CS 348
Computer Networks
Lec 3

Spring 2020 IIT Goa

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Recap

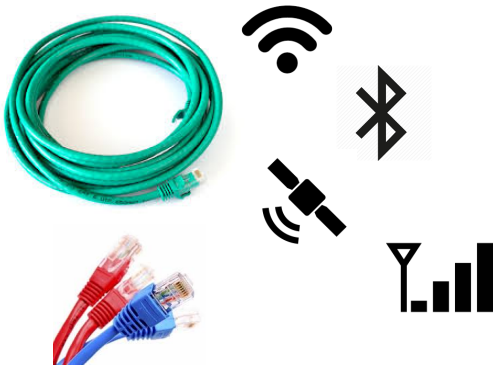
- What are the Physical Components of the Internet?
- What is the "Structure" of the Internet?

Physical Components

- Hosts/End-systems
- Communication links
    - Guided vs Unguided media
    - Point-to-point vs Broadcast
- Packet switches (Switches and Routers)


End System
(Server)

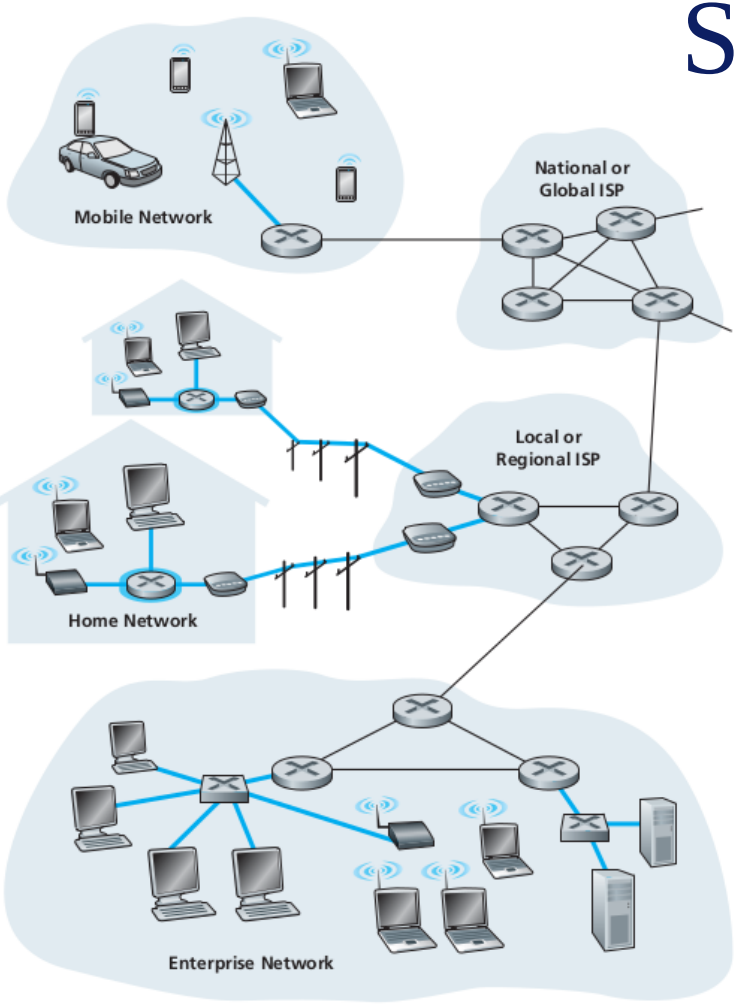

End System
(Client)



Recap: Some Key Ideas

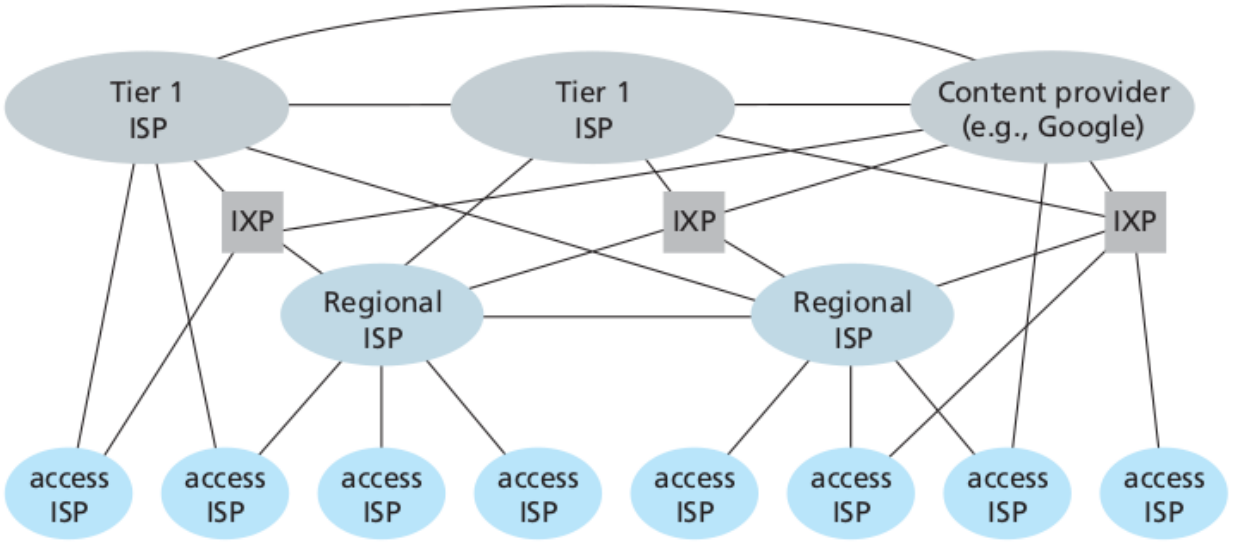
- **MAC** addresses: why do we need them?
- **IP** addresses: why do we need them?
- What is a **Switch**? What does it do?
- What is a **Router**? What does it do?

Structure



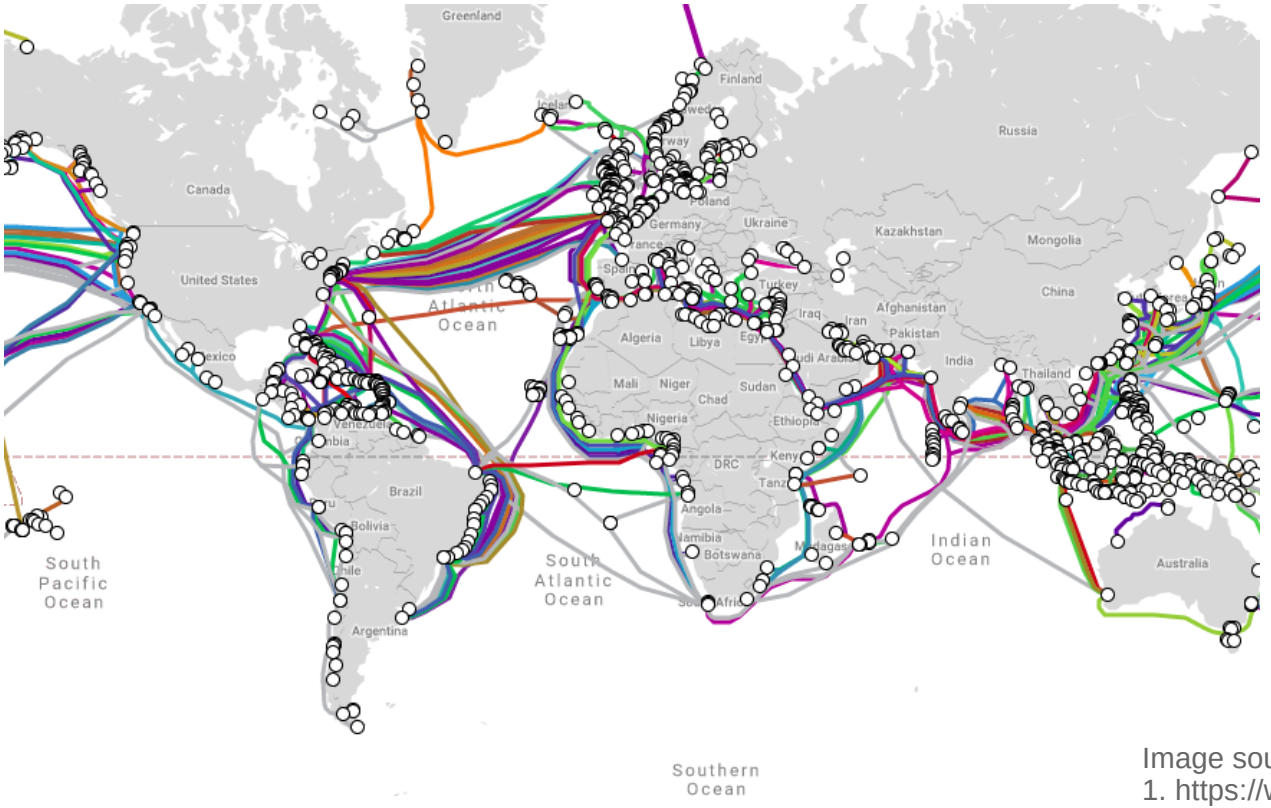
- **Access Networks**
- **Internet “core”**
  - ISPs connected together

Structure



- IXP: Internet Exchange Point
- There are about 20 global Tier-1 networks. Examples: AT&T, NTT, Tata Communications
- Main factor behind this structure: **Economics**

A map of undersea network cables

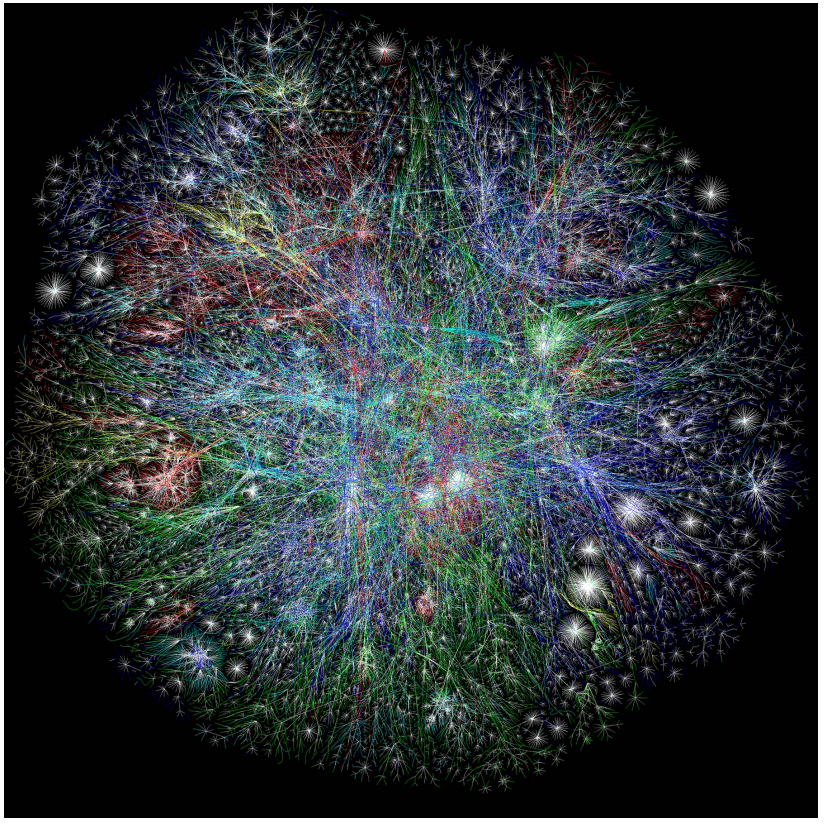


Sabotaging undersea cables?

https://www.wired.com/story/russia-undersea-internet-cables/

Image source:
1. https://www.submarinecablemap.com/
2. wikimedia commons

Visualizations of the Internet



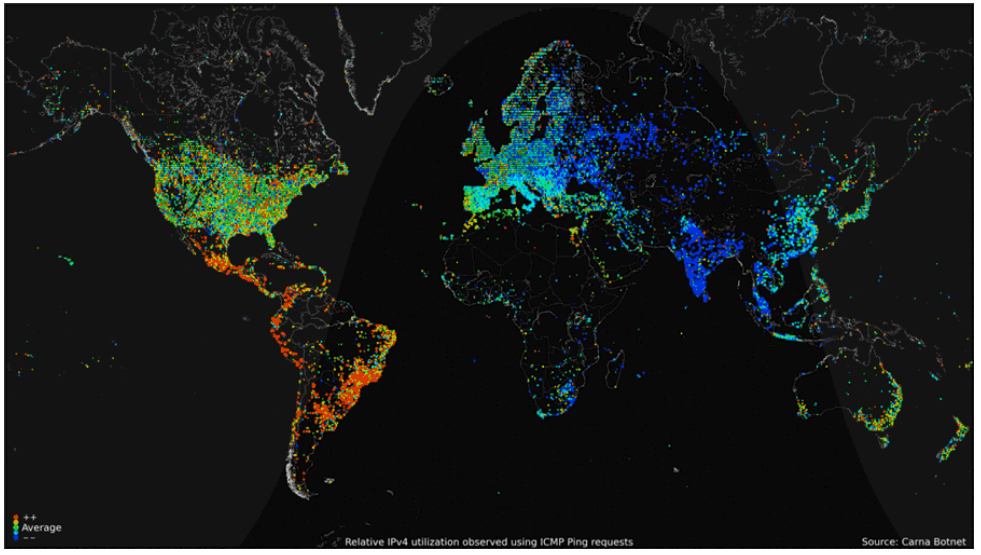


Image source:
https://www.kaspersky.com/blog/amazing-internet-maps/10441/

Exercise

1) Find out the IP address and MAC address of your computer when connected to the Internet
2) Find out which ISP provides Internet access to IIT Goa campus
3) Browse the Wikipedia entry for IEEE 802.3 (Ethernet) and IEEE 802.11 (WiFi)
4) Browse through some visualizations of the Internet at

   https://www.caida.org/research/topology/as_core_network/2008/

Questions

- Why is the structure of the Internet the way it is?
  - Why is it not perfectly hierarchical (a tree) ? Why not a mesh?
- How can I infer and map the structure of a network?
- How is routing done? How is the best route for a packet determined?
- How can I trace the path of a packet as it travels from my computer to some destination?

Reading Assignment

- Kurose and Ross: Sections 1.1, 1.2, 1.3

Linux Commands and Online tools for

- Finding the MAC and IP addresses of your computer's interfaces

  `$ ip addr show` or `$ ifconfig`

- Finding the IP address of a given url

  `$ host google.com` or `$ nslookup google.com` or `$ dig google.com`

- Tracing the route taken by packets to reach some IP address

  `$ traceroute 103.29.196.156`

- Finding geographical information, given the IP address: https://ipinfo.io/

- Finding geographic information for the output of traceroute:

  https://stefansundin.github.io/traceroute-mapper/

  https://geotraceroute.com/