SOFAB

Data Storage & Transmission Rate
Storage/Internet/LAN/Fiber-Optic

By Capt. Hani Alsohaibi, SOFAB Telecom

The Fastest Data Transfer Rate in World on a Worldwide Grid Infrastructure:

On 15 February 2009 the Worldwide LHC Computing Grid collaboration (WLCG) officially announced the successful completion of a service challenge at the Computing for High Energy and Nuclear Physics 2006 conference (CHEP'06) in Mumbai, India. The challenge involved sustaining a continuous flow of physics data on a worldwide Grid infrastructure at up to 1 GB/s. The maximum sustained data rates achieved correspond to transferring a DVD of scientific data from CERN every five seconds.

Names of Sizes of Storage Data:

bit	bit
Byte	Byte
KB	Kilo Byte
MB	Mega Byte
GB	Giga Byte
TB	Tera Byte
PB	Peta Byte

Measurements of Data Transfer Rates:

Bps	Bytes per second
KBps	Kilo Bytes per second
MBps	Mega Bytes per second
GBps	Giga Bytes per second

Measurements of Data:

1 Byte	= 8 bits			
1 KB	= 1000 Bytes	= 8000 bits		
1 MB	= 1000 KB	= 1000,000 Bytes		
1 GB	= 1000 MB	= 1000,000 KB	= 1000,000,000 Bytes	
1 TB	= 1000 GB	=1000,000 MB	= 1000,000,000 KB	= 1000,000,000,000 Bytes
1 PB	= 1000 TB	= 1000,000 GB	= 1000,000,000 MB	= 1000,000,000,000 KB
	= 1000 ,000,000,000,000 Bytes			

Transfer Data Rate is based on the Following Units:

bits	Bytes	Kilo Bytes	Mega Bytes	Giga Bytes

A lowercase "b" usually means a bit, while an uppercase "B" represents a byte.

Transfer Rate:

Bps: Byte per second
kBps: Kilo Byte per second
mBps: Mega Byte per second
gBps: Giga Byte per second

KBPS (Kilo Byte/Second)	Service Application	Level of Service
	KBPS (Kilo Byte/Second)	
50 kBps	Home Internet Service	Unprofessional Internet Service
100 kBps	Home Internet Service	Unprofessional Internet Service
250 kBps	Home Internet Service	Unprofessional Internet Service
500 kBps	Home Internet Service	Unprofessional Internet Service
	MBPS (Mega Byte Per Second)	
1 mBps	Office Internet Service	Semi Professional Internet Service
2 mBps	Office Internet Service	Semi Professional Internet Service
5 mBps	Office Internet Service	Professional Internet Service
10 mBps	Office Internet Service	Very Professional Internet Service
100 mBps	Low Speed Office LAN	Non Professional Office LAN Infrastructure
	GBPS (Giga Byte Per Second)	
1 gBps	High Speed Office LAN	Professional Office LAN Infrastructure
1 gBps	Fiber Optic LAN	Semi Professional Government LAN
8 gBps	Fiber Optic LAN	Professional Government LAN
10 gBps	Fiber Optic LAN	Very Professional Government LAN
20 gBps	Fiber Optic LAN	Optimum Professional Government LAN
30 gBps	Fiber Optic LAN	Ultimate Professional Government LAN

Measurements of Data Speed:
Today there are generally 2 ways of describing data transfer speeds: in bits per second, or in Bytes per second. As explained above, a Byte is made of 8 bits. Network engineers still describe network speeds (LAN Local Area Networks) in Bytes per second. This also describes Upload/Download Internet Speeds.

A lowercase "b" usually means a bit, while an uppercase "B" represents a byte.

Names for Different Sizes of Data:

Bit	A bit is simply a 1 or a 0. It is the most basic unit of data in a computer. It's like the dots and dashes in Morse code for a computer. It's also called machine language. Example “0” or “1”
Byte	In computer science a byte is a unit of measurement of information storage, that equals '8 bits', can be used to represent letters and numbers. For example, the number 01000001 is 8 bits long, and represents the letter A in ASCII.
KB	A KB is a unit of data that equals 1024 bytes. This is because 8 bytes cannot contribute into 1000.
MB	Megabyte is 1024kB squared, 10242
GB	A gigabyte is a unit of data storage worth a billion bytes meaning either exactly 1 billion bytes (10243) or approximately 1.07 billion bytes. More often than not in advertising, Gigabytes are presented as 1 billion bytes and not 10243 (read the fine print in your adverts!). This explains why a freshly formatted 500GB hard drive shows up at a 450GB one instead. Not too long ago many people were discussing storage in Megabytes. These days, storage has become so cheap that having Gigabytes is considered the norm.
TB	A terabyte is 10244 and is defined as about one trillion bytes, or 1024 gigabytes. Data centres such as those operated by Google handle thousands if not millions of terabytes of data each day. As storage becomes cheaper and faster, terabytes are becoming a commonly heard term.
PB	A petabytes, its the largest unit of storage data capacity.

Names for Different Transfer Sizes of Data:

Kilobyte per second	A **kilobyte per second** (**KB/s** or **KBps**) is a unit of data transfer rate equal to: 8,000 bits per second, or 1,000 bytes per second, or 8 kilobits per second.
Megabyte per second	A **megabyte per second** (**MB**/s or **MBps**) is a unit of data transfer rate equal to: 8,000,000 bits per second, or 1,000,000 bytes per second, or 1,000 kilobytes per second, or 8 megabits per second.
Gigabyte per second	A **gigabyte per second** (**GB**/s or **GBps**) is a unit of data transfer rate equal to: 8,000,000,000 bits per second, or 1,000,000,000 bytes per second, or 1,000,000 kilobytes per second, or 1,000 megabytes per second, or 8 gigabits per second.
Terabyte per second:	A **terabyte per second** (**TB**/s or **TBps**) is a unit of data transfer rate equal to: 8,000,000,000,000 bits per second, or 1,000,000,000,000 bytes per second, or 1,000,000,000 kilobytes per second, or 1,000,000 megabytes per second, or 1,000 gigabytes per second, or 8 terabits per second.

Conversion Formulas:

Name	Symbol	bit per second	byte per second	bit per second (formula)	byte per second (formula)
bit per second	bit/s	1	0.125	1	1/8
byte per second	B/s	8	1	8	1
kilobit per second	kbit/s	1,000	125	10^3	10^3/8
kibibit per second	Kibit/s	1,024	128	2^10	2^7
kilobyte per second	kB/s	8,000	1,000	8*10^3	10^3
kibibyte per second	KiB/s	8,192	1,024	2^13	2^10
megabit per second	Mbit/s	1,000,000	125,000	10^6	10^6/8
mebibit per second	Mibit/s	1,048,576	131,072	2^20	2^17
megabyte per second	MB/s	8,000,000	1,000,000	8*10^6	10^6
mebibyte per second	MiB/s	8,388,608	1,048,576	2^23	2^20
gigabit per second	Gbit/s	1,000,000,000	125,000,000	10^9	10^9/8
gibibit per second	Gibit/s	1,073,741,824	134,217,728	2^30	2^27
gigabyte per second	GB/s	8,000,000,000	1,000,000,000	8*10^9	10^9
gibibyte per second	GiB/s	8,589,934,592	1,073,741,824	2^33	2^30
terabit per second	Tbit/s	1,000,000,000,000	125,000,000,000	10^12	10^12/8
tebibit per second	Tibit/s	1,099,511,627,776	137,438,953,472	2^40	2^37
terabyte per second	TB/s	8,000,000,000,000	1,000,000,000,000	8*10^12	10^12
tebibyte per second	TiB/s	8,796,093,022,208	1,099,511,627,776	2^43	2^40

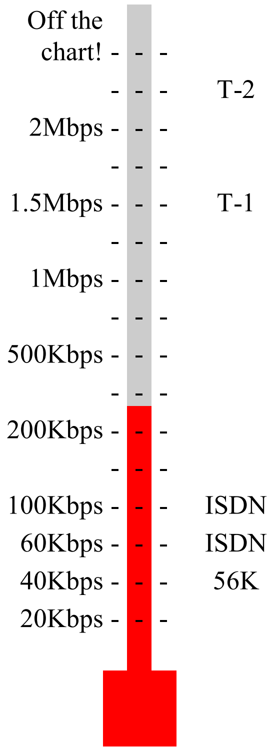
Examples:

Quantity	Unit	bits per second	bytes per second	Field	Description
56	kbit/s	56,000	7,000	Networking	56k modem - 56 kb/s - 56,000 b/s
64	kbit/s	64,000	8,000	Networking	64k ISDN - 64 kb/s - 64,000 b/s
1536	kbit/s	1,536,000	192,000	Networking	1536k T1 - 1,536,000 b/s (1.536 Mb/s)
1	Gbit/s	1,000,000,000	125,000,000	Networking	Gigabit Ethernet
10	Gbit/s	10,000,000,000	1,250,000,000	Networking	10 Gigabit Ethernet
1	Tbit/s	1,000,000,000,000	125,000,000,000	Networking	SEA-ME-WE 4 submarine cable - 1.28 terabits per second [1]
4	kbit/s	4,000	500	Audio data	minimum achieved for encoding recognizable speech (using special-purpose speech codecs)
8	kbit/s	8,000	1,000	Audio data	telephone quality
32	kbit/s	32,000	4,000	Audio data	MW quality
128	kbit/s	128,000	16,000	Audio data	128 kb/s MP3 - 128,000 b/s
192	kbit/s	192,000	24,000	Audio data	Nearly CD quality for a file compressed in the MP3 format
1,411.2	kbit/s	1,411,200	176,400	Audio data	CD audio (uncompressed, 16 bit samples × 44.1 kHz × 2 channels)
2	Mbit/s	2,000,000	250,000	Video data	VHS quality
8	Mbit/s	8,000,000	1,000,000	Video data	DVD quality
27	Mbit/s	27,000,000	3,375,000	Video data	HDTV quality
1.244	Gbit/s	1,244,000,000	155,500,000	Networking	OC-24, a 1.244 Gb/s SONET data channel
9.953	Gbit/s	9,953,000,000	1,244,125,000	Networking	OC-192, a 9.953 Gb/s SONET data channel
39.813	Gbit/s	39,813,000,000	4,976,625,000	Networking	OC-768, a 39.813 Gb/s SONET data channel, the fastest in current use
60	MB/s	480,000,000	60,000,000	Computer data interfaces	USB 2.0
625	MB/s	5,000,000,000	625,000,000	Computer data interfaces	USB 3.0
98.3	MB/s	786,432,000	98,304,000	Computer data interfaces	FireWire IEEE 1394b-2002 S800
120	MB/s	960,000,000	120,000,000	Computer data interfaces	Harddrive read, Samsung SpinPoint F1 HD103Uj [1]
133	MB/s	1,064,000,000	133,000,000	Computer data interfaces	PATA 33 - 133 MB/s
150	MB/s	1,200,000,000	150,000,000	Computer data interfaces	SATA 1.5Gb/s - First generation
300	MB/s	2,400,000,000	300,000,000	Computer data interfaces	SATA 3Gb/s - Second generation
600	MB/s	4,800,000,000	600,000,000	Computer data interfaces	SATA 6Gb/s - Third generation
533	MB/s	4,264,000,000	533,000,000	Computer data interfaces	PCI 133 - 533 MB/s

About Bandwidth:
Internet bandwidth is, in simple terms, the transmission speed or throughput of your connection to the Internet. However, measuring bandwidth can be tricky, since the lowest bandwidth point between your computer and the site you're looking at determines the effective transmission speed at any moment.

- Three factors outside of your computer control how quickly you can view Web pages:
- The Internet bandwidth between your computer and the site you're viewing.
- The round-trip time between your computer and the site you're viewing.
- The response time of the site you're viewing.

Speed Test Thermometer



Telephone Company Broadband Transmission Rates

Connection	Transmission Data Rate
DS-1 (Tier 1)	1.544 Mbit/s
E-1	2.048 Mbit/s
DS-3 (Tier 3)	44.736 Mbit/s
OC-3	155.52 Mbit/s
OC-12	622.08 Mbit/s
OC-48	2.488 Gbit/s
OC-192	9.953 Gbit/s
OC-768	39.813 Gbit/s
OC-1536	79.6 Gbit/s
OC-3072	159.2 Gbit/s

To test your internet speed, follow the link: http://www.ip-adress.com/speedtest/

Broadband World:

Broadband is often called "high-speed" Internet, because it usually has a high rate of data transmission. In general, any connection to the customer of 256 kbit/s (0.256 Mbit/s) or greater is more concisely considered broadband Internet. The International Telecommunication Union Standardization Sector (ITU-T) recommendation I.113 has defined broadband as a transmission capacity that is faster than primary rate ISDN, at 1.5 to 2 Mbit/s. The FCC definition of broadband is 768 kbit/s (0.8 Mbit/s). The Organization for Economic Co-operation and Development (OECD) has defined broadband as 256 kbit/s in at least one direction and this bit rate is the most common baseline that is marketed as "broadband" around the world. There is no specific bitrate defined by the industry, however, and "broadband" can mean lower-bitrate transmission methods. Some Internet Service Providers (ISPs) use this to their advantage in marketing lower-bitrate connections as broadband.

In practice, the advertised bandwidth is not always reliably available to the customer; ISPs often allow a greater number of subscribers than their backbone connection or neighborhood access network can handle, under the assumption that most users will not be using their full connection capacity very frequently. This aggregation strategy works more often than not, so users can typically burst to their full bandwidth most of the time; however, peer-to-peer (P2P) file sharing systems, often requiring extended durations of high bandwidth, stress these assumptions, and can cause major problems for ISPs who have excessively overbooked their capacity. For more on this topic, see traffic shaping. As takeup for these introductory products increases, telcos are starting to offer higher bit rate services. For existing connections, this most of the time simply involves reconfiguring the existing equipment at each end of the connection.

As the bandwidth delivered to end users increases, the market expects that video on demand services streamed over the Internet will become more popular, though at the present time such services generally require specialized networks. The data rates on most broadband services still do not suffice to provide good quality video, as MPEG-2 video requires about 6 Mbit/s for good results. Adequate video for some purposes becomes possible at lower data rates, with rates of 768 kbit/s and 384 kbit/s used for some video conferencing applications, and rates as low as 100 kbit/s used for videophones using H.264/MPEG-4 AVC. The MPEG-4 format delivers high-quality video at 2 Mbit/s, at the low end of cable modem and ADSL performance.

Increased bandwidth has already made an impact on newsgroups: postings to groups such as alt.binaries.* have grown from JPEG files to entire CD and DVD images. According to NTL, the level of traffic on their network increased from a daily inbound news feed of 150 gigabytes of data per day and 1 terabyte of data out each day in 2001 to 500 gigabytes of data inbound and over 4 terabytes out each day in 2002.[citation

Technology:

The standard broadband technologies in most areas are DSL and cable modems. Newer technologies in use include VDSL and pushing optical fiber connections closer to the subscriber in both telephone and cable plants. Fiber-optic communication, while only recently being used in fiber to the premises and fiber to the curb schemes, has played a crucial role in enabling Broadband Internet access by making transmission of information over larger distances much more cost-effective than copper wire technology. In a few areas not served by cable or ADSL, community organizations have begun to install Wi-Fi networks, and in some cities and towns local governments are installing municipal Wi-Fi networks. As of 2006, broadband mobile Internet access has become available at the consumer level in some countries, using the HSDPA and EV-DO technologies. The newest technology being deployed for mobile and stationary broadband access is WiMAX.

DSL (ADSL/SDSL):
Main article: Asymmetric digital subscriber line
Multilinking Modems

Roughly double the dial-up rate can be achieved with multilinking technology. What is required are two modems, two phone lines, two dial-up accounts, and ISP support for multilinking, or special software at the user end. This inverse multiplexing option was popular with some high-end users before ISDN, DSL and other technologies became available.

Diamond and other vendors had created dual phone line modems with bonding capability. The data rate of dual line modems is faster than 90 kbit/s. The Internet and phone charge will be twice the ordinary dial-up charge.

Load balancing takes two Internet connections and feeds them into your network as one double data rate, more resilient Internet connection. By choosing two independent Internet providers the load balancing hardware will automatically use the line with least load which means should one line fail, the second one automatically takes up the slack.

ISDN:

Integrated Service Digital Network (ISDN) is one of the oldest broadband digital access methods for consumers and businesses to connect to the Internet. It is a telephone data service standard. Its use in the United States peaked in the late 1990s prior to the availability of DSL and cable modem technologies. Broadband service is usually compared to ISDN-BRI because this was the standard broadband access technology that formed a baseline for the challenges faced by the early broadband providers. These providers sought to compete against ISDN by offering faster and cheaper services to consumers.

A basic rate ISDN line (known as ISDN-BRI) is an ISDN line with 2 data "bearer" channels (DS0 - 64 kbit/s each). Using ISDN terminal adapters (erroneously called modems), it is possible to bond together 2 or more separate ISDN-BRI lines to reach bandwidths of 256 kbit/s or more. The ISDN channel bonding technology has been used for video conference applications and broadband data transmission.

Primary rate ISDN, known as ISDN-PRI, is an ISDN line with 23 DS0 channels and total bandwidth of 1,544 kbit/s (US standard). ISDN E1 (European standard) line is an ISDN lines with 30 DS0 channels and total bandwidth of 2,048 kbit/s. Because ISDN is a telephone-based product, a lot of the terminology and physical aspects of the line are shared by the ISDN-PRI used for voice services.

An ISDN line can therefore be "provisioned" for voice or data and many different options, depending on the equipment being used at any particular installation, and depending on the offerings of the telephone company's central office switch. Most ISDN-PRI's are used for telephone voice communication using large PBX systems, rather than for data. One obvious exception is that ISPs usually have ISDN-PRI's for handling ISDN data and modem calls.

It is mainly of historical interest that many of the earlier ISDN data lines used 56 kbit/s rather than 64 kbit/s "B" channels of data. This caused ISDN-BRI to be offered at both 128 kbit/s and 112 kbit/s rates, depending on the central office's switching equipment.

Advantages:

- Constant data rate at 64 kbit/s for each DS0 channel.
- Two way broadband symmetric data transmission, unlike ADSL.
- 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.
- Call setup is very quick.
- Low latency
- ISDN Voice clarity is unmatched by other phone services.
- Caller ID is almost always available for no additional fee.
- Maximum distance from the central office is much greater than it is for DSL.
- 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:

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

T-1/DS-1:

These are highly-regulated services traditionally intended for businesses, that are managed through Public Service Commissions (PSCs) in each state, must be fully defined in PSC tariff documents, and have management rules dating back to the early 1980s which still refer to teletypes as potential connection devices. As such, T-1 services have very strict and rigid service requirements which drive up the provider's maintenance costs and may require them to have a technician on standby 24 hours a day to repair the line if it malfunctions. (In comparison, ISDN and DSL are not regulated by the PSCs at all.) Due to the expensive and regulated nature of T-1 lines, they are normally installed under the provisions of a written agreement, the contract term being typically one to three years. However, there are usually few restrictions to an end-user's use of a T-1, uptime and bandwidth data rates may be guaranteed, quality of service may be supported, and blocks of static IP addresses are commonly included.

Since a T-1 was originally conceived for voice transmission, and voice T-1's are still widely used in businesses, it can be confusing to the uninitiated subscriber. It is often best to refer to the type of T-1 being considered, using the appropriate "data" or "voice" prefix to differentiate between the two. A voice T-1 would terminate at a phone company's central office (CO) for connection to the PSTN; a data T-1 terminates at a point of presence (POP) or data center.

The T-1 line which is between a customer's premises and the POP or CO is called the local loop. The owner of the local loop need not be the owner of the network at the POP where your T-1 connects to the Internet, and so a T-1 subscriber may have contracts with these two organizations separately.

The nomenclature for a T-1 varies widely, cited in some circles a DS-1, a T1.5, a T1, or a DS1. Some of these try to distinguish amongst the different aspects of the line, considering the data standard a DS-1, and the physical structure of the trunk line a T-1 or T-1.5. They are also called leased lines, but that terminology is usually for data rates under 1.5 Mbit/s. At times, a T-1 can be included in the term "leased line" or excluded from it. Whatever it is called, it is inherently related to other broadband access methods, which include T-3, SONET OC-3, and other T-carrier and Optical Carriers. Additionally, a T-1 might be aggregated with more than one T-1, producing an nxT-1, such as 4xT-1 which has exactly 4 times the bandwidth of a T-1.

When a T-1 is installed, there are a number of choices to be made: in the carrier chosen, the location of the demarcation point, the type of channel service unit (CSU) or data service unit (DSU) used, the WAN IP router used, the types of bandwidths chosen, etc. Specialized WAN routers are used with T-1 lines that route Internet or VPN data onto the T-1 line from the subscriber's packet-based (TCP/IP) network using customer premises equipment (CPE). The CPE typical consists of a CSU/DSU that converts the DS-1 data stream of the T-1 to a TCP/IP packet data stream for use in the customer's Ethernet LAN. It is noteworthy that many T-1 providers optionally maintain and/or sell the CPE as part of the service contract, which can affect the demarcation point and the ownership of the router, CSU, or DSU.

Although a T-1 has a maximum of 1.544 Mbit/s, a fractional T-1 might be offered which only uses an integer multiple of 128 kbit/s for bandwidth. In this manner, a customer might only purchase 1/12th or 1/3 of a T-1, which would be 128 kbit/s and 512 kbit/s, respectively. T-1 and fractional T-1 data lines are symmetric, meaning that their upload and download data rates are the same.

Wired Ethernet:

Where available, this method of broadband connection to the Internet would indicate that Internet access is very fast. However, just because Ethernet is offered doesn't mean that the full 10, 100, or 1000 Mbit/s connection can be utilized for direct Internet access. In a college dormitory, for example, the 100 Mbit/s Ethernet access might be fully available to on-campus networks, but Internet access bandwidths might be closer to 4xT-1 data rate (6 Mbit/s). If you are sharing a broadband connection with others in a building, the access bandwidth of the leased line into the building would of course govern the end-user's data rate.

In certain locations, however, true Ethernet broadband access might be available. This would most commonly be the case at a POP or a data center, and not at a typical residence or business. When Ethernet Internet access is offered, it could be fiber-optic or copper twisted pair, and the bandwidth will conform to standard Ethernet data rates of up to 10 Gbit/s. The primary advantage is that no special hardware is needed for Ethernet. Ethernet also has a very low latency.

Rural broadband:

One of the great challenges of broadband is to provide service to potential customers in areas of low population density, such as to farmers, ranchers, and small towns. In cities where the population density is high, it is easy for a service provider to recover equipment costs, but each rural customer may require expensive equipment to get connected.

Several rural broadband solutions exist, though each has its own pitfalls and limitations[clarification needed]. Some choices are better than others, but are dependent on how proactive the local phone company is about upgrading their rural technology.

Wireless Internet Service Provider (WISPs) are rapidly becoming a popular broadband option for rural areas,[citation needed] although the technology's line-of-sight requirements hamper connectivity in areas with hilly and heavily foliated terrain. In addition, compared to hard-wired connectivity, there are security risks (unless robust security protocols are enabled); speeds are significantly slower (2 – 50 times slower); and the network can be less stable, due to interference from other wireless devices, weather and line-of-sight problems.Al[6]

Satellite Internet:
Main article: Satellite Internet

Satellites in geostationary orbits are able to relay broadband data from the satellite company to each customer. Satellite Internet is usually among the most expensive ways of gaining broadband Internet access, but in rural areas it may only compete with cellular broadband. However, costs have been coming down in recent years to the point that it is becoming more competitive with other broadband options.

Broadband satellite Internet also has a high latency problem is due to the signal having to travel to an altitude of 35,786 km (22,236 mi) above sea level (from the equator) out into space to a satellite in geostationary orbit and back to Earth again.. The signal delay can be as much as 500 milliseconds to 900 milliseconds, which makes this service unsuitable for applications requiring real-time user input such as certain multiplayer Internet games and first-person shooters played over the connection. Despite this, it is still possible for many games to be played, but the scope is limited to real-time strategy or turn-based games. The functionality of live interactive access to a distant computer can also be subject to the problems caused by high latency. These problems are more than tolerable for just basic email access and web browsing and in most cases are barely noticeable.

For geostationary satellites there is no way to eliminate this problem. The delay is primarily due to the great distances travelled which, even at the speed of light (about 300,000 km/second or 186,000 miles per second), can be significant. Even if all other signalling delays could be eliminated it still takes electromagnetic radio waves about 500 milliseconds, or half a second, to travel from ground level to the satellite and back to the ground, a total of over 71,400 km (44,366 mi) to travel from the source to the destination, and over 143,000 km (88,856 mi) for a round trip (user to ISP, and then back to user—with zero network delays). Factoring in other normal delays from network sources gives a typical one-way connection latency of 500–700 ms from the user to the ISP, or about 1,000–1,400 milliseconds latency for the total Round Trip Time (RTT) back to the user. This is far worse than most dial-up modem users' experience, at typically only 150–200 ms total latency.

Medium Earth Orbit (MEO) and Low Earth Orbit (LEO) satellites however do not have such great delays. The current LEO constellations of Globalstar and Iridium satellites have delays of less than 40 ms round trip, but their throughput is less than broadband at 64 kbps per channel. The Globalstar constellation orbits 1,420 km above the earth and Iridium orbits at 670 km altitude. The proposed O3b Networks MEO constellation scheduled for deployment in 2010 would orbit at 8,062 km, with RTT latency of approximately 125 ms. The proposed new network is also designed for much higher throughput with links well in excess of 1 Gbps (Giga bits per second).

Most satellite Internet providers also have a FAP (Fair Access Policy). Perhaps one of the largest disadvantages of satellite Internet, these FAPs usually throttle a user's throughput to dial-up data rates after a certain "invisible wall" is hit (usually around 200 MB a day). This FAP usually lasts for 24 hours after the wall is hit, and a user's throughput is restored to whatever tier they paid for. This makes bandwidth-intensive activities nearly impossible to complete in a reasonable amount of time (examples include P2P and newsgroup binary downloading).

The European ASTRA2Connect system has a FAP based on a monthly limit of 2Gbyte of data downloaded, with download data rates reduced for the remainder of the month if the limit is exceeded.

Advantages:

- True global broadband Internet access availability
- Mobile connection to the Internet (with some providers)

Disadvantages:

- High latency compared to other broadband services, especially 2-way satellite service
- Unreliable: drop-outs are common during travel, inclement weather, and during sunspot activity
- The narrow-beam highly directional antenna must be accurately pointed to the satellite orbiting overhead
- The Fair Access Policy limits heavy usage, if applied by the service provider
- VPN use is discouraged, problematic, and/or restricted with satellite broadband, although available at a price
- One-way satellite service requires the use of a modem or other data uplink connection
- Satellite dishes are very large. Although most of them employ plastic to reduce weight, they are typically between 80 and 120 cm (30 to 48 inches) in diameter.

Cellular broadband:
Main article: Cellular broadband

Cellular phone towers are very widespread, and as cellular networks move to third generation (3G) networks they can support fast data; using technologies such as EVDO, HSDPA and UMTS.

These can give broadband access to the Internet, with a cell phone, with Cardbus, ExpressCard, or USB cellular modems, or with cellular broadband routers, which allow more than one computer to be connected to the Internet using one cellular connection.

Power-line Internet:
Main article: Power line communication

This is a new service still in its infancy that may eventually permit broadband Internet data to travel down standard high-voltage power lines. However, the system has a number of complex issues, the primary one being that power lines are inherently a very noisy environment. Every time a device turns on or off, it introduces a pop or click into the line. Energy-saving devices often introduce noisy harmonics into the line. The system must be designed to deal with these natural signaling disruptions and work around them.

Broadband over power lines (BPL), also known as Power line communication, has developed faster in Europe than in the US due to a historical difference in power system design philosophies. Nearly all large power grids transmit power at high voltages in order to reduce transmission losses, then near the customer use step-down transformers to reduce the voltage. Since BPL signals cannot readily pass through transformers, repeaters must be attached to the transformers. In the US, it is common for a small transformer hung from a utility pole to service a single house. In Europe, it is more common for a somewhat larger transformer to service 10 or 100 houses. For delivering power to customers, this difference in design makes little difference, but it means delivering BPL over the power grid of a typical US city will require an order of magnitude more repeaters than would be required in a comparable European city.

The second major issue is signal strength and operating frequency. The system is expected to use frequencies in the 10 to 30 MHz range, which has been used for decades by licensed amateur radio operators, as well as international shortwave broadcasters and a variety of communications systems (military, aeronautical, etc.). Power lines are unshielded and will act as transmitters for the signals they carry, and have the potential to completely wipe out the usefulness of the 10 to 30 MHz range for shortwave communications purposes, as well as compromising the security of its users.

Wireless ISP:
Main article: Wireless Internet service provider

This typically employs the current low-cost 802.11 Wi-Fi radio systems to link up remote locations over great distances, but can use other higher-power radio communications systems as well.

Traditional 802.11b was licensed for omnidirectional service spanning only 100-150 meters (300–500 ft). By focusing the signal down to a narrow beam with a Yagi antenna it can instead operate reliably over a distance of many miles, although the technology's line-of-sight requirements hamper connectivity in areas with hilly and heavily foliated terrain. In addition, compared to hard-wired connectivity, there are security risks (unless robust security protocols are enabled); speeds are significantly slower (2 – 50 times slower); and the network can be less stable, due to interference from other wireless devices and networks, weather and line-of-sight problems.[6]

Rural Wireless-ISP installations are typically not commercial in nature and are instead a patchwork of systems built up by hobbyists mounting antennas on radio masts and towers, agricultural storage silos, very tall trees, or whatever other tall objects are available. There are currently a number of companies that provide this service. A wireless Internet access provider map for USA is publicly available for WISPS.

SOFAB

iBlast:
iBlast was the brand name for a theoretical bandwidth (7 Mbit/s), one-way digital data transmission technology from a Digital TV station to users that was developed between June 2000 to October 2005.

Advantages:

- Low cost, broadband data transmission from TV station to users. This technology can be used for transmitting website / files from Internet.

Disadvantages:

- One way data transmission.
- Privacy/security.
- Lack of 8VSB tuner built into many consumer electronic devices needed to receive the iBlast signal.
- In the end, the disadvantages outweighed the advantages and the glut of fiberoptic capacity that ensued following the collapse of the Internet bubble drove the cost of transmission so low that an ancillary service such as this was unnecessary, and the company folded at the end of 2005. The partner television stations as well as over 500 additional television stations not part of the iBlast Network continue to transmit separate digital signals as mandated by the Telecommunications Act of 1996.

Number	Prefix (Abbreviation)	Common Name
1000	Kilo (K)	Thousand
1000,000	Mega (M)	Million
1000,000,000	Giga (G)	Billion
1000,000,000,000	Tera (T)	Trillion
1000,000,000,000,000	Peta (P)	Quadrillion

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