Supernetting

Supernetting is used in routing tables to compact contiguous Class C networks. Suppose that a company needs to address 1,024 hosts. The company is assigned the four contiguous Class C addresses of 192.168.0.0 through 192.168.3.0, and it sets up its router to the Internet with the address of 192.168.0.1. The routes in the ISP routing table will contain the following:

Network	Subnet Mask	Route
192.168.0.0	255.255.255.0	192.168.0.1
192.168.1.0	255.255.255.0	192.168.0.1
192.168.2.0	255.255.255.0	192.168.0.1
192.168.3.0	255.255.255.0	192.168.0.1

Notice that all of the routes point to the same IP address of 192.168.0.1. These routes therefore seem redundant. The subnet mask tells IP at the router to examine 24 bits of every packet to determine the route that each packet will take. IP then examines 24 bits of the destination address of each packet and finds that the only difference in any of these four routes is in the third octet (specifically the 23rd and 24th bit):

Network	Third Octet
192.168.0.0	0000 0000
192.168.1.0	0000 0001
192.168.2.0	0000 0010
192.168.3.0	0000 0011

Any packet that is bound for any of these contiguous networks has the same first 22 bits; the only difference is in the 23rd and 24th bits. Since all of the networks are routed to the same IP address, supernetting can tell IP to look at only 22 bits. Using supernetting, the same routing table would include only one route instead of four:

Network	Subnet Mask	Route
192.168.0.0	255.255.252.0	192.168.0.1

Now if a packet is bound for 192.168.1.12, 192.168.2.115, 192.168.3.5, or 192.168.0.10, the subnet mask of 255.255.252.0 tells IP to look only at the first 22 bits. All of these addresses have the same first 22 bits:

Destination	First 22 Bits	Last 10 Bits
192.168.0.10	1100 0000.1010 1000.0000 00	00.0000 1010
192.168.1.12	1100 0000.1010 1000.0000 00	01.0000 1100
192.168.2.115	1100 0000.1010 1000.0000 00	10.0111 0011
192.168.3.5	1100 0000.1010 1000.0000 00	11.0000 0101

Internet Protocol Version 6 (IPv6)

Overview of IPv6

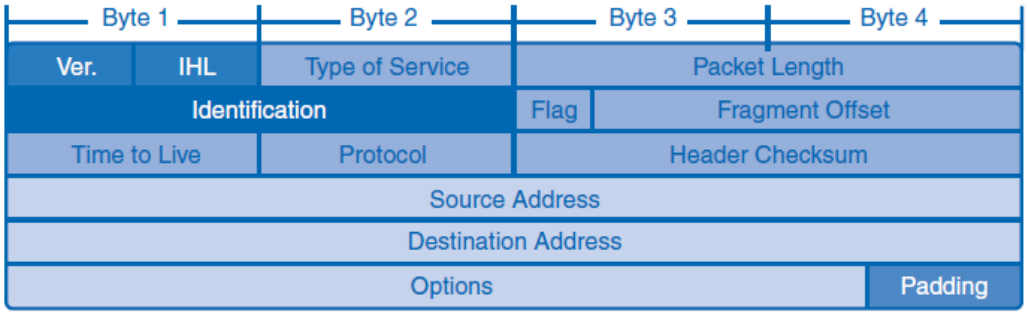
In the early 1990s, the Internet Engineering Task Force (IETF) grew concerned about the exhaustion of the IPv4 network addresses and began to look for a replacement for this protocol. This activity led to the development of what is now known as IPv6. This section presents a brief introduction to IPv6.

Creating expanded addressing capabilities was the initial motivation for developing this new protocol. Other issues were also considered during the development of IPv6, such as these:

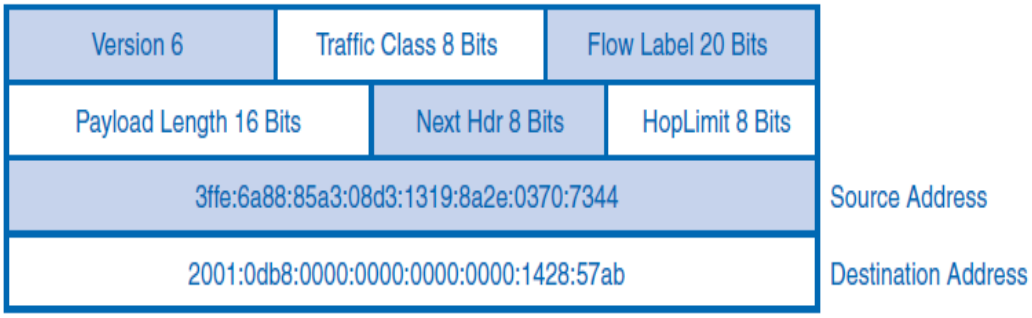
- Improved packet handling
- Increased scalability and longevity
- Quality of service (QoS) mechanisms
- Integrated security

To provide these features, IPv6 offers the following:

- 128-bit hierarchical addressing to expand addressing capabilities
- Header format simplification to improve packet handling
- Improved support for extensions and options for increased scalability/longevity and improved packet handling
- Flow-labeling capabilities as QoS mechanisms
- Authentication and privacy capabilities to integrate security



IPv4 Packet Header Fields



IPv6 Packet Header Fields

Features of IPv6

- Larger Address Space (128-bit IPv6 Address)
- Aggregation-based address hierarchy – Efficient backbone routing
- Efficient and Extensible IP datagram
- Stateless Address Autoconfiguration
- Security (IPsec mandatory)
- Mobility

Header Comparison between IPv4 and IPv6