

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.

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
  ```

- For quick file transfer through a data port, you can configure LPTS policer rate for SSH flow.

  Verify that the LPTS drops using the command, **show lpts pifib hardware entry brief location** *node-id* |**inc SSH**. If there are any LPTS drops, increase the rate up to a maximum of 50000 pps.

  Increase the value to the maximum only if required, as the CPU cycles usage increases with higher PPS.

  For example,

  ```
  Router#configure
  Router(config)#lpts pifib hardware police location 0/0/CPU0
  Router(config-pifib-policer-per-node)# flow ssh known rate 50000
  Router(config-pifib-policer-per-node)#commit
  ```

-

Verification

This show **show lpts pifib hardware entry brief location** command is updated to display the statistics of the flow types. The counters are printed under the OOS field description. The * indicates the statistics of the resources are exhausted. Note, that the LPTS functionality is not impacted.

```
RP/0/RP0/CPU0:Router# show lpts pifib hardware entry brief location 0/3/CPU0
Tue Dec 22 10:57:08.322 UTC

-------------------------------------------------------------------
             Node: 0/RP0/CPU0
-------------------------------------------------------------------
     G  - Global flowtype counters
    (*) - stats resources exhausted,
          stats are shared per flow type
-------------------------------------------------------------------

Type DestIP           SrcIP            Interface        vrf   L4     LPort/Type     RPort
 npu  Flowtype         DestNode   PuntPrio Accept Drop   Domain           OOS
---- ---------------- ---------------- ---------------- ----- ------ -------------- ------
 ---- ---------------- ---------- -------- ------ ------ ---------------- ------
IPV4 any              any              any              0     0      any            0
 0    Fragment         Local LC   LOW      0      0      0-default
IPV4 224.0.0.5        any              BE105.201        0     89     any            0
 0    OSPF-mc-known    Dlvr RP0   HIGH     1      0      0-default        *
IPV4 224.0.0.5        any              BE105.202        0     89     any            0
 0    OSPF-mc-known    Dlvr RP0   HIGH     1      0      0-default        *
IPV4 224.0.0.5        any              BE105.203        0     89     any            0
 0    OSPF-mc-known    Dlvr RP0   HIGH     1      0      0-default        *
IPV4 224.0.0.5        any              BE105.204        0     89     any            0
 0    OSPF-mc-known    Dlvr RP0   HIGH     1      0      0-default        *
IPV4 224.0.0.5        any              BE105.205        0     89     any            0
 0    OSPF-mc-known    Dlvr RP0   HIGH     1      0      0-default        *
IPV4 224.0.0.5        any              BE105.206        0     89     any            0
 0    OSPF-mc-known    Dlvr RP0   HIGH     1      0      0-default        *
```

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  Trap TrapStats   Policer Packet    Packet

                                                ID    ID      ID              Accepted  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_DOWM_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

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
```