Configuring Tag Switching

This chapter describes three sample cases where Tag Switching is configured on Cisco 7500/7200 series routers. These cases show the levels of control possible in selecting how Tag Switching is deployed in a network.

Table 9 lists the cases, including the steps to perform Tag Switching and their corresponding Cisco IOS CLI commands.

Table 9   Tag Switching—Levels of Control

This case	Describes
Case 1—Enable Tag Switching Incrementally in a Network	The steps necessary for incrementally deploying Tag Switching through a network, assuming that packets to all destination prefixes should be tag switched.
Case 2—Route Tagged Packets to Network A Only	The mechanism by which Tag Switching can be restricted, such that packets are tag switched to only a subset of destinations.
Case 3—Limit Tag Distribution on a Tag Switching Network	The mechanisms for further controlling the distribution of tag within a network.

For more information about the IOS CLI commands, see the chapter "Tag Switching Commands" in the *Cisco IOS Switching Services Command Reference*.

Figure 11 shows a router-only Tag Switching network with Ethernet interfaces. The following sections outline the procedures for configuring Tag Switching and displaying Tag Switching information in a network based on the topology shown in Figure 11.

Note   Ethernet interfaces are shown in Figure 11, but any of the interfaces that are supported could be used instead. ATM interfaces operating as TC-ATM interfaces are the exception to this statement.

Figure 11   **A Router-Only Tag Switching Network with Ethernet Interfaces**

Case 1—Enable Tag Switching Incrementally in a Network

In the first case, assume that you want to deploy Tag Switching incrementally throughout a network of routers, but that you do not want to restrict which destination prefixes are tag switched. For a description of the commands listed in these cases, see the chapter *Tag Switching Commands* in the *Cisco IOS Switching Services Command Reference*.

To enable Tag Switching incrementally in a network, perform these steps and enter the commands in router configuration mode (see Figure 11).

Step	Command	Purpose
1	At R1:	Enable Tag Switching between R1 and R3.
	Router# **configuration terminal** Router(config)# **ip cef distributed** Router(config)# **tag-switching advertise-tags** Router(config)# **interface e0/1** Router(config-if)# **tag-switching ip** Router(config-if)# **exit**	In order to configure distributed VIP Tag Switching, you must configure distributed CEF switching. Enter the **ip cef distributed** command on all routers.
	At R3:	
	Router# **configuration terminal** Router(config)# **ip cef distributed** Router(config)# **tag-switching advertise-tags** Router(config)# **interface e0/1** Router(config-if)# **tag-switching ip**	

Step	Command	Purpose
2	At R3: Router(config)# **interface e0/2** Router(config-if)# **tag-switching ip** Router(config-if)# **exit** At R4: Router# **configuration terminal** Router(config)# **ip cef distributed** Router(config)# **tag-switching advertise-tags** Router(config)# **interface e0/2** Router(config-if)# **tag-switching ip** Router(config-if)# **exit**	Enable Tag Switching between R3 and R4.

After you perform these steps, R1 applies tags to packets that are forwarded through interface e0/1, with a next hop to R3.

Tag switching can be enabled throughout the rest of the network by the repetition of steps 1 and 2 as appropriate on other routers until all routers and interfaces are enabled for Tag Switching. See the examplein the "Enabling Tag Switching Incrementally in a Network" section on page 57

Case 2—Route Tagged Packets to Network A Only

In the second case, assume

that you want to enable Tag Switching for a subset of destination prefixes. This option might be used to test Tag Switching across a large network. In this case, you would configure the system so that only a small number of destinations is tag switched (for example, internal test networks) without the majority of traffic being affected.

Perform the steps in the following table at each router in the network in router configuration mode (see Figure 11).

Step	Command	Purpose
1	Router(config)# **access-list-1 permit A** (Enter the actual network address and netmask in place of permit A. For example, access-list 1 permit 192.5.34. 0 0.0.0.255.)	Limit tag distribution by using access lists.
2	Router(config)# **tag-switching advertise-tags for 1**	Instruct the router to advertise for network A only to all adjacent tag switch routers. Any tags for other destination networks that the router may have distributed before this step are withdrawn.

Case 3—Limit Tag Distribution on a Tag Switching Network

The third case demonstrates the full control which is available to you in determining the destination prefixes and paths for which Tag Switching is enabled.

Configure the routers so that packets addressed to network A are tagged, all other packets are untagged, and only links R1-R3, R3-R4, R4-R6, and R6-R7 carry tagged packets addressed to A. For example, suppose the normally routed path for packets arriving at R1 addressed to network A or

network B is R1, R3, R5, R6, R7. A packet addressed to A would flow tagged on links R1-R3 and R6-R7, and untagged on links R3-R5 and R5-R6. A packet addressed to B would follow the same path, but would be untagged on all links.

Assume that at the outset the routers are configured so that packets addressed to network A are tagged and all other packets are untagged (as at the completion of Case 2).

Use the **tag-switching advertise-tags** command and access lists to limit tag distribution. Specifically, you need to configure routers R2, R5, and R8 to distribute no tags to other routers. This ensures that no other routers send tagged packets to any of those three. You also need to configure routers R1, R3, R4, R6, and R7 to distribute tags only for network A and to distribute them only to the appropriate adjacent router; that is, R3 distributes its tag for network A only to R1, R4 only to R3, and so on.

To limit tag distribution on a Tag Switching network, perform these steps in router configuration mode.

Step	Command	Purpose
1	Router(config)# **no tag-switching advertise-tags**	Configure R2 to distribute no tags.
2	Router(config)# **no tag-switching advertise-tags**	Configure R5 to distribute no tags.
3	Router(config)# **no tag-switching advertise-tags**	Configure R8 to distribute no tags
4	Router(config)# **access-list 2 permit R1** Router(config)# **no tag-switching advertise-tags for 1** Router(config)# **tag-switching advertise-tags for 1 to 2** Router(config)# **exit** (Enter the actual network address and netmask in place of permit R1. For example, access-list 1 permit 192.5.34.0 0.0.0.255.)	Configure R3 by defining an access list and by instructing the router to distribute tags for the networks permitted by access list 1 (created as part of Case 2) to the routers permitted by access list 2. The **access list 2 permit R1** command permits R1 and denies all other routers.
5	Router(config)# **access-list 1 permit A** Router(config)# **access-list 2 permit R1** Router(config)# **tag-switching advertise-tags for 1 to 2** Router(config)# **exit** (Enter the actual network address and netmask in place of permit A and permit R1. For example, access-list 1 permit 192.5.34.0 0.0.0.255.)	Configure R3.
6	Router(config)# **access-list 1 permit A** Router(config)# **access-list 2 permit R3** Router(config)# **tag-switching advertise-tags for 1 to 2** Router(config)# **exit** (Enter the actual network address and netmask in place of permit A and permit R3. For example, access-list 1 permit 192.5.34.0 0.0.0.255.)	Configure R4.
7	Router(config)# **access-list 1 permit A** Router(config)# **access-list 2 permit R4** Router(config)# **tag-switching advertise-tags for 1 to 2** Router(config)# **exit** (Enter the actual network address and netmask in place of permit A and permit R4. For example, access-list 1 permit 192.5.34.0 0.0.0.255.)	Configure R6.

Step	Command	Purpose
8	Router(config)# **access-list 1 permit A** Router(config)# **access-list 2 permit R6** Router(config)# **tag-switching advertise-tags for 1 to 2** Router(config)# **exit** (Enter the actual network address and netmask in place of permit A and permit R6. For example, access-list 1 permit 192.5.34.0 0.0.0.255.)	Configure R7.

Traffic Engineering

This section describes two sample cases supported by traffic engineering. These cases show how you can engineer traffic across a path in the network and establish a backup route for that traffic engineered path (see Table 10).

In both cases, the assumption is made that traffic from R1 and R2 (in Figure 12), which is intended for R11, would be directed by Layer 3 routing along the "upper" path R3-R4-R7-R10-R11.

Table 10   Sample Traffic Engineering Cases

This case	Describes
Case 1—Engineer traffic across a path	The steps necessary to engineer traffic across the "middle" path R3-R5-R8 (see Figure 12).
Case 2—Establish a backup path	The steps necessary for establishing a backup traffic engineering route for the engineered traffic for Case 1.

Figure 12 shows a router-only Tag Switching network with traffic engineered paths.

Figure 12   Sample Tag Switching Network with Traffic Engineered Paths

Case 1—Engineer Traffic Across a Path.

The following table lists the configuration commands you need to engineer traffic across the "middle" path R3-R5-R8 by building a tunnel R1-R3-R5-R8-R10, without affecting the path taken by traffic from R2 (see Figure 12).

To engineer traffic across a path, perform the following steps in router configuration mode:

Step	Command	Purpose
1	At R1: Router(config)# **ip cef distributed** Router(config)# **tag-switching tsp-tunnels** Router(config)# **interface e0/1** Router(config-if)# **tag-switching tsp-tunnels** Router(config-if)# **exit** At R3: Router(config)# **ip cef distributed** Router(config)# **tag-switching tsp-tunnels** Router(config)# **interface e0/1** Router(config-if)# **tag-switching tsp-tunnels** Router(config-if)# **exit** Router(config)# **interface e0/3** Router(config-if)# **tag-switching tsp-tunnels** Router(config-if)# **exit** At R5 and R8: Router(config)# **ip cef distributed** Router(config)# **tag-switching tsp-tunnels** Router(config)# **interface e0/1** Router(config-if)# **tag-switching tsp-tunnels** Router(config-if)# **exit** Router(config)# **interface e0/2** Router(config-if)# **tag-switching tsp-tunnels** Router(config-if)# **exit** At R10: Router(config)# **ip cef distributed** Router(config)# **tag-switching tsp-tunnels** Router(config)# **interface e0/1** Router(config-if)# **tag-switching tsp-tunnels** Router(config-if)# **exit**	Configure support for TSP tunnel signaling along the path. In order to configure distributed VIP Tag Switching, you must configure distributed CEF switching. Enter the **ip cef distributed** command on all routers. Note: To configure a Cisco 7200 series router, enter **ip cef**. To configure a Cisco 7500 series router, enter **ip cef distributed.**
2	At R1: Router(config)# **interface tunnel 2003** Router(config-if)# **ip unnumbered e0/1** Router(config-if)# **tunnel mode tag-switching** Router(config-if)# **tunnel tsp-hop 1 10.10.0.103**　(IP address of R3:e0/1) Router(config-if)# **tunnel tsp-hop 2 10.11.0.105**　(IP address of R5:e0/1) Router(config-if)# **tunnel tsp-hop 3 10.12.0.108**　(IP address of R8:e0/1) Router(config-if)# **tunnel tsp-hop 4 10.13.0.110 lasthop**　(IP address of R10:e0/1) Router(config-if)# **exit**	Configure a TSP tunnel at the headend.
3	At R1: Router(config)# **router traffic-engineering** Router(config)# **traffic-engineering filter 1 egress 10.14.0.111 255.255.255.255**	Configure the traffic engineering filter to classify the traffic to be routed. The filter selects all traffic where the autonomous system (AS) egress router is 10.14.0.111 (10.14.0.111 is the IP address of R11:e0/1).
4	At R1: Router(config)# **router traffic-engineering** Router(config)# **traffic-engineering route 1 tunnel 2003**	Configure the traffic engineering route to send the engineered traffic down the tunnel.

Case 2—Establish a Backup Path

Case 2 involves establishing a backup traffic engineering route for the engineered traffic for Case 1. This backup route uses the "lower" path. The backup route uses a tunnel R1-R3-R6 and relies on Layer 3 routing to deliver the packet from R6 to R11.

To set up a traffic engineering backup path (assuming Case 1 steps have been performed), follow these steps in router configuration mode:

Step	Command	Purpose
1	At R6: Router(config)# **ip cef distributed** Router(config)# **tag-switching tsp-tunnels** Router(config)# **interface e0/1** Router(config-if)# **tag-switching tsp-tunnels** Router(config-if)# **exit** At R3: Router(config)# **ip cef distributed** Router(config)# **tag-switching tsp-tunnels** Router(config)# **interface e0/4** Router(config-if)# **tag-switching tsp-tunnels** Router(config-if)# **exit**	Enable TSP tunnel signalling along the path (where such signalling is not already enabled).
2	At R1: Router(config)# **interface tunnel 2004** Router(config-if)# **ip unnumbered e0/1** Router(config-if)# **tunnel mode tag-switching** Router(config-if)# **tunnel tsp-hop 1 10.10.0.103** Router(config-if)# **tunnel tsp-hop 2 10.21.0.106 lasthop** Router(config-if)# **exit**	Configure the TSP tunnel at the headend. （IP address of R3:e0/1） （IP address of R6:e0/1）
3	At R1: Router(config)# **router traffic-engineering** Router(config)# **traffic-engineering route 1 tunnel 2004 pref 200**	Configure the traffic engineering route to send the engineered traffic down the tunnel if the middle path (Case 1 route) is unavailable.

Configuration Examples

This section provides sample configurations for the Cisco 7500/7200 series routers. It contains the following sections:

- Enabling Tag Switching Incrementally in a Network
- Enabling Tag Switching for a Subset of Destination Prefixes
- Selecting the Destination Prefixes and Paths
- Displaying Tag Switching TDP Binding Information
- Displaying Tag Switching Forwarding Table Information
- Displaying Tag Switching Interface Information
- Displaying Tag Switching TDP Neighbor Information
- Enabling TSP Tunnel Signalling
- Configuring a TSP Tunnel
- Displaying the TSP Tunnel Information
- Configuring a Traffic Engineering Filter and Route
- Displaying Traffic Engineering Configuration Information

Enabling Tag Switching Incrementally in a Network

The following example shows you how to configure Tag Switching incrementally throughout a network of routers. You enable Tag Switching first between one pair of routers (in this case, R1 and R3 shown in Figure 11) and add routers step by step until every router in the network is tag switch enabled.

```
router-1# configuration terminal
router-1(config)# ip cef distributed
router-1(config)# tag-switching ip
router-1(config)# interface e0/1
router-1(config-if)# tag-switching ip
router-1(config-if)# exit
router-1(config)#
router-3# configuration terminal
router-3(config)# ip cef distributed
router-3(config)# tag-switching ip
router-3(config)# interface e0/1
router-3(config-if)# tag-switching ip
router-3(config-if)# exit
router-3(config)#
```

Enabling Tag Switching for a Subset of Destination Prefixes

The following example shows the commands you enter at each of the routers to enable Tag Switching for only a subset of destination prefixes (see Figure 11).

```
Router(config)# access-list-1 permit A
Router(config)# tag-switching advertise-tags for 1
```

Selecting the Destination Prefixes and Paths

The following example shows the commands you enter to configure the routers to select the destination prefixes and paths for which Tag Switching is enabled. When you configure R2, R5, and R8 to distribute no tags to other routers, you ensure that no routers send them tagged packets. You also need to configure routers R1, R3, R4, R6, and R7 to distribute tags only for network A and only to the applicable adjacent router. This configuration ensures that R3 distributes its tag for network A only to R1, R4 only to R3, R6 only to R4, and R7 only to R6 (see Figure 11).

```
router-2(config)# no tag-switching advertise-tags
router-5(config)# no tag-switching advertise-tags
router-8(config)# no tag-switching advertise-tags
router-1(config)# access-list permit R1
router-1(config)# no tag-switching advertise-tags for 1
router-1(config)# tag-switching advertise-tags for 1 to 2
router-1(config)# exit

router-3# access-list 1 permit A
router-3# access-list 2 permit R1
router-3# tag-switching advertise-tags for 1 to 2
router-3# exit

router-4# access-list 1 permit A
router-4# access-list 2 permit R3
router-4# tag-switching advertise-tags for 1 to 2
router-4# exit
router-6# access-list 1 permit A
router-6# access-list 2 permit R4
router-6# tag-switching advertise-tags for 1 to 2
router-6# exit
router-7# access-list 1 permit A
router-7# access-list 2 permit R6
router-7# tag-switching advertise-tags for 1 to 2
router-7# exit
```

Displaying Tag Switching TDP Binding Information

Use the **show tag-switching tdp bindings** command to display the contents of the Tag Information Base (TIB). The display can show the entire database or can be limited to a subset of entries, based on prefix, input or output tag values or ranges, and/or the neighbor advertising the tag.

Note Ths command displays downstream mode bindings. For tag VC bindings, see the **show tag-switching atm-tdp bindings** command.

```
Router# show tag-switching tdp bindings

Matching entries:
  tib entry: 10.92.0.0/16, rev 28
        local binding:  tag: imp-null(1)
        remote binding: tsr: 172.27.32.29:0, tag: imp-null(1)
  tib entry: 10.102.0.0/16, rev 29
        local binding:  tag: 26
        remote binding: tsr: 172.27.32.29:0, tag: 26
  tib entry: 10.105.0.0/16, rev 30
        local binding:  tag: imp-null(1)
        remote binding: tsr: 172.27.32.29:0, tag: imp-null(1)
  tib entry: 10.205.0.0/16, rev 31
        local binding:  tag: imp-null(1)
        remote binding: tsr: 172.27.32.29:0, tag: imp-null(1)
  tib entry: 10.211.0.7/32, rev 32
        local binding:  tag: 27
        remote binding: tsr: 172.27.32.29:0, tag: 28
  tib entry: 10.220.0.7/32, rev 33
        local binding:  tag: 28
        remote binding: tsr: 172.27.32.29:0, tag: 29
  tib entry: 99.101.0.0/16, rev 35
        local binding:  tag: imp-null(1)
        remote binding: tsr: 172.27.32.29:0, tag: imp-null(1)
  tib entry: 100.101.0.0/16, rev 36
        local binding:  tag: 29
        remote binding: tsr: 172.27.32.29:0, tag: imp-null(1)
  tib entry: 171.69.204.0/24, rev 37
        local binding:  tag: imp-null(1)
        remote binding: tsr: 172.27.32.29:0, tag: imp-null(1)
  tib entry: 172.27.32.0/22, rev 38
        local binding:  tag: imp-null(1)
        remote binding: tsr: 172.27.32.29:0, tag: imp-null(1)
  tib entry: 210.10.0.0/16, rev 39
        local binding:  tag: imp-null(1)
  tib entry: 210.10.0.8/32, rev 40
        remote binding: tsr: 172.27.32.29:0, tag: 27
```

Displaying Tag Switching Forwarding Table Information

Use the **show tag-switching forwarding-table** command to display the contents of the Tag Forwarding Information Base (TFIB). The TFIB lists the tags, output interface information, prefix or tunnel associated with the entry, and number of bytes received with each incoming tag. A request can show the entire TFIB or can be limited to a subset of entries. A request can also be restricted to selected entries in any of the following ways:

- Single entry associated with a given incoming tag

- Entries associated with a given output interface

- Entries associated with a given next hop

- Single entry associated with a given destination

- Single entry associated with a given tunnel having the current node as an intermediate hop

```
Router# show tag-switching forwarding-table

Local Outgoing       Prefix            Bytes tag Outgoing       Next Hop
tag   tag or VC      or Tunnel Id      switched  interface
26    Untagged       10.253.0.0/16     0         Et4/0/0        172.27.32.4
28    1/33           10.15.0.0/16      0         AT0/0.1        point2point
29    Pop tag        10.91.0.0/16      0         Hs5/0          point2point
      1/36           10.91.0.0/16      0         AT0/0.1        point2point
30    32             10.250.0.97/32    0         Et4/0/2        10.92.0.7
      32             10.250.0.97/32    0         Hs5/0          point2point
34    26             10.77.0.0/24      0         Et4/0/2        10.92.0.7
      26             10.77.0.0/24      0         Hs5/0          point2point
35    Untagged   [T] 10.100.100.101/32 0         Tu301          point2point
36    Pop tag        168.1.0.0/16      0         Hs5/0          point2point
      1/37           168.1.0.0/16      0         AT0/0.1        point2point

[T]    Forwarding through a TSP tunnel.
       View additional tagging info with the 'detail' option
```

Displaying Tag Switching Interface Information

Use the **show tag-switching interfaces** command to show information about the requested interface or about all interfaces on which Tag Switching is enabled. The per-interface information includes the interface name and indications as to whether IP Tag Switching is enabled and operational.

```
Router# show tag-switching interfaces

Interface           IP    Tunnel  Operational
Hssi3/0             Yes   Yes     No
ATM4/0.1            Yes   Yes     Yes            (ATM tagging)
Ethernet5/0/0       No    Yes     Yes
Ethernet5/0/1       Yes   No      Yes
Ethernet5/0/2       Yes   No      No
Ethernet5/0/3       Yes   No      Yes
Ethernet5/1/1       Yes   No      No
```

The following shows sample output from the **show tag-switching interfaces** command when you specify **detail:**

```
Router# show tag-switching interface detail

Interface Hssi3/0:
        IP tagging enabled
        TSP Tunnel tagging enabled
        Tagging not operational
        MTU = 4470
Interface ATM4/0.1:
        IP tagging enabled
        TSP Tunnel tagging enabled
        Tagging operational
        MTU = 4470
        ATM tagging: Tag VPI = 1, Control VC = 0/32
Interface Ethernet5/0/0:
        IP tagging not enabled
        TSP Tunnel tagging enabled
        Tagging operational
        MTU = 1500
Interface Ethernet5/0/1:
        IP tagging enabled
        TSP Tunnel tagging not enabled
        Tagging operational
        MTU = 1500
Interface Ethernet5/0/2:
        IP tagging enabled
        TSP Tunnel tagging not enabled
        Tagging not operational
        MTU = 1500
Interface Ethernet5/0/3:
        IP tagging enabled
        TSP Tunnel tagging not enabled
        Tagging operational
        MTU = 1500
```

Displaying Tag Switching TDP Neighbor Information

Use the **show tag-switching tdp neighbors** command to display the status of Tag Distribution Protocol (TDP) sessions. The neighbor information branch can have information about all TDP neighbors or can be limited to the neighbor with a specific IP address or, TDP identifier, or to TDP neighbors known to be accessible over a specific interface.

```
Router# show tag-switching tdp neighbors

Peer TDP Ident: 10.220.0.7:1; Local TDP Ident 172.27.32.29:1
        TCP connection: 10.220.0.7.711 - 172.27.32.29.11029
        State: Oper; PIEs sent/rcvd: 17477/17487; Downstream on demand
Up time: 01:03:00
TDP discovery sources:
        ATM0/0.1
Peer TDP Ident: 210.10.0.8:0; Local TDP Ident 172.27.32.29:0
        TCP connection: 210.10.0.8.11004 - 172.27.32.29.711
        State: Oper; PIEs sent/rcvd: 14656/14675; Downstream;
Up time: 2d5h
        TDP discovery sources:
          Ethernet4/0/1
          Ethernet4/0/2
          POS6/0/0
        Addresses bound to peer TDP Ident:
          99.101.0.8      172.27.32.28    10.105.0.8      10.92.0.8
          10.205.0.8      210.10.0.8
```

Enabling TSP Tunnel Signalling

The following example shows you how to configure support for tag-switched path (TSP) tunnel signalling along a path and on each interface crossed by one or more tunnels:

```
Router(config)# ip cef distributed
Router(config)# tag-switching tsp-tunnels
Router(config)# interface e0/1
Router(config-if)# tag-switching tsp-tunnels
Router(config-if)# interface e0/2
Router(config-if)# tag-switching tsp-tunnels
Router(config-if)# exit
```

Configuring a TSP Tunnel

The following example shows you how to set the encapsulation of the tunnel to Tag Switching and how to define hops in the path for the TSP.

Follow these steps to configure a two-hop tunnel, hop 0 being the headend router. For hops 1 and 2, you specify the IP addresses of the incoming interfaces for the tunnel. The tunnel interface number is arbitrary, but must be less than 65,535.

```
Router(config)# interface tunnel 2003
Router(config-if)# tunnel mode tag-switching
Router(config-if)# tunnel tsp-hop 1 10.10.0.12
Router(config-if)# tunnel tsp-hop 2 10.50.0.24 lasthop
Router(config-if)# exit
```

To shorten the previous path, you delete a hop by entering the following commands:

```
Router(config)# interface tunnel 2003
Router(config-if)# no tunnel tsp-hop 2
Router(config-if)# tunnel tsp-hop 1 10.10.0.12 lasthop
Router(config-if)# exit
```

Displaying the TSP Tunnel Information

Use the **show tag-switching tsp tunnels** command to display information about the configuration and status of selected tunnels.

```
Router# show tag-switching tsp-tunnels

Signalling Summary:
        TSP Tunnels Process:            running
        RSVP Process:                   running
        Forwarding:                     enabled

TUNNEL ID DESTINATION     STATUS          CONNECTION
10.106.0.6.200310.2.0.12up  up
```

Configuring a Traffic Engineering Filter and Route

The following example shows you how to configure the traffic engineering routing process, a traffic engineering filter, and a traffic engineering route for that filter over a TSP-encapsulated tunnel.

```
Router(config)# router traffic-engineering
Router(config-router)# traffic-engineering filter 5 egress 83.0.0.1 255.255.255.255
Router(config-router)# traffic-engineering route 5 tunnel 5
```

Displaying Traffic Engineering Configuration Information

Use the **show ip traffic-engineering configuration** command to display information about the configured traffic engineering filters and routes. The following is sample output from the **show ip traffic-engineering configuration detail** command.

```
Router# show ip traffic-engineering configuration detail

Traffic Engineering Configuration
    Filter 5: egress 44.0.0.0/8, local metric: ospf-0/1
        Tunnel5 route installed
          interface up, route enabled, preference 1
          loop check on, passing, remote metric: connected/0
    Filter 6: egress 43.0.0.1/32, local metric: ospf-300/3
        Tunnel7 route installed
          interface up, route enabled, preference 50
          loop check on, passing, remote metric: ospf-300/2
        Tunnel6 route not installed
          interface up, route enabled, preference 75
          loop check on, passing, remote metric: connected/0
```