



Lesson 9



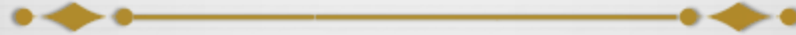
The Need for Addressing

Goals - you will be able to:



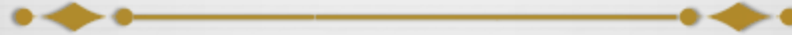
- ✦ Explain why messages need to contain addressing information (sender/recipient identification)
- ✦ Invent an informal addressing protocol for use in the Battleship game.
- ✦ Recall that browsing the Internet entails computers sending each other requests and sending back data to satisfy those requests

So far..



- ✦ We have only solved Internet problems when you are connected to one other person (so-called “point-to-point” communication). Obviously, the Internet is bigger than that, and today we’re going to look at problems that involve multiple people.

Broadcast Battleship



- ✦ We will start by playing a game that simulates some issues that arise when constructing the internet.
- ✦ We will play a crazy game of Battleship where instead of playing against one other person you will play multiple games against multiple other people simultaneously
- ✦ In our version today, you will play in groups of 3 (4 is OK)
- ✦ To make it easier to track, we've also simplified the play board to just a 3x3 grid (instead of 10x10)
- ✦ And we'll just play with paper and pencil...

The Rules

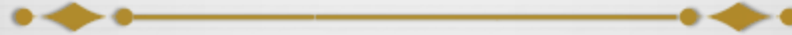


Pause...



- ✦ It seems that most of you have figured out a way to play battleship with your group.
- ✦ You will get to continue to play your game in a few minutes.
- ✦ We are going to add a new challenge: Your team is going to have to play Battleship without talking.
- ✦ You will only be able to use the Internet Simulator to communicate, let's check it out!

Differences in the new version...



- ✦ You connect to a “Room” with other people, instead of an individual partner.
- ✦ Every message that is sent gets broadcast to everyone in the “room”, including you
- ✦ Optional tutorial video
- ✦ NO TALKING, and play

Refine and Reflect



- ✦ What protocol have you been using? Did you have a protocol at all?
- ✦ How can you standardize your communication?
- ✦ How do you make your message as clear as possible?
- ✦ How do you make your message as efficient (short/easy to interpret) as possible?
- ✦ Now play again with NO TALKING

Questions to think about:



- ✦ How did your group decide upon a system for sending messages in the Battleship simulator?
- ✦ Were there disagreements or problems?
- ✦ How were they resolved?

Invent a Binary Protocol for Battleship



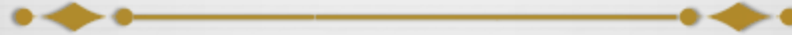
- ✦ Previously you came up with a method for exchanging messages on an open broadcast channel to play multiple games at once.
- ✦ Now that you've played it this way, with your group or with a partner, describe an efficient binary protocol for playing a 3-person game of Battleship that can be played accurately over the Internet Simulator
- ✦ Efficient meaning fewest number of bits

Things to think about:



- ✦ How will you standardize the recipient and sender addresses?
- ✦ Should you encode people's names or (hint) use a number?
- ✦ How would a recipient of your message know where an address ends and the other begins?
- ✦ What other info do you need to include?

Discuss and Share



- ✦ What pieces of information were common across all of the protocols?
- ✦ If we were to play a different game, what data would stay the same? What would change?

The point:



- ✦ A good solution uses a numeric address and fixed length message
- ✦ How many bits do you need for addresses?
 - ✦ For 3 people – 2 bits
- ✦ How many bits are needed for the total message?

What does this have to do with the Internet?



- ✦ A simple, but clever encoding protocol is to recognize that the addresses, coordinates, and hit/miss messages can each be encoded with 2 bits
- ✦ The scheme shown on the next slide uses 10 bits total. The last two bits are interesting: they indicate whether this is a shot being fired for the given row and column or whether it's a hit/miss response to the given row and column. Since the respondent who says hit or miss must clarify the coordinates of the shot they are responding to, the recipient doesn't have to remember the last shot they called.

"From player 1 to player 2, fire shot at C3"

01

10

11

11

00

From address:
2 bits to represent range of 0 – 3

To address:
2 bits to represent range of 0 – 3

Column #:
2 bits to represent range of 1 – 3, mapping to A, B, C

Row #:
2 bits to represent range of 1 – 3

Shot info:
2 bits to represent:

- 00 Fire from sender
- 01 Target Miss
- 10 Target Hit
- 11 Error

"From player 2 to player 1, C3 is a hit"

10

01

11

11

10

From address:
2 bits to represent range of 0 – 3

To address:
2 bits to represent range of 0 – 3

Column #:
2 bits to represent range of 1 – 3, mapping to A, B, C

Row #:
2 bits to represent range of 1 – 3

Shot info:
2 bits to represent:

- 00 Fire from sender
- 01 Target Miss
- 10 Target Hit
- 11 Error

Real IP Addresses



- ✦ It turns out computers on the Internet are addressed in a similar way to phones for many of the same reasons. The real addresses used on the Internet are called “Internet Protocol Addresses” or IP Addresses for short.
- ✦ Video with worksheet notes (pause at 4:10)

Essential Ideas:



- ✦ IP Addresses
- ✦ IP Packets
- ✦ IPv4 vs. IPv6

Quick Activity



✦ What is your IP address?

Security Concerns



Homework



- ✦ Answer questions on code studio for Stage 9
- ✦ Continue reading the article and answering questions from previous lesson