

S E E A L S O

This is largely a recap of the CCENT IPv6 topics in ICND 1 (100-105).

TOPIC	URL
IPv6 Basics	http://ccent.ccnacoobook.com/BookNotes/28_IPv6_Basics.pdf
IPv6 Addressing and Subnetting	http://ccent.ccnacoobook.com/BookNotes/29_IPv6_Addressng_and_Subnetting.pdf
IPv6 on Routers	http://ccent.ccnacoobook.com/BookNotes/30_IPv6_on_Routers.pdf
IPv6 on Hosts	http://ccent.ccnacoobook.com/BookNotes/31_IPv6_on_Hosts.pdf
IPv6 Routing	http://ccent.ccnacoobook.com/BookNotes/32_IPv6_Routing.pdf

A D D R E S S E S A N D S U B N E T T I N G

Two types of addresses:

- Global Unicast—A unique prefix identifies the enterprise where all subnets and hosts are
- Unique Local—like IPv4 private addresses

In the limited world of CCNA, you always have a /64 address by the time you're done subnetting. So, if you have a /48 prefix, you'll have 16 bits to subnet with and 64 bits to identify hosts. If you're not subnetting, then just set the 16 subnet bits to 0 and ignore them.

Link local addresses are a special unicast address that isn't routed off a network segment (LAN). You can literally assign the same link-local address to each of the interfaces on a router because the scope of each is limited to that interface. To use a link-local address as a next-hop address in a static route, you'll also have to specify the exit interface for the same reason. Hosts and router interfaces automatically give themselves link local addresses. The first part of any link-local address will always be FE80::/64. On Cisco routers, the automatic address uses EUI-64 rules to auto-generate the host bits.

Common Prefixes

FIRST DIGITS	ADDRESS TYPE
2 or 3	Global Unicast (like IPv4 public addresses)
FD	Unique Local Unicast (like IPv4 private addresses) You might see this called FC::/7, which is FC or FD, but you really shouldn't
FE80	Link Local

ADDRESS ASSIGNMENT

Hosts can be addressed in three ways: static configuration, SLAAC, and DHCPv6 (stateless or stateful).

The following table shows which information can be obtained in each way and includes a column for IPv4 DHCP for comparison.

	DHCP (IPv4)	NDP	SLAAC	DHCPv6
Address	•		•	(stateful)
Subnet Mask (Prefix Length)	•	•		(stateful)
Gateway (Default Router)	•	•		
DNS Server(s)	•			•

NDP (Network Discovery Protocol) lays the ground work for automatic self configuration by sending out a multicast request (RS=Router Solicitation) for any routers on the network segment to identify themselves. Once a router does (RA=Router Advertisement), the host knows the address of its gateway (the router that responded) and the prefix length (mask). From there, it's a trivial matter to calculate the prefix (subnet) of it's LAN.

SLAAC (StateLess Address AutoConfiguration) takes the prefix calculated from NDP and invents some host bits to give itself a full address. It can use EUI-64 (Cisco's choice for router interfaces) or just pick 64 random bits (Microsoft).

EUI-64 create 64 host bits from its 48-bit MAC address

- Insert FFFE in the middle of the MAC
- Counting from the left (of the entire address or the MAC—same thing), invert the 7th bit

Stateless DHCPv6 can augment SLAAC by providing settings that the host couldn't figure out on its own, for example the address to use for DNS. It's "stateless" because the server doesn't need to store information about the host. It simply answers a question and then forgets the exchange.

Stateful DHCPv6—Behaves more like IPv4 DHCP, keeping track of address leases. The only difference from IPv4 is that the gateway router is discovered through NDP.

CISCO IOS ROUTERS

Interface Addresses

Each router interface can have multiple IPv6 addresses and even an IPv4 address as well (double-stacking). It can only have one link-local address; when you enter a second link-local, you'll replace the first.

INTERFACE CONFIG COMMAND	DESCRIPTION
<code>ipv6 address 2001:db8::6/64</code>	Global Unicast
<code>ipv6 address 2001:db8::/64 eui-64</code>	Host bits calculated by EUI-64 algorithm
<code>ipv6 address FE80::6 link-local</code>	Link Local. There is no prefix length on a Link Local
<code>ipv6 address autoconfig</code>	SLAAC
<code>ipv6 address dhcp</code>	DHCPv6

Static Routes

Except for replacing the keyword "ip" with "ipv6," static routes are unchanged. As with IPv4, there are three ways to denote a route's destination.

DESTINATION	FORMAT
Exit Interface	<code>ipv6 route 2001:db8:4::/48 gi 0/0</code>
Next Hop Address	<code>ipv6 route 2001:db8:4::/48 2001:db8::6</code>
Both (required if next hop is link-local)	<code>ipv6 route 2001:db8:4::/48 gi0/0 fe80::6</code>

As before, you can create a floating static route by appending an Administrative Distance (1 to 254).