



# Implementing LPTS

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## LPTS Overview

Local Packet Transport Services (LPTS) maintains tables describing all packet flows destined for the secure domain router (SDR), making sure that packets are delivered to their intended destinations.

LPTS uses two components to accomplish this task: the port arbitrator and flow managers. The port arbitrator and flow managers are processes that maintain the tables that describe packet flows for a logical router, known as the Internal Forwarding Information Base (IFIB). The IFIB is used to route received packets to the correct Route Processor for processing.

LPTS interfaces internally with all applications that receive packets from outside the router. LPTS functions without any need for customer configuration. However, the policer values can be customized if required. The LPTS show commands are provided that allow customers to monitor the activity and performance of LPTS flow managers and the port arbitrator.

## LPTS Policers

In Cisco IOS XR, the control packets, which are destined to the Route Processor (RP), are policed using a set of ingress policers in the incoming ports. These policers are programmed statically during bootup by LPTS components. The policers are applied based on the flow type of the incoming control traffic. The flow type is determined by looking at the packet headers. The policer rates for these static ingress policers are defined in a configuration file, which are programmed on the route processor during bootup. You can change the policer values based on the flow types of these set of ingress policers. You are able to configure the rate per policer per node.



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### Note

- You can get the default policer values and the current rates of the flow types from the output of the following show command:

```
show lpts pifib hardware police
```

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### Configuration Example

Configure the LPTS policer for the OSPF and BGP flow types with the following values globally for all nodes:

- ospf unicast default rate 3000
- bgp default rate 4000

```
Router#configure
Router(config)#lpts pifib hardware police
Router(config-pifib-policer-global)#flow ospf unicast default rate 3000
Router(config-pifib-policer-global)#flow bgp default rate 4000
Router (config-pifib-policer-global)#commit
```

### Running Configuration

```
lpts pifib hardware police
flow ospf unicast default rate 3000
flow bgp default rate 4000
!
```

### Verification

```
Router#show run lpts pifib hardware police
lpts pifib hardware police
flow ospf unicast default rate 3000
flow bgp default rate 4000
```

### Configuration Example

Configure the LPTS policer for the OSPF and BGP flow types with the following values on an individual node - 0/RP0/CPU0:

- ospf unicast default rate 3000
- flow bgp default rate 4000

```
Router#configure
Router(config)#lpts pifib hardware police location 0/RP0/CPU0
Router(config-pifib-policer-per-node)#flow ospf unicast default rate 3000
Router(config-pifib-policer-per-node)#flow bgp default rate 4000
Router(config-pifib-policer-per-node)#commit
```

### Running Configuration

```
lpts pifib hardware police location 0/RP0/CPU0
flow ospf unicast default rate 3000
flow bgp default rate 4000
```

### Verification

The **show lpts pifib hardware police location 0/RP0/CPU0** command displays pre-Internal Forwarding Information Base (IFIB) information for the designated node.

```
Router#show lpts pifib hardware police location 0/RP0/CPU0
-----
Node 0/RP0/CPU0:
-----
Burst = 100ms for all flow types
-----
FlowType          Policer Type      Cur. Rate Burst      npu
```

```
-----
OSPF-uc-default      32106  np    3000  1000  0
BGP-default          32118  np    4000  1250  0
-----
```

**Verification**

The **show controllers npu stats traps-all instance all location 0/RP0/CPU0** command displays packets that are locally processed and packets that are dropped by the CPU.

Router# **show controllers npu stats traps-all instance all location 0/RP0/CPU0**

| Trap Type                                 | NPU ID | Trap ID | TrapStats ID | Policer | Packet Accepted | Packet Dropped |
|---|--------|---------|--------------|---------|-----------------|----------------|
| RxTrapMimSaMove (CFM_DOWN_MEP_DMM)        | 0      | 6       | 0x6          | 32037   | 0               | 0              |
| RxTrapMimSaUnknown (RCY_CFM_DOWN_MEP_DMM) | 0      | 7       | 0x7          | 32037   | 0               | 0              |
| RxTrapAuthSaLookupFail (IPMC default)     | 0      | 8       | 0x8          | 32033   | 0               | 0              |
| RxTrapSaMulticast                         | 0      | 11      | 0xb          | 32018   | 0               | 0              |
| RxTrapArpMyIp                             | 0      | 13      | 0xd          | 32001   | 0               | 0              |
| RxTrapArp                                 | 0      | 14      | 0xe          | 32001   | 11              | 0              |
| RxTrapDhcpv4Server                        | 0      | 18      | 0x12         | 32022   | 0               | 0              |
| RxTrapDhcpv4Client                        | 0      | 19      | 0x13         | 32022   | 0               | 0              |
| RxTrapDhcpv6Server                        | 0      | 20      | 0x14         | 32022   | 0               | 0              |
| RxTrapDhcpv6Client                        | 0      | 21      | 0x15         | 32022   | 0               | 0              |
| RxTrapL2Cache_LACP                        | 0      | 23      | 0x17         | 32003   | 0               | 0              |
| RxTrapL2Cache_LLDP1                       | 0      | 24      | 0x18         | 32004   | 0               | 0              |
| RxTrapL2Cache_LLDP2                       | 0      | 25      | 0x19         | 32004   | 1205548         | 0              |
| RxTrapL2Cache_LLDP3                       | 0      | 26      | 0x1a         | 32004   | 0               | 0              |
| RxTrapL2Cache_ELMI                        | 0      | 27      | 0x1b         | 32005   | 0               | 0              |
| RxTrapL2Cache_BPDU                        | 0      | 28      | 0x1c         | 32027   | 0               | 0              |
| RxTrapL2Cache_BUNDLE_BPDU                 | 0      | 29      | 0x1d         | 32027   | 0               | 0              |
| RxTrapL2Cache_CDP                         | 0      | 30      | 0x1e         | 32002   | 0               | 0              |
| RxTrapHeaderSizeErr                       | 0      | 32      | 0x20         | 32018   | 0               | 0              |
| RxTrapIpCompMcInvalidIp                   | 0      | 35      | 0x23         | 32018   | 0               | 0              |
| RxTrapMyMacAndIpDisabled                  | 0      | 36      | 0x24         | 32018   | 0               | 0              |
| RxTrapMyMacAndMplsDisable                 | 0      | 37      | 0x25         | 32018   | 0               | 0              |
| RxTrapArpReply                            | 0      | 38      | 0x26         | 32001   | 2693            | 0              |
| RxTrapFibDrop                             | 0      | 41      | 0x29         | 32018   | 0               | 0              |
| RxTrapMTU                                 | 0      | 42      | 0x2a         | 32020   | 0               | 0              |

|   |   |     |      |       |        |      |
|---|---|-----|------|-------|--------|------|
| RxTrapMiscDrop                          | 0 | 43  | 0x2b | 32018 | 0      | 0    |
| RxTrapL2AclDeny                         | 0 | 44  | 0x2c | 32034 | 0      | 0    |
| Rx_UNKNOWN_PACKET                       | 0 | 46  | 0x2e | 32018 | 0      | 0    |
| RxTrapL3AclDeny                         | 0 | 47  | 0x2f | 32034 | 0      | 0    |
| RxTrapOamY1731MplsTp (OAM_SWOFF_DN_CCM) | 0 | 57  | 0x39 | 32029 | 0      | 0    |
| RxTrapOamY1731Pwe (OAM_SWOFF_DN_CCM)    | 0 | 58  | 0x3a | 32030 | 0      | 0    |
| RxTrapOamLevel                          | 0 | 64  | 0x40 | 32023 | 0      | 0    |
| RxTrapRedirectToCpuOamPacket            | 0 | 65  | 0x41 | 32025 | 0      | 0    |
| RxTrapOamPassive                        | 0 | 66  | 0x42 | 32024 | 0      | 0    |
| RxTrap1588                              | 0 | 67  | 0x43 | 32038 | 0      | 0    |
| RxTrapExternalLookupError               | 0 | 72  | 0x48 | 32018 | 0      | 0    |
| RxTrapArplookupFail                     | 0 | 73  | 0x49 | 32001 | 0      | 0    |
| RxTrapUcLooseRpfFail                    | 0 | 84  | 0x54 | 32035 | 0      | 0    |
| RxTrapMplsControlWordTrap               | 0 | 88  | 0x58 | 32015 | 0      | 0    |
| RxTrapMplsControlWordDrop               | 0 | 89  | 0x59 | 32015 | 0      | 0    |
| RxTrapMplsUnknownLabel                  | 0 | 90  | 0x5a | 32018 | 0      | 0    |
| RxTrapIpv4VersionError                  | 0 | 98  | 0x62 | 32018 | 0      | 0    |
| RxTrapIpv4ChecksumError                 | 0 | 99  | 0x63 | 32018 | 0      | 0    |
| RxTrapIpv4HeaderLengthError             | 0 | 100 | 0x64 | 32018 | 0      | 0    |
| RxTrapIpv4TotalLengthError              | 0 | 101 | 0x65 | 32018 | 0      | 0    |
| RxTrapIpv4Ttl0                          | 0 | 102 | 0x66 | 32008 | 0      | 0    |
| RxTrapIpv4Ttl1                          | 0 | 104 | 0x68 | 32008 | 0      | 0    |
| RxTrapIpv4DipZero                       | 0 | 106 | 0x6a | 32018 | 0      | 0    |
| RxTrapIpv4SipIsMc                       | 0 | 107 | 0x6b | 32018 | 0      | 0    |
| RxTrapIpv6VersionError                  | 0 | 109 | 0x6d | 32018 | 0      | 0    |
| RxTrapIpv6HopCount0                     | 0 | 110 | 0x6e | 32011 | 0      | 0    |
| RxTrapIpv6LoopbackAddress               | 0 | 113 | 0x71 | 32018 | 0      | 0    |
| RxTrapIpv6MulticastSource               | 0 | 114 | 0x72 | 32018 | 0      | 0    |
| RxTrapIpv6NextHeaderNull                | 0 | 115 | 0x73 | 32010 | 0      | 0    |
| RxTrapIpv6Ipv4CompatibleDestination     | 0 | 121 | 0x79 | 32018 | 0      | 0    |
| RxTrapMplsTtl1                          | 0 | 125 | 0x7d | 32012 | 316278 | 2249 |
| RxTrapUcStrictRpfFail                   | 0 | 137 | 0x89 | 32035 | 0      | 0    |

|  |   |     |      |       |           |   |
|--|---|-----|------|-------|-----------|---|
| RxTrapMcExplicitRpfFail                        | 0 | 138 | 0x8a | 32033 | 0         | 0 |
| RxTrapOamp (OAM_BDL_DN_NON_CCM)                | 0 | 141 | 0x8d | 32031 | 0         | 0 |
| RxTrapOamEthUpAccelerated (OAM_BDL_UP_NON_CCM) | 0 | 145 | 0x91 | 32032 | 0         | 0 |
| RxTrapReceive                                  | 0 | 150 | 0x96 | 32017 | 125266112 | 0 |
| RxTrapUserDefine_FIB_IPV4_NULL0                | 0 | 151 | 0x97 | 32018 | 0         | 0 |
| RxTrapUserDefine_FIB_IPV6_NULL0                | 0 | 152 | 0x98 | 32018 | 0         | 0 |
| RxTrapUserDefine_FIB_IPV4_GLEAN                | 0 | 153 | 0x99 | 32016 | 0         | 0 |
| RxTrapUserDefine_FIB_IPV6_GLEAN                | 0 | 154 | 0x9a | 32016 | 0         | 0 |
| RxTrapUserDefine_IPV4_OPTIONS                  | 0 | 155 | 0x9b | 32006 | 0         | 0 |
| RxTrapUserDefine_IPV4_RSVP_OPTIONS             | 0 | 156 | 0x9c | 32007 | 0         | 0 |
| RxTrapUserDefine                               | 0 | 157 | 0x9d | 32026 | 0         | 0 |
| RxTrapUserDefine_BFD                           | 0 | 163 | 0xa3 | 32028 | 0         | 0 |
| RxTrapMC                                       | 0 | 181 | 0xb5 | 32033 | 0         | 0 |
| RxNetflowSnoopTrap0                            | 0 | 182 | 0xb6 | 32018 | 0         | 0 |
| RxNetflowSnoopTrap1                            | 0 | 183 | 0xb7 | 32018 | 0         | 0 |
| RxTrapMimSaMove (CFM_DOWN_MEP_DMM)             | 1 | 6   | 0x6  | 32037 | 0         | 0 |
| RxTrapMimSaUnknown (RCY_CFM_DOWN_MEP_DMM)      | 1 | 7   | 0x7  | 32037 | 0         | 0 |
| RxTrapAuthSaLookupFail (IPMC default)          | 1 | 8   | 0x8  | 32033 | 0         | 0 |
| RxTrapSaMulticast                              | 1 | 11  | 0xb  | 32018 | 0         | 0 |
| RxTrapArpMyIp                                  | 1 | 13  | 0xd  | 32001 | 0         | 0 |

### Associated Commands

- lpts pifib hardware police
- flow ospf
- flow bgp
- show lpts pifib hardware police

## Per Port Rate Limiting of Multicast and Broadcast Punt Packets

This feature enables rate limiting of multicast and broadcast punted traffic at the interface level. Currently, a rate limit is supported per NPU level. This feature supports rate limiting at the interface level so as to protect a port from receiving the multicast and broadcast storm of punted traffic. Rate limiting for all the L3 protocol punt packets and L2 protocol packets (only ERPS, and DOT1x) is supported on physical and bundle main interfaces.

## Configuring a Rate Limit to the Multicast and Broadcast Punted Traffic

You can configure the multicast and broadcast rate limit in three levels:

- Interface level
- Global level
- Domain level

Along with rate limiting the multicast and broadcast punted traffic, you can configure rate limit to these protocol punted traffic:

- ARP
- CDP
- LACP

The protocol specific configurations are explained in the below section.

### Limitation

When broadcast and multicast rate limit is configured along with ARP rate limit, the ARP packets increment broadcast and multicast counters.

### Interface Level

This example shows how to configure the rate limit of 1000 pps for the multicast and broadcast punted traffic at the TenGig interface:




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**Note** An interface level rate limit configuration has the highest priority over a global and domain level configurations.

---

1. Router# configure  
Enters the configuration mode.
2. Router(config)# lpts punt police 0/RP0/CPU0  
Enters punt configuration mode.
3. Router(config-lpts-punt-policer)# interface TenGigE0/0/0/3  
Enters per interface level policer configuration.
4. Router(config-lpts-punt-policer-global-if)# mcast rate 1000  
Configures a rate limit of 1000 pps for multicast punted traffic.
5. Router(config-lpts-punt-policer-global-if)# bcast rate 1000  
Configures a rate limit of 1000 pps for broadcast punted traffic.
6. Router(config-lpts-punt-policer-global-if)# commit  
Commit the configuration.

### Global Level

This example shows how to configure the rate limit of:

- 1000 pps for the multicast and broadcast punted traffic

1. Router# configure  
Enters the configuration mode.
2. Router(config)# lpts punt police 0/RP/CPU0  
Enters punt configuration mode.
3. Router(config-punt-policer-global)# mcast rate 1000  
Configures multicast rate limit of 1000 pps.
4. Router(config-punt-policer-global)# bcast rate 1000  
Configures broadcast rate limit of 1000 pps.
5. Router(config-punt-policer-global)# commit  
Commit the configuration.

## LPTS Domain Based Policers

You can configure a particular port, a group of ports, or a line card of a router with LPTS policers of a single domain. Configuration of port-based policers that belong to a particular domain enables better categorisation and control of different types of ingress traffic. For example, since iBGP traffic has a higher rate of traffic flow, the ports that handle iBGP traffic can be configured with higher policer rates compared to the ports that handle eBGP traffic.

### Restrictions

- The policer rates that are configured for ports or line cards are carried forwards as policer rates of the domain after configuring the ports or line cards as part of a domain. For example, if port hundredGigE 0/0/0/1 and port hundredGigE 0/0/0/2 have policer rate of 3000 for ospf unicast known flow and if the ports are configured as part of domain CORE, then the policer rate of domain CORE for ospf unicast known flow is 3000 unless it is configured otherwise.
- You can configure only one domain per router.
- A Domain name can be any word but can have up to a maximum of 32 characters.

### Configuration Example

To configure LPTS domain based policers, use the following steps:

1. Enter the LPTS hardware configuration mode and create a domain.
2. Configure the interfaces for the domain.
3. Enter the LPTS hardware configuration mode for the domain CORE, and then configure the ingress policer rates for the domain CORE at the global level.

4. Enter the LPTS hardware configuration mode for the domain CORE, and then configure the ingress policer rates for the domain CORE at the line card level.

### Configuration

```

/* Enter the LPTS hardware ingress policer configuration mode and create a domain named
CORE. */
Router# config
Router(config)# lpts pifib hardware domain CORE

/* Configure the interfaces for the domain CORE. */
Router(config-lpts-domains-CORE)# interface hundredGigE 0/0/0/1
Router(config-lpts-domains-CORE)# interface hundredGigE 0/0/0/2
Router(config-lpts-domains-CORE)# commit
Router(config-lpts-domains-CORE)# exit

/* Enter the LPTS hardware configuration mode for the domain CORE, and then configure the
ingress policer rates for the domain CORE at the global level. */
Router(config)# lpts pifib hardware police domain CORE
Router(config-lpts-policer-global-CORE)# flow ospf unicast known rate 6000
Router(config-lpts-policer-global-CORE)# flow ospf unicast default rate 7000
Router(config-lpts-policer-global-CORE)# commit
Router(config-lpts-policer-global-CORE)# exit
Router(config-lpts-policer-global)# exit

/* Enter the LPTS hardware configuration mode for the domain CORE, and then configure the
ingress policer rates for the domain CORE at the line card level. */
Router(config)# lpts pifib hardware police location 0/0/CPU0 domain CORE
Router(config-lpts-policer-global-CORE)# flow ospf unicast known rate 7000
Router(config-lpts-policer-global-CORE)# flow ospf unicast default rate 8000
Router(config-lpts-policer-global-CORE)# commit

```

### Running Configuration

```

lpts pifib hardware domain CORE
  interface HundredGigE0/0/0/1
  interface HundredGigE0/0/0/2
!
lpts pifib hardware police
  domain CORE
    flow ospf unicast known rate 6000
    flow ospf unicast default rate 7000
!

lpts pifib hardware police location 0/0/CPU0 domain CORE
  flow ospf unicast known rate 7000
  flow ospf unicast default rate 8000
!

```

### Verification

Use the following command to verify information about the LPTS domains configured:

```

Router# show lpts pifib domains
Thu Nov 21 15:49:31.334 IST

Domains Information: 1 Configured
-----
Domain: [1] CORE
-----
interface [-----] HundredGigE0/0/0/1

```



```
interface [-----] HundredGigE0/0/0/2
  0 local of total 2 interfaces
```

