The WS5000 Wireless Switch delivers on Symbol’s promise of:

- **Security and Scalability**
- **Manageability**
- **Availability**
- **ROI Advantage**
- **TCO Savings**

**Next-Generation Switch-Based Wireless LANs: The Power of Centralized Intelligence**

The WS5000 Wireless Switch is the wireless gatekeeper for your enterprise network. It enables you to easily upgrade to tomorrow’s standards, the WS5000 is the wireless gatekeeper for your enterprise network.

The WS5000 removes the overhead and complexity of first-generation access point-based wireless LANs, delivering a wireless network that is less expensive to implement and manage. The extensive functionality, expandability, and centralized management eliminate the time and management costs associated with access point-based solutions, providing a lower total cost of ownership.

Centralized management

The WS5000 simplifies day-to-day operations with unified management of hardware, software configuration, and network policies. Centralized management also enables the automatic distribution of configurations to all Access Ports—eliminating the need and the associated costs to configure and manage each access point.

Scales and grows more easily

Adding capacity and new functionality is easier and less expensive than an access point-based wireless LAN. The WS5000 enables your wireless network to scale as easily as your company grows, with a simple DPI feature that fits easily into any standard network equipment rack. Each WS5000 supports up to 30 Access Ports and 32 WLANs.

**Lower Total Cost of Ownership—Outstanding Investment Protection**

The WS5000 removes the overhead and complexity of first-generation access point-based wireless LANs, delivering a wireless network that is less expensive to implement and manage. The extensive functionality, expandability, and centralized management eliminate the time and management costs associated with access point-based solutions, providing a lower total cost of ownership. And with the flexibility to support the standards of today and tomorrow, as well as the legacy wireless networks of yesterday, the WS5000 provides outstanding investment protection.

**Extensive WLAN Functionality**

The comprehensive feature set of the WS5000 provides full control over wireless LAN traffic to provide peak performance. Extensive wireless LAN functionality enables you to maximize bandwidth and throughput, practice critical traffic, conserve power or mobile devices, and provide dependable connection speeds for users in challenging wireless environments.

**Scalable Radio Architecture**

Each WS5000 supports up to 31 single or dual-band Access Port radios, easily accommodates new coverage, radio types, channels, and spectrum—offering the broadest radio technology support in the industry. The WS5000 provides support across the 900 MHz, 2.4 GHz and 5 GHz frequencies with frequency hopping, direct sequence, and OFDM encoding techniques, as well as 802.11a, 802.11b, 802.11g (ready), and 802.11n (ready), HM, and DS radio operations.

**End-to-end layered security**

Our comprehensive suite of security mechanisms—including access control, authentication, and encryption—can be deployed at various locations in the enterprise network: the perimeter, the network, the servers, and client devices. The result is a layered security model that delivers robust end-to-end security. With support for the wireless security standards of today, and the ability to easily upgrade to tomorrow’s standards, the WS5000 is the wireless gatekeeper for your enterprise network.
The WS5000 redefines the standard for enterprise class wireless networks, delivering extensive functionality, security, scalability and management at a much lower total cost of ownership than first-generation access point-based wireless networks.

The WS5000 Wireless Switch delivers on Symbol’s promise of:

- Security and Scalability
- Manageability
- Availability
- ROI Advantage
- TCO Savings

The WS5000 is a platform for the next generation of wireless networks, delivering extensive functionality, security, scalability and management at a much lower total cost of ownership than first-generation access point-based wireless networks. By centralizing intelligence that was previously distributed throughout a wireless network via access points, this 2nd generation wireless switch architecture delivers an unparalleled level of wireless LAN control, performance and management simplicity.

Combined with Symbol Access Ports, the WS5000 (Representing the evolution of the access point from a network node that is difficult to scale to a simple RF media access device for the wireless switch. True plug-and-play with ‘zero configuration’, extensible, expandable media independent Access Port architecture that supports 802.11a, 802.11b, and 802.11g (ready), as well as supporting legacy access points. Symbol Access Ports bring a new level of simplicity to wireless network implementation and management, the WS5000 enables you to maximize bandwidth and throughput, parallel critical traffic, conserve power on mobile devices, and provide dependable correlation speeds for users in challenging wireless environments.

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Access Ports: Next-Generation Access Points

Access Ports bring a new level of simplicity to wireless network implementation and management, as well as an unprecedented upgrade capability. The innovative design removes duplicate computing components and management requirements associated with using access points throughout a wireless LAN. Access Ports are easily upgraded with new features and functionality via the WS5000’s advanced access point upgrade capability. The innovative design removes duplicate computing components and management requirements associated with using access points throughout a wireless LAN. Access Ports are easily upgraded with new features and functionality via the WS5000’s advanced access point upgrade capability.

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Scalable and easy to upgrade

Adding capacity and new functionality is easier and less expensive than an access point-based wireless LAN. The WS5000 enables your wireless network to scale easily as your company grows, with a simple SNMP-formula that fits easily into any standard network equipment. Each WS5000 supports up to 30 Access Ports and 32 WLANs.

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Virtual AP provides complete control over broadcast traffic, delivering overall improvement in network performance – from maximum bandwidth and network throughput to improved device battery life.

**Virtual AP: The Functionality of Four Access Points in One Access Port**

Without Virtual AP, a single access point can only support one wireless LAN. However, access points may be deployed for many wireless LANs, resulting in significant increases in capital and management expenses.

**Virtual AP Enables True Virtual LANs**

Virtual AP provides support for multiple BSSIDs, enabling the creation of true wireless virtual LANs (VLANs) — providing the ability to map multiple ESSIDs (Extended Service Set Identifiers) to multiple BSSIDs (Basic Service Set Identifiers). Wireless traffic engineering capabilities control client-to-client visibility, broadcast/trafﬁc control, packet forwarding behavior, and security policies.

**Power Saving for Client Devices**

The Power Save Protocol (PSP) polling feature provides two modes (sleep and idle) that enable devices to maximize battery life and maintain application performance. Doze mode enables devices to conserve power between wireless transmissions, while sleep mode ensures that packets are stored and reliably delivered when the device awakens.

**Per Device QoS with Bandwidth-Weighted Fair Queuing**

The WS5000 controls Quality of Service (QoS) for each mobile device by guaranteeing bandwidth for specific trafﬁc classes during periods of network congestion. With support for layer 2/3/4 classiﬁcation, DiffServ, and 802.1p, packets are assigned into a bandwidth-weighted fair queuing scheduler that allocates a percentage of available bandwidth to each class queue. In addition, the Power Save Protocol (PSP) provides per device sleep-stage queues that maintain application performance for devices in sleep mode.

**Advanced Channel Selection**

The WS5000 offers comprehensive RF management services: Automatic Channel Selection and Coherence. Automatic Channel Selection manages RF performance—automatically selecting the best channel for each Access Port based on noise and signal strength. Coherence ensures that broadcast trafﬁc is received only by the intended recipients; and the possible compromise in security of messages is eliminated since broadcast messages can no longer reach the wrong recipients.

Virtual AP provides a complete control over broadcast trafﬁc, which is associated with a BSSID. Control of broadcast trafﬁc, including network level messages, is extremely important because of its potential negative effect on performance. Intelligent control of broadcast trafﬁc forwarding through proxy ARP and other mechanisms ensures that broadcast trafﬁc is received only by the intended recipients. The resulting reduction in trafﬁc maximizes bandwidth and network throughput; device battery life and overall performance are improved with the elimination of the processing of messages intended for other recipients; and the possible compromise in conﬁdentiality and security of messages is eliminated since broadcast messages can no longer reach the wrong recipients.

**Load Balancing and Pre-emption Roaming**

Normal roaming does not occur until the device connection has reached a minimum connection speed of 1 Mbps—normal well beyond the boundaries of a cell and approximately halfway through an adjacent cell. Two features, client load balancing and pre-emption roaming, work hand-in-hand to ensure that devices roam before the connection quality erodes, providing users with more consistent connection speeds for smooth application performance.

**Automatic Channel Selection**

The degradation of RF performance due to environmental factors is eliminated with Automatic Channel Select (ACS). ACS optimizes radio channel planning and installation, scanning and selecting the best channel for each Access Port based on noise and signal properties. A complete set of conﬁguration controls provides time, mode of operation and Access Port exclusion lists.

**PSPP—Power Saving Protocol**

PSPP provides two modes: Sleep and Doze. Sleep mode enables devices to conserve power between wireless transmissions, while Doze mode ensures that packets are stored and reliably delivered when the device awakens.

**QoS: Quality of Service**

QoS ensures that broadcast trafﬁc is received only by the intended recipients. The resulting reduction in trafﬁc maximizes bandwidth and network throughput; device battery life and overall performance are improved with the elimination of the processing of messages intended for other recipients; and the possible compromise in conﬁdentiality and security of messages is eliminated since broadcast messages can no longer reach the wrong recipients.

**DiffServ**

DiffServ is a framework for service differentiation on the Internet. It relies on the use of classiﬁcation and admission control mechanisms to guide the allocation of network resources to different classes of users.

**802.1p**

802.1p is a standard that deﬁnes a virtual LAN, a collection of devices that form a logical network and share a common transmission path. Devices that are members of the same virtual LAN can communicate as if they were connected to the same physical LAN segment, regardless of how they are physically connected.

**802.11a and 802.11b**

802.11a and 802.11b are wireless communication standards that specify physical and data link layers of the Open Systems Interconnection (OSI) model for wireless networks. 802.11a is a wireless networking standard that operates in the 5 GHz unlicensed band, while 802.11b operates in the 2.4 GHz band.

**DiffServ, and 802.1p, packets are assigned into a bandwidth-weighted fair queuing scheduler that allocates a percentage of available bandwidth to each class queue. In addition, the Power Save Protocol (PSP) provides per device sleep-stage queues that maintain application performance for devices in sleep mode.**
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**Virtual AP: The Functionality of Four Access Points in One Access Port**

**Access Ports with Virtual AP (Requires Four Devices to Support Four Virtual LANs)**

Without Virtual AP, an access point can only support one wireless LAN. Access points must be deployed for each wireless LAN required, significantly increasing expense and management costs.

**Virtual AP Enables True Virtual LANs**

Access Points with no Virtual AP (Requires Four Devices to Support Four Virtual LANs)

VS5000, providing excellent investment protection. A wide range of 802.11a and 802.1b external antenna options enables the design of coverage patterns for the most challenging environments.

**Power Saving for Client Devices**

The Power Save Protocol (PSP) provides per device sleep-stage queues that maintain application performance for devices in sleep mode.

**Virtual AP Enables True Virtual LANs (VLANs)**

Virtual AP provides complete control over broadcast traffic, which is associated with a BSSID. Control of broadcast traffic, including network level messages, is extremely important because of its potential negative effect on performance: intelligent control of broadcast forwarding through proxy ARP and other mechanisms ensures that broadcast traffic is received only by the intended recipients. The resulting reduction in traffic maximizes bandwidth and network throughput, device battery life and overall performance.

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Normal roaming does not occur until the device connection has reached a minimum connection speed of 1 Mbps - normally well beyond the boundaries of a cell and approximately halfway through an adjacent cell. Two features, client load balancing and pre-emptive roaming, work hand-in-hand to ensure that devices roam before the connection quality erodes, providing users with more consistent connection speeds for smooth application performance.

**Automatic Channel Selection**

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A pioneer and leader in wireless LANs, Symbol offers a complete end-to-end layered security architecture that includes support for all of today's wireless security standards, and is easily upgradeable to support the standards of tomorrow.

**Layered Security Architecture**

<table>
<thead>
<tr>
<th>Security Layer</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>OPEN</td>
<td>Open System Access for Public Access Hot Spot</td>
</tr>
<tr>
<td>MEDIUM</td>
<td>Wireless LANs Access Control (ACLs) Pre-emptive Roaming occurs closer to the cell ‘edges’, ensuring that the load on any given access point is distributed through access devices within the actual cell, thus improving network performance, the network. The robust approach enables the deployment of multiple security mechanisms throughout your wireless network.</td>
</tr>
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</table>

**Network Access Control**

**Access Control Lists (ACLs)**

Layer 2048/Access Control Lists provide filtering for advanced network traffic control, enabling administrators to forward, drop or redirect packets based on application type, protocol, IP Address, MAC Address and more.

**Authentication**

Authentication ensures that only authorized users and devices can access your network. The WS5000 provides a comprehensive set of authentication mechanisms to support a variety of security requirements:

- **Automatic Channel Selection**
  - The degradation of RF performance due to environmental factors is eliminated with Automatic Channel Select (ACS). ACS optimizes radio channel planning and installation, scanning and selecting the best channel for each Access Port based on noise and signal properties. A complete set of configuration controls provides time, mode of operation and Access Port exclusion lists.

**Transmit Power Control**

Transmit Power Control minimizes radio interference for sites that require a very dense population of radios (Access Ports) to support bandwidth requirements. Configured from within the WS5000, this can also be part of a group policy.

**End-to-End Layered Security**

There is no element of networking—wired or wireless—more important than security. As a pioneer and leader in wireless LANs, Symbol has implemented a complete end-to-end layered security model that includes support for all of today’s wireless security standards, and is easily upgradeable to support the standards of tomorrow. Policy-based classes enable the organization of security requirements in groups—public, low, medium, and high. Policies are then configured to specify the correct level of control for users, applications, and devices within those groups.

**Normal vs Pre-emptive Roaming**

Normal Roaming (Frequently Results in Uneven Load Balancing and Poor Connection)

- Devices communicate over the wireless network all of the time, 24/7. Since normal roaming does occur until device has link up, many devices as well as another cell radiate the connection inside for Cell 1, and action limiting the maximum performance. The result is uneven bandwidthing — the fewer devices supported by the cell access point result in a lack of connection speed. This is remedied when the cell is ‘offload’ and the devices move to higher connection speeds, resulting in smoother running of applications.

Pre-emptive Roaming (Results in Even Load Balancing and Higher Connection Speeds)

Critical for mission-critical applications such as voice, video and high transactional access (e.g., point-of-sale and Internet access), clients require bandwidth guarantees.

- Pre-emptive roaming occurs closer to the cell ‘edges’, ensuring that the load on any given access point is distributed through access devices within the actual cell, thus improving network performance, the network.

**Automated Channel Selection (ACS)**

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**Policy-Based Classes**

- Policies are then configured to specify the correct level of control for users, applications, and devices within those groups.

**Pre-shared Keys**

- Pre-shared keys are also used for wireless access. Pre-shared keys can be used for simple shared authentication through non-wireless distribution of authentication keys.
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Layer 3/4 traffic control, enabling administrators to forward, drop or redirect packets based on application type, protocol, IP Address, MAC Address and more.

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- **Pre-emptive Roaming**
  - A complete set of configuration controls provides time, mode of operation and Access Port exclusion lists.

**Transmit Power Control**

Transmit Power Control minimizes radio interference for sites that require a very dense population of radios (Access Ports) to support bandwidth requirements. Configured from within the WS5000, this can also be part of a group policy.

**Pre-shared keys**

Simple shared authentication through non-wireless distribution of authentication keys ensures secure key management.

**Layered Security Architecture**

The robust and cost-effective layered approach enables the deployment of multiple security mechanisms throughout your wireless network.

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**Security Elements**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Network Access Control</td>
<td>Network-based packet filtering or ACLs that limit access based on MAC address and IP address</td>
<td>Restricts authorized users and devices for specific criteria.</td>
</tr>
<tr>
<td>Application Access Control</td>
<td>Authenticates users based on application or network-based packet filtering using TCP/UDP ports</td>
<td>Restricts unauthorized users and devices for specific applications.</td>
</tr>
<tr>
<td>User and Role Authentication</td>
<td>Provides one-way or mutual authentication between the network and associated mobile clients</td>
<td>Encrypts information of who and what log in to your network</td>
</tr>
<tr>
<td>Transport Encryption</td>
<td>Transforms or scrambles data into a form that is unreadable without the key.</td>
<td>Enables privacy of data to be maintained when sending data across insecure networks.</td>
</tr>
<tr>
<td>Encryption Key Management</td>
<td>Provides automated distribution and maintenance of encryption keys</td>
<td>Reduces management overhead by encrypting key distribution and increases security by constantly changing key keys.</td>
</tr>
<tr>
<td>Accounting</td>
<td>Creates audit logs of who/when/how</td>
<td>Allows tracking of activity and network status</td>
</tr>
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</table>

**Security Mechanisms**

<table>
<thead>
<tr>
<th>Control Mechanism</th>
<th>Best Used for Securing...</th>
<th>Authentication Support</th>
<th>Mobility Support</th>
<th>Layer of Security</th>
</tr>
</thead>
<tbody>
<tr>
<td>All-Access Control</td>
<td>Device, Application</td>
<td>No</td>
<td>Medium</td>
<td>Low</td>
</tr>
<tr>
<td>Firewall</td>
<td>Device, Application</td>
<td>No</td>
<td>Medium</td>
<td>Low</td>
</tr>
<tr>
<td>WEP (10/128)</td>
<td>Transport</td>
<td>No</td>
<td>Medium</td>
<td>Low</td>
</tr>
<tr>
<td>WPA2-PSK</td>
<td>Transport</td>
<td>Yes</td>
<td>Excellent</td>
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<td>Medium</td>
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<tr>
<td>WPA2-128</td>
<td>Transport, User</td>
<td>Yes</td>
<td>Excellent</td>
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**Security Mechanisms**

| Certificate Based Public Key Infrastructure (PKI) | PKI, used in conjunction with the AES-based VPN transport, uses secure digital certificates to provide robust authentication capabilities including verification of identity as well as integrity of data (ensuring that tampering or corruption has not occurred), and authorization for network access. |
| Encryption | Encryption ensures that data privacy is maintained while in transit. As a rule of thumb, the stronger the encryption, the more complex and expensive it is to implement and manage. The WS5000 supports a variety of encryption options that provide basic to strong encryption techniques, providing the flexibility to select the right level for your needs. |
| Mixed Equivalence IP (MEIP) | The B2421 Wired Equivalent Privacy (MEIP) provides static key encryption—a single key is distributed to all users for encryption and decryption of data. MEIP generates either a 40- or 128-bit key using the widely used RC-4 encryption algorithm. MEIP allows full interoperability with legacy clients and provides basic level of confidentiality against network security concerns in less critical environments, such as an open public-access application. |

**B2421 Extensible Authentication Protocol (EAP)**

The B2421 and Extensible Authentication Protocol (EAP) work hand-in-hand, providing the infrastructure for robust authentication and dynamic key rotation and distribution. EAP provides a means for mutual authentication. Authorized users identify themselves to the wireless network, and the wireless network identifies itself to the user—ensuring that unauthorized users cannot access your network, and authorized users do not inadvertently join a rogue network. A wide variety of authentication types can be used—from user name and password to voice signatures, public keys, biometrics, with the ability to upgrade to support future authentication types. And dynamic key rotation and distribution provides a new encryption key per user per session, greatly increasing the strength of the chosen encryption algorithm (WEP or TKIP) used to encode data. The WS5000 supports a variety of EAP methods, including Microsoft®—TLS, Funk Software®—TTLS, and WPA—PEAP.

Kerberos

Kerberos is a highly-trusted Kerberos of protocol meets all of the requirements for scalable, effective security in a mobile environment. Kerberos features mutual authentication and end-to-end encryption. All traffic is encrypted and security keys are generated on a per-client basis. Keys are never shared or reused, and are automatically distributed in a secure manner. The Kerberos ticket-based security mechanism enables fast roaming, even with the highest levels of security.
With support for the wireless security standards of today, and the ability to easily upgrade to tomorrow’s standards, the WS5000 is the wireless gatekeeper for your enterprise network.

802.1x/Extensible Authentication Protocol (EAP)

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Certificate Based Public Key Infrastructure (PKI)

PKI, used in conjunction with the AES-based VPN, transport, user secure digital certificates to provide robust authentication capabilities including verification of identity as well as integrity of data (ensuring that tampering or corruption has not occurred), and authorization for network access.

Encryption

Encryption ensures that data privacy is maintained while in transmission. As a rule of thumb, the stronger the encryption, the more complex and expensive it is to implement and manage. The WS5000 supports a range of encryption options that provide basic to strong encryption techniques, providing the flexibility to select the right level for your needs.

Wired Equivalent Privacy (WEP)

The 802.11 Wired Equivalent Privacy (WEP) provides static key encryption—a single key is distributed to all users for encryption and decryption of data. WEP generates either a 40- or 128-bit key using the widely used RC-4 encryption algorithm. WEP provides basic interoperability with legacy clients and provides basic over-the-air security in less critical environments, such as an open public-access application.

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<tr>
<td>Transport Encryption</td>
<td>Transforms or scrambles data into a form that’s unreadable through the key</td>
<td>Enables privacy of data to be maintained when sending data across insecure networks</td>
</tr>
<tr>
<td>Encryption Key Management</td>
<td>Provides automatic distribution and maintenance of encryption keys</td>
<td>Reduces management overhead by adjusting key distribution and increasing security by constantly changing key lengths</td>
</tr>
<tr>
<td>Accounting</td>
<td>Creates audit logs of who/when/how</td>
<td>Allows tracking of activity and network status</td>
</tr>
</tbody>
</table>

Security Mechanisms

<table>
<thead>
<tr>
<th>Control Mechanism</th>
<th>Best Used for Securing...</th>
<th>Authentication Support</th>
<th>Mobility Support</th>
<th>Layer of Security</th>
</tr>
</thead>
<tbody>
<tr>
<td>L2-Access Control Lists</td>
<td>Device Access, Application</td>
<td>No</td>
<td>Moderate</td>
<td>Low</td>
</tr>
<tr>
<td>802.1Q</td>
<td>Device Access, Application</td>
<td>No</td>
<td>Moderate</td>
<td>Low</td>
</tr>
<tr>
<td>802.1Q-VLAN</td>
<td>Transport</td>
<td>No</td>
<td>Poor</td>
<td>Moderate</td>
</tr>
<tr>
<td>802.1Q-VLAN</td>
<td>Transport</td>
<td>Yes</td>
<td>Poor</td>
<td>Medium</td>
</tr>
<tr>
<td>802.1Q-VLAN</td>
<td>Transport, User</td>
<td>Yes</td>
<td>Poor</td>
<td>Medium</td>
</tr>
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<td>Transport, User</td>
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</table>
The WS5000 is designed to grow and adapt to changing network and organizational needs—adding additional network capacity is easy and less expensive than traditional WLAN solutions.

### Web-based Management

- Provides secure, anytime-anywhere management with an intuitive, web-based GUI that supports step-by-step software-based wizards that enable easy configuration.

### Command Line Interface (CLI)

- Designed with well-known industry semantics and provides complete baseline management through Telnet or Serial interfaces.

### Four Interfaces

- Management Interfaces
  - Web-based management provides secure, anytime-anywhere management with an intuitive, web-based GUI that supports step-by-step software-based wizards that enable easy configuration.
  - The Command Line Interface (CLI) is designed with well-known industry semantics and provides complete baseline management through Telnet or Serial interfaces.
- Web-based management provides secure, anytime-anywhere management with an intuitive, web-based GUI that supports step-by-step software-based wizards that enable easy configuration of a wide variety of features.

### Ease of Management

- Management is intuitive and secure, and can be accessed via our command line interfaces (Telnet, Serial), embedded web-based Java applet, and standard Simple Network Management Protocol (SNMP).

### Policy-Based Management

- Policy-based management enables the creation of user, application, and device groups with specific resource and network access configurations, including physical layer attributes, VLAN topologies, forwarding rules, and security components. A wide variety of parameters can be configured for each group for up to 32 WLANs, either manually or by easy-to-use wizards, such as radio settings, service definitions, Quality of Service (QoS), virtual LANs, ESS/BSSID domains, Layer 2/3 filtering, DHCP, NAT, and more.

### Scalability

- The WS5000 Wireless Switch System is designed to grow and adapt to changing network and organizational needs. Adding additional network capacity is much easier and less expensive than traditional WLAN solutions: each WS5000 enables the addition of up to 30 Access Ports upon installation, ensuring all components in the wireless LAN are always up-to-date. Management is simplified because there is no longer a need to configure and load firmware on each access point.

### System Redundancy

- The WS5000 supports redundant warm-standby switch configuration. Designed for parallel use with an active WS5000, the WS5000-RS unit provides complete redundancy. Less expensive than the WS5000, this secondary device exchanges the system configuration and a simple heartbeat message with the primary WS5000 switch. In the event of a hardware or software failure, the redundant switch takes control of the wireless infrastructure ensuring consistency of operations and continuity of service.

### Power-over-Ethernet Accessories

- To lower your cost of installation, Symbol’s Wireless Switch System family includes a complete line of components to meet all your wireless networking needs, including a complete line of Power-over-Ethernet (PoE) devices. PoE devices eliminate the need to run costly power lines and install outlets to provide power for Access Ports, simplifying installation and reducing costs.
The WS5000 is designed to grow and adapt to changing network and organizational needs—adding additional network capacity is easy and less expensive than traditional WLAN solutions.

**WPA—Temporal Key Integrity Protocol (TKIP)**
WPA-TKIP addresses well-known vulnerabilities in WEP encryption. TKIP provides key rotation on a per-packet basis along with MIC message integrity check (MIC), which determines if data has been tampered or corrupted while in transit. This robust method of encryption provides a higher level of protection for your data and protects your network from a variety of types of attacks. Released by the WRCIA industry consortium, WPA-TKIP is an early version of the forthcoming IEEE 802.11i security standards.

**KeyGuard**
The implementation of TKIP is based on the IEEE 802.11 draft security standards. Like WIEEA’s version of TKIP, KeyGuard provides a different key for every packet of data, but uses a different version of message integrity check (MIC) to determine if data has been tampered or corrupted during transmission.

**WTLS Advanced Encryption Standard (AES) Virtual Private Networking (VPN)**
Symbol’s AirBeam® Safe VPN server provides a complete end-to-end VPN, ensuring the privacy, integrity and authentication of your wireless communications. The AES encryption algorithm (the standard encryption used by the U.S. government) provides a very high-level of security between clients and the VPN server. Support for session persistency and resume ensures continuous communications, protecting against interrupted transactions and preventing the need for re-connection. Extensive client support for DOS, Win CE, Pocket PC/Window Mobile 2003 and Windows PC platforms provides integration and security for all of your mobile devices.

**Ease of Management**
Management is intuitive and secure, and can be accessed via our command line interfaces (telnet, serial), embedded web-based java applet, and standard Simple Network Management Protocol (SNMP).

**Policy-Based Management**
Policy-based management enables the creation of user, application, and device groups with specific resource and network access configurations, including physical layer attributes, WLAN topologies, forwarding rules, and security components. A wide variety of parameters can be configured for each group for up to 32 WLANs, either manually or via easy-to-use islands, such as radio settings, service definitions, Quality of Service (QoS), virtual LAN, ESSID/BSSID domains, Layer 2/3 filtering, DHCP, NAT, and more.

**Power-over-Ethernet Accessories**
To lower your cost of installation, Symbol’s Wireless Switch System family includes a complete line of Power-over-Ethernet (PoE) devices. These devices eliminate the need to run costly power lines and install outlets to provide power for Access Points, simplifying installation and reducing costs.

**System Redundancy**
The WS5000 supports redundant warm-standby switch configuration. Designed for parallel use with an active WS5000, the WS5000-RS unit provides complete redundancy. Less expensive than the WS5000, this secondary device exchanges the system configuration and a simple heartbeat message with the primary WS5000 switch. In the event of a hardware or software failure, the redundant switch takes control of the wireless infrastructure ensuring consistency of operation and continuity of service.
The WS5000 offers next-generation wireless switch architecture for an unparalleled level of wireless LAN control, performance and management simplicity.

<table>
<thead>
<tr>
<th>FEATURES</th>
<th>BENEFITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switch-based architecture</td>
<td>Delivers unparalleled functionality, performance and simplicity of implementation and management via centralization of intelligence</td>
</tr>
<tr>
<td>Overlay network architecture</td>
<td>Simplifies network integration tasks by fitting in the distribution layer of an existing and trusted network</td>
</tr>
<tr>
<td>Works in conjunction with Symbol's family of next-generation Access Ports—AP100, AP200 and AP300 (ready)</td>
<td>Much lower costs and more functionality than traditional generation access ports, due to the centralization of processing power in the WS5000</td>
</tr>
<tr>
<td>Supports up to 30 Access Ports</td>
<td>Enables fast, easy and cost-effective expansion to meet growing company needs</td>
</tr>
<tr>
<td>Centralized management of Access Ports</td>
<td>Eliminates the need to configure and manage each device, dramatically reducing the time and costs previously associated with wireless LAN management</td>
</tr>
<tr>
<td>Supports 2.4 GHz and 5 GHz frequencies with frequency hopping, direct sequence, and OFDM encoding techniques, as well as 802.11a, 802.11b, 802.11g (ready), FH, and DS radio operations</td>
<td>Offers the broadest and most flexible radio technology support in the industry, with the ability to accommodate new coverage, radio types, channels, and spectrum; ensures maximum flexibility in wireless network design, enables the use of the right protocols to support specific applications for maximum cost-efficiencies</td>
</tr>
<tr>
<td>Upgradeable to support future 802.11 standards</td>
<td>Delivers outstanding investment protection—no forklift upgrade required to implement new standards</td>
</tr>
<tr>
<td>Per Device, Bandwidth Allocation—Weighted Fair Queuing</td>
<td>Enables the use of the right protocols to support specific applications for maximum cost-efficiencies</td>
</tr>
<tr>
<td>Power Save Protocol</td>
<td>Maximizes battery life of devices and ensures continual application performance for users</td>
</tr>
<tr>
<td>True virtual LAN support with multiple BSSID support</td>
<td>Enables segmentation of the wireless LAN to meet company needs, ensures that broadcast traffic reaches only devices for which it is intended; protects against broadcast storms; maximizes battery life for mobile devices by eliminating processing of unnecessary messages; and increases security by eliminating the possibility that broadcast messages could reach unintended recipients</td>
</tr>
<tr>
<td>Load Balancing and Pre-emptive Roaming</td>
<td>Ensures that devices roam before connection speed degrades; loads are always balanced between Access Ports, ensuring quality of application performance</td>
</tr>
<tr>
<td>Automatic Channel Selection</td>
<td>Reduces cost of installation by eliminating the need for manual configuration of Access Port channels</td>
</tr>
<tr>
<td>Transmit Power Control</td>
<td>Minimizes interference between wireless devices in networks where a dense population of Access Ports are required to meet bandwidth needs</td>
</tr>
<tr>
<td>Support for Access Control Lists (ACLs), 802.1X, Kerberos and Certificate Based Public Key Infrastructure (PKI)</td>
<td>Provides the flexibility to select from a complete security suite of authentication mechanisms to validate user identity and authorize network access</td>
</tr>
<tr>
<td>Support for WEP, WPA-TKIP, KeyGuard™ MCM and WTLS AES Virtual Private Networking (VPN)</td>
<td>Provides the flexibility to select from a complete security suite of encryption mechanisms to ensure privacy of data during transmission</td>
</tr>
<tr>
<td>Support for Command Line Interface (CLI), web-based interface and Simple Network Management Protocol (SNMP)</td>
<td>Support for multiple management protocols provides flexible anytime anywhere management; supports Symbol’s Enterprise Mobility Manager (SEMM) and Wavelink’s Mobile Manager</td>
</tr>
<tr>
<td>Policy-based management</td>
<td>Simplifies management by enabling a pre-defined set of policies to be assigned to a selected group of users, applications and device groups</td>
</tr>
<tr>
<td>Extensive management wizards</td>
<td>Greatly simplifies management tasks, such as adding new features</td>
</tr>
<tr>
<td>Standard 1U form factor chassis</td>
<td>Mounts into any standard 19” rack mount for co-location with other network equipment</td>
</tr>
<tr>
<td>Support for 802.3af Symbol or standard PoE devices</td>
<td>Eliminates the need to run expensive power lines and install outlets to provide power to Access Ports</td>
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Support for Access Control Lists (ACLs), 802.1X, Kerberos and Provides the flexibility to select from a complete security suite of authentication mechanisms to validate user identity and authorize network access.

Support for Command Line Interface (CLI), web-based interface Support for multiple management protocols provides flexible anytime anywhere management; supports Symbol’s Enterprise Mobility Manager (SEMM) and standard PoE devices.

Extensive management wizards Greatly simplifies management tasks, such as adding new features and Simple Network Management Protocol (SNMP) Wavelink’s Mobile Manager.

Virtual Private Networking (VPN)

Transmit Power Control Minimizes interference between wireless devices in networks where a dense population of Access Ports are required to meet bandwidth needs.

Automatic Channel Selection Reduces cost of installation by eliminating the need for manual configuration of Access Port channels.

Load Balancing and Pre-emptive Roaming Ensures that devices roam before connection speed degrades; loads are always balanced between Access Ports, ensuring quality of application performance.

True virtual LAN support with multiple BSSID support Enables segmentation of the wireless LAN to meet company needs, ensures that broadcast traffic reaches only devices for which it is intended; Per Device, Bandwidth Allocation—Weighted Fair Queuing Enables multiple mobile and wireless applications with quality of service during periods of network congestion.

Ability to upgrade Access Ports Enables very cost-effective implementation of new features, ensuring that the wireless LAN can always take advantage of new features and functionality.

Upgradeable to support future 802.11 standards Delivers outstanding investment protection—no forklift upgrade required to implement new standards.

802.11a, 802.11b, 802.11g (ready), FH, and DS radio operations cost-efficiencies with direct sequence, and OFDM encoding techniques, as well as spectrum; ensures maximum flexibility in wireless network design, enables the use of the right protocols to support specific applications for maximum performance.

Supports 2.4 GHz and 5 GHz frequencies with frequency hopping, direct sequence and OFDM encoding techniques, as well as 802.11a, 802.11b, 802.11g, 802.11i, and 802.11n operations.

Centralized management of Access Ports Eliminates the need to configure and manage each device, dramatically reducing the time and costs previously associated with it.

Supports up to 30 Access Ports Enables fast, easy and cost-effective expansion to meet growing company needs.

Access Ports—AP100, AP200 and AP300 (ready)

Works in conjunction with Symbol’s family of next-generation access ports, due to the centralization of processing power in the WS5000

Overlay network architecture Simplifies network integration tasks by fitting in the distribution layer of an existing and trusted network.

Switch-based architecture Delivers unparalleled functionality, performance and simplicity of implementation via centralization of intelligence.

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Switch-based architecture Delivers unparalleled functionality, performance and simplicity of implementation via centralization of intelligence.

Symbol—Your Complete Wireless Mobility Provider Symbol Technologies is the industry leader in wireless solutions, providing everything you need to put wireless mobility to work in your business. In addition to the Wireless Switch System, Symbol Technologies offers a broad range of wireless LAN clients and technology. CompactFlash™, PC and PCI-formatted cards enable PDAs and laptop connectivity. Design-in solutions enable integration of our award-winning technology into original designs. Voice-over-IP appliances bring the power of voice communications to your data network. Rugged and sealed mobile computers—front-end handhelds to thick-client wide area formats in a wide range of form factors with popular operating systems—integrate data capture and wireless LAN/WWAN connectivity.

Our extensive partner network delivers application software to your initiatives, allowing you to gain greater value and advantage from your wireless mobile technology. Symbol Technologies provide you with expertise required to implement system performance and realize the full potential of the Wireless System. Symbol’s total solution approach ensures smooth implementation and ongoing SAP support.

Symbol Technologies, from wireless innovation and expertise to the most complete range of products, services and solutions, to value and ROI—no other company can.

For more information, call or visit our convenience locations at visit us at www.symantecwireless.com.

Symbol Enterprise Mobility Services

Symbol Enterprise Mobility Services provide comprehensive support and technical expertise for designing, deploying and maintaining successful mobility solutions. Our diverse service offerings enhance your business operations, so you receive the highest value and uptime across the entire lifecycle of your mobility solution.

Our Mobility Services give you access to Symbol’s expertise in designing and deploying global mobility solutions. Our extensive knowledge base and experience of successful mobility implementations enables early adopters to gain competitive advantage. Symbol Certified Professional Services providers apply best practices that integrate established mobility systems, devices and applications into your business environment. As a seamless extension of Symbol, certified partners provide services ranging from design and implementation to training and project management to help ensure a smooth transition from implementation to operations. Symbol Customer Services deliver the experience, expertise and real capabilities for maximum uptime of your business operations. A flexible and comprehensive portfolio of support services ensures that your mobility infrastructure, systems and solutions operate at peak performance.

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Symbol Technologies is the industry leader in wireless solutions, providing everything you need to put wireless mobility to work in your business.

WS5000 Specifications

Packet Forwarding
- 802.1D-1999 Ethernet Bridging; 802.11-.802.3 Bridging; 802.1Q VLAN Tagging & Trunking; Proxy ARP; IP packet steering-redirection

Wireless Networking
- Wireless LAN: Supports 32 WLANs, Multi-ESS/BSSID traffic segmentation, VLAN to ESSID mapping, Power Save Protocol Polling, Pre-emptive Roaming, Congestion control with bandwidth allocation
- Access Port Radios: Supports 1-30 Access Ports, Automatic Access Port Adoption with ACLs, Access Port Load Balancing, Frequency Hopping Automatic Channel Selection, Direct Sequences 802.11a/b/g
- Protected Access Points: Supports 5-20 SP’s, 40-60 AP’s

Security
- Packet Filtering: L2/3/4 Stateful Packet Analysis; Network Address Translation
- Authentication Access Control Lists (ACLS); Pre-Shared Keys (PSK); Mechanisms: 802.1x/EAP, Transport Layer Security (TLS), Tunneled Transport Layer Security (TTLS), Protected EAP (PEAP); Kerberos; PKI Certificates
- Transport Encryption: WEP 40/128 (RC4); KeyGuard; WPA—TKIP; AES Key Exchange and Extensible Authentication Protocol (EAP), Kerberos

Quality of Service
- Per Device Weighted 8 queues per device; Bandwidth management controls; Fair Queuing: Power Save Protocol (PSP) integration
- Classification & Marking: Layer 1-4 Packet Classification; 802.1p VLAN Priority; DiffServ/TOS

System Resiliency & Redundancy
- Redundant Warm-Standby Switch; Access Port Load Balancing; Automation based watchdog timer

Management
- Command line interface (CLI) access through Web-Based GUI; Telnet; Serial/SSH/Secure Shell (SSH); Simple Network Management Protocol (SNMP) Client/Server
- MIBs—MIB-II, Etherstats, Wireless Switch specific monitoring and configuration

Physical Characteristics
- Form Factor: Standard 1RU
- Dimensions: 1.71 in. H x 16.89 in. W x 15.75 in. D
- Weight: 13.23 lbs/6 kg
- Physical Interfaces: RS232 serial console port; 10/100 Ethernet ports
- MTBF: >50,000 Hours
- Power Requirements
  - AC Input Voltage: 100-240 VAC
  - Max AC Input Current: 6A@115 VAC, 3A@230 VAC
  - Max Power Consumption: 100-240 VAC, 50/60 Hz, 3A
  - Input Frequency: 47 Hz to 63 Hz
- User Environment
  - Operating Temperature: 50° F to 95°F/10°C to 35°C
  - Storage Temperature: 40°F to 149°F/-40°C to 65°C
  - Operating Humidity: 8%-80% (w/o condensation)
  - Storage Humidity: 5%-95% (w/o condensation)
  - Operating Altitude: 50 ft. to 10,000 ft./16 m to 3,048 m
  - Storage Altitude: 50 ft. to 35,000 ft./16 m to 10,600 m
- Regulatory
  - Safety Certifications: FCC (Art.15, part B), Industry Canada, CE, VCCI, C-Tick, BSMI
  - EMI Compliance: UL 1950, cUL (Canada), VDE GS, DENAN (Japan), CB Cert
- Part Numbers
  - CC-5000-SME-WW
  - CC-5000-RS-WW
Symbol Technologies is the industry leader in wireless solutions, providing everything you need to put wireless mobility to work in your business.

**WS5000 Specifications**

### Network Security

- **Packet Filtering**: L2/3/4 Stateful Packet Analysis; Network Address Translation
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- **Pre-Shared Keys (PSK)**
- **Mechanisms**: 802.1x/EAP, Transport Layer Security (TLS), Tunneled Transport Layer Security (TTLS), Protected EAP (PEAP), Kerberos, PKI Certificates
- **Transport Encryption**: WEP 40/128 (RC4), KeyGuard, WPA—TKIP, AES
- **Key Exchange and Extensible Authentication Protocol (EAP)**
- **Management**
  - Command Line Interface (Serial, Telnet)
  - Secure Web Based GUI (SSL)
  - Telnet Server
  - SNMP v1/v2
  - SNMP Traps—40+ user configurable options
  - Syslog
  - TFTP Client
  - Simple Network Time Protocol (SNTP)
  - Text Based Switch Configuration Files
  - DHCP—Client/Server/Relay

### Physical Characteristics

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### Part Numbers

- CC-5000-SME-WW
- CC-5000-RS-WW
About Symbol Technologies
Symbol Technologies, Inc., The Enterprise Mobility Company™, is a recognized worldwide leader in enterprise mobility, delivering products and solutions that capture, move and manage information in real time to and from the point of business activity. Symbol enterprise mobility solutions integrate advanced data capture products, radio frequency identification technology, mobile computing platforms, wireless infrastructure, mobility software and world-class services programs under the Symbol Enterprise Mobility Services brand. Symbol enterprise mobility products and solutions are proven to increase workforce productivity, reduce operating costs, drive operational efficiencies and realize competitive advantages for the world’s leading companies. More information is available at www.symbol.com
About BarcodesInc

Who We Are
BarcodesInc is North America's leading provider of specialized digital data hardware and software solutions. Our products include barcode scanners, mobile computing devices, identification card equipment, point-of-sale systems, barcode label and receipt printers, and consumables, all of which help customers improve productivity and profitability. Our product and solution experts have been serving both small businesses and large enterprises since 1994.

We Owe Our Success To You
It’s true that data tracking is our expertise - but customer satisfaction is our true passion. We have one overriding objective: focus on you, the customer. We understand that each customer’s need is unique. That's why we listen carefully and tailor our solutions to meet your needs. We appreciate the opportunity to serve you and strive to exceed your expectations!

Why Choose BarcodesInc?

Dedicated Account Manager
Our Account Managers will not compromise when it comes to providing you top-notch service. Your Account Manager is the primary point of contact for your business and makes it a priority to get to know you, your company and all your needs.

Highly-Trained Technical Support
Our technical staff has the broadest knowledge and every significant certification in the industry. One of our friendly experts is always available to suggest products and solutions for any situation.

Incredible Value
Our purchasing power means big savings for you. Whatever your project, our team will work hard to deliver a solution that fits your budget.

Largest Inventory in the Industry and Same-Day Shipping
Whatever your barcoding, mobile computing, or printing needs, we will fill your order and ship it the same day.

Premier Access to Top Manufacturers
BarcodesInc maintains strong strategic partnerships with the leading manufacturers in barcoding, mobile computing, printing and RFID.

Responsive Customer Service
Every phone call and email is responded to promptly, completely and accurately by our customer service team.

Easy Returns
Damaged, defective or incorrectly ordered goods may be returned without hassle.