Local Area Network (LAN)

Baseband and Broadband: Definitions

- Baseband
  - dedicates entire bandpass of line to one channel
  - media usually driven from a single-ended voltage source
  - often used for digital transmission

- Broadband
  - divides line bandwidth into multiple channels
  - independent users can use line simultaneously
  - often used for analog transmission

A Local Area Network (LAN) is a computer network covering a small local area, like a home, office, or small group of buildings such as a home, office, or college. Current LANs are most likely to be based on switched Ethernet or Wi-Fi technology running at 10, 100 or 1,000 Mbit/ .

The defining characteristics of LANs are:

- much higher data rates,
- smaller geographic range - at most a few kilometers

Networks can be classified as baseband and broadband. Baseband LANs, such as Ethernet, ARCnet and Token Ring, are much more common in the office environment. Broadband LANs are popular where multiple services, such as closed circuit TV, data, and voice, are needed. Broadband is also popular in factory environments.

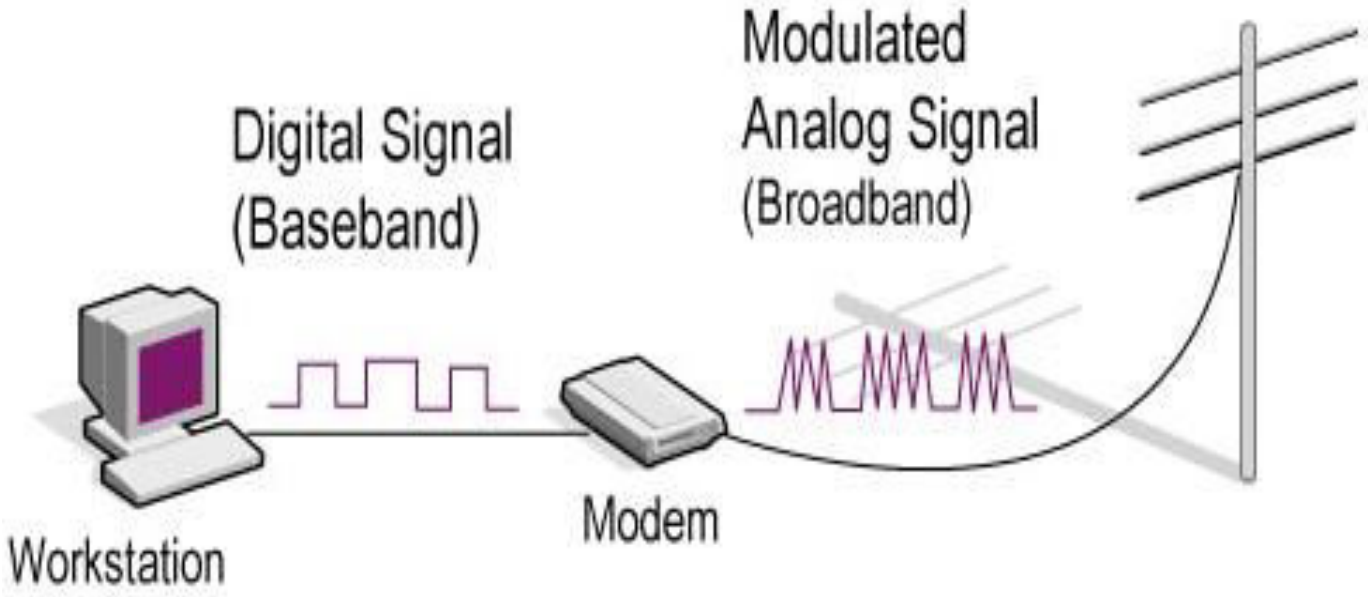
- baseband
  - cheaper
  - simpler to work with
  - adequate for most LANs (1km, 10Mbps)
- broadband
  - multiple channels
  - data, voice, video

SNo	Baseband	Broadband
1	Entire bandwidth of the cable is consumed by a signal	broadband transmission, signals are sent on multiple frequencies, allowing multiple signals to be sent simultaneously.
2	Digital signals	Analog signals
3	bi-directional transmission	unidirectional transmission
4	No Frequency division multiplexing possible	Frequency division multiplexing possible
5	Uses for short distance	Uses for long distance

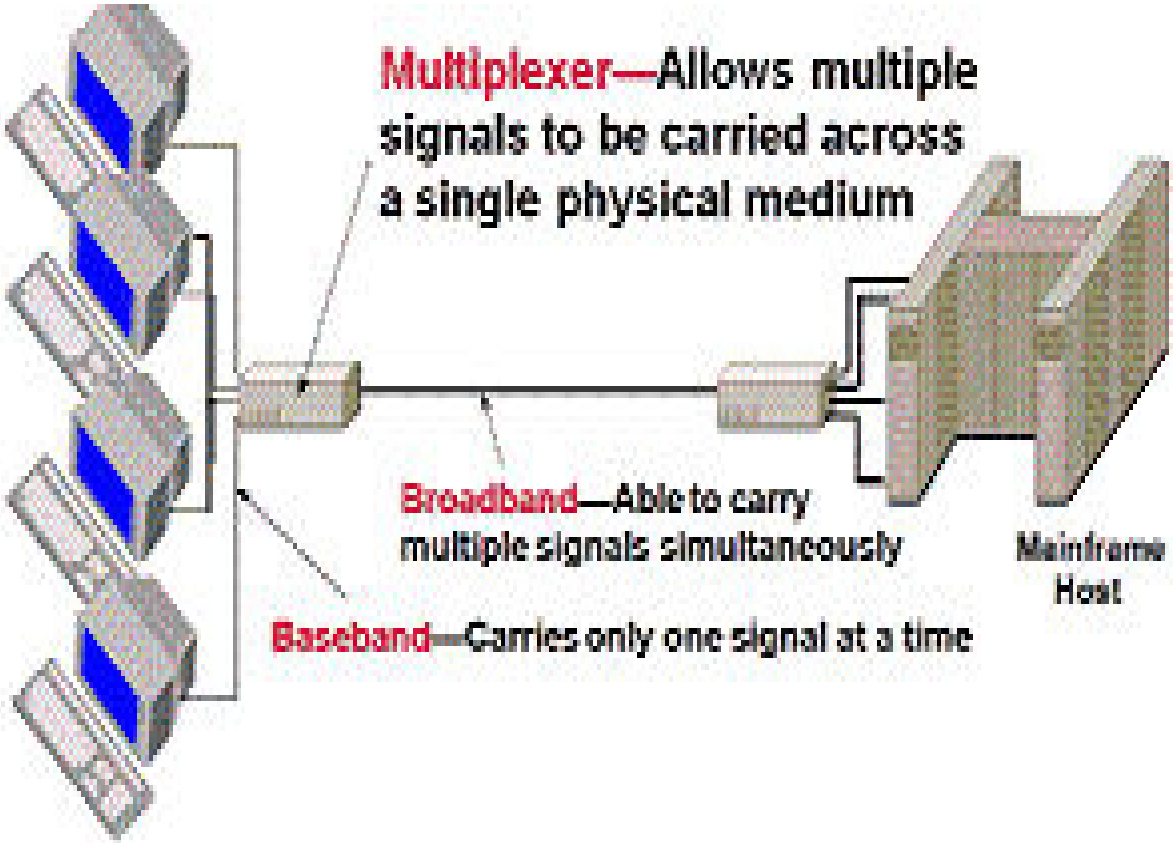
Baseband Transmission

Baseband Transmission is a signaling technology that sends digital signals over a single frequency as discrete electrical pulses.

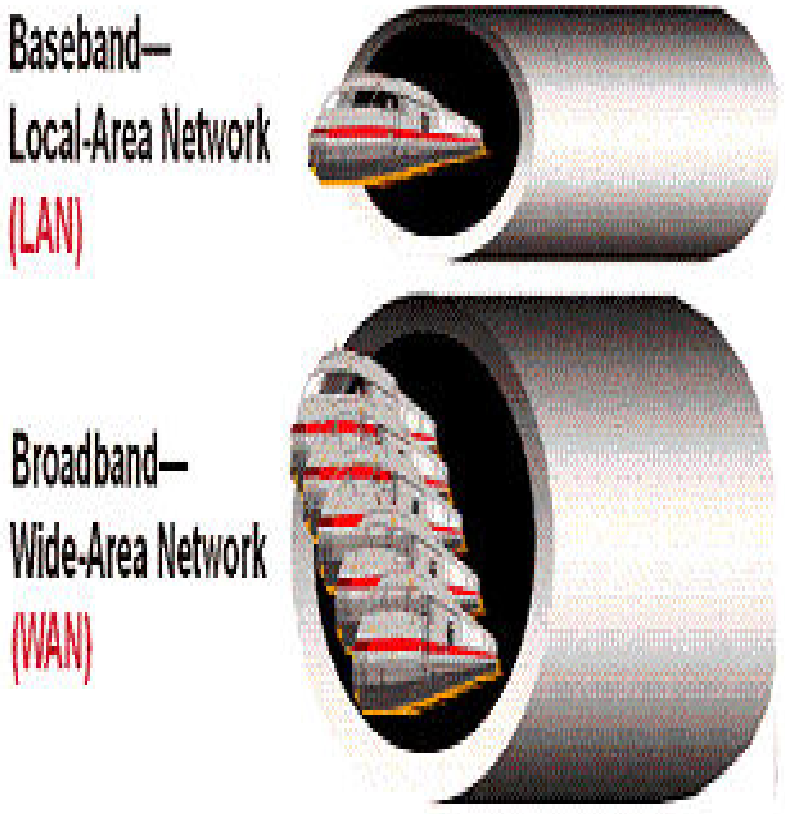
Baseband Transmission is a signaling technology that sends digital signals over a single frequency as discrete electrical pulses. The entire bandwidth of a baseband system carries only one data signal and is generally less than the amount of bandwidth available on a broadband transmission system.



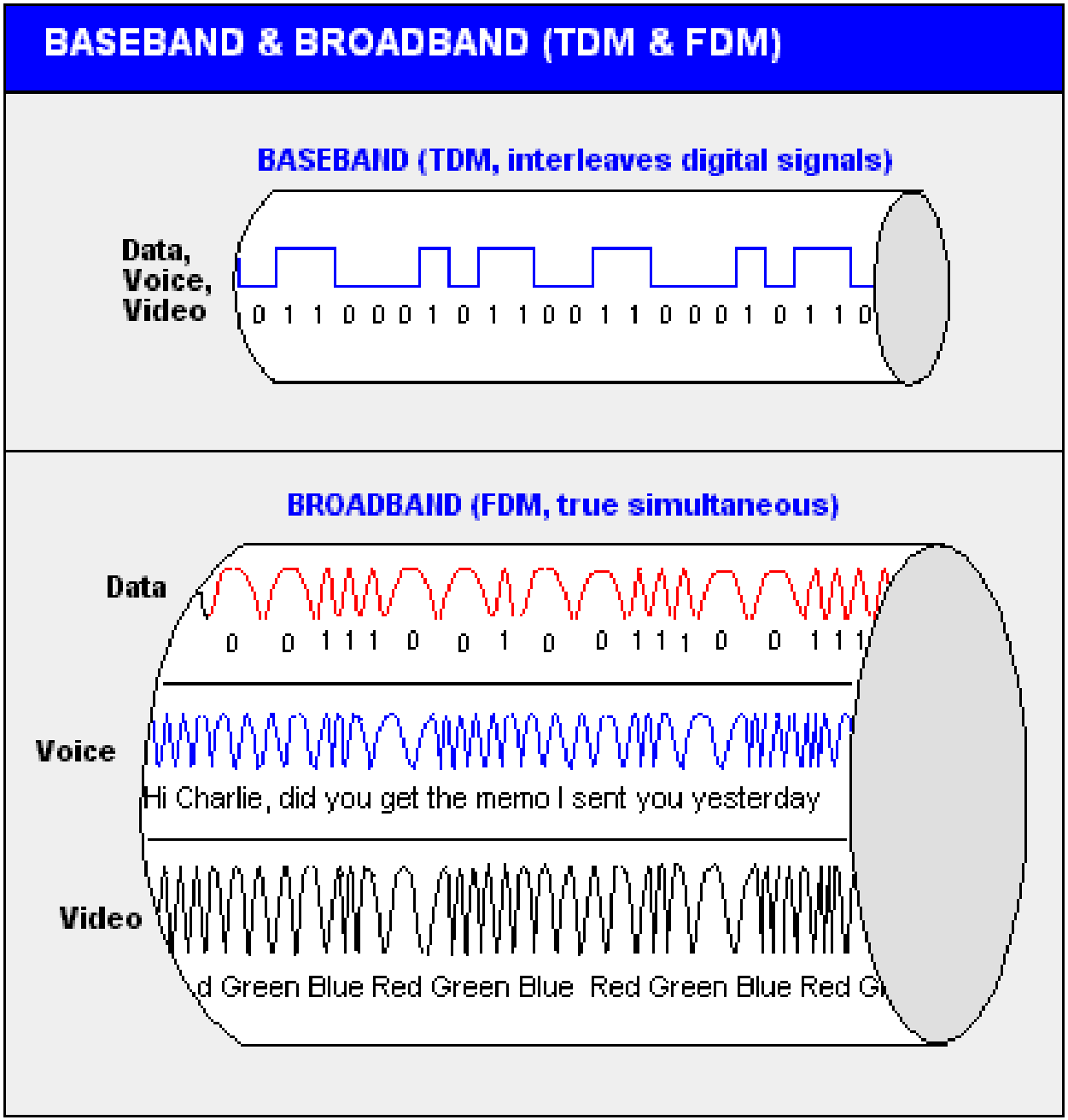
Baseband and Broadband


Multiplexer—Allows multiple signals to be carried across a single physical medium
Broadband—Able to carry multiple signals simultaneously
Baseband—Carries only one signal at a time
Mainframe Host

Baseband and broadband

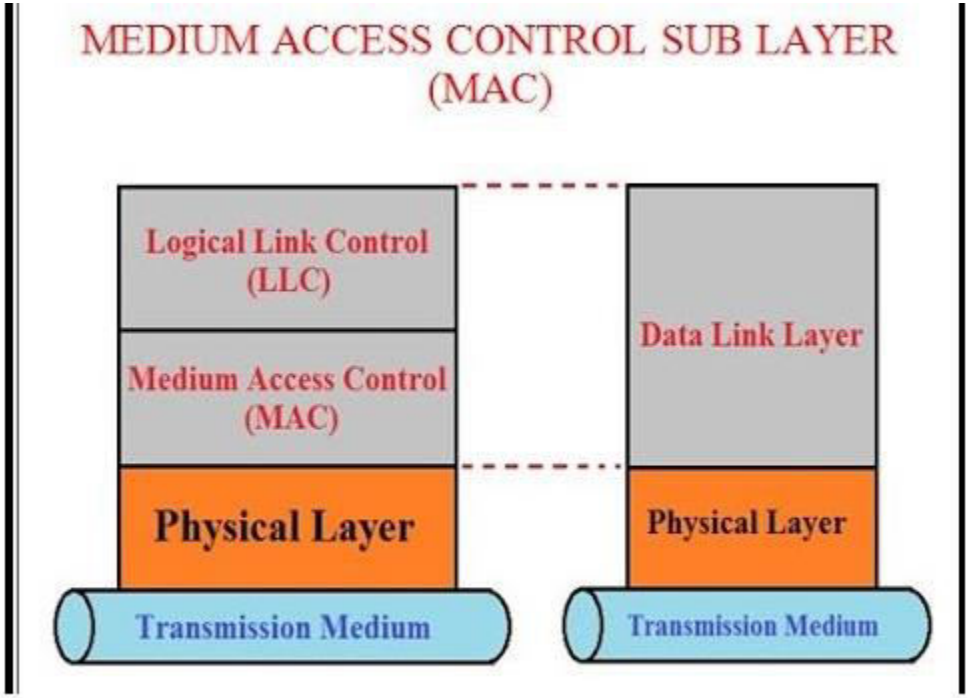


BASEBAND & BROADBAND (TDM & FDM)



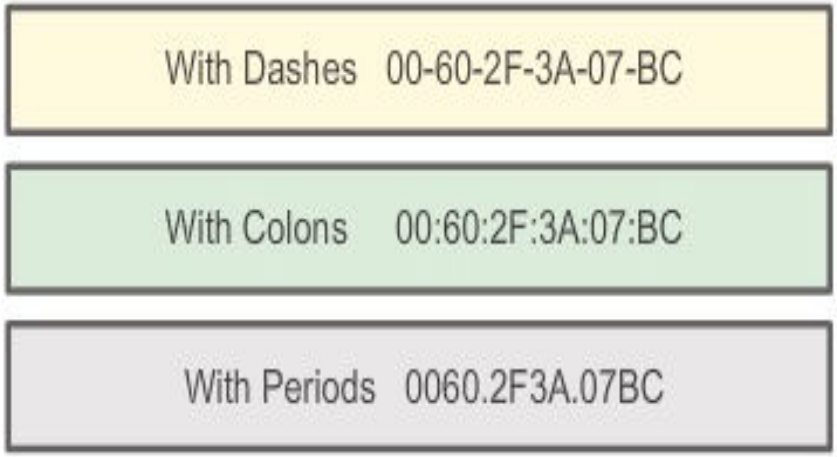
Media Access Control (MAC) Layer

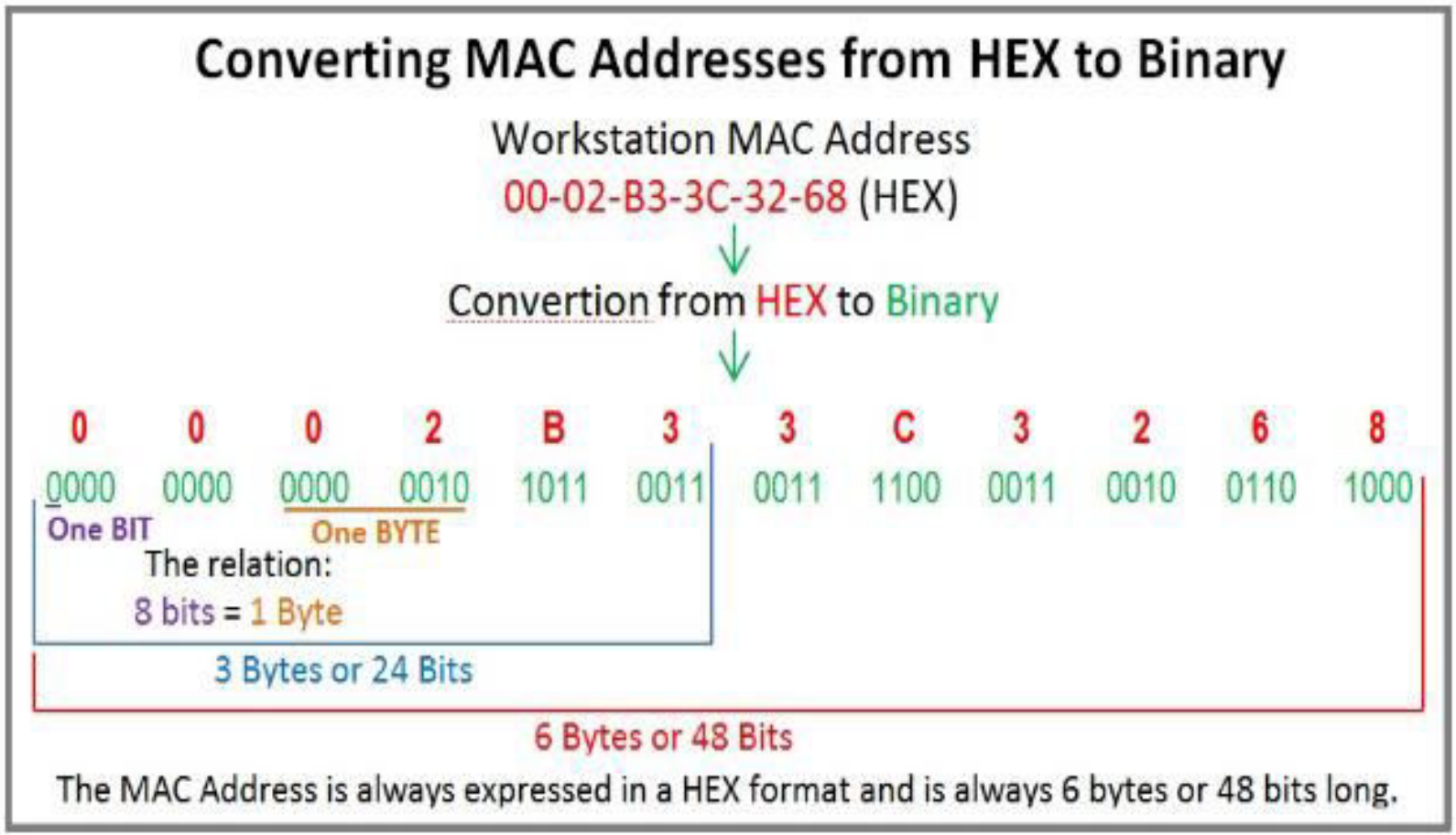
The Media Access Control (MAC) sublayer is the part of the OSI Network Model data link layer that determines who is allowed to access the physical media at any one time. It acts as an interface between the Logical Link Control sublayer and the network's physical layer.



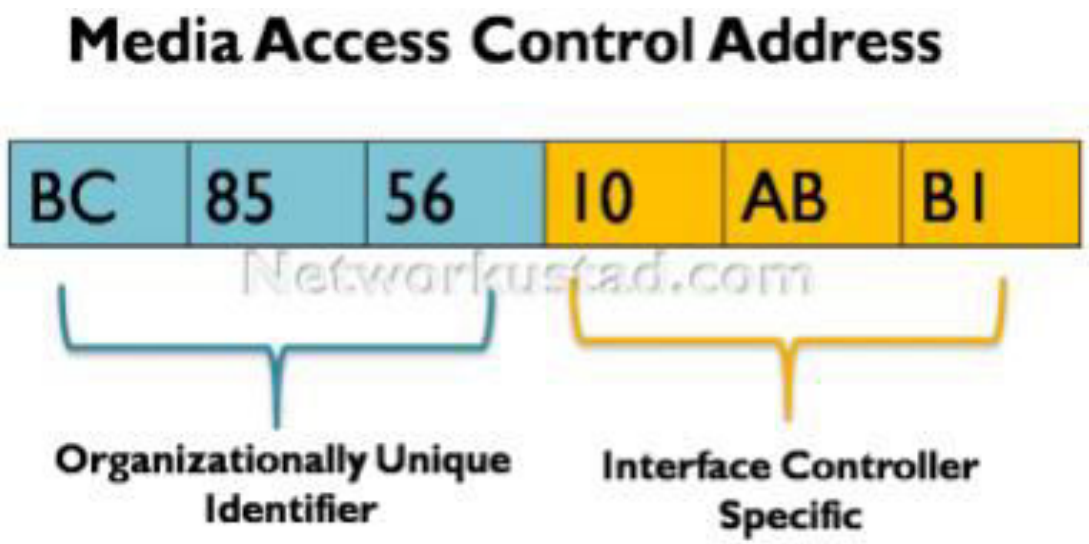
MAC Layer

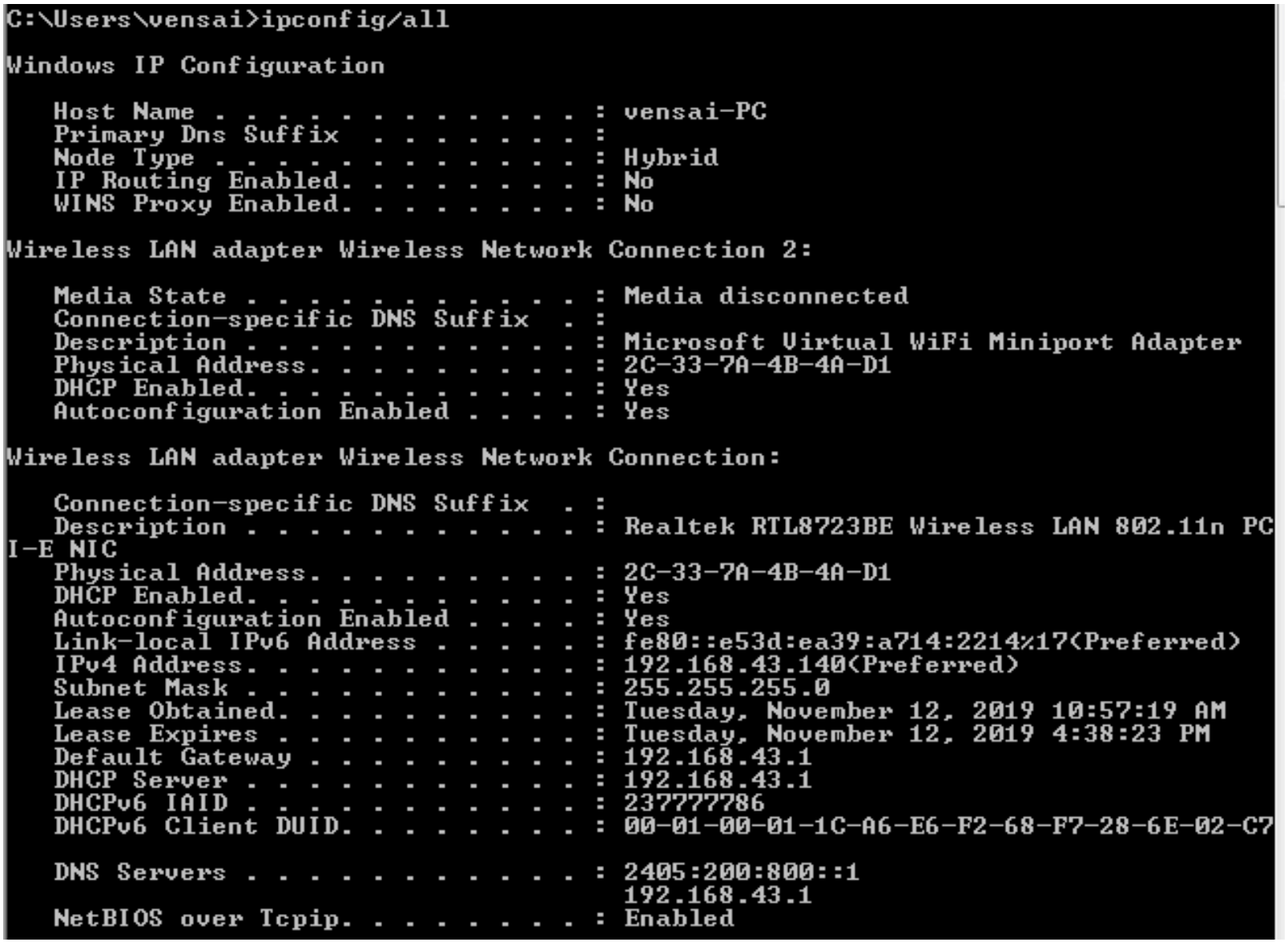
Essentially, the MAC layer determines which computer on the network is allowe to use the media at any given moment. The MAC layer is thus responsible for implementing the media access control method for the particular network architecture, such as Ethernet or Token Ring. The MAC layer is also responsible for making sure that data is delivered without errors.




Converting MAC Addresses from HEX to Binary
Workstation MAC Address
00-02-B3-3C-32-68 (HEX)
Convertion from HEX to Binary
0 0 0 2 B 3 3 C 3 2 6 8
0000 0000 0000 0010 1011 0011 0011 1100 0011 0010 0110 1000
One BIT
One BYTE
The relation:
8 bits = 1 Byte
3 Bytes or 24 Bits
6 Bytes or 48 Bits
The MAC Address is always expressed in a HEX format and is always 6 bytes or 48 bits long.

A media access control address or a MAC address of a device is a worldwide unique identifier assigned to a network interface controller. It is also known as "**hardware address**" or "**physical address**" and very important for communication



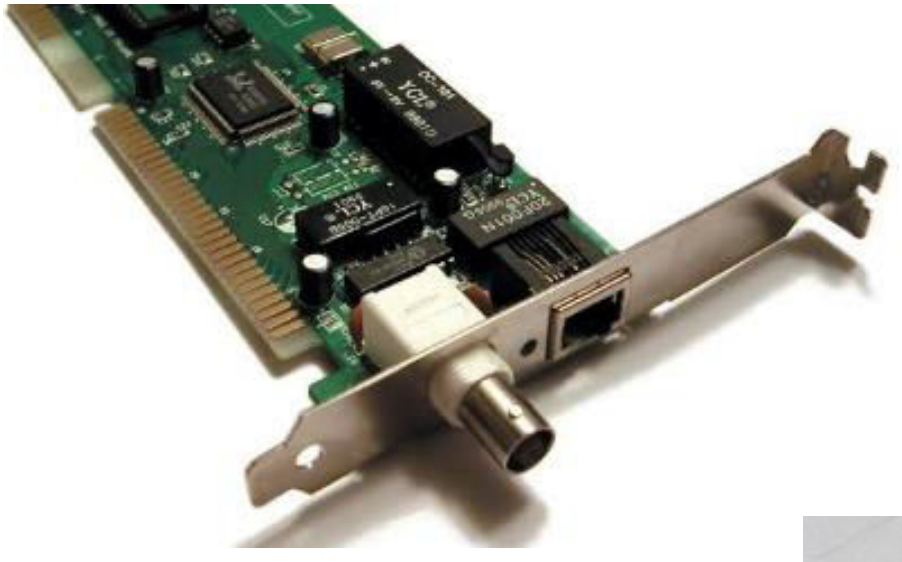

C:\Users\vensai>ipconfig/all
Windows IP Configuration
Host Name . . . . . : vensai-PC
Primary Dns Suffix . . . . . :
Node Type . . . . . : Hybrid
IP Routing Enabled. . . . . : No
WINS Proxy Enabled. . . . . : No
Wireless LAN adapter Wireless Network Connection 2:
Media State . . . . . : Media disconnected
Connection-specific DNS Suffix . :
Description . . . . . : Microsoft Virtual WiFi Miniport Adapter
Physical Address. . . . . : 2C-33-7A-4B-4A-D1
DHCP Enabled. . . . . : Yes
Autoconfiguration Enabled . . . . : Yes
Wireless LAN adapter Wireless Network Connection:
Connection-specific DNS Suffix . :
Description . . . . . : Realtek RTL8723BE Wireless LAN 802.11n PC
I-E NIC
Physical Address. . . . . : 2C-33-7A-4B-4A-D1
DHCP Enabled. . . . . : Yes
Autoconfiguration Enabled . . . . : Yes
Link-local IPv6 Address . . . . . : fe80::e53d:ea39:a714:2214%17(Preferred)
IPv4 Address. . . . . : 192.168.43.140(Preferred)
Subnet Mask . . . . . : 255.255.255.0
Lease Obtained. . . . . : Tuesday, November 12, 2019 10:57:19 AM
Lease Expires . . . . . : Tuesday, November 12, 2019 4:38:23 PM
Default Gateway . . . . . : 192.168.43.1
DHCP Server . . . . . : 192.168.43.1
DHCPv6 IAID . . . . . : 237777786
DHCPv6 Client DUID. . . . . : 00-01-00-01-1C-A6-E6-F2-68-F7-28-6E-02-C7
DNS Servers . . . . . : 2405:200:800::1
192.168.43.1
NetBIOS over Tcpip. . . . . : Enabled

LAN HARDWARE

Hardware needed for establishing the LAN is:

- One or more powerful, multiprocessor LAN server, dumb or intelligent terminals.
- A transmission medium such as coaxial cable, fiber optic etc. and the associated equipments such as connectors, splitters etc. In case of unguided media the suitable equipment for it is required.
- The physical connection to computer of the LAN is made through NIC. This is also known as MAC card. For laptop's PCMCIA card is needed.
- The ports needed, two types of ports are there serial and parallel. There are three different types of parallel ports found in PCs:

  1. *Unidirectional* – The unidirectional port is the original port found on PCs and all three ports can run in unidirectional mode.
  2. *Bidirectional* – The bidirectional port offers data transfer in both directions on the same lines.
  3. *Fast Parallel* – The fast parallel port not only offers bidirectional data transfer but also runs at a much faster data rate.



Personal Computer Memory Card International Association

LAN Operating Systems

- Network operating systems
  - Interface between hardware and application software
- Application software: client front ends and server back ends or engines

A **LAN Operating System**, or **Network Operating System** (NOS), is software that provides the network with multi-user, multitasking capabilities. The operating system facilitates communications and resource sharing, thereby providing the basic framework for the operation of the LAN. The operating system consists of modules that are distributed throughout the LAN environment. Some NOS modules reside in servers, while other modules reside in the clients.

NOP Architectures

- Peer-to-peer
- Client/server
- Current client/server

Peer-to-Peer NOSs

- Traditional NOSs: LANtastic or PowerLAN
- Printing & file sharing for less than 50 users
- Workstation as service requester (client) and/or service provider (server

Client/server NOSs

- Client software and server software: Netware3.12 and Microsoft LANManager

Client NOS

- Windows 95, OS/2 Warp Connect, Windows NT Workstation

Client NOS - Peer-to-Peer Networking Capabilities

- File and printer sharing
- Workgroup application

Sever NOSs - Types

- UNIX
- TCP/IP
- NFS
- NetWare
- Windows NT

Windows NT

- Applications
  - Web server
  - Database server
  - Application server

Transmission Media

various types of transmission media

There are two basic categories of Transmission Media:

- Guided
- Unguided.

Guided Transmission Media uses a "cabling" system that guides the data signals along a specific path. The data signals are bound by the "cabling" system. Guided Media is also known as Bound Media. There are four basic types of Guided Media:

- Open Wire
- Twisted Pair
- Coaxial Cable
- Optical Fibre

Implementing LAN