

Packet Networks *Part I: Local Area Networks* (Lecture 10.10/ML)

Local Area Network (LAN) is a group of computers and associated devices that share a common communications line and typically share the resources of a single processor or server within a small geographic area (for example, within an office building). A local area network may serve as few as two or three users (for example, in a home network) or many as thousands of users (for example, in an campus network).

LAN protocols operate on L2 of OSI-model, i.e. they are link layer protocols which only have meaning between two adjacent communication device. L2 is responsible of media control and local addressing of communication channel. This is, however, not so in case of many LAN protocols. L2 is commonly referred as Data-Link Layer (DLC) and is internally divided into Media Access Control (MAC) and Logical Link Control (LLC) sublayers. MAC layer contains address part of the L2 functionalities and therefore addresses are called MAC Addresses. MAC addresses in LAN protocols, like Ethernet, are 6 byte hexadecimal addresses which are unique. This is in contradiction to the L2-address structure of OSI-model. OSI L2-addresses are local and have therefore no effect to the overall communication in larger network. However, MAC addresses cannot be used as only addressing solution for larger network. This is due to assignment of these addresses, which is done by manufacturer (based on manufacturer prefix (2 bytes) and serial number of card (4 bytes)). This leads to uncontrolled distribution of addresses on the world.

The main local area network technology is *Ethernet*. Ethernet is specified in a standard IEEE 802.3. However, there exists other 'standard' version of Ethernet – Ethernet v2, which was originally developed by Xerox, DEC, and Intel. Main difference between these two standards is the Type(v2) <-> Length (IEEE) fields. Otherwise media control and address formatting is common.

Media control in Ethernet is based on Carrier Sense Multiple Access with Collision Detection (CSMA/CD). In CSMA/CD users compete for transmission channel and back off during collision. Any device connected to the Ethernet segment can try to send a frame at any time. Device senses whether the line is idle and begins to transmit if so. Case another device also sends frame at the same time, a collision happens. Collision is detected by receiving bits from other senders frame while still transmitting own frame. It is requirement in CSMA/CD that segment is not longer than minimum frame length divided by transmission speed. This allows to detect collision before sending is over (i.e. Control of frame is lost). In case of collision, each device waits a random amount of time and retries sending.

MORE INFO

Charles Spurgeon's Ethernet Web Site: <http://www.ots.utexas.edu/ethernet/>
(This site provides extensive information about Ethernet (IEEE 802.3) local area network (LAN) technology covering 10/100/1000 versions)