Computer Networks and the Internet

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Lecture 01

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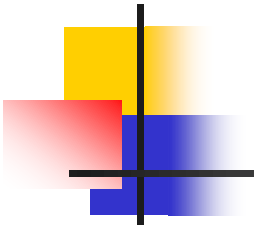
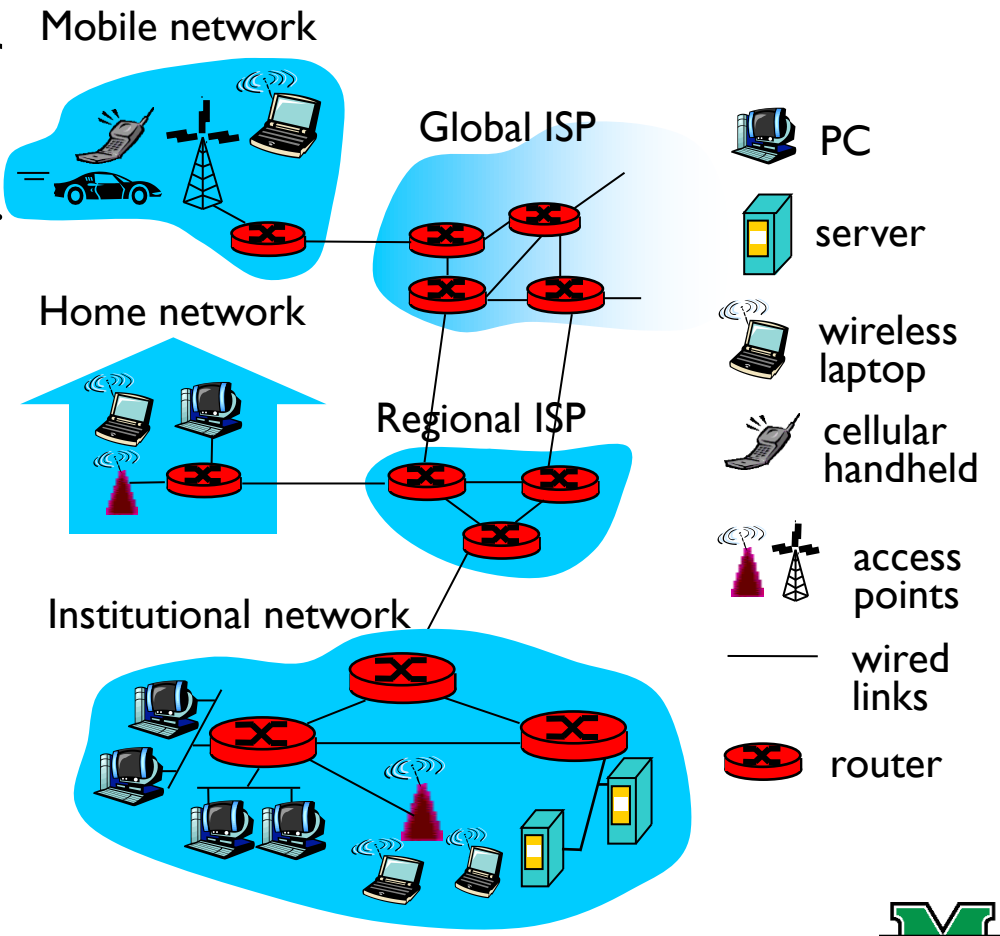


What Is the Internet?

- Two ways to describe the Internet
  - The basic hardware and software components that make up the Internet
  - A networking infrastructure that provides services to distributed applications

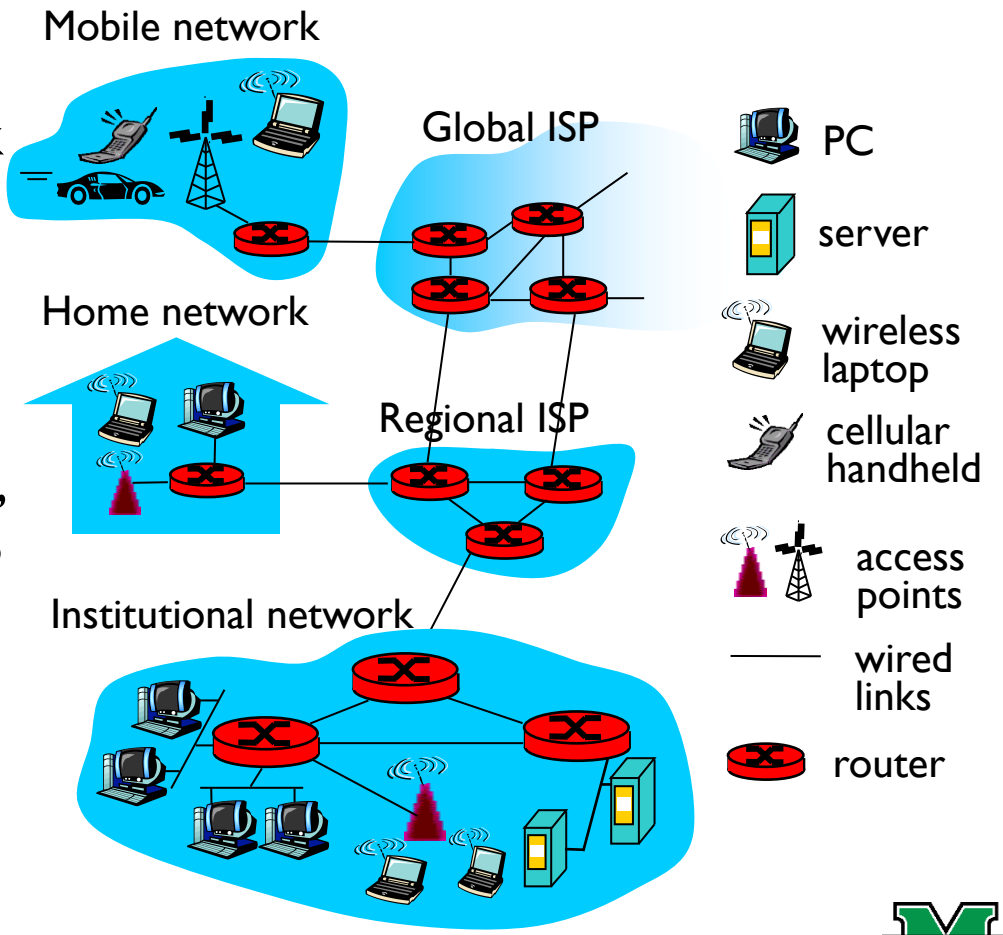
What Is the Internet: A Nuts-and-Bolts Description

- Hundreds of millions of computing devices
  - **Traditional** devices vs. **Nontraditional** devices
  - Devices = **hosts** or **end systems**
  - As of 2018, 22 billion end systems, and 4.021 billion Internet users



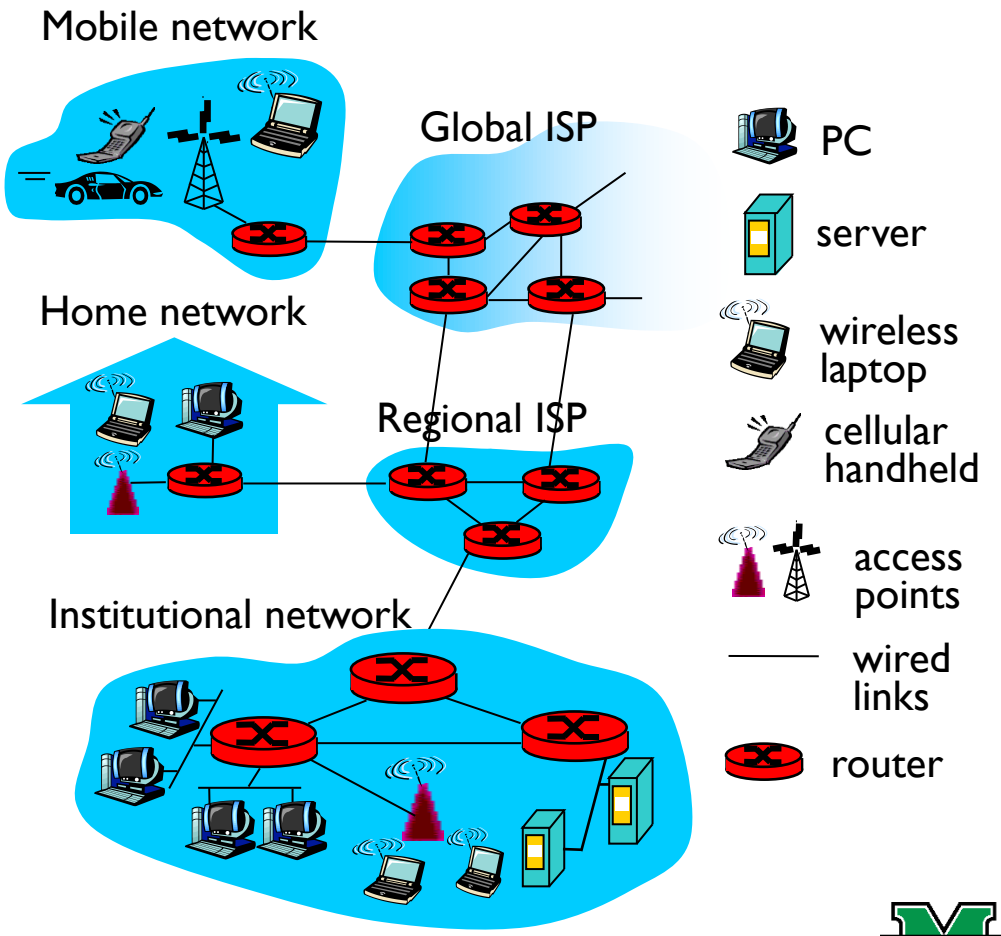
What Is the Internet: A Nuts-and-Bolts Description

- End systems connected together by a network through **communication links** and **packet switches**
- Communication links
  - Coaxial cable, copper wire, optical fiber, and radio spectrum
  - **Transmission rate**: bits/second



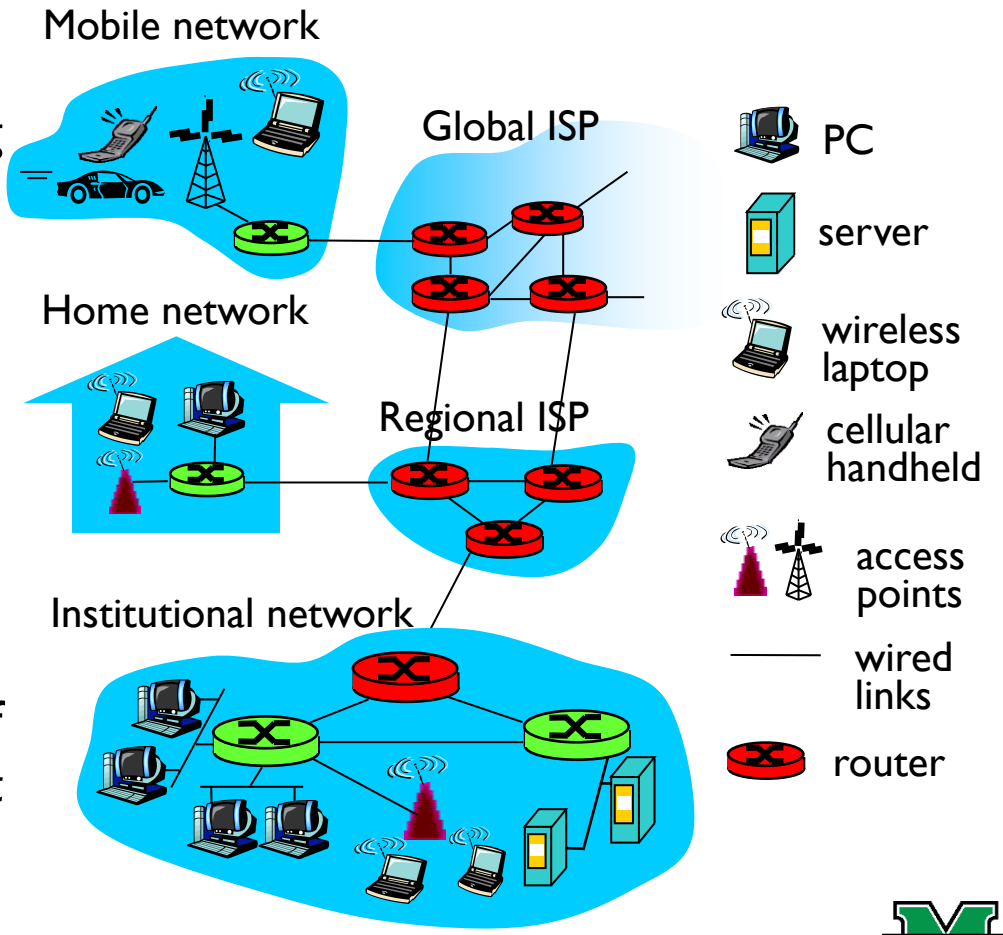
What Is the Internet: A Nuts-and-Bolts Description

- One end device sends data to another end device
  - sending device
    - segments the data
    - adds the header
    - send the **packet**
  - receiving device
    - receives packets
    - reassemble into data



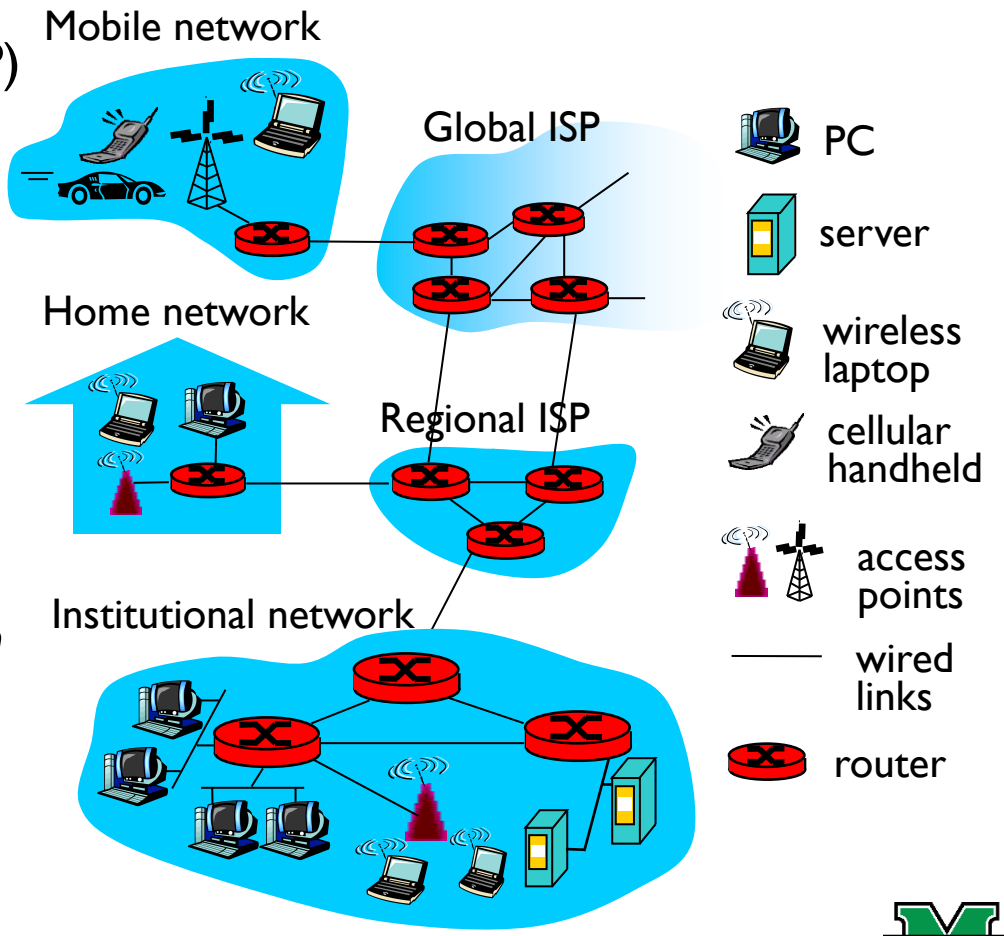
What Is the Internet: A Nuts-and-Bolts Description

- **Packet switches**
  - Incoming links & Outgoing links
- **Types of packet switches**
  - **Routers**
    - Used in the network core
  - **Link-layer switches**
    - Used in access networks
- **Route** or **path**
  - The sequence of *communication links* and *packet switches*



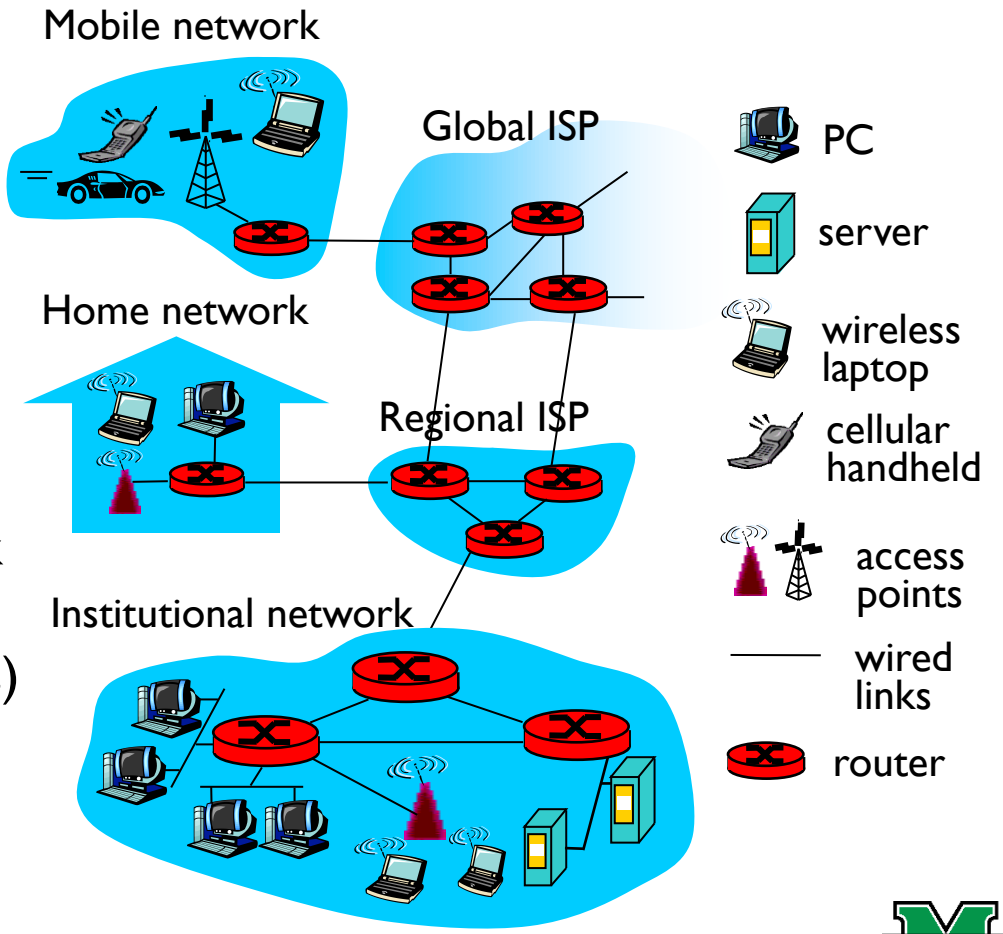
What Is the Internet: A Nuts-and-Bolts Description

- **Internet Service Provider** (ISP)
  - provide Internet access
  - different ISPs:
    - residential ISP
    - corporate ISP
    - university ISP
    - cellular data ISP
    - public ISP
- *packet switches + communication links = ISP*



What Is the Internet: A Nuts-and-Bolts Description

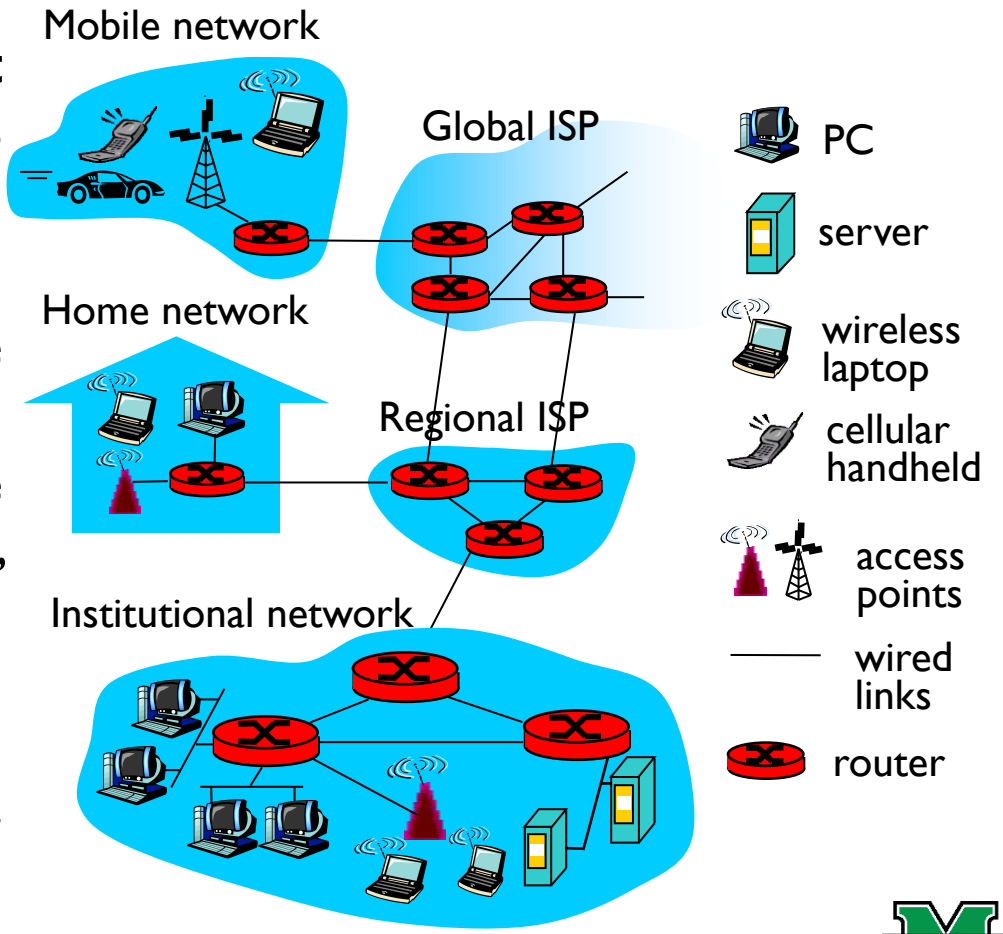
- **Protocols**
  - control the sending and receiving of information
  - **Transmission Control Protocol (TCP)**
  - **Internet Protocol (IP)**
- **Internet standards**
  - Internet Engineering Task Force (IETF)
  - requests for comments (RFCs)



What Is the Internet: A Services Description

Internet apps run on end system, not in the packet switch.

- **An infrastructure that provides services to applications**
- Communication infrastructure for distributed applications:
  - Web, email, mobile device apps, streaming, e-commerce, file sharing
- **Distributed applications**
  - involve multiple end systems that exchange data with each other



Protocol

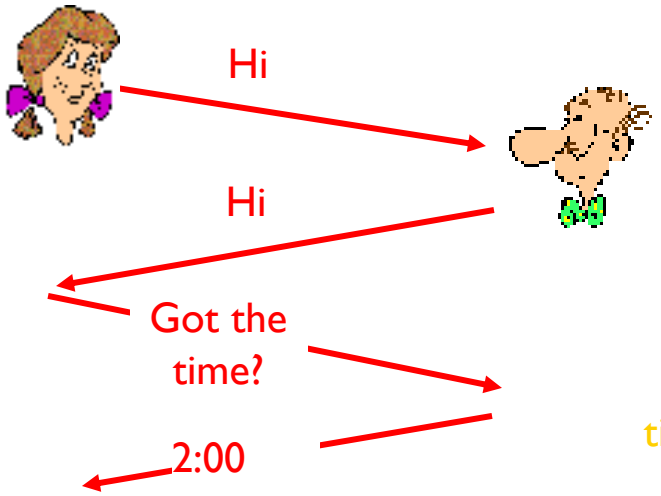
A protocol defines the format and the order of messages exchanged between two or more communicating entities, as well as the actions taken on the transmission and/or receipt of a message or other event.

human protocols:

- "ask someone for the time"

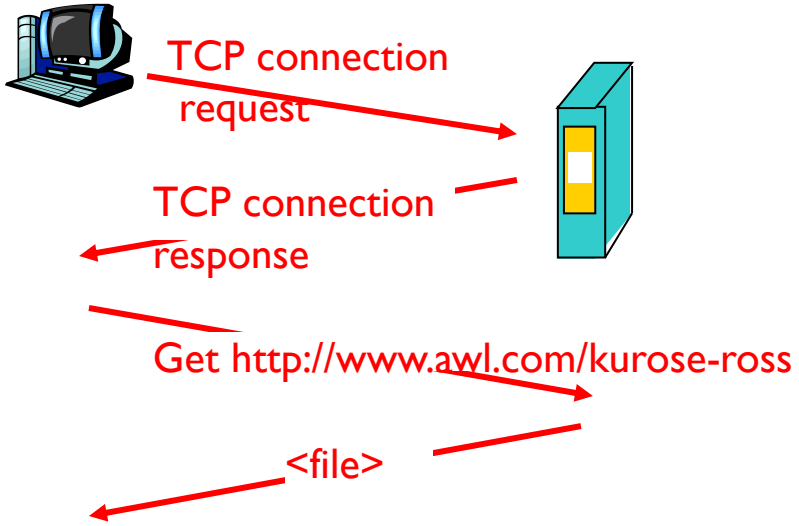
… specific msgs sent

… specific actions taken when msgs received, or other events



network protocols:

- machines rather than humans
- all communication activity in Internet governed by protocols
- "make a request to a Web server"



Q: a protocol for cutting a pizza equally?