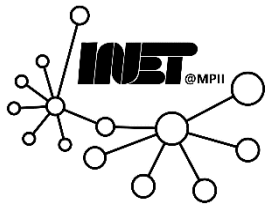
Data Networks

Introduction



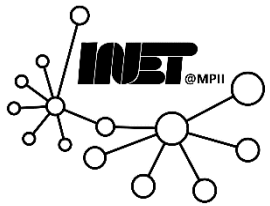
Introduction

Goals:

- Get "feel" & terminology
- More depth, detail *later* in course
- Approach:
  - Use Internet as example

Overview:

- What's the Internet?
- What's a protocol?
- Network edge:
  - *End-systems, access net, physical media*
- Network core:
  - *Packet/circuit switching, Network structure*
- Performance: *Delay, loss, throughput*
- Protocol layers, service models
- Networks under attack: Security
- History



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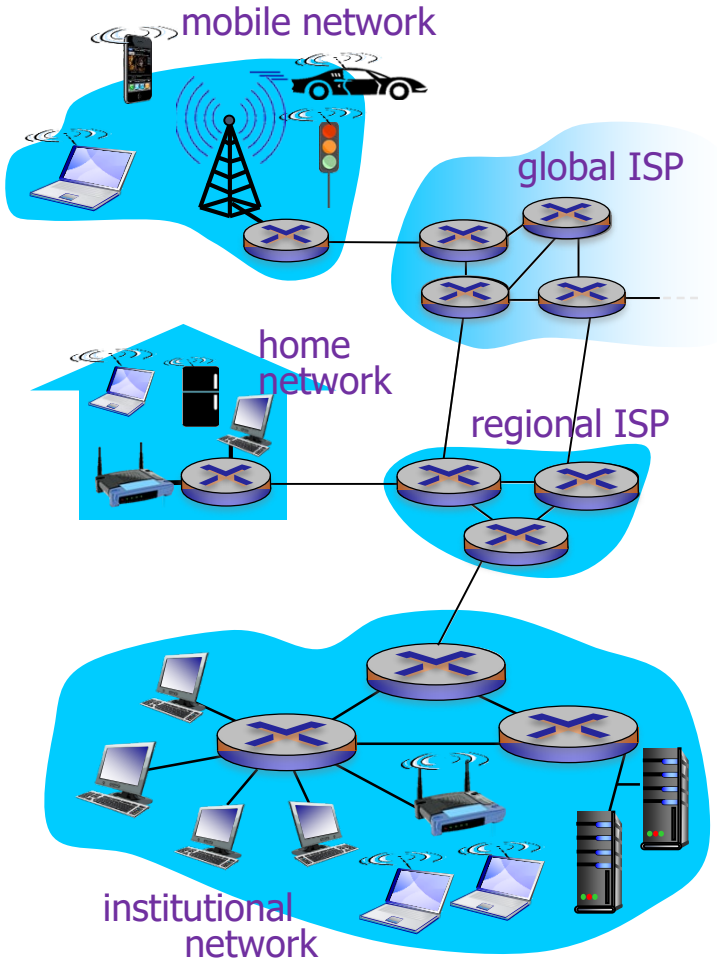
What's the Internet: "Nuts and bolts" view

Billions of connected computing devices

- *Hosts = end systems*
- Running *network apps*



“Fun” Internet-connected devices

IP picture frame
http://www.ceiva.com/

Web-enabled toaster +
weather forecaster

Tweet-a-watt:
monitor energy use

Slingbox: watch,
control cable TV remotely

sensorized
bed
mattress

Internet phones

Internet
refrigerator

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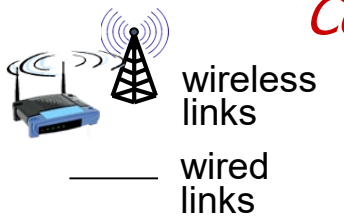
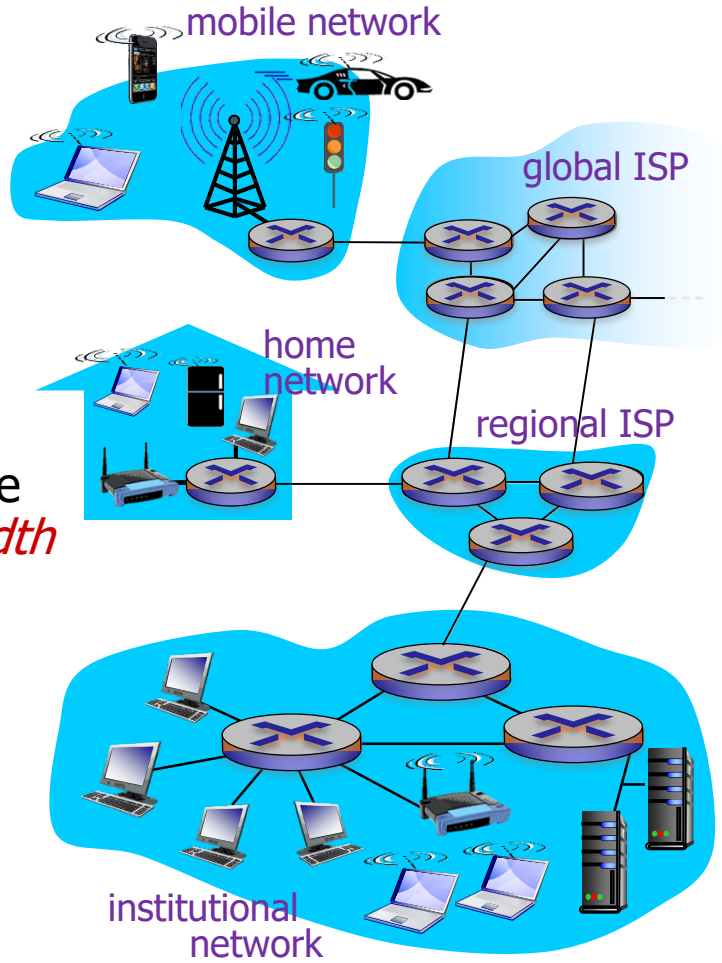


Communication links

- Fiber, copper, radio, satellite
- Transmission rate: *Bandwidth*

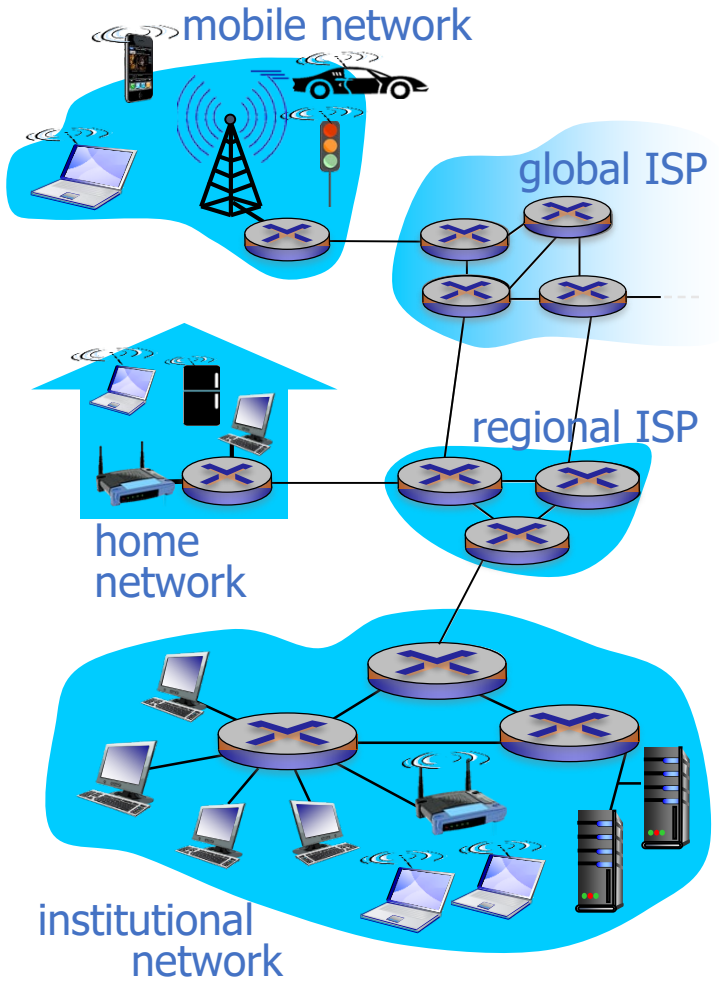
Packet switches: forward packets (chunks of data)

- *Routers* and *switches*



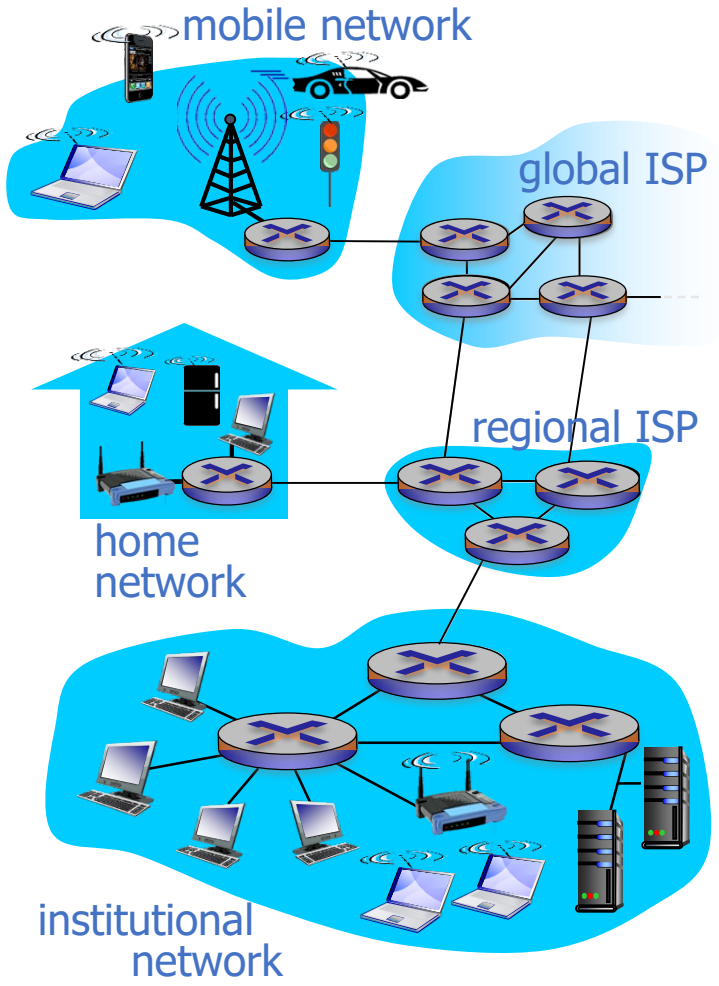
What's the Internet: "Nuts and bolts" view

- Internet:
  "Network of networks"
  - Interconnected ISPs
- Protocols control sending, receiving of messages
  - E.g., TCP, IP, HTTP, Skype, 802.11
- Internet standards
  - *RFC* : Request For Comments
  - *IETF* : Internet Engineering Task Force



What's the Internet: A service view

- *Infrastructure that provides services to applications*
  - Web, VoIP, email, games, e-commerce, social nets, …
- *Provides programming interface to apps*
  - Hooks that allow sending and receiving app programs to "connect" to Internet
  - Provides service options, analogous to postal service



Introduction: Roadmap

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What´s a protocol?

Human protocols:

- *"What's the time?"*
- *"I have a question"*
- *Introductions*

Network protocols:

- Machines rather than humans
- All communication activity in Internet governed by protocols

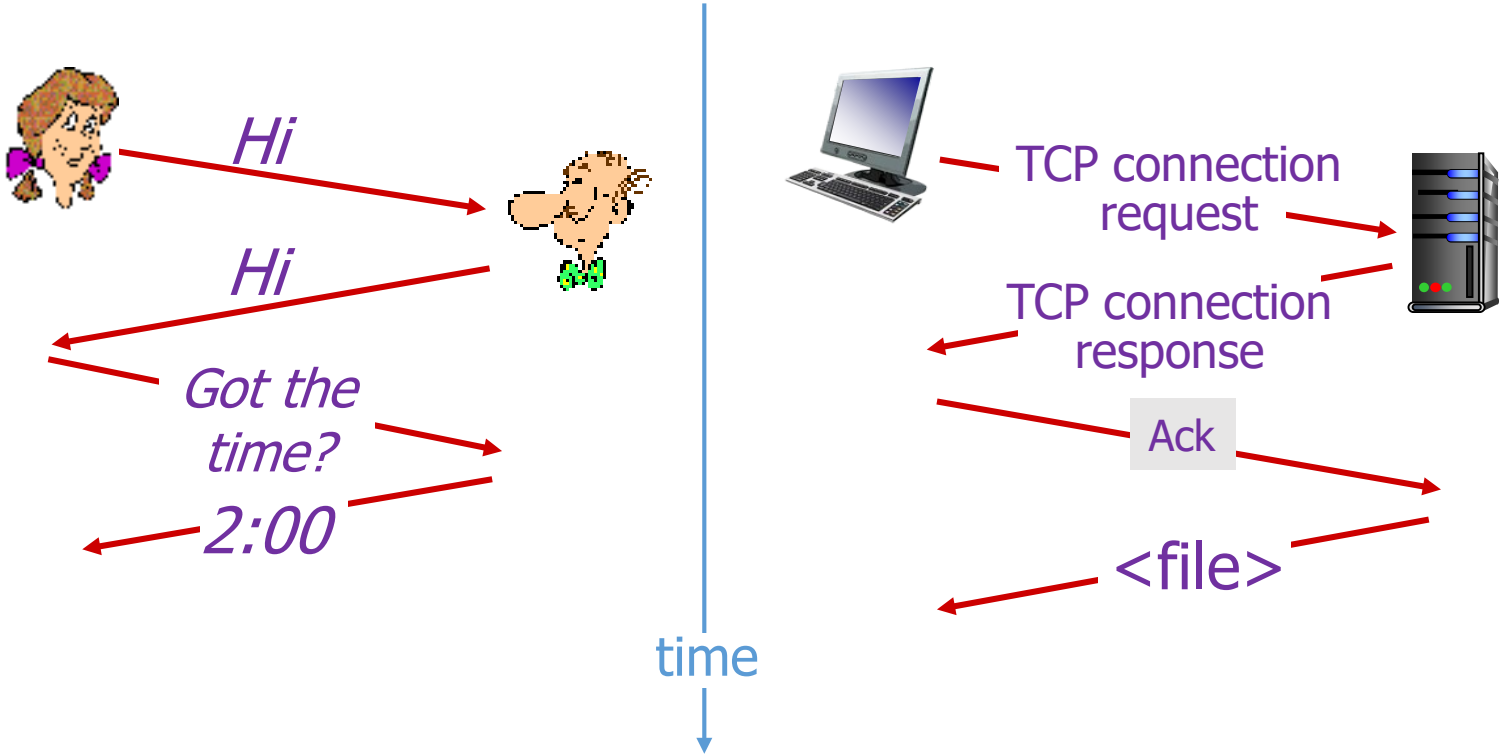
… specific messages sent

… specific actions taken when messages received, or other events

Protocols define format, order of messages sent and received among network entities, and actions taken on message transmission, receipt

What´s a protocol?

A human protocol & a computer network protocol



Q: Other human protocols?

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