

WLAN: ACCESS TO DIGITAL LIBRARIES WITHOUT WIRES

by

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ABSTRACT

The development of electronic resources and "Virtual Libraries" offers many new opportunities for accessing voluminous information. Wireless data communication is revolutionizing many jobs and services, much as the introduction of desktop computers did ten years ago. This developing technology offers great potential for broadening access to library services in ways never before conceived. Wireless data communication may be the next logical step in the evolution of library information systems.

There are three basic types of wireless technologies- Cellular, packet radio, and Wireless Local Area Network (WLAN). This paper discuss the various technology and considerations for WLAN.

Keywords: Wireless – network, WLAN, Mobile – access

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0 Introduction

Wireless data communication is revolutionizing many job and services, much as the introduction of desktop computers did ten years ago. This developing technology offers great potential for broadening access to library services in ways never before conceived.

The explosive growth of the Internet and the continued proliferation of electronic information resources places the libraries square in the middle of revolutionary changes in the way information stored and accessed. These dramatic changes in Wire/Cable-based electronic information delivery are paralleled by developments in the wireless realm.

The today's learning paradigm has shifted from learning in classroom to e-learning. e-Learning is a concept for learning anywhere, anytime, and in any language. It demands access to library online public access catalogue (OPAC), commercial database, and the Internet resources from anywhere. Traditional LAN (Local Area Network) technologies meets partial needs of new learning technology because Wired LAN provides inflexible layout to access point and to change topologies force rebuilding and reconfiguring the wiring systems.

Wireless LAN does the same thing as conventional computer LANs, only without the need to lay costly phone lines or coaxial cables throughout a building or campus. It can

be implemented fast, and provide mobility and easy access. This paper discusses the various technology and considerations for WLAN.

1 Why LAN in the sky

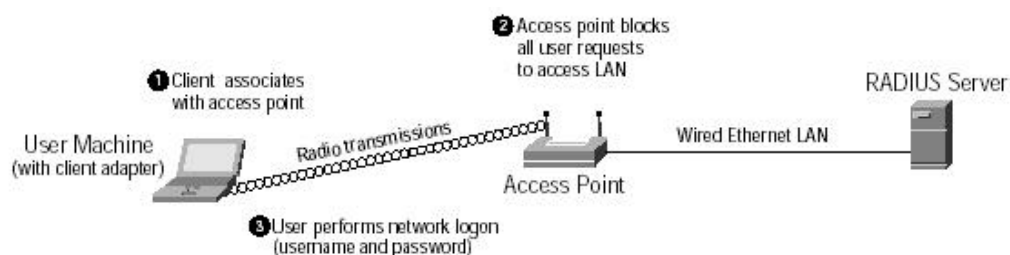
Wireless LANs (WLANs) are a great alternative to wired LAN and can compliment your existing wired LAN by extending its services and reach. WLAN use electromagnetic waves to transmit and receive data. It can be considered as a flexible data communication system.

WLAN systems can be configured in a variety of topology to meet the needs of specific applications and installations. First time cost of WLAN hardware can be higher than cost of Wired LAN hardware but the over all installation expenses and life cycle cost can be significantly lower.

1.1 Typical Configuration

In a typical WLAN configuration a transceiver- device that can transmit and receive – connect to the wired network from fixed location using standard cabling. This transceiver is usually called as access point. The access point receives, buffers, and transmits data between the WLAN and the wired network infrastructure. A single access point can support a small group of users and can function within range of a few hundred feet, depending on vendor offering. An antenna may be mounted practically anywhere as long as the desired radio converge is obtained.

End user access the LAN through WLAN adapters (Wireless version of network Interface cards) that are installed as PCMCIA cards in notebook or palmtop computers, and PCI cards in desktop PCs. It can also be integrated with handheld computers. WLAN adapters provides an interface between the client NOS (Network Operating System) and the airwaves via an antenna. The nature of the wireless connection is transparent to the NOS.



1.2 Types of WLAN technology

Three types of WLAN technologies are available – Microwave, spread spectrum, and infrared technology.

Microwave Technology: Microwave signals allow high – speed data transfers rates and have advantages of penetrating walls. They can also support application requiring full-motion video transmission and point-to-multipoint broadcasting. The drawback of microwave-based LAN devices are that they are limited to line-of-sight transmission, sending and receiving units must be closely aligned, the data path must be kept unobstructed. Transmission is limited to distance up to 30 Kms. Microwaves systems have been used with success in deploying campus wide LAN or WAN for multi-campus, education institutions. With the current state of microwave technology, these systems can offer substantial cost saving over leased lines and fiber optic connections.

A Spread spectrum technology: Most of WLAN vendors build systems that function in spread spectrum technology. It is one in which the transmitted signal is spread over wide frequency band, much wider, in fact, than the minimum bandwidth required to transmit the data being sent. This technique originally developed by the military for use in reliable and secure mission – critical communication systems. It is designed to provide reliability, integrity, and security, but at the cost of bandwidth efficiency. Some system use “Frequency hopping” FHSS (Frequency Hoping Spread Spectrum) to jump around the assigned array of channels. Other systems use a faster “Direct sequence” DSSS (Direct Sequence Spread Spectrum).

FHSS uses a narrowband carrier that changes frequency in a pattern known to both transmitter and receiver. When the changing pattern is properly synchronized across both ends, the net effect is to maintain a single logical channel.

DSSS generate 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. But a long chip also needs more bandwidth.

Infrared technology: Infrared (IR) systems use very high frequency-light waves to carry data. The waves are just below the visible light in the electromagnetic spectrum. IR can not penetrate opaque objects and is either direct (line-of-sight) or diffuse technology. Inexpensive direct systems provide a very limited range up to three feet, and typically used for personal area network.

2 Security issues in WLAN

A WLAN transmits data over the air using radio waves and it can be received by an WLAN client in the area served by the data transmitter. Installing WLAN may seem like putting Ethernet ports everywhere. Data privacy is a genuine concern with WLANs because there is no way to direct a WLAN transmission to only one recipient.

The IEEE 802.11b standard was published in 1999 for WLAN. This standard provides for full Ethernet like data rate of 11 Mbps over DSSS (Direct Sequence Spread Spectrum). Like all other 802 standard, the 802.11 standard focus on the bottom two layer of OSI model, which are physical layer and data link layer. This standard has been adopted by almost all of today’s vendors. It also defines two mechanisms for providing access control and privacy on WLANs.

They are SSID (Service Set Identifier) and WEP (Wired Equivalent Privacy).

SSID: SSID is a naming handle that provides a rudimentary level of access control. It is common network name for device in WLAN subsystem. It logically segments the subsystem and the access point is usually set to broadcast its SSID in its beacons. The use of SSID as a handle to permit/deny access may be unsafe because typically the SSID is not well secured.

WEP: The IEEE 802.11b standard stipulates an optional encryption scheme called WEP. WEP uses a symmetric scheme where the same key and algorithm are used for encryption and decryption of data. It performs access control by preventing unauthorized users who lack a correct WEP key, from gaining access to the network. Support for WEP with 40-bit encryption keys is a requirement for Wi-Fi (Wireless Fidelity) certification by WECA (Wireless Ethernet Compatibility Alliance). Some vendors implement the computationally intense activities of encryption and decryption in software, while others, like Cisco Systems, use hardware accelerators to minimize the performance degradation of encrypting and decrypting data streams.

3 Authentication in WLAN

A node cannot participate until it is authenticated. WLAN standard 802.11b defines two ways of authentication – the open and shared key. The authentication method must be set on each node, and the setting should match that of the access point with which the node wants to associate. The open key authentication can associate with access point even without supply WEP key. It is default to all wireless devices.

In the shared key authentication process, client sends a challenge text packet that the client must encrypt with correct WEP key and return to the access point. If the client has wrong key or no key, it will fail authentication and will not allow associating with access point.

4 WLAN considerations

Before deploying the WLAN solution in Libraries, consider some of these issues. These issues always help to decide WLAN technologies.

Throughput: Throughput is affected by the number of users, range, the type of WLAN system used, latency and bottleneck on the wired positions of the LAN. Data rates for the most widespread commercial WLANs are in the 1.6 Mbps range.

Range: The distances over which RF and IR waves can communicate depend on the transmission power and receive capabilities of the transceivers. It also depends upon the path to be taken for the data. Interaction with typical building objects like walls, metal, and even people, can affect how energy propagates. This limits the range and converge of a particular system. Vendors manufacture WLAN equipment with different range, so before purchasing make sure that equipment meets your requirement.

Integrity and Reliability: Wireless data technologies have been proven through more than fifty years of wireless application in both commercial and military systems.

While radio interference can cause degradation in throughput, such interference is rare in the workplace. Robust designs of proven wireless LAN technology and the limited distance over which signals travel result in connections that are far more robust than cellular phone connections and provide data integrity performance equal to or better than wired networking.

Compatibility with the existing network: Most WLAN provide industry standard interconnection with wired networks that use Ethernet or Token ring. Once installed, the network node treats wireless nodes like any other network components.

Interoperability of wireless devices: WLAN systems from different vendors may not be interoperable. This is due to three reasons.

- ✍️ Different technologies will not interoperate.
- ✍️ Systems using different frequency bands will not interoperate even if they both employ the same technology.
- ✍️ Systems from different vendors may not interoperate even if they both employ the same technology and the same frequency band, due to difference in implementation by each vendor.

It is always advisable to select the product of Wi-Fi certified.

Interference and coexistence: Product, which transmits energy in the same frequency spectrum, can potentially provide same measure of interference. Another concern is the co-location of multiple WLANs. While WLANs from same manufacturers may face signal interference, other coexists without interference.

Security: In WLAN data travels in the air, so security provision is typically build in. It is extremely difficult for unintended receivers to listen in on WLAN traffic because most of vendor employ complex encryption techniques.

Scalability: Wireless network can be designed to be extremely simple or quite complex. Wireless networks can support large numbers of nodes and physical area by adding access points to boost or extend coverage.

Cost: A WLAN implementation includes infrastructure cost in the wireless access point and user cost of WLAN adapters. The cost of installing and maintaining a WLAN is generally lower than the cost of installing and maintaining a traditional wired LAN. A WLAN eliminates direct cost of cabling and the labor associated with installing and repairing it.

Available WLAN products in Market:

1. CISCO provides complete range of IEEE 802.11b compliance product for WLAN.
INDOOR: Aironet, AP-340, AP-350 (with security features).
OUTDOOR: BR-350 (bridge antenna) COMBO UNITS (Bridge/Access point).
More information available at www.cisco.com

2. D-Link: D-Link products support IEEE 802.11b, Wi-Fi certified, 128-bit WEP encryption.

DWL-650, PCMCIA cards, DWL – 500 , PCI Cards, DWL-1000 AP (Access point). More information available at www.dlink-india.com

3. 3COM: products are IEEE 802.11b standard and Wi-Fi certified. Products are: AirConnect 11 Mbps, Wireless access point 6000, AirConnect 11 Mbps Wireless LAN PC card, AirConnect 11 Mbps Wireless LAN Building-to-building Bridge. More information are available at www.3com.com

4. TATA TELECOM: Avaya Wireless LAN solutions for outdoor LAN, Education and healthcare industries.

5 Advantages of WLAN in Libraries

For researchers, the use of PDAs and wireless connectivity with library building eliminate unnecessary steps in the research process. Users can conveniently search the online catalogue anywhere in the building, even in the book stacks. This freedom of movement eliminates unnecessary foot traffic to/from the OPAC terminal. For librarians, using wireless PDAs can make assisting patrons easier and more efficiently. Rather than taking the patron to the OPAC terminal, it is now possible to take the terminal to the patron. Librarian can automate inventory checking and the collection of serial usage data could also be used with handheld wireless computer.

One of the most attractive components of wireless connectivity is the ability to break the physical restraints of building or landline telephones.

6 Conclusion

WLAN offers many benefits over wired LANs, they extend into place where you can not install cable and offer mobility. After release of standard 802.11b has been adopted by almost all of today's wireless vendor. Consequently, wireless network adapters card price dropped considerably. Though WLAN registered success in local area network but is still in a developing stage. Interoperability and security are major issues for WLAN because 802.11b have not solved these issues completely. Searching a place of wireless local area network (WLAN) in libraries and education institutions especially in Indian environment needs thorough economic feasibility study, which can be taken as a research project.

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