

CSC358H5: Principles of Computer Networking — Winter 2025

Worksheet 1: Layering, Protocols, and Encapsulation

Q0 Knowledge Check (from Week 01 Lecture) For each statement below, specify if it is true or false:

- 0.a** The end-to-end principle ensures that packets are always securely/reliably transferred from one host to another. ☐ TRUE ☐ FALSE
- 0.b** In a layered architecture, layers provide modularity and allow for abstraction. ☐ TRUE ☐ FALSE
- 0.c** There is only one protocol available at L4. ☐ TRUE ☐ FALSE
- 0.d** The TCP header is the outermost header of the packets on the wire (*i.e.*, the chunk of bits produced by L2) that use TCP. ☐ TRUE ☐ FALSE

Q1 (Applications with Multiple Streams)

- 1.a** Name three applications that require tying multiple streams together. For each application, explain what each stream corresponds to.
- 1.b** In the context of OSI model, which layer manages tying multiple streams together?
- 1.c** In the context of 4-layer Internet model, which layer manages tying multiple streams together?

Q2 (Transport Layer and Multiplexing)

Which of the following statements are true?

- ☐ Transport layer multiplexing assigns different IP addresses to multiple data streams.
- ☐ TCP multiplexing manages multiple logical sessions over a single application-level connection, such as synchronizing audio and video streams in a video call.
- ☐ Transport layer multiplexing ensures that data from multiple applications on the same device is sent and received correctly using port numbers.
- ☐ Application layer is responsible for splitting data into chunks to be sent over multiple streams.

Q3 (A Day In Life of A Packet)

Consider the network in figure 1, where Host A sends a TCP connection request to Host B. The connection request packet travels along the path: $A \rightarrow R_1 \rightarrow R_2 \rightarrow B$. Considering a 4-layer Internet model, describe the actions performed by each layer as the packet moves through the layers of Host A, router R_1 , router R_2 , and Host B. Whenever applicable, explain the packet created by each layer.

[NOTE: At this stage of the course, it is challenging to provide a precise description of the changes the packet undergoes. Our current explanation will remain high-level and approximate. There are many details you are not yet familiar with. For now, focus on understanding key concepts like layering, encapsulation, and decapsulation.]

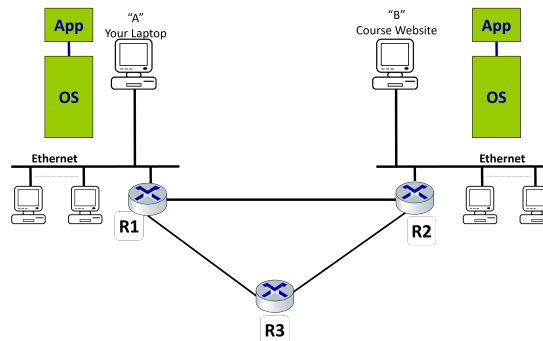


Figure 1: Host A sends a TCP SYN packet to Host B. The packet travels along the path: $A \rightarrow R_1 \rightarrow R_2 \rightarrow B$.