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 subn	et mask of 255.255.252.0 to	ells IP to look or	nly at the first 22
bits. All of these addres	sses have the same first 22	bits:	

University of Babylon/College of Information Technology/ Information Network Dept. / First Class / Second Semester/ Subject : Network and Distributed System/ Lecture : 3

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

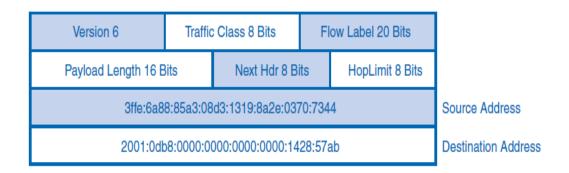
To provide these features, IPv6 offers the following:

- 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

University of Babylon/College of Information Technology/ Information Network Dept. / First Class / Second Semester/ Subject : Network and Distributed System/ Lecture : 3

Ву	te 1	Byte 2	Byte 3 Byte 4 _		Byte 4		
Ver.	IHL	Type of Service	Packet Length				
	Identification		Flag	Fragment Offset		et	
Time	to Live	Protocol	Header Checksum		Header Checksum		
	Source Address						
	Destination Address						
	Options Padding			Padding			

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

	vers hle	m TOS	to tal k	ength	Removed (6)
	identification		flags fl	flags flag-offset	• ID, flags, flag offset
20	TTL	protocol	header che	schoum.	• TOS, <u>hlen</u>
bytes	so urce address				• header checksum
	destination address				Changed (3)
		options and padding			 total length => payload
		IP	v4		 protocol => next heade TTL => hop limit
Ť	vers t	raffic class	flow-la	bel	Added (2)
		ad length	nextheader	hop limit	• traffic class
	paylo		source address		
40 bytes	paylo	source	address		• flow label
			e address ion address		

Header Comparison between IPv4 and IPv6