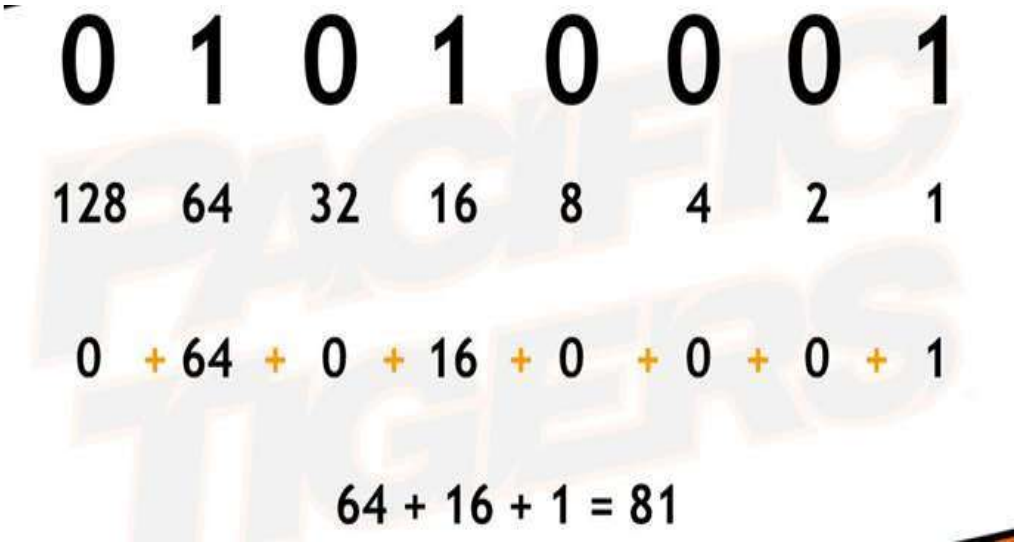
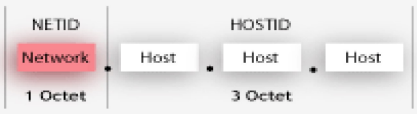
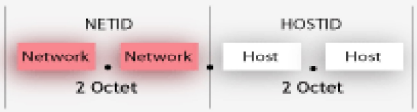
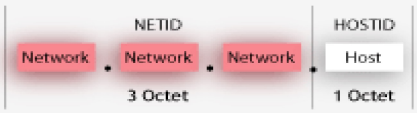
Hexadecimal	Binary	Decimal
0	0000	0
1	0001	1
2	0010	2
3	0011	3
4	0100	4
5	0101	5
6	0110	6
7	0111	7
8	1000	8
9	1001	9
A	1010	10
B	1011	11
C	1100	12
D	1101	13
E	1110	14
F	1111	15

Number	0	1	2	3	4	5	6	7
Binary	0000	0001	0010	0011	0100	0101	0110	0111
Hexadecimal	0	1	2	3	4	5	6	7

Number	8	9	10	11	12	13	14	15
Binary	1000	1001	1010	1011	1100	1101	1110	1111
Hexadecimal	8	9	A	B	C	D	E	F

Circuit Globe



CLass	First Octet Range	Default Subnet Mask	Max Hosts	Format
A	1-126	255.0.0.0	16M	
B	128-191	255.255.0.0	64K	
C	192-223	255.255.255.0	254	
D	224-239	N/A	N/A	
E	240-255	N/A	N/A	

IP address Classes

Class	# Network Bits	# Hosts Bits	Decimal Address Range	Subnet mask
Class A	8 bits	24 bits	1-126	255.0.0.0
Class B	16 bits	16 bits	128-191	255.255.0.0
Class C	24 bits	8 bits	192-223	255.255.255.0
Class D	Reserved for Multicasting		224-239	N/A
Class E	Reserved for R & D		240-255	N/A

CLASS A (1-126)

Default subnet mask = 255.0.0.0

Network	Subnets/Hosts		
	Host	Host	Host
255 .	0 .	0 .	0

CLASS B (128-191)

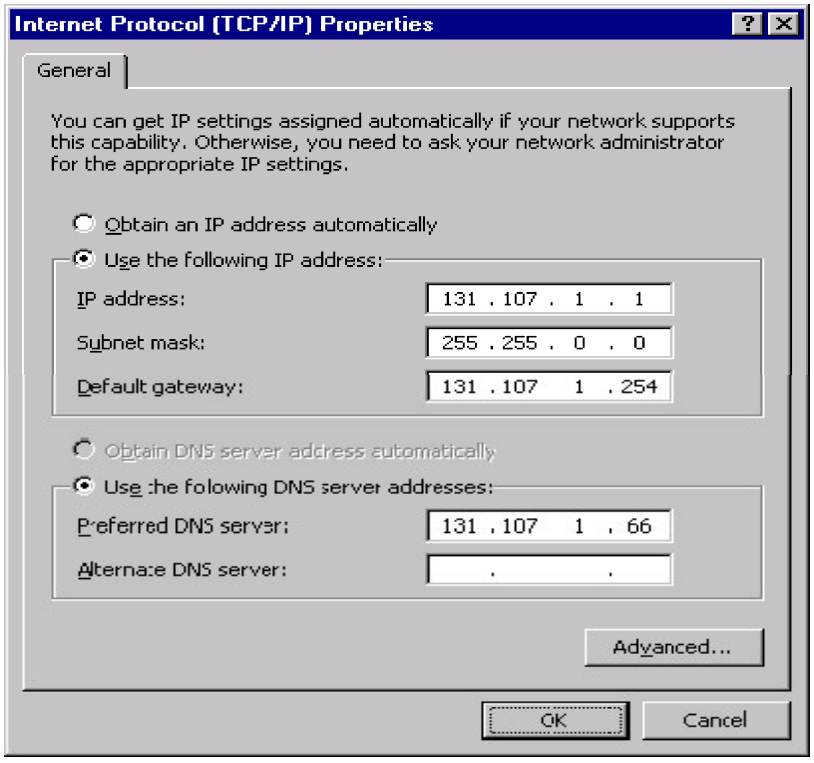
Default subnet mask = 255.255.0.0

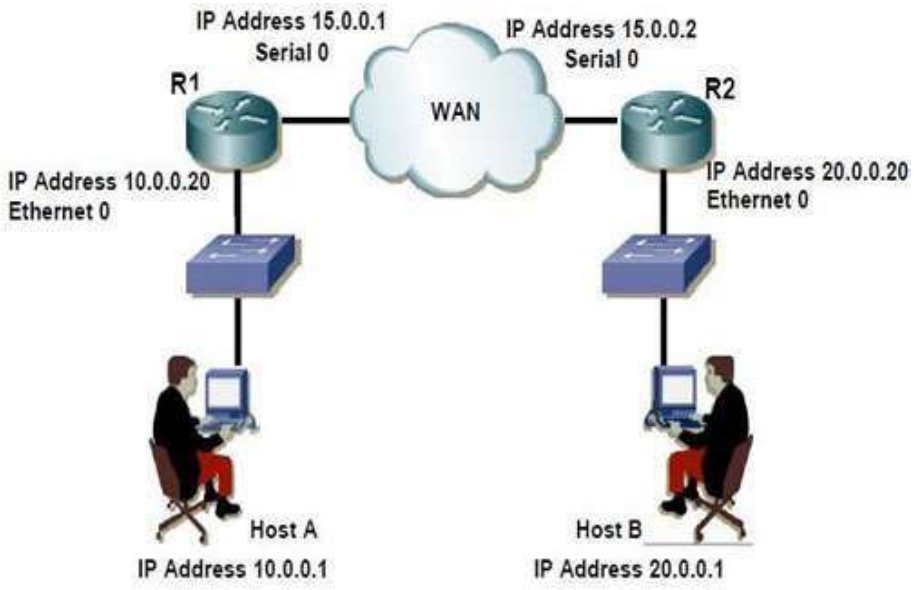
Network	Network	Subnets/Hosts	
		Host	Host
255 .	255 .	0 .	0

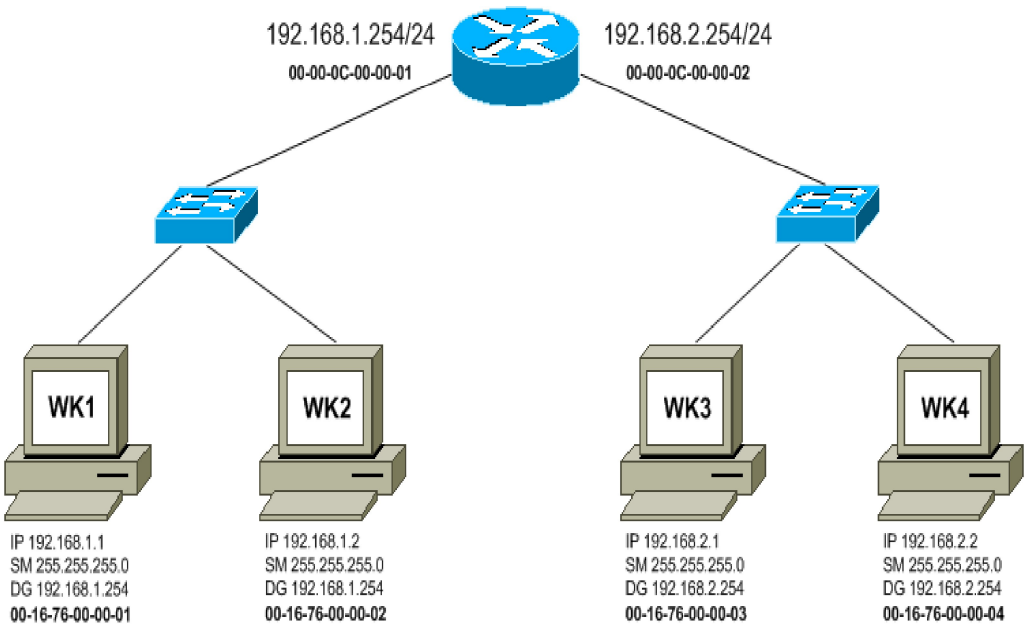
CLASS C (192-223)

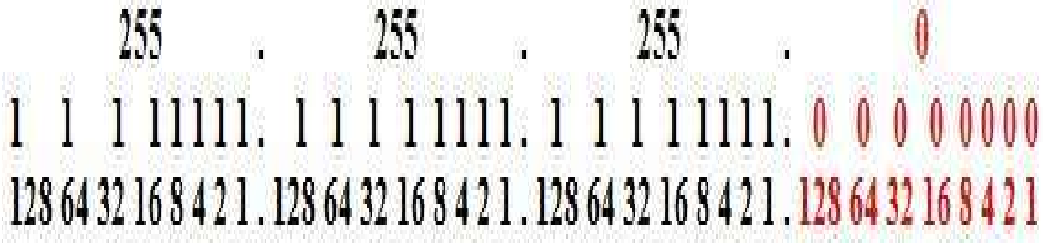
Default subnet mask = 255.255.255.0

Network	Network	Network	Subnets/Hosts
			Host
255 .	255 .	255 .	0

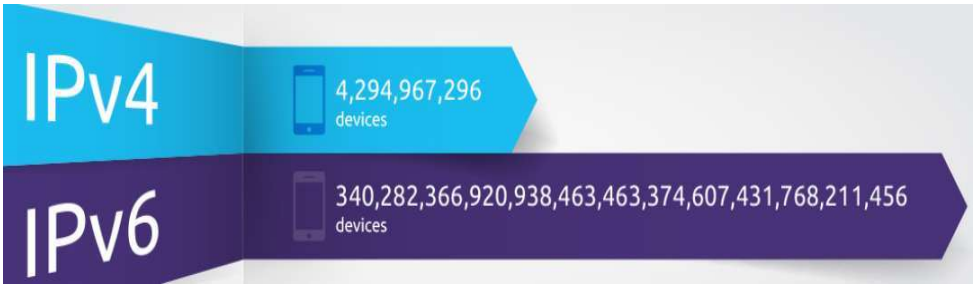


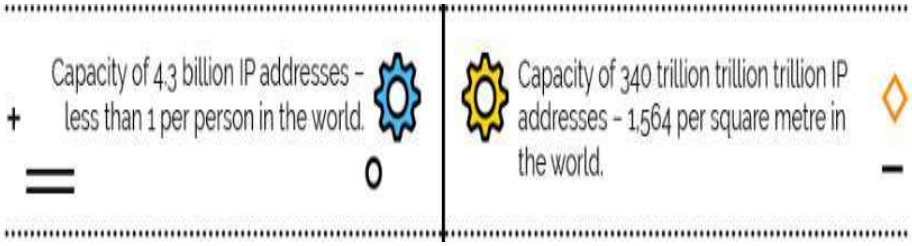

IP Address 15.0.0.1
Serial 0
IP Address 15.0.0.2
Serial 0
R1
WAN
R2
IP Address 10.0.0.20
Ethernet 0
IP Address 20.0.0.20
Ethernet 0
Host A
IP Address 10.0.0.1
Host B
IP Address 20.0.0.1


192.168.1.254/24
00-00-0C-00-00-01
192.168.2.254/24
00-00-0C-00-00-02
WK1
WK2
WK3
WK4
IP 192.168.1.1
SM 255.255.255.0
DG 192.168.1.254
00-16-76-00-00-01
IP 192.168.1.2
SM 255.255.255.0
DG 192.168.1.254
00-16-76-00-00-02
IP 192.168.2.1
SM 255.255.255.0
DG 192.168.2.254
00-16-76-00-00-03
IP 192.168.2.2
SM 255.255.255.0
DG 192.168.2.254
00-16-76-00-00-04



	Internet Protocol version 4 (IPv4)	Internet Protocol version 6 (IPv6)
Deployed	1981	1999
Address Size	32-bit number	128-bit number
Address Format	Dotted Decimal Notation: 192.149.252.76	Hexadecimal Notation: 3FFE:F200:0234:AB00: 0123:4567:8901:ABCD
Prefix Notation	192.149.0.0/24	3FFE:F200:0234::/48
Number of Addresses	2^{32} = ~4,294,967,296	2^{128} = ~340,282,366, 920,938,463,463,374, 607,431,768,211,456





IPv6: Address Compression

- Drop leading 0s in each group

  2001:0db8:0000:0000:0000:0053:0000:0004

  becomes

  2001:db8:0:0:0:53:0:4

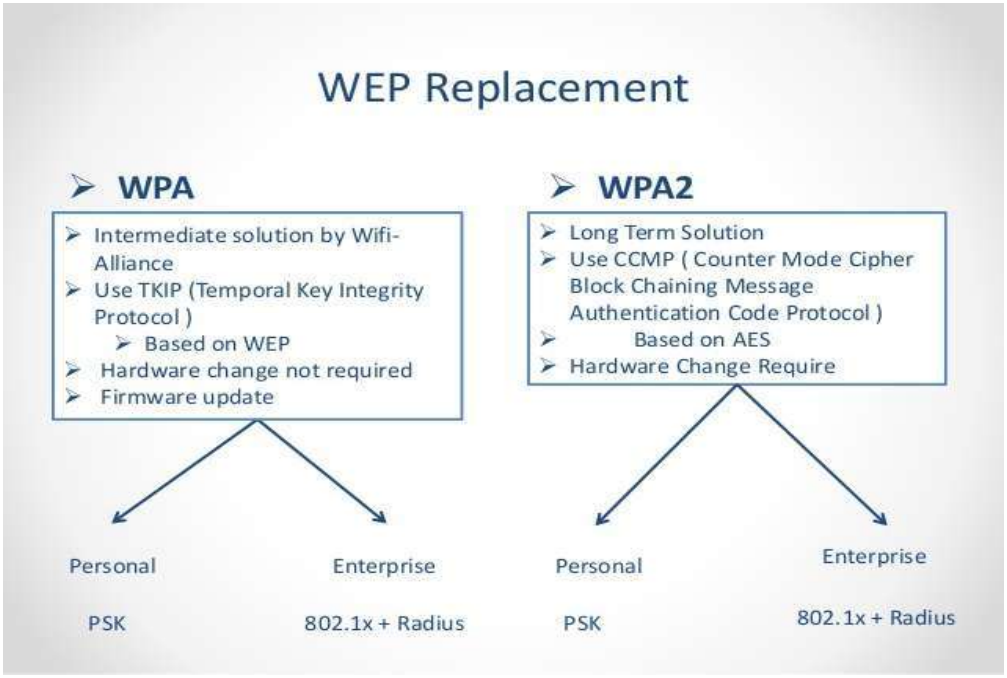
- Replace the first group of 0s with ::

  2001:0db8:0000:0000:0000:0053:0000:0004

  becomes

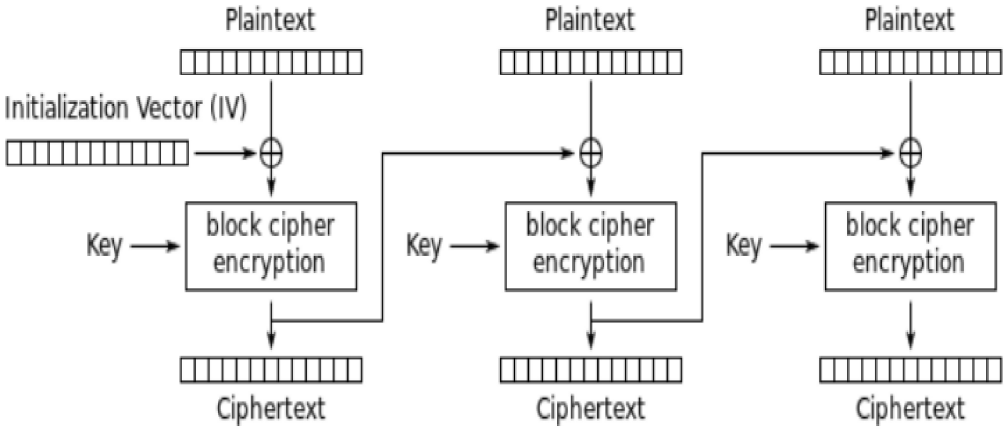
  2001:db8::53:0:4

- Only one set of :: can exist in an address

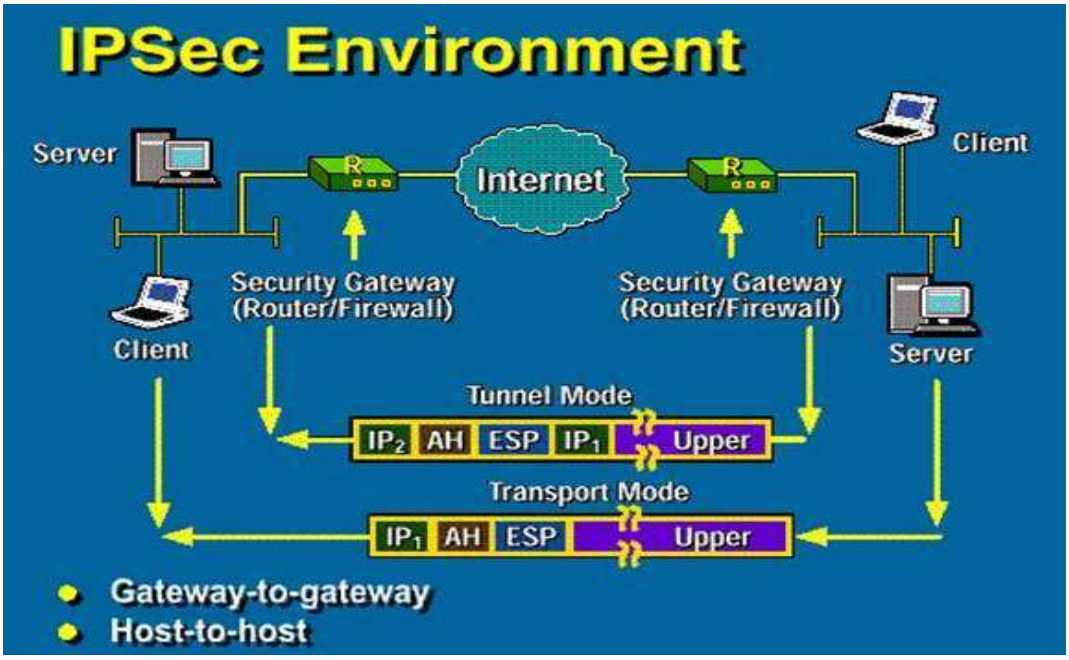


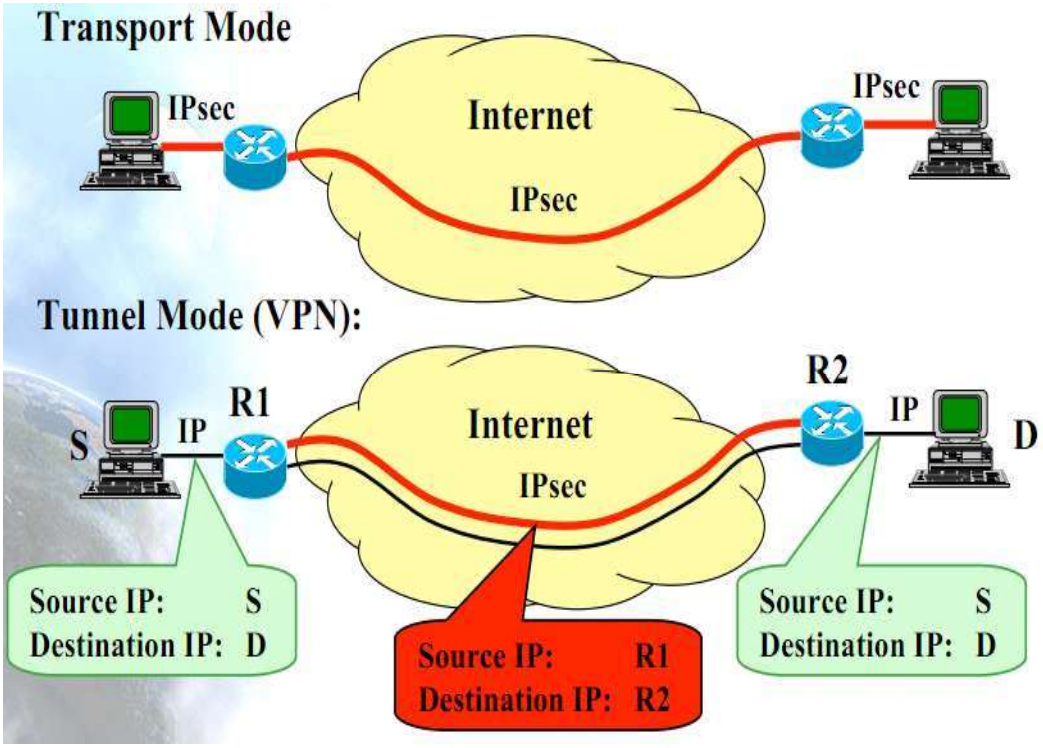
802.11 Wireless Standards					
IEEE Standard	802.11a	802.11b	802.11g	802.11n	802.11ac
Year Adopted	1999	1999	2003	2009	2014
Frequency	5 GHz	2.4 GHz	2.4 GHz	2.4/5 GHz	5 GHz
Max. Data Rate	54 Mbps	11 Mbps	54 Mbps	600 Mbps	1 Gbps
Typical Range Indoors*	100 ft.	100 ft.	125 ft.	225 ft.	90 ft.
Typical Range Outdoors*	400 ft.	450 ft.	450 ft.	825 ft.	1,000 ft.

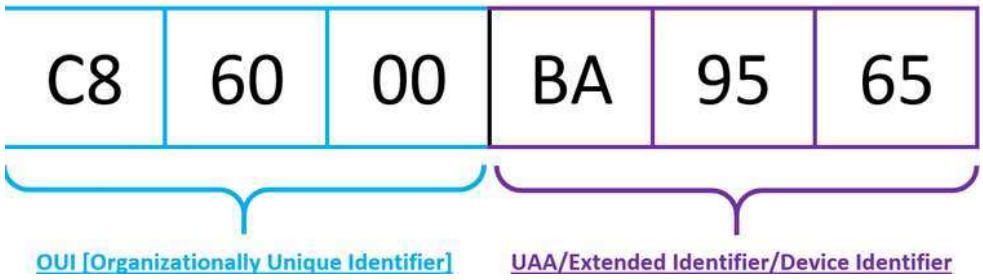
	Authentication	Encryption	Suitable for corporate WAN	Suitable for home and small business WLAN
WEP	none	WEP	poor	less than good
WPA (PSK)	PSK	TKIP	poor	best
WPA2 (PSK)	PSK	AES-CCMP	poor	best
WPA (full)	802.1x	TKIP	better	good (expensive)
WPA2 (full)	802.1x	AES-CCMP	best	good (expensive)



Cipher Block Chaining (CBC) mode encryption


IPSec Environment
Server
Internet
Client
Security Gateway
(Router/Firewall)
Security Gateway
(Router/Firewall)
Client
Server
Tunnel Mode
IP2 AH ESP IP1 Upper
Transport Mode
IP1 AH ESP Upper
Gateway-to-gateway
Host-to-host


Transport Mode
IPsec
Internet
IPsec
IPsec
Tunnel Mode (VPN):
S
IP
R1
Internet
IPsec
R2
IP
D
Source IP: S
Destination IP: D
Source IP: R1
Destination IP: R2
Source IP: S
Destination IP: D


C8
60
00
BA
95
65
OUI [Organizationally Unique Identifier]
UAA/Extended Identifier/Device Identifier