

# Lesson 3: The Need for Addressing

## Overview

Students complete a scheduling challenge three times, once unplugged, and twice on the Internet Simulator, to explore the need for addressing messages online. Students first complete a challenge where they are allowed to talk to one another to fill out a weekly schedule. They then move on to a version of the Internet Simulator where all of their messages are "broadcast" or sent to everyone in the same simulator room. This challenge forces students to develop shared rules for communicating to complete the scheduling activity a second and then third time. The wrap up helps students connect their experiences to real-life rules, or protocols, used on the Internet for addressing messages.

## Purpose

Now that students have explored what it takes to link devices on a network, they are ready to learn how devices communicate with each other. Prior to this lesson, the Internet Simulator was set up only for point-to-point communication. This new version is setup to "broadcast" every message to every person in the same simulator room. This closely mimics a real life problem that computer scientists had to solve: With all the bits passing through many computers on a network, how would a computer know if it was the intended recipient? Which computer should get a reply? Internet Protocol (IP) solves a portion of this problem by assigning a unique IP address to each device and standardizing how sender and recipient are identified.

## Standards

Full Course Alignment

### CSP Conceptual Framework

- **CSN-1** - Computer systems and networks facilitate how data is transferred.

### CSTA K-12 Computer Science Standards (2017)

- **NI** - Networks & the Internet

## Agenda

### Lesson Modifications

### Warm Up (5 minutes)

## Objectives

Students will be able to:

- Describe the way the Internet Protocol helps uniquely identify one another on the Internet
- Explain the need for open and shared protocols for communicating on the Internet

## Preparation

- Preview the Internet Simulator (Broadcast version)
- Preview the Wrap Up slides in **CSP Unit 2 - The Internet**
- Preview the **The Internet: IP Addresses - Video**

## Links

**Heads Up!** Please make a copy of any documents you plan to share with students.

For the teachers

- **CSP Unit 2 - The Internet** - Slides

For the students

- **The Internet: IP Addresses and DNS** - Video ([Download](#))
- **U2L03 The Need for Addressing** - Activity Guide

## Activity (30 minutes)

### Scheduling Unplugged - Week 1 (10 minutes)

### Scheduling on the Internet Simulator - Week 2 (10 minutes)

### Formalizing Rules - Week 3 (10 minutes)

## Wrap Up (10 minutes)

### Assessment: Check For Understanding

# Teaching Guide

## Lesson Modifications



**Attention, teachers!** If you are teaching virtually or in a socially-distanced classroom, please read the full lesson plan below, then click **here** to access the modifications.

## Warm Up (5 minutes)

**Discuss:** *Imagine you were in a room with 5 other people, all with the same name as you. What might happen when you start communicating? How could you solve these problems?*

**Discussion Goal:** This discussion is meant to foreshadow some of the issues students will face when they use the Internet Simulator. Key points to draw out:

- There might be confusion about who the person is trying to talk to because everyone has the same name.
- Multiple people might be talking at once, making it hard to tell what people are talking about.
- People may stop communicating because of the confusion.

Have students brainstorm silently, then discuss with a neighbor, and finally share with the whole class.

## Remarks

Yesterday, you created a network that had strengths and weaknesses. Today, we are going to use a tool where one of the strengths is that everyone is connected and can get communications quickly at the same time. From our discussion, you might be starting to understand some of the weaknesses of this type of network.

## Activity (30 minutes)

### Scheduling Unplugged - Week 1 (10 minutes)


**Group:** This activity works best with groups of 6, though groups of 5 and 4 are also possible. Rather than a group of 6 and a group of 4, make two groups of 5.

#### Teaching Tip


**Running Each Week:** This lesson has students completing the same activity three times. Each time students need to create a schedule for the week that allows them to see every other member of their group on one of the days. Each time this activity should take roughly 3 - 5 minutes.


**Running It Unplugged First:** This first unplugged run of the activity gives students a feel for how it runs. This will make sure that any confusion when they get to the Internet Simulator is caused by the lack of identifying information in the simulator and not simply misunderstanding what to do.

### **Distribute: U2L03 The Need for Addressing**

 **Do This:** With your group follow the directions given in the box for Week 1

- If you are a group of 5, everyone cross out Sunday
- If you are a group of 4, everyone cross out Sunday and Saturday
- Before starting to schedule each week, choose a random day of that week when you're busy and cross it out

 **Run Week 1:** Have students work on filling out their schedules, agreeing with one another on the days when they will meet. This should take 3 - 5 minutes for all groups to finish. When they're done ask students to quickly check that their schedules actually line up.

 **Discuss:** *With your group check that everyone's schedules match. Then discuss what worked well, what made this tricky, if there's anything you want to try differently in Week 2.*

Students do not need to share out their conversations with the class but circulate the room and listen as they discuss.

### **Remarks**

Let's get on the Internet Simulator and try this activity out again. This time, however, all communication is going to have to happen on the Internet Simulator.

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**Internet Simulator**

## Scheduling on the Internet Simulator - Week 2 (10 minutes)


 **Do This:** Have students set up their boards for week two in the same way as last time:


- If you're a group of 4 or 5 cross out Saturday and/or Sunday.
- Randomly cross out a day in Week 2.
- Once you're ready you can start on Week 2, but no talking is allowed at all.

### Teaching Tip

**Same Groups:** Students should be in the same set of groups they were in for the Unplugged Activity. When they get to the Simulator click "Add Room" button to make as many rooms as necessary for your class.


**Week 4:** A fourth week is included on the activity guide in case your classroom wants to run the activity another time at some point in the lesson. If not feel free to ignore it.


 **Do This:** Login and join a room with your group mates. Once everyone is in the room complete Week 2 on the simulator only, no talking!

 **Discuss:** *Fill out the table on the back side of your sheet. What problems did you have when communicating on the Internet Simulator this time around? What solutions did you create or would you like to try for Week 3?*

Have students share out some of the challenges they encountered and ways they're going to try to address them the second time around.

## Formalizing Rules - Week 3 (10 minutes)

 **Do This:** Agree with your group on the set of rules you'd like to try this time around for how to communicate. Then complete Week 3 like the previous two weeks. No talking!

 **Do This:** Based on your experience, take 5 minutes to write down in the rules section the collective rules you and your team would advise using going forward.

**Discuss:** *Have a few volunteers share the rules that their group developed.*

**Discussion Goal:** Use the share out to highlight common features across multiple sets of rules. Namely that:


- Regardless of the rule, it needs to be clear and everyone needs to agree to them
- The sender and receiver need to be included in all messages to be understood


The goal of this discussion should be to set up the wrap up discussion where students connect their experiences in this lesson to computer science concepts that will be introduced.

## Wrap Up (10 minutes)

### *Remarks*

Today we saw a lot of really important principles that are important on the Internet. The first is that if we want to talk to each other we need to know who messages are going from and to. The other is that we all are going to need to be using the same set of rules if we want to communicate with one another. Let's watch a video about these concepts.


 **Display: The Internet: IP Addresses and DNS.** You can stop the video at the 3:23 mark. We watch the second half of this video in a later lesson on DNS.

 **Discuss:** *What are the similarities and differences between Internet Protocol (IP) and the addressing rules our class made? Would rules like ours or IP work if they were secret?*

Have students share their responses with a neighbor before discussing with the whole class.

**Discussion Goal:** Students should walk away with an understanding that both the class rules and IP are shared, open protocols. Key points:

- All devices and computers on the Internet use IP to connect and communicate with each other.
- Devices are assigned unique numbers (converted to binary sequences) called IP addresses.
- All devices format the sender and receiver information the same way so that devices on different networks can still communicate.
- These shared rules are called protocols. The Internet as we know it is actually these sets of protocols that are used to communicate over networks.

 **Journal:** Add the following vocab words and definitions to your journal: protocol, IP address, Internet Protocol.

### *Remarks*

Today we took an important step in learning about the Internet. We saw that it's not just important to build a network connecting all these devices, but we need open and shared rules, or protocols, for how these devices will communicate. In coming lessons we'll be learning more about the protocols on

Now these devices will communicate in coming lessons. We will be learning more about the protocols on the Internet.

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## Assessment: Check For Understanding

*Check For Understanding Question(s) and solutions can be found in each lesson on Code Studio. These questions can be used for an exit ticket.*

**Question:** Pick the two statements that are true about the Internet Protocol (IP):

**Question:** Describe how the Internet Protocol (IP) allows devices to easily connect and communicate on the Internet.

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Check For Understanding

