Implementing ADSL and Deploying Dial Access for IPv6

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Finding Feature Information

Your software release may not support all the features documented in this module. For the latest feature information and caveats, see the release notes for your platform and software release. To find information about the features documented in this module, and to see a list of the releases in which each feature is supported, see the Feature Information Table at the end of this document.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to   n. An account on   is not required.

Restrictions for Implementing ADSL and Deploying Dial Access for IPv6

- ADSL and dial deployment are available for interfaces with PPP encapsulation enabled, including PPP over ATM (PPPoA), PPP over Ethernet (PPPoE), PPP over async, and PPP over ISDN.
- Network Address Translation (NAT) is not supported for IPv6 TACACS servers in Cisco IOS Release 15.1(1)S.

Information About Implementing ADSL and Deploying Dial Access for IPv6

Address Assignment for IPv6

A Cisco router configured with IPv6 will advertise its IPv6 prefixes on one or more interfaces, allowing IPv6 clients to automatically configure their addresses. In IPv6, address assignment is performed at the network layer, in contrast to IPv4 where a number of functions are handled in the PPP layer. The only function handled in IPv6 control protocol is the negotiation of a unique interface identifier. Everything else, including Domain Name Server (DNS) server discovery, is done within the IPv6 protocol itself.

Contrary to IPv4 address assignment, an IPv6 user will be assigned a prefix, not a single address. Typically, the ISP assigns a 64- or 48-bit prefix.

In IPv6, ISPs assign long-lived prefixes to users, which has some impact on the routing system. In typical IPv4 environments, each network access server (NAS) has a pool of 24-bit addresses and users get addresses from this pool when dialing in. If a user dials another point of presence (POP) or is connected to another NAS at the same POP, a different IPv4 address is assigned.

Addresses for IPv6 are assigned using two methods:

Stateless Address Autoconfiguration

Assigning addresses using the stateless address autoconfiguration method can be used only to assign 64-bit prefixes. Each user is assigned a 64-bit prefix, which is advertised to the user in a router advertisement (RA). All addresses are automatically configured based on the assigned prefix.

A typical scenario is to assign a separate 64-bit prefix per user; however, users can also be assigned a prefix from a shared pool of addresses. Using the shared pool limits addresses to only one address per user.

This method works best for the cases where the customer provider edge (CPE) router is a single PC or is limited to only one subnet. If the user has multiple subnets, Layer 2 (L2) bridging, multilink subnets or proxy RA can be used. The prefix advertised in the RA can come from an authorization, authentication, and accounting (AAA) server, which also provides the prefix attribute, can be manually configured, or can be allocated from a prefix pool.

The Framed-Interface-Id AAA attribute influences the choice of interface identifier for peers and, in combination with the prefix, the complete IPv6 address can be determined.

Prefix Delegation

Prefix delegation uses Dynamic Host Configuration Protocol (DHCP). When the user requests a prefix from the prefix delegator, typically the NAS, the prefix is allocated as described in the Stateless Address Autoconfiguration, page 2.

An IPv6 prefix delegating router selects IPv6 prefixes to be assigned to a requesting router upon receiving a request from the client. The delegating router might select prefixes for a requesting router in the following ways:

- Static assignment based on subscription to an ISP
- Dynamic assignment from a pool of available prefixes
- Selection based on an external authority such as a RADIUS server using the Framed-IPv6-Prefix attribute (see the Prefix Delegation, page 2).

DHCP SIP Server Options

Two DHCP for IPv6 Session Initiation Protocol (SIP) server options describe a local outbound SIP proxy: one carries a list of domain names, the other a list of IPv6 addresses. These two options can be configured in a DHCPv6 configuration pool.

AAA over IPv6

Vendor-specific attributes (VSAs) have been developed to support AAA for IPv6. The Cisco VSAs are inacl, outacl, prefix, and route.

Prefix pools and pool names are configurable through AAA. Customers can deploy IPv6 RADIUS or the TACACS+ server to communicate with Cisco IOS routers.

AAA features are described in the following sections:

RADIUS over IPv6

The following RADIUS attributes as described in RFC 3162 are supported for IPv6:

- Framed-Interface-Id
- Framed-IPv6-Pool
- Framed-IPv6-Prefix
- Framed-IPv6-Route
- Login-IPv6-Host

These attributes can be configured on a RADIUS server and downloaded to access servers, where they can be applied to access connections.

RADIUS Per-User Attributes for Virtual Access in IPv6 Environments

The following IPv6 attributes for RADIUS attribute-value (AV) pairs are supported for virtual access:

Framed-Interface-Id

The Framed-Interface-Id attribute indicates the IPv6 interface identifier to be configured. This per-user attribute is used during the IPv6CP negotiations and may be used in access-accept packets. If the Interface-

Identifier IPv6CP option has been successfully negotiated, this attribute must be included in an Acc-0Request packet as a hint by the NAS to the server that it would prefer that value.

Framed-IPv6-Pool

The Framed-IPv6-Pool attribute is a per-user attribute that contains the name of an assigned pool that should be used to assign an IPv6 prefix for the user. This pool should either be defined locally on the router or defined on a RADIUS server from which pools can be downloaded.

Framed-IPv6-Prefix

The Framed-IPv6-Prefix attribute performs the same function as the Cisco VSA--it is used for virtual access only and indicates an IPv6 prefix (and corresponding route) to be configured. This attribute is a per-user attribute and lets the user specify which prefixes to advertise in Neighbor Discovery Router Advertisement messages. The Framed-IPv6-Prefix attribute may be used in access-accept packets and can appear multiple times. The NAS will create a corresponding route for the prefix.

To use this attribute for DHCP for IPv6 prefix delegation, create a profile for the same user on the RADIUS server. The username associated with the second profile has the suffix "-dhcpv6."

The Framed-IPv6-Prefix attribute in the two profiles is treated differently. If a NAS needs both to send a prefix in router advertisements (RAs) and delegate a prefix to a remote user's network, the prefix for RA is placed in the Framed-IPv6-Prefix attribute in the user's regular profile, and the prefix used for prefix delegation is placed in the attribute in the user's separate profile.

Framed-IPv6-Route

The Framed-IPv6-Route attribute performs the same function as the Cisco VSA: It is a per-user attribute that provides routing information to be configured for the user on the NAS. This attribute is a string attribute and is specified using the **ipv6 route** command.

IPv6 ACL

You can specify a complete IPv6 access list. The unique name of the access list is generated automatically. The access list is removed when its user logs out. The previous access list on the interface is reapplied.

The inacl and outacl attributes allow you to a specific existing access list configured on the router. The following example shows ACL number 1 specified as the access list:

```
cisco-avpair = "ipv6:inacl#1=permit 2001:DB8:cc00:1::/48",
cisco-avpair = "ipv6:outacl#1=deny 2001:DB8::/10",
```

IPv6 Pool

For RADIUS authentication, the IPv6 Pool attribute extends the IPv4 address pool attributed to support the IPv6 protocol. It specifies the name of a local pool on the NAS from which to get the prefix and is used whenever the service is configured as PPP and whenever the protocol is specified as IPv6. Note that the address pool works in conjunction with local pooling. It specifies the name of the local pool that has been preconfigured on the NAS.

IPv6 Prefix

The IPv6 Prefix# attribute lets you indicate which prefixes to advertise in Neighbor Discovery Router Advertisement messages. When the IPv6 Prefix# attribute is used, a corresponding route (marked as a per-user static route) is installed in the routing information base (RIB) tables for the given prefix.

```
cisco-avpair = "ipv6:prefix#1=2001:DB8::/64",
cisco-avpair = "ipv6:prefix#2=2001:DB8::/64",
```

IPv6 Route

The IPv6 route attribute allows you to specify a per-user static route. A static route is appropriate when the Cisco IOS software cannot dynamically build a route to the destination. See the description of the **ipv6 route** command for more information about building static routes.

The following example shows the IPv6 route attribute used to define a static route:

```
cisco-avpair = "ipv6:route#1=2001:DB8:cc00:1::/48",
cisco-avpair = "ipv6:route#2=2001:DB8:cc00:2::/48",
```

Login-IPv6-Host

The Login-IPv6-Host attribute is a per-user attribute that indicates the IPv6 system with which to connect the user when the Login-Service attribute is included.

TACACS+ Over an IPv6 Transport

An IPv6 server can be configured to use TACACS+. Both IPv6 and IPv4 servers can be configured to use TACACS+ using a name instead of an IPv4 or IPv6 address.

IPv6 Prefix Pools

The function of prefix pools in IPv6 is similar to that of address pools in IPv4. The main difference is that IPv6 assigns prefixes rather than single addresses.

As in IPv4, a pool or a pool definition in IPv6 can be configured locally or it can be retrieved from an AAA server. Overlapping membership between pools is not permitted.

Once a pool is configured, it cannot be changed. If you change the configuration, the pool will be removed and re-created. All prefixes previously allocated will be freed.

Prefix pools can be defined so that each user is allocated a 64-bit prefix or so that a single prefix is shared among several users. In a shared prefix pool, each user may receive only one address from the pool.

How to Configure ADSL and Deploy Dial Access in IPv6

Configuring the NAS

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **hostname** *name*
4. **aaa new-model**
5. **aaa authentication ppp** {**default** | *list-name*} *method1* [*method2...*]
6. **aaa authorization configuration default** {**radius** | **tacacs+**
7. **show ipv6 route** [*ipv6-address* | *ipv6-prefix* / *prefix-length* | *protocol* | *interface-type interface-number*
8. **virtual-profile virtual-template** *number*
9. **interface serial** *controller-number* **:** *timeslot*
10. **encapsulation** *encapsulation-type*
11. **exit**
12. **dialer-group** *group-number*
13. **ppp authentication** *protocol1* [*protocol2...*] [**if-needed**] [*list-name* | **default**] [**callin**] [**one-time**] [**optional**]
14. **interface virtual-template** *number*
15. **ipv6 enable**
16. **dialer-list** *dialer-group* **protocol** *protocol-name* {**permit** | **deny** | **list** *access-list-number* | *access-group*}
17. **radius-server host** {*hostname* | *ip-address*} [**test username** *user-name*] [**auth-port** *port-number*] [**ignore-auth-port**] [**acct-port** *port-number*] [**ignore-acct-port**] [**timeout** *seconds*] [**retransmit** *retries*] [**key** *string*] [**alias** {*hostname* | *ip-address*}] [**idle-time** *seconds*

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** Router> enable	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** Router# configure terminal	Enters global configuration mode.