12.3.4 IPv6 Configuration Facts

There are a number of ways that an IPv6 address can be configured.

This lesson covers the following topics:

- IPv6 configuration methods
- IPv6 configuration process

IPv6 Configuration Methods

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

Method	Description
Static full assignment	Static full assignment is where the entire 128-bit IPv6 address and all other configuration information is statically assigned to the host.
Static partial assignment	Static partial assignment is where the prefix is statically assigned and the interface ID uses the modified EUI-64 format derived from the MAC address.
Stateless autoconfiguration	Stateless autoconfiguration is where 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: • Router solicitation (RS) is a message sent by the client to request that the routers respond. • Router advertisement (RA) is a message sent by the router periodically and in response to RS messages to inform clients of the IPv6 subnet prefix and the default gateway address. NDP is also used by hosts to discover the address of other interfaces on the network, replacing the need for Address Resolution Protocol (ARP). ⓘ Even though NDP provides enough information for the addressing of the client and for clients to learn the addresses of other clients on the network, it does not provide the client with DNS server information or other IP configuration information besides the IP address and the default gateway.
DHCPv6	IPv6 uses an updated version of DHCP (called DHCPv6) that operates in one of two different modes: • Stateful DHCPv6 is used when the DHCP server provides each client with the 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. • Stateless DHCPv6 does not provide the client an IP address and does not track the status of each client, but rather is used to supply the client with the DNS server IP address. Stateless DHCPv6 is most useful when used in conjunction with stateless autoconfiguration.

IPv6 Configuration Process

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 modifying 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 then 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), the process continues.
3. The host waits for a router advertisement (RA) message from a router to learn the prefix.
    - If an RA message is not received, the host sends out a router solicitation (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 attempts to use stateful DHCPv6 to receive configuration information.
4. The RA message contains information that identifies how the IPv6 address and other information is to be configured. Possible combinations are:

Configuration Method	Description
Use stateful autoconfiguration	Obtains the interface ID, subnet prefix, default gateway, and other configuration information from a DHCPv6 server. The host sends out a REQUEST message addressed to the multicast address FF02::1:2 to request this information from the DHCPv6 server.
Use stateless autoconfiguration	Sets the interface ID automatically. Gets the subnet prefix and default gateway from the RA message. Gets DNS and other configuration information from a DHCPv6 server.

	The host sends out an INFORMATION-REQUEST message addressed to the multicast address FF02::1:2 to request this information from the DHCPv6 server.

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 has already been verified in step 2.