

Computer Networks and the Internet



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Lecture 01

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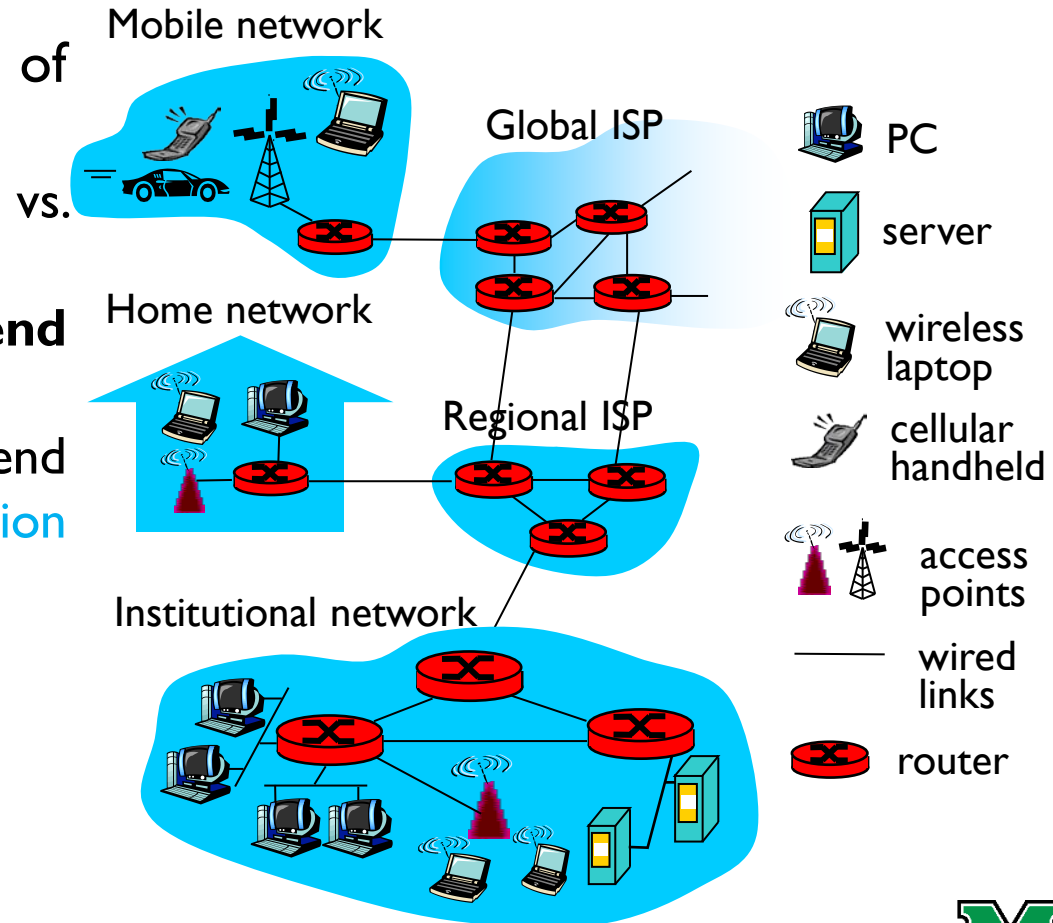


What Is the Internet?

- 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

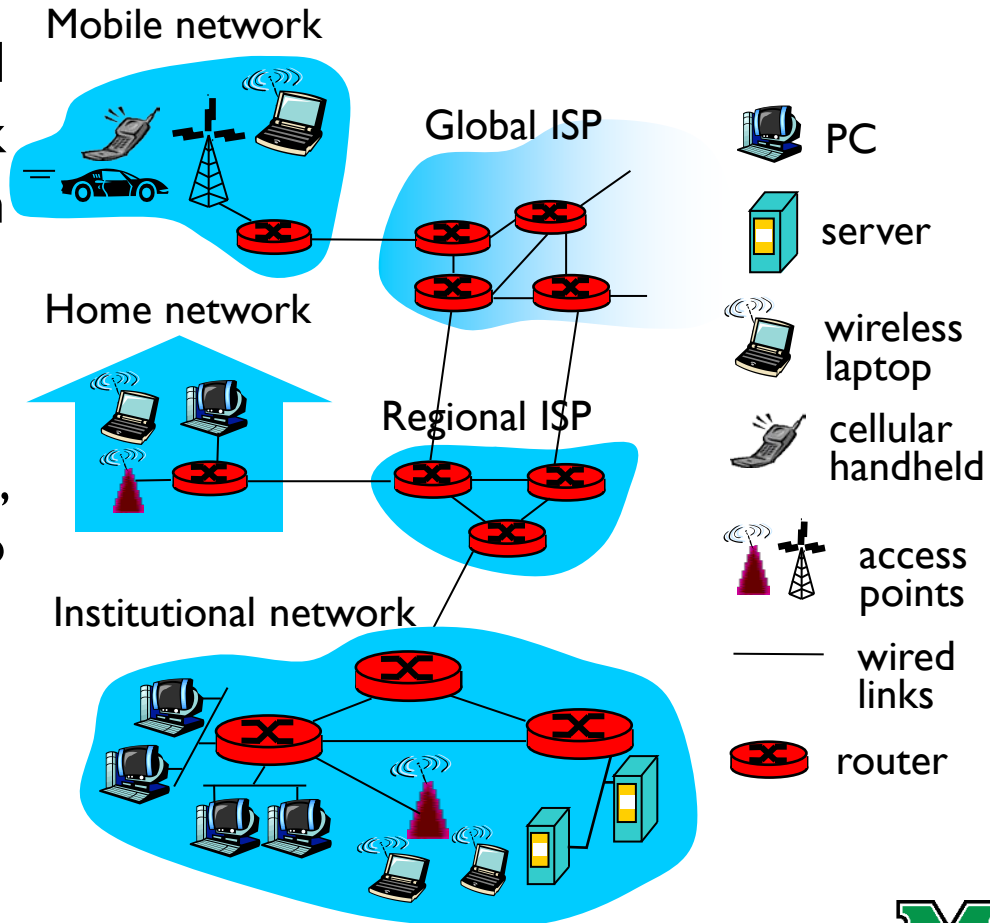
- Hundreds of millions of computing devices
 - **Traditional** devices
 - **Nontraditional** devices
 - Devices = **hosts** or **end systems**
 - As of 2018, **22 billion** end systems, and **4.021 billion** Internet users



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

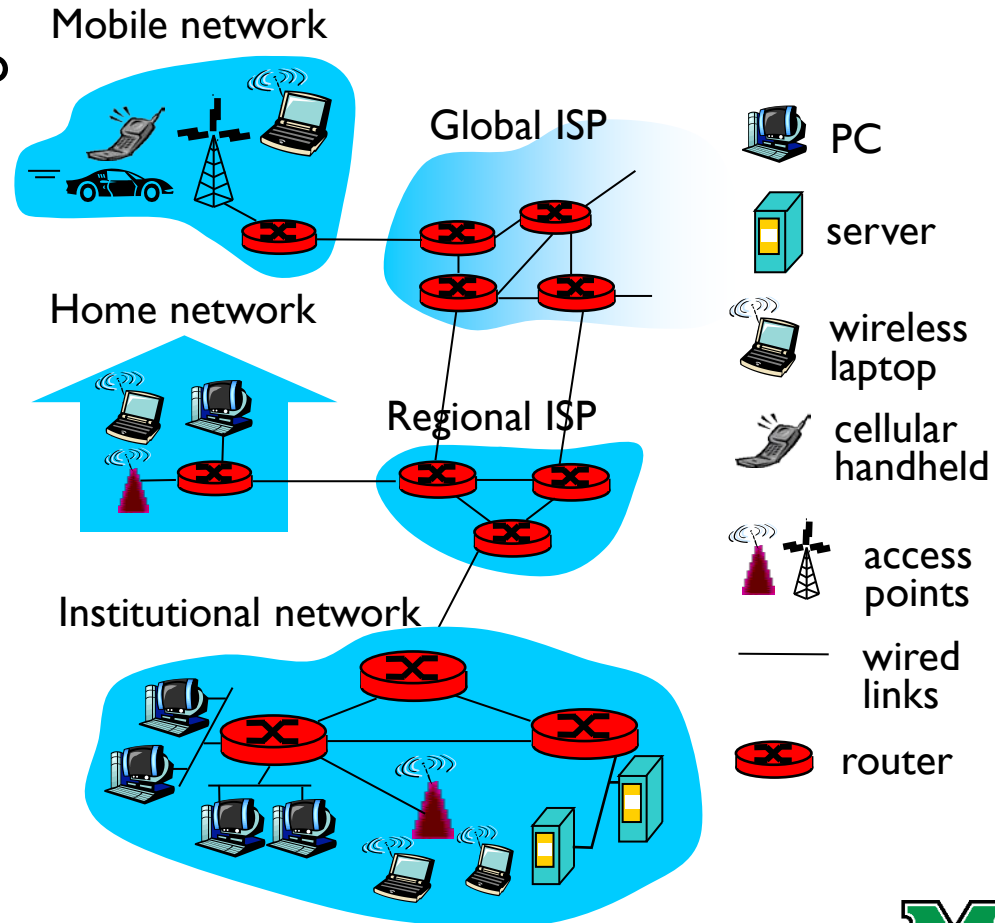
- End systems connected together by a network through **communication links** and **packet switches**

- 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**

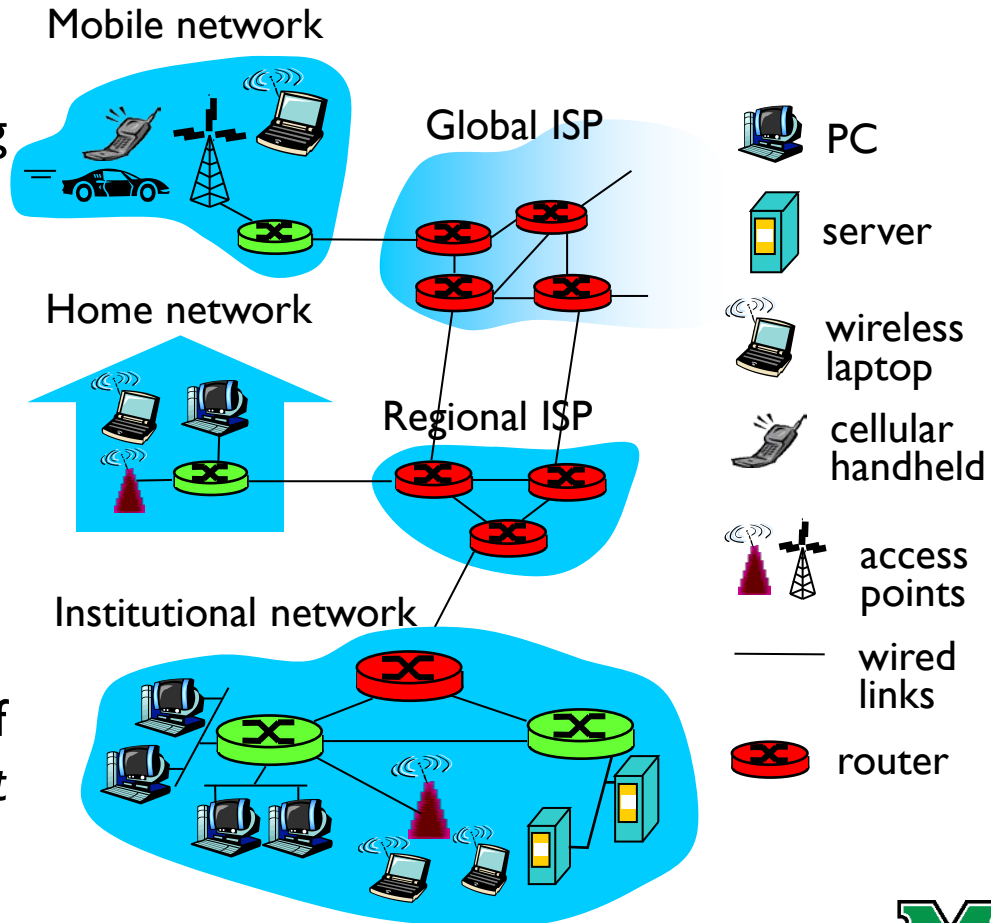
- Incoming links & Outgoing links

- **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

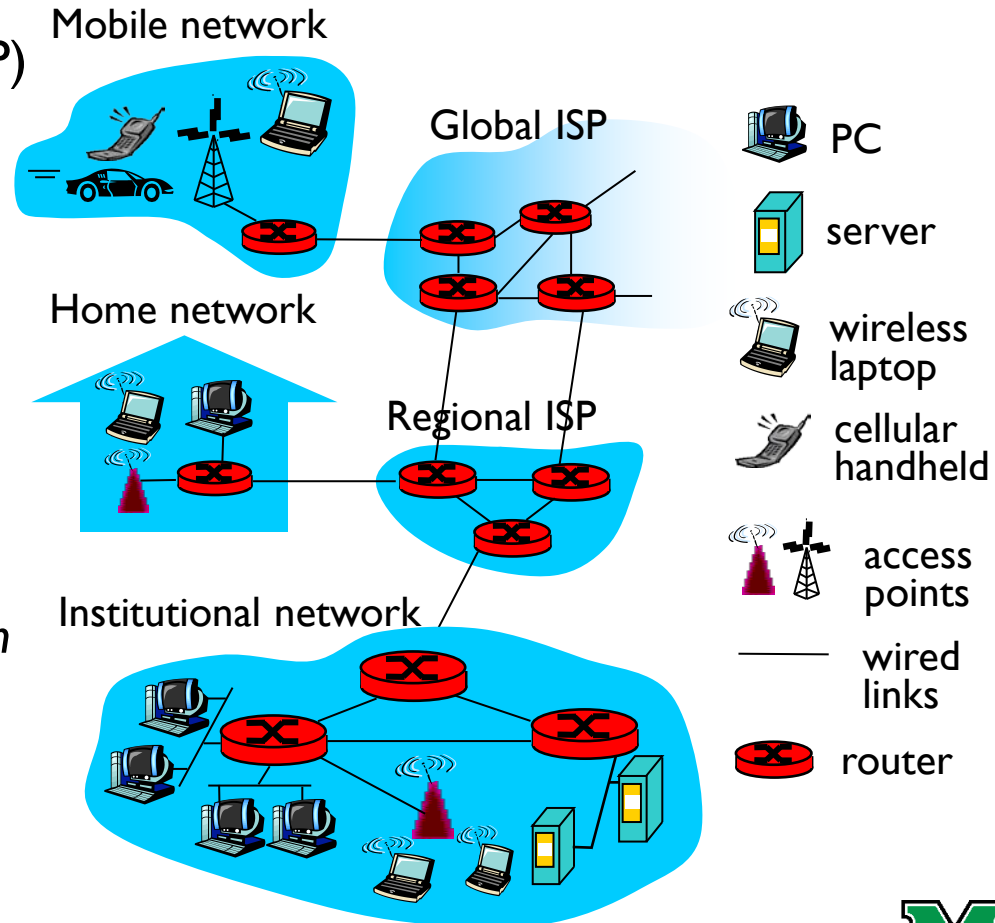


What Is the Internet: A Nuts-and-Bolts Description

■ 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*



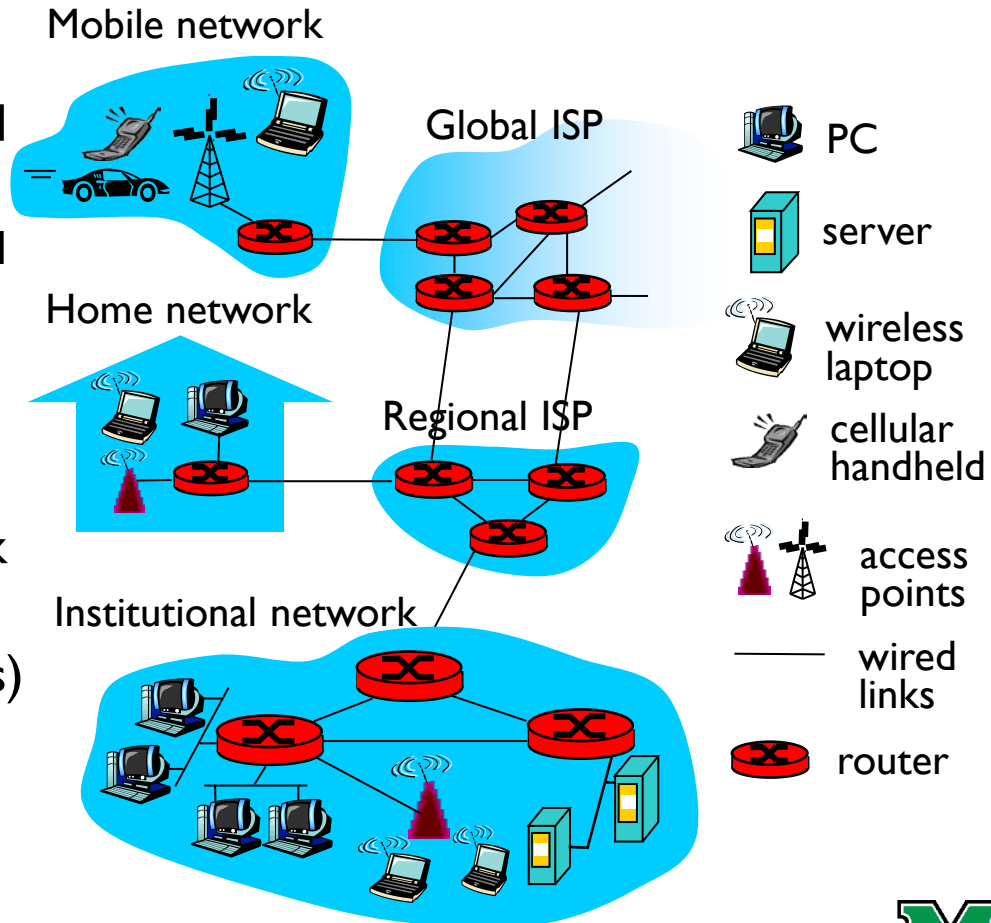
What Is the Internet: A Nuts-and-Bolts Description

■ 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)



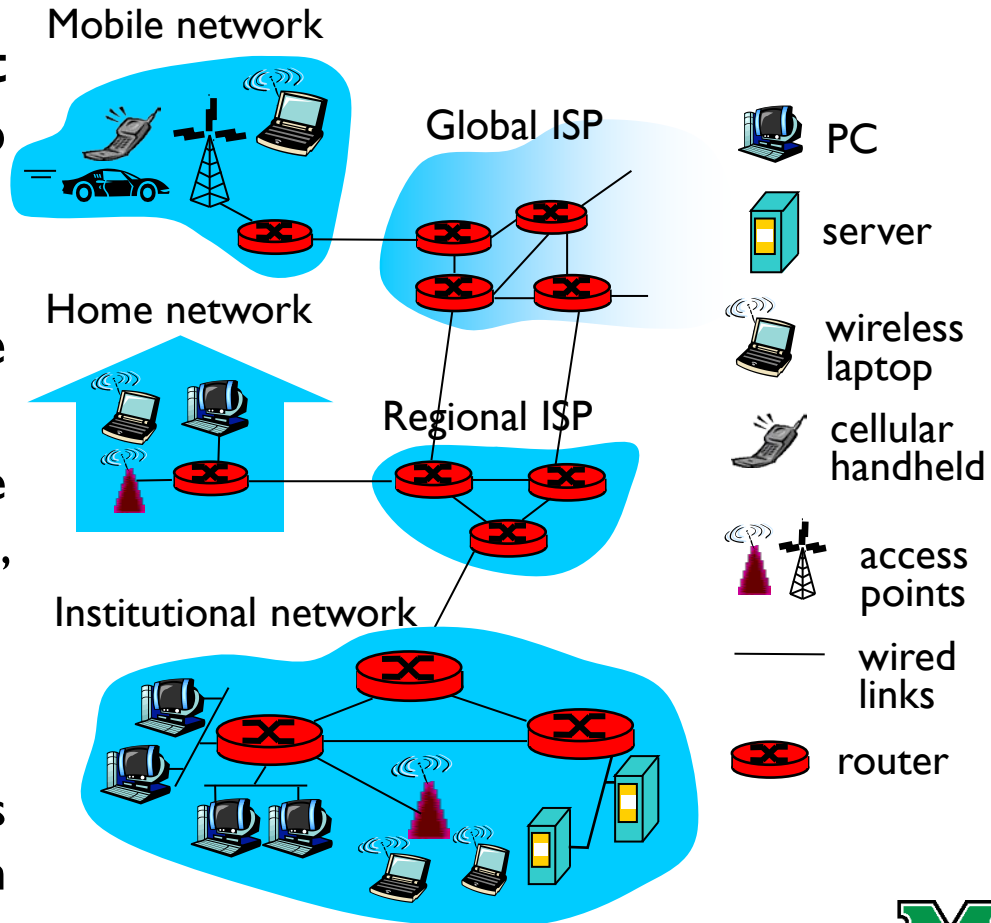
What Is the Internet: A Services Description

*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

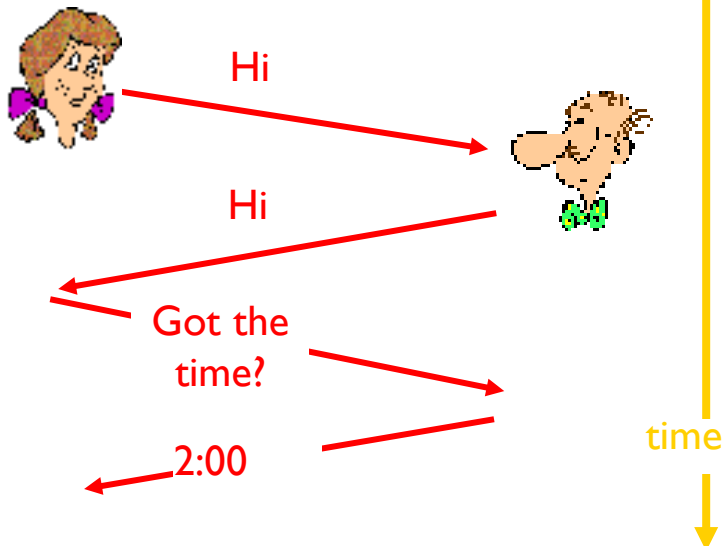


A protocol defines the format and the order of messages exchanged between two or more communicating entities, as well as the actions taken on the transmission and/or receipt of a message or other event.

Protocol

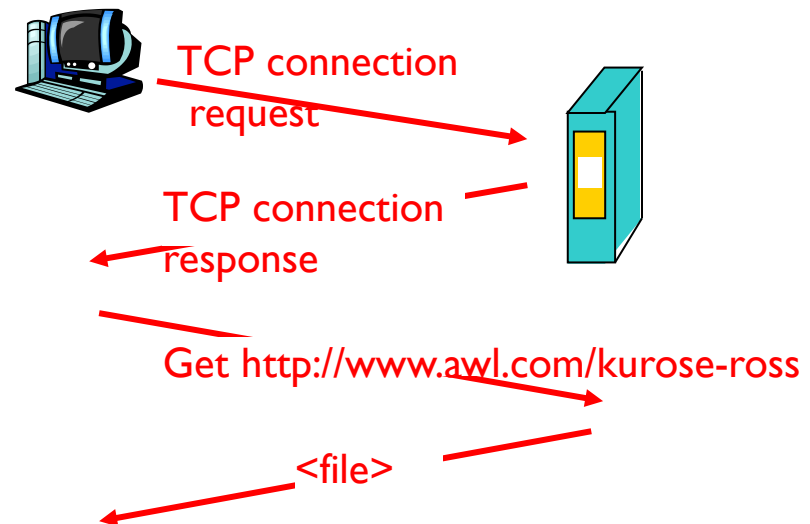
human protocols:

- “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?