Computer Networking
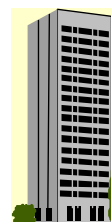
❖ Process in which two or more computers or devices transfer data and instructions

❖ First came WANs, then LANs, then Internet
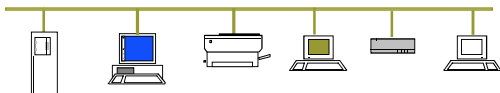

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Local Area Networks

❖ Networks in the same room or building are called LANs (local area networks)

❖ LANs allow sharing of computer-related resources such as printers, hardware, secondary storage, software, and data

❖ Ethernet is the common protocol used for LANs (local area networks)

❖ LAN Network cable can consist of wire pairs, coaxial or fiber optic cabling

❖ Wireless LAN Networks utilize Radio waves for the communication medium to deliver WIFI service

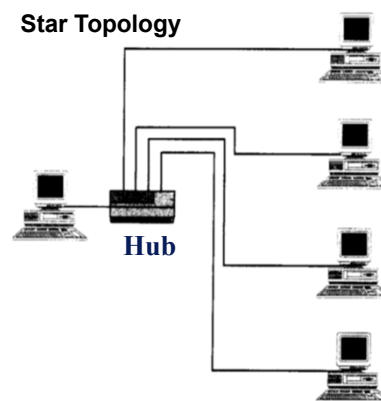Copyright © 2017 R.M. Laurie   2

Organizing LAN Resources

❖ Client/server
- ◆ Host Server computer controls access to software, data, and hardware
- ◆ Clients rely on Host for services
- ◆ Typical model used for Internet Databases

❖ Peer-to-peer
- ◆ Each computer, or peer, has equal capabilities
- ◆ Enables users to connect to each other's hard disks and exchange files directly

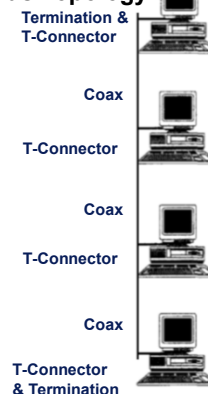Copyright © 2017 R.M. Laurie   3

LAN Topologies

Star Topology

Hub

Bus Topology

Termination & T-Connector

Coax

T-Connector

Coax

T-Connector

Coax

T-Connector & Termination

Ring Topology is Obsolete
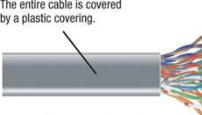
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Networking Media

TWISTED-PAIR CABLES
The entire cable is covered by a plastic covering.
Pairs of copper wires are insulated with a plastic coating and twisted together; most cables contain at least two pairs.

10BaseT = 10Mbps = Cat5
100BaseT = 100Mbps = Cat5
1000BaseT = 1Gbps = Cat6
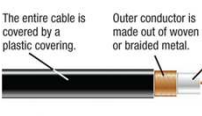Gigabit Ethernet = 1Gbps

COAXIAL CABLES
The entire cable is covered by a plastic covering.
Outer conductor is made out of woven or braided metal.
White insulating material surrounds the copper wire.
The innermost part of the cable is a single copper wire.

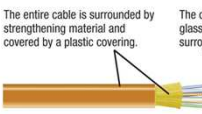10Base2 = 10Mbps = ThickNet
10Base5 = 10Mbps = ThinNet

FIBER-OPTIC CABLES
The entire cable is surrounded by strengthening material and covered by a plastic covering.
The core of each fiber is a single glass or plastic tube, which is surrounded by a reflective cladding.
A protective plastic coating protects each fiber; a cable contains multiple fibers.

Gigabit Ethernet = 1-Gbps to
100 Gigabit Ethernet = 100-Gbps

Wireless Internet Access Points

❖ **Allows wireless connection to Internet in a public location**
  ◆ **Wi-Fi**
  ◆ **3G and 4G network**
  ◆ **WiMAX**
  ◆ **Satellite**
❖ **Wifi LANS**
  ◆ **802.11 b, g, n, ac (Wi-Fi)**
❖ **Bluetooth**
  ◆ **Short-range radio waves transmit data between eight Bluetooth devices**
  ◆ **Usually peripherals**

CELLULAR PHONES
Can be used wherever cellular phone coverage is available.

SATELLITE PHONES
Can be used virtually anywhere.

802.11 SERIES OF STANDARDS

Standard	Transfer Rates
802.11	1 or 2 Mbps
802.11a	Up to 54 Mbps
802.11b	Up to 11 Mbps
802.11g	54 Mbps and higher
802.11n	108 Mbps and higher

Internetworking using ARPANET

❖ **It is desired to have a single network**
  ◆ **Interconnect LANs using WAN Technology**
❖ **Department of Defense sponsors research**
  ◆ **ARPA = Advanced Research Projects Agency**
  ◆ **Systems Survivability utilizing Redundancy**
  ◆ **Connect all computers on military bases worldwide**
  ◆ **Research Began 1969, ARPANET operational 1985**
❖ **Specification made Available to Public**
  ◆ ***Open System*=Anyone can build compatible system**
  ◆ **ARPANET Internetworking Protocol = TCP/IP**
❖ **ARPANET extended to civilian use and is now called *The Internet***

The Internet

❖ **The Internet is a worldwide collection of networks that links millions of computers utilized by businesses, governments, educational institutions, and individuals**
❖ **Infrastructure that 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 communication facilities**
  ◆ **HTTP, HTTPS, and FTP provide application facilities**
  ◆ **Accommodates changes in computers, networks, and services**   **http://www.warriorsofthe.net**

TCP/IP Internetworking Protocols

Client contacts server specified by *URL =Uniform Resource Locator*

Client Computers
HTTP
TCP
IP

Server Computers
HTTP, TCP, IP

Router IP

The Internet Infrastructure

Router IP

Router IP

Local Area Network

❖ **IP** = Internet Protocol
  ◆ Provides end to end communication
❖ **TCP** = Transmission Control Protocol
  ◆ Provides reliable data transport
❖ **HTTP** = Hyper-Text Transfer Protocol
  ◆ Provides Application Facilities

How the Internet Works = http://youtu.be/7_LPdttKXPc

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Accessing a Web Site

❖ **HTTP (Hyper Text Transfer Protocol) accesses web sites files located on the web server**
❖ **Each web site has URL (Uniform Resource Locator)**
  ◆ http://www.islandman**.org**
  ◆ http://www.umuc**.edu**
  ◆ http://mail.yahoo**.com**
  ◆ http://maps.google**.com**
  ◆ ftp://ftp.islandman.org

  ◆ **.edu** (education)
  ◆ **.com** (commercial)
  ◆ **.gov** (government)
  ◆ **.mil** (military)
  ◆ **.net** (network admin.)
  ◆ **.org** (non-profit)

  http://www.umuc.edu/cs/courses/index.html

  Protocol Server Domain   TLD   Folder Path   File

❖ **Domain Name Server matches URL with *IP address***
  ◆ www.nmcnet.edu → **12.178.198.111** (Octet <= 255)
  ◆ www.whois.ws → **69.25.212.161**

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The World Wide Web

❖ **The World Wide Web, or Web, consists of a worldwide collection of Web pages documents**
❖ **A Web site is a collection of related Web pages and associated items**
❖ **A home page is the first page that a Web site displays**
❖ **A Web server is a computer that delivers requested Web pages to computer via Internet**
❖ **WWW top layer protocol is HTTP or HTTPS**
❖ **HTML is the standard for web documents**
  ◆ **HTML and CSS are taught in CMST385**
  ◆ **JavaScript is taught in CMST386**

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E-Commerce and Online Shopping

❖ **The exchange of goods and services using the Internet and World Wide Web**
  ◆ **Buying products or services online—both physical and downloadable items**
  ◆ **Typically paid via credit card or online payment service such as PayPal**
  ◆ **Worldwide online sales will be $4 trillion by 2020**
❖ **Online Auctions = Ebay**
❖ **Secure transactions**
  ◆ **https = secure http protocol**
  ◆ **Encryption**
  ◆ **Spybot Search and Destroy www.safer-networking.org**
  ◆ **Spybot Anti-beacon www.safer-networking.org/spybot-anti-beacon**

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HTML Markup: Document Example

HTML Tag nesting order: **Last Open is First Closed**

```
<html>
 <head>
  <title> Philosophy of Freedom </title>
 </head>
 <body>
  <h2>Freedom</h2>
  <hr>
  <p> Freedom is just another word
     for nothing left to lose. <br>
   <em> Janis Joplin </em></p>
  <hr>
 </body>
</html>
```

Philosophy of Freedor ×

iGoogle   free ip   »   Other bookmarks

Freedom

Freedom is just another word for nothing left to lose.
Janis Joplin
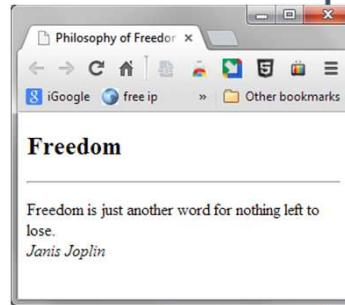
Markdown: Human readable code

❖ **A compact minimalist document format code**
   ◆ **Used at www.jottit.com**

Freedom

Freedom is just another word for nothing left to lose.
Janis Joplin

The chains that keep us from true freedom are bad experiences of the past, good experiences of the past, fears and anxieties about the future, ambitions for the future, clinging to present things, and delusions about our own importance.
Anthony Demello

```
#Freedom

---

Freedom is just another word
     for nothing left to lose.
*Janis Joplin*

---

The chains that keep us from true freedom are bad experiences of the past, good
     experiences of the past, fears and anxieties about the future, ambitions for the
     future, clinging to present things, and delusions about our own importance.
*Anthony Demello*
---
```

Markdown: Block Level Codes

To get this...	Type this...
A paragraph of text	*End with blank line or 2 spaces*
———————	*--- is called Horizontal Rule*
Largest Heading	*# at beginning of line*
X-Large Heading	*## at beginning of line*
Large Heading	*### at beginning of line*
Normal Heading	*#### at beginning of line*
Small Heading	*##### at beginning of line*
Smallest Heading	*###### at beginning of line*
Block quote indented text	*> at beginning of line*

• **Hierarchical Bullet List**
  ○ **Second Level bullet item**
	+ Bullet List item
	   + Second level bullet item

1. **Number List Item** 2. **Number List Item**	*1. Number List Item* *1. Number List Item*

Markdown: Inline Coding

To get this...	Type this...
New line of text without ↵ blank line above	*End preceding line with ↵*
emphasized text shows *italics*	**emphasized* text shows *italics**
Strong text shows as **bold**	***Strong** text shows as **bold***
Emphasized Strong text	****Emphasized Strong*** text*
Some ~~Strike through~~ text	*Some ~~Strike through~~ text*
Display Image	*![Alt text](URLpath2image.jpg)*
Display Image with title	*![Alt text](URLpath2image.jpg "title")*
Link to webpage	*<URLofWebpage2Link>*
Link Text to webpage	*[Link text](URLofWebpage2Link)*
Link Text to webpage with title	*[Freedom](freedom.html "title")*
Link Image to webpage	*[![Alt text](URLpath2image.jpg)](URL)*
Fenced code block	*``` This is some code ```*