

Application Note

Introduction to IPv6 Addressing and Configuration

Revision History

May 20, 2016	Initial release

IPv6 Address Configuration

The address configuration of a device on an IPv6 capable network has some significant differences from an IPv4 network. One major difference is the role routers can play in address configuration, ant the fact that with IPv6 an interface can have multiple prefixes and IP addresses, and unlike IPv4, all of them are primary. The intent of this document is to provide a summary and brief description of the most common configurations.

Auto Configuration

Referred to as “IPv6 Stateless Address Auto Configuration” because a DHCPv6 server is not needed. A device can assign multiple addresses to itself. It is also called Stateless Address Auto Configuration (SLACC).

Stateless Auto Configuration is a method for a device to configure itself without outside help.
Stateful Auto Configuration is a method where configuration information is provided by a server.

When your NetBurner device boots up it will do the following:

1. Assign a Link Local address based on it's MAC address with a prefix of FE80. This address can only be used on the local link (local area network).
2. It will then attempt to connect to a router to configure a routable Global Internet Address. The router will either: tell the device how to determine its Global Internet Address (AutoConfig bit set), or tell the device that “stateful” autoconfiguration is in use and provide the DHCPv6 server IP address (router AutoConfig bit is not set). If a DHCPv6 address is provided your NetBurner device will automatically start the DHCPv6 client, otherwise it will remain disabled.

DHCP for IP Version 6

DHCP is not needed in IPv6 as much as it was in IPv4, but it does provide a few things for the network administrator:

1. Control over IPv6 addresses.
2. Ability to provide additional configuration options, such as NTP.

As with IPv4, the DHCPv6 server can assign IP information and options. **In order for DHCPv6 to operate properly, the routers on the IPv6 network must have their Auto Configuration bit set to off**.

Static Addressing

Similar to IPv4, you can assign static address for the IP address, DNS, NTP, etc. You will need to ensure there is not an address conflict if used on a network with DHCPv6 and/or AutoConfig from the routers on the network. Should be avoided if at all possible because unlike IPv4, the routers play a major role in IPv6 configuration and routing.

Network Routing

In the previous sections you can see that an IPv6 device can have multiple IP addresses. So how is a packet route determined?

Example 1, Router Auto Configuration Enabled

In order for router auto configuration to be enabled, by definition a DHCP server is not present. In this example there are two routers, R1 and R2, each providing a different IP prefix. The device then has 3 addresses:

FE80:xxxx	Link Local address
2001:xxxx	From R1 (autoconfig bit set)
2002:xxxx	From R2 (autoconfig bit set)

DHCP client is disabled.

When you make an outgoing connection that is to a Link Local address, you connect directly and no information is sent to a router. When you make an outgoing connection outside the local network, the first time a router is selected at random. That router will either: route the connection, or reply to the sender with information that a different router should be used (in this case R2).

Example 2, Router Auto Configuration Disabled

If router auto configuration is disabled, and a DHCPv6 server is present (requires the network admin to configure the routers properly), the router should be configured to set the proper flags in the Router Advertisement to inform the device to send a DHCPv6 request. In this example there are again two routers, R1 and R2. The device then has 2 addresses:

FE80:xxxx	Link Local address
2001:xxxx	From R1 (autoconfig bit clear)
2002:xxxx	From R2 (autoconfig bit set)
2001:yyyy	From DHCP server

The routing procedure is identical to Example 1. The only difference is we now have an address provided by the network administrator through DHCPv6.

Router Advertisement Messages

There are four flags in a Router Advertisement (RA) message:

M : Managed Address Configuration Flag. Set if DHCPv6 is available.
O : Other Configuration Flag. Set if DHCPv6 is available for other configuration information such as DNS, NTP, etc.

Stateless Address Auto Configuration is used by default, and is based on Router Advertisement message.

M	O	Description
0	0	DHCPv6 is not used. Routers are used for configuration. This is Stateless Address Auto Configuration (SLACC).
0	1	DHCPv6 is not used to assign addresses, only to assign other configuration settings. The routers provide address information. This is stateless DHCPv6.
1	0	Not typically used
1	1	DHCPv6 is used for address and other configuration. This is stateful DHCPv6.

The RA also contains an options section with the following flags:

L : On-Link Flag. Other devices with the same prefix are on the same local subnet.
A : Address Configuration Flag. The prefix can be used for stateless address configuration (SLACC).