CS 43: Computer Networks

01: Course Administration & Introduction

September 2, 2025

Slides adapted from Kurose & Ross, Kevin Webb, Vasanta Chaganti

Today

- About your instructor
- What is this course about?
- Course Administration
  - Structure & Grading
  - Academic Honesty
  - How does this class work?
- Introduction [If time]
  - What does it take to transmit a packet over the Internet?

Hi! I'm Dr. Ranysha Ware! I'm an award-winning computer scientist.

You can call me:

Dr. Ware / Professor Ware (she / they)

- PhD in CS: Carnegie Mellon University
- MS in CS: UMass Amherst
- BS in CS: SUNY New Paltz
- Thesis work: How to modernize congestion control algorithm evaluations?

https://www.cs.swarthmore.edu/~rware/

RANYSHA WARE AWARDED PRIZE FOR WORK ON INTERNET FAIRNESS

Friday, February 7, 2020 - by Virginia Alvino Young

Ranysha Ware, a Ph.D. student in Carnegie Mellon University's **Computer Science Department**, has received a 2020 **Applied Networking Research Prize** (ANRP) from the **Internet Engineering Task Force**. She is being recognized for her work on congestion control fairness.

Ware leads a research project on internet fairness that recently demonstrated how Google's new congestion control algorithm (CCA) **gives an unfair advantage** to its own traffic, and **proposed new guidelines** for developing future algorithms.

She is one of six recipients of the ANRP this year, and one of two who will present their work March 21–27 at the IETF 107 in Vancouver, British Columbia.

Ware earned her M.S. in computer science from the University of Massachusetts Amherst. She is a Facebook Emerging Scholar and two-time recipient of the National GEM Consortium Fellowship.

What This Class is about

How networks (focus on the Internet) work

Mobile phone

www.google.com

Google Server

The Internet is Exciting!

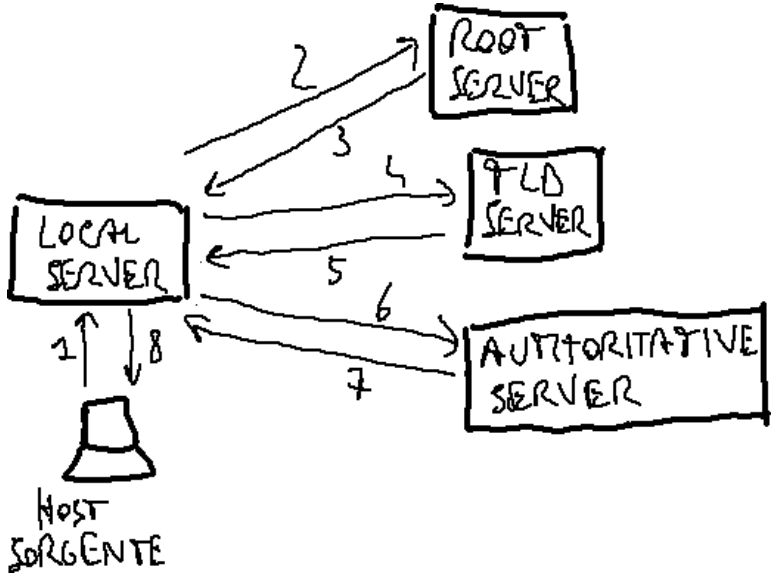
- Rapid growth and success.
  - 1977: 111 machines on Internet
  - 1981: 213
  - 1983: 562
  - 1986: 5000
  - 1989: 10,000
  - 1992: 1,000,000
  - 2001: 150 – 175 million
  - 2002: > 200 million
  - 2024: ~ 5.5 billion (>4B are phones/tablets)

What This Class is about

How applications that use networks work:

HTTP 404 Error Message

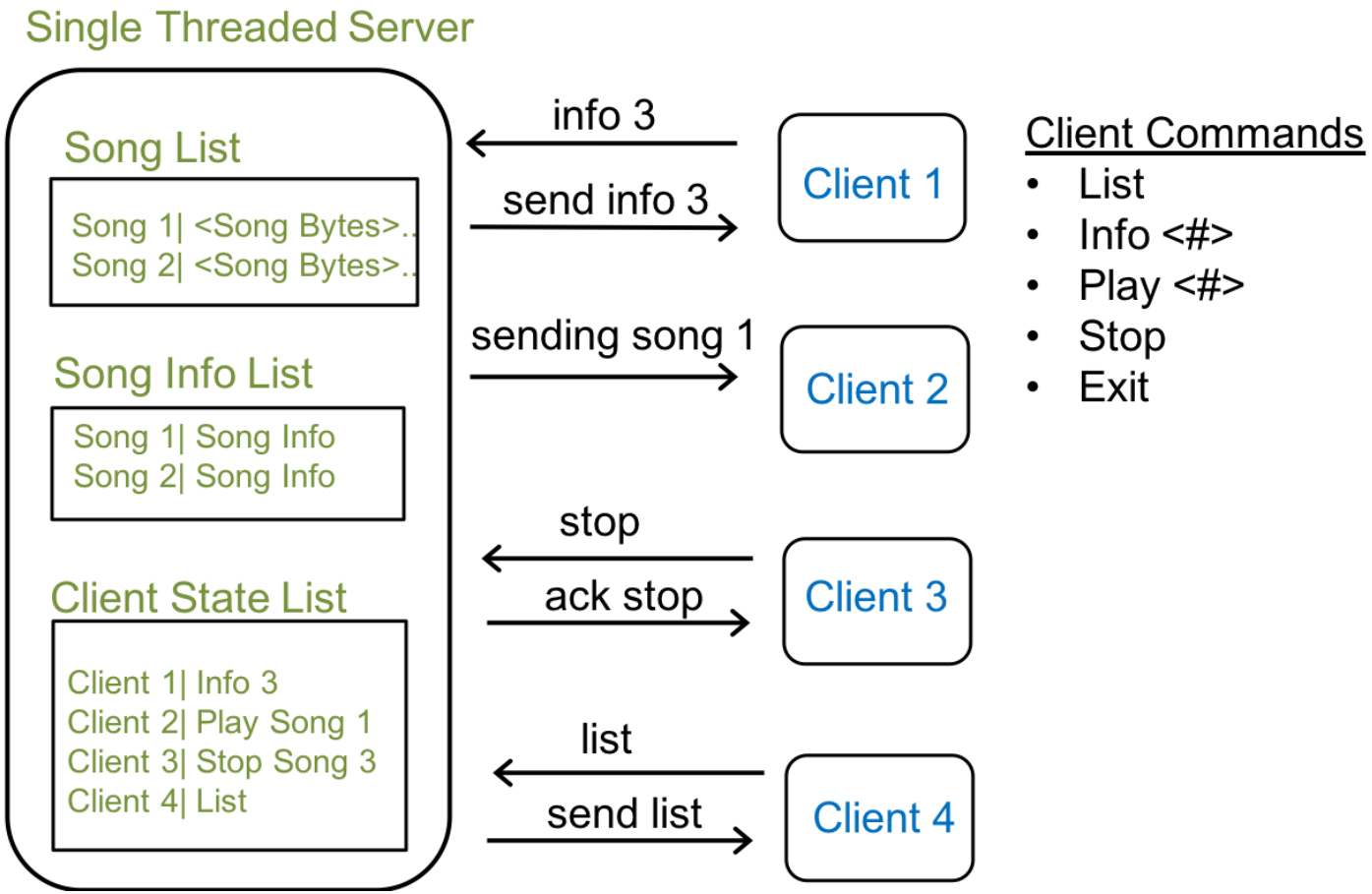
Email



DNS

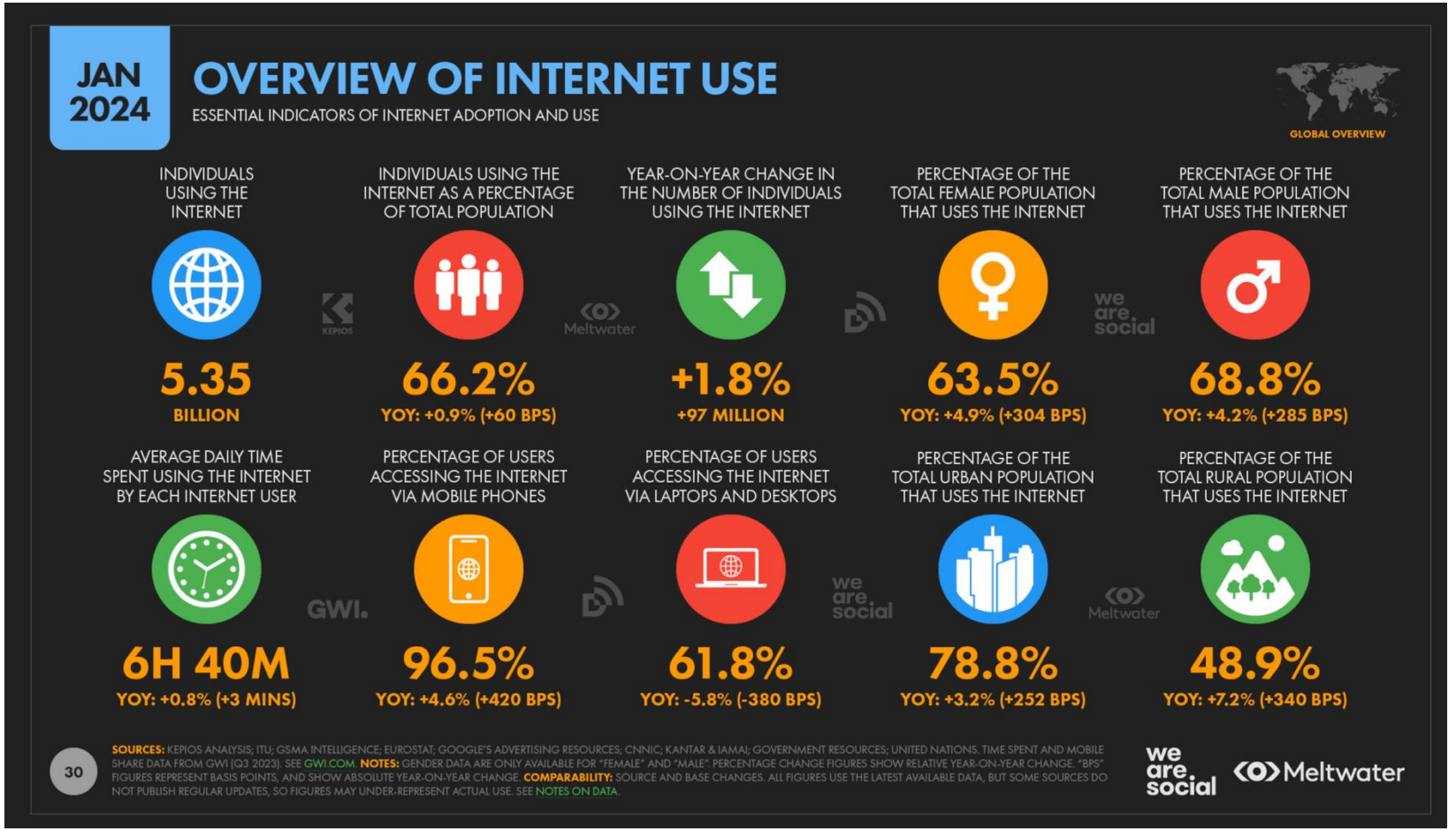
What This Class is about

How to write programs that communicate over networks



What This Class is about

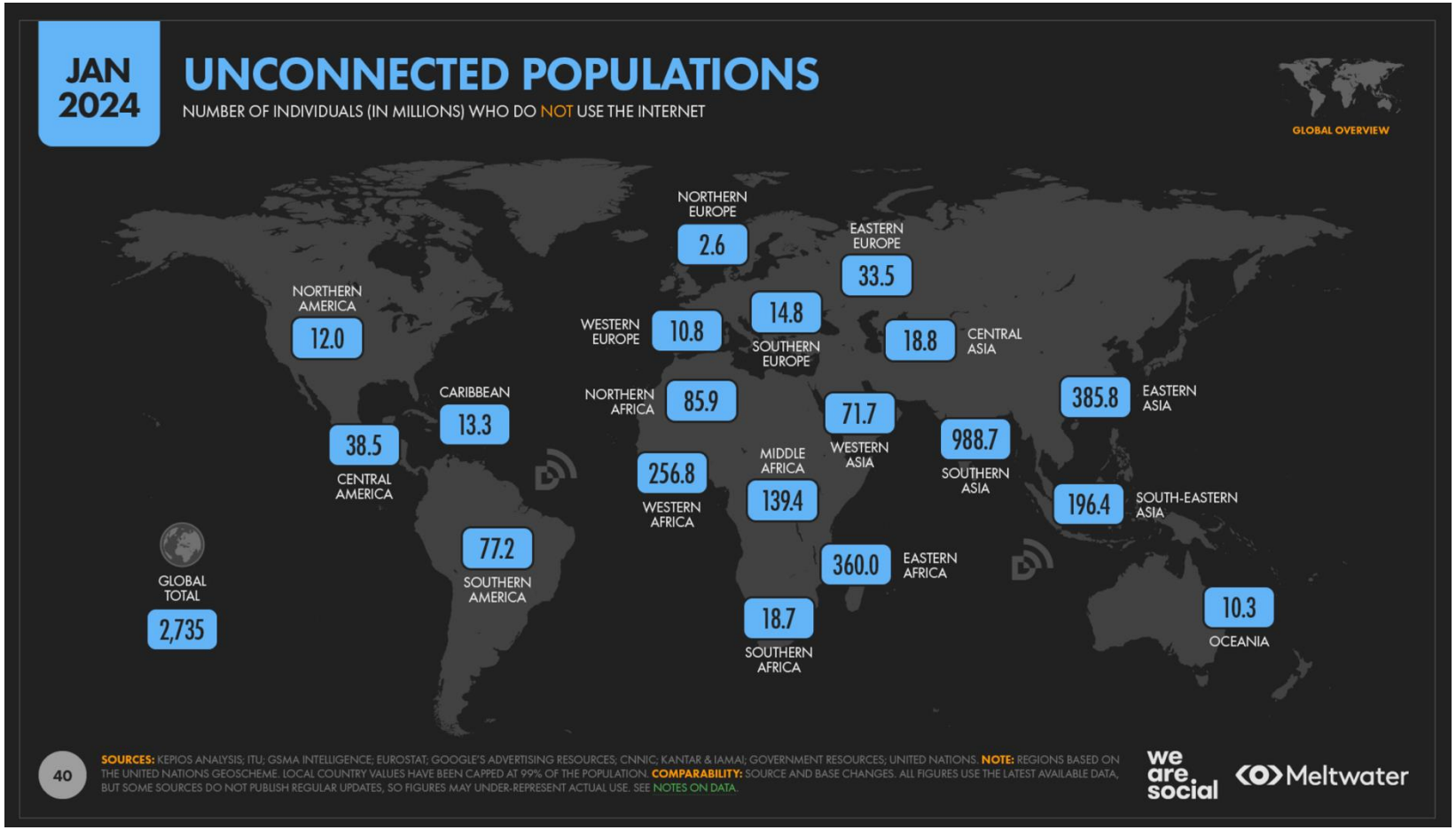
How different protocols, policies, and mechanisms interact.



https://datareportal.com/reports/digital-2024-global-overview-report

What This Class is about

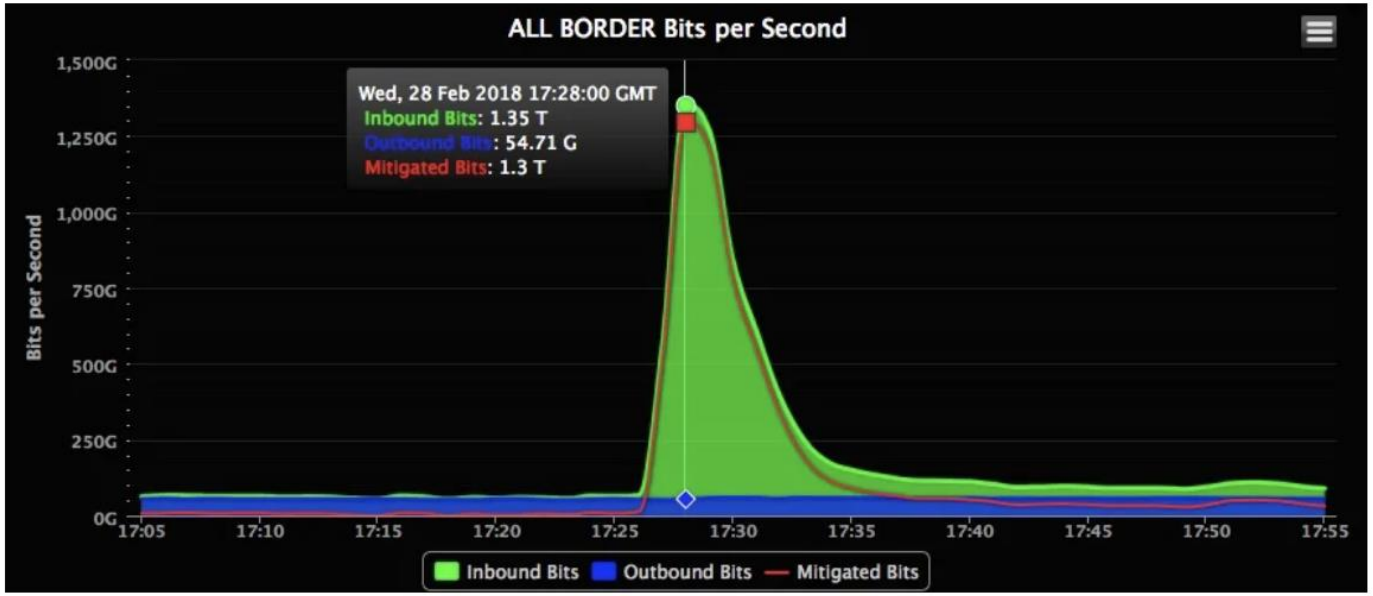
How different protocols, policies, and mechanisms interact.



https://datareportal.com/reports/digital-2024-global-overview-report

What This Class is about

How different protocols, policies, and mechanisms interact.



Real-time traffic from the DDoS attack. AKAMAI

Github, 2018: One of the largest DDoS Attacks

- *1.3 Tbps, packet sending rate: 126.9 million per second.*

https://www.cloudflare.com/learning/ddos/memcached-ddos-attack/

What This Class is about

How different protocols, policies, and mechanisms interact.

Image Courtesy: Ars Technica

Net Neutrality: ISPs vs Content Providers

https://arstechnica.com/tech-policy/2017/07/facebook-alphabet-amazon-and-netflix-called-to-testify-on-net-neutrality/

What This Class is about

How different protocols, policies, and mechanisms interact.

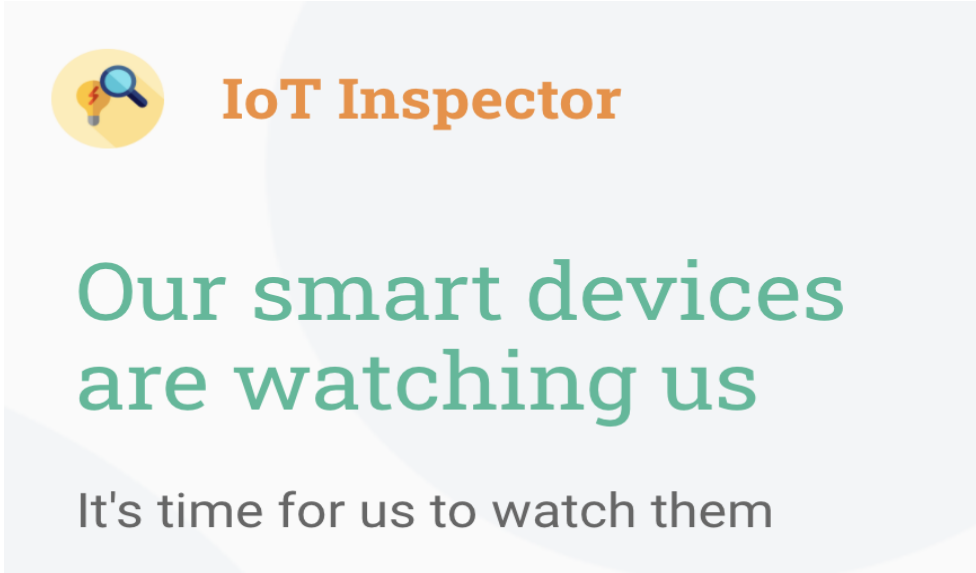


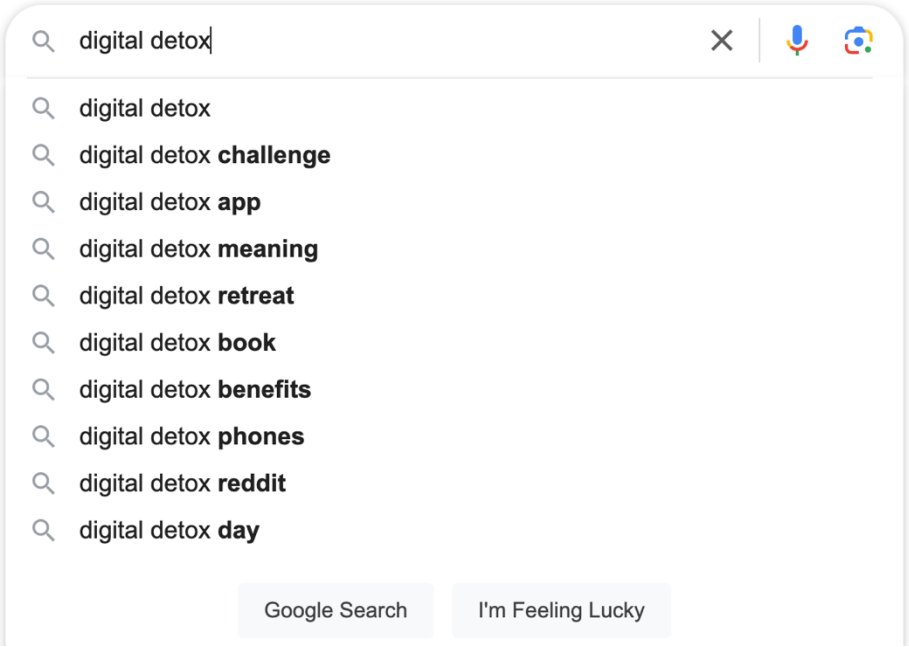
Image Courtesy: https://iotinspector.org/

Network Privacy

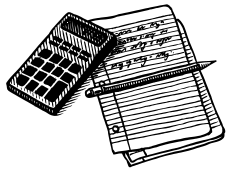
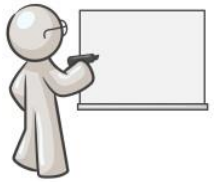
https://www.nytimes.com/2020/01/07/opinion/location-tracking-privacy.html

Why should you care?

When was the last time you went 24 hours without going online?



Classes: Interactive Classes with Peer Instruction

Readings	Reading Quiz	Instruction	Labs/Exam
			
First Exposure	Gauge understanding	Explore, add context, Provide feedback	Show Knowledge Mastery

- You do the “easy” part before class
- Class is reserved for interactive, customized experiences
- To learn, YOU must actively work with a problem and construct your own understanding of it

Peer Instruction: In-class discussions

- Based on readings for that day
- Individually think about the questions (1 -2 minutes)
- Discuss: Analyze problems with your group
  - (5 – 10 minutes)
  - Practice analyzing, talking about challenging concepts
  - Reach consensus
  - If you have questions, raise your hand and I'll come over
- Class-wide discussions Led by YOU (students) – tell us what you talked about in discussion that everyone should know!

Clickers!

- Lets you vote on questions in real time.
- Like pub trivia, except the subject is always networking ☺

Clicker Registration

https://forms.gle/y3s84nZpfaFpwpMK9

If you don't register your clicker, I can't give you credit for participation!

Participation scores count from week 2 (via paper hand-ins or clickers)

Locating your Clicker ID

iClicker with Hexadecimal ID

Hexadecimal number: numbers 0-9 and letters A – F

ID is also visible when you turn your clicker on.

What do I expect from you?

- Do the reading (and/or watching videos) and complete reading quizzes before class
- Show up to class and participate using iClickers and worksheets
- Take biweekly quizzes about the prior 2 weeks content
  - Quizzes will cover everything from labs, reading, in class discussion
- Attend lab and do the lab assignments on time
- Take the final exam
- Do your own work, don’t use AI tools to short circuit your learning
- Communication! Ask for help, attend OH, ask questions on Ed
- Read all course announcements on Ed
- Take care of yourself and be respectful of yourself and others

What can you expect from you?

- Respond to Ed posts within 24 hours (not on the weekends!)
- Office hours
  - Mondays 3pm-430pm in Martin 238
  - Thursdays 10am-11am in Martin 338
- Post slides on the course website before class
- Adhere to policies as outlined in the syllabus
- Post assignments and return graded assignments in a timely manner
- Treat you with kindness and respect
- Be receptive to constructive feedback

Resources: EdStem

- Edstem Q&A Forum: https://edstem.org/us/courses/85057/discussion
- All announcements will be on EdStem
- Use Edstem!
  - asking questions (not asked previously)
  - answering questions (you've worked through)
  - when in doubt (e.g., posting code)– leave a private message
  - Response within a day (except on the weekends)

- Email ***doesn't scale***: course related questions/comments edstem/office hours

Course Grade Distribution

- 5% Readings Quizzes (based on assigned readings/videos)
- 5% Class and Lab Attendance
- 30% Quizzes
- 20% Final Exam
- 40% Lab assignments

Course Grade Distribution

- 5% Readings Quizzes (based on assigned readings/videos)
- 5% Class and Lab Attendance
- 30% Quizzes
- 20% Final Exam
- 40% Lab assignments

I will drop your three lowest quizzes/no-shows.

How to succeed in an Upper Level Class

- Reading comprehension!
- Pre-Reqs: 31 & 35 and ACTUALLY applying material you learnt from those classes
  - remember valgrind and gdb? they'll be your best friends … again!
- Working through code, problem sets, and reading material like you would in the "real-world"
  - making sure you read and understand required readings/videos
  - try/brainstorm different approaches...
  - growth mindset

- It’s been a weird couple of years …and it’s okay to not be on top of everything
- Please reach out to:
  - Me (Porf. Ware)
  - Your Academic Advisors
  - Student Deans
  - Counseling & Psychological Services

by KC Green

Policies: Late Submissions

- Lab Lateness
  - 2 days of extra time for the semester (granularity of days)
  - Email AFTER you are done!
  - No Email: Grade whatever is present at the deadline.

Policies: Academic Dishonesty

- Collaboration
  - **You may discuss approaches, not solutions**
  - You must submit your own work
  - Exams may include questions on programming
- Cheating
  - We take this very seriously. It can have a negative impact on your course grade, your GPA and your record at Swarthmore and beyond.
  - **Don't do it!**

Policies: Academic Dishonesty

- Few examples of cheating on labs
  - Screen sharing with folks not in your lab partnership
  - “Let me read my code out to you, or share the exact API for a particular function”
  - Share in words the content in your code: “I first used strncpy to copy the string up to n bytes, and then appended a null character at the end”
  - I’m applying a “security mindset” to “think like an attacker” on course assessment infrastructure

Policies: Academic Dishonesty

- Examples of how not to cheat:
  - Behave as though you are a CS ninja
  - “What approaches did you try so far?”, “Looks like you have gotten more of the string than you need to, use man pages to look at other string functions”
  - Don’t know how to help your friend? Ask them to post to Edstem to the class or send a post privately to me.

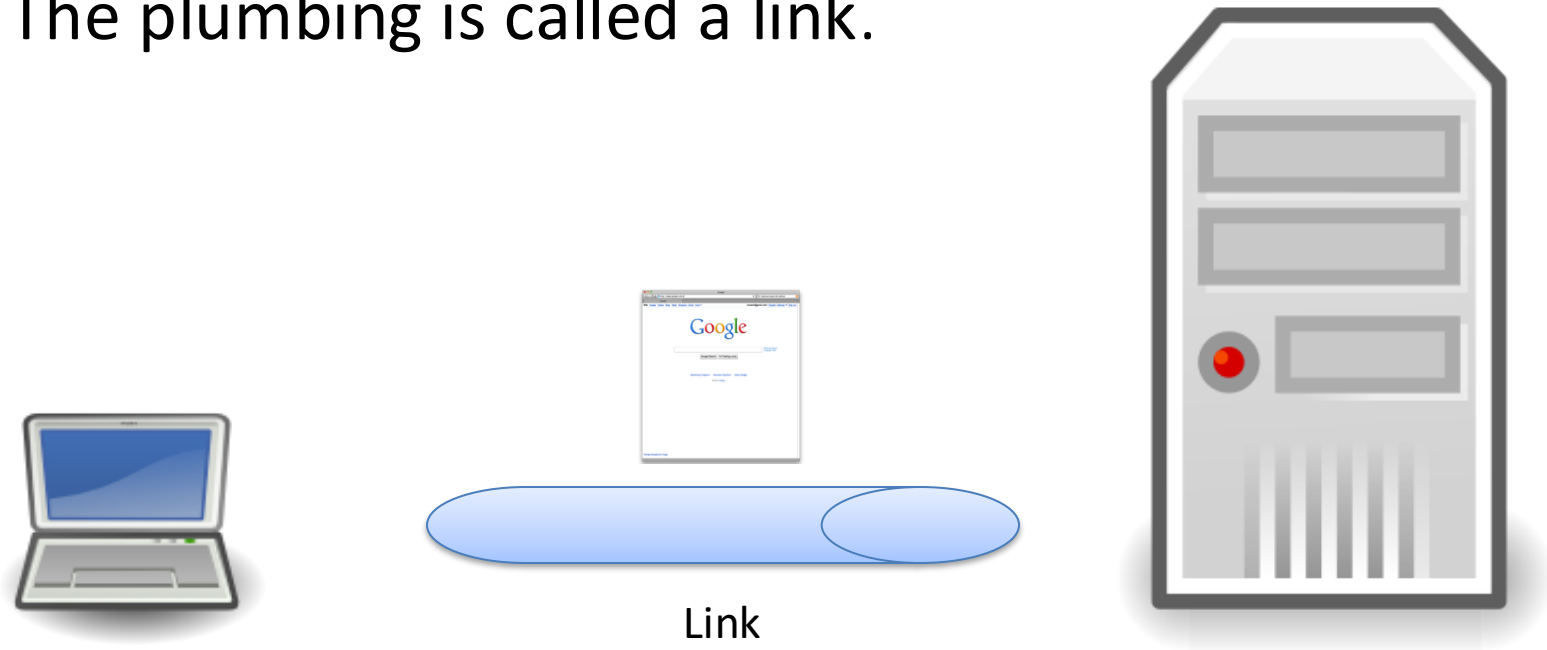
Administrative Questions?

- All of this info is on the class website
- Feel free to ask Q&A on the Edstem discussion board
- It's my first time semester here.
  Would be great to get (constructive) feedback!

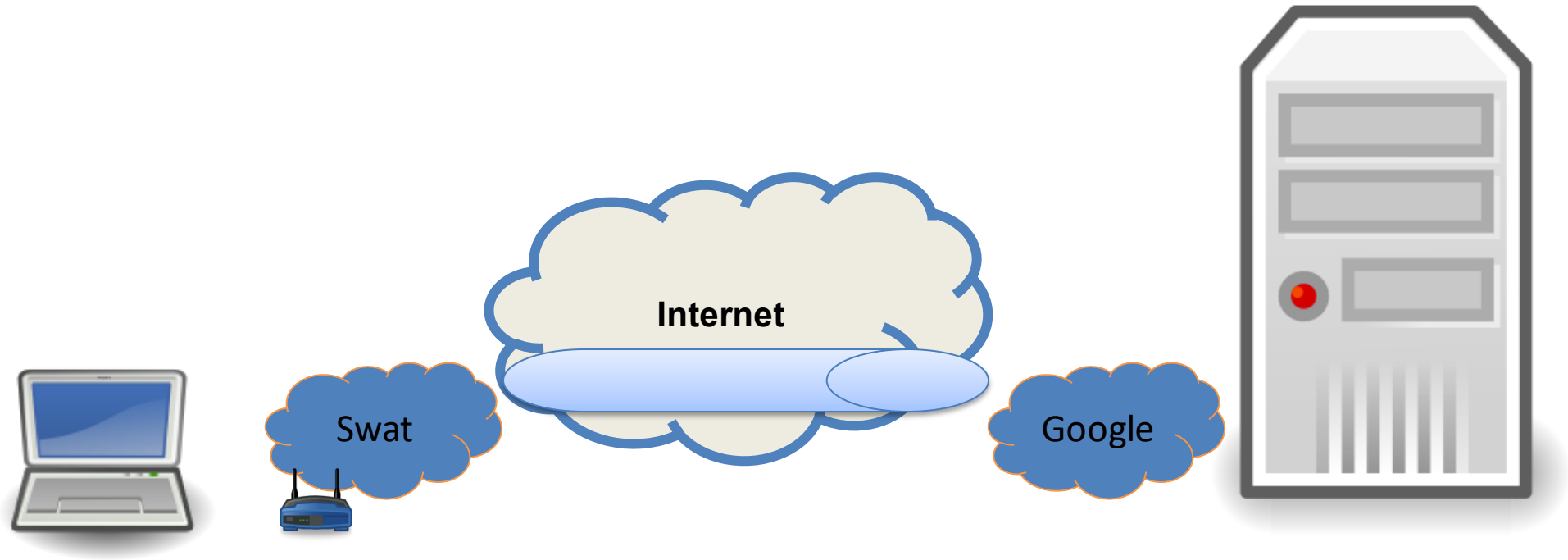
A "Simple" Task

Send information from one computer to another

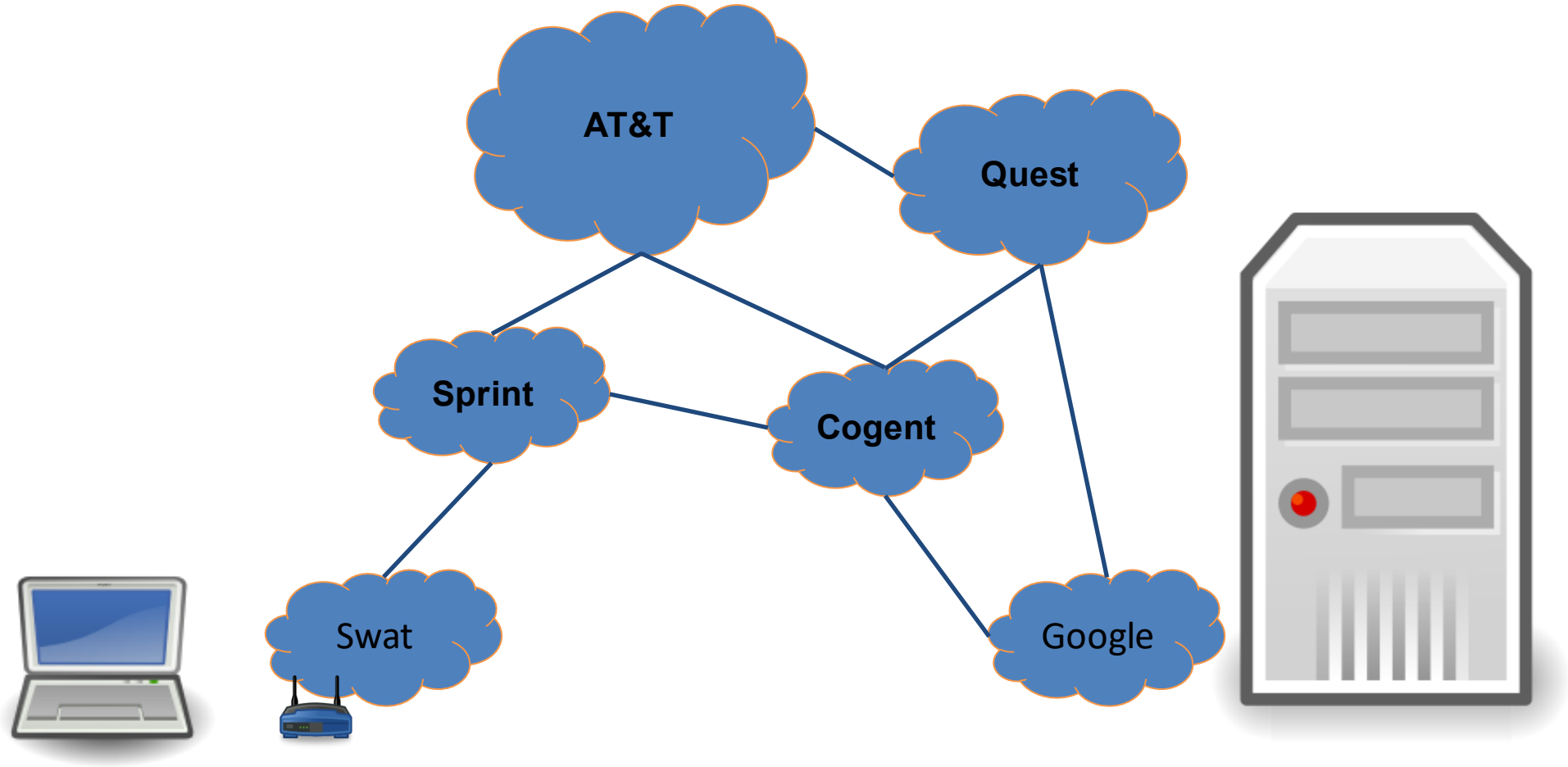
- hosts: endpoints of a network
- The plumbing is called a link.



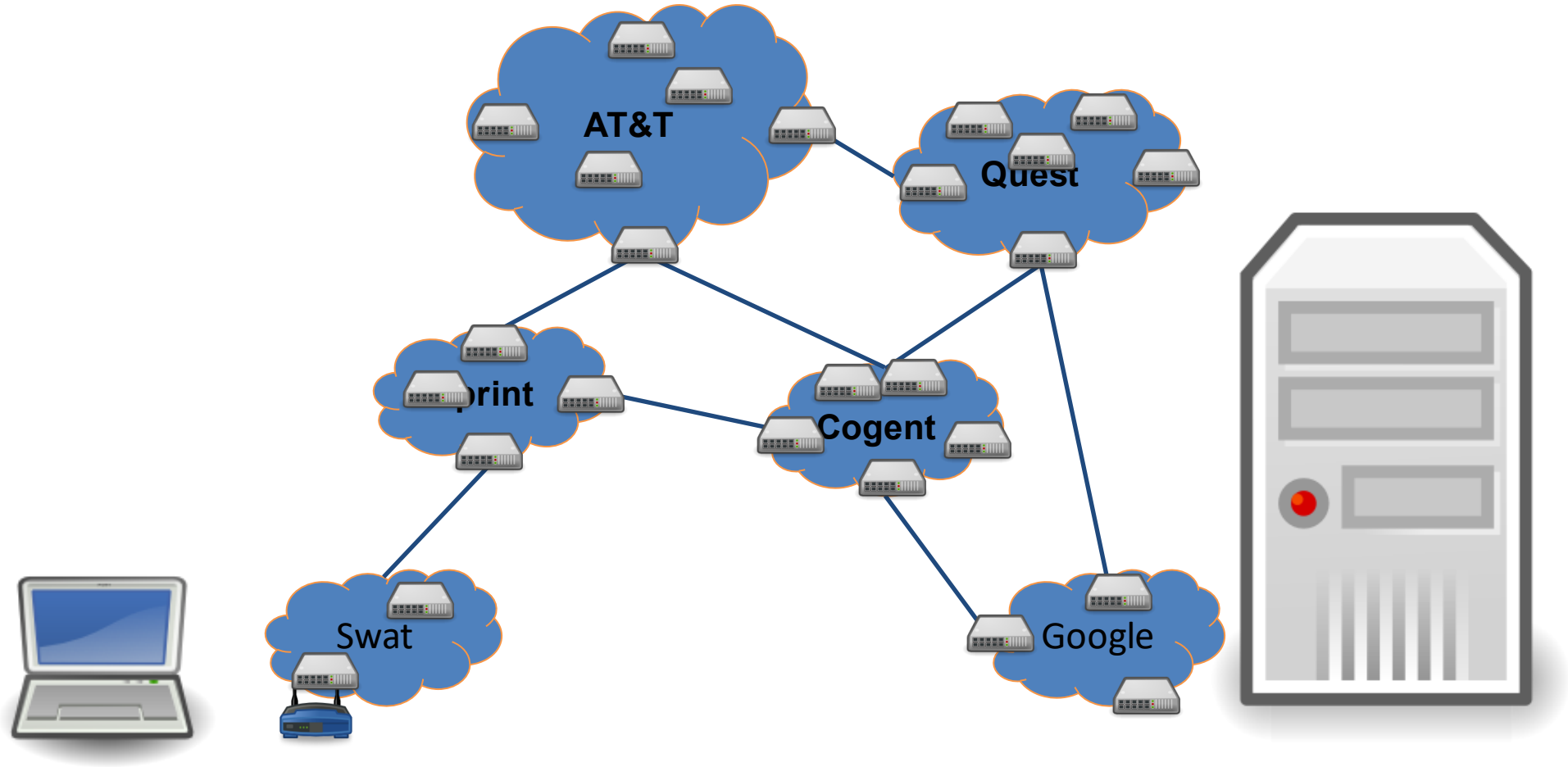
Not Really So Simple…



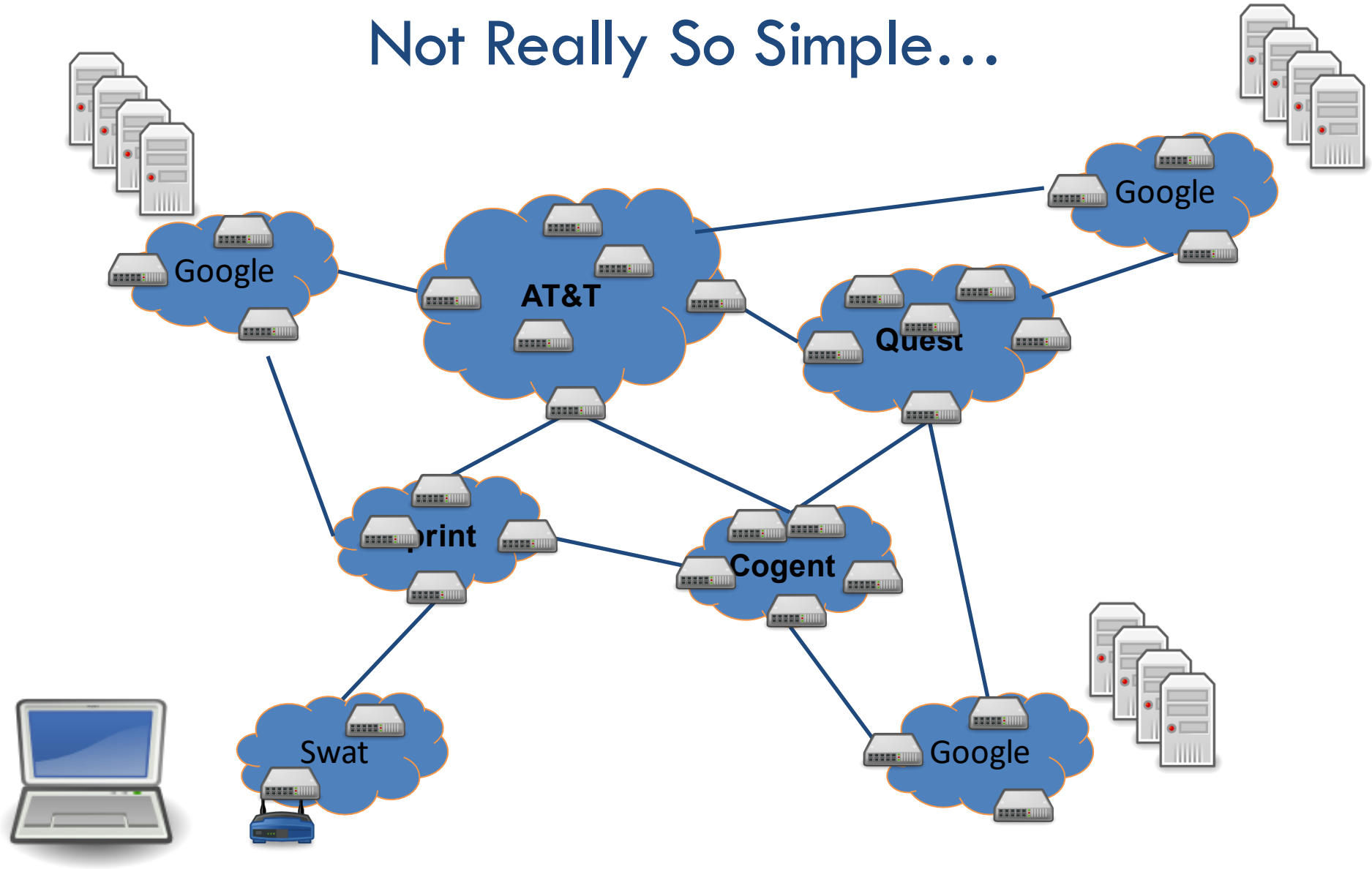
Not Really So Simple…



Not Really So Simple…



Not Really So Simple…



We only need…

- Manage complexity and scale up
  - Layering abstraction: divide responsibility
  - Protocols: standardize behavior for interoperability

We only need…

- Manage complexity and scale up
- Naming and addressing
  - Agreeing on how to describe/express a host, application, network, etc.

We only need…

- Manage complexity and scale up
- Naming and addressing
- Moving data to the destination
  - Routing: deciding how to get it there
  - Forwarding: copying data across devices/links

We only need…

- Manage complexity and scale up
- Naming and addressing
- Moving data to the destination
- Reliability and fault tolerance
  - How can we guarantee that the data arrives?
  - How do we handle link or device failures?

We only need…

- Manage complexity and scale up
- Naming and addressing
- Moving data to the destination
- Reliability and fault tolerance
- Resource allocation, Security, Privacy..

We only need…

- Manage complexity and scale up
- Naming and addressing
- Moving data to the destination
- Reliability and fault tolerance
- Resource allocation, Security, Privacy..

(Lots of others too.)

TODO List

- Reading: Protocols
  - Sections 1.1, 1.5
  - Reading Quiz: https://forms.gle/o2EtnL7SWLQjYVQp7
- iClicker registration: https://forms.gle/89eA9682c6wU57Qb6
- Assignment 0: https://forms.gle/2rmWjK7Ee2n5YXWJ8
- Policy Quiz: https://forms.gle/wQZfyQ16xT49EBAr5