QoS: DiffServ for Quality of Service Overview Configuration Guide

First Published: 2013-01-16

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Read Me First

Important Information about Cisco IOS XE 16

Effective Cisco IOS XE Release 3.7.0E (for Catalyst Switching) and Cisco IOS XE Release 3.17S (for Access and Edge Routing) the two releases evolve (merge) into a single version of converged release—the Cisco IOS XE 16—providing one release covering the extensive range of access and edge products in the Switching and Routing portfolio.

Feature Information

Use Cisco Feature Navigator to find information about feature support, platform support, and Cisco software image support. An account on Cisco.com is not required.

Related References

- Cisco IOS Command References, All Releases

Obtaining Documentation and Submitting a Service Request

For information on obtaining documentation, using the Cisco Bug Search Tool (BST), submitting a service request, and gathering additional information, see What's New in Cisco Product Documentation.

To receive new and revised Cisco technical content directly to your desktop, you can subscribe to the What's New in Cisco Product Documentation RSS feed. RSS feeds are a free service.
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.

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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.

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 cbQoSMIB and MQC. The cbQoSMIB is the Cisco recommended MIB. Implementation of DiffServ MIB does not replace the cbQoSMIB.

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 queueing (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.

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**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.

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**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>Example: Device&gt; enable</td>
<td>- Enter your password if prompted.</td>
</tr>
<tr>
<td><strong>Step 2</strong> configure terminal</td>
<td>Enters global configuration mode.</td>
</tr>
<tr>
<td>Example: Device# configure terminal</td>
<td></td>
</tr>
<tr>
<td><strong>Step 3</strong> qos diffservmib</td>
<td>Enables DiffServ MIB support for QoS policy maps.</td>
</tr>
<tr>
<td>Example: 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>Example: 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 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 an 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)
```
Example: DiffServ MIB SNMP Walk Output

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

diffServClfrElementNext.201.2011 = diffServMeterSucceedNext.10001

diffServClfrElementNext.202.2021 = diffServMeterSucceedNext.10002

diffServClfrElementSpecific.201.2011 = diffServMultiFieldClfrAddrType.1

diffServClfrElementSpecific.202.2021 = diffServMultiFieldClfrAddrType.1

diffServClfrElementStorage.201.2011 = 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 = c9

diffServMultiFieldClfrDstAddr.2 = c0 a8 01

diffServMultiFieldClfrDstPrefixLength.1 = 0

diffServMultiFieldClfrDstPrefixLength.2 = 24

diffServMultiFieldClfrDscp.1 = 41
diffServMultiFieldClfrDscp.2 = -1

diffServMultiFieldClfrFlowId.1 = 0

diffServMultiFieldClfrFlowId.2 = 20000

diffServMultiFieldClfrProtocolo.1 = 255
diffServMultiFieldClfrProtocolo.2 = 6

diffServMultiFieldClfrL4PortMin.1 = 0

diffServMultiFieldClfrL4PortMin.2 = 1000

diffServMultiFieldClfrL4PortMax.1 = 65555

diffServMultiFieldClfrL4PortMax.2 = 10000

diffServMultiFieldClfrSrcAddr.1 = diffServMultiFieldClfrSrcAddr.2 = 10

diffServMultiFieldClfrSrcPrefixLength.1 = 24

diffServMultiFieldClfrSrcPrefixLength.2 = 24

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

diffServTBParamType.8000 = diffServTBParamSimpleTokenBucket

diffServTBParamType.8001 = diffServTBParamSrTCMBlimd

diffServTBParamRate.8000 = 64000

diffServTBParamRate.8001 = 64000

diffServTBParamBurstSize.8000 = 512000

diffServTBParamBurstSize.8001 = 512000

diffServTBParamInterval.8000 = 250000

diffServTBParamInterval.8001 = 100000

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
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<td>diffServCountActNextFree.0</td>
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</tr>
<tr>
<td>diffServCountActOctets.111</td>
<td>0x0008888888</td>
</tr>
</tbody>
</table>
DiffServ MIB

Example: DiffServ MIB SNMP Walk Output

diffServCountActOctets.121 = 0x000999999

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.500 = randomDrop(4)

diffServAlgDropType.501 = other(1)

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

diffServAlgDropStorage.500 = volatile(2)

diffServAlgDropStorage.501 = volatile(2)

diffServAlgDropStorage.502 = volatile(2)

diffServAlgDropStatus.500 = active(1)

diffServAlgDropStatus.501 = active(1)

diffServAlgDropStatus.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)

diffServRandomDropDropStatus.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 = diffServMaxRateAbsolute.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)
diffServSchedulerStatus.800 = active(1)
diffServSchedulerStatus.801 = active(1)
diffServMinRateNextFree.0 = 0
diffServMinRatePriority.901 = 4294967295
diffServMinRatePriority.902 = 1
diffServMinRateAbsolute.901 = 128
diffServMinRateAbsolute.902 = 0
diffServMinRateRelative.901 = 0
diffServMinRateRelative.902 = 750
diffServMinRateStorage.901 = volatile(2)
diffServMinRateStorage.902 = volatile(2)
diffServMinRateStatus.901 = active(1)
diffServMinRateStatus.902 = active(1)
diffServMaxRateNextFree.0 = 0
diffServMaxRateAbsolute.902.1 = 1000
diffServMaxRateAbsolute.902.2 = 0
diffServMaxRateRelative.902.1 = 0
diffServMaxRateRelative.902.2 = 500
diffServMaxRateThreshold.902.1 = 25000
diffServMaxRateThreshold.902.2 = 0
diffServMaxRateStorage.902.1 = volatile(2)
diffServMaxRateStorage.902.2 = volatile(2)
diffServMaxRateStatus.902.1 = active(1)
diffServMaxRateStatus.902.2 = active(1)

**Additional References**

**Related Documents**

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<th>Related Topic</th>
<th>Document Title</th>
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<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>
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**Standards and RFCs**

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<th>Standard/RFC</th>
<th>Title</th>
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<tr>
<td>RFC 3289</td>
<td>Management Information Base for the Differentiated Services Architecture</td>
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**MIBs**

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<thead>
<tr>
<th>MIB</th>
<th>MIBs Link</th>
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<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 1: 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>