INTERNET AND INTRANET

By Prakash Kafle

7 Chapters

1: Introduction (10)

2: Internet Protocol Overview (10)

3: Protocols and Client/Server Applications (10)

4: HTTP and the Web Services (15)

5: Designing Internet Systems and Servers (15)

6: Internet and Intranet Systems Development (10)

7: Internet and Intranet Applications (10)

Chapter 1

Introduction

By Prakash Kafle

Overview

1.1 History and Development of Internets and Intranets

1.2 IANA, RIR/NIR/LIR and ISPs for Internet number management

1.3 Internet Domain and Domain Name System

1.4 Internet Access Overview

1.5 Internet Backbone Networks: Optical Backbone, Marine Cables, Teleports, Satellites and Terrestrial Links

History and Development of Internets and Intranets

High Level Phases:

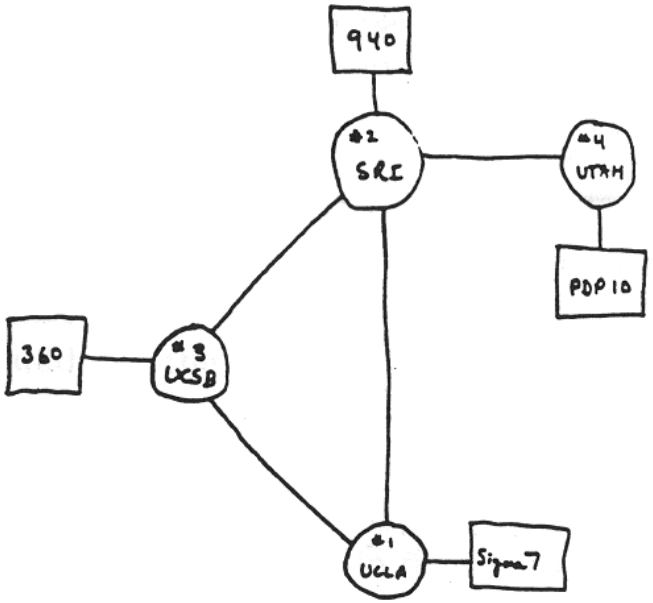
- Dawn of Electronic Computing
- Pre-Internet Communication
- Research Networks - 1960s - 1970's
- The First "Internet" - Mid 1980's
- The Web Makes it Easy - Early 1990's
- Ubiquity of the Internet - 1996 and beyond

Internet History

1961-1972: Early packet-switching principles

- 1961: Kleinrock – queueing theory shows effectiveness of packet-switching
- 1964: Baran – packet switching in military nets
- 1967: ARPAnet conceived by Advanced Research Projects Agency
- 1969: first ARPAnet node operational

- 1972:
  - ARPAnet public demonstration
  - NCP (Network Control Protocol) first host-host protocol
  - first e-mail program



THE ARPA NETWORK

Internet History

1972-1980: Internetworking, new and proprietary nets

- 1970: ALOHAnet satellite network in Hawaii
- 1974: Cerf and Kahn - architecture for interconnecting networks
- 1976: Ethernet at Xerox PARC
- ate70's: proprietary architectures: DECnet, SNA, XNA
- late 70's: switching fixed length packets (ATM precursor)
- 1979: ARPAnet has 200 nodes

Cerf and Kahn's internetworking principles:

- minimalism, autonomy - no internal changes required to interconnect networks
- best effort service model
- stateless routers
- decentralized control

define today's Internet architecture

Internet History

- 1982: smtp e-mail protocol defined
- 1983: deployment of TCP/IP
- 1983: DNS defined for name-to-IP-address translation
- 1985: ftp protocol defined
- 1988: TCP congestion control
- new national networks: Csnet, BITnet, NSFnet, Minitel
- 100,000 hosts connected to confederation of networks

Internet History

1990, 2000's: commercialization, the Web, new apps

- Early 1990's: ARPAnet decommissioned
- 1991: NSF lifts restrictions on commercial use of NSFnet (decommissioned, 1995)
- early 1990s: Web
  - hypertext [Bush 1945, Nelson 1960's]
  - HTML, HTTP: Berners-Lee
  - 1994: Mosaic, later Netscape
  - late 1990's: commercialization of the Web

Late 1990's – 2000's:

- more killer apps: instant messaging, P2P file sharing
- network security to forefront
- est. 50 million host, 100 million+ users
- backbone links running at Gbps

Internet History

After 2000: Ubiquity of the Internet

- ~800 million hosts
- Voice, Video over IP
- P2P applications: BitTorrent (file sharing), Skype (VoIP), PPLive (video)
- more applications: YouTube, gaming
- wireless, mobility

Let's begin …

What is:

The Internet?

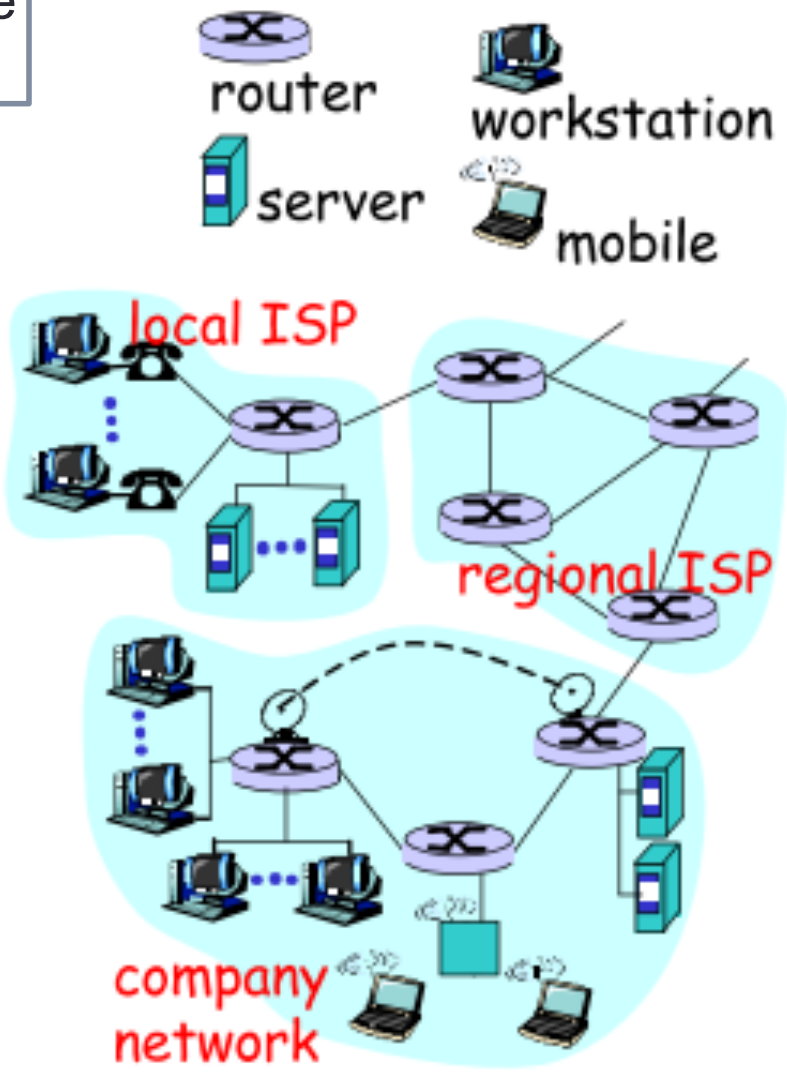
A protocol?

What's the Internet: A *Nuts* and *Bolts* view

the basic hardware and software components that make up the Internet

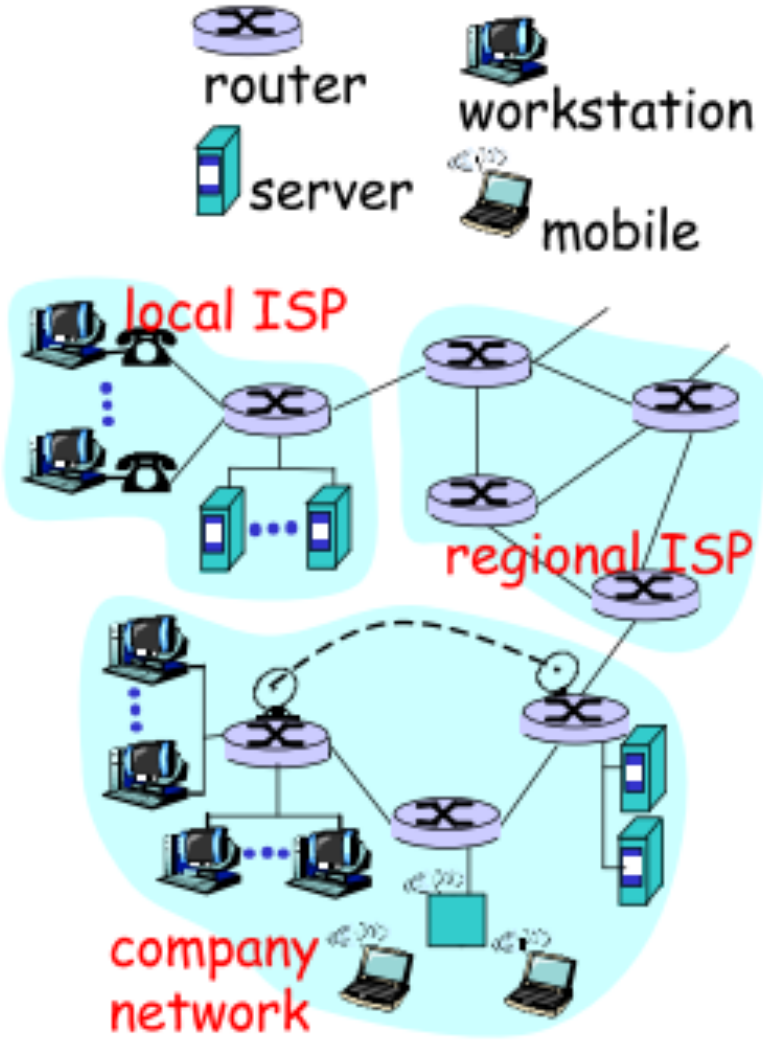
- Millions of connected computing devices: *hosts, end-systems*
  - PCs, workstations, servers
  - PDAs, phones, toasters

  running *network apps*
- *Communication links*
  - fiber, copper, radio, satellite
- *Routers:* forward packets (chunks) of data thru network



What's the Internet: A *Nuts* and *Bolts* view

- *Protocols*: control sending & receiving of messages
  - e.g., TCP, IP, HTTP, FTP, PPP
- *Internet:* "network of networks"
  - loosely hierarchical
  - public Internet versus private intranet
- Internet standards
  - RFC: Request for comments
  - IETF: Internet Engineering Task Force

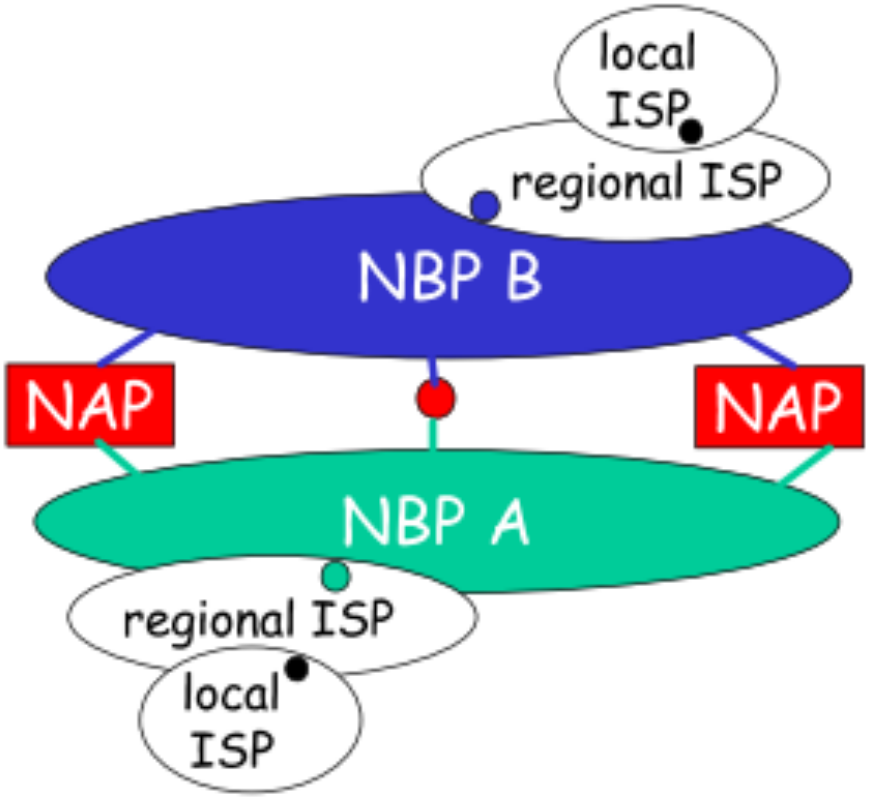


What's the Internet: A *Service* view

- Communication *infrastructure* enables distributed applications:
  - *WWW, email, games, e-commerce, database, voting …*
  - *More?*
- *Communication services provided:*
  - *Connection less*
  - *Connection oriented*

Internet Structure: network of networks

- roughly hierarchical
- national/international backbone providers (NBPs)
  - e.g. Genuity/Level 3, Sprint, AT&T, IBM, UUNet, MCI
  - interconnect (peer) with each other privately, or at public Network Access Point (NAPs)
- regional ISPs
  - connect into NBPs
- local ISP, company
  - connect into regional ISPs



What's a protocol?

Human protocols:

- "what's the time?"
- "I have a question"
- introductions

… specific msgs sent

… specific actions taken when msgs received, or other events

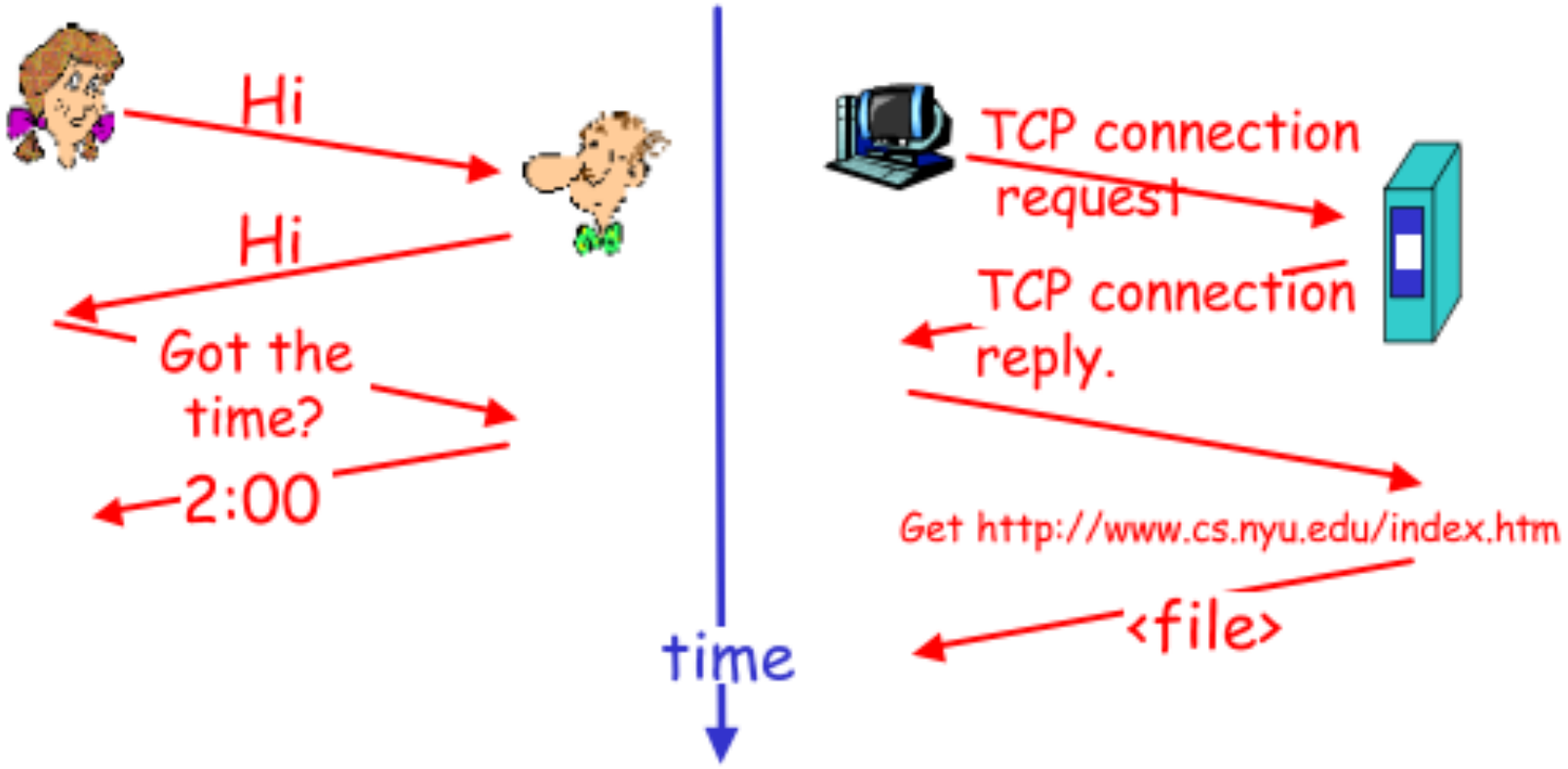
Network protocols:

- machines rather than humans
- all communication activity in Internet governed by protocols

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

What's a protocol?

A human protocol and a computer network protocol:



What's a protocol?

- In summary, a protocol is :
  - An agreement about communication between two or more entities
  - It specifies
    - Format of messages
    - Meaning of messages
    - Rules for exchange
    - Procedures for handling problems
- Protocols are specified typically in a document, such as an Internet RFC
- Many formal and semi-formal representations can describe protocols
  - Space-Time diagrams
  - Finite State Machines (FSM)

Thank You !!!