WHAT IS THE INTERNET?

1. Which of the following descriptions below correspond to a *"nuts-and-bolts"* view of the Internet? Select one or more of the answers below that are correct. [Hint: more than one of answers below are correct].

- [x] A collection of billions of computing devices, and packet switches interconnected by links.
- [x] A collection of hardware and software components executing protocols that define the format and the order of messages exchanged between two or more communicating entities, as well as the actions taken on the transmission and/or receipt of a message or other event.
- [ ] A place I go for information, entertainment, and to communicate with people.
- [ ] A platform for building network applications.
- [x] A "network of networks".

2. Which of the following descriptions below correspond to a *"services"* view of the Internet? Select one or more of the answers below below that are correct below that are correct. [Hint: more than one of answers below are correct].

- [ ] A "network of networks".
- [x] A platform for building network applications.
- [ ] A collection of billions of computing devices, and packet switches interconnected by links.
- [x] A place I go for information, entertainment, and to communicate with people.
- [ ] A collection of hardware and software components executing protocols that define the format and the order of messages exchanged between two or more communicating entities, as well as the actions taken on the transmission and/or receipt of a message or other event.

WHAT IS A PROTOCOL?

3. Which of the following human scenarios involve a protocol (recall: "Protocols define the format, order of messages sent and received among network entities, and actions taken on message transmission, receipt")? Select one or more answers below that are correct. Hint: more than one of answers below are correct.

- [x] A student raising her/his hand to ask a really insightful question, followed by the teaching acknowledging the student, listening carefully to the question, and responding with a clear, insightful answer. And then thanking the student for the question, since teachers *love* to get questions.
- [x] One person asking, and getting, the time to/from another person.
- [ ] A person reading a book.
- [x] Two people introducing themselves to each other.
- [ ] A person sleeping.

1.

ACCESS NETWORK PER-SUBSCRIBER SPEEDS.

Match the access network with the approximate speeds that a subscriber might experience. (Note: if you look these up, do so in the 8E textbook, slides,or video -- not in the 7E or earlier versions, since link access speeds are always increasing over the years).

QUESTION LIST:

Ethernet

[D]

802.11 WiFi

[A]

Cable access network

[C]

Digital Subscriber Line

[F]

4G cellular LTE

[E]

ANSWER LIST:

A. Wireless. 10's to 100's of Mbps per device.

B. Wireless, up to 10's Kbps per device.

C. Wired. Up to 10's to 100's of Mbps downstream per user.

D. Wired. Up to 100's Gbps per link.

E. Wireless. Up to 10's Mbps per device.

F. Wired. Up to 10's of Mbps downstream per user.

G. Wired. Up to 1 Tbps per link.

2.

LINK TRANSMISSION CHARACTERISTICS.

Which of the following physical layer technologies has the highest transmission rate *and* lowest bit error rate in practice?

- (•) Fiber optic cable
- ( ) 802.11 WiFi Channel
- ( ) 4G/5G cellular
- ( ) Coaxial cable
- ( ) Twisted pair (e.g., CAT5, CAT6)
- ( ) Satellite channel

1. Which of the characteristics below are associated with the technique of *packet switching*? Select all correct answers. [Hint: more than one of the answers is correct].

- [ ] Reserves resources needed for a call from source to destination.
- [x] Data may be queued before being transmitted due to other user's data that's also queueing for transmission.
- [ ] Frequency Division Multiplexing (FDM) and Time Division Multiplexing (TDM) are two approaches for implementing this technique.
- [x] This technique is used in the Internet.
- [x] Resources are used on demand, not reserved in advance.
- [ ] This technique was the basis for the telephone call switching during the 20th century and into the beginning of this current century.
- [x] Congestion loss and variable end-end delays are possible with this technique.

2. Which of the characteristics below are associated with the technique of *circuit switching*? Select all correct answers. [Hint: more than one of the answers is correct].

- [ ] Resources are used on demand, not reserved in advance.
- [x] This technique was the basis for the telephone call switching during the 20th century and into the beginning of this current century.
- [ ] Data may be queued before being transmitted due to other user's data that's also queueing for transmission.
- [x] Frequency Division Multiplexing (FDM) and Time Division Multiplexing (TDM) are two approaches for implementing this technique.
- [ ] Congestion loss and variable end-end delays are possible with this technique.
- [ ] This technique is used in the Internet.
- [x] Reserves resources needed for a call from source to destination.

WHAT IS A NETWORK OF NETWORKS?

3. When we say that the Internet is a "network of networks," we mean? Check all that apply (hint: check two or more).

- [ ] The Internet is the *fastest* network ever built.
- [x] The Internet is made up of a lot of different networks that are interconnected to each other.
- [x] The Internet is made up of access networks at the edge, tier-1 networks at the core, and interconnected regional and content provider networks as well.
- [ ] The Internet is the *largest* network ever built.

PACKET SWITCHING OR CIRCUIT-SWITCHING?

Consider a scenario in which 5 users are being multiplexed over a channel of 10 Mbps. Under the various scenarios below, match the scenario to whether circuit switching or packet switching is better.

QUESTION LIST:

Each user generates traffic at an average rate of 2.1 Mbps, generating traffic at a rate of 15 Mbps when transmitting

C

Each user generates traffic at an average rate of 2 Mbps, generating traffic at a rate of 2 Mbps when transmitting

B

Each user generates traffic at an average rate of 0.21 Mbps, generating traffic at a rate of 15 Mbps when transmitting

4. A

ANSWER LIST:

A. Packet switching

B. Circuit switching

C. Neither works well in this overload scenario

COMPONENTS OF PACKET DELAY.

Match the description of each component of packet delay to its name in the pull down list.

1.

QUESTION LIST:

Time needed to perform an integrity check, lookup packet information in a local table and move the packet from an input link to an output link in a router.

C

Time spent waiting in packet buffers for link transmission.

D

Time spent transmitting packets bits into the link.

B

Time need for bits to physically propagate through the transmission medium from end one of a link to the other.

A

ANSWER LIST:

A. Propagation delay

B. Transmission delay

C. Processing delay

D. Queueing delay

Match the function of a layer in the Internet protocol stack to its its name in the pulldown menu.

1.

QUESTION LIST:

Protocols that are part of a distributed network application.

D

Transfer of data between one process and another process (typically on different hosts).

E

Delivery of datagrams from a source host to a destination host (typically).

A

Transfer of data between neighboring network devices.

C

Transfer of a bit into and out of a transmission media.

B

ANSWER LIST:

A. Network layer

B. Physical layer

C. Link layer

D. Application Layer

E. Transport layer

2.

WHAT'S A "PACKET" REALLY CALLED?

Match the name of an Internet layer with unit of data that is exchanged among protocol entities at that layer, using the pulldown menu.

QUESTION LIST:

Application layer

A

Transport layer

D

Network layer

C

Link layer

B

Physical layer

E

ANSWER LIST:

A. Message

B. Frame

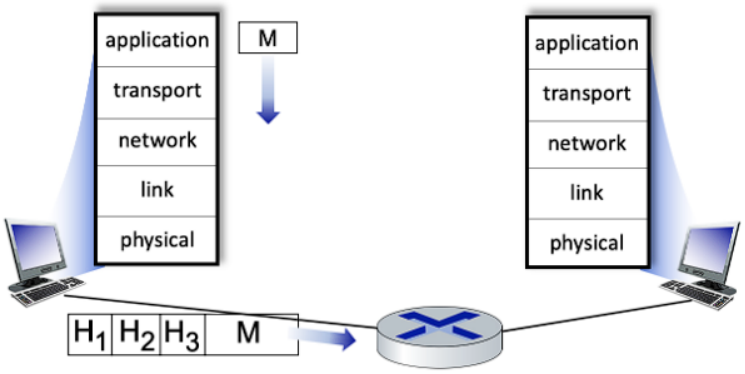
C. Datagram

D. Segment

E. Bit

3.

Consider the figure below, showing a link-layer frame heading from a host to a router. There are three header f header with a header label shown in the figure.



QUESTION LIST:

Header H_1

Ξ

Header H_2

Λ

Header H_3

3

ANSWER LIST:

A. Network Layer

B. Transport layer

C. Physical layer

D. Application layer

E. Link layer