

CSET 2200

IPv6

IPv4 exhaustion

- ▶ IPv4 provides 4294967296 IPs
- ▶ Seems like plenty
- ▶ In effect not enough
 - ▶ Classful is wasteful
 - ▶ Many /8 unavailable

Short term solutions

- ▶ PAT/NAT bought us time
- ▶ CIDR helped allocate better

Address Allocation

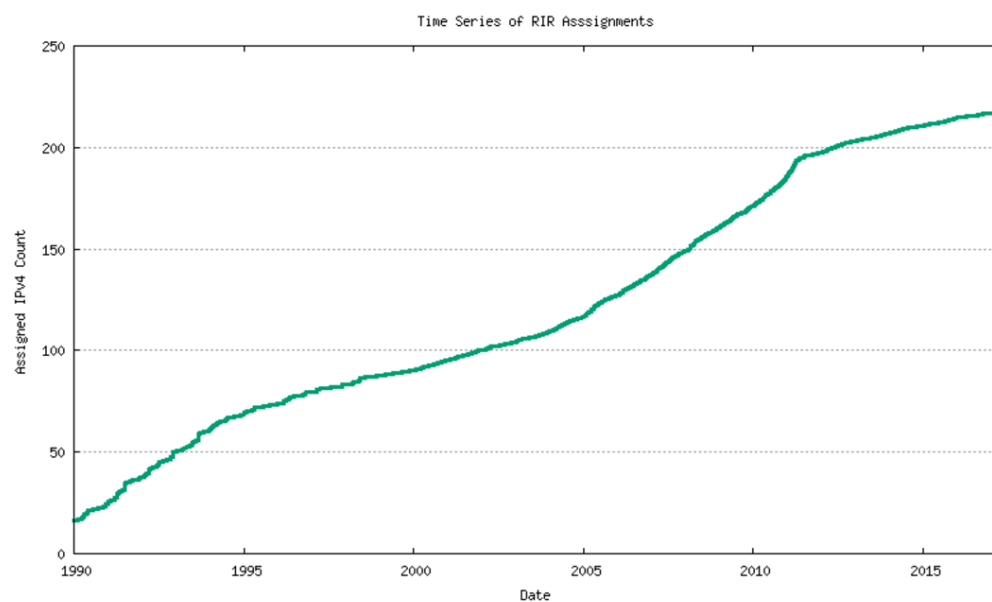


Figure 8 - Cumulative RIR Address assignments

Figure 1: Address Allocation

Enter IPv6

- ▶ 128 bit address space
- ▶ Builds on work of IPv4

IPv6 Addresses

340282366920938463463374607431768211456

IPv6

- ▶ Defines a new IP protocol
- ▶ RFC 2460
- ▶ Requires changes to many underlying protocols

IPv6 Address Format

- ▶ 8 groups of 4 hex digits
- ▶ Remember each hex digit 0-15 (4 bits)
- ▶ 16 bits per group * 8 group = 128 bits

Example

- ▶ 2001:0470:c3af:0000:0000:0000:0000:0000/48

Address abbreviation

- ▶ Leading 0's can be omitted
- ▶ A single group of multiple 0 groupings can be replaced by ::
- ▶ 2001:470:c3af::/48 would be above

IPv6 Networks

- ▶ Similar to IPv4
- ▶ We have Host and network pieces
- ▶ If multiple of 4 or 16, easy with hex
- ▶ Else we need to go to binary

IPv6 Prefixes

- ▶ Start with 2 or 3 global routed
- ▶ 2001 = US
- ▶ 3FFE = old experimental space still used

IPv6 Reserved Prefixes

- ▶ FD = Unique Local
- ▶ FF = Multicast
- ▶ FE80 = Link Local

Subnet Allocation

- ▶ Most often a /64 allocated
- ▶ Makes auto addressing easier
- ▶ Companies usually get a /48

Interface Addressing

- ▶ Interfaces can be statically assigned
- ▶ Also assigned via EUI-64

EUI-64

- ▶ Based on MAC address
- ▶ Should be unique
- ▶ Split MAC address in half
- ▶ Insert FFFE between the halves
- ▶ Flip bit 7 of first octet

Example

- ▶ 78:31:c1:c0:76:fc
- ▶ 7831:c1 c0:76fc
- ▶ 7831:c1ff:fec0:76fc
- ▶ 5831:c1ff:fec0:767v

Assigning addresses to hosts

- ▶ Normally EUI-64 addresses
- ▶ Can also be DHCP
- ▶ Neighbor Discovery Protocol used too
- ▶ Stateless Address Auto Configuration (SLAAC)

Neighbor Discovery Protocol

- ▶ Helps hosts find neighbors
- ▶ Replaces ARP
- ▶ Also supports prefix discovery
- ▶ Router discovery

DHCP and IPv6

- ▶ DHCP does not provide default router
- ▶ Can be used stateless with NDP SLAAC to help

Special Multicast Addresses

- ▶ FF02:1 - All Nodes
- ▶ FF02:2 - All Routers
- ▶ FF02:9 - RIPNng

Configuring IPv6 on Cisco Routers

- ▶ Need to enable ipv6
- ▶ Command is ipv6 unicast-routing

Interface Configuration

- ▶ `ipv6 address`
`/`
- ▶ `ipv6 address / eui-64`
- ▶ `ipv6 address dhcp`
- ▶ `ipv6 address autoconfig`

IPv6 Routing

- ▶ `ipv6 route /`
- ▶ `ipv6 route /`
- ▶ `ipv6 route / interface`
- ▶ Default can be set with `autoconfig`

Questions

Demonstration