
802.11a/b/g - What do all those numbers and letters mean anyway?

Every wireless user (and potential user) has seen 802.11a or 802.11b or 802.11g or 802.11a/b or 802.11b/g or 802.11a/b/g stamped on every wireless router, access point, adapter, print server or other device. Most users know that the letters denote speed, but few understand that there are other characteristics of these wireless network transmission specifications that are important in choosing and implementing a wireless home network. The standards also define the distance the network can operate over, the security capabilities included and the frequency over which the networks operate. Following is a brief overview of these important wireless standards, what they are, where they came from and what's important to consider when choosing and implementing wireless LAN technologies.

802.11 - What is it?

802.11 is a family of specifications for Wireless Local Area Networks that is developed and maintained by the Institute of Electrical and Electronics Engineers (IEEE). All of the specifications are built upon the foundation of the Ethernet protocol and Carrier Sense Multiple Access with Collision Avoidance for sharing transmission media. Currently there are nineteen 802.11-related specifications that define everything from Japanese regulatory extensions (802.11j) to wireless communication standards for Metropolitan Area Networks (MANs 802.15). We'll only look at the "most important" 802.11 standards for wireless home networks in this article (if you want more information, Whatis.com has an 802.11 Fast Guide that can walk you through every 802.11-related standard).

802.11b - It's almost everywhere

The 802.11b specification is an enhancement to 802.11 and is the most prevalent, least expensive (in terms of equipment) available today. 802.11b operates in the 2.4 to 2.4835GHz frequency range (the same as some cordless phones in your home) and delivers a maximum bandwidth limit of 11Mbps. This speed is significantly impacted by walls, and distance (around 100 to 150 feet *outdoors*) as well as the nature of the network - a half-duplex, shared, medium. With all of these factors in mind the *best* possible throughput for any one user is really around 6Mbps, not the 11Mbps you'll hear about. And when walls, distance and possible interference from cordless phones and even your microwave are added, your network performance is probably really only around 2 to 3 Mbps.

802.11a - The business specification

Most enterprise wireless LAN access points use 802.11a as their specification of choice. 802.11a operates in the 5.725 to 4.850GHz frequency range (so you won't get interference from phones and appliances) and offers speeds up to 54Mbps. The range is a bit less - 25 to 75 feet *outdoors*, and is a bit more expensive (in terms of devices) than 802.11b. Due to its increased bandwidth

alone, users can expect much higher performance - on the order of 10 to 11Mbps.

802.11g - The latest and greatest

802.11g, like 802.11b uses the 2.4 to 2.485GHz frequency range, but unlike 802.11b, delivers 54Mbps of bandwidth. The range for 802.11g is also the same as for 802.11b - 100 to 150 feet *outdoors*, and interference remains a problem. The good news is however, that performance is much higher than 802.11b - and users can expect to get around 10 or 11Mbps under normal conditions.

What does all of this mean to you?

1. If you're using 802.11b or 802.11g, keep your wireless devices far away from cordless phones and appliances.
2. Don't expect to get 54Mbps or even 11Mbps throughput on your wireless LAN. It works at half duplex (in other words cut the number in half right off the bat), you're probably going to have walls between you and the access point and experience interference on the network - and you're sharing it as well. So a good rule of thumb for a home network is to expect about a 25% or less of the available bandwidth for each user (assuming only one or two users on the network at a time).
3. It's worth the few extra dollars you'll spend to buy 802.11g devices rather than 802.11b - for the increased performance alone.
4. If you have a large number of walls, or need to cover a large area - consider purchasing bigger antennas, speed boosters and even extra access points to increase the range - and performance - of the network.
5. Most importantly, take the time to plan your network and ensure that you've figured out what you need, where you'll place critical components and what you expect the real performance of that network to be for every user.

Now that you understand the 802.11 speed specs, you should also be aware of a couple other 802.11-related specifications - especially for those of you concerned about the security of your network (and that should be everyone!) and those of you who love "bleeding edge" technology and are considering adding Wi-Fi telephones to your home.

- 802.11i - require newer Temporal Key Integrity Protocol (TKIP and Advanced Encryption Standard (AES) encryption integration. Newer equipment is already available with these capabilities and we strongly suggest that you make sure your new equipment supports this standard before you buy.
- 802.1X - provides an authentication foundation for wireless LAN. Using 802.1X using Extensible Authentication Protocol (EAP) to authenticate users through an access point to an authentication server. This protocol and specification is most often used on corporate wireless LANs employing an authentication server such as RADIO (Remote Authentication Dial-In User Service).

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- 802.11e - provides a means to ensure Quality of Service (QoS) on a wireless LAN - especially important for delay sensitive voice and video transmissions.

Wireless is definitely the “way to go” for most home networks. Taking the time to design your home wireless network in advance and choosing the “right” equipment that supports the 802.11 standards you’ll need are important to the performance of the network, your satisfaction with it, and your network’s ability to aid you in becoming more productive and your business more profitable.

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