Single-rate three-color marker (srTCM)

- The Single Rate Three Color Marker (srTCM) can be used as component in a Diffserv traffic conditioner
- The srTCM meters a traffic stream and marks its packets according to three traffic parameters
  - Committed Information Rate (CIR) (green)
  - Committed Burst Size (CBS) (yellow)
  - and Excess Burst Size (EBS) (red)
- A packet is marked
  - green if it doesn't exceed the CBS
  - yellow if it does exceed the CBS, but not the EBS
  - red otherwise

Single-rate three-color marker (srTCM)

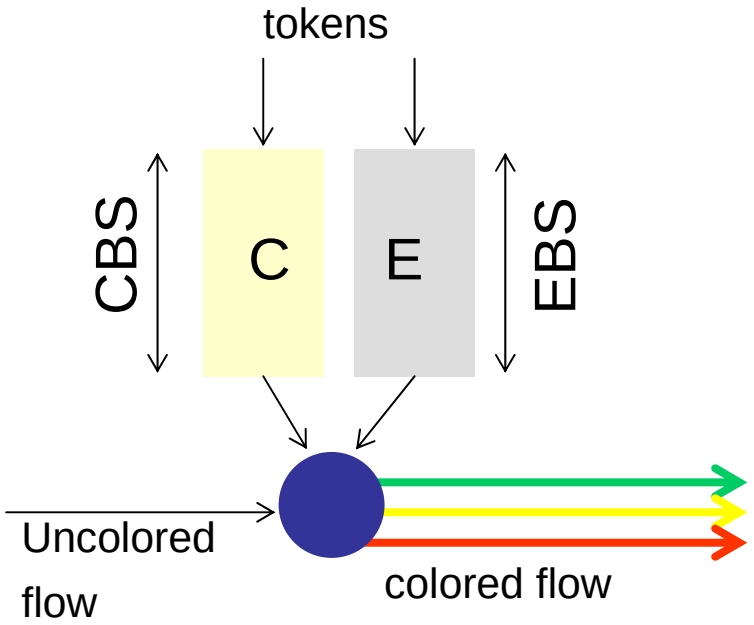
- The Meter operates in one of two modes
  - In the **Color-Blind mode**, the Meter assumes that the packet stream is uncolored
  - In the **Color-Aware mode** the Meter assumes that some preceding entity has pre- colored the incoming packet stream so that each packet is either green, yellow, or red
- The Marker (re)colors an IP packet according to the results of the Meter
- The color is coded in the DS field of the packet in a Per-Hop-Behavior specific manner
- This means that green, yellow and red traffic are treated differently in the network
- The specific way in which traffic is treated (Per Hop behavior) will be detailed in the following

Single-rate three-color marker (srTCM)

- 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

Single-rate three-color marker (srTCM)

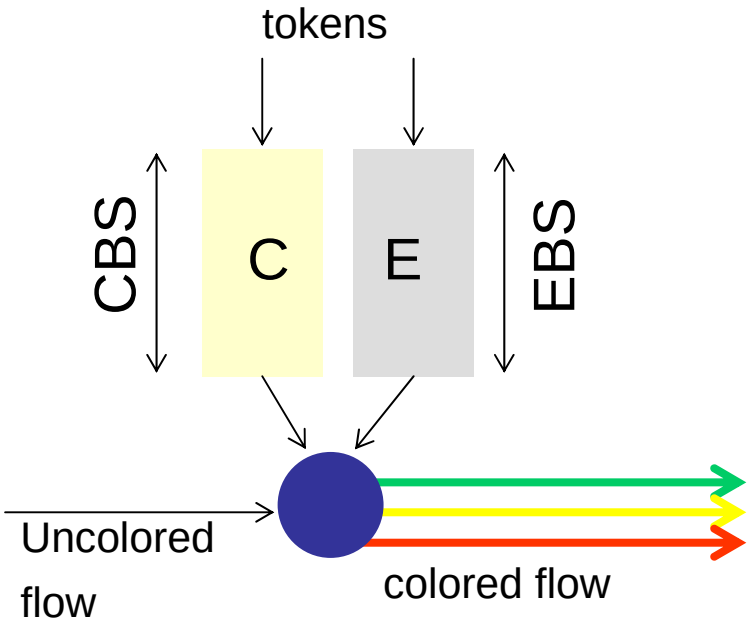
- The behavior of the Meter is specified in terms of its mode and two token buckets, C and E, which both share the common rate CIR
- The maximum size of the token bucket C is CBS and the maximum size of the token bucket E is EBS
- The token buckets C and E are initially (at time 0) full, i.e., the token count Tc(0) = CBS and the token count Te(0) = EBS
- Thereafter, the token counts Tc and Te are updated CIR times per second as follows
  - If Tc is less than CBS, Tc is incremented by one, else
  - if Te is less then EBS, Te is incremented by one, else
  - neither Tc nor Te is incremented



srTCM operating in the Color-blind mode

Single-rate three-color marker (srTCM)

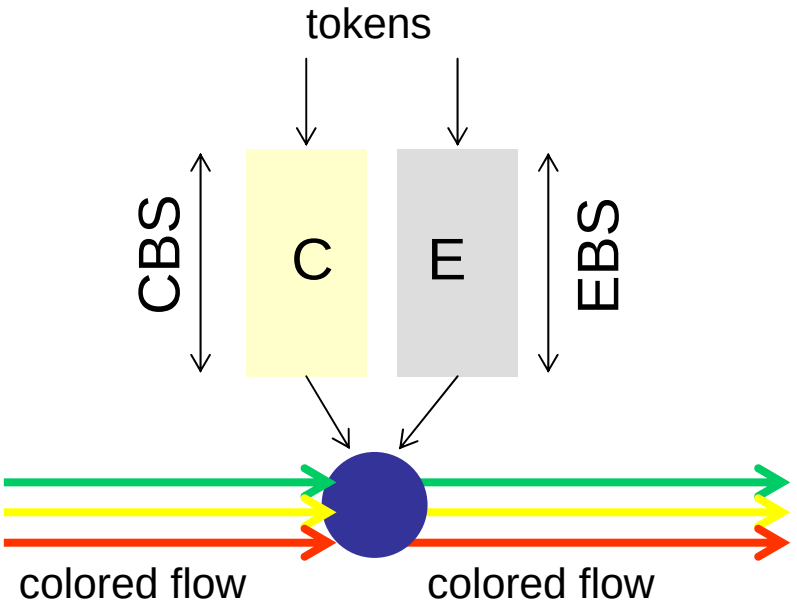
- When a packet of size B bytes arrives at time t, the following happens if the srTCM is configured to operate in the Color-Blind mode:
  - If Tc(t)-B >= 0, the packet is green and Tc is decremented by B down to the minimum value of 0, else
  - if Te(t)-B >= 0, the packets is yellow and Te is decremented by B down to the minimum value of 0, else
  - the packet is red and neither Tc nor Te is decremented



srTCM operating in the Color-blind mode

Single-rate three-color marker (srTCM)

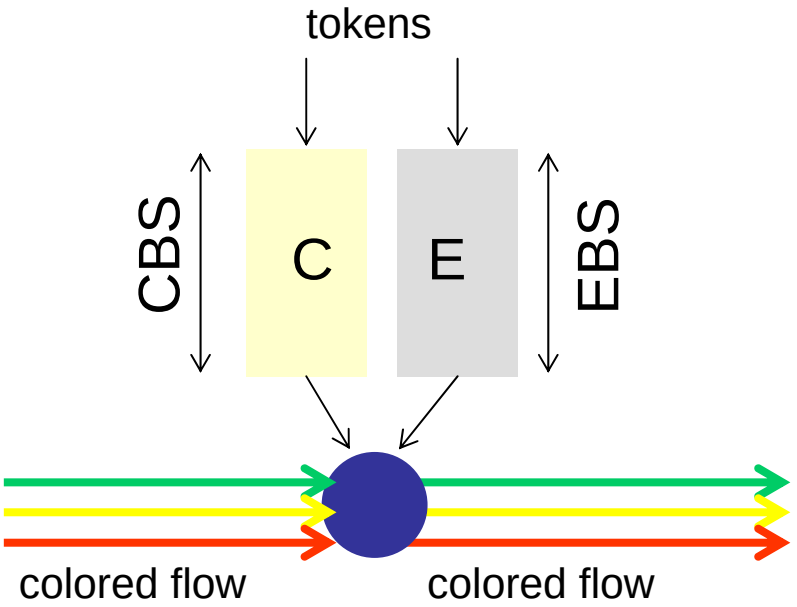
- When a packet of size B bytes arrives at time t, the following happens if the srTCM is configured to operate in the Color-Aware mode:
  - If the packet has been precolored as green and Tc(t)-B >= 0, the packet is green and Tc is decremented by B down to the minimum value of 0, else
  - If the packet has been precolored as green or yellow and if Te(t)-B >= 0, the packets is yellow and Te is decremented by B down to the minimum value of 0, else
  - the packet is red and neither Tc nor Te is decremented



srTCM operating in the Color-aware mode

Single-rate three-color marker (srTCM)

- The srTCM can be used to mark a packet stream in a service, where different, decreasing levels of assurances are given to packets which are green, yellow, or red
- For example, a service may
  - discard all red packets, because they exceeded both the committed and excess burst sizes
  - forward yellow packets as best effort
  - forward green packets with a low drop probability



srTCM operating in the Color-aware mode

Two-rate three-color marker (trTCM)

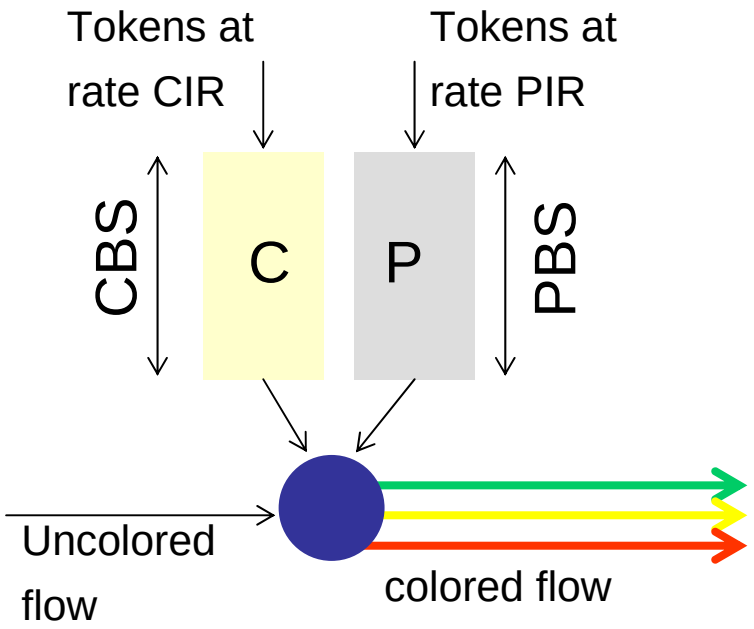
- The trTCM meters an IP packet stream and marks its packets based on two rates
  - Peak Information Rate (PIR) and
  - Committed Information Rate (CIR)
- and their associated burst sizes to be either
  - Green
  - Yellow
  - Red
- A packet is marked red if it exceeds the PIR
- Otherwise it is marked either yellow or green depending on whether it exceeds or doesn't exceed the CIR

Two-rate three-color marker (trTCM)

- The trTCM is configured by setting its mode (color-blind or color-aware) and by assigning values to four traffic parameters:
  - a Peak Information Rate (PIR) and its associated Peak Burst Size (PBS)
  - a Committed Information Rate (CIR) and its associated Committed Burst Size (CBS)
- The PIR and CIR are measured in bytes of IP packets per second, i.e., it includes the IP header, but not link specific headers
- The PIR must be equal to or greater than the CIR
- The PBS and the CBS and are measured in bytes and both of them must be configured to be greater than 0
- It is recommended that they be configured to be equal to or greater than the size of the largest possible IP packet in the stream

Two-rate three-color marker (trTCM)

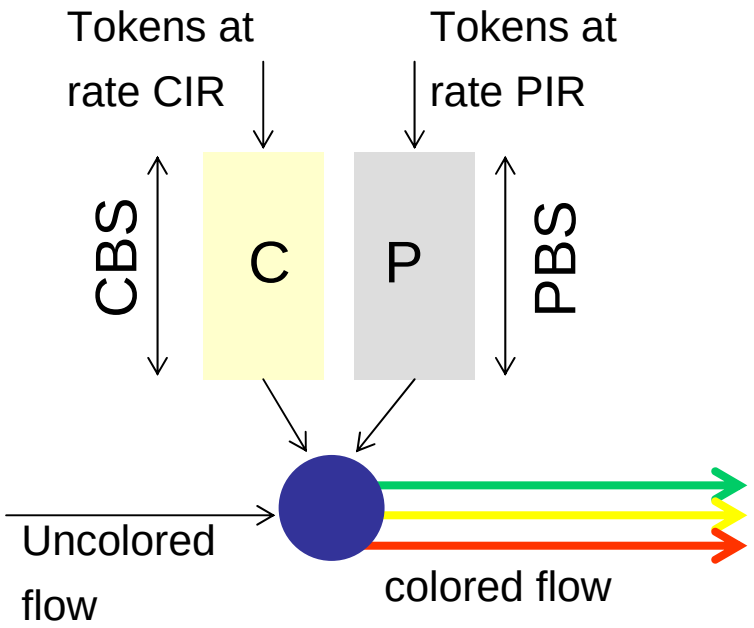
- The behavior of the Meter is specified in terms of its mode and two token buckets, P and C, with rates PIR and CIR, respectively
- The maximum size of the token bucket P is PBS and the maximum size of the token bucket C is CBS
- The token buckets P and C are initially (at time 0) full, i.e., the token count Tp(0) = PBS and the token count Tc(0) = CBS
- Thereafter, the token count Tp is incremented by one PIR times per second up to PBS
- The token count Tc is incremented by one CIR times per second up to CBS



trTCM operating in the Color-blind mode

Two-rate three-color marker (trTCM)

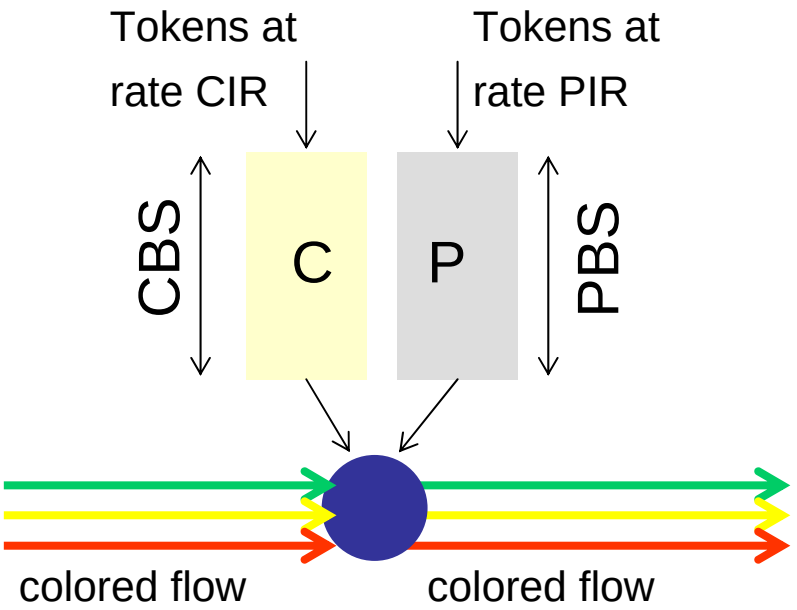
- When a packet of size B bytes arrives at time t, the following happens if the trTCM is configured to operate in the Color-Blind mode:
  - If Tp(t)-B < 0, the packet is red, else
  - if Tc(t)-B < 0, the packet is yellow and Tp is decremented by B, else
  - the packet is green and both Tp and Tc are decremented by B



trTCM operating in the Color-blind mode

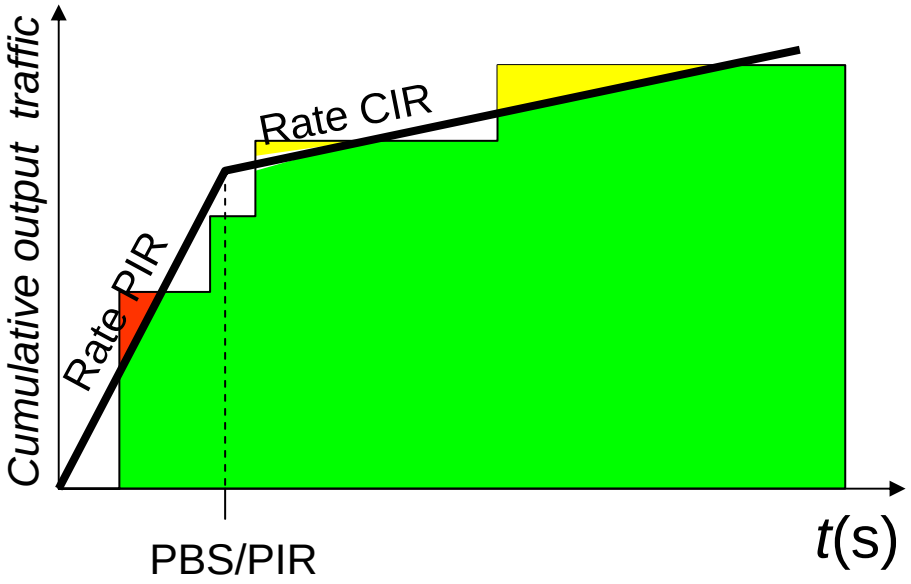
Two-rate three-color marker (trTCM)

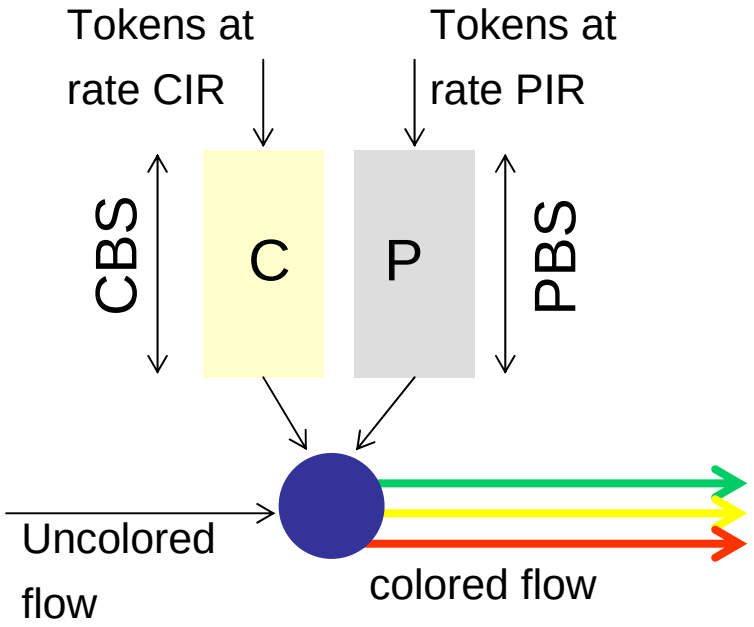
- When a packet of size B bytes arrives at time t, the following happens if the trTCM is configured to operate in the Color-Aware mode:
  - If the packet has been precolored as red or if Tp(t)-B < 0, the packet is red, else
  - if the packet has been precolored as yellow or if Tc(t)-B < 0, the packet is yellow and Tp is decremented by B, else
  - the packet is green and both Tp and Tc are decremented by B



trTCM operating in the Color-aware mode

Two-rate three-color marker (trTCM)





trTCM operating in the Color-blind mode