A university has 150 LANs with 100 hosts in each LAN.

(a) Suppose the university has one Class B address. Design an appropriate subnet addressing scheme.

(b) Design an appropriate CIDR addressing scheme. a) Class B's address has 14 bits for the network ID and 16 bits for the host ID. We need to decide how many bits to allocate to the subnet id versus the host id for designing an appropriate subnet addressing scheme. We can choose either 7 bits or 8 bits to identify the hosts.

b) The CIDR addressing scheme involves generating a prefix length that indicates the length of the network mask.

A router has the following CIDR entries in its routing table:

Address/mask Next hop

135.46.56.0/22 Interface 0

135.46.60.0/22 Interface 1

192.53.40.0/23 Router 1

default Router 2

Câu a) What does the router do if a packet with an IP address 135.46.63.10 arrives?

Câu b) What does the router do if a packet with an IP address 135.46.57.14 arrives? a) The router will forward the packet to Interface 1 if a packet with an IP address 135.46.63.10 arrives.

b) The packet will be forwarded to Interface 0 if a packet with an IP address 135.46.57.14 arrives.

Cách nhận biết:

Xét 135.46.63.10 có 135.46 giống Interface 0 và 1.

135.46.63 lớn hơn Interface 1 thì chọn Interface 1, ngược nếu ví dụ như đề câu b chỉ có 57 (lớn hơn 56 nhưng nhỏ hơn 60) -> chọn Interface 0.

Nếu đề hỏi khác nữa như cho 10.10.10.10 không giống cái nào ở Interface 0, 1 hay Router 1 thì mặc định chọn Default -> Router 2.

Consider the three-way handshake in TCP connection setup.

a) Suppose that an old SYN segment from station A arrives at station B, requesting a TCP connection. Explain how the three-way handshake procedure ensures that the connection is rejected.

b) Now suppose that an old SYN segment from station A arrives at station B, followed a bit later by an old ACK segment from A to a SYN segment from B. Is this connection request also rejected?

a) In a three-way handshake procedure, one must ensure the selection of the initial sequence number is always unique. If station B receives an old SYN segment from A, B will acknowledge the request based on the old sequence number. When A receives the acknowledge segment from B, A will find out that B received a wrong sequence number. A will discard the acknowledgement packet and reset the connection.

b) If an old SYN segment from A arrives at B, followed by an old ACK segment from A to a SYN segment from B, the connection will also be rejected. Initially, when B receives an old SYN segment, B will send a SYN segment with its own distinct sequence number set by itself. If B receives the old ACK from A, B will notify A that the connection is invalid since the old ACK sequence number does not match the sequence number previously defined by B. Therefore, the connection is rejected.

A bit stream 1101011011 is transmitted using the standard CRC method. The polynomial generator is x+ x + 1. What is the actual bit string transmitted? Show the major steps to your answer. Bitstream is 1101011011

The polynomial generator is x+x=1

The Bit form = 111

Thus, n=3.

Suppose a IP header consists of four 16-bit words: (11111111 11111111, 11111111 00000000, 11110000 11110000, 11000000 11000000). Please find the Internet checksum for the code. Đổi cái đám nhị nhân 16 bit ra decimal, ra số âm xong lấy 65536 (16 bit thì là 2^16) rồi cộng cho số âm đó.

A0 = 11111111 11111111 = 2^16 - 1 = 65535

A1 = 11111111 00000000 = 2^16 - 256 = 65280

A2 = 11110000 11110000 = 2^16 - 3856 = 61680

A3 = 11000000 11000000 = 2^16 - 16192 = 49344

x= (A0 + A1 + A2 + A3) % 65535 = 241839 % 65535 = 45234

("%" có nghĩa là chia lấy phần dư, hay còn gọi là modulo)

A4 = -x % 65535 = -45234 % 65535 = 20301 (đổi x sang số âm, sau đó chia 65535 lấy phần dư)

The checksum would = 01001111 01001101 (đổi A4 decimal sang nhị phân ra checksum).

Suppose that a group of computers is connected to an Ethernet LAN. If the computers communicate only with each other, does it make sense to use IP protocol in the computers? Should the computers run TCP directly over Ethernet? How is addressing handled? IP convention can be utilized since the IP convention is a lot of necessities for tending to also as directing information on the Internet. Since the computer can't run principles-based TCP without IP, TCP uses IP addresses. There is a need to utilize an individual custom streaming convention. that depends on Ethernet or another link layer as a lower layer.

(1) The figures below show the TCP/UDP communication pattern diagrams. Which diagram works for TCP? Why?

(2) Fill the missing steps (blank boxes) in both diagrams for TCP/UDP correspondingly.

Link ảnh đi kèm của đề: https://imgur.com/5A2tz94 1) Diagram (b) will work for TCP since it is a network protocol that shows the details of how data is sent as well as received.

2) Missing steps : (a) bind, connect , (b) bind>listen>accept, connect.

Suppose that two peer-to-peer processes provide a service that involves the transfer of discrete messages. Suppose that the peer processes are allowed to exchange PDUs that have a maximum size of M bytes including H bytes of header. Suppose that a PDU is not allowed to carry information from more than one message.

a. Develop an approach that allows the peer processes to exchange messages of arbitrary size.

b. What essential control information needs to be exchanged between the peer processes?

c. Now suppose that the message transfer service provided by the peer processes is shared by several message source-destination pairs. Is additional control information required, and if so, where should it be placed? a) To convert arbitrary sizes, large contents must be split into bytes of each length that will be transmitted in multiple PDUs.

b) Peer-to-peer processes move information allowing messages to be aggregated.

c) A PDU must be attached to the sequence ID, to process each sequence independently when a message is selected. This stream ID can be dodged if the source and target work for them to process a content transfer at a certain time.

Consider a network link that has distance of 100 meters, and signal traverses at the speed of light in cable 2.5 x 10^8 meters per second. The link has transmission bandwidth of 100 megabits/second (100 x 10^6 bits per second). The packet size is 400 bits. What is the signal propagation delay? d = 100 megabits / second

(Cách đổi đơn vị: 100 megabits / second = 100x10^3 kilobits / seconds, đổi ngược lại thì chia cho 1000)

v = 2.5x10^8 meters per / second

Đề này cho đã cùng đơn vị sẵn nên không cần phải đổi, lấy chia luôn.

Công thức Signal propagation delay (seconds):

=> t(prop) = d / v = 100 / (2.5x10^8) = 4x10^(-7) seconds

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R = 100 x 10^6 (bit / sec)

Đề này cho đã cùng đơn vị sẵn nên không cần phải đổi, lấy chia luôn.

Công thức Packet transmission delay (seconds):

=> t(trans) = L / R = 400 / (100 x 10^6) = 4x10^(-6) seconds

Suppose an application layer entity wants to send an L-byte message to its peer process, using an existing TCP connection. The TCP segment consists of the message plus 20 bytes of header. The segment is encapsulated into an IP packet that has an additional 20 bytes of header. The IP packet in turn goes inside an Ethernet frame that has 18 bytes of header and trailer. What percentage of the transmitted bits in the physical layer correspond to message information, if L = 100 bytes, 500 bytes, 1000 bytes

Note: Explain your answer in details Đây cũng là cách trình bày để lấy trọn vẹn 3 điểm của bài.

TCP / IP over Ethenet allows data frames with a payload size up to 1460 bytes. Therefore, L = 100, 500, 1000 are within this limit (chưa biết nếu vượt limit thì khác thế nào, nhưng mình nghĩ đề ra sẽ không vượt limit đâu).

TCP: 20 bytes of header (lấy trong đề)

IP: 20 bytes of header (lấy trong đề)

Ethernet: 18 bytes of header and trailer (lấy trong đề)

Therefore:

L = 100 bytes, 100 / (100 + 20 + 20 + 18) = 63% efficiency

L = 500 bytes, 500 / ( 500 + 20 + 20 + 18) = 90% efficiency

L = 500 bytes, 1000 / ( 1000 + 20 + 20 + 18) = 95% efficiency

Suppose the size of an uncompressed text file is 1 megabyte

a. How long does it take to download the file over a 32 kilobit/second modem?

b. How long does it take to take to download the file over a 1 megabit/second modem?

c. Suppose data compression is applied to the text file. How much do the transmission times in parts (a) and (b) change?

If we assume a maximum compression ratio of 1:6, then we have the following times for the 32 kilobit and 1 megabit lines respectively:

Note: Explain your answer in details. Câu a)

(Đổi hết sang đơn vị bit và bit / second)

Size text file = 1 x 1024 x 1024 x 8 (bit)

Speed = 32 x 1000 (bit / second)

=> T (32k) = (1 x 1024 x 1024 x 8) / (32 x 1000) = 262.144 (seconds)

Câu b)

(Đổi hết sang đơn vị bit và bit / second)

Size text file = 1 x 1024 x 1024 x 8 (bit)

Speed = 1 x 1000 x 1000 (bit / second)

=> T (1M) = (1 x 1024 x 1024 x 8) / (1 x 1000 x 1000) = 8.38 (seconds)

Câu c)

(Đề kêu 1:6 thì chỉ việc nhân thêm cho 6 ở chỗ tốc độ là xong, nếu trường ra đề 1:10 thì nhân 10)

=> T (32k) = (1 x 1024 x 1024 x 8) / (32 x 1000 x 6) = 43.69 (seconds)

=> T (1M) = (1 x 1024 x 1024 x 8) / (1 x 1000 x 1000 x 6) = 1.4 (seconds)

Sender A wants to send 100111010011011 to receiver B. This transmission uses CRC algorithm for error detection with generator polynomial bits string is 10111. What is bits string will be transmitted on the medium. Show your all steps to have result.

Note: Explain your answer in details. Step 1: Add 0000 to data bits string. It will be 1001110100110110000 (0.5 điểm)

Step 2: Divide 1001110100110110000 to 10111 by modulo (chia lấy phần dư)

(Cách chia:

Lấy 5 số đầu dùng phép xor với 10111

10011 xor 10111 => 00100

Lấy tiếp 2 số cho đủ 5 số (so với số 1 đầu tiên)

=> 10010 xor 10111 = 00101)

Lấy tiếp 2 số cho đủ 5 số (so với số 1 đầu tiên)

=> 10110 xor 10111 = 00001

Lấy tiếp 4 số cho đủ 5 số (so với số 1 đầu tiên)

=> 10110 xor 10111 = 00001

Lấy tiếp 4 số cho đủ 5 số (so với số 1 đầu tiên)

=> 11100 xor 10111 = 01011

Lấy tiếp 1 số cho đủ 5 số (so với số 1 đầu tiên)

=> 10110 xor 10111 = 0001

Do còn mỗi 1 số 0, không còn đủ để bù đắp nữa, thêm vào chuyển thành kết quả => 00010

(Xong được phần này các bạn được 1.5 điểm, nhưng làm giấy phải làm đúng như phép chia thực thụ nha, các bạn tập tành làm)

Step 3: Lấy 4 số cuối của step 2, thay số 4 số 0000 ở step 1, ta được kết quả cuối cùng.

The transmitted bits string is 1001110100110110010. (0.5 điểm)