Address scopes

« (config-ml2.html) » (config-auto-allocation.html) (https://bugs.launchpad.net/neutron/+filebug?field.title=Address%20scopes%20in%20Neutron&field.comment=%0A%0A%0AThis bug tracker is for errors with the documentation, use the following as a template and remove or add fields as you see fit. Convert [ ] into [x] to check boxes:%0A%0A- [ ] This doc is inaccurate in this way: _____%0A- [ ] This is a doc addition request.%0A- [ ] I have a fix to the document that I can paste below including example: input and output. %0A%0AIf you have a troubleshooting or support issue, use the following resources:%0A%0A - Ask OpenStack: http://ask.openstack.org%0A - The mailing list: http://lists.openstack.org%0A - IRC: 'openstack' channel on Freenode%0A%0A----------%0ARelease:%2012.0.1.dev11%20on%202018-03-07%2021:05%0ASHA:%2043df2709acbdce86686a40b75fd34e96880427d0%0ASource:%20https://git.openstack.org/cgit/openstack/neutron/tree/doc/source/admin/config-address-scopes.rst%0AURL: https://docs.openstack.org/neutron/queens/admin/config-address-scopes.html&field.tags=doc)

UPDATED: 2018-03-07 21:05

Address scopes build from subnet pools. While subnet pools provide a mechanism for controlling the allocation of addresses to subnets, address scopes show where addresses can be routed between networks, preventing the use of overlapping addresses in any two subnets. Because all addresses allocated in the address scope do not overlap, neutron routers do not NAT between your projects' network and your external network. As long as the addresses within an address scope match, the Networking service performs simple routing between networks.

Accessing address scopes¶

Anyone with access to the Networking service can create their own address scopes. However, network administrators can create shared address scopes, allowing other projects to create networks within that address scope.

Access to addresses in a scope are managed through subnet pools. Subnet pools can either be created in an address scope, or updated to belong to an address scope.

With subnet pools, all addresses in use within the address scope are unique from the point of view of the address scope owner. Therefore, add more than one subnet pool to an address scope if the pools have different owners, allowing for delegation of parts of the address scope. Delegation prevents address overlap across the whole scope. Otherwise, you receive an error if two pools have the same address ranges.

Each router interface is associated with an address scope by looking at subnets connected to the network. When a router connects to an external network with matching address scopes, network traffic routes between without Network address translation (NAT). The router marks all traffic connections originating from each interface with its corresponding address scope. If traffic leaves an interface in the wrong scope, the router blocks the traffic.

Backwards compatibility¶

Networks created before the Mitaka release do not contain explicitly named address scopes, unless the network contains subnets from a subnet pool that belongs to a created or updated address scope. The Networking service preserves backwards compatibility with pre-Mitaka networks through special address scope properties so that these networks can perform advanced routing:

1. Unlimited address overlap is allowed.
2. Neutron routers, by default, will NAT traffic from internal networks to external networks.
3. Pre-Mitaka address scopes are not visible through the API. You cannot list address scopes or show details. Scopes exist implicitly as a catch-all for addresses that are not explicitly scoped.

Create shared address scopes as an administrative user¶

This section shows how to set up shared address scopes to allow simple routing for project networks with the same subnet pools.

> **Note**
>
> Irrelevant fields have been trimmed from the output of these commands for brevity.

1. Create IPv6 and IPv4 address scopes:

```
$ openstack address scope create --share --ip-version 6 address-scope-ip6

+------------+--------------------------------------+
| Field      | Value                                |
+------------+--------------------------------------+
| headers    |                                      |
| id         | 28424dfc-9abd-481b-afa3-1da97a8fead7 |
| ip_version | 6                                    |
| name       | address-scope-ip6                    |
| project_id | 098429d072d34d3596c88b7dbf7e91b6     |
| shared     | True                                 |
+------------+--------------------------------------+
```

```
$ openstack address scope create --share --ip-version 4 address-scope-ip4

+------------+--------------------------------------+
| Field      | Value                                |
+------------+--------------------------------------+
| headers    |                                      |
| id         | 3193bd62-11b5-44dc-acf8-53180f21e9f2 |
| ip_version | 4                                    |
| name       | address-scope-ip4                    |
| project_id | 098429d072d34d3596c88b7dbf7e91b6     |
| shared     | True                                 |
+------------+--------------------------------------+
```

2. Create subnet pools specifying the name (or UUID) of the address scope that the subnet pool belongs to. If you have existing subnet pools, use the **openstack subnet pool set** command to put them in a new address scope:

```
$ openstack subnet pool create --address-scope address-scope-ip6 \
--share --pool-prefix 2001:db8:a583::/48 --default-prefix-length 64 \
subnet-pool-ip6
+-------------------+--------------------------------------+
| Field             | Value                                |
+-------------------+--------------------------------------+
| address_scope_id  | 28424dfc-9abd-481b-afa3-1da97a8fead7 |
| created_at        | 2016-12-13T22:53:30Z                 |
| default_prefixlen | 64                                   |
| default_quota     | None                                 |
| description       |                                      |
| id                | a59ff52b-0367-41ff-9781-6318b927dd0e |
| ip_version        | 6                                    |
| is_default        | False                                |
| max_prefixlen     | 128                                  |
| min_prefixlen     | 64                                   |
| name              | subnet-pool-ip6                      |
| prefixes          | 2001:db8:a583::/48                   |
| project_id        | 098429d072d34d3596c88b7dbf7e91b6     |
| revision_number   | 1                                    |
| shared            | True                                 |
| tags              | []                                   |
| updated_at        | 2016-12-13T22:53:30Z                 |
+-------------------+--------------------------------------+
```

```
$ openstack subnet pool create --address-scope address-scope-ip4 \
--share --pool-prefix 203.0.113.0/24 --default-prefix-length 26 \
subnet-pool-ip4
+-------------------+--------------------------------------+
| Field             | Value                                |
+-------------------+--------------------------------------+
| address_scope_id  | 3193bd62-11b5-44dc-acf8-53180f21e9f2 |
| created_at        | 2016-12-13T22:55:09Z                 |
| default_prefixlen | 26                                   |
| default_quota     | None                                 |
| description       |                                      |
| id                | d02af70b-d622-426f-8e60-ed9df2a8301f |
| ip_version        | 4                                    |
| is_default        | False                                |
| max_prefixlen     | 32                                   |
| min_prefixlen     | 8                                    |
| name              | subnet-pool-ip4                      |
| prefixes          | 203.0.113.0/24                       |
| project_id        | 098429d072d34d3596c88b7dbf7e91b6     |
| revision_number   | 1                                    |
| shared            | True                                 |
| tags              | []                                   |
| updated_at        | 2016-12-13T22:55:09Z                 |
+-------------------+--------------------------------------+
```

3. Make sure that subnets on an external network are created from the subnet pools created above:

```
$ openstack subnet show ipv6-public-subnet
+-------------------+-----------------------------------------+
| Field             | Value                                   |
+-------------------+-----------------------------------------+
| allocation_pools  | 2001:db8:a583::2-2001:db8:a583:0:ffff:ff |
|                   | ff:ffff:ffff                            |
| cidr              | 2001:db8:a583::/64                      |
| created_at        | 2016-12-10T21:36:04Z                    |
| description       |                                         |
| dns_nameservers   |                                         |
| enable_dhcp       | False                                   |
| gateway_ip        | 2001:db8:a583::1                        |
| host_routes       |                                         |
| id                | b333bf5a-758c-4b3f-97ec-5f12d9bfceb7    |
| ip_version        | 6                                       |
| ipv6_address_mode | None                                    |
| ipv6_ra_mode      | None                                    |
| name              | ipv6-public-subnet                      |
| network_id        | 05a8d31e-330b-4d96-a3fa-884b04abfa4c    |
| project_id        | 098429d072d34d3596c88b7dbf7e91b6        |
| revision_number   | 2                                       |
| segment_id        | None                                    |
| service_types     |                                         |
| subnetpool_id     | a59ff52b-0367-41ff-9781-6318b927dd0e    |
| tags              | []                                      |
| updated_at        | 2016-12-10T21:36:04Z                    |
+-------------------+-----------------------------------------+
```

```
$ openstack subnet show public-subnet
+-------------------+--------------------------------------+
| Field             | Value                                |
+-------------------+--------------------------------------+
| allocation_pools  | 203.0.113.2-203.0.113.62             |
| cidr              | 203.0.113.0/26                       |
| created_at        | 2016-12-10T21:35:52Z                 |
| description       |                                      |
| dns_nameservers   |                                      |
| enable_dhcp       | False                                |
| gateway_ip        | 203.0.113.1                          |
| host_routes       |                                      |
| id                | 7fd48240-3acc-4724-bc82-16c62857edec |
| ip_version        | 4                                    |
| ipv6_address_mode | None                                 |
| ipv6_ra_mode      | None                                 |
| name              | public-subnet                        |
| network_id        | 05a8d31e-330b-4d96-a3fa-884b04abfa4c |
| project_id        | 098429d072d34d3596c88b7dbf7e91b6     |
| revision_number   | 2                                    |
| segment_id        | None                                 |
| service_types     |                                      |
| subnetpool_id     | d02af70b-d622-426f-8e60-ed9df2a8301f |
| tags              | []                                   |
| updated_at        | 2016-12-10T21:35:52Z                 |
+-------------------+--------------------------------------+
```

Routing with address scopes for non-privileged users¶

This section shows how non-privileged users can use address scopes to route straight to an external network without NAT.

1. Create a couple of networks to host subnets:

```
$ openstack network create network1
+---------------------------+--------------------------------------+
| Field                     | Value                                |
+---------------------------+--------------------------------------+
| admin_state_up            | UP                                   |
| availability_zone_hints   |                                      |
| availability_zones        |                                      |
| created_at                | 2016-12-13T23:21:01Z                 |
| description               |                                      |
| headers                   |                                      |
| id                        | 1bcf3fe9-a0cb-4d88-a067-a4d7f8e635f0 |
| ipv4_address_scope        | None                                 |
| ipv6_address_scope        | None                                 |
| mtu                       | 1450                                 |
| name                      | network1                             |
| port_security_enabled     | True                                 |
| project_id                | 098429d072d34d3596c88b7dbf7e91b6     |
| provider:network_type     | vxlan                                |
| provider:physical_network | None                                 |
| provider:segmentation_id  | 94                                   |
| revision_number           | 3                                    |
| router:external           | Internal                             |
| shared                    | False                                |
| status                    | ACTIVE                               |
| subnets                   |                                      |
| tags                      | []                                   |
| updated_at                | 2016-12-13T23:21:01Z                 |
+---------------------------+--------------------------------------+
```

```
$ openstack network create network2
+---------------------------+--------------------------------------+
| Field                     | Value                                |
+---------------------------+--------------------------------------+
| admin_state_up            | UP                                   |
| availability_zone_hints   |                                      |
| availability_zones        |                                      |
| created_at                | 2016-12-13T23:21:45Z                 |
| description               |                                      |
| headers                   |                                      |
| id                        | 6c583603-c097-4141-9c5c-288b0e49c59f |
| ipv4_address_scope        | None                                 |
| ipv6_address_scope        | None                                 |
| mtu                       | 1450                                 |
| name                      | network2                             |
| port_security_enabled     | True                                 |
| project_id                | 098429d072d34d3596c88b7dbf7e91b6     |
| provider:network_type     | vxlan                                |
| provider:physical_network | None                                 |
| provider:segmentation_id  | 81                                   |
| revision_number           | 3                                    |
| router:external           | Internal                             |
| shared                    | False                                |
| status                    | ACTIVE                               |
| subnets                   |                                      |
| tags                      | []                                   |
| updated_at                | 2016-12-13T23:21:45Z                 |
+---------------------------+--------------------------------------+
```

2. Create a subnet not associated with a subnet pool or an address scope:

```
$ openstack subnet create --network network1 --subnet-range \
198.51.100.0/26 subnet-ip4-1
+-------------------+--------------------------------------+
| Field             | Value                                |
+-------------------+--------------------------------------+
| allocation_pools  | 198.51.100.2-198.51.100.62           |
| cidr              | 198.51.100.0/26                      |
| created_at        | 2016-12-13T23:24:16Z                 |
| description       |                                      |
| dns_nameservers   |                                      |
| enable_dhcp       | True                                 |
| gateway_ip        | 198.51.100.1                         |
| headers           |                                      |
| host_routes       |                                      |
| id                | 66874039-d31b-4a27-85d7-14c89341bbb7 |
| ip_version        | 4                                    |
| ipv6_address_mode | None                                 |
| ipv6_ra_mode      | None                                 |
| name              | subnet-ip4-1                         |
| network_id        | 1bcf3fe9-a0cb-4d88-a067-a4d7f8e635f0 |
| project_id        | 098429d072d34d3596c88b7dbf7e91b6     |
| revision_number   | 2                                    |
| service_types     |                                      |
| subnetpool_id     | None                                 |
| tags              | []                                   |
| updated_at        | 2016-12-13T23:24:16Z                 |
+-------------------+--------------------------------------+
```

```
$ openstack subnet create --network network1 --ipv6-ra-mode slaac \
--ipv6-address-mode slaac --ip-version 6 --subnet-range \
2001:db8:80d2:c4d3::/64 subnet-ip6-1
+-------------------+----------------------------------------+
| Field             | Value                                  |
+-------------------+----------------------------------------+
| allocation_pools  | 2001:db8:80d2:c4d3::2-2001:db8:80d2:c4d |
|                   | 3:ffff:ffff:ffff:ffff                  |
| cidr              | 2001:db8:80d2:c4d3::/64                |
| created_at        | 2016-12-13T23:28:28Z                   |
| description       |                                        |
| dns_nameservers   |                                        |
| enable_dhcp       | True                                   |
| gateway_ip        | 2001:db8:80d2:c4d3::1                  |
| headers           |                                        |
| host_routes       |                                        |
| id                | a7551b23-2271-4a88-9c41-c84b048e0722   |
| ip_version        | 6                                      |
| ipv6_address_mode | slaac                                  |
| ipv6_ra_mode      | slaac                                  |
| name              | subnet-ip6-1                           |
| network_id        | 1bcf3fe9-a0cb-4d88-a067-a4d7f8e635f0   |
| project_id        | 098429d072d34d3596c88b7dbf7e91b6       |
| revision_number   | 2                                      |
| service_types     |                                        |
| subnetpool_id     | None                                   |
| tags              | []                                     |
| updated_at        | 2016-12-13T23:28:28Z                   |
+-------------------+----------------------------------------+
```

3. Create a subnet using a subnet pool associated with an address scope from an external network:

```
$ openstack subnet create --subnet-pool subnet-pool-ip4 \
--network network2 subnet-ip4-2
+-------------------+--------------------------------------+
| Field             | Value                                |
+-------------------+--------------------------------------+
| allocation_pools  | 203.0.113.2-203.0.113.62             |
| cidr              | 203.0.113.0/26                       |
| created_at        | 2016-12-13T23:32:12Z                 |
| description       |                                      |
| dns_nameservers   |                                      |
| enable_dhcp       | True                                 |
| gateway_ip        | 203.0.113.1                          |
| headers           |                                      |
| host_routes       |                                      |
| id                | 12be8e8f-5871-4091-9e9e-4e0651b9677e |
| ip_version        | 4                                    |
| ipv6_address_mode | None                                 |
| ipv6_ra_mode      | None                                 |
| name              | subnet-ip4-2                         |
| network_id        | 6c583603-c097-4141-9c5c-288b0e49c59f |
| project_id        | 098429d072d34d3596c88b7dbf7e91b6     |
| revision_number   | 2                                    |
| service_types     |                                      |
| subnetpool_id     | d02af70b-d622-426f-8e60-ed9df2a8301f |
| tags              | []                                   |
| updated_at        | 2016-12-13T23:32:12Z                 |
+-------------------+--------------------------------------+
```

```
$ openstack subnet create --ip-version 6 --ipv6-ra-mode slaac \
--ipv6-address-mode slaac --subnet-pool subnet-pool-ip6 \
--network network2 subnet-ip6-2
+-------------------+--------------------------------------+
| Field             | Value                                |
+-------------------+--------------------------------------+
| allocation_pools  | 2001:db8:a583::2-2001:db8:a583:0:fff |
|                   | f:ffff:ffff:ffff                     |
| cidr              | 2001:db8:a583::/64                   |
| created_at        | 2016-12-13T23:31:17Z                 |
| description       |                                      |
| dns_nameservers   |                                      |
| enable_dhcp       | True                                 |
| gateway_ip        | 2001:db8:a583::1                     |
| headers           |                                      |
| host_routes       |                                      |
| id                | b599c2be-e3cd-449c-ba39-3cfcc744c4be |
| ip_version        | 6                                    |
| ipv6_address_mode | slaac                                |
| ipv6_ra_mode      | slaac                                |
| name              | subnet-ip6-2                         |
| network_id        | 6c583603-c097-4141-9c5c-288b0e49c59f |
| project_id        | 098429d072d34d3596c88b7dbf7e91b6     |
| revision_number   | 2                                    |
| service_types     |                                      |
| subnetpool_id     | a59ff52b-0367-41ff-9781-6318b927dd0e |
| tags              | []                                   |
| updated_at        | 2016-12-13T23:31:17Z                 |
+-------------------+--------------------------------------+
```

By creating subnets from scoped subnet pools, the network is associated with the address scope.

```
$ openstack network show network2
+---------------------------+------------------------------+
| Field                     | Value                        |
+---------------------------+------------------------------+
| admin_state_up            | UP                           |
| availability_zone_hints   |                              |
| availability_zones        | nova                         |
| created_at                | 2016-12-13T23:21:45Z         |
| description               |                              |
| id                        | 6c583603-c097-4141-9c5c-     |
|                           | 288b0e49c59f                 |
| ipv4_address_scope        | 3193bd62-11b5-44dc-          |
|                           | acf8-53180f21e9f2            |
| ipv6_address_scope        | 28424dfc-9abd-481b-          |
|                           | afa3-1da97a8fead7            |
| mtu                       | 1450                         |
| name                      | network2                     |
| port_security_enabled     | True                         |
| project_id                | 098429d072d34d3596c88b7dbf7e |
|                           | 91b6                         |
| provider:network_type     | vxlan                        |
| provider:physical_network | None                         |
| provider:segmentation_id  | 81                           |
| revision_number           | 10                           |
| router:external           | Internal                     |
| shared                    | False                        |
| status                    | ACTIVE                       |
| subnets                   | 12be8e8f-5871-4091-9e9e-     |
|                           | 4e0651b9677e, b599c2be-e3cd- |
|                           | 449c-ba39-3cfcc744c4be       |
| tags                      | []                           |
| updated_at                | 2016-12-13T23:32:12Z         |
+---------------------------+------------------------------+
```

4. Connect a router to each of the project subnets that have been created, for example, using a router called **router1**:

```
$ openstack router add subnet router1 subnet-ip4-1
$ openstack router add subnet router1 subnet-ip4-2
$ openstack router add subnet router1 subnet-ip6-1
$ openstack router add subnet router1 subnet-ip6-2
```

Checking connectivity¶

This example shows how to check the connectivity between networks with address scopes.

1. Launch two instances, **instance1** on **network1** and **instance2** on **network2**. Associate a floating IP address to both instances.
2. Adjust security groups to allow pings and SSH (both IPv4 and IPv6):

```
$ openstack server list
+--------------+-----------+-------------------------------------------------------------------------------+------------+
| ID           | Name      | Networks                                                                      | Image Name |
+--------------+-----------+-------------------------------------------------------------------------------+------------+
| 97e49c8e-... | instance1 | network1=2001:db8:80d2:c4d3:f816:3eff:fe52:b69f, 198.51.100.3, 203.0.113.3| cirros     |
| ceba9638-... | instance2 | network2=203.0.113.3, 2001:db8:a583:0:f816:3eff:fe42:1eeb, 203.0.113.4    | centos     |
+--------------+-----------+-------------------------------------------------------------------------------+------------+
```

Regardless of address scopes, the floating IPs can be pinged from the external network:

```
$ ping -c 1 203.0.113.3
1 packets transmitted, 1 received, 0% packet loss, time 0ms
$ ping -c 1 203.0.113.4
1 packets transmitted, 1 received, 0% packet loss, time 0ms
```

You can now ping **instance2** directly because **instance2** shares the same address scope as the external network:

> **Note**
>
> BGP routing can be used to automatically set up a static route for your instances.

```
# ip route add 203.0.113.0/26 via 203.0.113.2
$ ping -c 1 203.0.113.3
1 packets transmitted, 1 received, 0% packet loss, time 0ms
```

```
# ip route add 2001:db8:a583::/64 via 2001:db8::1
$ ping6 -c 1 2001:db8:a583:0:f816:3eff:fe42:1eeb
1 packets transmitted, 1 received, 0% packet loss, time 0ms
```

You cannot ping **instance1** directly because the address scopes do not match:

```
# ip route add 198.51.100.0/26 via 203.0.113.2
$ ping -c 1 198.51.100.3
1 packets transmitted, 0 received, 100% packet loss, time 0ms
```

```
# ip route add 2001:db8:80d2:c4d3::/64 via 2001:db8::1
$ ping6 -c 1 2001:db8:80d2:c4d3:f816:3eff:fe52:b69f
1 packets transmitted, 0 received, 100% packet loss, time 0ms
```

If the address scopes match between networks then pings and other traffic route directly through. If the scopes do not match between networks, the router either drops the traffic or applies NAT to cross scope boundaries.

« (config-ml2.html) » (config-auto-allocation.html) (https://bugs.launchpad.net/neutron/+filebug?field.title=Address%20scopes%20in%20Neutron&field.comment=%0A%0A%0AThis bug tracker is for errors with the documentation, use the following as a template and remove or add fields as you see fit. Convert [ ] into [x] to check boxes:%0A%0A- [ ] This doc is inaccurate in this way: _____%0A- [ ] This is a doc addition request.%0A- [ ] I have a fix to the document that I can paste below including example: input and output. %0A%0AIf you have a troubleshooting or support issue, use the following resources:%0A%0A - Ask OpenStack: http://ask.openstack.org%0A - The mailing list: http://lists.openstack.org%0A - IRC: 'openstack' channel on Freenode%0A%0A----------%0ARelease:%2012.0.1.dev11%20on%202018-03-07%2021:05%0ASHA:%2043df2709acbdce86686a40b75fd34e96880427d0%0ASource:%20https://git.openstack.org/cgit/openstack/neutron/tree/doc/source/admin/config-address-scopes.rst%0AURL: https://docs.openstack.org/neutron/queens/admin/config-address-scopes.html&field.tags=doc)

UPDATED: 2018-03-07 21:05

OpenStack Documentation

Neutron 12.0.1

(../index.html)

Installation Guide (../install/index.html)

OpenStack Networking Guide (index.html)
- Introduction (intro.html)
- Configuration (config.html)
- Deployment examples (deploy.html)
- Operations (ops.html)
- Migration (migration.html)
- Miscellaneous (misc.html)
- Archived Contents (archives/index.html)

Neutron Configuration Options (../configuration/index.html)

Command-Line Interface Reference (../cli/index.html)

Neutron Feature Classification (../feature_classification/index.html)

Contributor Guide (../contributor/index.html)

Page Contents