QoS: DiffServ for Quality of Service Overview Configuration Guide, Cisco IOS Release 15M&T

First Published: January 16, 2013
Last Modified: January 16, 2013

Americas Headquarters
Cisco Systems, Inc.
170 West Tasman Drive
San Jose, CA 95134-1706
USA
http://www.cisco.com
Tel: 408 526-4000
800 553-NETS (6387)
Fax: 408 527-0883
THE SPECIFICATIONS AND INFORMATION REGARDING THE PRODUCTS IN THIS MANUAL ARE SUBJECT TO CHANGE WITHOUT NOTICE. ALL STATEMENTS, INFORMATION, AND RECOMMENDATIONS IN THIS MANUAL ARE BELIEVED TO BE ACCURATE BUT ARE PRESENTED WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED. USERS MUST TAKE FULL RESPONSIBILITY FOR THEIR APPLICATION OF ANY PRODUCTS.

THE SOFTWARE LICENSE AND LIMITED WARRANTY FOR THE ACCOMPANYING PRODUCT ARE SET FORTH IN THE INFORMATION PACKET THAT SHIPPED WITH THE PRODUCT AND ARE INCORPORATED HEREIN BY THIS REFERENCE. IF YOU ARE UNABLE TO LOCATE THE SOFTWARE LICENSE OR LIMITED WARRANTY, CONTACT YOUR CISCO REPRESENTATIVE FOR A COPY.

The Cisco implementation of TCP header compression is an adaptation of a program developed by the University of California, Berkeley (UCB) as part of UCB's public domain version of the UNIX operating system. All rights reserved. Copyright © 1981, Regents of the University of California.

NOTWITHSTANDING ANY OTHER WARRANTY HEREIN, ALL DOCUMENT FILES AND SOFTWARE OF THESE SUPPLIERS ARE PROVIDED "AS IS" WITH ALL FAULTS. CISCO AND THE ABOVE-NAMED SUPPLIERS DISCLAIMS ALL WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING, WITHOUT LIMITATION, THOSE OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT OR ARISING FROM A COURSE OF DEALING, USAGE, OR TRADE PRACTICE.

IN NO EVENT SHALL CISCO OR ITS SUPPLIERS BE LIABLE FOR ANY INDIRECT, SPECIAL, CONSEQUENTIAL, OR INCIDENTAL DAMAGES, INCLUDING, WITHOUT LIMITATION, LOST PROFITS OR LOSS OR DAMAGE TO DATA ARISING OUT OF THE USE OR INABILITY TO USE THIS MANUAL, EVEN IF CISCO OR ITS SUPPLIERS HAVE BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

Any Internet Protocol (IP) addresses and phone numbers used in this document are not intended to be actual addresses and phone numbers. Any examples, command display output, network topology diagrams, and other figures included in the document are shown for illustrative purposes only. Any use of actual IP addresses or phone numbers in illustrative content is unintentional and coincidental.

Cisco and the Cisco logo are trademarks or registered trademarks of Cisco and/or its affiliates in the U.S. and other countries. To view a list of Cisco trademarks, go to this URL: http://www.cisco.com/go/trademarks. Third-party trademarks mentioned are the property of their respective owners. The use of the word partner does not imply a partnership relationship between Cisco and any other company. (1110R)

© 2014 Cisco Systems, Inc. All rights reserved.
CONTENTS

CHAPTER 1

Overview of DiffServ for Quality of Service 1
Finding Feature Information 1
Information About Differentiated Services 1
   Differentiated Services Definition 1
   DS Field Definition 2
   Per-Hop Behaviors 2
      Default PHB 2
      Class-Selector PHB 2
      Assured Forwarding PHB 3
      Expedited Forwarding PHB 4
   Benefits of Implementing Differentiated Services 4
   Differentiated Services Components 4
   Differentiated Services Feature Sets 5
   Sample DiffServ Implementation 6
      Sample DiffServ Configurations 8
      DiffServ Implementation Troubleshooting Logs 13
   Accounting Functionality and DiffServ 17
Where to Go Next 17
Additional References 18

CHAPTER 2

DiffServ MIB 21
Finding Feature Information 21
Information About DiffServ MIB 22
   Restrictions for DiffServ MIB 22
   MQC and DiffServ MIB 23
   Hierarchical Policies and DiffServ MIB 23
   How to Configure DiffServ MIB 23
   Enabling DiffServ MIB 23
Contents

Configuration Examples for DiffServ MIB 24
  Example: Enabling DiffServ MIB 24
  Example: DiffServ MIB SNMP Walk Output 24
Additional References 28
Feature Information for DiffServ MIB 29
Overview of DiffServ for Quality of Service

This module contains an overview of implementing Differentiated Services (DiffServ) on your network. DiffServ is a set of end-to-end quality of service (QoS) capabilities. End-to-end QoS is the ability of the network to deliver service required by specific network traffic from one end of the network to another. Cisco IOS QoS software supports three types of service models: best-effort services, Integrated Services (IntServ), and Differentiated Services.

• Finding Feature Information, page 1
• Information About Differentiated Services, page 1
• Where to Go Next, page 17
• Additional References, page 18

Finding Feature Information

Your software release may not support all the features documented in this module. For the latest caveats and feature information, see Bug Search Tool and the release notes for your platform and software release. To find information about the features documented in this module, and to see a list of the releases in which each feature is supported, see the feature information table at the end of this module.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to www.cisco.com/go/cfn. An account on Cisco.com is not required.

Information About Differentiated Services

Differentiated Services Definition

Differentiated Services is a multiple service model that can satisfy differing QoS requirements. With Differentiated Services, the network tries to deliver a particular kind of service based on the QoS specified by each packet. This specification can occur in different ways, for example, using the 6-bit differentiated services code point (DSCP) setting in IP packets or source and destination addresses. The network uses the QoS specification to classify, mark, shape, and police traffic and to perform intelligent queueing.
Differentiated Services is used for several mission-critical applications and for providing end-to-end QoS. Typically, Differentiated Services is appropriate for aggregate flows because it performs a relatively coarse level of traffic classification.

**DS Field Definition**

A replacement header field, called the DS field, is defined by Differentiated Services. The DS field supersedes the existing definitions of the IP version 4 (IPv4) type of service (ToS) octet (RFC 791) and the IPv6 traffic class octet. Six bits of the DS field are used as the DSCP to select the Per-Hop Behavior (PHB) at each interface. A currently unused 2-bit (CU) field is reserved for explicit congestion notification (ECN). The value of the CU bits is ignored by DS-compliant interfaces when determining the PHB to apply to a received packet.

**Per-Hop Behaviors**

RFC 2475 defines PHB as the externally observable forwarding behavior applied at a DiffServ-compliant node to a DiffServ Behavior Aggregate (BA).

With the ability of the system to mark packets according to DSCP setting, collections of packets with the same DSCP setting that are sent in a particular direction can be grouped into a BA. Packets from multiple sources or applications can belong to the same BA.

In other words, a PHB refers to the packet scheduling, queueing, policing, or shaping behavior of a node on any given packet belonging to a BA, as configured by a service level agreement (SLA) or a policy map.

**Default PHB**

The default PHB essentially specifies that a packet marked with a DSCP value of 000000 (recommended) receives the traditional best-effort service from a DS-compliant node (that is, a network node that complies with all of the core DiffServ requirements). Also, if a packet arrives at a DS-compliant node, and the DSCP value is not mapped to any other PHB, the packet will get mapped to the default PHB.

**Class-Selector PHB**

To preserve backward-compatibility with any IP precedence scheme currently in use on the network, DiffServ has defined a DSCP value in the form xxx000, where x is either 0 or 1. These DSCP values are called Class-Selector Code Points. (The DSCP value for a packet with default PHB 000000 is also called the Class-Selector Code Point.)

The PHB associated with a Class-Selector Code Point is a Class-Selector PHB. These Class-Selector PHBs retain most of the forwarding behavior as nodes that implement IP Precedence-based classification and forwarding.

For example, packets with a DSCP value of 11000 (the equivalent of the IP Precedence-based value of 110) have preferential forwarding treatment (for scheduling, queueing, and so on), as compared to packets with a DSCP value of 100000 (the equivalent of the IP Precedence-based value of 100). These Class-Selector PHBs ensure that DS-compliant nodes can coexist with IP Precedence-based nodes.
Assured Forwarding PHB

Assured Forwarding (AF) PHB is nearly equivalent to Controlled Load Service available in the integrated services model. An AF PHB defines a method by which BAs can be given different forwarding assurances.

For example, network traffic can be divided into the following classes:

- **Gold**: Traffic in this category is allocated 50 percent of the available bandwidth.
- **Silver**: Traffic in this category is allocated 30 percent of the available bandwidth.
- **Bronze**: Traffic in this category is allocated 20 percent of the available bandwidth.

Further, the AF PHB defines four AF classes: AF1, AF2, AF3, and AF4. Each class is assigned a specific amount of buffer space and interface bandwidth, according to the SLA with the service provider or policy map.

Within each AF class, you can specify three drop precedence (dP) values: 1, 2, and 3.

Assured Forwarding PHB can be expressed as follows:

\[ \text{AF}n_y \]

In this example, \( n \) represents the AF class number (1, 2, 3, or 4) and \( y \) represents the dP value (1, 2, or 3) within the \( \text{AF}n \) class.

In instances of network traffic congestion, if packets in a particular AF class (for example, AF1) need to be dropped, packets in the AF1 class will be dropped according to the following guideline:

\[ \text{dP(AF}n_y) \geq \text{dP(AF}n_z) \geq \text{dP(AF}n_x) \]

where \( \text{dP(AF}n_y) \) is the probability that packets of the AF\( n_y \) class will be dropped. In other words, \( y \) denotes the dP within an AF\( n \) class.

In the following example, packets in the AF13 class will be dropped before packets in the AF12 class, which in turn will be dropped before packets in the AF11 class:

\[ \text{dP(AF13)} \geq \text{dP(AF12)} \geq \text{dP(AF11)} \]

The dP method penalizes traffic flows within a particular BA that exceed the assigned bandwidth. Packets on these offending flows could be re-marked by a policer to a higher drop precedence.

An AF\( x \) class can be denoted by the DSCP value, xyzab0, where \( xyz \) can be 001, 010, 011, or 100, and \( ab \) represents the dP value.

The table below lists the DSCP value and corresponding dP value for each AF PHB class.

<table>
<thead>
<tr>
<th>Drop Precedence</th>
<th>Class 1</th>
<th>Class 2</th>
<th>Class 3</th>
<th>Class 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Drop Precedence</td>
<td>001010</td>
<td>010010</td>
<td>011010</td>
<td>100010</td>
</tr>
<tr>
<td>Medium Drop Precedence</td>
<td>001100</td>
<td>010100</td>
<td>011100</td>
<td>100100</td>
</tr>
<tr>
<td>High Drop Precedence</td>
<td>001110</td>
<td>010110</td>
<td>011110</td>
<td>100110</td>
</tr>
</tbody>
</table>
Expedited Forwarding PHB

Resource Reservation Protocol (RSVP), a component of the integrated services model, provides a guaranteed bandwidth service. Applications such as Voice over IP (VoIP), video, and online trading programs require this kind of robust service. The EF PHB, a key ingredient of DiffServ, supplies this kind of robust service by providing low loss, low latency, low jitter, and assured bandwidth service.

EF can be implemented using PQ, along with rate-limiting on the class (or BA). When implemented in a DiffServ network, EF PHB provides a virtual leased line, or premium service. For optimal efficiency, however, EF PHB should be reserved for only the most critical applications because, in instances of traffic congestion, it is not feasible to treat all or most traffic as high priority.

EF PHB is ideally suited for applications that require low bandwidth, guaranteed bandwidth, low delay, and low jitter.

The recommended DSCP value for EF PHB is 101110.

Benefits of Implementing Differentiated Services

Use the Implementing DiffServ for End-to-End Quality of Service feature set to implement the Differentiated Services architecture. The benefits of implementing Differentiated Services include the following:

• Reduces the burden on network devices and easily scales as the network grows.
• Allows customers to keep any existing Layer 3 ToS prioritization scheme that may be in use.
• Allows customers to mix DiffServ-compliant devices with any existing ToS-enabled equipment in use.
• Alleviates bottlenecks through efficient management of current corporate network resources.

Differentiated Services Components

The following components make up the foundation of a Cisco Differentiated Services implementation:

• Traffic conditioning (traffic policing and traffic shaping)--Traffic conditioning is performed at the edges of a DiffServ domain. Traffic conditioners perform traffic shaping and policing functions to ensure that traffic entering the DiffServ domain conforms to the rules specified by the Traffic Conditioning Agreement (TCA) and complies with the service provisioning policy of the domain. Traffic conditioning may range from simple code point re-marking to complex policing and shaping operations.

• Packet classification--Packet classification uses a traffic descriptor (for example, the DSCP) to categorize a packet within a specific group in order to define that packet. After the packet has been defined (that is, classified), the packet is accessible for QoS handling on the network.

Using packet classification, you can partition network traffic into multiple priority levels or classes of service. When traffic descriptors are used to classify traffic, the source agrees to adhere to the contracted terms and the network promises a QoS. Traffic policers and traffic shapers use the traffic descriptor of the packet (that is, the classification of the packet) to ensure adherence to that agreement.

• Packet marking--Packet marking is related to packet classification. Packet marking allows you to classify a packet based on a specific traffic descriptor (such as the DSCP value). This classification can then be
used to apply user-defined differentiated services to the packet and to associate a packet with a local QoS group.

Associating a packet with a local QoS group allows users to associate a group ID with a packet. The group ID can be used to classify packets into QoS groups based on prefix, autonomous system, and community string. A user can set up to 64 DSCP values and 100 QoS group markings.

- Congestion management--Congestion management (or scheduling) is achieved through traffic scheduling and traffic queueing. When there is network congestion, a scheduling mechanism such as CBWFQ is used to provide guaranteed bandwidth to the different classes of traffic.
- Congestion avoidance--Congestion avoidance techniques monitor network traffic loads in an effort to anticipate and avoid congestion at common network bottlenecks. Congestion avoidance is achieved through packet dropping. Among the more commonly used congestion avoidance mechanisms is WRED.

With WRED and Differentiated Services, you have the option of allowing WRED to use the DSCP value when WRED calculates the drop probability of a packet.

**Differentiated Services Feature Sets**

This section lists many of the feature sets that correspond to the DiffServ components listed earlier. The feature sets listed below provide the necessary functionality that allows you to implement DiffServ:

- Modular QoS Command-Line Interface (CLI) (MQC)--The MQC provides a CLI structure that allows you to apply QoS features on your network.
- Packet Marking (Marking Network Traffic)--Packet marking allows you to differentiate packets by designating them different identifying values. For example, you can mark packets by setting the IP Precedence bits or the IP differentiated services code point (DSCP) in the type of service (ToS) byte.
- Committed Access Rate (CAR)--CAR performs packet classification through IP Precedence and QoS group settings. CAR can also perform metering and class-based policing of traffic, providing bandwidth management.
- Traffic Policing--This feature allows you to limit the input or output transmission rate of a class of traffic based on user-defined criteria. It also enables the system to mark packets according to a user-defined criterion, such as the IP Precedence value, the QoS group, or the DSCP value, among others. Such traffic can then be dropped or transmitted, as desired.
- Traffic Shaping (Regulating Packet Flow)--Traffic shaping "shapes" the flow of traffic by reducing outbound flow traffic to avoid congestion. Traffic shaping constrains traffic to a particular bit rate using a token bucket mechanism.
- Class-Based Weighted Fair Queueing (CBWFQ)--CBWFQ is a scheduling mechanism used to provide a minimum bandwidth guarantee to traffic classes during times of network congestion at an interface.
- Low Latency Queueing (LLQ)--LLQ is a scheduling mechanism that brings strict priority queueing (PQ) to CBWFQ. Strict PQ allows delay-sensitive data such as voice to be dequeued and sent before packets in other queues are dequeued.
- Weighted Random Early Detection (WRED) and Weighted Fair Queueing (WFQ)--WRED and WFQ are intelligent queueing schemes that can be used with CAR for implementing Differentiated Services.
Sample DiffServ Implementation

The following section provides a sample DiffServ implementation. It includes sample configurations and troubleshooting logs, which can be used for monitoring system performance.

The figure below shows a sample DiffServ implementation with three routers: remote router 1, central router, and remote router 2.

In this example, we want to give end-to-end QoS to several different types of traffic classes using the Cisco IOS Differentiated Services feature set.

Traffic classes along with the SLAs for each traffic class in use on the sample DiffServ implementation are described as follows:

- Voice is considered premium class. The gold class of traffic consists of TACACS sessions, along with traffic marked with DSCP values 12 and 14. The silver traffic class consists of Telnet, Simple Main Transfer Protocol (SMTP), and FTP sessions. The bronze traffic class consists of web traffic and traffic marked with DSCP values 28 and 30. Anything else is considered as belonging to the "best-effort" traffic class.

- The premium class should be forwarded with the lowest delay possible up to a maximum of 500 kbps during periods of congestion. The gold class should be treated preferentially over the silver class, which in turn should be treated preferentially over the bronze class. The gold, silver, and bronze classes should have 35 percent, 25 percent, and 15 percent, respectively, of the interface bandwidth as the minimum bandwidth guarantees. The bronze class should be shaped to 320 kbps, and the best-effort class should be policed to 56 kbps.

- To provision for the various traffic classes, the traffic needs to be classified based on DSCP values in a DiffServ domain. So that traffic can be classified based on DSCP values, the traffic should be premarked with the appropriate DSCP values at the time of entering the network.
In the figure above, the correct place to do this kind of traffic marking is in the incoming direction of Fast Ethernet interface 0/0 of remote router 1 and in the incoming direction of serial interface 0/1 of remote router 2. This marking can be achieved through an input service policy.

The table below lists the DSCP values used to mark different classes of traffic entering into the sample network.

### Table 2: DSCP Values for Traffic Classes and Traffic Types

<table>
<thead>
<tr>
<th>Traffic Class</th>
<th>Traffic Type</th>
<th>DSCP Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Premium</td>
<td>Voice</td>
<td>46</td>
</tr>
<tr>
<td>Gold</td>
<td>TACACS</td>
<td>10</td>
</tr>
<tr>
<td>Silver</td>
<td>Telnet</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>SMTP</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>FTP</td>
<td>22</td>
</tr>
<tr>
<td>Bronze</td>
<td>HTTP</td>
<td>26</td>
</tr>
</tbody>
</table>

To achieve the marking scheme noted in the table above, use the following configuration for the policy map called SETDSCP in the input direction of Fast Ethernet interface 0/0 of remote router 1:

```conf
class-map match-all EF
    match access-group 101
class-map match-all AF1
    match access-group 102
class-map match-all AF21
    match access-group 108
class-map match-all AF22
    match access-group 109
class-map match-all AF23
    match access-group 110
class-map match-all AF3
    match access-group 104
policy-map SETDSCP
    class EF
        set ip dscp 46
    class AF1
        set ip dscp 10
    class AF21
        set ip dscp 18
    class AF22
        set ip dscp 20
    class AF23
        set ip dscp 22
    class AF3
        set ip dscp 26
```

Once the traffic classes are marked with the appropriate DSCP values using the SETDSCP policy map, the different behavior aggregate requirements for each of the traffic classes can be met by using the configuration for the following policy map called VOIP in the output direction:

```conf
class-map match-all premium
    match ip dscp 46
class-map match-all gold
    match ip dscp 10 12 14
class-map match-all silver
    match ip dscp 18 20 22
```
Sample DiffServ Configurations

This section contains the configurations for each of the routers shown in the figure above.

The examples demonstrate how marking, shaping, policing, and monitoring are done through the Modular QoS CLI.

Remote Router 1 Configuration

Current configuration:
Remote1# show running-config
Building configuration...
!
version 12.1
no service single-slot-reload-enable
service timestamps debug uptime
service timestamps log uptime
no service password-encryption
!
hostname Remote1
!
logging rate-limit console 10 except errors
no logging console
!
ip subnet-zero
!
ip dhcp smart-relay
!
ip cef
!
class-map match-all gold
 match ip dscp 10 12 14
class-map match-all EF
 match access-group 101
class-map match-all AF21
 match access-group 108
class-map match-all AF23
 match access-group 110
class-map match-all AF22
 match access-group 109
class-map match-all AF3
 match access-group 104

class-map match-all bronze
 match ip dscp 26 28 30
class-map best-effort
 match access-group 105
policy-map VOIP
class premium
 priority 500
class gold
 bandwidth percent 35
class silver
 shape average 320000
 bandwidth percent 25
class bronze
 bandwidth percent 15
class best-effort
 police 56000 1750 1750 conform-action set-dscp-transmit 0
class-map match-all AF1
    match access-group 102
!
policy-map VOIP
    class platinum
        priority 500
    class gold
        bandwidth percent 50
    class bronze
        shape average 320000
        bandwidth percent 15
    class silver
        bandwidth percent 35
    class best-effort
        police 56000 1750 1750
        conform-action set-dscp-transmit 0
        exceed-action drop
        violate-action drop
policy-map SETDSCP
    class EF
        set ip dscp 46
    class AF1
        set ip dscp 10
    class AF3
        set ip dscp 26
    class AF21
        set ip dscp 18
    class AF22
        set ip dscp 20
    class AF23
        set ip dscp 22
!
call rsvp-sync
cns event-service server
!
interface FastEthernet0/0
    ip address 4.1.1.1 255.255.255.0
    load-interval 60
    speed auto
    half-duplex
    service-policy input SETDSCP
!
interface Serial0/0
    bandwidth 2000
    ip address 2.1.1.1 255.255.255.0
    load-interval 60
    service-policy output VOIP
!
interface Serial0/1
    no ip address
    shutdown
!
ip classless
ip route 1.1.1.0 255.255.255.0 2.1.1.2
ip route 3.1.1.0 255.255.255.0 2.1.1.2
!
access-list 101 permit udp any any range 16384 32768
access-list 102 permit tcp any any eq tacacs
access-list 104 permit tcp any any eq www
access-list 105 permit ip any any
access-list 108 permit tcp any any eq telnet
access-list 109 permit tcp any any eq smtp
access-list 110 permit tcp any any eq ftp
!
voice-port 1/0/0
!
voice-port 1/0/1
!
dial-peer cor custom
!
dial-peer voice 11 pots
destination-pattern 2220
port 1/0/0
!
dial-peer voice 1 voip
destination-pattern 1110
session target ipv4:1.1.1.2
ip precedence 5
!
line con 0
transport input none
line aux 0
line vty 0 4
login
!
no scheduler allocate
end

Central Router Configuration

Current configuration:
Central# show running-config
Building configuration...
Current configuration:
!
version 12.1
no service single-slot-reload-enable
service timestamps debug uptime
service timestamps log uptime
no service password-encryption
!
hostname Central
!
logging rate-limit console 10 except errors
no logging console
ip dhcp smart-relay
!
ip cef
!
class-map match-all gold
  match ip dscp 10 12 14
class-map match-all bronze
  match ip dscp 26 28 30
class-map match-all platinum
  match ip dscp 46
class-map match-all silver
  match ip dscp 18 20 22
class-map match-all best-effort
  match ip dscp 0
!
policy-map AVVID
  class silver
    bandwidth percent 35
    random-detect dscp-based
    random-detect dscp 18 20 40 10
    random-detect dscp 20 20 40 30
    random-detect dscp 22 2 3 3
  class gold
    bandwidth percent 50
    random-detect dscp-based
    random-detect dscp 10 20 40 10
    random-detect dscp 12 20 40 15
    random-detect dscp 14 20 40 20
  class bronze
    bandwidth percent 15
    random-detect dscp-based
    random-detect dscp 26 20 40 10
    random-detect dscp 28 20 40 20
    random-detect dscp 30 20 40 30
  class platinum
    priority 500
!
!cns event-service server
!
interface Serial4/0
  bandwidth 2000
ip address 3.1.1.1 255.255.255.0
no ip mroute-cache
load-interval 60
service-policy output AVVID
!
interface Serial4/1
ip address 2.1.1.2 255.255.255.0
no ip mroute-cache
service-policy output AVVID
clockrate 2015232
!
interface Serial4/2
no ip address
no ip mroute-cache
shutdown
!
interface Serial4/3
no ip address
no ip mroute-cache
shutdown
!
ip classless
ip route 0.0.0.0 0.0.0.0 10.0.153.1
ip route 1.1.1.0 255.255.255.0 3.1.1.2
ip route 4.1.1.0 255.255.255.0 2.1.1.1
ip http server
!
line con 0
  exec-timeout 0 0
  transport input none
line aux 0
line vty 0 4
line vty 5 15
end

Remote Router 2 Configuration

Remote2# show running-config
Building configuration...
Current configuration:
!
version 12.1
no service single-slot-reload-enable
service timestamps debug uptime
service timestamps log uptime
no service password-encryption
!
hostname Remote2
!
logging rate-limit console 10 except errors
no logging console
!
ip dhcp smart-relay
!
ip cef
!
class-map match-all gold
  match ip dscp 10 12 14
!
class-map match-all EF
  match access-group 101
!
class-map match-all AF21
  match access-group 108
!
class-map match-all AF22
  match access-group 110
!
class-map match-all AF23
  match access-group 109
!
class-map match-all bronze
  match ip dscp 26 28 30
!
class-map match-all platinum
  match ip dscp 46
!
class-map match-all silver
match ip dscp 18 20 22
class-map match-all best-effort
  match access-group 105
class-map match-all AF3
  match access-group 104
class-map match-all AF1
  match access-group 102
!
!
policy-map VOIP
  class platinum
    priority 500
  class gold
    bandwidth percent 50
  class bronze
    shape average 320000
    bandwidth percent 15
  class silver
    bandwidth percent 35
  class best-effort
    police 56000 1750 1750 conform-action set-dscp-transmit 0 exceed-action drop violate-action drop
!
policy-map SETDSCP
  class EF
    set ip dscp 46
  class AF1
    set ip dscp 10
  class AF3
    set ip dscp 26
  class AF21
    set ip dscp 18
  class AF22
    set ip dscp 20
  class AF23
    set ip dscp 22
!
interface Serial0/0
  bandwidth 2000
  ip address 3.1.1.2 255.255.255.0
  load-interval 60
  service-policy output VOIP
  clockrate 2000000
!
interface Serial0/1
  ip address 1.1.1.1 255.255.255.0
  load-interval 60
  no keepalive
  service-policy input SETDSCP
  clockrate 2000000
!
ip kerberos source-interface any
ip classless
ip route 2.1.1.0 255.255.255.0 3.1.1.1
ip route 4.1.1.0 255.255.255.0 3.1.1.1
no ip http server
!
access-list 101 permit udp any any range 16384 32768
access-list 102 permit tcp any any eq tacacs
access-list 104 permit tcp any any eq www
access-list 105 permit ip any any
access-list 108 permit tcp any any eq telnet
access-list 109 permit tcp any any eq smtp
access-list 110 permit tcp any any eq ftp
!
voice-port 1/0/0
!
voice-port 1/0/1
!
dial-peer cor custom
!
dial-peer voice 1 voip
  destination-pattern 2220
  session target ipv4:2.1.1.1
ip precedence 5
!
dial-peer voice 11 pots
destination-pattern 1110
port 1/0/0
!
line con 0
  transport input none
line aux 0
line vty 0 4
  login
  no scheduler allocate
end

DiffServ Implementation Troubleshooting Logs

This section contains sample troubleshooting logs for remote router 1 and the central router. These logs can be used for monitoring and maintaining the DiffServ implementation.

Remote Router 1

Remote1# show policy-map SETDSCP
Policy Map SETDSCP
  Class EF
    set ip dscp 46
  Class AF1
    set ip dscp 10
  Class AF3
    set ip dscp 26
  Class AF21
    set ip dscp 18
  Class AF22
    set ip dscp 20
  Class AF23
    set ip dscp 22
Remote1# show policy-map VOIP
Policy Map VOIP
  Class platinum
    Weighted Fair Queueing
    Strict Priority
    Bandwidth 500 (kbps) Burst 12500 (Bytes)
  Class gold
    Weighted Fair Queueing
    Bandwidth 50 (%) Max Threshold 64 (packets)
  Class bronze
    Traffic Shaping
    Average Rate Traffic Shaping
    CIR 320000 (bps) Max. Buffers Limit 1000 (Packets)
    Weighted Fair Queueing
    Bandwidth 15 (%) Max Threshold 64 (packets)
  Class silver
    Weighted Fair Queueing
    Bandwidth 35 (%) Max Threshold 64 (packets)
  Class best-effort
    police 56000 1750 1750 conform-action set-dscp-transmit 0 exceed-action drop violate-action drop
Remote1# show policy-map interface f0/0
FastEthernet0/0
  Service-policy input: SETDSCP (1611)
  Class-map: EF (match-all) (1612/3)
    2154221 packets, 176646532 bytes
    1 minute offered rate 642000 bps, drop rate 0 bps
    Match: access-group 101 (1614)
Remote1# show policy-map interface s0/0
Serial0/0

Service-policy output: VOIP (1558)
Class-map: platinum (match-all) (1559/8)
2988402 packets, 215165016 bytes
1 minute offered rate 564000 bps, drop rate 0 bps
Match: ip dscp 46 (1561)
Weighted Fair Queueing
Strict Priority
Output Queue: Conversation 264
Bandwidth 500 (kbps)
(pkts matched/bytes matched) 2988422/215166384
(total drops/bytes drops) 330478/23794416
Class-map: gold (match-all) (1563/2)
64300 packets, 96064200 bytes
1 minute offered rate 252000 bps, drop rate 0 bps
Match: ip dscp 10 12 14 (1565)
Weighted Fair Queueing
Output Queue: Conversation 265
Bandwidth 50 (%) Max Threshold 64 (packets)
(pkts matched/bytes matched) 64300/96064200
(depth/total drops/no-buffer drops) 0/0/0
Class-map: bronze (match-all) (1567/7)
115945 packets, 173221830 bytes
1 minute offered rate 479000 bps, drop rate 56000 bps
Match: ip dscp 26 28 30 (1569)
Traffic Shaping
Target Byte Sustain Excess Interval Increment Adapt
Rate Limit bits/int bits/int (ms) (bytes) Active
320000 2000 8000 8000 25 1000 -
Overview of DiffServ for Quality of Service

Sample DiffServ Implementation

<table>
<thead>
<tr>
<th>Queue</th>
<th>Packets</th>
<th>Bytes</th>
<th>Packets</th>
<th>Bytes</th>
<th>Depth</th>
<th>Delayed</th>
<th>Delayed Drops</th>
<th>Active Drops</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depth</td>
<td>64</td>
<td>8006</td>
<td>119528964</td>
<td>72784</td>
<td>108739296</td>
<td>yes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Weighted Fair Queueing

Output Queue: Conversation 266
Bandwidth 15 (%) Max Threshold 64 (packets)
(packets matched/bytes matched) 8006/119528964
(depth/total drops/no-buffer drops) 0/12749/0
Class-map: silver (match-all) (1572/9)
315979 packets, 472072626 bytes
1 minute offered rate 1258000 bps, drop rate 646000 bps

Weighted Fair Queueing

Output Queue: Conversation 267
Bandwidth 35 (%) Max Threshold 64 (packets)
(packets matched/bytes matched) 316253/472481982
(depth/total drops/no-buffer drops) 0/158914/0
Class-map: best-effort (match-all) (1576/10)
3548921 packets, 1051813080 bytes
1 minute offered rate 2801000 bps, drop rate 0 bps

Match: access-group 105 (1578)
Policy:
56000 bps, 1750 limit, 1750 extended limit
conformed 0 packets, 0 bytes; action: set-dscp-transmit 0
exceeded 0 packets, 0 bytes; action: drop
violated 0 packets, 0 bytes; action: drop
Class-map: class-default (match-any) (1580/0)
3549281 packets, 1051837716 bytes
1 minute offered rate 2801000 bps, drop rate 0 bps

Match: any (1582)
3549281 packets, 1051837644 bytes

1 minute rate 2801000 bps

Remote1# show queue serial 0/0
Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 631823
Queueing strategy: weighted fair
Output queue: 101/10000/64/593995 (size/max total/threshold/drops)
Conversations 4/7/256 (active/max active/max total)
Reserved Conversations 3/3 (allocated/max allocated)
Available Bandwidth 1000 kilobits/sec

(depth/weight/total drops/no-buffer drops/interleaves) 5/0/346494/0/0
Conversation 264, linktype: ip, length: 72
source: 0.0.0.0, destination: 1.1.1.2, id: 0x0000, ttl: 59,
TOS: 184 prot: 17, source port 0, destination port 16384

(depth/weight/total drops/no-buffer drops/interleaves) 63/45/166791/0/0
Conversation 267, linktype: ip, length: 1494
source: 0.0.0.0, destination: 1.1.1.2, id: 0x0000, ttl: 59,
TOS: 72 prot: 6, source port 0, destination port 23

(depth/weight/total drops/no-buffer drops/interleaves) 35/104/13461/0/0
Conversation 266, linktype: ip, length: 1494
source: 0.0.0.0, destination: 1.1.1.2, id: 0x0000, ttl: 59,
TOS: 0 prot: 17, source port 0, destination port 67

Remote1# show interface serial 0/0
Serial0/0 is up, line protocol is up
Hardware is PowerQUICC Serial
Internet address is 2.1.1.1/24
MTU 1500 bytes, BW 2000 Kbit, DLY 20000 usec,
reliability 255/255, txload 207/255, rxload 1/255
Encapsulation HDLC, loopback not set
Keepalive set (10 sec)
Last input 00:00:03, output 00:00:00, output hang never
Last clearing of "show interface" counters 00:50:30
Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 595699
Queueing strategy: weighted fair
Output queue: 114/10000/64/560199 (size/max total/threshold/drops)
Conversations 4/7/256 (active/max active/max total)
Reserved Conversations 3/3 (allocated/max allocated)
Available Bandwidth 1000 kilobits/sec
1 minute input rate 0 bits/sec, 0 packets/sec
1 minute output rate 1624000 bits/sec, 962 packets/sec
Central Router

Central# show policy-map interface serial 4/0
Seria14/0
Service-policy output: AVVID (2022)
Class-map: silver (match-all) (2023/2)
251162 packets, 375236028 bytes
1 minute offered rate 612000 bps, drop rate 0 bps
Match: ip dscp 18 20 22 (2025)
Weighted Fair Queueing
Output Queue: Conversation 265
Bandwidth 25 (%) (pkts matched/bytes matched) 3/4482
(depth/total drops/no-buffer drops) 0/0/0
mean queue depth: 0
Dscp (Prec) Random drop Tail drop Minimum Maximum Mark
0(0) 0/0 0/0 0/0 20 40 1/10
1 0/0 0/0 0/0 22 40 1/10
2 0/0 0/0 0/0 24 40 1/10
3 0/0 0/0 0/0 26 40 1/10
4 0/0 0/0 0/0 28 40 1/10
(...up to DSCP 63......)
61 0/0 0/0 0/0 30 40 1/10
62 0/0 0/0 0/0 32 40 1/10
63 0/0 0/0 0/0 34 40 1/10
rsvp 0/0 0/0 0/0 36 40 1/10
Class-map: gold (match-all) (2027/3)
102479 packets, 153103626 bytes
1 minute offered rate 250000 bps, drop rate 0 bps
Match: ip dscp 10 12 14 (2029)
Weighted Fair Queueing
Output Queue: Conversation 266
Bandwidth 35 (%) (pkts matched/bytes matched) 0/0
(depth/total drops/no-buffer drops) 0/0/0
mean queue depth: 0
Dscp (Prec) Random drop Tail drop Minimum Maximum Mark
0(0) 0/0 0/0 0/0 20 40 1/10
1 0/0 0/0 0/0 22 40 1/10
2 0/0 0/0 0/0 24 40 1/10
3 0/0 0/0 0/0 26 40 1/10
(...up to DSCP 63......)
61 0/0 0/0 0/0 30 40 1/10
62 0/0 0/0 0/0 32 40 1/10
63 0/0 0/0 0/0 34 40 1/10
rsvp 0/0 0/0 0/0 36 40 1/10
Class-map: bronze (match-all) (2031/4)
106605 packets, 159267870 bytes
1 minute offered rate 262000 bps, drop rate 0 bps
Match: ip dscp 26 28 30 (2033)
Weighted Fair Queueing
Output Queue: Conversation 267
Bandwidth 15 (%) (pkts matched/bytes matched) 0/0
(depth/total drops/no-buffer drops) 0/0/0
mean queue depth: 0
Dscp (Prec) Random drop Tail drop Minimum Maximum Mark
0(0) 0/0 0/0 0/0 20 40 1/10
...
Accounting Functionality and DiffServ

The accounting functionality of DiffServ allows you to collect and display service policy statistics on a per-class basis. The `show policy-map interface` command has been enhanced to include additional information related to traffic classes on a particular interface. The `show policy-map interface` command displays information including the incoming traffic rate, the dropped packet rate, the number of matched packets, and the number of matched bytes, for traffic classes that are attached to the specified interface. These details can be used for billing and accounting purposes, and for managing projects, as appropriate.

Where to Go Next

Decide which of the QoS feature sets you want to use in your DiffServ implementation and see the corresponding section of the *Cisco IOS Quality of Service Solutions Configuration Guide*. For more information about the specific section to use, see Where to Go Next, on page 17 below.
# Additional References

The following sections provide references related to implementing DiffServ for end-to-end QoS.

## Related Documents

<table>
<thead>
<tr>
<th>Related Topic</th>
<th>Document Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>QoS commands (including the <code>show policy-map interface</code> command)</td>
<td>Cisco IOS Quality of Service Solutions Command Reference, Release 12.4T.</td>
</tr>
<tr>
<td>MQC configuration tasks</td>
<td>&quot;Applying QoS Features Using the MQC&quot; module of the Cisco IOS Quality of Service Solutions Configuration Guide</td>
</tr>
<tr>
<td>Packet marking</td>
<td>&quot;Marking Network Traffic&quot; module in the &quot;Classification&quot; part of the Cisco IOS Quality of Service Solutions Configuration Guide</td>
</tr>
<tr>
<td>CAR</td>
<td>&quot;Classification&quot; part of the Cisco IOS Quality of Service Solutions Configuration Guide.</td>
</tr>
<tr>
<td>Traffic policing</td>
<td>&quot;Policing and Shaping&quot; part of the Cisco IOS Quality of Service Solutions Configuration Guide.</td>
</tr>
<tr>
<td>Traffic shaping (regulating packet flow)</td>
<td>&quot;Regulating Packet Flow&quot; module of the Cisco IOS Quality of Service Solutions Configuration Guide.</td>
</tr>
<tr>
<td>LLQ and CBWFQ</td>
<td>&quot;Congestion Management&quot; part of the Cisco IOS Quality of Service Solutions Configuration Guide.</td>
</tr>
<tr>
<td>WRED, DiffServ-compliant WRED</td>
<td>&quot;Congestion Avoidance&quot; part of the Cisco IOS Quality of Service Solutions Configuration Guide.</td>
</tr>
<tr>
<td>MPLS CoS enhancements</td>
<td>Cisco IOS IP Switching Configuration Guide</td>
</tr>
<tr>
<td>Two additional types of service models: best-effort services and Integrated Services (IntServ)</td>
<td>&quot;Quality of Service Overview&quot; module of the Cisco IOS Quality of Service Solutions Configuration Guide.</td>
</tr>
<tr>
<td>Additional QoS features not listed in the module</td>
<td>&quot;Quality of Service Overview&quot; module of the Cisco IOS Quality of Service Solutions Configuration Guide.</td>
</tr>
</tbody>
</table>
## RFCs

<table>
<thead>
<tr>
<th>RFC</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>RFC 2474</td>
<td><em>Definition of the Differentiated Services Field (DS Field) in the IPv4 and IPv6 Headers</em></td>
</tr>
<tr>
<td>RFC 2475</td>
<td><em>An Architecture for Differentiated Services Framework</em></td>
</tr>
<tr>
<td>RFC 2597</td>
<td><em>Assured Forwarding PHB</em></td>
</tr>
<tr>
<td>RFC 2598</td>
<td><em>An Expedited Forwarding PHB</em></td>
</tr>
<tr>
<td>RFC 2697</td>
<td><em>A Single Rate Three Color Marker</em></td>
</tr>
</tbody>
</table>

## Technical Assistance

<table>
<thead>
<tr>
<th>Description</th>
<th>Link</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Cisco Support and Documentation website provides online resources to download documentation, software, and tools. Use these resources to install and configure the software and to troubleshoot and resolve technical issues with Cisco products and technologies. Access to most tools on the Cisco Support and Documentation website requires a Cisco.com user ID and password.</td>
<td><a href="http://www.cisco.com/cisco/web/support/index.html">http://www.cisco.com/cisco/web/support/index.html</a></td>
</tr>
</tbody>
</table>
Chapter 2

DiffServ MIB

The DiffServ MIB is used to poll already configured information and statistics from the devices on which it is enabled.

Network service providers that deliver differentiated services to their customer must be able to configure and monitor routers in order to satisfy Service Level Agreements (SLAs). DiffServ is a protocol that allows the network service provider to use classes to control network traffic so that certain types of traffic get precedence. For example, voice traffic requires a relatively uninterrupted flow of data, and might get precedence over other kinds of traffic, such as e-mail. DiffServ can be offered to customers as a way to distinguish between various levels of service; for example, Premium, Gold, Silver, and Bronze. Therefore, SLAs and DiffServ technologies are closely linked.

- Finding Feature Information, page 21
- Information About DiffServ MIB, page 22
- How to Configure DiffServ MIB, page 23
- Configuration Examples for DiffServ MIB, page 24
- Additional References, page 28
- Feature Information for DiffServ MIB, page 29

Finding Feature Information

Your software release may not support all the features documented in this module. For the latest caveats and feature information, see Bug Search Tool and the release notes for your platform and software release. To find information about the features documented in this module, and to see a list of the releases in which each feature is supported, see the feature information table at the end of this module.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to www.cisco.com/go/cfn. An account on Cisco.com is not required.
Information About DiffServ MIB

Restrictions for DiffServ MIB

DiffServ MIB will not support the configurations described in this section even if the user has configured them through Modular QoS CLI (MQC) and they are functioning in the forwarding path.

---

**Note**
The restrictions do not result in configurations being rejected, because Diffserv MIB is not exposed to the unsupported configurations.

- DiffServ MIB provides the ability to read Simple Network Management Protocol (SNMP) requests only; it cannot be used to perform any provisioning tasks.

- Multiple filters in the same class-map definition are not supported. Therefore, in supported class maps that contain only one filter definition, match-any and match-all types are irrelevant.

---

**Note**
Class maps with one Access Control List (ACL) and that contain multiple Cisco Application Control Engines (ACEs) are supported. Class maps with one Differentiated Services Code Point (DSCP) filter that takes multiple DSCP values as part of one match criterion also are supported. However, match-not types are not supported.

- Fair queueing is not supported.

- Marking is not supported in the parent class of hierarchical policy.

- Policing in the parent class is not supported if queueing is configured in the child class.

- For priority and bandwidth feature configurations, the related table is populated with either kbps or relative percentage values only.

- Default values are not populated into the MIB tables.

---

**Note**
The classifier table does include defined defaults for address, port, and related fields.

- Random-detect functionality is not supported in the parent class of a hierarchical policy.

- Only child first (bottom-up) policing is supported in hierarchical policies.

- Any fields not supported by the current routing platform will contain the value 0, or some appropriate default value. For example, the Cisco ASR1000 Series Aggregation Services Routers do not support policer color-aware statistics, so fields related to these statistics will be set to 0 on those routers.
MQC and DiffServ MIB

Most Cisco products use the Modular QoS CLI (MQC) to support the provisioning of industry-standard Differentiated Services Architecture services. However, the industry standard for the provisioning of differentiated services (DiffServ MIB) differs from the MQC implementation. The DiffServ MIB feature is implemented on top of the MQC functionality and translates service provisioning instructions from the DiffServ MIB to MQC.

By implementing DiffServ MIB on top of the MQC provisioning language, MQC can still be used to enable QoS policies in Cisco products. In addition, Cisco products that support MQC already support direct mapping of actions between the cbQoS MIB and MQC. The cbQoS MIB is the Cisco recommended MIB. Implementation of DiffServ MIB does not replace the cbQoS MIB.

The Diffserv MIB feature maps each field in a set of tables defined in the DiffServ MIB RFC to an MQC supported action (where an action is available).

Hierarchical Policies and DiffServ MIB

For hierarchical policies the Modular QoS CLI (MQC) runs all classification instructions first, from the top of the hierarchy to the bottom of the hierarchy. It then performs feature execution in the following order: marking (top to bottom), policing (bottom to top), and queuing (bottom to top).

To translate the MQC implementation of a hierarchical policy to a DiffServ MIB implementation, the hierarchy must be separated into different chained functional blocks that determine the execution order of the features.

Note

Not all feature combinations from an MQC hierarchy are supported in the DiffServ MIB. For more information see the "Restrictions for DiffServ MIB" section.

How to Configure DiffServ MIB

Enabling DiffServ MIB

SUMMARY STEPS

1. enable
2. configure terminal
3. qos diffservmib
4. end
### DETAILED STEPS

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong> enable</td>
<td>Enables privileged EXEC mode.</td>
</tr>
<tr>
<td><strong>Example:</strong> Device&gt; enable</td>
<td></td>
</tr>
<tr>
<td><strong>Step 2</strong> configure terminal</td>
<td>Enters global configuration mode.</td>
</tr>
<tr>
<td><strong>Example:</strong> Device# configure terminal</td>
<td></td>
</tr>
<tr>
<td><strong>Step 3</strong> qos diffservmib</td>
<td>Enables DiffServ MIB support for quality of service (QoS) policy maps.</td>
</tr>
<tr>
<td><strong>Example:</strong> Device(config)# qos diffservmib</td>
<td></td>
</tr>
<tr>
<td><strong>Step 4</strong> end</td>
<td>(Optional) Returns to privileged EXEC mode.</td>
</tr>
<tr>
<td><strong>Example:</strong> Device(config)# end</td>
<td></td>
</tr>
</tbody>
</table>

### Configuration Examples for DiffServ MIB

#### Example: Enabling DiffServ MIB

The following example shows how to enable DiffServ MIB support for Quality of Service (QoS) policy maps:

```
Device> enable
Device# configure terminal
Device(config)# qos diffservmib
Device(config)# exit
```

#### Example: DiffServ MIB SNMP Walk Output

The following is sample output from a SNMP walk of the DiffServ MIB:

```diffservDataPathStart.1.1 = diffServClfrStorage.201
diffServDataPathStart.10.2 = diffServClfrStorage.202
diffServDataPathStorage.1.1 = volatile(2)
diffServDataPathStorage.10.2 = volatile(2)
diffServDataPathStatus.1.1 = active(1)
diffServDataPathStatus.10.2 = active(1)
```
diffServClfrNextFree.0 = 0
diffServClfrStorage.201 = volatile(2)
diffServClfrStorage.202 = volatile(2)
diffServClfrStatus.201 = active(1)
diffServClfrStatus.202 = active(1)
diffServClfrElementNextFree.0 = 0
diffServClfrElementPrecedence.201.2011 = 255
diffServClfrElementPrecedence.202.2021 = 255
diffServClfrElementNext.201.2011 = diffServMeterSucceedNext.10001
diffServClfrElementNext.202.2021 = diffServMeterSucceedNext.10002
diffServClfrElementSpecific.201.2011 = diffServMultiFieldClfrAddrType.1
diffServClfrElementSpecific.202.2021 = diffServMultiFieldClfrAddrType.1
diffServClfrElementStorage.201.2021 = volatile(2)
diffServClfrElementStorage.202.2021 = volatile(2)
diffServClfrElementStatus.201.2011 = active(1)
diffServClfrElementStatus.202.2021 = active(1)
diffServMultiFieldClfrNextFree.0 = 0
diffServMultiFieldClfrAddrType.1 = unknown(0)
diffServMultiFieldClfrAddrType.2 = ipv4(1)
diffServMultiFieldClfrDstAddr.1 =
diffServMultiFieldClfrDstAddr.2 = c9
diffServMultiFieldClfrDstPrefixLength.1 = 0
diffServMultiFieldClfrDstPrefixLength.2 = 8
diffServMultiFieldClfrSrcAddr.1 =
diffServMultiFieldClfrSrcAddr.2 = c0 a8 01
diffServMultiFieldClfrSrcPrefixLength.1 = 0
diffServMultiFieldClfrSrcPrefixLength.2 = 24
diffServMultiFieldClfrDscp.1 = 41
diffServMultiFieldClfrDscp.2 = -1
diffServMultiFieldClfrFlowId.1 = 0
diffServMultiFieldClfrFlowId.2 = 0
diffServMultiFieldClfrProtocol.1 = 255
diffServMultiFieldClfrProtocol.2 = 6
diffServMultiFieldClfrDstL4PortMin.1 = 0
diffServMultiFieldClfrDstL4PortMin.2 = 1000
diffServMultiFieldClfrDstL4PortMax.1 = 65555
diffServMultiFieldClfrDstL4PortMax.2 = 10000
diffServMultiFieldClfrSrcL4PortMin.1 = 0
diffServMultiFieldClfrSrcL4PortMin.2 = 2000
diffServMultiFieldClfrSrcL4PortMax.1 = 65555
diffServMultiFieldClfrSrcL4PortMax.2 = 20000
diffServMultiFieldClfrStorage.1 = volatile(2)
diffServMultiFieldClfrStorage.2 = volatile(2)
diffServMultiFieldClfrStatus.1 = active(1)
diffServMultiFieldClfrStatus.2 = active(1)
diffServMeterNextFree.0 = 0
diffServMeterSucceedNext.10001 = diffServActionInterface.111
diffServMeterSucceedNext.10002 = diffServActionInterface.121
diffServMeterFailNext.10001 = diffServActionInterface.112
diffServMeterFailNext.10002 = diffServActionInterface.122
diffServMeterSpecific.10001 = diffServTBParamType.8000
diffServMeterSpecific.10002 = diffServTBParamType.8000
diffServMeterStorage.10001 = volatile(2)
diffServMeterStorage.10002 = volatile(2)
diffServMeterStatus.10001 = active(1)
diffServMeterStatus.10002 = active(1)
diffServTBParamNextFree.0 = 0
diffServTBParamSimpleTokenBucket.8000 = diffServTBParamSimpleTokenBucket
diffServTBParamType.8001 = diffServTBParamType.8001
diffServTBParamRate.8000 = 64000
diffServTBParamRate.8001 = 512000
diffServTBParamBurstSize.8000 = 2000
diffServTBParamBurstSize.8001 = 51200
diffServTBParamInterval.8000 = 250000
diffServTBParamInterval.8001 = 1000
diffServTBParamStorage.8000 = volatile(2)
diffServTBParamStorage.8001 = volatile(2)
diffServTBParamStatus.8000 = active(1)
diffServTBParamStatus.8001 = active(1)
diffServActionNextFree.0 = 0
diffServActionInterface.111 = 10
diffServActionInterface.121 = 10
diffServActionNext.111 = diffServDscpMarkActEntry.41
Example: DiffServ MIB SNMP Walk Output

diffServActionNext.121 = diffServAlgDropType.500
diffServActionSpecific.111 = diffServCountActOctets.111
diffServActionSpecific.121 = diffServCountActOctets.121
diffServActionStorage.111 = volatile(2)
diffServActionStorage.121 = volatile(2)
diffServActionStatus.111 = active(1)
diffServActionStatus.121 = active(1)
diffServDscpMarkActDscp.0 = 0
diffServDscpMarkActDscp.1 = 1
diffServDscpMarkActDscp.2 = 2
diffServDscpMarkActDscp.3 = 3
diffServDscpMarkActDscp.4 = 4
diffServDscpMarkActDscp.5 = 5
diffServDscpMarkActDscp.6 = 6
diffServDscpMarkActDscp.7 = 7
diffServDscpMarkActDscp.8 = 8
diffServDscpMarkActDscp.9 = 9
diffServDscpMarkActDscp.10 = 10
diffServDscpMarkActDscp.11 = 11
diffServDscpMarkActDscp.12 = 12
diffServDscpMarkActDscp.13 = 13
diffServDscpMarkActDscp.14 = 14
diffServDscpMarkActDscp.15 = 15
diffServDscpMarkActDscp.16 = 16
diffServDscpMarkActDscp.17 = 17
diffServDscpMarkActDscp.18 = 18
diffServDscpMarkActDscp.19 = 19
diffServDscpMarkActDscp.20 = 20
diffServDscpMarkActDscp.21 = 21
diffServDscpMarkActDscp.22 = 22
diffServDscpMarkActDscp.23 = 23
diffServDscpMarkActDscp.24 = 24
diffServDscpMarkActDscp.25 = 25
diffServDscpMarkActDscp.26 = 26
diffServDscpMarkActDscp.27 = 27
diffServDscpMarkActDscp.28 = 28
diffServDscpMarkActDscp.29 = 29
diffServDscpMarkActDscp.30 = 30
diffServDscpMarkActDscp.31 = 31
diffServDscpMarkActDscp.32 = 32
diffServDscpMarkActDscp.33 = 33
diffServDscpMarkActDscp.34 = 34
diffServDscpMarkActDscp.35 = 35
diffServDscpMarkActDscp.36 = 36
diffServDscpMarkActDscp.37 = 37
diffServDscpMarkActDscp.38 = 38
diffServDscpMarkActDscp.39 = 39
diffServDscpMarkActDscp.40 = 40
diffServDscpMarkActDscp.41 = 41
diffServDscpMarkActDscp.42 = 42
diffServDscpMarkActDscp.43 = 43
diffServDscpMarkActDscp.44 = 44
diffServDscpMarkActDscp.45 = 45
diffServDscpMarkActDscp.46 = 46
diffServDscpMarkActDscp.47 = 47
diffServDscpMarkActDscp.48 = 48
diffServDscpMarkActDscp.49 = 49
diffServDscpMarkActDscp.50 = 50
diffServDscpMarkActDscp.51 = 51
diffServDscpMarkActDscp.52 = 52
diffServDscpMarkActDscp.53 = 53
diffServDscpMarkActDscp.54 = 54
diffServDscpMarkActDscp.55 = 55
diffServDscpMarkActDscp.56 = 56
diffServDscpMarkActDscp.57 = 57
diffServDscpMarkActDscp.58 = 58
diffServDscpMarkActDscp.59 = 59
diffServDscpMarkActDscp.60 = 60
diffServDscpMarkActDscp.61 = 61
diffServDscpMarkActDscp.62 = 62
diffServDscpMarkActDscp.63 = 63
diffServCountActNextFree.0 = 0
diffServCountActOctets.111 = 0x000888888
Example: DiffServ MIB SNMP Walk Output

diffServCountActOctets.121 = 0x00099999
diffServCountActPkts.111 = 0x000000088
diffServCountActPkts.121 = 0x000000099

diffServCountActStorage.111 = volatile(2)
diffServCountActStorage.121 = volatile(2)
diffServCountActStatus.111 = active(1)
diffServCountActStatus.121 = active(1)

diffServAlgDropNextFree.0 = 0

diffServAlgDropType.501 = randomDrop(4)
diffServAlgDropType.502 = headDrop(3)
diffServAlgDropNext.500 = nullOID
diffServAlgDropNext.501 = diffServQNext.600
diffServAlgDropNext.502 = diffServQNext.601

diffServAlgDropQMeasure.500 = nullOID
diffServAlgDropQMeasure.501 = diffServQNext.600
diffServAlgDropQMeasure.502 = diffServQNext.601

diffServAlgDropQThreshold.500 = 0

diffServAlgDropQThreshold.501 = 64
diffServAlgDropQThreshold.502 = 64

diffServAlgDropSpecific.500 = nullOID
diffServAlgDropSpecific.501 = nullOID
diffServAlgDropSpecific.502 = diffServRandomDropMinThreshBytes.701

diffServAlgDropOctets.500 = 0x000000000

diffServAlgDropOctets.501 = 0x000777777

diffServAlgDropOctets.502 = 0x000000000

diffServAlgDropPkts.500 = 0x000000000

diffServAlgDropPkts.501 = 0x000007777

diffServAlgDropPkts.502 = 0x000000000

diffServAlgRandomDropOctets.500 = 0x000000000

diffServAlgRandomDropOctets.501 = 0x000000000

diffServAlgRandomDropOctets.502 = 0x000666666

diffServAlgRandomDropPkts.500 = 0x000000000

diffServAlgRandomDropPkts.501 = 0x000000000

diffServAlgRandomDropPkts.502 = 0x000006666

Example: DiffServ MIB SNMP Walk Output

diffServAlgRandomDropStorage.500 = volatile(2)
diffServAlgRandomDropStorage.501 = volatile(2)
diffServAlgRandomDropStorage.502 = volatile(2)

diffServAlgRandomDropStatus.500 = active(1)
diffServAlgRandomDropStatus.501 = active(1)
diffServAlgRandomDropStatus.502 = active(1)

diffServRandomDropNextFree.0 = 0

diffServRandomDropMinThreshBytes.701 = 0

diffServRandomDropMinThreshPkts.701 = 1

diffServRandomDropMaxThreshBytes.701 = 0

diffServRandomDropMaxThreshPkts.701 = 10

diffServRandomDropProbMax.701 = 1000

diffServRandomDropWeight.701 = 512

diffServRandomDropSamplingRate.701 = 0

diffServRandomDropStorage.701 = volatile(2)

diffServRandomDropStatus.701 = active(1)
diffServQNextFree.0 = 0

diffServQNext.600 = diffServSchedulerNext.800
diffServQNext.601 = diffServSchedulerNext.801

diffServQMinRate.600 = diffServMinRatePriority.900
diffServQMinRate.601 = nullOID

diffServQMaxRate.600 = nullOID

diffServQMaxRate.601 = diffServMinRateAbsolute.901

diffServQStorage.600 = volatile(2)
diffServQStorage.601 = volatile(2)
diffServQStatus.600 = active(1)
diffServQStatus.601 = active(1)

diffServSchedulerNextFree.0 = 0
diffServSchedulerNext.800 = diffServSchedulerNext.801
diffServSchedulerNext.801 = nullOID

diffServSchedulerMethod.800 = diffServSchedulerPriority
diffServSchedulerMethod.801 = diffServSchedulerWFQ

diffServSchedulerMinRate.800 = diffServMinRatePriority.901
diffServSchedulerMinRate.801 = nullOID

diffServSchedulerMaxRate.800 = nullOID

diffServSchedulerMaxRate.801 = nullOID

diffServSchedulerStorage.800 = volatile(2)
diffServSchedulerStorage.801 = volatile(2)
Additional References

Related Documents

<table>
<thead>
<tr>
<th>Related Topic</th>
<th>Document Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cisco IOS commands</td>
<td>Cisco IOS Master Commands List, All Releases</td>
</tr>
<tr>
<td>QoS commands</td>
<td>Cisco IOS Quality of Service Solutions Command Reference</td>
</tr>
</tbody>
</table>

Standards and RFCs

<table>
<thead>
<tr>
<th>Standard/RFC</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>RFC 3289</td>
<td>Management Information Base for the Differentiated Services Architecture</td>
</tr>
</tbody>
</table>

MIBs

<table>
<thead>
<tr>
<th>MIB</th>
<th>MIBs Link</th>
</tr>
</thead>
<tbody>
<tr>
<td>DiffServ MIB</td>
<td>To locate and download MIBs for selected platforms, Cisco software releases, and feature sets, use Cisco MIB Locator found at the following URL: <a href="http://www.cisco.com/go/mibs">http://www.cisco.com/go/mibs</a></td>
</tr>
</tbody>
</table>
Technical Assistance

<table>
<thead>
<tr>
<th>Description</th>
<th>Link</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Cisco Support and Documentation website provides online resources to download documentation, software, and tools. Use these resources to install and configure the software and to troubleshoot and resolve technical issues with Cisco products and technologies. Access to most tools on the Cisco Support and Documentation website requires a Cisco.com user ID and password.</td>
<td><a href="http://www.cisco.com/cisco/web/support/index.html">http://www.cisco.com/cisco/web/support/index.html</a></td>
</tr>
</tbody>
</table>

Feature Information for DiffServ MIB

The following table provides release information about the feature or features described in this module. This table lists only the software release that introduced support for a given feature in a given software release train. Unless noted otherwise, subsequent releases of that software release train also support that feature.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to www.cisco.com/go/cfn. An account on Cisco.com is not required.

Table 3: Feature Information for DiffServ MIB

<table>
<thead>
<tr>
<th>Feature Name</th>
<th>Releases</th>
<th>Feature Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>DiffServ MIB</td>
<td>15.3(1)T</td>
<td>This feature provides support for QoS DiffServ MIB (RFC 3289). The following command was introduced or modified: qos diffservmib.</td>
</tr>
</tbody>
</table>