1. What is computer Networks? Explain the applications of computer Networks?

↳ Computer Networking refers to interconnected computing devices that can exchange data & share resources with each other.

The networked devices use a system of rules, called communications, protocols, to transmit information over. physical or wireless technologies.

Applications

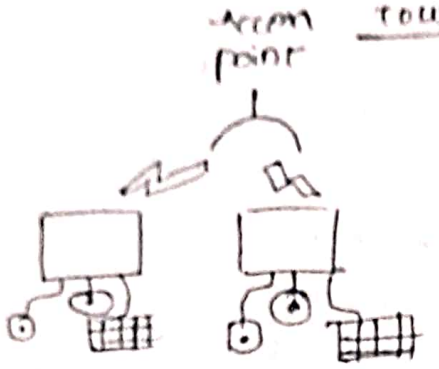
- Access to Remote Database information
- Data security & management
- communication
- shared resource
- Data sharing
- Directory services: it is possible to store the list of files in a central location to speed worldwide search operations
- Business Softwares
- Educational applications.
- Mobile users
- Social media

3. Explain the concept of Local Area Network. provide example of situations where setting up a LAN is beneficial.

↳ A LAN (Local Area Network) is a private Network that operates within and nearby a single building such as a home, office or factory. LANs are widely used to connect personal computers & consumer electronics to let them share resources & exchange information.

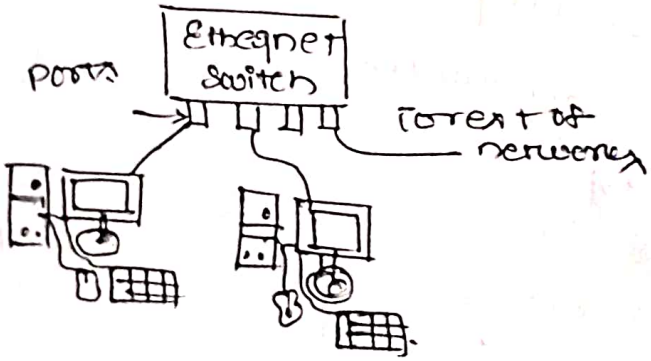
Le Wireless lans are pervasive today. this includes the cables introduced too much cost. in this system computer uses radio modem & an antenna for the sake of communication where

each computer talks to a device called an AP (Access point), wireless routers, or base stations.



these wireless lan will follows the mesh network

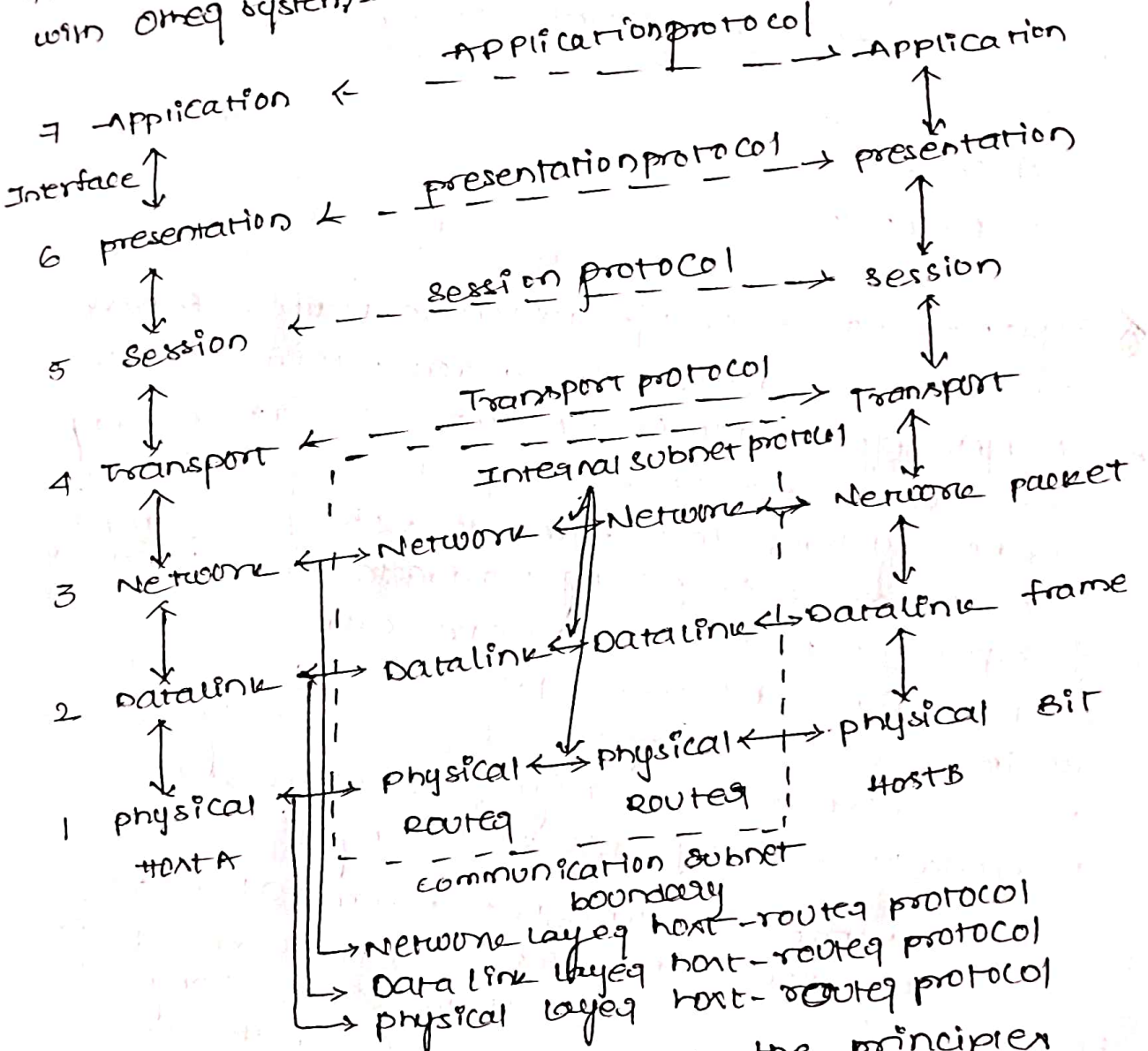
B. Wired LAN: use many different transmission technologies. Common physical modes of transmission are copper, coaxial cable & optical fibers. LANs has limited size that the worst-case transmission time is bounded and known in advance. knowing this helps with the task of designing network protocols. & Typically the wired LANs can run at speeds ranging from 100 Mbps to 40 Gbps. there has low latency & lower loss of packets. for wired LAN's we use mostly Ethernet's cables.



Ex: in the colleges & offices they will follow the wired LAN technique for the transmission of data in order to lower the data loss through the optical fibers over a small area which can be covered within the campus in which we can't access the data outside of that range.

3. Explain the OSI model & its seven layers?

A. This model is based on a proposal developed by a International standards organization as a first step toward international standardization of the protocols used in various layers. it was revised in 1995. it is called OSI Reference model. because it deals with connecting open systems. that is systems that are open for communication with other systems.



the OSI has seven layers. the principles that were applied to arrive at the seven layers can be briefly summarized as follows.

1. A Layer should be created where a different abstraction is needed.
2. Each layer should perform a well-defined function
3. The function of each layer should be chosen with an eye toward defining internationally standardized protocols

4. the layer boundaries should be chosen to minimize the information flow across the interfaces.
5. the No. of layers should be large enough that distinct functions need not be thrown together in the same layer out of necessity & small enough that the architecture does not become unwieldy.

three concepts are central to the OSI model:

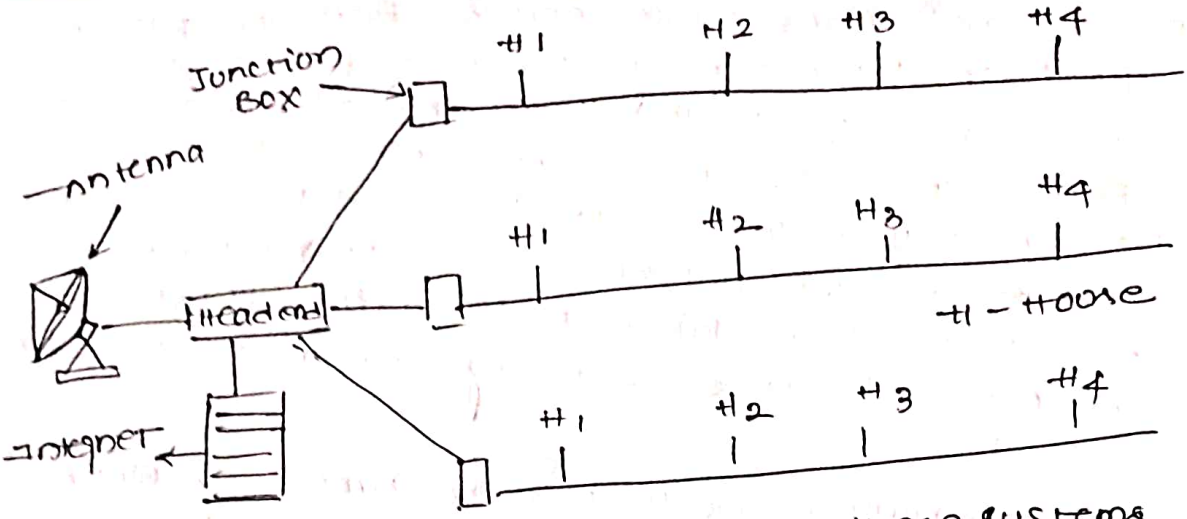
1) Services
2) Interfaces
3) protocols

Explain the concept of Metropolitan Area Network & provide an example of its use in a real-world scenario.

A. A MAN (Metropolitan Area Network) covers a city. At first these networks were locally designed, ad-hoc systems. then companies began jumping into the business, getting contracts from local governments to wire up entire cities. the next step was television programming & even entire channels designed for cable only. often these channels were highly specialized, such as all sports, all cooking, all gardening & soon

when the Internet began attracting a mass audience, the cable TV network operators began to realize that with some change they could provide internet also through the unused spectrum of the cable.

Cable television is not only MAN. Recent developments in high-speed wireless Internet access have resulted in another MAN, which has been standardized ieee 802.16 & popularly known as the WiMAX which is of wireless. Other wireless technique are LTE & 5G.



Ex: the cable television networks. these systems grew from earlier community antenna systems used in areas with poor over-the-air television reception. In those early systems, a large antenna was placed on top of a nearby hill & a signal was then piped to the subscribers houses

Q: Explain about error control process in data link layer?

A: After solving the problem of marking the start & end of each frame, we come to the next problem: i.e how to make sure all frames are eventually delivered to the network layer at the destination & in the proper order.

for an unacknowledged connectionless service, it is fine to keep sending the data without any acknowledge BUT for the connection oriented service it would not be fine at all,

the usual way to ensure reliable delivery is to provide the sender with some feedback about what is happening at the other end of the line. Typically these protocol calls the receiver to send a feedback (or) frames bearing positive (or) negative acknowledgement. if the sender get the positive acknowledgement then the data has been safely arrived to the receiver end.

on the other end if the sender Receiver an negative acknowledgement then the frame must be Retransmitted again

An additional complication comes from the possibility that hardware troubles may cause a frame to vanish completely. In this case the receiver will not react at all, since it has no reason to react. Similarly, if the acknowledgement frame is lost, the sender will not know how to proceed. It should be clear that in which protocol the sender is sending a frame & waiting for an acknowledgement.

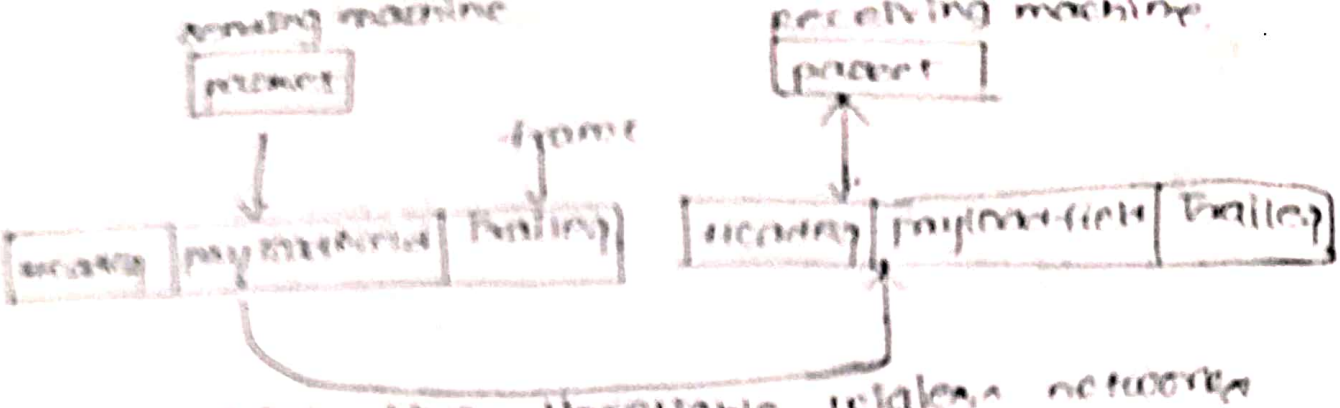
This possibility is dealt with the timers in which a timer is set to started while transmitting a frame data link layer. The timer is set to expire after an interval long enough for the frame to reach the destination be processed there, & have the acknowledgement propagate back to the sender. Normally the frame will be correctly received & the acknowledgement will propagate back with in the timer runs out in which the timer will be canceled. This makes the sender to alleged while the data is lost.

Examine the design issues in the data link layer of the OSI model also with suitable diagram explain?

The data link layer uses the services of the physical layer below it to send & receive bits over communication channels that may lose data it has NO of function including:

1. providing a well-defined service interface to the network layer.
2. Framing sequences of bytes as self-contained segement
3. Detecting and correcting transmission errors
4. Regulating the flow so that slow receivers are not submerged by fast senders

To accomplish these goals, the data link layer takes the packets it gets from the network layer encapsulates them into frames for transmission. Hege each from contains a frame header, a payload field for holding the packet & a frame trailer.



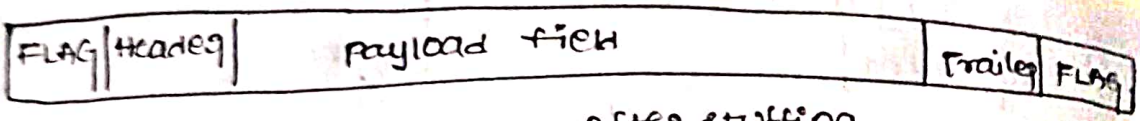
Also note when unreliable wireless networks are being used data link protocols to improve the data link layer often improves performance

Note Reliability in the protocol is overall goal & it is achieved when all layers work together. Usually there in many networks these functions are found mostly in the upper layers with minimal job.

9. Describe about byte stuffing & bit stuffing process in data link layer?.

A. Usually when the binary data such as photos or songs are being transmitted the risk of data may occur & this situation would interfere with the framing. One way to solve this problem is to have the sender's data link layer insert a special escape byte just before each "accidental" flag byte in the data. Now a framing flag byte can be distinguished from one in the data by the absence or presence of an escape byte before it. The data link layer on the receiving end removes the escape bytes before giving the data to network layer. This technique is called as byte stuffing

If an escape byte occurs in the middle of data it must also be stuffed with the flag escape byte. At the receiver the first escape byte is removed leaving the data byte that follows it



original bytes				after stuffing					
A	FLAG	B	→	A	ESC	FLAG	B		
A	ESC	B	→	A	ESC	ESC	B		
A	ESC	FLAG	B	→ A	ESC	ESC	ESC	FLAG	B
A	ESC	ESC	B	→ A	ESC	ESC	ESC	ESC	B

the slight simplification of PPP (point-to-point protocol)

the method of delimiting the bit stream gives rise to a disadvantage of byte stuffing, which is that it is tied to the use of 8-bit bytes. Framing can also be done at the bit level so frames can be contain an arbitrary no. of bits made up of units of any size. it was developed for the once-popular HDLC protocol. that is each frame begins & ends with the pattern 01111110 or 0x7E in hexadecimal, this pattern is a flag byte. Whenever the sender's data link layer encounters five consecutive 1's in the data it automatically stuffs a 0 bit into the outgoing bit stream.

this bit-stuffing is analogous to byte stuffing in which the escape byte is stuffed into the data before the flag byte in the outgoing character & also when received sees five consecutive incoming 1-bits followed by a 0 bit. it automatically destuffs the 0 bit just as byte stuffing it is transparent to the network layer in the both computers

a. 0110111111111111111110010

b. 0110111110111110100 10

stuffed bits

c. 0 110 11111011111 01111 0010

10. Explain the concept of framing in the Data link layer

A. The physical layer accepts a raw bit stream & attempts to deliver it to the destination. If the channel is noisy, as it is for most wireless & some wired connects the physical layer will add redundancy to its signals to reduce the bit error rate to a tolerable level. However the bit stream received by the data link layer is not guaranteed to be error-free. Some bits may have different values & the no. of bits received may be less than, equal to, or more than the no. of bits transmitted.

To make this error free of the data. then the bit stream is break up into the discrete frames, compute a short token called a checksum for each frame. & included it into the frame while transmitting. When a frame Reaches the destination the receiver recomputes the checksum based on the receiving frame. If the newly computed sum is different from the sum which was in frame then there have been occured error.

Breaking up of bit stream into frames is difficult. so a good design must make it easy for a receiver to find the start of new frames while using little of the channel bandwidth. which can be done through 4 framing techniques

1. Byte count
2. Flag bytes with byte stuffing
3. Flag bits with bit stuffing
4. Physical layer coding violations.

4) Describe the point to point ... topology
. with suitable network diagram:

A. · point to point:

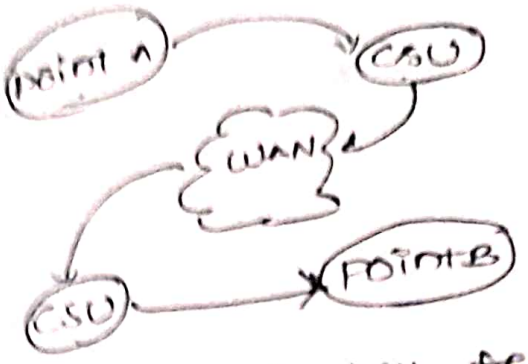
point to point Networks or point-to-point connection is type of private data connection that is connecting securely two or more location's for private data services.

it might also be configured to usually carry voice, internet & data service together all over same point-to-point network.

it simply refers to type of communication connection among two endpoints or nodes of communication. it is connection among pairs of machines

Transmission from point-to-point with only to users is know as unicasting.

Unicasting is usually choosen for the data securely sending & receiving purpose in an confidential manner. the transmision will takes place in the fixed path which connects the point to point. this network includes various connections among individual pairs of machine. a packet present on these type of networks might be needed to go through the intermediate computers before they reach their destination computers. the packets also need to follow multiple routes of different length sizes



6. Summarize the key features of connection-oriented services versus connectionless services

A.

connection-oriented service	connectionless service
* connection-oriented service is related to the telephone system	* connection-less service is related to the postal system
* connection-oriented service is preferred by long & steady communication	* connection-less service is preferred by bursty communication
* connection-oriented services are feasible	* connection-less services are not feasible
* In connection-oriented service congestion is not possible	* In connection-less service congestion is not possible.
* packets follow the same route	* packets do not follow the same route.