Modern Methods of Communication

Plain Old Telephone Service (POTS)

Plain old telephone service (**POTS**) is the voice-grade telephone service that remains the basic form of residential and small business service connection to the telephone network in most parts of the world. The name is a retronym, and is a reflection of the telephone service still available after the advent of more advanced forms of telephony such as ISDN, mobile phones and VoIP. POTS has been available almost since the introduction of the public telephone system in the late 19th century, in a form mostly unchanged to the normal user despite the introduction of Touch-Tone dialing, electronic telephone exchanges and fiber-optic communication into the public switched telephone network (PSTN).

The system was originally known as the **Post Office Telephone Service/System** in many countries. The term was dropped as telephone services were removed from the control of national post offices.

POTS services include:

- bi-directional, or full duplex, voiceband path with limited frequency range of 300 to 3400 Hz: in other words, a signal to carry the sound of the human voice both ways at once;
- call-progress tones, such as dial tone and ringing signal;
- subscriber dialing;
- operator services, such as directory assistance, long distance calling, and conference calling assistance;
- a standards compliant analog telephone interface including BORSCHT functions

In the United States, the pair of wires from the central switch office to a subscriber's home is called a subscriber loop. It is typically powered by −48V direct current (DC) and backed up by a large bank of batteries (connected in series) in the central office, resulting in continuation of service during most commercial power outages. The subscriber loop typically carries a "load" of about 300 Ohms, and does not pose a threat of electrocution to human beings (although shorting the loop can be felt as an unpleasant sensation).

Many calling features became available to POTS subscribers after computerization of telephone exchanges during the 1970s and 1980s. The services include:

- Voicemail
- Caller ID
- Call waiting
- Speed dialing
- Conference call (three-way calling)
- Enhanced 911

- Centrex
- and other services.

Due to the wide availability of POTS, new forms of communications devices such as modems and facsimile machines are designed to use POTS to transmit digit.

Modem

Short for ***mo****dulator-****dem****odulator.* A modem is a device or program that enables a computer to transmit data over, for example, telephone or cable lines. Computer information is stored digitally, whereas information transmitted over telephone lines is transmitted in the form of analog waves. A modem converts between these two forms.

Fortunately, there is one standard interface for connecting external modems to computers called *RS-232.* Consequently, any external modem can be attached to any computer that has an RS-232 port, which almost all personal computers have. There are also modems that come as an expansion board that you can insert into a vacant expansion slot. These are sometimes called *onboard* or *internal modems*.

While the modem interfaces are standardized, a number of different protocols for formatting data to be transmitted over telephone lines exist. Some, like CCITT V.34, are official standards, while others have been developed by private companies. Most modems have built-in support for the more common protocols -- at slow data transmission speeds at least, most modems can communicate with each other. At high transmission speeds, however, the protocols are less standardized.

Aside from the transmission protocols that they support, the following characteristics distinguish one modem from another:

- **bps :** How fast the modem can transmit and receive data. At slow rates, modems are measured in terms of baud rates. The slowest rate is 300 baud (about 25 cps). At higher speeds, modems are measured in terms of bits per second (bps). The fastest modems run at 57,600 bps, although they can achieve even higher data transfer rates by compressing the data. Obviously, the faster the transmission rate, the faster you can send and receive data. Note, however, that you cannot receive data any faster than it is being sent. If, for example, the device sending data to your computer is sending it at 2,400 bps, you must receive it at 2,400 bps. It does not always pay, therefore, to have a very fast modem. In addition, some telephone lines are unable to transmit data reliably at very high rates.
- **voice/data:** Many modems support a switch to change between voice and data modes. In data mode, the modem acts like a regular modem. In voice mode, the modem acts like a regular telephone. Modems that support a voice/data switch have a built-in loudspeaker and microphone for voice communication.

- **auto-answer :** An auto-answer modem enables your computer to receive calls in your absence. This is only necessary if you are offering some type of computer service that people can call in to use.
- **data compression :** Some modems perform data compression, which enables them to send data at faster rates. However, the modem at the receiving end must be able to decompress the data using the same compression technique.
- **flash memory :** Some modems come with *flash memory* rather than conventional ROM, which means that the communications protocols can be easily updated if necessary.
- **Fax capability:** Most modern modems are fax modems, which means that they can send and receive faxes.

al information.

Digital data connections

Broadband

Broadband Internet access, often shortened to just "broadband", is a high data rate connection to the internet— typically contrasted with dial-up access using a 56k modem.

Dial-up modems are limited to a bitrate of less than 56 kbit/s (kilobits per second) and require the dedicated use of a telephone line — whereas broadband technologies supply more than double this rate and generally without disrupting telephone use.

Although various minimum bandwidths have been used in definitions of broadband, ranging up from 64 kbit/s up to 4.0 Mbit/s[1], the 2006 OECD report is typical by defining broadband as having download data transfer rates equal to or faster than 256 kbit/s, while the United States (US) Federal Communications Commission (FCC) as of 2010, defines "Basic Broadband" as data transmission speeds of at least 4 megabits per second (Mbps), or 4,000,000 bits per second, downstream (from the Internet to the user's computer) and 1 Mbit/s upstream (from the user's computer to the Internet). The trend is to raise the threshold of the broadband definition as the marketplace rolls out faster services.

Data rates are defined in terms of *maximum download* because several common consumer broadband technologies such as ADSL are "asymmetric"—supporting much slower maximum upload data rate than download.

"Broadband penetration" is now treated as a key economic indicator.

DSL

DSL (Digital Subscriber Line) is a technology for bringing high- bandwidth information to homes and small businesses over ordinary copper telephone lines. xDSL refers to different variations of DSL, such as ADSL, HDSL, and RADSL. Assuming your home or small business is close enough to a telephone company central office that offers DSL service, you may be able to receive data at rates up to 6.1 megabits (millions of bits) per second (of a theoretical 8.448 megabits per second), enabling continuous transmission of motion video, audio, and even 3-D effects. More typically, individual connections will provide from 1.544 Mbps to 512 Kbps downstream and about 128 Kbps upstream. A DSL line can carry both data and voice signals and the data part of the line is continuously connected. DSL installations began in 1998 and will continue at a greatly increased pace through the next decade in a number of communities in the U.S. and elsewhere. Compaq, Intel, and Microsoft working with telephone companies have developed a standard and easier-to-install form of ADSL called G.Lite that is accelerating deployment. DSL is expected to replace ISDN in many areas and to compete with the cable modem in bringing multimedia and 3-D to homes and small businesses.

ISDN

ISDN (Integrated Services Digital Network) is a set of CCITT/ITU standards for digital transmission over ordinary telephone copper wire as well as over other media. Home and business users who install an ISDN adapter (in place of a telephone modem) receive Web pages at up to 128 Kbps compared with the maximum 56 Kbps rate of a modem connection. ISDN requires adapters at both ends of the transmission so your access provider also needs an ISDN adapter. ISDN is generally available from your phone company in most urban areas in the United States and Europe. In many areas where DSL and cable modem service are now offered, ISDN is no longer as popular an option as it was formerly.

Advantages:

1. Constant data rate at 64 kbit/s for each DS0 channel.
2. Two way broadband symmetric data transmission, unlike ADSL.
3. One of the data channels can be used for phone conversation without disturbing the data transmission through the other data channel. When a phone call is ended, the bearer channel can immediately dial and re-connect itself to the data call.
4. Call setup is very quick.
5. Low latency
6. ISDN Voice clarity is unmatched by other phone services.
7. Caller ID is almost always available for no additional fee.
8. Maximum distance from the central office is much greater than it is for DSL.
9. When using ISDN-BRI, there is the possibility of using the low-bandwidth 16 kbit/s "D" channel for packet data and for always on capabilities.

Disadvantages:

1. ISDN offerings are dwindling in the marketplace due to the widespread use of faster and cheaper alternatives.
2. ISDN routers, terminal adapters ("modems"), and telephones are more expensive than ordinary POTS equipment, like dial-up modems.
3. ISDN provisioning can be complicated due to the great number of options available.
4. ISDN users must dial in to a provider that offers ISDN Internet service, which means that the call could be disconnected.
5. ISDN is billed as a phone line, to which is added the bill for Internet ISDN access.
6. "Always on" data connections are not available in all locations.
7. Some telephone companies charge unusual fees for ISDN, including call setup fees, per minute fees, and higher rates than normal for other services.

Wireless 802.11

IEEE 802.11 is a set of standards carrying out wireless local area network (WLAN) computer communication in the 2.4, 3.6 and 5 GHz frequency bands. They are created and maintained by the IEEE LAN/MAN Standards Committee (IEEE 802). The base current version of the standard is **IEEE 802.11-2007.**

The 802.11 family includes over-the-air modulation techniques that use the same basic protocol. The most popular are those defined by the 802.11b and 802.11g protocols, which are amendments to the original standard. 802.11-1997 was the first wireless networking standard, but 802.11b was the first widely accepted one, followed by 802.11g and 802.11n. Security was originally purposefully weak due to export requirements of some governments,[1] and was later enhanced via the 802.11i amendment after governmental and legislative changes. 802.11n is a new multi-streaming modulation technique. Other standards in the family (c–f, h, j) are service amendments and extensions or corrections to the previous specifications.

Within the IEEE 802.11 Working Group the following IEEE Standards Association Standard and Amendments exist:

- IEEE 802.11: The WLAN standard was originally 1 Mbit/s and 2 Mbit/s, 2.4 GHz RF and infrared [IR] standard (1997), all the others listed below are Amendments to this standard, except for Recommended Practices 802.11F and 802.11T.
- IEEE 802.11a: 54 Mbit/s, 5 GHz standard (1999, shipping products in 2001)
- IEEE 802.11b: Enhancements to 802.11 to support 5.5 and 11 Mbit/s (1999)
- IEEE 802.11c: Bridge operation procedures; included in the IEEE 802.1D standard (2001)
- IEEE 802.11d: International (country-to-country) roaming extensions (2001)
- IEEE 802.11e: Enhancements: QoS, including packet bursting (2005)
- *IEEE 802.11F: Inter-Access Point Protocol (2003) Withdrawn February 2006*
- IEEE 802.11g: 54 Mbit/s, 2.4 GHz standard (backwards compatible with b) (2003)

Cable Internet Access

In telecommunications, **cable Internet access**, often called simply *cable Internet*, is a form of broadband Internet access that uses the cable television infrastructure. Like digital subscriber line and fiber to the premises services, cable Internet access provides network edge connectivity (last mile access) from the Internet service provider to an end user. It is integrated into the cable television infrastructure analogously to DSL which uses the existing telephone network. Cable TV networks and telecommunications networks are the two predominant forms of residential Internet access. Recently, both have seen increased competition from fiber deployments, wireless, and mobile networks.

Broadband cable Internet access requires a cable modem at the customer's premises and a cable modem termination system at a cable operator facility, typically a cable television headend. The two are connected via coaxial cable or a Hybrid Fiber Coaxial (HFC) plant. While access networks are sometimes referred to as *last-mile* technologies, cable Internet systems can typically operate where the distance between the modem and the termination system is up to 100 miles (160 km). If the HFC network is large, the cable modem termination system can be grouped into hubs for efficient management.

Cable broadband provides Internet access over the same coaxial cable that brings television to the premises. Cable Internet access speed does not fluctuate according to the physical location of its customers. However, this technology does assign specified amounts of bandwidth to areas. If many local residents are online at the same time, supply might run short of demand, slowing Internet access speed for everyone in the area. Cable plans are commonly advertised as having "speeds up to" a certain threshold, allowing for slower speeds.

ATM

Asynchronous transfer mode (ATM) is a switching technology that facilitates the movement of data from one point to another. It is one of the preferred technologies because of its efficiency of use, especially with different hardware components. Unlike other types of technology, the speed and efficiency used in asynchronous transfer mode makes it one of the most common network protocol standards in use today.

The main **advantage** of asynchronous transfer mode technology is the ability to transfer many different types of data at the same time. This is because all bandwidth is utilized, as long as it is available. Other types of technologies will often not allow all the bandwidth to be used once a particular function is started. Therefore, it makes for a very efficient way to transfer video files, pictures, e-mail and even live streaming audio and video.

Encoding data in asynchronous transfer mode is remarkably consistent, with each cell being 53 bytes in length. This helps during the processing of the data because there is no need to worry about where each cell starts and ends, unlike what is required with TCP/IP. Therefore, dealing

with more known factors means there is a greater ability to contribute resources to to encoding and decoding, thus speeding up the data transmission

Wireless access point

In computer networking, a **wireless access point** (WAP) is a device that allows wired communication devices to connect to a wireless network using Wi-Fi, Bluetooth or related standards. The WAP usually connects to a router, and can relay data between the wireless devices (such as computers or printers) and wired devices on the network.

Industrial grade WAPs are rugged, with a metal cover and a DIN rail mount. During operations they can tolerate a wider temperature range, high humidity and exposure to water, dust, and oil. be used as a bridge, router, or a client.

Prior to wireless networks, setting up a computer network in a business, home, or school often required running many cables through walls and ceilings in order to deliver network access to all of the network-enabled devices in the building. With the advent of the Wireless Access Point, network users are now able to add devices that access the network with few or no cables. Today's WAPs are built to support a standard for sending and receiving data using radio frequencies rather than cabling. Those standards, and the frequencies they use are defined by the IEEE. Most WAPs use IEEE 802.11 standards Wireless security includes: WPA-PSK, WPA2, IEEE 802.1x/RADIUS, WDS, WEP, TKIP, and CCMP (AES) encryption. Unlike home consumer models, industrial wireless access points can also

.*Limitations:*

One IEEE 802.11 WAP can typically communicate with 30 client systems located within a radius of 100 m. However, the actual range of communication can vary significantly, depending on such variables as indoor or outdoor placement, height above ground, nearby obstructions, other electronic devices that might actively interfere with the signal by broadcasting on the same frequency, type of antenna, the current weather, operating radio frequency, and the power output of devices. Network designers can extend the range of WAPs through the use of repeaters and reflectors, which can bounce or amplify radio signals that ordinarily would go un-received. In experimental conditions, wireless networking has operated over distances of several kilometers.

Wireless Adapters

A wireless-N network adapter is a device that allows a computer to connect to a wireless network, specifically a network utilizing wireless-N technology and standards. This simply refers

to a specific type of wireless network, which is faster than previous wireless-G network systems and allows a wireless network to transmit data faster. Like any other type of network adapter, this device is typically connected directly to the motherboard through an internal installation or can be an external device that connects through a universal serial bus (USB) port. A wireless-N network adapter is typically backward compatible with older wireless-G network devices, such as routers, but requires a wireless-N enabled router or hub to take advantage of higher speeds.

Network adapters are devices that connect to or are installed inside of a computer and allow the computer to connect to a network. These adapters can be wired and allow a computer to connect through a physical connection, typically an Ethernet cable, or they can be wireless. A wireless network adapter allows a computer to connect to a wireless network, typically through a wireless router or hub. In the past, wireless-B and wireless-G networks were standard, but newer network standards have increased performance and a wireless-N network adapter is typically required to connect to this kind of network.