

OSI Model Compared to TCP/IP

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OSI model	TCP/IP			
Application	Telnet	FTP	DHCP	TFTP
Presentation	HTTP	SMTP	DNS	SNMP
Session	Application layer			
Transport	TCP			UDP
	Transport layer			
Network	ICMP			ARP
	IP			
	Internet layer			
Data Link	Network interface layer			
Physical				

IP Address : Representation in Dotted Decimal Notation

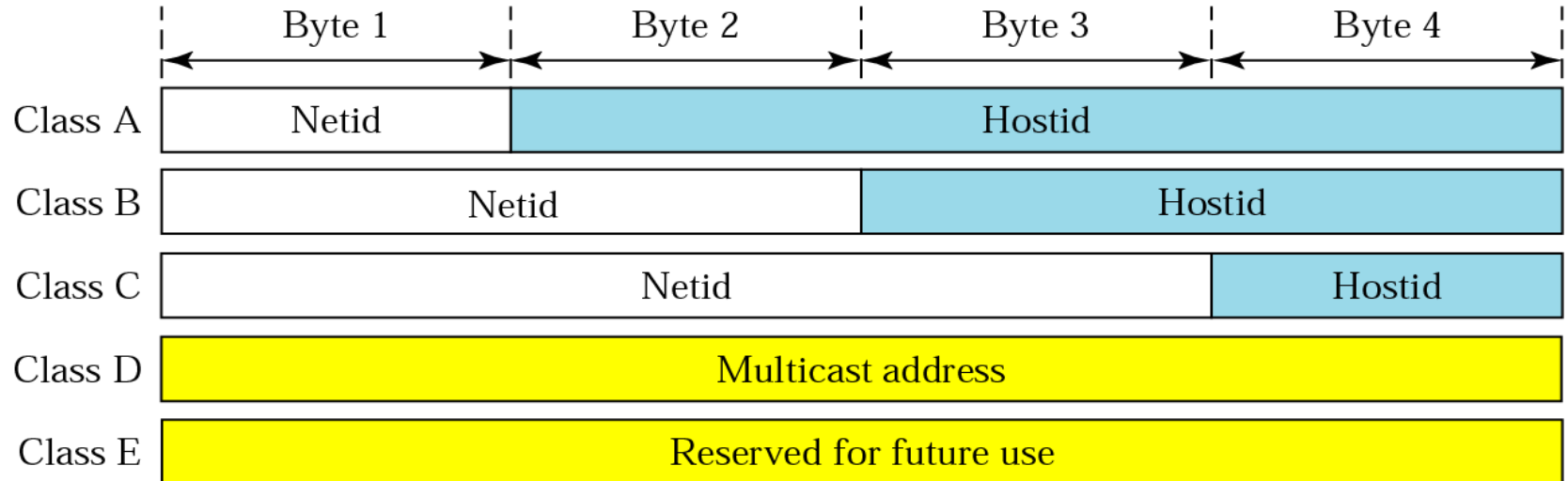
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10000000 00001011 00000011 00011111

128.11.3.31

IP Address : Two Levels of Hierarchy

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IP Address : Classes ??

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	First byte	Second byte	Third byte	Fourth byte
Class A	0			
Class B	10			
Class C	110			
Class D	1110			
Class E	1111			

IP Address : Subnet and Subnet Mask

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Class	Default Subnet	Subnet Mask
Class A	/8	255.0.0.0
Class B	/16	255.255.0.0
Class C	/24	255.255.255.0

IP Address : Private IP Address Space

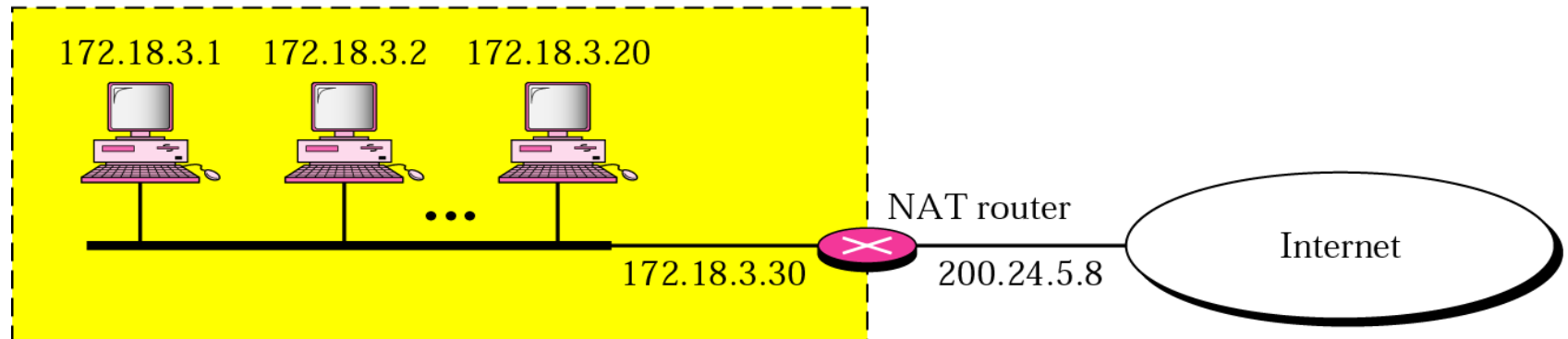
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Range	Total Hosts
10.0.0.0 - 10.255.255.255	2^{24}
172.16.0.0 - 172.31.255.255	2^{20}
192.168.0.0 - 192.168.255.255	2^{16}

NAT : Network Address Translation

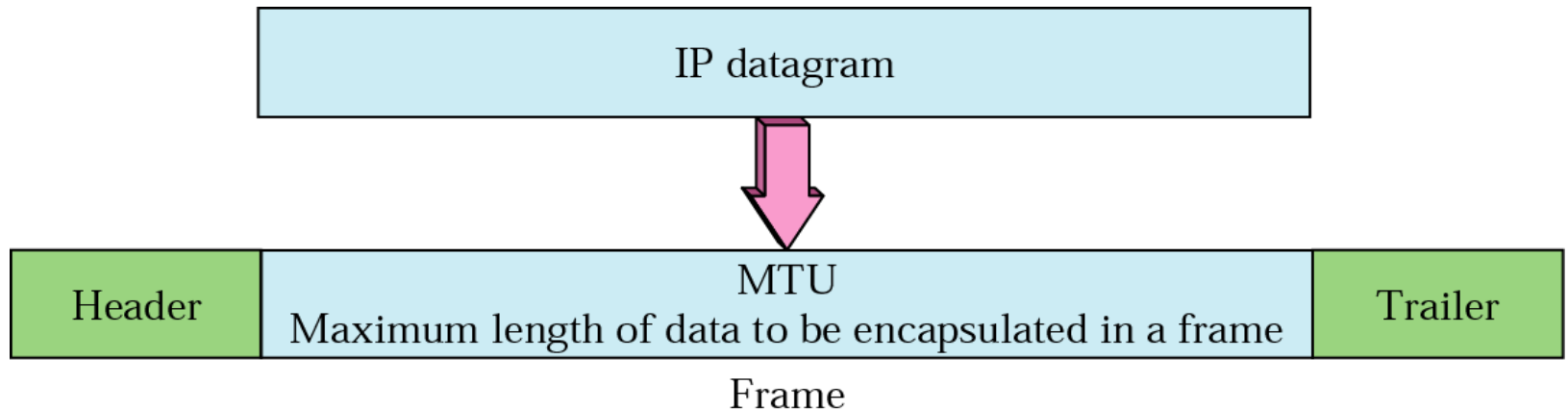
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Site using private addresses



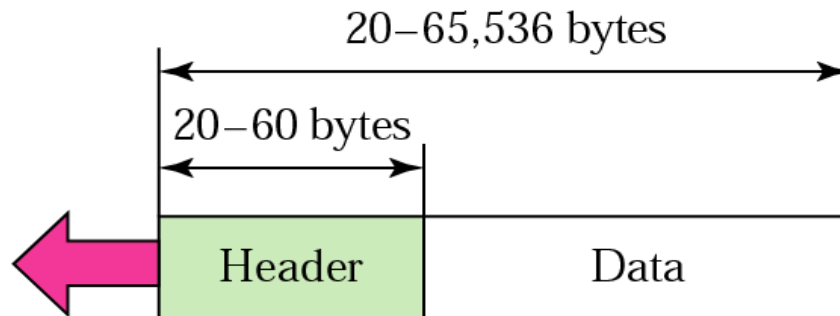
MTU : Maximum Transmission Unit

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IPV4 Frame Format

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VER 4 bits	HLEN 4 bits	DS 8 bits	Total length 16 bits	
Identification 16 bits			Flags 3 bits	Fragmentation offset 13 bits
Time to live 8 bits		Protocol 8 bits	Header checksum 16 bits	
Source IP address				
Destination IP address				
Option				

IPV4 Frame Format: Description

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- VER => Defines the Version of IP.
- HLEN => Header Length
- DS => Differentiated Service. Defines the Class of Packet for QoS.
- Total Length => Length of Data = Total Length-Header Length.

- Identification
 - When datagram is Fragmented => Identification copied to all.
 - All Fragments have the same Identification.
 - Helps in Reassembling the datagram.

- Flags
 - 3 Bits => Reserved, MF and DF
 - DF => Don't Fragment.
 - MF => More Fragment.

IPV4 Frame Format: Description

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- Fragmentation Offset => Offset value of Fragment.
- TTL => Time To Live. If TTL =0 Then Packet is discarded.
- Protocol
 - Defines Higher Layer Protocols.
 - Higher Layer Protocols => TCP, UDP.
- Checksum => Computes Checksum
- Source IP Address => IP Address of Source Machine.
- Destination IP Address => IP Address of Destination Machine.
- Option => Optional Field Used for Network Testing and debugging.

Header Checksum Calculation

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4	5	0	28
1		0	0
4	17	0	
10.12.14.5			
12.6.7.9			
4, 5, and 0 → 0100010100000000			
28 → 00000000000011100			
1 → 00000000000000001			
0 and 0 → 00000000000000000			
4 and 17 → 0000010000010001			
0 → 00000000000000000			
10.12 → 0000101000001100			
14.5 → 0000111000000101			
12.6 → 0000110000000110			
7.9 → 0000011100001001			
Sum → 0111010001001110			
Checksum → 1000101110110001			

Question ??

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- The Asia Pacific Network Information Center (APNIC) has to provide service to 8 Local ISPs from the network pool of 17.10.0.0/20. From the available pool each Local ISP has to provide service to their Six (6) dedicated clients.
- Design the complete IP Address Plan which includes IP Pool, Usable IP Pool and Subnet Mask for each network.

???

IPV6 : Internet Protocol Version 6

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- ❑ It is Known as Internetworking Protocol Next Generation (IPng).
- ❑ It is suitable for Fast growing Internet.
- ❑ It is also suitable for Next Generation Networks (NGN).
- ❑ Features
 - ✓ Larger Address Space (128 Bit Address Space).
 - ✓ Supports Resource Allocation via Flow Control Field.
 - ✓ Supports More Security.
 - ✓ Better Header Format (Base Header and Extension Header)

IPv6 : 128 Bit Addressing Scheme

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Unabbreviated

FDEC ■ BA98 ■ 0074 ■ 3210 ■ 000F ■ BBFF ■ 0000 ■ FFFF



FDEC ■ BA98 ■ 74 ■ 3210 ■ F ■ BBFF ■ 0 ■ FFFF

Abbreviated

IPV6 : Abbreviated Address

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Abbreviated

FDEC ■ 0 ■ 0 ■ 0 ■ 0 ■ BBFF ■ 0 ■ FFFF

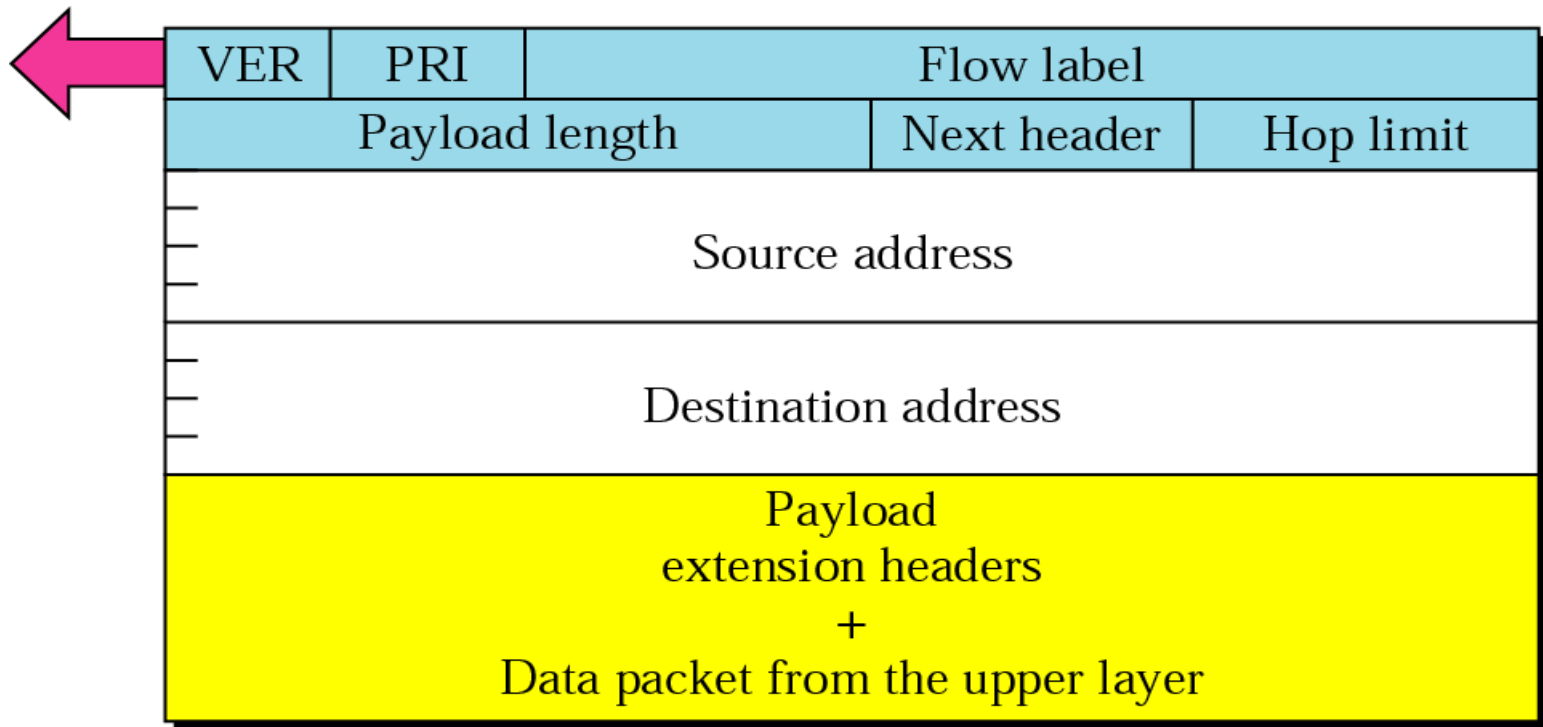


FDEC ■ ■ BBFF ■ 0 ■ FFFF

More Abbreviated

IPV6 : Header Format (Base Header + Extension Header)

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IPV6 : Header Format Description

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- ❑ VER (4 Bits) => Specifies the Version of IPV6.
- ❑ Priority (4 Bits) => Defines the Priority of Packet.
- ❑ Flow Label (24 Bits) => Used for Resource Reservation.

- ❑ Payload Length (16 Bits)
Total Length of IP Datagram Excluding Base Header.

- ❑ Next Header (8 Bits)
Provides Information about Extension Header.

- ❑ Hop Limit (8 Bits) => Same as TTL in IPV4.
- ❑ Source Address => 128 Bit Source IPV6 Address
- ❑ Destination Address => 128 Bit Destination IPV6 Address

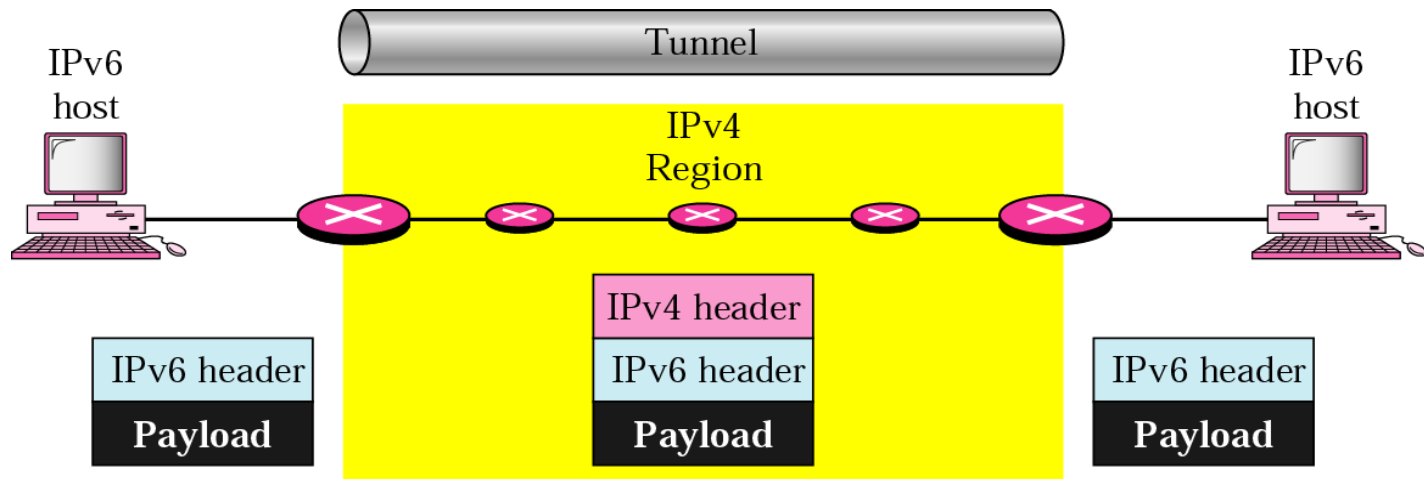
IPV6 Transition strategies

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- ❑ Tunneling
- ❑ Dual Stack
- ❑ Header Translation

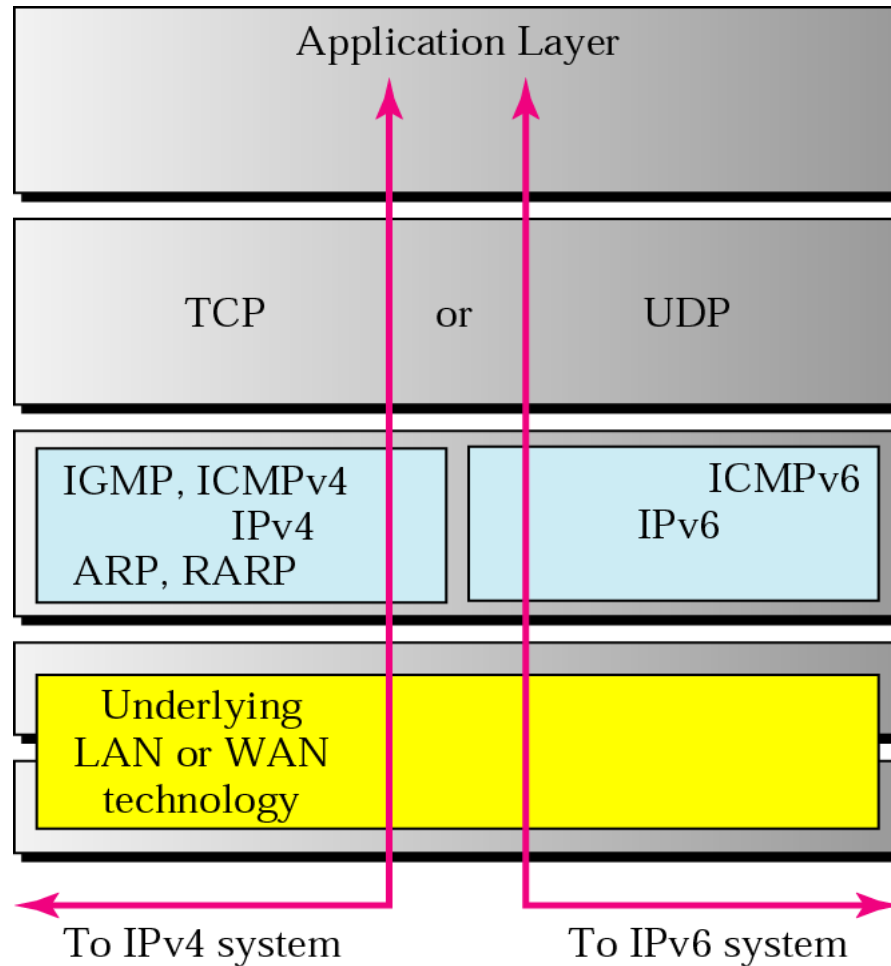
IPv6 Transition : Tunneling

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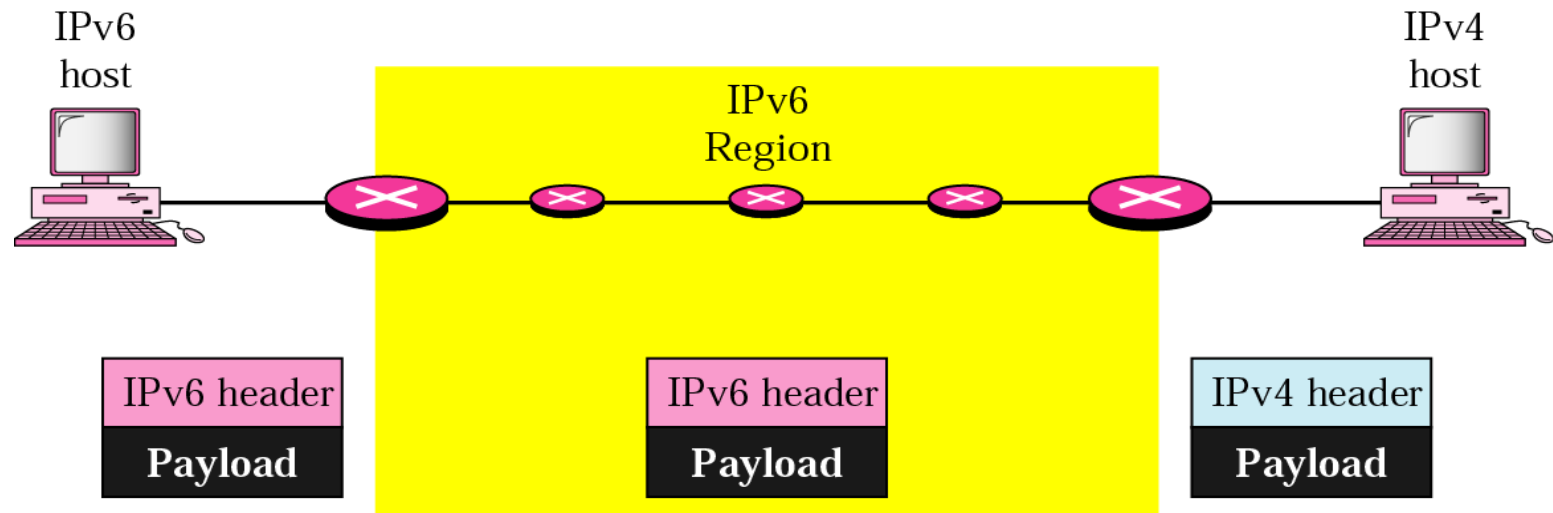
IPV6 Transition : Dual Stack

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IPv6 Transition : Header Translation

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Thank You