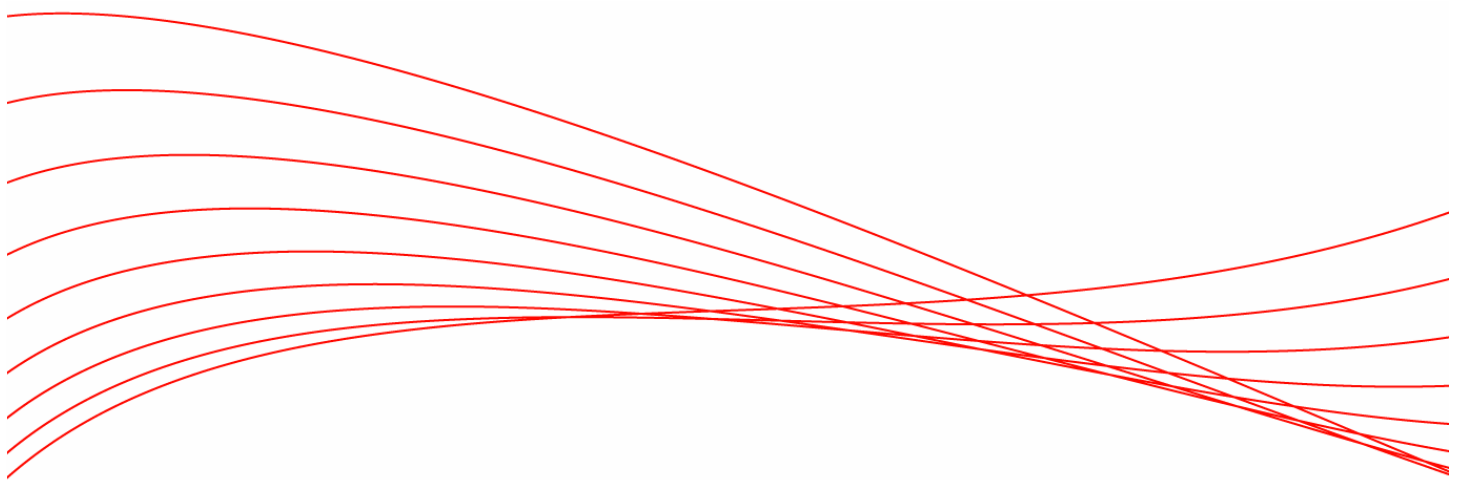


Voice over Wireless LAN Solution Brief



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Introduction

Companies are rapidly adopting Wireless LAN (WLAN) technology. IDC, for example, projects that worldwide shipments of WLAN technology will have a compound annual growth rate of 28.4 percent through 2009.¹

WLAN technology is taking off because of the enterprise-wide productivity benefits it provides. Giving workers greater flexibility to access the corporate network without being tethered to the network by a wire, means that workers can access and contribute data far more quickly than before, boosting the productivity of all other workers who depend on critical information and, hence, increasing the overall agility of the organization. In addition, WLANs make it possible to more easily offer new applications, such as secure guest access to network resources. Such access can benefit many in the workplace, from temporary consultants for a financial audit, to parents needing to stay in contact with their professional lives while waiting by the hospital bedside of an ill or injured child.

Meanwhile, Internet Protocol (IP) telephony or Voice over IP (VoIP) is also gaining popularity as a way to implement business communication anywhere, any time. More than 40 percent of North American and 30 percent of European enterprises have deployed VoIP or are in the process of doing so, according to Forrester.²

The marriage of WLAN and IP telephony technologies is Voice over WLAN (VoWLAN), which enables voice communications throughout a corporate campus or other facilities served by a WLAN.³ The number of companies using VoWLAN may triple between 2005 and 2007, according to Infonetics Research, with 10 percent of companies already using VoWLAN technology and 31 percent of companies expecting to do so. Infonetics cites the greater availability of handsets and infrastructure for the technology, as well as the use of voice applications to justify and spur adoption of WLANs.⁴ "The perfect storm is brewing" for VoWLAN adoption, agrees Forrester.⁵

This Solution Brief explains

- The business benefits of VoWLAN technology
- The relevant technologies and standards and their evolving nature
- How the ProCurve Networking Adaptive EDGE Architecture™ and ProCurve Networking products enable organizations to take advantage of VoWLAN today as well as be ready for VoWLAN advances as they become available.

Business Benefits of VoWLAN Technology

Expectations for mobility are on the rise throughout the business world. Employees who already enjoy wireless e-mail and wireless intranet access to corporate resources are ready to enjoy that access through mobile devices that enable real-time communications anywhere employees may be in their organization's facility or campus. Many observers see VoWLAN, which can enable that access, as one of the major new applications for WLANs. The productivity boon from VoWLAN—which helps to ensure that workers can always reach and be reached by their colleagues when needed, especially when they're away from their desks—is substantial.

In theory, cell phones should already provide the anywhere-connectivity benefit of VoWLAN. But many enterprise facilities experience cell interference or poor interior coverage, making cell phones unreliable and impractical. Meanwhile, for the organization, VoWLAN also means avoiding or minimizing the expense of cell phones and per-minute or per-month charges. Companies can leverage their existing WLANs and IP telephony infrastructure—and boost their ROI in those technologies—by adopting VoWLAN. Alternatively, companies that lack one or both of these enabling technologies can use the productivity benefits of VoWLAN as an additional reason to justify their adoption.

¹ Market Analysis: Worldwide Enterprise Wireless LAN Equipment 2005-2009 Forecast, IDC, May 2005.

² Forrester, op. cit.

³ VoWLAN can also include seamless roaming from GSM to WiFi. This scenario has relatively little practical application at present and is not the focus of this Solution Brief.

⁴ "Survey: Use of Voice over WLANs to Triple by 2007," by Jeff Caruso, Network World Newsletter, 10/27/05.

⁵ Forrester, op. Cit.

Another factor driving adoption of VoWLAN and increasing its benefit to the organization is the convergence of technologies on the client device. Mobile devices such as HP iPAQs already have access to the WLAN as well as the ability to support both voice and data on a single handheld device. Organizations contemplating a move to such converged mobile devices from other mobile platforms, like DECT or proprietary cordless phones, will find the business benefits of VoIP another compelling reason to make that move. For example, VoIP enables the use of intuitive graphical interfaces, so users are freed from having to reference PBX cheat sheets or to enter non-intuitive, even cryptic, key sequences on legacy phone pads to access special phone features. As a result, users are more productive.

By adding a wireless capacity to VoIP, VoWLAN technology extends the benefits of applications such as presence, find-me follow-me, unified messaging, and push-to-talk to the wireless environment. It has particular application in several key vertical markets, including healthcare, retail, and education.

- **Healthcare**—Because VoWLAN gives hospital workers immediate access to each other and to their patients, the productivity benefits of the technology translate into improved patient care. The time lag inherent in paging systems is eliminated, so doctors can immediately give potentially life-saving instructions or reduce the time it takes to arrive at a patient's bedside. Nurses can be more productive as well, giving or receiving instructions and resolving issues about patients without having to return repeatedly to the nurses' station. These benefits are especially critical in the emergency room or trauma center, where every second's delay in communication can have life-threatening consequences. In addition, many healthcare facilities restrict or disallow the use of cellular phones, due to concerns over interference with medical equipment. VoWLAN provides for a way to provide real-time communication for healthcare personnel when cellular communication is prohibited.
- **Retail**—Better, faster, more satisfying customer service is the bottom-line benefit of enabling retail employees—from store clerks and associates to managers—to be in touch anywhere in the retail environment. Store associates and other employees can respond to customer requests anywhere in the store, without having to find a telephone or a manager. Managers, in turn, can play a more active role on the retail floor, and be more available to employees and customers, without having to miss the calls they would take from their desks. VoWLAN can also enhance the effectiveness of site security and inventory personnel.
- **Education**--VoWLAN enables real-time communications throughout a school campus, including classrooms, assembly halls, lunchrooms, and outdoor athletic fields. As a result, educators and school staff can communicate immediately with each other, with first responders, with parents, and others as needed, while maintaining supervision over students. Messages—both voice and text—can be sent without the intrusion and distraction of public address or paging systems. School administrators gain the flexibility to communicate to specific teachers and staff or simultaneously to the entire school population. Teachers can communicate directly with parents during the school day to address problems as they occur.

A VoWLAN Primer

Companies contemplating a move to VoWLAN may understand the business benefits but they also need to understand how they can address issues regarding the technology, such as the ability to deliver toll-quality voice in a reliable and secure fashion. Here's a look at key concepts in VoWLAN technology.

Wireless LAN security used to get bad press due to the effectively now-obsolete Wired Equivalency Privacy (WEP) security scheme. Researchers quickly discovered that WEP was insecure and vulnerable to eavesdropping because of its weak keying scheme and poor vector initialization. The widely available IEEE 802.11i security specification has addressed the need for heightened wireless security through robust authentication, encryption, and key rotation schemes to deliver enterprise-class security to protect all network resources and keep them safe.

Internet protocols and Ethernet LANs were designed primarily for relatively bursty, asynchronous data traffic. As a result, the latency and jitter associated with the transmission of data packets have not been major issues, because they rarely create a noticeable impact in applications like e-mail and Web browsing. Voice transmission, in contrast, requires a steady stream of audio packets to satisfy the user. Excessive packet loss and jitter will result in voice quality degradation with noticeable gaps in the audio stream—similar to the poor voice quality experience when talking on a cell phone with weak signal strength.

Since real-time voice and video traffic is delay-sensitive, network impairments like delay, jitter, and packet loss can adversely affect the quality of the application. A high-quality converged network must be designed and configured with quality of service (QoS) end-to-end to ensure that voice quality is maintained and video runs smoothly. The challenge for implementing wireless voice applications is even higher, since available over-the-air bandwidth is more limited than in a hardwired environment.

In order to provide predictable voice quality over a WLAN network, SpectraLink Corporation has developed a de-facto industry standard QoS mechanism called SpectraLink Voice Priority (SVP). It is implemented in wireless phone handsets, wireless access points, and SpectraLink servers. This IEEE 802.11-compliant mechanism minimizes latency for voice transmission by providing priority queuing for voice packets over data packets and increasing the probability that all voice packets are transmitted in a predictable and timely manner. In addition to priority queuing, the enhanced access points and phone handsets transmit voice packets using a zero backoff interval in a coordinated fashion, thereby eliminating the random contention based transmission delays that can have an adverse effect on voice traffic for solutions without QoS.

The SpectraLink VIEW (Voice Interoperability for Enterprise Wireless) Certification Program is a strategic program designed to guarantee interoperability and ensure superior voice quality between wireless LAN infrastructure equipment and SVP-compatible Wi-Fi telephony client devices available from many leading manufacturers. In addition, SpectraLink VIEW-certified products must meet enterprise-grade performance criteria for voice quality, security, capacity, and seamless roaming.

Several emerging wireless standards are further enabling VoWLAN implementation. For example, the IEEE 802.11e-2005 ratified specification for wireless QoS enhancements includes packet prioritization, scheduled access, and call admission control. Eager to spur interoperability among multi-vendor wireless gear, the Wi-Fi Alliance created a certification process on a subset of 802.11e called Wi-Fi Multi-media (WMM). WMM provides four categories of relative QoS: voice, video, best-effort and background. Wi-Fi Alliance-based certification, including WMM, is supported by many leading wireless vendors including ProCurve Networking.

Another requirement for seamless VoWLAN solutions is “fast roaming”—with no dropped calls and audio degradation—as users move from access point to access point across a large area. Fast roaming minimizes the time it takes to associate and authenticate to a new access point by caching the user’s security credentials, in effect “pre-identifying” the user to the new access point and eliminating the need—and costly overhead—for the user to be authenticated. The result is that the user roams more effectively, without the latency that could impact a voice call.

Today, fast roaming is accomplished through proprietary techniques. A proposed IEEE specification for fast roaming—IEEE 802.11r—is currently under development and is expected to be ratified in Spring 2007. ProCurve supports fast roaming today on the Wireless Edge Services xl Module and corresponding Radio Ports (see below), and is closely monitoring the 802.11r drafts to ensure that current products will support IEEE 802.11r when the standard becomes available.

Finally, customers may have concerns about whether VoWLAN phones are compatible with, and can meet the regulatory requirements of, Emergency Call Services (ECS) such 911, 999, and 112. In the U.S., Enhanced-911 provides ECS operators with the physical location of a caller’s phone, to improve emergency responsiveness. VoWLAN phones used in enterprise environments, which are not subject to cellular telephone locationing requirements, are treated like any other wired extension on a corporate telephone system. The administrator programs location information for phones (both wired and wireless) into the traditional PBX or IP PBX for downloading to the local telephone company’s Automatic Location Information (ALI) database and updates the information whenever the primary location of the telephone is changed. Since wireless phones are identified with the locations stored in the ALI database, users should be cautioned not to use VoWLAN phones for ECS calls when the phones are outside their primary facility.

VoWLANs and the ProCurve Networking Adaptive EDGE Architecture

The foundation for all of ProCurve’s networking products and solutions—including its products and solutions for VoWLAN enablement—is the ProCurve Networking Adaptive EDGE Architecture. It is an architecture that, unlike traditional network design, can change or “adapt” to meet changing network needs, so that organizations can adopt new technologies and solutions, such

as VoWLAN, when they are ready to do so, without having to make “forklift” upgrades of their infrastructures.

The Adaptive EDGE Architecture is a strategy for solution design that contrasts to the traditional design in which all intelligence decision-making capability is located at the core of the network. ProCurve’s approach maintains complete command of the network in a centralized manner, and pushes out control—and intelligence—to the network edge where users connect. Complete command from the center along with intelligence at the edge of the network, enables a user-centric solution and is the hallmark of the Adaptive EDGE Architecture.

Intelligence at the edge enforces security, QoS, and bandwidth allocation processes, enabling appropriate network connectivity when and where needed, and maintaining session persistence as mobile users move across wireless zones.

The Adaptive EDGE Architecture’s control from the center provides another distinctive benefit for VoWLAN solutions: The ability to manage a communications infrastructure in a consistent fashion, including both the wired and wireless portions and, within the wireless sphere, both standalone (“heavy”) access points and coordinated (“lightweight”) radio ports. In the world of the Adaptive EDGE Architecture, wired and wireless, standalone access points and coordinated radio ports, are all managed in a unified way. ProCurve Identity Driven Manager (IDM) functionality, along with ProCurve Manager Plus (PCM+) determines how the network applies security, QoS, bandwidth limits, and ACLs, based on user identity or device type, regardless of where and how users connect to the network. This results in a network that is customized for the user and which follows the user wherever he or she attaches to the network. This contrasts to competitive approaches that require entirely separate management systems for different types of network equipment.

Solution Topology

Figure 1 presents a network topology that extends VoWLAN capability across both the corporate headquarters and remote office of an enterprise, and integrates wireless voice capability using ProCurve Networking equipment to leverage the existing IP telephony infrastructure at each site.

Both offices are connected to a public-switched telephone network (PSTN) to provide local phone service, support emergency call service (for example, 911, 999, 112), and protect against the loss of telephone service in the event of a WAN link failure. This topology also shows a traditional PBX at the corporate headquarters, to give an enterprise a smooth migration to IP telephony without forcing an expensive forklift replacement.

ProCurve Networking switches provide IP connectivity and power to IP phone handsets and wireless access points over standard Cat-5 Ethernet cable via the IEEE 802.3af Power over Ethernet (PoE) Standard, with redundant PoE power. This solution highlights the benefit of using both coordinated radio ports in the corporate headquarters and standalone access points in the remote office, all managed in a unified way using PCM+ and IDM. For the corporate site, a Redundant Wireless Services xl Module is deployed for increased reliability and availability of voice and other important business applications.

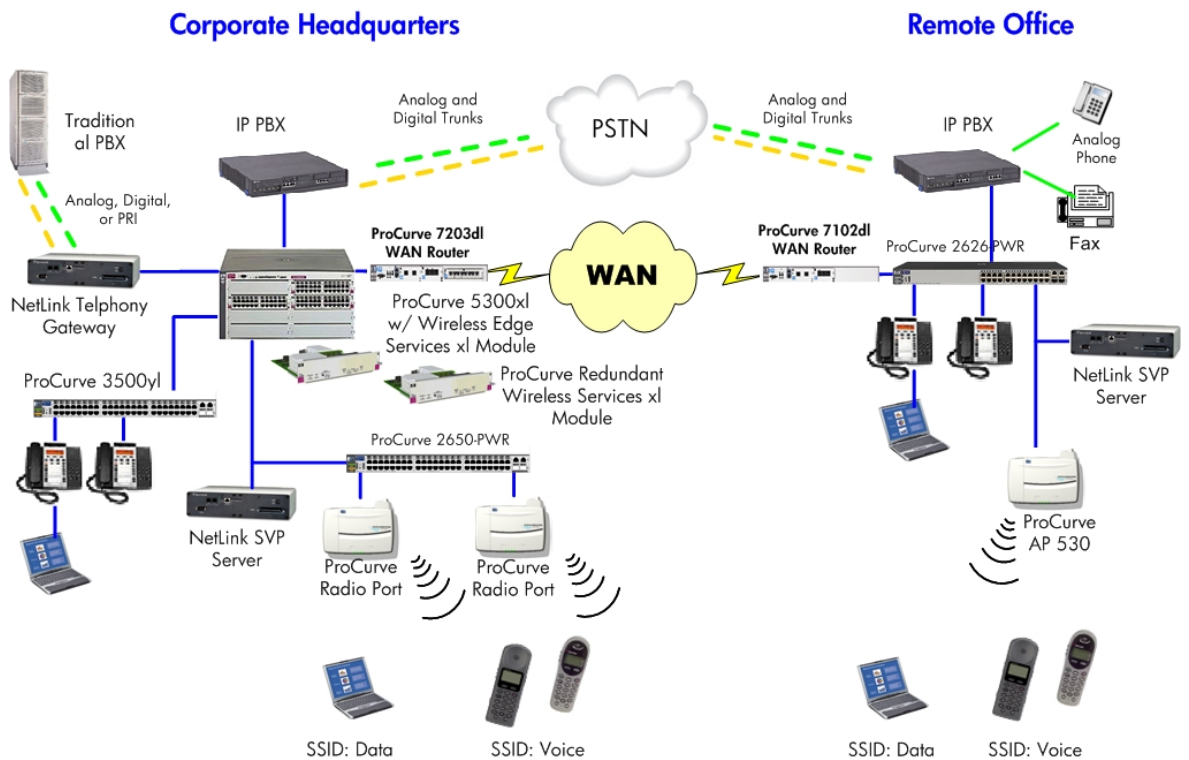


Figure 1: VoWLAN Topology

The topology includes the following components:

NetLink SVP Server – The SpectraLink NetLink SVP Server provides admission control to avoid over-subscription of access points, ensuring that excellent voice quality is maintained on a shared wireless voice and data network. The NetLink SVP Server can support thousands of users depending on the number of NetLink SVP Servers and the average wireless telephone usage.

NetLink Telephony Gateway – The SpectraLink Telephony Gateway provides the interface between the LAN and the traditional PBX (telephone switch). Each NetLink Telephony Gateway supports up to 16 wireless telephone users. Up to 40 NetLink Telephony Gateways can be linked for a system capacity of 640 active users.

Traditional PBX and IP PBX – The SpectraLink NetLink solution supports digital and IP station interfaces to a variety of telephone systems by emulating proprietary digital telephone sets. It also supports connections through direct IP interfaces to leading IP telephony platforms via licensed protocols and OEM agreements. These digital and IP interfaces deliver most of the features and functions of a wired desk phone on the NetLink wireless handsets.

ProCurve Wireless Edge Services xl Module — The ProCurve Wireless Edge Services xl Module seamlessly integrates WLAN RF management and IDM role based policy enforcement into the 5300xl intelligent edge switch enabling network administrators to easily deploy and centrally manage a multi-service network. It provides coordinated control for ProCurve Radio Ports (described below) connected either directly to the switch 5300xl or via any standard PoE Ethernet switch such as the ProCurve 2600-PWR series or 3500yl series. The Wireless Edge Services xl Module scales to meet future demands; the network administrator can simply add more Radio Port licenses, up to 36 per module, to accommodate growing infrastructure needs. The Wireless Edge Services xl module and Radio Ports support both WMM and SVP.

ProCurve Redundant Wireless Services xl Module — For increased availability of wireless voice and data services, the ProCurve Redundant Wireless Services xl Module can be placed in an open slot of the 5300xl, which houses the primary Wireless Edge Services xl Module, or any other 5300xl on the same subnet, to automatically adopt Radio Ports should the primary module fail or become unavailable.

ProCurve Radio Ports 210, 220 and 230 – Working in conjunction with the ProCurve Wireless Edge Services xl Module, ProCurve Radio Ports enable advanced wireless services to assure a resilient and highly secure, mobile multi-service network that is easy to deploy and manage. The ProCurve family of radio ports provides choice and flexibility to address a wide range of deployment needs. Network architects can choose between flexible dual radio (802.11a and 802.11b/g) and highly cost-effective single radio (802.11b/g) designs, integrated or external antenna configurations, as well as customized housings for office area and in-ceiling deployment. Installation is as simple as plug-and-play. The Radio Ports include the following:

- Radio Port 210: Single radio 802.11b/g Radio Port with integrated diversity antennas
- Radio Port 220: Dual radio 802.11a + b/g Radio Port with external antenna selection, plenum rated
- Radio Port 230: Dual radio 802.11a + b/g Radio Port with integrated diversity antennas available for both radios

ProCurve Access Point 530— The ProCurve Access Point 530 is a dual-radio 802.11b/g and 802.11a/b/g access point that offers flexible radio and antenna configuration, security, user authentication and IDM-driven access control policies ideally suited for small branch or satellite offices. The Access Point 530 supports both WMM and SVP.

The Access Point 530 can deliver simultaneous dual 2.4 GHz radio operation, allowing for one radio to be dedicated to voice clients, while the other radio can service data traffic and periodic rogue AP scanning. This capability addresses a key challenge in running VoWLAN: in order to achieve QoS, the network must avoid interference between voice and data packets. In dual 802.11b/g mode, the 530 virtually eliminates the possibility of voice/data packet interference, thereby improving voice quality and performance. The 530's dual 802.11b/g mode also holds a financial benefit to companies, particularly companies seeking to extend wireless voice and data coverage to a large number of small branch offices. Deploying a single 530 to each office, rather than having to use two separate access points, or a more complex controller-based system, can significantly reduce the cost of deployment. (See Figure 2.)

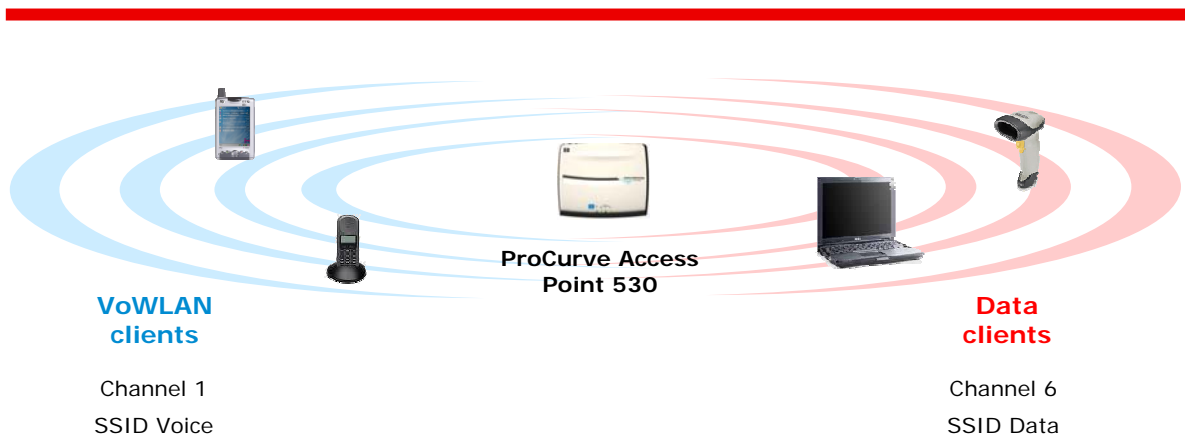


Figure 2: The Access Point 530 in dual voice/data mode.

The ProCurve Networking Difference

Organizations have options when they choose to adopt VoWLAN technology. The ProCurve Networking solutions, based on the Adaptive EDGE Architecture, provide distinctive business and technology benefits to VoWLAN adopters.

Integrated Approach—The integrated, modular approach of ProCurve Networking makes the adoption of VoWLAN an incremental addition with minimal strain on an organization's financial and technical resources. For example, an organization can easily adapt its infrastructure for VoWLAN by adding a Wireless Edge Services xl Module to its existing ProCurve 5300xl Series Switch and attach ProCurve Radio Ports downstream, without having to add additional appliances or configure individual access points. Moreover, the switch 5300xl with the Wireless

Edge Services xl Module implements a single set of policy definitions based on IDM, covering both wired and wireless environments. That means that security and access control is applied just once and then enforced throughout the network, greatly reducing the time and cost of implementing and managing the network. In addition, unified, “single pane of glass” wired and wireless device management is provided by the ProCurve Manager Plus application with ProCurve Mobility Manager plug-in. This allows for easier troubleshooting of potential network problems that may affect VoWLAN performance. Other solutions available in the marketplace today require separate management tools for different aspects of the network.

Simplistic Resiliency—Time-sensitive mission-critical applications demand a reliable infrastructure to operate effectively. ProCurve mobility infrastructure solutions are designed and built with simplistic resiliency in mind. In deploying the ProCurve Wireless Edge Services xl Module and Radio Ports, an administrator can simply add a ProCurve Wireless Redundant Services xl Module to a 5300 switch, either the same switch that houses the primary Wireless Edge Services xl Module or another 5300 switch. This provides complete failover capability ensuring continued availability of wireless services in the event of a primary module hardware failure or loss of network connectivity between Radio Ports and the primary Wireless Edge Services xl Module. In addition, the 5300 switch itself employs (optional) redundant hot swappable power supplies, providing uninterrupted power to minimize network downtime and potential interruption of mission-critical applications.

Choice and Flexibility—Every organization is distinct, with distinct requirements for its VoWLAN implementation. A one-size-fits-all solution won't be optimal for anyone. ProCurve Networking offers a variety of solutions, including both standalone and coordinated architectures, to suit a variety of needs. For example, a large corporate campus that has to provide wireless coverage for a broad geographic area will benefit from a coordinated architecture to easily deploy and centrally manage a multi-service network. On the other hand, consider an organization with many small branches, a relatively small number of client devices, and perhaps a single access point in each branch, such as a financial services or retail organization. This organization will typically be better served using a standalone access point, such as the ProCurve Wireless Access Point 530. The 530 AP can be managed effectively using PCM+ and IDM, even in environments lacking onsite IT support. And because the same IDM policies can be applied at both the corporate headquarters and the remote office, employees experience the same, consistent network access at every site. Even more important, the administrator only needs to define and apply policies once, centrally, to be uniformly enforced across the campus and remote sites alike.

Standards-based Approach—As has been discussed throughout this Solution Brief, the ProCurve Networking VoWLAN solutions and broader Adaptive EDGE Architecture are built from the ground-up to support existing and emerging specifications. ProCurve is in fact a driving force behind the development and promotion of many relevant industry networking standards. Open standards promote interoperability and allow organizations to choose best-of-breed solutions, without being locked into proprietary, single-vendor solutions.

ProCurve Networking has broad support for open industry standards, such as IEEE 802.1X, IEEE 802.1AB-2005, also known as the Link Layer Discovery Protocol (LLDP), and ANSI/TIA-1057 LLDP-MED (Media Endpoint Discovery). These are examples of ProCurve's leadership role in driving specifications that provide a direct benefit to organizations adopting VoIP and WLAN. The 802.1X authentication specification enables each connected device to authenticate securely with the network. LLDP enables accurate discovery of physical topology, and simplifies network management and troubleshooting. LLDP-MED provides auto-configuration of IP phones, including the “voice” VLAN and QoS, detailed phone inventory management, and more.,

Summary

Organizations are moving rapidly to adopt VoWLAN solutions to enhance business communication and boost employee productivity while leveraging their existing investment in WLAN and VoIP infrastructures. To ensure that those moves are successful, businesses require solutions that can provide the necessary reliability, enterprise-class security, and QoS requirements to ensure even the most demanding applications, like wireless voice and video, run smoothly. But while voice and video traffic need preferential treatment, the organization will benefit by using a single, comprehensive management system for its entire network—voice and data, wireless and wired—to reduce the time and operational cost to manage and provide consistent service to employees regardless of where they are in the network or how they are connecting to it.

ProCurve Networking solutions, based on the Adaptive EDGE Architecture, are designed from the ground-up with these requirements in mind. Organizations adopting these solutions and architecture gain the speed and cost benefits of control at the edge, the comprehensive management benefits of command from the center, and the flexibility to expand their networks and increase their capabilities when and as they choose, in the most cost-effective manner possible.

To find out more about
ProCurve Networking
products and solutions,
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www.procurve.com



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