# IPv6 Address Assignment

IPv6 Address assignment methods:

- Manual assignment
- Stateless address autoconfiguration (SLAAC)
- Stateless DHCPv6
- Stateful DHCPv6

1. Manual Assignment
   - As with IPv4, an IPv6 address can be statically assigned by a network administrator.

2. Stateless address autoconfiguration (SLAAC)
   - DHCP clients autoconfigure their own IPv6 address based on Router Advertisements (RA). IPv6 hosts listen for these RAs and use the advertised prefix, which must be 64 bits long. The host generates the remaining 64 host bits either by using the IEEE EUI-64 format or by creating a random sequence of bits.

     Example:

```
Router(config)#ipv6 unicast-routing
Router(config)#int g0/0
Router(config-if)#ipv6 address 2001:211:A:1::/64
Router(config-if)#ipv6 address autoconfig
Router(config-if)#no shutdown
Router(config-if)#exit
```

3. Stateless DHCPv6
   - Used to supply additional parameters to clients that already have an IPv6 address. It works in combination with SLAAC. For example, an IPv6 host gets its addressing and default router information using SLAAC from information contained within an RA. However, the IPv6 host also queries a DHCPv6 server for other information it needs, such as the DNS server address. The query for other configurations is triggered by the *other configuration* flag bit set in the RA.
   - Why we call it Stateless? - the DHCPv6 server does not assign IPv6 addresses, and therefore does not need to maintain any dynamic state information for the clients; therefore, it is called *stateless*.

     Example:

```
Router(config)#ipv6 dhcp pool IPv6-Stateless
Router(config-dhcpv6)#dns-server 2001:211:A:1::1
Router(config-dhcpv6)#domain-name teralogic.com.my
Router(config-dhcpv6)#exit

Router(config)#int g0/0
Router(config-if)#ipv6 nd other-config-flag
Router(config-if)#ipv6 dhcp server IPv6-Stateless
Router(config-if)#exit
```

4. Stateful DHCPv6
   - Similar to DHCP for IPv4 (DHCPv4). When stateful DHCPv6 is implemented, RAs use the ***managed address configuration*** flag bit to tell IPv6 hosts to get their addressing and additional information only from the DHCPv6 server. This flag tells the hosts to disregard the prefixes in the RA and instead query the DHCPv6 server for addressing and other information.
   - DHCPv6 Operation
     - The client sends a **SOLICIT** message to find a DHCPv6 server and request assignment of addresses and other configuration information.
     - Any DHCPv6 servers that can meet the client's requirement respond to the client with an **ADVERTISE** message.
     - The client chooses one of the servers and sends a **REQUEST** message to it, asking it to confirm the addresses and other information that were advertised.
     - The server responds with a **REPLY** message that contains the confirmed addresses and configuration information.
     - Like with DHCPv4, a DHCPv6 client renews its lease after a period of time by sending a **RENEW** message.
     - By default, the four-message exchange is used; when the **rapid-commit** option is enabled by both the client and server, the two-message exchange is used (SOLICIT-REPLY).

     Example:

```
Router(config)#ipv6 unicast-routing

Router(config)#ipv6 dhcp pool IPv6-Stateful
Router(config-dhcpv6)# address prefix 2001:211:B:1::/64
Router(config-dhcpv6)#dns-server 2001:211:B:1::1
Router(config-dhcpv6)#domain-name teralogic.com.my
Router(config-dhcpv6)#exit

Router(config)#int g0/0
Router(config-if)#ipv6 address 2001:211:B:1::/64
Router(config-if)#ipv6 nd managed-config-flag
Router(config-if)#ipv6 dhcp server IPv6-Stateful
Router(config-if)#no shutdown
Router(config-if)#exit
```