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Wireless Networking, Part 1: Capabilities and Hardware

These days it isn't uncommon for a home to have multiple personal computers, and as such, it just makes sense for them to be able to share files, as well as to share one Internet connection. Wired networking is an option, but it is one that may require the installation and management of a great deal of wiring in order to get even a modestly sized home set up. With wireless networking equipment becoming extremely affordable and easy to install, it may be worth considering by those looking to build a home network, as well as by those looking to expand on an existing wired network.

The first installment in this two-part series of Tech Tips will provide an introduction to the basic capabilities and hardware involved in wireless networking. Once that foundation has been established, we'll take a look at a few setup and security related considerations that should be addressed once the physical installation is complete.

Capabilities

The basic standard that covers wireless networking is the Institute for Electrical and Electronics Engineers' (IEEE) 802.11, which is close kin to the wired Ethernet standard, 802.3. Many people will recognize 802.11 more readily when accompanied by one of three suffixes (a, b, or g), used to specify the exact protocol of wireless networking.

The 802.11a protocol first hit the scene in 2001, and despite a small surge in recent popularity, it is definitely the least common of the three at this time. The signals are transmitted on a 5 GHz radio frequency, while "b" and "g" travel on 2.4 GHz. The higher frequency means that the signal can travel less distance in free space and has a harder time penetrating walls, thus making the practical application of an 802.11a network a bit limited. The maximum transfer rate, however, is roughly 54 Mbps, so it makes up for its limited range with respectable speed.

As mentioned, 802.11b and 802.11g networks operate on a 2.4 GHz radio band, which gives a much greater range as compared to 802.11a. One downside to being on the 2.4 GHz band is that many devices share it, and interference is bound to be an issue. Cordless phones and Bluetooth devices are two of many items that operate at this frequency. The range of these two protocols is about 300 feet in free air, and the difference between the two comes down to speed. 802.11b came first, released back in 1999, and offers speeds up to 11 Mbps. 802.11g first appeared in 2002 and it is a backwards compatible improvement over 802.11b and offers speeds up to 54 Mbps.

On top of these protocols, some manufacturers have improved upon the 802.11g standard and can provide speeds of up to 108 Mbps. This doesn't involve a separate protocol, but just a bit of tweaking in areas like better data compression, more efficient data packet bursting, and by using two radio channels simultaneously. Typically, stock 802.11g equipment is not capable of these speeds, and those interested need to shop for matched components that specify 108 Mbps support. I say "matched components" as this is not a standard protocol and the various manufacturers may take different approaches to achieving these speeds. In order to ensure the best results when trying to achieve these elevated speeds, components from the same manufacturer should be used together. For instance, only Netgear brand network adaptors rated for 108 Mbps data transfer should be used with something like the Netgear WG624 wireless router (http://www.geeks.com/details.asp?invtid=WGT624NAR).

Considering your typical broadband Internet connection is going to offer data transfer rates of 10 Mbps or less, it can be seen that even 802.11b would be more than adequate if you just want to surf the web. Sharing files on your LAN (Local Area Network) is where the faster protocols will really make a difference, and comparing the prices of 802.11b and 802.11g components may show that there is little to no difference in selecting a "g" capable device over a comparable "b" capable device.

Hardware

Access Point – Wireless Access Point (WAP) is the central device that manages the transmission of wireless signals on a network. A base access point may be capable of handling up to 10 connections, and more robust APs may be able to manage up to 255 connections simultaneously. The D-Link DWL-1000AP+ (http://www.dlink.com/products/?pid=37) is an example of a wireless access point capable of 802.11b transmissions.

Router – In somewhat technical terms, a router is a network device that forwards data packets. It is generally the connection between at least two networks, such as two LANs, or a LAN and ISP's (Internet Service Provider's) network. For our purposes, and for the sake of simplicity, a wireless router is basically an access point with the added feature of having a port for sharing a broadband Internet connection. The D-Link AirPlus G (http://www.geeks.com/details.asp?invtid=DI524-R&cat=NET) is an 802.11g capable router that provides access for numerous wireless connections and four hard-wired connections to one WAN (Wide Area Network Internet) connection. A typical router for home use will generally cost less than an access point, and via settings within the firmware, can be used as just an access point anyway. Wired or wireless, all the computers using the router can share files over the network, as well as sharing a broadband internet connection. Communication between wireless computers (or a wireless computer and a wired computer) will max out at 54 Mbps, while communication between wired computers will take full advantage of the 100 Mbps provided via the 802.3 protocol.

Network Adaptor – A network adaptor is required for every computer that you would like to be connected to the wireless network. Many laptops, such as this Sony Centrino 1.5 GHz (http://www.geeks.com/details.asp?invtid=PCGZ1RA-R&cat=NBB) now include a wireless adaptor built in, so no extra hardware is needed. For those with systems that don't have wireless capabilities built in, adding them is fairly simple, and can be done using a variety of connections. Desktop computers can go wireless by adding a PCI slot network adaptor such as the 802.11g capable D-Link DWL-G510 (http://www.dlink.com/products/?pid=308). Notebook users can easily add wireless connectivity by using a PCMCIA adaptor, such as this 802.11g capable device (http://www.geeks.com/details.asp?invtid=PBW006-N&cat=NET). And for truly convenient plug-n-play connectivity to wireless networks, USB adaptors such as this 802.11g capable dongle (http://www.geeks.com/details.asp?invtid=80211GWUD&cat=NET) are available.

Antenna/Extender – These items are not essential, but given the specifics of a wireless environment, they may be helpful. Devices such as the Hawking Hi-Gain Antenna (http://www.geeks.com/details.asp?invtid=HAI6SIP-N&cat=NET) or the Super Cantenna (http://www.geeks.com/details.asp?invtid=SCB10&cat=NET) serve the purpose of increasing the wireless signal strength, and therefore extend the range of a given wireless network. Not only can a large area of open space be covered, but the signal quality may be improved in structures with walls and floors that obstruct the signal transmission.

Final Words

In this Tech Tip, we took a look at the basics of wireless networking as it relates to capabilities and hardware. In the second part of this two-part series, we will look at some of the basic setup and security considerations that should be addressed. The physical installation of a wireless network may be exponentially easier than a wired network, but the more difficult part is setting up the software and security to make sure everything stays up and running without incident.