

SMU Course #: EETS 7315

DATA COMMUNICATIONS
 Week #12 -- Dr. Baker

IP Datagram (PDU) Part 1

0 1 2 3 4 5 6 7

← Bit Numbers

Version	IHL
Type of Service	
Total Length	
Identification	
Flags	
Fragment Offset	
Time to Live	
Protocol	
Header Checksum	

IP Version, Hdr Length in 32-bit words (minimum of 5)

Differentiated Services

Total length of datagram, including header, up to 65,535 bytes

Unique numerical ID for datagram during its life in the internet

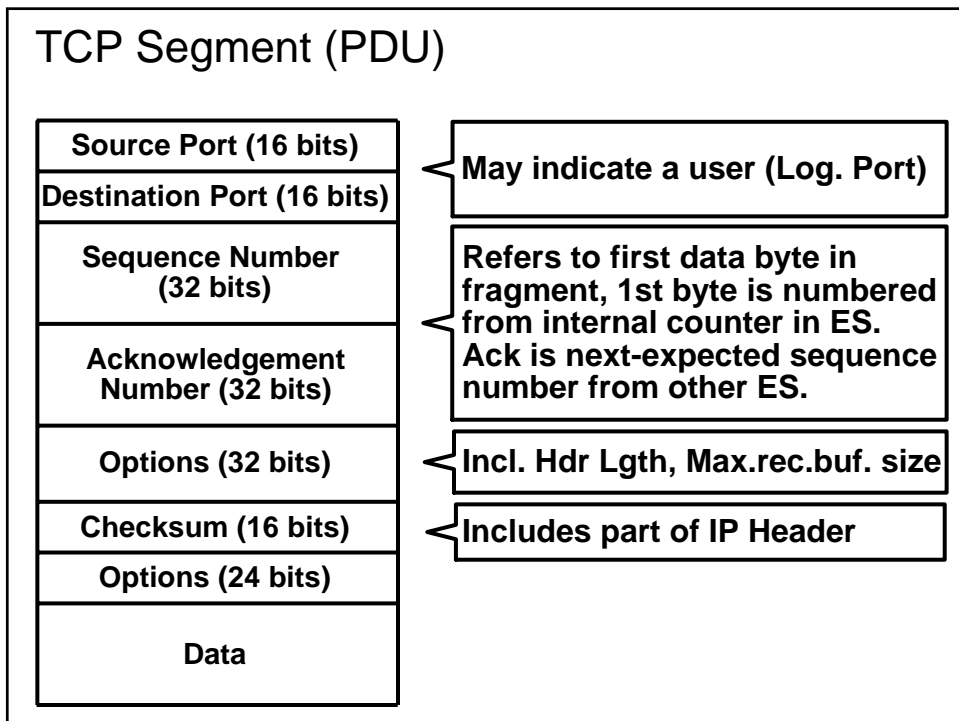
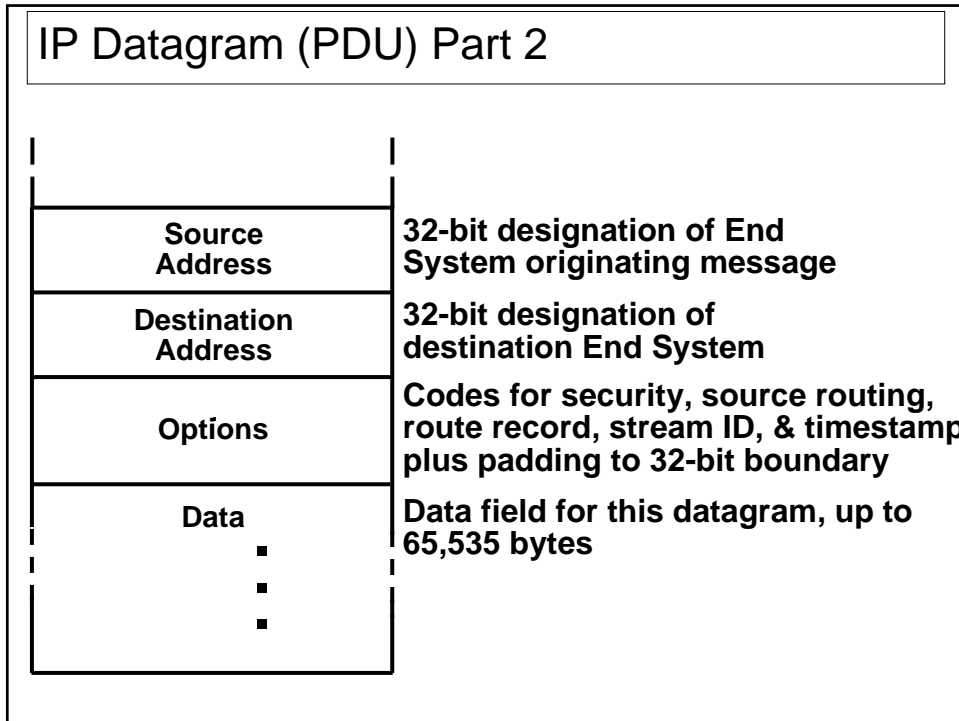
Fragmentation Control (64-bit units)

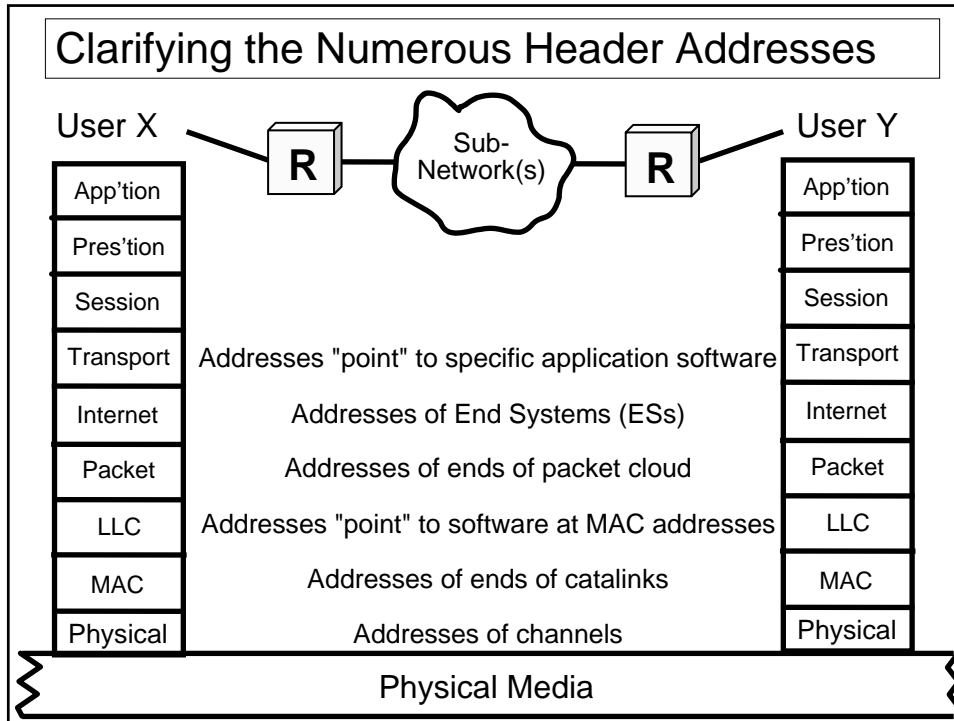
Relative location of data in message

One-second decrements

Points to software module at ES

One's complement sum of header





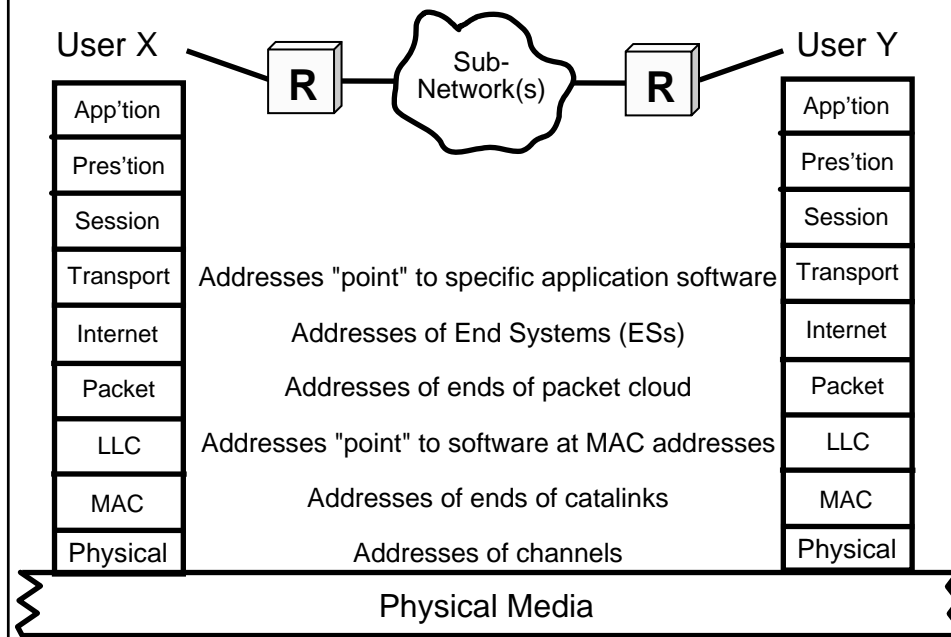
TCP/IP Issues

- Inflexibility of IP address length
- Lack of built-in error-reporting system
- Lack of modularity and OSI conformance

Related Topics (Alphabet Soup 101)

- ICMP (Internet Control Message Protocol) generates error reports when things fall apart
- ARP (Address Resolution Protocol) translates between incoming IP and physical addresses
- DHCP (Dynamic Host Control Protocol) Assigns temporary IP address to outgoing physical address
- DNS (Domain Name System) distributed database for translating system name to net. addr.
- RIP (Routing Information Protocol) old way of updating router tables
- OSPF (Open Shortest Path First) improved way of updating router tables

Clarifying the Numerous Header Addresses



Comparing Popular Architectures - I			
OSI	DECNET	SNA/SAA	TCP/IP
7. Application	User-defined	LU 6.2	FTP, SMTP TELNET
6. Presentation	Data Access Protocol (DAP)	NAU Pres. Services	
5. Session	Distributed Naming Svc.(DNS)	Data Flow Control	
4. Transport	Network Svcs. Protocol	Virtual Path Control	Transport Control Prot.
3. Network	Routing Protocol	Explicit Path Control	Internet Protocol
2. Data Link	DDCMP, HDLC, Ethernet, etc.	SDLC	
1. Physical	Serial Interface Drivers and Receivers		

Comparing Popular Architectures - II			
OS/2 LAN Manager	NetWare	3Com 3+	Vines
7. LAN Manager	Application	Application	Application
6. Server Mess. Block (SMB)	NetWare Core Protocols (NCP)	Redirector & ServerMess.Blk	Remote Procedure Calls(Net RPC)
5. NetBIOS	NetBIOS	NetBIOS	
4. NetBEUI	NetWare SPX	Sequenced Packet Prot.(SPP)	VINES Inter-process Com. Protocol(VIPC)
3. TokREUI	NetWare IPX	Internetwork Datagram Prot.	VINES Internet Protocol(VIP)
2.	Interface Cards: Ethernet, Token Ring, etc.		
1.	Serial Interface Drivers and Receivers		

Routing Protocols

- Remember, routers are computers.
- Routers can store information that can be used as a basis for routing decisions.
- There are advantages to letting the routers themselves determine the best routes, with adjustments controlled by a NCC (Network Control Center).
- The quasi-standard automatic router protocols within a network today is Open Shortest Path First (OSPF).

Border Gateway Protocol (BGP)

- OSPF is used within the network; BGP between networks in an internet
- In the public Internet, a datagram may pass through multiple networks on its way to a destination, so it may be routed several times by both OSPF and BGP
- Note the distinction here: There are many internets; there is only one Internet
- Many companies have their own internet

Internets, intranets, and extranets

- An intranet is a private internet, usually used by a company for interoffice traffic
- An intranet may be interconnected to the Internet via a firewall or network address translator (NAT) for security purposes
- An extranet is where you have two intranets interconnected via a secure tunnel through the Internet
- Extranets are sometimes called VPNs (Virtual Private Networks)

Introduction to IPv6

- RFC 1752
- New Features
 - Larger address
 - Class of service for audio, video
 - Multicast support
 - Authentication
 - Encryption
- Coexist with IPv4

Addressing

- Version 4 is dotted decimal. Example:
 - 129.119.104.125, representing 32 bits, each section representing 8 bits.
- Version 6 is coloned hexadecimal.
- Leading 0's may be omitted.
Example: 1080:0002:4544:0000:
8532:9A14:0648:417A =
- 1080:2:4544::8532:9A14:648:417A,
- each section representing 16 bits.

IPv6 Header

0 1 2 3 4 5 6 7 ← Bit Numbers

Version	Traffic Class	
Flow Label		
Payload Length		
Next Header.	Hop Limit	
Source Address (16 bytes)		
Destination Address (16 bytes)		

Traffic Class Priorities

- Background (e.g., news)
- Unattended data (e-mail)
- Attended bulk (e.g., FTP)
- Interactive (remote login, windowing)
- Control traffic (routing protocols & network management)
- Others to be defined

Next Header (Incomplete list)

- IP
- TCP
- UDP
- Routing
- Fragment
- Interdomain Routing
- Resource Reservation
- Security
- Authentication
- ICMP
- No next header