



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.

Configuration Example

Configure the LPTS policer for the OSPF and BGP flowtypes with the following values:

- ospf unicast default rate 200
- bgp configured rate 200

- bgp default rate 100

```
Router#configure
Router(config)#lpts pifib hardware police
Router(config-pifib-policer-global)#flow ospf unicast default rate 200
Router(config-pifib-policer-global)#flow bgp configured rate 200
Router(config-pifib-policer-global)#flow bgp default rate 100
Router (config-pifib-policer-global)#commit
```

Running Configuration

```
lpts pifib hardware police
flow ospf unicast default rate 200
flow bgp configured rate 200
flow bgp default rate 100
!
```

Verification

```
Router#show run lpts pifib hardware police
lpts pifib hardware police
flow ospf unicast default rate 200
flow bgp configured rate 200
flow bgp default rate 100
```



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

Configuration Example

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

- ospf unicast default rate 100
- bgp configured rate 300

```
Router#configure
Router(config)#lpts pifib hardware police
Router(config-pifib-policer-per-node)#flow ospf unicast default rate 200
Router(config-pifib-policer-per-node)#flow bgp configured rate 200
Router(config-pifib-policer-per-node)#flow bgp default rate 100
Router(config-pifib-policer-per-node)#commit
```

Running Configuration

```
lpts pifib hardware police location 0/RP0/CPU0
flow ospf unicast default rate 100
flow bgp configured rate 300
```

Verification

```
Router#show run lpts pifib hardware police
lpts pifib hardware police
flow ospf unicast default rate 100
flow bgp configured rate 300
!
```

Verification

The **show controllers npu stats traps-all instance all location 0/0/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 0/0/CPU0**

| Trap Type | NPU ID | Trap ID | TrapStats ID | Policer | Packet Accepted | Packet Dropped |
|---|--------|---------|--------------|---------|-----------------|----------------|
| RxTrapMimSaMove (CFM_DOWM_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 |

Understanding ACL-based Policers

ACL-based LPTS policers are session-based policers that provide secure network access for each session.

Benefits

These are the benefits of ACL-based policer:

- Provides rate limit on incoming packets based on session.
- Modifies policer rates depending on traffic load.
- Blocks entire traffic based on a specific session without impacting other sessions with the same flow.

Restrictions

- It is recommended to have up to 10 prefixes in a single ACL. The ACEs in an ACL should be managed such that there is no overlap of prefixes.
- Up to 50 ACL-based LPTS policers can be configured on a router.

- ACL-based LPTS policers can be configured to an IPv4 LPTS session that has a particular flow type and that matches the default VRF.

Configure IPv4 ACL-based LPTS Policers

This section describes how you can configure IPv4 ACL-based LPTS policers.

Configuration Example

To configure ACL-based LPTS policers for IPv4 sessions, complete the following configurations:

1. Configure an ACL.
2. Configure LPTS policer for a particular IPv4 session matching an ACL and default VRF.

Configuration

```
/* Enter the global configuration mode and configure an ACL */
Router# configure
Router(config)# ipv4 access-list ACL1_OSPF
Router(config-ipv4-acl)# 10 permit ipv4 host 192.168.1.5 any
Router(config-ipv4-acl)# commit
Router(config-ipv4-acl)# exit

/* Configure LPTS policer for a particular IPv4 session matching an ACL and default VRF.
*/
Router(config)# lpts pifib hardware police
Router(config-pifib-policer-global)# acl ACL1_OSPF rate 2000 vrf default
Router(config-if)# commit
```

Verification

Use the following command to display the ACL-based LPTS policer entries attached to matching entries:

```
Router#show lpts pifib hardward entry statistics location 0/RP0/CPU0
```

| Offset | NPU | L3 | VRF id | L4 | Intf | Dest | Pkts/Drops | laddr,Port | raddr,Port | acl_name | |
|--------|------|-----|--------|---------|------|-------|------------|------------|------------------|----------|-----------|
| ---- | ---- | --- | ----- | --- | --- | ----- | ----- | ----- | ----- | ----- | |
| 37 | 0 | [0] | IPV4 | * | any | any | Local | 0/0 | any,any | any,any | |
| 38 | 0 | [1] | IPV4 | * | any | any | Local | 0/0 | any,any | any,any | |
| . | . | . | . | . | . | . | . | . | . | . | |
| . | . | . | . | . | . | . | . | . | . | . | |
| 187 | 0 | [0] | IPV4 | * | ICMP | any | Local | 0/0 | any,8 | any,ECHO | ACL3_ICMP |
| 188 | 0 | [1] | IPV4 | * | ICMP | any | Local | 0/0 | any,8 | any,ECHO | ACL3_ICMP |
| 189 | 0 | [2] | IPV4 | * | ICMP | any | Local | 0/0 | any,8 | any,ECHO | ACL3_ICMP |
| 190 | 0 | [3] | IPV4 | * | ICMP | any | Local | 0/0 | any,8 | any,ECHO | ACL3_ICMP |
| 8963 | 0 | [0] | IPV4 | default | UDP | OptV2 | Local | 22588/0 | 192.168.10.2,646 | any,any | ACL4_UDP |
| 8964 | 0 | [1] | IPV4 | default | UDP | OptV2 | Local | 22590/0 | 192.168.10.2,646 | any,any | ACL4_UDP |
| 8965 | 0 | [2] | IPV4 | default | UDP | OptV2 | Local | 0/0 | 192.168.10.2,646 | any,any | ACL4_UDP |
| 8966 | 0 | [3] | IPV4 | default | UDP | OptV2 | Local | 0/0 | 192.168.10.2,646 | any,any | ACL4_UDP |
| . | . | . | . | . | . | . | . | . | . | . | |
| . | . | . | . | . | . | . | . | . | . | . | |
| 8279 | 0 | [0] | IPV4 | default | OSPF | OptV2 | Local | 846248/0 | 192.168.10.5,any | any,any | ACL1_OSPF |
| 8280 | 0 | [1] | IPV4 | default | OSPF | OptV2 | Local | 962717/0 | 192.168.10.5,any | any,any | ACL1_OSPF |
| 8281 | 0 | [3] | IPV4 | default | OSPF | OptV2 | Local | 421169/0 | 192.168.10.5,any | any,any | ACL1_OSPF |
| 8281 | 0 | [4] | IPV4 | default | OSPF | OptV2 | Local | 0/0 | 192.168.10.5,any | any,any | ACL1_OSPF |
| . | . | . | . | . | . | . | . | . | . | . | |

| | | | | | | | | | | | |
|------|---|-----|------|---------|------|-------|-------|---------|------------------|---------|-----------|
| . | . | . | . | . | . | . | . | . | . | . | . |
| . | . | . | . | . | . | . | . | . | . | . | . |
| 8339 | 0 | [0] | IPV4 | red8 | OSPF | OptV2 | Local | 0/0 | 192.168.10.5,any | any,any | ACL1_OSPF |
| 8340 | 0 | [1] | IPV4 | red8 | OSPF | OptV2 | Local | 0/0 | 192.168.10.5,any | any,any | ACL1_OSPF |
| 8341 | 0 | [2] | IPV4 | red8 | OSPF | OptV2 | Local | 11099/0 | 192.168.10.5,any | any,any | ACL1_OSPF |
| 8342 | 0 | [1] | IPV4 | red8 | OSPF | OptV2 | Local | 0/0 | 192.168.10.5,any | any,any | ACL1_OSPF |
| . | . | . | . | . | . | . | . | . | . | . | . |
| . | . | . | . | . | . | . | . | . | . | . | . |
| . | . | . | . | . | . | . | . | . | . | . | . |
| 8363 | 0 | [0] | IPV4 | red7 | OSPF | OptV2 | Local | 0/0 | 192.168.10.5,any | any,any | ACL1_OSPF |
| 8364 | 0 | [1] | IPV4 | red7 | OSPF | OptV2 | Local | 0/0 | 192.168.10.5,any | any,any | ACL1_OSPF |
| 8365 | 0 | [2] | IPV4 | red7 | OSPF | OptV2 | Local | 11099/0 | 192.168.10.5,any | any,any | ACL1_OSPF |
| 8366 | 0 | [3] | IPV4 | red7 | OSPF | OptV2 | Local | 0/0 | 192.168.10.5,any | any,any | ACL1_OSPF |
| . | . | . | . | . | . | . | . | . | . | . | . |
| . | . | . | . | . | . | . | . | . | . | . | . |
| . | . | . | . | . | . | . | . | . | . | . | . |
| 8375 | 0 | [0] | IPV4 | red6 | OSPF | OptV2 | Local | 0/0 | 192.168.10.5,any | any,any | ACL1_OSPF |
| 8376 | 0 | [1] | IPV4 | red6 | OSPF | OptV2 | Local | 0/0 | 192.168.10.5,any | any,any | ACL1_OSPF |
| 8377 | 0 | [2] | IPV4 | red6 | OSPF | OptV2 | Local | 11103/0 | 192.168.10.5,any | any,any | ACL1_OSPF |
| 8378 | 0 | [3] | IPV4 | red6 | OSPF | OptV2 | Local | 0/0 | 192.168.10.5,any | any,any | ACL1_OSPF |
| . | . | . | . | . | . | . | . | . | . | . | . |
| . | . | . | . | . | . | . | . | . | . | . | . |
| . | . | . | . | . | . | . | . | . | . | . | . |
| 8391 | 0 | [0] | IPV4 | red5 | OSPF | OptV2 | Local | 0/0 | 192.168.10.5,any | any,any | ACL1_OSPF |
| 8392 | 0 | [1] | IPV4 | red5 | OSPF | OptV2 | Local | 0/0 | 192.168.10.5,any | any,any | ACL1_OSPF |
| 8393 | 0 | [2] | IPV4 | red5 | OSPF | OptV2 | Local | 11104/0 | 192.168.10.5,any | any,any | ACL1_OSPF |
| 8394 | 0 | [3] | IPV4 | red5 | OSPF | OptV2 | Local | 0/0 | 192.168.10.5,any | any,any | ACL1_OSPF |
| . | . | . | . | . | . | . | . | . | . | . | . |
| . | . | . | . | . | . | . | . | . | . | . | . |
| . | . | . | . | . | . | . | . | . | . | . | . |
| 8411 | 0 | [0] | IPV4 | red4 | OSPF | OptV2 | Local | 0/0 | 192.168.10.5,any | any,any | ACL1_OSPF |
| 8412 | 0 | [1] | IPV4 | red4 | OSPF | OptV2 | Local | 0/0 | 192.168.10.5,any | any,any | ACL1_OSPF |
| 8413 | 0 | [2] | IPV4 | red4 | OSPF | OptV2 | Local | 11101/0 | 192.168.10.5,any | any,any | ACL1_OSPF |
| 8414 | 0 | [3] | IPV4 | red4 | OSPF | OptV2 | Local | 0/0 | 192.168.10.5,any | any,any | ACL1_OSPF |
| . | . | . | . | . | . | . | . | . | . | . | . |
| . | . | . | . | . | . | . | . | . | . | . | . |
| . | . | . | . | . | . | . | . | . | . | . | . |
| 8427 | 0 | [0] | IPV4 | red3 | OSPF | OptV2 | Local | 0/0 | 192.168.10.5,any | any,any | ACL1_OSPF |
| 8428 | 0 | [1] | IPV4 | red3 | OSPF | OptV2 | Local | 0/0 | 192.168.10.5,any | any,any | ACL1_OSPF |
| 8429 | 0 | [2] | IPV4 | red3 | OSPF | OptV2 | Local | 11107/0 | 192.168.10.5,any | any,any | ACL1_OSPF |
| 8430 | 0 | [3] | IPV4 | red3 | OSPF | OptV2 | Local | 0/0 | 192.168.10.5,any | any,any | ACL1_OSPF |
| . | . | . | . | . | . | . | . | . | . | . | . |
| . | . | . | . | . | . | . | . | . | . | . | . |
| . | . | . | . | . | . | . | . | . | . | . | . |
| 8439 | 0 | [0] | IPV4 | red1 | OSPF | OptV2 | Local | 0/0 | 192.168.10.5,any | any,any | ACL1_OSPF |
| 8440 | 0 | [1] | IPV4 | red1 | OSPF | OptV2 | Local | 0/0 | 192.168.10.5,any | any,any | ACL1_OSPF |
| 8441 | 0 | [2] | IPV4 | red1 | OSPF | OptV2 | Local | 11099/0 | 192.168.10.5,any | any,any | ACL1_OSPF |
| 8442 | 0 | [3] | IPV4 | red1 | OSPF | OptV2 | Local | 0/0 | 192.168.10.5,any | any,any | ACL1_OSPF |
| . | . | . | . | . | . | . | . | . | . | . | . |
| . | . | . | . | . | . | . | . | . | . | . | . |
| . | . | . | . | . | . | . | . | . | . | . | . |
| 8276 | 0 | [1] | IPV4 | default | OSPF | OptV2 | Local | 1752/0 | any,any | any,any | |

