# Wireless LAN Overview

The wireless LAN is a new way to extend the reach of local area networks (LAN). Instead of plugging into a LAN wall outlet, you connect wirelessly to a wireless LAN access point. All you need is a wireless LAN card for the user and a wireless LAN access point connected to the Ethernet LAN. This enables truly wireless access to the LAN and the Internet. Wireless LAN users can enjoy the freedom of being automatically connected to the LAN and of mobile computing without any attached cables. Wireless LAN is fast and convenient: no more cables or searching for LAN outlets.

## **USB Wireless LAN Card**

### Features and benefits

- Ethernet speeds(11Mpbs) across your wireless LAN
- Flexible and standards-based (IEEE802.11b) interoperability
- ♦ Mobile connectivity
- Security equivalent to wired networks
- High performance up to 11Mbps
- Long range: The freedom to access real-time information anywhere, anytime within a building or multi-building complex without wires.
- Manageable: Installing a USB wireless LAN is fast and easy, and eliminates the need to pull cable through walls and ceilings.
- Quick and easy problem shooting.

### Application

- Healthcare: More and more healthcare professionals around the world are taking advantage of the speed, mobility and flexibility of wireless LAN solutions to increase the quality of patient care and reduce costs. Hospitals can access patient information at bedside, monitor pharmaceutical data and other information vital to quality of patient care.
- Hospitality and Retail: From hotels and casinos, to cruise lines and rental car agencies, wireless technology provides the hospitality industry a mobile service advantage, allowing workers access to real-time information. Retail companies use products to provide mobile and portable points-of-sale and in-store inventory tracking that simplify and speed customer interactions.
- Warehousing and Distribution: Handheld devices with barcode readers monitor inventory and warehouse storage and shipment to control warehousing costs and ensure speedy delivery of products.
- Manufacturing: WLANs have helped manufacturing improve productivity and speed with instant data access to monitor inventory, track shipments and run production



equipment.

- Education: Wireless LANs in education offer a low-cost solution to high-speed Internet access with the flexibility to meet the needs of the ever-changing educational landscape.
- Finance: In the fast-paced world of finance, access to real-time information is crucial. Financial traders employ wireless solutions to receive up-to-the-minute pricing information and real-time data anywhere on the trading floor.

#### **Software Driver**

• Windows98/2000/ME (NDIS 5)

### Specification

specification			
PRODUCT FEATURES			
Data rate	1, 2, 5.5, 11 Mbps per channel		
Aggregate throughput	6 Mbps		
DATA RATES DISTANCE	Indoor Range	Outdoor Range	
RANGE			
@ 11 Mbps	25m	100m	
@ 5.5 Mbps	35m	120m	
@ 2 Mbps	40m	130m	
@ 1 Mbps	50m	140m	
ANTENNA	Internal		
NETWORK INTERFACE			
Network operating	Windows98, ME, 20	00	
Network Drivers	NDIS5 (Windows 98, ME, 2000)		
Network Protocol	TCP/IP, IPX, AppleTalk, NetBEUI.		
RADIO SPECIFICATIONS			
Modulation Technique	Direct sequence spread spectrum		
Wireless LAN Standard	Compliant with IEEE 802.11/b		
Frequency range	2.4-2.4835 GHz		
SENSITIVITY			
@ 11 Mbps	-81 dBm, 1E-6 BER		
@ 5.5 Mbps	-85 dBm, 1E-6 BER		
@ 2 Mbps	-89 dBm, 1E-6 BER		
@ 1 Mbps	-93 dBm, 1E-6 BER		
MODULATION			



@ 11 Mbps	DQPSK (CCK)		
@ 5.5 Mbps	DQPSK (CCK)		
@ 2 Mbps	DQPSK		
@ 1 Mbps	DBPSK		
OUTPUT POWER			
USA	+18 dBm		
Europe	+18/ +2 dBm		
Approvals of compliance	FCC part 15.247,15.249, ETSI 300-328		
CONFIGURATION &			
MANAGEMENT			
Configuration and setup	Utility for configuration and monitor;		
	Utility for Device firmware Upgrade		
	(DFU).		
LED Indicators	Red: Power On, Green: Activity		
POWER CONSUMPTION			
With supply voltage of 5V			
Receive Mode	330 mA		
Transmit Mode	450 mA		
SIZE & WEIGHT			
Dimensions (L/W/H)	108.5mm × 71.2mm × 22mm		
Weight (include box)	100g (body and cable, no box)		
ENVIRONMENTAL			
Operating temperature	0°C-40°C		
Operating humidity	10%-90% non-condensing		



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### **Installing Your WLAN Card (Windows 98)**

1. Before you install your WLAN card, make sure that you have removed other network devices (e.g., PCI Ethernet card). If you have other network devices, please turn off your computer and remove the device.

2. Plug in your WLAN card to a USB port. Click "Next" in the following dialog box.

Add New Hardware Wiz	ard
Add New Hardware Wiz	ard This wizard searches for new drivers for: WINMATE USB WLAN card A device driver is a software program that makes a hardware device work.
	< Back Next > Cancel

3. Instruct the Windows to "Search for the best driver for your device" and click "Next".

Add New Hardware Wit	What do you want Windows to do?  Search for the best driver for your device. [Recommended].  Display a list of all the drivers in a specific location, so you can select the driver you want.
	< <u>B</u> ack Next> Cancel



4. In the following box, specify the directory where your driver is located (e.g., "A:\" if the driver file is on a floppy disk).

	Windows will search for new drivers in its driver database on your hard drive, and in any of the following selected locations. Click Next to start the search. Eloppy disk drives CD-ROM drive Microsoft Windows Update Specify a location: A:\ Browse
·	< <u>B</u> ack Next > Cancel

5. A dialog box which shows "WINMATE USB WIRELESS LAN CARD" will appear. Click "Next" to proceed or "Back" to change the location of the driver.

Add New Hardware Wiz	ard
	Windows driver file search for the device: WINMATE USB WIRELESS LAN CARD Windows is now ready to install the best driver for this device. Click Back to select a different driver, or click Next to continue. Location of driver: A:\USBWLAN.INF
	< <u>B</u> ack <u>Next&gt;</u> Cancel



6. A dialog box "WINMATE USB WIRELESS CARD Properties" shows up. This dialog box allows you to set up the wireless options of your card. In this box you usually need to configure the following properties: select a channel (1 through 14), the ESSID which is used to enroll the station to an AP, the operating mode (ad-hoc or infrastructure), rate (1, 2, 5.5, or 11 Mbps), and the WEP key. Leave the fields in Authentication Type, Fragmentation Threshold, Preamble Type, and RTS Threshold as they were. You do not need to configure your WLAN card at this moment. You can change these values by the configuration utility later whenever necessary.

WINMATE USB WLAN Proper	ties ? 🗙
Advanced	
The following properties must b adapter. Click the setting you w then select its value on the righ	e set to use this network ant to change on the left, and t.
Property:	<u>V</u> alue:
Authentication Type Channel ESSID Fragmentation Threshold Operating Mode Preamble Type Rate (Mbps) RTS Threshold WEP KEY #1 WEP KEY #2 WEP KEY #3 WEP KEY #4 WEP Key to use	Open System
	OK Cancel

Click OK when you finish the above configuration. Or, you can configure your card later by the configuration utility.



7.. After you click "Finish" in the following box, you will be asked to restart your computer. Click "No" because we need to set up more network properties.

Add New Hardware Wiz	ard
	WINMATE USB WIRELESS LAN CARD
	Windows has finished installing the software that your new hardware device requires.
ی 😵	
	Cancel

System S	Settings Change 🛛 🛛 🕅
?	To finish setting up your new hardware, you must restart your computer. Do you want to restart your computer now?
	<u>Yes</u>

Click No.



8. From the Control Panel, use the right button of the mouse to click "Network" and select "Properties". The following dialog box appears. Click TCP/IP (or, if you have installed other network devices before, select TCP/IP-WINMATE USB WIRELESS LAN CARD).

etwork		?
Configuration   Identificat	tion Access Control	1
The following <u>n</u> etwork	components are insta	alled:
Client for Microsoft		
	/IRELESS LAN CAR	
		-0
Анн 1	Bemove	Properties
Client for Microsoft Ne	ı. tworks	•
File and Print Shari	na	
TCP/IP is the protoco wide-area networks.	ol you use to connec	t to the Internet and
		2
		OK Cancel

9. Set up the IP address. We recommend users to use "Specify an IP address" instead of the default "Obtain an IP address automatically". Please ask your system administrator for the appropriate setting of the IP address. If you are running the infrastructure mode, you also need to set up the Gateway appropriately. Please ask your SA for the appropriate address of the gateway.



P/IP Properties				?
Bindings	Adv	/anced	1	NetBIOS
DNS Configuration	Gateway	WINS Co	onfiguratio	n IP Address
An IP address can If your network doe your network admir the space below.	be automa is not autor iistrator for	tically assig natically as an address	ined to thi sign IP ac ;, and thei	s computer. Idresses, ask n type it in
C <u>O</u> btain an IP a	address au	tomatically		
- • Specify an IP	address:			1
IP Address:	192	.168.	1.10	
S <u>u</u> bnet Mask	255	. 255 . 2	55.0	
-				
			3.0	857
			OK	Cancel

10. Click OK and save the changes you made for the network properties. Windows will request to restart your computer. After the system restarts, you can use your USB WLAN card.

System 9	Settings Change 🛛 🕺
?	To finish setting up your new hardware, you must restart your computer. Do you want to restart your computer now?



## **Installing Your WLAN Card (Windows 2000)**

1. Plug in your WLAN card to a USB port. Click "Next" in the following dialog box.

Found New Hardware Wizard
Welcome to the Found New Hardware Wizard         This wizard helps you install a device driver for a hardware device.         To continue, click Next.
< Back Next > Cancel

2. Instruct the Windows to "Search for a suitable driver"

Found New Hardware Wizard	
Install Hardware Device Drivers A device driver is a software program that enables a hardware device to work with an operating system.	
This wizard will complete the installation for this device:	
A device driver is a software program that makes a hardware device work. Windows needs driver files for your new device. To locate driver files and complete the installation click Next.	
What do you want the wizard to do?	
<ul> <li>Search for a suitable driver for my device (recommended)</li> </ul>	
Display a list of the known drivers for this device so that I can choose a specific driver	
< Back Next > Cancel	



3. Specify the directory where your driver is located

Found New Hardware Wizard
Locate Driver Files Where do you want Windows to search for driver files?
Search for driver files for the following hardware device:
The wizard searches for suitable drivers in its driver database on your computer and in any of the following optional search locations that you specify.
To start the search, click Next. If you are searching on a floppy disk or CD-ROM drive, insert the floppy disk or CD before clicking Next.
Optional search locations:
Floppy disk drives
CD-ROM drives
Specify a location
Microsoft Windows Update
< Back Next > Cancel

4. A dialog box which shows "WINMATE USB WIRELESS LAN CARD" will appear. Click "Next" to proceed or "Back" to change the location of the driver.

Found New Hardware Wizard
Driver Files Search Results The wizard has finished searching for driver files for your hardware device.
The wizard found a driver for the following device:
WINMATE USB WLAN card
Windows found a driver for this device. To install the driver Windows found, click Next.
d:\driver\20001214\winmate 2.21.03\usbwlan.inf
< Back Next > Cancel



5. Click OK to continue the installation and neglect the "Digital Signature".

Digital Signature Not Found
<ul> <li>The Microsoft digital signature affirms that software has been tested with Windows and that the software has not been altered since it was tested.</li> <li>The software you are about to install does not contain a Microsoft digital signature. Therefore, there is no guarantee that this software works correctly with Windows.</li> <li>WINMATE USB Wireless LAN</li> <li>If you want to search for Microsoft digitally signed software, visit the Windows Update Web site at http://windowsupdate.microsoft.com to see if one is available.</li> <li>Do you want to continue the installation?</li> </ul>
Yes No More Info

6. Now Windows copies necessary files to the system. Click Finish.



You still need to configure the network properties before your WLAN card can be used..



7. Use the right button of the mouse to click "My Network", and select "Properties".

🔁 Network and Dial-up Connections	
File Edit View Favorites Tools Advanced Help	1
📙 🖶 Back 👻 🤿 👻 📓 🔞 Search 🖓 Folders 🖓 History 🛛 🖓 😤 🗙 🖄 🗐 🎹 🔹	
Address 🔁 Network and Dial-up Connections	<b>-</b> ∂∞
Make New Connection     Local Area Connection     Disable   Status   Create Shortcut   Delete   Rename   Properties	
Deletes the selected connection(s).	1
Local Area Connection Properties	
General Sharing	
Configure	
Install       Uninstall       Properties	
Allows your computer to access resources on a Microsoft network.  Show icon in taskbar when connected	
OK Cancel	



8. Click TCP/IP and configure your IP as in the following. You may need to consult your system administrator to acquire an appropriate IP address.

Advanced TCP/IP Set	ttings			? ×
IP Settings DNS	WINS   Options	1		
IP addresses		·		
IP address 192.168.1.168		Subnet mask 255.255.255.0		J
	Add	Edit	Remove	
Default gateways: Gateway 192.168.1.254		Metric 1		I
1	Add	E dit	Remove	
Interface metric:	1			
		ОК	Can	cel

After you finish the network setting, you are able to use your WLAN card.



# **Installing Your WLAN Card (Windows ME)**

1. Before you install your WLAN card, make sure that you have removed other network devices (e.g., PCI Ethernet card). If you have other network devices, please turn off your computer and remove the device

2. Plug in your WLAN card to a USB port. Select "Specify the location of the driver" and click "Next".

Add New Hardware Wiz	ard
	Windows has found the following new hardware: WINMATE USB WLAN card Windows can automatically search for and install software that supports your hardware. If your hardware came with installation media, insert it now and click Next. What would you like to do? Automatic search for a better driver (Recommended) Specify the location of the driver (Advanced)
	< Back Next > Cancel

3. Give the location of the directory that contains the device driver.

Add New Hardware Wiz	ard
	<ul> <li>Windows will search for new drivers in its driver database on your hard drive, and in any of the following selected</li> <li>Search for the best driver for your device. (Recommended).</li> <li>Removable Media (Floppy, CD-ROM)</li> <li>✓ Specify a Jocation:</li> <li>C:\Wireless LAN</li> <li>Display a list of all the drivers in a specific location, so you can select the driver you want.</li> </ul>
	< <u>B</u> ack Next > Cancel



4. Windows find the driver for the WLAN card. Click "Next."

Add New Hardware Wizard		
Add New Hardware Wize	ard Windows driver file search for the device: WINMATE USB Wireless LAN Windows is now ready to install the best driver for this device. Click Back to select a different driver, or click Next to continue. Location of driver: C:\WIRELE~1\USBWLAN.INF	
	< <u>B</u> ack Next> Cancel	

5. You can simply leave all the wireless settings as they are at this moment, and configure them later in the configuring/monitor utility. Click "OK" here.

WINMATE USB Wireless	LAN Properties	? ×
Advanced		
The following properties m adapter. Click the setting y then select its value on the	ust be set to use this netwo you want to change on the l e right.	rk eft, and
Property:	<u>V</u> alue:	
Authentication Type Channel	3	<u>.</u>
ESSID Fragmentation Threshold Operating Mode Preamble Type Rate (Mbps) RTS Threshold WEP KEY #1 WEP KEY #2 WEP KEY #3 WEP KEY #4 WEP Key to use	▼.	
	ОК	Cancel



6. Click "Finish" in the following dialog box.

Add New Hardware Wiz	ard
	WINMATE USB Wireless LAN
	Windows has finished installing the new hardware device.
8	
	< <u>B</u> ack <b>Finish</b> Cancel

You do not need to restart your computer at this moment because you need to configure the network properties. Say "No" to the following dialog box.

System S	Settings Change		
?	To finish setting up your new hardware, you must restart your computer. Do you want to restart your computer now?		
	Yes <u>N</u> o		



7. From the Control Panel, use the right button of the mouse to click "Network" and select "Properties  $\rightarrow$  Configuration  $\rightarrow$  TCP/IP". The following dialog box appears. Configure your IP as in the following. You may need to consult your system administrator to acquire an appropriate IP address and the gateway address.

TCP/IP Properties							
Bindings DNS Configuration	Advanced Gateway WINS Configu	NetBIOS   uration IP Address					
An IP address can be automatically assigned to this computer. If your network does not automatically assign IP addresses, ask your network administrator for an address, and then type it in the space below.							
O Obtain an IP address automatically Specify an IP address:							
<u>I</u> P Address:	192.168.1.	168					
S <u>u</u> bnet Mas	255.255.255.	0					
Detect connection to network media							
	OK	Cancel					

After you finish these network configuration and restart the computer, you are able to use your USB WLAN card.



# **Configuring Your WLAN card**

We offer a convenient utility which allows users to configure all the WLAN parameters and to monitor the current signal quality.

Run the SETUP.EXE under the UsrCfg directory, and follow the instruction to complete the installation. Then reboot your computer. Whenever your USB WLAN card is connected to the PC, you can find a small icon appearing in the bottom right corner of the tool bar as in the following figure:



If the WLAN card is successfully associated with an AP, the icon is in blue color. If there is no AP, the AP is out of the range, or there is any mistake happening, the icon is in red color. Click the icon to pop up the configuration/monitor box:

ATMEL 11Mbps W	ireless LAN USB Card Monitor Utility
-Configuration	
Operating Mode	Infrastructure
Channel	1 Change
SSID	WINMATE4
Tx Rate	Fixed 11 Mbps
	WEP
MAC Address	00-03-E1-00-00-08
Associated to AP wi	th BSSID: 00-01-03-7B-DD-9B
	Excellent 100%
Signal Strength 🔳	
Emmas	
- Flames	Tx Rx
Successful	9836
Unsuccessful	
•	• • •
WEP	Short Preamble RTS Fragmentation
	Version



If the card is associated to an AP, a message "Associated to AP with BSSID xx-xx-xx-xx" will appear, where the 12 digit HEX number is the MAC address of the AP. The signal strength will show up in the middle of the box as a blue bar. The Successful and unsuccessful Tx and Rx frames also show up.

You can select the communication mode between Ad-hoc mode and Infrastructure mode by click "change" button to make changes. In the Ad-hoc mode, for every station participating in a Network the user must select the same channel and rate (1, 2, 5.5, or 11Mbps).

Change Configurat	ion 🗵
Operating Mode	
Channel	Ad-Hoc Infrastructure
SSID	ANY
Tx Rate	Fixed 11 Mbps
-Preferred BSSID -	
Enable	00 00 00 00 00 00
OK	Cancel
ļ	

In the infrastructure mode, you do not need to specify the channel. Instead, you need to configure the ESSID.

Change Configurat	ion	×
Operating Mode	Infrastructure	
Channel	03 💌	
SSID	ANY	
Tx Rate	Fixed 11 Mbps  Fixed 1 Mbps Fixed 2 Mbps Fixed 2 Mbps	
Preferred BSSID -	Fixed 5.5 Mbps Fixed 11 Mbps	1
🗖 Enable	00 00 00 00 00 00	
OK	Cancel	

ESSID is used in the infrastructure mode to enroll the station to the AP. One can



specify ESSID up to 32 characters. Please note that it is case sensitive (i.e., WINMATE is different from Winmate or winmate). If you want your station to connect to the wired network through an AP, you should obtain the ESSID of that AP from your system administrator. You can enter "ANY" (which is also the default value) as the ESSID, and the WLAN card will search for an available AP, if there is any, to associate with.

Select the Transmission rate. This will not affect the receiving rate because the rate of the receiving station is determined by that of the transmission station.

WEP stands for Wired Equivalent Privacy. It served like a network password and is an optional information to add the security of the wireless communication. The stations, either in Ad-Hoc mode or Infrastructure mode, should have the same WEP to associate with the other station. Please bear in mind that the WEP keys must be in HEX and in two characters per byte formats. You can store up to four sets of WEP KEYs in the field WEP KEY #1 to WEP KEY #4, and select among one of them in the field WEP KEY, or simply use the value "None" if you do not want the WEP option.

Now you can enjoy the convenience and speed of wireless connection to the network!



# FAQ

Q1. What is an AP (Access Point)?

Ans: An AP is the bridge to connect two different protocols, Ethernet 802.3 and wireless 802.11b. It can stand alone as the center of a wireless infrastructure, providing connections to your wired networks. Or, it can act as a repeater, increasing wireless communication range. The maximum communication range is based on how you configure your wireless infrastructure. If your purpose is merely transferring files between two nearby computers, you can connect these two PCs by two WLAN cards through ad-hoc mode (explained below) without using an AP.

Q2. Please explain "infrastructure" mode and "ad hoc" mode.

Ans: The 802.11 standard defines two modes: infrastructure and ad-hoc. In the infrastructure mode, the wireless network consists of at least one access point connected to the wired network infrastructure and a set of wireless end stations. The ad-hoc mode is a peer-to-peer LAN. It is a set of 802.11 wireless stations that communicate directly with one another without using an access point or any connection to a wired network. This mode is useful for quickly and easily setting up a wireless network anywhere that a wired infrastructure does not exist or is not required for service.

Q3. What is the maximum transmission rate among WLAN cards? Ans. In 802.11b, the theoretical maximum transmission rate is 11Mbps. It also supports 1Mbps, 2Mbps, and 5.5Mbps rates when the transmission condition is not very good. If you have more than two wireless stations connecting on the same channel, the 11Mbps rate would be shared by these stations.

Q4. What does the "channel selection" mean in your driver?

Ans: In 802.11 there are total of 14 channels within the 2.4GHz to 2.4835 GHz bandwidth. If you are working under the "ad hoc" mode, you have to assign one of the channel. All PCs in this group should be configured to this assigned channel so that your group could form up. If you are using the infrastructure mode, the system administrator would have set a specific channel for the AP, and the client stations can auto detect that channel to associate with it. In the latter case, the channel selection in the driver does not matter.

Q5. What OS can your driver support?



Ans: Our device driver uses NDIS 5, which support Windows 98 and Windows 2000. Linux driver will be ready soon.

Q6. Does the radio wave emitting from a WLAN card have any threat to human health?

Ans: To date, scientific studies have been unable to attribute adverse health effects to WLAN transmissions. As with other wireless technologies, WLANs must meet stringent government and industry standards for safety. In addition, it is expected that any health effects related to radio transmissions would be correlated to power of the transmitter, and the output power of WLAN system is limited by FCC regulations to under 100mW, much less than that of a mobile phone.



# WLAN Glossary

### Access Point (AP)

A device that transports data between a wireless network and a wired network (infrastructure).

### ad-hoc network

A wireless network composed only of stations (no access point). Also known as peer to peer network

### application layer

The top layer of OSI seven layers. It establishes communications with other users and provides such services as file transfer and electronic mail to the end users of the network.

### association service

An IEEE 802.11 service that enables the mapping of a wireless station to the distribution system via an access point.

### authentication

The process a station uses to announce its identity to another station. IEEE 802.11 specifies two forms of authentication: open and shared key.

## bandwidth

Specifies the amount of the frequency spectrum that is usable for data transfer. In other words, it identifies the maximum data rate that a signal can attain on the medium without encountering significant attenuation.

## baseband

A signal that has not undergone any shift in frequency. Normally with LANs, a baseband signal is purely digital.

## **Basic Service Set (BSS)**

A set of 802.11-compliant stations that operates as a fully connected, wireless network.

## BSSID

A 6-byte address that distinguishes a particular AP from others. Also known as a network ID or the MAC address of the AP.



### Cyclic Redundancy Check (CRC)

An error-detection process that (at the transmitting station) divides the data being sent by a particular polynomial and appends the resulting remainder to the transmitted data.

### Data link layer

The bottom second layer of the OSI layers. It provides synchronization and transmission error control to packets. In 802.11 LANs, it encompasses the logical link control (LLC) and medium access control (MAC) layers.

### Differential quadrature phase shift keying (DQPSK)

A modulation process that the IEEE 802.11 direct sequence physical layer uses to transmit data. It operates at a specific center frequency and varies the phase of the signal to represent double-bit symbols.

### Direct sequence spread spectrum (DSSS)

Combines a data signal at the sending station with a higher data rate bit sequence, which many refer to as a chip sequence (aka. processing gain). A high processing gain increases the signal's resistance to interference.

### **Extended Service Set (ESS)**

A collection of basic service sets tied together via a distribution system.

## Frequency hopping spread spectrum (FHSS)

Takes the data signal and modulates it with a carrier signal that hops from frequency to frequency as a function of time over a wide band of frequencies.

## **IEEE 802.X**

A set of specifications for Local Area Networks (LAN) from The Institute of Electrical and Electronic Engineers (IEEE). Most wired networks conform to 802.3, the specification for CSMA/CD based Ethernet networks. The 802.11 committee completed a standard for 1 and 2 Mbps wireless LANs in 1997 that has a single MAC layer for the following physical-layer technologies: Frequency Hopping Spread Spectrum, Direct Sequence Spread Spectrum, and Infrared. IEEE 802.11 b, an 11 Mbps version of the standard, was finalized at the end of 1999.

## Independent Basic Service Set Network (IBSS Network)

A 802.11-based wireless network that has no backbone infrastructure and consists of



at least two wireless stations. This type of network is often referred to as an ad hoc network because it can be constructed quickly without much planning.

#### Industrial, Scientific, and Medicine bands (ISM bands)

Radio frequency bands that the Federal Communications Commission (FCC) authorized for wireless LANs. The ISM bands are located at 902 MHz, 2.400 GHz, and 5.7 GHz.

#### Infrastructure network

A wireless network centered about an access point. In this environment, the access point not only provides communication with the wired network but also mediates wireless network traffic in the immediate neighborhood.

### Logical Link Control (LLC) layer

The highest layer of the IEEE 802 reference model, providing similar functions of a traditional data link control protocol.

### Medium Access Control (MAC) layer

Provides medium acess services for IEEE 802 LANs.

### Microcell

A bounded physical space in which a number of wireless devices can communicate. Because it is possible to have overlapping cells as well as isolated cells, the boundaries of the cell are established by some rule or convention.

### Multipath

The signal variation caused when radio signals take multiple paths from transmitter to receiver.

#### narrowband system

A wireless system that uses dedicated frequencies assigned by the FCC licenses. The advantage of narrowband system is that if interference occurs, the FCC will intervene and issue an order for the interfering source to cease operations.

### NetBIOS

A standard interface between networks and PCs that allows applications on different computers to communicate within a LAN. It was created by IBM for its early PC



network, was adopted by Microsoft, and has since become a de facto industry standard. It is not routable across a WAN.

#### open system authentication

The IEEE 802.11 default authentication method, which is a very simple, two-step process. First the station wanting to authenticate with another station sends an authentication management frame containing the sending station's identity. The receiving station then sends back a frame alerting whether it recognizes the identity of the authenticating station.

#### **Open System Interconnection (OSI)**

An ISO standard specifying an open system capable of enabling the communications between diverse systems. It has the following seven layers of distinction: physical, data link, network, transport, session, and application. These layers provide the functions necessary to allow standardized communications between two application processes.

#### peer-to-peer network

A network where there are communications between a group of equal devices. A peer-to-peer LAN does not depend on a dedicated server, but allows any node to be installed as a non-dedicated server and share its files and peripherals across the network.

#### physical layer

Provides the transmission of bits through a communication channel by defining electrical, mechanical, and procedural specifications.

#### **Point Coordination Function (PCF)**

An IEEE 802.11 mode that enables contention-free frame transfer based on a priority mechanism. Enables time-bounded services that support the transmission of voice and video.

#### **Quadrature Phase Shift Keying (QPSK)**

A modulation technique that changes the phase of a signal to represent different, four-bit binary words.

#### Radio Frequency (RF) Terms: GHz, MHz, Hz



The international unit for measuring frequency is Hertz (Hz), which is equivalent to the older unit of cycles per second. One Mega-Hertz (MHz) is one million Hertz. One Giga-Hertz (GHz) is one billion Hertz. For reference: the standard US electrical power frequency is 60 Hz, the AM broadcast radio frequency band is 0.55 -1.6 MHz, the FM broadcast radio frequency band is 88-108 MHz, and microwave ovens typically operate at 2.45 GHz.

#### reassociation service

Enables an IEEE 802.11 station to change its association with different access points as the station moves throughout the facility.

#### roaming

Movement of a wireless node between two microcells. Roaming usually occurs in infrastructure networks built around multiple access points.

#### shared key authentication

A type of authentication that assumes each station has received a secret shared key through a secure channel independent from an 802.11 network. Stations authenticate through shared knowledge of the secret key. Use of shared key authentication requires implementation of the 802.11 WEP algorithm.

#### spread spectrum

A modulation technique that spreads a signal's power over a wide band of frequencies. The main reasons for this technique are that the signal becomes much less susceptible to electrical noise and interferes less with other radio-based systems.

### **Transmission Control Protocol (TCP)**

A commonly used protocol for establishing and maintaining communications between applications on different computers. TCP provides full-duplex, acknowledged, and flow-controlled service to upper-layer protocols and applications.

## Wired Equivalent Privacy (WEP)

An optional IEEE 802.11 function that offers frame transmission similar to a wired network. The WEP generates secret shared encryption keys that both source and destination stations can use to alter frame bits to avoid disclosure to eavesdroppers.



## FEDERAL COMMUNICATIONS COMMISSION INTERFERENCE STATEMENT

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

-- Reorient or relocate the receiving antenna.

-- Increase the separation between the equipment and receiver.

-- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

-- Consult the dealer or an experienced radio/TV technician for help.

#### CAUTION:

Any changes or modifications not expressly approved by the grantee of this device could void the user's authority to operate the equipment.

#### FCC RF Radiation Exposure Statement

This equipment complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and **operated with a** minimum distance of 20 centimeters between the radiator and your body.

