

All modern networks are made up of computers that are connected via the airwaves, via wires, or both. The computers do the work of “routing” or “switching” the information to be shared so it gets to the right place. The airwaves and/or wires make a path for the information to travel on.

Networks that use the airwaves are often less expensive to build. Only very remote rural areas such as communities near the north and south pole rely solely on airwave communication

Networks that are built with cables cost more to build, but networks such as copper telephone networks already exist in many areas. State-of-the-art large capacity fiber networks can carry large amounts of information.

Networks	Examples	Technology
Airwave Networks	AM & FM Radio; Broadcast TV; Satellite Radio & TV; GPS	Hub & Spoke: The broadcast tower talks to the radio, TV, or satellite receiver.
	Emergency Services Radio; Mobile phones; Satellite Phones; WiFi; Wi-Max;	Hub & Spoke: 2 way radios both talk and receive messages from the broadcast tower. (aka transceivers= receive and transmit)
	Family Radio Service; CB Radio	Ad-Hoc Networks: Radios talk and listen directly to each other without going through a tower
	Next generation communication networks	Meshed Networks: Ad-hoc Networks that are coordinated to get the most communication from available transceivers
Wire & Cable	Internet DSL; Cable TV; Cable Internet; Internet Back-haul; Telephone	Materials that transmit energy well- copper, glass (fiber-optic)
Combined	City-Wide and County Wide Intranet; LANS; Hotspots; The Internet	Fiber & Airwave networks combined to best advantage

Airwave Networks	Owned by	Public Subsidy	Technology	Good At	Bad At
AM & FM Radio	Transmission towers owned by radio broadcasters	Exclusive licenses for public airwaves; Partial funding of public broadcasters	Centralized broadcast towers and receivers located within broadcast area	Delivering information from central point to many receivers within a local area	Allowing radio audiences to talk back to broadcasters; linking into a global network; lateral information sharing
Broadcast Television	Television Networks	Exclusive licenses for public airwaves; Partial funding of public broadcasters	Centralized broadcast towers and receivers located within broadcast area	Delivering information from central point to many receivers within a local area; providing television free of charge	Standard broadcasting equipment can't deliver many channels without interference on the network
Emergency Service Radio	Cities and towns	Public airwaves using exclusive frequencies set aside for this purpose	Centralized network, often uses wireless communications in local area	Reliably sending essential emergency information when required very quickly; Mobility	Transmitting a lot of information constantly; being used as a primary communication channel
Mobile Phones	Telecom providers: Verizon, ATT, TMobile	Exclusive licenses for public airwaves.	Series of interconnected broadcast towers communicating with handsets	Voice communication between mobile handsets	Sending data between networks owned by different operators; Universal coverage;
Ad Hoc	Ownerless	Non-exclusive use of public airwaves (unlicensed).	Self-healing, ad-hoc network made of nodes that both send and receive information	Routing around damage to the network; allowing network nodes to both send and receive information; automatically configuring network (ad-hoc)	Connecting to the internet unless one or more nodes has internet connectivity; long-distance broadcasts
Internet via WiFi	Providers, cities, communities, universities, individuals (whoever owns internet back-haul and equipment)	Non-exclusive use of public airwaves (unlicensed).	Very short range radio broadcasts share internet connections within 300 meters	Low-cost or no-cost sharing internet connections; forming part of larger hub-and-spoke WiFi networks that distribute internet connections across large areas	Creating meshed networks; Many wifi networks in the same place can create interference.
Wi-Max		Exclusive licenses for public airwaves.	Long range broadcast of the internet using radio waves	Broadcasting internet over longer distances than WiFi can achieve.	High bandwidth OR long distance, not both at the same time. Proprietary technology causes interoperability issues.
Satellite	TV companies, satellite providers, some subsidized by gov't	Public airwaves; exclusive rights to launch a satellite or lease gov't owned satellite	Information bounced to satellite in orbit above the earth, satellite signal is bounced down to receivers	Providing television, phone and internet service in very remote areas	Limited capacity; cost prohibitive to use; international law limits total number of satellites

Cable // Fiber Networks	Owned by	Public Subsidy	Technology	Good At	Bad At
Telephone	Telephone companies- AT&T	Universal Service Fund tax, millions of acres of public and private land, millions of dollars in tax subsidies; close relationship with state & nat'l politicians	Distributed network with centralized switches	Two-way traffic; Delivering voice traffic from one point to another through switches with minimal loss of information	Routing around damage, dynamically adding new clients, transferring large amounts of information over copper lines
Cable Television	Cable companies: ATT, Time Warner, ComCast	Millions of acres of public and private land use, non-competitive exclusivity rights	Decentralized fiber-optic network that delivers connectivity to subscribers	Using centralized network to deliver many more TV channels than broadcast TV	Universal service; only those who pay can access network; not available everywhere; expensive build-out
Telephone DSL Internet	Telephone companies	Ongoing public investment in upgrading telephone lines	Regular copper phone lines and upgraded switches connect computers to internet.	Using existing telephone network to access distributed, global internet; more extensive than cable internet network.	Providing download speeds equal to upload speeds; transferring large amounts of data (video, etc)
Cable Internet	Cable companies	Public and private land use; Non-competitive exclusivity rights;	Uses decentralized cable network to provide access to distributed global internet	Delivering high download speeds (often for content provided by cable company)	Providing equal download and upload speeds; slows down when many users are online at the same time
Broadband Over Power Lines	Utility companies; Power-line communication hardware companies	Public subsidies for original development of electrical system, land use and rights of way	Uses power-line communication to provide broadband connectivity through electrical lines	Potentially providing broadband connectivity to areas without DSL service; Acting as backhaul for WiFi; Automatic meter reading	Standardization: equipment is not standardized. Reliability: interference from other electrical devices; operation in the same band as shortwave radio.
Internet Backhaul	Universities Telecom companies	Land Use; Use of rights of way Original backhaul was completely publicly funded.	High capacity fiber trunks	Transporting information <i>between</i> distributed networks	Non-Competitive Pricing; Overbuilt in population centers- non-existent in many areas; increasing concentration of ownership