

A Three Color Marker
<[draft-heinanen-diffserv-tcm-01.txt](#)>

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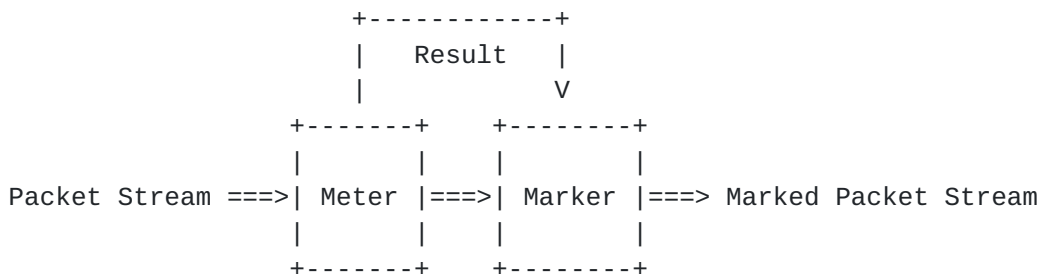
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Abstract

This document defines a Three Color Marker (TCM), which can be used as component in a Diffserv traffic conditioner [RFC2475, [RFC2474](#)]. The TCM meters a traffic stream and marks its packets according to three traffic parameters, Committed Information Rate (CIR), Committed Burst Size (CBS), and Excess Burst Size (EBS), to be either green, yellow, or red. The TCM is useful, for example, in policing a service, where green, yellow, and red packets are forwarded with increasing discard probability.

1. Introduction

The Three Color Marker (TCM) meters an IP packet stream and marks its packets either green, yellow, or red. The Meter meters each packet and passes the packet and the metering result to the Marker:



The Meter operates in one of two modes. In the Color-Blind mode, the Meter assumes that the packet stream is uncolored. In the Color-Aware mode the Meter assumes that the packet stream has been precolored.

The Marker (re)colors an IP packet according to the results of the Meter. The color is coded in the DS field [[Nichols](#)] of the packet in a PHB specific manner (see [section 4](#) for an example).

2. Configuration

The TCM is configured by setting its mode and by assigning values to the three traffic parameters: a Committed Information Rate (CIR), a Committed Burst Size (CBS), and an Excess Burst Size (EBS).

The CIR is measured in bytes of IP packets per second, i.e., it includes the IP header, but not link specific headers.

The CBS and the EBS and are measured in bytes. The CBS and EBS MUST be configured so that at least one of them is larger than 0. It is RECOMMENDED that when the value of the CBS or the EBS is larger than 0, it is larger than or equal to the size of the largest possible IP packet in the stream.

3. Metering

The behavior of the Meter is specified in terms of its mode and two token buckets, C and E, which both share the common CIR. The maximum size of the token bucket C is CBS and the maximum size of the token bucket E is EBS.

The token buckets C and E are initially (at time 0) full, i.e., the token count $T_c(0) = CBS$ and the token count $T_e(0) = EBS$. Thereafter,

the token counts T_c and T_e are updated CIR times per second as follows:

- o If T_c is less than CBS, T_c is incremented by one, else
- o if T_e is less than EBS, T_e is incremented by one, else
- o neither T_c nor T_e is incremented.

When a packet of size B bytes arrives at time t , the following happens if the TCM is configured to operate in the Color-Blind mode:

- o If $T_c(t) - B \geq 0$, the packet is green and T_c is decremented by B down to the minimum value of 0, else
- o if $T_e(t) - B \geq 0$, the packet is yellow and T_e is decremented by B down to the minimum value of 0, else
- o the packet is red and neither T_c nor T_e is decremented.

When a packet of size B bytes arrives at time t , the following happens if the TCM is configured to operate in the Color-Aware mode:

- o If the packet has been precolored as green and $T_c(t) - B \geq 0$, the packet is green and T_c is decremented by B down to the minimum value of 0, else
- o If the packet has been precolored as green or yellow and if $T_e(t) - B \geq 0$, the packet is yellow and T_e is decremented by B down to the minimum value of 0, else
- o the packet is red and neither T_c nor T_e is decremented.

The actual implementation of a Meter doesn't need to be modeled according to the above formal specification.

4. Marking

The Marker reflects the metering result by setting the DS field of the packet to a particular codepoint. In case of the AF PHB [[Heinanen](#)], the color can be coded as the drop precedence of the packet.

5. Service Example

The TCM can be used to mark a packet stream in a service, where different, decreasing levels of assurances (either absolute or relative) are given to packets which are green, yellow, or red.

6. Discussion

The TCM specified in this document is by no means the only possible way to color packets. Another three color marker could be defined, for example, by giving the green and yellow packets their own committed information rates. Possible specification of other multicolor markers is left for future study in other documents.

7. Security Concerns

The TCM has no known security concerns.

8. References

[Heinanen] J. Heinanen, et al., Assured Forwarding PHB Group. Internet draft [draft-ietf-diffserv-af-05.txt](#), February 1999.

[Nichols] K. Nichols and B. Carpenter, Format for Diffserv Working Group Traffic Conditioner Drafts. Internet draft [draft-ietf-diffserv-trafficcon-format-00.txt](#), February 1999.

[RFC2474] K. Nichols, et al., Definition of the Differentiated Services Field (DS Field) in the IPv4 and IPv6 Headers. [RFC 2474](#), December 1998.

[RFC2475] S. Blake, et al., An Architecture for Differentiated Services. [RFC 2475](#), December 1998.

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