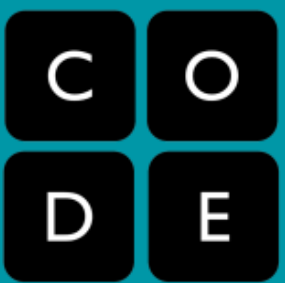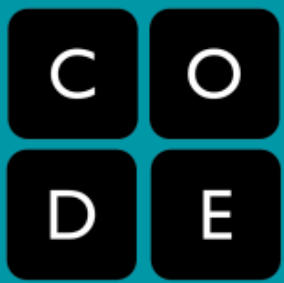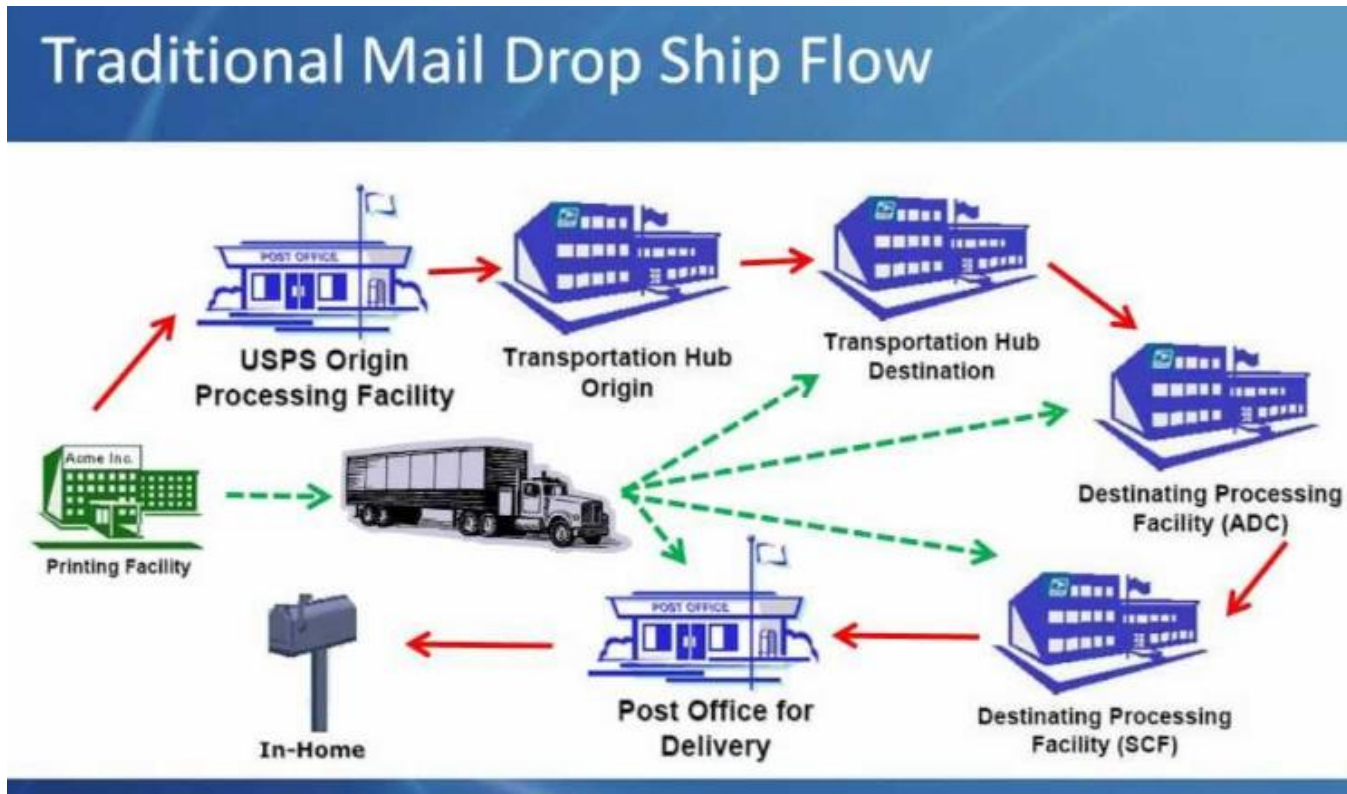# Routers and Redundancy

Unit 1 Lesson 10 (U1L10)

Warm-Up (In your notes)

Imagine you were going to send a letter to a friend living in another state. In your notes, list the steps you imagine your letter would have to take through the different parts of the postal system. Don't worry if you're not sure about your answers, just make an educated guess.


Traditional Mail Drop Ship Flow

When we send messages through a network we don't actually want everyone on the network to receive them. <u>If we include information about who the message is intended for</u> then we can allow portions of the network to focus on sorting and routing messages, so that they can continue on their way to their intended target. In the mail system, mail facilities, post offices, or a mail carrier fills this role.

In a network of computers, certain computers called "routers" do the same thing, directing messages towards the target computer based on the IP addresses included in the message.
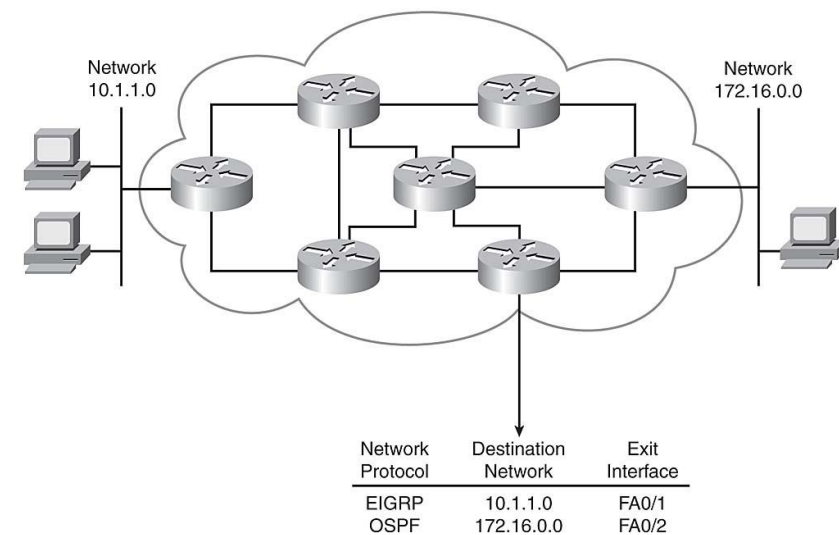
Internet Simulator

Today's activity uses the newest version of the Internet Simulator

Messages now have "To" and "From" addresses in a format similar to IP addresses (just an 8-bit address instead of a full 32 bits)

This allows messages to be sent to a single intended recipient.

The Internet Simulator also simulates the routing of messages across a network, with messages possibly being routed across multiple routers in unpredictable sequences before finally being delivered.

This is done to simulate the way traffic travelling across the Internet is constantly rebalanced in response to over- or under-usage of some channels.

A message will usually make it to its destination, but we can't know for sure how it will get there.
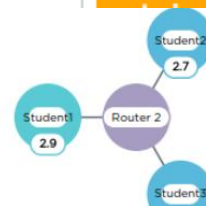
Activity:

1. Form groups of 3-4 (No groups of 2)

2. Navigate to the Internet Simulator in Unit 1 Lesson 10

3. Join the router that matches your group number.

▼ **Lesson 10: Routers and Redundancy**

🖥 1   Lesson Overview

🖥 2   Internet Simulator: Routers

☑ 3-7   Check Your Understanding

3   4   5   6   7

Lobby for Computer Science Principles

Router 1 (router1)	Nobody connected yet. Connect up to 6 people.	Join
Router 2 (router2)	Nobody connected yet. Connect up to 6 people.	Join
Router 3 (router3)	Nobody connected yet. Connect up to 6 people.	Join
Router 4 (router4)	Nobody connected yet. Connect up to 6 people.	Join

...ator

...to the Internet Simulator.

...nected to your entire class you are
...er. You can see who else is on your

Close the notes window.

Student2
2.7

Student1 — Router 2
2.9

Student3

Activity – Round 1
- Send a simple "hello" to a friend who is connected to the **same** router. **Make sure you know their IP Address**
- Reply to your friend with a "What's up?"

WARNING

I see **ALL** messages from **ALL** students.

Do not message the following:
- Anything inappropriate
- Anything you don't want **everyone** to see

Activity – Round 2

Have a Conversation: Choose two classmates on your router and exchange a short conversation with one another. Make sure your messages are getting through and that you're not sharing any secrets. You'll see why in a second!

Topic: If you could travel anywhere in the world for 1 month, where would it be? Why?
This is a silent activity. No talking please.

Activity Guide - Routers and Redundancy

Pass out the activity guide.

Getting Started

Go to the Internet Simulator: Log into Code Studio and find today's lesson.

Choose a Router: Add a router if you need more space. Then join a router with a few of the people sitting closest to you. Ideally, you'll have 3-4 classmates with you on your router.

Activity

Find Your Classmate's IP Address: To begin today's activity, explore the new version of the Internet Simulator. You've likely noticed that the structure of the messages has changed a little bit to

	To	From	Message
ASCII	13.2	13.8	Hey there!
Binary			

⚠ WARNING

I see **ALL** messages from **ALL** students.

Do not message the following:
- Anything inappropriate
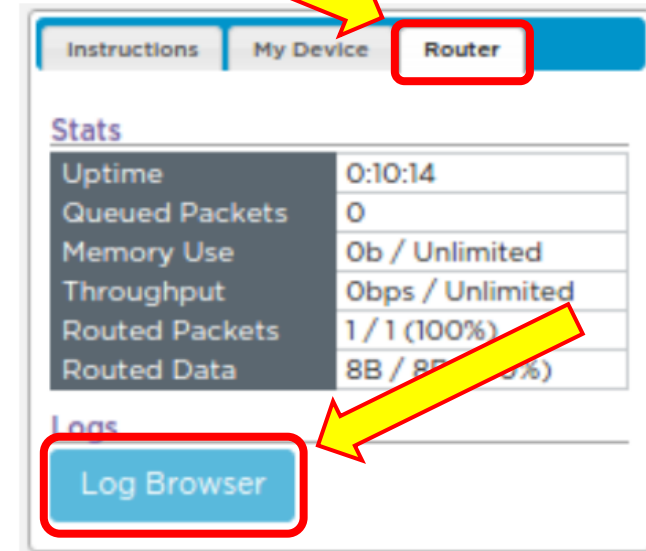- Anything you don't want **everyone** to see

Work with your group to answer the questions.

Read the Traffic: Move to the router tab and click the "Log Browser" button to see the network traffic for your router. Then respond to the questions below.
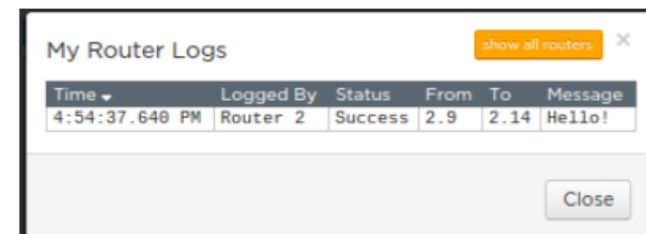
- How many total messages passed over your router?

- About what percent of those messages did you actually receive?

- Did all the messages get through? Why might a message have been "Dropped"?

- Can you trace a full conversation between two of your classmates? What types of things are people talking about?

Instructions	My Device	Router

Stats

Uptime	0:10:14
Queued Packets	0
Memory Use	0b / Unlimited
Throughput	0bps / Unlimited
Routed Packets	1 / 1 (100%)
Routed Data	8B / 8 ... %)

Logs

Log Browser

My Router Logs   show all routers

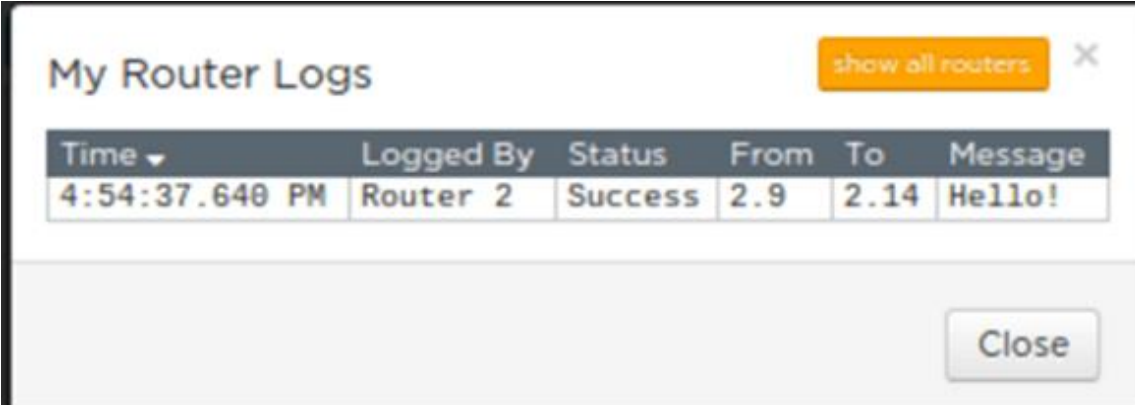| Time	Logged By	Status	From	To	Message
4:54:37.640 PM	Router 2	Success	2.9	2.14	Hello!

Close

6:00

Thoughts:
- Routing messages functions very differently from broadcasting.
- The messages are only sent to the user they are intended for.
- This is just like when you write a letter to a friend, where an address on the outside of the letter tells the mail service how to properly route your letter

The view we have in this table of traffic wouldn't be available to a normal user on the network -- this is a simulation after all -- but it **WOULD** be visible to the router.

A router needs to read the header of the message to route it correctly * But the contents of the message are right there too, and if it wanted, a router could read all the messages going across it, just like you did.

This should raise some questions about privacy and security -- we'll talk more about this later.

Activity – Round 3 (6-8 min.)

1st: Find a Classmate on a <u>Different Router</u>: You can actually send a message to classmates on different routers if you like; you just need to know their IP addresses. Ask two classmates from different routers to share their IP addresses with you.

2nd: Have a Conversation: Once again have a short conversation with each of your classmates.

<u>**Topic**</u>: If you could meet any living person on the planet, who would it be? Why?

⚠ **WARNING**

I see **ALL** messages from **ALL** students.

Do not message the following:
- Anything inappropriate
- Anything you don't want **everyone** to see

Work with your group to answer the questions.

Read the Traffic: In the same tab as before, click on the "Log Browser" button again, and then the "Show all routers" button. Then respond to the questions below.

Log Browser

- How many total messages were sent?

show all routers

Message

hello!

- Can you trace the full conversation between two of your classmates? What are they talking about?

6:00

- Is there anything different about the way messages are being sent this time? Why might that be the case?

Thoughts:

Router 5	Success	6.12	5.5	cool beans
Router 8	Success	6.12	5.5	cool beans
Router 13	Success	6.12	5.5	cool beans
Router 6	Success	6.12	5.5	cool beans

On the Internet Simulator we see messages appearing in the Router Logs multiple times (like in the image above). This is done to simulate a message passing through multiple routers on its way to its destination. A row is created each time it shows up at a new router.

Reflect

If you trace carefully you'll notice that messages between two people don't **always** visit the same routers along the way. <u>This is not a mistake</u>; it's modeled after the way the actual Internet was designed.

IN YOUR NOTES, answer the following:
- Why might the Internet have been designed to be flexible about how messages get from one person to another?
- Why go through the trouble of creating multiple paths between users?

Efficiency: Communication lines can become backed up with traffic. The ability to choose whichever one currently has the least traffic improves the speed of transmission.

Reliability: Having many redundant paths means if one goes down, there are many others that a message can take.

Lesson 10: Routers and Redundancy

🖥 1 — Lesson Overview

🖥 2 — Internet Simulator: Routers

☑ 3-7 — Check Your Understanding

3 4 5 6 7