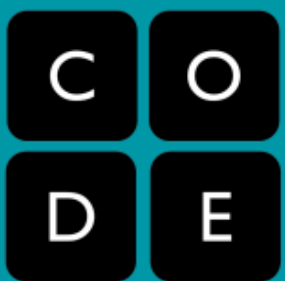
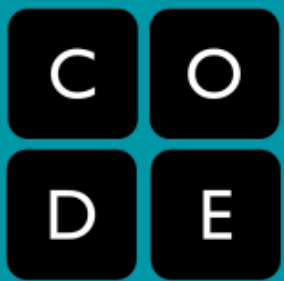


Packets and Making a Reliable Internet

Unit 1 Lesson 11 (U1L11)



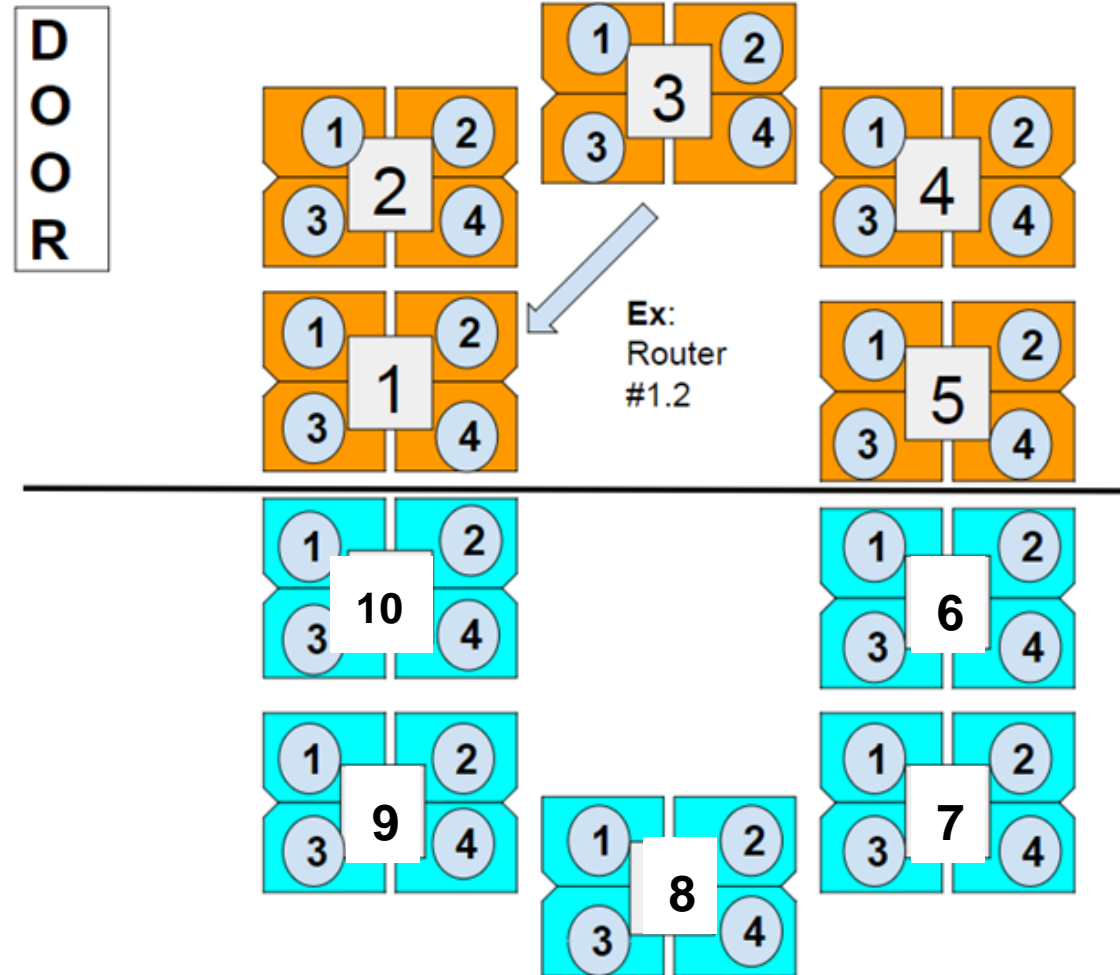
Warm Up:

IN YOUR NOTES, respond to the following situation:

Your friend sent you a message on the Internet, but you never received it. Based on what you already know about routers and the physical Internet, list what reasons might explain this fact.



Activity: Packets Unplugged (1 Post-it/Image per student)



Activity: Packets Unplugged (1 Post-it/Image per student)

1st: Make a simple drawing on your Post-It or use the Image provided.

2nd: You have just made a message that you are going to send to someone else on the other side of the room. However, we're going to imagine that it's too big to send all at once. **So tear it into 4 EQUAL pieces.**

3rd: Look across the room to find a partner. If you're seated in the middle, DO NOT choose another student in the middle.

4th: Once you have a partner, tell them your IP Address. Write your partner's IP Address on the back of EACH piece of your drawing, indicating that it's going to that address. For example **"To: 4.2"**



Goal: You are going to try to send your drawing to your partner across the room, and also to receive and reconstruct your partner's drawing.



Rules:

- No moving - You may not move from your current position.
- Only one piece at a time - You may hand one (**and only one**) piece of paper at a time to any person who is **within arm's reach**. You can't pass a handful of paper to anyone.
- Forward messages to destination - If you receive a piece of paper that is not for you, you should hand it to someone who can get it closer to its intended destination.
- Collect all your pieces and reconstruct the drawing - You are looking for pieces of paper with your address on it, and once you have them all to reconstruct the drawing your partner sent you.
- Start and stop on my command - When I say "GO" everyone start passing pieces of paper. And stop when I call "STOP"

Activity: Packets Unplugged: Debrief

- 1) For a student who was able to get the whole drawing - did the pieces of paper come to you in order? If not, why?
- 2) Did anyone not get all the pieces intended for them? What happened?
- 3) What happened at the table in the middle - what was that like?
- 4) What do you think this has to do with the internet and how it works?

The interesting question: If you receive some but not all of the pieces of a message, what can you as the recipient do to fix it? **What should the protocol be?**



Additional Thoughts

When we communicate on the Internet, we are not just sending short text messages as we did yesterday. We also use the Internet to exchange documents, videos, music, and scientific data, and these files can easily grow to enormous size.

All of this would not be a problem if the Internet were perfectly reliable, but in reality, errors sometimes occur. Wires can be cut, routers can be overwhelmed with traffic, and interference with electric or radio signals can cause messages to become corrupted. The response to this problem is to split large messages into smaller pieces of information called packets.

Internet Simulator – Packets and Unreliability:

This version of the Internet Simulator has been structured to simulate the unreliability of the Internet.

You'll notice a few changes:

- You will only be allowed to send packets containing 8 characters of text!
- Anything larger than 8 characters will be cut off...
- However, you may construct multiple packets prior to sending them, by clicking "**Add Packet**", and then send them all with one click of the "**Send**" button.
- Every message has a small chance of being dropped on each "hop" it makes between routers.

The screenshot shows the "Send a Message" interface. It features two message construction panels, each with a close button (x) in the top right corner. Each panel has three columns: "To", "From", and "Message".

The top panel shows:

	To	From	Message
ASCII	2.12	1.8	The In
Binary	0010 1100	0001 1000	01010100 01101000

64/64 bits

The bottom panel shows:

	To	From	Message
ASCII	2.12	1.8	ternet
Binary	0010 1100	0001 1000	01110100 01100101

64/64 bits

Below the panels are two buttons: "Add Packet" (blue) and "Send" (orange). Both buttons are highlighted with a red border. Two yellow arrows point from the bottom towards the "Add Packet" and "Send" buttons.

Internet Simulator – Packets and Unreliability:

1st: Access the simulator in Unit 1 Lesson 11

2nd: Join a router that is **DIFFERENT** from your groupmates

3rd: Practice exchanging messages across routers (2-3 minutes). Try sending a message with multiple packets to someone, and then send the same message to someone on a different router.

4th: View the router logs to examine the result of your transmissions

What do you notice?

- Packets are dropped with some frequency.
- Packets of more than 8 characters are always truncated to just the first 8 characters.
- Packets sometimes arrive out of order.

CHALLENGE: Develop a Protocol

Goal: IN YOUR NOTES, develop a protocol to overcome the unreliability of the network, so that a message can be sent and both the sender and receiver can be confident that the entire message was received.

Guidelines:

- All communication can only be done through the simulator.
- The full message must be at least 80 characters long, broken into 10 packets, and not known beforehand (keep it a secret).
- The sender and receiver must be sure that the entire message was successfully transmitted and reconstructed.

Class share out

- Who wants to present/share their protocol?
- What challenges did you experience?
- How did you adjust on future trials?
- What was something common that all groups did?

The Internet:
Packets,
Routing &
Reliability
(6:25)



Wrap-Up: Connecting our Activity to TCP

The challenges we encountered in today's activity very closely mirror those that exist on the actual Internet.

The response was the development of a protocol called the Transmission Control Protocol, or more simply, TCP.

TCP divides larger messages into smaller packets which have ordering information added to their header.

When a packet arrives at a destination computer, an acknowledgement is sent to the sender, letting them know they don't need to resend that packet.

Once all the packets have arrived, the ordering information in the headers of the packets allows them to be reordered to create the original message

▼ Lesson 11: Packets and Making a Reliable Internet

- 1 Lesson Overview
- 2 Internet Simulator: Packets
- 3 The Internet: Packets, Routing, and Reliability
- 4-7 Check Your Understanding

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