Select an ISP Connection Type

Connection Technologies

In the 1990s, the Internet was typically used for data transfer. Transmission speeds were slow compared to the high-speed connections that are available today. The additional bandwidth allows for transmission of voice and video as well as data. Today there are many ways to connect to the Internet. Phone, cable, satellite, and private telecommunications companies offer broadband Internet connections for businesses and home use.

Analog Telephone

Analog telephone, also called plain old telephone service (POTS), transmits over standard voice telephone lines. This type of service uses an analog modem to place a telephone call to another modem at a remote site, such as an Internet service provider. The modem uses the telephone line to transmit and receive data. This method of connection is known as dialup.

Integrated Services Digital Network

ISDN uses multiple channels and can carry different types of services; therefore, it is considered a type of broadband. ISDN is a standard for sending voice, video, and data over normal telephone wires. ISDN technology uses the telephone wires as an analog telephone service.

Broadband

Broadband is a technology that is used to transmit and receive multiple signals using different frequencies over one cable. For example, the cable used to bring cable television to your home can carry computer network transmissions at the same time. Because the two transmission types use different frequencies, they do not interfere with each other.

Broadband uses a wide range of frequencies that can be further divided into channels. In networking, the term broadband describes communication methods that transmit two or more signals at the same time. Sending two or more signals simultaneously increases the rate of transmission. Some common broadband network connections include cable, DSL, ISDN, and satellite. The figure shows equipment used to connect to or transmit broadband signals.

DSL and ADSL

Digital Subscriber Line
DSL is an always-on service, which means that there is no need to dial up each time you want to connect to the Internet. DSL uses the existing copper telephone lines to provide high-speed digital data communication between end users and telephone companies. Unlike ISDN, where the digital data communications replaces the analog voice communications, DSL shares the telephone wire with analog signals.

With DSL, the voice and data signals are carried on different frequencies on the copper telephone wires. A filter prevents DSL signals from interfering with phone signals. A DSL filter is connected between each telephone and phone jack.

The DSL modem does not require a filter. The DSL modem is not affected by the frequencies of the telephone. A DSL modem can connect directly to your computer, or it can be connected to a networking device to share the Internet connection with multiple computers.

**Asymmetric Digital Subscriber Line**

ADSL has different bandwidth capabilities in each direction. Downloading is the receiving of data from the server to the end user. Uploading is the sending of data from the end user to the server. ADSL has a fast download rate which is beneficial to users who are downloading large amounts of data. The upload rate of ADSL is slower than the download rate. ADSL does not perform well when hosting a web server or FTP server, both of which involve upload-intensive Internet activities.

**Line of Sight Wireless Internet Service**

Line of sight wireless Internet is an always-on service that uses radio signals for transmitting Internet access. Radio signals are sent from a tower to the receiver that the customer connects to a computer or network device. A clear path between the transmission tower and customer is required. The tower may connect to other towers or directly to an Internet backbone connection. The distance the radio signal can travel and still be strong enough to provide a clear signal depends on the frequency of the signal. Lower frequency of 900 MHz can travel up to 40 miles (65 km), while a higher frequency of 5.7 GHz can only travel 2 miles (3 km). Extreme weather condition, trees, and tall buildings can affect signal strength and performance.
WiMax

Worldwide Interoperability for Microwave Access (WiMAX) is an IP-based wireless 4G broadband technology that offers high-speed mobile Internet access for mobile devices. WiMAX is a standard called IEEE 802.16e. It supports a MAN-sized network and has download speeds up to 70 Mb/s and distances up to 30 miles (50 km). Security and QoS for WiMAX are equivalent to cellular networks.

WiMAX uses a low wavelength transmission, usually between 2 GHz to 11 GHz. These frequencies are not as easily disrupted by physical obstructions because they can better bend around obstacles than higher frequencies. Multiple Input Multiple Output (MIMO) technology is supported, which means additional antennas can be added to increase the potential throughput.

There are two methods of transmitting a WiMAX signal:

- **Fixed WiMAX** - A point-to-point or point-to-multipoint service with speeds up to 72 Mb/s and a range of 30 miles (50 km).
- **Mobile WiMAX** - A mobile service, like Wi-Fi, but with higher speeds and a longer transmission range.

Other Broadband Technologies

Broadband technology provides several different options for connecting people and devices for the purpose of communicating and sharing information. Each offers different features or is designed to support specific needs. It is important to have a clear understanding of the several broadband technologies and how they can best support a customer.

**Cellular**

Cellular technology enables the transfer of voice, video, and data. With a cellular WAN adapter installed, a user can access the Internet over the cellular network. There are different cellular WAN characteristics:

- **1G** - Analog voice only
- **2G** - Digital voice, conference calls, and caller ID; data speeds less than 9.6 Kb/s
- **2.5G** - Data speeds between 30 Kb/s and 90 Kb/s; supports web browsing, short audio and video clips, games, and application and ring tone downloads
- **3G** - Data speeds between 144 Kb/s and 2 Mb/s; supports full-motion video, streaming music, 3D gaming, and faster web browsing
• **3.5G** - Data speeds between 384 Kb/s and 14.4 Mb/s; supports high-quality streaming video, high-quality video conferencing, and VoIP

• **4G** - Data speeds between 5.8 Mb/s and 672 Mb/s when mobile, and up to 1 Gb/s when stationary; supports IP-based voice, gaming services, high-quality streamed multimedia, and IPv6

Cellular networks use one or more of the following technologies:

• **Global System for Mobile communications (GSM)** - Standard used by the worldwide cellular network

• **General Packet Radio Service (GPRS)** - Data service for users of GSM

• **Quad-band** - Allows a cellular phone to operate on all four GSM frequencies: 850 MHz, 900 MHz, 1800 MHz, and 1900 MHz

• **Short Message Service (SMS)** - Data service used to send and receive text messages

• **Multimedia Messaging Service (MMS)** - Data service used to send and receive text messages and can include multimedia content

• **Enhanced Data Rates for GSM Evolution (EDGE)** - Increased data rates and improved data reliability

• **Evolution-Data Optimized (EV-DO)** - Improved upload speeds and QoS

• **High Speed Downlink Packet Access (HSDPA)** - Enhanced 3G access speed

**Cable**

A cable Internet connection does not use telephone lines. Cable uses coaxial cable lines originally designed to carry cable television. A cable modem connects your computer to the cable company. You can plug your computer directly into the cable modem, or you can connect a router, switch, hub, or multipurpose network device so that multiple computers can share the connection to the Internet. Like DSL, cable offers high speeds and an always-on service, which means that even when the connection is not in use, the connection to the Internet is still available.

**Satellite**

Broadband satellite is an alternative for customers who cannot get cable or DSL connections. A satellite connection does not require a phone line or cable, but uses a satellite dish for two-way communication. The satellite dish transmits and receives signals to and from a satellite that relays these signals back to a service provider, as shown in the figure. Download speed can reach up to 10Mb/s or more, while upload speed ranges about 1/10th of download speeds. It takes time for the signal from the satellite dish to relay to
your ISP through the satellite orbiting the Earth. Due to this latency, it is difficult to use time-sensitive applications, such as video gaming, VoIP, and video conferencing.

**Fiber Broadband**

Fiber broadband provides faster connection speeds and bandwidth than cable modems, DSL, and ISDN. Fiber broadband can deliver a multitude of digital services, such as telephone, video, data, and video conferencing simultaneously.

**Selecting and ISP for the Customer**

Several WAN solutions are available for connecting between sites or to the Internet. WAN connection services provide different speeds and levels of service. You should understand how users connect to the Internet and the advantages and disadvantages of different connection types. The ISP that you choose can have a noticeable effect on network service. Some private resellers that connect to a phone company may sell more connections than allowed, which slows the overall speed of the service to customers.

There are four main considerations for an Internet connection:

- **Cost**
- **Speed**
- **Reliability**
- **Availability**

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**POTS**

A POTS connection is extremely slow, but it is available wherever there is a telephone. There are two major disadvantages of using the phone line with an analog modem. The first is that the telephone line cannot be used for voice calls while the modem is in use. The second is the limited bandwidth provided by analog phone service. The maximum bandwidth using an analog modem is 56 Kb/s, but in reality, it is usually much lower than that. An analog modem is not a good solution for the demands of busy networks.

**ISDN**

ISDN is very reliable because it uses POTS lines. ISDN is available in most places where the telephone company supports digital signaling to carry the data. Because it uses digital technology, ISDN offers faster connection times,
faster speeds, and higher quality voice than traditional analog telephone service. It also allows multiple devices to share a single telephone line.

**DSL**

DSL allows multiple devices to share a single telephone line. DSL speeds are generally higher than ISDN. DSL allows the use of high-bandwidth applications or multiple users to share the same connection to the Internet. In most cases, the copper wires already in your home or business are capable of carrying the signals needed for DSL communication.

There are limitations to DSL technology:

- DSL service is not available everywhere, and it works better and faster the closer the installation is to the telephone provider's central office (CO).
- In some cases, installed telephone lines will not qualify to carry all DSL signals.
- The voice information and data carried by DSL must be separated at the customer site. A device called a filter prevents data signals from interfering with voice signals.

**Cable**

Most homes that have cable television have the option to install high-speed Internet service using that same cable. Many cable companies offer telephone service as well.

**Satellite**

People who live in rural areas often use satellite broadband because they need a faster connection than dialup, and no other broadband connection is available. The cost of installation and the monthly service fees are generally much higher than those of DSL and cable. Heavy storm conditions can degrade the quality of the connection slowing down or even disconnecting the connection.

**Cellular**

Many types of wireless Internet services are available. The same companies that offer cellular service may offer Internet service. PC Card/ExpressBus, USB, or PCI and PCIe cards are used to connect a computer to the Internet. Service providers may offer wireless Internet service using microwave technology in limited areas.