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How WiFi Works

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If you've been in an airport, coffee shop, library or hotel recently, chances are you've been right in the middle of a wireless network. Many people also use wireless networking, also called WiFi or 802.11 networking, to connect their computers at home, and some cities are trying to use the technology to provide free or low-cost Internet access to residents. In the near future, wireless networking may become so widespread that you can access the Internet just about anywhere at any time, without using wires.

WiFi has a lot of advantages. Wireless networks are easy to set up and inexpensive. They're also unobtrusive -- unless you're on the lookout for a place to watch streaming movies on your tablet, you may not even notice when you're in a hotspot. In this article, we'll look at the technology that allows information to travel over the air. We'll also review what it takes to create a wireless network in your home.

A wireless network uses radio waves, just like cell phones, televisions and radios do. In fact, communication across a wireless network is a lot like two-way radio communication. Here's what happens:

1. A computer's wireless adapter translates data into a radio signal and transmits it using an antenna.
2. A wireless router receives the signal and decodes it. The router sends the information to the Internet using a physical, wired Ethernet connection.

The process also works in reverse, with the router receiving information from the Internet, translating it into a radio signal and sending it to the computer's wireless adapter.

The radios used for WiFi communication are very similar to the radios used for walkie-talkies, cell phones and other devices. They can transmit and receive radio waves, and they can convert 1s and 0s into radio waves and convert the radio waves back into 1s and 0s. But WiFi radios have a few notable differences from other radios:

As long as they all have wireless adapters, several devices can use one router to connect to the Internet. This connection is convenient, virtually invisible and fairly reliable; however, if the router fails or if too many people try to use high-bandwidth applications at the same time, users can experience interference or lose their connections. Although newer, faster standards like 802.11ac could help with that.

They use 802.11 networking standards, which come in several flavors:

802.11a transmits at 5 GHz and can move up to 54 megabits of data per second. It also uses orthogonal frequency-division multiplexing (OFDM), a more efficient coding technique that splits that radio signal into several sub-signals before they reach a receiver. This greatly reduces interference.

802.11b is the slowest and least expensive standard. For a while, its cost made it popular, but now it's becoming less common as faster standards become less expensive. 802.11b transmits in the 2.4 GHz frequency band of the radio spectrum. It can handle up to 11 megabits of data per second, and it uses **complementary code keying** (CCK) modulation to improve speeds.

802.11g transmits at 2.4 GHz like 802.11b, but it's a lot faster -- it can handle up to 54 megabits of data per second. 802.11g is faster because it uses the same OFDM coding as 802.11a.

802.11n is the most widely available of the standards and is backward compatible with a, b and g. It significantly improved speed and range over its predecessors. For instance, although 802.11g theoretically moves 54 megabits of data per second, it only achieves real-world speeds of about 24 megabits of data per second because of network congestion. 802.11n, however, reportedly can achieve speeds as high as 140 megabits per second. 802.11n can transmit up to four streams of data, each at a maximum of 150 megabits per second, but most routers only allow for two or three streams.

802.11ac is the newest standard as of early 2013. It has yet to be widely adopted, and is still in draft form at the Institute of Electrical and Electronics Engineers (IEEE), but devices that support it are already on the market. 802.11ac is backward compatible with 802.11n (and therefore the others, too), with n on the 2.4 GHz band and ac on the 5 GHz band. It is less prone to interference and far faster than its predecessors, pushing a maximum of 450 megabits per second on a single stream, although real-world speeds may be lower. Like 802.11n, it allows for transmission on multiple spatial streams -- up to eight, optionally. It is sometimes called 5G WiFi because of its frequency band, sometimes Gigabit WiFi because of its potential to exceed a gigabit per second on multiple streams and sometimes Very High Throughput (VHT)for the same reason.

Other 802.11 standards focus on specific applications of wireless networks, like wide area networks (WANs) inside vehicles or technology that lets you move from one wireless network to another seamlessly.

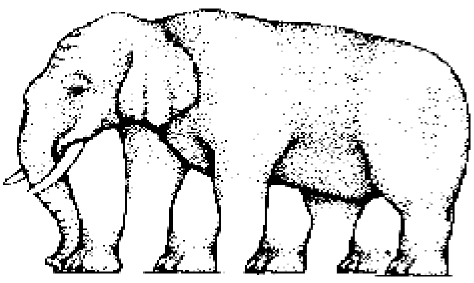
WiFi radios can transmit on any of three frequency bands. Or, they can "frequency hop" rapidly between the different bands. Frequency hopping helps reduce interference and lets multiple devices use the same wireless connection simultaneously.

Optical Illusion

What do you see?

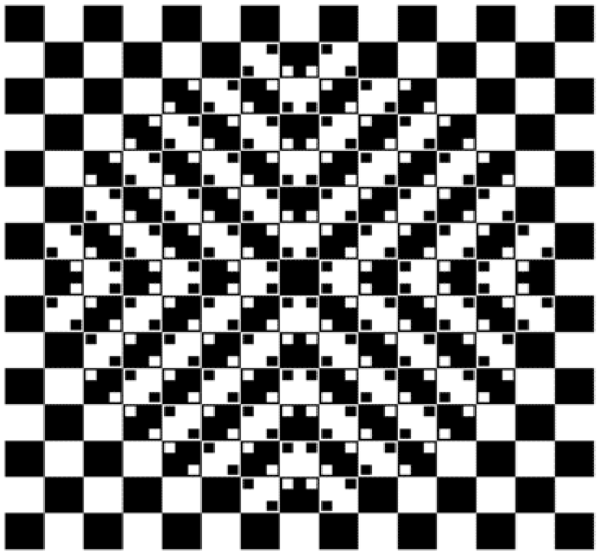
Do you see a Beautiful Woman or a Cool Jazz Horn Blower?

How many legs does this elephant have?



Wavy Lines Illusion

Are these lines straight and parallel?



Use a straight edge to test.

Comic Corner

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