5.6.3 IPv6 Address Type Facts

In IPv6, addresses are assigned to interfaces (network connections). All interfaces are required to have an IPv6 address, and each interface can have more than one IPv6 address. IPv6 defines the following types of addresses:

<table>
<tr><th>Address Type</th><th colspan="2">Description</th></tr>
<tr><td rowspan="4">Unicast</td><td colspan="2">Unicast addresses are assigned to a single interface, for the purpose of allowing that one host to send and receive data. Packets sent to a unicast address are delivered to the interface identified by that address.

Three types of unicast IPv6 addresses are as follows:</td></tr>
<tr><td>Link-local</td><td>Link-local addresses (also known as local link addresses) are addresses that are valid on only the current subnet. Details include the following:

▪ Link-local addresses have an FE80::/10 prefix. This includes any address beginning with FE8, FE9, FEA, or FEB.
▪ All nodes must have at least one link-local address, although each interface can have multiple addresses.
▪ Link-local addresses are used for automatic address configuration, for neighbor discovery, or for subnets that have no routers.

Do not use link-local IPv6 addressing on routed networks. Routers never forward packets destined for link-local addresses to other subnets.</td></tr>
<tr><td>Unique local</td><td>Unique local addresses are private addresses used for communication within a site or between a limited number of sites. In other words, unique local addressing is commonly used for network communications that do not cross a public network; they are the equivalent of private addressing in IPv4. Details include the following:

▪ Because unique local addresses are not registered with IANA, they cannot be used on a public network (such as the Internet) without address translation.
▪ Addresses beginning with a prefix of FC00 or FD00 are unique local addresses.
▪ Following the prefix, the next 40 bits are used for the Global ID. The Global ID is generated randomly, creating a high probability of uniqueness on the entire Internet.
▪ Following the Global ID, the remaining 16 bits in the prefix are used for subnet information.
▪ Unique local addresses are likely to be globally unique, but they are not globally routable. Unique local addresses might be routed between sites by a local ISP.

The process for designing a network addressing scheme when using unique local addresses is similar to that used for global unicast addresses. The key difference is how the prefix is defined. Because the address range is not registered, a global routing prefix does not have to be requested from an ISP. Instead, each organization defines its own prefix.</td></tr>
<tr><td>Global unicast</td><td>Global unicast addresses are addresses that are assigned to individual interfaces that are globally unique. All IPv6 addresses that haven't been specifically reserved for other purposes are defined as global unicast addresses. The global routing prefix assigned to an organization by an ISP is typically 48 bits long (/48), but it could be as short as /32 or as long as /56, depending on the ISP. All subnet IDs within the same organization must begin with the same global routing prefix, but they must also be uniquely identified using a different value in the subnet field.

Using this addressing scheme allows organizations to define a large number (2^{16}) of IPv6 subnets. When designing an IPv6 network, separate IPv6 subnets should be defined by the following:

▪ Network segments separated by routers
▪ VLANs
▪ Point-to-point WAN links</td></tr>
<tr><td>Multicast</td><td colspan="2">Multicast addresses represent a dynamic group of hosts. Packets sent to a multicast address are sent to all interfaces identified by that address. If different multicast addresses are used for different functions, only the devices that need to participate in a particular function will respond to the multicast; devices that have no need to participate in the function will ignore the multicast. Details include the following:

▪ All multicast addresses have an FF00::/8 prefix.
▪ Multicast addresses that are restricted to the local link have only an FF02::/16 prefix. Packets starting with FF02 are not forwarded by routers.
▪ Multicast addresses with an FF01::/16 prefix are restricted to a single node.
The following are well-known multicast addresses:

▪ FF02::1 is for all nodes on the local link. This is the equivalent of the IPv4 subnet broadcast address. FF01::1 is for all interfaces on a node.</td></tr>
</table>

	▪ FF02::2 is for all routers on the local link. FF01::2 is for all routers on node-local. ▪ FF02::1:2 is for all DHCP servers or DHCP relay agents on the local link. DHCP relay agents forward these packets to other subnets. There are no broadcast addresses in IPv6. IPv6 multicast addresses are used instead of broadcast addresses.
Anycast	The *anycast* address is a unicast address that is assigned to more than one interface, typically belonging to different hosts. An anycast packet is routed to the nearest interface having that address (based on routing protocol decisions). Details include the following: ▪ An anycast address is the same as a unicast address. Assigning the same unicast address to more than one interface makes it an anycast address. ▪ You can have a link-local, unique local, or global unicast anycast address. ▪ When you assign an anycast address to an interface, you must explicitly identify the address as an anycast address (to distinguish it from a unicast address). ▪ Anycast addresses can be used to locate the nearest server of a specific type (e.g., the nearest DNS or network time server).
Loopback	The local loopback address for the local host is 0:0:0:0:0:0:0:1 (also identified as ::1 or ::1/128). The local loopback address is not assigned to an interface. It can be used to verify that the TCP/IP protocol stack has been properly installed on the host.