Figure 106: Service Profile HARQ Profile

The main grouping sections are:

- **Key settings**. This simply displays:
  - **Profile #**
- **Hybrid ARQ Profile**. This displays all that the available configuration parameters . These are:
  - **Name**. This is the profile name and it is a text field
  - **Description**. This is the profile description and it is a text field.
  - **Enable**. This is a check box to enable/disable the HARQ profile.
  - **Channel-mapping.** This is the HARQ Map Length. This is assigned as a number in the range 0 to 16 with a default of 4.
  - **Num-retires.** This is the HARQ Number of Retries. This is assigned as a number in the range 0 to 16 with a default of 1.
  - **Pdu-sn-support.** This is the HARQ PDU SN Support. The options are none, short (default) and long.

The System is pre-configured with 6 default profiles. If the User wants to add any of their own configurations, they must delete a profile before they can add and configure a new one.

When in Edit mode, the User is presented with (refer to **Figure 107**):

- **<Add harq-profile>.** If the User selects this option and there is available profile to be added then they can simply add and then they will be dropped directly into the configuration window.
- A List of all the profiles with a red box beside each profile. If the User navigates to the red icon then this will present the User with the ability to delete the profile.
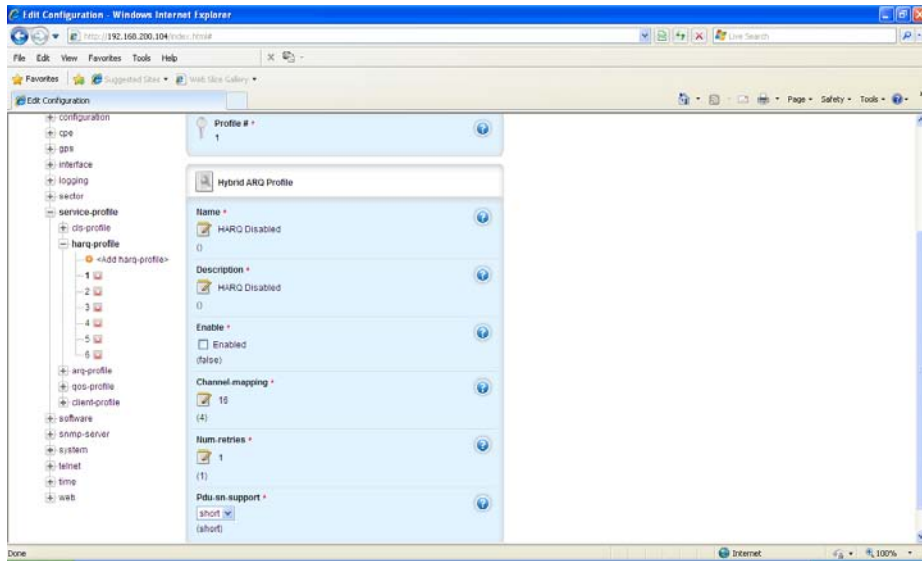
Figure 107: Service Profile HARQ Profile Edit Capability

3.5.5.3 ARQ Profile

At Main Web GUI Interface Screen select the *Configuration* Tab, then the **service-profile** Main Menu option and then the **arq-profile** Main Menu Sub-Element*.* This User is presented with all the 3 pre-configured default profiles. To physically view all the profile configuration parameters then the User must actually select a profile and two main grouping sections are presented (refer to Figure 108).
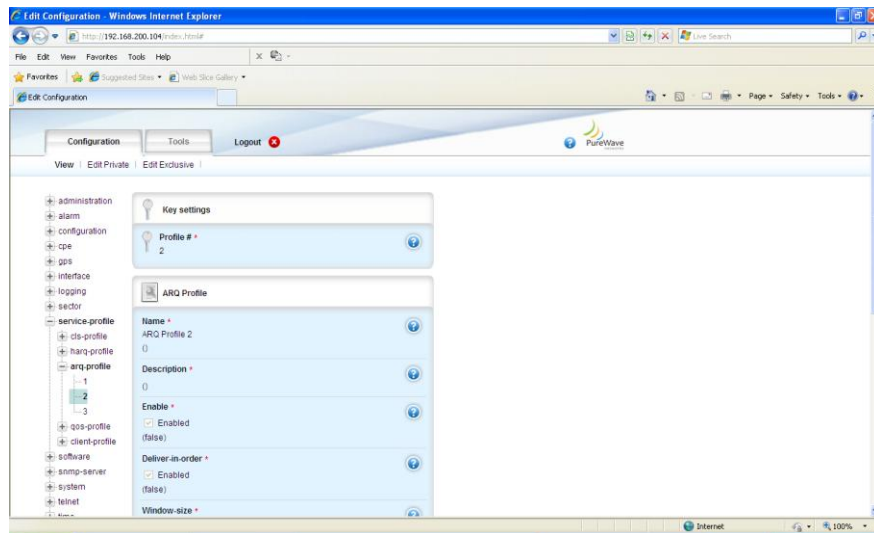

Figure 108: Service Profile ARQ Profile

The main grouping sections are:

- **Key settings**. This simply displays:
  - **Profile #**
- **ARQ Profile**. This displays all that the available configuration parameters. These are:
  - **Name**. This is the profile name and it is a text field
  - **Description**. This is the profile description and it is a text field.
  - **Enable**. This is a check box to enable/disable the ARQ profile.
  - **Deliver-in-order.** This is a check box to enable/disable the ARQ deliver in order option.
  - **Window-size.** This is the ARQ Window Size. This is assigned as a number in the range 1 to 1024 (default).
  - **Timeout-tx-delay.** This is the ARQ Transmit Retry Timeout Delay. This is assigned in units of 5msec in the range 0 to 1310 with a default of 5 (25msec).
  - **Timeout-rx-delay.** This is the ARQ Receive Retry Timeout Delay. This is assigned in units of 5msec in the range 0 to 1310 with a default of 5 (25msec).
  - **Block-lifetime.** This is the ARQ Transmit Retry Timeout Delay. This is assigned in units of 5msec in the range 0 to 1310 with a default of 5 (25msec).
  - **Sync-loss.** This is the ARQ Sync Loss Timeout. This is assigned in units of 5msec in the range 0 to 1310 with a default of 120 (600msec).
  - **Purge-timeout.** This is the ARQ Purge Timeout. This is assigned in units of 5msec in the range 0 to 1310 with a default of 32 (160msec).
  - **Block-size.** This is the ARQ Block Size. The options are 16, 32, 64, 128 (default), 256, 512 and 1024.
  - **Ack-processing-time.** This is the ARQ Acknowledge Processing Time. This is assigned as a number in msec in the range 0 (default) to 255.

The System is pre-configured with 6 default profiles. If the User wants to add any of their own configurations, they must delete a profile before they can add and configure a new one.

When in Edit mode, the User is presented with:

- **<Add arq-profile>**. If the User selects this option and there is available profile to be added then they can simply add and then they will be dropped directly into the configuration window.
- A List of all the profiles with a red box beside each profile. If the User navigates to the red icon then this will present the User with the ability to delete the profile (refer to Figure 109).
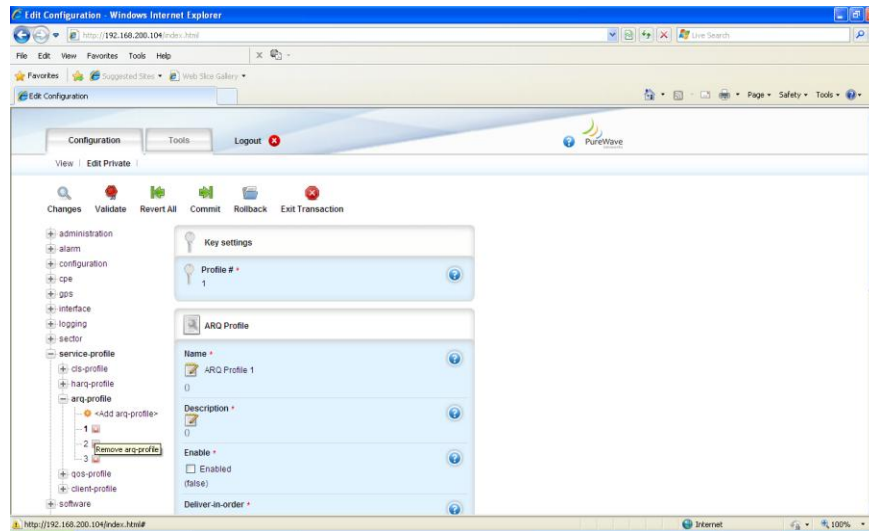
Figure 109: Service Profile ARQ Profile Edit Capability

3.5.5.4 Quality of Service, QoS Profile

A QoS Profile contains all information in regards to QoS type, latency, throughput and etc. These Profiles are independent of direction and can be applied to multiple service flows. The types of QoS that are offered are:

- Best Effort or BE. Alternatively this is described as MIR or Maximum Information Rate.
- Unsolicited Grant Service or UGS. An alternative for this is CIR or Committed Information Rate.
- Extended Real-Time Polling Service or eRTPS. This is also known as Dynamic CIR.

Best Effort is by far the most commonly used QoS type that is configured in the majority of deployments. It is bursty in nature and provides for up to a maximum rate. As an example, it could provide for internet speeds of up to 3 Mbps. The disadvantage of a Best Effort Service is that it does not provide any guarantee that the configured throughput will be achieved. A Base Station will offer throughput to BE configured Subscribers as long as there is bandwidth available and there are no other CIR configured Subscriber demanding throughput

Unsolicited Grant Service connections provide for a dedicated and guaranteed Service Level Agreement. It is typically used for applications that require constant bit rate services such as VoIP. Any traffic assigned to a UGS service flow will be allocated for the sole use by that Subscriber. The allocated traffic for this UGS will be removed from the available 'pool' of throughput for the Base Station to which the Subscriber has been configured. UGS connections typically provide low latency which is ideal for VoIP applications.

Extended Real-Time Polling Service is a QoS type that is very similar to UGS. Traffic is allocated for the sole use by a Subscriber CPE but only when the Subscriber CPE requests traffic. However, when traffic is

not being requested by the Subscriber, the allocated eRTPS bandwidth can be used by any other Subscriber. The eRTPS is the preferred QoS type for VoIP applications due to the dynamic resource control.

There are 16 QoS profiles that have been pre-configured and stored in the Base Station. These can be viewed at the summary level (refer to Figure 110). At Main Web GUI Interface Screen select the **Configuration** Tab and then select the **service-profile** Main Menu Sub-Element**.**

For full examination and configuration of the QoS profiles then the User needs to navigate into the Main Menu Sub-Element level.

Profile #	Name	Description	Max-sustained-traffic-rate	Max-latency	Data-delivery-service	Traffic-priority	Max-traffic
1	Unlimited BE	Unlimited BE	25000000	200	BE_Service	5	0
2	256Kbps BE	256Kbps BE	256000	200	BE_Service	5	0
3	384Kbps BE	384Kbps BE	384000	200	BE_Service	5	0
4	512Kbps BE	512Kbps BE	512000	200	BE_Service	5	0
5	1Mbps BE	1Mbps BE	1024000	200	BE_Service	5	0
6	1.5Mbps BE	1.5Mbps BE	1536000	200	BE_Service	5	0
7	2Mbps BE	2Mbps BE	2048000	200	BE_Service	5	0
8	3Mbps BE	3Mbps BE	3072000	200	BE_Service	5	0
9	5Mbps BE	5Mbps BE	5120000	200	BE_Service	5	0
10	VoIP - G711	VoIP - G711 eRTPS	110000	60	eRTP_Service	5	110000
11	VoIP - G729	VoIP - G729 eRTPS	40000	60	eRTP_Service	5	40000
12	VoIP - G729 x2	VoIP - G729 x2 eRTPS	80000	60	eRTP_Service	5	80000
13	VoIP - UGS	VoIP - G711 Premium UGS	110000	60	UGS_Service	5	110000
14	3MIR/0.5CIR	3MIR/0.5CIR Mbps nRTPS	3072000	200	nRTP_Service	5	0
15	1.5MIR/0.256CIR	1.5MIR/0.256CIR Mbps nRTPS	1536000	200	nRTP_Service	5	0
16	1.5Mbps - RTPS	1.5Mbps RTPS - Streaming	1544000	200	RTP_Service	5	0

Figure 110: Default Quality of Service Profiles

At Main Web GUI Interface Screen select the **Configuration** Tab, then the **service-profile** Main Menu Option and then the **qos-profile** Main Menu Sub-Element**.** This User is presented with all the 16 pre-configured default profiles (refer to Figure 111). To physically view all the profile configuration parameters then the User must actually select a profile and two main grouping sections are presented.
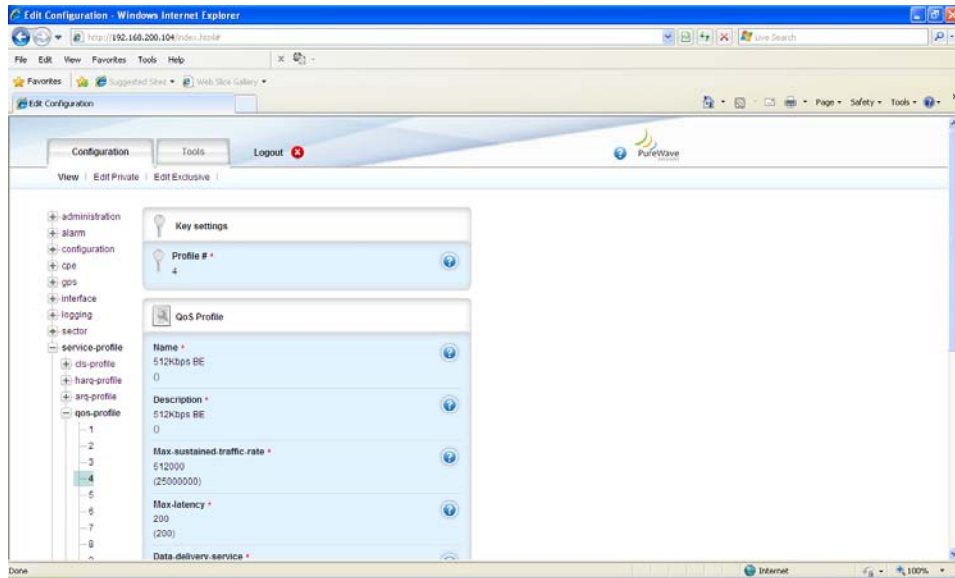
Figure 111: Quality of Service Profiles

The main grouping sections are:

- **Key settings**. This simply displays:
    - **Profile #**
- **QoS Profile**. This displays all that the available configuration parameters. These are:
    - **Name**. This is the profile name and it is a text field.
    - **Description**. This is the profile description and it is a text field.
    - **Max-sustained-traffic-rate**. This is a Maximum Sustained Traffic Rate. This is assigned in bits per second in the range 0 to 4294967295.
    - **Max-latency.** This is a Maximum Latency. This is assigned in milliseconds in the range 0 to 65535.
    - **Data-delivery-service.** This is the Data Delivery Service. The options that are available via a dropdown menu are UGS_Service, RTP_Service, nRTP_Service, BE_Service and eRTP_Service.
    - **Traffic-priority.** This is the Traffic Priority Level. This is assigned as a number in the range 0 (default) to 7.
    - **Max-traffic-burst.** This is a Maximum Traffic Burst Size. This is assigned in bits per second in the range 0 to 4294967295.
    - **Min-reserved-traffic-rate.** This is a Maximum Reserved Traffic Rate. This is assigned in bits per second in the range 0 to 4294967295.
    - **Tolerated-jitter.** This is a Tolerated Jitter. This is assigned in milliseconds in the range 0 to 65535.
    - **Unsolicited-grant-interval.** This is a Unsolicited Grant Interval. This is assigned as a number in the range 0 to 65535.

       o ***Unsolicited-poll-interval.*** This is a Unsolicited Poll Interval. This is assigned as a number in the range 0 to 65535.

The System is pre-configured with 16 default profiles. If the User wants to add any of their configurations, they must delete a profile before they can add and configure a new one.

When in Edit mode, the User is presented with (refer to **Figure 112**):

- ***<Add qos-profile>***. If the User selects this option and there is available profile to be added then they can simply add and then they will be dropped directly into the configuration window.
- A List of all the profiles with a red box beside each profile. If the User navigates to the red icon then this will present the User with the ability to delete the profile.
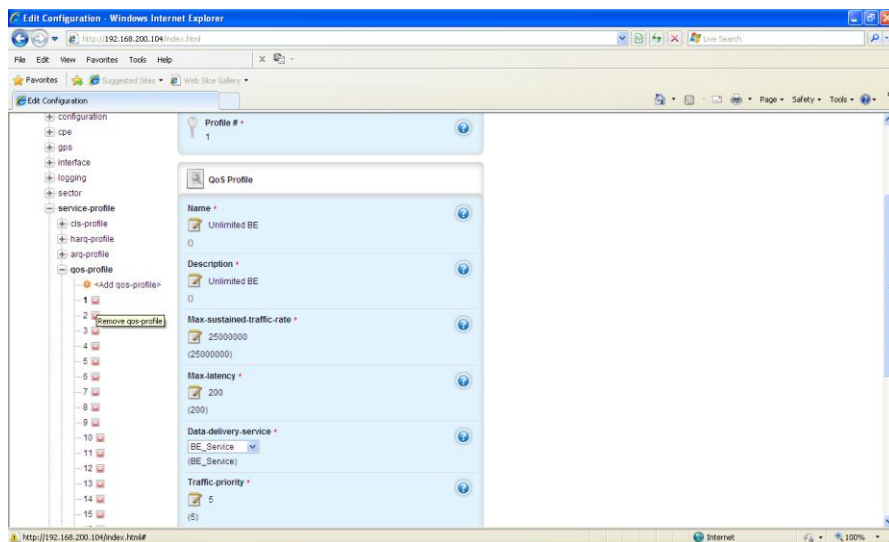

Figure 112: Quality of Service Edit Capability

3.5.5.5 Client Profile

A Client Profile is a set a Service Flows that correspond to a specific Service Level Agreement assigned to a customer. The system is pre-configured with 8 Client Profiles and each Profile must be configured with an Uplink and a Downlink Service Flow. Therefore, each Client Profile supports up to 16 service flows and each service flow is uni-directional.

At Main Web GUI Interface Screen select the ***Configuration*** Tab, then the ***service-profile*** main menu option and then the ***client-profile*** main Menu Sub-Element***.*** This User is presented with all the 8 pre-configured default profiles. To physically view all the profile configuration parameters then the User must actually select a profile and three main grouping sections are presented (refer to **Figure 113**).
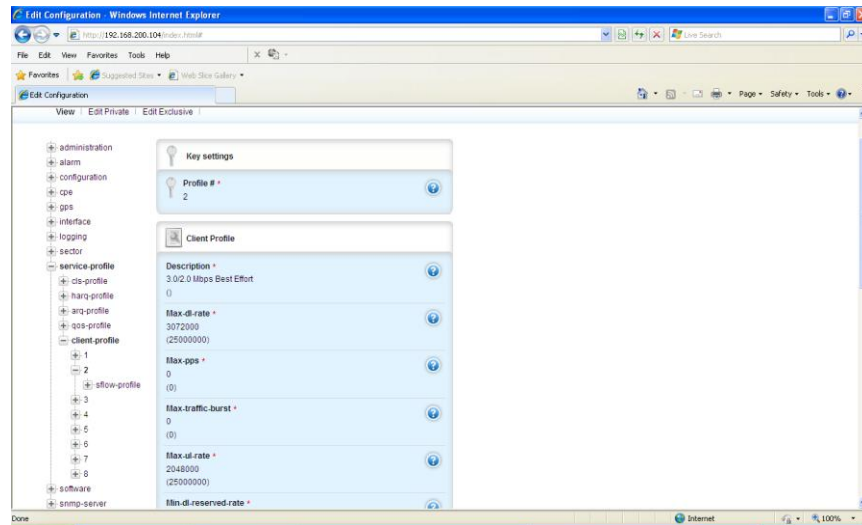
Figure 113: Client Profile

The main grouping sections are:

- **Key settings**. This simply displays:
  - **Profile #**
- **ARQ Profile**. This displays all that the available configuration parameters. These are:
  - **Description**. This is the profile description and it is a text field.
  - **Max-dl-rate**. This is a Maximum Downlink Rate that is reserved for this client. This is assigned in bits per second in the range 0 to 4294967295.
  - **Max-pps.** This is a Maximum Packets per second. This is assigned as a number in the range 0 to 65535.
  - **Max-traffic-burst.** This is a Maximum Client Traffic Burst. This is as a number in the range 0 to 4294967295.
  - **Max-ul-rate.** This is a Maximum Uplink Rate for this client. This is assigned in bits per second in the range 0 to 4294967295.
  - **Min-dl-reserved-rate.** This is a Minimum Downlink Rate that is reserved for this client. This is assigned in bits per second in the range 0 to 4294967295
  - **Min-ul-reserved-rate.** This is a Minimum Uplink Rate for this client. This is assigned in bits per second in the range 0 to 4294967295
  - **Name.** This is the profile name and it is a text field.
  - **Num-sflow.** This is the Number of Service Flows for the Client Profile. This is as a number in the range 1 to 16.
  - **Priority.** This is the Traffic Priority for this Client. This is assigned as a number in the range 1 to 8.
- **Service Flow Profile**. This lists all the Service Flow Profiles. The configurable parameters for each Service Flow Profile are:
  - **Profile #.** This is the number of the Client profile.
  - **Name.** This is the name of the Client profile.

- o **Description.** This is the text description of the Client profile.
- o **Direction**. This is the direction of the traffic flow.
- o **Arq-profile-num.** This is the number of the arq profile that has been assigned for this Client Profile.
- o **Cls-profile-num.** This is the number of the classifier profile that has been assigned for this Client Profile.
- o **Harq-profile-num.** This is the number of the harq profile that has been assigned for this Client Profile.
- o **Qos-profile-num.** This is the number of the QoS profile that has been assigned for this Client Profile.

To define a Client profile then the User must be in the Edit Mode. There are two ways to edit and configure a Client Profile.

(1)   At the Main Web GUI Interface Screen select the **Configuration** Tab, then the **service-profile** Main Menu Option and then the **client-profile** Main menu Sub-Element**.** This User must then select the Client Profile that they wish to configure and scroll down to the bottom of the Window. They will be presented with the Service Flow Profile (refer to **Figure 114**). If the User enters the Edit Mode then at the end of each profile the **Edit** and **Delete** Command Menu Options will appear. The User can select the Edit Command Menu option and they will be navigated into the Edit Mode.
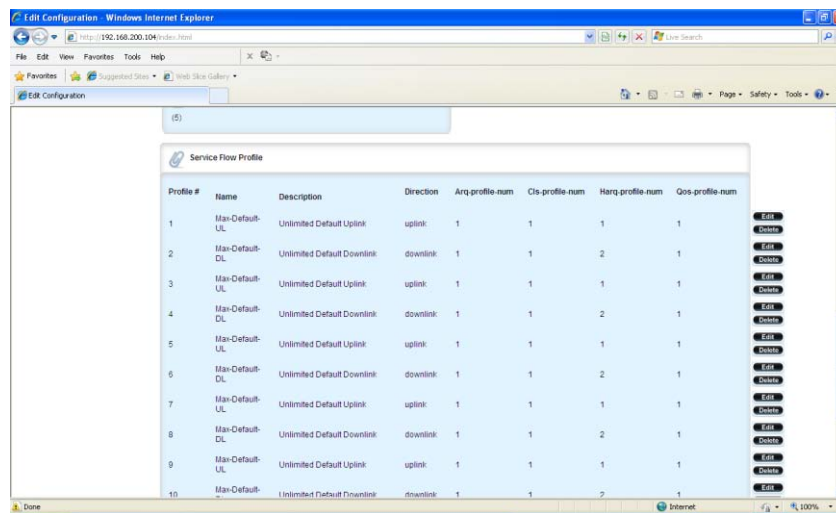

Figure 114: Client Profile Edit Capability

(2)   The User can navigate direct to the Service Flow Profile options. At the Main Web GUI Interface Screen select the **Configuration** Tab, then the **service-profile** Main Menu Option**,** then the **client-profile** Main Menu Sub-Element**,** then the relevant **profile #,** then **sflow-profile** and finally the **relevant profile #.** The User is presented with two main grouping sections. The User must be in Edit Mode to configure any of the parameters (refer to **Figure 115**). When in Edit Mode if the

User navigates to the red icon then this will present the User with the ability to delete the profile.
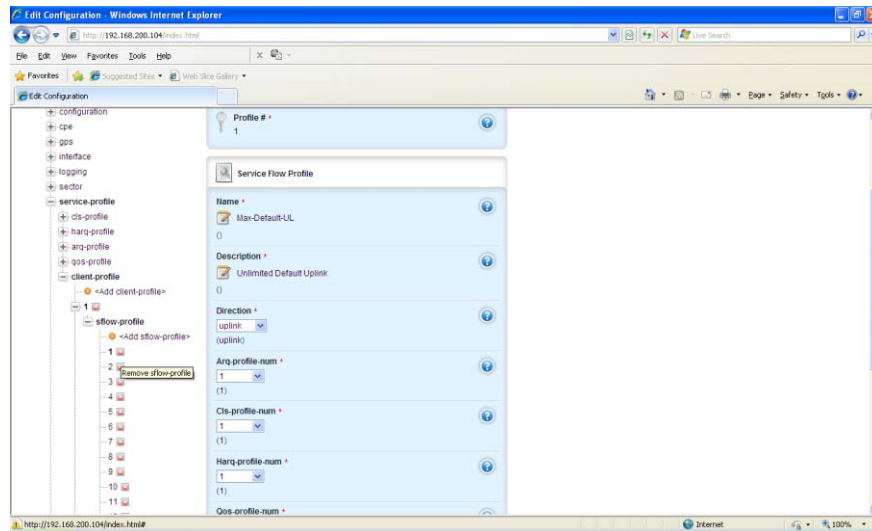

Figure 115: Client Profile Edit Full Capability

The main grouping sections are:

- **Key settings**. This simply displays:
  - **Profile #**
- **Service Flow Profile**. This displays all that the available configuration parameters. These are:
  - **Name**. This is the Service Flow name and it is a text field.
  - **Description**. This is the Service Flow description and it is a text field.
  - **Direction**. This is the direction of traffic flow for the Service Flow. The options are downlink or uplink.
  - **Arq-profile-num.** This is the ARQ Profile Number that is used by this Service Flow. The options are any of the 3 ARQ profiles that have been configured in the ARQ Profile configuration (refer to section 3.5.5.3).
  - **Cls-profile-num.** This is the CLS Profile Number that is used by this Service Flow. The options are any of the 64 CLS profiles that have been configured in the CLS Profile configuration (refer to section 3.5.5.1).
  - **Harq-profile-num.** This is the HARQ Profile Number that is used by this Service Flow. The options are any of the 6 HARQ profiles that have been configured in the HARQ Profile configuration (refer to section 3.5.5.2).
  - **Qos-profile-num.** This is the QoS Profile Number that is used by this Service Flow. The options are any of the 16 QoS profiles that have been configured in the QoS Profile configuration (refer to section 3.5.5.4).

3.6 Base Station Software Upgrade

One of the Base Stations' key features is that it has been designed to support a "Software Defined Radio" (SDR) architecture. The distinct advantage is that a Base Station can be remotely upgraded with additional features and capabilities as these are developed. The Base Station maintains two software versions/images that may be selectively enabled, thus providing a fail-safe software upgrade procedure.

The software upgrade process may be performed from the CLI, the Web Interface, as well as from the PureView EMS. In this section, the software upgrade procedures using the Web Interface is detailed.

The first step in the process is to copy the software to a directory on the PC which is running the FTP server. Please ensure the PureWave directory structure is kept intact. Copy the software image, as provided by PureWave, to the assigned home directory of the FTP server (**Figure 116**).
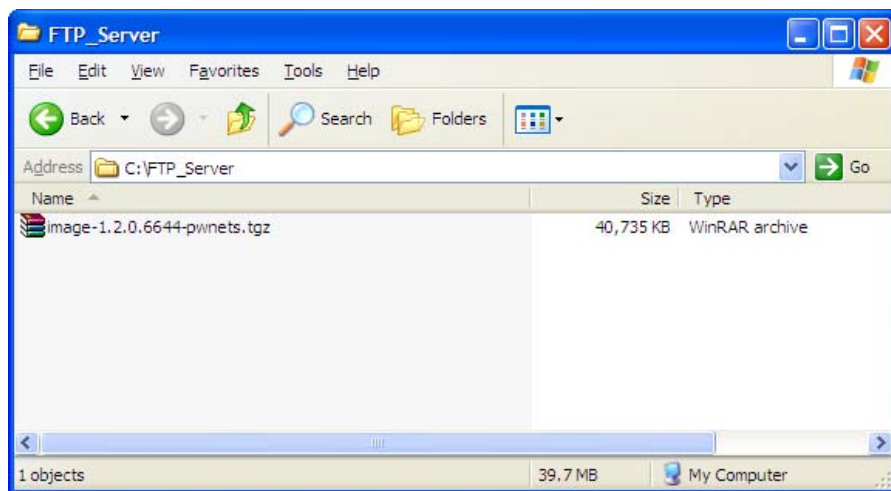

Figure 116: Software Components

The next step is to confirm and setup the FTP Server. There are a number of free commercially available FTP Servers that can be used (refer to **Figure 117**, which is a 3CDaemon). Ensure that the FTP Server is running.
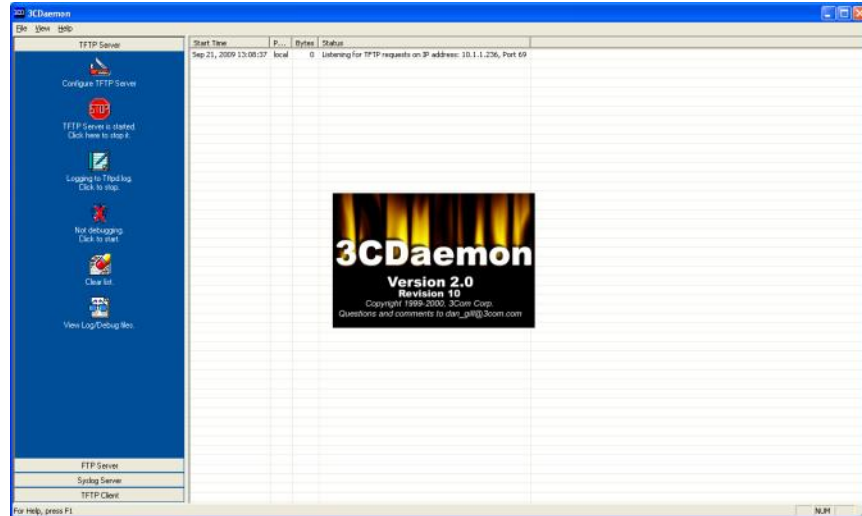
Figure 117: FTP Server Configuration

At the Main Web GUI Interface Screen select the **Configuration** Tab and then the **software** Main Menu Option. This will display the software Settings and the display is split into two main grouping sections. There are three further sub-element associated with this option. There are no User configurable options for the **software** Main Menu Option.

The Base Station flash contains two partitions which are both loaded with software. There is a partition "A" and a partition "B". The GUI will provide an indication as to current status of the software.

The two main grouping sections for this Menu Main Sub-Element are (refer to **Figure 118**):

- **Software Image Management**. This displays the details for each software image. The options are:
    - o **Current Boot.** This indicates which partition provided the current active software load.
    - o **Next Boot.** This indicates after the next reboot of the Base Station, which partition the software will be loaded from.
    - o **Boot Partition A.** This indicates the software revision that is currently loaded into partition A.
    - o **Boot Partition B.** This indicates the software revision that is currently loaded into partition B.
    - o **Sw Version Candidate.** This is not relevant for the current method of software upgrade. It will simply indicate "No Software candidate available".
- **Software Image Status**. This provides an indication of the download status. The options are:
    - o **State Detail.** This will provide an indication of the current state of software upgrade detail.
    - o **Download Progress.** This is a percentage indicator of the state of download progress.
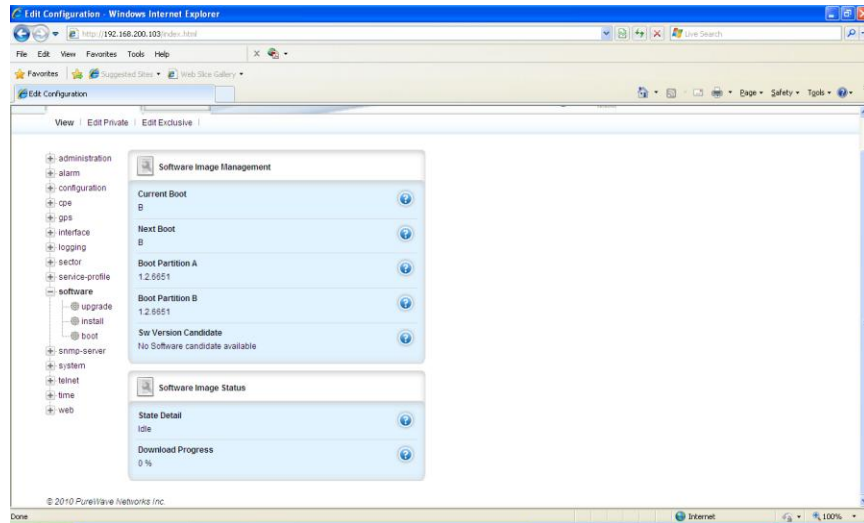
Figure 118: Software Image Management Dialog

3.6.1 Single-Step Software Upgrade

The Base Station software upgrade process can be performed using a single operation. This performs the following procedure while providing continual upgrade status to the User.

(1)   Downloads the software image file from a user defined location using FTP, HTTP, or HTTPS.

(2)   Unpacks the downloaded software image, verifies the image integrity (CRC and MD5 checksum), and prepares for installation.

(3)   Performs a complex set of operations to upgrade the various components of the Base Station.

(4)   Selects the new software image installed in the secondary partition as the partition to be used after the next Base Station reboot.

(5)   Reboots the Base Station.

To execute the Single-Step Software Upgrade Procedure, at the Main Web GUI Interface Screen the **Configuration** Tab, then the **software** Main Menu Option and then the **upgrade** Main Menu Sub-Element**.** The User will be presented with two main grouping sections (refer to Figure 119).

In the **Download, Install, Select Software Image and Reboot** section, enter the URL of the new software image in the **SW Image URL** box. There are a variety of formats of the URL of remote source file is. These can be displayed if the User selects the "help" key. These URL formats are defined as:

- ftp://[user[:password]@]hostname[:port]/filepath
- http://hostname[:port]/filepath
- https://hostname[:port]/filepath

Where [ ] indicates optional items. Thus,

- user:password@ is optional, and the :password part can be omitted
- [:port] is also optional

Examples using ftp (you can substitute http or https):

- ftp://myhost.com/filename
- ftp://myhost.com/directory/filename
- ftp://myhost.com:2323/directory/filename
- ftp://myname@myhost.com:2323/directoryname/filename
- ftp://myname:password@myhost.com:2323/directoryname/filename

URL of remote source file; format is as follows:

- protocol://[user[:password]]@host[:port]/path
- protocol can be ftp, http, or https

Figure 119: Single-Step Software Upgrade Dialog

Once the URL has been entered, the User must select the **Perform** Command Menu Option in the **Download Software Images, install, select and reboot on Base Station** section to initiate the upgrade process. This action will upgrade the Base Station in one simple step. It will:

(1)   Transfer the software to the relevant partition on the Base Station. The software will always be loaded into the non Current Boot partition. For example, if the Current Boot is A, then the software will be loaded into B.

(2)   Write the software into the relevant partition flash. This step will automatically change the next boot option to the other partition from which it currently is. This is of course the partition to which the software has just been downloaded.

(3)   Automatically reboot the Base Station. The reboot will then automatically be loaded from the next boot partition which was changed in step (2) above. This means that the Base Station will now be operational on the software that was just downloaded.

3.6.2 Multi-Step Software Upgrade

The Base Station software upgrade process can also be performed in multiple steps as an alternative to the single step process. This will present the User with better control over the various stages of the software upgrade process.

3.6.2.1 Software Download and Installation

In this procedure the following steps are performed:

(1)   Downloads the software image file from a user defined location using FTP, HTTP, or HTTPS.
(2)   Unpacks the downloaded software image, verifies the image integrity (CRC and MD5 checksum), and prepares for installation.
(3)   Performs a complex set of operations to upgrade the various components of the Base Station.

The first step is the software download and installation procedure. At the Main Web GUI Interface Screen select the **Configuration** Tab, then the **software** Main Menu Option and then the **install** Main Menu Sub-Element**.** The User will be presented with two main grouping sections (refer to Figure 120).

In the **Download and Install Software Images** section, then enter the URL of the new software image in the **SW Image URL** box. There are a variety of formats of the URL of remote source file is. These can be displayed if the User selects the "help" key. These URL formats are defined as:

- ftp://[user[:password]@]hostname[:port]/filepath
- http://hostname[:port]/filepath
- https://hostname[:port]/filepath

Where [ ] indicates optional items. Thus,

- user:password@ is optional, and the :password part can be omitted
- [:port] is also optional

Examples using ftp (you can substitute http or https):

- ftp://myhost.com/filename
- ftp://myhost.com/directory/filename
- ftp://myhost.com:2323/directory/filename
- ftp://myname@myhost.com:2323/directoryname/filename
- ftp://myname:password@myhost.com:2323/directoryname/filename

URL of remote source file; format is as follows:

- protocol://[user[:password]]@host[:port]/path
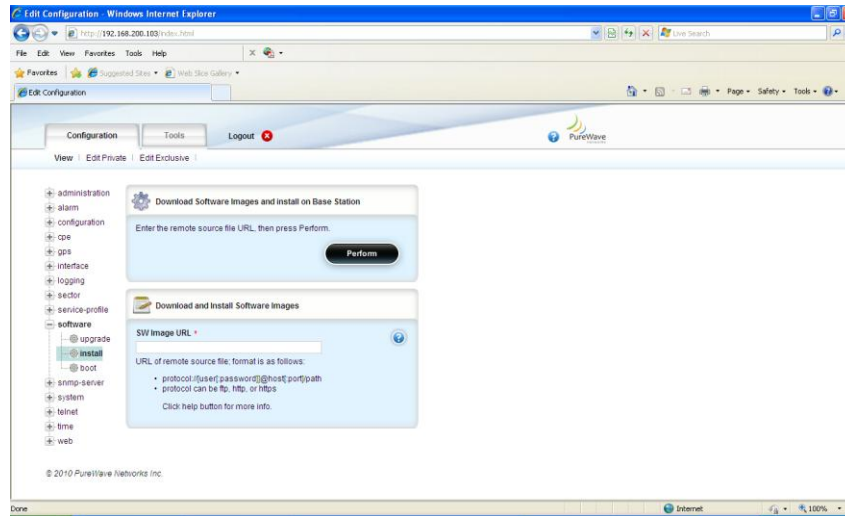- protocol can be ftp, http, or https

Figure 120: Software Download and Installation Dialog

Once the URL has been entered, the User must select the **Perform** Command Menu Option in the **Download Software Images, install, select and reboot on Base Station** section to initiate the upgrade process. This action will upgrade the Base Station in one simple step. It will:

(1)   Transfer the software to the relevant partition on the Base Station. The software will always be loaded into the non Current Boot partition. For example, if the Current Boot is A, then the software will be loaded into B.

3.6.2.2 Software Partition Selection and Display

The final step in the Multiple Step Software Upgrade process is the software partition selection and display procedure.

At the Main Web GUI Interface Screen select the **Configuration** Tab, then the **software** Main Menu Option and then the **boot** Main Menu Sub-Element. The User will be presented with two main grouping sections (refer to **Figure 121**):

- **Select Next SW Image to Boot from**
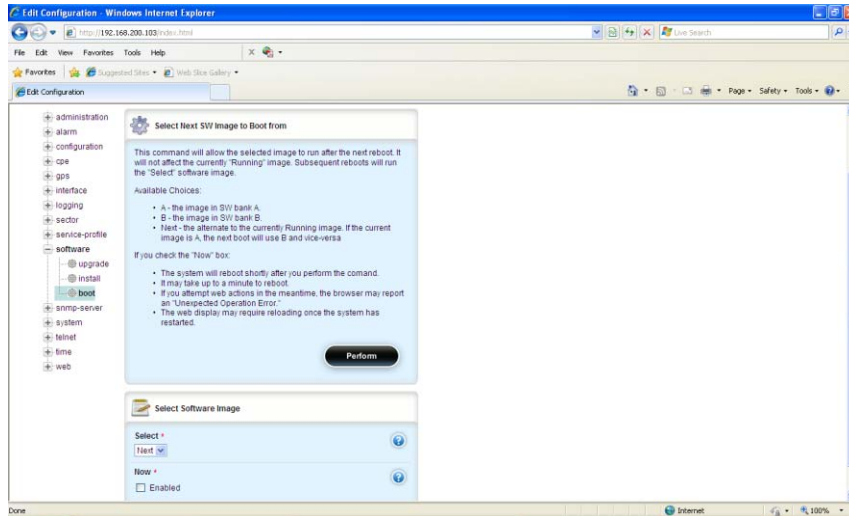- **Select Software Image**

Figure 121: Software Partition Selection and Display

The purpose of the *Select Next SW Image to Boot from* is that this command will allow the selected image to run after the next reboot. It will not affect the currently "Running" image. Subsequent reboots will run the "Select" software image. The available choices are:

- A: The image loaded in software bank A.
- B: The image loaded in software bank B.
- Next: The alternative to the currently "Running " image. If the current image is A, the next boot will use B and vice versa.

The User needs to scroll down to the Select Software Image grouping and thus select what actions they wish to take (refer to **Figure 122**). The User does not need to be in Edit Mode within this menu option.

- **Select**. The options to select here are:
    - Next
    - B
    - A
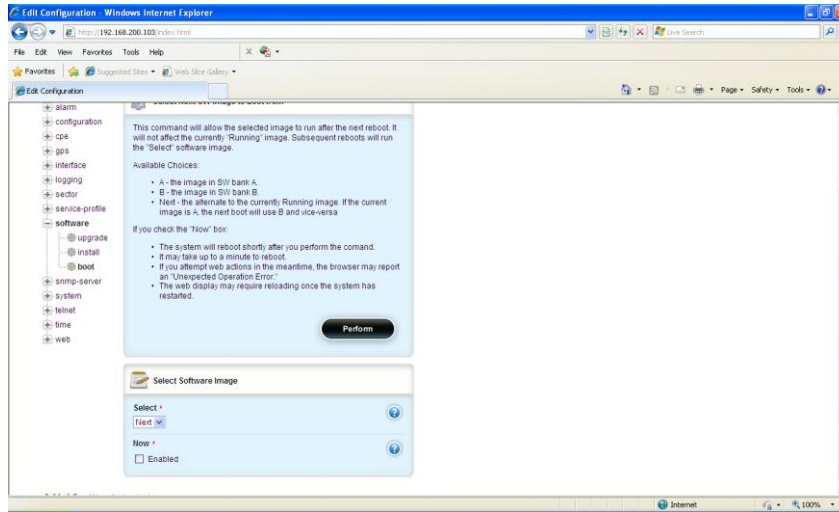- **Now**. This is a check box that has to be enabled.

Figure 122: Software Image Partition Selection

To execute the procedure then the User needs to select the **Perform** Command Menu Option in the **Select Next SW Image to Boot from** grouping section. If the "Now" box is checked (i.e. enabled) the system will reboot shortly after the **Perform** Command Menu Option has been selected. It may take up to a minute for the Base Station to reboot. If the User attempts to navigate in the Web Interface window, the browser may report an "Unexpected Operation Error". The Web Interface may require re-loading once the Base Station has restarted.

3.6.3 Base Station Performance Monitoring

There are a number of monitoring parameters that can be checked to determine the overall performance of the Base Station and for any Subscribers that are connected to the Base Station. These parameters are contained within a variety of menu options.

The User's starting point is Web GUI Main Web GUI Interface Screen.

3.6.3.1 Interface

At Main Web GUI Interface Screen select the **Configuration** Tab and then the **interface** Main Menu Option this will display the key settings window. This window details enabled the configuration of the backhaul interfaces There are two Main Menu Sub-Elements to this window and the window is split into two main grouping sections (refer to Figure 123).
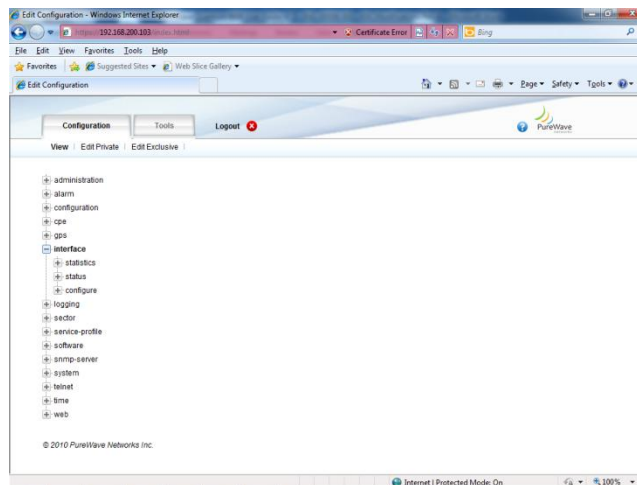

Figure 123: Performance Monitoring Interface

The Main Menu Sub-Elements are:

- **statistics**. These are not applicable and returns no values. **status**. This describes the configured settings and the current status of these interfaces.
- **configure**. This configures the backhaul interfaces speed and mode of operation

- **Interface Settings and Status**. The configured settings and their current status that are displayed for the five interfaces are:
    - o **Admin State**. This is the admin state.
    - o **Oper State**. This is the operational state.
    - o **Link Speed**. This is the interface link speed.
    - o **Duplex Type**. This is duplex setting.
    - o **Maximum MTU Length**. This is the maximum configured MTU Length.
    - o **MAC Address**. This is the MAC address of the interface.

At the Main Web GUI Interface Screen select the **Configuration** Tab and then the **interface** Main Menu Option**,** then the **status** main Menu Sub-Element**.** The resulting window will be split into two main sections (refer to **Figure 124**). These are:

- **Key Settings**.
    - o **Name**. This will indicate which interface is being displayed
- **Interface Statistics and Status**. The following settings and status are displayed. These are not editable parameters.
    - o **Admin State**. This is the admin state.
    - o **Oper State**. This is the operational state.
    - o **Link Speed**. This is the interface link speed.
    - o **Duplex Type**. This is duplex setting.
    - o **Maximum MTU Length**. This is the maximum configured MTU Length.
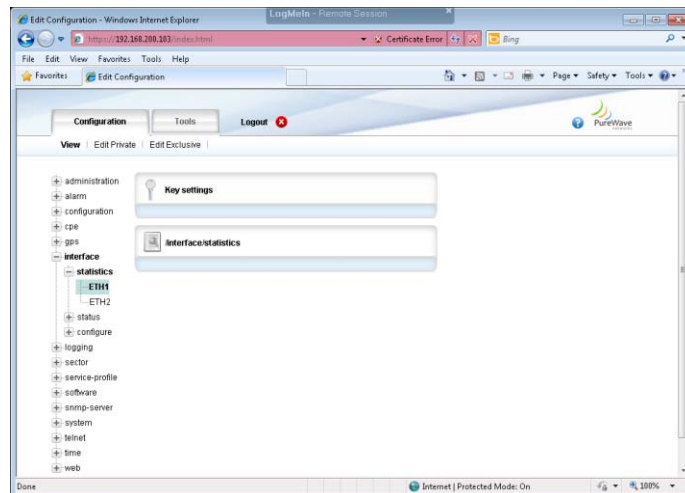   - o **MAC Address**. This is the MAC address of the interface.

Figure 124: Interface Status Key Settings and Status

The same format is repeated for all interfaces and therefore only one will be outlined. To view the Interface Statistics of another interface then simply at the Main Web GUI Interface Screen select the

Configuration Tab, then the *interface* Main Menu Option, then the *status* Main Menu Sub-Element and then relevant interface.

At the Main Web GUI Interface Screen select the *Configuration* Tab and then the *interface* Main Menu Option*,* then the *configure* main Menu Sub-Element*.* The resulting window will be split into two main sections (refer to Figure 124).

3.6.3.2 Sector Statistics

At the Main Web GUI Interface Screen select the *Configuration* Tab and then the *sector* Main Menu Option*.* This will display the Sector Settings window (refer to Figure 125). There are no parameters to edit within the *sector* Main Menu Option.

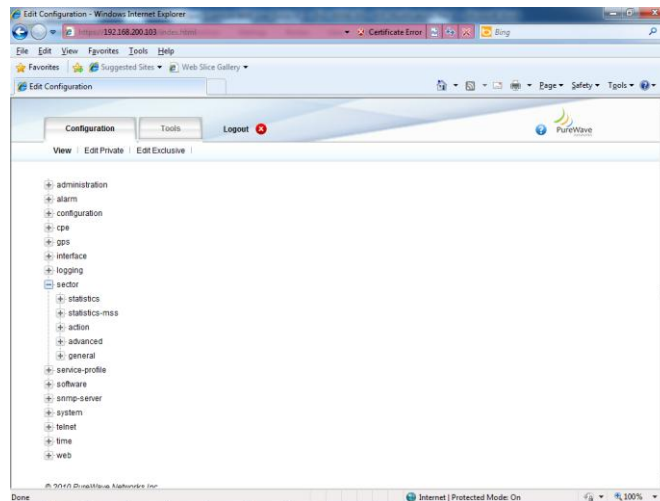
Figure 125: Sector Settings

There are two basic groups to this Sector option. These are:

- *Sector Advanced Settings (configured)*
- *Sector Provisioning (configured)*

Important sector statistics are contained within two options within the Sector Main Menu Option. The User now has to navigate to the next level, therefore at the Main Web GUI Interface Screen select the *sector* main Menu option and then the *statistics* Main Menu Sub-Element*.* There are four further sub-elements to this option and the window is split into four main grouping sections (refer to Figure 126).

The main grouping sections provide a summary of the information that can be obtained by selecting and navigating down into the Menu Sub-Element level.
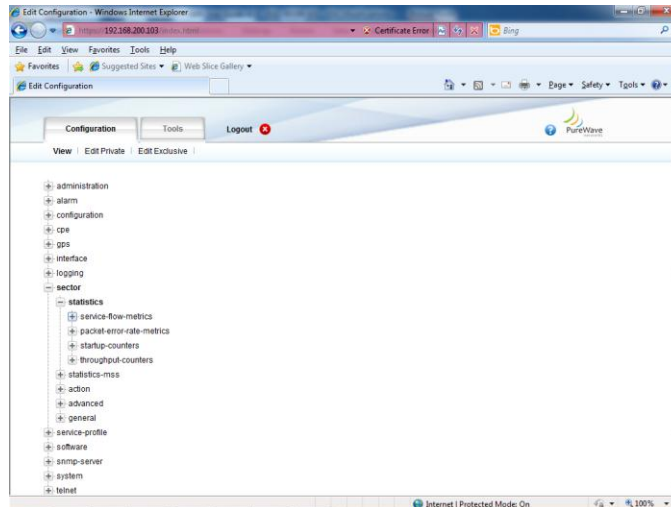
Figure 126: Sector Statistics Interface Key Settings

The further sub-elements are:

- **service-flow-metrics**. Several key service flow metrics are provided at a sector level (i.e. a Base Station level).
- **packer-error-rate-metrics**. This will display several key packet error rate counters.
- **startup-counters**. These are startup counters for a sector level.
- **throughput-counters**. Sector throughput counters are displayed.

The four main grouping sections are the summary for the sub-elements on a per sector basis:

- **Sector Service-Flow Metrics.**
- **Sector Pkt Error-Rate Metrics.**
- **Sector Startup Counters.**
- **Sector Throughput Counters.**

To fully display all the available statistics the User now has to navigate to the next level, therefore at the Main Web GUI Interface Screen select the **Configuration** Tab and then the **sector** Main Menu Option then the **statistics** Main Menu Sub-Element, then **service-flow-metrics** and then **1.** This will display the Metrics window. There are two distinct groups to this window (refer to **Figure 127**).

- **Key Settings**. This indicates the relevant sector, which as has been described in number 1. This is not a configurable parameter.
- **Sector Service-Flow Metrics**. The following Metrics are displayed. These are displayed as a raw number but they can also be displayed in graphical form by selecting the "Graph" command button.
  - **DSA Requests**
  - **DSA Req Successes**

- o *DSC Requests*
- o *DSC Req Successes*
- o *DSD Requests*
- o *DSD Req Successes*
- o *Max Active Svc Flows*
- o *Max Active DL Svc Flows*
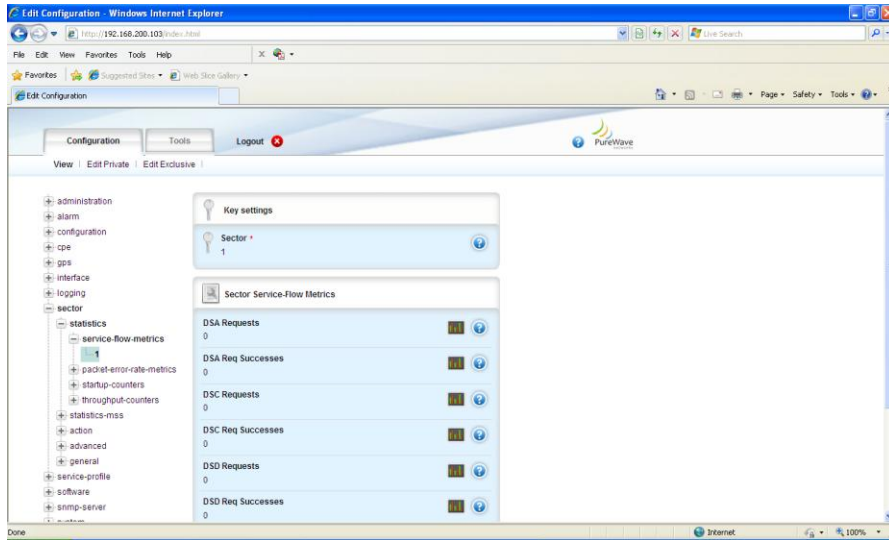- o *Max Active UL Svc Flows*

Figure 127: Sector Statistics Interface Key Settings

A similar format is repeated for the other three sector, statistics sub elements. The Key Settings window indicates the relevant sector. The information that is presented for each sub element, *packet-error-rate-metrics, startup-counters* and *throughput-counters* is:

- For the *packet-error-rate metrics* menu option the following *Sector Pkt Error-Rate Metrics* are displayed (refer to Figure 128)*:*
  - o *DL Packets Sent*
  - o *DL Packet Errors*
  - o *DL Pkt Error Rate*
  - o *UL Packets Sent*
  - o *UL Packet Errors*
  - o *UL Pkt Error Rate*
- For the *startup-counters* menu option, the following *Sector Startup Counters* are displayed (refer to Figure 129):
  - o *Authentication Attempts*
  - o *Authentication Successes*

- o *Ranging Attempts*
- o *Ranging Successes*
- o *Ranging Periodic*
- o *Bandwidth Requests*
- o *Handover Ranging*
- For the ***throughput-counters*** menu option, the following ***Sector Throughput Counters*** are displayed (refer to Figure 130):
  - o *DL User Bytes*
  - o *UL User Bytes*
  - o *DL MAC Bytes*
  - o *UL MAC Bytes*
  - o *DL User Packets*
  - o *UL User Packets*
  - o *DL MAC Packets*
  - o *UL MAC Packets*
  - o *DL User Pkt Errors*
  - o *UL User Pkt Errors*
  - o *DL MAC Pkt Errors*
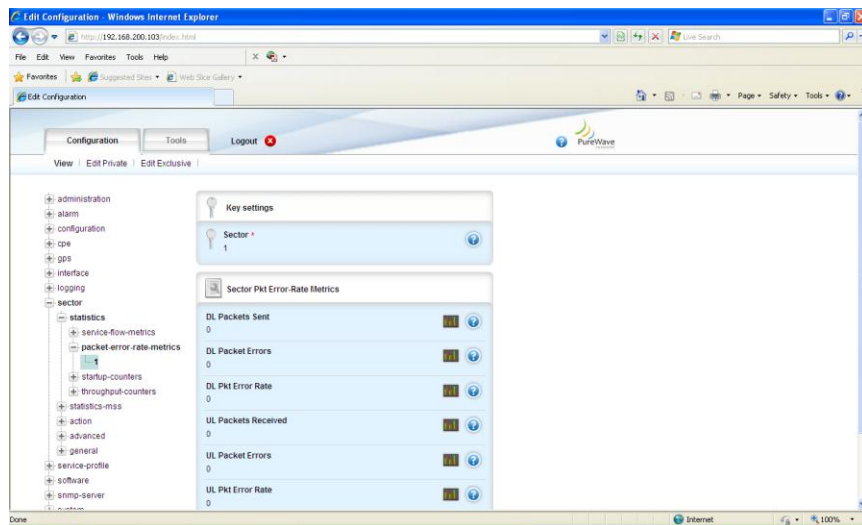 - o *UL MAC Pkt Errors*

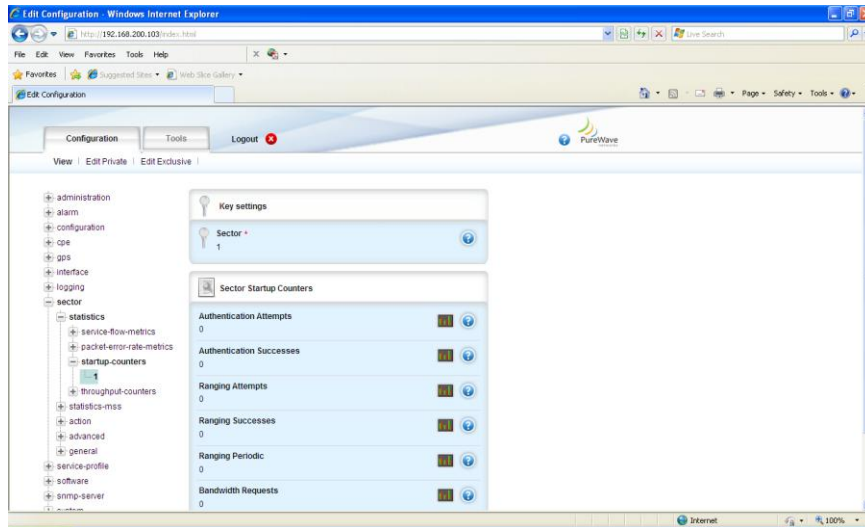Figure 128: Sector Statistics Packet Error Rate Metrics
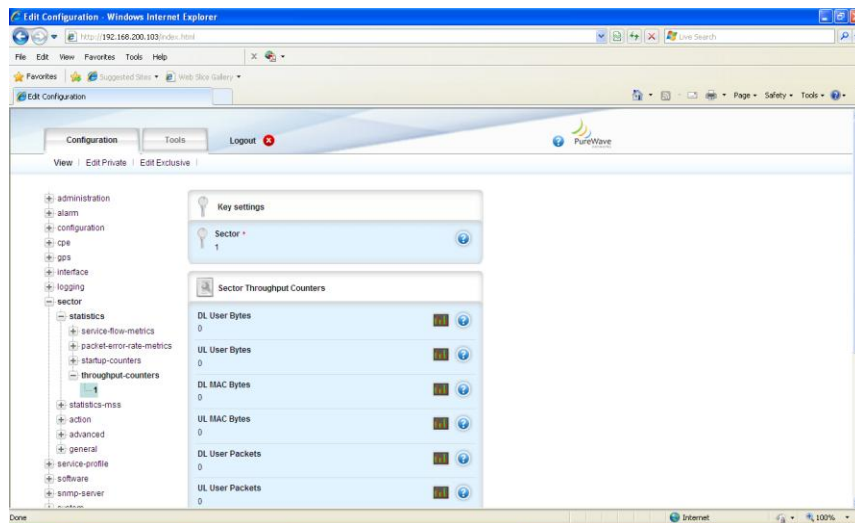
Figure 129: Sector Statistics Startup Counters

Figure 130: Sector Statistics Throughput Counters

Important Subscriber statistics are contained within the **statistics-mss** Main Menu Sub-Element within the Sector Main Menu Option. The User now has to navigate to the next level, therefore at the Main Web GUI Interface Screen select the **sector** Main Menu Option and then the **statistics-mss** Main Menu Sub-Element**.** There are seven further sub-elements to this option and the windows is split into the seven main grouping sections (refer to Figure 131). The main grouping sections provide a summary of the information that can be obtained by selecting and drilling down into the sub-element level.
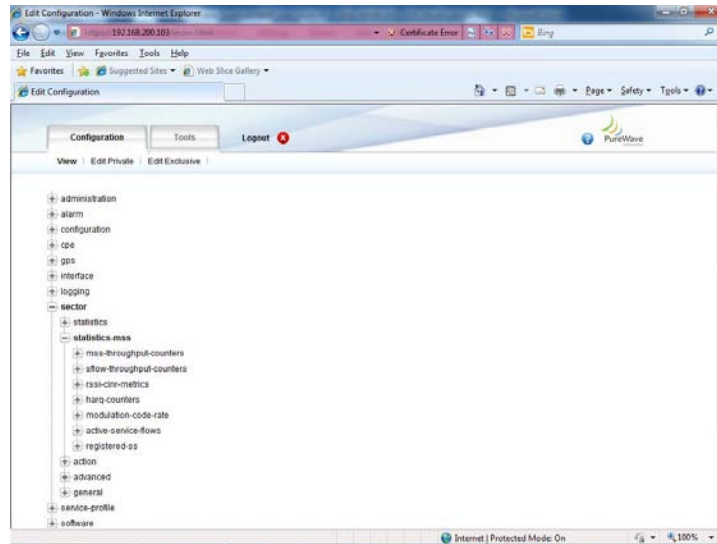
Figure 131: Sector MSS-Statistics Metrics

The further sub-elements are:

- **mss-throughput-counters**. This is the throughput counters for the Subscribers that are communicating with the Base Station.
- **sflow-throughput-counters.** These are the throughput counters per service flow.
- **rssi-cinr-counters.** These are the RSSI and CINR metrics per Subscriber and per upstream/ downstream direction.
- **harq-counters.** These are the HARQ counters per Subscriber.
- **modulation-code-rate.** These are the Modulation and Coding Scheme (MCS) per Subscriber.
- **active-service-flows.** These are the active Service flows per Subscriber.
- **registered-ss.** These are the registered Subscriber Station details.

The seven main grouping sections are the summary for the sub-elements on a per sector basis:

- *Throughput Counters per MSS*
- *Throughput Counters Per Service-Flow*
- *RSSI and CINR Metrics Per MSS*
- *HARQ Counters Per MSS*
- *Modulation and Coding Scheme (MCS)*
- *Active Service Flows*
- *Registered Subscriber Station*

To fully display all the available statistics the User now has to navigate to the next level, therefore at the Main Web GUI Interface Screen select the **Configuration** Tab, then the **sector** Main Menu Option, then the **statistics-mss** Main Menu Sub-Element and then one of the seven further sub-elements. Under each tree Sub-element a list of all the connected Subscribers will be displayed. The Use has to select the relevant Subscriber and the information will be displayed for the particular Subscriber.

At the Main Web GUI Interface Screen select the **Configuration** Tab and then the **sector** Main Menu Option, then the **statistics-mss** Main Menu Sub-Element and then **mss-throughput-counters.** There are two distinct groups to this window (refer to Figure 132).

- **Key Settings**. This indicates the relevant Subscriber. This is not a configurable parameter. The following information is presented:
  - **Sector**
  - **MAC Address**
- **Throughput Counters Per MSS.** The following Metrics are displayed. These are displayed as a raw number but they can also be displayed in graphical form by selecting the "Graph" command button.
  - **DL Bytes**
  - **Ul Bytes**
  - **DL Pkts**
  - **UL Pkts**
  - **DL Pkt Err**
  - **UL Pkt Err**
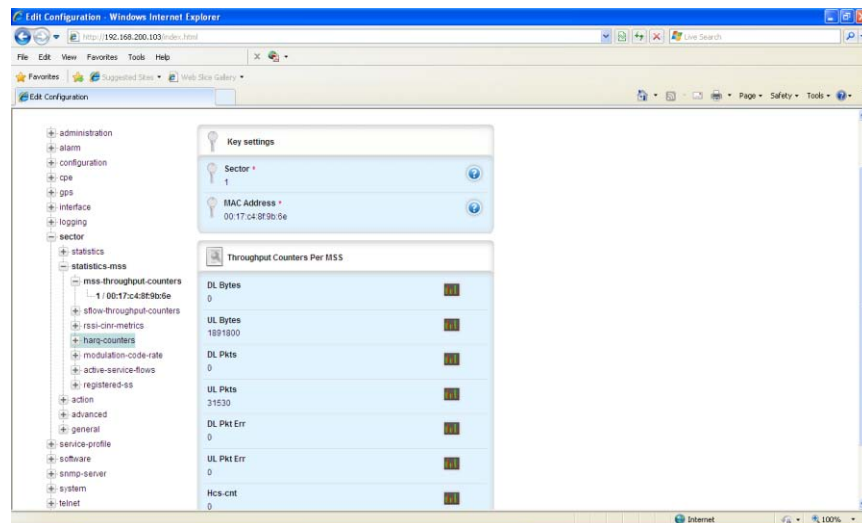 - **Hcs-cnt**
  - **Crc-cnt**

Figure 132: Sector Statistics MSS Throughput Counters

At the Main Web GUI Interface Screen select the **Configuration** Tab and then the **sector** Main Menu option, then the **statistics-mss** Main Menu Sub-Element and then **sflow-throughput-counters.** The Service Flows that have been defined for each Subscriber will be displayed. For each Subscriber there will be at least two defined Service Flows, one for Upstream and another for Downstream. There are two distinct groups to this window (refer to Figure 133).

- **Key Settings**. This indicates the relevant Subscriber. This is not a configurable parameter. The following information is presented:
  - o **Sector**
  - o **MAC Address**
  - o **SFID.** This is the Service Flow identifier.
- **Throughput Counters Per Service-Flow.** The following Metrics are displayed. These are displayed as a raw number but they can also be displayed in graphical form by selecting the "Graph" command button.
  - o **DL Bytes**
  - o **UL Bytes**
  - o **DL Pkts**
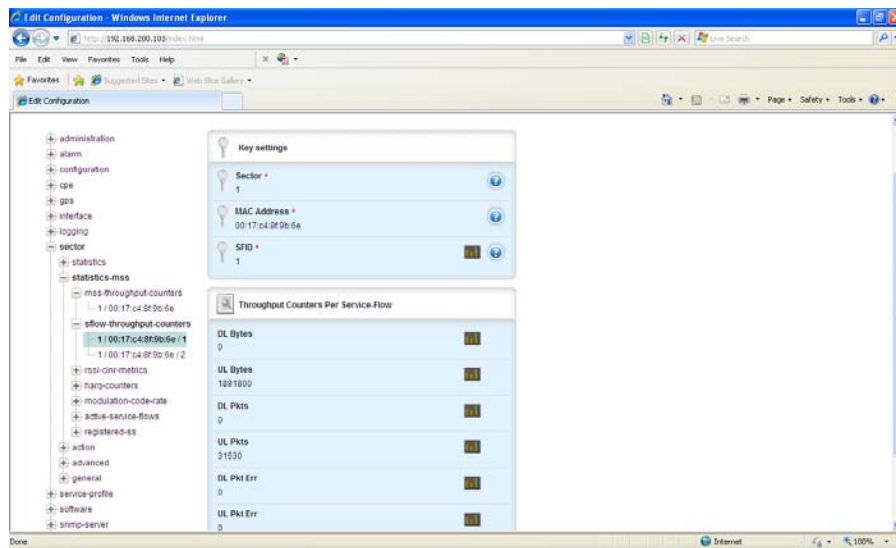 - o **UL Pkts**
  - o **DL Pkt Err**
  - o **UL Pkt Err**

Figure 133: Sector Statistics Service Flow Throughput Counters

At the Main Web GUI Interface Screen select the **Configuration** Tab and then the **sector** Main Menu Option, then the **statistics-mss** Main Menu Sub-Element and then **rssi-cinr-metrics.** The downstream and upstream direction for each Subscriber will be displayed. There are two distinct groups to this window. Figure 134 has the downstream RSSI parameters and Figure 135 has the upstream metrics.

- **Key Settings**. This indicates the relevant Subscriber. This is not a configurable parameter. The following information is presented:
  - o **Sector**
  - o **MAC Address**
  - o **Channel Dir.** This indicates the respective direction that the Metrics are displayed.

- **_Downstream RSSI/CINR Metrics._** The following Metrics are displayed. These are displayed as a raw number but they can also be displayed in graphical form by selecting the "Graph" command button. If the CLI is used to view metrics, the RSSI per antenna will be shown but will have the same value across all antennas.
    - o **_CINR Mean_**
    - o **_CINR Std Dev_**
    - o **_RSSI Mean_**
    - o **_RSSI Std Dev_**
- **_Upstream RSSI/CINR Metrics. ._** The following Metrics are displayed. These are displayed as a raw number but they can also be displayed in graphical form by selecting the "Graph" command button.
    - o **_Mean CINR_**
    - o **_Std Dev CINR_**
    - o **_Maximum RSSI_**
    - o **_Std Dev RSSI_**
    - o **_Antenna 1 RSSI_**
    - o **_Antenna 2 RSSI_**
    - o **_Antenna 3 RSSI_**
    - o **_Antenna 4 RSSI_**
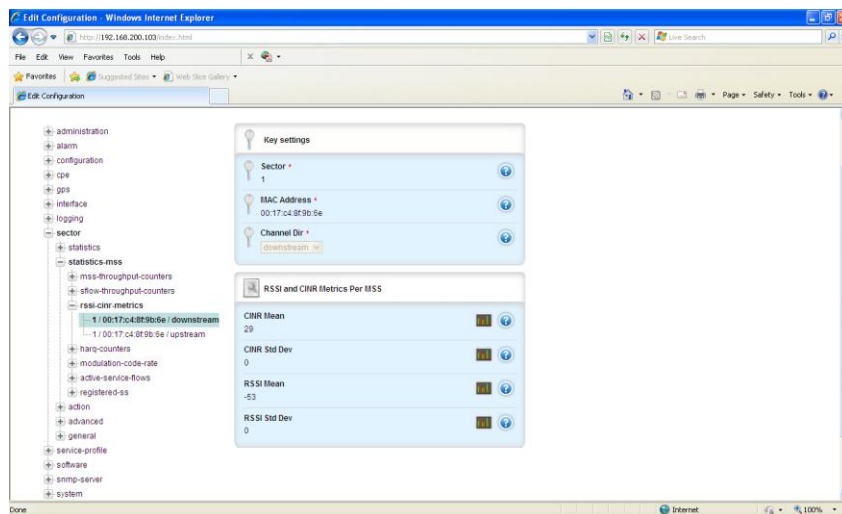   - o **_Antenna 5 RSSI_**
    - o **_Antenna 6 RSSI_**

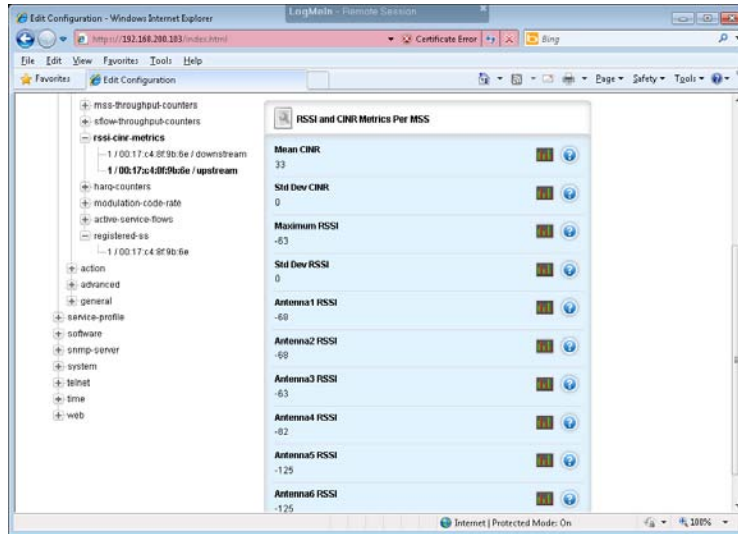Figure 134: Sector Statistics Downlink RSSI CINR Metrics

Figure 135 Sector Statistics Upstream RSSI CINR Metrics

At the Main Web GUI Interface Screen select the **Configuration** Tab and then the **sector** Main Menu Option, then the **statistics-mss** Main Menu Sub-Element and then **harq-counters.** There will be three HARQ Service Flow identifiers displayed for each Subscriber. There are two distinct groups to this window (refer to Figure 136).

- **Key Settings**. This indicates the relevant Subscriber. This is not a configurable parameter. The following information is presented:
  - **Sector**
  - **MAC Address**
  - **Svc Flow ID**
- **HARQ Counters Per MSS.** The following Metrics are displayed. These are displayed as a raw number but they can also be displayed in graphical form by selecting the "Graph" command button. It is not possible to view all the metrics in one window and therefore the User has to scroll down to view them all.
  - **HARQ Enabled.** This indicates whether HARQ has been enabled. This is not however a configurable parameter.
  - **HARQ DL Pkt Ack**
  - **HARQ DL Pkt Neg Ack**
  - **HARQ DL Pkt Trans**
  - **HARQ DL Pkt Retrans**
  - **HARQ DL Pky Discards**
  - **HARQ DL Pkt 1st Neg Ack**
  - **HARQ UL Pkt Ack**
  - **HARQ UL Pkt Neg Ack**
  - **HARQ UL Pkt Trans**

- o *HARQ UL Pkt Retrans*
- o *HARQ UL Pky Discards*
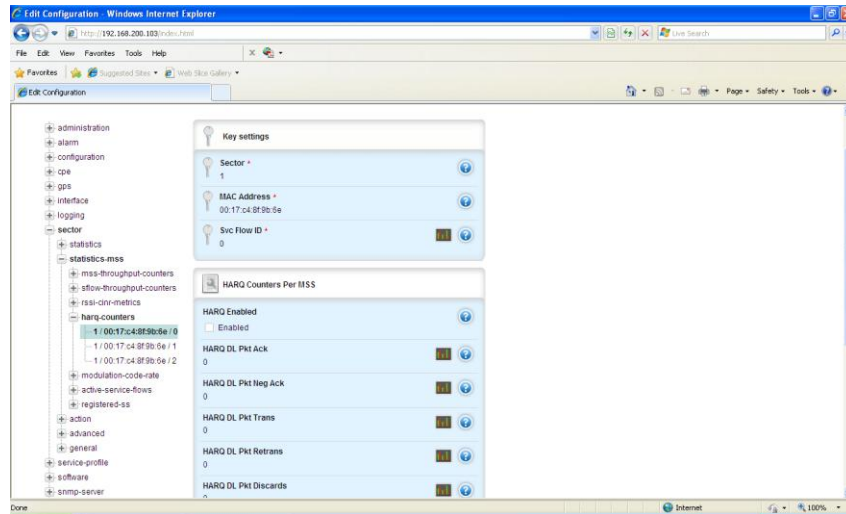- o *HARQ UL Pkt 1st Neg Ack*

Figure 136: Sector Statistics HARQ Counters

At the Main Web GUI Interface Screen select the **Configuration** Tab and then the **sector** Main Menu option, then the **statistics-mss** Main Menu Sub-Element and then **modulation-code-rate.** The information for each Subscriber is displayed. There are two distinct groups to this window (refer to Figure 137).

- **Key Settings**. This indicates the relevant Subscriber. This is not a configurable parameter. The following information is presented:
  - o **Sector**
  - o **MAC Address**
- **Modulation and Coding Scheme (MCS).** The following information is displayed.
  - o **DL MCS.** This indicates the maximum downlink MCS rate. The available options are:
    - QPSK 1/2
    - QPSK 3/4
    - QAM16 1/2
    - QAM16 3/4
    - QAM64 1/2
    - QAM64 2/3
    - QAM64 3/4
    - QAM64 5/6
  - o **UL MCS.** This indicates the maximum uplink MCS rate. The available options are the same as the downlink.
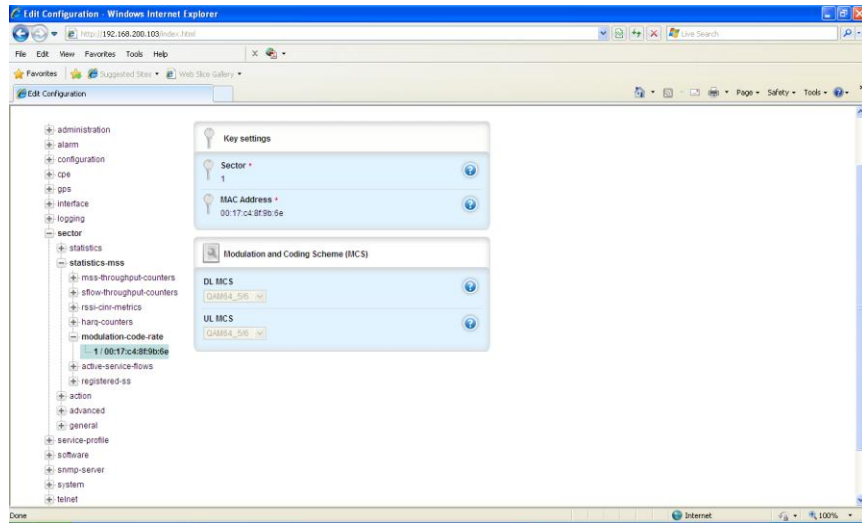
Figure 137: Sector Statistics Modulation Code Counters

At the Main Web GUI Interface Screen select the **Configuration** Tab and then the **sector** Main Menu Option, then the **statistics-mss** Main Menu Sub-Element and then **active-service-flows.** The Service Flows that are active for each Subscriber will be displayed. For each Subscriber there will be at least two active Service Flows, one for Upstream and another for Downstream. There are two distinct groups to this window (refer to **Figure 138**).

- **Key Settings**. This indicates the relevant Subscriber. This is not a configurable parameter. The following information is presented:
  - **Sector**
  - **MAC Address**
  - **Svc Flow ID.** This is the Service Flow identifier.
- **Active Service Flows.** The following Metrics are displayed. These are displayed as a raw number but they can also be displayed in graphical form by selecting the "Graph" command button.
  - **Svc Flow Dir.** This provides an indication of the respective direction. The options are uplink or downlink.
  - **UL Bytes.** This provides an indication of the Service Flow QoS (Quality of Service).
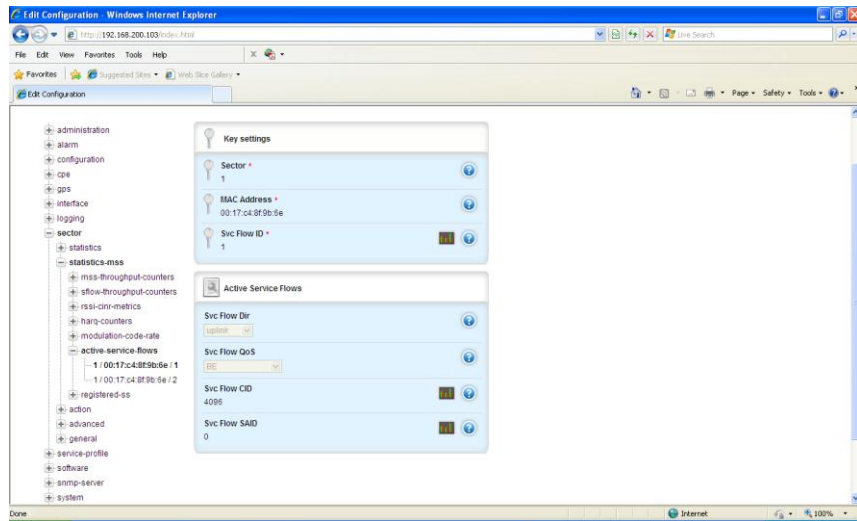 - **Svc Flow CID**
  - **Svc Flow SAID**

Figure 138: Sector Statistics Active Service Flows

At the Main Web GUI Interface Screen select the **Configuration** Tab and then the **sector** Main Menu Option, then the **statistics-mss** Main Menu Sub-Element and then **registered-ss.** The number of registered Subscribers will be displayed. There are two distinct groups to this window (refer to **Figure 139**).

- **Key Settings**. This indicates the relevant Subscriber. This is not a configurable parameter. The following information is presented:
  - o **Sector**
  - o **MAC Address**
- **Registered Subscriber Station.** The following information is displayed. These are not configurable parameters at this menu option.
  - o **Client Profile ID.**
  - o **Network Entry State.** This provides an indication as to the connected "state" of the Subscriber.
  - o **Uptime**. This is the Subscriber connected time.
  - o **Network Entry Type.** This indicated the way the CPE connected to the Base station. Initial – Means through means of initial ranging or Handover through handover ranging.
  - o **Authentication status**
  - o **SNR Reporting Method**
  - o **Basic CID**
  - o **Primary CID**
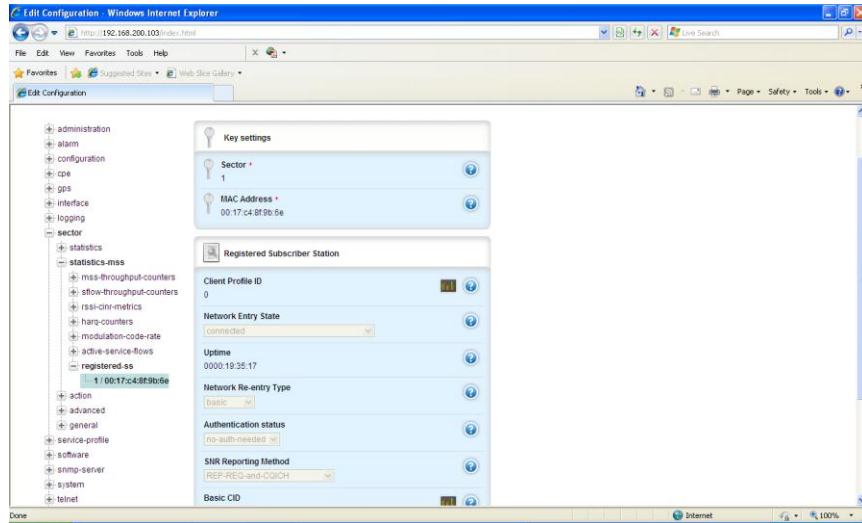 - o **Vendor ID**
  - o **MAC Version**

Figure 139: Sector Statistics Registered SS

3.6.3.3 Logging

The Base Station contains a number of internal system management logs. The Web Gui provides the User with complete flexibility on performing a number of key actions on these logs.

At the Main Web GUI Interface Screen select the *Configuration* Tab and then select the *logging* Main Menu Option*.* This will display all the system logs files (Figure 140).
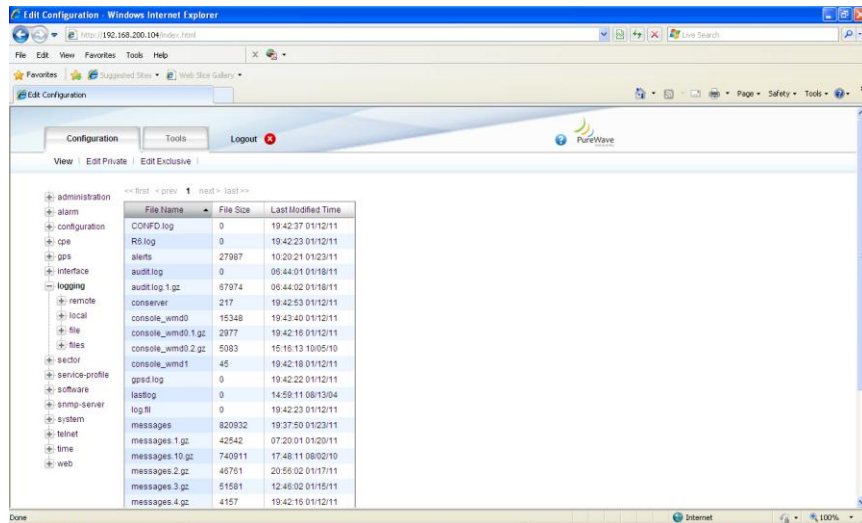

Figure 140: Main Menu Logging Options

The logging Main Menu option contains four Main Menu Sub-Elements. These are:

- **remote**. The User has the capability to define a remote server to forward a pre-defined log level.
- **local**. The User has the capability to define the minimum severity level to log.
- **file**. These are file actions that the User can perform.
- **files**. This describes the system log files.

At the Main Web GUI Interface Screen select the **Configuration** Tab and then select the **logging** Main Menu Option and then the **remote** Main Menu Sub-Element**.** The User is now presented with a window that displays the remote Log Server Settings. There are two distinct groups to this window (refer to Figure 141). The User is presented with a host Menu Sub-Element from the remote Main Menu Sub-Element level. If the User navigates to this level then it will display a list of all the log servers that have been configured. The User can select to view the relevant details.

- **Default Remote Log Server Settings**. The User can view and hence configure the default minimum severity log level to forward to the remote server. This will apply to all remote servers which have a level of default. The User must be in Edit Mode to configure. In addition to the default level there are nine available options. These are:
  - **none**
  - **debug**
  - **info**
  - **notice**
  - **warning**
  - **error**
  - **critical**
  - **alert**
  - **emergency**
- **Remote Log Server Settings.** For log servers that have configured the following information is displayed. To configure the User must be in Edit Mode. Once in Edit Mode, the User can **<Add host>**, delete or change the Severity Level of an existing host.
  - **Hostname.** If the User wants to add a remote server then they must enter the syslog remote server IP address or domain name. The User cannot edit the hostname for a syslog server that has been configured, this syslog must be deleted and then it can be re-added. When in the Edit Mode, there is a red box beside each hostname. If the User navigates to the red icon then this will present the User with the ability to delete the hostname.
  - **Severity Level.** The User can configure or re-configure the syslog server to that of the default level or any of the nine available options.
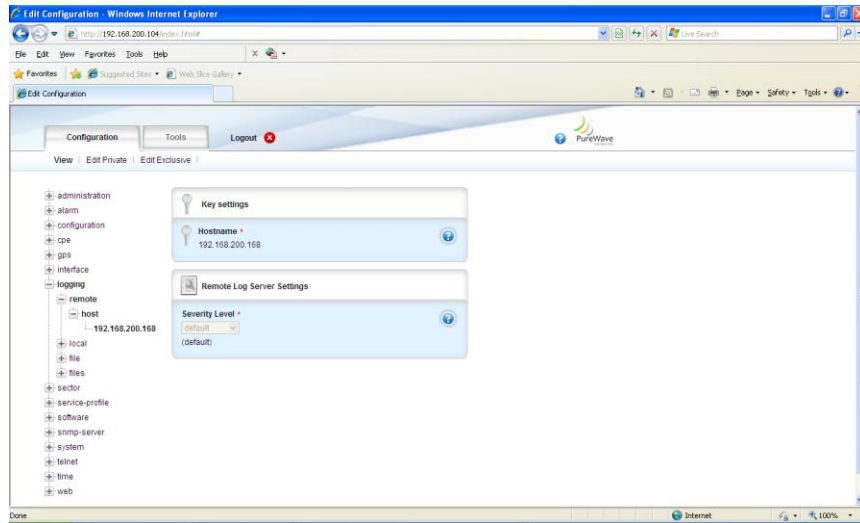
Figure 141: Logging Remote Host Information

At the Main Web GUI Interface Screen select the **Configuration** Tab and then select the **logging** Main Menu Option and then the **local** Main Menu Sub-Element**.** The User is now presented with a window that displays the local Log Server Settings. This only one distinct group to this window (refer to **Figure 142**). The User can select to view the relevant details.

- **Default Local Log Server Settings**. The User can view and hence configure the default minimum severity log level for the local internal log server. This will apply to all local servers except those which have been configured in the logging local override configuration. The User must be in Edit Mode to configure. To define the default level there are one of nine available options to select. These are:
  - ○ *none*
  - ○ *debug*
  - ○ *info*
  - ○ *notice*
  - ○ *warning*
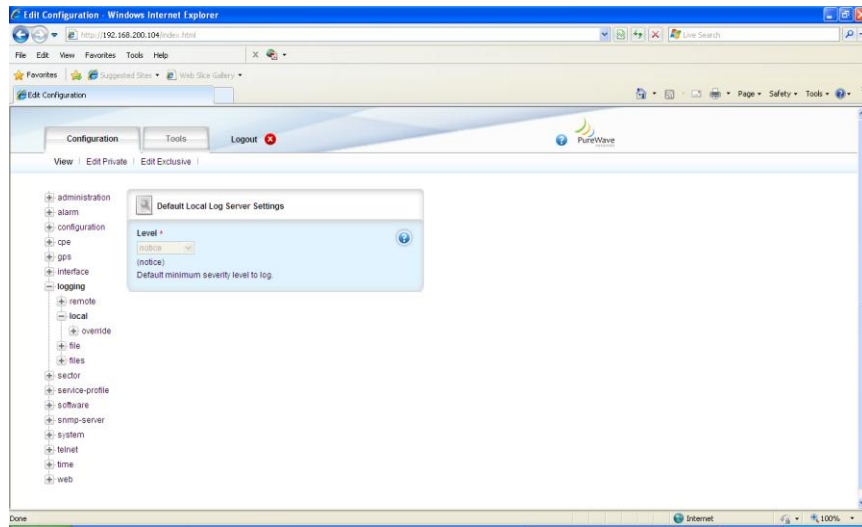 - ○ *error*
  - ○ *critical*
  - ○ *alert*
  - ○ *emergency*

Figure 142: Logging Local Information

At the Main Web GUI Interface Screen select the *Configuration* Tab, then select the *logging* Main Menu option*,* then the *local* Main Menu Sub-Element and then *override.* The User can now is now presented with an option to increase or decrease the internal sys log per daemon/application which are internal to the Base Station (refer to Figure 143). The User must be in Edit mode to configure.
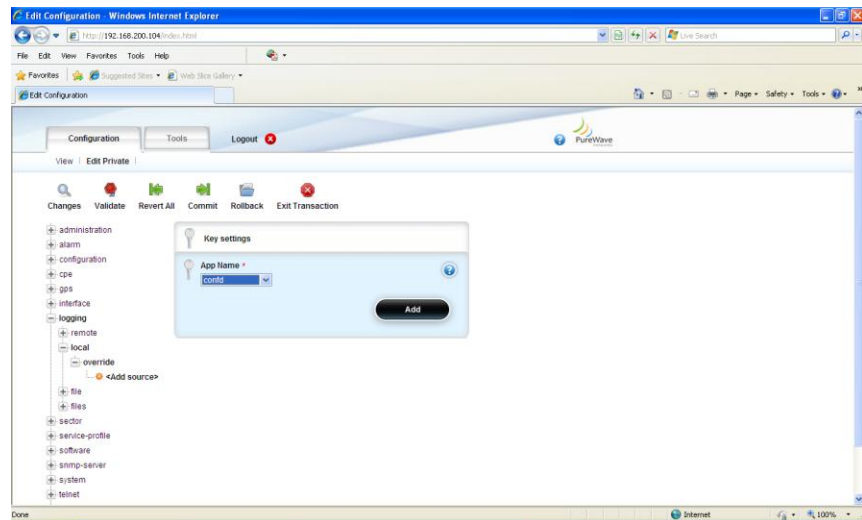

Figure 143: Logging Local Override

When in Edit mode only one distinct group to this window is displayed. The User must <Add Source> and define the relevant App Name. The configurable options are:

- **Key Settings**
- **App Name**
    - *confd*
    - *wmdlpcClientd*
    - *r6mgrd*
    - *sectord*
    - *statsd*
    - *genactiond*
    - *snmpactiond*
    - *gpsmgrsyncd*
    - *swumgrd*
    - *sysmgrd*

Once the **App Name** has been selected then the User is presented with an Application Log Settings menu where the **Severity Level** can be configured.

At the Main Web GUI Interface Screen select the **Configuration** Tab and then the **logging** Main Menu option and then the **file** Main Menu Sub-Element. The User is now presented with further Menu Sub-Elements (refer to Figure 144). The User now has top select one of the Menu Sub-Elements to be presented with an action.
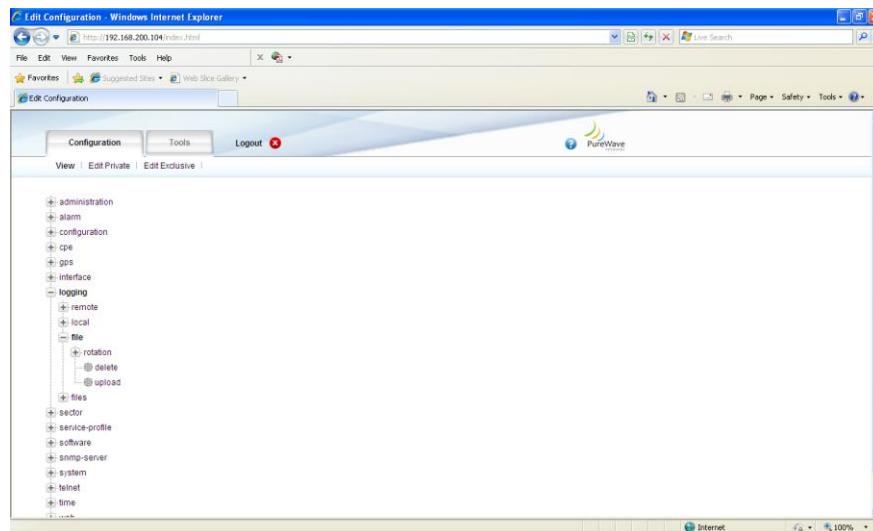

Figure 144: Logging File Information

At the Main Web GUI Interface Screen select the **Configuration** Tab, select the **logging** Main Menu Option, then the **file** Main Menu Sub-Element, then **rotation** and finally **force.**

This will force a reboot of the Base Station and the log file to effectively rotate and begin logging again. The rotate feature forces the logging to the relevant file to stop, it then compresses the file, effectively renames it (generally by appending a .1 to the end of the filename) and then starts the logging to a new file. E.g. the current sys log file is messages but at the last rotate action this file was rotated into messages.1.gz and the then logging started again to messages. An automatic rotation will occur when the file size reaches 5MBytes. There are no parameters to edit and the User simply has to select the **Perform** Command Menu Option to initiate the log file rotation (refer to Figure 145).
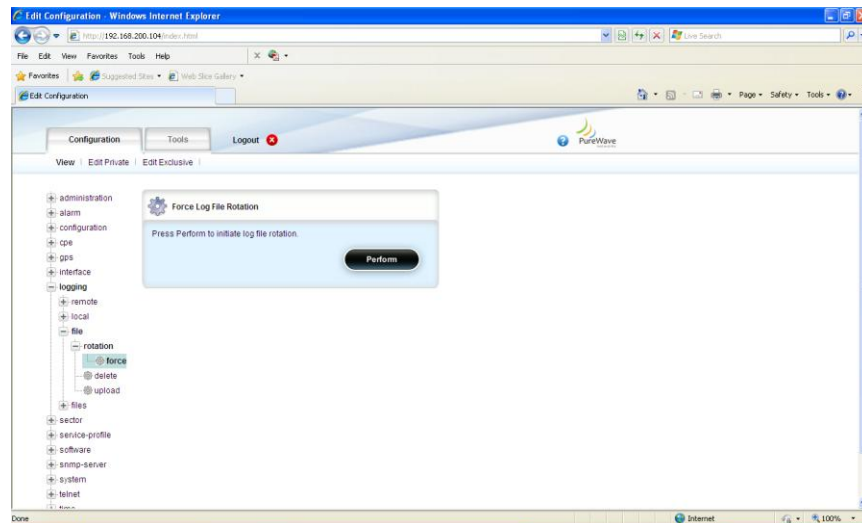

Figure 145: Logging File Rotation

At the Main Web GUI Interface Screen select the **Configuration** Tab, then the **logging** Main Menu Option**,** then the **file** Main Menu Sub-Element and then **delete.** This option provides a means for the User to delete a log file (refer to Figure 146). Two distinct window groups are presented to the User. These are:

- **Delete Log File**. This simply provides a description of the actions.
- **Delete Log File**. The User simply selects the log file that they would like to delete. The list of available files are presented via a drop down menu. The User does not have to be in Edit mode to select the log file.
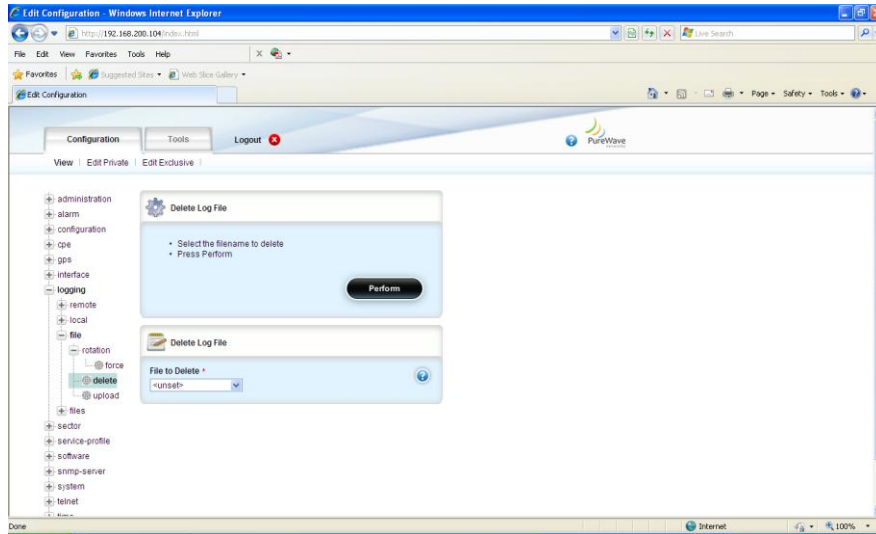
Figure 146: Logging File Delete

At the Main Web GUI Interface Screen select the **Configuration** Tab, then select the **logging** Main Menu Option**,** then the **file** Main Menu Sub-Element and then **upload.** This option provides a means for the User to upload a log file to a server URL. Two distinct window groups are presented to the User. These are (refer to Figure 147):

- **Upload Log File to Remote Server**. This simply provides a description of the actions.
- **Upload Log File**. The User does not have to be in Edit mode to perform these actions. Prior to uploading the file, the User must ensure that an FTP Server has been configured and is running. The User has to select the following information:
    o **File to Upload**. The User selects the log file that they would like to upload. The list of available files are presented via a drop down menu.
    o **Destination URL**. There are a variety of formats for the destination URL. These can be displayed if the User selects the "help" key. These URL formats are defined as:
        ▪ ftp://[user[:password]@]hostname[:port]/filepath
        ▪ http://hostname[:port]/filepath
        ▪ https://hostname[:port]/filepath

      Where [ ] indicates optional items. Thus,

        - user:password@ is optional, and the :password part can be omitted
        - [:port] is also optional

      Examples using ftp (you can substitute http or https):

        - ftp://myhost.com/filename
        - ftp://myhost.com/directory/filename
        - ftp://myhost.com:2323/directory/filename

If the User selects a relevant file, then the characteristics of the file are displayed. The following information will be displayed for each file (refer to **Figure 149**):

- **Key Settings**
  - **Filename**
- **System Log Files**
  - **Size**. This is the file size in bytes.
  - **Modified**. This was the date that the file was last modified.

Figure 149: Logging Files System Information

3.6.3.4 SNMP Server

Simple Network Management Protocol (SNMP) is an "Internet-standard protocol for managing devices on IP networks. The SNMP server exposes management data in the form of variables on the managed systems, which describe the system configuration (MIBs). These variables can then be queried and set by managing applications called Network Management Systems (NMS).

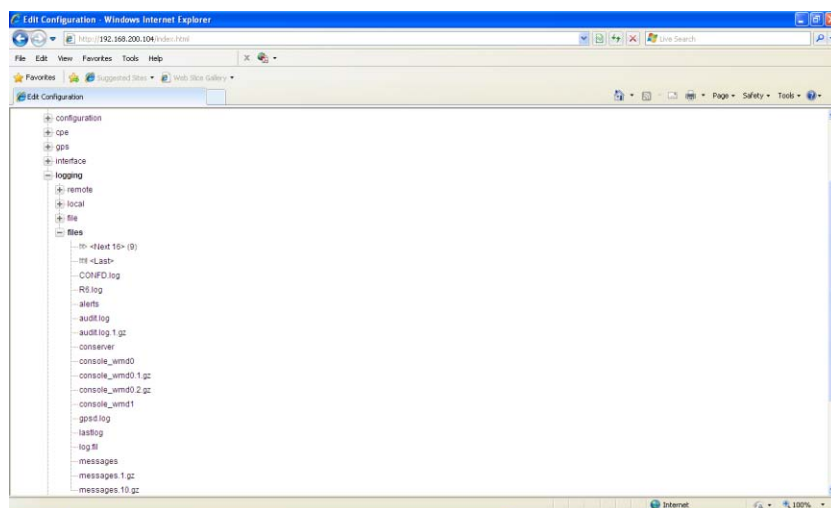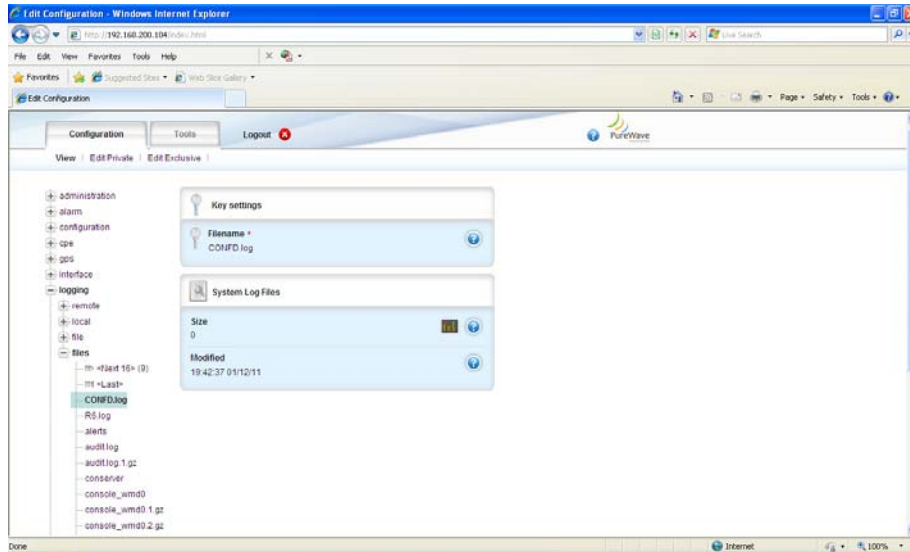To configure the SNMP Server, select the **Configuration** Tab and then select the **snmp-server from** Main Menu Option (Figure 150).
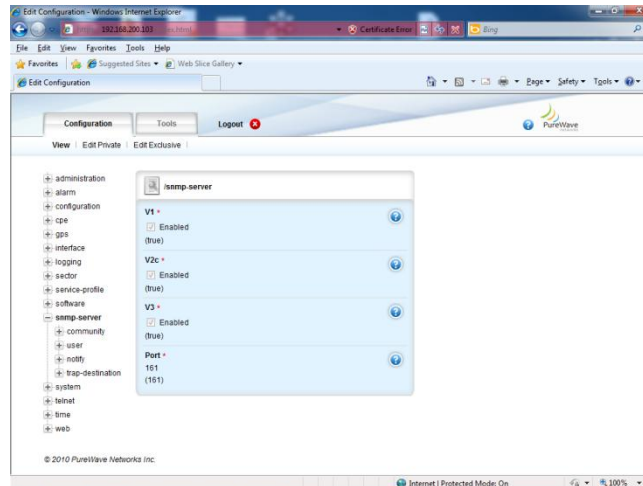
Figure 150 snmp-server configuration

When in Edit mode, the configurable options are:

- **SNMP v1 (enable/disable)**
- **SNMP v2c (enable/disable)**
- **SNMP v3 (enable/disable)**
- **Port (default 161)**

The **community** sub-menu (Figure 151) allows the configuration of the community string (basic password) used for security for with SNMP.   If the User wants to add or edit any of the existing community strings then they must then select **snmpCommunityTable** and enter the Edit Mode (Edit Private or Edit Exclusive).   The following options will be available

- **<Add snmpCommunityEntry>.** This allows addition of a new community string
- **private.** SNMP access which allows read-write permissions.
- **public.** SNMP access which allows read-only permissions.
- **standard trap.** Read-only permissions for sending SNMP traps.
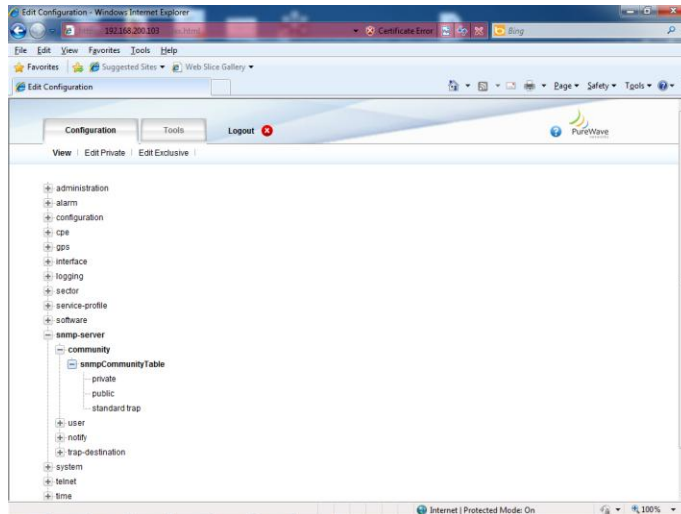
Figure 151 Community sub-menu

If the User wants to add or edit any of the existing community strings then they must then select enter the Edit Mode (Edit Private or Edit Exclusive).   The following options will be available for each entry (Figure 152)

- **Key Settings**
    - ○ **SNMP Community Index**
- **snmpCommunityEntry**
    - ○ **SNMP Community Name**. Name of the community string
    - ○ **SNMP Community Security Name**. Level of access including read-write and read-only
    - ○ **SNMP Community Context Engine ID**.
    - ○ **SNMP Community Context Name**.
    - ○ **SNMP Community Transport Tag**.
    - ○ **SNMP Community Storage Type**. Default value is permanent
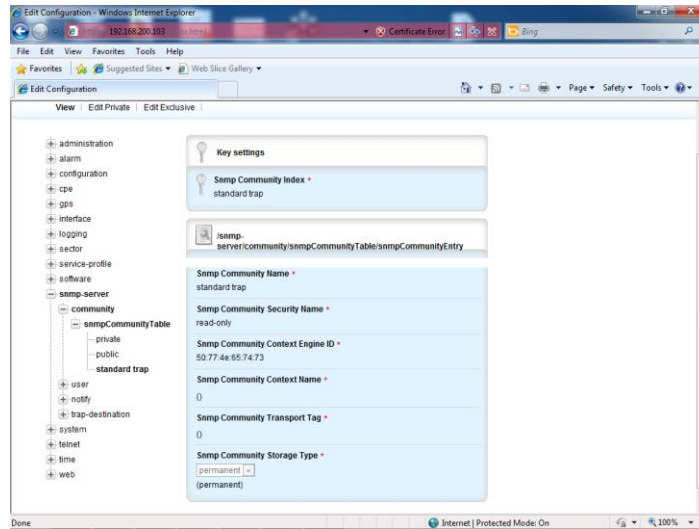
Figure 152 snmpCommunityEntry Table

The *user* sub-menu (Figure 153 and Figure 154) allows the protection of SNMPv3 packets from the above threats by utilizing a concept of multiple users where each user provides secret keys for authentication and privacy.   If the User wants to add or edit any of the existing user record then they must then select *user* and enter the Edit Mode (Edit Private or Edit Exclusive).   The following options will be available

- *Key Settings*
  - *Usm User Engine ID*
  - *Usm User Name*
- *usmUserEntry*
  - *Usm User Security Name*
  - *Usm User Clone From*.
  - *Usm User Auth Protocol*.
  - *Usm User Auth Key Change*.
  - *Usm User Own Auth Key Change*.
  - **Usm User Priv Protocol.**
  - **Usm User Priv Key Change.**
  - **Usm User Own Priv Key Change.**
  - **Usm User Public.**
  - **Usm User Storage Type.** Default is nonVolatile
  - **Usm User Auth Key.**
  - **Usm User Priv Key.**
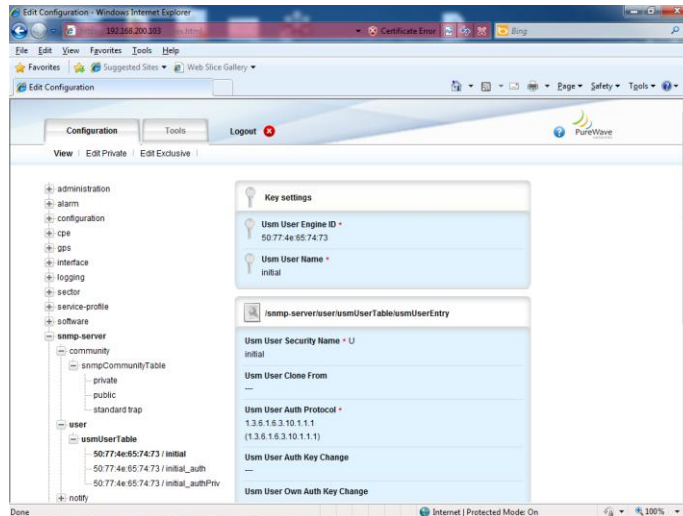
Figure 153 SNMP user configuration
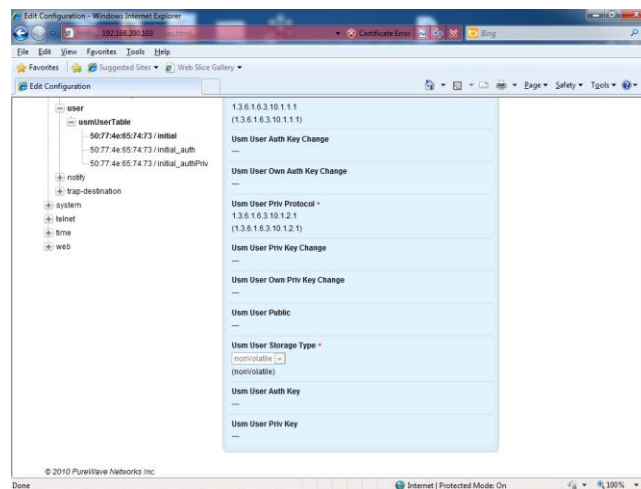
Figure 154 SNMP user configuration continued

The **notify** sub-menu (Figure 155) configures the SNMP notification generation mechanism. If the User wants to add or edit any of the existing community strings then they must then select **snmpNotifyTable** and enter the Edit Mode (Edit Private or Edit Exclusive).   The following options will be available

- **Key Settings**
    - ○ **SNMP Notify Name**
- **snmpNotifyEntry** (Field entries are explain in Table 12 SNMP Notification TableTable 12)
    - ○ **Snmp Notify Tag.**
    - ○ **Snmp Notify Type**.
    - ○ **Snmp Notify Storage Type**.
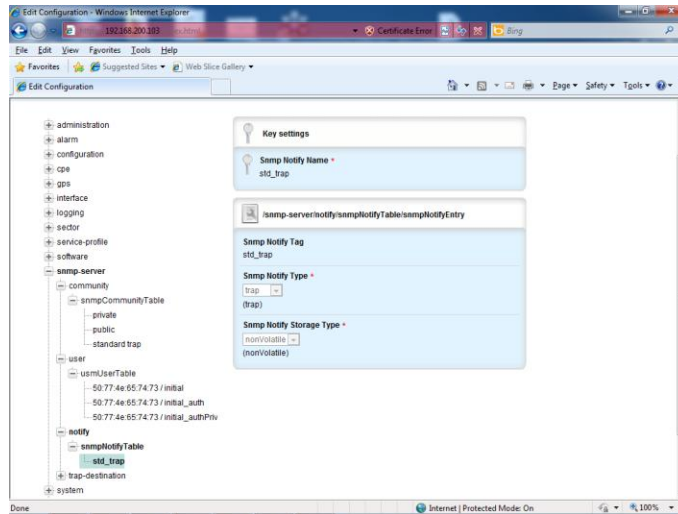
Figure 155 SNMP Notify Configuration

Name	Description	Field Example
Snmp Notify Name	A unique identifier used to index this table	1-32 chars
Snmp Notify Tag	A tag value used to reference one or more entries in snmpTargetAddrTable.	Example: "std_trap"
Snmp Notify Type	Selects the type of notification to be generated for the entries in the snmpTargetAddrTable referenced by snmpNotifyTag: trap(1) - Generates an SNMPv2c Trap PDU inform(2) - Generates an InformRequest PDU	Example: trap
Snmp Notify Storage Type	Specifies how the row should be stored.	The default value is nonVolatile.

Table 12 SNMP Notification Table
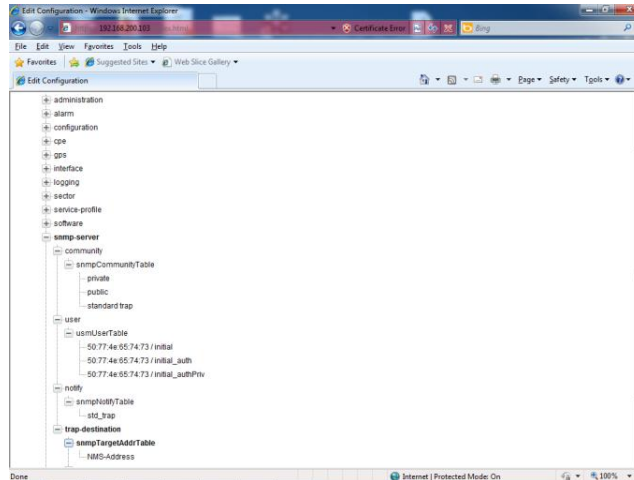
Figure 156 SNMP Trap Destination

The **trap destination** sub-menu (Figure 156) specifies the network and transport layer attributes of notification destinations. Each row in this table is used to send traps to a different NMS.

If the User wants to add or edit any of the existing trap destinations, then they must then select **NMS-Address** and enter the Edit Mode (Edit Private or Edit Exclusive).   The following options will be available below (Figure 157 and Figure 158)

- **Key Settings**
    - **NMS-Address**
- **snmpNotifyEntry** (Field entries are explain in Table 13Table 12 SNMP Notification Table)
    - **Snmp Target Addr TDomain.**
    - **Snmp Target Addr TAddress.**
    - **Snmp Target Addr Timeout.**
    - **Snmp Target Addr TAddress.**
    - **Snmp Target Addr Retry Count.**
    - **Snmp Target Addr Tag List.**
    - **Snmp Target Addr Params.**
    - **Snmp Target Addr Storage Type.**
    - **Snmp Target Addr Engine ID.**
    - **Snmp Target Addr TMask.**
    - **Enabled.**

Figure 157 Trap Destination Configuration Parameters
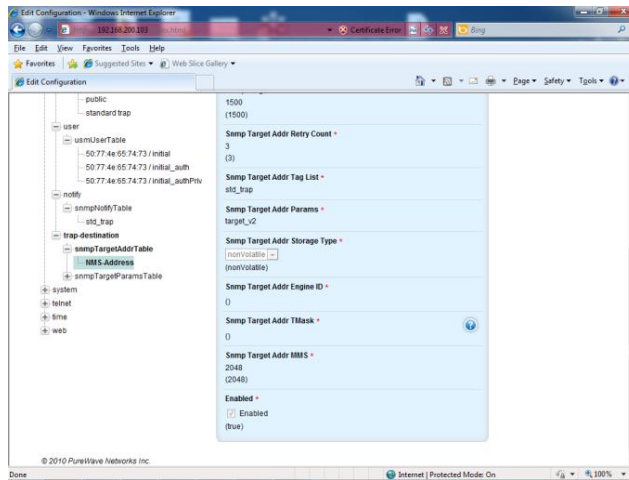
Figure 158 Trap Destination Configuration Parameters continued

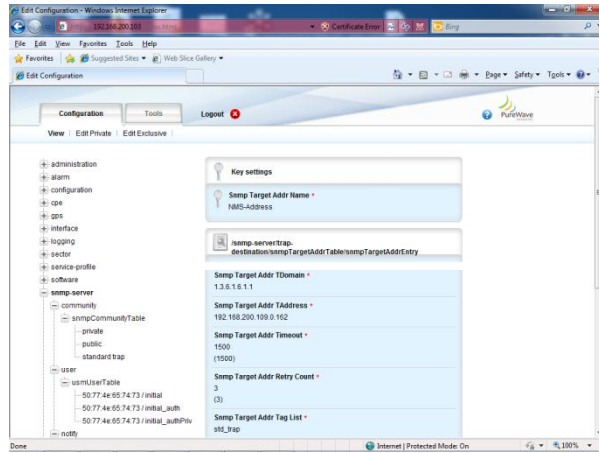| Name	Description	Field Example
snmpTargetAddrName	Name of the target snmpTargetAddrTable	1-32 chars
snmpTargetAddrTDomain	This object indicates the transport type of the address contained in the snmpTargetAddrTAddress object	"1.3.6.1.6.1.1" is the domain for UDP
snmpTargetAddrTAddress	Specifies the target address, which consists of an IP address followed by a UDP port number	Example: 127.0.0.1.0.162.
snmpTargetAddrTimeout	Sets a timeout value (in ticks) for the transmission of InformRequest PDU or TCP connection. The agent will wait this amount of time for a response to an InformRequest PDU or TCP connection before attempting again.	Example: 1500 is 1.5 seconds
snmpTargetAddrRetryCount	Sets the number of times that the agent will resend an InformRequest PDU or attempt to establish a TCP connection before abandoning further attempts and logging an error in the agent log file.	Example: 3
snmpTargetAddrTagList	A list that provides the correlation between snmpTargetAddrTable and snmpNotifyTable. When generating a notification, the agent searches this list for the value contained in snmpNotifyTag. If the list contains this value, then the agent uses the information in this row to create a destination for the notification.	For example: "std_trap"
snmpTargetAddrParams	Indexes the row in snmpTargetParamsTable that describes the security parameters to be used when sending the notification. If the row specified does not exist, the notification will not be sent.	For example: "target_v2"
snmpTargetAddrStorageType	Specifies how the row should be stored.	The default value is nonVolatile.
snmpTargetAddrEngineID	Internal use only, leave blank	""
snmpTargetAddrTMask	Internal use only, leave blank	""
snmpTargetAddrStorageType	Internal use only (Maximum message size) default 2048	2048
enabled	This field allows trap sending to a given NMS to be paused	true/false

Table 13 SNMP Target Address Table

3.6.3.5 Alarm Management

The Quantum Base Station has advanced alarm and fault management capabilities. When a fault or event occurs, an alarm condition will be raised. An alarm is a persistent indication of a fault that clears only when the triggering condition has been resolved.

To configure Alarm Management, select the **Configuration** Tab and then select the **alarm** Main Menu Option (Figure 159).
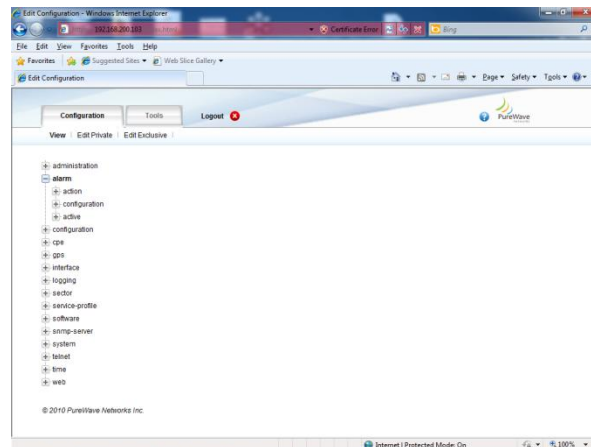
Figure 159 Alarm Management

When in View or Edit mode, the options are:

- **action.** *Allows acknowledgement, clearing and un-acknowledgment of alarms*
- **active.** *View a list of the active alarms*

To acknowledge, clear or un-acknowledge an alarm, select the **action** sub-Element (Figure 160)**.** The User is now presented with a window that displays an operation to be performed on the following alarm-names.

- **Voltage.** *Allows acknowledgement, clearing and un-acknowledgment of alarms*
- **Sector-Comm-Loss.** *Indicates if Sector is Up or Down.*
- **Temperature.** *Low, Hi or Normal Operating Temperature*
- **Sector-Down.** *View the active alarms*
- **GPS-Synch-Holdoff.** *Indicates if GPS is reliable or unreliable.*
- **GPS-Synch-Loss.** *Indicates if GPS is reliable or unreliable.*

Select the alarm type and click Perform to apply the action
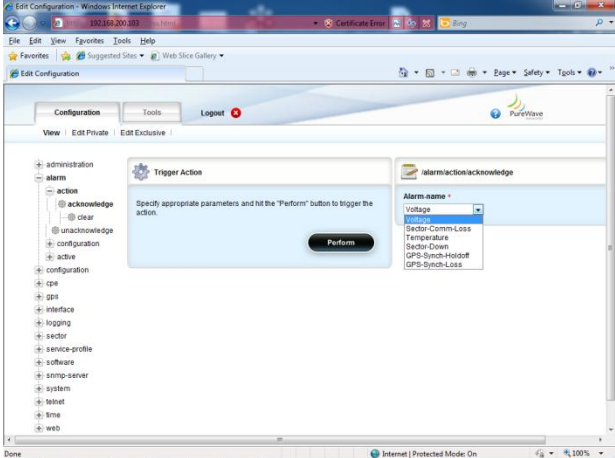
Figure 160 Alarm Action

Appendix A   Capacity Tables

We present here a set of tables specifying the raw (MAC-layer) throughput of a PureWave Quantum Family base Station for 5, 7 and 10MHz, under ideal conditions, corresponding to the maximum achievable performance that can be achieved using IEEE 802.16e per channel bandwidth and TDD configuration ratio.

All results assume PUSC, a MAP size of 4 symbols, and 1 preamble symbol. The numbers represent the maximum MAC layer performance using all sub-channels and exclude Ethernet Layer 2 or higher layer overheads. Values are in units of Mbps.

Note that these results are specific to the stated configuration under ideal conditions and should be considered indicative of expected results. Actual results will vary depending upon the actual configuration, error rate, environment, and numerous other factors.

| MCS Rate	10MHz			5MHz		
	Downlink	Uplink	Bi-Dir	Downlink	Uplink	Bi-Dir
64QAM-5/6	21.60	5.04	25.44	10.8	2.45	13.25
64QAM-3/4	19.44	4.54	22.90	9.72	2.2	11.92
64QAM-2/3	17.28	4.03	20.35	8.64	1.96	10.6
64QAM-1/2	12.96	3.02	15.26	6.48	1.47	7.95
16QAM-3/4	12.96	3.02	15.26	6.48	1.47	7.95
16QAM-1/2	8.64	2.02	10.18	4.32	0.98	5.3
QPSK-3/4	6.48	1.51	7.63	3.24	0.73	3.97
QPSK-1/2	4.32	1.01	5.09	2.16	0.49	2.65

Table 14: Max Throughput - 35:12 - 74%:26%

MCS Rate	10MHz			5MHz		
	Downlink	Uplink	Bi-Dir	Downlink	Uplink	Bi-Dir
64QAM-5/6	18.72	6.72	25.44	9.36	3.26	12.62
64QAM-3/4	16.85	6.05	22.90	8.42	2.94	11.36
64QAM-2/3	14.98	5.38	20.35	7.49	2.61	10.10
64QAM-1/2	11.23	4.03	15.26	5.62	1.96	7.57
16QAM-3/4	11.23	4.03	15.26	5.62	1.96	7.57
16QAM-1/2	7.49	2.69	10.18	3.74	1.31	5.05
QPSK-3/4	5.62	2.02	7.63	2.81	0.98	3.79
QPSK-1/2	3.74	1.34	5.09	1.87	0.65	2.52

Table 15: Max Throughput - 32:15 – 68%:32%

MCS Rate	10MHz			5MHz		
	Downlink	Uplink	Bi-Dir	Downlink	Uplink	Bi-Dir
64QAM-5/6	17.28	8.40	25.68	8.64	4.08	12.72
64QAM-3/4	15.55	7.56	23.11	7.78	3.67	11.45
64QAM-2/3	13.82	6.72	20.54	6.91	3.26	10.18
64QAM-1/2	10.37	5.04	15.41	5.18	2.45	7.63
16QAM-3/4	10.37	5.04	15.41	5.18	2.45	7.63
16QAM-1/2	6.91	3.36	10.27	3.46	1.63	5.09
QPSK-3/4	5.18	2.52	7.70	2.59	1.22	3.82
QPSK-1/2	3.46	1.68	5.14	1.73	0.82	2.54

Table 16: Max Throughput – 29:18 - 62%:38%

MCS Rate	10MHz			5MHz		
	Downlink	Uplink	Bi-Dir	Downlink	Uplink	Bi-Dir
64QAM-5/6	14.40	10.08	24.48	7.20	4.90	12.10
64QAM-3/4	12.96	9.07	22.03	6.48	4.41	10.89
64QAM-2/3	11.52	8.06	19.58	5.76	3.92	9.68
64QAM-1/2	8.64	6.05	14.69	4.32	2.94	7.26
16QAM-3/4	8.64	6.05	14.69	4.32	2.94	7.26
16QAM-1/2	5.76	4.03	9.79	2.88	1.96	4.84
QPSK-3/4	4.32	3.02	7.34	2.16	1.47	3.63
QPSK-1/2	2.88	2.02	4.90	1.44	0.98	2.42

Table 17: Max Throughput – 26:21 - 55%:45%

MCS Rate	7MHz		
	Downlink	Uplink	Bi-Dir
64QAM-5/6	11.5	5.0	16.6
64QAM-3/4	10.4	4.5	14.9
64QAM-2/3	9.2	4.0	13.2
64QAM-1/2	6.9	3.0	9.9
16QAM-3/4	4.6	2.0	6.6
16QAM-1/2	3.5	1.5	5.0
QPSK-3/4	2.3	1.0	3.3
QPSK-1/2	11.5	5.0	16.6

Table 18: Max Throughput – 21:12 - 64%:36%

MCS Rate	7MHz		
	Downlink	Uplink	Bi-Dir
64QAM-5/6	13.0	3.4	16.3
64QAM-3/4	11.7	3.0	14.7
64QAM-2/3	10.4	2.7	13.1
64QAM-1/2	7.8	2.0	9.8
16QAM-3/4	5.2	1.3	6.5
16QAM-1/2	3.9	1.0	4.9
QPSK-3/4	2.6	0.7	3.3
QPSK-1/2	13.0	3.4	16.3

Table 19: Max Throughput – 23:9 - 72%:28%

MCS Rate	7MHz		
	Downlink	Uplink	Bi-Dir
64QAM-5/6	8.6	6.7	15.4
64QAM-3/4	7.8	6.0	13.8
64QAM-2/3	6.9	5.4	12.3
64QAM-1/2	5.2	4.0	9.2
16QAM-3/4	3.5	2.7	6.1
16QAM-1/2	2.6	2.0	4.6
QPSK-3/4	1.7	1.3	3.1
QPSK-1/2	8.6	6.7	15.4

Table 20: Max Throughput – 17:15 - 53%:47%

Appendix B   Limited Warranty Statements

Hardware

PureWave, Inc ("PureWave" or the "Company") warrants to the original end-user ("Customer") that this hardware product will conform in all material respects to the specifications provided with the hardware and will be free from defects in workmanship and materials, under normal use and service, for a period of 365 days from the date of original shipment by PureWave.

PureWave's sole obligation under this limited warranty shall be, at PureWave's option, to repair the defective product or part, deliver to Customer an equivalent product or part to replace the defective item, or if neither of the two foregoing options is reasonably possible, refund to Customer the purchase price paid for the defective product. All products that are replaced will become the property of PureWave. Replacement products may be new or reconditioned. PureWave's obligations hereunder are conditioned upon the returned of affected articles in accordance with PureWave's Return Material Authorization (RMA) procedures.

The above warranty will also apply to any replaced or repaired product for 90 days from the date of shipment from PureWave of the replaced or repaired product, or the remainder of the initial warranty period, whichever is longer.

Software

PureWave warrants to the Customer that for a period of ninety (90) days from your receipt of the Product as demonstrated by written records (the "Warranty Period") the Software will perform substantially in accordance with the Documentation.

If the Software fails to comply with the warranty set forth above, your exclusive remedy will be, at the option of PureWave (i) a reasonable effort by PureWave to make the Software perform substantially in accordance with the Documentation, or (ii) return of the purchase price. This limited warranty applies only if you return all copies of the Product, together with proof of purchase, to PureWave during the Warranty Period.

This limited warranty is VOID if failure of the Software is due to modification of the Software not made by PureWave, or the abuse or misapplication of the Software.

PUREWAVE DOES NOT WARRANT THAT THE SOFTWARE IS ERROR FREE, THAT THE CUSTOMER WILL BE ABLE TO OPERATE THE SOFTWARE WITHOUT PROBLEMS OR INTERRUPTIONS OR THAT THE SOFTWARE OR ANY EQUIPMENT, SYSTEM OR NETWORK ON WHICH THE SOFTWARE IS USED WILL BE FREE OF VULNERABILITY TO INTRUSION OR ATTACK.

Additional Conditions

Notwithstanding anything else herein or otherwise, PureWave reserves the right to establish amendments to its RMA Policy from time to time. Further, **PureWave Technical Support may prefer to troubleshoot the wireless link with an onsite Customer technician while the Products are in their original non-conforming state. This process might assist Customer in understanding and troubleshooting the issue. If PureWave was not afforded the opportunity to troubleshoot an allegedly non-conforming Product in original non-conforming state, PureWave may approve or reject an RMA request in its sole discretion.**

No Fault Found

Notwithstanding sections above, if PureWave cannot duplicate any alleged non-conformity, the Product will be returned to the Customer as "No Fault Found." PureWave reserves the right to charge a testing fee in connection with a returned product that PureWave determines as "No Fault Found," and any s**uch payment must be received by PureWave prior to return shipment of the applicable Product to Customer.**

Warranty Limitations

PureWave's warranties do not apply to any product (hardware or software) which has (a) been subjected to abuse, misuse, neglect, accident, or mishandling, (b) been opened, repaired, modified, or altered by anyone other than PureWave, (c) been used for or subjected to applications, environments, or physical or electrical stress or conditions other than as intended and recommended by PureWave, (d) been improperly stored, transported, installed, or used, or (e) had its serial number or other identification markings altered or removed.

Warranty Disclaimer

PURWAVE'S SPECIFIC WARRANTIES SUMMARIZED ABOVE ARE THE ONLY WARRANTIES GIVEN BY PUREWAVE WITH RESPECT TO ITS PRODUCTS (HARDWARE AND SOFTWARE) AND ARE GIVEN IN LIEU OF ANY AND ALL OTHER WARRANTIES, WHETHER EXPRESS, IMPLIED, STATUTORY, OR ARISING BY CUSTOM, TRADE USAGE, OR COURSE OF DEALING, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, AND PUREWAVE DISCLAIMS ANY AND ALL OTHER WARRANTIES TO THE MAXIMUM EXTENT PERMITTED BY LAW. Without limiting the generality of the foregoing sentence, PureWave makes no warranty or representation, either expressed or implied, as to, and disclaims all liability and responsibility for, (a) the operation, compliance, labeling, or packaging of any of its products under the laws of any jurisdiction outside of the United States of America and (b) the regulatory compliance of any products in any jurisdiction in which it has not specifically identified compliance or the use of any product in any jurisdiction in any manner other than as contemplated in the regulatory certifications and approvals for that product in that jurisdiction. To the extent an implied warranty cannot be excluded, such warranty is limited in duration to the warranty period. The disclaimer and exclusion applies even if the express warranty fails of its essential purpose.

Obtaining Warranty Service

Customer must contact the Company, by sending an e-mail to support@pwnets.com to obtain warranty service authorization. When contacting PureWave for support, please be prepared to provide the product description and serial number and a description of the problem. The Customer will be expected to complete a "Return Material Authorization (RMA)" form to initiate the request. Full instructions as to how to complete and where to send the form are provided on the form. Date of proof of purchase from PureWave will be required.

Products returned to PureWave Inc must be pre-authorized by PureWave with a Return Material Authorization (RMA) number and sent prepaid and packaged appropriately for safe shipment. The Customer requesting the RMA will be the exporter. The exporter is responsible to ship RMA equipment to PureWave's address and has to bear the cost and risk involved in bringing the goods to PureWave's location.

Risk of loss in return shipment will be borne by Customer, and it is recommended that returned goods be insured and/or sent by a method that provides for tracking of the package. Responsibility for loss or damage does not transfer to PureWave until the returned item is received by PureWave. Provided that PureWave determines that the item is actually defective, the repaired or replaced item will be shipped to Customer, at PureWave's expense, (1) not later than thirty (30) days after PureWave receives the defective product or (2) to the terms of a separate written agreement with PureWave.

If the allegedly non-conforming Product is not received by PureWave within thirty (30) days of Customer initiating the RMA request, the RMA process for that Product will be deemed cancelled.

You may also obtain the status of their RMA request(s) by sending an e-mail to support@pwnets.com referencing their assigned RMA Number(s).

No product will be accepted for repair or replacement by PureWave without a RMA number. The product must be returned to PureWave, properly packaged to prevent damage, shipping and handling charges prepaid, with *the RMA number prominently displayed on the outside of the container.* If PureWave determines that a returned product is not defective or is not covered by the terms of the warranty, the Customer will be charged a service charge and return shipping charges.

Table 21 summarizes the conditions and charges that PureWave reserves the right to levy.

RMA Related Issue	Under Warranty
Repair and return	No charge, PureWave pays
Shipment of unit to PureWave	Customer pays
Regular Shipment to Customer	No charge, PureWave pays
Expedited shipment to Customer	Customer pays the additional cost of the expedited shipping
No Fault Found	PureWave reserves the right to levy a charge
Warranty for repaired and or replaced product	Remainder of the original warranty or 90 days

Table 21: Summary of PureWave RMA Conditions and Charges

Assistance

For assistance, contact your nearest PureWave Networks Sales and Service office. Additional information is available on the PureWave Networks website at http://www.pwnets.com.

For Customer Service call: 650-528-5200, or Email: support@pwnets.com.