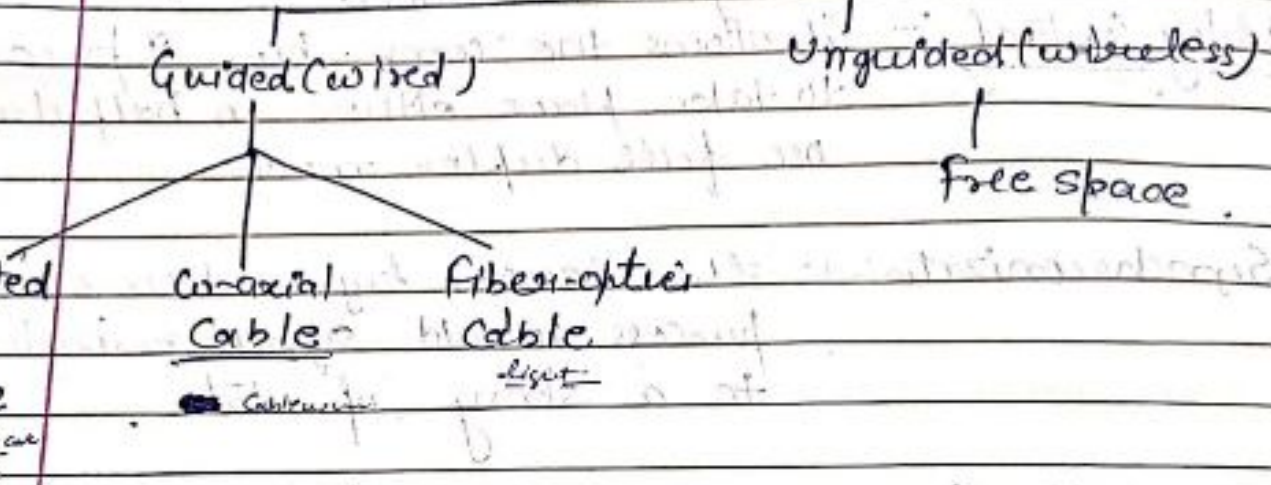
Transmission Media



Transmission medium can be defined as anything that can carry information from a source to destination.

Fareg, the t/m medium for a people having a dinner conversation in the air.

Guided Media :- are those that provide a conduit from one device to another.
(link/connection)

A s/g travelling from any of these media is directed & contained by the physical limits of the medium.

Twisted pair & coaxial cable use copper conductor that accepts & transport s/g in the form of electric current.

Optical fiber is a cable that accepts and transport s/g in the form of light.

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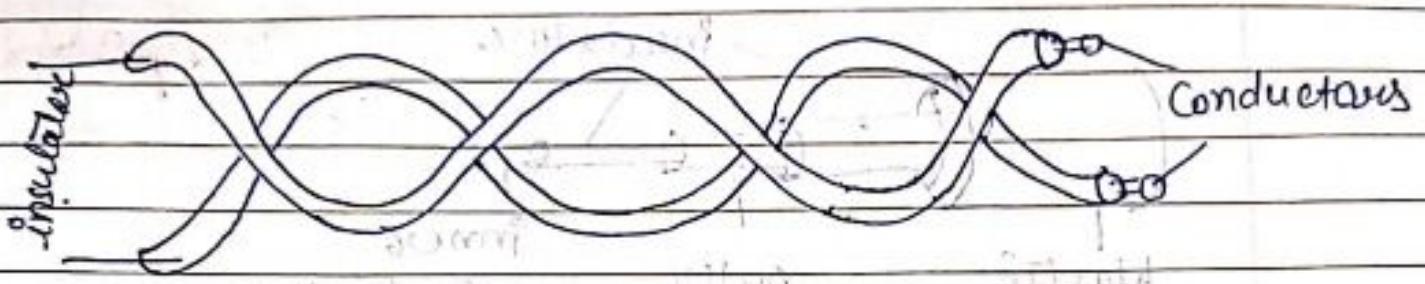
Twisted pair cable :-

it consists of 2 conductors each with its own plastic insulation twisted together as shown in figure.



Unshielded Vs Shielded twisted pair cable :-

The most common twisted pair cable used in comm. is referred to as UTP. very chip & badly affected by noise interference

IBM has also produced a version of twisted pair cable for its use called STP

STP has a metal foil covering each pair of insulated conductors.

Twisted pair cables are used in telephone lines to provide data & voice channels, in ISDN, in local loo

Coaxial Cable :-

It carriers s/g of higher freq. ranges than those in twisted pair cable.

Instead of having 2 wires, coaxe has a central core conductor of solid wire enclosed in a insulating sheath, which is encased in a outer conductor of metal foil.

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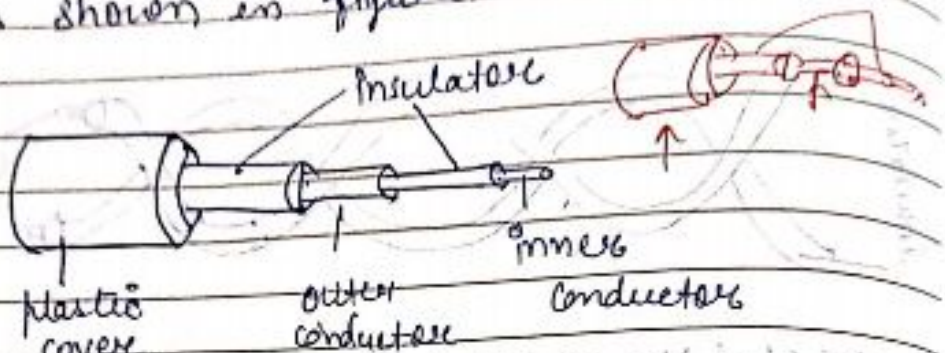
- large BW & loss losses
- suitable for pt to pt or pt to multiple app.
- easy to install
- attenuation is less as compare to twisted pair

Date: Cable.

The outer metallic wrapping serves both as a shield against noise & as the 2nd conductor. This outer conductor is also enclosed in an insulating sheath. as shown in figure.



Coaxial cables was widely used in analog t/p n/w later it was used in digital t/p n/w. Cable TV n/w also used coaxial cables.

Another app. of coaxial cable is in ethernet LAN.

Fiber Optic Cable :- A fiber optic cable is like a glass and or plastic and transmits s/g in the form of light. To understand optical fiber, we need to explain several aspects of nature of light. Light is launched into the fiber using a light source such as a photo transmitter. The optical fiber cables are cost. light LED & it is detected on the other side using a photo detector. Costlier than the other 2 type but have many adv. (i) high BW 100 mbps to 2 GB. (ii) low attenuation (iii) Not affected by EMI.

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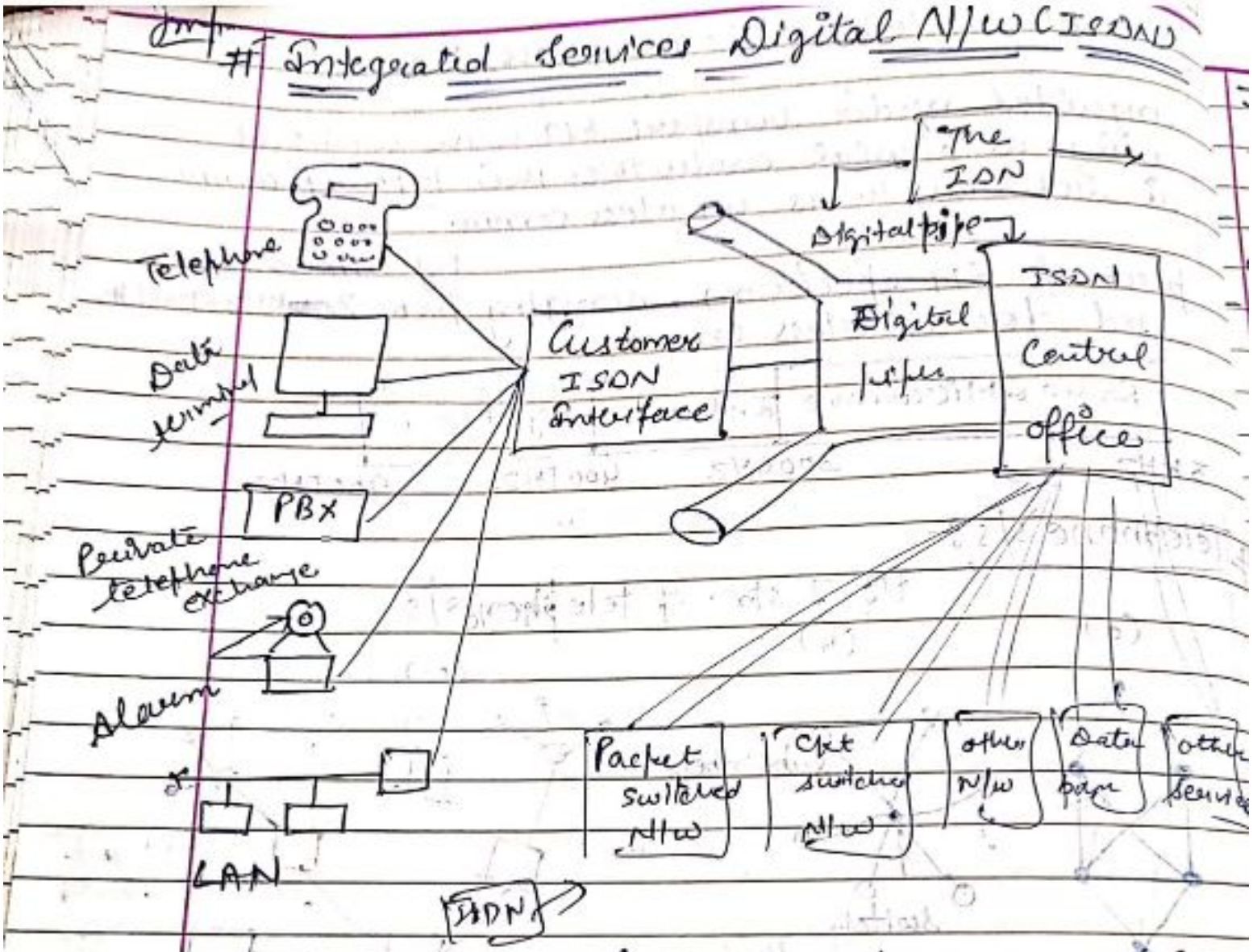
Integrated Services Digital N/W (ISDN)



Subscriber loop & ISDN channel str.

How to make connecting using ISDN.

N	B
1st gen	2nd gen.
64 Kbps	622 Mbps
bw. small	bw large
quality poor	

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It is a wide area n/w. Due to rapid advances in comp. & comm. tech., these 2 fields have merged into each other.
The first Generation of ISDN is called as NBISDN & it is based on the use of 64 Kbps channel. The main imp device in the NBISDN is Frame Relay.

The 2nd Generation of ISDN is referred to as the Broadband ISDN. It supports very high data rate in 100 of Mbps. It has a packet switching orientation. The main imp contribution of Broadband ISDN is the ATM
Asyn. TIF Mode

Principle of ISDN :- The ISDN works on the based the Std. define by ITU-T.
The ISDN is supported by wide range of voice & non-voice application.
ISDN supports a variety of application that include both switched & non-switched connections.
The switched connection includes both packet switched & ckt switched connections.

Types of ISDN :- NB, BB.

Narrowband ISDN :- has smaller BW & it can support the data rate of 64 Kbps only.

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Due to low bit rates the quality of service provided by N-ISDN is poor. This means that the quality of video s/g in this is very poor.

- The BBISDN can support higher data rate due to the use of optical fiber cable.

The BW of optical fiber cable is very high. Hence the BBISDN can allow transmission of very high quality video, images through it.

- Digital pipes of various sizes are available to satisfy the diff^n needs. For eg a residential user will require a less capacity digital pipe than the capacity required for an office.

The data rate on the pipe will vary depending on the need of app.

- The ISDN interface supports :- telephone service, data service, private telephone exchanges, LANet This is the meaning of ISDN service.

The ISDN central office is connected to the integrated Digital N/W (IDN) as shown in fig.

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Date:
Page No.:

The IDN consists of packet switched n/w, ckt switched n/w, other n/w, data base, other service etc.

Various services provided by ISD are:-

(i) Voice app.
(ii) Data app.
(iii) FAX
(iv) telemetext services
(v) Video services.

The central office performs the various operations:-

(i) provides access to the ckt switched n/w.
(ii) " Subscribe access to the dedicated line.
(iii) " " " packet switched n/w
(iv) To accomodate multiplex access via digital PBX & LAN.

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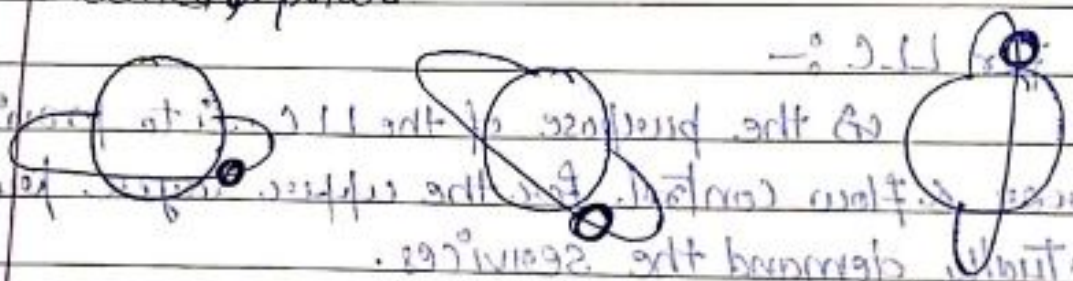
Satellite Networks :-

It is a combination of nodes some of which are satellites that provides comm. from one pt on the Earth to another.

A Node in the n/w can be a satellite, earth station or an end user terminal.

- Satellites can provide the capability to & from any location of the earth no matter how remote. This adv. makes high quality comm. available to undeveloped parts of the world.

Orbits :- An artificial satellite needs to have an orbit, the path in which it travels around the earth. The orbit can be equatorial, inclined or polar.



The period of a satellite, time required for a satellite to make a complete trip around the earth is determined by Kepler's laws.

Based on the loc. of the orbit satellites can be ÷ded into 3 categories :- altitude

1. Geo stationary Earth Orbit (GEO) 35,786 km
2. Medium Earth Orbit (MEO) b/w 5000 - 15000
3. Low Earth Orbit LEO - below 2000 km.

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N/w layer :- It is responsible for carrying the packets from the source to destination. The n/w layer has higher responsibility than DLL because the DLL is only supposed to move the frame from one end of the wire to the other end.
- establishing & maintaining a logical connection b/w nodes.
- finding a route from source to destination

Design issues / Duties of N/w Layer :-

(i) Internetworking (ii) Addressing (iii) Routing
(iv) Packeting (v) ~~Framing~~ Fragmentation

(i) Internetworking :-
→ This is main duty of n/w layer it provides logical connection b/w diff types of n/w

(ii) addressing :-
→ It is necessary to identify each device on the internet uniquely. This is similar to a telephone no/s. The add. use in the n/w layer should uniquely & universely define the connection of all comp.

(iii) Routing :-
→ In a n/w layer, there are multiple routes available from source to destination & one of them is choosen. The n/w layer decides the route to be taken. This is called as routing & it depends on various criteria.

(iv) packetizing :-
→ The n/w layer encapsulate the packet R^ed from the upper layer protocol & makes new packet. This is called as packetising. It is done by a n/w layer protocol called IP (Internet Protocol)

to hold data in packet that can be sent using a given protocol

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Qn) Fragmentation :- The data gram comes with travel in diff n/w. Each routers decapsulate the IP data gram from R'ed frame then this data gram is processed & encapsulate in the another frame.

Types of Connection Services :-

1) Connection oriented Services
2) " less n/w "

In connection oriented services, the user is given a reliable end to end connection. In a connectionless service, the user simply bundles the info together with an address & then send it off in the hope that it will reach its destination.

Internal Organisation of the N/w layer :-

Basically there are 2 methodology for organising the subnet under

1. To use Connection oriented services
2. " " connectionless n/w

In the Connection oriented Service a connection is called as virtual ckt. It is similar to physical connection. In a connectionless n/w service the independent packets are called as data gram

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Virtual circuit :- The principle behind the virtual ckt is to choose only one route from source to destination. When a conn is established, it is used for all the traffic flowing over the connection. When the connection is released, the virtual ckt is terminated.

Data Gram :-

With a data gram, the route from source to destination are not work out in advance. Each packet end is routed independently. These packets can follow diff route. The data gram subnets has to do more work but they are more robust and deal with failure & congestion more easily as compared to virtual ckt subnets.

March 24, 2015

 # Congestion :- slow link, slow processor, more of source → causes

An imp issue in packet switching n/w is congestion. When too many packets are present in a part of a subnet, the performance degrades. This situation is k/as congestion.

Congestion in a n/w may occure when the load on the n/w is greater than the no. of packets sent to the n/w is greater than the capacity of the n/w.

Need of Congestion Control :-

It is not possible to completely avoid the congestion but it is necessary to control it. The congestion will result in buffer overflow & loss of packets.

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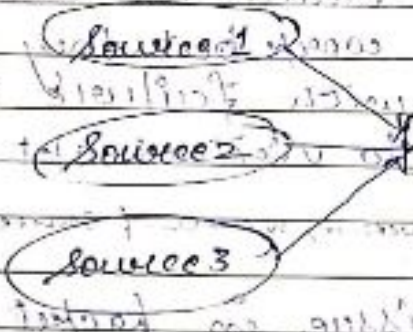
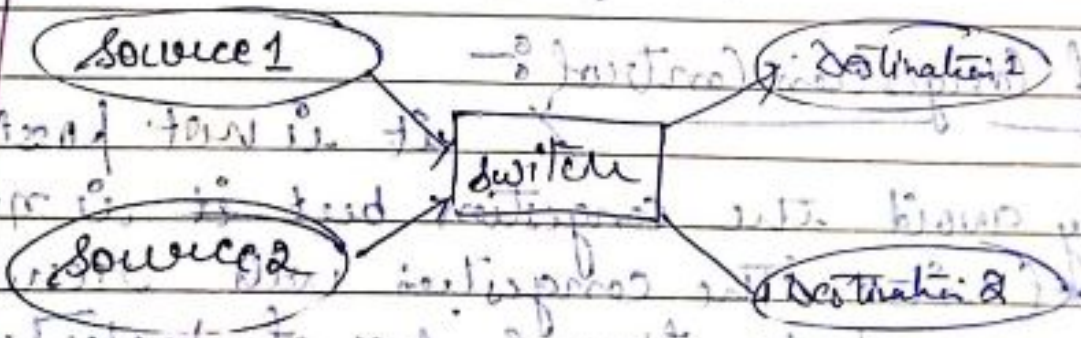
congestion control is necessary to ensure that the users get good quality of service.

Causes :— i) if suddenly a stream of packets start coming on 3 or 4 i/p lines which all need the same o/p line then a queue will build up.

ii) if the m/m capacity is not sufficient to hold these packets some of them will be lost.



iii) congestion is caused due to slow link. other problems will be solved if the high speed links become available. Consider the configuration shown in fig. If both of the sources begins to send at the peak rate congestion will occur at the switch.



all links are 1Gbps.

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(iii) Congestion is caused by the slow processor the problem will be solved when processor speed is improve. Faster processors will transmit more data per unit time.

Principle of congestion control :-

→ The soln to congestion problems
- open loop soln
- closed loop soln

Congestion control refers to the tech & mechanisms which can either prevent congestion from happening or remove congestion after it has taken place.

The open loop congestion control is based on the prevention of congestion where as the closed loop soln is for removing the congestion

Classification :- (i) open loop control :-

→ open loop soln try to solve the problems by excellent design to prevent the congestion from happening. It is exercised by using the tools such as deciding when to accept the new packets, when to discard the packet and making the scheduling decision.

(ii) Closed loop control :- Based on the following 3 steps

(i) detect the congestion & locate it by monitoring the s/s
(ii) t/f the info about congestion to places where action can be taken.
(iii) Adjust the s/s operation to correct the congestion.

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Tech. for achieving good QoS (quality of service)

(i) Traffic Shaping — open loop control
(ii) Leaky Bucket Algo
(iii) Token
(iv) Admission Control
(v) Packet scheduling

Traffic Shaping

- It is one of the imp reason behind congestion is bursty nature of traffic; If the traffic had a uniform data rate then congestion will be less common.
- TS is an open loop control that manages the congestⁿ by forcing the packet to be more predictable.
- TS is a mechanism to control the amount & rate of the traffic sent to the n/w.
- The 2 TS tech are discarded
(i) Leaky Bucket, (ii) Token Bucket

packet
unregulated flow

(i) Leaky Bucket Algorithm :-

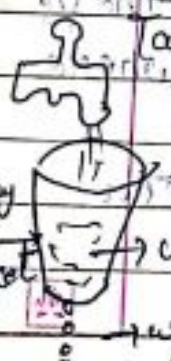

Fig (a)

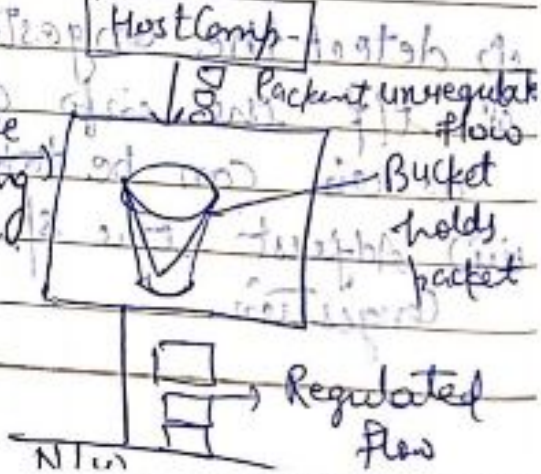

fig (b)

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It is algo used to control congestion in n/w traffic. Its working is similar to leaky bucket & hence the name.

Leaky Bucket is a bucket with hole at bottom. Flow of water from hole is at constant rate which is independent of water entering the bucket.

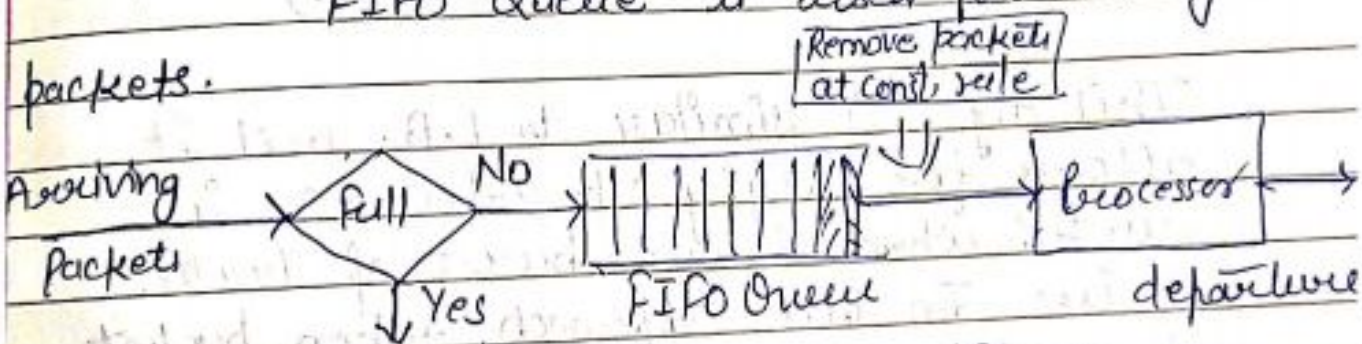
If the bucket is full, any additional water entering in bucket is thrown out. Same tech. is applied to control congestion n/w traffic.

Every host in n/w is having a buffer with finite queue length. Packets which are put in the buffer are thrown away when bucket is full.

L.B. Implementation :-

fig(2) shows Implement^{n} of L.B. principle.

FIFO Queue is used for holding the packets.



Algo :- Step I :- Initialize the counter to n at the tick of clock.

II :- If n > packet size, then send the packet & decrement the counter by packet size.

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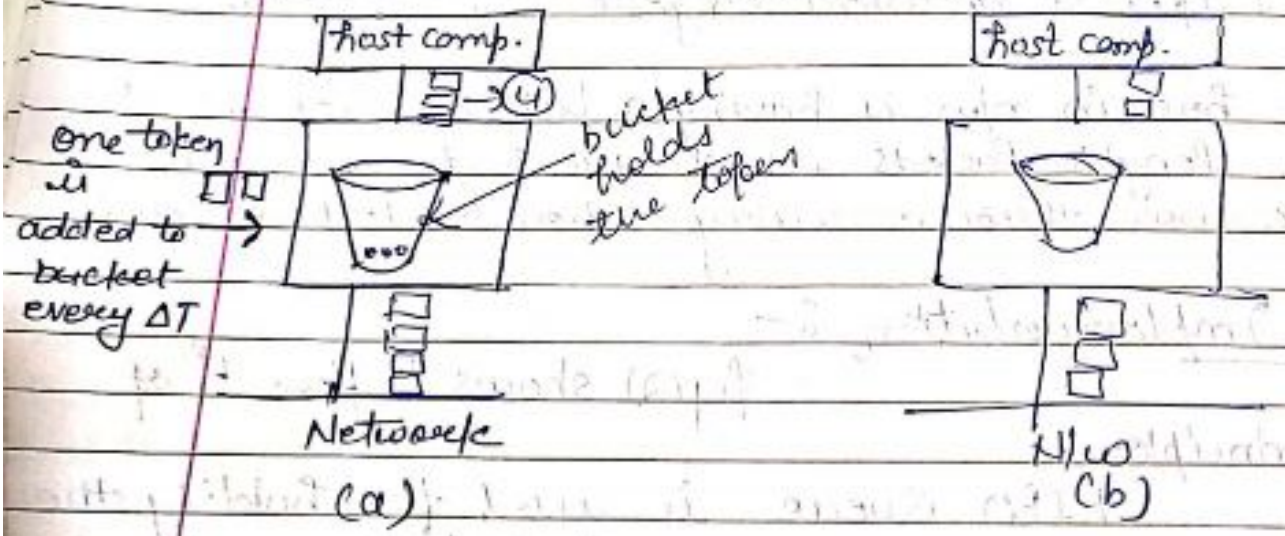
(iii) Repeat step (2) until n becomes smaller than packet size.

(iv) Reset the counter & go back to step I.

⟹ L.B. algo shapes bursty traffic into fixed rate traffic. It drops packet if Bucket is full.

(ii) Token Bucket Algorithm :-



This algo is similar to L.B. but it allows for varying o/p rates. This is useful when larger burst of traffic arise. In this approach token bucket is used to manage the queue regulator that controls the rate of packet flow into the n/w.

A token generator constantly produces token at a rate of R tokens/sec. & places them into token bucket with depth of D tokens.

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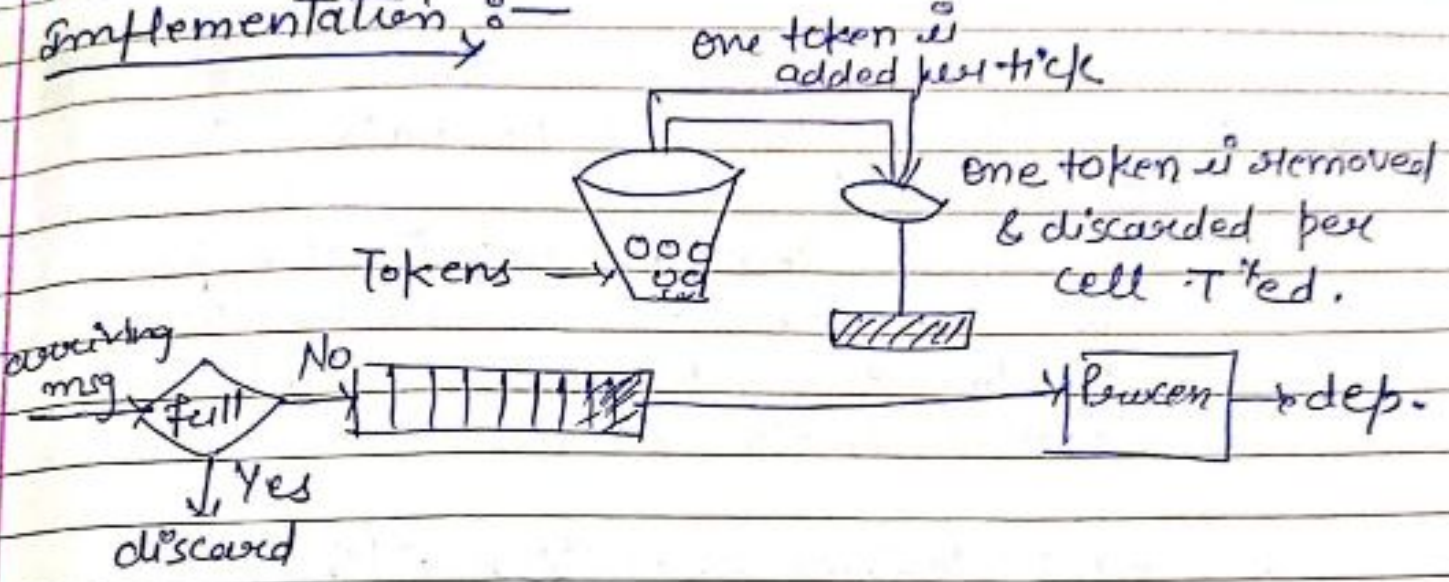
Assuming that each token grants the ability to transmit a fixed no. of bytes, if token bucket fills, newly generated tokens are discarded.

Implementation :—



→ Token bucket can easily implemented with counter. Token is initiated to zero (0).

→ Each time token is added, counter is incremented by 1 & each time a unit of data is dispatched counter is decremented by one (1).

→ if counter contains zero, host can't send any data

→ Token Bucket allows bursty traffic at max. possible rate.

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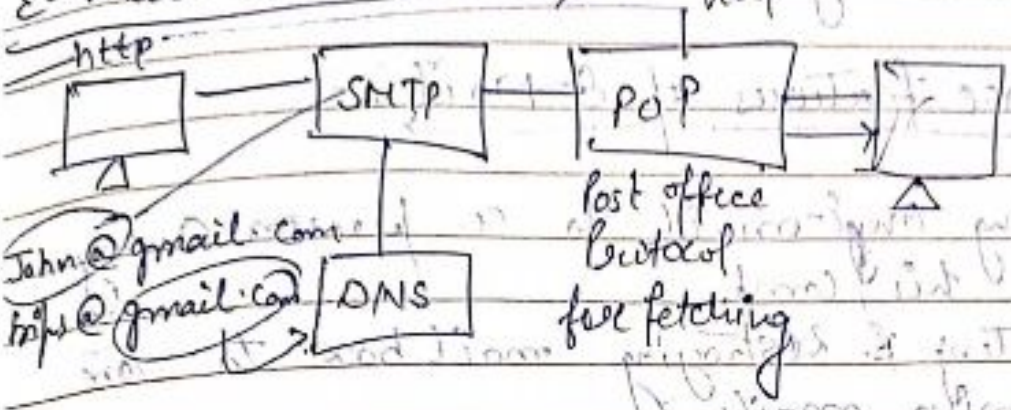
E-Mail :-

It is the most popular n/w service. gmail is based on mechanism of SMTP.

E-mail architecture :-



Basic Fun :-

(i) Composition :- The process of creating msg to answer any one it is composite. the s/s provides a no of header files attached to each msg.

(ii) Transfer :- it is the process of moving the msg from sender to Rter. This needs to establish a conn. from sender to destination to send a msg & after sending release the conn.

(iii) Reporting :- Acknowledgement :- This is used whether the msg was delivered or not. to tell the sender

(iv) Displaying :- it is the process of displaying the incoming msgs.

(v) Disposition :- it is depend upon the Rter what does he want after R'ing.

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Some of the possibilities are:-

(i) delete after reading.
(ii) ——— before ———.
(iii) save msg.
(iv) Forward msg.

Advance features of E-Mail:-

(i) F/wing any E-mail to a person away from his comp.
(ii) Creating & destroying mail box to store incoming mails.
(iii) Sending a mail to a large group of people.
(iv) Automatic notification of undelievered E-mails.
(v) To provide registered E-mails.
(vi) it provide C.C.

header

Name of recipient
R'ee postal add.
State
Zip code
Priority: urgent/ordinary
Encryption
Sender name & postal add.
Date
Subject

Act

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Design issues of App. layer :-

An app service element may call services of other app. service element in the app. entity. The general purpose service elements are
(i) Association Control Service Elements.
(ii) Commitment, Con-currency & Recovery.
(iii) Remote operation service elements.
(iv) Reliable t/f service elements.

These element provide commonly used services which are required by most of the app. processes & that's why they are p/as General Purpose App Service Elements.

Besides them there are some app. specific service elements. they provides Specific types of services Some times these services are directly provided to human users. Most common type of App. Specific service elements are :- (i) Virtual terminal
(ii) file t/f access & management
(iii) Directory Services.

App process also represents resources associated with comm. Thus it partly resides in OSI mod App layer partly in the end s/s.

The part of the app process which provides resources for OSI comm. is k/a app. entity.

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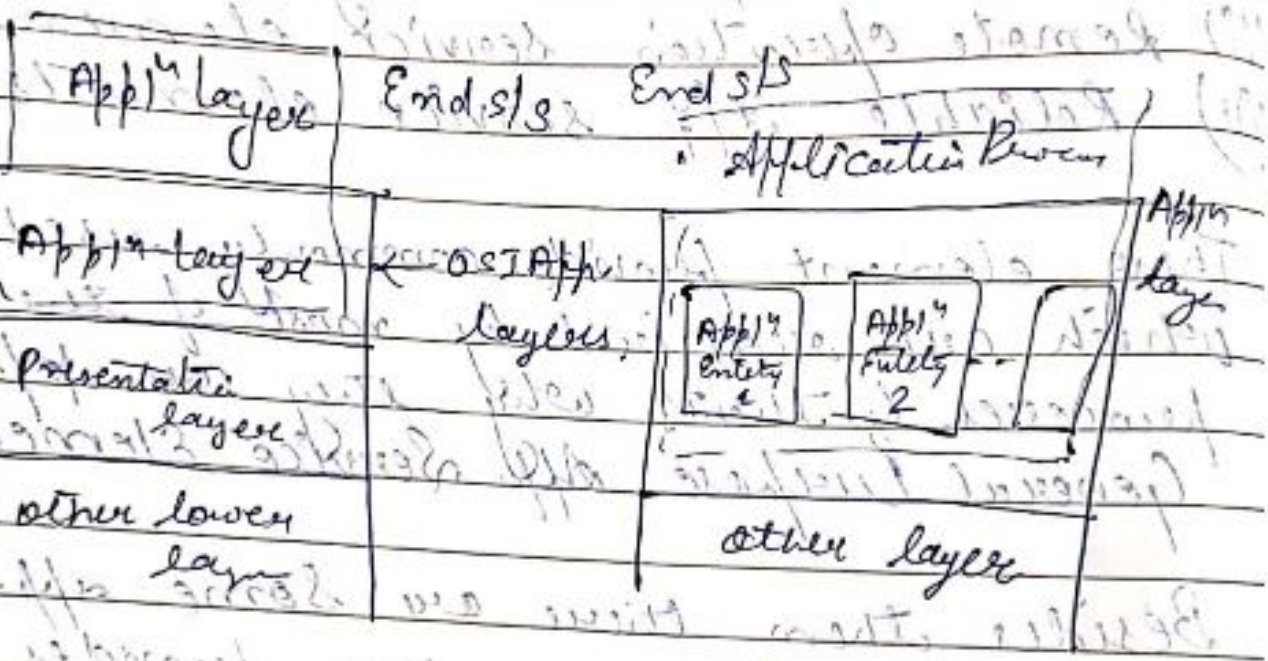
An app. process can have one or more app. entities. Each entity represents diffn set of resources used for OSI comm. The other OSI layer implements single entity and it is only the app. layer which may implement multiple entities.



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