ANATOMY OF A SUCCESSFUL WIRELESS CLIENT SERVER SOLUTION

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Wireless local area networks (WLANs) are uniquely positioned today to support corporate enterprise client/server efforts to extend the reach of information systems to the front lines of business operations. Designed to address the various issues associated with placing mobile computers in the hands of mobile front line workers, wireless networks function as a transparent extension to existing distributed, wired enterprise computing networks. Built to be flexible, scalable, and modular, the architecture of a wireless network needs to be unparalleled in its ability to seamlessly migrate from today's solution to tomorrow's technology, evolving with the needs of the client/server.

The features and benefits of wireless local area networks in client/server environments are best illustrated by examining the systems from four key perspectives: an open systems approach to application connectivity, scalable radio media independent architecture, a systems approach to network management and an end node connectivity strategy.

Open Systems Connectivity

Implied in the paradigm of extending the reach is an inherent connection to back end systems or servers. Wireless local area networks need to support virtually all approaches to back end application connectivity including the traditional three tier client/server model of terminal emulation, two and three tier models that require file transfers for disconnected clients, and transaction oriented client/server solutions, with a true open systems approach. This is accomplished through the support of industry standard operating systems, languages and protocols, enabling applications to be designed with the same tools and techniques used for the desktop environment. It eliminates the need for specialized knowledge of proprietary wireless APIs, libraries, and techniques required by other systems. This is attained by true protocol independence on the network infrastructure, supporting TCP/IP, IPX, and other industry standard protocols, providing a transparent communication pipe from back end LAN based systems to the mobile front line computers.

Scalable Media Independent Architecture

The wireless local area network infrastructure must be broken into two significant parts; the radio and the access point (wireless network hardware). In the past, a lack of standards forced customers to buy all of the hardware components from a single vendor. This is no longer the case. Standardization of technology and features like radio media independence gives the end user the flexibility to select the best radio technology today while maintaining a migration path to the future.

When selecting a radio, the band of operation (UHF, 900 MHz or 2.4 GHz) as well as the vendor should be appropriate to the application that the customer is trying to implement. It should not be selected just because it is the latest technology or the only radio offered by a vendor. Although the trend is toward vendors entering the market to produce radios and network components in accordance with the upcoming IEEE 802.11 standard, it is important to note that the expertise to provide a wireless local area network solution is far more complex than the expertise needed to produce the radio itself. The ability to satisfy the expectations of wireless customers with respect to issues such as roaming, subsecond performance, network management and power management is not acquired quickly. For this reason, it is necessary to

evaluate specific radios and wireless network operating systems separately for the best of both solutions, just as network interface cards (NICs) for Ethernet are evaluated separately from the network operating systems (NOS) that use them.

The basic building block of the local area wireless network infrastructure is an access point. The access point, which has been called many names from transceiver to base to RFU, provides wireless connectivity to mobile computers by bridging radio traffic from these devices onto the wired enterprise LAN. Some access points are not media independent. They utilize an embedded radio and force system designers to link today's implementation decisions to a specific radio technology and band. This requires decisions to be based in part on future capacity requirements which are difficult to accurately predict. As a result, companies have a tendency to buy more capacity than they really need, which can greatly increase the initial cost of the system.

The major issue in radio technology decisions involves range versus speed trade-offs, with faster radios also having reduced communication ranges. Higher speed radios therefore significantly increase system costs, as a 50% reduction in the range of a radio results in a requirement of four times the number of access points to cover the same area.

The premium paid for future capacity is wasted if radio technology advancements occur before the need for the additional capacity evolves. With an embedded radio in the access point, the entire infrastructure will need to be replaced to take advantage of new radios, thereby failing to provide a return on the initial investment.

As we look into the functionality of each access point we can basically equate it to a media independent multi-port bridge from the wired media to the wireless media. With changing radio technologies and the upcoming 2.4 GHz standard, the importance of radio media independence strikes a strong cord. Media independence de-risks the current wireless decision, providing multiple degrees of freedom in network scaling and flexibility. System designers can select the most appropriate radio technology for today's needs and have a clean and simple migration path to solve tomorrow's needs with tomorrow's technology.

As radio technology evolves, new radios can be installed to support incremental growth on the network while still supporting the existing population on the initial radio. Or if a complete migration to new technology is required, only the radios need to be changed. In all cases the initial investment in infrastructure remains intact and the interface to the enterprise network remains the same, appearing as transparent Ethernet bridges.

Since the radio range of an access point is limited, coverage over large areas is accomplished using multiple access points. These access points are installed to provide adjacent areas of coverage ensuring that as a device moves out of the range of one access point, it moves into the range of another. The wireless link with the mobile computer is seamlessly and transparently handed off from access point to access point, without impact on the device's connection to the wired enterprise LAN.

This type of roaming computer presents some unique challenges but is a basic need for wireless networks, especially those deploying a client server strategy. First, a roaming device's network address is no longer equal to its physical location, a problem which must be solved in routed enterprise networks. Secondly, battery powered mobile computers typically do not maintain continuous connections with the network as advanced power management techniques cycle the radio off when not actively communicating. Both of these issues can be addressed by wireless networking operating system software in the access points. Utilizing message filters, and spanning tree routing tables, the access points can track location and status of devices in the network, and manage traffic accordingly. This isolates the LAN environment from the issues of mobile devices and allows the access point based infrastructure to seamlessly and transparently integrated into the enterprise network.

Network Management

Within most organizations, the trend is toward more complex networks supporting more applications and more users. But typically, the number of people supporting and maintaining these networks is decreasing. Add to this scenario the blurring between wired and wireless solutions, and you further complicate the matter with roaming and batch versus real-time client/server requirements. For these reasons, it is becoming increasingly important that a cohesive network management strategy be implemented and that industry standard tools, platforms and applications be used to manage the wired and wireless infrastructure seamlessly. Since most network administrators simply do not have the time to learn proprietary tools, wireless diagnostic strategies should fit the mold of current troubleshooting strategies such as PING, MIB II instrumentation and configuration capability through SNMP or Telnet.

Another desirable network management feature is the ability to upgrade programs and add enhancements electronically. Without this capability, these functions require a forklift truck and the labor intensive effort of a number of people to physically disconnect each access point, usually located 25 feet high, individually program each one and then reinstall each unit in its original location. When done electronically, the access points never need be removed. A programmer can update all units by probing them from the host.

End Node Connectivity Strategy

Today there is an abundance of mobile computers which address an entire host of business needs in vertical markets. Hand-held or forklift truck mounted units are leading the way for wireless application specific solutions in retail, warehousing, distribution, transportation and health care environments. But wireless communications need not be limited to merely supporting hand-held terminals and specific vendor offerings. Customers should be able to select the best of breed and incorporate a variety of components into a single wireless solution. Technology has advanced to the point where a well-designed wireless infrastructure can support any vendor's standard ISA bus radio boards, PCMCIA radio network interface cards and RS232 radios. In addition, wireless systems should be able to provide customers with the ability to connect virtually any communications component to the network, including PCs, time and attendance systems, scales, monitors, printers and more.

Summary

Wireless local area networks for client/server environments should be designed to be a transparent wireless extension of existing enterprise networks and offer levels of scalability, flexibility, modularity and functionality to meet the unique needs of each customer. Wireless networks should also provide a true open systems client/server solution designed for front-line mobile computing in the real world.

When evaluating open-systems client/server solutions, seek answers to the following questions when comparing one system to another:

Assessing radio components:

- Does the solution provide a migration path to the evolving IEEE 802.11 standard and other emerging radio technologies?
- Can your network support radios from other vendors or are you locked into the radio technology developed and supported by your network provider?

Assessing network capabilities:

- Can you use industry standard network management platforms to manage the wireless backbone and mobile computers?

- Is the wireless mobile solution an extension of the wired backbone, supporting industry standard protocols such as TCP/IP and IPX/SPX?

Matching customer needs with technology offerings:

- Does your network provider offer a wide range of terminals and a choice of radios to choose from to fill a variety of communications needs?
- Is your system open to supporting peripheral devices from other vendors in the wireless infrastructure or are you limited to using only devices from your network?