CSE 390B, Winter 2023

Building Academic Success Through Bottom-Up Computing

E-Portfolio Workshop & Computer Networks

Final Project Overview, E-Portfolio Workshop, Overview of Computer Networks

Lecture Outline

- **Final Project Overview**
  - **E-Portfolio Details and Topics Brainstorming**
- E-Portfolio Workshop
  - Reflection Work Session and Feedback
- Overview of Computer Networks
  - Connecting Computers to The Internet

Final Project E-Portfolio Overview

- You will create an E-Portfolio that is geared toward a new Allen School student
- Your E-Portfolio is a culminating project in having you reflect on the **metacognitive skills** you've learned and **providing advice** for entering the program
- During our final class, you will give a short presentation on your E-Portfolio

Final Project Due Dates

- Part I: E-Portfolio Outline
  - Due next Tuesday (3/7) at 11:59pm
- Part II: Final E-Portfolio
  - Due Tuesday of finals week (3/14) at 4:00pm
- Part III: E-Portfolio Presentations
  - During the scheduled CSE 390B final
  - CSE 390B Final Time: Tuesday, 3/14 from 4:30-6:20pm
  - CSE 390B Final Location: CSE2 G04 (same as usual classroom)

Reflection on Metacognitive Skills

Individually first, take some time to reflect on the following questions, and then discuss in groups:

- Which two metacognitive topics would you consider including in your E-Portfolio and why?
  - Reflect on which ones you've grown the most in, have impacted you the most, were most challenging to grow in, etc.
- What are some examples of yourself demonstrating those two metacognitive skills?
  - Please be specific here! Aim to share these skills as if you are telling a story and showing concrete applications of these skills

Reflection on a Technical Skill

Individually first, take some time to reflect on the following questions, and then discuss in groups:

- What technical topic from CSE 390B would you consider including in your E-Portfolio and why?
  - Reflect on technical skills that helped connect the dots, were most interesting to you, most challenging for you to grasp, etc.
- What is the impact of having knowledge of that technical skill? In other words, why is that technical skill useful?
  - Please be specific here as well — think about how this technical skill would be useful in an academic or personal setting

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E-Portfolio Workshop

- Individually, spend 15-20 minutes completing the following steps:
  - Aim to finalize the two metacognitive skills, two examples of you applying them, and one technical skill you plan on reflecting on
  - Begin drafting your reflection on a document (should be in paragraph form in final e-portfolio, but bullet points ok for now)

- Goal by the end of class today is to receive feedback on your reflections and complete part one of the final project, the E-Portfolio outline

E-Portfolio Workshop

- Now, get into groups and complete the following:
  - One group member presents on their reflection so far
  - Each group member listening should provide one question, comment, constructive feedback, or complement to the presenter
  - Repeat until everyone has had a chance to present

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- **Overview of Computer Networks**
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Overview of Computer Networks

- We will go over an overview of networks
  - Take CSE 333 (Systems Programming), CSE 461 (Computer Networks), and CSE 452 (Distributed Systems) to learn more

- Our focus:
  - Brief intro to what connecting to the internet looks like under the hood
  - What that connection might look like implemented in our computer

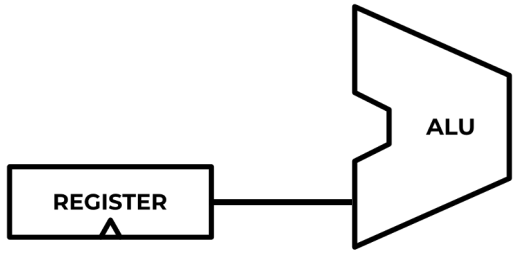
How Do Computer Networks Work?

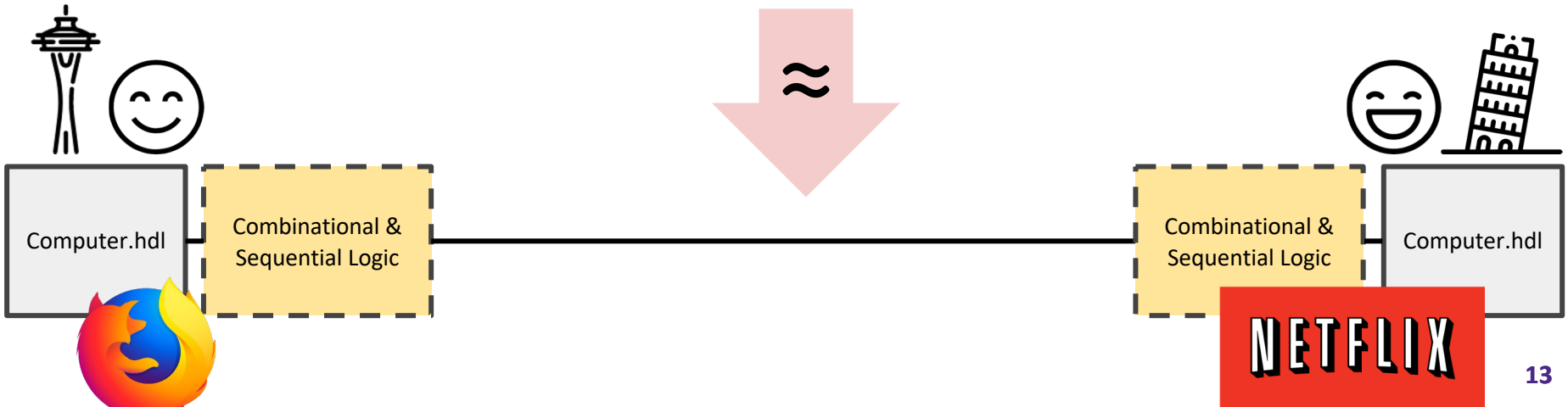
- How do you think we connect computers in different physical locations?

- What modes of communication do you think computers use to network with one another?

Networks = Really, Really Long Wires

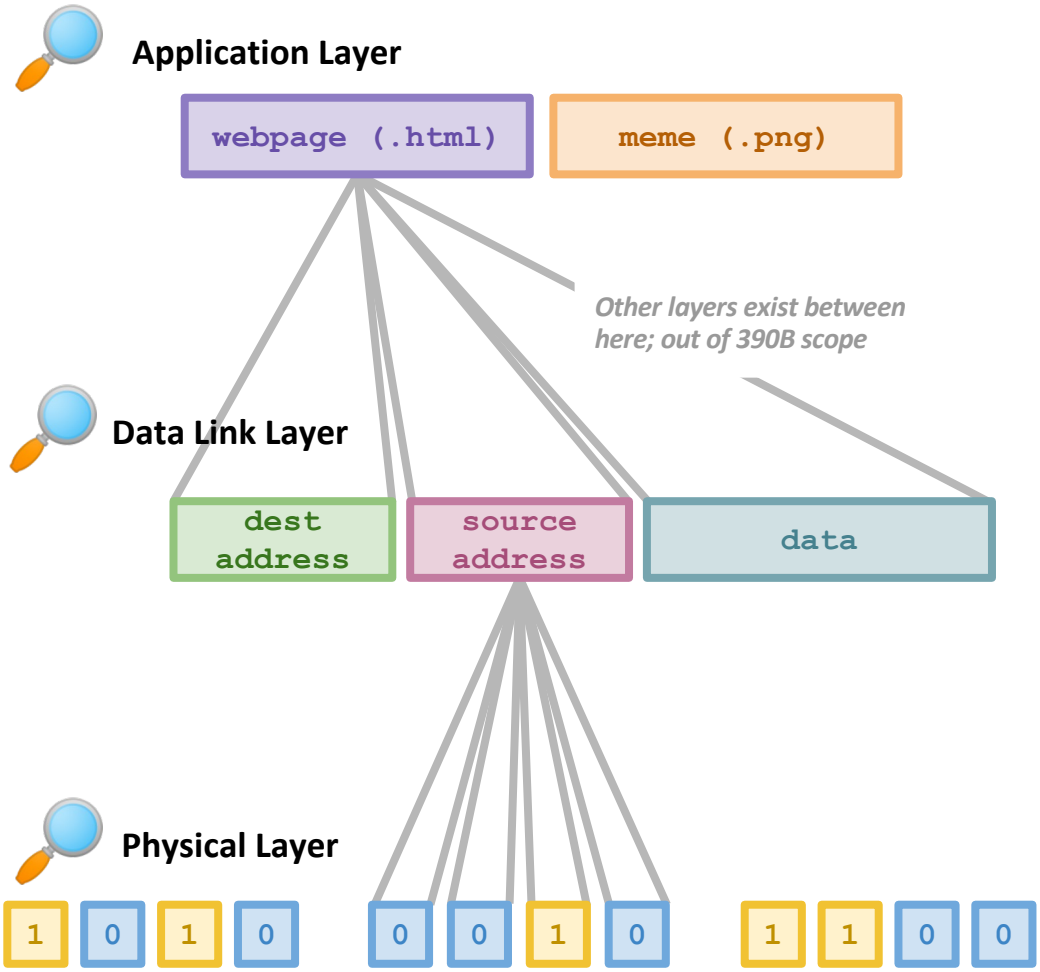
- At a fundamental level, there's nothing magic about the Internet—it's the same concepts we used to build our CPU, just with longer wires
  - Still 1s and 0s, still just combinational + sequential logic





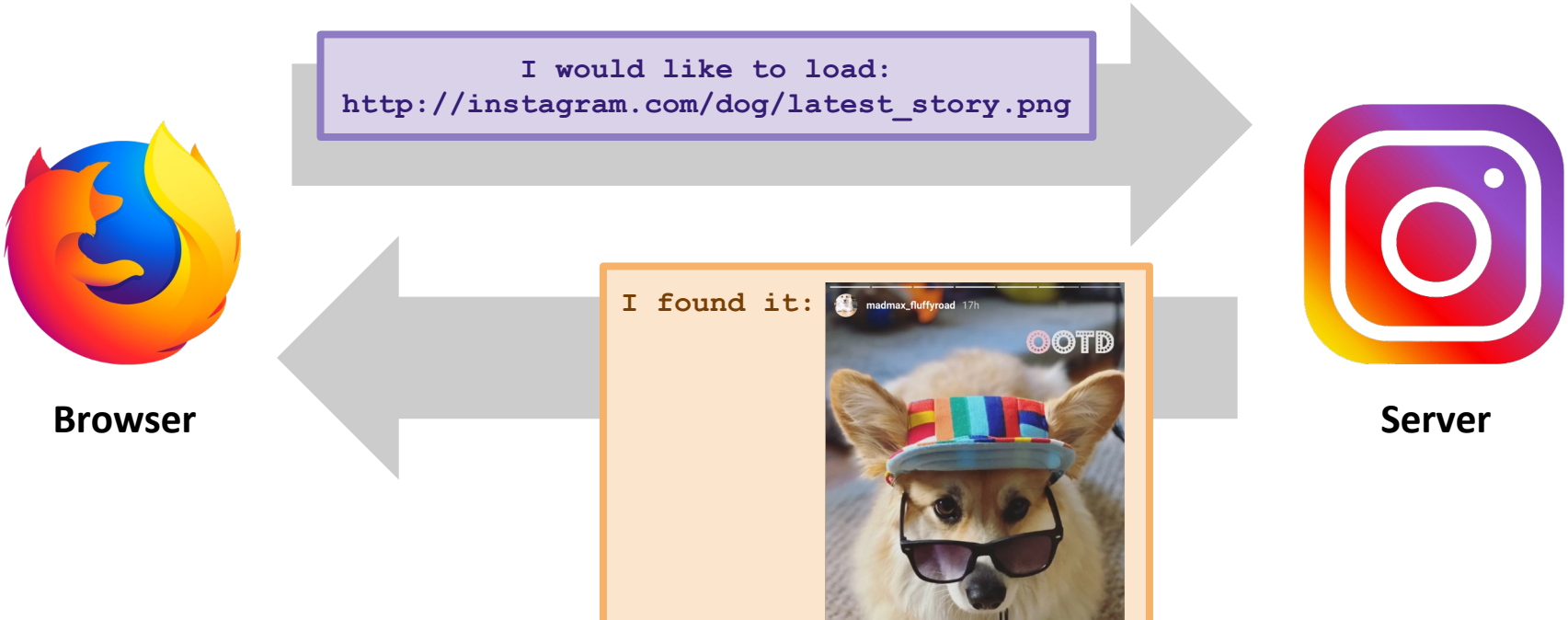
Thinking about the Network: Layers

- To manage the complexity, we think about the network in layers
- It's all 0s and 1s, but each layer is a different way of "framing" or thinking about those 0s and 1s
  - Each layer zooms out a little more



Application Layer

- Conceptually the "top" layer: looking at internet traffic as direct communication between applications
- Common use: HTTP (HyperText Transfer Protocol)
  - Your browser sends an HTTP request to a server
  - The server sends back an HTTP response with data attached



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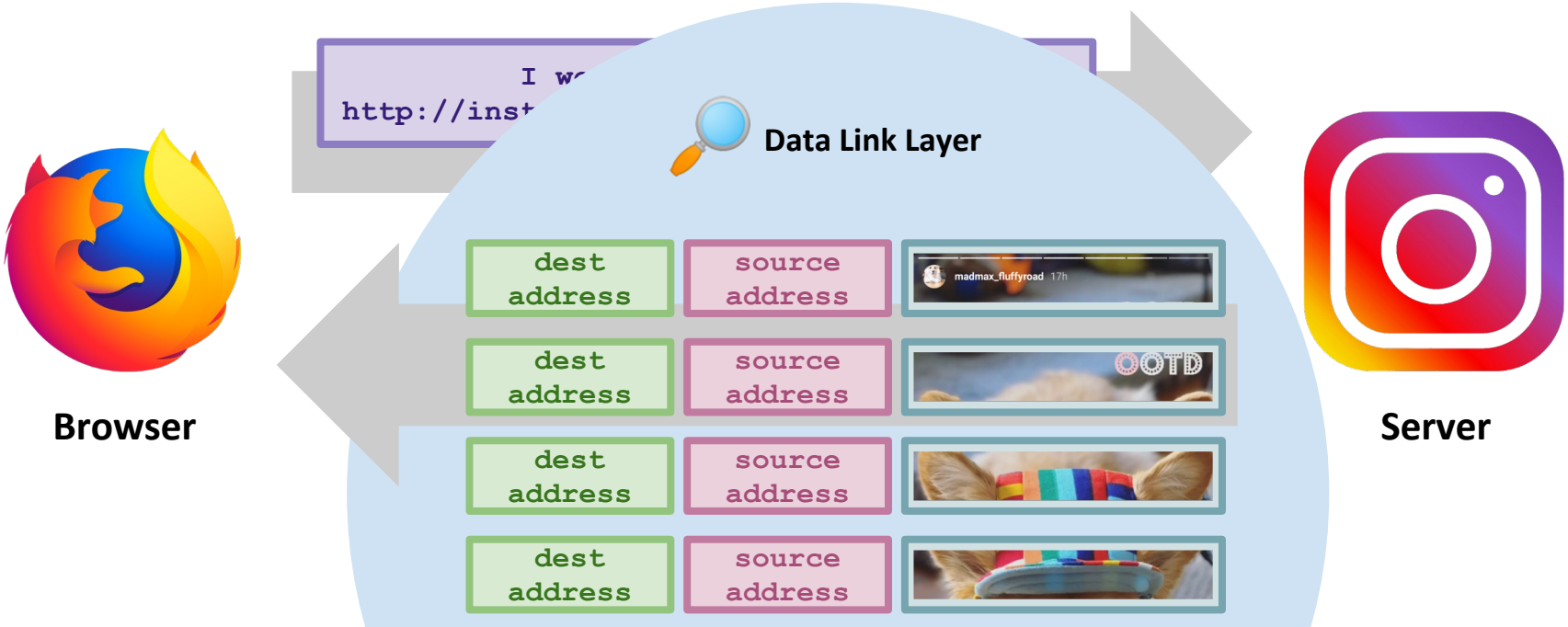
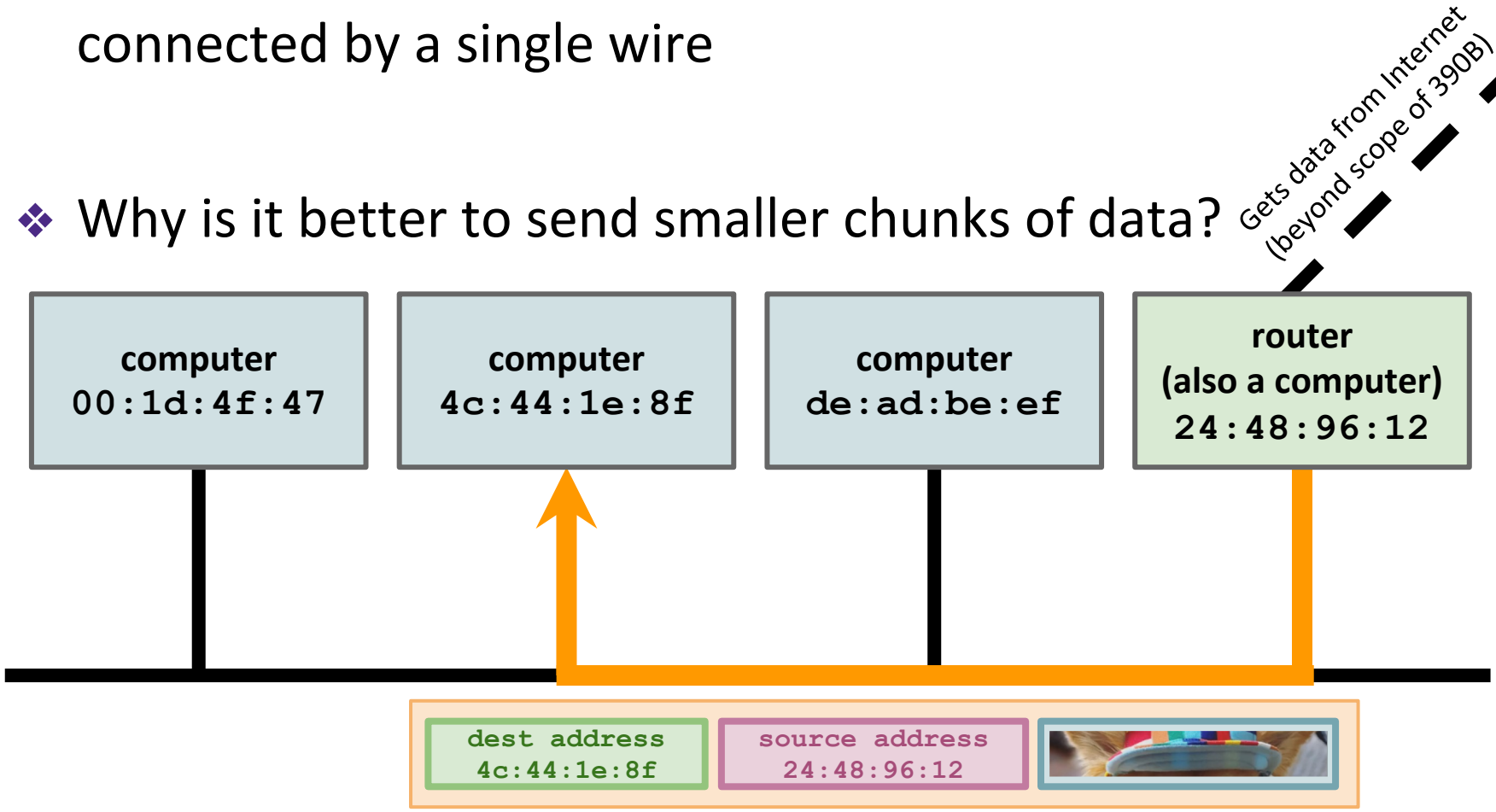


Data Link Layer

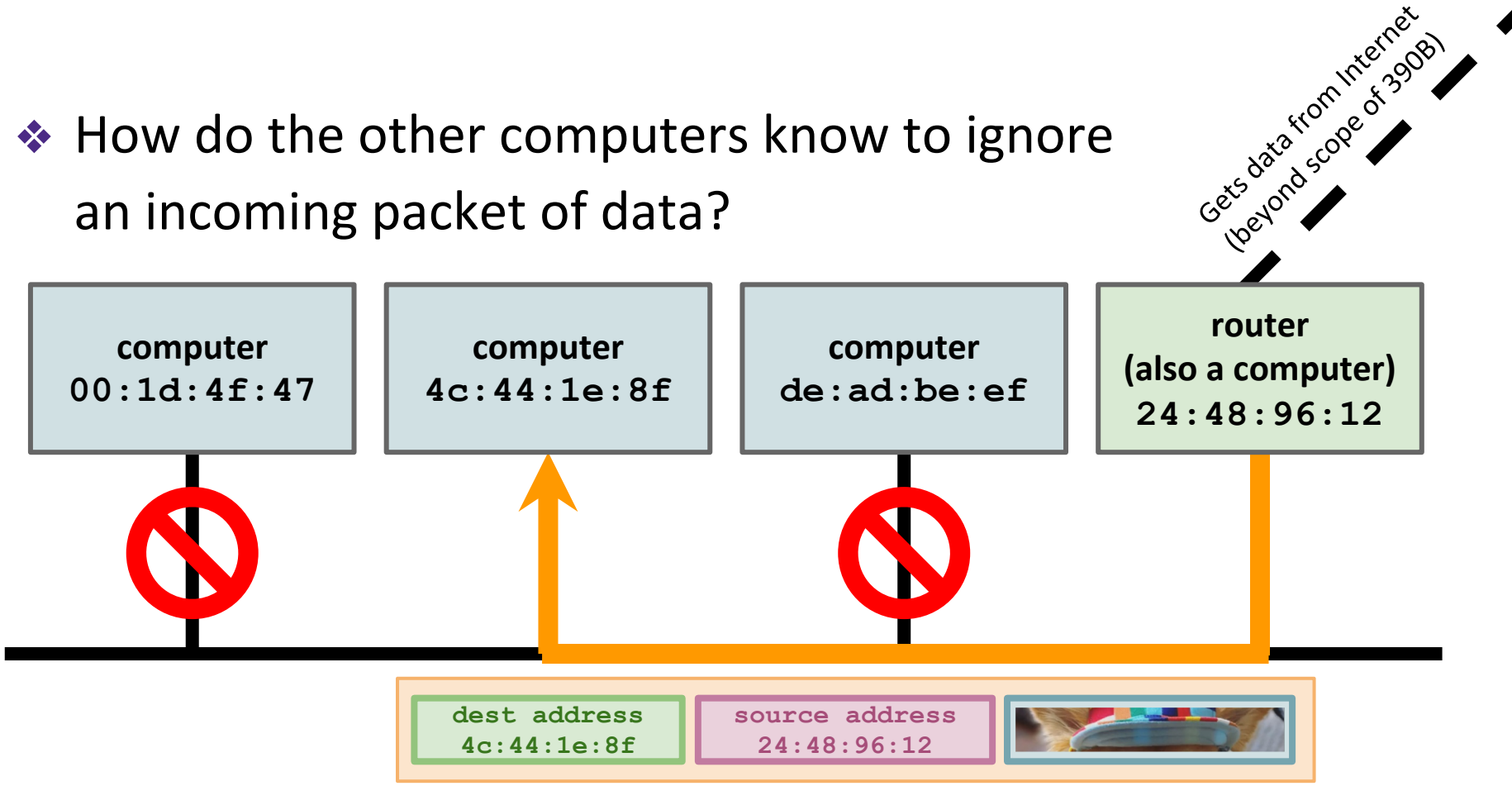
- A computer network is simply multiple computers connected by a single wire

- Why is it better to send smaller chunks of data?



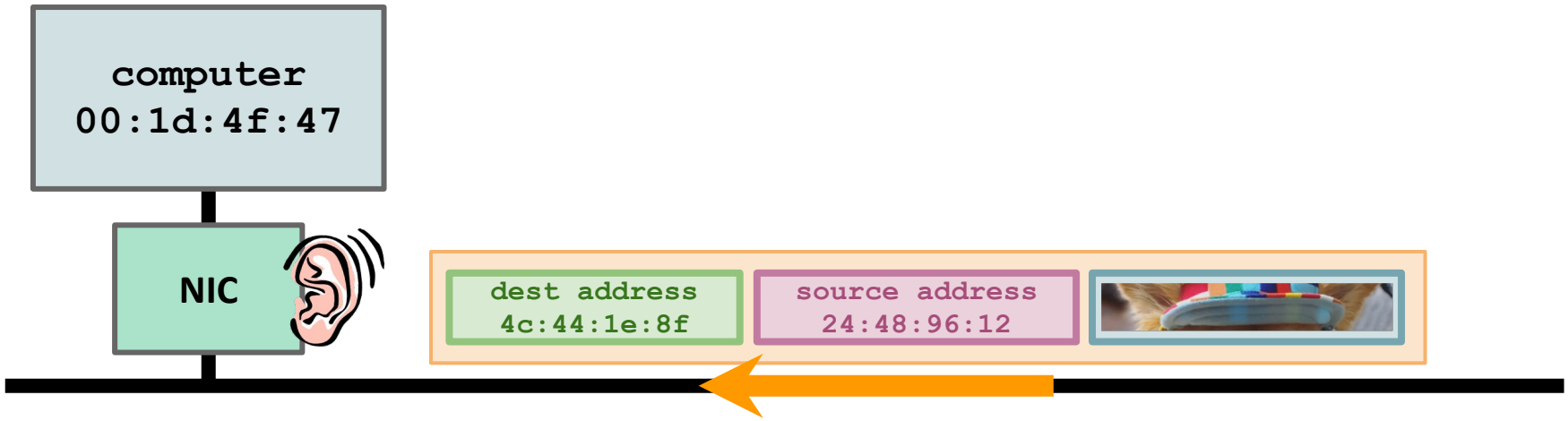
Data Link Layer

- Every computer will "hear" the message
- How do the other computers know to ignore an incoming packet of data?



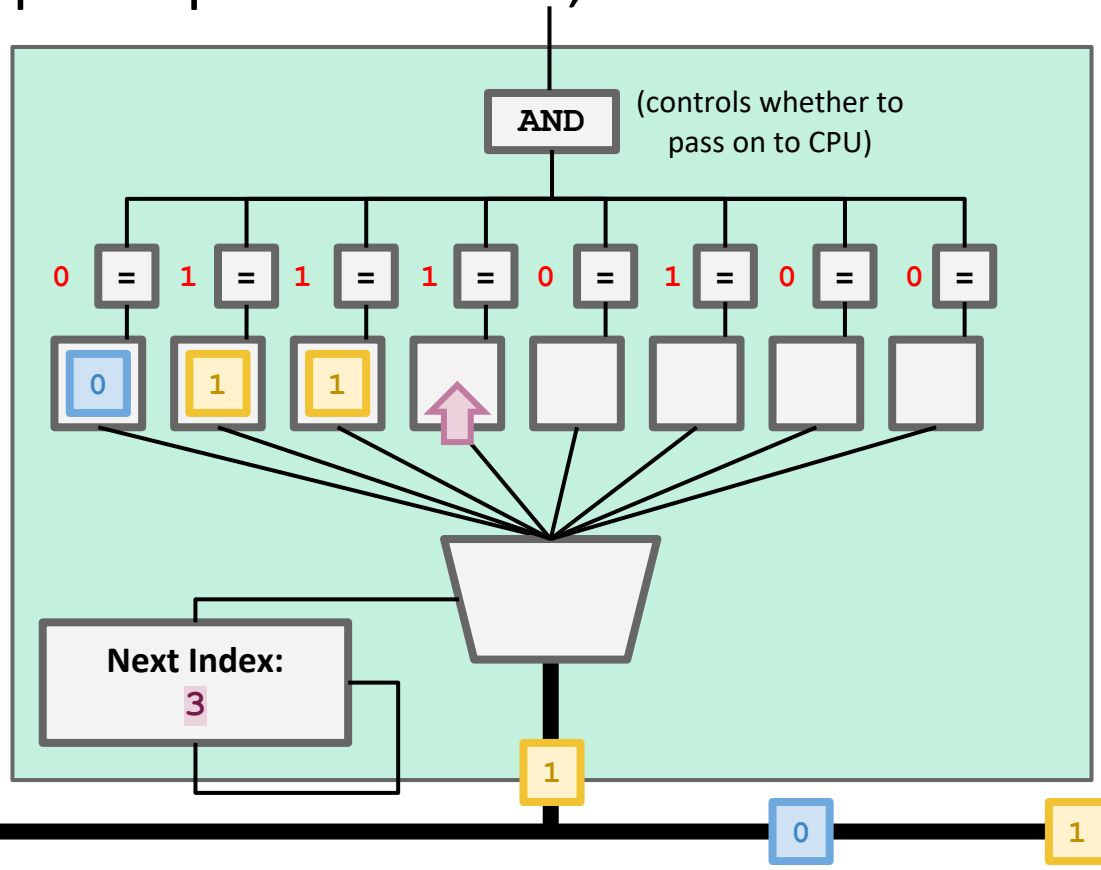
NIC (Network Interface Card)

- We don't want the CPU to waste time always listening to the network wire, especially when it's not even the destination computer
- Solution: **the NIC**—a new piece of the computer dedicated to dealing with the network wire
  - Listens to the network wire until it hears a destination address, checks if it matches this computer, and only sends to CPU if so



NIC Implementation in Your Computer

- Before, we would have to accept NIC as "magic"
- Now, we can imagine exactly how to build this chip, and for a simple implementation, turns out it's doable!



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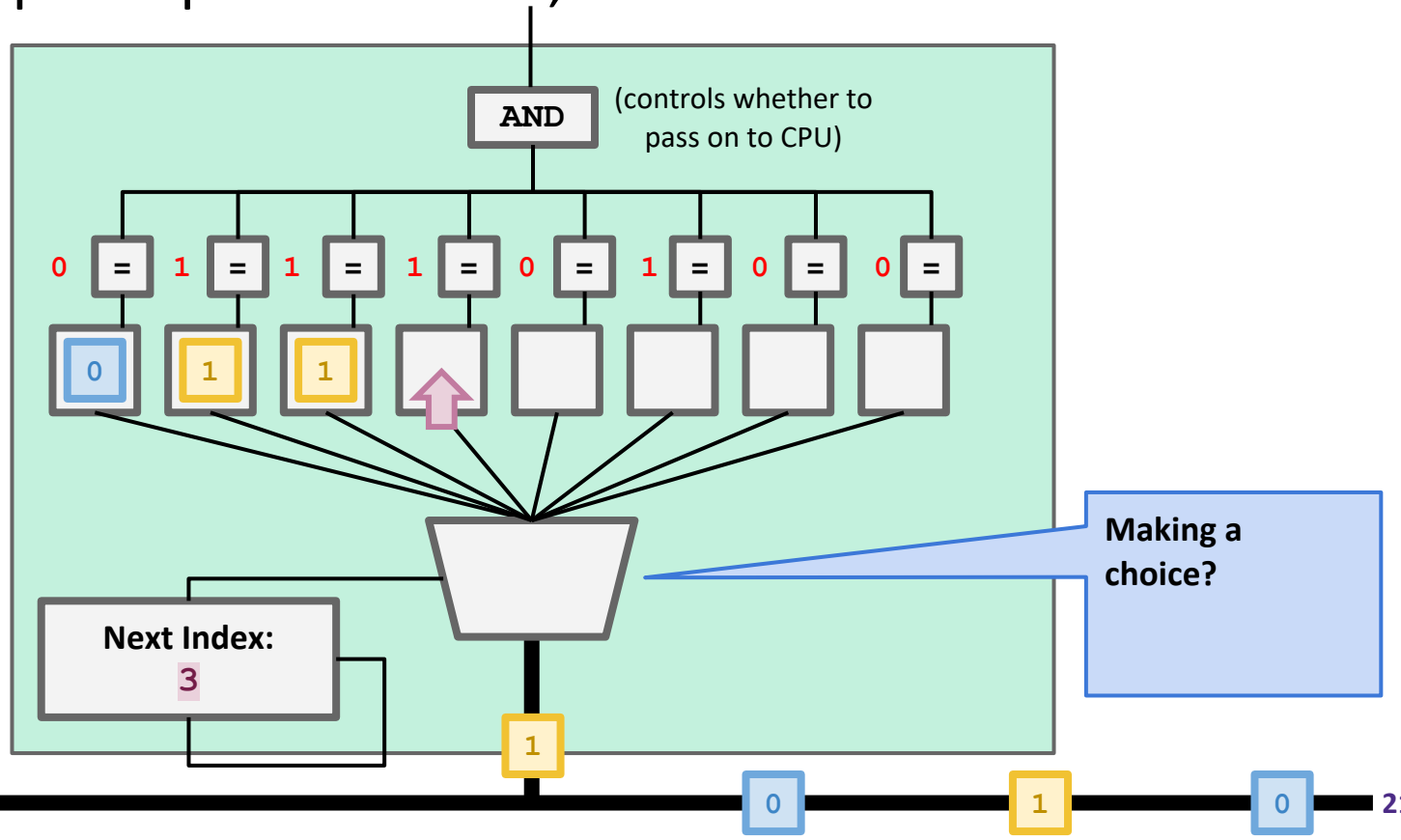

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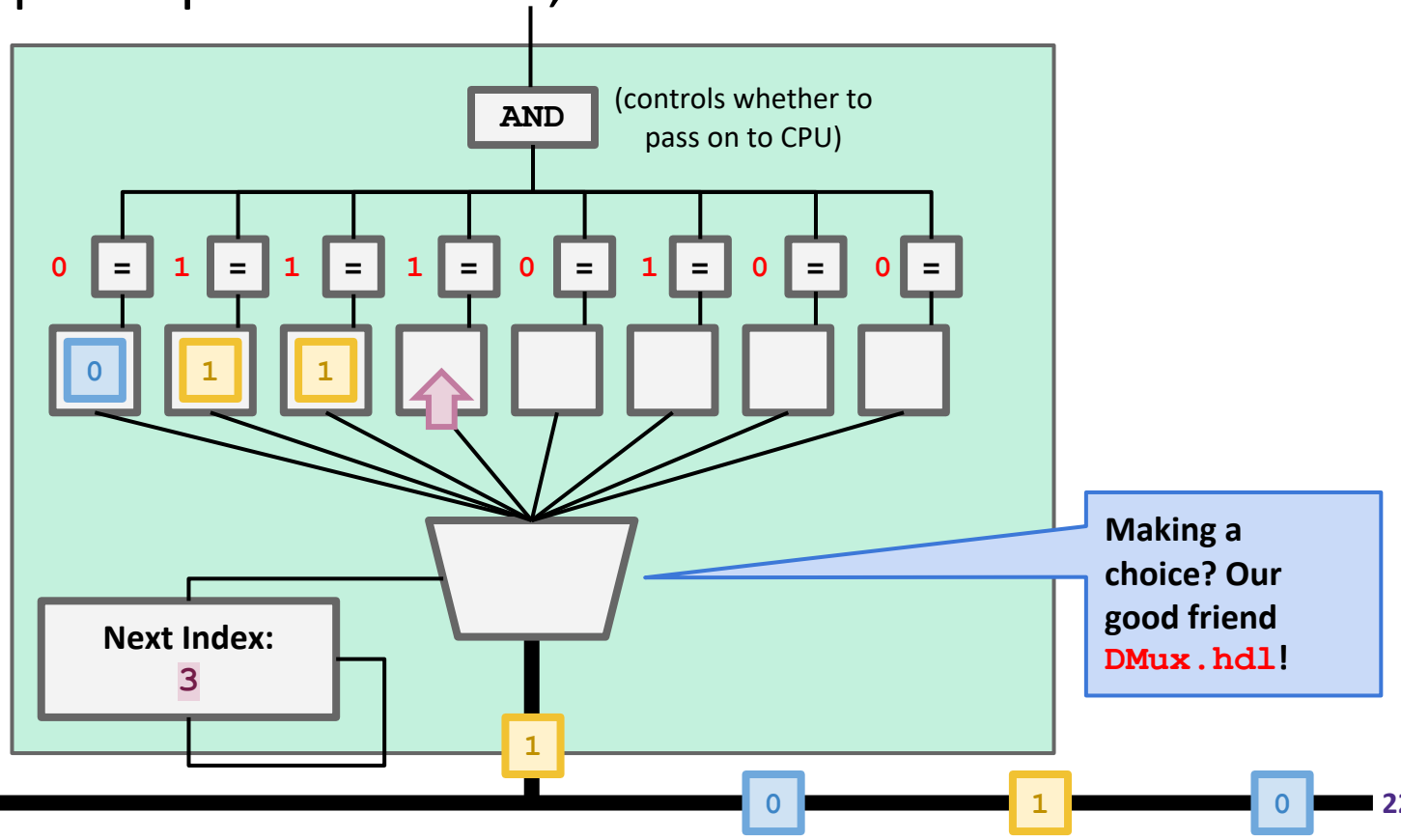

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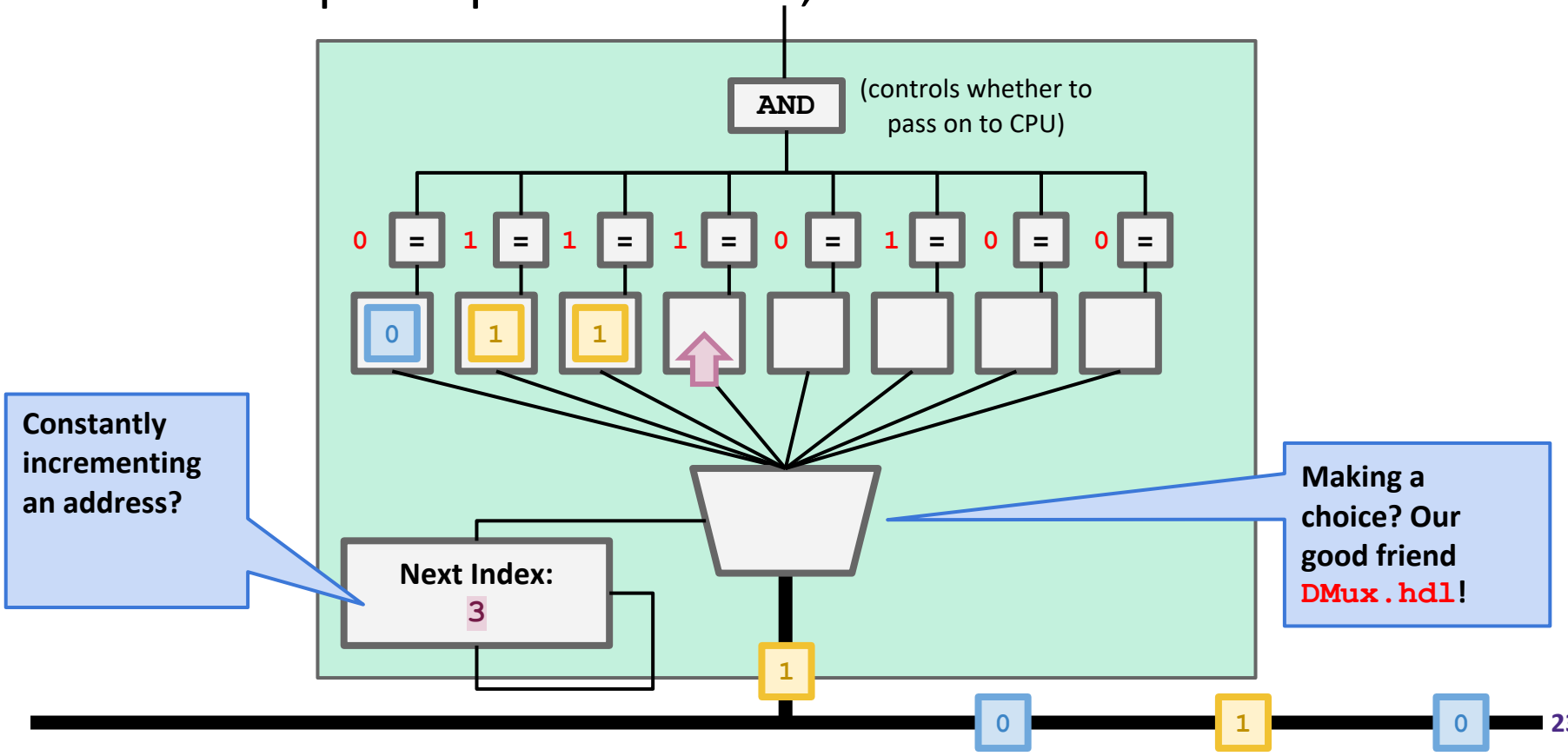

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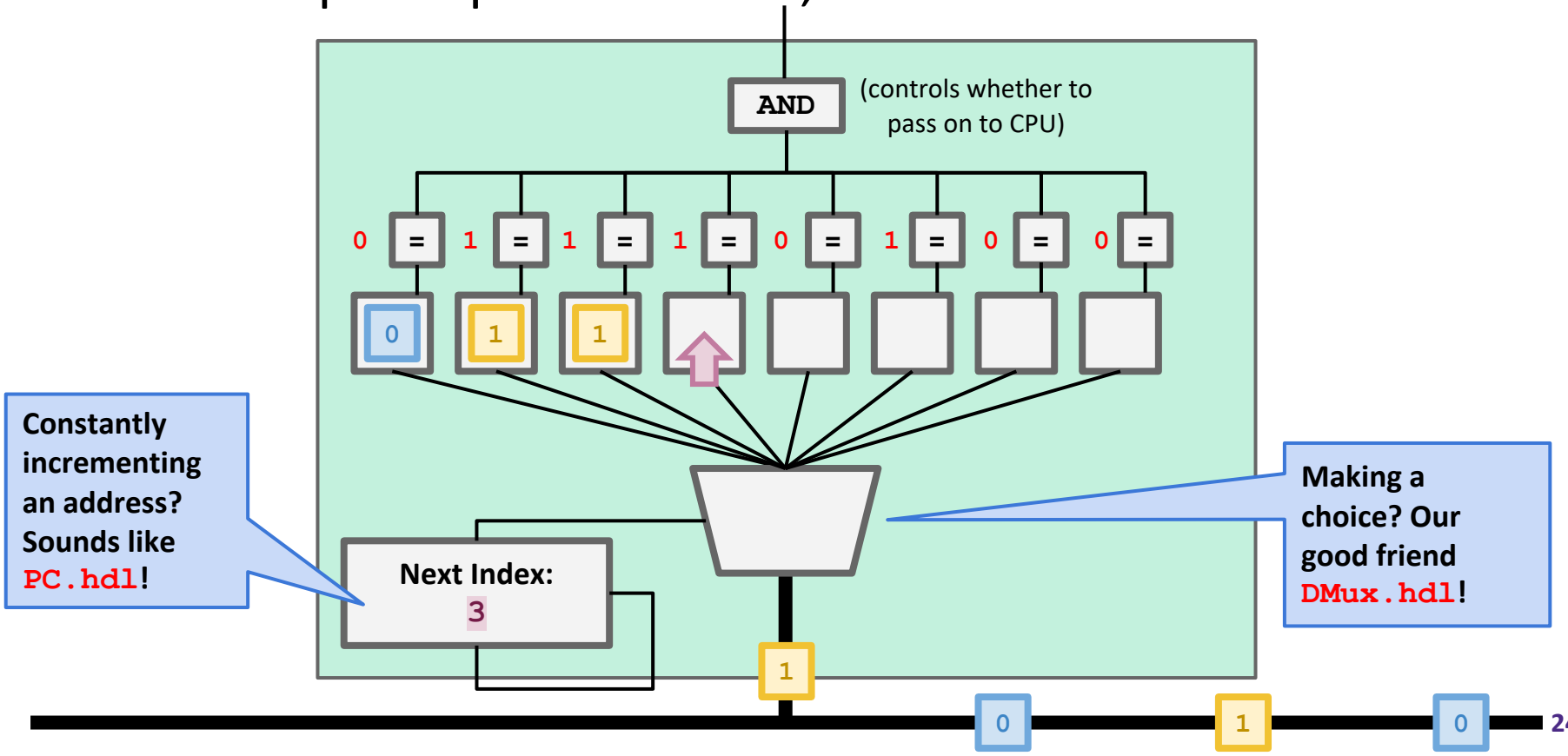

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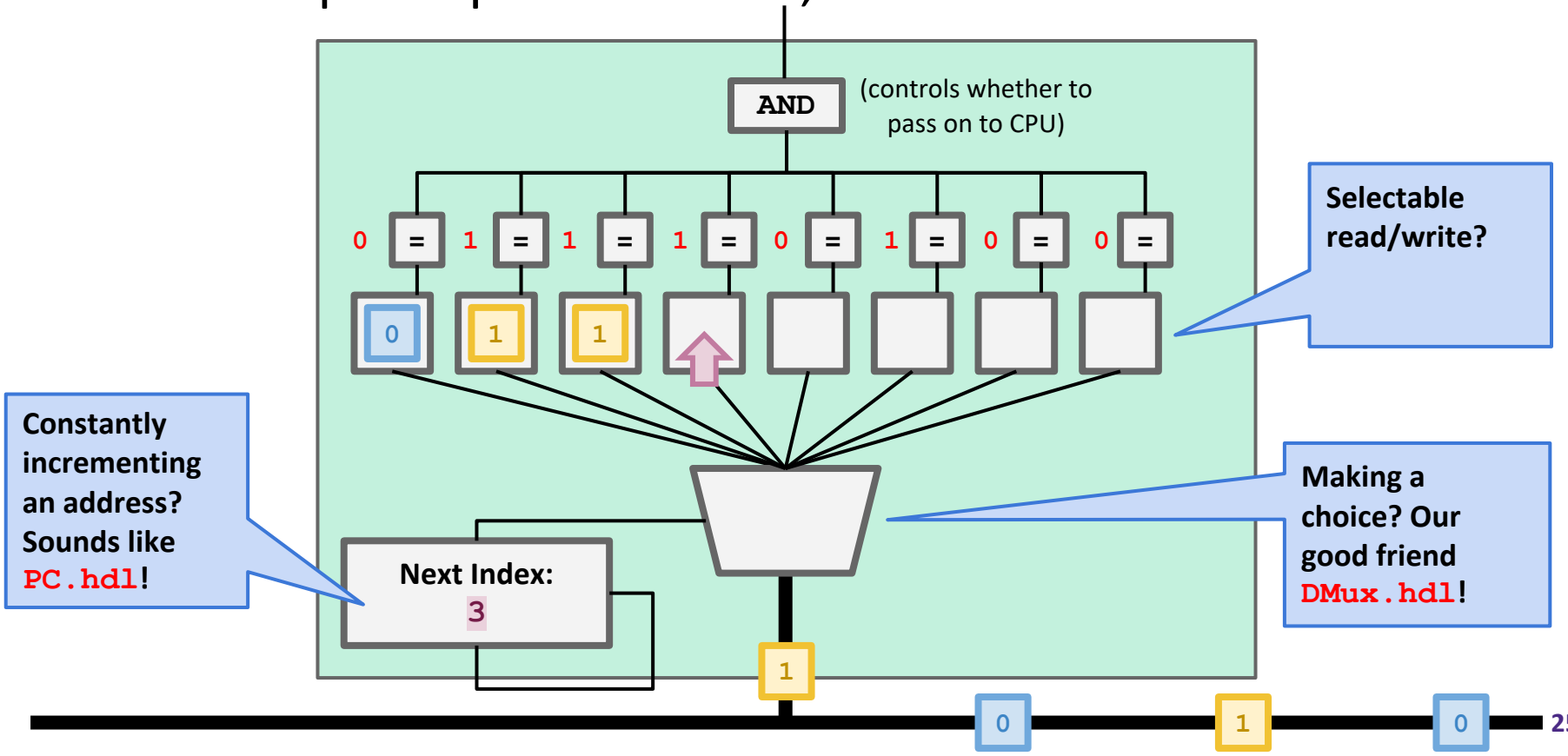

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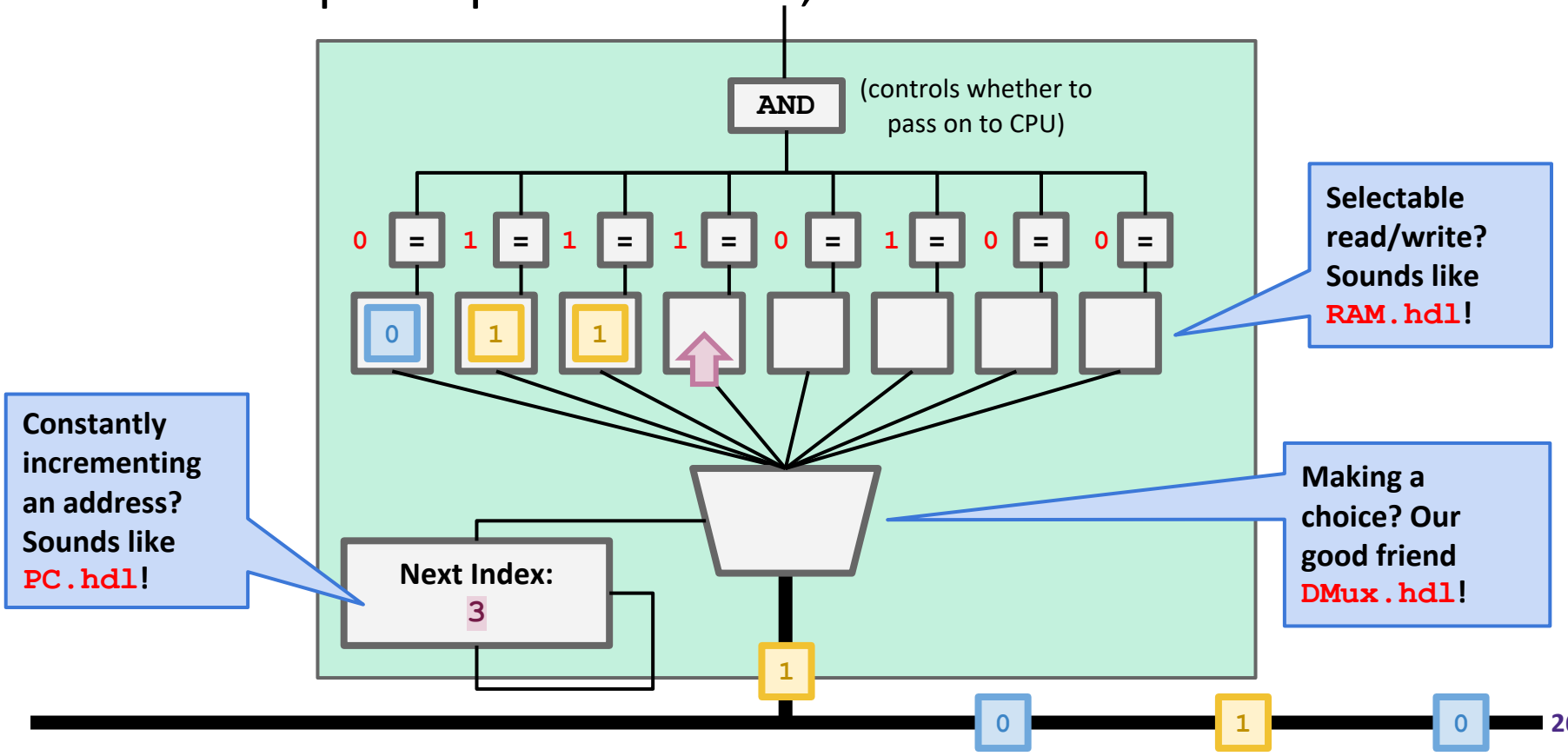

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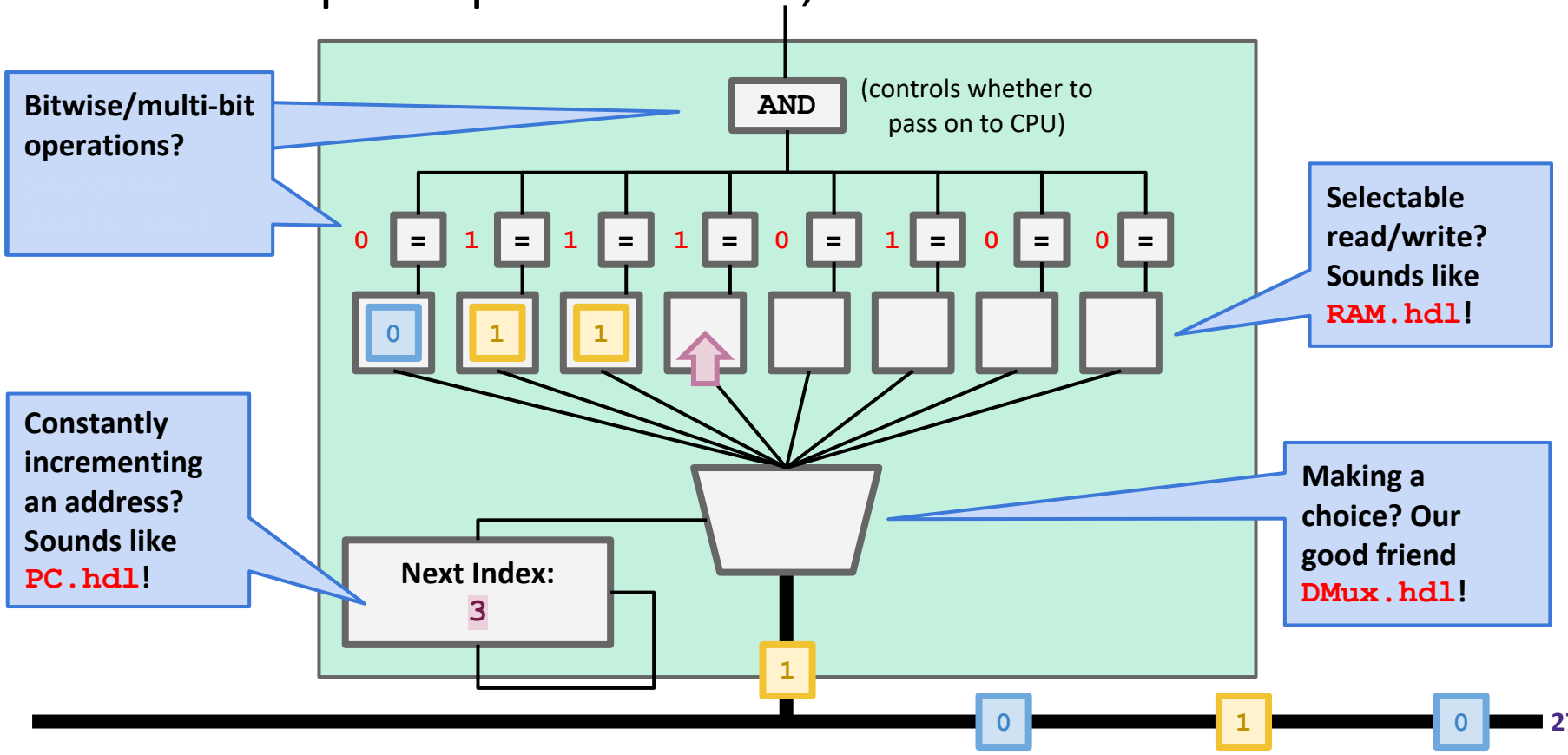

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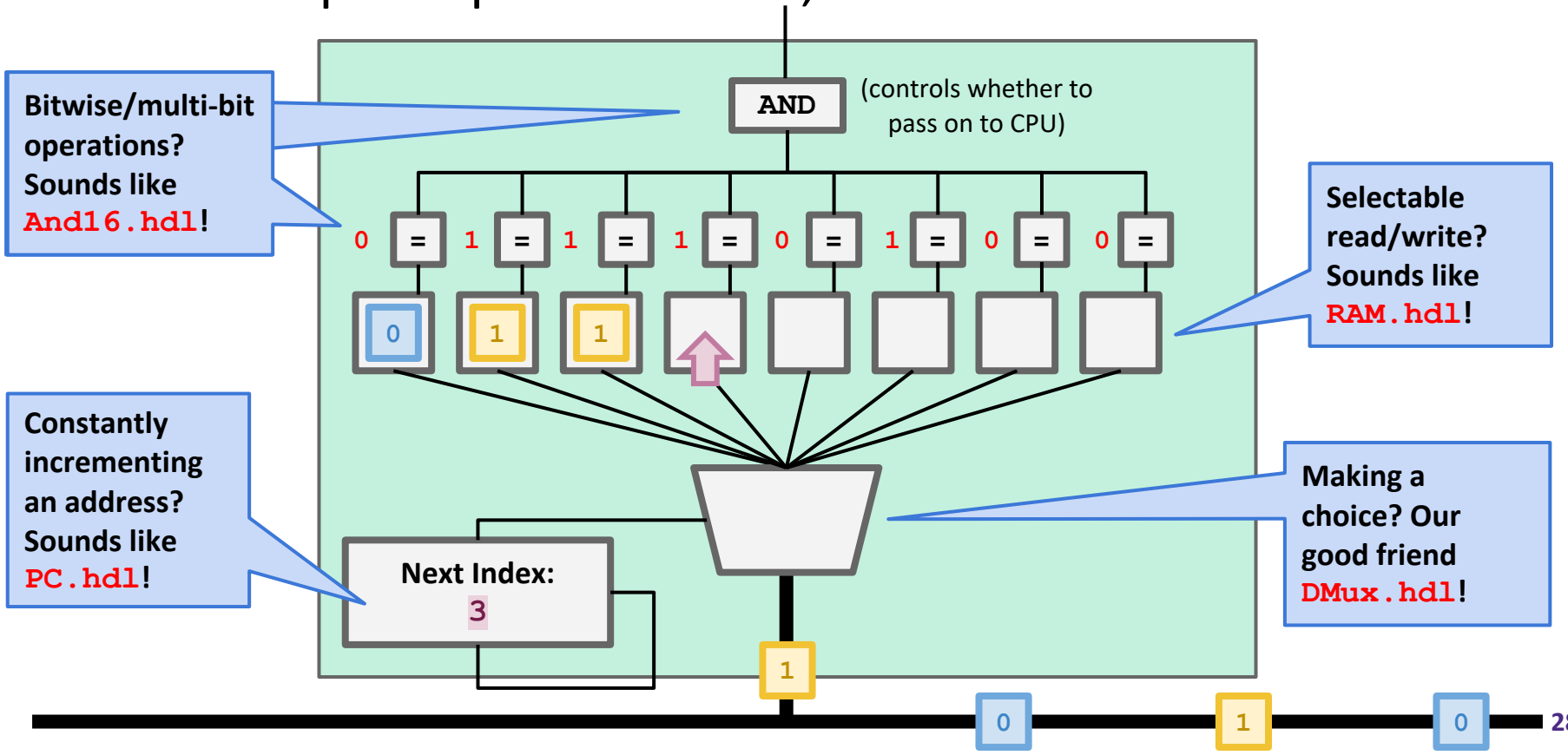
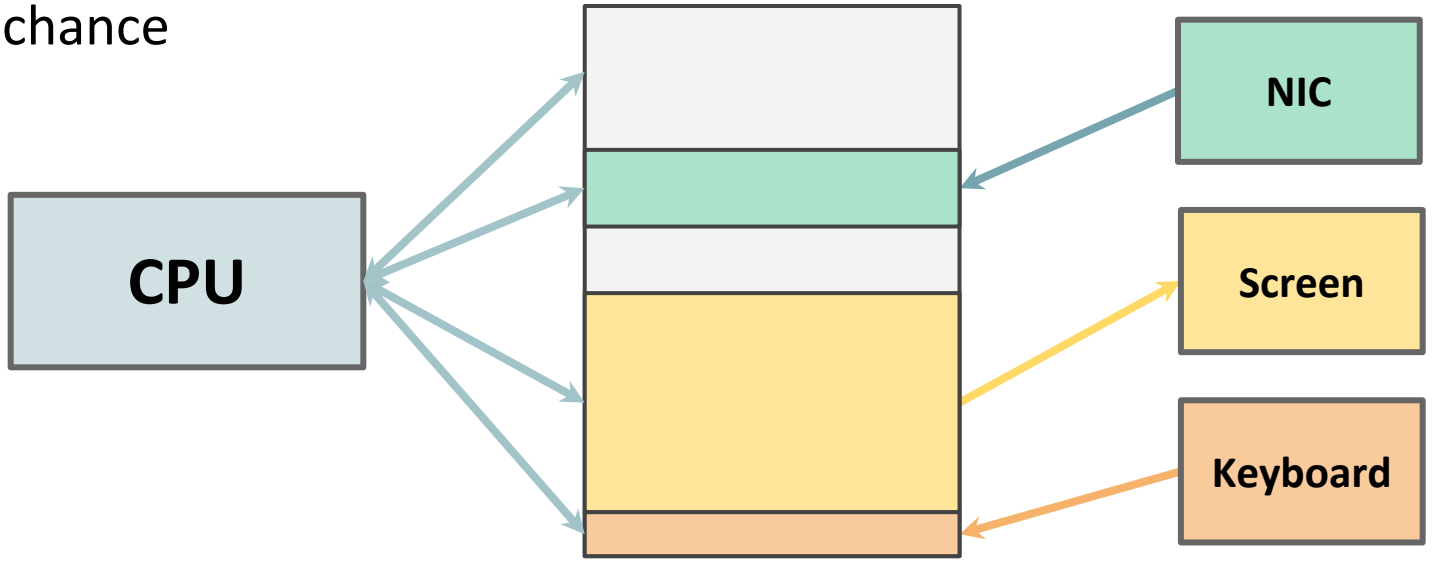


Connecting NIC to Memory

- The keyboard and screen communicated with the CPU via memory maps—agreed-upon regions of RAM that can be read/written by the hardware of the devices themselves
- The NIC could be implemented in the same way
  - Every time the right address is detected, copy the following data into part of RAM where the CPU can retrieve it once it gets a chance



Takeaways: Computer Networks

- The network is fundamentally the same hardware we've been looking at
- Its incredible power comes from scale: how much data and how many computers it connects
  - To manage this complexity, we think of it in layers
- Interfacing with the network can be done with specialized hardware
  - This frees the CPU from monitoring constantly
  - Access data only when needed

Post-Lecture 18 Reminders

- Project Reminders
  - **Project 7, Part II: Professor Meeting Report due tonight (3/2) at 11:59pm**
  - Project 8: Debugging & Implementing a Compiler due next Tuesday (3/7) at 11:59pm
  - Final Project, Part I: E-Portfolio Outline due next Tuesday (3/7) at 11:59pm

- Lecture next Tuesday (3/7) will be held virtually on Zoom
  - Eric will announce on Ed again and post the Zoom link
  - Lecture next Thursday (3/9) will be back in person, led by your TAs