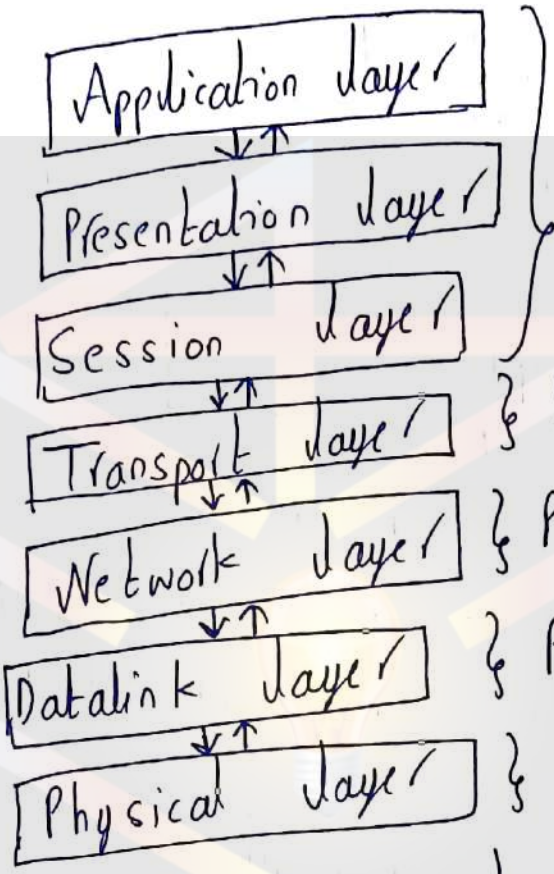
1) Explain in detailed about ISO - OSI & TCP/IP reference model in detailed.

Ans OSI



→ OSI (Open System interconnection)

→ Created by ISO

→ It was created as a frame work & reference model to explain how different technologies work together & interact.

→ It is not a standard that networking protocols follow each layer

has specific functions it is responsible for all layers work together in the correct order to move data around a network.

TCP - 7 layers
UDP - virtual (5 layers)

→ Physical layer:-

→ Deals with all aspects of physically moving data from one computer to the next.

→ Converts data from upper layers into 1's & 0's for transmission over media.

→ Defines how data is encoded on to the media to transmit the data

→ Defines on this layer cable standards wireless standards & fiber optics standards

→ It is copper wiring, Fiber optics cable, anything that can be used to transmit data is defined on the physical layer of OSI model

ex: of devices

HUB: Use to transmit data

→ Functions of Physical layer:

→ bit synchronization: moving info in one particular order

→ bit rate control: bit per sec

→ Physical topologies: all types of topology

→ Transmission mode: Simple duplex, half duplex & Full duplex.

→ Data link layer: (Wired connection)

→ It is responsible for moving frames from node to node or computer to computer

→ It can move frames from one adjacent computer to another

→ It cannot move frames across routers (wireless).

[Frames cannot be sent segments are used]

→ requires MAC address or physical address

→ Protocols defined include:
ethernet protocol & point to point protocol.

→ Device example switch, bridge

→ Two subdayers of Data link dayer
i) LLC (logical link control)
ii) MAC (Media access control)

→ logical link control:

→ Data link layer addressing, flow control, address notification & error control.

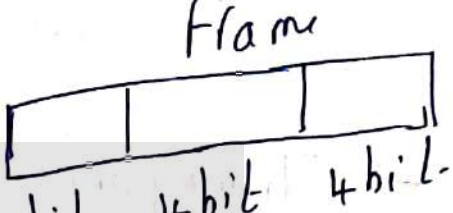
→ Media access control:

→ Determines which computer has access to the network media at any given time

→ Determines where one frame ends & the next one starts called frame synchronizabion.

→ Functions of DLL:

→ framming
→ Physical Addressing
→ error control
→ flow control
→ Acess control



→ Network layer: (wireless)

Responsible for moving packets (data) from one end of the network to end the other, called end to end communication

→ requires logical address (IP)
→ exi router
→ routing is the ability of various network devices & their related software to move data packets from source to destination.

→ Segments in the network layer is referred as packet.

→ Functions of NL :-

→ routing
→ logical address.

→ Transport layer :-

→ Takes data from higher level of OSI model and breaks it into segments that can be sent to lower level layers for data transmission
→ Reassembles data segments into data that high level protocols & applications can be used
→ Also puts segments in correct order called sequencing so that they can reassemble in correct order at destination
→ Concerned with the reliability of the transport of sent data.

→ May use a connection oriented protocol such as TCP to ensure destination received segment

→ May use a connectionless protocol such as UDP to send segments without assurance of delivery.

→ Functions of transport layer :-

→ Segmentation & Reassembling

→ Session layer :-

→ Responsible for managing the dialogue b/n Network divisors

→ Establishes, manages & terminates connection

→ Provides duplex, half duplex or simplex duplex communications b/n devices

→ Provides procedures for establishing checkpoints, termination & restart or recovery.

→ Functions of Session layer:

→ Session establishment, maintanance & termination
→ Synchronization
→ Dialogue controller

→ Presentation layer:

→ concerned with how data is presented to network.
→ Handles 3 primary tasks

i) Translation
ii) Compression
iii) Encryption

} Functions & tasks

Translation → Changes data so that another type of computer can understand it (ASCII codes).

Compression → Makes data similar to send more data in same amount of time.

Encryption → Encodes data to protect from interception or droping.

→ Application layer :

→ Contains all services or protocols needed by application software or operating systems to communicate on the network

ex: → Firefox web browser uses http

→ Email program may use pop3 (post office protocol) to read emails & SMTP to send emails

→ Functions of Application layers:

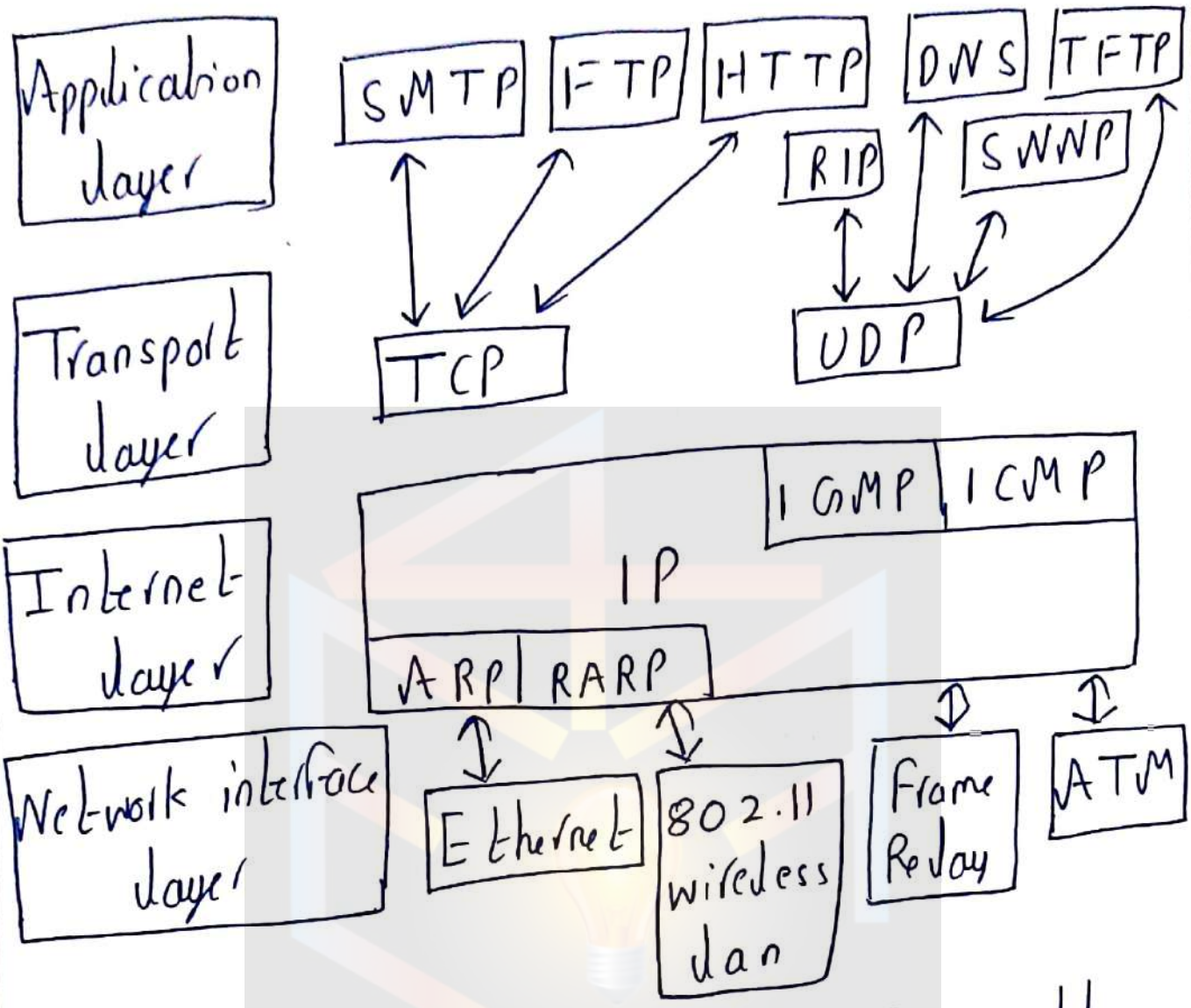
→ Network virtual Terminal

→ FTAM (File transfer Access & Management).

→ Mail Services

→ Directory services.

→ TCP/IP Model :-



→ Application layer : protocol defines the rules when implementing specific network applications to provide accurate & effecient data delivery.

→ Tipical protocols:

FTP - File transfer protocol

Telnet - remote terminal protocol.

SMTP - Simple mail transfer protocol
HTTP - Hypertext transfer protocol (Web browsing)

→ N compases same functions as these OSI model layers presentation layer, application, & session layer.

→ Transport layer: TCP & UDP

TCP :- (connection)

→ Physical connection
→ TCP provides a function to allow virtually exist also called virtual circuit.

UDP (connection less layer)

→ Dividing the chunks of data
→ reassamble segments into the original chunk
→ provides functions reordering & data resend
→ offering a reliable bite stream delivery service.

→ Functions are same as transport layer

→ Synchronize source & destination computer to setup the session b/n the respective computer.

→ Internet (or) Network layer:

Host to network layer: It is the lowest layer of TCP/IP reference model

→ It combines the datalink & physical layer are combined

→ Data transfer b/n network nodes in a single WAN & b/n nodes on same LAN.

2) Explain congestion control algorithms in detailed.

Ans Congestion: To many packets present in the network causes packet delay & loss that degrades performance. This is congestion.

I) Warning bit:

→ A special bit in the packet header is set by the router to warn the source when conjusion is detected

→ The bit is coppied & piggy backed on the acknowledgement & sent to the sender

→ The sender monitors the no. of ACK (acknowledgement) packets with warning bit set & adjust it's transmission rate accordingly.

II) Choke packet:

→ A more direct way of telling source to slowdown

→ A choke packet is a control packet generated at a conjusted node & transmitted to restrict traffic flow

→ The source on receiving the choke packet must reduce the speed by a certain %.

→ An example of choke packet is the ICMP source packet.

Hop by Hop choke packet:-

→ Over a long distance or at a hight speed choke packet are not effective

→ A more effective method is to send choke packet hop by hop

→ This requires each hop to reduce it's transmission even before the choke packets arrive at the source.

III) Load shedding:-

→ When buffer becomes full routers simply discard packets.

→ Which packet is choosen to be the victim depends on the application & on the error strategy used in the data link layer

→ For a file transfer.

ex: cannot discard older packet since this will cause a gap in the received data

→ For real time voice or video it is probably better to throw away old data & keep new packets

→ get the application to mark packets with discard priority.

IV) Random Early Discard (RED)

→ This is a pro active approach in which the router discards one or more packets before the buffer becomes completely full.

→ Each time a packet arrives the RED algorithm computes the average queue length if is average.

→ If average is lower than some lower threshold

→ Conjuction is assumed to minimal or non existant & packet is queued.

→ If average is greater than some upper threshold, conjusion is assumed to be serious & packet is discarded.

→ If average b/n 2 thresodds this might indicates the 1 set of conjusion the probability of conjusion is done calculated.

V) Traffic Shapping :-

→ Another method of conjusion control is to shape the traffic before it enter the network.

→ Traffic shapping controls the rate at which packets are sent used in ATM & integrated servic network

→ At connection setup time, the sender & carrier negosiate a traffic pattern (shape)

→ two traffic shapping algorithm.

i) leaky bucket

ii) token bucket.

i) Leaky bucket :- The leaky bucket algorithm used to control rate in a network. It is implemented as a single server queue with constant service time

→ The bucket overflow then packets are discarded

→ The leaky bucket enforces a constant o/p rate regardless of the buzzness of the i/p Does nothing when i/p is ideal.

→ The host injects one packet per clock tick on to the network. This result in a uniform flow of packet. Smoothing out borst & reducing conjusion.

→ when the packets are the same size the one packet per bucket is okay for variable lengthy packet it is better to allow a fixed no. of bits per bucket

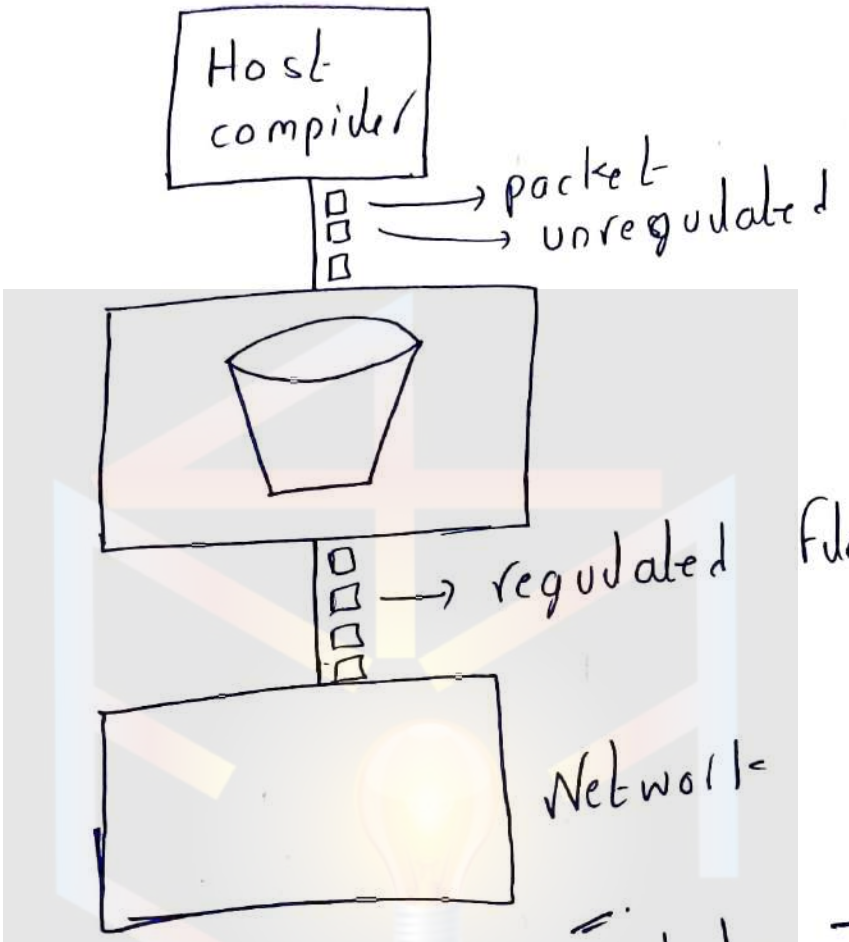
ex:- 1024 bytes per bucket will allow one 1024 bytes packet or two 512 byte packet or four 256 bytes on one bucket.

ii) Token bucket :- It contrast to the LB, the token bucket algorithm allow the o/p rate to vary depending on the size of burst.

→ In the TB algorithm the bucket holds tokens to transmit a packet the host must capture & destory one token.

→ Tokens are generated by a clock at the rate of one token every Δ sec.

→ Ideal host can capture & save up tokens in order to send larger burst later.



→ LB discards packets, TB doesnot, TB discards Tokens

→ With TB, A packet can only be transmitted if their are enough tokens to cover its length in bytes

→ LB sends packet at an

average rate, TB allows for larger burst to be sent faster by speeding up the o/p

→ TB allows saving's up token, (permissions) to send large burst.

LB doesnot allow savings.