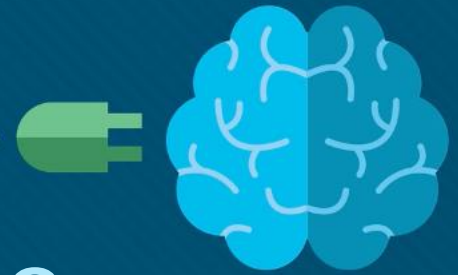


Module 13: Build a Home Network

Networking Essentials (NETESS)

Module Objectives

Module Title: Build a Home Network
Module Objective: Configure an integrated wireless router and wireless client to connect securely to the internet.

Topic Title	Topic Objective
Home Network Basics	Describe the components required to build a home network.
Network Technologies in the Home	Describe wired and wireless network technologies.
Wireless Standards	Describe Wi-Fi.
Wireless Traffic Controls	Explain how wireless traffic is controlled.
Set Up a Home Router	Configure wireless devices for secure communications.

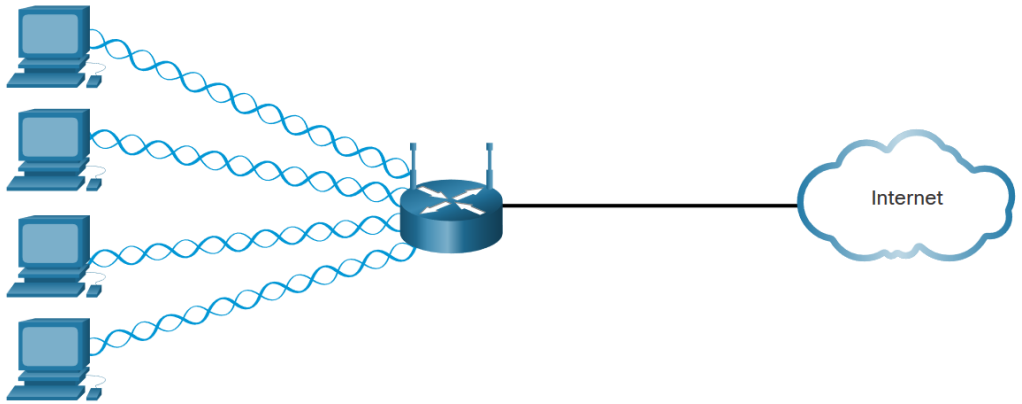
13.1 Home Network Basics

Connecting Home Devices

Wireless technology enables networks to be easily expanded, without the limitations of cabled connections.

One of the main advantages of wireless is the ability to provide anytime, anywhere connectivity.

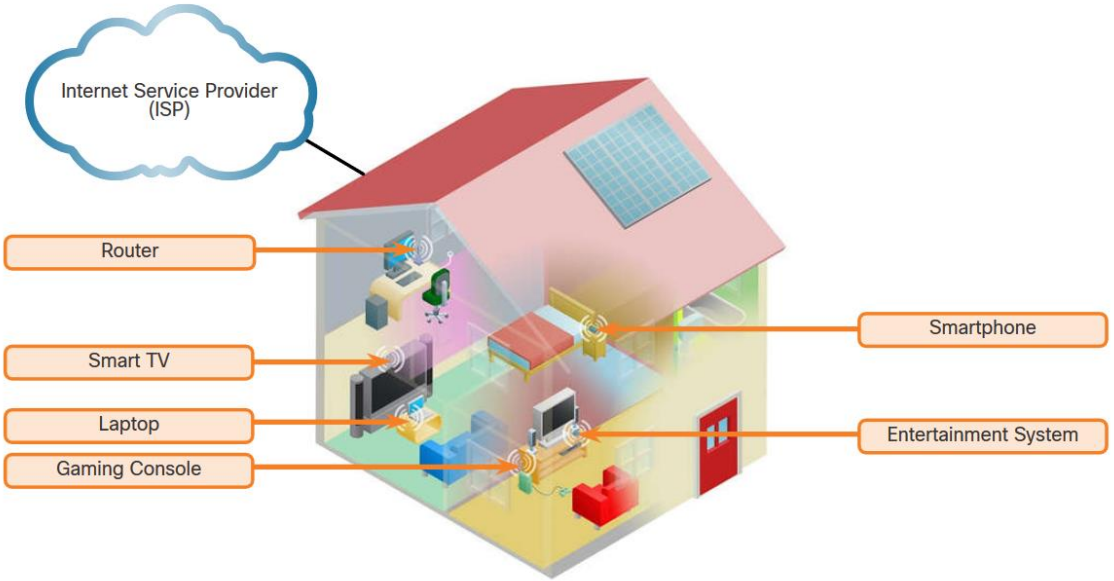
Wireless technology is fairly easy and inexpensive to install. New and visiting users can join the network quickly and easily.



Components of a Home Network

In addition to an integrated router, there are many different types of devices that might be connecting to a home network. Examples include:

- Desktop computers
- Gaming systems
- Smart TV systems
- Printers
- Scanners
- Security cameras
- Telephones
- Climate control devices



Typical Home Network Routers

Small business and home routers typically have two primary types of ports:

Ethernet Ports - Usually labeled “Ethernet” or “LAN”, these ports connect to the internal switch portion of the router.
Internet Port - Used to connect the device to another network such as the internet through a cable or DSL modem.

Many home routers include a radio antenna and a built-in wireless access point.

13.2 Network Technologies in the Home

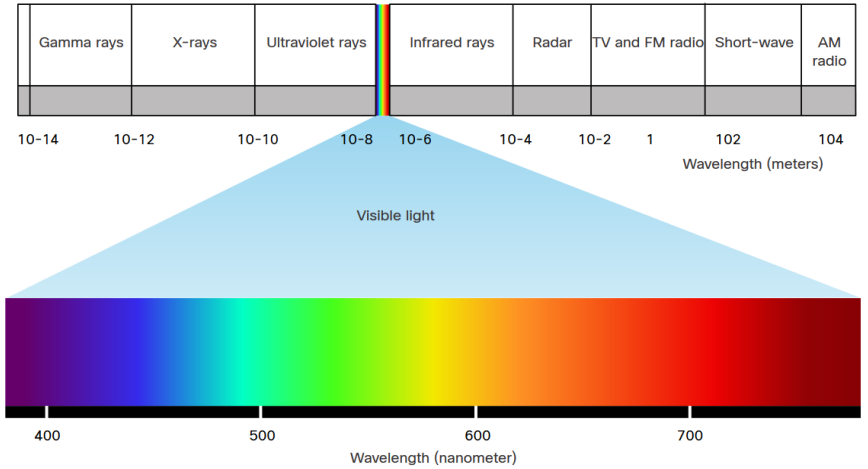
The Electromagnetic Spectrum

Wireless technologies use electromagnetic waves to carry information between devices.

The electromagnetic spectrum includes such things as radio and television broadcast bands, visible light, x-rays and gamma-rays.

Each of these has a specific range of wavelengths and associated energies

Some frequencies are set aside for public use. These unlicensed sections of the spectrum are incorporated into consumer products, including the Wi-Fi routers found in most homes.

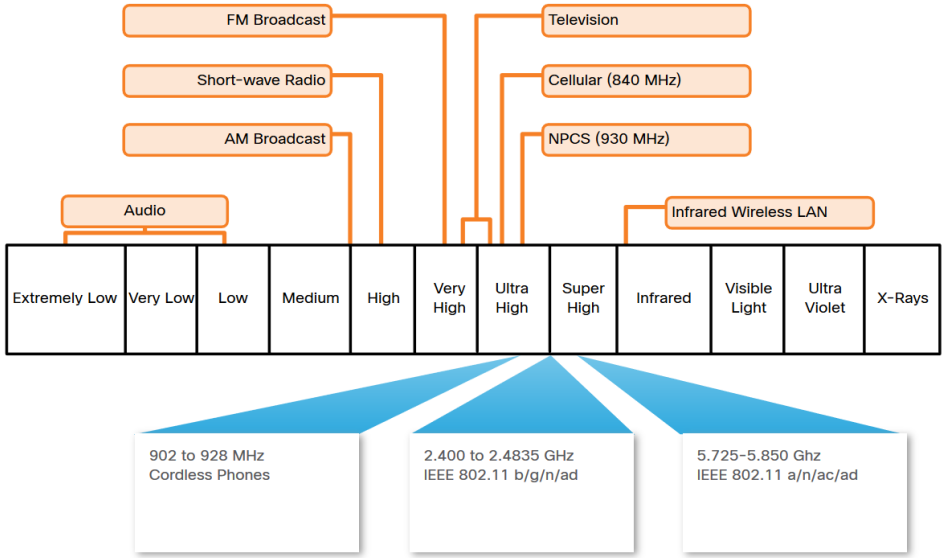


LAN Wireless Frequencies

The wireless technologies most frequently used in home networks are in the unlicensed 2.4 GHz and 5 GHz frequency ranges.

Blue tooth for example uses the 2.4GHz band.

Other technologies that use the 2.4 GHz and 5 GHz bands are the modern wireless LAN technologies that conform to the various IEEE 802.11 standards.

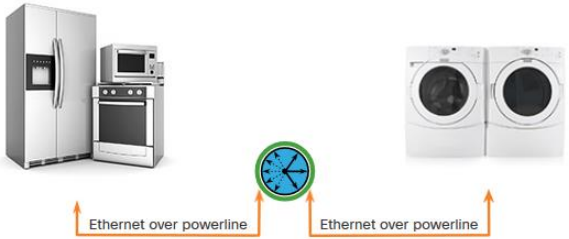


Wired Network Technologies

Category 5e Ethernet cable is the most common wiring used in a LAN. The cable is made up of 4 pairs of wires that are twisted to reduce electrical interference.

Coaxial cable has an inner wire surrounded by a tubular insulating layer, that is then surrounded by a tubular conducting shield. Most coax cables also have an external insulating sheath or jacket.

With Ethernet of Powerline existing power lines in a house can be used to connect devices to an Ethernet LAN.



13.3 Wireless Standards

Wi-Fi Networks

The main organization responsible for the creation of wireless technical standards is the IEEE.

The IEEE 802.11 standard governs the WLAN environment.

Wireless standards for LANs use the 2.4 GHz and 5 GHz frequency bands. Collectively these technologies are referred to as Wi-Fi.

Another organization, known as the Wi-Fi Alliance, is responsible for testing wireless LAN devices from different manufacturers.

Wireless standards are constantly improving the connectivity and speed of Wi-Fi networks.

Wireless Settings

Network mode - Determines the type of technology that must be supported. For example, **802.11b**, **802.11g**, **802.11n** or **Mixed Mode**.

Network Name (SSID) - Used to identify the WLAN. All devices that wish to participate in the WLAN must have the same SSID.

Standard Channel - Specifies the channel over which communication will occur. By default, this is set to **Auto** to allow the AP to determine the optimum channel to use.

SSID Broadcast - Determines if the SSID will be broadcast to all devices within range. By default, set to **Enabled**.

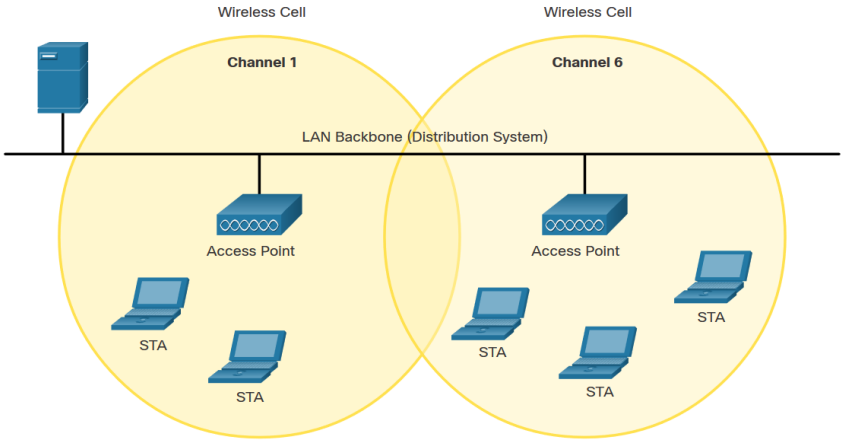
13.4 Wireless Traffic Controls

Wireless Channels

Wireless Channels are created by dividing up the available RF spectrum. Each channel is capable of carrying a different conversation.

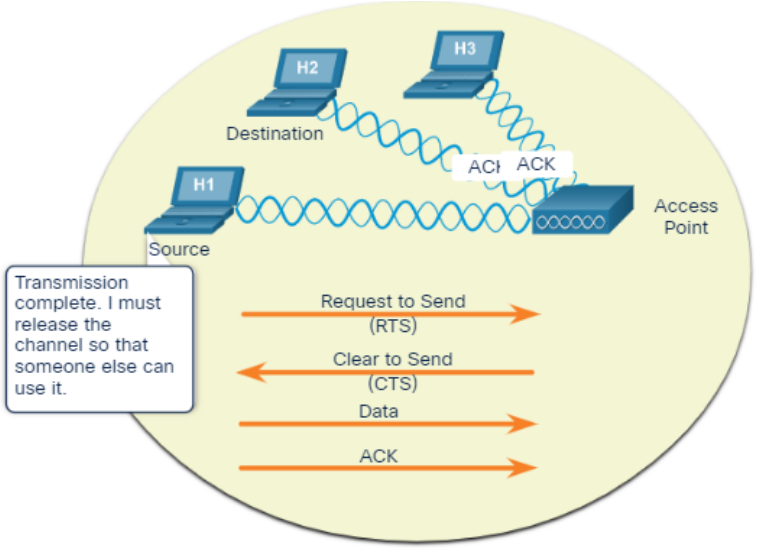
Multiple APs can function in close proximity as long as they use different channels for communication.

Some 5 GHz wireless technologies combine multiple channels to create a single wide channel, which provides more bandwidth and increases the data rate.



Wireless as a Shared Media

- Collisions occur on shared media occur when two or more devices attempt to communicate at the same time.
- Ethernet protocols detect the collisions using, Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA).
- CSMA/CA creates a reservation on the channel for a specific conversation between devices.
  - First, a device asks permission from the AP with a Request to Send (RTS) message.
  - If the channel is available, the AP responds with a CTS message which is broadcast to all devices within the network.
  - When the conversation is complete, the device that requested the channel sends a broadcast ACK message indicating the channel can be released.



13.5 Set Up a Home Router

First Time Setup

Many wireless routers designed for home use have an automatic setup utility that can be used to configure the basic settings on the router.

To connect to the router using a wired connection, plug an Ethernet patch cable into the network port on the computer. Plug the other end into a LAN port on the router.

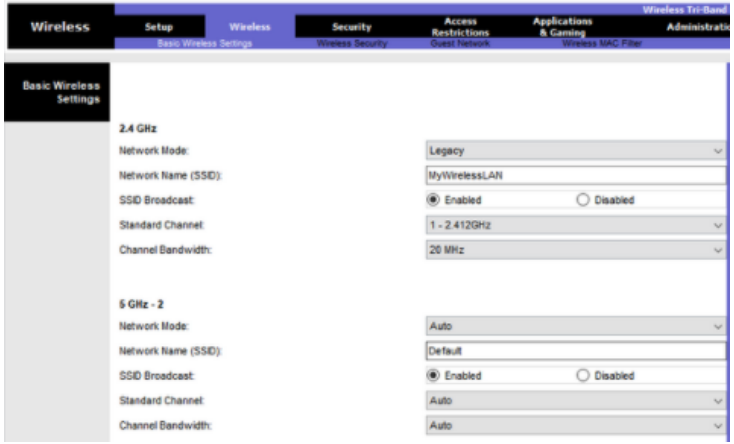
The Internet port will connect to the DSL or cable modem.

After confirming that the computer is connected to the network router and the link lights on the NIC indicate a working connection, the computer needs an IP address.

Most network routers are set up so that the computer receives an IP address automatically from a local DHCP server automatically configured on the wireless router.

Design Considerations

There are several design considerations that should be made before entering the configuration utility, or manually configuring the router.



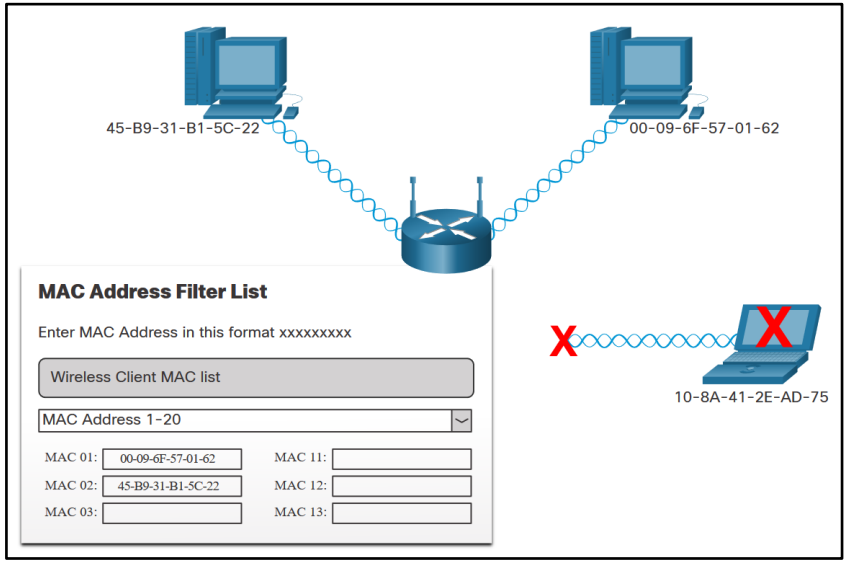
- What should the network be called?
  - The SSID should not give away information about the network or the device.

- What types of devices will connect to the network?
  - Devices will need to operate with a compatible standard to the access point.
  - For example: if a device only has the necessary radio for 802.11 b/g, it will not connect if the wireless router or access point is configured to only accept 802.11n or 802.11ac standards.

MAC Address Filtering

MAC address filtering can be configured on some routers to identify which hosts are allowed on the wireless network.

For example, the two top devices in the figure are allowed to connect, but not the device at the lower right.



Video - Typical Home Network Setup

Lab - Configure a Wireless Router and Client

In this lab, you will complete the following objectives:

- Configure basic settings on a wireless router.
- Connect a wireless client.

13.6 Build a Home Network Summary

What Did I Learn in this Module?

- Configure basic settings on a wireless router.
- Connect a wireless client.
- One of the main advantages of wireless is the ability to provide anytime, anywhere connectivity.
- Wireless technology is fairly easy and inexpensive to install. The cost of home and business wireless devices continues to decrease.
- Wireless technology is fairly easy and inexpensive to install. The cost of home and business wireless devices continues to decrease.
- Small business and home routers typically have two primary types of ports: Ethernet ports and internet ports.
- Wireless technologies use electromagnetic waves to carry information between devices.
- The wireless technologies most frequently used in home networks are in the unlicensed 2.4 GHz and 5 GHz frequency ranges.
- The most commonly implemented wired protocol is the Ethernet protocol. Ethernet uses a suite of protocols that allow network devices to communicate over a wired LAN connection.
- The IEEE 802.11 standard governs the WLAN environment. There are amendments to the IEEE 802.11 standard that describe characteristics for different standards of wireless communications.

What Did I Learn in this Module? (Cont.)

- Wireless devices that transmit over the same frequency range create interference in a Wi-Fi network.
- Channels are created by dividing up the available RF spectrum. Each channel is capable of carrying a different conversation.
- Multiple APs can function in close proximity to one another as long as they use different channels for communication. Normally each wireless conversation makes use of a separate channel.
- n a shared media Ethernet wired network, collisions occur when two or more devices attempt to send messages on the network at the same time.
- Wireless technology uses an access method called Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA).
- Before entering the configuration utility, or manually configuring the router through a web browser, you should consider how your network will be used.
- Many routers support MAC address filtering which enables you to specifically identify which devices are allow to access the wireless network.

Build a Home Network Summary

Module 13 – New Terms and Commands

- wireless
- mobility
- scalability
- internet port
- access point
- electromagnetic spectrum
- 2.4 GHz
- 5 GHz
- 802.11
- 802.11 a/b/g/n/ac/ad
- Category 5e cable
- coaxial cable
- Ethernet over Powerline
- Wi-Fi
- Wi-Fi Alliance
- mixed mode
- SSID
- channel
- SSID broadcast
- Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA)
- Request to Send (RTS)
- Clear to Send (CTS)
- acknowledgement (ACK)
- MAC address filtering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