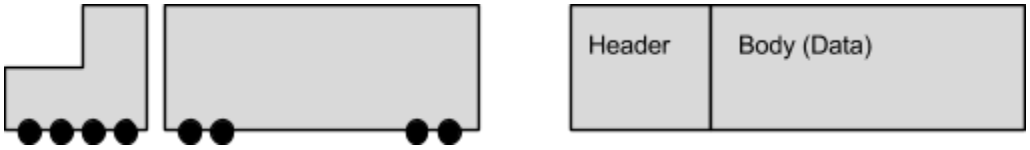
POGIL-CSP: Internet II: Where is the Data?

(15 min) A. Data & Packets	start time:



On roads, cargo is transported in vehicles. On the Internet, data is transported in **packets** (messages), which contain the **data** being transferred, and a **header** that contains useful information such as the source and final destination. Internet packets follow a set of rules collectively called **TCP/IP** (**Transmission Control Protocol** and **Internet Protocol**).

1. A vehicle's **driver** decides which roads to take to reach a destination, often using a map or directions from a friend or GPS navigation tool. Instead, suppose you are in an unknown area with no signs, no map, and no GPS. You know your destination, but not which roads to follow to get there. At each intersection, a police officer tells you which way to go to reach your destination. Explain why the officer does **not** need to give you complete directions.

2. Similarly, Internet **packets** know their intended destination, but **not** how to get there. When connections meet, a special computer (called a **router**) decides which route each packet should take. When a router finds out that a nearby **connection** is **blocked**, what should it do?

3. Both vehicles and packets vary in size. What is the advantage of using larger vehicles (e.g. a bus instead of a car)? What problems could arise if vehicle get too big?

4. Instead of one (very) large vehicle, we could divide the cargo across **several smaller vehicles**. What are some advantages of this approach? Hints: In heavy traffic, which vehicles are most or least maneuverable? What if a vehicle is lost or destroyed?

5. Audio and image files can easily be 1Mb or larger. Given your previous answers, explain why TCP/IP transfers them in smaller packets (e.g. 500 to 15,000 bits).

(20 min) B. Net Neutrality	start time:

Different types of vehicles (e.g. cars, trucks, motorbikes) use the same roads, and we can develop new technologies and vehicles (e.g. hybrid, electric, or fuel cell) without changing the road system (although new vehicles may need places to recharge or refuel). Similarly, In TCP/IP**,** routers and other devices along the way look only at the packet's header, and only the original sender and receiver must agree on how to interpret a packet's data. This is called an **end-to-end architecture.**

1. If routers examine the data inside a packet, what will have to happen to the routers whenever someone develops a new type of data?

2. Will this encourage or discourage new ideas and products? Explain.

3. Describe some benefits of an **end-to-end architecture** for the Internet.

4. Some Internet connections are used so heavily that packets are delayed or lost (although TCP/IP provides ways to detect and resend missing packets).
Why might packets for streaming audio or video **get priority** over email?

5. Why might companies that provide and maintain the Internet backbone **delay or penalize** certain types of network traffic?

6. What sorts of businesses might **pay extra** for their packets to have priority?

7. **Net neutrality** is the policy of treating all data packets the same way, regardless of the data, source, destination, etc. Summarize its pros and cons in complete sentences.

8. What are some situations when **vehicle contents** are examined?

9. Similarly, a **firewall** computer examines **packet data** going to or from a network. For example, a school's firewall might block connections to gambling sites. Describe two or more other scenarios where a firewall might be used (for example, by a government, company, or even a private home).