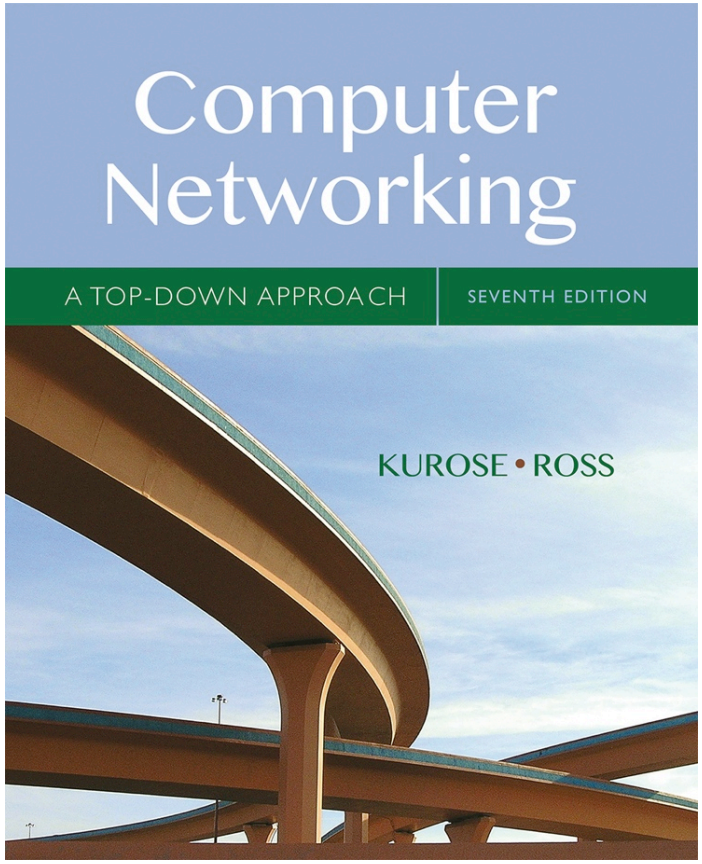
Chapter 1

- Get the overview and terminology
- …… depth coming up later in course
- Approach: use Internet as example



Computer Networking: A Top Down Approach

7th edition
Jim Kurose, Keith Ross
Pearson/Addison Wesley
April 2016

Chapter 1: roadmap

1.1 What is the Internet?

1.2 Network edge

- end systems, access networks, links

1.3 Network core

- circuit switching, packet switching, network structure

1.4 Performance

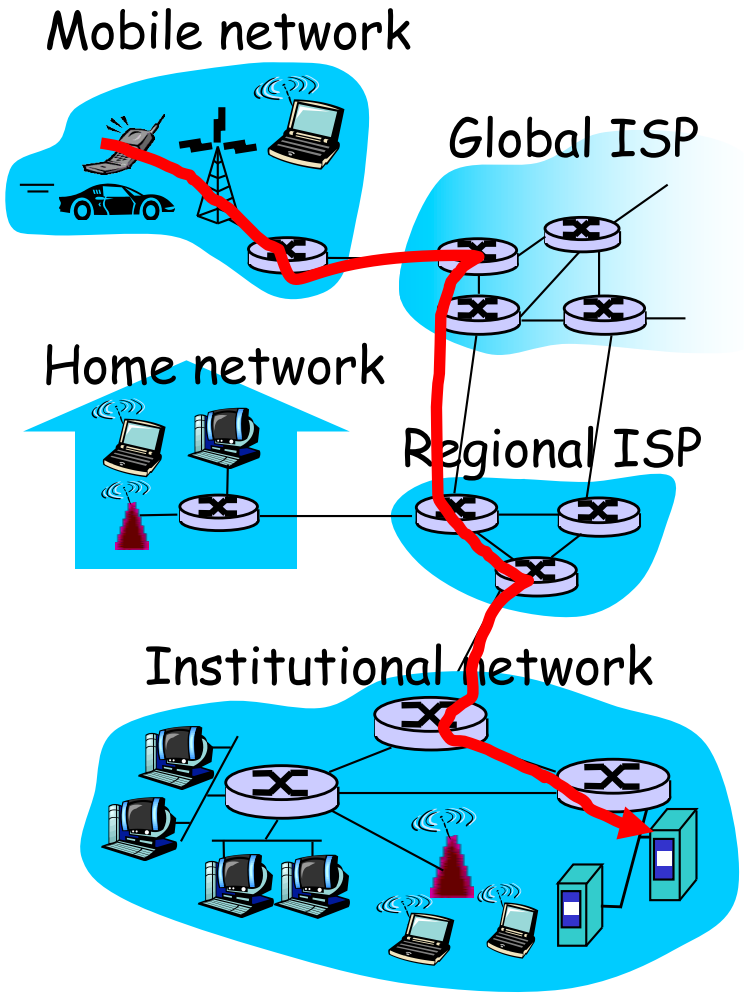
- delay, loss and throughput

1.5 Protocol layers, service models

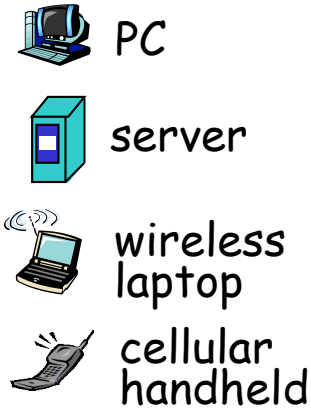
1.6 Networks under attack: security

1.7 History

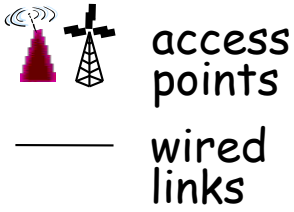
What is the Internet?



What is the Internet: "nuts and bolts" view

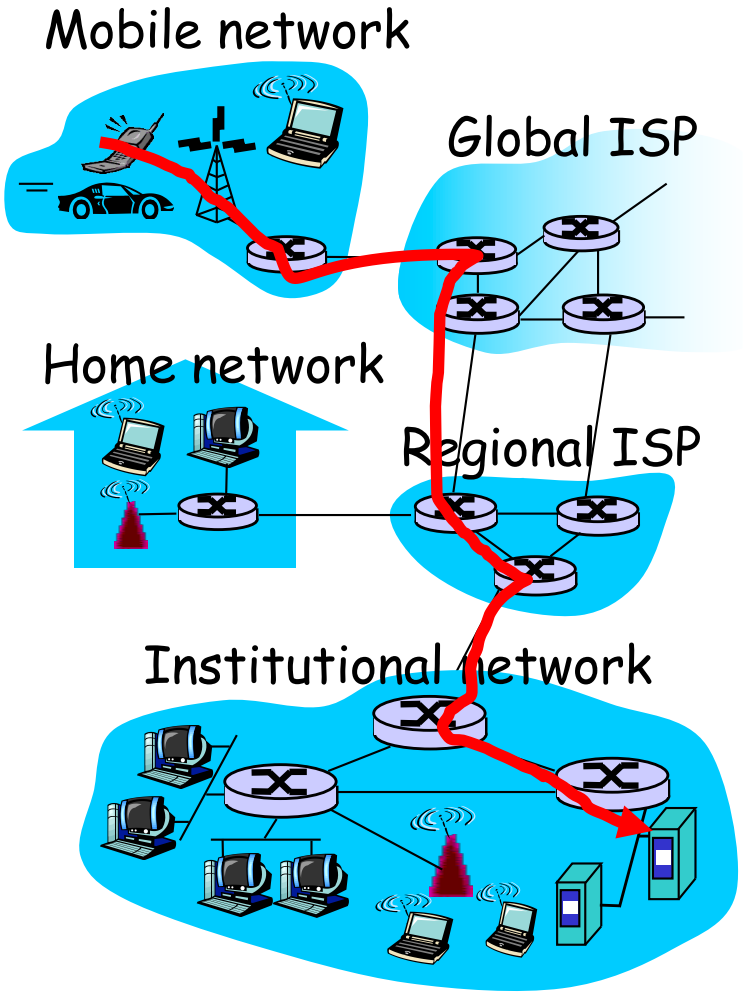


- millions of connected computing devices:
  - hosts = end systems
  - running network apps



- communication links
  - fiber, copper, radio, satellite
  - transmission rate = *bandwidth*

- routers: forward packets
  - routers or switches



… to Internet of (Every)Things

IP Phones

Smartphones

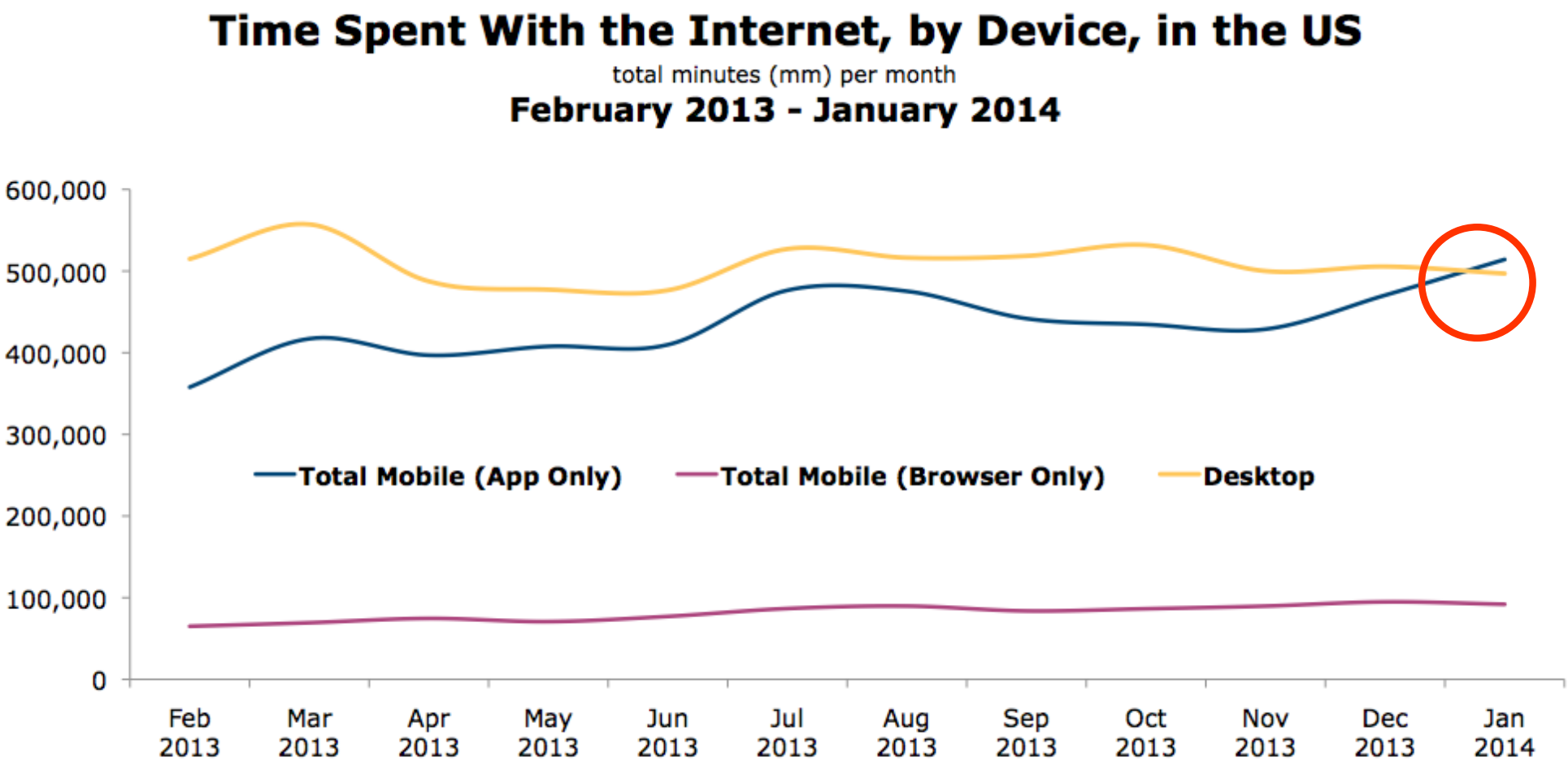
Home Appliances

Sensors

Wearables

Drones

Mobile is King



ComScore 2014

- 7.7B mobile-connected devices vs 7.1B world's population
- 1.4B smartphones vs. 2B PCs

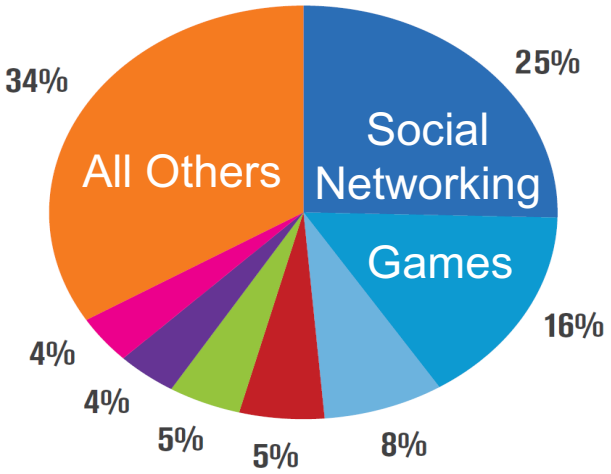
Cisco VNI 2014

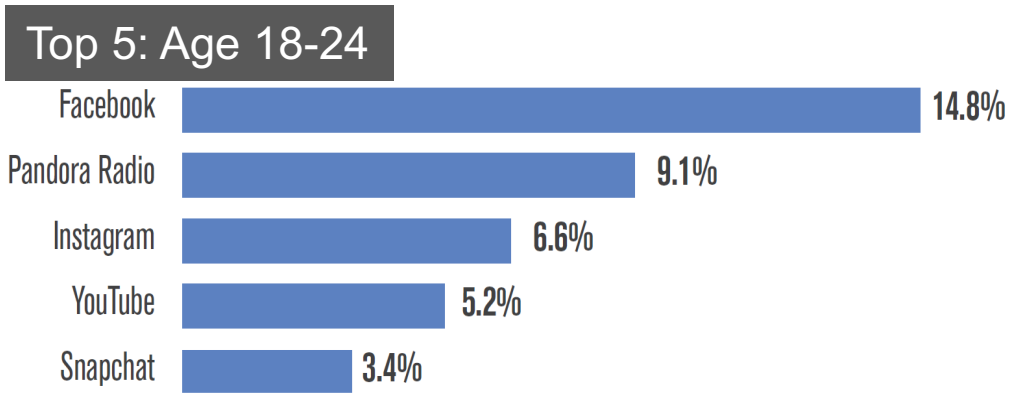
Mobile and Social

TOTAL POPULATION	ACTIVE INTERNET USERS	UNIQUE MOBILE USERS	ACTIVE MOBILE SOCIAL ACCOUNTS
7.2 Billion	3.0 Billion	3.6 Billion	1.7 Billion

We are social, Global Digital Snapshot, Jan 2015

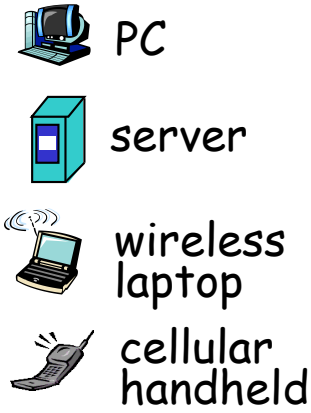
Time Spent on Mobile Apps





ComScore, June 2014

What is the Internet: "nuts and bolts" view



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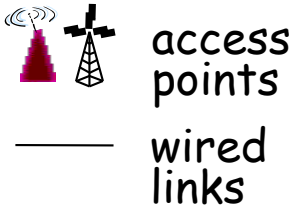

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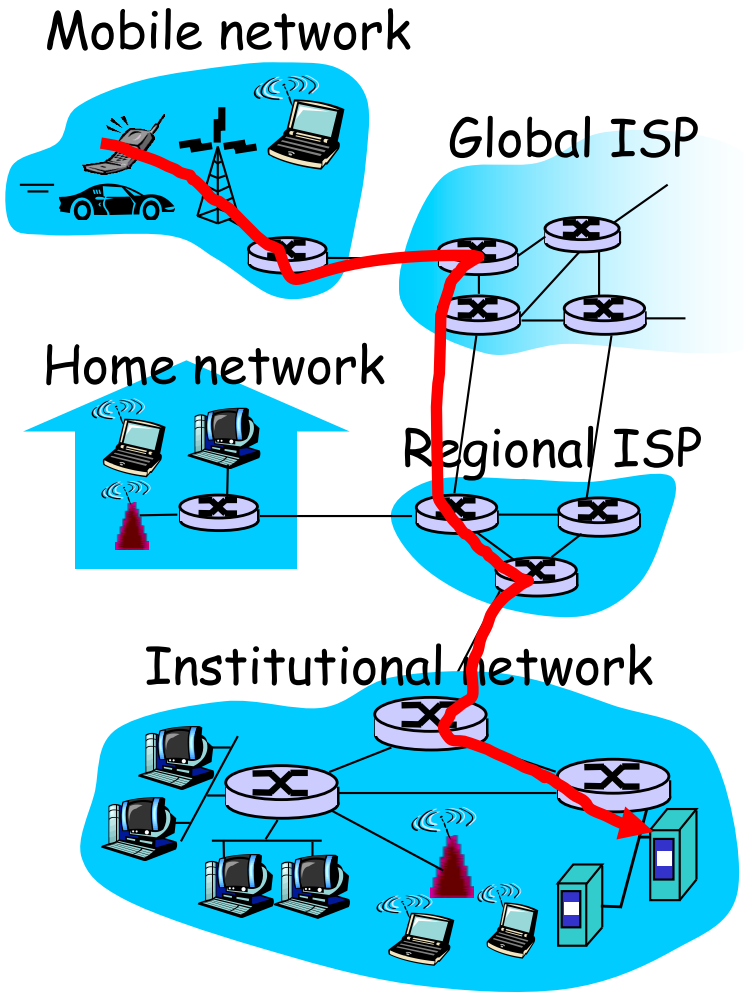
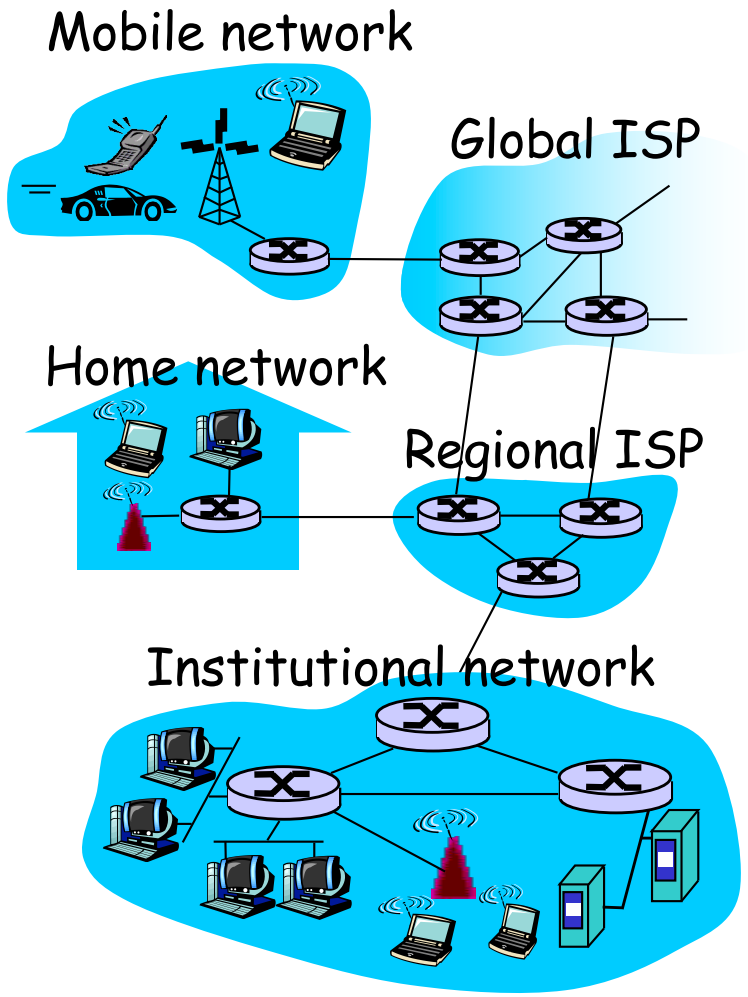


What is the Internet: "nuts and bolts" view

These components interoperate via protocols and standards

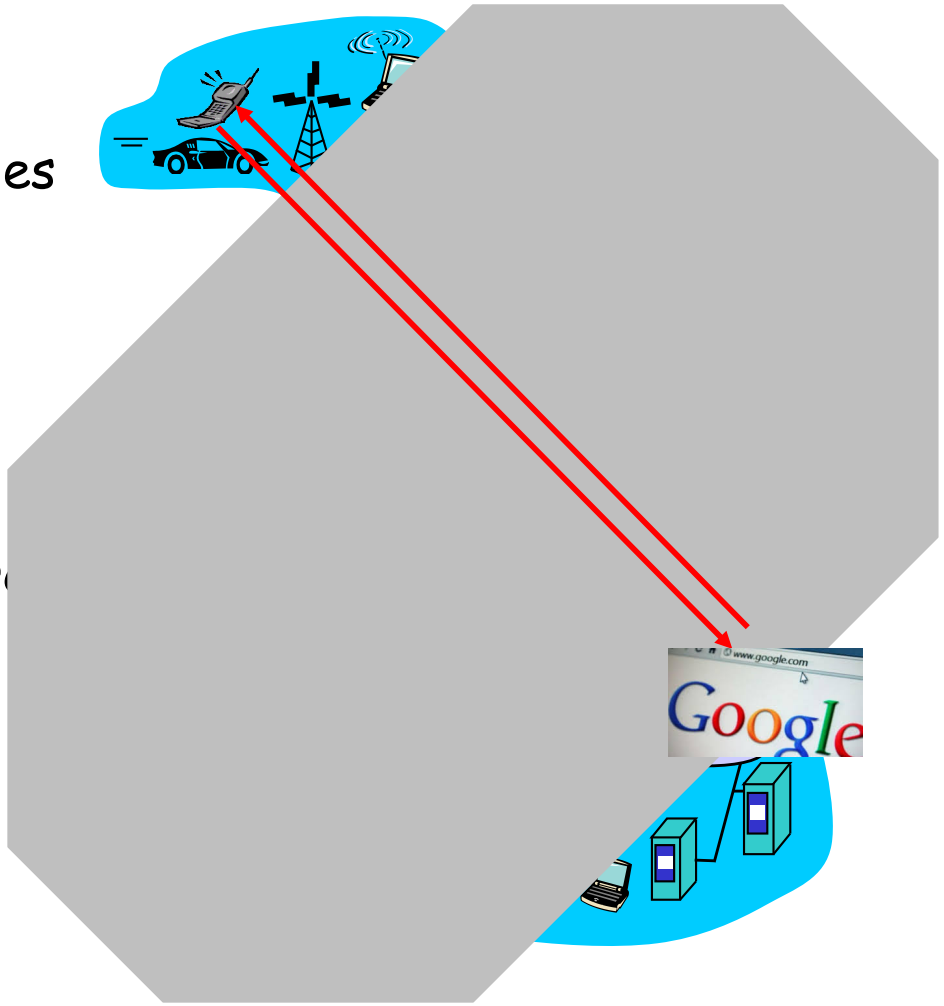
- Internet: "network of networks"
  - loosely hierarchical
- Protocols control sending+ receiving of msgs. E.g.:
  - HTTP, Skype
  - TCP/IP
  - WiFi (802.11)
- Internet standards
  - RFC: Request for comments
  - IETF: Internet Engineering Task Force



What is the Internet: a "service" view

From an application developer's point-of-view, it seems like an API.

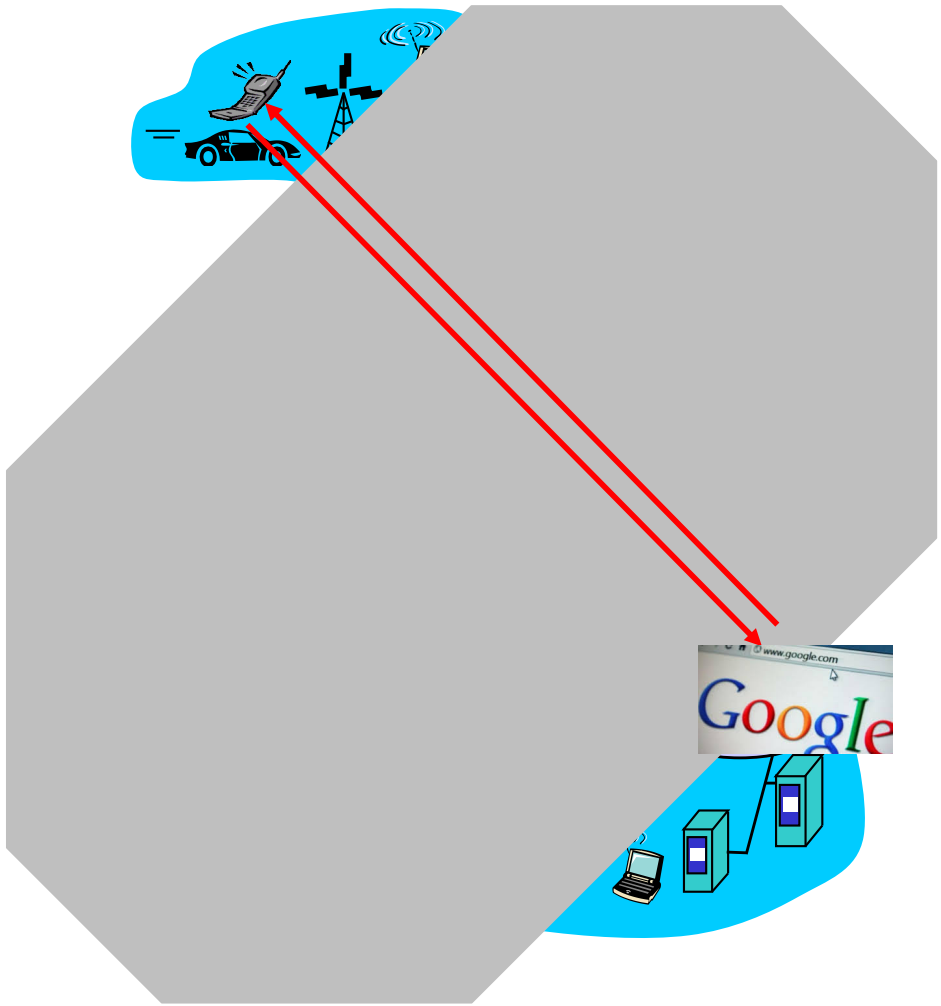
- communication infrastructure enables distributed applications:
  - Web, VoIP, email, games, e-commerce, file sharing
- communication services provided to applications:
  - reliable data delivery from sour to destination
  - "best effort" (unreliable) data delivery



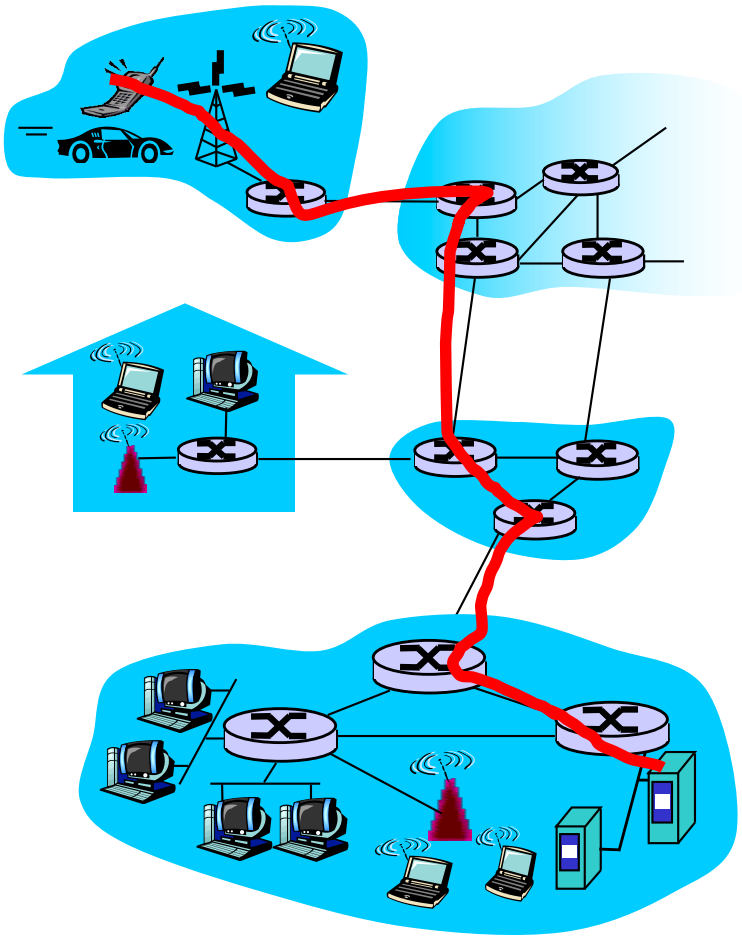
- Analogy: Postal Service.

What is the Internet: two views

"Service" View



"Nuts and bolts" View



It all works because of protocols.

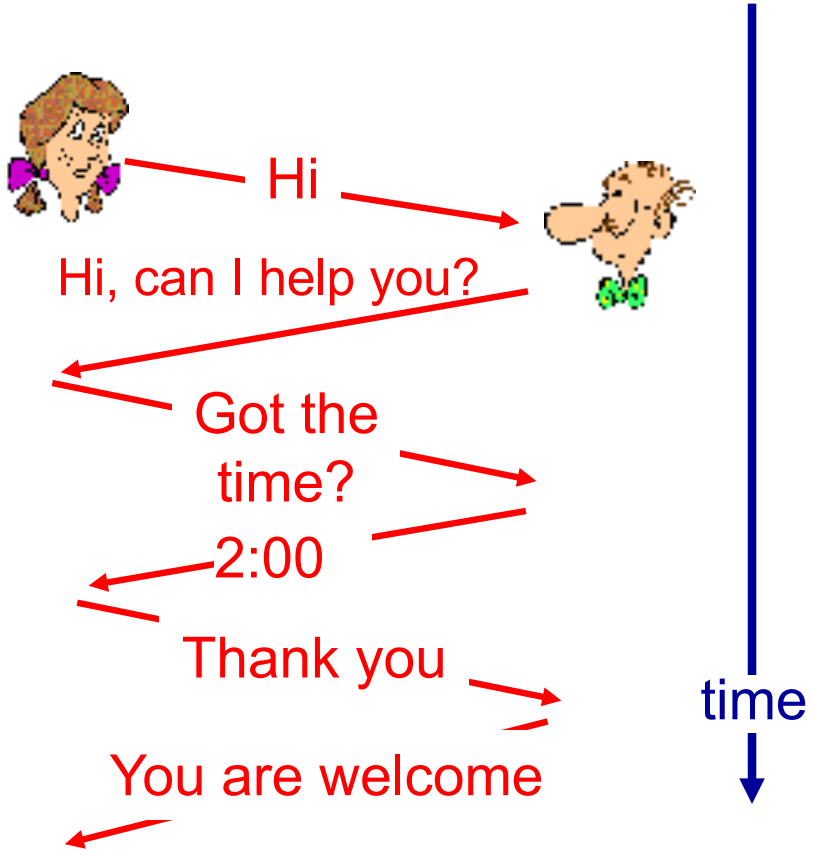
What is a protocol?

human protocols:

- "what's the time?"

… specific msgs sent

… specific actions taken
when msgs received, or
other events



Q: Other examples of human protocols?

A: Q & A in class, introductions, automated phone service (airline, banking, healthcare), ordering coffee at starbucks, bank, ….

What is a protocol?

human protocols:

- "what's the time?"

… specific msgs sent

… specific actions taken when msgs received, or other events

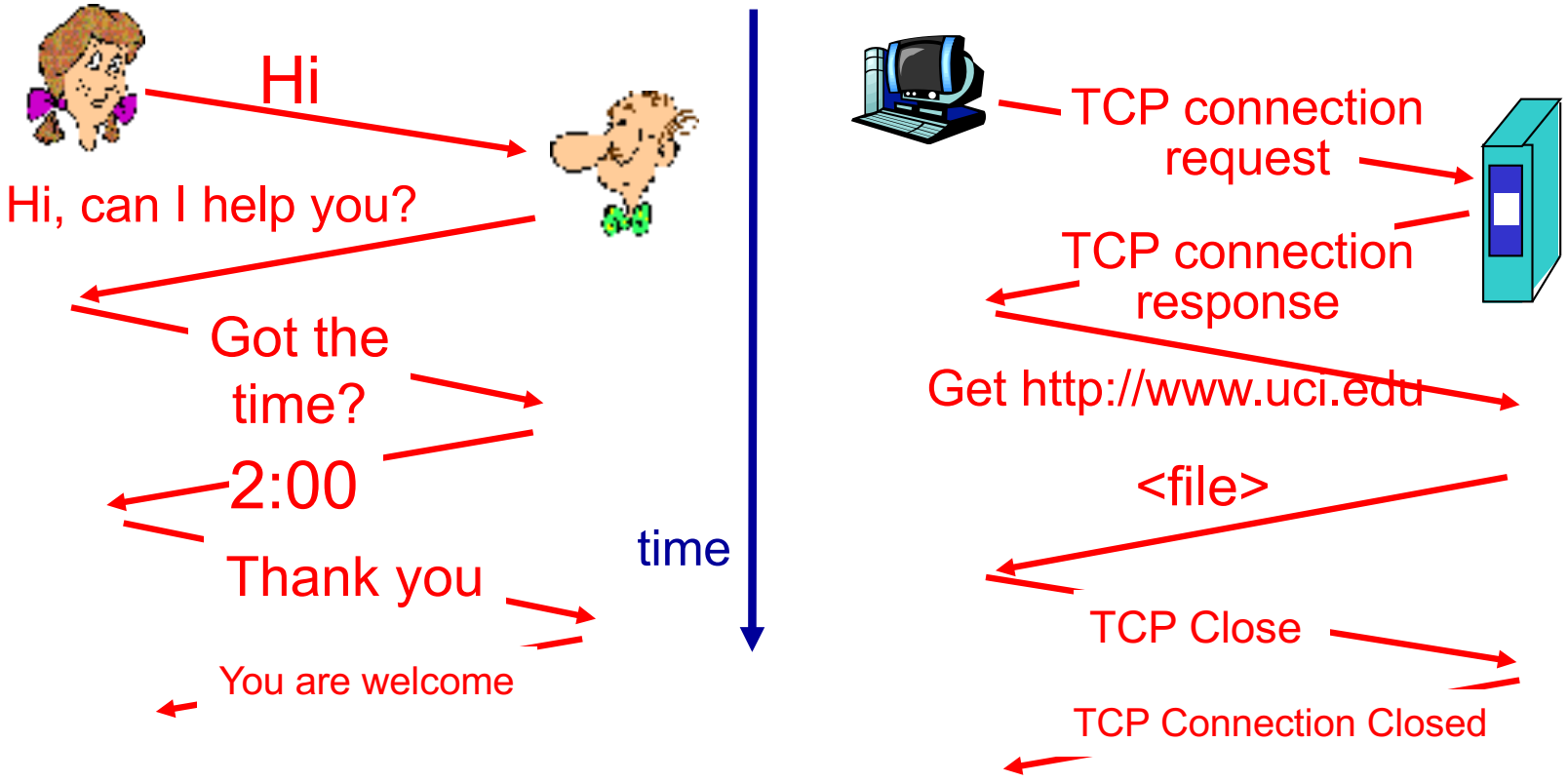
network protocols:

- machines rather than humans

- all communication activity in Internet is governed by protocols

What is a protocol?

Human vs. computer network protocol:



- protocols define format, order of msgs sent and received among network entities, and actions taken on msg Tx/Rx
- protocols do NOT define the content