

Class Test-1, Spring 2020-21

Computer Networks (CS31006)

Sample Solution

1. Assume that you want to run two different instances of HTTP servers, which will host two different sets of contents. What can be the problem if you run them on the same port address? Assuming that the two servers are hosted on ports 80 and 8080, respectively, and the domain name of your machine is `www.mypages.ac.in`; what will be the two complete URLs to access the two servers, assuming that you want to access the `index.html` web-page which is hosted in both the servers?

[2 + 2 = 4]

Answer:

IP address is used to identify a host in the network, but, within a host, the port number is required to identify the service (process) we want to connect to. If two HTTP servers are run on the same port, then it would not be possible to specify which server we want to connect to.

The two urls will be

`http://www.mypages.ac.in` (same as `http://www.mypages.ac.in:80`)

And

`http://www.mypages.ac.in:8080`

(appending `/index.html` at the end is optional)

2. Consider the following HTML code snippet for the page `mypage.html`:

```
<!DOCTYPE html>
<html>
<head>
This is a sample page for the CS31006 course
</head>
<body>


</body>
</html>
```

How many HTTP GET requests are required to render this page properly on a web browser?

Write down those GET requests, assuming that the domain name is `www.mynetworkcourse.org` and you are using HTTP version 1.1. A sample GET request looks as follows:

GET `http://www.w3.org/pub/WWW/TheProject.html` HTTP/1.1

[1 + 2 = 3]

Answer:

3 GET requests:

GET www.mynetworkcourse.org/mypage.html HTTP/1.1

GET www.mynetworkcourse.org/network.gif HTTP/1.1

GET www.mynetworkcourse.org/images/cs31006.gif HTTP/1.1

3. Why can't we use SMTP to retrieve emails from a mail transfer agent (MTA)? I design a modification of SMTP as follows: the MTA will poll for the user agents (UAs); whenever it will find out that a UA with a new email in its mailbox at the MTA is online, it will use SMTP to push the email to the client mailbox at the UA. Do you see any problem in this modification of the protocol?

[1 + 2 = 3]

Answer:

The UA of the receiver **pulls** the emails from the MTA using POP or IMAP protocol.

SMTP cannot be used to retrieve these emails since the recipient's MTA server cannot connect to the UA because the UA is not a server, and thus does not have a fixed IP/domain and fixed port for the UA client application. Instead, the UA needs to connect to MTA and pull the mails.

UAs are client applications and not servers, which are not always running, and mostly do not have predetermined fixed ip/port. Moreover these can be behind firewalls and NATs which will prevent MTA from connecting them. Thus the MTA cannot periodically poll the UAs.

4. Both HTTP and FTP use a client-server model to transfer the files from the server to the clients on request. Then why do we need FTP as a separate protocol for file transfer – can't we use HTTP for large file transfers?

[2]

Answer:

We can use HTTP for large file transfers, however using FTP has its benefits. In FTP, for transferring large files a separate data channel is used for that while the command channel remains lightweight. Thus, commands from clients experience less queuing delay.

5. Why does FTP use two separate channels: one each for command and data? Explain in what situation the “passive” mode of operation of FTP is useful.

[2 + 2 = 4]

Answer:

FTP is used for large file transfer; if command channel is used for data transfer as well, the commands for other clients may experience a higher queuing delay (or busy waiting if not multiplexed), while one client is being served. Thus the command channel and data channel are separated to keep the command channel lightweight.

In active mode, the client chooses a port and listens to it, while the server connects to the client's port. But this will not work if a firewall or NAT is present which does not allow incoming connections to reach the client. In this situation passive mode of operation is required.

6. How many transactions are usually observed between a client computer and a local name server, for any DNS name lookup, and why? In the context of your answer, do you see any performance bottleneck in a situation where a single local name server is handling many (say, thousands of) client computers?

[2 + 1 = 3]

Answer:

In both iterative and recursive resolution, there are only two transactions between a client computer and a local name server. The client computer sends a DNS query, and the local name server responds with a DNS response.

[In recursive resolution, the local DNS server resolves the DNS query by querying other DNS servers, and responds with the final response. In iterative resolution, the local dns server responds with authority servers (NS record).]

Yes, there is a possibility of a performance bottleneck if a single local name server is handling thousands of requests, and majority of these requests involve recursive DNS queries.

7. Explain the significance of each field in the following DNS entry in a DNS Resource Record: cse.iitkgp.ac.in 86400 IN A 203.110.245.250

[3]

Answer:

Domain Name	Time to live	Class	Type	Value
cse.iitkgp.ac.in	86400	IN	A	203.110.245.250

	For how long a query response can be cached (86400 sec = 24 hours)	Internet resource	The value will be IPv4 address of 32 bits	IPv4 address
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8. State whether each of the following statements is True or False, with a brief (1-2 sentence(s)) explanation in support of your answer:

- (a) All the devices in the network need to support all five layers of the protocol stack.
- (b) The Protocol Data Unit (PDU) length decreases as you go downwards along the protocol stack.
- (c) To ensure reliability, DNS uses an enhanced variant of UDP that provides reliable data delivery.
- (d) In the context of HTTP, a persistent connection with pipelining is more efficient than an ordinary persistent connection.

[2 + 2 + 2 + 2 = 8]

Answer:

- (a) False
Intermediate devices between two hosts might not have Application layer or Transport layer, or even Network Layer. Eg. L2 switches support only upto data link layer.
- (b) False
As we go downwards, each layer adds its own header and the PDU length increases. E.g. Transport layer adds TCP header while Network layer adds IP header.
- (c) False
DNS reliability is ensured at the application layer.
- (d) True
With pipelining, the client does not wait for the response before sending the next request which enhances efficiency.