CS 43: Computer Networks

01: Course Administration & Introduction

August 31, 2026



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

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?

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Hi! I’m Prof. Ranysha Ware!

You can call me:

Professor Ware / Dr. 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?



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.

Today

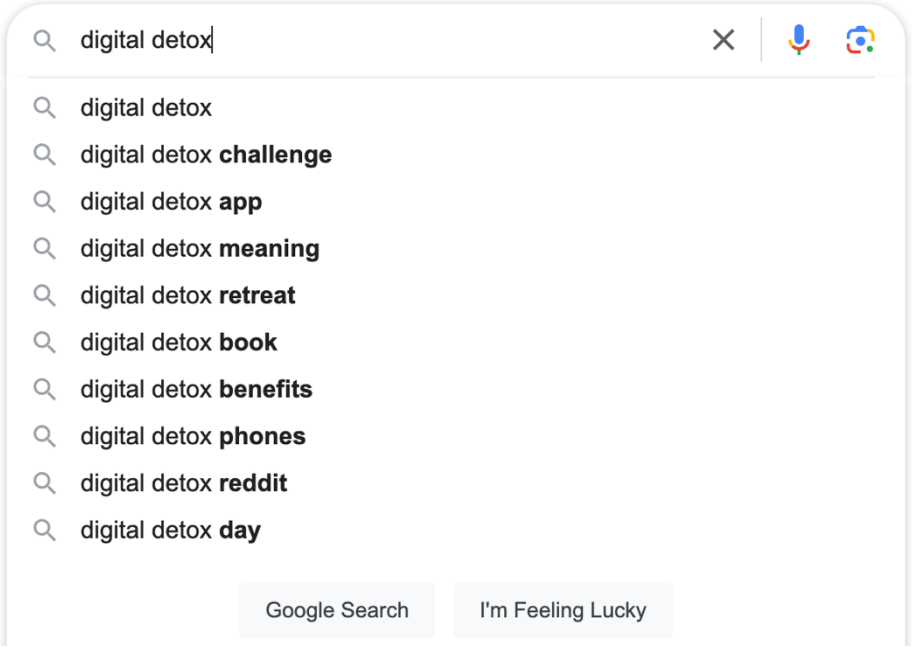
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What is the Internet?

Why should you care?

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

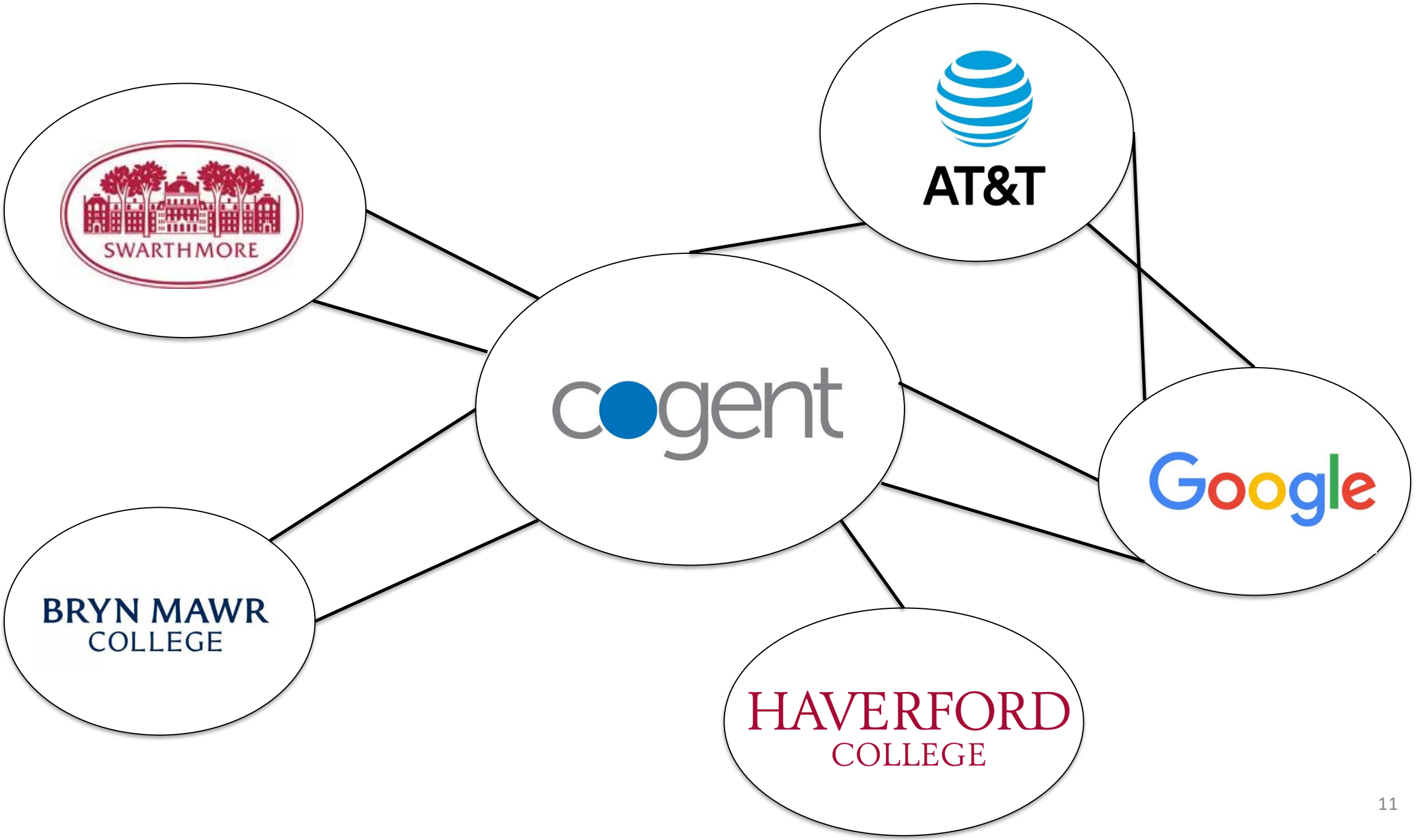


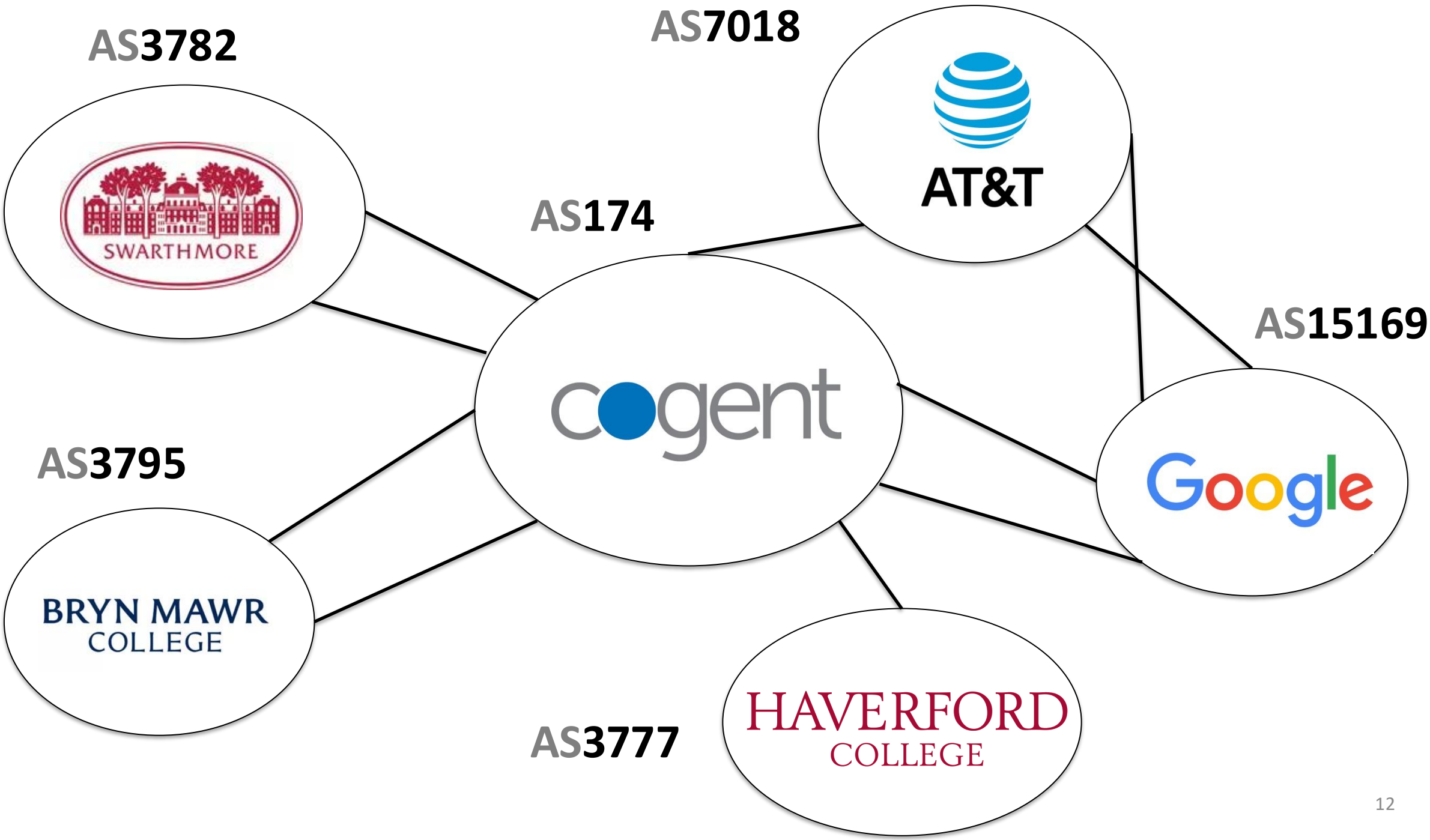


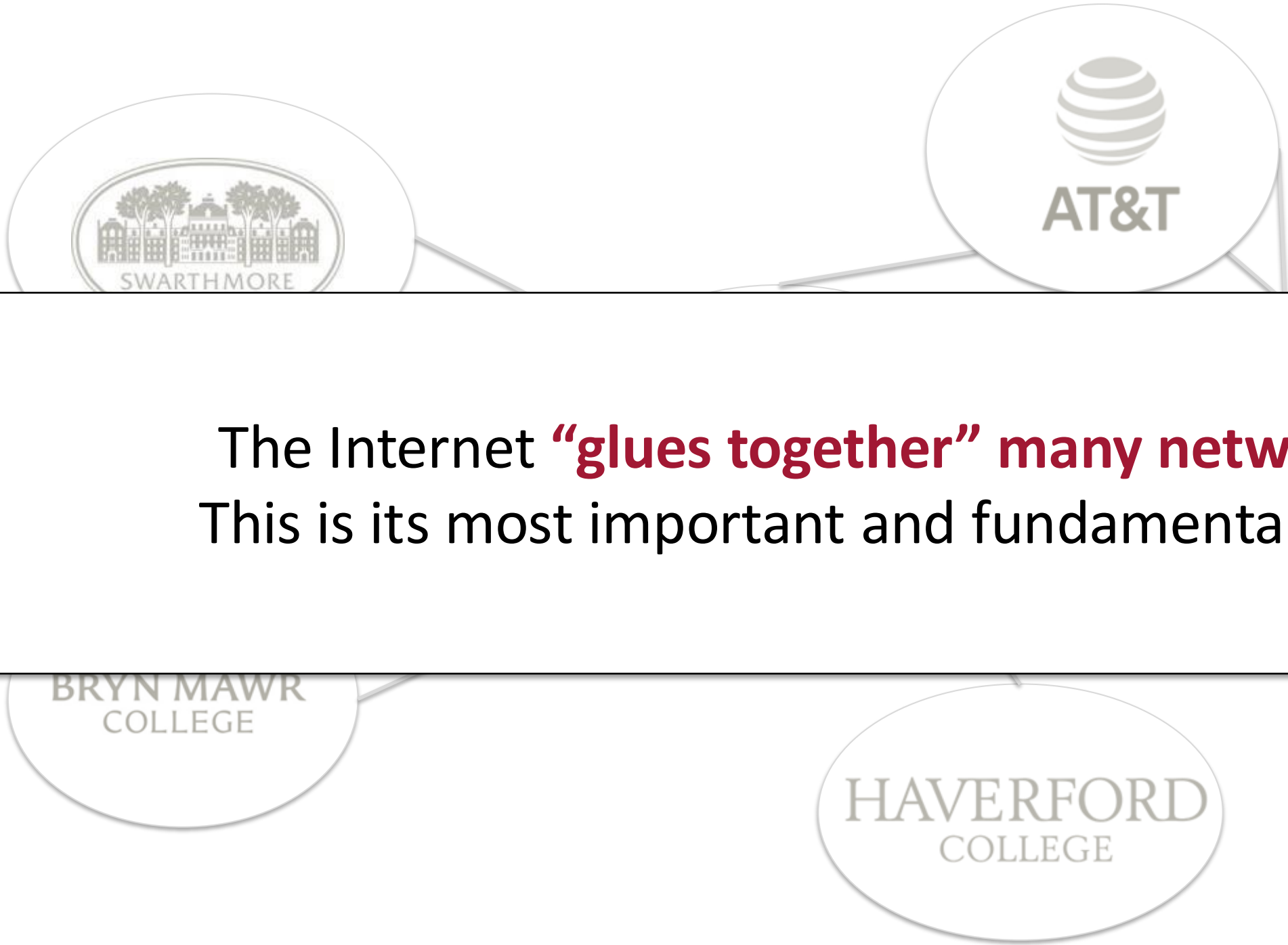
Internet

Internet

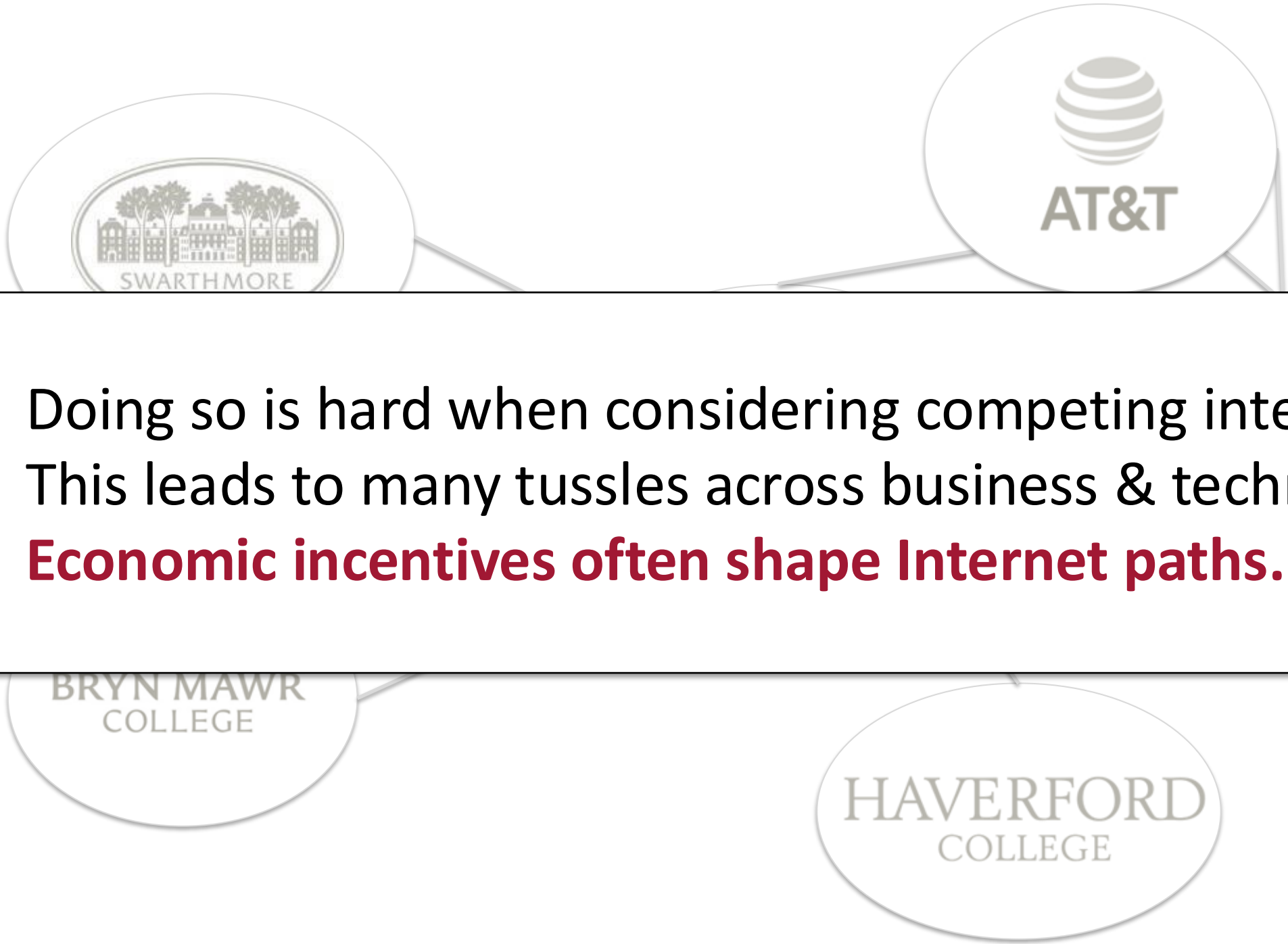
A network of ***networks***


SWARTHMORE
AT&T
cogent
Google
BRYN MAWR
COLLEGE
HAVERFORD
COLLEGE


AS3782
SWARTHMORE
AS7018
AT&T
AS174
cogent
AS15169
Google
AS3795
BRYN MAWR
COLLEGE
AS3777
HAVERFORD
COLLEGE



The Internet **"glues together" many networks**.
This is its most important and fundamental goal.



Doing so is hard when considering competing interests.
This leads to many tussles across business & technology.
Economic incentives often shape Internet paths.

The Internet is huge

The Internet is huge

~ 80,000 # of interconnected networks as of August 2026

~ 30 billion estimated* # of connected devices in 2023

~ 13 exabytes estimated* daily global IP traffic in 2022

~ 82% of all Internet traffic estimated* percentage of video traffic in 2022

* Cisco Visual Networking Index

The Internet is **incredibly diverse**

what

it connects

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what	**devices**	phones, servers, sensors, pacemakers, …
it connects	**applications**	web, video streaming, gaming, …
	users	governments, operators, malicious, …

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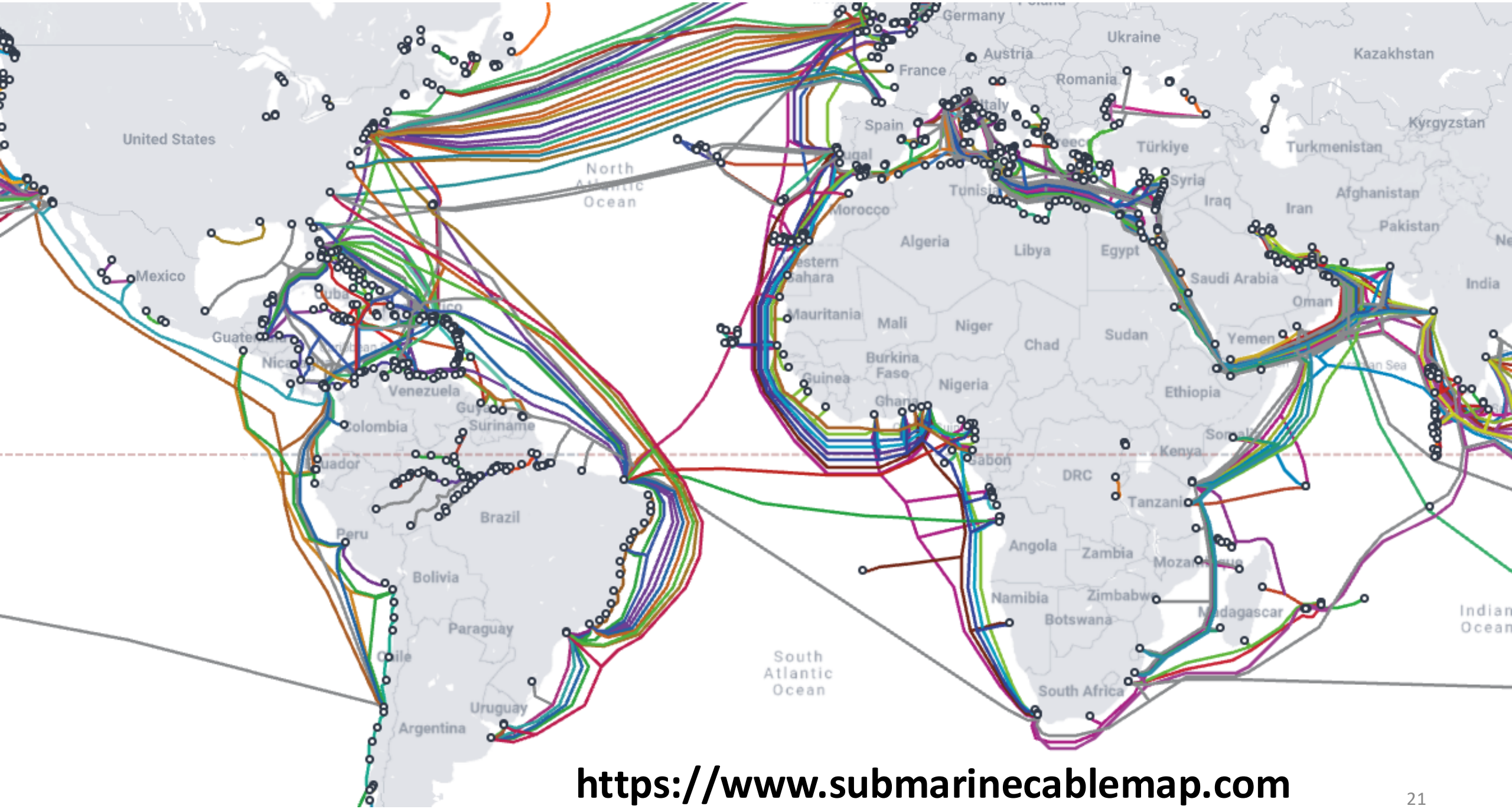
how

it connects

The Internet is **incredibly diverse**

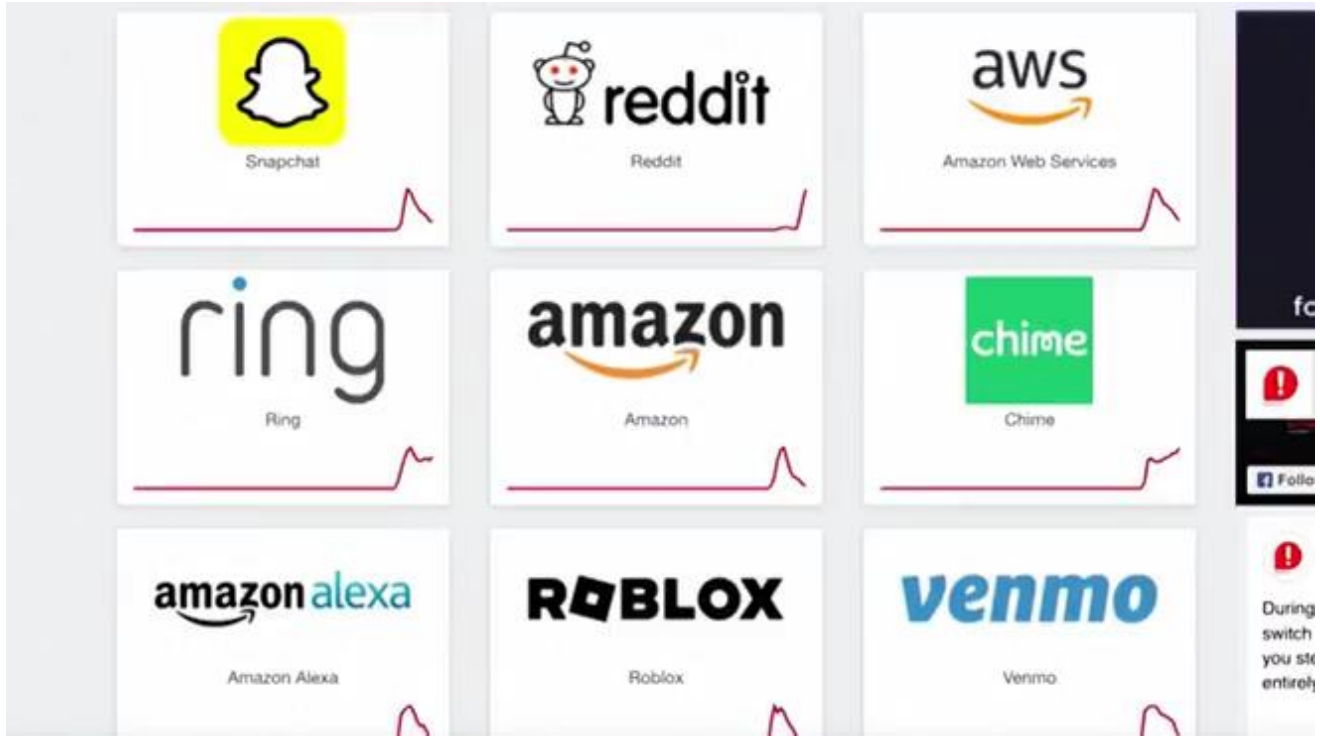
what	**devices**	phones, servers, sensors, pacemakers, …
it connects	**applications**	web, video streaming, gaming, …
	users	governments, operators, malicious, …

how	**technology**	optical fiber, satellite, wireless, copper, …		
it connects				
		from	to	delta
	latency	microseconds	seconds	10^6
	bandwidth	kilobits/sec	terabits/sec	10^9
	loss rate	0%	100%	



https://www.submarinecablemap.com

The Internet is **prone to failure**

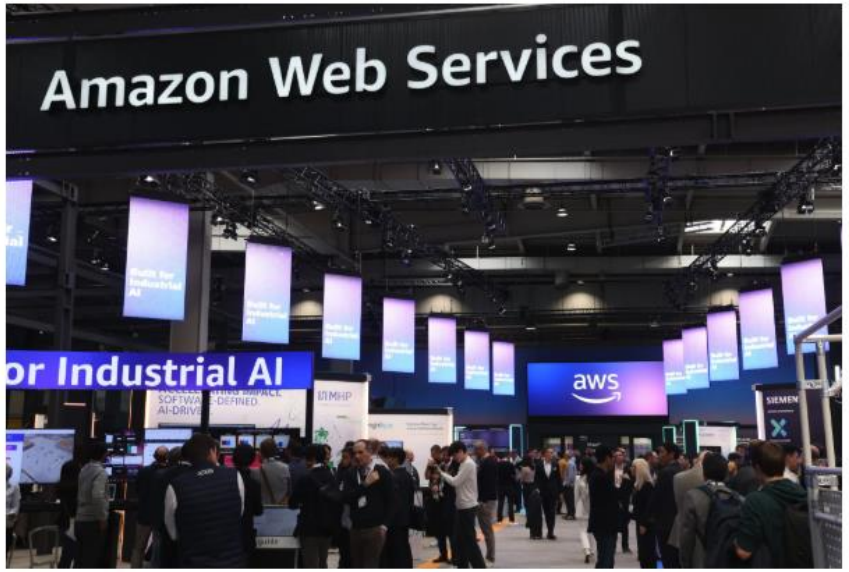


Source: http://downdetector.com

Amazon Outage Forces Hundreds of Websites Offline for Hours

Amazon Web Services, a major provider of cloud services, cited a problem at its data center in Northern Virginia. The outage highlighted the fragility of global internet infrastructure.

Listen · 6:05 min Share full article 431



The Amazon Web Services pavilion at a trade fair in Hanover, Germany, in March. Sean Gallup/Getty Images

By Jenny Gross
Reporting from London

Oct. 20, 2025

Source: NYTimes

The Internet is **always changing**

	1970s	2020s
bandwidth		
# hosts		
killer app		

The Internet is **always changing**

	1970s	2020s
bandwidth	$O(10^4)$ bits/second	$O(10^{14})$
# hosts	$O(10^2)$	$O(10^{10})$
killer app	copy files	video

One cannot design for a fixed target!

	1970s	2020s	**2030s**
bandwidth	$O(10^4)$ bits/second	$O(10^{14})$	?
# hosts	$O(10^2)$	$O(10^{10})$	
killer app	copy files	video	

To sum up

the Internet is …

To sum up

the Internet is …

A **network** of **networks**…

of enormous **scale** and **diversity**…

prone to **failures**…

in **perpetual evolution**…

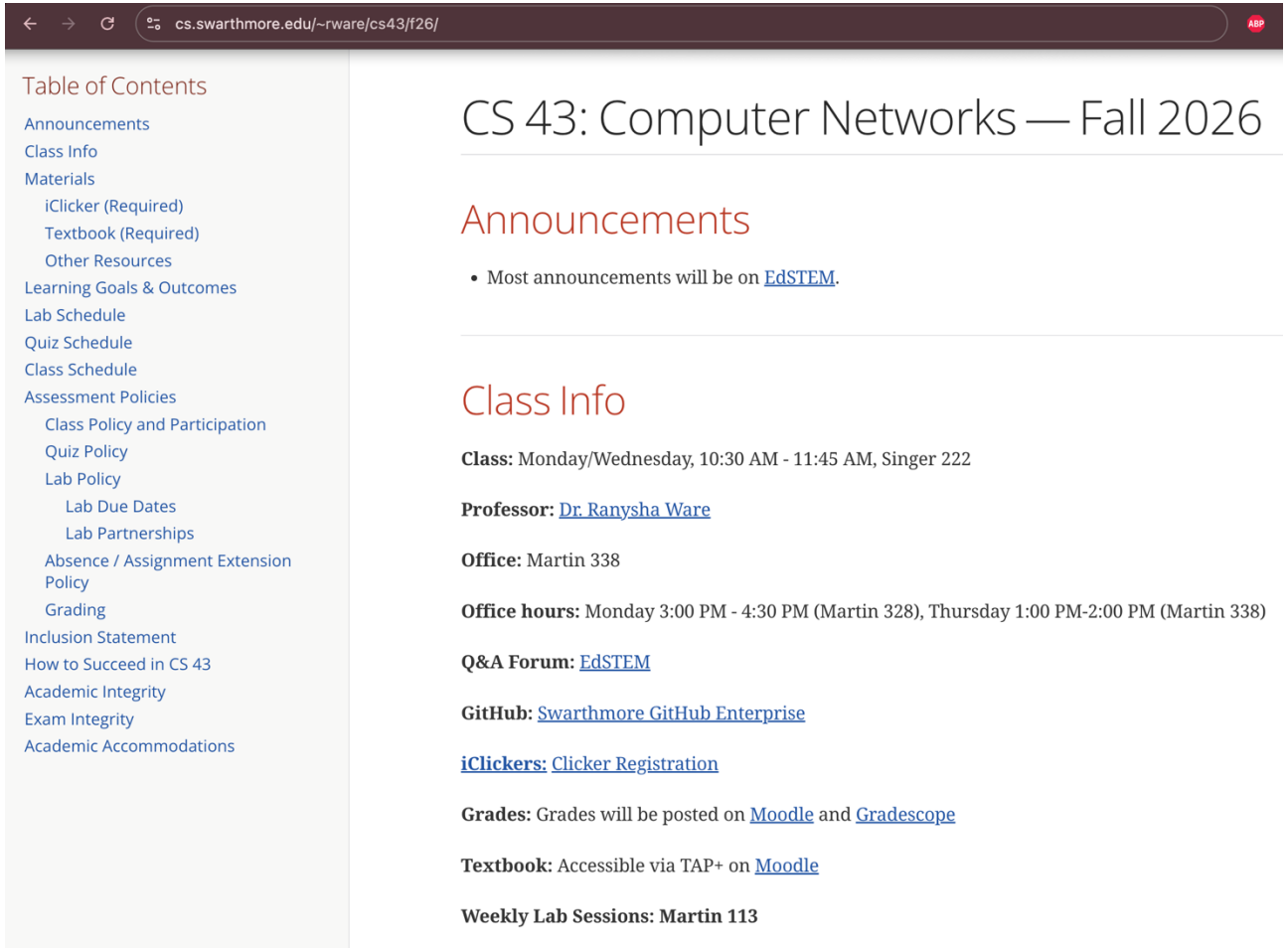
After this class questions you'll be able to answer:

- How does typing a website name in a browser reach the right server anywhere in the world, in under a second?
- Why does a video call get choppy while a file download just gets slower?
- Why doesn't cutting an undersea cable break the Internet?
- How can a government shut down the Internet for an entire country?
- How does your laptop get a working connection the instant you plug in a cable, without you configuring anything?

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Read the syllabus and complete the policy quiz!



`https://www.cs.swarthmore.edu/~rware/cs43/f26/`

Our Shared Values In This Class

Diversity, inclusion, and a mutual sense of belonging are all core values of this course. All participants in this course must be treated with respect by other members of the Swarthmore CS community. We must all strive, students and faculty both, to never make anyone feel unwelcome or unsafe in any way. Violations of these principles are viewed as unacceptable, and we take them very seriously. If you ever feel discriminated against or otherwise excluded, no matter how minor the offense, we encourage you to reach out to Prof. Ware or one of the College Deans

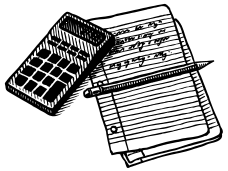
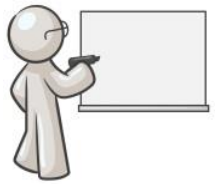
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How to Be A Good Classmate

- **Everyone** deserves to be — and participate — in class & lab
- We can **all** learn something from one another
- Come to class prepared (readings, assignments)
- Give others a chance to answer
- Avoid distracting others during class

Classes: Interactive Classes with Peer Instruction

Readings	Reading Quiz	Instruction	Labs/Quizzes/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
- Short reading quiz with 1-3 high level questions
- 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://join.iclicker.com/DQLN

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

Participation scores count from week 2

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.

Resources: EdStem

- Edstem Q&A Forum: https://edstem.org/us/courses/104164/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

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 weekly quizzes about the week's 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 me**?

- Respond to Ed posts within 24 hours (not on the weekends!)
- Office hours
  - Mondays 3pm-430pm in Martin 238
  - Thursdays 1pm-2pm 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

Course Grade Distribution

- 38% Lab assignments - 6 (6% each, Lab 4 is 8%)
- 30%. Quizzes - 12 (2.5% each, lowest dropped)
- 22% Final Exam
- 5%   Reading Quizzes
- 5%. In-class polls, worksheets, and attendance

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

How to succeed in an Upper Level Systems 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"
  - lab assignments are larger, more difficult, and not always directly related to that week's lectures
  - making sure you read and understand required readings/videos
  - try/brainstorm different approaches...
  - growth mindset

- Do not suffer in silence
- **Please reach out to:**
  - Me (Prof. Ware)
  - Your Academic Advisors
  - Student Deans
  - Counseling & Psychological Services



by KC Green

Why did you come Swarthmore?

It upholds academic honest to…

- Copy code from the textbook or `man` pages and add a comment in files saying where it came from.
- Discuss approaches to assignments with classmates, but not solutions
- Ask questions in lecture, even if the question is “I have no idea what’s going on”
- Ask for help from Prof. Ware when you are struggling – attend office hours or ask for a 1-on-1 meeting
- If you’re unsure whether something is allowed, ask
- Submit your own work, even when it is incomplete

It violates academic integrity to…

- Have anyone (or anything) look at your code who is not your lab partner or Prof. Ware
- Claiming code not written by you as your own work
- Use GenAI/LLMs on any course work (this includes chat/autocomplete features in IDEs like VSCode):
  - Put any course materials into GenAI tools
  - Put any of your code or other materials generated for this course into GenAI tools
- Copy answers from someone else's quiz or exam

You can learn from your mistakes but actions have consequences…

It is CS department policy to **report all** suspected violations to the College's Senior Associate Dean of Student Life:

According to the Faculty Handbook:

> "It is the opinion of the faculty that for an intentional first offense failure in the course may be appropriate. Suspension for a semester or deprivation of the degree in that year may also be appropriate when warranted by the seriousness of the offense. For a second offense the penalty normally should be expulsion."

Administrative Questions?

- All of this info is on the class website
  - Please complete the policy quiz:

- Feel free to ask Q&A on the Edstem discussion board

- It's my second year here.
  Would be great to get (constructive) feedback!

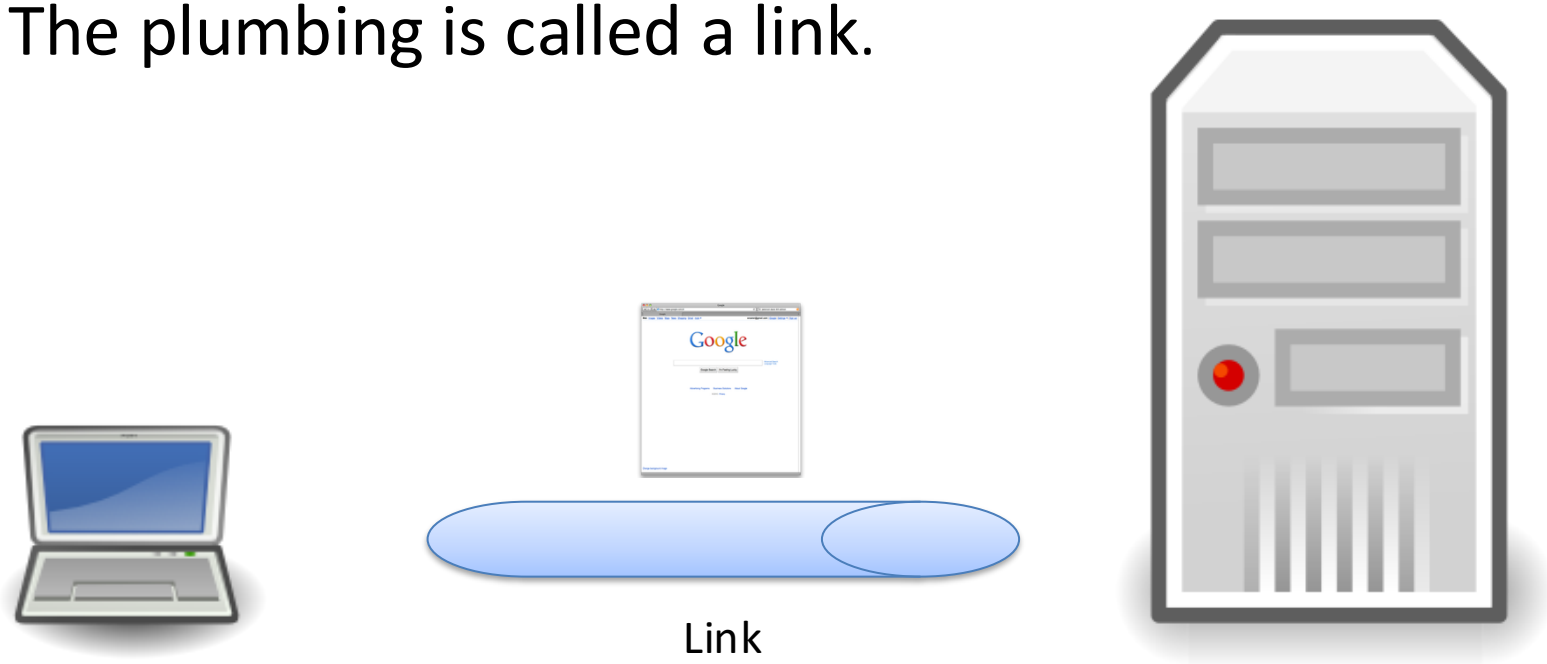
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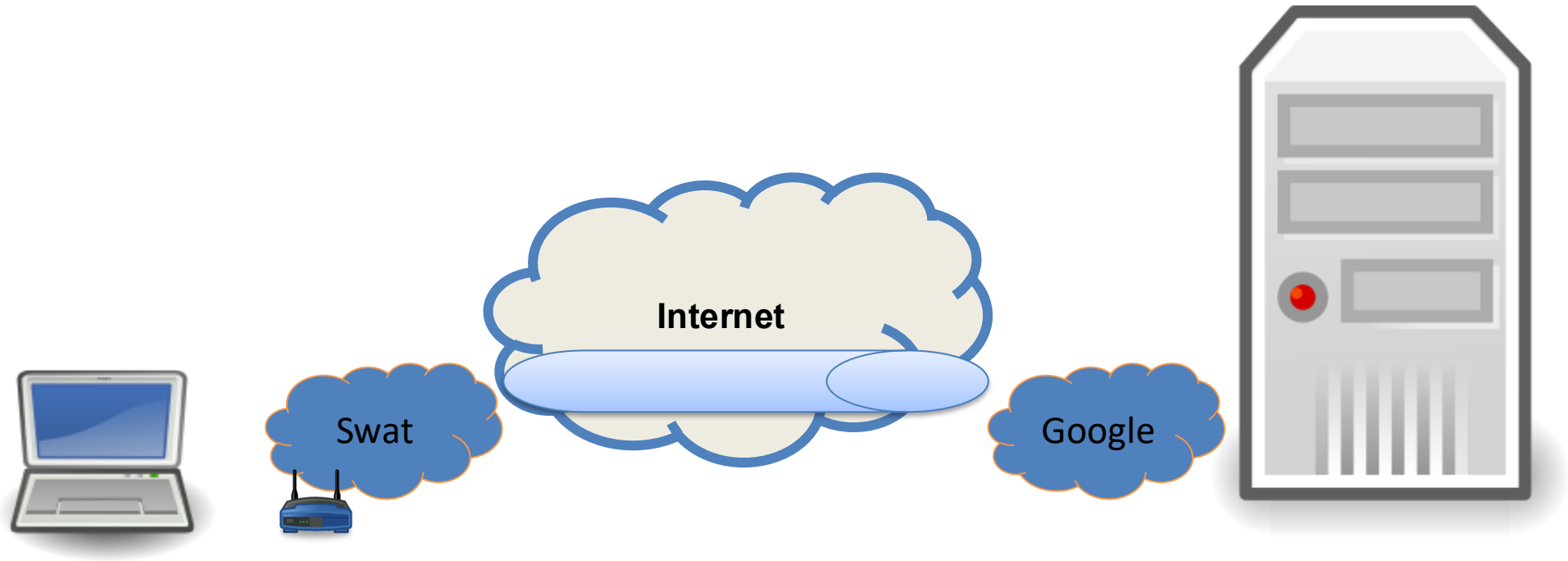
A “Simple” Task

Send information from one computer to another

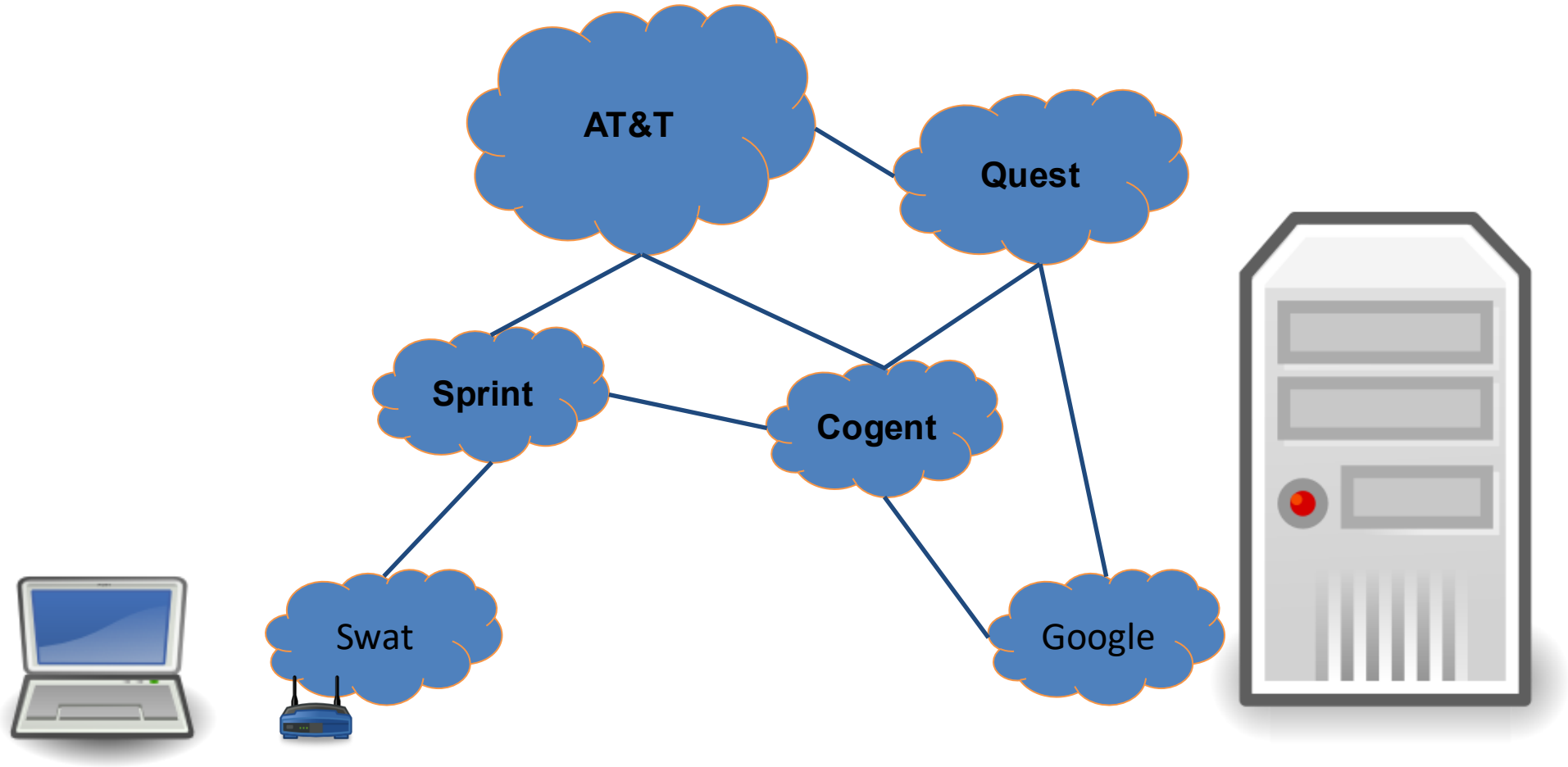
- hosts: endpoints of a network
- The plumbing is called a link.



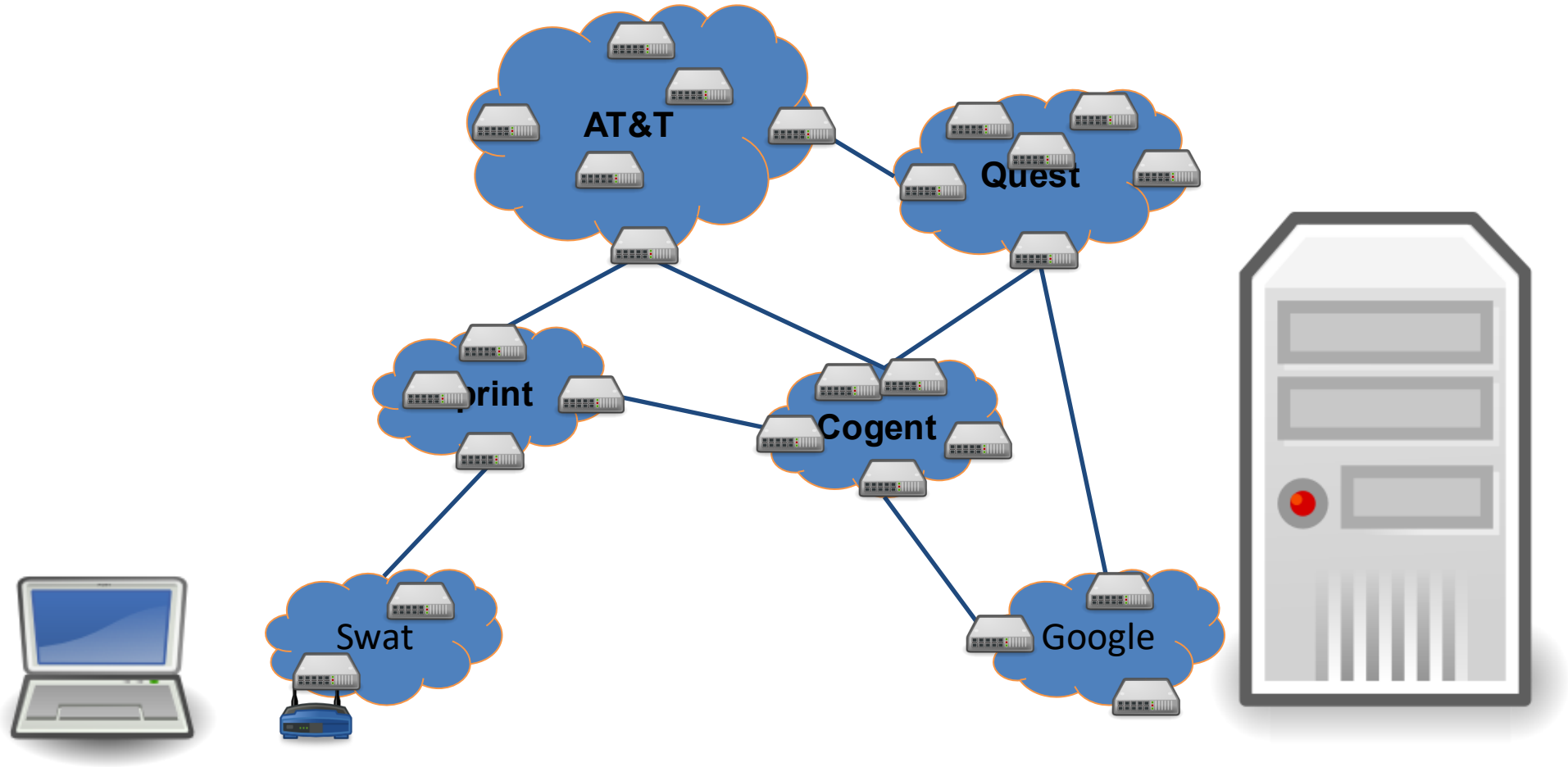
Not Really So Simple…



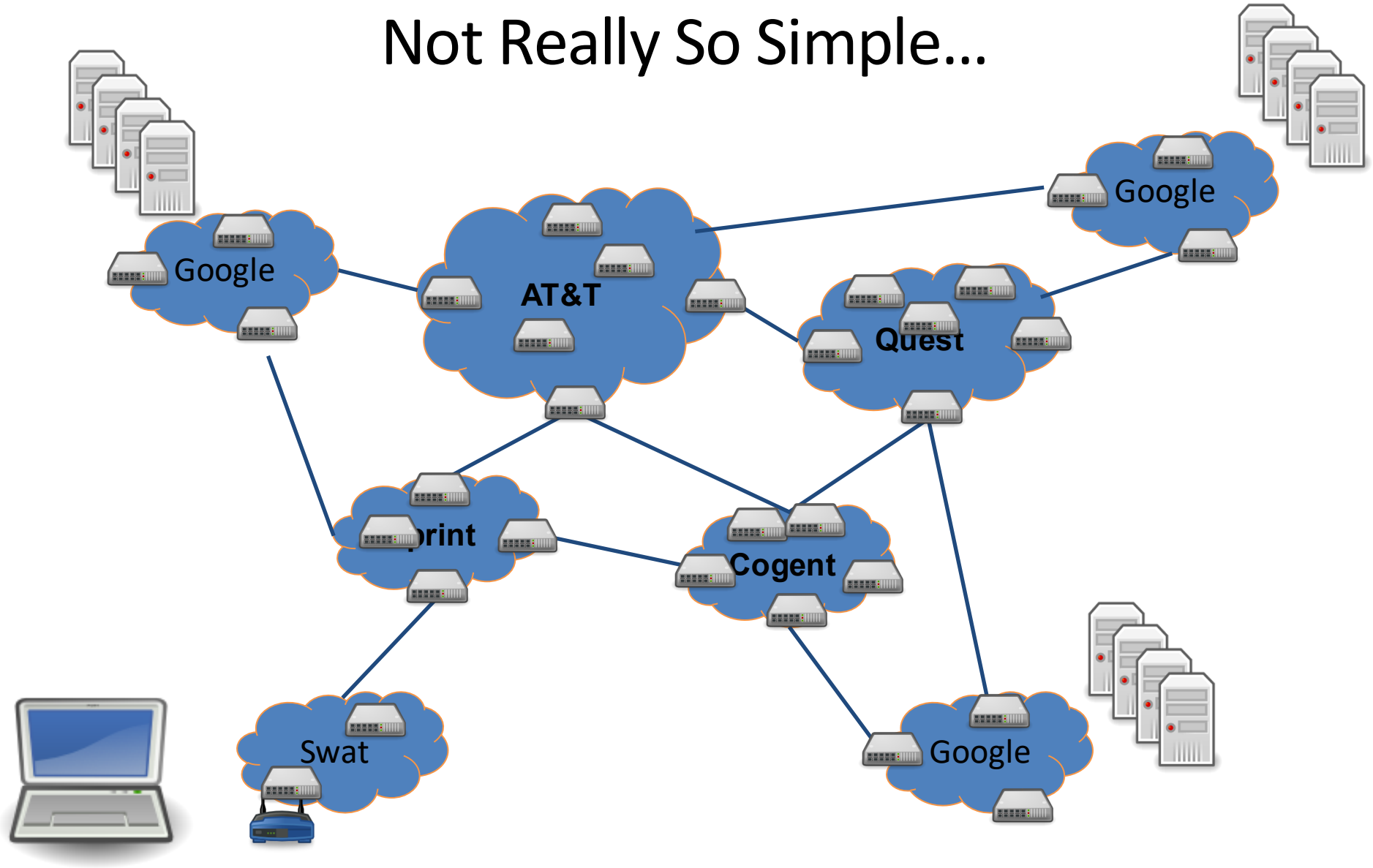
Not Really So Simple…



Not Really So Simple…



Not Really So Simple…



Example Peer Instruction Question:
What of these are **required** to get your packet from your laptop to a Google server?

A. Manage complexity and scale up

B. Naming and addressing

C. Moving data to a destination

D. Reliability and fault tolerance

E. Security and Privacy

TODO List

- Reading: Protocols and Layering
  - K&R Sections 1.1, 1.5
- iClicker registration: https://join.iclicker.com/DQLN
- Assignment 0: https://forms.gle/TESwRPAwj1cANdJUA
- Policy Quiz: https://forms.gle/jDRDM4MexeY9sv4i9
- Let me know if you need accommodations