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**Assignment 1: Part 1**

**Q1.**

1. A website can achieve this by attaching a permanent cookie to the client. The data attached to the permanent cookie will be stored in a database where the company can hold the information.

2. The role of the “If-Modified-Since” header in the conditional GET request is used to reduce the server load by having the last time it was modified. If it has not been modified since the last time it was sent, then the same version can just be sent again. However if it has been modified a new version will need to be requested and then sent to the client, without the “If-Modified-Since” header this would need to be done every time.

3. The “304 Not Modified” response means that the HTTP file has not been modified since the last time it was requested. The “200 OK” response is just the usual response indicating that the request has been sent.

4. Some common DNS record types hold specific useful information as well as a time to live, to ensure that the records stay up to date. For example the A record type holds the ip address of a domain. The CNAME record type holds the canonical name associated with an alias (forward one domain to another domain). The NS record type holds the hostname of a domain. The MX type holds the mailserver associated with the name, used for directing mail to an email server.

5. An iterative query is done by the host sending the name of the server to the local DNS server, if this server has it, it will send it back to the host, if not it will send it to the root DNS server, if the root server replies that it doesn’t have it, then the local server will send the name to the TLD DNS server, if this server does not have it either then the local server will send it to the authoritative DNS server which will have it if it exists, at any of these requests if the server being requested from knows the ip address associated with the name, it will be returned to the local server, which will send it back to the host. A recursive query works by the host sending the name to the local DNS server, if this server does not have it, its sends the name to the root DNS server, if this server does not have it, it will send it to the TLD DNS server itself unlike in the iterative query, if the TLD server does not have it, then it will send it to the authoritative DNS server which will have it if it exists and this will be sent back to the TLD server, which send it to the root server, which send it to the local server, which send it to the host. The recursive method creates a heavy load at the upper levels of the hierarchy.

**Q2.**

1. connection request 1RTT, request file 1RTT, query n DNS servers RTT1 … RTTn

Therefore the amount of time that elapses is: RTT + RTT + (n)(RTT) = 2RTT + nRTT

2a. For non-persistent HTTP this will take 2RTT per object, since there are 10 objects this will take a total of 20RTT

2b. For non-persistent HTTP done parallelly up to 3 at a time, this allows for the first 9 to be done in the same first 6RTT, then the last done in 2RTT. Total of 8RTT.

2c. With Persistent HTTP all of the images can be sent over the same TCP connection. This allows it take as little as 2RTT total.

**Q3.**

1. The mail server and the web server can have the same alias for the hostname. This RR type for this would be a MX record, used for mail exchange.

2. The main reason for cyber criminals to spoof a crypto site such as these is to steal the user credentials, and in turn use these to sell crypto investments to be deposited into there own accounts instead of the users.

3a. The IP address of uottawa.ca is 137.122.8.77

3b. The CNAME record type holds the canonical name associated with an alias (forward one domain to another domain). The uottawa.ca CNAME record includes ns1.d-zone.ca, and datacomm.uottawa.ca. TTL means time-to-live and is used to make sure that records are kept up to date.

4. SMTP, POP3, and IMAP are used to send mail between servers. SMTP does this by using persistent connection over TCP, the messages must be in 7-bit ASCII format. POP3 does this over a TCP connection as well, POP3 is stateless across sessions, no memory of what happened others sessions. IMAP keeps all the messages in one place at the server, this allows the user to organize messages into folders, it also keeps the users state across multiple sessions.

**Q4.**

1a.

F = 15Gbits, Us = 30 Mbps, di = 2 Mbps, u = 700 Kbps, N = 10  
F = 15000 Mbits u = 0.7 Mbps

The total time in a P2P network is the max of:

F/Us, F/dmin, and NF/utotal

F/Us = 15000 Mbits/ 30 Mbps = 500s  
F/dmin = 15000 Mbits / 2 Mbps = 7500s  
NF/utotal = (10)(15000)/(30 + 10\*0.7) = 4054s

With N = 100

Only one that will change is NF/utotal = (100)(15000)/(30+0.7\*100) = 15000s

The max time in scenario one is 7500s, the max time in scenario two is 15000s.  
Increasing the number of users made it take longer to distribute the file.

1b.

F = 15Gbits, Us = 30 Mbps, di = 2 Mbps, u = 300 Kbps, N = 50  
F = 15000 Mbits u = 0.3 Mbps

F/Us = 15000 Mbits/ 30 Mbps = 500s  
F/dmin = 15000 Mbits / 2 Mbps = 7500s  
NF/utotal = (50)(15000)/(30 + 50\*0.3) = 16666s

With u = 700 Kbps = 0.7 Mbps

NF/utotal = (50)(15000)/(30 + 50\*0.7) = 10000s

The max time in scenario one is 16666s, the max time in scenario 2 is 10000s

Increasing the upload speed of the users made the maximum time decrease.