The 30th IETF Meeting and the Next Generation of the Internet Protocols

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Data Communications
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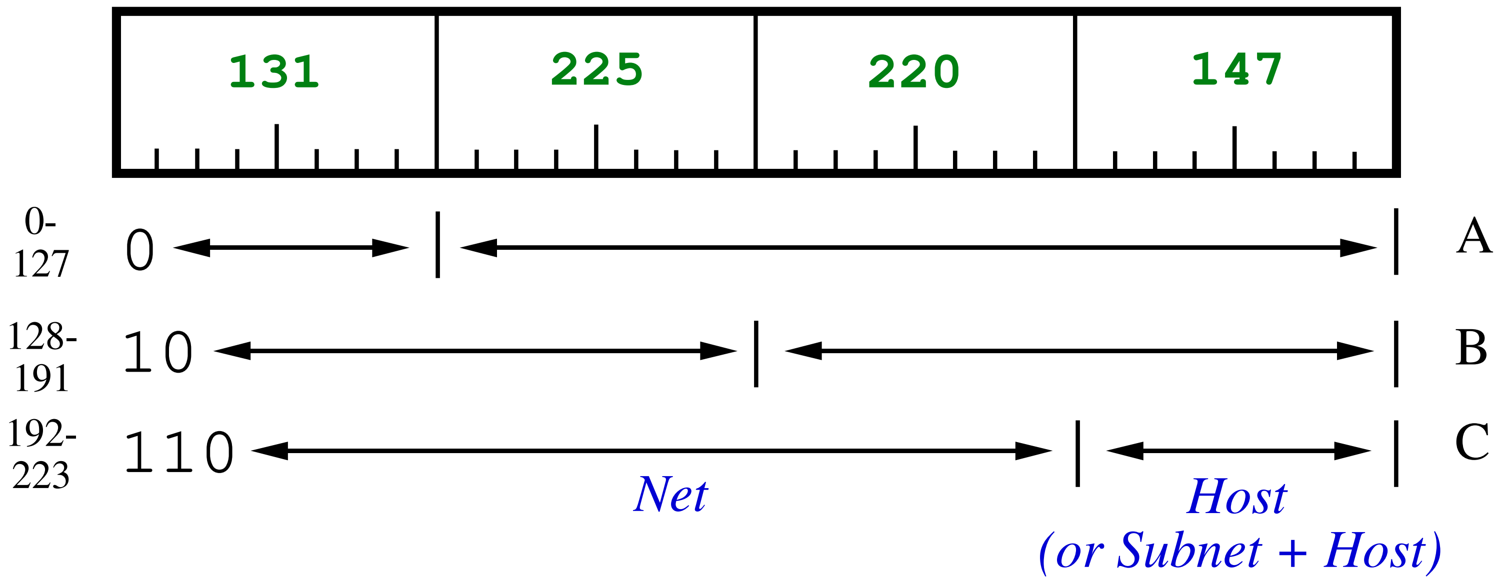
- IETF background
- Reasons for changes to IP
- Differences between versions
- Transition plan
- Deployment schedule

The IETF

The Internet Engineering Task Force is the protocol engineering arm of the Internet. The IETF is a large open international community of network designers, operators, vendors, and researchers concerned with the evolution of the Internet architecture and the smooth operation of the Internet. It is open to any interested individual.

The actual technical work of the IETF is done in its working groups, which are organized by topic into several areas (for example: routing, network management, security).

IPv4 Addresses



A class C network is too small for most organizations, while class B networks are too scarce for the demand. Assigning several class C networks per site bloats the routing tables of the backbone networks.

In any case, there aren't anywhere near enough network numbers to address every household in North America, to say nothing of addressing every electric appliance in the world.

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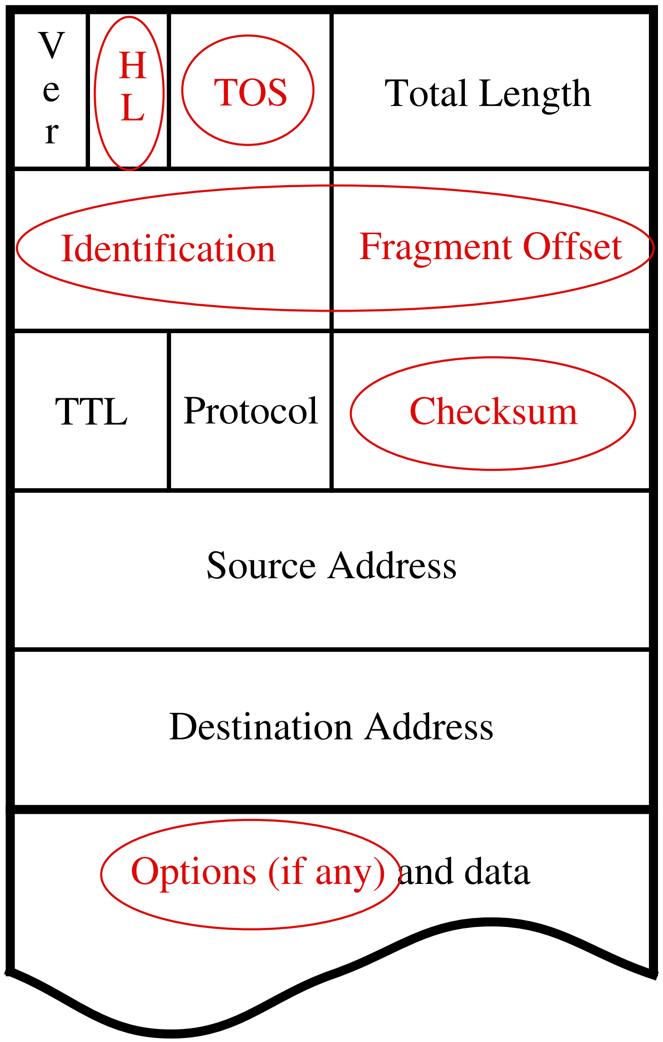
IPv4 Packet Header Format



Options – inefficient to use.

Header Length – unnecessary w/o options.

Type of Service – ill-defined and seldom implemented in routers.

Identification and Fragment Offset – not needed for most packets.

Checksum – redundant with UDP or TCP checksum.

A New Version of IP

- Expanded addressing

  128 bits with no specific network classes
- Streamlined header

  Seldom-used functions are moved out
- Improved support for options and extensions

  Routers need not examine most options
- Flow labeling

  Allows faster processing by routers and enables resource reservation

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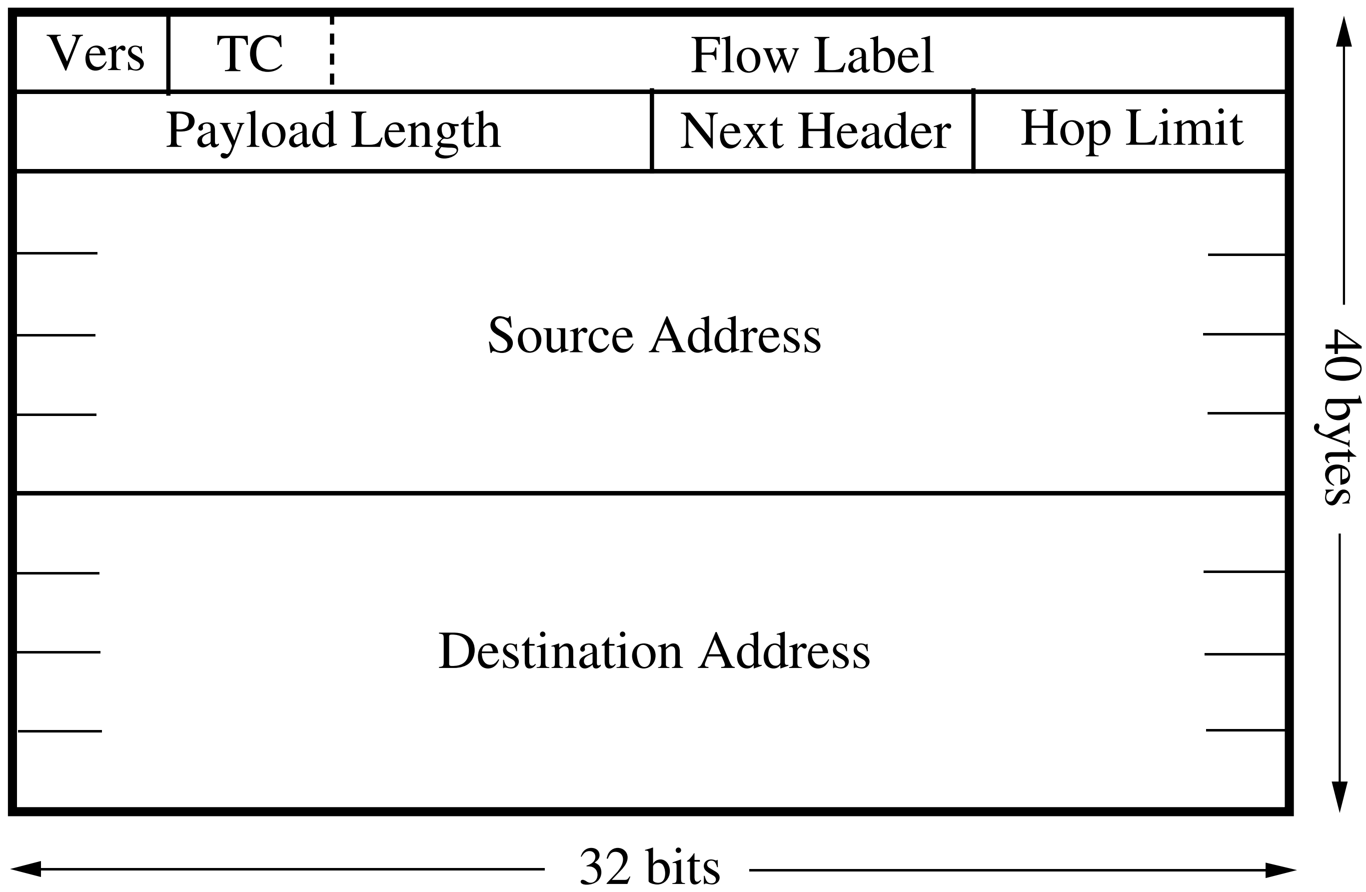
IP6 Header



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Flow Label

TC	Flow ID
4	24

Traffic Class

0–7 time-sensitivity of flow-controlled traffic
8–15 drop priority of non-flow-controlled traffic

Flow ID

A *random* value which, combined with the IP6 source address, uniquely identifies a traffic flow

Extension Headers

Currently defined types: Hop-by-hop options, Routing, Fragment, Authentication, Security, and End-to-end options.

IP6 Header NH = TCP	TCP header and data ...

IP6 Header NH = Routing	Routing Hdr NH = TCP	TCP header and data ...

IP6 Header NH = Routing	Routing Hdr NH = Frag	Frag Hdr NH=TCP	TCP header and data ...

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Address Types

Prefix	Fraction	Allocation
00	1/4	reserved
01	1/4	Provider-based unicast
10	1/4	Reserved for geographic addressing plan
110	1/8	reserved
1110 00	1/64	Encoded NSAP addresses
1110 01	1/64	reserved
1110 10	1/64	reserved
1110 11	1/64	Embedded IPX addresses
1111 0	1/32	reserved
1111 10	1/64	reserved
1111 110	1/128	reserved
1111 1110	1/256	Local-use addresses
1111 1111	1/256	Multicast

Address Examples

Notation (hexadecimal):

0123:4567:89AB:CDEF:0123:4567:89AB:CDEF

Abbreviation:

FE00:0:0:0:0:0:0:1 = FE00::1 (loopback addr)

Trailing IPv4 address:

::131.225.220.147 or ::FFFF:131.225.220.147

01	Provider	Subscriber	Subnet(s)	Node
2	p	n	m	126-m-n-p

1111 1110	000 . . . 000	Subnet	Node
8	n	m	120-m-n

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Auto–Configuration

Host autonomously constructs a unique address usable only on the local wire. (A well-known prefix plus a unique suffix.)

Host sends an address request to a well-known multicast address. Request contains:

- Unique (on the wire) cookie
- Address currently in use (if any)
- IPv4 address (for transition)
- Authentication information

Reply contains:

- Fully specified address(es)
- Address lifetimes
- Advisory/mandatory flags for lifetimes
- Possible “stop using address X” orders

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Transition Plan

Goals of the IP6 transition plan:

Allow incremental "one at a time" upgrade of hosts and routers from IPv4 to IP6.

Few or no dependencies of "finish step X before starting Y."

No switches to flip to choose between v4 and 6.

Complete the transition before IPv4 addresses run out!

Transition techniques:

IPv4-compatible addresses.

IP6–in–IPv4 encapsulation.

IPv4/IP6 header translation (optional).

Transition Plan (cont.)

Transition step	Depends on
DNS support for IP6 addresses	nothing
Upgrade IPv4 host or router to IP6/IPv4	DNS support
Deploy new IP6/IPv4 host or router	DNS support
Change IP6/IPv4 area to IP6-only	Upgrade all routers in area Translating router at border Disable IPv4 routing
Change host or router to IP6-only	Change area to IP6-only
Deploy new IP6-only host or router	Change area to IP6-only

Deployment Schedule

July 1994	Announcement of IPng
August ’94	First test implementations
September ’94	Internet Drafts
December ’94	Documents submitted as Proposed Standards
July 1995	Beta software from vendors
December ’95	Scaling tests complete
December ’96	Production code