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COMPUTER NETWORK - II DBC

Chap-1 : High speed LANs, ATM and satellite communication,

-> half duplex ni hub use / full ni -> switch

* => Fast Ethernet :
- Also called IEEE 802.3u standard approved in June 1995

CSMA/CD :- Carrier Sense Multiple Access

	Fast ethernet	Gigabit Ethernet
1.	IEEE 802.3u June 1995	1. IEEE 802.3z In 1998
2.	data speed :- 100mbps	2. dataspeed : 1GBPS
3.	LAN cabling schems :-	3. standard
4.	100Base-T4 category 3 UTP signaling speed of 25MHz - Require Four twisted pairs. - encoding scheme 8B/6T - On 8bitmap 6 trees.	4. support half & full duplex mode
		5. Gigabit : point to point
		6. Common configuration of gigabit ethernet having hub or switch
		7. central switch is connected to computers on the periphery. - all lines are buffered
	100Base-TX category 5UTP clock rate of 125MHz Two twisted pair cable - Encoding scheme 4B/5B support - full duplex. - Speed 100mbps	8. CSMA/CD full duplex protocol not used
		9. computer & switch between line is full duplex.

- 100BaseFX.
- Two stand for multimode fiber
- Support fullduplex with 100mbps (speed)
- distance station and hub (2km)

half-duplex
no). CSMA/CD required
(no) Supports

→ Giga Ethernet cabling schems
- support copper & fiber cabling.
- Lasers:- light source.
  Two wavelength.
  1) 0.85 Microns (short)
  2) 1.3 " (long).

- Three fiber diameters
  1) 10, 50 microns 2) 62.5 Microns 3) 10 microns 4) 50 micron
- 10µ is single mode
- 50, 62.5 multimode.

- 1000Base-SX.
  - Multimode fiber (50, 62.5 Microns)
  - encoding scheme called 8B/10B
  - Max length segment 500m
- 1000 Base-L-X
  - uses single (10µ) on Multimode (50, 62.5 µ) fiber.
  - uses 8B/10B encoding scheme
  - length Maximum segment: 5000m.
  - 1.3µ lasers operating over.
  - Campus backbones

- 1000Bs-CX.
- Shielded twisted pair (STP)
- length segment : 25 m
- height Fiber above & deep UTP (unshield twisted pair) below

- 1000 Base-T
- Max length - 100m
- Category 5 UTP
- 4 pair UTP used.
- Speed 125MHz (4 twisted pairs x 2 bits twisted pair = 8 parallel bits per clock cycle)

* Communication Satelines.
- Modern Satellites = Multiple antennas & Multiple transponders.
- Big microwave repeater.
- It contains several transponders.
  - listens
  - amplifies
  - rebroadcasts.
- The effect of solar, lunar, and planetary gravity.
- This fine-tuning activity is called station keeping.
- The downward beams can broad or narrow. Covering and area only 100 km in diameter.
- This mode of operation is known as a bent pipe.

- satellite's period :-

- Keplers laws; radius orbit 3/2 power
- Near the surface = 90 Minute
- 35,800 km ઉંચાઈ 24 hours.
- 3,84,000 km ઉંચાઈ 1 Month

- Geostationary Satellites :-
- satellites on altitude of 35,800 km in circular equatorial orbit motionless in the sky.
- It would not tracked
- To prevent total chaos in the sky, orbit slot allocation is done by ITU (International telecomunication unit)

- Issues :- - orbit slots
- Frequencies

Band	problems
L	low bandwith; crowded
S	" "
C	Terrestrial interference
KU	Rain
KA	Rain; equipment cost

Low - Earth Orbit Satellites (LEO)

- LEO Satelites are close to earth.
- ex :- Iridium, globalstar, Teledesic

— Iridium

→ Iridium project a chain of low-Orbit satellites
- proposal by Motorola (1990) launched in 1997
- original proposal :- 77 low-orbit satellites
→ Revised version :- 66 " " "

- altitude of 750 km in circular polar orbits.
- providing worldwide telecommunication service.
- provides voice, data, paging, fax, and navigation service everywhere on land, sea and, air.
- Iridium satellites are arrange in northsouth Nacklaces.

* ~~Satelites~~ versus ~~Fiber~~.
- one satellites = 32 degree
- 6 satellites nacklaces cover entier earth
- satellites = 48 sats

* Satelites versus fiber.

— A single Fiber has, ~~in~~ more potential bandwidth

* pubic switched Telephone Network (PSTN)

- Original goal :- transmitting human voice in a more- or less recognizable form.
- suitability for use in computer-computer communication is often marginal.
- Introduction of fiberoptics & digital technology

~~Alexander~~

ADSL:-

- Alexandar Graham Bell patented the telephone in 1876.

- perivior to 1984, the telephone system was organized as highly-redundant, Multilevel hierarchy.

- Two-wire connections between each subscriber's telephone and the end office are known in the trade as the local loop.

Chap-2 Routing, Congestion Control, Tunneling and

* Datagram Subnets Vs virtual-circuit Subnets.

- Two different organization services.
  1) connectionless service
  2) connection oriented service

Connectionless service:- datagram,
=> ~~virtual circuit~~ datagram Subnet; advance setup is not needed

=> connection oriented service: path ~~router~~ to
Path from the source router to the destination router. before any data packet is called VC.

- VC:- virtual circuit
- Telephone system & subnet is called a virtual-circuit subnet

Comparsion of Datagram Subnet and virtual-circuit Subnets

Issues	Datagram subnet	virtual-circuit subnet
Circuit Setup	not need	required
Addressing	full source & destination address	short VC number

State information	Routers do not hold	VC require routing table
Routing	Routed independently	route chosen when VC is setup
Effect of router failure	packet lost	Failed router terminated
Quality of service	difficult	easy.
Congestion control	"	"

* Routing Algorithm

=> Main function of the network layer is routing packets from the source machine to the destination machine

=> routing algo = adaptive & non adaptive

=> Non-Adaptive :- computed in advance, off-line, (Static routing) and downloaded to the routers when the network is booted. This procedure is called static routing

=> Adaptive :- (dynamic routing algo) Topology & traffic

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* Routing Algorithm (~~Nonadaptive / Static routing~~)
1) shortest path Routing
2) flooding
3) Distance vector routing
4) Link-State Routing
5) Hierarchical Routing
6) Broadcast "
7) Multicast "
8) Routing for mobile Hosts
9) Routing in Ad Hoc Networks

non-adaptive / static routing Algo

adaptive algo / dynamic routing algo

1) Shortest path Routing :-

- Each node of the graph represents a router and each arc represents a communication line (often called a link)

- Labels on the arcs - distance, bandwidth, average traffic, communication cost, mean queue length, measured delay, and other factors.

→ one well-know algorithm is form Dijkstra (1959)

2) Flooding :-

- Static routing algo.
- Flooding generates vast numbers of duplicate packets.

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Parts of flooding:- Selective flooding :-
routers do not send every incoming packet out
of every line, but only going right direction

=> Westbound Packet on an eastbound line.

-> Use of Flooding:-
- Military applications
- Distributed database application
- wireless networks

* Distance vector Routing:-
- " " " is also known as distributed
Bellman-ford routing algorithm and the
Ford-Fulkerson algorithm.
- It was the original ARPANET routing algorithm

-> RIP :- Routing Internal Protocol.
-> distance table = routing table

- The router is assumed to know the "distance"
to each of its neighbours.
- Assume that delay used as Metric

* The count to Infinity problem.

=> Link-state Routing :-
- Distance vector used to used ARPANET 1979. often replaced by link state Routing

Two- primary problems of distance vector routing
-> line Bandwith selecting the route.
- long to converge (count to infinity problem)

- Each router must do the following.

1) Discover its neighbours and learn their network address.
2) Measure the delay or cost to each of its neighbours.
3) construct a packet to all other routers.
4) send this packet to all other routers.
5) Compute the shortest path to every other router.

* Hierarchical Routing :-

- In hierarchial routing, the routers are grouped into regions, with each router knowing all the details about how to route packet to destinations within its own region but knowing nothing about the internal structure of the other regions.

- Group the regions into clusters, clusters into zones.

* Congestion *

- when too many packets are present in (a part) of the subnet.

- General principles of congestion control :-
  1) Monitor the system.
     - detect when and where congestion occurs
  2) pass information to where action can be taken
  3) Adjust system operation to correct the problem.

* Congestion prevention policies :-

Layer	policies.
- Transport (timeout determination)	- Retransmission policy. - Out-of-order caching policy. - Acknowledgement policy. - flow control policy. - Timeout determination.
- Network (Packet, circuit, Routing)	- virtual circuits versus datagram inside the subnet. - packet queueing and service policy - packet discard policy - Routing algorithm - Packet lifetime management.
- Data link	- Retransmission policy - Out-Of-order caching policy

- Acknowledgement policy
- Flow control policy.

* Tunneling :-

- source and destination hosts are on the same type of network. but there is a different network in between. (TCP/IP)

- Tcp/Ip :- Transmission control protocol/Internet protocol

- Tunneling of packets through a foreign network works the Someway,

x virtual private networks. (VPNs)

→ private networks :- Leasing T1 lines / T3 lines - very expen

→ Virtual private networks are overlay networks on top of public networks but with most of the properties of private networks.

- VPNs are called virtual because they are Merly an illusion.

- popular approach : is to build VPNs directly over the Internet.

common design
- Firwall & Create tunnels through the internet.

SA :- Source Address / second Address.

Ipsec :- Internet protocol security.

Ipsec is used for the tunneling a single authenticated, encrypted SA. Thus, providing Integrity control, secrecy, and even considerable Immunity to traffic analysis.

- Esp :- Electronic Mobility IP
- Esp :- Encapsulating security payload.

Chap :- 3 Internetworking and network Security

- Internetworking :- Numerous protocol are in LAN, MPN, WAN layer widespread use in every layer.

- SNA :- system network Architecture
- FDDI :- Fyber Distributed data interface.

→ Ipx :- Intern network Package exchange
- ATM :- Automated Tailed machine.
- MPLS :- Multi protocol label switching

How Networks differ.

Item	Some possibilities
Service offered	Connection oriented vs connectionless
Protocols	IP, IPX, SNA, ATM, MPLS, Apple Talk, etc.
Addressing	Flat (802.2) vs hierarchical (IP)
Multicasting	present or absent
Broadcasting	" " "
Packet size	Every network has its own maximum.
Security	present or absent: many different kinds.
Quality of service	Reliable, Ordered and unordered delivery.
Error handling	Sliding window, rate control, other, or none
Flow control	Leaky bucket, token bucket, RED, Choke, packets etc.
Congestion control	privacy rules, encryption, etc
Security	Different timeouts, flow specification, etc.
Parameters	By connect time, by packet, by byte, or not at all.
Accounting	

→ Some of the many ways networks can differ.
A source on network transit one or more network before the destination network.

- Protocol conversions are need.
- Address " required directory system.

- Differing QOS :- Issue when a packet has real-time delivery constraints.

- QOS :- offline operating simulators.

* Error, Flow and congestion control :-
* different security mechanisms, parameter setting and accounting rules.

* Fragmentation :-

- Each network imposes some maximum size on its packets.

- Two Types of Fragmentation
  - Transparent "
  - Non-Transparent fragmentation.

* Transparent fragmentation :-

- when an oversized packet arrives at gateway, the gateway breaks it up into fragments.

- ATM world, fragmentation is called segmentation.

- All packets must exit via the same gateway.

- ATM required transparent fragmentation
- small packet

* Non-Transparent Fragmentation

- Refrains from recombing fragments at any intermediate gateway.
- Recombination occurs only at the destination host.
- Large packet. (Header)

Advantage :- Multiple bit gatways can be used and higher performance can be achieved.