

Chapter 12

Configuring Two-Rate Tricolor or Four-Color Marking

Networks police traffic by limiting the input or output transmission rate of a class of traffic on the basis of user-defined criteria. Policing traffic allows you to control the maximum rate of traffic sent or received on an interface and to partition a network into multiple priority levels or classes of service.

Policers require you to apply a burst size and bandwidth limit to the traffic flow, and set a consequence for packets that exceed these limits—usually a higher loss priority, so that packets exceeding the policer limits are discarded first.

Two-rate tricolor marking (TCM) (as defined in RFC 2698, *A Two Rate Three Color Marker*) extends the functionality of class-of-service (CoS) traffic policing by providing three levels of drop precedence (loss priority) instead of two. RFC 2698 describes TCM as a “color-aware” method of traffic policing because TCM polices traffic according to the color classification of each packet, which can be red, yellow, or green. In the JUNOS software implementation, you can configure four loss priorities instead of three. The software marks loss priorities as high, medium-high, medium-low, and low. This allows you to provision even more granular service-level agreements (SLAs) across the Differentiated Services (DiffServ) domain.

Two-rate TCM (or four-color marking) are supported on the following routing platforms:

- T-series and M320 platforms with Enhanced II Flexible PIC Concentrators (FPCs)
- T640 platforms with Enhanced Scaling FPC4

The platforms that support two-rate TCM interoperate with other platforms, as shown in Table 28.

Table 28: Two-Rate TCM Platform Interoperation

Packet Sent from Other Platforms	Received by Platforms that Support Two-Rate TCM
low	low
high	medium-high
Packet Sent from Platforms that Support Two-Rate TCM	Received by Other Platforms
low	low
medium-low	low
medium-high	high
high	high

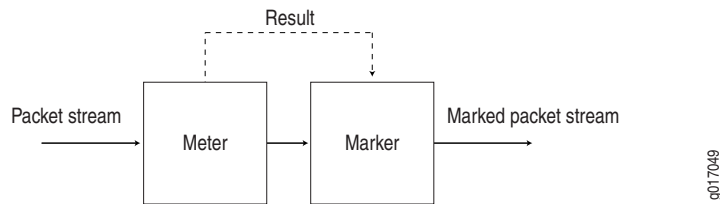
You can monitor how packets are marked by issuing the `show class-of-service forwarding-table classifier` command:

```

user@host> show class-of-service forwarding-table classifier
Classifier table index: 33166, # entries: 8, Table type: IEEE 802.1
Entry #   Code point   Queue #   PLP
  0         000           1         2 <---- medium-low
  1         001           2         2
  2         010           2         1 <---- high
  3         011           1         1
  4         100           2         3 <---- medium-high
  5         101           1         3
  6         110           1         0 <---- low
  7         111           2         0
    
```

Policers provide two functions: metering and marking. The policer meters each packet and passes the packet and the metering result to the marker, as shown in Figure 10.

Figure 10: Flow of Tricolor Marking Policer Operation



The meter operates in one of two modes. In the colorblind mode, the meter treats the packet stream as uncolored. Any preset loss priorities are ignored. In the color-aware mode, the meter inspects the packet loss priority (PLP) field, which has been set by an upstream device as PLP high, medium-high, medium-low, or low; in other words, the PLP field has already been set by a behavior aggregate (BA) or multifield (MF) classifier. The marker changes the PLP of each incoming IP packet according to the results of the meter. For more information, see “Color-Aware Mode” on page 170.

Two-rate TCM is so called because traffic is policed according to two rates: the *committed information rate* (CIR) and the *peak information rate* (PIR). The CIR specifies the average rate at which packets are admitted to the network. As each packet enters the network, it is counted. Packets that do not exceed the CIR are marked low PLP. Packets that exceed the CIR but are below the PIR are marked medium-high PLP. Packets that exceed the PIR are marked high PLP. For more information, see “How Two-Rate Tricolor Marking Works” on page 169.

For information about how to use marking policers with BA and MF classifiers, see “Setting the PLP with a BA Classifier” on page 176 and “Setting the PLP with a Multifield Classifier” on page 177.

You configure marking policers by defining the policer and multiple levels of PLP for classifiers, rewrite rules, random early detection (RED) drop profiles, and firewall filters. To configure marking policers, you can include the following statements at the [edit class-of-service] hierarchy level of the configuration:

```
[edit class-of-service]
tri-color;
classifiers {
  (dscp | dscp-ipv6 | exp | ieee-802.1 | inet-precedence) classifier-name {
    import (classifier-name | default);
    forwarding-class class-name {
      loss-priority (low | medium-low | medium-high | high) {
        code-points [ aliases ] [ 6-bit-patterns ];
      }
    }
  }
}
rewrite-rules {
  (dscp | dscp-ipv6 | exp | ieee-802.1 | inet-precedence) rewrite-name {
    import (rewrite-name | default);
    forwarding-class class-name {
      loss-priority (low | medium-low | medium-high | high)
        code-point (alias | bits);
    }
  }
}
schedulers {
  scheduler-name {
    drop-profile-map loss-priority (any | low | medium-low | medium-high | high)
      protocol any drop-profile profile-name;
  }
}

[edit firewall]
policer name {
  then loss-priority (low | medium-low | medium-high | high);
}
```

```

three-color-policer name {
  two-rate {
    (color-aware | color-blind);
    committed-information-rate bps;
    committed-burst-size bytes;
    peak-information-rate bps;
    peak-burst-size bytes;
  }
}
filter filter-name {
  <family family> {
    term rule-name {
      then {
        three-color-policer {
          two-rate policer-name;
        }
      }
    }
  }
}

```

The following limitations apply to TCM:

- When you enable TCM on a 10-port 1-Gigabit Ethernet PIC or a 10-Gigabit Ethernet PIC, for queues 6 and 7 only, the output of the `show interfaces queue interface-name` command does not display the number of queued bytes and packets, or the number of bytes and packets dropped due to RED. If you do not configure tricolor marking on the interface, these statistics are available for all queues.
- When you enable TCM, Transmission Control Protocol (TCP)-based configurations for drop profiles are rejected. In other words, you cannot include the `protocol` statement at the [edit class-of-service schedulers scheduler-name drop-profile-map] hierarchy level. The result is that drop profiles are applied to packets with the specified PLP and any protocol type.
- On Gigabit Ethernet IQ PICs, for IEEE-802.1 rewrite rules, only two loss priorities are supported. Exiting packets with medium-high loss priority are treated as high, and packets with medium-low loss priority are treated as low. In other words rewrite rules corresponding to high and low apply instead of those corresponding to medium-high and medium-low.
- When some PICs with Frame Relay encapsulation mark a packet with high loss priority, the packet is treated as having medium-high loss priority on T-series and M320 platforms with Enhanced II FPCs and the T640 platform with Enhanced Scaling FPC4.
- TCM is not supported on aggregated Ethernet and aggregated SONET/SDH interfaces.
- In a single firewall filter term, you cannot configure both the `loss-priority` action modifier and the `three-color-policer` action modifier. These statements are mutually exclusive.

This chapter discusses the following topics:

- How Two-Rate Tricolor Marking Works on page 169
- Enabling Tricolor Marking on page 172
- Configuring a Two-Rate Tricolor Marking Policer on page 172
- Applying a Tricolor Marking Policer to a Firewall Filter on page 174
- Applying a Tricolor Marking Policer to an Interface on page 175
- Setting the PLP with a BA Classifier on page 176
- Setting the PLP with a Multifield Classifier on page 177
- Associating the PLP with a Drop-Profile Map on page 178
- Associating the PLP with a Rewrite Rule on page 179
- Verifying Your Configuration on page 179
- Example: Configuring Tricolor Marking on page 180

How Two-Rate Tricolor Marking Works

With two-rate TCM, you can enforce traffic policing according to two separate rates—the committed information rate (CIR) and the peak information rate (PIR). The CIR specifies the average rate at which packets are admitted to the network. The PIR is greater than or equal to the CIR.

Colorblind Mode

All packets are evaluated by the CIR. If a packet exceeds the CIR, it is evaluated by the PIR. In colorblind mode, the policer supports three loss priorities only: low, medium-high, and high.

In colorblind mode, packets that exceed the CIR, but are below the PIR are marked yellow (medium-high). Packets that exceed the PIR are marked red (high), as shown in Table 29.

Table 29: Colorblind Mode Two-Rate TCM Color-to-PLP Mapping

Color	PLP	Assigned If...
Green	low	Packet does not exceed the CIR.
Yellow	medium-high	Packet exceeds the CIR but does not exceed the PIR.
Red	high	Packet exceeds the PIR.

If you are using colorblind mode and you wish to configure an output policer that marks packets to have medium-low loss priority, you must configure a policer at the [edit firewall policer *policer-name*] hierarchy level. For example:

```

firewall {
  policer 4PLP {
    if-exceeding {
      bandwidth-limit 40k;
      burst-size-limit 4k;
    }
    then loss-priority medium-low;
  }
}

```

Apply this policer at one or both of the following hierarchy levels:

- [edit firewall family *family* filter *filter-name* term *rule-name* then policer *policer-name*]
- [edit interfaces *interface-name* unit *logical-unit-number* family *family* filter]

Color-Aware Mode

In color-aware mode, the metering treatment the packet receives depends on its classification. Metering can increase a packet’s preassigned PLP, but cannot decrease it, as shown in Table 30.

Table 30: Color-Aware Mode Two-Rate TCM Color-to-PLP Mapping

Incoming PLP	Packet Metered Against	Possible Cases	Outgoing PLP
low	CIR and PIR	Packet does not exceed the CIR.	low
		Packet exceeds the CIR but not the PIR.	medium-high
		Packet exceeds the PIR.	high
medium-low	PIR only	Packet does not exceed the CIR.	medium-low
		Packet does not exceed the PIR.	medium-low
		Packet exceeds the PIR.	high
medium-high	PIR only	Packet does not exceed the CIR.	medium-high
		Packet does not exceed the PIR.	medium-high
		Packet exceeds the PIR.	high
high	Not metered by the policer.	All cases.	high

The following sections describe the operation in more detail.

Incoming PLP Low

Packets belonging to the green class have already been marked by a classifier with low PLP. The marking policer can leave the packet’s PLP unchanged or increase the PLP to medium-high or high. Therefore, these packets are metered against both the CIR and the PIR.

For example, if a BA or MF classifier marks a packet with low PLP according to the type-of-service (ToS) bits in the IP header, and the two-rate TCM policer is in color-aware mode, the output loss priority is as follows:

- If the rate of traffic flow is less than the CIR, packets remain marked as low PLP.
- If the rate of traffic flow is greater than the CIR but less than the PIR, some of the packets are marked as medium-high PLP, and some of the packets remain marked as low PLP.
- If the rate of traffic flow is greater than the PIR, some of the packets are marked as high PLP, and some of the packets remain marked as low PLP.

Incoming PLP Medium-Low

Packets belonging to the yellow class have already been marked by a classifier with medium-low or medium-high PLP. The marking policer can leave the packet's PLP unchanged or increase the PLP to high. Therefore, these packets are metered against the PIR only.

For example, if a BA or MF classifier marks a packet with medium-low PLP according to the ToS bits in the IP header, and the two-rate TCM policer is in color-aware mode, the output loss priority is as follows:

- If the rate of traffic flow is less than the CIR, packets remain marked as medium-low PLP.
- If the rate of traffic flow is greater than the CIR but less than the PIR, packets remain marked as medium-low PLP.
- If the rate of traffic flow is greater than the PIR, some of the packets are marked as high PLP, and some of the packets remain marked as medium-low PLP.

Incoming PLP Medium-High

Packets belonging to the yellow class have already been marked by a classifier with medium-low or medium-high PLP. The marking policer can leave the packet's PLP unchanged or increase the PLP to high. Therefore, these packets are metered against the PIR only.

If a BA or MF classifier marks a packet with medium-high PLP according to the ToS bits in the IP header, and the two-rate TCM policer is in color-aware mode, the output loss priority is as follows:

- If the rate of traffic flow is less than the CIR, packets remain marked as medium-high PLP.
- If the rate of traffic flow is greater than the CIR but less than the PIR, packets remain marked as medium-high PLP.
- If the rate of traffic flow is greater than the PIR, some of the packets are marked as high PLP, and some of the packets remain marked as medium-high PLP.

Incoming PLP High

Packets belonging to the red class have already been marked by a classifier with high PLP. The marking policer can only leave the packet's PLP unchanged. Therefore, these packets are not metered against the CIR or the PIR and all the packets remain marked as high PLP.

Enabling Tricolor Marking

By default, TCM is not enabled. To enable TCM, include the `tri-color` statement at the `[edit class-of-service]` hierarchy level:

```
[edit class-of-service]
tri-color;
```

If you do not include this statement in the configuration, you cannot configure medium-low or medium-high PLP for classifiers, rewrite rules, drop profiles, or firewall filters.

Configuring a Two-Rate Tricolor Marking Policer

A tricolor marking policer polices traffic on the basis of metering rates, including the CIR, the PIR, their associated burst sizes, and any policing actions configured for the traffic. To configure a tricolor marking policer, include the following statements at the `[edit firewall]` hierarchy level:

```
[edit firewall]
three-color-policer name {
  two-rate {
    (color-aware | color-blind);
    committed-information-rate bps;
    committed-burst-size bytes;
    peak-information-rate bps;
    peak-burst-size bytes;
  }
}
```

You can specify the values for `bps` and `bytes` either as complete decimal numbers or as decimal numbers followed by the abbreviation `k` (1000), `m` (1,000,000), or `g` (1,000,000,000).

The color-aware two-rate policer implicitly marks packets as loss priority low, medium-low, medium-high, or high. The colorblind two-rate tricolor policer implicitly marks packets as loss priority low, medium-high, or high. For more information, see “How Two-Rate Tricolor Marking Works” on page 169.



NOTE: For colorblind mode, if you wish to configure an output policer that marks packets so that they have medium-low loss priority, you must configure a policer at the [edit firewall policer *policer-name*] hierarchy level.

For example:

```

firewall {
  policer 4PLP {
    if-exceeding {
      bandwidth-limit 40k;
      burst-size-limit 4k;
    }
    then loss-priority medium-low;
  }
}

```

Apply this policer at one or both of the following hierarchy levels:

- [edit firewall family *family* filter *filter-name* term *rule-name* then policer *policer-name*]
- [edit interfaces *interface-name* unit *logical-unit-number* family *family* filter]

Table 31 describes the configurable statements.

Table 31: Tricolor Marking Policer Statements

Statement	Meaning	Configurable Values
two-rate	Marking is based on the CIR and the PIR.	N/A
color-aware	Metering depends on the packet's preclassification. Metering can increase a packet's assigned PLP, but cannot decrease it. For more information, see “How Two-Rate Tricolor Marking Works” on page 169.	
color-blind	All packets are evaluated by the CIR. If a packet exceeds the CIR, it is evaluated by the PIR.	
committed-information-rate	Guaranteed bandwidth under normal line conditions and the average rate up to which packets are marked green.	32,000 through 40,000,000,000 bps
committed-burst-size	Maximum number of bytes allowed for incoming packets to burst above the CIR, but still be marked green.	1500 through 100,000,000,000 bytes
peak-information-rate	Maximum achievable rate. Packets that exceed the CIR but are below the PIR are marked yellow. Packets that exceed the PIR are marked red.	32,000 through 40,000,000,000 bps
peak-burst-size	Maximum number of bytes allowed for incoming packets to burst above the PIR, but still be marked yellow.	1500 through 100,000,000,000 bytes

Applying a Tricolor Marking Policer to a Firewall Filter

To rate-limit traffic by attaching a tricolor marking policer to a firewall filter, include the `three-color-policer` statement:

```
three-color-policer two-rate name;
```

You can include this statement at the following hierarchy levels:

- [edit firewall family *family* filter *filter-name* term *rule-name* then]
- [edit firewall filter *filter-name* term *rule-name* then]

In the family statement, the protocol family can be any, `ccc`, `inet`, `inet6`, `mpls`, or `vpls`.

Example: Applying a Tricolor Marking Policer to a Firewall Filter

Apply the `trtc1` policer to a firewall filter:

```
firewall {
  three-color-policer trtc1 { # Configure the trtc1 policer.
    two-rate {
      color-blind;
      committed-information-rate 1048576;
      committed-burst-size 65536;
      peak-information-rate 10485760;
      peak-burst-size 131072;
    }
  }
  filter fil { # Configure the fil firewall filter, which attaches the trtc1 policer.
    term default {
      then {
        three-color-policer {
          two-rate trtc1;
        }
      }
    }
  }
}
```

For more information about applying policers to firewall filters, see the *JUNOS Policy Framework Configuration Guide*.

Applying a Tricolor Marking Policer to an Interface

To apply a tricolor marking policer to an interface, you must reference the filter name in the interface configuration. To do this, include the `filter` statement:

```
filter {
  input filter-name;
  output filter-name;
}
```

You can include these statements at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number* family *family*]
- [edit logical-routers *logical-router-name* interfaces *interface-name* unit *logical-unit-number* family *family*]

The filter name that you reference should have an attached tricolor marking policer, as shown in “Applying a Tricolor Marking Policer to a Firewall Filter” on page 174.

Example: Applying a Tricolor Marking Policer to an Interface

Apply the `trtcm1` policer to an interface:

```
firewall {
  three-color-policer trtcm1 { # Configure the trtcm1 policer.
    two-rate {
      color-blind;
      committed-information-rate 1048576;
      committed-burst-size 65536;
      peak-information-rate 10485760;
      peak-burst-size 131072;
    }
  }
  filter fil { # Configure the fil firewall filter, which attaches the trtcm1 policer.
    term default {
      then {
        three-color-policer {
          two-rate trtcm1;
        }
      }
    }
  }
}
interfaces { # Configure the interface, which attaches the fil firewall filter.
  so-1/0/0 {
    unit 0 {
      family inet {
        filter {
          input fil;
        }
      }
    }
  }
}
```

Setting the PLP with a BA Classifier

Behavior aggregate (BA) classifiers take action on incoming packets. When TCM is enabled, T-series and M320 platforms support four classifier PLP designations: **low**, **medium-low**, **medium-high**, and **high**. To configure the PLP for a classifier, include the following statements at the [edit class-of-service] hierarchy level:

```
[edit class-of-service]
classifiers {
  (dscp | dscp-ipv6 | exp | ieee-802.1 | inet-precedence) classifier-name {
    import (classifier-name | default);
    forwarding-class class-name {
      loss-priority (low | medium-low | medium-high | high) {
        code-points [ aliases ] [ 6-bit-patterns ];
      }
    }
  }
}
```

The inputs for a classifier are the CoS values. The outputs for a classifier are the forwarding class and the loss priority (PLP). A classifier sets the forwarding class and the PLP for each packet entering the interface with a specific set of CoS values.

For example, in the following configuration, the **assured-forwarding** forwarding class and **medium-low** PLP are assigned to all packets entering the interface with the **101110** CoS values:

```
class-of-service {
  classifiers {
    dscp dscp-cl {
      forwarding-class assured-forwarding {
        loss-priority medium-low {
          code-points 101110;
        }
      }
    }
  }
}
```

To use this classifier, you must configure the settings for the **assured-forwarding** forwarding class at the [edit class-of-service forwarding-classes queue *queue-number* **assured-forwarding**] hierarchy level. For more information, see “Configuring Forwarding Classes” on page 79.

Setting the PLP with a Multifield Classifier

Multifield classifiers take action on incoming or outgoing packets, depending whether the firewall rule is applied as an input filter or an output filter. When TCM is enabled, T-series and M320 platforms support four multifield classifier PLP designations: *low*, *medium-low*, *medium-high*, and *high*.

To configure the PLP for a multifield classifier, include the `loss-priority` statement in a policer or firewall filter that you configure at the at the `[edit firewall]` hierarchy level:

```
[edit firewall]
family family-name {
  filter filter-name {
    term term-name {
      from {
        match-conditions;
      }
      then {
        loss-priority (low | medium-low | medium-high | high);
        forwarding-class class-name;
      }
    }
  }
}
```

The inputs (match conditions) for a multifield classifier are one or more of the six packet header fields: destination address, source address, IP protocol, source port, destination port, and DSCP. The outputs for a multifield classifier are the forwarding class and the loss priority (PLP). In other words, a multifield classifier sets the forwarding class and the PLP for each packet entering or exiting the interface with a specific destination address, source address, IP protocol, source port, destination port, or DSCP.

For example, in the following configuration, the forwarding class `expedited-forwarding` and PLP `medium-high` are assigned to all IPv4 packets with the `10.1.1.0/24` or `10.1.2.0/24` source address:

```
firewall {
  family inet {
    filter classify-customers {
      term isp1-customers {
        from {
          source-address 10.1.1.0/24;
          source-address 10.1.2.0/24;
        }
        then {
          loss-priority medium-high;
          forwarding-class expedited-forwarding;
        }
      }
    }
  }
}
```

To use this classifier, you must configure the settings for the `expedited-forwarding` forwarding class at the `[edit class-of-service forwarding-classes queue queue-number expedited-forwarding]` hierarchy level. For more information, see “Configuring Forwarding Classes” on page 79.

Associating the PLP with a Drop-Profile Map

RED drop profiles take action on outgoing packets. When TCM is enabled, T-series and M320 platforms support four drop-profile map PLP designations: `low`, `medium-low`, `medium-high`, and `high`.

To configure the PLP for the drop-profile map, include the following statements at the `[edit class-of-service]` hierarchy level:

```
[edit class-of-service]
 schedulers {
   scheduler-name {
     drop-profile-map loss-priority (any | low | medium-low | medium-high | high)
     protocol any drop-profile profile-name;
   }
 }
```

When you configure TCM, the drop-profile map’s protocol type must be `any`.

The inputs for a drop-profile map are the loss priority and the protocol type. The output for a drop-profile map is the drop profile name. In other words, the map sets the drop profile for each packet with a specific PLP and protocol type exiting the interface.

For example, in the following configuration, the `dp` drop profile is assigned to all packets exiting the interface with a medium-low PLP and belonging to any protocol:

```
class-of-service {
  schedulers {
    af {
      drop-profile-map loss-priority medium-low protocol any drop-profile dp;
    }
  }
}
```

To use this drop-profile map, you must configure the settings for the `dp` drop profile at the `[edit class-of-service drop-profiles dp]` hierarchy level. For more information, see “Configuring RED Drop Profiles” on page 105.

Associating the PLP with a Rewrite Rule

Rewrite rules take action on outgoing packets. When TCM is enabled, T-series and M320 platforms support four rewrite PLP designations: **low**, **medium-low**, **medium-high**, and **high**. To configure the PLP for a rewrite rule, include the following statements at the [edit class-of-service] hierarchy level:

```
[edit class-of-service]
rewrite-rules {
  (dscp | dscp-ipv6 | exp | ieee-802.1 | inet-precedence) rewrite-name {
    import (rewrite-name | default);
    forwarding-class class-name {
      loss-priority (low | medium-low | medium-high | high)
      code-point (alias | bits);
    }
  }
}
```

The inputs for a rewrite rule are the forwarding class and the loss priority (PLP). The output for a rewrite rule are the CoS values. In other words, a rewrite rule sets the CoS values for each packet exiting the interface with a specific forwarding class and PLP.

For example, if you configure the following, the 000000 CoS values are assigned to all packets exiting the interface with the **assured-forwarding** forwarding class and **medium-high** PLP:

```
class-of-service {
  rewrite-rules {
    dscp dscp-rw {
      forwarding-class assured-forwarding {
        loss-priority medium-high code-point 000000;
      }
    }
  }
}
```

To use this classifier, you must configure the settings for the **assured-forwarding** forwarding class at the [edit class-of-service forwarding-classes queue *queue-number* assured-forwarding] hierarchy level. For more information, see “Configuring Forwarding Classes” on page 79.

Verifying Your Configuration

The following operational mode commands are useful for checking the results of your configuration:

- `show class-of-service`
- `show interfaces interface-name extensive`
- `show interfaces queue interface-name`

For information about these commands, see the *JUNOS Interfaces Command Reference* and *JUNOS System Basics and Services Command Reference*.

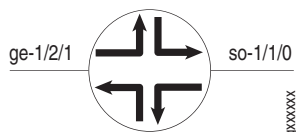
Example: Configuring Tricolor Marking

Configure a two-rate tricolor marking policer on an input Gigabit Ethernet interface.

Traffic enters the Gigabit Ethernet interface and exits a SONET/SDH OC12 interface. Oversubscription occurs when you send line-rate traffic from the Gigabit Ethernet interface out the OC-12 interface.

Figure 11 shows the sample topology.

Figure 11: Tricolor Marking Sample Topology



Input Interface The tricolor marker and policer are applied on the ingress Gigabit Ethernet interface. Incoming packets are metered. Packets that do not exceed the CIR are marked with low loss priority. Packets that exceed the CIR but do not exceed the PIR are marked with medium-high loss priority. Packets that exceed the PIR are marked with high loss priority.

```

interfaces {
  ge-1/2/1 {
    unit 0 {
      family inet {
        filter {
          input trtcm-filter;
        }
      }
    }
  }
}
firewall {
  three-color-policer trtcm1 {
    two-rate {
      color-aware;
      committed-information-rate 100m;
      committed-burst-size 65536;
      peak-information-rate 200m;
      peak-burst-size 131072;
    }
  }
  filter trtcm-filter {
    term one {
      then {
        three-color-policer {
          two-rate trtcm1;
        }
      }
    }
  }
}

```

Output Interface Transmission scheduling and weighted random early detection (WRED) profiles are applied on the output OC12 interface. The software drops traffic in the low, medium-high, and high drop priorities proportionally to the configured drop profiles.

```

class-of-service {
  drop-profiles {
    low-tcm {
      fill-level 80 drop-probability 100;
    }
    med-tcm {
      fill-level 40 drop-probability 100;
    }
    high-tcm {
      fill-level 10 drop-probability 100;
    }
  }
  tri-color;
  interfaces {
    so-1/1/0 {
      scheduler-map tcm-sched;
    }
  }
  scheduler-maps {
    tcm-sched {
      forwarding-class queue-0 scheduler q0-sched;
      forwarding-class queue-3 scheduler q3-sched;
    }
  }
  schedulers {
    q0-sched {
      transmit-rate percent 50;
      buffer-size percent 50;
      drop-profile-map loss-priority low protocol any drop-profile low-tcm;
      drop-profile-map loss-priority medium-high protocol any
        drop-profile med-tcm;
      drop-profile-map loss-priority high protocol any drop-profile high-tcm;
    }
    q3-sched {
      transmit-rate percent 50;
      buffer-size percent 50;
    }
  }
}

```

Medium-Low Loss Priority In another example, the 4PLP filter and policer causes certain packets to be marked with medium-low loss priority.

```

interfaces {
  ge-7/2/0 {
    unit 0 {
      family inet {
        filter {
          input 4PLP;
        }
        policer {
          input 4PLP;
        }
        address 11.45.10.2/30;
      }
    }
  }
}

firewall {
  three-color-policer trTCM {
    two-rate {
      color-blind;
      committed-information-rate 400m;
      committed-burst-size 100m;
      peak-information-rate 1g;
      peak-burst-size 500m;
    }
  }
  policer 4PLP {
    if-exceeding {
      bandwidth-limit 40k;
      burst-size-limit 4k;
    }
    then loss-priority medium-low;
  }
  family inet {
    filter 4PLP {
      term 0 {
        from {
          precedence 1;
        }
        then loss-priority medium-low;
      }
    }
  }
  filter filter_trTCM {
    term default {
      then {
        three-color-policer {
          two-rate trTCM;
        }
      }
    }
  }
}

```