MIDTERM SOLUTION

Q1. Consider a scenario, where "ABC limited" runs its own DNS servers for the "abclimited.com" zone. The master name server is called "ns1.abclimited.com", and the slave is "ns2.abclimited.com". Our DNS servers accept recursive requests from machines within our company, but will ***not*** assume other machines will accept such request. Both the server and resolver perform caching, and the caches are initially empty. For this scenario answer the following: **[2+2+2]**

    a. Suppose a user from ABC limited tries to access www.mcs.nust.edu.pk. In this case draw a complete flow diagram indicating all the intermediate DNS servers involved for the name resolution of www.mcs.nust.edu.pk.

    b. List all the DNS queries sent and received by intermediate DNS servers. You can make assumption regarding names and IP addresses of the intermediate servers.

    c. Again draw the flow diagram BUT with an assumption that all DNS servers apart from root server support recursive quires.
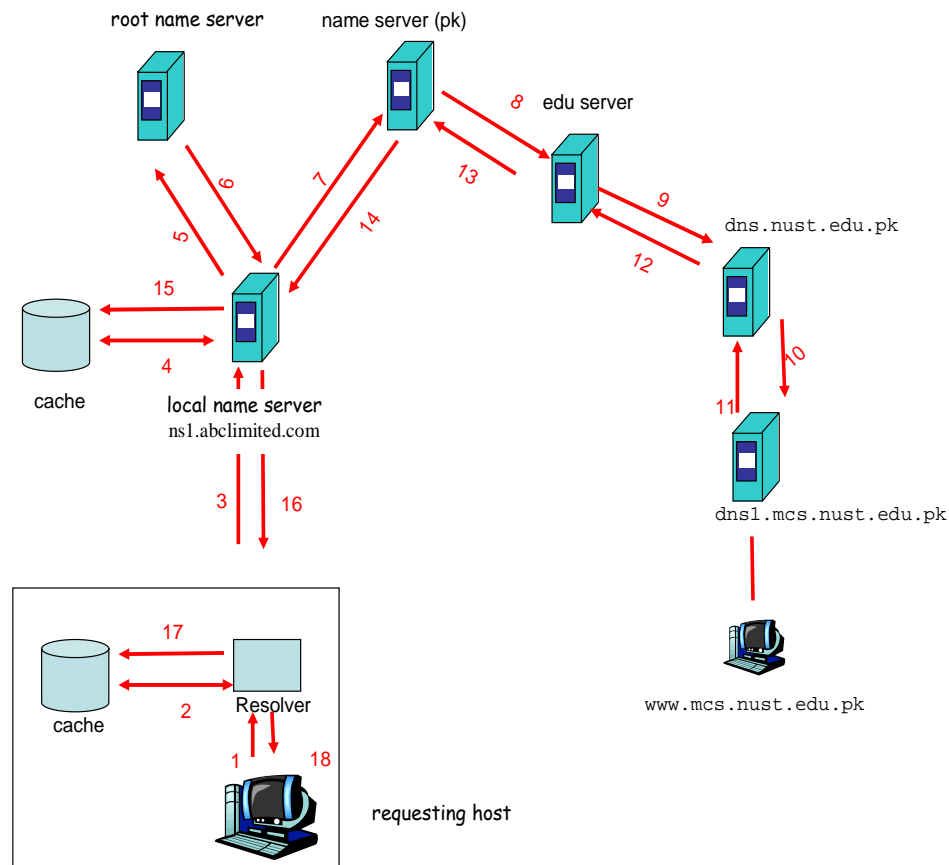
Answer: part a

root name server   name server (pk)

edu server

dns.nust.edu.pk

15

5   6   7   8   9

10   11

4   12

cache

local name server
ns1.abclimited.com

dns1.mcs.nust.edu.pk

3   16   14   13

17

cache   2   Resolver

1   18

www.mcs.nust.edu.pk

requesting host
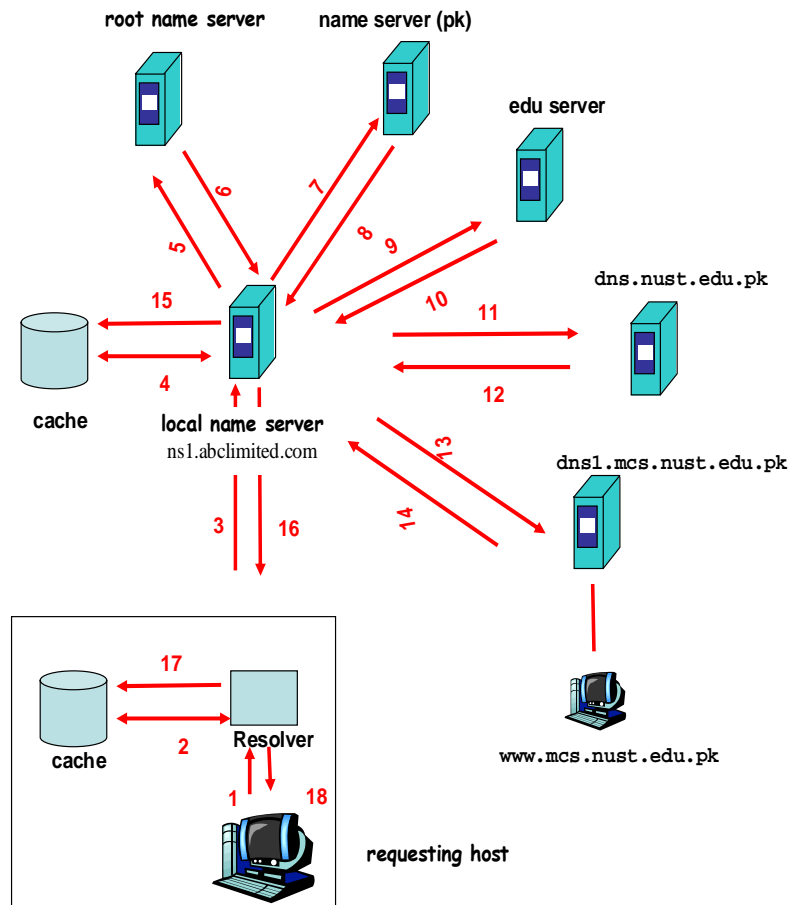
Answer: part b

5.   Query: www.mcs.nust.edu.pk

6.   Reply: dns.pk, 102.11.1.20, A

7.   Query: www.mcs.nust.edu.pk

8.   Reply: dns.edu.pk, 112.11.1.20, A

9.   Query: www.mcs.nust.edu.pk

10.   Reply: dns.nust.edu.pk, 72.11.1.20, A

11.   Query: www.mcs.nust.edu.pk

12.   Reply: dns.mcs.nust.edu.pk, 175.11.1.20, A

13.   Query: www.mcs.nust.edu.pk

14.   Reply: www.mcs.nust.edu.pk, 180.1.1.2, A

Answer: part c

root name server   name server (pk)

8 edu server

6 *7*

13

5 *14*

9

dns.nust.edu.pk

15

12

cache   4

local name server
ns1.abclimited.com

10

11

3 16

dns1.mcs.nust.edu.pk

17

2 Resolver

cache

www.mcs.nust.edu.pk

1 18

requesting host

Q2. The RRT between a source and destination is 0.3 seconds. A user access a web page comprising of 20 objects and the transmit time for each object is 0.2 ms. Find the total delay involved from sending a request and receiving the complete page for the following HTTP connections: **[1+1+1]**

    a. Non persistent HTTP connection

    b. Persistent HTTP connection without pipelining
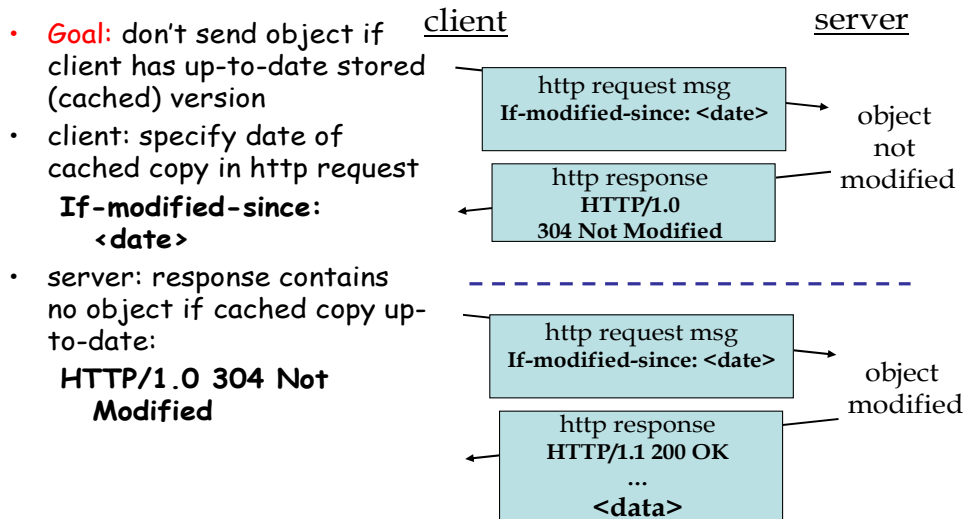
    c. Persistent HTTP connection with pipelining

Answer:

a. **(2 x 0.3 + 0.0002) x 21 = 12.6042 sec**

b. **(2 x 0.3 + 0.0002) + (1 x 0.3 + 0.0002) x 20 = 6.6042 sec**

c. **(2 x 0.3 + 0.0002) + (0.0002 + 20) = 0.6042 sec**

Q3. Explain the working and advantage of conditional GET request of HTTP. **[2+1]**
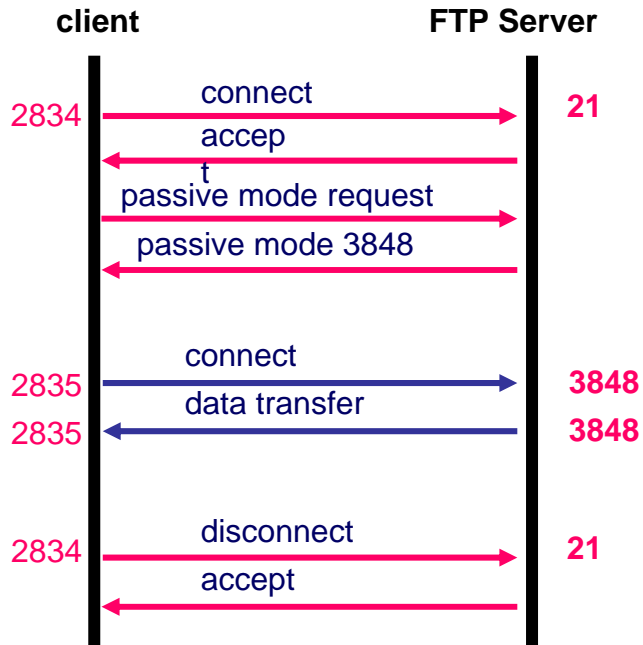
Answer:

User-server interaction: conditional GET

- **Goal:** don't send object if client has up-to-date stored (cached) version
- client: specify date of cached copy in http request
  - **If-modified-since:** **<date>**
- server: response contains no object if cached copy up-to-date:
  - **HTTP/1.0 304 Not Modified**

client   server

http request msg
If-modified-since: <date> → object not modified

http response
**HTTP/1.0
304 Not Modified**

http request msg
If-modified-since: <date> → object modified

http response
**HTTP/1.1 200 OK
...
<data>**

Advantages:

   a.   **decreases response time**

   b.   **decrease in network traffic**

   c.   **up to date information**

Q4. Suppose a client system (192.168.14.10) protected by a firewall wants to download a file from a FTP server (112.23.14.5). For this scenario, draw a flow indicating connection establishment and data transfer of FTP. **[3]**

Answer:

```
        client              FTP Server

              connect
2834  ─────────────────────▶   21
              accep
        ◀─────────────────
              t
        passive mode request
        ─────────────────────▶
        passive mode 3848
        ◀─────────────────────


              connect
2835  ─────────────────────▶  3848
              data transfer
2835  ◀─────────────────────  3848


              disconnect
2834  ─────────────────────▶   21
              accept
        ◀─────────────────────
```

Q5. Each layer in the OSI Model provides a service, service interface and protocol (peer interface). In this regard explain the services, interface and protocol of transport layer. **[3]**

Answer:

Service:

- Provide end-to-end communication between processes

- Demultiplexing of communication between hosts

- Possible other services:

  Reliability in the presence of errors

  Timing properties

  Rate adaption (flow-control, congestion control)

Interface: send message to specific process at given destination; local process receives messages sent to it

Protocol: implement syntax and semantics for reliability, flow control, packetization of large messages, framing Examples: TCP and UDP

Q6. For each of the following network conditions and traffics, specify whether circuit or packet switching is better and give reasons. **[2+2]**

    a.   Frequent link failures

    b.   Video traffic

Answer:

    a.   Packet switching

    b.   Circuit switching

Q7. You have a network ID of 206.17.250.0 and need to divide it into nine subnets. You are required to provide the largest possible number of hosts per subnet. For this network provide the following: **[2+2+1+1]**

    a. Subnet mask of the network

    b. All subnet IDs

    c. Broadcast Address of Third subnet

    d. First valid IP address of fifth subnet

Answer:

    a.   255.255.255.240

    b.   206.17.250.0

            206.17.250.16

            206.17.250.32

            206.17.250.48

            206.17.250.64

            206.17.250.80

            ……

            206.17.250.240

    c.   206.17.250.31

    d.   206.17.250.65

Q8. Suppose two hosts, A and B, are separated by 10000 kilometers and are connected by a direct link with bandwidth 1 Mbps. Suppose the propagation speed over the link is 2.5×10^8 meters/sec. Consider sending a 1 MB file continuously as one big message from A to B. What is the transmission delay? What is the propagation delay? **[1+1]**

Answer:

Transmission delay: 1 MB / 1 Mbps = 8 sec

Propagation delay: 10000km / 2.5 x 10^8 m/s = 0.04 sec