

Technology Positioning

Bluetooth and IEEE 802.11b Wireless Technology Positioning Paper

Positioning Brief

Introduction

Chained? In reality, we are securely wired to our workstation with a network cable feeding us all the necessary information we need to complete our day's work. Most corporate applications are built around the concept of having a fast link from our desktop or notebook PC to the corporate data store and the Internet. However, recent studies show that many workers spend up to half of their time away from their desk. Pervasive access to networked business tools has become critical, whether the employee is down the hall in a meeting, in another part of the corporate campus, or away from the office on business. The prevalence of low-cost portable computers, cellular telephones and handheld devices, coupled with the explosion of Internet applications and e-commerce, has resulted in the need for users to have network access regardless of physical location or device type.

The obvious solution is to provide connectivity without wires. However, until today, wireless technologies have only been adopted in specialized environments such as manufacturing, warehousing and retail vertical markets. For the general business community, the case for wireless

networking was less compelling. Too slow and too expensive were the most common complaints, as well as the fact that existing technology uses too much power to be deployed in the growing population of handheld devices. All that has changed.

Two technology standards have arisen to fill these needs—IEEE 802.11b and Bluetooth. Each is a method that allows your portable devices to access the network as well as talk with one another—without the inconvenience of cables. As we will discuss, 802.11b (or 802.11 High Rate) is an 11 Mbps wireless standard designed to provide full network services to a user with a notebook or desktop PC. Bluetooth is a 1 Mbps technology optimized for low cost and low power to provide wireless connectivity to a much wider variety of mobile electronic devices. Bluetooth will drive a new concept called “personal area networking” where a user's mobile devices will be able to exchange information in close proximity and connect to networks as the user roams from location to location.

802.11b: Full-Service Wireless Networking

The 802.11b standard is a recently ratified IEEE specification for wireless LANs. 802.11b uses Ethernet-like protocols to provide up to 11 Mbps throughput with fallback rates of 5.5 Mbps, 2 Mbps, and 1 Mbps. It is an extension to the original IEEE 802.11 standard that supports only 1 Mbps and 2 Mbps data rates. Most 802.11b networks use an access point as a “wireless hub” which communicates with network interface cards in portable and desktop PCs (Figure 1). In a normal office-building environment, the network cards and access points can communicate up to 100 meters. In addition, users can be “handed off” across multiple access points to create a broad campus-wide wireless network. The speed and range of 802.11b are sufficient for users to run

all but the most bandwidth-intensive network operations as if they were on the wired LAN.

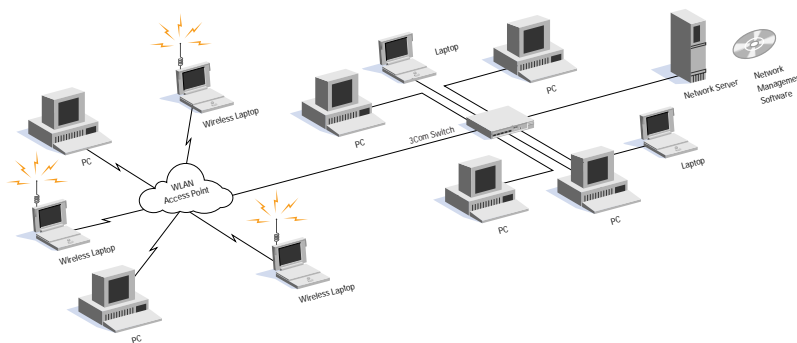
For those worried about cross-vendor compatibility, 3Com and other leading wireless vendors have formed the Wireless Ethernet Compatibility Alliance (WECA) www.wirelessethernet.org. WECA is an independent organization chartered with certifying interoperability of 802.11b products. WECA has created a nickname for this called “Wi-Fi,” and has enlisted an independent test lab to perform interoperability certification on 802.11b products. Only products that pass WECA certification will be permitted to use the “Wi-Fi” logo. This should help quickly establish interoperability in the 802.11b market.

AirConnect

IEEE 802.11b Features Include:

Feature	Benefits
Speed	2.4 GHz direct sequence spread spectrum radio providing an 11 Mbps maximum data rate without line-of-sight requirements
Dynamic rate shifting	fallback rates of 5.5 Mbps, 2 Mbps, and 1 Mbps when RF conditions deteriorate
Coverage	802.11b supports range measured in hundreds of meters (over 300 meters in open air; up to 100 meters in office environments)
Robustness	an Ethernet-like link layer protocol combined with acknowledgment of packets provide reliable data delivery and efficient use of the network bandwidth
Interoperability	unlike previous standards, 802.11b allows only for one standard signaling technique. WECA will certify products as interoperable
Power management	802.11b network interface cards can go to sleep and access points will buffer messages to these clients, contributing to longer notebook computer battery life
Roaming support	allows for seamless "hand offs" between access points as a user moves across a building or campus
Load balancing	802.11b NICs change the access point with which they are associated in order to improve performance (e.g., if their current access point is congested with traffic or is providing a low-quality signal)
Scalability	up to three access points can be co-located in a given coverage area to support hundreds of users
Simultaneous voice and data support	
Security	built-in authentication and encryption

Figure 1: An 802.11b wireless LAN can provide PCs with Ethernet-speed wireless network services over an entire corporate campus.



802.11b Applications

In general, 802.11b is designed to allow for use of any application or network service running over the wired network.

Feature	Benefits
Hard to wire areas	provides access to network services in areas otherwise hard or expensive to wire, such as historic buildings, buildings with asbestos, and classrooms
Flexible workgroups	lower total cost of ownership for workspaces that are frequently reconfigured
Networked conference rooms	users can access the network as they move from meeting to meeting, getting up-to-date access to information and the ability to communicate decisions while "on the go"
Ad hoc networking	on-site consultants and small workgroups increase productivity with quick network setup and collaboration software
Branch office networking	provides an easy-to-install, use, and maintain network for a remote or sales office
Campus-wide network mobility	roaming capabilities allow enterprises to set up easy-to-use wireless networks that cover the entire campus transparently

Bluetooth: Wireless Connectivity for Personal Devices

The notion of your phone, laptop, and handheld device being able to talk seamlessly to one another may seem far-fetched. In fact, it is possible today with a new wireless technology called Bluetooth. Bluetooth was developed to meet the growing need for personal mobile devices to communicate without wires in what has become known as a Personal Area Network or PAN (see Figure 2).

A group of nine promoters—3Com, Ericsson, IBM, Intel, Lucent, Microsoft, Motorola, Nokia, and Toshiba—comprise the Bluetooth Special Interest Group (SIG). The purpose of the SIG is to create a de facto wireless standard that meets the communication needs of all mobile computing and communication devices, regardless of their size or power budget. A Bluetooth radio in these personal devices allows them to communicate wirelessly and without line-of-sight restrictions.

Specifically, Bluetooth efforts have uniquely focused on the concept of a platform-independent Personal Area Network (PAN), where personal devices such as handhelds and mobile phones can communicate and synchronize with one another. In addition, personal devices with Bluetooth radios can use a Bluetooth Access Point as a gateway to a corporate network or the Internet for low-bandwidth access (Figure 2). As handheld devices and web-enabled phones proliferate, application gateways will emerge to provide simple and fast access to networked information via these Bluetooth Access Points as users roam their environments. In addition, Bluetooth will provide basic network connectivity for standard computing devices, such as Bluetooth-enabled notebooks. This will allow users to download files or access the Internet in specific locations such as conference rooms and meeting areas.

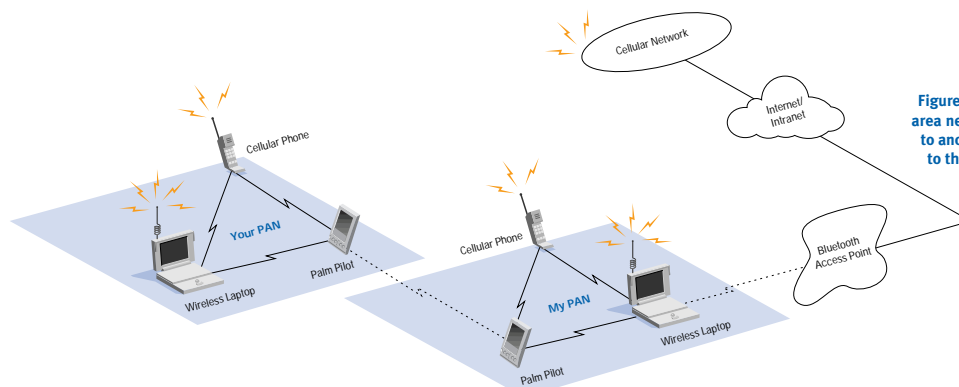


Figure 2: With Bluetooth, a personal area network (PAN) can be connected to another personal area network or to the Internet via an Access Point.

The Key Features of Bluetooth Include:

Feature	Benefits
Low cost	enabling broad deployment
Low power	enabling a wide array of devices, including handhelds and mobile phones
Speed	2.4 GHz radio providing up to 1Mbps throughput without line-of-sight requirements
Personal area range	<ul style="list-style-type: none"> • up to 10 meters client-to-client in open air, up to 5 meters in building • up to 100 meters client-to-access point in open air, up to 30 meters in-building
Simple application development	Bluetooth connects application to application through standard Bluetooth "profiles," eliminating dependency on common devices and operating systems
Interoperable	auto-discovery of other devices and Bluetooth applications on other devices
Voice and data support	three voice channels and seven data connections per personal area network
Security	built-in authentication and encryption
Broad industry acceptance	the Bluetooth standard is supported by over 1300 adopter companies

Bluetooth Applications

Bluetooth can be used for three general types of applications:

- Personal Area Network (PAN) applications where two or more client products with Bluetooth communicate to one another directly
- LAN Access applications where a client product with Bluetooth communicates to the broader network via a Bluetooth LAN access point
- WAN Access applications where a Bluetooth-enabled product communicates through a wireless WAN device (i.e., GSM, CDMA, PDC, etc.) to gain connectivity

Personal Area Network Applications

Personal device synchronization	automatically synchronize a personal contacts list between a mobile phone, notebook PC and handheld device
Ad hoc connectivity	transfer business cards, files, and other information to another user's Bluetooth-enabled devices
Cordless computer	human interface devices like mice, keyboards, game pads, and joysticks all connect wirelessly to the computer
Cordless peripherals	unlimited access to a variety of wireless peripherals including printers, scanners, fax, copier, storage systems, and more

LAN Access Applications

Localized information access	a user sitting in a conference room gets the telephone number of a colleague from a central server using a Bluetooth connection from his handheld
Localized wireless LAN access	in the middle of a meeting, a user realizes he needs the latest sales forecast and downloads it to his notebook from the corporate server
Public internet access	while in transit, a traveler checks his favorite news site and downloads his email over the Internet from his airline's hospitality center
Wireless synchronization	a user synchronizes his handheld device with the enterprise server via Bluetooth access points distributed around the building

WAN Access Applications

Internet access on the road	a traveler is lost and looks up directions to his hotel on his handheld via a Bluetooth mobile phone connection to the Internet
Fax/file transfers on the road	while on the road, a salesperson retrieves the latest price sheet from their home office computer and then faxes a quotation to their customer's fax machine via mobile phone, all from their car
Cordless telephony/headset	a user selects a contact name from a handheld, the handheld wirelessly prompts the mobile phone in the user's briefcase to dial the number, and the audio from the call is wirelessly forwarded to the user's headset

AirConnect



Comparing the Technologies **AirConnect**

Where 802.11b Wireless LANs Make Sense

The original 802.11 wireless LAN technology has succeeded in vertical market applications such as manufacturing, inventory control, and retail point of sale, and is now a \$400 million market (International Data Corporation, 1999). With the substantial price/performance improvements of 802.11b, an entirely new market for horizontal applications will open up. Corporations will now deploy wireless LANs as an extension of their wired LAN in order to gain full access to their

corporate applications and networked peripherals, making them more productive workers while they are on the move. They will provide coverage in conference rooms and branch offices at first, with some eventually deploying wireless LAN technology across their entire campus. Small businesses and home users will also install wireless LANs instead of wired networks to take advantage of the “no wires” installation and maintenance savings that a wireless LAN offers.

Where Bluetooth Makes Sense

Bluetooth is optimized for “personal area network” device-to-device connectivity, such as synchronization, short data transfers, or voice pass through. It is uniquely able to handle the low power budget of the smallest mobile devices, such as handhelds, mobile phones, mobile headsets, and cameras.

Via network Access Points and mobile phones used as WAN gateways, Bluetooth will also be used to provide “light” network access for notebook PCs and instantaneous access to networked information for handheld devices and smart phones.

Summary

3Com strongly believes that both 802.11b and Bluetooth are important technologies that will see widespread acceptance and deployment in the next 2-3 years. With the advent of highly-integrated solutions, Bluetooth will inevitably become the most pervasive wireless connectivity technology

going forward, uniquely providing wireless connectivity for personal area devices such as handhelds and mobile phones, while 802.11b will become the pervasive wireless LAN standard for businesses and home PCs.

About 3Com Corporation

With over 300 million customer connections worldwide, 3Com Corporation connects more people and organizations to information and each other in more innovative, simple and reliable ways than any other networking company. 3Com delivers e-Networking solutions through information access products and network systems to enter-

prises, small businesses, consumers, carriers and network service providers. For more information regarding Bluetooth technology, refer to the Bluetooth Special Interest Group website at www.Bluetooth.com. For more information regarding 3Com wireless products and technologies, visit www.3com.com/wireless.