

INFORMATION UPDATE

Broadband Networks: Wired & Wireless



DEPARTMENT OF PUBLIC SAFETY
Vermont Public Safety Broadband Commission

Broadband technology enable us to communicate information through voice and data by utilizing a wide range of devices and network systems. This information sheet provides descriptions of these networks to facilitate productive discussions from a common understanding of broadband technology.

What is Broadband?

Broadband commonly refers to internet access via a variety of high-speed wired and wireless networks, including cable, DSL, FiOS, Wi-Fi, WiMAX, 3G, 4G and satellite, all of which are faster than earlier analog dial-up by a huge magnitude. (PC Magazine Encyclopedia)

Mobile Broadband

Mobile broadband, can also be referred to as a mobile network or cellular network. This type of connection utilizes cell towers to transfer a signal. The network is made up of “cells” that connect to one another and to telephone switches or exchanges. These cells are areas of land that are typically hexagonal, have at least one transceiver, and use various radio frequencies. These transceivers are the cell towers that have become ubiquitous in our electronically connected world. They connect to each other to hand off packets of signals—data, voice, and text—ultimately bringing these signals to mobile devices such as phones and tablets that act as receivers. Providers use each other’s towers in many areas, creating a complex web that offers the widest possible network coverage to subscribers. (Lifewire, How Does a Mobile Network Work, Priya Viswanathan, Aug. 27, 2018)

Types of Broadband



Wired Broadband

Wired refers to any physical medium consisting of cables. The cables can be copper wire, twisted pair or fiber optic. A wired network is used to carry different forms of electrical signals from one end to the other. Mostly, in wired networks, one internet connection is being taken using a T1 line or cable modem. This connection is shared among multiple devices using a wired network concept. Consumer services provided via a wired broadband network include cable television, internet and phone services. In the case of a Digital Subscriber Line (DSL) the same wires as a regular telephone line are used. However, since DSL works within the frequencies that the telephone doesn’t, consumers can use the internet while making phone calls. Wired broadband has high reliability as the signal is directly conveyed through a manufactured cable. However, wired network installation is cumbersome and requires more time. Wired broadband coverage can be limited as it must operate in an area covered by a connected wired system. Wired broadband speeds can dwarf wireless broadband speeds. A wired network can support speeds up to 10 Gbps (gigabits per second), while a wireless network can support speeds of over 800 Mbps (megabits per second). One Gbps equals 1,000 Mbps.



Wireless Broadband

Wireless refers to a medium made of electromagnetic waves or infrared waves. These radio frequency waves include microwaves. All of the wireless devices will have antenna or sensors and, as so named, do not use wires for data or voice communication. Typical wireless devices include cellular mobile, wireless sensors, TV remotes, satellite disc receivers and laptops with a WLAN card. While wireless broadband can span more areas than a wired network, a wireless network can experience weakened or blocked signals. In particular, among the causes for cell signal blockage are: the distance a device is from the nearest cell tower, local terrain obstructions such as hills and mountains, man-made obstructions such as a highway overpass or large building, and vegetation. **Fixed wireless** is an expanding practice. This approach involves connecting existing fiber, cable or DSL internet between two fixed locations via a radio and a receiver. Fixed wireless relies on small stations to transfer data at high speeds, similar to a satellite, but localized. Since the stations are clustered close together, the technology is capable of delivering faster internet speed with lower latency. However, signals are generally transmitted via line-of-sight and avoiding signal obstructions is a challenge.

What is latency?

Network latency is an expression of how much time it takes for a packet of data to get from one designated point to another. In some environments, latency is measured by sending a packet that is returned to the sender; the round-trip time is considered the latency.

Specifications	Wired Network	Wireless Network
Speed of Operation	Higher	Lower compared to wired networks, but advanced wireless technologies such as LTE, LTE-A and WLAN-11 will make it possible to achieve speeds equivalent to a wired network.
System Bandwidth	High	Low, as frequency spectrum is a very scarce resource.
Cost	Less, as cables are not expensive.	More, as wireless subscriber stations, wireless routers, wireless access points and adapters are expensive.
Installation	Wired network installation is cumbersome and it requires more time.	Wireless network installation is easy and it requires less time.
Mobility	Limited, as it operates in the area covered by systems connected by the wired network.	Not limited, as it operates in the entire wireless network coverage area.
Transmission Medium	Copper wires, optical fiber cables, Ethernet.	EM waves or radiowaves or infrared.
Network Coverage Extension	Requires hubs and switches for network coverage limit extension.	More area is covered by wireless base stations which are connected to one another.
Applications	LAN (Ethernet), MAN (metropolitan area network)	WLAN, WPAN (Zigbee, bluetooth), infrared, cellular (GSM, CDMA, LTE)
Channel Interference & Signal Power Loss	Interference is less as one wired network will not affect the other.	Interference is higher due to obstacles between wireless transmitters and receivers.
QoS (Quality of Service)	Better	Poor due to high value of jitter and delay in connection setup. (Jitter refers to latency variations over time.)
Reliability	High compared to wireless counterparts, as manufactured cables have higher performance.	Reasonably. The failure of a router will affect the entire network.

<http://www.rfwireless-world.com/Terminology/wired-network-vs-wireless-network.html>