Welcome to the Airespace Product Guide!

Airespace System 1.2: Last Updated October 10, 2003

Refer to the *OVERVIEWS* section to see a big picture view of Airespace products and features.

See the *SOLUTIONS* section to look through real-world network and application-specific solutions to real-world problems.

Go to the *TASKS* section to find detailed instructions on how to install, configure, use, and troubleshoot Airespace products and supported 802.11 networks.

Visit the *REFERENCES* section to see technical information, such as the Access Point Site Survey Guide, Quick Installation Guides, Web Browser Online Help files, and Release Notes.

FCC Statements for Airespace Switches and Appliances

FCC Statements for Airespace APs

Legal Information

Airespace Technical Support

Airespace System Release Notes

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Legal Information

This section includes the following legal information:

- *Limited Warranty*
- *Software License Agreement*
- *SSH Source Code Statement*
- *OpenSSL Project License Statements*
- *Trademarks and Service Marks*

Limited Product Warranty

The following describes the Airespace, Inc. standard Product Warranty for End Customers.

Products

- Airespace Wireless Switch (40XX) Family
- Airespace WLAN Appliance (41XX) Family
- Airespace Access Point (1200) Family

Limited Warranty

Airespace warrants that:

- For a period of one (1) year from the date of installation of the Product at the End Customer's site but not to exceed twenty-four (24) months after date of shipment by Airespace, the Hardware shall free from defects in materials and workmanship.
- For a period of three (3) months from the date of installation of the Product but not to exceed fifteen (15) months after date of shipment by Airespace, the Software shall substantially conform to the applicable specifications in Airespace's then-current published documentation.

  The date of shipment by Airespace is set forth on the packaging material in which the Product is shipped. This limited warranty extends only to you the original purchaser of the Product.

Exclusive Remedy

Your sole remedy under the limited warranty described above is, at Airespace's sole option and expense, the repair or replacement of the non-conforming Product or refund of the purchase price of the non-conforming Products. Airespace's obligation under this limited warranty is subject to compliance with Airespace's then-current Return Material Authorization ("RMA") procedures. All replaced Products will become the property of Airespace. Exchange Products not returned to Airespace will be invoiced at full Product list prices. Replacement Products may be new, reconditioned or contain refurbished materials. In connection with any warranty services hereunder, Airespace may in its sole discretion modify the Product at no cost to you to improve its reliability or performance.

Warranty Claim Procedures

Should a Product fail to conform to the limited warranty during the applicable warranty period as described above, Airespace must be notified during the applicable warranty period in order to have any obligation under the limited warranty.

The End Customer or their designated reseller must obtain a Return Material Authorization number (RMA number) from Airespace for the non-conforming Product and the non-conforming Product must be returned to Airespace according to the then-current RMA procedures. The End Customer or their designated reseller is responsible to ensure that the shipments are insured, with the transportation charges prepaid and that the RMA number is clearly marked on the outside of the package. Airespace will not accept collect shipments or those returned without an RMA number clearly visible on the outside of the package.

Exclusions and Restrictions

Airespace shall not be responsible for any software, firmware, information or memory data contained in, stored on or integrated with any Product returned to Airespace pursuant to any warranty or repair.

Upon return of repaired or replaced Products by Airespace, the warranty with respect to such Products will continue for the remaining unexpired warranty or sixty (60) days, whichever is longer. Airespace may provide out-of-warranty repair for the Products at its then-prevailing repair rates.

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Airespace Technical Support can provide end users and channel partners the following services:

- Telephone support
- Troubleshooting
- Escalating issues, as required

Please have the following available when making a call:

- Equipment model number(s)
- Airespace Wireless Switch and WLAN Appliance AireOS software revision level (AS_1_2_x_x)
- Airespace Control System Software revision level (1.2.x.xx)
- Symptom(s)
- Network configuration

You can find Airespace Technical Support information at *http://www.airespace.com/*.

FCC Statements for Airespace APs

This section includes the following FCC statements for the Airespace AP:

- *Class A Statement*
- *RF Radiation Hazard Warning*
- *Non-Modification Statement*
- *Deployment Statement*

Class A Statement

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

RF Radiation Hazard Warning

To ensure compliance with FCC RF exposure requirements, this device must be installed in a location such that the antenna of the device will be greater than 20 cm (8 in.) from all persons. Using higher gain antennas and types of antennas not covered under the FCC certification of this product is not allowed.

Installers of the radio and end users of the Airespace Wireless Enterprise Platform must adhere to the installation instructions provided in this manual.

Non-Modification Statement

Use only the supplied internal antenna, or external antennas supplied by the manufacturer. Unauthorized antennas, modifications, or attachments could damage the badge and could violate FCC regulations and void the user's authority to operate the equipment.

Note: Refer to the *Airespace System Release Notes* for 802.11a external antenna information. Contact Airespace, Inc. for a list of FCC-approved 802.11a and 802.11b/g external antennas.

Deployment Statement

This product is certified for indoor deployment only. Do not install or use this product outdoors.

FCC Statements for Airespace Switches and Appliances

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

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OVERVIEWS

Refer to the following for information about the Airespace Wireless Enterprise Platform (Airespace System) and other high-level subjects:

- *About the Airespace System*
  - *AireOS*
  - *Single-Airespace Switch or Appliance Deployments*
  - *Multiple-Airespace Switch and Appliance Deployments*
  - *AireOS Security*
  - *Airespace Wired Security*
  - *AireWave Director Software*
  - *Client Roaming*
  - *External DHCP Servers*
  - *Airespace Mobility Group*
  - *Airespace Wired Connections*
  - *Airespace WLANs*
  - *Transferring Files*
  - *Power Over Ethernet*
- *Airespace Switches and Appliances*
- *Airespace Access Points*
- *Third-Party Access Points*
- *Rogue Access Points*
- *Airespace Control System Software*
- *Airespace Web Browser Interface*
- *Airespace Command Line Interface*

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About the Airespace System

The Airespace Wireless Enterprise Platform (Airespace System) is designed to provide 802.11 wireless networking solutions for enterprises and service providers. The Airespace System simplifies deploying and managing large scale wireless LAN networks and enables a unique best-in-class security infrastructure. The AireOS, or Airespace Operating System, manages all subscriber, communications, and system administration functions, performs *AireWave Director Software* functions, manages system-wide mobility policies using the AireOS Security solution, and coordinates all security functions using the *AireOS Security* framework.

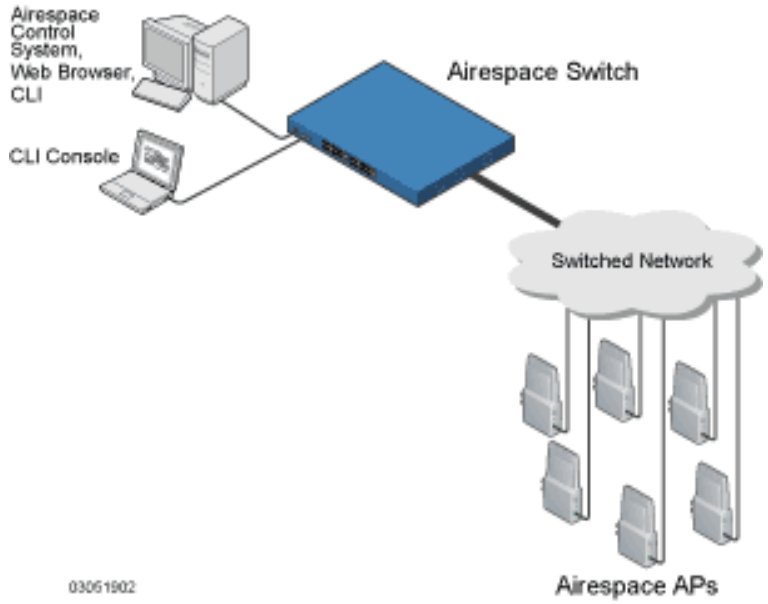
The Airespace System consists of Airespace Wireless Switches and WLAN Appliances (*Airespace Switches and Appliances*) and their associated Airespace APs (*Airespace Access Points*) controlled by the AireOS, all managed by any or all of the AireOS management interfaces.

- The Airespace Control System Software (ACS Software Server) interface is used to configure and monitor one or more Airespace Switches and Appliances and associated APs, and has tools to facilitate large-system monitoring and control. The *Airespace Control System Software* runs on any Windows 2000 or XP platform.
- A full-featured CLI (command line interface) can be used to configure and monitor individual Airespace Switches and Appliances. Refer to the *Airespace Command Line Interface* section.
- A full-featured Web Browser (HTTP) interface hosted by Airespace Switches and Appliances running on any platform with a supported Web browser can be used to configure and monitor individual Airespace Switches and Appliances. See the *Airespace Web Browser Interface* section.
- An industry-standard SNMP V1, V2c, and V3 interface can be used with any SNMP-compliant third-party network management system.

The Airespace solution also allows service providers to incorporate their existing Cisco 1200, Cisco 350 and ORiNOCO 2000 Access Points (*Third-Party Access Points*) into an expanding Airespace network.

The following figure shows the Airespace System components.

Figure - Airespace System Components in Appliance Mode



Refer to the following for more information:

- *AireOS*
- *Single-Airespace Switch or Appliance Deployments*
- *Multiple-Airespace Switch and Appliance Deployments*
- *AireOS Security*
- *Airespace Wired Security*
- *AireWave Director Software*

About the AireOS

The AireOS, or Airespace Operating System, is software that controls Airespace Wireless Switches and Airespace Access Points. It includes *AireOS Security* and *AireWave Director Software* functions.

Single-Airespace Switch or Appliance Deployments

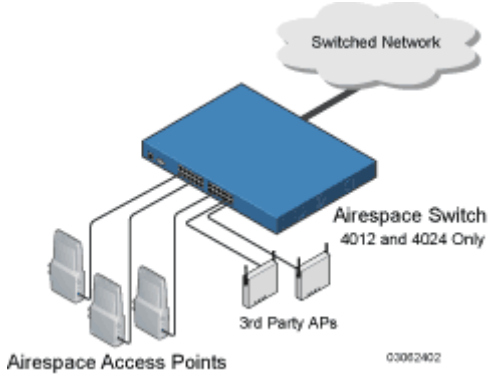
As described in *About the Airespace System*, a standalone Airespace Wireless Switch or WLAN Appliance can support Airespace Access Points (Airespace APs) and third-party APs across multiple floors and buildings simultaneously, and supports the following features:

- Autodetecting and autoconfiguring Airespace APs as they are added to the network, as described in *AireWave Director Software*.
- Full control of *Airespace Access Points*.
- Full control of associated *Third-Party Access Points* through the native third-party AP interface, and real-time control of system-wide WLAN 802.1x security policies.
- Full control of up to 16 Airespace AP and one third-party AP WLAN policy engines, as described in the *Airespace Switch and Appliance Quick Installation Guide*.

The following figures show typical single Airespace Wireless Switch deployed in *Direct Connect Mode* and *Appliance Mode*.

- In Direct Connect Mode, Airespace APs and third-party APs connect directly to the Model 4012 or 4024 Airespace Wireless Switch front panel, with or without the Airespace Wireless Switch providing *Power Over Ethernet* to the APs.

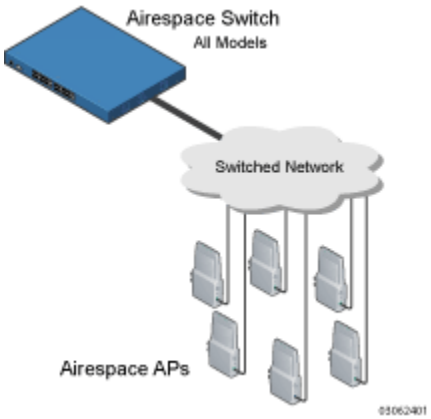
Figure - Typical Single 4012 or 4024 Airespace Wireless Switch Deployed in Direct Connect Mode



- In Appliance Mode, Airespace APs connect to the Model 4012 or 4024 Airespace Wireless Switch or 4101 or 4102 Airespace WLAN Appliances through the switched network. The switched network equipment may or may not provide *Power Over Ethernet* to the Airespace APs.

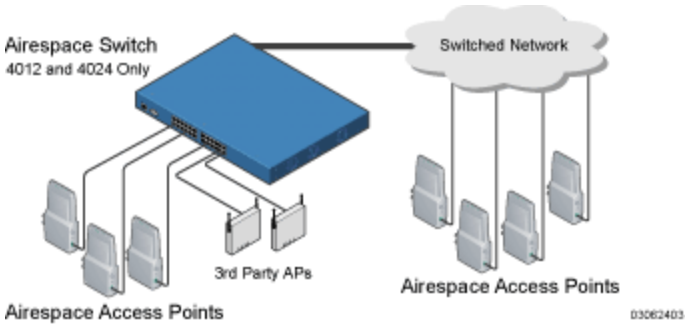
  Note that the 4102 Airespace WLAN Appliance uses two redundant GigE connections to bypass single network failures. At any given time one of the 4102 Airespace WLAN Appliance GigE connections is active and the other is passive. Upon a switched network failure, the active connection becomes passive, and the passive connection becomes active.

Figure - Typical Airespace Wireless Switches and WLAN Appliances Deployed in Appliance Mode



- In Hybrid Mode, the APs simultaneously connect to the Model 4012 or 4024 Airespace Wireless Switch in Direct Connect and Appliance Mode, with or without the Airespace Wireless Switch or the switched network equipment providing *Power Over Ethernet* to the Airespace APs.

Figure - Typical 4012 or 4024 Single Airespace Wireless Switch Deployed in Hybrid Mode



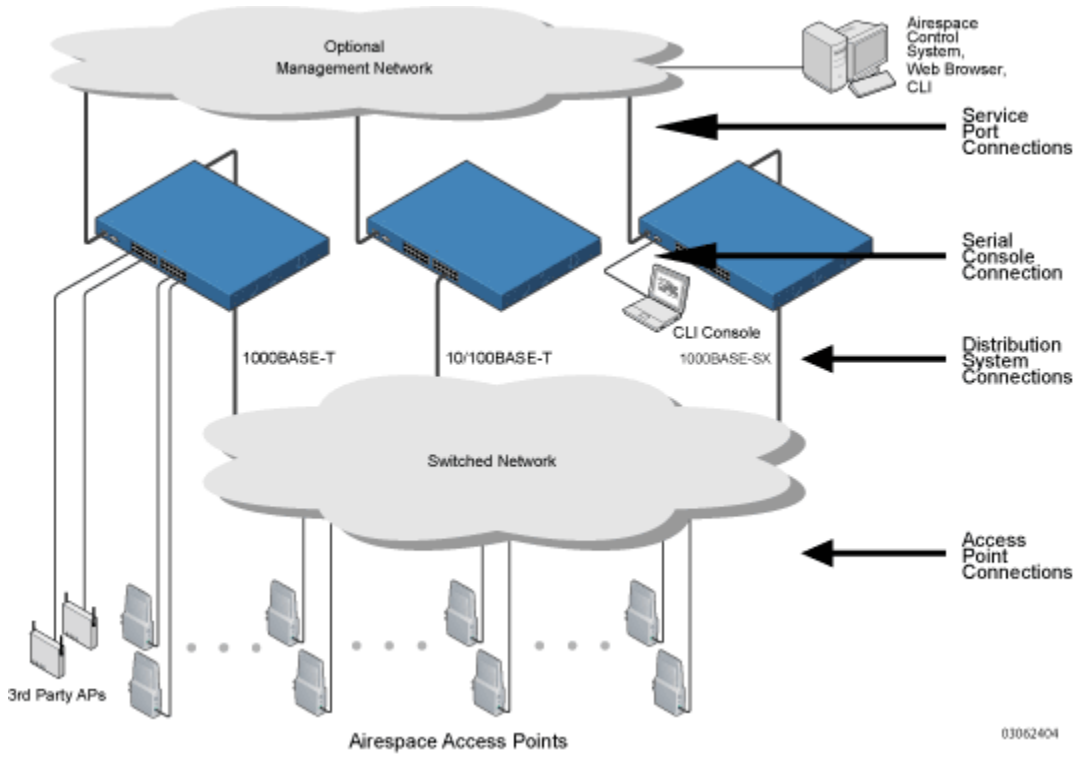
Multiple-Airespace Switch and Appliance Deployments

Each Airespace Wireless Switch can support Airespace APs and third-party APs across multiple floors and buildings simultaneously. Similarly, each Airespace WLAN Appliance can support Airespace APs across multiple floors and buildings simultaneously. However, the Airespace System's full functionality is realized when it includes multiple Airespace Switches and Appliances. That is, a multiple-Airespace Switch and Appliance system has the following additional features over a single-Airespace Switch or Appliance deployment:

- Autodetecting and autoconfiguring Airespace Switch or Appliance RF parameters as the Airespace Switches and Appliances are added to the network, as described in *AireWave Director Software*.
- *Same-Airespace Switch or Appliance (Layer 2) Roaming* and *Inter-Subnet (Layer 3) Roaming*.
- Automatic *Airespace Switch and Appliance Failover Protection* to any redundant Airespace Switch or Appliance with unused ports.

The following figure shows a typical multiple-Airespace Switch and Appliance deployment, with the Airespace Switch or Appliance in *Direct Connect Mode*, *Appliance Mode* and *Hybrid Mode*. The figure also shows an optional dedicated Management Network and the three physical connection types between the switched network and the Airespace Switch or Appliance, as further described in *Switched Network Connection to an Airespace Switch or Appliance*.

Figure - Typical Multiple-Airespace Wireless Switch and WLAN Appliance Deployment



About AireOS Security

AireOS Security bundles Layer 1, Layer 2 and Layer 3 802.11 Access Point security components into a simple, system-wide policy manager that creates independent security policies for each of up to 16 Airespace WLANs and one third-party WLAN. (Refer to *Airespace WLANs*.)

One of the barriers that made enterprises avoid deploying 802.11 networks was the inherent weakness of WEP (Wired Equivalent Privacy) encryption. Because WEP is so insecure, enterprises have been looking for more secure solutions for business-critical traffic.

The Layer 2 WEP weakness problem can be overcome using more-robust industry-standard security solutions, such as:

- 802.1X dynamic keys with EAP (extended authorization protocol), or
- WPA (Wi-Fi protected access) dynamic keys. The Airespace WPA implementation includes:
  - AES (advanced encryption standard),
  - TKIP + Michael (temporal key integrity protocol + message integrity code checksum) dynamic keys, or
  - WEP (Wired Equivalent Privacy) keys.

The WEP problem can be further solved using industry-standard Layer 3 security solutions, such as:

- Terminated and pass-through VPNs (virtual private networks), and
- Terminated and pass-through IPSec (IP security) protocols. The terminated Airespace IPSec implementation includes:
  - IKE (internet key exchange),
  - DH (Diffie-Hellman) groups, and
  - Three optional levels of encryption: DES (ANSI X.3.92 data encryption standard), 3DES (ANSI X9.52-1998 data encryption standard), or AES/CBC (advanced encryption standard/cipher block chaining).

  The Airespace IPSec implementation also includes industry-standard authentication using:
  - MD5 (message digest algorithm), or
  - SHA-1 (secure hash algorithm-1).
- The Airespace System supports local and RADIUS MAC (media access control) filtering.
- The Airespace System supports local and RADIUS user/password authentication.
- The Airespace System also uses manual and automated Blacklisting to block access to network services. In manual Blacklisting, the operator blocks access using client MAC addresses. In automated Blacklisting, which is always active, the AireOS software automatically blocks access to network services for an operator-defined period of time when a client fails to authenticate for a fixed number of consecutive attempts. This can be used to deter brute-force login attacks.

These and other *AireOS Security* features use industry-standard authorization and authentication methods to ensure the highest possible security for your business-critical wireless LAN traffic.

For information about Airespace wired security, refer to *Airespace Wired Security*.

About Airespace Wired Security

Many traditional Access Point vendors concentrate on security for the Wireless interface similar to that described in the *AireOS Security* section. However, for secure Airespace Switch and Appliance-to-Management Interfaces (*Airespace Control System Software*, *Airespace Web Browser Interface*, and *Airespace Command Line Interface*), Airespace Switch and Appliance-to-AP, and inter-Airespace Switch and Appliance communications during device management and *Client Roaming*, the AireOS includes built-in security.

The AireOS automatically loads signed X.509 certificates into each Airespace Switch and Appliance and Airespace AP to authenticate IPSec tunnels between devices. These IPSec tunnels ensure secure communications for mobility and management.

Airespace Switches and Appliances and Airespace APs also use the signed certificates to verify downloaded code before it is loaded, ensuring that hackers do not download malicious code into any Airespace Wireless Switch, Airespace WLAN Appliance or Airespace AP.

For information about Airespace wireless security, refer to *AireOS Security*.

About AireWave Director Software

Airespace, Inc. is the only company to offer the powerful, comprehensive, and dynamic AireWave Director Software solution to the 802.11 market. The AireWave Director Software allows Airespace Switches and Appliances to continually monitor their associated Airespace APs for the following information:

- Traffic Load -- How much total bandwidth is used for transmitting and receiving traffic. This allows WLAN managers to track network growth and plan network growth ahead of client demand.
- Interference -- How much traffic is coming from other 802.11 sources.
- Noise -- How much non-802.11 noise is interfering with the currently-assigned channel.
- Coverage -- Received Signal Strength (RSSI) and Signal to Noise Ratio (SNR) for all clients.
- Nearby APs.

Using the collected information, the AireWave Director Software can periodically reconfigure the 802.11 RF network within operator-defined limits for best efficiency. To do this, AireWave Director Software:

- Dynamically reassign channels to increase capacity and performance, both within the same Airespace Switch or Appliance and across multiple Airespace Switches and Appliances.
- Adjust the transmit power to balance coverage and capacity, both within the same Airespace Switch or Appliance and across multiple Airespace Switches and Appliances.
- Allows the operator to assign nearby Airespace APs into groups to streamline AireWave Director Software algorithm processing.
- As new clients associate, they are load balanced across grouped Airespace APs reporting to each Airespace Switch or Appliance. This is particularly important when many clients converge in one spot (such as a conference room or auditorium), because AireWave Director Software can automatically force some subscribers to associate with nearby APs, allowing higher throughput for all clients.
- Automatically detect and configure new Airespace APs as they are added to the network. The AireWave Director Software automatically adjusts nearby Airespace APs to accommodate the increased coverage and capacity.
- Automatically detect and configure new Airespace Switches and Appliances as they are added to the network. The AireWave Director Software automatically distributes associated Airespace APs to maximize coverage and capacity.
- Detect and report coverage holes, where clients consistently connect to an Airespace AP at a very low signal strength.
- Automatically define Airespace Switch and Appliance Groups within operator-defined Mobility Groups.

The AireWave Director Software solution thus allows the operator to avoid the costs of laborious historical data interpretation and individual Access Point reconfiguration. The power control features of AireWave Director Software ensure client satisfaction, and the coverage hole detection feature can alert the operator to the need for an additional (or relocated) Airespace AP.

Note that the AireWave Director Software uses separate monitoring and control for each of the deployed networks: 802.11a and 802.11b/802.11g. Also note that the AireWave Director Software is automatically enabled, but can be customized or disabled for individual Airespace APs.

Finally, for operators requiring easy manual configuration, the AireOS can recommend the best radio settings, and then assign them on operator command.

The AireWave Director Software controls produce a network that has optimal capacity, performance, and reliability. The AireWave Director Software functions also free the operator from having to continually monitor the network for noise and interference problems, which can be transient and difficult to troubleshoot. Finally, the AireWave Director Software controls ensure that clients enjoy a seamless, trouble-free connection through the Airespace 802.11 network.

About the Master Airespace Switch or Appliance

When you are adding Airespace APs to a *Multiple-Airespace Switch and Appliance Deployments* network configured in *Appliance Mode*, it is convenient to have all of the Airespace APs associate with one Master Airespace Wireless Switch or WLAN Appliance on the same subnet. That way, the operator does not have to log into multiple Airespace Switches and Appliances to find out which Airespace Switch or Appliance newly-added Airespace APs associated with.

One Airespace Switch or Appliance in each subnet can be assigned as the Master Airespace Switch or Appliance while adding Airespace APs. As long as a Master Airespace Switch or Appliance is active on the same subnet, all new Airespace APs without a *Primary Airespace Switch or Appliance* assigned automatically attempt to associate with the Master Airespace Switch or Appliance. This process is described in *Airespace Switch and Appliance Failover Protection*.

The operator can monitor the Master Airespace Switch or Appliance using the *Airespace Web Browser Interface* or the *Airespace Control System Software* GUI, and watch as Airespace APs associate with the Master Airespace Switch or Appliance. The operator can then verify Airespace AP configuration and assign a *Primary Airespace Switch or Appliance* to the Airespace AP, and reboot the Airespace AP so it reassociates with its Primary Airespace Switch or Appliance.

Note: Airespace APs without a *Primary Airespace Switch or Appliance* assigned always search for a Master Airespace Switch or Appliance first upon reboot. After adding Airespace APs through the Master Airespace Switch or Appliance, assign a Primary Airespace Switch or Appliance to each Airespace AP.
Airespace recommends that you disable the Master Airespace Switch or Appliance setting on all Airespace Switches and Appliances after initial configuration.

About the Primary Airespace Switch or Appliance

In *Multiple-Airespace Switch and Appliance Deployments* networks, Airespace APs can associate with any Airespace Wireless Switch or WLAN Appliance in *Appliance Mode* on the same subnet. To ensure that each Airespace AP associates with a particular Airespace Switch or Appliance, the operator can assign a Primary Airespace Switch or Appliance to the Airespace AP.

When an Airespace AP is added to a switched network, it looks for its Primary Airespace Switch or Appliance first, then a *Master Airespace Switch or Appliance*, then the least-loaded Airespace Switch or Appliance with available primary and secondary ports. Refer to *Airespace Switch and Appliance Failover Protection* for more information.

About Client Roaming

The Airespace System supports seamless client roaming across APs managed by the same Airespace Wireless Switch or WLAN Appliance, between Airespace Switches and Appliances on the same subnet, and across Airespace Switches and Appliances on different subnets. The following chapters describes the three modes of roaming supported by the Airespace System.

Same-Airespace Switch or Appliance (Layer 2) Roaming

Each Airespace Switch and Appliance supports same-Airespace Switch or Appliance client roaming across Airespace APs and third-party APs managed by the same Airespace Switch or Appliance, whether in *Direct Connect Mode*, *Appliance Mode* or *Hybrid Mode*. This roaming is transparent to the client, as the session is sustained and the client continues using the same DHCP-assigned or client-assigned IP address. Same-Airespace Switch or Appliance roaming is supported in *Single-Airespace Switch or Appliance Deployments* and *Multiple-Airespace Switch and Appliance Deployments*.

Inter-Airespace Switch and Appliance (Layer 2) Roaming

Similarly, in *Multiple-Airespace Switch and Appliance Deployments*, the Airespace System supports client roaming across Airespace APs and third-party APs managed by Airespace Switches and Appliances on the same subnet. This roaming is also transparent to the client, as the session is sustained and a tunnel between Airespace Switches and Appliances allows the client to continue using the same DHCP-assigned or client-assigned IP address as long as the session remains active. Note that the tunnel is torn down when the client sends a DHCP Discover with a 0.0.0.0 client IP address or a 169.254.*.* client auto-IP address, or when the operator-set session timeout is exceeded.

Inter-Subnet (Layer 3) Roaming

Similarly, in *Multiple-Airespace Switch and Appliance Deployments*, the Airespace System supports client roaming across Airespace APs and third-party APs managed by Airespace Switch and Appliance on different subnets. This roaming is transparent to the client, because the session is sustained and a tunnel between the Airespace Switches and Appliances allows the client to continue using the same DHCP-assigned or client-assigned IP address as long as the session remains active. Note that the tunnel is torn down when the client sends a DHCP Discover with a 0.0.0.0 client IP address or a 169.254.*.* client auto-IP address, or when the operator-set session timeout is exceeded.

Special Case: Voice Over IP Telephone Roaming

802.11 VoIP telephones actively seek out associations with the strongest RF signal to ensure best Quality of Service (QoS) and maximum throughput. The minimum VoIP telephone requirement of 20 millisecond or shorter latency time for the roaming handover is easily met by the Airespace System, which has an average handover latency of nine or fewer milliseconds.

This short latency period is controlled by Airespace Switches and Appliances, rather than allowing independent APs to negotiate roaming handovers.

The Airespace System supports 802.11 VoIP telephone roaming across Airespace APs and third-party APs managed by Airespace Switches and Appliances on different subnets. This roaming is transparent to the VoIP telephone, because the session is sustained and a tunnel between Airespace Switches and Appliances allows the VoIP telephone to continue using the same DHCP-assigned IP address as long as the session remains active. Note that the tunnel is torn down when the VoIP telephone sends a DHCP Discover with a 0.0.0.0 VoIP telephone IP address or a 169.254.*.* VoIP telephone auto-IP address, or when the operator-set session timeout is exceeded.

About External DHCP Servers

The AireOS is designed to operate as a 'DHCP Proxy' with industry-standard external DHCP Servers that support DHCP Relay. This means that each Airespace Wireless Switch or WLAN Appliance appears as a DHCP Relay agent to the DHCP Server. This also means that the Airespace Switch or Appliance appears as a DHCP Server to wireless clients at the virtual IP address.

Because the Airespace Switch or Appliance controls the client IP address obtained from a DHCP Server, it maintains the same IP address for that client during same-Airespace Switch or Appliance, inter-Airespace Switch and Appliance, and inter-subnet *Client Roaming*.

Per-WLAN Assignment

All *Airespace WLANs* can be configured to use the same or different DHCP Servers, or no DHCP Server. This allows operators considerable flexibility in configuring their Wireless LANs, as further described in the *Airespace WLANs* section.

Note that Airespace WLANs that support *Management over Wireless* must allow the management clients to obtain an IP address from a DHCP Server.

Security Considerations

For enhanced security, it is recommended that operators require all clients to obtain their IP addresses from a DHCP server. To enforce this requirement, all *Airespace WLANs* can be configured with a 'DHCP Required' setting and a valid DHCP Server IP address, which disallows client static IP addresses. If a client associating with a WLAN with 'DHCP Required' set does not obtain its IP address from the designated DHCP Server, it is not allowed access to any network services.

If slightly less security is tolerable, operators can create *Airespace WLANs* with 'DHCP Required' disabled and a valid DHCP Server IP address. Clients then have the option of using a static IP address or obtaining an IP address from the designated DHCP Server.

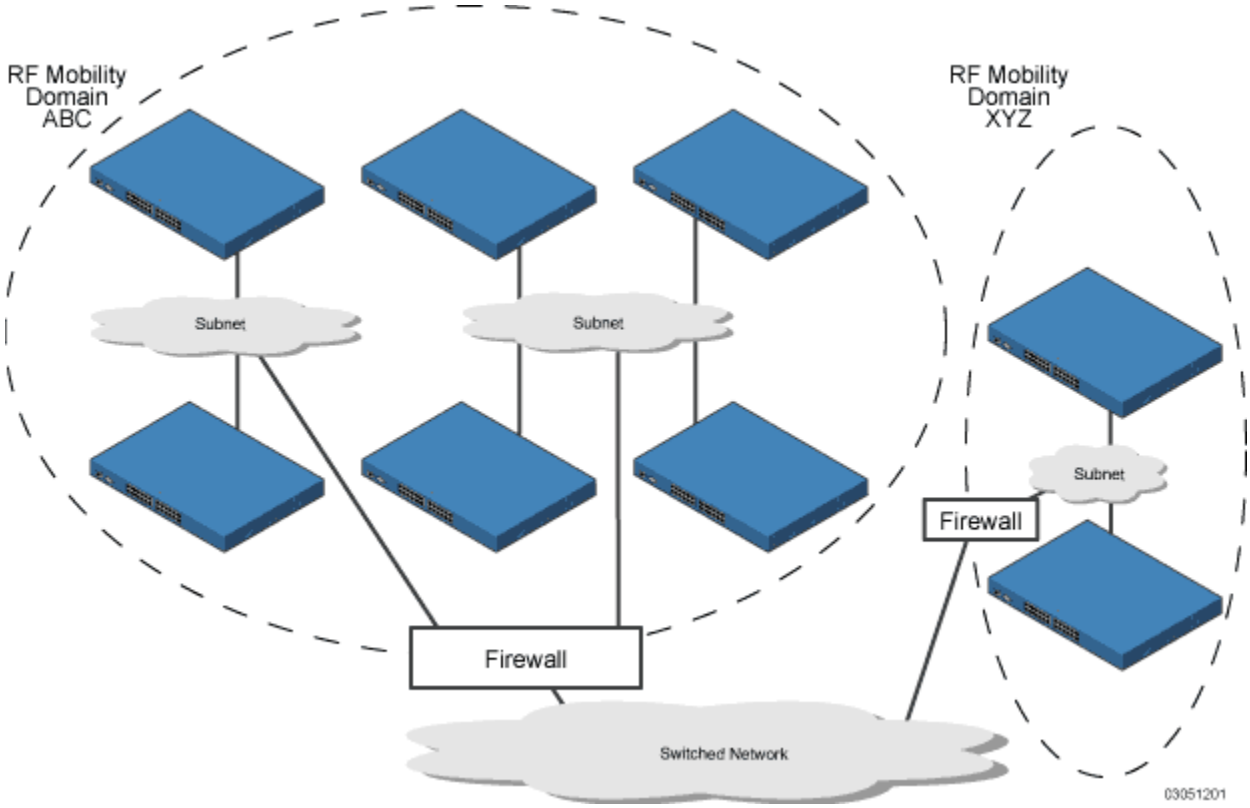
Operators are also allowed to create separate *Airespace WLANs* with 'DHCP Required' disabled and a DHCP Server IP address of 0.0.0.0. These WLANs drop all DHCP requests and force clients to use a static IP address. Note that these WLANs do not support *Management over Wireless*.

About Airespace Mobility Groups

Airespace System operators can define Mobility Groups to allow client roaming across groups of Airespace Wireless Switches and WLAN Appliances. Because the Airespace Switches and Appliances in *Multiple-Airespace Switch and Appliance Deployments* can detect each other across the switched network and over the air, it is important that each enterprise, institution, and wireless internet service provider isolate their Airespace Switches and Appliances. The AireOS makes it easy for operators to create this isolation by allowing them to assign a Mobility Group Name to their Airespace Switches and Appliances. This assignment can be made using the *Airespace Web Browser Interface*, the *Airespace Control System Software*, or the *Airespace Command Line Interface*.

The following figure shows the results of creating Mobility Group Names for two groups of Airespace Switches and Appliances. The Airespace Switches and Appliances in the ABC Mobility Group recognize and communicate with each other through their *Airespace Access Points* and through their shared subnets, but the ABC Mobility Group tags the XYZ Airespace APs as *Rogue Access Points*. Likewise, the Airespace Switches and Appliances in the XYZ Mobility Group do not recognize or communicate with the Airespace Switches and Appliances in the ABC Mobility Group. This feature ensures Mobility Group isolation across the switched network.

Figure - Typical Airespace Mobility Group Name Application



The Airespace Mobility Group feature can also be used to limit roaming between different floors, buildings, or campuses in the same enterprise by assigning different Mobility Group names to different Airespace Switches and Appliances within the same wireless network.

If enabled, *AireWave Director Software* operation is constrained within each Airespace Mobility Group.

Note: Because the Airespace Switches and Appliances talk to each other when they are in the same mobility group, Airespace recommends that operators do not add physically-separated Airespace Switches and Appliances to the same static mobility group to avoid unnecessary traffic on the switched network.

About Airespace Wired Connections

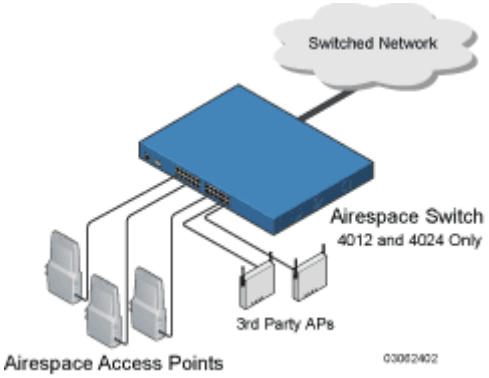
The Airespace System components communicate with each other using industry-standard Ethernet cables and connectors. The following sections contain details of the Airespace wired connections.

Between Airespace Wireless Switches and APs

When operated in *Direct Connect Mode*, the 4012 and 4024 *Airespace Switches and Appliances* uses standard 802.3 CAT-5 (Category 5) or higher twisted-pair Ethernet cables to connect to *Airespace Access Points* and *Third-Party Access Points*. The CAT-5 cable is rated to carry 100 Mbps (recommended for 802.11a, 802.11a/b, 802.11a/g or 802.11a/b/g installations) or 10 Mbps (only recommended for low-bandwidth applications and 802.11b-only installations).

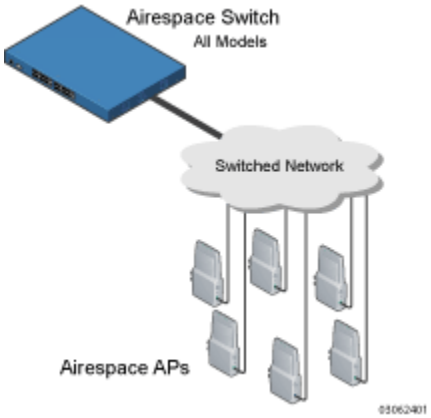
The 4012 and 4024 Airespace Wireless Switches connect to the switched network using a copper 10/100Base-T cable or a copper or fiber-optic GigE cable.

Note that the 4101 and 4102 Airespace WLAN Appliances operate only in *Appliance Mode*, and do not connect directly to any Access Points.



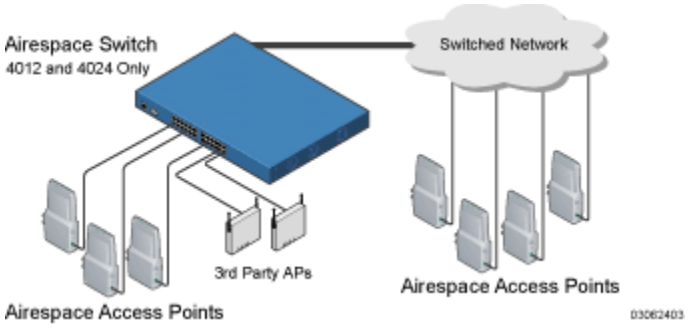
When the Airespace Wireless Switch or WLAN Appliance is operated in *Appliance Mode*, the Airespace APs communicate with the Airespace Switch or Appliance through the switched network. The 4012 and 4024 Airespace Wireless Switches connect to the switched network using a copper 10/100Base-T cable or a copper or fiber-optic GigE cable.

The 4101 Airespace WLAN Appliance connects to the switched network using a fiber-optic GigE cable. The 4102 Airespace WLAN Appliance connects to the switched network using two fiber-optic GigE cables: two redundant GigE connections to bypass single network failures. At any given time one of the 4102 Airespace WLAN Appliance GigE connections is active and the other is passive. Upon a switched network failure, the active connection becomes passive, and the passive connection becomes active.



When the 4012 and 4024 Airespace Wireless Switches are operated in *Hybrid Mode*, some Airespace APs and third-party APs use the CAT-5 cable to connect to the Airespace Wireless Switch in *Direct Connect Mode* and some connect in *Appliance Mode*. The Airespace Wireless Switch connects to the switched network using a copper 10/100Base-T cable or a copper or fiber-optic GigE cable.

Note that the 4101 and 4102 Airespace WLAN Appliances only operate in *Appliance Mode*, and do not connect directly to any Access Points.



Standard CAT-5 cable supports a 100 m (328 ft.) run between the Airespace APs and the Airespace Wireless Switch. This allows a single Airespace Wireless Switch to serve Airespace APs in multiple buildings and/or floors in a single building.

The standard CAT-5 cable can also be used to conduct power for the Airespace APs from a network device equipped with *Power Over Ethernet* (PoE) capability. This power distribution plan can be used to reduce the cost of individual AP power supplies and related cabling.

Between Airespace Switches and Appliances and Other Network Devices

The 4012 and 4024 Airespace Wireless Switches communicate with other Airespace Wireless Switches and WLAN Appliances or network devices through standard CAT-5 cable connected to front-panel Port 1, which supports up to 100 Mbps, or through Gigabit Ethernet (or GigE) cabling, which supports up to 1 Gbps (1,000 Mbps).

The 4101 Airespace WLAN Appliance connects to the switched network using a fiber-optic GigE cable. The 4102 Airespace WLAN Appliance connects to the switched network using two fiber-optic GigE cables: two redundant GigE connections to bypass single network failures. At any given time one of the 4102 Airespace WLAN Appliance GigE connections is active and the other is passive. Upon a switched network failure, the active connection becomes passive, and the passive connection becomes active.

About Airespace WLANs

The Airespace System can control up to 16 Wireless LANs for *Airespace Access Points* plus one WLAN for *Third-Party Access Points*. Each WLAN has a separate WLAN ID (1 through 17), a separate WLAN SSID (WLAN Name), and can be assigned unique security policies. A separate WLAN 17 can be created for *Third-Party Access Points* connected to a Model 4012 or 4024 Airespace Wireless Switch front panel in *Direct Connect Mode*.

The Airespace APs broadcast all active WLAN SSIDs and enforce the policies defined for each WLAN, while the operator-managed third-party APs broadcast the third-party AP SSID and enforce the operator-defined policies.

Note that many enterprises use different WLANs to separate traffic for different sections or departments.

If *Mgmt Via Wireless* is enabled on a non-IPSec WLAN, the Airespace System operator can manage the System across the enabled WLAN using CLI and Telnet (*Airespace Command Line Interface*), http/https (*Airespace Web Browser Interface*), and SNMP (*Airespace Control System Software*).

To configure the Airespace WLANs, refer to *Configuring WLANs*.

About File Transfers

The Airespace System operator can upload and download code, configuration, and certificate files to and from an Airespace Wireless Switch or WLAN Appliance using Airespace CLI commands, Airespace Web Browser Interface commands, or Airespace Control System Software (ACS Software) commands.

- To use CLI commands, refer to *Transferring Files To and From an Airespace Switch or Appliance*
- To use the Web Browser Interface, go to *Using the Airespace Web Browser Interface*
- To use ACS Software Server commands, continue with *Using the Airespace Control System Software*

About Power Over Ethernet

Airespace Wireless Switches and WLAN Appliances and Airespace APs supports 802.3af-compliant Power over Ethernet (PoE), which can reduce the cost of discrete power supplies, additional wiring, conduits, outlets, and installer time. PoE also frees installers from having to mount *Airespace Access Points* or other powered equipment near AC outlets, providing greater flexibility in positioning Airespace APs for maximum coverage.

When you are using PoE, the installer runs a single CAT-5 cable from each Airespace AP to the PoE-equipped *Airespace Switches and Appliances* or other network element, or to a PoE power hub. When the PoE equipment determines that the Airespace AP is PoE-enabled, it sends 48 VDC over the unused pairs in the Ethernet cable to power the Airespace AP.

Note: Airespace APs can receive power from the Airespace Wireless Switch or any other network device conforming to the IEEE 802.3af standard.

Note: Each Airespace AP can also receive power from an *Airespace AP External Power Converter*.

The Airespace Wireless Switch can be ordered with or without PoE, as required. It can be ordered with internal PoE or an external third-party PoE hub. Contact Airespace for recommended external PoE hubs.

About Airespace Switches and Appliances

The Airespace Wireless Switch and WLAN Appliance are enterprise-class high-performance wireless switching platforms that support 802.11a and 802.11b/802.11g (802.11b/g) protocols. They operate under control of the AireOS, and includes wire-speed Layer 2 switching designed to support the Airespace Switched Architecture, which results in an Airespace System that can automatically adjust to real-time changes in the 802.11 RF environment. The Airespace Switches and Appliances are built around high-performance network and security hardware, resulting in highly reliable 802.11 enterprise networks with unparalleled security.

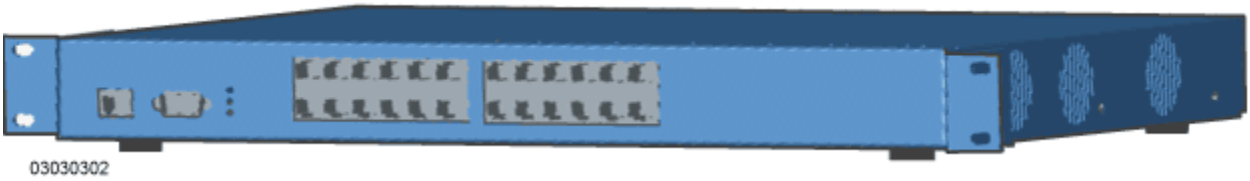
This section includes the following:

- *4012 and 4024 Airespace Wireless Switch Models*
- *4101 and 4102 Airespace WLAN Appliance Models*
- *Airespace Switch and Appliance Features*
- *Airespace Switch and Appliance Model Numbers*
- *Direct Connect Mode*
- *Appliance Mode*
- *Hybrid Mode*
- *Distribution System Port*
- *Service (Management) Port*
- *Airespace Switch and Appliance Memory*
- *Startup Wizard*
- *Airespace Switch and Appliance Failover Protection*
- *Switched Network Connection to an Airespace Switch or Appliance*
- *Enhanced Security Module*
- *Airespace Wired Connections*
- *Airespace WLANs*
- *Transferring Files*
- *Configuring the Airespace Switch or Appliance*
- *Transferring Files To and From an Airespace Switch or Appliance*
- *Updating the AireOS Software*
- *Clearing Configurations*
- *Resetting the Airespace Switch or Appliance*
- *Airespace Switch and Appliance Quick Installation Guide*

4012 and 4024 Airespace Wireless Switch Models

About the Airespace System gives a comprehensive overview of the Airespace System and the place of the Airespace Wireless Switches and WLAN Appliances in that system. The following figure shows the 4024 Airespace Wireless Switch. The 4012 Airespace Wireless Switch is similar to the 4024, but has 12 front-panel RJ-45 jacks instead of 24.

Figure - 4024 Airespace Wireless Switch



The 4012 and 4024 Airespace Wireless Switches are one-unit high 802.11 Wireless Switches that communicate directly (*Direct Connect Mode*), indirectly (*Appliance Mode*), or both (*Hybrid Mode*) with up to 24 (Model 4024) or 12 (Model 4012) associated *Airespace Access Points* and/or *Third-Party Access Points*. The 4012 and 4024 Airespace Wireless Switches can be factory- or field-equipped with an Enhanced Security Module (Crypto Card) to support VPN, IPSec and other processor-intensive tasks, and with one 1000Base-T (copper) or 1000Base-SX (fiber-optic) Network Adaptor Module to allow the Airespace Wireless Switch to communicate with the switched network at GigE (Gigabit Ethernet) speeds.

4101 and 4102 Airespace WLAN Appliance Models

The following figure shows the 4102 Airespace WLAN Appliance. The 4101 Airespace WLAN Appliance is similar to the 4102, but has one front-panel SX/LC jack instead of two.

Figure - 4102 Airespace WLAN Appliance

The 4101 and 4102 Airespace WLAN Appliances are one-unit high 802.11 Wireless Appliances that communicate indirectly through the switched network (*Appliance Mode*) with up to 36 associated *Airespace Access Points*. The 4101 and 4102 Airespace WLAN Appliances can be factory-ordered with an Enhanced Security Module (Crypto Card) to support VPN, IPSec and other processor-intensive tasks, and with one (4101) or two (4102) 1000Base-SX network connectors to allow the Airespace WLAN Appliance to communicate with the switched network at GigE (Gigabit Ethernet) speeds.

The two redundant GigE connections on the 4102 allow the Airespace WLAN Appliance to bypass single network failures. At any given time one of the 4102 Airespace WLAN Appliance GigE connections is active and the other is passive. Upon a switched network failure, the active connection becomes passive, and the passive connection becomes active.

Airespace Switch and Appliance Features

Because Airespace Wireless Switches and WLAN Appliances perform most of the processes normally performed by SOHO Access Points, it can reduce the amount of inter-AP traffic on the wired backbone network when used in *Direct Connect Mode*. When operated in *Appliance Mode*, Airespace Switches and Appliances connect to the associated Airespace APs through the switched network. When deployed in *Hybrid Mode*, Airespace Wireless Switches simultaneously communicate with their associated APs through their front-panel ports as well as through the switched network.

Note that the 4101 and 4102 Airespace WLAN Appliances are designed to operate exclusively in *Appliance Mode*. As such, they are limited to controlling *Airespace Access Points*. However the operator can use *Airespace Control System Software* as a gateway to independently detect and manage *Third-Party Access Points*.

After each Airespace Switch or Appliance is installed and configured, the AireOS *AireWave Director Software* is activated, and the AireOS manages and controls associated Airespace APs and/or third-party APs (*Direct Connect Mode* only), with information about their relative positions, IP Addresses, and MAC addresses. This information allows all Airespace Switches and Appliances within each *Airespace Mobility Group* to constantly monitor and dynamically adjust the RF environment, maximizing performance, minimizing interference, and distributing the client load.

When operated in *Direct Connect Mode*, the 4012 or 4024 Airespace Wireless Switches communicate directly with Airespace APs and third-party APs via 10/100Base-T Ethernet cables.

When operated in *Appliance Mode*, the 4012 and 4024 Airespace Wireless Switches communicate with Airespace APs via 10/100Base-T Ethernet or 1000Base-T or 1000Base-SX cables through the switched network.

When operated in *Appliance Mode*, the 4101 and 4102 Airespace WLAN Appliances communicate with Airespace APs via 1000Base-SX cables through the switched network. Note that the 4102 Airespace WLAN Appliance uses two redundant GigE connections to bypass single network failures. At any given time one of the 4102 Airespace WLAN Appliance GigE connections is active and the other is passive. Upon a switched network failure, the active connection becomes passive, and the passive connection becomes active.

The 4012 or 4024 Airespace Wireless Switches communicate with switched network via front-panel 10/100Base-T Ethernet Port 1, or via a 1000Base-T or 1000Base-SX Network Port. The 4101 or 4102 Airespace WLAN Appliances communicate with switched network via one (4101) or two (4102) 1000Base-SX Network Ports: the 4102 Airespace WLAN Appliance uses two redundant GigE connections to bypass single network failures.

Regardless of operating mode, the network operator can control the Airespace Switches and Appliances with the following AireOS management interfaces:

- With optional *Airespace Control System Software* (ACS Software Server) inband or out-of-band via an 10/100Base-T Service/Management Port (recommended), or via the switched network.
- With the built-in *Airespace Command Line Interface* via a serial RS232-C Console Port (direct connection), or via the switched network (Telnet connection).
- With the built-in *Airespace Web Browser Interface* via a dedicated 10/100Base-T Service/Management Port (recommended), or via the switched network, using either http or https (http + SSL).

Refer to the following for more information about the Airespace Switches and Appliances:

- *Airespace Switch and Appliance Model Numbers*
- *Direct Connect Mode*
- *Appliance Mode*
- *Hybrid Mode*

- *Distribution System Port*
- *Service (Management) Port*
- *Airespace Switch and Appliance Memory*
- *Startup Wizard*
- *Airespace Switch and Appliance Failover Protection*
- *Switched Network Connection to an Airespace Switch or Appliance*
- *Enhanced Security Module*
- *Airespace Access Points*
- *Airespace WLANs*
- *Transferring Files*
- *Configuring the Airespace Switch or Appliance*
- *Transferring Files To and From an Airespace Switch or Appliance*
- *Updating the AireOS Software*
- *Clearing Configurations*
- *Resetting the Airespace Switch or Appliance*
- *Airespace Switch and Appliance Quick Installation Guide*

Airespace Switch and Appliance Model Numbers

The Airespace Wireless Switch and WLAN Appliance models are as follows:

- AS-4012 - Twelve-Port Airespace Wireless Switch with an optional 1000Base-T or 1000Base-SX/LC Network Adapter, used in *Direct Connect Mode*, *Appliance Mode*, and *Hybrid Mode*.
- AS-4024 - 24-Port Airespace Wireless Switch with an optional 1000Base-T or 1000Base-SX/LC Network Adapter, used in *Direct Connect Mode*, *Appliance Mode*, and *Hybrid Mode*.
- AS-4012-POE - Twelve-Port Airespace Wireless Switch with built-in PoE Hub and an optional 1000Base-T or 1000Base-SX/LP Network Adapter, used in *Direct Connect Mode*, *Appliance Mode*, and *Hybrid Mode*.
- AS-4012-POE - 24-Port Airespace Wireless Switch with built-in PoE Hub and an optional 1000Base-T or 1000Base-SX/LC Network Adapter, used in *Direct Connect Mode*, *Appliance Mode*, and *Hybrid Mode*.
- AS-4101 - 36-Port Airespace WLAN Appliance with one 1000Base-SX/LC Network Adapter, used only in *Appliance Mode*.
- AS-4102 - 36-Port Airespace WLAN Appliance with one 1000Base-SX/LC Network Adapter, used only in *Appliance Mode*. The 4102 Airespace WLAN Appliance uses two redundant GigE connections to bypass single network failures. That is, at any given time one of the 4102 Airespace WLAN Appliance GigE connections is active and the other is passive. Upon a switched network failure, the active connection becomes passive, and the passive connection becomes active.

Note that all Airespace Switch and Appliance models come from the factory with 19-inch EIA equipment rack flush-mount ears and tabletop mounting feet.

The following upgrade modules are also available:

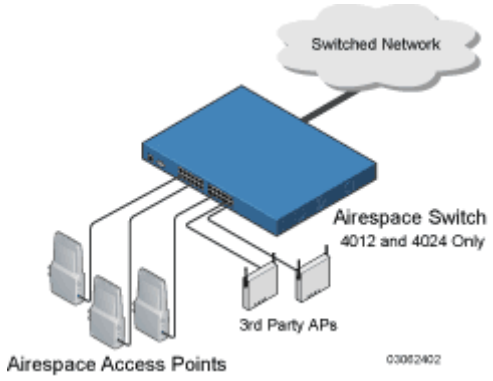
- AS-Switch-ESM - Enhanced Security Module: Supports VPN, IPSec and other processor-intensive security options. This is a factory-orderable option for all Airespace Switches and Appliances, and is a field-installable option for the 4012 and 4024 Airespace Wireless Switches.
- AS-Switch-GT - 1000Base-T Network Adapter Module: Supports 1000Base-T connections to the switched network. This is a factory-orderable and field-installable option for 4012 and 4024 Airespace Wireless Switches.
- AS-Switch-GSX - 1000Base-SX Network Adapter Module: Supports 1000Base-SX connections to the switched network. This is a factory-orderable and field-installable option for 4012 and 4024 Airespace Wireless Switches, and is factory-installed in 4101 and 4102 Airespace WLAN Appliances.

Airespace Wireless Switch Direct Connect Mode

The 4012 and 4024 Airespace Wireless Switches can be operated in Direct Connect Mode, in *Appliance Mode*, or in *Hybrid Mode*. In Direct Connect Mode, the Airespace Wireless Switches are directly connected to up to 24 (Model 4024) or up to 12 (Model 4012) Airespace APs and/or third-party APs over CAT-5 or higher Ethernet cabling. The benefit of this mode is that the Airespace Wireless Switches can provide *Power Over Ethernet*.

The following figure shows an Airespace Wireless Switch in the Direct Connect Mode, and the rest of the section describes the 4012 and 4024 Airespace Wireless Switch connections to the switched network.

Figure - Airespace Wireless Switch Direct Connect Mode



The Airespace Wireless Switch filters packets and forwards them between LAN segments. When the Airespace Wireless Switch is operated in Direct Connect Mode, it transmits data between all connected Airespace APs and third-party APs, which results in fewer packets being placed on the backbone network.

The 4012 and 4024 Airespace Wireless Switches communicate with the backbone network via a 1000Base-T or 1000Base-SX Network Port, or via front-panel 10/100Base-T Ethernet Port 1 as described in the *Switched Network Connection to an Airespace Switch or Appliance* section.

Note: When you use front-panel 10/100Base-T Ethernet Port 1 to communicate with the switched network, you can no longer use that port to communicate with an Airespace AP or third-party AP.

The Airespace Wireless Switch or WLAN Appliance uses industry-standard SNMP traps and flags to communicate with the *Airespace Control System Software*, and communicates with AireOS management interfaces as follows:

- With an optional ACS Software Server or other AireOS management interface, either directly connected or through an out-of-band AireOS Management Network, or via a dedicated 10/100Base-T *Service (Management) Port*.
- With an optional VT-100 CLI console via a serial RS232-C Console Port.

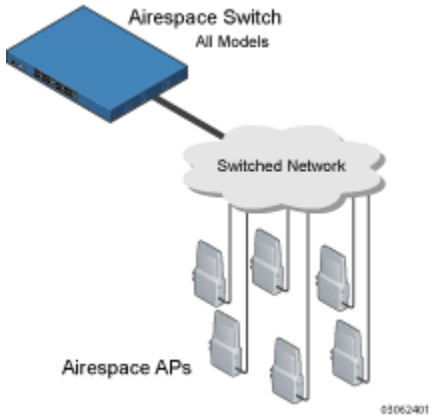
Note: Airespace recommends that you not use the switched network for your AireOS management, because a service outage on your switched network means that you have no dedicated path to the Airespace Wireless Switch.

The Airespace Wireless Switch can be equipped with built-in *Power Over Ethernet* circuitry or an external PoE hub, which allows associated Airespace APs and/or third-party APs to receive power over the CAT-5 Ethernet cabling.

Airespace Switches and Appliances in Appliance Mode

All 4012 and 4024 Airespace Wireless Switches and 4101 and 4102 Airespace WLAN Appliances can be operated in Appliance Mode. (The 4012 and 4024 Airespace Wireless Switches can also be operated in *Direct Connect Mode* or *Hybrid Mode*.) In Appliance Mode, the Airespace Switch or Appliance communicates indirectly with up to 36 (Models 4101 and 4102), up to 24 (Model 4024) or up to 12 (Model 4012) associated Airespace APs (and/or third-party APs for 4012 or 4024 Airespace Wireless Switches) through the switched network. The following figure shows an Airespace Switch or Appliance in Appliance Mode.

Figure - Airespace Wireless Switch or WLAN Appliance Deployed in Appliance Mode

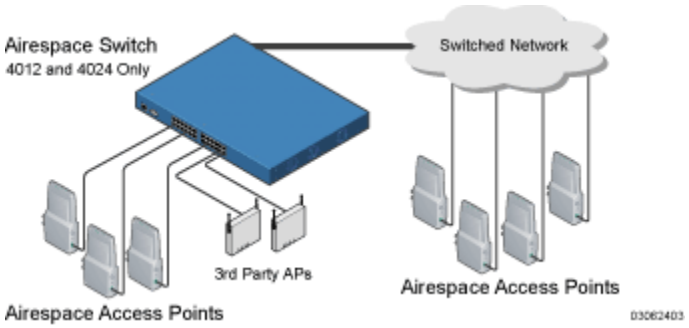


The Airespace Switch or Appliance communicates with the switched network using one of the interfaces described in the *Switched Network Connection to an Airespace Switch or Appliance* section.

Airespace Wireless Switch Hybrid Mode

The 4012 and 4024 Airespace Wireless Switches can be operated in Hybrid Mode, *Appliance Mode* or *Direct Connect Mode*. In Hybrid Mode, the Airespace Wireless Switch communicates directly and indirectly with up to 24 (Model 4024) or up to 12 (Model 4012) associated Airespace APs and/or third-party APs over Ethernet cabling, and with associated Airespace APs through the switched network. The following figure shows an Airespace Wireless Switch in Hybrid Mode.

Figure - Airespace Wireless Switch Deployed in Hybrid Mode



The Airespace Wireless Switch communicates with the switched network using one of the interfaces described in the *Switched Network Connection to an Airespace Switch or Appliance* section.

About the Distribution System Port

As described in *Switched Network Connection to an Airespace Switch or Appliance*, the 4012 and 4024 Airespace Wireless Switch and 4101 Airespace WLAN Appliance logical Distribution System port can be assigned to only one physical port (*Airespace Wired Connections*), and can communicate with the switched network through one physical port. The 4102 Airespace WLAN Appliance uses two redundant physical ports to ensure continued communications through the switched network in case part of the switched network fails.

Note: The Distribution System Port cannot be assigned to the dedicated Airespace Switch or Appliance front-panel *Service (Management) Port*.

The Distribution System port provides an uplink to the switched network. As such, it:

- Sends messages through the switched network to autodiscover and communicate with other Airespace Switches and Appliances.
- Listens across the switched network for Airespace AP polling messages to autodiscover, associate with, and communicate with as many Airespace APs as it is configured to allow.

Note: Should another Airespace WLAN Appliance or Airespace Wireless Switch in Appliance Mode fail, its dropped Airespace APs poll the switched network for another Airespace Switch or Appliance. When an online Airespace Switch or Appliance has any remaining primary or emergency Ethernet ports, it listens to the switched network for Airespace AP polling messages to autodiscover, associate with, and communicate with as many Airespace APs as it is configured to allow. Refer to the *Airespace Switch and Appliance Failover Protection* section for more information.

The Distribution System port is the logical port through which the Airespace Switch or Appliance talks to the switched network, and must be configured for the following:

- Airespace Switch or Appliance statically set IP address, IP netmask, and default router.
- Physical port assignment.
- If required, VLAN assignment.
- Web and Secure Web modes.
- Spanning Tree Protocol, if required.

Refer to the *Configuring the Airespace Switch or Appliance* section for configuration instructions.

About the Service (Management) Port

The Service Port on the Airespace Wireless Switch or WLAN Appliance front panel is a 10/100Base-T Ethernet port dedicated to AireOS management. The Service Port is configured with an IP address, subnet mask, and IP assignment protocol separate from the *Distribution System Port*. This allows the operator to manage the Airespace Switch or Appliance directly or through a dedicated AireOS management network, such as 10.1.2.x, which can ensure AireOS management access during switched network downtime.

Airespace created the Service (Management) port to remove the Airespace System management from the switched network data stream to improve security and to provide a faster management connection.

Note that you cannot assign a Gateway to the Service (Management) Port, and so the Port is not routable, unlike the other front-panel 10/100Base-T ports.

Also note that the Service Port is not auto-sensing, unlike the other front-panel 10/100Base-T ports: you must use the correct straight-through or crossover Ethernet cable to communicate with the Service (Management) Port.

Refer to the *Configuring Other Ports and Parameters* for information on how to configure the Service Port.

About the Startup Wizard

When an Airespace Wireless Switch or WLAN Appliance is powered up with a new factory AireOS software load or after being reset to factory defaults, the bootup script runs the Startup Wizard, which prompts the installer for initial configuration. The Startup Wizard:

- Ensures that the Airespace Switch or Appliance has a System Name, up to 32 characters.
- Adds an Administrative User Name and Password, each up to 24 characters.
- Ensures that the Airespace Switch or Appliance can communicate with the CLI, ACS Software, or Web Browser AireOS management interfaces (either directly or indirectly) through the *Service (Management) Port* by accepting a valid IP configuration protocol (none or DHCP), and if 'none', IP address and netmask. If you do not want to use the Service (Management) Port, enter 0.0.0.0 for the IP address and netmask; this disables the Service Port.

  Note: Airespace recommends that you not use the switched network for your AireOS management, because a service outage on your switched network means that you have no dedicated path to the Airespace Wireless Switch.

- Ensures that the Airespace Switch or Appliance can communicate with the switched network (802.11 Distribution System) through the *Distribution System Port* by collecting a valid static IP configuration protocol (none), IP address, netmask, default router, and physical port assignment.
- Collects the WLAN 1 802.11 SSID, or Network Name.
- Enables and/or disables the 802.11b/g and 802.11a Airespace AP networks.
- Enables or disables *AireWave Director Software*.

To use the Startup Wizard, refer to *Using the Startup Wizard*.

About Airespace Switch and Appliance Memory

The Airespace Wireless Switches and WLAN Appliances contain two kinds of memory: volatile RAM, which holds the current, active Airespace Switch or Appliance configuration, and NVRAM (non-volatile RAM), which holds the reboot configuration. When you are configuring the AireOS in an Airespace Switch or Appliance, you are modifying volatile RAM; you must save the configuration from the volatile RAM to the NVRAM to ensure that the Airespace Switch or Appliance reboots in the current configuration.

Knowing which memory you are modifying is important when you are:

- Using the *Startup Wizard*
- *Clearing Configurations*
- *Saving Configurations*
- *Resetting the Airespace Switch or Appliance*
- *Logging Out of the CLI*

Airespace Switch and Appliance Failover Protection

Each Airespace Wireless Switch and WLAN Appliance with front-panel 10/100Base-T ports can normally associate with as many primary Airespace APs as it has physical ports. Thus, a 12-port 4012 Airespace Wireless Switch can associate with 12 primary Airespace APs, and a 24-port 4024 Airespace Wireless Switch can associate with 24 primary Airespace APs.

However, each 4012 and 4024 Airespace Wireless Switch can also associate with as many secondary Airespace APs as it has physical ports. Thus, a 12-port 4012 Airespace Wireless Switch can associate with 24 Airespace APs (12 primary and 12 secondary), and a 24-port 4024 Airespace Wireless Switch can associate with 48 Airespace APs (24 primary and 24 secondary).

Model 4101 and 4102 Airespace WLAN Appliances can associate with up to 36 Airespace APs, and have no front-panel 10/100Base-T ports. Note that the 4101 and 4102 Airespace WLAN Appliances associate with 36 primary Airespace APs and no secondary Airespace APs.

In a multiple-Airespace Switch and Appliance system (refer to *Multiple-Airespace Switch and Appliance Deployments*), this means that if one Airespace Switch or Appliance fails, its dropped Airespace APs immediately do the following under direction of the *AireWave Director Software*:

- If the Airespace AP has a *Primary Airespace Switch or Appliance* assigned, it attempts to associate with that Airespace Switch or Appliance.
- If the Airespace AP has no Primary Airespace Switch or Appliance assigned or if its Primary Airespace Switch or Appliance is unavailable, it attempts to associate with a *Master Airespace Switch or Appliance* on the same subnet.
- If the Airespace AP has no Primary Airespace Switch or Appliance assigned and there is no Master Airespace Switch or Appliance active, it attempts to associate with the least-loaded Airespace Switch or Appliance on the same subnet to respond with unused primary or secondary ports.

This means that when sufficient Airespace Switches and Appliances are deployed in *Appliance Mode*, should one Airespace Switch or Appliance fail, active Airespace AP client sessions are momentarily dropped while the dropped Airespace AP associates with an unused port on another Airespace Switch or Appliance, allowing the client device to immediately reassociate and reauthenticate.

Because the Airespace APs and/or third-party APs plug into the front of the Airespace Wireless Switch when it is deployed in *Direct Connect Mode*, Airespace Switch and Appliance failover protection is not supported for Airespace APs in Direct Connect Mode.

Switched Network Connection to the Airespace Switch or Appliance

The 4012 and 4024 Airespace Wireless Switch can be operated in *Hybrid Mode*, *Appliance Mode* or *Direct Connect Mode*. The 4101 and 4102 Airespace WLAN Appliance can be operated in *Appliance Mode*. Regardless of operating mode, the Airespace Switches and Appliances use the switched network as an 802.11 Distribution System.

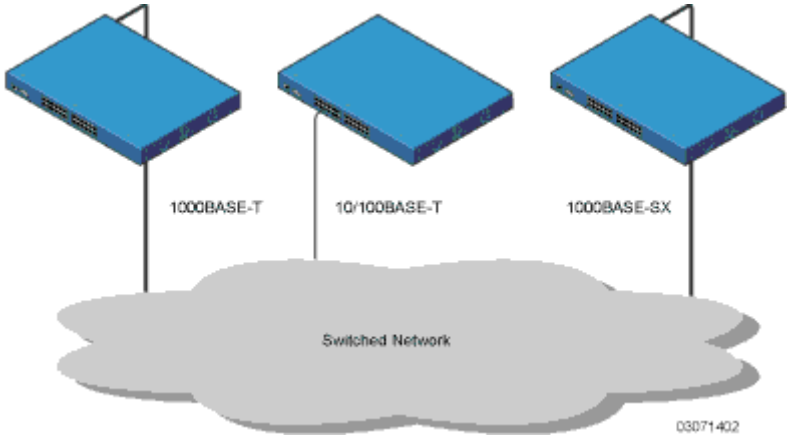
Regardless of the Ethernet port type or speed, each Airespace Switch and Appliance monitors and communicates with its related Airespace Switches and Appliances across the switched network.

Model 4012 and 4024 Airespace Wireless Switches

The 4012 and 4024 Airespace Wireless Switch can communicate with the switched network through one of three physical interfaces, but the logical *Distribution System Port* can be assigned to only one physical port. The three physical interfaces are:

- A GigE 1000Base-SX fiber-optic cable can plug into the optional LC connector (AS-Switch-GSX) Network Adapter Module on the rear of the Airespace Wireless Switch.
- Alternatively, a GigE 1000Base-T copper cable can plug into the optional RJ-45 (AS-Switch-GT) Network Adapter Module connector on the rear of the Airespace Wireless Switch.
- Alternatively, one Ethernet 10/100Base-T cable can plug into Port 1 of the RJ-45 10/100Base-T connectors on the front of the Airespace Wireless Switch.

Figure - Physical Switched Network Connections to the 4012 and 4024 Airespace Wireless Switch

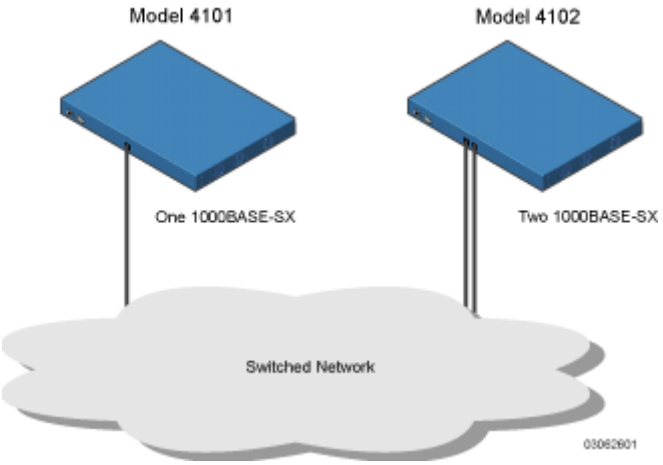


Model 4101 and 4102 Airespace WLAN Appliances

The 4101 and 4102 Airespace WLAN Appliances can communicate with the switched network through one (4101) or two (4102) physical interfaces, and the logical *Distribution System Port* can be assigned to the one or two physical ports. The physical interfaces areas follows:

- A GigE 1000Base-SX fiber-optic cable can plug into the LC connector on the front of the 4101 Airespace WLAN Appliance.
- Two GigE 1000Base-SX fiber-optic cables can plug into the LC connectors on the front of the 4102 Airespace WLAN Appliance. Note that the two GigE ports are redundant--the first port that becomes active is the master, and the second port becomes the backup port.

Figure - Physical Switched Network Connections to the 4101 and 4102 Airespace WLAN Appliance



Enhanced Security Module

The 4012 and 4024 Airespace Wireless Switches can be equipped with an optional Enhanced Security Module (AS-Switch-ESM), which slides into the rear panel of the Airespace Wireless Switches, and which is factory-installed inside the chassis in the 4101 and 4102 Airespace WLAN Appliances. The Enhanced Security Module adds significant hardware encryption acceleration to the Airespace Wireless Switch or WLAN Appliance, which enables the following through the *Distribution System Port*:

- Sustain up to 1 Gbps throughput with Layer 2 and Layer 3 encryption enabled.
- Provide a built-in VPN server for mission-critical traffic.
- Support high-speed, processor-intensive encryption, such as IPSec and 3DES.
- Provides sufficient processor power to have six or more WLANs active at any given time.

The following figure shows the Enhanced Security Module sliding into the rear of a 4012 or 4024 Airespace Wireless Switch.

Figure - 4012 and 4024 Airespace Wireless Switch Enhanced Security Module Location

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About Airespace Access Points

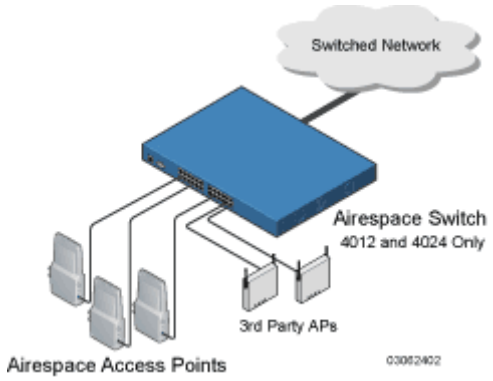
The Airespace AP is a part of the innovative Airespace Wireless Enterprise Platform (Airespace System). When associated with an *Airespace Switches and Appliances* as described below, the Airespace AP provides advanced 802.11a and/or 802.11b/g Access Point functions in a single aesthetically pleasing enclosure. The following figure shows the Airespace Access Point.

Figure - Airespace Access Point with Ceiling-Mount Base

Note that the Airespace AP is manufactured in a neutral color so it blends into most environments (but can be painted), contains pairs of high-gain internal antennas for unidirectional (180-degree) or omni-directional (360-degree) coverage (*Airespace AP External and Internal Antennas*), and is plenum-rated for installations in hanging ceiling spaces.

In the Airespace System, most of the processing responsibility is removed from traditional SOHO (small office, home office) APs and resides in the Airespace Wireless Switches and WLAN Appliances. The following figure shows *Airespace Access Points* and *Third-Party Access Points* connected to the 4012 or 4024 Airespace Wireless Switch front panel in *Direct Connect Mode*.

Figure - 4012 and 4024 Airespace Wireless Switch and Access Points



Refer to the following for more information on Airespace APs:

- *Airespace AP Models*
- *Airespace AP External and Internal Antennas*
- *Airespace AP LEDs*
- *Airespace AP Connectors*
- *Airespace AP Power Requirements*
- *Airespace AP External Power Converter*
- *Airespace AP Mounting Options*
- *Airespace AP Physical Security*
- *Monitor Mode*
- *Airespace Access Point Deployment Guide*
- *Airespace Access Point Quick Installation Guide*

About Airespace AP Models

The Airespace AP includes one 802.11a radio (AS-1200-A), one 802.11b/802.11g radio (AS-1200-BG), or one 802.11a and one 802.11b/g radio (AS-1200-ABG). The Airespace AP is available in the following configurations:

- AS-1200-A - Airespace AP with one 802.11a radio, two high-gain internal antennas, and one 5 GHz external antenna adapter
- AS-1200-A-int - Airespace AP with one 802.11a radio, two high-gain internal antennas, and no external antenna adapters
- AS-1200-BG - Airespace AP with one 802.11b/g radio and four high-gain internal antennas, one 5 GHz external antenna adapter, and two 2.4 GHz external antenna adapters
- AS-1200-BG-int - Airespace AP with one 802.11b/g radio, four high-gain internal antennas, and no external antenna adapters
- AS-1200-ABG - Airespace AP with one 802.11a and one 802.11b/g radio and four high-gain internal antennas, one 5 GHz external antenna adapter, and two 2.4 GHz external antenna adapters
- AS-1200-ABG-int - Airespace AP with one 802.11a and one 802.11b/g radio, four high-gain internal antennas, and no external antenna adapters

The Airespace AP is shipped with a color-coordinated ceiling mount base, and projection and flush wall mount brackets. These brackets and base allow quick mounting to ceiling or wall.

The Airespace AP can be powered by *Power Over Ethernet* or by an *Airespace AP External Power Converter*. The two power converter models are:

- AS-AP-PWR110 - External 110 VAC-to-48 VDC Power Converter for any Airespace AP
- AS-AP-PWR220 - External 220 VAC-to-48 VDC Power Converter for any Airespace AP
- AS-AP-PWR_UNIV - External 110-220 VAC-to-48 VDC Power Converter for any Airespace AP

About Airespace AP External and Internal Antennas

Note: Airespace APs must use the factory-supplied internal or external antennas to avoid violating FCC requirements and voiding the user's authority to operate the equipment. Refer to *FCC Statements for Airespace APs* for detailed information.

The 1200 Airespace AP enclosure contains one 802.11a and/or one 802.11b/g radio and four (two 802.11a and two 802.11b/g) high-gain antennas, which can be independently enabled or disabled to produce a 360-degree omnidirectional coverage area.

Also note that the wireless LAN operator can disable either one of each pair of the Airespace AP internal antennas to produce a 180-degree sectorized coverage area. This feature can be useful, for instance, for outside-wall mounting locations where coverage is only desired inside the building.

The following sections contain more information about Airespace AP internal and external antennas:

- *External Antenna Connectors*
- *Antenna Sectorization*
- *802.11a Internal Antenna Patterns*
- *802.11b/g Internal Antenna Patterns*
- *802.11a/b/g Internal Antenna Patterns*

External Antenna Connectors

The AS-1200-A, AS-1200-BG, and AS-1200-ABG Airespace APs have male reverse-polarity TNC jacks for installations requiring factory-supplied external directional or high-gain antennas. The external antenna option can create more flexibility in Airespace AP and antenna placement.

Note that the 802.11b/g 2.4 GHz Left external antenna connector is associated with the internal Side A antenna, and that the 2.4 GHz Right external antenna connector is associated with the internal Side B antenna. When you have 802.11b/g diversity enabled, the Left external or Side A internal antennas are diverse from the Right external or Side B internal antennas.

Also note that the 802.11a 5 GHz Left external antenna connector is separate from the internal antennas, and adds diversity to the 802.11a transmit and receive path.

Finally, note that the AS-1200-A-int, AS-1200-BG-int, and AS-1200-ABG-int Airespace APs are not equipped with external antenna jacks, and are used for installations requiring only internal Airespace AP antennas.

Antenna Sectorization

Note that the Airespace System supports Antenna Sectorization, which can be used to increase the number of clients and/or client throughput in a given air space. Installers can mount two Airespace APs back-to-back and the Airespace System operator can disable the second antenna in both Airespace APs to create a 360-degree coverage area with two sectors.

802.11a Internal Antenna Patterns

The 1200 Airespace AP can contain one 802.11a radio which drives two fully-enclosed high-gain antennas which can provide a large 360-degree coverage area. The two internal antennas can be used at the same time to provide a 360-degree (Omnidirectional) coverage area, or either antenna can be disabled to provide a 180-degree (Sectorized) coverage area.

When equipped with an optional factory-supplied external antenna, the 802.11a radio supports receive and transmit diversity between the internal antenna and the external antenna. The diversity function provided by Airespace radios can result in lower multipath fading, fewer packet retransmissions, and higher client throughput.

Figure - 1200 Airespace AP 802.11a OMNI (Dual Internal) Azimuth Antenna Gain Pattern

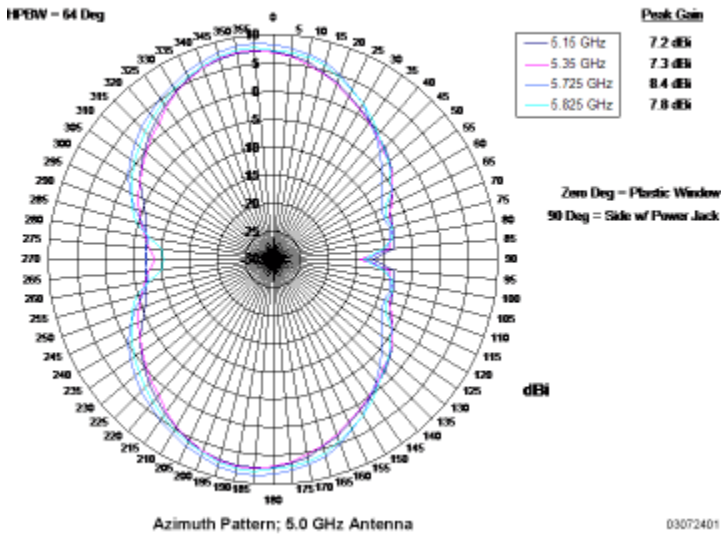


Figure - 1200 Airespace AP 802.11a OMNI (Dual Internal) Elevation Antenna Gain Pattern

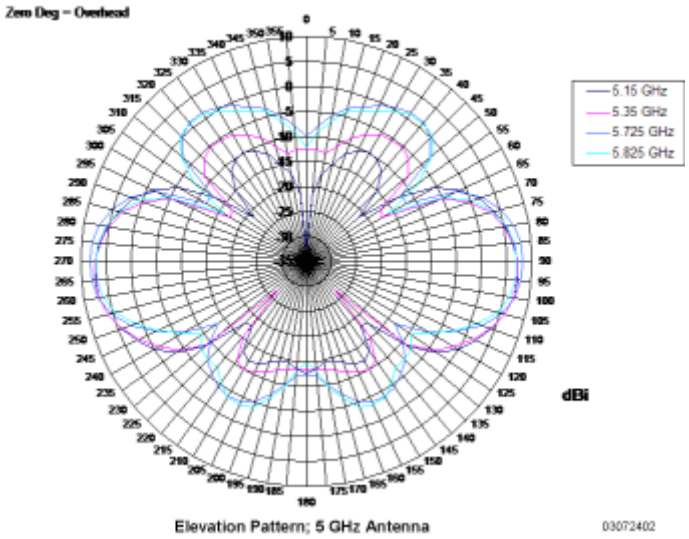


Figure - 1200 Airespace AP 802.11a Sectorized (Single Internal) Azimuth Antenna Gain Pattern

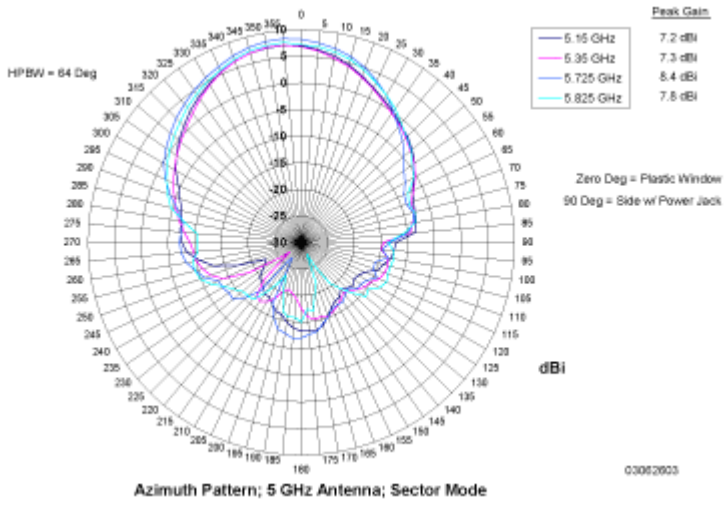
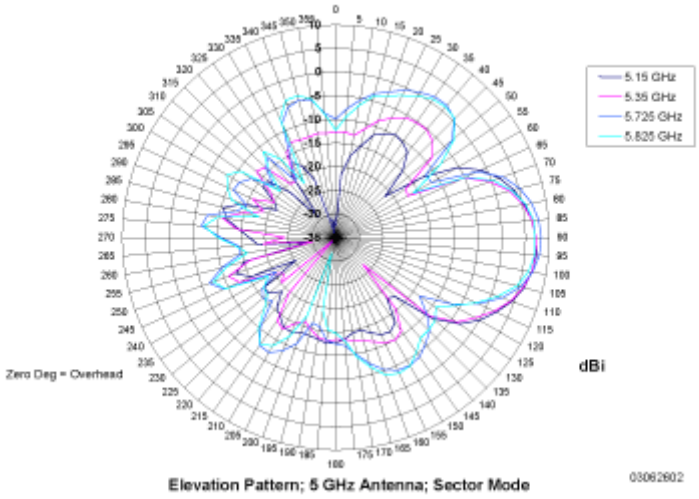


Figure - 1200 Airespace AP 802.11a Sectorized (Single Internal) Elevation Antenna Gain Pattern



802.11b/g Internal Antenna Patterns

The 1200 Airespace AP enclosure can contain one 802.11b/g radio which drives two fully-enclosed high-gain antennas which can provide a large 360-degree coverage area. The two internal antennas can be used at the same time to provide a 360-degree (Omnidirectional) coverage area, or either antenna can be disabled to provide a 180-degree (Sectorized) coverage area.

The 802.11b/g radio supports receive and transmit diversity between the internal antennas and/or optional factory-supplied external antennas.

Figure - 1200 Airespace AP 802.11b/g OMNI (Dual Internal) Azimuth Antenna Gain Pattern

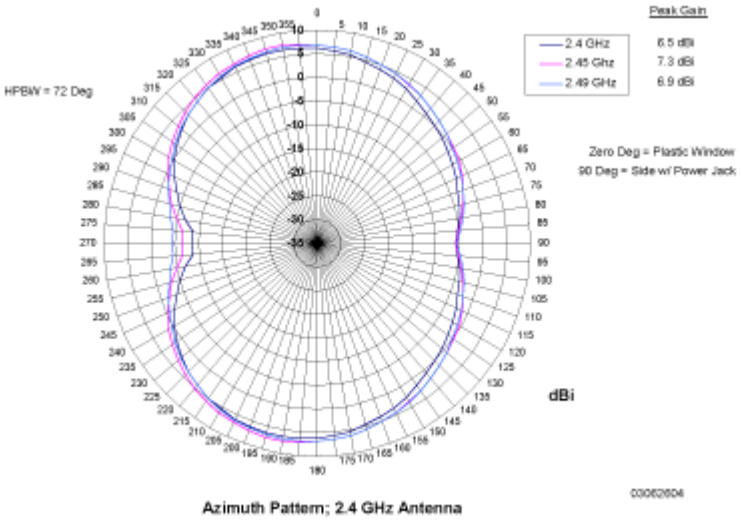


Figure - 1200 Airespace AP 802.11b/g OMNI (Dual Internal) Elevation Antenna Gain Pattern

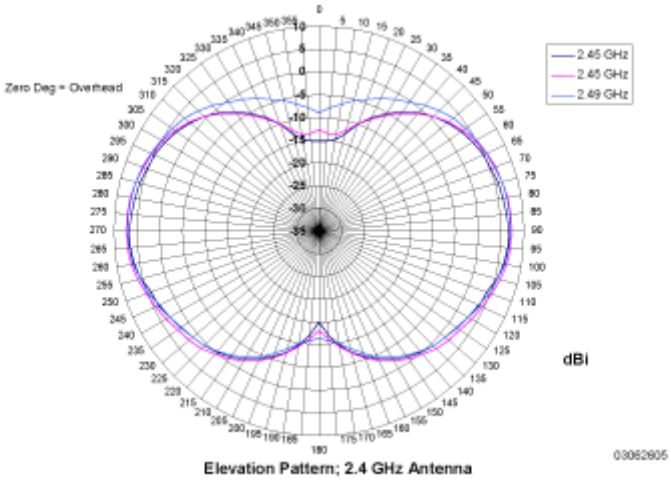


Figure - 1200 Airespace AP 802.11b/g Sectorized (Single Internal) Azimuth Antenna Gain Pattern

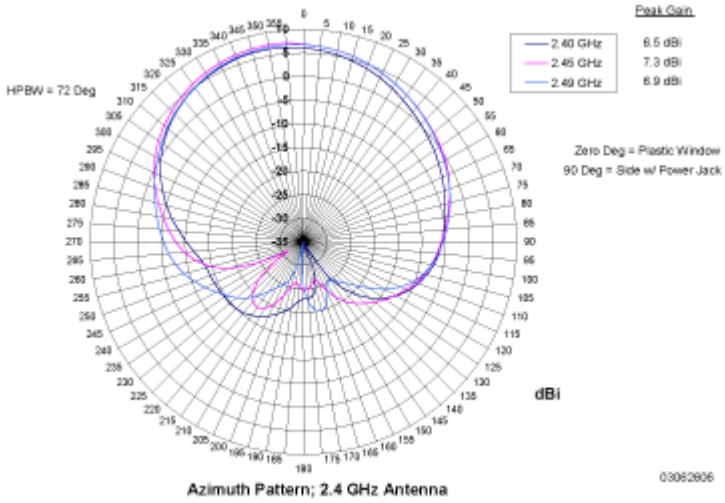
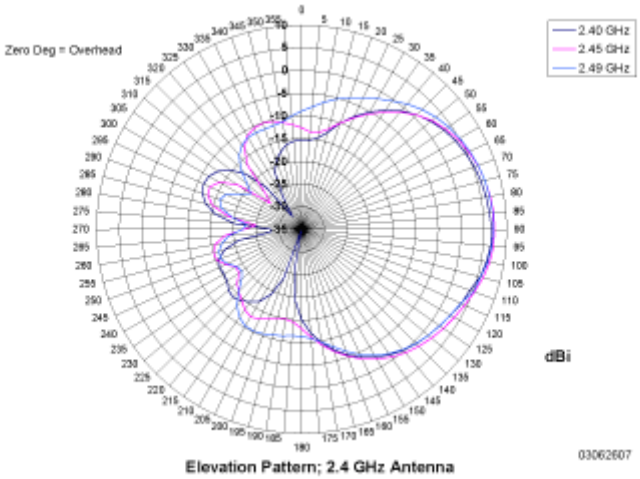


Figure - 1200 Airespace AP 802.11b/g Sectorized (Single Internal) Elevation Antenna Gain Pattern



802.11a/b/g Internal Antenna Patterns

The AS-1200-ABG Airespace AP enclosure contains one 802.11a and one 802.11b/g radio and four fully-enclosed high-gain antennas which provide large 360-degree 802.11a and 802.11b/g coverage areas, a shown in the *802.11a Internal Antenna Patterns* and *802.11b/g Internal Antenna Patterns* sections.

Note that the 802.11b/g radio supports receive and transmit diversity between the internal antennas, while the 802.11a radio only supports diversity between the internal antennas and an optional factory-supplied external antenna.

About Airespace AP LEDs

Each Airespace AP is equipped with four LEDs across the top of the case. They can be viewed from nearly any angle. The LEDs indicate power and fault status, 2.4 GHz (802.11b/g) radio activity, and 5 GHz (802.11a) radio activity.

This LED display allows the wireless LAN manager to quickly monitor the Airespace AP status. For more detailed troubleshooting instructions, refer to the *Troubleshooting* section.

About Airespace AP Connectors

The Airespace AP has the following external connectors:

- One RJ-45 Ethernet jack, used for connecting the Airespace AP to the 4012 or 4024 Airespace Wireless Switch or to the switched network.
- One 48 VDC power input jack, used to plug in an optional factory-supplied external power adapter.
- Three male reverse-polarity TNC antenna jacks, used to plug optional external antennas into the Airespace AP: two for an 802.11b/g radio, and one for an 802.11a radio.

Figure - Airespace AP External Connectors

A. 2.4 GHz/802.11b Left External Antenna, Power, and Ethernet

B. 5 GHz/802.11a and 2.4 GHz/802.11b Right External Antennas

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The Airespace AP communicates with an Airespace Wireless Switch or WLAN Appliance using standard CAT-5 (Category 5) or higher 10/100 Mbps twisted pair cable with RJ-45 connectors. Plug the CAT-5 cable into the RJ-45 jack on the side of the Airespace AP.

Note that the Airespace AP can receive power over the CAT-5 cable from the Airespace Wireless Switch or switched network equipment. Refer to *Power Over Ethernet* for more information about this option.

The Airespace AP can be powered from an optional factory-supplied external AC-to-48 VDC power adapter. If you are powering the Airespace AP using an external adapter, plug the adapter into the 48 VDC power jack on the side of the Airespace AP.

The Airespace AP includes two 802.11a and two 802.11b/g high-gain internal antennas, which provide omnidirectional coverage. However, some Airespace AP models can also use optional factory-supplied external high-gain and/or directional antennas, as described in *Airespace AP External and Internal Antennas*. When you are using external antennas, plug them into the male reverse-polarity TNC jacks on the side of the Airespace AP as described in the *Airespace Access Point Quick Installation Guide*.

Note: The Airespace APs must use the factory-supplied internal or external antennas to avoid violating FCC regulations and voiding the user's authority to operate the equipment, as described in *FCC Statements for Airespace APs*.

About Airespace AP Power Requirements

The Airespace AP requires a 48 VDC nominal (between 38 and 57 VDC) power source capable of providing 7 Watts. The polarity of the DC source does not matter because the Airespace AP can use either a +48 VDC or a -48 VDC nominal source.

Airespace APs can receive power from an external power converter (see figure below) plugged into the side of the Airespace AP case, or from *Power Over Ethernet*.

Figure - Typical Airespace AP External Power Converter

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For more information about the Airespace AP specifications and capacities, refer to *Specifications*, to be determined.

About Airespace AP External Power Converter

The Airespace AP can receive power from an external 115 VAC-to-48 VDC power converter or from *Power Over Ethernet* equipment.

The external power converter plugs into a secure 115 VAC convenience outlet (to avoid having cleaning personnel unplug the converter when they use power cleaning equipment). The converter produces the required 48 VDC output (*Airespace AP Power Requirements*) for the Airespace AP. The converter output feeds into the side of the Airespace AP through a 48 VDC jack (*Airespace AP Connectors*).

About Airespace AP Mounting Options

Refer to the *Airespace Access Point Quick Installation Guide* for the Airespace AP mounting options.

About Airespace AP Physical Security

The side of the Airespace AP housing includes a slot for a Kensington MicroSaver Security Cable. You can use any MicroSaver Security Cable to ensure that your Airespace AP stays where you mounted it!

Refer to the *Kensington* website for more information about their security products, or to the *Airespace Access Point Quick Installation Guide* for installation instructions.

About Airespace AP Monitor Mode

The Airespace APs, Airespace Wireless Switches, and Airespace WLAN Appliances are capable of performing rogue detection and containment while providing regular service. However, if the administrator would prefer to dedicate specific Airespace APs to rogue detection and containment, or if a network that provides IDS only functions is desired, the Monitor mode should be enabled.

The Monitor function is set for all 802.11 radios on a per-Access Point basis in the *Airespace APs > Details* section in the *Using the Web Browser Interface*.

About Third-Party Access Points

The Airespace System can control all parameters for existing Cisco 1200, Cisco 350 and ORiNOCO 2000 Access Points using the third-party user interface from within the *Airespace Control System Software* application. In addition, the Airespace System can be used to enforce real-time control of system-wide 802.1x security policies for third-party AP WLANs as described in *AireOS Security*.

Note: Third-party APs must be connected directly to the front panel of 4012 and 4024 Airespace Wireless Switches for the AireOS to control them using the third-party AP WLAN 17. Because the 4101 and 4102 Airespace WLAN Appliances do not have front-panel AP ports, WLAN 17 is not supported on the 4101 or 4102 Airespace WLAN Appliances.

About Rogue Access Points

Because they are inexpensive an readily available, clients are plugging unauthorized rogue access points (rogue APs) into existing LANs and building ad hoc wireless networks without IT department knowledge or consent.

These rogues can be a serious breach of network security, because they can be plugged into a network port behind the corporate firewall. Because clients generally do not enable any security settings on the rogues, it is easy for unauthorized clients to use the access point to intercept network traffic and hijack client sessions. Even more alarming, wireless clients and war chalkers frequently publish unsecure access point locations, increasing the odds of having the enterprise security breached.

Rather than using a person with a scanner to manually detect rogue APs, the Airespace System automatically collects information on rogue access points detected by its managed *Airespace Access Points* and *Third-Party Access Points*, by MAC and IP address, and allows the system operator to tag and monitor them as described in the *Detecting and Monitoring Rogue Access Points* section. Finally, the AireOS can be used to discourage rogue AP clients by sending them deauthenticate and disassociate messages from one to four Airespace APs. Because this real-time detection is automated, it saves labor costs used for detecting and monitoring rogue APs while improving LAN security.

See also *Rogue AP Tagging and Containment*.

Rogue AP Tagging and Containment

This built-in detection, tagging, monitoring and containment capability allows system administrators to take required actions:

- Receive new rogue notifications, eliminating hallway scans.
- Monitor unknown rogues until they are eliminated or acknowledged.
- Determine the closest authorized *Airespace Access Points* and *Third-Party Access Points*, making directed scans faster and more effective.
- Contain rogue APs by sending their clients deauthenticate and disassociate messages from one to four Airespace APs.
- Tag rogue APs:
  - Acknowledge rogue APs when they are outside of the LAN and do not compromise the LAN or WLAN security.
  - Accept rogue APs when they do not compromise the LAN or WLAN security.
  - Tag rogue APs as unknown until they are eliminated or acknowledged.
  - Tag rogue APs as contained and continue discouraging rogue AP clients from associating with the rogue AP, by having between one and four Airespace APs transmit deauthenticate and disassociate messages to the rogue AP clients. This function can contain one or more channels on the same rogue AP.

To facilitate automated rogue detection in a crowded RF space, Airespace APs can be configured to operate in *Monitor Mode*, allowing monitoring without creating unnecessary interference.

About the Airespace Control System Software

The Airespace Control System Software (ACS Software Server) is an AireOS management tool that extends the capabilities of the *Airespace Web Browser Interface* and the *Airespace Command Line Interface* from an individual Airespace Wireless Switch or WLAN Appliance to a network of Airespace Switches and Appliances.

The ACS Software Server includes the same configuration, performance monitoring, security, fault management, and accounting options used at the Airespace Switch and Appliance level, but adds a graphical view of multiple Airespace Wireless Switches, Airespace WLAN Appliances and managed Access Points.

ACS Software Server simplifies adding and configuring Airespace Switches and Appliances while decreasing data entry errors with the *ACS Airespace Switch and Appliance Autodiscovery* algorithm. The ACS Software Server also uses industry-standard SNMP traps and flags to communicate with the Airespace Switches and Appliances.

The ACS Software Server can be run as a normal Windows application, or can be installed as a service, which runs continuously and resumes running after a reboot.

The value added by ACS Software Server includes graphical views of the following:

- *ACS Airespace Switch and Appliance Autodiscovery* of each Airespace Switch and Appliance as it appears on the switched network.
- Auto-discovery of *Airespace Access Points* as they associate with operating Airespace Switches and Appliances.
- Auto-discovery of *Rogue Access Points* and manual association of *Third-Party Access Points* with Airespace Wireless Switches.
- Map-based organization of Access Point areas, helpful when the enterprise spans more than one geographical area. (Refer to *Configuring ACS Software*.)
- User-supplied Campus, Building and Floor graphics, which show the following:
  - Locations and status of managed Access Points. (Refer to *Adding Devices to the ACS Software Database*.)
  - Approximate locations of rogue APs, based on signal strength received by nearest managed Airespace APs. (Refer to *Detecting and Monitoring Rogue Access Points*.)
  - Locations of coverage holes, based on received signal strength from clients. (Refer to *Finding Coverage Holes*.)
- System-wide control:
  - Network, Airespace Wireless Switch, Airespace WLAN Appliance and managed AP configuration is streamlined using customer-defined templates.
  - Network, Airespace Wireless Switch, Airespace WLAN Appliance and managed AP status and alarm monitoring.
  - Automated monitoring: rogue APs, coverage holes, security violations, Airespace Switches and Appliances, and Airespace APs.
  - Full event logs available for rogue APs, coverage holes, security violations, Airespace Switches and Appliances, and Airespace APs.
  - Native third-party AP control and monitoring from within ACS Software Server.
  - User-controllable *AireWave Director Software*.
  - User-defined automatic Airespace Switches and Appliances status audits, missed trap polling, configuration backups, and policy cleanups.

About ACS Airespace Switch and Appliance Autodiscovery

Manually adding Airespace Switch and Appliance data to a management database can be time consuming, and is susceptible to data entry errors. The *Airespace Control System Software* (ACS Software Server) includes a built-in Airespace Wireless Switch and WLAN Appliance Autodiscovery function that speeds up database creation while eliminating errors.

Airespace Switch and Appliance Autodiscovery is limited to the *Airespace Mobility Group* defined by the Airespace System operator.

The *Using ACS Software Airespace Switch and Appliance Autodiscovery* task allows operators to search for a single Airespace Switch or Appliance by IP address, and facilitates a multiple-Airespace Switch or Appliance search across a range of IP addresses. In either case, the Autodiscovery function finds all Airespace Switches and Appliances on the switched network within the specified IP address range, and automatically enters discovered Airespace Switch and Appliance information into the ACS Software Server database.

Note: Airespace Switch and Appliance Autodiscovery can take a long time on a Class C address range. Because of the large number of addresses in a Class B or Class A range, Airespace recommends that you do not attempt Autodiscovery across Class B or Class A ranges.

As *Airespace Access Points* associate with an Airespace Switch or Appliance, the Airespace Switch or Appliance immediately transmits the Airespace AP information to the *Airespace Control System Software*, which automatically adds the Airespace AP to the ACS Software Server database.

Once the Airespace AP information is in the ACS Software Server database, operators can add the Airespace AP to the appropriate spot on an ACS Software Server map using *Arranging Airespace APs on Floorplan Maps*, so the topological map of the air space remains current.

About the Airespace Web Browser Interface

The Airespace Web Browser Interface is built into each Airespace Switch and Appliance. The Web Browser Interface allows up to five users to simultaneously browse into the built-in Airespace Wireless Switch or WLAN Appliance http/https (http + SSL) Web server, configure parameters, and monitor operational status for the Airespace Switch or Appliance and its associated Access Points.

Note: Airespace strongly recommends that you enable the https: and disable the http: interfaces to ensure more robust security for your Airespace System.

Because the CLI works with one Airespace Switch or Appliance at a time, the Airespace Web Browser Interface is especially useful in *Single-Airespace Switch or Appliance Deployments*, or in *Multiple-Airespace Switch and Appliance Deployments* when you wish to connect to a single Airespace Switch or Appliance.

Note: Some popup window filters can be configured to block the Airespace Web Browser Online Help windows. If your system cannot display the Online Help windows, disable or reconfigure your browser popup filter software.

Refer to *Using the Airespace Web Browser Interface* for more information on the Airespace Web Browser Interface.

About the Airespace Command Line Interface

The Airespace Command Line Interface (CLI) is built into the Airespace Wireless Switches and WLAN Appliances, and is one of the AireOS management interfaces described in *About the Airespace System*. The Airespace CLI allows operators to use a VT-100 emulator to locally or remotely configure, monitor and control individual Airespace Switches and Appliances, and to access extensive debugging capabilities.

Because the CLI works with one Airespace Switch or Appliance at a time, the Airespace Command Line Interface is especially useful in *Single-Airespace Switch or Appliance Deployments*, or in *Multiple-Airespace Switch and Appliance Deployments* when you wish to connect to a single Airespace Switch or Appliance.

The Airespace Switch or Appliance and its associated Airespace APs can be configured and monitored using the Command Line Interface (CLI), which consists of a simple text-based, tree-structured interface that allows up to five users with Telnet-capable terminal emulators to simultaneously configure and monitor all aspects of the Airespace Switch or Appliance and associated Airespace APs.

Refer to *Using the Airespace CLI* and the *Airespace CLI Reference* for more information.

Notes:

SOLUTIONS

- *AireOS Security*
- *Configuring a Firewall for ACS Software Server*
- *Configuring AireOS for SpectraLink NetLink Telephones*
- *Management over Wireless*
- *Configuring a WLAN for a DHCP Server*
- *Customizing the Web Auth Login Screen*

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AireOS Security

AireOS Security includes the following sections:

- *Overview*
- *Layer 1 Solutions*
- *Layer 2 Solutions*
- *Layer 3 Solutions*
- *Single Point of Configuration Policy Manager Solutions*
- *Rogue AP Solutions*
- *Integrated Security Solutions*
- *Simple, Cost-Effective Solutions*

Overview

The industry-leading AireOS Security solution bundles potentially complicated Layer 1, Layer 2 and Layer 3 802.11 Access Point security components into a simple policy manager that customizes system-wide security policies on a per-WLAN basis (*AireOS Security*). Unlike SOHO (small office, home office) 802.11 products, the AireOS Security solution included in the Airespace Wireless Enterprise Platform (Airespace System) provides simpler, unified, and systematic security management tools.

One of the biggest hurdles to WLAN deployment in the enterprise is the WEP (Wired Equivalent Privacy) encryption, which has proven to be a weak standalone encryption method. A newer problem is the availability of low-cost APs, which can be connected to the enterprise switched network and used to mount 'man-in-the-middle' and denial-of-service attacks. Also, the complexity of add-on security solutions has prevented many IT managers from embracing the new 802.11 benefits. Finally, the 802.11 security configuration and management cost has been daunting for resource-bound IT departments.

Layer 1 Solutions

The AireOS Security solution ensures that all clients gain access within an operator-set number of attempts. Should a client fail to gain access within that limit, it is automatically blacklisted (blocked from access) until the operator-set timer expires.

Layer 2 Solutions

If a higher level of security and encryption is required, the network administrator can also implement industry-standard security solutions, such as: 802.1X dynamic keys with EAP (extended authorization protocol), or WPA (Wi-Fi protected access) dynamic keys. The Airespace WPA implementation includes AES (advanced encryption standard), TKIP + Michael (temporal key integrity protocol + message integrity code checksum) dynamic keys, or WEP (Wired Equivalent Privacy) static keys. Blacklisting is also used to automatically block Layer 2 access after an operator-set number of failed authentication attempts.