

DATA COMMUNICATOIN NETWORKING

Instructor: Ouldooz Baghban Karimi

Course Book: Computer Networking, A Top-Down Approach
By: Kurose, Ross

Course Overview

- **Basics of Computer Networks**
 - Internet & Protocol Stack
 - Application Layer
 - Transport Layer
 - **Network Layer**
 - Data Link Layer
- **Advanced Topics**
 - Case Studies of Computer Networks
 - Internet Applications
 - Network Management
 - Network Security

ICMP

Internet Control Message Protocol

- **Communicate network layer information between routers & hosts**

- Error Reporting
 - Unreachable host, network, port, protocol
 - Echo request/reply (used by ping)

- **Network Layer “above” IP**

- Error Reporting
 - ICMP messages carried above IP
 - ICMP message
 - Type
 - Code
 - 8 bytes of IP datagram causing error

<u>Type</u>	<u>Code</u>	<u>description</u>
0	0	echo reply (ping)
3	0	dest. network unreachable
3	1	dest host unreachable
3	2	dest protocol unreachable
3	3	dest port unreachable
3	6	dest network unknown
3	7	dest host unknown
4	0	source quench (congestion control - not used)
8	0	echo request (ping)
9	0	route advertisement
10	0	router discovery
11	0	TTL expired
12	0	bad IP header

IPv6

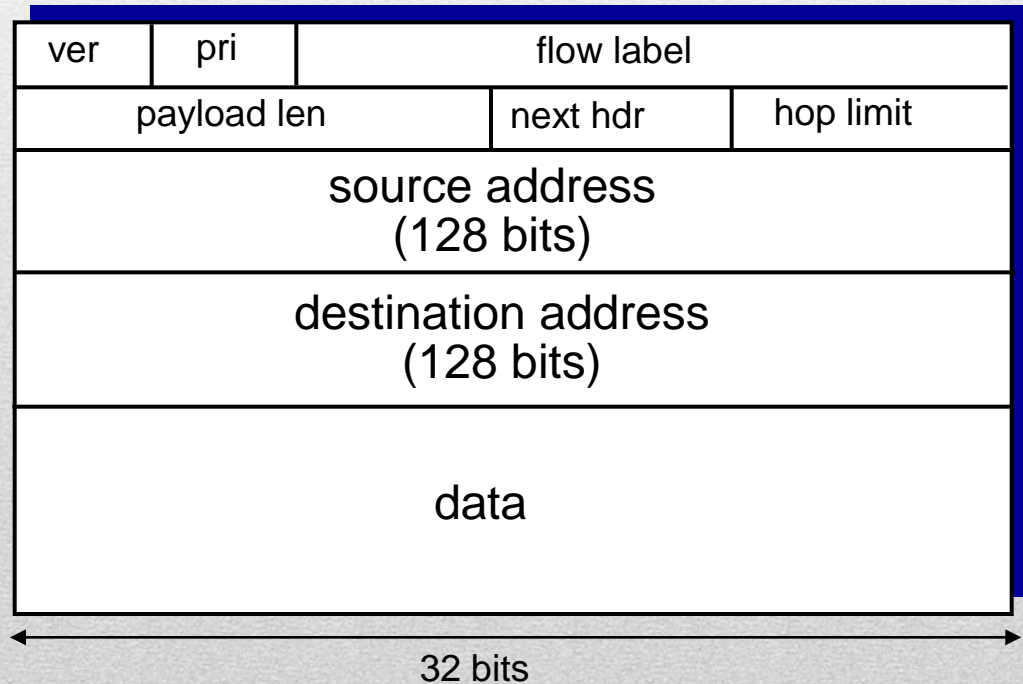
- **Motivations**

- 32-bit address space soon to be completely allocated
- Header format helps speed processing & forwarding
- Header changes to facilitate QoS

- **Datagram Format**

- Fixed-length 40 byte header
- No fragmentation allowed

IPv6 Datagram Format

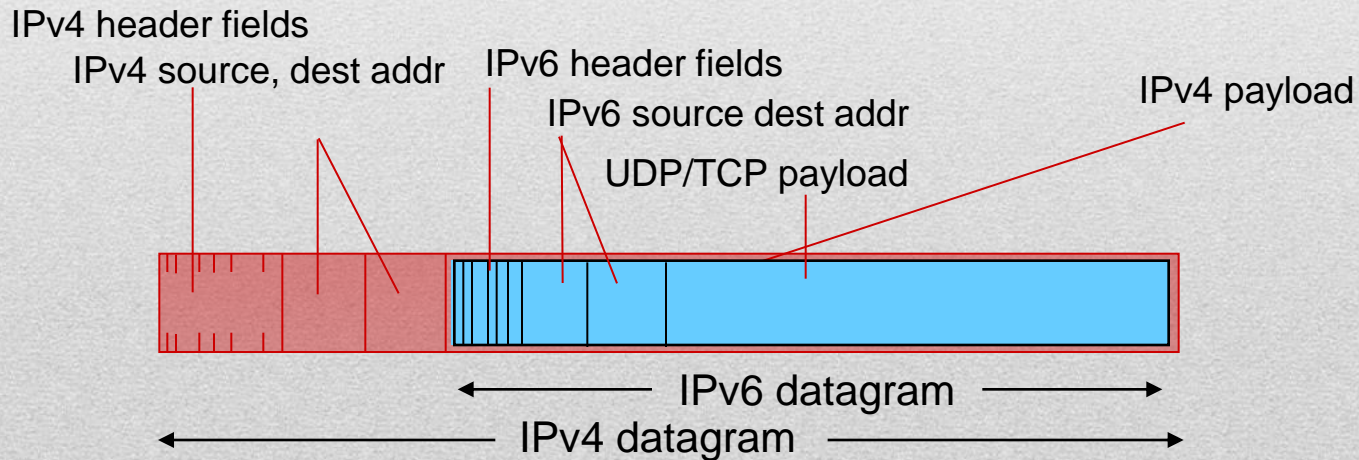


IPv6

- **Priority:** Identify priority among datagrams in flow
- **Flow Label:** Identify datagrams in same “flow.” (concept of “flow” not well defined).
- **Next header:** Identify upper layer protocol for data
- **Checksum:** Removed entirely to reduce processing time at each hop
- **Options:** Allowed, but outside of header, indicated by “Next Header” field
- **ICMPv6:** new version of ICMP
 - additional message types, e.g. “Packet Too Big”
 - multicast group management functions

Transmission from IPv4 to IPv6

- Not all routers can be upgraded simultaneously
 - No “flag days”
 - How will network operate with mixed IPv4 and IPv6 routers?
- **Tunneling:** IPv6 datagram carried as payload in IPv4 datagram among IPv4 routers



Tunneling

