

Week2 IEEE 802.3 以太网 (Ethernet)

Ethernet 1

1 2.1. Which of the following topology is used by traditional Ethernet ? 下列哪种拓扑为传统以太网中常使用？

- ☐ A. Ring 环
- ☐ B. Star 星形
- ☐ C. Mesh 网状
- ☒ D. Bus 总线

正确答案：D 你选对了

2 2.2. Which of the following features are correct for traditional Ethernet 下列对传统以太网特性的叙述何者为正确？

- ☐ A. The receiver will send an ACK to sender if a frame is received correctly. 接收端成功正确收到讯框后，会送一个回复（ACK）给发送者
- ☒ B. The receiver will NOT send an NAK (negative acknowledgement) to sender even a received frame is not correct. 即使接收到的讯框有误，接收者也不会送出讯框错误回复（NACK）给发送者。
- ☐ C. A connection must be established between the sender and the receiver before a frame is transmitted. 在传送讯框之前，传送端和接收端之间必须先建立联机
- ☒ D. No connection needs to be established before a frame is transmitted. 在讯框被传送出去前，不需事先做联机

正确答案：B、D 你选对了

Ethernet: Unreliable, Connectionless

- **Connectionless:** No handshaking between sending and receiving NICs
- **Unreliable:** receiving NIC doesn't send ACKs or NACKs to sending NIC

Ethernet 2

1 2.3. Which of the following are correct for 10Base5 Ethernet ?下列哪些对10Base5以太网络的叙述是正确的？

- ☐ A. The maximum length of a segment is 100 meters 一个网段长度最大为100公尺
- ☒ B. The maximum length of a segment is 500 meters 一个网段长度最大为500公尺
- ☐ C. The speed is 5 Mbps 网络速度为5Mbps
- ☒ D. The speed is 10 Mbps 网络速度为10Mbps

正确答案：B、D 你选对了

An Ethernet segment is implemented on a coaxial cable of up to 500 m.

2 2.4. Which of the following components are used in 10Base5 Ethernet ?下列哪些组件为10Base5以太网网络所使用？

- ☒ A. Transceivers 收发器
- ☒ B. Terminators 终端器
- ☐ C. Optical Fiber 光纤
- ☒ D. Repeaters 中继器

正确答案：A、B、D 你选对了

A **transceiver** (a small device directly attached to the tap) detects when the line is idle and drives signal when the host is transmitting. The transceiver also receives incoming signal.

3 2.5. Which of the following statements are correct for “repeaters” used in 10Base5 Ethernet ?下列哪些对于在10based5以太网网络使用的 ” 中继器” 的叙述是正确的？

- ☐ A. It’ s a device that forwards analog signals 此设备是用来传送模拟讯号
- ☒ B. It’ s device that forwards digital signals 此设备是用来传送数字讯号
- ☐ C. It’ s a layer 2 device since it will forward a frame based on the MAC address 其为网络第二层设备，因为它是依据MAC地址来决定如何转送
- ☒ D. It’ s a layer 1 device since it only forwards signals without dealing with the MAC address of a frame. 其为网络第一层设备，因为它只是转送讯号而不管讯框中的MAC地址

正确答案：B、D 你选对了

4 2.6. Which of the following statements are correct for 10Base5 Ethernet with multiple segments ? 下列哪些对于多网段10Base5以太网络的叙述是正确的？

- ☒ A. All nodes are in the same collision domain 所有节点皆在同一碰撞区域
- ☐ B. Only the nodes in the same segment are in the same collision domain. 只有在同一网段上的节点才会在同一碰撞区域
- ☒ C. The maximum network length is around 2500 meters 整个网络最大长度约为2500公尺
- ☐ D. The maximum network length is around 1000 meters. 整个网络最大长度约为1000公尺

正确答案：A、C 你选对了

Bus topology: all nodes in same collision domain (can collide with each other)

No more than **four repeaters** may be positioned between any pair of hosts. → An Ethernet has a total reach of only 2500 m.

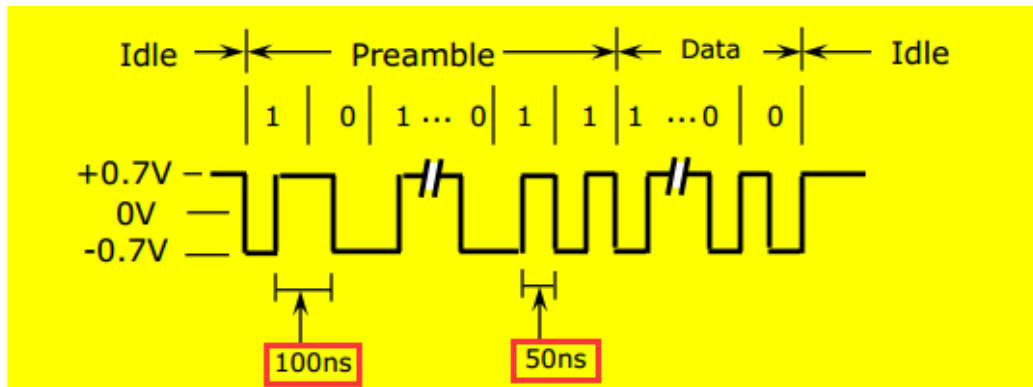
5 2.7. Which of the following statements are correct for “Manchester encoding” used by 10Base5 Ethernet ? 下列哪些对于10Base5以太网中使用的“曼彻斯特编码”的叙述是正确的？

- ☐ A. Each bit has a transition in the beginning of the bit 在每一个位的开始就会有电位变化
- ☒ B. Each bit has a transition in the middle of the bit 在每一个位的中间会有电位变化
- ☐ C. Each bit has two transitions 每一位都会有两次电位变化
- ☒ D. Used to synchronize the clocks in sending and receiving nodes 用来让发送端节点和接受端节点的clocks可以同步

正确答案：B、D 你选对了

Cable Signaling (**Manchester Encoding**)

- Each bit has a transition
- Allows clocks in sending and receiving nodes to synchronize to each other



Ethernet 3

1 2.8. Which of the following are correct for 10Base2 Ethernet ? 下列哪些对10Base2以太网络的叙述是正确的？

- ☒ A. The maximum length of a segment is 200 meters 一个网段长度最大为200公尺
- ☐ B. The maximum length of a segment is 2000 meters 一个网段长度最大为2000公尺
- ☒ C. The speed is 10 Mbps 速度为10Mbps
- ☐ D. The speed is 100 Mbps 速度为100Mbps

正确答案：A、C 你选对了

2 2.9. Which of the following are correct for 10BaseT Ethernet ? 下列哪些对10BaseT以太网络的叙述是正确的？

- ☐ A. Use coaxial cable 使用同轴电缆
- ☒ B. Use twisted pair cable 使用双绞线电缆
- ☒ C. The maximum length of a link is 100 meters 每一段链结最长为100公尺
- ☐ D. The maximum length of a link is 1000 meters 每一段链结最长为1000公尺

正确答案：B、C 你选对了

3 2.10. Which of the following are correct for 10BaseT Ethernet ? 下列哪些对10BaseT以太网络的叙述是正确的？

- ☒ A. The common network configuration is like “star” with many point-to-point segments 常见的网络配置为“星状”包含多个点对点的网段
- ☐ B. The common network configuration is still a “bus”. 常见的网络配置依然是“总线”拓撲
- ☒ C. “Hub” is used to connect the point-to-point segments. “集线器”是用来连结多个点对点的网段
- ☒ D. “Switch” can also be used to connect the point-to-point segments. “交换机”也可以用来连结多个点对点的网段

正确答案: A、C、D 你选对了

Ethernet 4

1 2.11. Consider 4 stations are connected by a “hub” of 10baseT Ethernet. How many stations can transmit simultaneously without a collision ? 假如10basedT以太网络“集线器”连接有4个工作站。请问有多少个工作站可以同时传送且不会发生碰撞？(请输入一整数)

1

正确答案: 1

2 2.12. Consider 4 stations are connected by “Hub1” of 10baseT Ethernet, another 4 stations are connected by “Hub2” of 10baseT Ethernet, and Hub1 and Hub2 are connected directly. How many stations can transmit simultaneously without a collision ? 假如10basedT以太网络“集线器 1”连接有4个工作站，“集线器 2”也连接有4个工作站，且集线器1和集线器用一个网线直接相连。请问有多少工作站可同时传送且不会发生碰撞？(请输入一整数)

1

正确答案: 1

hub不对封包作处理，收到后直接广播，只要同时传送就会造成碰撞

- 3 2.13. Consider 4 stations are connected by a “switch” of 10baseT Ethernet. How many stations can transmit simultaneously without a collision ? 假如10basedT以太网网络 “交换机” 联结有4个工作站。请问有多少个工作站可以同时传送且不会发生碰撞？(请输入一整数)

4

正确答案: 4

- 4 2.14. Consider 4 stations are connected by “Switch1” of 10baseT Ethernet, another 4 stations are connected by “Switch2” of 10baseT Ethernet, and Switch1 and Switch2 are connected directly. How many stations can transmit simultaneously without a collision ? 假如10basedT以太网网络 “交换机 1” 联结有4个工作站, “交换机 2” 联结有4个工作站, 且交换机1和交换机2直接相连。请问有多少个工作站可同时传送且不会发生碰撞？(请输入一整数)

8

正确答案: 8

switch上有芯片, 收到封包后会进行处理后转送, 所以各个端口均可以同时传送

Each Ethernet port can have a transmission simultaneously.

Ethernet 5

- 1 2.15. Which of the following are correct for an Ethernet frame ? 下列哪些对以太网帧的叙述是正确的？

- ☐ A. The “preamble” is a sequence of “00000000...00” for better synchronizations between the sender and receiver. “preamble” 是一个 “00000000...00” 的序列, 为了让传送端及接收端之间可以达到同步
- ☒ B. The “preamble” is a sequence of “101010...10” for better synchronizations between the sender and receiver. “preamble” 是一个 “101010...10” 的序列, 为了让传送端及接收端之间可以达到同步。
- ☐ C. Both destination MAC address and source MAC address have a length of 8 bytes. 目的地MAC地址和来源MAC地址长度皆为8 字节
- ☐ D. The “padding field” is used when the data part (LLC-frame) of the frame is less than 64 bytes. 当帧的数据部分长度少于64字节时, 会使用到padding 字段

正确答案: B 你选对了

A: Preamble: (101010...1010) for Synchronization

C: Source and Destination MAC Addresses (48bits each→6bytes).

D: PAD: Padding when LLC-Frame < 46 bytes

- 2 2.18. An Ethernet adaptor (Network card) will receive all the frames from the link but only accept (handle) what kind of frames ? 以太网适配器（网络卡）从链结会收到所有的讯框，但它只会接受何种讯框？

- ☒ A. Frames addressed to its own address 目的地地址为自己地址的讯框
- ☐ B. Frames addressed to all unicast address 所有目的地地址为单播地址的讯框
- ☒ C. Frames addressed to the broadcast address 目的地地址为广播地址的讯框
- ☐ D. Frames addressed to all multicast addresses 目的地地址为所有群播地址的讯框

正确答案：A、C 你选对了

To summarize, an Ethernet adaptor **receives all frames and accepts**

- Frames addressed to its own address
- Frames addressed to the broadcast address
- Frames addressed to a multicast address if it has been instructed

- 3 2.16.(a) The minimum length of an Ethernet frame is _____ bytes ?
(a) 以太网讯框的最短长度为 _____ 字节？

64

正确答案：64

- 4 2.16.(b) the maximum length of an Ethernet frame is _____ bytes ?
(b) 以太网讯框的最大长度为 _____ 字节？

1518

正确答案：1518

- **Min 64 bytes** to distinguish from collision
- **Max 1518 bytes** to prevent dominating bandwidth

- 5 2.17. The Ethernet MAC address is presented as a sequence of six numbers separated by colons. Each number corresponds to 1 byte of the 6-byte address and is given by a pair of hexadecimal digits, one for each of the 4-bit nibbles in the byte. What is the MAC address for 00001000 00000000 00101011 11100100 10110001 00000010 ?

以太网之MAC地址以六个用冒号隔开的数字来呈现，每一个数字对应到1字节，且可用十六进制来表示，请问下列MAC地址00001000 00000000 00101011 11100100 10110001 00000010，如何用上述方式来表示？(每格请填入两个数字或字母的组合,如00, 2b, 08..., 英文字母请用小写)

__(1)__:__(2)__:__(3)__:__(4)__:__(5)__:__(6)__

08:00:2b:e4:b1:02

正确答案: 08:00:2b:e4:b1:02

Ethernet 6

- 1 2.19. Which of the following MAC protocol is used by Ethernet ?下列何者为以太网使用的MAC协议？

- ☐ A. (a)CSMA (Carrier Sense Multiple Access)
- ☐ B. (b)Random Multiple Access Protocol
- ☐ C. (c)CSMA/CA (Carrier Sense Multiple Access with Collision Avoidance)
- ☒ D. (d)CSMA/CD (Carrier Sense Multiple Access with Collision Detection)

正确答案: D 你选对了

2 2.20. Which of the following are correct for CSMA (Carrier Sense Multiple Access) protocol ? 下列哪些对于CSMA (Carrier Sense Multiple Access) 协议的叙述是正确的 ?

- ☒ A. (a)Listen (carrier sense) before transmit. 传输前先听
- ☐ B. (b)Transmit a frame any time when a station has frame. 当工作站有讯框时就立即传送
- ☒ C. (c)If channel is sensed idle, then transmit entire frame without considering if frame collision is detected. 当侦测到频道为空闲时, 就传送整包讯框, 无论是否侦测到讯框碰撞
- ☒ D. (d)If channel is sensed busy, then defer transmission. 假如侦测到频道为忙碌时, 就延迟传输

正确答案: A、C、D 你选对了

Ethernet 7

1 2.21. Which of the following are correct for CSMA/CD (Carrier Sense Multiple Access with Collision Detection) protocol ? 下列哪些对于CSMA/CD协议的叙述是正确的 ?

- ☒ A. Listen (carrier sense) before transmit. 传输前先听
- ☒ B. If channel is sensed idle, then transmit a frame and stop the transmission when a collision is detected. 假如侦测频道为空闲时, 就开始传送讯框, 一旦发现碰撞发生, 立即停止传送
- ☐ C. If channel is sensed idle, then transmit entire frame without considering if frame collision is detected. 假如侦测频道为空闲时, 就开始传送整个讯框, 无论是否侦测到讯框碰撞
- ☐ D. If channel is sensed busy, then defer transmission for a random time. 假如侦测频道为忙碌时, 则延迟一段随机数时间后再传送

正确答案: A、B 你选对了

2 2.22. Which of the following are correct when a “collision” happens for CSMA/CD protocol ? 针对CSMA/CD 协议，当碰撞发生时，下列叙述哪些是正确的？

- ☒ A. A jamming sequence (frame) will be sent to enforce the collision. 扰乱讯号会被送出，以强迫发生碰撞
- ☐ B. The entire frame will still be transmitted. 整个讯框仍会被传送
- ☐ C. The transmission is stopped and after a random delay, the frame is transmitted again immediately. 传输会先停止，经过延迟一段随机数的时间后，会立即传送该讯框
- ☒ D. The transmission is stopped and after a random delay, the frame is transmitted again from the carrier sense step. 传输会先停止，经过延迟一段随机数的时间后，会由载波侦测的步骤开始传送该讯框

正确答案：A、D 你选对了

3 2.23. The “collision window” of the CSMA/CD protocol is time required to detect a collision. Which of the following are correct for collision window ? Assume the one way propagation time of the network is “a”. CSMA/CD 协议中的”冲撞窗口”是指侦测碰撞所需要的时间。下列哪些有关冲撞窗口的叙述是正确的？假设网络最远两端单向的讯号传递时间为 ‘a’

- ☐ A. The collision window is equal to a 冲撞窗口等于a
- ☒ B. The collision window is equal to 2a 冲撞窗口等于2a
- ☒ C. The worst case scenario to detect a collision happens when the two hosts are at opposite ends of the Ethernet 侦测碰撞之最差情况(需要最长时间)是当两个主机位于以太网络的两端
- ☐ D. The worst case scenario to detect a collision happens when the two hosts are close to each other. 侦测碰撞之最差情况(需要最长时间)是当两个主机非常靠近

正确答案：B、C 你选对了

- 4 2.24. Consider that a maximally configured Ethernet is 2500 m long, and there may be up to four repeaters between any two hosts, the round trip delay has been determined to be 51.2 us. For 10Mbps Ethernet (such as 10base5), what is the minimum length of a frame in order to detect all possible collisions ? _____ bits

假设最长的以太网最长为2500公尺，在任意两主机之间可能最多可以有4个中继器，而讯号来回的延迟时间为51.2 us。针对 10Mbps 以太网(如10base5)，为了能侦测到所有可能的碰撞，一个讯框长度至少要有多少位？_____

512

正确答案: 512

Ethernet 8

- 1 2.25. The minimum length of a frame for the Ethernet is 64 bytes. Which of the following are correct when a node receives a frame shorter than 64 bytes ?

以太网讯框之最短长度为64 字节。当一个节点收到小于64 字节的讯框时，下列哪些叙述是正确的？

- ☐ A. No, it is impossible for a node to receive frames shorter than 64 bytes. 不可能收到长度小于64字节的讯框。
- ☒ B. Frames shorter than 64 bytes will be treated as “collided” frames and will be dropped directly. 长度小于64字节的讯框会被当作被碰撞过的讯框，且被直接舍弃
- ☐ C. Frames shorter than 64 bytes can still be processed as some of the fields such as MAC addresses are correct. 长度小于64字节的讯框依然会被处理，因为某些字段的值(如MAC地址)是正确的
- ☐ D. Frames shorter than 64 bytes can still be processed as long as they are “broadcast” frames to all nodes. 长度小于64字节的讯框依然会被处理，只要它是广播讯框

正确答案: B 你选对了

Ethernet 9

- 1 2.26. The "exponential backoff algorithm" used by CSMA/CD protocol works as each time a network adaptor tries to transmit but fails, it "doubles" the amount of time it waits before trying again. Assume the collision window or slot time of the network is "T"

(a) For the first collision, the waiting time for the node to randomly select is among

[__(1)__, __(2)__] T times

用于CSMA/CD协议中的指数后退算法运作方式为，每当网络适配器传送失败时，再次尝试传送之前的延迟时间上限会加倍。假设冲撞窗口(或讯槽时间)为T。

(a) 针对第一次碰撞，节点等待的时间随机变量的范围是在 [__(1)__, __(2)__] T (每个空格请输入一整数)

[0,1]

正确答案: [0,1]

- 2 2.26. The "exponential backoff algorithm" used by CSMA/CD protocol works as each time a network adaptor tries to transmit but fails, it "doubles" the amount of time it waits before trying again. Assume the collision window or slot time of the network is "T"

(b) For the second collision, the waiting time for the node to randomly select is among

[__(3)__, __(4)__] T times

用于CSMA/CD协议中的指数后退算法运作方式为，每当网络适配器传送失败时，再次尝试传送之前的延迟时间上限会加倍。假设冲撞窗口(或讯槽时间)为T。

(b) 针对第二次碰撞，节点等待的时间随机变量的范围是在 [__(3)__, __(4)__] T (每个空格请输入一整数)

[0,3]

正确答案: [0,3]

- 3 2.26. The "exponential backoff algorithm" used by CSMA/CD protocol works as each time a network adaptor tries to transmit but fails, it "doubles" the amount of time it waits before trying again. Assume the collision window or slot time of the network is "T"

(c) For the third collision, the waiting time for the node to randomly select is among

[__(5)__, __(6)__] T times

用于CSMA/CD协议中的指数后退算法运作方式为，每当网络适配器传送失败时，再次尝试传送之前的延迟时间上限会加倍。假设冲撞窗口(或讯槽时间)为T。

(c) 针对第三次碰撞，节点等待的时间随机变量的范围是在 [__(5)__, __(6)__] T (每个空格请输入一整数)

[0,7]

正确答案: [0,7]

Ethernet 10

1 2.27.Which of the following are correct for Ethernet performance ?

下列哪些对于以太网效能的叙述是正确的？

- ☒ A. Ethernets work best under lightly loaded conditions. 以太网在负载较轻的状况下运作最好
- ☐ B. Ethernets work very well under heavy loads as all collisions will be detected. 以太网在负载重的状况下运作非常好, 因为所有碰撞皆可被侦测到
- ☒ C. Under heavy loads, too much of the network' s capacity is wasted by collisions. 在负载重的状况下, 太多的网络带宽资源会因为碰撞而浪费掉
- ☐ D. The throughput of an Ethernet depends on the traffic load, heavy load will have better throughput. 以太网吞吐量大小取决于流量负载, 负载越重吞吐量越高

正确答案: A、C 你选对了

- Ethernets work best under **lightly loaded** conditions.
- Under **heavy loads**, too much of the network' s capacity is wasted by collisions.