UDP: The User Datagram Protocol

Internet Protocols

CSC / ECE 573

Fall, 2005

N. C. State University

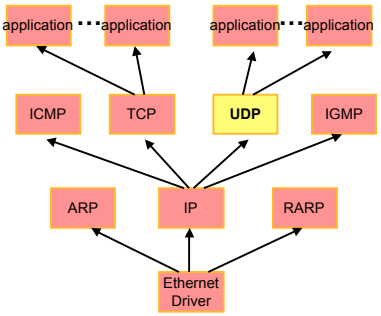
Today's Lecture

I. Port Numbers

II. UDP function

III. UDP header

What Layer is UDP?



UDP PORTS

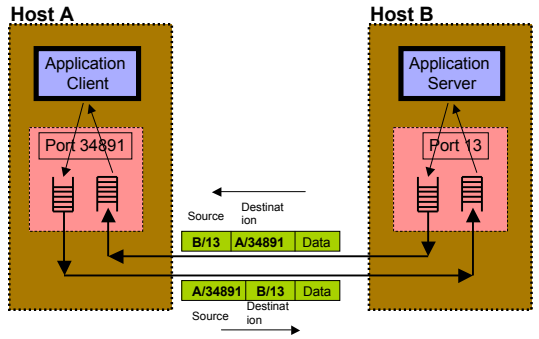
Interprocess Communication

- Distributed applications means communication between services on different hosts
- Services vs. processes
  - processes are created and destroyed dynamically by the OS
  - a single process may provide multiple services; must be clear which service the requestor needs
  - binding of "service required" and "process that handles this service" should be determined by the server

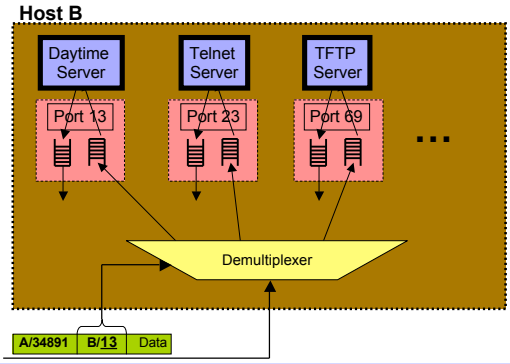
Protocol *Ports*

- *Port* ≡ abstract source or destination service specifier
  - identified by an unsigned 16-bit integer
  - packets carry both source and destination ports
- OS provides an interface for processes to *bind to* or associate with ports

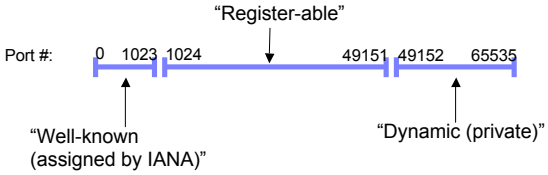
UDP Ports Example



UDP Input Demultiplexing



UDP / TCP Port Number Space



- The Well Known ports can only be used by system (or root) processes
- Registered ports can be used by ordinary user processes

Examples of Well-Known UDP Ports

PORT #	SERVICE
7	ECHO
9	DISCARD
13	DAYTIME
17	Quote of the Day
23	Telnet
53	DNS
68	BOOTPC
69	TFTP
123	NTP
161	SNMP

- See http://www.iana.org/assignments/port-numbers for more

UDP FUNCTION

User Datagram Protocol (UDP, RFC 768)

- Same service (or lack of) as IP
  - connectionless, no state maintained
  - unreliable, no notification of arrival (datagram may have been discarded, duplicated, or delivered out of order)
  - no flow control (source may transmit faster than destination is able to receive)
- UDP adds to IP
  - source and destination ports
  - payload checksum (optional) for data integrity
  - nothing else!

When Should UDP Be Used?

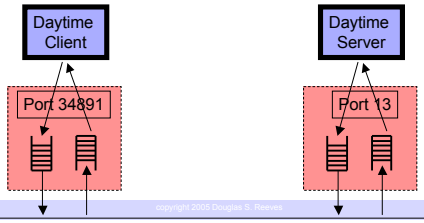
1. When reliable delivery is unimportant (non-critical application),
   or the application layer provides reliability
2. When flow control is unimportant (there are only a few datagrams to send),
   or the application layer provides flow control
3. When TCP characteristics (retransmission delay, processing and packet overhead) are unacceptable

UDP or TCP?

- File transfer
- Multicast and broadcast of announcements
- Streaming audio and video
- Routing protocols
- Web access (HTTP)
- Instant messaging (text chat)
- Examples of "UDP-able" applications?

UDP Service Binding

1. Application programs negotiate with the OS to be listed as the service bound to a port
2. OS creates internal queue to hold arriving messages for the port



UDP Service Binding (cont'd)

Upon receipt of a datagram, UDP checks if destination port is currently "active" (bound to a running process)

if no process is receiving on this port

send ICMP "Destination Unreachable / Port Not Bound to Service" error message and discard datagram

else if receiving queue is full

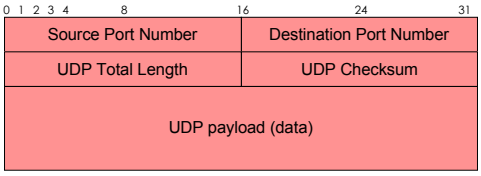
discards datagram (no error message sent back)

else

enqueue datagram for receiving process

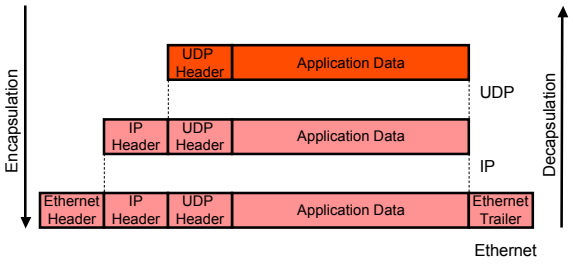
UDP HEADER

UDP Datagram Format



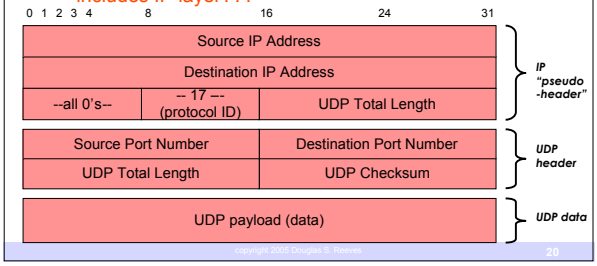
- Source Port #, Destination Port #
- Total Length: of UDP header and data
  - why needed? what is max value?
- UDP Checksum

(Remember…)



UDP Checksum

- Checksum: across pseudo-header, UDP header, and data
  - why needed?
  - includes IP layer???



UDP Checksum (cont'd)

- Same algorithm as IP checksum
- If received checksum is incorrect, datagram is silently discarded (no error message sent back)

Summary

1. UDP provides
   1. checksum on the payload, for data integrity
   2. port numbers, to identify what process should receive the incoming data
2. That's all!
3. Unreliable delivery, same as the underlying IP layer

Next Lecture

- Transmission Control Protocol (TCP)