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# OSI and TCP Layer

Diagram

Description automatically generated

Figure - 1

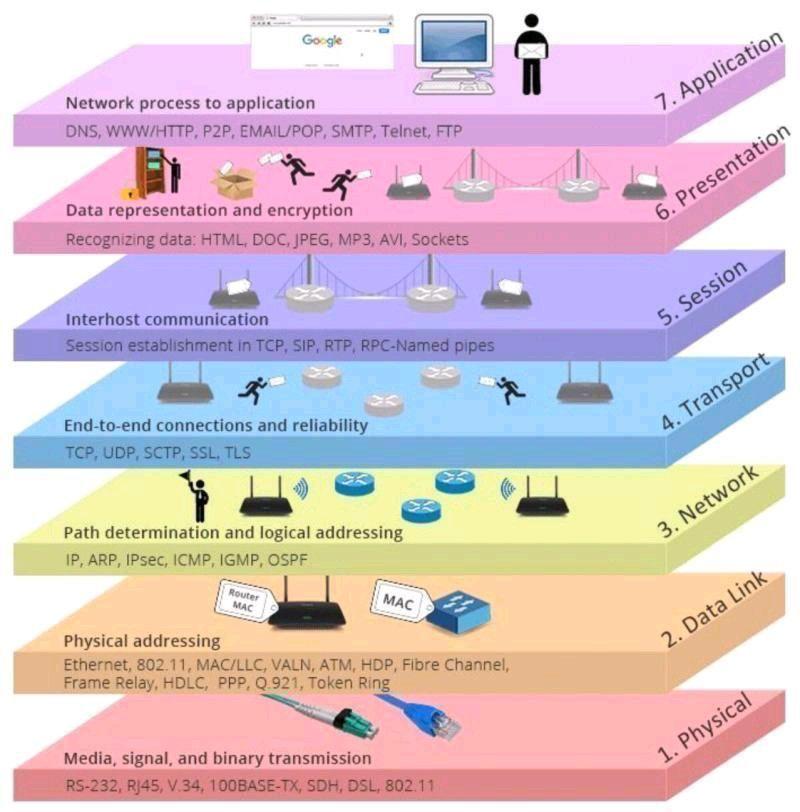


Figure – 2

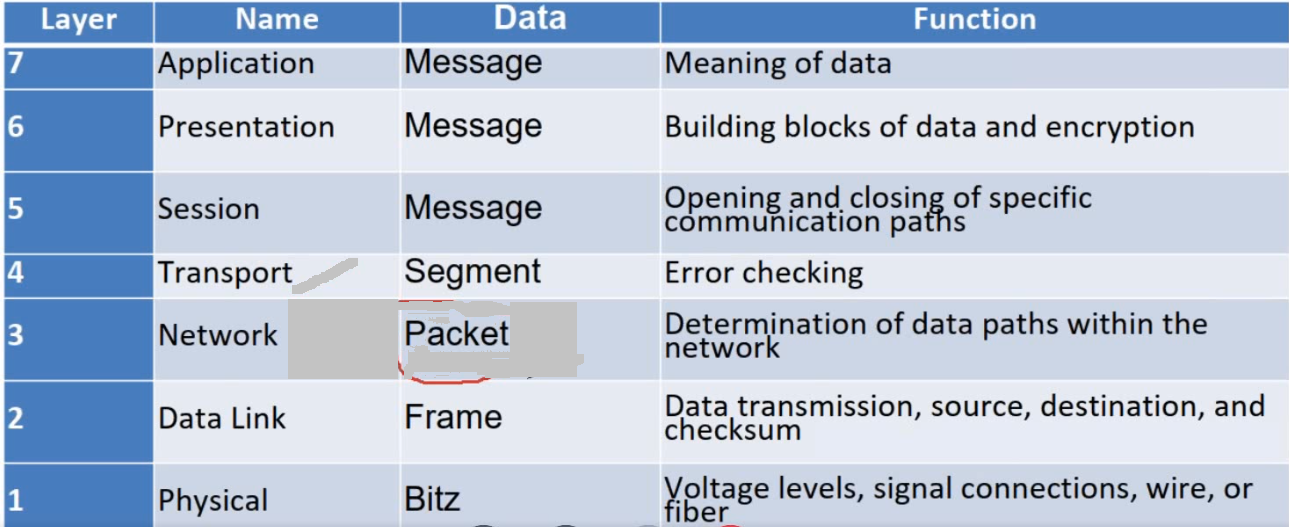


Figure – 3

# Ethernet Frame: -

Standard: -

IEEE 802.3 - Ethernet

IEEE 802.11 – Wi-Fi

## Ethernet frame structure: -

Ethernet frame Normal IEEE 802.3 compliant Ethernet frames are between 64 and 1518 bytes long. They are made up of five or six different fields:

* destination MAC address
* source MAC address
* Type/length field
* Data payload
* Optional Padding field
* CRC
* Additionally, when transmitted on the Ethernet medium, a 7-byte preamble field and Start-Of-Frame (SOF) delimiter bytes are appended.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Preamble | SOF Delimiter | Destination address  (such as Multicast, Broadcast and Unicast) | Source address | Type/Length | DATA/ Payload  (with optional padding) | CRC |

**Preamble: -**

Preamble is a series of 56 bits alternating with 1 and 0. These bits are used for synchronization

and give each participant the time to observe the activity on the bus before the actual data arrives.

**SFD: -**

The start of frame delimiter (10101011), the last byte of the preamble, indicates to the receiver that the actual data is on its way.

**MAC address: -**

Size of MAC address: 6 bytes (48 bits). The MAC broadcast address is FF FF FF FF FF FF.

**TYPE: -**

The TYPE field is different for IEEE802.3 and Ethernet II (DIX standard).

For Ethernet II, the field type refers to the higher-level protocol that uses an Ethernet frame to send data. Xerox assigns a code of 2 bytes to every protocol that is developed for Ethernet. Some examples:

0600h XNS

0800h IP (Internet Protocol)

0806h ARP protocol

0835h Reverse ARP protocol

8100h IEEE802 1.q tag frame (VLAN)

The IEEE802.3 defines the field TYPE as LENGTH field in order to be able to send the number of actual data bytes.

**DATA: -**

The data field contains the data to be sent. This data field is transparent- this means that the content of this field is completely free for Ethernet. Only the length has to be a minimum of 46 bytes and not more than 1500 bytes.

**PAD: -**

The padding bits are random data bits that, if necessary, can be added to the data in order to reach the minimum required 46 bytes.

**FCS: -**

The check sum is a 4-byte CRC value that the sender creates and sends. The receiver can check the integrity of the data with this code.

Note: -

Ping: - ICMP is used for testing network connections using ping program.

# Hub and Switch

## Hub: -

A hub is actually a multiport repeater: it regenerates incoming signals to all other ports as can be seen from figure below.

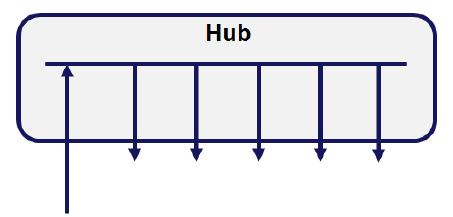


Figure – 4

## Switch: -

Switch is used to interlink LAN segments with more intelligence. Before a packet is transmitted from one segment to the other segment via a switch, it checks the MAC address and on this basis it decides whether to transport to the other segment or not. Switch in accordance with OSI model is shown below.

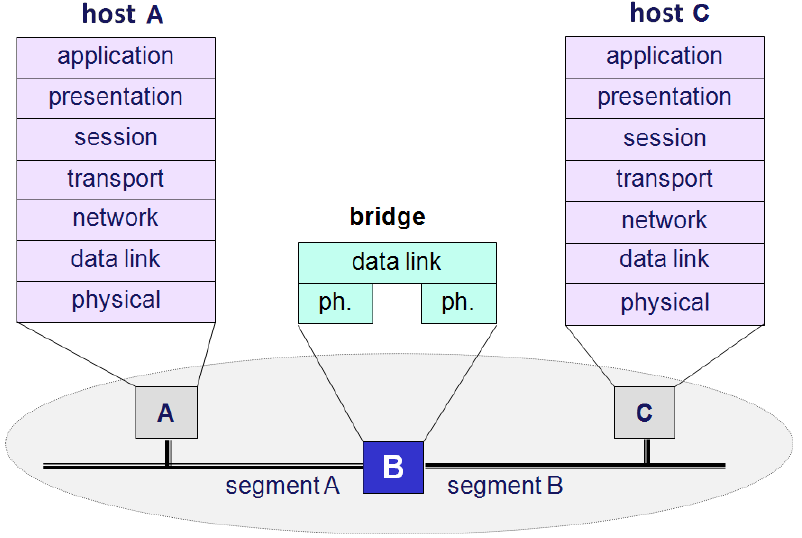


Figure – 5

A MAC address table is updated from a software point of view for every port. This

table is filled by listening on the relevant segment of the network and by copying all MAC

addresses that occur on that segment to the table. Every address is retained for a limited

time and is deleted again as soon as a certain time (the hold time) has lapsed. This technique

avoids that inactive stations are addressed or that stations are not recognized anymore.

Linking the segments of a local network via a switch has a number of advantages over the

link with a repeater or a hub. When using a switch, a segment is not loaded with the frames

of the other segment that do not belong there from an addressing point of view. The load

per segment is reduced by this bridge function. At the same time, fault situations are not

transmitted as the switch also checks the correct building of the frame.