

CS 372 Introduction to Computer Networks
Self-Check Exercises: Lecture 14

Solutions

- 1) The transport layer resides on/in the network (**edge** / core - circle one or both) and manages communications from process to process.
- 2) The network layer resides on/in the network (**edge** / **core** - circle one or both) and manages communications from host to host.
- 3) What is the purpose of transport-layer multiplexing?
Dividing information from multiple sources and of multiple sizes into discrete blocks of data with headers identifying them, so they can be de-multiplexed at the receiving end.
- 4) What is the process of transport-layer de-multiplexing?
Use information contained in the header of a transport-layer segment to determine the proper socket to deliver the data to, and feed the data (possibly reassembling it in the process) back up to the application layer.
- 5) For de-multiplexing, how is a TCP socket identified?
 - Source IP Address, Source Port Number
 - Destination IP Address, Destination Port Number
- 6) For de-multiplexing, how is a UDP socket identified?
 - Destination IP Address, Destination Port Number
- 7) Server X is running *enigma* services on port #2100. Client A is running an application that uses port #437 to request an *enigma* TCP connection to server X. Client B is running an application that uses port #1296 to request an *enigma* TCP connection to server X.

IP addresses:

Server X: 201.64.107.12
Client A: 128.193.51.213
Client B: 128.193.35.127

- a. The connection created for Client A is identified by the sockets at the endpoints as follows:

| On Client A | IP address | Port # |
|-------------|-----------------------|-------------|
| Destination | 201.64.107.12 | 2100 |
| Source | 128.193.51.213 | 437 |

| Server X | IP address | Port # |
|-------------|-----------------------|-------------|
| Destination | 128.193.51.213 | 437 |
| Source | 201.64.107.12 | 2100 |

- b. The connection created for Client B is identified by the sockets at the endpoints as follows:

| On Client B | IP address | Port # |
|-------------|-----------------------|-------------|
| Destination | 201.64.107.12 | 2100 |
| Source | 128.193.35.127 | 1296 |

| Server X | IP address | Port # |
|-------------|-----------------------|-------------|
| Destination | 128.193.35.127 | 1296 |
| Source | 201.64.107.12 | 2100 |

- c. Client A starts a second application (running at the same time as the first application) that uses port #213 to request an *enigma* TCP connection to server X. The connection created for Client A is identified by the sockets at the endpoints as follows:

| On Client A | IP address | Port # |
|-------------|-----------------------|-------------|
| Destination | 201.64.107.12 | 2100 |
| Source | 128.193.51.213 | 213 |

| Server X | IP address | Port # |
|-------------|-----------------------|-------------|
| Destination | 128.193.51.213 | 213 |
| Source | 201.64.107.12 | 2100 |

- d. Is it OK for Client B to start a second application (running at the same time as the first application) that uses port #213 to request an *enigma* TCP connection to server X? Why or why not?

Yes. The combination of Client B's IP address and the port number will still be unique, even though Client A is using the same port number on its host machine.

- e. Is it OK for Client A to start a third application (running at the same time as the first and second applications) that uses port #213 to request an *enigma* TCP connection to server X? Why or why not?

No. There would be no way to distinguish this connection from Client A's second connection.