

CS2021 ASSIGNMENT 10 (Due Date: Dec 10, 2021)

Question 1

State the medium for data communication or telecommunication in each of the following networks.

- (a) Wireless computer network using WiFi or WiMAX technologies.
- (b) Wired computer network, like Ethernet.
- (c) Wired landline phone network.
- (d) Network of cell phones and base stations.

Answer:

- (a) Nonconducting medium such as water, air or space.
- (b) Copper cable and fiber optics.
- (c) Copper cable and fiber optics.
- (d) Air.

Question 2

State the purposes of each of the following addresses, numbers or IDs. Besides, describe which firm or which system generate those addresses, numbers or IDs.

- (a) MAC address.
- (b) IP address.
- (c) Port number.
- (d) Session ID.
- (e) Process ID.

Answer:

- (a) It is a unique number being assigned for a device, like a cell phone or a computer. By using the MAC addresses (both sender MAC address and destination MAC address), data could be transmitted from the sender device to the destination device.

- (b) It is a unique number being assigned for a device which has been connected to the Internet. By using the IP addresses (both the sender IP and destination IP), an IP datagram can be transmitted from the sender device to the destination device via the TCP/IP protocol.

- (c) Port number is a unique number being assigned for an application protocol, like HTTP or FTP. Once an IP datagram has arrived the destination device, the operating system can thus identify which application program or application server the message inside the datagram should be pass to. For instance, the machine running with a web server has received an IP datagram with port number 80, the operating system could thus pass the datagram to the (service queue of the) web server process.

- (d) A session ID is a unique number being assigned by the application process for a datagram (or multiple datagrams) to be transmitted from the sender device to the destination device. It is especially suitable for making connection between two devices for a task with multiple steps and multiple datagrams transmission. Sometimes, a process might initiate multiple sessions for multiple tasks. Each task is a sub-process of the process. Once a datagram has been pass to the process, it could thus identify from the session ID which sub-process the datagram should be pass to.

- (e) Process ID is a unique number being assigned by the operating system. Each program, which is running in a computer, will be assigned with a process ID.

Question 3

The concepts of circuit switching, message switching and packet switching have been introduced in the class.

- (a) Imagine that you make a voice call via the telecommunication network to your friend. The connection is based on which switching method?
- (b) Imagine that your smart phone has been connected to a WiFi access point. You invoke your LINE App and make a LINE call to your friend. The connection is based on which switching method?
- (c) Imagine that your notebook has been connected to the Internet. The browser Chrome has been invoked and you have typed the URL `www.nchu.edu.tw`. The request for the webpage is thus sent to the NCHU web server. The connection is based on which switching method?

Answer:

- (a) Circuit switching.
- (b) Packet switching.
- (c) Packet switching.

Question 4

Once a data packet has been routing from the sender computer to the destination computer via the Internet, the packet could be disappeared and unable to arrive the destination computer. State three possible causes for this phenomena.

Answer: (i) The noise caused by the radiation in the air and the electrical noise in the conducting media could corrupt the signal and make the data in the signal irrecoverable. Thus, the packet is lost. (ii) As each packet has been assigned with a number for the maximum number of time the packet to be forwarded. It is called the Time-To-Live (TTL). Once a packet has not arrived the destination IP address within the TTL, it will be discarded. The packet is considered being lost. (iii) The machine associated with the destination IP address has been shut down.

Question 5

- (a) State the possible sources of channel noise.
- (b) State the effect of channel noise on a packet which is being routed in the Internet.
- (c) State the difference between *error detection* and *error correction*.

Answer:

- (a) (i) The radiation will cause the noise on a non-conducting media, like water, air or space. (ii) The electrical noise on a conducting medium.
- (b) Packet loss.
- (c) With error detection mechanism, the destination device could detect if the IP datagram has error. If it is, the destination device could send a 're-send' message to the sender device for re-sending the datagram. With error correction mechanism, the destination device could attempt to recover the datagram. If it succeeds, it will reduce the traffic of the Internet for handling resend and the time for the destination device to wait for the re-sent datagram.

Question 6

In the lecture, three network models have been introduced. All of them are layered models. The bottom layer is always named the physical layer and the top layer is named the application layer. HTTP is an application layer protocol which supports all web applications. Protocols are thus categorized in accordance with the layers they belong to.

- (a) Other than HTTP, state another three application layer protocols which have been applied in the implementation of the application systems in our computers or smart phones.
- (b) Among the three network models, state which network model is the most popular for the implementation of today Internet.

Answer:

- (a) (i) Voice-over-IP (VOIP), (ii) file transfer protocol (FTP) and (iii) simple mail transfer protocol (SMTP).
- (b) TCP/IP, i.e. the Tanenbaum or Stalling model.