# Teaching Network Infrastructure to High School Students

**Motivation:**

- High school students will spend their entire lives on the Internet but most existing high school curricula do not cover network architecture or mechanics.
- Students who have learned infrastructure concepts at the secondary level would have an easier transition to college level infrastructure courses and careers in this field.
- All students, regardless of academic concentration, should have basic understanding of the mechanics for network infrastructure.

**Goal:**

- Provide secondary teachers with resources to assist them with instructing students on network infrastructure concepts
- Modules have been created to help assist educators in teaching students how to better understand what is behind the Internet

**Learning Outcomes:**

- Develop firmer understanding of how the Internet functions and is physically made (Module 1)
- Understand the Stop and Wait Protocol, the simplest approach to reliable data transmission on the Internet (Module 2)
- Discover geographic location of internet components used by web browser (Module 3)

**Position**:

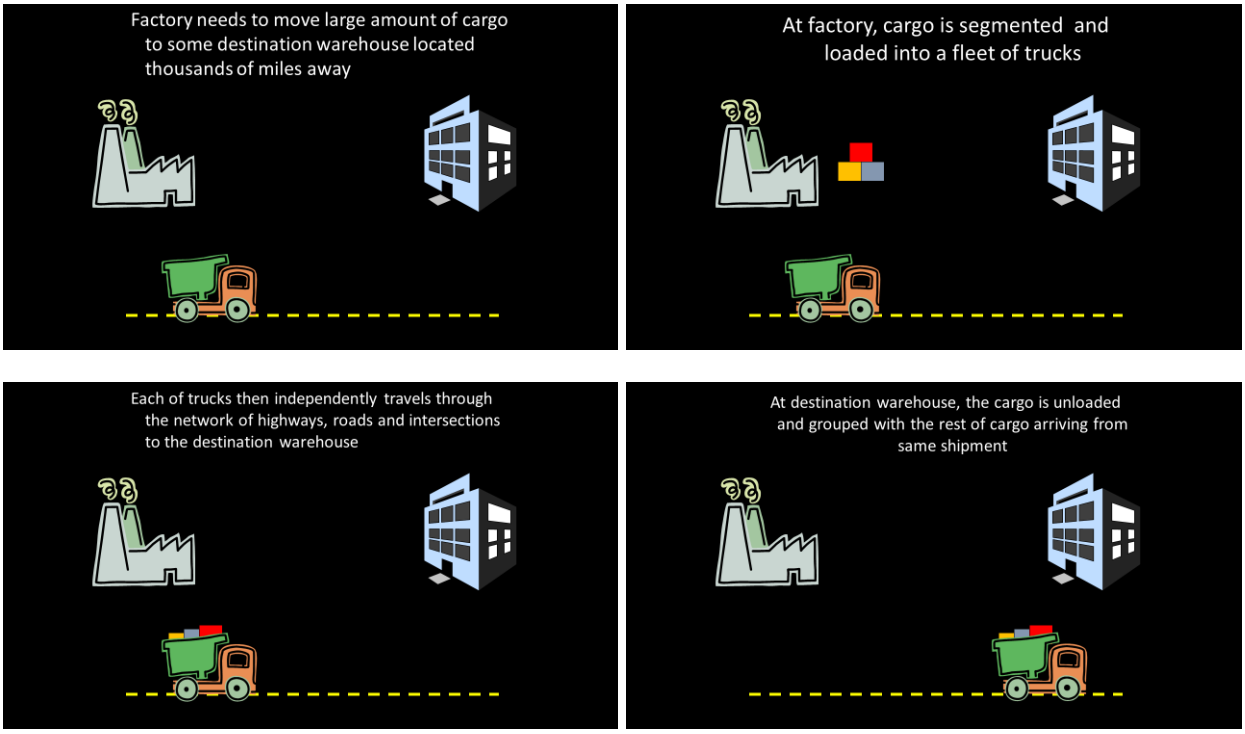
- Fulfill curriculum gap following AP Computer Science Exam
- Can be used in any class with at least basic programming being taught

**Consider the following guiding question for all of the educational modules that follow:**

**Question:** What is the Internet?

**Answer:** A computer network that interconnects millions of computing devices throughout the world.

**Now consider the following analogy about information traveling across the Internet:**




**The analogy explained:**

Packet switched networks which transport packets (or units of data) are in many ways similar to transportation networks of highways, roads, and intersections which transport vehicles.

**The parts of the analogy:**

- Packets = trucks full of cargo
- Communication links = highways and roads
- Packet switches = intersections
- End systems = buildings

Truck takes a path through a transportation network.

Packet takes a path through a computer network.

**Questions that follow:**

1. What does the Internet network actually look like? Is there a way that I can model this to better understand it?

   *Answer: It looks much like a series of wires on which information can travel with some additional subtleties worth investigating.* ***Module 1*** *will expound this by allowing students to create a physical model of the Internet using regular household/classroom objects.*

2. How does the sender know that the shipment arrived at its destination? Moreover, how does the sender know if it can send another shipment? Particularly, when sending information on the Internet highway, how does a sender of information (packets) know when its information has been received and when it can send more?

   *Answer: Using some communication protocol. The simplest protocol to use is called STOP-AND-WAIT.* ***Module 2*** *will involve learning how this protocol works, and then creating a visual simulation of the process.*

3. Which roads does the truck move along on its delivery journey from factory to building? Does a packet actually choose a specific path when travelling across communication links on the Internet from end system to end system?

   *Answer: A specific path is chosen by a packet as it moves across communication links on the Internet. Packets physically move across the globe through a series of cables and wires that allow the transmission of data.* ***Module 3*** *will allow students to create a visual depiction of this by creating a computer program that will plot the actual latitude/longitude points on a map that a packet moves along from source to destination.*

**Important final note:**

Each teacher has their own time constraints, learning objectives, and available resources. As a result, the educational modules that help answer the above questions can be completed in any order and in any quantity. That being said, each additional module that you are able to complete with your students will allow your students to gain an even better understanding of how the Internet functions and how it looks behind the exterior with which they have become so familiar throughout their lives thus far.