Consider an *N*-hop path (i.e. *N-1*intermediate routers) between a source and destination as depicted in the figure below. The source wants to transmit a file of size *kP*bits to the destination. There are two options: (i) Transmit the entire file as one large chunk (i.e. packet) of data. This is what we refer to as *message switching* or (ii) Break up the file into *k*packets, each of size *P*bits and transmit these packets back-to-back. As you may recall, this is *packet switching*.

A close up of a device

Description automatically generated

All links (i.e. hops) have the same transmission delay and propagation delay. Assume that the propagation delay of a link is d sec. Assume that the transmission delay for transmitting P bits on a link is T sec. Thus, transmitting the entire file (as is the case in message switching) on a link takes kT sec.

Assume that there is no other traffic on the network. Ignore the time taken by each router to process each packet (or message). Assume that packet headers are negligible.

Compare the end-to-end delay incurred in transmitting the file for the two options outlined above, i.e. message switching vs packet switching. Which incurs lower delay and under what conditions?

# Quiz questions (week 1)

**Q1.**Packet switching, instead of circuit switching, is generally used to transfer data in the Internet. True or false? True

**Q2.**Propagation delay depends on the size of the packet. True or false? false

**Q3.**Which of the following delays is significantly affected by the load in the network? (B)

A. Processing delay

B. Queuing delay

C. Transmission delay

D. Propagation delay

**Q4.**Consider a packet that has just arrived at a router. What is the correct order of the delays encountered by the packet until it reaches the next-hop router? (C)

A. Transmission, processing, propagation, queuing

B. Propagation, processing, transmission, queuing

C. Processing, queuing, transmission, propagation

D. Queuing, processing, propagation, transmission

**Q5.**As an application developer, what measure would you take to reduce the total delay involved in transferring image files across the Internet? Hint: You do not have control on the core of the network i.e., route taken, bandwidth etc.

simply compress the size of the image.

**Q6.**Is it possible to increase the upstream data rate while using ADSL? If yes how?

Frequency re-allocation for ADSL upstream and downstream data would work (to some extent).

Quiz2

**Q1.**In the Internet, which layer has only one choice of protocol B

A. Physical

B. Network

C. Transport

D. Application

**Q2.**Which layer is NOT implemented in Internet routers D

A. Physical

B. Data link

C. Network

D. Transport

**Q3.**Do a quick search on the Internet on "firewall" (some information about firewall is also available in your text on page 376, 7th Ed., for example). Why do you think that firewall violates the layering principle?

Firewall access various Application and Transport layer header fields thus breaking the endto-end notion for these layers.

**Q4.**Find about about "TCP Splitting" from the Internet. Your text also contains some information about TCP Splitting on page 303, 7th Ed., for example. What is the motivation for TCP Splitting to break the layering principle? C

A. Security

B. Performance in terms of reducing the packet header size

C. Performance in terms of reducing the end-to-end delay

D. Performance in terms of reducing the queueing delay in the routers

**Q5.**Network applications run on B

A. network core devices, such as routers and switches

B. end hosts, such as smartphones and desktops

C. access routers or gateways, such as wireless routers

D. all of the above

**Q6**. If two processes on the same machine want to communicate with each other, they B

A. must send messages to each other

B. do not have to send messages to each other, but can simply share some common memory space within the same machine

C. must use TCP

D. could use FTP

**Q7**. The client process must use a well-known port number for its socket. True or False? F

**Q8**. Client-Server architecture can only be implemented with TCP at the transport layer. True or False? UDP F

**Q9.**HTTP belongs to B

A. Transport layer

B. Application layer

C. Network layer

D. Physical layer

**Q10**. To send the number 256, HTTP will consume C

A. 1 byte

B. 2 bytes

C. 3 bytes

D. 4 bytes

**Q11**. We could achieve some of the things achieved with cookies today if HTTP was 'stateful' (i.e., NOT stateless). True or False? True

**Q12**. If SMTP only allows 7-bit ASCII, how do we send pictures/videos/files via email?

A. We use a different protocol instead of SMTP B

B. We encode these objects as 7-bit ASCII

C. We’re really sending links to the objects, rather than the objects themselves

D. We don’t !! You have been lied to !!

**Q13**. Which of the following is NOT true? D

A. HTTP is pull-based, SMTP is push-based

B. HTTP uses a separate header for each object, SMTP uses a multipart message format

C. SMTP uses persistent connections

D. HTTP uses client-server communication but SMTP does not

**quiz 3**

**Q1**. If a local name server has no clue about where to find the address for a hostname then

B

A. Server asks its adjacent name server

B. Server asks its root name server

C. Request is not processed

D. Server explodes

**Q2**. Which of the following is an example of a Top Level Domain?

D

A. yoda.jedi.starwars.com

B. jedi.starwars.com

C. starwars.com

D. .com

**Q3**. A web browser needs to contact [www.cse.unsw.edu.au](http://www.cse.unsw.edu.au/). The minimum number of DNS requests sent is:

A

A. 0

B. 1

C. 2

D. 3

**Q4**. The role of the CDN provider’s authoritative DNS name server in a content distribution network basically is:

B

A. to provide an alias address for each browser access to the “origin server” of a CDN website

B. to map the query for each CDN object to the CDN server closest to the requestor

C. to provide a mechanism for CDN “origin servers” to provide paths for clients (browsers)

D. none of the above, CDN networks do not use DNS

**Q5**. When web-based email is used, two mail servers communicate with each other using HTTP. True or False?

False

**Q6**. P2P networks must have servers to help new peers find other peers. True or False?

False

**Q7**. P2P networks must maintain trackers to help new peers join the network. True or False?

False

**Q8**. The 'rarest first' is a P2P networking policy to select B

A. the next peer to download chunks from

B. the next chunk to download

C. the tracker to query for other peers

D. the file to download

**Q9**.The 'rarest first' policy helps C

A. download precious files

B. download chunks that no other peers have

C. duplicate chunks in the P2P network so even if a peer disappears, other peers will contain the chunks

D. remove chunks from the network that are rarely used

**Q10**. In BitTorrent, Peer A will never send chunks to Peer B if Peer B is not in Peer A's top 4 list. True or False? False

**Q11**. In DHT, a hash function converts D

A. an integer to a real number

B. an a real number to an integer

C. an integer to a string

D. a string to an integer

**Q12**. Which of the following will help address the 'peer churn' (i.e., a peer disappearing) problem? D

A. each peer knows its two immediate predecessors

B. each peer knows its two immediate successors

C. each peer knows its immediate successor and two immediate predecessors

D. each peer knows its immediate predecessor and two immediate successors