7 Availability, mobility, and controller functionality

This chapter describes the availability and mobility concepts, including:

- Availability overview
- Mobility manager
- Defining management users
- Configuring network time
- Configuring Check Point event logging
- Enabling SNMP
- Using controller utilities
- Configuring Web session timeouts

The HiPath Wireless Controller provides additional functionality including:

- **Availability** – Maintains service availability in the event of a HiPath Wireless Controller outage
- **Mobility** – Allows multiple HiPath Wireless Controllers on a network discover each other and exchange information about a client session. A maximum of up to 12 controllers can be linked to allow users to transparently roam across controllers in the mobility domain.

7.1 Availability overview

The HiPath Wireless Controller, Access Points and Convergence Software system provides this feature to maintain service availability in the event of a HiPath Wireless Controller outage.

The availability feature links two HiPath Wireless Controllers as a pair, to share information about their Wireless APs. If one controller fails, its Wireless APs are allowed to connect to the backup controller. The second HiPath Wireless Controller provides the wireless network and a pre-assigned VNS for the Wireless AP.

Note: During a failover event, the maximum number of failover APs a backup controller can accommodate is equal to the maximum number of APs supported by the hardware platform.

Note: Wireless APs that attempt to connect to a backup controller during a failover event are assigned to the VNS that is defined in the system's default AP configuration provided the administrator has not assigned the failover Wireless APs to one or more VNSs. If a system default AP configuration does not exist for the controller (and the administrator has not assigned the failover Wireless APs to any VNS), the APs will not be assigned to any VNS during the failover.

A HiPath Wireless Controller will not accept a connection by a foreign AP if the HiPath Wireless Controller believes its availabilitty partner controller is in service.

Also, the default AP configuration assignment is only applicable to new APs that failover to the backup controller. Any AP that has previously failed-over and is already known to the backup system will receive the configuration already present on that system.

For more information, see Section 4.5.7, "Configuring the default Wireless AP settings", on page 128.

From the viewpoint of a Wireless AP, if a HiPath Wireless Controller or the connection to it fails, the Wireless AP begins its discovery process. The Wireless AP is directed to the appropriate backup controller of the pair. This connection may require the Wireless AP to reboot. Users on the Wireless AP must log in again and be authenticated on the second HiPath Wireless Controller.

Note: The availability feature provides APs with a list of interfaces to which the AP should attempt to automatically connect to when a connection with an active controller link is lost. The provided list identifies the local active interfaces (enabled on the primary and backup controllers) for the active controller as well as the active interfaces for the backup controller. The list is sorted by top-down priority. If the active link is lost (poll failure), the AP automatically scans (pings) all addresses in its availability interface list. The AP will then connect to the highest priority interface that responds to its probe.

7.1.1 Availability prerequisites

Before you begin, ensure you have completed the following:

- Choose the primary and secondary HiPath Wireless Controllers.
- Verify the network accessibility for the TCP/IP connection between the two controllers. The availability link is established as a TCP session on port 13907.
- Set up a DHCP server for AP subnets to support Option 78 for SLP, so that it points to the IP addresses of the physical interfaces on both HiPath Wireless Controllers.

Note: You should also confirm that the **Poll Timeout** parameter on the **AP Properties** page is set to its default value i.e., 15 (seconds). For more information, see Section 4.5.2, “Modifying a Wireless AP’s properties”, on page 90.
If the **Poll Timeout** value is less than 15 (seconds), the Wireless AP failover will not succeed because the secondary controller will not be ‘ready’ to accept the failover APs. The secondary controller takes around 12 to 14 seconds after the primary controller goes down to be ‘ready’ to accept the failover Wireless APs.
If the **Poll Timeout** value is more than 15 (seconds), the Wireless APs failover will be unnecessarily delayed, because the Wireless APs will continue polling the primary controller even though the secondary controller is ‘ready’ to accept them as the failover APs.

Now set up each HiPath Wireless Controller separately. One method is as follows:

1. On the **AP Registration** page, set up each HiPath Wireless Controller in Stand-alone Mode.
2. On the **Topology** tab, define a VNS on each HiPath Wireless Controller with the same SSID. The IP addresses must be unique. For more information, Section 6.3, “Topology for a VNS”, on page 164. A HiPath Wireless Controller C20/C2400 VLAN Bridged VNS can permit two controllers to share the same subnet (different IP addresses). This setup provides support for mobility users in a VLAN Bridged VNS.
3. On both HiPath Wireless Controllers, set the Registration Mode to Allow only approved so that no more Wireless APs can register unless they are approved by the administrator.
4. On the **AP Registration** page, enable the two HiPath Wireless Controllers as an availability pair.

5. On each HiPath Wireless Controller, on the **Access Approval** page, check the status of the Wireless APs and approve any APs that should be connected to that controller.

   System AP defaults can be used to assign a group of VNSs to the foreign APs:

   - If the APs are not yet known to the system, the AP will be initially configured according to AP default settings. To ensure better transition in availability, it is recommended that the AP default settings match the desired VNS assignment for failover APs.
   - AP assignment to VNSs according to the AP default settings can be overwritten by manually modifying the AP VNS assignment. (For example, select and assign each VNS that the AP should connect to.)
   - If specific foreign APs have been assigned to a VNS, those specific foreign AP assignments are used.

An alternate method to setting up APs includes:

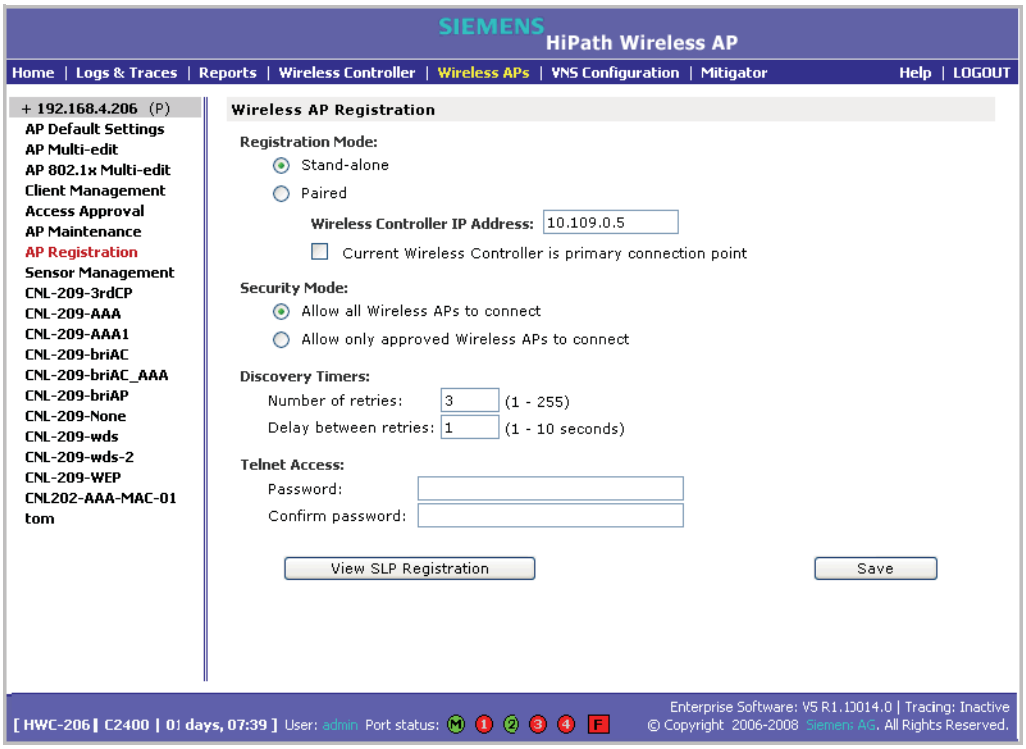
1. Add each Wireless AP manually to each HiPath Wireless Controller.
2. On the **AP Properties** page, click **Add Wireless AP**.
3. Define the Wireless AP, and then click **Add Wireless AP**.

   Manually defined APs will inherit the default AP configuration settings.

Caution: If two HiPath Wireless Controllers are paired and one has the **Allow All** option set for Wireless AP registration, all Wireless APs will register with that HiPath Wireless Controller.

To set the primary or secondary HiPath Wireless Controllers for availability:

1. From the main menu, click **Wireless AP Configuration**. The **Wireless APs** page is displayed.
2. In the left pane, click **AP Registration**. The **Wireless AP Registration** page is displayed.



3. To enable availability, select the **Paired** option.
4. Do one of the following:
   - For a primary controller, in the **Wireless Controller IP Address** box, type the IP address of the physical port of the secondary HiPath Wireless Controller. This IP address must be on a routable subnet between the two HiPath Wireless Controllers.
   - For a secondary controller, in the **Wireless Controller IP Address** box, type the IP address of the Management port or physical port of the primary HiPath Wireless Controller.
5. Do one of the following:
   - To set this HiPath Wireless Controller as the primary connection point, select the **Current Wireless Controller is primary connect point** checkbox.
   - To set this HiPath Wireless Controller as the secondary connection point, clear the **Current Wireless Controller is primary connect point** checkbox.

   If the **Current Wireless Controller is primary connect point** checkbox is selected, the specified controller waits for a request. If the **Current Wireless Controller is primary connect point** checkbox is cleared, the specified controller sends a connection request. Confirm that one controller has this

checkbox selected, and the second controller has this checkbox cleared, since improper configuration of this option will result in incorrect network configuration.

6. To set the security mode for the HiPath Wireless Controller, select one of the following options:

   - **Allow all Wireless APs to connect** – If the HiPath Wireless Controller does not recognize the serial number, it sends a default configuration to the Wireless AP. Or, if the HiPath Wireless Controller recognizes the serial number, it sends the specific configuration (port and binding key) set for that Wireless AP.
   - **Allow only approved Wireless APs to connect –** If the HiPath Wireless Controller does not recognize the serial number, the operator is prompted to create a configuration. Or, if the HiPath Wireless Controller recognizes the serial number, it sends the configuration for that Wireless AP.

   Note: During the initial setup of the network, it is recommended to select the **Allow all Wireless APs to connect** option. This option is the most efficient way to get a large number of Wireless APs registered with the HiPath Wireless Controller.

   Once the initial setup is complete, it is recommended that the security mode is reset to the **Allow only approved Wireless APs to connect** option. This option ensures that no unapproved Wireless APs are allowed to connect. For more information, see Section 4.5, “Configuring Wireless AP settings”, on page 87.

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7. To save your changes, click **Save**.

Note: When two HiPath Wireless Controllers have been paired as described above, each HiPath Wireless Controller's registered Wireless APs will appear as foreign on the other controller in the list of available Wireless APs when configuring a VNS topology.

7.1.2 Viewing the Wireless AP availability display

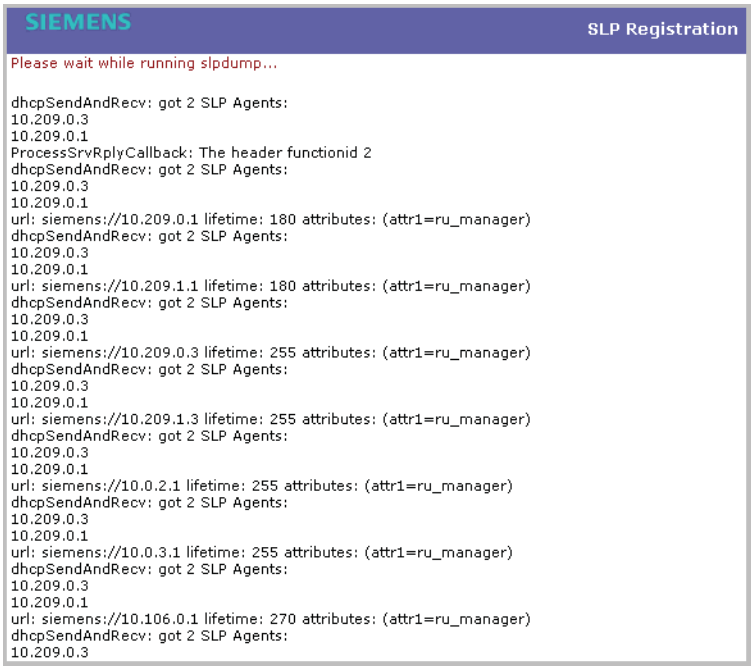
For more information, see Section 10.1.1, “Viewing the Wireless AP availability display”, on page 295.

7.1.3 Viewing SLP activity

In normal operations, the primary HiPath Wireless Controller registers as an SLP service called ac_manager. The controller service directs the Wireless APs to the appropriate HiPath Wireless Controller. During an outage, if the remaining HiPath Wireless Controller is the secondary controller, It registers as the SLP service ru_manager.

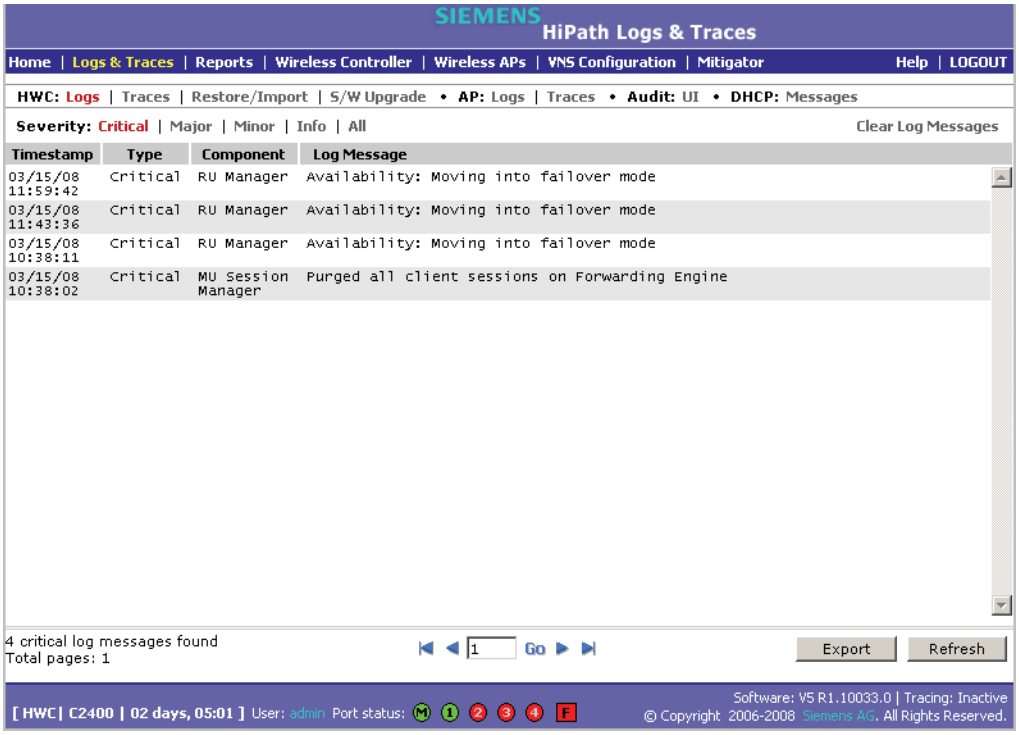
To view SLP activity:

1. From the main menu, click **Wireless AP Configuration**. The **Wireless APs** page is displayed.
2. In the left pane, click **AP Registration**. The **Wireless AP Registration** page is displayed.
3. To confirm SLP registration, click **View SLP Registration**. A pop-up page displays the results of the diagnostic slpdump tool, to confirm SLP registration.



7.1.4 Events and actions during a failover

If one of the HiPath Wireless Controllers in a pair fails, the connection between the two HiPath Wireless Controllers is lost. This triggers a failover mode condition, and a critical message is displayed in the information log of the remaining HiPath Wireless Controller.



After the Wireless AP on the failed HiPath Wireless Controller loses its connection, it will try to connect to all enabled interfaces on both controllers without rebooting. If the Wireless AP is unsuccessful, it will begin the discovery process. If the Wireless AP is not successful in connecting to the HiPath Wireless Controller after five minutes of attempting, the Wireless AP will reboot.

If the AP is assigned to different VNSs on the two controllers, it will reboot. Because of the pairing of the two HiPath Wireless Controllers, the Wireless AP will then register with the other HiPath Wireless Controller.

All user sessions using the AP that fails over will terminate unless the **Maintain client sessions in event of poll failure** option is enabled on the **AP Properties** tab or **AP Default Settings** page.

Note: A Wireless AP connects first to a HiPath Wireless Controller registered as ac_manager and, if not found, then seeks an ru_manager. If the primary HiPath Wireless Controller fails, the secondary one registers as ru_manager. This enables the secondary HiPath Wireless Controller to be found by Wireless APs after they reboot.

When the Wireless APs connect to the second HiPath Wireless Controller, they will be assigned to the VNS that is defined in the system's default AP configuration. The wireless device users will log in again and be authenticated on the second HiPath Wireless Controller.

When the failed HiPath Wireless Controller recovers, each HiPath Wireless Controller in the pair goes back to normal mode. They exchange information that includes the latest lists of registered Wireless APs. The administrator must release the Wireless APs manually on the second HiPath Wireless Controller, so that they may re-register with their home HiPath Wireless Controller. Foreign APs can now all be released at once by using the **Foreign** button on the **Access Approval** page to select all foreign APs, and then clicking **Released**.

To support the availability feature during a failover event, administrators need to do the following:

1. Monitor the critical messages for the failover mode message, in the information log of the remaining HiPath Wireless Controller (in the **Reports and Displays** section of the HiPath Wireless Controller).
2. After recovery, on the HiPath Wireless Controller that did not fail, select the foreign Wireless APs, and then click **Release** on the **Access Approval** page.

7.2 Mobility manager

The HiPath Wireless Controller, Access Points and Convergence Software system allows multiple HiPath Wireless Controllers (up to 12) on a network to discover each other and exchange information about a client session. This technique enables a wireless device user to roam seamlessly between different Wireless APs on different HiPath Wireless Controllers.

The solution introduces the concept of a mobility manager, where one HiPath Wireless Controller on the network is designated as the mobility manager and all others are designated as mobility agents.

The wireless device keeps the IP address, VNS assignment, and filtering rules it received from its home HiPath Wireless Controller—the HiPath Wireless Controller that it first connected to. The VNS on each HiPath Wireless Controller must have the same SSID and RF privacy parameter settings.

For the mobility manager you have two options:

- Rely on SLP with DHCP Option 78
- Define at the agent the IP address of the mobility manager. By explicitly defining the IP address, the agent and the mobility manager are able to find each other directly without using the SLP discovery mechanisms. Direct IP definition is recommended in order to provide tighter control of the registration steps for multi-domain installations.

The HiPath Wireless Controller designated as the mobility manager:

- The mobility manager is explicitly identified as the manager for a specific mobility domain. Agents will connect to this manager to establish a mobility domain.

- Defines at the agent the IP address of the mobility manager, which allows for the bypass of SLP. Agents directly find and attempt to register with the mobility manager.
- Uses SLP, if this method is preferred, to register itself with the SLP Directory Agent as SiemensNet
- Defines the registration behavior for a multi-controller mobility domain set:
  - **Open mode** – A new agent is automatically able to register itself with the mobility manager and immediately becomes part of the mobility domain
  - **Secure mode** – The mobility manager does not allow a new agent to automatically register. Instead, the connection with the new agent is placed in pending state until the administrator approves the new device.
- Listens for connection attempts from mobility agents
- Establishes connection and sends a message to the mobility agent specifying the Heartbeat interval, and the mobility manager's IP address if it receives a connection attempt from the agent
- Sends regular Heartbeat messages containing wireless device session changes and agent changes to the mobility agents and waits for a returned update message

The HiPath Wireless Controller designated as a mobility agent:

- Uses SLP or a statically configured IP address to locate the mobility manager
- Defines at the agent the IP address of the mobility manager, which allows for the bypass of SLP. Agents directly find and attempt to register with the mobility manager.
- Attempts to establish a TCP/IP connection with the mobility manager
- Updates its tables, and sets up data tunnels to and between all HiPath Wireless Controllers it has been informed of when it receives the connection-established message
- Uses the information from every Heartbeat message received to update its own tables and updates the mobility manager with information on the wireless device users and data tunnels it is managing

If a controller configured as the mobility manager is lost, the following occurs:

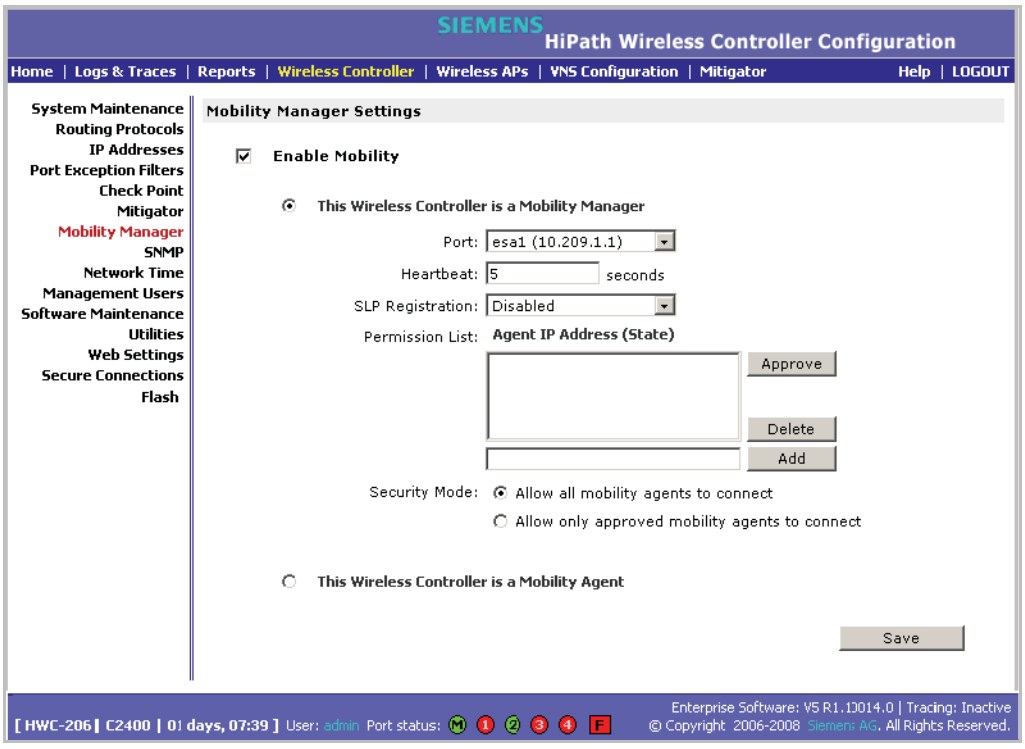
- Agent to agent connections will remain active.
- Mobility agents will continue to operate based on the mobility information last coordinated before the manager link was lost. The mobility location list remains relatively unaffected by the controller failure. Only entries associated with the failed controller are cleared from the registration list, and users that

have roamed from the manager controller to other agents are terminated and required to re-register as local users with the agent where they are currently located.

- Participant controllers are reset to nodal operation
- Any user sessions that roamed away from their home AP are terminated and must reconnect
- Users need to reconnect to network, re-authenticate, and obtain new IP address
- The data link between active controllers remains active after the loss of a mobility manager
- Mobility agents continue to use the last set of mobility location list to service known users
- Existing users:
  - Existing users remain in mobility scenario, and if the users are known to mobility domain, they continue to be able to roam between connected controllers
- New users:
  - New users become local at attaching controller
  - Roaming to another controller resets session

To designate a mobility manager:

1. From the main menu, click **Wireless Controller Configuration**. The **Wireless Controller Configuration** page is displayed.
2. In the left pane, click **Mobility Manager**. The **Mobility Manager Settings** page is displayed.



3. To enable mobility for this controller, select the **Enable Mobility** checkbox. The controller mobility options appear.
4. Select the **This Wireless Controller is a Mobility Manager** option. The mobility manager options appear.
5. In the **Port** drop-down list, click the interface on the HiPath Wireless Controller to be used for the mobility manager process. Ensure that the selected interface is routable on the network.
6. In the **Heartbeat** box, type the time interval (in seconds) at which the mobility manager sends a Heartbeat message to a mobility agent. The default is **5** seconds.
7. In the **SLP Registration** drop-down list, click whether to enable or disable SLP registration.
8. In the **Permission** list, click the agent IP addresses you want to approve that are in pending state, by selecting the agent and clicking **Approve**. New agents are only added to the domain if they are approved.

   You can also add or delete controllers that you want to be part of the mobility domain. To add a controller, type the agent IP address in the box, and then click **Add**. To delete a controller, click the controller in the list, and then click **Delete**.
9. Select the Security Mode option:

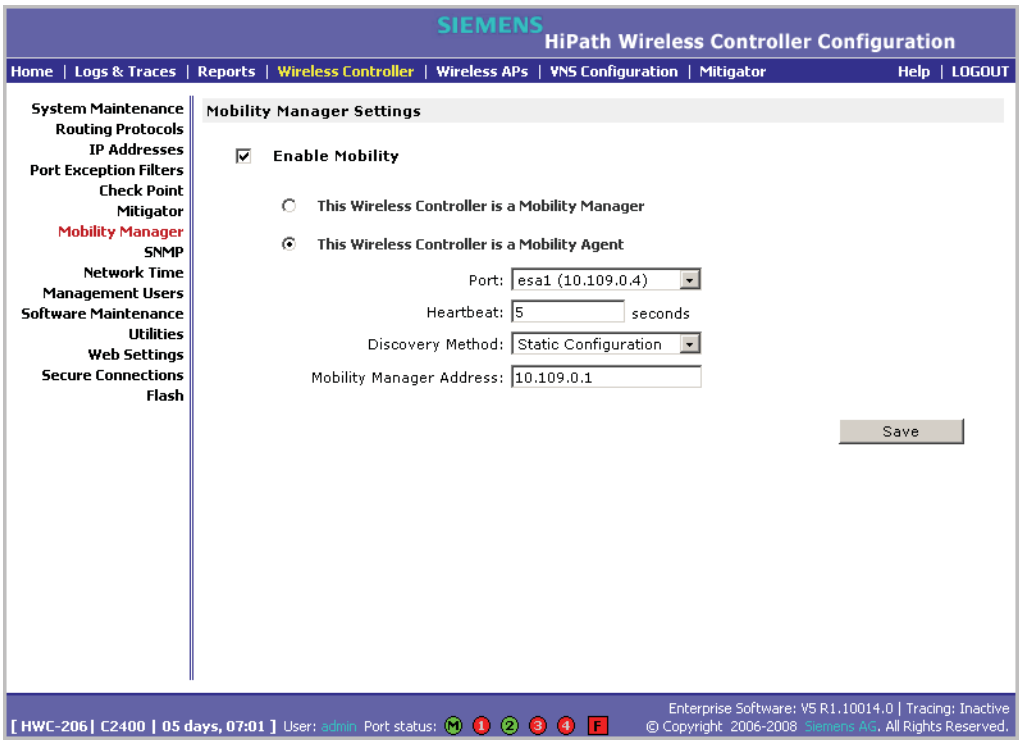
- **Allow all mobility agents to connect** – All mobility agents can connect to the mobility manager.
- **Allow only approved mobility agents to connect** – Only approved mobility agents can connect to the mobility manager.

10. To save your changes, click **Save**.

Note: If you set up one HiPath Wireless Controller on the network as a mobility manager, all other HiPath Wireless Controllers must be set up as mobility agents.

To designate a mobility agent:

1. From the main menu, click **Wireless Controller Configuration**. The **Wireless Controller Configuration** page is displayed.
2. In the left pane, click **Mobility Manager**. The **Mobility Manager Settings** page is displayed.
3. To enable mobility for this controller, select the **Enable Mobility** checkbox. The controller mobility options are displayed,
4. Select the **This Wireless Controller is a Mobility Agent** option. The mobility agent options are displayed.



5. From the **Port** drop-down list, click the port on the HiPath Wireless Controller to be used for the mobility agent process. Ensure that the port selected is routable on the network.
6. In the **Heartbeat** box, type the time interval (in seconds) to wait for a connection establishment response before trying again. The default is **60** seconds.
7. From the **Discovery Method** drop-down list, click one of the following:
   - **SLPD** – Service Location Protocol Daemon is a background process acting as a SLP server. It provides the functionality of the Directory Agent and Service Agent for SLP. Use SLP to support the discovery of siemensNET service to attempt to locate the area mobility manager controller.
   - **Static Configuration** – Select Static Configuration if you want to enter the IP address of the mobility manager manually. Defining a static configuration for a mobility manager IP address bypasses SLP discovery.
8. In the **Mobility Manager Address** box, type the IP address for the designated mobility manager.
9. To save your changes, click **Save**.

7.2.1 Displays for the mobility manager

For more information, see Section 10.1.4, “Viewing displays for the mobility manager”, on page 300.

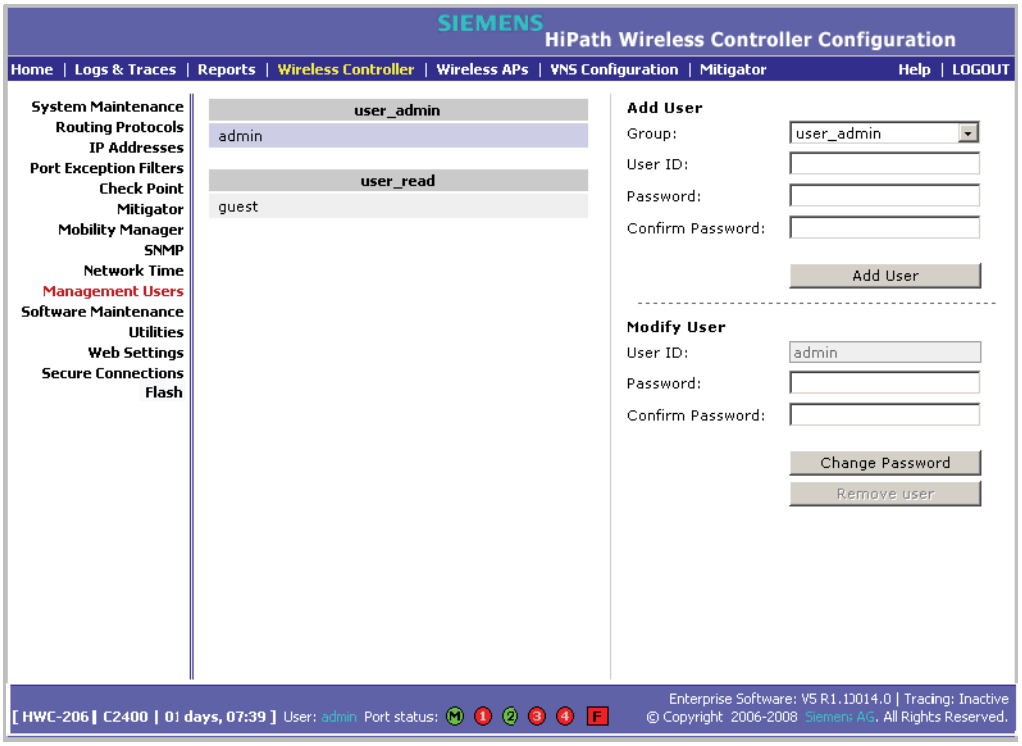
7.3 Defining management users

On this page you define the login user names that have access to the HiPath Wireless Assistant, either for HiPath Controller, Access Points and Convergence Software administrators with read/write privileges, or users with read only privileges. For each user added, you can also define and modify a user ID and password.

Note: When adding or modifying a management user, note the following password character constraints:
• Allowed characters include A-Z a-z 0-9 ~!@#$%^&*()_+|-=\{}[];<>?,./
• Characters not allowed include ` ' " : and space is not valid.

To add a HiPath Wireless Controller management user:

1. From the main menu, click **Wireless Controller Configuration**. The **Wireless Controller Configuration** page is displayed.
2. In the left pane, click **Management Users**. The **Management Users** page is displayed.



   The **user_admin** list displays Admin users who have read/write privileges. The **user_read** list is for users who have read only privileges.

3. From the **Group** drop-down list, click **Admin** or **Read only**.
4. In the **User ID** box, type the user ID for the new user. A User ID can only be used once, in only one category.
5. In the **Password** box, type the password for the new user.
6. In the **Confirm Password**, retype the password.
7. Click **Add User**. The new user is added to the appropriate user list.

To modify a HiPath Wireless Controller management user:

1. From the main menu, click **Wireless Controller Configuration**. The **Wireless Controller Configuration** page is displayed.
2. In the left pane, click **Management Users**. The **Management Users** page is displayed.
3. Click the user you want to modify.

4. In the **Password** box, type the new password for the user.
5. In the **Confirm Password**, retype the new password.
6. To change the password, click **Change Password**.

To remove a HiPath Wireless Controller management user:

1. From the main menu, click **Wireless Controller Configuration**. The **Wireless Controller Configuration** page is displayed.
2. In the left pane, click **Management Users**. The **Management Users** page is displayed.
3. Click the user you want to remove.
4. To remove the user, click **Remove user**. The user is removed from the list.

7.4 Configuring network time

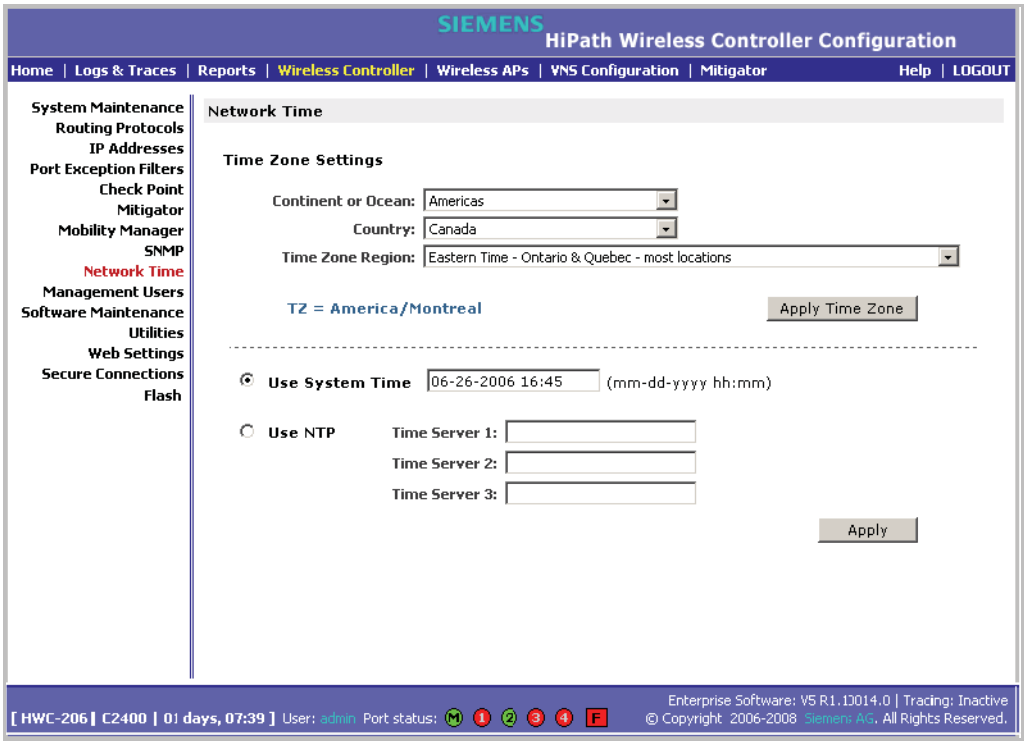
You can synchronize the elements on the network to a universal clock. This ensures accuracy in usage logs. Network time is synchronized in one of two ways:

- using system time
- using Network Time Protocol (NTP), an Internet standard protocol that synchronizes client workstation clocks.

Note: If the HiPath Wireless Controller is left powered-down for more than 78 hours, its capacitor dies down and is unable to keep the system clock working. In such a case, you must synchronize the network time, using the NTP server. If the NTP server is not reachable, you must first manually set the system to the correct time, and then use the system time to synchronize the network time.

To apply time zone settings:

1. From the main menu, click **Wireless Controller Configuration**. The **Wireless Controller Configuration** page is displayed.
2. In the left pane, click **Network Time**. The **Network Time** page is displayed.



3. From the **Continent or Ocean** drop-down list, click the appropriate large-scale geographic grouping for the time zone.
4. From the **Country** drop-down list, click the appropriate country for the time zone. The contents of the drop-down list change based on the selection in the **Continent or Ocean** drop-down list.
5. From the **Time Zone Region** drop-down list, click the appropriate time zone region for the selected country.
6. To apply your changes, click **Apply Time Zone**.

To set system time parameters:

1. From the main menu, click **Wireless Controller Configuration**. The **Wireless Controller Configuration** page is displayed.
2. In the left pane, click **Network Time**. The **Network Time** page is displayed.
3. To use system time, select the **Use System Time** radio button.
4. Type the time setting in the **Use System TIme** box, using the mm-dd-yyyy hh:mm format.
5. To apply your changes, click **Apply.**

To set Network Time Protocol:

1. From the main menu, click **Wireless Controller Configuration**. The **Wireless Controller Configuration** page is displayed.
2. In the left pane, click **Network Time**. The **Network Time** page is displayed.
3. To use Network Time Protocol, select the **Use NTP** radio option.
4. In the **Use System Time** box, type the time setting using the mm-dd-yyyy hh:mm format.
5. In the **Time Server 1** box, type the IP address or FQDN of a standard NTP Time Server. You can repeat this step for the **Time Server 2** and **Time Server 3** boxes.
6. To apply your changes, click **Apply**.

7.5 Configuring Check Point event logging

The HiPath Wireless Controller can forward specified event messages to an ELA server using the OPSEC ELA protocol - Event Logging API (Application Program Interface). On the ELA server, the event messages are tracked and analyzed, so suspicious messages can be forwarded to a firewall application that can take corrective action.

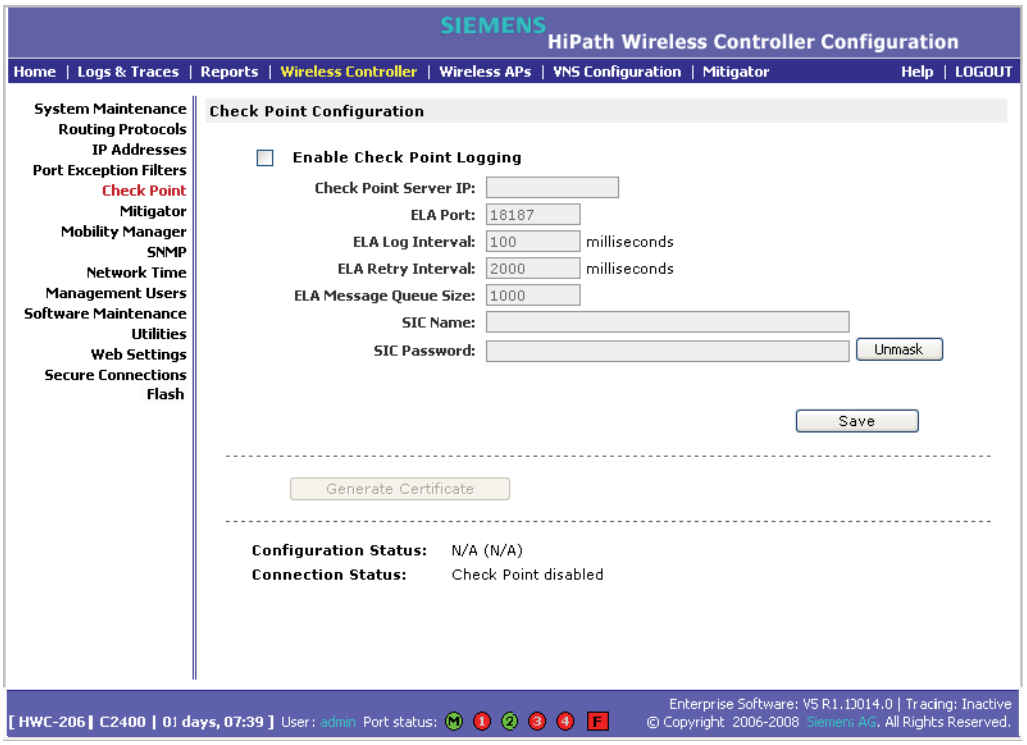
Check Point created the OPSEC (Open Platform for Security) alliance program for security application and appliance vendors to enable an open industry-wide framework for inter operability.

When ELA is enabled on the HiPath Wireless Controller, it forwards the specified event messages from its internal event server to the designated ELA Management Station on the enterprise network.

Note: Before you set up the HiPath Wireless Controller, you must first create OPSEC objects for HiPath Wireless Controller in the Check Point management software. The name and password you define must also be entered into the **Check Point Configuration** page.

To enable and configure Check Point:

1. From the main menu, click **Wireless Controller Configuration**. The **Wireless Controller Configuration** page is displayed.
2. In the left pane, click **Check Point**. The **Check Point Configuration** page is displayed.



3. To enable check point logging, select the **Enable Check Point Logging** checkbox.
4. Type the following information:
   - **Check Point Server IP** – Specifies the IP address of the ELA Management Station
   - **ELA Port** – Specifies the port to use for ELA. The default port is 18187.
   - **ELA Log Interval** – Specifies the amount of time (in milliseconds) you want the system to wait before attempting to log once there is a connection between HiPath Wireless Controller and the Check Point gateway. The default is **100** milliseconds.
   - **ELA Retry Interval** – Specifies the amount of time (in milliseconds) you want the system to wait before attempting a re-connection between HiPath Wireless Controller and the Check Point gateway. The default is **2000** milliseconds.
   - **ELA Message Queue Size** – Specifies the number of messages the log queue holds if the HiPath Wireless Controller and the Check Point gateway become disconnected. The default is **1000** log entries.
   - **SIC Name** – Specifies the Secure Internal Communication (SIC) Name, your security-based ID.

- **SIC Password** – Specifies your Secure Internal Communication (SIC) password. You can use the **Unmask** button to display the password.

5. To save your changes, click **Save**.
6. To create the certificate to be sent to the ELA Management Station, click **Generate Certificate**.

   If the certificate is properly generated and the connection with the ELA Management Station is made, the **Connection Status** section displays the following message:

   OPSEC Connection OK

   If there is an error in generating the certificate or establishing the connection, the **Connection Status** section displays the following message:

   OPSEC Connection Error

7.5.1 ELA Management Station events

The events for the ELA Management Station are grouped under Siemens and are mapped as info events and alert events. The alerts include:

- Wireless AP registration and/or authentication failed
- Authentication User Request unsuccessful
- RADIUS server rejected login (Access Rejected)
- An unknown AP has attempted to connect. AP authentication failure.
- A connection request failed to authenticate with the CM messaging server. This may indicate port-scanning of the HiPath Wireless Controller, or a back-door access attempt.
- Unauthorized client attempting to connect

7.6 Enabling SNMP

The HiPath Wireless Controller, Access Points and Convergence Software system supports Simple Network Management Protocol (SNMP), Version 1 and 2c. SNMP, a set of protocols for managing complex networks, is used to retrieve HiPath Wireless Controller statistics and configuration information.

SNMP sends messages, called protocol data units (PDUs), to different parts of a network. Devices on the network that are SNMP-compliant, called agents, store data about themselves in Management Information Bases (MIBs) and return this data to the SNMP requesters.

Note: In this current release (V5 R1), the SNMP protocol does not support the Wireless 802.11n AP since some of the Wireless 802.11n AP properties are not accurately reported.

7.6.1 MIB support

The HiPath Wireless Controller, Access Points and Convergence Software system accepts SNMP Get commands and generates Trap messages. Support is provided for the retrieval information from the router MIB-II (SNMP_GET) as well as SNMP traps. The supported MIBs include:

- SNMPv2-MIB
- IF-MIB
- IEEE802dot11-MIB
- RFC1213-MIB

Note: The HiPath Wireless Controller is not fully compliant with MIB II. For example, esa/IXP ports only provide interface statistics.

The Siemens **Enterprise MIB** includes:

- HIPATH-WIRELESS-HWC-MIB
- HIPATH-WIRELESS-PRODUCTS-MIB
- HIPATH-WIRELESS-SMI.my
- HIPATH-WIRELESS-DOT11-EXTNS-MIB
- HIPATH-WIRELESS-BRANCH-OFFICE-MIB

The MIB is provided for compilation into an external NMS. No support has been provided for automatic device discovery by an external NMS.

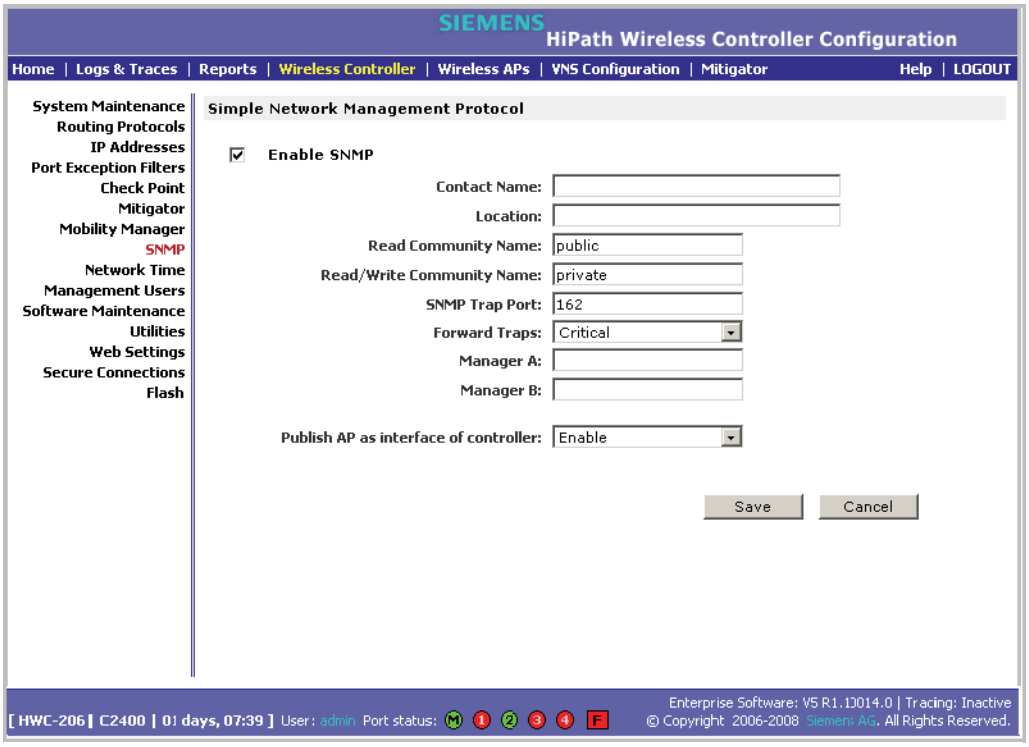
The HiPath Wireless Controller is the only point of SNMP access for the entire system. In effect, the HiPath Wireless Controller proxies sets, gets, and alarms from the associated Wireless APs.

7.6.2 Enabling SNMP on the HiPath Wireless Controller

You can enable SNMP on the HiPath Wireless Controller to retrieve statistics and configuration information.

To enable SNMP Parameters:

1. From the main menu, click **Wireless Controller Configuration**. The **Wireless Controller Configuration** page is displayed.
2. In the left pane, click **SNMP**. The **Simple Network Management Protocol** page is displayed.



3. Type the following:
   - **Contact Name** – Specifies the name of SNMP administrator.
   - **Location** – Specifies the location of the SNMP administration machine.
   - **Read Community Name** – Specifies the community name for users with read privileges.
   - **Read/Write Community Name** – Specifies the community name for users with read and write privileges.
   - **SNMP Trap Port** – Specifies the destination port for SNMP traps. The industry standard is 162. If left blank, no traps are generated.

- **Forward Traps** – Specifies the security level of the traps to be forwarded. From the drop-down list, click **Informational**, **Minor**, **Major**, or **Critical**.
- **Manager A** – Specifies the IP address of the specific machine on the network where the SNMP traps are monitored.
- **Manager B** – Specifies the IP address of a second machine on the network where the SNMP traps are monitored, if Manager A is not available.

Note: For security purposes, it is recommended that you immediately change the Read Community Name (public) and the Read/Write Community Name (private) to names that are less obvious and more secure.

---

4. In the **Publish AP as interface of controller** drop-down list, click whether to enable or disable publishing the Wireless AP and their interfaces as interfaces of the HiPath Wireless Controller. By default this option is enabled.

   When this option is enabled, all Wireless APs and their interfaces are published as interfaces of the HiPath Wireless Controller when you retrieve topology statistics and configuration information using the SNMP protocol.

   Topology statistics and configuration information on Wireless APs are retrievable using both proprietary and standard MIB. The **Publish AP as interface of controller** option only affects information retrieved through standard MIB, i.e. IF-MIB, RFC1213. All information that is retrieved through proprietary MIB is not affected. If the **Publish AP as interface of controller** option is disabled, the Wireless APs' interfaces are not considered interfaces of the HiPath Wireless Controller.

   For example, if the **Publish AP as interface of controller** option is disabled, querying the ifTable would return information on the HiPath Wireless Controller physical interfaces, plus all VNSs that are configured on that controller. If enabled, querying the same table would return the above information, in addition to information on each Wireless APs' interfaces.

5. To save your changes, click **Save**.

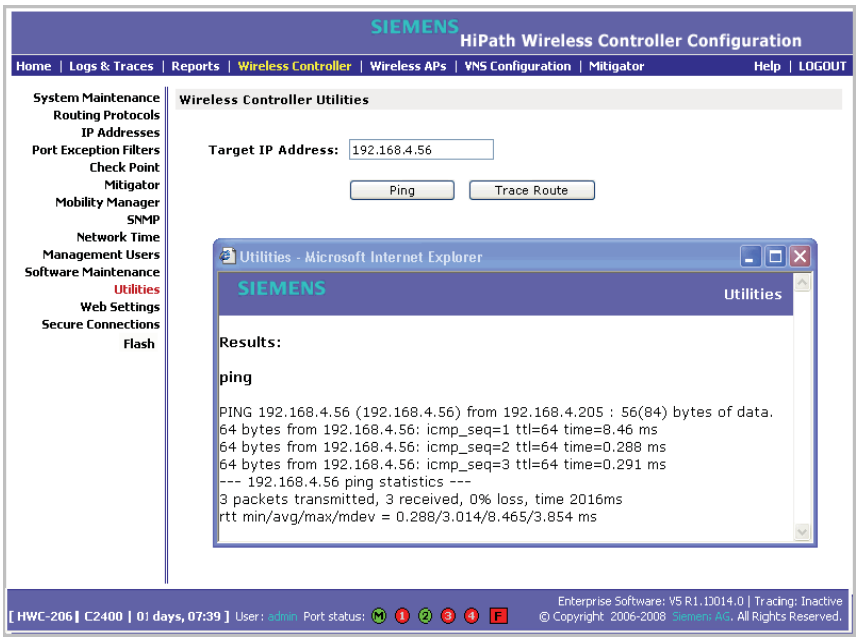
7.7 Using controller utilities

You can use HiPath Wireless Controller utilities to test a connection to the target IP address or to record the route through the Internet between your computer and the target IP address.

To test or record IP address connections:

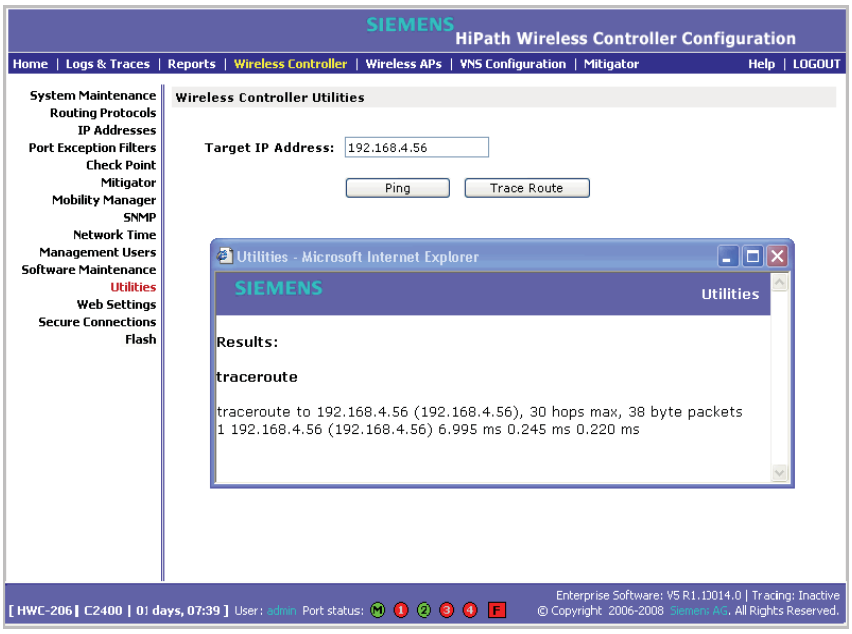
1. From the main menu, click **Wireless Controller Configuration**. The **Wireless Controller Configuration** page is displayed.
2. In the left pane, click **Utilities**. The **Wireless Controller Utilities** page is displayed.
3. In the **Target IP Address** box, type the IP address of the destination computer.
4. To test a connection to the target IP address, click **Ping**. A pop-up window is displayed with the ping results.

   The following is an example of ping results.



5. To record the route through the Internet between your computer and the target IP address, click **Trace Route**.

   The following is an example of trace results.

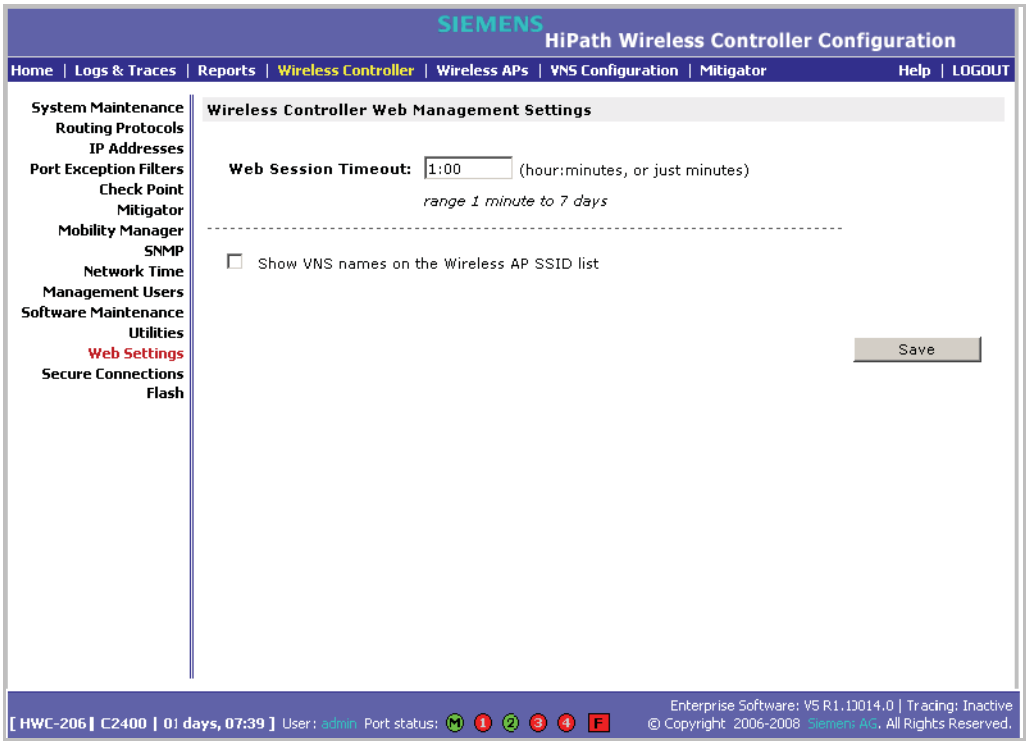


7.8 Configuring Web session timeouts

You can configure the time period to allow Web sessions to remain inactive before timing out.

To configure Web session timeouts:

1. From the main menu, click **Wireless Controller Configuration**. The **Wireless Controller Configuration** page is displayed.
2. In the left pane, click **Web Settings** The **Wireless Controller Web Management Settings** page is displayed.



3. In the **Web Session Timeout** box, type the time period to allow the Web session to remain inactive before it times out. This can be entered as hour:minutes, or as minutes. The range is 1 minute to 168 hours.
4. Select the **Show VNS names on the Wireless AP SSID list** checkbox to allow the names of the VNSs to appear in the SSID list for Wireless APs.
5. To save your settings, click **Save**.

Note: Pages that auto-refresh will time-out, unless a manual action takes place prior to the end of the timeout period.

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8 Working with third-party APs

You can set up the HiPath Wireless Controller to handle wireless device traffic from third-party access points, providing the same policy and network access control. This process requires the following steps:

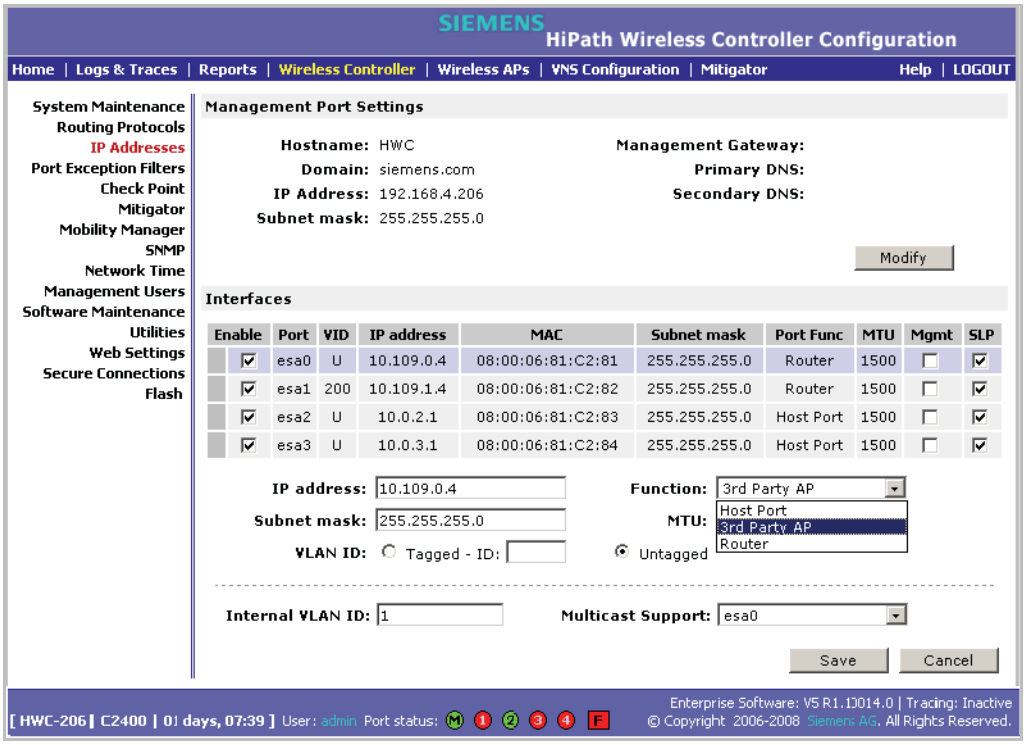
- Step 1 – Define a data port as a third party AP port:
- Step 2 – Define a VNS for the third-party AP port:
- Step 3 – Define authentication by Captive Portal and RAD policy for the third-party AP VNS:
- Step 4 – Define filtering rules for the third-party APs:

Attention: The HiPath Wireless Outdoor AP is not a third party AP. The HiPath Wireless Outdoor AP belongs to the HiPath product family.

To set up third-party APs:

Step 1 – Define a data port as a third party AP port:

1. From the main menu, click **Wireless Controller Configuration**. The **Wireless Controller Configuration** page is displayed.
2. From the left pane, click **IP Address**. The **Management Port Settings and Interfaces** page is displayed.



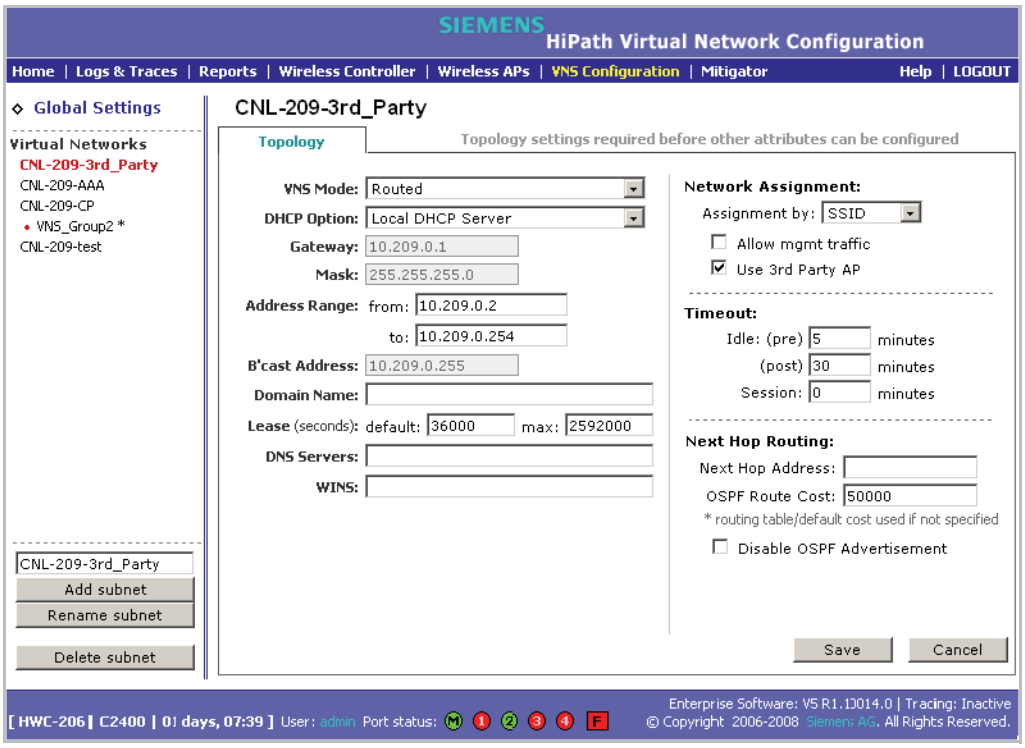
3. Click the port, and in the **Function** box, click **3rd-party AP** from the drop-down list. Make sure that Management Traffic and SLP are disabled for this port.

4. Connect the third-party access point to this port, via a switch.

Step 2 – Define a VNS for the third-party AP port:

1. From the main menu, click **Virtual Network Configuration**. The **Virtual Network Configuration** page is displayed.

2. In the left pane, type a name that will identify the new VNS in the **Add subnet** box, and then click **Add subnet**. The name is displayed in the **Virtual Networks** list. The **Topology** tab is displayed.



3. In the **Assignment by** drop-down list, click **SSID**.
4. To define a VNS for a third-party AP, select the **Use 3rd Party AP** checkbox.
5. Continue configuring your VNS, as described in Section 6.3.1, “Configuring topology for a VNS for Captive Portal”, on page 165.

Note: Bridge Traffic at AP and MAC-based authentication are not available for third-party VNSs.

Step 3 – Define authentication by Captive Portal and RAD policy for the third-party AP VNS:

1. Click the **Auth & Acct** tab.
2. In the **Authentication Configuration** page, click **Configure Captive Portal Settings**.
3. In the **Captive Portal Settings** page, define the Captive Portal configuration.
4. Click the **RAD Policy** tab.
5. Define the the filter IDs to match those in RADIUS server.

Step 4 – Define filtering rules for the third-party APs:

1. Because the third-party APs are mapped to a physical port, you must define the Exception filters on the physical port, using the **Port Exception Filters** page. For more information, see Section 6.9, “Configuring filtering rules for a VNS”, on page 194.
2. Define filtering rules that allow access to other services and protocols on the network such as HTTP, FTP, Telnet, SNMP.

In addition, modify the following functions on the third-party access point:

- Disable the access point's DHCP server, so that the IP address assignment for any wireless device on the AP is from the DHCP server at the HiPath Wireless Controller with VNS information.
- Disable the third-party access point's layer-3 IP routing capability and set the access point to work as a layer-2 bridge.

Here are the differences between third-party access points and Wireless APs on the HiPath Wireless Controller, Access Points and Convergence Software system:

- A third-party access point exchanges data with the HiPath Wireless Controller's data port using standard IP over Ethernet protocol. The third-party access points do not support the tunnelling protocol for encapsulation.
- For third-party access points, the VNS is mapped to the physical data port and this is the default gateway for mobile units supported by the third-party access points.
- A HiPath Wireless Controller cannot directly control or manage the configuration of a third-party access point.
- Third-party access points are required to broadcast an SSID unique to their segment. This SSID cannot be used by any other VNS.
- Roaming from third-party access points to Wireless APs and vice versa is not supported.

9 Working with the Mitigator

This chapter describes Mitigator concepts, including:

9.1 Mitigator overview

The Mitigator is a mechanism that assists in the detection of rogue APs. Mitigator functionality does the following:

Wireless AP:

- Runs a radio frequency (RF) scanning task.
- Alternating between scan functions, providing its regular service to the wireless devices on the network.

Note: If a Wireless AP is part of a WDS link you cannot configure it to act as a scanner in Mitigator.

HiPath Wireless Controller:

- Runs a data collector application that receives and manages the RF scan messages sent by the Wireless AP. RF data collector data includes lists of all connected Wireless APs, third-party APs, and the RF scan information that has been collected from the Wireless APs selected to perform the scan.

- Runs an Analysis Engine that processes the scan data from the data collector through algorithms that make decisions about whether any of the detected APs or clients are rogue APs or are running in an unsecure environment (for example, ad-hoc mode).

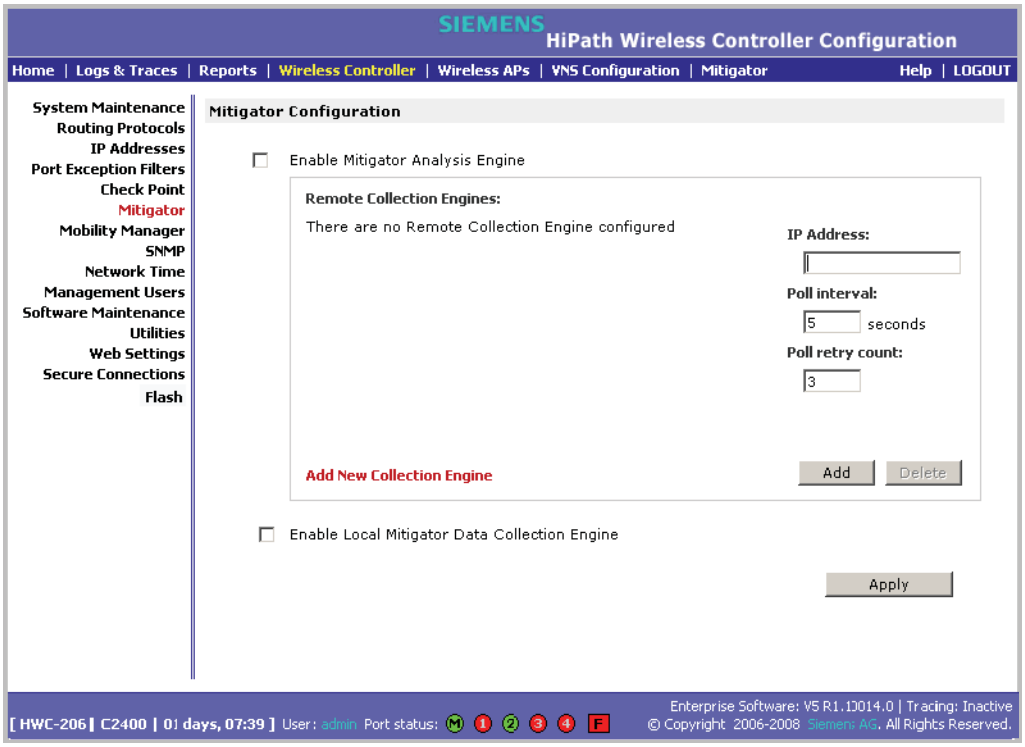
Note: In a network with more than one HiPath Wireless Controller, it is not necessary for the data collector to be running on the same controller as the Analysis Engine. One controller can be a dedicated Analysis Engine while the other controllers run data collector functionality. No more than one Analysis Engine can be running at a time. You must ensure that the controllers are all routable.

9.2 Enabling the Analysis and data collector engines

Before using the Mitigator, you must enable and define the Analysis and data collector engines.

To enable the Analysis engine:

1. From the main menu, click **Wireless Controller Configuration**. The **Wireless Controller Configuration** page is displayed.
2. In the left pane, click **Mitigator**. The **Mitigator Configuration** page is displayed.



3. To enable the Mitigator Analysis Engine, select the **Enable Mitigator Analysis Engine** checkbox.
4. To enable the Mitigator Data Collection Engine on this HiPath Wireless Controller, select the **Enable Local Mitigator Data Collection Engine** checkbox.
5. To identify the remote RF Data Collector Engine that the Analysis Engine will poll for data, type the IP address of the HiPath Wireless Controller on which the remote Data Collector resides in the **IP Address** box.

Note: Currently, the HiPath Wireless Controller C20 does not support the Remote Collection Engines functionality of the HiPath Wireless Controller, Access Points and Convergence Software solution. The Remote Collection Engines functionality is only available for the HiPath Wireless Controller C2400.

---

6. For the data collection engine:
   - In the **Poll interval** box, type (in seconds) the interval that the Analysis Engine will poll the RF Data Collector to maintain connection status. The default is **30** seconds.
   - In the **Poll retry count** box, type the number of times the Analysis Engine will attempt to poll the RF Data Collector to maintain connection status, before it stops sending requests. The default is **2** attempts.
7. Click **Add**. The IP address of the Data Collection Engine, with its Poll Interval and Poll Retry parameters is displayed in the list.

Note: For each remote RF Data Collection Engine defined here, you must:

• Enable it by selecting the **Enable Mitigator Analysis Engine** checkbox on the remote HiPath Wireless Controller
• Ensure that the controllers are routable by whatever means you use (for example, static routes, or OSPF).

---

8. To add a new collection engine, click **Add Collection Engine**.
9. Repeat steps 4 to 7.
10. To save your changes, click **Apply**.

9.3 Running Mitigator scans

The Mitigator feature allows you to view the following:

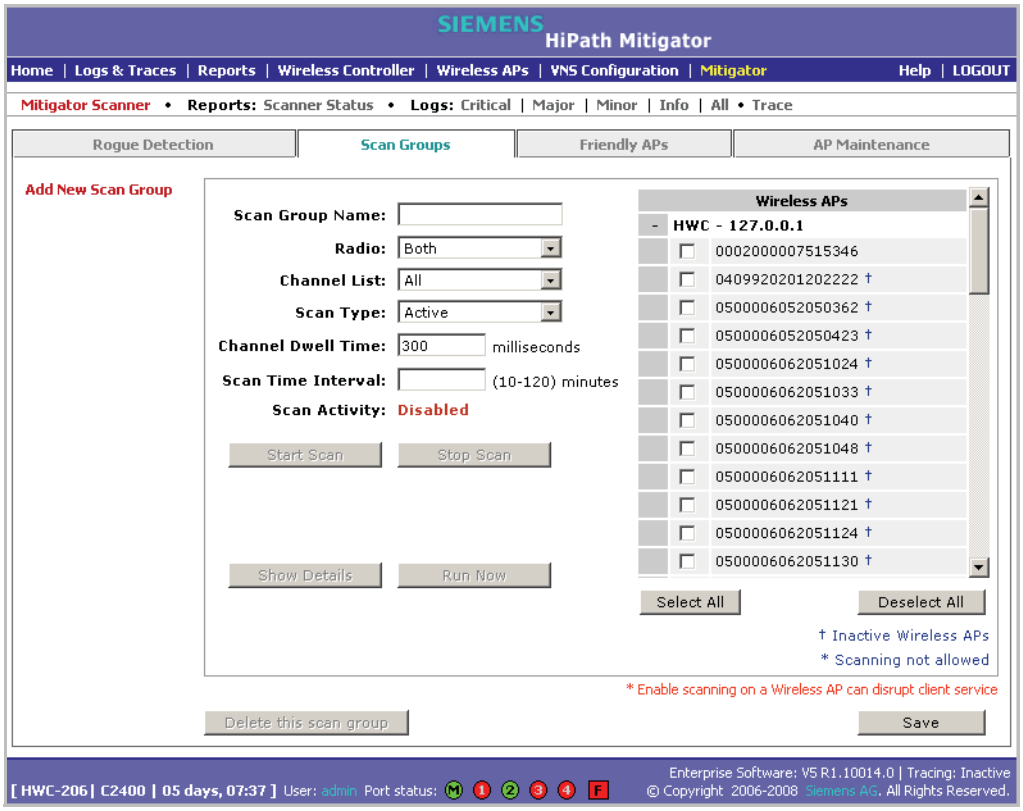
- Scan Groups
- Friendly APs
- AP Maintenance

Note: A scan will not run on an inactive AP, even though it is displayed as part of the Scan Group. If it becomes active, it will be sent a scan request during the next periodic scan.

Note: The HiPath Wireless 802.11n APs can not be added to the **Scan Group** because they are not equipped to carry out scanning.

To run the Mitigator scan task mechanism:

1. From the main menu, click **Mitigator**. The **Mitigator** page is displayed.
2. Click the **Scan Groups** tab.



3. In the **Scan Group Name** box, type a unique name for this scan group.

4. In the **Wireless APs** list, select the checkbox corresponding to the Wireless APs you want included in the new scan group, which will perform the scan function.

Note: A Wireless AP can participate in only one Scan Group at a time. It is recommended that the Scan Groups represent geographical groupings of Wireless APs.

---

5. In the **Radio** drop-down list, click one of the following:
   - **Both** – The a and b/g radios both perform the scan function.
   - **a** – Only the a radio performs the scan function.
   - **b/g** – Only the b/g radio performs the scan function.
6. In the **Channel List** drop-down list, click one of the following:
   - **All** – Scanning is performed on all channels.
   - **Current** – Scanning is performed on only the current channel.
7. In the **Scan Type** drop-down list, click one of the following:
   - **Active** – The Wireless AP sends out ProbeRequests and waits for ProbeResponse messages from any access points.
   - **Passive** – The Wireless AP listens for 802.11 beacons.
8. In the **Channel Dwell Time** box, type the time (in milliseconds) for the scanner to wait for a response from either 802.11 beacons in passive scanning, or ProbeResponse in active scanning.
9. In the **Scan Time Interval** box, type the time (in minutes) to define the frequency at which a Wireless AP within the Scan Group will initiate a scan of the RF space. The range is from one minute to 120 minutes.
10. To initiate a scan using the periodic scanning parameters defined above, click **Start Scan**.
11. To initiate an immediate scan that will run only once, click **Run Now**.

Note: If necessary, you can stop a scan by clicking **Stop Scan**.
A scan must be stopped before modifying any parameters of the Scan Group, or before adding or removing a Wireless AP from a Scan Group.

---

12. The **Scan Activity** box displays the current state of the scan engine.
13. To view a pop-up report showing the timeline of scan activity and scan results, click **Show Details**.
14. To save your changes, click **Save**.

9.4 Analysis engine overview

The Analysis engine relies on a database of known devices on the Controller, Access Points and Convergence Software system. The Analysis engine compares the data from the RF Data Collector with the database of known devices.

This database includes the following:

- **Wireless APs** – Registered with any HiPath Wireless Controller with its RF Data Collector enabled and associated with the Analysis Engine on this HiPath Wireless Controller.
- **Third-party APs** – Defined and assigned to a VNS.
- **Friendly APs** – A list created in the Mitigator user interface as potential rogue access points are designated by the administrator as Friendly.
- **Wireless devices** – Registered with any HiPath Wireless Controller that has its RF Data Collector enabled and has been associated with the Analysis Engine on this HiPath Wireless Controller.

The Analysis Engine looks for access points with one or more of the following conditions:

- **Unknown MAC address and unknown SSID** (critical alarm)
- **Unknown MAC, with a valid SSID** - a known SSID is being broadcast by the unknown access point (critical alarm)
- **Known MAC, with an unknown SSID** - a rogue may be spoofing a MAC address (critical alarm)
- **Inactive Wireless AP with valid SSID** (critical alarm)
- **Inactive Wireless AP with unknown SSID** (critical alarm)
- **Known Wireless AP with an unknown SSID** (major alarm)
- **In ad-hoc mode** (major alarm)

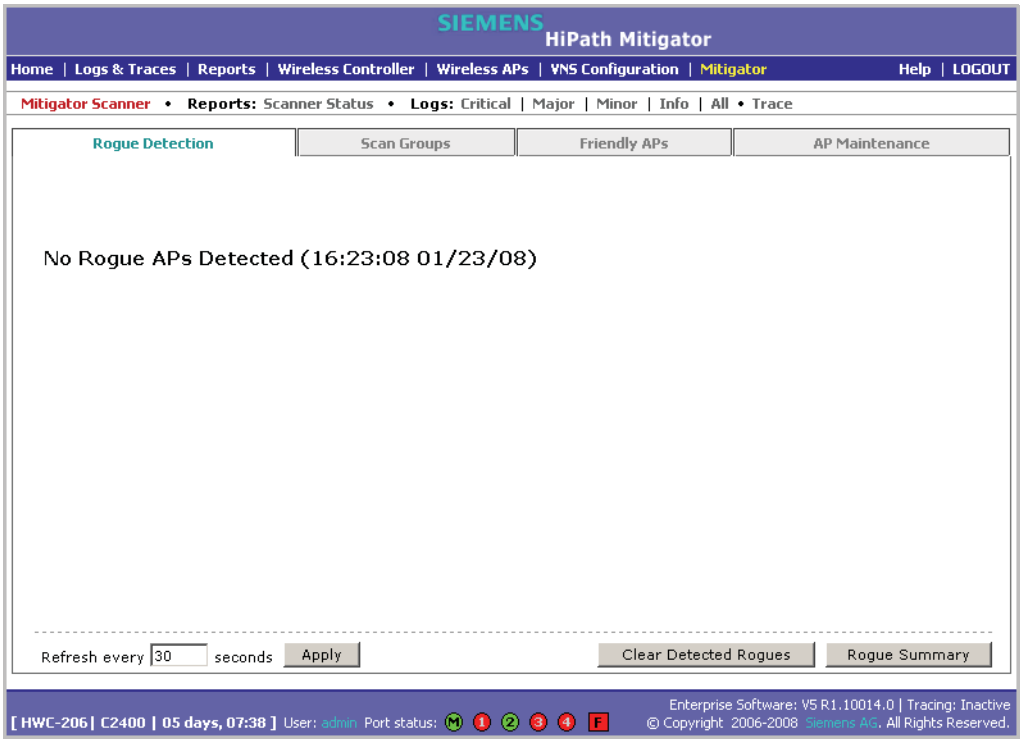
Note: In the current release, there is no capability to initiate a DoS attack on the detected rogue access point. Containment of a detected rogue requires an inspection of the geographical location of its Scan Group area, where its RF activity has been found.

9.5 Working with Mitigator scan results

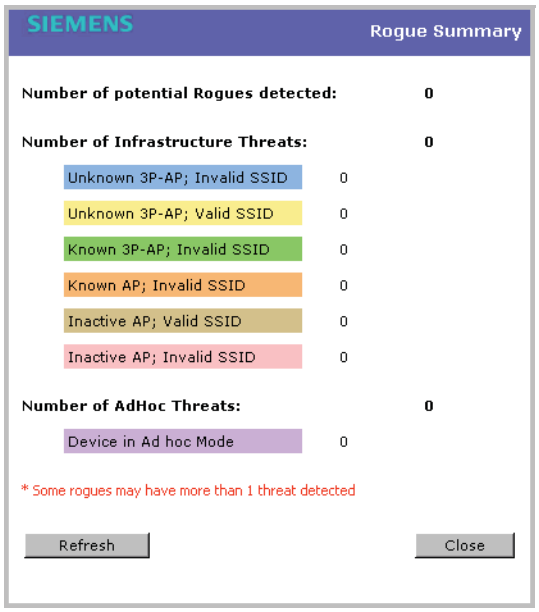
When viewing the Mitigator scan results, you can delete individual or all of the access points from the scan results. You can also add access points from the scan results to the **Friendly AP** list.

To view Mitigator scan results:

1. From the main menu, click **Mitigator**. The **Mitigator** page is displayed.
2. Click the **Rogue Detection** tab.
3. To modify the page's refresh rate, type a time (in seconds) in the **Refresh every __ seconds** box.
4. Click **Apply**. The new refresh rate is applied.



5. To view the Rogue Summary report, click **Rogue Summary**. The Rogue Summary report is displayed in a pop-up window.



6. To clear all detected rogue devices from the list, click **Clear Detected Rogues**.

Note: To avoid the Mitigator's database becoming too large, it is recommended that you either delete Rogue APs or add them to the **Friendly APs** list, rather than leaving them in the **Rogue** list.

To add an AP from the Mitigator scan results to the list of friendly APs:

1. From the main menu, click **Mitigator**. The **Mitigator** page is displayed.
2. Click the **Rogue Detection** tab.
3. To add a Wireless AP to the **Friendly APs** list, click **Add to Friendly List**. The AP is removed from this list and is displayed in the **Friendly AP Definitions** section of the **Friendly AP's** tab.

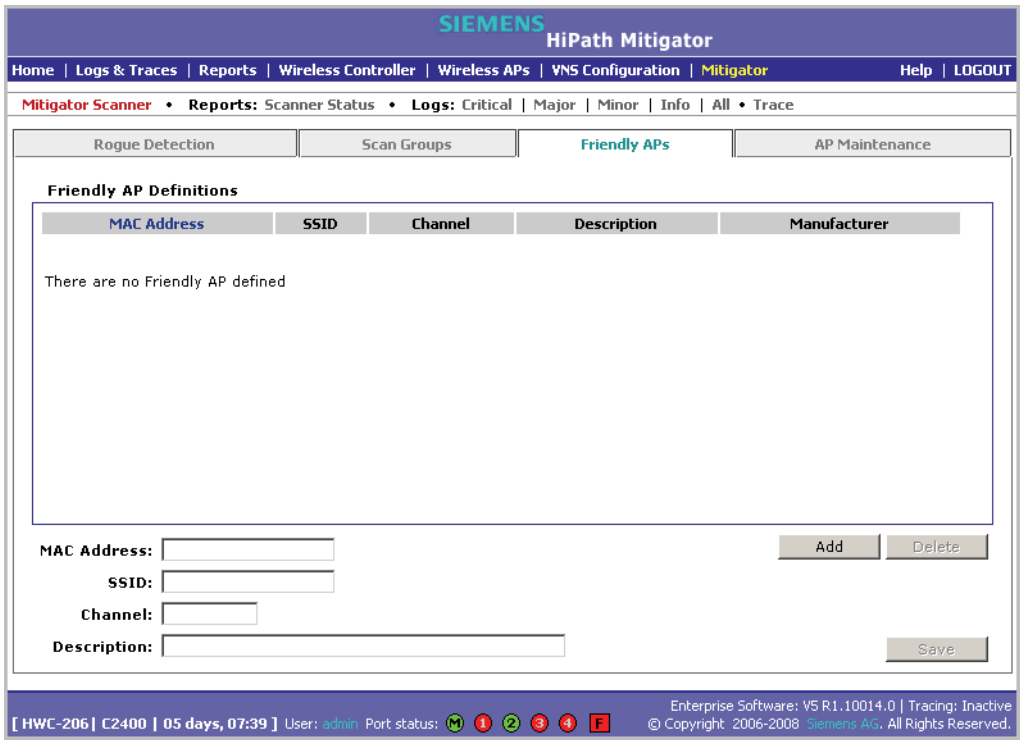
To delete an AP from the Mitigator scan results:

1. From the main menu, click **Mitigator**. The **Mitigator** page is displayed.
2. Click the **Rogue Detection** tab.
3. To delete a specific AP from the Mitigator scan results, click the corresponding **Delete** button. The AP is removed from the list.
4. To clear all rogue access points from the Mitigator scan results, click **Clear Detected Rogues**. All APs are removed from the list.

9.6 Working with friendly APs

To view the friendly APs:

1. From the main menu, click **Mitigator**. The **Mitigator** page is displayed.
2. Click the **Friendly APs** tab.



To add friendly APs manually:

1. From the main menu, click **Mitigator**. The **Mitigator** page is displayed.
2. Click the **Friendly APs** tab.
3. To add friendly access points manually to the **Friendly AP Definitions** list, type the following:
   - **MAC Address** – Specifies the MAC address for the friendly AP
   - **SSID** – Specifies the SSID for the friendly AP
   - **Channel** – Specifies the current operating channel for the friendly AP
   - **Description** – Specifies a brief description for the friendly AP
4. Click **Add**. The new access point is displayed in the list above.

To delete a friendly AP:

1. From the main menu, click **Mitigator**. The **Mitigator** page is displayed.
2. Click the **Friendly APs** tab.
3. In the **Friendly AP Definitions** list, click the access point you want to delete.
4. Click **Delete**. The selected access point is removed from the **Friendly AP Definitions** list.
5. To save your changes, click **Save**.

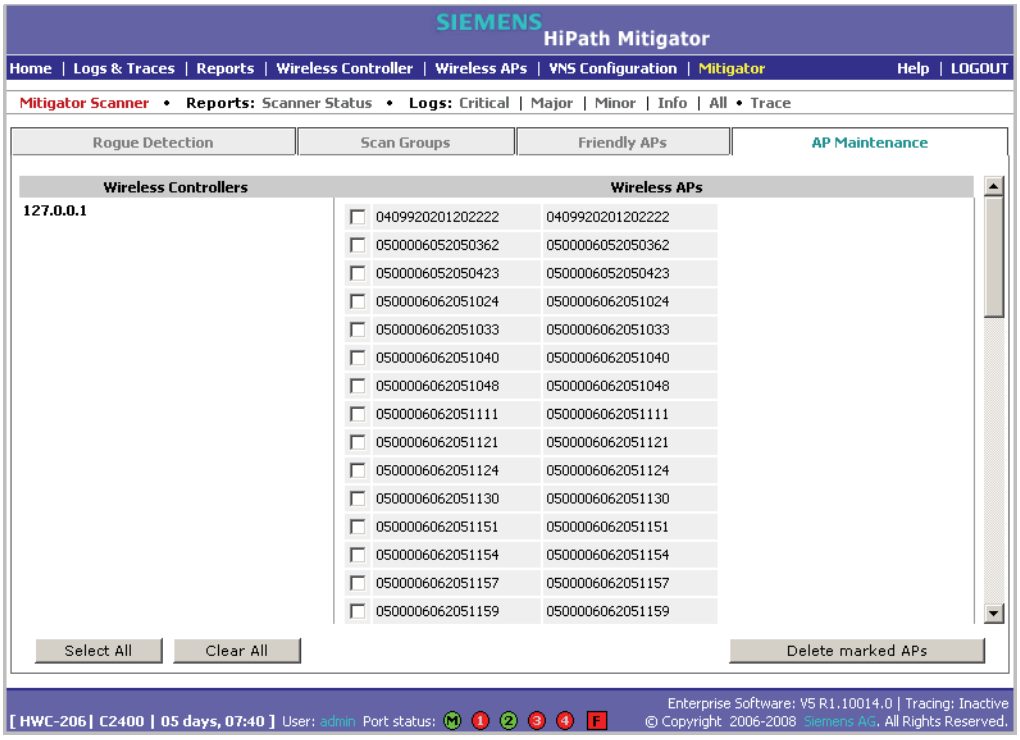
To modify a friendly AP:

1. From the main menu, click **Mitigator**. The **Mitigator** page is displayed.
2. Click the **Friendly APs** tab.
3. In the **Friendly AP Definitions** list, click the access point you want to modify.
4. Modify the access point by making the appropriate changes.
5. To save your changes, click **Save**.

9.7 Maintaining the Mitigator list of APs

To maintain the Wireless APs:

1. From the main menu, click **Mitigator**. The **Mitigator** page is displayed.
2. Click the **AP Maintenance** tab. Inactive APs and known third-party APs are displayed.
3. Select the applicable APs.



4. To delete the selected APs, click **Delete marked APs**.

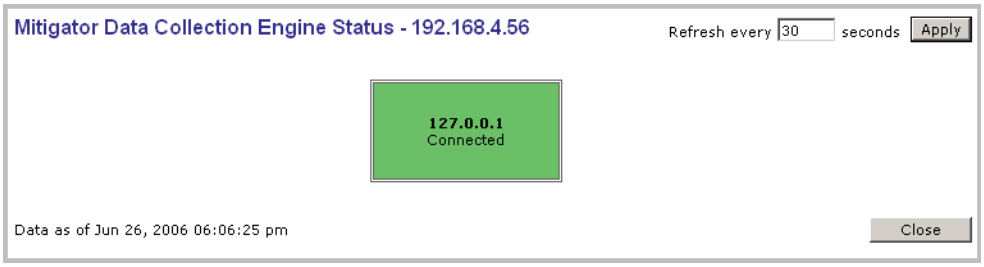
Note: The selected APs are deleted from the Mitigator database, not from the HiPath Wireless Controller database. You can delete the APs from the HiPath Wireless Controller database after you delete them from the Wireless AP Configuration **Access Approval** page of the corresponding RF Data Collector Engine. You can also delete the selected third-party APs if they are removed from the corresponding VNS in the RF Collector Engine, or if that VNS has been deleted from the VNS list.

9.8 Viewing the Scanner Status report

When the Mitigator is enabled, you can view a report on the connection status of the RF Data Collector Engines with the Analysis Engine.

To view the Mitigator scanner engine status display:

1. From the main menu, click **Mitigator**. The **Mitigator** page is displayed.
2. Click the **Reports: Scanner Status**. The Scanner Status report is displayed, as shown in the example below.



The boxes display the IP address of the Data Collector engine. The status of the Data Collector engine is indicated by one of the following colors:

- **Green** – The Analysis Engine has connection with the Data Collector on that HiPath Wireless Controller.
- **Yellow** – The Analysis Engine has connected to the communication system of the other controller, but has not synchronized with the Data Collector. Ensure that the Data Collector is running on the remote controller.
- **Red** – The Analysis Engine is aware of the Data Collector and attempting connection.

If no box is displayed, the Analysis Engine is not attempting to connect with that Data Collector Engine.

Note: If the box is displayed red and remains red, ensure your IP address is correctly set up to point to an active controller. If the box remains yellow, ensure the Data Collector is running on the remote controller.

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10 Working with reports and displays

This chapter describes the various reports and displays available in the HiPath Wireless Controller, Access Points and Convergence Software system.

10.1 Viewing the displays

The following displays are available in the HiPath Wireless Controller, Access Points and Convergence Software system:

- Active Wireless APs
- Active Clients by Wireless AP
- Active Clients by VNS
- Port & VNS Filter Statistics
- VNS Interface Statistics
- Wireless Controller Port Statistics
- Wireless AP Availability
- Dynamic Authorization Statistics
- Wired Ethernet Statistics by Wireless AP
- Wireless Statistics by Wireless AP
- WDS VNS Wireless AP Statistics
- System Information
- Manufacturing Information
- Client Location in Mobility Zone
- Mobility Tunnel Matrix

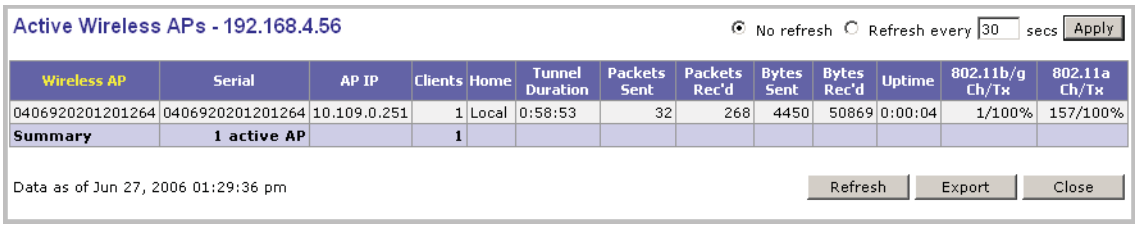
Note: The **Client Location in Mobility Zone** and **Mobility Tunnel Matrix** displays only appear if the mobility manager function has been enabled for the controller.

To view reports and displays:

1. From the main menu, click **Reports & Displays**. The **HiPath Reports & Displays** page is displayed.

Note: The **Client Location in Mobility Zone** and **Mobility Tunnel Matrix** displays only appear if the mobility manager function has been enabled for the controller.

2. In the **List of Displays**, click the display you want to view (some examples will follow):



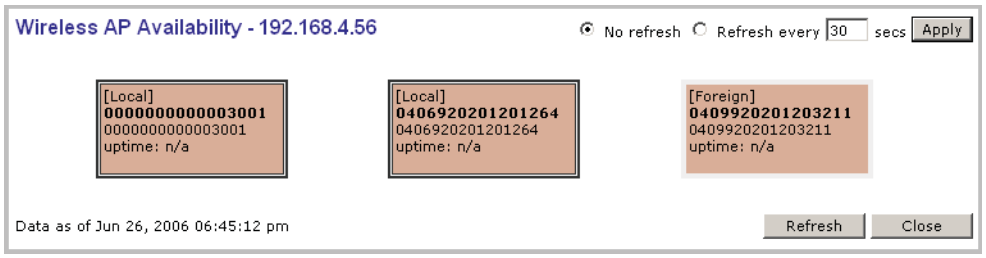
Note: Statistics are expressed in relation to the AP. Therefore, **Packets Sent** means the AP has sent that data to a client and **Packets Rec'd** means the AP has received packets from a client.

10.1.1 Viewing the Wireless AP availability display

This display reports the active connection state of a Wireless AP (availability to the HiPath Wireless Controller for service). Depending on the state of the Wireless AP, the following is displayed:

Green – Wireless AP is configured on the HiPath Wireless Controller and is presently connected.

Red – Wireless AP is configured on the HiPath Wireless Controller but is presently not connected (not available to service this HiPath Wireless Controller).



In normal operations, when the HiPath Wireless Controller **Availability** feature is enabled, the local Wireless APs are green, and the foreign Wireless APs are red. If the other HiPath Wireless Controller fails, and the foreign Wireless APs connect to the current HiPath Wireless Controller, the display will show all Wireless APs as green. If the Wireless APs are not connected they show up as red.

10.1.2 Viewing statistics for Wireless APs

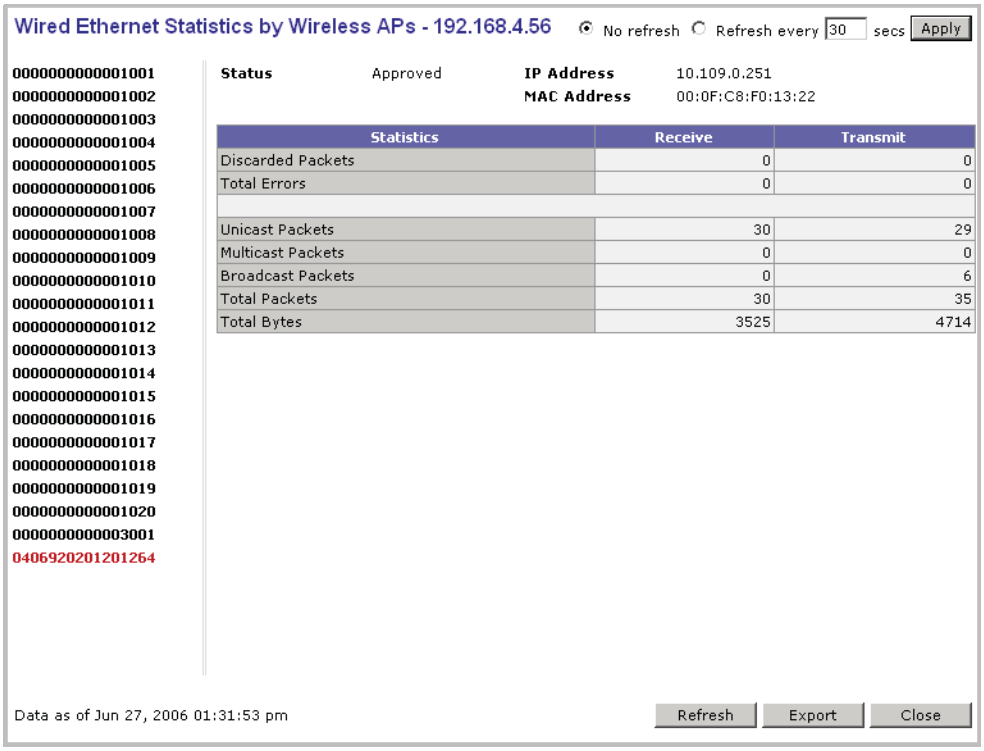
Two displays are snapshots of activity at that point in time on a selected Wireless AP:

- Wired Ethernet Statistics by Wireless AP
- Wireless Statistics by Wireless AP

The statistics displayed are those defined in the 802.11 MIB, in the IEEE 802.11 standard.

To view wired Ethernet statistics by Wireless AP:

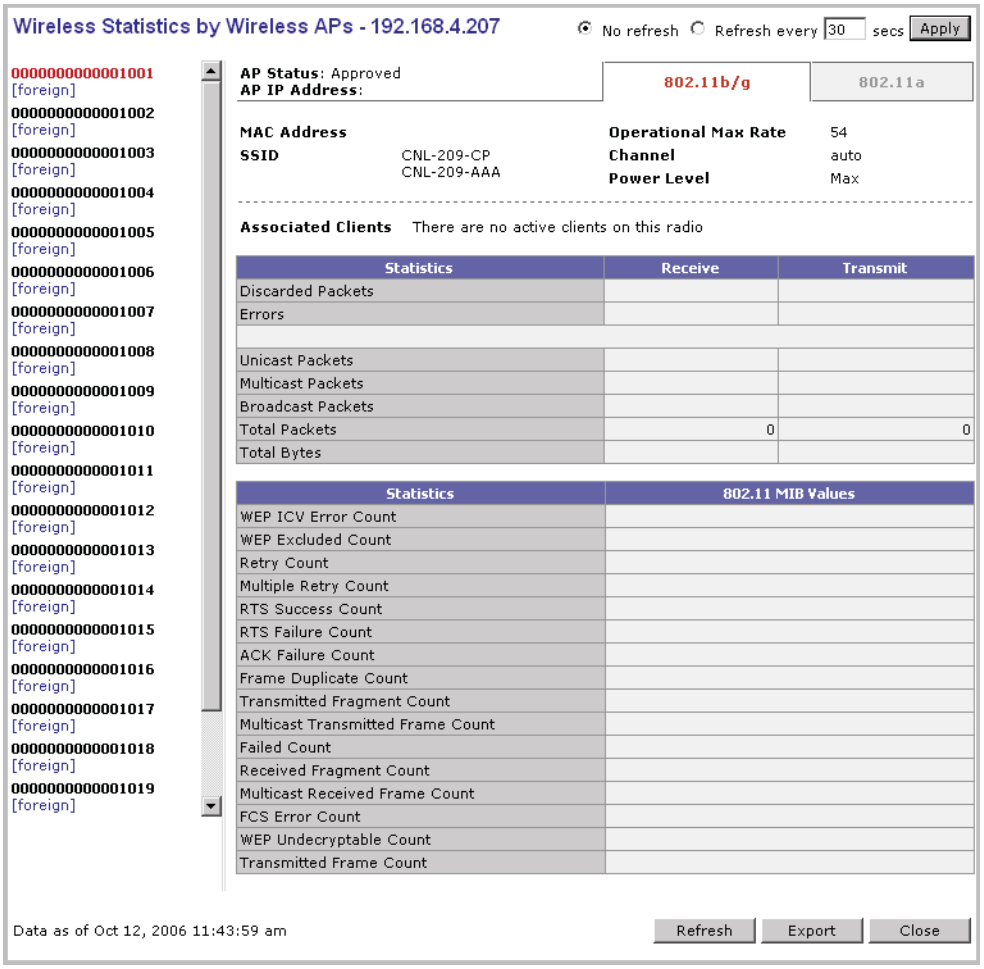
1. From the main menu, click **Reports & Displays**. The **HiPath Reports & Displays** page is displayed.
2. Click the **Wired Ethernet Statistics by Wireless AP** display option. The **Wired Ethernet Statistics by Wireless APs** display opens in a new browser window.



3. In the **Wired Ethernet Statistics by Wireless APs** display, click a registered Wireless AP to display its information.

To view Wireless Statistics by Wireless AP:

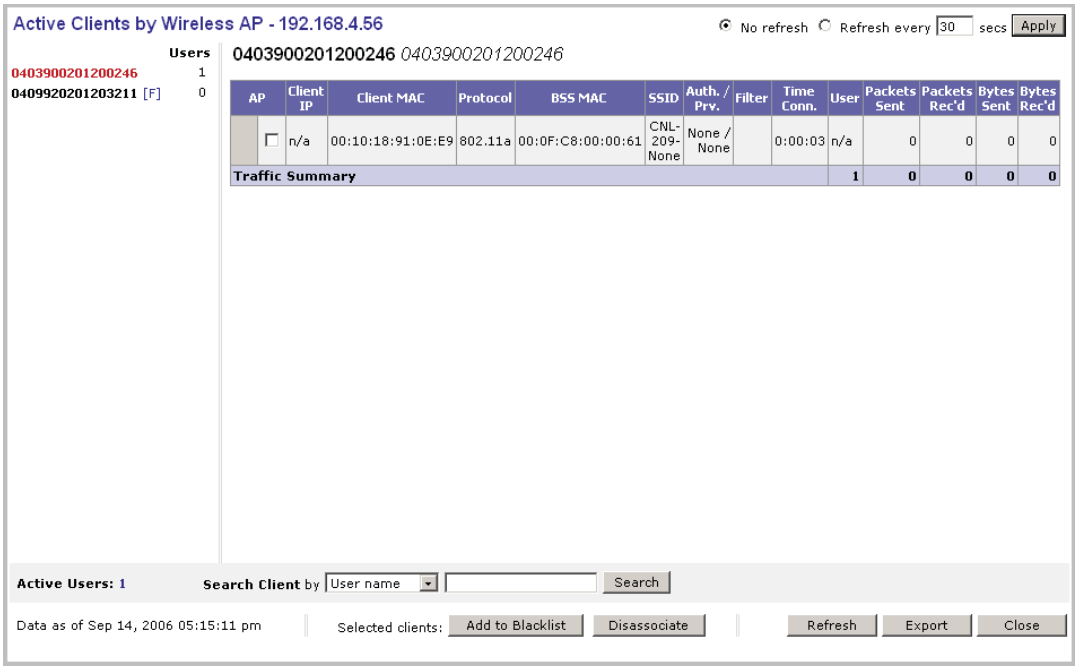
1. From the main menu, click **Reports & Displays**. The **HiPath Reports & Displays** page is displayed.
2. Click the **Wireless Statistics by Wireless AP** display option. The **Wireless Statistics by Wireless APs** display opens in a new browser window.



3. In the **Wireless Statistics by Wireless APs** display, click a registered Wireless AP to display its information.
4. Click the appropriate tab to display information for each radio on the Wireless AP.
5. To view information on selected associated clients, click **View Client**. The **Associated Clients** display opens in a new browser window.

To view Active Clients by Wireless AP statistics:

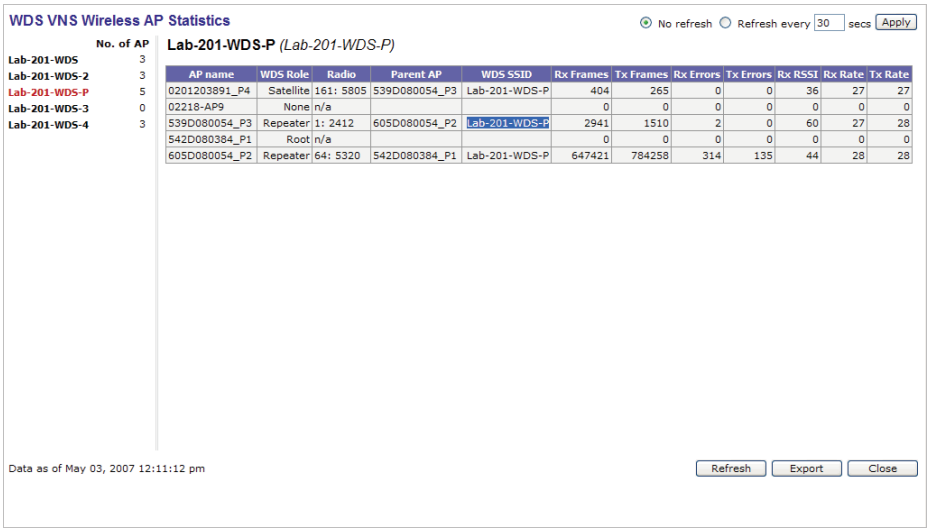
1. From the main menu, click **Reports & Displays**. The **HiPath Reports & Displays** page is displayed.
2. Click the **Active Clients by Wireless APs** display option. The **Active Clients by Wireless APs** display opens in a new browser window.



- Statistics are expressed in respect of the AP. Therefore, **Packets Sent** means the AP has sent that data to a client and **Packets Rec'd** means the AP has received packets from a client.
- If the client is authenticated, a green check mark icon is displayed in the first column of the display.
- **Time Conn** is the length of time that a client has been on the system, not just on an AP. If the client roams from one AP to another, the session stays, therefore **Time Conn** does not reset.
- A client is displayed as soon as the client connects (or after refresh of page). The client disappears as soon as it times out.

To view WDS Wireless AP Statistics:

1. From the main menu, click **Reports & Displays**. The **HiPath Reports & Displays** page is displayed.
2. Click the **WDS Wireless AP Statistics** display option. The **WDS Wireless AP Statistics** display opens in a new browser window.



Note: RSSI value on the **WDS VNS Wireless AP Statistics** report denotes the signal strength. The minimum value is 1 and maximum value is 60. The higher the RSSI value, the stronger the received signal.

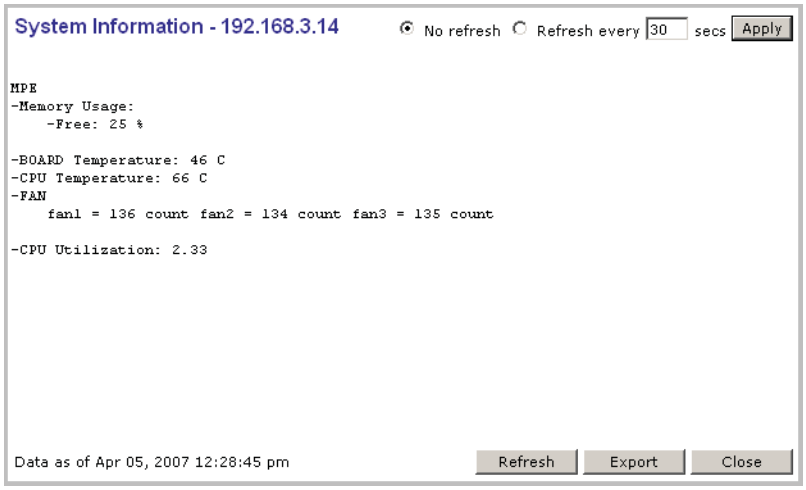
10.1.3 Viewing the System Information and Manufacturing Infomation displays

System Information – Displays system information including memory usage and CPU and board temperatures.

Manufacturing Information – Displays manufacturing information including the card serial number and CPU type and frequency.

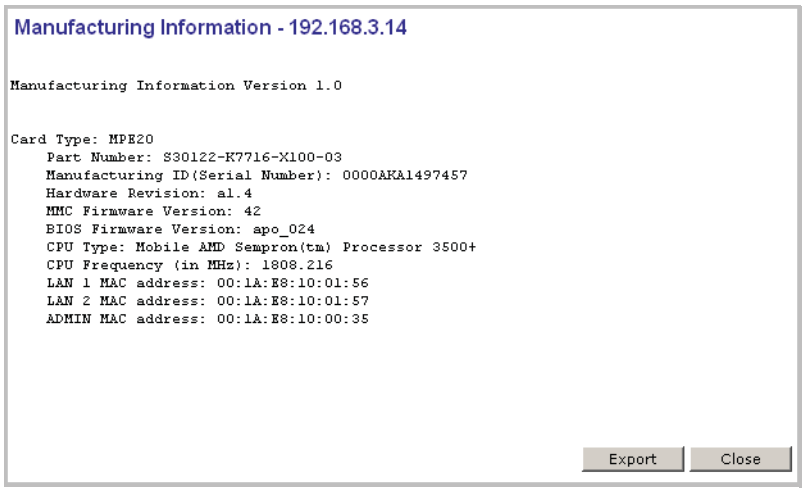
To view system information:

1. From the main menu, click **Reports & Displays**. The **HiPath Reports & Displays** page is displayed.
2. Click the **System Information** display option. The **System Information** display opens in a new browser window.



To view manufacturing information:

1. From the main menu, click **Reports & Displays**. The **HiPath Reports & Displays** page is displayed.
2. Click the **Manufacturing Information** display option. The **Manufacturing Information** display opens in a new browser window.



10.1.4 Viewing displays for the mobility manager

When a HiPath Wireless Controller has been configured as a mobility manager, two additional displays appear as options on the **HiPath Reports & Displays** page:

- **Client Location in Mobility Zone** – Displays the active wireless clients and their status

- **Mobility Tunnel Matrix** – Displays a cross-connection view of the state of inter-controller tunnels, as well as relative loading for user distribution across the mobility domain

To view mobility manager displays:

1. From the main menu, click **Reports & Displays**. The **HiPath Reports & Displays** page is displayed.
2. Click the appropriate mobility manager display:
   - Client Location in Mobility Zone
   - Mobility Tunnel Matrix

The colored status indicates the following:

- **Green** – The mobility manager is in communication with an agent and the data tunnel has been successfully established.
- **Yellow** – The mobility manager is in communication with an agent but the data tunnel is not yet successfully established.
- **Red** – The mobility manager is not in communication with an agent and there is no data tunnel.

Client Location in Mobility Zone

You can do the following:

- Sort this display by home or foreign controller

- Search for a client by MAC address, user name, or IP address, and typing the search criteria in the box
- Define the refresh rates for this display
- Export this information as an xml file

Mobility Tunnel Matrix

- Provides connectivity matrix of mobility state
- Provides a view of:
  - Tunnel state
  - If a tunnel between controllers is reported down, it is highlighted in red
  - If only a control tunnel is present, it is highlighted in yellow
  - If data and control tunnels are fully established, it is highlighted in green
  - Tunnel Uptime
  - Number of clients roamed (Mobility loading)
  - Local controller loading
  - Mobility membership list

A HiPath Wireless Controller is only removed from the mobility matrix if it is explicitly removed by the administrator from the Mobility permission list. If a particular link between controllers, or the controller is down, the corresponding matrix connections are identified in red color to identify the link.

The Active Clients by VNS report for the controller on which the user is home (home controller) will display the known user characteristics (IP, statistics, etc.). On the foreign controller, the Clients by VNS report does not show users that have roamed from other controllers, since the users remain associated with the home controller's VNS.

The Active Clients by AP report on each controller will show both the loading of local and foreign users (users roamed from other controllers) that are taking resources on the AP.

Note: The statistics from the mobility manager are updated every thirty seconds, regardless of the refresh period for the displays.

10.2 Viewing reports

The following reports are available in the HiPath Wireless Controller, Access Points and Convergence Software system:

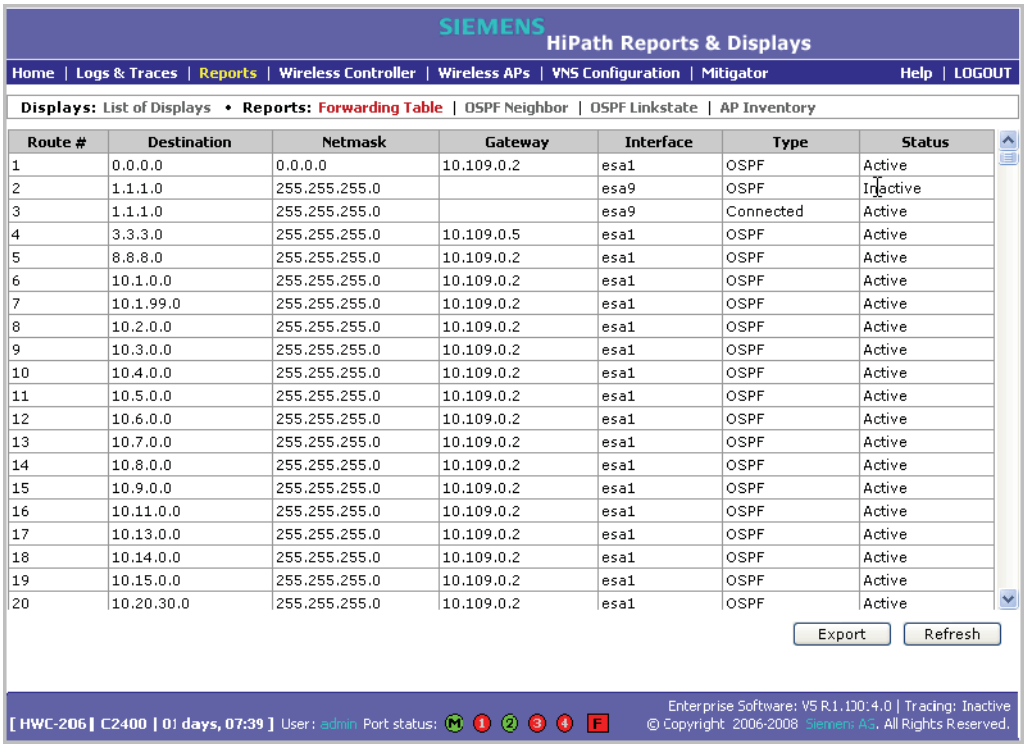
- Forwarding Table (routes defined on the **Routing Protocols** pages)
- OSPF Neighbor (if OSPF is enabled on the **Routing Protocols** pages)
- OSPF Linkstate (if OSPF is enabled on the **Routing Protocols** pages)
- AP Inventory (a consolidated summary of Wireless AP setup)

To view reports:

1. From the main menu, click **Reports & Displays**. The **HiPath Reports & Displays** page is displayed.
2. In the **Reports** list, click the report you want to view:
   - Forwarding Table
   - OSPF Neighbor
   - OSPF Linkstate
   - AP Inventory

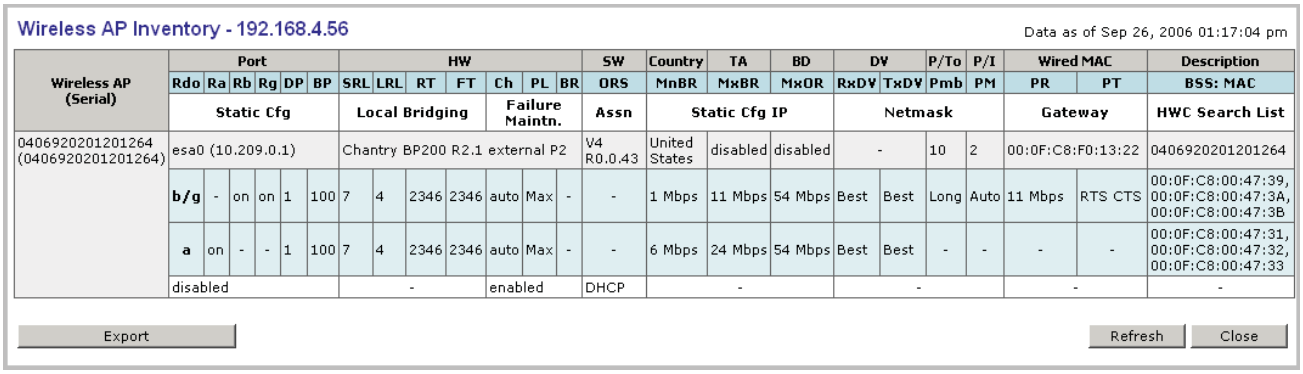
Note: The **AP Inventory** report opens in a new browser window. All other reports appear in the current browser window.

The following is an example of a **Forwarding Table** report:



Note: If you open only automatically refreshed reports, the Web management session timer will not be updated or reset. Your session will eventually timeout.

The following is an example of the AP Inventory report:



Wireless AP (Serial)	Port						HW							SW	Country	TA	BD	DV		P/To	P/I	Wired MAC		Description
	Rdo	Ra	Rb	Rg	DP	BP	SRL	LRL	RT	FT	Ch	PL	BR	ORS	MnBR	MxBR	MxOR	RxDV	TxDV	Pmb	PM	PR	PT	BSS: MAC
	Static Cfg						Local Bridging				Failure Maintn.			Assn	Static Cfg IP			Netmask				Gateway		HWC Search List
0406920201201264 (0406920201201264)	esa0 (10.209.0.1)						Chantry BP200 R2.1 external P2							V4 R0.0.43	United States	disabled	disabled	-		10	2	00:0F:C8:F0:13:22		0406920201201264
	b/g	-	on	on	1	100	7	4	2346	2346	auto	Max	-	-	1 Mbps	11 Mbps	54 Mbps	Best	Best	Long	Auto	11 Mbps	RTS CTS	00:0F:C8:00:47:39, 00:0F:C8:00:47:3A, 00:0F:C8:00:47:3B
	a	on	-	-	1	100	7	4	2346	2346	auto	Max	-	-	6 Mbps	24 Mbps	54 Mbps	Best	Best	-	-	-	-	00:0F:C8:00:47:31, 00:0F:C8:00:47:32, 00:0F:C8:00:47:33
	disabled						-				enabled			DHCP	-			-				-		-

The following is a description of the column names and abbreviations found in the **AP Inventory** report:

- **Rdo** – Radio
- **Ra** – 802.11a radio. The data entry for an Wireless AP indicates whether the **a** radio is on or off.

- **Rb** – 802.11b protocol enabled. Possible values are **on** or **off**.
- **Rg** – 802.11g protocol enabled. Possible values are **on** or **off**.
- **DP** – DTIM period
- **BP** – Beacon Period
- **SRL** – Short Retry Limit
- **LRL** – Long Retry Limit
- **RT** – RTS Threshold
- **FT** – Fragmentation Threshold
- **Ch** – Channel served by the corresponding radio.
- **PL** – Power Level (Defined in the Wireless AP radio properties pages.)
- **BR** – Basic Rate (Only applies to Wireless APs running 3.1 or earlier.)
- **ORS** – Operational Rate Set (Only applies to Wireless APs running 3.1 or earlier.)
- **MnBR** – Minimum Basic Rate (For more information, see the Wireless AP radio configuration tabs.)
- **MxBR** – Maximum Basic Rate
- **MxOR** – Maximum Operational Rate
- **RxDV** – Receive Diversity
- **TxDV** – Tx Diversity
- **Pmb** – Preamble (long, short)
- **PM** – Protection Mode
- **PR** – Protection Rate
- **PT** – Protection Type
- **BSS** – Basic Service Set
- **MAC** – MAC address
- **BSS: MAC** – Also called BSSID, this is the MAC address of a (virtual) wireless interface on which the Wireless AP serves a BSS/VNS. There could be 8 per radio.
- **Port** – Ethernet Port and associated IP address of the interface on the HiPath Wireless Controller through which the Wireless AP communicates.
- **HW** – Hardware version of the Wireless AP.
- **SW** – Software version executing on theWireless AP.

- **TA** – Telnet access (enabled or disabled).
- **BD** – Broadcast disassociation (enabled or disabled). If enabled, whenever the Wireless AP is going offline in a controlled fashion it will send the disassociation frame to all its clients as a broadcast.
- **DV** – Diversity
- **P/To** – Poll timeout. If polling is enabled, a numeric value.
- **P/I** – Poll interval. If polling is enabled, a numeric value.
- **Wired MAC** – The physical address of the Wireless AP's wired Ethernet interface.
- **Description** – As defined on the **AP Properties** page.
- **Failure Maintn.** – Maintain MU sessions on Wireless AP when the Wireless AP loses the connection to the HiPath Wireless Controller.
- **Assn** – Assignment (address assignment method)
- **Static Cfg** – Wireless AP's IP address if statically configured (same as the **Static Values** radio button on the **AP Static Configuration** page).
- **Static Cfg IP** – Statically Configured IP. If the Wireless AP's IP address is configured statically, the IP address is displayed.
- **Netmask** – If the Wireless AP's IP address is configured statically, the netmask that is statically configured for the Wireless AP.
- **Gateway** – If the Wireless AP's IP address is configured statically, the IP address of the gateway router that the Wireless AP will use.
- **HWC Search List** – The list of IP addresses that the Wireless AP is configured to try to connect to in the event that the current connection to the HiPath Wireless Controller is lost.

To export and save a report in XML:

1. On the report page, click **Export**. A Windows **File Download** dialog is displayed.
2. Click **Save**. A Windows **Save As** dialog is displayed.

Note: If your default XML viewer is Internet Explorer or Netscape, clicking **Open** will open the exported data to your display page. You must right-click to go back to the export display. The XML data file will not be saved to your local drive.

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3. Browse to the location where you want to save the exported XML data file, and in the **File name** box enter an appropriate name for the file.
4. Click **Save**. The XML data file is saved in the specified location.

11 Performing system maintenance

This chapter describes system maintenance processes, including:

- Performing Wireless AP client management
- Resetting the Wireless APs to their factory default settings
- Performing system maintenance tasks
- Performing HiPath Wireless Controller software maintenance
- Working with system logs, trace messages, and audits

11.1 Performing Wireless AP client management

There are times when for service reasons or security issues, you want to cut the connection with a particular wireless device. You can view all the associated wireless devices, by MAC address, on a selected Wireless AP. You can do the following:

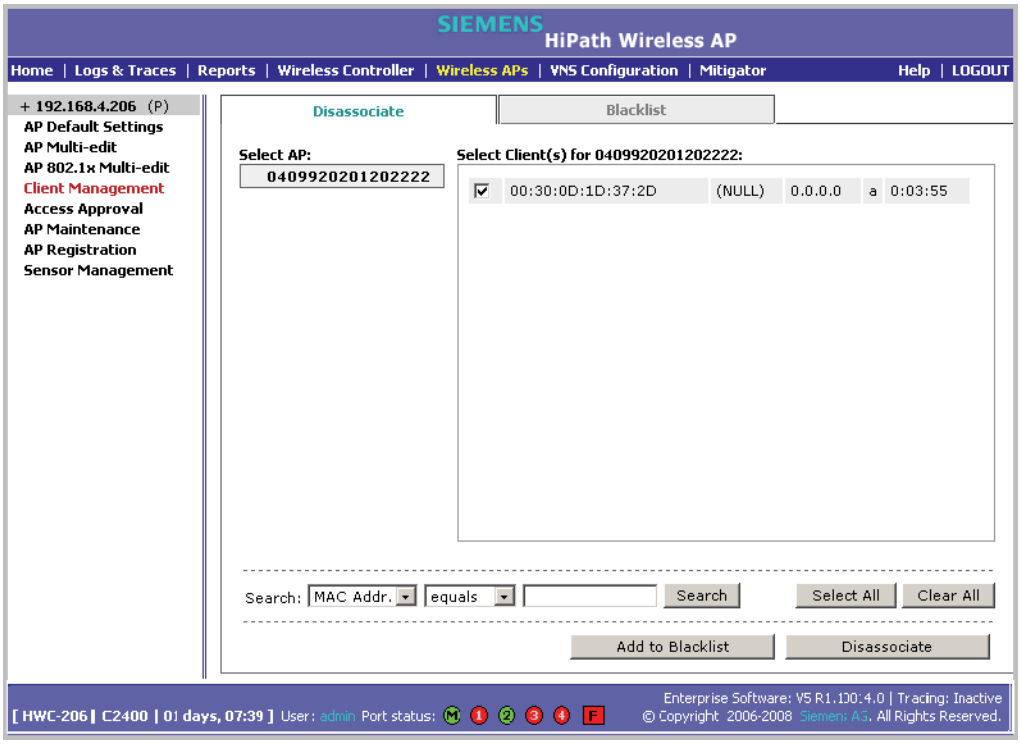
- Disassociate a selected wireless device from its Wireless AP.
- Add a selected wireless device's MAC address to a blacklist of wireless clients that will not be allowed to associate with the Wireless AP.
- Backup and restore the HiPath Wireless Controller database. For more information, see Section 11.4, “Performing HiPath Wireless Controller software maintenance”, on page 320.

11.1.1 Disassociating a client

In addition to the following procedure below, you can also disassociate wireless users directly from the **Active Clients by VNS** page. For more information, see Chapter 10, “Working with reports and displays”.

To disassociate a wireless device client:

1. From the main menu, click **Wireless AP Configuration**. The **Wireless AP Configuration** page is displayed.
2. From the left pane, click **Client Management**. The **Disassociate** tab is displayed.



3. In the **Select AP** list, click the AP you want to disassociate.
4. In the **Select Client(s)** list, select the checkbox next to the client you want to disassociate.

Note: You can search for a client by MAC Address, IP Address or User ID, by selecting the search parameters from the drop-down lists and typing a search string in the **Search** box and clicking **Search**. You can also use the **Select All** or **Clear All** buttons to help you select multiple clients.

---

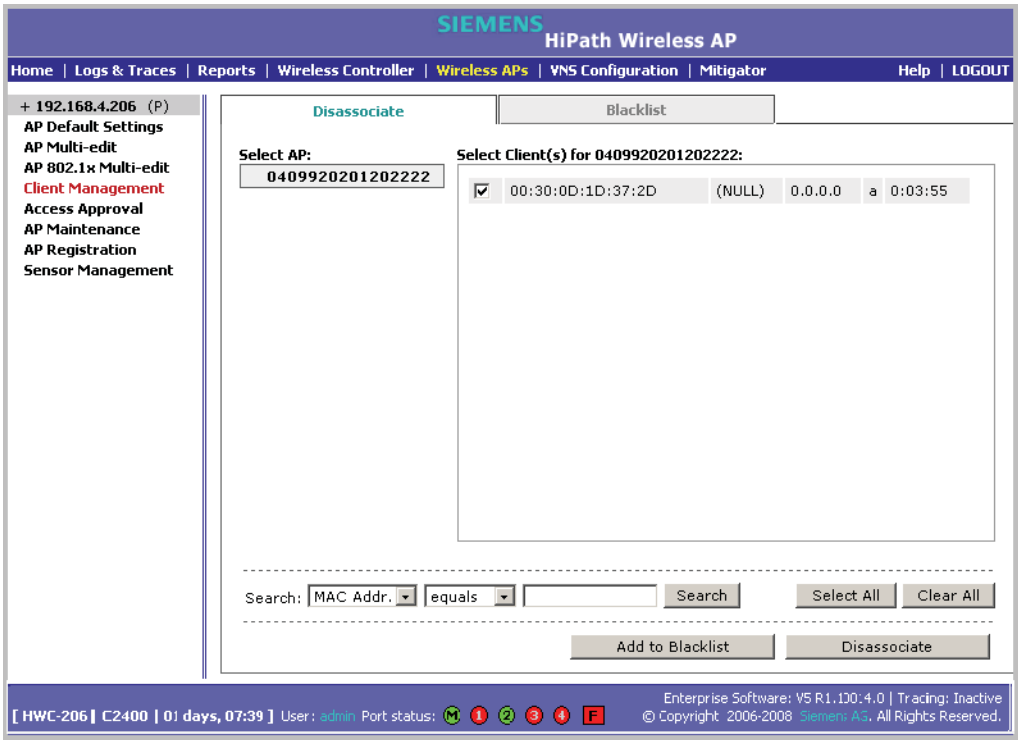
5. Click **Disassociate**. The client's session terminates immediately.

11.1.2 Blacklisting a client

The **Blacklist** tab displays the current list of MAC addresses that are not allowed to associate. A client is added to the blacklist by selecting it from a list of associated APs or by typing its MAC address.

To blacklist a wireless device client:

1. From the main menu, click **Wireless AP Configuration**. The **Wireless AP Configuration** page is displayed.
2. From the left pane, click **Client Management**. The **Disassociate** tab is displayed.



3. In the **Select AP** list, click the AP you want to disassociate.
4. In the **Select Client(s)** list, select the checkbox next to the client you want to disassociate, if applicable.

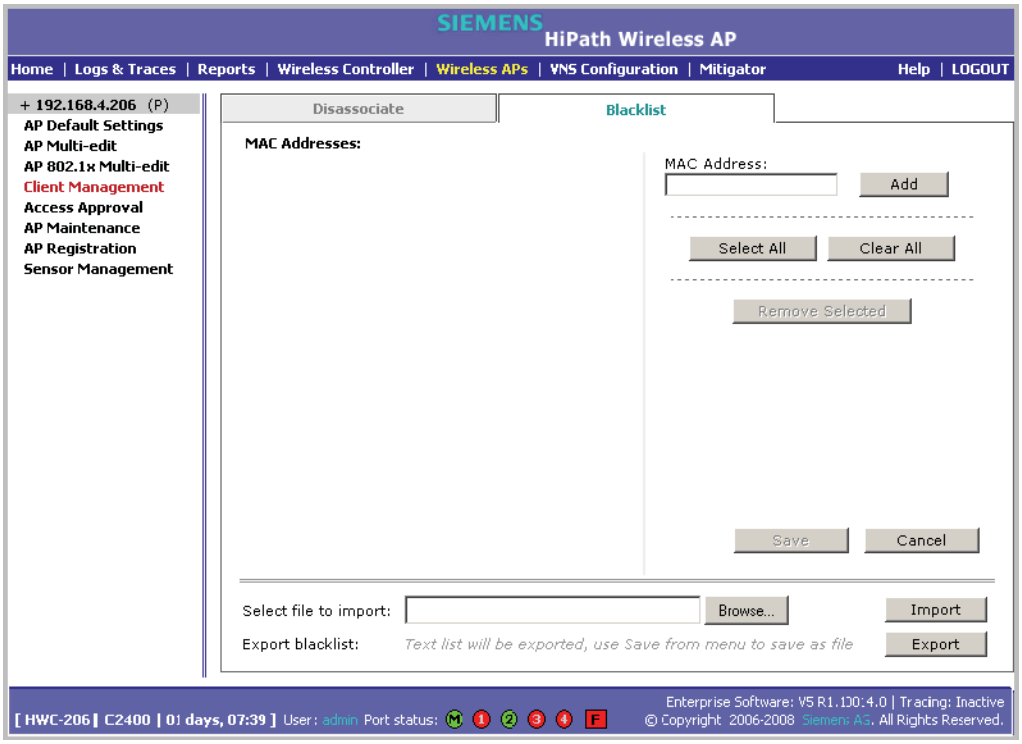
Note: You can search for a client by MAC Address, IP Address or User ID, by selecting the search parameters from the drop-down lists and typing a search string in the **Search** box and clicking **Search**. You can also use the **Select All** or **Clear All** buttons to help you select multiple clients.

---

5. Click **Add to Blacklist**. The selected wireless client's MAC address is added to the blacklist.

To blacklist a wireless device client using its MAC address:

1. From the main menu, click **Wireless AP Configuration**. The **Wireless AP Configuration** page is displayed.
2. From the left pane, click **Client Management**. The **Disassociate** tab is displayed.
3. Click the **Blacklist** tab.



4. To add a new MAC address to the blacklist, in the **MAC Address** box type the client's MAC address.
5. Click **Add**. The client is displayed in the **MAC Addresses** list.

Note: You can use the **Select All** or **Clear All** buttons to help you select multiple clients.

---

6. To save your changes, click **Save**.

To clear an address from the blacklist:

1. From the main menu, click **Wireless AP Configuration**. The **Wireless AP Configuration** page is displayed.
2. From the left pane, click **Client Management**. The **Disassociate** tab is displayed.

3. Click the **Blacklist** tab.
4. To clear an address from the blacklist, select the corresponding checkbox in the **MAC Addresses** list.
5. Click **Remove Selected**. The selected client is removed from the list.

Note: You can use the **Select All** or **Clear All** buttons to help you select multiple clients.

---

6. To save your changes, click **Save**.

To import a list of MAC addresses for the blacklist:

1. From the main menu, click **Wireless AP Configuration**. The **Wireless AP Configuration** page is displayed.
2. From the left pane, click **Client Management**. The **Disassociate** tab is displayed.
3. Click the **Blacklist** tab.
4. Click **Browse** and navigate to the file of MAC addresses you want to import and add to the blacklist.
5. Click the file, and then click **Import**. The list of MAC addresses is imported.

To export a list of MAC addresses for the blacklist:

1. From the main menu, click **Wireless AP Configuration**. The **Wireless AP Configuration** page is displayed.
2. From the left pane, click **Client Management**. The **Disassociate** tab is displayed.
3. Click the **Blacklist** tab.
4. To export the current blacklist, use the browser's save option to save the file as a text (.txt) file. It is recommend that a descriptive file name is used.
5. Click **Export**. The saved blacklist file is exported.

11.2 Resetting the Wireless APs to their factory default settings

You can reset the HiPath Wireless AP and the HiPath Wireless Outdoor AP to their factory default settings.

11.2.1 Resetting the HiPath Wireless AP to its factory default settings

The AP boot-up sequence includes a random delay interval, followed by a vulnerable time interval. During the vulnerable time interval (2 seconds), the LEDs flash in a particular sequence to indicate that the HiPath Wireless Controller is in the vulnerable time interval. For more information, see Section 4.2.3.1, “HiPath Wireless AP LED status”, on page 74.

If you power up the AP and interrupt the power during the vulnerable time interval three consecutive times, the next time the AP reboots, it will restore its factory defaults including the user password and the default IP settings.

Caution: The restoration of factory default settings does not erase the non-volatile log.

To reset the HiPath Wireless AP to its factory default settings:

1. Switch off, and then switch on the HiPath Wireless AP. The HiPath Wireless AP reboots.
2. Switch off, and then switch on the HiPath Wireless AP during the vulnerable time interval.

   Note: You should refer to the HiPath Wireless AP’s LED pattern to determine the vulnerable period. For more information, see Section 4.2.3.1, “HiPath Wireless AP LED status”.

   ---

3. Repeat Step 2 two more times.

   When the HiPath Wireless AP reboots for the fourth time, after having its power supply interrupted three consecutive times, it restores its factory default settings. The HiPath Wireless AP then reboots again to put the default settings into effect.

   Note: You should refer to the HiPath Wireless AP’s LED pattern to confirm that the HiPath Wireless AP is set to its factory defaults. For more information, see Section 4.2.3.1, “HiPath Wireless AP LED status”.

Reset button (Hardware)

Some models of the HiPath Wireless AP have a reset button. If your model is equipped with a reset button, you can set it to its factory default settings by pressing and holding the reset button for approximately six seconds.

Note: If you press the reset button and do not hold it over six seconds, the HiPath Wireless AP will merely reboot, and not reset to its factory defaults.

The following figure illustrates the location of the reset button on the HiPath Wireless APs.

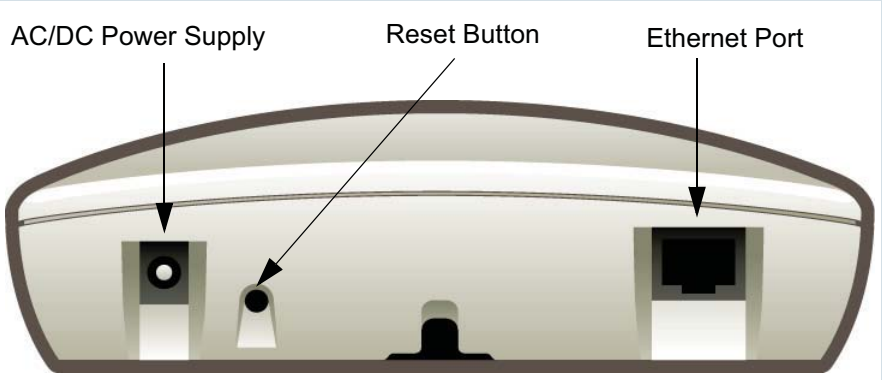


Figure 20 Position of the reset button in the HiPath Wireless AP

11.2.1.1 Resetting the HiPath Wireless Outdoor AP to its factory default settings

All models of the HiPath Wireless Outdoor AP have a reset button.

You can set the HiPath Wireless Outdoor AP to its factory default settings by pressing and holding the reset button for approximately six seconds.

Note: If you press the reset button and do not hold it over six seconds, the HiPath Wireless Outdoor AP will merely reboot, and not reset to its factory defaults.

The following figure illustrates the location of the reset button on the HiPath Wireless Outdoor AP.

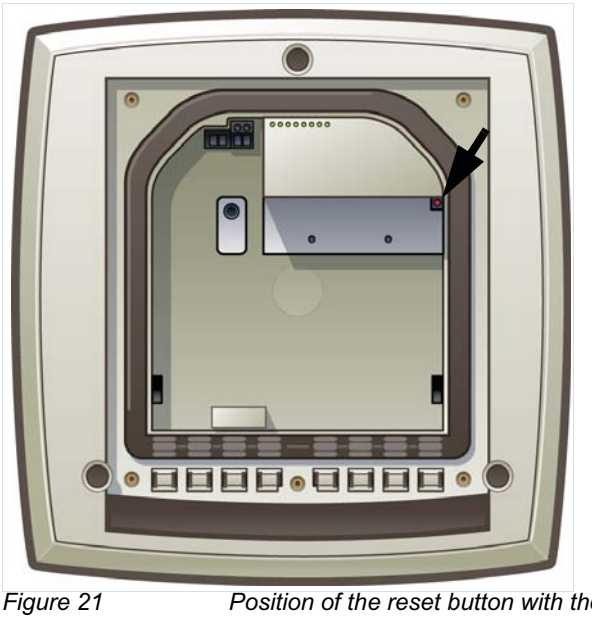


Figure 21 Position of the reset button with the housing cover removed

Attention: The reset button is located below the housing cover beside the sockets for the external antennas. To access the reset button, you must remove the housing cover. For more information, see the *HiPath Wireless Outdoor AP Installation Guide.*

11.2.1.2 Resetting the HiPath Wireless 802.11n AP to its factory default settings

You can set the HiPath Wireless 802.11n AP to its factory default settings by pressing and holding the reset button for approximately four seconds.

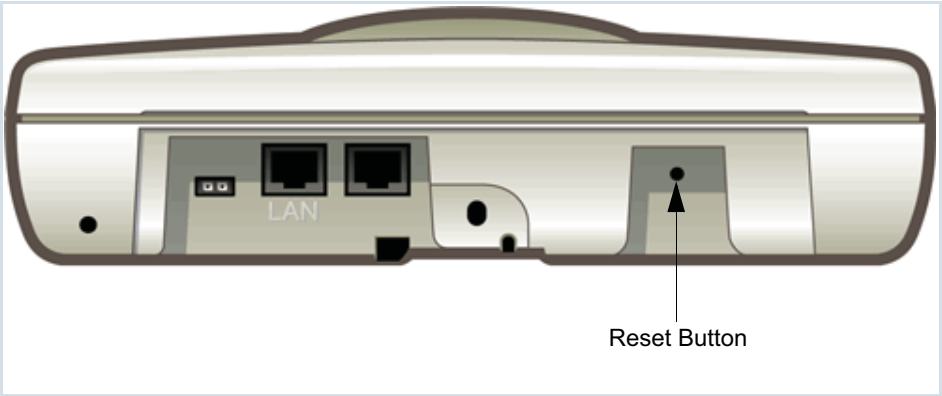


Figure 22 Position of the reset button in the HiPath Wireless 802.11n AP

Note: If you press the reset button and do not hold it over four seconds, the HiPath Wireless 802.11n AP will merely reboot, and not reset to its factory defaults.

11.3 Performing system maintenance tasks

You can perform various maintenance tasks, including:

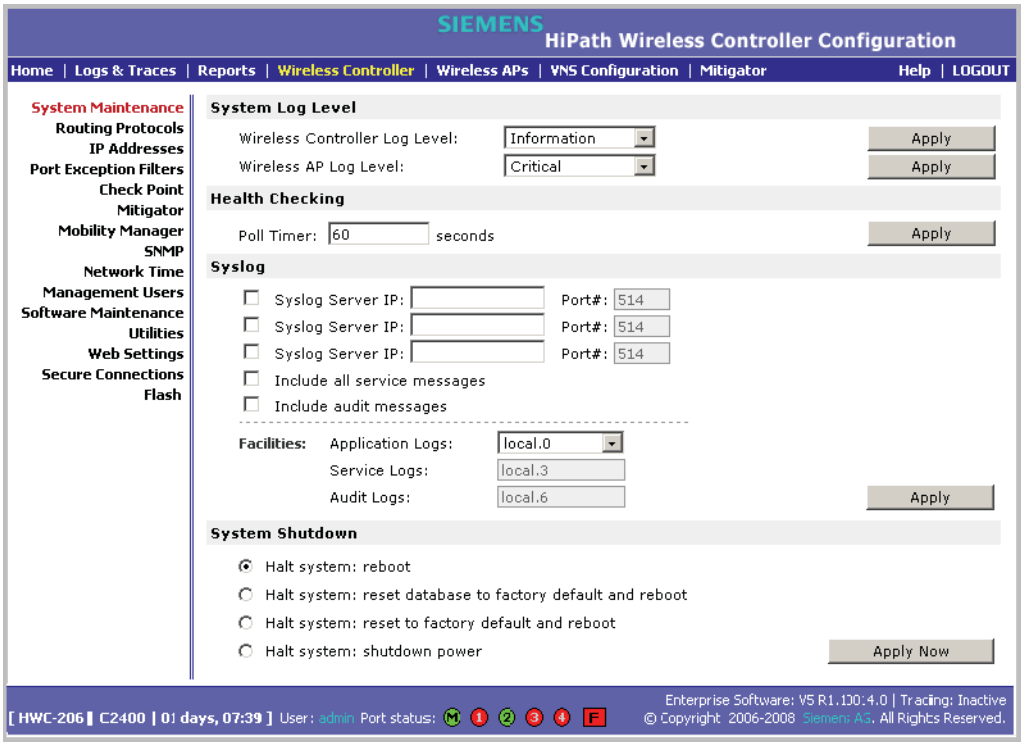
- Changing the log level
- Setting a poll interval for checking the status of the Wireless APs (Health Checking)
- Enabling and defining parameters for Syslog event reporting
- Forcing an immediate system shutdown, with or without reboot

Syslog event reporting uses the syslog protocol to relay event messages to a centralized event server on your enterprise network. In the protocol a device generates messages, a relay receives and forwards the messages, and a collector (a syslog server) receives the messages without relaying them.

Note: The log statements **Low water mark level was reached** and **Incoming message dropped, because of the rate limiting mechanism** indicate that there is a burst of log messages coming to the event server and the processing speed is slower than the incoming rate of log messages. These messages do not indicate that the system is impaired in any way. For more information, see Section 11.5.1, “Logs, traces, audits, and DHCP messages”, on page 342.

To change the log levels:

1. From the main menu, click **Wireless Controller Configuration**. The **Wireless Controller Configuration** page is displayed.



2. In the **System Log Level** section, from the **Wireless Controller Log Level** drop-down list, select the least severe log level for the Controller that you want to receive: **Information**, **Minor**, **Major**, **Critical**. For example, if you select **Minor**, you receive all **Minor**, **Major** and **Critical** messages. If you select **Major** you receive all **Major** and **Critical** messages. The default is **Information**.
3. Click **Apply**.
4. From the **Wireless AP Log Level** drop-down list, select the least severe log level for the AP that you want to receive: **Information**, **Minor**, **Major**, **Critical**. The default is **Critical**.
5. Click **Apply**.

To set a poll interval:

1. From the main menu, click **Wireless Controller Configuration**. The **Wireless Controller Configuration** page is displayed.
2. In the **Health Checking** section, in the **Poll Timer** box, type the time interval (in seconds) for the HiPath Wireless Controller to check that each Wireless AP is connected. The default is **60** seconds.

3. Click **Apply**.

To enable and define parameters for Syslog:

1. From the main menu, click **Wireless Controller Configuration**. The **Wireless Controller Configuration** page is displayed.
2. In the **Syslog** section, to enable the **Syslog** function for up to three syslog servers, select the appropriate checkboxes.
3. For each enabled syslog server, in the **IP** box, type a valid IP address for the server on the network.
4. For each enabled syslog server, in the **Port #** box, type a valid port number to connect on. The default port for syslog is **514**.
5. To include all system messages, select the **Include all service messages** checkbox. If the box is not selected, only component messages (logs and traces) are relayed. This setting applies to all three servers. The additional service messages are:
    - DHCP messages reporting users receiving IP addresses
    - Startup Manager Task messages reporting component startup and failure
6. To include audit messages, select the **Include audit messages** checkbox.
7. From the **Application Logs** drop-down list, select the log level (local.0 - local.6) to be sent to the syslog server. This setting applies all three servers.
8. If the **Include all service messages** checkbox is selected, the **Service Logs** drop-down list becomes selectable. Select the log level (local.0 - local.6) to be sent to the syslog server. This setting applies all three servers.
9. If you selected the **Include audit messages** checkbox, the **Audit Logs** drop-down list becomes available. Select the log level (local.0 - local.6) to be sent to the syslog server. This setting applies all three servers.
10. To apply your changes, click **Apply**.

Note: The syslog daemon must be running on both the HiPath Wireless Controller and on the remote syslog server before the logs can be synchronized. If you change the log level on the HiPath Wireless Controller, you must also modify the appropriate setting in the syslog configuration on remote syslog server.

Table 28 displays Syslog and Controller, Access Points and Convergence Software event log mapping.

Syslog Event	Controller, Access Points and Convergence Software Event
LOG_CRIT	Critical
LOG_ERR	Major
LOG_WARNING	Minor
LOG_INFO	Information
LOG_DEBUG	Trace

Table 28 Syslog and Controller, Access Points and Convergence Software event log mapping

To force an immediate system shutdown:

1. From the main menu, click **Wireless Controller Configuration**. The **Wireless Controller Configuration** page is displayed.
2. To shut down the system, including associated Wireless APs, select the appropriate shut down option:
   - **Halt system: reboot**
   - **Halt system: reset database to factory default and reboot** – Restores all aspects of the system configuration to the initial settings. However, the Management IP address and license key are preserved. This permits the user to remain connected through the Management interface.
   - **Halt system: reset to factory default and reboot** – Resets the entire system configuration to the factory shipping state. The Management IP address reverts to 192.168.10.1 and the license key is removed.
   - **Halt system** – The system enters the halted state, which stops all functional services and the application. To restart the system, the power to the system must be reset.
3. Click **Apply Now**. The system is immediately halted.

11.4 Performing HiPath Wireless Controller software maintenance

Software Maintenance can include the following administrator tasks:

- Working with a flash memory card
- Upgrading HiPath Wireless Controller software
- Backing up the HiPath Wireless Controller database
- Restoring the HiPath Wireless Controller database
- Maintaining the HiPath Wireless Controller product license keys

11.4.1 Working with a flash memory card

The HiPath Wireless Controller C2400 supports the use of a flash memory card to store your system's image files.

Note: To use the flash memory card capabilities of the HiPath Wireless Controller C2400, you must remove the cover of the flash memory card from the HiPath Wireless Controller and then insert a flash memory card. A flash memory card is not shipped with your HiPath Wireless Controller 2400. For more information, see the *HiPath Wireless Controller, Access Points and Convergence Software Controller C2400 Installation Instructions*.

When working with a flash memory card, use the HiPath Wireless Assistant to:

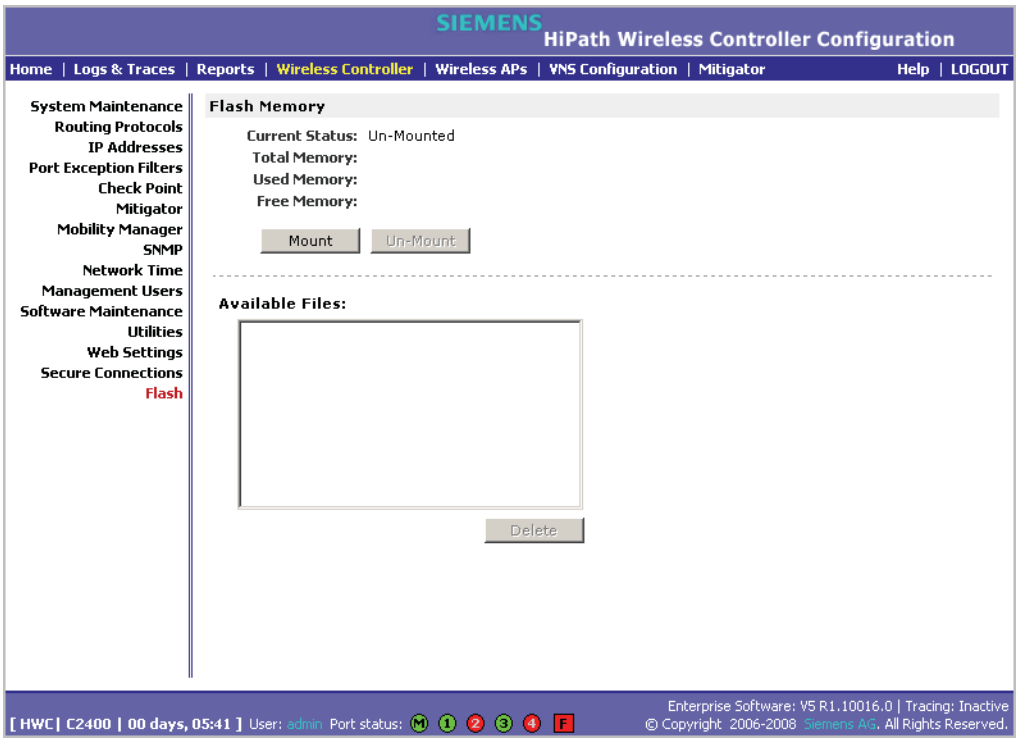
- **Mount the flash memory card** – By mounting the flash memory card, you make the flash memory card that has been inserted into the HiPath Wireless Controller 2400 available for use.
- **Unmount the flash memory card** – By unmounting the flash memory card, you make the flash memory card that has been inserted into the HiPath Wireless Controller 2400 unavailable for use.

  Caution: You must always unmount the flash memory card via the HiPath Wireless Assistant before removing it from the HiPath Wireless Controller. Failure to do so may corrupt the files on the flash card.

- **Delete files stored on the flash memory card** – By deleting files stored on the flash memory card, you make additional space on the flash memory card available.

To mount a flash memory card:

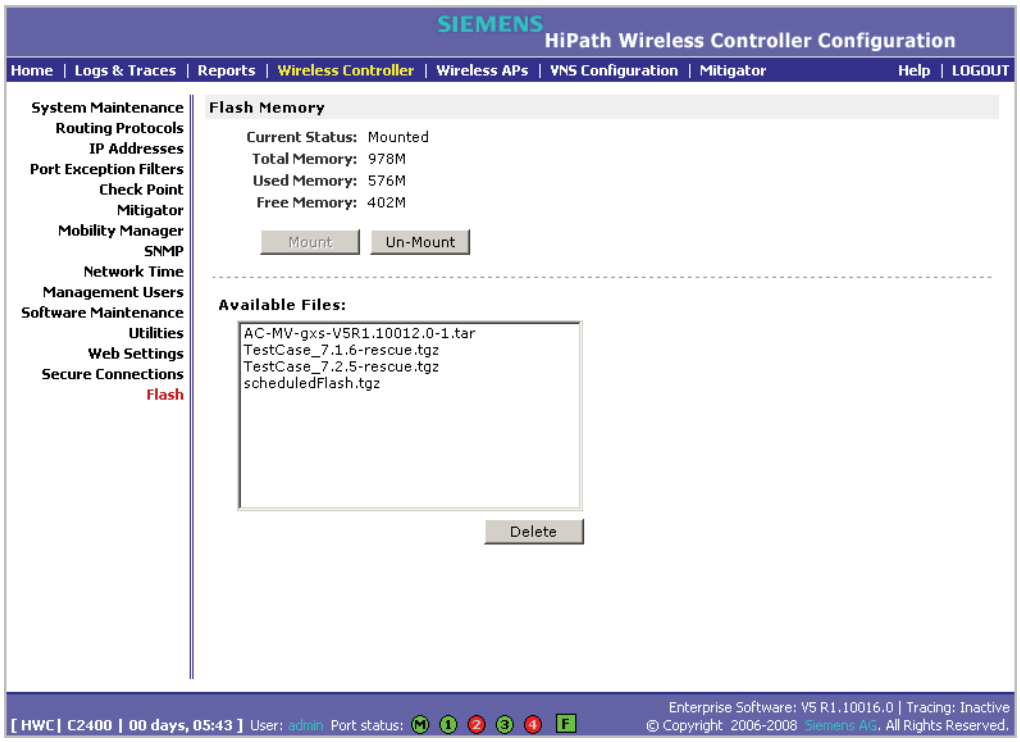
1. From the main menu, click **Wireless Controller Configuration**. The **Wireless Controller Configuration** page is displayed.
2. From the left pane, click **Flash**. The **Flash Memory** page is displayed.



3. Click **Mount**, and then click **Ok** to confirm the flash memory card mount. Once the mounting process is complete, the flash memory space is displayed and the files contained on the flash memory card are listed in the **Available Files** box.

To unmount a flash memory card:

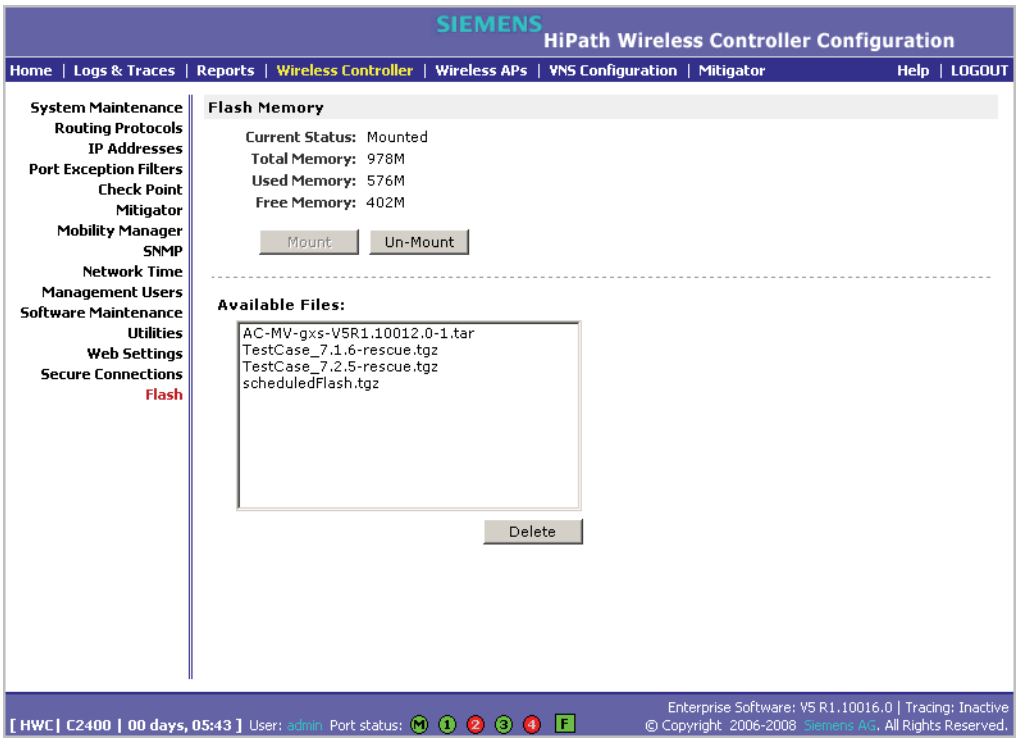
1. From the main menu, click **Wireless Controller Configuration**. The **Wireless Controller Configuration** page is displayed.
2. From the left pane, click **Flash**. The **Flash Memory** page is displayed. The mounted flash memory space is displayed and the **Available Files** box displays any files located on the flash memory card.



3. Click **Un-Mount**, and then click **Ok** to confirm the flash memory card unmount. Once the unmounting process is complete, the **Flash Memory** page is refreshed and no longer displays any of the flash memory information.

To delete a flash memory card:

1. From the main menu, click **Wireless Controller Configuration**. The **Wireless Controller Configuration** page is displayed.
2. From the left pane, click **Flash**. The **Flash Memory** page is displayed. The mounted flash memory space is displayed and the **Available Files** box displays any files located on the flash memory card.



3. In the **Available Files** box, click the file you want to delete, and then click **Delete**.
4. To confirm the file deletion from the flash memory card, click **Ok**. The file is deleted.

11.4.2 Upgrading HiPath Wireless Controller software

When you upgrade HiPath Wireless Controller software, you have the following options:

- Upgrade using a local or remote image file:
  - A local image file can be stored on the HiPath Wireless Controller or on a flash memory card.
- Perform the upgrade now or schedule the upgrade for a future date
- Backup the current system image

Note: In order to access an FTP server during either the remote upgrade, remote backup, or remote restore processes, ensure that the HiPath Wireless Controller's Management port is phsysically connected to the network and that the FTP server and Management port share the same network segment.

In the V5 release, you can upgrade from any past release, starting from V4 R1.5.x, directly to the new release without having to apply intermediate upgrades. The upgrade procedure can be initiated using the HiPath Wireless Assistant or via CLI commands.

Note: To upgrade to version V5, a HiPath Wireless Controller running an earlier software version than V4 R1.5.x (such as V3.1 GPx, V4R0 GA, or V4R0 GP1 etc.) must first be upgraded to the minimum supported version of V4 R1.5.x.

Note: If you are upgrading the two HiPath Wireless Controllers in 'Availability' mode, you must ensure that both of them are running the same version of the software.

Unlike previous releases, V5 is provided as a single TAR (.tar) package.

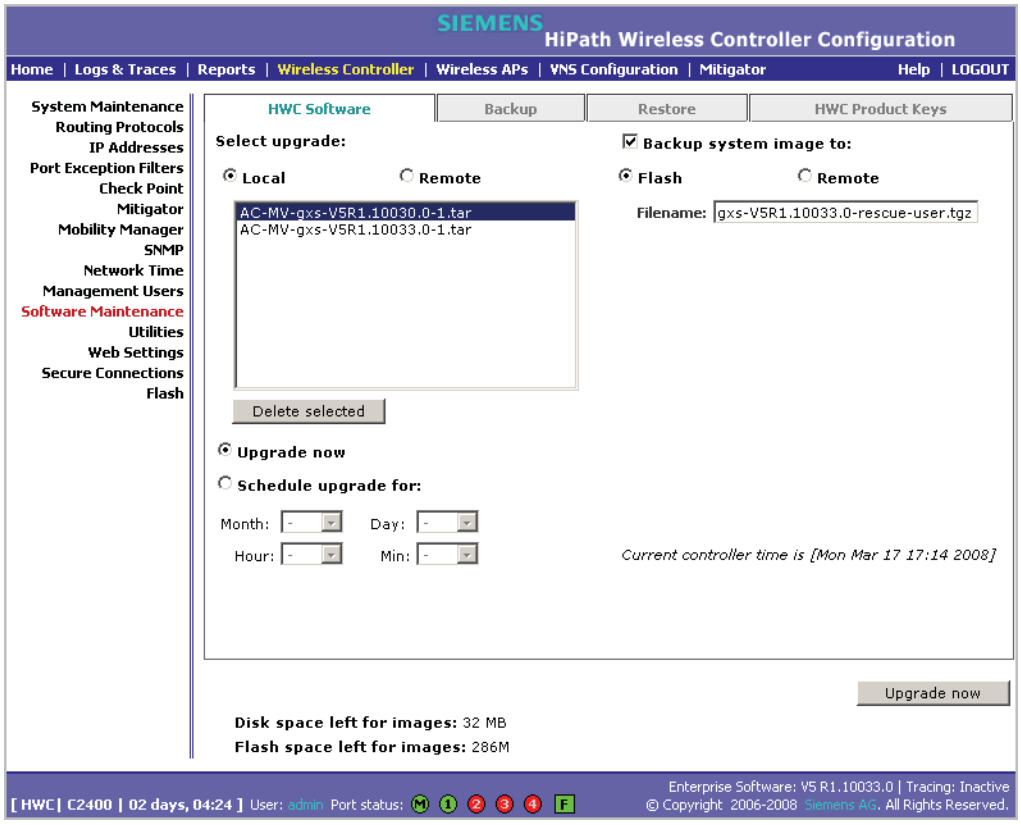
11.4.2.1 Upgrading using a local or remote image file

When you upgrade HiPath Wireless Controller software, two upgrade scenarios are available:

- **Local** – A local upgrade involves upgrading the HiPath Wireless Controller using an image file (.tar) that is located on the HiPath Wireless Controller or flash memory card.
- **Remote** – A remote upgrade involves upgrading the HiPath Wireless Controller using an image file that is located on an external FTP server. If the image file (.tar) you want is located on an external FTP server, you have the following two options:
  - Launch the upgrade with the image file remaining on the external FTP server.
  - First download the remote image file onto the HiPath Wireless Controller or flash memory card, and then perform the HiPath Wireless Controller upgrade.

To perform a local upgrade of HiPath Wireless Controller software:

1. From the main menu, click **Wireless Controller Configuration**. The **Wireless Controller Configuration** page is displayed.
2. From the left pane, click **Software Maintenance**. The **HWC Software** tab is displayed.



3. Select **Local**, and then click the image file you want to upgrade to from the **Select upgrade** list.
4. If applicable, backup the current system image:
   - To save the backup image locally, select the **Flash** option, and then type a file name for the backup image in the **Filename** box. The filename must end with the .tgz extension.

     Note: If you are performing an upgrade on a HiPath Wireless Controller C20, the **Flash** option is not available. Instead, to save the backup image locally, select the **Local** option. The **Filename** box is populated with the automatically generated file name for the backup image. You cannot edit the file name of the backup image file.

   - To save the backup image on a remote FTP server, select the **Remote** option, and then type the following:
     - **FTP Server** – The IP address of the FTP server that will store the image file.
     - **User ID** – The user ID used to log in to the FTP server.
     - **Password** – The corresponding password for the user ID.

- **Confirm** – The corresponding password for the user ID, to confirm it was typed correctly.
- **Directory** – The directory on the server in which the image file is to be stored.
- **Filename** – The name of the image file.The filename must end with the .tgz extension.

5. If applicable, clear the **Backup system image to** option if you do not want to save a backup image of your current system.

Caution: You should always backup your current system during the upgrade process. Having a backup image of your system provides you the option of restoring your system to its previous configuration, if needed.

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6. Do one of the following:

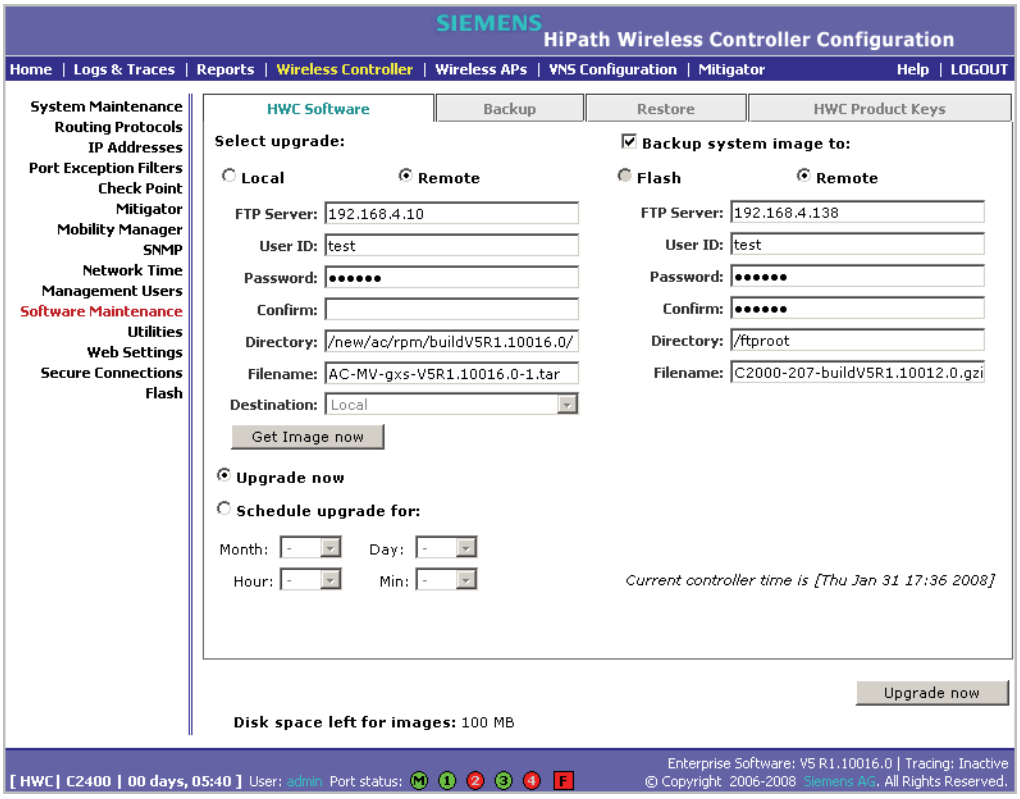
- To schedule a backup, select the **Schedule upgrade for** option.
  a) Use the **Month**, **Day**, **Hour**, and **Minute** drop-down lists to schedule the upgrade.
  b) Click **Schedule upgrade**.
  c) Review the upgrade settings in the dialog box that is displayed. If correct, click **OK** to confirm the upgrade. Once you confirm the upgrade, the **HWC Software** tab fields become grayed out.

Note: A scheduled upgrade is not a recurring event. The HiPath Wireless Controller only allows one scheduled upgrade to be scheduled at a time.

- To perform the upgrade now, select the **Upgrade now** option.
  a) Click the **Upgrade now** button.
  b) Review the upgrade settings in the dialog box that is displayed. If correct, click **OK** to confirm the upgrade. Once you confirm the upgrade, all sessions are closed. The Software maintenance window is displayed, providing the status of the upgrade. The previous software is uninstalled automatically. The new software is installed. The HiPath Wireless Controller reboots automatically. The database is updated and migrated.

To perform a remote upgrade of HiPath Wireless Controller software with the image file remaining on the FTP server:

1. From the main menu, click **Wireless Controller Configuration**. The **Wireless Controller Configuration** page is displayed.
2. From the left pane, click **Software Maintenance**. The **HWC Software** tab is displayed.
3. Select **Remote**. The ftp server boxes are displayed.



4. Type the following:
   - **FTP Server** – The IP address of the FTP server to retrieve the image file from.
   - **User ID** – The user ID used to log in to the FTP server.
   - **Password** – The corresponding password for the user ID.
   - **Confirm** – The corresponding password for the user ID, to confirm it was typed correctly.
   - **Directory** – The directory on the server in which the image file that is to be retrieved is stored.
   - **Filename** – The name of the image file to retrieve.

5. If applicable, backup the current system image:
   - To save the backup image locally, select the **Flash** option, and then type a file name for the backup image in the **Filename** box. The filename must end with the .tgz extension.
   - To save the backup image on a remote FTP server, select the **Remote** option, and then type the following:
     - **FTP Server** – The IP of the FTP server that will store the image file.
     - **User ID** – The user ID used to log in to the FTP server.
     - **Password** – The corresponding password for the user ID.
     - **Confirm** – The corresponding password for the user ID, to confirm it was typed correctly.
     - **Directory** – The directory on the server in which the image file is to be stored.
     - **Filename** – The name of the image file. The filename must end with the .tgz extension.
6. If applicable, clear the **Backup system image to** option if you do not want to save a backup image of your current system.

   Caution: You should always backup your current system during the upgrade process. Having a backup image of your system provides you the option of restoring your system to its previous configuration, if needed.

7. Do one of the following:
   - To schedule a backup, select the **Schedule upgrade for** option.
     a) Use the **Month**, **Day**, **Hour**, and **Minute** drop-down lists to schedule the upgrade.
     b) Click **Schedule upgrade**.
     c) Review the upgrade settings in the dialog box that is displayed. If correct, click **OK** to confirm the upgrade. Once you confirm the upgrade, the **HWC Software** tab fields become grayed out.

     Note: A scheduled upgrade is not a recurring event. The HiPath Wireless Controller only allows one scheduled upgrade to be scheduled at a time.

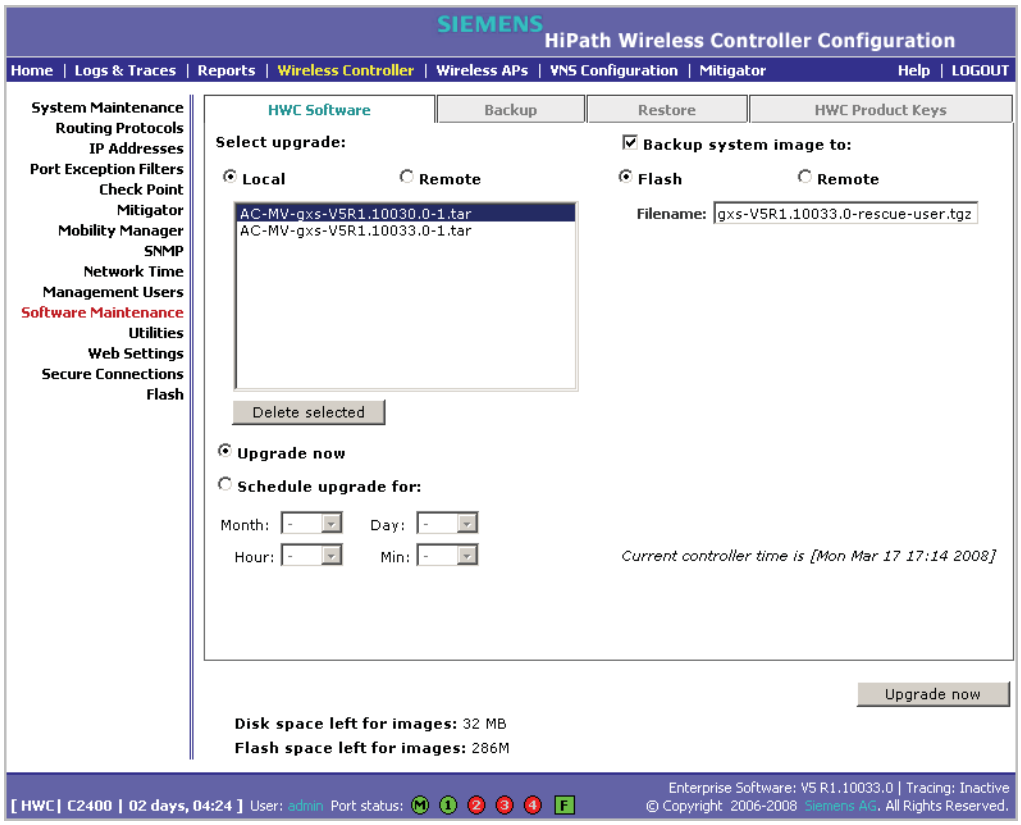
   - To perform the upgrade now, select the **Upgrade now** option.

a) Click the **Upgrade now** button.

b) Review the upgrade settings in the dialog box that is displayed. If correct, click **OK** to confirm the upgrade. Once you confirm the upgrade, all sessions are closed. The Software maintenance window is displayed, providing the status of the upgrade. The previous software is uninstalled automatically. The new software is installed. The HiPath Wireless Controller reboots automatically. The database is updated and migrated.

To perform a remote upgrade of HiPath Wireless Controller software using a downloaded image file from an the FTP server:

1. From the main menu, click **Wireless Controller Configuration**. The **Wireless Controller Configuration** page is displayed.
2. From the left pane, click **Software Maintenance**. The **HWC Software** tab is displayed.



3. Select **Remote,** and then type the following:
   - **FTP Server** – The IP address of the FTP server to retrieve the image file from.
   - **User ID** – The user ID used to log in to the FTP server.
   - **Password** – The corresponding password for the user ID.

- **Confirm** – The corresponding password for the user ID, to confirm it was typed correctly.
- **Directory** – The directory on the server in which the image file that is to be retrieved is stored.
- **Filename** – The name of the image file to retrieve.
- **Destination** – Select the location where the image file is to be saved:
  - **Flash** – The image file will be saved on the flash memory card.
  - **Local** – The image file will be saved on the HiPath Wireless Controller.

4. Click **Get Image now**. The **FTP Image** window is displayed, providing the status and results of the FTP upload. The image is uploaded onto your system and added to the **Select upgrade** list.
5. In the **Select upgrade** list, click the image file you want to upgrade to.
6. If applicable, backup the current system image:
   - To save the backup image locally, select the **Flash** option, and then type a file name for the backup image in the **Filename** box. The filename must end with the .tgz extension.
   - To save the backup image on a remote FTP server, select the **Remote** option, and then type the following:
     - **FTP Server** – The IP address of the FTP server that will store the image file.
     - **User ID** – The user ID used to log in to the FTP server.
     - **Password** – The corresponding password for the user ID.
     - **Confirm** – The corresponding password for the user ID, to confirm it was typed correctly.
     - **Directory** – The directory on the server in which the image file is to be stored.
     - **Filename** – The name of the image file. The filename must end with the .tgz extension.
7. If applicable, clear the **Backup system image to** option if you do not want to save a backup image of your current system.

Caution: You should always backup your current system during the upgrade process. Having a backup image of your system provides you the option of restoring your system to its previous configuration, if needed.

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8. Do one of the following:
   - To schedule a backup, select the **Schedule upgrade for** option.
     a) Use the **Month**, **Day**, **Hour**, and **Minute** drop-down lists to schedule the upgrade.
     b) Click **Schedule upgrade**.
     c) Review the upgrade settings in the dialog box that is displayed. If correct, click **OK** to confirm the upgrade. Once you confirm the upgrade, the **HWC Software** tab fields become grayed out.

     Note: A scheduled upgrade is not a recurring event. The HiPath Wireless Controller only allows one scheduled upgrade to be scheduled at a time.

   - To perform the upgrade now, select the **Upgrade now** option.
     a) Click the **Upgrade now** button.
     b) Review the upgrade settings in the dialog box that is displayed. If correct, click **OK** to confirm the upgrade. Once you confirm the upgrade, all sessions are closed. The Software maintenance window is displayed, providing the status of the upgrade. The previous software is uninstalled automatically. The new software is installed. The HiPath Wireless Controller reboots automatically. The database is updated and migrated.

11.4.2.2 Modifying a scheduled software upgrade

To modify a schedule software upgrade, you first need to cancel the existing schedule upgraded, and then reschedule a new software upgrade.

To modify a schedule software upgrade:

1. From the main menu, click **Wireless Controller Configuration**. The **Wireless Controller Configuration** page is displayed.
2. From the left pane, click **Software Maintenance**. The **HWC Software** tab is displayed.
3. Click **Cancel upgrade**.
4. In the dialog box that is displayed, click **OK** to confirm the cancellation of the upgrade. The scheduled software upgrade is cancelled and the **HWC Software** tab fields become available for scheduling a new software upgrade. For more information, see Section 11.4.2, “Upgrading HiPath Wireless Controller software”, on page 324.

11.4.2.3 Deleting a software image

You can delete a software image if it is no longer needed on your system.

To delete a software upgrade:

1. From the main menu, click **Wireless Controller Configuration**. The **Wireless Controller Configuration** page is displayed.
2. From the left pane, click **Software Maintenance**. The **HWC Software** tab is displayed.
3. In the **Select upgrade** list, click the software upgrade you want to delete.
4. Click **Delete selected**.
5. In the dialog box that is displayed, click **OK** to confirm the deletion of the upgrade. The **Software Maintenance** window is displayed, providing the status and results of the deletion.

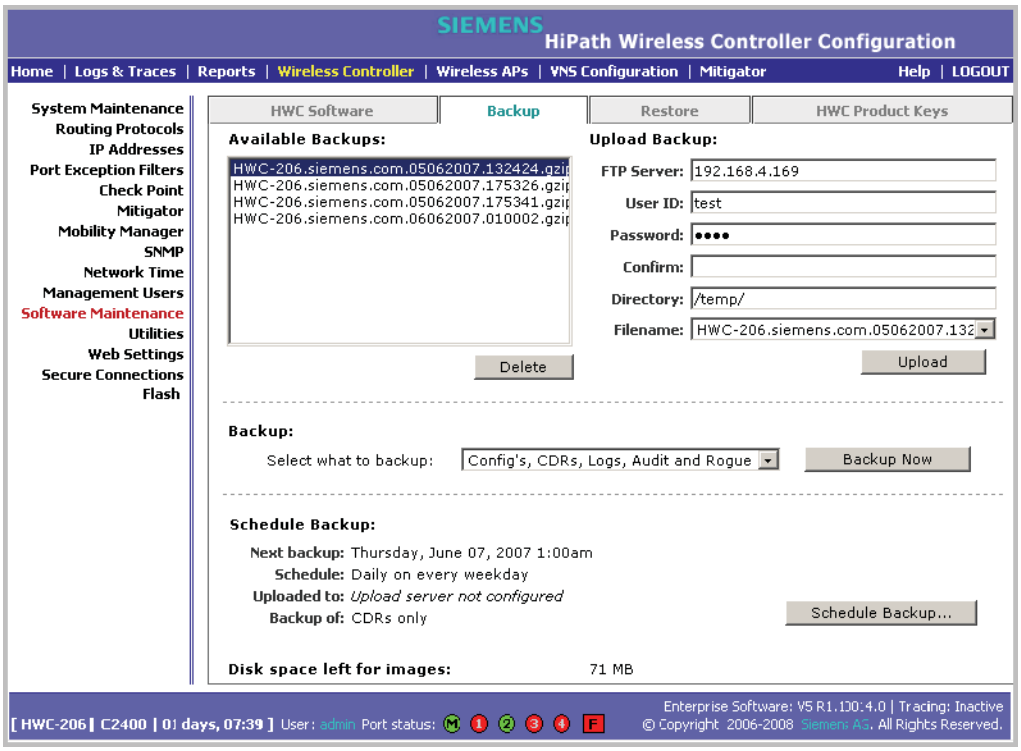
11.4.3 Backing up the HiPath Wireless Controller database

When you backup the HiPath Wireless Controller database, you can choose to do the following:

- Backup the HiPath Wireless Controller database now
- Upload a backup to an FTP server
- Schedule when a backup occurs
- Schedule a backup and copy it to an FTP server

To back up the HiPath Wireless Controller database now:

1. From the main menu, click **Wireless Controller Configuration**. The **Wireless Controller Configuration** page is displayed.
2. From the left pane, click **Software Maintenance**. The **HWC Software** tab is displayed.
3. Click the **Backup** tab.



The **Available Backups** list displays items that have already been backed up and are available.

4. In the **Backup** section, click an item from the **Select what to backup** drop-down list.
5. To launch the backup of the selected items, click **Backup Now**. The **Software Maintenance** window is displayed, providing the status and results of the backup.

11.4.3.1 Uploading a backup to an FTP server

You can upload an existing backup file to an FTP server. When an existing backup is uploaded to an FTP server, the uploaded backup file is removed from the **Available Backups** list.

To upload an existing backup to an FTP server:

1. From the main menu, click **Wireless Controller Configuration**. The **Wireless Controller Configuration** page is displayed.
2. From the left pane, click **Software Maintenance**. The **HWC Software** tab is displayed.
3. Click the **Backup** tab.

4. To upload a backup, type the following:
   - **FTP Server** – The IP of the FTP server to where the backup will be copied to.
   - **User ID** – The user ID used to log in to the FTP server.
   - **Password** – The corresponding password for the user ID.
   - **Confirm** – The corresponding password for the user ID to confirm it was typed correctly.
   - **Directory** – The directory on the server where the image file will be stored.
5. In the **Filename** drop-down list, click the backup you want to upload.
6. Click **Upload**. The **Software Maintenance** window is displayed, providing the status and results of the backup.

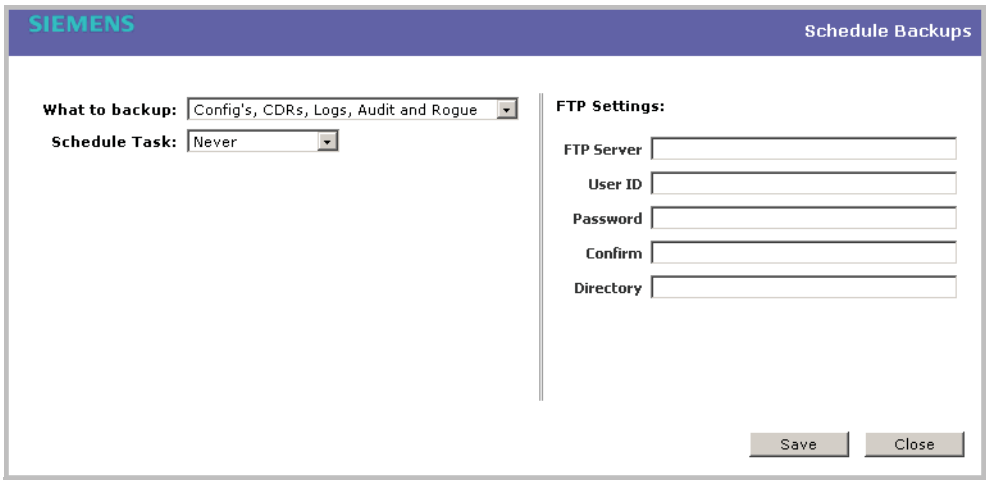
11.4.3.2 Scheduling a backup

When you schedule a backup, you can either chose to save the back to an FTP server or have the scheduled backup saved on your system.

Note: If you do not specify an FTP server in the **Schedule Backups** window when you define the backup schedule, the backup is added to the **Available Backups** list on the **Backup** tab.

To schedule a backup:

1. From the main menu, click **Wireless Controller Configuration**. The **Wireless Controller Configuration** page is displayed.
2. From the left pane, click **Software Maintenance**. The **HWC Software** tab is displayed.
3. Click the **Backup** tab.
4. Click **Schedule Backup**. The **Schedule Backups** page is displayed.



5. In the **What to backup** drop-down list, click what you want to backup:
   - Config's, CDRs, Logs, Audit and Rogue
   - Configurations only
   - CDRs only
   - Logs only
   - Audit only
   - Rogue only
6. In the **Schedule task** drop-down list, click the frequency of the backup:
   - **Daily** – Click the **Start Time** and **Recurrence** for the backup.
   - **Weekly** – Click the **Start Time** and **Recurrence** for the backup.
   - **Monthly** – Click the **Start Time** and **Recurrence** for the backup.
   - **Never** – Click to make the scheduled backup a one-time event.
7. If applicable, specify an FTP server to where the scheduled backup will be copied to. In the **FTP settings** section, type the following:
   - **FTP Server** – The IP of the FTP server to where the scheduled backup will be copied to.
   - **User ID** – The user ID used to log in to the FTP server.
   - **Password** – The corresponding password for the user ID.
   - **Confirm** – The corresponding password for the user ID to confirm it was typed correctly.
   - **Directory** – The directory on the server where the image file will be stored.

8. To save your changes, click **Save**.

11.4.3.3 Deleting a backup

You can delete a backup if it is no longer needed on your system.

To delete a backup:

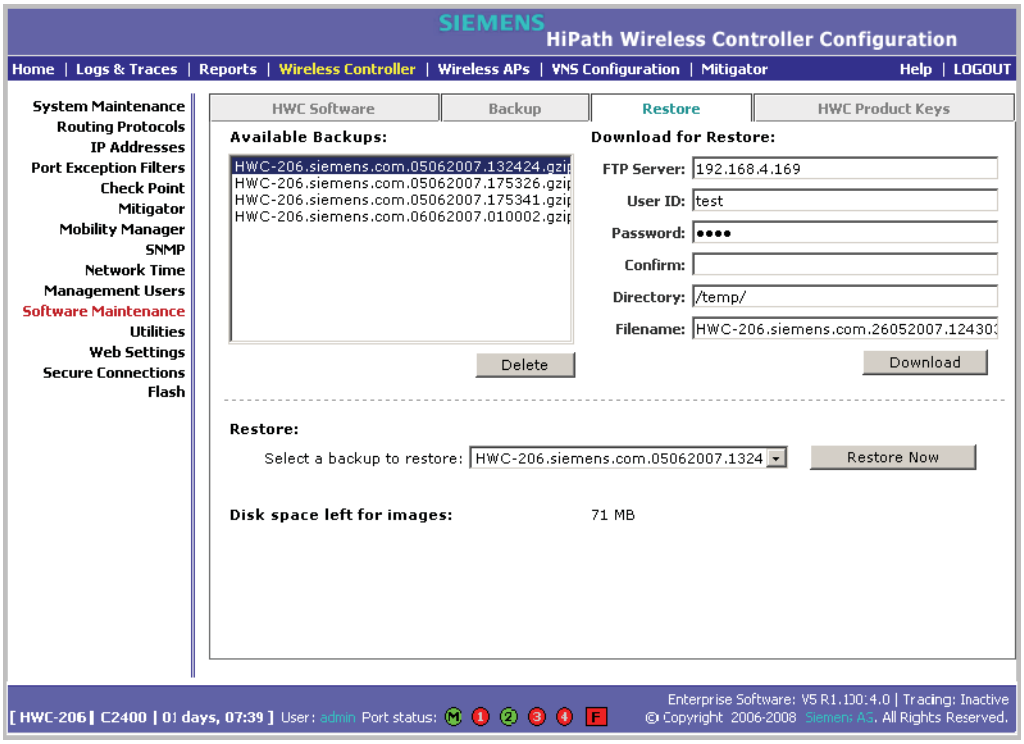
1. From the main menu, click **Wireless Controller Configuration**. The **Wireless Controller Configuration** page is displayed.
2. From the left pane, click **Software Maintenance**. The **HWC Software** tab is displayed.
3. Click the **Backup** tab.
4. In the **Available Backups** list, click the backup you want to delete.
5. Click **Delete**.
6. In the dialog box that is displayed, click **OK** to confirm the deletion. The **Software Maintenance** window is displayed, providing the status and results of the deletion.

11.4.4 Restoring the HiPath Wireless Controller database

When you restore the HiPath Wireless Controller database, you can choose to download a backup from an FTP server for a restore.

To restore the HiPath Wireless Controller software:

1. From the main menu, click **Wireless Controller Configuration**. The **Wireless Controller Configuration** page is displayed.
2. From the left pane, click **Software Maintenance**. The **HWC Software** tab is displayed.
3. Click the **Restore** tab.



The **Available Backups** list displays items that have already been backed up and are available.

4. In the **Restore** section, click the backup configuration you want to restore from the **Select a backup to restore** drop-down list.
5. To restore the backup configuration, click **Restore Now**.
6. Review the restore settings in the dialog box that is displayed. If correct, click **OK** to confirm the restore. The **Software Maintenance** window is displayed, providing the status and results of the restore.
7. Reboot your system. For more information, see Section 11.3, “Performing system maintenance tasks”, on page 317.

To download a backup from an FTP server for a restore:

1. From the main menu, click **Wireless Controller Configuration**. The **Wireless Controller Configuration** page is displayed.
2. From the left pane, click **Software Maintenance**. The **System Maintenance** page is displayed.
3. Click the **Restore** tab.
4. To download a backup for a restore, type the following:
   - **FTP Server** –The FTP server to retrieve the backup file from.

- **User ID** – The user ID used to log in to the FTP server.
- **Password** – The corresponding password for the user ID.
- **Confirm** – The corresponding password for the user ID to confirm it was typed correctly.
- **Directory** – The directory on the server in which the backup file that is to be retrieved is stored.
- **Filename** – The name of the image file to retrieve.

5. Click **Download**. The backup is downloaded and added to the **Available Backups** list.

To delete a backup available for restore:

1. From the main menu, click **Wireless Controller Configuration**. The **Wireless Controller Configuration** page is displayed.
2. From the left pane, click **Software Maintenance**. The **System Maintenance** page is displayed.
3. Click the **Restore** tab.
4. To delete a backup from the list, click the backup in the **Available Backups** list you want to delete.
5. Click **Delete**.
6. Review the restore settings in the dialog box that is displayed. If correct, click **OK** to confirm the deletion. The **Software Maintenance** window is displayed, providing the status and results of the deletion.

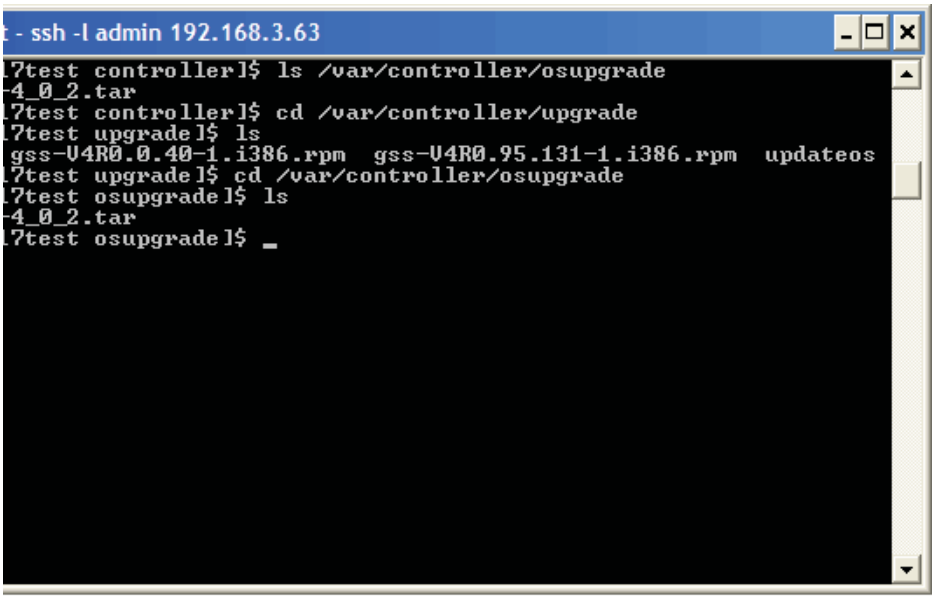
11.4.5 Upgrading a HiPath Wireless Controller using SFTP

You can upload an image file to the HiPath Wireless Controller using Secure FTP (SFTP). The HiPath Wireless Controller supports any SFTP client.

Note: You must enable management traffic before you try to connect with a SFTP client. Specify the exact image path for the corresponding SW package (see directory information below). Otherwise, the HiPath Wireless Controller cannot locate them for SW upgrades/updates.

To upload an image file:

1. Launch the SFTP client, point it to the HiPath Wireless Controller and login in. The exact details of how to do this will depend on the client used. The following uses putty as an example:



2. Change to the directory to receive the uploaded file:
   - For AP images change to: /var/controller/images/ap/
   - For HiPath Wireless Controller images change to: /var/controller/upgrade
   - For OS archives change to: /var/controller/osupgrade
3. Upload the image file using the SFTP client upload feature.
4. To complete a HiPath Wireless Controller upgrade or an AP upgrade go to the appropriate **Software Maintenance** page. For more information, see Section 11.4.2, “Upgrading HiPath Wireless Controller software”, on page 324.

11.4.6 Maintaining the HiPath Wireless Controller product license keys

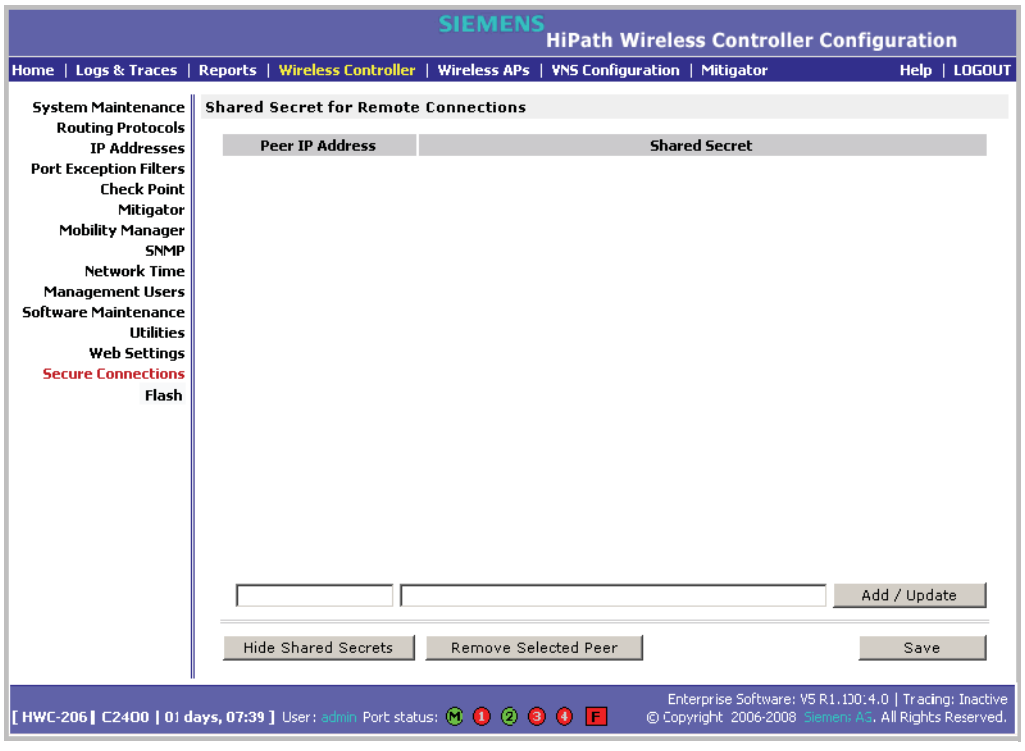
Software maintenance also includes the product key maintenance for first time setup and upgrades. For more information, see Section 3.2.3, “Applying the product license key”, on page 41.

11.4.7 Configuring the HiPath Wireless Controller for interaction with the HiPath Wireless Manager

The HiPath Wireless Manager application provides administrators with a graphical overview of the entire HiPath wireless network, including real time wireless event monitoring. You must configure each HiPath Wireless Controller in order to interact with the HiPath Wireless Manager. To configure the HiPath Wireless Controller to interact with the HiPath Wireless Manager, a shared secret must be defined for both. For more information, see the *HiPath Wireless Manager User Guide*.

To configure a shared secret for interaction with the HiPath Wireless Manager:

1. From the main menu, click **Wireless Controller Configuration**. The **Wireless Controller Configuration** page is displayed.
2. From the left pane, click **Secure Connections**. The **Shared Secret for Remote Connections** page is displayed.



3. In the first box, type the controller's IP address.
4. In the second box, type the shared secret to be used by both the HiPath Wireless Controller and the HiPath Wireless Manager. The shared secret can be a maximum of 16 (232 ASCII) characters. Each IP connection can have a different secret.

5. Click **Add/Update**. The table is updated with the IP address and shared secret.
6. To hide the shared secrets, click **Hide Shared Secrets**. To show the shared secrets, click **Show Shared Secrets**.
7. To remove a connections, click the IP address in the table and then click **Remove Selected Peer**.
8. To save your changes, click **Save**.

11.5 Working with system logs, trace messages, and audits

The system stores configuration data and log files. These files include:

- event and alarm logs (triggered by events)
- trace messagess (triggered by component activity)
- User interface audit messages
- DHCP messages
- accounting files (created every 30 minutes, to a maximum of six files)

The files are stored in the operating system and have a maximum size of one GB. The accounting files are stored in flat files in a directory that is created every day. Eight directories are maintained in a circular buffer — when all are full, the most recent replaces the earliest.

11.5.1 Logs, traces, audits, and DHCP messages

The HiPath Wireless Controller generates four types of messages:

- **Logs (including alarms)** – Messages that are triggered by events
- **Traces** – Messages that display activity by component, for system debugging, troubleshooting, and internal monitoring of software

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Caution: In order for the **Debug Info** option on the **Wireless AP Traces** page to return trace messages, this option must enabled while Wireless AP debug commands are running. To do so, you need to run a Wireless AP CLI command to turn on a specific Wireless AP debug. Once the CLI command is run, select the **Debug Info** option, and then click **Retrieve Traces**. For more information, see the *HiPath Wireless Controller, Access Points and Convergence Software CLI Reference Guide*.

Because Wireless AP debugging can affect the normal operation of Wireless AP service, enabling debugging is not recommended unless specific instructions are provided.

- **Audits** – Messages that record administrative changes made to the system
- **DHCP** – Messages that record DHCP service events

11.5.1.1 Working with logs

The log messages contain the time of event, severity, source component, and any details generated by the source component. Log messages are divided into two groups:

- HiPath Wireless Controller logs
- Wireless AP logs

Log severity levels

Log messages are classified at four levels of severity:

- Information (the activity of normal operation)
- Minor (alarm)
- Major (alarm)
- Critical (alarm)

The alarm messages (minor, major or critical log messages) are triggered by activities that meet certain conditions that should be known and dealt with. The following are examples of events on the HiPath Wireless Controller that generate an alarm message:

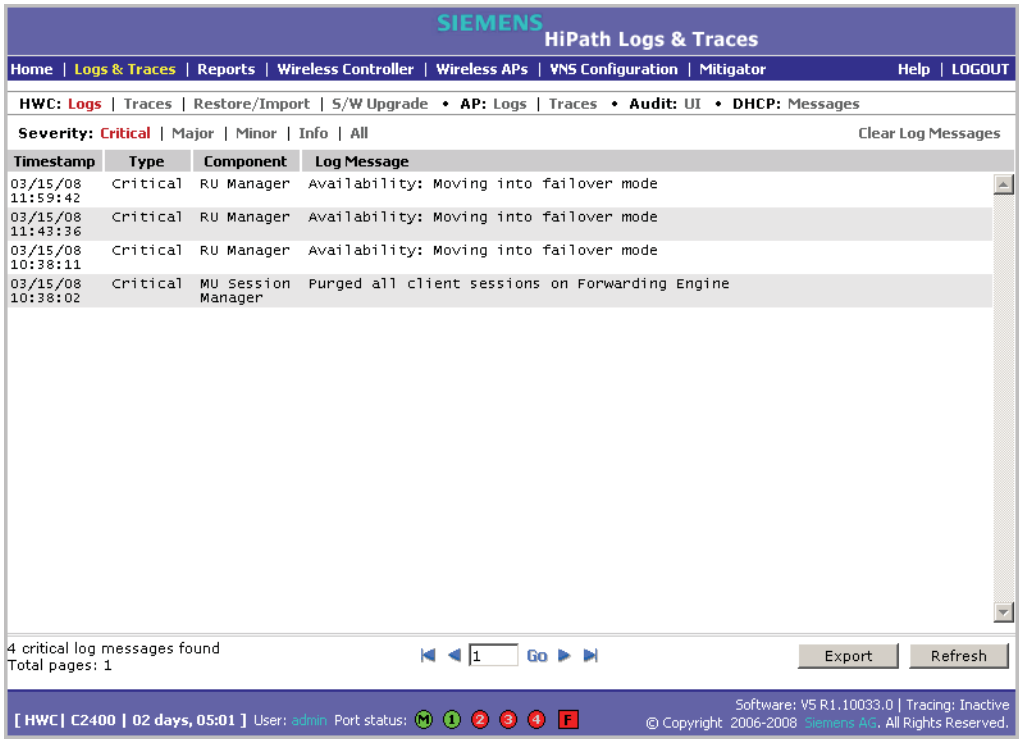
- Reboot due to failure
- Software upgrade failure on the HiPath Wireless Controller
- Software upgrade failure on the Wireless AP
- Detection of rogue access point activity without valid ID

If SNMP is enabled on the HiPath Wireless Controller, alarm conditions will trigger a trap in SNMP (Simple Network Management Protocol). An SNMP trap is an event notification sent by the managed agent (a network device) to the management system to identify the occurrence of conditions.

Note: The log statements **Low water mark level was reached** and **Incoming message dropped, because of the rate limiting mechanism** indicate that there is a burst of log messages coming to the event server and the processing speed is slower than the incoming rate of log messages. These messages do not indicate that the system is impaired in any way.

To view HiPath Wireless Controller logs:

1. From the main menu, click **Logs & Traces**. The **Logs & Traces** page is displayed.
2. Click the **HWC: Logs** tab. The HiPath Wireless Controller log page is displayed and the events are displayed in chronological order:



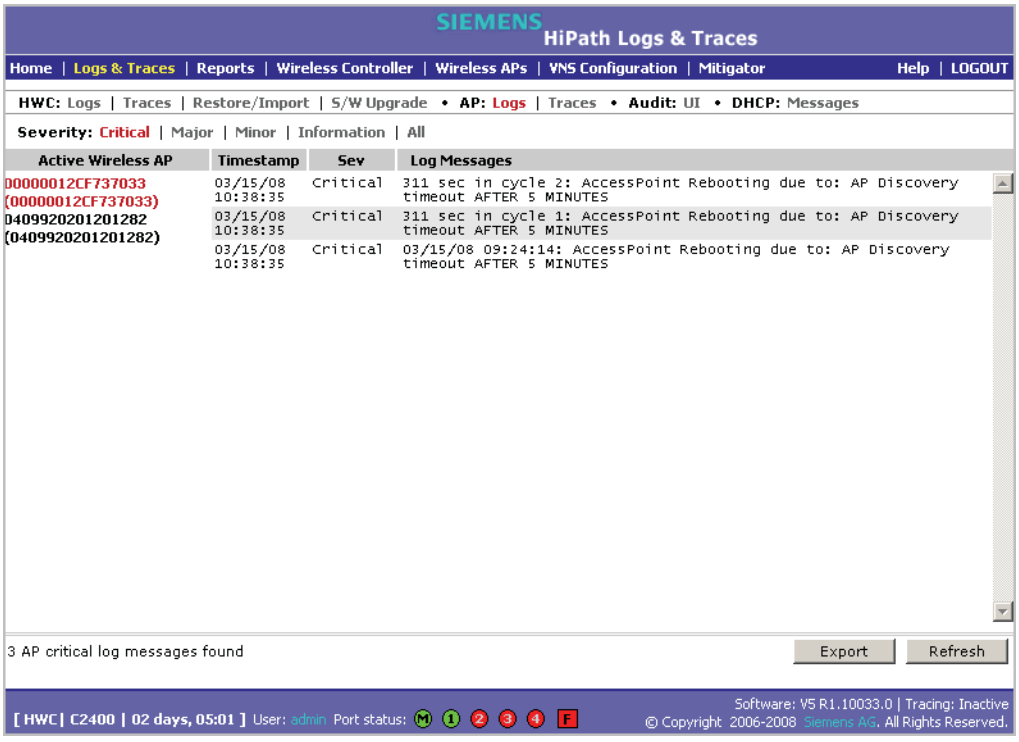
3. To sort the events by **Timestamp**, **Type**, or **Component**, click the appropriate column heading.
4. To filter the events by severity, **Critical**, **Major**, **Minor**, **Info**, and **All**, click the appropriate log severity.
5. To refresh the HiPath Wireless Controller log page, click **Refresh**.

6. To export the HiPath Wireless Controller log page, click **Export**. The **File Download** dialog is displayed.
7. Do one of the following:
   - To open the log file, click **Open**.
   - To save the log file, click **Save**, and then navigate to the directory location you want to save the file.
     - Click **Save**.

Note: The component "Langley" is the term for the inter-process messaging infrastructure on the HiPath Wireless Controller.

To view Wireless AP logs:

1. From the main menu, click **Logs & Traces**. The **Logs & Traces** page is displayed.
2. Click the **AP: Logs** tab. The Wireless AP log page is displayed and the events are displayed in chronological order:

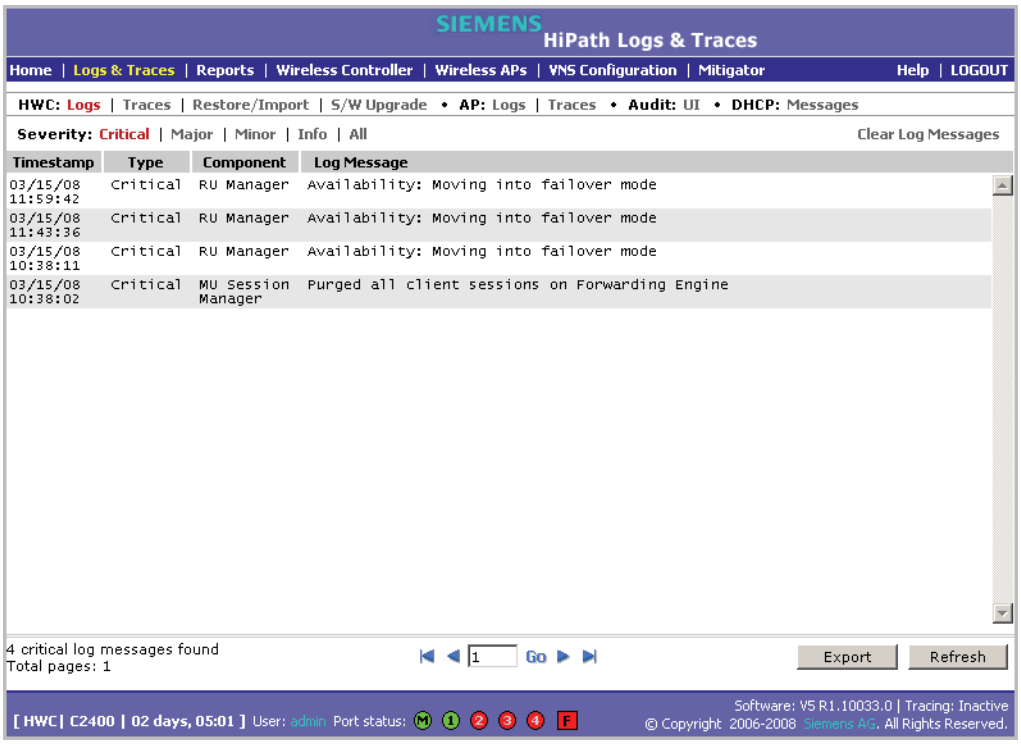


3. In the **Active Wireless AP** list, click a Wireless AP to view the log events for that particular Wireless AP.
4. To sort the events by **Timestamp** or **Severity**, click the appropriate column heading.

5. To filter the events by severity, **Critical**, **Major**, **Minor**, **Info**, and **All**, click the appropriate log severity.
6. To refresh the HiPath Wireless Controller log page, click **Refresh**.
7. To export the HiPath Wireless Controller log page, click **Export**. The **File Download** dialog is displayed.
8. Do one of the following:
   - To open the log file, click **Open**.
   - To save the log file, click **Save**, and then navigate to the directory location you want to save the file.
     - Click **Save**.

To clear HiPath Wireless Controller logs:

1. From the main menu, click **Logs & Traces**. The **Logs & Traces** page is displayed.
2. Click the **HWC: Logs** tab. The HiPath Wireless Controller log page is displayed and the events are displayed in chronological order:

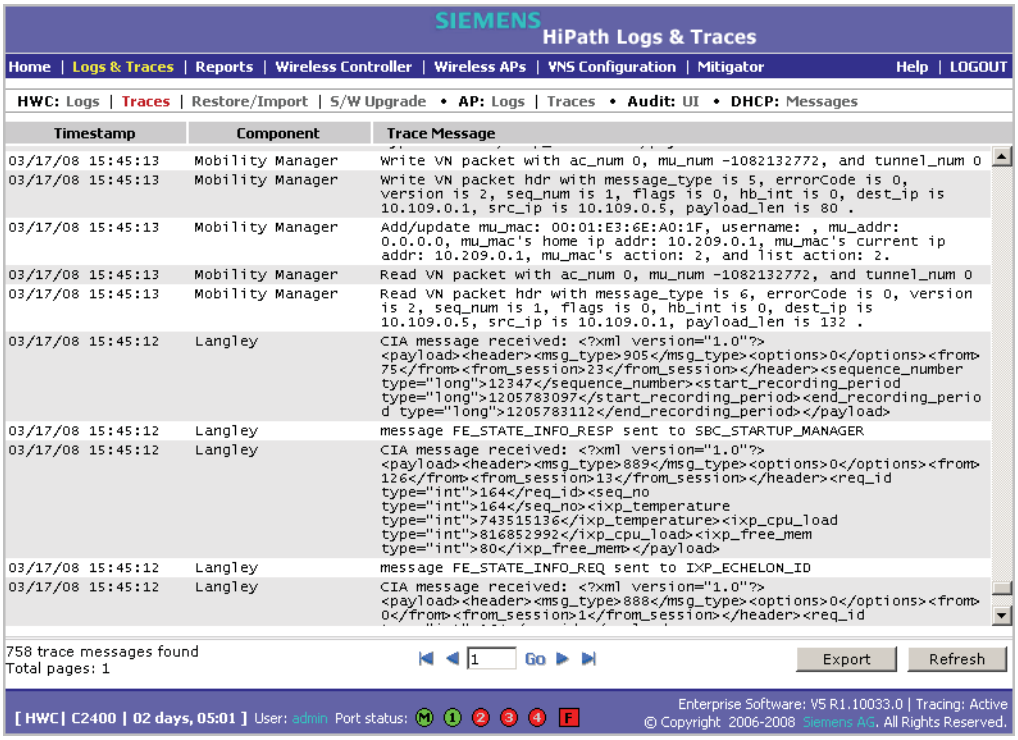


3. To clear the logs, click **Clear Log Messages**.
4. To confirm the deletion of the HiPath Wireless Controller log messages, click **Ok**. The HiPath Wireless Controller log messages are deleted.

11.5.1.2 Working with trace messages

To view HiPath Wireless Controller traces:

1. From the main menu, click **Logs & Traces**. The **Logs & Traces** page is displayed.
2. Click the **HWC: Traces** tab. The HiPath Wireless Controller trace page is displayed and the events are displayed in chronological order:



3. To sort the events by **Timestamp** or **Component**, click the appropriate column heading.
4. To refresh the HiPath Wireless Controller trace page, click **Refresh**.
5. To export the HiPath Wireless Controller trace page, click **Export**. The **File Download** dialog is displayed.
6. Do one of the following:
   - To open the trace file, click **Open**.
   - To save the trace file, click **Save**, and then navigate to the directory location you want to save the file.
     - Click **Save**.

To view Wireless AP traces:

1. From the main menu, click **Logs & Traces**. The **Logs & Traces** page is displayed.
2. Click the **AP: Traces** tab. The Wireless AP trace page is displayed.

Caution: In order for the **Debug Info** option on the **Wireless AP Traces** page to return trace messages, this option must enabled while Wireless AP debug commands are running. To do so, you need to run a Wireless AP CLI command to turn on a specific Wireless AP debug. Once the CLI command is run, select the **Debug Info** option, and then click **Retrieve Traces**. For more information, see the *HiPath Wireless Controller, Access Points and Convergence Software CLI Reference Guide*.

Because Wireless AP debugging can affect the normal operation of Wireless AP service, enabling debugging is not recommended unless specific instructions are provided.

3. In the **Active Wireless AP** list, click the Wireless 802.11n AP whose trace messages you want to view.
4. In the **Collect traces for** section, do the following:
   - **Configurations** – Select to collect trace configuration information.

- **Start/Stop Tracing** – Click to start or stop the collection of traces for this Wireless AP.
- **Retrieve Traces** – Click to view the available configuration traces in the **Trace Log Output** section.

- **Debug info** – Select to collect trace debug information for this Wireless AP.
  - **Start/Stop Tracing** – Click to start or stop the collection of traces for this Wireless AP.
  - **Retrieve Traces** – Click to view the available debug traces in the **Trace Log Output** section.
- **Reports** – Select to view available crash files.
  - **Retrieve Traces** – Click to view available crash files in the **Trace Log Output** section.
  - **Delete all crash reports** – Click to delete all crash reports for this Wireless AP.

5. To refresh the HiPath Wireless Controller trace page, click **Refresh**.
6. To export and view the Wireless AP trace page in HTML format, click **Export**.

Working with Wireless 802.11n AP traces

Wireless 802.11n AP traces are combined into a single .tar.gz file and can only be viewed by saving the tar.gz file to a directory on your computer.

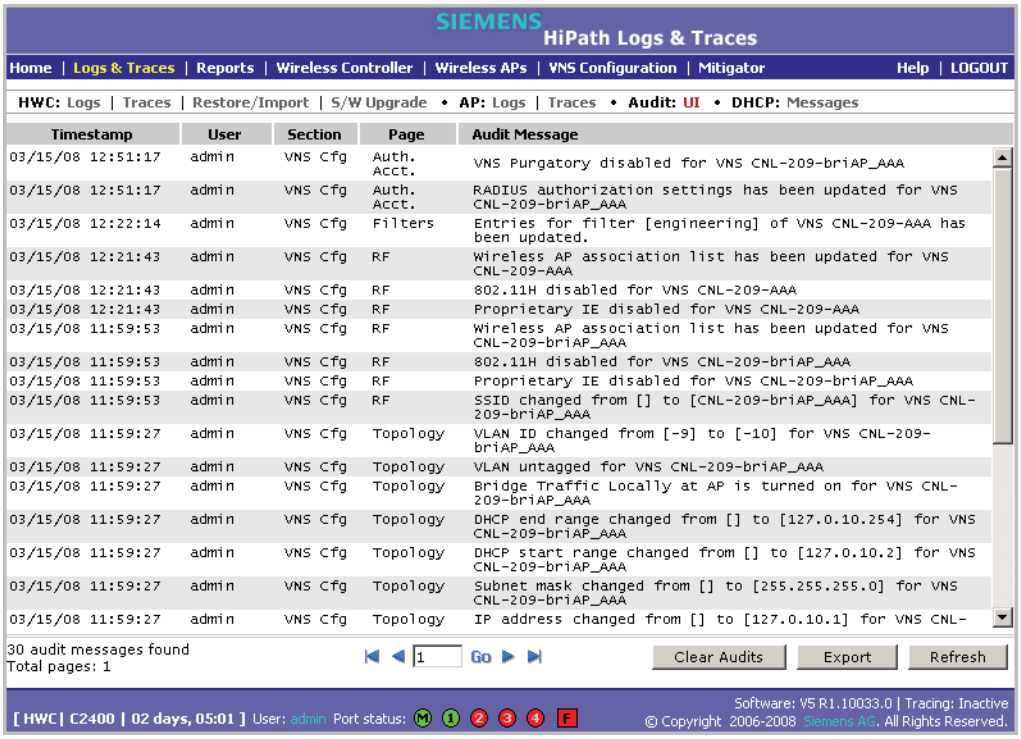
To view Wireless 802.11n AP traces:

1. From the main menu, click **Logs & Traces**. The **Logs & Traces** page is displayed.
2. Click the **AP Traces** tab. The Wireless AP trace page is displayed.
3. In the **Active Wireless AP** list, click the Wireless 802.11n AP whose trace messages you want to view.
4. Click **Retrieve Traces**. The **File Download** dialog appears.
5. Click **Save** and navigate to the location on your computer that you want to save the Wireless 802.11n AP trace report. The file is saved as a .tar.gz file.
6. To view the file, unzip the .tar.gz file.

11.5.1.3 Working with audit messages

To view audits:

1. From the main menu, click **Logs & Traces**. The **Logs & Traces** page is displayed.
2. Click the **Audit: UI** tab. The audit page is displayed and the events are displayed in chronological order.

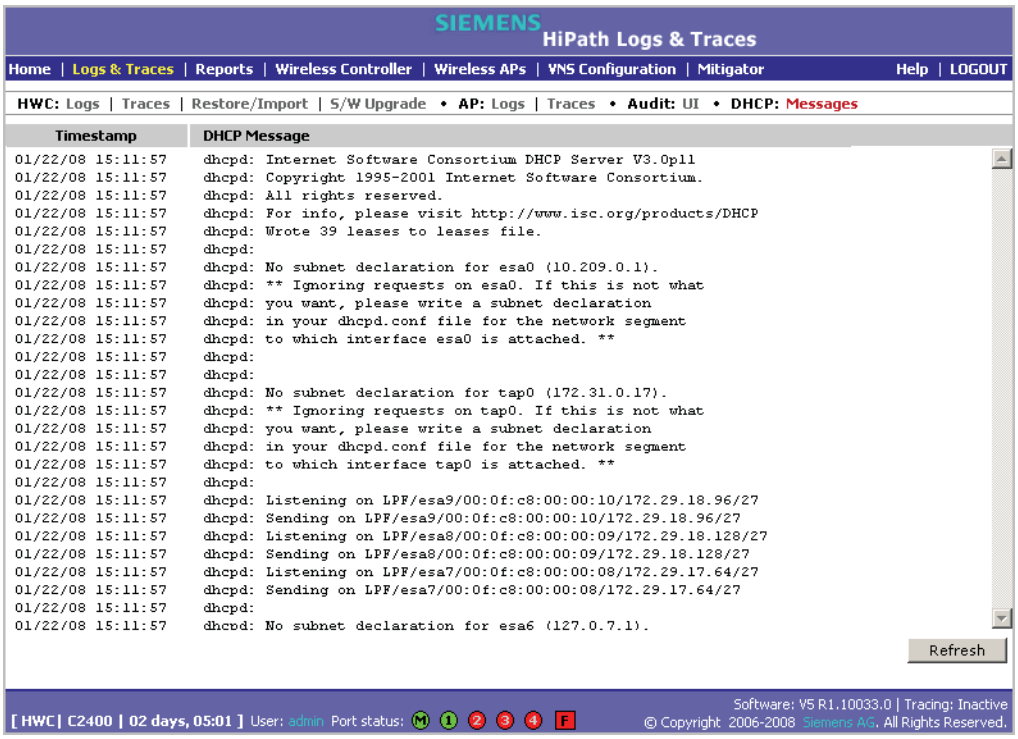


3. To sort the events by **Timestamp**, **User**, **Section**, or **Page**, click the appropriate column heading.
4. To refresh the audit page, click **Refresh**.
5. To export the audit page, click **Export**. The **File Download** dialog is displayed.
6. Do one of the following:
   - To open the audit file, click **Open**.
   - To save the audit file, click **Save**, and then navigate to the directory location you want to save the file.
     - Click **Save**.

11.5.1.4 Working with DHCP messages

To view DHCP messages:

1. From the main menu, click **Logs & Traces**. The **Logs & Traces** page is displayed.
2. Click the **DHCP: Messages** tab. The DHCP message page is displayed and the events are displayed in chronological order.



3. To sort the events by timestamp, click **Timestamp**.
4. To refresh the DHCP message page, click **Refresh**.

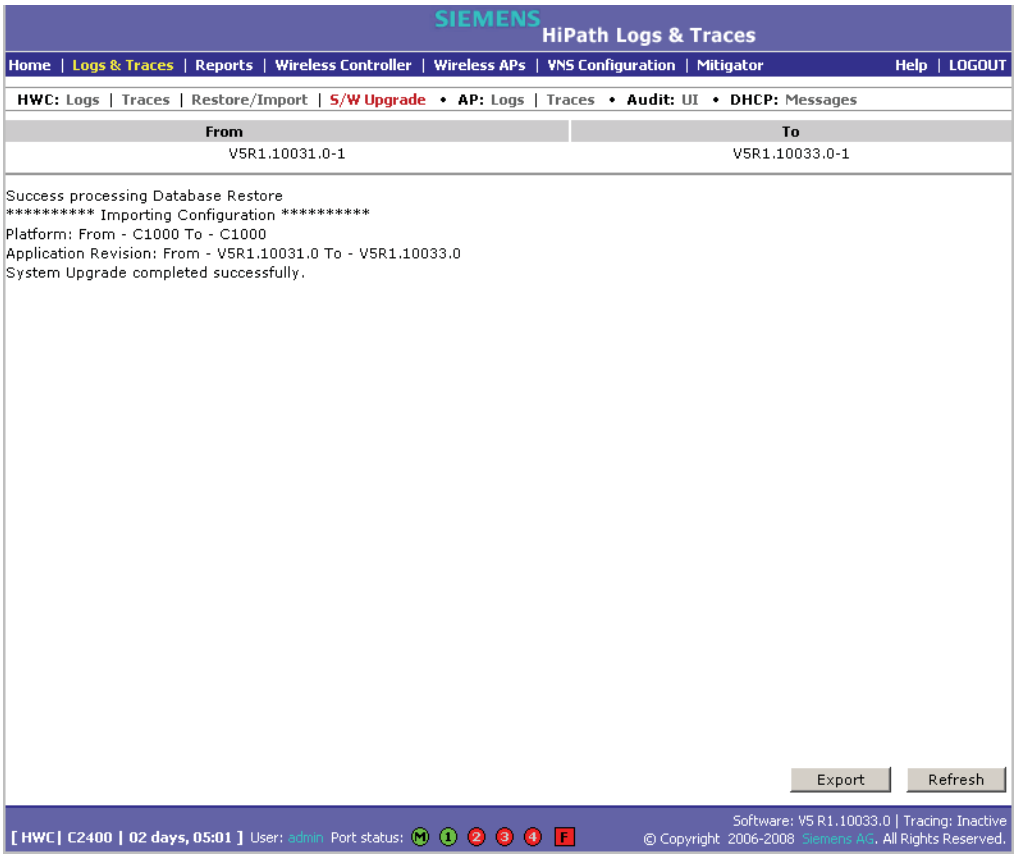
11.5.1.5 Working with software upgrade messages

The **S/W Upgrade** tab displays the most recent upgrade actions, either success or failure. Some examples of the actions that can be dispayed are:

- FTP failure during backup system image
- Database reset failure
- Database export failure
- Database import details

To view software upgrade messages:

1. From the main menu, click **Logs & Traces**. The **Logs & Traces** page is displayed.
2. Click the **S/W Upgrade** tab. The software upgrade message page is displayed.



3. To refresh the software upgrade message page, click **Refresh**.
4. To export the software upgrade message page, click **Export**. The **File Download** dialog is displayed.
5. Do one of the following:
   - To open the file, click **Open**.
   - To save the file, click **Save**, and then navigate to the directory location you want to save the file.
     - Click **Save**.

11.5.1.6 Working with restore/import messages

The **Restore/Import** tab displays the most recent restore/import results.

To view restore/import messages:

1. From the main menu, click **Logs & Traces**. The **Logs & Traces** page is displayed.
2. Click the **Restore/Import** tab. The restore/import message page is displayed.

3. To refresh the restore/import message page, click **Refresh**.
4. To export the restore/import message page, click **Export**. The **File Download** dialog is displayed.
5. Do one of the following:
   - To open the file, click **Open**.
   - To save the file, click **Save**, and then navigate to the directory location you want to save the file.
     - Click **Save**.

12 Glossary

12.1 Networking terms and abbreviations

Term	Explanation
AAA	Authentication, Authorization and Accounting. A system in IP-based networking to control what computer resources users have access to and to keep track of the activity of users over a network.
Access Point (AP)	A wireless LAN transceiver or "base station" that can connect a wired LAN to one or many wireless devices.
Ad-hoc mode	An 802.11 networking framework in which devices or stations communicate directly with each other, without the use of an access point (AP). (Compare Infrastructure Mode)
AES	Advanced Encryption Standard (AES) is an algorithm for encryption that works at multiple network layers simultaneously. As a block cipher, AES encrypts data in fixed-size blocks of 128 bits. AES was created by the National Institute of Standards and Technology (NIST). AES is a privacy transform for IPSec and Internet Key Exchange (IKE). AES has a variable key length - the algorithm can specify a 128-bit key (the default), a 192-bit key, or a 256-bit key. For the WPA2/802.11i implementation of AES, a 128 bit key length is used. AES encryption includes 4 stages that make up one round. Each round is then iterated 10, 12 or 14 times depending upon the bit-key size. For the WPA2/802.11i implementation of AES, each round is iterated 10 times.
AES-CCMP	AES uses the Counter-Mode/CBC-MAC Protocol (CCMP). CCM is a new mode of operation for a block cipher that enables a single key to be used for both encryption and authentication. The two underlying modes employed in CCM include Counter mode (CTR) that achieves data encryption and Cipher Block Chaining Message Authentication Code (CBC-MAC) to provide data integrity.
ARP	Address Resolution Protocol. A protocol used to obtain the physical addresses (such as MAC addresses) of hardware units in a network environment. A host obtains such a physical address by broadcasting an ARP request, which contains the IP address of the target hardware unit. If the request finds a unit with that IP address, the unit replies with its physical hardware address.
Association	A connection between a wireless device and an Access Point.
asynchronous	Asynchronous transmission mode (ATM). A start/stop transmission in which each character is preceded by a start signal and followed by one or more stop signals. A variable time interval can exist between characters. ATM is the preferred technology for the transfer of images.
BSS	Basic Service Set. A wireless topology consisting of one Access Point connected to a wired network and a set of wireless devices. Also called an infrastructure network. *See also* IBSS.
Captive Portal	A browser-based authentication mechanism that forces unauthenticated users to a Web page. Sometimes called a "reverse firewall".

Table 29

Term	Explanation
CDR	Call Data (Detail) Record In Internet telephony, a call detail record is a data record that contains information related to a telephone call, such as the origination and destination addresses of the call, the time the call started and ended, the duration of the call, the time of day the call was made and any toll charges that were added through the network or charges for operator services, among other details of the call. In essence, call accounting is a database application that processes call data from your switch (PBX, iPBX, or key system) via a CDR (call detail record) or SMDR (station message detail record) port. The call data record details your system's incoming and outgoing calls by thresholds, including time of call, duration of call, dialing extension, and number dialed. Call data is stored in a PC database
CHAP	Challenge-Handshake Authentication Protocol. One of the two main authentication protocols used to verify a user's name and password for PPP Internet connections. CHAP is more secure than PAP because it performs a three-way handshake during the initial link establishment between the home and remote machines. It can also repeat the authentication anytime after the link has been established.
CLI	Command Line Interface.
Collision	Two Ethernet packets attempting to use the medium simultaneously. Ethernet is a shared media, so there are rules for sending packets of data to avoid conflicts and protect data integrity. When two nodes at different locations attempt to send data at the same time, a collision will result. Segmenting the network with bridges or switches is one way of reducing collisions in an overcrowded network.
Datagram	A datagram is "a self-contained, independent entity of data carrying sufficient information to be routed from the source to the destination computer without reliance on earlier exchanges between this source and destination computer and the transporting network." (RFC1594). The term has been generally replaced by the term packet. Datagrams or packets are the message units that the Internet Protocol deals with and that the Internet transports.
Decapsulation	*See* tunnelling.
Device Server	A specialized, network-based hardware device designed to perform a single or specialized set of server functions. Print servers, terminal servers, remote access servers and network time servers are examples of device servers.
DHCP	Dynamic Host Configuration Protocol. A protocol for assigning dynamic IP addresses to devices on a network. With dynamic addressing, a device can have a different IP address every time it connects to the network. In some systems, the device's IP address can even change while it is still connected. DHCP also supports a mix of static and dynamic IP addresses. DHCP consists of two components: a protocol for delivering host-specific configuration parameters from a DHCP server to a host and a mechanism for allocation of network addresses to hosts. (IETF RFC1531.) Option 78 specifies the location of one or more SLP Directory Agents. Option 79 specifies the list of scopes that a SLP Agent is configured to use.(RFC2610 - DHCP Options for Service Location Protocol)

Table 29

Term	Explanation
Directory Agent (DA)	A method of organizing and locating the resources (such as printers, disk drives, databases, e-mail directories, and schedulers) in a network. Using SLP, networking applications can discover the existence, location and configuration of networked devices. With Service Location Protocol, client applications are 'User Agents' and services are advertised by 'Service Agents'. The User Agent issues a multicast 'Service Request' (SrvRqst) on behalf of the client application, specifying the services required. The User Agent will receive a Service Reply (SrvRply) specifying the location of all services in the network which satisfy the request. For larger networks, a third entity, called a 'Directory Agent', receives registrations from all available Service Agents. A User Agent sends a unicast request for services to a Directory Agent (if there is one) rather than to a Service Agent. (SLP version 2, RFC2608, updating RFC2165)
Diversity antenna and receiver	The AP has two antennae. Receive diversity refers to the ability of the AP to provide better service to a device by receiving from the user on which ever of the two antennae is receiving the cleanest signal. Transmit diversity refers to the ability of the AP to use its two antenna to transmit on a specific antenna only, or on a alternate antennae. The antennae are called diversity antennae because of this capability of the pair.
DNS	Domain Name Server
DSSS	Direct-Sequence Spread Spectrum. A transmission technology used in Local Area Wireless Network (LAWN) transmissions where a data signal at the sending station is combined with a higher data rate bit sequence, or chipping code, that divides the user data according to a spreading ratio. The chipping code is a redundant bit pattern for each bit that is transmitted, which increases the signal's resistance to interference. If one or more bits in the pattern are damaged during transmission, the original data can be recovered due to the redundancy of the transmission. (Compare FHSS)
DTIM	DTIM delivery traffic indication message (in 802.11 standard)
Dynamic WEP	The IEEE introduced the concept of user-based authentication using per-user encryption keys to solve the scalability issues that surrounded static WEP. This resulted in the 802.1X standard, which makes use of the IETF's Extensible Authentication Protocol (EAP), which was originally designed for user authentication in dial-up networks. The 802.1X standard supplemented the EAP protocol with a mechanism to send an encryption key to a Wireless AP. These encryption keys are used as dynamic WEP keys, allowing traffic to each individual user to be encrypted using a separate key.
EAP-TLS EAP-TTLS	EAP-TLS Extensible Authentication Protocol - Transport Layer Security. A general protocol for authentication that also supports multiple authentication methods, such as token cards, Kerberos, one-time passwords, certificates, public key authentication and smart cards. IEEE 802.1x specifies how EAP should be encapsulated in LAN frames. In wireless communications using EAP, a user requests connection to a WLAN through an access point, which then requests the identity of the user and transmits that identity to an authentication server such as RADIUS. The server asks the access point for proof of identity, which the access point gets from the user and then sends back to the server to complete the authentication. EAP-TLS provides for certificate-based and mutual authentication of the client and the network. It relies on client-side and server-side certificates to perform authentication and can be used to dynamically generate user-based and session-based WEP keys. EAP-TTLS (Tunneled Transport Layer Security) is an extension of EAP-TLS to provide certificate-based, mutual authentication of the client and network through an encrypted tunnel, as well as to generate dynamic, per-user, per-session WEP keys. Unlike EAP-TLS, EAP-TTLS requires only server-side certificates. (*See also* PEAP)

Table 29

Term	Explanation
ELA (OPSEC)	Event Logging API (Application Program Interface) for OPSEC, a module in Check Point used to enable third-party applications to log events into the Check Point VPN-1/FireWall-1 management system.
Encapsulation	*See* tunnelling.
ESS	Extended Service Set (ESS). Several Basic Service Sets (BSSs) can be joined together to form one logical WLAN segment, referred to as an extended service set (ESS). The SSID is used to identify the ESS. (*See* BSS and SSID.)
FHSS	Frequency-Hopping Spread Spectrum. A transmission technology used in Local Area Wireless Network (LAWN) transmissions where the data signal is modulated with a narrowband carrier signal that "hops" in a random but predictable sequence from frequency to frequency as a function of time over a wide band of frequencies. This technique reduces interference. If synchronized properly, a single logical channel is maintained. (Compare DSSS)
Fit, thin and fat APs	A thin AP architecture uses two components: an access point that is essentially a stripped-down radio and a centralized management controller that handles the other WLAN system functions. Wired network switches are also required. A fit AP, a variation of the thin AP, handles the RF and encryption, while the central management controller, aware of the wireless users' identities and locations, handles secure roaming, quality of service, and user authentication. The central management controller also handles AP configuration and management. A fat (or thick) AP architecture concentrates all the WLAN intelligence in the access point. The AP handles the radio frequency (RF) communication, as well as authenticating users, encrypting communications, secure roaming, WLAN management, and in some cases, network routing.
FQDN	Fully Qualified Domain Name. A "friendly" designation of a computer, of the general form computer.[subnetwork.].organization.domain. The FQDN names must be translated into an IP address in order for the resource to be found on a network, usually performed by a Domain Name Server.
FTM	Forwarding Table Manager
FTP	File Transfer Protocol
Gateway	In the wireless world, an access point with additional software capabilities such as providing NAT and DHCP. Gateways may also provide VPN support, roaming, firewalls, various levels of security, etc.
Gigabit Ethernet	The high data rate of the Ethernet standard, supporting data rates of 1 gigabit (1,000 megabits) per second.
GUI	Graphical User Interface
Heartbeat message	A heartbeat message is a UDP data packet used to monitor a data connection, polling to see if the connection is still alive. In general terms, a heartbeat is a signal emitted at regular intervals by software to demonstrate that it is still alive. In networking, a heartbeat is the signal emitted by a Level 2 Ethernet transceiver at the end of every packet to show that the collision-detection circuit is still connected.
Host	(1) A computer (usually containing data) that is accessed by a user working on a remote terminal, connected by modems and telephone lines. (2) A computer that is connected to a TCP/IP network, including the Internet. Each host has a unique IP address.

Table 29

Term	Explanation
HTTP	Hypertext Transfer Protocol is the set of rules for transferring files (text, graphic images, sound, video, and other multimedia files) on the World Wide Web. A Web browser makes use of HTTP. HTTP is an application protocol that runs on top of the TCP/IP suite of protocols. (RFC2616: Hypertext Transfer Protocol -- HTTP/1.1)
HTTPS	Hypertext Transfer Protocol over Secure Socket Layer, or HTTP over SSL, is a Web protocol that encrypts and decrypts user page requests as well as the pages that are returned by the Web server. HTTPS uses Secure Socket Layer (SSL) as a sublayer under its regular HTTP application layering. (HTTPS uses port 443 instead of HTTP port 80 in its interactions with the lower layer, TCP/IP.) SSL uses a 40-bit key size for the RC4 stream encryption algorithm, which is considered an adequate degree of encryption for commercial exchange.
IBSS	Independent Basic Service Set. *See* BSS. An IBSS is the 802.11 term for an adhoc network. *See* adhoc network.
ICMP	Internet Control Message Protocol, an extension to the Internet Protocol (IP) defined by RFC792. ICMP supports packets containing error, control, and informational messages. The PING command, for example, uses ICMP to test an Internet connection.
ICV	ICV (Integrity Check Value) is a 4-byte code appended in standard WEP to the 802.11 message. Enhanced WPA inserts an 8-byte MIC just before the ICV. (*See* WPA and MIC)
IE	Internet Explorer.
IEEE	Institute of Electrical and Electronics Engineers, a technical professional association, involved in standards activities.
IETF	Internet Engineering Task Force, the main standards organization for the Internet.
Infrastructure Mode	An 802.11 networking framework in which devices communicate with each other by first going through an Access Point (AP). In infrastructure mode, wireless devices can communicate with each other or can communicate with a wired network. (*See* ad-hoc mode and BSS.)
Internet or IP telephony	IP or Internet telephony are communications, such as voice, facsimile, voice-messaging applications, that are transported over the Internet, rather than the public switched telephone network (PSTN). IP telephony is the two-way transmission of audio over a packet-switched IP network (TCP/IP network). An Internet telephone call has two steps: (1) converting the analog voice signal to digital format, (2) translating the signal into Internet protocol (IP) packets for transmission over the Internet. At the receiving end, the steps are reversed. Over the public Internet, voice quality varies considerably. Protocols that support Quality of Service (QoS) are being implemented to improve this.
IP	Internet Protocol is the method or protocol by which data is sent from one computer to another on the Internet. Each computer (host) on the Internet has at least one IP address that uniquely identifies it. Internet Protocol specifies the format of packets, also called datagrams, and the addressing scheme. Most networks combine IP with a higher-level protocol called Transmission Control Protocol (TCP), which establishes a virtual connection between a destination and a source.
IPC	Interprocess Communication. A capability supported by some operating systems that allows one process to communicate with another process. The processes can be running on the same computer or on different computers connected through a network.

Table 29

Term	Explanation
IPsec IPsec-ESP IPsec-AH	Internet Protocol security (IPSec) Internet Protocol security Encapsulating Security Payload (IPsec-ESP). The encapsulating security payload (ESP) encapsulates its data, enabling it to protect data that follows in the datagram.Internet Protocol security Authentication Header (IPsec-AH). AH protects the parts of the IP datagram that can be predicted by the sender as it will be received by the receiver.IPsec is a set of protocols developed by the IETF to support secure exchange of packets at the IP layer. IPsec has been deployed widely to implement Virtual Private Networks (VPNs). IPsec supports two encryption modes: Transport and Tunnel. Transport mode encrypts only the data portion (payload) of each packet, but leaves the header untouched. The more secure Tunnel mode encrypts both the header and the payload. On the receiving side, an IPSec-compliant device decrypts each packet. For IPsec to work, the sending and receiving devices must share a public key. This is accomplished through a protocol known as Internet Security Association and Key Management Protocol/Oakley (ISAKMP/Oakley), which allows the receiver to obtain a public key and authenticate the sender using digital certificates.
isochronous	Isochronous data is data (such as voice or video) that requires a constant transmission rate, where data must be delivered within certain time constraints. For example, multimedia streams require an isochronous transport mechanism to ensure that data is delivered as fast as it is displayed and to ensure that the audio is synchronized with the video. Compare: asynchronous processes in which data streams can be broken by random intervals, and synchronous processes, in which data streams can be delivered only at specific intervals.
ISP	Internet Service Provider.
IV	IV (Initialization Vector), part of the standard WEP encryption mechanism that concatenates a shared secret key with a randomly generated 24-bit initialization vector. WPA with TKIP uses 48-bit IVs, an enhancement that significantly increases the difficulty in cracking the encryption. (*See* WPA and TKIP)
LAN	Local Area Network.
License installation	
LSA	Link State Advertisements received by the currently running OSPF process. The LSAs describe the local state of a router or network, including the state of the router's interfaces and adjacencies. *See* also OSPF.
MAC	Media Access Control layer. One of two sublayers that make up the Data Link Layer of the OSI model. The MAC layer is responsible for moving data packets to and from one Network Interface Card (NIC) to another across a shared channel.
MAC address	Media Access Control address. A hardware address that uniquely identifies each node of a network.
MIB	Management Information Base is a formal description of a set of network objects that can be managed using the Simple Network Management Protocol (SNMP). The format of the MIB is defined as part of the SNMP. A MIB is a collection of definitions defining the properties of a managed object within a device. Every managed device keeps a database of values for each of the definitions written in the MIB. Definition of the MIB conforms to RFC1155 (Structure of Management Information).
MIC	Message Integrity Check or Code (MIC), also called "Michael", is part of WPA and TKIP. The MIC is an additional 8-byte code inserted before the standard 4-byte integrity check value (ICV) that is appended in by standard WEP to the 802.11 message. This greatly increases the difficulty in carrying out forgery attacks. Both integrity check mechanisms are calculated by the receiver and compared against the values sent by the sender in the frame. If the values match, there is assurance that the message has not been tampered with. (*See* WPA, TKIP and ICV).

Table 29

Term	Explanation
MTU	Maximum Transmission Unit. The largest packet size, measured in bytes, that a network interface is configured to accept. Any messages larger than the MTU are divided into smaller packets before being sent.
MU	Mobile Unit, a wireless device such as a PC laptop.
multicast, broadcast, unicast	Multicast: transmitting a single message to a select group of recipients. Broadcast: sending a message to everyone connected to a network. Unicast: communication over a network between a single sender and a single receiver.
NAS	Network Access Server, a server responsible for passing information to designated RADIUS servers and then acting on the response returned. A NAS-Identifier is a RADIUS attribute identifying the NAS server. (RFC2138)
NAT	Network Address Translator. A network capability that enables a group of computers to dynamically share a single incoming IP address. NAT takes the single incoming IP address and creates new IP address for each client computer on the network.
Netmask	In administering Internet sites, a netmask is a string of 0's and 1's that mask or screen out the network part of an IP address, so that only the host computer part of the address remains. A frequently-used netmask is 255.255.255.0, used for a Class C subnet (one with up to 255 host computers). The ".0" in the "255.255.255.0" netmask allows the specific host computer address to be visible.
NIC	Network Interface Card. An expansion board in a computer that connects the computer to a network.
NMS	Network Management System. The system responsible for managing a network or a portion of a network. The NMS talks to network management agents, which reside in the managed nodes.
NTP	Network Time Protocol, an Internet standard protocol (built on top of TCP/IP) that assures accurate synchronization to the millisecond of computer clock times in a network of computers. Based on UTC, NTP synchronizes client workstation clocks to the U.S. Naval Observatory Master Clocks in Washington, DC and Colorado Springs CO. Running as a continuous background client program on a computer, NTP sends periodic time requests to servers, obtaining server time stamps and using them to adjust the client's clock. (RFC1305)
OFDM	Orthogonal frequency division multiplexing, a method of digital modulation in which a signal is split into several narrowband channels at different frequencies. OFDM is similar to conventional frequency division multiplexing (FDM). The difference lies in the way in which the signals are modulated and demodulated. Priority is given to minimizing the interference, or crosstalk, among the channels and symbols comprising the data stream. Less importance is placed on perfecting individual channels. OFDM is used in European digital audio broadcast services. It is also used in wireless local area networks.
OID	Object Identifier.
OPSEC	OPSEC (Open Platform for Security) is a security alliance program created by Check Point to enable an open industry-wide framework for interoperability of security products and applications. Products carrying the "Secured by Check Point" seal have been tested to guarantee integration and interoperability.
OS	Operating system.

Table 29

Term	Explanation
OSI	Open System Interconnection. An ISO standard for worldwide communications that defines a networking framework for implementing protocols in seven layers. Control is passed from one layer to the next, starting at the application layer in one station, down through the presentation, session, transport, network, data link layer to the physical layer at the bottom, over the channel to the next station and back up the hierarchy.
OSI Layer 2	At the Data Link layer (OSI Layer 2), data packets are encoded and decoded into bits. The data link layer has two sublayers: • the Logical Link Control (LLC) layer controls frame synchronization, flow control and error checking • The Media Access Control (MAC) layer controls how a computer on the network gains access to the data and permission to transmit it.
OSI Layer 3	The Network layer (OSI Layer 3) provides switching and routing technologies, creating logical paths, known as virtual circuits, for transmitting data from node to node. Routing and forwarding are functions of this layer, as well as addressing, internetworking, error handling, congestion control and packet sequencing.
OSPF	Open Shortest Path First, an interior gateway routing protocol developed for IP networks based on the shortest path first or link-state algorithm. Routers use link-state algorithms to send routing information to all nodes in an internetwork by calculating the shortest path to each node based on a topography of the Internet constructed by each node. Each router sends that portion of the routing table (keeps track of routes to particular network destinations) that describes the state of its own links, and it also sends the complete routing structure (topography). Using OSPF, a host that obtains a change to a routing table or detects a change in the network immediately multicasts the information to all other hosts in the network so that all will have the same routing table information. The host using OSPF sends only the part that has changed, and only when a change has taken place. (RFC2328)
OUI	Organizationally Unique Identifier (used in MAC addressing).
Packet	The unit of data that is routed between an origin and a destination on the Internet or any other packet-switched network. When any file is sent from one place to another on the Internet, the Transmission Control Protocol (TCP) layer of TCP/IP divides the file into packets. Each packet is separately numbered and includes the Internet address of the destination. The individual packets for a given file may travel different routes through the Internet. When they have all arrived, they are reassembled into the original file (by the TCP layer at the receiving end).
PAP	Password Authentication Protocol is the most basic form of authentication, in which a user's name and password are transmitted over a network and compared to a table of name-password pairs. Typically, the passwords stored in the table are encrypted. (*See* CHAP).
PDU	Protocol Data Unit. A data object exchanged by protocol machines (such as management stations, SMUX peers, and SNMP agents) and consisting of both protocol control information and user data. PDU is sometimes used as a synonym for “packet".
PEAP	PEAP (Protected Extensible Authentication Protocol) is an IETF draft standard to authenticate wireless LAN clients without requiring them to have certificates. In PEAP authentication, first the user authenticates the authentication server, then the authentication server authenticates the user. If the first phase is successful, the user is then authenticated over the SSL tunnel created in phase one using EAP-Generic Token Card (EAP-GTC) or Microsoft Challenged Handshake Protocol Version 2 (MSCHAP V2). (*See* also EAP-TLS).
PHP server	Hypertext Preprocessor
PKI	Public Key Infrastructure

Table 29

Term	Explanation
PoE	Power over Ethernet. The Power over Ethernet standard (802.3af) defines how power can be provided to network devices over existing Ethernet connection, eliminating the need for additional external power supplies.
POST	Power On Self Test, a diagnostic testing sequence performed by a computer to determine if its hardware elements are present and powered on. If so, the computer begins its boot sequence.
push-to-talk (PTT)	The push-to-talk (PTT) is feature on wireless telephones that allows them to operate like a walkie-talkie in a group, instead of standard telephone operation. The PTT feature requires that the network be configured to allow multicast traffic. A PTT call is initiated by selecting a channel and pressing the "talk" key on the wireless telephone. All wireless telephones on the same network that are monitoring the channel will hear the transmission. On a PTT call you hold the button to talk and release it to listen.
QoS	Quality of Service. A term for a number of techniques that intelligently match the needs of specific applications to the network resources available, using such technologies as Frame Relay, Asynchronous Transfer Mode (ATM), Ethernet and 802.1 networks, SONET, and IP-routed networks. QoS features provide better network service by supporting dedicated bandwidth, improving loss characteristics, avoiding and managing network congestion, shaping network traffic, setting traffic priorities across the network. Quality-of-Service (QoS): A set of service requirements to be met by the network while transporting a flow. (RFC2386)
RADIUS	Remote Authentication Dial-In User Service. An authentication and accounting system that checks User Name and Password and authorizes access to a network. The RADIUS specification is maintained by a working group of the IETF (RFC2865 RADIUS, RFC2866 RADIUS Accounting, RFC2868 RADIUS Attributes for Tunnel Protocol Support).
RF	Radio Frequency, a frequency in the electromagnetic spectrum associated with radio wave propagation. When an RF current is supplied to an antenna, an electromagnetic field is created that can propagate through space. These frequencies in the electromagnetic spectrum range from Ultra-low frequency (ULF) -- 0-3 Hz to Extremely high frequency (EHF) -- 30GHz - 300 GHz. The middle ranges are: Low frequency (LF) -- 30 kHz - 300 kHz, Medium frequency (MF) -- 300 kHz - 3 MHz, High frequency (HF) -- 3MHz - 30 MHz, Very high frequency (VHF) -- 30 MHz - 300 MHz, Ultra-high frequency (UHF)-- 300MHz - 3 GHz.
RFC	Request for Comments, a series of notes about the Internet, submitted to the Internet Engineering Task Force (IETF) and designated by an RFC number, that may evolve into an Internet standard. The RFCs are catalogued and maintained on the IETF RFC website: www.ietf.org/rfc.html.
Roaming	In 802.11, roaming occurs when a wireless device (a station) moves from one Access Point to another (or BSS to another) in the same Extended Service Set (ESS) -identified by its SSID.
RP-SMA	Reverse Polarity-Subminiature version A, a type of connector used with wireless antennas
RSN	Robust Security Network. A new standard within IEEE 802.11 to provide security and privacy mechanisms. The RSN (and related TSN) both specify IEEE 802.1x authentication with Extensible Authentication Protocol (EAP).
RSSI	RSSI received signal strength indication (in 802.11 standard)
RTS / CTS	RTS request to send, CTS clear to send (in 802.11 standard)
Segment	In Ethernet networks, a section of a network that is bounded by bridges, routers or switches. Dividing a LAN segment into multiple smaller segments is one of the most common ways of increasing available bandwidth on the LAN.

Table 29

Term	Explanation
SLP	Service Location Protocol. A method of organizing and locating the resources (such as printers, disk drives, databases, e-mail directories, and schedulers) in a network. Using SLP, networking applications can discover the existence, location and configuration of networked devices. With Service Location Protocol, client applications are 'User Agents' and services are advertised by 'Service Agents'. The User Agent issues a multicast 'Service Request' (SrvRqst) on behalf of the client application, specifying the services required. The User Agent will receive a Service Reply (SrvRply) specifying the location of all services in the network which satisfy the request. For larger networks, a third entity, called a 'Directory Agent', receives registrations from all available Service Agents. A User Agent sends a unicast request for services to a Directory Agent (if there is one) rather than to a Service Agent. (SLP version 2, RFC2608, updating RFC2165)
SMI	Structure of Management Information. A hierarchical tree structure for information that underlies Management Information Bases (MIBs), and is used by the SNMP protocol. Defined in RFC1155 and RFC1442 (SNMPv2).
SMT (802.11)	Station ManagemenT. The object class in the 802.11 MIB that provides the necessary support at the station to manage the processes in the station such that the station may work cooperatively as a part of an IEEE 802.11 network. The four branches of the 802.11 MIB are: • dot11smt - objects related to station management and local configuration • dot11mac - objects that report/configure on the status of various MAC parameters • dot11res - Objects that describe available resources • dot11phy - Objects that report on various physical items.
SNMP	Simple Network Management Protocol. A set of protocols for managing complex networks. SNMP works by sending messages, called protocol data units (PDUs), to different parts of a network. SNMP-compliant devices, called agents, store data about themselves in Management Information Bases (MIBs) and return this data to the SNMP requesters. SNMP includes a limited set of management commands and responses. The management system issues Get, GetNext and Set messages to retrieve single or multiple object variables or to establish the value of a single variable. The managed agent sends a Response message to complete the Get, GetNext or Set.
SNMP trap	An event notification sent by the SNMP managed agent to the management system to identify the occurrence of conditions (such as a threshold that exceeds a predetermined value).
SSH	Secure Shell, sometimes known as Secure Socket Shell, is a Unix-based command interface and protocol for securely getting access to a remote computer. SSH is a suite of three utilities - slogin, ssh, and scp - secure versions of the earlier UNIX utilities, rlogin, rsh, and rcp. With SSH commands, both ends of the client/server connection are authenticated using a digital certificate, and passwords are protected by being encrypted.
SSID	Service Set Identifier. A 32-character unique identifier attached to the header of packets sent over a Wireless LAN that acts as a password when a wireless device tries to connect to the Basic Service Set (BSS). Several BSSs can be joined together to form one logical WLAN segment, referred to as an extended service set (ESS). The SSID is used to identify the ESS. In 802.11 networks, each Access Point advertises its presence several times per second by broadcasting beacon frames that carry the ESS name (SSID). Stations discover APs by listening for beacons, or by sending probe frames to search for an AP with a desired SSID. When the station locates an appropriately-named Access Point, it sends an associate request frame containing the desired SSID. The AP replies with an associate response frame, also containing the SSID. Some APs can be configured to send a zero-length broadcast SSID in beacon frames instead of sending their actual SSID. The AP must return its actual SSID in the probe response.

Table 29

Term	Explanation
SSL	Secure Sockets Layer. A protocol developed by Netscape for transmitting private documents via the Internet. SSL works by using a public key to encrypt data that's transferred over the SSL connection. URLs that require an SSL connection start with https: instead of http. SSL uses a program layer located between the Internet's Hypertext Transfer Protocol (HTTP) and Transport Control Protocol (TCP) layers. The "sockets" part of the term refers to the sockets method of passing data back and forth between a client and a server program in a network or between program layers in the same computer. SSL uses the public-and-private key encryption system from RSA, which also includes the use of a digital certificate. SSL has recently been succeeded by Transport Layer Security (TLS), which is based on SSL.
Subnet mask	(*See* netmask)
Subnets	Portions of networks that share the same common address format. A subnet in a TCP/IP network uses the same first three sets of numbers (such as 198.63.45.xxx), leaving the fourth set to identify devices on the subnet. A subnet can be used to increase the bandwidth on the network by breaking the network up into segments.
SVP	SpectraLink Voice Protocol, a protocol developed by SpectraLink to be implemented on access points in order to facilitate voice prioritization over an 802.11 wireless LAN that will carry voice packets from SpectraLink wireless telephones.
Switch	In networks, a device that filters and forwards packets between LAN segments. Switches operate at the data link layer (layer 2) and sometimes the network layer (layer 3) of the OSI Reference Model and therefore support any packet protocol. LANs that use switches to join segments are called switched LANs or, in the case of Ethernet networks, switched Ethernet LANs.
syslog	A protocol used for the transmission of event notification messages across networks, originally developed on the University of California Berkeley Software Distribution (BSD) TCP/IP system implementations, and now embedded in many other operating systems and networked devices. A device generates a messages, a relay receives and forwards the messages, and a collector (a syslog server) receives the messages without relaying them. Syslog uses the user datagram protocol (UDP) as its underlying transport layer mechanism. The UDP port that has been assigned to syslog is 514. (RFC3164)
TCP / IP	Transmission Control Protocol. TCP, together with IP (Internet Protocol), is the basic communication language or protocol of the Internet. Transmission Control Protocol manages the assembling of a message or file into smaller packets that are transmitted over the Internet and received by a TCP layer that reassembles the packets into the original message. Internet Protocol handles the address part of each packet so that it gets to the right destination. TCP/IP uses the client/server model of communication in which a computer user (a client) requests and is provided a service (such as sending a Web page) by another computer (a server) in the network.
TFTP	Trivial File Transfer Protocol. An Internet software utility for transferring files that is simpler to use than the File Transfer Protocol (FTP) but less capable. It is used where user authentication and directory visibility are not required. TFTP uses the User Datagram Protocol (UDP) rather than the Transmission Control Protocol (TCP). TFTP is described formally in Request for Comments (RFC) 1350.
TKIP	Temporal Key Integrity Protocol (TKIP) is an enhancement to the WEP encryption technique that uses a set of algorithms that rotates the session keys. TKIPs' enhanced encryption includes a per-packet key mixing function, a message integrity check (MIC), an extended initialization vector (IV) with sequencing rules, and a re-keying mechanism. The encryption keys are changed (rekeyed) automatically and authenticated between devices after the rekey interval (either a specified period of time, or after a specified number of packets has been transmitted).

Table 29

Term	Explanation
TLS	Transport Layer Security. (*See* EAP, Extensible Authentication Protocol)
ToS / DSCP	ToS (Type of Service) / DSCP (Diffserv Codepoint). The ToS/DSCP box contained in the IP header of a frame is used by applications to indicate the priority and Quality of Service (QoS) for each frame. The level of service is determined by a set of service parameters which provide a three way trade-off between low-delay, high-reliability, and high-throughput. The use of service parameters may increase the cost of service.
TSN	Transition Security Network. A subset of Robust Security Network (RSN), which provides an enhanced security solution for legacy hardware. The Wi-Fi Alliance has adopted a solution called Wireless Protected Access (WPA), based on TSN. RSN and TSN both specify IEEE 802.1x authentication with Extensible Authentication Protocol (EAP).
Tunnelling	Tunnelling (or encapsulation) is a technology that enables one network to send its data via another network's connections. Tunnelling works by encapsulating packets of a network protocol within packets carried by the second network. The receiving device then decapsulates the packets and forwards them in their original format.
UDP	User Datagram Protocol. A connectionless protocol that, like TCP, runs on top of IP networks. Unlike TCP/IP, UDP/IP provides very few error recovery services, offering instead a direct way to send and receive packets over an IP network. It is used primarily for broadcasting messages over a network.
U-NII	Unlicensed National Information Infrastructure. Designated to provide short-range, high-speed wireless networking communication at low cost, U-NII consists of three frequency bands of 100 MHz each in the 5 GHz band: 5.15-5.25GHz (for indoor use only), 5.25-5.35 GHz and 5.725-5.825GHz. The three frequency bands were set aside by the FCC in 1997 initially to help schools connect to the Internet without the need for hard wiring. U-NII devices do not require licensing.
URL	Uniform Resource Locator. the unique global address of resources or files on the World Wide Web. The URL contains the name of the protocol to be used to access the file resource, the IP address or the domain name of the computer where the resource is located, and a pathname -- a hierarchical description that specifies the location of a file in that computer.
VLAN	Virtual Local Area Network. A network of computers that behave as if they are connected to the same wire when they may be physically located on different segments of a LAN. VLANs are configured through software rather than hardware, which makes them extremely flexible. When a computer is physically moved to another location, it can stay on the same VLAN without any hardware reconfiguration. The standard is defined in IEEE 802.1Q - Virtual LANs, which states that "IEEE 802 Local Area Networks (LANs) of all types may be connected together with Media Access Control (MAC) Bridges, as specified in ISO/IEC 15802-3. This standard defines the operation of Virtual LAN (VLAN) Bridges that permit the definition, operation and administration of Virtual LAN topologies within a Bridged LAN infrastructure."
VNS	Virtual Network Services (VNS). A Siemens specific technique that provides a means of mapping wireless networks to a wired topology.
VoIP	Voice Over Internet Protocol. An internet telephony technique. With VoIP, a voice transmission is cut into multiple packets, takes the most efficient path along the Internet and is reassembled when it reaches the destination.
VPN	Virtual Private Network. A private network that is constructed by using public wires to connect nodes. These systems use encryption and other security mechanisms to ensure that only authorized users can access the network and that the data cannot be intercepted.

Table 29

Term	Explanation
VSA	Vendor Specific Attribute, an attribute for a RADIUS server defined by the manufacturer.(compared to the RADIUS attributes defined in the original RADIUS protocol RFC2865). A VSA attribute is defined in order that it can be returned from the RADIUS server in the Access Granted packet to the Radius Client.
Walled Garden	A restricted subset of network content that wireless devices can access.
WEP	Wired Equivalent Privacy. A security protocol for wireless local area networks (WLANs) defined in the 802.11b standard. WEP aims to provide security by encrypting data over radio waves so that it is protected as it is transmitted from one end point to another.
Wi-Fi	Wireless fidelity. A term referring to any type of 802.11 network, whether 802.11b, 802.11a, dual-band, etc. Used in reference to the Wi-Fi Alliance, a nonprofit international association formed in 1999 to certify interoperability of wireless Local Area Network products based on IEEE 802.11 specification.
WINS	Windows Internet Naming Service. A system that determines the IP address associated with a particular network computer, called name resolution. WINS supports network client and server computers running Windows and can provide name resolution for other computers with special arrangements. WINS supports dynamic addressing (DHCP) by maintaining a distributed database that is automatically updated with the names of computers currently available and the IP address assigned to each one. DNS is an alternative system for name resolution suitable for network computers with fixed IP addresses.
WLAN	Wireless Local Area Network.
WMM	Wi-Fi Multimedia (WMM), a Wi-Fi Alliance certified standard that provides multimedia enhancements for Wi-Fi networks that improve the user experience for audio, video, and voice applications. This standard is compliant with the IEEE 802.11e Quality of Service (QoS) extensions for 802.11 networks. WMM provides prioritized media access by shortening the time between transmitting packets for higher priority traffic. WMM is based on the Enhanced Distributed Channel Access (EDCA) method.
WPA	Wireless Protected Access, or Wi-Fi Protected Access is a security solution adopted by the Wi-Fi Alliance that adds authentication to WEPs' basic encryption. For authentication, WPA specifies IEEE 802.1x authentication with Extensible Authentication Protocol (EAP). For encryption, WPA uses the Temporal Key Integrity Protocol (TKIP) mechanism, which shares a starting key between devices, and then changes their encryption key for every packet. Certificate Authentication (CA) can also be used. Also part of the encryption mechanism are 802.1X for dynamic key distribution and Message Integrity Check (MIC) a.k.a. Michael. WPA requires that all computers and devices have WPA software.
WPA-PSK	Wi-Fi Protected Access with Pre-Shared Key, a special mode of WPA for users without an enterprise authentication server. Instead, for authentication, a Pre-Shared Key is used. The PSK is a shared secret (passphrase) that must be entered in both the Wireless AP or router and the WPA clients. This preshared key should be a random sequence of characters at least 20 characters long or hexadecimal digits (numbers 0-9 and letters A-F) at least 24 hexadecimal digits long. After the initial shared secret, the Temporal Key Integrity Protocol (TKIP) handles the encryption and automatic rekeying.

Table 29

12.2 Controller, Access Points and Convergence Software terms and abbreviations

Term	Explanation
CTP	CAPWAP Tunnelling Protocol (CTP). The Wireless AP uses a UDP (User Datagram Protocol) based tunnelling protocol called CAPWAP Tunnelling Protocol (CTP) to encapsulate the 802.11 packets and forward them to the HiPath Wireless Controller. The CTP protocol defines a mechanism for the control and provisioning of Wireless APs (CAPWAP) through centralized access controllers. In addition, it provides a mechanism providing the option to tunnel the mobile client data between the access point and the access controller.
DRM (dynamic radio/RF management)	Dynamic Radio Management (DRM) functionality of the HiPath Wireless Controller is used to help establish the optimum radio configuration for your Wireless APs. DRM is enabled by default. The HiPath Wireless Controller's DRM: • Adjusts power levels to balance coverage if another Wireless AP, which is assigned to the same SSID and is on the same channel, is added to or leaves the network. • Allows wireless clients to be moved to another Wireless AP if the load is too high. • Scans automatically for a channel, using a channel selection algorithm. • Avoids other WLANs by reducing transmit power whenever other Wireless APs with the same channel, but different SSIDs are detected. The DRM feature is comprised of two funtions: • Auto Channel Selection (ACS) – ACS provides an easy way to optimize channel arrangement based on the current situation in the field. ACS provides an optimal solution only if it is triggered on all Wireless APs in a deployment. Triggering ACS on a single Wireless AP or on a subset of Wireless APs provides a useful but suboptimal solution. Also, ACS only relies on the information observed at the time it is triggered. Once a Wireless AP has selected a channel, it will remain operating on that channel until the user changes the channel or triggers ACS. • Auto Tx Power Control (ATPC) – ATPC guarantees your LAN a stable RF environment by automatically adapting transmission power signals according to the coverage provided by the Wireless APs. ATPC can be either enabled or disabled.
HiPath Wireless Controller	The HiPath Wireless Controller is a rack-mountable network device designed to be integrated into an existing wired Local Area Network (LAN). It provides centralized control over all access points (both Wireless APs and third-party access points) and manages the network assignment of wireless device clients associating through access points.
Langley	Langley is a Controller, Access Points and Convergence Software term for the inter-process messaging infrastructure on the HiPath Wireless Controller.
Mitigator	The Mitigator is a mechanism that assists in the detection of rogue access points. The feature has three components: (1) a radio frequency (RF) scanning task that runs on the Wireless AP, (2) an application called the Data Collector on the HiPath Wireless Controller that receives and manages the RF scan messages sent by the Wireless AP, (3) an Analysis Engine on the HiPath Wireless Controller that processes the scan data.

Table 30

Term	Explanation
Mobility manager (and mobility agent)	The technique in Controller, Access Points and Convergence Software by which multiple HiPath Wireless Controllers on a network can discover each other and exchange information about a client session. This enables a wireless device user to roam seamlessly between different Wireless APs on different HiPath Wireless Controllers, to provide mobility to the wireless device user. One HiPath Wireless Controller on the network must be designated as the mobility manager. All other HiPath Wireless Controllers are designated as mobility agents. Relying on SLP, the mobility manager registers with the Directory Agent and the mobility agents discover the location of the mobility manager.
Data Collector	The Data Collector is an application on the HiPath Wireless Controller that receives and manages the Radio Frequency (RF) scan messages sent by the Wireless AP. This application is part of the Mitigator technique, working in conjunction with the scanner mechanism and the Analysis Engine to assist in detecting rogue access points.
Virtual Network Services (VNS)	The Virtual Network Services (VNS) technique is Siemens's means of mapping wireless networks to the topology of an existing wired network. When you set up Virtual Network Services (VNS) on the HiPath Wireless Controller, you are defining subnets for groups of wireless users. This VNS definition creates a virtual IP subnet where the HiPath Wireless Controller acts as a default gateway for wireless devices. This technique enables policies and authentication to be applied to the groups of wireless users on a VNS, as well as the collecting of accounting information. When a VNS is set up on the HiPath Wireless Controller, one or more Wireless APs (by radio) are associated with it. A range of IP addresses is set aside for the HiPath Wireless Controller's DHCP server to assign to wireless devices.
Wireless AP	The Wireless AP is a wireless LAN thin access point (IEEE 802.11) provided with unique software that allows it to communicate only with a HiPath Wireless Controller. (A thin access point handles the radio frequency (RF) communication but relies on a controller to handle WLAN elements such as authentication.) The Wireless AP also provides local processing such as encryption. The Wireless AP is a dual-band access point, with 802.11a/b/g/n radios.

Table 30

Glossary

Controller, Access Points and Convergence Software terms and abbreviations

A HiPath Wireless Controller's physical description

This appendix describes the physical description and LEDs, SSD codes and their description of the following models of the HiPath Wireless Controller:

- HiPath Wireless Controller C2400
- HiPath Wireless Controller C20

A.1 HiPath Wireless C2400 Controller front panel

The HiPath Wireless C2400 Controller is composed of the following three cards:

- Media/Persistent Storage Card
- Network Processor Card
- Host HiPath Wireless Controller Card

The following figure identifies the main components on the front panel of HiPath Wireless C2400 Controller.

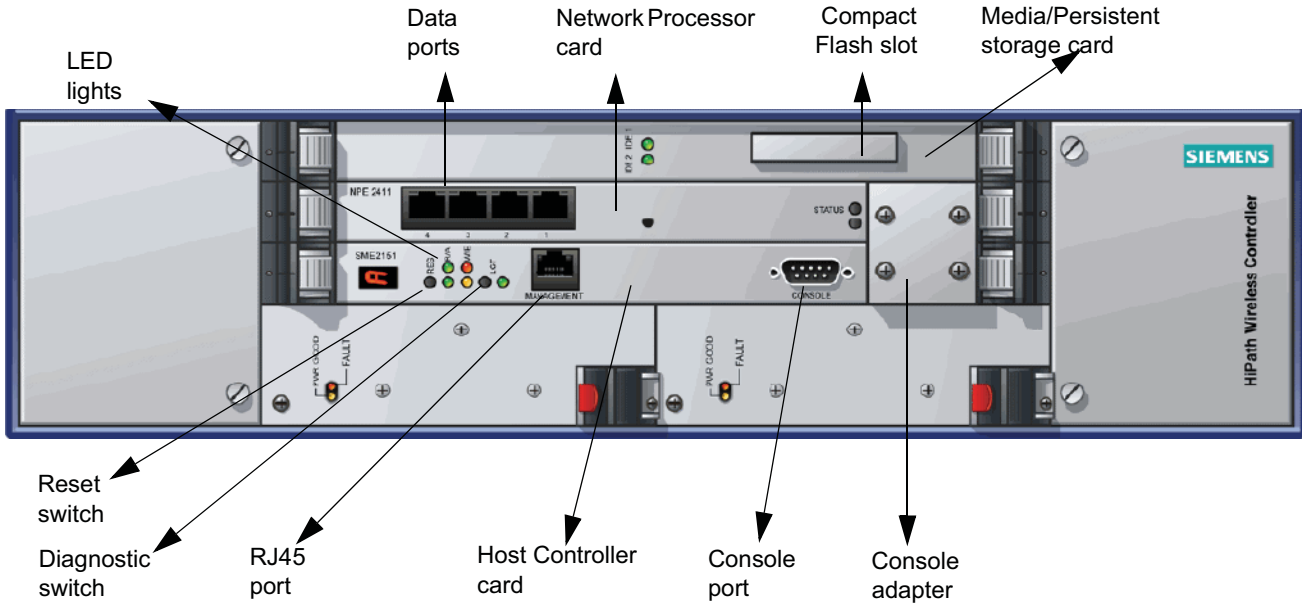


Figure 23 HiPath Wireless C2400 Controller front panel

The HiPath Wireless C2400 Controller has five LED lights and two switches on its front panel.

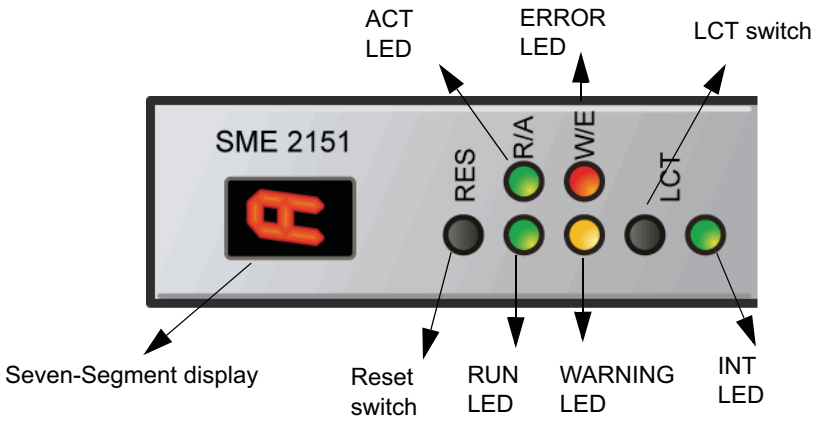


Figure 24 HiPath Wireless C2400 Controller's LED lights and switches

The description of the LED states and switches is provided below:

- Reset Switch – Reboots the system.
- RUN LED – Indicates the CPU's initialization has completed and the system is ready to provide application level services.
- ACT LED – Indicates the system's software is in active running state.
- WARNING/ERROR LEDs – Indicate a problem in the running state of the system.
  - Whenever either of the alarm LEDs is lit, the seven-segment display provides the corresponding code point for the error indication. When the system is fully active and running, the console displays the letter **A** as seen in Figure 24.
- LCT Switch – The LCT button is used during the manufacturing process and is inactive otherwise.
- INT LED – Not used in the current release.

A.2 LED states and Seven Segment Display (SSD) codes

Firmware initialization:

Active LED	Warning LED	Error LED	SSD Codes	Condition
Green			0	The processor has started; and the firmware has taken control.
Green			3	The Host Controller Card has failed to download Bootloader from Flash.
Green			4	The system is checking firmware consistency.
Green			5	The system is formatting memory.
Green			6	The system is initializing load device. **Note:** If the SSD code is stuck at 6 for more than a minute, it implies that the Network Processor Card is installed in wrong slot.
Green			9	The system is loading subsystem.
Green			b	The system is starting the operation system. The system is active.

Table 31 LED states and SSD codes during firmware initialization

Note: Although the Active LED will be lit Green during the firmware initialization, this LED state is irrelevant to the SSD display or the condition. You must ignore the LED state during the firmware initialization.

Application initialization:

Active LED	Warning LED	Error LED	SSD Code	Condition
Green			0	Application initialization started.
Green			1	Forwarding Engine initialization complete. Application initialization.
Green			A	Application initialization complete. System active.
Green			H	System halted. Administrator requested halting of system.

Table 32 LED states and SSD codes during application initialization

Warning conditions:

Active LED	Warning LED	Error LED	SSD Code	Condition
Green	Yellow		1	High temperature reached.
Green	Yellow		2	Fan unit failure. Rotation counter indicates zero speed for one of the lateral trays. May be the result of fan tray removal.
Green	Yellow		3	Power supply failure. Failed to detect one of the power supplies. May be the result of the fan tray removal of one of the power supplies.
Green	Yellow		4	FDD low sector count (40 backup sectors remaining).
Green	Yellow		5	FDD extremely low sector count (20 backup sectors remaining)

Table 33 LED states and SSD codes during warning conditions

Error conditions:

Active LED	Warning LED	Error LED	SSD Code	Condition
Green		Red	1	Failed to identify FDD. Possibly due to removal of FDD card.
Green		Red	2	Failed to initialize NPE card.
Green		Red	3	Critical threshold reached (95C for NPE). The system will reboot.
Green		Red	4	Full fan assembly failure (both trays). The system will reboot.
Green		Red	5	Application initialization failure. Startup manager failed to initialize all the components of the system. The system will reboot.
Green		Red	6	Lost connectivity with ethernet interface. Possible failure of NPE card. The system will reboot.
Green		Red	7	MF 1000 card failure. Backup sectors exhausted.
Green		Red	8	NP 4000 card initialization failure. Firmware self test (BIST) has detected failure in one or more components (memory, bus, interconnects)

Table 34 LED states and SSD codes during error conditions

A.3 HiPath Wireless C2400 Controller back panel

The following figure identifies the main components on the back panel of HiPath Wireless C2400 Controller.

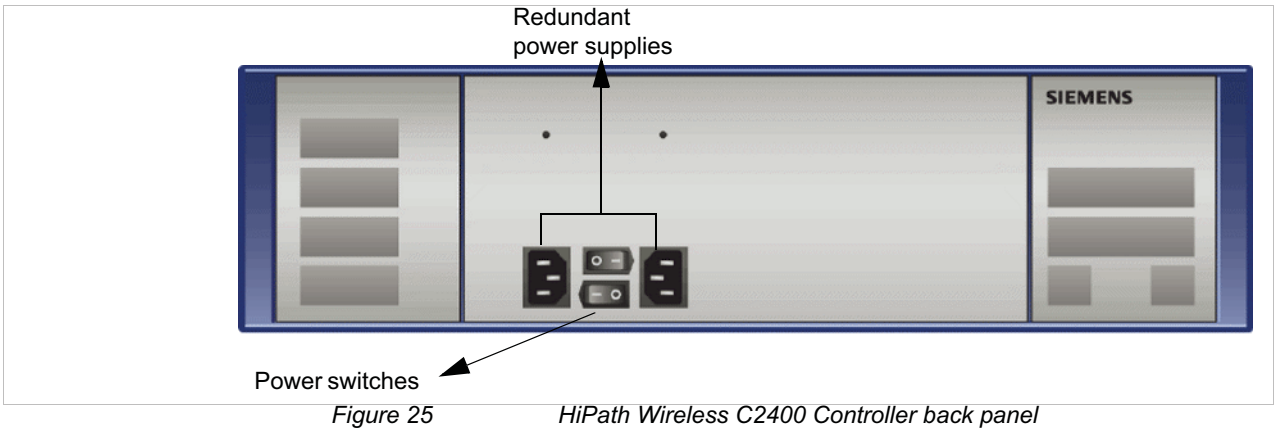


Figure 25 HiPath Wireless C2400 Controller back panel

Note: The hardware for the HiPath Wireless C2400 Controller Campus and the HiPath Wireless C2400 Controller Enterprise are identical.

A.4 HiPath Wireless C20 Controller

A.4.1 HiPath Wireless C20 Controller front panel

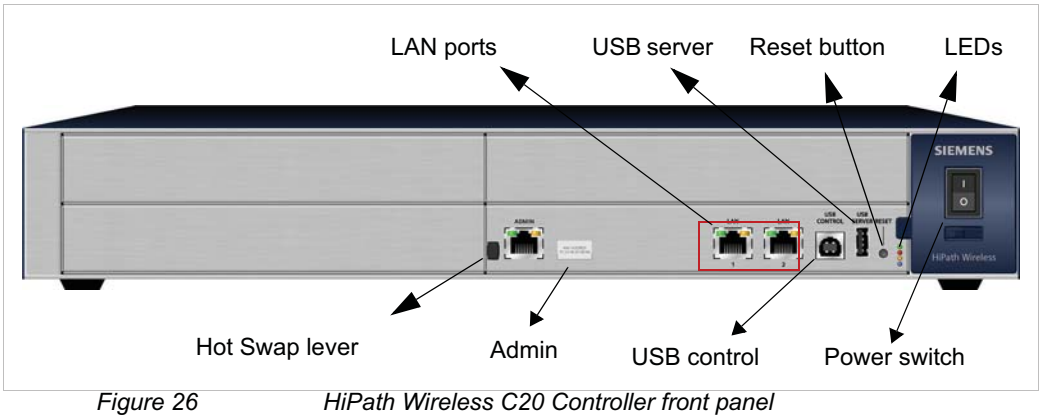


Figure 26 HiPath Wireless C20 Controller front panel

Note: The hot swap lever is not enabled in the current release. Pulling the hot swap lever will not affect the normal operation if the HiPath Wireless C20 Controller is already running. However, if you attempt to reboot the HiPath

Wireless C20 Controller with the hot swap lever pulled out, the controller will fail to reboot. If you pull the hot swap lever while the HiPath Wireless C20 Controller is in operation, the Hot Swap LED will light up.

The HiPath Wireless C20 Controller has four lights on its front panel.

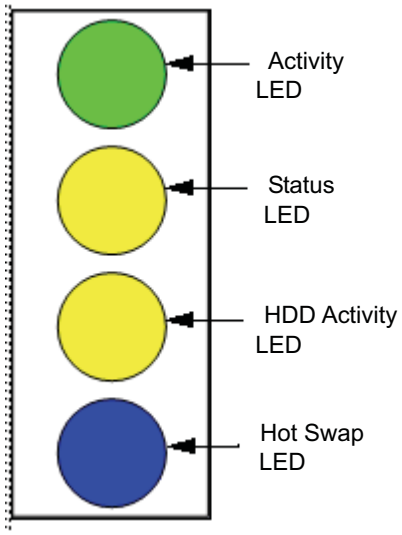


Figure 27 HiPath Wireless C20 Controller LED lights

The functional definitions of the HiPath Wireless C20 Controller's LEDs are provided below:

- ACTIVITY LED – Indicates the CPU activity, including the amount of traffic carried to and from the Wireless APs.
- STATUS LED – Indicates the normal state of the HiPath Wireless Controller as seen by the system's software. This LED covers all stages of the HiPath Wireless Controller, ranging from restarting, to shutting-down. As long as the HiPath Wireless Controller is running normally, this LED will remain lit.
- HDD Activity LED – Is hardware controlled to report Hard Drive Device (HDD) activity.
- Hot Swap LED – Indicates that the hot swap lever on the HiPath Wireless Controller is pulled out.

A.4.2 HiPath Wireless C20 Controller back panel

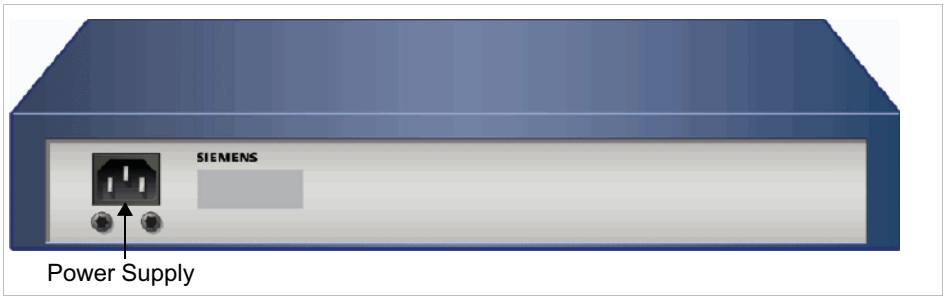


Figure 28 HiPath Wireless C20 Controller back panel

B Regulatory information

Warning: Warnings identify essential information. Ignoring a warning can lead to problems with the application.

This chapter provides the regulatory information for the HiPath Wireless Controller C20/C2400 and the HiPath Wireless AP models:

- AP 2610/2620 (AP26XX series)
- AP 3610/3620 (AP36XX series)

Note: Throughout this appendix, the term ‘Wireless AP’ refers to both AP models (AP26XX series and AP36XX series). Specific AP models are only identified in this appendix where it is necessary to do so.

Note: For technical specifications and certification information for the HiPath Wireless Outdoor AP, models AP 2650/2660, see the *HiPath Wireless Outdoor AP Installation Guide.*

Configuration of the Wireless AP frequencies and power output are controlled by the regional software license and proper selection of the country during initial installation and set-up. Customers are only allowed to select the proper country from their licensed regulatory domain related to that customer’s geographic location, thus allowing the proper set-up of access points in accordance with local laws and regulations. The Wireless AP must not be operated until properly configured with the correct country setting or it may be in violation of the local laws and regulations.

Warning: Changes or modifications made to the HiPath Wireless Controller or the Wireless APs which are not expressly approved by Siemens could void the user's authority to operate the equipment.

Only authorized Siemens service personnel are permitted to service the system. Procedures that should be performed only by Siemens personnel are clearly identified in this guide.

Note: The HiPath Wireless Controllers and the Wireless APs are in compliance with the European Directive 2002/95/EC on the restriction of the use of certain hazardous substances (RoHS) in electrical and electronic equipment.

B.1 HiPath Wireless Controller C20/C2400

Conformance standards and directives

Safety

- UL 60950-1 (U.S)
- CSA C22.2 No.60950-01-03 (Canada)
- 2006/95/EC Low Voltage Directive (LVD)
- EN 60950-1 (Europe)
- IEC 60950-1 with applicable National Differences
- AS/NZS 60950.1 (Australia/New Zealand)

EMC (Emissions / Immunity)

- FCC Part 15, Subpart B, Class A (North America)
- ICES-003, Class A (Canadian Emissions)
- 89/336/EEC EMC Directive
- EN 55022: Class A (European Emissions)
- EN 55024: includes EN 61000-2,3,4,5,6,11 (European Immunity)
- EN 61000-3-2: (Harmonics)
- EN 61000-3-3: (Flicker)
- IEC/CISPR 22: Class A (International Emissions)
- IEC/CISPR 24: includes IEC/EN 61000-4-2,3,4,5,6,11 (International Immunity)
- Australia/New Zealand AS/NZS 3548 via EU standards (ACMA)

RoHS

- European Directive 2002/95/EC

B.2 Wireless APs 26XX and 36XX

B.2.1 Wi-Fi certification

The AP26XX is Wi-Fi certified under Certification ID # WFA4279 for operation in accordance with IEEE 802.11a/b/g. The AP26XX Wireless APs with internal and external antennas are designed and intended to be used indoors.

The AP36XX is Wi-Fi certified under Certification ID # WFA5917 for operation in accordance with IEEE 802.11a/b/g/n. The AP36XX Wireless APs with internal and external antennas are designed and intended to be used indoors.

Note: Operation in the European Community and rest of the world may be dependant on securing local licenses, certifications, and regulatory approvals.

B.2.2 AP2620 external antenna AP

Optional approved 3rd party external antennas

The AP2620 external antenna APs can also be used with optional certified external antennas.

Antenna diversity

There are some limitations for using different antennas and Tx/Rx diversity:

- If **Alternate** antenna diversity is used for Tx or Rx, then the same antenna model must be used as left and right antennas. In addition, if cables are used to connect external antennas, the cables must be of the same length and similar attenuation. If these rules are not respected, antenna diversity will not function properly and there will be degradation in the link budget in both directions.
- You can choose to install only one antenna provided that both Tx and Rx diversity are configured to use that antenna and only that antenna. You can choose to install one antenna for 11b/g band and one antenna for 11a band, provided that the antenna diversity is configured appropriately on both radios.

Sensor support

Changing the antenna on sensors is not supported (at this stage) for the following reasons:

- The sensor factors the antenna gain and pattern in its calculations and therefore it needs to know the antenna type and gain.

- The sensor operating in mitigation mode becomes a transmitter and must obey the same CTLs as the normal AP software.
- Neither the sensor nor the HiPath Wireless Manager HiGuard support configuring the antenna.

B.2.3 United States

B.2.3.1 FCC Declaration of Conformity Statement

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operation.

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

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment or devices.
- Connect the equipment to an outlet other than the receiver's.
- Consult a dealer or an experienced radio/TV technician for suggestions.

B.2.3.2 USA conformance standards

This equipment meets the following conformance standards:

Safety

- UL 60950-1
- UL 2043 Plenum Rated as part of UL 60950-1. Suitable for use in environmental air space in accordance with Section 300.22.C of the National Electrical Code.

EMC

- FCC CFR 47 Part 15, Class B

Radio transceiver

- CFR 47 Part 15.247, Subpart C (2.4 GHz)

- CFR 47 Part 15.407, Subpart E (5 GHz)

Other

- IEEE 802.11a (5 GHz)
- IEEE 802.11b/g (2.4 GHz)
- IEEE 802.11n (AP36XX)
- IEEE 802.3af (PoE)

Warning: The Wireless APs must be installed and used in strict accordance with the manufacturer's instructions as described in this guide and related documentation for the device to which the Wireless AP is connected. Any other installation or use of the product violates FCC Part 15 regulations.

Operation of the Wireless AP is restricted for indoor use only, specifically in the UNII 5.15 - 5.25 GHz band in accordance with 47 CFR 15.407(e).

This Part 15 radio device operates on a non-interference basis with other devices operating at the same frequency when using antennas provided or other Siemens certified antennas. Any changes or modification to the product not expressly approved by Siemens could void the user's authority to operate this device.

For the product available in the USA market, only channels 1 to 11 can be operated. Selection of other channels in the 2.4 GHz band is not possible.

B.2.3.3 FCC RF Radiation Exposure Statement

The Wireless AP complies with FCC RF radiated exposure limits set forth for an uncontrolled environment. End users must follow the specific operating instructions for satisfying RF exposure compliance. This device has been tested and has demonstrated compliance when simultaneously operated in the 2.4 GHz and 5 GHz frequency ranges. This device must not be co-located or operated in conjunction with any other antenna or transmitter.

Caution: The radiated output power of the Wireless AP is below the FCC radio frequency exposure limits as specified in "Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields" (OET Bullet 65, Supplement C). This equipment should be installed and operated with a minimum distance of 25 cm between the radiator and your body or other co-located operating antennas.

B.2.3.4 AP2620 optional 3rd party external antennas

The AP2620 external antenna APs can also be used with optional certified 3rd party antennas. However, in order to comply with the local laws and regulations, an approval may be required by the local regulatory authorities. The following optional antennas have been tested and approved for use with the external antenna model.

Caution: When using an approved 3rd party external antenna (other than the default), the power must be adjusted according to these tables.

Professional installation

To comply with FCC part 15 rules in the United States, the system must be professionally installed to ensure compliance with the Part 15 certification. It is the responsibility of the operator and professional installer to ensure that only certified systems are deployed in the United States. The use of the system in any other combination (such as co-located antennas transmitting the same information) is expressly forbidden. The following are the requirements of professional installation:

- The device cannot be sold retail to the general public or by mail order. It must be sold to dealers.
- Installation must be controlled.
- Installation must be carried out by licensed professionals (equipment sold to dealers who hire installers)
- Installation requires special training (special programming and antenna and cable installations)
- The intended use is generally not for the general public. Instead, it is generally for industry/commercial use.

#	Model	Application	Shape	Gain (dBi)	Frequency (MHz)	Coax Cable Length/Type	Connector Type
Cushcraft							
#1	SR2405135D xxxxxx	indoor	Directional	5	2400-2500	3 feet / 19AWG CMP(ETL) C(ETL) 9700851	RPSMA
#2	S24493DSxxx xxx	indoor	Omni, 2 inputs	3	2400-2500 4900-5990	3 feet / 19AWG CMP(ETL) C(ETL) 9700851	RPSMA, 2ea.
#3	SL24513Pxxx xxx	indoor	Omni	3	2400-2500 5150-5350	3 feet / 19AWG CMP(ETL) C(ETL) 9700851	RPSMA
#4	S24497Pxxxx xx	indoor	Directional	7	2400-2500 4900-5990	3 feet / 19AWG CMP(ETL) C(ETL) 9700851	RPSMA
Hyperlink Tech							
#5	HG2458CUxx x	indoor	Omni	3	2300-2600 4900-6000	1 foot / 20AWG Coleman Cable 921021	N-female
Maxrad							
#6	MDO24005PT xxxxxx	indoor	Omni, 2 inputs	5.2	2400-2485	3 feet / 19AWG CMP(ETL) C(ETL) 9700851	RPSMA, 2ea.

Table 35 List of FCC approved antennas

Note: The qualification testing and results are based on above described antennas, cable types, lengths, and connector types. Other cable lengths and connector types are also available which are specified by the suffix part of the part numbers (for example, SR2405135Dxxxxxx, where the xxxxxx suffix represents cable length and/or connector type). The antenna feedline used in testing are the minimum cable length. Longer cable may be used with losses greater than or equal to the cables used for testing. The maximum power settings must be adjusted according to these tables.

Note: If one of the following antenna is used, you must select an operating channel (on the **Wireless APs** configuration pages) and the corresponding allowed max power from the values listed in Table 36. DO NOT select a higher power than the value listed in Table 36.

Antenna			Antenna #1 Cushcraft SR2405135 Dxxxxxx	Antenna #2 Cushcraft S24493DSx xxxxx	Antenna #3 Cushcraft SL24513Px xxxxx	Antenna #4 Cushcraft S24497Pxx xxxx	Antenna #5 Hyperlink Tech HG2458CUxx x	Antenna #6 Maxrad MDO24005PT xxxxxx
	Frequency (MHz)	Ch. No.	Power limit (dBm)	Power limit (dBm)	Power limit (dBm)	Power limit (dBm)	Power limit (dBm)	Power limit (dBm)
11b	2412	1	16	18	17	16	17	17
	2417	2	17	17	17	16	17	17
	2422	3	18	18	18	18	18	18
	2427	4	18	18	18	18	18	18
	2432	5	18	18	18	18	18	18
	2437	6	18	18	18	18	18	18
	2442	7	18	18	18	18	18	18
	2447	8	18	18	18	18	18	18
	2452	9	18	18	18	18	18	18
	2457	10	18	18	18	18	18	18
	2462	11	18	18	18	18	18	18
11g	2412	1	10	13	13	10	12	13
	2417	2	14	15	15	14	15	14
	2422	3	15	16	16	15	16	16
	2427	4	16	18	18	16	17	17
	2432	5	16	18	18	17	18	18
	2437	6	16	18	18	17	18	18
	2442	7	18	18	18	18	18	18
	2447	8	18	18	18	18	18	18
	2452	9	18	18	18	18	18	18
	2457	10	17	17	17	17	17	18
	2462	11	14	14	14	14	14	14

Table 36 FCC Antenna channel-power information

Antenna			Antenna #1 Cushcraft SR2405135 Dxxxxxx	Antenna #2 Cushcraft S24493DSx xxxxx	Antenna #3 Cushcraft SL24513Px xxxxx	Antenna #4 Cushcraft S24497Pxx xxxx	Antenna #5 Hyperlink Tech HG2458CUxx x	Antenna #6 Maxrad MDO24005PT xxxxxx
	Frequency (MHz)	Ch. No.	Power limit (dBm)	Power limit (dBm)	Power limit (dBm)	Power limit (dBm)	Power limit (dBm)	Power limit (dBm)
11a	5180	36	N/S	17	17	17	17	N/S
	5200	40	N/S	17	17	17	17	N/S
	5220	44	N/S	17	17	17	17	N/S
	5240	48	N/S	17	17	17	17	N/S
	5260	52	N/S	18	18	18	18	N/S
	5280	56	N/S	18	18	18	18	N/S
	5300	60	N/S	18	18	18	18	N/S
	5320	64	N/S	18	18	18	18	N/S
	5745	149	N/S	15	N/S	15	15	N/S
	5765	153	N/S	15	N/S	15	15	N/S
	5785	157	N/S	14	N/S	14	14	N/S
	5805	161	N/S	14	N/S	14	14	N/S
	5825	165	N/S	14	N/S	14	14	N/S

Table 36 FCC Antenna channel-power information

Caution: Channels designated as N/S are not supported by the antenna and must not be selected from the **Wireless APs** configuration pages.

Caution: For antenna #3 (Cushcraft SL24513Pxxxxxx), do not select the **Auto** channel selection (on the **Wireless APs** configuration pages) for the 11a radio. Instead, only select a channel from the listed supported channels in Table 36. Operating on a channel that is NOT supported (N/S) is in violation of the law.

Caution: If you select the **Auto** channel selection (on the **Wireless APs** configuration pages), you must also select the power values listed in Table 37. DO NOT select a higher power than the value listed in Table 37.

Antenna	11a (dBm)	11b/g (dBm)
#1	N/S	10
#2	14	13
#3	17	13
#4	14	10
#5	14	12
#6	N/S	13

Table 37 Auto channel selection

RF safety distance

The antennas used for this transmitter must be installed to provide a separation distance of at least 25 cm from all persons and must not be co-located or operating in conjunction with another antenna or transmitter.

B.2.4 Canada

B.2.4.1 Department of Communications Compliance Statement

This digital apparatus does not exceed the Class B limits for radio noise emissions from digital apparatus as set out in the interference-causing equipment standard entitled "Digital Apparatus," ICES-003 of the Department of Communications.

Cet appareil numerique respecte les limites de bruits radioelectriques applicables aux appareils numeriques de Classe B prescrites dans la norme sur le materiel brouilleur: "Appareils Numeriques," NMB-003 edictee par le ministere des Communications.

This device complies with Part 15 of the FCC Rules and Canadian Standard RSS-210. Operation is subject to the following conditions:

- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operation.
- This Class B digital apparatus complies with Canadian ICES-003.
- Operation in the 5150-5250 MHz band is only for indoor usage to reduce potential for harmful interference to co-channel mobile satellite systems.
- Please note that high power radars are allocated as primary users (meaning they have priority) and can cause interference in the 5250-5350 MHz and 5470-5725 MHz bands of LE-LAN devices.
- For the product available in the Canadian market, only channels 1 to 11 can be operated. Selection of other channels in the 2.4 GHz band is not possible.
- The maximum antenna gain permitted for the AP26XX operating in the 5250-5350 MHz band to comply with the e.i.r.p. limit is 4.3 dBi for the internal antenna and 5 dBi for the default external antenna that is shipped with the unit. To comply with the e.i.r.p. limit with the optional external antennas, refer to Table 39.
- The maximum antenna gain permitted for the AP26XX operating in the 5725-5825 MHz band to comply with the e.i.r.p. limit is 4.3 dBi for the internal antenna and 5 dBi for the default external antenna that is shipped with the unit. To comply with the e.i.r.p. limit with the optional external antennas, refer to Table 39.
- The maximum antenna gain permitted for the AP36XX operating in the bands 5250-5350 MHz and 5470-5725 MHz to comply with the e.i.r.p. limit is 6 dBi for the internal antenna and 5 dBi for the external antenna.

- The maximum antenna gain permitted for the AP36XX operating in the 5725-5825 MHz band to comply with the e.i.r.p. limits specified for point-to-point and non point-to-point operation as appropriate is 6 dBi for the internal antenna and 5 dBi for the external antenna.

B.2.4.2 Canada conformance standards

This equipment meets the following conformance standards:

Safety

- C22.2 No.60950-1-03
- UL 2043 Plenum Rated as part of UL 60950-1. Suitable for use in environmental air space in accordance with Sections 2-128, 12-010(3) and 12-100 of the Canadian Electrical Code, Part 1, C22.1

EMC

- ICES-003, Class B

Radio transceiver

- RSS-210 (2.4 GHz and 5GHz)

Other

- IEEE 802.11a (5 GHz)
- IEEE 802.11b/g (2.4 GHz)
- IEEE 802.11n (AP36XX)
- IEEE 802.3af (PoE)

B.2.4.3 AP2620 optional 3rd party external antennas

The AP2620 external antenna APs can also be used with optional certified 3rd party antennas. However, in order to comply with the local laws and regulations, an approval may be required by the local regulatory authorities. The following optional antennas have been tested with and approved for use with the external antenna model.

Caution: When using an approved 3rd party external antenna (other than the default), the power must be adjusted according to these tables.

Professional installation

This device must be professionally installed. The following are the requirements of professional installation:

- The device cannot be sold retail to the general public or by mail order. It must be sold to dealers.
- Installation must be controlled.
- Installation must be carried out by licensed professionals (equipment sold to dealers who hire installers)
- Installation requires special training (special programming and antenna and cable installations)

The intended use is generally not for the general public. Instead, it is generally for industry/commercial use.

#	Model	Application	Shape	Gain (dBi)	Frequency (MHz)	Coax Cable Length/Type	Connector Type
Cushcraft							
#1	SR2405135Dxxxxxx	indoor	Directional	5	2400-2500	3 feet / 19AWG CMP(ETL) C(ETL) 9700851	RPSMA
#2	S24493DSxxxxxx	indoor	Omni, 2 inputs	3	2400-2500 4900-5990	3 feet / 19AWG CMP(ETL) C(ETL) 9700851	RPSMA, 2ea.
#3	SL24513Pxxxxxx	indoor	Omni	3	2400-2500 5150-5350	3 feet / 19AWG CMP(ETL) C(ETL) 9700851	RPSMA
#4	S24497Pxxxxxx	indoor	Directional	7	2400-2500 4900-5990	3 feet / 19AWG CMP(ETL) C(ETL) 9700851	RPSMA
Hyperlink Tech							
#5	HG2458CUxxx	indoor	Omni	3	2300-2600 4900-6000	1 foot / 20AWG Coleman Cable 921021	N-female
Maxrad							
#6	MDO24005PTxxxxxx	indoor	Omni, 2 inputs	5.2	2400-2485	3 feet / 19AWG CMP(ETL) C(ETL) 9700851	RPSMA, 2ea.

Table 38 List of IC (Industry Canada) approved antennas

Note: The qualification testing and results are based on above described antennas, cable types, lengths, and connector types. Other cable lengths and connector types are also available which are specified by the suffix part of the part numbers (ex. SR2405135Dxxxxxx, where the xxxxxx suffix represents cable length and/or connector type). The antenna feedline used in testing are the minimum cable length. Longer cable may be used with losses greater than or equal to the cables used for testing. The maximum power settings must be adjusted according to these tables.

Note: If one of the following antenna is used, you must select an operating channel (on the **Wireless APs** configuration pages) and the corresponding allowed max power from the values listed in Table 39. DO NOT select a higher power than the value listed in Table 39.

Antenna			**Antenna #1 Cushcraft SR2405135D xxxxxx**	**Antenna #2 Cushcraft S24493DSxx xxxx**	**Antenna #3 Cushcraft SL24513Pxx xxxx**	**Antenna #4 Cushcraft S24497Pxx xxxx**	**Antenna #5 Hyperlink Tech HG2458CUxxx**	**Antenna #6 Maxrad MDO24005P Txxxxxx**
	Frequency (MHz)	Ch. No.	Power limit (dBm)	Power limit (dBm)	Power limit (dBm)	Power limit (dBm)	Power limit (dBm)	Power limit (dBm)
11b	2412	1	16	18	17	16	17	17
	2417	2	17	17	17	16	17	17
	2422	3	18	18	18	18	18	18
	2427	4	18	18	18	18	18	18
	2432	5	18	18	18	18	18	18
	2437	6	18	18	18	18	18	18
	2442	7	18	18	18	18	18	18
	2447	8	18	18	18	18	18	18
	2452	9	18	18	18	18	18	18
	2457	10	18	18	18	18	18	18
	2462	11	18	18	18	18	18	18

Table 39 IC Antenna channel-power information

Antenna			Antenna #1 Cushcraft SR2405135D xxxxxx	Antenna #2 Cushcraft S24493DSxx xxxx	Antenna #3 Cushcraft SL24513Pxx xxxx	Antenna #4 Cushcraft S24497Pxx xxxx	Antenna #5 Hyperlink Tech HG2458CUxxx	Antenna #6 Maxrad MDO24005P Txxxxxx
	Frequency (MHz)	Ch. No.	Power limit (dBm)	Power limit (dBm)	Power limit (dBm)	Power limit (dBm)	Power limit (dBm)	Power limit (dBm)
11g	2412	1	10	13	13	10	12	13
	2417	2	14	15	15	14	15	14
	2422	3	15	16	16	15	16	16
	2427	4	16	18	18	16	17	17
	2432	5	16	18	18	17	18	18
	2437	6	16	18	18	17	18	18
	2442	7	18	18	18	18	18	18
	2447	8	18	18	18	18	18	18
	2452	9	18	18	18	18	18	18
	2457	10	17	17	17	17	17	18
	2462	11	14	14	14	14	14	14
11a	5180	36	N/S	17	17	17	17	N/S
	5200	40	N/S	17	17	17	17	N/S
	5220	44	N/S	17	17	17	17	N/S
	5240	48	N/S	17	17	17	17	N/S
	5260	52	N/S	18	18	18	18	N/S
	5280	56	N/S	18	18	18	18	N/S
	5300	60	N/S	18	18	18	18	N/S
	5320	64	N/S	18	18	18	18	N/S
	5745	149	N/S	15	N/S	15	15	N/S
	5765	153	N/S	15	N/S	15	15	N/S
	5785	157	N/S	14	N/S	14	14	N/S
	5805	161	N/S	14	N/S	14	14	N/S
	5825	165	N/S	14	N/S	14	14	N/S

Table 39 IC Antenna channel-power information

Caution: Channels designated as N/S are not supported by the antenna and must not be selected from the **Wireless APs** configuration pages.

Caution: For antenna #3 (Cushcraft SL24513Pxxxxxx), do not select the **Auto** channel selection (on the **Wireless APs** configuration pages) for the 11a radio. Instead, only select a channel from the listed supported channels in Table 36. Operating on a channel that is NOT supported (N/S) is in violation of the law.

Caution: If you select the **Auto** channel selection (on the **Wireless APs** configuration pages), you must also select the power values listed in Table 40. DO NOT select a higher power than the value listed in Table 40.

Antenna	11a (dBm)	11b/g (dBm)
#1	N/S	10
#2	14	13
#3	17	13
#4	14	10
#5	14	12
#6	N/S	13

Table 40 Auto channel selection

RF safety distance

The antennas used for this transmitter must be installed to provide a separation distance of at least 25 cm from all persons and must not be co-located or operating in conjunction with another antenna or transmitter.

B.2.5 European community

The Wireless APs are designed for use in the European Union and other countries with similar regulatory restrictions where the end user or installer is allowed to configure the Wireless AP for operation by entry of a country code relative to a specific country. Upon connection to the controller, the software will prompt the user to select a country code. After the country code is selected, the controller will set up the Wireless AP with the proper frequencies and power outputs for that country code.

Although outdoor use may be allowed and may be restricted to certain frequencies and/or may require a license for operation, the Wireless AP is intended for indoor use and must be installed in a proper indoor location. Use the installation utility provided with the controller software to ensure proper set-up in accordance with all European spectrum usage rules. Contact local Authority for procedure to follow and regulatory information. For more details on legal combinations of frequencies, power levels and antennas, contact Siemens.

Declaration of Conformity with R&TTE Directive of the European Union 1999/5/EC

The following symbol indicates compliance with the Essential Requirements of the R&TTE Directive of the European Union (1999/5/EC).

CE0891

B.2.5.1 Declaration of Conformity in Languages of the European Community

English	Hereby, Siemens, declares that this Radio LAN device is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC.
Finnish	Valmistaja Siemens vakuuttaa täten että Radio LAN device tyyppinen laite on direktiivin 1999/5/EY oleellisten vaatimusten ja sitä koskevien direktiivin muiden ehtojen mukainen.
Dutch	Hierbij verklaart Siemens dat het toestel Radio LAN device in overeenstemming is met de essentiële eisen en de andere relevante bepalingen van richtlijn 1999/5/EG. Bij deze verklaart Siemens dat deze Radio LAN device voldoet aan de essentiële eisen en aan de overige relevante bepalingen van Richtlijn 1999/5/EC.
French	Par la présente Siemens déclare que l'appareil Radio LAN device est conforme aux exigences essentielles et aux autres dispositions pertinentes de la directive 1999/5/CE. Par la présente, Siemens déclare que ce Radio LAN device est conforme aux exigences essentielles et aux autres dispositions de la directive 1999/5/CE qui lui sont applicables.
Swedish	Härmed intygar Siemens att denna Radio LAN device står I överensstämmelse med de väsentliga egenskapskrav och övriga relevanta bestämmelser som framgår av direktiv 1999/5/EG.
Danish	Undertegnede Siemens erklærer herved, at følgende udstyr Radio LAN device overholder de væsentlige krav og øvrige relevante krav i direktiv 1999/5/EF.
German	Hiermit erklärt Siemens die Übereinstimmung des "WLAN Wireless Controller bzw. Access Points" mit den grundlegenden Anforderungen und den anderen relevanten Festlegungen der Richtlinie 1999/5/EG.
Greek	ΜΕ ΤΗΝ ΠΑΡΟΥΣΑ Siemens ΔΗΛΩΝΕΙ ΟΤΙ Radio LAN device ΣΥΜΜΟΡΦΩΝΕΤΑΙ ΠΡΟΣ ΤΙΣ ΟΥΣΙΩΔΕΙΣ ΑΠΑΙΤΗΣΕΙΣ ΚΑΙ ΤΙΣ ΛΟΙΠΕΣ ΣΧΕΤΙΚΕΣ ΔΙΑΤΑΞΕΙΣ ΤΗΣ ΟΔΗΓΙΑΣ 1999/5/ΕΚ.
Icelandic	Siemens lysir her med yfir að thessi bunadur, Radio LAN device, uppfyllir allar grunnkrofur, sem gerdar eru i R&TTE tilskipun ESB nr 1999/5/EC.
Italian	Con la presente Siemens dichiara che questo Radio LAN device è conforme ai requisiti essenziali ed alle altre disposizioni pertinenti stabilite dalla direttiva 1999/5/CE.
Spanish	Por medio de la presente Siemens declara que el Radio LAN device cumple con los requisitos esenciales y cualesquiera otras disposiciones aplicables o exigibles de la Directiva 1999/5/CE.
Portuguese	Siemens declara que este Radio LAN device está conforme com os requisitos essenciais e outras disposições da Directiva 1999/5/CE.
Malti	Hawnhekk, Siemens, jiddikjara li dan Radio LAN device jikkonforma mal-htigijiet essenzjali u ma provvedimenti ohrajn relevanti li hemm fid-Dirrettiva 1999/5/EC.

New Member States requirements of Declaration of Conformity

Estonian	Käesolevaga kinnitab Siemens seadme Radio LAN device vastavust direktiivi 1999/5/EÜ põhinõuetele ja nimetatud direktiivist tulenevatele teistele asjakohastele sätetele.
Hungary	Alulírott, Siemens nyilatkozom, hogy a Radio LAN device megfelel a vonatkozó alapvetõ követelményeknek és az 1999/5/EC irányelv egyéb elõírásainak.
Slovak	Siemens týmto vyhlasuje, že Radio LAN device spĺňa základné požiadavky a všetky príslušné ustanovenia Smernice 1999/5/ES.
Czech	Siemens tímto prohlašuje, že tento Radio LAN device je ve shodě se základními požadavky a dalšími příslušnými ustanoveními směrnice 1999/5/ES."
Slovenian	Šiuo Siemens deklaruoja, kad šis Radio LAN device atitinka esminius reikalavimus ir kitas 1999/5/EB Direktyvos nuostatas.
Latvian	Ar šo Siemens deklarē, ka Radio LAN device atbilst Direktīvas 1999/5/EK būtiskajām prasībām un citiem ar to saistītajiem noteikumiem
Lithuanian	Siemens deklaruoja, kad Radio LAN device atitinka 1999/5/EC Direktyvos esminius reikalavimus ir kitas nuostatas".
Polish	Niniejszym, Siemens, deklaruję, że Radio LAN device spełnia wymagania zasadnicze oraz stosowne postanowienia zawarte Dyrektywie 1999/5/EC.

B.2.5.2 European conformance standards

This equipment meets the following conformance standards:

Safety

- 2006/95/EC Low Voltage Directive (LVD)
- IEC/EN 60950-1 + National Deviations

EMC (Emissions / Immunity)

- 89/336/EEC EMC Directive
- EN 55011/CISPR 11, Class B, Group 1 ISM
- EN 55022/CISPR 22, Class B
- EN 55024/CISPR 24, includes IEC/EN 61000-4-2,3,4,5,6,11
- EN 61000-3-2 and -3-3 (Harmonics and Flicker)
- EN 60601-1-2 (EMC immunity for medical equipment)
- EN 50385 (EMF)
- ETSI/EN 301 489-1 & -17

Radio transceiver

- R&TTE Directive 1999/5/EC
- ETSI/EN 300 328 (2.4 GHz)
- ETSI/EN 301 893 (5 GHz)

Other

- IEEE 802.11a (5 GHz)
- IEEE 802.11b/g (2.4 GHz)
- IEEE 802.11n (AP36XX)
- IEEE 802.3af (PoE)

RoHS

- European Directive 2002/95/EC

B.2.5.3 AP2620 optional 3rd party external antennas

The AP2620 external antenna APs can also be used with optional certified 3rd party antennas. However, in order to comply with the local laws and regulations, an approval may be required by the local regulatory authorities. The following optional antennas have been tested with and approved for use with the external antenna model.

Caution: When using an approved 3rd party external antenna (other than the default), the power must be adjusted according to these tables.

Professional installation

This device must be professionally installed. The following are the requirements of professional installation:

- The device cannot be sold retail to the general public or by mail order. It must be sold to dealers.
- Installation must be controlled.
- Installation must be carried out by licensed professionals (equipment sold to dealers who hire installers)
- Installation requires special training (special programming and antenna and cable installations)

The intended use is generally not for the general public. Instead, it is generally for industry/commercial use.

#	Model	Location	Type	Gain (dBi)	Frequency (MHz)
			Huber+Suhner		
#1	SOA 2454/360/7/20/DF	outdoor-capable	Omni	6 8	2400-2500 4900-5875
#2	SPA 2456/75/9/0/DF	outdoor-capable	Planar 2 or 1 inputs	9	2400-2500 5150-5875
#3	SPA 2400/80/9/0/DS	outdoor-capable	Planar 2 inputs	8.5	2300-2500
#4	SWA 0859/360/4/10/V	outdoor-capable	Omni	7	2400-5875
#5	SOA 2400/360/4/0/DS	outdoor-capable	Omni	3.5	2400-2500
#6	SPA 2400/40/14/0/DS	outdoor-capable	Planar 2 inputs	13.5	2400-2500
#7	SWA 2459/360/4/45/V	outdoor-capable	Omni	>4	2400-5875

Table 41 Approved antenna list for Europe

Note: If one of the following antenna is used, you must select an operating channel (on the **Wireless APs** configuration pages) and the corresponding allowed max power from the values listed in Table 42. DO NOT select a higher power than the value listed in Table 42.

Antenna			Antenna #1 Huber +Suhner SOA 2454/ 360/7/20/ DF	Antenna #2 Huber +Suhner SPA 2456/ 75/9/0/DF	Antenna #3 Huber +Suhner SPA 2400/ 80/9/0/DS	Antenna #4 Huber +Suhner SWA 0859/ 360/4/10/V	Antenna #5 Huber +Suhner SOA 2400/ 360/4/0/DS	Antenna #6 Huber +Suhner SPA 2400/ 40/14/0/DS	Antenna #7 Huber +Suhner SWA 2459/ 360/4/45/V
	Frequency (MHz)	Ch. No.	Power limit (dBm)	Power limit (dBm)	Power limit (dBm)	Power limit (dBm)	Power limit (dBm)	Power limit (dBm)	Power limit (dBm)
11b	2412	1	15	14	14	15	15	9	15
	2417	2	15	14	14	15	15	9	15
	2422	3	15	14	14	15	15	9	15
	2427	4	15	14	14	15	15	9	15
	2432	5	15	14	14	15	15	9	15
	2437	6	15	14	14	15	15	9	15
	2442	7	15	14	14	15	15	9	15
	2447	8	15	14	14	15	15	9	15
	2452	9	15	14	14	15	15	9	15
	2457	10	15	14	14	15	15	9	15
	2462	11	15	14	14	15	15	9	15
	2467	12	15	14	14	15	15	9	15
	2472	13	15	14	15	15	15	10	15
11g	2412	1	15	13	14	15	15	9	15
	2417	2	15	13	14	15	15	9	15
	2422	3	15	13	14	15	15	9	15
	2427	4	15	13	14	15	15	9	15
	2432	5	15	13	14	15	15	9	15
	2437	6	15	13	14	15	15	9	15
	2442	7	15	14	14	15	15	10	15
	2447	8	15	14	14	15	15	10	15
	2452	9	15	14	14	15	15	10	15
	2457	10	15	14	14	15	15	10	15
	2462	11	15	14	14	15	15	10	15
	2467	12	15	14	14	15	15	10	15
	2472	13	15	13	13	15	15	9	15

Table 42 ETSI Antenna channel-power information

Antenna			Antenna #1 Huber +Suhner SOA 2454/ 360/7/20/ DF	Antenna #2 Huber +Suhner SPA 2456/ 75/9/0/DF	Antenna #3 Huber +Suhner SPA 2400/ 80/9/0/DS	Antenna #4 Huber +Suhner SWA 0859/ 360/4/10/V	Antenna #5 Huber +Suhner SOA 2400/ 360/4/0/DS	Antenna #6 Huber +Suhner SPA 2400/ 40/14/0/DS	Antenna #7 Huber +Suhner SWA 2459/ 360/4/45/V
	Frequency (MHz)	Ch. No.	Power limit (dBm)	Power limit (dBm)	Power limit (dBm)	Power limit (dBm)	Power limit (dBm)	Power limit (dBm)	Power limit (dBm)
11a	5180	36	16	16	N/S	16	N/S	N/S	16
	5200	40	16	16	N/S	16	N/S	N/S	16
	5200	44	16	16	N/S	16	N/S	N/S	16
	5240	48	16	16	N/S	16	N/S	N/S	16
	5260	52	16	16	N/S	16	N/S	N/S	16
	5280	56	16	16	N/S	16	N/S	N/S	16
	5300	60	16	16	N/S	16	N/S	N/S	16
	5320	64	16	16	N/S	16	N/S	N/S	16
	5500	100	20	19	N/S	20	N/S	N/S	20
	5520	104	20	19	N/S	20	N/S	N/S	20
	5540	108	20	19	N/S	20	N/S	N/S	20
	5560	112	20	19	N/S	20	N/S	N/S	20
	5580	116	20	19	N/S	20	N/S	N/S	20
	5600	120	20	19	N/S	20	N/S	N/S	20
	5620	124	20	19	N/S	20	N/S	N/S	20
	5640	128	20	19	N/S	20	N/S	N/S	20
	5660	132	20	19	N/S	20	N/S	N/S	20
	5680	136	20	19	N/S	20	N/S	N/S	20
	5700	140	20	19	N/S	20	N/S	N/S	20

Table 42 ETSI Antenna channel-power information

Caution: Channels designated as N/S are not supported by the antenna and must not be selected from the **Wireless APs** configuration pages.

Caution: If you select the **Auto** channel selection (on the **Wireless APs** configuration pages), you must also select the power values listed in Table 43. DO NOT select a higher power than the value listed in Table 43.

Antenna	11a (dBm)	11b/g (dBm)
#1	16	15
#2	16	13
#3	N/S	13
#4	16	15
#5	N/S	15
#6	N/S	9
#7	16	15

Table 43 Auto channel selection

RF safety distance

The antennas used for this transmitter must be installed to provide a separation distance of at least 25 cm from all persons and must not be co-located or operating in conjunction with another antenna or transmitter.

B.2.5.4 Conditions of use in the European community

The Wireless APs with internal and external antennas are designed and intended to be used indoors. Some EU countries allow outdoor operation with limitations and restrictions, which are described in this section. It is the responsibility of the end user to ensure operation in accordance with these rules, frequencies, and transmitter power output. The Wireless AP must not be operated until properly configured for the customer's geographic location.

Caution: The user or installer is responsible to ensure that the Wireless AP is operated according to channel limitations, indoor / outdoor restrictions, license requirements, and within power level limits for the current country of operation. A configuration utility has been provided with the HiPath Wireless Controller to allow the end user to check the configuration and make necessary configuration changes to ensure proper operation in accordance with the spectrum usage rules for compliance with the European R&TTE directive 1999/5/EC.

The Wireless APs with internal and external antennas are designed to be operated only indoors within all countries of the European Community. Some countries require limited channels of operation. These restrictions are described in this section.

Caution: The Wireless AP is completely configured and managed by the HiPath Wireless Controller connected to the network. Please follow the instructions in this user guide to properly configure the Wireless AP.

• The Wireless APs require the end user or installer to ensure that they have a

valid license prior to operating the Wireless AP. The license contains the region and the region exposes the country codes which allow for proper configuration in conformance with European National spectrum usage laws

• There is a default group of settings that each Wireless AP receives when it connects to the controller. There is the ability to change these settings. The user or installer is responsible to ensure that each Wireless AP is properly configured.

• The software within the controller will automatically limit the allowable channels and output power determined by the selected country code. Selecting the incorrect country of operation or identifying the proper antenna used, may result in illegal operation and may cause harmful interference to other systems.

• This device employs a radar detection feature required for European Community operation in the 5 GHz band. This feature is automatically enabled when the country of operation is correctly configured for any European Community country. The presence of nearby radar operation may result in temporary interruption of operation of this device. The radar detection feature will automatically restart operation on a channel free of radar.

• The 5 GHz Turbo Mode feature is not enabled for use on the Wireless APs.

• The **Auto** channel setting of the 5 GHz described in this user guide must always remain enabled to ensure that automatic 5 GHz channel selection complies with European requirements.

• The 5150- 5350 MHz band, channels 36, 40, 44, 48, 52, 56, 60, or 64, are restricted to indoor use only.

• The external antenna APs must only use antennas that are certified by Siemens.

• The 2.4 GHz band, channels 1 - 13, may be used for indoor or outdoor use but there may be some channel restrictions.

• In Greece and Italy, the end user must apply for a license from the national spectrum authority to operate outdoors.

• In Belgium, outdoor operation is only permitted using the 2.46 - 2.4835 GHz band: Channel 13.

• In France, outdoor operation is only permitted using the 2.4 - 2.454 GHz band: Channels 1 - 7.

B.2.5.5 European spectrum usage rules

The AP configured with approved internal or external antennas can be used for indoor and outdoor transmissions throughout the European community as shown in the Table 44. Some restrictions apply in Belgium, France, Greece, and Italy.

Country	5.15-5.25 (GHz) Channels: 36,40,44,48	5.25-5.35 (GHz) Channels: 52,56,60,64	5.47-5.725 (GHz) Channels: 100,104,108,112,116, 120,124,128,132,136,140	2.4-2.4835 (GHz) Channels: 1 to 13 (Except Where Noted)
Austria	Indoor only	Indoor only	Indoor or outdoor	Indoor or outdoor
Belgium	Indoor only	Indoor only	Indoor or outdoor *	Indoor only
Bulgaria	Indoor only	Indoor only	Indoor or outdoor	Indoor or outdoor
Denmark	Indoor only	Indoor only	Indoor or outdoor	Indoor or outdoor
Cyprus	Indoor only	Indoor only	Indoor or outdoor	Indoor or outdoor
Czech Rep.	Indoor only	Indoor only	Indoor or outdoor	Indoor or outdoor
Estonia	Indoor only	Indoor only	Indoor or outdoor	Indoor or outdoor
Finland	Indoor only	Indoor only	Indoor or outdoor	Indoor or outdoor
France	Indoor only	Indoor only	Indoor or outdoor	Indoor ch. 1-13 Outdoor 1-7 only
Germany	Indoor only	Indoor only	Indoor or outdoor	Indoor or outdoor
Greece	Indoor only	Indoor only	Indoor (Outdoor w/License)	Indoor (Outdoor w/license)
Hungary	Indoor only	Indoor only	Indoor or outdoor	Indoor or outdoor
Iceland	Indoor only	Indoor only	Indoor or outdoor	Indoor or outdoor
Ireland	Indoor only	Indoor only	Indoor or outdoor	Indoor or outdoor
Italy	Indoor only	Indoor only	Indoor or outdoor	Indoor (Outdoor w/license)
Latvia	Indoor only	Indoor only	Indoor or outdoor	Indoor or outdoor
Liechtenstein	Indoor only	Indoor only	Indoor or outdoor	Indoor or outdoor
Lithuania	Indoor only	Indoor only	Indoor or outdoor	Indoor or outdoor
Luxembourg	Indoor only	Indoor only	Indoor or outdoor	Indoor or outdoor
Netherlands	Indoor only	Indoor only	Indoor or outdoor	Indoor or outdoor
Malta	Indoor only	Indoor only	Indoor or outdoor	Indoor or outdoor
Norway	Indoor only	Indoor only	Indoor or outdoor	Indoor or outdoor
Poland	Indoor only	Indoor only	Indoor or outdoor	Indoor or outdoor
Portugal	Indoor only	Indoor only	Indoor or outdoor	Indoor or outdoor
Slovak Rep.	Indoor only	Indoor only	Indoor or outdoor	Indoor or outdoor
Slovenia	Indoor only	Indoor only	Indoor or outdoor	Indoor or outdoor
Spain	Indoor only	Indoor only	Indoor or outdoor	Indoor or outdoor

Table 44 European spectrum usage rules

Country	5.15-5.25 (GHz) Channels: 36,40,44,48	5.25-5.35 (GHz) Channels: 52,56,60,64	5.47-5.725 (GHz) Channels: 100,104,108,112,116, 120,124,128,132,136,140	2.4-2.4835 (GHz) Channels: 1 to 13 (Except Where Noted)
Sweden	Indoor only	Indoor only	Indoor or outdoor	Indoor or outdoor
Switzerland	Indoor only	Indoor only	Indoor or outdoor	Indoor or outdoor
U.K	Indoor only	Indoor only	Indoor or outdoor	Indoor or outdoor

Table 44 European spectrum usage rules

Note: * Belgium requires notifying the spectrum agency if deploying > 300 meter wireless links in outdoor public areas.

B.2.6 Certifications of other countries

The Wireless APs have been certified for use in various other countries. When the Wireless AP is connected to the Siemens HiPath Wireless Controller, the user is prompted to select a country code. Once the correct country code is selected, the controller automatically sets up the Wireless AP with the proper frequencies and power outputs for that country code.

Note: It is the responsibility of the end user to select the proper country code for the country the device will be operated within or run the risk violating local laws and regulations.

Optional 3rd party external antennas

The external antenna Wireless APs can also be used with optional certified 3rd party antennas. However, in order to comply with the local laws and regulations, an approval may be required by the local regulatory authorities.

Other country specific compliance standards, approvals and declarations

- IEC 60950-1 CB Scheme + National Deviations
- AS/NZS 60950.1 (Safety)
- AS/NZS 3548 (Emissions via EU standards – ACMA)
- AS/NZS 4288 (Radio via EU standards)
- EN 300 328 (2.4 GHz)
- EN 301 893 (5 GHz)
- EN 301 489-1 & -17 (RLAN)
- IEEE 802.11a (5 GHz)
- IEEE 802.11b/g (2.4 GHz)
- IEEE 802.11n (AP36XX)
- IEEE 802.3af (PoE)

C optiPoint WL2 Configuration

This appendix describes the recommended configuration for the optiPoint WL2 wireless telephone with the HiPath Wireless LAN Solution. In addition, corresponding configurations should be made on the PBX, if applicable.

Note: Update your optiPoint WL2 wireless telephone software to the latest available firmware. The following information in this appendix refers to an optiPoint WL2 telephone running firmware version 50.002.43.00079.

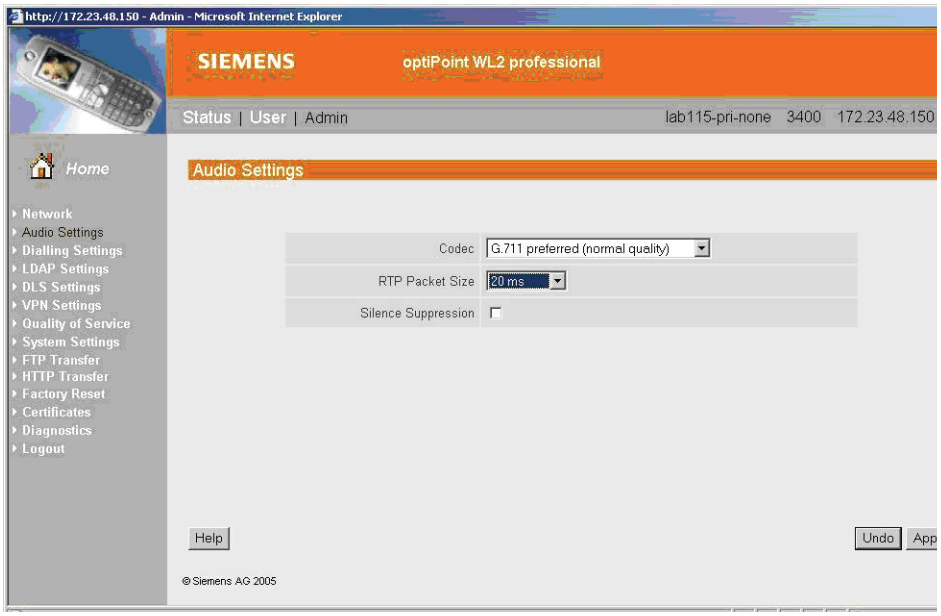
C.1 optiPoint WL2 wireless telephone configuration

To configure audio settings:

1. Launch your Web browser, and in the browser address bar type the optiPoint WL2's IP address. The **optiPoint WL2 professional Handset** page is displayed.
2. In the optiPoint WL2 professional menu, click **Admin**. The **Network: Profile Selection** page is displayed.
3. In the left pane, click **Audio Settings**. The Audio Settings page is displayed.
4. Configure the following audio settings:
   - In the **Codec** drop-down list, click **G.711 preferred (normal quality)**.

     The alternative **G729** codec would only provide a small increase in capacity at the expense of a significant increase in sensitivity to lost packets and degradation of quality.
   - In the **RTP Packet Size** drop-down list, click **20ms**.

     The **10ms** setting would not improve voice quality, but it would significantly decrease the per-AP voice capacity. The **30ms** setting would worsen the impact of lost packets while roaming.
   - Clear the **Silence Suppression** checkbox. The **Silence Suppression** option should be disabled.



To configure Quality of Service protocol settings:

1. In the left pane, click **Quality of Service**. The **Quality of Service: Protocol Settings** page is displayed.
2. Configure the following Quality of Service settings:
   - In the **DSCP Class for Voice** drop-down list, click **Expedited Forwarding** to ensure maximum voice priority.
   - In the **DSCP Class for Signalling** drop-down list, click **Best Effort**.

     Under normal conditions **Best Effort** ensures a more reliable delivery for Signaling than for Voice (more retries) at the expense of a potential higher delay.
   - In the **VLAN Settings** section, select **None**.

To configure WLAN settings:

1. In the left pane, click **Network**. The **Network: Profile Selection** page is displayed.
2. In the **List of Profiles**, click **Edit** for the profile you want to configure. The **Network: Profile Name** page is displayed.
3. In the left pane, click **WLAN**. The **Network: WLAN for profile** page is displayed.
4. Configure the following WLAN settings:
   - In the **Output Power (in%)** drop-down list, click **100**.

     Use the maximum **100%** unless there is a reason to reduce it.
   - In the **Transmission Rate** drop-down, click **Auto**.

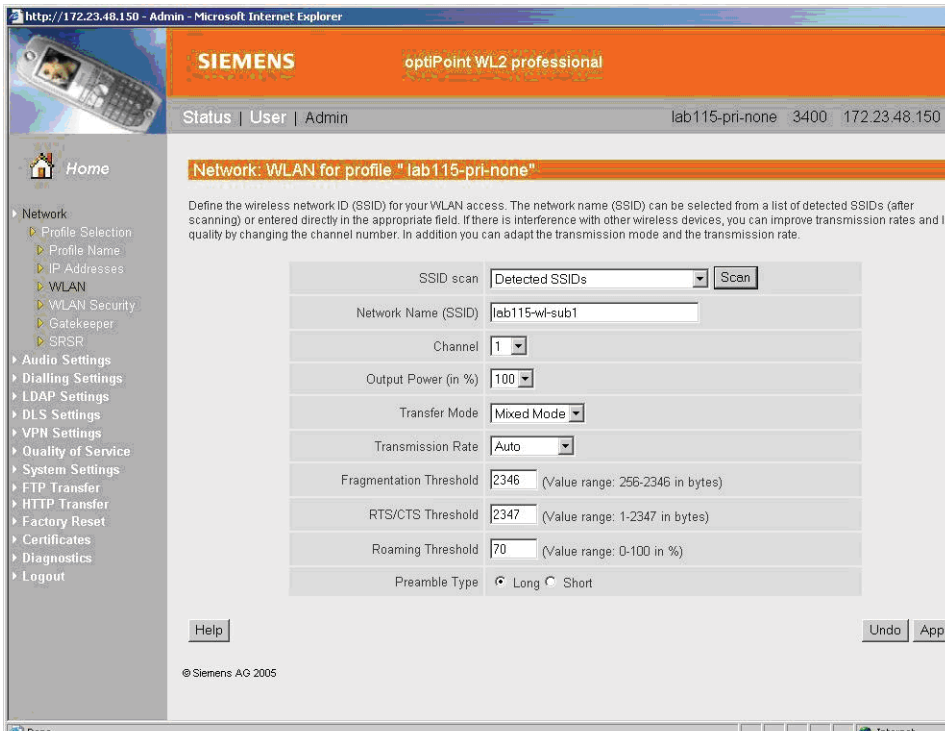
Note: When the **Transmission Rate** is set to a value, it does not force the phone to only use that particular PHY transmission rate. Instead, it forces the phone to only use PHY rates that are smaller or equal to the set rate.

   - In the **Fragmentation Threshold** box, ensure that the default value **2346** is used.
   - In the **RTS/CTS Threshold** box, ensure that the default value **2347** is used.
   - In the **Roaming Threshold** box, type a roaming threshold between the range of -75 dBm to -65 dBm, depending on the parameters of the deployment.

A larger value, for example -65 dBm will cause the phone to scan for alternate Wireless APs more often, which will result in more wireless traffic and slightly decreased battery life. A smaller value, for example -75 dBm will cause the phone to roam too late, causing voice interruptions during roaming.

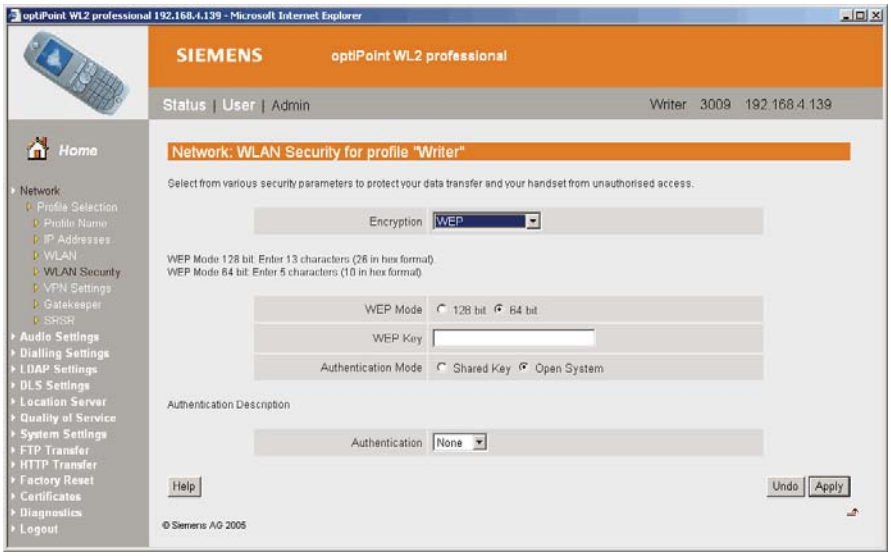
- In the **Preamble Type** section, select **Short**. The short preamble provides for higher voice capacity.

  If legacy pre-11b devices are present in the coverage area or you are unsure if legacy pre-11b devices are present in the coverage area, select **Long**.



To configure WLAN security settings:

1. In the left pane, click **Network**. The **Network: Profile Selection** page is displayed.
2. In the left pane, click **WLAN Security**. The **Network: WLAN Security for profile** page is displayed.
3. Configure the following WLAN security settings:
   - Click **WEP**.

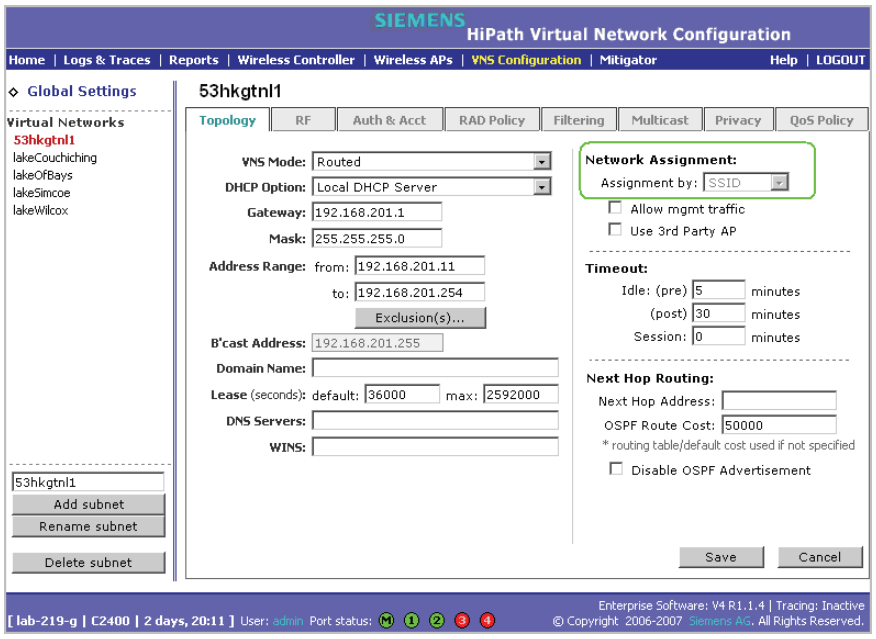


C.2 HiPath Wireless Controller configuration

The following settings must be configured on the HiPath Wireless Controller.

To configure a VNS topology:

1. From the main menu, click **Virtual Network Configuration**. The **Virtual Network Configuration** page is displayed.
2. Configure the following VNS topology settings:
   - A dedicated VNS must be used for WL2 phones. No other non-voice client should be allowed in this VNS.
   - In the **Assignment by** drop-down list, click **SSID**. The VNS must be a non-RADIUS VNS.



To configure privacy settings:

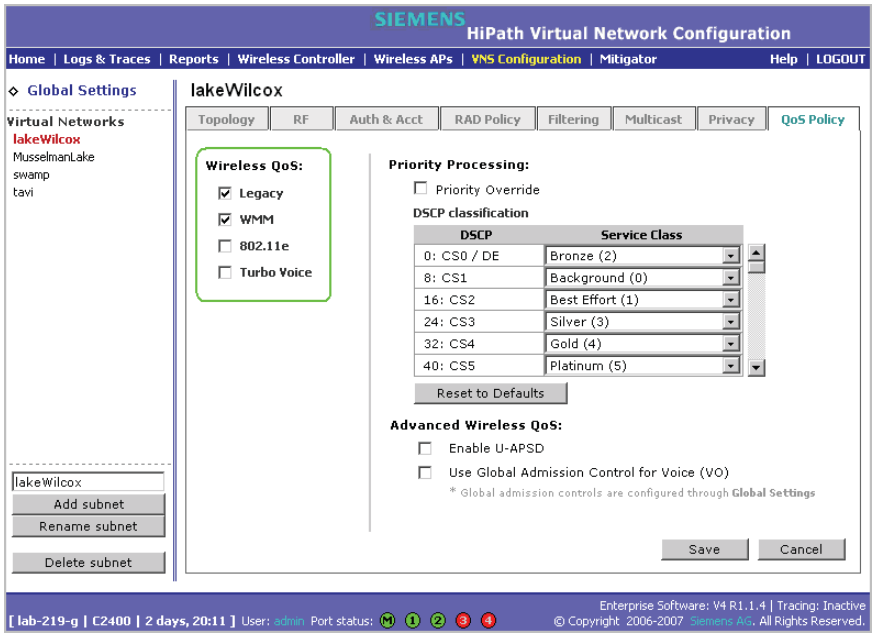
1. Click the **Privacy** tab.
2. Configure the following privacy settings:
   - The privacy settings on the HiPath Wireless Controller must match those on the optiPoint WL2 phone.
   - If the optiPoint WL2 phone is configured to use **WEP**, select the **Static Keys (WEP)** option for the VNS.

To configure QoS policy settings:

1. Click the **QoS Policy** tab.
2. Configure the following QoS policy settings:
   - For good voice quality and battery life, select **WMM**.
   - If the VNS is shared with legacy devices that require priority but do not support **WMM**, select **Legacy**.
   - If applicable, select **802.11e** or **Enable U-APSD**. (The next release of the optiPoint WL2 may require .11e support).

Note: The **Turbo Voice** and **Use Global Admission Control for Voice (VO)** options should be cleared. These options should not be used in the same VNS as the optiPoint WL2. These features are not currently supported on the optiPoint WL2.

- The **Priority Override** option should normally be cleared. If the phone and PBX are configured properly, the default DSCP classification should work well. If you are unsure, sniff the packets over the air and check that the voice packets are sent with priority 6 or 7 in both UL and DL directions.



To configure Wireless AP radio properties:

1. From the main menu, click **Wireless AP Configuration**. The **HiPath Wireless AP** page is displayed.
2. Click the applicable radio tab.
3. Configure the following radio settings:
   - In the **DTIM Period** box, type **5**.

     Note: A **DTIM Period** value of **1** may produce better results if significant RF interference exists in your environment. Use a **DTIM Period** value of **5** unless you notice a significant improvement when using a value of **1**.

   - In the **Beacon Period** box, type **100** (ms).
   - In the **RTS/CTS Threshold** box, ensure that the default value **2346** is used.
   - In the **Frag. Threshold** box, ensure that the default value **2346** is used.

- In the **Radio Mode** drop-down list, click **g**.

  Note: Enable 11b only if 11b devices are used on the same VNS as the optiPoint WL2 phone.

- In the **Rx Diveristy** drop-down list, click **Best**.
- In the **Tx Diversity** drop-down list, click **Best**.

  Note: If you experience variable or unstable signals, in the **Tx Diversity** drop-down list, click **Left**.

- In the **Min Basic Rate** drop-down list, click **1Mbps** if .11b is enabled.

  Note: Use a **Min Basic Rate** of **6Mbps** if you are using only optiPoint WL2 phones on the VNS, as this will increase the number of concurrent calls per AP. Use a **Min Basic Rate** of **2Mbps** or **1Mbps** if your site has sparse RF coverage.

- In the **Max Basic Rate** drop-down list, click the default maximum possible basic rate. For example, click **11Mbps** if you are using using **1** or **2 Mbps** as the **Min Basic Rate**. Otherwise, click **24Mbps**.
- In the **Max Operational Rate** drop-down list, click the default maximum rate. For example, **54Mbps**.
- In the **Preamble** drop-down list, click **Short**. The short preamble provides for higher voice capacity.

  If legacy pre-11b devices are present in the coverage area or you are unsure if legacy pre-11b devices are present in the coverage area, click **Long**.

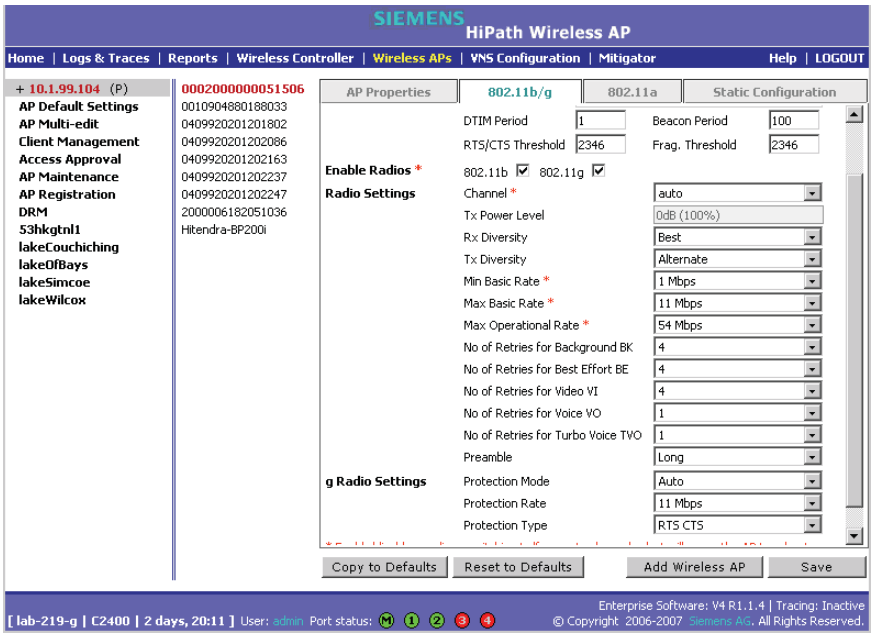
- In the **Total # of Tries for Background BK** drop-down list, click **adaptive (multi-rate)**.
- In the **Total # of Tries for Best Effort BE** drop-down list, click **adaptive (multi-rate)**.
- In the **Total # of Tries for Video VI** drop-down list, click **adaptive (multi-rate)**.
- In the **Total # of Tries for Voice VO** drop-down list, click **adaptive (multi-rate)**.

- In the **Total # of Tries for Turbo Voice TVO** drop-down list, click **adaptive (multi-rate)**.

Note: At a minimum, use **adaptive (multi-rate)** for **Total # of Tries for Best Effort BE** and **Total # of Tries for Voice VO** since this will significantly improve voice quality.

- In the **Protection Mode** drop-down list, click **Auto**.
- In the **Protection Rate** drop-down list, click **11 Mbps**.
- In the **Protection Type** drop-down list, click **CTS**. The CTS protection mode allows for higher voice capacity.

  If legacy pre-11b devices are present in the coverage area or you are unsure if legacy pre-11b devices are present in the coverage area, click **RTS CTS**. RTS CTS mode provides more robust protection.



D SpectraLink Wireless Telephones

The HiPath Wireless LAN Solution, consisting of the HiPath Wireless Controller, Wireless APs, and the HiPath Wireless Convergence Software, seamlessly integrates with SpectraLink Wireless Telephones to serve mobile voice and data requirements. The standards-based architecture of HiPath Wireless LAN provides an exceptional infrastructure for voice quality and handset-reliability to the SpectraLink telephones.

D.1 Network Topology

The following image depicts a typical network topology for SpectraLink telephones.

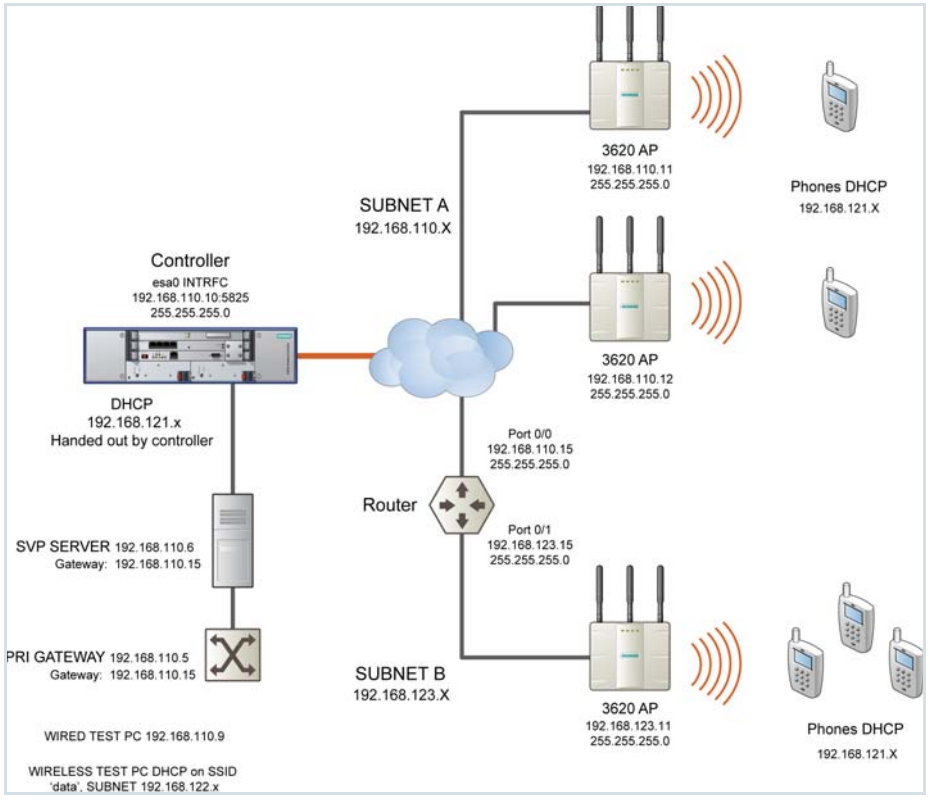


Figure 29 SpectraLink Network Topology

Note: The network topology depicted in Figure 29 is a dedicated network for SpectraLink Telephones. Other topologies are supported and can be used as required.

Note: For a successful deployment, all the network elements in the SpectraLink network should be provisioned to prioritize voice data.

D.2 Configuring HiPath Wireless Controller for SpectraLink Telephones

This section describes how to configure the HiPath Wireless Controller and Wireless APs for use with SpectraLink Wireless Telephones.

You have to configure the following features in the HiPath Wireless Controller to set it up for SpectraLink telephones:

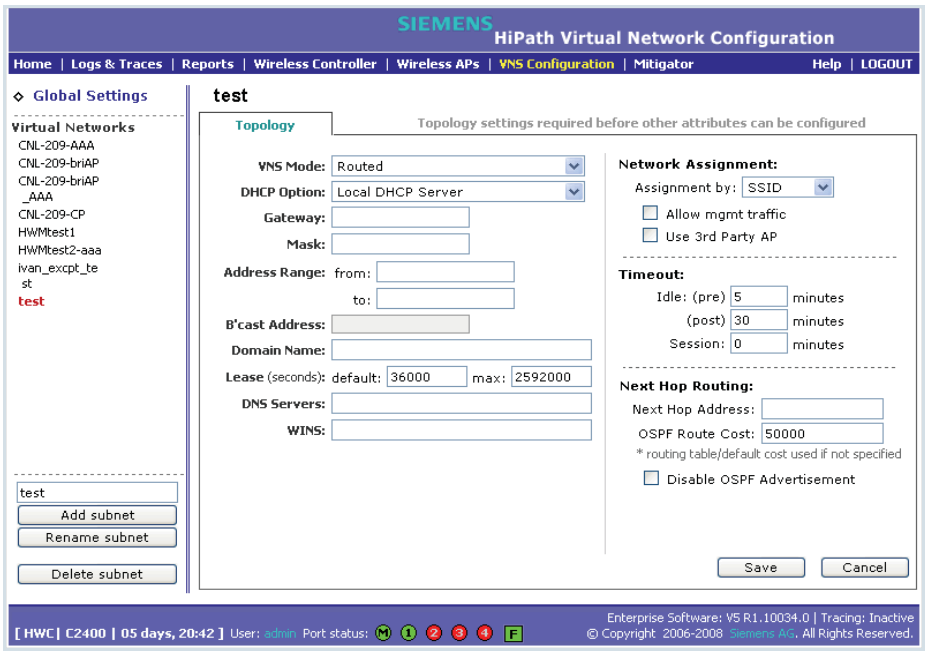
- Radio properties
- SSID
- Filters
- Multicast configuration
- Security
- Quality of Service (QoS)

Note: The configuration process for SpectraLink telephones applies identically to HiPath Wireless APs, HiPath Wireless Outdoor APs and HiPath Wireless 802.11n APs, unless specified otherwise.

D.2.1 Setting up SSID

To set up the SSID:

1. From the main menu, click **Virtual Network Configuration**. The **Virtual Network Configuration** screen is displayed.
2. In the left pane, type a name that will identify the new VNS in the **Add subnet** box.
3. Click **Add subnet**. The name is displayed in the **Virtual Networks** list. The **Topology** tab is displayed.



4. From the **VNS Mode** drop-down menu, select appropriate mode after considering the following details:

Note: It is recommended that you should choose **Bridge Traffic Locally at HWC** VNS for SpectraLink network deployment.

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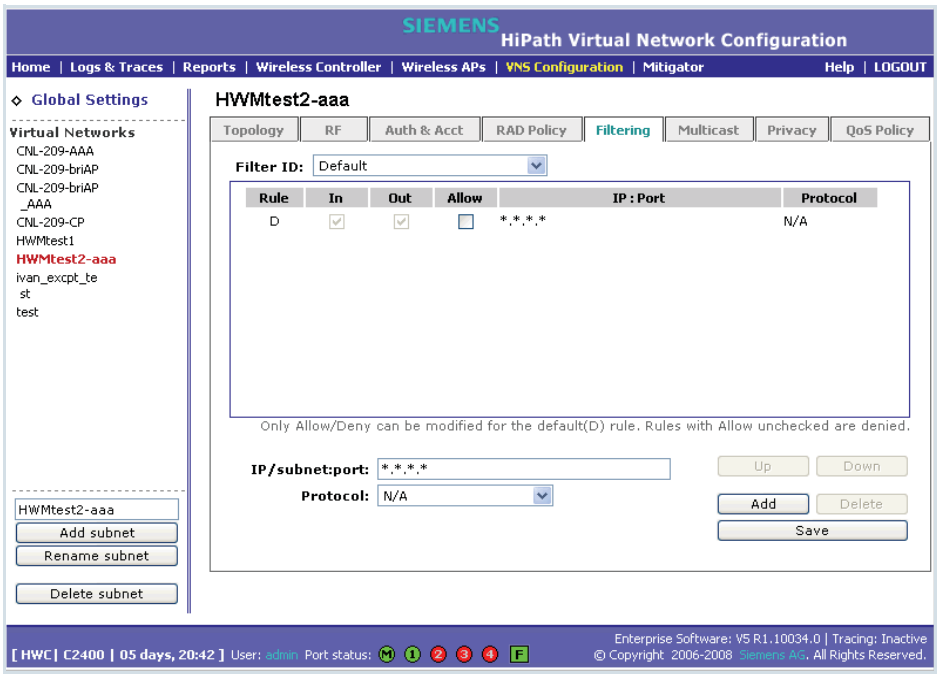
5. From the **DHCP Option** drop-down menu, you can select either the **Local DHCP Server** or **Use DHCP Relay**, depending upon your network topology.
6. In the **Gateway** box, type the network gateway address.
7. In the **Mask** box, type the appropriate values.
8. In the **Address Range** boxes (**from** and **to**), type the IP address range.
9. From the **Assignment Type** drop-down menu, select **SSID**.
10. Under **Timeout** section, type **2** in the **pre** and **post** boxes.
11. Under **Next Hop Routing** section, type **50000** in the **OSPF Route Cost** box.
12. Click **Save**.

D.2.2 Configuring filters

To configure the filters:

1. From the main menu, click **Virtual Network Configuration**. The **Virtual Network Configuration** screen is displayed.
2. On the **Virtual Network Configuration** screen, click the **Filtering** tab. The filtering rule for the **Default** filter is displayed in the centre pane.



3. Type the IP address of SVP server in **IP/Subnet:port** box.
4. From the **Protocol** drop-down menu, select **UDP**.
5. Click **Add**. The new filtering rule for the SVP server is displayed in the centre pane.
6. Click **Up**. The filtering rule for the SVP server moves up, before the filter rule for **Default** filter.
7. Type the IP address of SpectraLink Gateway in **IP/Subnet:port** box, and then repeat steps 4 to 6.
8. Add the filtering rules for the IP addresses of all network elements as explained in steps 3 to 6.

Note: You must ensure that all the filtering rules, including the ones for SVP/ Gateway and other network elements, are moved up, before the filtering rule for the **Default** filter.

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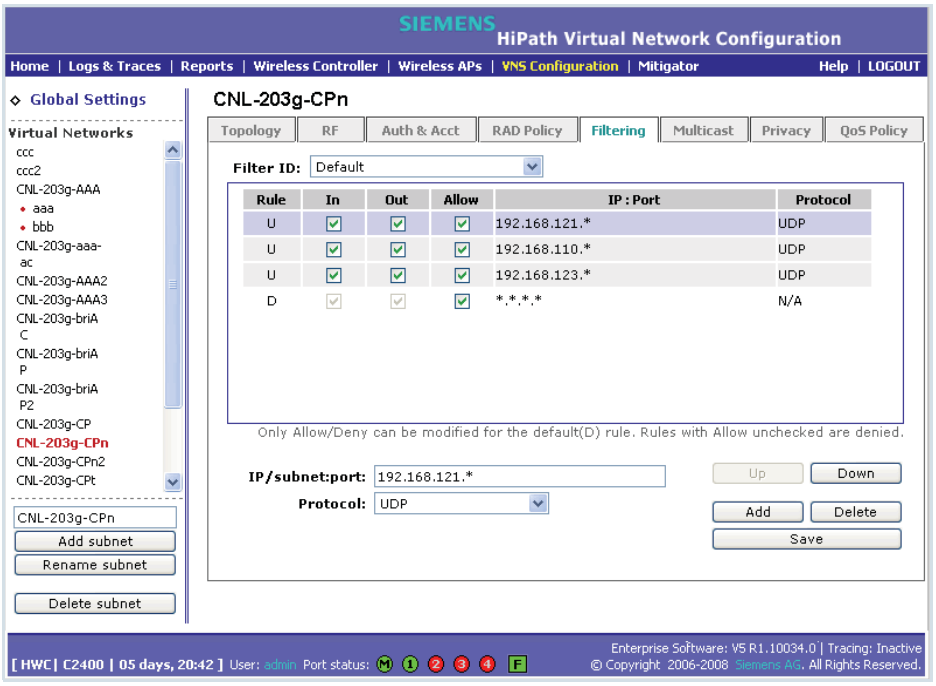
9. Select the **Allow** option of the **Default** filter.
10. Click **Save**.

The following screen-shot depicts how the configuration will appear in context of the network topology illustrated in Figure 29 on page 419.



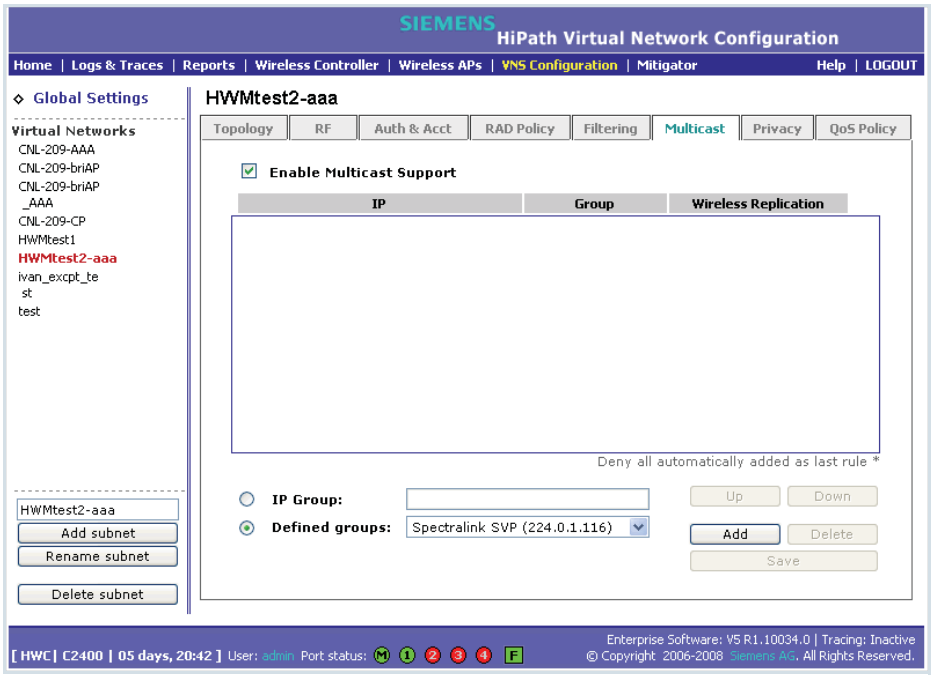
Note: You must complete the remaining configuration as explained in the subsequent sections, and then check if the deployment is working properly. If the deployment is working properly, you should deselect **Allow** option of the **Default** filter in order to secure the network
The secure setup in context of the network topology illustrated in Figure 29 on page 419 will be as follows:
• Allow 192.168.121.* UDP
• Allow 192.168.110.* UDP
• Allow 192.168.123.* UDP
• Disallow *.*.*.* N/A T

D.2.3 Setting up Multicast configuration

Note: Before you set up multicast configuration, you must specify the physical port for routing multicast traffic on the **Wireless Controller configuration** screen (**Wireless Controller Configuration**>**IP addresses**>.

To set up multicast configuration:

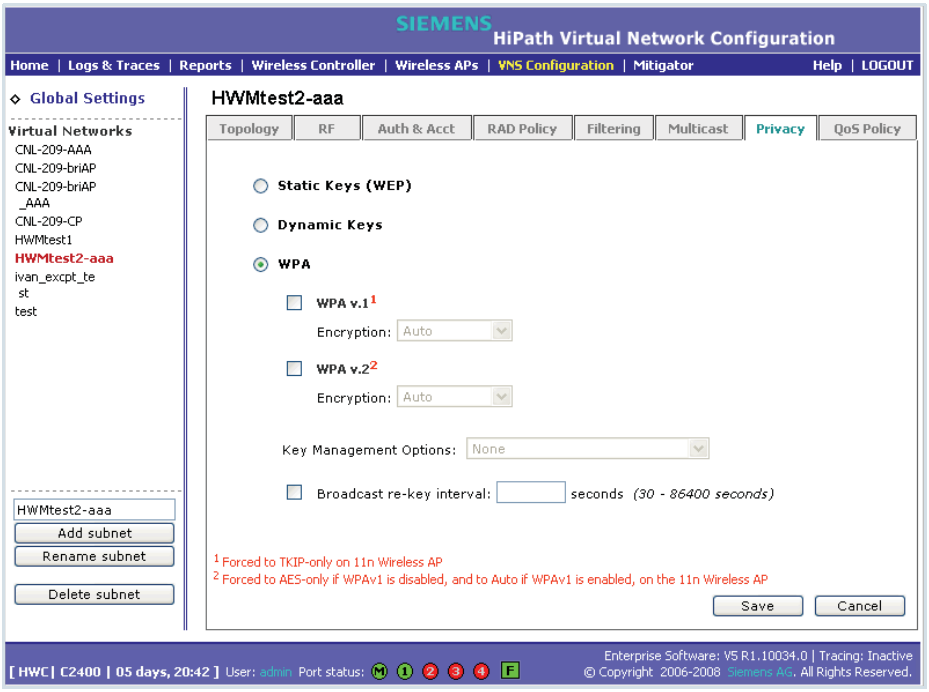
1. From the main menu, click **Virtual Network Configuration**. The **Virtual Network Configuration** screen is displayed.
2. On the **Virtual Network Configuration** screen, click the **Multicast** tab.
3. Select **Enable Multicast Support**.
4. From the **Defined groups** drop-down list, select **Spectralink SVP (224.0.1.116)** and then click **Add**.
5. Select **Wireless Replication** checkbox.
6. Click **Save** button.



D.2.4 Setting up Security

To set up the security:

1. From the main menu, click **Virtual Network Configuration**. The **Virtual Network Configuration** screen is displayed.
2. On the **Virtual Network Configuration** screen, click the **Privacy** tab.
3. Select the **WPA-PSK** radio button.



4. Select the **WPA v.2** radio button.
5. Under **WPA v.2** section, select **AES** only from the **Encryption** drop-down menu.

Note: The SpectraLinke telephones must also be for WPA v.2 security.

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6. Enter the appropriate pass phrase in the **Pre-shared** key field.
7. Click **Save**.

D.2.5 Setting up Quality of Service (QoS)

To set up Quality of Service (QoS):

1. From the main menu, click **Virtual Network Configuration**. The **Virtual Network Configuration** screen is displayed.
2. On the **Virtual Network Configuration** screen, click the **QoS Policy** tab.
3. Under the **Wireless QoS** section, select the following:
   - Legacy

- Turbo Voice

Note: If you are using HiPath Wireless APs and HiPath Wireless Outdoor APs, you must ensure that **Turbo Voice** QoS is selected to achieve best voice quality with the SpectraLink telephones.
Turbo Voice QoS does not have any effect on HiPath Wireless 802.11n APs as these APs provide best voice quality regardless of whether **Turbo Voice** QoS is selected or not.

Note: To achieve “higher call capacity”, you must ensure that **WMM** QoS is deselected.

Note: The HiPath Wireless 802.11n APs supports only the **WMM** QoS. If you are using 802.11n APs, and you want to achieve “higher call capacity”, you must ensure that **WMM** QoS is deselected.
The **Legacy**, **802.11e**, and **Turbo Voice** QoSs do not have any effect on the 802.11n APs regardless of whether these QoSs are selected or not.

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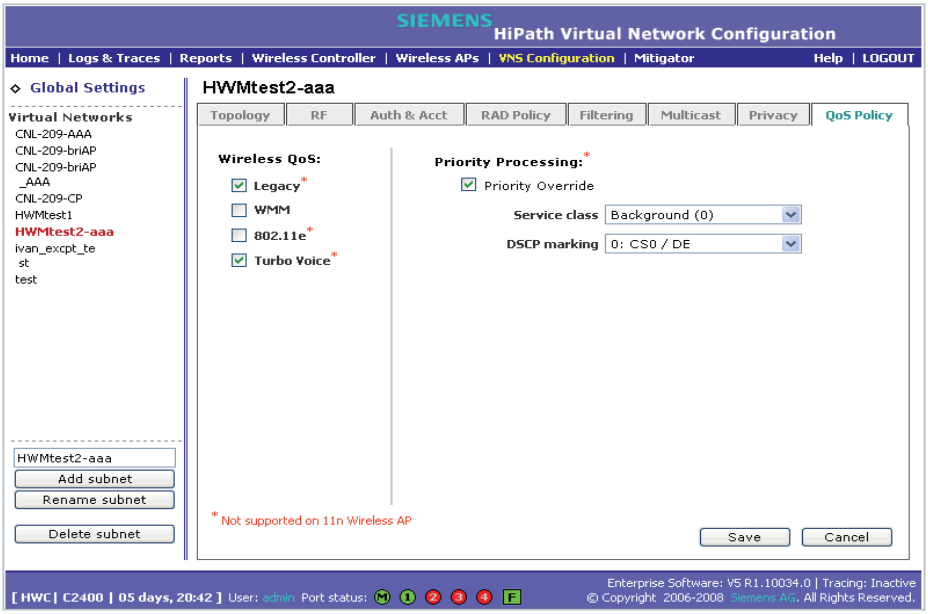
4. Under the **Priority Processing** section, select **Priority Override**.
5. Retain the default value in **Service Class** drop-down menu.
6. Retain the default value in **DSCP marking** drop-down menu.



7. Click **Save**.

D.2.6 Setting up Radio Properties

To set up the radio for Voice Wireless LAN in HiPath Wireless AP (Models 2610/2620):

1. From the main menu, click **Wireless AP Configuration**. The **Wireless AP Configuration** screen is displayed.
2. From the list of Wireless APs, select the Wireless AP that is being used for the Voice WLAN.
3. On the **Wireless AP Configuration** screen, click **802.11b/g** or **802.11a/g**, depending upon the radio that is being used for Voice WLAN.
4. Under **Base Settings**, set the **DTIM Period** to **3**:
5. Under **Basic Radio Settings**, set the following parameters:
   - **Tx Diversity**: Set the **Tx Diversity** to either **Left** or **Right**.
   - **Total # of retries for Voice VO**: Set the **Total # of retries for Voice VO** to **adaptive (multi-rate)**.

   Note: It is recommended that the **Tx Diversity** should be set to **Left**.
6. Retain the default values for all other parameters.
7. Click **Save**.

To set up the radio for Voice Wireless LAN in HiPath Wireless 802.11n APs (Models AP3610/3620):

1. From the main menu, click **Wireless AP Configuration**. The **Wireless AP Configuration** screen is displayed.
2. From the list of Wireless APs, select the Wireless 802.11n AP that is being used for the Voice WLAN.
3. On the **Wireless AP Configuration** screen, click **802.11b/g/n** or **802.11a/g/n**, depending upon the radio that is being used for Voice WLAN.
4. Under **Base Settings**, set the **DTIM Period** to **3**.
5. Retain the default values for all other parameters.
6. Click **Save**.

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