

# Assignment #2

*Introduction to Networks and Communications  
CS 455/555*

*Department of Computer Science  
Old Dominion University*

- 1- Suppose you wanted to do a transaction from a remote client to a server as fast as possible. Would you use UDP or TCP? Why?
- 2- Consider an HTTP client that wants to retrieve a Web document at a given URL. The IP address of the HTTP server is initially unknown. What transport and application-layer protocols besides HTTP are needed in this scenario?
- 3- In Section 2.7 from the textbook, the UDP server described needed only one socket, whereas the TCP server needed two sockets. Why? If the TCP server were to support  $n$  simultaneous connections, each from a different client host, how many sockets would the TCP server need?
- 4- Consider the figure below, where a client is sending an HTTP GET message to a web server, `gaia.cs.umass.edu`.



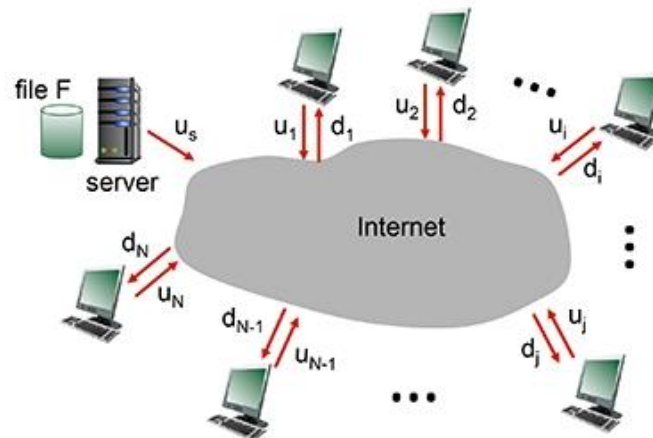
Suppose the client-to-server HTTP GET message is the following:

```
GET /kurose_ross/interactive/quotation9.htm HTTP/1.1
Host: gaia.cs.umass.edu
Accept: video/mpeg
Accept-Language: en-us, fr
If-Modified-Since: Wed, 21 Feb 2018 11:50:08 -0800
User Agent: Mozilla/5.0 (Windows NT 6.1; WOW64; rv:9.0.1)
Gecko/20100101 Firefox/9.0.1
```

Answer the following questions:

- a) What version of HTTP is the client running?
- b) What formats of text, images, audio, and video does the client browser prefer to receive?
- c) What languages is the browser indicating that it is willing to accept?
- d) What is the type of client browser and the client's operating system?

- 5- In this problem, you'll compare the time needed to distribute a file that is initially located at a server to clients via either client-server download or peer-to-peer download.

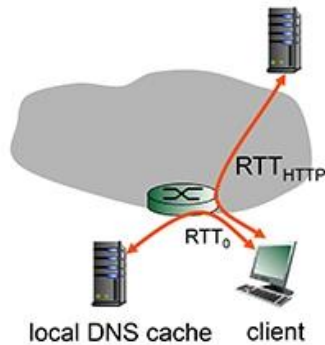


The problem is to distribute a file of size  $F = 2$  Gbits to each of these 8 peers. Suppose the server has an upload rate of  $u = 83$  Mbps, and that the 8 peers have upload rates and download rates as follow:

	Upload rate	Download rate
Peer 1	$u_1 = 28$ Mbps	$d_1 = 28$ Mbps,
Peer 2	$u_2 = 23$ Mbps	$d_2 = 16$ Mbps,
Peer 3	$u_3 = 20$ Mbps	$d_3 = 25$ Mbps,
Peer 4	$u_4 = 30$ Mbps	$d_4 = 32$ Mbps,
Peer 5	$u_5 = 26$ Mbps	$d_5 = 14$ Mbps,
Peer 6	$u_6 = 18$ Mbps	$d_6 = 21$ Mbps,
Peer 7	$u_7 = 29$ Mbps	$d_7 = 36$ Mbps,
Peer 8	$u_8 = 28$ Mbps	$d_8 = 31$ Mbps,

Answer the following questions:

- What is the minimum time needed to distribute this file from the central server to the 8 peers using the client-server model?
  - What is the minimum time needed to distribute this file using peer-to-peer download?
- 6- Suppose within your Web browser you click on a link to obtain a Web page. The IP address for the associated URL is not cached in your local host, so a DNS lookup is necessary to obtain the IP address. Suppose that only one DNS server, the local DNS cache, is visited with an RTT delay of  $RTT_0 = 1$  msecs. Initially, let's suppose that the Web page associated with the link contains exactly one object, consisting of a small amount of HTML text. Suppose the RTT between the local host and the Web server containing the object is  $RTT_{\text{HTTP}} = 97$  msecs.



Assuming zero transmission time for the HTML object, how much time elapses from when the client clicks on the link until the client receives the object?

- 7- **[Graduate Students Only]** Develop a Web server in (Python or C or Java ) that is capable of processing only one request and fulfills all the functionalities as described in the programming assignment #1 in page 181 from the textbook.

### Submission instructions

- Must submit a typed report. Handwritten report is **not** accepted
- Must submit online (**BlackBoard**)
  - Only pdf file format is accepted. It is your responsibility to create the pdf file, and it is your responsibility to watch for errors and mistakes when you create your pdf files.
- Submission after the due date is not accepted.
  - In case of emergency (*i.e., due to unexpected disease*), please contact me as soon as possible.
  - Permission might be granted only for acceptable excuses. A proof must be provided (*i.e., a note from a physician or an emergency report*)
- The assignment is due at 11:00 *p.m.*

### Submission instructions for Question 10:

- Must submit all source and header files. *Please do not submit object and/or executable files.*
- Zip all the **source** and **header** files into one file and name it as “**Assg2-Q10**”.
- Submit the zipped file in the respective Blackboard link.
- Your program must compile on the computers in one of the labs at the Department of Computer Science at ODU.

**Grading Rubric [Undergraduate Students]:**

<i><b>Question #</b></i>	<i><b>Total marks</b></i>
1	15
2	15
3	15
4	20
5	20
6	15
<b>Total</b>	<b>100</b>

**Grading Rubric [Graduate Students]:**

<i><b>Question #</b></i>	<i><b>Total marks</b></i>
1	10
2	10
3	10
4	20
5	20
6	10
7	20
<b>Total</b>	<b>100</b>