A T3 line multiplexes 28 T1 lines. Each T1 multiplexes 24 64Kbps channels. How many channels are there on a T3 line? What is the bit rate of a T3?

Assume you are building a CSMA/CD protocol and the newtork specification calls for a shared medium 1 Km in diameter. That is, from one end of the network to the other the maximum distance is 1 Km. Assume the speed of light in the medium is 2/3 c.
a) What is the round trip propagation time?
b) What does the round trip time imply about have to do with the minimum packet size?
c) What is the minimum packet size if you want to run the network at 10 Mbps.
d) What is the minimum packet size if you want to run the network at 100 Mbps.
e) Assuming you want to send 10Mbit of data from one host to another on the network, how long does it take?
f) What is the maximum packet size for your protocol?
g) Does your protocol guarentee any quality of service (QoS)?

Briefly explain both FDM and TDM. List three advantages of TDM?

Consider a frame of 5 bytes of information to be checked with a 1 byte CRC code, given as:

$G(x) = x^8 + x^2 + x + 1$

In hardware the CRC is calculated with LFSRs which epresents the CRC polynomial. The CRC operation is equivalent to polynomial division where the 1 bits of the data reperesnt the polynomial coefficients. Calculate the CRC for the following data

D(x) = MSB 00000000 00000000 0000000 00000100 00011100 LSB

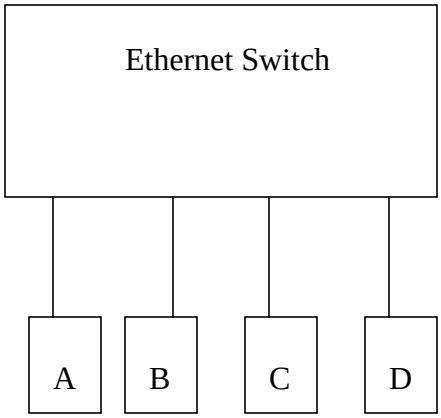
a) What polynonial does D(x) represent, the coefficients represent the coefficients. The CRC is the remaninder when D(x) is divided by G(x).

b) Assume that the reciever data stream D'(x) has an error as shown.

D'(x) = MSB 00000000 00000000 0000000 00000100 00011101 LSB

What is the CRC now? Was it able to detect the error? Can it correct the error?

Consider the following network:



A (a.deptx.company.com) - 129.1.10.5
B (b.deptx.company.com) - 129.1.10.6
C (c.deptx.company.com) - 129.1.10.7
D (d.deptx.company.com) - 129.1.10.8 (DNS server)

Show the sequence of packets that will be placed on the network (including ARP, DNS, and ping messages) if host A pings host B.

An ARP query packet is encapsulated in
a) a link-layer frame addressed to a specific adapter
b) a link-layer broadcast frame
c) an IP datagram
d) none of the above

Each LAN adapter has a unique LAN address.
a) FALSE
b) TRUE

Consider a computer network consisting of several interconnected 10BaseT hubs, but which does not include any bridges or routers. Then this network has only one collision domain.
a) TRUE
b) FALSE

The entries in a bridge table need to be configured by the network administrator.
a) TRUE
b) FALSE

TCP and IP headers both require a minimum of 20 bytes. Suppose an application generates chunks of 60 bytes of data every second, and each chunk gets encapsulated in a TCP segment and then an IP datagram. What percentage of each IP datagram will contain application data.

Ethernet adds another 26 bytes of header and trailer. For the same example, assume the underlying physical layer is ethernet. What percentage of each ethernet frame will be application data?

Wireless 802.11 adds another 24 byte PLCP for each ethernet frame less the 8 byte preamble of the corresponding wired ethernet frame. What percentage of each 802.11 ethernet frame will be application data?

What is the transmission time for the frame on the wireless 802.11b standard LAN. According the the 802.11 standard the PLCP is transmitted at 1Mbps while the remainder of the frame will transmit at a higher rate up to 11 Mbps for 802.11b. What percentage of the total transmission time will be application data.

Assume we now are now using IPSec for authentication in the transport mode. That is we are running the the AH protocol which introduces another 24 bytes of overhead. What percentage of each IP datagram will now contain application data.

Draw the layers of the protocol stack representing the transmission of authenticated data over an 802.11 wireless LAN.

Before sending a packet into a datagram network, the source must determine all of the links that packet will traverse between source and destination.

a) FALSE
b) TRUE

What is a port number in TCP/IP?

Can the same service be implemented using either TCP or UDP? If so could they use the same port number?

What are sequence/acknowledge numbers used for in TCP/IP?

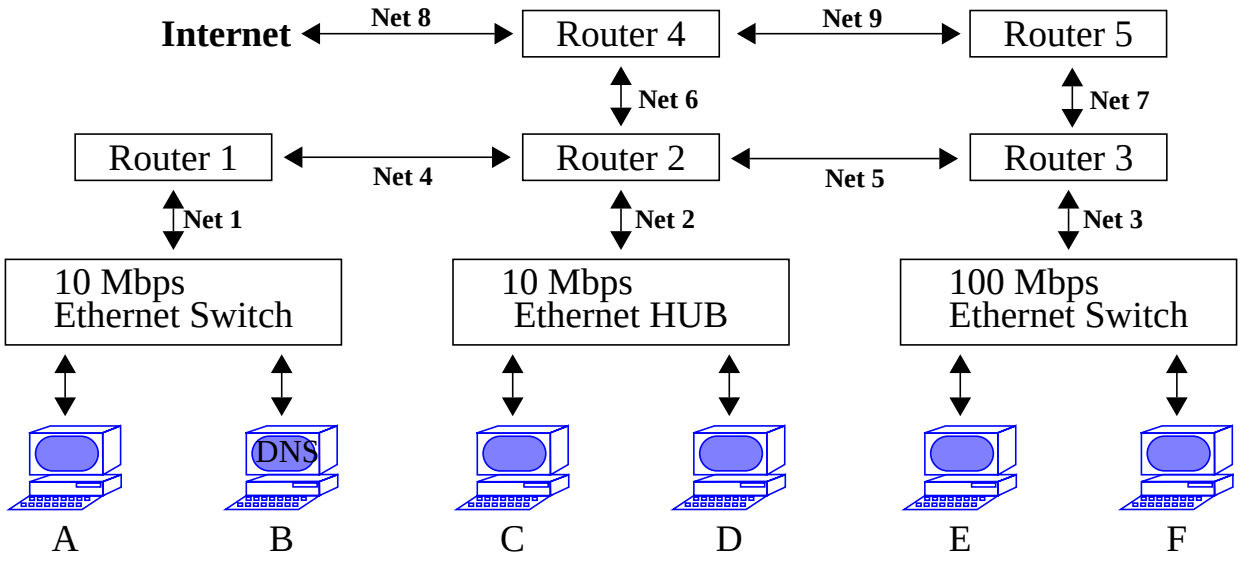
Why is UDP called an ‘unreliable’ transport service?

Describe the TCP/IP three-way handshake.

What is the difference between congestion control and flow control?

What type of applications benefit from a connectionless transport protocol?

Given the following network that you are very familiar with.



Circle the individual ethernet collision domains.

Assuming that all ARP tables are initially empty, the routing tables are stable, and the DNS server can resolve any request. Show the sequence of packets that will occur for **A** to send two ping requests to **D** .

Assuming that all ARP tables are initially empty, the routing tables are stable, and the DNS server can resolve any request. Show the sequence of packets that will occur for **A** to send a ping requests to **D** with the ttl set to 1 hop**.**

Given the density of prime numbers and the BigInteger constructor that probabilistically generates large prime numbers, how many attemts on average are required to generate a 128 bit large number that is very likely prime with certainty $(1\text{-}2^{-20})$?

Hints: BigInteger(int bitLength, int certainty, Random rnd) constructor generates a probably prime number of bitLength bits with probability $(1\text{-}2^{-certainty})$. It does this by generating a random number candidate and iteratively checking if the number is prime. If the candidate is not prime an average 2 iterations are required and another candidate is selected. If the certainty is set to 20, 20 iterations are performed and the candidate is considered prime with a probability of $(1\text{-}2^{-20})$. The number of prime numbers is n/lnn out of n. ln(2) is about 0.7.