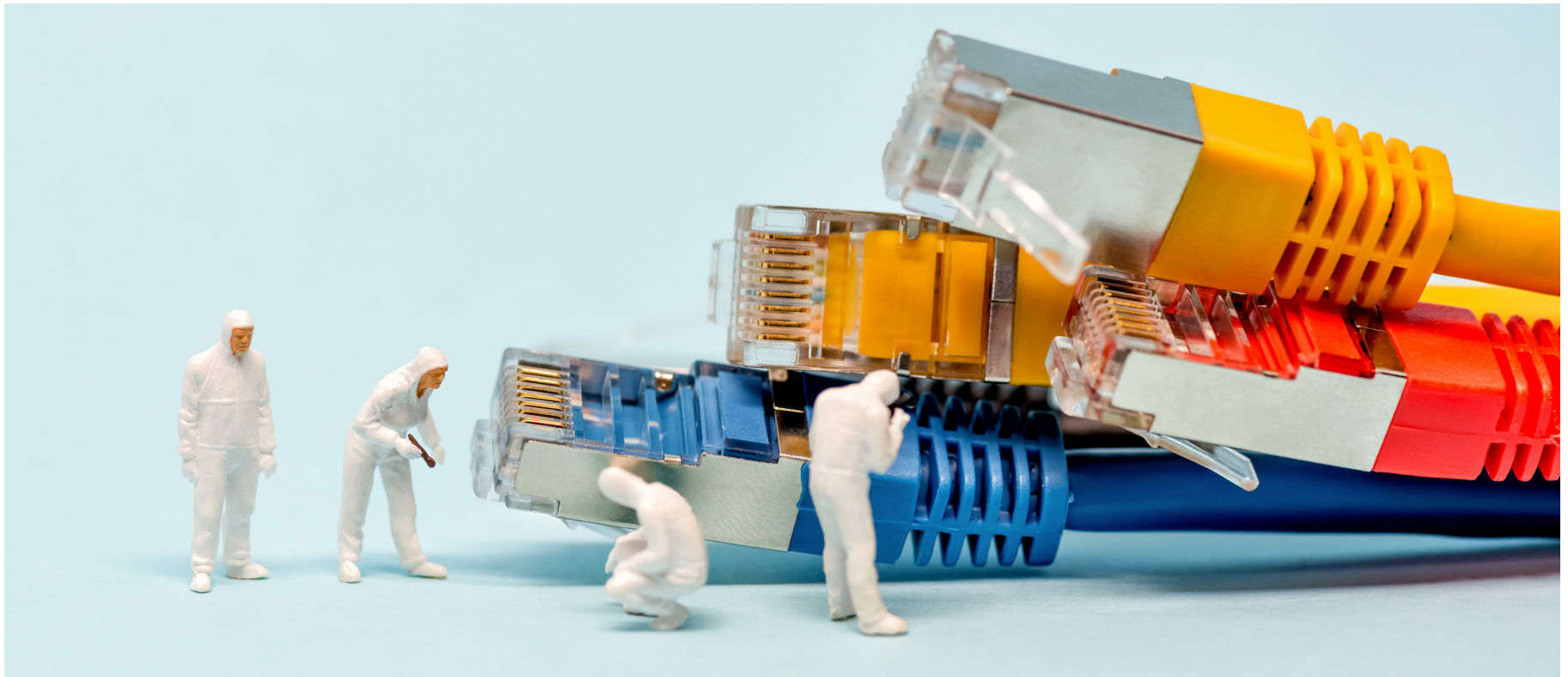




Computer Networking

COMP 177 | Fall 2020 | University of the Pacific | Jeff Shafer



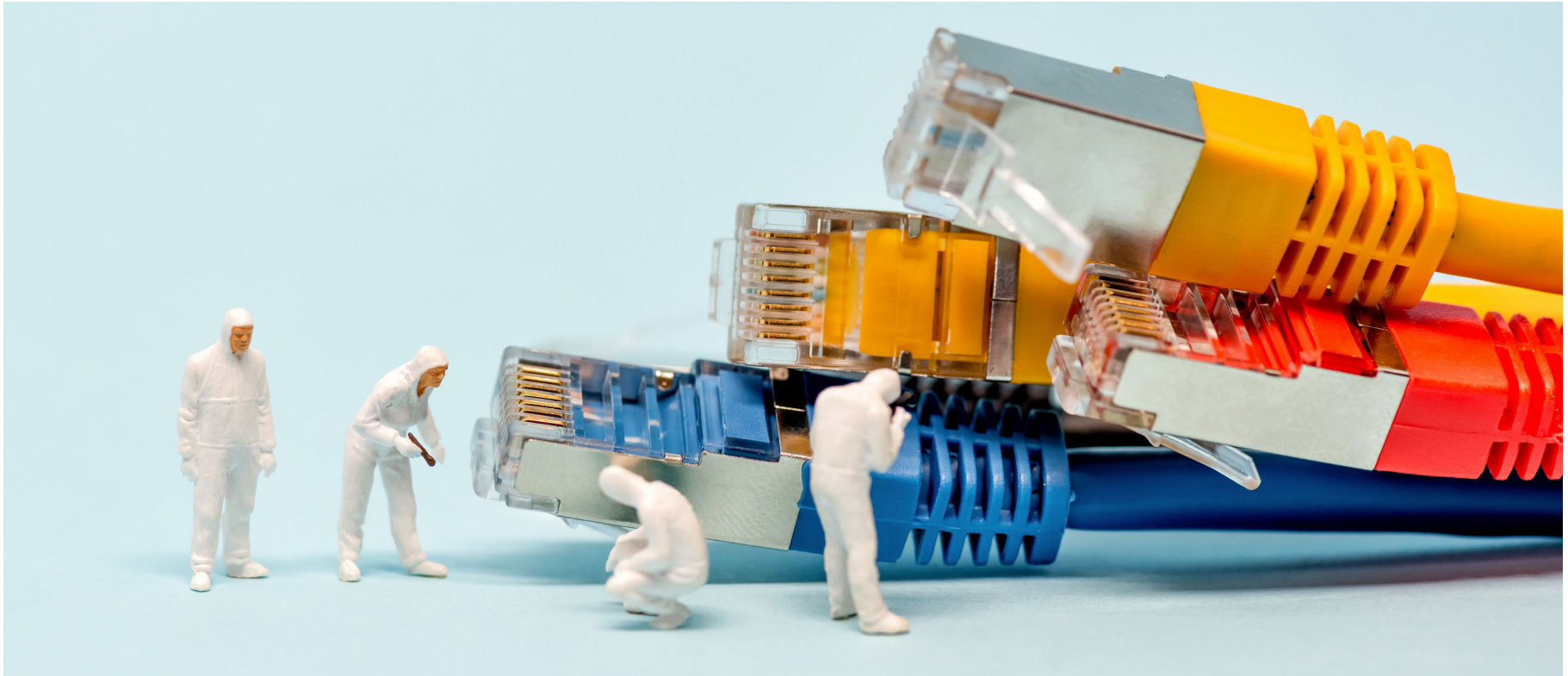
Online Course Mechanics

Common Questions

- Class sessions
 - Live on Zoom @ 8am & 3:30pm
 - Recorded automatically, accessible in Canvas
- No exams
 - High stakes testing not recommended for online courses
 - Emphasis on projects & homework
- Labs
 - Start during scheduled time
 - Due at midnight Pacific-time

Discussion

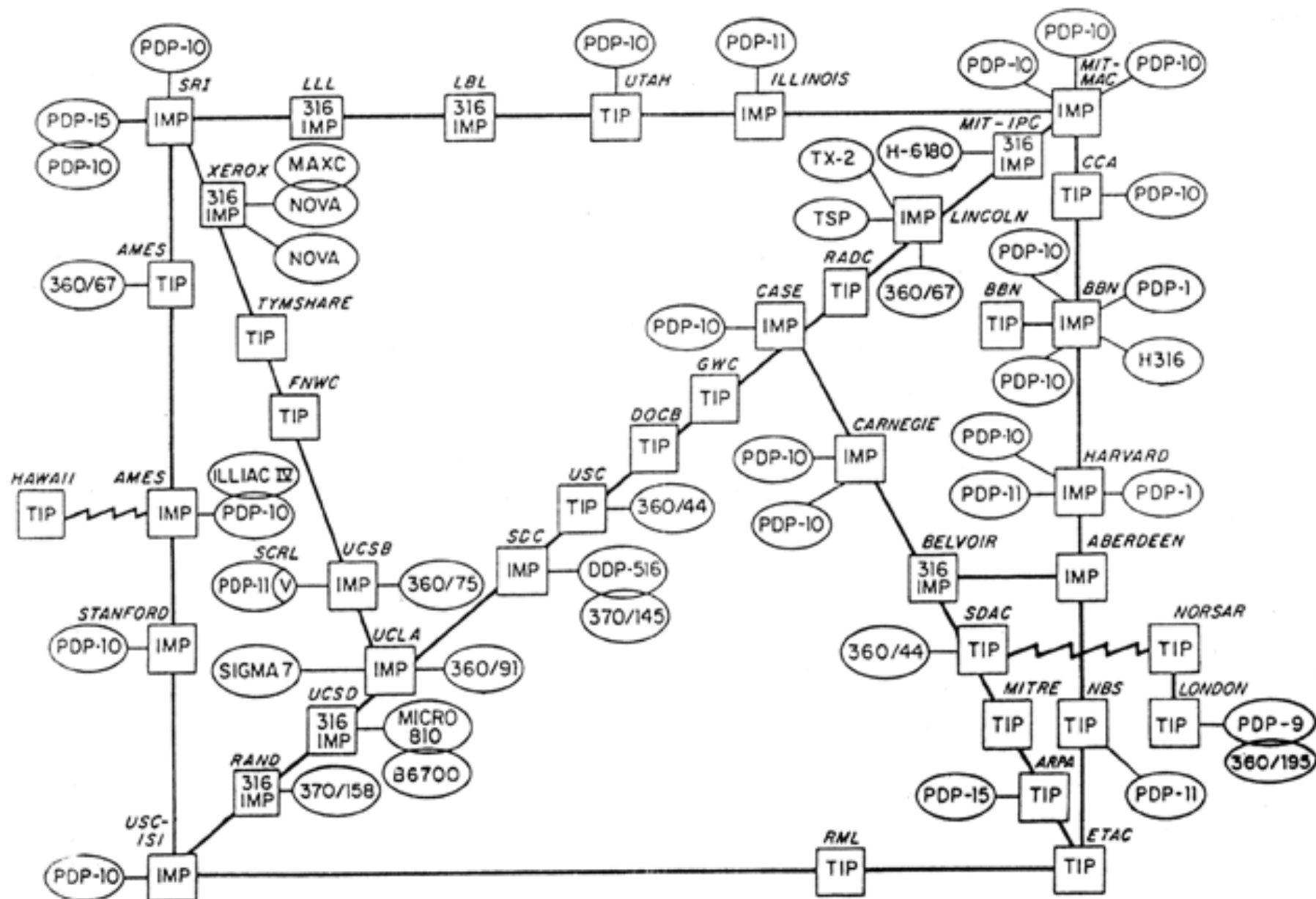
- **Thoughts or concerns on this plan so far?**
- **Use of Zoom chat?**
- **Videos on or off?**
- **Ideas to increase class engagement?**



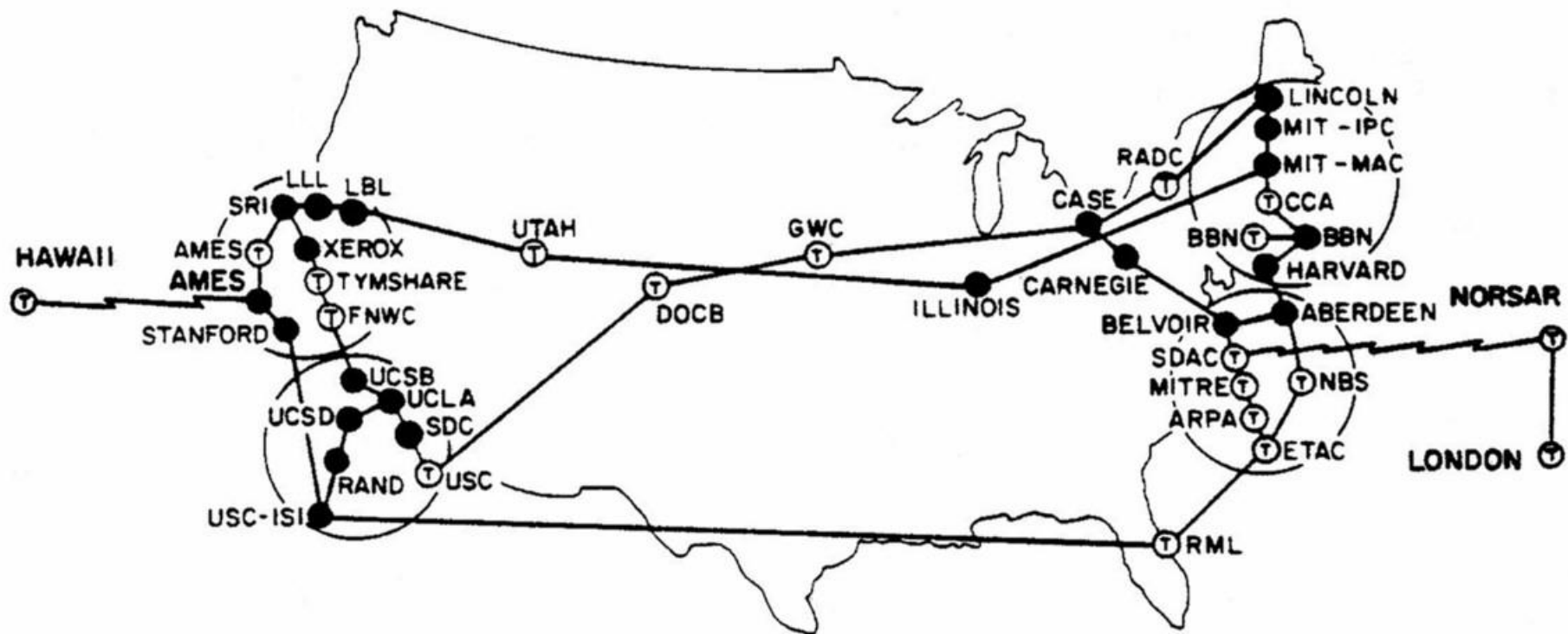
Course Motivation



ARPA NETWORK, LOGICAL MAP, SEPTEMBER 1973



ARPANET Geographic Map, Sept 1973

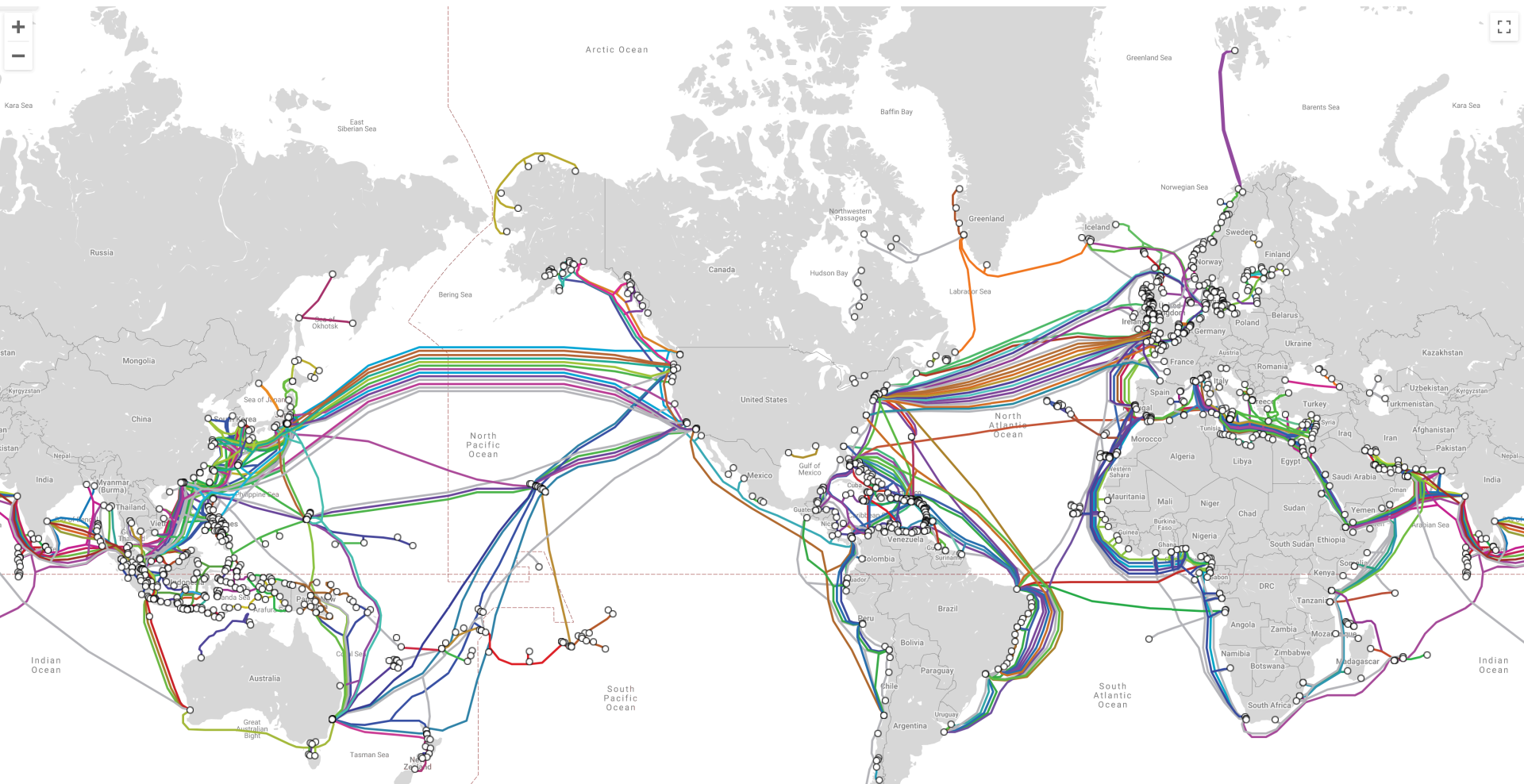




**5
MINUTES
LATER...**

45 Years Later...

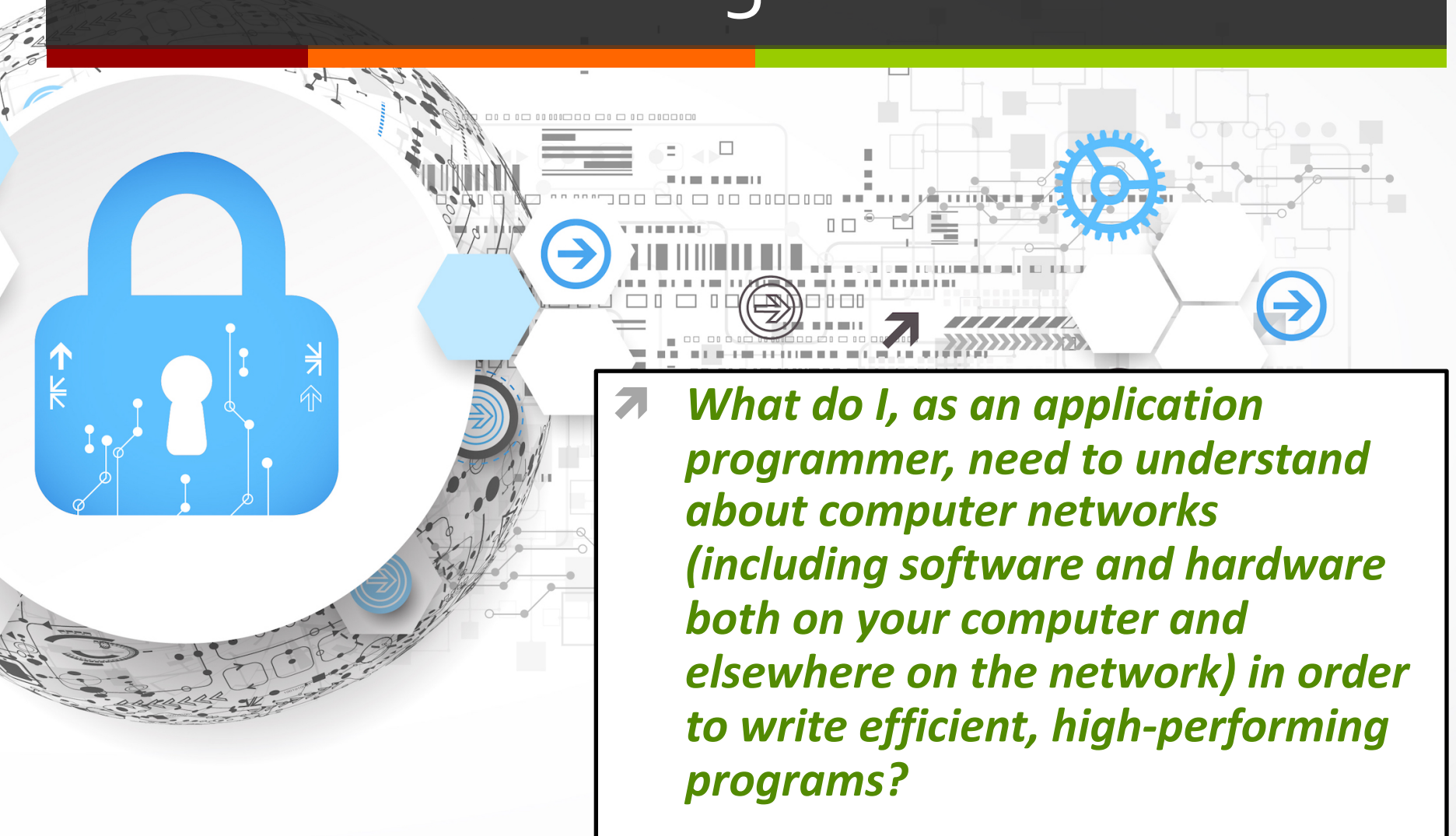
Submarine Cable Map, August 2020



<https://www.submarinecablemap.com/>



Motivating Question for Class



➤ ***What do I, as an application programmer, need to understand about computer networks (including software and hardware both on your computer and elsewhere on the network) in order to write efficient, high-performing programs?***

Course Overview



Online Class

- Will have **live video class** at the scheduled time
 - Tuesday/Thursday 8-9:45am
- Class will be
 - Part *lecture*
 - Part Q&A
 - Part independent or small group work on *class activities*
- Recordings available in Canvas

Access via recurring Zoom meeting for class sessions
(Link on front page of Canvas & Canvas calendar)

Online Class

- Will have **live video lab** at the scheduled time
 - Monday 3:30-6:30pm
- Lab will be
 - A little bit of lecture, plus....
 - A large part of independent or small group work on lab exercises
- Recordings available in Canvas (*of the lecture portion*)

Access via recurring Zoom meeting for lab sessions
(Link on front page of Canvas & Canvas calendar)

Online Support

Group Q&A

- Slack Channel
 - <https://ecpe.slack.com/>
 - Look for “comp177”
 - **Post questions to group unless the issue is unique to you**
 - DM'ing instructor is preferable to email

Personal Q&A

- 1:1 Zoom Meeting Office Hours
 - <https://calendly.com/jeff-shafer>

COMP_177_01-Computer Networking Lecture-80748

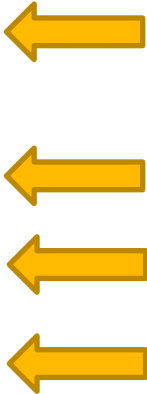
Topics examined in this course include computer networks and the internet, LAN and WAN architectures, and packet switched networks and routing. Students learn about the 7-layer OSI model and internet protocol stack, socket programming and client/server systems, wireless and security. The course includes a laboratory. Also listed as ECPE 177. Prerequisites: Completion of all Fundamental Skills; COMP 053 and ECPE 170 with a 'C-' or better. Junior or Senior standing. (Fall, every year)



Cheat Sheet
on front
page of
Canvas site

Online Course Cheat Sheet

Class Website (Assignments, lecture slides, resources)	https://cyberlab.pacific.edu/courses/comp177
Class Slack (Use <u>class</u> comp177 channel for all questions that would be helpful to your classmates. DM instructor otherwise)	https://ecpe.slack.com/
Instructor Email	jshafer@pacific.edu
Instructor 1:1 Meeting	https://calendly.com/jeff-shafer
Zoom Classroom (Recurring meeting, Tue/Thur 8:00am-9:45am)	https://pacific.zoom.us/j/93194077026?
Zoom Lab (Recurring meeting, Mon 3:30-6:30pm)	https://pacific.zoom.us/j/97224934521?



Websites

Main website

- <https://cyberlab.pacific.edu/>

Canvas CMS

(gradebook, assignments, ...)

- <http://canvas.pacific.edu>

Textbook

➤ No print textbook

➤ Supplemental free online textbooks

➤ *An Introduction to Computer Networks* by Peter L Doral, Second Edition

➤ <http://intronetworks.cs.luc.edu/>

➤ *Computer Networking: Principles, Protocols and Practice* by Olivier Bonaventure

➤ <https://open.umn.edu/opentextbooks/textbooks/computer-networking-principles-protocols-and-practice>

Lecture Topics

➤ Networking Fundamentals

- Ethernet
- WiFi
- TCP, UDP
- IPv4, IPv6
- ARP
- ICMP
- VLANs
- NAT

➤ Application Layer Protocols

- HTTP
- DNS
- DHCP

➤ Socket Programming

- TCP and UDP



*Alphabet soup
of protocols,
but they'll
make sense by
Decemeber!*

Class Tools – Virtualization



➤ Network programming projects

➤ Python 3.x

➤ **Scapy** library for packet crafting -
<https://scapy.net/>

➤ Recommended environment is a **Ubuntu 20.04 LTS desktop** running in a virtual machine

➤ Free download of VMware Workstation (WIN) or VMware Fusion (MAC):
<https://cyberlab.pacific.edu/resources/pacific-vmware-licenses>

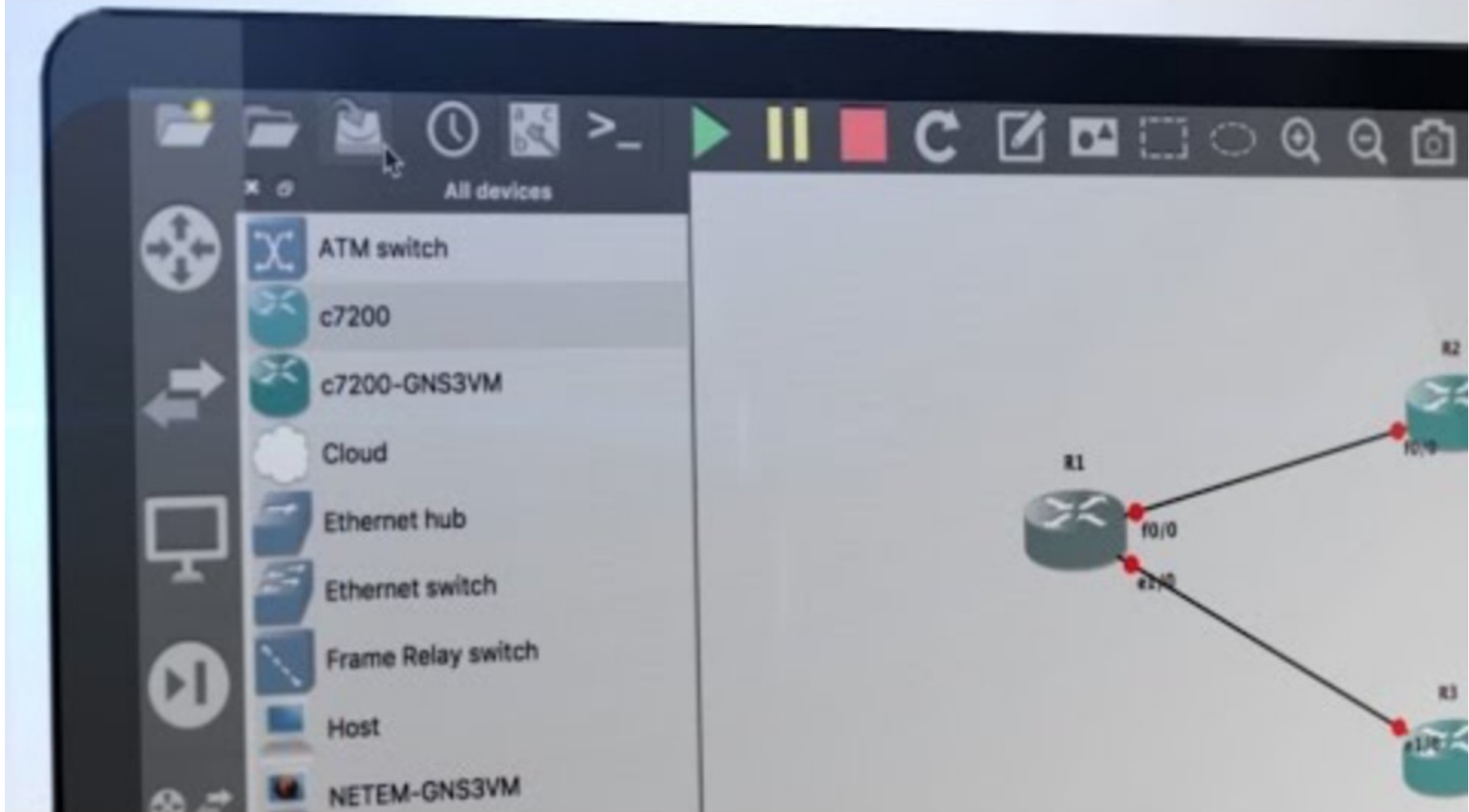
Class Tools – GNS3



➤ Laboratory Exercises

- GNS3 Network emulator
- Open source / free
- Can virtualize *real* devices and run their *real* software
 - Cisco switches & routers
 - Docker instances
 - Linux appliances
 - Many more!
 - <https://gns3.com/marketplace/appliances>

Lab Tools – GNS3



Lab Topics

➤ Core Topics

- Switching
- Static Routing
- Dynamic Routing
- Neighbor Discovery
- VLANs
- Firewalls

➤ Bonus Topics

- Ability to do more complicated (& more *interesting*) labs in a virtual environment since we aren't limited by physical hardware

Course Components

➤ “Homework” Category

➤ Class Activities – 20%

- Complete each day after class lecture
- “Minimal” out of class time
- Due by midnight Pacific time (*add +1 day if you’re taking the class from overseas*)

➤ Homework Assignments – 20%

- Extension of class activities; reinforces knowledge

Course Components

➤ **Projects – 40%**

- “Network Discovery” tool in Python
- “Traceroute” tool in Python
- “Port Scanner” tool in Python
- “Web Server” (& “Advanced Web Server”) in Python

➤ **Presentations – 10%**

➤ **Labs – 10%**

- Using GNS3 to create simulated network environments

Questions?

➤ Questions?

➤ Concerns?

Next Steps

1. Go to Canvas
 2. Find the *COMP 177* course
 3. Find the first assignment: *Getting Started Questions*
 1. Q&A questions
 2. Virtual machine setup to prepare for class activities, projects, and labs
- **Assignment “due” Wednesday at 11:59pm**
- *But if you run into difficulties with VM setup, don’t stress about deadline, just DM me on Slack*