Course Name: A Level (2nd Sem) Subject: DCN

Topic: DIGITAL SUBSCRIBER LINE Date: 26-03-20

Digital Subscriber Line:

- After traditional modems reached their peak data rate, telephone companies developed the technology, DSL, to provide higher-speed access to the Internet.
- Digital subscriber line (DSL) technology is one of the most promising for supporting high-speed digital communication over the existing local loops.
- DSL technology is a set of technologies, each differing in the first letter (ADSL, VDSL, HDSL, and SDSL). The set is often referred to as xDSL, where *x* can be replaced by A, V, H, or S.

ADSL:

- The first technology in the set is asymmetric DSL (ADSL). ADSL, like a 56K modem, provides higher speed (bit rate) in the downstream direction (from the Internet to the resident) than in the upstream direction (from the resident to the Internet). That is the reason it is called asymmetric.
- ADSL is an asymmetric communication technology designed for residential users; it is not suitable for businesses.

ADSL Lite:

- A new version of ADSL technology called ADSL Lite (or Universal ADSL or splitterless ADSL) allows an ASDL Lite modem to be plugged directly into a telephone jack and connected to the computer. The splitting is done at the telephone company.
- It can provide a maximum downstream data rate of 1.5 Mbps and an upstream data rate of 512 kbps.

HDSL:

- The high-bit-rate digital subscriber line (HDSL) was designed as an alternative to the T-line (1.544 Mbps). The T-1 line uses alternate mark inversion (AMI) encoding, which is very susceptible to attenuation at high frequencies. This limits the length of a T-l line to 3200 ft (1 km). For longer distances, a repeater is necessary, which means increased costs.
- HDSL uses 2B1Q encoding, which is less susceptible to attenuation.

- A data rate of 1.544 Mbps (sometimes up to 2 Mbps) can be achieved without repeaters up to a distance of 12,000 ft (3.86 km). HDSL uses two twisted pairs (one pair for each direction) to achieve full-duplex transmission.

SDSL:

- The symmetric digital subscriber line (SDSL) is a one twisted-pair version of HDSL.
- It provides full-duplex symmetric communication supporting up to 768 kbps in each direction.
- SDSL, which provides symmetric communication, can be considered an alternative to ADSL.
- ADSL provides asymmetric communication, with a downstream bit rate that is much higher than the upstream bit rate.
- Although this feature meets the needs of most residential subscribers, it is not suitable for businesses that send and receive data in large volumes in both directions.

VDSL:

- The very high-bit-rate digital subscriber line (VDSL), an alternative approach that is similar to ADSL, uses coaxial, fiber-optic, or twisted-pair cable for short distances.
- It provides a range of bit rates (25 to 55 Mbps) for upstream communication at distances of 3000 to 10,000 ft. The downstream rate is normally 3.2 Mbps.

Summary of DSL technologies

Technology	*Downstream Rate*	*Upstream Rate*	*Distance (jt)*	*Twisted Pairs*	*Line Code*
ADSL	1.5-6.1 Mbps	16-640 kbps	12,000	1	DMT
ADSL Lite	1.5 Mbps	500 kbps	18,000	1	DMT
HDSL	1.5-2.0 Mbps	1.5-2.0 Mbps	12,000	2	2B1Q
SDSL	768 kbps	768 kbps	12,000	1	2B1Q
VDSL	25-55 Mbps	3.2 Mbps	3000-10,000	1	DMT

Exercises:

A. What is DSL technology? What are the services provided by the telephone companies using DSL?

B. Compare ADSL with SDSL.