Introduction to the Internet and Data Networking

Doug Dooley
dougdooley@yahoo.com
http://www.geocities.com/dougdooley/

Goals of the Course

- **<u>Week 1:</u>** Gain a basic understanding of how the Internet was formed.
- **<u>Week 2:</u>** Understand the following networking concepts: LAN/WAN, Seven Layer OSI Model, TCP/IP.
- **<u>Week 3:</u>** Gather an overview of the various core technologies of Data Networking
- **<u>Week 4:</u>** Understand what companies, agencies, and organizations are helping to build the Internet today.
- **<u>Week 5:</u>** Have an ability to discuss the pros/cons of the Internet and why it will change the way we work, live, play, and learn.

Last Week – Review & Questions

Review:

- Development of the "Internet" – DARPA created **ARPANET -> NSFNET -> "Internet"** (DoD funded Research, Gov't Agency & Academia, Commericial, Future ?)
- Internet ~100M Hosts, doubles (~1.5x) yearly growth rate, Closely tied to TCP/IP

Questions:

1) UNIX? Why is it so special?
2) Intranet & Extranet
3) IP Telephony (Voice-Over)
4) Circuit Speeds

Basic Network Topology

- Star Configuration – single hub or switch, single point of failure
- Loop Configuration – commonly used in Token Ring and FDDI
- Meshed (Fully-Meshed) Configuration – modified loop with interconnects among all nodes. Very redundant, often complex.
- Tree (Multi-Tier) Configuration – hierarchical approach, very common in IP networks.

Circuit Switching vs. Packet Switching

1. Bandwidth guaranteed 2. Once circuit is established, full capacity of circuit is available for single communication 3. Traffic tends to be more predictable 4. Circuit costs are independent of the amount of data transmitted	1. Bandwidth dynamically allocated on as-needed basis 2. Multi-conversations can occur concurrently over single physical link 3. Traffic is very bursty, more susceptible to delay from congestion 4. More cost-effective and better overall performance

Types of Services
Connection-Oriented vs. Connectionless

- Connection-Oriented Service: Prior to the transmission of data a physical (and virtual) link is established between the sending and receiving nodes. The link remains in effect for the duration of the session. Data is transmitted in proper sequence. This lends itself to more **reliability**.

- Connectionless Service: no link is established prior to communication, rather the data is partitioned into packets and routed through the network. Each packet independent and capable of arriving in any order. This lends itself to more **efficient** usage of the link.

ISO Seven Layer - OSI Model

Software	Application (7)	Application or Service-Oriented Layer
	Presentation (6)	
	Session (5)	
Software/Hardware	Transport (4)	Delivery & Verification
Hardware	Network (3)	Communication or Network-Oriented Layer
	Data Link (2)	
	Physical (1)	

“**A P***acket* **S***hould* **T***ravel* **N***icely* **D***own* **P***ipes*”

TCP/IP & OSI Model

OSI Layers	Included Protocols		TCP/IP Layers
Application	**FTP**	**SNMP**	Application
Presentation	**Telnet**	**TFTP**	
	Finger	**NFS**	
	SMTP	**DNS**	
Session	**POP**	**BOOTP**	
Transport	TCP	UDP	Host-to-Host
Network	IP Address		Internet
Data Link	MAC Address		Network Interface
Physical	Transmission Media		

Example #1 – Snail Mail

Interactive Role Play – FUN!

I apologize in advance, we will be taking some liberties on how the US Postal Service works.

Example #2 – E-Mail

Interactive Role Play, Again – Also FUN!

Summarize Key Points

- Network Topology – star, loop, meshed, tier
- Circuit vs. Packet Switching
- Connection-Oriented vs. Connectionless
- Seven Layer OSI Model
- TCP/IP & Examples
- Example to pull in all concepts discussed: Snail Mail vs. Email (understanding switching, routing, TCP/IP, and OSI)