

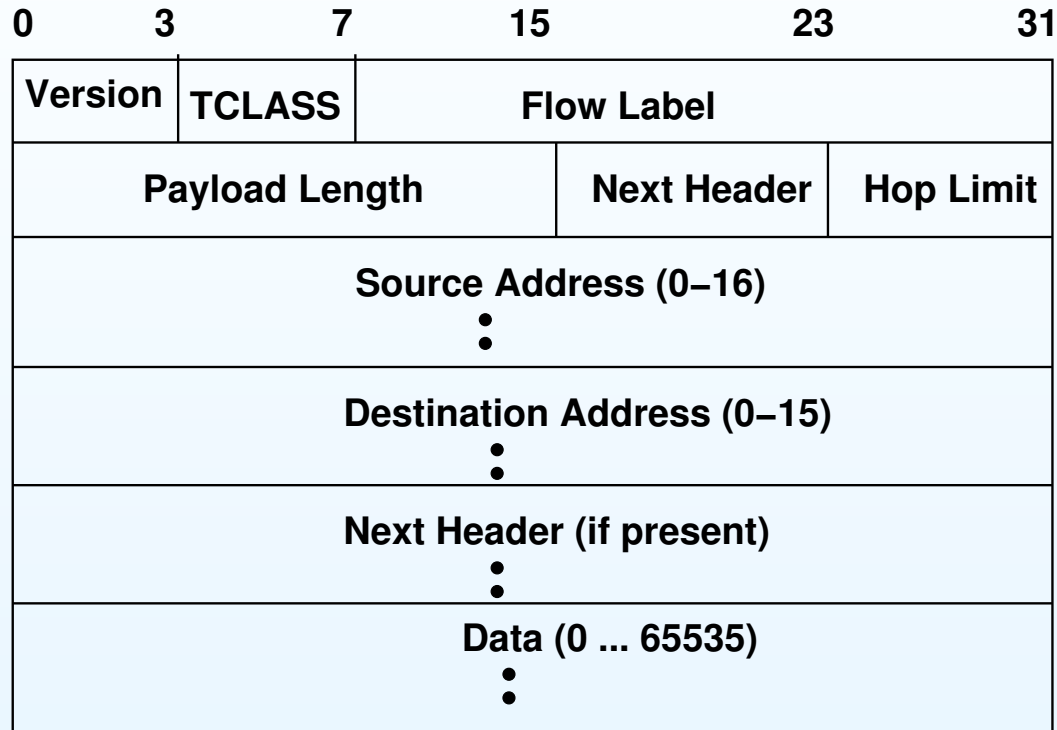
## Why IPv6

---

IPv6 was needed to resolve a number of important and less important issues.

- Scarce address space.
- Overworked routers.
- The need to support real-time applications (streaming).
- The desire for type-of-service routing.
- The need for better security.
- The need mobile hosting.
- The need for better address management.

# What's New



**IPv6 Packet Format**

## More What's New

---

- 128 bit addresses (16 bytes)
- TCLASS is traffic class which can be used to do routing based on traffic type.
  - 7 classes of congestion controlled traffic
  - 7 classes of non-congestion controlled, low delay traffic
- Flow Label is a unique identifier that identifies a virtual circuit type of packet switching methodology.
- Next Header is for handling options.
- Payload length is the length of just the data.
- TOS is gone, as are the fragmentation fields which are moved to the options area.

# Addresses

---

- 128 bits is lots of space.
- Addressing is designed to provide lots of hierarchy.



**IPv6 Address Format**

The prefix space specifies the type of address which follows:

## Address Types

<b>Prefix</b>	<b>Use</b>
0000 001	OSI NSAP (OSI Network Layer)
0000 010	Novelle
010	Provider based
100	Geographic based
1111 1110 10	Link local use for offline nets
1111 1110 11	Site local use for offline subnets
1111 1111	Multicast

# Provider-based Unicast Addresses

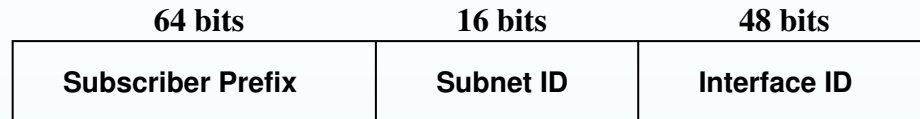
	5 bits	n bits	56 – n bits	64 bits
010	Registry ID	Provider ID	Subscriber ID	Intra-subscriber ID

**IPv6 Unicast Address Format**

- Registry ID is the identifier of the registrar that provided the address (INTERNIC (11000), RIPE NCC (01000), APNIC (00100))
- Provider ID which is Registrar dependent and identifies the entity that provides the addresses to subscribers. e.g. ISP's.
- Subscriber ID is provider dependent and identifies a subscriber. A subscriber could be an entity such as a university or a company.
- The intra-subscriber ID would be defined by the subscriber and would identify down to the level of an actual host.

# Unicast Address Intra-subscriber Format

---



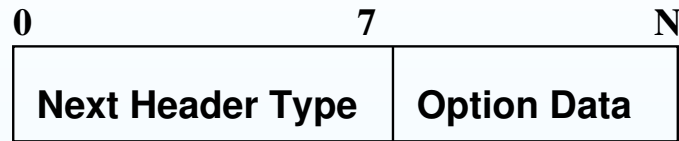
## Example Intra-subscriber Format

- Subscriber prefix is the ID assigned to the subscriber which could be part of an entity.
- Subnet identifies the the division of the network, such as a department.
- Interface identifies a specific device. One possibility is the 48-bit physical layer address.

The notation is based on hexadecimal, colon-separated strings:

A304:0000:0000:1234:C4D2:0000:1342:B200 or  
A304:::1234:C4D2::1342:B200

# IPv6 Options



**IPv6 Option Format**

1. Hop-by-hop options
  2. Source Routing
  3. Fragmentation
  4. Authentication of sender
  5. Encrypted Security Payload
  6. Destination Options
- Options must occur in order
  - Next header is number of the next option type.

## New Features

---

- Host will broadcast for an address prefix and then add its own LAN address.
- Site local and link local addresses for offline operation and for NAT.
- Devices can have multiple addresses for a single interface.
- Mobility is supported as follows:
  - Mobile host gets a local auto-configuration address.
  - Mobile host reports to its home system that it is currently remote and gives its current address.
  - Traffic to home is rerouted to new address.
  - Routers learn the correct route.
- Anycast addresses are assigned to a group of computers and a packet addressed to one is delivered to the "closest". In source routing it could be used to identify a group of routers to use.