



## Understanding MAP-T Exception Handling

The MAP-T Exception Handling with VSM feature handles fragmented packets, TCP MSS clamping, path MTU and ICMP packets. Depending on the header details of the fragmented packets, the CGN application directly interacts with the line cards to process or forward the packets to VSM.



**Note** When MAP-T is configured for exception handling with VSM, the static route details are automatically configured with Service App details for an IPV6 to IPV4 translated packet. No manual configuration is required to configure the static routes. But in the case of an IPv4 to IPv6 translated packet, static routes have to be manually configured.

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## Configuration and Scalability Limits

- Ensure that ServiceInfra is configured before other steps are executed to configure MAP-T for exception handling. The service infrastructure is used for the management plane.
- Configuring map-t-cisco instances :
  - Only a single external domain can be configured for each map-t-cisco instance.
  - The maximum number of CPE domains that can be configured for MAP-T exception handling is 1024.
  - The number of map-t-cisco instances supported for exception handling is 32 and the maximum number of CPE domain parameters that can be used in a single map-t-cisco instance is 256.
  - A map-t-cisco instance can be configured only with a default VRF.
- To ensure IPv4/IPv6 translation is successfully performed, set the path MTU of the tunnel for both IPv4 and IPv6 traffic to 1500 bytes.

- The IOS XR software does not support IPv6 fragmentation.
- If an IPv4 packet that does not have a DF bit set is translated to an IPv6 packet that exceeds the configured MTU, the packet is translated by VSM and forwarded.

**Note**

- If the Path-MTU value is not configured, the default value is assumed to be 1280 bytes.
  - Configure the MTU on physical VSM interfaces to 1518 bytes.
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- If an IPv6 packet that does not have a fragment header set is translated to an IPv4 packet that exceeds the minimum MTU, the packet is dropped and an ICMP error message is sent.
  - Modification of path-mtu value is not recommended. If you modify the path-mtu setting, delete the service-inline interface and configure it again for the path-mtu changes to take effect.
  - Deletion of ServiceApp configuration from a MAP-T domain is not permitted.

## Supported IPv6 Extension Headers

This implementation of MAP-T exception handling supports the following IPV6 extension headers:

- Hop-by-Hop Options header (if this header exists, it must be the first one following the main/regular header)
- Destination Options header.
- Routing header.
- Fragment header.

## Processing of Fragmented Packets

The following table shows how MAP-T handles a fragmented IPv6 packet that is translated to an IPv4 packet.

| Fragment Header | More Fragment flag | Fragment off | Action taken  |
|-----------------|--------------------|--------------|---|
| 0               | x                  | x            | Lookup success. Processed by 8X100 GE line card               |
| 1               | 0                  | 0            | Lookup success based on protocol field. Forward packet to VSM |
| 1               | 0                  | 1            | Last fragment. Forward packet to VSM.                         |
| 1               | 1                  | 0            | First fragment. Forward packet to VSM                         |

| Fragment Header | More Fragment flag | Fragment off | Action taken                           |
|-----------------|--------------------|--------------|--|
| 1               | 1                  | 1            | Middle fragment. Forward packet to VSM |

The following table shows how MAP-T handles fragmentation for an IPv4 packet that is translated to an IPv6 packet.

| Do Not Fragment bit | More Fragment bit | Fragment off | Action   |
|---------------------|-------------------|--------------|--|
| 0                   | 0                 | 0            | Lookup success based on protocol value. The translated packet will contain a Fragment header |
| 0                   | 0                 | 1            | Lookup fail. Forward to VSM  |
| 0                   | 1                 | 0            | Lookup fail. Forward to VSM  |
| 0                   | 1                 | 1            | Lookup fail. Forward to VSM  |
| 1                   | 0                 | 0            | Lookup success. Processed by 8X100 GE line card  |

## Configuring MAP-T for Exception Handling with VSM

Perform these tasks to configure MAP-T for exception handling with VSM

### Running Configuration

```
interface ServiceInfra1
ipv4 address 1.1.1.1 255.255.255.252
service-location 0/4/CPU0
!
interface ServiceApp1
ipv4 address 40.40.40.1 255.255.255.0
service cgV6 cgn123 service-type map-t-cisco
!
service cgV6 cgn123
service-location preferred-active 0/4/CPU0
service-inline interface tenGigE 0/0/0/0/2
```

```
service-type map-t-cisco map1
address-family ipv4
interface ServiceApp1
tcp mss 335
path-mtu 1200
!
address-family ipv6
interface ServiceApp2
tcp mss 1254
path-mtu 1500
!
cpe-domain ipv4 prefix length 24
cpe-domain ipv6 vrf default
cpe-domain ipv6 prefix length 48
sharing-ratio 256
contiguous-ports 16
cpe-domain-name cpe0 ipv4-prefix 192.1.1.0 ipv6-prefix 2301:0:1122::
cpe-domain-name cpe1 ipv4-prefix 192.1.2.0 ipv6-prefix 2301:1:1122::
cpe-domain-name cpe2 ipv4-prefix 192.1.3.0 ipv6-prefix 2301:2:1122::
cpe-domain-name cpe3 ipv4-prefix 192.1.4.0 ipv6-prefix 2301:3:1122::
cpe-domain-name cpe4 ipv4-prefix 192.1.5.0 ipv6-prefix 2301:4:1122::
cpe-domain-name cpe5 ipv4-prefix 192.1.6.0 ipv6-prefix 2301:5:1122::
cpe-domain-name cpe6 ipv4-prefix 192.1.7.0 ipv6-prefix 2301:6:1122::
cpe-domain-name cpe7 ipv4-prefix 192.1.8.0 ipv6-prefix 2301:7:1122::
cpe-domain-name cpe8 ipv4-prefix 192.1.9.0 ipv6-prefix 2301:8:1122::
cpe-domain-name cpe9 ipv4-prefix 192.1.10.0 ipv6-prefix 2301:9:1122::
cpe-domain-name cpe10 ipv4-prefix 192.1.11.0 ipv6-prefix 2301:a:1122::
cpe-domain-name cpe11 ipv4-prefix 192.1.12.0 ipv6-prefix 2301:b:1122::
cpe-domain-name cpe12 ipv4-prefix 192.1.13.0 ipv6-prefix 2301:c:1122::
cpe-domain-name cpe13 ipv4-prefix 192.1.14.0 ipv6-prefix 2301:d:1122::
cpe-domain-name cpe14 ipv4-prefix 192.1.15.0 ipv6-prefix 2301:e:1122::
cpe-domain-name cpe15 ipv4-prefix 192.1.16.0 ipv6-prefix 2301:f:1122::
cpe-domain-name cpe16 ipv4-prefix 192.1.17.0 ipv6-prefix 2301:10:1122::
cpe-domain-name cpe17 ipv4-prefix 192.1.18.0 ipv6-prefix 2301:11:1122::
```

```

cpe-domain-name cpe18 ipv4-prefix 192.1.19.0 ipv6-prefix 2301:12:1122::
cpe-domain-name cpe19 ipv4-prefix 192.1.20.0 ipv6-prefix 2301:13:1122::
cpe-domain-name cpe20 ipv4-prefix 192.1.21.0 ipv6-prefix 2301:14:1122::
cpe-domain-name cpe21 ipv4-prefix 192.1.22.0 ipv6-prefix 2301:15:1122::
cpe-domain-name cpe22 ipv4-prefix 192.1.23.0 ipv6-prefix 2301:16:1122::
cpe-domain-name cpe23 ipv4-prefix 192.1.24.0 ipv6-prefix 2301:17:1122::
cpe-domain-name cpe24 ipv4-prefix 192.1.25.0 ipv6-prefix 2301:18:1122::
cpe-domain-name cpe25 ipv4-prefix 192.1.26.0 ipv6-prefix 2301:19:1122::
cpe-domain-name cpe26 ipv4-prefix 192.1.27.0 ipv6-prefix 2301:1a:1122::
cpe-domain-name cpe27 ipv4-prefix 192.1.28.0 ipv6-prefix 2301:1b:1122::
cpe-domain-name cpe28 ipv4-prefix 192.1.29.0 ipv6-prefix 2301:1c:1122::
cpe-domain-name cpe29 ipv4-prefix 192.1.30.0 ipv6-prefix 2301:1d:1122::
cpe-domain-name cpe30 ipv4-prefix 192.1.31.0 ipv6-prefix 2301:1e:1122::
cpe-domain-name cpe31 ipv4-prefix 192.1.32.0 ipv6-prefix 2301:1f:1122::
ext-domain-name ext1 ipv6-prefix 6301:d01:1122::/48 ipv4-vrf default
!

```

## Troubleshooting ICMP Errors

This section covers details of errors encountered during translation of packets from IPv4 to IPv6 and vice versa.

[Translating ICMP IPv4 Headers to ICMP IPv6 Headers](#)

[Translating ICMP IPv6 Headers to ICMP IPv4 Headers](#)

### Translating ICMP IPv4 Headers to ICMP IPv6 Headers

|                                  | IPv4 Header                                  | IPv6 Header   | Description of the error                                   |
|----------------------------------|--|---------------|--|
| Destination Unreachable (Type 3) | Network Unreachable (code 0)                 | Type 1 code 0 | Communication with destination administratively prohibited |
|                                  | Host Unreachable (code 1)                    | Type 1 code 0 | No route to destination                                    |
|                                  | Protocol Unreachable (code 2)                | Type 4 code 1 | Unrecognized Next Header type encountered                  |
|                                  | Port Unreachable (code 3)                    | Type 1 code 4 | Port unreachable   |
|                                  | Fragmentation Needed and DF was set (code 4) |               | No route to destination                                    |

|                             | IPv4 Header                          | IPv6 Header   | Description of the error                                   |
|-----------------------------|--------------------------------------|---------------|--|
|                             | Source Route Failed(code 5)          |               | No route to destination                                    |
|                             | code 6                               | Type 1 code 0 | No route to destination                                    |
|                             | code 7                               | Type 1 code 0 | No route to destination                                    |
|                             | code 8                               | Type 1 code 0 | No route to destination                                    |
|                             | code 9                               | Type 1 code 1 |  |
|                             | code 10                              | Type 1 code 1 | Communication with destination administratively prohibited |
|                             | code 11                              | Type 1 code 0 | No route to destination                                    |
|                             | code 12                              | Type 1 code 0 | No route to destination                                    |
|                             | code 13                              | Type 1 code 0 | No route to destination                                    |
|                             | code 14                              | Drop          |  |
|                             | code 15                              | Type 1 code 1 | Communication with destination administratively prohibited |
|                             | Time Exceeded (type 11)              | Type 3        | Time Exceeded  |
| Parameter Problem (Type 12) | Pointer indicates the error (code 0) | Type 4 code 0 | Parameter Problem  |
|                             | Missing a required option (code 1)   | Drop          |  |
|                             | Bad Length (code 2)                  | Type 4 code 0 | Erroneous header field encountered                         |
|                             | Echo request (Type 8)                | Type 128      | Echo Request   |
|                             | Echo reply (Type 0)                  | Type 129      | Echo Reply   |

## Translating ICMP IPv6 Headers to ICMP IPv4 Headers

|                                  | IPv6 Header  | IPv4 Header | Description of the error                  |
|----------------------------------|--|-------------|---|
| Destination Unreachable (Type 1) | No route to destination (code 0)                   | code 1      | No route to destination                   |
|                                  | Communication with destination prohibited (code 1) | code 10     | Communication with destination prohibited |
|                                  | Beyond scope of src address (code 2)               | code 1      | Beyond scope of src address               |

|                            | <b>IPv6 Header</b>                            | <b>IPv4 Header</b>                             | <b>Description of the error</b>                            |
|----------------------------|---|--|--|
|                            | Address unreachable (code 3)                  | code 1   | Address unreachable  |
|                            | Port unreachable (code 4)                     | code 3   | Port unreachable   |
|                            | Packet Too Big (Type 2)                       | Type 3 code 4                                  | Fragmentation needed and Don't Fragment was Set            |
| Time Exceeded (type 3)     | Hop limit exceeded in transmit (code 0)       | Type 11 code 0                                 | Time to Live exceeded in Transit                           |
|                            | Fragment reassembly timeout (code 1)          | Type 11 code 1                                 | Fragment Reassembly Time Exceeded                          |
| Parameter Problem (Type 4) | Erroneous header field (code 0)               | erroneous header field (code 0) Type 12 code 0 | Pointer indicates the error                                |
|                            | Unrecognized next header field (code 1)       | Type 3 code 2                                  | Protocol Unreachable                                       |
|                            | Unrecognized IPv6 option encountered (code 2) | drop   | Communication with destination administratively prohibited |

