-336 QoS mechanism details.

For example, here we classify TCP/UDP packet with port '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.



LAN Ports Setup

Configure the LAN1/LAN2 Ethernet port, default is '**Auto**' for auto-negotiation.



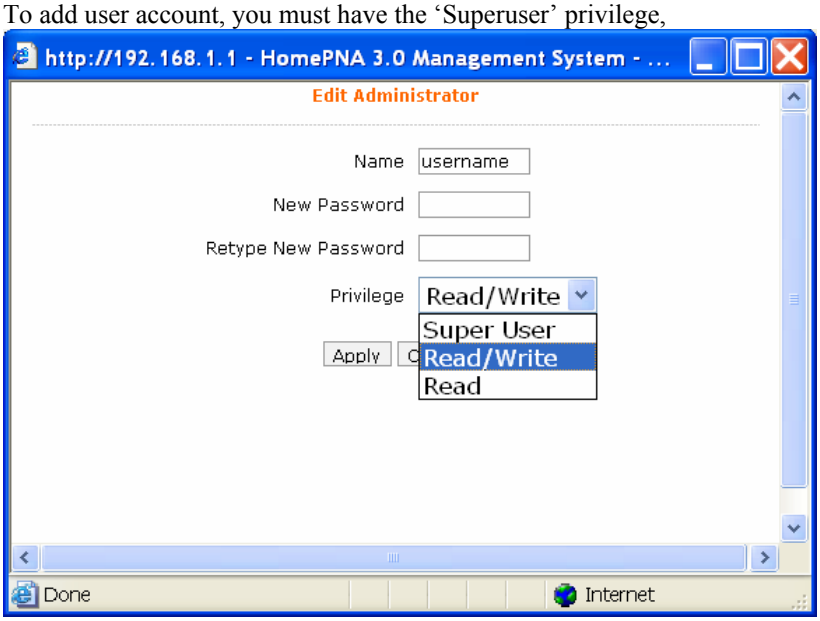
Administration

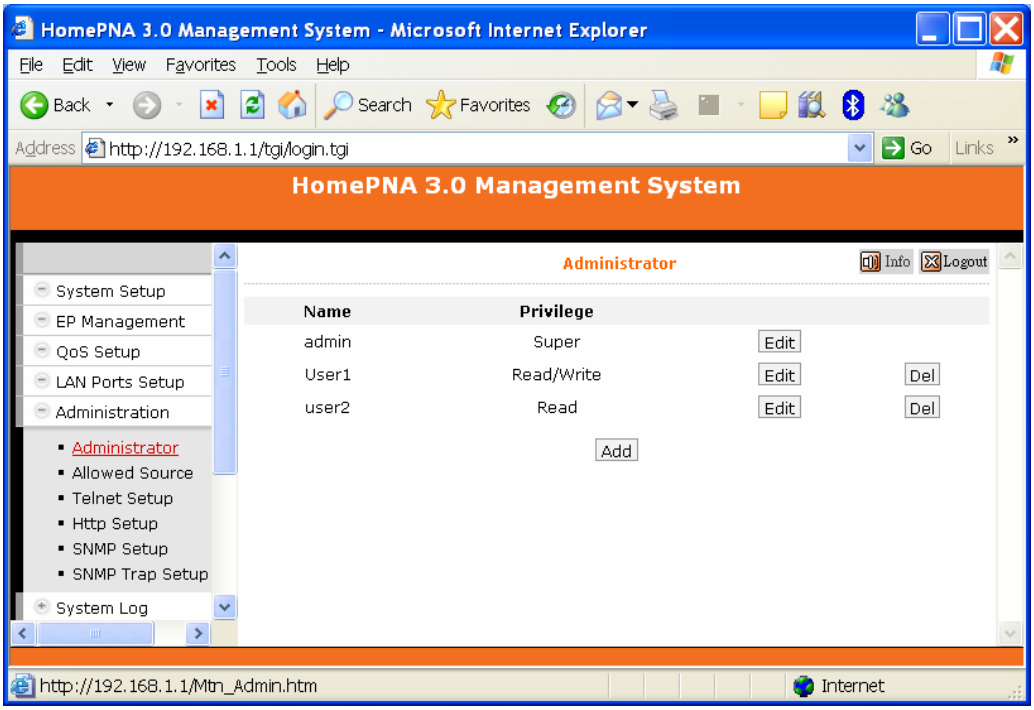
This setting is for the Administrator account, the allowable Host with specified source IP, and the protocols like HTTP/TELNET/ICMP/SNMP of CEM-336 management.

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 must have the 'Superuser' privilege,





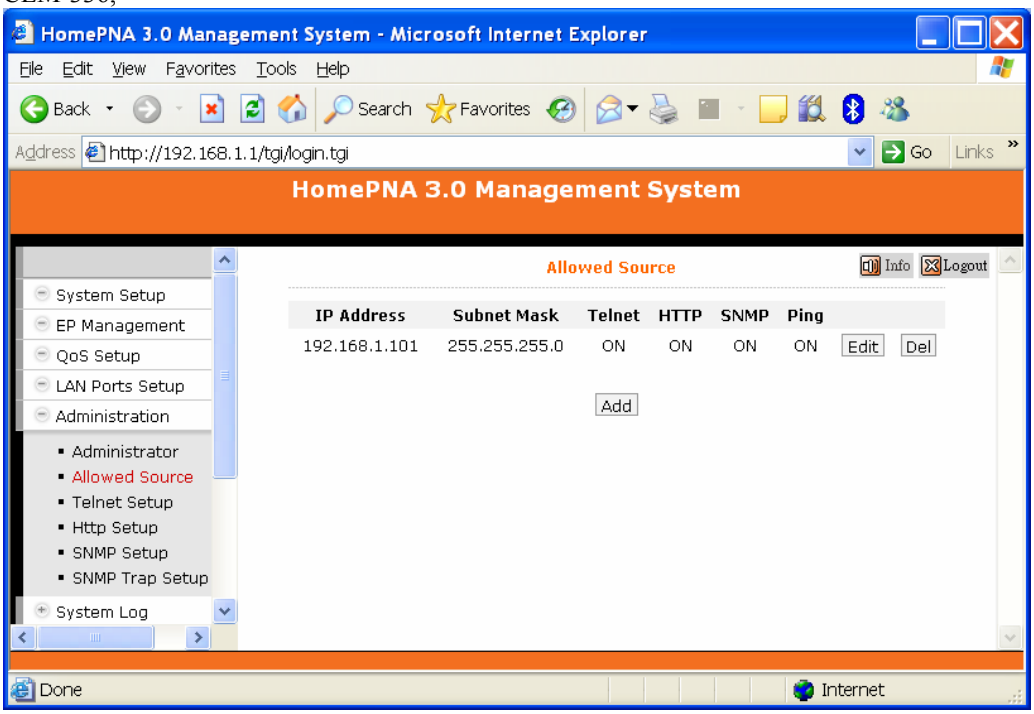
Allowed Source

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-336 will accept the packet, else discard it.

(Incoming Source IP Address **&** Subnet Mask) = (IP Address **&** Subnet Mask)

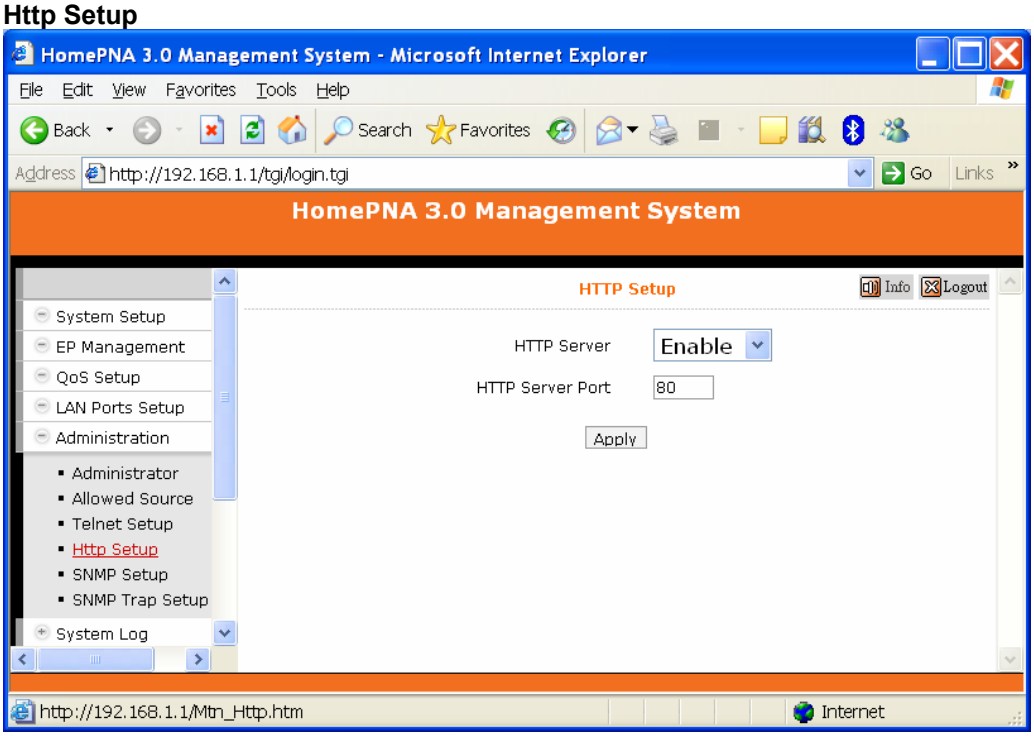
For the factory default setting, it will accept all incoming packets.

For example, the following filter set permits all Hosts with IP address '192.168.1.xxx' to access and configure CEM-336,



For each programmed filter set, you can further specify if the protocol Telnet/Http/Snmp/Ping is enabled or not.

Http Setup



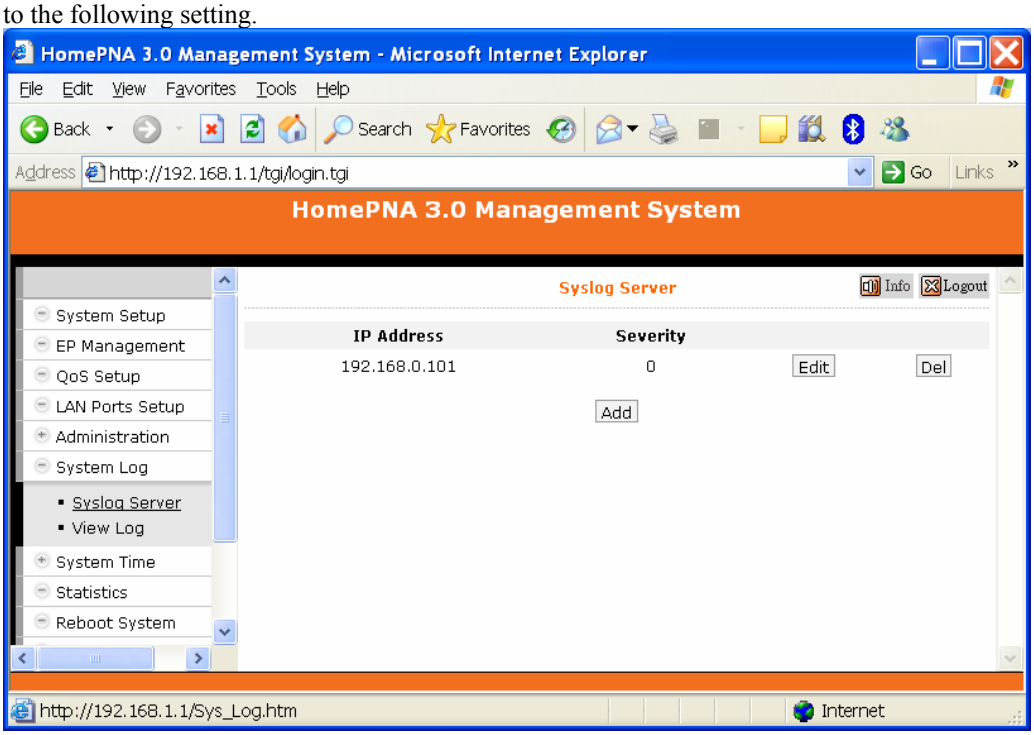
Specify that if the built-in Web server is enable or not and assign the port number for the Web server.

System Log

By designating the **Syslog** Server IP on CEM-336, CEM-336 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

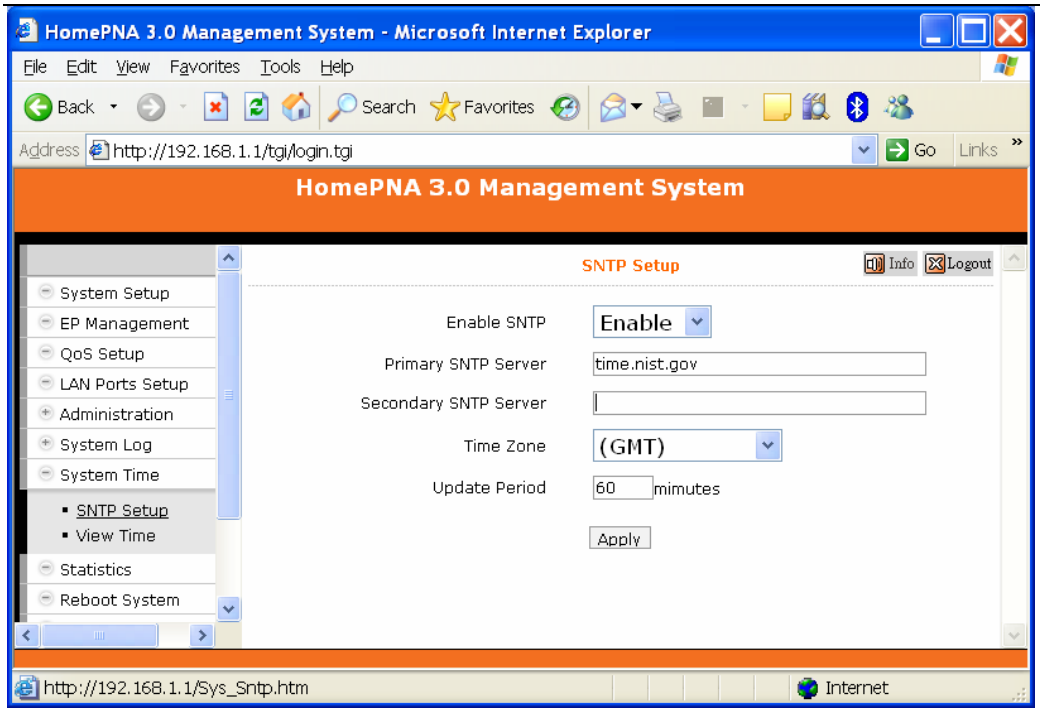
For example, CEM-336 will emit only 'EMERGENCY' event to Server with IP address '**192.168.0.101**' according to the following setting.



System Time

In order to provide correct timestamp for **Syslog** event, CEM-336 supports SNTP protocol and you may assign the locally SNTP servers to CEM-336.

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 must be setup correctly. Else CEM-336 couldn't reach the SNTP server by its domain name.

Backup/Restore Configuration

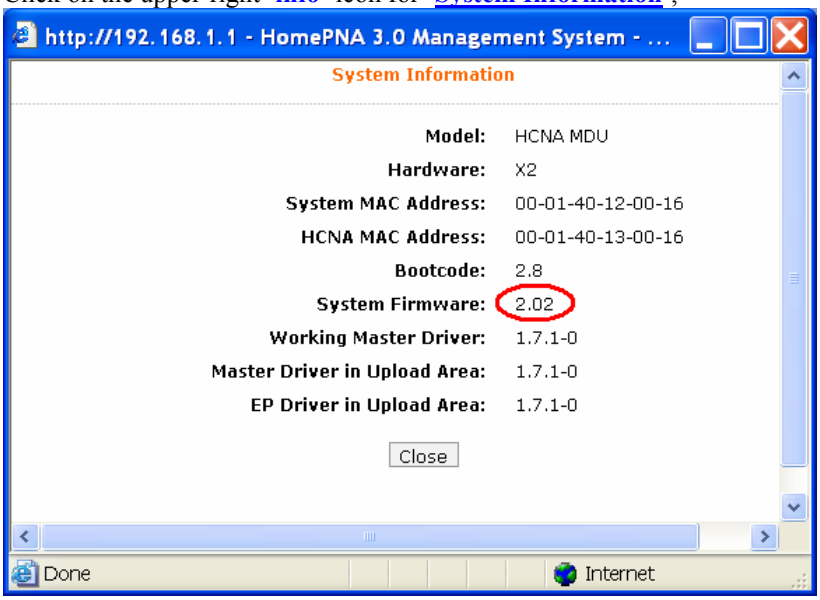
Use to backup current configuration to a file with filename extension '**.shc**'. Or to restore the CEM-336 configuration form the previous saved file.

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-336 flash ROM '**Upload Area**', then to '**Activate**' it. A coax network system with one CEM-336 and two connected EPs will be used as an example to demonstrate the upgrade details.

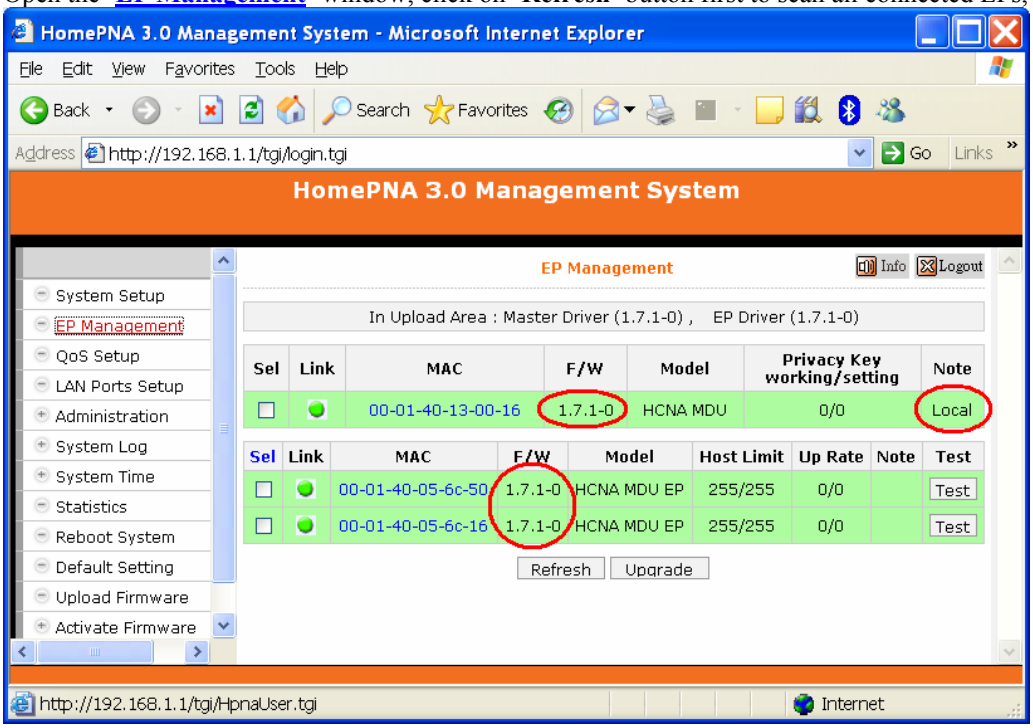
Current System Firmware and HCNA Driver Versions

Click on the upper-right '**info**' icon for '**System Information**',



The system firmware version is '**2.02**'.

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 '**1.7.1-0**'. And the two EP's device driver version is also '**1.7.1-0**'.

New System Firmware and HCNA Driver Files

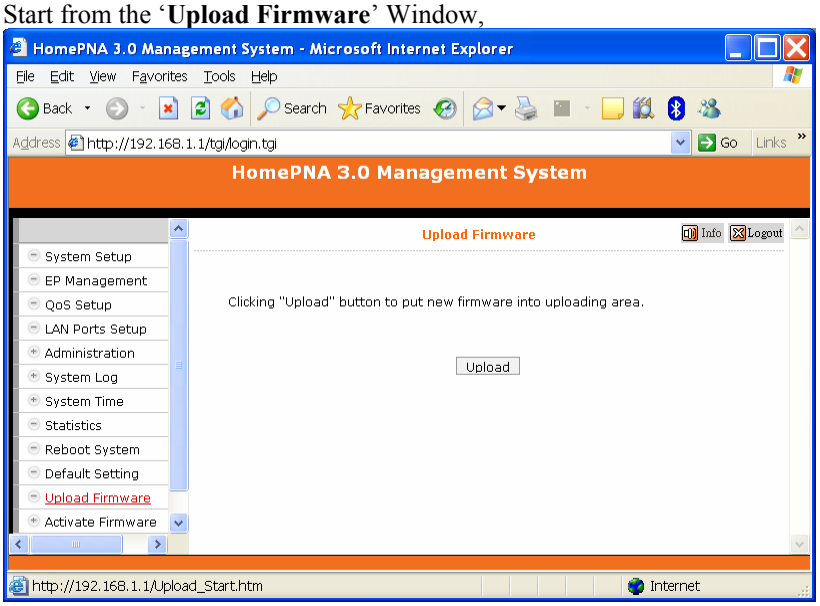
In this example, preparing the following binary files to upgrade the CEM-366 and the two connected EPs,

- **Sysfw-2.03.bin** → CEM-336 system firmware version '**2.03**'
- **CEMEPhpnaV1.7.2-0.bin** → EP HCNA device (as CET-330) driver version '**1.7.2-0**'
- **CEMhpnaV1.7.2-0.bin** → CEM-336 Master HCNA device driver version '**1.7.2-0**'

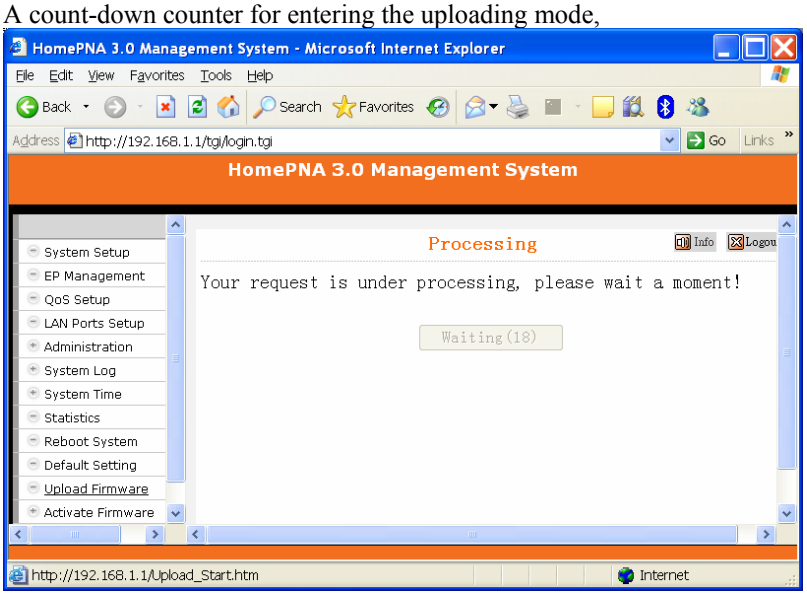
System Firmware

Upload the New System Firmware

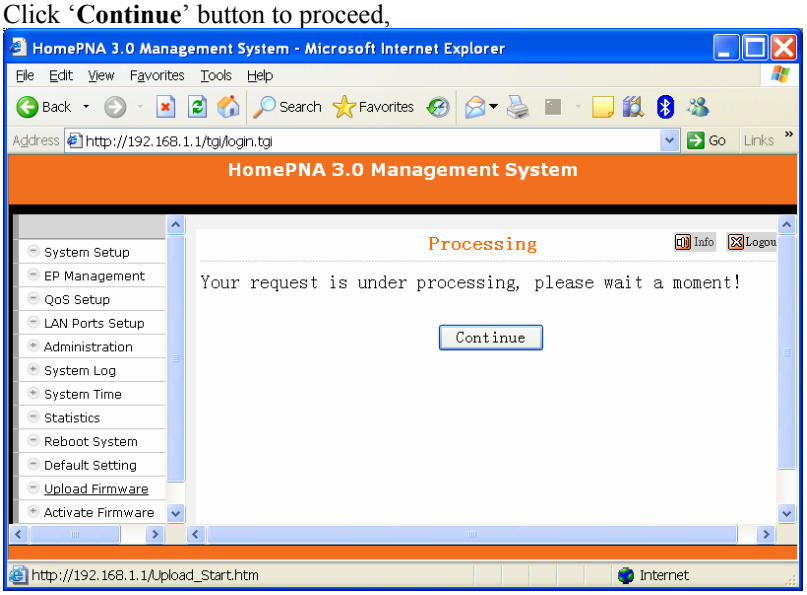
Start from the '**Upload Firmware**' Window,



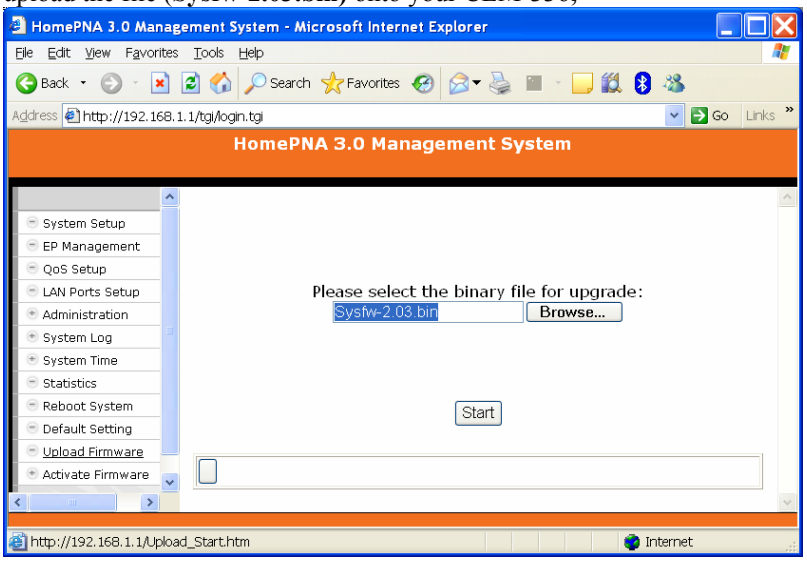
A count-down counter for entering the uploading mode,



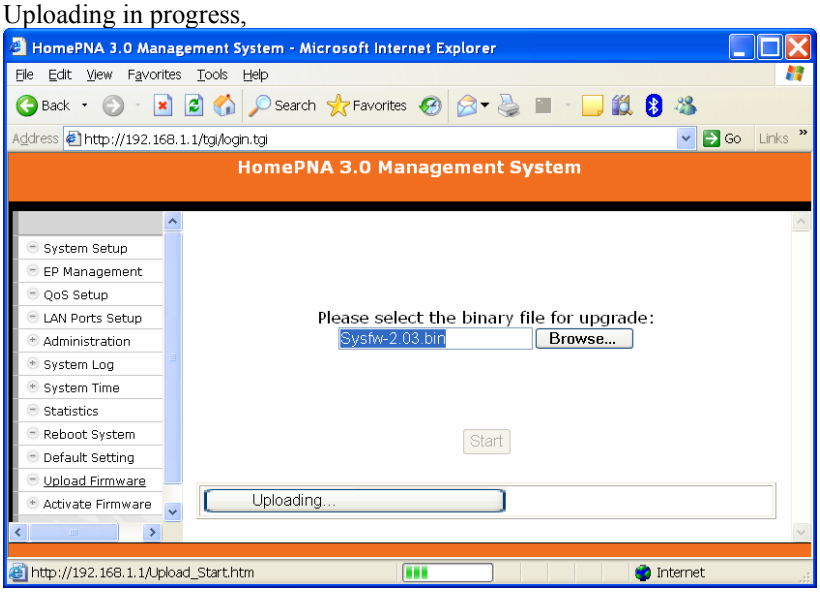
Click '**Continue**' button to proceed,



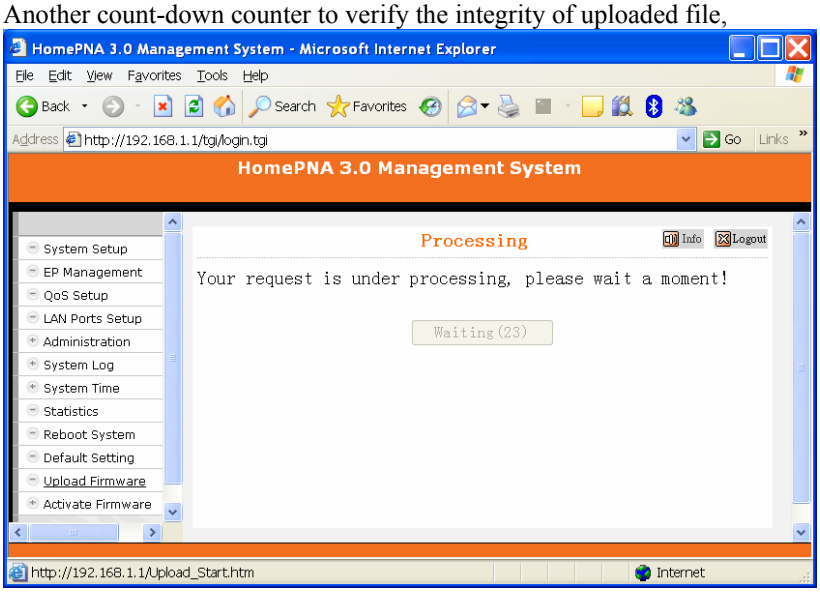
Click '**Browse**' button to locate where the new system firmware resides at your PC, then click '**Start**' button to upload the file (**Sysfw-2.03.bin)** onto your CEM-336**,**



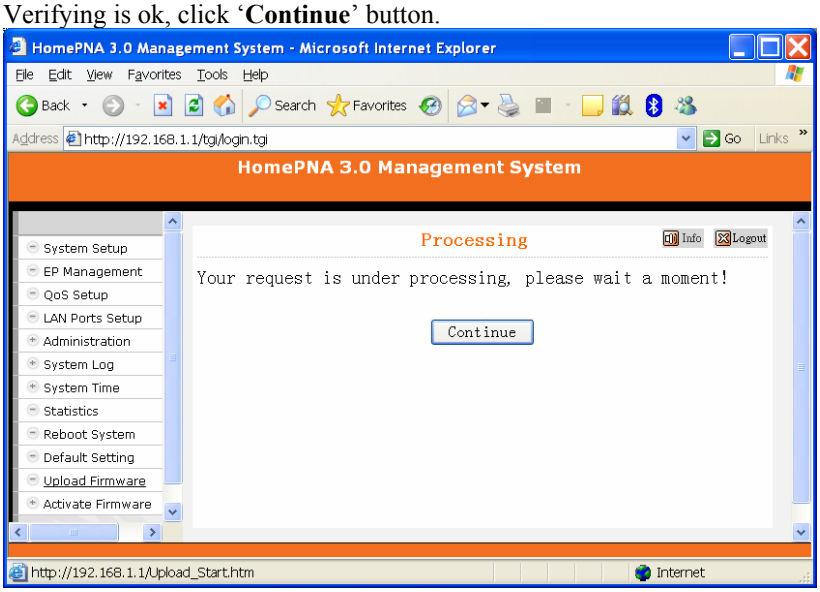
Uploading in progress,



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

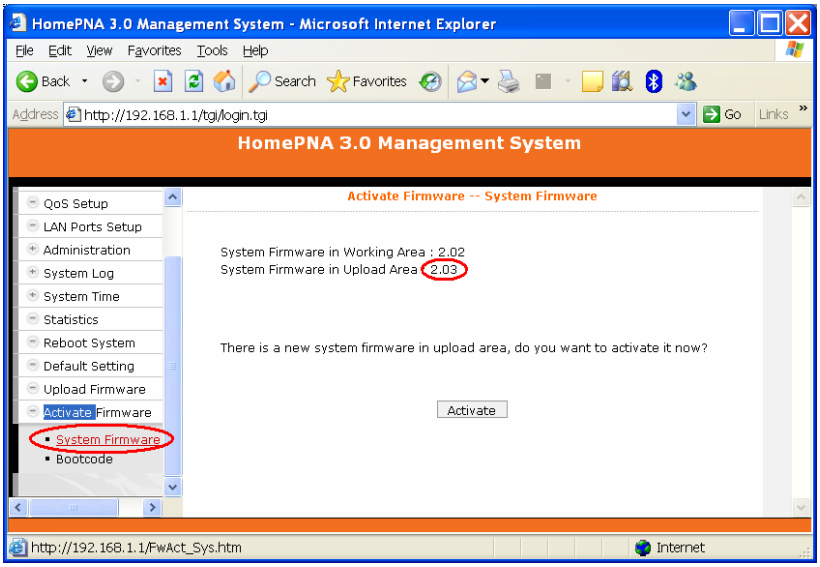


Verifying is ok, click '**Continue**' button.

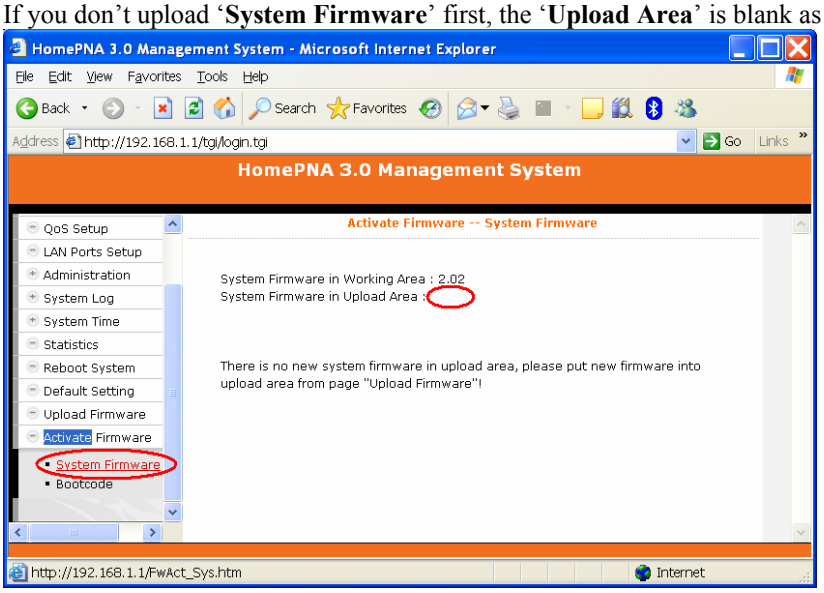


Check the New System Firmware in 'Upload Area'

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 '**2.03**'.

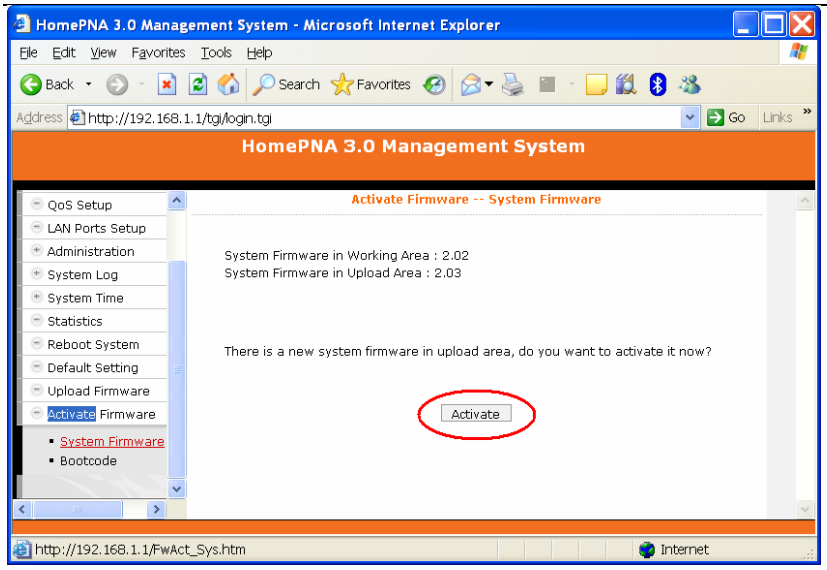


If you don't upload '**System Firmware**' first, the '**Upload Area**' is blank as following,

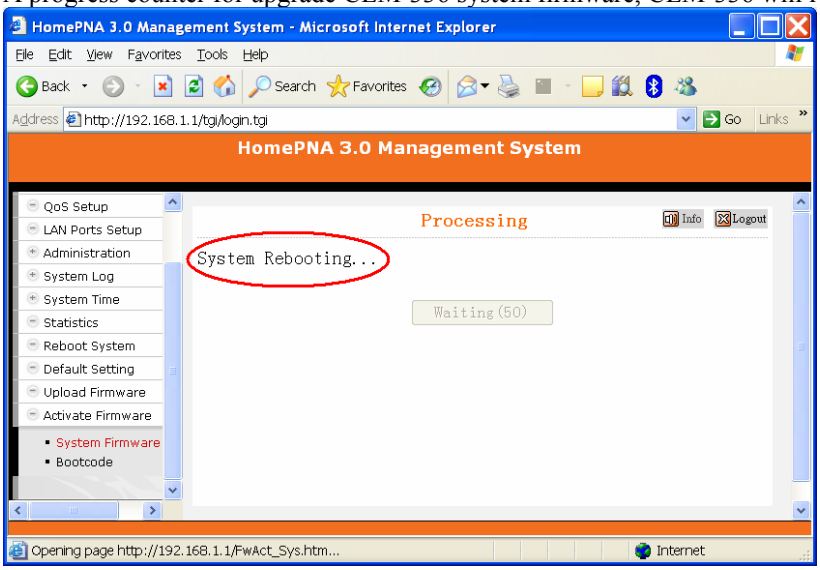


Activate the New System Firmware

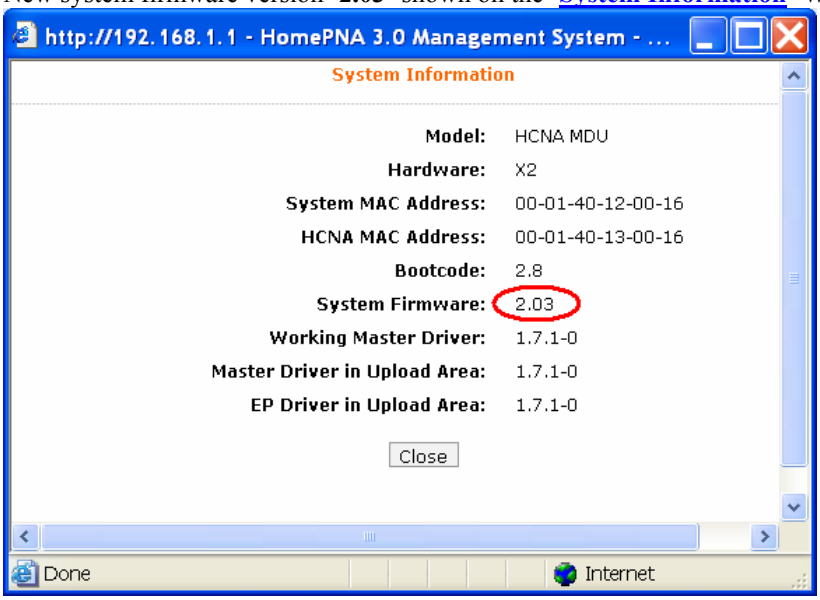
Click '**Activate**' button in the '**System Firmware**' Window will do the real upgrade and replace the old '**System Firmware**' (**OS**),



A progress counter for upgrade CEM-336 system firmware, CEM-336 will reboot after upgrade is completed,



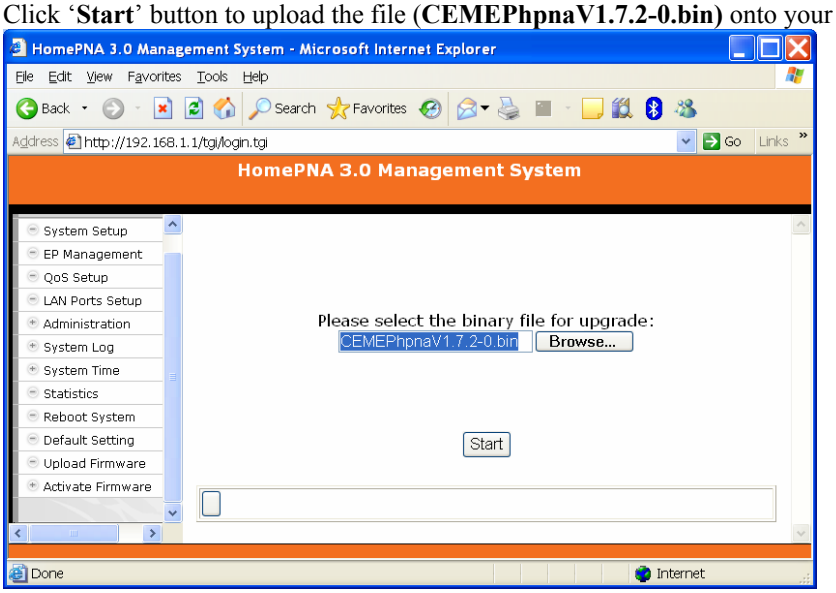
New system firmware version '**2.03**' shown on the '**System Information**' Window,



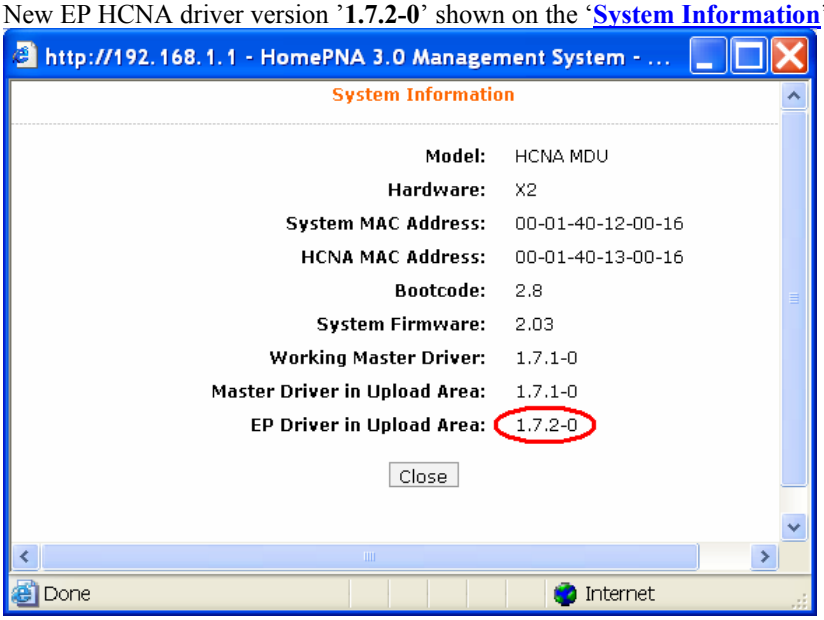
EP HCNA Driver

Upload the New EP HCNA Driver

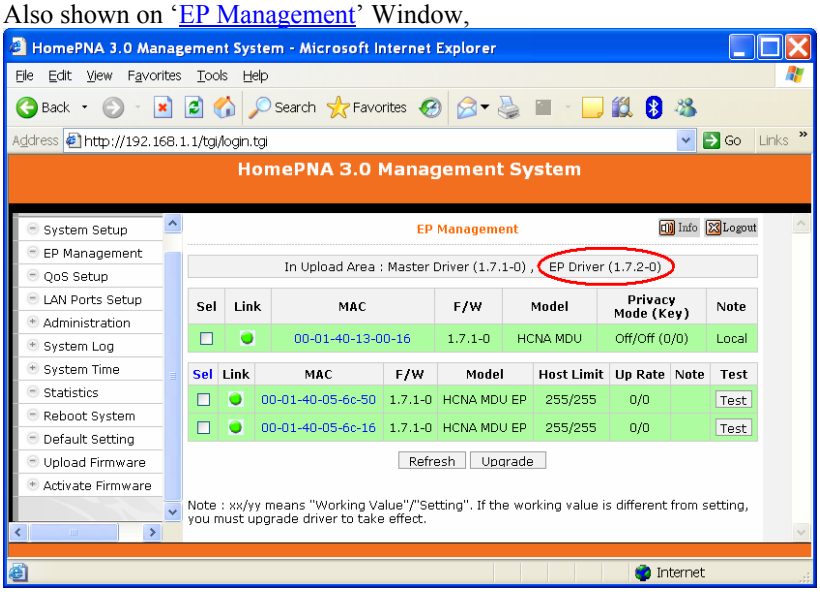
Start from the '**Upload Firmware**' Window as upload new system firmware…
Click '**Start**' button to upload the file (**CEMEPhpnaV1.7.2-0.bin)** onto your CEM-336**,**



New EP HCNA driver version '**1.7.2-0**' shown on the '**System Information**' Window,

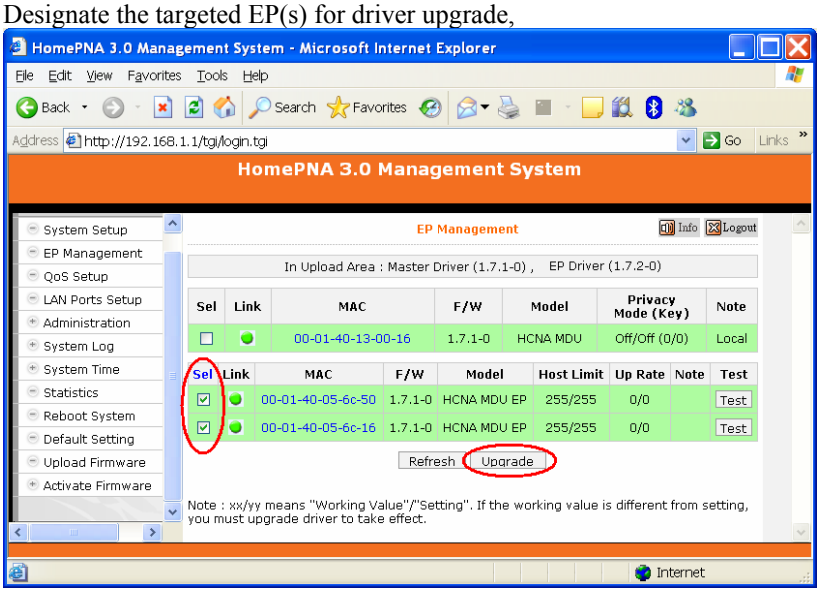


Also shown on 'EP Management' Window,

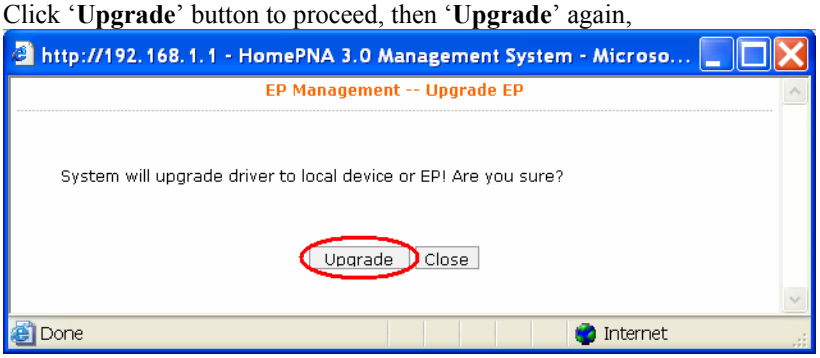


Upgrade EPs with the New EP HCNA Driver

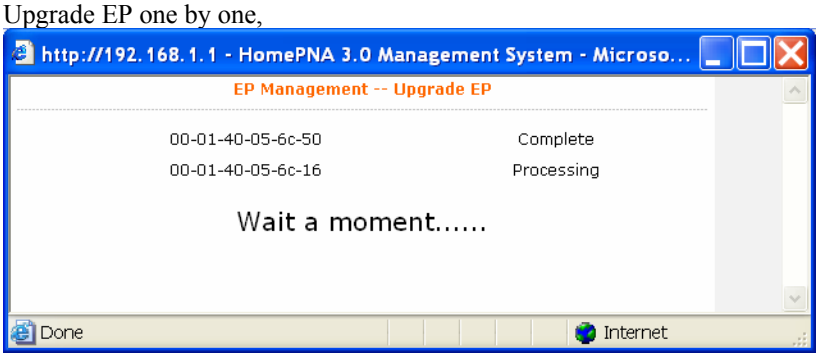
Designate the targeted EP(s) for driver upgrade,



Click '**Upgrade**' button to proceed, then '**Upgrade**' again,

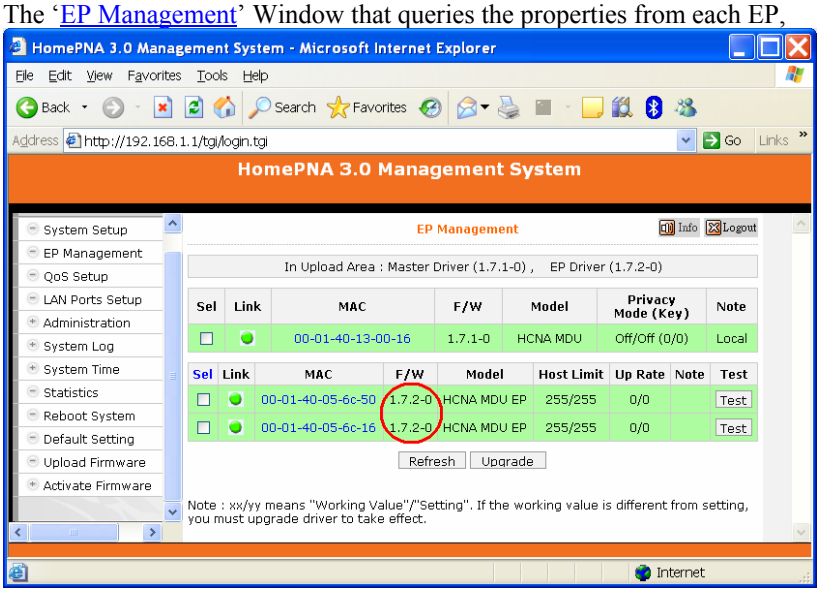


Upgrade EP one by one,



EP runs the New HCNA Driver

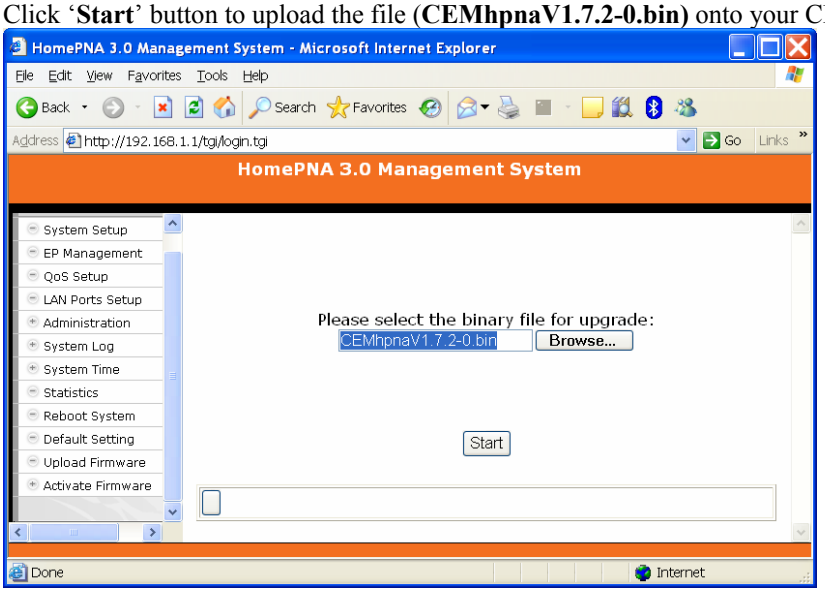
The 'EP Management' Window that queries the properties from each EP,



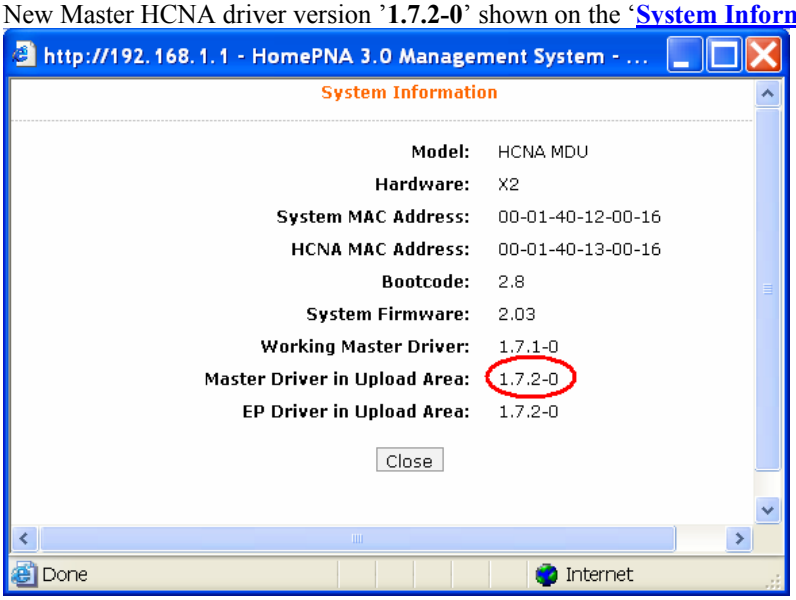
Master HCNA Driver

Upload the New Master HCNA Driver

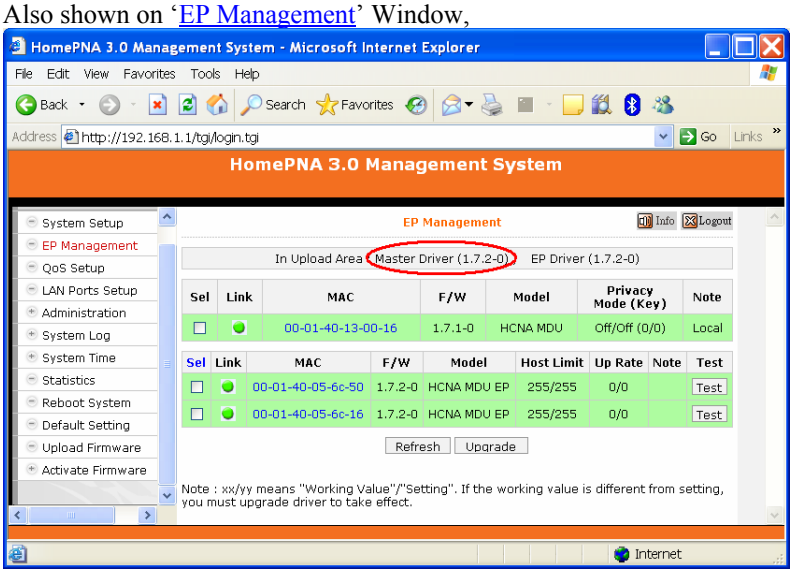
Start from the '**Upload Firmware**' Window as upload new system firmware…
Click '**Start**' button to upload the file **(CEMhpnaV1.7.2-0.bin)** onto your CEM-336**,**



New Master HCNA driver version '**1.7.2-0**' shown on the '**System Information**' Window,

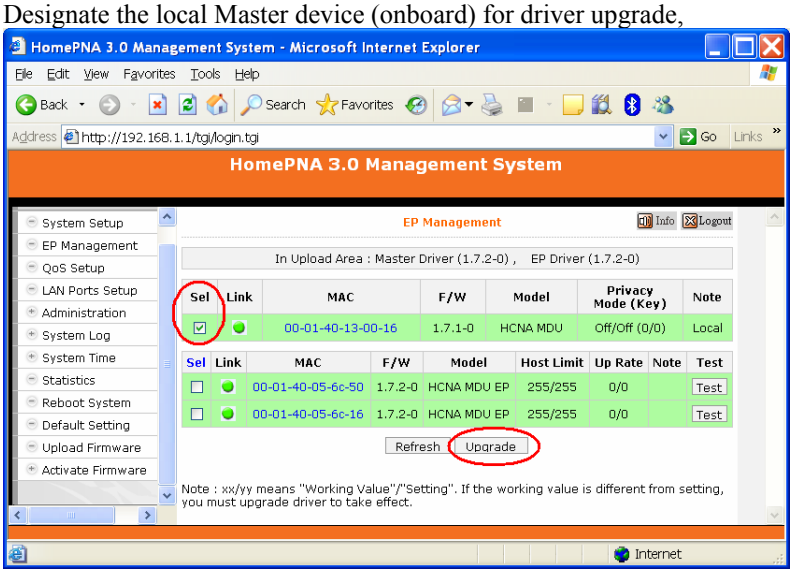


Also shown on 'EP Management' Window,

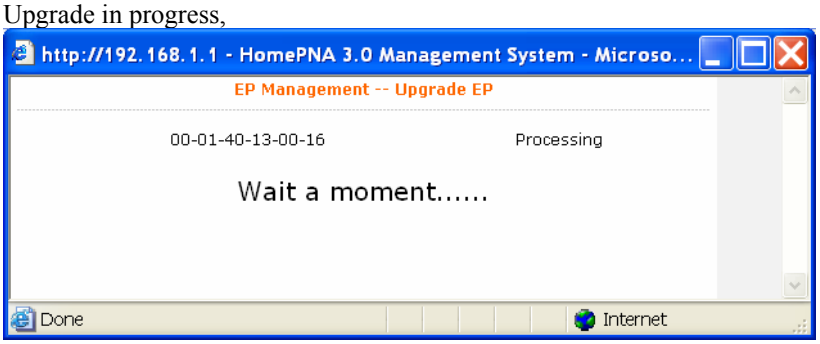


Upgrade Master with the New Master HCNA Driver

Designate the local Master device (onboard) for driver upgrade,

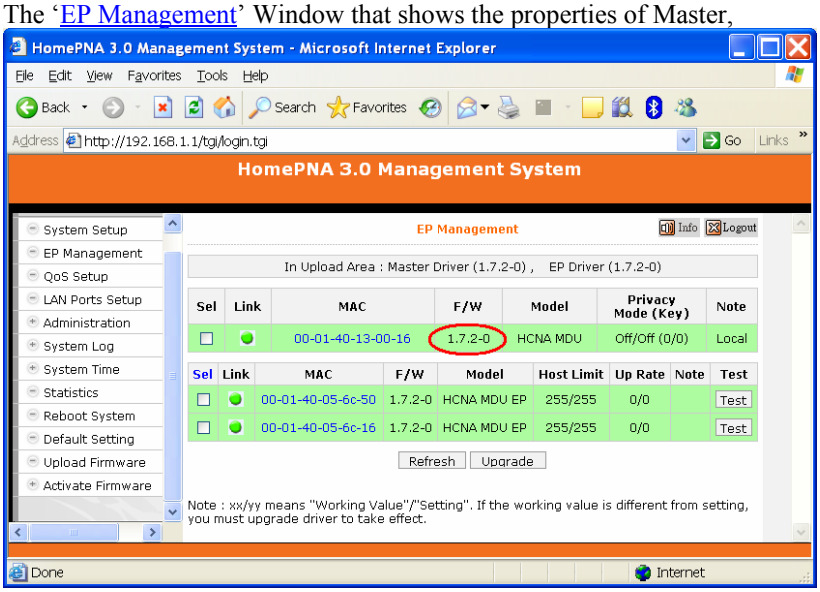


Upgrade in progress,



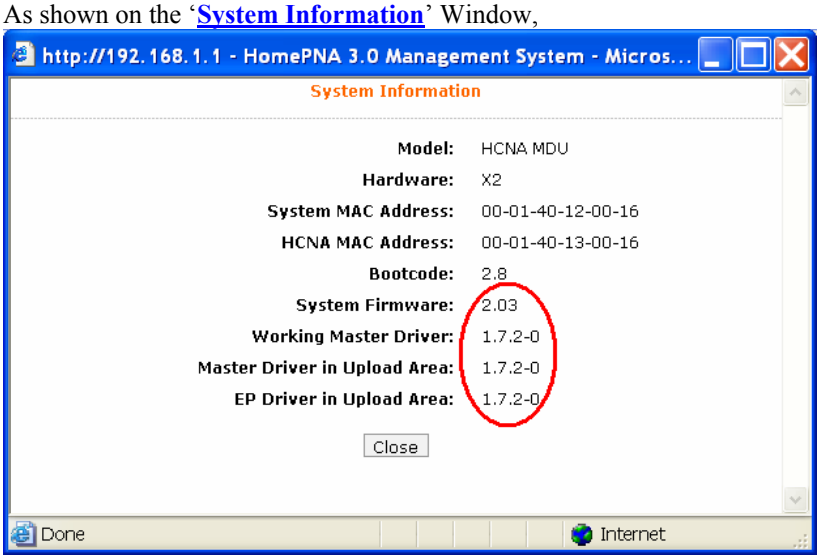
Master runs the New HCNA Driver

The 'EP Management' Window that shows the properties of Master,



System Firmware and HCNA Driver Versions after Upgrade

As shown on the '**System Information**' Window,



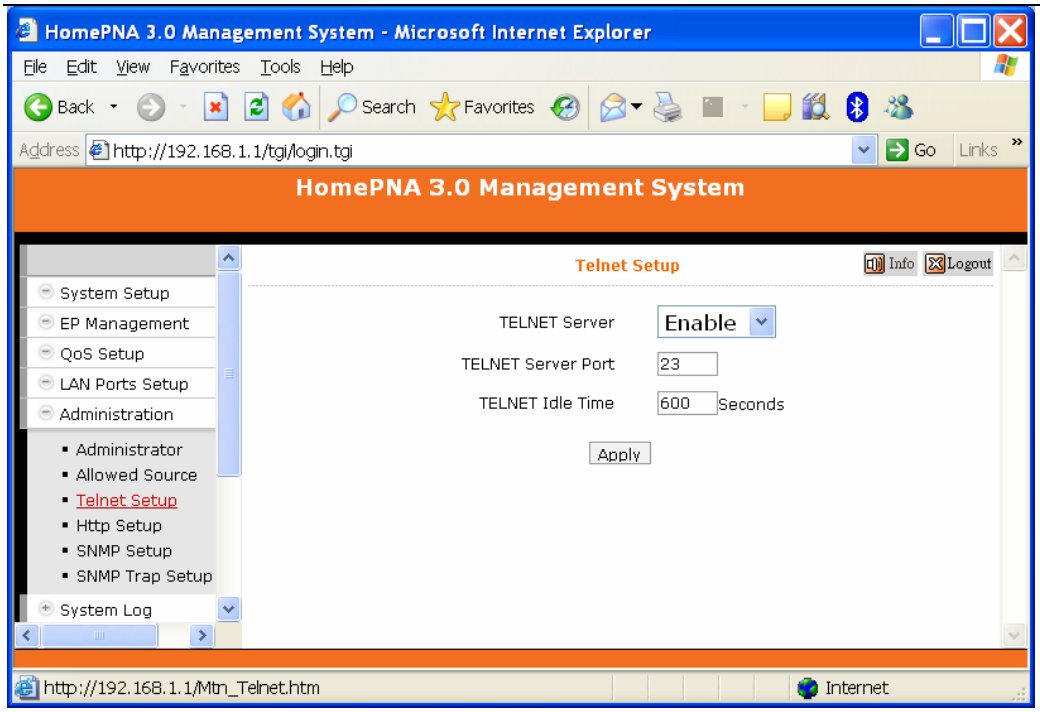
Use Telnet

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
hpnareboot   - 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
sntp         - config sntp 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 by 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'. For example,'00-01-40-13-03-36'.

<ip> IPv4 address, format in 'nnn.nnn.nnn.nnn where n=0~9'. For example, '192.168.1.1'. Also applicable for **<mask>**, **<default gateway>**

<interface> Network interface name, '**eth0**' for LAN interface, '**hpna0**' for HCNA interface.

<fid> Flash ROM file id represented different firmware/driver, 'n where n=0~6',
'n=0': System bootcode (bootloader)
'n=1': System firmware (OS)
'n=2': Master HCNA driver
'n=3': EP HCNA driver

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
dconfig		Dump all configurations/settings.
default		Reset all settings to factory default, except Password.
diag	-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

dir		Show detail file information resides in flash ROM. Include 'Working Area' and 'Upload Area', refer Figure 4. The listed filenames are, 'bootcode': bootloader 'sysfw': system firmware 'HcnaMduM': Master HCNA driver 'HcnaMduEp': EP HCNA driver 'diagsw': utility file for diagnosis Accompanying file's date, size, version.
dns	[-s <pri/sec> <ip>]	Display or setup DNS server setting. -s pri <ip>: setup Primary DNS server's IP -s sec <ip>: setup Secondary DNS server's IP
exit		Close the Telnet console.
quit		Close the Telnet console.
ep	[-c <hostcnt>] [-n <note>] [-u <uprate index>] <mac>	Setup the EP Properties Profile related setting values. Use command 'upep' to take effect on EP. (replace the working values with the setting ones) <hostcnt>: EP Host Limit setting value (0~255), default 255 <note>: EP Note setting value <uprate index>: EP Up Rate setting value (0~1500, *64Kbps), default 0 for unlimited <mac>: designated EP MAC to configure
filter	[-s <set> [-c <act/deact>] [-a <ip> -m <mask>] [-t <allow/deny>] [-w <allow/deny>] [-n <allow/deny>] [-p <allow/deny>]]	Display or setup the filter rule set, refer the section "Allow Source" 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
help		Display all commands with brief description
hpnareboot		Reset Master HCNA device'
ipconfig	[-a <ip> -m <mask> -g <default gateway>]	Display or setup system IP network, include IP address <ip>, subnet mask <mask>, and default gateway <default gateway>.
logserver	[-s <set> [-c <act/deact>] [-a <ip> -v <severity>]]	Display or setup Unix-like **Syslog** servers(max 5 set) <set>: server index, at most 5 servers (0~4) <act/deact>: activate or de-activate the server with IP address <ip> <severity>: select the severity level, refer section "System Log", default level 6 (info)
master	-k <on/off/key(0x…)>	Setup Master HCNA device Privacy Mode and Privacy Key setting values. Use command 'upmaster' to take effect on Master device. (replace the working values with the setting ones) <on/off>: set 'Privacy Mode' to ON or OFF, default OFF <key(0xnnnn)>, n is 0~F: 4-digit 'Privacy Key' in hexadecimal, default 0x0
passwd	[name] -o <oldpasswd> -n <newpasswd>	Change user's password, user can update its own password. Only superuser has the privilege to rewrite other's password, [name]: user's account name, default to current login name if not supplied <oldpasswd>: old password, superuser can bypass this parameter <newpasswd>: new password

ping	[-n <count>] [-w <timeout>] [-l <pktlen>] address	ICMP ping function, <count>: number of ping requests(max 65535) <timeout>: expiry timer in each reply(1~60 sec) <pktlen>: sent packet length(64~1500) address: target IP address
reboot		Reboot system, exclude Master HCNA device.
rmep	<mac>	Remove designated EP Properties Profile. <mac>: EP MAC <mac> to be removed
service	[-s <telnet/http> [-c <on/off>] [-p <port)>] [-t <idle>]]	Display or setup Telnet and Http service. <telnet/http>: configure Telnet or Http <on/off>: enable or disable this service <port>: TCP port number (0~65535) <idle>: expiry timer to logoff automatically (0~32767 sec) default 300 seconds
showep	[-f] [-n <note>] [-m <mac>]	Display EP connection status and properties, and check if it matches the stored Properties Profile in CEM-336. -f: force to re-scan all connected EPs -n: display EP with matched <note> -m: display EP with MAC address <mac>
showlog		Display the (Syslog) logged messages.
showmaster		Display Master HCNA information, include driver version, properties(Privacy Mode, Privacy Key)
snmp	[-c <act/deact>] [-p <port>] [-n <name>] [-t <contact>] [-l <location>] [-r <rcomm>] [-w <wcomm>]	Display or setup basic SNMP system configuration. <act/deact>: activate(enable) or de-activate(disable) SNMP agent <port>: SNMP UDP port number (0~65535), default 161 <name>: SNMP system name <contact>: SNMP system contact information <location>: SNMP system location information <rcomm>: SNMP system read-only community name, default 'public' <wcomm>: SNMP system read-write community name, default 'private'
snmptrapserver	[-s <set> [-c <act/deact>] [-p <port>] [-a <ip>] [-m <community>]]	Display or setup 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'
snmptrapsetup	[-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
sntp	[-c <act/deact>] [-r <refresh time>] [-z <time zone>] [-s <set> -a address]	Display or setup SNTP configuration for System Time. <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
stat	[-r]	Display port statistics, include LAN1/LAN2/HCNA. -r: reset all port statistics counter to 0
swconfig	[-p <lan1/lan2> [-s <auto /10h /10f /100h /100f>]]	Display or setup Ethernet port LAN1/LAN2 properties. <lan1/lan2>: configure LAN1 or LAN2 port <auto>: auto-negotiation mode <10h>: 10Mbps, half-duplex mode

		<10f>: 10Mbps, full-duplex mode <100h>: 100Mbps, half-duplex mode <100f>: 100Mbps, full-duplex mode
swqos	[-q <queue> [-w <weight>] [-d <discard mode>]]	Display or setup the QoS configuration, include priority queue, service weight and discard ratio while congestion, refer Priority 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), defaut 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 Priority for more.
swqostc	[-s <set> [-c <act/deact>] [-p <port> -q <queue>]]	Display or setup 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)
tftp	-s <ip> -c <get/put> -f <file>	Run TFTP client to get file (upload file onto CEM-336) or to put file (retrieve file from CEM-336) from TFTP server IP <ip>. <get/put>: run TFTP command 'get' or 'put' <file>: filename
time		Display current System Time.
upep	[-a] [-m <mac>] [-n <note>]	Upgrade EP HCNA driver (stored in Upload Area), this operation also synchronize EP with EP Properties Profile stored in CEM-336, -a: upgrade all on-line EP at once -m: upgrade the EP with matched MAC <mac> -n: upgrade (matched MAC <mac>) EP 'Note' property <note>
upmaster		Upgrade Master HCNA driver (stored in Upload Area), this operation also synchronize Master HCNA device with its setting values in Properties Profile.
upsys		Upgrade the uploaded system firmware (stored in Upload Area), then reboot.
useradd	name -p <password> -r <ro/rw>	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
userdel	name	Delete the management user account by name. name: user name
users		Display all user accounts.

Use SNMP

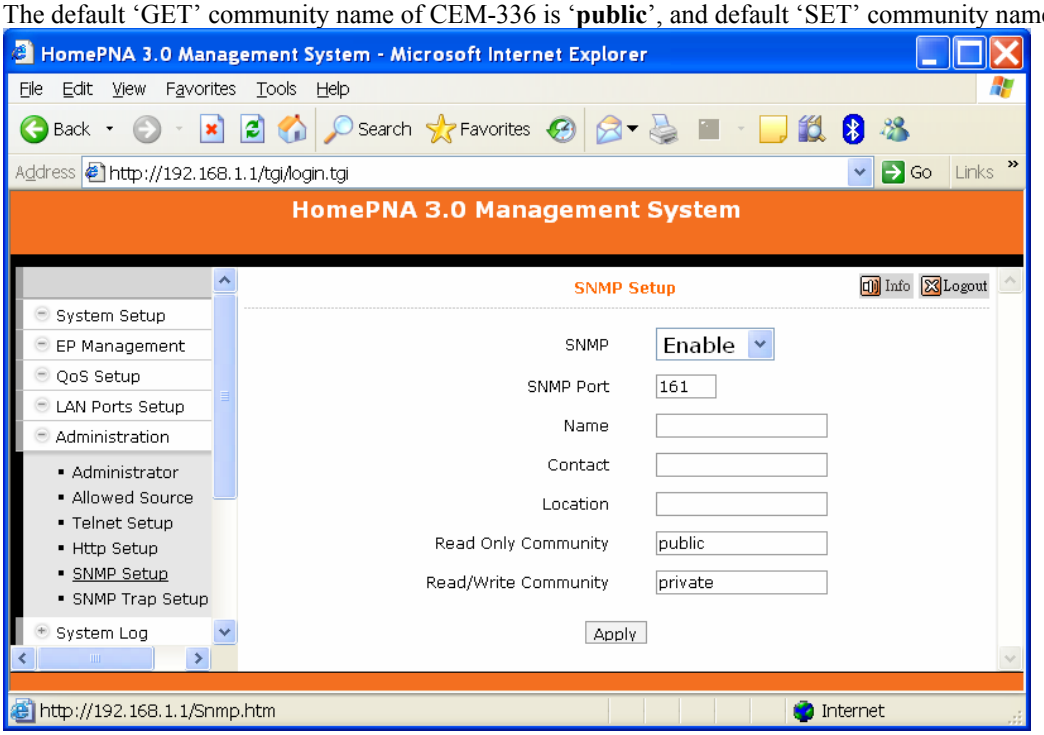
The **SNMP Agent** resides in CEM-336 will handle requests from remote **SNMP Manager**. The CEM-336 SNMP agent supports standard SNMP community-based operations (SNMP V1/V2c) as 'SET', 'GET' and 'TRAP'.

You need to specify the correct **Read-Only Community Name** into bridge before any SNMP 'GET' operation can work. Also setup the **Read/Write Community Name** for SNMP 'SET' operation. 'SET' operation can modify the setting within CEM-336. While 'Get' is read-only operation used to report the requested SNMP data to SNMP manager.

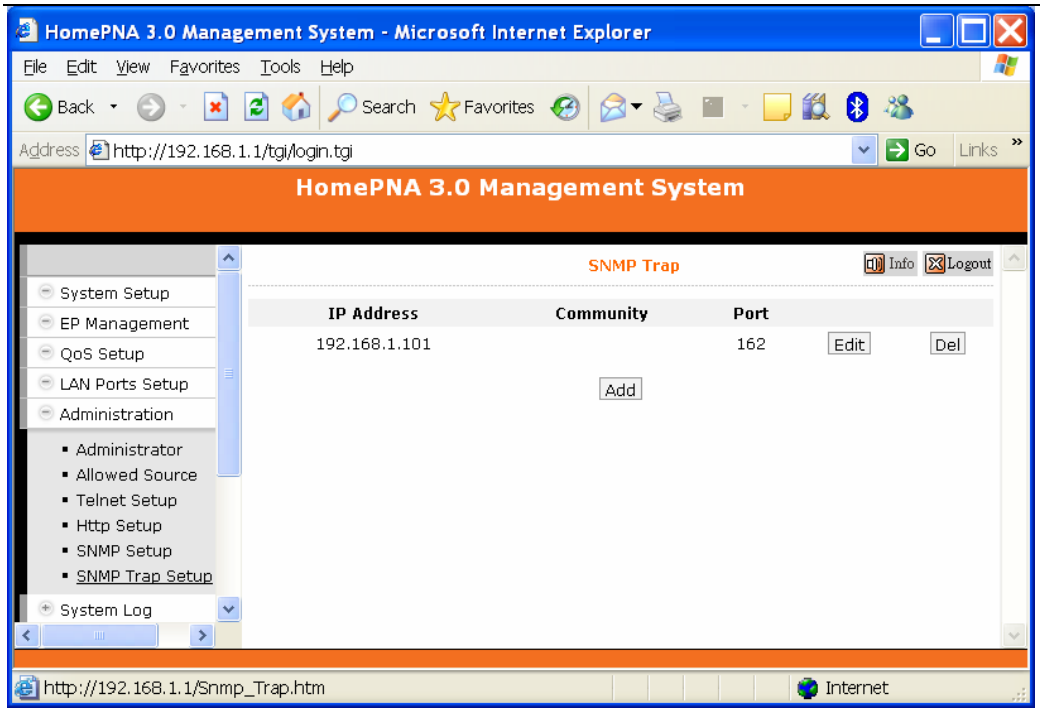
You may need the accompanying proprietary **MIB file** for some popular SNMP/MIB manager software to manage the bridge system. The CEM-336 bridge system may also be integrated into your original SNMP management system by this MIB file.

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-336.

The default 'GET' community name of CEM-336 is '**public**', and default 'SET' community name is '**private**'.



For the following example, the '**TRAP Server'** with IP address '**192.168.1.101**' will capture all traps emitted from CEM-336 SNMP agent,


HomePNA 3.0 Management System - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites
Address http://192.168.1.1/tgi/login.tgi
Go Links
HomePNA 3.0 Management System
SNMP Trap
Info Logout
System Setup
EP Management
QoS Setup
LAN Ports Setup
Administration
Administrator
Allowed Source
Telnet Setup
Http Setup
SNMP Setup
SNMP Trap Setup
System Log
IP Address
Community
Port
192.168.1.101
162
Edit
Del
Add
http://192.168.1.1/Snmp_Trap.htm
Internet

4

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-336 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-336 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-336 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-336, you can assign higher priority for total 8 different TCP/UDP protocols.

A

SPECIFICATIONS

NETWORK INTERFACE

- HomePNA3.0 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
- Password for Access Protection
- QoS Support for 802.1p, IP TOS, UDP/TCP Protocols
- Upgrade HCNA Driver onto Endpoint
- Enable/Disable Endpoint

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 CET-330)
- Support up to 15 Endpoints
- Enable/Disable Endpoint
- Limited Host (PC) Number/Upload Bandwidth on Each Endpoint
- Upgrade HCNA Driver onto Endpoint
- Max Attenuation between Endpoints: 55dB

POWER REQUIREMENT

- 5V DC Input
- Power Consumption : < 4Watts

ENVIRONMENTAL CONDITION

- Operation: 0 ℃– 55 ℃ (32 – 131 ℉)
- Storage : -10℃ – 65 ℃ (14 – 149 ℉)
- Humidity : 10% – 95% Non-condensing

PHYSICALS

- Dimensions: 160 x 116 x 30 mm
- Weight: 260g