Implementing LPTS

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.

For a complete description of the LPTS commands listed in this module, refer to the LPTS Commands module of *IP Addresses and Services Command Reference for Cisco ASR 9000 Series Routers*.

Feature History for Implementing LPTS

Release	Modification
Release 7.3.2	Monitor LPTS host path drops via YANG data model was introduced.
Release 5.3.2	NP LPTS Based Policer was introduced.
Release 3.9.0	LPTS was introduced.

Prerequisites for Implementing LPTS

The following prerequisites are required to implement LPTS:

You must be in a user group associated with a task group that includes the proper task IDs. The command reference guides include the task IDs required for each command. If you suspect user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Restrictions for Implementing LPTS

The following restrictions apply for implementing LPTS:

- These line cards do not support mask-based LPTS, use host entry to configure LPTS instead:
  - A9K-16X100GE-TR
  - A99-32X100GE-TR
  - A9K-20HG-FLEX-SE
  - A9K-20HG-FLEX-TR
  - A99-24HG-FLEX-SE
  - A99-24HG-FLEX-TR
  - A99-32X100GE-X-SE
  - A99-32X100GE-X-TR
  - A9K-8HG-FLEX-SE
  - A9K-8HG-FLEX-TR

Information About Implementing LPTS

To implement LPTS features mentioned in this document you must understand the following concepts:

LPTS Overview

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 or line card for processing.

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

LPTS Policers

Table 1: Feature History Table

Feature Name	Release Information	Description
Monitor LPTS Host Path Drops via YANG Data Model	Release 7.3.2	This feature allows you to use the `Cisco-IOS-XR-lpts-pre-ifib-oper.yang` data model to monitor the policer action for Local Packet Transport Services (LPTS) flow type for all IOS XR platforms. To access this data model, see the Github repository.

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 line cards. 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 line card 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 (locally) and globally using the command-line interface (CLI); therefore, overwriting the static policer values.

Note If two different ACLs with same ACEs are applied to an LPTS Policer, only the first ACL applied takes effect. When the first ACL is removed, the second ACL does not take effect on the LPTS Policer. If you want the second ACL to take effect on the LPTS Policer, reconfigure it on the LPTS Policer.

IP TOS Precedence

By default, router allows all packets into the network. The IP table of service (TOS) precedence feature allows you to classify packets by IP precedence value. The IP precedence value can be configured for every flow. Once configured for a flow type, only packets that match the defined IP precedence value are allowed, and others are rejected.

The precedence value can either be a number or name. This table lists configurable precedence values:

Table 2: Precedence Values

Precedence Number	Precedence Name	Description
0	routine	Matches packets with routine precedence.
1	priority	Matches packets with priority precedence.
2	immediate	Matches packets with immediate precedence.
3	flash	Matches packets with flash precedence.

4	flash-override	Matches packets with flash override precedence.
5	critical	Matches packets with critical precedence.
6	internet	Matches packets with internetwork control precedence.
7	network	Matches packets with network control precedence.

ACL Based Policer

ACL based policer is a session based policer that provides secure network access based on session.

Note

- The ACL based policer feature is supported only on ASR 9000 Enhanced Ethernet Line Cards, ASR 9000 3rd Generation Line Cards, and ASR 9000 4th Generation Line Cards.
- SNMP is not supported on ASR 9000 4th Generation Line Cards. Therefore, the ACL entries configured based on LPTS are not displayed if the ACLs are configured on ASR 9000 4th Generation Line Cards.
- When multiple ACLs are configured for an LPTS policier, only the first ACL details are displayed in the LPTS statistics command output.

Benefits

These are the benefits of ACL based policer:

- Rate limit incoming packets based on session.
- Modify policer rate depending on traffic load.
- Block entire traffic based on a specific session without impacting other sessions with same flow.

Configuring LPTS Policers

This task allows you to configure the LPTS policers.

SUMMARY STEPS

1. **configure**
2. **lpts pifib hardware police** [**location** *node-id*]
3. **flow** *flow_type* {**rate** *rate*}
4. **commit**
5. **show lpts pifib hardware police** [**location** {**all** | *node_id*}]

DETAILED STEPS

Procedure

	Command or Action	Purpose
Step 1	**configure**	

Step 2	**lpts pifib hardware police** [**location** *node-id*]
	Example:
	`RP/0/RSP0/CPU0:router(config)# lpts pifib hardware police location 0/2/CPU0`
	`RP/0/RSP0/CPU0:router(config-pifib-policer-per-node)#`
	`RP/0/RSP0/CPU0:router(config)# lpts pifib hardware police`
	`RP/0/RSP0/CPU0:router(config-pifib-policer-global)#`
		Configures the ingress policers and enters pifib policer global configuration mode or pifib policer per node configuration mode.
		The example shows pifib policer per node configuration mode and global.

Step 3	**flow** *flow_type* {**rate** *rate*}
	Example:
	`RP/0/RSP0/CPU0:router(config-pifib-policer-per-node)# flow ospf unicast default rate 20000`
		Configures the policer for the LPTS flow type. The example shows how to configure the policer for the ospf flow type.
		• Use the *flow_type* argument to select the applicable flow type. For information about the flow types, see *IP Addresses and Services Command Reference for Cisco ASR 9000 Series Routers*.
		• Use the **rate** keyword to specify the rate in packets per seconds (PPS). The range is from 0 to 4294967295.
		Note
		LPTS policy for ntp-default flow type, supports a flow rate of 100 pps on Cisco ASR 9000 Series Router.
		Starting with Cisco IOS XR Release 6.1.3, LPTS policy for ntp-default flow type, supports a flow rate higher than 100 pps on Cisco ASR 9000 Series Router.
		Based on the number of NTP client scale requirement, you can increase the flow rate value to allow higher packets per second (PPS). For example,
		`lpts pifib hardware police location 0/0/CPU0`
		`flow ntp default rate 1000`
		`flow ntp known rate 1000`

Step 4	**commit**	
Step 5	**show lpts pifib hardware police** [**location** {**all** | *node_id*}] **Example:**	Displays the policer configuration value set. • (Optional) Use the **location** keyword to display pre-Internal Forwarding Information Base (IFIB)

	Command or Action	Purpose

	`RP/0/RSP0/CPU0:router# show lpts pifib hardware police location 0/2/cpu0`	information for the designated node. The *node-id* argument is entered in the *rack/slot/module* notation.
		• Use the **all** keyword to specify all locations.
		Starting Cisco IOS XR Software Release 7.3.2, you can use `Cisco-IOS-XR-lpts-pre-ifib-oper` YANG data model across all IOS XR platforms to retrieve the policer statistics of the flow type. The following example shows the sample RPC request:
		`===== RPC request ======`
		`<rpc message-id="101" xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">`
		`<get>`
		`<filter>`
		`<lpts-pifib xmlns="http://cisco.com/ns/yang/Cisco-IOS-XR-lpts-pre-ifib-oper">`
		`<nodes>`
		`<node>`
		`<node-name>0/0/CPU0</node-name>`
		`<pifib-hw-flow-policer-stats/>`
		`</node>`
		`</nodes>`
		`</lpts-pifib>`
		`</filter>`
		`</get>`
		`</rpc>`
		`##`
		The policer stats of each flow type is the aggregate of all the NPU counters. In the example, the NPU ID of 255 indicates that the value is an aggregate of all NPU stats and provides a simplified view of policer stats per flow type.

Configuring LPTS Policer with IP TOS Precedence

This task allows you to configure the LPTS policers with IP table of service (TOS) precedence:

SUMMARY STEPS

1. **configure**
2. **lpts pifib hardware police** [**location** *node-id*]
3. **flow** *flow_type*
4. **precedence** {*number* | *name*}
5. **commit**
6. **show lpts pifib hardware police** [**location** {**all** | *node_id*}]

DETAILED STEPS

Procedure

	Command or Action	Purpose
Step 1	**configure**	

Step 2	**lpts pifib hardware police** [**location** *node-id*]
	Example:
	`RP/0/RSP0/CPU0:router(config)# lpts pifib hardware police location 0/2/CPU0`
	`or`
	`RP/0/RSP0/CPU0:router(config)# lpts pifib hardware police`
		Configures the ingress policers. You can configure per node or all locations.
		The example shows configuration of pifib policer on an individual node and globally for all nodes respectively.

Step 3	**flow** *flow_type*
	Example:
	`RP/0/RSP0/CPU0:router(config-pifib-policer-per-node)# flow telnet default`
	`or`
	`RP/0/RSP0/CPU0:router(config-pifib-policer-global)# flow telnet default`
		Configures the policer for the LPTS flow type. The example shows how to configure the policer for the telnet flow type per node or global mode (all locations).
		• Use the *flow_type* argument to select the applicable flow type. For information about the flow types, see *IP Addresses and Services Command Reference for Cisco ASR 9000 Series Routers*.

Step 4	**precedence** {*number* | *name*}
	Example:
	`RP/0/RSP0/CPU0:router(config-pifib-policer-per-node)# precedence 5 6 7`
	`or`
	`RP/0/RSP0/CPU0:router(config-pifib-policer-global)# precedence 5 6 7`
		Configures IP TOS **precedence** against a flow type. You can specify either a precedence number or name. For more information about **precedence**, use the question mark (?) online help function.
		The example shows how to configure IP TOS **precedence** 5, 6, and 7 per node or global mode.

Step 5	**commit**	
Step 6	**show lpts pifib hardware police** [**location** {**all** | *node_id*}] **Example:** `RP/0/RSP0/CPU0:router# show lpts pifib hardware police location 0/2/cpu0`	Displays the policer configuration value set. • (Optional) Use the **location** keyword to display policer value for the designated node. The *node-id* argument is entered in the *rack/slot/module* notation. • Use the **all** keyword to specify all locations.

Mapping the LPTS Policer with an ACL

This task allows you to map the LPTS policer with an ACL.

Note

1. LPTS to ACL map supports only the following values:
   - Source Destination Address
   - Source and destination port
   - Protocol number
   - Object Groups (both network and port groups)
2. When multiple ACLs are configured for an LPTS policier, only the first ACL details are displayed in the LPTS statistics command output.
3. When you are applying an ACL on an LPTS entry, LPTS entry filters and ACL should be defined in the same order. So, if you want to limit incoming traffic from the host 10.10.10.10 to any router ip address you need to define LPTS ACL as permit ip from any to 10.10.10.10.

   For example, assume that 10.10.10.10 is the remote address from which traffic should be filtered. The LPTS and ACL should be defined as shown in the following table.

LPTS (local address, port, remote address, port)	ACL
(any,23, 10.10.10.10,65248)	ipv4 access-list lpts 10 permit ipv4 any host 10.10.10.10

4. You can configure a maximum of 50 ACLs per LPTS policer.
5. You can use the following commands to view the LPTS ACL Policer information:
   - **show lpts pifib hardware entry** *acl name* **statistics** *location*
   - **show lpts pifib hardware police** *location*
   - **show lpts pifib hardware entry statistics** *location*

Note The A9K-20HG-FLEX-SE, A9K-20HG-FLEX-TR, A99-32X100GE-X-SE, A99-32X
A9K-8HG-FLEX-SE, and A9K-8HG-FLEX-TR line cards do not include LPTS ACL
show lpts pifib hardware police location and **show lpts pifib hardware entry statistic**

SUMMARY STEPS

1. **configure**
2. **lpts pifib hardware police acl** *acl-name1* **rate** *100* **vrf** *vrf1*
3. **commit**

DETAILED STEPS

Procedure

	Command or Action	Purpose
Step 1	**configure**	
Step 2	**lpts pifib hardware police acl** *acl-name1* **rate** *100* **vrf** *vrf1* **Example:** `RP/0/RSP0/CPU0:router(config)# lpts pifib hardware police acl acl-name1 rate 100 vrf vrf1`	Maps the LPTS policer with the ACL by name *acl-name1*.
Step 3	**commit**	

NP Based Policer

Network processor (NP) based policers in LPTS allow rate limit packets based on a specific NP with specific rate.

Benefits of NP based policer

- Rate limit incoming packets based on a specific NP with specific rate.
- Provides secure network access based on the context of a user or a device.

  For example, if a user does not require specific traffic on a particular NP, then the rate limit can be set to 0.
- Modify policer rate depending on traffic load.
- Full utilization of traffic through each NP depending on traffic.
- Stop or block complete traffic based on a specific NP without impacting other NPs with same flow.

Supported Features of NP Based Policer

- Supports Cisco ASR 9000 High Density 100GE Ethernet line cards (such as A9K-8x100G-LB-SE and A9K-8x100G-LB-TR) only.
- Supports ACL, global, local, NP based and static policers.

  For sample configurations, see Configuring ACL, NP, LPTS Local, LPTS Global, and LPTS Static Policers: Example, on page 11.
- Supports existing LPTS and LPTS ACL policer features.
- Supports existing scale limits of all protocols.

Configuring NP Based Policer in LPTS

This task allows you to configure NP based policer in LPTS.

SUMMARY STEPS

1. **configure**
2. **lpts pifib hardware police** [**location** *node-id*]**np** *np-number*
3. **flow** *flow_type* {**default** | **known**} {**rate** *rate*}
4. **commit**
5. **show lpts pifib hardware entry np** *np-number* **statistics** [**location** {**all** | *node_id*}]

DETAILED STEPS

Procedure

	Command or Action	Purpose
Step 1	**configure**	

Step 2	**lpts pifib hardware police** [**location** *node-id*]**np** *np-number*
	Example:
	`RP/0/RSP0/CPU0:router(config)# lpts pifib hardware police location 0/1/CPU0 np np3`
	`RP/0/RSP0/CPU0:router(config-pifib-policer-per-node)#`
		Configures the NP based ingress policers and enters pifib policer per node configuration mode.

Step 3	**flow** *flow_type* {**default**	**known**} {**rate** *rate*} **Example:** `RP/0/RSP0/CPU0:router(config-pifib-policer-per-node)# flow ospf multicast known rate 100`	Configures the NP based policer for the LPTS flow type. The example shows how to configure the policer for the OSPF flow type. • Use the *flow_type* argument to select the applicable flow type. • Use the **rate** keyword to specify the rate in packets per seconds (PPS). The range is from 0 to 4294967295.
Step 4	**commit**	
Step 5	**show lpts pifib hardware entry np** *np-number* **statistics** [**location** {**all**	*node_id*}] **Example:** `RP/0/RSP0/CPU0:router# show lpts pifib hardware entry np np3 statistics location 0/1/cpu0`	Displays statistics of NP based policer in LPTS. • (Optional) Use the **location** keyword to display pre-Internal Forwarding Information Base (IFIB) information for the designated node. The *node-id* argument is entered in the *rack/slot/module* notation. • Use the **all** keyword to specify all locations.

Configuring ACL, NP, LPTS Local, LPTS Global, and LPTS Static Policers: Example

This topic contains sample configurations and output examples of ACL, NP based, LPTS local, LPTS global, and LPTS static policers.

ACL Based Policer

The following is a sample ACL based policer configuration. In this example, the ACL is applied to a BGP session.

```
RP/0/RSP1/CPU0:router(config)# ipv4 access-list lpts_acl_1
RP/0/RSP1/CPU0:router(config-ipv4-acl)# 10 permit tcp any host 200.0.0.1
RP/0/RSP1/CPU0:router(config-ipv4-acl)# 20 deny ipv4 any any
RP/0/RSP1/CPU0:router(config-ipv4-acl)# commit
RP/0/RSP1/CPU0:router(config-ipv4-acl)# end
RP/0/RSP1/CPU0:router(config)# lpts pifib hardware police acl lpts_acl_1 rate 1000
RP/0/RSP1/CPU0:router(config)# commit
```

The following is a show command and its sample output for the preceding policer configuration:

```
RP/0/RSP1/CPU0:router# show lpts pifib hardware entry brief  location 0/1/cpu0

             Node: 0/1/CPU0:
----------------------------------------
L3 - L3 Protocol;L4 - Layer4 Protocol; Intf - Interface;
Dest - Destination Node; V - Virtual;
na - Not Applicable or Not Available;
LU - Local chassis fabric unicast;
LM - Local chassis fabric multicast;
RU - Multi chassis fabric unicast;
RM - Multi chassis fabric multicast;
def - default

Offset L3   VRF id       L4     Intf            Dest       laddr,Port raddr,Port
acl name
------ ---- ------------ ------ --------------- ---------  ----------
-----------------------------------
8      IPV4 *            any    any             Local      any,any any,any

9      CLNS *            -      any             LU(30)     - -

10     IPV4 *            ICMP   any             Local      any,any any,ECHO

11     IPV4 *            OSPF   Optimized       LM[6]      224.0.0.5,any any,any

12     IPV4 *            OSPF   Optimized       LM[6]      224.0.0.6,any any,any

13     IPV4 *            OSPF   Optimized       LM[6]      any,any any,any

14     IPV4 default      TCP    any             LU(30)     any,65145 200.0.0.1,179
lpts_acl_1
15     IPV4 default      TCP    any             LU(30)     any,179 200.0.0.1,any
lpts_acl_1
16     IPV4 default      TCP    any             LU(30)     any,23 any,any

17     IPV4 default      UDP    any             LU(30)     any,161 any,any

18     IPV4 **nVSatellite UDP    any             LU(30)     any,161 any,any

19     IPV4 default      UDP    any             LU(30)     any,162 any,any
```

```
20      IPV4 **nVSatellite UDP    any             LU(30)     any,162 any,any
21      IPV4 default      L2TPV3 any             LU(30)     any,any any,any
22      IPV4 *            OSPF   any             LM[2]      224.0.0.5,any any,any
23      IPV4 *            OSPF   any             LM[2]      224.0.0.6,any any,any
24      IPV4 *            TCP    any             LU(30)     any,any any,179
25      IPV4 *            UDP    any             LU(30)     any,1701 any,any
26      IPV4 *            TCP    any             LU(30)     any,179 any,any
27      IPV4 *            ICMP   any             LU(30)     any,any any,ECHOREPLY
28      IPV4 *            ICMP   any             Local      any,any any,UNREACH
29      IPV4 *            ICMP   any             Local      any,any any,TIMXCEED
30      IPV4 *            ICMP   any             Local      any,any any,PARAMPROB
31      IPV4 *            ICMP   any             Local      any,any any,SRCQUENCH
32      IPV4 *            ICMP   any             Local      any,any any,REDIRECT
33      IPV4 *            ICMP   any             Local      any,any any,TSTAMP
34      IPV4 *            ICMP   any             Local      any,any any,MASKREQ
35      IPV4 *            TCP    any             LU(30)     any,any any,any
36      IPV4 *            UDP    any             LU(30)     any,any any,any
37      IPV4 *            RSVP   any             Local      any,any any,any
38      IPV4 *            OSPF   any             LM[2]      any,any any,any
39      IPV4 *            any    any             LU(30)     any,any any,any
40      IPV4 *            UDP    any             Local      any,any any,any
4       IPV6 *            any    any             Local      any,any any,any
5       IPV6 *            ICMP6  any             Local      any,any any,NDRTRSLCT
6       IPV6 *            ICMP6  any             Local      any,any any,NDRTRADV
7       IPV6 *            ICMP6  any             Local      any,any any,NDNBRSLCT
8       IPV6 *            ICMP6  any             Local      any,any any,NDNBRADV
9       IPV6 *            ICMP6  any             Local      any,any any,ECHOREQ
10      IPV6 default      UDP    any             LU(30)     any,161 any,any
11      IPV6 **nVSatellite UDP    any             LU(30)     any,161 any,any
12      IPV6 default      UDP    any             LU(30)     any,162 any,any
13      IPV6 **nVSatellite UDP    any             LU(30)     any,162 any,any
14      IPV6 default      ICMP6  any             LM[6]      any,any any,MLDLQUERY
```

```
15     IPV6 default      ICMP6  any            LM[6]      any,any any,LSTNRREPORT

16     IPV6 default      ICMP6  any            LM[6]      any,any any,MLDLSTNRDN

17     IPV6 default      ICMP6  any            LM[6]      any,any any,LSTNRREPORTv2

18     IPV6 *            OSPF   any            LU(30)     ff02::5,any any,any

19     IPV6 *            OSPF   any            LU(30)     ff02::6,any any,any

20     IPV6 *            TCP    any            LU(30)     any,any any,179

21     IPV6 *            TCP    any            LU(30)     any,179 any,any

22     IPV6 *            ICMP6  any            LU(30)     any,any any,ECHOREPLY

23     IPV6 *            ICMP6  any            Local      any,any any,UNREACH

24     IPV6 *            ICMP6  any            Local      any,any any,PAK2BIG

25     IPV6 *            ICMP6  any            Local      any,any any,TIMXCEED

26     IPV6 *            ICMP6  any            Local      any,any any,HDRBAD

27     IPV6 *            OSPF   any            LU(30)     any,any any,any

28     IPV6 *            TCP    any            LU(30)     any,any any,any

29     IPV6 *            UDP    any            LU(30)     any,any any,any

30     IPV6 *            any    any            LU(30)     any,any any,any
```

The following is another show command and its sample output:

```
RP/0/RSP1/CPU0:router# show lpts pifib hardware entry stat location 0/1/cpu0 | i IPV4 default
 | i TCP

14     IPV4 default      TCP    any            LM[6]      6/0             any,65145
200.0.0.1,179        lpts_acl_1
15     IPV4 default      TCP    any            LU(30)     0/0             any,179
200.0.0.1,any          lpts_acl_1
16     IPV4 default      TCP    any            LU(30)     0/0             any,23 any,any
```

NP Based Policer

The following is a sample NP based policer configuration:

```
RP/0/RSP0/CPU0:vkg1-lpts# lpts pifib hardware police location 0/1/CPU0
np np2 flow bgp known rate 50
np np3 flow ospf multicast known rate 100
!
lpts pifib hardware police
!
```

The following is a show command and its sample output for the preceding policer configuration:

```
RP/0/RSP1/CPU0:router# show lpts pifib hardware entry np 3 statistics location 0/1/CPU0

             Node: 0/1/CPU0:
```

```
---------------------------------------
L3 - L3 Protocol;L4 - Layer4 Protocol; Intf - Interface;
Dest - Destination Node;
LU - Local chassis fabric unicast;
LM - Local chassis fabric multicast;
RU - Multi chassis fabric unicast;
RM - Multi chassis fabric multicast;
na - Not Applicable or Not Available

Offset L3   VRD id       L4     Intf            Dest       Pkts/Drops      laddr,Port
raddr,Port          acl name
------ ---- ------------ ------ --------------- ---------- ----------------
---------------------          ----------------------------------
8      IPV4 *            any    any             Local      0/0             any,any any,any

9      CLNS *            -      any             LU(30)     0/0             - -

10     IPV4 *           ICMP   any             Local      0/0            any,any any,ECHO

11     IPV4 *            OSPF   Optimized       LU(30)     0/0             224.0.0.5,any
any,any
12     IPV4 *            OSPF   Optimized       LU(30)     0/0             224.0.0.6,any
any,any
13     IPV4 *            OSPF   Optimized       LU(30)     0/0             any,any any,any

14     IPV4 default      TCP    any             LU(30)     0/0             any,23 any,any

15     IPV4 default      L2TPV3 any             LU(30)     0/0             any,any any,any

16     IPV4 *            OSPF   any             LU(30)     0/0             224.0.0.5,any
any,any
17     IPV4 *            OSPF   any             LU(30)     0/0             224.0.0.6,any
any,any
```

The following is another show command and its sample output:

```
RP/0/RSP1/CPU0:router# show lpts pifib hardware police np np3  location 0/1/CPU0

Fri Mar 27 09:32:21.500 UTC
-------------------------------------------------------------
               Node 0/1/CPU0:
-------------------------------------------------------------
Burst = 100ms for all flow types
-------------------------------------------------------------
FlowType               Policer Type    Cur. Rate  Def. Rate  Accepted             Dropped
             TOS Value
---------------------- ------- ------- ---------- ---------- --------------------
-------------------- ----------
unconfigured-default   100     Static  2500       2500       0                    0
             01234567
L2TPv2-fragment        185     Static  10000      10000      0                    0
             01234567
Fragment               101     Static  2500       2500       0                    0
             01234567
OSPF-mc-known          102     np  100       2000       0                     0
        01234567
OSPF-mc-default        103     Static  1500       1500       0                    0
             01234567
OSPF-uc-known          104     Static  2000       2000       0                    0
             01234567
OSPF-uc-default        105     Static  1000       1000       0                    0
             01234567
ISIS-known             143     Static  2000       2000       0                    0
             01234567
```

```
ISIS-default            144     Static  1500       1500       0                   0
             01234567
BFD-known               150     Static  9600       9600       0                   0
             01234567
BFD-default             160     Static  45340      9600       0                   0
             01234567
BFD-MP-known            178     Static  11520      11520      0                   0
             01234567
BFD-MP-0                179     Static  128        128        0                   0
             01234567
BFD-BLB-known           183     Static  11520      11520      0                   0
             01234567
BFD-BLB-0               184     Static  128        128        0                   0
             01234567
BFD-SP-0                182     Static  512        512        0                   0
             01234567
```

LPTS Policer Applied for LC (Local)

The following is a sample configuration for LPTS policer applied for a line card (local):

```
RP/0/RP0/CPU0:router# lpts pifib hardware police location 0/7/CPU0
 flow ospf unicast known rate 30
!
```

The following is a show command and its sample output for the preceding policer configuration:

```
RP/0/RP0/CPU0:router# show lpts pifib hardware police location 0/7/CPU0 | i OSPF

Fri Aug 21 03:51:36.105 UTC
OSPF-mc-known           102     Static  2000       2000       5095                0
             01234567
OSPF-mc-default         103     Static  1500       1500       0                   0
             01234567
OSPF-uc-known           104     Local   30         2000       36                  0
             01234567
OSPF-uc-default         105     Static  1000       1000       0                   0
             01234567
```

LPTS Policer (Global)

The following is a sample configuration for LPTS policer applied globally:

```
RP/0/RP0/CPU0:router# lpts pifib hardware police location 0/7/CPU0
 flow ospf unicast known rate 30
!
lpts pifib hardware police
 flow ospf multicast known rate 50
!
```

The following is a show command and its sample output for the preceding policer configuration:

```
RP/0/RP0/CPU0:router# show lpts pifib hardware police location 0/7/CPU0 | i OSPF

Fri Aug 21 03:54:06.678 UTC
OSPF-mc-known           102     Global  50         2000       5111                0
             01234567
OSPF-mc-default         103     Static  1500       1500       0                   0
             01234567
```

```
OSPF-uc-known          104     Local   30         2000       36                  0
             01234567
OSPF-uc-default        105     Static  1000       1000       0                   0
             01234567
```

LPTS Static Policer

The following is a sample output for LPTS static policer:

```
RP/0/RP0/CPU0:router# show lpts pifib hardware police location 0/7/CPU0 | i OSPF

Fri Aug 21 03:54:06.678 UTC
OSPF-mc-known          102     Global  50         2000       5111                0
             01234567
OSPF-mc-default        103     Static  1500       1500       0                   0
             01234567
OSPF-uc-known          104     Local   30         2000       36                  0
             01234567
OSPF-uc-default        105     Static  1000       1000       0                   0
             01234567
```

Configuration Examples for Implementing LPTS Policers

This section provides the following configuration example:

Configuring LPTS Policers: Example

The following example shows how to configure LPTS policers:

```
configure
 lpts pifib hardware police
  flow ospf unicast default rate 200
  flow bgp configured rate 200
  flow bgp default rate 100
 !
 lpts pifib hardware police location 0/2/CPU0
  flow ospf unicast default rate 100
  flow bgp configured rate 300
 !
```

The following is the show command and the sample output:

```
show lpts pifib hardware police location 0/2/CPU0
```

```
RP/0/RSP1/CPU0:rtr1#
RP/0/RSP1/CPU0:rtr1# show lpts pifib hardware police location 0/2/CPU0
-------------------------------------------------------------
                Node 0/2/CPU0:
-------------------------------------------------------------
Burst = 100ms for all flow types
-------------------------------------------------------------
FlowType                      Policer   Type     Cur. Rate   Def. Rate   Accepted
Dropped       TOS Value
----------------------        -------   -------- ----------  ----------- ----------
--------     ---------------
unconfigured-default             0      Static     2500         2500         0
  0           01234567
L2TPv2-fragment                  85     Static     10000        10000        0
  0           01234567
```

```
Fragment                         1      Static     3000          3000          0
  0           01234567
OSPF-mc-known                    2      Static     2000          2000          0
  0           01234567
OSPF-mc-default                  3      Static     1500          1500          0
  0           01234567
.                                .        .         .             .           .
  .               .
.                                .        .         .             .           .
  .               .
.                                .        .         .             .           .
  .               .
.                                .        .         .             .           .
  .               .
DHCPv4                           92     Static     4000          4000          0
  0           01234567
DHCPv6                           93     Static     4000          4000          0
  0           01234567
ONEPK                            95     Static     2500          2500          0
  0           01234567
TPA                              96     Static     2500          2500          0
  0           01234567
IETF-BOB                         97     Static     9600          9600          0
  0           01234567
------------------------
statistics:
Packets accepted by deleted entries: 0
Packets dropped by deleted entries: 0
Run out of statistics counter errors: 0

RP/0/RSP1/CPU0:rtr1#
```

Configuring LPTS policers with IP TOS Precedence: Example

- The following example shows how to configure IP TOS to telnet default flow and allow packets with precedence 3 or 4 at node 0/0/CPU0:

  ```
  configure
  lpts pifib hardware police location 0/0/CPU0
  flow telnet default
  precedence 3 4
  ```

- The following example shows how to configure IP TOS to telnet known flow to only allow packets with precedence 5 or 6 or 7 at all nodes

  ```
  configure
  lpts pifib hardware police
  flow telnet known
  precedence 5 6 7
  ```

- The following example shows how to configure IP TOS to telnet known flow to only allow packets with routine and network precedence at all nodes

  ```
  configure
  lpts pifib hardware police
  flow telnet known
  precedence routine network
  ```

Additional References

The following sections provide references related to implementing LPTS.

Related Documents

Related Topic	Document Title
Cisco IOS XR LPTS commands: complete command syntax, command modes, command history, defaults, usage guidelines, and examples	*Cisco LPTS Commands* module in the *IP Addresses and Services Command Reference for Cisco ASR 9000 Series Routers*

Standards

Standards	Title
No new or modified standards are supported by this feature, and support for existing standards has not been modified by this feature.	—

MIBs

MIBs	MIBs Link
—	To locate and download MIBs, use the Cisco MIB Locator found at the following URL and choose a platform under the Cisco Access Products menu: https://mibs.cloudapps.cisco.com/ITDIT/MIBS/servlet/index

RFCs

RFCs	Title
No new or modified RFCs are supported by this feature, and support for existing RFCs has not been modified by this feature.	—

Technical Assistance

Description	Link
The Cisco Technical Support website contains thousands of pages of searchable technical content, including links to products, technologies, solutions, technical tips, and tools. Registered Cisco.com users can log in from this page to access even more content.	http://www.cisco.com/techsupport