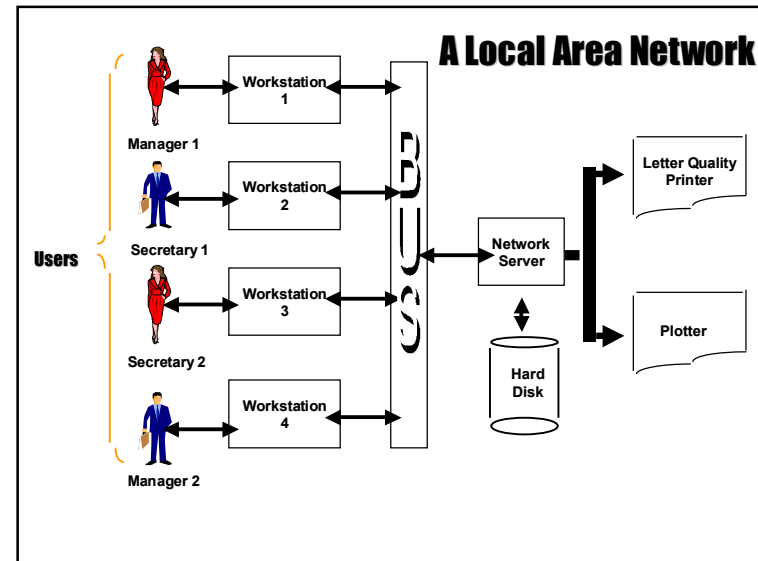


## Types of Computer Networks

- LAN (local area network)
  - ❖ Limited area but could include 100 or so microcomputers
  - ❖ Facilitates office automation
  - ❖ Sharing of software, data, peripherals
- WAN (wide area network)
  - ❖ Covers a large geographic area
  - ❖ Includes a wide variety of circuits
  - ❖ Usually includes host computers

1

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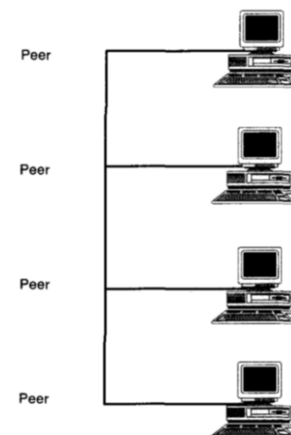
## Local Area Network Approaches

- Peer to Peer Approach
  - ❖ All computers have equal access
- Client/server Approach
  - ❖ Clients are users, typically using LANs (Some processing is best done locally)
  - ❖ Server is mainframe or microcomputer connected to LAN (Global processing)

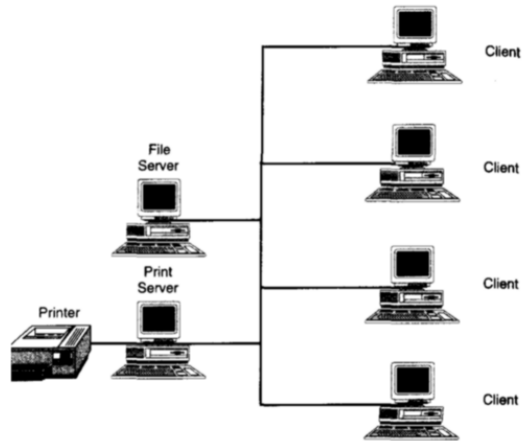
3

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## LAN- Peer to Peer Network



## LAN - Client/Server Network



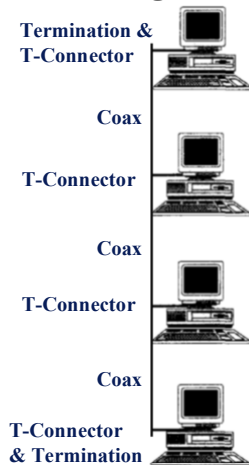
## Network Topologies

- Bus
  - ❖ Single conductor with taps
- Star
  - ❖ Requires Hub
- Ring
  - ❖ Requires two conductors

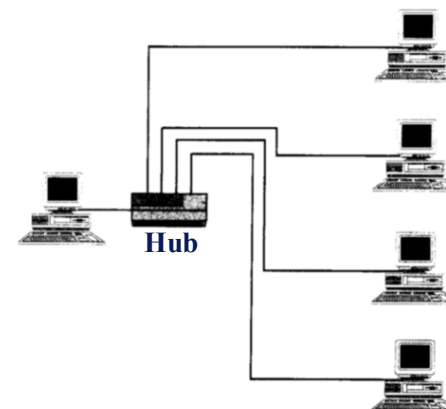
6

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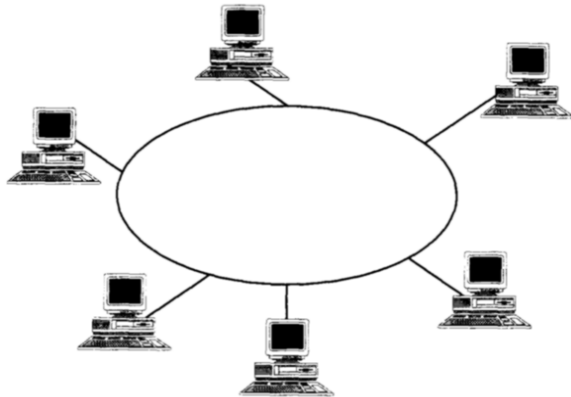
## Bus Network Topology



## Star Network Topology



## Ring Network Topology



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## LAN Technologies Proliferate

### ■ Performance Considerations

- ❖ Reliability
- ❖ Speed
- ❖ Capacity
- ❖ Ease of Installation
- ❖ Distance
- ❖ Cost

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## LAN Technologies Limitations

- Media (Cables)
- Signals
  - ❖ Voltage
  - ❖ Frequency
- Data Encoding
- Closed Proprietary Networks: IBM, DEC, etc
- LAN Technologies are often incompatible
  - ❖ Data can't be exchanged between LAN's

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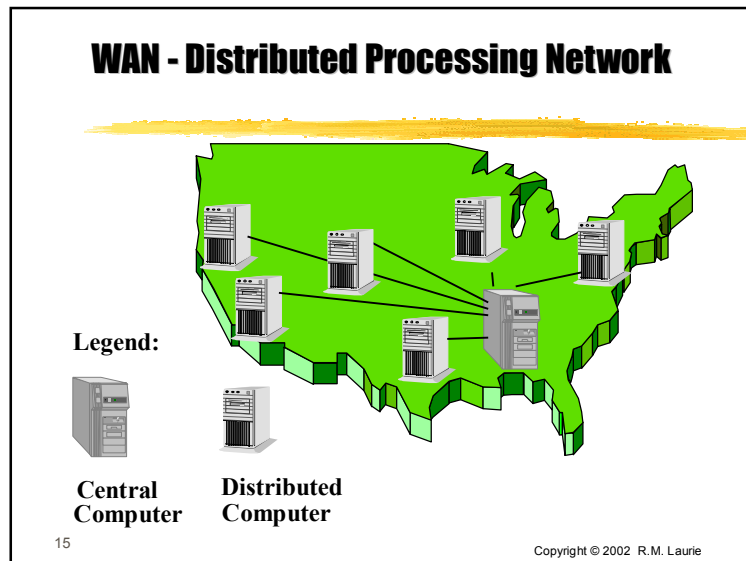
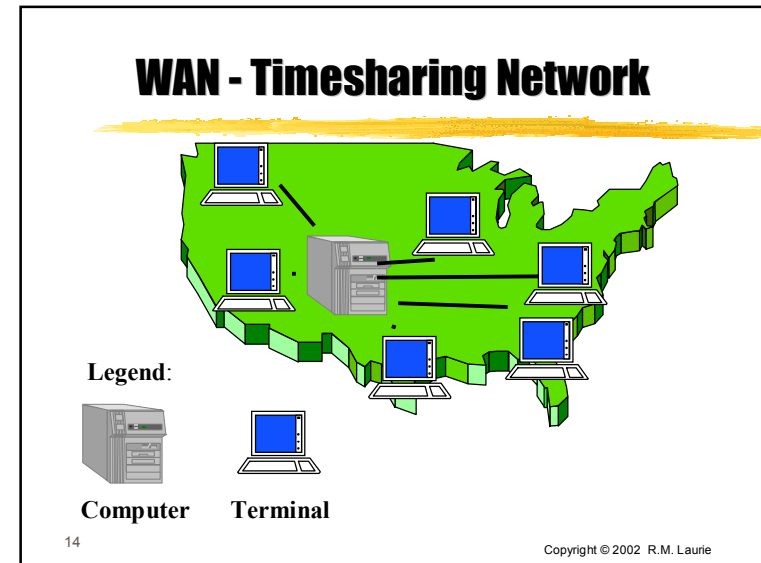
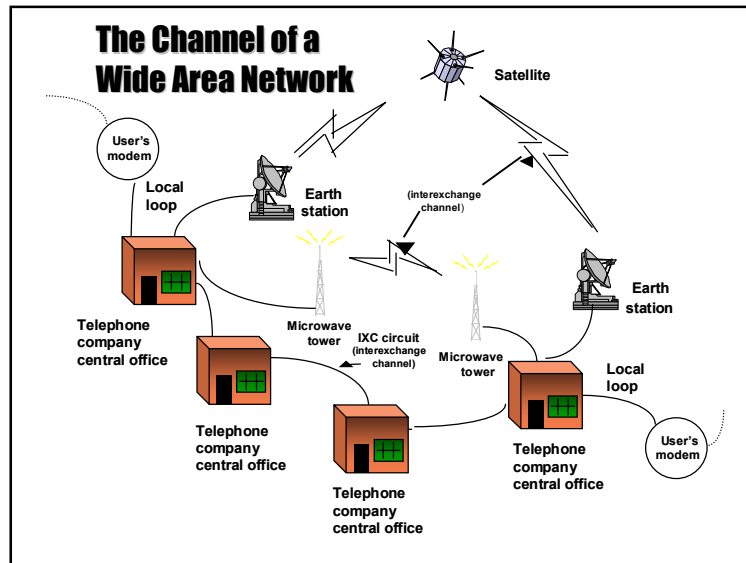
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## WAN Channel Components

- Local loop
  - ❖ Typical Media
    - ◆ Twisted pair
    - ◆ Coax (buried)
- IXC circuit (interexchange)
  - ❖ Long Distance Transmission Trunk
  - ❖ Typical Media
    - ◆ Microwave
    - ◆ Fiber-optical cable
    - ◆ Satellite

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- ### WAN Technologies
- Long-Haul Transmissions (Global)
  - Use computers to coordinate transmission
  - Usually uses telecommunications network
  - LANs and WANs are incompatible
    - ❖ Data encoding
    - ❖ Signaling
    - ❖ Transmission speeds
    - ❖ Addressing
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## Internetworking

- It is desired to have a single network
  - ❖ Interconnect LANs using WAN
  - ❖ Access any computer on a LAN remotely via WAN technology
- Department of Defense sponsor research
  - ❖ ARPA = Advanced Research Projects Agency
  - ❖ Systems Survivability utilizing Redundancy
  - ❖ Early 1980's ARPANET was the first

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## ARPANET

- Developed with Government Funding
- Specification made Available to Public
  - ❖ Open System
  - ❖ Any company could build compatible system
  - ❖ ARPANET Internetworking Protocol = TCP/IP
- TCP/IP becomes the standard
  - ❖ Connecting LANs and WANs
- ARPANET is now called the Internet

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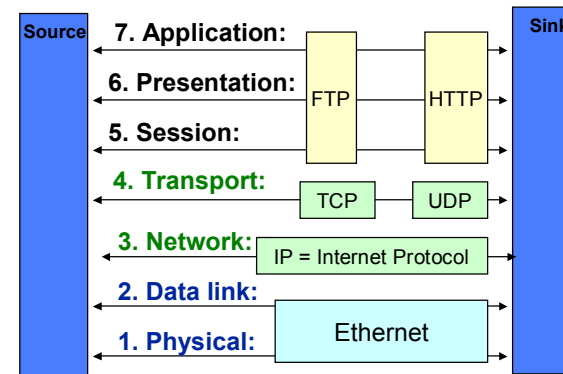
## TCP/IP Protocol Suite

- Combination of two Protocols
- IP = Internet Protocol
  - ❖ Provides basic end to end communication
  - ❖ Layer 3: Network Layer of OSI Model
- TCP = Transmission Control Protocol
  - ❖ Provides Reliable data transport
  - ❖ Layer 4: Transport Layer of OSI Model

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## TCP/IP Protocol Suite



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## Growth of the Internet

Year	Approximate Number Of Computers On The Internet	Quantity of Networked Computers Limited by IP Address Format to
1983	562	
1984	1,024	
1985	1,961	
1986	2,308	
1987	5,089	
1988	28,174	$2^{32} = 4,294,967,296$
1989	80,000	
1990	290,000	
1991	500,000	15x total computers in existence
1992	727,000	
1993	1,200,000	
1994	2,217,000	
1995	4,852,000	2/3 population of earth
1996	9,472,000	
1997	16,146,000	
1998	29,670,000	
1999	43,230,000	Currently available in every country on planet
2000	73,000,000	

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## Global Information Infrastructure

- Infrastructure = Basic Service on which society depends
  - ❖ Roads, telephones, mail, electricity, Internet
- Internet is general purpose and efficient
  - ❖ Almost any network application can use
  - ❖ Supports a wide variety of services
  - ❖ TCP/IP provides basic communication facilities
  - ❖ Accommodates changes in computers, networks, and services

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## What are intranets?

- Use Internet Technology on Corporate LAN
- Intranet applications
  - ❖ Policy and procedure manuals
  - ❖ Product and pricing information
  - ❖ Employee information
  - ❖ Job openings
  - ❖ Documents needing signatures
  - ❖ Schedules and calendars
  - ❖ Access to databases
  - ❖ Access to groupware

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## History of the WWW - 1

- 1980's
  - ❖ WAN Technology, Distributed DP
  - ❖ ARPA Net, DoD Redundancy
  - ❖ BitNET Email
- 1990, 1991
  - ❖ Euro Lab of Particle Physics (CERN)
  - ❖ Driven by Sharing Research Information
  - ❖ First Web Server - Stanford Univ. (SLAC)

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## History of the WWW - 2

### ■ 1992

- ❖ CERN -Text based browser (free)
- ❖ Primary use was Research Information
- ❖ 50 Web Servers by end of year

### ■ 1993

- ❖ NCSA Mosaic - First graphical browser
- ❖ First Graphical Web Sites
- ❖ 250 Web Servers by end of year

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## History of the WWW - 3

### ■ 1994

- ❖ Marc Andreessen and Jim Clark left NCSA
- ❖ Founded Mosaic Communications Corp.
- ❖ Later called Netscape Corp.
- ❖ Netscape Navigator Beta released October
- ❖ 2,500 Web Servers by end of year
- ❖ Online Services include Web Access

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## History of the WWW - 4

### ■ 1995

- ❖ Microsoft Corp. released IE ver 1.0
- ❖ Sun Corp. released HotJava (Interactive)
- ❖ Streaming Audio developed by RealAudio
- ❖ Virtual Reality Modeling Language (VRML)
- ❖ Netscape Navigator 2.0 (Frames and Java)
- ❖ InterNIC started charging for domain names
  - ◆ Network Information Center (SRI)

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## History of the WWW - 5

### ■ 1996

- ❖ Netscape Navigator 3.0 (better Integration)
- ❖ Microsoft Corp. released IE ver 3.0
  - ◆ First real competitor to Navigator
- ❖ The Browser Wars Begin
- ❖ NCSA no longer supports Mosaic
- ❖ Online Services include Navigator or IE
- ❖ Data Pushing Introduced
- ❖ Internet Content Regulation Proposed
- ❖ W3C establishes standards: HTML 4, CSS

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## History of the WWW - 6

- 1997
  - ❖ Netscape Navigator 4.0
  - ❖ Microsoft IE 4.0
  - ❖ The Java War
  - ❖ The Internet is everywhere
- 1999
  - ❖ Microsoft IE 5 = Dynamic HTML
- 2000
  - ❖ Netscape 6 = Dynamic HTML
- 2001
  - ❖ Microsoft IE 6 and Opera 6

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## Web Browser Ap - 1

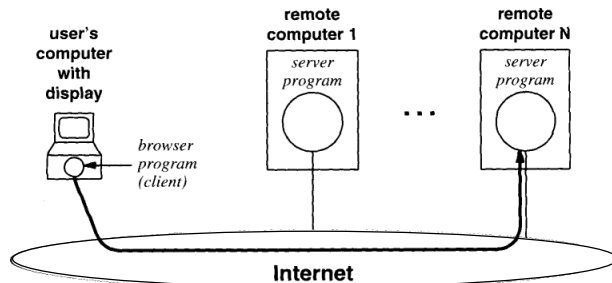
- Used to access web sites and display information as specified in HTML files
- Each web site has a URL address
  - ❖ Universal Resource Locator
  - ❖ www.geocities.com
- DNS matches URL with IP address
  - ❖ Domain Name Server
  - ❖ www.ad.umuc.edu >> 255.255.255.255
- Browser is fault tolerant HTML and scripting language interpreter

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## Web Browser Ap - 2

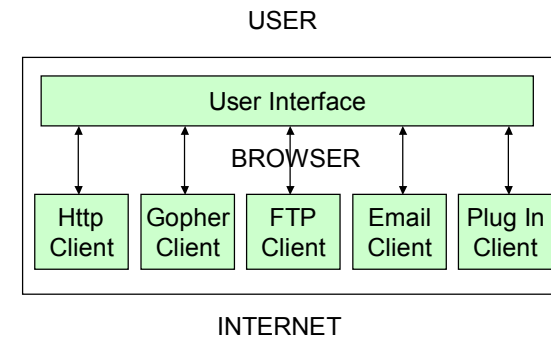
Browser contacts servers as specified by URL



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## Web Browser Ap - 3



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# HTML

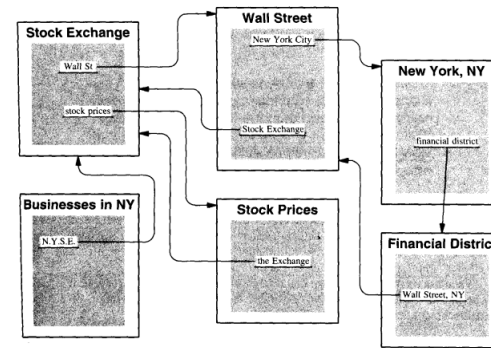
- HyperText Markup Language
- Web publishing file format
- ASCII text based
- Processor Independence
- Browser Independence
- Provides layout information for:
  - ❖ Text, Images, Animation, Sound
  - ❖ Interaction with server forms and programs
- HTML is not a programming Language

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# Hyper Link Redirection

## ■ HTML Document Hyperlinks



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