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

White Paper Series

Volume 1

Introduction

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Introduction

The importance and increasing adoption of wireless local area networks is undeniable. The flexibility, mobility, increased productivity and cost savings when compared to the cost of a wired network deployment and ensuing moves, adds and changes are the driving forces behind the rapid adoption of WLANs.

Initially considered a luxury or novelty for providing portable internet or email access, wireless LANs increasingly provide untethered access to business applications and network resources, enabling anywhere, anytime access and serve as a foundation for real-time connectivity for advanced applications such as wireless telephony, location tracking and manufacturing control systems. Wireless networks are no longer a novelty or luxury; they have become a key element of IT backbones everywhere.

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.azuresol.com

As enterprises have attempted to enable more applications for mobility over their WLANs, it has become increasingly apparent that early WLANs are often incapable of supporting these applications. Early WLANs were designed to provide coverage throughout desired areas while utilizing as few access points as possible, resulting in networks that are not well-suited to supporting applications that require high bandwidth, roaming, low latency and Quality of Service (QoS). Additionally, the early generation of WLANs provided very little capability for management and provided limited security alternatives, which are provided by current WLAN architectures, along with such advanced functionality as client permission control.

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 aware of the experiences of the early adapters are being careful to design networks that fulfill these requirements.

Yesterday – WLANs Designed to Provide Coverage

Early adapters of WLANs deployed networks that focused on providing *coverage* throughout areas for which portable network access was desired. These networks typically utilized access points transmitting at high power levels and high gain antennas that provided the largest coverage areas per access point location.

These early networks were largely the result of a desire to provide wireless access, deployed often only to provide access to notebook computers in meeting areas, and were not driven by any need to wirelessly enable specific applications and were affected by the high cost of access points when compared to today.

Often viewed by management as a novelty and implemented to satisfy employee demands for wireless access while attempting to prevent the security risks associated by employees deploying their own wireless networks, enterprises and institutions are finding that these early WLANs are incapable of supporting applications whose wireless enablement is now desired.

Traditionally intended for portable, not truly mobile, data traffic of business productivity tools such as e—mail, Internet access and limited access to shared files on network resources, WLANs were designed only for data traffic that is irregular, bursty and not continuous; there are periods of high network utilization and periods of low network utilization, and the duration of these periods is unpredictable.

As WLANs became more prevalent, they began to become the preferred means of network connectivity. This resulted in bandwidth-intensive and potentially latency-sensitive applications such as video also migrating onto the wireless medium.

The challenge created by these applications is that they demanded a different type of service of the network. Best-effort service became insufficient as these applications required high throughout and deterministic behavior.

Today – WLANs Planned and Designed to Support Applications

The trend and objectives of current 802.11 wireless network designs are the support of a growing number of client users and specific current applications, typically accompanied by a desire to create a foundation for the support of future applications, such a voice, the most demanding of applications upon a WLAN.

Rather than focusing solely on providing *coverage*, today's wireless LAN design objective is focused on providing *capacity* and supporting roaming, low latency and Quality of Service (QoS), essential to high quality voice and video, as these applications are extremely sensitive to delays in data transit.

The bandwidth provided by a WLAN is inversely proportionate to the distance between the wireless client and access point; the further away from an access point, the less data throughput. Legacy WLAN designs, focused on providing coverage and signal over as large an area as possible while utilizing the fewest number of access points, due to access point cost and uncertain usage forecasts, resulted in networks that provide extremely low capacity in areas between access points. These designs provided *coverage* and, innocently, did not address *capacity*, or the amount of data throughput required by the number of clients and the applications used by those clients in the future.

Older WLAN designs also unwittingly failed to address fast client roaming, low latency, security and QoS, essential to voice services, as well as a growing variety of different client types. Networks supporting voice and location tracking, whose requirements on a WLAN are similar to voice, must be carefully designed with sufficient, yet not too much access point cell overlap. The failure to provide enough overlap between cells will result in the failure to maintain voice call quality as clients roam between access points. Too much overlap will result in a network that fails to allow clients to roam, keeping clients attached to an access point too long, with degraded

call quality resulting from the fact that the client is obtaining low throughput since it is too far from the access point to which it is attached.

While QoS is of less impact, the fast roaming requirement for voice is essential for thin client and application delivery services like Citrix applications, where session persistence is important, and communications with moving assets, such as automated guided vehicles, where real-time communications are essential. The failure of a WLAN to provide fast roaming will result in the time-consuming, productivity-adverse requirement to continuously log in as clients move across access point coverage areas. Imagine the impact of such a dilemma in a hospital where a coverage-based WLAN design causes nurses, doctors and other caregivers using Citrix-based care management applications to continually log in again and again as they move from patient room to patient room. We've been called in several times to help in this exact situation, and we can assure you that neither the need to constantly log in nor the potential for compromised data integrity was acceptable to the hospital's management.

Often, even when not contemplating voice in the immediate future, informed enterprises are planning and deploying WLANs that are capable of supporting, or expanding to support, voice and other similarly demanding services, protecting their upfront investment in infrastructure and implementation. Having spent considerable sums of money in the implementation of legacy WLANs, and, often, considerably more in increasingly futile attempts to upgrade these legacy networks to increase capacity and support advanced applications requiring fast roaming and QoS, many enterprises are keenly aware of the fact that there will be future demands to support more and more applications, many of which may be currently unknown and unrecognized, over their WLAN. These forward-thinking enterprises are committed to avoiding the deployment of networks that will not meet their long-term requirements by deploying high capacity dual-band, 802.11g/a/n networks supporting fast roaming, low latency and QoS.

Even when electing to deploy a single band network or a network that does not support fast roaming, low latency and QoS today, enterprises are looking forward to the future need for more capacity and the need to support advanced services and embracing the concept of designing new networks that can be readily expanded to meet long term requirements, by doing things like restricting 802.11g access point transmit power output levels so that coverage areas will be similar to that of the inherently, FCC-mandated lower output power of 802.11a access points.

By doing so, these organizations will be able to double capacity by adding or enabling 802.11a radios in existing access points, leveraging access point, cabling, power and installation labor investments.

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.

The first generations of WLANs are typically unable to support the more demanding applications, and are being replaced by networks that support advanced applications like voice, video, thin client applications and real time location services.

In the ensuing volumes of this white paper series, we will explore the planning and design process that is critical to developing a mobility platform that supports today's and tomorrow's applications, 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 Wireless' 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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