# ASSIGNMENT OF TELECOMMUNICATION SYSTEMS

# Submitted By : Muhammad Hamza

# Roll no: 2k17/TCT/49

# Submitted To : Mam Shadab Kalhoro

# Asymmetric digital subscriber line (ADSL)

# Asymmetric digital subscriber line (ADSL) is a type of [digital subscriber line](https://en.wikipedia.org/wiki/Digital_subscriber_line%22%20%5Co%20%22Digital%20subscriber%20line) (DSL) technology, a data communications technology that enables faster data transmission over [copper](https://en.wikipedia.org/wiki/Copper%22%20%5Co%20%22Copper) [telephone lines](https://en.wikipedia.org/wiki/Telephone_line%22%20%5Co%20%22Telephone%20line) than a conventional [voice band](https://en.wikipedia.org/wiki/Voiceband%22%20%5Co%20%22Voiceband) [modem](https://en.wikipedia.org/wiki/Modem%22%20%5Co%20%22Modem) can provide. ADSL differs from the less common [symmetric digital subscriber line](https://en.wikipedia.org/wiki/Symmetric_digital_subscriber_line%22%20%5Co%20%22Symmetric%20digital%20subscriber%20line) (SDSL). In ADSL, [Bandwidth](https://en.wikipedia.org/wiki/Bandwidth_%28computing%29%22%20%5Co%20%22Bandwidth%20%28computing%29) and [bit rate](https://en.wikipedia.org/wiki/Bit_rate%22%20%5Co%20%22Bit%20rate) are said to be asymmetric, meaning greater toward the customer premises ([downstream](https://en.wikipedia.org/wiki/Downstream_%28networking%29%22%20%5Co%20%22Downstream%20%28networking%29)) than the reverse ([upstream](https://en.wikipedia.org/wiki/Upstream_%28networking%29%22%20%5Co%20%22Upstream%20%28networking%29)).

# Very High Speed Digital Subscriber Line (VDSL)

Very high speed digital subscriber line (VDSL) is a DSL technology that provides a faster data transfer rate than asymmetric digital subscriber line (ADSL) and ADSL2+ technologies. It sends out data in the 13 to 55 Mbps range over small distances, which are typically between 330 to 1650 yards of twisted pair copper wire. The shorter the distance, the higher the data transfer rate. VDSL enables users to upload, download and process data more rapidly.

# Symmetric Digital Subscriber Line (SDSL)

Symmetric digital subscriber line (SDSL) is a technology based on DSL, which enables data transfer on a single line and allows symmetric bandwidth on the upstream and downstream. The working mechanism of SDSL is considered opposite to that of asymmetric digital subscriber line (ADSL) technology, which offers much faster download than upload speeds.

**High-bit-rate digital subscriber line**

High-bit-rate digital subscriber line (HDSL) is a [telecommunications](https://en.wikipedia.org/wiki/Telecommunication%22%20%5Co%20%22Telecommunication) protocol standardized in 1994. It was the first [digital subscriber line](https://en.wikipedia.org/wiki/Digital_subscriber_line%22%20%5Co%20%22Digital%20subscriber%20line) (DSL) technology to use a higher [frequency spectrum](https://en.wikipedia.org/wiki/Frequency_spectrum%22%20%5Co%20%22Frequency%20spectrum) of copper, [twisted pair](https://en.wikipedia.org/wiki/Twisted_pair%22%20%5Co%20%22Twisted%20pair) cables. HDSL was developed to transport [DS1](https://en.wikipedia.org/wiki/Digital_Signal_1%22%20%5Co%20%22Digital%20Signal%201) services at 1.544 Mbit/s and 2.048 Mbit/s over telephone local loops without a need for [repeaters](https://en.wikipedia.org/wiki/Repeater%22%20%5Co%20%22Repeater). Successor technology to HDSL includes [HDSL2 and HDSL4](https://en.wikipedia.org/wiki/HDSL2%22%20%5Co%20%22HDSL2), proprietary [SDSL](https://en.wikipedia.org/wiki/Symmetric_digital_subscriber_line%22%20%5Co%20%22Symmetric%20digital%20subscriber%20line), and [G.SHDSL](https://en.wikipedia.org/wiki/G.SHDSL%22%20%5Co%20%22G.SHDSL).

# Hybrid Fiber Coaxial network (HFC network)

A hybrid fiber coaxial (HFC) network is a telecommunication technology in which [optical fiber](http://searchtelecom.techtarget.com/definition/optical-fiber) cable and [coaxial cable](http://searchdatacenter.techtarget.com/definition/coaxial-cable) are used in different portions of a [network](http://searchnetworking.techtarget.com/definition/network) to carry [broadband](http://searchtelecom.techtarget.com/definition/broadband) content (such as video, [data](http://searchdatamanagement.techtarget.com/definition/data), and voice). Using HFC, a local [CATV](http://searchnetworking.techtarget.com/definition/CATV) company installs fiber optic cable from the cable head-end (distribution center) to serving nodes located close to business and residential users and from these nodes uses coaxial cable to individual businesses and homes. An advantage of HFC is that some of the characteristics of fiber optic cable (high [bandwidth](http://searchenterprisewan.techtarget.com/definition/bandwidth) and low noise and interference susceptibility) can be brought close to the user without having to replace the existing coaxial cable that is installed all the way to the home and business.

**CABLE TV FOR DATA TRANSFER:**

Cable companies are now competing with telephone companies for the residential customer who wants high-speed data transfer. DSL technology provides high-data-rate connections for residential subscribers over the local loop.

**1. Bandwidth**

 Even in an HFC system, the last part of the network, from the fiber node to the subscriber premises, is still a coaxial cable. This coaxial cable has a bandwidth that ranges from 5 to 750 MHz (approximately). To provide Internet access, the cable company has divided this bandwidth into three bands: video, downstream data, and upstream data.

**2. CM and CMTS**

To use a cable network for data transmission, we need two key devices: a cable modem (CM) and a cable modem transmission system (CMTS).

**CM**

The cable modem (CM) is installed on the subscriber premises. It is similar to an ADSL.

**CMTS**

The cable modem transmission system (CMTS) is installed inside the distribution hub by the cable company. It receives data from the Internet and passes them to the combiner, which sends them to the subscriber. The CMTS also receives data from the subscriber and passes them to the Internet. Figure 1.77 shows the location of the CMTS.

**3. Data Transmission Schemes: DOCSIS**

Several schemes have been designed for data transmission over an HFC network.

***Upstream Communication***

The following describes the steps that must be followed by a CM:

           The CM checks the downstream channels for a specific packet periodically sent by the CMTS. The packet asks any new CM to announce itself on a specific upstream channel.

           The CMTS sends a packet to the CM, defining its allocated downstream and upstream

           channels.

           The CM then starts a process, called ranging, which determines the distance between the CM and CMTS. This process is required for synchronization between all CMs and CMTSs for the minislots used for timesharing of the upstream channels.

           The CM sends a packet to the ISP, asking for the Internet address.

           The CM and CMTS then exchange some packets to establish security parameters, which are needed for a public network such as cable TV.

           The CM sends its unique identifier to the CMTS.

           Upstream communication can start in the allocated upstream channel; the CM can contend for the minislots to send data.

***Downstream Communication***

In the downstream direction, the communication is much simpler. There is no contention because there is only one sender. The CMTS sends the packet with the address of the receiving CM, using the allocated downstream channel.