Managing Address Space

Address blocks provide an organizational structure for addresses used across the network. Address blocks can consist of static addresses or dynamic addresses allocated to DHCP servers for lease assignment. An address block can have any number of child address blocks and can culminate in one or more child subnets. The address block administrator is responsible for these objects. This administrator can create parent and child address blocks or subnets, which are always the leaf nodes of the address space. Static subnets can be further subdivided into one or more IP address ranges. However, dynamically added subnets create their own subnets that the administrator cannot modify or delete.

Note For IPv6 address management, see Viewing IPv6 Address Space, on page 14.

Address Block Administrator Role

The address block administrator role manages address space at a higher level than that of specific subnet or static address allocations. This is actually a middle manager role, because there is likely to be a higher authority handing out address blocks to the system.

Related Topics

Required Permissions

To exercise the functions available to the address administrator, you must have at the:

- **Regional cluster**—The regional-addr-admin role assigned. This role should probably be unencumbered by further subnet-utilization, lease-history, and dhcp-management subrole restrictions.

• **Local cluster**—The addrblock-admin role assigned.

Role Functions

These functions are available to the address block administrator at the:

• **Regional cluster**:

  • Address aggregation. For example, if the 10.0.0.0/16 address block exists at the regional cluster and a local cluster administrator creates the 10.1.1.0/24 address block, the local address block (through replication) is rolled up under its parent at the regional cluster. This allows a unified view of the address space at the regional cluster without affecting the local cluster configuration.
  • Address delegation. Administrators can delegate address space to the local cluster, thereby giving up authority of the delegated object.
  • DHCP utilization reports. The regional cluster supports DHCP utilization reporting across regions, protocol servers, and sets of network hardware. The central configuration administrator can poll the local clusters for DHCP utilization by virtual private network (VPN), if defined, time range, and criteria that contain the following choices: owner, region, address type, address block, subnet, or all. For details on querying DHCP utilization, see Querying Utilization History Data, on page 17.
  • Lease history reports. This provides a single vantage point on the lease history of multiple DHCP servers. The administrator can query the history data at the local cluster to constrain the scope of the history report. Lease histories can be queried by VPN (if defined), time range and criteria that contain the following choices: IP address, MAC address, IP address range, or all. This is an important feature to meet government and other agency mandates concerning address traceability. For details on querying lease history, see Querying Leases.
  • Polling configurations. The administrator can control the intervals and periods of local cluster polling for replication, IP histories, and DHCP utilization. You can also set the lease history and DHCP utilization trimming ages and compacting intervals at the CCM server level. (See the *"Managing the Central Configuration" chapter in Cisco Prime Network Registrar 10.1 Administration Guide*)
  • Check the DHCP and address data consistency.

• **Local cluster**:

  • Manage address blocks, subnets, and address types.
  • Check the DHCP and address data consistency.

Address Blocks and Subnets

An address block is an aggregate of IP addresses based on a power-of-two address space that can be delegated to an authority. For example, the 192.168.0.0/16 address block (part of the RFC 1918 private address space) includes 216 (or 65536) addresses. Address blocks can be further divided into child address blocks and subnets. For example, you might want to delegate the 192.168.0.0/16 address block further into four child address blocks—192.168.0.0/18, 192.168.64.0/18, 192.168.128.0/18, and 192.168.192.0/18.

Note The DHCP server also uses address blocks to manage subnet allocation for on-demand address pools (see Configuring Subnet Allocation). Address blocks used for dynamic address pools must be created using the **dhcp-address-block** command in the CLI. The unified address view in the web UI also displays these dynamic address blocks, but does not provide an edit link to them, because they have been delegated in their entirety to the DHCP server. They should not be further subdivided for subnet allocation. The DHCP server automatically handles these address blocks as it receives subnet requests. These address pools are indicated by a **D** (for "Delegated").

A subnet is the leaf node of the address space and cannot be further subdivided. If you create the 192.168.50.0/24 subnet, you can subsequently create an address block by that same name, and the subnet will become a child of the address block. However, you cannot further subdivide or delegate the 192.168.50.0/24 subnet.

Subnets can have one or more defined address ranges. Address blocks cannot have address ranges. When you create an address range for a subnet by using the web UI, it becomes a static range, meaning that it cannot be allocated dynamically using DHCP. However, the web UI shows any dynamic ranges defined by DHCP scopes for the subnet. Displaying the ranges as such indicates where overlaps may occur between assigning static addresses for the address space and dynamic addresses for scopes.

The address space view shows the hierarchy of address block and subnets and their parent-child relationships. The hierarchy does not go down to the level of address ranges for each subnet. These are displayed when you access the subnet.

Related Topics

Viewing Address Blocks, Subnets, and Address Types, on page 13

Knowing When to Add Address Blocks, on page 4

Adding Address Blocks, on page 5

Delegating Address Blocks, on page 7

Pushing Subnets to Local DHCP Servers and Routers, on page 10

Creating Reverse Zones from Subnets, on page 7

Reclaiming Subnets, on page 7

Adding Children to Address Blocks, on page 8

Adding Address Ranges to Subnets, on page 9

Viewing Address Utilization for Address Blocks, Subnets, and Scopes, on page 11

# Subnet Allocation and DHCP Address Blocks

Cisco Prime Network Registrar supports creating on-demand address pools as a network infrastructure for address provisioning and VPNs. Traditionally, the DHCP server is limited to interact with individual host devices. Through subnet allocation, the server can interact with VPN routers and other provisioning devices to provision entire IP subnets. This Cisco Prime Network Registrar feature enhances the on-demand address pool capability currently supported by the Cisco IOS Relay Agent.

Cisco Prime Network Registrar supports explicitly provisioned subnets. You must explicitly configure the DHCP server address space and subnet allocation policies before the server can allocate pools or leases. You can thereby configure a server as a pool manager to manage subnets and delegate them to client devices.

You manage DHCP subnet allocation using DHCP server address block objects in Cisco Prime Network Registrar. A DHCP address block is a range of contiguous IP addresses delegated to the DHCP server for assignment. The server expects to subdivide these addresses into pools so that it or other servers or devices can allocate them. DHCP address blocks are parents to subnets. These DHCP address blocks are distinct from the address blocks you can create using the Cisco Prime Network Registrar web UI, which are static. DHCP address blocks cannot include static address ranges or lease reservations.

The image below shows a sample environment where a DHCP server allocates entire subnets to access concentrators or other provisioning devices, in addition to servicing individual clients. The traditional client/server relationship is shown on the left of the diagram, while the subnet allocation to access concentrators is shown on the right of the diagram. Dialup customers, for example, connect to the service provider network at two ISP gateways (routers), which connect to the management network segment where the DHCP server resides. The gateways provision addresses to their connected clients based on the subnet requested from the DHCP server.

Figure 1: Sample DHCP Subnet Allocation Configuration
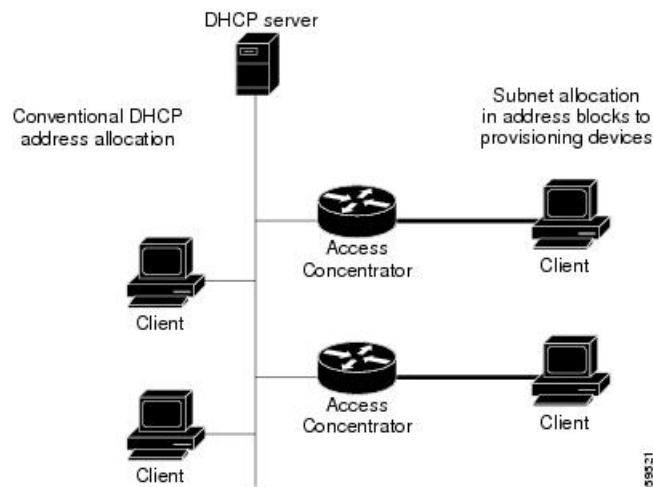
Knowing When to Add Address Blocks

This use case describes the set of user actions associated with adding a new address block to the network in a shared management network. These preconditions are assumed:

1. From summary IP address utilization reports, an address block administrator notes that the top level address block of the company is nearing the 90% utilization mark.
2. The address block administrator submits a request for more address space from ARIN (or some other numbering authority) and the request is granted.

Once the address space is made available, the regional address administrator:

1. Adds the new blocks to the central address block map, and based on a review of the utilization reports, creates and delegates address blocks to be used by the local clusters. The action of delegating the address blocks causes them to be pushed to the local clusters.
2. Allocates the new address space to network elements as needed using failover synchronization to simplify the configuration tasks:

• Allocates subnets to a failover pair (gets a scope template for the subnet, either from the subnet or the failover pair).
• Finds a free subnet (finds the address block of the right type).
• Allocates the free subnet to an address destination (DHCP server or other destination).

Adding Address Blocks

Once you configure your network, you can add DHCPv4 address blocks.

Local Advanced and Regional Advanced Web UI

To view the CCM address blocks, from the **Design** menu, choose **Address Blocks** under the **DHCPv4** submenu to open the List/Add DHCP Address Blocks page.

To add an address block, click the **Add Address Block** icon in the Address Blocks pane on the left. Enter its network address in the Address field, then choose the address mask from the drop-down list. For example, enter 192.168.50.0 in the Address field, then choose 24 in the drop-down list to create the 192.168.50.0/24 address block, which is all the addresses in the range 192.168.50.0 through 192.168.50.255.

For a review of the number of available addresses for each subnet mask, see the table below. These available hosts exclude the two network and broadcast addresses in each range.

Table 1: Subnet Masking

Network Mask	Octet Designation	Available Hosts in Each Address Range
/8	255.0.0.0	16777214
/9	255.128.0.0	8338606
/10	255.192.0.0	4194302
/11	255.224.0.0	2097150
/12	255.240.0.0	1048574
/13	255.248.0.0	524286
/14	255.252.0.0	262142
/15	255.254.0.0	131070
/16	255.255.0.0	65534
/17	255.255.128.0	32766
/18	255.255.192.0	16382
/19	255.255.224.0	8190
/20	255.255.240.0	4084
/21	255.255.248.0	2046

Network Mask	Octet Designation	Available Hosts in Each Address Range
/22	255.255.252.0	1022
/23	255.255.254.0	510
/24	255.255.255.0	254
/25	255.255.255.128	126
/26	255.255.255.192	62
/27	255.255.255.224	30
/28	255.255.255.240	14
/29	255.255.255.248	6
/30	255.255.255.252	2

CLI Command

Use **address-block** [*vpn-name*/]*address*/*mask* **create** [*attribute=value ...*]. For example:

```
nrcmd> address-block 192.168.0.0/16 create
```

Configuring Private Networks in VPN for a Tenant

To configure the private networks in VPN for a tenant, do the following:

Regional Advanced Web UI

Step 1   Select the required tenant from the **Tenant** sub menu under the **Settings** drop–down list at the top of the web UI.

Step 2   Select the required VPN from the **VPN** sub menu under the **Settings** drop–down list at the top of the web UI.

Step 3   Navigate to the **Design** menu and choose **VPNs** under the **DHCP Settings** submenu to open the List/Add VPNs page. Set the *Tenant-Private-Network* attribute to true. This attribute indicates that this VPN represents the tenant non-routable (RFC1918) addresses on a local cluster.

    Note   It applies only to regional CCM clusters and will be ignored if set on a local cluster.

Step 4   Create the private address blocks (for example, 10.0.0.0/24).

CLI Commands

Use **session set** *attribute=value* to set tenants and VPNs. Use **vpn** *name* **set tenant-private-network**=*value* to indicate that this VPN represents the tenant non-routable addresses on a local cluster. Then, create the private address block using **address-block** [*vpn-name*/]*address/mask* **create**. For example:

```
nrcmd-R> session set tenant=t1

nrcmd-R [Tenant:t1]> session set vpn=vpn1
```

```
nrcmd-R [Tenant:t1 VPN:vpn1]> vpn vpn1 set tenant-private-network=true

nrcmd-R [Tenant:t1 VPN:vpn1]> address-block 10.0.0.0/24 create
```

Delegating Address Blocks

Address block delegation is the coordinated actions of marking the delegated address block at the regional cluster as being delegated to a local cluster and creating the delegated address block in the local cluster. To delegate an address block to a local cluster, the address block cannot have child address blocks or subnets. The delegated address block created at the local server must have the same address size as the one at the regional cluster.

You can delegate only one address block to one local cluster at a time; you cannot delegate it to multiple local clusters. You can also delegate an address block to an owner.

To delegate an address block, you must:

1. Have the central configuration administrator create a local cluster to which to delegate the address block (see the *"Configuring Server Clusters" section in Cisco Prime Network Registrar 10.1 Administration Guide*).
2. Have the central configuration administrator synchronize the regional cluster with the local cluster (see the *"Synchronizing with Local Clusters" section in Cisco Prime Network Registrar 10.1 Administration Guide*). The local cluster will have address source references to the regional cluster through the synchronization process.
3. Delegate the address block to the cluster or an owner.

CLI Command

When connected to a regional cluster, you can use the **address-block** *name* **delegate** *cluster-name* command.

Creating Reverse Zones from Subnets

You can create reverse zones from subnets directly on the List/Add Subnets page instead of having to do so manually (see the "*Adding Reverse Zones from Subnets" section in Cisco Prime Network Registrar 10.1 Authoritative and Caching DNS User Guide*). Click the **Reverse Zone** tab and choose a configured zone template from the drop-down list, then click **Report** to show the changesets for the creation. Confirm the creation by clicking **Run**.

Related Topics

Reclaiming Subnets

Once you delegate a subnet to the DHCP server or router, you can reclaim it if necessary.

Local Advanced and Regional Web UI

Step 1 From the **Design** menu, choose **Subnets** under the **DHCPv4** submenu to open the List/Add Subnets page.

Step 2 Select the subnet from the Subnets pane on the left to open the corresponding Edit Subnet page.

Step 3 Click **Reclaim** at the top of the page. This opens the Reclaim Subnet page.

Step 4 If you want to force deleting the subnet, check the **Force Delete** check box.

Step 5 Click **Reclaim Subnet**.

Note When you push or reclaim subnets for a managed or virtual router, this sets the primary and secondary relationships that are set for the router for all the related subnets and scopes as well. For details on routers, see the *"Pushing and Reclaiming Subnets for Routers" section in Cisco Prime Network Registrar 10.1 Administration Guide*.

CLI Command

When connected to a regional cluster, you can use the **subnet** *name* **reclaim** [**-force**] command.

Adding Children to Address Blocks

You might want to subdivide undelegated address blocks into child address blocks or subnets.

Local Advanced and Regional Advanced Web UI

Step 1 From the **Design** menu, choose **Address Blocks** under the **DHCPv4** submenu to open the List/Add Address Blocks page.

Step 2 Click the name of an address block that is not marked as delegated (**D**). This opens the Edit Address Block page.

Step 3 To add a child address block, add an address that is part of the address block network address in the Address/Mask field of the Child Address Blocks section. Choose a higher mask value than the parent address block, then click **Add**.

An error message appears if you try to set the same network address for a child address block as for a child subnet.

Omitting a value when you click **Add** automatically adds the subdivisions of the parent address space with the appropriate mask value. For example, if the parent space is 192.168.50.0/24, you omit any child subnet value, and click **Add**, the web UI adds the children in this order:

192.168.50.0/26

192.168.50.64/26

192.168.50.128/26

192.168.50.192/26

Step 4 To add a child subnet, add an address in the Address/Mask field of the Child Subnets section of the page that is part of the address block network address, but choose a higher mask value than the parent address block. Then click **Add**.

An error message appears if you try to set the same network address for a child address block as for a child subnet.

If you omit a value when you click **Add**, this automatically adds the subdivisions of the parent address space with the appropriate mask value. For example, if the parent space is 192.168.50.0/24, you omit any child subnet value, and click **Add**, the web UI adds the children in this order:

192.168.50.0/26

192.168.50.64/26

192.168.50.128/26

192.168.50.192/26

Adding Address Ranges to Subnets

You can edit the subnet data and add any number of address ranges to a subnet. These ranges must be in the designated network of the subnet.

Local Advanced and Regional Web UI

Step 1   From the **Design** menu, choose **Subnets** under the **DHCPv4** submenu to open the List/Add Subnets page.

Step 2   Click the name of the subnet to which you want to add address ranges, in the Subnets pane on the left. This opens the Edit Subnet page.

Step 3   Enter the starting address of the range in the Start field in the IP Ranges area of the page, then add the ending address in the End field. If you add just the host numbers in these fields, the relative address in the range determined by the address mask is used.

Step 4   Click **Add IP Range**.

Step 5   Click **Save** to save the changes.

Pulling and Pushing

Pulling Replica Address Space from Local Clusters

You may choose to pull address space from the replica data of the local clusters instead of explicitly creating it.

Note   Pulling replica address space from a local cluster where IPv4 subnets were removed does not clear the server name on the subnet. Although the subnet is no longer used, it is still considered allocated to the server. Hence, the delete operation does not appear for the subnet, so that you cannot delete the subnet from the regional cluster. To push or reallocate the subnet to a different cluster, or remove it from the regional cluster, you must first reclaim the subnet (see Reclaiming Subnets, on page 7). This clears the reference to the local server.

Regional Advanced Web UI

Step 1   In the DHCP Address Tree (or DHCPv6 Address Tree) page, click the **Pull Data** icon in the Address Tree pane.

Step 2   In the Select Pull Replica Address Space (or Select Pull Replica IPv6 Address Space) page:

- To omit reservations while pulling replica, check the **Omit Reservations** check box.
- Select the Data Synchronization Mode (**Update**, **Complete** or **Exact**)

Step 3   Click **Report** at the top or bottom of the page.

Step 4   Confirm the summary and click **OK**.

CLI Commands

When connected to a regional cluster, you can use the following pull commands:

- **ccm pullAddressSpace** < **update** | **complete** | **exact** > [**-omitreservations**] [**-report-only**] [**-report**]

- **ccm pullIPv6AddressSpace** < **update** | **complete** | **exact** > [**-report-only**] [**-report**]

Pushing Subnets to Local DHCP Servers and Routers

You can push subnets to local DHCP servers and routers.

Local Advanced and Regional Web UI

Step 1   Have the central configuration administrator create a local cluster and resynchronize it with the local cluster.

Step 2   Create a subnet at the regional cluster:

a) From the **Design** menu, choose **Subnets** under the **DHCPv4** submenu. This opens the List/Add Subnets page.

b) Click the **Add Subnet** icon in the Subnets pane on the left.

c) Enter at least the network address and choose the mask of the subnet, then click **Add Subnet**.

Step 3   Have the central configuration administrator create a scope template so that it can create a scope to contain a subnet:

a) Log into the regional cluster as the central configuration administrator.

b) From the **Design** menu, choose **Scope Templates** under the **DHCPv4** submenu to open the List/Add DHCP Scope Templates page.

c) Click the **Add Scope Templates** icon in the left pane, to open the Add DHCP Scope Template page.

d) Enter the name for the scope template and click **Add Scope Template**.

e) In the Edit DHCP Scope Template *scopename* page, among other entries on this page, enter the **create-range** expression in the Range Expression field to create a scope with that subnet. (If you choose a policy for the scope template, be sure that the policy exists at the local cluster, or you must push the policy to the local cluster. See the *"Pushing Policies to Local Clusters" section in Cisco Prime Network Registrar 10.1 Administration Guide*.)

Step 4   As regional address administrator, add the subnet to the local cluster DHCP server:

a) Log into the regional cluster as the regional address administrator.

b) From the **Design** menu, choose **Subnets** under the **DHCPv4** submenu to open the List/Add Subnets page.

c) Select the subnet from the Subnets pane on the left, to open the corresponding Edit Subnet page.

d) Click **Push** at the top of the page. This opens the Push Subnet page.

e) Choose the scope template from the drop-down list.

f) Choose the router and the router interface from the drop-down lists.

g) Choose the cluster from the drop-down list.

h) Click **Push Subnet**.

CLI Command

When connected to a regional cluster, you can use the **subnet** *name* **push** *cluster*/*failover-pair* [**-template**=*template-name*] command.

Viewing Address Space

The address space is a hierarchical tree of address blocks and subnets in IPv4 and prefixes in IPv6, sorted in IP address order. You can choose the level of depth at which to display the tree. You can also expand and contract nodes, which recursively expands or contracts all child nodes. If you pick a new level, this overrides the previous expansion or contraction.

Local Advanced and Regional Advanced Web UI

To view the address space as a hierarchical tree:

• From the **Design** menu, choose **Address Tree** under the **DHCPv4** submenu to open the DHCP Address Tree page. Note that you can choose a VPN (if configured).

• From the **Design** menu, choose **Address Tree** under the **DHCPv6** submenu to open the DHCP v6 Address Tree page. Note that you can choose a VPN (if configured).

Viewing Address Utilization for Address Blocks, Subnets, and Scopes

You can view the current address utilization for address blocks, subnets, and scopes.

Tip For address utilization for IPv6 prefixes, see Viewing Address Utilization for Prefixes, on page 14.

Local Advanced and Regional Advanced Web UI

The function is available on the DHCP Address Tree page, List/Add DHCP Address Blocks page, and List/Add Subnets page. When you click the **Current Usage** tab, the utilization detail appears.

Note To ensure the proper subnet-to-server mapping on this page, you must update the regional address space view so that it is consistent with the relevant local cluster. Do this by pulling the replica address space, or reclaiming the subnet to push to the DHCP server (see Reclaiming Subnets, on page 7). Also ensure that the particular DHCP server is running.

The other columns in the Current Usage tab identify:

- **Type**—Whether the address space is an address block, subnet, or scope.

- **Utilization**—Displays a progress bar which indicates the usage and availability of addresses.

- **View Utilization History**—Appears at the regional cluster only. Clicking the **Report** icon (📊) opens the Utilization History Details page.

In the Current Usage tab, the Utilization Detail column items are expandable so that you can view the scope data for an address block or subnet. If you click the View Details icon (🔍) next to the address block, subnet, or scope name in this column, this opens the Utilization Details page for selected item.

The Utilization Details page is read-only, and shows detailed address utilization attributes for the address block, subnet, or scope in the form of chart and table. If you want to drill down to the actual breakup of the usage, you can click the View Details icon on the row and an overlay with the breakup in the form of a chart with appropriate legends is displayed. You can hover on different parts of the chart to get more details about that particular type of usage. Click the **Table** tab to view the address utilization attributes described in the table below.

Table 2: Address Utilization Attributes

Utilization Attribute	Description
Tenant	The tenant organization or group that is associated with the administrator
aggregation-level	Granularity of this utilization data. The scope-level is the most detailed data available from the DHCP server. Aggregated counters are reported at the subnet-level and addr-block-level or at the network-level. These are the sum of scope-level data in a given subnet, address block, or network.
Total Addresses	
total-dynamic	Total number of leases, excluding reserved ones.
total-reserved	Total number of reserved leases.
Free Dynamic	
avail	Number of dynamic leases that are currently available for issue to clients.
other-avail	Number of dynamic leases that the DHCP failover partner currently has available for issue to clients.
Active Dynamic	
offered	Number of dynamic leases that are currently offered to clients, but not yet acknowledged as being leased.
leased	Number of dynamic leases that are currently acknowledged as leased to clients.
expired	Number of dynamic leases that are past the lease expiration period, but will not be available for other clients (except after the policy grace-period expires).
pend-avail	Number of dynamic leases that are waiting acknowledgement from the failover partner that it did not reissue the lease.

Utilization Attribute	Description
Reserved	
reserved-active	Number of reserved leases that clients are actively using.
reserved-inactive	Number of reserved leases that clients are not actively using.
Unavailable	
unavail	Number of unreserved dynamic leases that a client declines or the server marks with an address conflict (usually indicating configurations that need correcting).
reserved-unavail	Number of reserved leases that a client declines or the server marks with an address conflict (usually indicating configurations that need correcting).
Deactivated	
deactivated	Number of dynamic and reserved leases that clients are actively leasing (that are not offered, expired, or released), but that an administrator deactivated.
leased-deactivated	Number of dynamic leases that clients are actively leasing (that are not offered, expired, or released), but that an administrator deactivated.
reserved-leased- deactivated	Number of reserved leases that clients are actively leasing (that are not offered, expired, or released), but that an administrator deactivated.
Additional Attributes	
primary-subnet	The primary-subnet for this subnet-level or scope-level utilization data.
selection-tags	The comma-separated list of selection tags associated with scope-level utilization data.

Viewing Address Blocks, Subnets, and Address Types

You can view the address blocks and subnets created for a network.

Local Advanced and Regional Advanced Web UI

From the **Design** menu, choose **Address Tree** under the **DHCPv4** submenu to open the DHCP Address Tree page.

To choose a level of depth for the address space, click one of the addresses in the Address Tree pane on the left. The details about the address appear in the page. The Address Type column identifies the type of object displayed, an address block or a subnet. The Owner column identifies the owner of the address space, and the Region column identifies the assigned region for the address space.

Address spaces that were assigned dynamically are indicated by a **D** (for "Delegated") in the Address Type column. You cannot delete this delegated address space.

To refresh the view, click the **Refresh** icon.

You can add, modify, and delete address types. From the **Design** menu, choose **Address Types** under the **DHCP Settings** submenu to open the List/Add Address Types page. Click the **Add Address Types** icon in

the Address Types pane on the left to open the Add Address Space Type page, and modify settings on the Edit Address Type page. You can also pull replica address types, push address types, and reclaim address types on the List/Add Address Types page.

CLI Commands

Use **address-type** *name* **create** [*attribute=value*] to create the address types.

Use **address-type** *name* **delete** to delete the addres types.

When connected to a regional cluster, you can use the following pull, push, and reclaim commands. For push and reclaim, a list of clusters or "all" may be specified.

- **address-type** < *name* | **all** > **pull** < **ensure** | **replace** | **exact** > *cluster-name* [**-report-only** | **-report**]
- **address-type** < *name* | **all** > **push** < **ensure** | **replace** | **exact** > *cluster-list* [**-report-only** | **-report**]
- **address-type** *name* **reclaim** *cluster-list* [**-report-only** | **-report**]

Viewing IPv6 Address Space

From the **Design** menu, choose **Address Tree** under the **DHCPv6** submenu, in the local advanced or regional advanced web UI, to view the DHCP v6 Address Tree page. This page is like the DHCP Address Tree page for IPv4 (see Viewing Address Space, on page 11). On the View Unified v6 Address Space page you can:

- Set a VPN for the address space from the VPN submenu under the **Settings** drop-down list at the top of the web UI.
- Add a prefix by clicking the **Add IPv6 Prefix** icon in the Address Tree pane, enter the prefix name, address, and choose a prefix type and prefix template. Click **Add IPv6 Prefix** (see Creating and Editing Prefixes).
- Edit a prefix by selecting its name in the Address Tree pane. This opens the Edit Prefix page (see Creating and Editing Prefixes).
- View the current usage of the prefix space (see Viewing Address Utilization for Prefixes, on page 14).

Viewing Address Utilization for Prefixes

You can view the current address utilization for prefixes.

Local Advanced and Regional Web UI

The function is available on the DHCP v6 Address Tree page Viewing Address Space, on page 11.

Tip You can use the DHCP v6 Address Tree page to push and reclaim prefixes. Click the **Push** or **Reclaim** icon for the desired prefix. (See Creating and Editing Prefixes for details.)

When you click the **Current Usage** tab, the utilization detail appears.

Note To ensure the proper prefix-to-server mapping on this page, you must update the regional address space view so that it is consistent with the relevant local cluster. Do this by pulling the v6 replica address space or pushing the prefix to the DHCP server. Also ensure that the particular DHCP server is running.

The other columns under the Current Usage tab identify:

- **Range**—Address range of the prefix.
- **Type**—Whether the address space is a prefix or link.
- **Active Dynamic**—Addresses that are part of a dynamic range managed by DHCP and that are currently leased, but not reserved.
- **Active Reserved**—Appears at the regional cluster only. Addresses that are part of a dynamic range and are reserved.
- **View Utilization History**—Appears at the regional cluster only. Clicking the **Report** icon (▣) opens the Utilization History Details page.

In the Current Usage tab, the Utilization Detail column are expandable so that you can view the prefix or parent prefix data. If you click the View Details icon (▣) next to the prefix or the parent prefix in this column, this opens the Utilization Details page for selected item.

The Utilization Details page is a read-only page that shows detailed address utilization attributes for the prefix or the parent prefix (identified as Totals). If you want to drill down to the actual breakup of the usage, you can click the View Details icon on the row and an overlay with the breakup in the form of a chart with appropriate legends is displayed. You can hover on different parts of the chart to get more details about that particular type of usage. Click the **Table** tab to view the address utilization attributes described in the table below.

Table 3: Address Utilization Attributes

Utilization Attribute	Description
Tenant	Tenant owner of this prefix.
aggregation-level	Granularity of the utilization data. Prefix-level indicates the data is for the specific prefix; totals indicates the data is for the parent prefix, which is the sum of its prefix-level counters.
dhcp-type	DHCP address assignment type, which can be dhcp (stateful), stateless (option configuration), prefix-delegation, or infrastructure (maps a client address to a link without an address pool).
Total Addresses	
active-dynamic	Total number of dynamic leases in active use (leased, offered, released, expired, or revoked. The Active Dynamic category shows the states of these leases.
total-reserved	Total number of reserved leases.
Active Dynamic	
offered	Number of dynamic (unreserved) leases that are currently offered to clients, but not yet acknowledged as being leased.
leased	Number of dynamic leases that are currently acknowledged as leased to clients.
expired	Number of dynamic leases that are past the lease expiration period, but will not be available for other clients (except after the policy grace-period expires).
revoked	Number of dynamic leases that the client can no longer use, but that some other client could be using.

Utilization Attribute	Description
Reserved	
reserved-active	Number of reserved leases that clients are actively using.
reserved-inactive	Number of reserved leases that clients are not actively using.
Unavailable	
unavail	Number of unreserved dynamic leases that a client declines or the server marks with an address conflict (usually indicating configurations that need correcting).
reserved-unavail	Number of reserved leases that a client declines or the server marks with an address conflict (usually indicating configurations that need correcting).
Deactivated	
deactivated	Number of dynamic and reserved leases that clients are actively leasing (that are not offered, expired, or released), but that an administrator deactivated.
leased-deactivated	Number of dynamic leases that an administrator deactivated.
reserved-leased- deactivated	Number of reserved leases that an administrator deactivated.
Prefix Delegation Lease Counts	
max-pd-balancing-length	Prefix length used for counting the prefix delegation leases.
prefixes-in-use	Number of prefixes, of the max-pd-balancing-length prefix length, that are in use.
prefixes-available	Number of prefixes, of the max-pd-balancing-length prefix length, available to any client on this server.
prefixes-other-available	Number of prefixes, of the max-pd-balancing-length prefix length, available to any client on the failover partner.
prefixes-in-transition	Number of prefixes, of the max-pd-balancing-length prefix length, in transition between the failover partners.
Failover Related	
available	Number of prefix delegation leases available to any client on this server. This is the count of the number of lease objects and not the number of prefixes of a specific prefix-length.
other-available	Number of prefix delegation leases that this server believes the partner has available to any client.
pending-available	Number of leases that are in the pending-available state.
pending-delete	Number of leases that are in the pending-delete state.
Additional Attributes	

Utilization Attribute	Description
cluster-id	Local cluster that reported this utilization data.
link-name	Link for this prefix-level utilization data.
owner	Owner associated with this prefix or link.
region	Region associated with this prefix or link.
selection-tags	Comma-separated list of selection tags associated with prefix-level utilization data.
timestamp	Time when this utilization data was collected.

Generating Utilization History Reports

You can extract utilization history data so that you can determine how many addresses in the subnet were allocated and what the free address space is. You can use additional administrative functions to trim and compact the utilization database of records, to manage the size of the database.

Related Topics

Querying Utilization History Data

When local is registered with regional or on default poll (every 1 hour) or on manual poll, the DHCP utilization data is collected. All available scope and prefix information will be collected by the regional server.

By default, polling is enabled for all clusters, because these values are unset on the cluster object when it is created. The global settings on the regional CCM server control the polling interval and offset for all clusters when the values are not set. Setting these values on the local cluster overrides the server default value. If *addrutil-poll-interval* is set to 0, this disables polling for that cluster.

Regional Web UI

Step 1 You must set the selection criteria for querying the utilization data—In the Advanced mode, from the **Operate** menu, choose **DHCP Utilization History** under the **Reports** submenu. This opens the Query Utilization History page.

Step 2 You can query the v4 and v6 utilization history by enabling the **v4 History** or **v6 History** radio button. Also, you can query utilization history based on the following criteria:

    a. **Time range**—Choose from one of the following time ranges for the lease history data:

        • Today

        • last 10 days

        • last 30 days

> • last 60 days
>
> • last 90 days
>
> • from/to (limited to 90 days)
>
>> If you choose this value, also choose the Start Date and End Date month, day, and year from the drop-down lists. The result depends on the value of the *addrutil-poll-interval* attribute.

> b. **Owner**—Choose the owner from the adjacent drop-down list.
> c. **Region**—Choose the region from the adjacent drop-down list.
> d. **Aggregation Level**—Choose the aggregation level from the adjacent drop-down list.
> e. **Subnet**—Choose the subnet from the adjacent drop-down list.
> f. **Cluster**—Choose the cluster from the adjacent drop-down list.

Step 3   Choose the filter Attribute and the Type from the drop-down lists and enter the value of the filter Type selected in the Value field. Then click the + icon to add the filter. If there is any existing custom filter, you can click the **X** icon next to it to remove the filter.

Step 4   Click **Apply Filter** to display the results. You can click the Report icon (▥) in the View Details column to open the Utilization History Details page.

Trimming and Compacting Utilization History Data

The subnet and prefix utilization history databases are trimmed automatically. The CCM server performs background trimming at the regional cluster, which trims off the utilization data older than a certain age at regular intervals. The trimming interval is preset to 24 hours, and the age (how far back to go in time before trimming) to 24 weeks.

You can also compact records older than a certain age to reduce the amount of history that is stored. Only the first data point will be retained for each compact interval. All other data points will be deleted.

You must be a central configuration administrator assigned the database subrole to adjust the values of and perform utilization database trimming and compacting.

Regional Advanced Web UI

Step 1   From the **Operate** menu, choose **Manage Servers** under the **Servers** submenu to open the Manage Servers page.

Step 2   Click the **Local CCM Server** link in the Manage Servers pane on the left, to open the Edit Local CCM Server page.

Step 3   Under the Address Utilization Settings, set the following attributes:

> a) *addrutil-poll-interval*—How often to collect subnet and prefix utilization from all the DHCP servers. If it is set to 0, the polling is disabled.
> b) *addrutil-poll-retry*—The number of retries for a given polling interval, if polling fails.
> c) *addrutil-poll-offset*—Provides a fixed time of day for subnet utilization polling. This time is interpreted as a time of day offset, with 0 being 12 midnight, provided the polling interval is less than 24 hours, and the offset value is less than the polling interval. If the offset value is greater than the polling interval, or the interval is greater than 24 hours, the offset will be ignored.
>
>> The scheduler for polling will ensure that the first polling event occurs at the offset time. For example, if you set the interval to 4 hours and the offset to 2am, the polling would occur at 2am, 6am, 10am, 2pm, 6pm and 10pm.

d) *addrutil-trim-interval*—How often to trim the old subnet and prefix utilization data automatically, the default being not to trim the data. You must set this to a value to trigger any background trimming. The bounded values are 0 to one year, and you can use units in seconds (s), minutes (m), hours (h), days (d), weeks (w), months (m), and years (y).

e) *addrutil-trim-age*—How far back in time to trim the old subnet and prefix utilization data automatically, the preset value being 24 weeks. (However, the *addrutil-trim-interval* value must be set to other than 0 for trimming to be in effect at all.) The bounded values are 24 hours to one year, and you can use units in seconds (s), minutes (m), hours (h), days (d), weeks (w), months (m), and years (y).

Step 4 You can also force immediate trimming and compacting. Find the Trimming/Compacting section:

a) **Trim/Compact age**—How far in time to go back to trim the data. There are no bounds to this value. However, if you set a very small value (such as 1m), it trims or compacts very recent data, which can be undesirable. In fact, if you set it to zero, you lose all of the collected data. Setting the value too high (such as 10y) may end up not trimming or compacting any data.

b) **Compact interval**—Time interval at which to compact the subnet and prefix utilization records older than the Trim/Compact age. This interval can be some multiple of the polling interval. For example, if the compact interval is set to twice the polling interval, it eliminates every other record.

Step 5 If you are trimming immediately, click **Trim All Utilization Data** among the controls at the bottom of the page. If you are compacting the data, click **Compact All Utilization Data**.