Assignment 9

Due Jan 11 at 10:59am **Points** 15 **Questions** 15 **Time Limit** None

Instructions

While working on this assignment, you certify that you have neither given help to nor received help from any other person.

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	11 minutes	14.25 out of 15

Submission Details:

Time:	11 minutes
Current Score:	14.25 out of 15
Kept Score:	14.25 out of 15

ⓘ Correct answers are hidden.

Score for this quiz: **14.25** out of 15
Submitted Jan 11 at 9:54pm
This attempt took 11 minutes.

Question 1 — 1 / 1 pts

Suppose there are three WiFi access points (APs) in a particular café operating in an ISP's own IP address subnet. The network administrator configures each AP to operate over channel a non-overlapping channel selected from the range 1 - 11. Which of the following are the non-overlapping channels of the three APs?

- [x] 1, 6, and 11
- [ ] 1, 5, and 11
- [ ] 2, 6, and 10
- [ ] 3, 4, and 5

Partial — Question 2 — 0.5 / 1 pts

Use the pulldown menus below to match the approximate transmission rate with the the wireless technology that achieves that rate. Of course, sender/receiver distance, noise and other factors determine actual transmission speed, so "your mileage may vary" (YMMV).

802.11 ax	10 Gbps
5G celluar	3.5 Gbps
802.11 ac	14 Gbps
4G LTE	hundreds of Mbps
802.11 g	54 Mbps
Bluetooth	2 Mbps

Question 3 — 1 / 1 pts

What is meant when we say that a network of devices is operating in "infrastructure mode"?

- ( ) Network devices can communicate directly with each other, with no need for messages to be relayed through a base station. The devices are the "infrastructure".
- (•) Devices communicate with each other and to the larger outside world via a base station (also known as an access point).

Nice! This answer is correct.

- ( ) All network equipment, except the mobile devices, must be racked in a temperature-controlled and power-smoothed building.
- ( ) The mobile device is operating in a reduced power mode, forcing the network base station and routers to take on additional functionality that would normally be done by the mobile.

Nice! This answer is correct.

Partial

Question 4

0.75 / 1 pts

Which of the following statements about the characteristics of wireless links are true?

- [x] The **"hidden terminal problem"** happens when A sends to B over a wireless channel, and an observer, C (that can be even closer to A than B), does not detect/receive A's transmission because of **physical obstacles** in the path between A and B.
- [x] The "hidden terminal problem" happens when A sends to B over a wireless channel, and an observer, C (that can be even closer to A than B), does not detect/receive A's transmission because of physical obstacles in the path between A and C.
- [x] **Path loss** refers to the decrease in the strength of a radio signal as it propagates through space.
- [ ] **Multipath propagation** occurs when a sender sends multiple copies of a frame to a receiver, which is relayed over different by base stations or other wireless devices to the receiver.
- [x] **Multipath propagation** occurs when portions of the electromagnetic wave reflect off objects and the ground taking paths of different lengths between the sender and a receiver, and thus arriving at the receiver at slightly different points in time.
- [x] The **bit error rate (BER)** of a wireless channel *decreases* as the **signal-to-noise ratio (SNR)** increases.
- [ ] The **bit error rate (BER)** of a wireless channel *increases* as the **signal-to-noise ratio (SNR)** increases.
- [ ] **Path loss** refers to link-layer frames that are corrupted due to the higher bit error rates in wireless channels.
- [ ] **Path loss** refers to the dropping of link-layer frames that are being relayed among wireless access points due to buffer overflow, just as network-layer datagrams are dropped at routers with full buffers.
- [ ] The "hidden terminal problem" refers to the fact that many people can never seem to find their mobile phones.
- [ ] The **"hidden terminal problem"** happens when A sends to B over a wireless channel, and an observer, C (that is further away from A than B), does not detect/receive A's transmission because the **signal strength** of A's transmission has **faded** significantly by the time it reaches C.

Question 5

1 / 1 pts

What is the purpose of a beacon frame in WiFi (802.11) networks?

- ( ) A beacon frame allows a mobile node to determine the direction in which it should move in order to obtain an increasing signal strength.
- (•) A beacon frame allows an access point to advertise its existence, and the frequency channel it is operating on, to devices that want to connect to an access point.

Nice! This answer is correct.

- ( ) A beacon frame allows a mobile device to signal that it is ready to receive a frame.
- ( ) A beacon frame allows a node with a directional antenna to aim the antenna towards the beacon point to maximize the quality of the send and receive signal.

Nice! This answer is correct.

Question 6

1 / 1 pts

Why are link-layer ACKs used in WiFi (802.11) networks? [Hint: check two of the boxes below].

- [x] Wireless links are noisier than wired links, and so bit level errors are more likely to occur, making link-layer error recovery more valuable that in less-noisy wired links.
- [ ] The sender can used the differences in the signal strength in an ACK to infer whether the receiver is moving towards, or away from, the sender
- [ ] Hearing a receiver ACK, all other stations will stop transmitting. This reduces collisions.
- [x] Because of the hidden terminal problem, a node that is transmitting and hears no collisions still doesn't know if there was a collision at the receiver.

Nice! This answer is correct.

Question 7

1 / 1 pts

Why does the WiFi (802.11) link-layer frame have three addresses? [Note: WiFi actually has four MAC addresses in the frame, but we're only focusing here on the three widely used ones].

Because the *sender* of this frame can be either the access point or a link-layer host or router interface, and we need to identify which of these two is the sender.

Because both the access point that will relay this frame to the intended link-layer receiving host or router interface, as well as that intended destination host or router interface need to be specified.

Nice! This answer is correct.

Because there may be two hosts or routers that are possible destinations for this link-layer frame and we need to identify which of these is the intended receiver.

Nice! This answer is correct.

Question 8

1 / 1 pts

What is the purpose of RTS (request to send) and CTS (clear to send) frames in WiFi (802.11) networks? Select one or more of the answers below. [Hint: check two answers below].

RTC/CTS frames allow a sender to gather CTS frames from all other network nodes, so that it knows it can then send without collisions.

A CTS that is sent allows a receiver to force other nodes (other than the intended sender who sent the RTS) to refrain from transmitting, thus allowing the sender who sent the RTS to then transmit a frame with less likelihood of a collision.

RTC/CTS frames helps nodes in a wireless network mitigate the effects of the hidden terminal problem.

A CTS allows a receiver to let the sender (who sent that RTS) know that it (the receiver) has enough buffers to hold a frame transmitted by that sender

Nice! This answer is correct.

Question 9

1 / 1 pts

Which of the following statement are true about the 802.11 (WiFi) MAC protocol?

The 802.11 MAC protocol performs **carrier sensing**. That is, it listens before transmitting and will only transmit if the channel is sensed idle.

The 802.11 MAC protocol performs **collision avoidance**. That is, an 802.11 sender and receiver can use approaches such as RTS/CTS, inter-frame spacing, and explicit acknowledgments to try avoid, rather than detect, colliding transmissions from another node.

Nice! This answer is correct.

The 802.11 MAC protocol performs **collision detection**. That is, an 802.11 sender will listen to the channel while it is transmitting, and stop transmitting when it detects a colliding transmission from another node.

Nice! This answer is correct.

Question 10

1 / 1 pts

Which of the following statement are true about the Bluetooth protocol?

Bluetooth uses TDM, FDM, polling, error detection and correction, and has sleep modes to conserve device power. Pretty sophisticated for a consumer technology!

Nice! This answer is correct.

Bluetooth transmission rates can be as high as in WiFi networks.

Bluetooth transmits all frames in the same frequency band.

Bluetooth networks have a centralized controller that serves to coordinate the various client devices in a Bluetooth piconet.

Nice! This answer is correct.

Question 11

1 / 1 pts

Question 11

In 4G LTE cellular systems, what is an International Mobile Subscriber Identity (IMSI)?

- A 64-bit identifier that identifies the cellular network to which an mobile subscriber is attaching. Somewhat analogous to the Autonomous System (AS) number used in BGP to identify/name networks.
- Assigned by a mobile carrier network to a device, when the device attaches to the radio access network, serving a similar link-layer role as MAC addresses in a wired network.
- A fancy name for a globally unique phone number, including country code.
- **A 64-bit identifier stored on a cellular SIM (Subscriber Identity Module) card that identifies the subscriber in the worldwide cellular carrier network system.**

Nice! This answer is correct.

Question 12

1 / 1 pts

Which of the following statements is true about the link-level service of reliable data transfer (using ACKs) in WiFi (802.11) networks and in 4G cellular networks?

- **Both WiFi and LTE provide link-level reliable data transfer.**

Nice! This answer is correct.

- LTE provides link-level reliable data transfer but WiFi does not.
- WiFi provides link-level reliable data transfer but LTE does not.
- Neither WiFi nor LTE provide link-level reliable data transfer.

Nice! This answer is correct.

Question 13

1 / 1 pts

Which of the following statements is true about "sleep modes" that allow a wireless device to "sleep" and occasionally "wake up" as a technique for saving battery life?

- **Both WiFi and LTE provide sleep modes.**

Nice! This answer is correct.

- Neither WiFi nor LTE provide sleep modes.
- WiFi provides sleep modes but LTE does not.
- LTE provides sleep modes but WiFi does not.

Nice! This answer is correct.

Question 14

1 / 1 pts

Which of the following statements is true about how 4G cellular networks (operated by different carriers/companies) connect together?

- **4G networks are generally all-IP, and so cellular networks interconnect (peer) directly to each other, or peer at the cellular equivalents of the Internet Exchange Points that we saw used for interconnecting wired networks in the public Internet.**

Nice! This answer is correct.

- In a 4G network, the radio access network connects to the legacy phone network for voice calls, but to the public Internet for data connections.
- 4G networks connect to each other using the existing phone interconnection networks from earlier 3G and 2G networks.

Nice! This answer is correct.

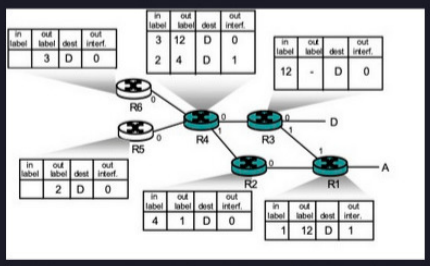
Question 15

1 / 1 pts

Multiprotocol Label Switching (MPLS) evolved from a number of industry efforts in the mid-to-late 1990s to improve the

forwarding speed of IP routers by adopting a key concept from the world of virtual-circuit networks: a fixed-length label. The goal was not to abandon the destination-based IP datagram-forwarding infrastructure for one based on fixed-length labels and virtual circuits, but to augment it by selectively labeling datagrams and allowing routers to forward datagrams based on fixed-length labels (rather than destination IP addresses) when possible.

Consider below MPLS network with all routers R1 - R6 are MPLS enabled. In this case, the forwarding tables are MPLS-enhanced forwarding with no destination IP addresses. In this MPLS network example, each router has a forwarding table as indicated in the figure below.



Match the routers via which the packets will switched in each of the following cases.

Packets from R6 are destined for D — These packets will be switched

Packets from R5 are destined for D — These packets will be switched

Quiz Score: **14.25** out of 15

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