

5.6.8 IPv6 Address Assignment Facts

An IPv6 address can be configured using any of the following methods:

Method	Description
Static Full Assignment	The entire 128-bit address and all other configuration information is statically assigned to the host.
Static Partial Assignment	The prefix is statically assigned and the interface ID is derived from the MAC address.
Stateless Autoconfiguration	<p>Clients automatically generate the interface ID and learn the subnet prefix and default gateway through the Neighbor Discovery Protocol (NDP). NDP uses the following messages for autoconfiguration:</p> <ul style="list-style-type: none">▪ A <i>Router solicitation</i> (RS) is a message sent by the client, requesting that routers respond.▪ A <i>Router advertisement</i> (RA) is a message sent periodically by the router and in response to RS messages, informing clients of the IPv6 subnet prefix and the default gateway address. <p>Hosts also use NDP to discover the addresses of other interfaces on the network, removing the need for the Address Resolution Protocol (ARP).</p> <p>NDP provides enough information for the addressing of the client and for clients to learn the addresses of other clients on the network. However, it does not provide the client with DNS server information or any other IP configuration information besides the IP address and the default gateway.</p>
DHCPv6	<p>IPv6 uses an updated version of DHCP (called DHCPv6) that operates in one of two modes:</p> <ul style="list-style-type: none">▪ <i>Stateful</i> DHCPv6 is when the DHCP server provides each client an IP address, default gateway, and other IP configuration information (such as the DNS server IP address). The DHCP server tracks the status (or state) of the client.▪ <i>Stateless</i> DHCPv6 does not provide the client an IP address and does not track the status of each client. It is instead used to supply the client with the DNS server IP address. Stateless DHCPv6 is most useful when used in conjunction with stateless autoconfiguration.

When a host starts up, it uses the following process to configure the IPv6 address for each interface:

1. The host generates an IPv6 address using the link-local prefix (FE80::/10) and modifies the MAC address to get the interface ID. For example, if the MAC address is 20-0C-FB-BC-A0-07, the link-local address for the interface would be FE80::220C:FBFF:FEBC:A007.
2. The host sends a neighbor solicitation (NS) message addressed to its own link-local address to see if the address it has chosen is already in use:
 - If the address is in use, the other network host responds with a neighbor advertisement (NA) message. The process stops and manual configuration of the host is required.
 - If the address is not in use (no NA message is received), the process continues.
3. The host waits for an RA message from a router to learn the prefix:
 - If an RA message is not received, the host sends out an RS message addressed to all routers on the subnet, using the multicast address FF02::2.
 - The router sends out an RA message addressed to all interfaces on the subnet, using the multicast address FF02::1.
 - If no routers respond, the host will attempt to use stateful DHCPv6 to receive configuration information.
4. The RA message contains information that identifies how the IPv6 address and other information should be configured. The following table shows possible combinations:

Configuration Method	Description
Stateful Autoconfiguration	<p>Obtains the interface ID, subnet prefix, default gateway, and other configuration information from a DHCPv6 server.</p> <p>The host sends out a REQUEST message addressed to the multicast address FF02::1:2, requesting this information from the DHCPv6 server.</p>
Stateless Autoconfiguration	<p>Sets the interface ID automatically.</p> <p>Obtains the subnet prefix and default gateway from the RA message.</p> <p>Obtains DNS and other configuration information from a DHCPv6 server.</p> <p>The host sends out an INFORMATION-REQUEST message addressed to the multicast address FF02::1:2, requesting this information from the DHCPv6 server.</p>

5. If a manual address or stateful autoconfiguration is used, the host sends an NS message to make sure the address is not already in use. If stateless autoconfiguration is used, the NS message at this step is unnecessary because the interface ID was verified in step 2.