Unit : 5 Network Layer

* Explain Network Layer with its Design issues.

=> The Network Layer is the third layer of the OSI model.

Network Layer handles the service requests from the transport layer in OSI model.

Network Layer forwards the service requests to the data link layer in OSI model.

The Network layer translates the logical addresses into the physical addresses.

This are the Design issues in Network Layer.

1 Store and Forward Packet switching:

The Sender is send the data packet to the nearest router

and Receiver router receive the Packet.

2 Service Provided to Transport Layer:

The network layer transfers it is services to the transport layer.

The network addresses for the transport layer should be Uniform.

3 Connectionless Service:

It is used to transfer the data packets between senders to receiver without creating the connection.

4 Connection-Oriented service:

It is used to transfer the data packets between senders to receiver with creating the connection.

* Difference between Connection-oriented Service and Connection-less Service.

=>	Connection-Oriented service	Connection-less Service
1	There is need to create Connection.	There is no need to create the connection.
2	More Feasible Service.	Less Feasible service.
3	Packets are follow the same route For transfer.	Packets are not Follow the same route for the transfer.
4	Require High range of bandwidth.	Require low range of bandwidth.
5	Requires Authentication for transfer Packets.	Does not requires Authentication for transfer Packets.
6	Create Virtual Path.	Does not create virtual path.

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* Explain IP Protocol in Network Layer.

=> IP Protocol stands for Internet Protocol which is used in TCP/IP model.

IP Protocol is used to send the data packets to the source to destination location.

IP Protocol is work on IP Address.

According to IP Address, IP Protocol can send the data to the sender to the Receiver location.

IP Protocol is also know as TCP/IP or UDP/IP Protocol.

In IP Protocol, IP Packet e send over the network for transfer the data.

IP Packet consists two component
(i) Header
(ii) Pay load

(ii) Header :

IP Header consists all the Basic information about the IP Packet.

Header is also consists the Source and destination IP address with Packet and Header length.

Header is also consists the transfer Protocol that can be used to transfer data Packet from the sender to receiver.

(iii) Payload :

Payload is the data that can be transfer from the sender to the receiver.

There are two types of IPv4 Address.

(a) Public Address
(b) Private Address

a Public Address :

Public Address is global or external address that can be used in Outside the network.

b Private Address :

Private Address is local or internal address that can be used within the network.

* Explain AnyCast Routing.

=> AnyCast Routing is also know as IP Anycast.

AnyCast is Routing method in which incoming requests can be routed to a variety of different nodes.

In this routing method groups of routing paths to a collection of endpoints and assigns the same IP address.

In this method, each device in the routing group display

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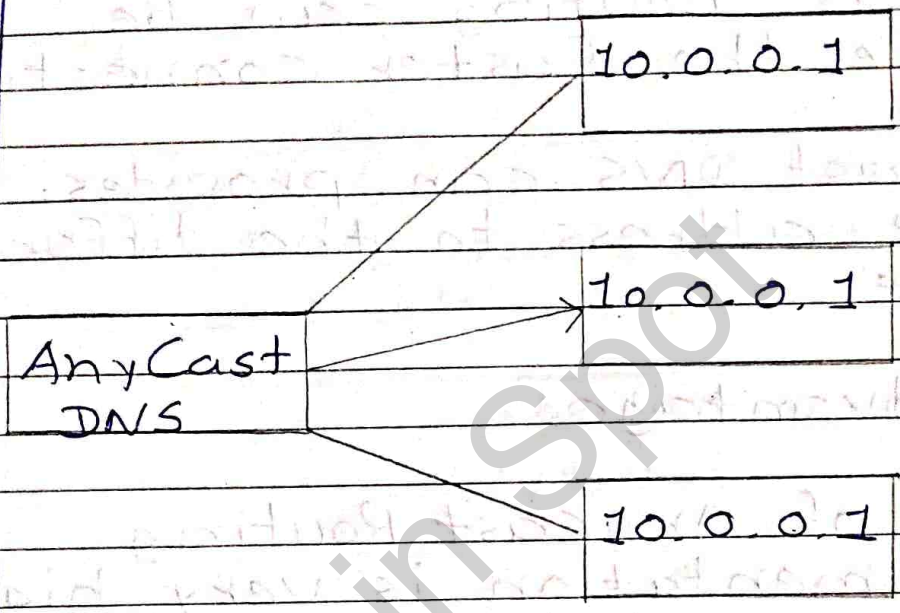
the same address.

In Anycast Routing, Multiple endpoints can share a common IP address.



Anycast can be provides the Point to Point Communication.

Anycast can Provides a multiple number of membership.

Anycast Routing is ruled by Border Gateway Protocol and It can also use IPV6 and IPV4.

→ Advantages:

1 AnyCast Routing can utilized Load balancing very easily.

2 AnyCast Routing can be provide the faster connection.

3 AnyCast DNS can provides same address to the different device.

→ Disadvantages.

1 Cost of AnyCast Routing implementation is very high.

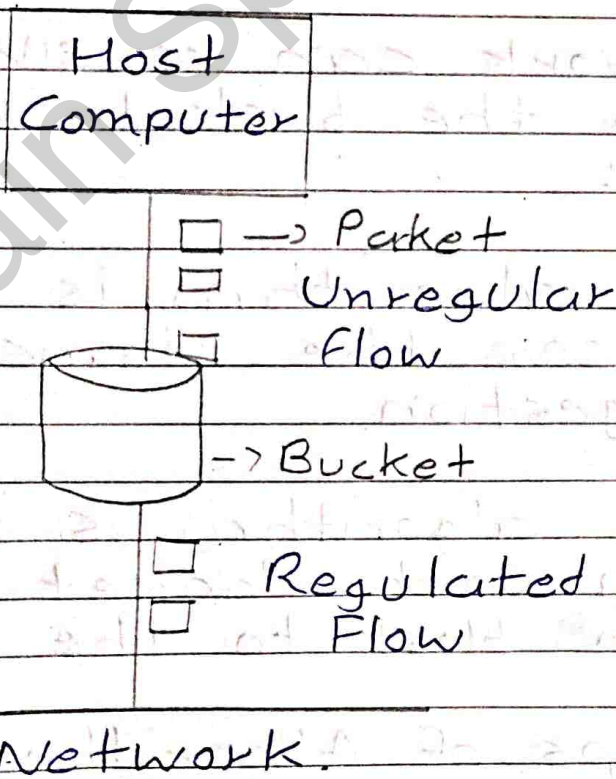
2 AnyCast Routing require a special hardware support.

3 AnyCast Routing requires a proper traffic routing implement IP AnyCast.

* Explain Leaky Bucket Algorithm with example.

=> Leaky Bucket Algorithm is a type of Traffic Shaping Algorithm.

Traffic Shaping Algorithm is used to control the rate of traffic which is sent to the network.



In this Algorithm, Computer host can send a Packet to the network in a unregular Flow.

Computer host is throw the Unregular Flow packet in the Bucket.

All the Packet is collect in the bucket.

After the Packet is collect in the bucket, Packet can send to the network in a regular Flow.

Network can receive the Packet from the bucket in a regular Flow.

This algorithm is use to reduces the chance of the congestion.

This algorithm is also provides a smooth Packet transmission from Host to the Network.

- Steps of Algorithm:

1 Initialize a counter n at the tick of clock.

2 If n is greater than the size

of the packet than send the packet and decrement by counter with packet size.

3 Repeat the step until n is smaller than the packet size.

4 Reset the counter and go to the step 1.

Ex. Let n = 1000 and Packet =

300	500	200	400

=> Here, Set the n = 1000

Step 1: We want to send the 400 size Packet.

So, 1000 = n > 400. So, Packet can be send.

So, n = 1000 - 400 = 600

Step 2:

300	500	200

of the packet than send the packet and decrement by counter with packet size.

3 Repeat the step until n is smaller than the packet size.

4 Reset the counter and go to the step 1.

Ex. Let n = 1000 and Packet =

300	500	200	400

=> Here, Set the n = 1000

Step 1: We want to send the 400 size Packet.

So, 1000 = n > 400. So, Packet can be send.

So, n = 1000 - 400 = 600

Step 2:

300	500	200

We want to send 200 size Packet.

So, 600 > 200, So, we can send the Packet.

∴ n = 600 − 200 = 400

Step 3 : | 300 | 500 |

We want to send 500 size Packet.

So, 400 < 500. So, we can not send this Packet.

Here, we have to reset the counter.

So, New Value of n = 1000

So, 1000 > 500, So, we can send this Packet.

∴ n = 1000 − 500 = 500

Step 4 : | 300 |

We want to send 300 size Packet.

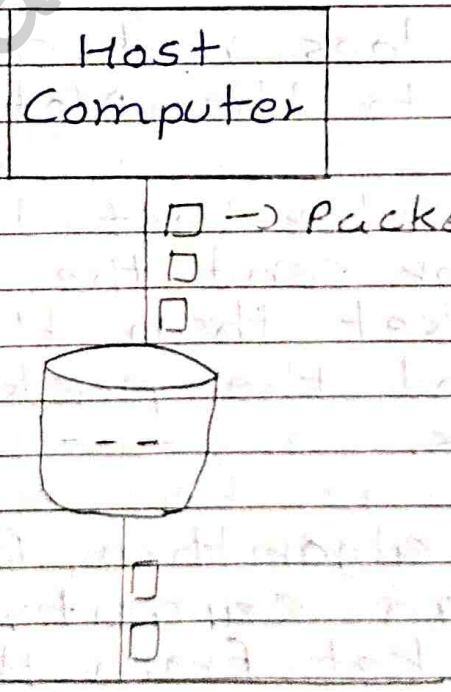
So, 500 > 300, So, we can send this Packet.

∴ n = 500 - 300 = 200.

* Explain Token Bucket Algorithm.

=> Token Bucket Algorithm is a type of Traffic shapping algorithm.

Traffic shaping Algorithm is used to control the rate of traffic which is sent to the network.



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Token Bucket Algorithm is provide the better output compare to the Leaky Bucket Algorithm.

In Token Bucket Algorithm Computer Host need to permission to send the Packet into the bucket.

For send the Packet into the Bucket every Packet require particular time.

If Bucket has Δn time so, Computer host can send only n Packet into the bucket.

Bucket does not send constant Packet to the Network.

If Computer Host does not have token for send the Packet into the bucket than Host can not send the packet to the Network.

In this algorithm, Bucket has maximum capacity to collect the packet from the computer host.

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* Explain Quality Of Service in Network Layer.

=> Quality of Service in Network Layer is used to determine a Network capability.

Quality of Service is also Provides a set of techniques to improve the performances of Computer network.

Quality of Service is refers to set of techniques that used to manage the computer network.

QoS helps to manage the bandwidth and allocate the bandwidth effectively.

QoS allows to Prioritization of traffic based on services requirements.

QoS Provides the Packet scheduling algorithm for the packet transmission.

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QoS is used to minimize delays in network communication.

~~This~~

This are the Basic Requirement of Quality of Service.

This are Four basic QoS requirement.

(i) Delay
(ii) Jitter
(iii) Throughput
(iv) Error Rate.

(i) Delay :

Quality of Service is used to decrease the delay in computer communication network.

(ii) Jitter :

Jitter means variability in packet arrival times.

QoS is helps to control Jitter in computer network.

(iii) Throughput:

Quality of service can increase the throughput of the computer network.

(iv) Error Rate:

Quality of Service can control the error rate in computer network.

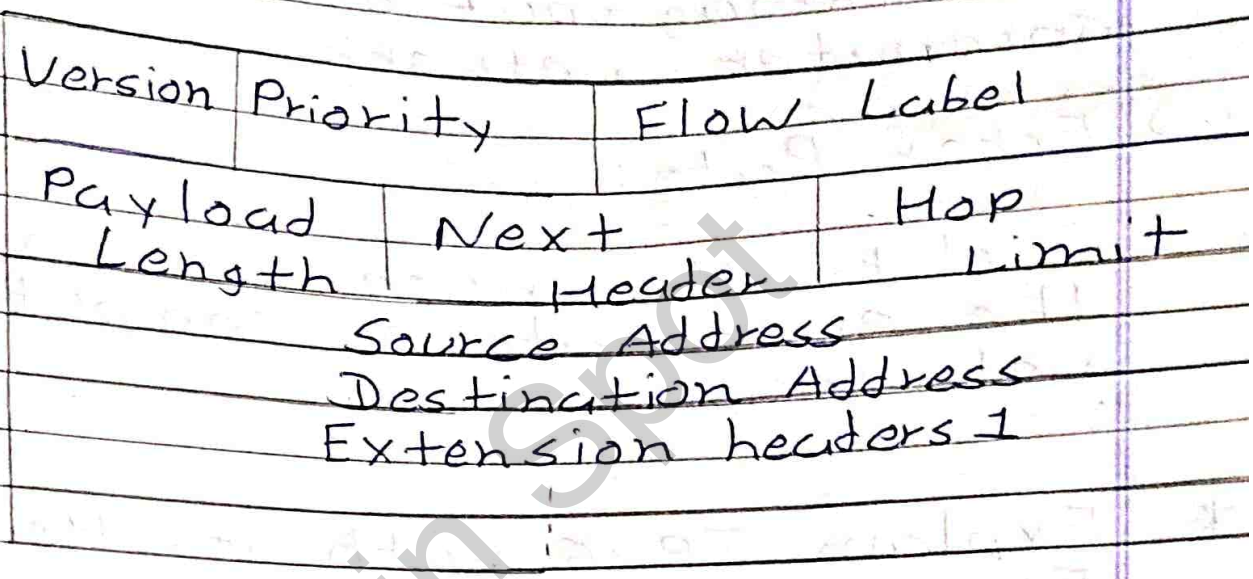
* Explain IPv6 with its Header Format.

=> IPv6 is the most recent version of the Internet Protocol.

IPv6 Provides an identification and location system for computer network.

IPv6 addresses length is 128 bits and it was the exhaustion of IPv4 address.

IPv6 Header has two types of Header which includes Fixed header and



This are the element of the IPv6 Header.

- Version : Length of Version is 4-bits which indicates the Internet Protocol version.
- Priority : Length of Priority is 8 bits which indicates the priority of packet.

It helps to routers to handles the traffic based on priority of packet.

- Flow Label : Length of Flow Label is 20 bits.

It is helps to source to label the packet belonging to the same flow in order to request.

- Payload Length : Length of Payload is 16 bits.

It is helps to indicates the total size of payload which contains information about particular packets.

- Next Headers : Length of Next Header is 8-bits.

It is helps to indicates the type of extension header.

- Hop Limit : Length of the hop Limit is 8-bits.

It is indicates the maximum number of intermedicate nodes IPv6 Packet.

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- Source Address: Source Address is the IPv6 address of original source of the packet.
- Destination Address: Destination address is the final address of IPv6 Packet.