

## Lesson 2.1: Data Transmission

### Objectives

In this lesson, students will:

- ❖ Gain a high level understanding of the internet
- ❖ Learn how data is transmitted over the internet
- ❖ Practice creative problem solving

### Agenda

1. The Internet	5 mins
2. How Data Travels on the Internet	10 mins
3. Packets	5 mins
4. Student Activity: The Internet Game	20 mins
5. Wrap Up and Reflections	5-10 mins

### Preparation

- Become familiar with the internet game so that you can explain it quickly and clearly.
- Print out the message pages for the student activity.
- Make signs, each with a URL name on it listed in the message pages.
- Have scissors available for students and optionally 12 envelopes to hold a message piece.

### Resources & Links

- Video explaining internet at a high level:  
<https://tinyurl.com/y6em59v2>

## 1. The Internet



**Engage** students in a brief class discussion and instruction:

You have probably heard a lot about the internet and you may have used it many times. Have you thought about what the internet is?

First, let's look at what a Network is: A network is a set of connected computing devices that can communicate with each other.

The Internet is a network that spans the planet.

The following fun video can help us understand more about the internet:



<https://tinyurl.com/y6em59v2>



### Discussion Points:

- What is the internet?
- How are the computers connected to each other?
- What are examples of computing devices?

## 2. How Data Travels on the Internet



**Engage** students in a teacher led discussion and instruction:

How do you get to youtube to watch a video?

Possible answers: “enter [www.youtube.com](http://www.youtube.com) in chrome (or ....)”  
“search for youtube “

While that is true and you will be taken to your destination, there actually is no place by the name [www.youtube.com](http://www.youtube.com). Youtube.com is a URL which is an easy way to remember the address of a web page. The actual address and all addresses inside the internet are combinations of numbers.

It's like on a cell phone, you select or enter someone's name, and the phone dials the telephone number. The name was translated to the number from your address book. Something similar happens with web pages on the internet.

When you enter `www.youtube.com`, the request goes out to the internet to a translation table called DNS (Domain Name Service), where the domain names or URL gets translated into an address. This address is called an IP address and typically looks like this: `216.3.128.12`.

An IP (Internet Protocol) address is assigned to every computer or device connected to the internet.

Computers that store information and do work for others on the internet are called **servers**. Every website has a server and every server has an ip address.

Let's try to understand what the DNS does by making a little DNS table ourselves. Pull out a piece of paper and draw a grid similar to that shown below:

**DNS Table**

<b>codeforfun.com</b>	<b>198.185.159.144</b>

Let's fill in the table:

- Survey the class for their favorite websites and write the URLs in the left column
- Use a site like <http://get-site-ip.com> to find the IP addresses for those sites and write them in the corresponding rows of the right column.

Reiterate that a table like this is used on the internet to look up the address for a website whenever the URL of the website is requested.

### 3. Packets



**Engage** students in a short teacher led instruction:

The other thing that happens inside the internet is that messages are not always sent as a single long message. Why is that?

Believe it or not, the Internet isn't able to send and receive an unlimited amount of information at one time. Imagine if you tried to send all of your favorite pictures to your grandma in just one single envelope. It just wouldn't all fit.

The same is true for long messages on the internet. Every message we send through the Internet gets chopped up and each piece is sent individually. It's like putting each message piece in a separate envelope and mailing it. We call those "**packets**" in internet talk.

Now, let's play an internet game!

### 3. Student Activity: The Internet Game: Delivering Messages on the Internet



Students will engage in an unplugged activity, "the internet game", simulating delivery of messages divided into packets.

After becoming familiar with the instructions, have the server signs, the printed messages and printed DNS table ready and explain the game to students. You can adjust team sizes and number of messages based on class size.

Make sure that each message piece is carried one at a time. The game works best when browser and server teams are at opposite ends of the room and the messenger team is near the browser teams.

#### Internet Game Instructions:

##### Roles:

- 4 "browser" teams of 2 students each. Each team receives a printed message.
- 4 server teams of 2 students each. Each team receives a sign with the IP address on it.
- 2 students are the DNS look-up service. The team receives the DNS table print out.
- 2 students are message carriers. They carry an envelope with a packet to the correct server.

#### Instructions for the game:

##### Browser Teams:

1. Each message states the URL where it needs to be delivered and how many pieces it must be ripped or cut into. Each piece represents a packet.
2. Browsers go to the DNS translation table team, give them the URL to find out the IP address of where the message needs to be delivered.
3. Browser team places each packet in an envelope and labels it as follows:
  - IP address of destination
  - The packet number. If a message is cut into 4 pieces, it must be labeled with 1/4, 2/4, 3/4 or 4/4 so the server knows the order and if all packets have arrived.
4. Browser team requests a messenger from the message team to carry the packet to the correct server.

**DNS Server Teams:**

1. Complete the DNS look-up table with the missing IP addresses
2. When a “browser” comes to you, look up the IP address for the the URL given to you and give it to the “browser”

**Messenger Teams:**


1. When called, pick up a packet from the browser team and deliver it to the correct server.

**Receiving Server Teams:**

1. Server team holds the sign with its IP address
2. Wait until all packets have been delivered.
3. Make sure you have all packets, then reassemble them to compose the complete message. Raise your hand when done.

The game is over when all servers have completed their task and read their messages out loud !

**4. Wrap Up and Reflections**

 <b>Reflection Points:</b>
<ul style="list-style-type: none"> <li>● What did you learn today?</li> <li>● What is a URL?</li> <li>● How are messages sent over the internet?</li> <li>● What is a packet?</li> <li>● What is the DNS table for?</li> </ul>

Message pages follow. Print one copy for each browser student team.

Dolphins  
communicate with  
each other by  
clicking, whistling  
and other sounds.

Number of pieces: 5

To URL: [www.codeforfun.com](http://www.codeforfun.com)

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# DOLPHINS CAN LIVE UP TO 50 YEARS!

Number of pieces: 3

To URL: [scratch.mit.edu](http://scratch.mit.edu)

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# DOLPHINS SLEEP WITH HALF THEIR BRAIN AWAKE AND ALERT

Number of pieces: 4

To URL: CSisFun.com

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Dolphins use a  
blowhole on top of  
their heads to  
breathe.

Number of pieces: 4

To URL: [code.org](http://code.org)

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## Exhibit A: DNS Table

### DNS Look-Up Table

CSisFun.com	
scratch.mit.edu	
code.org	
codeforfun.com	