

Strategic Planning and Design for Application-Driven Wireless Local Area Networks

White Paper Series

Volume 2

Strategic Planning for Today's and Tomorrow's WLAN



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Introduction

Today, many early adopters of WLANs are undergoing a technology refreshment, replacing legacy WLANs that were incapable of supporting advanced applications with networks that are designed to provide capacity, coverage, reliability, roaming and other functionality required of advanced applications.

And, those who are deploying their first WLANs are becoming increasingly aware of the experiences of the early adapters and are being careful to design networks that will support current and future applications and ensure lowest total cost of ownership by eliminating the all too frequent “rip and replace” scenario that results from deploying a WLAN whose planning did not, wittingly or unwittingly, consider all of the enterprise’s applications that would utilize the WLAN to provide mobility.

This white paper will present a process for determining an enterprise’s WLAN requirements and the critical criteria that must be established in order to develop planning and design requirements necessary to implement a WLAN that will meet the enterprise’s current and known future mobility requirements.

About this White Paper Series

This educational series, Strategic Planning and Design for Application-Driven Wireless Local Area Networks, explores the evolution of wireless local area networks from their initial implementations to their current status as critical and necessary elements of IT networks and the planning and design process that is critical to developing a mobility platform that supports applications far beyond what were contemplated when the 802.11b specification was ratified in 1999.

The entire series is available at www.azureol.com.

A Planning Process for Success

In over 12 years of providing wireless broadband solutions to clients in all vertical markets we have seen the most successful implementations result from an enterprise-wide effort to seek an understanding of each of the enterprise's business processes' immediate and long-term mobility requirements.

All too frequently we have been called upon to help a client who is experiencing difficulties rolling out a new application that utilizes a WLAN only to find that it was originally designed and deployed to support a specific business unit's application with little or no consideration given to the mobility initiatives of other areas of the enterprise, almost never as a result of negligence, but usually as a result of rushed timelines or the difficulties in assemble stakeholders and defining future requirements effectively.

An excellent example of this situation is a hospital for which the wireless network was designed to provide basic caregiver access to a laboratory information system and guest access to the Internet. While initially serving mobility requirements well, the system not only began to groan under the strain of newly added wireless telephony and a growing number of Citrix-based healthcare information system applications, but delivered unreliable performance for these new applications as it was not designed to support roaming clients, as these future applications were not identified when the network was designed and deployed. Unfortunately, as is often the case with WLANs, it was not possible to correct the deficiencies of the existing system, and the hospital was faced with the dreaded "rip and replace" of the legacy WLAN.

When an enterprise is able to assemble stakeholders, comprised of leaders of various business units or processes, IT leaders, telecom leaders and corporate management, it is able to identify and define all of the applications that will leverage the WLAN for mobility and define global requirements that will drive the network's design criteria.

Criteria Requiring Definition

Following are some of the major criteria for which enterprise-wide stakeholder input is critical in defining the requirements of the WLAN:

Applications Requirements - The short history of WLANs has shown that it has been difficult to foresee the variety and number of applications for which wireless enablement will be desired and such trends are expected to continue.

Without question, the most important step an enterprise can take when planning to implement a wireless LAN is to gain an understanding of the applications it intends to support over the network and architect a network that will support these applications, at a minimum.

For each application, it is recommended to determine the requirements that must be met for that application to operate safely and effectively. This includes a determination of at least the following:

- areas of the enterprise where each application will be used
- user and application density in each area; define how many of which network loads are in each area of the enterprise
- data rate of each application, preferably defined as bits per packet and packets per second, as a high-packet rate consumes available bandwidth
- allowed latency for each application
- reliability required for each application
- security requirements, including HIPAA compliance and intrusion detection/prevention
- overall expected uptime for the wireless network
- client device manufacturers' specific requirements.

Once all of these requirements are known, for current and planned applications that will leverage the WLAN for mobility, the requirements can be aggregated and fundamentally establish the baseline performance requirements of the WLAN.

Implementing a network to satisfy the most demanding of applications, voice, as described previously, and location tracking and wireless intrusion detection, because of their triangulation function requiring significant access point cell overlap, is often the best means of ensuring that the WLAN will be capable of supporting the most demanding applications, whether known or still unknown. Such a design will also provide desired functionality for applications delivered by Citrix and other application delivery services for which session persistence is critical.

The existence or future existence of thin client applications or those delivered by Citrix and other application delivery services is often overlooked but of great importance. We have witnessed a number of clients who suffered through painful experiences as a result of overlooking the fact that their “data” applications utilized Citrix for delivery. Applications that use Citrix or similar services are far more sensitive to latency and jitter and require a wireless network that is designed to standards much like those required for voice, especially when the clients using the applications are truly mobile, as in healthcare information systems.

Capacity Requirements -

Capacity, both of the WLAN and that which is required to be delivered to a specific number of clients in specific areas, must be determined. While capacity of a WLAN is often perceived in terms of the access points’ throughput capacity, the number of

clients and the applications in use within particular areas must be quantified in order to determine true network capacity.

If a large number of clients, using a bandwidth-intensive application occupy high-density workstation areas, a greater number of access points, with individual coverage areas reduced by lowering transmit output power, may be required in order to satisfy client capacity requirements in these areas. By increasing the number of access points, each providing coverage to a smaller space and serving fewer clients, overall network capacity is increased.

Somewhat similarly, a more dense architecture with smaller access point coverage areas is frequently required when wireless VoIP is implemented, as virtually every manufacturer's access point limit the concurrent number of wireless phones that may associate concurrently with a single access point in order to maintain call quality.

Coverage Requirements -

The areas throughout which WLAN coverage is required need to be carefully identified. While this may seem trivial, careful consideration must be given to all areas and spaces, both horizontal and vertical. All too often, coverage required in order to maintain connectivity for wireless VoIP in stairwells, elevators, mezzanine areas and other areas is forgotten or simply overlooked, resulting in a network that is incapable of maintaining a telephone call in all areas in which call continuity is desired.

Roaming Requirements -

Identifying the requirement to support client roaming is essential to establishing network design criteria. This functionality is essential to designing a network that can support applications with a low tolerance for latency, like voice, video, and

applications utilizing Citrix, thin client and other application delivery services.

Client Devices -

The wireless infrastructure is only one half of the wireless networking environment; notebooks, tablets, PDAs, phones and other devices can contain a wide variety of disparate wireless client cards that can have significant effect on WLAN performance. It is important to identify the various client devices and their differing output power levels, receiver sensitivity and usages prior to conducting the network design so that the network can provide and maintain connectivity with each of them.

Environmental Stability -

The likelihood of the environment to remain the same or change during the course of time is an important factor for the planning and design phase of WLAN implementation. The stakeholder group must be able to determine the extent of foreseeable facility use and configuration changes in order to allow for a system plan and design that can accommodate such changes. Construction materials, furniture, building supplies, inventory, raw materials, storage shelving, moving assets and other contents all affect wireless network signals in varying ways, with some absorbing, some reflecting and some blocking signal. While the basic environmental characteristics may readily be known, it is important to recognize what contents may be temporary, seasonal or likely to change. It is also important to take into account the possible changes in travel paths of moving assets such as automated guided vehicles, lift trucks and trains.

Gaining an understanding of these and a few other criteria will allow an enterprise to establish its planning and design criteria for a new WLAN in the confidence that the networks will support all current and identifiable applications for which the wireless network is intended to provide mobility.

Summary

Initially often deployed as a novelty with no clear purpose other than portable network access, WLANs have been embraced and advanced to become an essential element of network architectures, with an increasing number of applications using the network for mobility and an increasing number of networks struggling to support applications for which they were never designed to provide mobility.

Regardless of whether an enterprise is planning to implement its first WLAN or is upgrading a legacy network, it is important to understand the demands placed upon the network by various applications that will utilize the network and establish performance criteria that will ensure that the network will, in fact, support the applications after they are implemented. And, the best way to ensure that all of an enterprise's current and future mobility-enabled applications will be supported by the WLAN is to assemble a group of stakeholders, comprised of leaders of various business units or processes, IT leaders, telecom leaders and corporate management, who can identify and define all of the applications that will leverage the WLAN for mobility and define global requirements that will drive the network's design criteria.

In the ensuing volumes of this white paper series, we will discuss various design alternatives that ensure lowest total cost of ownership and introduce a strategy for deploying a WLAN that meets current requirements and can be upgraded, without suffering the "rip and replace" scenario that has plagued the early adopters of WLAN.

About Azure Solutions

Azure Solutions is an IT systems integrator that specializes in providing its clients and partners with wireless networking solutions that include wireless local area networks, point to point and point to multipoint wireless links and wireless wide area networks, as well as applications like telephony, video, real time location systems and manufacturing control systems that are enabled for mobility by wireless networks. Services include planning, site survey, design, spectrum analysis, project management, implementation, testing, support, maintenance and troubleshooting.

Providing solutions and services across the US, Canada and Mexico, Azure's clients include such enterprises and organizations as General Motors, Honda America Manufacturing, Kellogg Company, Whirlpool Corporation, Trinity Health, Ann Arbor Public Schools, Spectrum Health, Toyota Motor Corporation, SC Johnson, the University of Michigan, the American Cancer Society and the United States' Departments of Treasury, Defense and Energy.

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