300471606

NWEN243 (2021) - Clouds and Networking   Assignment 1

Networking Basics and Data Link Layer Concepts

Instructions:
- *Attempt all questions. You should expect to spend ~1 minute per mark to write the answers.*
- *Please refer to the lecture materials and recommended references (see Course Outline) to find the answers. You are strongly advised NOT to search the internet for answers from unverified sources.*

1. [6 marks] Access Networks are primarily concerned with connecting users or end-systems to the Internet. What the three most common access network technologies that you use? What are the pros and cons of each technology that you experienced?

2. [4 marks] What was the first message sent on the Internet? Briefly explain how that came about?

3. [10 marks] What are the layers of the Internet Protocol stack and their respective responsibilities?

4. [6 marks] What are two reasons for using the layered protocol model/approach? Is there a disadvantage for using a layered approach?

5. [5 marks] Briefly explain, with the help of a diagram, the hidden terminal problem in wireless networks?

6. [6 marks] With the help of a diagram, explain the exposed terminal problem in wireless networks? Is the exposed terminal problem as bad as the hidden terminal problem? Briefly explain your answer.

7. [5 marks] In multiple access methods, what form of *channel partitioning* is similar to the "taking turns" approach? Briefly explain your answer.

8. [8 marks] Suppose we have the following bit pattern to be transmitted, 1010 0111 0101 1001, and an odd parity scheme is used.

1	0	1	0	p_1
0	1	1	1	p_2
0	1	0	1	p_3
1	0	0	1	p_4
q_1	q_2	q_3	q_4	

(a) What would the value of the parity bits (p_1, p_2, p_3, p_4) and (q_1, q_2, q_3, q_4) be for the case of a 2-dimensional parity scheme?
(b) Show how a single-bit error can be detected and corrected.
(c) Show how a double-bit error can be detected but not corrected.

Due: 26/07/2021 23:59hrs

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1. Access Networks are primarily concerned with connecting users or end-systems to the Internet. What the three most common access network technologies that you use? What are the pros and cons of each technology that you experienced?

Type	Pros	Cons
Residential/Home **Example:** **Dial-up home router (cable, DSL, fibre modem)**	-Usually combined into a singular box -Has a wireless access point and ethernet connection -Easily connects a device such as a tv or laptop to an edge	-Short range -Relatively slow speeds compared to institutional/enterprise networks -ethernet (1 Gbps) is faster than wireless (54 Mbps) access which limits range -significant slowdown when connecting multiple devices
Institutional/Enterprise **Example:** **Institutional/Enterprise Routers**	-Has ability to hold web or mail severs that are connected to the router -Composed of ethernet switches connecting to a router that leads to an ISP -significant range in transmission rate	-Expensive to set up -Hard to identify specific faults in the network
Mobile	-Can be used remotely -No physical setup required (connected by mobile device)	-Isp charge a lot (expensive) -limited speeds -Need to be in an area provided by your ISP

2. What was the first message sent on the Internet? Briefly explain how that came about?

The first message sent on the internet on October 29, 1969, was 'LO'
UCLA student Charley Kline attempts to transmit the text "login" to a computer at the Stanford Research Institute over the first link on the ARPANET, which was the precursor to the modern Internet. After the letters "l" and "o" are sent the system crashed.

3. What are the layers of the Internet Protocol stack and their respective responsibilities?
TCP/IP Reference Model

Layers	Function
5. Application	-To allow access to network resource; provides functions needed by users
4. Transport	-To provide reliable process to process massage delivery and error delivery; provides end to end delivery
3.Network	-To move packets from source to destination -To provide internetworking - Send packets over multiple link
2. Link	-data-link layer is responsible for transferring a packet from one node to a physically adjacent node over a link
1.Physical	-Send bits as signal

4. What are two reasons for using the layered protocol model/approach? Is there a disadvantage for using a layered approach?

Pros

-it provides a structural way to discuss system components; It takes something very complicated and breaks it up into something smaller and more manageable.

-it makes it easier to update the system components; You can make changes to one layer without affecting the layer above and below (Abstraction).

Cons

-functionally on one layer might need information that is present only on another layer with violates the goal of separating the layers in the first place

5. Briefly explain, with the help of a diagram, the hidden terminal problem in wireless networks?

In wireless networking, the hidden node problem or hidden terminal problem occurs when a node can communicate with a wireless access point (AP), but cannot directly communicate with other nodes that are communicating with that AP.
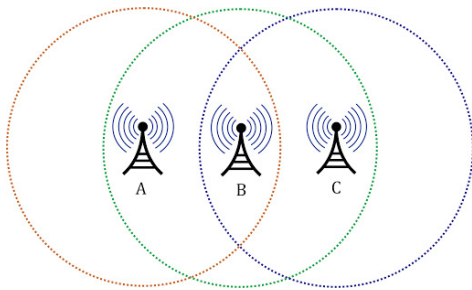

A and C is in range of B, however A and C are not in range of each other. As A and C are out of each others range they cannot detect when each other are in transmission, hence they transmit at the same time enabling B from receiving neither signals as a collision occurs.

>This could be resolved by increasing range or moving the terminals

6. With the help of a diagram, explain the exposed terminal problem in wireless networks? Is the exposed terminal problem as bad as the hidden terminal problem? Briefly explain your answer.

Exposed terminal problem occur when two nodes waiting to transmit, each to a different target node know of each others intention to transmit but not of each others target. One node transmits and, in accordance with the network protocol, the other waits for it to finish. This is a problem as it unnecessarily consumes additional time and resources.
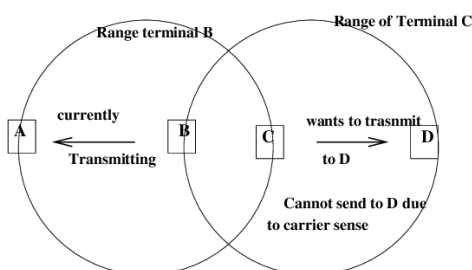
B is currently transmitting to A whilst C wants to transmit to D. C incorrectly identifies that this is not possible as it detects B's broadcast. However B's broadcast does not reach D, allowing for C to broadcast however it cannot identify this.

The exposed terminal problem is not as bad as the hidden terminal problem. Without a solution the worst case for exposed terminal problem is a delay in the network caused by transfer of packages as terminals having to wait for prior transfer to complete. However, for a hidden terminal

problem a collision occurs which means that packages transmissions are not received at all by the intended terminal.

7. In multiple access methods, what form of channel partitioning is similar to the "taking turns" approach? Briefly explain your answer.
Time division multiple access (TDMA)
This is because TDMA gives channel access to transmission times in "rounds".
A fixed amount of time is allocated for each round (unused slots automatically idle - runs in turns).
The used slots are not skipped but this causes the method to be slow and inefficient if many stations are not transmitting data.

8. Suppose we have the following bit pattern to be transmitted, 1010 0111 0101 1001, and an odd parity scheme is used.

1	0	1	0	p_1
0	1	1	1	p_2
0	1	0	1	p_3
1	0	0	1	p_4
q_1	q_2	q_3	q_4	

(a) What would the value of the parity bits (p1, p2, p3, p4) and (q1, q2, q3, q4) be for the case of a 2-dimensional parity scheme?

p1	0
p2	1
p3	0
p4	0
q1	0
q2	0
q3	0
q4	1

(b) Show how a single-bit error can be detected and corrected.
If a single-bit error occurs then both its rows and column parity bit would be incorrect, this means you are able to identify the exact bit with the error and corrected.

(c) Show how a double-bit error can be detected but not corrected.
If there are two errors in the same row, errors would show in the column parity but there would be not difference in the row parity. This means we could not correct the error as we would not be able to identify what row it was in.