# Next Generation Internet Protocol (IPng) Update

**Bob Gilligan**
**gilligan@eng.sun.com**

**SunSoft Internet Engineering Group**

# Overview of the talk

- Why a new IP is necessary
- Overview of IPv6
- Status of IPv6 specification and standardization
- Status of IPv6 implementations and testing

# Why a new IP is necessary

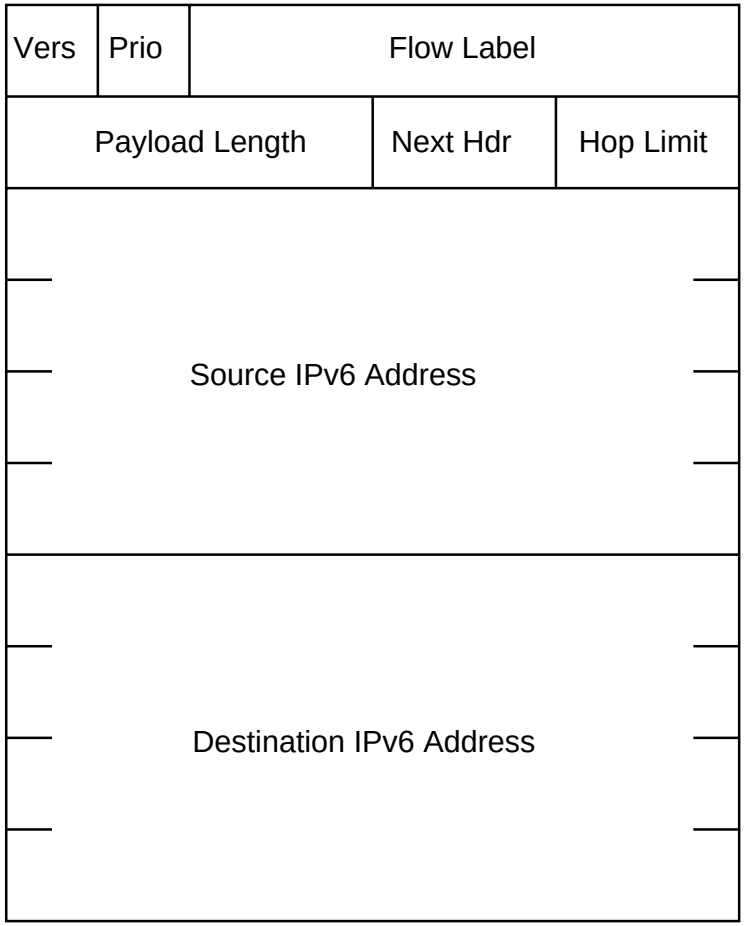
- 32-bit address space
- 1.4 Billion out of 3.8 Billion unicast addresses allocated [rfc1466]
    - Approximately 1 - 2 % of allocated addresses in use
- Internet growing exponentially
    - Address space will be exhausted if current growth trends continue
    - Estimates of run-out date:  2005 +/- 5 years
- Forces driving growth
    - New low-cost Internet devices
    - Low cost = high volume = lots of IP addresses

# IPv6: the New Internet Protocol

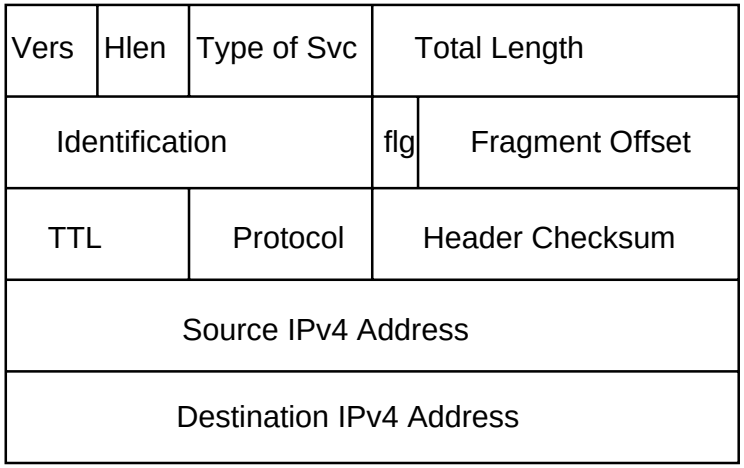
- New IP-layer header format
  - Simplified header with 64-bit alignment
  - Version number = 6
- 128-bit hierarchical IP address
  - Allows embedded IEEE 802 MAC address for stateless auto-configuration
- Flow label and priority fields for time-critical traffic
- Flexible extension header mechanism
  - Authentication and privacy options
  - Source routing option

# IP Headers Compared

**IPv6**




**IPv4**



# IPv6 New Features

- Plug-and-play with stateless address auto-configuration
  - Also simplifies re-numbering
- Multicast improved and made standard
- IP layer authentication and privacy to be provided in all implementations
- Source routing allows Internet service provider selection
- Flow label and priority enables new multimedia applications
  - Audio/video conferencing over the Internet

# IPv6 Design and Specification Status

- Three IETF working groups:
  - Core IPng, autoconfiguration, transition
  - Working since October 1994
- 17 documents written by working group
- Base specifications moved to Internet standards track in December 1995
  - Three maturity levels : Proposed, Draft, Full Standard
  - IPv6 specs at Proposed Standard level
- Remaining specifications expected to advance to proposed standard level within 6 months

# IPv6 Specifications - Status

- Base IPv6 specification [Proposed Standard]
- ICMP specification [Proposed Standard]
- Neighbor discovery
- Stateless address auto-configuration
- Path MTU discovery
- Addressing architecture (6 documents) [1 Proposed Standard]
- Transition mechanisms [Proposed Standard]
- Transition routing architecture
- Domain Name System (DNS) extensions [Proposed Standard]

# IPv6 Specifications - Continued

- Routing protocols (3 documents)
  - RIP, OSPF, IDRP - routing working groups
- Security (5 documents) [5 Proposed Standard]
  - IP security working group
- Generic tunneling
- DHCP for IPv6
- Socket interface API
- Mobility (2 documents)
  - Mobile IP working group
- IPv6 over datalink media
  - Ethernet, FDDI, Token Ring, PPP

# IPv6 prototypes underway (From the IPv6 web page)

- Host products
  - Digital Unix (DEC), VMS (DEC), Solaris 2 (Sun), HPUX (SICS), Streams (Mentat), FTP Software, BULL, BS 2000 (Siemens-Nixdorf)
- Router products
  - Digital, Bay Networks, Cisco, Ipsilon, Penril, Telebit
- Research implementations
  - 4.4 BSD (Inria), 4.4 BSD (NRL), BSDI (WIDE), Linux
- When will first IPv6 products ship?

# IPv6 Testing

- First IPv6 test event held Feb 5-9 at University of New Hampshire
  - Ten implementations participated
  - Basic IPv6 functionallity tested
- University of New Hampshire organizing IPv6 testing consortium
  - Next test scheduled for June
- Should we plan IPv6 testing at Connectathon 97?
  - Need volunteer to coordinate

# Summary

- IPv6 development is well underway
  - IPv6 is now on the Internet standards track
  - Product and research implementations are under devlopment
  - Testing is in progress
- For more information:
  - http://playground.sun.com/ipng