

1.

## KNOWLEDGE CHECKS

### LINK-LAYER SERVICES.

Which of the following services may be implemented in a link-layer protocol? Select one or more statements.

- ☒ Flow control between directly connected nodes.
- ☐ End-end path determination through multiple IP routers.
- ☒ Bit-level error detection and correction.
- ☐ Lookup and forwarding on the basis of an IP destination address.
- ☒ Coordinated access to a shared physical medium.
- ☐ TLS security (including authentication) between directly connected nodes.
- ☒ Multiplexing down from / multiplexing up to a network-layer protocol.
- ☒ Reliable data transfer between directly connected nodes.

That's Correct!

CHECK

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## KNOWLEDGE CHECKS

### TWO DIMENSIONAL PARITY.

Which of the following statements is true about a two-dimensional parity check (2D-parity) computed over a payload?

- ☒ 2D-parity can detect and correct any case of a single bit flip in the payload.
- ☐ 2D-parity can detect and correct any case of two bit flips in the payload.
- ☒ 2D-parity can detect any case of a single bit flip in the payload.
- ☒ 2D-parity can detect any case of two bit flips in the payload.

That's Correct!

CHECK

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Comments welcome and appreciated: [kurose@cs.umass.edu](mailto:kurose@cs.umass.edu)

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## KNOWLEDGE CHECKS

### CHANNEL PARTITIONING PROTOCOLS.

Which of the following statements is true about channel partitioning protocols?

- ☐ There can be simultaneous transmissions resulting in collisions.
- ☐ Channel partitioning protocol can achieve 100% utilization, in the case that there is only one node that always has frames to send
- ☒ There can be times when the channel is idle, when a node has a frame to send, but is prevented from doing so by the medium access protocol.
- ☒ Channel partitioning protocols can achieve 100% channel utilization, in the case that all nodes always have frames to send.

That's Correct!

CHECK



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## KNOWLEDGE CHECKS

### PURE ALOHA AND CSMA.

Which of the following statements is true about both Pure Aloha, and CSMA (both with and without collision detection)?

- ☐ There can be times when the channel is idle, when a node has a frame to send, but is prevented from doing so by the medium access protocol.
- ☒ Pure Aloha and CSMA can achieve 100% utilization, in the case that there is only one node that always has frames to send
- ☒ There can be simultaneous transmissions resulting in collisions.
- ☐ Pure Aloha and CSMA can achieve 100% channel utilization, in the case that all nodes always have frames to send.

That's Correct!



CHECK



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## POLLING AND TOKEN-PASSING PROTOCOLS.

Which of the following statements is true about polling and token-passing protocols?

- ☐ There can be simultaneous transmissions resulting in collisions.
- ☐ There can be times when the channel is idle for more than a short period of time, when a node has a frame to send, but is prevented from doing so by the medium access protocol.
- ☒ These protocols can achieve close to 100% utilization, in the case that there is only one node that always has frames to send (the fact that the utilization is close to, but not exactly, 100% is due to a small amount of medium access overhead but not due to collisions)
- ☒ These protocols can achieve close to 100% channel utilization, in the case that all nodes always have frames to send (the fact that the utilization is close to, but not exactly, 100% is due to a small amount of medium access overhead but not due to collisions)

That's Correct!



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## CHARACTERISTICS OF MULTIPLE ACCESS PROTOCOLS (A).

Consider the following multiple access protocols that we've studied: (1) TDMA, and FDMA (2) CSMA (3) Aloha, and (4) polling. Which of these protocols are collision-free (e.g., collisions will never happen)?

- ☐ Aloha
- ☒ Polling
- ☐ CSMA and CSMA/CD
- ☒ TDMA and FDMA

That's Correct!



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## KNOWLEDGE CHECKS

### CHARACTERISTICS OF MULTIPLE ACCESS PROTOCOLS (B).

Consider the following multiple access protocols that we've studied: (1) TDMA, and FDMA (2) CSMA (3) Aloha, and (4) polling. Which of these protocols requires some form of centralized control to mediate channel access?

- ☒ TDMA and FDMA
- ☐ CSMA and CSMA/CD
- ☐ Aloha
- ☒ Polling

That's Correct!



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### CHARACTERISTICS OF MULTIPLE ACCESS PROTOCOLS (C).

Consider the following multiple access protocols that we've studied: (1) TDMA, and FDMA (2) CSMA (3) Aloha, and (4) polling. For which of these protocols is the maximum channel utilization 1 (or very close to 1)?

- ☐ Aloha
- ☐ CSMA and CSMA/CD
- ☒ TDMA and FDMA
- ☒ Polling

That's Correct!



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## CHARACTERISTICS OF MULTIPLE ACCESS PROTOCOLS (D).

Consider the following multiple access protocols that we've studied: (1) TDMA, and FDMA (2) CSMA (3) Aloha, and (4) polling. For which of these protocols is there a maximum amount of time that a node knows that it will have to wait until it can successfully gain access to the channel?

- ☐ CSMA and CSMA/CD
- ☒ Polling
- ☒ TDMA and FDMA
- ☐ Aloha

That's Correct!



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## KNOWLEDGE CHECKS

### DIFFERENT TYPES OF ADDRESSING (A).

We've now learned about both IPv4 addresses and MAC addresses. Consider the address properties below, and use the pulldown menu to indicate which of these properties is *only* a property of MAC addresses (and therefore is not a property of IPv4 addresses - careful!).

- ☐ This address is allocated by DHCP.
- ☒ This is a 48-bit address.
- ☐ This is a 128-bit address.
- ☐ This is a 32-bit address.
- ☒ This address remains the same as a host moves from one network to another.
- ☐ This address must be unique among all hosts in a subnet.
- ☐ This is a network-layer address.
- ☒ This is a link-layer address.

That's Correct!



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## DIFFERENT TYPES OF ADDRESSING (B).

We've now learned about both IPv4 addresses and MAC addresses. Consider the address properties below, and use the pulldown menu to indicate which of these properties is *only* a property of IPv4 addresses (and therefore is not a property of MAC addresses - careful!).

- ☒ This address is allocated by DHCP.
- ☐ This is a link-layer address.
- ☐ This is a 128-bit address.
- ☐ This address remains the same as a host moves from one network to another.
- ☒ This is a network-layer address.
- ☒ This is a 32-bit address.
- ☐ This is a 48-bit address.
- ☐ This address must be unique among all hosts in a subnet.

That's Correct!



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## DIFFERENT TYPES OF ADDRESSING (C).

We've now learned about both IPv4 addresses and MAC addresses. Consider the address properties below, and use the pulldown menu to indicate which of these properties is a property of *both* IPv4 addresses *and* MAC addresses.

- ☐ This is a 32-bit address.
- ☒ This address must be unique among all hosts in a subnet.
- ☐ This is a 48-bit address.
- ☐ This is a link-layer address.
- ☐ This is a network-layer address.
- ☐ This address is allocated by DHCP.
- ☐ This address remains the same as a host moves from one network to another.
- ☐ This is a 128-bit address.

That's Correct!



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## FIELDS IN AN ETHERNET FRAME.

Use the pulldown menus below to match the name of the field with the function/purpose of a field within an Ethernet frame.

### QUESTION LIST:

Cyclic redundancy check (CRC) field

3

Source address field

4

Data (payload) field

5

Type field.

3

Sequence number field

2

### ANSWER LIST:

A. 48-bit MAC address of the sending node.

B. Used to detect and possibly correct bit-level errors in the frame.

C. Used only to detect, but never correct, bit-level errors in the frame.

D. Used for flow control.

E. The contents of this field is typically (bit not always) a network-layer IP datagram.

F. This field does not exist in the Ethernet frame

G. Used to demultiplex the payload up to a higher level protocol at the receiver.

That's Correct!



CHECK



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6.4-4. Fields in an Ethernet frame. Use the pulldown menus below to match the name of the field with the function/purpose of a field within an Ethernet frame.

- Cyclic redundancy check (CRC) field: Used to detect and possibly correct bit-level errors
- Source address field: 48-bit MAC
- Data (payload) field: The contents of this field is typically (bit not always) a network-layer IP datagram.
- Type field: Used to demultiplex the payload up to a higher level protocol at the receiver.
- Sequence number field: This field does not exist in the Ethernet frame



## KNOWLEDGE CHECKS

### SWITCH FORWARDING AND FILTERING.

Suppose an Ethernet frame arrives to an Ethernet switch, and the Ethernet switch does not know which of its switch ports leads to the node with the given destination MAC address? In this case, what does the switch do?

- ☐ Use the address resolution protocol (ARP) to determine the appropriate outgoing port.
- ☒ Flood the frame on all ports except the port on which the frame arrived.
- ☐ Choose a port randomly and forward the frame there.
- ☐ Drop the frame without forwarding it.

That's Correct!



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### SELF-LEARNING SWITCHES.

Which of the following statements are true about a self learning switch?

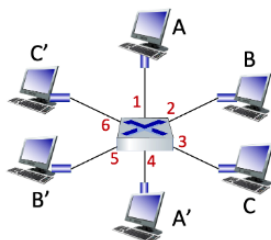
- ☒ A self-learning switch will age-out (forget) a self-learned association of a MAC address x and switch port y if it doesn't see a frame with MAC address x incoming on switch port y after some amount of time.
- ☒ A self learning switch associates the source MAC address on an incoming frame with the port on which it arrived, and stores this matching in a table. The switch has now learned the port that leads to that MAC address.
- ☐ A self-learning switch never forgets a self-learned association of a MAC address x and switch port y.
- ☒ A self-learning switch frees a network manager from a least one configuration task that might be associated with managing a switch

That's Correct!



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Consider the simple star-connected Ethernet LAN shown below, and suppose the Ethernet switch is a learning switch, and that the switch table is initially empty. Suppose C sends an Ethernet frame address to C' and C' replies back to C. How many of these two frames are also received at B's interface?



- ☐ 4
- ☐ 2
- ☒ 1
- ☐ 0

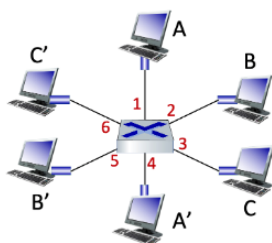
That's Correct!



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## LEARNING SWITCH STATE REMOVAL.

Consider the simple star-connected Ethernet LAN shown below, and suppose the switch table contains entries for each of the 6 hosts. How will those entries be removed from the switch table?



- ☐ The table entry can *only* be removed by the network manager, who would use the SNMP protocol to remove the entry.
- ☒ An entry for a host will be removed if that host doesn't transmit any frames for a certain amount of time (that is, table entries will timeout).
- ☐ A table entry for a host will be removed by the STPP (Switch Table Purge Protocol) which will be used by a host to signal the switch when it (the host) is shutting down or otherwise leaving the network.
- ☐ They'll remain in the switch forever (or until it is re-booted).

That's Correct!



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## MAC ADDRESSES (VERSUS OTHER TYPES OF ADDRESSES AND IDENTIFIERS).

Which of the following statements are true about MAC (link-layer) addresses? Select one or more statements below.

- ☐ Is contained in a SIM card and used when a device identifies itself and connects to an LTE network.
- ☐ A portion of the address bits are associated with the network to which the device is attached, and so changes as the device moves from one network to another.
- ☒ Generally stays unchanged as a device moves from one network to another.
- ☒ Has 48 bits.
- ☐ Has 32 bits.
- ☒ Generally does not change, and is associated with a device when it is manufactured/created.

That's Correct!

