



DSL Q&A - Part One

With the tremendous growth in Internet usage, the need to provide faster connection speeds continues. Traditional technologies such as modems can often not provide the desired increase in speed (bandwidth). A number of new technologies are being developed with 'DSL', that provides high speed over existing telephone cabling becoming increasingly popular. Vicomsoft has gained valuable experience and knowledge about DSL Internet access and would like to make this information available to those interested in the subject.

We present this information in a Q&A (Questions and Answers) format that we hope will be useful. Our current knowledge relates primarily to DSL access in the USA and Canada, although we understand that there are plans to deploy DSL services in a number of countries world-wide. The explanations we provide should apply equally to DSL access in most countries. We welcome feedback and comments from any readers on the usefulness or content.

Part one of the Q&A is general in nature and although it contains technical phrases (since it is a technical subject) we have used as few as possible. Part Two is technical in nature and for those who really need to delve further into the technology issues. The DSL FAQ gives an insight as to how users of our products would use the DSL technology and is available for both Windows and Mac OS.

All aspects of the Internet, and especially new technology series such as DSL are constantly changing. We are providing the best information available to us as at date of writing and intend to update it periodically as we become aware of changes and/or more information becomes available. We intend this Q&A as a guide only and recommend that users obtain specific information to determine applicability to their specific requirements. (This is another way of saying that we can't be held liable or responsible for the content).

Vicomsoft does not sell DSL modems or Internet access. Our software enables the interconnection of local and wide area networks to the Internet using any connection method including: modem, cable modem, ISDN, T1 and DSL. Accordingly we are neutral on the technologies or methods used by people connect to the Internet (but admit to being biased to encouraging people to connect somehow).

DSL access to the Internet is becoming increasingly available at decreasing prices directly or indirectly from an increasing number of telephone companies ('Telcos'). It also appears to becoming more accepted by small business users, education and large businesses. From our tests, from our own use, from feedback we have received from users, from the recent progress made by the DSL companies and from what we have read, it would appear that accessing the Internet via DSL systems is an option that is definitely worth considering for users who have it available to them.

Part One: Questions

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Part One: Answers

1. What is DSL?

DSL refers to a class of technology used to obtain more bandwidth over existing copper telephone cabling running between a customer's premises and a Telco's Central Office. DSL allows simultaneous voice and high-speed data services such as super fast Internet access over a single pair of copper telephone wires. There are several variations of 'DSL' that include:

ADSL -

R-ADSL -

HDSL -

VDSL -

SDSL - Asymmetric Digital Subscriber Line

Rate-Adaptive Digital Subscriber Line

High Bit-Rate Digital Subscriber Line

Very High Bit-Rate Digital Subscriber Line

Symmetric Digital Subscriber Line

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As the saying goes, 'there is no such thing as a free lunch' and a Telco must make compromises between costs, distance, speeds, reliability, equipment, etc when implementing or offering 'DSL' services. Each variation of 'DSL' reflects the different compromises made by Telco's when deciding how far and how fast data can flow on a particular kind of subscriber line.

2. **What's special about DSL?**

The cables connecting most households to the phone network are mainly simple twisted pair copper wires, which have only been able to carry analogue traffic. Modem speeds have gradually increased through the use of various compression and other techniques, but at today's fastest (56 kbit/s) they are approaching the theoretical limit for this technology.

DSL technology enables much higher speeds across the twisted pair lines from the Central Office to the home, school or business. Speeds up to 2 Megabits per second are achievable in some areas - 30 or more times faster than today's fastest modems. This means that some consumers and tele-workers will be able to use applications that need these higher speeds even if high performance (fibre) cable networks are not available in their location.

3. **What is PPPoE?**

PPPoE stands for Point to Point Protocol over Ethernet. PPP is usually used over serial communications like dial-up modem connections. Many DSL Internet service providers now use PPP over Ethernet because of its added login and security features. A whole Q&A document is dedicated to PPPoE here <http://www.vicomsoft.com/knowledge/reference/PPPoE.html>

4. **What is a DSL modem?**

a DSL "modem" is a device that is placed at either end of the copper phone line to allow a computer (or LAN) to be connected to the Internet through a DSL connection. Unlike a dial up connection, it usually does not require a dedicated phone line (a POTS splitter box enables the line to be shared simultaneously). DSL is considered to be the next generation of modem technology. Although DSL modems resemble conventional analogue modems they provide much higher throughput.

5. **How does DSL compare to access using normal (analogue) modems, Cable modems and ISDN?**

Analogue modems allow digital data to flow over the Telco's existing analogue network by performing a digital to analogue conversion for transmission onto the network and vice versa on the receiving end. The only necessity for analogue modems is that each end of the call must have a compatible modem. This makes analogue modem connections the most ubiquitous form of data communications available today. However, analogue modems are limited by the Telco's voice bandwidth service. Current analogue modems are struggling to achieve rates of only 56 kbit/s over those networks.

Cable modems are capable of very high speed throughput (bandwidth) and are used when accessing the Internet across a television cable company's network (usually fibre). However



access via cable modem from a cable company is normally structured in a way that has a group of users sharing a 'node' in a specific area. The more subscribers in that area, the less bandwidth is available to each. So although the cable modem itself can handle high throughput, the bandwidth available to a user may be less.

ISDN is a Telco technology that provides digital service across existing telephone copper wiring typically in increments of 64 Kbit/s channels. ISDN has been around for many years, but its popularity in the USA is only now beginning to increase as a result of limitations of analogue modems and the rise of Internet usage. Roll-out of this service by most Telcos in the USA has been slow due to high costs, lack of standards and low acceptance rate by consumers. [Note: ISDN is widespread throughout a number of other countries including Germany, France and the UK].

DSL are also Telco technologies but unlike ISDN they appear to be gaining widespread Telco approval. Backed by the Telcos, they appear the candidates to provide next generation high bandwidth services to the home, school or business using the existing telephone cabling infrastructure. DSL technology puts a high speed digital link on the copper telephone line, and routes it directly to a packet switching data network for efficient wide area transmission, bypassing the voice network. DSL modems use digital coding techniques to squeeze up to 99% more capacity out of a copper telephone line without interfering with regular phone services. That means you could be simultaneously talking on the phone or sending a fax - while accessing web pages on the Internet.

6. What are the main benefits of connecting to the Internet via DSL?

DSL can provide virtually instantaneous transmission of voice, data and video over ordinary copper phone lines. A DSL connection can eliminate the frustrating delays associated when waiting to download information and graphics from the Internet. It provides residential subscribers with a cost effective uninterrupted high speed Internet connection. For schools, businesses and branch offices, DSL provides fast access to mission-critical information on corporate Intranet servers and the Internet. Another significant benefit is that a DSL connection is always on-line (like a LAN connection) with no waiting time for dialling or connecting.

7. Why has it taken Telephone companies so long to deploy DSL?

There are many reasons that affect the speed and ubiquity of actual deployment. Factors such as the level of an installed ISDN base, the existence of cable competition, the state of the existing local loop (distance between the central office and service user) architecture, the level of Internet access, content provision, and pricing, as well as individual Telco's strategies will create different conditions for DSL deployment on a region-by-region basis.

Though wide-scale commercial deployments have begun, there is still work to be done before DSL can be deployed to the consumer mass market. The Universal ADSL Working Group (UAWG) has agreed to establish a standard for interoperability in order to simplify DSL installation and facilitate retail solutions for the consumer mass market. Members of the group include Microsoft, Intel, Compaq, Ameritech, Bell Atlantic, Bell South, GTE, SBC Communications, Sprint and U S West. Other companies participating in the group include



communications and chip companies such as Texas Instruments, Rockwell, Alcatel Telecom, Ariel Corporation, Ericsson Telecom AB, GlobeSpan Technologies and Nortel.

8. Can everyone have Internet access via DSL services?

Unfortunately DSL services are not yet universally available. DSL is being implemented in several metropolitan areas, but interoperability issues have to be resolved before DSL is fully implemented. Other factors also affect the rate of implementation. The cost of building the DSL infrastructure from the existing Telco's switching networks is expensive and may impact other revenue sources. Another consideration is whether the user is within a usable distance from the Central Office switching station. DSL networks do however continue to grow and the new telephone and Internet access sources of revenue should encourage expansion.

In addition, not all Telco's are offering Internet access yet and many that do are continuing to do so on a limited or trial basis.

Bell South has already begun to roll out its DSL service in major metropolitan markets in Louisiana, Georgia, Alabama, Florida, and North Carolina. In 1999, the company will extend service to another 23 markets. GTE's DSL service is now available in the following states: California, Florida, Hawaii, Illinois, Indiana, Kentucky, North Carolina, Oregon, Texas, Washington, Michigan, Ohio, Virginia, Missouri, Pennsylvania, and Wisconsin. Bell Atlantic's DSL service now is available in selected Washington, D.C., Pittsburgh, Philadelphia and New Jersey metropolitan areas. New York and Boston will be among the markets added early in 1999. US West's roll out of their DSL service is expected to reach over 400,000 customers in the Phoenix area by the end of 1999.

ISP's slow deployment of DSL has made it difficult to predict how widely the services will be available. The Yankee Group Inc. expects 300,000 DSL lines to be installed by year-end and 1.78 million by the year 2000. Similarly, TeleChoice Inc. forecasts 1 million lines by the turn of the century. (A year ago, however, TeleChoice estimated 5 million DSL lines by 2000).

(Source: <http://www.lantimes.com/98/98feb/802b001a.html>)

Many industry analysts predict that throughout 1999 DSL services will be deployed on a larger scale and made available to the consumer mass market. If you are interested in access to the Internet via DSL but are unsure whether its available in your area, call your Telco or ISP and ask them about their DSL plans.

9. When will DSL be available to the rest of the world?

In other markets such as Germany and the Scandinavian countries, large Telco's have made public commitments to DSL deployment. However in most industrialised markets, DSL deployment is currently limited to trials. This is presently the case in Japan, New Zealand, Australia, Switzerland, Belgium, the UK, Netherlands, France, Italy, Spain, Taiwan, and Korea. (Trials and/or limited deployment are also occurring in some developing countries, e.g. Brazil, China.)

10. How do I get connected to the Internet via DSL?

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If you are already connected to an ISP for Internet access, you will only have to determine if your ISP supports DSL technology and what their rates are. If you are not yet connected to the Internet, you will have to determine which ISP is available to you, if you are able to purchase Internet access only, if you are obligated to buy or rent the connection equipment, such as modems, routers or splitters from your ISP or if you can purchase them separately. The technology is changing rapidly, but the important thing is to ensure your equipment matches the provider's equipment.

11. Do I need a separate telephone line for the DSL service?

This will depend upon your present set-up and the type of DSL service that is being installed. If you are using ADSL, your Telco or DSL ISP will put a POTS splitter box in your home or office to separate the voice and data traffic coming through on the same line. Your computer, telephone and Internet access will all be routed through this single connection. If you are using SDSL, a separate phone line may need to be installed for your DSL connection in addition to your normal telephone line.

12. What is the theoretical performance of DSL?

As mentioned previously, there are different types of DSL services. They are:

- ADSL -
- R-ADSL -
- HDSL -
- VDSL -
- SDSL - Asymmetric Digital Subscriber Line
- Rate-Adaptive Digital Subscriber Line
- High Bit-Rate Digital Subscriber Line
- Very High Bit-Rate Digital Subscriber Line
- Symmetric Digital Subscriber Line

Here is a simple table for you to see the theoretical performances of the different types of DSL services. As you can see the theoretical performance of some DSL services are quite comparable to T1 and E1 speeds that are usually more appropriate in Universities and corporate environments. Note however that many users of high speed connectivity often purchase subsets (i.e. lesser) bandwidth than the theoretical maximum.

Connection	Maximum Transfer Rate	Distance Limitations Using 24-Gauge Wire
56 K Analogue Modem	56 kbit/s	None
ISDN	Up to 128 Kbps (Multilink PPP)	3.4 miles / 5.4 Km
Cable Modem	10-30 Mbit/s Downstream 128 kbit/s to 10 Mbit/s Upstream (Shared bandwidth)	30 miles / 48 Km over coaxial cable
ADSL	1.5 - 8 Mbit/s Downstream Up to 1.544 Mbit/s Upstream	3.4 miles / 5.4 Km

HDSL	T1 - 1.544 Mbit/s (2 wire pairs) E1 - 2.048 Mbit/s (3 wire pairs)	2.2 miles / 3.6 Km 3.4 miles / 5.4 Km
SDSL	T1 - 1.544 Mbit/s E1 - 2.048 Mbit/s	2 miles / 3 Km
VDSL	13 - 52 Mbit/s Downstream 1.5 - 2.3 Mbit/s Upstream Up to 34 Mbit/s if symmetric	1,000 ft/304 m 4,500 ft/1371 m depending on speed
R-ADSL	1.5 - 8 Mbit/s Downstream Up to 1.544 Mbit/s Upstream	3.4 miles / 5.4 Km

13. What is the real-world performance of DSL?

One factor which affects the performance of DSL services is distance from the Telco Central Office to the home, school or business which the DSL line is connected to. In the table above you will see a column for distance. This represents the maximum distance at which you would see the bandwidth listed for that service. The further away you are from the Central Office, the lower the perceived speed.

14. How do I determine how far I am from my Central Office?

Your ISP or Telco should be able to calculate this information for you in airline and/or wire feet. The closer you are to your Central Office, the higher the speeds you can achieve using DSL. This will also determine the type of DSL service available to you.

15. What equipment do I need to get connected to the Internet?

The hardware required to make DSL work is effectively a DSL modem (in your home or office). It is possible to lease your DSL modem directly from your Telco or DSL ISP to ensure complete compatibility with their network equipment.

There are two other pieces of equipment you'll need on your end to make your DSL modem work: a computer, and an interface card such as an Ethernet 10base T card.

16. How does the DSL line physically attach to my computer?

The DSL modem is plugged into the telephone line and the ethernet cable connected to the DSL modem is plugged into the back of a computer, into a router or into a ethernet hub to distribute the access to other computers. A router requires a single IP address for itself, supplied by the ISP. The router then connects to an ethernet network utilising ethernet cables. If the modem is plugged directly into your computer, a specially wired cable called a "crossover cable"(which can be purchased for around \$5.00) has to be used. DSL modems can also be an internal PCI card which accept the DSL line directly.

17. What if I have more than one computer?



If you wanted to connect several computers at one location to the Internet using traditional one-by-one methods each computer system would require an individual modem/ISDN Terminal Adapter, separate telephone lines, separate ISP accounts, etc. Alternatively you could use a dedicated hardware router and obtain a business account from your ISP. These usually require hardware updates above and beyond the initial cost. This alternative also requires technical skills (hardware routers are not for the faint hearted) and the business ISP account may be costly.

A Vicomssoft solution is an easy-to-use cost-effective alternative. It will allow multiple users on a local network to simultaneously share one ordinary ISP account and one DSL connection to the Internet.

The combination of a Vicomssoft solution and a DSL modem is ideal in a number of scenarios where Internet access is required by more than one computer, whether at home, school or in business.

18. What is the set-up process?

Your Telco or ISP should be able to run engineering tests on your lines which will determine what speeds are available to you. Decide on a cost/speed package. Get a due date from your ISP (usually within 10 to 30 days). Before the due date the lines up to your home, school or business will be provisioned for DSL. The hardware will be brought to you or sent to you by the due date. On the due date technicians will come to your home or business to 'turn up' the circuit (so that you can use the DSL service). Before this day you should square away the details of your account with your ISP with regard to a regular dial-up account, DNS, IP addresses, and billing.

19. Does DSL provide regular phone service also?

Some Telco's provide POTS service on the DSL line. This means that you get a POTS splitter box that lets you plug a telephone, fax machine, regular modem, or answering machine into the DSL line in addition to the DSL modem. Simultaneous use of POTS service does not 'eat into' DSL bandwidth. However, some Telco's do not offer the capability of running POTS on their DSL lines and will install a new line to be used only for the DSL service.

20. Can I convert my existing line to DSL or do I need a new line?

In many cases you can convert an existing line to a DSL line. However, the best path to take would be to call your local Telco or ISP for further information.

21. Can I convert an ISDN line to DSL?

ISDN lines can, in most cases, be converted to DSL.

22. How much does it cost?



It varies. DSL service availability is still in the early stages, but pricing in some areas has been very aggressive. There are charges for the line and hardware and also for the Internet access. Check with your Telco or ISP to find out about pricing.

23. **How am I billed?**

This will depend on your ISP. Some will bill you directly for all costs associated with your DSL lines. Others will charge only for Internet access and you will receive a separate bill from your Telco for their services.

24. **How should I choose between what type of connection to use?**

The decision to use either DSL or a dial up service depends upon the facilities offered by your Telco or DSL ISP when compared against another ISP offering a dial up service. The following are a few considerations when deciding what type of connection to use and who to use to provide your Internet access.

- * What Internet services do you want to use, such as email, web browsing, file transfers, etc.?
- * How much does the Internet account cost per month?
- * Are there costs for making a phone call to your ISP?
- * Does your ISP have any additional charges?
- * Does each service offer you sufficient email addresses?
- * Are you able to get personal web space?
- * Do you require additional phone lines to be installed?
- * Can the ISP be accessed through a local call?

Considerations might be the number of mailboxes that you are allowed, the amount of personal web space, is your Internet Service a flat fee or is it a scalable charge depending upon the amount of data you transfer and the services you require.

Firstly, it is a good idea to decide what is important to you, then, which of the available providers is best suited to deliver those services.

24. **What is the point of having all this bandwidth available?**

Initially this service was designed with business in mind. It was meant for remote Local Area Networks to be able to act seamlessly as one network. It was also designed for the person working from the home office to have rapid access to the network in order to maximise their productivity and time. The benefits of having this service are obvious. These services allow the home office/small office user the capability of accessing network servers (i.e. WWW, mail, FTP, etc.) without being restricted by the long access and transfer times imposed by ordinary analogue modem and ISDN lines.

25. **What is "Splitterless" DSL Technology?**

As mentioned previously a POTS splitter box divides the standard telephone line so it can carry voice and data simultaneously. "Splitterless" DSL technology (also referred to as DSL-Lite)

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does not require an on-site installation (as no box needs to be installed). "Splitterless" DSL achieves that division with software rather than hardware.

26. Can I convert from my existing DSL service to "Splitterless" DSL?

Standard DSL technology is convertible to "splitterless" technology. Telco's are expected to offer "splitterless" DSL to all existing and future subscribers when it becomes widely available throughout 1999. If you are interested in "splitterless" DSL call your Telco or DSL ISP for more information.

27. What's the downside of using DSL?

There is a cost to a Telco associated with deploying DSL but it is small compared with the cost of digging up roads to install cable. The cost of DSL is expected to drop once the new "splitterless" technology (DSL-Lite) becomes widely available. There are also limits to the distance over which DSL can be used, so that the user needs to be within a maximum distance of the Central Office.

28. What's the bottom line? What does Vicomssoft recommend?

Vicomssoft does not sell DSL or access to the Internet via DSL modems. Furthermore, our products can be used with any type of Internet connection, be it modem dial-up, ISDN, T1, DSL or cable modem. In other words, we are neutral on the subject of how people connect to the Internet (but will admit to being biased to encouraging them to do so in some way).

From our tests and customer feedback, plus the recent progress made by phone companies and Internet Service Providers, accessing the Internet via ADSL is an option that is definitely worth considering for users who have it available to them.