Assignment 4 “Application Layer”

Sample answers

1.1

1.2
2.1

With a single recursive query we will know either:
- The ip of domain.com
- That domain.com is unknown

2.2

With a single iterative query we will know either:
- The ip of domain.com
- That domain.com is unknown in the DNS server
- A referral of an other DNS server to query for domain.com

3.1

Prints the headers only of the http get request of the https://www.uoc.gr/.

3.2

$ curl --head https://www.uoc.gr/

HTTP/1.1 200 OK
HTTP revision HTTP/1.1 with 200 response status code and OK reason phrase.

Date: Mon, 02 Nov 2020 08:01:33 GMT
When the response was generated.

Server: Apache/2.2.34 (Unix)
The server is an Apache running on Unix.

Set-Cookie: PHPSESSID=04ca159eb1414a36daa55019d8584bcd; path=/
Suggest the client to store cookies named 'PHPSESSID' and 'path'.

Expires: Thu, 19 Nov 1981 08:52:00 GMT
Until when the response can be considered valid.

Cache-Control: no-store, no-cache, must-revalidate, post-check=0
Pragma: no-cache
Do not cache the response.

Set-Cookie: template=basic; expires=Tue, 03-Nov-2020 14:01:33 GMT; path=/
Suggest the client to store cookies named 'template', 'expires' and 'path'.
Vary: Accept-Encoding, User-Agent
Accept-Encoding: The responses vary based on the accepted encoding provided by the user.
User-Agent: The responses vary based on the requesting user's provided agent information (os and browser).

Content-Type: text/html; charset=UTF-8
The content of the response is html and the charset is UTF-8.

4.1
Looks up and prints the DNS records that match http://www.csd.uoc.gr/.

4.2
$ dig www.csd.uoc.gr | grep -v '^;'
www.csd.uoc.gr. 17 IN CNAME tehanu.csd.uoc.gr.

CNAME record which states that www.csd.uoc.gr. is an alias of tehanu.csd.uoc.gr.
Also the record will be valid and can be cached for the next 17 seconds.

tehanu.csd.uoc.gr. 42 IN A 147.52.206.199

A record which states that tehanu.csd.uoc.gr maps to the IP 147.52.206.199.
Also the record will be valid and can be cached for the next 42 seconds.

In both records IN states the class of the record which stands for Internet.

4.3
Semantically it means that the top level domain is the root empty domain, however practically is used to distinguish between absolute domain names that end with a dot, from relative or incomplete domains that don't end with a dot.

Reference - http://www.dns-sd.org/TrailingDotsInDomainNames.html

5.1
Print the response from the ftp request of the ftp://ftp.cc.uoc.gr/mirrors/linux/ and also messages sent between curl and the server with the -v option.
$ curl -v ftp://ftp.cc.uoc.gr/mirrors/linux/ 2>&1 | grep '^>'

> USER anonymous
> PASS ftp@example.com

Send the user credential where the username is ‘anonymous’ and the password is ‘ftp@example.com’.

> PWD

Request the current working directory.

> CWD mirrors

Request to change the working directory to the directory ‘mirrors’ relative to the cwd.

> CWD linux

Request to change the working directory to the directory ‘linux’ relative to the cwd.

> EPSV

Enter extended passive mode.

> TYPE A

Sets the transfer mode to A which stands for ASCII.

> LIST

Request information of the current working directory.

The email sent by majordomo was received by tenar.csd.uoc.gr, then it was sent to amavisd-new where it was scanned for viruses and then it was sent back to tenar.csd.uoc.gr.
6.2
The Received headers are appended by every MTA the email passes from. The sent email is a copy of the email that was sent initially from the user to the server so it has not yet passed from any MTA and therefore has no Received headers.

6.3
With an empty line.

6.4
The difference between the Date header values of the two emails is around 3 seconds, however the duration that took for our email to reach majordomo is unknown. We can estimate the transmit duration is (on average) equal to the transmit duration of the response which by Received header is around 3 seconds. So we can estimate that it took less than 1 second for the majordomo to compose the email.

7.1
Every stand alone information is a packaged HTML compressed directory, referred to as a document. Every document is IDed by a timestamp of its creations followed by a hash of its content. Also a url scheme is defined for these documents based on their id that can be used by them.

When two peers communicate they exchange their collections of the ids that they have. Also they optionally can send a bound timestamp to define the starting point of time from which they are interested in (using a hash of an empty document).

Every peer tries to establish a connection with another peer that has communicated for a duration of time.

After a TCP connection is established between two peers, a single packet is sent with all the 20-byte ids (8 bytes for the timestamp + 12 bytes for the hash) and the optional bound timestamp. Then both peers start sending all the missing documents from the other peer using the HTTP like protocol with 3 headers: Id, Encoding, Length. When the connection becomes idle for a duration of time the connection is terminated.

7.2
- Communication payload overhead, which is minimal just 20 bytes per document
- Redundant data transmission, is none because the are unique ids and no duplicated content by the hash being part of the ids
- Propagation of information, it will be based on the two timeouts: delay to reconnect with a known peer, timeout duration of an established connection.