

## 11.3.3 Internet Services Facts

There are many options for connecting computers to the internet through an ISP. Each method has its advantages and disadvantages, as discussed in the following table:

Method	Description
Public Switched Telephone Network (PSTN)	<p>The PSTN uses a single POTS phone line with a modem.</p> <ul style="list-style-type: none"> <li>▪ Dial-up uses a single 64 Kbps channel.</li> <li>▪ Common data transfer rates include 14.4 Kbps, 28.8 Kbps, 33.3 Kbps, and 56 Kbps.</li> <li>▪ Dial-up offers a minimum level of network connectivity for a low investment. It is available virtually anywhere that regular voice grade communications are available.</li> <li>▪ Computers dial an access server at the ISP. You must configure the system with the ISP server's phone number, along with a user name and password to log on.</li> <li>▪ The phone line cannot be used for voice and for the internet simultaneously.</li> </ul>
Digital Subscriber Line (DSL)	<p>DSL offers digital communications over existing POTS lines.</p> <ul style="list-style-type: none"> <li>▪ Data is sent using multiplexed channels over existing telephone wiring.</li> <li>▪ Implementation requires a DSL router or a single DSL network interface connected to the phone line.</li> <li>▪ DSL service is not available everywhere; the location must be within a fixed distance of network switching equipment.</li> </ul> <p>There are several variations of DSL (collectively referred to as xDSL):</p> <ul style="list-style-type: none"> <li>▪ Asymmetrical DSL (ADSL) provides different download and upload speeds. <ul style="list-style-type: none"> <li>▪ ADSL allows regular analog phone calls and digital access on the same line at the same time. Splitters are required to separate the analog signals from the digital signals.</li> <li>▪ ADSL works well for regular internet access (browsing), but is not the best choice if you need to host internet services (for example, to maintain your own website).</li> </ul> </li> <li>▪ Symmetrical DSL (SDSL) provides equal download and upload speeds. <ul style="list-style-type: none"> <li>▪ The entire line is used for data; simultaneous voice and data is not supported.</li> <li>▪ Splitters are not required because voice traffic does not exist on the line.</li> <li>▪ This is a viable option for organizations that wish to host internet services (like a web server).</li> </ul> </li> <li>▪ Very high DSL (VDSL or VHDSDL) is similar to asymmetrical DSL, but has higher speeds. <ul style="list-style-type: none"> <li>▪ Both voice and digital data are supported on the same line at the same time.</li> <li>▪ Splitters are required to separate voice signals from digital data signals.</li> </ul> </li> </ul>
Cable	<p>Companies that provide cable television access typically offer internet access. Existing cable TV lines provide bandwidth for internet access.</p> <ul style="list-style-type: none"> <li>▪ Cable internet uses the Data over Cable Service Interface Specification (DOCSIS) that allows data signals to be sent on existing cable TV infrastructures. DOCSIS specifies channel widths, modulation techniques, and how core components of the network communicate.</li> <li>▪ A cable modem is a device that connects a computer system to the internet using a cable television network. But a cable modem doesn't function as a modem anymore because it doesn't modulate and demodulate a signal between an analog network and a digital end device. Many cable internet service providers (ISPs) are migrating to a fully digital network, including their television signals. Because of this, cable modems on digital systems are not modems. They are called media converters or cable terminal devices.</li> <li>▪ Speeds are usually much faster than those provided by DSL, but the bandwidth is shared between all users within the same area (neighborhood). Actual speeds may be much less than the maximum.</li> </ul>
Satellite	<p>Satellite provides internet access by using signals transmitted to and received from orbiting satellites.</p> <ul style="list-style-type: none"> <li>▪ Satellite service providers offer nearly 100% global network coverage, making local network infrastructure unnecessary. Satellite service is usually available when other internet access technologies are not.</li> <li>▪ Satellite requires a local portable transmitter with an antenna (dish) and an unobstructed line of sight.</li> <li>▪ Satellite reception is subject to atmospheric and weather conditions. Fog, rain, or snow can disrupt service.</li> </ul>
Cellular	<p>Cellular networking uses a digital mobile phone network for internet access. Two main communication technologies are used with mobile networks:</p> <ul style="list-style-type: none"> <li>▪ Global System for Mobile Communications (GSM) was created in Europe and is used by the majority of the world's mobile service providers. GSM uses time-division multiple access (TDMA) technology to allow multiple connections on the same frequency.</li> <li>▪ Code Division Multiple Access (CDMA) is used by the majority of mobile service providers in the United States. It enables multiple connections on the same frequency. With CDMA, each call is encoded with a unique key and then transmitted</li> </ul>

	<p>simultaneously. The unique keys are then used to extract each call from the transmission.</p> <p>Many mobile devices, like smart phones and tablets, can be purchased with mobile data technology integrated. A cellular adapter can be installed on a notebook computer to enable cellular internet access. Cellular networking is a truly mobile solution; the mobile device can be in motion and still have internet access. The user does not have to manually reconnect the device as it moves from cell tower to cell tower. However, the faster the device is moving, the less bandwidth is available.</p> <p>Cellular internet access is limited to areas with cell service coverage. Coverage is dictated by the provider's network. Some areas have weak coverage or no coverage at all.</p> <p>Cellular networks used for voice and data include the following types:</p> <ul style="list-style-type: none"> <li>2G (second generation) networks were the first to offer digital data services. 2G data speeds are slow (14.4 Kbps) and are used mainly for text messaging, not internet connectivity. 2.5G supports speeds up to 144 Kbps.</li> <li>EDGE (also called 2.75G) networks are an intermediary, between 2G and 3G networks. EDGE is the first cellular technology to be truly internet-compatible, with speeds of 400–1,000 Kbps.</li> <li>3G offers simultaneous voice and data. Minimum speeds for stationary users are quoted at 2 Mbps or higher. The following extensions enhance 3G networks: <ul style="list-style-type: none"> <li>HSPA+ (also known as <i>smart antenna</i>) uses multiple-input and multiple-output (MIMO), and significantly increases data throughput and link range without additional bandwidth or increased transmit power.</li> <li>Long Term Evolution (LTE) and LTE-Advanced increase downlink/uplink speeds to 100/50 Mbps and 1Gbps/500Mbps, respectively.</li> </ul> </li> <li>4G is available with minimum speeds around 3–8 Mbps, with over 100 Mbps possible. 4G: <ul style="list-style-type: none"> <li>Uses MIMO.</li> <li>Is not compatible with 3G; 4G requires a complete retrofit on the part of service providers and new equipment for the consumer.</li> <li>Utilizes Worldwide Interoperability for Microwave Access (WiMAX). WiMAX delivers high-speed internet service (up to 1 Gbps for stationary users) to large geographical areas.</li> </ul> </li> </ul>
Wireless	<p>Wireless internet access is frequently available at local businesses, hotels, airports, libraries, and mass transit. Additionally, many city and residential areas have coverage from a wireless internet provider.</p> <ul style="list-style-type: none"> <li>Some providers offer a nationwide network of wireless access points in public locations like airports.</li> <li>Wireless networks in downtown areas allow limited roaming (moving) within the area of coverage. However, dead spots might limit access.</li> <li>Wireless networks in residential areas are best suited for stationary clients.</li> </ul>
Broadband Over Power Line (BPL)	<p>BPL is a system that transmits two-way data over the existing electrical distribution wiring. This service could be enabled within a single building or provided throughout a metropolitan area. BPL avoids the expense of a dedicated network of wires for data communication. Multiplexing is used to divide the electrical wiring into multiple channels used for data transmissions and electrical power delivery.</p> <p>Another version of BPL is used within a home to interconnect home computers and networking peripherals. The electrical connections in a home serve as a LAN to home computers and other networking devices that have an Ethernet port, like home entertainment devices. Configurations for this version of BPL typically include the following:</p> <ul style="list-style-type: none"> <li>An Ethernet cable connected to the computer (or peripheral) and a powerline adapter.</li> <li>Powerline adapters plugged into power outlets throughout the facility.</li> <li>An Ethernet connection established using the existing electrical wiring as the network medium.</li> </ul>
Integrated Services Digital Network (ISDN)	<p>ISDN offers digital communications over existing POTS lines or T1 lines.</p> <ul style="list-style-type: none"> <li>ISDN is more common in Europe than in the United States.</li> <li>The transmission medium is divided into channels for digital data.</li> <li>Subscribers must be within a certain distance of the phone company equipment, although this distance can be extended with repeaters.</li> <li>Phone calls use digital ISDN phones or analog phones connected to a converter.</li> </ul> <p>There are two main implementations of ISDN:</p> <ul style="list-style-type: none"> <li>ISDN BRI (basic rate) provides two 64 Kbps data channels and one 16 Kbps control channel. BRI uses four wires on the existing POTS installation. With ISDN BRI, you can use one channel for voice and one channel for data, or both channels for different voice calls. Depending on the implementation, you can also bond the B channels to use them together for faster data speeds.</li> <li>ISDN PRI (primary rate) provides twenty-three 64 Kbps data channels and one 64 Kbps control channel on a T1 line (or thirty 64 Kbps data channels and one 64 Kbps control channel on an E1 line).</li> </ul>

