




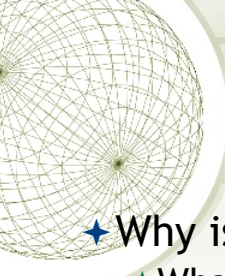
Introduction

Info 341 Networking and Distributed Applications



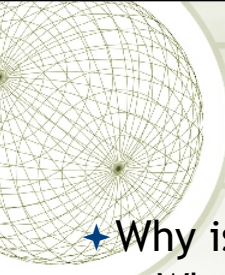
Motivating Networking

- ★ Why is networking useful?
- ◆ What can you do with networking?



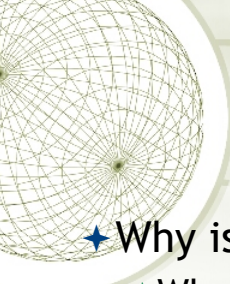
Motivating Networking

- ★ Why is networking useful?
 - ✦ What can you do with networking?
 - ✦ Remote Access
 - ✦ Resource Sharing
 - ✦ Information Dissemination
 - ✦ Communication
 - ✦ Collaboration
 - ✦ Remote Management
 - ✦ Fun



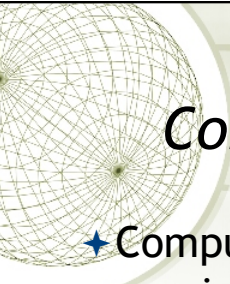
Motivating Networking

- ★ Why is networking useful?
 - ✦ What can you do with networking?
 - ✦ Remote Access - telnet/ssh
 - ✦ Resource Sharing - ftp/file transfer
 - ✦ Information Dissemination - http/web
 - ✦ Communication - IM/chat/email
 - ✦ Collaboration - Netmeeting/Video Conference
 - ✦ Remote Management - backups/configuration
 - ✦ Fun - Games



Motivating Networking

- ★ Why is networking useful?
 - ◆ What can you do with networking?
 - ◆ ...
- ★ What did computer users do before networking existed?

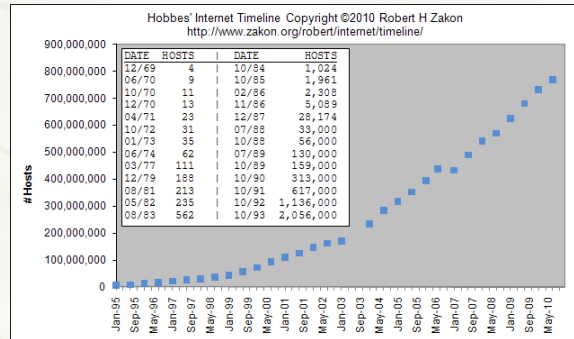


Computer Network Growth

- ★ Computer networks have been consistently growing since 1970' s
 - ◆ Were there “networks” around before computers?

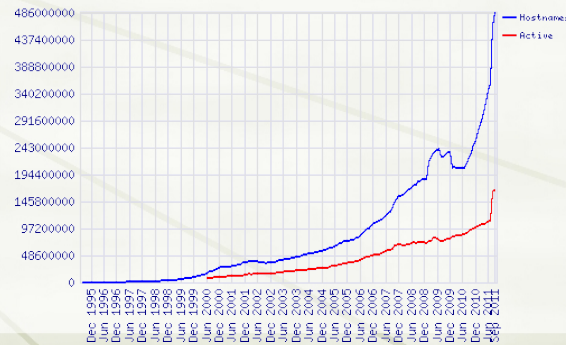
Historic Growth of Networks

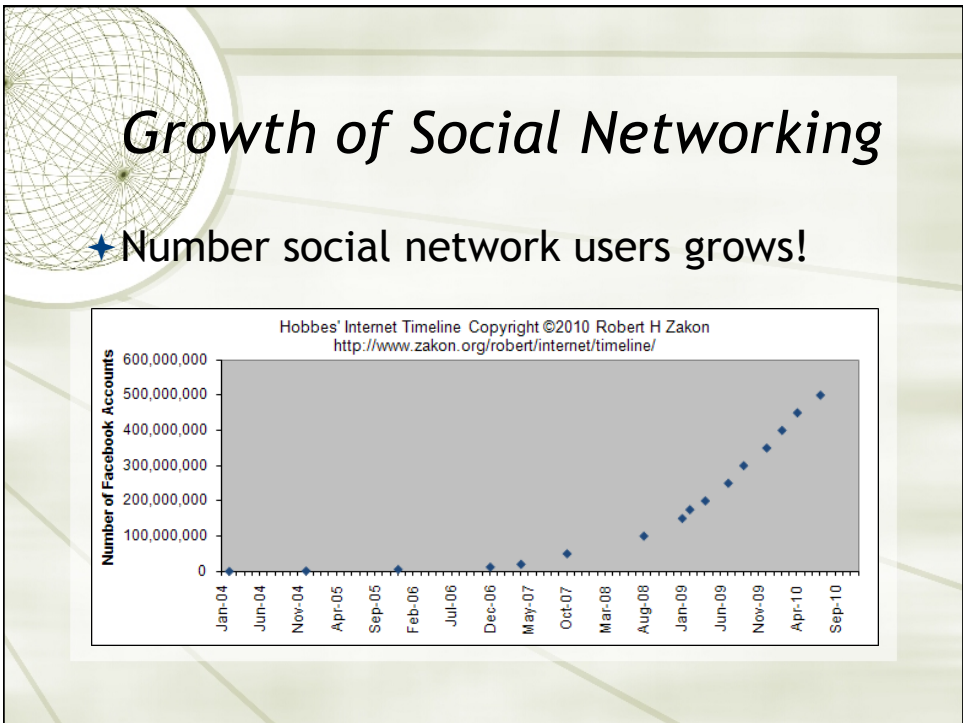
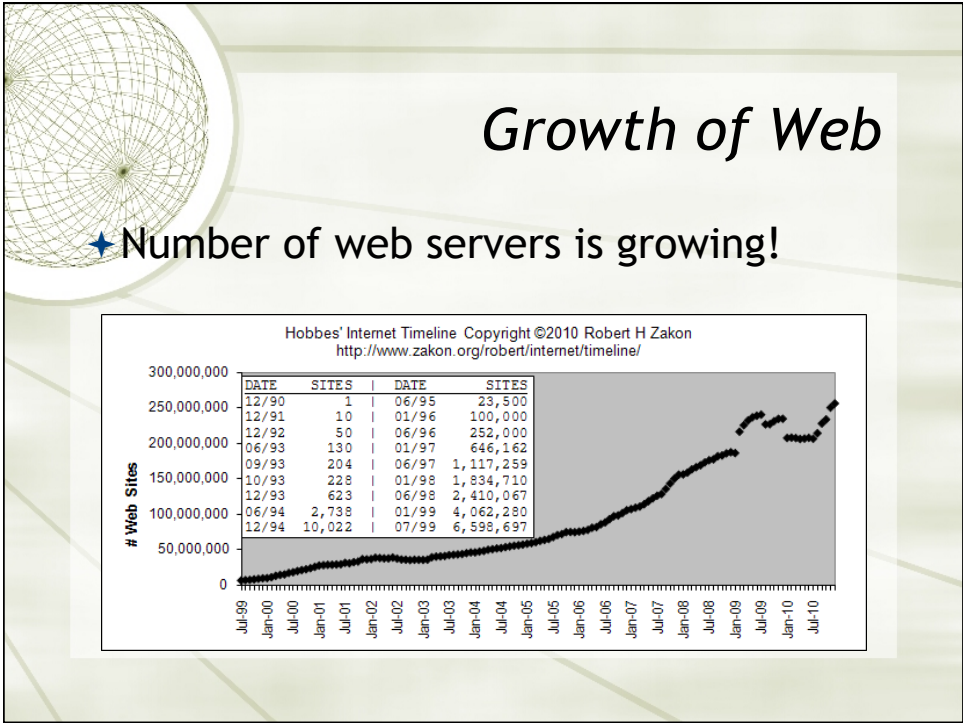
- ★ Growth in Hosts
- ★ What's a "host"?

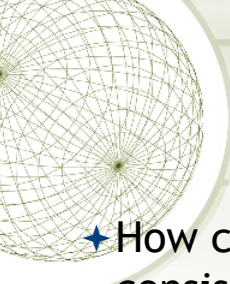


Growth of Domain/Host Names

- ★ What is a "hostname"?
- ★ What is a "domain name"?

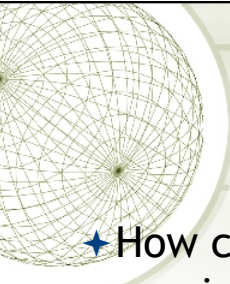







Some Initial Principles

- ★ How can we talk about networking in a consistent way?




Some Initial Principles

- ★ How can we talk about networking in a consistent way?
 - ★ Data Transferred
 - ★ Equipment Required
 - ★ Protocols



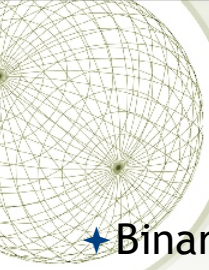
Networks transfer data

- ★ What is data?



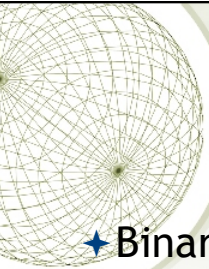
Networks transfer data

- ★ What is data?
- ★ How can we represent data?



Binary Representations

- ★ Binary (0, 1) is used to encode data
 - ◆ Series of binary digits (bits) can represent many different things ...



Binary Representations

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 - ◆ Series of binary digits (bits) can represent many different things ...

A series of Bits	Decimal Number	ASCII Character
1	1	soh
100	4	eot
1101	13	cr
110100	52	"4"
1000001	65	"A"
1010100	84	"T"
1111011	123	"{"



Hex Representations

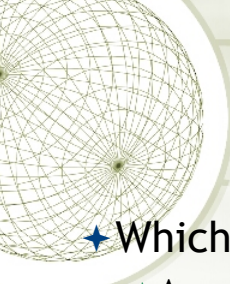
- ★ Hex (0-9A-F) is commonly used to represent binary data

A series of Bits	Decimal Number	ASCII Character	Hexidecimal
1	1	soh	1
100	4	eot	4
1101	13	cr	D
110100	52	"4"	34
1000001	65	"A"	41
1010100	84	"T"	54
1111101	125	"}"	7D



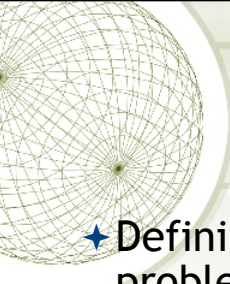
Bits, Bytes, Octets

- ★ Our "series of binary digits" is almost always 8 bits
 - ★ A series of 8 bits we often call a "byte"
 - ★ A byte is sometimes called an "octet"
- ★ Network speed is often measured in bits and bytes
 - ★ Kbps (kilo bits per second)
 - ★ KBps (kilo bytes per second)
 - ★ Mbps (mega bits per second)
 - ★ MBps (mega bytes per second)



Simple Comparison

- ✦ Which is faster?
 - ✦ A network running at 7 Mbps
 - ✦ A network running at 1 MBps
- ✦ Which is faster?
 - ✦ A network running at 1024 KBps
 - ✦ A network running at 1 MBps




Data Transferred

- ✦ Defining networking by the data is problematic
 - ✦ Why should the specific data matter?
 - ✦ Why should the network care?
- ✦ Generally, we don't describe networks around the data transferred
 - ✦ Some caveats

Equipment

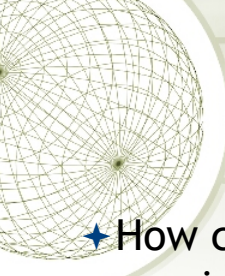
- ★ Maybe describe networks by the necessary equipment
 - ★ NIC
 - ★ Hub
 - ★ Switch
 - ★ Router
 - ★ AP



The image displays various network hardware components. On the left, a green Network Interface Card (NIC) is shown. In the center, there is a long, thin network switch with many ports. To the right, a blue Netgear switch is visible. Below the switch, there is a blue wireless router with two antennas. On the far right, there are several stacked network devices, likely hubs or switches, in a light grey color.

Protocols

- ★ Maybe describe networks by the protocols ...
 - ★ HTTP
 - ★ FTP
 - ★ TCP/IP
 - ★ ARP/RARP
 - ★ TLS/SSL
 - ★ SNMP
 - ★ SMTP
 - ★ ...



Some Initial Principles


- ★ How can we talk about networking in a consistent way?
 - ✦ Layered Model

Application

Network

Physical

Simple Three Layer Model



Some Initial Principles

- ★ How can we talk about networking in a consistent way?
 - ✦ Layered Model

Application

Network

Physical

Simple Three Layer Model

Application

Presentation

Session

Transport

Network

Data link

Physical

OSI 7 Layer Model

Some Initial Principles

- ★ How can we talk about networking in a consistent way?
 - ✦ Layered Model

The diagram illustrates three networking models as vertical stacks of layers:

- Simple Three Layer Model:** Application, Network, Physical.
- OSI 7 Layer Model:** Application, Presentation, Session, Transport, Network, Data link, Physical.
- Internet Reference Model:** Application, Transport, Internetwork, Network Access, Physical.

During the quarter ...

- ★ Work through the layers, bottom up
 - ✦ Data transmission and encoding
 - ✦ Media control, media access
 - ✦ Networks of networks
 - ✦ Protocols for applications

The diagram shows the Internet Reference Model layers from bottom to top:

- Physical
- Network Access
- Internetwork
- Transport
- Application