AACS2034 Fundamentals of Computer Networks

Tutorial 10: Application Layer

Q1. The functionality of application layer in X model fits roughly into the top three layers of the OSI model. Draw the Table 1 and answer the item (1) to item (4) in your answer booklet. *(201605 TAR UC, resit)* (2 marks)

OSI model	(4) TCP/IP Model
(1) Application Layer	Application layer
(2) Presentation Layer	
(3) Session Layer	

Table 1: Networking Model

Q2. Differentiate the functions of the OSI application layer, presentation layer and session layer. *(201703 TAR UC, resit)* (12 marks)

Difference	Application Layer	Presentation Layer	Session Layer
Layer	The top layer of both OSI and TCP/IP models	The second layer of OSI layer, not present in TCP/IP model	The third layer of OSI layer, not present in TCP/IP model
Function	Provides interface for communication between applications and layers underneath in the network model	Formats, or presents, data from the source device into a compatible form for receipt by the destination device	Creates & maintain dialogues between source & destination applications
Purpose	Used to exchange data between programs running on the source & destination hosts	Used to compress, encrypt & decrypt data for transmission	Handles the exchange of information to initiate dialogs, keep them active, and to restart sessions

Q3. Provide **TWO (2)** applications that are supported by peer-to-peer (P2P). *(201705 TAR UC, resit)* (3 marks)

- eDonkey
- G2
- BitTorrent
- Bitcoin
- Frostwire

Q4. Differentiate between GET message and POST message. *(201703 TAR UC, resit)* (4 marks)

GET	**Differences**	**POST**
A client request, used to request data.	Usage	Used to send messages that upload data to the web server.
Sent by a web browser to request pages from a web server.	Purpose	When the users enters data into a form embedded in the web page, POST includes the data in the message sent to the server.

Q5. (a) List **ONE (1)** protocol that is used to send e-mail messages. *(201705 TAR UC, resit)*

(1 mark)

Simple Mail Transfer Protocol (SMTP)

(b) Provide **TWO (2)** comparisons of Post Office Protocol version 3 (POP3) and Internet Message Access Protocol (IMAP). *(201705 TAR UC, resit)* (4 marks)

Differences	Post Office Protocol Version 3 (POP3)	Internet Message Access Protocol (IMAP)
Protocol working method	It allows for email messages to be downloaded to the client's device	The original message reside on the server until manually deleted by user.
Centralization of message	There is no centralized location where email messages are kept	Requires a centralized mail server to store e-mail messages
TCP port used	Using TCP port 110	Using TCP port 143

(c) Briefly explain TWO (2) processes that are handled by e-mail servers. *(201705 TAR UC, resit)* (4 marks)

Mail Transfer Agent (MTA)
- Governs e-mail handling between servers and servers

Mail Delivery Agent (MDA)
- Missed out

Q6. With reference to Figure 1, answer the following questions:

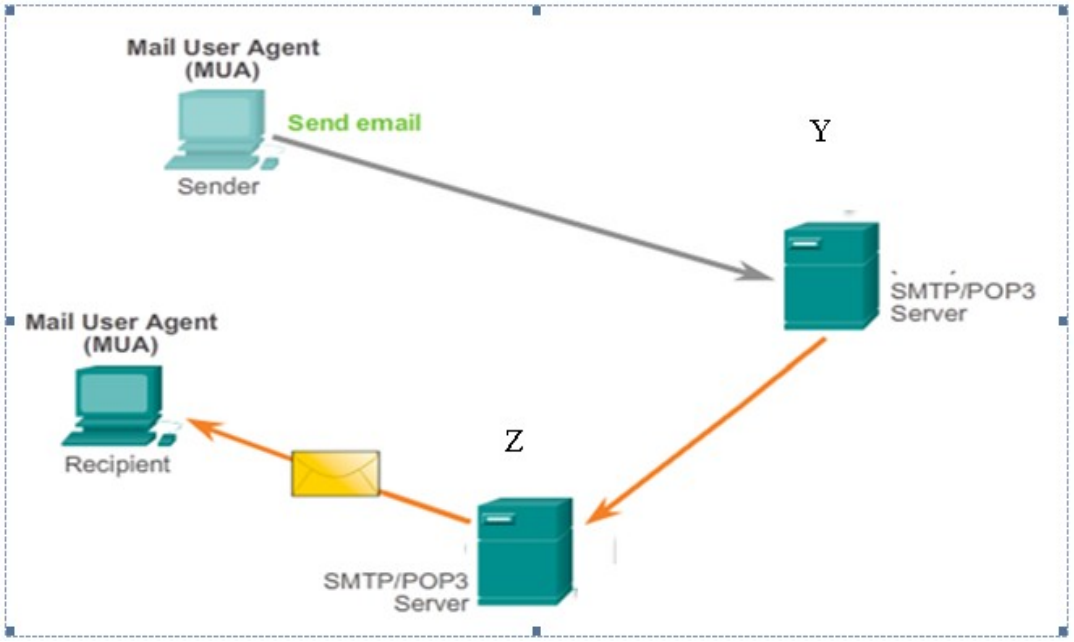

Figure 1: Email Operation

(i) Identify the type of mail agents labeled with Y and Z. *(201609 TAR UC, Main)* (3 marks)

Y: Mail Transfer Agent (MTA)
Z: Mail Delivery Agent (MDA)

(ii) Differentiate between mail agent Y and mail agent Z. *(201609 TAR UC, Main)* (6 marks)

Mail agent Y (Mail Transfer agent)	Mail agent Z (Mail delivery agent)
Used to forward e-mail	Accepts email from mail transfer agent (MTA) and

	perform delivery
Receives message from MUA or from another MTA on another e-mail server	The MDA receives all the inbound mail from the MTA and place it at appropriate user inboxes
Based on the message header, MTA determines how to forward the message to reach its destination	The MDA resolves final delivery issues, such as virus scanning, spam filtering, and return-receipt handling

Q7. XYZ Company plans to implement a new application in its network that is able to connect the local mail server for sending and receiving daily emails to their clients.

(i) What are the **TWO (2)** types of protocols and their respective port numbers that are essential in developing the new application? *(201603 TAR UC, resit)* (4 marks)

Two types of protocols uand its port numbers:
- SMTP uses TCP port 25
- POP3 uses UDP port 110

(ii) Discuss **THREE (3)** types of mail agents involved in the new application. *(201603 TAR UC, resit)* (9 marks)

Mail User Agent (MUA)
- Used to compose messages
- Known as an email client
- Allows messages to be sent and received, placing in the client's mailbox

Mail Transfer Agent (MTA)
- Used to forward e-mail
- Receives messages from MUA or another MTA
- MTA looks in message header to determine how the message must be forwarded to reach the destination

Mail Delivery agent (MDA) (NOTE: Instructor answer missing, check back!)
- Accepts mail from MTA
- Performs the actual delivery
- Place the mail inside inboxes
- Resolve final delivery issues (virus scanning, spam filtering, return-receipt handling)

Q8. (a) Describe how the DNS works by using the destination address: www.cisco.com. *(201603 TAR UC, resit)* (8 marks)

Tutorial 10: Application Layer

- First, a domain name or URL (www.cisco.com) is entered in the address field of the browser. The browser passes the name to the resolver.
- Secondly, the resolver sends the DNS request to the DNS server.
- Thirdly, the server then searches its records and resolves te name with a corresponding IP address
- Lastly, the DNS serveer then sends the IP address back to the client that made the request. The IP address will be used in the encapsulation process as the destination address for packets going to www.cisco.com.

(b) Give any **FOUR (4)** examples of top level domains. *(201603 TAR UC, resit)* (4 marks)

- .au – Australia
- .co – Columbia
- .com – business/industry
- .edu – education field
- .gov – government agency
- .jp – Japan
- .my – Malaysia
- .org – non-profit organization

Q9. The Dynamic Host Configuration Protocol (DHCP) service enables devices on a network to obtain information from a DHCP server.

(i) Give **FOUR (4)** examples of the information obtains from a DHCP server. *(201605 TAR UC, resit)* (2 marks)

- *DNS server's IP address*
- *Lease expire date and time*
- *Lease obtain date & time*
- *MISSING ONE*

(ii) With the aid of diagram, illustrate the FOUR (4) steps process of DHCP. *(201605 TAR UC, resit)* (12 marks)

DHCP Discover

- When a DHCP-configured boots up or connects to the network, the client broadcasts a DHCP DISCOVER packet to identify any available DHCP servers on the network.

DHCP Offer

- DHCP server replies with a DHCP OFFER, which is a lease message with an unassigned IP address, subnet mask, DNS server, and default gateway information as well as the destination of the lease

DHCP Request

- The client can receive multiple DHCP OFFER packets if the local network has more than one DHCP server. The client must choose between them and broadcast a DHCP REQUest packet that identifies the explicai server and lease ofer that it is accepting.

DHCP Acknowledge

Tutorial 10: Application Layer

- Assuming that the IP address requested by the client, or offered by the server is still valid, the chosen server would return a DHCP ACK (acknowledgement) message. The ACK message lets the client know that the lease is finalized.

Q10. Briefly explain the main function and state the well-known port number with transport layer protocol used for the following application layer protocols:

(i) Hypertext Transfer Protocol (HTTP) *(201703 TAR UC, resit)* (4 marks)

- It is used to transfer files that make up the web pages of the internet
- TCP port 80

(ii) Domain Name System (DNS) *(201703 TAR UC, resit)* (4 marks)

- It is used to resolve Internet names to IP addresses
- TCP/UDP port 53

(iii) Dynamic Host Configuration Protocol (DHCP) *(201703 TAR UC, resit)* (4 marks)

- It is used to assign an IP address, subnet mask, default gateway, and DNS server to a host
- UDP port 67