Act Big Consulting

Small & Medium Business Marketing & IT

"Put the right foot forward and leave greater impressions."

Overview of Wireless LANs for Small Business

The widespread reliance on networking among today's businesses and the dramatic growth of the Internet and online services are strong testimonies to the efficiencies of shared data and resources. With wireless networks, users can access shared information without looking for a place to plug in, and network managers can set up or augment networks without installing or moving wires. Wireless networks offer the productivity, service, convenience, and cost advantages of traditional wired networks and the following advantages:

- **Speed & Simplicity:** Installing wireless can be fast and easy by eliminating the need to pull vast amounts of cable through walls and ceilings.
- **Installation Flexibility:** Wireless technology allows networks to go everywhere wired ones cannot.
- **Reduced Ownership Cost:** While initial investments required for hardware can be higher, overall installation expenses and life-cycle costs are significantly lower. Long-term cost benefits are greatest for small, dynamic, growing businesses where frequent moves, additions, and changes are the norm.
- **Mobility:** Wireless networks provide users with complete access to information from anywhere in their organization increasing productivity and service opportunities not possible with conventional wired networks.
- **Scalability:** Wireless networks can be configured using a variety of topologies, meeting the needs of specific applications and environments. Configurations are easily changed and range from peer-to-peer networks suitable for a small numbers and small spaces to full infrastructure networks for hundreds of users over the largest facilities.

Wireless Technology Options

The most important component in any wireless network is the cell. The cell is defined as the area where all the wireless communication takes place. In general, a cell covers a circular area. Within each cell there are Access Points. The Access Point in turn interconnects cells of a wireless network and also connects to a wired Ethernet LAN through some sort of cable connection. The number of wireless stations per cell is dependent on the amount and type of data traffic. To allow continuous communication between cells, individual cells

overlap. Cells can be used to accommodate traffic needs for a small to medium sized business network between workstations and/or workgroups. A stand-alone cell would require no cabling.

Another option is wired bridging. In a wired bridging configuration each access point is wired to the backbone of a wired Ethernet LAN. Once connected to a wired network, network management functions of the wired and the wireless network can be controlled. Wireless bridging is also an option which allows cells to be connected to remote wireless networks. In this situation, networking can stretch for miles if it were linked successively and effectively from access point to access point.

Finally, by connecting several Access Points to external directional antennas instead of their omni-directional antennas access points can provide multi-cells. This is useful for areas of heavy network traffic since with this configuration they automatically choose the best Access Point. Roaming can also be provided for portable stations. Roaming is seamless, and it allows a work session to be maintained when moving between cells.

Manufacturers of wireless networks have a range of technologies to choose from when designing a wireless networking solution. Each technology comes with its own set of advantages and limitations. Types of wireless solutions include the following:

Spread Spectrum
Most wireless networks use spread-spectrum technology, a wideband radio frequency technique developed by the military for use in reliable, secure, mission-critical communications systems. Spread-spectrum is designed to trade off bandwidth efficiency for reliability, integrity, and security. In other words, more bandwidth is consumed than in the case of narrowband transmission, but the trade-off produces a signal that is, in effect, louder and thus easier to detect, provided that the receiver knows the parameters of the spread spectrum signal being broadcast. If a receiver is not tuned to the right frequency, a spread spectrum signal looks like background noise. There are two types of spread spectrum radio: frequency hopping and direct sequence.

Narrowband Technology
A narrowband radio system transmits and receives user information on a specific radio frequency. Narrowband radio keeps the radio signal frequency as narrow as possible just to pass the information. Undesirable crosstalk between communications channels is avoided by carefully coordinating different users on different channel frequencies. A private telephone line is much like a radio frequency. When each home in a neighborhood has its own private telephone line, people in one home cannot listen to calls made to other homes. In a radio system, privacy and noninterference are accomplished by the use of separate radio frequencies. The radio receiver filters out all radio signals except the ones on its designated frequency.

Frequency-Hopping Spread Spectrum Technology
Frequency-hopping spread-spectrum uses a narrowband carrier that changes frequency in a pattern known to both transmitter and receiver. Properly synchronized, the net effect is to maintain a single logical channel. To an unintended receiver, FHSS appears to be short-duration impulse noise.

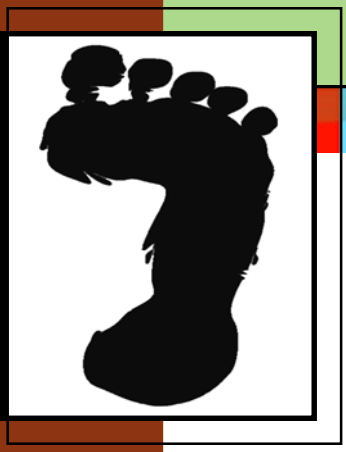
Direct-Sequence Spread Spectrum Technology
Direct-sequence spread-spectrum generates a redundant bit pattern for each bit to be transmitted. This bit pattern is called a chip or chipping code. The longer the chip, the greater the probability that the original data can be recovered and, of course, the more bandwidth required. Even if one or more bits in the chip are damaged during transmission, statistical techniques embedded in the radio can recover the original data without the need for retransmission. To an unintended receiver, DSSS appears as low-power wideband noise and is rejected by most narrowband receivers.

Infrared Technology
Infrared systems use very high frequencies, just below visible light in the electromagnetic spectrum, to carry data. Like light, IR cannot penetrate opaque objects; it is either directed (line-of-sight) or diffuse technology. Inexpensive directed systems provide very limited range and typically are used for PANs but occasionally are used in specific WLAN applications. High performance directed IR is impractical for mobile users and is therefore used only to implement fixed subnetworks. Diffuse or reflective IR WLAN systems do not require line-of-sight, but cells are limited to individual rooms.

Microcells and Roaming
Wireless communication is limited by how far signals carry for given power output. WLANs use cells, called microcells, similar to the cellular telephone system to extend the range of wireless connectivity. At any point in time, a mobile PC equipped with a WLAN adapter is associated with a single access point and its microcell, or area of coverage. Individual microcells overlap to allow continuous communication within wired network. They handle low-power signals and hand off users as they roam through a given geographic area.

Wireless LAN Configurations
Wireless LANs can be simple or complex. At its most basic, two PCs equipped with wireless adapter cards can set up an independent network whenever they are within range of one another. This is called a peer-to-peer network. On-demand networks such as in this example require no administration or preconfiguration. In this case each client would only have access to the resources of the other client and not to a central server.

Installing an access point can extend the range of an ad hoc network, effectively doubling the range at which the devices can communicate. Since the access point is connected to the wired network each client would have access to server resources as well as to other clients. Each access point can accommodate many clients; the specific number depends on the number and nature of the transmissions involved. Many real-world applications exist where



a single access point services from 15-50 client devices. Access points have a finite range, about 500 feet indoor and 1000 feet outdoors. In a large facility such as a warehouse, or on a campus it is necessary to install more than one access point. Access point positioning is accomplished by means of a site survey. The goal is to blanket the coverage area with overlapping coverage cells so that clients might range throughout the area without ever losing network contact. The ability of clients to move seamlessly among a cluster of access points is called roaming. Access points hand the client off from one to another in a way that is invisible to the client, ensuring unbroken connectivity.

To solve particular problems of topology, the network designer might choose to use Extension Points to augment the network of access points. Extension Points look and function like access points, but they are not tethered to the wired network as are APs. EPs function just as their name implies: they extend the range of the network by relaying signals from a client to an AP or another EP. EPs may be strung together in order to pass along messaging from an AP to far-flung clients, just as in a bucket brigade.

One last item of wireless network equipment to consider is the directional antenna. Let's suppose you had a wireless network in your building 1 and wanted to extend it to a leased building 2, one mile away. One solution might be to install a directional antenna on each building, each antenna targeting the other. The antenna on 1 is connected to your wired network via an access point. The antenna on 2 is similarly connected to an access point in that building, which enables wireless network connectivity in that facility.

The Bottom Line

Translating the benefits of wireless networks into quantified ROI can prove difficult. Some benefits, such as lower networking costs, are self-evident, but other soft benefits, such as increased productivity, higher employee satisfaction and faster decision making, are not as easily measured in dollars and cents. Act Big Consulting helps clients maximize the return on their wireless networking investments. For more information write to solutions@actbigger.com or call 617.480.4213.

About Act Big Consulting

Act Big Consulting (AB) is a professional services firm delivering customer-focused business solutions to small and medium businesses (SMB). AB combines leading-edge customer marketing technologies with business strategy to help clients build customer loyalty. By creating the necessary connection between technology and strategy, AB builds solutions that help clients derive greater internal business performance and cultivate long-term relationships with their most valuable customers.

Act Big specializes in services helping small and medium businesses derive growth and brand loyalty from enhanced customer understanding and integrated marketing. Founded in 2001, Act Big Consulting serves clients nationwide from offices in Boston, Massachusetts. For more information about our solutions and services, contact askbig@actbigger.com or call 617.480.4213.