Introduction to Wireless Technology

In office LAN environments, wireless LANs (WLANs) using the 802.11 standard offer compelling value. Wireless connectivity can save costs by eliminating the need to rewire buildings with multiple cables. WLANs enable workers to be more productive by providing access to the Internet, e-mail, and network files wherever they are in the business campus. Finally, WLANs enable a flexible work environment—departments and small businesses can efficiently rearrange desktop PCs, printers, or other IT devices, accommodating a dynamic organization without calling in IT administrative resources. With data rates ranging from 11 Mbps to 108 Mbps, WLANs provide flexibility and maximum productivity, so more work can be accomplished quickly, for less cost.

Extending an Existing Ethernet (Wired) Network

In an office environment, wireless access points are used to add a Wireless Local Area Network (WLAN) to an existing Ethernet Local Area Network (LAN). Wireless Access points provide a 'bridge' between your Ethernet network and a wireless network, enabling data communication between the two. A wireless access point will typically connect into a switch or a router (with built in switch) to communicate with your Ethernet network. Wireless access points are ideal for providing instant network connectivity to your mobile workforce (i.e. sales staff or field support personnel) visiting the office on a periodic basis. Wireless access points are also extremely useful in providing connectivity to areas of your building that Ethernet cabling cannot reach, such as conference rooms, refreshment areas and temporary offices.

Boosting Wireless Signal

Wireless access points can also be used be 'repeat' (boost) a wireless signal transmitted from a wireless router or another wireless access point. This process is similar to 'daisy-chaining' switches, but boosting signal, rather than extending cables. If you work in a small office, a single wireless router (or wireless access point connected to a wired router) will probably provide more than ample wireless coverage to all your network users. This does depend on each environment though and cannot be guaranteed. However if you work in a larger building, the wireless signal from a single wireless device may not reach all the rooms and floors. In this situation the positioning of one or more wireless access points will boost the signal around the building to ensure complete coverage, resulting in good network performance, to all networked users.

Choosing the right WLAN technology is an important factor in determining your overall return on investment. NETGEAR offers a comprehensive line of business-class wireless products with innovative technology that extends range, performance, and capacity while improving and simplifying management.

Power over Ethernet – see the Power over Ethernet section for wireless advantages

Overview of 802.11 Technology

Typically, WLAN networks are set up using wireless adapters in the laptop or PC, and an access point (AP) that connects the WLAN into the wired LAN. This configuration is also known as infrastructure mode. An AP is a device that both transmits and receives network data. It is typically connected to the wired backbone through the use of a standard Ethernet cable. Essentially the wireless equivalent to a LAN hub, the AP receives, buffers, and transmits data between WLAN and wired infrastructure.

WLANs can also be created in ad-hoc or peer-to-peer mode, where two wireless adapters connect directly to each other, without an AP. This type of network requires no administration or preconfiguration, but also bypasses the LAN, inhibiting access to LAN resources.

802.11 Wireless Technology Standards

NETGEAR offers business-class wireless devices that support each of the following protocols, as well as tri-mode products (802.11a, 802.11b/g) that support multiple protocols simultaneously.

802.11B

Quick Spec: 11 Mbps, three nonoverlapping channels, 32 users per AP, 2.4 GHz
802.11b products have been on the market since the late 90's. Fast enough for many network applications and file transfers, it is a very mature solution, 802.11b offers a great value at low cost. Widely deployed, it is used in many business and public locations such as airports, coffee shops, and hotels.

The 802.11b protocol is based on a radio frequency modulation technique known as direct sequence spread spectrum (DSSS). DSSS is less susceptible to radio noise and interference because it spreads a transmission signal over a broad band of radio frequencies. Use 802.11b products for best compatibility—most public hotspots as well as business and home environments offer 802.11b compatibility.

Benefits

- Most affordable: In most situations, 802.11b products are the lowest price points for client adapters, routers, and APs.
- Good growth path: Interoperates with 802.11g protocol.
- Longer range: Up to 500 meters in an open environment.
- Lower power consumption: 802.11b client cards typically require less power, so client devices operate longer when running on batteries.

Note that 802.11b devices operate in the 2.4 GHz range, and may be more susceptible to interference due to portable phones, microwave ovens, baby monitors, and so on.

802.11G

Quick Spec: 54-108 Mbps, three nonoverlapping channels, 32 users per AP, 2.4 GHz
802.11g features data rates up to 108 Mbps, making it ideal for moving larger files, online training, or other demanding network applications. Business-class 802.11g devices offer strong security, network management capabilities, Power over Ethernet, and performance-enhancing technology such as Super G™ and AutoCell™. 802.11g offers compatibility with 802.11b devices, operates within the 2.4 GHz band, and uses orthogonal frequency division multiplexing (OFDM) technology.

802.11g technology is ideal for adding wireless performance to an existing 802.11b network. It provides a smooth path for higher performance as needed—after all, it's 4 to 15 times faster—while continuing to support the existing 802.11b investment.

Benefits

- Highest speeds: Up to 108 Mbps theoretical peak throughput while in Super G turbo mode
- Backward compatibility: 802.11b compatibility is written into the 802.11g IEEE specification.
- Lower power consumption: Portable devices operate over longer periods compared to 802.11a devices.
- Longer range: 802.11g signals travel farther and can work through walls and floors more effectively than 802.11a signals.

Note that 802.11g devices operate in the 2.4 GHz range, and may be more susceptible to interference due to portable phones, microwave ovens, baby monitors, and so on.

802.11A

Quick Spec: 54-108 Mbps, 13 nonoverlapping channels, 64 users per AP, 5 GHz
802.11a provides up to 108 Mbps, delivering plenty of bandwidth for demanding network applications such as

voice, video, and large file transfers. It offers more channels than 802.11b/g, which means 802.11a can be used in high-density situations. Because it operates in the 5-GHz range, there is less likelihood of interference with devices such as microwave ovens. Business-class 802.11a devices offer strong security, network management capabilities, Power over Ethernet, and performance-enhancing technology such as Super G and RF Management. 802.11a networks are ideal in high-density environments, such as convention halls, office bullpens, computer labs, and large conference rooms. These devices are popular in larger businesses due to the ability to support more users per access point and more non-overlapping channels.

Benefits

802.11a offers certain advantages over 802.11b products:

• Highest speeds: Up to 108 Mbps peak throughput with Atheros Super G turbo mode enabled

• Higher density: More channels mean more APs can be co-located.

• Interference free: Operates in the unregulated 5-GHz frequency range, with less possibility of interference from other devices.

Note that due to its higher operating frequency, range can be less than 802.11b/g systems, which operate at a lower frequency.

Also, note that 802.11a devices are not directly compatible with 802.11b/g devices; however, NETGEAR offers dual-mode and tri-mode access wireless products which overcome this limitation.

NETGEAR VALUE-ADDED FEATURES

Super G/Super AG

NETGEAR products use Super G technology, which provides more than double the speed and throughput of standard and 802.11g WLAN technologies. Performance is increased using four technologies—bursting, compression, fast frame, and dynamic turbo. NETGEAR products with Super G monitor the entire 802.11g (2.4 GHz) band, and increase the throughput only when channels are available and the application demands additional bandwidth. Offering improvement to any network connection, maximum performance and throughput are achieved in an all-Super G or Super AG network. Super AG capabilities are the same as Super G, but include both 802.11g and 802.11a protocols.

RF Management and Control

NETGEAR WLAN Access Points include RF Management and control. This cognitive radio software automatically configures WLAN products for optimal performance. RF Management automatically and dynamically:

• Adjusts the power used by an AP to increase or decrease the range of a unit

• Changes the channel to prevent interference

• Moves users to other access points in order to load balance and prevent AP overload

• Re-associates quickly and seamlessly to the network when moving between APs (client adapters)

ANTENNAS

NETGEAR offers a comprehensive range of antennas and boosters for use in extending the range of both indoor and outdoor WLANs.

Extended Range (XR)

Traditional Wi-Fi chipset architectures focus on maximizing throughput in order to perform well in benchmarks and typical office environments. Such designs typically don't perform well at long range. NETGEAR products with XR technology feature a new baseband architecture that dramatically stretches the performance of a WLAN by enabling long-range connections—up to three times the range of a standard 802.11g network. XR technology helps eliminate dead spots and maintains connectivity when signals are made faint when passing through dense floors, walls, or other barriers. In order to achieve the range, throughput across the range is lessened, making this unsuitable for business environments that have several available access points. This technology is ideal for

home applications, where there is typically one or two access points for the entire household to share.

Wireless Distribution System (WDS)

WDS supplies wireless point-to-point bridging, point-to-multipoint bridging, and repeater functionality for deployment over large areas.

Full Network Management Capabilities

In addition to remote configuration and management through a Web browser or Telnet with a command line interface, NETGEAR business-class WLAN products support SNMP MIB I, MIB II, and 802.11 MIB protocols. They can be remotely monitored and managed with network management software such as NETGEAR Network Management Software, NMS100.