



► Internet Protocol Version 6 (IPv6)

- IPv4 → 4,294,467,295 IP addresses

Class A → 16,777,216

Class B → 65,535

Class C → 256

Large companies (Apple, IBM, Microsoft, etc.) allocated one or more Class A addresses




Many IP
addresses
are wasted!



► Internet Protocol Version 6 (IPv6)

- IPv6 is 128-bit long:

340,282,366,920,938,463,463,374,607,431,768,211,456



Enough IP
addresses for the
entire galaxy!



► Internet Protocol Version 6 (IPv6)

- IP Address representation:

IPv4 → 51.151.64.242

Octet

IPv6 → 2041:1234:140F:1122:AB91:564F:875B:131B

- On browsers:

Hexadectet
or **hextet**

IPv4: <http://51.151.64.242/index.html>

IPv6:

[http://\[2041:1234:140F:1122:AB91:564F:875B:131B\]/index.html](http://[2041:1234:140F:1122:AB91:564F:875B:131B]/index.html)



► Internet Protocol Version 6 (IPv6)

- Shortening IPv6 Addresses:

Original : 2041:0000:140F:0000:0000:0000:875B:131B
Short : 2041:0000:140F::875B:131B



Original : 2001:0000:0000:0012:0000:0000:1234:56ab
Wrong! : 2001::12::1234:56AB



You can remove zeros only once!



► Internet Protocol Version 6 (IPv6)

- Shortening IPv6 Addresses:

Original	: 2041: <u>0000</u> :140F: <u>0000:0000:0000</u> :875B:131B
Short	: 2041: <u>0</u> :140F:: <u>875B</u> :131B

Original	: 2001:0001:0002:0003:0004:0005:0006:0007
Short	: 2001:1:2:3:4:5:6:7

- Rules:
 - An entire string of zeros can be removed, you can only do this once
 - 4 zeros can be removed, leaving only a single zero
 - Leading zeros can be removed

► Internet Protocol Version 6 (IPv6)



IPv6 Address Types:

- **Unicast Address**

- Link Local Address: Only valid in local networks. Starts with FE80::/10
- Global Unicast Address: Worldwide unique address. Starts with 2000 to 3FFF

- **Multicast address** - Same as IPv4. Starts with FF00::/8

- **Anycast Address** - Similar to broadcast but instead of sending to all nodes, sends to the closest nodes to sender.



► Internet Protocol Version 6 (IPv6)

IPv6 Special Addresses:

Address	Meaning
0:0:0:0:0:0:0:0	Equals ::. The equivalent of IPv4's 0.0.0.0 and is typically the source address of a host before the host receives an IP address when you're using DHCP-driven stateful configuration
0:0:0:0:0:0:0:1	Equals ::1. The equivalent of 127.0.0.1 in IPv4.
2000::/3	The global unicast address range allocated for Internet access.
FC00::/7	The unique local unicast range.
FE80::/10	The link-local unicast range.
FF00::/8	The multicast range.
3FFF:FFFF::/32	Reserved for examples and documentation.
2001:0DB8::/32	Also reserved for examples and documentation.
2002::/16	Used with 6to4 tunneling, which is an IPv4-to-IPv6 transition system.



Internet Protocol Version 6 (IPv6)

Stateless Autoconfiguration (EUI-64):

48-bit MAC address

00	0C	42	28	79	45		
00000000	00001100	01000010	00101000	01111001	01000101		
Move manufacturer ID and reverse 7-th bit			Move device ID at the end				
00000010	00001100	01000010	11111111	11111110	00101000	01111001	01000101
02	0C	42	FF	FE	28	79	45

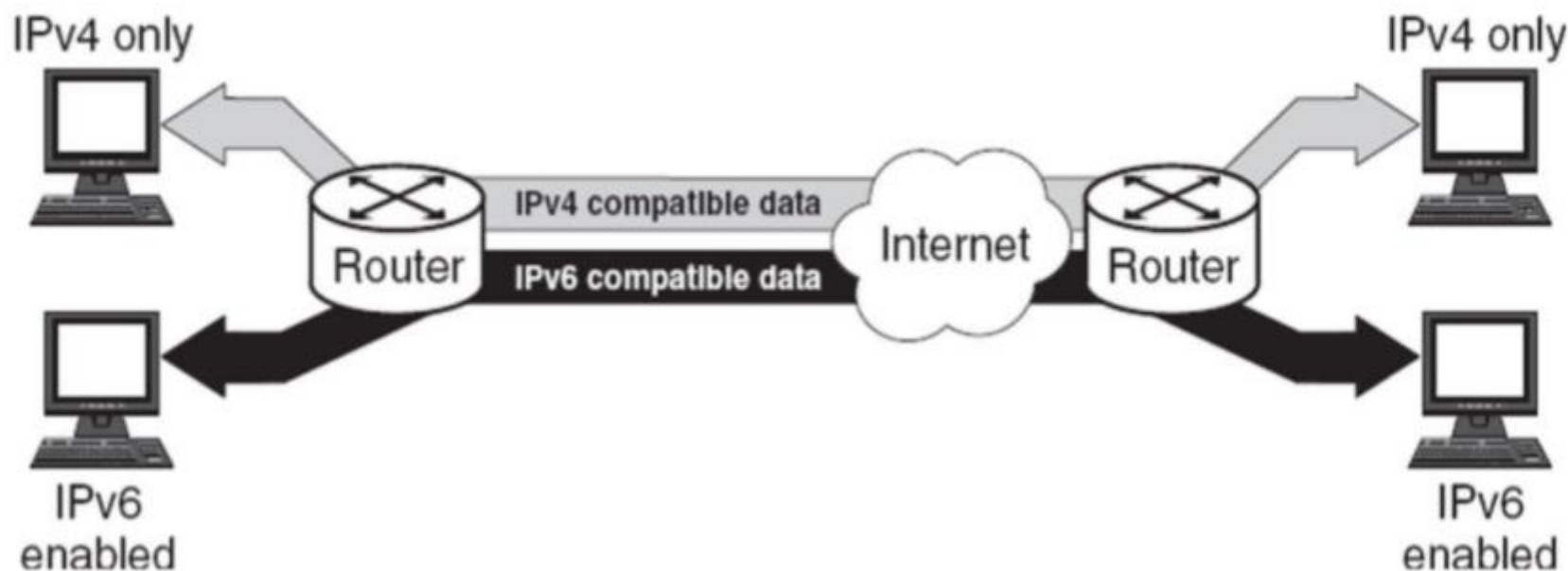
64-bit EUI-64 address



► Internet Protocol Version 6 (IPv6)

Migrating to IPv6:

- Dual Stacking
 - Most common and easiest migration
 - Allows devices to communicate either IPv4 or IPv6
 - Lets you upgrade your devices to IPv6 one at a time





Internet Protocol Version 6 (IPv6)

Migrating to IPv6:

- 6to4 Tunneling
 - Useful for carrying IPv6 packets over IPv4 network
 - Puts IPv4 header onto the front of IPv6 packet

