



# Why enterprises should deploy voice over wireless LAN (VoWLAN)





## Introduction

For far too long, enterprise productivity has been constrained by wired communications networks. At one time, wired voice and data network services were the only solution available, and business could be conducted only when a user was within reach of a wired connection. Even when users had access to that wired connection, it was inconvenient to redirect phone calls to a temporary work location, which was particularly trying when a person moved between several temporary locations each day. With the evolution of communications technologies to all IP-based voice networks and wireless local area networks based on the IEEE 802.11 or WiFi standards, there is no longer any reason for users to be constrained by the limits of wired communications.

In modern, responsive organizations, business is done on the move. Resolving problems and responding to customer requests in this dynamic environment requires that associates be able to move about freely and collaborate on a moment's notice, yet still be available to customers and co-workers. Those interactions can extend from the office to the shop floor and out to the loading dock. Some employees will need to stay in contact even when they are out of the office. Flexible organizations require a reliable mobile network that will allow their employees to remain accessible and productive while on the move.

Adding mobility to business communications can deliver a major boost in productivity and business agility. Customers can reach critical contacts and those contacts in turn can communicate with engineering, manufacturing, shipping and other areas instantly. With the speed of modern business, organizations cannot afford to have critical communications languishing in voicemail while problems and customer frustrations escalate. In the time it takes an associate to return to their desk to make a phone call or access a critical piece of information, the wrong product could be built, picked and shipped.

The technology for carrying voice over a wireless LAN infrastructure has now progressed to the point where it can deliver secure, dependable communications. These mobile communications links can keep the organization operating efficiently and allow companies to thrive in this demanding, dynamic environment.

## Why deploy voice over your wireless LAN?

Organizations have a lot to gain from mobilizing their internal communications with a VoWLAN deployment, and those benefits can be grouped in several key areas.

**Productivity:** Flexible, effective communications can drive productivity, and that impact can be seen in a variety of work environments. In an office, associates can make critical contacts with customers, suppliers and other departments immediately regardless of where they are. Instant communication accelerates workflow and can also help to keep bad situations from getting worse. Mobile access will also allow busy associates to be productive during what were "dead times" in their schedules, for instance, when they are moving between meetings or walking to a work location. They can now use that time to check voicemail, follow-up on tasks and return less pressing calls.

Mobile communications can also impact productivity in operating areas. Healthcare organizations have found that nurses and other care providers can use their time far more productively if they do not have to return to a central desk between tasks. With mobile communications capability, they can schedule their tasks better, save steps and focus more of their time on patient care.

Similar productivity improvements can be seen in warehousing, manufacturing and shipping environments. A forklift operator might spend several minutes retrieving a set of components for the production line only to find that they were sent to fetch the wrong item. With no way to recall the operator or change instructions, critical minutes will pass and that lost time can have a ripple effect on the downstream production processes. When managers on the production line or the loading dock recognize a problem, they should be able to communicate immediately through the entire production stream to get it resolved quickly and efficiently.

Effective mobile communications can allow the organization to function on one shared plane of intelligence rather than as a set of disconnected and uncoordinated operators. Getting the right information to the right people immediately is the key to efficiency and productivity.



**Accessibility:** Closely tied to productivity is accessibility. In a fast-moving organization, business can't stop simply because someone is away from their desk. Voicemail is useful for asynchronous communications, but when a situation needs to be addressed immediately, direct contact is a necessity. Customer relationships can deteriorate quickly while the person with the necessary information or the manager with the authority to approve an exception is in a meeting or is unreachable because no one knows where they are. That critical person may be a manager, a sales associate, an engineer, a production worker, a nurse or a technician – essentially anyone who is in physical contact with the business process. In a fast-paced organization today, critical contacts are needed up and down the organizational hierarchy.

**Responsiveness:** Mobile access allows companies to respond more quickly and more effectively. Not only can customers and suppliers reach their contacts within the organization more dependably, those contacts can in turn reach out to their internal resources immediately without having to wait for those

parties to return to their desks. A quick conference among the members of the support staff can fix the situation and can also demonstrate the advantage of dealing with a responsive, customer-focused organization.

This type of responsiveness can have particular relevance in retail environments. With a WLAN-based mobile voice network, salespeople on the floor can be summoned to assist customers more quickly. Once there, they can contact managers, access product or credit specialists, and confirm stock locally or in other stores all without having to leave the customer's side. The customer's needs are met and the sale is made by getting the right resource to the right place at the right time.

**Converged networks:** The wireless LAN may be one of several radio-based communications systems that are used within the organization. Push-to-talk private radio systems and wide area walkie-talkie services like the iDEN-based Sprint/Nextel network are widely used in the construction, manufacturing, retail and hospitality industries. Adding another wireless voice solution that does not connect with

those systems will result in a dysfunctional set of wireless islands, or worse, force people to carry multiple wireless devices so they can access all of the wireless communities they need to do their jobs. Improving productivity involves making it easier, not harder, for people to communicate.

**Improved in-building coverage:** Many organizations have come to depend on cell phones to add that mobility element to their communications. However, the metal/concrete structures of many enterprises can make indoor cellular coverage challenging. Mobility without reliability will not increase productivity. A well-designed VoWLAN solution can provide highly reliable indoor operation as well as better integration with PBX system features like call park, transfer and conferencing to speed collaboration and improve responsiveness. Finally, as the WLAN is customer owned, there is no charge for calls placed over it.

In summary, adding mobility to the communications environment inside your enterprise can increase productivity, improve accessibility and allow your organization to be more efficient and responsive, while providing a reliable in-building solution.

## Is VoWLAN technology enterprise-ready?

In the early days of wireless LANs, there were concerns regarding their reliability and security, which led some to question whether the technology could support mission-critical business communications. Most of those concerns stemmed from the first generation WLANs that employed autonomous access points with data-oriented protocols and relied on inadequate security solutions. WLAN technology has made major strides since those early implementations and has now arrived at the point where it can rival wired networks for robustness and reliability.

A number of important developments were key to this transition. On the infrastructure front, the first major step was the development of centrally controlled WLAN switching systems. Unlike the first generation autonomous access points that required manual site planning and adjustment to ensure adequate coverage and capacity, modern WLAN networks use an array of simple or “thin”

access points whose operations are coordinated by a central controller. By coordinating their operation, the controller can ensure reliable, non-interfering coverage throughout the facility. Further, since the WLAN is centrally controlled, a user can move through the coverage area, and their connection will be handed off automatically from access point to access point with virtually no interruption. That capability is particularly important for mobile voice support.

A major concern with VoIP over WLANs has been quality of service (QoS). Wireless LANs operate on a shared channel, and in early implementations, all stations vied for access to the channel on an equal basis. If large data transfers shared the channel with short voice frames, the result could be increased delay and jitter (i.e., the variation in delay that is seen from packet to packet) for the voice traffic. For the voice user, that could translate into poor call quality and awkward transmission delays. Today, voice-enabled WLANs can take advantage of the new IEEE 802.11e or Wi-Fi Multi-Media (WMM) standard that gives priority to voice transmissions over data traffic, thereby ensuring high-quality voice. The transmission quality of a well-designed WLAN voice network will typically exceed what users experience on their cellular service.

Security was also a concern with early wireless LANs, as the rudimentary Wired Equivalent Privacy (WEP)-based encryption made it relatively easy for even unsophisticated hackers to intercept and monitor WLAN voice transmissions. This is a concern in all business communications, but particularly so in healthcare where regulatory requirements, such as HIPAA in the United States, mandate great care in ensuring the privacy of patient medical information. WLANs today can take advantage of the IEEE 802.11i-defined Wi-Fi Protected Access (WPA) and Wi-Fi Protected Access 2 (WPA2). The latter option uses encryption based on the Advanced Encryption Standard (AES), the new encryption standard for the US Government. So the encryption now used on WLAN voice is a full generation beyond what is used in most business communications. Most importantly, that higher level of security can be implemented with no adverse impact on performance.

While the WLAN infrastructure has improved in its ability to support voice applications, new and better user devices have also appeared. The initial VoWLAN phones were relatively simple, voice-only handsets that operated in the 2.4 GHz band with a maximum

bit rate of 11 Mbps (i.e, the IEEE 802.11b standard). That relatively low transmission rate limited the number of simultaneous voice calls an access point could support. Now there are WLAN handsets and other voice-enabled devices that support 54 Mbps 802.11g and 802.11a radio links operating in the 2.4 GHz and 5 GHz radio bands. Those higher capacity radio links can support about three times the number of simultaneous voice calls per access point. These new WLAN voice devices also incorporate the 802.11e/WMM QoS standards and feature encryption using the more secure WPA or WPA2 options.

One last and often overlooked element in mobile networks is battery life. Many early VoWLAN implementations labored with devices whose batteries drained in a few hours, requiring spare batteries and battery swaps before the end of a shift. New power-saving options like WMM-Automatic Power Save Delivery (APSD) have made significant advances in power conservation, greatly improving battery life. Where the infrastructure and handsets are provided by the same manufacturer, even more advanced server-based power management functions can be incorporated making the devices easier and less intrusive even in heavy use applications.

## Defining VoWLAN applications

In evaluating VoWLAN solutions for enterprise organizations, it is important to remember that voice communications can take two different forms: connection-based and push-to-talk. Traditional connection-oriented voice services are typical in office environments. Those office users will also require access to PBX-type features like the ability to conference multiple parties onto the connection or to transfer it to another mobile or wired station. Further, if personnel move between company facilities or spend some part of their time in the field, they may require devices that combine cellular as well as WLAN voice capabilities.

Along with telephony-oriented voice communications, push-to-talk or walkie-talkie communications are a mainstay in production, materials handling and security environments. Given the dynamic nature of those tasks, users value the quick access provided by a push-to-talk system, particularly one that can operate in both one-to-one and traditional group call modes.

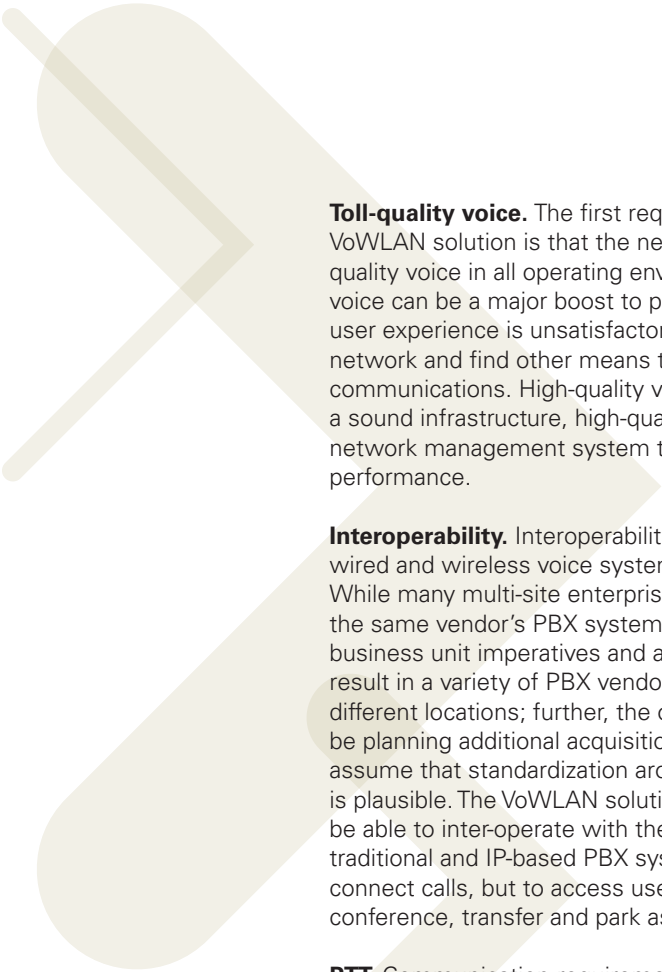
Users have also come to realize that many mobile workers need more than a simple voice device. Just as cellular carriers are supporting smartphones and PDAs, these same requirements are found in WLAN environments. These devices allow support for standard Windows Mobile applications such as email, calendar, contacts and other Personal Information Management (PIM) services, Internet and Intranet access as well as access to server-based line-of-business applications.

While simple data requirements may be supported on a VoWLAN smartphone, other users may require a full function mobile computer. Depending on the application they are used in, those mobile computers may require bar code scanners, signature capture and other functions in addition to telephony-oriented and push-to-talk voice communications. As they are often used in manufacturing and production environments, both PDAs and mobile computing devices may require ruggedized designs that can tolerate spills and drops.

In conducting the VoWLAN product search, it is important to recognize the full range of potential applications and devices. Mobility can improve productivity in a wide variety of areas, so the solution should be expandable to incorporate all of the potential applications that may develop.

## What to look for in a VoWLAN solution

Voice over WLAN solutions range from simple networks supporting a few voice-only handsets for specific users to multifunction systems that support dual-mode WLAN-cellular handsets along with smartphones and mobile computers that provide a variety of telephony, push-to-talk and data applications for different parts of the enterprise. To ensure that the solution is extensible enough to meet all of these requirements, it is important to understand the scope of the enterprise's communications needs and opportunities that are available in the mobility space. That requirements assessment will be a major step in determining the direction to follow for the VoWLAN implementation. Correctly implemented, WLANs can provide a robust, manageable and secure wireless infrastructure for both voice and data communications. The key will be to choose products that incorporate state-of-the-art architectures and designs, and implement them in the most functional manner.



**Toll-quality voice.** The first requirement in a VoWLAN solution is that the network provides toll-quality voice in all operating environments. Mobile voice can be a major boost to productivity, but if the user experience is unsatisfactory, they will avoid the network and find other means to make their critical communications. High-quality voice is the result of a sound infrastructure, high-quality handsets, and a network management system that ensures ongoing performance.

**Interoperability.** Interoperability with your existing wired and wireless voice systems will also be key. While many multi-site enterprises try to utilize the same vendor's PBX systems in all facilities, business unit imperatives and acquisitions often result in a variety of PBX vendors and models in different locations; further, the organization may be planning additional acquisitions, so you cannot assume that standardization around a single vendor is plausible. The VoWLAN solution you select must be able to inter-operate with the widest range of traditional and IP-based PBX systems not only to connect calls, but to access users features like conference, transfer and park as well.

**PTT.** Communication requirements span well beyond voice telephony, and the solution must be capable of incorporating the full range of those requirements. In the push-to-talk (PTT) environment, traditional group call walkie-talkie service is expected. Group call PTT can be distracting in many environments, so a well-designed system should include one-to-one transmission capability as well. Interconnection with existing PTT systems and services is a must. As the number of users on the network increases, bandwidth efficiency must be considered. An ideal system would not have any degradation in the number of users that can operate on an access point when going from telephony to PTT.

**Multi-mode communication support.** The definition of mobility should extend to data capabilities as well. As a minimum, the solution should provide generic data capabilities like Internet/intranet access, email, personal information management and text messaging.

**Application flexibility.** Significant business value can be realized when customized applications are mobilized. Many organizations lack the specialized software development expertise needed to develop those solutions, so it is important to choose partners with an established

network of experienced systems integrators who can work with you to customize those applications. For maximum flexibility, there should be multiple options for application enablement including client server (eg. Windows Mobile®, Symbian), web services and browser based.

**Extensibility.** Given the dynamic nature of the mobility market, it is also important that the solution be extensible to support additional devices and to incorporate additional capabilities and requirements as they are discovered. Mobility is contagious, and when user groups see these applications in action, the experience will spawn new ideas for incorporating mobility in other areas.

Along with those general attributes, there are a number of technical capabilities that will also be important in supporting WLAN voice.

**Robust, reliable WLAN infrastructure:** The foundation of any enterprise-grade VoWLAN deployment is a robust wireless infrastructure, and that infrastructure must extend anywhere a user might be when they need to make or receive a call. The configuration must be designed to provide adequate capacity and good signal strength throughout the required coverage area. Poor signal conditions will result in diminished voice quality, dropped connections and no-service-available conditions.

**Voice-capable QoS and hand-off abilities:** To deliver enterprise-grade voice services, the infrastructure and user devices should make use of the IEEE 802.11e/WiFi Multi-Media (WMM) quality of service (QoS) standards. The network must be capable of handing off connections from access point to access point quickly and securely as the user moves through the coverage area.

**Channel availability:** The 2.4 GHz ISM band used for the 802.11b and g radio links can accommodate only three non-interfering channels. Users who are shopping for voice-capable WLAN solutions should ensure that the equipment they are selecting is also capable of supporting the 802.11a radio link that operates in the 5 GHz U-NII band with its 23 non-interfering channels.

**Battery conservation:** Batteries are a critical concern in any mobile device. The WiFi Multi-Media (WMM) Automatic Power Save Delivery (APSD) standard can increase battery life 20 to 40%. However, that might not meet the requirements

of many communications-intensive applications. Device capacity will vary significantly, but there are VoWLAN solutions that can very adequately cover even an extended shift.

**State-of-the-art security:** To ensure adequate security, the solution should support encryption based on the AES-based WiFi Protected Access-2 (WPA-2). Authentication should use the IEEE 802.1x-defined Extensible Authentication Protocol (EAP), which allows for strong authentication where credentials are exchanged over a secure connection. The most advanced solutions incorporate client certificates and certificate authentication to thwart “man-in-the-middle” attacks and other more advanced hacking strategies.

**Network management:** Once the network is installed, the network operations personnel will have to be able to assess performance, respond to trouble calls, diagnose problem conditions and plan for growth and expansion. A comprehensive VoWLAN solution should address the design and network management requirements as well as the client devices and infrastructure elements. Ideally, the information should be presented on a dashboard that allows the network management personnel to identify those problem areas quickly.

## Thinking ahead in VoWLAN: fixed mobile convergence and mobile unified communications

One potential pitfall in deploying a VoWLAN solution today is failing to consider developments in the overall voice communications environment. With the adoption of IP-based voice networks and WLAN voice, the two most important developments we have seen are fixed mobile convergence (FMC) and mobile unified communications. Even if your initial deployment does not include these capabilities, it is absolutely essential that the solution you deploy be capable of incorporating these options as user requirements grow and change.

Fixed mobile convergence is the idea of merging cellular and wired or wireless private networks with the ability to pass calls between them transparently. With an increasingly mobile workforce, more users are dividing their time between their desk, meetings that are held throughout a campus and visits to customers and remote offices. Those users

are looking for a dual-mode Wi-Fi/cellular handset and a functional infrastructure that will allow them to remain accessible with a single telephone number regardless of where they are located.

One very important feature of this type of FMC solution is that outside contacts will always be calling a business number, the user’s desk phone. Even though the telephone system may be forwarding calls to a user’s personal cell phone, all the caller ever sees is the business number. In that way, if the employee leaves the company, their contacts continue to call that business number. That is particularly important with sales-people who are fielding calls from customers and prospects.

The first wave of fixed mobile convergence solutions focused solely on basic voice telephone calls. The voice industry is now focusing its attention on the potential of unified communications (UC). While different groups define UC differently, the two most visible of those features are user presence and unified messaging. Up until now, the user lost access to those enhanced capabilities when they walked out the door. Mobile UC could provide a far more functional communication to the mobile user that is also better integrated with the fixed network.

So while the initial implementation of a VoWLAN solution might look to provide a simple mobile voice capability over the existing wireless LAN infrastructure, the vision of mobile communications is moving far beyond that. In planning for a WLAN voice network today, an organization should consider how they will extend the full range of these productivity-enhancing features to both WLAN and cellular-connected users.

## Conclusion

Providing mobile workers inside the enterprise with wireless functional voice and data communications can allow them to be accessible and productive regardless of where they are located. That continuous accessibility can make your organization more responsive and boost productivity in ways that have a direct impact on ROI. Organizations whose employees can communicate more freely and respond more quickly can outperform their competitors by providing better service more efficiently and at a lower overall cost, making voice over wireless LAN one of the essentials to a mobile solution that enhances business agility.



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