

Wireless Networking—802.11?

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Wi-Fi is the popular term used to refer to the technology that allows wireless networking between local computers and seemingly wireless access to the Internet. *Wi-Fi* stands for wireless fidelity and is an obvious play on the audio pre-stereo term *Hi-Fi*, meaning high fidelity. Setting up a wireless network is inexpensive and reasonably easy to accomplish. Each computer needs a wireless adapter that can be purchased for as little as \$50. When the adapter is plugged into the computer, most computers will recognize it and install the necessary software automatically. Today, such adapters are often built into new computers.

Your wired connection to the Internet, usually a telephone DSL or a cable-modem, needs to be attached to a wireless access point to make the Internet available wirelessly. A wireless access point costs as little as \$100. The necessary software is built into the access point. All that is required is for you to answer a few simple questions through your Web browser.

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“OK, I’m sold!” you think and set out for your favorite computer store. You ask the sales consultant—i.e., computer “geek”—for a *Wi-Fi* adapter and a *Wi-Fi* access point. The geek replies, “A, B or G?” You think it must be some kind of code or geek-speak. But what does it mean and what is the appropriate answer? Does it really matter?

Wi-Fi has become an alphabet soup. It wasn’t originally that way. There was a standard known as IEEE 802.11b that governed the wireless transmission of digital information. The data transmission speed was as fast as 11 megabits per second (Mbps) and the transmission distance was as far as 150 feet. Life was simple.

But users demanded more. Why can’t it transmit data faster? Why can’t it transmit data over greater distances? The engineers responded with the introduction of IEEE 802.11a and IEEE 802.11g. Thus, the geek’s question, “A, B or G?” Each answer results in a different price and delivers different capabilities. Although each version begins with IEEE 802.11, the choice of *a*, *b*, or *g* may or

may not result in compatibility problems with other *Wi-Fi* components. At this point it may sound complicated, but it is really not as complicated as you may think. In the next 700 words, you, too, can become a *Wi-Fi* expert. Let’s start at the beginning.

BECOMING A WI-FI EXPERT

Wi-Fi refers to the Institute of Electrical and Electronic Engineers (IEEE) standard number 802.11 that defines the protocols for wireless networking. The standard has several versions. The first popular version was 802.11b, and it is still the most common. There were complaints that it interfered with wireless home telephones and that it was interfered with by wireless home appliances. The result was 802.11a. Others complained that it was not fast enough. The result was 802.11g.

Differing Transmission Frequencies

The easiest way to sort out the similarities and differences of the three standards is to look at Table 1. The first thing that you notice is that *b* and *g* share the same transmission frequency (2.4 GHz) as do the most popular wireless telephones. This is why they can potentially cause telephone interference or why wireless telephones can potentially cause disruption of data transmission. I say *potentially* because this problem was recognized in the design of most *b* or *g* access points and adapters, and therefore the interference is unlikely. It should be a consideration in only the most critical applications. The transmission frequency of 802.11a is 5 GHz, which is generally unused.

TABLE 1

IEEE Standard	Transmit Frequency	Data Rate	Transmit Distance	Compatible With	Relative Cost
802.11a	5.0 GHz	54 Mbps	75 ft	None	\$\$\$
802.11b	2.4 GHz	11 Mbps	150 ft	None	\$
802.11g	2.4 GHz	54 Mbps	150 ft	802.11b	\$\$

Data Rates

The *a* and *g* versions can transfer information at 54 Mbps, while *b* runs at 11 Mbps. Remember, the speed of a network is limited by the speed of the slowest link. If you are using your wireless network to access the Internet by way of a DSL line or cable-modem, that link is probably limited to 1 Mbps, so an 11-Mbps wireless link is more

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than up to the task. Even if three or four people are accessing the Internet simultaneously, there is still enough bandwidth so your wireless network will not cause any delays. If most of your wireless network traffic is local—that is, between the computers in your home or office—and if you are transferring large files—probably pictures, movies, or audio files—the additional speed of a 54-Mbps network will come in handy.

Adapting to Distances

Unless you have a very large home or office, distance considerations should not be a problem. Of course, walls and electrical equipment cut down on the actual usable distance. You should also be aware of the usually unadvertised secret that the greater the distance between the wireless access point and the wireless adapter, the slower the data rate.

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The network controls the data rate automatically in order to assure accurate data transmission. An 11-Mbps network transmitting across a distance of 150 feet may be running at only 2 Mbps. The bottom line is that the ability to transmit across greater distances is usually better with *g*. The only contravening consideration is the level of security required—greater distance means less security.

Compatibility Issues

If all your machines are desktop computers that will never be removed from your network, compatibility is not an issue. You will settle on the *a*, *b*, or *g* standard and buy only network interfaces that are within the chosen standard. If you are including portable computers—laptops, palm-tops, or tablets—that you expect to take out of your home or office and use on the road at a Wi-Fi hot spot in an airport, hotel, or coffee shop, then compatibility is a

real issue. Most hot spots are currently *b*-equipped. This means that your equipment should be either type *b* or *g*.

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If you are leaning toward *g*, be sure that the adapter you purchase specifically states that it is 802.11b-compatible. The standard *g* is backward-compatible with *b*, but sometimes a manufacturer will save a little money by shaving a corner on compatibility. Also, for the future when *g* may become more common than *b*, remember that although *g* is backward-compatible with *b*, *b* is *not* forward-compatible with *g*.

Cost

Last but not least is cost. The most expensive standard at the moment is *a*. Recognizing the lack of compatibility between *a* and *b* or *g*—because *a* uses a different transmission frequency than *b* or *g*—many manufacturers have built an extra *b/g* transmitter into their *a* devices to make them compatible, like a dual-band cellphone. This raises the price. Although *g* is generally more expensive than *b*, the price difference is almost inconsequential. Many consultants believe that 802.11g will soon dominate the marketplace, especially if *b* compatibility is maintained.

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I have come to the end of the table. My recommendation would be to answer the geek's question by saying, "I'd like 802.11g." The only consideration we have not discussed here is security. If you want to use wireless networking in a system that contains identifiable patient data, please read my next column. ■

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