**Homework #2** Due: Dec. 19

1. Why is it necessary to have layering in a network? What is data encapsulation in computer networking?

Layering allows the network to be split among different layers. Each layer has unique characteristics. Layers are designed to divide relevant functionality into each layer. Layering the network allows people to understand the network more thoroughly.

In computer networking, encapsulation is a method of designing modular communication protocols in which logically separate functions in the network are abstracted from their underlying structures by inclusion or information hiding within higher level objects.

The result of encapsulation is that each lower layer provides a service to the layer or layers above it, while at the same time each layer communicates with its corresponding layer on the receiving node. These are known as adjacent-layer interaction and same-layer interaction, respectively.

1. What are the five layers in the Internet protocol stack? What are the principal responsibilities of each of these layers?
2. **Application**

HTTP, SMTP, and FTP protocols. Used to send data over multiple end systems

1. **Transport**

Transfers the content between two endpoints. TCP and UDP protocols are used in the transport layer

1. **Network**

Move the packets between any two hosts in the network. IP protocol is used in network layer.

1. **Link**

Move the packets from one node to the next another node. Point-to-point protocol is used in data link layer.

1. **Physical**

Transfer the individual bits from one node to the next node within the frame.

1. Describe *multiplexing* and *demultiplexing* in transport layer.

**Multiplexing**: Transport layer gathers chunks of data it receives from different sockets and encapsulate them with transport headers. Passing these resulting segments to the network layer is called multiplexing.

**Demultiplexing**: The reverse process which is delivering data to the correct socket by the transport layer is called demultiplexing.

1. What is the difference between *segment* and *datagram*?

They are essentially the same, but what differs from them lies in what protocol they come from. It’s called a segment if the unit of data sent is from the transport protocol TCP. It’s called a datagram if the unit of data is sent from the network protocol.

1. What are the types of addresses (identifiers) used in each of the following layers?
2. Application layer

Specific addresses

1. Network layer

Logical addresses

1. Data-link layer

Physical addresses