

WI-FI TECHNOLOGY

WI-FI™ WIRELESS TECHNOLOGY

With advances in products in technology moving at lightning speed, Toshiba once again demonstrates its dedication to developing products to enable total mobility and freedom to work more productively—anywhere! One of the most exciting new developments is called Wi-Fi—a shortened form of “wireless fidelity.” Wi-Fi, a fast, wireless networking technology was developed by Toshiba and other technology industry leaders such as Microsoft, Ericsson, Nokia, Intel, IBM, Motorola, 3Com, Lucent Technologies as well as many other companies.

Wi-Fi, also called IEEE802.11b, is the seal of approval that Wi-Fi equipment will work with all other brands of (Wi-Fi) certified equipment. Wi-Fi product that is certified now can display on its packaging the Wi-Fi logo.

Some of today’s other wireless technologies include:

Bluetooth – a new technology based on short-range radio transmission in the 2.45GHz frequency spectrum. Connections are secure and maintained even if devices are not within line of sight.

IEEE802.11a – a new specification for wireless LAN operating in the 5GHz frequency spectrum, enabling devices to link to a network over ranges as far as 300 feet and at speeds of up to 54Mb per second. In the future, the faster IEEE802.11a will serve as an enhancement to 802.11b.

HyperLAN2 – a new European standard for wireless LAN operating in the 5GHz frequency spectrum that delivers higher quality of service and allows voice data to be prioritized over other data. HyperLAN2 is a competing product of IEEE802.11a.

WI-FI USAGE AREAS

- **Wide Area Networks (WANs)** – which use cellular phone systems to transmit and receive data
- **Local Area Networks (LANs)** – which are used in office, residential and public access environments to connect a number of computers together or to an ISP
- **Personal Area Networks (PANs)** – which create a connection between two or more portable computers without the need for cables or connectors, forming an ad hoc network

WI-FI USAGE MODELS:

Wi-Fi was created specifically to operate as a wireless Ethernet. It is an open-standard technology that enables wireless connectivity between laptops and local area networks. Wi-Fi (IEEE802.11b) standard products are being developed to cross all market segments, including enterprise, small business, home, public access, education and more.

WI-FI TECHNOLOGY

Wi-Fi business-specific benefits include:

- achieves the same performance as with a wired 10BaseT LAN connection
- provides a seamless add-on to an Ethernet Intranet
- enables roaming capabilities for mobile users inside or outside of a building

In the home, a Wi-Fi network can be used to connect a notebook PC with the home entertainment system, or provide instant Internet access.

Colleges and universities use Wi-Fi as an alternative to installing miles of CAT5 cabling through housing facilities, study labs, libraries and classrooms—covering the entire campus.

Use of Wi-Fi currently is exploding in public access areas, airports, hotels and even restaurants—underscoring the need freedom of mobility—to work anywhere, any time.

WI-FI COMPONENTS

Wi-Fi uses direct-sequence, spread spectrum technology which can create a wireless connection between PCs and networks via “access points” that are connected to the network and placed in various areas (usually mounted on a wall or in the ceiling). The access points send and receive network signals between wireless users and the wired network in a building or home. End users access the wireless LAN with Toshiba Wi-Fi components that are built into notebook computers or with Toshiba Wi-Fi PCMCIA cards that upgrade desktop and notebook computers to wireless computing devices.

Although Wi-Fi operates in the 2.45GHz spectrum, (the same as a microwave oven) and at speeds of up to 11 Mbps, it achieves Ethernet levels of performance, throughput and reliability—all without cables! Each wireless LAN system typically covers up to 100 meters (300 feet). A single access point typically supports up to 30 wireless stations, and more can be added to increase capacity. Especially flexible for growing businesses, Wi-Fi access points can be added as a business grows, or easily removed and redeployed should the business relocate.

Wi-Fi can be implemented in PCs using PC cards and a wide variety of access points can be connected to an Ethernet wall jack or hub to create a "wireless bridge" from computing device to the LAN.

WI-FI SYSTEM INTERFACE

Wi-Fi is the new term for the IEEE802.11b High Rate standard. It places wireless LAN technology on an equal footing with 10BaseT Ethernet capabilities.

W I - F I T E C H N O L O G Y

While currently Wi-Fi and Bluetooth coexist in the same 2.4GHz frequency, little to no data collision seems to be occurring as reported after testing by eWeek (October 29, 2000), PC Magazine (Dec. 11, 2000), and other publications.

WIRELESS ETHERNET COMPATIBILITY ALLIANCE (WECA)

The Wireless Ethernet Compatibility Alliance (WECA) was founded by six influential market makers, including: 3Com, Cisco Systems, Intersil, Agere Systems, Nokia and Symbol Technologies. The group works toward multi-vendor interoperability by certifying that systems from different manufacturers can be used within the same wireless infrastructure. WECA now is supported by more than 80 leading companies.

WECA's mission is to certify interoperability of Wi-Fi wireless LAN products and to promote Wi-Fi as the global wireless standard across all market segments.

W I - F I P R O D U C T C E R T I F I C A T I O N

Products awarded the Wi-Fi logo have undergone strict, rigorous and independent testing at Agilent's Silicon Valley Networking Lab (SVNL). Testing, which typically takes two to four days per product to complete, ensures product interoperability between network PC adaptor cards and devices, and access points from different vendors. To date, more than 100 products for the enterprise, small office, home and public access areas have passed Wi-Fi certification testing.

W I - F I I N T H E F U T U R E

Toshiba is working with partners on many uses for Wi-Fi, such as a broad range of mobile computing environments in the office, as well as the home, hotels, retail establishments and airports.

Market forecasters predict that manufacturers' revenue in the total worldwide wireless LAN industry will approach nearly \$900 million by 2002. The primary market drivers will include:

- the growing need to enable access to information from portable devices
- increased speed requirements
- larger industry players and competition entering the market
- the global adoption of open standards and the resulting interoperability among devices

Additionally, users can expect even greater speeds and lower equipment costs—using wireless LANs will become as normal as using a cordless phone.

The uses for Wi-Fi are nearly boundless—and Toshiba will be there to continue developing new applications of wireless technology to enrich people's lives!

WI-FI TECHNOLOGY

FREQUENTLY ASKED QUESTIONS (FAQS)

Where does Wi-Fi fit best?

Cable-less Wi-Fi works well within a highly mobile workforce or student population with a high concentration of notebook users. It is used in conference rooms and common areas, and is an excellent alternative to using cables for organizations experiencing rapid growth.

What are the benefits of Wi-Fi to business users?

Wi-Fi allows PC users a more flexible way of working, enabling them to communicate using portable computing devices rather than traditional hard-wired devices. Wi-Fi achieves the same performance as a wired 10BaseT LAN connection, while offering flexibility with sustained performance and seamless add-on to an Ethernet intranet in the office.

Does Toshiba offer Wi-Fi capabilities in all of its products?

Toshiba offers a complete family of mobile client products for wireless applications, including Wi-Fi PC cards, Wi-Fi access points and Wi-Fi integrated notebooks. Toshiba will continue to expand its wireless solutions in the future.

Does Toshiba provide installation services and support for Wi-Fi?

Toshiba Wireless Services Advisors provide comprehensive, wireless services and specialize in this area. Our team can design, install and support your wireless LAN solution.

How does Wi-Fi compare to Bluetooth?

The IEEE802.11b or Wi-Fi technology has been designed specifically to be the best solution for one particular application—wireless Ethernet. It is meant for implementation in PCs and in network access points. In PCs, it may be directly built in, or added on in the form of PC cards. Because it offers data rates of up to 11 Mbps, Wi-Fi is a good technology to wirelessly link multiple users to broadband network equipment such as DSL or cable modems.

Bluetooth is a short-range radio interface that enables inter-connectivity between a broad range of electronic devices such as mobile phones, digital cameras and PCs. Its 1 Mbps gross data rate makes it suitable for the exchange of varieties of data including files, business cards, digital photos, voice, music, email and Web content from the Internet.

Are there conflicts when Wi-Fi and Bluetooth are built into a single device?

The Bluetooth wireless technology and the Wi-Fi technology both operate in the 2.45 GHz ISM band, so each may create some interference. Because Bluetooth “hops” frequently from one channel to another, and Wi-Fi technology uses a subset of the ISM band channels, slight interference may occur. Toshiba is considering various methods of ensuring the best possible co-existence between Bluetooth and Wi-Fi technologies, including the development of “connection management” software to ensure compatibility.

W I - F I T E C H N O L O G Y

In what market segments will Wi-Fi certified products be sold?

Wi-Fi standard products are being developed for use across all market segments including enterprise, small business, home public access and education.

Will Wi-Fi products work anywhere?

Wi-Fi currently is approved in the U.S. and elsewhere. Check with WECA at www.wi-fi.org for more information about specific countries.

Will consumers have to pay a higher price for WI-FI products?

Due to rapid global standardization, it is not anticipated that consumers will face significantly higher prices for Wi-Fi enabled products.

What are Toshiba's global wireless initiatives?

Toshiba's global wireless initiatives involve the development of a wide range of new products, as well as enhancements of existing products. Toshiba also has formed alliances with key strategic partners in the hardware, software, networking and telecommunications sectors to bring computer and electronic device users complete mobility at the office, home or on the road.

When you think about wireless computing, think Toshiba!