A

Seminar report

On

Asymmetric Digital Subscriber Line

Submitted in partial fulfillment of the requirement for the award of degree
Of MCA

SUBMITTED TO:
www.studymafia.org

SUBMITTED BY:
www.studymafia.org

Preface

I have made this report file on the topic **Asymmetric Digital Subscriber Line;** I have tried my best to elucidate all the relevant detail to the topic to be included in the report. While in the beginning I have tried to give a general view about this topic.

My efforts and wholehearted co-corporation of each and everyone has ended on a successful note. I express my sincere gratitude to ……..who assisting me throughout the preparation of this topic. I thank him for providing me the reinforcement, confidence and most importantly the track for the topic whenever I needed it.

Acknowledgement

I would like to thank respected Mr…….. and Mr. ……..for giving me such a wonderful opportunity to expand my knowledge for my own branch and giving me guidelines to present a seminar report. It helped me a lot to realize of what we study for.

Secondly, I would like to thank my parents who patiently helped me as i went through my work and helped to modify and eliminate some of the irrelevant or un-necessary stuffs.

Thirdly, I would like to thank my friends who helped me to make my work more organized and well-stacked till the end.

Next, I would thank Microsoft for developing such a wonderful tool like MS Word. It helped my work a lot to remain error-free.

Last but clearly not the least, I would thank The Almighty for giving me strength to complete my report on time.

CONTENTS

DSL: An Introduction to ADSL

What is it?

Digital Subscriber Line (DSL) is a technology that brings high bandwidth information to homes and small businesses over the existing 2 wire copper telephone lines. Since DSL works on the existing telephone infrastructure, DSL systems are considered a key means of opening the bottleneck in the of the existing telephone network, as telephone companies seek cost-effective ways of providing much higher speed to their customers. DSL is a technology that assumes digital data does not require change into analog form and back.

This gives it two main advantages. Digital data is transmitted to your computer directly as digital data, and this allows the phone company to use a much wider bandwidth for transmitting it to you, thereby giving the user a huge boost in bandwidth compared to analog modems. Not only that, but DSL uses the existing phone line and in most cases does not require an additional phone line.

The digital signal can be separated or filtered, so that some of the bandwidth can be used to transmit an analog signal so that normal telephone calls can be made while a computer is connected to the internet. This gives "always-on" Internet access and does not tie up the phone line. No more busy signals, no more dropped connections, and no more waiting for someone in the household to get off the phone.

Because analog transmission only uses a small portion of the available amount of information that could be transmitted over copper wires, the maximum amount of data that you can receive using ordinary modems is about 56 Kbps (thousands of bits per second). With ISDN you can receive up to 128 Kbps.

This shows that the ability of your computer to receive information is constrained by the fact that the telephone company filters information that arrives as digital data, puts it into analog form for your telephone line, and requires your modem to change it back into digital.

In other words, the analog transmission between your home or business and the phone company is a bandwidth bottleneck. DSL however offers users a choice of speeds ranging from 144 Kbps to 1.5Mbps. This is 2.5 times to 25 times faster than a standard 56 Kbps dial-up modem. This digital service can be used to deliver bandwidth intensive applications like streaming audio/video, online games, application programs, telephone calling, video conferencing and other high-bandwidth services.

What different types are there?

HDSL is the pioneering high speed format, but is not a commercially viable option due to its need for two twisted pairs and does not have support for normal telephone services.

SDSL is symmetric DSL, and operates over a single twisted pair with support for standard voice transmission. The problem with this system is that it is limited to relatively short distances and suffers NEXT limitation due to the use of the same frequencies for transmitting and receiving.

IDSL stands for ISDN DSL, and is in many ways similar to ISDN technology. It's disadvantages are the lack of support for analog voice, and that its 128kbps rate is not much greater than that offered by standard 56kbps V90 modems.

VDSL provides very high bit rate DSL, up to 52Mbps, but requires shorter connections lengths than are generally practical. It has been used in conjunction with an experimental project, FTTC (Fiber to the Curb), but development in this area has slowed due to commercial viability issues.

ADSL is the most promising DSL technology, proving suitable for personal broadband requirements and allowing for the same channel to still act as a traditional POTS service.

Rate Adaptive DSL, **RADSL**, is a further advancement which is able to automatically optimize the ADSL data rate to suit the conditions of the line being used.

The Inner Workings

What is it?

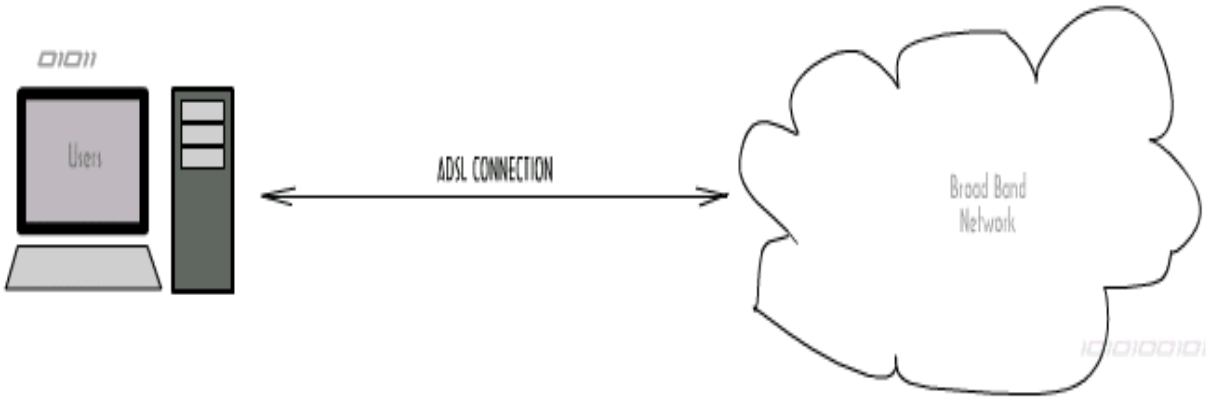
ADSL (Asymmetric Digital Subscriber Line) is a broadband communication technology used for transmitting digital information at a high bandwidth on existing phone lines to homes and businesses. ADSL converts existing copper telephone lines into access paths for multimedia and high speed data communications, and maintains the regular telephone voice services.

Unlike regular dialup phone service, ADSL provides continuously available, "always on" connection. ADSL is asymmetric in that it was specifically designed to exploit the one-way nature of most multimedia communication in which large amounts of information flow toward the user and only a small amount of interactive control information is returned. This meant that it uses most of the channel to transmit downstream to the user and only a small part to receive information from the user.

Several experiments with ADSL to real users began in 1996. In 1998, wide-scale installations began in several parts of the U.S. In 2000 and beyond, ADSL and other forms of DSL are expected to become generally available in urban areas. With ADSL (and other forms of DSL), telephone companies are competing with cable companies and their cable modem services. ADSL was conceived originally by researchers at telephone companies for video-on-demand type applications, but has since become focused on providing higher speed Internet services, such as the World Wide Web.

Asymmetric Digital Subscriber Line (ADSL) can supply the necessary bandwidth for applications such as; fast access to the Internet, video conferencing, interactive multimedia, and Video-On-Demand. This technology is designed to solve the most severe bottleneck in the data access network between the Central Office and the customer, or end-user. As a minimum, ADSL provides T1 rate or higher in the downstream direction and 64 kbps or higher in the upstream.

The "enhanced performance" ADSL Standard provides for multiple channels with total downstream rates as high as 8 Mbps, plus bi-directional channels up to 768 kbps. Since ADSL was designed for residential or small-office, home-office (SOHO) type services, it was designed from the outset to operate with “plain old telephone service” (POTS) simultaneously on the same line, so that an additional copper line would not need to be installed at each location. Therefore ADSL simultaneously accommodates analog (voice) information on the same line.



How it works

The copper wires have lots of room for carrying more than your phone conversations -- they are capable of handling a much greater bandwidth, or range of frequencies, than that demanded for voice. DSL exploits this "extra capacity" to carry information on the wire without disturbing the line's ability to carry conversations. The entire plan is based on matching particular frequencies to specific tasks.

POTS

One of the ways that POTS makes the most of the telephone company's wires and equipment is by limiting the frequencies that the switches, telephones and other equipment will carry. Human voices, speaking in normal conversational tones, can be carried in a frequency range of 0 to 3,400 Hertz (cycles per second). This range of frequencies is tiny. The wires themselves have the potential to handle frequencies up to several million Hertz in most cases.[1] The use of such a small portion of the wire's total bandwidth is historical -- remember that the telephone system has been in place, using a pair of copper wires to each home, for about a century. By limiting the frequencies carried over the lines, the telephone system can pack lots of wires into a very small space without worrying about interference between lines. Modern equipment that sends digital rather than analog data can safely use much more of the telephone line's capacity. DSL does just that.

Modems

POTS connects your home or small business to a telephone company office over copper wires that are wound around each other and called twisted pair. Traditional phone service was created to let you exchange voice information with other phone users and the type of signal used for this kind of transmission is called an analog signal. An input device such as a phone set takes an acoustic signal (which is a natural analog signal) and converts it into an electrical equivalent in terms of volume (signal amplitude) and pitch (frequency of wave change). Since the telephone company's signalling is already set up for this analog wave transmission, it's easier for it to use that as the way to get information back and forth between your telephone and the telephone company. That's why your computer has to have a modem - so that it can demodulate the analog signal and turn the values into a string of 1s and 0s.[9] This is called digital information.

Analog modems send their signals through the public switched telephone network, the same one that connects ordinary telephones.[3] ADSL modems "piggyback" their signals on top of the voice signal. On the phone company's premises, the line gets split - the voice calls are sent to the public switched telephone network, and the data transmission goes to the Internet. This method moves data off the phone companies' lines and instead uses connections optimized for carrying Internet traffic.

Signal Splitting

ADSL works by splitting the phone line into two frequency ranges. The frequencies below 4 kHz are reserved for voice, and the range above that is used for data. Several modulation technologies are used by various kinds of DSL, although these are being standardized by the International Telecommunication Union (ITU). Different DSL modem makers are using either Discrete Multi-Tone Technology (DMT) or Carrier-less Amplitude Modulation (CAP). A third technology, known as Multiple Virtual Line (MVL), is another possibility.

Presented here are the two competing and incompatible standards for ADSL. The official ANSI standard for ADSL is DMT. According to equipment manufacturers, most of the ADSL equipment installed today uses DMT. The earlier and more easily implemented standard was the CAP system, which was used on many of the early installations of ADSL. While both accomplish the same result with similar speeds, DMT and CAP are distinctively different in design and application, and are not compatible with each other.

CAP

CAP operates by dividing the signals on the telephone line into three distinct bands: Voice conversations are carried in the 0 to 4 KHz (kilohertz) band, as they are in all POTS circuits. The upstream channel (from the user back to the server) is carried in a band between 25 and 160 KHz. The downstream channel (from the server to the user) begins at 240 KHz and goes up to a point that varies depending on a number of

conditions (line length, line noise, number of users in a particular telephone company switch) but has a maximum of about 1.5 MHz (megahertz). This system, with the three channels widely separated, minimizes the possibility of interference between the channels on one line, or between the signals on different lines. [1]

DMT

DMT also divides signals into separate channels, but doesn't use two fairly broad channels for upstream and downstream data. Instead, DMT divides the data into 247 separate channels, each 4 KHz wide. One way to think about it is to imagine that the phone company divides your copper line into 247 different 4-KHz lines and then attaches a modem to each one. You get the equivalent of 247 modems connected to your computer at once! Each channel is monitored and, if the quality is too impaired, the signal is shifted to another channel. This system constantly shifts signals between different channels, searching for the best channels for transmission and reception. In addition, some of the lower channels (those starting at about 8 KHz), are used as bidirectional channels, for upstream and downstream information. Monitoring and sorting out the information on the bidirectional channels, and keeping up with the quality of all 247 channels, makes DMT more complex to implement than CAP, but gives it more flexibility on lines of differing quality.

Low-Pass Filter

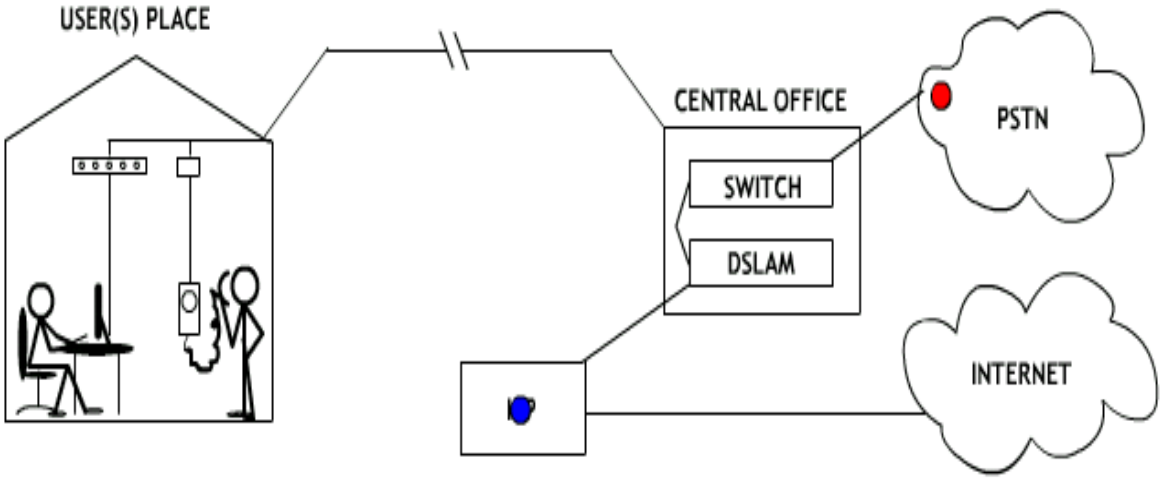
CAP and DMT are similar in one way that you can see as a DSL user. If you have ADSL installed, you were almost certainly given small filters to attach to the outlets that don't provide the signal to your ADSL modem. These filters are low-pass filters -- simple filters that block all signals above a certain frequency. Since all voice conversations take place below 4 KHz, the low-pass (LP) filters are built to block everything above 4 KHz, preventing the data signals from interfering with standard telephone calls.

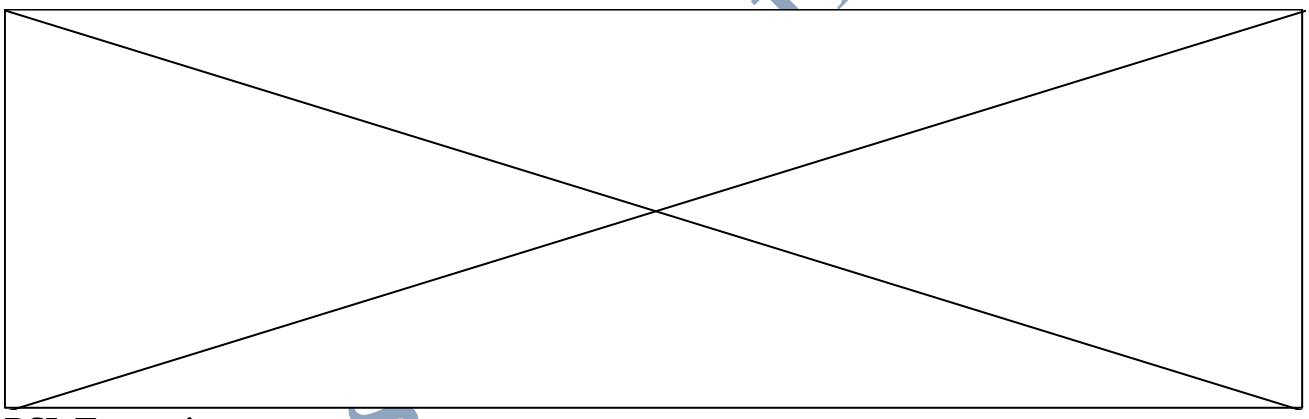
DSL Hardware/equipment

To interconnect multiple DSL users to a high-speed backbone network, the telephone company uses a Digital Subscriber Line Access Multiplexer (DSLAM). Typically, the DSLAM connects to an asynchronous transfer mode (ATM) network that can aggregate data transmission at gigabit data rates. At the other end of each transmission, a DSLAM de-multiplexes the signals and forwards them to appropriate individual DSL connections.

ADSL uses two pieces of equipment, one on the customer end and one at the Internet service provider, Telephone Company or other provider of DSL services. At the

customer's location there is a DSL transceiver, which may also provide other services. The DSL service provider has a DSL Access Multiplexer (DSLAM) to receive customer connections.





DSL Transceiver

Most residential customers call their DSL transceiver a "DSL modem." The engineers at the telephone company or ISP call it an ATU-R. Regardless of what it's called, it's the point where data from the user's computer or network is connected to the DSL line. The transceiver can connect to a customer's equipment in several ways, though most residential installation uses USB or 10 base-T Ethernet connections. While most of the ADSL transceivers sold by ISPs and telephone companies are simply transceivers, the devices used by businesses may combine network routers, network switches or other networking equipment in the same platform.

DSLAM

The DSLAM at the access provider is the equipment that really allows DSL to happen. A DSLAM takes connections from many customers and aggregates them onto a single, high-capacity connection to the Internet. DSLAMs are generally flexible and able to support multiple types of DSL in a single central office, and different varieties of

protocol and modulation -- both CAP and DMT, for example -- in the same type of DSL. In addition, the DSLAM may provide additional functions including routing or dynamic IP address assignment for the customers.

The DSLAM provides one of the main differences between user service through ADSL and through cable modems. Because cable-modem users generally share a network loop that runs through a neighbourhood, adding users means lowering performance in many instances. ADSL provides a dedicated connection from each user back to the DSLAM, meaning that users won't see a performance decrease as new users are added -- until the total number of users begins to saturate the single, high-speed connection to the Internet. At that point, an upgrade by the service provider can provide additional performance for all the users connected to the DSLAM.[2]

Various Applications of ADSL

The success of new multimedia services on the information highways with ever-present access by residential customers including faster internet, faster access to multimedia, e.g. VoD(Video on Demand) and digital TV, home shopping and home access to corporate networks will depend on cost effective solutions and the ability to reach as many subscribers as possible.

ADSL provides high-speed digital services and is being adopted by many telephone companies around the world.

The following is a comparison of download speeds between ADSL modems and other modems:

Modem Type Download Speed (for a short video – 7.5 MB)

6 Mbps ADSL	10 sec
1.5 Mbps ADSL	40 sec
1.5 Mbps Cable	40 sec
128 Kbps ISDN	7 mins
28.8 Kbps	35 mins
14.4 Kbps	71 mins

With the increase of speed of the internet, more applications arise, like **education**. The internet promises to revolutionise educational opportunities for future children. However at the moment, to avail of sufficient technology for this can be expensive and slow.

ADSL offers a fast on-ramp to the internet, other schools, communities colleges and universities, libraries at a low cost.

Multi-Service Selection is the ability to access information (e.g. financial and medical records) regardless of physical location using the internet, Corporate LANs and on-line databases. It is very beneficial to businesses. ADSL will increase the benefits furthermore, mainly because it increases the data services speed by up to 300 times.

Real Estate professionals need better access to market and property specifications so they have the latest listing information and can provide this information to their clientele. Agents will then be able to better manage the time spent with clients and match properties to the specific needs of the buyer. Much of this information is very large and therefore would be difficult to access easily and take an very long amout of time to download over conventional modems.

An ADSL system delivers high speed downloading and allows the selling agent to provide a more detailed graphical content of listed properties. So the buyer can see each property - from several angles; external views, internal rooms and features – and determine if the property is suitable.

Video Conferencing meets the need to meet face-to-face in business. It removes the barriers of location and enhances the customer experience while creating saving in travel cost and time. Video conferencing requires access to high speed communications media. ADSL is the optimum media solution for video conferencing due to its ability to make use of the approximately 750 million lines currently available to virtually every location on the planet.

Technology Description

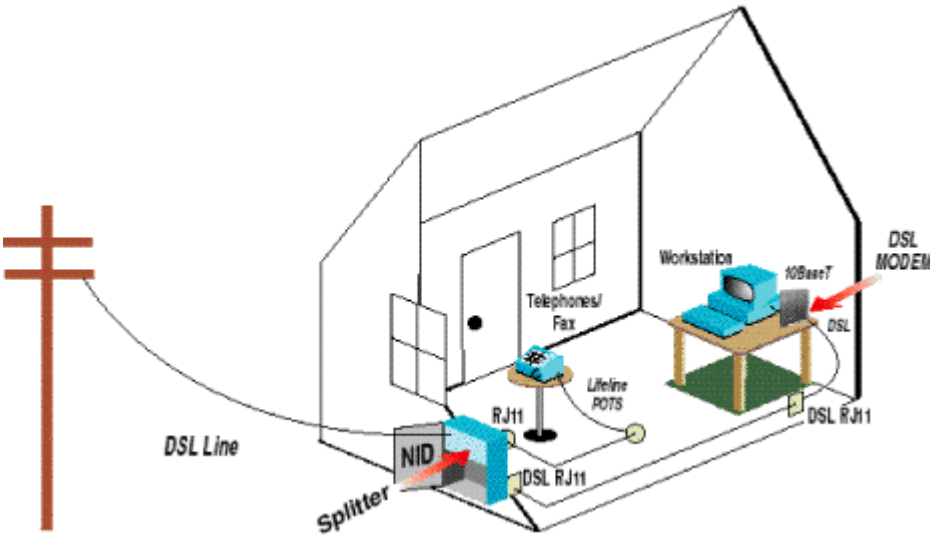
ADSL is a major advance in the information technology field. The main concept was to be able to work in larger bit rates with more efficiency over the present copper line technology. It is being viewed as a quick way to deliver data e.g. MPEG videos and live video conferencing over the existing copper lines. With an embedded base of over 125 million local loops in the United States alone, it makes sense to find a way to reuse this infrastructure.

There are however few basic requirements that ADSL had to satisfy:

* Full use of the copper line frequency spectrum (1.1Mhz).

* An advanced coding/decoding method.

* Ability to work simultaneously with POTS on the same copper line.

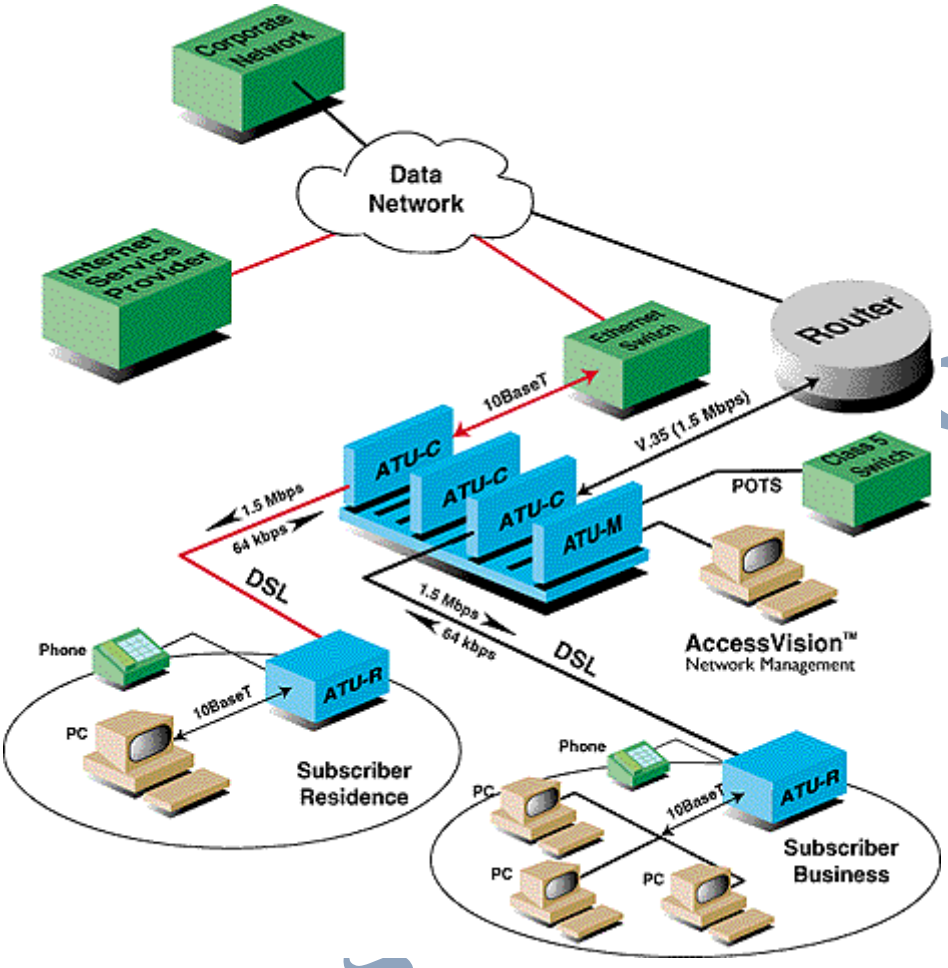


In the simplest version of this architecture a customer would only need a new ADSL modem. This modem would have RJ-11 jacks that would support the existing analog telephone service. (SEE DIAGRAM 1).

Using the existing subscriber line already installed from the central office to the customer's premises, two ADSL devices are connected to both ends of the local loop. (SEE DIAGRAM 2) The ADSL functions at the central office are handled by the ATU-C (ADSL Terminal Unit). The ATU-C transmits high-speed simplex channels downstream, and sends and receives lower-speed duplex channels. The ATU-C units may either be standalone, or mounted with others in an equipment shelf. In the future, the ATU-C will be integrated into access nodes and remote access nodes.

The ATU-C is paired with its mirror image, an ADSL remote terminal unit (ATU-R). The ATU-R is generally a standalone device, and receives downstream data and transceives corresponding duplex data.

A 'splitter' (which is a filter), one at the user end and one at the exchange end, separates the telephony signal from the ADSL signal (SEE DIAGRAM 1). This means that telephone calls can be made at the same time that data is being sent or received (i.e. a customer can surf the Internet and still make telephone calls).



ADSL Channel Configurations

Frequency Division Multiplexing (FDM) is used for ADSL over a 1 MHz spectrum. Diagram 3 illustrates the general allocation of the frequency spectrum above the voice band.The downstream (high capacity) data rate is largely dependent on the length of the subscriber line from the central office and the gauge of the twisted pair cable. Richard Karpinski outlines the length and gauge requirements in Table 1.

Loop Class	Description	Expected Rate
Class I	6,000 ft, 26 gauge	6.176 Mb/s
Class II	8,000 ft, 26 gauge	4.632 Mb/s
Class III	12,000 ft, 24 gauge or 9,000 ft, 26 gauge	3.088 Mb/s
Class IV	18,000 ft, 26 gauge	1.544 Mb/s

Table 1: Characteristics of ADSL (Karpinski 26)

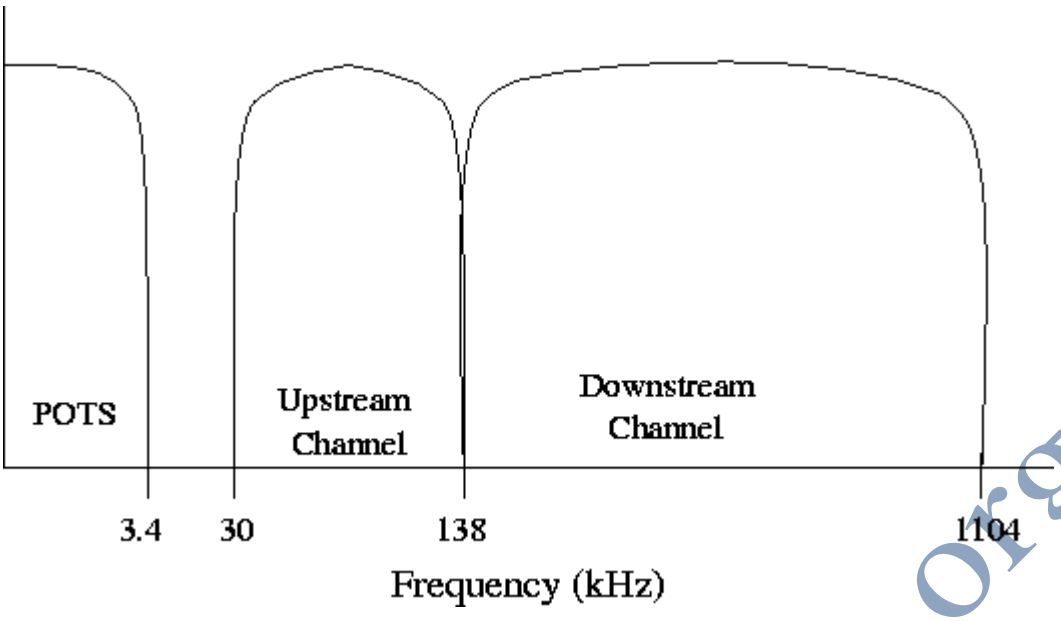


Diagram3: FDM for ADSL

Besides the 0-3.4 MHz band of voice communications, ADSL provides for a low speed upstream channel (from subscriber to central office) and a high speed downstream channel (from central office to subscriber). The baseband occupied by POTS (Plain Old Telephone Service) is split from the data channels which guarantees POTS services in the case of ADSL system failure (e.g. passive filters).

Depending on the loop length and cable gauge, an upstream channel of 9.6 to 384 kb/s provides for the subscriber's need to transmit data, while a downstream channel of 1.544 to 7.000 Mb/s delivers TV, video on demand and computer network connectivity. ADSL can provide VCR-type functionality, like fast forward, rewind, freeze frame, pause, etc. - on demand. There are two main methods of handling the FDM cinnection, CAP and DMT.

Competitors & Comparison

When you connect to the Internet, you might connect through a regular modem, through a local-area network connection in your office, through a cable modem or through a digital subscriber line (DSL) connection. DSL is a very high-speed connection that uses the same wires as a regular telephone line.

How it compares

In order to achieve data transmission rates of up to 300 times faster than analog modems, DSL technologies use a wider band of frequencies. Also, because DSL uses a digital signal, unlike today's analog modems, DSL transmissions do not pass through the regular analog voice telephone network. This element of DSL can clear the "congestion" that a lot of dial-up Internet traffic causes (the cause of delayed dial tone in certain high-Internet use areas).

ADSL provides always-on high-speed Internet access over a single dedicated telephone line; cable modems offer always-on high-speed Internet access over a shared cable television line. While cable modems have greater downstream (from the Internet into the home) bandwidth capabilities, that bandwidth is shared among all users in a neighbourhood, and will therefore vary, perhaps dramatically, as more users in a neighbourhood get online at the same time to compete for bandwidth. Cable modem upstream (from the home to the Internet) traffic will in many cases be slower than ADSL, either because the particular cable modem is inherently slower, or because too many people in a neighbourhood are trying to send or receive data at the same time. [5]

The big difference between ADSL and cable modems, however, is the number of lines available to each. There are no more than 12 million homes today that can support two-way cable modem transmissions, and while the figure is growing steadily, it will not catch up with telephone lines for many years. Only about 20 percent of homes are ready for cable modems now, compared to the 50 to 60 percent of homes that are ready for ADSL service. Additionally, many of the older cable networks are not capable of offering a return channel; consequently, such networks will need significant upgrading before they can offer high bandwidth services.

The strengths

Always-On Service

Always on service means that ADSL users are automatically connected. There is no need to dial to the ISP to establish a connection. This means that there will be no more problems such as busy signals. Dial up connections meant that they require a constant connection to the server and any number of problems can plague the connection. With an ADSL always on service, users won’t have to deal with dropped connections and disconnections.

Phone/Internet Simultaneously

With dial up connections, users had to tie up and occupy the phone line whenever they were using the internet. Some users even installed a second line so they could use both at once. With ADSL, even thought both the computer and phone require the same line, both can still operate at the same time as the other. This means that users can leave their Internet connection open, and still use the phone line for voice calls.

Speed

Speed is one of the main reasons for upgrading from a slower dial up connection. ADSL can reach speeds that are 25 times faster than a dial-up Modem. This means faster surfing, faster downloads, and faster games.

Dedicated Connection

From the technical standpoint, HFC cable networks have high capacity, although this capacity is shared by all the customers connected, meaning that the actual data rate is much lower. Also, most cable networks are designed for broadcast and are therefore one-way networks.

Existing infrastructure

DSL doesn't necessarily require new wiring; it can use the phone line you already have. The key benefit of DSL is that by transmitting on an existing telephone line, it reuses the existing infrastructure of installed copper cables. This saves the costs (as much as $1000-1500 per home) of installing a new dedicated wide bandwidth fibre optic cable. DSL is therefore very attractive for those with access to existing copper telephone lines.

Costs are incremental

Unlike most alternatives, DSL technology does not require a large upfront expenditure. Individual modem links can be provided as new customers demand service, and therefore costs are incremental. Some competitive methods such as hybrid-fibre coax (HFC, or cable) demand a high-up front expenditure to deploy head-end and cable infrastructure. This is often a high fixed cost regardless of how many customers are initially connected. Such systems are therefore highly sensitive to service penetration (i.e. the percentage of homes that take a service).

Integrated diagnostics and maintenance features

There are no problems with using DSL over old copper - that's the beauty of DSL. DSL technology is designed to cope with worst-case interference from adjacent cables (crosstalk) and has spare margins in the design. However, a telephone region may contain a percentage of very old, very poor quality cables with poor connections and poor deployment practice. Some DSL transceiver technologies, such as DMT are able to adapt the signals sent over the line. DMT type systems can therefore avoid frequency regions that are not suitable for transmission. DSL modems have integrated diagnostics and maintenance features which provide useful indicators to the operators of line

conditions and trends in cable loss. These features help with operations and management of the link. If a geographic region is of particularly poor quality it may already be affecting the quality and reliability of the regular telephone service and will often be targeted for rehabilitation with new cables.[7]

The weaknesses

Maximum range

ADSL is a distance-sensitive technology: As the connection's length increases, the signal quality decreases and the connection speed goes down. In general, the maximum range for DSL without a repeater is 5.5 km, though for speed and quality of service reasons many ADSL providers place a lower limit on the distances for the service. At the extremes of the distance limits, ADSL customers may see speeds far below the promised maximums, while customers nearer the central office have faster connections and may see extremely high speeds in the future. Another factor is the gauge of the copper wire. The heavier 24 gauge wire carries the same data rate farther than 26 gauge wire. If you live beyond the 5.5 kilometre range, you may still be able to have DSL if your phone company has extended the local loop with optical fibre cable. [3]

Asynchronous

The connection is faster for receiving data than it is for sending data over the Internet. This means that some services that require a high upload speed will be useless on an ADSL connection.

Not available everywhere

The service is not available everywhere. This has got to do mainly with distance. If distance is a limitation for DSL, then why it's not also a limitation for voice telephone calls. The answer lies in small amplifiers called loading coils that the telephone company uses to boost voice signals. Unfortunately, these loading coils are incompatible with ADSL signals, so a voice coil in the loop between your telephone and the telephone company's central office will disqualify you from receiving ADSL. Other factors that might disqualify you from receiving ADSL include:

- Bridge taps - These are extensions, between you and the central office, that extend service to other customers. While you wouldn't notice these bridge taps in normal phone service, they may take the total length of the circuit beyond the distance limits of the service provider.
- Fibre-optic cables - ADSL signals can't pass through the conversion from analog to digital and back to analog that occurs if a portion of your telephone circuit comes through fibre-optic cables.
- Distance - Even if you know where your central office is (don't be surprised if you don't -- the telephone companies don't advertise their locations), looking at a

map is no indication of the distance a signal must travel between your house and the office.

The Current & Future Status

The current uses

A connection that's up to 25x times faster will let you use the Internet as it was meant to be. Web pages will snap up on your screen right away, files will download with amazing speed, and you'll be able to play network games smoothly. The DSL connection is a dedicated link. Unlike ISDN and analogue modem connections the DSL connection is up 24 hours a day. This gives you some additional options like running servers.

DSL is basically a high speed data "pipe" that can be used to transmit any high speed data application, such as video conferencing, fast Internet access, interactive multimedia, on-line home banking, remote office or remote LAN applications. For example, an advertising agency might use a DSL modem in order to send heavy graphic files back and forth for client approvals. They could then submit the print advertisement to the publication in the same way, in a matter of seconds. Another application is known as telecommuting, or work-from-home. An employee with a DSL modem at home will be able to be connect at nearly LAN speeds to their office network, using their regular telephone line width POTS (plain old telephone service) remaining available for telephone calls, faxes, and so on.[10]

The current usage

On March 6, 2002, it was announced that DSL deployment reached 18.7 million subscribers worldwide at the end of 2001. "These figures confirm DSL as the world's leading broadband technology, exceeding global cable modem subscribers by more than five million," said DSL Forum chairman, William Rodey. "With 188% global growth in 2001 and accelerating deployment in many markets a round the world, DSL broadband is well on the way to a global mass market."[11]

Region	Total DSL Subscribers	Residential DSL Subscribers	Residential % of Users	Business DSL Subscribers	Business % of Users
Asia-Pacific	7,949,000	6,970,000	87.7	979,000	12.3
North America	5,510,000	4,267,000	77.4	1,242,000	22.6
Western Europe	4,232,000	3,523,000	83.2	709,000	16.8
South & South East	499,000	374,000	75	125,000	25

Asia					
Latin America	380,000	271,000	71.3	110,000	28.7
Eastern Europe	53,000	32,000	60.4	21,000	39.6
Middle East & Africa	48,000	37,000	77	11,000	23
Global Totals	18,671,000	15,473,000	82.9	3,196,000	17.1

"Today, most DSL enabled phone lines are residential," said Rodey, "but many are already being used for business purposes by people working at home outside normal office hours, telecommuting or keeping in touch with colleagues working in other time zones. With the deployment of SHDSL services specifically designed for small and medium-sized businesses, particularly in Europe during 2002, we will expect to see additional growth in business phone lines enabled by DSL, in parallel with residential subscriber growth."

Conclusion

ADSL was born of the need for speed coupled with the desire for low cost dedicated remote network access. There is no doubt that ADSL will revolutionize the way we see the World Wide Web, and quite possibly witness the demise of home entertainment as we know it. As the phoenix from the flames we will see ADSL emerge heralding the coming of a new age of remote multimedia. There is little doubt that ADSL will be around for a long time to come, albeit under another name.

If we are to truly realise the potential of the cyberspace concept we will need to access it with as much convenience as turning on the television. With the internet influencing our lives more and more each day, it will be high speed ADSL connections that power the revolution. In the future people will view ADSL like they view cable TV. That such a small object as an ADSL card may weild such an influence over our lives may seem a little unbalanced, or is that asymmetric

References

- www.google.com
- www.wikipedia.com
- www.studymafia.org