Configure CGNAT

For supported software information, click here.

Carrier-grade NAT (CGNAT) is a large-scale approach to network address translation (NAT). CGNAT translates multiple private IPv4 addresses to a limited number public IPv4 addresses, or private IPv6 addresses to public IPv6 addresses, using network address and port translation (NAPT) methods. In CGNAT, only port translation of the source address is required for packets communicating from the network to outside.

CGNAT can replace NAT on devices in enterprise networks. Using CGNAT, you can deliver seamless IPv4 connectivity even while using limited public addresses. You can define private IPv4 addresses in your network and use Versa CGNAT to manage address translation to the public IPv4 addresses.

To configure CGNAT, you define the address pool to translate and the rules, or criteria, to use for address translation. There are two types of address translation, NAT and NAPT.

For Releases 22.1 and later, you can configure NAT64, to translate IPv4 addresses to IPv6 addresses, and vice versa, and DNS64, to allow an IPv6-only client to initiate communications by name to an IPv4-only server.

For Releases 22.1.3 and later, you can configure network obfuscation to hide the actual IP address of a server. To allow network obfuscation to work, when you configure a CGNAT address pool, you create a dynamic IP address–only pool, which allocates dynamic destination NAT (DNAT) IP addresses. In response to a client's DNS request, the VOS device advertises an IP address allocated from the dynamic IP address pool to the client instead of the DNS server's actual IP address. The VOS device also creates a dynamic DNAT binding between the allocated dynamic destination IP address and the actual IP address of the DNS server using an endpoint-independent filtering (EIF) entry and gateway. For more information, see Configure a DNS Proxy.

Configure CGNAT Address Pools

You configure address pools to use for CGNAT. For each pool, you define the IP address and port ranges to use, as well as other parameters for the pool.

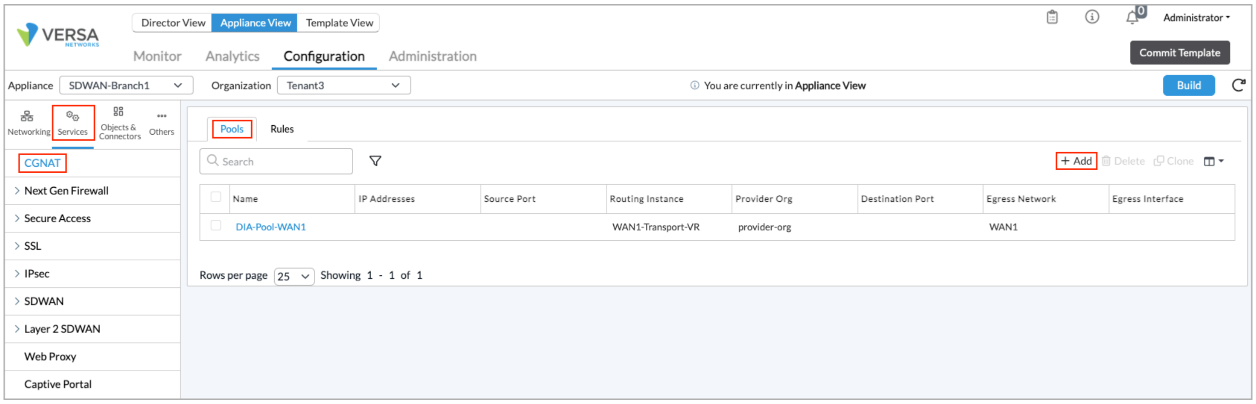
To configure a CGNAT address pool:

1. In Director view:
    a. Select the Configuration tab in the top menu bar.
    b. Select Templates > Device Templates in the horizontal menu bar.

c. Select an organization in the Organization field.

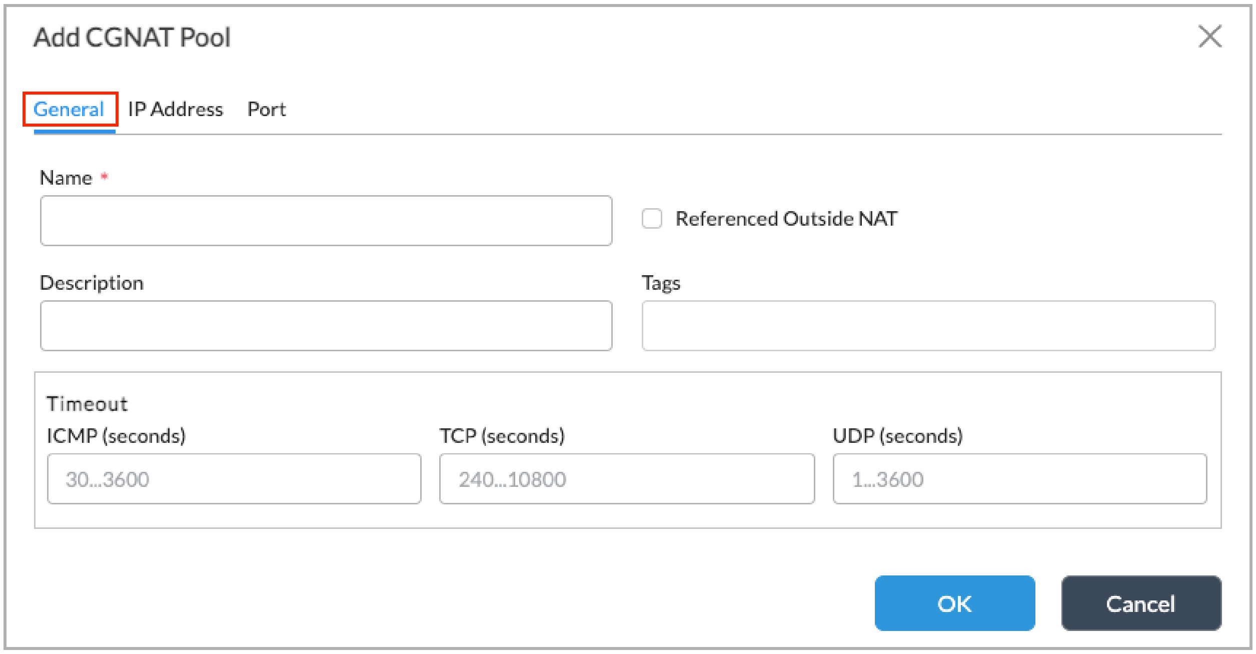
d. Select a template in the main pane. The view changes to Appliance view.

2. Select the Configuration tab in the top menu bar.
3. Select Services > CGNAT in the left menu bar. The main pane displays the CGNAT pools that are already configured.



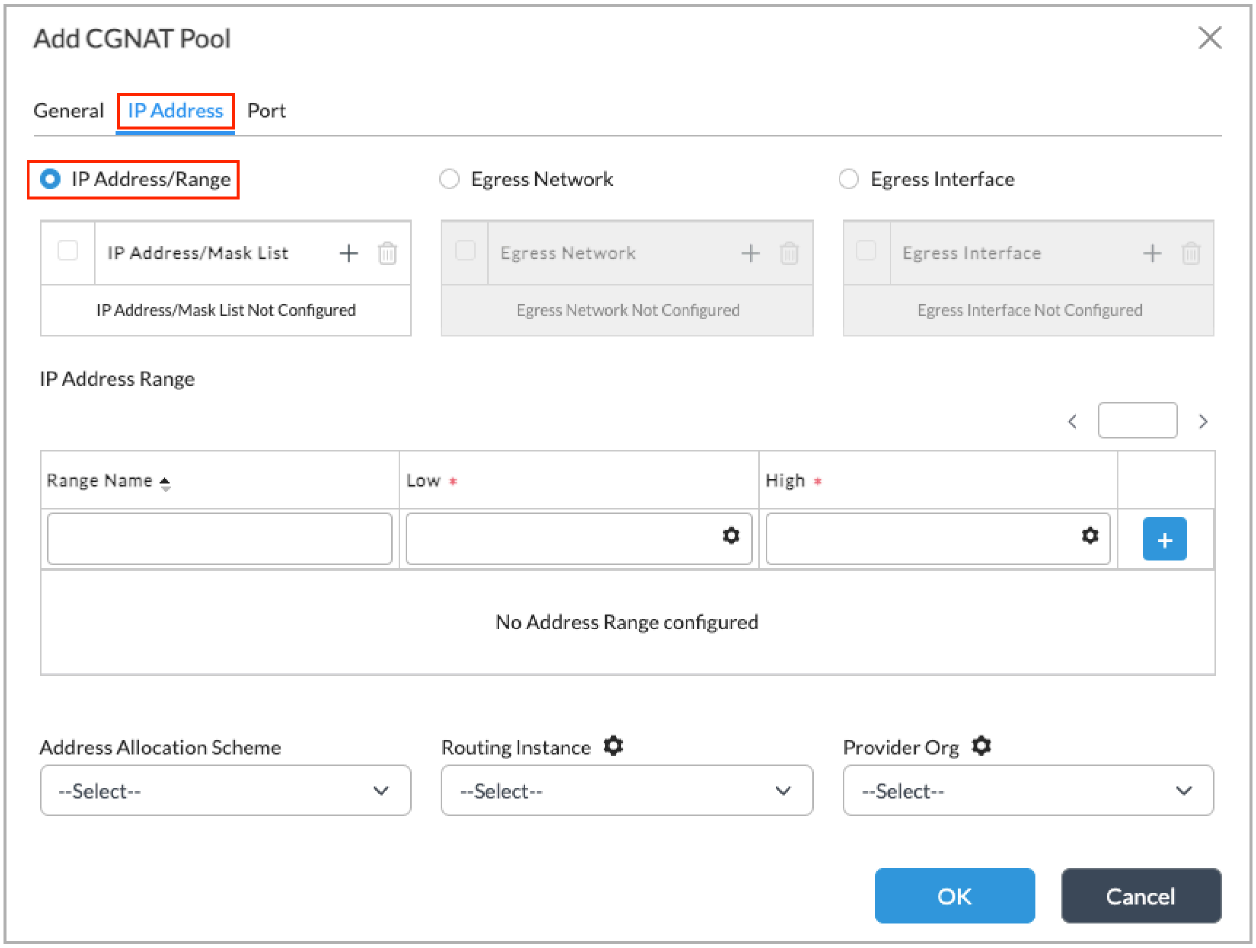
Name	IP Addresses	Source Port	Routing Instance	Provider Org	Destination Port	Egress Network	Egress Interface
DIA-Pool-WAN1			WAN1-Transport-VR	provider-org		WAN1	

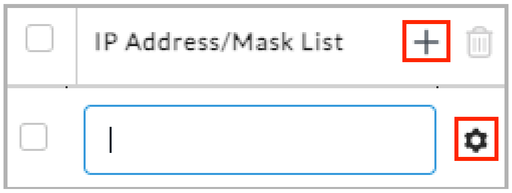
4. Click the + Add icon to add a pool. The Add CGNAT Pool popup window displays.
5. Select the General tab, and then enter information for the following fields.

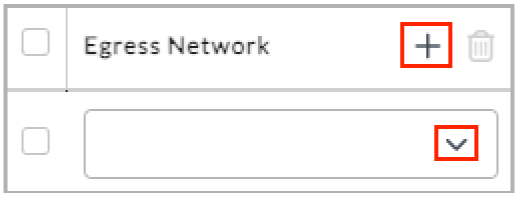
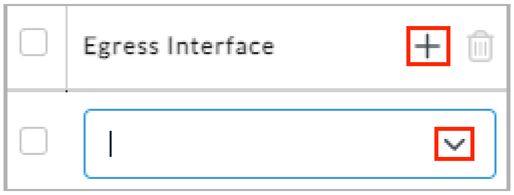


Field	**Description**
Name	Enter a name for the pool.
Description	Enter a text description for the pool.
Tags	Enter tags to help identify the pool.
Referenced Outside NAT	(For Releases 22.1.3 and later.) Click to create a dynamic pool of destination IP addresses. Enable this option when you configure network obfuscation. For more information, see Configure a DNS Proxy.
Timeout (Group of Fields)	
◦ ICMP	Enter the ICMP mapping timeout, in seconds. *Range*: 30 through 3600 seconds *Default*: None
◦ TCP	Enter the TCP mapping timeout, in seconds. *Range*: 240 through 10800 seconds *Default*: None
◦ UDP	Enter the UDP mapping timeout, in seconds. *Range*: 1 through 3600 seconds *Default*: None

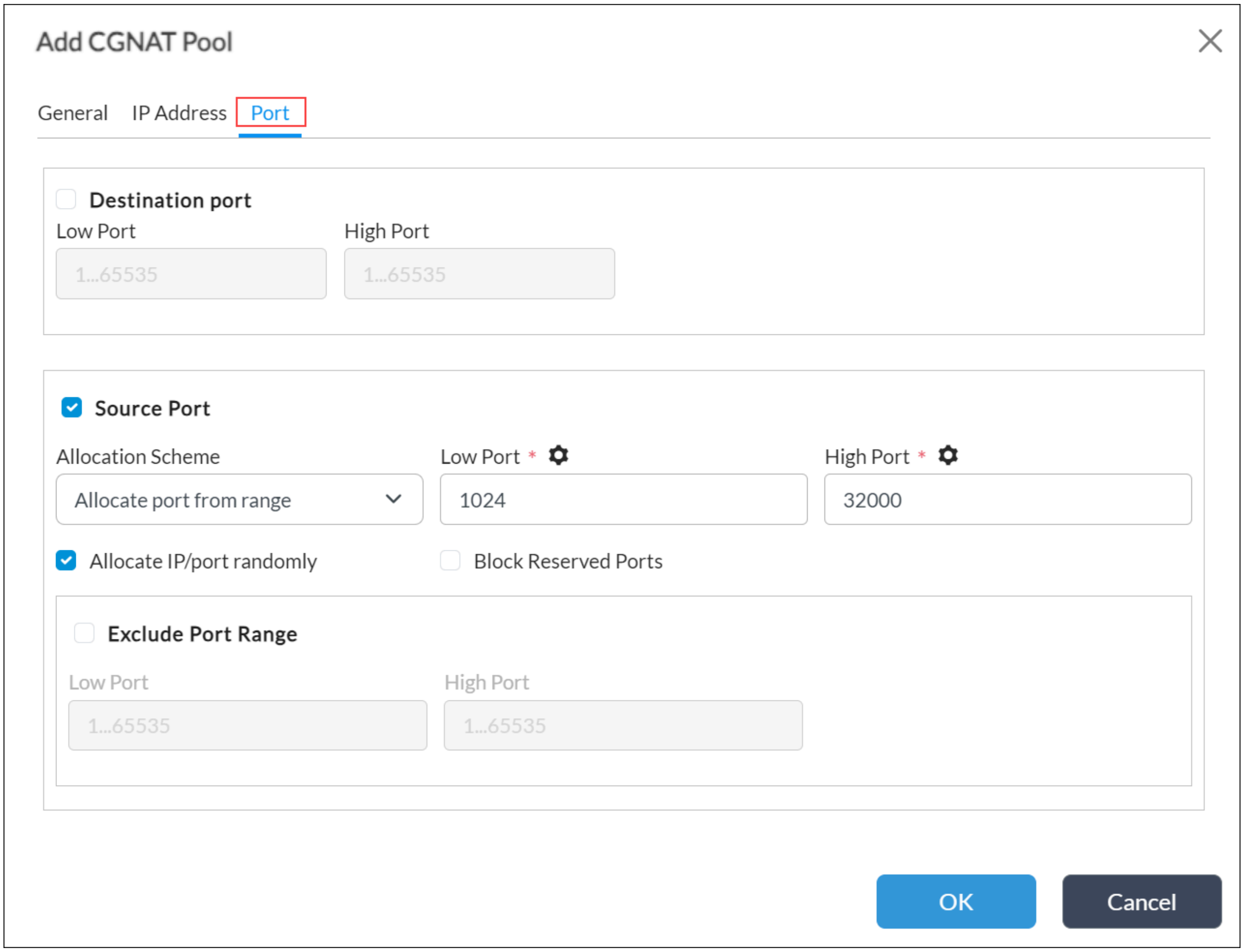
6. Select the IP address tab to define the IP addresses or IP address range for NAT. Enter information for the following fields.


Add CGNAT Pool
General
IP Address
Port
● IP Address/Range
○ Egress Network
○ Egress Interface
□ IP Address/Mask List
IP Address/Mask List Not Configured
□ Egress Network
Egress Network Not Configured
□ Egress Interface
Egress Interface Not Configured
IP Address Range
Range Name
Low *
High *
No Address Range configured
Address Allocation Scheme
--Select--
Routing Instance
--Select--
Provider Org
--Select--
OK
Cancel

Field	Description
IP Address/Range (Group of Fields)	Click to configure IP addresses and ranges.
◦ IP Address/Mask List	Click the ＋ Add icon to configure one or more IP addresses and masks. Click the ⚙ Parameterize icon to parameterize this field so that the field receives its value from bind data.  IP Address/Mask List
IP Address Range (Group of Fields)	
◦ Range Name	Enter a name for the IP address range.
◦ Low	Enter the lowest IP address in the range, or click the ⚙ Parameterize icon to parameterize this field.
◦ High	Enter the highest IP address in the range, or click the ⚙ Parameterize icon to parameterize this field.
◦ ＋ Add icon	Click the Add icon to add the IP address range. Note that you can configure multiple IP address ranges, each with a unique name.
Egress Network	Click to use one or more egress networks. Click the ＋ Add icon, and then select a network name in the list.

	
Egress Interface	Click to use one or more egress networks. Click the + Add icon, and then select an interface name in the list. 
Address Allocation Scheme	Select the address allocation scheme to use.
Routing Instance	Select the routing instance to use, or click the ⚙ Parameterize icon to parameterize this field.
Provider Organization	Select the provider organization to which the CGNAT pool belongs, or click the ⚙ Parameterize icon to parameterize this field.

7. Select the Port tab, and then enter information for the following fields.



Add CGNAT Pool

□ Destination port

Low Port: 1...65535 High Port: 1...65535

☑ Source Port

Allocation Scheme: Allocate port from range

Low Port *: 1024

High Port *: 32000

☑ Allocate IP/port randomly

□ Block Reserved Ports

□ Exclude Port Range

Low Port: 1...65535 High Port: 1...65535

Field	Description
Destination Port (Group of Fields)	Click to configure the NAT destination port.
◦ Low Port	Enter the lowest port number in the range. *Range*: 1 through 65535 *Default*: None
◦ High Port	Enter the highest port number in the range. *Range*: 1 through 65535 *Default*: None
Source Port (Group of Fields)	Click to configure the NAT source port.
◦ Allocation Scheme	Select the allocation scheme to be used for source port allocation: ◦ Allocate port from range ◦ Automatic ports assignment
◦ Low Port	When the allocation scheme is to allocate ports from a range, enter the lowest port number of the range. *Range*: 1 through 65535 *Default*: None
◦ High Port	When the allocation scheme is to allocate ports from a range, enter the highest port number of the range. *Range*: 1 through 65535 *Default*: None
◦ Allocate IP/Port Randomly	Select to allocate the IP addresses or port numbers randomly.
◦ Block Reserved Ports	(For Releases 22.1.4 and later.) Select to block reserved ports from the ports allocated for source

	NAT if the CGNAT pool is address-based.
◦ Exclude Port Range (Group of Fields)	(For Releases 22.1.3 and later.) Click to exclude a range of source ports.
◦ Low Port	Enter the lowest port number in the range. *Range*: 1 through 65535 *Default*: None
◦ High Port	Enter the highest port number in the range. *Range*: 1 through 65535 *Default*: None

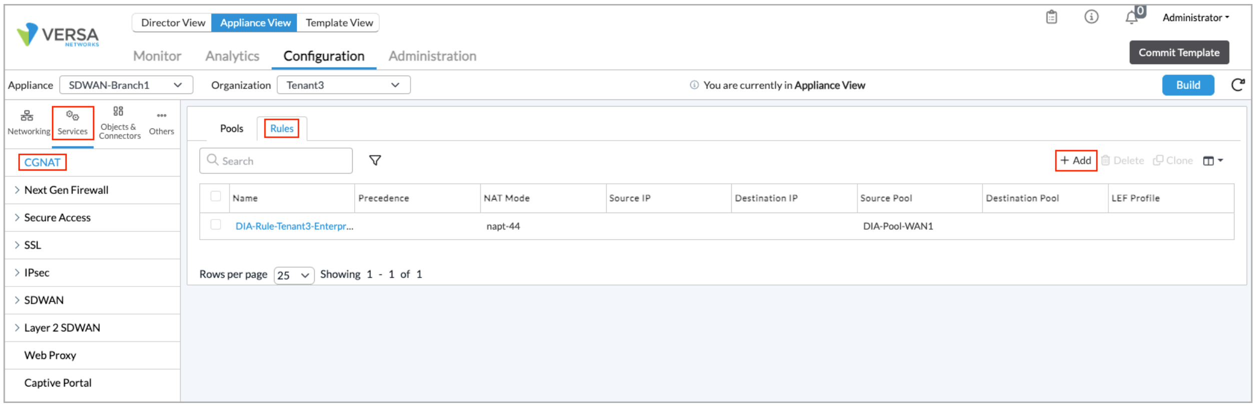
6. Click OK.

Configure CGNAT Rules

You configure the rules to define the criteria to use for address translation.

To configure CGNAT rules:

1. In Director view:
    a. Select the Administration tab in the top menu bar.
    b. Select Appliances in the left menu bar.
    c. Select a device name in the main panel. The view changes to Appliance view.
2. Select the Configuration tab in the top menu bar.
3. Select Services > CGNAT in the left menu bar.



Appliance: SDWAN-Branch1

Organization: Tenant3

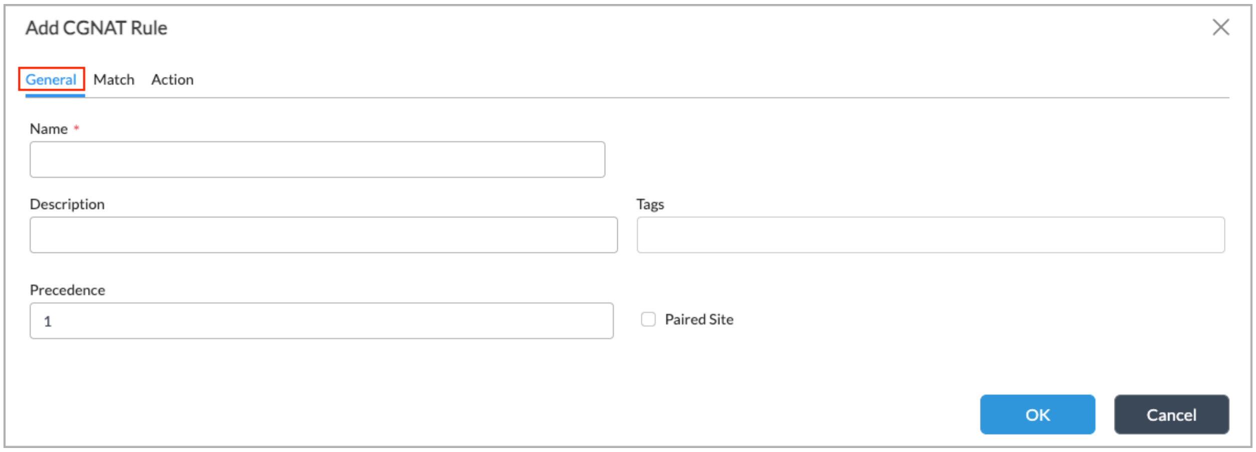
Name	Precedence	NAT Mode	Source IP	Destination IP	Source Pool	Destination Pool	LEF Profile
DIA-Rule-Tenant3-Enterpr...		napt-44			DIA-Pool-WAN1		

Rows per page 25 Showing 1 - 1 of 1

4. In the main pane, select the Rules tab in the horizontal menu bar. The main pane displays the rules that are already configured.

5. Click the + Add icon to configure a rule. The Add CGNAT Rule popup window displays.

6. Select the General tab, and then enter information for the following fields.



Name *

Description

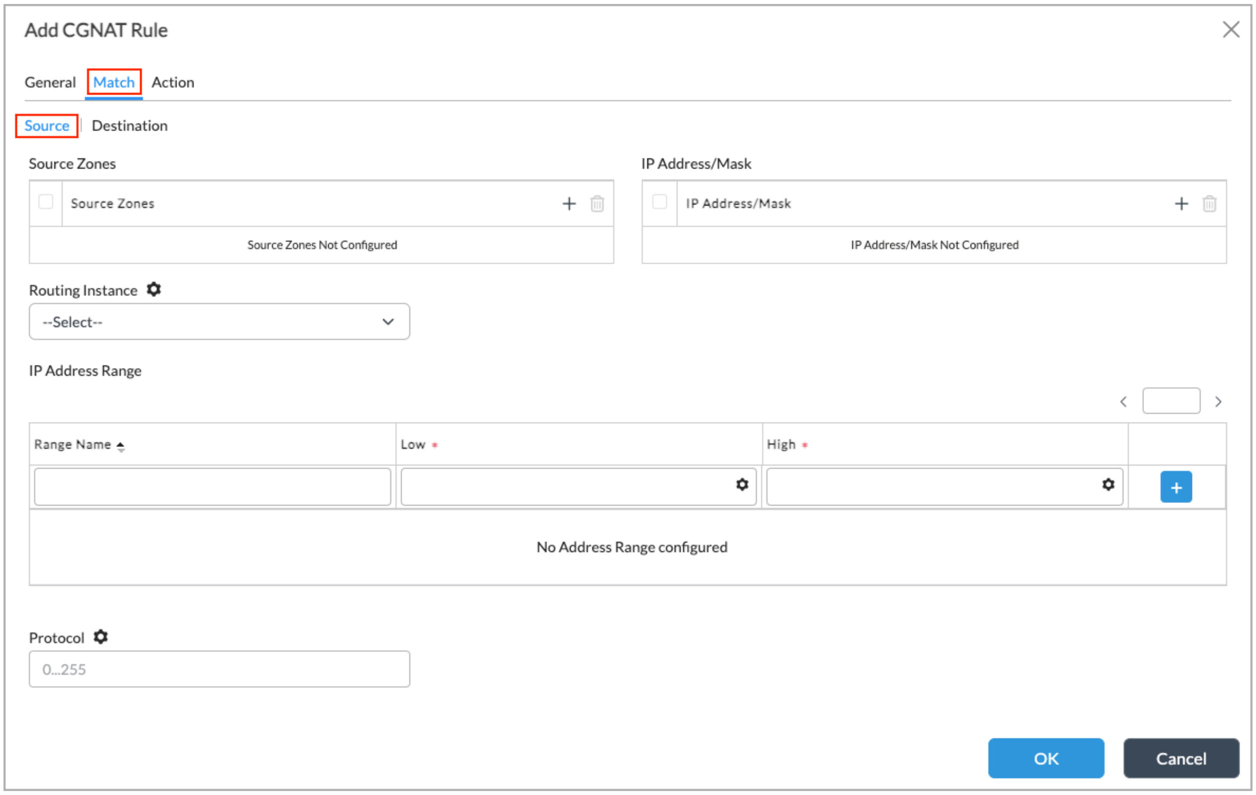
Tags

Precedence: 1

□ Paired Site

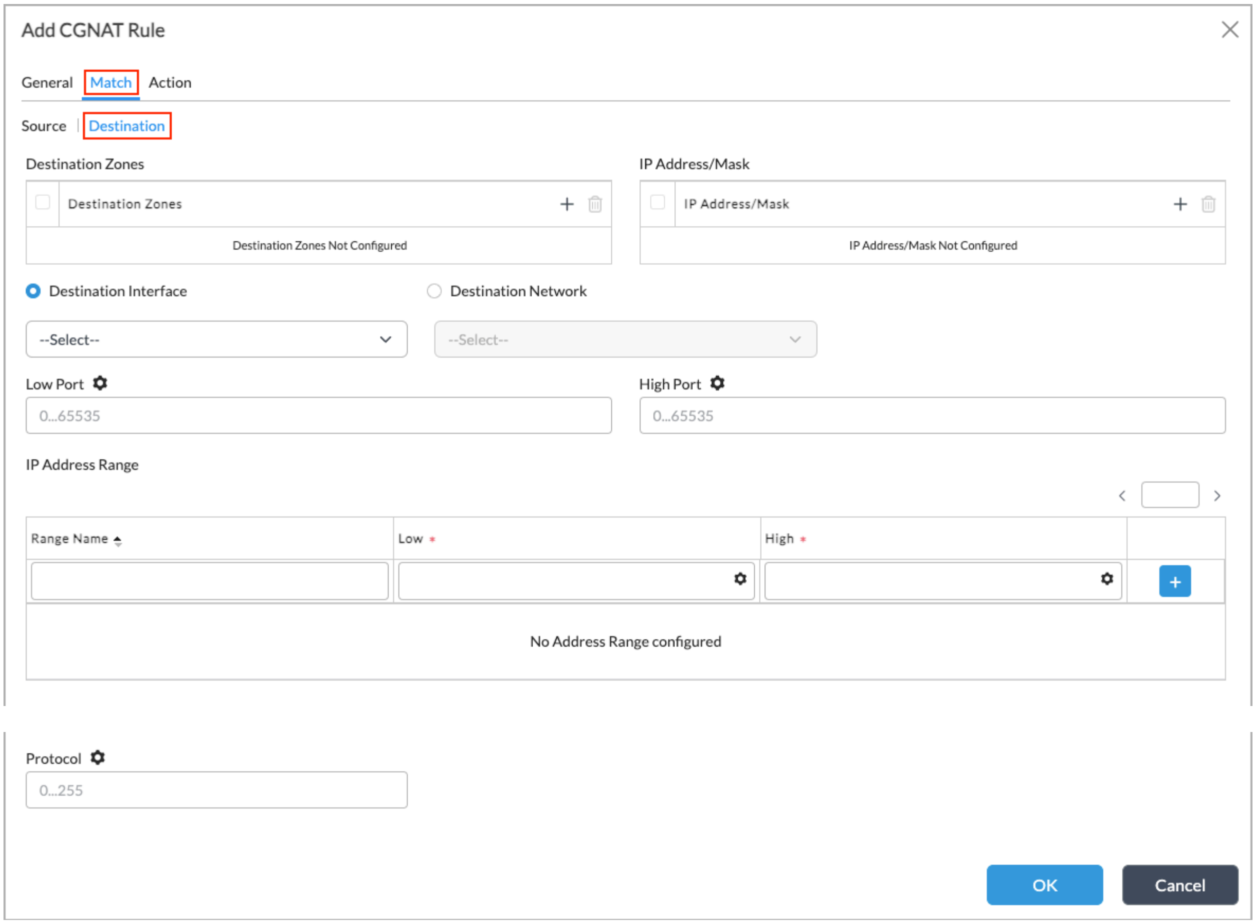
Field	Description
Name	Enter a name for the CGNAT rule.
Description	Enter a text description for the CGNAT rule.
Tags	Enter a keyword or phrase that allows you to filter the CGNAT rule. Tags are useful when you have many rules and want to view those that are tagged with a particular keyword.
Precedence	Enter a value for the priority of the rule. You can configure multiple rules and assign each a priority. A rule or rules with a higher priority value take precedence over rules with a lower priority value. *Range:* 0 through 255 *Default:* 1
Paired Site	Click to enable a paired site. For more information, see Configure Paired CPE Devices and Location IDs.

7. Select the Match tab, and then select the Source tab to configure the criteria to select source traffic for translation. Enter information for the following fields.



Field	Description
Source Zones	Click the + Add icon and then select a source zone.
IP Address/Mask	Click the + Add icon and then select the IP address and mask of the source zone.
Routing Instance	Select the routing instance.
IP Address Range (Group of Fields)	
◦ Range Name	Enter a name for the IP address range.
◦ Low	Enter the lowest IP address in the IP address range.
◦ High	Enter the highest IP address in the IP address range.
Protocol	Enter the protocol value to apply to the source traffic.

8. Select the Destination tab to configure the criteria to select destination traffic for translation. Enter information for the following fields.



Add CGNAT Rule

General | Match | Action

Source | Destination

Destination Zones

□	Destination Zones
	Destination Zones Not Configured

IP Address/Mask

□	IP Address/Mask
	IP Address/Mask Not Configured

● Destination Interface: --Select--

○ Destination Network: --Select--

Low Port: 0...65535

High Port: 0...65535

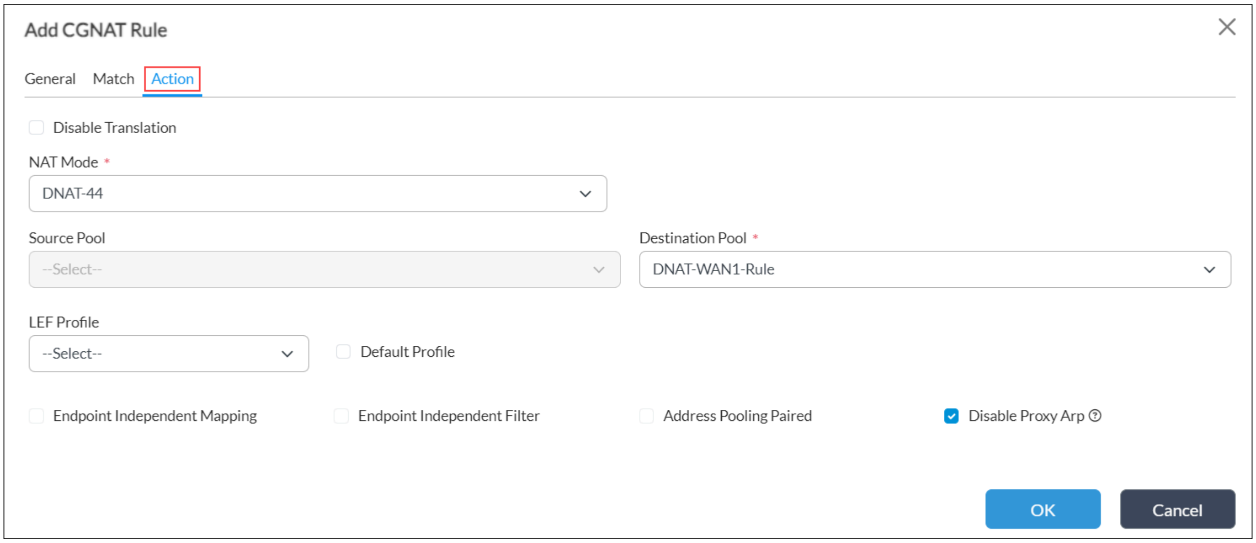
IP Address Range

Range Name	Low *	High *
No Address Range configured		

Protocol: 0...255

Field	Description
Destination Zones	Click the + Add icon, and then select a destination zone.
IP Address/Mask	Click the + Add icon, and then select the IP address and mask of the destination zone.
Destination Interface	Click and then select the destination interface. You can select a destination interface or a destination network, but not both.
Destination Network	Click and then select the destination network. You can select a destination interface or a destination network, but not both.
Low Port	Enter the lowest port number. *Range*: 0 through 65535 *Default*: None
High Port	Enter the highest port number. *Range*: 0 through 65535 *Default*: None
IP Address Range (Group of Fields)	
◦ Range Name	Enter a name for the IP address range.
◦ Low	Enter the lowest IP address in the IP address range.
◦ High	Enter the highest IP address in the IP address range.
Protocol	Enter the protocol value to apply to the destination traffic. *Range*: 0 through 255 *Default*: None

9. Select the Action tab to define the action to take on the traffic that meets the matching criteria. Enter information for the following fields.



Add CGNAT Rule

□ Disable Translation

NAT Mode *: DNAT-44

Source Pool: --Select--

Destination Pool *: DNAT-WAN1-Rule

LEF Profile: --Select--

□ Default Profile

□ Endpoint Independent Mapping

□ Endpoint Independent Filter

□ Address Pooling Paired

☑ Disable Proxy Arp

Field	Description
Disable Translation	Click to disable address translation.
NAT Mode	Select the NAT mode to use to translate private IPv4 addresses to public IPv4 addresses, or private IPv6 addresses to public IPv6 addresses. Network address and port translation methods aggregate multiple private IPv4 addresses into fewer public IPv4 addresses. ◦ Basic NAT-44—Translate source IPv4 addresses statically. ◦ DNAT-44—Translate IPv4 destination addresses statically. ◦ Dynamic NAT-44—Translate only source IPv4 addresses by dynamically choosing the NAT address from the source address pool. ◦ NAPT-44—Translate the transport identifier (that is, the source IP address) of an IPv4 private network to an IPv4 external address (that is, a public source IP address). Note that you can configure more than one public source addresses in a CGNAT address pool. ◦ Twice Basic NAT-44—Translate the IPv4 source and destination addresses statically. ◦ Twice Dynamic NAT-44—Translate the IPv4 source address by dynamically choosing the NAT address from the source address pool and translate the destination address statically. ◦ Twice NAPT-44—Translate the transport identifier of an IPv4 private network to a single IPv4 external address and translate the destination address statically. ◦ NPT-66—Translate the transport identifier of the IPv6 private network to a single IPv6 external address. ◦ NAT-64—Translate IPv4 addresses to IPv6 addresses, and vice versa. For more information, see Configure NAT64 and DNS64, below.
Source Pool	Select the source pool to associate with the translation mode.
Destination Pool	Select the destination pool to associate with the translation mode.

LEF Profile	Select the log export functionality profile to use for logging. Use either this field or the default profile field to associate a LEF profile with the CGNAT configuration. For information about configuring a LEF profile, see Configure Log Export Functionality. For information about associating a LEF profile to the configuration of a feature or service, see Apply Log Export Functionality.
Default Profile	Click to use the default LEF profile.
Endpoint-Independent Mapping	For the Dynamic NAT-44 and NAPT-44 NAT modes, click to enable endpoint-independent mapping, which NAT uses to perform translation for the duration of the session.
Endpoint-Independent Filter	For the Dynamic NAT-44 and NAPT-44 NAT modes, click to enable endpoint-independent filtering. Endpoint-independent filtering checks only the destination IP address and destination port of an inbound packet sent by an external endpoint when deciding whether to pass the packet.
Address Pooling Paired	For the Dynamic NAT-44 and NAPT-44 NAT modes, click to enable paired address pooling. Use this option for applications that require that all sessions associated with a single internal IP address to be mapped to the same external IP address for the duration of a session.
Disable Proxy ARP	(For Releases 22.1.3 and later.) Click to disable automatic proxy ARP installation for the following static NAT modes for IPv4 traffic: ◦ Basic NAT-44 ◦ DNAT-44 ◦ Twice Basic NAT-44 ◦ Twice Dynamic NAT-44 ◦ Twice NAPT-44 By default, proxy ARP is enabled. You can disable proxy ARP if you want to manually configure proxy ARP. To manually configure proxy ARP for an IP address or IP address range configured in CGNAT rules, see Configure Interfaces.

10. Click OK.

Configure CGNAT for IPv6

To configure CGNAT for IPv6, you configure Network Prefix Translation-66 (NPTv6). For Releases 22.1 and later, you can also configure Network Address Translation-64 (NAT64) and Domain Name System-64 (DNS64).

Configure NPTv6

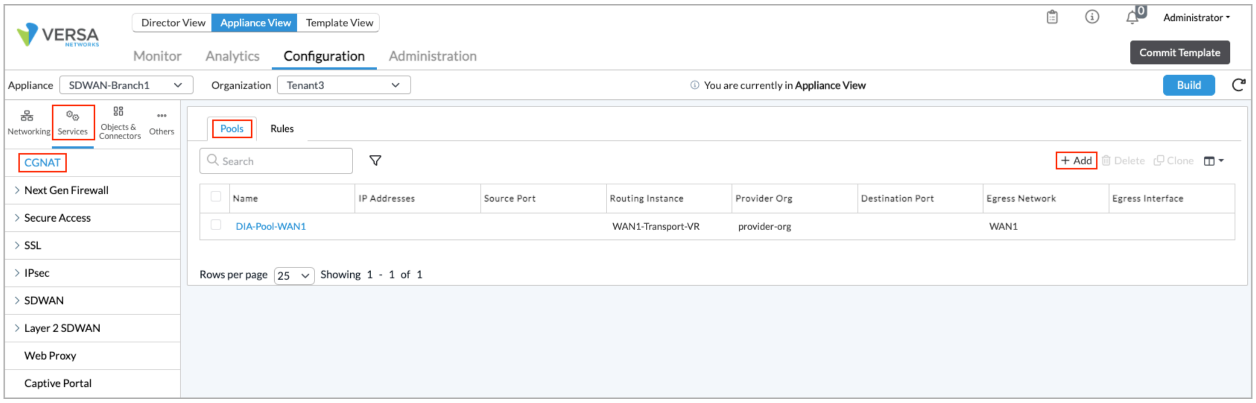
Network Prefix Translation (NPTv6) is a stateless, transport-agnostic IPv6-to-IPv6 function that provides the address-independence benefit associated with IPv4-to-IPv4 NAT (NAPT44). NPTv6 also provides a one-to-one relationship between addresses in the prefixes inside the edge network and outside the edge network, preserving end-to-end reachability at the network layer.

NPTv6 is an algorithmic translation in which the checksum remains the same even after the source NAT operation is performed. To compensate for changes to the address prefixes, checksum-neutral values are used for the remainder of the address bits.

It is recommended that you configure NPTv6 CGNAT pools that use prefixes smaller than /48.

To configure NPTv6:

1. In Director view:
    a. Select the Administration tab in the top menu bar.
    b. Select Appliances in the left menu bar.
    c. Select a device name in the main panel. The view changes to Appliance view.
2. Select the Configuration tab in the top menu bar.
3. Select Services > CGNAT in the left menu bar.
4. In the main pane, select the Pools tab in the horizontal menu bar. The main pane displays the pools that are already configured.



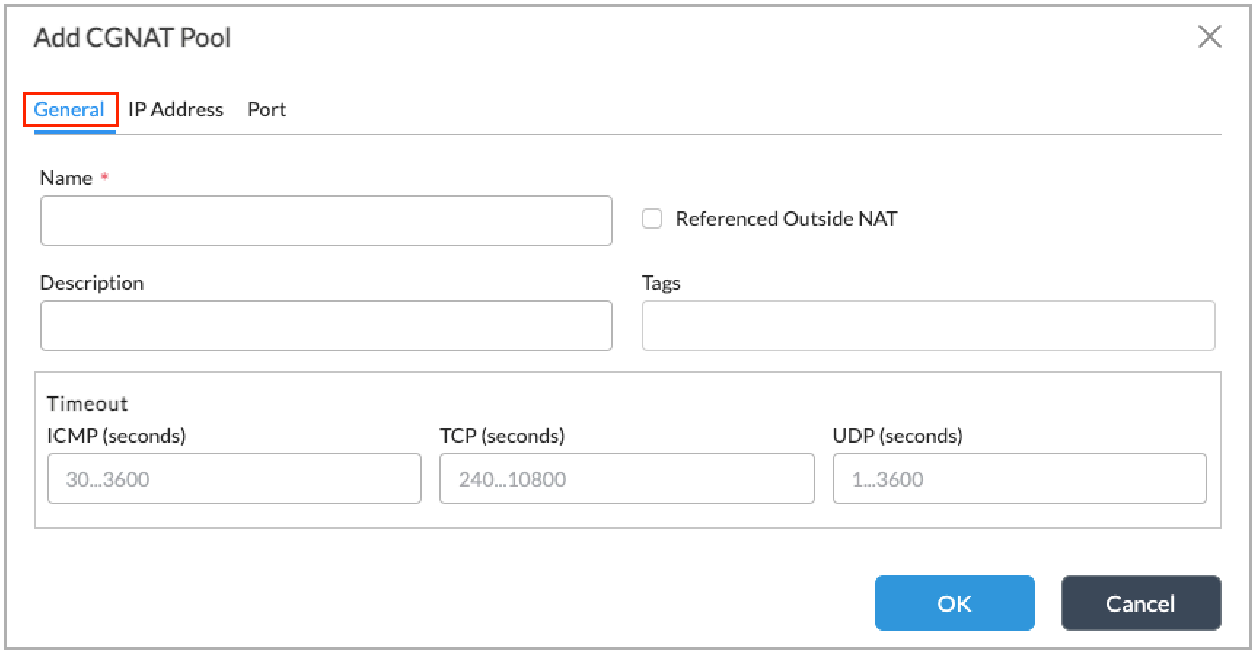
Appliance: SDWAN-Branch1 Organization: Tenant3

You are currently in Appliance View

Name	IP Addresses	Source Port	Routing Instance	Provider Org	Destination Port	Egress Network	Egress Interface
DIA-Pool-WAN1			WAN1-Transport-VR	provider-org		WAN1	

Rows per page 25 Showing 1 - 1 of 1

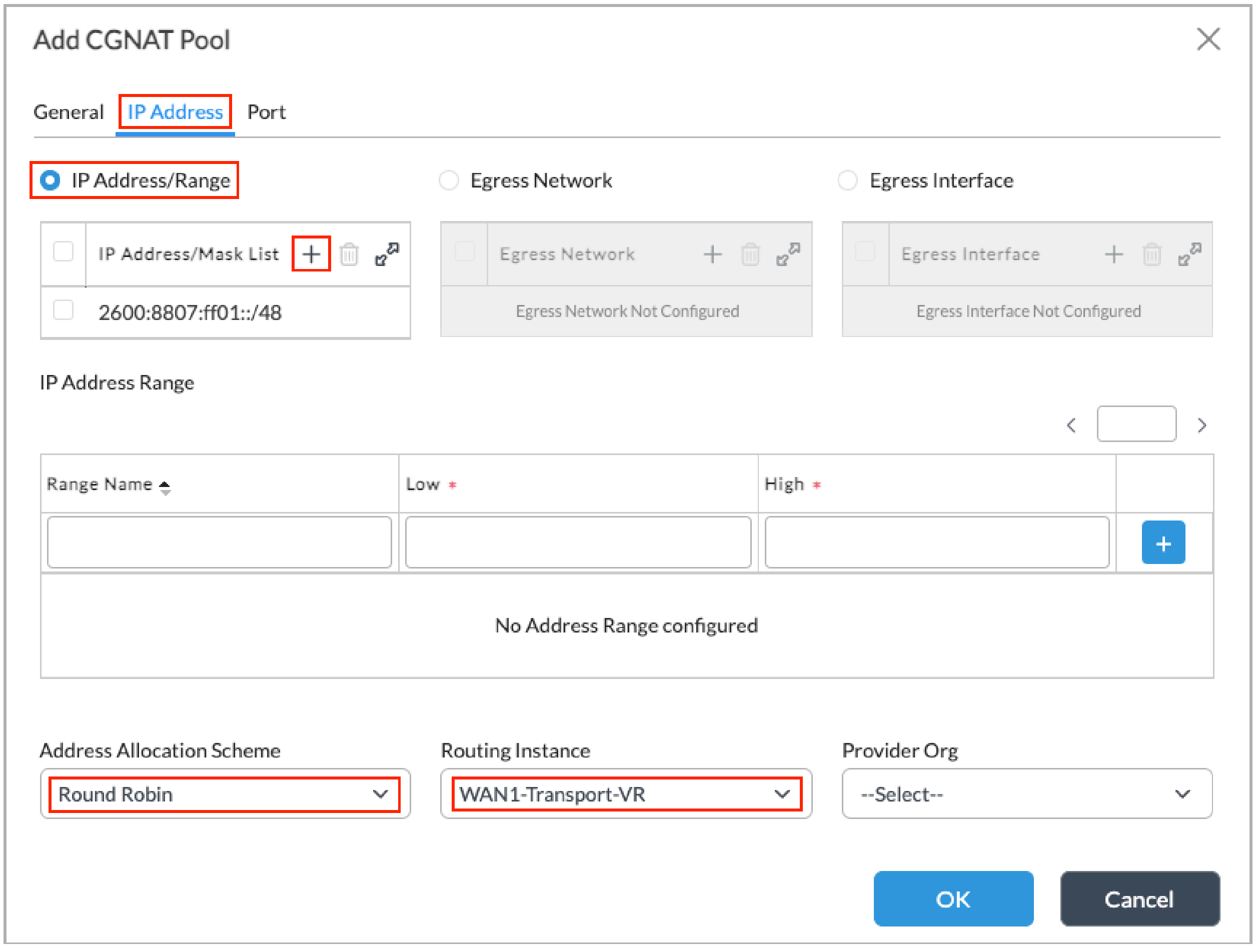
5. Click the + Add icon. The Add CGNAT Pool popup window displays.



6. Select the General tab, and then enter information for the following fields.

Field	**Description**
Name	Enter a name for the pool.
Description	Enter a text description for the pool.
Tags	Enter tags to help identify the pool.
Referenced Outside NAT	(For Releases 22.1.1 and later.) Click to create a dynamic pool of destination IP addresses. Enable this option when you configure network obfuscation. For more information, see Configure a DNS Proxy.
Timeout (Group of Fields)	
◦ ICMP	Enter the ICMP mapping timeout, in seconds. *Range*: 30 through 3600 seconds *Default*: None
◦ TCP	Enter the TCP mapping timeout, in seconds. *Range*: 240 through 10800 seconds *Default*: None
◦ UDP	Enter the UDP mapping timeout, in seconds. *Range*: 1 through 3600 seconds *Default*: None

7. Select the IP Address tab.



● IP Address/Range ○ Egress Network ○ Egress Interface

IP Address/Mask List: 2600:8807:ff01::/48

Egress Network Not Configured

Egress Interface Not Configured

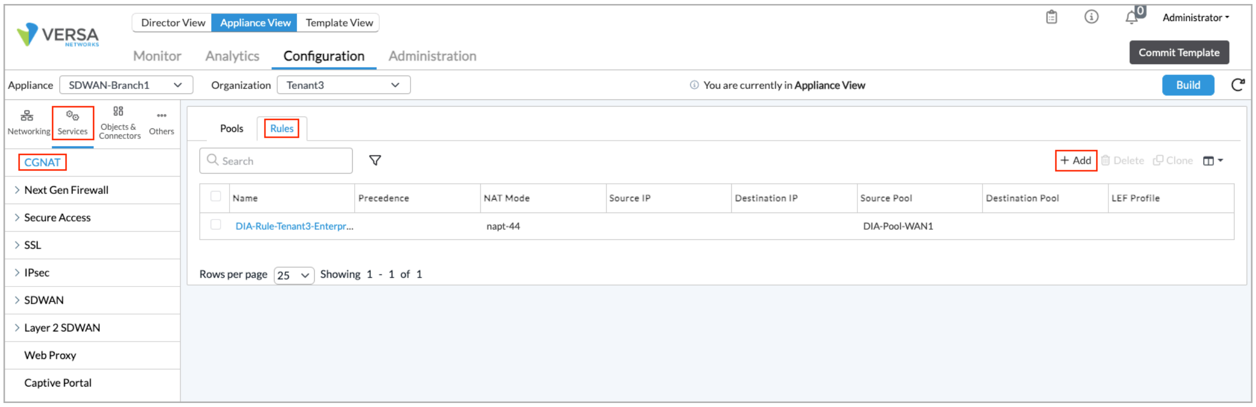
No Address Range configured

Address Allocation Scheme: Round Robin

Routing Instance: WAN1-Transport-VR

Provider Org: --Select--

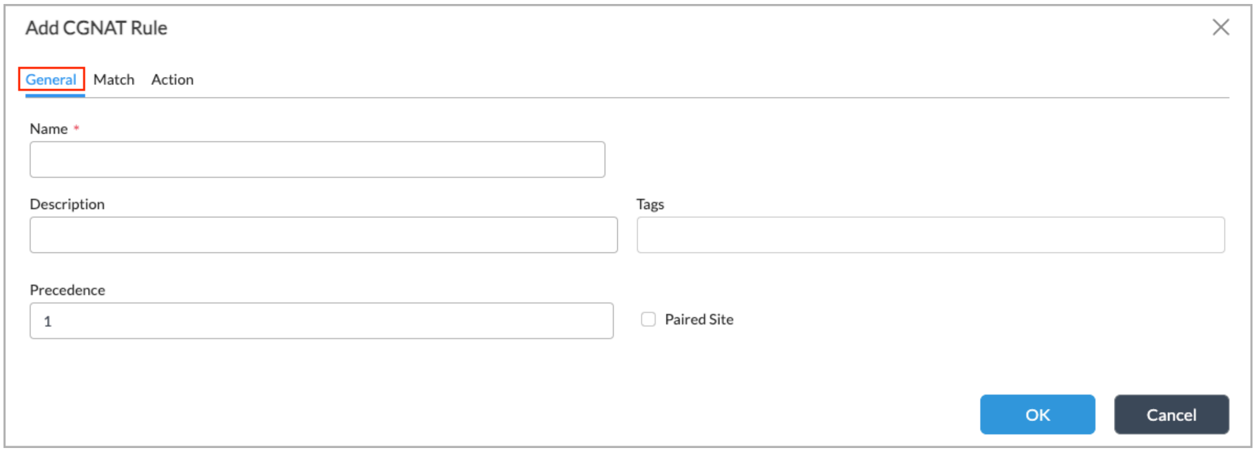
8. Click IP Address/Range, click the + Add icon, and then enter the IPv6 address range to use for the pool.
9. In the Address Allocation Scheme field, select Round Robin.
10. In the Routing Instance field, select a routing instance.
11. Click OK.
12. In the main CGNAT pane, select the Rules tab in the horizontal menu bar. The main pane displays the rules that are already configured.



Name	Precedence	NAT Mode	Source IP	Destination IP	Source Pool	Destination Pool	LEF Profile
DIA-Rule-Tenant3-Enterpr...		napt-44			DIA-Pool-WAN1		

Rows per page 25 Showing 1 - 1 of 1

13. Click the + Add icon. The Add CGNAT Rule popup window displays.



Name *

Description

Tags

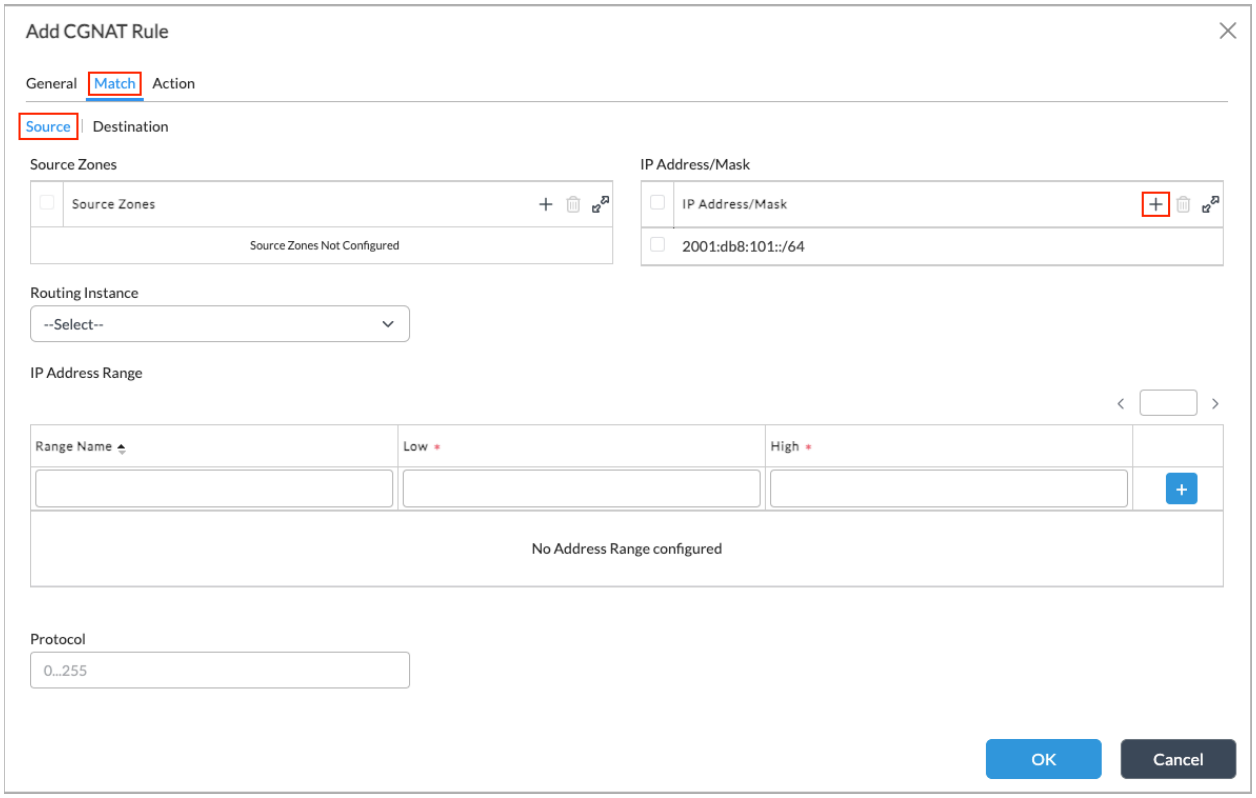
Precedence
1

□ Paired Site

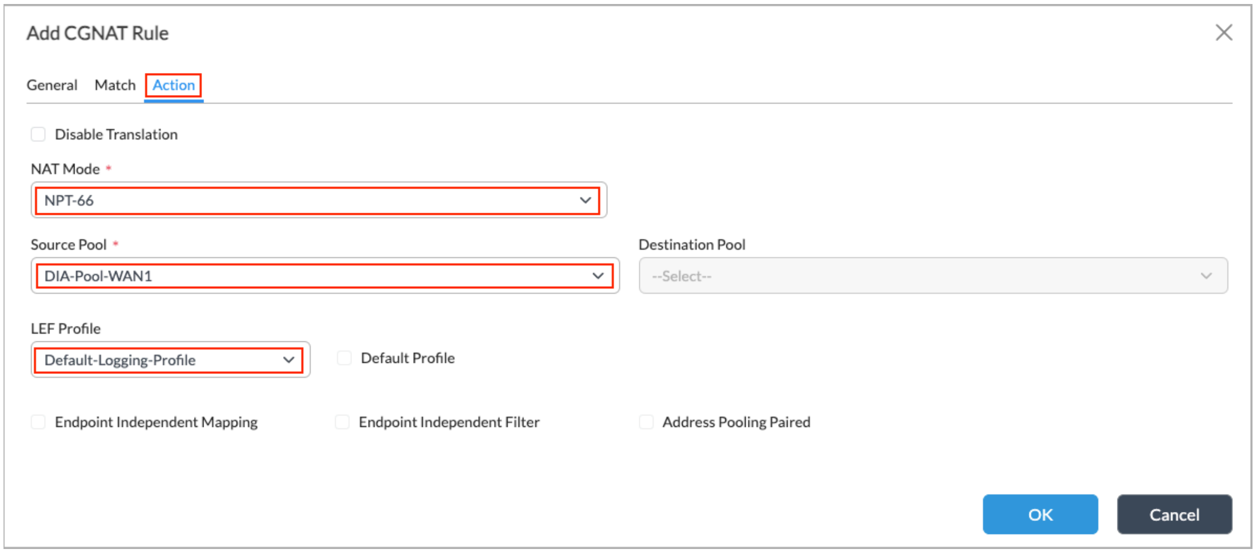
14. Select the General tab, and then enter information for the following fields.

Field	Description
Name	Enter a name for the CGNAT rule.
Description	Enter a text description for the CGNAT rule.
Tags	Enter a keyword or phrase that allows you to filter the CGNAT rule. Tags useful when you have many rules and want to view those that are tagged with a particular keyword.
Precedence	Enter a value for the priority of the rule. You can configure multiple rules and assign each a priority. A rule or rules with a higher priority value take precedence over rules with a lower priority value. *Range:* 0 through 255 *Default:* 1
Paired Site	Click to enable a paired site. For more information, see [Configure Paired CPE Devices and Location IDs]().

15. Select the Match tab, and then select the Source tab to configure the criteria to select source traffic for translation.



16. Click the + Add icon in the IP Address/Mask table, and then enter the source IPv6 address.
17. Select the Action tab.



□ Disable Translation

NAT Mode *: NPT-66

Source Pool *: DIA-Pool-WAN1

Destination Pool: --Select--

LEF Profile: Default-Logging-Profile

□ Default Profile

□ Endpoint Independent Mapping

□ Endpoint Independent Filter

□ Address Pooling Paired

18. In the NAT Mode field, select NPT-66.
19. In the Source Pool field, select the source pool to use.
20. In the LEF field, select the LEF profile to use.
21. Click OK.

Configure NAT64 and DNS64

For Releases 22.1 and later.

NAT64 and DNS64 allow you to configure basic services, such as firewall and DDoS rules, with originating IPv6 addresses and zones. Translated IPv4 packets can be routed over SD-WAN networks, paired TVI interfaces, or tunnel interfaces.

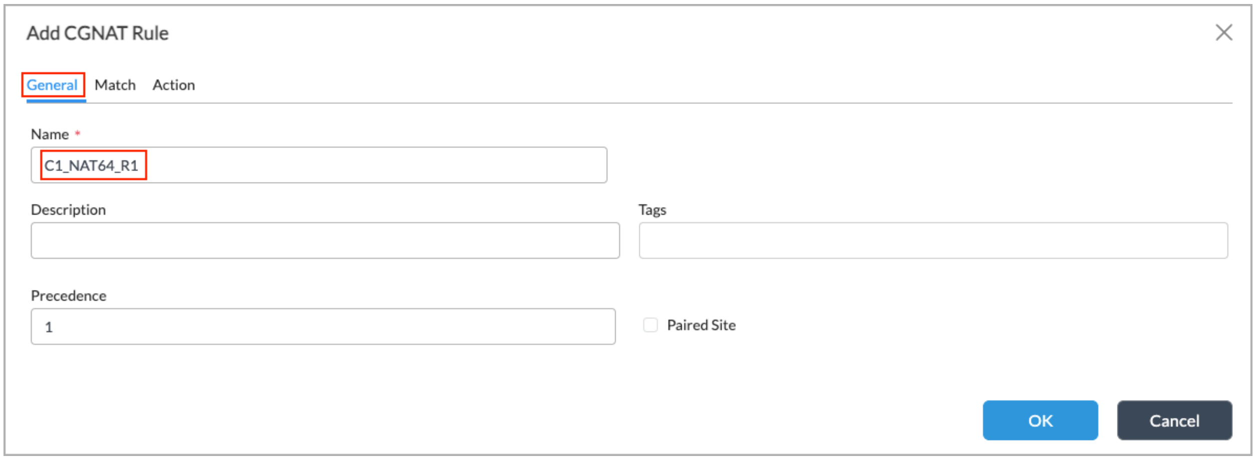
NAT64, defined in RFC 6146, provides a mechanism to translate IPv4 addresses to IPv6 addresses, and vice versa. The IPv4 destination address in the forward direction is derived from the IPv4-embedded IPv6 address in the IPv6 destination address field, as specified in RFC 6052. This IPv6 destination address is resolved by DNS64, as described below, with support for the prefix lengths /32, /40, /48, /56, /64, and /96. The IPv6 source addresses of IPv6 hosts are translated to and from IPv4 addresses by installing mappings in the normal Network Address Port Translation (NAPT) source NAT pool, and they adhere to the source NAT configurations for the NAPT pool.

DNS64, defined in RFC 6147, allows an IPv6-only client to initiate communications by name to an IPv4-only server. DNS64 is a mechanism for synthesizing AAAA resource records (RRs) from A RRs. A synthetic AAAA RR created by DNS64 from an original A RR contains the name of the owner of the original A RR, but it contains an IPv6 address instead of an IPv4 address. The IPv6 address is an IPv6 representation of the IPv4 address contained in the original A RR. The IPv6 representation of the IPv4 address is algorithmically generated from the IPv4 address returned in the A RR and a set of parameters configured in DNS64.

The only shared states between DNS64 and the NAT64 translator are the Pref64::/n keyword and an optional set of static parameters. You must configure the same keyword and parameters on both devices. There is no communication between the DNS64 device and NAT64 translator functions.

The following example shows how to configure NAT-64:

1. In Director view:
    a. Select the Administration tab in the top menu bar.
    b. Select Appliances in the left menu bar.
    c. Select a device name in the main panel. The view changes to Appliance view.
2. Select the Configuration tab in the top menu bar.
3. Select Services > CGNAT in the left menu bar.
4. In the main pane, select the Rules tab in the horizontal menu bar. The main pane displays the rules that are already configured.
5. Click the + Add icon. The Add CGNAT Rule popup window displays.



Name *: C1_NAT64_R1

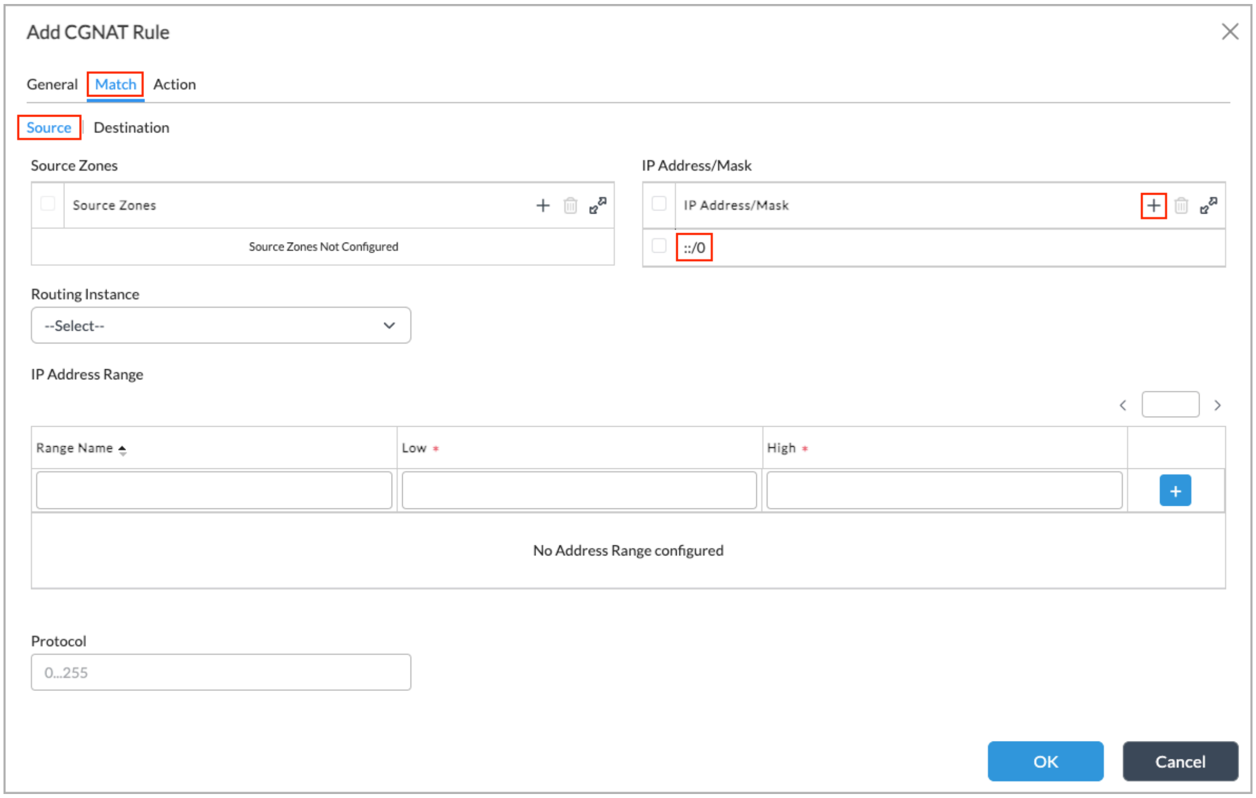
Description:

Tags:

Precedence: 1

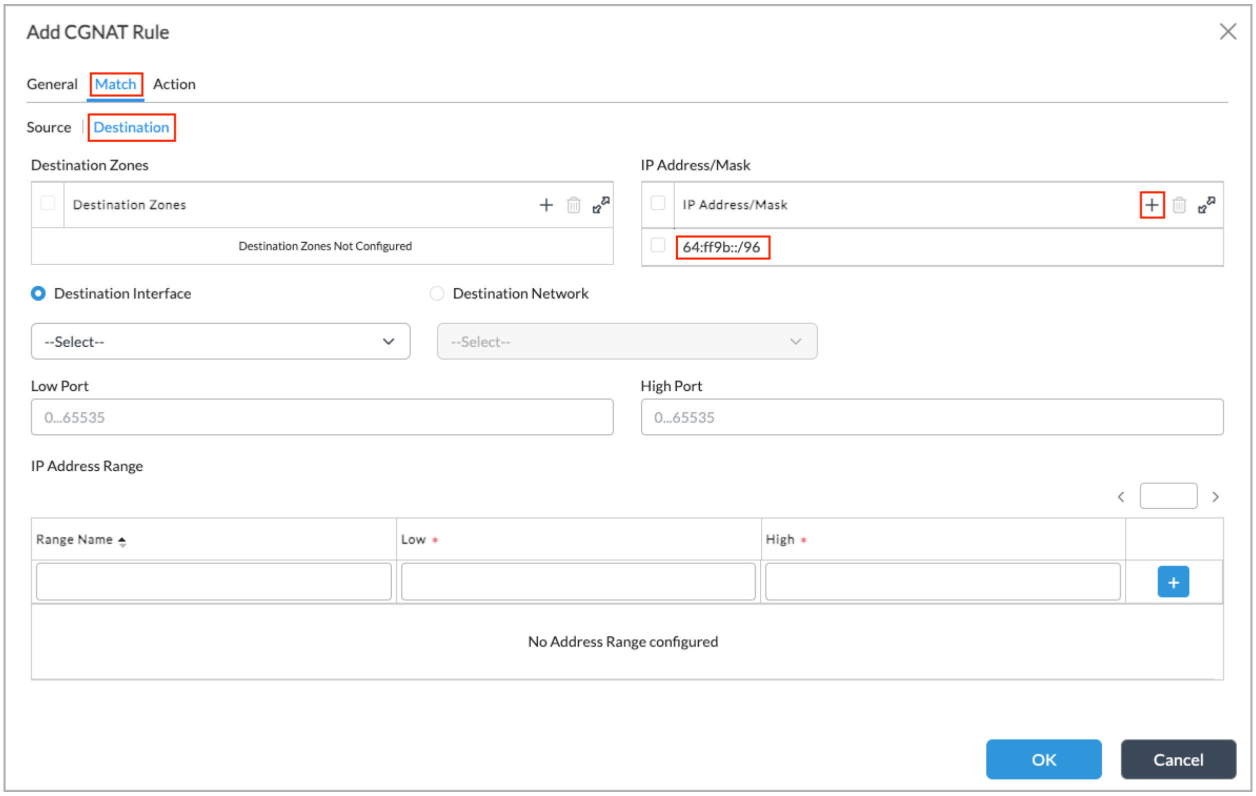
□ Paired Site

6. Select the General tab, and then enter a name for the rule in the Name field.
7. Select the Match tab.



8. Select the Source tab. The IP Address/Mask is not required. You can enter ::/0 to include all IPv6 addresses.

9. Select the Destination tab, click the + Add icon, and then enter the IPv6 address and mask in the IP Address/ Mask field.



Add CGNAT Rule

General | Match | Action

Source | Destination

Destination Zones: Destination Zones Not Configured

IP Address/Mask: 64:ff9b::/96

● Destination Interface: --Select--

○ Destination Network: --Select--

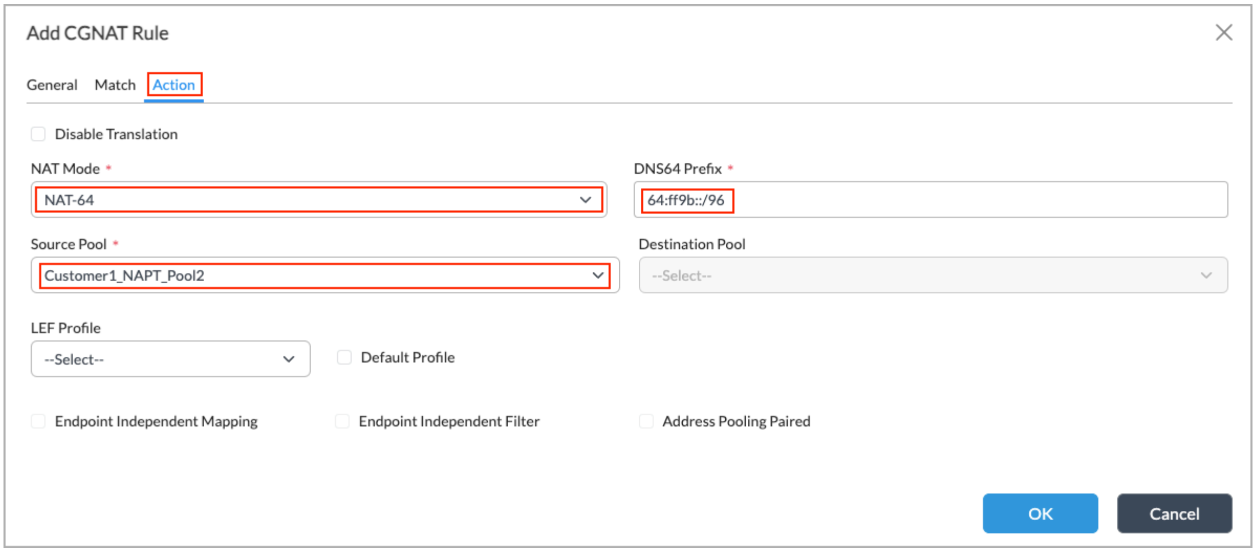
Low Port: 0...65535

High Port: 0...65535

IP Address Range

Range Name	Low *	High *
No Address Range configured		

10. Select the Action tab. and then enter information for the following fields.



Add CGNAT Rule

General | Match | Action

□ Disable Translation

NAT Mode *: NAT-64

DNS64 Prefix *: 64:ff9b::/96

Source Pool *: Customer1_NAPT_Pool2

Destination Pool: --Select--

LEF Profile: --Select--

□ Default Profile

□ Endpoint Independent Mapping

□ Endpoint Independent Filter

□ Address Pooling Paired

Field	Description
NAT Mode	Select NAT-64.
DNS64 Prefix	Enter the DNS64 prefix.

Field	Description
Source Pool	Select the source pool.

11. Click OK.

Supported Software Information

Releases 20.2 and later support all content described in this article, except:

- Release 22.1 adds support for NAT64 and DNS64.
- Release 22.1.3 adds support for disabling proxy ARP, dynamic DNAT, and exclude a range of source ports.
- Release 22.1.4 adds support for blocking reserved ports.

Additional Information

Apply Log Export Functionality
Configure a DNS Proxy
Configure Direct Breakout to the Internet
Configure Paired CPE Devices and Location IDs
Configure SNAT Pools
Versa Analytics Scaling Recommendations