HiPath Wireless Controller, Access Points and Convergence Software, V4.0

C10/C100/C1000 User Guide

SIEMENS

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1P A31003-W1040-U101-1-7619

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Content

1 About this Guide

This guide describes how to install, configure, and manage the Controller, Access Points and Convergence Software software. This guide is also available as an online help system.

To access the online help system:

1. In the HiPath Wireless Assistant Main Menu bar, click **Help**. The About HiPath Wireless Assistant screen appears.
2. In the left pane, click **Controller Documentation**. The online help system is launched.

1.1 Who should use this guide

This guide is a reference for system administrators who install and manage the Controller, Access Points and Convergence Software system.

Any administrator performing tasks described in this guide must have an account with full administrative privileges.

1.2 What is in this guide

This guide contains the following:

- Chapter 1, “About this Guide”, describes the target audience and content of the guide, the formatting conventions used in it, and how to provide feedback on the guide.
- Chapter 2, “Regulatory information”, provides the regulatory information for the HiPath C10/C100/C1000/C2400 Wireless LAN Controllers and the AP2610 and AP2620 wireless access points.
- Chapter 3, “Overview of the Controller, Access Points and Convergence Software solution”, provides an overview of the product, its features and functionality.
- Chapter 4, “Configuring the HiPath Wireless Controller”, describes how to perform the installation, first-time setup and configuration of the HiPath Wireless Controller, as well as configuring the data ports and defining routing.
- Chapter 5, “Configuring the wireless AP”, describes how to install the Wireless AP, how it discovers and registers with the HiPath Wireless Controller, how to view and modify the radio configuration, and how to enable Dynamic Radio Frequency Management.
- Chapter 6, “Virtual Network Services”, provides an overview of Virtual Network Services (VNS), the mechanism by which the Controller, Access Points and Convergence Software controls and manages network access.

- Chapter 7, “Virtual Network configuration”, provides detailed instructions in how to configure a VNS, its topology, authentication, accounting, RADIUS policy, multicast, filtering and privacy. Both Captive Portal and AAA types of VNS are described.
- Chapter 8, “Availability, mobility, and controller functionality”, describes how to set up the features that provide availability in the event of a controller failover, and mobility for a wireless device user.
- Chapter 9, “Working with third-party APs”, describes how to use the Controller, Access Points and Convergence Software features with third-party wireless APs.
- Chapter 10, “Working with the Mitigator”, explains the security tool that scans for, detects and reports on rogue access points.
- Chapter 12, “Performing system maintenance”, describes maintenance activities, such as software upgrades on both the HiPath Wireless Controller and the Wireless AP. This chapter also includes information on the logs, traces, reports and displays available.
- Chapter 13, “Glossary”, contains a list of terms and definitions for the HiPath Wireless Controller and the Wireless AP as well as standard industry terms used in this guide.
- Appendix A, “System states and LEDs”, provides a reference on the LED displays and their significance.

1.3 Formatting conventions

The Controller, Access Points and Convergence Software documentation uses the following formatting conventions to make it easier to find information and follow procedures:

- **Bold** text is used to identify components of the management interface, such as menu items and section of pages, as well as the names of buttons and text boxes.

  For example: Click **Logout**.
- `Monospace` font is used in code examples and to indicate text that you type.

  For example: Type `https://<hwc-address>[:mgmt-port>]`
- The following symbols are used to draw your attention to additional information:

> ⓘ Notes identify useful information that is not essential, such as reminders, tips, or other ways to perform a task.

> ⚠ Warnings identify information that is essential. Ignoring a warning can adversely affect the operation of your equipment or software.

1.4 Documentation feedback

If you have any problems using this document, please contact your next level of support:

- Siemens employees should contact the interactive Customer Engagement Team (i-CET).
- Customers should contact the Siemens Customer Support Center.

When you call, please have the following information ready. This will help us to identify the document that you are referring to.

- Title: HiPath Wireless Controller, Access Points and Convergence Software V4.0 C10/C100/C1000 User Guide
- Part Number: A31003-W1040-U101-1-7619

1.5 Safety Information

Dangers

- Replace the power cable immediately if it shows any sign of damage.
- Replace any damaged safety equipment (covers, labels and protective cables) immediately.
- Use only original accessories or components approved for the system. Failure to observe these instructions may damage the equipment or even violate safety and EMC regulations.
- Only authorized Siemens service personnel are permitted to service the system.

Warnings

- This device must not be connected to a LAN segment with outdoor wiring.
- Ensure that all cables are run correctly to avoid strain.
- Replace the power supply adapter immediately if it shows any sign of damage.
- Disconnect all power before working near power supplies unless otherwise instructed by a maintenance procedure.
- Exercise caution when servicing the hot swappable power supply of the HiPath Wireless Controller (C100/C1000).
- Exercise caution when servicing hot swappable HiPath Wireless Controller components: power supplies or fans. Rotating fans can cause serious personal injury.

- This unit may have more than one power supply cord. To avoid electrical shock, disconnect all power supply cords before servicing. In the case of unit failure of one of the power supply modules, the module can be replaced without interruption of power to the HiPath Wireless Controller. However, this procedure must be carried out with caution. Wear gloves to avoid contact with the module, which will be extremely hot.
- There is a risk of explosion if a lithium battery is not correctly replaced. The lithium battery must be replaced only by an identical battery or one recommended by the manufacturer.
- Always dispose of lithium batteries properly.
- Do not attempt to lift objects that you think are too heavy for you.

Cautions

- Check the nominal voltage set for the equipment (operating instructions and type plate). High voltages capable of causing shock are used in this equipment. Exercise caution when measuring high voltages and when servicing cards, panels, and boards while the system is powered on.
- Only use tools and equipment that are in perfect condition. Do not use equipment with visible damage.
- To protect electrostatic sensitive devices (ESD), wear a wristband before carrying out any work on hardware.
- Lay cables so as to prevent any risk of them being damaged or causing accidents, such as tripping.

1.6 Sicherheitshinweise

Gefahrenhinweise

- Sollte das Netzkabel Anzeichen von Beschädigungen aufweisen, tauschen Sie es sofort aus.
- Tauschen Sie beschädigte Sicherheitsausrüstungen (Abdeckungen, Typenschilder und Schutzkabel) sofort aus.
- Verwenden Sie ausschließlich Originalzubehör oder systemspezifisch zugelassene Komponenten. Die Nichtbeachtung dieser Hinweise kann zur Beschädigung der Ausrüstung oder zur Verletzung von Sicherheits- und EMV-Vorschriften führen.
- Das System darf nur von autorisiertem Siemens-Servicepersonal gewartet werden.

Warnhinweise

- Dieses Gerät darf nicht über Außenverdrahtung an ein LAN-Segment angeschlossen werden.
- Stellen Sie sicher, dass alle Kabel korrekt geführt werden, um Zugbelastung zu vermeiden.
- Sollte das Netzteil Anzeichen von Beschädigung aufweisen, tauschen Sie es sofort aus.
- Trennen Sie alle Stromverbindungen, bevor Sie Arbeiten im Bereich der Stromversorgung vornehmen, sofern dies nicht für eine Wartungsprozedur anders verlangt wird.
- Gehen Sie vorsichtig vor, wenn Sie an der Hotswap-fähigen Stromversorgung des HiPath Wireless Controllers (C100/C1000) Servicearbeiten durchführen.
- Gehen Sie vorsichtig vor, wenn Sie an Hotswap-fähigen HiPath Wireless Controller-Komponenten (Stromversorgungen oder Lüftern) Servicearbeiten durchführen. Rotierende Lüfter können ernsthafte Verletzungen verursachen.
- Dieses Gerät ist möglicherweise über mehr als ein Netzkabel angeschlossen. Um die Gefahr eines elektrischen Schlages zu vermeiden, sollten Sie vor Durchführung von Servicearbeiten alle Netzkabel trennen. Falls eines der Stromversorgungsmodule ausfällt, kann es ausgetauscht werden, ohne die Stromversorgung zum HiPath Wireless Controller zu unterbrechen. Bei dieser Prozedur ist jedoch mit Vorsicht vorzugehen. Das Modul kann extrem heiß sein. Tragen Sie Handschuhe, um Verbrennungen zu vermeiden.
- Bei unsachgemäßem Austausch der Lithium-Batterie besteht Explosionsgefahr. Die Lithium-Batterie darf nur durch identische oder vom Händler empfohlene Typen ersetzt werden.
- Achten Sie bei Lithium-Batterien auf die ordnungsgemäße Entsorgung.
- Versuchen Sie niemals, ohne Hilfe schwere Gegenstände zu heben.

Vorsichtshinweise

- Überprüfen Sie die für die Ausrüstung festgelegte Nennspannung (Bedienungsanleitung und Typenschild). Diese Ausrüstung arbeitet mit Hochspannung, die mit der Gefahr eines elektrischen Schlages verbunden ist. Gehen Sie mit großer Vorsicht vor, wenn Sie bei eingeschaltetem System Hochspannungen messen oder Karten, Schalttafeln und Baugruppen warten.
- Verwenden Sie nur Werkzeuge und Ausrüstung in einwandfreiem Zustand. Verwenden Sie keine Ausrüstung mit sichtbaren Beschädigungen.
- Tragen Sie bei Arbeiten an Hardwarekomponenten ein Armband, um elektrostatisch gefährdete Bauelemente (EGB) vor Beschädigungen zu schützen.
- Verlegen Sie Leitungen so, dass sie keine Unfallquelle (Stolpergefahr) bilden und nicht beschädigt werden.

1.7 Consignes de sécurité

Dangers

- Si le cordon de raccordement au secteur est endommagé, remplacez-le immédiatement.
- Remplacez sans délai les équipements de sécurité endommagés (caches, étiquettes et conducteurs de protection).
- Utilisez uniquement les accessoires d'origine ou les modules agréés spécifiques au système. Dans le cas contraire, vous risquez d'endommager l'installation ou d'enfreindre les consignes en matière de sécurité et de compatibilité électromagnétique.
- Seul le personnel de service Siemens est autorisé à maintenir/réparer le système.

Avertissements

- Cet appareil ne doit pas être connecté à un segment de LAN à l'aide d'un câblage extérieur.
- Vérifiez que tous les câbles fonctionnent correctement pour éviter une contrainte excessive.
- Si l'adaptateur d'alimentation présente des dommages, remplacez-le immédiatement.
- Coupez toujours l'alimentation avant de travailler sur les alimentations électriques, sauf si la procédure de maintenance mentionne le contraire.
- Prenez toutes les précautions nécessaires lors de l'entretien/des réparations du module d'alimentation du HiPath Wireless Controller pouvant être branché à chaud (C100/C1000).
- Prenez toutes les précautions nécessaires lors de l'entretien/réparations des modules du HiPath Wireless Controller pouvant être branchés à chaud : alimentations électriques ou ventilateurs.Les ventilateurs rotatifs peuvent provoquer des blessures graves.
- Cette unité peut avoir plusieurs cordons d'alimentation.Pour éviter tout choc électrique, débranchez tous les cordons d'alimentation avant de procéder à la maintenance.En cas de panne d'un des modules d'alimentation, le module défectueux peut être changé sans éteindre le HiPath Wireless Controller. Toutefois, ce remplacement doit être effectué avec précautions. Portez des gants pour éviter de toucher le module qui peut être très chaud.
- Le remplacement non conforme de la batterie au lithium peut provoquer une explosion. Remplacez la batterie au lithium par un modèle identique ou par un modèle recommandé par le revendeur.
- Sa mise au rebut doit être conforme aux prescriptions en vigueur.
- N'essayez jamais de soulever des objets qui risquent d'être trop lourds pour vous.

Précautions

- Contrôlez la tension nominale paramétrée sur l'installation (voir le mode d'emploi et la plaque signalétique). Des tensions élevées pouvant entraîner des chocs électriques sont utilisées dans cet équipement. Lorsque le système est sous tension, prenez toutes les précautions nécessaires lors de la mesure des hautes tensions et de l'entretien/réparation des cartes, des panneaux, des plaques.
- N'utilisez que des appareils et des outils en parfait état. Ne mettez jamais en service des appareils présentant des dommages visibles.
- Pour protéger les dispositifs sensibles à l'électricité statique, portez un bracelet antistatique lors du travail sur le matériel.
- Acheminez les câbles de manière à ce qu'ils ne puissent pas être endommagés et qu'ils ne constituent pas une source de danger (par exemple, en provoquant la chute de personnes).

2 Regulatory information

> ⚠ 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 C10/C100/C1000/C2400 and the AP2610 and AP2620 (AP26XX series) wireless access points.

Configuration of the AP26XX frequencies and power output are controlled by the regional software purchased with the HiPath Wireless Controller and is downloaded from the server upon initial set-up. Customers are only allowed to download the software related to that customers geographic location, thus allowing the proper set-up of Access Points in accordance with local laws and regulations. The AP26XX must not be operated until proper regional software is downloaded and properly configured.

> ⚠ 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.

2.1 WLAN HiPath Wireless Controller C10/C100/C1000/C2400

> ⚠ The HiPath Wireless Controllers 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.

Conformance Standards

Safety

- cULus Listed Device UL 60950:2000, 3rd Edition (North America)
- CSA C22.2 No.60950:2000, 3rd Edition (Canadian Safety)
- 73/23/EEC Low Voltage Directive (LVD)
- EN 60950-1:2001 (European Safety)
- CB Certification: IEC 60950:1999, 3rd Edition with applicable National Differences

- AS/NZS 3260 (Australia/New Zealand ACMA Safety of ITE)
- US 21 CFR Subpart J 1002.10, 1002.12 (Safety of Laser Products)
- CDRH Letter of Approval (US FDA Laser Approval)
- IEC/EN 60825 (Safety of Laser Products)

EMC (Emissions / Immunity)

- FCC Part 15, Subpart B, Class A (North America)
- ICES-003, Class A (Canadian Emissions)
- 89/336/EEC EMC Directive
- EN 55022:1998 A2:2003 Class A (European Emissions)
- EN 55024:1998 A2:2003 includes EN 61000-2,3,4,5,6,11 (European Immunity)
- EN 61000-3-2:2000 Class A (Harmonics)
- EN 61000-3-3:1995 A1:2001 (Flicker)
- IEC/CISPR 22:1997 Class A (International Emissions)
- IEC/CISPR 24:1998 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

2.2 AP2610 Internal Antenna AP, AP2620 External Antenna AP

The AP26XX is Wi-Fi certified under Certification ID # WOO2422 for operation in accordance with IEEE 802.11a/b/g. The AP26XX wireless access points with Internal and External antennas are designed and intended to be used indoors.

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

2.2.1 United States - 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.

This equipment meets the following conformance standards:

USA Conformance Standards

Safety

- UL 60950-1:2003, 1st Edition
- UL 2043 Plenum Rated as part of UL 60950. 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

- FCC ID: REB-APXXX1
- 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 802.3af (PoE)

> The AP26XX must be installed and used in strict accordance with the manufacturer's instructions as described in this guide and the quick start guide for the device to which AP26XX is connected. Any other installation or use of the product violates FCC Part 15 regulations.
>
> According to FCC, the AP2610 with internal antenna can use the UNII 5.15 - 5.25 GHz band only with indoor installations in accordance with 47 CFR 15.407(e). AP2620 with external antenna is not allowed to operate in this band in accordance with 47 CFR 15.407(d).
>
> 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.

2.2.1.1 FCC RF Radiation Exposure Statement

The AP26XX access point 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.

> The radiated output power of the AP26XX is far 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 20 centimeters (8 inches) between the radiator and your body or other co-located operating antennas.

2.2.2 Canada - 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: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation. This Class B digital apparatus complies with Canadian ICES-003.

This equipment meets the following conformance standards:

Canada Conformance Standards

Safety

- cULus Listed C22.2 No.60950-1-03, 1st Edition
- UL 2043 Plenum Rated as part of UL 60950. 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

- IC: 4702A-APXXXX
- RSS-210 (2.4 GHz and 5GHz)

Other

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

2.2.3 European Community

The AP26XX are wireless access points 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 access point 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 enter a country code. After the country code is entered, the controller will set up the wireless access point 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 AP26XX is intended for indoor use and must be installed in a proper indoor location. Use the installation utility provided with the controller software to insure 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 (!)

⚠	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.

2.2.3.1 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, dass sich dieser/diese/dieses Radio LAN device in Übereinstimmung mit den grundlegenden Anforderungen und den anderen relevanten Vorschriften der Richtlinie 1999/5/EG befindet". (BMWi)

Hiermit erklärt Siemens die Übereinstimmung des Gerätes Radio LAN device mit den grundlegenden Anforderungen und den anderen relevanten Festlegungen der Richtlinie 1999/5/EG. (Wien).

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, _e Radio LAN device spåòa základné po_iadavky a všetky príslušné ustanovenia Smernice 1999/5/ES.

Czech Siemens tímto prohlašuje, _e tento Radio LAN device je ve shodì se základními po_adavky a dalšími pøíslušnými ustanoveními smìrnice 1999/5/ES."

Slovenian Šiuo Siemens deklaruoja, kad šis Radio LAN device atitinka esminius reikalavimus ir kitas 1999/5/EB Direktyvos nuostatas.

Latvian Ar ðo Siemens deklarç, ka Radio LAN device atbilst Direktîvas 1999/5/EK bûtiskajâm prasîbâm un citiem ar to saistîtajiem noteikumiem

Lithuanian Siemens deklaruoja, kad Radio LAN device atitinka 1999/5/EC Direktyvos esminius reikalavimus ir kitas nuostatas".

Polish Niniejszym, Siemens, deklarujê, ¿e Radio LAN device spe³nia wymagania zasadnicze oraz stosowne postanowienia zawarte Dyrektywie 1999/5/EC.

European Conformance Standards

Safety

- 73/23/EEC Low Voltage Directive (LVD)
- CB Scheme, IEC 60950-1:2001, 1st Edition with all available National Differences
- Plenum Rated Enclosure

EMC (Emissions / Immunity)

- 89/336/EEC EMC Directive
- EN 55011/CISPR 11, Class B, Group 1 ISM
- EN 55022/CISPR 22, Class B
- EN 55024:1998 Class A, includes IEC/EN 61000-4-2,3,4,5,6,11
- EN 61000-3-2 and -3-3
- EN 60601-1-2 (EMC immunity for medical equipment)
- EN 50385 (EMF)
- EN/ETSI 301 489-1 & -17

Radio Transceiver

- R&TTE Directive 1999/5/EC
- ETSI/EN 300 328-2 2003-04 (2.4 GHz)
- ETSI/EN 301 893-1 2002-07 (5 GHz)

Other

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

RoHS

- European Directive 2002/95/EC

2.2.4 Conditions of Use in the European Community

The AP26XX wireless access points 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 insure operation in accordance with these rules, frequencies, and transmitter power output. The AP26XX must not be operated until proper regional software is downloaded.

⚠ The user or installer is responsible to ensure that he AP26XX 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 AP26XX wireless access points 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 for indoor use. These restrictions are described in this section.

ⓘ The AP26XX is completely configured and managed by the HiPath Wireless Controller connected to the network. Please follow the instructions in this software User Guide to properly configure the AP26XX.

- The AP2610 and AP2620 wireless access points require the end user or installer to ensure that they have a valid license prior to operating the AP26XX. 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 AP26XX 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 current country code entered. Incorrectly entering the 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 AP2610 and AP2620 access points.
- The AutoChannelSelect/SmartSelect 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 AP2620 with external antenna must be used only with the factory installed antennas, which 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 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.

2.2.5 Certifications of Other Countries

The AP2610 and AP2620 wireless access points have been certified for use in the countries listed in the table below. When the AP26XX is connected to the Siemens controller, the user is prompted to enter a country code. Once the correct country code is entered, the controller automatically sets up the AP26XX with the proper frequencies and power outputs for that country code.

> It is the responsibility of the end user to enter the proper country code for the country the device will be operated within.

Other Country Specific Compliance Standards, Approvals and Declarations

Australia and New Zealand

- AS/NZS 4288 (Radio via EU standards)
- AS/NZX 3260 (Safety via EU standards - ACMA)
- AS/NZS 3548 (Emissions via EU standards - ACMA)
- IEEE 802.11a/b/g
- IEEE 802.3af (PoE)
- EN 300 328-2:2003-04 (2.4 GHz)
- EN 301 893-1:2003-08 (5 GHz)
- EN 301 489-17:2002-08 (RLAN)
- IEC 60950-1:2001, 1st Edition with Australian Deviations

List of Supported 5 GHz Channels

Countries	**Supported Frequency Bands**	**Supported Channel Numbers**
Kuwait, Pakistan, Russia, Thailand, U.A.E., Venezuela, Vietnam	5 GHz Operation Not Supported	None
Australia	5.15-5.35 GHz 5.725-5.825 GHz	36, 40, 44, 48, 52, 56, 60, 64, 149, 153, 157, 161

Table 1 List of Permitted 5 GHz Channels for Other Countries

Countries	Supported Frequency Bands	Supported Channel Numbers
Brazil	5.15-5.35 GHz 5.470-5.725 GHz	36, 40, 44, 48, 52, 56, 60, 64, 100, 104, 108, 112, 116, 120, 124, 128, 132, 136, 140, 149, 153, 157, 161, 165
Chile, Hong Kong, India, New Zealand, Singapore	5.15-5.35 GHz 5.725-5.850 GHz	36, 40, 44, 48, 52, 56, 60, 64,149, 153, 157, 161, 165
Argentina, China, Macau	5.725-5.850 GHz	149, 153, 157, 161, 165
Japan, Mexico, Turkey	5.15-5.35 GHz	36, 40, 44, 48, 52, 56, 60, 64
Malaysia	5.25-5.35 GHz 5.725-5.850 GHz	52, 56, 60, 64, 149, 153, 157, 161, 165
S. Africa	5.15-5.35 GHz 5.470-5-725 GHz	36, 40, 44, 48, 52, 56, 60, 64, 100, 104, 108, 112, 116, 120, 124, 128, 132, 136, 140
S. Korea	5.15-5.35 GHz 5.47-5.60 GHz 5.725-5.825 GHz	36, 40, 44, 48, 52, 56, 60, 64, 100, 104, 108, 112, 116, 149, 153, 157, 161
Taiwan	5.25-5.35 GHz 5.470-5.725 GHz 5.725-5.825 GHz	56, 60, 64, 100, 104, 108, 112, 116, 120, 124, 128, 132, 136, 140,149, 153, 157, 161

Table 1 List of Permitted 5 GHz Channels for Other Countries

3 Overview of the Controller, Access Points and Convergence Software solution

This chapter describes HiPath Controller, Access Points and Convergence Software concepts, including:

- Conventional wireless LANS
- Elements of the solution
- Controller, Access Points and Convergence Software and your network
- System Configuration Overview

The next generation of Siemens wireless networking devices provides a truly scalable WLAN solution. Siemens Wireless APs are fit access points controlled through a sophisticated network device, the HiPath Wireless Controller. This solution provides the security and manageability required by enterprises and service providers.

The Controller, Access Points and Convergence Software system is a highly scalable Wireless Local Area Network (WLAN) solution developed by Siemens. Based on a third generation WLAN topology, the Controller, Access Points and Convergence Software system makes wireless practical for service providers as well as medium and large-scale enterprises.

The Controller, Access Points and Convergence Software system provides a secure, highly scalable, cost-effective solution based on the IEEE 802.11 standard. The system is intended for enterprise networks operating on multiple floors in more than one building, and is ideal for public environments, such as airports and convention centers that require multiple access points.

This chapter provides an overview of the fundamental principles of the Controller, Access Points and Convergence Software system.

3.1 Conventional wireless LANS

Wireless communication between multiple computers requires that each computer is equipped with a receiver/transmitter—a WLAN Network Interface Card (NIC)—capable of exchanging digital information over a common radio frequency. This is called an ad hoc network configuration. An ad hoc network configuration allows wireless devices to communicate together. This setup is defined as an independent basic service set (IBSS).

An alternative to the ad hoc configuration is the use of an access point. This may be a dedicated hardware bridge or a computer running special software. Computers and other wireless devices communicate with each other through this access point. The 802.11 standard defines access point communications as devices that allow wireless devices to communicate with a distribution system. This setup is defined as a basic service set (BSS) or infrastructure network.

To allow the wireless devices to communicate with computers on a wired network, the access points must be connected to the wired network providing access to the networked computers. This topology is called bridging. With bridging, security and management scalability is often a concern.

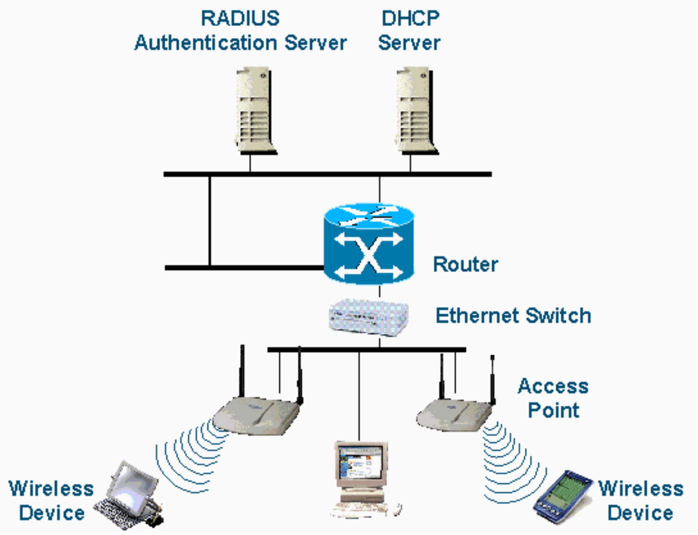


Figure 1 Standard wireless network solution example

The wireless devices and the wired networks communicate with each other using standard networking protocols and addressing schemes. Most commonly, Internet Protocol (IP) addressing is used.

3.2 Elements of the solution

The Controller, Access Points and Convergence Software solution consists of two devices:

- HiPath Wireless Controller
- wireless APs

This architecture allows a single HiPath Wireless Controller to control many Wireless APs, making the administration and management of large networks much easier.

There can be several HiPath Wireless Controllers in the network, each with a set of registered Wireless APs. The HiPath Wireless Controllers can also act as backups to each other, providing stable network availability.

In addition to the HiPath Wireless Controllers and Wireless APs, the solution requires three other components, all of which are standard for enterprise and service provider networks:

- RADIUS Server (Remote Access Dial-In User Service) or other authentication server
- DHCP Server (Dynamic Host Configuration Protocol)

- SLP (Service Location Protocol)

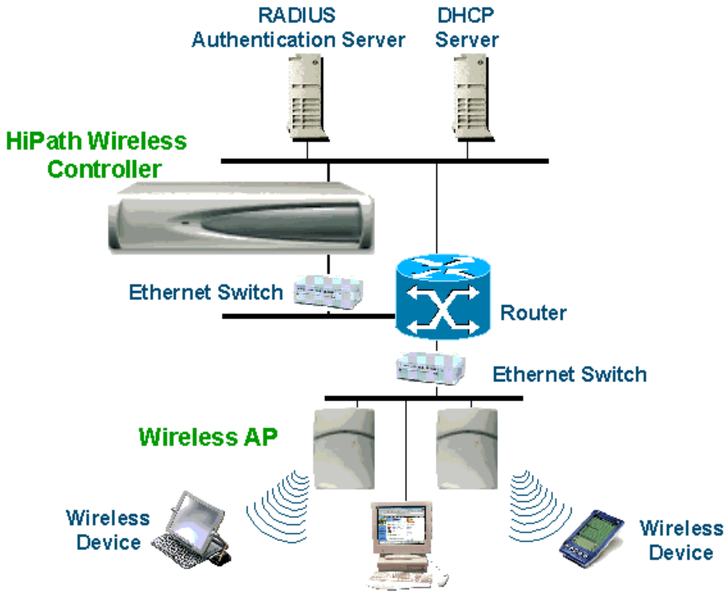


Figure 2 Siemens solution

As illustrated in Figure 2, the HiPath Wireless Controller appears to the existing network as if it were an access point, but in fact one HiPath Wireless Controller controls many Wireless APs.

The HiPath Wireless Controller has built-in capabilities to recognize and manage the Wireless APs. The HiPath Wireless Controller:

- Activates the Wireless APs
- Enables Wireless APs to receive wireless traffic from wireless devices
- Processes the data traffic from the Wireless APs
- Forwards or routes the processed data traffic out to the network
- Authenticates requests and applies access policies

Simplifying the Wireless APs makes them cost-effective, easy to manage, and easy to deploy. Putting control on an intelligent centralized HiPath Wireless Controller enables:

- Centralized configuration, management, reporting, and maintenance
- High security
- Flexibility to suit enterprise
- Scalable and resilient deployments with a few HiPath Wireless Controllers controlling hundreds of Wireless APs

The Controller, Access Points and Convergence Software system:

- **Scales up to Enterprise capacity –** One HiPath Wireless Controller (C1000 model) controls as many as 200 Wireless APs.One HiPath Wireless Controller C2400 controls as many as 200 Wireless APs. In turn each Wireless AP can handle up to 254 wireless devices, with each radio supporting a maximum of 128. With additional HiPath Wireless Controllers, the number of wireless devices the solution can support can reach into the thousands.
- **Integrates with existing network –** A HiPath Wireless Controller can be added to an existing enterprise network as a new network device, greatly enhancing its capability without interfering with existing functionality. Integration of the HiPath Wireless Controllers and Wireless APs does not require any reconfiguration of the existing infrastructure (for example, VLANs).
- **Offers centralized management and control –** An administrator accesses the HiPath Wireless Controller in its centralized location to monitor and administer the entire wireless network. From the HiPath Wireless Controller the administrator can recognize, configure, and manage the Wireless APs and distribute new software releases.
- **Provides easy deployment of Wireless APs –** The initial configuration of the Wireless APs on the centralized HiPath Wireless Controller can be done with an automatic “discovery” technique. For more information, see Section 5.2, “Discovery and registration overview”, on page 71.
- **Provides security via user authentication –** Uses existing authentication (AAA) servers to authenticate and authorize users.
- **Provides security via filters and privileges –** Uses virtual networking techniques to create separate virtual networks with defined authentication and billing services, access policies, and privileges.
- **Supports seamless mobility and roaming –** Supports seamless roaming of a wireless device from one Wireless AP to another on the same HiPath Wireless Controller or on a different HiPath Wireless Controller.
- **Integrates third-party access points –** Uses a combination of network routing and authentication techniques.
- **Prevents rogue devices –** Unauthorized access points are detected and identified as harmless or dangerous rogue APs.
- **Provides accounting services –** Logs wireless user sessions, user group activity, and other activity reporting, enabling the generation of consolidated billing records.
- **Offers troubleshooting capability –** Logs system and session activity and provides reports to aid in troubleshooting analysis.

- **Offers dynamic RF management –** Automatically selects channels and adjusts Radio Frequency (RF) signal propagation and power levels without user intervention.

3.3 Controller, Access Points and Convergence Software and your network

This section is a summary of the components of the Controller, Access Points and Convergence Software solution on your enterprise network. The following are described in detail in this guide:

- **HiPath Wireless Controller** – A rack-mountable network device that 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.
- **Wireless AP** – A wireless LAN fit access point (IEEE 802.11) that communicates only with a HiPath Wireless Controller.
- **RADIUS Server** (Remote Access Dial-In User Service) (RFC2865), or other authentication server – An authentication server that assigns and manages ID and Password protection throughout the network. Used for authentication of the wireless users in either 802.1x or Captive Portal security modes. The RADIUS Server system can be set up for certain standard attributes, such as filter ID, and for the Vendor Specific Attributes (VSAs). In addition, Radius Disconnect (RFC3576) which permits dynamic adjustment of user policy (user disconnect) is supported.
- **DHCP Server** (Dynamic Host Configuration Protocol) (RFC2131) – A server that assigns IP addresses, gateways, and subnet masks dynamically. IP address assignment for clients can be done by the DHCP server internal to the HiPath Wireless Controller, or by existing servers using DHCP relay. It is also used by the Wireless APs to discover the location of the HiPath Wireless Controller during the initial registration process. For SLP, DHCP should have Option 78 enabled. Option 78 specifies the location of one or more SLP Directory Agents.
- **Service Location Protocol (SLP)** (SLP RFC2608) – Client applications are User Agents and services that are advertised by a Service Agent. In larger installations, a Directory Agent collects information from Service Agents and creates a central repository. The Siemens solution relies on registering “siemens” as an SLP Service Agent.
- **Domain Name Server (DNS)** – A server used as an alternate mechanism (if present on the enterprise network) for the automatic discovery process. Controller, Access Points and Convergence Software relies on the DNS for Layer 3 deployments and for static configuration of Wireless APs. The controller can be registered in DNS, to provide DNS assisted AP discovery.

- **Web Authentication Server** – A server that can be used for external Captive Portal and external authentication. The HiPath Wireless Controller has an internal Captive portal presentation page, which allows Web authentication (Web redirection) to take place without the need for an external captive portal server.
- **RADIUS Accounting Server** (Remote Access Dial-In User Service) (RFC2866) – A server that is required if RADIUS Accounting is enabled.
- **Simple Network Management Protocol** (SNMP) – A Manager Server that is required if forwarding SNMP messages is enabled.
- **Check Point Server** (Check Point Event Logging API) – A server for security event logging that is required if a firewall application is enabled. Checkpoint ELA certification for OPSEC is provided.
- **Network infrastructure** – The Ethernet switches and routers must be configured to allow routing between the various services noted above. Routing must also be enabled between multiple HiPath Wireless Controllers for the following features to operate successfully:
  - Availability
  - Mobility
  - Mitigator for detection of rogue access points

  Some features also require the definition of static routes.
- **Web Browser** – A browser provides access to the HiPath Wireless Controller Management user interface to configure the Controller, Access Points and Convergence Software.
- **SSH Enabled Device** – A device that supports Secure Shell (SSH) is used for remote (IP) shell access to the system.
- **Zone Integrity** – The Zone integrity server enhances network security by ensuring clients accessing your network are compliant with your security policies before gaining access. Zone Integrity Release 5 is supported.

3.3.1 Network traffic flow

Figure 3 illustrates a simple configuration with a single HiPath Wireless Controller and two Wireless APs, each supporting a wireless device. A RADIUS server on the network provides authentication, and a DHCP server is used by the Wireless APs to discover the location of the HiPath Wireless Controller during the initial registration process. Network interconnectivity is provided by the infrastructure routing and switching devices.

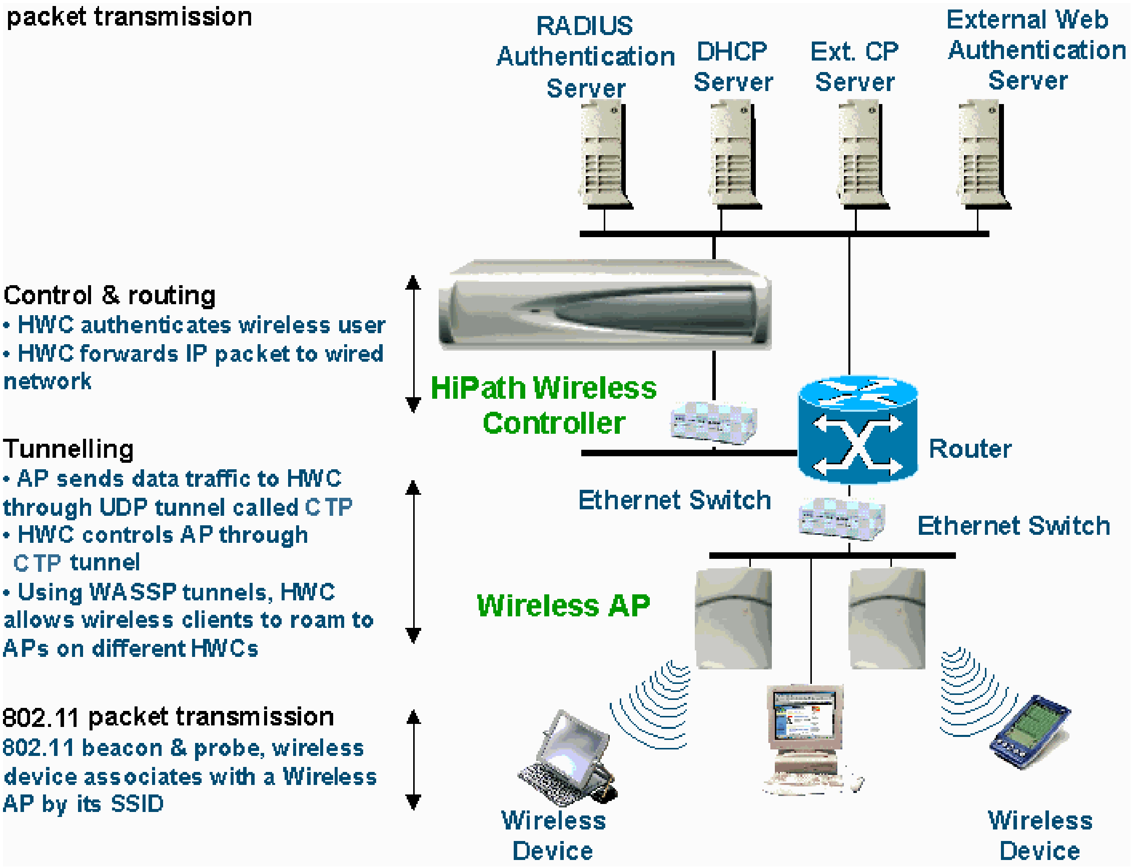

packet transmission
RADIUS Authentication Server
DHCP Server
Ext. CP Server
External Web Authentication Server
Control & routing
• HWC authenticates wireless user
• HWC forwards IP packet to wired network
HiPath Wireless Controller
Router
Tunnelling
• AP sends data traffic to HWC through UDP tunnel called CTP
• HWC controls AP through CTP tunnel
• Using WASSP tunnels, HWC allows wireless clients to roam to APs on different HWCs
Ethernet Switch
Ethernet Switch
Wireless AP
802.11 packet transmission
802.11 beacon & probe, wireless device associates with a Wireless AP by its SSID
Wireless Device
Wireless Device

Figure 3 Traffic Flow diagram

Each wireless device sends IP packets in the 802.11 standard to the Wireless AP. The Wireless AP uses a UDP (User Datagram Protocol) based tunnelling protocol to encapsulate the packets and forward them to the HiPath Wireless Controller. In a typical configuration, APs can be configured to locally bridge traffic (to a configured VLAN) directly at their network point of attachment. The HiPath Wireless Controller decapsulates the packets and routes these to destinations on the network.

The HiPath Wireless Controller functions like a standard router, except that it is configured to route only network traffic associated with wireless connected users. The HiPath Wireless Controller can also be configured to simply forward traffic to a default or static route if dynamic routing is not preferred.

3.3.2 Network security

The Controller, Access Points and Convergence Software system provides features and functionality to control network access. These are based on standard wireless network security practices.

Current wireless network security methods provide protection. These methods include:

- Shared Key authentication that relies on Wired Equivalent Privacy (WEP) keys
- Open System that relies on Service Set Identifiers (SSIDs)
- 802.1x that is compliant with Wi-Fi Protected Access (WPA)
- Captive Portal based on Secure Sockets Layer (SSL) protocol

The Controller, Access Points and Convergence Software system provides the centralized mechanism by which the corresponding security parameters are configured for a group of APs.

- Wired Equivalent Privacy (WEP) is a security protocol for wireless local area networks defined in the 802.11b standard
- Wi-Fi Protected Access version 1 (WPA1™) with Temporal Key Integrity Protocol (TKIP)
- Wi-Fi Protected Access version 2 (WPA2™) with Advanced Encryption Standard (AES) and Counter Mode with Cipher Block Chaining Message Authentication Code (CCMP)

3.3.2.1 Authentication

The HiPath Wireless Controller relies on a RADIUS server, or authentication server, on the enterprise network to provide the authentication information (whether the user is to be allowed or denied access to the network). A RADIUS client is implemented to interact with infrastructure RADIUS servers.

The HiPath Wireless Controller provides authentication using:

- Captive Portal – a browser-based mechanism that forces users to a Web page
- RADIUS (using IEEE 802.1x)

The 802.1x mechanism is a standard for authentication developed within the 802.11 standard. This mechanism is implemented at the wireless Port, blocking all data traffic between the wireless device and the network until authentication is complete. Authentication by 802.1x standard uses Extensible Authentication Protocol (EAP) for the message exchange between the HiPath Wireless Controller and the RADIUS server.

When 802.1x is used for authentication, the HiPath Wireless Controller provides the capability to dynamically assign per-wireless-device WEP keys (called per-station WEP keys in 802.11). Or in the case of WPA, the HiPath Wireless Controller is not involved in key assignment. Instead, the controller is involvement in the path between RADIUS server and the user to negotiate the appropriate set of keys. With WPA2 the material exchange produces a Pairwise Master Key which is used by the AP and the user to derive their temporal keys. (The keys change over time.)

In the Controller, Access Points and Convergence Software, a RADIUS redundancy feature is provided, where you can define a failover RADIUS server (up to 2 servers) in the event that the active RADIUS server fails.

3.3.2.2 Privacy

Privacy is a mechanism that protects data over wireless and wired networks, usually by encryption techniques.

Controller, Access Points and Convergence Software supports the Wired Equivalent Privacy (WEP) standard common to conventional access points.

It also provides Wi-Fi Protected Access version 1 (WPA v.1) encryption, based on Pairwise Master Key (PMK) and Temporal Key Integrity Protocol (TKIP). The most secure encryption mechanism is WPA version 2, using Advanced Encryption Standard (AES).

3.3.3 Virtual Network Services

Virtual Network Services (VNS) provide a versatile method of mapping wireless networks to the topology of an existing wired network.

When you set up VNS on the HiPath Wireless Controller you are defining subnets for groups of wireless users. The VNS definition provides the binding between VNS IP topology configuration (Routing, DHCP policy) and the RF configuration parameters that advertise and control network access (SSID, Privacy policy: WEP and WPA). 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 on user sessions that can be used for billing.

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

If routing protocol is enabled, the HiPath Wireless Controller advertises the VNS as a routable network segment to the wired network and routes traffic between the wireless devices and the wired network. The HiPath Wireless Controller C2400 also supports VLAN-bridged assignment for VNSs. This allows the controller to directly bridge the set of wireless devices associated with a VNS directly to a specified core VLAN.

The HiPath Wireless Controller C2400 can support up to 64 VNSs. The HiPath Wireless Controller C1000 can support up to 50 VNSs, the C100 can support up to 32 VNSs, and the C10 can support up to 16. The AP radios can be assigned to each of the configured VNSs in a system. Each AP can be the subject of 8 VNS assignments (corresponding to the number of SSIDs it can support). Once a radio has all 8 slots assigned, it is no longer eligible for further assignment.

3.3.4 Static routing and routing protocols

Routing can be used on the HiPath Wireless Controller to support the VNS definitions. Through the user interface you can configure routing on the HiPath Wireless Controller to use one of the following routing techniques:

- **Static routes** – Use static routes to set the default route of a HiPath Wireless Controller so that legitimate wireless device traffic can be forwarded to the default gateway.
- **Open Shortest Path First** (OSPF, version 2) (RFC2328) – Use OSPF to allow the HiPath Wireless Controller to participate in dynamic route selection. OSPF is a protocol designed for medium and large IP networks with the ability to segment routes into different areas by routing information summarization and propagation. Static Route definition and OSPF dynamic learning can be combined, but a static route definition will take precedence over dynamic rules.
- **Next-hop routing** – Use next-hop routing to specify a unique gateway to which traffic on a VNS is forwarded. Defining a next-hop for a VNS forces all the traffic in the VNS to be forwarded to the indicated network device, bypassing any routing definitions of the controller's route table.

3.3.5 Packet filtering policy

Policy refers to the rules that allow different groups of users access to the network. The Controller, Access Points and Convergence Software system can link authorized users to user groups. These user groups then can be confined to predefined portions of the network.

In the Controller, Access Points and Convergence Software system, network access policy is carried out by means of packet filtering within a VNS.

In the HiPath Wireless Controller user interface, you set up a packet filtering policy by defining a set of hierarchical rules that allow or deny traffic to specific IP addresses, IP address ranges, or service ports. The sequence and hierarchy of these filtering rules must be carefully designed based on your enterprise user access plan.

The authentication technique selected determines how filtering is carried out:

- If authentication is by SSID and Captive Portal, a non-authenticated filter allows all users to get as far as the Captive Portal Web page, where logon authentication occurs. When authentication is returned, then filters are applied, based on user ID and permissions.
- If authentication is by AAA (802.1x), users have logged on and have been authenticated before being assigned an IP address. When authentication is completed, the authenticated filter is assigned by default unless a more user-specific filter is returned or indicated by the authentication mechanism. The characteristics and level of access for a filter are controlled and defined by the system administrator.

3.3.6 Mobility and roaming

In typical configurations, APs are setup as bridges, which bridge wireless traffic to the local subnet. In bridging configurations, the user obtains an IP address from the same subnet as the AP. If the user roams within APs on the same subnet, it is able to keep using the same IP address. However, if the user roams to another AP outside of that subnet, its IP address is no longer valid. The user's client device must recognize that the IP address it has is no longer valid and re-negotiate a new one on the new subnet. The protocol does not mandate any action on the user. The recovery procedure is entirely client dependent. Some clients automatically attempt to obtain a new address on roam (which affects roaming latency), while others will hold on to their IP address. This loss of IP address continuity seriously affects the client's experience in the network, because in some cases it can take minutes for a new address to be negotiated.

The solution centralizes the user's network point of presence, therefore abstracting and decoupling the user's IP address assignment from that of the APs location subnet. That means that the user is able to roam across any AP without loosing its own IP address, regardless of the subnet on which the serving APs are deployed.

In addition, a HiPath Wireless Controller can learn about other HiPath Wireless Controllers on the network and then exchange client session information. This enables a wireless device user to roam seamlessly between different Wireless APs on different HiPath Wireless Controllers.

3.3.7 Network availability

Controller, Access Points and Convergence Software provides availability against Wireless AP outages, HiPath Wireless Controller outages, and even network outages. The HiPath Wireless Controller (C2400 model) in a VLAN bridged VNS can potentially allow the user to retain the IP address in a failover scenario, if the VNS/VLAN is common to both controllers. For example, availability is provided by defining a paired controller configuration by which each peer can act as the backup controller for the other's APs. APs in one controller are allowed to failover and register with the alternate controller.

If a HiPath Wireless Controller fails, all of its associated Wireless APs can automatically switch over to another HiPath Wireless Controller that has been defined as the secondary or backup HiPath Wireless Controller. If the AP reboots, the original HiPath Wireless Controller is restored. The original HiPath Wireless Controller is restored if it is active. However, active APs will continue to be attached to the failover controller until the administrator releases them back to the original home controller.

3.3.8 Quality of Service (QoS)

Controller, Access Points and Convergence Software provides advanced Quality of Service (QoS) management to provide better network traffic flow. Such techniques include:

- **WMM (Wi-Fi Multimedia)** – WMM is enabled per VNS. For C1000 controllers, these are primarily only AP features. The HiPath Wireless Controller provides centralized management of these AP features. For devices with WMM enabled, the standard provides multimedia enhancements for audio, video, and voice applications. WMM shortens the time between transmitting packets for higher priority traffic. WMM is part of the 802.11e standard for QoS.
- **IP ToS (Type of Service)** or **DSCP (Diffserv Codepoint)** – The **ToS/DSCP** field in the IP header of a frame indicates the priority and QoS for each frame. The IP TOS and/or DSCP is maintained within CTP (CAPWAP Tunneling Protocol) by copying the user IP QoS information to the CTP header—this is referred to as Adaptive QoS.

Quality of Service (QoS) management is also provided by:

- Assigning high priority to an SSID (configurable)
- Adaptive QoS (automatic)
- Support for legacy devices that use SpectraLink Voice Protocol (SVP) for prioritizing voice traffic (configurable)

3.4 System Configuration Overview

To set up and configure the HiPath Wireless Controller and Wireless APs, follow these steps:

1. First-time Setup – Perform “First-Time Setup” of the HiPath Wireless Controller on the physical network to modify the Management Port IP address for the enterprise network.
2. Product Key – Apply a Product Key file, for licensing purposes. If no Product Key is enabled, the HiPath Wireless Controller functions with some features enabled in demonstration mode. Not all features are enabled in this mode. For example, mobility is not enabled and cannot be used.
3. Data Port Setup – Set up the HiPath Wireless Controller on the network by configuring the physical data ports and their function as “host port”, “router port”, or “3rd party AP port”.
4. Routing Setup – Configure static routes and OSPF parameters for any port defined as a router port, if appropriate to the network.
5. Wireless AP Initial Setup – Connect the Wireless APs to the HiPath Wireless Controller. They will automatically begin the Discovery of the HiPath Wireless Controller, based on factors that include:
    - Their Registration mode (in the Wireless AP Registration screen)
    - The enterprise network services that will support the discovery process

   A new feature of the 4.0 release is a default AP configuration. The default AP configuration allows for a definition of a default configuration template, whereby APs automatically receive complete configuration. For typical deployments where all APs are to all have same configuration, this feature will expedite deployment, as an AP will automatically receive full configuration (including VNS assignment) upon initial registration with the HiPath Wireless Controller.

6. Wireless AP Configuration – Modify properties or settings of the Wireless AP, if desired.
7. Virtual Network Services (VNS) Setup – Set up one or more virtual subnetworks on the HiPath Wireless Controller. For each VNS, configure the following:
   - **Topology** – Configure the VNS.
   - **RF** – Assign the Wireless APs radios to the VNS.
   - **Authentication and Accounting** – Configure the authentication method for the wireless device user and enable the accounting method.
   - **RAD Policy** – Define filter ID values and VNS Groups
   - **Filtering** – Define filtering rules to control network access
   - **Multicast** – Define groups of IP addresses for multicast traffic
   - **Privacy** – Select and configure the wireless security method on the VNS.
   - **QoS Policy** – Configure the Qos Policy.

4 Configuring the HiPath Wireless Controller

This chapter introduces the HiPath Wireless Controller and describes the steps involved in its initial configuration and setup, including:

- System configuration overview
- Performing the first-time setup of the HiPath Wireless Controller
- Completing the system configuration
- Ongoing Operations of the Controller, Access Points and Convergence Software

The HiPath Wireless Controller is a network device designed to integrate with an existing wired Local Area Network (LAN). The rack-mountable HiPath Wireless Controller provides centralized management, network access, and routing to wireless devices that use Wireless APs to access the network. It can also be configured to handle data traffic from third-party access points.

The HiPath Wireless Controller provides the following functionality:

- Controls and configures Wireless APs, providing centralized management
- Authenticates wireless devices that contact a Wireless AP
- Assigns each wireless device to a VNS when it connects
- Routes traffic from wireless devices, using VNS, to the wired network
- Applies filtering policies to the wireless device session
- Provides session logging and accounting capability

The HiPath Wireless Controller is available in the following product families:

HiPath Wireless Controller (Rev.2) Model Number	**Specifications**
C10	● Four fast-Ethernet ports (10/100 BaseT), supporting up to 30 wireless APs ● One management port (10/100/1000 BaseT) ● One console port (DB9 serial) ● Power supply standard (S)

Table 2 HiPath Wireless Controller product families

HiPath Wireless Controller (Rev.2) Model Number	Specifications
C100	• Four fast-Ethernet ports (10/100 BaseT), supporting up to 75 Wireless APs • One management port (10/100/1000 BaseT) • One console port (DB9 serial) • Power supply redundant (R)
C1000	• Two GigE ports (dual 1GB SX network interfaces) supporting up to 200 Wireless APs • One management port (10/100/1000 BaseT) • One console port (DB9 serial) • Power supply redundant (R)

Table 2 HiPath Wireless Controller product families

The HiPath Wireless Controller is available in the following product families:

HiPath Wireless Controller Model Number	Specifications
C2400 (Enterprise license)	• Four GigE ports supporting up to 200 wireless APs • One management port (10/100 BaseT) • One console port (DB9 serial) • Power supply standard (R)
C2400 (Pro license)	• Four GigE ports supporting up to 100 wireless APs • One management port (10/100 BaseT) • One console port (DB9 serial) • Power supply standard (R)

Table 3 HiPath Wireless Controller product families

4.1 System configuration overview

The following section provides a high-level overview of the steps involved in the initial configuration of your system:

Step 1 – Before you begin configuration

Research the type of WLAN deployment that is required.

Step 2 – Preparing the network

Ensure relevant DHCP servers and RADIUS servers (if applicable) are available and configured.

Step 3 – Installing the hardware

Install the HiPath Wireless Controller C10/C100/C1000. For more information, see the *HiPath Wireless Controller, Access Points and Convergence Software Controller C10/C100/C1000 Installation Instructions.*

Install the HiPath Wireless Controller C2400. For more information, see the *HiPath Wireless Controller, Access Points and Convergence Software Controller C2400 Installation Instructions.*

Step 4 – Performing the first-time setup

Perform the first-time Setup of the HiPath Wireless Controller on the physical network, which includes configuring the physical port IP:

- Configure the default IP address to be the relevant subnet point of attachment to the existing network. The default IP address is 10.0.#.1.
- Setup the routing protocol table.
- To configure a physical port to attach to a VLAN, define the VLAN as part of the IP address assignment.

Applying the product license key

Apply a product license key file. If a product license key is not applied, the HiPath Wireless Controller functions with some features enabled in demonstration mode. Not all features are enabled in demonstration mode. For example, mobility is not enabled and cannot be used.

Configuring for remote access

In addition, the first-time setup also involves configuring for remote access, which includes:

- Setting up an administration station (laptop) on subnet 192.168.1.x/24. By default, the controller's interface is configured with static IP 192.168.10.1.
- Configuring the system management interface.
- Configuring the data interfaces.

  Set up the HiPath Wireless Controller on the network by configuring the physical data ports and their function as “host port”, “router port”, or “3rd party AP port”.
- Configure the routing table.

  Configure static routes or OSPF parameters for any port defined as a router port, if appropriate to the network.

For more information, see Section 4.2, “Performing the first-time setup of the HiPath Wireless Controller”, on page 47.

Step 5 – Configuring the VNS

8. Research and then configure the traffic topologies your network must support. Set up one or more virtual subnetworks on the HiPath Wireless Controller. For each VNS, configure the following:
   - **Topology** – Configure the VNS.
   - **RF** – Assign the Wireless APs radios to the VNS.
   - **Authentication and Accounting** – Configure the authentication method for the wireless device user and enable the accounting method. Both the authentication and the accounting configuration is optional. It only applies to captive portal or AAA VNSs.
   - **RAD Policy** – Define filter ID values and VNS Groups. This configuration is optional.
   - **Filtering** – Define filtering rules to control network access
   - **Multicast** – Define groups of IP addresses for multicast traffic. This configuration is optional. By default, the multicast feature is disabled.
   - **Privacy** – Select and configure the wireless security method on the VNS.
   - **QoS Policy** – Configure the Qos Policy.

For more information, see Section , “Virtual Network Services”, on page 107.

Step 6 – Registering and assigning APs to the VNS

Deploy Wireless APs to their corresponding network locations. Connect the Wireless APs to the HiPath Wireless Controller. Once the Wireless APs are powered on, they automatically begin the Discovery process of the HiPath Wireless Controller, based on factors that include:

- Their Registration mode (in the Wireless AP Registration screen)
- The enterprise network services that will support the discovery process

A new feature available in the 4.0 release is a default AP configuration. The default AP configuration allows for a definition of a default configuration template, whereby APs automatically receive complete configuration. For typical deployments where all APs are to all have same configuration, this feature will expedite deployment, as an AP will automatically receive full configuration (including VNS assignment) upon initial registration with the HiPath Wireless Controller. If applicable, modify the properties or settings of the Wireless APs.

For more information, see Section , “Configuring the wireless AP”, on page 69.

Step 7 – Confirming the AP firmware version

Confirm the latest firmware version is loaded. For more information, see Section 5.9, “Performing wireless AP software maintenance”, on page 101.

4.2 Performing the first-time setup of the HiPath Wireless Controller

Before you can connect the HiPath Wireless Controller to the enterprise network, you must change the IP address of the HiPath Wireless Controller management port from its factory default to the IP address suitable for your enterprise network. Access the HiPath Wireless Controller by one of two methods:

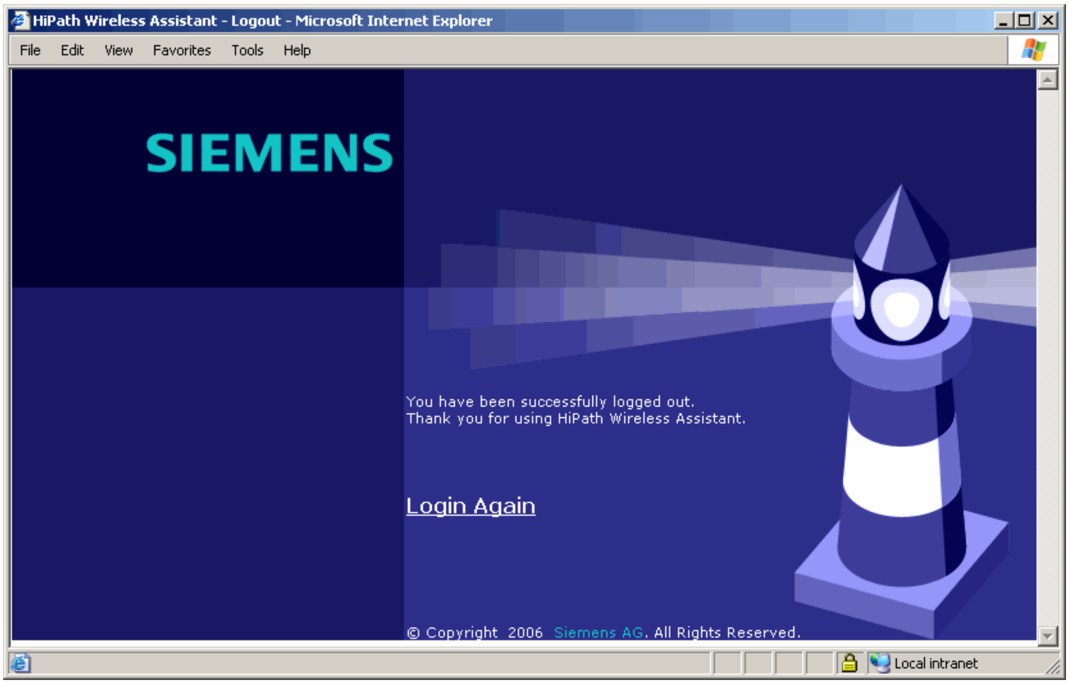
- Use a device supporting VT100 emulation, attached to the DB9 serial port (COM1 port) of the HiPath Wireless Controller via a cross-over (null modem) cable. Use the Command Line Interface (CLI) commands. For more information, see the *HiPath Wireless Controller, Access Points and Convergence Software CLI Reference Guide*.
- Use a laptop computer with a Web browser. Connect the supplied cross-over Ethernet cable between the laptop and management Ethernet port of the HiPath Wireless Controller. Follow the steps below.

4.2.1 Accessing the HiPath Wireless Controller

1. Statically assign an unused IP address in the 192.168.10.0/24 subnet for the Ethernet port of the computer. For example, 192.168.10.205.
2. Launch your Web browser (Internet Explorer version 6.0 or higher, or FireFox).
3. In the browser address bar, type the following:

   ```
   https://192.168.10.1:5825
   ```

   This launches the HiPath Wireless Assistant. The logon screen appears.


HiPath Wireless Assistant - Logout - Microsoft Internet Explorer
File
Edit
View
Favorites
Tools
Help
SIEMENS
Local intranet

You have been successfully logged out.
Thank you for using HiPath Wireless Assistant.

Login Again

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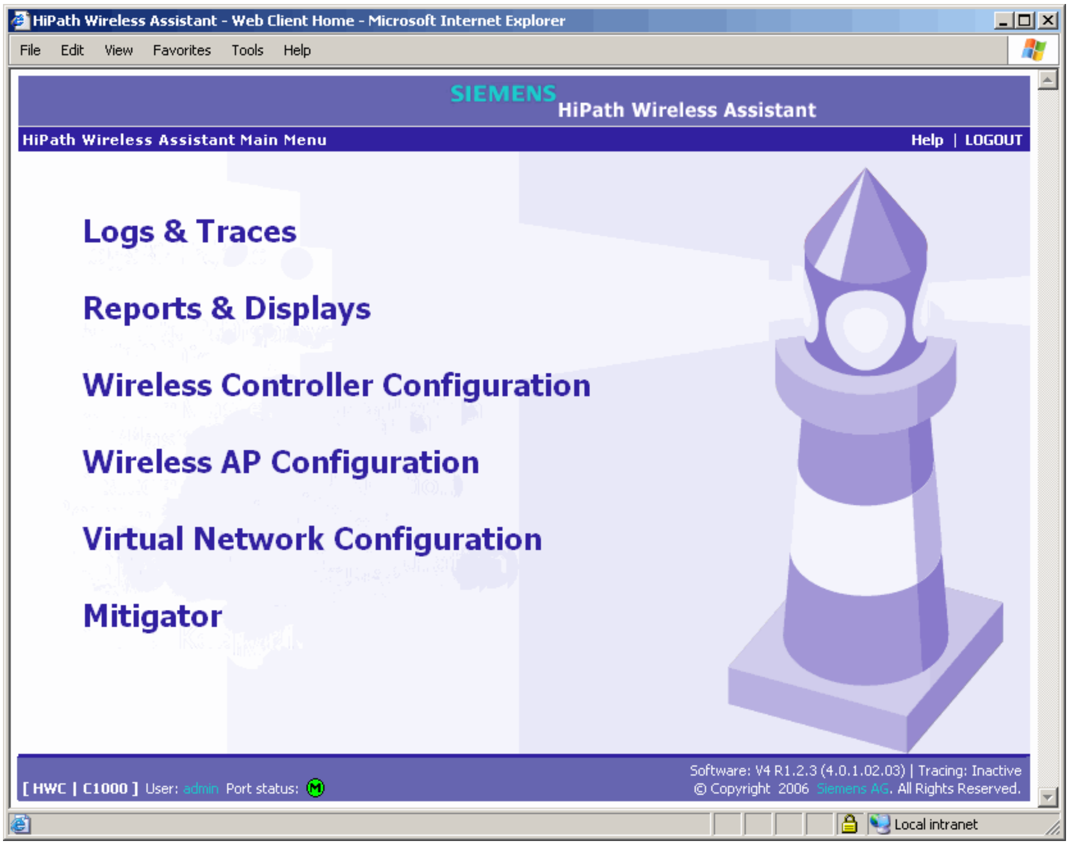
4. In the **User Name** box, type your user name. The default is `admin`.
5. In the **Password** box, type your password. The default is `abc123`.

6. Click **Login**. The HiPath Wireless Assistant main menu screen appears.


HiPath Wireless Assistant - Web Client Home - Microsoft Internet Explorer
File
Edit
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Tools
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HiPath Wireless Assistant
HiPath Wireless Assistant Main Menu
Help | LOGOUT
Logs & Traces
Reports & Displays
Wireless Controller Configuration
Wireless AP Configuration
Virtual Network Configuration
Mitigator
Local intranet

[HWC | C1000] User: admin Port status: M

Software: V4 R1.2.3 (4.0.1.02.03) | Tracing: Inactive
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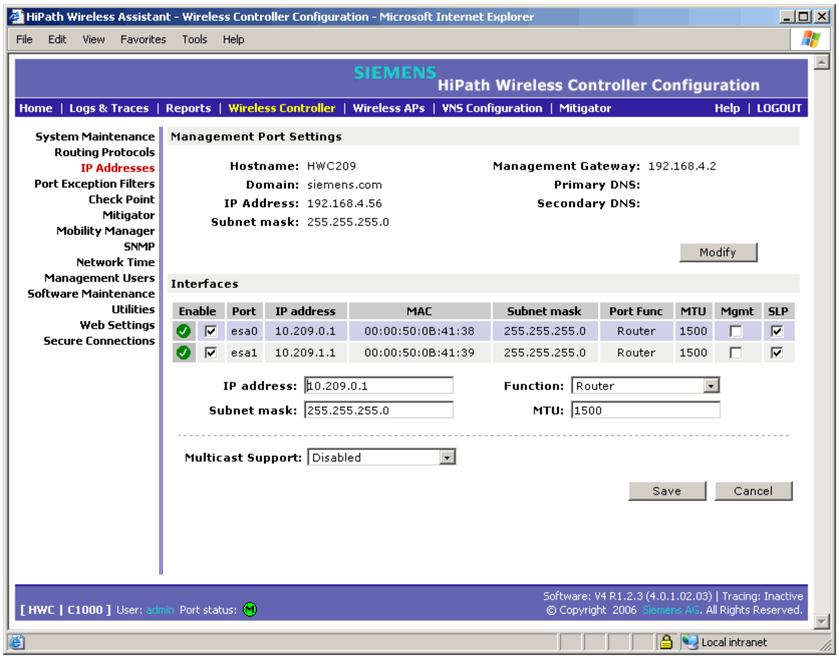
In the footer of the HiPath Wireless Assistant, the following is displayed:

- **[host name | product name | up time]**
  For example, [HWC | C1000 | 0 days, 17:11]. If there is no key (unlicensed), the product name will not be displayed.
- **User** is the user id you used to login in. For example, admin.
- **Port Status** is the connectivity state of the port. M is for the Management interface, which is on eth0 and the numbered lights reflect the esa ports on the system. Green indicates the interface is up and running. Red indicates the interface is down.
- For the HiPath Wireless Controller models C10 and C100, the footer of the HiPath Wireless Assistant does not include the link status of the physical interfaces.

7. From the main menu, click **Wireless Controller Configuration**. The **HiPath Wireless Controller Configuration** screen appears.

8. In the left pane, click **IP Addresses**. The factory default settings for the HiPath Wireless Controller are displayed.


HiPath Wireless Assistant - Wireless Controller Configuration - Microsoft Internet Explorer
File Edit View Favorites Tools Help
SIEMENS
HiPath Wireless Controller Configuration
Home | Logs & Traces | Reports | Wireless Controller | Wireless APs | VNS Configuration | Mitigator
Help | LOGOUT
System Maintenance
Routing Protocols
IP Addresses
Port Exception Filters
Check Point
Mitigator
Mobility Manager
SNMP
Network Time
Management Users
Software Maintenance
Utilities
Web Settings
Secure Connections
Modify
Save
Cancel
Local intranet

Management Port Settings

Hostname: HWC209
Domain: siemens.com
IP Address: 192.168.4.56
Subnet mask: 255.255.255.0
Management Gateway: 192.168.4.2
Primary DNS:
Secondary DNS:

Interfaces

Enable		Port	IP address	MAC	Subnet mask	Port Func	MTU	Mgmt	SLP
✓	☑	esa0	10.209.0.1	00:00:50:0B:41:38	255.255.255.0	Router	1500	□	☑
✓	☑	esa1	10.209.1.1	00:00:50:0B:41:39	255.255.255.0	Router	1500	□	☑

IP address: 10.209.0.1
Subnet mask: 255.255.255.0
Function: Router
MTU: 1500

Multicast Support: Disabled

[HWC | C1000] User: admin Port status: M
Software: V4 R1.2.3 (4.0.1.02.03) | Tracing: Inactive
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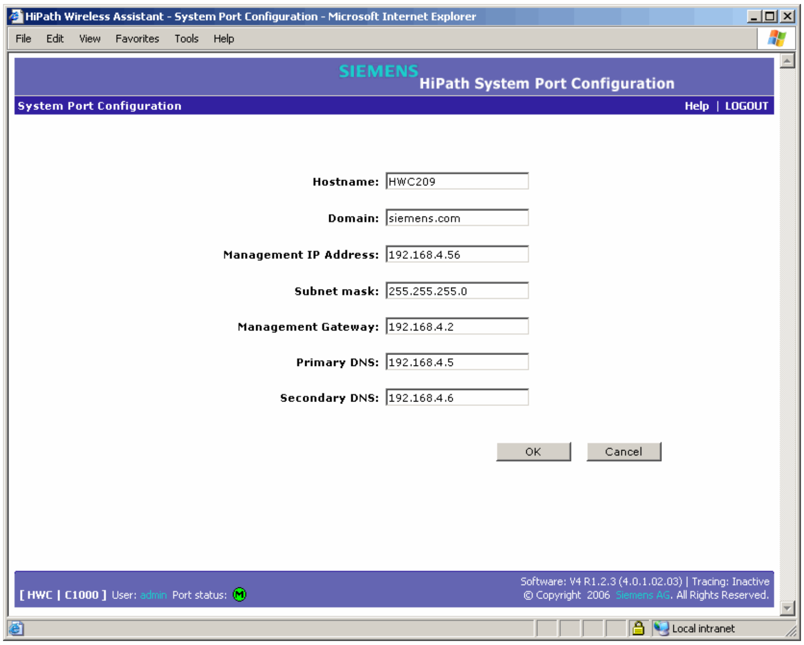
9. In the Management Port Settings section, click **Modify**. The **System Port Configuration** screen appears.


HiPath Wireless Assistant - System Port Configuration - Microsoft Internet Explorer
File Edit View Favorites Tools Help
SIEMENS
HiPath System Port Configuration
System Port Configuration
Help | LOGOUT
OK
Cancel
Local intranet

Hostname: HWC209
Domain: siemens.com
Management IP Address: 192.168.4.56
Subnet mask: 255.255.255.0
Management Gateway: 192.168.4.2
Primary DNS: 192.168.4.5
Secondary DNS: 192.168.4.6

[HWC | C1000] User: admin Port status: M
Software: V4 R1.2.3 (4.0.1.02.03) | Tracing: Inactive
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10. Type the following information:

- **Hostname** – Specifies the name of the HiPath Wireless Controller
- **Domain** – Specifies the IP domain name of the enterprise network

- **Management IP Address** – Specifies the new IP address for the HiPath Wireless Controller's management port. Change this as appropriate for the enterprise network.
- **Subnet mask** – Specifies the appropriate subnet mask for the IP address to separate the network portion from the host portion of the address (typically 255.255.255.0)
- **Management Gateway** – Specifies the default gateway of the network
- **Primary DNS** – Specifies the primary DNS server used by the network
- **Secondary DNS** – Specifies the secondary DNS server used by the network

11. To save your changes, click **OK.**

> The Web connection between the computer and the HiPath Wireless Controller is now lost. The IP addresses are now set to the network you defined.

4.2.1.1 Changing the administrator password

It is recommended to change your default administrator password once your system is installed.

To change the administrator password:

1. From the main menu, click **Wireless Controller Configuration**. The **HiPath Wireless Controller Configuration** screen appears.
2. In the left pane, click **Management Users**.
3. In the user_admin table, click **admin**.
4. In the Modify User **Password** box, type the new administrator password.
5. In the Modify User **Confirm Password** box, type the new administrator password again.
6. Click **Change Password**.

4.2.2 Connecting the HiPath Wireless Controller to your enterprise network

Once you have modified the management port configuration settings, the next step is to connect the HiPath Wireless Controller to your enterprise network.

To connect the HiPath Wireless Controller to your enterprise network:

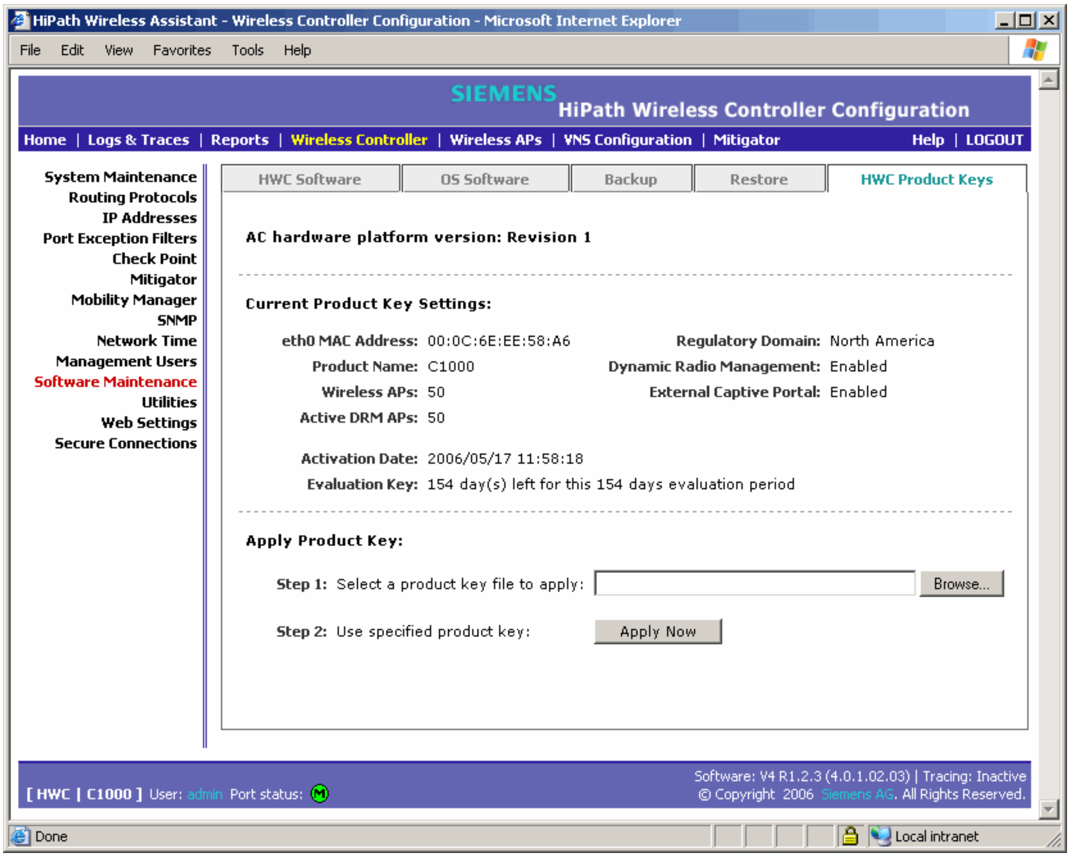
1. Disconnect your computer from the HiPath Wireless Controller management port.
2. Connect the HiPath Wireless Controller management port to the enterprise Ethernet LAN. The HiPath Wireless Controller resets automatically.
3. Log on to the HiPath Wireless Assistant. The system is visible to the enterprise network.

4.2.3 Applying the product license key

To ensure all available system functionality is enabled, your product license key must be applied.

To apply the product license key:

1. From the main menu, click **Wireless Controller Configuration**. The **HiPath Wireless Controller Configuration** screen appears.
2. In the left pane, click **Software Maintenance**.
3. Click the **HWC Product Keys** tab.



AC hardware platform version: Revision 1

Current Product Key Settings:

eth0 MAC Address: 00:0C:6E:EE:58:A6
Product Name: C1000
Wireless APs: 50
Active DRM APs: 50

Regulatory Domain: North America
Dynamic Radio Management: Enabled
External Captive Portal: Enabled

Activation Date: 2006/05/17 11:58:18
Evaluation Key: 154 day(s) left for this 154 days evaluation period

Apply Product Key:

Step 1: Select a product key file to apply:

Step 2: Use specified product key:

[HWC | C1000] User: admin Port status: M

Software: V4 R1.2.3 (4.0.1.02.03) | Tracing: Inactive
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4. In the Apply Product Key section, click **Browse** to navigate to the location of the product key file and select the file.

5. Click **Apply Now**. The product license key is applied.

4.2.4 Setting up the data ports

The next step in the initial setup of the HiPath Wireless Controller is to configure the physical data ports.

A new HiPath Wireless Controller is shipped from the factory with all its data ports set up as host ports. Support of management traffic is disabled on all data ports. Port configuration allows for the explicit state of the administration state for each interface. By default, data interface states will be disabled. You can then enable each of the data interfaces individually. A disabled interface does not allow data to flow (receive/transmit).

VLAN ID parameter

You can define a specific VLAN tag to be applied to a particular interface. All packets associated with that port will be tagged with the corresponding VLAN. This allows the HiPath Wireless Controller to directly attach to a VLAN network without the need to remove VLAN tags at the connection port.

You can redefine the data ports to function as one of three types:

- **Host Port**

  Use a host port definition for connecting Wireless APs, with no dynamic routing. A host port has dynamic routing disabled to ensure that the port does not participate in dynamic routing operations, such as OSPF, to advertise the availability of Virtual Network Segments (VNS) hosted by the HiPath Wireless Controller. Host ports may still be used as the target for static route definitions.

- **Third-Party AP Port**

  Use a third-party AP port definition for a port to which you will connect third-party APs. Only one port can be configured for third-party APs.

  Selecting this option prepares the port to support a third-party AP setup allowing the mapping of a VNS to the physical port. The VNS settings permit the definition of policy, such as filters and Captive Portal, which manage the traffic flow for wireless users connected to these APs.

  The third-party APs must operate as layer-2 bridges. The third-party AP VNS is isolated from the rest of the network. The HiPath Wireless Controller assumes control over the layer-3 functions including DHCP.

- **Router Port**

  Use a router port definition for a port that you want to connect to an upstream, next-hop router in the network. Dynamic routing protocol, such as OSPF, can be turned on for this port type.

  Wireless APs can be attached to a router port. The HiPath Wireless Controller will create a virtual VNS port and handle wireless device traffic in the same manner as a host port.

> ⓘ Third-party access points must not be directly connected to a router port.

There is a fourth port type that is not configurable in the HiPath Wireless Assistant:

- **Virtual Network Services (VNS) interface**

  A VNS port is a virtual port created automatically on the HiPath Wireless Controller when a new VNS is defined. The VNS port becomes the default gateway for wireless devices on this VNS. No Wireless APs can be associated with a VNS port and no routing is permitted on this port.

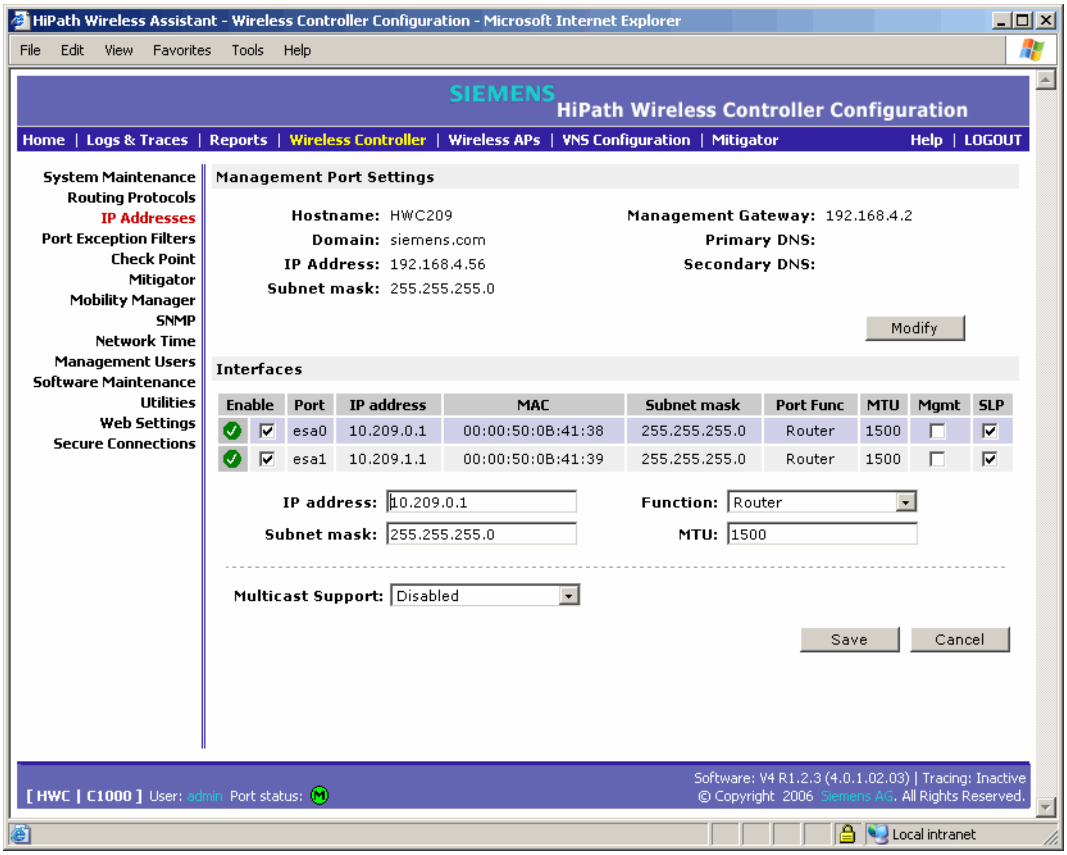
The chart below summarizes the port types and their functions:

Port Type	Host	3rd-Party AP	Router	VNS
IP Forwarding	No	No	Selectable. Route wireless device traffic only.	No
Wireless AP support	Yes	No	Yes	No
Mgmt traffic support (SNMP, HTTP, TELNET, SLP, RADIUS, DHCP)	Selectable	Selectable	Selectable	Selectable
Routing protocol support (IP, OSPF and PIM)	No	No	Selectable	No

Table 4 Port types and functions

To configure the data port interfaces on the HiPath Wireless Controller:

1. From the main menu, click **Wireless Controller Configuration**. The **HiPath Wireless Controller Configuration** screen appears.
2. In the left pane, click **IP Addresses**. The **Management Port Settings and Interfaces** screen appears.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IP Addresses
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Check Point
Mitigator
Mobility Manager
SNMP
Network Time
Management Users
Software Maintenance
Utilities
Web Settings
Secure Connections
Modify
Save
Cancel
Local intranet

Management Port Settings

Hostname: HWC209
Domain: siemens.com
IP Address: 192.168.4.56
Subnet mask: 255.255.255.0
Management Gateway: 192.168.4.2
Primary DNS:
Secondary DNS:

Interfaces

Enable	Port	IP address	MAC	Subnet mask	Port Func	MTU	Mgmt	SLP
✓ ☑	esa0	10.209.0.1	00:00:50:0B:41:38	255.255.255.0	Router	1500	☐	☑
✓ ☑	esa1	10.209.1.1	00:00:50:0B:41:39	255.255.255.0	Router	1500	☐	☑

IP address: 10.209.0.1
Subnet mask: 255.255.255.0
Function: Router
MTU: 1500

Multicast Support: Disabled

[HWC | C1000] User: admin Port status: M

Software: V4 R1.2.3 (4.0.1.02.03) | Tracing: Inactive
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The lower portion of the **HiPath Wireless Controller Configuration** screen displays either four Ethernet ports (for the C10 and C100), or two ports (for the C1000). For each port, the MAC address is displayed automatically.

For the HiPath Wireless Controller models C10 and C100, the footer of the HiPath Wireless Assistant does not include the link status of the physical interfaces.

The lower portion of the **HiPath Wireless Controller Configuration** screen displays the four Ethernet ports. For each port, the MAC address is displayed automatically.

3. To select a port, click it.

   Port configuration allows for the explicit state of the administration state for each interface. By default, data interface states will be disabled. You can then enable each of the data interfaces individually. A disabled interface does not allow data to flow (receive/transmit).

4. Type the following:

   - **IP address** – The IP Address of the physical Ethernet port.

- **Subnet mask** – The appropriate subnet mask for the IP address, which separates the network portion from the host portion of the address (typically 255.255.255.0).
- **MTU** – The Maximum Transmission Unit or maximum packet size for this port. The default setting is 1500. If you change this setting and are using OSPF, be sure that the MTU of each port in the OSPF link matches.

> If the routed connection to an AP traverses a link that imposes a lower MTU than the default 1500 bytes, the HiPath Wireless Controller and AP both participate in MTU discovery to automatically learn the correct MTU and adjust their settings accordingly. At the HiPath Wireless Controller, MTU adjustments are tracked on a per AP basis.

5. Select a **Function** from the drop-down list:
   - **Host Port** – Specifies a port for connecting Wireless APs, with no dynamic routing.
   - **Third-Party AP Port** – Specifies a port to which you will connect third-party access points.
   - **Router Port** – Specifies a port that you want to connect to an upstream, next-hop router in the network.

> For OSPF routing on a port, the port must be configured as a router port. Only one port should be configured as a router port.

6. To enable management traffic, select the **Mgmt** checkbox. Enabling management provides access to SNMP (v2, get), SSH, and HTTPs management interfaces.

> This option does not override the built-in protection filters on the port.
> The built-in protection filters for the port, which are restrictive in the types of packets that are allowed to reach the management plane, are extended with a set of definitions that allow for access to system management services through that interface (SSH, SNMP, HTTPS:5825).

7. To enable the SLP protocol, select the **SLP** checkbox.

   Wireless APs use this port for discovery and registration. Other controllers can use this port to enable inter-controller device mobility if this port is configured to use SLP or the HiPath Wireless Controller is running as a manager and SLP is the discovery protocol used by the agents.

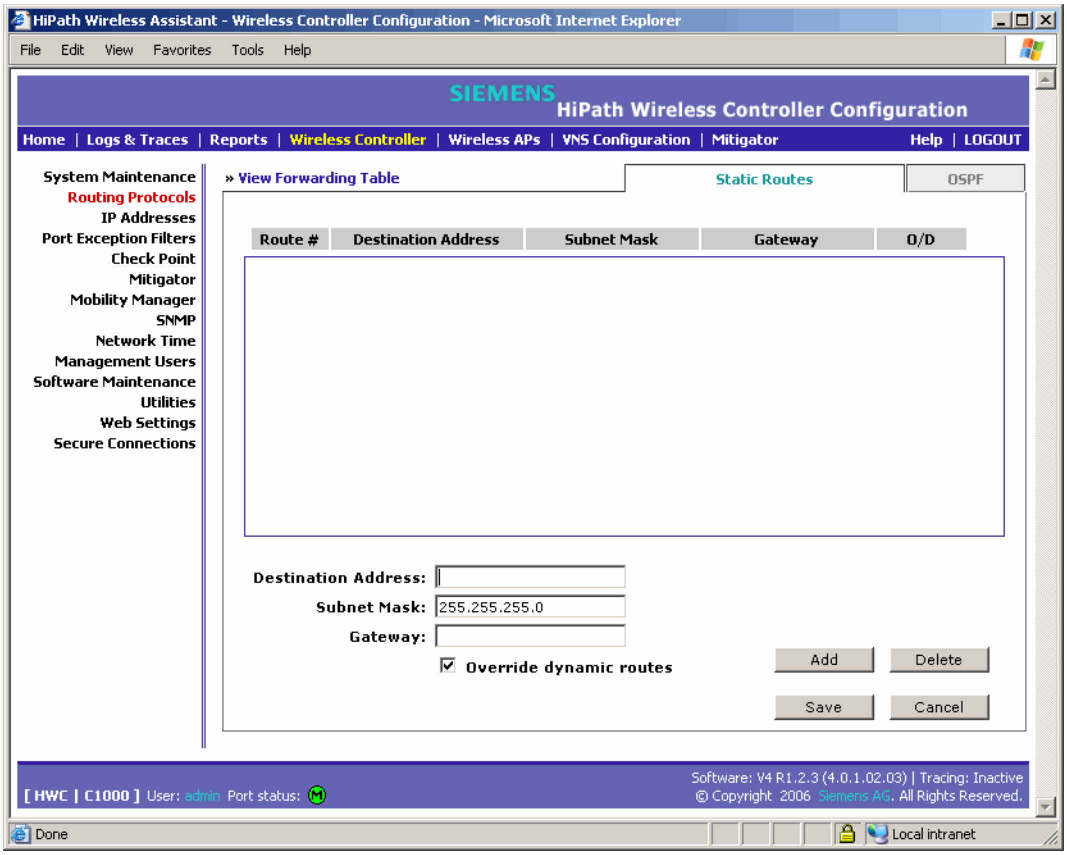
8. To allow **Multicast Support**, select **Enabled** from the drop-down list.
9. To save your changes, click **Save**.

4.2.5 Setting up static routes

It is recommended that you define a default route to your enterprise network, either with a static route or by using OSPF protocol. A default route enables the HiPath Wireless Controller to forward packets to destinations that do not match a more specific route definition.

To set a static route on the HiPath Wireless Controller:

1. From the main menu, click **Wireless Controller Configuration**. The **HiPath Wireless Controller Configuration** screen appears.
2. In the left pane, click **Routing Protocols**. The **Static Routes** tab appears.



HiPath Wireless Assistant - Wireless Controller Configuration - Microsoft Internet Explorer
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Help | LOGOUT
System Maintenance
Routing Protocols
IP Addresses
Port Exception Filters
Check Point
Mitigator
Mobility Manager
SNMP
Network Time
Management Users
Software Maintenance
Utilities
Web Settings
Secure Connections
» View Forwarding Table
Static Routes
OSPF
Add
Delete
Save
Cancel
[HWC | C1000] User: admin Port status: M
Software: V4 R1.2.3 (4.0.1.02.03) | Tracing: Inactive
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Done
Local intranet

Route #	Destination Address	Subnet Mask	Gateway	O/D

Destination Address:

Subnet Mask: 255.255.255.0

Gateway:

☑ Override dynamic routes

3. To add a new route, in the **Destination Address** box type the destination IP address of a packet. To define a default static route for any unknown address not in the routing table, type **0.0.0.0**.
4. In the **Subnet Mask** box, type the appropriate subnet mask to separate the network portion from the host portion of the IP address (typically 255.255.255.0). To define the default static route for any unknown address, type 0.0.0.0.

5. In the **Gateway** box, type the IP address of the specific router port or gateway on the same subnet as the HiPath Wireless Controller to which to forward these packets. This is the IP address of the next hop between the HiPath Wireless Controller and the packet's ultimate destination.
6. Click **Add**. The new route is added to the list of routes.
7. Select the **Override dynamic routes** checkbox to give priority over the OSPF learned routes, including the default route, which the HiPath Wireless Controller uses for routing. This option is selected by default.

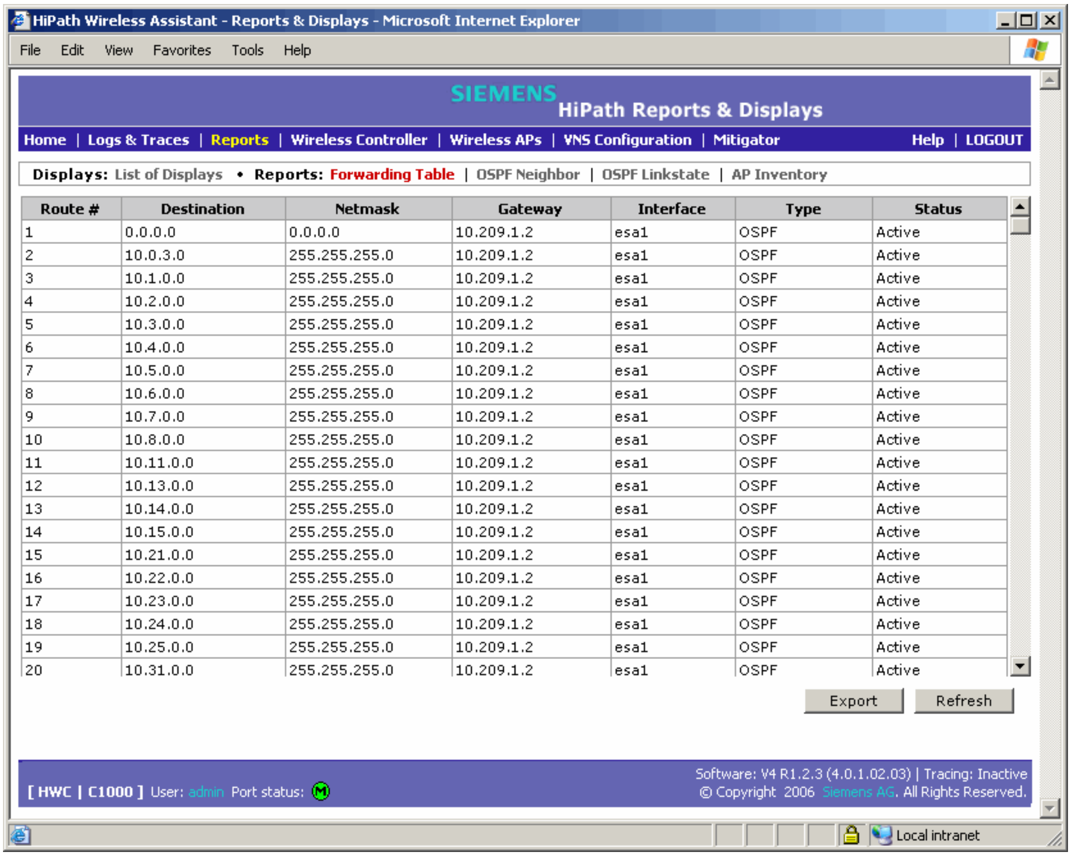
   To remove this priority for static routes, so that routing is controlled dynamically at all times, clear the **Override dynamic routes** checkbox.

   > If you enable dynamic routing (OSPF), the dynamic routes will normally have priority for outgoing routing. For internal routing on the HiPath Wireless Controller, the static routes normally have priority.

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

To view the forwarding table on the HiPath Wireless Controller:

1. From the main menu, click **Reports & Displays**. The **HiPath Reports & Displays** screen appears.
2. To view the static routes that have been defined for the HiPath Wireless Controller, click **Forwarding Table**. The **Forwarding Table** appears.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Help | LOGOUT
Displays: List of Displays • Reports: Forwarding Table | OSPF Neighbor | OSPF Linkstate | AP Inventory
Export
Refresh
[HWC | C1000] User: admin Port status: M
Software: V4 R1.2.3 (4.0.1.02.03) | Tracing: Inactive
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Local intranet

Route #	Destination	Netmask	Gateway	Interface	Type	Status
1	0.0.0.0	0.0.0.0	10.209.1.2	esa1	OSPF	Active
2	10.0.3.0	255.255.255.0	10.209.1.2	esa1	OSPF	Active
3	10.1.0.0	255.255.255.0	10.209.1.2	esa1	OSPF	Active
4	10.2.0.0	255.255.255.0	10.209.1.2	esa1	OSPF	Active
5	10.3.0.0	255.255.255.0	10.209.1.2	esa1	OSPF	Active
6	10.4.0.0	255.255.255.0	10.209.1.2	esa1	OSPF	Active
7	10.5.0.0	255.255.255.0	10.209.1.2	esa1	OSPF	Active
8	10.6.0.0	255.255.255.0	10.209.1.2	esa1	OSPF	Active
9	10.7.0.0	255.255.255.0	10.209.1.2	esa1	OSPF	Active
10	10.8.0.0	255.255.255.0	10.209.1.2	esa1	OSPF	Active
11	10.11.0.0	255.255.255.0	10.209.1.2	esa1	OSPF	Active
12	10.13.0.0	255.255.255.0	10.209.1.2	esa1	OSPF	Active
13	10.14.0.0	255.255.255.0	10.209.1.2	esa1	OSPF	Active
14	10.15.0.0	255.255.255.0	10.209.1.2	esa1	OSPF	Active
15	10.21.0.0	255.255.255.0	10.209.1.2	esa1	OSPF	Active
16	10.22.0.0	255.255.255.0	10.209.1.2	esa1	OSPF	Active
17	10.23.0.0	255.255.255.0	10.209.1.2	esa1	OSPF	Active
18	10.24.0.0	255.255.255.0	10.209.1.2	esa1	OSPF	Active
19	10.25.0.0	255.255.255.0	10.209.1.2	esa1	OSPF	Active
20	10.31.0.0	255.255.255.0	10.209.1.2	esa1	OSPF	Active

This report displays all defined routes, whether static or OSPF, and their current status.

3. To update the display, click **Refresh**.

4.2.6 Setting up OSPF Routing

To enable OSPF (OSPF RFC2328) routing, you must:

- Define one data port as a router port in the IP Addresses screen
- Enable OSPF globally on the HiPath Wireless Controller
- Define the global OSPF parameters
- Enable (or disable) OSPF on the port that you defined as a router port

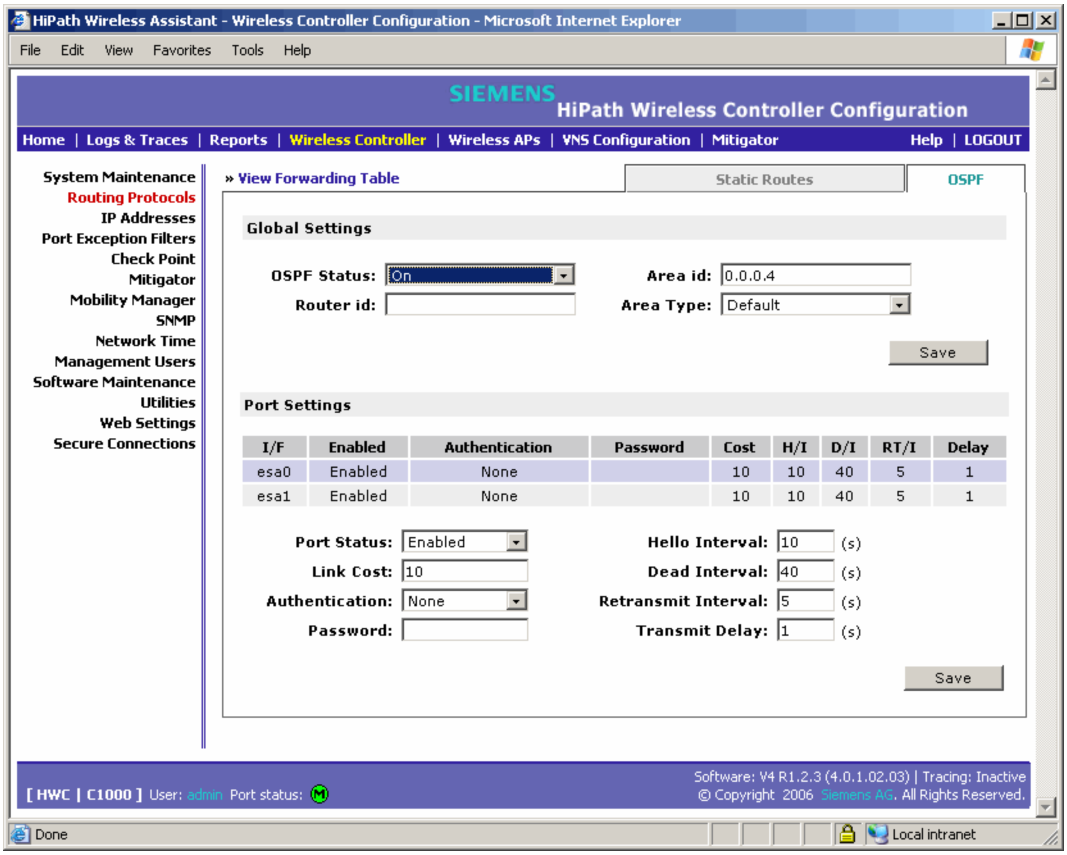
Ensure that the OSPF parameters defined here for the HiPath Wireless Controller are consistent with the adjacent routers in the OSPF area. This consistency includes the following:

- If the peer router has different timer settings, the protocol timer settings in the HiPath Wireless Controller must be changed to match, in order to achieve OSPF adjacency.

- The MTU of the ports on either end of an OSPF link must match. The MTU for ports on the HiPath Wireless Controller is defined as 1500, in the IP Addresses screen, during data port setup. This matches the default MTU in standard routers.

To set OSPF Routing Global Settings on the HiPath Wireless Controller:

1. From the main menu, click **Wireless Controller Configuration**. The **HiPath Wireless Controller Configuration** screen appears.
2. In the left pane, click **Routing Protocols**. The **Static Routes** tab appears.
3. Click the **OSPF** tab.


HiPath Wireless Assistant - Wireless Controller Configuration - Microsoft Internet Explorer
File Edit View Favorites Tools Help
SIEMENS
HiPath Wireless Controller Configuration
Home | Logs & Traces | Reports | Wireless Controller | Wireless APs | VNS Configuration | Mitigator | Help | LOGOUT
System Maintenance
Routing Protocols
IP Addresses
Port Exception Filters
Check Point
Mitigator
Mobility Manager
SNMP
Network Time
Management Users
Software Maintenance
Utilities
Web Settings
Secure Connections
» View Forwarding Table
Static Routes
OSPF
Save
Save
Done
Local intranet

Global Settings

OSPF Status: On
Area id: 0.0.0.4
Router id:
Area Type: Default

Port Settings

I/F	Enabled	Authentication	Password	Cost	H/I	D/I	RT/I	Delay
esa0	Enabled	None		10	10	40	5	1
esa1	Enabled	None		10	10	40	5	1

Port Status: Enabled
Link Cost: 10
Authentication: None
Password:
Hello Interval: 10 (s)
Dead Interval: 40 (s)
Retransmit Interval: 5 (s)
Transmit Delay: 1 (s)

[HWC | C1000] User: admin Port status: M

Software: V4 R1.2.3 (4.0.1.02.03) | Tracing: Inactive
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4. From the **OSPF Status** drop-down list, select **ON** to enable OSPF.
5. In the **Router ID** box, type the IP address of the HiPath Wireless Controller. This ID must be unique across the OSPF area. If left blank, the OSPF daemon automatically picks a router ID from one of the HiPath Wireless Controller’s interface IP addresses.
6. In the **Area ID** box, type the area. 0.0.0.0 is the main area in OSPF.
7. From the **Area Type** drop-down list, select one of the following:

- **Default** – The default acts as the backbone area (also known as area zero). It forms the core of an OSPF network. All other areas are connected to it, and inter-area routing happens via a router connected to the backbone area.
- **Stub** – The stub area does not receive external routes. External routes are defined as routes which were distributed in OSPF via another routing protocol. Therefor, stub areas typically rely on a default route to send traffic routes outside the present domain.
- **Not-so-stubby** – The not-so-stubby area is a type of stub area that can import autonomous system (AS) external routes and send them to the default/backbone area, but cannot receive AS external routes from the backbone or other areas.

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

To set OSPF Routing Port Settings on the HiPath Wireless Controller:

1. From the main menu, click **Wireless Controller Configuration**. The **HiPath Wireless Controller Configuration** screen appears.
2. In the left pane, click **Routing Protocols**.
3. Click the **OSPF** tab. The **OSPF Settings** screen appears.
4. From the **Port Status** drop-down list, select **Enabled** to enable OSPF on the port. The default setting is **Disabled**.
5. In the **Link Cost** box, type the OSPF standard for your network for this port. This is the cost of sending a data packet on the interface. The lower the cost, the more likely the interface is to be used to forward data traffic. The default setting is **10** for C100/C1000.

> ⓘ If more than one port is enabled for OSPF, it is important to prevent the HiPath Wireless Controller from serving as a router for other network traffic (other than the traffic from wireless device users controlled by the HiPath Wireless Controller). To ensure that the HiPath Wireless Controller is never the preferred OSPF route, set the Link Cost to its maximum value of 65535. Filters should also be defined that will drop routed packets. For more information, see Section 7.6, “Configuring filtering rules for a VNS”, on page 153.

6. From the **Authentication** drop-down list, select the authentication type for OSPF on your network: **None** or **Password**. The default setting is **None**.
7. If **Password** was selected as the authentication type, in the **Password** box, type the password. If **None** was selected as the Authentication type, leave this box blank. This password must match on either end of the OSPF connection.
8. Type the following:
   - **Hello-Interval** – Specifies the time in seconds (displays OSPF default).The default setting is **10** seconds.

- **Dead-Interval** – Specifies the time in seconds (displays OSPF default). The default setting is **40** seconds.
- **Retransmit-Interval** – Specifies the time in seconds (displays OSPF default). The default setting is **5** seconds.
- **Transmit Delay**– Specifies the time in seconds (displays OSPF default). The default setting is **1** second.

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

To confirm that ports are set for OSPF:

1. To confirm that the ports are set up for OSPF, and that advertised routes from the upstream router are recognized, click **View Forwarding Table**. The **Forwarding Table** appears.

   The following additional reports display OSPF information when the protocol is in operation:

   - **OSPF Neighbor** – Displays the current neighbors for OSPF (routers that have interfaces to a common network)
   - **OSPF Linkstate** – Displays the Link State Advertisements (LSAs) 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.

2. To update the display, click **Refresh**.

4.2.7 Filtering at the interface level

The Controller, Access Points and Convergence Software has a number of built-in filters that protect the system from unauthorized traffic. These filters are specific only to the HiPath Wireless Controller. These filters are applied at the network interface level and are automatically invoked. By default, these filters provide stringent-level rules to allow only access to the system's externally visible services. In addition to these built-in filters, the administrator can define specific exception filters at the interface-level to customize network access. These filters do not depend on a VNS definition.

4.2.8 Built-in port-based exception filters

On the HiPath Wireless Controller, various port-based exception filters are built in and invoked automatically. These filters protect the HiPath Wireless Controller from unauthorized access to system management functions and services via the ports. Access to system management functions is granted if the administrator selects the **allow management** option.

For example, on the HiPath Wireless Controller’s data interfaces (both physical interfaces and VNS virtual interfaces), the built-in exception filter prohibits invoking SSH, HTTPS, or SNMP. However, such traffic is allowed, by default, on the management port.

> ℹ You can also enable management traffic in the VNS definition.

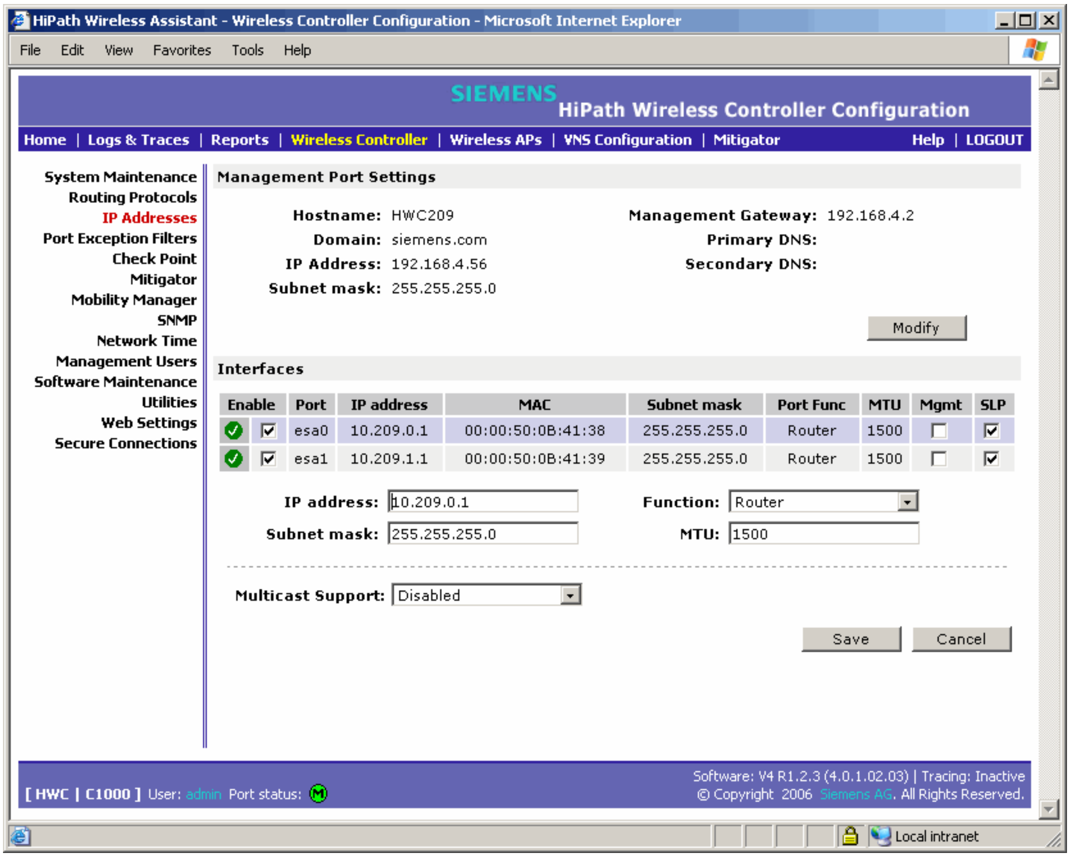
If management traffic is explicitly enabled for any interface (physical port or VNS), access is implicitly extended to that interface through any of the other interfaces (VNS). Only traffic specifically allowed by the interface’s exception filter is allowed to reach the HiPath Wireless Controller itself. All other traffic is dropped. Exception filters are dynamically configured and regenerated whenever the system's interface topology changes (for example, a change of IP address for any interface).

Enabling management traffic on an interface adds additional rules to the exception filter, which opens up the well-known IP(TCP/UDP) ports, corresponding to the HTTPS, SSH, and SNMP applications.

The port-based built-in exception filtering rules, in the case of traffic from VNS users, are applicable to traffic targeted directly for the VNSs interface. For example, a VNS filter may be generic enough to allow traffic access to the HiPath Wireless Controller's management (for example, Allow All [*.*.*.*]). Exception filter rules are evaluated after the user's VNS assigned filter policy, as such, it is possible that the VNS policy allow the access to management functions that the exception filter denies. These packets are dropped.

To enable SSH, HTTPS, or SNMP access through a data interface:

1. From the main menu, click **Wireless Controller Configuration**. The **HiPath Wireless Controller Configuration** screen appears.
2. In the left pane, click **IP Addresses**. The **Management Port Settings** screen appears.


HiPath Wireless Assistant - Wireless Controller Configuration - Microsoft Internet Explorer
File Edit View Favorites Tools Help
SIEMENS
HiPath Wireless Controller Configuration
Home | Logs & Traces | Reports | Wireless Controller | Wireless APs | VNS Configuration | Mitigator
Help | LOGOUT
System Maintenance
Routing Protocols
IP Addresses
Port Exception Filters
Check Point
Mitigator
Mobility Manager
SNMP
Network Time
Management Users
Software Maintenance
Utilities
Web Settings
Secure Connections
Modify
Save
Cancel
Local intranet

Management Port Settings

Hostname: HWC209
Domain: siemens.com
IP Address: 192.168.4.56
Subnet mask: 255.255.255.0
Management Gateway: 192.168.4.2
Primary DNS:
Secondary DNS:

Interfaces

Enable	Port	IP address	MAC	Subnet mask	Port Func	MTU	Mgmt	SLP
✓ ☑	esa0	10.209.0.1	00:00:50:0B:41:38	255.255.255.0	Router	1500	☐	☑
✓ ☑	esa1	10.209.1.1	00:00:50:0B:41:39	255.255.255.0	Router	1500	☐	☑

IP address: 10.209.0.1
Subnet mask: 255.255.255.0
Function: Router
MTU: 1500

Multicast Support: Disabled

[HWC | C1000] User: admin Port status: M

Software: V4 R1.2.3 (4.0.1.02.03) | Tracing: Inactive
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3. Select the appropriate interface in the **IP Addresses** screen.
4. Select the corresponding **Management** checkbox.
5. To save your changes, click **Save**.

4.2.9 User defined port-based exception filters

You can add specific filtering rules at the port level in addition to the built-in rules. Such rules give you the capability of restricting access to a port, for specific reasons, such as a Denial of Service (DoS) attack.

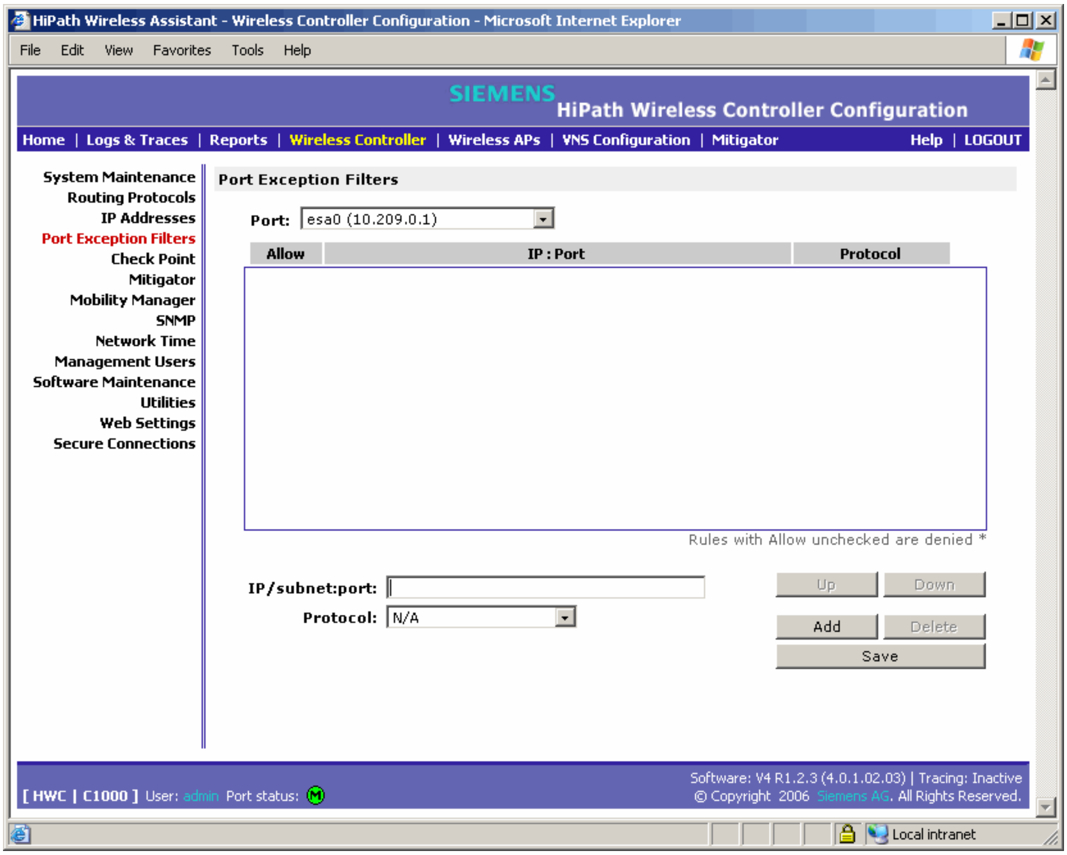
The filtering rules are set up in the same manner as filtering rules defined for a VNS — specify an IP address and then either allow or deny traffic to that address. For more information, see Section 7.6, “Configuring filtering rules for a VNS”, on page 153.

The rules defined for port exception filters are prepended to the normal set of restrictive exception filters and have precedence over the system's normal protection enforcement.

> ⚠ If defined improperly, user exception rules may seriously compromise the systems normal security enforcement rules. They may also disrupt the system's normal operation and even prevent system functionality altogether. It is advised to only augment the exception-filtering mechanism if absolutely necessary.

To define port exception filters:

1. From the main menu, click **Wireless Controller Configuration**. The **HiPath Wireless Controller Configuration** screen appears.
2. In the left pane, click **Port Exception Filters**. The **Port Exception Filters** screen appears.


HiPath Wireless Assistant - Wireless Controller Configuration - Microsoft Internet Explorer
File Edit View Favorites Tools Help
SIEMENS
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IP Addresses
Port Exception Filters
Check Point
Mitigator
Mobility Manager
SNMP
Network Time
Management Users
Software Maintenance
Utilities
Web Settings
Secure Connections
Port Exception Filters
Allow
IP : Port
Protocol
Up
Down
Add
Delete
Save
[HWC | C1000] User: admin Port status:
Local intranet

Port: esa0 (10.209.0.1)

Rules with Allow unchecked are denied *

IP/subnet:port:

Protocol: N/A

Software: V4 R1.2.3 (4.0.1.02.03) | Tracing: Inactive
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3. Select the applicable data port from the **Port** drop-down list.
4. In the **IP / subnet: port** box, type the destination IP address. You can also specify an IP range, a port designation or a port range on that IP address.
5. From the **Protocol** drop-down list, select the protocol you want to specify for the filter. This list may include UDP, TCP, IPsec-ESP, IPsec-AH, ICMP. The default is N/A.
6. Click **Add**. The new filter appears in the **Filter** area of the screen.

7. To select the new filter, click it.
8. To allow traffic, select the **Allow** checkbox.
9. To adjust the order of the filtering rules, click **Up** or **Down** to position the rule. The filtering rules are executed in the order defined here.
10. To save your changes, click **Save**.

4.3 Completing the system configuration

Once you have performed the initial configuration of the HiPath Wireless Controller, you are now ready to do the following:

- **Configuring the VNS** – For more information, see Section , “Virtual Network Services”, on page 107.
- **Registering and assigning APs to the VNS** – For more information, see Section , “Configuring the wireless AP”, on page 69.

4.4 Ongoing Operations of the Controller, Access Points and Convergence Software

Once you have configured the VNS and registered and assigned APs to the VNS, the Controller, Access Points and Convergence Software system configuration is complete. Ongoing operations of the Controller, Access Points and Convergence Software system can include the following:

- HiPath Wireless Controller System Maintenance
- Wireless AP Maintenance
- Client Disassociate
- Logs and Traces
- Reports and Displays

For more information, see Section , “Performing system maintenance”, on page 241.

5 Configuring the wireless AP

This chapter discusses the Wireless AP and its role in the Controller, Access Points and Convergence Software solution, including:

- Wireless AP overview
- Discovery and registration overview
- Configuring the wireless APs for the first time
- Adding and registering a Wireless AP manually
- Modifying wireless AP settings
- Modifying a wireless AP’s properties based on a default AP configuration
- Modifying the wireless AP’s default setting using the Copy to Defaults feature
- Configuring APs simultaneously
- Performing wireless AP software maintenance

5.1 Wireless AP overview

The wireless AP is a wireless LAN access point that uses the 802.11 wireless standards (802.11a+b/g) for network communications. The wireless AP bridges network traffic to an Ethernet LAN. The wireless AP is provided with proprietary software that allows it to communicate only with the HiPath Wireless Controller.

The Wireless AP physically connects to a LAN infrastructure and establishes an IP connection to the HiPath Wireless Controller. The wireless AP has no user interface—instead the wireless AP is managed through the HiPath Wireless Assistant. The AP's configuration is centrally managed and applied from the HiPath Wireless Controller. In addition, the HiPath Wireless Controller provides centralized management (verification and upgrade) of the AP firmware image.

All communication with the HiPath Wireless Controller is carried out using a UDP-based protocol, which encapsulates IP traffic from the wireless AP and directs it to the HiPath Wireless Controller. The HiPath Wireless Controller decapsulates the packets and routes them to the appropriate destinations, while managing sessions and applying policy.

Wireless AP models

The wireless AP has two models:

- **Model AP2610** – Internal antenna, internal dual (multimode) diversity antennas
- **Model AP2620** – External antenna (dual external antennas), RP-SMA connectors

> In order to comply with FCC regulations in North America, the U-NII Low Band (5.15 to 5.25 GHz band) is disabled for the Model AP2620.

Wireless AP radios

The wireless AP has two radios:

- **5 GHz radio supporting the 802.11a standard –** The 802.11a standard is an extension to 802.11 that applies to wireless LANs and provides up to 54 Mbps in the 5-GHz band. The 802.11a standard uses an orthogonal frequency division multiplexing encoding scheme, rather than Frequency-Hoping Spread Spectrum (FHSS) or Direct-Sequence Spread Spectrum (DSSS).
- **2.4 GHz radio supporting the 802.11b/g standards –** The 802.11g standard applies to wireless LANs and specifies a transmission rate of 54 Mbps. The 802.11b (High Rate) standard is an extension to 802.11 that specifies a transmission rate of 11 Mbps. Since 802.11g uses the same communication frequency range as 802.11b (2.4 GHz), 802.11g devices can co-exist with 802.11b devices on the same network.

The radios on the wireless AP are enabled or disabled through the HiPath Wireless Assistant. Both radios can be enabled to offer service simultaneously. For more information, see Section 7.1, “Topology for a VNS”, on page 124.

The Unlicensed National Information Infrastructure (U-NII) bands are three frequency bands of 100 MHz each in the 5 GHz band, designated for short-range, high-speed, wireless networking communication.

The Wireless AP supports the full range of 802.11a:

- 5.15 to 5.25 GHz – U-NII Low Band
- 5.25 to 5.35 GHz – U-NII Middle Band
- 5.725 to 5.825 GHz – U-NII High Band
- New 5.470 GHz to 5.725 GHz Band (when approved by FCC)

Wireless AP international licensing

Wireless APs are licensed to operate in North America, Japan (Wireless APs support 802.11j), the European Union countries, and European Union free trade countries. Each European Union country is assigned a particular radio band. The wireless AP must be configured to operate on the appropriate radio band according to each European Union country. For more information, see Section 2.2.3, “European Community”, on page 22.

To configure the appropriate radio band according to each European Union country, use the HiPath Wireless Assistant. For more information, see Section 5.5.3, “Modifying a wireless AP’s properties”, on page 86.

5.2 Discovery and registration overview

When the wireless AP is powered on, it automatically begins a discovery process to determine its own IP address and the IP address of the HiPath Wireless Controller. When the discovery process is successful, the wireless AP registers with the HiPath Wireless Controller.

5.2.1 Wireless AP discovery

Wireless APs discover the IP address of a HiPath Wireless Controller using a sequence of mechanisms that allow for the possible services available on the enterprise network. The discovery process is successful when the wireless AP successfully locates a HiPath Wireless Controller to which it can register.

You must ensure that the appropriate services on your enterprise network are prepared to support the discovery process. The following five steps summarize the discovery process:

- **Step 1 – Use the IP address of the last successful connection to a HiPath Wireless Controller.**

  Once a wireless AP has successfully registered with a HiPath Wireless Controller, it recalls that controller's IP address, and uses that address on subsequent reboots. The AP bypasses discovery and goes straight to registration. If this discovery method fails, it cycles through the remaining steps until successful.

- **Step 2 – Use the predefined static IP addresses for the HiPath Wireless Controllers on the network (if configured).**

  You can specify a list of static IP addresses of the HiPath Wireless Controllers on your network. On the **Static Configuration** tab, add the addresses to the Wireless Controller Search List.

> ⚠ Wireless APs configured statically can only connect to HiPath Wireless Controllers in the list. Improperly configured wireless APs cannot connect to a non-existent HiPath Wireless Controller address, and therefore cannot receive a corrected configuration.

- **Step 3 – Use Dynamic Host Configuration Protocol (DHCP) Option 78 to locate a Service Location Protocol (SLP) Directory Agent (DA), followed by a unicast SLP request to the Directory Agent.**

  To use the DHCP and unicast SLP discovery method, you must ensure that the DHCP server on your network supports Option 78 (DHCP for SLP RFC2610). The wireless APs use this method to discover the HiPath Wireless Controller.

  This solution takes advantage of two services that are present on most networks:

  - **DHCP (Dynamic Host Configuration Protocol)** – The standard means of providing IP addresses dynamically to devices on a network.
  - **SLP (Service Location Protocol) –** A means of allowing client applications to discover network services without knowing their location beforehand. Devices advertise their services using a Service Agent (SA). In larger installations, a Directory Agent (DA) collects information from SAs and creates a central repository (SLP RFC2608).

  The HiPath Wireless Controller contains an SLP SA that, when started, queries the DHCP server for Option 78 and if found, registers itself with the DA as service type Siemens. The HiPath Wireless Controller contains a DA (slpd).

  The wireless AP queries DHCP servers for Option 78 in order to locate any DAs. The wireless APs SLP User Agent then queries the DAs for a list of Siemens SAs.

  Option 78 must be set for the subnets connected to the ports of the HiPath Wireless Controller and the subnets connected to the wireless APs. These subnets should must contain an identical list of DA IP addresses.

- **Step 4 – Use a Domain Name Server (DNS) lookup for the host name Controller.domain-name.**

  If no DA is found, or if it has no Siemens SAs registered, the Wireless AP attempts to locate a HiPath Wireless Controller via DNS.

  If you use this method for discovery, place an A record in the DNS server for Controller.<domain-name>. The <domain-name> is optional, but if used, ensure it is listed with the DHCP server.

- **Step 5 – Use a multicast SLP request to find SLP SAs**

  If all of the preceding methods fail to locate a HiPath Wireless Controller, the wireless AP sends a multicast SLP request, looking for any SLP Service Agents providing the Siemens service.

5.2.2 Registration after discovery

Any of the discovery steps 2 through 5 can inform the wireless AP of a list of multiple IP addresses to which the wireless AP may attempt to connect. Once the wireless AP has discovered these addresses, it sends out connection requests to each of them. These requests are sent simultaneously. The AP will attempt to register only with the first which responds to its request.

When the wireless AP obtains the IP address of the HiPath Wireless Controller, it connects and registers, sending its serial number identifier to the HiPath Wireless Controller, and receiving from the HiPath Wireless Controller a port IP address and binding key.

Once the wireless AP is registered with a HiPath Wireless Controller, the wireless AP must be configured. After the wireless AP is registered and configured, it can be assigned to a Virtual Network Segment (VNS) to handle wireless traffic.

5.2.2.1 Default AP configuration

Default AP configuration simplifies the registration after discovery process. Default AP configuration acts as a configuration template that can be automatically assigned to new registering APs. The default AP configuration allows you to specify common sets of radio configuration parameters and VNS assignments for APs. For more information, see Section 5.5.2, “Configuring the default AP settings”, on page 83.

5.2.3 Understanding the wireless AP LED status

When the wireless AP is powered on and boots, you can follow its progress through the registration process by observing the LED sequence described below.

The Status LED (center) also indicates power—unlit when unit is off, and green (solid) when the AP has completed discovery and is operational.

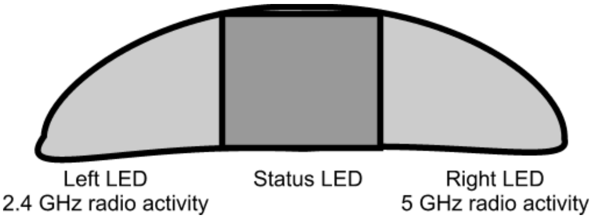


Figure 4 Wireless AP LED

⚠ Never disconnect a wireless AP from its power supply during a firmware upgrade. Disconnecting a wireless AP from its power supply during a firmware upgrade may cause firmware corruption rendering the AP unusable.

The table below assumes the software uses a timer and multiple phases to simulate LED blinking on all three LEDs. For example, an LED status of Red indicates the LED is solid colored Red, an LED status of Off/Green/Off indicates that the LED is Off for the first phase, Green for the second phase, and Off for the third phase.

Left LED Status	**Center LED Status**	**Right LED Status**	**AP Status**
Off	Off	Off	Powered-off
Off	Green	Off	Beginning of Power-On-Self-Test (POST) (0.5 seconds)
Off	Off	Off	POST
Off	Red	Off	Failure during POST
Green	Off	Green	Random delay – State displayed only after a vulnerable reset
Green/Off	Off/Green	Green/Off	Vulnerable time interval – The Wireless AP resets to factory default if powered-off for three consecutive times during this state. No vulnerable period when AP is resetting to factory defaults.
Green/Off/ Off	Off/Green/Off	Off/Off/Green	Resetting to factory defaults announcement – Replaces vulnerable period. This pattern is repeated twice to notify the operator when the factory configuration is restored.
Off	Orange (Green + Red)	Off	Attempting to obtain an IP address via DHCP.
Off	Red/Orange	Off	No DHCP reply has been received.
Off	Green/ Orange	Off	Failed discovery (SLP).
Off	Off/Orange	Off	HiPath Wireless Controller has been discovered. Registering the AP.
Off	Off/Red	Off	Registration of the AP has failed.
Off	Off/Green	Off	Standby, registered with a HiPath Wireless Controller, waiting for configuration.

Left LED Status	**Center LED Status**	**Right LED Status**	**AP Status**
Green when 802.11b/g enabled Off otherwise	Green	Green when 802.11a enabled Off otherwise	Radios enabled per user settings
Off	Red/Green	Off	Upgrading firmware.

Table 5 Wireless AP LED status

Random delays do not occur during normal reboot. A random delay only occurs after vulnerable period power-down.

The wireless AP can be reset to its factory default settings. For more information, see Section 12.2, “Resetting the AP to its factory default settings”, on page 246.

5.3 Configuring the wireless APs for the first time

Before the wireless AP is configured for the first time, you must first confirm that the following has already occurred:

- The HiPath Wireless Controller has been set up. For more information, see Chapter 4, “Configuring the HiPath Wireless Controller”.
- The Controller, Access Points and Convergence Software has been configured. For more information, see Chapter 4, “Configuring the HiPath Wireless Controller”.
- The wireless APs have been installed. For more information, see the *HiPath Wireless Controller, Access Points and Convergence Software AP Installation Instructions*.

Once the above processes are complete, you can then continue with the wireless AP initial configuration. The wireless AP initial configuration involves two steps:

- **Step One** – Define parameters for the discovery process. For more information, see Section 5.3.1, “Defining properties for the discovery process”, on page 77.
- **Step Two** – Connect the wireless AP to a power source to initiate the discovery and registration process. For more information, see Section 5.3.2, “Connecting the Wireless AP to a power source and initiating the discovery and registration process”, on page 80.

Adding a wireless AP manually option

An alternative to the automatic discovery and registration process of the wireless AP is to manually add and register a wireless AP to the HiPath Wireless Controller. For more information, see Section 5.4, “Adding and registering a Wireless AP manually”, on page 80.

5.3.1 Defining properties for the discovery process

Before a wireless AP is configured, you must define properties for the discovery process. The discovery process is the process by which the wireless APs determine the IP address of the HiPath Wireless Controller.

The properties that need to be defined are:

- Security mode
- Discovery timers

Security mode

Security mode is a HiPath Wireless Controller property. It defines how the controller behaves when registering new, unknown devices. During the registration process, the HiPath Wireless Controller's approval of the wireless AP's serial number depends on the security mode that has been set:

- **Allow all Wireless APs to connect**
  - If the HiPath Wireless Controller does not recognize the registering serial number, a new registration record is automatically created for the AP (if within MDL license limit). The AP receives a default configuration. The default configuration can be the default template assignment.
  - If the HiPath Wireless Controller recognizes the serial number, it indicates that the registering device is pre-registered with the controller. The controller uses the existing registration record to authenticate the AP and the existing configuration record to configure the AP.
- **Allow only approved Wireless APs to connect (this is also known as secure mode)**
  - If HiPath Wireless Controller does not recognize the AP, the AP's registration record is created in pending state (if within MDL limits. The administrator is required to manually approve a pending AP for it to provide active service. The pending AP receives minimum configuration, which only allows it to maintain an active link with the controller for future state change. The AP's radios are not configured or enabled. Pending APs are not eligible for configuration operations (VNS Assignment, default template, Radio parameters) until approved.
  - If the HiPath Wireless Controller recognizes the serial number, the controller uses the existing registration record to authenticate the AP. Following successful authentication, the AP is configured according to its stored configuration record.

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.

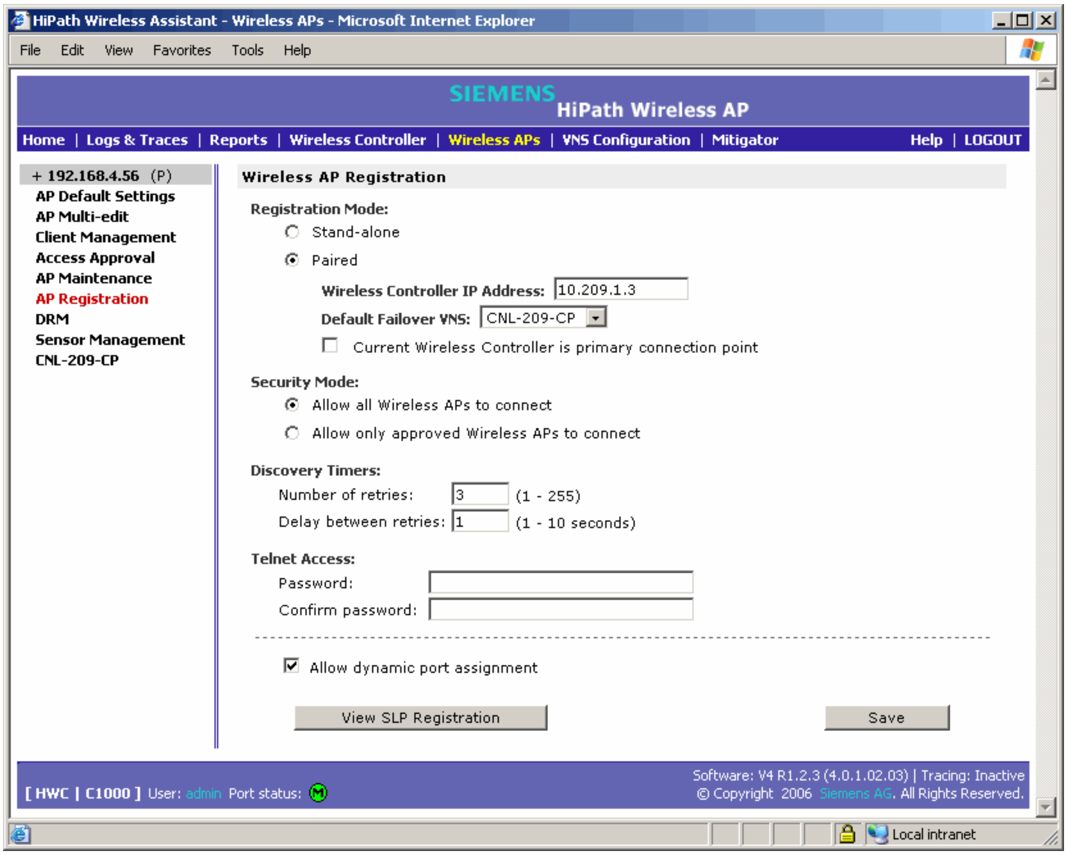
Once the initial setup is complete, it is recommended that the security mode is reset to the **Allow only approved Wireless APs to connect** option. This option ensures that no unapproved wireless APs are allowed to connect. For more information, see Section 5.5, “Modifying wireless AP settings”, on page 81.

Discovery timers

The discovery timer parameters dictate the number of retry attempts and the time delay between each attempt.

To define the discovery process parameters:

1. From the main menu, click **Wireless AP Configuration**. The **HiPath Wireless AP** screen appears.
2. In the left pane, click **AP Registration**. The **Wireless AP Registration** screen appears.


HiPath Wireless Assistant - Wireless APs - Microsoft Internet Explorer
File
Edit
View
Favorites
Tools
Help
SIEMENS
HiPath Wireless AP
Home | Logs & Traces | Reports | Wireless Controller | Wireless APs | VNS Configuration | Mitigator
Help | LOGOUT
+ 192.168.4.56 (P)
AP Default Settings
AP Multi-edit
Client Management
Access Approval
AP Maintenance
AP Registration
DRM
Sensor Management
CNL-209-CP
View SLP Registration
Save
[HWC | C1000] User: admin Port status:
Software: V4 R1.2.3 (4.0.1.02.03) | Tracing: Inactive
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Local intranet

Wireless AP Registration

Registration Mode:

○ Stand-alone

● Paired

Wireless Controller IP Address: 10.209.1.3

Default Failover VNS: CNL-209-CP

□ Current Wireless Controller is primary connection point

Security Mode:

● Allow all Wireless APs to connect

○ Allow only approved Wireless APs to connect

Discovery Timers:

Number of retries: 3 (1 - 255)

Delay between retries: 1 (1 - 10 seconds)

Telnet Access:

Password:

Confirm password:

☑ Allow dynamic port assignment

3. In the Security Mode section, select one of the following:
   - **Allow all Wireless APs to connect**
   - **Allow only approved Wireless APs to connect**

   The **Allow all Wireless APs to connect** option is selected by default. For more information, see Section 5.3.1, “Security mode”, on page 77.

4. In the Discovery Timers section, type the discovery timer values in the following boxes:
   - **Number of retries**
   - **Delay between retries**

   The default number of retries is 3, and the default delay between retries is 1 second.
5. To save your changes, click **Save**.

Once the discovery parameters are defined, you can connect the Wireless AP to a power source.

5.3.2 Connecting the Wireless AP to a power source and initiating the discovery and registration process

When a Wireless AP is powered on, it automatically begins the discovery and registration process with the HiPath Wireless Controller. A Wireless AP can be connected and powered in the following ways:

- Power over Ethernet (802.3af):
  - PoE enabled switch port
  - PoE Injector
- Power by AC adaptor

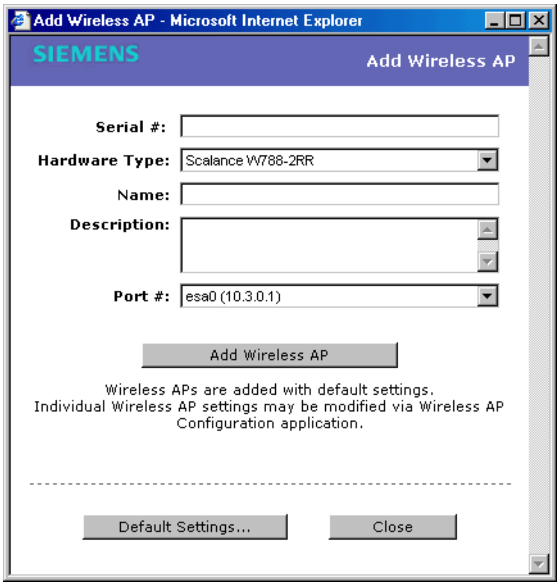
For more information, see the *AP Install Guide.*

5.4 Adding and registering a Wireless AP manually

An alternative to the automatic discovery and registration process of the Wireless AP is to manually add and register a Wireless AP to the HiPath Wireless Controller. The Wireless AP is added with default settings. For more information, see Section 5.5, “Modifying wireless AP settings”, on page 81.

To add and register a Wireless AP manually:

1. From the main menu, click **Wireless AP Configuration**. The **HiPath Wireless AP** screen appears.
2. Click **Add Wireless AP**. The Add Wireless AP screen appears.



Serial #:

Hardware Type: Scalance W788-2RR

Name:

Description:

Port #: esa0 (10.3.0.1)

Wireless APs are added with default settings.
Individual Wireless AP settings may be modified via Wireless AP Configuration application.

3. In the **Serial #** box, type the unique identifier.
4. From the **Hardware Type** drop-down list, select the hardware type of the Wireless AP.
5. In the **Name** box, type a unique name for the Wireless AP.
6. In the **Description** box, type descriptive comments for the Wireless AP.
7. In the **Port #** drop-down list, select the Ethernet port through which the Wireless AP can be reached.
8. Click **Add Wireless AP**. The wireless AP is added and registered.
9. Click **Close**.

5.5 Modifying wireless AP settings

Wireless APs are added with default settings, which you can adjust and configure according to your network requirements. In addition, you can modify the properties and the settings for each radio on the wireless AP.

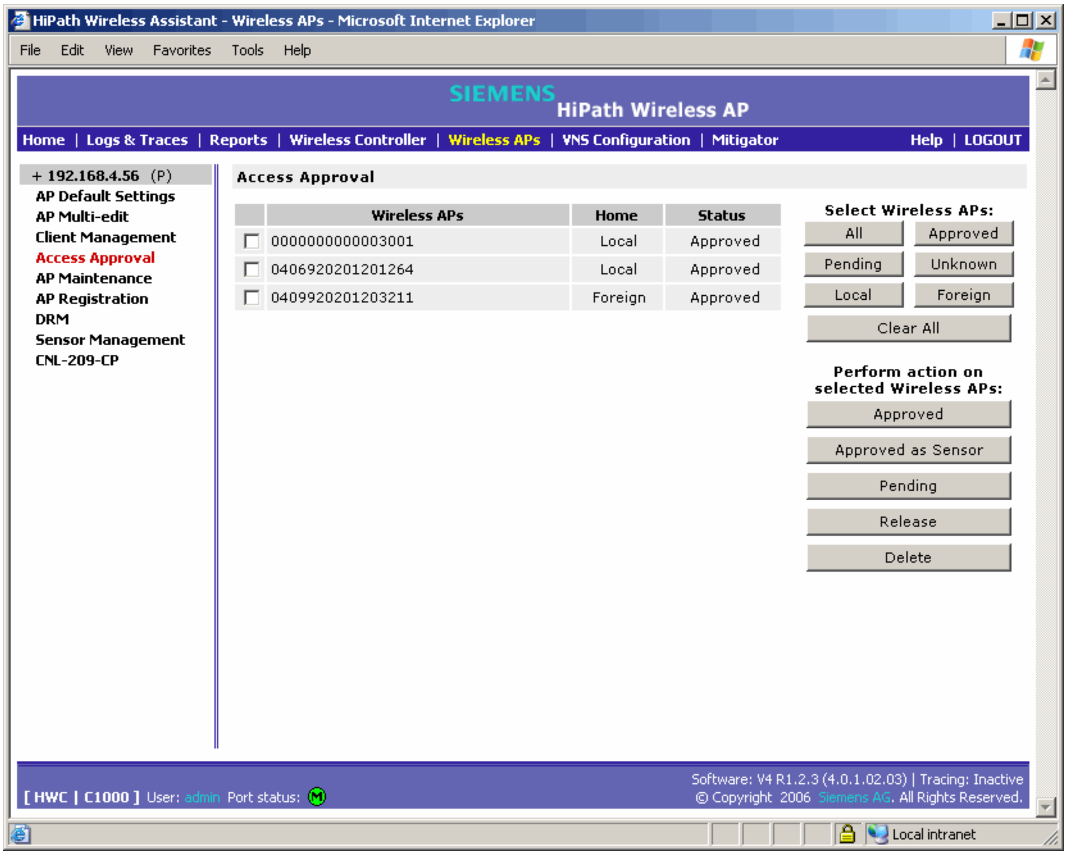
You can also locate and select APs in specific registration states to modify their settings. For example, this feature is useful when approving pending APs when there are a large number of other APs that are already registered. From the Access Approval screen, the administrator can click **Pending** to select all pending APs, then click **Approve** to approve all selected APs.

5.5.1 Modifying a Wireless AP’s status

If during the discovery process, the HiPath Wireless Controller security mode was **Allow only approved Wireless APs to connect**, then the status of the wireless AP is Pending. You must modify the security mode to **Allow all Wireless APs to connect**. For more information, see Section 5.3.1, “Security mode”, on page 77.

To modify a wireless AP's registration status:

1. From the main menu, click **Wireless AP Configuration**. The **HiPath Wireless AP** screen appears.
2. In the left pane, click **Access Approval**. The **Access Approval** screen appears, displaying the registered wireless APs and their status.


HiPath Wireless Assistant - Wireless APs - Microsoft Internet Explorer
File Edit View Favorites Tools Help
SIEMENS
HiPath Wireless AP
Home | Logs & Traces | Reports | Wireless Controller | Wireless APs | VNS Configuration | Mitigator
Help | LOGOUT
+ 192.168.4.56 (P)
AP Default Settings
AP Multi-edit
Client Management
Access Approval
AP Maintenance
AP Registration
DRM
Sensor Management
CNL-209-CP
Access Approval

	Wireless APs	Home	Status
□	0000000000003001	Local	Approved
□	0406920201201264	Local	Approved
□	0409920201203211	Foreign	Approved

Select Wireless APs:
All
Approved
Pending
Unknown
Local
Foreign
Clear All
Perform action on selected Wireless APs:
Approved
Approved as Sensor
Pending
Release
Delete
[HWC | C1000] User: admin Port status: M
Software: V4 R1.2.3 (4.0.1.02.03) | Tracing: Inactive
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Local intranet

3. To select the wireless APs for status change, do one of the following:
    - For a specific Wireless AP, select the corresponding checkbox.
    - For Wireless AP's by category, click one of the **Select Wireless APs** buttons.

    To deselect your Wireless AP selections, click **Clear All**.
4. Click the appropriate **Perform action on selected Wireless APs** option:
    - **Approved** – Change a Wireless AP's status from Pending to Approved, if the AP Registration screen was set to register only approved Wireless APs.
    - **Approved as Sensor** – **<<<need description>>>**
    - **Pending** – AP is removed from active list, and is forced into discovery.
    - **Release** – Release foreign Wireless APs after recovery from a failover.
    - **Delete** – Delete this Wireless AP from the VNS.

5.5.2 Configuring the default AP settings

Wireless APs are added with default settings. You can modify the system's AP default settings accordingly, and then use these default settings to configure newly added APs. In addition, you can base the system's AP default settings on an existing AP configuration or have configured APs inherit the properties of the default AP configuration when they register with the system.

To configure the default AP settings:

1. From the main menu, click **Wireless AP Configuration**. The **HiPath Wireless AP** screen appears.
2. In the left pane, click **AP Default Settings**.
3. Modify the following AP default settings as required:
    - AP Properties
    - Radio Settings
    - Static Configuration
    - Dynamic Radio Management
    - VNS Assignments
4. In the AP Properties section, modify the following:
    - **Poll Timeout * Interval** – Type the timeout and interval values, in seconds, for polling the controller. The default values are 10 seconds and 2 seconds, respectively.

- **Telnet Access** – Select whether Telnet Access is enabled or disabled.
- **Maintain client sessions** – Select whether the AP should remain active if a link loss with the controller occurs.This option is enabled by default.
- **Broadcast for disassoc**. – Select if you want to force all clients to disassociate from the wireless AP under the following conditions:
  - If the wireless AP is preparing to reboot or to enter one of the special modes (DRM initial channel selection).
  - If a BSSID is deactivated or removed on the wireless AP.

  This option is enabled by default.
- **Country** – Select the country of operation.

5. In the Radio Settings section, modify the following:
   - **Enable Radio** – Select the radios you want to enable.
   - **DTIM * Beacon Period** – For each radio, type the Delivery Traffic Indication Message (DTIM) period and the time units between beacon transmissions. The DTIM measures the number of beacons in the DTIM cycle. The default values are 1 and 100 milliseconds, respectively.
   - **RTS/CTS * Frag. Threshold** – For each radio, type the size of a data unit, which if below, a Request To Send (RTS)/Clear to Send (CTS) handshake is not performed. Also type the maximum size of a packet or data unit that can be delivered. The default values are 2346.
   - **Channel** – For each radio, select the wireless channel that the Wireless AP will use to communicate with wireless devices. Depending on the regulatory domain (based on country), some channels may be restricted. The default value is based on North America. The **Auto** selection allows the Wireless AP to select the appropriate channel automatically. For more information, see Chapter 2, “Regulatory information”.
   - **TX Power Level** – For each radio, select the Tx power level: **Min**, **13%**, **25%**, **50%**, or **Max**. If Dynamic Radio Management (DRM) was enabled on the DRM screen, this option is read-only.
   - **RX Diversity** – For each radio, select **Best** for the best signal from both antennas, or **Left** or **Right** to choose either of the two diversity antennas.
   - **TX Diversity** – For each radio, select **Alternate** for the best signal from both antennas, or **Left** or **Right** to choose either of the two diversity antennas.
   - **Operational Rate Set** – For each radio, select the data rate that clients can operate at while associated with the AP: **1**, **2**, **5.5**, **6**, **9**, **11**, **12**, **18**, **24**, **36**, **48**, or **54** Mbps. The **Best data rate** allows the Wireless AP to select the best data rate automatically.

- **Basic Rates** – Select the data rates that must be supported by all stations in a BSS: **1**, **2** or **1**, **2**, **5.5**, and **11** Mbps.
- **Preamble** – Select a preamble value: **Short**, **Long**, or **Auto**.
- **Protection Mode** – Select a protection mode: **None**, **Auto**, or **Always**. The default value is Auto.
- **Protection Rate** – Select a protection rate: **1**, **2**, **5.5**, or **11** Mbps. The default value is 11.
- **Protection Type** – Select a protection type: **CTS** or **RTS CTS**. The default value is RTS CTS.
- **Min Basic Rate** – For both radios, select the minimum data rate that must be supported by all stations in a BSS: **1**, **2**, **5.5**, or **11** Mbps.
- **Max Basic Rate** – For both radios, select the maximum data rate that must be supported by all stations in a BSS: **1**, **2**, **5.5**, or **11** Mbps.
- **Max Operational Rate** – For both radios, select the maximum data rate that clients can operate at while associated with the AP: **11**, **12**, **18**, **24**, **36**, **48**, or **54** Mbps.

6. In the **Static Configuration** section, modify the following:
   - In the **Add** box, type the IP address of the HiPath Wireless Controller that will control this Wireless AP.
   - Click **Add**. The IP address is added to the list.
   - Repeat to add additional HiPath Wireless Controllers.
   - Click **Up** and **Down** to modify the order of the controllers. The maximum is three controllers.

     The Wireless AP attempts to connect to the IP addresses in the order in which they are listed. The Wireless AP is successful when it finds a HiPath Wireless Controller that will allow it to register.

     This feature allows the Wireless AP to bypass the discovery process. If the **Wireless Controller Search List** box is not populated, the wireless AP will use SLP to discover a HiPath Wireless Controller.

     The DHCP function for wireless clients must be provided locally by a local DHCP server, unless each wireless client has a static IP address.

7. In the **Dynamic Radio Management** section, modify the following:
   - **Enable** – Select **Enable** or **Disable**. DRM is enabled by default.

- **Coverage** – Select **Shaped** or **Standard**. Shaped coverage adjusts the range based on neighboring Wireless APs and standard coverage adjusts the range to the client that is the most distant, as indicated by its signal strength.
- **Avoid WLAN** – For each radio, select **On** or **Off.**
- **Minimum TX** – For each radio, select the minimum power level that the range of transmit power can be adjusted dynamically.
- **Maximum TX** – For each radio, select the maximum power level that the range of transmit power can be adjusted dynamically.

8. In the **VNS Assignments** section, assign the radios for each VNS in the list by selecting or clearing the radio checkbox.
9. To save your changes, click **Save**.

5.5.3 Modifying a wireless AP's properties

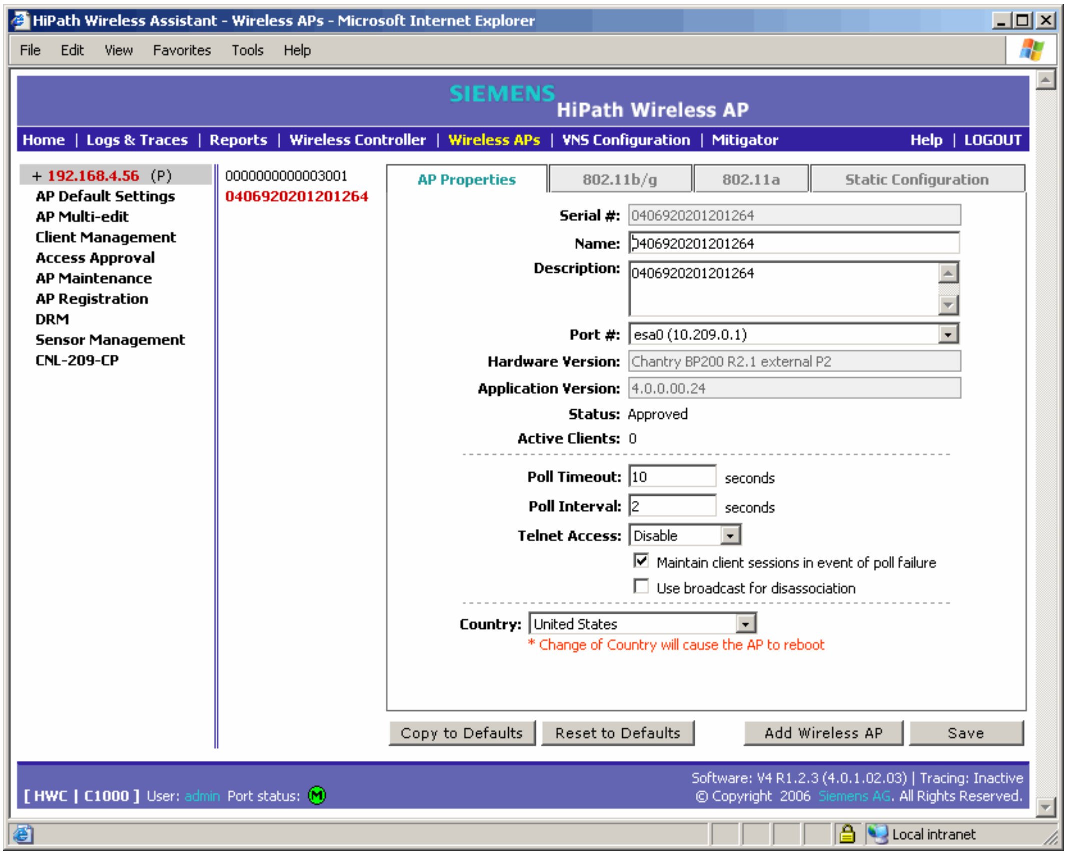
Once a wireless AP has successfully registered, you can then modify its properties. Modifying an APs properties can include modifying properties on the following tabs:

- AP properties
- 802.11b/g
- 802.11a
- Static Configuration

Modifying an APs properties is similar to modifying the system's AP default settings, only now you are modifying an individual AP.

To modify a wireless AP's properties:

1. From the main menu, click **Wireless AP Configuration**. The **HiPath Wireless AP** screen appears.
2. In the Wireless AP list, click the wireless AP whose properties you want to modify. The **AP Properties** tab displays wireless AP information.



Serial #: 0406920201201264

Name: 0406920201201264

Description: 0406920201201264

Port #: esa0 (10.209.0.1)

Hardware Version: Chantry BP200 R2.1 external P2

Application Version: 4.0.0.00.24

Status: Approved

Active Clients: 0

Poll Timeout: 10 seconds

Poll Interval: 2 seconds

Telnet Access: Disable

☑ Maintain client sessions in event of poll failure

☐ Use broadcast for disassociation

Country: United States

* Change of Country will cause the AP to reboot

[HWC | C1000] User: admin Port status: M

Software: V4 R1.2.3 (4.0.1.02.03) | Tracing: Inactive
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3. Modify the Wireless AP's information:

   - **Name** – Type a unique name for the Wireless AP that identifies the Wireless AP. The default value is the Wireless AP's serial number.
   - **Description** – Type comments for the wireless AP.
   - **Port #** – Select the Ethernet port of the controller the wireless AP is connected to.
   - **Poll Timeout** – Type the timeout value, in seconds, for polling the controller. The default value is 10 seconds.
   - **Poll Interval** – Type the interval value, in seconds, for polling the controller. The default value is 2 seconds.
   - **Telnet Access** – Select whether Telnet Access to the wireless AP is enabled or disabled.
   - **Maintain client session in event of poll failure –** Select this option if the AP should remain active if a link loss with the controller occurs.This option is enabled by default.

- **Use broadcast for disassociation –** Select if you want the wireless AP to use broadcast disassociation when disconnecting all clients, instead of disassociating each client one by one. This will affect the behavior of the AP under the following conditions:
  - If the Wireless AP is preparing to reboot or to enter one of the special modes (DRM initial channel selection).
  - If a BSSID is deactivated or removed on the Wireless AP.

  This option is disabled by default.
- **Country** – Select the country of operation. This option is only available with some licenses.

The following on the **AP Properties** tab are view only:

- **Serial #** – Displays a unique identifier that is assigned during the manufacturing process.
- **Hardware Version** – Displays the current version of the Wireless AP hardware.
- **Application Version** – Displays the current version of the Wireless AP software.
- **Status**:

  Approved – Indicates that the wireless AP has received its binding key from the HiPath Wireless Controller after the discovery process.
  - **Pending** – Indicates that the wireless AP has not yet successfully been approved for access with the secure controller.

  You can modify the status of a Wireless AP on the Access Approval screen. For more information, see Section 5.5.1, “Modifying a Wireless AP’s status”, on page 82
- **Active Clients** – Displays the number of wireless devices currently active on the Wireless AP.

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

5.5.4 Modifying the wireless AP’s radio properties

Most properties of the wireless AP’s radios can be modified without requiring a reboot of the wireless AP. However, modifying the following will require a reboot of the wireless AP:

- Enabling or disabling either radio
- Changing the radio channel between Auto and any fixed channel number

If the wireless AP does require a reboot, a warning message is displayed to the user in the HiPath Wireless Assistant.

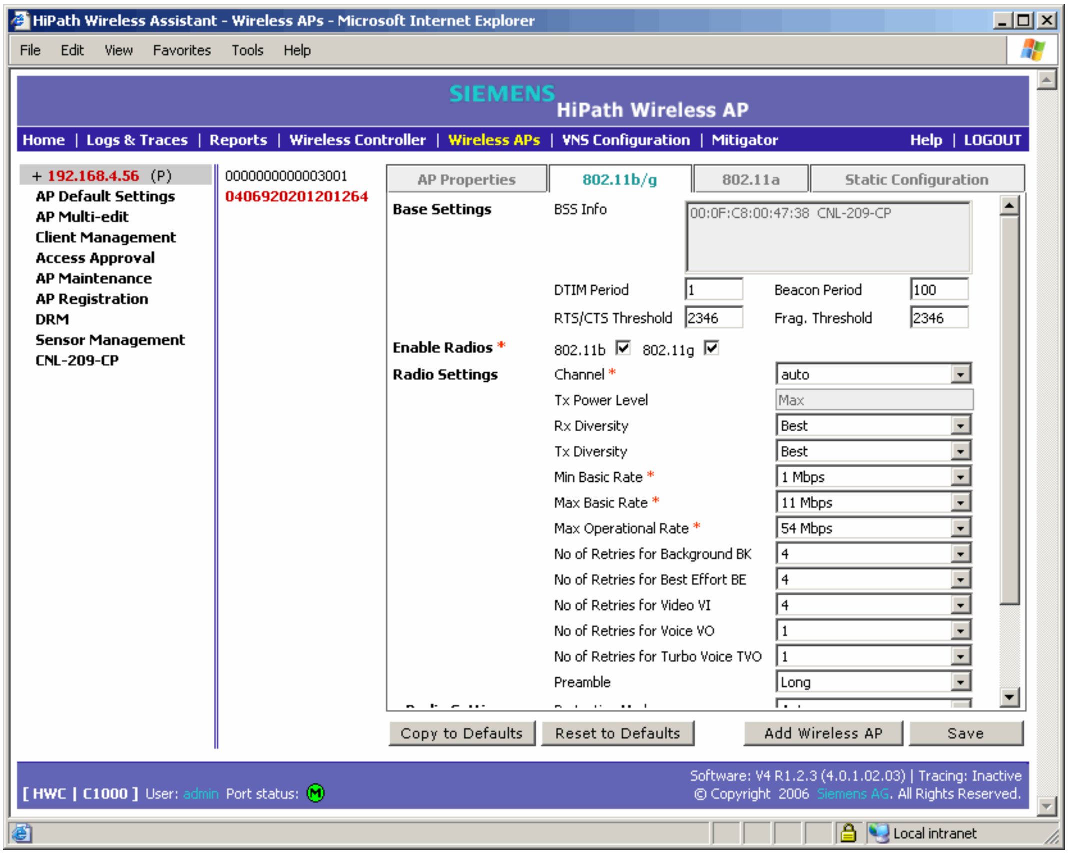
To modify the wireless AP’s radio properties:

1. From the main menu, click **Wireless AP Configuration**. The **HiPath Wireless AP** screen appears.
2. Click the appropriate wireless AP in the list.
3. Click the radio tab you want to modify.

   Each tab displays the radio settings for each radio on the wireless AP. If the radio has been assigned to a VNS, the VNS names and MAC addresses appear in the Base Settings area. The HiPath Wireless Controller C2400 can support up to 64 VNSs. The HiPath Wireless Controller C1000 can support up to 50 VNSs, the C100 can support up to 32 VNSs, and the C10 can support up to 16. The AP radios can be assigned to each of the configured VNSs in a system. Each AP can be the subject of 8 VNS assignments (corresponding to the number of SSIDs it can support). Once a radio has all 8 slots assigned, it is no longer eligible for further assignment.

   The BSS Info area is view only. After VNS configuration, the Basic Service Set (BSS) area displays the MAC address on the wireless AP for each VNS and the SSIDs of the VNSs to which this radio has been assigned.

   - If applicable, click the **802.11b/g** tab to modify the radio properties.


HiPath Wireless Assistant - Wireless APs - Microsoft Internet Explorer
File Edit View Favorites Tools Help
SIEMENS
HiPath Wireless AP
Home | Logs & Traces | Reports | Wireless Controller | Wireless APs | VNS Configuration | Mitigator
Help | LOGOUT
+ 192.168.4.56 (P)
AP Default Settings
AP Multi-edit
Client Management
Access Approval
AP Maintenance
AP Registration
DRM
Sensor Management
CNL-209-CP
0000000000003001
0406920201201264
AP Properties
802.11b/g
802.11a
Static Configuration
Copy to Defaults
Reset to Defaults
Add Wireless AP
Save
[HWC | C1000] User: admin Port status:
Software: V4 R1.2.3 (4.0.1.02.03) | Tracing: Inactive
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Base Settings

BSS Info: 00:0F:C8:00:47:38 CNL-209-CP

DTIM Period: 1 Beacon Period: 100

RTS/CTS Threshold: 2346 Frag. Threshold: 2346

Enable Radios *: 802.11b ☑ 802.11g ☑

Radio Settings

Channel *: auto

Tx Power Level: Max

Rx Diversity: Best

Tx Diversity: Best

Min Basic Rate *: 1 Mbps

Max Basic Rate *: 11 Mbps

Max Operational Rate *: 54 Mbps

No of Retries for Background BK: 4

No of Retries for Best Effort BE: 4

No of Retries for Video VI: 4

No of Retries for Voice VO: 1

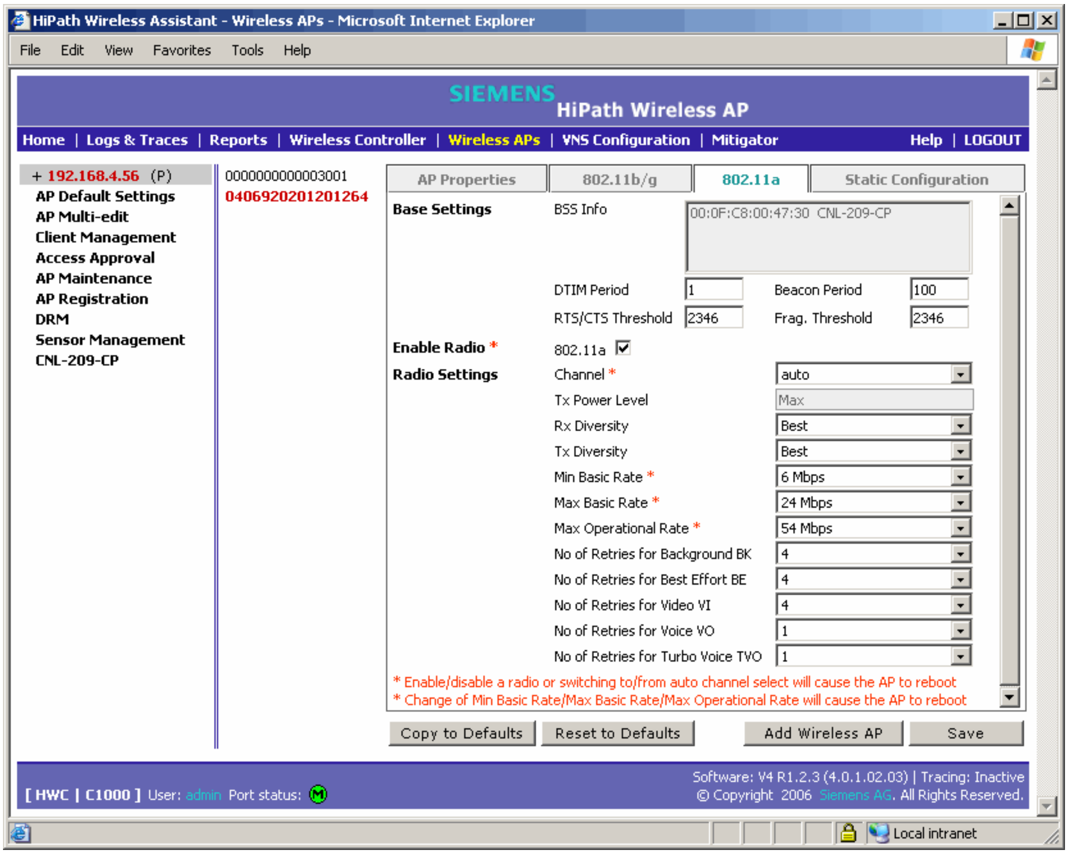
No of Retries for Turbo Voice TVO: 1

Preamble: Long

- **DTIM Period** – Type the Delivery Traffic Indication Message (DTIM) period. The default value is 1. This measures the number of beacons in the DTIM cycle.
- **Beacon Period** – Type the time units between beacon transmissions. The default value is 100 milliseconds.
- **RTS/CTS Threshold** – Type the size of a data unit, which if below, a Request To Send (RTS)/Clear to Send (CTS) handshake is not performed. The default value is 2346.
- **Frag. Threshold** – Type the maximum size of a packet or data unit that can be delivered. The default value is 2346.
- **802.11b** – Select to enable the 802.11b radio.
- **802.11g** – Select to enable the 802.11g radio.
- **Channel** – Select the wireless channel that the wireless AP will use to communicate with wireless devices. Depending on the regulatory domain (based on country), some channels may be restricted. The default value is based on North America. The **Auto** selection allows the wireless AP to select the appropriate channel automatically. For more information, see Chapter 2, “Regulatory information”.
- **Tx Power Level** – Select the Tx power level: **Min**, **13%**, **25%**, **50%**, or **Max**. If Dynamic Radio Management (DRM) was enabled on the DRM screen, this option is read-only.
- **Rx Diversity** – Select **Best** for the best signal from both antennas, or **Left** or **Right** to choose either of the two diversity antennas.
- **Tx Diversity** – Select **Alternate** for the best signal from both antennas, or **Left** or **Right** to choose either of the two diversity antennas.
- **Min Basic Rate** – Select the minimum data rate that must be supported by all stations in a BSS: **1**, **2**, **5.5**, or **11** Mbps.
- **Max Basic Rate** – Select the maximum data rate that must be supported by all stations in a BSS: **1**, **2**, **5.5**, or **11** Mbps.
- **Max Operational Rate** – Select the maximum data rate that clients can operate at while associated with the AP: **11**, **12**, **18**, **24**, **36**, **48**, or **54** Mbps.
- **No of Retries for Background BK** – Select the number of retries for the Background transmission queue. The default value is 4. The recommended rate is **adaptive (multi-rate)**.
- **No of Retries for Best Effort BE** – Select the number of retries for the Best Effort transmission queue. The default value is 4. The recommended rate is **adaptive (multi-rate)**.

- **No of Retries for Video VI** – Select the number of retries for the Video transmission queue. The default value is 4. The recommended rate is **adaptive (multi-rate)**.
- **No of Retries for Voice VO** – Select the number of retries for the Voice transmission queue. The default value is 1. The recommended rate is **adaptive (multi-rate)**.
- **No of Retries for Turbo Voice TVO** – Select the number of retries for the Turbo Voice transmission queue. The default value is 1. The recommended rate is **adaptive (multi-rate)**.
- **Preamble** – Select a preamble value: **Short**, **Long**, or **Auto**.
- **Protection Mode** – Select a protection mode: **None**, **Auto**, or **Always**. The default value is Auto.
- **Protection Rate** – Select a protection rate, in Mbps: **1**, **2**, **5.5**, or **11**. The default value is 11.
- **Protection Type** – Select a protection type: **CTS** or **RTS CTS**. The default value is RTS CTS.

- If applicable, click the **802.11a** tab to modify the radio properties.



0000000000003001
0406920201201264

Base Settings

BSS Info	00:0F:C8:00:47:30 CNL-209-CP		
DTIM Period	1	Beacon Period	100
RTS/CTS Threshold	2346	Frag. Threshold	2346

Enable Radio * 802.11a ☑

Radio Settings

Channel *	auto
Tx Power Level	Max
Rx Diversity	Best
Tx Diversity	Best
Min Basic Rate *	6 Mbps
Max Basic Rate *	24 Mbps
Max Operational Rate *	54 Mbps
No of Retries for Background BK	4
No of Retries for Best Effort BE	4
No of Retries for Video VI	4
No of Retries for Voice VO	1
No of Retries for Turbo Voice TVO	1

* Enable/disable a radio or switching to/from auto channel select will cause the AP to reboot
* Change of Min Basic Rate/Max Basic Rate/Max Operational Rate will cause the AP to reboot

[HWC | C1000] User: admin Port status: M

Software: V4 R1.2.3 (4.0.1.02.03) | Tracing: Inactive
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- **DTIM Period** – Type the Delivery Traffic Indication Message (DTIM) period. The default value is 1. This measures the number of beacons in the DTIM cycle.
- **Beacon Period** – Type the time units between beacon transmissions. The default value is 100 milliseconds.
- **RTS/CTS Threshold** – Type the size of a data unit, which if below, a Request To Send (RTS)/Clear to Send (CTS) handshake is not performed. The default value is 2346.
- **Frag. Threshold** – Type the maximum size of a packet or data unit that can be delivered. The default value is 2346.
- **802.11a** – Select to enable the 802.11a radio.
- **802.11j** – Select to enable the 802.11j radio. This radio is only available in Japan.
- **Channel** – Select the wireless channel that the wireless AP will use to communicate with wireless devices. Depending on the regulatory domain (based on country), some channels may be restricted. The default value is based on North America. The **Auto** selection allows the wireless AP to select the appropriate channel automatically. For more information, see Chapter 2, “Regulatory information”.

- **Tx Power Level** – Select the Tx power level: **Min**, **13%**, **25%**, **50%**, or **Max**. If Dynamic Radio Management (DRM) was enabled on the DRM screen, this option is read-only.
- **Rx Diversity** – Select **Best** for the best signal from both antennas, or **Left** or **Right** to choose either of the two diversity antennas.
- **Tx Diversity** – Select **Alternate** for the best signal from both antennas, or **Left** or **Right** to choose either of the two diversity antennas.
- **Min Basic Rate** – Select the minimum data rate that must be supported by all stations in a BSS: **1**, **2**, **5.5**, or **11** Mbps.
- **Max Basic Rate** – Select the maximum data rate that must be supported by all stations in a BSS: **1**, **2**, **5.5**, or **11** Mbps.
- **Max Operational Rate** – Select the maximum data rate that clients can operate at while associated with the AP: **11**, **12**, **18**, **24**, **36**, **48**, or **54** Mbps.

> ⓘ Radio a channels 100 to 140 occupy the 5470-5725 MHz band in the regulatory domains of the European Union and European Union free trade countries. Radio B/G Channels 12 to 14 are not available in North America.

- **No of Retries for Background BK** – Select the number of retries for the Background transmission queue. The default value is 4. The recommended rate is **adaptive (multi-rate)**.
- **No of Retries for Best Effort BE** – Select the number of retries for the Best Effort transmission queue. The default value is 4. The recommended rate is **adaptive (multi-rate)**.
- **No of Retries for Video VI** – Select the number of retries for the Video transmission queue. The default value is 4. The recommended rate is **adaptive (multi-rate)**.
- **No of Retries for Voice VO** – Select the number of retries for the Voice transmission queue. The default value is 1. The recommended rate is **adaptive (multi-rate)**.
- **No of Retries for Turbo Voice TVO** – Select the number of retries for the Turbo Voice transmission queue. The default value is 1. The recommended rate is **adaptive (multi-rate)**.

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

5.5.5 Setting up the wireless AP using static configuration

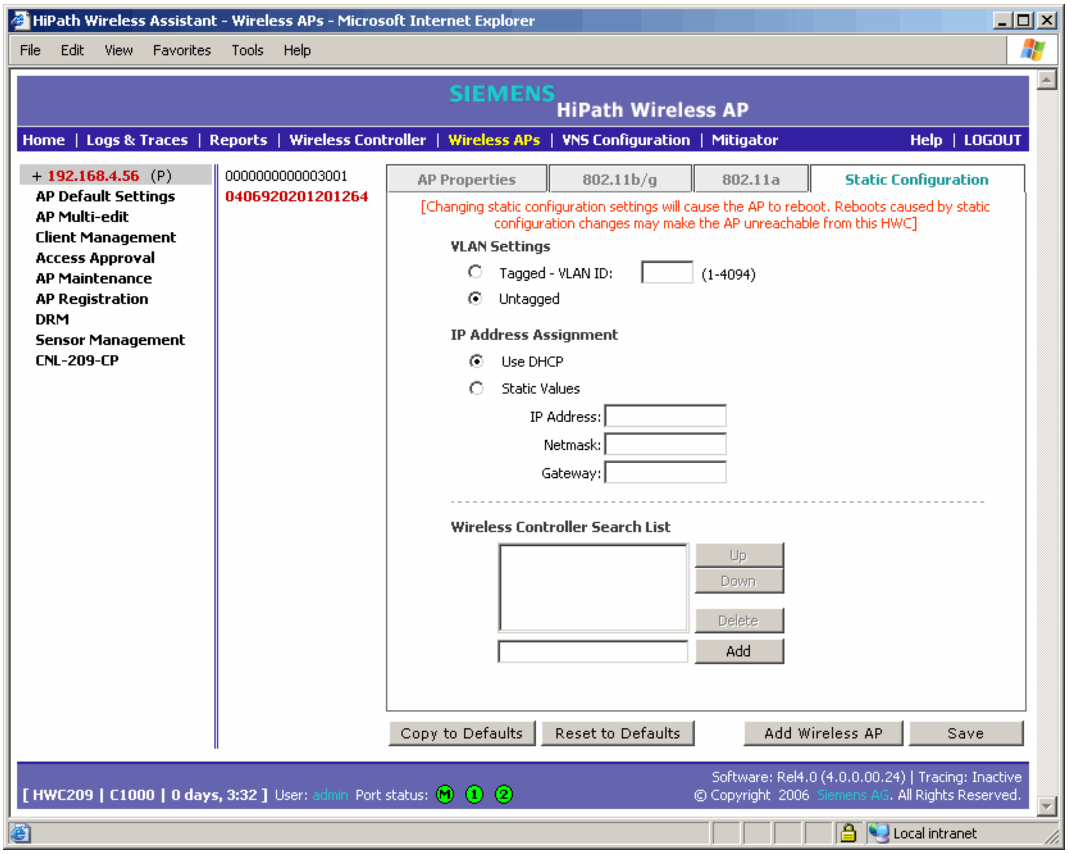
The wireless AP static configuration feature provides the HiPath Wireless Controller, Access Points and Convergence Software solution with the capability for a network with either a central office or a branch office model. The static configuration settings assist in the setup of branch office support. These settings are not dependent of branch topology, but instead can be employed at any time if required. In the branch office model, wireless APs are installed in remote sites, while the HiPath Wireless Controller is in the central office. The wireless APs require the capability to interact in both the local site network and the central network. To achieve this model, a static configuration is used.

> In static configuration, if the wireless AP cannot register with the HiPath Wireless Controller within the specified number of retries, the wireless AP will use SLP, DNS, and SLP multicast as a backup mechanism. If unsuccessful, the wireless AP resumes the discovery process with the static configuration, followed with SLP, DNS, and SLP multicast. For more information, see Section 5.2, “Discovery and registration overview”, on page 71.

To set up a wireless AP using static configuration:

1. From the main menu, click **Wireless AP Configuration**. The **HiPath Wireless AP** screen appears.
2. Click the appropriate wireless AP in the list.

3. Click the **Static Configuration** tab.



[Changing static configuration settings will cause the AP to reboot. Reboots caused by static configuration changes may make the AP unreachable from this HWC]

VLAN Settings

○ Tagged - VLAN ID: (1-4094)

● Untagged

IP Address Assignment

● Use DHCP

○ Static Values

IP Address:

Netmask:

Gateway:

[HWC209 | C1000 | 0 days, 3:32] User: admin Port status: M 1 2

Software: Rel4.0 (4.0.0.00.24) | Tracing: Inactive
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4. Select one of the VLAN settings for the wireless AP:

   - **Tagged - VLAN ID** – Select if you want to assign this AP to a specific VLAN and type the value in the box.
   - **Untagged** – Select if you want this AP to be untagged. This option is selected by default.

5. Select one of the two methods of IP address assignment for the wireless AP:

   - **Use DHCP** – Select this option to enable Dynamic Host Configuration Protocol (DHCP). This option is enabled by default.
   - **Static Values** – Select this option to specify the IP address of the wireless AP.
     - **IP Address** – Type the IP address of the AP.
     - **Subnet Mask** – Type the appropriate subnet mask to separate the network portion from the host portion of the address.
     - **Gateway** – Type the default gateway of the network.

> ⓘ For first-time deployment of the wireless AP for static IP assignment, (a branch office scenario is an example of a setup that may require static IP assignment), it is recommended to use DHCP initially on the central office network to obtain an IP address for the wireless AP. Then enter these values in the **Static Configuration** tab for this wireless AP and save the configuration. Since APs ship from the factory with DHCP mode enabled by default, the APs require the assistance of a local DHCP server to obtain its initial IP address. The AP can then register with the controller, at which point it can receive the proper static definition parameters and be moved to its target location if necessary.

6. In the **Add** box, type the IP address of the HiPath Wireless Controller that will control this wireless AP.
7. Click **Add**. The IP address is added to the list.
8. Repeat steps 5 and 6 to add additional HiPath Wireless Controllers.
9. Use the **Up** and **Down** buttons to modify the order of the controllers. The maximum is three controllers.

   The wireless AP attempts to connect to the IP addresses in the order in which they are listed. The wireless AP is successful when it finds a HiPath Wireless Controller that will allow it to register.

   This feature allows the wireless AP to bypass the discovery process. If the **Wireless Controller Search List** box is not populated, the wireless AP will use SLP to discover a HiPath Wireless Controller.

   The DHCP function for wireless clients must be provided locally by a local DHCP server, unless each wireless client has a static IP address.
10. To save your changes, click **Save**.

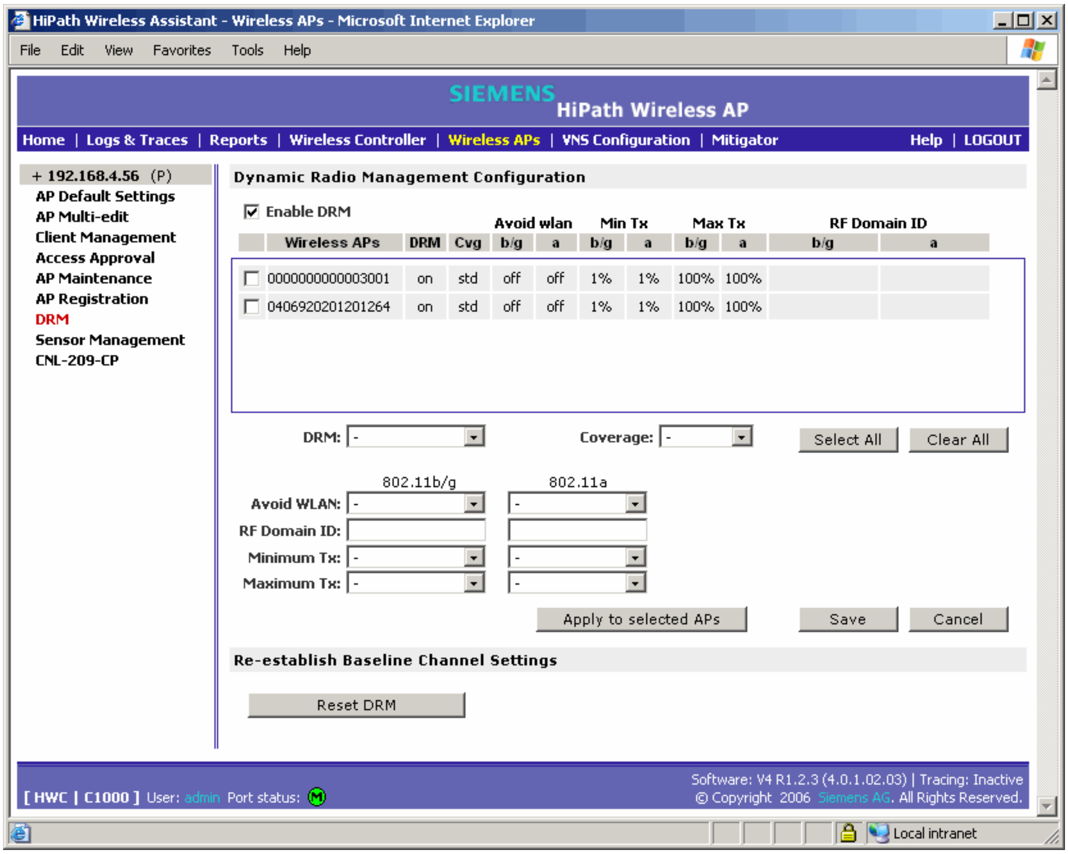
5.5.6 Configuring Dynamic Radio Management

The Dynamic Radio Management (DRM) feature for the wireless AP is enabled by default. The DRM feature:

- 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 APs with the same channel, but different SSIDs are detected.

To configure the DRM software:

1. From the main menu, click **Wireless AP Configuration**. The **HiPath Wireless AP** screen appears.
2. In the left pane, click **DRM**.
3. Confirm the **Enable DRM** checkbox is selected.
4. To refresh the wireless APs list, click **Save**. The list is populated with the wireless APs.



Dynamic Radio Management Configuration

☑ Enable DRM

				Avoid wlan		Min Tx		Max Tx		RF Domain ID	
	Wireless APs	DRM	Cvg	b/g	a	b/g	a	b/g	a	b/g	a
□	0000000000003001	on	std	off	off	1%	1%	100%	100%		
□	0406920201201264	on	std	off	off	1%	1%	100%	100%		

DRM: -

Coverage: -

	802.11b/g	802.11a
Avoid WLAN:	-	-
RF Domain ID:		
Minimum Tx:	-	-
Maximum Tx:	-	-

Re-establish Baseline Channel Settings

[HWC | C1000] User: admin Port status: M

Software: V4 R1.2.3 (4.0.1.02.03) | Tracing: Inactive
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5. From the list of registered wireless APs, select the checkbox corresponding to the wireless AP you want to configure for DRM. The DRM properties are populated with default values when DRM is enabled.
6. In the **Coverage** drop-down list, select:
   - **Std** – (Standard Coverage) Adjusts the range to the client that is the most distant, as indicated by its signal strength.
   - **Shpd** – (Shaped Coverage) Adjusts the range based on neighboring wireless APs.
7. If applicable, from the **Avoid WLAN** drop-down list, select **on.**

8. In the **RF Domain ID** box, type a string that uniquely identifies a group of APs that cooperate in managing RF channels and power levels. The maximum length of the string is 15 characters.

> If SSID Broadcast is disabled and DRM is enabled, you must provide an **RF Domain ID**.

9. From the **Minimum** drop-down list, select the minimum power level that the range of transmit power can be adjusted dynamically.
10. From the **Maximum** drop-down list, select the maximum power level that the range of transmit power can be adjusted dynamically.
11. Click **Apply to selected APs**.
12. To save your changes, click **Save.**
13. To re-establish baseline settings, forcing the APs to go through the auto-channel selection process, click **Reset DRM**.

5.6 Modifying a wireless AP's properties based on a default AP configuration

If you have a wireless AP that is already configured with its own settings, but would like the wireless AP to be reset to use the system's default AP settings, use the **Reset to Defaults** feature on the AP Properties tab.

To configure a wireless AP with the system's default AP settings:

1. From the main menu, click **Wireless AP Configuration**. The **HiPath Wireless AP** screen appears.
2. In the wireless AP list, click the wireless AP whose properties you want to modify. The **AP Properties** tab displays wireless AP information.
3. Click **Reset to Defaults** to have the wireless AP inherit the system's default AP settings. A pop-up window asking you to confirm the configuration change appears.
4. Click **OK** to confirm resetting the AP to the default settings.

5.7 Modifying the wireless AP's default setting using the Copy to Defaults feature

You can modify the system's default AP settings by using the **Copy to Defaults** feature on the AP Properties tab. This feature allows the properties of an already configured AP to become the system's default AP settings.

To modify the system’s default AP settings based on an already configured AP:

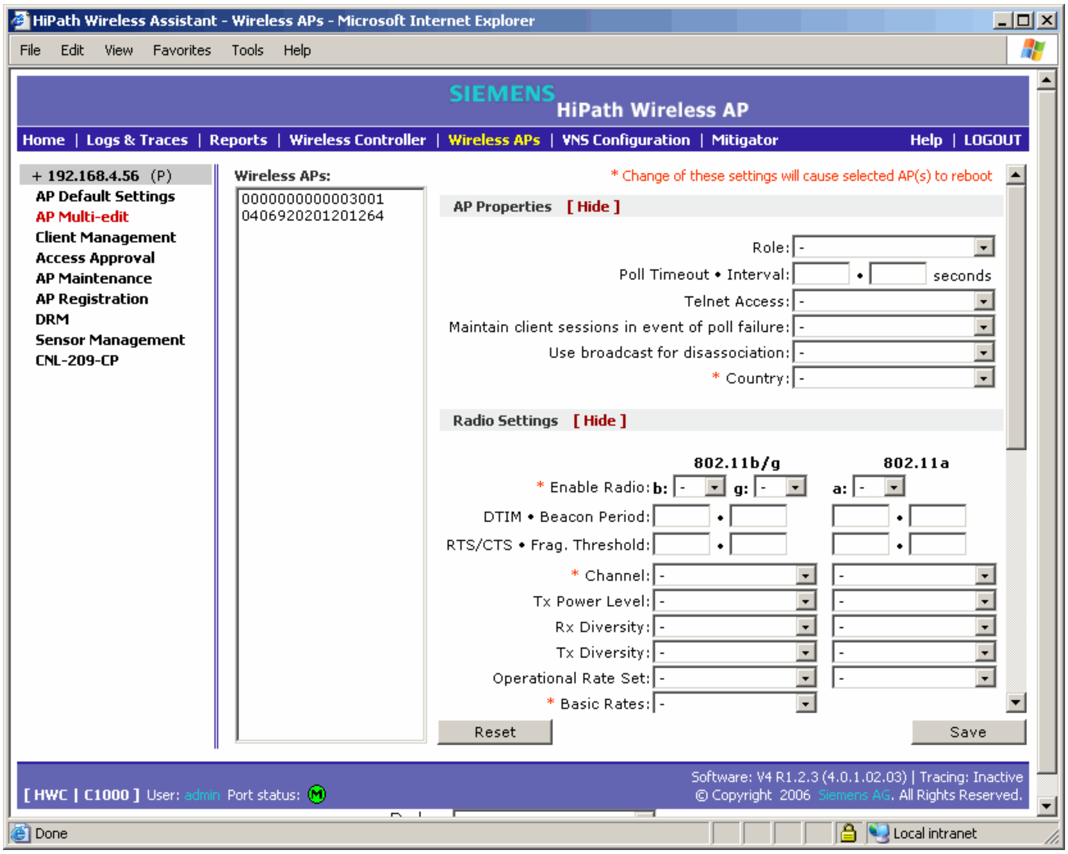
1. From the main menu, click **Wireless AP Configuration**. The **HiPath Wireless AP** screen appears.
2. In the wireless AP list, click the wireless AP whose properties you want to become the system’s default AP settings. The **AP Properties** tab displays wireless AP information.
3. If applicable, modify the AP’s properties. For more information, see Section 5.5.3, “Modifying a wireless AP’s properties”, on page 86.
4. Click **Copy to Defaults** to make this AP’s configuration be the system’s default AP settings. A pop-up window asking you to confirm the configuration change appears.
5. Click **OK** to confirm resetting the system’s default AP settings.

5.8 Configuring APs simultaneously

In addition to configuring APs individually, you can also configure multiple APs simultaneously by using the AP Multi-edit functionality.

To configure APs simultaneously:

1. From the main menu, click **Wireless AP Configuration**. The **HiPath Wireless AP** screen appears.
2. In the left pane, click **AP Multi-edit**.


HiPath Wireless Assistant - Wireless APs - Microsoft Internet Explorer
File Edit View Favorites Tools Help
SIEMENS HiPath Wireless AP
Home | Logs & Traces | Reports | Wireless Controller | Wireless APs | VNS Configuration | Mitigator
Help | LOGOUT
+ 192.168.4.56 (P)
AP Default Settings
AP Multi-edit
Client Management
Access Approval
AP Maintenance
AP Registration
DRM
Sensor Management
CNL-209-CP
Reset
Save
Done
Local intranet

Wireless APs:
0000000000003001
0406920201201264

* Change of these settings will cause selected AP(s) to reboot

AP Properties [Hide]

Role: -
Poll Timeout • Interval: • seconds
Telnet Access: -
Maintain client sessions in event of poll failure: -
Use broadcast for disassociation: -
* Country: -

Radio Settings [Hide]

	802.11b/g	802.11a
* Enable Radio:	b: - g: -	a: -
DTIM • Beacon Period:	•	•
RTS/CTS • Frag. Threshold:	•	•
* Channel:	-	-
Tx Power Level:	-	-
Rx Diversity:	-	-
Tx Diversity:	-	-
Operational Rate Set:	-	-
* Basic Rates:	-	

[HWC | C1000] User: admin Port status: M

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3. In the **Wireless APs** list, select one or more APs to edit. To select multiple APs, select the appropriate APs from the list while pressing the CTRL key.

> When using multi-edit configuration, any box or option that is not explicitly modified will not be changed by the update.
> The Wireless APs shown in the Wireless APs list can be from any version of the software. Attributes that are common between software versions are set on all Wireless APs. Attributes that are not common, are only sent to the AP versions to which the attributes apply. Attempting to set an attribute that does not apply for an AP will not abort the multi-edit operation.

4. Modify the configuration of the selected Wireless APs:
   - **AP Properties** – For more information, see Section 5.5.3, “Modifying a wireless AP’s properties”, on page 86.
   - **Radio Settings** – For more information, see Section 5.5.4, “Modifying the wireless AP’s radio properties”, on page 88.
   - **Static Configuration** – For more information, see Section 5.5.5, “Setting up the wireless AP using static configuration”, on page 93.
5. In the **AP Properties**, **Radio Settings**, and **Static Configuration** sections of the page, select and enter the attributes you want to edit for all selected APs.
6. To save your changes, click **Save.**

5.9 Performing wireless AP software maintenance

Periodically, the software used by the wireless APs is altered for reasons of upgrade or security. The new version of the AP software is installed from the HiPath Wireless Controller.

The software for each wireless AP can be uploaded either immediately, or the next time the wireless AP connects. Part of the wireless AP boot sequence is to seek and install its software from the HiPath Wireless Controller.

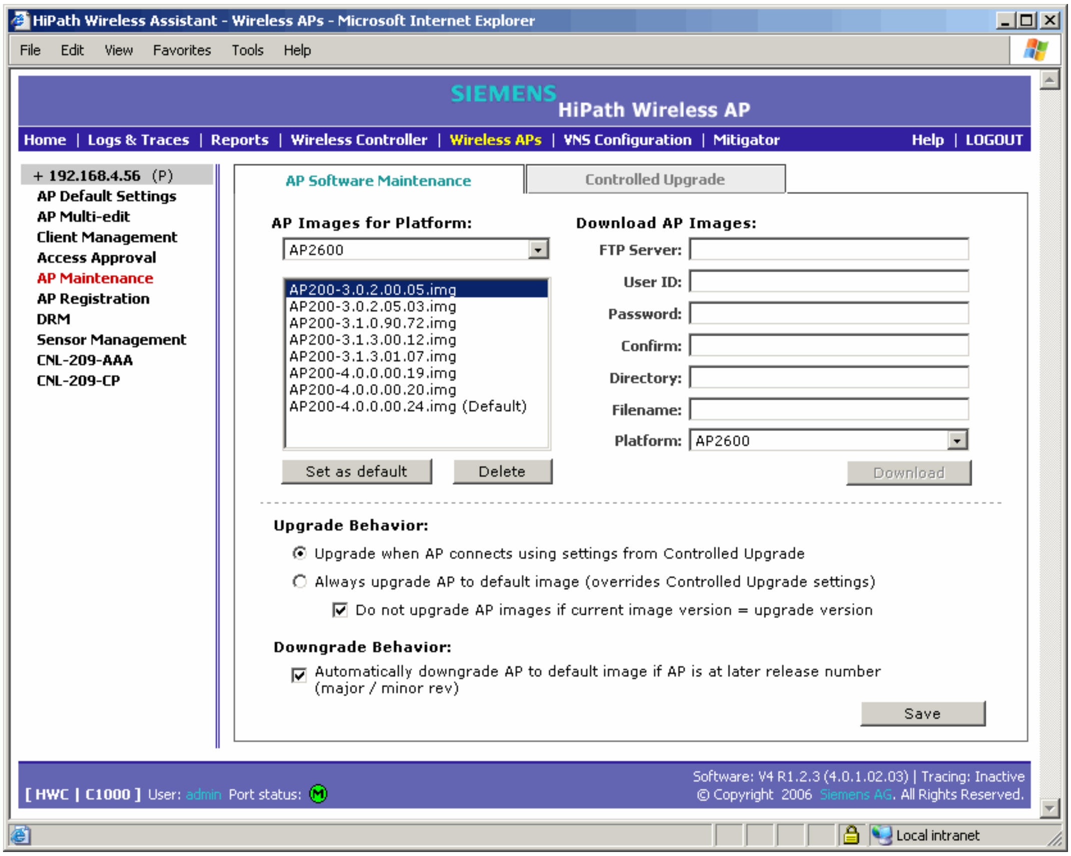
Although a number of the properties of each radio on a wireless AP can be modified without requiring a reboot of the AP, a reboot is required after:

- enabling or disabling either radio, or changing the radio channel between Auto and any fixed channel number
- adding the wireless AP to a VNS, or changing its radio assignment in a VNS

The wireless AP keeps a backup copy of its software image. When a software upgrade is sent to the wireless AP, the upgrade becomes the wireless AP's current image and the previous image becomes the backup. In the event of failure of the current image, the wireless AP will run the backup image.

To maintain the list of current wireless AP software images:

1. From the main menu, click **Wireless AP Configuration**. The **Wireless AP Configuration** screen appears.
2. From the left pane, click **AP Maintenance**. The **AP Software Maintenance** tab appears.



AP Images for Platform: AP2600

AP200-3.0.2.00.05.img
AP200-3.0.2.05.03.img
AP200-3.1.0.90.72.img
AP200-3.1.3.00.12.img
AP200-3.1.3.01.07.img
AP200-4.0.0.00.19.img
AP200-4.0.0.00.20.img
AP200-4.0.0.00.24.img (Default)

Download AP Images:

FTP Server:
User ID:
Password:
Confirm:
Directory:
Filename:
Platform: AP2600

Upgrade Behavior:

● Upgrade when AP connects using settings from Controlled Upgrade
○ Always upgrade AP to default image (overrides Controlled Upgrade settings)
☑ Do not upgrade AP images if current image version = upgrade version

Downgrade Behavior:

☑ Automatically downgrade AP to default image if AP is at later release number (major / minor rev)

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Software: V4 R1.2.3 (4.0.1.02.03) | Tracing: Inactive
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3. From the **AP Images for Platform** drop-down list select the appropriate platform.

4. To select an image to be the default image for a software upgrade, select it in the list, and then click **Set as default**.

5. In the **Upgrade Behavior** area, select one of the following:

   - **Upgrade when AP connects using settings from Controlled Upgrade** – The **Controlled Upgrade** tab appears. Controlled upgrade allows you to individually select and control the state of an AP image upgrade: which APs to upgrade, when to upgrade, how to upgrade, and to which image the upgrade or downgrade should be done. Administrators decide on the levels of software releases that the equipment should be running.

   - **Always upgrade AP to default image (overrides Controlled Upgrade settings)** – Selected by default. Allows for the selection of a default revision level (firmware image) for all APs in the domain. As the AP registers with the controller, the firmware version is verified. If it does not match the same value as defined for the default-image, the AP is automatically requested to upgrade to the default-image.

6. Select the **Do not upgrade AP images if current image version = upgrade version** checkbox to prevent an upgrade if current image version is the same as the upgrade version. Selecting this option overrides upgrade behavior.
7. Select the **Automatically downgrade the AP to the default image if AP is at later release number (major/minor rev)** checkbox to allow an older image to be installed if selected.
8. To save your changes, click **Save**.

To delete a wireles AP software image:

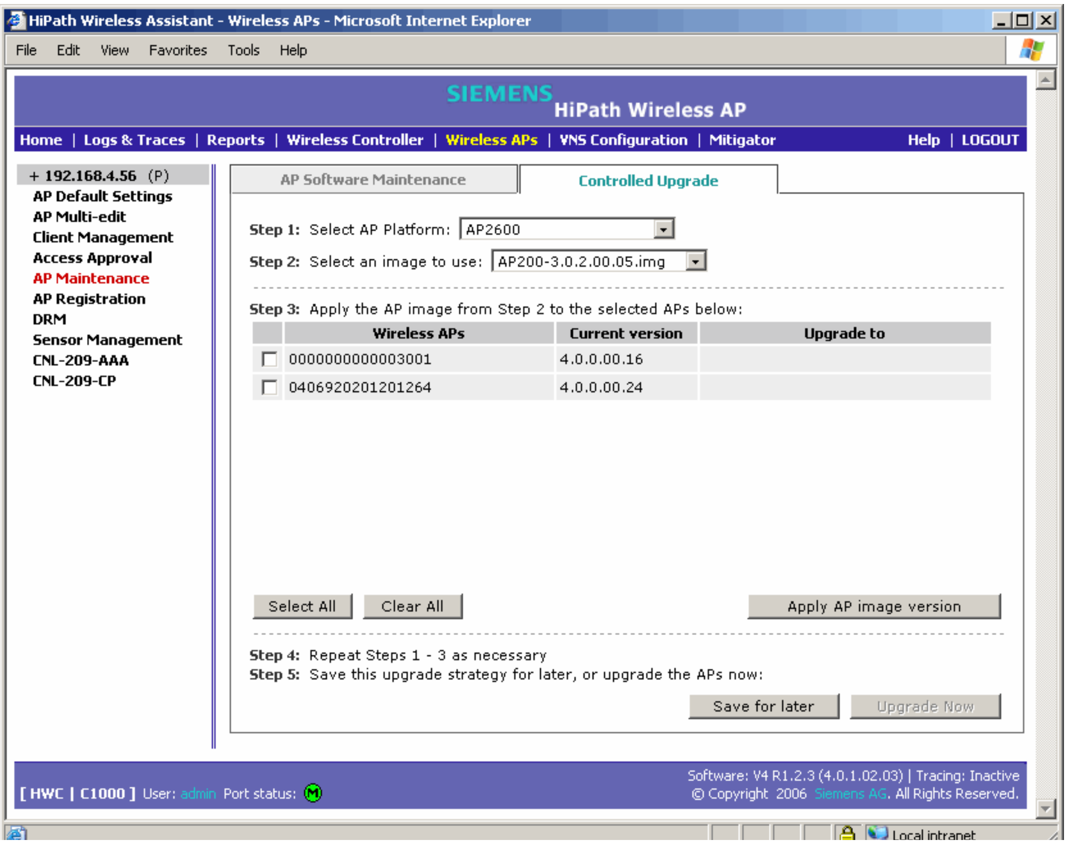
1. From the main menu, click **Wireless AP Configuration**. The **Wireless AP Configuration** screen appears.
2. From the left pane, click **AP Maintenance**. The **AP Software Maintenance** tab appears.
3. From the **AP Images for Platform** drop-down list, select the appropriate platform.
4. To select an image in the **AP Images** list to delete, click it.
5. Click the **Delete** button. The image is removed from the list.

To download a new wireless AP software image:

1. From the main menu, click **Wireless AP Configuration**. The **Wireless AP Configuration** screen appears.
2. From the left pane, click **AP Maintenance**. The **AP Software Maintenance** tab appears.
3. In the **Download AP Images** list, type the following:
   - **FTP Server** – The IP of the FTP server to retrieve the image file from.
   - **User ID** – The user ID that the controller should use when it attempts 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.
   - **Platform** – The AP hardware type to which the image applies. The are several types of AP and they require different images.
4. Click **Download**. The new software image is downloaded.

To define parameters for a wireless AP controlled software upgrade:

1. From the main menu, click **Wireless AP Configuration**. The **Wireless AP Configuration** screen appears.
2. From the left pane, click **AP Maintenance**. The **AP Software Maintenance** tab appears.
3. Click the **Controlled Upgrade** tab.



Step 1: Select AP Platform: AP2600

Step 2: Select an image to use: AP200-3.0.2.00.05.img

Step 3: Apply the AP image from Step 2 to the selected APs below:

	Wireless APs	Current version	Upgrade to
□	0000000000003001	4.0.0.00.16	
□	0406920201201264	4.0.0.00.24	

Step 4: Repeat Steps 1 - 3 as necessary
Step 5: Save this upgrade strategy for later, or upgrade the APs now:

[HWC | C1000] User: admin Port status: M

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The **Controlled Upgrade** tab will appear only when the **Upgrade Behavior** is set to **Upgrade when AP connects using settings from Controlled Upgrade** on the **AP Software Maintenance** tab.

4. From the **Select AP Platform** drop-down list, select the type of AP you want to upgrade.
5. From the **Select an image to use** drop-down list, select the software image you want to use for the upgrade.
6. In the list of registered **Wireless APs**, select the checkbox for each Wireless APs to be upgraded with the selected software image.
7. Click **Apply AP image version**. The selected software image appears in the **Upgrade To** column of the list.

8. To save the software upgrade strategy to be run later, click **Save for later**.
9. To run the software upgrade immediately, click **Upgrade Now**. The selected Wireless AP reboots, and the new software version is loaded.

> ⓘ The **Always upgrade AP to default image** checkbox on the **AP Software Maintenance** tab overrides the **Controlled Upgrade** settings.

6 Virtual Network Services

This chapter describes Virtual Network Services (VNS) concepts, including:

- VNS overview
- Setting up a VNS checklist
- Topology of a VNS
- RF assignment for a VNS
- Authentication for a VNS
- Filtering for a VNS
- Data protection on a VNS—WEP and WPA
- VNS global settings
- Setting up a new VNS

6.1 VNS overview

A VNS is an IP subnet designed to enable Wireless APs to interact with wireless devices. A VNS is similar to a regular IP subnet. A VNS has the following properties:

- Each VNS is assigned a unique identifier.
- Each VNS is assigned a Service Set Identifier (SSID). The SSID does not have to be unique.
- Each VNS is assigned a range of IP addresses for wireless devices. All of the wireless devices share the same IP address prefix—the part of the IP address that identifies the network and subnet.

  The IP addresses of the wireless devices are assigned dynamically by the HiPath Wireless Controller's Dynamic Host Configuration Protocol (DHCP) server within the assigned range.

> If the VNS is in branch mode, the HiPath Wireless Controller's DHCP server will not assign IP addresses to the wireless devices. You can allow the enterprise network's DHCP server to provide the IP addresses for the VNS by enabling DHCP Relay.
> The assigned addresses must be within range of the VNS definition and the controller must be defined in the network as the path for traffic delivery to the mobile units. For more information, see Section 7.1.1.8, “Using a DHCP relay for the VNS”, on page 131.

These IP addresses are not virtual IP addresses. They are regular IP addresses and are unique over the network. These IP addresses are advertised to other hosts on the network to exchange traffic with the wireless devices in the VNS.

- A single overall filtering policy applies to all the wireless devices within the VNS. Additional filtering can be applied when the wireless user is authenticated by the Remote Authentication Dial-In User Service (RADIUS) server. This does not apply for a bridged VNS.
- When the HiPath Wireless Controller creates a VNS, it also creates a virtual IP subnet for that VNS. This does not apply for a bridged VNS.
- Each VNS represents a mobility group that, when configured, can be carried across multiple HiPath Wireless Controllers. This does not apply for a bridged VNS.
- Each VNS also offers unique Authentication, Authorization and Accounting (AAA) services. This does not apply for a bridged VNS.

6.2 Setting up a VNS checklist

VNS provides a versatile means of mapping wireless networks to the topology of an existing wired network. When you set up a VNS on the HiPath Wireless Controller, you are defining a subnet for a group of wireless device users. The VNS definition creates a virtual IP subnet where the HiPath Wireless Controller acts as a default gateway to wireless devices.

In addition you can determine if the VNS is to apply for traffic bridging at the AP. This type of VNS requires specification of RF parameters and authentication parameters (if AAA type), although filtering specifications and topology specifications do not apply.

The HiPath Wireless Controller C2400 provides the option to define a VNS as locally bridged to a VLAN at the controller. To support that configuration, you must define which VLAN the VNS should bride to. With this configuration, it is possible that the controller is not involved in the IP address assignment for user addresses. Instead, the IP addresses for users are assigned directly by the DHCP infrastructure that services the VLAN.

> In a VLAN-bridged VNS, the default configuration dictates that the controller is not the DHCP server for that segment. However, DHCP services can selectively be enabled, including DHCP Relay, allowing you to use the controller to become the default DHCP server for the VLAN, if applicable.

Before defining a VNS, the following properties must be determined:

- A user access plan for both individual users and user groups
- The RADIUS attribute values that support the user access plan
- The location and identity of the Wireless APs that will be used on the VNS

- The routing mechanism to be used on the VNS
- For tunneled configurations mostly, the network addresses that the VNS will use
- A VLAN bridged VNS (at the controller) requires the specification of the IP address for the controller's own interface point (Port) on that VLAN. In addition, if the you elect to have the controller operate as the default DHCP server for the VLAN, the corresponding IP topology for that subnet must also be specified.
- The type of authentication for wireless device users on the VNS
- The specific filters to be applied to the defined users and user groups to control network access
- The quality of service (QoS) requirements
- What privacy mechanisms should be employed between the Wireless APs and the wireless devices
- Classification list for traffic priority. For example, whether the VNS is to be used for voice traffic and if voice traffic is to be given priority.
- Whether the VNS traffic is to be bridged directly to the network at the AP or tunneled to the controller for forwarding. Bridging at the AP is useful in branch office deployments in which APs must provide service even when the connection to the controller is unavailable.

User access plan

The user access plan should analyze the enterprise network and identify which users should have access to which areas of the network. What areas of the network should be separated? Which users can go out to the World Wide Web?

The Controller, Access Points and Convergence Software system relies on authenticating users via a RADIUS server (or other authentication server). To make use of this feature, an authentication server on the network is required. Make sure that the server's database of registered users, with login identification and passwords, is current.

In the case of certificate-based installations, you must ensure that the proper user certificate profiles are setup on the RADIUS server.

> To deploy Controller, Access Points and Convergence Software without a RADIUS server (and without authentication of users on the network), select **SSID** for network assignment (in the Topology screen). In the Authentication - Configure Captive Portal screen, select the **No Captive Portal** radio button. There will be no authentication of users, but Controller, Access Points and Convergence Software is otherwise operational.

The user access plan should also identify the user groups in your enterprise, and the business structure of the enterprise network, such as:

- Department (such as Engineering, Sales, Finance)
- Role (such as student, teacher, library user)
- Status (such as guest, administration, technician)

For each user group, you should set up a filter ID attribute in the RADIUS server, and then associate each user in the RADIUS server to at least one filter ID name. You can define specific filtering rules, by filter ID attribute, that will be applied to user groups to control network access. Filtering is applied by the controller. Filter ID assignments is a configuration option, and not a requirement to setup per user filter ID definitions. If a filter is not returned by the Access-Accept confirmation for a particular user, the controller uses the default filter profile for the VNS as the applicable filter set.

6.3 Topology of a VNS

Before you decide if a VNS will participate in a VLAN and configure a VNS, define the global settings that will apply to all VNS definitions. For example, global settings can include identifying the location of the RADIUS servers and enabling priority traffic handling for voice-over-internet traffic and dynamic authorization server support.

The type of network assignment determines all the other factors of the VNS. There are two options for network assignment:

- **SSID**:
  - Has Captive Portal authentication, or no authentication
  - Requires restricted filtering rules before authentication
  - Requires filtering rules for group filter IDs after authentication. A default filter applies if a more specific filter is not indicated by the RADIUS Access-Accept response.
  - Used for a VNS supporting wireless voice traffic (QoS)
  - Used for a VNS supporting third-party APs
  - Has WEP and WPA-PSK privacy
- **AAA**:
  - Has 802.1x authentication
  - Requires filtering rules for group filter IDs and default filter. A definition of group filter IDs is optional. If a filter is not specified or not returned by the Access-Accept response, the default filter group is applied.
  - Has WEP and WPA privacy
  - Controller is involved in authenticating users. 802.1x packets for AAA assignment are forwarded by the AP to the controller, through to the RADIUS server.

Traffic behavior types

There are 2 traffic types available when setting up your VNS:

- Tunneled to controller
- Bridged at AP

There are 3 traffic types available when setting up your VNS:

- Tunneled to controller
- Bridged at AP
- Bridged to VLAN at controller

You assign available Wireless APs, by radio, to the VNS. A Wireless AP radio is available for VNS assignment until it has been assigned to a maximum eight VNSs.

The HiPath Wireless Controller C2400 can support up to 64 VNSs. The HiPath Wireless Controller C1000 can support up to 50 VNSs, the C100 can support up to 32 VNSs, and the C10 can support up to 16. Each AP's radio can be assigned to any of the VNSs defined in the system, with up to 8 assignments per radio.

Once a VNS definition is saved, the HiPath Wireless Controller updates this information on the Wireless AP. The VNS broadcasts the updates during beacon transmission, unless the SSID beacon is suppressed on the **Topology** tab.

The Wireless AP Configuration screen lists defined VNSs and which radio each has been assigned to.

On the **Topology** tab, define parameters for DHCP for IP address assignment. DHCP IP assignment is not applicable to Bridged at AP mode. DHCP assignment is disabled by default for Bridged to VLAN mode. However, you can enable DHCP server/relay functionality to have the controller service the IP addresses for the VLAN (and wireless users).

You can also configure this VNS for management traffic only, or for third-party APs, or for voice traffic.

6.4 RF assignment for a VNS

The second step in setting up a VNS is to configure the RF assignment for the VNS. From the RF tab you assign APs to a VNS and SSID definitions.

6.5 Authentication for a VNS

The third step in setting up a VNS is to configure the authentication mechanism for the VNS. The authentication mechanism depends on the network assignment. In addition, all VNS definitions can include authentication by Media Access Control (MAC) address. Authentication by MAC address provides a method of access control for a user as it associates with the AP based on the device's MAC address.

6.5.1 Authentication with SSID network assignment

If network assignment is SSID, there are two authentication options:

- **None** – This authentication method is the default for a new SSID assignment VNS. Authentication VNS, unless MAC-based authorization is used, the default filter is applied, not the non-authentication filter. For more information, see Section 6.6, “Filtering for a VNS”, on page 114.
- **Captive Portal** – This authentication method employs a Web redirection which directs a user's web session to an authentication server. Typically, the user must provide their credentials (userID, password) to be authenticated. The captive portal redirection operation will redirect any web page requests corresponding to targets not explicitly allowed by the non-authenticated filter. The redirection will instruct the user's web page to contact the defined authentication web server. You must ensure that the authentication web server is explicitly listed as an allow destination in order for traffic to access it.

  The HiPath Wireless Controller supports two modes of captive portal authentication:

  - **Internal captive portal** – The controller's own captive portal authentication page (configured as an editable form) is used to request user credentials.
  - **External captive portal** – An entity outside of the HiPath Wireless Controller is responsible for handling the user authentication process, presenting the credentials request forms and performing user authentication procedures. The controller is then informed of the authentication results via its Business Echosystem's interfaces.

  Four authentication types are supported for captive portal authentication:

  - Password Authentication Protocol (PAP)
  - Challenge Handshake Authentication Protocol (CHAP)
  - Windows-specific version of CHAP (MS CHAP)
  - MS CHAP v2 (Windows-specific version of CHAP, version 2)

  For Captive Portal authentication, the RADIUS server must support the selected authentication type: PAP, CHAP (RFC2484), MS-CHAP (RFC2433), or MS-CHAPv2 (RFC2759).

6.5.2 Authentication with AAA (802.1x) network assignment

If network assignment is AAA with 802.1x authentication, the wireless device user requesting network access must first be authenticated. The wireless device's client utility must support 802.1x. The user's request for network access along with login identification or a user profile is forwarded by the HiPath Wireless Controller to a RADIUS server. Controller, Access Points and Convergence Software supports the following authentication types:

- **Extensible Authentication Protocol - Transport Layer Security (EAP-TLS)** – Relies on client-side and server-side certificates to perform authentication. Can be used to dynamically generate a Pairwise Master Key for encryption.
- **Extensible Authentication Protocol with Tunneled Transport Layer Security (EAP-TTLS)** – Relies on mutual authentication of client and server through an encrypted tunnel. Unlike EAP-TLS, it requires only server-side certificates. The client uses PAP, CHAP, or MS-CHAPv2 for authentication.
- **Protected Extensible Authentication Protocol (PEAP)** – Is an authentication protocol similar to TTLS in its use of server side certificates for server authentication and privacy and its support for a variety of user authentication mechanisms.

For 802.1x, the RADIUS server must support RADIUS extensions (RFC2869).

Until the access-accept is received from the RADIUS server for a specific user, the user is kept in an unauthenticated state. 802.1x rules dictate no other packets other than EAP are allowed to traverse between the AP and the HiPath Wireless Controller until authentication completes. Once authentication is completed (access-accept is received), the user's client is then allowed to proceed with IP services, which typically implies the request of an IP address via DHCP. In addition, the definition of a specific filter ID is optional configuration. If a specific filter ID is not defined or returned by the access-accept operation, the HiPath Wireless Controller assigns the VNS' default filter for authenticated users.

> The HiPath Wireless Controller only assigns the device's IP after the client requests one.

Both Captive Portal and AAA (802.1x) authentication mechanisms in Controller, Access Points and Convergence Software rely on a RADIUS server on the enterprise network. You can identify and prioritize up to three RADIUS servers on the HiPath Wireless Controller—in the event of a failover of the active RADIUS server, the HiPath Wireless Controller will poll the other servers in the list for a response. Once an alternate RADIUS server is found, it becomes the active RADIUS server, until it either also fails, or the administrator redefines another.

6.6 Filtering for a VNS

The VNS capability provides a technique to apply policy, to allow different network access to different groups of users. This is accomplished by packet filtering.

After setting authentication, define the filtering rules for the filters that apply to your network and the VNS you are setting up. Several filter types are applied by the HiPath Wireless Controller:

- **Exception filter** – Protect access to a system's own interfaces, including the VNS' own interface. VNS exception filters are applied to user traffic intended for the HiPath Wireless Controller's own interface point on the VNS. These filters are applied after the user's specific VNS state assigned filters.
- **Non-authenticated filter with filtering rules that apply before authentication** – Controls network access and to direct users to a Captive Portal web page for login.
- **Group filters, by filter ID, for designated user groups** – Controls access to certain areas of the network, with values that match the values defined for the RADIUS filter ID attribute.
- **Default filter** – Controls access if there is no matching filter ID for a user.

Within each type of filter, define a sequence of filtering rules. The filtering rule sequence must be arranged in the order that you want them to take effect. Each rule is defined to allow or deny traffic in either direction:

- **In** – From a wireless device in to the network
- **Out** – From the network out to a wireless device

6.6.1 Final filter rule

The final rule in any filter should act as a catch-all for any traffic that did not match a filter. This final rule should either allow all or deny all traffic, depending on the requirements for network access. For example, the final rule in a non-authenticated filter for captive portal is typically deny all. A final allow all rule in a default filter will ensure that a packet is not dropped entirely if no other match can be found.

A default rule of deny all is automatically created by the system for initial filter definitions. The administrator can change the action to allow all. However, a default filter rule cannot be removed. Since a default filter rule provides a catch-all default behavior for packet handling, all applicable user defined filter rules must be defined prior to this rule.

Each rule can be based on any one of the following:

- Destination IP address or any IP address within a specified range that is on the network subnet (as a wildcard)
- Destination ports, by number and range
- Protocols (UDP, TCP, etc.)

6.6.2 Filtering sequence

The filtering sequence depends on the type of authentication used:

- **No authentication (network assignment by SSID)**

  Only the default filter will apply. Specific network access can be defined.

- **Authentication by captive portal (network assignment by SSID)**

  The non-authenticated filter will apply before authentication. Specific network access can be defined. The filter should also include a rule to allow all users to get as far as the Captive Portal Web page where the user can enter login identification for authentication. When authentication is returned, the filter ID group filters are applied. If no filter ID matches are found, then the default filter is applied. The filter ID group is an optional behavior specification. If a filter ID is not returned, or an invalid one is returned, the default filter group is applied.

- **Authentication by AAA (802.1x)**

  AAA assignment requires that user authentication is completed using the 802.1x/EAP protocol before a user is granted access to a network resource. Therefor, the enforcement of non-authenticated traffic rules is not applicable. When authentication is returned, then the filter ID group filters are applied. A VNS can have a subgoup with Login-LAT-Group ID that has its own filtering rules. The Login-LAT-Group indicates that a user session should be associated with a more specific VNS (a child VNS). The sub-VNS provides a different topology definition than the parent VNS, as well as having its own set of filter definitions. filter IDs returned in association with a Login-LAT-Group definition are applied to the user, in relation to the sub-VNS indicated by the Login-LAT-Group specification. If no filter ID matches are found, then the default filter is applied.

The following is a high-level description of how HiPath Wireless Controller filters traffic:

Step One – The HiPath Wireless Controller attempts to match each packet of a VNS to the filtering rules that apply to the wireless device user.

Step Two – If a filtering rule is matched, the operation to allow or deny is executed.

Step Three – The next packet is fetched for filtering.

6.7 Data protection on a VNS—WEP and WPA

On wireless and wired networks, data is protected by encryption techniques. The type of data protection that is available depends on the VNS assignment mode:

- WEP and WPA-PSK is only available for assignment by SSID
- WPA (Enterprise) is only available for assignment by AAA

Data protection encryption techniques

- **Wired Equivalent Privacy (WEP)** – WEP encrypts data sent between wireless nodes. Each node must use the same encryption key.
- **Wi-Fi Protected Access Privacy (WPA v.1 and v.2)** – Encryption is by Advanced Encryption Standard (AES) or by Temporal Key Integrity Protocol (TKIP). If WPA v.2 is selected, both WPA v.1 and WPA v.2 are supported simultaneously, defaulting to the highest encryption method. Two modes are available:
  - **Enterprise** – Specifies 802.1x authentication and requires an authentication server
  - **Pre-Shared Key (PSK)** – Relies on a shared secret. The PSK is a shared secret (pass-phrase) that must be entered in both the wireless access point or router and the WPA clients.

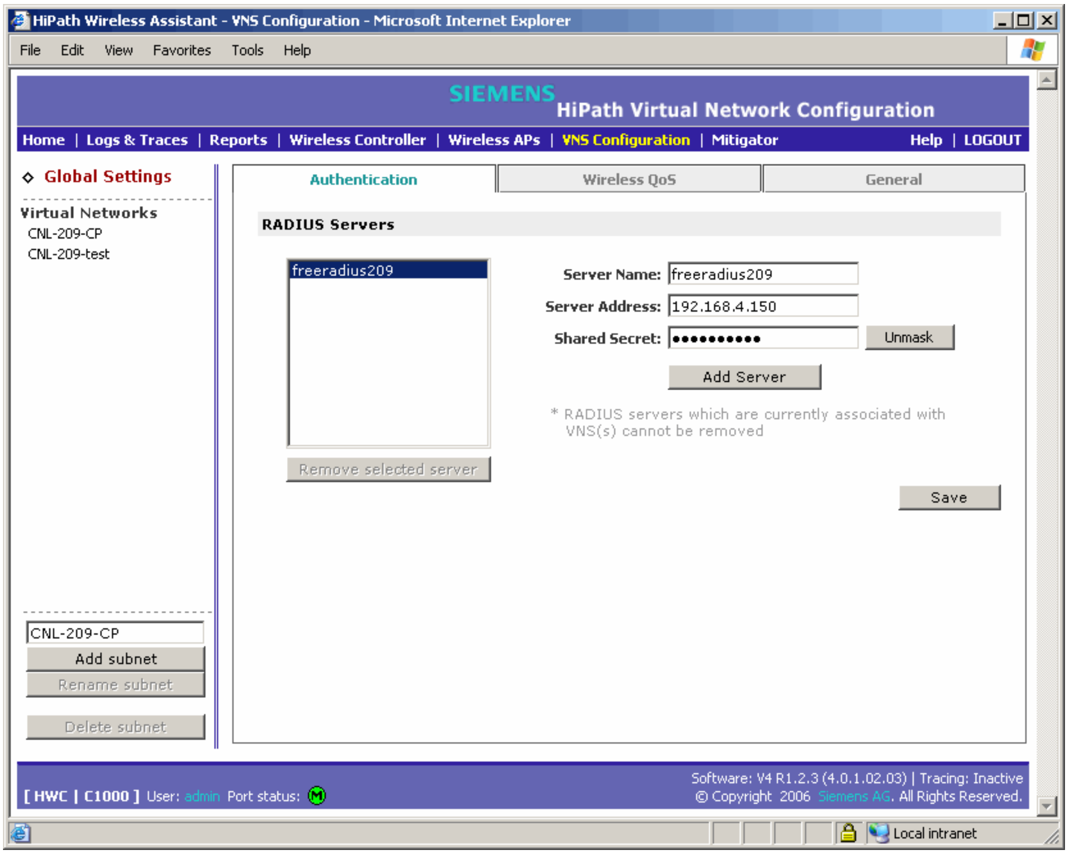
6.8 VNS global settings

Before defining a specific VNS, define the global settings that will apply to all VNS definitions. These global settings include:

- Identify the location and password of RADIUS servers on the enterprise network. The defined servers appear as available choices when you set up the authentication mechanism for each VNS.
- Define the shared secret used to encrypt the Pairwise Master Key (PMK) for WPA2 v.2 pre-authentication between HiPath Wireless Controllers on the network.
- Enable Dynamic Authorization Server (DAS) configuration support.
- Adjust admission control thresholds.

To define RADIUS servers for VNS global settings:

1. From the main menu, click **Virtual Network Configuration**. The Virtual Network list appears.
2. In the left pane, click **Global Settings**. The **Authentication** tab appears.



Server Name: freeradius209

Server Address: 192.168.4.150

Shared Secret: ●●●●●●●●●●

* RADIUS servers which are currently associated with VNS(s) cannot be removed

CNL-209-CP

Software: V4 R1.2.3 (4.0.1.02.03) | Tracing: Inactive
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3. To define a RADIUS server available on the network, do the following:
   - In the **Server Name** box, type a name.
   - In the **Server Address** box, type the IP address.
   - In the **Shared Secret** box, type the password that is required in both directions. This password is used to validate the connection between controller and the RADIUS server.
4. In order to proofread your password before saving the configuration, click **Unmask**. The password is displayed. To mask the password, click **Mask**.

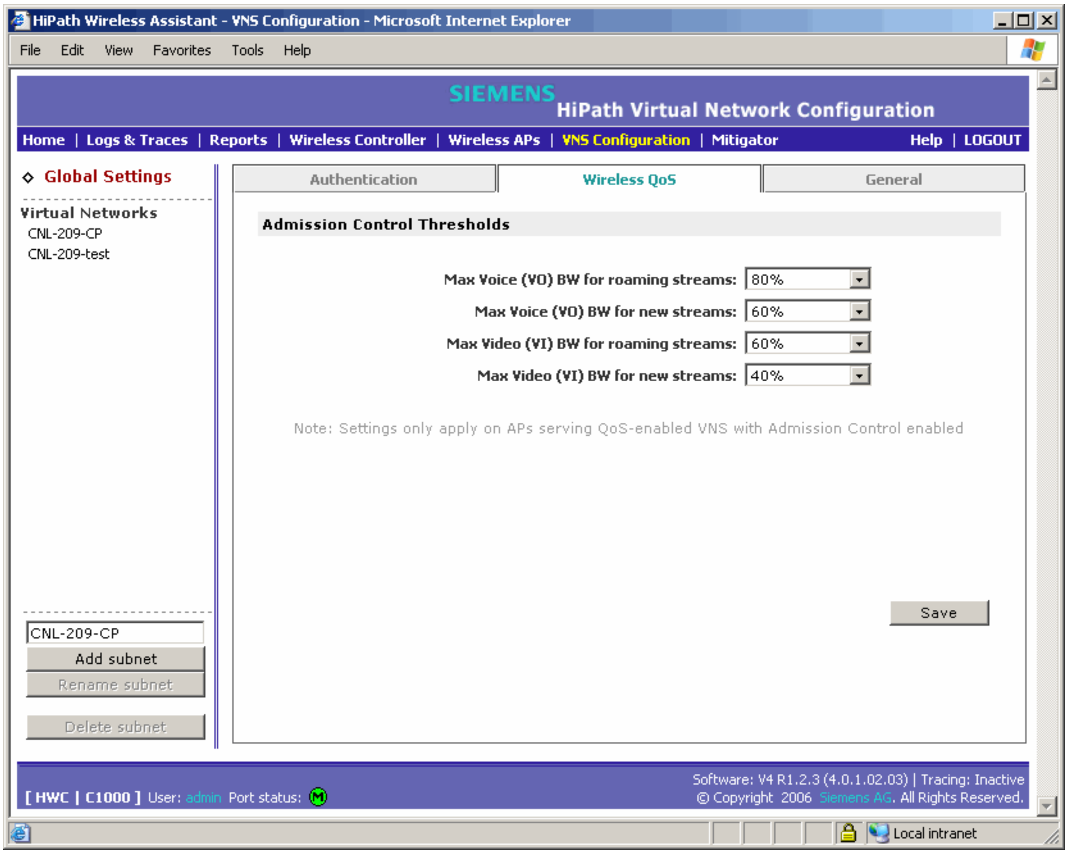
   This precautionary step is highly recommended in order to avoid an error, later, when the HiPath Wireless Controller attempts to communicate with the RADIUS server.
5. To add the server to the list, click **Add**.
6. To remove a server, select the server in the list and click **Remove selected server**.
7. To save your changes, click **Save**.

To define DAS for VNS global settings:

1. From the main menu, click **Virtual Network Configuration**. The Virtual Network list appears.
2. In the left pane, click **Global Settings**. The **Authentication** tab appears.
3. Click the **DAS** tab.
4. To enable DAS support, select the **Enable DAS Support** checkbox.
5. In the **seconds** box, type the replay protection time limit. The default value is 300.
6. To enable authorize-only service type, select the **Enable Authorize-only service type** checkbox. By default, the **Require Username attribute to identify a session** checkbox is selected.
7. To save your changes, click **Save**.

To define admission control thresholds for VNS global settings:

1. From the main menu, click **Virtual Network Configuration**. The Virtual Network list appears.
2. In the left pane, click **Global Settings**. The **Authentication** tab appears.
3. Click the **Wireless QoS** tab.


HiPath Wireless Assistant - VNS Configuration - Microsoft Internet Explorer
File Edit View Favorites Tools Help
SIEMENS
HiPath Virtual Network Configuration
Home | Logs & Traces | Reports | Wireless Controller | Wireless APs | VNS Configuration | Mitigator
Help | LOGOUT
Global Settings
Virtual Networks
CNL-209-CP
CNL-209-test
CNL-209-CP
Add subnet
Rename subnet
Delete subnet
Authentication
Wireless QoS
General
Save
[HWC | C1000] User: admin Port status:
Software: V4 R1.2.3 (4.0.1.02.03) | Tracing: Inactive
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Local intranet

Admission Control Thresholds

Max Voice (VO) BW for roaming streams: 80%

Max Voice (VO) BW for new streams: 60%

Max Video (VI) BW for roaming streams: 60%

Max Video (VI) BW for new streams: 40%

Note: Settings only apply on APs serving QoS-enabled VNS with Admission Control enabled

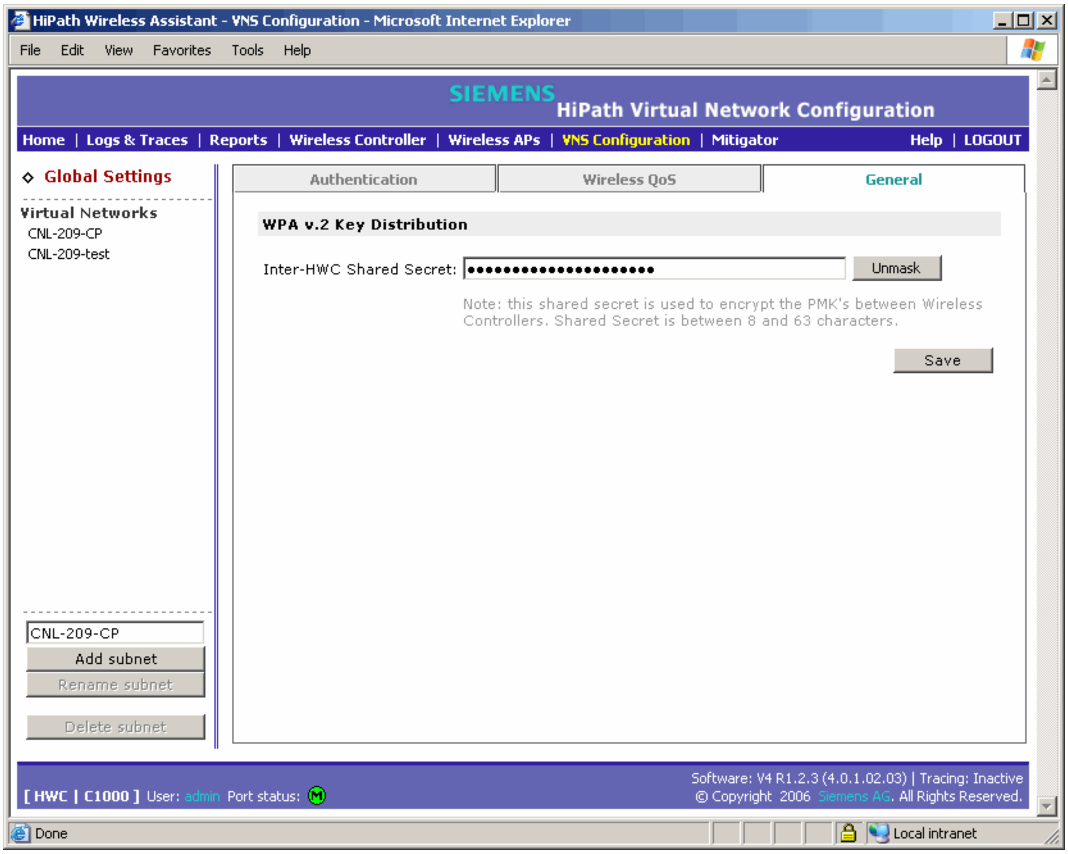
4. Using the percentage drop-down lists, define the thresholds for the following:
   - Max Voice (VO) bandwidth for re-association
   - Max Voice (VO) bandwidth for association
   - Max Video (VI) bandwidth for re-association
   - Max Video (VI) bandwidth for association
   - Reserved Video (VI) bandwidth
   - Reserved bandwidth for non-admission controlled flows

   These global QoS settings apply to all APs that serve QoS enabled VNS with admission control.

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

To define inter-HiPath Wireless Controller shared secret for VNS global settings:

1. From the main menu, click **Virtual Network Configuration**. The Virtual Network list appears.
2. In the left pane, click **Global Settings**.
3. Click the **General** tab.



Inter-HWC Shared Secret: ••••••••••••••••••••

Note: this shared secret is used to encrypt the PMK's between Wireless Controllers. Shared Secret is between 8 and 63 characters.

[HWC | C1000] User: admin Port status: M

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4. In the **Inter-HWC Shared Secret** box, type a password between 8 and 63 characters long, to be used between HiPath Wireless Controllers. The same shared secret must also be defined on the other HiPath Wireless Controllers on the network. The Inter-HWC shared secret is also used to protect communications between the HiPath Wireless Controller and the HiPath Wireless Manager.
5. In order to proofread your password before saving the configuration, click **Unmask**. The password is displayed. To mask the password, click **Mask**.

   This precautionary step is highly recommended in order to avoid an error, later, when the HiPath Wireless Controller attempts to communicate with the RADIUS server.
6. To save your changes, click **Save**.

6.9 Setting up a new VNS

Now that you are familiar with the VNS concepts, you can now set up a new VNS. Setting up a new VNS involves the following general steps:

- Step one – Create a VNS name
- Step two – Define the topology parameters
- Step three – Configure the VNS

For information on setting up a new VNS, see Chapter 7, “Virtual Network configuration”.

7 Virtual Network configuration

This chapter discusses VNS (Virtual Network Services) configuration, including:

- Topology for a VNS
- Assigning Wireless AP radios to a VNS
- Authentication for a VNS
- Defining accounting methods for a VNS
- Defining RADIUS filter policy for VNSs and VNS groups
- Configuring filtering rules for a VNS
- Enabling multicast for a VNS
- Configuring privacy for a VNS
- Defining a VNS with no authentication
- Defining priority level for VNS traffic
- Configuring Quality of Service (QoS)
- Bridging traffic locally

Setting up a VNS defines a virtual IP subnet for a group of wireless device users, where the HiPath Wireless Controller acts as a default gateway to wireless devices. For each VNS, you define its topology, authentication, accounting, RADIUS servers, filtering, multicast parameters, privacy and policy mechanism. When you set up a new VNS, additional tabs appear only after you save the topology.

A critical topology option to define for a VNS is the VNS type:

- Routed VNS – User traffic is tunneled to the HiPath Wireless Controller. (This is the default setup.)
- Bridged at the AP VNS – User traffic is directly bridged to a VLAN at the AP network point of access (switch port).
- VLAN bridged VNS – User traffic is tunneled to the HiPath Wireless Controller and is directly bridged at the controller to a specific VLAN. WIth this VNS type, mobile users become a natural extension of a VLAN subnet.

Setting up a new VNS involves the following general steps:

- Step one – Create a VNS name
- Step two – Define the topology parameters
- Step three – Configure the VNS

Before you can define the VNS topology parameters and configure the VNS, you must first create a new VNS name.

To create a new VNS name:

1. From the main menu, click **Virtual Network Configuration**. The Virtual Network Configuration screen appears.
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 appears in the Virtual Networks list. The Topology screen appears.

The following sections describe in detail how to define the VNS topology parameters and configure the VNS.

7.1 Topology for a VNS

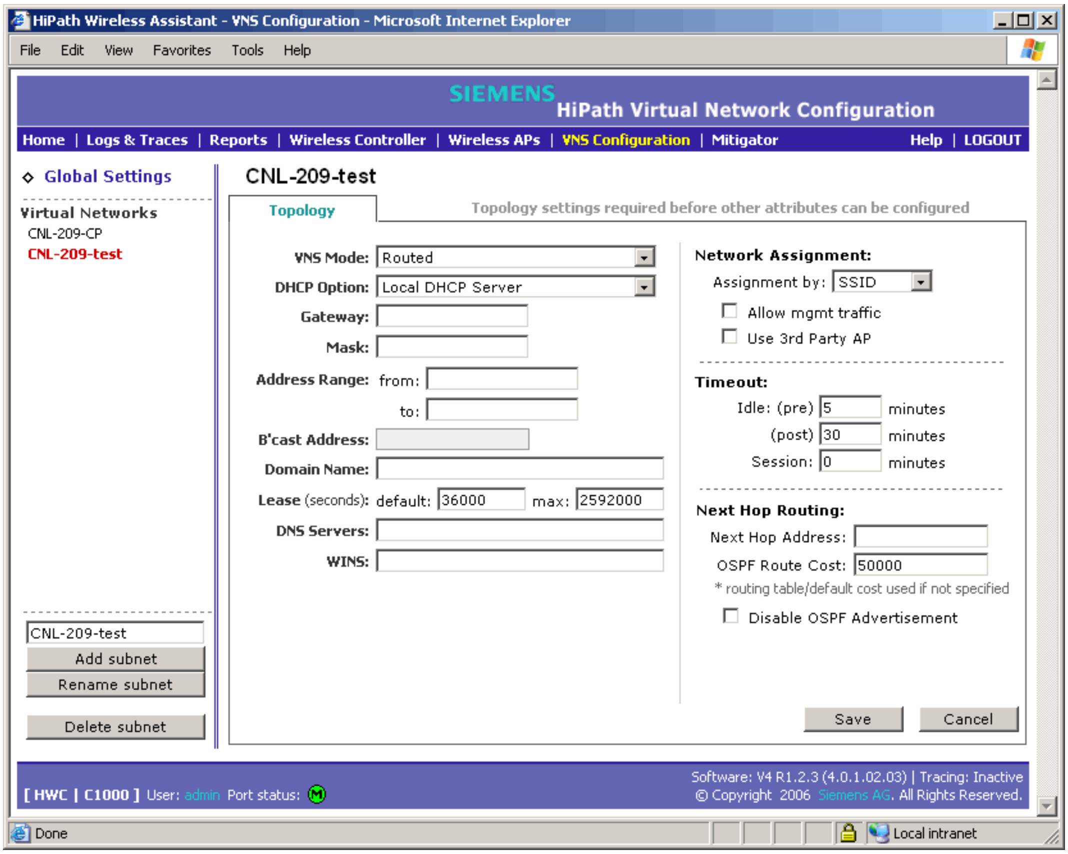
In the Topology screen, the key choice for a VNS is the type of network assignment, which determines all the other factors of the VNS. When you have completed defining the topology for your VNS, save the topology settings. Once your topology is saved, you can then access the remaining VNS tabs and continue configuring your VNS.

There are two options for network assignment:

- **SSID –** The SSID determines the VNS to which a user profile will be assigned (user topology/IP, filters):
  - Has Captive Portal authentication, or no authentication (as well as MAC-based authentication).
  - Requires restricted filtering rules before authentication and, after authentication, filtering rules for group filter IDs.
  - Is used for a VNS supporting wireless voice traffic (QoS).
  - Is used for a VNS supporting third-party APs.
  - Has WEP and WPA-PSK privacy.
- **AAA** (Authentication, Authorization and Accounting):
  - has 802.1x authentication (as well as MAC-based authentication).
  - requires filtering rules for group filter IDs and default filter.
  - has Dynamic WEP and WPA (WPA v.1 and WPA v.2) privacy.

7.1.1 Configuring topology for a VNS for Captive Portal

The section describes how to set up a VNS for Captive Portal. The **RF** tab, where you assign APs to VNSs, is not accessible until the topology for the VNS has been configured and saved.


HiPath Wireless Assistant - VNS Configuration - Microsoft Internet Explorer
File Edit View Favorites Tools Help
SIEMENS HiPath Virtual Network Configuration
Home | Logs & Traces | Reports | Wireless Controller | Wireless APs | VNS Configuration | Mitigator | Help | LOGOUT
Global Settings
Virtual Networks
CNL-209-CP
CNL-209-test
Add subnet
Rename subnet
Delete subnet
Topology
Save
Cancel
Done
Local intranet

CNL-209-test

Topology settings required before other attributes can be configured

VNS Mode: Routed
DHCP Option: Local DHCP Server
Gateway:
Mask:
Address Range: from:
to:
B'cast Address:
Domain Name:
Lease (seconds): default: 36000 max: 2592000
DNS Servers:
WINS:

Network Assignment:
Assignment by: SSID
□ Allow mgmt traffic
□ Use 3rd Party AP

Timeout:
Idle: (pre) 5 minutes
(post) 30 minutes
Session: 0 minutes

Next Hop Routing:
Next Hop Address:
OSPF Route Cost: 50000
* routing table/default cost used if not specified
□ Disable OSPF Advertisement

CNL-209-test

[HWC | C1000] User: admin Port status:

Software: V4 R1.2.3 (4.0.1.02.03) | Tracing: Inactive
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To create an SSID for Captive Portal VNS:

1. From the main menu, click **Virtual Network Configuration**. The Virtual Network Configuration screen appears.
2. In the left pane Virtual Networks list, click the VNS you want to create an SSID for. The Topology tab is displayed.
3. From the **Assignment by** drop-down list, select **SSID**.

7.1.1.1 Defining session timeout parameters

The HiPath Wireless Controller allows a client to associate to the AP and exist on the network without having authentication. Every associated user has a user session tracked by the HiPath Wireless Controller from the time of association with the AP. Users can be temporarily (or longer for SSID assigned VNSs) be in the non-authenticated state. Pre timeout is the maximum amount of time allowed to elapse from the last time any traffic was received by the system for an un-authenticated user. For example, a user may have disconnected from the system (shutdown the device, moved out of range, etc.). A pre timeout expires and cleans up the session.

The post timeout is the max amount of time that is allowed to elapse from the last time any traffic was received for an authenticated user. For example, a user may have disconnected from the system and is no longer be connected. A post timeout expires and cleans up the session.

A client that exceeds either the pre or post timeout value will be forced to disassociate.

The session timer defines the maximum amount of time a session is allowed to be connected to the system. The session timer is particularly useful in pay-per-use models. When the lifetime of the session reaches the defined limit, the session is expired and cleaned up. A user would have to re-authenticate with the system to continue to receive network services.

> The VNS timeout parameters define the default timers applicable to session management within the VNS. However, RADIUS authentication (access-accept) may return specific timers applicable to the particular user. A RADIUS returned value overwrites the VNS default values for the specific user.
>
> In addition, a zero (0) value for any of the timers indicates a non-applicable value. Therefor, the corresponding timer is not enforced.

To define the session timeout parameters for a VNS

1. From the main menu, click **Virtual Network Configuration**. The Virtual Network Configuration screen appears.
2. In the left pane Virtual Networks list, click the VNS you want to define the session timeout parameters for. The Topology tab is displayed.
3. In the **Idle (pre)** box, type the number of minutes that a client is allowed to be idle on the VNS before authentication.
4. In the **Idle (post)** box, type the number of minutes that a client is allowed to be idle on the VNS after authentication.
5. In the **Session** box, type the maximum time limit of a session. If you do not provide a Session value, there is no time limit.

7.1.1.2 Enabling management traffic

If management traffic is enabled for a VNS, it overrides the built-in exception filters that prohibit traffic on the HiPath Wireless Controller data interfaces. For more information, see Section 7.6, “Configuring filtering rules for a VNS”, on page 153.

To enable management traffic on a VNS:

1. From the main menu, click **Virtual Network Configuration**. The Virtual Network Configuration screen appears.
2. In the left pane Virtual Networks list, click the VNS you want to enable management traffic for. The Topology tab is displayed.
3. Select the **Allow mgmt traffic** checkbox.

7.1.1.3 Enabling third-party APs on a VNS

Configuring a VNS for third-party APs is only available with SSID network assignment. Use this function as part of the process defined in Chapter 9, “Working with third-party APs”.

A third-party AP VNS allows for the specification of a segregated subnet by which non-HiPath Wireless APs are used to provide RF services to users while still utilizing the HiPath Wireless Controller for user authentication and user policy enforcement.

> Third-party AP devices are not fully integrated with the system and therefore must be managed individually to provide the correct user access characteristics. Also, third-party AP devices must be defined in bridge mode so that user traffic is directly transposed to the third-party AP subnet and picked up by the HiPath Wireless Controller for forwarding and policy enforcement.

To enable third-party APs on a VNS:

1. From the main menu, click **Virtual Network Configuration**. The Virtual Network Configuration screen appears.
2. In the left pane Virtual Networks list, click the VNS you want to enable third-party APs for. The Topology tab is displayed.
3. Select the **Use 3rd Party AP** checkbox.

   The definition of third-party AP identification parameters allows the system to be able to differentiate the third-party AP device (and corresponding traffic) from user devices on that segment. Devices identified as third-party APs are considered pre-authenticated, and are not required to complete the corresponding authentication verification stages defined for users in that segment (typically Captive portal enforcement).

   In addition, third-party APs have a specific set of filters (third-party) applied to them by default, which allows the administrator to provide different traffic access restrictions to the third-party AP devices for the users that use those resources. The third-party filters could be used to allow access to third-party APs management operations (for example, HTTP, SNMP).
4. To save your changes, click **Save**.

7.1.1.4 Defining a next hop route and OSPF advertisement for a VNS

The next hop definition allows the administrator to define a specific host as the target for all non-VNS targeted traffic for users in a VNS. The next hop IP identifies the target device to which all VNS (user traffic) will be forwarded to. Next-hop definition supersedes any other possible definition in the routing table.

If the traffic destination from a wireless device on a VNS is outside of the VNS, it is forwarded to the next hop IP address, where this router applies policy and forwards the traffic. This features applies to unicast traffic only. In addition, you can also modify the Open Shortest Path First (OSPF) route cost.

OSPF is an interior gateway routing protocol developed for IP networks based on the shortest path first or link-state algorithm. Using OSPF, a host that obtains a change to a routing table or detects a change in the network immediately distributes 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.

To define a next hop route and OSPF advertisement:

1. From the main menu, click **Virtual Network Configuration**. The Virtual Network Configuration screen appears.
2. In the left pane Virtual Networks list, click the VNS you want to define a next-hop route for. The Topology tab is displayed.
3. In the **Next Hop Address** box, type the IP address of the next hop router on the network through which you wish all traffic on this VNS to be directed.
4. In the **OSPF Route Cost** box, type the OSPF cost of reaching the VNS subnet.

   The OSPF cost value provides a relative cost indication to allow upstream routers to calculate whether or not to use the controller as a better fit or lowest cost path to reach devices in a particular network. The higher the cost, the less likely of the possibility that the controller will be chosen as a route for traffic, unless that controller is the only possible route for that traffic.
5. To disable OSPF advertisement on this VNS, select the **disable OSPF Advertisement** checkbox.

7.1.1.5 Defining the IP address for the VNS (for the DHCP server on the controller)

Bridged at the AP VNSs do not require the definition of a corresponding IP address definition for the VNS since all traffic for users in that VNS will be directly bridged by the AP at the local network point of attachment (VLAN at AP port).

The IP address definition is only required for a routed VNS or VLAN bridged VNS.

To define the IP address for the VNS:

1. From the main menu, click **Virtual Network Configuration**. The Virtual Network Configuration screen appears.
2. In the left pane Virtual Networks list, click the VNS you want to define the IP address for. The Topology tab is displayed.
3. In the **Gateway** box, type the HiPath Wireless Controller's own IP address in that VNS.

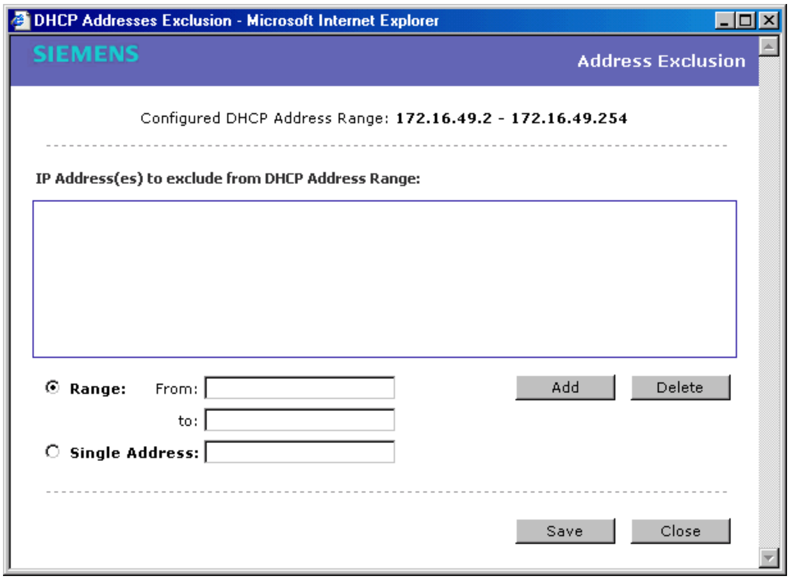
   This IP address is the default gateway for the VNS. The HiPath Wireless Controller advertises this address to the wireless devices when they sign on. For routed VNSs, it corresponds to the IP address that is communicated to MUs (in the VNS) as the default gateway for the VNS subnet. (MUs target the HiPath Wireless Controller's interface in their effort to route packets to an external host).

   For a VLAN bridged VNS, the IP address corresponds to the HiPath Wireless Controller's own point of presence on the VLAN. In this case, the controller's interface is typically not the gateway for the subnet. The gateway for the subnet is the infrastructure router defined to handle the VLAN.
4. In the **Mask** box, type the appropriate subnet mask for this IP address to separate the network portion from the host portion of the address (typically 255.255.255.0).

   The following values to DHCP configuration are only applicable for configurations if the controller is the DHCP server for users in the VNS—a routed VNS or a VLAN bridged VNS with DHCP enabled (by default, DHCP is disabled). These values are not visible for a bridged at AP VNS or a VLAN bridged VNS with DHCP disabled (by default, DHCP is disabled).

   The **Address Range** boxes (from and to) populate automatically with the range of IP addresses to be assigned to wireless devices using this VNS, based on the IP address you provided.

   - To modify the address in the **Address Range from** box, type the first available address.
   - To modify the address in the **Address Range to** box, type the last available address.
   - If there are specific IP addresses to be excluded from this range, click **Exclusion(s)**. The DHCP Address Exclusion subscreen appears.



Configured DHCP Address Range: **172.16.49.2 - 172.16.49.254**

IP Address(es) to exclude from DHCP Address Range:

- In the DHCP Address Exclusion subscreen, do one of the following:
  - To specify an IP range, type the first available address in the **From** box and type the last available address in the **to** box. Click **Add** for each IP range you provide.
  - To specify a IP address, select the **Single Address** option and type the IP address in the box. Click **Add** for each IP address you provide.
- To save your changes, click **Save**. The DHCP Address Exclusion subscreen closes.

5. The **Broadcast Address** box populates automatically based on the Gateway IP address and subnet mask of the VNS.
6. In the **Domain Name** box, type the external enterprise domain name.

7.1.1.6 Modifying time limits for IP assignments

The following procedure is only applicable for configurations if the controller is the DHCP server for users in the VNS—a routed VNS or a VLAN bridged VNS with DHCP enabled (by default, DHCP is disabled). These values are not visible for a bridged at AP VNS or a VLAN bridged VNS with DHCP disabled (by default, DHCP is disabled).

Time limits for IP assignments dictate the default and the maximum time limits a wireless device can keep the DHCP server-assigned IP address.

To modify time limits for IP assignments:

1. From the main menu, click **Virtual Network Configuration**. The Virtual Network Configuration screen appears.
2. In the left pane Virtual Networks list, click the VNS you want to set time limits for. The Topology tab is displayed.
3. In the **Lease default** box, type the default time limit. The default time limit dictates how long a wireless device can keep the DHCP server assigned IP address. The default value is 36000 seconds (10 hours).
4. In the **Lease max** box, type the maximum time limit. The default time limit is 2539000 seconds (approximately 705 hours or 29 days).

7.1.1.7 Setting the name server configuration

Although this procedure could also apply to any VNS type, normally these settings are defined in the context of DHCP definitions and therefor these values are not available for configurations if DHCP service is not defined.

A VLAN bridged VNS has an option to define the DHCP behavior for the VNS. By default, the DHCP service is disable although the administrator can elect to have the controller's VNS interface on the VLAN become either the actual DHCP server (enable DHCP) or become the relay agent for DHCP requests.

To set the name server configuration:

1. From the main menu, click **Virtual Network Configuration**. The Virtual Network Configuration screen appears.
2. In the left pane Virtual Networks list, click the VNS you want to set the name server configuration for. The Topology tab is displayed.
3. In the **DNS Servers** box, type the IP Address of the Domain Name Servers to be used.
4. If applicable, in the **WINS** box, type the IP address if the DHCP server uses Windows Internet Naming Service (WINS).

7.1.1.8 Using a DHCP relay for the VNS

Although this procedure could also apply to any VNS type, normally these settings are defined in the context of DHCP definitions and therefor these values are not available for configurations if DHCP service is not defined.

Using a DHCP relay forces the HiPath Wireless Controller to forward DHCP requests to an external DHCP server on the enterprise network. This function bypasses the local DHCP server for the HiPath Wireless Controller and allows the enterprise to manage IP address allocation to a VNS from its existing infrastructure.

The range of IP addresses assigned to the wireless device users on this VNS should also be designated on the external DHCP server.

To use an external DHCP server for the VNS:

1. From the main menu, click **Virtual Network Configuration**. The Virtual Network Configuration screen appears.
2. In the left pane Virtual Networks list, click the VNS you want to use DHCP relay for. The Topology tab is displayed.
3. From the **DHCP Option** drop-down list, select **Use DHCP Relay**.
4. In the **Gateway** box, type the IP address for the VNS.
5. In the **Mask** box, type the appropriate subnet mask for this IP address.
6. In the **DHCP Server** box, type the IP address of the DHCP server to which DHCP discover and request messages will be forwarded for clients on this VNS. In the case of relay, the HiPath Wireless Controller does not handle DHCP requests from users, but instead forwards the requests to the indicated DHCP server.

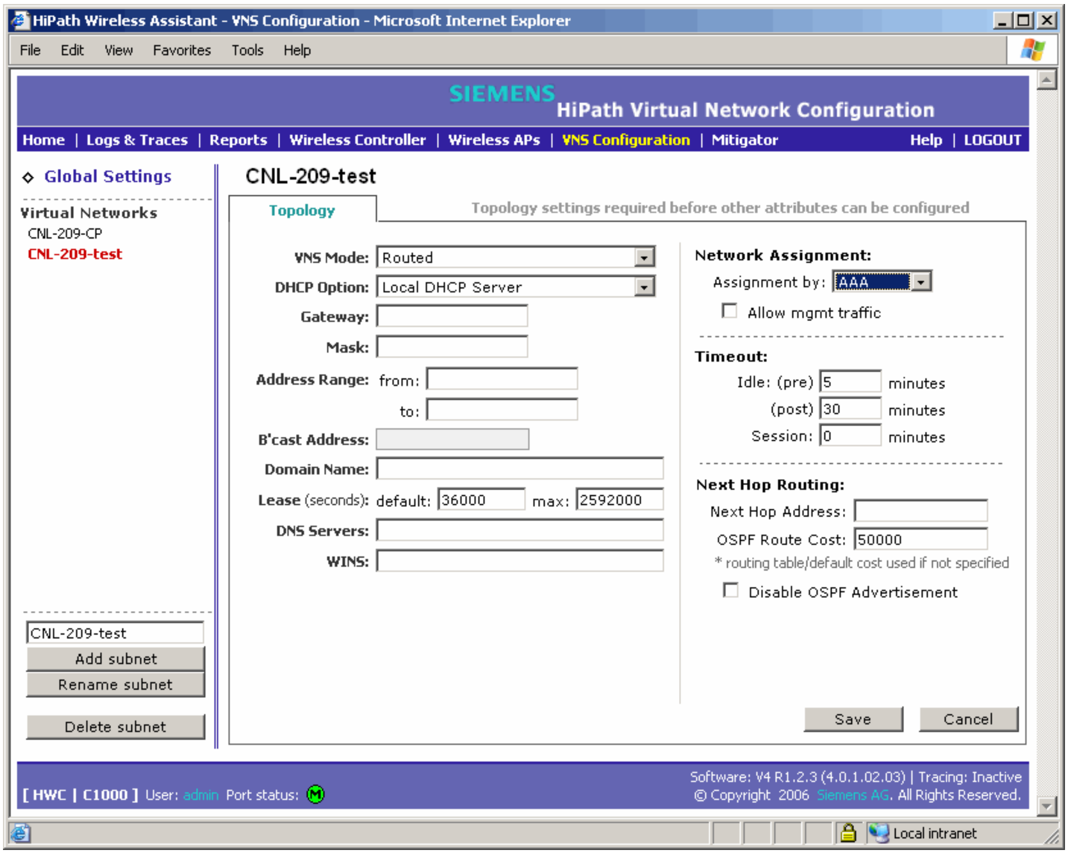
> The DHCP Server must be configured to match the VNS settings. In particular for Routed VNS', the DHCP server must identify the HiPath Wireless Controller's interface IP as the default Gateway (router) for the subnet. (Users intending to reach devices outside of the subnet will forward the packets to the default gateway (controller) for delivery upstream.)

7.1.2 Configuring topology for a VNS for AAA

The following sections describe how to configure the topology for a VNS for AAA.

To create an AAA topology:

1. From the main menu, click **Virtual Network Configuration**. The Virtual Network Configuration screen appears.
2. In the left pane Virtual Networks list, click the VNS you want to create an AAA topology for. The Topology tab is displayed.
3. From the **Assignment by** drop-down list, select **AAA**.


HiPath Wireless Assistant - VNS Configuration - Microsoft Internet Explorer
File Edit View Favorites Tools Help
SIEMENS
HiPath Virtual Network Configuration
Home | Logs & Traces | Reports | Wireless Controller | Wireless APs | VNS Configuration | Mitigator
Help | LOGOUT
Global Settings
Virtual Networks
CNL-209-CP
CNL-209-test
Add subnet
Rename subnet
Delete subnet
Topology
Save
Cancel
Local intranet

CNL-209-test

Topology settings required before other attributes can be configured

VNS Mode: Routed
DHCP Option: Local DHCP Server
Gateway:
Mask:
Address Range: from:
to:
B'cast Address:
Domain Name:
Lease (seconds): default: 36000 max: 2592000
DNS Servers:
WINS:

Network Assignment:
Assignment by: AAA
□ Allow mgmt traffic

Timeout:
Idle: (pre) 5 minutes
(post) 30 minutes
Session: 0 minutes

Next Hop Routing:
Next Hop Address:
OSPF Route Cost: 50000
* routing table/default cost used if not specified
□ Disable OSPF Advertisement

CNL-209-test

[HWC | C1000] User: admin Port status: M

Software: V4 R1.2.3 (4.0.1.02.03) | Tracing: Inactive
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4. Configure the topology for your VNS accordingly. For more information, see Section 7.1, “Topology for a VNS”, on page 124.

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

7.1.3 Saving your topology properties

Once your topology is defined, you can then save your topology properties to continue configuring your VNS. To save your topology properties, click **Save**.

7.2 Assigning Wireless AP radios to a VNS

If two HiPath Wireless Controllers have been paired for availability (for more information, see Section 8.1, “Availability overview”, on page 189), each HiPath Wireless Controller's registered Wireless APs will appear as foreign in the list of available Wireless APs on the other HiPath Wireless Controller.

Once you have assigned a Wireless AP radio to eight VNSs, it will not appear in the list for another VNS setup. Each radio can support up to eight SSIDs (16 per AP). Each AP can be assigned to any of the VNSs defined within the system. The HiPath Wireless Controller C2400 can support up to 64 VNSs. The HiPath Wireless Controller C1000 can support up to 50 VNSs, the C100 can support up to 32 VNSs, and the C10 can support up to 16.

To assign Wireless APs to a VNS

1. From the main menu, click **Virtual Network Configuration**. The Virtual Network Configuration screen appears.
2. In the left pane Virtual Networks list, click the VNS you want to assign Wireless APs to. The Topology tab is displayed.
3. Click the **RF** tab.
4. In the **SSID** box, type the SSID that wireless devices will use to access the Wireless AP.
5. In the Advanced RF Settings, select the following:
   - **Suppress SSID** – Select to prevent this SSID from appearing in the beacon message sent by the Wireless AP. The wireless device user seeking network access will not see this SSID as an available choice, and will need to specify it.
   - **Enable proprietary IE** – **<<<attention reviewer... need definition. Im not sure what this option does>>>**
   - **Enable 11h support** – Select to enable TPC (Transmission Power Control) reports. By default this option is disabled. It is recommened to enable this option.
     - **Apply power back-off** – Select to enable the AP to use reduced power (as does the 11h client). By default this option is disabled. It is recommened to enable this option.
   - **Process client IE requests** – **<<<attention reviewer... need definition. Im not sure what this option does>>>**
6. From the **Wireless APs** list, select the APs and their radios that you want to assign to the VNS. You can also use the **Select APs** list, to select APs and their radios by grouping:
   - All radios – Select to assign all of the APs' radios.
   - a radios – Select to assign only the APs' a radios.
   - b/g radios – Select to assign only the APs' b/g radios.
   - local APs - all radios – Select to assign only the local APs.
   - local APs - a radios – Select to assign only the local APs' a radios.
   - local APs - b/g radios – Select to assign only the local APs' b/g radios.

- foreign APs - all radios – Select to assign only the foreign APs.
- foreign APs - a radios – Select to assign only the foreign APs' a radios.
- foreign APs - b/g radios – Select to assign only the foreign APs' b/g radios.
- clear all selections – Select to clear all of the AP radio assignments.
- original selections – Select to return to the AP radio selections prior to the most recent save.

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

   You can view the VNSs that each radio is assigned to by clicking on each radio tab in the Wireless AP Configuration screen.

7.3 Authentication for a VNS

The next step in configuring a VNS is to set up the authentication mechanism. There are various authentication combinations available:

- If network assignment is by SSID, authentication can be:
  - none
  - by Captive Portal using internal Captive Portal
  - by Captive Portal using external Captive Portal
  - by MAC-based authentication
- If network assignment is by AAA (802.1x), authentication can be:
  - by 802.1x authentication, the wireless device user must be authenticated before gaining network access
  - by MAC-based authentication

The first step for any type of authentication is to select RADIUS servers for:

- Authentication
- Accounting
- MAC-based authentication

MAC-based authentication enables network access to be restricted to specific devices by MAC address. In addition to the other types of authentication, when MAC-based authentication is employed the HiPath Wireless Controller queries a RADIUS server to determine if the wireless client's MAC address is authorized to access the network.

7.3.1 Vendor Specific Attributes

In addition to the standard RADIUS message, you can include Vendor Specific Attributes (VSAs). The Controller, Access Points and Convergence Software authentication mechanism provides six VSAs for RADIUS and other authentication mechanisms.

Attribute Name	ID	Type	Messages	Description
Siemens-URL-Redirection	1	string	Returned from RADIUS server	A URL that can be returned to redirect a session to a specific Web page.
Siemens-AP-Name	2	string	Sent to RADIUS server	The name of the AP the client is associating to. It can be used to assign policy based on AP name or location.
Siemens-AP-Serial	3	string	Sent to RADIUS server	The AP serial number. It can be used instead of (or in addition to) the AP name.
Siemens-VNS-Name	4	string	Sent to RADIUS server	The name of the Virtual Network the client has been assigned to. It is used in assigning policy and billing options, based on service selection.
Siemens-SSID	5	string	Sent to RADIUS server	The name of the SSID the client is associating to. It is used in assigning policy and billing options, based on service selection.
Siemens-BSS-MAC	6	string	Sent to RADIUS server	The name of the BSS-ID the client is associating to. It is used in assigning policy and billing options, based on service selection and location.

Table 6 Vendor Specific Attributes

The first five of these VSAs provide information on the identify of the specific Wireless AP that is handling the wireless device, enabling the provision of location-based services.

The RADIUS message also includes RADIUS attributes Called-Station-Id and Calling-Station-Id in order to include the MAC address of the wireless device.

> ⓘ Siemens-URL-Redirection is supported by MAC-based authentication.

7.3.2 Defining authentication for a VNS for Captive Portal

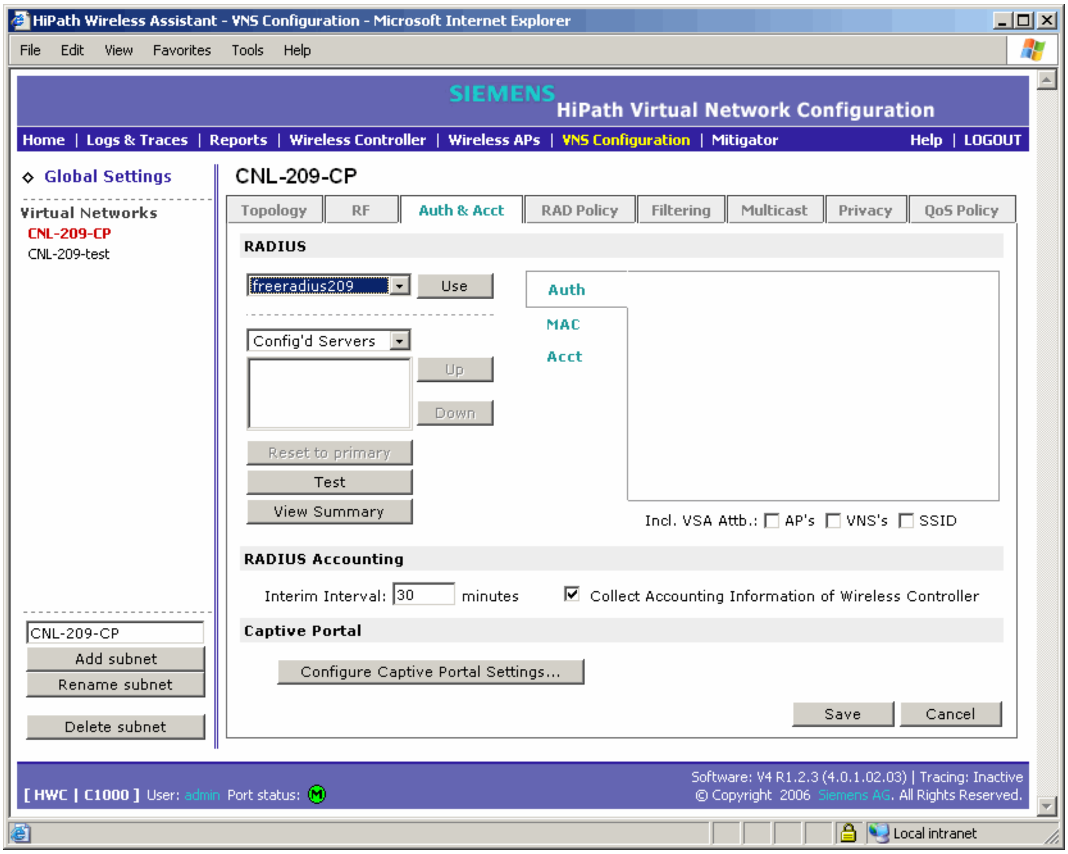
For Captive Portal authentication, the wireless device connects to the network, but can only access the specific network destinations defined in the non-authenticated filter. For more information, see Section 7.6.2, “Defining non-authenticated filters”, on page 156. One of these destinations should be a server, either internal or external, which presents a web page login screen—the Captive Portal. The wireless device user must input an ID and a password. This request for authentication is sent by the HiPath Wireless Controller to a RADIUS server or other authentication server. Based on the permissions returned from the authentication server, the HiPath Wireless Controller implements policy and allows the appropriate network access.

Captive Portal authentication relies on a RADIUS server on the enterprise network. There are three mechanisms by which Captive Portal authentication can be carried out:

- Internal Captive Portal – The HiPath Wireless Controller presents the Captive Portal Web page, carries out the authentication, and implements policy.
- External Captive Portal – After an external server presents the Captive Portal Web page and carries out the authentication, the HiPath Wireless Controller implements policy.
- External Captive Portal with internal authentication – After an external server presents the Captive Portal Web page, the HiPath Wireless Controller carries out the authentication and implements policy.

To define authentication by Captive Portal:

1. From the main menu, click **Virtual Network Configuration**. The Virtual Network Configuration screen appears.
2. In the left pane Virtual Networks list, click the VNS you want to set up authentication by Captive Portal for. The Topology tab is displayed.
3. Click the **Auth & Acct** tab. On the **Auth & Acct** tab, there are three options:
    - **Auth** – Use to define authentication servers.
    - **MAC** – Use to define servers for MAC-based authentication.
    - **Acct** – Use to define accounting servers.



HiPath Wireless Assistant - VNS Configuration - Microsoft Internet Explorer
File Edit View Favorites Tools Help
SIEMENS
HiPath Virtual Network Configuration
Home | Logs & Traces | Reports | Wireless Controller | Wireless APs | VNS Configuration | Mitigator
Help | LOGOUT
Global Settings
Virtual Networks
CNL-209-CP
CNL-209-test
Add subnet
Rename subnet
Delete subnet
CNL-209-CP
Topology
RF
Auth & Acct
RAD Policy
Filtering
Multicast
Privacy
QoS Policy
RADIUS
Use
Up
Down
Reset to primary
Test
View Summary
Auth
MAC
Acct
RADIUS Accounting
Captive Portal
Configure Captive Portal Settings...
Save
Cancel
[HWC | C1000] User: admin Port status:
Software: V4 R1.2.3 (4.0.1.02.03) | Tracing: Inactive
© Copyright 2006 Siemens AG. All Rights Reserved.
Local intranet

RADIUS: freeradius209

Config'd Servers

Incl. VSA Attb.: □ AP's □ VNS's □ SSID

Interim Interval: 30 minutes

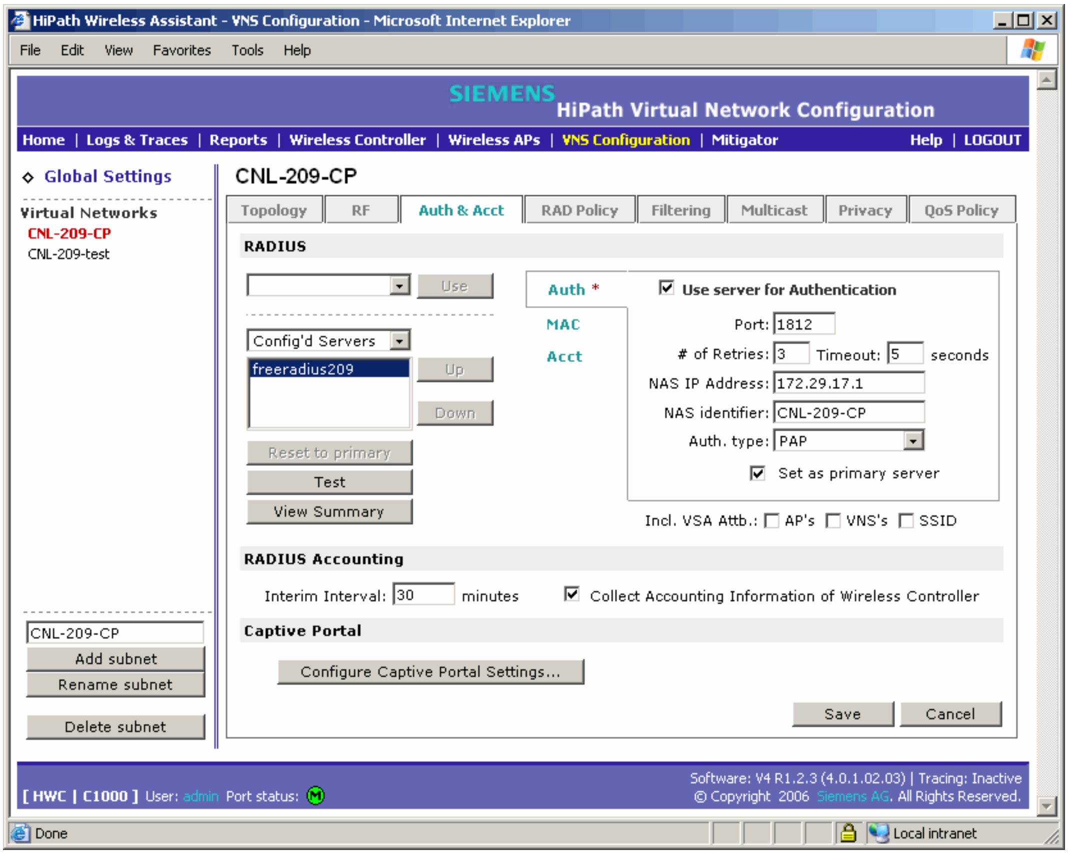
☑ Collect Accounting Information of Wireless Controller

CNL-209-CP

4. Click **Auth**. The Authentication fields are displayed.

5. From the **RADIUS** drop-down list, select the server you want to use for Captive Portal authentication, and then click **Use**. The server's default information is displayed.

   The RADIUS servers are defined in the Global Settings screen. For more information, see Section 6.8, “VNS global settings”, on page 116.


HiPath Wireless Assistant - VNS Configuration - Microsoft Internet Explorer
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HiPath Virtual Network Configuration
Home | Logs & Traces | Reports | Wireless Controller | Wireless APs | VNS Configuration | Mitigator
Help | LOGOUT
Global Settings
Virtual Networks
CNL-209-CP
CNL-209-test
Topology
RF
Auth & Acct
RAD Policy
Filtering
Multicast
Privacy
QoS Policy
Use
Up
Down
Reset to primary
Test
View Summary
MAC
Acct
Captive Portal
Configure Captive Portal Settings...
Save
Cancel
Add subnet
Rename subnet
Delete subnet
[HWC | C1000] User: admin Port status:
Software: V4 R1.2.3 (4.0.1.02.03) | Tracing: Inactive
© Copyright 2006 Siemens AG. All Rights Reserved.
Done
Local intranet

CNL-209-CP

RADIUS

Config'd Servers: freeradius209

Auth * ☑ Use server for Authentication

Port: 1812

# of Retries: 3 Timeout: 5 seconds

NAS IP Address: 172.29.17.1

NAS identifier: CNL-209-CP

Auth. type: PAP

☑ Set as primary server

Incl. VSA Attb.: □ AP's □ VNS's □ SSID

RADIUS Accounting

Interim Interval: 30 minutes ☑ Collect Accounting Information of Wireless Controller

The selected server is no longer available in the **RADIUS** drop-down list.

The server name now appears in the list of configured servers, next to the **Up** and **Down** buttons, where it can be prioritized for RADIUS redundancy. The server can also be assigned again for MAC-based authentication or accounting purposes.

A red asterisk appears next to **Auth**, indicating that a server has been assigned.

6. In the **Port** box, type the port used to access the RADIUS server. The default is 1812.

7. In the **# of Retries** box, type the number of times the HiPath Wireless Controller will attempt to access the RADIUS server.

8. In the **Timeout** box, type the maximum time that a HiPath Wireless Controller will wait for a response from the RADIUS server before attempting again.

9. In the **NAS Identifier** box, type the Network Access Server (NAS) identifier. The NAS identifier is a RADIUS attribute that identifies the server responsible for passing information to designated RADIUS servers and then acting on the response returned. This is an optional step.

10. In the **Auth. Type** drop-down list, select the authentication protocol to be used by the RADIUS server to authenticate the wireless device users. The authentication protocol applies to a VNS with Captive Portal authentication:
    - PAP – Password Authentication Protocol
    - CHAP – Challenge Handshake Authentication Protocol
    - MS-CHAP – Windows-specific version of CHAP
    - MS-CHAP2 – Windows-specific version of CHAP, version 2
11. In the **Include VSA Attributes** section, click the appropriate checkboxes to include the Vendor Specific Attributes in the message to the RADIUS server:
    - AP's
    - VNS's
    - SSID

    The Vendor Specific Attributes must be defined on the RADIUS server.
12. If appropriate, click the **Reset to Primary** checkbox. This checkbox is visible when a RADIUS server has not yet been selected as a primary server, or if the server you are configuring has already been selected as the primary server, the **Reset to Primary** checkbox is selected.

    RADIUS redundancy defines additional backup RADIUS servers that the system will attempt to communicate with in case a connection with the identified primary server fails. If connection to an active primary server fails, the system automatically attempts to connect to one of the alternate servers in sequence. If the system succeeds in registering with a defined alternate server, it becomes the active primary server, which is identified by the A on the list. You can subsequently reset or change the identification of the primary server by clicking the applicable **Reset to Primary** checkbox.
13. To save your changes, click **Save**.

> ⓘ If you have already assigned a server to either MAC-based authentication or accounting, and you want to use it again for authentication, highlight its name in the list next to the **Up** and **Down** buttons and select the **Use server for Authentication** checkbox. The server's default information is displayed.

7.3.2.1 Defining the RADIUS server priority for RADIUS redundancy

If more than one server has been defined for any type of authentication, you can define the priority of the servers in the case of failover.

In the event of a failover of the main RADIUS server—if there is no response after the set number of retries—then the other servers in the list will be polled on a round-robin basis until a server responds.

If one of the other servers becomes the active server during a failover, when the new active server properties are displayed the **Set as primary server** checkbox is selected.

If all defined RADIUS servers fail to respond, a critical message is generated in the logs.

To define the RADIUS server priority for RADIUS redundancy:

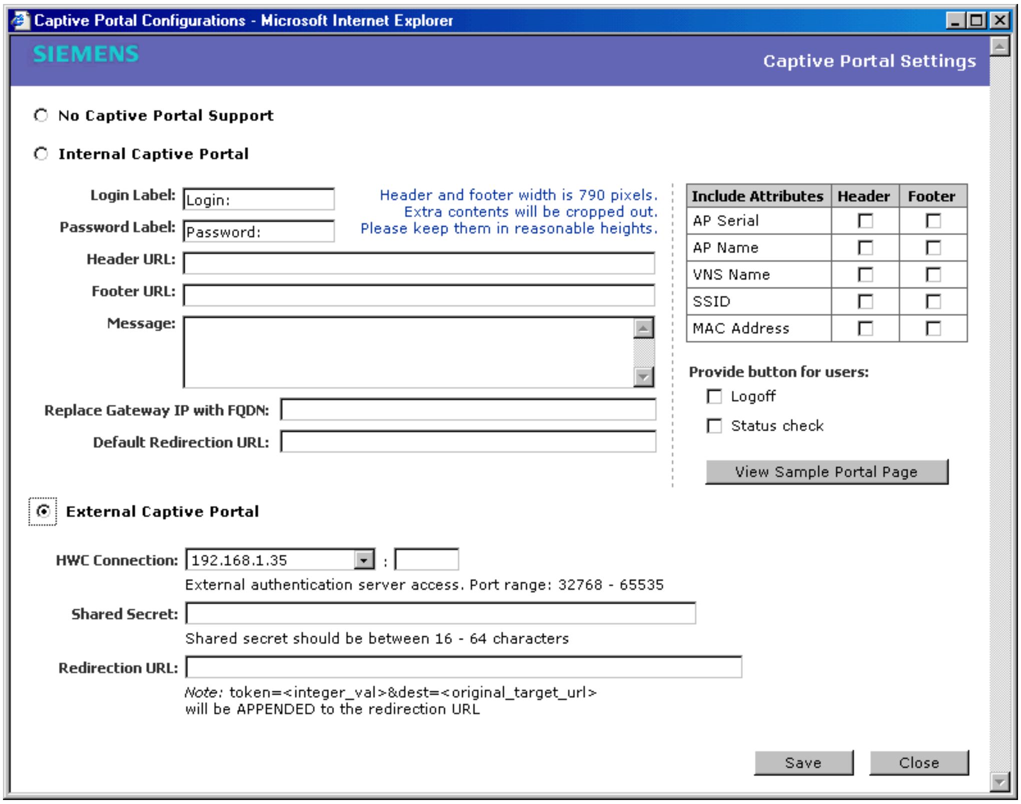
1. From the main menu, click **Virtual Network Configuration**. The Virtual Network Configuration screen appears.
2. In the left pane Virtual Networks list, click the VNS you want to define the RADIUS server priority for. The Topology tab is displayed.
3. Click the **Auth & Acct** tab.
4. From the drop-down list, select the servers group you want to prioritize:
   - Configured Servers
   - Authentication Servers
   - MAC Servers
   - Accounting Servers
5. In the server list, select the RADIUS server and click **Up** or **Down** to arrange the order. The first server in the list is the active one.
6. To test the HiPath Wireless Controller’s connection to all configured RADIUS servers, click **Test**. The Test RADIUS servers window appears displaying the message transaction with the RADIUS server, which allows you to visually verify the state of the server connection and user authentication.
7. In the **User ID** box, type the user ID that you know can be authenticated.
8. In the **Password** box, type the corresponding password.
9. Click **Test**. The Test Result window appears.
10. To view a summary of the RADIUS configuration, click **View Summary**. The **RADIUS summary** window appears.
11. To save your changes, click **Save**.

7.3.2.2 Configuring Captive Portal for internal or external authentication

There are three Captive Portal options:

- No Captive Portal Support
- Internal Captive Portal – Define the parameters of the internal Captive Portal page presented by the HiPath Wireless Controller, and the authentication request from the HiPath Wireless Controller to the RADIUS server.
- External Captive Portal – Define the parameters of the external Captive Portal page presented by an external server. The authentication can be carried out by an external authentication server or by the HiPath Wireless Controller request to a RADIUS server.

For more information on configuring Captive Portal settings, see Section 7.3.2.2, “To configure the Captive Portal settings for internal Captive Portal:”, on page 142 or Section 7.3.2.2, “To configure the Captive Portal Settings for external Captive Portal:”, on page 144.



Captive Portal Configurations - Microsoft Internet Explorer

SIEMENS

Captive Portal Settings

○ No Captive Portal Support

○ Internal Captive Portal

Login Label: Login:

Password Label: Password:

Header URL:

Footer URL:

Message:

Replace Gateway IP with FQDN:

Default Redirection URL:

Header and footer width is 790 pixels.
Extra contents will be cropped out.
Please keep them in reasonable heights.

Include Attributes	Header	Footer
AP Serial	□	□
AP Name	□	□
VNS Name	□	□
SSID	□	□
MAC Address	□	□

Provide button for users:

□ Logoff

□ Status check

View Sample Portal Page

● External Captive Portal

HWC Connection: 192.168.1.35 :

External authentication server access. Port range: 32768 - 65535

Shared Secret:

Shared secret should be between 16 - 64 characters

Redirection URL:

Note: token=<integer_val>&dest=<original_target_url>
will be APPENDED to the redirection URL

Save Close

To configure the Captive Portal settings for internal Captive Portal:

1. From the main menu, click **Virtual Network Configuration**. The Virtual Network Configuration screen appears.
2. In the left pane Virtual Networks list, click the VNS you want to configure the Captive Portal settings for. The Topology tab is displayed.
3. Click the **Auth & Acct** tab.

4. Click **Configure Captive Portal Settings**. The Captive Portal Configurations window appears.
5. Select the **Internal Captive Portal** option.
6. In the **Login Label** box, type the text that will appear as a label for the user login field.
7. In the **Password Label** box, type the text that will appear as a label for the user password field.
8. In the **Header URL** box, type the location of the file to be displayed in the Header portion of the Captive Portal screen. This page can be customized to suit your organization, with logos or other graphics.

> ⚠ If you use logos or graphics, ensure that the graphics or logos are appropriately sized. Large graphics or logos may force the login area out of view.

9. In the **Footer URL** box, type the location of the file to be displayed in the Footer portion of the Captive Portal screen.
10. In the **Message** box, type the message that will appear above the Login box to greet the user. For example, the message could explain why the Captive Portal page is appearing, and instructions for the user.
11. In the **Replace Gateway IP with FQDN** box, type the appropriate name if a Fully Qualified Domain Name (FQDN) is used as the gateway address.
12. In the **Default Redirection URL** box, type the URL to which the wireless device user will be directed to before authentication.
13. In the right pane, select the appropriate checkboxes to include the following VSA Attributes in the message to the authentication server:
    - AP Serial number
    - AP Name
    - VNS Name
    - SSID
    - MAC Address
14. In the right pane, select whether these VSA attributes apply to the header or footer of the Captive Portal page.

    The selections influence what URL is returned in either area. For example, wireless users can be identified by which Wireless AP or which VNS they are associated with, and can be presented with a Captive Portal web page that is customized for those identifiers.

15. To provide users with a logoff button, select **Logoff**. The Logoff button launches a popup logoff screen, allowing users to control their logoff.
16. To provide users with a status check button, select **Status check**. The Status check button launches a popup window, which allows users to monitor session statistics such as system usage and time left in a session.
17. To save your changes, click **Save**.
18. To see how the Captive Portal page you have designed will look, click **View Sample Portal Page**.

> ⓘ In order for Captive Portal authentication to be successful, all the URLs referenced in the Captive Portal setup must also be specifically identified and allowed in the non-authenticated filter. For more information, see Section 7.6.2, “Defining non-authenticated filters”, on page 156.

To configure the Captive Portal Settings for external Captive Portal:

1. From the main menu, click **Virtual Network Configuration**. The Virtual Network Configuration screen appears.
2. In the left pane Virtual Networks list, click the VNS you want to configure the Captive Portal settings for. The Topology tab is displayed.
3. Click the **Auth & Acct** tab.
4. Click **Configure Captive Portal Settings**. The Captive Portal Configurations window appears.
5. Select the **External Captive Portal** option.
6. In the **HWC Connection** drop-down list, select the IP address.
7. Type the port of the HiPath Wireless Controller.

   The external Captive Portal page on the external authentication server will send the request back to the HiPath Wireless Controller to allow the HiPath Wireless Controller to continue with the RADIUS authentication and filtering.

   In the **Shared Secret** box, type the password common to both the HiPath Wireless Controller and the external web server if you want to encrypt the information passed between the HiPath Wireless Controller and the external web server.
8. In the **Redirection URL** box, type the URL to which the wireless device user will be directed to before authentication.
9. To save your changes, click **Save**.

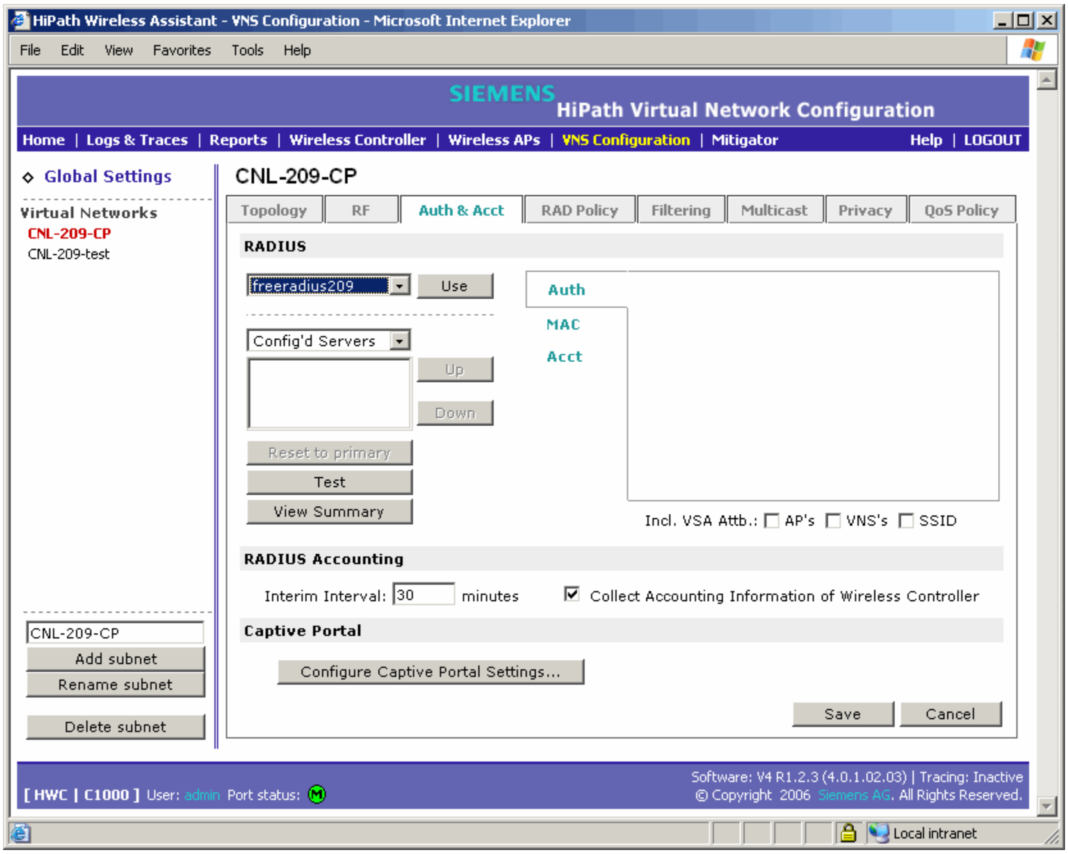
> ⓘ You must add a filtering rule to the non-authenticated filter that allows access to the External Captive Portal site. For more information, see Section 6.6, “Filtering for a VNS”, on page 114.

7.3.3 Defining authentication for a VNS for AAA

If network assignment is AAA with 802.1x authentication, the wireless device must successfully complete the user authentication verification prior to being granted network access. This enforcement is performed by both the user's client and the AP. The wireless device's client utility must support 802.1x. The user's EAP packets request for network access along with login identification or a user profile is forwarded by the HiPath Wireless Controller to a RADIUS server.

To define authentication by AAA (802.1x)

1. From the main menu, click **Virtual Network Configuration**. The Virtual Network Configuration screen appears.
2. In the left pane Virtual Networks list, click the VNS you want to set up authentication by AAA for. The Topology tab is displayed.
3. Click the **Auth & Acct** tab. On the **Auth & Acct** tab, there are three options:
   - **Auth** – Use to define authentication servers.
   - **MAC** – Use to define servers for MAC-based authentication.
   - **Acct** – Use to define accounting servers.


HiPath Wireless Assistant - VNS Configuration - Microsoft Internet Explorer
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Help | LOGOUT
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Add subnet
Rename subnet
Delete subnet
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RAD Policy
Filtering
Multicast
Privacy
QoS Policy
Use
Up
Down
Reset to primary
Test
View Summary
Auth
MAC
Acct
Configure Captive Portal Settings...
Save
Cancel
Local intranet

CNL-209-CP

RADIUS

freeradius209

Config'd Servers

Incl. VSA Attb.: □ AP's □ VNS's □ SSID

RADIUS Accounting

Interim Interval: 30 minutes

☑ Collect Accounting Information of Wireless Controller

Captive Portal

[HWC | C1000] User: admin Port status: M

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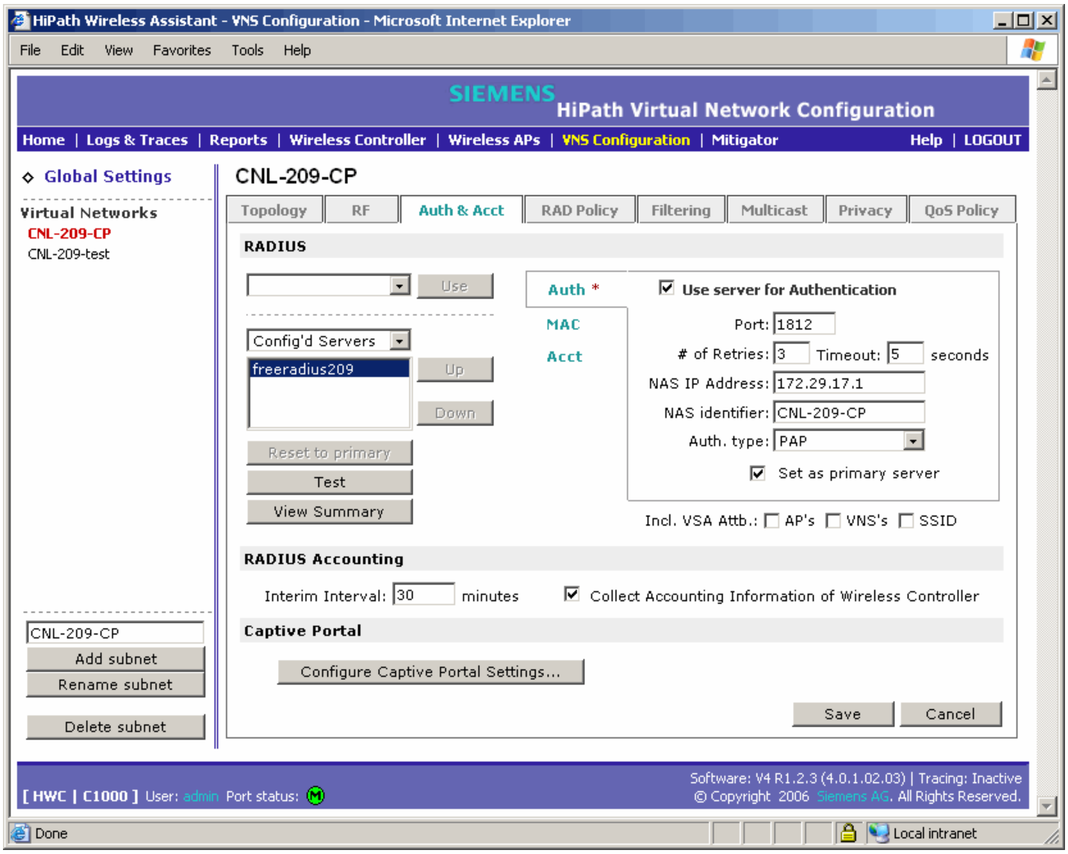
4. Click **Auth**. The Authentication fields are displayed.

5. From the **RADIUS** drop-down list, select the server you want to use for Captive Portal authentication, and then click **Use**. The server's default information is displayed.

   The RADIUS servers are defined in the Global Settings screen. For more information, see Section 6.8, “VNS global settings”, on page 116.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Global Settings
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CNL-209-CP
CNL-209-test
Topology RF Auth & Acct RAD Policy Filtering Multicast Privacy QoS Policy
RADIUS
Use
Config'd Servers
Up
Down
Reset to primary
Test
View Summary
Auth *
MAC
Acct
RADIUS Accounting
Captive Portal
Configure Captive Portal Settings...
Save
Cancel
Add subnet
Rename subnet
Delete subnet
Done
Local intranet

CNL-209-CP

freeradius209

☑ Use server for Authentication

Port: 1812

# of Retries: 3 Timeout: 5 seconds

NAS IP Address: 172.29.17.1

NAS identifier: CNL-209-CP

Auth. type: PAP

☑ Set as primary server

Incl. VSA Attb.: □ AP's □ VNS's □ SSID

Interim Interval: 30 minutes ☑ Collect Accounting Information of Wireless Controller

[HWC | C1000] User: admin Port status:

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The selected server is no longer available in the **RADIUS** drop-down list.

The server name now appears in the list of configured servers, next to the **Up** and **Down** buttons, where it can be prioritized for RADIUS redundancy. The server can also be assigned again for MAC-based authentication or accounting purposes.

A red asterisk appears next to **Auth**, indicating that a server has been assigned.

6. In the **Port** box, type the port used to access the RADIUS server. The default is 1812.
7. In the **# of Retries** box, type the number of times the HiPath Wireless Controller will attempt to access the RADIUS server.
8. In the **Timeout** box, type the maximum time that a HiPath Wireless Controller will wait for a response from the RADIUS server before attempting again.
9. In the **NAS Identifier** box, type the Network Access Server (NAS) identifier. The NAS identifier is a RADIUS attribute that identifies the server responsible for passing information to designated RADIUS servers and then acting on the response returned. This is an optional step.
10. In the **Include VSA Attributes** section, click the appropriate checkboxes to include the Vendor Specific Attributes in the message to the RADIUS server:

- AP's
- VNS's
- SSID

The Vendor Specific Attributes must be defined on the RADIUS server.

11. If applicable, select **Set as primary server**.
12. To save your changes, click **Save**.

> If you have already assigned a server to either MAC-based authentication or accounting, and you want to use it again for authentication, highlight its name in the list next to the **Up** and **Down** buttons and select the **Use server for Authentication** checkbox. The server's default information is displayed.

7.3.4 Defining MAC-based authentication for a VNS

MAC-based authentication enables network access to be restricted to specific devices by MAC address. The HiPath Wireless Controller queries a RADIUS server for a MAC address when a wireless client attempts to connect to the network.

MAC-based authentication can be set up on any type of VNS, in addition to the Captive Portal or AAA authentication. To set up a RADIUS server for MAC-based authentication, you must set up a user account with UserID=MAC and Password=MAC for each user.

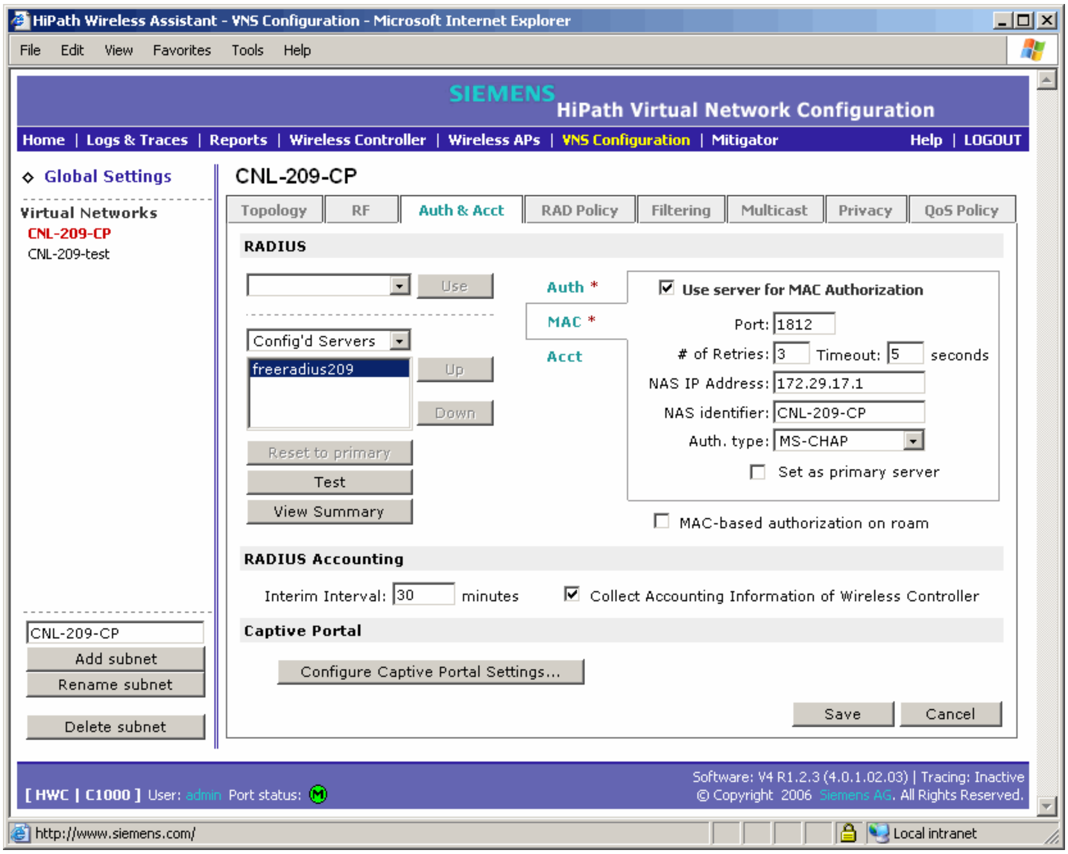
If MAC-based authentication is to be used in conjunction with the 802.1x or Captive Portal authentication, an additional account with a real UserID and Password must also be set up on the RADIUS server.

To define MAC-based authentication for a VNS:

1. From the main menu, click **Virtual Network Configuration**. The Virtual Network Configuration screen appears.
2. In the left pane Virtual Networks list, click the VNS you want to set up MAC-based authentication for. The Topology tab is displayed.
3. Click the **Auth & Acct** tab. On the **Auth & Acct** tab, there are three options:
   - **Auth** – Use to define authentication servers.
   - **MAC** – Use to define servers for MAC-based authentication.
   - **Acct** – Use to define accounting servers.
4. Click **MAC**. The MAC fields are displayed.

5. From the **RADIUS** drop-down list, select the server you want to use for MAC authentication, and then click **Use**. The server's default information is displayed and a red asterisk appears next to **MAC**, indicating that a server has been assigned.

   The RADIUS servers are defined in the Global Settings screen. For more information, see Section 6.8, "VNS global settings", on page 116.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RF
Auth & Acct
RAD Policy
Filtering
Multicast
Privacy
QoS Policy
Use
Up
Down
Reset to primary
Test
View Summary
Auth *
MAC *
Acct
Configure Captive Portal Settings...
Save
Cancel
http://www.siemens.com/
Local intranet

CNL-209-CP

RADIUS

Config'd Servers: freeradius209

☑ Use server for MAC Authorization

Port: 1812

# of Retries: 3 Timeout: 5 seconds

NAS IP Address: 172.29.17.1

NAS identifier: CNL-209-CP

Auth. type: MS-CHAP

☐ Set as primary server

☐ MAC-based authorization on roam

RADIUS Accounting

Interim Interval: 30 minutes ☑ Collect Accounting Information of Wireless Controller

Captive Portal

CNL-209-CP

[HWC | C1000] User: admin Port status: M

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6. If applicable, to use a server that has already been used for another type of authentication or accounting, select the server you want to use for MAC authentication, and then select **User server for MAC Authentication**.
7. In the **Port** box, type the port used to access the RADIUS server. The default is 1812.
8. In the **# of Retries** box, type the number of times the HiPath Wireless Controller will attempt to access the RADIUS server.
9. In the **Timeout** box, type the maximum time, in seconds, that a HiPath Wireless Controller will wait for a response from the RADIUS server before attempting again.
10. In the **NAS IP Address** box, type the Network Access Server (NAS) IP address.

11. In the **NAS Identifier** box, type the Network Access Server (NAS) identifier. The NAS identifier is a RADIUS attribute that identifies the server responsible for passing information to designated RADIUS servers and then acting on the response returned. This is an optional step.
12. In the **Auth. Type** field, select the authentication protocol to be used by the RADIUS server to authenticate the wireless device users for a Captive Portal VNS.
13. In the **Include VSA Attributes** section, click the appropriate checkboxes to include the Vendor Specific Attributes in the message to the RADIUS server:
    - AP’s
    - VNS’s
    - SSID

    The Vendor Specific Attributes must be defined on the RADIUS server.
14. If applicable, select **Set as primary server**.
15. To enable MAC-based authentication on roam, select **MAC-based authentication on roam**.

> Only select this checkbox if you are using MAC based authentication and if you want your clients to be authorized every time they roam to another AP. If this feature is not enabled, and MAC-based authentication is in use, the client is authenticated only at the start of a session.

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

7.4 Defining accounting methods for a VNS

The next step in configuring a VNS is to define the methods of accounting. Accounting tracks the activity of a wireless device users. There are two types of accounting available:

- **HiPath Wireless Controller accounting** – Enables the HiPath Wireless Controller to generate Call Data Records (CDRs) in a flat file on the HiPath Wireless Controller.
- **RADIUS accounting** – Enables the HiPath Wireless Controller to generate an accounting request packet with an accounting start record after successful login by the wireless device user, and an accounting stop record based on session termination. The HiPath Wireless Controller sends the accounting requests to a remote RADIUS server.

HiPath Wireless Controller accounting creates Call Data Records (CDRs) in a standard format of authenticated user sessions, such as start time and duration of session. The CDRs are stored in flat files that can be downloaded via the Command Line Interface (CLI).

If RADIUS accounting is enabled, a RADIUS accounting server needs to be specified.

To define accounting methods for a VNS:

1. From the main menu, click **Virtual Network Configuration**. The Virtual Network Configuration screen appears.
2. In the left pane Virtual Networks list, click the VNS you want to define accounting methods for. The Topology tab is displayed.
3. Click the **Auth & Acct** tab.
4. To enable HiPath Wireless Controller accounting, select **Collect Accounting Information of Wireless Controller**.
5. From the **RADIUS** drop-down list, select the server you want to use for RADIUS accounting, and then click **Use**. The server's default information is displayed and a red asterisk appears next to **Acct**, indicating that a server has been assigned.

   The RADIUS servers are defined in the Global Settings screen. For more information, see Section 6.8, "VNS global settings", on page 116.
6. Select **Use server for RADIUS Accounting**.
7. In the **Port** box, type the port used to access the RADIUS server. The default is 1812.
8. In the **# of Retries** box, type the number of times the HiPath Wireless Controller will attempt to access the RADIUS server.
9. In the **Timeout** box, type the maximum time that a HiPath Wireless Controller will wait for a response from the RADIUS server before attempting again.
10. In the **Interim Interval** box, type the time interval when accounting records are sent. Interim accounting records are sent if the interim time interval is reached before the session ends. The default is 60 minutes.
11. To save your changes, click **Save**.

7.5 Defining RADIUS filter policy for VNSs and VNS groups

The next step in configuring a VNS is to define the filter ID values for a VNS. These filter ID values must match those set up on the RADIUS servers.

> ⓘ This configuration step is optional. If filter ID values are not defined, the system uses the default filter as the applicable filter group for authenticated users within a VNS. However, if more user-specific filter definitions are required, for example filters based on a user's department, then the filter ID configuration is used to overwrite the default assignment.

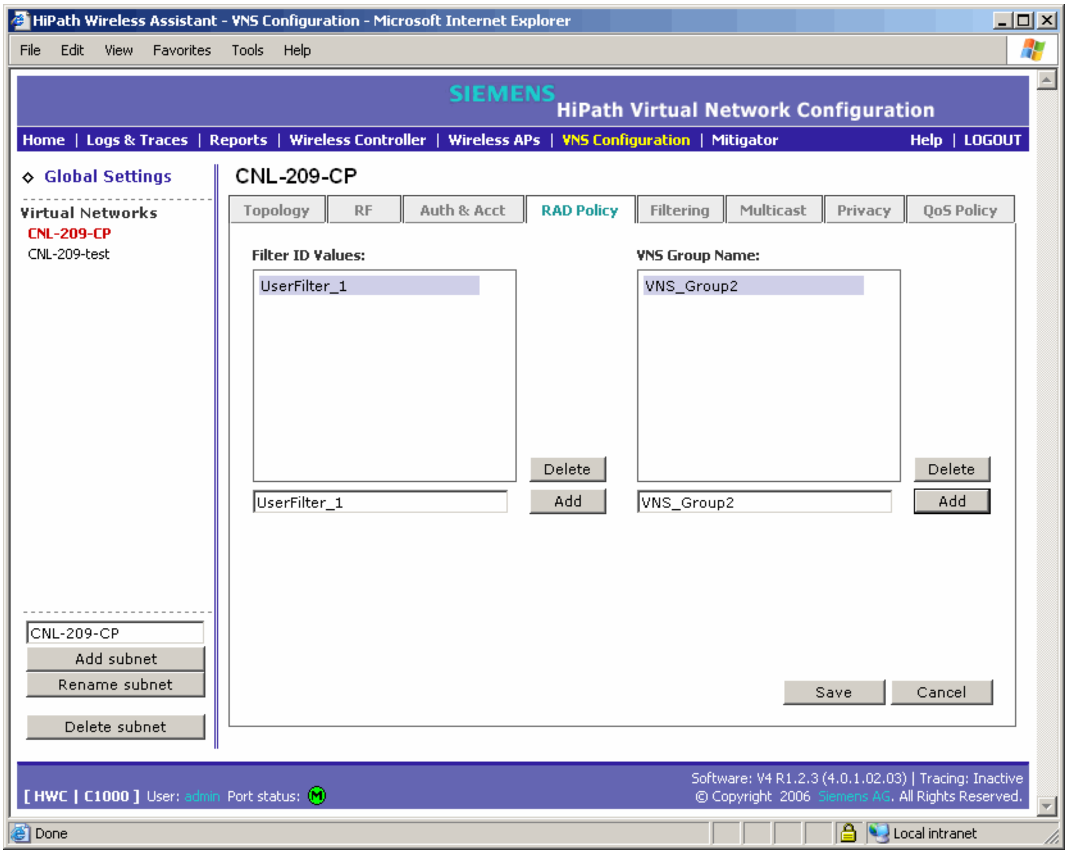
In addition to the filter ID values, you can also set up a group ID for a VNS with AAA authentication. You can set up a group within a VNS that relies on the RADIUS attribute Login-LAT-Group (RFC2865). For each group, you can define filtering rules to control access to the network.

If you define a group within an AAA VNS, the group (or child) definition acquires the same authentication and privacy parameters as the parent VNS. However, you need to define a different topology and filtering rules for this group.

All the filters are exposed. For the Assignment by SSID with no authentication, the filter that is applied to the client session is the default filter.

To define the filter ID values on a VNS:

1. From the main menu, click **Virtual Network Configuration**. The Virtual Network Configuration screen appears.
2. In the left pane Virtual Networks list, click the VNS you want to define filter ID values for. The Topology tab is displayed.
3. Click the **RAD Policy** tab.



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Rename subnet
Delete subnet
Topology
RF
Auth & Acct
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Privacy
QoS Policy
Delete
Add
Delete
Add
Save
Cancel
[HWC | C1000] User: admin Port status:
Done
Local intranet

CNL-209-CP

Filter ID Values: UserFilter_1

UserFilter_1

VNS Group Name: VNS_Group2

VNS_Group2

CNL-209-CP

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4. In the **Filter ID Values** box, type the name of a group that you want to define specific filtering rules for to control network access.
5. Click the corresponding **Add** button. The filter ID value appears in the list. These filter ID values will appear in the **Filter ID** list on the **Filtering** tab. These filter ID values must match those set up for the filter ID attribute in the RADIUS server.
6. If applicable, repeat steps 4 and 5 to add additional filtering ID values.
7. In the **VNS Group Name** box, type the name of a VNS group you want to create and define within the selected parent VNS.
8. Click the corresponding **Add** button. The Group Name will appear as a child of the parent VNS in the left pane Virtual Networks list.
9. To your changes, click **Save**.

7.6 Configuring filtering rules for a VNS

The next step in configuring a VNS is to configure the filtering rules for a VNS.

In an AAA VNS, a non-authenticated filter is unnecessary because users have already been authenticated. When authentication is returned, the filter ID group filters are applied. For AAA, a VNS can have a sub-group with Login-LAT-group ID that has its own filtering rules. If no filter ID matches are found, then the default filter is applied. VNS Policy is also applicable for Captive Portal and MAC-based authorization.

7.6.1 Filtering rules for an exception filter

The exception filter provides a set of rules aimed at restricting the type of traffic that is delivered to the controller. By default, your system is shipped with a set of restrictive filtering rules that help control access through the interfaces to only absolutely necessary services.

By configuring to allow management on an interface, an additional set of rules are added to the shipped filter rules that provide access to the system's management configuration framework (SSH, HTTPS, SNMPAgent). Most of this functionality is handled directly behind the scenes by the system, rolling and un-rolling canned filters as the system's topology and defined access privileges for an interface change.

> An interface for which **Allow Management** is enabled, can be reached by any other interface. By default, **Allow Management** is disabled and shipped interface filters will only permit the interface to be visible directly from it's own subnet.

The visible exception filters definitions, both in physical ports and VNS definitions, allow administrators to define a set of rules to be prepended to the system's dynamically updated exception filter protection rules. Rule evaluation is performed top to bottom, until an exact match is determined. Therefor, these user-defined rules are evaluated before the system’s own generated rules. As such, these user-defined rules may inadvertently create security lapses in the system's protection mechanism or create a scenario that filters out packets that are required by the system.

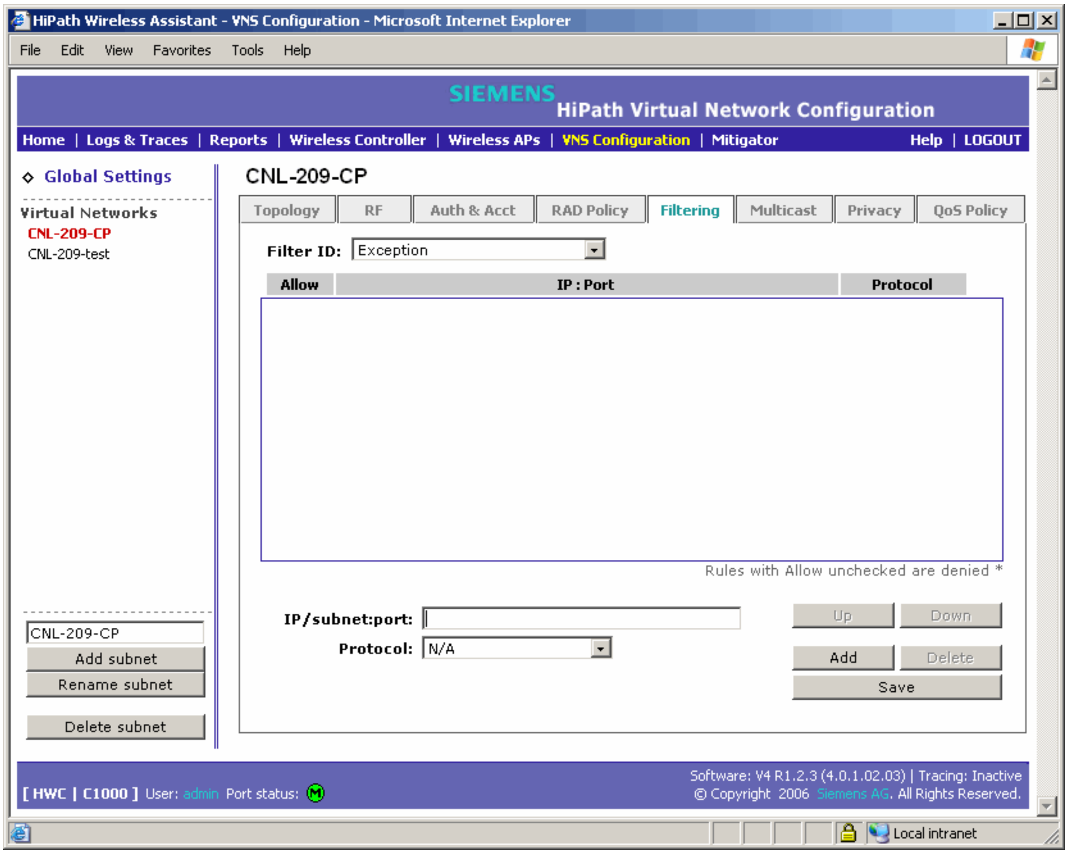
> ⓘ Use exception filters only if absolutely necessary. It is recommended to avoid defining general allow all or deny all rule definitions since those definitions can easily be too liberal or too restrictive to all types of traffic.

The exception rules are evaluated in the context of referring to the specific controller's interface. The destination address for the filter rule definition is typically defined as the interface's own IP address. The port number for the filter definition corresponds to the target (destination) port number for the applicable service running on the controller's management plane.

The exception filter on an VNS applies only to the destination portion of the packet. Traffic to a specified IP address and IP port is either allowed or denied. Adding exception filtering rules allows network administrators to either tighten or relax the built-in filtering that automatically drops packets not specifically allowed by filtering rule definitions. The exception filtering rules can deny access in the event of a DoS attack, or can allow certain types of management traffic that would otherwise be denied. Typically, **Allow Management** is enabled

To define filtering rules for an exception filter:

1. From the main menu, click **Virtual Network Configuration**. The Virtual Network Configuration screen appears.
2. In the left pane Virtual Networks list, click the VNS you want to define filter ID values for. The Topology tab is displayed.
3. Click the **Filtering** tab.
4. From the **Filter ID** drop-down list, select **Exception**.



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Allow
IP : Port
Protocol
Add subnet
Rename subnet
Delete subnet
Up
Down
Add
Delete
Save
[HWC | C1000] User: admin Port status:
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Filter ID: Exception

Rules with Allow unchecked are denied *

IP/subnet:port:

Protocol: N/A

5. For each filtering rule you are defining, do the following:

   - In the **IP/subnet:port** box, type the destination IP address. You can also specify an IP range, a port designation, or a port range on that IP address.

   - In the **Protocol** drop-down list, select the applicable protocol. The default is N/A.

6. Define a rule to allow access to the default gateway for this VNS:

   - Select **IP/Port.**

   - Type the default gateway IP address (VNS' IP address) that you defined in the Topology tab for this VNS.

7. Click **Add**. The information appears in the Filter Rules area of the tab.

8. Select the new filter, then select the **Allow** checkbox applicable to the rule you defined.

9. Edit the order of a filter by selecting the filter and clicking the **Up** and **Down** buttons. The filtering rules are executed in the order you define here.

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

> ⓘ For external Captive Portal, you need to add an external server to a non-authentication filter.

7.6.2 Defining non-authenticated filters

Defining non-authenticated filters allows administrators to identify destinations to which a user is allowed to access without incurring an authentication redirection. Typically, the recommended default rule is to deny all. Administrators should define a rule set that will permit users to access essential services:

- DNS (IP of DNS server)
- Default Gateway (VNS Interface IP)

Any HTTP streams requested by the client for denied targets will be redirected to the specified location.

The non-authenticated filter should allow access to the Captive Portal page IP address, as well as to any URLs for the header and footer of the Captive Portal page. This filter should also allow network access to the IP address of the DNS server and to the network address—the gateway of the VNS. The VNS gateway is used as the IP for an internal Captive Portal page. An external Captive Portal will provide a specific IP definition of a server outside the HiPath Wireless Controller.

Redirection and Captive Portal credentials apply to HTTP traffic only. A wireless device user attempting to reach websites other than those specifically allowed in the non-authenticated filter will be redirected to the allowed destinations. Most HTTP traffic outside of those defined in the non-authenticated filter will be redirected.

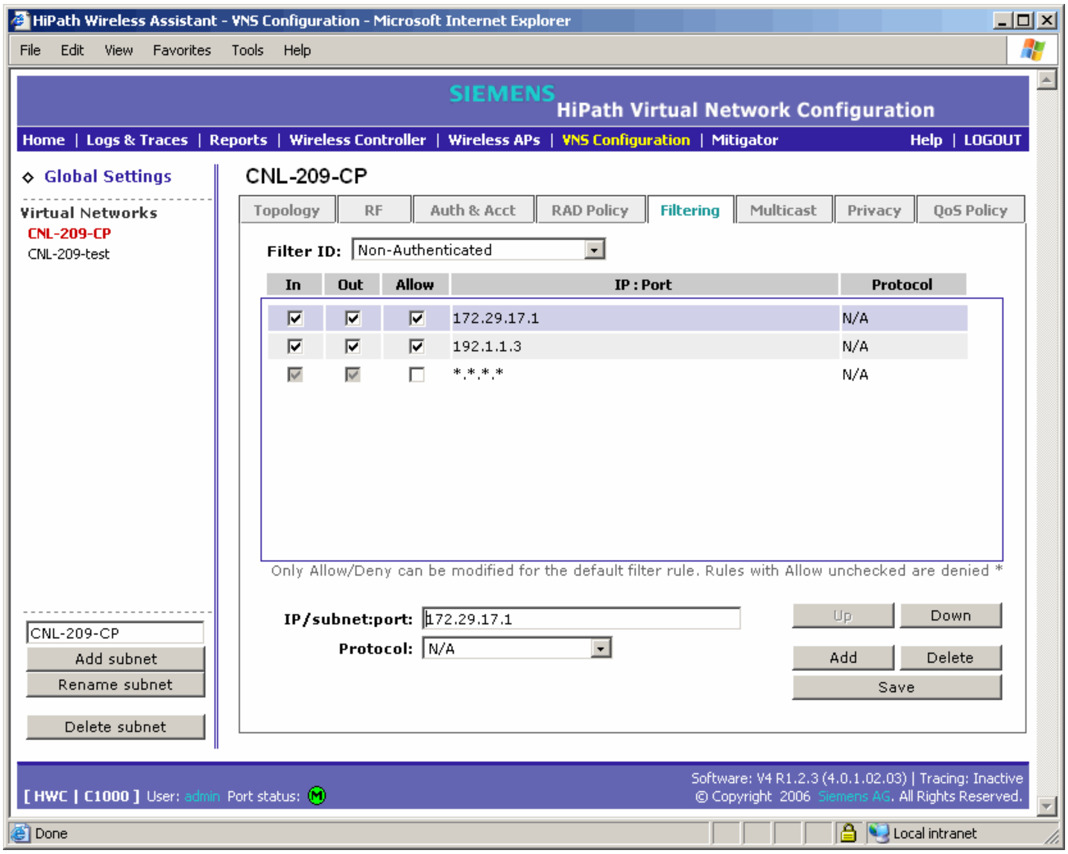
> ⓘ Although non-authenticated filters definitions are used to assist in the redirection of HTTP traffic for restricted or denied destinations, the non-authenticated filter is not restricted to HTTP operations. The filter definition is general. Any traffic other than HTTP that the filter does not explicitly allow will be discarded by the controller.

The non-authenticated filter is applied by the HiPath Wireless Controller to sessions until they successfully complete authentication. The authentication procedure results in an adjustment to the user's applicable filters for access policy. The authentication procedure may result in the specification of a specific filter ID or the application of the default filter for the VNS.

Typically, default filter ID access is less restrictive than a non-authenticated profile. It is the administrator's responsibility to define the correct set of access privileges.

To define filtering rules for a non-authenticated filter:

1. From the main menu, click **Virtual Network Configuration**. The Virtual Network Configuration screen appears.
2. In the left pane Virtual Networks list, click the VNS you want to define filter ID values for. The Topology tab is displayed.
3. Click the **Filtering** tab.
4. From the **Filter ID** drop-down list, select **Non-Authenticated**.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Add subnet
Rename subnet
Delete subnet
Topology
RF
Auth & Acct
RAD Policy
Filtering
Multicast
Privacy
QoS Policy
Up
Down
Add
Delete
Save
[HWC | C1000] User: admin Port status:
Software: V4 R1.2.3 (4.0.1.02.03) | Tracing: Inactive
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Done
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Filter ID: Non-Authenticated

In	Out	Allow	IP : Port	Protocol
☑	☑	☑	172.29.17.1	N/A
☑	☑	☑	192.1.1.3	N/A
☑	☑	□	*.*.*.*	N/A

Only Allow/Deny can be modified for the default filter rule. Rules with Allow unchecked are denied *

IP/subnet:port: 172.29.17.1

Protocol: N/A

The Filtering tab automatically provides a Deny All rule already in place. Use this rule as the final rule in the non-authenticated filter for Captive Portal.

5. For each filtering rule you are defining, do the following:
   - In the **IP/subnet:port** box, type the destination IP address. You can also specify an IP range, a port designation, or a port range on that IP address.
   - In the **Protocol** drop-down list, select the applicable protocol. The default is N/A.
6. For Captive Portal assignment, define a rule to allow access to the default gateway for this VNS:

- Select **IP/Port.**
- Type the default gateway IP address that you defined in the Topology tab for this VNS.

7. Click **Add**. The information appears in the Filter Rules area of the tab.
8. Select the new filter, then do the following:
   - If applicable, select **In** to refer to traffic from the wireless device that is trying to get on the network.
   - If applicable, select **Out** to refer to traffic from the network host that is trying to get to a wireless device.
   - Select the **Allow** checkbox applicable to the rule you defined.
9. Edit the order of a filter by selecting the filter and clicking the **Up** and **Down** buttons. The filtering rules are executed in the order you define here.
10. To save your changes, click **Save**.

> ⓘ Administrators must ensure that the non-authenticated filter allows access to the corresponding authentication server:
>
> - Internal captive portal – IP address of the VNS interface
> - External captive portal P – IP address of external captive portal server

7.6.2.1 Non-authenticated filter examples

A basic non-authenticated filter for internal Captive Portal should have three rules, in the following order:

In	Out	Allow	IP / Port	Description
x	x	x	IP address of default gateway (VNS Interface IP)	Allow all incoming wireless devices access to the default gateway of the VNS.
x	x	x	IP address of the DNS Server	Allow all incoming wireless devices access to the DNS server of the VNS.
x	x		*.*.*.*	Deny everything else.

Table 7 Non-authenticated filter example A

> ⓘ For external Captive Portal, an additional rule to Allow (in/out) access to the external Captive Portal authentication/Web server is required.

If you place URLs in the header and footer of the Captive Portal page, you must explicitly allow access to any URLs mentioned in the authentication's server page, such as:

- Internal captive portal – URLs referenced in a header or footer
- External CP – URLs mentioned in the page definition

Here is another example of a non-authenticated filter that adds two more filtering rules. The two additional rules do the following:

- Deny access to a specific IP address.
- Allows only HTTP traffic.

In	Out	Allow	IP / Port	Description
x	x	x	IP address of the default gateway	Allow all incoming wireless devices access to the default gateway of the VNS.
x	x	x	IP address of the DNS Server	Allow all incoming wireless devices access to the DNS server of the VNS.
x	x		[a specific IP address, or address plus range]	Deny all traffic to a specific IP address, or to a specific IP address range (such as:0/24).
x	x		*.*.*.*:80	Deny all port 80 (HTTP) traffic.
x	x		*.*.*.*	Deny everything else.

Table 8 Non-authenticated filter example B

Once a wireless device user has logged in on the Captive Portal page, and has been authenticated by the RADIUS server, then the following filters will apply:

- **Filter ID** – If a filter ID associated with this user was returned by the authentication server.
- **Default filter** – If no matching filter ID was returned from the authentication server

7.6.3 Filtering rules for a filter ID group

When the wireless device user provides the identification credentials, identification is sent by the HiPath Wireless Controller to the RADIUS server, or other authentication server, through a sequence of exchanges depending on the type of authentication protocol used.

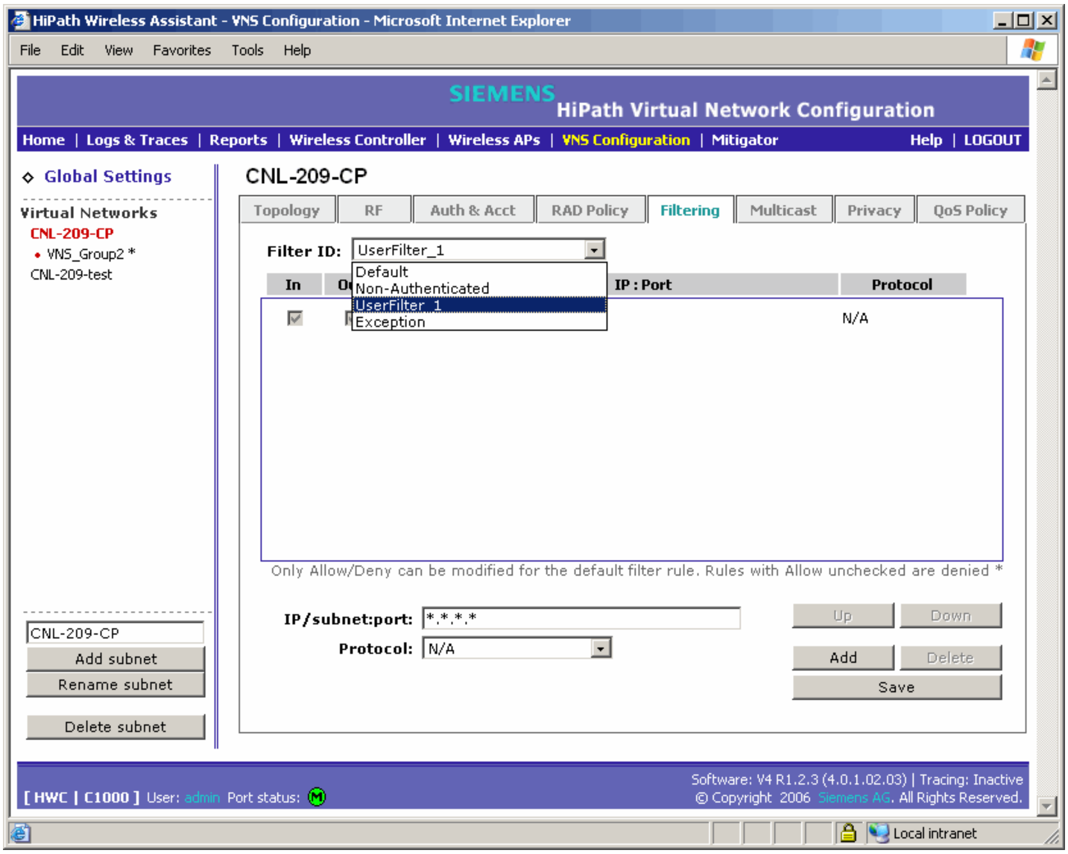
When the server allows this request for authentication—the server sends an access-accept message, the RADIUS server may also send back to the HiPath Wireless Controller a filter ID attribute value associated with the user. For an AAA VNS, a Login-LAT-Group identifier for the user may also be returned. VNS Policy is also applicable for Captive Portal and MAC-based authorization.

If the filter ID attribute value (or Login-LAT-Group attribute value) from the RADIUS server matches a filter ID value that you have set up on the HiPath Wireless Controller, the HiPath Wireless Controller applies the filtering rules that you defined for that filter ID value to the wireless device user.

If no filter ID is returned by the authentication server, or no match is found on the HiPath Wireless Controller, the filtering rules in the default filter will apply to the wireless device user.

To define filtering rules for a filter ID group:

1. From the main menu, click **Virtual Network Configuration**. The Virtual Network Configuration screen appears.
2. In the left pane Virtual Networks list, click the VNS you want to define filtering rules for a filter ID group. The Topology tab is displayed.
3. Click the **Filtering** tab.
4. From the **Filter ID** drop-down list, select one of the names you defined in the **Filter ID Values** field on the **RAD Policy** tab. For example, select one of your organization's user groups, such as Sales, Engineering, Teacher, Guest, etc.



Filter ID: UserFilter_1

Default
Non-Authenticated
UserFilter_1
Exception

☑ N/A

Only Allow/Deny can be modified for the default filter rule. Rules with Allow unchecked are denied *

IP/subnet:port: *.*.*.*

Protocol: N/A

Software: V4 R1.2.3 (4.0.1.02.03) | Tracing: Inactive
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The Filtering tab automatically provides a Deny All rule already in place. This rule can be modified to Allow All, if appropriate to the network access needs for this VNS.

5. For each filtering rule you are defining, do the following:
   - In the **IP/subnet:port** box, type the destination IP address. You can also specify an IP range, a port designation, or a port range on that IP address.
   - In the **Protocol** drop-down list, select the applicable protocol. The default is N/A.
6. Click **Add**. The information appears in the Filter Rules area of the tab.
7. Select the new filter, then do the following:
   - If applicable, select **In** to refer to traffic from the wireless device that is trying to get on the network.
   - If applicable, select **Out** to refer to traffic from the network host that is trying to get to a wireless device.
   - Select the **Allow** checkbox applicable to the rule you defined.
8. Edit the order of a filter by selecting the filter and clicking the **Up** and **Down** buttons. The filtering rules are executed in the order you define here.
9. To save your changes, click **Save**.

7.6.3.1 Filtering rules by filter ID examples

Below are two examples of possible filtering rules for a filter ID. The first example disallows some specific access before allowing everything else.

In	Out	Allow	IP / Port	Description
x	x		*.*.*.*:22-23	SSH and telnet sessions
x	x		[specific IP address, range]	Deny all traffic to a specific IP address or address range
x	x	x	*.*.*.*	Allow everything else

Table 9 Filtering rules by filter ID example A

The second example does the opposite of the first example. It allows some specific access and denies everything else.

In	Out	Allow	IP / Port	Description
x	x	x	[specific IP address, range]	Allow traffic to a specific IP address or address range.

Table 10 Filtering rules by filter ID example B

In	Out	Allow	IP / Port	Description
x	x		*.*.*.*.	Deny everything else.

Table 10 Filtering rules by filter ID example B

7.6.4 Filtering rules for a default filter

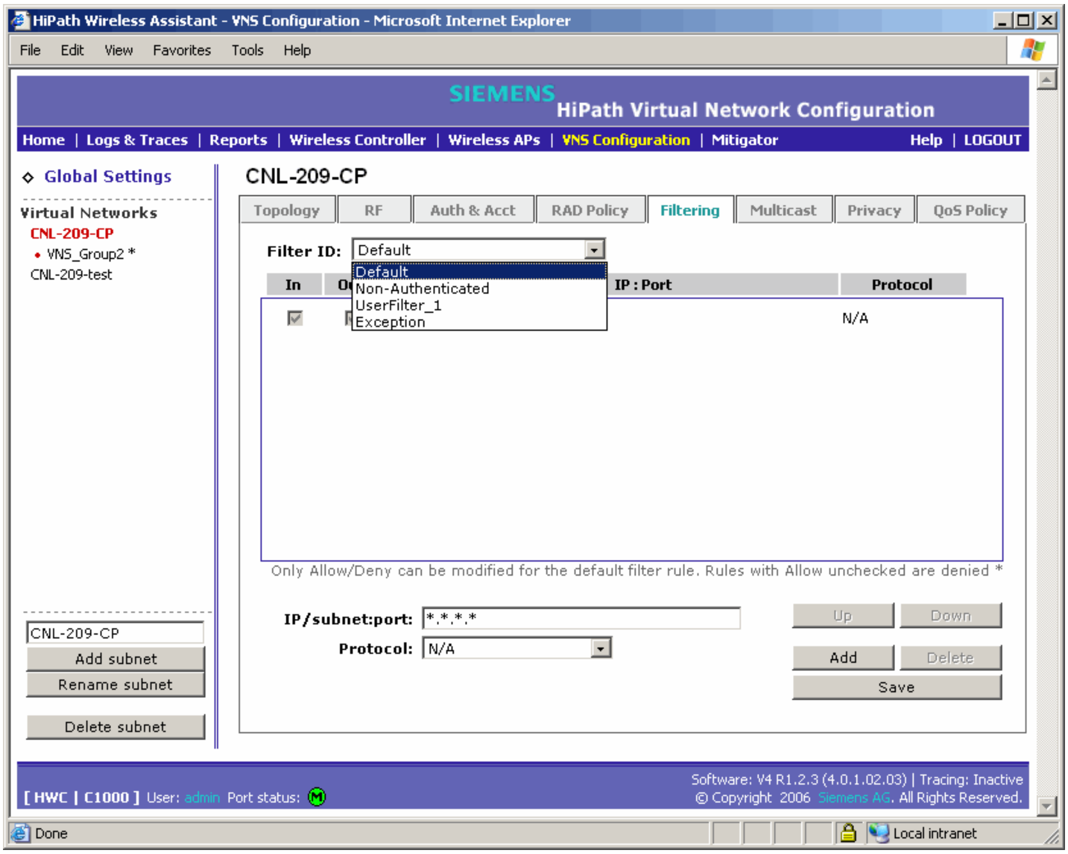
After authentication of the wireless device user, the default filter will apply only after:

- No match is found for the Exception filter rules.
- No filter ID attribute value is returned by the authentication server for this user.
- No match is found on the HiPath Wireless Controller for a filter ID value.

The final rule in the default filter should be a catch-all rule for any traffic that did not match a filter. A final Allow All rule in a default filter will ensure that a packet is not dropped entirely if no other match can be found. VNS Policy is also applicable for Captive Portal and MAC-based authorization.

To define the filtering rules for a default filter

1. From the main menu, click **Virtual Network Configuration**. The Virtual Network Configuration screen appears.
2. In the left pane Virtual Networks list, click the VNS you want to define the filtering rules for a default filter. The Topology tab is displayed.
3. Click the **Filtering** tab.
4. From the **Filter ID** drop-down list, select **Default**.



CNL-209-CP

Filter ID: Default

N/A

Only Allow/Deny can be modified for the default filter rule. Rules with Allow unchecked are denied *

IP/subnet:port: *.*.*.*

Protocol: N/A

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The Filtering tab automatically provides a Deny All rule already in place. This rule can be modified to Allow All, if appropriate to the network access needs for this VNS.

7.6.4.1 Default filter examples

The following are examples of filtering rules for a default filter:

In	Out	Allow	IP / Port	Description
x	x		Intranet IP, range	Deny all access to an IP range
x	x		Port 80 (HTTP)	Deny all access to web browsing
x	x		Intranet IP	Deny all access to a specific IP
x	x	x	*.*.*.*	Allow everything else

Table 11 Default filter example A

In	Out	Allow	IP / Port	Description
x			Port 80 (HTTP) on host IP	Deny all incoming wireless devices access to web browsing the host
	x		Intranet IP 10.3.0.20, ports 10-30	Deny all traffic from the network to the wireless devices on the port range, such as TELNET (port 23) or FTP (port 21)
x		x	Intranet IP 10.3.0.20	Allow all other traffic from the wireless devices to the Intranet network
	x	x	Intranet IP 10.3.0.20	Allow all other traffic from Intranet network to wireless devices
x	x	x	*.*.*.*.	Allow everything else

Table 12 Default filter example B

7.6.4.2 Filtering rules for an AAA child group VNS

If you defined a child group for an AAA VNS, it will have the same authentication parameters and filter IDs as the parent VNS. However, you can define different filtering rules for the filters IDs in the child configuration from those in the parent configuration.

7.6.4.3 Filtering rules between two wireless devices

Traffic from two wireless devices that are on the same VNS and are connected to the same Wireless AP will pass through the HiPath Wireless Controller and therefore be subject to filtering policy. You can set up filtering rules that allow each wireless device access to the default gateway, but also prevent each device from communicating with each other.

Add the following two rules to a filter ID filter, before allowing everything else:

In	Out	Allow	IP / Port	Description
x	x	x	[Intranet IP]	Allow access to the Gateway IP address of the VNS only
x	x		[Intranet IP, range]	Deny all access to the VNS subnet range (such as 0/24)
x	x	x	*.*.*.*.	Allow everything else

Table 13 Rules between two wireless devices

7.7 Enabling multicast for a VNS

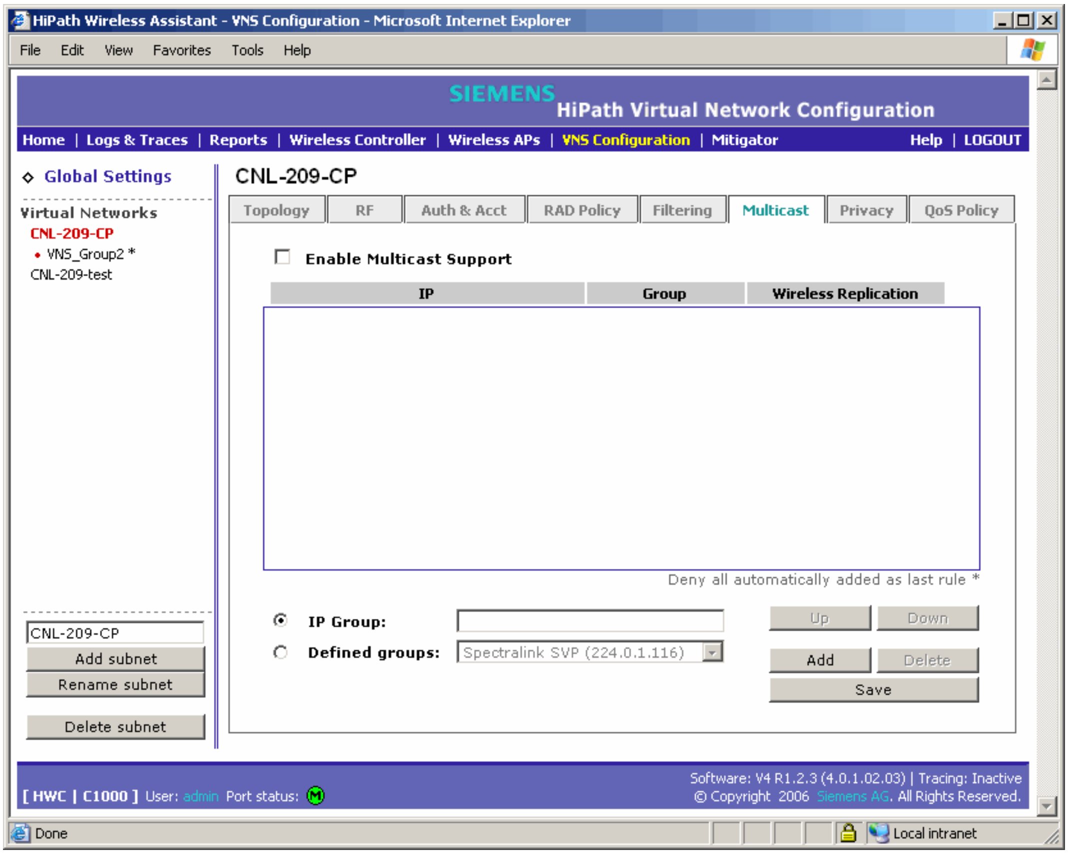
A mechanism that supports multicast traffic can be enabled as part of a VNS definition. This mechanism is provided to support the demands of VoIP and IPTV network traffic, while still providing the network access control.

Define a list of multicast groups whose traffic is allowed to be forwarded to and from the VNS. The default behavior is to drop the packets. For each group defined, you can enable Multicast Replication by group.

> ⓘ Before enabling multicast filters and depending on the topology of the VNS, you may need to define which physical interface to use for multicast relay. Define the multicast port on the IP Addresses screen of the Wireless Controller Configuration tab. For more information, see Section 4.2.4, “Setting up the data ports”, on page 53.

To enable multicast for a VNS:

1. From the main menu, click **Virtual Network Configuration**. The Virtual Network Configuration screen appears.
2. In the left pane Virtual Networks list, click the VNS you want to enable Multicast for. The Topology tab is displayed.
3. Click the **Multicast** tab.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Help | LOGOUT
◇ Global Settings
Virtual Networks
CNL-209-CP
• VNS_Group2 *
CNL-209-test
CNL-209-CP
Add subnet
Rename subnet
Delete subnet
CNL-209-CP
Topology
RF
Auth & Acct
RAD Policy
Filtering
Multicast
Privacy
QoS Policy
IP
Group
Wireless Replication
Up
Down
Add
Delete
Save
[HWC | C1000] User: admin Port status: M
Done
Local intranet

☐ Enable Multicast Support

Deny all automatically added as last rule *

● IP Group:

○ Defined groups: Spectralink SVP (224.0.1.116)

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4. To enable the multicast function, click **Enable Multicast Support**.

5. Define the multicast groups by selecting one of the radio buttons:

   - **IP Group** – Type the IP address range.
   - **Defined groups** – Select from the drop-down list.

6. Click **Add**. The group is added to the list above.

7. To enable the wireless multicast replication for this group, select the corresponding **Wireless Replication** checkbox.

8. To modify the priority of the multicast groups, select the group row and click the **Up** or **Down** buttons.

   A Deny All rule is automatically added as the last rule, IP = *.*.*.* and the **Wireless Replication** checkbox is not selected. This rule ensures that all other traffic is dropped.

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

The multicast packet size should not exceed 1450 bytes.

7.8 Configuring privacy for a VNS

Privacy is a mechanism that protects data over wireless and wired networks, usually by encryption techniques. The following section describes how the Privacy mechanism is handled for a Captive Portal VNS and an AAA VNS.

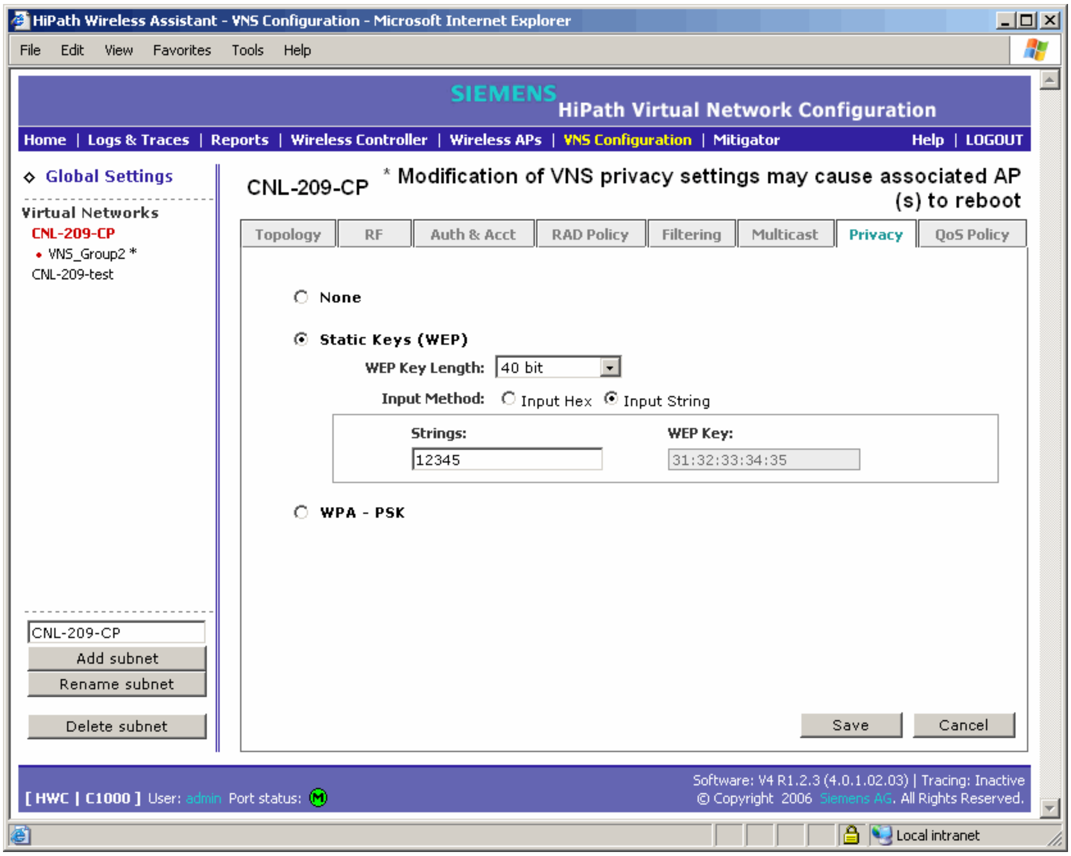
7.8.1 Privacy for a VNS for Captive Portal

For the Captive Portal VNS, there are three options for the privacy mechanism:

- **None**
- **Static Wired Equivalent Privacy (WEP)** – Keys for a selected VNS, so that it matches the WEP mechanism used on the rest of the network. Each radio can support up to eight SSIDs (16 per AP). Each AP can participate in up to 50 VNSs. For each VNS, only one WEP key can be specified. It is treated as the first key in a list of WEP keys.
- **Wi-Fi Protected Access (WPA) Pre-Shared key (PSK)** – Privacy in PSK mode, using a Pre-Shared Key (PSK), or shared secret for authentication. WPA-PSK is a security solution that adds authentication to enhanced WEP encryption and key management. WPA-PSK mode does not require an authentication server. It is suitable for home or small office.

To configure privacy by static WEP for a Captive Portal VNS:

1. From the main menu, click **Virtual Network Configuration**. The Virtual Network Configuration screen appears.
2. In the left pane Virtual Networks list, click the VNS you want to configure privacy by static WEP for a Captive Portal. The Topology tab is displayed.
3. Click the **Privacy** tab.
4. Select **Static Keys (WEP)**.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SIEMENS
HiPath Virtual Network Configuration
Home | Logs & Traces | Reports | Wireless Controller | Wireless APs | VNS Configuration | Mitigator
Help | LOGOUT
Global Settings
Virtual Networks
CNL-209-CP
VNS_Group2 *
CNL-209-test
Add subnet
Rename subnet
Delete subnet
Topology
RF
Auth & Acct
RAD Policy
Filtering
Multicast
Privacy
QoS Policy
Save
Cancel
Local intranet

CNL-209-CP

* Modification of VNS privacy settings may cause associated AP (s) to reboot

○ None

● Static Keys (WEP)

WEP Key Length: 40 bit

Input Method: ○ Input Hex ● Input String

Strings: 12345

WEP Key: 31:32:33:34:35

○ WPA - PSK

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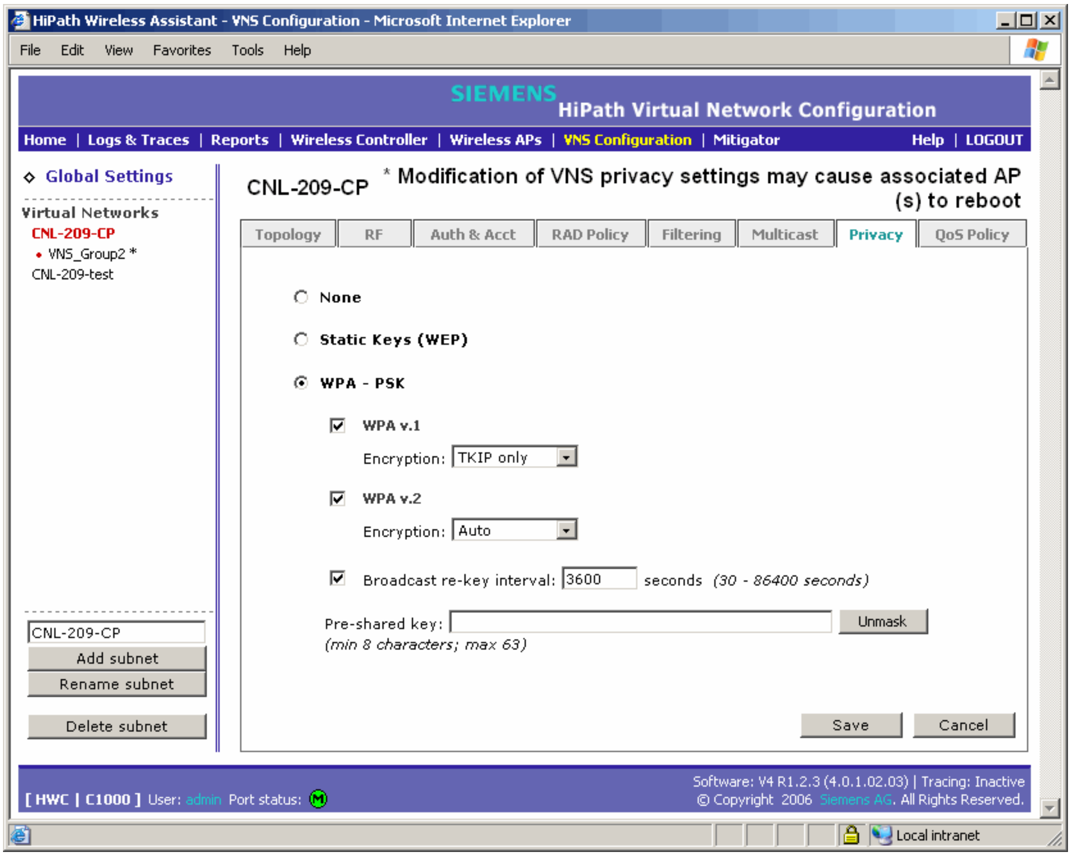
5. From the **WEP Key Length** drop-down list, select the WEP encryption key length:
   - 40-bit
   - 104-bit
   - 128-bit
6. Select one of the following input methods:
   - **Input Hex** – If you select **Input Hex**, type the WEP key input in the **WEP Key** box. The key is generated automatically, based on the input.
   - **Input String** – If you select **Input String**, type the secret WEP key string used for encrypting and decrypting in the **WEP Key String** box. The WEP Key box is automatically filled by the corresponding Hex code.
7. To save your changes, click **Save**.

To configure privacy by WPA-PSK for a Captive Portal VNS

1. From the main menu, click **Virtual Network Configuration**. The Virtual Network Configuration screen appears.
2. In the left pane Virtual Networks list, click the VNS you want to configure privacy by WPA-PSK for a Captive Portal. The Topology tab is displayed.
3. Click the **Privacy** tab.
4. Select **WPA-PSK**.
5. To enable WPA v1 encryption, select **WPA v.1**.
6. If WPA v.1 is enabled, select one of the following encryption types from the **Encryption** drop-down list:
   - **Auto** – The AP will advertise both TKIP and CCMP (Counter Mode with Cipher Block Chaining Message Authentication Code Protocol) for WPAv1. CCMP is an IEEE 802.11i encryption protocol that uses the encryption cipher AES (Advanced Encryption Standard). Auto is the default.
   - **TKIP only** – The AP will advertise TKIP as an available encryption protocol for WPAv1. It will not advertise CCMP.
7. To enable WPA v2-type encryption, select **WPA v.2**.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Global Settings
Virtual Networks
CNL-209-CP
VNS_Group2 *
CNL-209-test
Add subnet
Rename subnet
Delete subnet
Topology
RF
Auth & Acct
RAD Policy
Filtering
Multicast
Privacy
QoS Policy
Unmask
Save
Cancel
Local intranet

CNL-209-CP * Modification of VNS privacy settings may cause associated AP (s) to reboot

○ None

○ Static Keys (WEP)

● WPA - PSK

☑ WPA v.1

Encryption: TKIP only

☑ WPA v.2

Encryption: Auto

☑ Broadcast re-key interval: 3600 seconds *(30 - 86400 seconds)*

Pre-shared key:
(min 8 characters; max 63)

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[HWC | C1000] User: admin Port status: M

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8. To enable re-keying after a time interval, select **Broadcast re-key interval**.

   If this checkbox is not selected, the Broadcast encryption key is never changed and the Wireless AP will always use the same broadcast key for Broadcast/Multicast transmissions. This will reduce the level of security for wireless communications.

9. In the **Broadcast re-key interval** box, type the time interval after which the broadcast encryption key is changed automatically. The default is 3600.

10. In the **Pre-Shared Key** box, type the shared secret key to be used between the wireless device and Wireless AP. The shared secret key is used to generate the 256-bit key.

11. In order to proofread your entry before saving the configuration, click **Unmask** to display the Pre-Shared Key. To mask the key, click **Mask**.

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

7.8.2 Privacy for a VNS for AAA

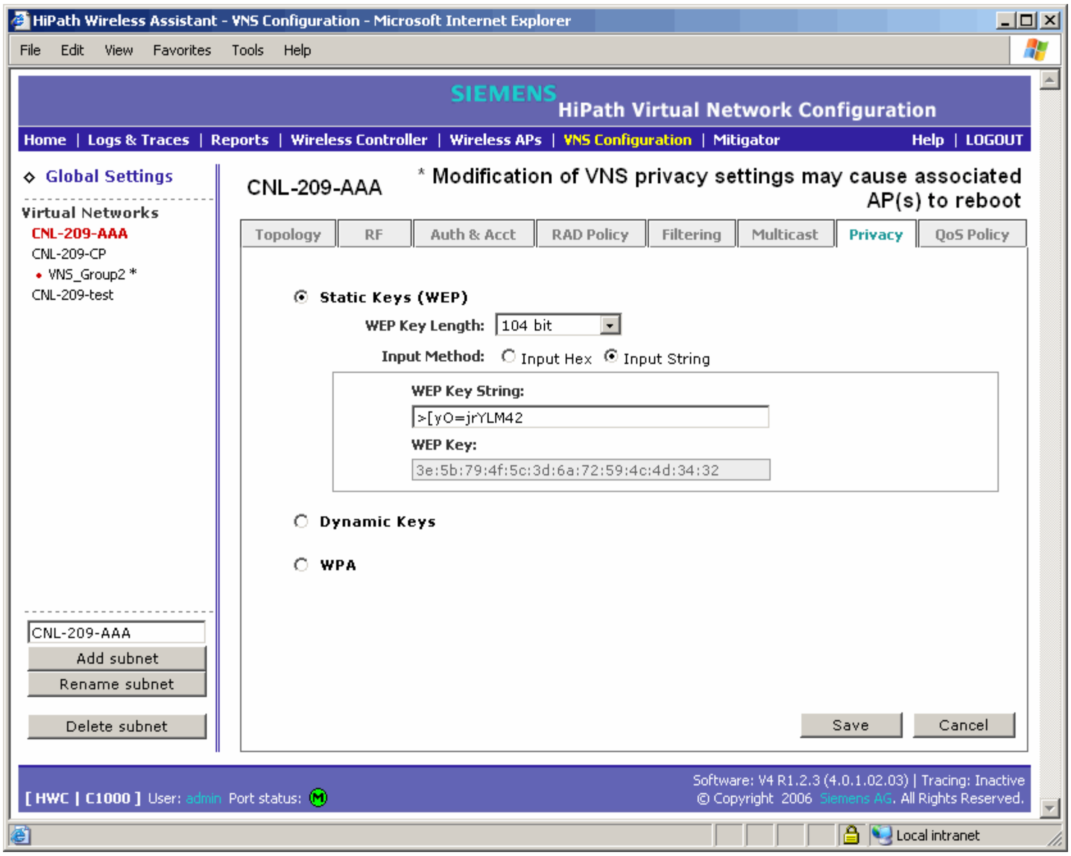
For a VNS with authentication by 802.1x (AAA), there are four Privacy options:

- Static keys (WEP)

- Dynamic keys
- Wi-Fi Protected Access (WPA) version 1, with encryption by Temporal Key Integrity Protocol (TKIP)
- Wi-Fi Protected Access (WPA) version 2, with encryption by Advanced Encryption Standard with Counter-Mode/CBC-MAC Protocol (AES-CCMP)

To set up static WEP privacy for an AAA VNS:

1. From the main menu, click **Virtual Network Configuration**. The Virtual Network Configuration screen appears.
2. In the left pane Virtual Networks list, click the AAA VNS you want to configure privacy by WPA-PSK for a Captive Portal. The Topology tab is displayed.
3. Click the **Privacy** tab.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Help | LOGOUT
Global Settings
Virtual Networks
CNL-209-AAA
CNL-209-CP
VNS_Group2 *
CNL-209-test
Add subnet
Rename subnet
Delete subnet
Topology
RF
Auth & Acct
RAD Policy
Filtering
Multicast
Privacy
QoS Policy
Save
Cancel
Local intranet

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* Modification of VNS privacy settings may cause associated AP(s) to reboot

● Static Keys (WEP)

WEP Key Length: 104 bit

Input Method: ○ Input Hex ● Input String

WEP Key String: >[yO=jrYLM42

WEP Key: 3e:5b:79:4f:5c:3d:6a:72:59:4c:4d:34:32

○ Dynamic Keys

○ WPA

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4. Select **Static Keys (WEP)**.
5. From the **WEP Key Length** drop-down list, select the WEP encryption key length:
   - 40-bit

- 104-bit
- 128-bit

6. Select one of the following input methods:
   - **Input Hex** – If you select **Input Hex**, type the WEP key input in the **WEP Key** box. The key is generated automatically, based on the input.
   - **Input String** – If you select **Input String**, type the secret WEP key string used for encrypting and decrypting in the **WEP Key String** box. The WEP Key box is automatically filled by the corresponding Hex code.
7. To save your changes, click **Save**.

7.8.2.1 Dynamic WEP privacy for an AAA VNS

The dynamic key WEP mechanism changes the key for each user and each session.

To set up dynamic WEP privacy for a selected AAA VNS:

1. From the main menu, click **Virtual Network Configuration**. The Virtual Network Configuration screen appears.
2. In the left pane Virtual Networks list, click the AAA VNS you want to set up dynamic WEP privacy for. The Topology tab is displayed.
3. Click the **Privacy** tab.
4. Select **Dynamic Keys**.
5. To save your changes, click **Save**.

7.8.2.2 Wi-Fi Protected Access (WPA v1 and WPA v2) Privacy for an AAA VNS

The VNS Privacy feature supports Wi-Fi Protected Access (WPA v1 and WPA v2), a security solution that adds authentication to enhanced WEP encryption and key management.

The authentication portion of WPA for AAA is in Enterprise Mode:

- Specifies 802.1x with Extensible Authentication Protocol (EAP)
- Requires a RADIUS or other authentication server
- Uses RADIUS protocols for authentication and key distribution
- Centralizes management of user credentials

The encryption portion of WPA v1 is Temporal Key Integrity Protocol (TKIP). TKIP includes:

- A per-packet key mixing function that shares a starting key between devices, and then changes their encryption key for every packet (unicast key) or after the specified re-key time interval (broadcast key) expires
- An extended WEP key length of 256-bits
- An enhanced Initialization Vector (IV) of 48 bits, instead of 24 bits, making it more difficult to compromise
- A Message Integrity Check or Code (MIC), an additional 8-byte code that is inserted before the standard WEP 4-byte Integrity Check Value (ICV). These integrity codes are used to calculate and compare, between sender and receiver, the value of all bits in a message, which ensures that the message has not been tampered with.

The encryption portion of WPA v2 is Advanced Encryption Standard (AES). AES includes:

- A 128 bit key length, for the WPA2/802.11i implementation of AES
- Four stages that make up one round. Each round is iterated 10 times.
- A per-packet key mixing function that shares a starting key between devices, and then changes their encryption key for every packet or after the specified re-key time interval expires.
- The Counter-Mode/CBC-MAC Protocol (CCMP), 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
  - Cipher Block Chaining Message Authentication Code (CBC-MAC) to provide data integrity

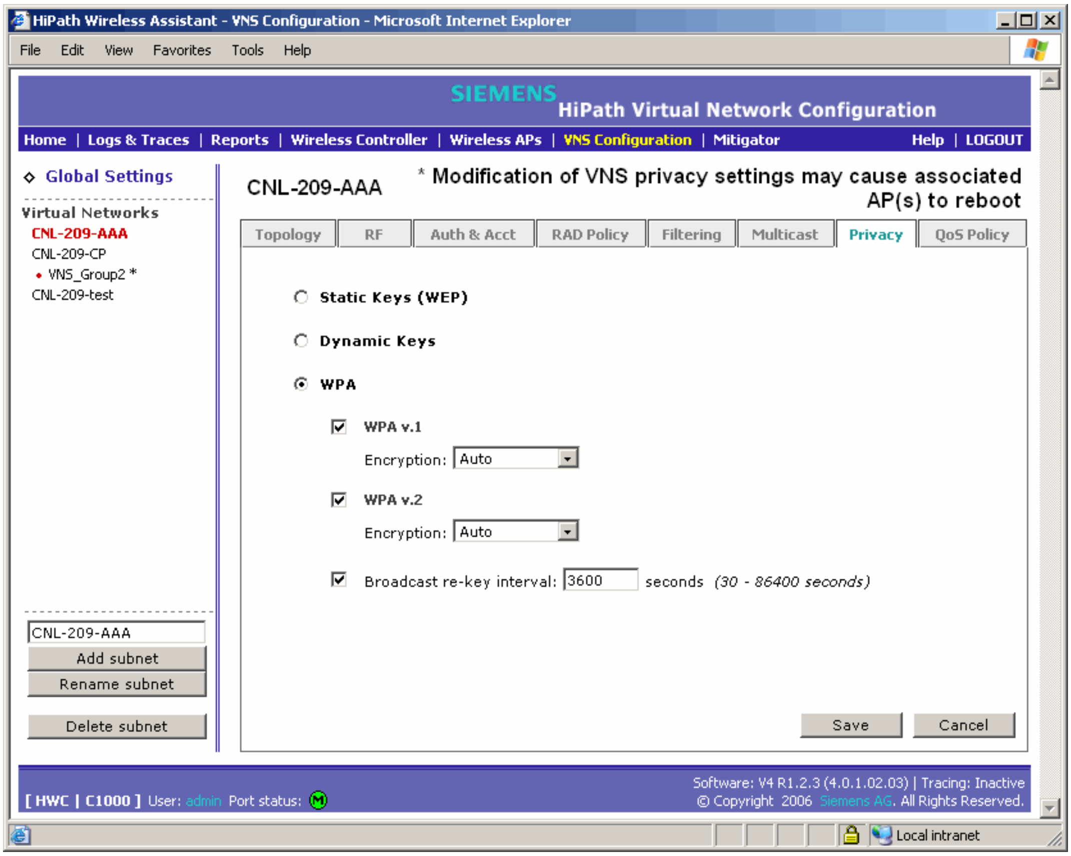
The following is an overview of the WPA authentication and encryption process:

- **Step one** – The wireless device client associates with Wireless AP.
- **Step two** – Wireless AP blocks the client's network access while the authentication process is carried out (the HiPath Wireless Controller sends the authentication request to the RADIUS authentication server).
- **Step three** – The wireless client provides credentials that are forwarded by the HiPath Wireless Controller to the authentication server.
- **Step four** – If the wireless device client is not authenticated, the wireless client stays blocked from network access.
- **Step five** – If the wireless device client is authenticated, the HiPath Wireless Controller distributes encryption keys to the Wireless AP and the wireless client.

- **Step six** – The wireless device client gains network access via the Wireless AP, sending and receiving encrypted data. The traffic is controlled with permissions and policy applied by the HiPath Wireless Controller.

To set up Wi-Fi Protected Access privacy (WPA) for an AAA VNS:

1. From the main menu, click **Virtual Network Configuration**. The Virtual Network Configuration screen appears.
2. In the left pane Virtual Networks list, click the AAA VNS you want to configure privacy by WPA-PSK for a Captive Portal. The Topology tab is displayed.
3. Click the **Privacy** tab.
4. Select **WPA**.



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CNL-209-CP
VNS_Group2 *
CNL-209-test
Add subnet
Rename subnet
Delete subnet
Topology
RF
Auth & Acct
RAD Policy
Filtering
Multicast
Privacy
QoS Policy
Save
Cancel
[HWC | C1000] User: admin Port status: M
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* Modification of VNS privacy settings may cause associated AP(s) to reboot

○ Static Keys (WEP)

○ Dynamic Keys

● WPA

☑ WPA v.1

Encryption: Auto

☑ WPA v.2

Encryption: Auto

☑ Broadcast re-key interval: 3600 seconds *(30 - 86400 seconds)*

5. To enable WPA v1 encryption, select **WPA v.1**.
6. From the **Encryption** drop-down list, select one of the following encryption types:

- **Auto** – The AP will advertise both TKIP and CCMP (Counter Mode with Cipher Block Chaining Message Authentication Code Protocol) for WPAv1. CCMP is an IEEE 802.11i encryption protocol that uses the encryption cipher AES (Advanced Encryption Standard). Auto is the default.
- **TKIP only** – The AP will advertise TKIP as an available encryption protocol for WPAv1. It will not advertise CCMP.

7. To enable re-keying after a time interval, select **Broadcast re-key interval**.

   If this checkbox is not selected, the Broadcast encryption key is never changed and the Wireless AP will always use the same broadcast key for Broadcast/Multicast transmissions. This will reduce the level of security for wireless communications.

8. In the **Broadcast re-key interval** box, type the time interval after which the broadcast encryption key is changed automatically. The default is 3600.
9. To save your changes, click **Save**.

7.9 Defining a VNS with no authentication

You can set up a VNS that will bypass all authentication mechanisms and run Controller, Access Points and Convergence Software with no authentication of a wireless device user.

A VNS with no authentication can still control network access using filtering rules. For more information on how to set up filtering rules that allow access only to specified IP addresses and ports, see Section 7.6.2, “Defining non-authenticated filters”, on page 156.

To define a VNS with no authentication:

1. From the main menu, click **Virtual Network Configuration**. The Virtual Network Configuration screen appears.
2. In the left pane Virtual Networks list, click the VNS you want to configure with no authentication. The Topology tab is displayed.
1. From the **Assignment by** drop-down list, select **SSID**.
1. Configure the topology for this VNS, then click **Save**. For more information, see Section 7.1.1, “Configuring topology for a VNS for Captive Portal”, on page 125. You must save your changes before moving to the next tab.
2. Click the **Auth & Acct** tab.
3. Click **Configure Captive Portal Settings**. The Captive Portal Configurations subscreen appears.
4. Select **No Captive Portal Support**. You must save your changes before moving to the next tab.

5. Click the **Filtering** tab.
6. Define a default filter that will control specific network access for any wireless device users on this VNS. For more information, see Section 7.6, “Configuring filtering rules for a VNS”, on page 153.

   These rules should be very restrictive and the final rule should be a Deny All rule. The non-authenticated filter for a VNS with no authentication will not have a Captive Portal page for login.
7. To save your changes, click **Save**.

7.10 Defining priority level for VNS traffic

Voice over Internet Protocol (VoIP) using 802.11 wireless local area networks are enabling the integration of internet telephony technology on wireless networks. Various issues including quality-of-service (QoS), call control, network capacity, and network architecture are factors in VoIP over 802.11 WLANs.

Wireless voice data requires a constant transmission rate and must be delivered within a time limit. This type of data is called isochronous data. This requirement for isochronous data is in contradiction to the concepts in the 802.11 standard that allow for data packets to wait their turn, in order to avoid data collisions. Regular traffic on a wireless network is an asynchronous process in which data streams are broken up by random intervals.

To reconcile the needs of isochronous data, mechanisms are added to the network that give voice data traffic or another traffic type priority over all other traffic, and allow for continuous transmission of data.

In order to provide better network traffic flow, the Controller, Access Points and Convergence Software provides advanced Quality of Service (QoS) management. These management techniques include:

- **WMM (Wi-Fi Multimedia)** – Enabled globally on the Wireless AP, the standard provides multimedia enhancements that improve the user experience for audio, video, and voice applications. WMM is part of the 802.11e standard for QoS.
- **IP ToS (Type of Service) or DSCP (Diffserv Codepoint)** – The ToS/DSCP field in the IP header of a frame is used to indicate the priority and Quality of Service for each frame. The IP TOS and/or DSCP is maintained within CTP (CAPWAP Tunneling Protocol) by copying the user IP QoS information to the CTP header—this is referred to as Adaptive QoS.

7.10.1 Setting up a VNS for voice traffic

In order to set up a VNS for voice-over-IP traffic, a number of factors should be considered on the enterprise network and in the Controller, Access Points and Convergence Software system.

On the enterprise network, the wireless telephone users will require access to:

- **Private Branch Exchange (PBX)** – A private telephone system within an enterprise, with such features as voicemail.
- **Telephony Gateway** – For access to an external standard telephone network, such as the wireless cellular network or the public switched telephone network (PSTN). The Telephony Gateway should be located on the same subnet as the HiPath Wireless Controller.

For large deployments, an SVP server is required on the enterprise network if Spectralink devices are to be supported.

To configure the VNS for voice-over-IP traffic:

1. From the main menu, click **Virtual Network Configuration**. The Virtual Network Configuration screen appears.
2. In the left pane Virtual Networks list, click the VNS you want to configure for voice-over-IP traffic. The Topology tab is displayed.
3. From the **Assignment by** drop-down list, select **SSID**.
4. Click the **Auth & Acct** tab.
5. Click **Configure Captive Portal Settings**. The Captive Portal Configurations subscreen appears.
6. Select **No Captive Portal Support**, and then click **Save**. No authentication is used since wireless telephone users do not have a user interface in which they can enter authentication identification.
7. Click the **Multicast** tab.
8. Select **Enable Multicast Support**. Several VoIP implementations use multicast for their operations:
    - Device Discovery and registration
    - Push-to-talk feature/Group talk feature
9. Do one of the following:
    - Select **IP Group** and define the multicast groups by typing the IP address range in the **IP Group** box.
    - Select **Defined groups** and select the predefined multicast group from the **Defined groups** drop-down list. For example, Spectralink-enabled devices using the SVP Protocol.
10. Click the **Filtering** tab.

11. Define rules that allow access to the DNS server, to the Telephony Gateway, and then deny all other traffic. For more information, see Section 7.6, “Configuring filtering rules for a VNS”, on page 153.
12. Click the **Privacy** tab.
13. Configure privacy to use 104-bit WEP key. This is recommended for greater security. For more information, see Section 7.8, “Configuring privacy for a VNS”, on page 167.

> The most popular level of security support is 104-bit WEP key. (Although, newer phones support WPA-PSK, which is considered a better method). Select the method that is better suited for your deployment and for the type of devices that are deployed on your network.

14. Click the **QoS Policy** tab.
15. Configure the priority levels. For more information, see Section 7.11, “Configuring Quality of Service (QoS)”, on page 180.

    For a VoIP VNS, you should select the voice priority level that is the highest priority value allowed by the system.
16. To save your changes, click **Save**.

> Voice priority is required for use with SpectraLink phones.

To configure a Wireless AP radio for a voice traffic VNS

1. From the main menu, click **Wireless AP Configuration**. The Wireless AP screen appears.
2. In the left pane, click the Wireless AP you want to configure for voice-over-IP traffic. The AP Properties tab is displayed.
3. Select one of the following tabs:
   - **802.11b/g**
   - **802.11a**
4. In the **Enable Radios** section, select the appropriate radio checkboxes.
5. In the **Radio Settings** section, modify the following values:
   - Min Basic Rate
   - Max Basic Rate
   - Max Operational Rate

For more information, see Section 5.5.4, “Modifying the wireless AP’s radio properties”, on page 88.

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

7.11 Configuring Quality of Service (QoS)

QoS policy is configured for each VNS and applies to routed, bridged at AP, and bridged at controller VNSs.

Each VNS has a configurable policy for the QoS characteristics of the VNS. For every user associated with the VNS there will be a different behavior on the wireless traffic.

> Active QoS is only applied on the wireless/802.11 domain, not on the wired domain.

The APs are capable of supporting 4 queues. The queues are implemented per radio. For example, 4 queues per radio. The queues are:

Queue Name	Purpose	Number
AC_VO	Voice	3
AC_VI	Video	2
AC_BK	Background	1
AC_BE	Best Effort	0

Table 14 Queues

Traffic is classified into the VoicePriority queue (highest level access class) in view of the level of priority override defined for the VNS. VNS' for which override priority setting has been defined as voice priority will have access to the higher priority queue.

The HiPath Wireless Controller supports the definition of 8 levels of user priority. These priority levels are mapped at the AP to the best appropriate access class. Of the 8 levels of user priority, 6 are considered low priority levels and 2 are considered high priority levels.

WMM clients have the same 4 AC queues. WMM clients will classify the traffic and use these queues when they are associated with a WMM-enabled AP. WMM clients will behave like non-WMM clients—map all traffic to the BE queue—when not associated with WMM-enabled AP.

The prioritization of the traffic on the downstream (for example, from wired to wireless) and on the upstream (for example, from wireless to wired) is dictated by the configuration of the VNS and the QoS tagging within the packets, as set by the wireless devices and the host devices on the wired network.

Both Layer 3 tagging (DSCP) and Layer 2 (802.11d) tagging are supported, and the mapping is conformant with the WMM specification. If both L2 and L3 priority tags are available, then both are taken into account and the chosen AC is the highest resulting from L2 and L3. If only one of the priority tags is present, it is used to select the queue. If none is present, the default queue AC_BE is chosen.

VNS type	Packet type	L2	L3
Tunneled	Untagged	No	Yes
Branch	VLAN tagged	Yes	Yes
Branch	Untagged	No	Yes
Branch or Tunneled	WMM	Yes	Yes
Branch or Tunneled	non-WMM	No	Yes

Table 15 Traffic prioritization

The mapping of the tagged packets to the queues in the AP are as follows:

DSCP bin	802.1d	WMM
111xxx	7	AC_VO
110xxx	6	AC_VO
101xxx	5	AC_VI
100xxx	4	AC_VI
011xxx	3	AC_BE
010xxx	2	AC_BK
001xxx	1	AC_BK
000xxx	0	AC_BE

Table 16 Tagged packets mapping – Where xxx can be either 1 or 0.

> If the wireless packets to be transmitted must include the L2 priority (send to a WMM client from a WMM-enabled AP), the outbound L2 priority is copied from the inbound L2 priority if available, or it is inferred from the L3 priority using the above table if the L2 inbound priority is missing.

The following 6 options are available for configuring the QoS behavior of the VNS:

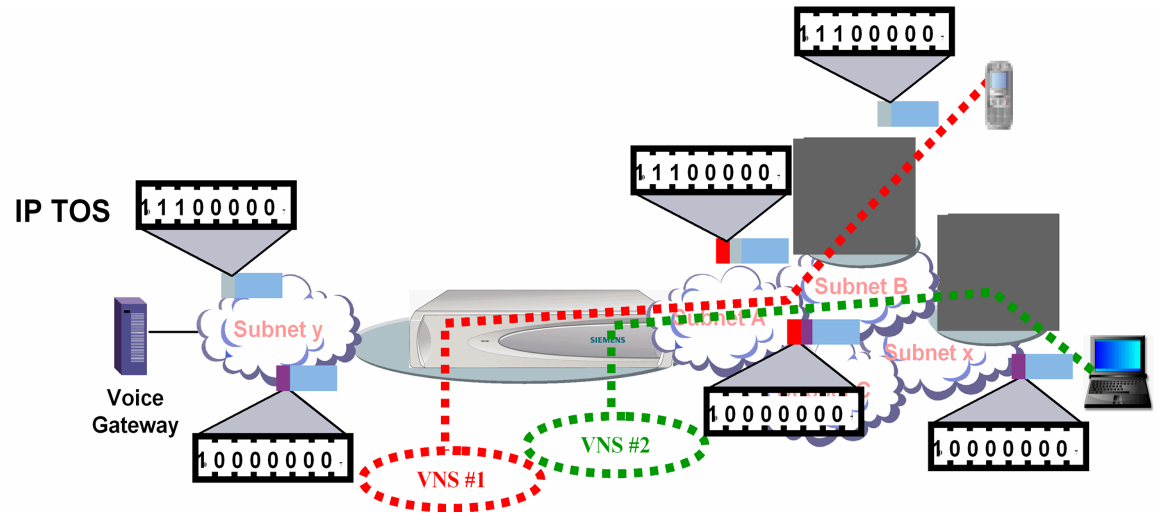
- **Best Effort** – WMM is disabled and all traffic to and from the wireless client device will be handled as best effort traffic and will use the queue designated as best effort.

- **WMM Priority** WMM (WiFi Multimedia – Enables WMM (WiFi Multimedia), which is a WiFi-defined industry standard intended to provide a standard QoS solution until 802.11e specification is ratified. This new capability is designed to improve the user experience of voice, video, and audio applications over a Wi-Fi network. This mode for a VNS enables the WMM capability on the SSID that is being offered. Therefore, the WMM IE (Information Element) is included in the 802.11 beacon on the given SSID, allowing WMM clients such as wireless VoIP handsets, PDAs, and wireless laptops to use WMM. This mode enables prioritization of traffic in both downstream and upstream directions, but only for WMM clients.
- **Pre-WMM Priority** – Does not enable WMM, but enables prioritization of the traffic in the downstream direction at the AP for all clients (WMM or non-WMM) in the VNS.
- **Pre-WMM and WMM Priority** – Enables WMM, enabling prioritization of the traffic in the downstream and upstream directions, but it also enables prioritization of the traffic in the downstream direction for the non-WMM clients.
- **Voice VNS w/o WMM** – Forces the highest priority (AC_VO) for the traffic in the downstream direction for all clients (WMM or non-WMM) in the VNS. This mode changes the channel access parameters for the downstream direction in order to provide optimum voice performance. With this mode, WMM is not enabled so there is no prioritization in the upstream direction.

> ⓘ All traffic on this VNS will be prioritized to use AC_VO. This option is available for backward compatibility purposes.

- **Voice VNS with WMM** – Forces the highest priority (AC_VO) for the traffic in the downstream direction for all clients (WMM or non-WMM) in the VNS. This mode changes the channel access parameters for the downstream and upstream directions in order to provide optimum voice performance. With this mode, WMM is also enabled and there is prioritization in the upstream direction for WMM clients. All non-WMM clients will use AC_BE for upstream.

For the wired domain an Adaptive QoS mechanism is offered. With this mechanism, the original QoS - TOS field (Diffserv/Precedence bits) of the original user packet is maintained end-to-end within the CTP tunneling. This is achieved by copying the original TOS fields from the user packet to the tunneled packet. The following diagram displays this process.



At this time, Layer 2 802.1d bits are not carried across the tunnel. The HiPath Wireless Controller C2400 supports functionality (CTP_QoS field) by which L2 priority flags for user traffic received from a core VLAN is copied into the CTP header (CTP_QoS field) and passed to the AP to determine the corresponding access class.

7.11.1 Defining the service class for the VNS

Service class is determined by the combination of the following operations:

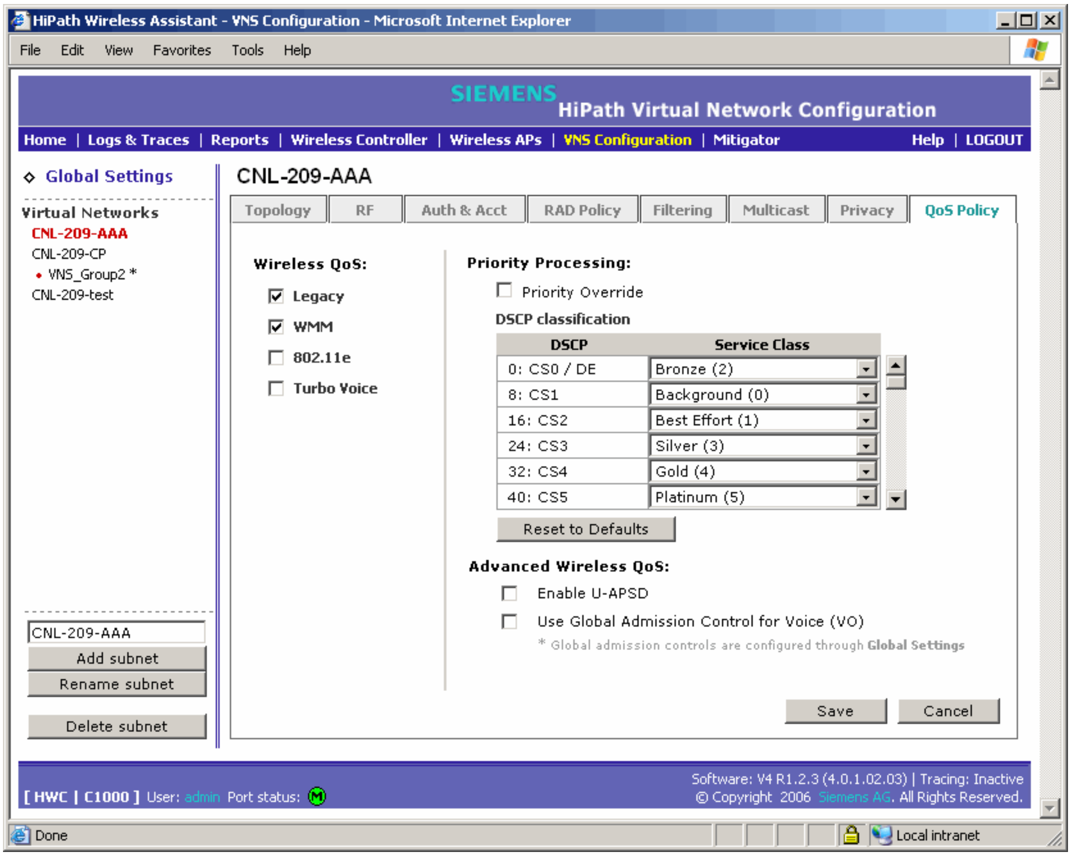
- The class of treatment given to a packet. For example, queuing or per hop behavior (PHB).
- The packet marking of the output packets (user traffic and/or transport).

Service class name (number)	Priority level
Network Control (7)	7 (highest priority)
Premium (Voice) (6)	6
Platinum (video) (5)	5
Gold (4)	4
Silver (3)	3
Bronze (2)	2
Best Effort (1)	1
Background (0)	0 (lowest priority)

Table 17 Service class

To configure QoS Policy on a VNS:

1. From the main menu, click **Virtual Network Configuration**. The Virtual Network Configuration screen appears.
2. In the left pane Virtual Networks list, click the VNS you want to configure for QoS.
3. Click the **QoS Policy** tab.


HiPath Wireless Assistant - VNS Configuration - Microsoft Internet Explorer
File Edit View Favorites Tools Help
SIEMENS
HiPath Virtual Network Configuration
Home | Logs & Traces | Reports | Wireless Controller | Wireless APs | VNS Configuration | Mitigator
Help | LOGOUT
Global Settings
Virtual Networks
CNL-209-AAA
CNL-209-CP
VNS_Group2 *
CNL-209-test
Add subnet
Rename subnet
Delete subnet
Topology
RF
Auth & Acct
RAD Policy
Filtering
Multicast
Privacy
QoS Policy
Reset to Defaults
Save
Cancel
[HWC | C1000] User: admin Port status:
Software: V4 R1.2.3 (4.0.1.02.03) | Tracing: Inactive
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Done
Local intranet

CNL-209-AAA

Wireless QoS:

☑ Legacy
☑ WMM
□ 802.11e
□ Turbo Voice

Priority Processing:

□ Priority Override

DSCP classification

DSCP	Service Class
0: CS0 / DE	Bronze (2)
8: CS1	Background (0)
16: CS2	Best Effort (1)
24: CS3	Silver (3)
32: CS4	Gold (4)
40: CS5	Platinum (5)

Advanced Wireless QoS:

□ Enable U-APSD
□ Use Global Admission Control for Voice (VO)
* Global admission controls are configured through **Global Settings**

4. From the Wireless QoS list, select the following:

- **Legacy** – Select if your VNS will support legacy devices that use SpectraLink Voice Protocol (SVP) for prioritizing voice traffic. If selected, the Turbo Voice option is displayed.
- **WMM** – Select to enable WMM. WMM is part of the 802.11e standard for QoS **<<< attention reviewer: need descriptions of what this option does.>>**. If selected, the Turbo Voice and the Advanced Wireless QoS options are displayed.
- **802.11e** – **<<< attention reviewer: need descriptions of what this option does.>>** Select to enable the 802.11e standard. If selected, the Turbo Voice and the Advanced Wireless QoS options are displayed:

- **Turbo Voice** – **<<< attention reviewer: need descriptions of what this option does.>>**:

5. To define the service class and DSCP marking for the VNS, select the **Priority Override** checkbox:
   - Service class – From the drop-down list, select the appropriate priority level:
     - Network control (7) – The highest priority level.
     - Premium (Voice) (6)
     - Platinum (5)
     - Gold (4)
     - Silver (3)
     - Bronze (2)
     - Best Effort (1)
     - Background (0) – The lowest priority level
   - DSCP marking –
6. If you want to assign a service class to each DSCP marking, clear the **Priority Override** checkbox and define the DSCP service class priorities in the DSCP classification table.
7. The Advanced Wireless QoS options are only displayed if the WMM or 802.11e checkboxes are selected:
   - Enable U-APSD checkbox – **<<<need def. explanation>>>**
   - Use Global Admission Control for Voice (VO) checkbox – **<<<need def. explanation>>>**

> Voice priority is required for use with SpectraLink phones.

8. To save your changes, click Save.

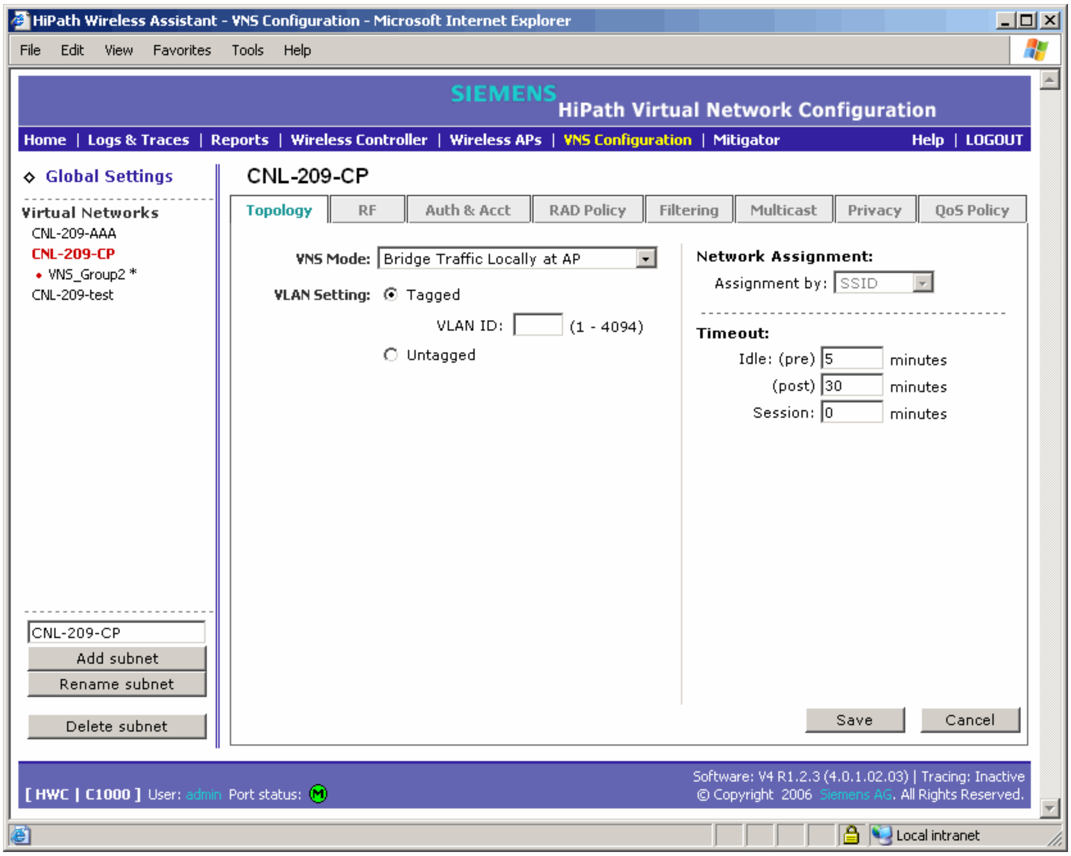
7.12 Bridging traffic locally

A VNS must first be setup before traffic can be bridged locally. For more information, see Chapter 6, “Virtual Network Services”.

To bridge traffic locally:

1. From the main menu, click **Virtual Network Configuration**. The Virtual Network Configuration screen appears.
2. In the left pane Virtual Networks list, click the VNS that you want to define topology parameters for.
3. Click the **Topology** tab.
4. In the **VNS Mode** drop-down list, click **Bridge Traffic Locally at AP** to enable branch office mode.
5. To define the VLAN Setting, select one of the following:
   - **Tagged**
   - **Untagged**

   If you select **Tagged**, type the VLAN ID in the **VLAN ID** box. The default value is 1.



CNL-209-CP

VNS Mode: Bridge Traffic Locally at AP

VLAN Setting: ● Tagged

VLAN ID: (1 - 4094)

○ Untagged

Network Assignment:

Assignment by: SSID

Timeout:

Idle: (pre) 5 minutes

(post) 30 minutes

Session: 0 minutes

CNL-209-CP

[HWC | C1000] User: admin Port status:

Software: V4 R1.2.3 (4.0.1.02.03) | Tracing: Inactive
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ⓘ The VLAN IDs are assigned by the branch office network administrator. The AP will operate correctly only if the VLAN ID is unique per AP and there is at most one untagged VNS per AP.

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

ⓘ In previous releases, an entire AP had to be put into branch mode. In the current release, an individual VNS can be put into bridging mode. An AP can have bridged and non-bridged VNSs.
If it has more then one branch mode VNS, only one bridged VNS can be untagged per AP. The other branch mode VNSs need to have unique VLAN ID. You must have VLAN aware L2 switches to support this feature.

ⓘ When a VNS is setup for bridged mode, it cannot be switched to tunneled mode. The administrator must delete and re-add the VNS.

8 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 8 controllers can be linked to allow users to transparently roam across controllers in the mobility domain.

8.1 Availability overview

The HiPath Wirelesss 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.

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.

ⓘ 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.

8.1.1 Availability prerequisites

Before you begin, ensure you have completed the following:

- Choose the primary and secondary HiPath Wireless Controllers.
- Purchased two availability licenses to enable availability on a pair of controllers.
- Verify the network reacheability 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.

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

1. In the AP Registration screen, set up each HiPath Wireless Controller in Stand-alone Mode and Secure Mode (allow only approved Wireless APs to connect).
2. In the VNS Configuration, Topology screen, define a VNS on each HiPath Wireless Controller with the same SSID. The IP addresses must be unique. For more information, see A HiPath Wireless Controller 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.Section 7.1, “Topology for a VNS”, on page 124.
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. In the AP Registration screen, enable the two HiPath Wireless Controllers as an availabiity pair.
5. On each HiPath Wireless Controller, in the Access Approval screen, 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:

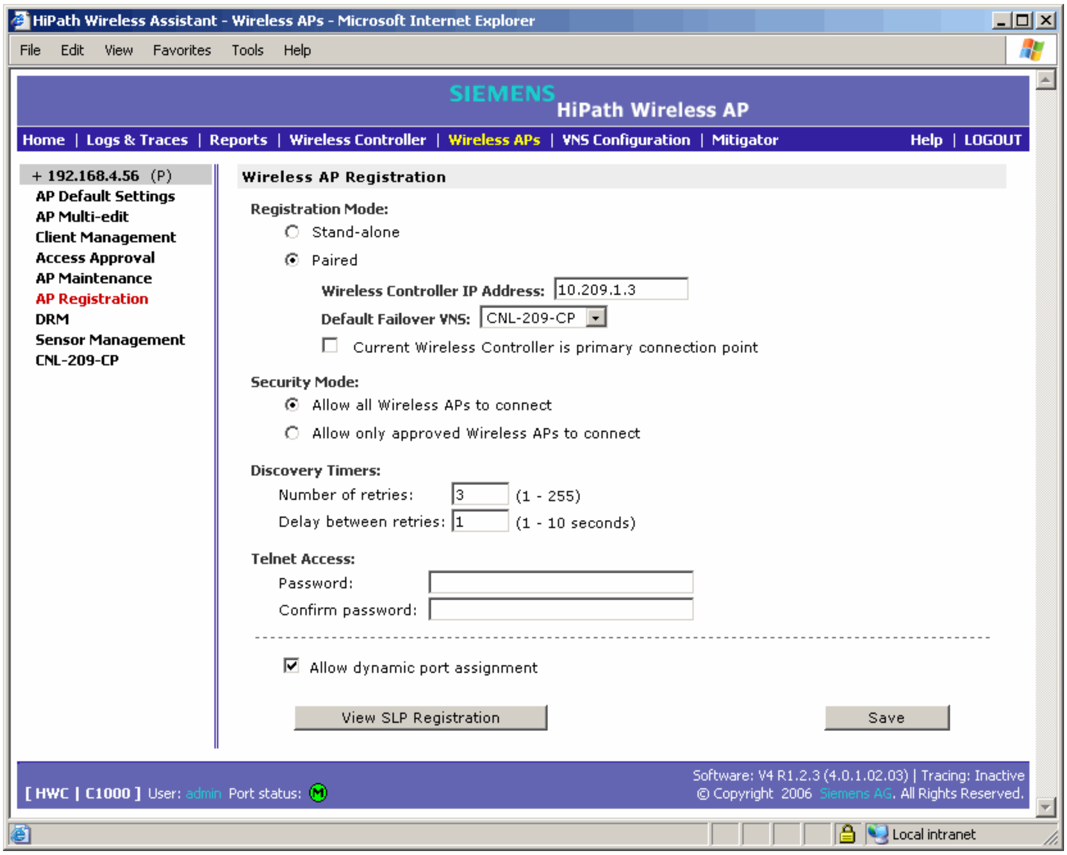
1. Add each wireless AP manually to each HiPath Wireless Controller.
2. From the AP Properties screen, click **Add Wireless AP**.
3. Define the wireless AP and click **Add Wireless AP**.

   Manually defined APs will inherit the AP default configuration settings.

> ⚠ 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** screen appears.
2. In the left pane, click **AP Registration**. The **Wireless AP Registration** screen appears.


HiPath Wireless Assistant - Wireless APs - Microsoft Internet Explorer
File Edit View Favorites Tools Help
SIEMENS
HiPath Wireless AP
Home | Logs & Traces | Reports | Wireless Controller | Wireless APs | VNS Configuration | Mitigator
Help | LOGOUT
+ 192.168.4.56 (P)
AP Default Settings
AP Multi-edit
Client Management
Access Approval
AP Maintenance
AP Registration
DRM
Sensor Management
CNL-209-CP
View SLP Registration
Save
[HWC | C1000] User: admin Port status: M
Software: V4 R1.2.3 (4.0.1.02.03) | Tracing: Inactive
© Copyright 2006 Siemens AG. All Rights Reserved.
Local intranet

Wireless AP Registration

Registration Mode:
○ Stand-alone
● Paired

Wireless Controller IP Address: 10.209.1.3
Default Failover VNS: CNL-209-CP
□ Current Wireless Controller is primary connection point

Security Mode:
● Allow all Wireless APs to connect
○ Allow only approved Wireless APs to connect

Discovery Timers:
Number of retries: 3 (1 - 255)
Delay between retries: 1 (1 - 10 seconds)

Telnet Access:
Password:
Confirm password:

☑ Allow dynamic port assignment

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. From the **Default Failover VNS** drop-down list select the HiPath Wireless Controller to be paired. This list is populated only after a VNS has been defined.
6. 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.
7. 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.

> 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 5.5, “Modifying wireless AP settings”, on page 81.

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

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

8.1.2 Viewing the Wireless AP availability display

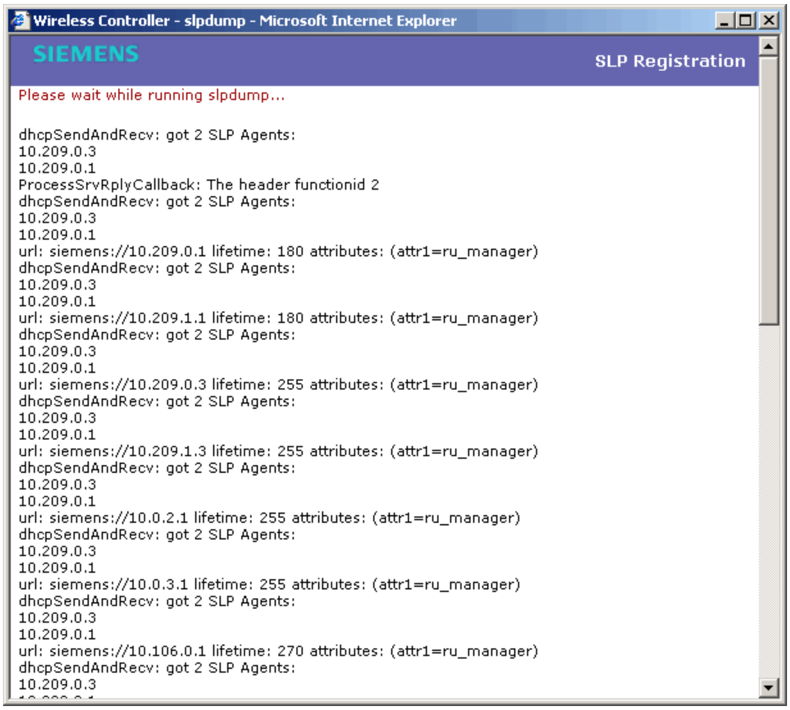
For more information, see Section 11.1.1, “Viewing the Wireless AP availability display”, on page 233.

8.1.3 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** screen appears.
2. In the left pane, click **AP Registration**. The **Wireless AP Registration** screen appears.
3. To confirm SLP registration, click the **View SLP Registration** button. A popup screen displays the results of the diagnostic slpdump tool, to confirm SLP registration.

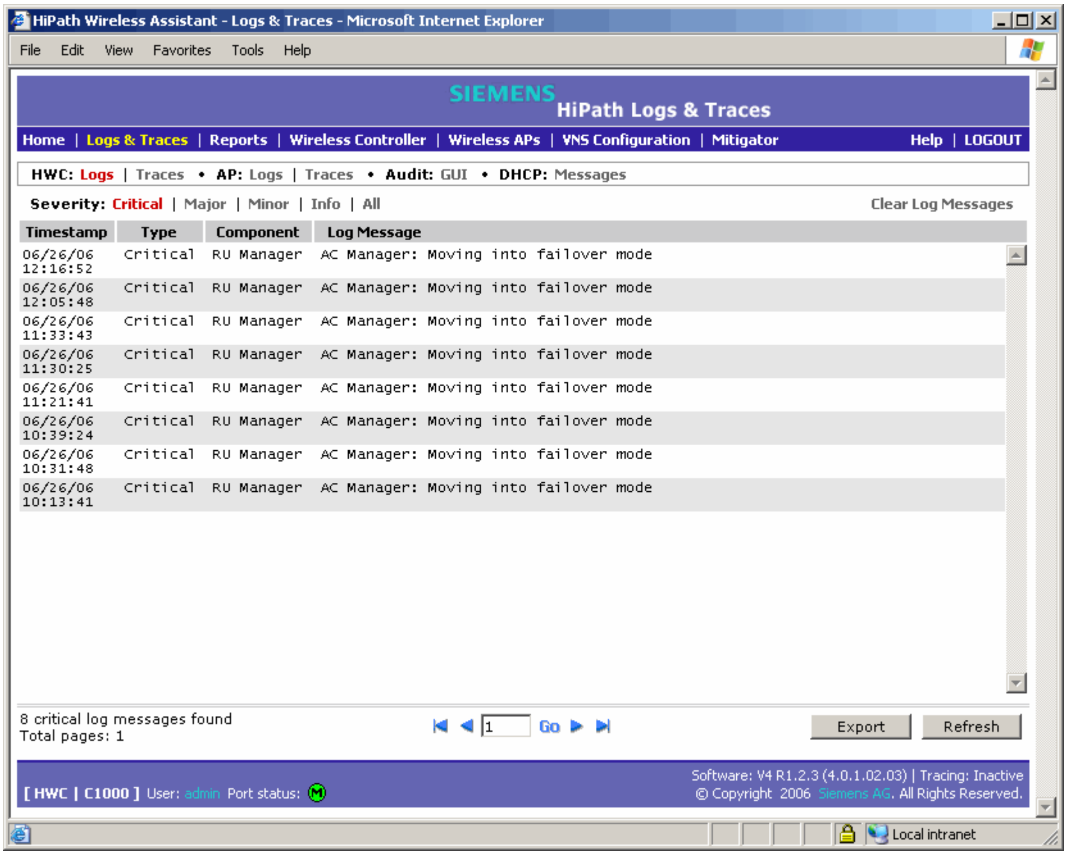


```
Please wait while running slpdump...

dhcpSendAndRecv: got 2 SLP Agents:
10.209.0.3
10.209.0.1
ProcessSrvRplyCallback: The header functionid 2
dhcpSendAndRecv: got 2 SLP Agents:
10.209.0.3
10.209.0.1
url: siemens://10.209.0.1 lifetime: 180 attributes: (attr1=ru_manager)
dhcpSendAndRecv: got 2 SLP Agents:
10.209.0.3
10.209.0.1
url: siemens://10.209.1.1 lifetime: 180 attributes: (attr1=ru_manager)
dhcpSendAndRecv: got 2 SLP Agents:
10.209.0.3
10.209.0.1
url: siemens://10.209.0.3 lifetime: 255 attributes: (attr1=ru_manager)
dhcpSendAndRecv: got 2 SLP Agents:
10.209.0.3
10.209.0.1
url: siemens://10.209.1.3 lifetime: 255 attributes: (attr1=ru_manager)
dhcpSendAndRecv: got 2 SLP Agents:
10.209.0.3
10.209.0.1
url: siemens://10.0.2.1 lifetime: 255 attributes: (attr1=ru_manager)
dhcpSendAndRecv: got 2 SLP Agents:
10.209.0.3
10.209.0.1
url: siemens://10.0.3.1 lifetime: 255 attributes: (attr1=ru_manager)
dhcpSendAndRecv: got 2 SLP Agents:
10.209.0.3
10.209.0.1
url: siemens://10.106.0.1 lifetime: 270 attributes: (attr1=ru_manager)
dhcpSendAndRecv: got 2 SLP Agents:
10.209.0.3
```

8.1.4 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 appears in the information log of the remaining HiPath Wireless Controller.


HiPath Wireless Assistant - Logs & Traces - Microsoft Internet Explorer
File Edit View Favorites Tools Help
SIEMENS
HiPath Logs & Traces
Home | Logs & Traces | Reports | Wireless Controller | Wireless APs | VNS Configuration | Mitigator
Help | LOGOUT
HWC: Logs | Traces • AP: Logs | Traces • Audit: GUI • DHCP: Messages
Severity: Critical | Major | Minor | Info | All
Clear Log Messages
Go
Export
Refresh
Local intranet

Timestamp	Type	Component	Log Message
06/26/06 12:16:52	Critical	RU Manager	AC Manager: Moving into failover mode
06/26/06 12:05:48	Critical	RU Manager	AC Manager: Moving into failover mode
06/26/06 11:33:43	Critical	RU Manager	AC Manager: Moving into failover mode
06/26/06 11:30:25	Critical	RU Manager	AC Manager: Moving into failover mode
06/26/06 11:21:41	Critical	RU Manager	AC Manager: Moving into failover mode
06/26/06 10:39:24	Critical	RU Manager	AC Manager: Moving into failover mode
06/26/06 10:31:48	Critical	RU Manager	AC Manager: Moving into failover mode
06/26/06 10:13:41	Critical	RU Manager	AC Manager: Moving into failover mode

8 critical log messages found
Total pages: 1

1

[HWC | C1000] User: admin Port status: M

Software: V4 R1.2.3 (4.0.1.02.03) | Tracing: Inactive
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After the wireless AP on the failed HiPath Wireless Controller loses its connection, it will attempt a reboot, unless the **Link Persistence** option is enabled. (If the AP is unsuccessful after five minutes of attempting to register with the controller, the AP does not reboot, and instead waits five minutes before attempting to reboot and register again.)

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 screen.

> ⓘ 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 failover VNS defined in setup in that HiPath Wireless Controller. 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 screen 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* area).
2. After recovery, on the HiPath Wireless Controller that did not fail, select the foreign Wireless APs and click on the **Release** button (in the *Wireless AP Configuration - AP Maintenance* screen).

8.2 Mobility manager

The Controller, Access Points and Convergence Software system allows multiple HiPath Wireless Controllers (up to 8) on a network 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 instalations.

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

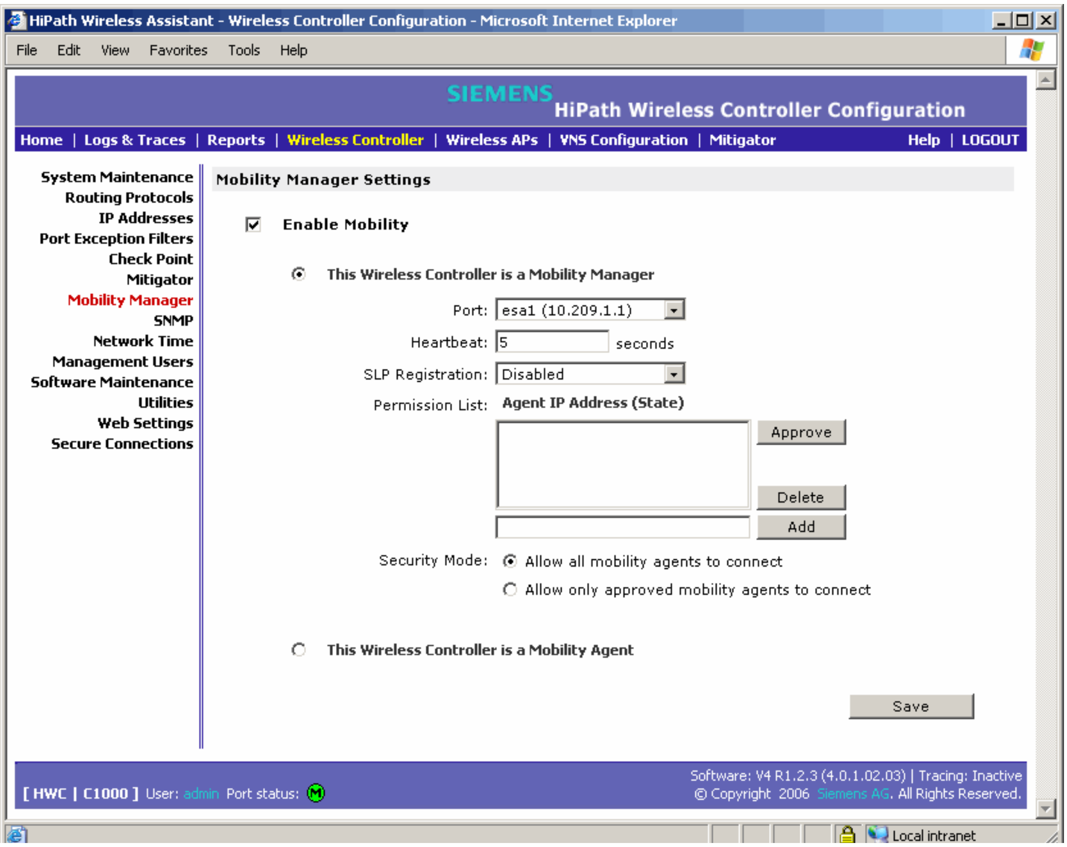
- Uses the information from every Heartbeat message received to update its own tables and updates the mobility manager with information on the wireless device users and data tunnels it is managing

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

- Agent to agent connections will remain active.
- Mobiltity agents will continue to operate based on the mobility information last coordinated before the manager link was lost. The mobilility 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** screen appears.
2. In the left pane, click **Mobility Manager**. The **Mobility Manager Settings** screen appears.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Mitigator
Mobility Manager
SNMP
Network Time
Management Users
Software Maintenance
Utilities
Web Settings
Secure Connections
Approve
Delete
Add
Save
Local intranet

Mobility Manager Settings

☑ Enable Mobility

● This Wireless Controller is a Mobility Manager

Port: esa1 (10.209.1.1)

Heartbeat: 5 seconds

SLP Registration: Disabled

Permission List: Agent IP Address (State)

Security Mode: ● Allow all mobility agents to connect
○ Allow only approved mobility agents to connect

○ This Wireless Controller is a Mobility Agent

[HWC | C1000] User: admin Port status: M

Software: V4 R1.2.3 (4.0.1.02.03) | Tracing: Inactive
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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, select 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, select whether to enable or disable SLP registration.

8. In the Permission list, select 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.

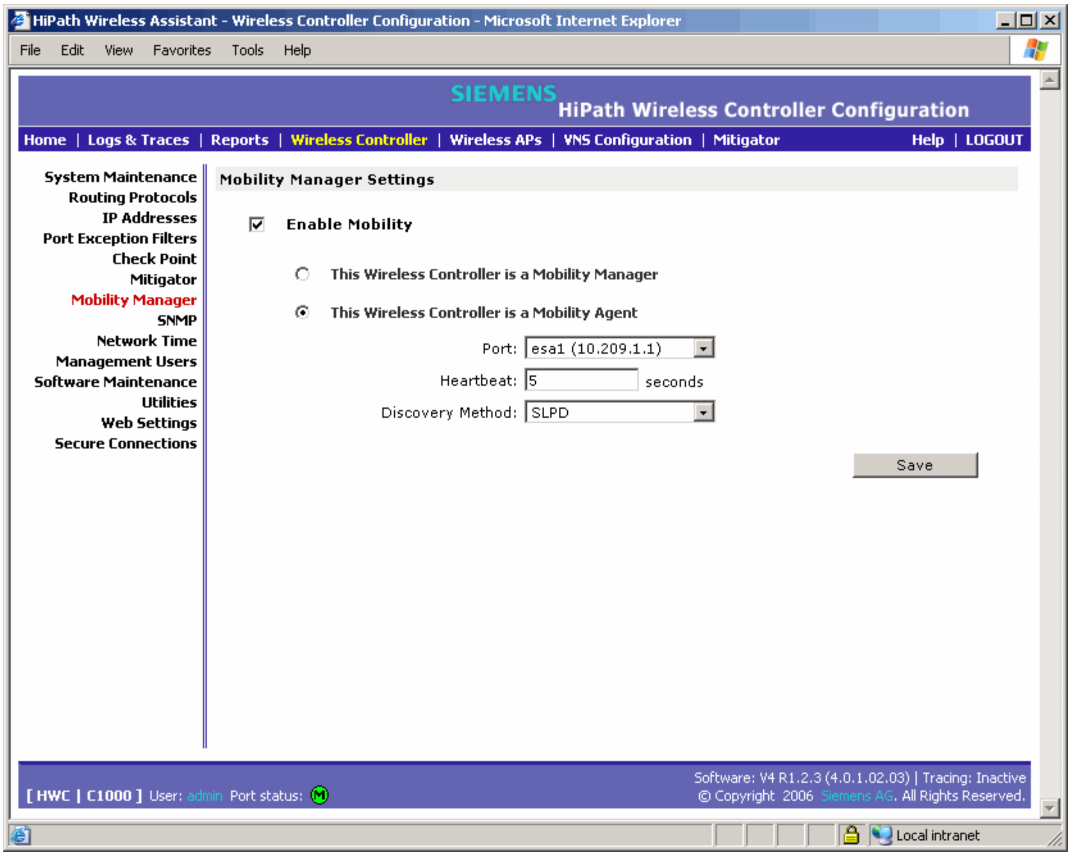
   You can also add or delete controllers that you want to be part of the mobility domain. To add a controller, type the agent IP address in the box, and then click **Add**. To delete a controller, select the controller in the list, and then click **Delete**.

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**.

> 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** screen appears.
2. In the left pane, click **Mobility Manager**. The **Mobility Manager Settings** screen appears.
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 Agent** option. The mobility agent options appear.



Mobility Manager Settings

☑ Enable Mobility

○ This Wireless Controller is a Mobility Manager

● This Wireless Controller is a Mobility Agent

Port: esa1 (10.209.1.1)

Heartbeat: 5 seconds

Discovery Method: SLPD

[HWC | C1000] User: admin Port status:

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5. In the **Port** drop-down list, select 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, select 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**.

8.2.1 Displays for the mobility manager

For more information, see Section 11.1.3, “Viewing displays for the mobility manager”, on page 236.

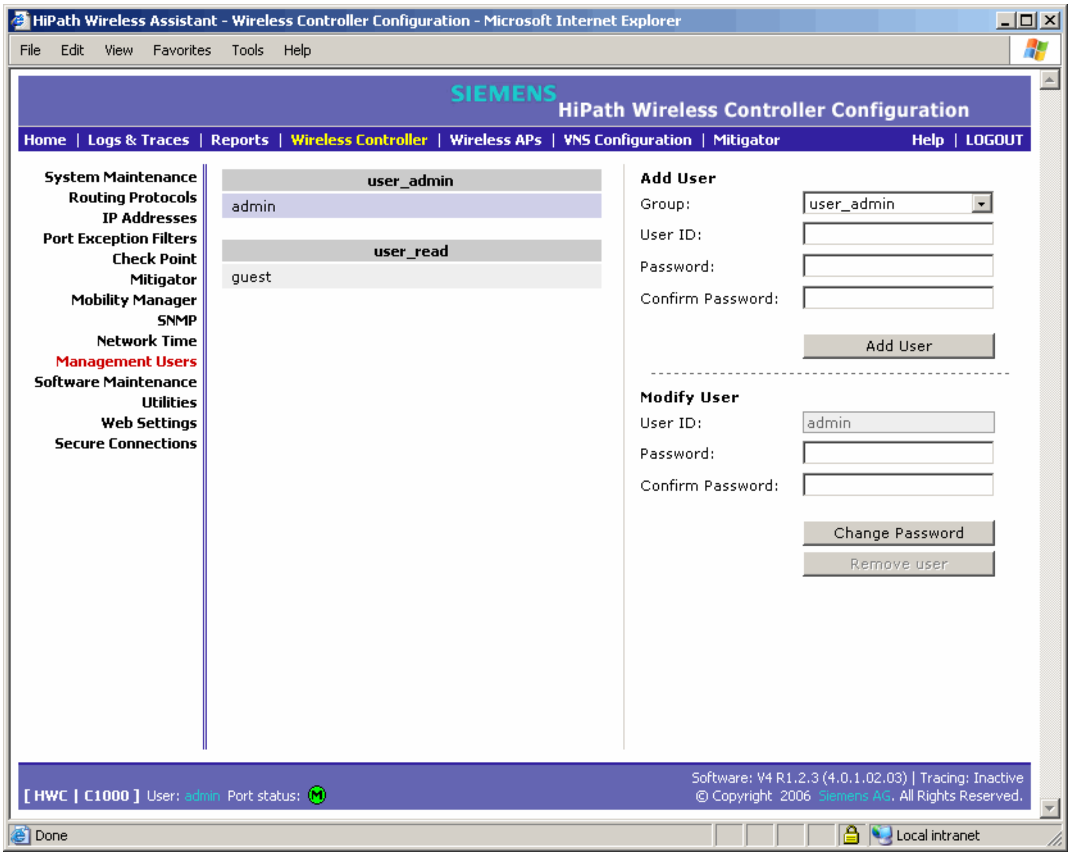
8.3 Defining management users

In this screen you define the login user names that have access to the HiPath Wireless Assistant, either for 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.

To add a HiPath Wireless Controller management user

1. From the main menu, click **Wireless Controller Configuration**. The **Wireless Controller Configuration** screen appears.

2. In the left pane, click the **Management Users** option. The **Management Users** screen appears.



user_admin
admin

user_read
guest

Add User
Group: user_admin
User ID:
Password:
Confirm Password:

Modify User
User ID: admin
Password:
Confirm Password:

[HWC | C1000] User: admin Port status: M
Software: V4 R1.2.3 (4.0.1.02.03) | Tracing: Inactive
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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** pull-down list, select **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**, re-type the password. The $ character is not permitted.
7. Click on the **Add User** button. 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** screen appears.
2. In the left pane, click the **Management Users** option. The **Management Users** screen appears.
3. To select a user to be modified, click it.
4. In the **Password** box, type the new password for the user.
5. In the **Confirm Password**, re-type 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** screen appears.
2. In the left pane, click the **Management Users** option. The **Management Users** screen appears.
3. To select a user to be removed, click it.
4. To remove the user, click **Remove user**. The user if removed from the list.

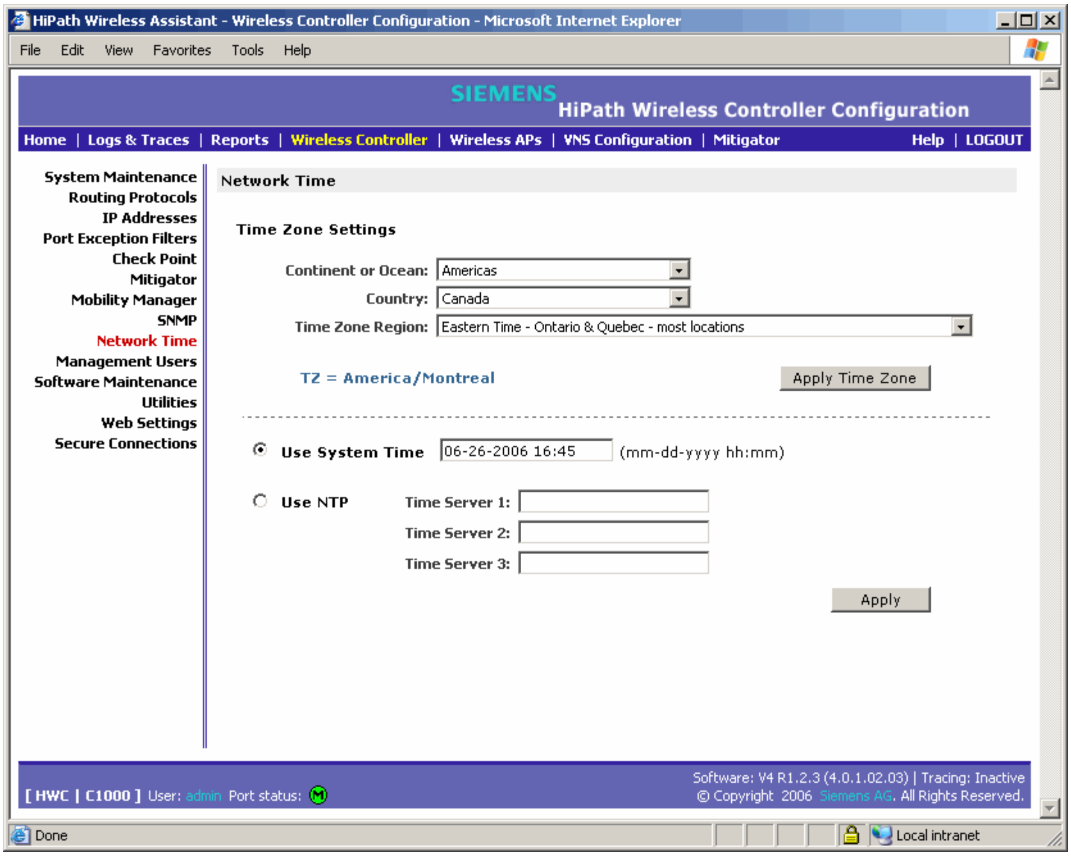
8.4 Configuring network time

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.

To apply time zone settings:

1. From the main menu, click **Wireless Controller Configuration**. The **Wireless Controller Configuration** screen appears.
2. In the left pane, click **Network Time**. The **Network Time** screen appears.



Network Time

Time Zone Settings

Continent or Ocean: Americas

Country: Canada

Time Zone Region: Eastern Time - Ontario & Quebec - most locations

TZ = America/Montreal

◉ Use System Time 06-26-2006 16:45 (mm-dd-yyyy hh:mm)

○ Use NTP Time Server 1: Time Server 2: Time Server 3:

[HWC | C1000] User: admin Port status:

Software: V4 R1.2.3 (4.0.1.02.03) | Tracing: Inactive
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3. From the **Continent or Ocean** drop-down list, select the appropriate large-scale geographic grouping for the time zone.
4. From the **Country** drop-down list, select 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, select 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** screen appears.
2. In the left pane, click **Network Time**. The **Network Time** screen appears.
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** screen appears.
2. In the left pane, click **Network Time**. The **Network Time** screen appears.
3. To use Network Time Protocol, select the **Use NTP** radio button.
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**.

8.5 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.

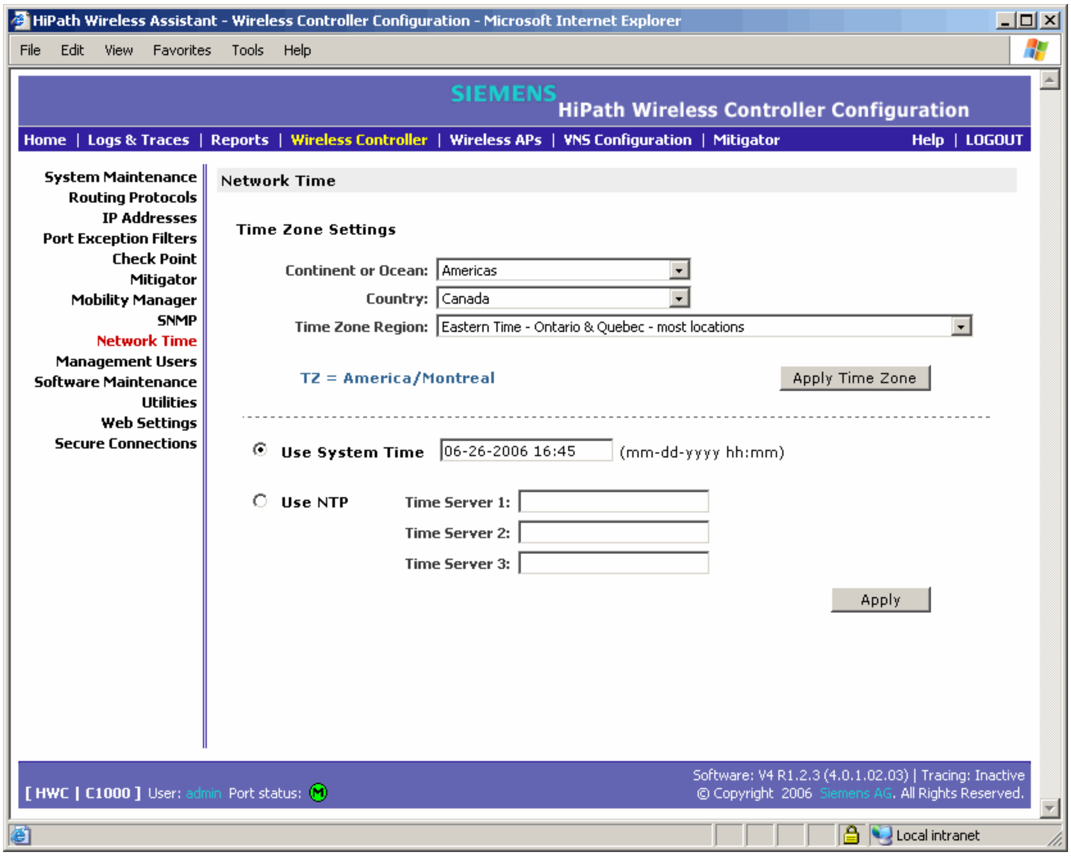
Check Point created the OPSEC (Open Platform for Security) alliance program for security application and appliance vendors to enable an open industry-wide framework for inter operability.

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.

> 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 HiPath Wireless Controller Check Point configuration screen.

To enable and configure Check Point:

1. From the main menu, click **Wireless Controller Configuration**. The **Wireless Controller Configuration** screen appears.
2. In the left pane, click **Check Point**. The **Check Point Configuration** screen appears.



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Check Point
Mitigator
Mobility Manager
SNMP
Network Time
Management Users
Software Maintenance
Utilities
Web Settings
Secure Connections
Apply Time Zone
Apply
Local intranet

Network Time

Time Zone Settings

Continent or Ocean: Americas

Country: Canada

Time Zone Region: Eastern Time - Ontario & Quebec - most locations

TZ = America/Montreal

● Use System Time 06-26-2006 16:45 (mm-dd-yyyy hh:mm)

○ Use NTP Time Server 1: Time Server 2: Time Server 3:

[HWC | C1000] User: admin Port status: M

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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** button.

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

   OPSEC Connection OK

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

   OPSEC Connection Error

8.5.1 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 backdoor access attempt.
- Unauthorized client attempting to connect

8.6 Enabling SNMP

The 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.

8.6.1 MIB support

The 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

> ℹ 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.

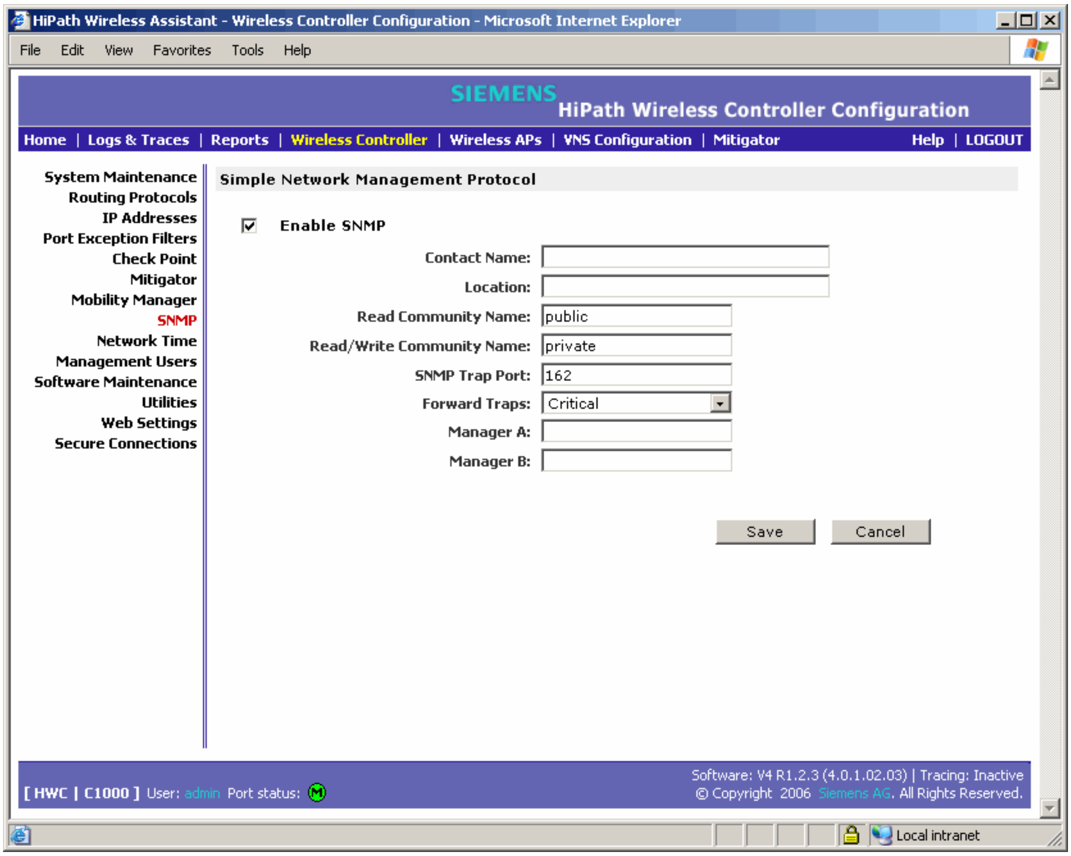
The HiPath Wireless Controller is the only point of SNMP access for the entire system. In effect, the HiPath Wireless Controller proxies sets, gets, and alarms from the associated Wireless APs.

8.6.2 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** screen appears.
2. In the left pane, click **SNMP**. The **Simple Network Management Protocol** screen appears.



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Check Point
Mitigator
Mobility Manager
SNMP
Network Time
Management Users
Software Maintenance
Utilities
Web Settings
Secure Connections
Save
Cancel
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Simple Network Management Protocol

☑ Enable SNMP

Contact Name:

Location:

Read Community Name: public

Read/Write Community Name: private

SNMP Trap Port: 162

Forward Traps: Critical

Manager A:

Manager B:

3. Type: the following information:
   - **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, select **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

> 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.

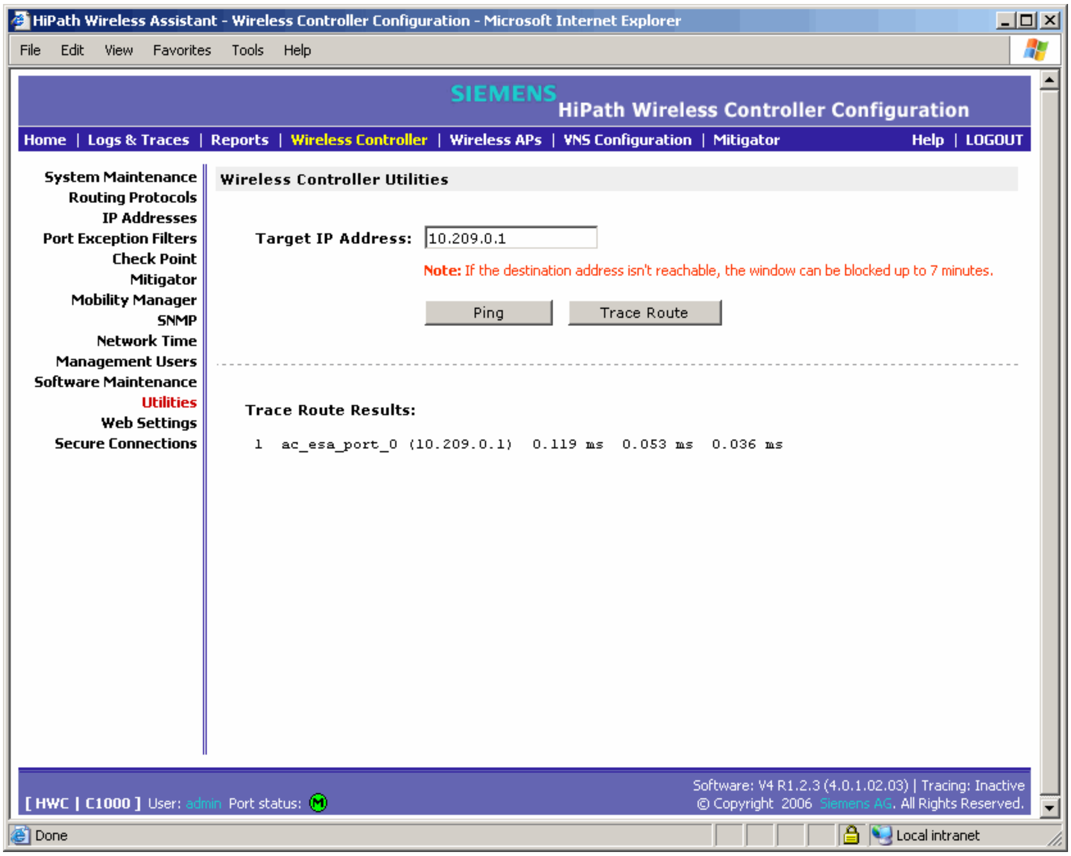
8.7 Using controller utilities

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** screen appears.
2. In the left pane, click **Utilities**. The **Wireless Controller Utilities** screen appears.
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**.
5. To record the route through the Internet between your computer and the target IP address, click **Trace Route**.

   The following shows an example screen after clicking the **Trace Route** button.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Software Maintenance
Utilities
Web Settings
Secure Connections
Ping
Trace Route
[HWC | C1000] User: admin Port status: M
Software: V4 R1.2.3 (4.0.1.02.03) | Tracing: Inactive
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Done
Local intranet

Wireless Controller Utilities

Target IP Address: 10.209.0.1

Note: If the destination address isn't reachable, the window can be blocked up to 7 minutes.

Trace Route Results:

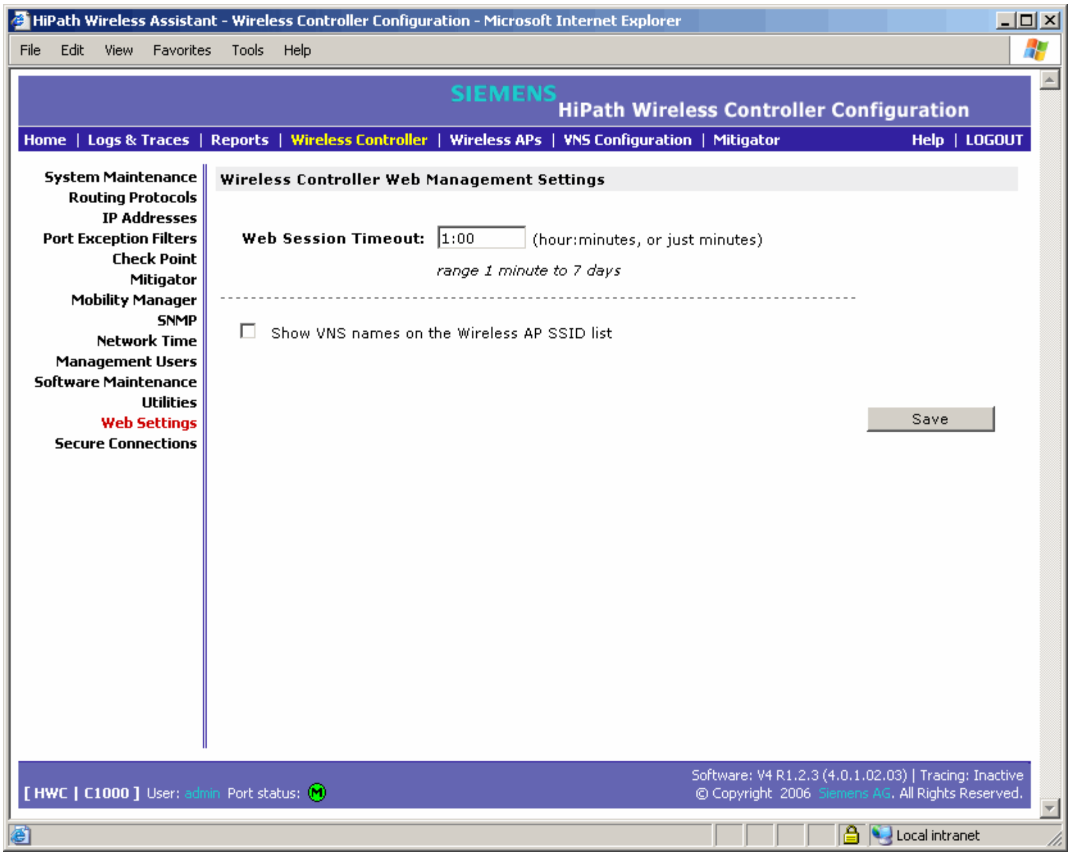
```
1   ac_esa_port_0 (10.209.0.1)   0.119 ms   0.053 ms   0.036 ms
```

8.8 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** screen appears.
2. In the left pane, click **Web Settings** The **Wireless Controller Web Management Settings** screen appears.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Software Maintenance
Utilities
Web Settings
Secure Connections
Save
[HWC | C1000] User: admin Port status: M
Software: V4 R1.2.3 (4.0.1.02.03) | Tracing: Inactive
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Local intranet

Wireless Controller Web Management Settings

Web Session Timeout: 1:00 (hour:minutes, or just minutes)

range 1 minute to 7 days

□ Show VNS names on the Wireless AP SSID list

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**.

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

9 Working with third-party APs

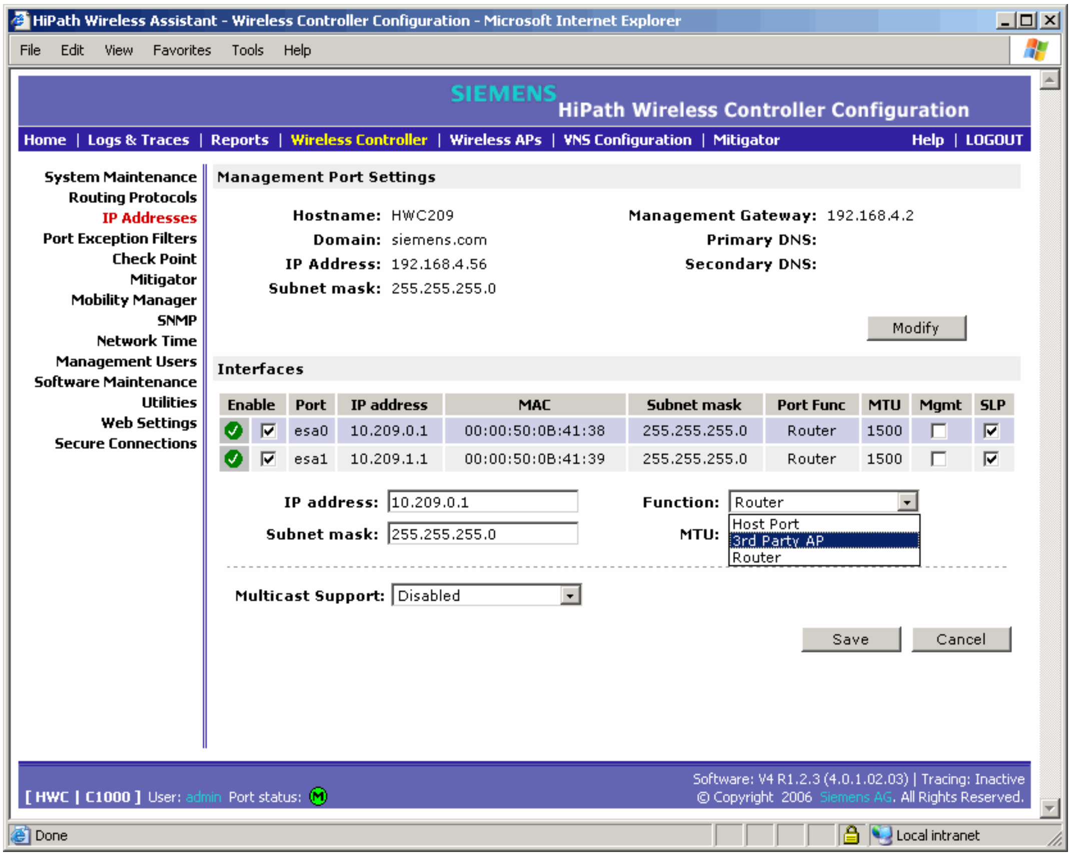
You can set up the HiPath Wireless Controller to handle wireless device traffic from third-party access points, providing the same policy and network access control. This process requires the following steps:

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

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** screen appears.
2. From the left pane, click **IP Address**. The **Management Port Settings and Interfaces** screen appears.



Management Port Settings

Hostname: HWC209
Domain: siemens.com
IP Address: 192.168.4.56
Subnet mask: 255.255.255.0
Management Gateway: 192.168.4.2
Primary DNS:
Secondary DNS:

Interfaces

Enable		Port	IP address	MAC	Subnet mask	Port Func	MTU	Mgmt	SLP
✓	☑	esa0	10.209.0.1	00:00:50:0B:41:38	255.255.255.0	Router	1500	□	☑
✓	☑	esa1	10.209.1.1	00:00:50:0B:41:39	255.255.255.0	Router	1500	□	☑

IP address: 10.209.0.1
Subnet mask: 255.255.255.0
Function: Router
MTU:
Multicast Support: Disabled

[HWC | C1000] User: admin Port status: M
Software: V4 R1.2.3 (4.0.1.02.03) | Tracing: Inactive
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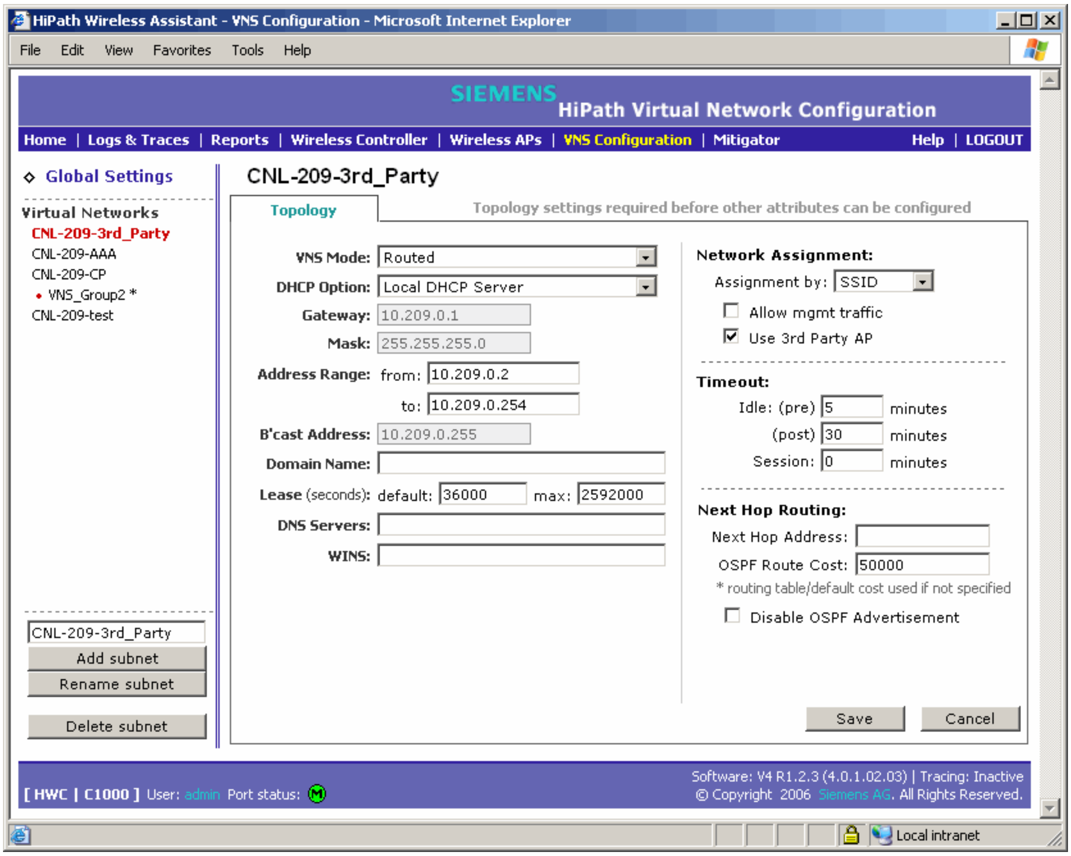
3. Highlight the appropriate port, and in the **Function** box, select **3rd-party AP** from the drop-down list. Make sure that Management Traffic and SLP are disabled for this port.

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 screen appears.

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 appears in the Virtual Networks list. The Topology screen appears.


HiPath Wireless Assistant - VNS Configuration - Microsoft Internet Explorer
File Edit View Favorites Tools Help
SIEMENS
HiPath Virtual Network Configuration
Home | Logs & Traces | Reports | Wireless Controller | Wireless APs | VNS Configuration | Mitigator
Help | LOGOUT
Global Settings
Virtual Networks
CNL-209-3rd_Party
CNL-209-AAA
CNL-209-CP
VNS_Group2 *
CNL-209-test
Add subnet
Rename subnet
Delete subnet
Topology
Save
Cancel
Local intranet

CNL-209-3rd_Party

Topology settings required before other attributes can be configured

VNS Mode: Routed

DHCP Option: Local DHCP Server

Gateway: 10.209.0.1

Mask: 255.255.255.0

Address Range: from: 10.209.0.2 to: 10.209.0.254

B'cast Address: 10.209.0.255

Domain Name:

Lease (seconds): default: 36000 max: 2592000

DNS Servers:

WINS:

Network Assignment:

Assignment by: SSID

☐ Allow mgmt traffic

☑ Use 3rd Party AP

Timeout:

Idle: (pre) 5 minutes

(post) 30 minutes

Session: 0 minutes

Next Hop Routing:

Next Hop Address:

OSPF Route Cost: 50000

* routing table/default cost used if not specified

☐ Disable OSPF Advertisement

[HWC | C1000] User: admin Port status: M

Software: V4 R1.2.3 (4.0.1.02.03) | Tracing: Inactive

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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 7.1.1, “Configuring topology for a VNS for Captive Portal”, on page 125.

> Bridge Traffic at AP and MAC-based authentication are not available for Third Party VNSs.

Step 3 – Define authentication by captive portal for the third-party AP VNS

1. Click on the **Authentication** tab. In the *Authentication* configuration screen,
2. click the **Captive Portal** radio button.
3. In the Captive Portal portion of the screen, define the RADIUS Attributes and the filter IDs to match those in RADIUS.

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 screen. For more information, see Section 7.6, “Configuring filtering rules for a VNS”, on page 153.
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 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.

10 Working with the Mitigator

This chapter describes Mitigator concepts, including:

- Mitigator overview
- Enabling the Analysis and data collector engines
- Running Mitigator scans
- Analysis engine overview
- Working with Mitigator scan results
- Working with friendly APs
- Viewing the Mitigator list of third-party APs
- Maintaining the Mitigator list of APs
- Viewing the Scanner Status report

10.1 Mitigator overview

The Mitigator is a mechanism that assists in the detection of rogue access points. It includes the following three components:

- The wireless AP runs a radio frequency (RF) scanning task. The wireless AP itself also functions as a scan device, alternating scan functionality while providing its regular service to the wireless devices on the network.
- The HiPath Wireless Controller runs a data collector application that receives and manages the RF scan messages sent by the wireless AP. The scan data includes lists of all connected wirless APs, third-party APs, other friendly APs, and the RF scan information that has been collected from the wireless APs. The data collector also informs the Analysis Engine of all the connected and unconnected access points, third party APs, and connected clients configured on the controller on which the data collector is running.
- The HiPath Wireless Controller 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).

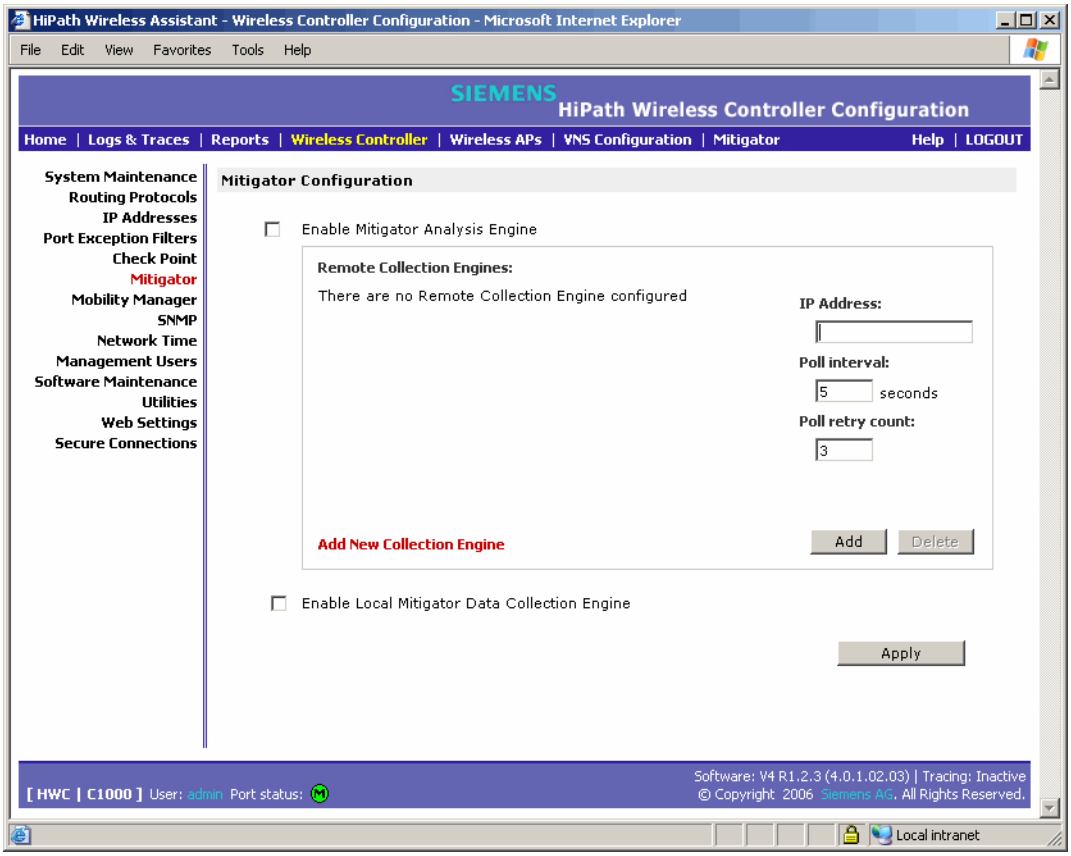
> In a network with more than one HiPath Wireless Controller, it is not necessary for the data collector to be running on the same controller as the Analysis Engine. One controller can be a dedicated Analysis Engine while the other controllers run data collector functionality. No more than one Analysis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

10.2 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** screen appears.
2. In the left pane, click **Mitigator**. The **Mitigator Configuration** screen appears.



HiPath Wireless Assistant - Wireless Controller Configuration - Microsoft Internet Explorer

Mitigator Configuration

□ Enable Mitigator Analysis Engine

Remote Collection Engines:

There are no Remote Collection Engine configured

IP Address:

Poll interval: 5 seconds

Poll retry count: 3

□ Enable Local Mitigator Data Collection Engine

[HWC | C1000] User: admin Port status:

Software: V4 R1.2.3 (4.0.1.02.03) | Tracing: Inactive
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3. To enable the Mitigator Analysis Engine, select the **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. The local IP address is displayed by default.
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, appears in the list.

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**.

10.3 Running Mitigator scans

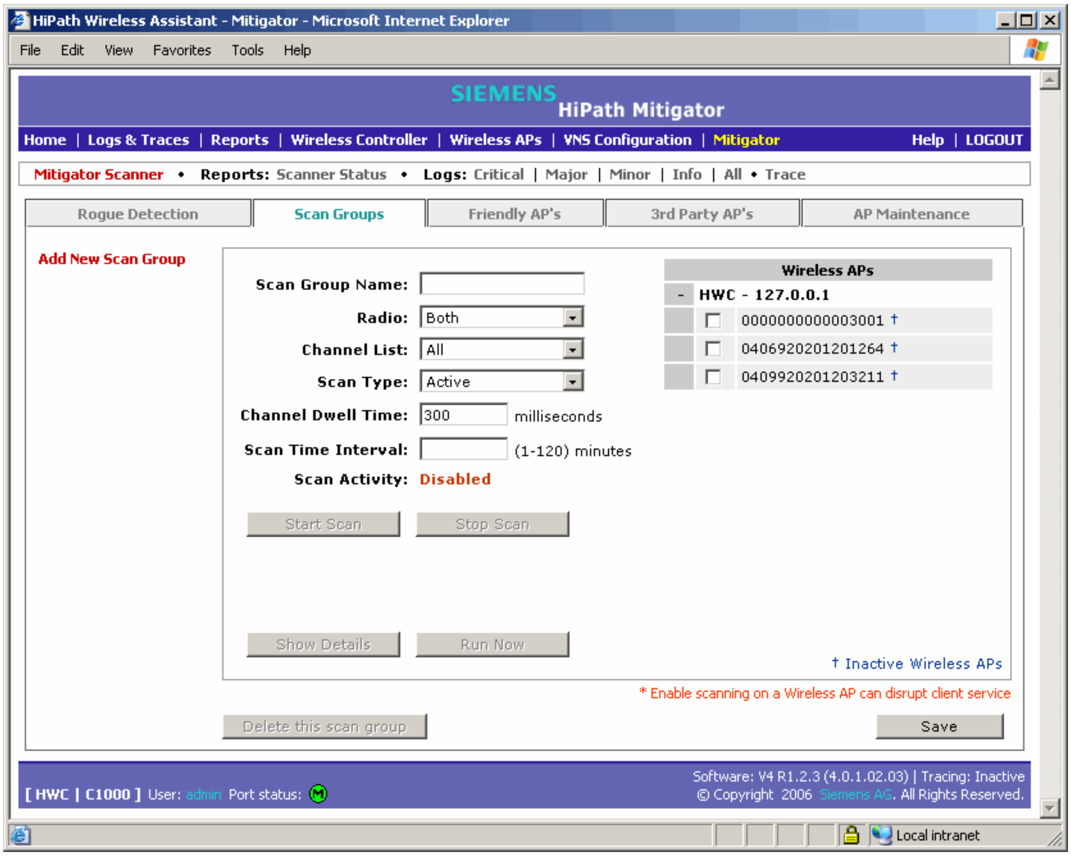
The Mitigator feature allows you to view the following:

- Scan Groups
- Friendly APs
- Third Party APs

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

To run the Mitigator scan task mechanism:

1. From the main menu, click **Mitigator**. The **Mitigator** screen appears.
2. Click the **Scan Groups** tab.


HiPath Wireless Assistant - Mitigator - Microsoft Internet Explorer
File Edit View Favorites Tools Help
SIEMENS
HiPath Mitigator
Home | Logs & Traces | Reports | Wireless Controller | Wireless APs | VNS Configuration | Mitigator
Help | LOGOUT
Mitigator Scanner • Reports: Scanner Status • Logs: Critical | Major | Minor | Info | All • Trace
Rogue Detection
Scan Groups
Friendly AP's
3rd Party AP's
AP Maintenance
Add New Scan Group
Start Scan
Stop Scan
Show Details
Run Now
Delete this scan group
Save
Local intranet

Scan Group Name:

Radio: Both

Channel List: All

Scan Type: Active

Channel Dwell Time: 300 milliseconds

Scan Time Interval: (1-120) minutes

Scan Activity: Disabled

Wireless APs	
-	HWC - 127.0.0.1
□	0000000000003001 †
□	0406920201201264 †
□	0409920201203211 †

† Inactive Wireless APs

* Enable scanning on a Wireless AP can disrupt client service

[HWC | C1000] User: admin Port status: M

Software: V4 R1.2.3 (4.0.1.02.03) | Tracing: Inactive
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3. In the **Scan Group Name** box, type a unique name for this scan group.

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

> 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, select one of the following:
   - **Both** – The 2.4 GHz and 5.0 GHz radios both perform the scan function.
   - **2.4 GHz** – Only the 2.4 GHz radio performs the scan function.
   - **5.0 GHz** – Only the 5.0 GHz radio performs the scan function.

6. In the **Channel List** drop-down list, select 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, select 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**.

> 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 popup report showing the timeline of scan activity and scan results, click **Show Details**.
14. To save your changes, click **Save**.

10.4 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)

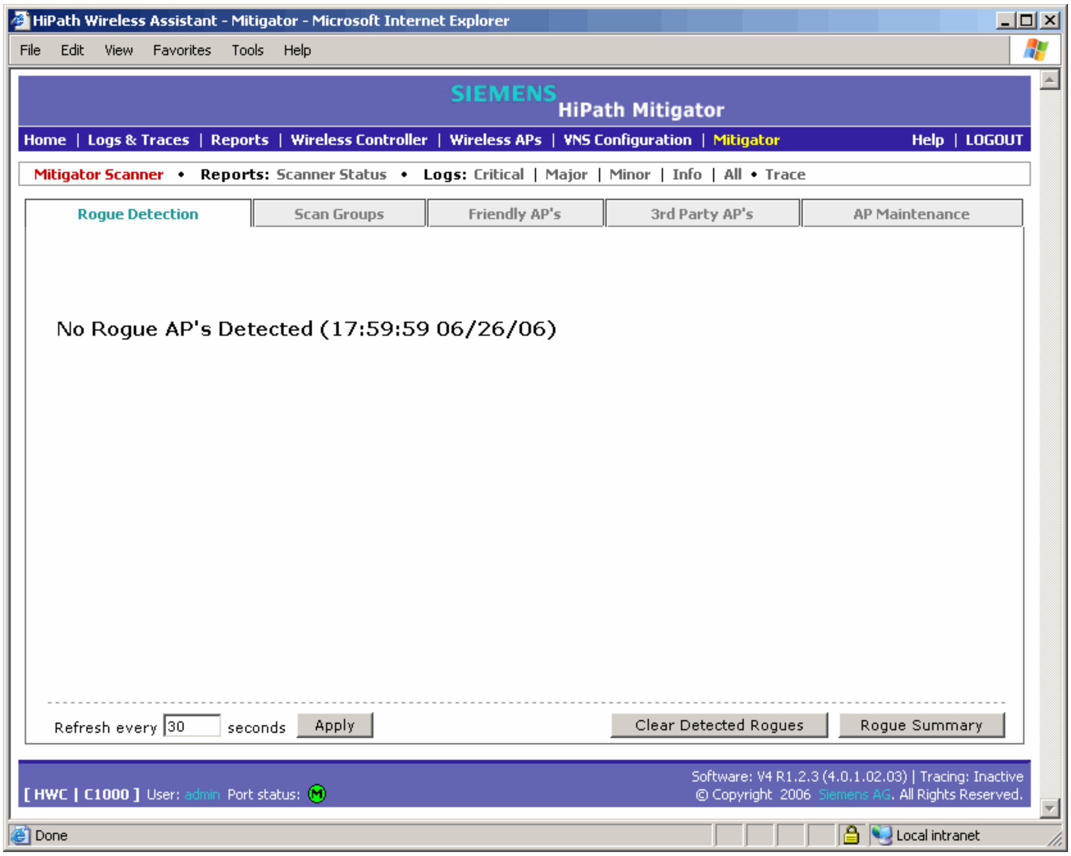
> ⓘ In the current release, there is no capability to initiate a DoS attack on the detected rogue access point. Containment of a detected rogue requires an inspection of the geographical location of its Scan Group area, where its RF activity has been found.

10.5 Working with Mitigator scan results

When viewing the Mitigator scan results you can delete all or selected 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** screen appears.
2. Click the **Rogue Detection** tab.
3. To modify the screen's refresh rate, type a time (in seconds) in the **Refresh every __ seconds** box.
4. Click **Apply**. The new refresh rate is applied.



HiPath Wireless Assistant - Mitigator - Microsoft Internet Explorer
File Edit View Favorites Tools Help
SIEMENS HiPath Mitigator
Home | Logs & Traces | Reports | Wireless Controller | Wireless APs | VNS Configuration | Mitigator
Help | LOGOUT
Mitigator Scanner • Reports: Scanner Status • Logs: Critical | Major | Minor | Info | All • Trace
Rogue Detection
Scan Groups
Friendly AP's
3rd Party AP's
AP Maintenance
Apply
Clear Detected Rogues
Rogue Summary
Done
Local intranet

No Rogue AP's Detected (17:59:59 06/26/06)

Refresh every 30 seconds

[HWC | C1000] User: admin Port status:

Software: V4 R1.2.3 (4.0.1.02.03) | Tracing: Inactive
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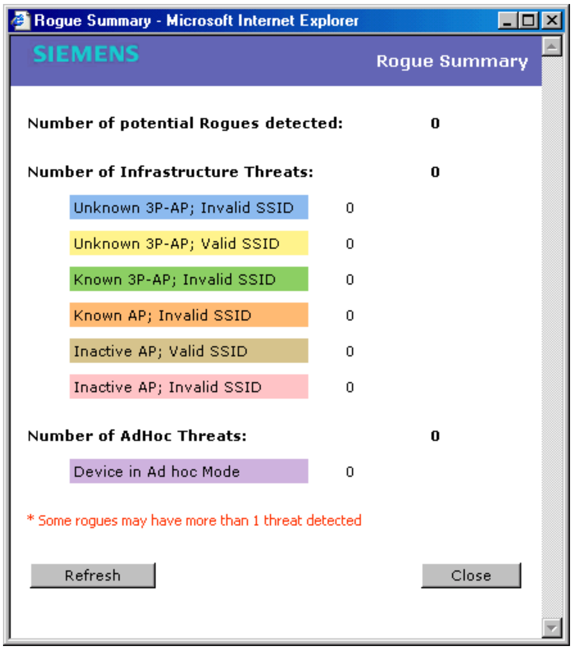
5. To view the Rogue Summary report, click **Rogue Summary**. The Rogue Summary report appears in a popup window.
6. To clear all detected rogue devices from the list, click **Clear Detected Rogues**.



Number of potential Rogues detected:		0
Number of Infrastructure Threats:		0
Unknown 3P-AP; Invalid SSID	0	
Unknown 3P-AP; Valid SSID	0	
Known 3P-AP; Invalid SSID	0	
Known AP; Invalid SSID	0	
Inactive AP; Valid SSID	0	
Inactive AP; Invalid SSID	0	
Number of AdHoc Threats:		0
Device in Ad hoc Mode	0	

* Some rogues may have more than 1 threat detected

> To avoid the Mitigator's database becoming too large, it is recommended that you either delete Rogue APs or add them to Friendly AP 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** screen appears.
2. Click the **Rogue Detection** tab.
3. To add a Wireless AP to the Friendly APs list, click **Add to Friendly List**. The access point item is removed from this list and appears in the **Friendly AP Definitions** area of the **Friendly APs** tab.

> A third-party access point always appears initially as a Rogue AP. It can be added to the Friendly APs list.

To delete an AP from the Mitigator scan results:

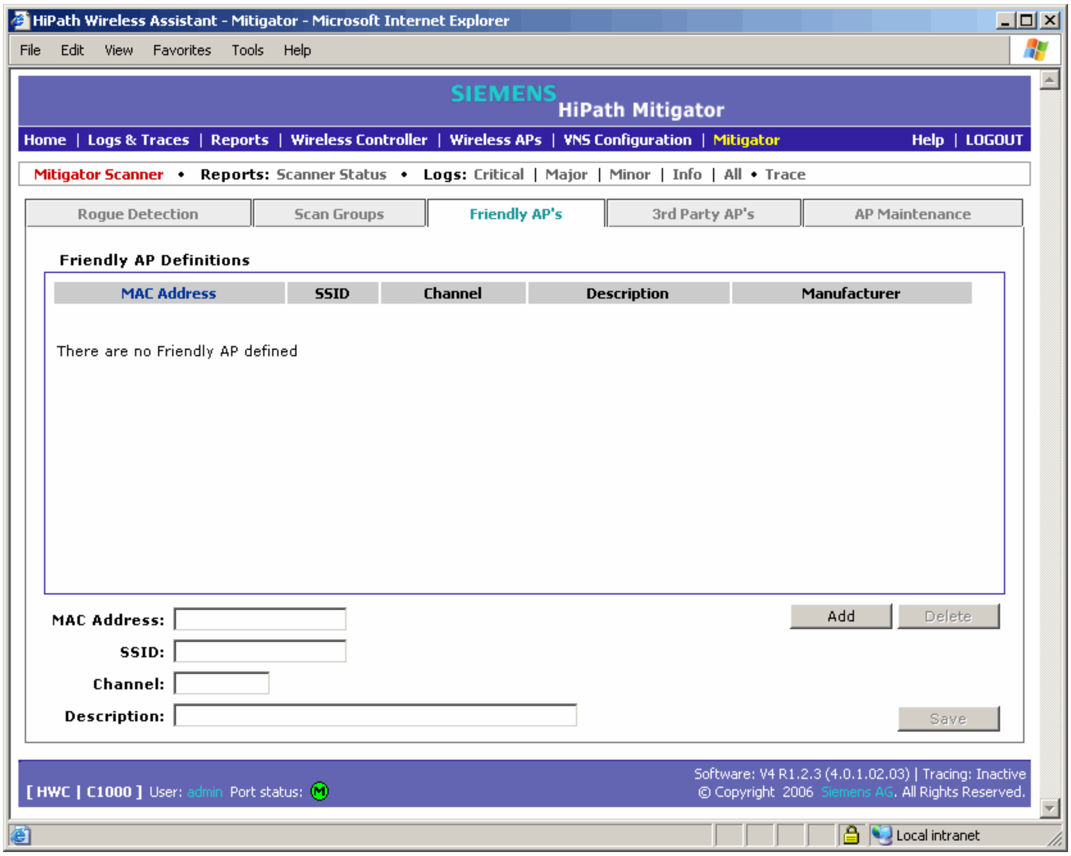
1. From the main menu, click **Mitigator**. The **Mitigator** screen appears.
2. Click the **Rogue Detection** tab.
3. To delete a specific AP from the Mitigator scan results, click the corresponding **Delete** button. The AP is removed from the list.

4. To clear all rogue access points from the Mitigator scan results, click **Clear Detected Rogues**. All APs are removed from the list.

10.6 Working with friendly APs

To view the friendly APs:

1. From the main menu, click **Mitigator**. The **Mitigator** screen appears.
2. Click the **Friendly APs** tab.


HiPath Wireless Assistant - Mitigator - Microsoft Internet Explorer
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HiPath Mitigator
Home | Logs & Traces | Reports | Wireless Controller | Wireless APs | VNS Configuration | Mitigator
Help | LOGOUT
Mitigator Scanner • Reports: Scanner Status • Logs: Critical | Major | Minor | Info | All • Trace
Rogue Detection
Scan Groups
Friendly AP's
3rd Party AP's
AP Maintenance
Add
Delete
Save
Local intranet

Friendly AP Definitions

MAC Address	SSID	Channel	Description	Manufacturer

There are no Friendly AP defined

MAC Address:
SSID:
Channel:
Description:

[HWC | C1000] User: admin Port status: M

Software: V4 R1.2.3 (4.0.1.02.03) | Tracing: Inactive
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To add friendly APs manually:

1. From the main menu, click **Mitigator**. The **Mitigator** screen appears.
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 appears in the list above.

To delete a friendly AP:

1. From the main menu, click **Mitigator**. The **Mitigator** screen appears.
2. Click the **Friendly APs** tab.
3. To select an access point from the **Friendly AP Definitions** list to delete, click it.
4. Click **Delete**. The selected access point is removed from the **Friendly AP Definitions** list.
5. To save your changes, click **Save**.

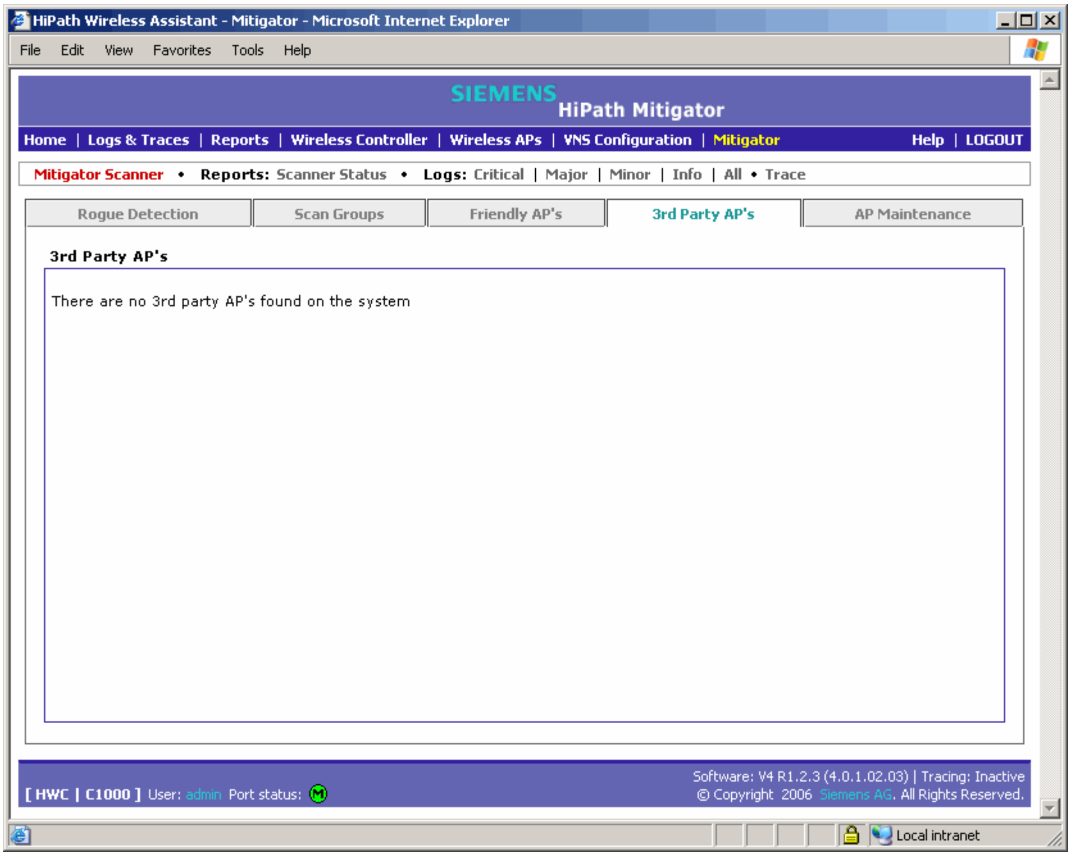
To modify a friendly AP:

1. From the main menu, click **Mitigator**. The **Mitigator** screen appears.
2. Click the **Friendly APs** tab.
3. To select an access point from the **Friendly AP Definitions** list to modify, click it.
4. Modify the access point by making the appropriate changes.
5. To save your changes, click **Save**.

10.7 Viewing the Mitigator list of third-party APs

To view known third-party access points:

1. From the main menu, click **Mitigator**. The **Mitigator** screen appears.
2. Click the **3rd Party AP's** tab.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Help | LOGOUT
Mitigator Scanner • Reports: Scanner Status • Logs: Critical | Major | Minor | Info | All • Trace
Rogue Detection
Scan Groups
Friendly AP's
3rd Party AP's
AP Maintenance
[HWC | C1000] User: admin Port status:
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Local intranet

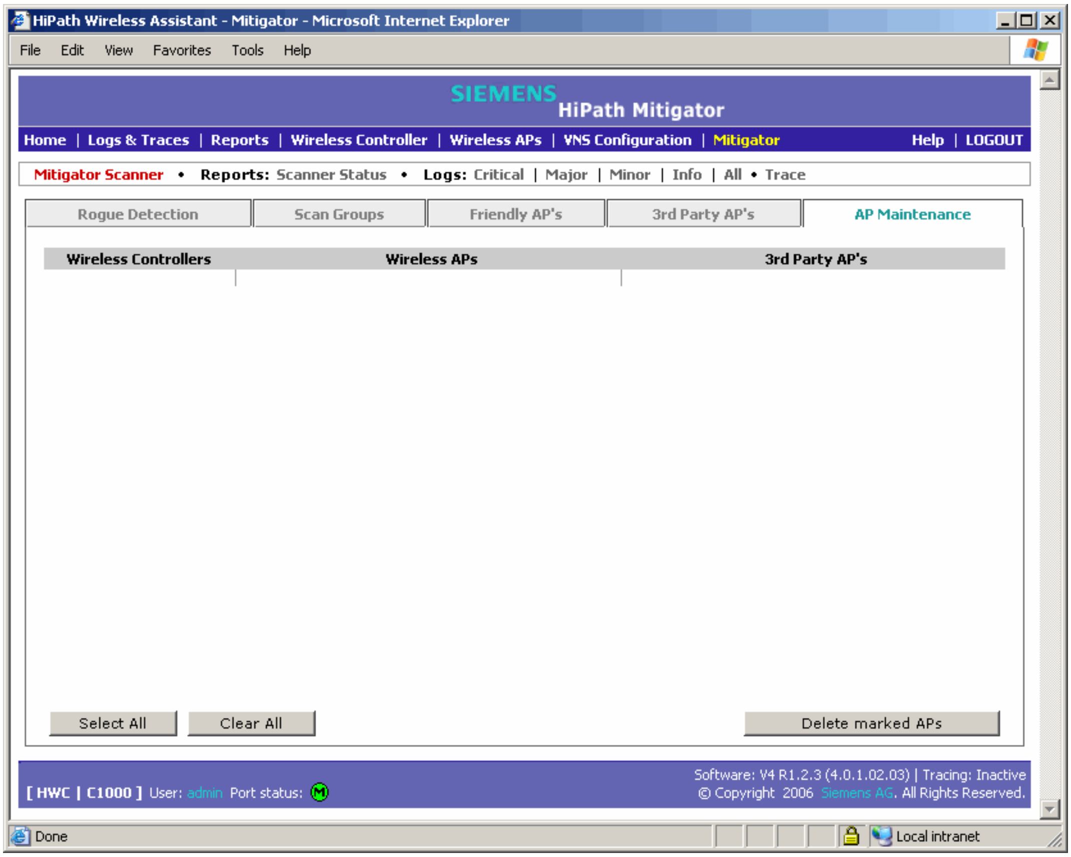
3rd Party AP's

There are no 3rd party AP's found on the system

10.8 Maintaining the Mitigator list of APs

To maintain the wireless APs:

1. From the main menu, click **Mitigator**. The **Mitigator** screen appears.
2. Click the **AP Maintenance** tab. The deleted access points are marked with a Deleted flag.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Help | LOGOUT
Mitigator Scanner • Reports: Scanner Status • Logs: Critical | Major | Minor | Info | All • Trace
Rogue Detection
Scan Groups
Friendly AP's
3rd Party AP's
AP Maintenance
Wireless Controllers
Wireless APs
3rd Party AP's
Select All
Clear All
Delete marked APs
[HWC | C1000] User: admin Port status:
Software: V4 R1.2.3 (4.0.1.02.03) | Tracing: Inactive
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Done
Local intranet

3. To delete the marked access points from the Mitigator database, click **Delete marked APs**.

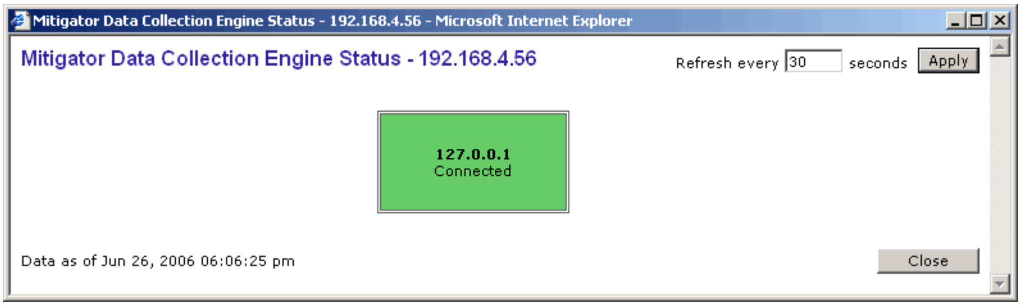
> The selected access points are deleted from the Mitigator database, not from the HiPath Wireless Controller database.

10.9 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** screen appears.
2. Click the **Scanner Status** link. The Scanner Status report appears, as shown in the example below.



Mitigator Data Collection Engine Status - 192.168.4.56

Refresh every 30 seconds

127.0.0.1
Connected

Data as of Jun 26, 2006 06:06:25 pm

Mitigator Data Collection Engine Status - 192.168.4.56 - Microsoft Internet Explorer
Apply
Close

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 appears, the Analysis Engine is not attempting to connect with that Data Collector Engine.

> ℹ If the box appears 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.

11 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.

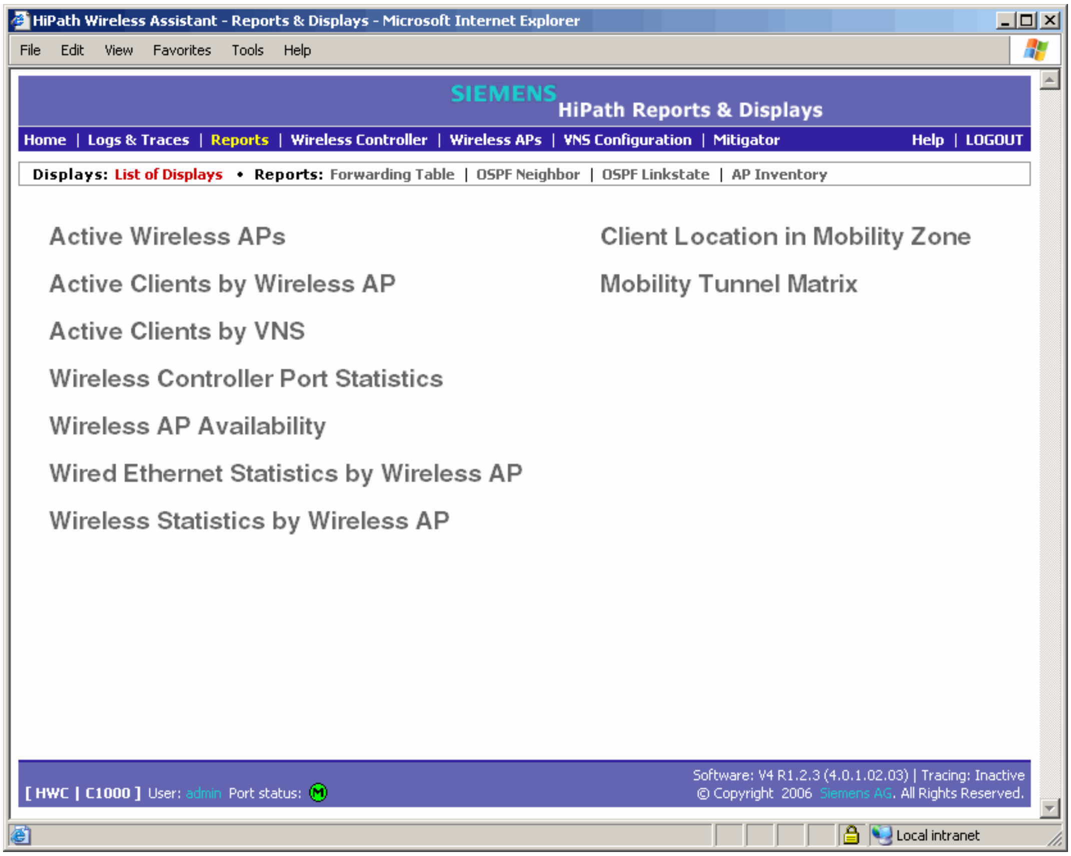
11.1 Viewing the displays

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
- Wireless Controller Port Statistics
- Wireless AP Availability
- Wired Ethernet Statistics by Wireless AP
- Wireless Statistics by Wireless AP
- Client Location in Mobility Zone
- Mobility Tunnel Matrix

To view reports and displays:

1. From the main menu, click **Reports & Displays**. The **HiPath Reports & Displays** screen appears.


HiPath Wireless Assistant - Reports & Displays - Microsoft Internet Explorer
File
Edit
View
Favorites
Tools
Help
SIEMENS
HiPath Reports & Displays
Home | Logs & Traces | Reports | Wireless Controller | Wireless APs | VNS Configuration | Mitigator
Help | LOGOUT
Displays: List of Displays • Reports: Forwarding Table | OSPF Neighbor | OSPF Linkstate | AP Inventory
[HWC | C1000] User: admin Port status: M
Local intranet

Active Wireless APs

Active Clients by Wireless AP

Active Clients by VNS

Wireless Controller Port Statistics

Wireless AP Availability

Wired Ethernet Statistics by Wireless AP

Wireless Statistics by Wireless AP

Client Location in Mobility Zone

Mobility Tunnel Matrix

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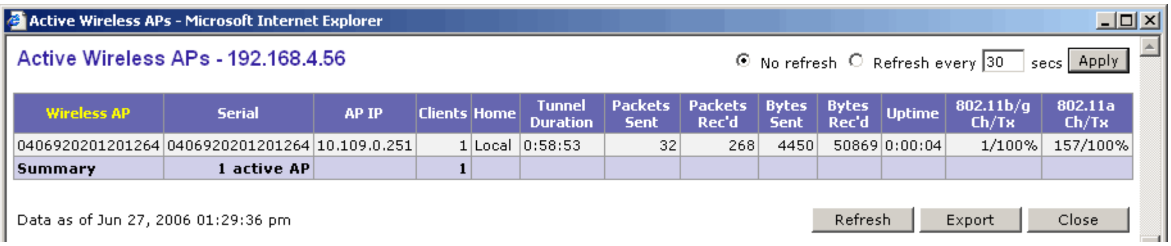
> The two displays on the right-hand side of the screen only appear if the mobility manager function has been enabled for the controller.

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



Active Wireless APs - 192.168.4.56

● No refresh ○ Refresh every 30 secs

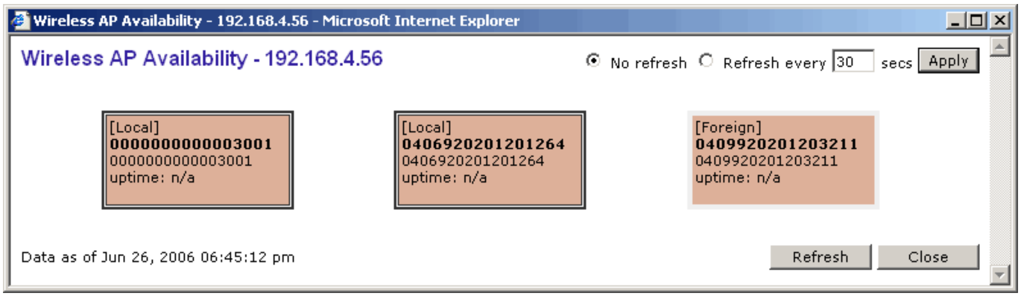
Wireless AP	Serial	AP IP	Clients	Home	Tunnel Duration	Packets Sent	Packets Rec'd	Bytes Sent	Bytes Rec'd	Uptime	802.11b/g Ch/Tx	802.11a Ch/Tx
0406920201201264	0406920201201264	10.109.0.251	1	Local	0:58:53	32	268	4450	50869	0:00:04	1/100%	157/100%
Summary	**1 active AP**		**1**									

Data as of Jun 27, 2006 01:29:36 pm

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.

11.1.1 Viewing the Wireless AP availability display

When the **AP Registration** screen has been saved for the HiPath Wireless Controller in Paired Mode, the Wirelss AP Availability display will show the status of both local and foreign Wireless APs for that HiPath Wireless Controller.



Wireless AP Availability - 192.168.4.56 - Microsoft Internet Explorer

Wireless AP Availability - 192.168.4.56

[Local]
0000000000003001
0000000000003001
uptime: n/a

[Local]
0406920201201264
0406920201201264
uptime: n/a

[Foreign]
0409920201203211
0409920201203211
uptime: n/a

Data as of Jun 26, 2006 06:45:12 pm

In normal operations, when Availability 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 attached they do not appear in the report.

11.1.2 Viewing statistics for Wireless APs

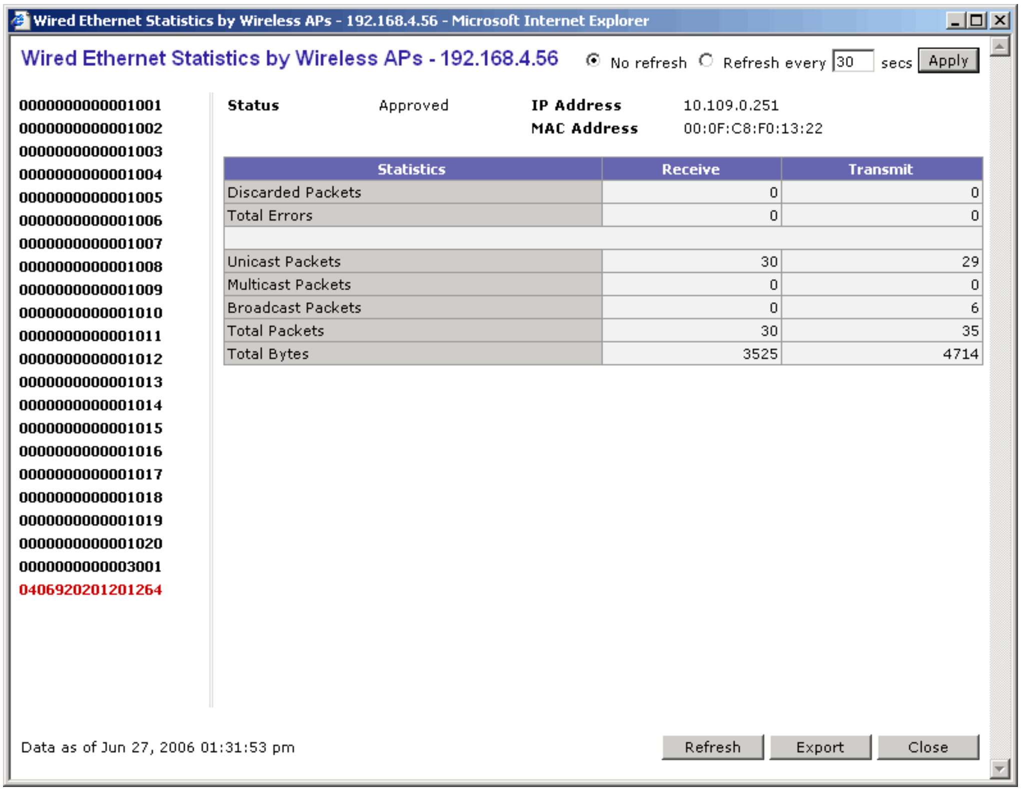
Two displays are snapshots of activity at that point in time on a selected Wireless AP:

- Wired Ethernet Statistics by Wireless APs
- Wireless Statistics by Wireless APs

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

To view wired Ethernet statistics by wireless APs:

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



Wired Ethernet Statistics by Wireless APs - 192.168.4.56 - Microsoft Internet Explorer

Wired Ethernet Statistics by Wireless APs - 192.168.4.56 ● No refresh ○ Refresh every 30 secs Apply

```
0000000000001001
0000000000001002
0000000000001003
0000000000001004
0000000000001005
0000000000001006
0000000000001007
0000000000001008
0000000000001009
0000000000001010
0000000000001011
0000000000001012
0000000000001013
0000000000001014
0000000000001015
0000000000001016
0000000000001017
0000000000001018
0000000000001019
0000000000001020
0000000000003001
0406920201201264
```

Status Approved **IP Address** 10.109.0.251
MAC Address 00:0F:C8:F0:13:22

Statistics	Receive	Transmit
Discarded Packets	0	0
Total Errors	0	0
Unicast Packets	30	29
Multicast Packets	0	0
Broadcast Packets	0	6
Total Packets	30	35
Total Bytes	3525	4714

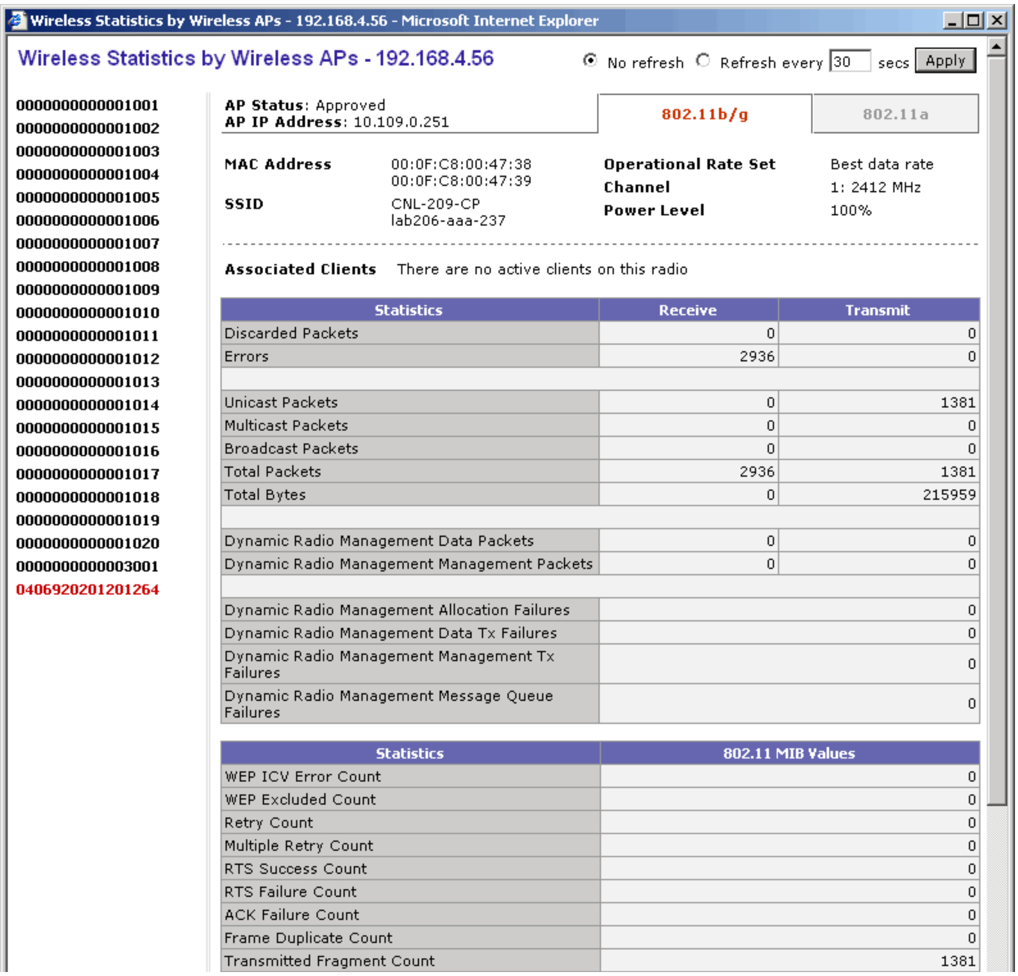
Data as of Jun 27, 2006 01:31:53 pm

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

To view Wireless Statistics by Wireless APs:

1. From the main menu, click **Reports & Displays**. The **HiPath Reports & Displays** screen appears.

2. Click the **Wireless Statistics by Wireless APs** display option. The **Wireless Statistics by Wireless APs** display appears in a new browser window.



Wireless Statistics by Wireless APs - 192.168.4.56 - Microsoft Internet Explorer

Wireless Statistics by Wireless APs - 192.168.4.56

● No refresh ○ Refresh every 30 secs Apply

0000000000001001
0000000000001002
0000000000001003
0000000000001004
0000000000001005
0000000000001006
0000000000001007
0000000000001008
0000000000001009
0000000000001010
0000000000001011
0000000000001012
0000000000001013
0000000000001014
0000000000001015
0000000000001016
0000000000001017
0000000000001018
0000000000001019
0000000000001020
0000000000003001
0406920201201264

AP Status: Approved
AP IP Address: 10.109.0.251

802.11b/g | 802.11a

MAC Address	00:0F:C8:00:47:38 00:0F:C8:00:47:39	**Operational Rate Set**	Best data rate
		Channel	1: 2412 MHz
SSID	CNL-209-CP lab206-aaa-237	**Power Level**	100%

Associated Clients There are no active clients on this radio

Statistics	Receive	Transmit
Discarded Packets	0	0
Errors	2936	0
Unicast Packets	0	1381
Multicast Packets	0	0
Broadcast Packets	0	0
Total Packets	2936	1381
Total Bytes	0	215959
Dynamic Radio Management Data Packets	0	0
Dynamic Radio Management Management Packets	0	0
Dynamic Radio Management Allocation Failures		0
Dynamic Radio Management Data Tx Failures		0
Dynamic Radio Management Management Tx Failures		0
Dynamic Radio Management Message Queue Failures		0

Statistics	802.11 MIB Values
WEP ICV Error Count	0
WEP Excluded Count	0
Retry Count	0
Multiple Retry Count	0
RTS Success Count	0
RTS Failure Count	0
ACK Failure Count	0
Frame Duplicate Count	0
Transmitted Fragment Count	1381

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

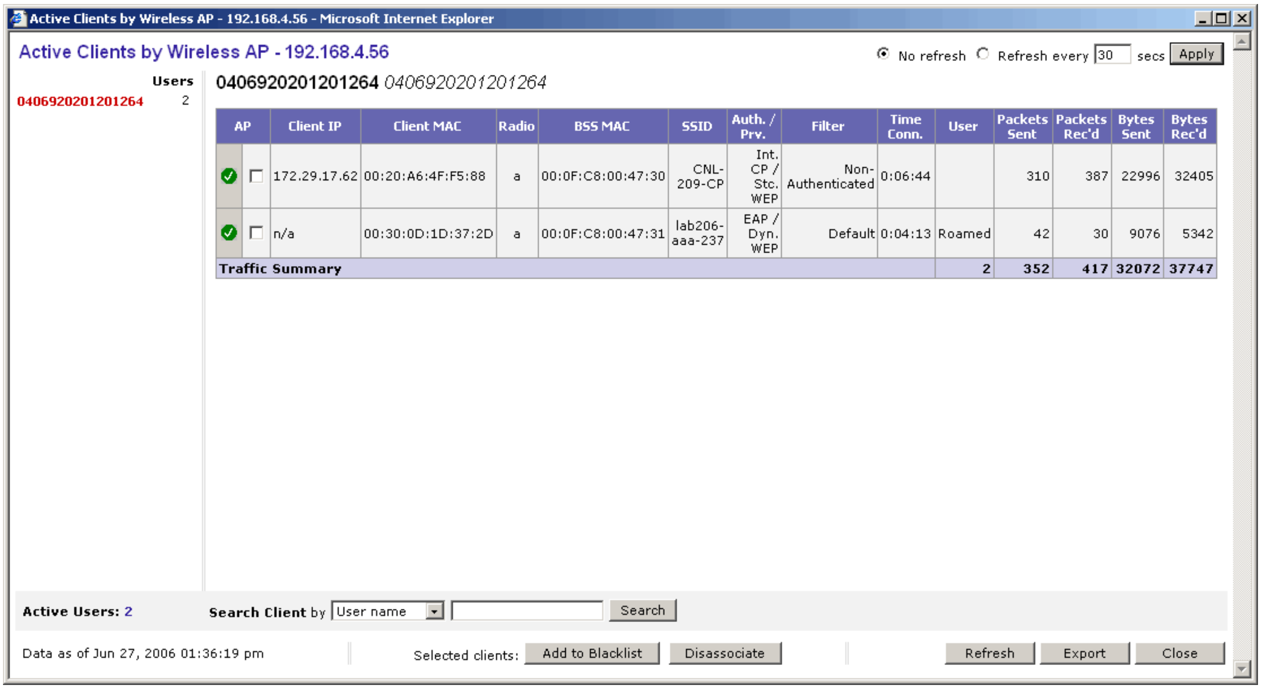
4. Click the appropriate tab to display information for each radio on the Wireless AP.

5. To view information on a selected associated client, click **View Client**. The **Associated Clients** display appears in a new browser window.

To view wired Ethernet statistics by Wireless APs:

1. From the main menu, click **Reports & Displays**. The **HiPath Reports & Displays** screen appears.

2. Click the **Active Clients by Wireless APs** display option. The **Active Clients by Wireless APs** display appears in a new browser window.



Active Clients by Wireless AP - 192.168.4.56 - Microsoft Internet Explorer

Active Clients by Wireless AP - 192.168.4.56

● No refresh ○ Refresh every 30 secs

	Users
0406920201201264	2

0406920201201264 *0406920201201264*

AP		Client IP	Client MAC	Radio	BSS MAC	SSID	Auth. / Prv.	Filter	Time Conn.	User	Packets Sent	Packets Rec'd	Bytes Sent	Bytes Rec'd
✓	□	172.29.17.62	00:20:A6:4F:F5:88	a	00:0F:C8:00:47:30	CNL-209-CP	Int. CP / Stc. WEP	Non-Authenticated	0:06:44		310	387	22996	32405
✓	□	n/a	00:30:0D:1D:37:2D	a	00:0F:C8:00:47:31	lab206-aaa-237	EAP / Dyn. WEP	Default	0:04:13	Roamed	42	30	9076	5342
Traffic Summary										2	352	417	32072	37747

Active Users: 2

Search Client by User name

Data as of Jun 27, 2006 01:36:19 pm

Selected clients:

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.

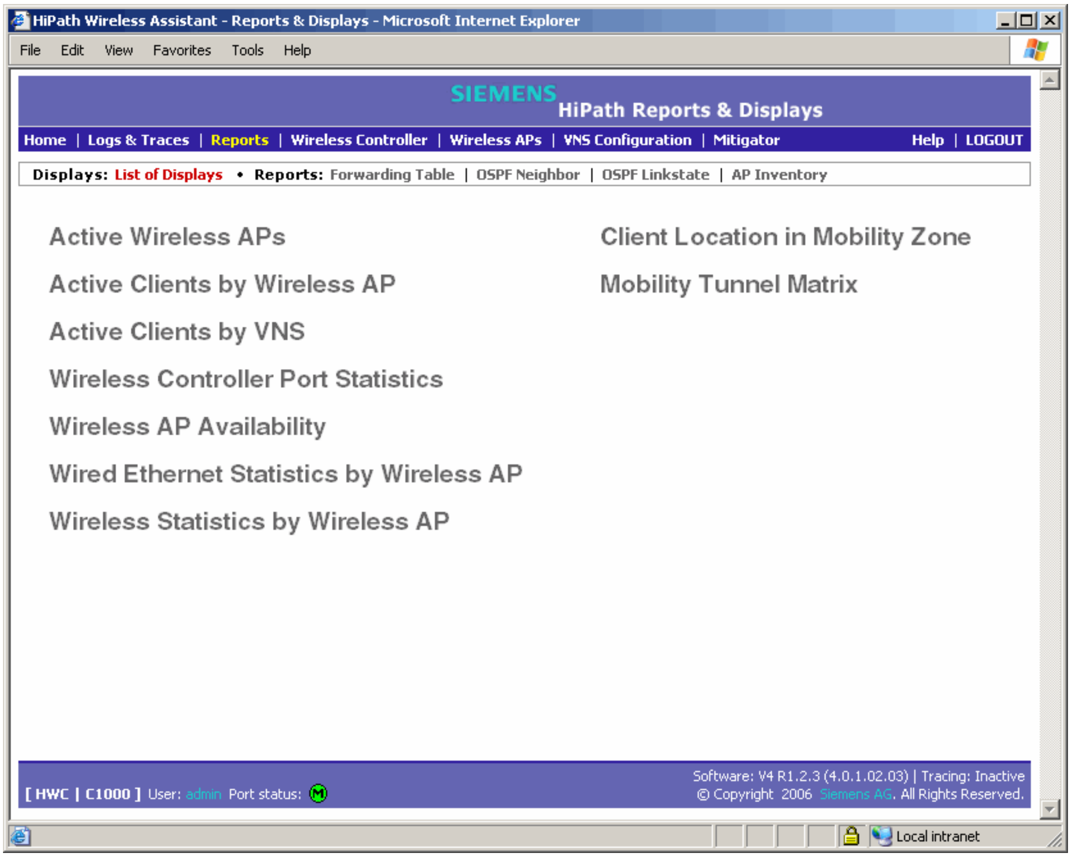
Time Conn is the length of time that a client has been on the system, not just on an AP. If the client roams from one AP to another, the session stays, therefore **Time Conn** does not reset.

A client appears as soon as the client connects (or after refresh of screen). The client disappears as soon as it times out.

11.1.3 Viewing displays for the mobility manager

When a HiPath Wireless Controller has been configured as a mobility manager, two additional displays appear as options in the *List of Displays* screen:

- **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



HiPath Wireless Assistant - Reports & Displays - Microsoft Internet Explorer
File Edit View Favorites Tools Help
SIEMENS
HiPath Reports & Displays
Home | Logs & Traces | Reports | Wireless Controller | Wireless APs | VNS Configuration | Mitigator
Help | LOGOUT
Displays: List of Displays • Reports: Forwarding Table | OSPF Neighbor | OSPF Linkstate | AP Inventory

Active Wireless APs

Active Clients by Wireless AP

Active Clients by VNS

Wireless Controller Port Statistics

Wireless AP Availability

Wired Ethernet Statistics by Wireless AP

Wireless Statistics by Wireless AP

Client Location in Mobility Zone

Mobility Tunnel Matrix

[HWC | C1000] User: admin Port status: M
Software: V4 R1.2.3 (4.0.1.02.03) | Tracing: Inactive
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Local intranet

To view mobility manager displays:

1. From the main menu, click **Reports & Displays**. The **List of Displays** screen appears.
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 highlighed in red
  - If only a control tunnel is present, it is highlighted in yellow
  - If data and control tunnels are fully established, it is highlighed 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 colour 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.

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

11.2 Viewing reports

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

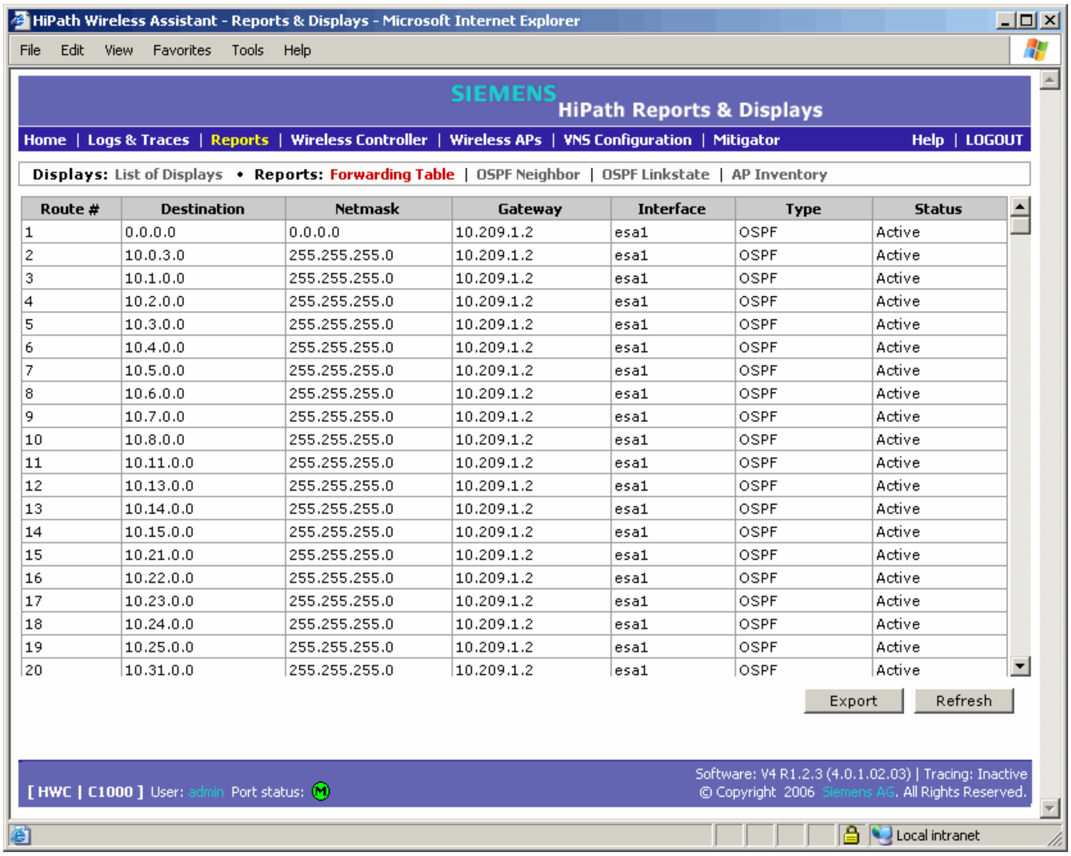
- Forwarding Table (routes defined in the HiPath Wireless Controller Routing Protocols screen)
- OSPF Neighbor (if OSPF is enabled in the Routing Protocols screen)
- OSPF Linkstate (if OSPF is enabled in the Routing Protocols screen)
- AP Inventory (a consolidated summary of Wireless AP setup)

To view reports:

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

> The **AP Inventory** report appears in a new browser window. All other reports appear in the current browser window.

An example of a **Forwarding Table** report is shown below:


HiPath Wireless Assistant - Reports & Displays - Microsoft Internet Explorer
File Edit View Favorites Tools Help
SIEMENS
HiPath Reports & Displays
Home | Logs & Traces | Reports | Wireless Controller | Wireless APs | VNS Configuration | Mitigator
Help | LOGOUT
Displays: List of Displays • Reports: Forwarding Table | OSPF Neighbor | OSPF Linkstate | AP Inventory
Export
Refresh
Local intranet

Route #	Destination	Netmask	Gateway	Interface	Type	Status
1	0.0.0.0	0.0.0.0	10.209.1.2	esa1	OSPF	Active
2	10.0.3.0	255.255.255.0	10.209.1.2	esa1	OSPF	Active
3	10.1.0.0	255.255.255.0	10.209.1.2	esa1	OSPF	Active
4	10.2.0.0	255.255.255.0	10.209.1.2	esa1	OSPF	Active
5	10.3.0.0	255.255.255.0	10.209.1.2	esa1	OSPF	Active
6	10.4.0.0	255.255.255.0	10.209.1.2	esa1	OSPF	Active
7	10.5.0.0	255.255.255.0	10.209.1.2	esa1	OSPF	Active
8	10.6.0.0	255.255.255.0	10.209.1.2	esa1	OSPF	Active
9	10.7.0.0	255.255.255.0	10.209.1.2	esa1	OSPF	Active
10	10.8.0.0	255.255.255.0	10.209.1.2	esa1	OSPF	Active
11	10.11.0.0	255.255.255.0	10.209.1.2	esa1	OSPF	Active
12	10.13.0.0	255.255.255.0	10.209.1.2	esa1	OSPF	Active
13	10.14.0.0	255.255.255.0	10.209.1.2	esa1	OSPF	Active
14	10.15.0.0	255.255.255.0	10.209.1.2	esa1	OSPF	Active
15	10.21.0.0	255.255.255.0	10.209.1.2	esa1	OSPF	Active
16	10.22.0.0	255.255.255.0	10.209.1.2	esa1	OSPF	Active
17	10.23.0.0	255.255.255.0	10.209.1.2	esa1	OSPF	Active
18	10.24.0.0	255.255.255.0	10.209.1.2	esa1	OSPF	Active
19	10.25.0.0	255.255.255.0	10.209.1.2	esa1	OSPF	Active
20	10.31.0.0	255.255.255.0	10.209.1.2	esa1	OSPF	Active

[HWC | C1000] User: admin Port status: M

Software: V4 R1.2.3 (4.0.1.02.03) | Tracing: Inactive
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> If you open only automatically refreshed report pages, the web management session timer will not be updated or reset. Your session will eventually timeout.

To export and save a report in XML:

1. On the report window, click **Export**. A Windows **File Download** dialog appears.
2. Click the **Save** button. A Windows **Save As** dialog appears.

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

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.

12 Performing system maintenance

This chapter describes system maintenance processes, including:

- Performing wireless AP client management
- Resetting the AP to its factory default settings
- Performing system maintenance tasks
- Performing HiPath Wireless Controller software maintenance
- Configuring Controller, Access Points and Convergence Software logs and traces

12.1 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:

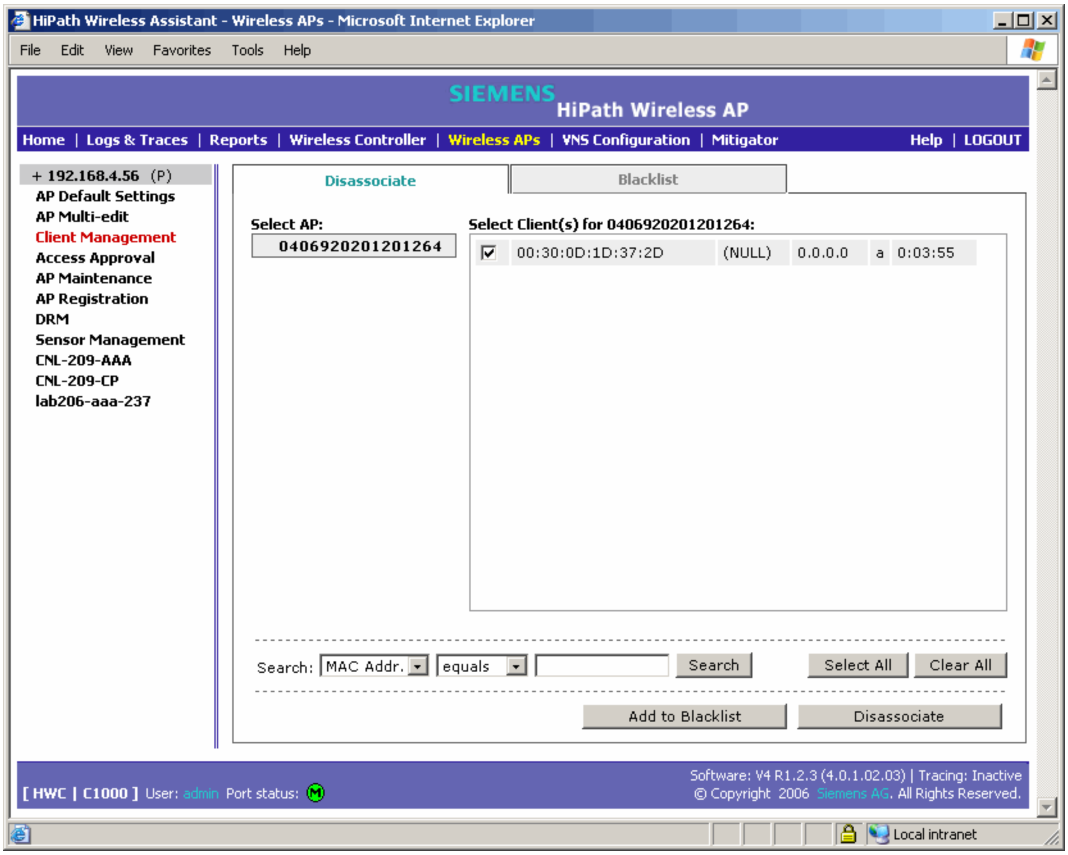
- Disassociate a selected wireless device from its Wireless AP.
- Add a selected wireless device's MAC address to a Blacklist of wireless clients that will not be allowed to associate with the Wireless AP.
- Backup and restore the HiPath Wireless Controller database. For more information, see Section 12.4, “Performing HiPath Wireless Controller software maintenance”, on page 250.

12.1.1 Disassociating a client

In addition to the following procedure below, you can also disassociate wireless users directly from the Active Clients by VNS display page. For more information, see Section , “Working with reports and displays”, on page 231.

To disassociate a wireless device client:

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



Select AP: 0406920201201264

Select Client(s) for 0406920201201264:

☑ 00:30:0D:1D:37:2D (NULL) 0.0.0.0 a 0:03:55

Search: MAC Addr. equals

[HWC | C1000] User: admin Port status: M

Software: V4 R1.2.3 (4.0.1.02.03) | Tracing: Inactive
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3. In the **Select AP** list, click the AP you want to dissassociate.

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

> 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.

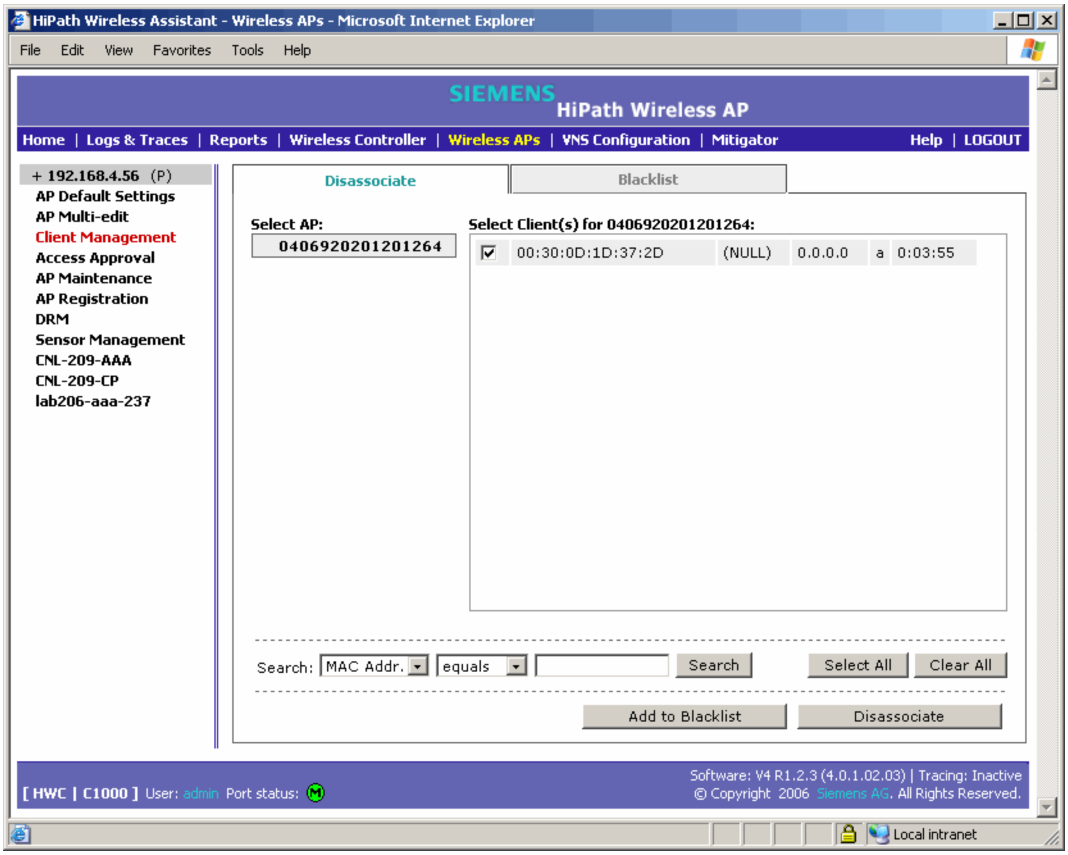
5. Click **Disassociate**. The client's session terminates immediately.

12.1.2 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 entering its MAC address.

To blacklist a wireless device client:

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



Select AP: 0406920201201264

Select Client(s) for 0406920201201264:

☑ 00:30:0D:1D:37:2D (NULL) 0.0.0.0 a 0:03:55

Search: MAC Addr. equals

[HWC | C1000] User: admin Port status: M

Software: V4 R1.2.3 (4.0.1.02.03) | Tracing: Inactive
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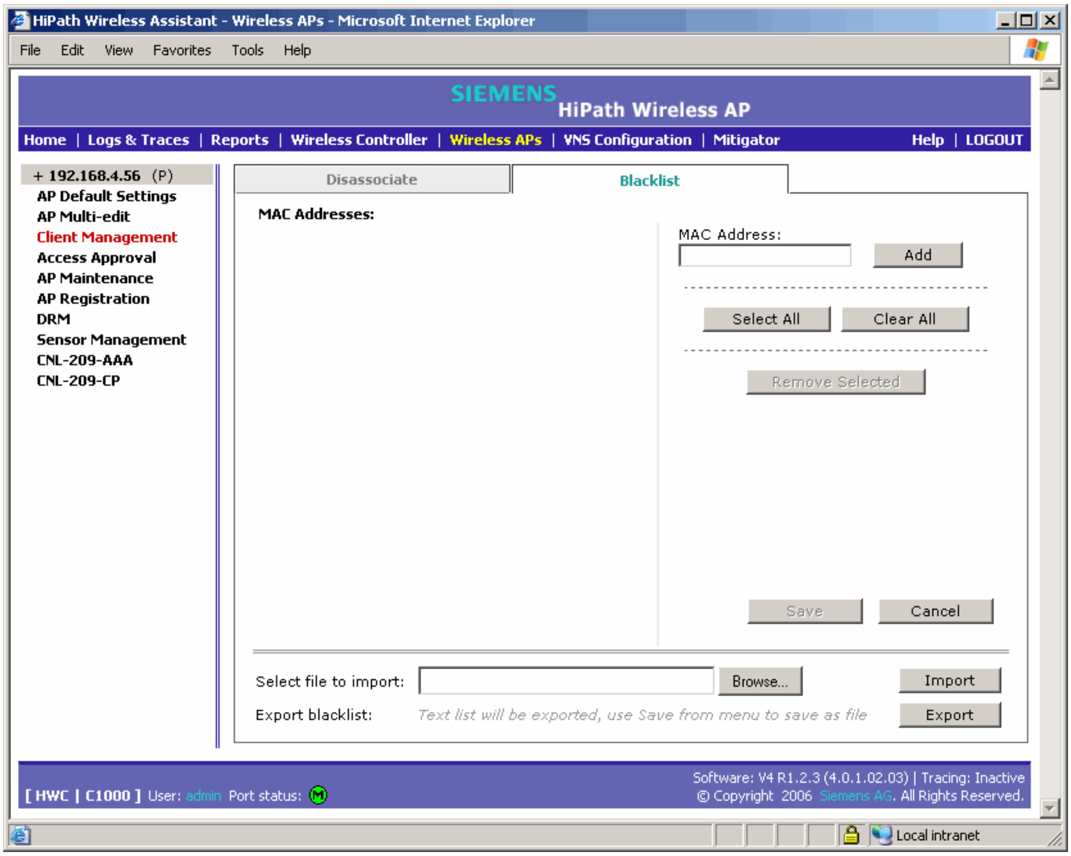
3. In the **Select AP** list, click the AP you want to dissassociate.
4. In the **Select Client(s)** list, select the checkbox next to the client you want to disassociate, if applicable.

> 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** screen appears.
2. From the left pane, click **Client Management**. The **Disassociate** tab appears.
3. Click the **Blacklist** tab.


HiPath Wireless Assistant - Wireless APs - Microsoft Internet Explorer
File Edit View Favorites Tools Help
SIEMENS HiPath Wireless AP
Home | Logs & Traces | Reports | Wireless Controller | Wireless APs | VNS Configuration | Mitigator
Help | LOGOUT
+ 192.168.4.56 (P)
AP Default Settings
AP Multi-edit
Client Management
Access Approval
AP Maintenance
AP Registration
DRM
Sensor Management
CNL-209-AAA
CNL-209-CP
Disassociate
Blacklist
MAC Addresses:
MAC Address:
Add
Select All
Clear All
Remove Selected
Save
Cancel
Select file to import:
Browse...
Import
Export blacklist:
Text list will be exported, use Save from menu to save as file
Export
[HWC | C1000] User: admin Port status:
Software: V4 R1.2.3 (4.0.1.02.03) | Tracing: Inactive
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Local intranet

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

> 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** screen appears.
2. From the left pane, click **Client Management**. The **Disassociate** tab appears.
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.

> 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** screen appears.
2. From the left pane, click **Client Management**. The **Disassociate** tab appears.
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. Select 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** screen appears.
2. From the left pane, click **Client Management**. The **Disassociate** tab appears.
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.

12.2 Resetting the AP to its factory default settings

You can reset the 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 5.2.3, “Understanding the wireless AP LED status”, on page 73.

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.

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

To reset the AP to its factory default settings:

1. Reboot the AP.
2. Depower and repower the AP during the vulnerable time interval.
3. Repeat Step 2 two more times.

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

12.3 Performing system maintenance tasks

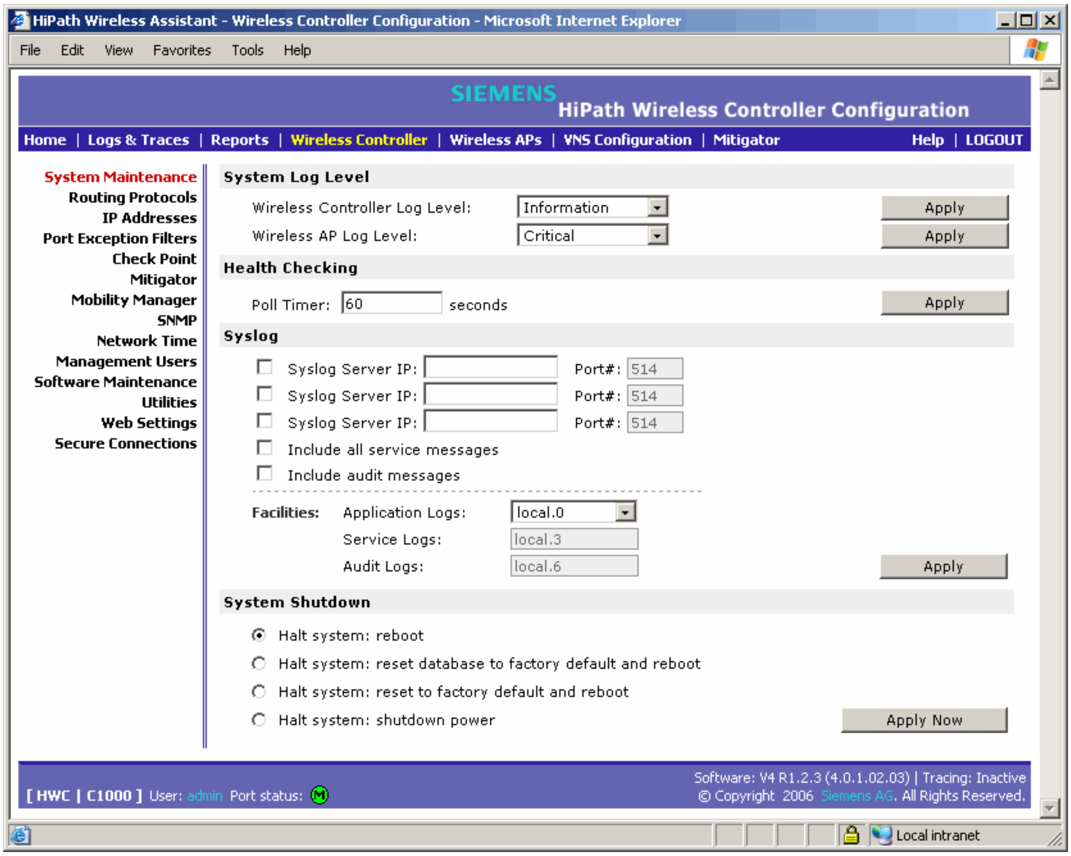
You can perform various maintenance tasks, including:

- 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.

To change the log levels:

1. From the main menu, click **Wireless Controller Configuration**. The **Wireless Controller Configuration** screen appears.


HiPath Wireless Assistant - Wireless Controller Configuration - Microsoft Internet Explorer
File Edit View Favorites Tools Help
SIEMENS
HiPath Wireless Controller Configuration
Home | Logs & Traces | Reports | Wireless Controller | Wireless APs | VNS Configuration | Mitigator
Help | LOGOUT
System Maintenance
Routing Protocols
IP Addresses
Port Exception Filters
Check Point
Mitigator
Mobility Manager
SNMP
Network Time
Management Users
Software Maintenance
Utilities
Web Settings
Secure Connections
Apply
Apply
Apply
Apply
Apply Now
Local intranet

System Log Level

Wireless Controller Log Level: Information

Wireless AP Log Level: Critical

Health Checking

Poll Timer: 60 seconds

Syslog

☐ Syslog Server IP: Port#: 514

☐ Syslog Server IP: Port#: 514

☐ Syslog Server IP: Port#: 514

☐ Include all service messages

☐ Include audit messages

Facilities: Application Logs: local.0

Service Logs: local.3

Audit Logs: local.6

System Shutdown

● Halt system: reboot

○ Halt system: reset database to factory default and reboot

○ Halt system: reset to factory default and reboot

○ Halt system: shutdown power

[HWC | C1000] User: admin Port status: M

Software: V4 R1.2.3 (4.0.1.02.03) | Tracing: Inactive
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2. In the **System Log Level** area, 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** screen appears.
2. From the left pane, click **System Maintenance**. The **System Maintenance** screen appears.
3. In the **Health Checking** area, 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.
4. Click **Apply**.

To enable and define parameters for Syslog:

1. From the main menu, click **Wireless Controller Configuration**. The **Wireless Controller Configuration** screen appears.
2. From the left pane, click **System Maintenance**. The **System Maintenance** screen appears.
3. In the **Syslog** area, to enable the **Syslog** function for up to three syslog servers, select the appropriate checkboxes.
4. For each enabled syslog server, in the **IP** box, type a valid IP address for the server on the network.
5. For each enabled syslog server, in the **Port #** box, type a valid port number to connect on. The default port for syslog is **514**.
6. 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 all three servers. The additional service messages are:
   - DHCP messages reporting users receiving IP addresses
   - Startup Manager Task messages reporting component startup and failure
7. To include audit messages, select the **Include audit messages** checkbox.
8. 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.
9. 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.
10. 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.

11. To apply your changes, click on the **Apply** button.

> 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 18shows 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 18   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** screen appears.
2. From the left pane, click **System Maintenance**. The **System Maintenance** screen appears.
3. 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**
   - **Halt system: reset to factory default and reboot**
   - **Halt system,:shutdown power**
4. Click **Apply Now**. The system is immediately halted.

12.4 Performing HiPath Wireless Controller software maintenance

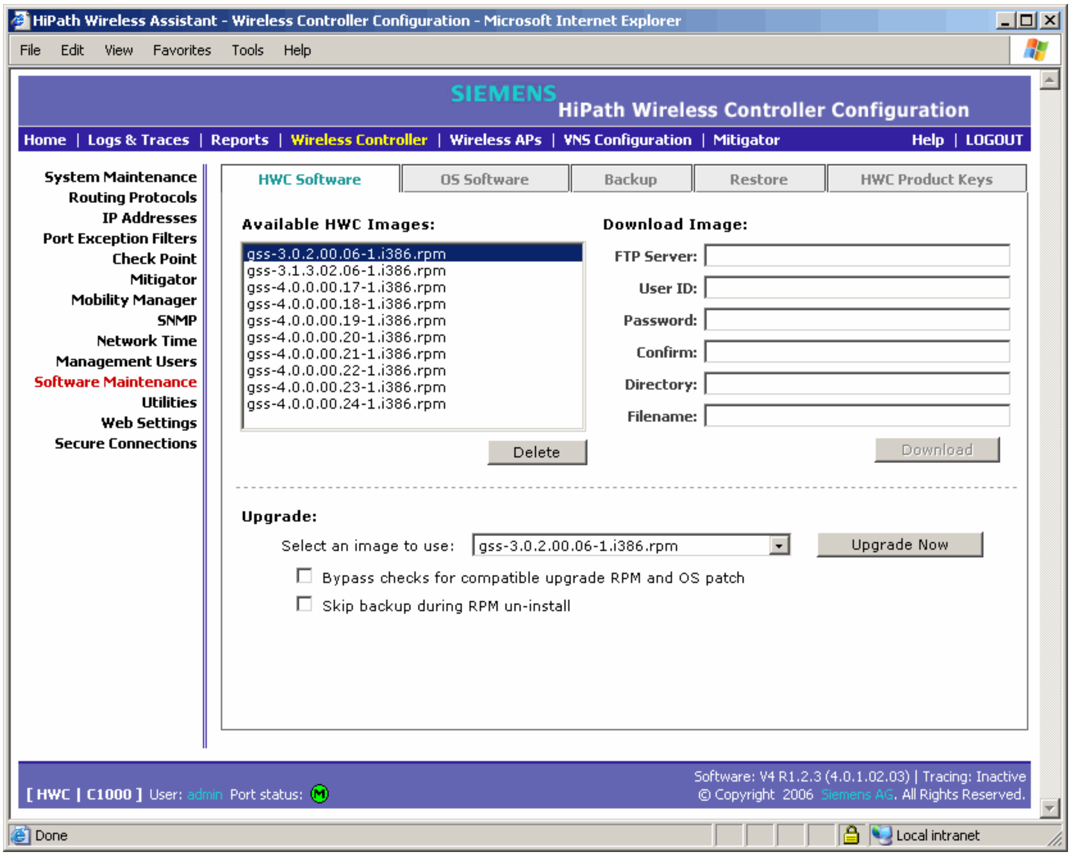
You can update the core HiPath Wireless Controller software files, and the Operating System (OS) software using the Software Maintenance function. A facility to backup and restore the HiPath Wireless Controller database is also available. The maintenance interface also includes the product key maintenance, for first-time setup and upgrades, if appropriate. For more information, see Section 4.2.3, “Applying the product license key”, on page 52.

12.4.1 Updating HiPath Wireless Controller software

You can update the core HiPath Wireless Controller software files using the Software Maintenance function.

To upgrade HiPath Wireless Controller software:

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



Available HWC Images:

gss-3.0.2.00.06-1.i386.rpm
gss-3.1.3.02.06-1.i386.rpm
gss-4.0.0.00.17-1.i386.rpm
gss-4.0.0.00.18-1.i386.rpm
gss-4.0.0.00.19-1.i386.rpm
gss-4.0.0.00.20-1.i386.rpm
gss-4.0.0.00.21-1.i386.rpm
gss-4.0.0.00.22-1.i386.rpm
gss-4.0.0.00.23-1.i386.rpm
gss-4.0.0.00.24-1.i386.rpm

Download Image:

FTP Server:
User ID:
Password:
Confirm:
Directory:
Filename:

Upgrade:

Select an image to use: gss-3.0.2.00.06-1.i386.rpm

□ Bypass checks for compatible upgrade RPM and OS patch
□ Skip backup during RPM un-install

[HWC | C1000] User: admin Port status: M

Software: V4 R1.2.3 (4.0.1.02.03) | Tracing: Inactive
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The **Available HWC Images** area displays the list of software versions that have been downloaded and are available.

3. In the **Upgrade** area, select an image from the **Select an image to use** drop-down list.

> It is recommended that the **Bypass checks for compatible upgrade RPM and OS patch** and the **Skip backup during RPM un-install** options remain disabled.

4. To launch the upgrade with the selected image, click on the **Upgrade Now** button.
5. In the dialog box that appears, confirm the upgrade.

   At this point, all sessions are closed. The previous software is uninstalled automatically. The new software is installed. The HiPath Wireless Controller reboots automatically. The database is updated and migrated.

To download a new HiPath Wireless Controller software image:

1. From the main menu, click **Wireless Controller Configuration**. The **Wireless Controller Configuration** screen appears.
2. From the left pane, click **Software Maintenance**. The **HWC Software** tab appears.
3. To download a new image to be added to the list, in the **Download Image** area type the following:
   - **FTP Server** – The IP of the FTP server to retrieve the image file from.
   - **User ID** – The user ID that the controller should use when it attempts 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.
   - **Platform** – The AP hardware type to which the image applies. The are several types of AP and they require different images.
4. Click **Download**. The image is downloaded and added to the list.

To delete a HiPath Wireless Controller software image:

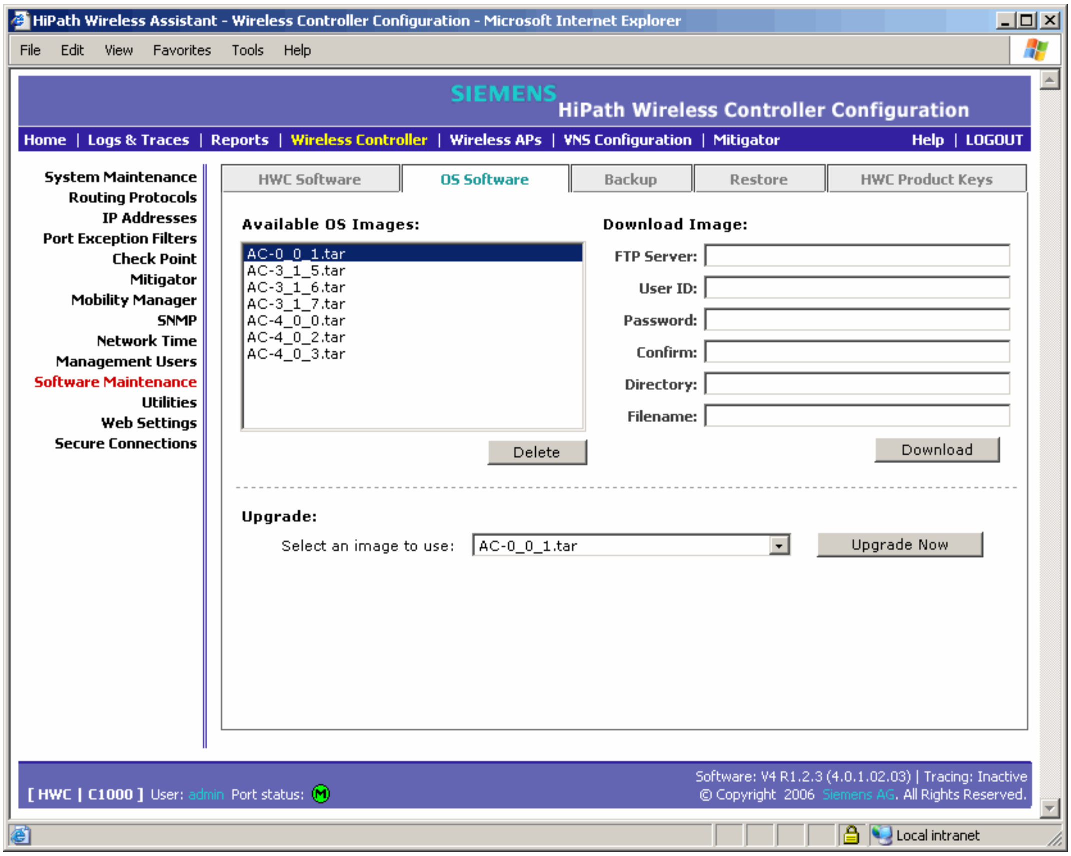
1. From the main menu, click **Wireless Controller Configuration**. The **Wireless Controller Configuration** screen appears.
2. From the left pane, click **Software Maintenance**. The **HWC Software** tab appears.
3. To delete a software image from the list, in the **Available HWC Images** list, click the image.
4. Click **Delete**. The image is removed from the list.

12.4.2 Updating operating system software

You can update the Operating System (OS) software using the Software Maintenance function.

To upgrade operating system software:

1. From the main menu, click **Wireless Controller Configuration**. The **Wireless Controller Configuration** screen appears.
2. From the left pane, click **Software Maintenance**. The **HWC Software** tab appears.
3. Click the **OS Software** tab.



HiPath Wireless Assistant - Wireless Controller Configuration - Microsoft Internet Explorer

File Edit View Favorites Tools Help

SIEMENS HiPath Wireless Controller Configuration

Home | Logs & Traces | Reports | Wireless Controller | Wireless APs | VNS Configuration | Mitigator Help | LOGOUT

System Maintenance
Routing Protocols
IP Addresses
Port Exception Filters
Check Point
Mitigator
Mobility Manager
SNMP
Network Time
Management Users
Software Maintenance
Utilities
Web Settings
Secure Connections

HWC Software | OS Software | Backup | Restore | HWC Product Keys

Available OS Images:

AC-0_0_1.tar
AC-3_1_5.tar
AC-3_1_6.tar
AC-3_1_7.tar
AC-4_0_0.tar
AC-4_0_2.tar
AC-4_0_3.tar

Delete

Download Image:

FTP Server:
User ID:
Password:
Confirm:
Directory:
Filename:

Download

Upgrade:

Select an image to use: AC-0_0_1.tar

Upgrade Now

[HWC | C1000] User: admin Port status: M

Software: V4 R1.2.3 (4.0.1.02.03) | Tracing: Inactive
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Local intranet

The **Available OS Images** area displays the list of software versions that have been downloaded and are available.

4. In the **Upgrade** area, select an image from the **Select an image to use** drop-down list.
5. To launch the upgrade with the selected image, click **Upgrade Now**.
6. In the dialog box that appears, confirm the upgrade.

   At this point, all sessions are closed. The previous software is uninstalled automatically. The new software is installed. The HiPath Wireless Controller reboots automatically.

To download a new operating system software image:

1. From the main menu, click **Wireless Controller Configuration**. The **Wireless Controller Configuration** screen appears.
2. From the left pane, click **Software Maintenance**. The **HWC Software** tab appears.
3. Click the **OS Software** tab.
4. To download a new image to be added to the list, in the **Download Image** area type the following:
   - **FTP Server** – The IP of the FTP server to retrieve the image file from.
   - **User ID** – The user ID that the controller should use when it attempts 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.
   - **Platform** – The AP hardware type to which the image applies. The are several types of AP and they require different images.
5. Click **Download**. The image is downloaded and added to the list.

To delete a HiPath Wireless Controller software image:

1. From the main menu, click **Wireless Controller Configuration**. The **Wireless Controller Configuration** screen appears.
2. From the left pane, click **Software Maintenance**. The **HWC Software** tab appears.
3. Click the **OS Software** tab.

4. To delete a software image from the list, in the **Available OS Images** list, click the image.

5. Click **Delete**. The image is removed from the list.

12.4.3 Backing up HiPath Wireless Controller software

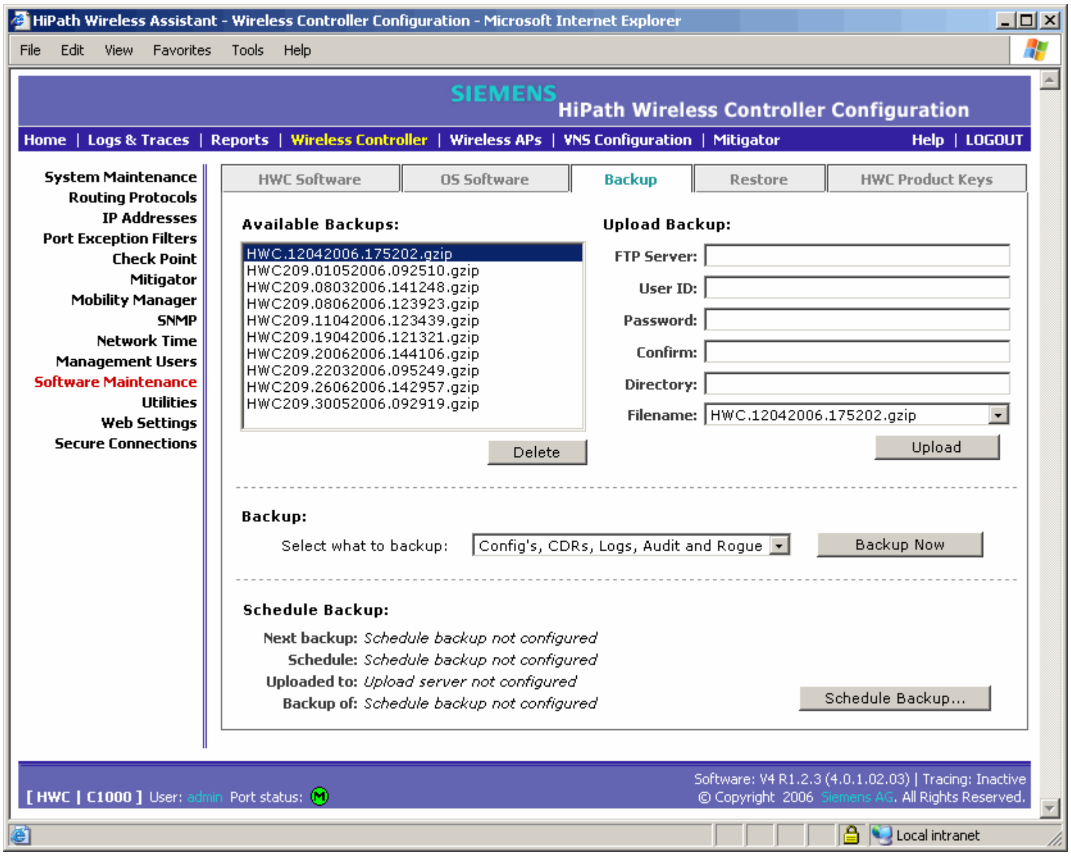
You can backup the HiPath Wireless Controller database. You can also schedule the backups to occur. When a scheduled backup is defined, you can configure to have the scheduled backup copied to an FTP server when the backup is complete.

To back up the HiPath Wireless Controller software:

1. From the main menu, click **Wireless Controller Configuration**. The **Wireless Controller Configuration** screen appears.

2. From the left pane, click **Software Maintenance**. The **HWC Software** tab appears.

3. Click the **Backup** tab.



Available Backups:

HWC.12042006.175202.gzip
HWC209.01052006.092510.gzip
HWC209.08032006.141248.gzip
HWC209.08062006.123923.gzip
HWC209.11042006.123439.gzip
HWC209.19042006.121321.gzip
HWC209.20062006.144106.gzip
HWC209.22032006.095249.gzip
HWC209.26062006.142957.gzip
HWC209.30052006.092919.gzip

Upload Backup:

FTP Server:
User ID:
Password:
Confirm:
Directory:
Filename: HWC.12042006.175202.gzip

Backup:

Select what to backup: Config's, CDRs, Logs, Audit and Rogue

Schedule Backup:

Next backup: *Schedule backup not configured*
Schedule: *Schedule backup not configured*
Uploaded to: *Upload server not configured*
Backup of: *Schedule backup not configured*

[HWC | C1000] User: admin Port status: M
Software: V4 R1.2.3 (4.0.1.02.03) | Tracing: Inactive
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The **Available Backups** area displays the list items that have been backed up and are available.

4. In the **Backup** area, select an item from the **Select what to backup** drop-down list.

5. To launch the backup with the selected items, click on the **Backup Now** button.
6. In the dialog box that appears, confirm the backup. The items are backed up.

To upload a new backup:

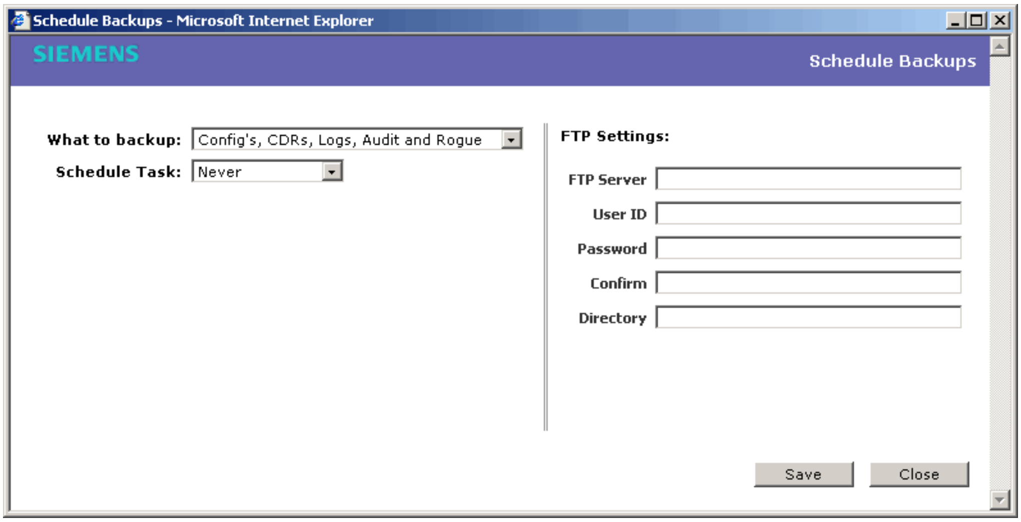
1. From the main menu, click **Wireless Controller Configuration**. The **Wireless Controller Configuration** screen appears.
2. From the left pane, click **Software Maintenance**. The **HWC Software** tab appears.
3. Click the **Backup** tab.
4. To upload a new backup, which will be added to the list, in the **Upload Backup** area type the following:
   - **FTP Server** – The IP of the FTP server to retrieve the image file from.
   - **User ID** – The user ID that the controller should use when it attempts 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.
   - **Filename** – The name that will be given to the image file when it is stored on the FTP server.
   - **Platform** – The AP hardware type to which the image applies. The are several types of AP and they require different images.
5. Click **Upload**. The backup is uploaded and added to the list.

To delete a backup:

1. From the main menu, click **Wireless Controller Configuration**. The **Wireless Controller Configuration** screen appears.
2. From the left pane, click **Software Maintenance**. The **HWC Software** tab appears.
3. Click the **Backup** tab.
4. To delete a backup from the list, in the **Available Backups** list, click the backup.
5. Click **Delete**. The backup is removed from the list.

To schedule a backup:

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



What to backup: Config's, CDRs, Logs, Audit and Rogue
Schedule Task: Never

FTP Settings:
FTP Server
User ID
Password
Confirm
Directory

5. In the What to backup drop-down list, select 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, select the frequency of the backup:
   - Daily
   - Weekly
   - Monthly
   - Never
7. In the FTP settings area, 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 that the controller should use when it attempts 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.

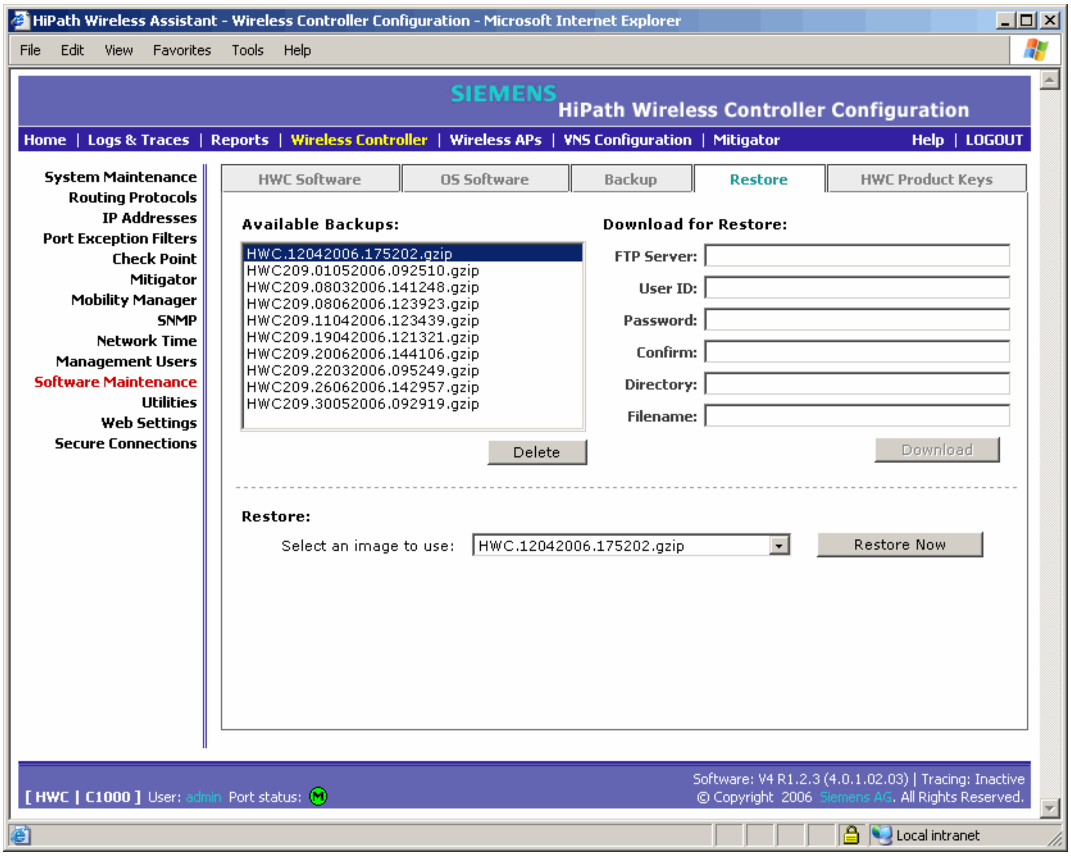
8. To save your changes, click **Save**.

12.4.4 Restoring HiPath Wireless Controller software

You can restore the HiPath Wireless Controller database.

To restore the HiPath Wireless Controller software:

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



Available Backups:

```
HWC.12042006.175202.gzip
HWC209.01052006.092510.gzip
HWC209.08032006.141248.gzip
HWC209.08062006.123923.gzip
HWC209.11042006.123439.gzip
HWC209.19042006.121321.gzip
HWC209.20062006.144106.gzip
HWC209.22032006.095249.gzip
HWC209.26062006.142957.gzip
HWC209.30052006.092919.gzip
```

Download for Restore:

FTP Server:
User ID:
Password:
Confirm:
Directory:
Filename:

Restore:

Select an image to use: HWC.12042006.175202.gzip

[HWC | C1000] User: admin Port status: M

Software: V4 R1.2.3 (4.0.1.02.03) | Tracing: Inactive
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The **Available Backups** area displays the list items that have been backed up and are available.

4. In the **Restore** area, select an item from the **Select an image to use** drop-down list.

5. To launch the backup with the selected items, click on the **Restore Now** button.

6. In the dialog box that appears, confirm the restore. The image is restored.

To download for restore:

1. From the main menu, click **Wireless Controller Configuration**. The **Wireless Controller Configuration** screen appears.

2. From the left pane, click **Software Maintenance**. The **System Maintenance** screen appears.

3. Click the **Restore** tab.

4. To download an image for restore, which will be added to the list, in the **Download for Restore** area type the following:

   - **FTP Server** –The FTP server to retrieve the image file from.

- **User ID** – The user ID that the controller should use when it attempts 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.
- **Platform** – The AP hardware type to which the image applies. The are several types of AP and they require different images.

5. Click **Download**. The image is downloaded and added to the list.

To delete a backup available for restore:

1. From the main menu, click **Wireless Controller Configuration**. The **Wireless Controller Configuration** screen appears.
2. From the left pane, click **Software Maintenance**. The **System Maintenance** screen appears.
3. Click the **Restore** tab.
4. To delete a backup from the list, in the **Available Backups** list, click the backup.
5. Click **Delete**. The backup is removed from the list.

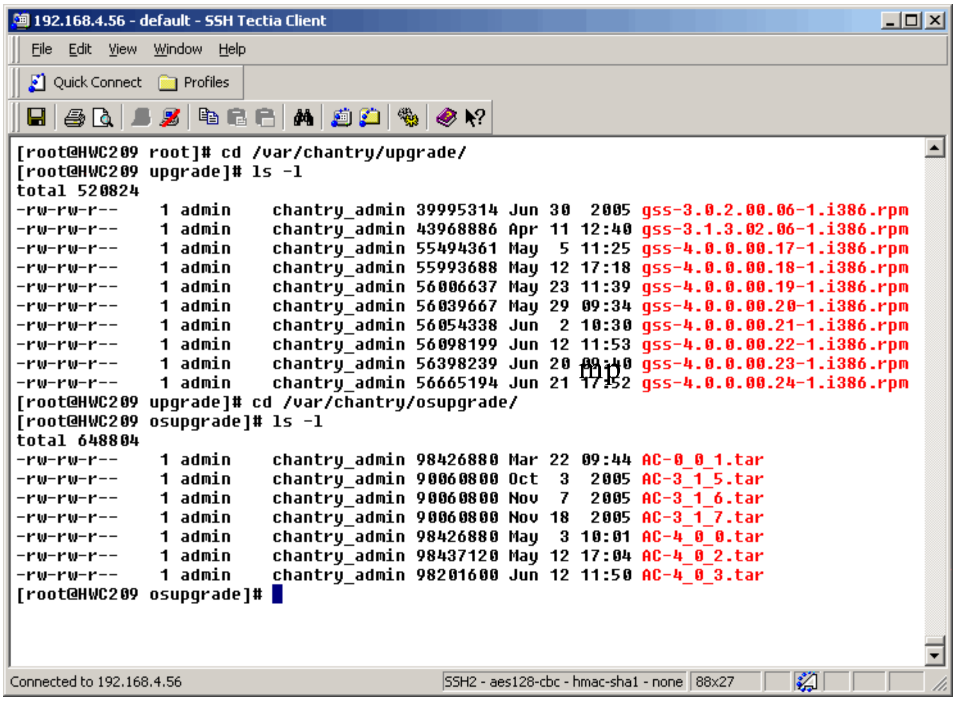
12.4.5 Upgrading a HiPath Wireless Controller using SFTP

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

> 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 screenshot uses putty as an example:


192.168.4.56 - default - SSH Tectia Client
File
Edit
View
Window
Help
Quick Connect
Profiles
Connected to 192.168.4.56
SSH2 - aes128-cbc - hmac-sha1 - none
88x27

```
[root@HWC209 root]# cd /var/chantry/upgrade/
[root@HWC209 upgrade]# ls -l
total 520824
-rw-rw-r--    1 admin    chantry_admin 39995314 Jun 30  2005 gss-3.0.2.00.06-1.i386.rpm
-rw-rw-r--    1 admin    chantry_admin 43968886 Apr 11 12:40 gss-3.1.3.02.06-1.i386.rpm
-rw-rw-r--    1 admin    chantry_admin 55494361 May  5 11:25 gss-4.0.0.00.17-1.i386.rpm
-rw-rw-r--    1 admin    chantry_admin 55993688 May 12 17:18 gss-4.0.0.00.18-1.i386.rpm
-rw-rw-r--    1 admin    chantry_admin 56006637 May 23 11:39 gss-4.0.0.00.19-1.i386.rpm
-rw-rw-r--    1 admin    chantry_admin 56039667 May 29 09:34 gss-4.0.0.00.20-1.i386.rpm
-rw-rw-r--    1 admin    chantry_admin 56054338 Jun  2 10:30 gss-4.0.0.00.21-1.i386.rpm
-rw-rw-r--    1 admin    chantry_admin 56098199 Jun 12 11:53 gss-4.0.0.00.22-1.i386.rpm
-rw-rw-r--    1 admin    chantry_admin 56398239 Jun 20 09:40 gss-4.0.0.00.23-1.i386.rpm
-rw-rw-r--    1 admin    chantry_admin 56665194 Jun 21 17:52 gss-4.0.0.00.24-1.i386.rpm
[root@HWC209 upgrade]# cd /var/chantry/osupgrade/
[root@HWC209 osupgrade]# ls -l
total 648804
-rw-rw-r--    1 admin    chantry_admin 98426880 Mar 22 09:44 AC-0_0_1.tar
-rw-rw-r--    1 admin    chantry_admin 90060800 Oct  3  2005 AC-3_1_5.tar
-rw-rw-r--    1 admin    chantry_admin 90060800 Nov  7  2005 AC-3_1_6.tar
-rw-rw-r--    1 admin    chantry_admin 90060800 Nov 18  2005 AC-3_1_7.tar
-rw-rw-r--    1 admin    chantry_admin 98426880 May  3 10:01 AC-4_0_0.tar
-rw-rw-r--    1 admin    chantry_admin 98437120 May 12 17:04 AC-4_0_2.tar
-rw-rw-r--    1 admin    chantry_admin 98201600 Jun 12 11:50 AC-4_0_3.tar
[root@HWC209 osupgrade]#
```

2. Change to the directory to receive the uploaded file:
   - For AP images change to: /var/tftp/chantry
   - For HiPath Wireless Controller images change to: /var/chantry/upgrade
   - For OS archives change to: /var/chantry/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 12.4.1, “Updating HiPath Wireless Controller software”, on page 250 or Section 12.4.2, “Updating operating system software”, on page 252.

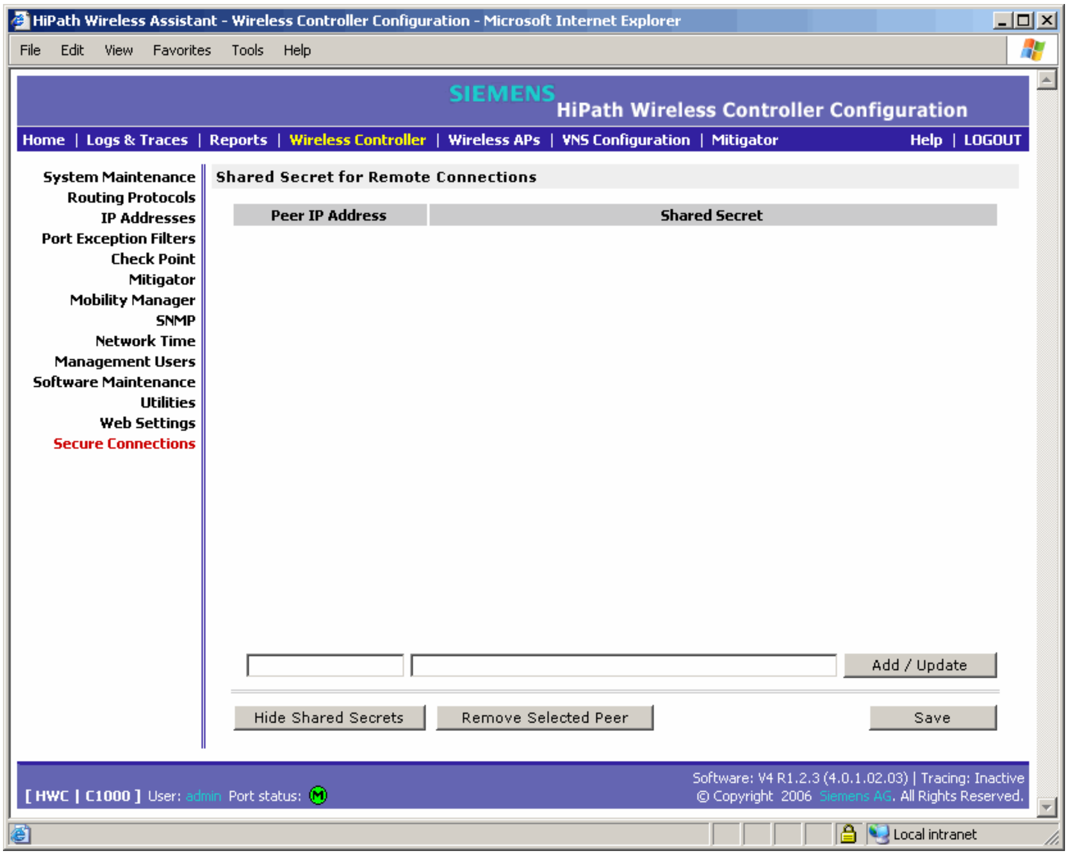
12.4.6 Configuring the controller for interaction with the HiPath Wireless Manager

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** screen appears.
2. From the left pane, click **Secure Connections**. The **Shared Secret for Remote Connections** screen appears.


HiPath Wireless Assistant - Wireless Controller Configuration - Microsoft Internet Explorer
File Edit View Favorites Tools Help
SIEMENS
HiPath Wireless Controller Configuration
Home | Logs & Traces | Reports | Wireless Controller | Wireless APs | VNS Configuration | Mitigator
Help | LOGOUT
System Maintenance
Routing Protocols
IP Addresses
Port Exception Filters
Check Point
Mitigator
Mobility Manager
SNMP
Network Time
Management Users
Software Maintenance
Utilities
Web Settings
Secure Connections
Shared Secret for Remote Connections
Peer IP Address
Shared Secret
Add / Update
Hide Shared Secrets
Remove Selected Peer
Save
[HWC | C1000] User: admin Port status:
Software: V4 R1.2.3 (4.0.1.02.03) | Tracing: Inactive
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Local intranet

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, select the IP address in the table and then click **Remove Selected Peer**.
8. To save your changes, click **Save**.

12.4.7 Configuring Controller, Access Points and Convergence Software logs and traces

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

- event and alarm logs (triggered by events)
- trace logs (triggered by component activity)
- 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).

12.4.8 Viewing log, alarm and trace messages

The HiPath Wireless Controller generates three 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
- Audits: files that record administrative changes made to the system (the GUI Audit displays changes to the Graphical User Interface on the HiPath Wireless Controller)

12.4.8.1 Logs including alarms

The log messages contain the time of event, severity, source component and any details generated by the source component. The messages are classified at four levels of severity:

- Informational, 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.

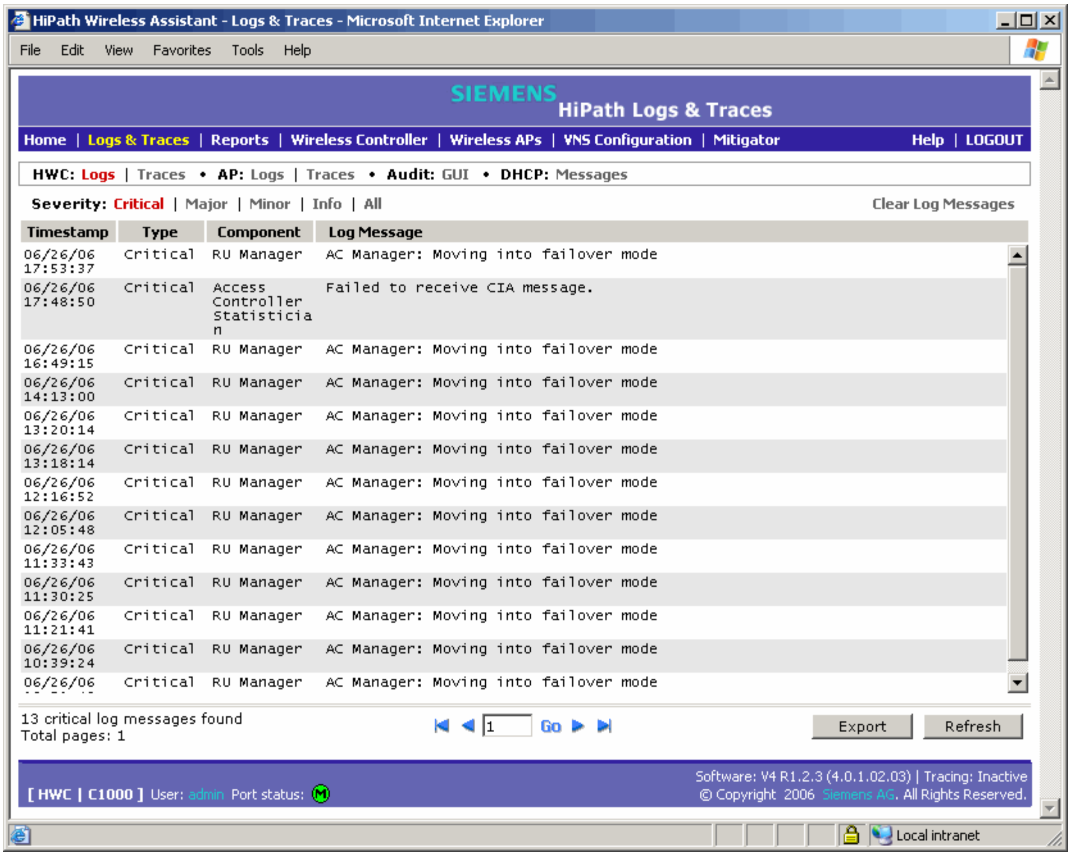
Examples of events on the HiPath Wireless Controller that generate an alarm message:

- 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. (For more information, see Section 9.4, “Setting up SNMP”, on page 159.)

To view logs:

1. From the main menu, click **Logs & Traces**. The **Logs & Traces** screen appears.
2. In the Navigation bar, click one of the **Log** tabs. The selected Log screen appears. The following is an example of the HiPath Wireless Controller logs:


HiPath Wireless Assistant - Logs & Traces - Microsoft Internet Explorer
File Edit View Favorites Tools Help
SIEMENS
HiPath Logs & Traces
Home | Logs & Traces | Reports | Wireless Controller | Wireless APs | VNS Configuration | Mitigator
Help | LOGOUT
HWC: Logs | Traces • AP: Logs | Traces • Audit: GUI • DHCP: Messages
Severity: Critical | Major | Minor | Info | All
Clear Log Messages
Go
Export
Refresh
[HWC | C1000] User: admin Port status:
Local intranet

Timestamp	Type	Component	Log Message
06/26/06 17:53:37	Critical	RU Manager	AC Manager: Moving into failover mode
06/26/06 17:48:50	Critical	Access Controller Statistician	Failed to receive CIA message.
06/26/06 16:49:15	Critical	RU Manager	AC Manager: Moving into failover mode
06/26/06 14:13:00	Critical	RU Manager	AC Manager: Moving into failover mode
06/26/06 13:20:14	Critical	RU Manager	AC Manager: Moving into failover mode
06/26/06 13:18:14	Critical	RU Manager	AC Manager: Moving into failover mode
06/26/06 12:16:52	Critical	RU Manager	AC Manager: Moving into failover mode
06/26/06 12:05:48	Critical	RU Manager	AC Manager: Moving into failover mode
06/26/06 11:33:43	Critical	RU Manager	AC Manager: Moving into failover mode
06/26/06 11:30:25	Critical	RU Manager	AC Manager: Moving into failover mode
06/26/06 11:21:41	Critical	RU Manager	AC Manager: Moving into failover mode
06/26/06 10:39:24	Critical	RU Manager	AC Manager: Moving into failover mode
06/26/06	Critical	RU Manager	AC Manager: Moving into failover mode

13 critical log messages found
Total pages: 1

Software: V4 R1.2.3 (4.0.1.02.03) | Tracing: Inactive
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The events are displayed in chronological order, sorted by the **Timestamp** column.

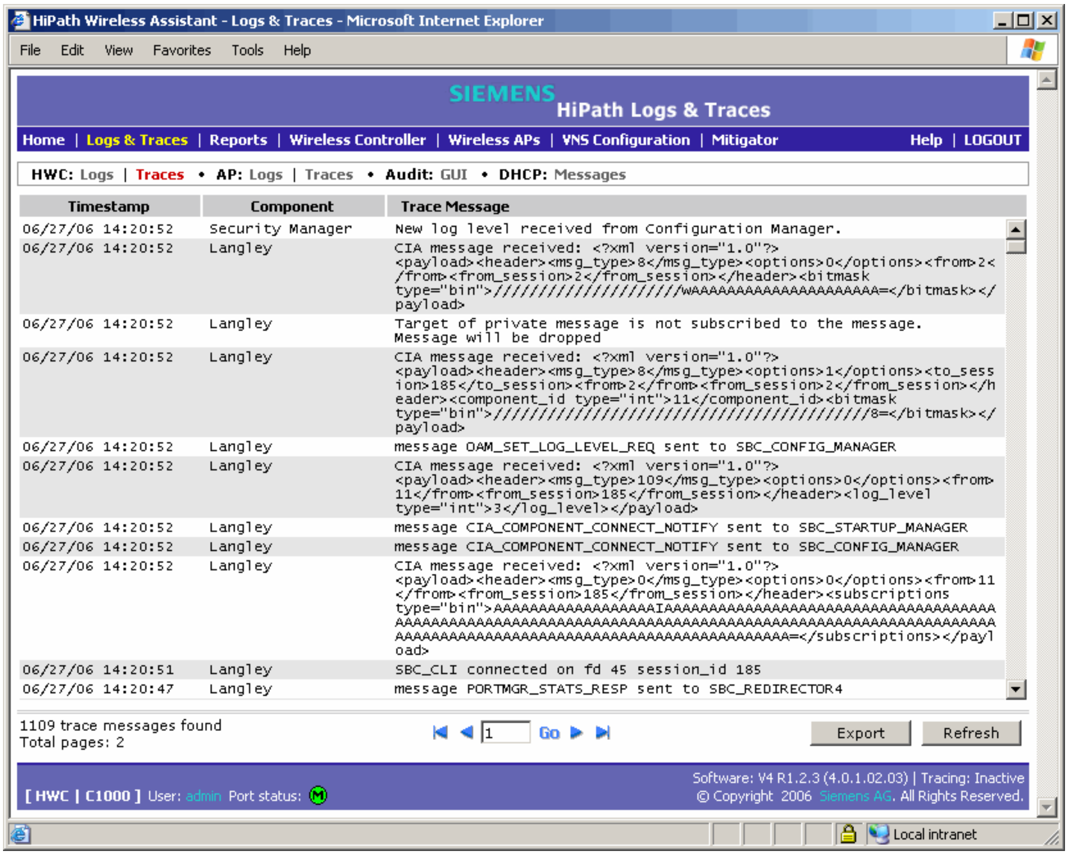
3. To sort the display by **Type** or **Component**, click the appropriate column heading.

4. To filter the logs by severity, in order to display only **Info**, **Minor**, **Major**, or **Critical** logs, click the appropriate **Log** tab at the top of the screen.
5. To refresh the information in any display, click **Refresh**.
6. To export information from a display as an HTML file, click the **Export** button.

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

To view traces:

1. From the main menu, click **Logs & Traces**. The **Logs & Traces** screen appears.
2. In the Navigation bar, click one of the **Traces** tabs. The selected Trace screen appears. The following is an example of the HiPath Wireless Controller traces:


HiPath Wireless Assistant - Logs & Traces - Microsoft Internet Explorer
File Edit View Favorites Tools Help
SIEMENS
HiPath Logs & Traces
Home | Logs & Traces | Reports | Wireless Controller | Wireless APs | VNS Configuration | Mitigator
Help | LOGOUT
HWC: Logs | Traces • AP: Logs | Traces • Audit: GUI • DHCP: Messages

Timestamp	Component	Trace Message
06/27/06 14:20:52	Security Manager	New log level received from Configuration Manager.
06/27/06 14:20:52	Langley	CIA message received: <?xml version="1.0"?> <payload><header><msg_type>8</msg_type><options>0</options><from>2</from><from_session>2</from_session></header><bitmask type="bin">////////////////////WAAAAAAAAAAAAAAAAAAAAAA=</bitmask></payload>
06/27/06 14:20:52	Langley	Target of private message is not subscribed to the message. Message will be dropped
06/27/06 14:20:52	Langley	CIA message received: <?xml version="1.0"?> <payload><header><msg_type>8</msg_type><options>1</options><to_session>185</to_session><from>2</from><from_session>2</from_session></header><component_id type="int">11</component_id><bitmask type="bin">//8=</bitmask></payload>
06/27/06 14:20:52	Langley	message OAM_SET_LOG_LEVEL_REQ sent to SBC_CONFIG_MANAGER
06/27/06 14:20:52	Langley	CIA message received: <?xml version="1.0"?> <payload><header><msg_type>109</msg_type><options>0</options><from>11</from><from_session>185</from_session></header><log_level type="int">3</log_level></payload>
06/27/06 14:20:52	Langley	message CIA_COMPONENT_CONNECT_NOTIFY sent to SBC_STARTUP_MANAGER
06/27/06 14:20:52	Langley	message CIA_COMPONENT_CONNECT_NOTIFY sent to SBC_CONFIG_MANAGER
06/27/06 14:20:52	Langley	CIA message received: <?xml version="1.0"?> <payload><header><msg_type>0</msg_type><options>0</options><from>11</from><from_session>185</from_session></header><subscriptions type="bin">AAAAAAAAAAAAAAAAAAIAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA=</subscriptions></payload>
06/27/06 14:20:51	Langley	SBC_CLI connected on fd 45 session_id 185
06/27/06 14:20:47	Langley	message PORTMGR_STATS_RESP sent to SBC_REDIRECTOR4

1109 trace messages found
Total pages: 2

1
Go
Export
Refresh
[HWC | C1000] User: admin Port status:
Software: V4 R1.2.3 (4.0.1.02.03) | Tracing: Inactive
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Local intranet

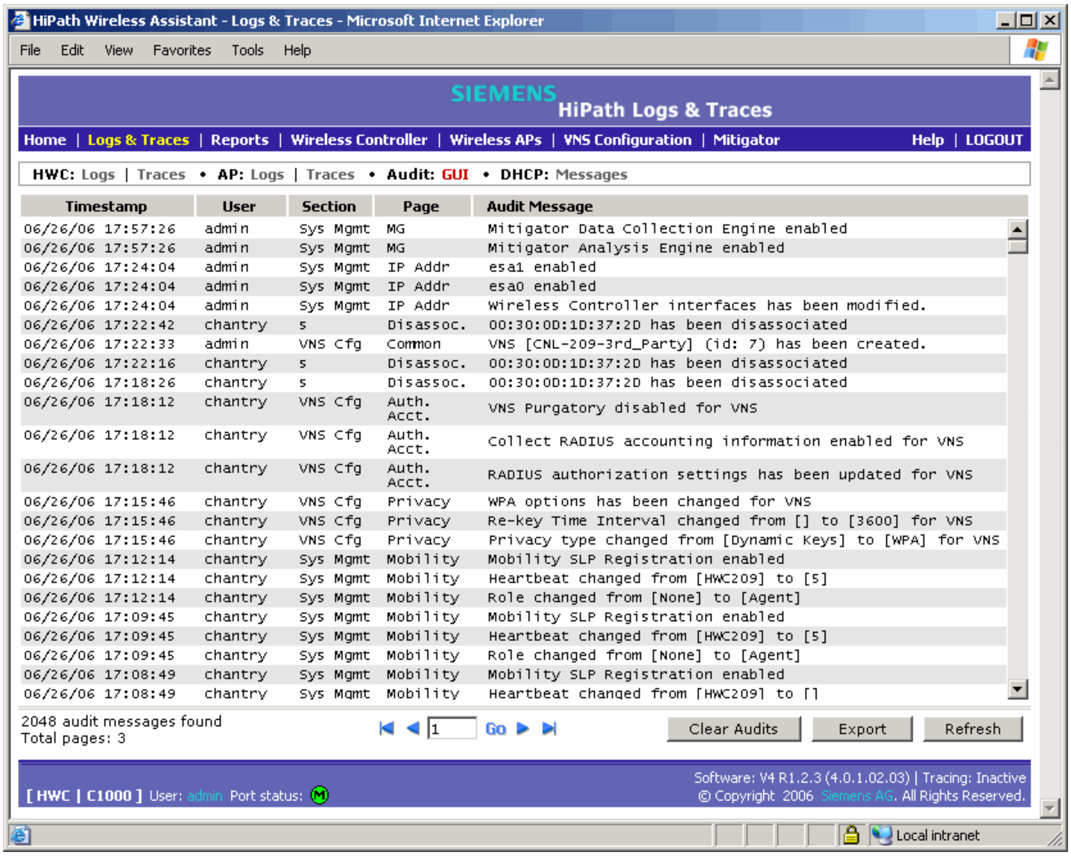
The events are displayed in chronological order, sorted by the **Timestamp** column.

3. To sort the display by **Type** or **Component**, click the appropriate column heading.
4. To filter the traces by severity, in order to display only **Info**, **Minor**, **Major**, or **Critical** traces, click the appropriate **Traces** tab at the top of the screen.

5. To refresh the information in any display, click **Refresh**.
6. To export information from a display as an HTML file, click the **Export** button.

To view audits:

1. From the main menu, click **Logs & Traces**. The **Logs & Traces** screen appears.
2. In the Navigation bar, click the **Audit: GUI** tab. The **Audit** screen appears.


HiPath Wireless Assistant - Logs & Traces - Microsoft Internet Explorer
File Edit View Favorites Tools Help
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HiPath Logs & Traces
Home | Logs & Traces | Reports | Wireless Controller | Wireless APs | VNS Configuration | Mitigator
Help | LOGOUT
HWC: Logs | Traces • AP: Logs | Traces • Audit: GUI • DHCP: Messages

Timestamp	User	Section	Page	Audit Message
06/26/06 17:57:26	admin	Sys Mgmt	MG	Mitigator Data Collection Engine enabled
06/26/06 17:57:26	admin	Sys Mgmt	MG	Mitigator Analysis Engine enabled
06/26/06 17:24:04	admin	Sys Mgmt	IP Addr	esa1 enabled
06/26/06 17:24:04	admin	Sys Mgmt	IP Addr	esa0 enabled
06/26/06 17:24:04	admin	Sys Mgmt	IP Addr	Wireless Controller interfaces has been modified.
06/26/06 17:22:42	chantry	s	Disassoc.	00:30:0D:1D:37:2D has been disassociated
06/26/06 17:22:33	admin	VNS Cfg	Common	VNS [CNL-209-3rd_Party] (id: 7) has been created.
06/26/06 17:22:16	chantry	s	Disassoc.	00:30:0D:1D:37:2D has been disassociated
06/26/06 17:18:26	chantry	s	Disassoc.	00:30:0D:1D:37:2D has been disassociated
06/26/06 17:18:12	chantry	VNS Cfg	Auth. Acct.	VNS Purgatory disabled for VNS
06/26/06 17:18:12	chantry	VNS Cfg	Auth. Acct.	Collect RADIUS accounting information enabled for VNS
06/26/06 17:18:12	chantry	VNS Cfg	Auth. Acct.	RADIUS authorization settings has been updated for VNS
06/26/06 17:15:46	chantry	VNS Cfg	Privacy	WPA options has been changed for VNS
06/26/06 17:15:46	chantry	VNS Cfg	Privacy	Re-key Time Interval changed from [] to [3600] for VNS
06/26/06 17:15:46	chantry	VNS Cfg	Privacy	Privacy type changed from [Dynamic Keys] to [WPA] for VNS
06/26/06 17:12:14	chantry	Sys Mgmt	Mobility	Mobility SLP Registration enabled
06/26/06 17:12:14	chantry	Sys Mgmt	Mobility	Heartbeat changed from [HWC209] to [5]
06/26/06 17:12:14	chantry	Sys Mgmt	Mobility	Role changed from [None] to [Agent]
06/26/06 17:09:45	chantry	Sys Mgmt	Mobility	Mobility SLP Registration enabled
06/26/06 17:09:45	chantry	Sys Mgmt	Mobility	Heartbeat changed from [HWC209] to [5]
06/26/06 17:09:45	chantry	Sys Mgmt	Mobility	Role changed from [None] to [Agent]
06/26/06 17:08:49	chantry	Sys Mgmt	Mobility	Mobility SLP Registration enabled
06/26/06 17:08:49	chantry	Sys Mgmt	Mobility	Heartbeat changed from [HWC209] to []

2048 audit messages found
Total pages: 3

1
Go
Clear Audits
Export
Refresh
[HWC | C1000] User: admin Port status:
Software: V4 R1.2.3 (4.0.1.02.03) | Tracing: Inactive
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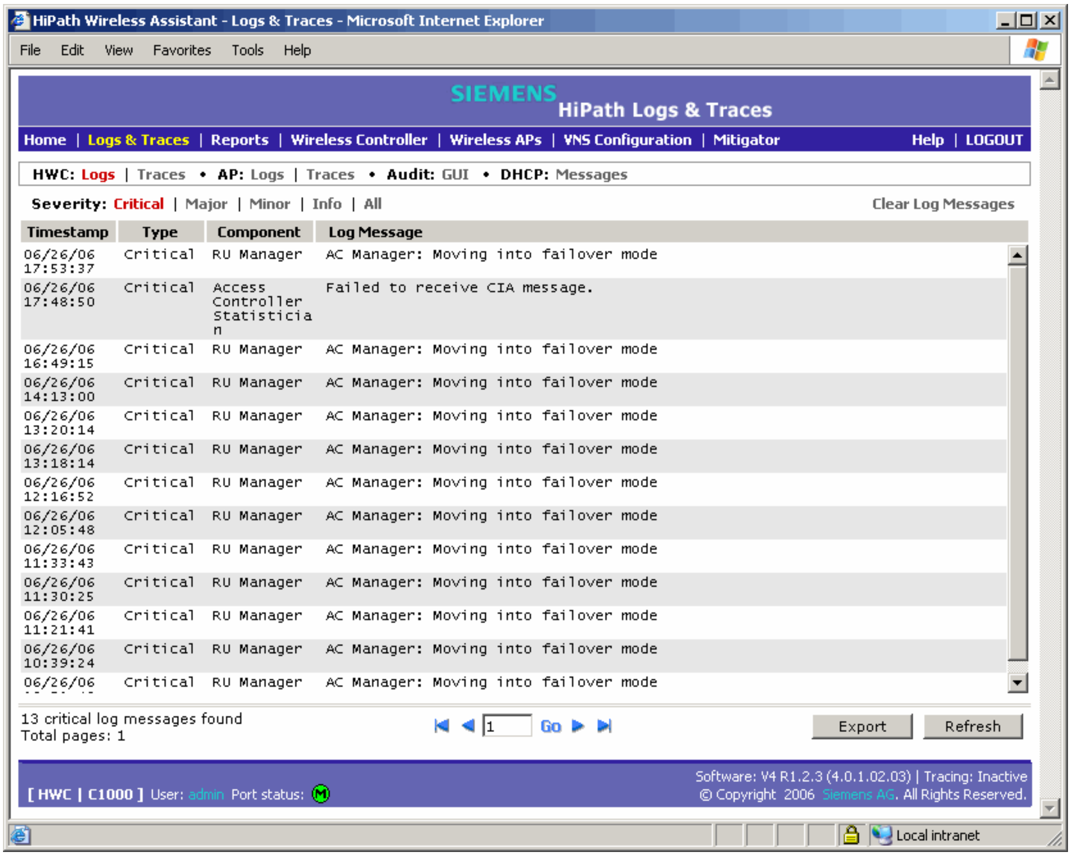
Local intranet

The events are displayed in chronological order, sorted by the **Timestamp** column.

3. To sort the display by **User**, **Section**, **Page**, or **Audit Message**, click the appropriate column heading.
4. To clear the audits from the list, click **Clear Audits**.
5. To refresh the information in any display, click **Refresh**.
6. To export information from a display as an HTML file, click the **Export** button.

To clear logs:

1. From the main menu, click **Logs & Traces**. The **Logs & Traces** screen appears.
2. In the Navigation bar, click one of the **Log** tabs. The selected Log screen appears. The following is an example of the HiPath Wireless Controller logs: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HWC: Logs | Traces • AP: Logs | Traces • Audit: GUI • DHCP: Messages
Severity: Critical | Major | Minor | Info | All
Clear Log Messages
Go
Export
Refresh
Local intranet

Timestamp	Type	Component	Log Message
06/26/06 17:53:37	Critical	RU Manager	AC Manager: Moving into failover mode
06/26/06 17:48:50	Critical	Access Controller Statisticia n	Failed to receive CIA message.
06/26/06 16:49:15	Critical	RU Manager	AC Manager: Moving into failover mode
06/26/06 14:13:00	Critical	RU Manager	AC Manager: Moving into failover mode
06/26/06 13:20:14	Critical	RU Manager	AC Manager: Moving into failover mode
06/26/06 13:18:14	Critical	RU Manager	AC Manager: Moving into failover mode
06/26/06 12:16:52	Critical	RU Manager	AC Manager: Moving into failover mode
06/26/06 12:05:48	Critical	RU Manager	AC Manager: Moving into failover mode
06/26/06 11:33:43	Critical	RU Manager	AC Manager: Moving into failover mode
06/26/06 11:30:25	Critical	RU Manager	AC Manager: Moving into failover mode
06/26/06 11:21:41	Critical	RU Manager	AC Manager: Moving into failover mode
06/26/06 10:39:24	Critical	RU Manager	AC Manager: Moving into failover mode
06/26/06	Critical	RU Manager	AC Manager: Moving into failover mode

13 critical log messages found
Total pages: 1

[HWC | C1000] User: admin Port status: M

Software: V4 R1.2.3 (4.0.1.02.03) | Tracing: Inactive
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The events are displayed in chronological order, sorted by the **Timestamp** column.

3. To clear the logs, click **Clear Log Messages**.

13 Glossary

13.1 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.

Table 19

Term	Explanation
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".
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.

Table 19

Term	Explanation
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)
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)

Table 19

Term	Explanation
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 Access Point (AP). These encryption keys are used as dynamic WEP keys, allowing traffic to each individual user to be encrypted using a separate key.

Table 19

Term	Explanation
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)
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)

Table 19

Term	Explanation
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.

Table 19

Term	Explanation
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.
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.)

Table 19

Term	Explanation
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 19

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.

Table 19

Term	Explanation
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).
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)

Table 19

Term	Explanation
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.

Table 19

Term	Explanation
OS	Operating system.
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).

Table 19

Term	Explanation
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
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.

Table 19

Term	Explanation
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.

Table 19

Term	Explanation
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.
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).

Table 19

Term	Explanation
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.

Table 19

Term	Explanation
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.
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.

Table 19

Term	Explanation
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.

Table 19

Term	Explanation
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).
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.

Table 19

Term	Explanation
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 19

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.

Table 19

Term	Explanation
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 access point 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 19

13.2 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 access points (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.

Table 20

Term	Explanation
DRM (dynamic radio/ RF management)	The DRM feature consists of software on the Wireless AP that provides dynamic radio frequency (RF) management. For Wireless APs with the DRM feature enabled and on a common channel, the power levels will be adjusted to balance coverage if a Wireless AP is added to, or leaves, the network. The feature also allows wireless clients to be moved to another Wireless AP if the load is too high. The feature can also be set to scan automatically for a channel, using a channel selection algorithm.
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.
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.

Table 20

Term	Explanation
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 both 802.11a and 802.11b/g radios.

Table 20

A System states and LEDs

A.1 HiPath Wireless Controller system states and LEDs

The HiPath Wireless Controller has the two system states: Standby and Active.

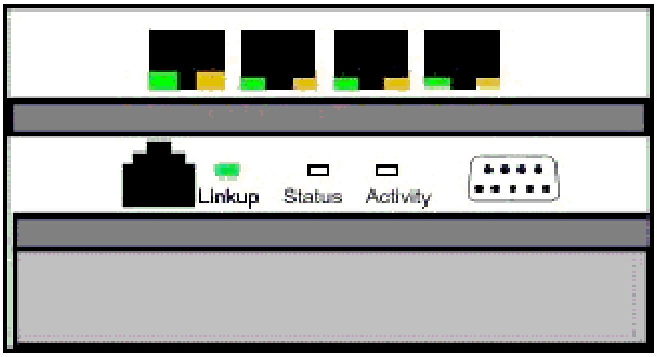
It enters Standby state when shut down in the user interface. During this state, the HiPath Wireless Controller:

- sends a control message to Wireless APs to enter Standby state
- does not handle any wireless traffic or sessions
- disables DHCP, Policy Manager, Security Manager, Wireless AP Manager, and Redirector
- remains on the wired network

The HiPath Wireless Controller enters Active state on startup in the user interface. It responds to the Wireless AP's discover message by returning a message indicating that the Wireless AP can enter the active state.

A.1.1 Activity and traffic monitoring

The activity and traffic on the HiPath Wireless Controller is monitored via three LEDs on the back of the HiPath Wireless Controller. These LEDs are Link, Status, and Activity.



The three LEDs perform the following functions:

- Link LED: Displays the link status of management port Ethernet link as seen by the system software. This LED is only visible at the back of the HiPath Wireless Controller
- Status LED: Indicates the state of the controller from software point of view, normal operation, whether processes have gone down, are restarting, and so on. This LED is visible from both the front and the back of the HiPath Wireless Controller.

- Activity LED: Indicates the amount of traffic carried to and from Wireless APs. This LED is visible from both the front and the back of the HiPath Wireless Controller.

Table 21 shows the sequence of the Status and Activity LEDs.

System State	Status LED	Activity LED
Power up	Off	Off
Services started: WDTSTAT installed (init.d starts services)	Blinking Amber	Off
Startup Manager Task started	Solid Amber	Blinking Amber
Startup Manager Task completes startup – all components started	Solid Green	Blinking green, if traffic Blank, if no traffic
A component fails to start or needs restarting (Startup Manager Task retrying that component)	Solid Amber	Blinking green
HiPath Wireless Controller fails to boot	Solid Red	Off
A component fails (no more retries)	Solid Red	Off
System about to be reset by watchdog	Blinking Red	Off

Table 21 Status and Activity LED sequence

A.2 Wireless AP system states

For the Wireless AP, the Status LED in the center also indicates power. The Status LED is dark when unit is off and is green (solid) when the AP has completed discovery and is operational.

The chart below shows states and corresponding Status LED displays:

State / Process	Description	LEDs
Power	Wireless AP not powered.	Off
Power	Start up: Power On Self Test (POST)	Steady green (briefly)
Power	Power On Self Test (POST) successful	Off (briefly)
Discovery	If the POST self test is successful, the AP begins Discovery process. Wireless AP is powered on and searching for an active HiPath Wireless Controller. It sends a discover message and waits for a response	Orange (steady)
Fail to find DHCP	Wireless AP failed to find DHCP (will stay in this state until a route appears).	Red-orange (alternate blink)

Table 22 Wireless AP system states and status LED displays

State / Process	**Description**	**LEDs**
Failed discovery	If there are SLP issues in failed discovery, the LED display changes.	Green-orange (alternate blink)
Registration	Wireless AP learns the HiPath Wireless Controller's IP address, and can begin the Registration process	Orange (blink)
Failed Registration	Wireless AP fails to learn the HiPath Wireless Controller's IP address.	Red (blink)
Standby	1. Wireless AP enters this state from Discovery when it encounters an active HiPath Wireless Controller and completes the Registration process. 2. Wireless AP enters this state from Active when it receives a control message from the HiPath Wireless Controller to enter this state. If the Wireless AP has any wireless device traffic, it will drop the traffic.	Green (blink)
	Wireless AP fails to register. It will wait 5 seconds and try again.	Red (slow blink)
	Firmware download from the HiPath Wireless Controller is in progress	Orange + green (blink)
Active (Ready)	Wireless AP has received a control message from an active HiPath Wireless Controller to enter active or ready state. It is ready to receive wireless traffic. **Note:** The two Traffic LEDs on either side of the Status LED display a green (blink) if there is active wireless traffic. The left LED is for the 2.4 GHz radio. The right LED is for the 5 GHz radio.	Green (steady)
Vulnerable time interval	Vulnerable time interval (the HiPath Wireless Controller resets to factory default if powered-off for three consecutive times during this state). No vulnerable period when access point is resetting to factory defaults.	Left: Green/Off Center: Off/ Green Right: Green/ Off
Upgrading firmware	Wireless AP is upgrading its firmware	Center: Red/ Green

Table 22 Wireless AP system states and status LED displays

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Our strengths - Your advantages

Siemens is known worldwide as a trailblazer in the advancement of information and communication technologies. No other company offers such a comprehensive and innovative product portfolio.

With the one-of-a-kind Siemens convergence architecture, HiPath, guide your customers to a secure and flexible migration into the world of innovative IP convergence solutions.

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