Network Address Translation Configuration Commands

Generic Commands

description

Syntax **description** *description-string*
no description

Context config>service>vprn>nat>outside>pool>address-range
config>service>vprn>nat>outside>pool
config>router>nat>outside>pool>address-range
config>router>nat>outside>pool
config>router>nat>inside>subscriber-id
config>service>ipfix>export-policy
config>aaa>isa-radius-plcy>servers>server
config>service>upnp>upnp-policy

Description This command creates a text description which is stored in the configuration file to help identify the content of the entity.

The **no** form of the command removes the string from the configuration.

Default **none**

Parameters *string —* The description character string. Allowed values are any string composed of printable, 7-bit ASCII characters. If the string contains special characters (#, $, spaces, etc.), the entire string must be enclosed within double quotes.

shutdown

Syntax [**no**] **shutdown**

Context config>srevice>vprn>nat>outside>pool>address-range
config>service>vprn>nat>outside>pool
config>router>nat>outside>pool>address-range
config>router>nat>outside>pool
config>router>nat>inside>dual-stack-lite
config>router>nat>inside>nat64
config>router>nat>inside>redundancy>subscriber-identification
config>service>vprn>nat>inside>nat64
configure>router>nat>inside>deterministic>prefix
config>router>nat>inside>subscriber-id
config>router>nat>outside>pool>redundancy
config>service>ipfix>export-policy

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Description   This command administratively disables the entity. When disabled, an entity does not change, reset, or remove any configuration settings or statistics. Many entities must be explicitly enabled using the **no shutdown** command.

The **shutdown** command administratively disables an entity. The operational state of the entity is disabled as well as the operational state of any entities contained within. Many objects must be shut down before they may be deleted.

ISA Configuration Commands

nat-group

Syntax **nat-group** *nat-group-id* [**create**]
no nat-group *nat-group-id*

Context config>isa

Description This command configures an ISA NAT group.

active-mda-limit

Syntax **active-mda-limit** *number*
no active-mda-limit

Context config>isa>nat-group

Description This command configures the number of active ISAs in active-standby ISA redundancy model for NAT. The active ISAs are automatically selected by the system and any the remaining ISA beyond the number of active limit will automatically assume the standby role. An ISA in the standby mode is idle until the failure of an active ISA occurs. Standby ISA can accept traffic from exactly one failed active ISA. Multiple standby ISAs can be configured in the system to protect against multiple simultaneous failures.

Once the active ISA fails, the standby ISA will start forwarding traffic. NAT translations from the failed ISA will have to be re-initiated by the clients and consequently setup on the newly active ISA.

In order for this commands to take effect, the intra-chassis redundancy mode must be set to active-standby (**config>isa>nat-group>redundancy active-stanby**).

Default none

Parameters *number —* Specifies the active MDA limit.

Values 1 — 14

failed-mda-limit

Syntax **failed-mda-limit** [1..2]
no failed-mda-limit

Context config>isa>nat-group

Description This command configures the maximum number of supported simultaneously failures

in active-active intra-chassis NAT redundancy model. Traffic from the failed ISAs is distributed over the remaining ISA in the system. Memory resources are reserved in every ISA to accommodate new

mappings from the failed ISA. However, bandwidth is not reserved and each ISA operates at max speed in all conditions (with failure or without the failure).

NAT translations are no preserved across switchovers and consequently they will have to be re-initiated by the clients.

In order for this commands to take effect, the intra-chassis redundancy mode must be set to active-active (**config>isa>nat-group>redundancy active-active**).

Default none

Parameters *number —* Specifies the number of simultaneous ISA failures supported in active-active intra-chassis NAT redundancy model.

Values 1 — 2

mda

Syntax [**no**] **mda** *mda-id*

Context config>isa>nat-group

Description This command configures an ISA NAT group MDA.

Parameters *mda-id —* Specifies the MDA ID in the *slot/mda* format.

Values slot: 1 — 10

mda: 1 — 2

radius-accounting-policy

Syntax **radius-accounting-policy** *nat-accounting-policy*
no radius-accounting-policy

Context config>isa>nat-group

Description This command specifies the RADIUS accounting policy to use for each MDA in this ISA group.

The **no** form of the command removes the policy ID from the configuration.

Default none

Parameters *nat-accounting-policy —* Reference to the nat-accounting-policy which defines:

- Source IP addresses that will be assigned to BB-ISA cards.
- Parameters related to RADIUS server itself .
- List of RADIUS attributes that will be included in accounting messages.

redundancy

Syntaxy	**redundancy** {**active-active**|**active-standby**} **no redundancy**
Context	config>isa>nat-group
Description	This command configures intra-chassis redundancy mode for NAT.
Default	none
Parameters	**active-active** — Specifies the intra-chassis redundancy active-active mode of operation of this NAT ISA group.
	active-standby — Specifies the intra-chassis redundancy active-standby mode of operation of this NAT ISA group.

session-limits

Syntax	**session-limits**
Context	config>isa>nat-group config>service>nat
Description	This command configures the ISA NAT group session limits.

reserved

Syntax	**reserved** *num-sessions* **no reserved**
Context	config>isa>nat-group>session-limits config>service>nat
Description	This command configures the number of sessions per block that will be reserved for prioritized sessions.
Parameters	*num-sessions* — Specifies the number of sessions reserved for prioritized sessions.
	Values 0 — 4194303

watermarks

Syntax	**watermarks high** *percentage* **low** *percentage* **no watermarks**
Context	config>isa>nat-group>session-limits config>service>nat
Description	This command configures the ISA NAT group watermarks.

high *percentage* — Specifies the high watermark of the number of sessions for each MDA in this NAT ISA group.

Values 1— 100

low *percentage* — Specifies the low watermark of the number of sessions for each MDA in this NAT ISA group.

Values 0— 99

NAT Configuration Commands

nat

Syntax   [**no**] **nat**

Context   config>service>vprn
config>router

Description   This command configures, creates or deletes a NAT instance.

deterministic-script

Syntax   **deterministic-script**

Context   config>service>nat

Description   This command configures the script generated for deterministic NAT.

location

Syntax   **location** *remote-url*
no location

Context   config>service>nat>>deterministic-script

Description   This command configures the remote location where the Python script will be exported. The Python script is then used offline to perform reverse query. If this command is configured, the Python script generation is triggered by any modification of the deterministic NAT configuration. The new script reflects the change in mappings caused by configuration change. However, the script must be manually exported to the outside location with the **admin nat save-deterministic-nat** command. The script cannot be stored locally on the system.

The script allows two forms of queries:

- Forward - input is NAT inside parameters, output is NAT outside parameters.
- Backward – input is NAT outside parameters, output is NAT inside parameters.

Forward Query:

```
user@external-server:/home/ftp/pub/det-nat-script$ ./det-nat.py -f -s 10 -a 20.0.5.10
```

output:

```
subscriber has public ip address 85.0.0.1 from service 0 and is using ports [1324 -
1353]
```

Reverse Query:

```
user@external-server:/home/ftp/pub/det-nat-script$./det-nat.py -b -s 0 -a 85.0.0.1 -
p 3020
```

output:

```
subscriber has private ip address 20.0.5.66 from service 10
```

Default none

Parameters *remote-url —* A remote location where the script is stored:
  [{ftp://|tftp://}<login>:<pswd>@ <remote-locn>/][<file-path>]
  Maximum length is 180 characters.

inside

Syntax **inside**

Context config>service>vprn>nat
config>router>nat

Description This command enters the "inside" contex to configure the inside NAT instance.

outside

Syntax **outside**

Context config>service>vprn>nat
config>router>nat

Description This command enters the "outside" context to configure the outside NAT instance.

downstream-ip-filter

Syntax **downstream-ip-filter** *filter-id*
no downstream-ip-filter

Context config>router>nat>outside
config>service>vprn>nat>outside

Description This command specifies a filter to apply to the downstream traffic after routing in the the outside
virtual router instance and before the NAT function; it is useful for traffic that bypasses the egress
filters applied in the inside virtual router instance, such as DSLite traffic.

The **no** form of the command removes the filter from the configuration.

Parameters *filter-id —* Specifies a filter up to 64 characters in length.

downstream-ipv6-filter

Syntax	**downstream-ipv6-filter** *filter-id* **no downstream-ipv6-filter**
Context	config>router>nat>outside config>service>vprn>nat>outside
Description	This command configures the ipv6-filter for downstream traffic. This filter is applied to downstream traffic after it leaves the outside virtual router instance but before the NAT function is applied. This is useful for shared v6 filters that apply to all v6 DSM hosts. The **no** form of the command removes the filter from the configuration.
Default	no downstream-ipv6-filter
Parameters	*filter-id* — Specifies an IPv6 filter up to 64 characters in length.

mtu

Syntax	**mtu** [512..9000] **no mtu**
Context	config>service>vprn>nat>outside
Description	This command configures the Maximum Transmission Unit (MTU) for downstream traffic flowing through this router (as outside NAT router). The system fragments IP datagrams exceeding the MTU. The **no** form of the command reverts to the default.
Default	0
Parameters	[512..9000] — Specifies the MTU for downstream traffic.

destination-prefix

Syntax	[**no**] **destination-prefix** *ip-prefix/length*
Context	config>service>vprn>nat>inside config>router>nat>inside
Description	This command configures a destination prefix. An (internal) static route will be created for this prefix. All traffic that hits this route will be subject to NAT. The system will not allow a destination-prefix to be configured if the configured nat-policy refers to an IP pool that resides in the same service (as this would result in a routing loop).
Parameters	*ip-prefix* — Specifies the IP prefix; host bits must be zero (0).
	Values a.b.c.d
	length — Specifies the prefix length.

Values 0 — 32

deterministic

Syntax **deterministic**

Context config>service>vprn>nat>inside
configure>router>nat>inside

Description This command enables the context to configure deterministic NAT.

classic-lsn-max-subscriber-limit

Syntax **classic-lsn-max-subscriber-limit** *max*
no classic-lsn-max-subscriber-limit

Context config>service>vprn>nat>inside>deterministic
configure>router>nat>inside>deterministic

Description This command affects ingress hashing of the subscribers for deterministic NAT. It will also affect hashing of the subscribers for non-deterministic NAT if the both types of NAT are configured simultaneously. The hashing will ensure that traffic load is distributed over multiple MS-ISAs in the system. For deterministic LSN44, $(32 - n)$ bits of the source IP address will be considered for hashing, where 2^n= classic-lsn-max-subscriber-limit.

The scope of this command is the inside routing instance. This command must match the largest subscriber limit of all pools that are referenced by nat-policies configured within the corresponding inside routing instance.

This parameter must be configured before any prefix is configured and can be modified only if there are no prefixes configured under the deterministic NAT CLI hierarchy.

If non-deterministic NAT is not used simultaneously with deterministic NAT within a routing context, then hashing for non-deterministic NAT will be performed based on the subscriber.

Default none

Parameters *max —* The power of 2 (2^n) number that must match the largest subscriber limit number in a deterministic pool referenced from this inside routing instance. The range for this command is the same as the subscriber-limit command under the pool hierarchy.

dslite-max-subscriber-limit

Syntax **dslite-max-subscriber-limit** *max*
no dslite-max-subscriber-limit

Context config>service>vprn>nat>inside>dslite
configure>router>nat>inside>dslite

configure>router>nat>inside>deterministic

Description   This command sets the value for the number of high order bits of the source IPv6 address that will be considered as DS-Lite subscriber. The remaining bits of the source IPv6 address will be masked off, effectively aggregation all IPv6 source addresses under the configured prefix length into a single DS-Lite subscriber. Source IPv4 addresses/ports of the traffic carried within the DS-Lite subscriber will be translated into a single outside IPv4 address and the corresponding deterministic port-block (port-blocks can be extended).

The range of values for subscriber-prefix-length in non-deterministic DS-Lite is limited from 32 to 64 (a prefix will be considered as a DS-Lite subscriber) or it can be set to a value of 128 (the source IPv6 address is considered as a DS-Lite subscriber).

In cases where deterministic DS-Lite is enabled in a giver inside routing context, the range of values of the subscriber-prefix-length depends on the value of dslite-max-subscriber-limit parameter as follows:

$$\textbf{subscriber-prefix-length} - n = [32..64,128]$$

$$\textbf{where } n = \log 2(\textbf{dslite-max-subscriber-limit})$$

[or in an alternate form: dslite-max-subscriber-limit = 2^n.]

In other words the largest prefix length for the deterministic DS-lite subscriber will be 32+n, where n = log2(dslite-max-subscriber-limit). The subscriber prefix length can extend up to 64 bits. Beyond 64 bits for the subscriber prefix length, there only one value is allowed: 128. In the case n must be 0, which means that the mapping between B4 elements (or IPv6 address) and the IPv4 outside addresses is in 1:1 ratio (no sharing of outside IPv4 addresses).

This parameter can be changed only when there are no deterministic prefixes configured in the same routing context.

Default   128

Parameters   *max* — In non-deterministic DS-Lite this value can be 32 — 64,128 , assuming that the deterministic DS-Lite is not concurrently enabled in the same inside routing context.

In case that deterministic DS-Lite is enabled, this value can be within the range [(32+n)..64,128] where n = log2(dslite-max-subscriber-limit). The value of 128 is allowed only when n=0 (each subscriber is mapped to a single outside IPv4 IP address).

prefix

Syntax   **prefix** *ip-prefix/length* **subscriber-type** *nat-sub-type* **nat-policy** *nat-policy-name* [**create**]
prefix *p-prefix/length* **subscriber-type** *nat-sub-type*
no prefix *ip-prefix/length* subscriber-type *nat-sub-type*

Context   config>service>vprn>nat>inside>deterministic
configure>router>nat>inside>deterministic

Description   This command is applicable only to deterministic NAT (LSN44 or DS-Lite). It configures prefixes on the inside and their association with outside deterministic pools via the nat-policy. Subscribers within the prefix will be deterministically mapped to outside IP addresses and corresponding port-ranges in the associated pool.

Multiple prefixes within an inside routing instance can be defined and they can reference different nat-policies (and therefore outside pools and routing instances). Moreover, prefixes from multiple routing instances can share the same deterministic pool.

Non-deterministic NAT can be used simultaneously with deterministic NAT within the same inside routing instance. However, they cannot share the same pool.

Prefixes can be added/removed under the condition that the associated deterministic pool is in a 'no shutdown' mode.

Removing a prefix or modifying the map statement under it requires that the prefix be in a 'shutdown' mode.

The subscribers under the prefix are mapped deterministically into the outside IPv4 addresses and port ranges. Note that the subscribers in LSN44 are the IPv4 addresses under the configured prefix, while in DS-Lite the subscribers are IPv6 source addresses that fall under the configured prefix OR IPv6 sub-prefixes whose length is determined by the DS-Lite subscriber-prefix-length command.

Default   no prefix

Parameters   *ip-prefix/length* — A prefix on the inside encompassing subscribers that will be deterministically mapped to an outside IP address and port block in the corresponding pool.

Values	<ip-prefix/ip-pref*>	<ipv4-prefix>/<ipv4-prefix-length> |
		<ipv6-prefix>/<ipv6-prefix-length>
	<ipv4-prefix>	a.b.c.d (host bits must be 0)
	<ipv4-prefix-length>	[0..32]
	<ipv6-prefix>	x:x:x:x:x:x:x:x (eight 16-bit pieces)
		x:x:x:x:x:x:d.d.d.d
		x - [0..FFFF]H
		d - [0..255]D

<ipv6-prefix-length> : [0..128]
<nat-sub-type>   : classic-lsn-sub|dslite-lsn-sub
<nat-policy-name> Reference to a nat-policy that points to an outside pool and outside routing instance up to 32 characters in length.

map

Syntax   **map start** *inside-ip-address* **end** *inside-ip-address* **to** *outside-ip-address*
            no map start *inside-ip-address* **end** *inside-ip-address*

Context   config>service>vprn>nat>inside>deterministic>prefix
            configure>router>nat>inside>deterministic>prefix

Description   This command is applicable to prefixes in deterministic NAT (LSN44 and DS-Lite). Its purpose is to split the number of subscribers within the configured prefix over available sequence of outside IP addresses.

There are several rules guiding the usage of the map statement:

- If the number of subscribers[1] per configured prefix is greater than the subscriber-limit per outside IP parameter (2^n), then the lowest n bits of the map start <inside-addr-start> must be set to 0.

- If the number of subscribers per configured prefix is equal or less than the subscriber-limit per outside IP parameter (2^n), then only one map command for this prefix is allowed. In this case there is no restriction on the lower n bits of the map start <inside-ip-addres>. The range of the inside IP addresses in such map statement represents the prefix itself.

- <outside-ip-address> in the map statements must be unique amongst all map statements referencing the same pool. In other words, two map statements cannot reference the same <outside-ip-address> in a pool.

To modify map statements, the corresponding prefix must be in a shutdown mode.

Map statements can be configured automatically by the system, as soon as the prefix is enabled (no shutdown state) or they can be configured manually by the operator while the prefix is disabled.

The following is an example of the map statement for the LSN44 case:

- The subscriber-limit in the pool is 128

- The pool has an address range 128.251.0.1 - 128.251.0.10

- The prefix is 10.0.0.0/24

- The map statement is configured as:

  map start 10.0.0.0 end 10.0.0.255 to 128.251.0.1

Since each outside IP address can accommodate only 128 hosts, the subscribers (IPv4 addresses in LSN44) from the 10.0.0.0/24 prefix will be split and mapped into two outside IP addresses

  10.0.0.0 – 10.0.0.127 (10.0.0.0/25) - 128.251.0.1

  10.0.0.128 – 10.0.0.255 (10.0.0.128/25) - 128.251.0.2

The first IP address range will be mapped to the 'to' address in the map statement => 128.251.0.1. The second IP address range will be mapped into the next consecutive IP address in the pool assuming that this IP address is free. In this case this consecutive address (128.251.0,2) would not be shown in the map statement.

For Deterministic DS-Lite, the example would be:

- Tthe subscriber-limit in the pool is 128

- The pool has an address range 128.251.0.1 - 128.251.0.10

- The prefix is 2001:DB8::/56

- The subscriber-prefix-length = 64

- The map statement is configured as:

  map start 2001:BD8::/64 end 2001:BD8::FF:0:0:0/64 to 128.251.0.1

There are 256 DS-Lite subscribers within the 2001:DB8::/56 prefix. Each subscriber will be a /64 IPv6 prefix as dictated by the subscriber-prefix-length command.

Since each outside IP address can accommodate only 128 hosts, the subscribers from the 2001:DB8::/56 prefix will be split and mapped into two outside IP addresses

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1.Subscriber in LSN44 is equals to an inside IPv4 address, while in DS-Lite, the subscriber can be an IPv6 address or IPv6 prefix. If the subscriber-prefix-length command is set to 128, then the subscriber in DS-Lite is an IPv6 address. Otherwise it will be an IPv6 prefix with length in the range [32..64] as set by the subscriber-prefix-length command.

2001:DB8:: – 2001:DB8:0:7F:: (2001:DB8::/57) - 128.251.0.1

2001:DB8:0:80:: – 2001:DB8:0:FF::(2001:DB8:0:FF::/57) - 128.251.0.2

The first IP prefix range will be mapped to the 'to' address in the map statement => 128.251.0.1. The second IP prefix range will be mapped into the next consecutive IP address in the pool assuming that this IP address is free. In this case this consecutive address (128.251.0,2) would not be shown in the map statement.

Default   By default, the system will automatically divide the prefix and create the map statements when the prefix command is enabled (no shutdown). However, this automatic map provisioning can be overruled by manual configuration.

Parameters   *inside-ip-start* — Start IPv4/v6 address or IPv6 prefix on the inside.

inside-ip-end — End IPv4/v6 address or IPv6 prefix on the inside. The number of subscribers (range of inside IPv4 addresses in LSN44 or IPv6 addresses or prefixes in DS-Lite) in the map statement does not have to be a power of 2. Rather it has to be a multiple of a power of two ∨ $m * 2^n$, where m is the number of consecutive outside IP addresses to which the subscribers are mapped and the 2^n is the subscriber-limit per outside IP.

outside-ip-start — The first outside IPv4 address in the pool to which the subscribers are mapped. In case that the number of subscribers in the map statement is larger than the subscriber-limit for the outside-ip address, the consecutive outside IP addresses will be used for additional mappings. Those additional (consecutive) outside IP addresses are not shown in the map statement (only the first address is shown in the map statement).

dual-stack-lite

Syntax   **dual-stack-lite**

Context   config>service>vprn>nat>inside
config>router>nat>inside

Description   This command enables the context to configure Dual Stack Lite parameters.

In order for the ds-lite feature to work, the ingress traffic (the IPv6 traffic that has to go to the NAT) must come from an IOM-3. If an IOM-2 is used, the IPv6 packet with destination the NAT will be dropped and an ICMP packet will be sent back.

address

Syntax   [**no**] **address** *ipv6-address*

Context   config>router>nat>inside>dual-stack-lite
config>service>vprn>nat>inside>dual-stack-lite

Description   This command configures the IP address of the NAT redundancy peer in the realm of this virtual router instance.

subscriber-prefix-length

Syntax	**subscriber-prefix-length** *prefix-length* **no subscriber-prefix-length**
Context	config>router>nat>inside>dual-stack-lite
Description	This command sets the value for the number of high order bits of the source IPv6 address that will be considered as DS-Lite subscriber. The remaining bits of the source IPv6 address will be masked off, effectively aggregation all IPv6 source addresses under the configured prefix length into a single DS-Lite subscriber. Source IPv4 addresses/ports of the traffic carried within the DS-Lite subscriber will be translated into a single outside IPv4 address and the corresponding deterministic port-block (port-blocks can be extended).

The range of values for subscriber-prefix-length in non-deterministic DS-Lite is limited from 32 to 64 (a prefix will be considered as a DS-Lite subscriber) or it can be set to a value of 128 (the source IPv6 address is considered as a DS-Lite subscriber).

In cases where deterministic DS-Lite is enabled in a giver inside routing context, the range of values of the subscriber-prefix-length depends on the value of dslite-max-subscriber-limit parameter as follows:

subscriber-prefix-length – n = [32..64,128]

where n = log2(dslite-max-subscriber-limit)

[or in an alternate form: dslite-max-subscriber-limit = 2^n.]

In other words the largest prefix length for the deterministic DS-lite subscriber will be 32+n, where n = log2(dslite-max-subscriber-limit). The subscriber prefix length can extend up to 64 bits. Beyond 64 bits for the subscriber prefix length, there only one value is allowed: 128. In the case n must be 0, which means that the mapping between B4 elements (or IPv6 address) and the IPv4 outside addresses is in 1:1 ratio (no sharing of outside IPv4 addresses).

This parameter can be changed only when there are no deterministic prefixes configured in the same routing context.

The **no** form of the command reverts to the default.

Default	128
Parameters	*prefix-length* — In non-deterministic DS-Lite this value can be [32..64,128], assuming that the deterministic DS-Lite is not concurrently enabled in the same inside routing context. In case that deterministic DS-Lite is enabled, this value can be within the range [(32+n)..64,128] where n = log2(dslite-max-subscriber-limit). The value of 128 is allowed only when n=0 (each subscriber is mapped to a single outside IPv4 IP address).

> **Values**   32 — 64

ip-fragmentation

Syntax **ip-fragmentation {disabled|fragment-ipv6|fragment-ipv6-unless-ipv4-df-set}**
no ip-fragmentation

Context configure>router>nat>inside>dslite>address
configure>router>nat>inside>>nat64
configure>service>vprn>nat>inside>nat64
configure>service>vprn>nat>inside>dslite>address

Description This command configures downstream IPv6 fragmentation behavior in DS-lite and NAT64. IPv6 fragmentation is performed in the ISA. IPv4 fragmentation is not affected by this command. If desired, downstream IPv4 packet can be fragmented in the carrier IOM before the packet reaches ISA (and the NAT function). The IPv4 fragmentation in the downstream direction can be set by the **configure>router/vprn>nat>outside>mtu** command

DS-Lite IPv6 Fragmentation in Downstream Direction (IPv4 to IPv6)

In case that the length of the received IPv4 packet is larger than the configured tunnel-mtu value while fragmentation is allowed, the resulting IPv6 packet will be fragmented (IPv4 is tunneled within IPv6). The maximum size of the of the fragmented IPv6 packet will be 48bytes larger than the configured tunnel-mtu value. This is due to the size of the tunneling IPv6 header: 40bytes basic IPv6 header + 8 bytes of extended fragmentation IPv6 header.

In case that fragmentation is not allowed while the IPv4 packet size is larger than configured tunnel-mtu size, the IPv4 packet will be dropped and an ICMPv4 Datagram Too Big message will be generated towards the source. The advertised mtu size in that ICMP message will be set to configured tunnel-mtu value.

NAT64 IPv6 Fragmentation in Downstream Direction (IPv4to IPv6)

In contrast to DS-lite, NAT64 transport is not based on tunneling. Instead, IP headers are translated between IPv4 and IPv6. Consequently, NAT64 fragmentation operates based on the ipv6-mtu, as opposed to tunnel-mtu in DS-lite which represents the size of the tunnel payload (IPv4 packet).

In case that the length of the translated IPv6 packet exceeds the size of the configured ipv6-mtu value while fragmentation is allowed, the resulting IPv6 packet will be fragmented. The maximum size of the of the fragmented IPv6 packet will be the configured ipv6-mtu value.

In case that fragmentation is not allowed while the translated IPv6 packet size is larger than configured ipv6-mtu size, the IPv4 packet (that is supposed to be translated into IPv6) will be dropped and an ICMPv4 Datagram Too Big message will be generated towards the source. The advertised mtu size in that ICMP message will be set to the ipv6-mtu value minus 28bytes. The 28bytes comes from the size of the IPv6 overhead of the translated packet (20bytes difference between the IP header sizes ∨ 40bytes in IPv6 vs 20bytes in IPv4; 8 bytes for extended IPv6 fragmentation header).

Default disabled

Parameters **disabled** — IPv6 Fragmentation is disabled. In case that the packet size is larger

than what is set by the mtu value (tunnel-mtu or ipv6-mtu) , the IPv4 packet will be dropped and ICPMv4 Datagram Too Big messages will be sent back to the source.

fragment-ipv6 — IPv6 fragmentation will be performed in all cases, regardless of the DF bit setting in the tunneled/translated IPv4 packet.

fragment-ipv6-unless-ipv4-df-set — IPv6 Fragmentation will be performed only in cases when DF bit in tunneled/translated IPv4 packet is cleared.

tunnel-mtu

Syntax	**tunnel-mtu** *mtu-bytes* **no tunnel-mtu**
Context	config>router>nat>inside>dual-stack-lit>address config>service>vprn>nat>inside>dual-stack-lite
Description	This command sets the size of the payload in IPv6 packet in downstream DS-lite direction. The payload is, in essence, the tunneled IPv4 packet.

l2-aware

Syntax	**l2-aware**
Context	config>router>nat>inside
Description	This command enters the "l2-aware" context for configuration specific to Layer 2-aware NAT.

address

Syntax	[**no**] **address** *ip-address/mask*	
Context	config>router>nat>inside	
Description	This command configures the IP address and mask of the subnet.	
	The **no** form of the command removes the IP address and prefix length from the configuration.	
Default	none	
Parameters	*ip-address/mask* — Specifies the IP address and maskof the subnet.	
	Values	ip-address: a.b.c.d mask: 16 — 32

nat64

Syntax	[**no**] **nat64**
Context	config>service>vprn>inside
Description	This command enables the context to configure NAT64. The **no** form of the command disables NAT64.

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drop-zero-ipv4-checksum

Syntax	[no] **drop-zero-ipv4-checksum**
Context	config>service>vprn>inside>nat64
Description	This command specifies if UDP datagrams with zero IPv4 checksum are dropped.
	If this command is disabled, the system calculates the IPv6 checksum for each such datagram.

ignore-tos

Syntax	[no] **ignore-tos**
Context	config>service>vprn>inside>nat64
Description	This command specifies if the IPv4 Type Of Service (TOS) is ignored and the IPv6 traffic class bits set to zero.
	If this command is disabled, the system copies the IPv4 TOS into the IPv6 traffic class.
Default	disabled

insert-ipv6-fragment-header

Syntax	[no] **insert-ipv6-fragment-header**
Context	config>service>vprn>inside>nat64
Description	This command specifies if the system always inserts an IPv6 fragment header, to indicate that the sender allows fragmentation.
	The **no** form of the command does not allow the system to insert an IPv6 fragment header.
Default	disabled

l2-aware

Syntax	**l2-aware**
Context	config>services>vprn>nat>inside
Description	This command enters the "l2-aware" context for configuration specific to Layer 2-aware NAT.

address

Syntax	[**no**] **address** *ip-address/mask*
Context	config>services>vprn>nat>inside>l2-aware
Description	This command configures a Layer 2-aware NAT address. This address will act as a local address of the system. Hosts connected to the inside service will be able to ARP for this address. To verify connectivity, a host can also ping the address. This address is typically used as next hop of the default route of a Layer 2-aware host. The given mask defines a Layer 2-aware subnet. The (inside) IP address used by anLayer 2-aware host must match one of the subnets defined here or it will be rejected.
Parameters	*ip-address —* Specifies the IP address in a.b.c.d format.
	mask — Specifies the mask.
	Values 16 — 32

nat-policy

Syntax	**nat-policy** *nat-policy-name* **no nat-policy**
Context	config>services>vprn>nat>inside config>router>nat>inside
Description	This command configures the NAT policy that will be used for large-scale NAT in this service. The **no** form of the command removes the policy name from the configuration.
Parameters	*nat-policy-name —* Specifies the NAT policy name.
	Values 32 chars max

nat64

Syntax	|[**no**] **nat64**
Context	config>service>vprn>nat>inside config>router>nat>inside
Description	This command enables the context to configure NAT64 parameters. The **no** form of the command disables NAT64.

drop-zero-ipv4-checksum

Syntax	[**no**] **drop-zero-ipv4-checksum**
Context	config>service>vprn>nat>inside>nat64 config>router>nat>inside>nat64

Description   This command enables the NAT64 node to drop received UDP datagrams with zero IPv4 checksum. By default, checksum is re-calculated for non-fragmented datagrams.

The **no** form of the command disabales the command.

Default   disabled

ignore-tos

Syntax   [no] **ignore-tos**

Context   config>service>vprn>nat>inside>nat64
config>router>nat>inside>nat64

Description   This command specifies whether the IPv4 Type Of Service (TOS) is ignored and the IPv6 traffic class bits set to zero.

When disabled, the system copies the IPv4 TOS into the IPv6 traffic class.

The **no** form of the command recognizes the IPv4 Type Of Service (TOS).

Default   disabled

insert-ipv6-fragment-header

Syntax   [no] **insert-ipv6-fragment-header**

Context   config>service>vprn>nat>inside>nat64
config>router>nat>inside>nat64

Description   This command specifies whether the NAT64 node will insert IPv6 fragment header to IPv6 packets for which the DF bit is not set in the corresponding IPv4 packet, and is not already a fragment.

The **no** form of the command disables the insertion.

Default   disabled

ipv6-mtu

Syntax   **ipv6-mtu** [1280..9212]
no ipv6-mtu

Context   config>service>vprn>nat>inside>nat64
config>router>nat>inside>nat64

Description   This command sets the size of the IPv6 downstream packet in NAT64. This packet is translated from IPv4.

The **no** form of the command reverts to the default.

Default   11520

Parameters   [1280..9212] — Specifies the IPv6 MTU.

> **Values**   1280 — 9212

prefix

Syntax   **prefix** *ipv6-prefix/prefix-length*
no prefix

Context   config>service>vprn>nat>inside>nat64
config>router>nat>inside>nat64

Description   This command configures the IPv6 prefix used to derive the IPv6 address from the IPv4 address, and is same as the prefix used by DNS64 to generate AAAA record returned for IPv4 endpoint resolution. NAT64 node announces this prefix in routing to attract traffic from IPv6 hosts. If the prefix is not configured, then a well known prefix, 64:FF9B::/96, is used.

The **no** form of the command removes the prefix from the NAT64 configuration.

Parameters   *ipv6-prefix/prefix-length —* Specifies the NAT64 destination prefix.

> **Values**   ipv6-prefix: x:x:x:x:x:x:x:x   (eight 16-bit pieces)
>   x:x:x:x:x:x:d.d.d.d
>   x - [0..FFFF]H
>   d - [0..255]D
>   prefix-length   32, 40, 48, 56, 64, 96

set-tos

Syntax   **set-tos** [0..255]
no set-tos

Context   config>service>vprn>nat>inside>nat64
config>router>nat>inside>nat64

Description   This command specifies the value of the IPv4 Type Of Service (TOS) field. When enabled, the NAT64 node ignores IPv6 traffic-class and sets IPv4 TOS to supplied tos-value in the translated IPv4 packet.

The **no** form of the command reverts to the default.

Default   0

Parameters   [0..255] — Sets the IPv4 TOS to a fixed value the IPv6 Traffic Class and set the IPv4 TOS to a fixed value and ignores the IPv6 traffic class.

subscriber-prefix-length

Syntax	**subscriber-prefix-length** *prefix-length*
	no subscriber-prefix-length
Context	config>service>vprn>nat>inside>nat64
	config>router>nat>inside>nat64
Description	This command specifies the IPv6 address prefix length to be used for the NAT64 subscribers in this virtual router instance.
	The no form of the command
Default	128
Parameters	*prefix-length* — Specifies the subscriber identification for Large Scale NAT.
	Values 32 — 64

redundancy

Syntax	**redundancy**
Context	config>router>nat>inside
	config>service>vprn>nat>inside
Description	This command enables the context to configure redundancy parameters.

peer

Syntax	**peer** *ipv4-address*
	no peer
Context	config>router>nat>inside>redundancy
	config>service>vprn>nat>inside>redundancy
Description	This command is used in LSN44 multi-chassis redundancy in conjunction with filters. The configuredpeer address is an IPv4 address that is configured under an interface on the peering LSN44 node (active or standby). This IPv4 interface address is advertized via routing on the inside in order to attract traffic from the standby to the active LSN44 node.
	If configured, the steering-route will be advertized only from the active LSN44 node. Consequently, upstream traffic for LSN44 will be attracted to the active LSN44 node. The nat action in the ipv4-filter on the active LSN44 node will forward traffic to the local MS-ISA where LSN44 function is performed. However, in that case that upstream traffic somehow arrives on the standby LSN44 node, the nat action in the IPv4-filter will forward traffic to the peer address (active LSN44 node).
	The **no** form of the command removes the peer ipv4-address from the configuration.
Default	none
Parameters	*ipv4-address* — Specifies the IP address of the NAT redundancy peer.
	Values ipv4-address: a.b.c.d

peer6

Syntax	**peer6** *ipv6-address* **no peer6**
Context	config>router>nat>inside>redundancy config>service>vprn>nat>inside>redundancy
Description	This command is used in NAT64 multi-chassis redundancy in conjunction with filters. The configured peer6 address is an IPv6 address configured under an interface on the peering NAT64 node (active or standby). This IPv6 interface address is advertized via routing on the inside in order to attract traffic from the standby to the active NAT64 node.

Under normal circumstances, the NAT64 prefix will be advertized only from the active NAT64 node. Consequently, upstream traffic for NAT64 will be attracted to the active NAT64 node. The nat action in the ipv6-filter on the active NAT64 node will forward traffic to the local MS-ISA where NAT64 function is performed. However, in that case that upstream traffic somehow arrives on the standby NAT64 node, the nat action in the IPv6-filter will forward traffic to the peer6 address (active NAT64 node).

The **no** form of the command removes the peer6 ip-address from the configuration.

Default	none
Parameters	*ipv6-address* — Specifies the IPv6 address of the NAT redundancy peer.

Values	ipv6-address:	ipv6-address - x:x:x:x:x:x:x:x (eight 16-bit pieces)
		x:x:x:x:x:x:d.d.d.d
		x - [0..FFFF]H
		d - [0..255]D

steering-route

Syntax	**steering-route** *ip-prefix/length* **no steering-route**
Context	config>router>nat>inside>redundancy config>service>vprn>nat>inside>redundancy
Description	This command is optionally used in LSN44 multi-chassis redundancy when filters are used on the inside to send traffic destined for the LSN44 function to MS-ISA, where NAT is performed.

If configured, the steering-route is advertised only from the active LSN44 node: the purpose is to bring the LSN44 node activity awareness to downstream routers. In this fashion, downstream routers can make a more intelligent decision when forwarding traffic in the upstream direction. Based on the steering-route, traffic can be sent directly towards the active LSN44 node. This route avoids an extra forwarding hop which would ensue in the case without LSN44 activity awareness, where the upstream traffic can be forwarded to the standby LSN44 node and then to the active LSN44 node.

LSN44 node activity (active/stanby) is evaluated per isa-group based on monitoring routes advertized on the outside.

The **no** form of the command removes the ip-prefix/length from the configuration.

Default   none

Parameters   *ip-prefix/length —* Specifies the IP address and length of the steering route.

Values	ip-prefix: a.b.c.d
	ip-prefix-length: 0 — 32

subscriber-identification

Syntax   **subscriber-identification**

Context   config>router>nat>inside

Description   This command enables the context to configure subscriber identification for Large Scale NAT.

attribute

Syntax   **attribute** [**vendor** *vendor-id*] **attribute-type** *attribute-type*
            no attribute

Context   config>router>nat>inside>subscriber-id
            configure>service>vprn>nat>inside>subscriber-identification

Description   This command defines the attribute that will in addition to framed-ip-address (inside IP address) and service-id be used for correlating BNG subscriber with the NAT subscriber.

Only a single attribute at the time can be configured. The attribute will be extracted from the BNG accounting start and/or interim-update messages via Radius accounting proxy server. This attribute can be then optionally passed to the Large Scale NAT44 accounting server. User-name attribute (if included) in Large Scale NAT44 accounting messages will be automatically set to the subscriber-id string.

The attribute parameter can be changed at any given time and the change will be reflected automatically when the next interim-update message from the BNG host is received by Radius accounting proxy.

In case that the BNG accounting message in RADIUS accounting proxy does not contain this attribute, subscriber aware Large Scale NAT44 functionality for this particular subscriber will be disabled.

Default   attribute vendor "alu" attribute-type "alc-sub-string"

Parameters   **vendor** *vendor-id* — specifies the RADIUS vendor ID.

Values	standard, alu, 3gpp
Default	alu

attribute-type *attribute-type* **—** Specifies the RADIUS attribute to be used as subscriber. identifier

Values   **alc-sub-string (alu)** — Subscriber-id string (Alc-Subsc-ID-Str) is cached in Large Scale NAT44 application and used to correlate Large Scale NAT44 subscriber to BNG subscriber.

user-name (stnd) — User-Name standard Radius attribute is cached in Large Scale NAT44 application and is used to correlate Large Scale NAT44 subscriber to BNG subscriber.

class (stnd) — Class standard Radius attribute is cached in Large Scale NAT44 application and is used to correlate Large Scale NAT44 subscriber to BNG subscriber. Class attribute is initially set and send by Radius server. As such it must be echoed by BNG in all accounting messages.

station-id (stnd) — Calling-Station-Id Radius attribute is cached in Large Scale NAT44 application and is used to correlate Large Scale NAT44 subscriber to BNG subscriber.

imsi (3gpp) — International Mobile Subscriber Identification is used in WiFI Offload applications as a SIM card identifier.

imei (3gpp) — International Mobile Equipment Identification is used in WiFI Offload applications as a physical phone device identifier.

drop-unidentified-traffic

Syntax   [**no**] **drop-unidentified-traffic**

Context   config>router>nat>inside>subscriber-id

Description   When this command denies address translation to subscribers that have not been identified via accounting messages sent by BNG and received by Radius accounting proxy. This command has effect only in Subscriber Aware Application.

Default   no drop-unidentified-traffic

radius-proxy-server

Syntax   **radius-proxy-server router** *router-instance* **name** *server-name*
no radius-proxy-server

Context   config>router>nat>inside>subscriber-id
configure>service>vprn>nat>inside>subscriber-identification

Description   This command configures RADIUS proxy server parameters. This is a reference to a RADIUS accounting proxy server in Subscriber Aware Large Scale NAT44 application. RADIUS accounting proxy server will cache attributes related to a BNG subscriber as they are received in standard accounting messages (RFC 2866). Radius accounting proxy server can be configured in any routing instance within 7750 SR.

Default   none

Parameters   **router** *router-instance* — Specifies the routing instance in which the RADIUS accounting proxy is configured.

name *server-name* — Specifies the name reference to the RADIUS accounting proxy server that is instantiated in 7750 SR.

mtu

Syntax   **mtu** [512..9000]
no mtu

Context   config>router>nat>outside

Description   This command configures the MTU for downstream traffic flowing through this router (as outside NAT router). The system fragments IP datagrams exceeding the MTU.

Default   none

Parameters   [512..9000] — Specifies the MTU for downstream traffic.

pool

Syntax	**pool** *nat-pool-name* [**nat-group** *nat-group-id* **type** *pool-type* [**applications** *applications*] **create**] **no pool** *nat-pool-name*
Context	config>service>vprn>nat>outside config>router>nat>outside
Description	This command creates a NAT pool in the outside routing context. The nat pool defines the parameters that will be used for IP address and port translation within the pool.
Default	none
Parameters	*nat-pool-name —* Specifies the NAT pool name.

> **Values**   32 chars max

nat-group-id — Specifies the NAT group ID.

> **Values**   1 — 4

create — This parameter must be specified to create the instance.

pool-type — Species the pool type, either large-scale or L2-aware.

applications *applications* **—** This creation-time parameter configures the nat-pool for protocol agnostic operation. The IP addresses are translated in 1:1 fashion regardless of the protocol. No ports are translated for TCP or UDP traffic. Traffic through the pool can be initiated from inside or outside. When nat-pool is configured in agnostic mode, certain parameters in the pool are pre-set and cannot be changed:

- mode one-to-one
- no port-forward-range
- no port-reservation
- subscriber-limit 1
- deterministic port-reservation 65536.

This pool is used to configure static 1:1 NAT, where the operator have the control of the mapping between the inside and outside IP addresses. The static IP address mapping is using CLI constructs used in deterministic NAT (prefix and map deterministic NAT commands in the inside routing context).

ALG for TCP/UDP are supported in protocol agnostic pool.

> **Values**   agnostic

address-range

Syntax	**address-range** *start-ip-address end-ip-address* [**create**] **no address-range** *start-ip-address end-ip-address*
Context	config>service>vprn>nat>outside>pool

config>router>nat>outside>pool

Description   This command configures a NAT address range.

Parameters   *start-ip-address —* Specifies the beginning IP address in a.b.c.d form.

end-ip-address — Specifies the ending IP address in a.b.c.d. form.

create — This parameter must be specified to create the instance.

drain

Syntax   [**no**] **drain**

Context   config>service>vprn>nat>outside>pool>address-range
config>router>nat>outside>pool>address-range

Description   This command starts or stops draining this NAT address range. When an address-range is being drained, it will not be used to serve new hosts. Existing hosts, however, will still be able to use the address that was assigned to them even if it is being drained.An address-range can only be deleted if the parent pool is shut down or if the range itself is effectively drained (no hosts are using the addresses anymore).

mode

Syntax   **mode** {**auto** | **napt** | **one-to-one**}
no mode

Context   config>router>nat>outside>pool

Description   This command specifies the mode of operation of this NAT address pool.

The no form of the command reverts to the default.

Default   auto

Parameters   {auto | napt | one-to-one} — Specifies the mode of operation of this NAT pool.

port-forwarding-range

Syntax   **port-forwarding-range** *range-end*
no port-forwarding-range

Context   config>router>nat>outside>pool>address-range

Description   This command configures the end of the port range available for port forwarding. The start of the range is always equal to one.

Note that the number of ports that can be configured is half of the available block => 64512 : 2 = 32256

In combination with port-forwarding-range the formulas are:

"max port-reservation blocks" = 65535 - "port-forwarding-range"

"max port-reservation ports" = (65535 - "port-forwarding-range") / 2

with:

the default min value for "port-forwarding-range" = 1023

Also, the same applies for max port-forwarding-range if the port-reservation is already configured:

"max port-forwarding-range" = 65535 - "port-reservation blocks"

"max port-forwarding-range" = 65535 - ("port-reservation ports" * 2)

The **no** form of the command reverts to the default.

Default	1023
Parameters	*range-end —* Pecifies the end of the port range available for port forwarding.
	Values 1023 — 65535

deterministic

Syntax	**deterministic**
Context	config>service>vprn>nat>outside>pool
Description	This command configures deterministic NAT for this pool

port-reservation

Syntax	**port-reservation** *num-ports*
	no port-reservation
Context	config>service>vprn>nat>outside>pool>deterministic
Description	This command is applicable only to deterministic NAT. It configures the number of deterministic ports per subscriber (for example a subscriber is an inside IP address in LSN44 or IPv6 address or prefix in DS-lite). Once this command is enabled, the pool will transition into deterministic mode of operation. This means that the subscribers can use dynamic port-blocks in the pool only as a mean to expand the range of originally assigned deterministic ports. A pool with such property is referred to as deterministic pool. However, deterministic NAT and non-deterministic NAT cannot use the same pool simultaneously.
	All subscribers in deterministic pool are pre-mapped during the configuration phase to outside IP addresses and deterministic port-blocks. Because of this, the deterministic pool cannot be oversubscribed with subscribers (first-come, first-served).
	Once the deterministic pool becomes operational (no shutdown) a log is created. The same applies if the pool is disabled (shutdown). As a result of this 'one time' logging, there will be no additional logging when a subscriber starts using ports from the pre-assigned deterministic port block. This

drastically reduces the logging overhead. However, when a deterministic port block is expanded by a dynamic port block, a log will be created on any allocation/de-allocation of the dynamic port block. The logs are also created for static port forwards (including PCP).

The number of subscribers per outside IP address (subscriber-limit) multiplied by the number of deterministic ports per subscriber (port-reservation) will determine the port range of an outside IP address that will be dedicated to deterministic mappings. The number of subscribers per outside IP address in deterministic NAT must be power of 2 (2^n). Once the deterministic ports are allocated, the dynamic ports are carved out of the remaining port space of the same outside IP address according to the existing port-reservation command under the same hierarchy,

Parameters *num-ports —* Specifies the number of ports in a deterministic port block that is allocated and dedicated to a single subscribers during the configuration phase.

      Values   1 — 65535

port-reservation

Syntax **port-reservation blocks** *num-blocks*
port-reservation ports *num-ports*
no port-reservation

Context config>service>vprn>nat>outside>pool
config>router>nat>outside>pool

Description This command configures the size of the port-block that will be assigned to a host that is served by this pool. The number of ports configured here will be available to UDP, TCP and ICMP (as identifiers).

Parameters **blocks** *num-blocks —* Specifies the number of port-blocks per IP address. Setting num-blocks to one (1) for large scale NAT will enable 1:1 NAT for IP addresses in this pool.

      Values   1 — 65535

    ports *num-ports —* Specifies the number of ports per block.

      Values   1 — 32256

mode

Syntax **mode {auto|napt|one-to-one}**
no mode

Context config>service>vprn>nat>outside>pool

Description This command configures the mode of operation of this NAT pool.

Parameters **napt** — Specifies NAPT (Network Address Port Translation)

    auto — The system selects the actual mode based upon other configuration parameters; the actual mode can be NAPT or 1:1 NAT (also known as 'Basic NAT').

oneToOne — Indicates 1:1 NAT (also known as 'Basic NAT')

port-forwarding-dyn-block-reservation

Syntax [no] **port-forwarding-dyn-block-reservation**

Context configure>service>vprn>nat>outside>pool
configure>service>router>nat>outside>pool

Description This command will enable the reservation of the dynamic port blocks when the first port forward for the subscriber is created. The dynamic port bloc allocation is logged only if the block is being utilized (mapping are created). In other words, dynamic port block reservation due to the port forward creation but without any dynamic mapping, will not be logged.

The reserved port block will be released only when the last mapping in the block expires AND there is not port forward associated with the subscriber. The de-allocation log (syslog or Radius) will be generated when the dynamic port block is completely released.

Dynamic port block reservation can be enabled only if the configured maximum number of subscriber per outside IP address is less or equal then the maximum number of configured port blocks per outside IP address.

Default port-forwarding-dyn-block-reservation

port-forwarding-range

Syntax **port-forwarding-range** *range-end*
no port-forwarding-range

Context config>service>vprn>nat>outside>pool

Description This command specifies the end of the port range available for port forwarding. The start of the range is always equal to one.

Parameters *range-end* — Specifies the port forwarding range end.

Values 1023 — 65535

redundancy

Syntax **redundancy**

Context config>router>nat>outside>pool

Description This command enables the context to configure NAT pool redundancy parameters.

export

Syntax   **export** *ip-prefix/length*
              no export

Context   config>router>nat>outside>pool>redundancy

Description This command configures the route to export to the peer. While the export prefix is configured and the value of the object tmnxNatPlLsnRedActive is equal to true, the system exports this prefix in the realm of the virtual router instance associated with this pool; to the NAT redundancy peer, the presence of this prefix is an indication that the Large Scale NAT function in this virtual router instance is active; hence, the export prefix of this system is the monitor prefix of the peer.

The export prefix must be different from the monitor prefix.

Parameters *ip-prefix/length* — Specifies the IP address and length of the prefix to be exported.

Values   ip-prefix: a.b.c.d
              ip-prefix-length: 0 — 32

follow

Syntax   **follow router** *router-instance* **pool** *name*
              no follow

Context   configure>service>vprn>nat>outside>pool>redundancy
              configure>router> nat>outside>pool>redundancy

Description This command implicitly enables Pool Fate-Sharing Group (PFSG) which is required in case of multiple NAT policies per inside routing context. A NAT pool configured with this command will not advertize or monitor any route in order to change its (activity) state but instead it will directly follow the state of the lead pool in the PFSG. Once the lead pool changes its (activity) state, all the remaining pools following the lead pool will change their state accordingly.

Default   no follow

Parameters **router** *router-instance* — Specifies the routing instance where the lead pool resides.

Values   <router-name>|<service-id>
              router-name   - "Base"
              service-id   - [1..2147483647]

pool *name* — The pool whose activity state is being shared up to 32 characters in length.

monitor

Syntax   **monitor** *ip-prefix/length*
              no monitor

Context   config>router>nat>outside>pool>redundancy

Description This command configures the IP address of the prefix to be monitored.

While the monitor prefix is configured, the system monitors the presence of this prefix in the routing table of the virtual router instance associated with this pool; the presence of this prefix is an indication that the NAT redundancy peer is active; the monitor prefix of this system is the export prefix of the peer.

The monitor prefix must be different from the export prefix.

Parameters *ip-prefix/length —* Specifies the peer route to monitor.

> **Values** ip-prefix: a.b.c.d
> ip-prefix-length: 0 — 32

subscriber-limit

Syntax	**subscriber-limit** [1..65535] **no subscriber-limit**
Context	config>service>vprn>nat>outside config>nat>outside>pool
Description	This command configures the maximum number of subscribers per outside IP address. In case multiple port blocks per subscriber are used, the block size is typically small; all blocks assigned to a given subscriber belong to the same IP address; the subscriber limit guarantees that any subscriber can get a mimimum number of ports.
Default	65535
Parameters	*limit —* Specify the maximum number of subscribers per IP address. **Values** 1 — 65535

watermarks

Syntax	**watermarks high** *percentage-high* **low** *percentage-low* **no watermarks**
Context	config>service>vprn>nat>outside>pool config>router>nat>outside>pool
Description	This command configures the watermarks for this NAT pool.
Parameters	**high** *percentage-high —* Specifies the high percentage. **Values** 1 — 100 **low** *percentage-low —* Specifies the low percentage. **Values** 0 — 99

upstream-ip-filter

Syntax	**upstream-ip-filter** *filter-id* **no upstream-ip-filter**
Context	config>service>vprn>nat>outside config>router>nat>outside
Description	This command configures the ip-filter for upstream traffic. This filter is applied to the upstream traffic after the NAT function and before it enters the outside virtual router instance; it is useful for traffic that bypasses the ingress filters applied in the inside virtual router instance, such as DSLite traffic.
Default	none
Parameters	*filter-id* — Specifies the identifier of an IP filter.

upstream-ipv6-filter

Syntax	**upstream-ipv6-filter** *filter-id* **no upstream-ipv6-filter**
Context	config>router>nat>outside config>service>vprn>nat>outside
Description	This command configures the ipv6-filter for upstream traffic. This filter is applied to the upstream traffic after the NAT function and before it enters the outside virtual router instance. This is useful for shared v6 filters that apply to all v6 DSM hosts.
Default	no upstream-ipv6-filter
Parameters	*filter-id* — Specifies the identifier of an ipv6-filter.

NAT Service Configuration Commands

nat-policy

Syntax	**nat-policy** *nat-policy-name* [**create**] **no nat-policy** *nat-policy-name*
Context	config>service>nat
Description	This commmand configures a NAT policy.
Parameters	*nat-policy-name* — Specifies the NAT policy name.
	Values 32 chars max

alg

Syntax	**alg**
Context	config>service>nat
Description	This command enables the context to configure Application Level Gateway parameters of this policy.

ftp

Syntax	[**no**] **ftp**
Context	config>service>nat>alg
Description	This command enables FTP ALG. The **no** form of the command disables FTP ALG.
Default	ftp

pptp

Syntax	[**no**] **pptp**
Context	config>service>nat>alg
Description	This command enables PPTP application-level gateway (ALG). The call-id is captured in the outgoing call management messages and along with the source IP address and the source TCP, is translated by NAT. Once the PPTP call is established, the call-id in the associated GRE packet in the incoming direction (from outside to inside) is correspondingly

translated so that it matches the call-id mapping established during the call establishment phase. The call-ids used in the mappings are selected randomly and they try to honor parity (odds/even).

A PPTP session can be initiated only from the inside of NAT.

GRE traffic is allowed through NAT only if the corresponding mapping exists. This mapping is created during the call negotiation phase.

There can be seven calls (GRE tunnels) per control session.

Default   disabled

rtsp

Syntax	[no] rtsp
Context	config>service>nat>alg
Description	This command enables RTSP ALG.
	The no form of the command disables RTSP ALG.
Default	no rtsp

sip

Syntax	[no] sip
Context	config>service>nat>alg
Description	This command enables SIP ALG.
	The no form of the command disables SIP ALG.
Default	no sip

block-limit

Syntax	block-limit [1..40]
	no block-limit
Context	config>service>nat>alg
Description	This command configures the maximum number of port blocks per subscriber.
	The no form of the command reverts to the default.
Default	1

filtering

Syntax   **filtering** *filtering-mode*
no filtering

Context   config>service>nat>nat-policy

Description   This command configures the filtering of the NAT policy.

Parameters   *filtering-mode —* Specifies the way that inbound traffic is filtered.

Values   address-and-port-dependent | endpoint-independent

ipfix-export-policy

Syntax   **ipfix-export-policy** [32 chars max]
no ipfix-export-policy

Context   config>service>nat>nat-policy

Description   This command configures the IP flow information export protocol.

The **no** form of the command removes the

pool

Syntax   **pool** *nat-pool-name* **service-name** *service-name*
pool *nat-pool-name* **router** *router-instance*
no pool

Context   config>service>nat>nat-policy

Description   This command configures the NAT pool of this policy.

Parameters   *nat-pool-name —* Specifies the name of the NAT pool.

Values   32 chars max

router-instance — Specifies the router instance the pool belongs to, either by router name or service ID.

Values   *router-name*: "Base" | "management"

Default   Base

Values   1 — 2147483648
svc-name — a string up to 64 characters in length.

service-name — Specifies the name of the service.

Values   64 chars max

port-limits

Syntax	**port-limits**
Context	config>service>nat>nat-policy
Description	This command configures the port limits of this policy.

forwarding

Syntax	**forwarding** *limit*
	no forwarding
Context	config>service>nat>nat-policy>port-limits
Description	This command configures the maximum number of port forwarding entries.
Parameters	*limit* — Specifies the maximum number of port forwarding entries per subscriber.

        Default   0

reserved

Syntax	**reserved num-ports**
	no reserved
Context	config>service>nat>nat-policy>port-limits
Description	This command configures the number of ports per block that will be reserved for prioritized sessions.
Parameters	*num-ports* — Specifies the number of ports to reserve for prioritized sessions.

        Values   1 — 65534

watermarks

Syntax	**watermarks high** *percentage-high* **low** *percentage-low*
	no watermarks
Context	config>service>nat>nat-policy port-limits
Description	This command configures the port usage watermarks for the NAT policy.
Parameters	*percentage-high* — Specifies the high percentage.

        Values   1 — 100

    percentage-low — Specifies the low percentage.

        Values   0 — 99

priority-sessions

Syntax [**no**] **priority-sessions**

Context config>service>nat>nat-policy

Description This command configures the prioritized sessions of this NAT policy.

fc

Syntax [**no**] **fc** *fc-name*

Context config>service>nat>nat-policy>priority-sessions

Description This command configures the forwarding classes that have their sessions prioritized.

Parameters *fc-name —* Specifies the forwarding class.

Values be | l2 | af | l1 | h2 | ef | h1 | nc

max

Syntax **max** *num-sessions*
no max

Context config>service>nat>nat-policy>session-limits

Description This command configures the session limit of this policy. The session limit is the maximum number of sessions allowed for a subscriber associated with this policy

Parameters *num-sessions —* Specifies the session limit.

Values 1 — 65535

tcp-mss-adjust

Syntax **tcp-mss-adjust** *segment-size*
no tcp-mss-adjust

Context config>service>nat>nat-policy

Description This command configures the value to adjust the TCP Maximum Segment Size (MSS) option.

The **no** form of the command returns the segment size to the default.

Default 0

Parameters *segment-size —* specifies the value to put into the TCP Maximum Segment Size (MSS) option if not already present, or if the present value is higher.

Values   0, 160 — 10240

timeouts

Syntax	[**no**] **timeouts**
Context	config>service>nat>nat-policy
Description	This command configures session idle timeouts for this policy.

icmp-query

Syntax	**icmp-query** [**min** *minutes*] [**sec** *seconds*]
	no icmp-query
Context	config>service>nat>nat-policy>timeouts
Description	This command configures the timeout applied to an ICMP query session.
Parameters	**min** *minutes* — Specifies the timeout, in minutes, applied to an ICMP query session

           Values   1 — 4

           Default   1

         sec *seconds* — Specifies the timeout, in seconds, applied to an ICMP query session

           Values   1 — 59

sip

Syntax	**sip min** *minutes*] [**sec** *seconds*]
	no sip
Context	config>service>nat>nat-policy>timeouts
Description	This command configures the SIP inactive media timeout.
Parameters	**min** *minutes* — Specifies the SIP inactive media timeout, in minutes.

           Values   1 — 4

           Default   1

         sec *seconds* — Specifies the SIP inactive media timeout, in seconds.

           Values   1 — 59

subscriber-retention

Syntax   **subscriber-retention** [**hrs** *hours*] [**min** *minutes*]
                  no subscriber-retention

Context   config>service>nat>nat-policy>timeouts

Description   This command specifies the subscriber retention timeout, the time a NAT subscriber and its associated IP address is kept after all hosts and associated port blocks have expired.

If a NAT subscriber host appears before the retention timeout has elapsed, it will be given the same outside IP address.

Parameters   **hrs** *hours* **—** Configures the hours a subscribers's IP address is kept after all hosts and port blocks have expired.

         Values   1 — 24

min *minutes* **—** Configures the minutes a subscribers's IP address is kept after all hosts and port blocks have expired.

         Values   1 — 59

icmp-query

Syntax   **icmp-query** [**min** *minutes*] [**sec** *seconds*]
                  no icmp

Context   config>service>nat>nat-policy>timeouts

Description   This command configures the timeout applied to an ICMP query session.

Parameters   *minutes —* Specifies the timeout in minutes.

         Values   1 — 4

seconds — Specifies the timeout in seconds.

         Values   1 — 59

tcp-established

Syntax   **tcp-established** [**hrs** *hours*] [**min** *minutes*] [**sec** *seconds*]
                  no tcp-established

Context   config>service>nat>nat-policy>timeouts

Description   This command configures the idle timeout applied to a TCP session in the established state.

Parameters   *hours —* Specifies the timeout hours field.

         Values   1 — 24

minutes — Specifies the timeout minutes field.

         Values   1 — 59

seconds — Specifies the timeout seconds field.

Values   1 — 59

tcp-syn

Syntax	**tcp-syn** [**hrs** *hours*] [**min** *minutes*] [**sec** *seconds*] **no tcp-syn**
Context	config>service>nat>nat-policy>timeouts
Description	This command configures the timeout applied to a TCP session in the SYN state.
Parameters	*hours —* Specifies the timeout hours field.

Values   1 — 24

minutes — Specifies the timeout minutes field.

Values   1 — 59

seconds — Specifies the timeout seconds field.

Values   1 — 59

tcp-time-wait

Syntax	**tcp-time-wait** [**min** *minutes*] [**sec** *seconds*] **no tcp-time-wait**
Context	config>service>nat>nat-policy>timeouts
Description	This command configures the timeout applied to a TCP session in a time-wait state.
Parameters	*minutes —* Specifies the timeout minutes field.

Values   1 — 4

seconds — Specifies the timeout seconds field.

Values   1 — 59

tcp-transitory

Syntax	**tcp-transitory** [**hrs** *hours*] [**min** *minutes*] [**sec** *seconds*] **no tcp-transitory**
Context	config>service>nat>nat-policy>timeouts
Description	This command configures the idle timeout applied to a TCP session in a transitory state.
Parameters	*hours —* Specifies the timeout hours field.

Values 1 — 24

minutes — Specifies the timeout minutes field.

Values 1 — 59

seconds — Specifies the timeout seconds field.

Values 1 — 59

udp

Syntax **udp** [**hrs** *hours*] [**min** *minutes*] [**sec** *seconds*]
no udp

Context config>service>nat>nat-policy>timeouts

Description This command configures the UDP mapping timeout.

Parameters *hours —* Specifies the timeout hours field.

Values 1 — 24

minutes — Specifies the timeout minutes field.

Values 1 — 59

seconds — Specifies the timeout seconds field.

Values 1 — 59

udp-dns

Syntax **udp-dns** [**hrs** *hours*] [**min** *minutes*] [**sec** *seconds*]
no udp-dns

Context config>service>nat>nat-policy>timeouts

Description This command configures the timeout applied to a UDP session with destination port 53.

Parameters *hours —* Specifies the timeout hours field.

Values 1 — 24

minutes — Specifies the timeout minutes field.

Values 1 — 59

seconds — Specifies the timeout seconds field.

Values 1 — 59

udp-initial

Syntax	**udp-initial** [**min** *minutes*] [**sec** *seconds*]
	no udp-initial
Context	config>service>nat>nat-policy>timeouts
Description	This command configures the UDP mapping timeout applied to new sessions.
Parameters	*minutes* — Specifies the timeout minutes field.

> **Values** 1 — 4

seconds — Specifies the timeout seconds field.

> **Values** 1 — 59

udp-inbound-refresh

Syntax	[**no**] **udp-inbound-refresh**
Context	config>service>nat>nat-policy>timeouts
Description	This command specifies the NAT inbound refresh behavior.
Default	disabled

pcp-server-policy

Syntax	**pcp-server-policy** *name* [**create**]
	no pcp-server-policy *name*
Context	config>service>nat
Description	This command configures a a PCP server policy name.
	The **no** form of the command removes the name from the configuration.
Parameters	*name* — Specifies a PCP server policy name up to 32 characters in length.

lifetime

Syntax	**lifetime minimum** [60..86399] **maximum** [61..86400]
	no lifetime
Context	config>service>nat>pcp-server-policy
Description	This command configures the lifetime of explicit mappings made by the PCP servers.
Parameters	**minimum** [60..86399] — Specifies the minimum lifetime of explicit mappings made by the PCP servers using this PCP policy, in seconds.

maximum [61..86400] — Specifies the maximum lifetime of explicit mappings made by the PCP servers using this PCP policym in seconds.

max-description-size

Syntax	**max-description-size** *size* **no max-description-size**
Context	config>service>nat>pcp-server-policy
Description	This command specifies the maximum length of mapping descriptions made by the PCP servers using this PCP policy.
Default	64
Parameters	*size —* Specifies the maximum length of mapping descriptions made by the PCP servers.
	Values 1 — 64

opcode

Syntax	[**no**] **opcode**
Context	config>service>nat>pcp-server-policy
Description	This command specifies the PCP opcodes supported by the PCP servers using this PCP policy.

announce

Syntax	[**no**] **announce**
Context	config>service>nat>pcp-server-policy>opcode
Description	This command enables/disables support for the **announce** opcode.

get

Syntax	[**no**] **get**
Context	config>service>nat>pcp-server-policy>opcode
Description	This command enables/disables support for the **get** opcode.

map

Syntax [no] **map**

Context config>service>nat>pcp-server-policy>opcode

Description This command enables/disables support for the **map** opcode.

option

Syntax [no] **option**

Context config>service>nat>pcp-server-policy

Description This command configures the PCP options supported by the PCP servers using this PCP policy..

description

Syntax [no] **description**

Context config>service>nat>pcp-server-policy>option

Description This command enables/disables support for the **description** option.

next

Syntax [no] **next**

Context config>service>nat>pcp-server-policy>option

Description This command enables/disables support for the **next** option

port-reservation

Syntax [no] **port-reservation**

Context config>service>nat>pcp-server-policy>option

Description This command enables/disables support for the **port-reservation** option

prefer-failure

Syntax [**no**] **prefer-failure**

Context config>service>nat>pcp-server-policy>option

Description This command enables/disables support for the **prefer-failure** option

third-party

Syntax [**no**] **third-party**

Context config>service>nat>pcp-server-policy>option

Description This command enables/disables support for the **third-party** option

version

Syntax **version minimum** [1..255] **maximum** [1..255]
no version

Context config>service>nat>pcp-server-policy

Description This command configures the accepted protocol version range.

Parameters **minimum** [1..255] — specifies the minimum protocol version supported by the PCP servers using this PCP policy.

Default 1

maximum [1..255] — specifies the maximum protocol version supported by the PCP servers using this PCP policy.

Values 1

IPFlow Information Export Protocol Commands

ipfix

Syntax	**ipfix**
Context	config>service
Description	This command enables the context to configure IPFIX parameters.

ipfix-export-policy

Syntax	**ipfix-export-policy** *policy-name* [**create**] **no ipfix-export-policy policy-name**
Context	config>service>ipfix
Description	This command creates an IPFIX export policy with a set of transport parameters that will be used to transmit IPFIX records generated by an application within 7750 SR node to an external collector node. This policy name can be referenced from each application within 7750 SR that requires flow logging.
Default	none
Parameters	*policy-name —* Specifies the name of the policy that can be referenced within an application in 7750 SR node that requires flow logging.

collector

Syntax	**collector router** *router-instance* **ip** *ip-address* [**create**] **no collector router** *router-instance* **ip** *ip-address*
Context	config>service>ipfix>export-policy
Description	This command defines an external collector node that will collect IPFIX records sent by 7750 SR node. The IPFIX records will be streamed to the collector node using UDP transport. Traffic is originated from a random ephemeral UDP port to the destination port 4739. Up to two collector nodes can be defined for redundancy purposes.
	UDP streams are stateless due to the significant volume of transactions. However they do contain 32bit sequence numbers such that packet loss can be identified.
	Multiple IPFIX records are sent in a single UDP packet. UDP packet transmission is triggered when the packet size containing IPFIX records exceeds the configured MTU value or the internal timer which is set to 250ms, whichever occurs first.
Default	none

Parameters   **router** *router-instance* **—** Router instance from which the collector node is reachable.

      Values   <router-name>|<service-id>
                router-name: "Base"
                service-id :   1 — 2147483647

        ip *ip-address* — IPv4 address of the external collector node to which IPFIX records will be sent.

mtu

Syntax   **mtu** [*512..9212*]
        no mtu

Context   config>service>ipfix>export-policy

Description   This command sets the MTU size of the UDP packet containing IPFIX records destined for the collector node. Multiple records will be stuffed into a single IP packet until stuffing an additional data record would exceed MTU or the internal timer of 250ms expires.

Default   1500

Parameters   *[512..9212] —* Specifies the the Maximum Transmission Unit range.

source-address

Syntax   **source-address** *ip-address*
        no source-address

Context   config>service>ipfix>export-policy

Description   This command configures the source address from which UDP streams containing IPFIX flow records will be sourced.

Default   none

Parameters   *ip-address —* Source IPv4 address from which UDP streams are sent.

template-refresh-timeout

Syntax   **template-refresh-timeout** [**hrs** *hours*] [**min** *minutes*] [**sec** *seconds*]
        no template-refresh-timeout

Context   config>service>ipfix>export-policy

Description   This command configures the time interval in which Template Set messages are sent to the collector node. Template sets is an IPFIX message that defines fields for subsequent IPFIX messages but contains no data of its own. In other words, IPFIX data is NOT passed as set of TLVs, but instead data is encoded with a scheme defined through the Template Set message.

Default   10 minutes

Parameters   **hrs** *hours* — Specifies the time interval, in hours, after which IPFIX templates are resent to this collector.

      Values   1 — 24

    min *minutes* — Specifies the time interval, in minutes, after which IPFIX templates are resent to this collector.

      Values   1 — 59

    sec *seconds* — Specifies the time interval, in seconds, after which IPFIX templates are resent to this collector.

      Values   1 — 59

AAA Policy Commands

isa-radius-policy

Syntax	**isa-radius-policy** *name* [**create**] **no isa-radius-policy** *name*
Context	config>aaa
Description	This command creates a policy template related to transport of accounting messages from the BB-ISA card to the accounting server. It also defines accounting attributes that will be included in accounting messages. The policy template will be instantiated once it is applied to the BB-ISA cards in the nat-group.
	The **no** form of the command removes the policy name from the configuration.
Default	none
Parameters	*name* — Specifies the name of the ISA RADIUS policy that can be referenced by a NAT application.

acct-include-attributes

Syntax	[**no**] **acct-include-attributes**
Context	config>aaa>isa-radius-plcy
Description	This command configures attributes to be included in RADIUS accounting messages.

auth-include-attributes

Syntax	**auth-include-attributes**
Context	config>aaa>isa-radius-plcy
Description	This command configures attributes to be included in RADIUS authentication messages.

acct-delay-time

Syntax	[**no**] **acct-delay-time**
Context	config>aaa>isa-radius-plcy>acct-include-attributes
Description	

acct-trigger-reason

Syntax [**no**] **acct-trigger-reason**

Context config>aaa>isa-radius-plcy>acct-include-attributes

Description

called-station-id

Syntax [**no**] **called-station-id**

Context config>aaa>isa-radius-plcy>acct-include-attributes
config>aaa>isa-radius-plcy>auth-include-attributes

Description This command includes called station id attributes.

The **no** form of the command excludes called station id attributes.

calling-station-id

Syntax [**no**] **calling-station-id**

Context config>aaa>isa-radius-plcy>acct-include-attributes
config>aaa>isa-radius-plcy>auth-include-attributes

Description This command enables the inclusion of the calling-station-id attribute in RADIUS authentication requests and RADIUS accounting messages.

Default no calling-station-id

circuit-id

Syntax [**no**] **circuit-id**

Context config>aaa>isa-radius-plcy>acct-include-attributes
config>aaa>isa-radius-plcy>auth-include-attribributes

Description This command enables the generation of the agent-circuit-id for RADIUS.

dhcp-options

Syntax [**no**] **dhcp-options**

Context config>aaa>isa-radius-plcy>acct-include-attributes
config>aaa>isa-radius-plcy>auth-include-attributes

Description   This command enables insertion of RADIUS VSA containing all dhcp-options from dhcp-discover (or dhcp-request) message. The VSA contains all dhcp-options in a form of the string. If required (the total length of all dhcp-options exceeds 255B), multiple VSAs are included.

Default   no dhcp-options

dhcp-vendor-class-id

Syntax   [**no**] **dhcp-vendor-class-id**

Context   config>aaa>isa-radius-plcy>acct-include-attributes
config>aaa>isa-radius-plcy>auth-include-attributes

Description   This command includes the "[26-6527-36] Alc-DHCP-Vendor-Class-Id" attribute in RADIUS accounting messages. The content of the DHCP Vendor-Class-Identifier option (60) is mapped in this attribute.

Default   no dhcp-vendor-class-id

dhcp6-options

Syntax   [**no**] **dhcp6-options**

Context   config>aaa>isa-radius-plcy>acct-include-attributes

Description   If a DHCPv6 stack is active for a UE, this attribute defines if options received in the last DHCPv6 message should be reflected.

Default   no alc-dhcp6-options

dhcp6-options

Syntax   [**no**] **dhcp6-options**

Context   config>aaa>isa-radius-plcy>auth-include-attributes

Description   If authentication was triggered by DHCPv6, this knob defines if options received in that DHCPv6 message should be reflected in the radius Access-Request.

Default   no alc-dhcp6-options

ipv6-address

Syntax   [**no**] **ipv6-address**

Context   config>aaa>isa-radius-plcy>auth-include-attributes

Description   This attribute defines if the ipv6 address of the UE is present during authentication if the datatrigger packet is IPv6.

Default   no ipv6-address

ipv6-address

Syntax   [**no**] **ipv6-address**

Context   config>aaa>isa-radius-plcy>acct-include-attributes

Description   If an active IA_NA lease exists, this attribute defines if the IA_NA address of the UE is present in accounting.

Default   no ipv6-address

include-radius-attribute

Syntax   [**no**] **include-radius-attribute**

Context   config>aaa>nat-accounting-policy

Description   This command enables the context to specify the RADIUS parameters that the system should include into RADIUS authentication-request messages.

frame-counters

Syntax   [**no**] **frame-counters**

Context   config>aaa>isa-radius-plcy>acct-include-attributes

Description   This command includes the frame-counters attribute.

The **no** form of the command excludes frame-counters attribute.

framed-ip-addr

Syntax   [**no**] **framed-ip-addr**

Context   config>aaa>isa-radius-plcy>acct-include-attributes
config>aaa>isa-radius-plcy>auth-include-attributes

Description   This command enables the inclusion of the framed-ip-addr attribute.

The **no** form of the command excludes called framed-ip-addr attributes.

framed-ip-netmask

Syntax	[**no**] **framed-ip-netmask**
Context	config>aaa>isa-radius-plcy>acct-include-attributes
Description	This command enables the inclusion of the framed-ip-netmask attribute.
	The **no** form of the command disables the inclusion.

framed-ipv6-prefix

Syntax	[**no**] **framed-ipv6-prefix**
Context	config>aaa>isa-radius-plcy>acct-include-attributes
Description	If an active SLAAC lease exists, this attribute defines if the SLAAC prefix of the UE is present in accounting..
Default	no framed-ipv6-prefix

hardware-timestamp

Syntax	[**no**] **hardware-timestamp**
Context	config>aaa>isa-radius-plcy>acct-include-attributes
Description	This command enables the inclusion of the hardware timestamp attributes.
	The **no** form of the command excludes the hardware timestamp attributes.

inside-service-id

Syntax	[**no**] **inside-service-id**
Context	config>aaa>isa-radius-plcy>acct-include-attributes
Description	This command enables the inclusion of the NAT inside service ID attributes.
	The **no** form of the command excludes NAT inside service ID attributes.

mac-address

Syntax	[**no**] **mac-address**
Context	config>aaa>isa-radius-plcy>acct-include-attributes
	config>aaa>isa-radius-plcy>auth-include-attributes

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Description   This command enables the generation of the client MAC address RADIUS attribute.

multi-session-id

Syntax   [**no**] **multi-session-id**

Context   config>aaa>isa-radius-plcy>acct-include-attributes

Description   This command enables the inclusion of the multi-session-id attributes.

The **no** form of the command excludes the multi-session-id attributes.

nas-identifier

Syntax   [**no**] **nas-identifier**

Context   config>aaa>isa-radius-plcy>acct-include-attributes
config>aaa>isa-radius-plcy>auth-include-attributes

Description   This command enables the inclusion of the NAS-Identifier attributes.

The **no** form of the command excludes NAS-Identifier attributes.

nas-ip-address-origin

Syntax   **nas-ip-address-origin** {**isa-ip**|**system-ip**}
no nas-ip-address-origin

Context   config>aaa>isa-radius-plcy

Description   This command specifies the RADIUS NAS-IP-Address attribute.

The **no** form of the command reverts to the default.

Default   systemip

Parameters   **systemip** — Specifies that the value of the object TIMETRA-VRTR-MIB::vRiaIpAddress.1.1.1 is used.

isaip — Specifies that a value in the range specified by tmnxRadIsaPlcySrvSrcAddrStart and tmnxRadIsaPlcySrvSrcAddrEnd is used that corresponds to the ISA card that transmits the Access-Request packet or the Accounting-Request packet.

nas-port-id

Syntax   [**no**] **nas-port-id**

Context   config>aaa>isa-radius-plcy>acct-include-attributes

config>aaa>isa-radius-plcy>auth-include-attributes

Description   This command enables the generation of the nas-port-id RADIUS attribute. Optionally, the value of this attribute (the SAP-id) can be prefixed by a fixed string and suffixed by the circuit-id or the remote-id of the client connection. If a suffix is configured, but no corresponding data is available, the suffix used will be 0/0/0/0/0/0.

nas-port-type

Syntax   [no] **nas-port-type**

Context   config>aaa>isa-radius-plcy>acct-include-attributes
config>aaa>isa-radius-plcy>auth-include-attributes

Description   This commmand enables the generation of the NAS-Port-Type RADIUS attribute

The **no** form of the command disables the generation.

nat-subscriber-string

Syntax   [no] **nat-subscriber-string**

Context   config>aaa>isa-radius-plcy>acct-include-attributes

Description   This command enables the inclusion of the NAT subscriber string attributes.

The **no** form of the command excludes NAT subscriber string attributes.

octet-counters

Syntax   [no] **octet-counters**

Context   config>aaa>isa-radius-plcy>acct-include-attributes

Description   This command enables the inclusion of the octet-counters attributes.

The **no** form of the command excludes octet-counters attributes.

outside-ip

Syntax   [no] **outside-ip**

Context   config>aaa>isa-radius-plcy>acct-include-attributes

Description   This command enables the inclusion of the outside IP attributes.

The **no** form of the command excludes outside IP attributes.

outside-service-id

Syntax	[no] **outside-service-id**
Context	config>aaa>isa-radius-plcy>acct-include-attributes
Description	This command enables the inclusion of the NAT outside service ID attributes.
	The **no** form of the command excludes NAT outside service ID attributes.

port-range-block

Syntax	[no] **port-range-block**
Context	config>aaa>isa-radius-plcy>acct-include-attributes
Description	This command enables the inclusion of the NAT port range block attributes.
	The **no** form of the command excludes NAT port range block attributes.

release-reason

Syntax	[no] **release-reason**
Context	config>aaa>isa-radius-plcy>acct-include-attributes
Description	This command enables the inclusion of the release reason attributes.
	The **no** form of the command excludes release reason attributes.

remote-id

Syntax	[no] **remote-id**
Context	config>aaa>isa-radius-plcy>acct-include-attributes config>aaa>isa-radius-plcy>auth-include-attributes
Description	This command enables the sending of remote ID option. The client DHCP Unique Identifier (DUID) is used as the remote ID.
	The **no** form of the command disables the sending of remote ID option relay packet.

wifi-ssid-vlan

Syntax	[no] **wifi-ssid-vlan**
Context	config>aaa>isa-radius-plcy>auth-include-attributes

Description   This command enables including the per-SSID VLAN ID in Alc-Wlan-SSID-VLAN.

password

password *password* [**hash**|**hash2**]
no password

Context   config>aaa>isa-radius-plcy

Description   This command specifies the password that is used in the RADIUS access requests.It shall be specified as a string of up to 32 characters in length.

The **no** form of the command resets the password to its default of **ALU** and will be stored using hash/hash2 encryption.

Default   ALU

Parameters   *password —* Specifies a password string up to 32 characters in length.

hash — Specifies the key is entered in an encrypted form. If the **hash** parameter is not used, the key is assumed to be in a non-encrypted, clear text form. For security, all keys are stored in encrypted form in the configuration file with the **hash** parameter specified.

hash2 — Specifies the key is entered in a more complex encrypted form. If the **hash2** parameter is not used, the less encrypted **hash** form is assumed.

session-time

Syntax   [**no**] **session-time**

Context   config>aaa>isa-radius-plcy>acct-include-attributes

Description   This command enables the inclusion of the session-time attributes.

The **no** form of the command excludes session-time attributes.

subscriber-data

Syntax   [**no**] **subscriber-data**

Context   config>aaa>isa-radius-plcy>acct-include-attributes

Description   This command enables the inclusion of subscriber data attributes.

The **no** form of the command excludes subscriber data attributes.

subscriber-id

Syntax	[no] **subscriber-id**
Context	config>aaa>isa-radius-plcy>acct-include-attributes
Description	This command specifies that subscriber ID attributes should be included into RADIUS accounting messages.

ue-creation-type

Syntax	[no] **ue-creation-type**
Context	config>aaa>isa-radius-plcy>acct-include-attributes
Description	This command enables including the Alc-Wlan-Ue-Creation-Type.

user-name

Syntax	[no] **user-name**
Context	config>aaa>isa-radius-plcy>acct-include-attributes
Description	This command enables the inclusion of user name attributes.
	The **no** form of the command excludes user name attributes.

wifi-rssi

Syntax	[no] **wifi-rssi**
Context	config>aaa>isa-radius-plcy>acct-include-attributes
Description	This command enables including the Alc-RSSI.

wifi-ssid-vlan

Syntax	[no] **wifi-ssid-vlan**
Context	config>aaa>isa-radius-plcy>acct-include-attributes
Description	This command enables including the per-SSID VLAN ID in the Alc-Wlan-SSID-VLAN.

acct-update-triggers

Syntax	**acct-update-triggers**
Context	config>aaa>isa-radius-plcy
Description	This command enables the context to enable or disable the sending of triggered interim-updates, with the exception of the following:

- After an update interval change, an interim update is always sent to indicate the start of the new interval.
- Mobility-triggered updates are configured in the (**service vprn** <*svc-id*>|**router**) **wlan-gw mobility-triggered-acct** context.
- NAT port block allocation depends on the inclusion of NAT-related attributes (port-range, out-side-service, outside-ip).

address-state

Syntax	[**no**] **address-state**
Context	config>aaa>isa-radius-plcy>acct-update-triggers
Description	If enabled, an interim-update will be sent for a DSM UE whenever a DHCP, SLAAC or DHCPv6 address gets allocated or freed.
Default	no address-state

radius-accounting-server

Syntax	**radius-accounting-server**
Context	config>aaa>nat-acct-plcy
Description	This command creates the context for defining RADIUS accounting server attributes under a given session authentication policy.

access-algorithm

Syntax	**access-algorithm** {**direct** | **round-robin** | **hash-based**} **no access-algorithm**
Context	config>aaa>isa-radius-plcy>servers
Description	This command configures the algorithm used to access the list of configured RADIUS servers.
Default	direct
Parameters	**direct** — Specifies that the first server will be used as primary server for all requests, the second as secondary and so on.

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round-robin — Specifies that the first server will be used as primary server for the first request, the second server as primary for the second request, and so on. If the router gets to the end of the list, it starts again with the first server.

hashed-based — Specifies that the selection is based on the hash-based procedures.

retry

Syntax	**retry** *count*
Context	config>aaa>isa-radius-plcy>servers
Description	This command configures the number of times the router attempts to contact the RADIUS server for authentication, if not successful the first time.
	The **no** form of the command reverts to the default value.
Default	3
Parameters	*count —* Specifies the retry count.
	Values 1 — 10

router

Syntax	**router** *router-instance*
	router service-name *service-name*
	no router
Context	config>aaa>isa-radius-plcy>servers
Description	This command specifies the number of times the router attempts to contact the RADIUS server for authentication, if not successful the first time.
	The **no** form of the command reverts to the default value.

server

Syntax	**server** *server-index* [**create**]
	no server *server-index*
Context	config>aaa>isa-radius-plcy>servers
Description	This command adds a RADIUS server and configures the RADIUS server IP address, index, and key values.
	Up to five RADIUS servers can be configured at any one time. RADIUS servers are accessed in order from lowest to highest index for authentication requests until a response from a server is received. A higher indexed server is only queried if no response is received from a lower indexed server (which

implies that the server is not available). If a response from a server is received, no other RADIUS servers are queried.

The **no** form of the command removes the server from the configuration.

Default   none

Parameters   *server-index* — The index for the RADIUS server. The index determines the sequence in which the servers are queried for authentication requests. Servers are queried in order from lowest to highest index.

Values   1 — 16 (a maximum of 5 accounting servers)

source-address-range

Syntax   **source-address-range** *start-ip-address*
no source-address

Context   config>aaa>isa-radius-plcy>servers

Description   This command configures the source address of the RADIUS packet. The system IP address must be configured in order for the RADIUS client to work. See Configuring a System Interface in the 7750 SR OS Router Configuration Guide. Note that the system IP address must only be configured if the source-address is not specified. When the no source-address command is executed, the source address is determined at the moment the request is sent. This address is also used in the nas-ip-address attribute: over there it is set to the system IP address if no sourceaddress was given.

The **no** form of the command reverts to the default value.

Default   systemIP address

Parameters   *ip-address* — The IP prefix for the IP match criterion in dotted decimal notation.

Values   0.0.0.0 - 255.255.255.255

timeout

Syntax   **timeout** [**sec** *seconds*] [**min** *minutes*]
no timeout

Context   config>aaa>isa-radius-plcy>servers

Description   This command configures the number of seconds the router waits for a response from a RADIUS server.

The **no** form of the command reverts to the default value.

Default   5

Parameters   **sec** *seconds* — Specifies the wait for a response from a RADIUS server in seconds.

min *minutes* **—** Specifies the wait for a response from a RADIUS server in minutes.

accounting

Syntax **accounting** [**port** *udp-port*]
no accounting

Context config>aaa>isa-radius-plcy>servers>server

Description This command configures accounting for this server.

port *port —* Specifies the UDP port number on which to contact the RADIUS server for authentication.

Values 1 — 65535

authentication

Syntax **authentication** [**port** *udp-port*]
no authentication

Context config>aaa>isa-radius-plcy>servers>server

Description This command configures authentication for this server.

Parameters **port** *port —* Specifies the UDP port number on which to contact the RADIUS server for authentication.

Values 1 — 65535

coa

Syntax **coa** [**port** *udp-port*]
no coa

Context config>aaa>isa-radius-plcy>servers>server

Description This command configures Change of Authorization (CoA) messages.

ip-address

Syntax **ip-address** *ip-address*
no ip-address

Context config>aaa>isa-radius-plcy>servers>server

Description Configures the The IP address of the RADIUS server. Two RADIUS servers cannot have the same IP address. An error message is generated if the server address is a duplicate.

secret

Syntax **secret** *secret-key* **| hash-key** [**hash**|**hash2**]
no secret

Context config>aaa>isa-radius-plcy>servers>server

Description This command configures the secret key to access the RADIUS server. This secret key must match the password on the RADIUS server.

hash — Specifies the key is entered in an encrypted form. If the hash parameter is not used, the key is assumed to be in a non-encrypted, clear text form. For security, all keys are stored in encrypted form in the configuration file with the hash parameter specified.

hash2 — Specifies the key is entered in a more complex encrypted form. If the hash2 parameter is not used, the less encrypted hash form is assumed.

user-name-format

Syntax **user-name-format** *user-name-format* [**mac-format** *mac-format*]
no user-name-format

Context config>aaa>isa-radius-plcy

Description This command defines the format of the user-name field in the session authentication request sent to the RADIUS server. For authentication of IPv6 triggers (ICMPv6, DHCPv6, IPv6 data-trigger) the user-name format will always fall back to mac only.

The **no** form of the command switches to the default format, **mac**.

Default By default, the MAC source address of the DHCP DISCOVER message is used in the user-name field.

Parameters *user-name-format* — Specifies the user name format in RADIUS message.

mac-format — Specifies how a MAC address is represented when contacting a RADIUS server. This is only used while the value of is equal to the DHCP client vendor options and if the MAC address is used by default of the DHCP client vendor options.

Examples:	ab:	00:0c:f1:99:85:b8	Alcatel-Lucent 7xxx style
	XY-	00-0C-F1-99-85-B8	IEEE canonical style
	mmmm.	0002.03aa.abff	Cisco style

NAT Subscriber Management Commands

nat-policy

Syntax	**nat-policy** *policy-name* **no nat-policy**
Context	config>subscriber-mgmt>sub-profile
Description	This command configures the NAT policy to be used for subscribers associated with this subscriber profile.
Parameters	*policy-name —* Specifies the policy name.
	Values 32 chars max

save-deterministic-script

Syntax	**save-deterministic-script**
Context	admin>nat
Description	This command saves the script that calculates Deterministic NAT map entries.
	Once the location for the Python deterministic NAT script is configured, the script is generated/updated every time deterministic NAT configuration is modified. However, the script must be manually exported to the remote location. This command triggers the export of the script to a remote location.

upnp

Syntax	**upnp**
Context	config>service
Description	This command enables the context to configure UPnP parameters
Default	upnp

upnp-policy

Syntax	**upnp-policy** *policy-name* [**create**] **no upnp-policy** *policy-name*
Context	config>service>upnp

Description	This command creates a new upnp-policy or enters the configuration context of an existing upnp-policy .
	The **no** form of the command removes the upnp-policy policy-name from the configuration.
Default	none
Parameters	*policy-name —* Specifies the name of the UPnP policy up to 32 characters in length.

upnp-policy

Syntax	**upnp-policy** *policy-name* **no upnp-policy**
Context	config>subscr-mgmt>sub-prof
Description	This command enables UPnP IGD services for the subscriber. All ESM hosts of the subscriber could use the UPnP protocol to create port mapping. This featurse only support L2-Aware NAT host.
	UPnP parameters are defined in the referenced upnp-policy configured in the **configure**>**service**>**upnp** context.
Default	no upnp-policy
Parameters	*policy-name —* Specifies the UPnP (Universal Plug 'n Play) policy associated with this subscriber profile up to 32 characters in length.

http-listening-port

Syntax	**http-listening-port** [1..65535] **no http-listening-port**
Context	config>service>upnp>upnp-policy
Description	This command specifies the listening port of UPnP server.
	The **no** form of the command reverts to the default.
Default	5000
Parameters	[1..65535] — Specifies the HTTP TCP port this UPnP IGD listens to.

mapping-limit

Syntax	**mapping-limit** [1..256] **no mapping-limit**
Context	config>service>upnp>upnp-policy
Description	This command specifies the maximum number of UPnP mapping per subscriber.

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The **no** form of the command reverts to the default.

Default   256

Parameters   [1..256] — Specifies the upper limit of the number of UPnP mappings per subscriber.

strict-mode

Syntax   [no] **strict-mode**

Context   config>service>upnp>upnp-policy

Description   This command enable UPnP strict mode. With strict-mode, system only allows changes to existing UPnP mapping if the request comes from same UPnP client.

Default   no strict-mode

NAT Show Commands

nat-accounting-policy

Syntax   **nat-accounting-policy**
          nat-accounting-policy *policy-name*
          nat-accounting-policy *policy-name* **associations**
          nat-accounting-policy

Context   show>aaa

Description   This command displays NAT accounting policy information.

Parameters   *policy-name —* Specifies the NAT policy name.

          Values   32 chars max

          associations — Keyword that displays the router instances and/or subscriber profiles associated with
          the NAT policy.

Sample Output

```
A:SR12_PPPOE# show aaa nat-accounting-policy "my-acct-plcy"
===============================================================================
NAT accounting policy "my-acct-plcy"
===============================================================================
Description              : my accounting policy
-------------------------------------------------------------------------------
RADIUS accounting server settings
-------------------------------------------------------------------------------
Access algorithm         : direct
Retry                    : 3
Router                   : 101
Source address start     : 10.10.10.10
Source address end       : 10.10.10.20
Timeout (s)              : 5
Last management change   : 01/28/2012 14:47:59
Include attributes       : framed-ip-addr nas-identifier nat-subscriber-
                           string user-name inside-service-id outside-
                           service-id outside-ip port-range-block hardware-
                           timestamp release-reason multi-session-id frame-
                           counters octet-counters session-time
===============================================================================
===============================================================================
Servers for "my-acct-plcy"
===============================================================================
Index Address          Port
-------------------------------------------------------------------------------
1    17.0.0.5          1813
2    17.0.0.1          1813
===============================================================================
```

```
================================================================================
Servers ISA group connection status for "my-acct-plcy"
================================================================================
Index Group Member State                   Tx-rq    Rq-timeout Send-retry
--------------------------------------------------------------------------------
1     3     1      out-of-service           3        1          2
1     3     2      out-of-service           9        3          6
2     3     1      in-service               1        0          0
2     3     2      out-of-service           6        2          4
================================================================================
A:SR12_PPPOE#


A:SR12_PPPOE# show aaa nat-accounting-policy "my-acct-plcy" associations
================================================================================
NAT groups associated with "my-acct-plcy"
================================================================================
Group
--------------------------------------------------------------------------------
1
3
--------------------------------------------------------------------------------
No. of groups: 2
================================================================================
A:SR12_PPPOE#
```

nat-group

Syntax **nat-group**
nat-group *nat-group-id* [**associations**]
nat-group *nat-group-id* **statistics mda** *mda-id*
nat-group *nat-group-id* **member** [1..255]
nat-group *nat-group-id* **member** [1..255] **reassembly-statistics**
nat-group *nat-group-id* **member** [1..255] **statistics**
nat-group [*nat-group-id*] **members**

Context show>isa

Description This command lists all used (active) member ISAs (or group members). Up to 16 group members can be displayed (16 is the supported number of LAG links). Members can share physical ISAs (MDAs) and the physical locality of the group members can be determined from the **Mda** column in the output.

The number of group members will be <=X and the actual number of displayed group members will depend on the configuration based calculation.

Parameters *nat-group-id —* Specifies the NAT group ID.

Values 1 — 4

statistics — Keyword; displays NAT group statistics.

member — Displays statistics information about the resources of a member of a NAT ISA group.

reassembly-statistics — Displays statistics information about IP datagram reassembly on NAT-capable ISA groups.

associations — Displays associations applicable to the specified NAT group.

Sample Output

```
show isa nat-group
===============================================================================
ISA NAT Group Summary
===============================================================================
Mda Group 1 Group 2 Group 3
-------------------------------------------------------------------------------
3/1 active - -
3/2 - active busy
4/1 - busy active
4/2 - standby standby
===============================================================================


show isa nat-group 1 members
===============================================================================
ISA Group 1 members
===============================================================================
Group Member State  Mda Addresses Blocks   Se-% Hi Se-Prio
-------------------------------------------------------------------------------
1    1       active 1/2 17        2088     < 1  N  0
1    2       active 1/2 17        2088     < 1  N  0
1    3       active 1/2 17        2088     < 1  N  0
1    4       active 2/2 17        2088     < 1  N  0
1    5       active 2/2 17        2088     < 1  N  0

-------------------------------------------------------------------------------
No. of members: 5
===============================================================================


*A:SR12_PPPOE>config>isa>nat-group# show isa nat-group 1
===============================================================================
ISA NAT Group 1
===============================================================================
Admin state               : inService
Operational state         : inService
Active MDA limit          : 2
-------------------------------------------------------------------------------
NAT specific information for ISA group 1
-------------------------------------------------------------------------------
Reserved sessions         : 0
High Watermark (%)        : (Not Specified)
Low Watermark (%)         : (Not Specified)
Accounting policy         : my-acct-plcy
Last Mgmt Change          : 01/28/2012 14:47:59
-------------------------------------------------------------------------------
===============================================================================
ISA Group 1 members
===============================================================================
Group Member    State       Mda Addresses Blocks    Se-% Hi Se-Prio
-------------------------------------------------------------------------------
```

```
1    1           active        3/1  3          3         < 1  N  0
1    2           active        3/2  4          4         < 1  N  0
--------------------------------------------------------------------------------
No. of members: 2
================================================================================
A:SR12_PPPOE#


*A:SR12_PPPOE>config>isa>nat-group# show isa nat-group
================================================================================
ISA NAT Group Summary
================================================================================
Mda  Group 1            Group 2            Group 3            Group 4
--------------------------------------------------------------------------------
2/1  -                  provisioned        -                  -
3/1  active             -                  up                 -
3/1  active             -                  up                 -
3/2  active             -                  up                 -
3/2  active             -                  up                 -
================================================================================
A:SR12_PPPOE#


*A:SR12_PPPOE>config>isa>nat-group# show isa nat-group 1
================================================================================
ISA NAT Group 1
================================================================================
Admin state            : inService
Operational state      : inService
Active MDA limit       : 2


--------------------------------------------------------------------------------
NAT specific information for ISA group 1
--------------------------------------------------------------------------------
Reserved sessions      : 0
High Watermark (%)     : (Not Specified)
Low Watermark (%)      : (Not Specified)
Accounting policy      : my-acct-plcy
Last Mgmt Change       : 01/28/2012 14:47:59
--------------------------------------------------------------------------------
================================================================================
ISA Group 1 members
================================================================================
Group Member     State        Mda  Addresses  Blocks     Se-% Hi Se-Prio
--------------------------------------------------------------------------------
1    1           active        3/1  3          3         < 1  N  0
1    2           active        3/2  4          4         < 1  N  0
--------------------------------------------------------------------------------
No. of members: 2
================================================================================
A:SR12_PPPOE#


A:SR12_PPPOE# show isa nat-group 3 member 1 statistics
================================================================================
ISA NAT Group 3 Member 1
================================================================================
no resource                                              : 0
pkt rx on wrong port                                     : 0
```

```
unsupported protocol                                     : 0
no host or host group                                    : 0
no ip or port                                            : 0
no matching flow                                         : 3
max flow exceeded                                        : 0
TCP no flow for RST                                      : 0
TCP no flow for FIN                                      : 0
TCP no flow                                              : 0
addr. dep. filtering                                     : 0
ICMP type unsupported                                    : 0
ICMP local unsupported                                   : 0
ICMP checksum error                                      : 0
ICMP embedded checksum error                             : 0
ICMP unsupported L4                                      : 0
ICMP too short                                           : 0
ICMP length error                                        : 0
Pkt not IPv4 or IPv6                                     : 0
Pkt rcv error                                            : 0
Pkt error                                                : 0
IPv4 header checksum violation                           : 0
IPv4 header malformed                                    : 0
IPv4 malformed packet                                    : 0
IPv4 ttl zero                                            : 0
IPv4 opt /IPv6 ext headers                               : 0
IPv4 undefined error                                     : 0
IPv6 fragments unsupported                               : 0
TCP/UDP malformed                                        : 0
TCP/UDP checksum failure                                 : 0
TCP/UDP length error                                     : 0
Pkt send error                                           : 0
no buf to copy pkt                                       : 0
no policy                                                : 0
locked by mgmt core                                      : 0
port range log failed                                    : 0
MTU exceeded                                             : 0
DS Lite unrecognized next hdr                            : 0
DS Lite unknown AFTR                                     : 0
too many fragments for IP packet                         : 0
too many fragmented packets                              : 0
too many fragment holes                                  : 0
too many frags buffered                                  : 0
fragment list expired                                    : 0
fragment rate too high                                   : 0
flow log failed                                          : 0
no multiple host or subscr. IPs allowed                  : 0
to local                                                 : 1
to local ignored                                         : 0
NAT64 disabled                                           : 0
NAT64 invalid src addr                                   : 0
NAT64 frag has zero checksum                             : 0
NAT64 v4 has zero checksum                               : 0
NAT64 ICMP frag unsupported                              : 0
CPM out of memory                                        : 0
new flow                                                 : 1
TCP closed                                               : 1
TCP expired                                              : 0
UDP expired                                              : 0
ICMP expired                                             : 0
ICMP local                                               : 0
```

```
found flow                                          : 34
ARPs ignored                                        : 4
Fragments RX L2A                                    : 0
Fragments RX LSN                                    : 0
Fragments RX DSL                                    : 0
Fragments RX OUT                                    : 0
Fragments TX L2A                                    : 0
Fragments TX LSN                                    : 0
Fragments TX DSL                                    : 0
Fragments TX NAT64                                  : 0
Fragments TX OUT                                    : 0
flow create logged                                  : 0
flow delete logged                                  : 0
flow log pkt tx                                     : 0
===============================================================================
A:SR12_PPPOE#



config>isa# show isa nat-group 1 member 1 statistics
===============================================================================
ISA NAT Group 1 Member 1
===============================================================================
no resource                                         : 0
    [eNatFlowNoResource]                    "no resource",\
        ->the default, all errors without more specific reason

    [eNatFlowWrongPort]                     "pkt rx on wrong port",\
        -> packet came in on wrong port on ISA

    [eNatFlowWrongProt]                     "unsupported protocol",\
        -> protocol  is not UDMP/TCP/ICMP

    [eNatFlowNoHostGrp]                     "no host or host group",\
        -> can not create new host group because out of resources, or
current host group is not usable at the moment (because in a transient
state)

    [eNatFlowNoIpOrPort]                    "no ip or port",\
         -> no Ip or port range available

    [eNatFlowNoMatchingFlow]                "no matching flow",\
        -> no matching flow found

    [eNatFlowMaxExceeded]                   "max flow exceeded",\
         -> max flows for subscriber exceeded

    [eNatFlowTcpUnexpectedRst]              "TCP no flow for RST",\
    [eNatFlowTcpUnexpectedFin]              "TCP no flow for FIN",\
    [eNatFlowTcpUnexpected]                 "TCP no flow",\
        -> TCP state machine problem

    [eNatFlowAddressDependentFiltering]     "addr. dep. filtering",\
        -> pkt dropped because of addr. dependent filtering

    [eNatFlowUnsupportedICMP]               "ICMP type unsupported",\
        -> unsupported icmp type

    [eNatFlowUnsupportedLocalICMP]          "ICMP local unsupported",\
        -> packet to ip address on ISA is not an echo request
```

```
        [eNatFlowIcmpChecksumError]             "ICMP checksum error",\
            -> ICMP checksum error

        [eNatFlowIcmpEmbeddedPktChecksumError]  "ICMP embedded checksum
error",\
            -> checksum error on embedded IP header

        [eNatFlowIcmpEmbeddedPktUnsupportedL4]  "ICMP unsupported L4",\
            -> embedded IP packet is not UDP/TCP

        [eNatFlowIcmpTooShort]                  "ICMP too short",\
            -> packet too short to include the ICMP header

        [eNatFlowIcmpLengthError]               "ICMP length error",\
            -> packet too short to include the embedded header

        [eNatFlowPacketErrorNotIp]              "Pkt not IPv4 or IPv6",\
        [eNatFlowPacketErrorRecv]               "Pkt rcv error",\
        [eNatFlowPacketError]                   "Pkt error",\
        [eNatFlowPacketErrorIpv4HdrChk]         "IPv4 header checksum
violation",\
        [eNatFlowPacketErrorIpv4HdrMal]         "IPv4 header malformed",\
        [eNatFlowPacketErrorIpv4PktMal]         "IPv4 malformed packet",\
        [eNatFlowPacketErrorIpv4TtlZero]        "IPv4 ttl zero",\
        [eNatFlowPacketErrorIpv4Optv6Ext]       "IPv4 opt /IPv6 ext headers",\
        [eNatFlowPacketErrorIpv4Bad]            "IPv4 undefined error", \
        [eNatFlowPacketErrorIpv6Frag]           "IPv6 fragments unsupported",\
        [eNatFlowPacketErrorTcpUdpMal]          "TCP/UDP malformed",\
        [eNatFlowPacketErrorTcpUdpChk]          "TCP/UDP checksum failure",\
        [eNatFlowPacketErrorTcpUdpLen]          "TCP/UDP length error",\
            -> malformed incoming packet

        [eNatFlowPacketSendError]               "Pkt send error",\
            -> failed to tx the packet

        [eNatFlowPacketNoCpyBuf]                "no buf to copy pkt",\
            -> failed to copy the packet to another buffer needed for
correct processing

        [eNatFlowLockedByMgmtCore]              "locked by mgmt core",\
            -> resources temp. locked by the mgmt core

        [eNatFlowPRLogFailed]                   "port range log failed",\
            -> port range log failed

        [eNatFlowMtuExceeded]                   "MTU exceeded",\
            -> outgoing packet too big for DS-Lite tunnel or nat64 mtu

        [eNatFlowDslUnrecNextHdr]               "DS Lite unrecognized next
hdr",\
            ->ipv6 pkt has wrong next header

        [eNatFlowDslUnknownAFTR]                "DS Lite unknown AFTR",\
            -> AFTR address is unrecognised

        [eNatFlowTooManyFragsForIpPkt]          "too many fragments for IP
packet",\
        [eNatFlowTooManyFragmentedPkts]         "too many fragmented
```

```
packets",\
     [eNatFlowTooManyFragHoles]               "too many fragment holes",\
     [eNatFlowFragListExpire]                 "fragment list expired",\
     [eNatFlowTooManyFragBufs]                "too many frags buffered",\
     [eNatFlowFragRateTooHigh]                "fragment rate too high",\
         -> various fragment problems

     [eNatFlowNoPolicy]                       "no policy",\
         ->vrf not mapped to a policy

     [eNatFlowLogFailed]                      "flow log failed",\
         -> flow logging can not follow the setup rate

     [eNatFlowMultiHostOrSubscrIp]            "no multiple host or
subscr. IPs allowed",\
         ->multiple hosts or subscribers on the inside in use without
port translation

     [eNatFlowToLocalError]                   "to local ignored",\
         -> radius authentication failure (?)

     [eNatFlow64Disabled]                     "NAT64 disabled",\
         -> nat64 was disabled

     [eNatFlow64InvalidSource]                "NAT64 invalid src addr",\
         -> source address matches pref64

     [eNatFlow64FragZeroChecksum]             "NAT64 frag has zero
checksum",\
         -> v4 UDP frag has zero checksum

     [eNatFlow64ZeroChecksum]                 "NAT64 v4 has zero checksum",\
         -> v4 UDP has zero checksum, and policy configured to drop

     [eNatFlow64FragIcmp]                     "NAT64 ICMP frag unsupported"\
         ->v4 fragmented ICMP
```

l2-aware-hosts

Syntax   **l2-aware-hosts** [**outside-router** *router-instance*] [**outside-ip** *outside-ip-address*] [**inside-ip-prefix** *ip-prefix/mask*]

Context   show>service>nat

Description   This command displays layer-2 aware NAT hosts.

Parameters   *nat-policy-name —* Specifies the NAT policy name.

    Values   32 chars max

    nat-group-id — Specifies the NAT group ID.

    Values   1 — 4

    router-instance — Specifies the router instance.

NAT Commands

Values   router-name: Base , management
                  service-id: 1 — 2147483647
                  svc-name: A string up to 64 characters in length.

outside-ip-address — Specifies the outside IP address.

Values   a.b.c.d

sub-ident — Specifies the identifier.

Values   32 chars max

Sample Output

```
show service nat l2-aware-hosts
===============================================================================
Layer-2-Aware NAT hosts
===============================================================================
Inside IP Out-Router Outside IP Subscriber
-------------------------------------------------------------------------------
13.0.0.100 Base 81.81.0.0 Sub001
13.0.0.102 Base 81.81.0.0 Sub001
13.0.0.101 Base 81.81.0.203 Sub002
13.0.0.103 Base 81.81.0.0 Sub003
-------------------------------------------------------------------------------
No. of hosts: 4
===============================================================================
```

l2-aware-subscribers

Syntax   **l2-aware-subscribers** [**nat-policy** *nat-policy-name*] [**nat-group** *nat-group-id*] [**member** [*1..255*]] [**outside-router** *router-instance*] [**outside-ip** *outside-ip-address*]
l2-aware-subscribers *subscriber sub-ident*

Context   show>service>nat

Description This command displays layer-2 aware NAT subscribers.

Parameters   *nat-policy-name —* Specifies the NAT policy name.

Values   32 chars max

nat-group-id — Specifies the NAT group ID.

Values   1 — 4

router-instance — Specifies the router instance.

Values   router-name: Base , management
                  service-id: 1 — 2147483647
                  svc-name: A string up to 64 characters in length.

outside-ip-address — Specifies the outside IP address.

Values   a.b.c.d

sub-ident — Specifies the identifier.

> **Values** 32 chars max

Sample Output

```
show service nat l2-aware-subscribers
================================================================================
Layer-2-Aware NAT subscribers
================================================================================
Subscriber Policy Group/Member
Outside IP Router Ports
--------------------------------------------------------------------------------
Sub001 outPolicy 1/1
81.81.0.0 Base 32-33
Sub002 outPolicy2 1/1
81.81.0.203 Base 32-41
Sub003 outPolicy 1/1
81.81.0.0 Base 34-35
--------------------------------------------------------------------------------
No. of subscribers: 3
================================================================================


show service nat l2-aware-subscribers subscriber "Sub881"
================================================================================
Layer-2-Aware NAT subscriber Sub001
================================================================================
Policy : outPolicy
ISA NAT group : 1
ISA NAT group member : 1
Outside router : Base
Outside IP : 81.81.0.0
ICMP Port usage (%) : < 1
ICMP Port usage high : false
UDP Port usage (%) : < 1
UDP Port usage high : false
TCP Port usage (%) : < 1
TCP Port usage high : false
Session usage (%) : < 1
Session usage high : false
Number of sessions : 0
Number of reserved sessions : 0
Ports : 32-33
================================================================================
```

nat-policy

Syntax **nat-policy** *nat-policy-name* **associations**
nat-policy *nat-policy-name*
nat-policy *nat-policy-name* **statistics**
nat-policy

Context show>service>nat

Description   This command displays NAT policy information.

Parameters   *nat-policy-name —* Specifies the NAT Policy name.

        Values   32 chars max

    associations — Keyword; displays the router instances and/or subscriber profiles associated with the NAT policy.

    statistics — Keyword; displays statistics of the specified NAT policy.

Sample Output

```
show service nat nat-policy
===============================================================================
NAT policies
===============================================================================
Policy Description
-------------------------------------------------------------------------------
outPolicy
outPolicy2
outPolicy3
-------------------------------------------------------------------------------
No. of NAT policies: 3
===============================================================================


*A:SR12_PPPOE>show>router>nat#  show service nat nat-policy "priv-nat-policy"
===============================================================================
NAT Policy priv-nat-policy
===============================================================================
Pool                             : privpool
Router                           : Base
Filtering                        : endpointIndependent
Block limit                      : 4
Reserved ports                   : 0
Port usage High Watermark (%)    : (Not Specified)
Port usage Low Watermark (%)     : (Not Specified)
Port forwarding limit            : 64
Session limit                    : 65535
Reserved sessions                : 0
Session usage High Watermark (%) : (Not Specified)
Session usage Low Watermark (%)  : (Not Specified)
ALG enabled                      : ftp rtsp sip
Prioritized forwarding classes   : (Not Specified)
Timeout TCP established (s)       : 7440
Timeout TCP transitory (s)        : 240
Timeout TCP SYN (s)               : 15
Timeout TCP TIME-WAIT (s)         : 0
Timeout UDP mapping (s)           : 300
Timeout UDP initial (s)           : 15
Timeout UDP DNS (s)               : 15
Timeout ICMP Query (s)            : 60
Timeout SIP Inactive Media (s)    : 120
Subscriber retention (s)          : 0
UDP inbound refresh               : false
TCP MSS Adjust                   : (Not Specified)
Destination-NAT IP               : (Not Specified)
```

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```
IPFIX export policy                  : (Not Specified)
Last Mgmt Change                     : 01/28/2012 14:47:59
===============================================================================
*A:SR12_PPPOE>show>router>nat#


show service nat nat-policy "outPolicy2" associations
===============================================================================
NAT Policy outPolicy2 Subscriber Profile Associations
===============================================================================
sub_prof_B_3
-------------------------------------------------------------------------------
No. of subscriber profiles: 1
===============================================================================


show service nat nat-policy "outPolicy2" statistics
===============================================================================
NAT Policy outPolicy2 Statistics
===============================================================================
mda 3/1
-------------------------------------------------------------------------------
hostsActive               : 1
hostsPeak                 : 1
sessionsTcpCreated        : 0
sessionsTcpDestroyed      : 0
sessionsUdpCreated        : 0
sessionsUdpDestroyed      : 0
sessionsIcmpQueryCreated  : 0
sessionsIcmpQueryDestroyed : 0
===============================================================================
```

pcp-server-policy

Syntax	**pcp-server-policy** **pcp-server-policy** *name*
Context	show>router>nat
Description	This command displays PCP server policy information.

port-forwarding-entries

Syntax	**port-forwarding-entries**
Context	show>router>nat
Description	This command displays port forwarding entries.

Sample Output

```
*A:SR12_PPPOE#  show service nat port-forwarding-entries
```

```
===============================================================================
NAT port forwarding entries
===============================================================================
Subscriber
iRtr      iAddress                               prot iPort type
oRtr      oAddress                               persist-id oPort expiry

===============================================================================
100       1.2.3.4                                tcp  666  classic-lsn-sub
Base      13.0.0.6                          N/A       666  N/A

100       1.2.3.4                                udp  666  classic-lsn-sub
Base      13.0.0.6                          N/A       666  N/A

-------------------------------------------------------------------------------
No. of entries: 2
===============================================================================
*A:SR12_PPPOE#
```

dual-stack-lite-subscribers

Syntax **dual-stack-lite-subscribers subscriber** *dslite-sub-id*
dual-stack-lite-subscribers [**nat-policy** *nat-policy-name*] [**nat-group** *nat-group-id*]
[**member** [1..255]] [**outside-router** *router-instance*] [**outside-ip** *outside-ip-address*] [**inside-ip-prefix** *ipv6-prefix*]

Context show>router>nat

Description This command displays Dual Stack Lite subscriber information.

Parameters **subscriber** *dslite-sub-id* — Specifies the identification of LSN subscribers of a particular virtual router instance.

> **Values** dslite-sub-id: ipv6-address - x:x:x:x:x:x:x:x (eight 16-bit pieces)
> x:x:x:x:x:x:d.d.d.d
> x - [0..FFFF]H
> d - [0..255]D

nat-policy *nat-policy-name* — Specifies the NAT policy name up to 32 characters in length.

nat-group *nat-group-id* — Specifies the NAT group ID.

> **Values** 1 — 4

member [1..255] — Identifies the member ID of a NAT ISA group.

outside-router *router-instance* — Specifies the router instance.

> **Values** router-name: Base , management
> service-id: 1 — 2147483647
> svc-name: A string up to 64 characters in length.

outside-ip *outside-ip-address* — Specifies the outside IP address.

inside-ip-prefix *ipv6-prefix* — Specifies the inside IP address.

Sample Output

```
*A:SR12_PPPOE# show router 100 nat dual-stack-lite-subscribers
===============================================================================
Large-Scale NAT subscribers
===============================================================================
Subscriber                         Policy                       Group/Member
  Outside IP                                   Router           Ports
-------------------------------------------------------------------------------
2001:470:1F00:FFFF::189
                                   priv-nat-policy              3/2
  13.0.0.5                                     Base             504
-------------------------------------------------------------------------------
No. of subscribers: 1
===============================================================================
*A:SR12_PPPOE#
```

l2-aware-blocks

Syntax   **l2-aware-blocks** [**outside-ip-prefix** *ip-prefix/length*] [**outside-port** *[1..65535]*] [**pool** *pool-name*]

Context   show>router>nat

Description   This command displays Layer 2 aware NAT blocks.

Parameters   *ip-prefix —* Specifies the IP prefix.

      Values   a.b.c.d (host bits must be 0)

    length — Specifies the IP prefix length.

      Values   1 — 32

    pool-name — Specifies the pool name.

      Values   32 chars max

Sample Output

```
show router nat l2-aware-blocks
===============================================================================
Layer-2-Aware NAT blocks for Base
===============================================================================
81.81.0.0 [32..33]
Pool               : MyPool
Policy             : outPolicy
Started            : 2010/02/04 16:24:55
Subscriber ID      : Sub001
81.81.0.0 [34..35]
Pool               : MyPool
Policy             : outPolicy
Started            : 2010/02/04 16:25:24
Subscriber ID      : Sub003
81.81.0.203 [32..41]
Pool               : MyPool2
```

```
Policy               : outPolicy2
Started              : 2010/02/04 16:25:21
Subscriber ID        : Sub002
-------------------------------------------------------------------------------
Number of blocks: 3
===============================================================================
```

lsn-blocks

Syntax   **lsn-blocks** [**inside-router** *router-instance*] [**inside-ip** *ip-address*] [**outside-ip-prefix** *ip-prefix/length*] [**outside-port** *[1..65535]*] [**pool** *pool-name*]

Context   show>router>nat

Description   This command displays large scale NAT blocks.

Parameters   *router-instance —* Specifies the router instance name and service ID.

> **Values**   router-name: Base , management
> service-id: 1 — 2147483647
> svc-name: A string up to 64 characters in length.

ip-address — Specifies the IP address in a.b.c.d format.

ip-prefix — Specifies the IP prefix.

> **Values**   a.b.c.d (host bits must be 0)

length — Specifies the IP prefix length.

> **Values**   1 — 32

pool-name — Specifies the pool name.

> **Values**   32 chars max

Sample Output

```
*A:SR12_PPPOE>show>router>nat# show router Base nat lsn-blocks
===============================================================================
Large-Scale NAT blocks for Base
===============================================================================
13.0.0.5 [1024..1527]
Pool                              : privpool
Policy                           : priv-nat-policy
Started                          : 2012/01/28 19:10:17
Inside router                    : vprn100
Inside IP address                : 2001:470:1F00:FFFF::189
-------------------------------------------------------------------------------
Number of blocks: 1
===============================================================================
A:SR12_PPPOE#
```

lsn-hosts

Syntax	**lsn-hosts host** *ip-address*
	lsn-hosts [**outside-router** *router-instance*] [**outside-ip** *ip-address*] [**inside-ip-prefix** *ip-prefix/mask*]
Context	show>router
Description	This command displays large scale NAT hosts.
Parameters	*router-instance* — Specifies the router instance name and service ID.

Values   router-name: Base , management
                        service-id: 1 — 2147483647
                        svc-name: A string up to 64 characters in length.

ip-address — Specifies the IP address in a.b.c.d format.

ip-prefix — Specifies the IP prefix.

     Values   a.b.c.d (host bits must be 0)

length — Specifies the IP prefix length.

     Values   1 — 32

pool-name — Specifies the pool name.

     Values   32 chars max

Sample Output

```
show router 588 nat lsn-hosts
===============================================================================
Large-Scale NAT hosts for router 550
===============================================================================
Inside IP Out-Router Outside IP
-------------------------------------------------------------------------------
13.0.0.5 500 81.81.0.0
13.0.0.6 500 81.81.3.1
13.0.0.7 500 81.81.0.0
13.0.0.8 500 81.81.0.0
13.0.0.9 500 81.81.3.1
13.0.0.10 500 81.81.0.0
-------------------------------------------------------------------------------
No. of hosts: 6
===============================================================================

show router 558 nat lsn-hosts host 13.8.8.5
===============================================================================
Large-Scale NAT host details
===============================================================================
Policy : ls-outPolicy
ISA NAT group : 1
ISA NAT group member : 1
Outside router : vprn500
Outside IP : 81.81.0.0
ICMP Port usage (%) : < 1
ICMP Port usage high : false
UDP Port usage (%) : 2
UDP Port usage high : false
```

```
TCP Port usage (%) : < 1
TCP Port usage high : false
Session usage (%) : < 1
Session usage high : false
Number of sessions : 5
Number of reserved sessions : 0
Ports : 1432-1631
===============================================================================
```

pool

Syntax **pool** *pool-name*
pool

Context show>router>nat

Description This command displays NAT pool information.

Parameters *pool-name —* Specifies the pool name.

> **Values** 32 chars max

Sample Output

```
show router nat pool
===============================================================================
NAT pools
===============================================================================
Pool NAT-group Type Admin-state
-------------------------------------------------------------------------------
MyPool 1 l2Aware inService
MyPool2 1 l2Aware inService
-------------------------------------------------------------------------------
No. of pools: 2
===============================================================================


*A:SR12_PPPOE>show>router>nat# show router "Base" nat pool "privpool"
===============================================================================
NAT Pool privpool
===============================================================================
ISA NAT Group                     : 3
Pool type                         : largeScale
Admin state                       : inService
Mode                              : auto (napt)
Port forwarding range             : 1 - 1023
Port reservation                  : 128 blocks
Block usage High Watermark (%)    : (Not Specified)
Block usage Low Watermark (%)     : (Not Specified)
Subscriber limit per IP address   : 65535
Active                            : true
Last Mgmt Change                  : 01/28/2012 14:47:59
===============================================================================
NAT address ranges of pool privpool
===============================================================================
```

```
Range                                                            Drain Num-blk
-------------------------------------------------------------------------------
13.0.0.5 - 13.0.0.6                                                    1
-------------------------------------------------------------------------------
No. of ranges: 1
===============================================================================
NAT members of pool privpool ISA NAT group 3
===============================================================================
Member                                                         Block-Usage-% Hi
-------------------------------------------------------------------------------
1                                                                   < 1      N
2                                                                   < 1      N
-------------------------------------------------------------------------------
No. of members: 2
===============================================================================
A:SR12_PPPOE#
```

summary

Syntax **summary**

Context show>router>nat

Description This command displays the NAT information summary.

Sample Output

```
*A:SR12_PPPOE>show>router>nat# show router Base nat summary
===============================================================================
NAT pools
===============================================================================
Pool                        NAT-group  Type        Admin-state
-------------------------------------------------------------------------------
privpool                        3       largeScale inService
pubpool                         1       largeScale inService
-------------------------------------------------------------------------------
No. of pools: 2
===============================================================================
A:SR12_PPPOE#
```

upnp

Syntax	**upnp**
Context	show>service
Description	This command enables the context to display UPnP policy parameters.

upnp-policy

Syntax	**upnp-policy** *policy-name* **upnp-policy** *policy-name* **statistics** **upnp-policy**
Context	show>service>upnp
Description	This commands displays upnp-policy related information.
	Without any parameters the system outputs a list of configured UPnP policies.
Parameters	*policy-name —* The system displays the configuration of the specified policy.
	statistics — The system displays statistics for the specified policy.

Sample OUTPUT

```
show service upnp upnp-policy
===============================================================================
UPnP policies
===============================================================================
Policy                        Description
-------------------------------------------------------------------------------
test
-------------------------------------------------------------------------------
No. of UPnP policies: 1
===============================================================================

show service upnp upnp-policy "test"
===============================================================================
UPnP Policy test
===============================================================================
Description                : (Not Specified)
Mapping limit              : 256
Strict mode                : false
HTTP listening port        : 5000
Last Mgmt Change           : 01/26/2015 19:23:41
-------------------------------------------------------------------------------
Active mappings            : 2
Mapped subscribers         : 1
Associated subscribers     : 1
===============================================================================


show service upnp upnp-policy "test" statistics
```

```
===============================================================================
UPnP Policy test Statistics
===============================================================================
rx SSDP M-SEARCH                                        : 109
rx HTTP GET device description                          : 0
rx HTTP GET service description                         : 109
rx UPnP AddPortMapping                                  : 6
rx UPnP ClearPortMapping                                : 0
rx UPnP DeletePortMapping                               : 1
rx UPnP ForceTermination                                : 0
rx UPnP GetConnectionTypeInfo                           : 0
rx UPnP GetExternalAddress                              : 6
rx UPnP GetGenericPortMappingEntry                      : 43
rx UPnP GetNATRSIPStatus                                : 8
rx UPnP GetSpecificPortMappingEntry                     : 1
rx UPnP GetStatusInfo                                   : 49
rx UPnP RequestConnection                               : 0
rx UPnP SetConnectionType                               : 0
rx UPnP unsupported optional action                     : 6
rx UPnP invalid request                                 : 0
tx SSDP M-SEARCH                                        : 109
tx TCP reset                                            : 0
tx HTTP OK                                              : 109
tx UPnP OK                                              : 101
tx UPnP error                                           : 19
drop no memory                                          : 0
portmapping created                                     : 4
portmapping updated                                     : 1
portmapping failed: conflict with other host           : 0
portmapping failed: conflict with pinhole              : 0
portmapping failed: hit limits                          : 0
portmapping failed: other reason                        : 0
===============================================================================
```

NAT Clear Commands

upnp-mappings

Syntax   **upnp-mappings subscribe**r *sub-ident-string* **protocol {tcp|udp} outside-port** *port-number*
upnp-mappings subscriber *sub-ident-string*

Context   clear>nat

Description   This command remove UPnP mappings for the specified subscriber. If **protocol** and **outside-port** are not specified, then all UPnP mappings of subscriber will be removed.

Parameters   **subscriber** *sub-ident-string* — clears mappings for the specified subscriber.

protocol {**tcp|udp**} — Clears the mappings for the specified protocol.

outside-port *port-number* — Clears mappings for the specified outside-port.

upnp-policy-statistics

Syntax   **upnp-policy-statistics** *policy-name*

Context   clear>nat

Description   This command clears UPnP policy statistics.

Parameters   *policy-name —* Clears UPnP policy statistics for the specified policy.

nat-group

Syntax   **nat-group** *nat-group-id* **member** [*1..255*] **l2-aware-subscribers**
nat-group *nat-group-id* **member** [*1..255*] **statistics**

Context   clear>nat>isa

Description   This command clears ISA nat-group commands related statistics or removes all the subscribers that are associated with a specific nat-group member

Parameters   *nat-group-id —* Specifies the NAT group ID to clear.

Values   1 — 4

statistics — Specifies to clear the NAT group ID's statistics.

l2-aware-subscribers — Specifies to clear the NAT group ID's l2-aware subscribers.

NAT Tools Commands

nat

Syntax	**nat**
Context	tools>dump tools>perform
Description	This command enables the dump or perform tools for NAT.

isa

Syntax	**isa**
Context	tools>dump>nat
Description	This command enables the dump tools for NAT ISA.

resources

Syntax	**resources mda** *mda-id*
Context	tools>dump>nat>isa
Description	This command enables dump ISA resources for an MDA.

Sample Output

```
AR12_PPPOE# tools dump nat isa resources mda 3/1

Resource Usage for Slot #3 Mda #1:

                             | Total         | Allocated     | Free
-----------------------------+---------------+---------------+---------------
                       Flows |       6291456 |             0 |       6291456
                    Policies |           256 |             2 |           254
                 Port-ranges |       1310720 |           128 |       1310592
                       Ports |   12884901888 |             0 |   12884901888
                 IP-addresses |          65536 |             1 |          65535
            Large-scale hosts |         524288 |             0 |         524288
         L2-aware subscribers |          65536 |             0 |          65536
               L2-aware hosts |          65536 |             0 |          65536
               Delayed ICMP's |            200 |             0 |            200
                  ALG session |        1572864 |             0 |        1572864
                   LI entries |           8191 |             0 |           8191
       Upstream fragment lists |          16384 |             0 |          16384
```

```
    Downstream fragment lists |         16384 |              0 |         16384
       Upstream fragment holes |        131072 |              0 |        131072
     Downstream fragment holes |        131072 |              0 |        131072
       Upstream fragment bufs |         13824 |              0 |         13824
     Downstream fragment bufs |         13824 |              0 |         13824
            flow log dest. set 0 |             2 |              0 |             2
         flow log packets set 0 |            50 |              0 |            50
            flow log dest. set 1 |             2 |              0 |             2
         flow log packets set 1 |            50 |              0 |            50
            flow log dest. set 2 |             1 |              0 |             1
         flow log packets set 2 |            50 |              0 |            50

A:SR12_PPPOE#
```

sessions

Syntax   **sessions** [**nat-group** *nat-group-id*] [**mda** *mda-id*] [**protocol** {**icmp**|**tcp**|**udp**}] [**inside-ip** *ip-address*] [**inside-router** *router-instance*] [**inside-port** *port-number*] [**outside-ip** *ipv4-address*] [**outside-port** *port-number*] [**foreign-ip** *ipv4-address*] [**foreign-port** *port-number*] [**dslite-address** *ipv6-address*] [**destination-ip** *ipv4-address*] [**destination-port** *port-number*] [**wlan-gw-ue** *ieee-address*] [**upnp**]

Context   tools>dump>nat

Description   This command dumps ISA sessions.

Sample Output

```
*A:SR12_PPPOE# tools dump nat sessions
===============================================================================
Matched 2 sessions on Slot #3 MDA #1
===============================================================================
Owner             : LSN-Host@1.2.3.4
Router            : 100
FlowType          : UDP PortFwd
Inside IP Addr    : 1.2.3.4          Inside Port       : 666
Outside IP Addr   : 13.0.0.6         Outside Port      : 666
Foreign IP Addr   : *                Foreign Port      : *
Dest IP Addr      : *                Dest Port         : *
-------------------------------------------------------------------------------
Owner             : LSN-Host@1.2.3.4
Router            : 100
FlowType          : TCP PortFwd
Inside IP Addr    : 1.2.3.4          Inside Port       : 666
Outside IP Addr   : 13.0.0.6         Outside Port      : 666
Foreign IP Addr   : *                Foreign Port      : *
Dest IP Addr      : *                Dest Port         : *
-------------------------------------------------------------------------------
===============================================================================


===============================================================================
Matched 1 session on Slot #3 MDA #2
===============================================================================
Owner             : LSN-Host@2001:470:1F00:FFFF::189
```

```
Router            : 100
FlowType          : TCP              Timeout (sec)     : 6769
Inside IP Addr    : 138.203.16.218   Inside Port       : 41555
Outside IP Addr   : 13.0.0.5         Outside Port      : 1529
Foreign IP Addr   : 15.0.0.1         Foreign Port      : 22
Dest IP Addr      : 15.0.0.1         Dest Port         : 22
-------------------------------------------------------------------------------
===============================================================================
*A:SR12_PPPOE#
```

histogram

Syntax	**histogram router** *router-instance* **pool** *pool-name* **bucket-size** [1..65536] **num-buckets** [2..50]
Context	tools>dump>nat
Description	This command displays a NAT pool port usage histogram
Parameters	**router** *router-instance* —
	pool *pool-name* — Specifies the identification of the NAT pool.
	bucket-size [1..65536] — Specifies the unit of the X-axis of the histogram; a value of ten, for example, would return in a histogram with results for [0-9], [10-19], [20-29], ... ports.
	num-buckets [2..50] — Specifies the size of the histogram; a value of five, for example, would result in five results: [0-9], [10-19], [20-29], [30-39], [40-infinite].

port-forwarding-action

Syntax	**port-forwarding-action**
Context	tools>dump>nat
Description	This command displays NAT port forwarding actions.

l2-aware

Syntax	**l2-aware create subscriber** *sub-ident-string* **ip** *ip-address* **protocol** {**tcp**|**udp**} [**port** *port*] **lifetime** *lifetime* [**outside-ip** *ip-address*] [**outside-port** *port*] **l2-aware delete subscriber** *sub-ident-string* **ip** *ip-address* **protocol** {**tcp**|**udp**} **port** *port* **l2-aware modify subscriber** *sub-ident-string* **ip** *ip-address* **protocol** {**tcp**|**udp**} **port** *port* **lifetime** *lifetime*
Context	tools>perform>nat>port-forwarding-action
Description	This command Layer-2-Aware NAT port forwarding action.

lsn

Syntax   **lsn create router** *router-instance* [**b4** *ipv6-address*] [**aftr** *ipv6-address*] **ip** *ip-address*
protocol {**tcp**|**udp**} [**port** *port*] **lifetime** *lifetime* [**outside-ip** *ipv4-address*] [**outside-port** *port*]
lsn delete router *router-instance* [**b4** *ipv6-address*] **ip** *ip-address* **protocol** {**tcp**|**udp**} **port**
port
lsn modify router *router-instance* [**b4** *ipv6-address*] **ip** *ip-address* **protocol** {**tcp**|**udp**} **port**
port **lifetime** *lifetime*

Context   tools>perform>nat>port-forwarding-action

Description   This command enables large-scale NAT port forwarding actions.

Sample Output

```
*A:SR12_PPPOE# tools perform nat port-forwarding-action  lsn create router 100
ip 1.2.3.4 protocol tcp lifetime infinite outside-port 666
*A:SR12_PPPOE# tools perform nat port-forwarding-action  lsn create router 100
ip 1.2.3.4 protocol udp lifetime infinite outside-port 666
*A:SR12_PPPOE# configure system persistence nat-port-forwarding location cf3:
*A:SR12_PPPOE# tools dump persistence nat-port-forwarding
---------------------------------------
Persistence Info
---------------------------------------
Client             : nat-fwds
File Info :
 Filename           : cf3:\nat_fwds.002
 File State         : CLOSED (Not enough space on disk)
Subsystem Info :
 Nbr Of Registrations : 524288
 Registrations In Use : 2
 Subsystem State      : NOK
*A:SR12_PPPOE#

show+service+nat
|   |   |   +---l2-aware-hosts
|   |   |   +---l2-aware-subscribers
|   |   |   +---lsn-subscribers
|   |   |   +---nat-policy
|   |   |   +---pcp-server-policy
|   |   |   +---port-forwarding-entries
|   |   |   |   +---classic-lsn-sub
|   |   |   |   +---dslite-lsn-sub
|   |   |   |   +---l2-aware-sub
|   |   |   |   +---nat64-lsn-sub
```

NAT Filter Commands

action

Syntax	**action nat** [**nat-policy-name** *nat-policy-name*] **no action**
Context	config>filter>ip-filter>entry
Description	This command specifies packets matching the entry criteria will be subject to large-scale NAT.
Default	no action nat
Parameters	**nat** — Specifies that traffic matching the specified criteria will be diverted to NAT. **policy-name** *nat-policy-name* — Specifies the NAT policy to be used.