THE UNIVERSITY OF MELBOURNE

Week 11
Application Layer

COMP90007 Internet Technology

Prepared by: Chenyang Lu (Luke)

Your Tutor

Chenyang Lu (Luke)

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- Workshop Slides: https://github.com/LuChenyang3842/Internet-technology-teaching-material

Day	Time	Location
Tue	18:15	Bouverie st –B114
Wed	10:00	Elec Engineering -122
Wed	17:15	Bouverie-sr 132

Tutor Feedback

https://apps.eng.unimelb.edu.au/casmas/index.php?r=qoct/feedback&subjCode=COMP90007

For students who attend Wednesday 10:00 am Tutorial, please choose Wed 5:15pm in dropdown list to leave feedback.

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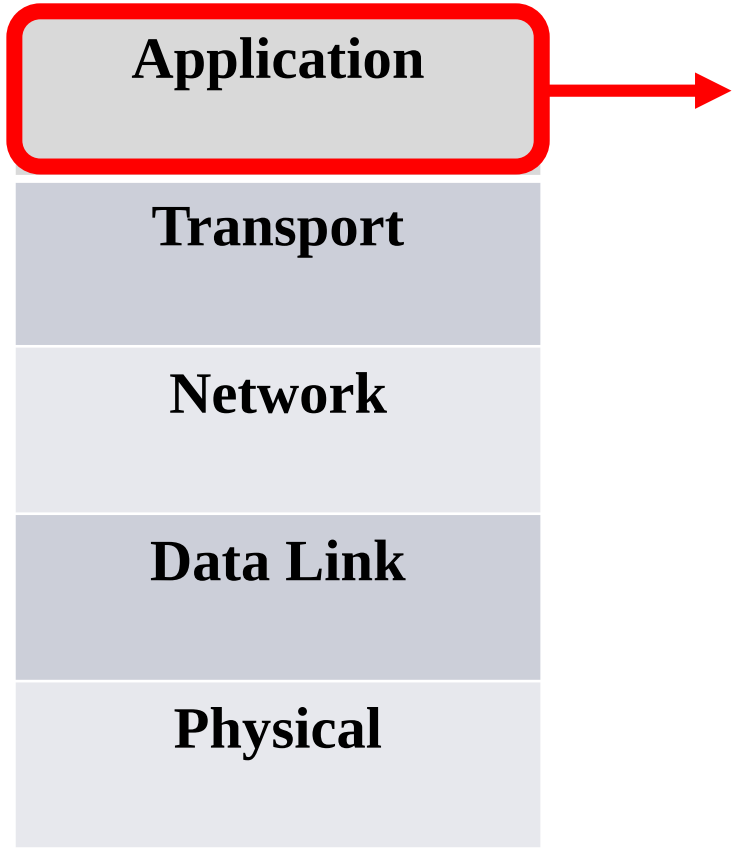
Application Layer

Application Layer



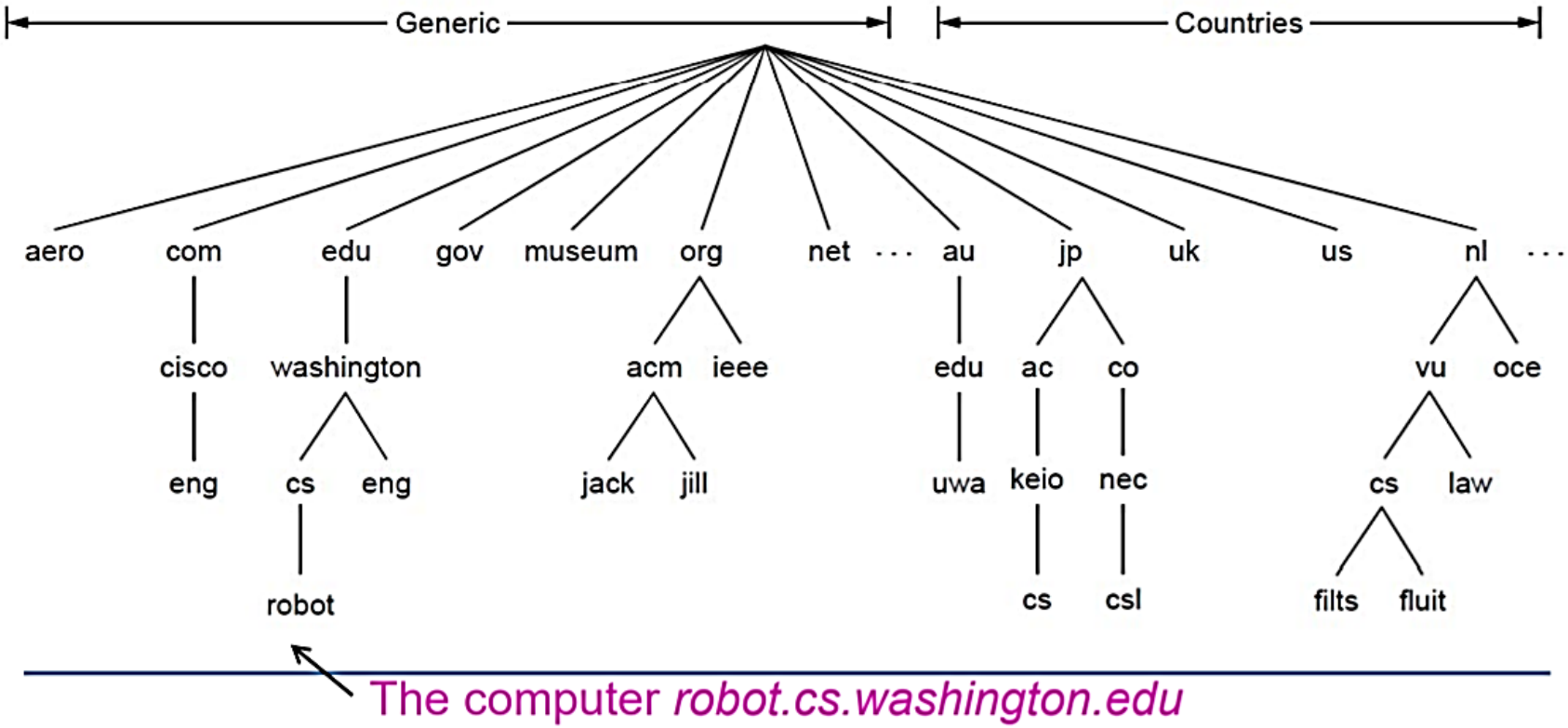
1. DNS (Domain Name server)
   - Query process
2. WWW components
3. HTTP (Hyper transfer protocol)
   - Non-persistent/ Persistent
   - HTTP Request Message format
   - HTTP Request method
   - HTTP Error code
4. Cookie/Session
5. Web Cache
6. Multi-media data transmission
7. Email

DNS (Domain Name Server)

Question: What is the main function of Domain Name sever?

Main function: Map between IP address and name

Implemented in a hierarchy of many name servers (distributed database)



Question 1 DNS

What are the **disadvantages** of having only **one central DNS server** that serves all machines connected to the internet?

Answer:
Some of the disadvantages of a single DNS are:

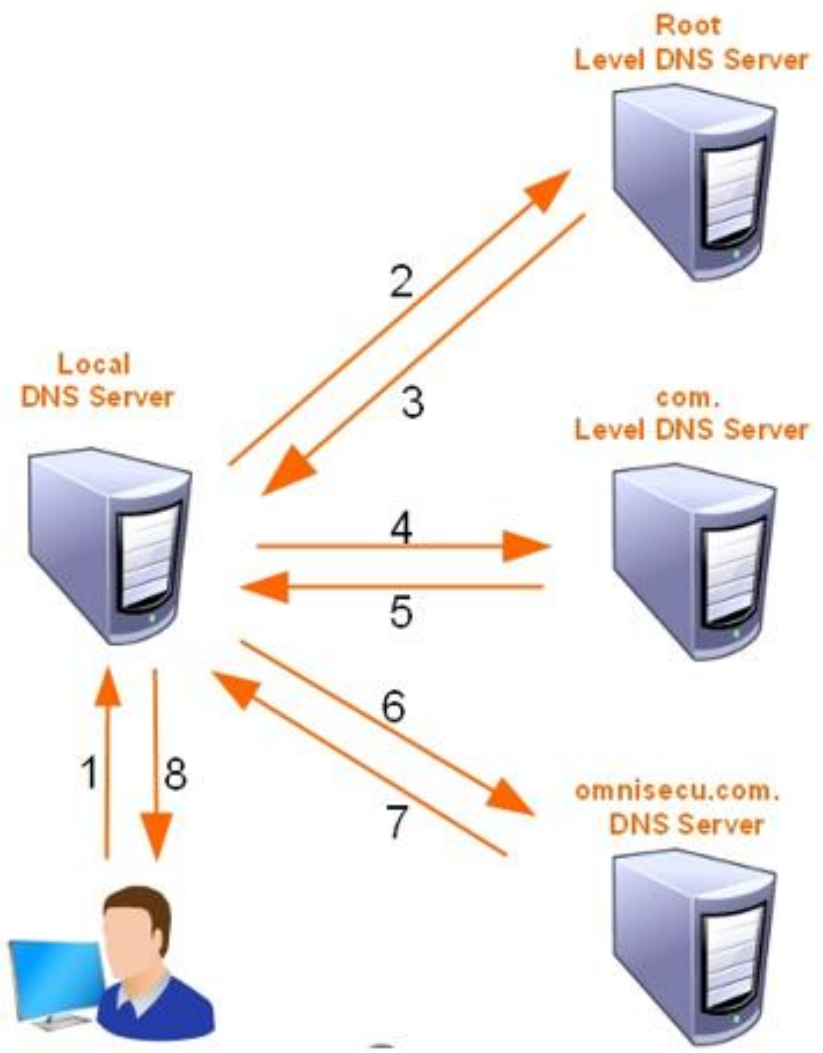
- *Single point of failure*
- *Traffic congestion at server*
- *Distant centralised server for remote queries*
- *Maintenance issues, not only for keeping large amount of data upto date but also the prospect of simple service maintenance could cause big disruptions.*
- *May not be able to service all queries fast enough, also scaling on the computation front may be an issue.*

Question 2 DNS

- What does **iterative mode** of execution when querying a DNS mean? Where is it used?

- What is the **recursive mode**?

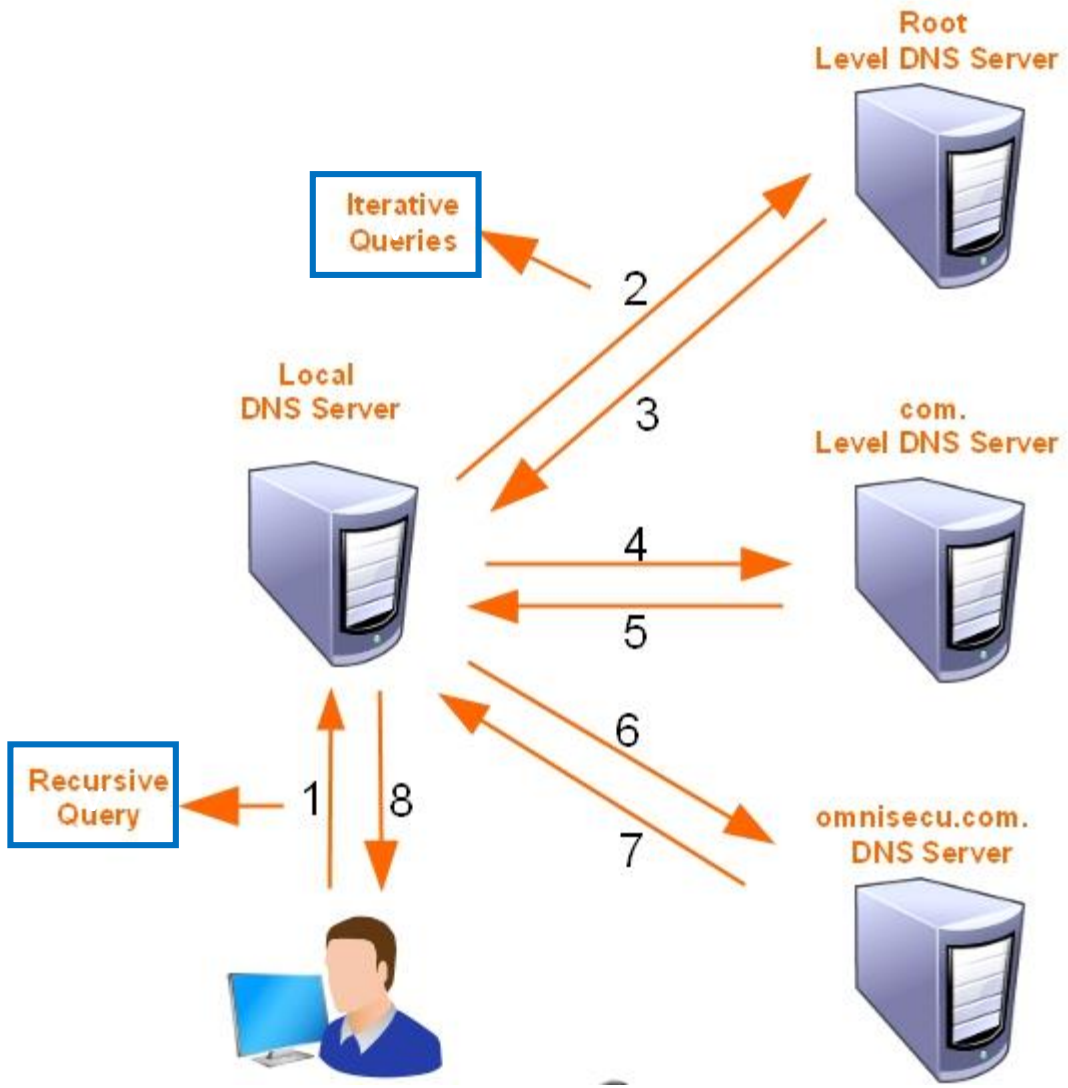
Please explain with an example.



Answer:

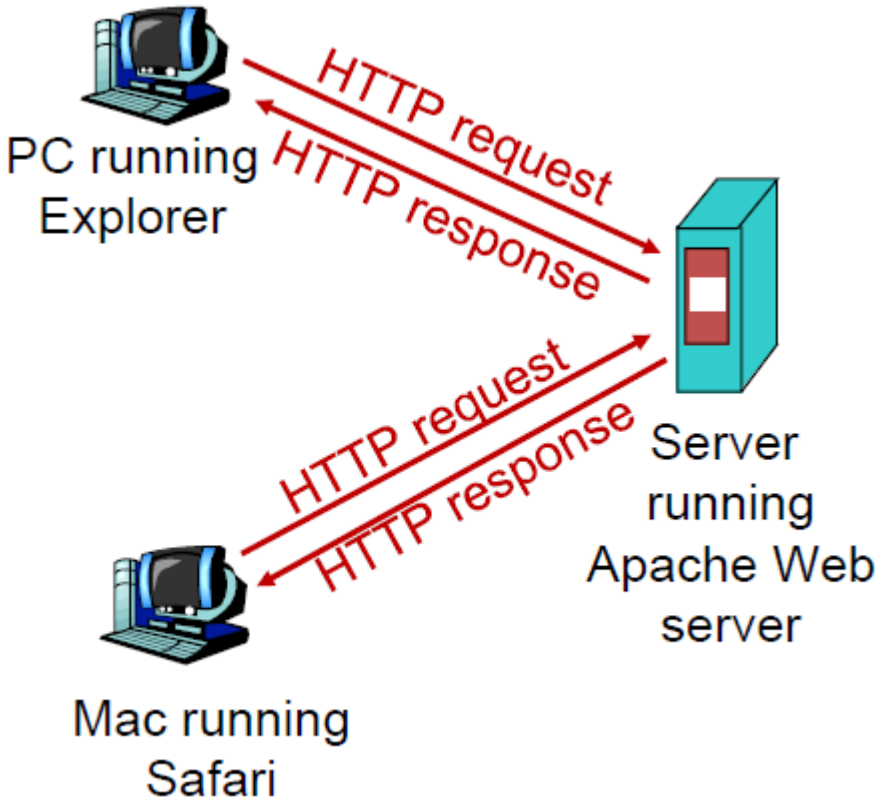
Iterative queries are requests that are propagated from one name server to another, gathering partial results in the form of which name server might know the location of the authoritative record till we reach that location.

At which point, we return the final answer (Resource record mapping) to our end user who requested the domain initially, this is referred to as **recursive**, where we return the final answer only to the end user and not partial answers. **Recursive queries** are when a local PC/device delegates to local server the DNS query to recursively follow-up the query with other servers in the DNS system.



WWW components

- Client and sever software
  - Client software: Browser
  - Server software: Apache
- Web Markup Language (HTML)
- Web Scripting language JavaScript (JS)
- HTTP



HTTP (Hyper Text Transfer Protocol)

- Request Message
- Response Message
- HTTP Methods
- HTTP Status Code
- Non-persistent/ Persistent HTTP

HTTP (Hyper Text Transfer Protocol)

- ❑ Request Message
- ❑ Response Message
- ❑ HTTP Methods
  - GET
  - PUT
  - POST
  - DELETE
  - HEAD
  - OPTION
  - ……
- ❑ HTTP Status Code
  - 1xx
  - 2xx
  - 3xx
  - 4xx
  - 5xx
- ❑ Non-persistent/ Persistent HTTP

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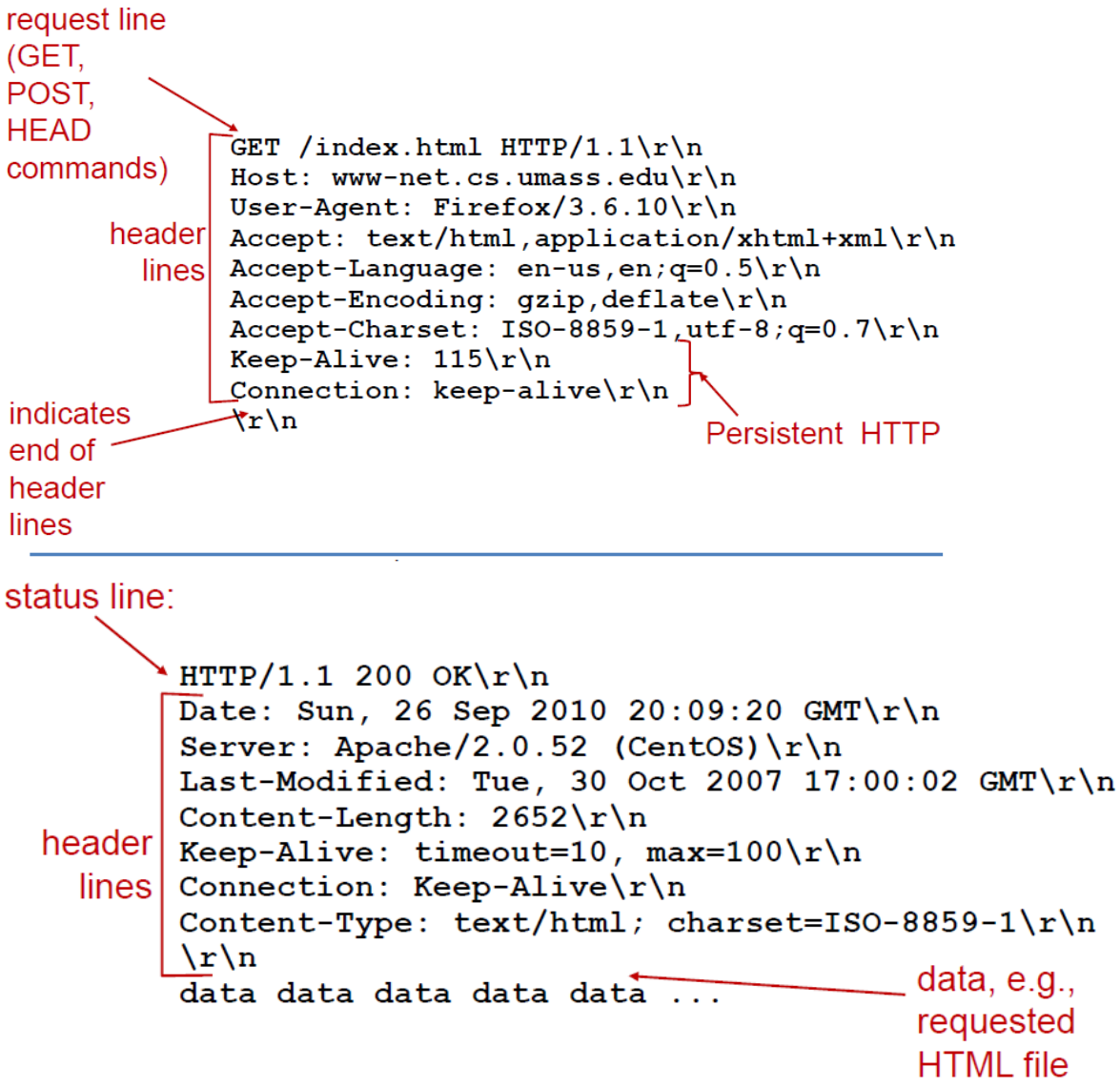

Question 3

What is non-persistent HTTP connections?
Explain with an example request.

Answer:
Sessions where only one object/response is returned and a new connection is established for every response to be provided.

Question4

What are the benefits of a persistent HTTP connection?

Answer:
A connection established remains open for some time after the transmission of an object, allowing multiple objects to be sent using the same connection as opposed to tearing down an existing connection and recreating it for every response to be sent..

Cookie

What is cookie?

- Cookies to place small amount *(<4Kb)* of info on users Computer
- Cookies are transferred between server and client
- Cookie information stored at both client and server

What can cookie be used for?

- *User Tracking*
- Authorization
- Recommendations
- User session state
- Shopping carts

Cookie

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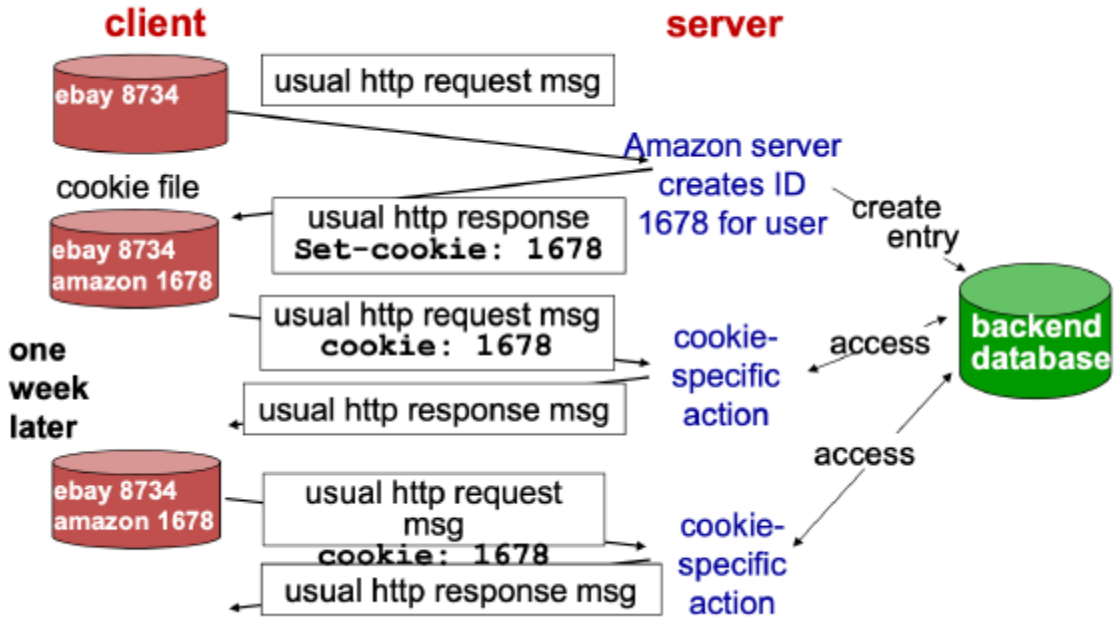
- Cookies are transferred between server and client Cookie information stored at both client and server

Session

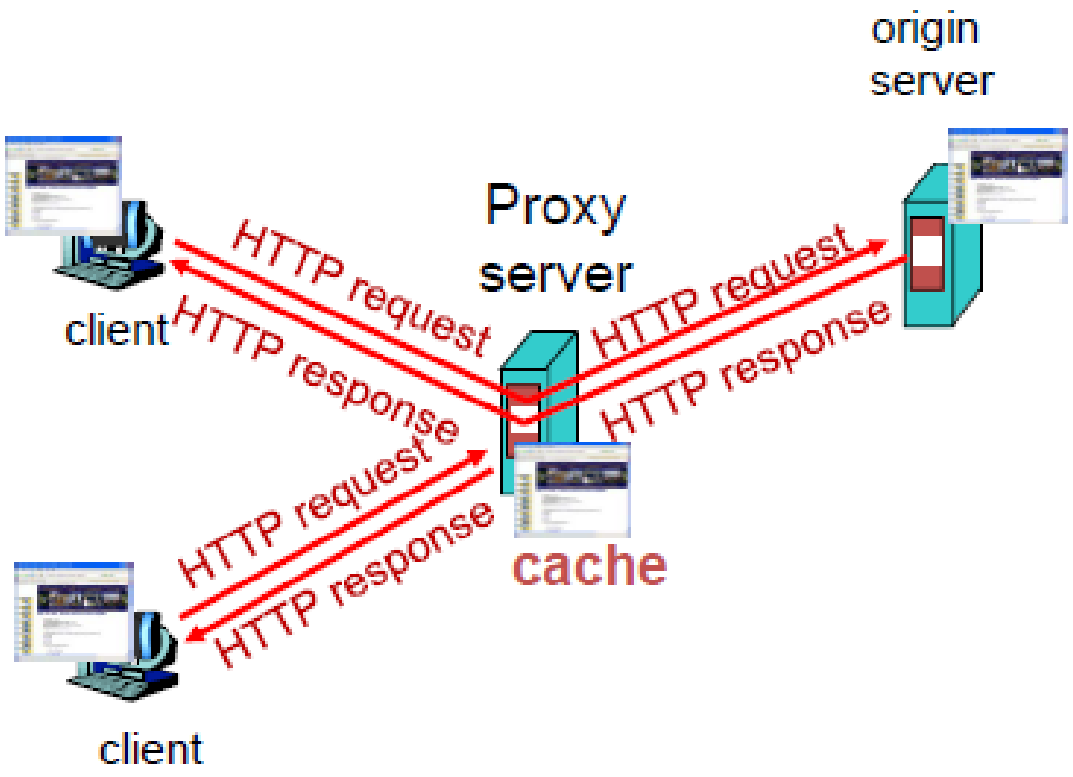
- Session information can be large
- When user closes the website, the session ends
- Session information maintains in Server side

Question 5 HTTP

Give an example execution of an HTTP request with a **cookie** being used?



Web Caching (Proxy Cache)



Question 6 Web Caching

Web Caching can cause problems such as stale data being served to clients. What are the benefits of web caching?

Ans.

- Reduced response time to distant servers.
- Reduced traffic to congested servers.

Question 7 Multi-media data compression

What is perceptual coding in terms of compressing media to deliver data over the internet? Give two examples?

Ans.

Perceptual coding is that some media content such as audio can be coded into digital form without loss of any perceived quality.

Example

some sounds can mask other sounds for human hearing and at that point those sounds that are identified can be used to reduce the data size to be transmitted. For example –

Frequency masking: Some sounds at certain frequencies can mask/hide others so there is no point encoding the ones humans cannot hear.

Temporal masking: Human ears can miss soft sounds immediately after loud sounds, takes time for the ear to adjust, so no need to put these in the compressed data as well.

Email

Three Components involved in email system:

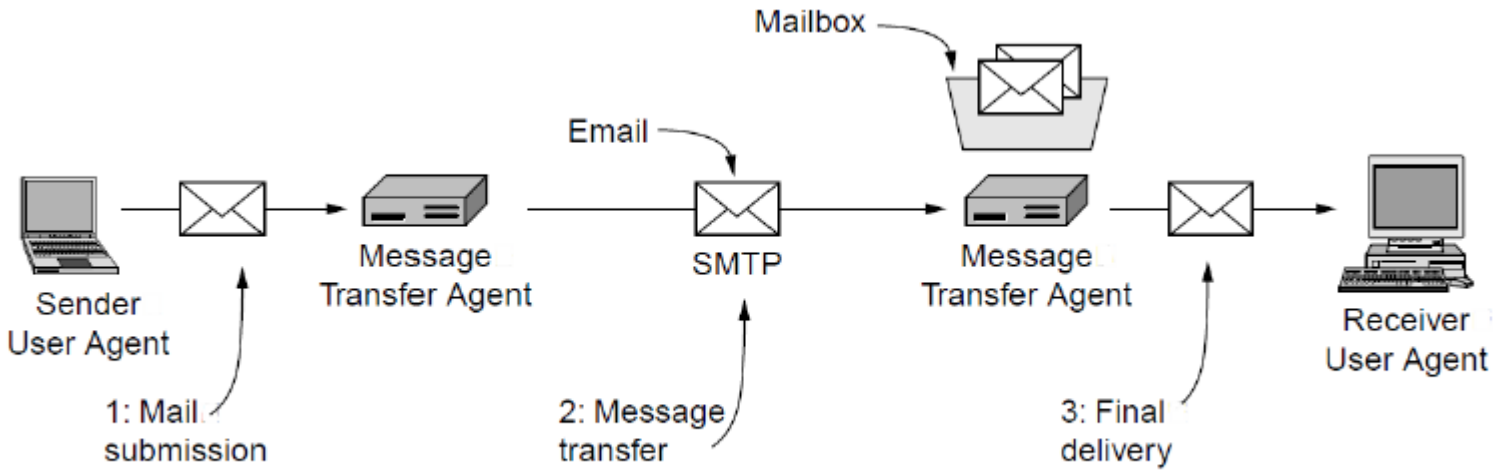
- **User Agent :**
  - Allow user to read and send email
- **Mail Transfer Agent:**
  - Transport messages from source – destination
- **Message Transfer protocol:**
  - **Transfer protocol**
    - SMTP
  - **Delivery Protocol**
    - POP3
    - IMAP

Question 8 Email (SMTP)

What is SMTP protocol and where is it used?

Ans.
SMTP is an application layer protocol for mail transfer.
It is used

1. Transfer mail from the user agent to the MTA and
2. Transfer email between MTAs.



Question 9 Other Layers

What are the two missing layers of the OSI protocol that we did not see in the Internet so far? Give one service for each.

OSI Model

Application Layer
Presentation Layer
Session
Transport
Network
Data Link
Physical

Question 9 Other Layers

What are the two missing layers of the OSI protocol that we did not see in the Internet so far? Give one service for each.

Ans.
Presentation and Session Layer.
Services can be: formatting, encryption, compression for presentation layer
authentication, authorization, session management for the Session layer.