

# aries

## Small Office Connectivity

Introduction to Wireless Local Area Network

*white paper*

## Introduction

A wireless local area network (WLAN) is a flexible data communications system that can use either infrared or radio frequency (RF) technology to transmit and receive information over the air, through walls, ceilings and even cement structures. A typical wireless LAN comprised of an access point and the wireless LAN adapter installed on the notebook. The Access Point is essentially the wireless equivalent of a LAN hub. An Access Point is typically connected with the wired backbone through a standard Ethernet cable, and communicates with wireless devices by means of an antenna. The coverage area of the access point determines the boundary of the LAN (Local Area Network) and is omni-directional with the access point at its center, forming a cell. The size of the cell depends upon the strength of the propagated infrared/radio signal and the type and construction of walls, partitions, and other physical characteristics of the environment.

Wireless LAN has increasingly become an important adjunct to the more traditional wired LANs, to satisfy the needs for mobility, relocation, ad hoc networking connectivity, and coverage of locations in accessible for wiring. When a wireless LAN is deployed in conjunction to the traditional LAN connectivity, wireless LAN users also enjoy the full range of network services just like a wired LAN counterpart.

While adaptable to both indoor and outdoor environments, wireless LANs are especially suited to large indoors locations such as office buildings, manufacturing plants, hospitals, stock exchange trading floors etc. Wireless LANs are commonly deployed in wide-open areas like school campuses, airports and cargo ports.

The importance of Wireless LAN, however, goes far beyond just the absence of wires. The Wireless LAN defines a new definition of what a network infrastructure can be. No longer does an infrastructure need to be fixed and difficult to change. Instead, it can move with the user and change as fast as the organization does.

## Benefits to the Users

With wireless LANs, network engineers can quickly set up or augment networks without installing or relocating cables; users can access the network without looking for a network point. Wireless LANs can offer productivity, convenience, and cost advantage over traditional wired networks:

**Reduced Cost-of-Ownership:** Setting up a wireless LAN requires an investment in wireless LAN adapters and access point, the overall cost may be lower than the cost of setting up a wired LAN which includes network adapter, switches/hubs, cables and labor costs. In a dynamic work environment where there are frequent changes to the office structure, wireless LANs offer significant cost savings, as there is no re-wiring cost to consider.

For example, a dentist can carry his notebook between patient rooms and use a virtual imaging application to project what a patient's teeth will look like after braces. This can be done over a wireless network, eliminating the need for a PC and network connection in each patient room. And at the touch of a button, the dentist can send a copy of the image to the front desk printer for the patient to grab on the way out of the door.

**Ease of installation:** Installing a wireless LAN is fast and easy, without having to channel walls/ceilings, laying cables, making up connectors and fixing wall sockets.

**Installation Flexibility:** Wireless LAN makes it much easier to add or move workstations, and to provide connectivity in areas where it is difficult to lay cable.

**Mobility:** Wireless connectivity provides mobility, from workers who must traverse the warehouse, to sales personnel who need to take their presentation tools with them down the hall. Wireless LAN is a natural extension to an organization's wired network. It can greatly increase productivity by providing real-time access to e-business applications and valuable networked data.

**Scalability:** Adding new users to the network is as simple as issuing wireless LAN cards. Wireless LAN can be configured as a peer-to-peer network environment suitable for a small number of users to full infrastructure networks of thousands of users that enable roaming over a wide area.

### **The 802.11b Wireless Standard**

The IEEE 802.11 standard has emerged as the realm of Wireless LANs. The 802.11 standard allow for two types of transmissions: Frequency Hopping Spread Spectrum (FHSS) and Direct Sequence Spread Spectrum (DSSS). The Spread Spectrum was initially developed by the U.S. military. With FHSS, the signal hops from one frequency to another at a predetermined rate known only to the transmitter and receiver. With DSSS, a redundant "chipping code" is sent with each signal burst, and only the transmitter and receiver knows the chipping sequence. Both forms of spread spectrum consume more bandwidth than a typical narrowband transmission, but this enables a louder signal that is easier for the receiver to detect than a narrowband signal.

The recent evaluation of the High Rate wireless standard, 802.11b provides for a full Ethernet-like data rate of 11Mbps over DSSS and has become the predominant Wireless LAN standard.

Where Wireless LAN present as a real premium

Organizations leasing office space may not want to invest in the installation and maintenance of wired LAN. Wireless LANs represent a one-time investment; once configured, wireless LANs can be moved from place to place with little or no modification, and will not incur additional installation cost.

The local authorities often protect historical buildings; they are prohibited against any alteration - including the drilling of holes for new cabling. Wireless LANs offer the only viable option for such environments. In such instances, Wireless LAN can be quickly installed, and placed into service.

## How Wireless LAN Works

The coverage area of radio frequency (RF) and infrared (IR) signal are determined by the design of the products (including the receiver and transmitting power) and the surrounding environments. The transmitted signals interact with building objects, including walls, metal surfaces and human beings, all of which will influence the signal propagation, and this determine the range and coverage a particular wireless system can achieves. IR signals can be blocked out by solid objects and is therefore more restrictive for deployment. Most wireless LAN systems use RF because it can penetrate indoor walls and obstacles. When RF propagates in an indoor environment, it “bounce off” reflective and semi-reflective surfaces such as walls, partitions, furniture and equipment. Signal reaches the receiver from all directions, but at different strengths and time dispersion, depending on the path they have traveled.

Wireless LAN products operate within the specified 900MHz, 2.4GHz and 5.8GHz frequency bands. Most wireless LANs use the 2.4GHz frequency band because it is most widely accepted.

Those devices, in general, transmit power of less than one watt - and are generally designed to contain their signaling within a 100m to 300m range. Special directional antennas can be mounted to span longer distances if required.

For the end-users to be connected to a wireless LAN service, they will need to install wireless LAN Cards (PCMCIA cards) in their notebooks or handheld computers. An ISA Wireless LAN cards are required for desktop computers.



Wireless LAN PCI card (with a wireless LAN PCMCIA card in the slot.)



Wireless LAN PCMCIA card.

The number of users connected affect the performance of a wireless LAN service. Data rates for the most widespread commercial wireless LANs are confined to 11Mbps. Users of traditional Ethernet or Token Ring LANs generally experience little or no difference in performance when converting to wireless LAN services. Wireless LANs provide throughput sufficient for the common office applications, including electronic mail exchange, access to shared peripherals, Internet access, and access to multi-user databases and applications.

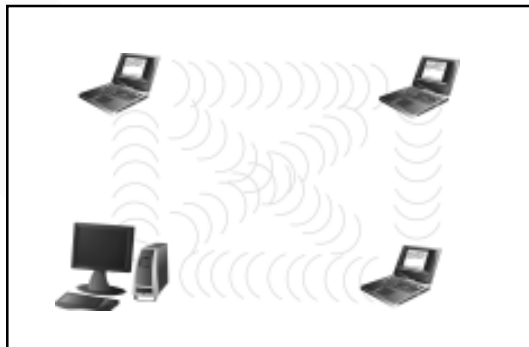
Wireless LAN communicates through the air; in its crude form it is therefore vulnerable to eavesdroppers via the use of specialized equipment. To address this problem, the Wireless LAN specification (802.11) provides two security tools (privacy and authentication) through a mechanism, named wired equivalent privacy (WEP) to prevent intrusion. The WEP tool encrypts the information transmitted over the air, and only the receivers that have the correct encryption key can decrypt the information. Hence WEP provides privacy and security comparable to that of a traditional wired network.

## Wireless LAN Implementation

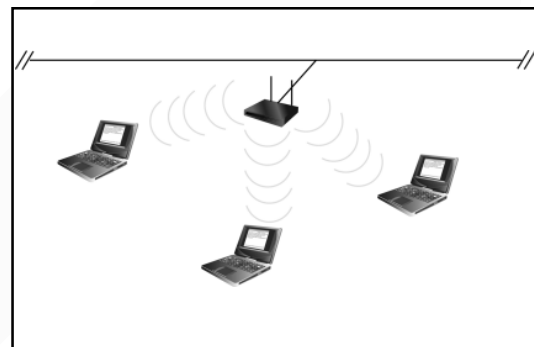
A wireless LAN implementation includes infrastructure cost for the wireless access points, wireless LAN adapters and wireless PDAs (Personal Data Assistant) for some applications. The cost of the implementation depends primarily on the number of access points deployed and the number of network users. The number of access points typically depends on the required coverage region and/or the number and type of users to be serviced. In a typical office situation, one access point is generally sufficient to cover an area with a radius of 100-150m.

The cost of installing and maintaining a wireless LAN generally is lower than that of installing and maintaining a traditional wired LAN. First, wireless LAN configuration eliminates the costs associated with cabling. Secondly, wireless LANs simplify moves, adds, and changes to the user environment that reduces the indirect costs of user downtime and administration.

Currently, wireless networking is frequently used as augment rather than a complete replacement of wired LAN networks, to support mobile user. Wireless networking is capable of supporting large numbers of nodes and/or large physical areas the addition of more access points to boost or extend coverage. At its most basic form, a peer-to-peer, on-demand network comprises of two PCs each equipped with a wireless adapter card. On-demand networks such as in this example require no administration or pre-configuration. In this case each PC could only have access to the resources of the other client but not to a central server.



Peer-to-peer wireless configuration



Server/Clients wireless configuration

By the addition of a server and an access point, the wireless users will have access to server resources as well as to each other. Many real-world applications exist where a single access point services between 15 to 50 clients.

Access points have a finite range; in a very large facility such as a college campus it is necessary to install more than one access point. For most installation with multiple access points, the recommendation is to have the coverage area of one access point overlapping that of another, in order to provide non-disruptive services as the user moves within the boundaries of access points. The ability to move around the wireless campus is called "Roaming". Roaming is seamless and generally not noticeable by the users. A client computer hops from one access point to another by automatically select the access point in its area that provides the clearest signal.

## **Why Wireless LAN is important?**

“Investments at the desktop are idle, because people are spending less time at their desks”, quoted by an analyst from Gartner Group. Most analysts agree that the Wireless LAN market segment is set to take off in 2001, reaching \$2.2 billion by 2005. With the growing important of Internet and e-Business applications, access to real-time data without being confined to one’s desk is fueling the Wireless LAN segment.

## **Summary**

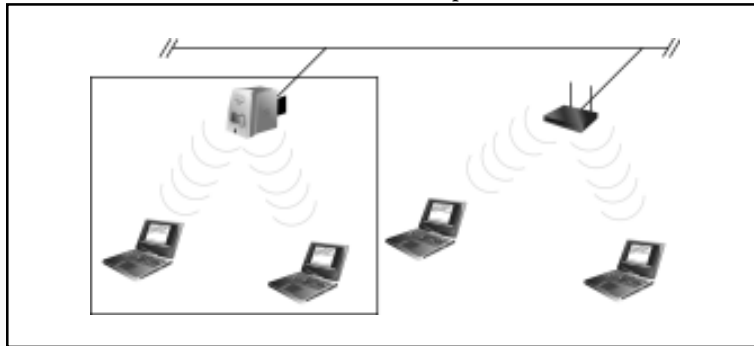
Flexibility and mobility make wireless LANs both effective extensions and attractive alternatives to wired networks. Wireless LANs provide all the functionality of wired LANs, without the physical constraints of the wire itself. Wireless LAN configurations range form simple peer-to-peer topologies to complex networks offering distributed data connectivity and

roaming. Besides offering end-user mobility within a networked environment, wireless LANs enable portable networks, allowing LANs to move with the knowledge workers that use them.

### **Celestix and Wireless Networking**

On February 1, 2001, Celestix Networks announced its new fully integrated Network Server Appliance called Aries that supports the IEEE 802.11b wireless standard. The new Aries Server Appliance provides high-speed, secure, and reliable connectivity for both wired and wireless environment.

Enabling Wireless Networking (802.11b) is as easy as plugging in an optional PCMCIA card into the server. Within minutes, users can have their entire network running, and have Internet access with wireless LAN capabilities for the entire office, enabling the freedom to work, whenever one can be most productive. The traditional complexities of other servers have been omitted from this innovative product without sacrificing functionality and performance. Set up and maintenance is a breeze with the Aries' simple user interface. The Aries is designed so that a typical office manager could



Aries/Client Wireless Configuration

### **Aries is also Apple AirPort Compatible**

Aries also supports Apple AirPort enabled Macintosh computers. Aries allows Apple Macintosh users to have Internet access and share files with other type of computers. For example, suppose you created a document in Microsoft Word for Windows. A co-worker can access that document, use Word for the Macintosh to modify it, and then place it back on the server so you can see those revisions using Word for Windows. This feature is supported by the Aries because Aries functions as an AppleTalk router. Macintosh clients need only the Macintosh operating system software to function as workstations-no additional software is required.

For more information on Aries Server Appliance, please visit <http://www.celestix.com>