# Question 1

Two of the main protocols in use for network communications are: TCP (Transmission Control Protocol) and UDP (User Datagram Protocol)

1. **Discuss the advantages and disadvantages of these two protocols and discuss how they differ.**

1. TCP is a connection-oriented protocol, whereas UDP is a connectionless protocol.

2. The speed for TCP is slower while the speed of UDP is faster.

3. TCP uses handshake protocol like SYN, SYN-ACK, ACK while UDP uses no handshake protocols.

4. TCP does error checking and also makes error recovery, on the other hand, UDP performs error checking, but it discards erroneous packets.

5. TCP has acknowledgment segments, but UDP does not have any acknowledgment segment.

6. When we compare TCP vs UDP protocol, TCP is heavy-weight, and UDP is lightweight.

1. **For the following applications determine whether you would use**

**TCP or UDP and explain the reasons for your choice**

* 1. File Transfer,

TCP – Need a secure reliable connection, to prevent data lose

* 1. Watching a real time streamed video,

UDP – Not worried about slight data lose, prefer light weight and fast connection

* 1. Web Browsing,

TCP - It uses TCP to ensure that the entire request gets to the client or server intact.

* 1. A Voice over IP (VoIP) telephone conversation,

UDP – As we don’t want delays between conversations, and wouldn’t want to wait for a secure connection to be made with TCP (enjoy a real-time and uninterrupted call).

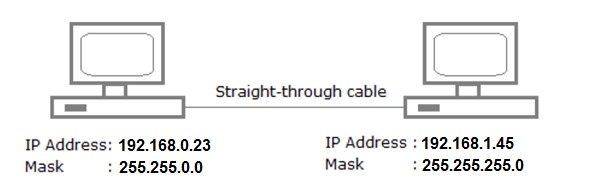
1. **Draw a Diagram showing how packets might traverse the internet, and how they may arrive at their destination. Include in the diagrams any acknowledgements, packet order and priority. Provide a diagram for both the TCP and the UDP protocols.**

Diagram, schematic

Description automatically generated**Diagram

Description automatically generated**

# Question 2

Referring to the picture below, a network administrator is connecting hosts A and B directly through their Ethernet interfaces, as shown in the illustration. Ping attempts between the hosts are unsuccessful.

1. **What could potentially be wrong? What can be done to provide connectivity between the hosts? Show any working out.**

We should prefer to use crossover when we are connecting devices of the same type, and straight through for different types. When connecting two hosts or two switches together you need to swap the transmit and receive pairs. This is what a crossover cable does.

***On entirely different networks, class b vs class c can’t talk to each other.***

1. **Explain the difference between a straight through cable and a cross-over cable.**
2. Crossover cable, Pin 1 is crossed with Pin 3, and Pin 2 is crossed with Pin 6 while in Straight-through cable Pin connection is one to one.
3. Straight-through cables are mainly used for connecting non-similar devices while crossover cables are mostly used for connecting similar devices.
4. Straight through cable connects a computer with a DSL modem while Crossover cable connects Router to Router and Computer to Computer.

# Question 3

**What are the differences between ‘Circuit Switched’ and ‘Packet Switched’ networks? Give examples of each, and provide examples of when you may use one over another, providing the advantages of each type.**

Packet-switched networks move data in separate, small blocks -- packets -- based on the destination address in each packet. When received, packets are reassembled in the proper sequence to make up the message. Circuit-switched networks require dedicated point-to-point connections during calls.

### **Advantages of circuit switching over packet switching:**

* Decreases the delay the user experiences before and during a call
* The call will be done with a steady bandwidth, dedicated channel, and consistent data rate
* Packets are always delivered in the correct order

### Advantages of packet switching over circuit switching:

* More efficient than circuit switching
* Data packets are able to find the destination without the use of a dedicated channel
* Reduces lost data packets because packet switching allows for resending of packets
* More cost-effective since there is no need for a dedicated channel for voice or data traffic

Circuit switching - ordinary telephone calls

Packet switching - the Internet and most local area networks (most things now a days)

*Circuit switch, relying on entire circuit to do the transmitting, circuit gets altered (older tech). Packet switching, uses router to decide the network. Packet switch sends tiny chunks instead of entire packet (like with circuit switch) and is reassembled at the end.*

# Question 4

**a) Subnet the following:**

Networks for: Use any network – doesn’t matter anyway for this (just show the subnetting mask you get at the end and maybe the subnetting table)

14 hosts - Use 16 (magic number) (if we don’t want to expand), but do 32 instead as we want to expand (go up)

**255.255.255.224**

47 hosts – Use 64

**255.255.255.192**

1. **What is the hexadecimal value for 127.0.0.1?**

**Local host in IPv6 =** ::1

1. **What is FF:FF:FF:FF:FF:FF (255.255.255.255 broadcast address) in decimal and binary?**

Decimal = **255.255.255.255**

Binary =11111111 11111111 11111111 11111111

# Question 5

1. **Define encapsulation/decapsulation.**

Encapsulation is the packaging/moving of data from the upper layers down to lower layers of the OSI/networking model (in the source computer), each layer adding headers of information. This packaging is encapsulation.

Decapsulation is the unpackaging of data moving from lower levels of the networking models, to the upper levels (in the destination computer). Each layer unpacks corresponding headers and uses that information to obtain the actual data. This unpacking is dencapsulation.

1. **What are the roles of the following OSI 7-layer model layers?** 
   1. Transport

(Layer 4 up) Transmits the actual data using transmission protocols (UDP/TCP)

Data here is called TCP Segment or UDP Datagram

* 1. Network

(Layer 3 up) Decides which physical path the data will take

Data here is called packets

* 1. Physical

(Layer 1 up) Transmits raw bit stream over the physical medium

Data here is called bits

1. **What are CSMA/CD and CSMA/CA? How do they differ?**

CSMA / CD It is operated in the medium access control layer. It senses of the shared channel is busy for broadcasting and interrupts the broadcast until the channel is free. In CSMA/CD collision is detected by broadcast sensing from the other stations. Upon collision detection in CSMA/CD, the transmission is stopped and a jam signal is sent by the stations and then the station waits for a random time context before retransmission.

CSMA/CA is a network protocol for carrier transmission. Like CSMA/CD it is also operated in the medium access control layer. Unlike CSMA/CD(that is effective after a collision) CSMA / CA is effective before a collision.

**Differences**