

DiffServ Compliant WRED

DiffServ Compliant WRED extends the functionality of Weighted Random Early Detection to enable support for DiffServ and Assured Forwarding (AF) per hop behavior (PHB). This feature enables customers to implement AF PHB by coloring packets according to Differentiated Services Code Point (DSCP) values and then assigning preferential drop probabilities to those packets.

Note This feature can be used with IP packets only. It is not intended for use with Multiprotocol Label Switching (MPLS)-encapsulated packets.

- Information About DiffServ Compliant WRED, on page 1
- How to Configure DiffServ Compliant WRED, on page 2
- Configuration Examples for DiffServ Compliant WRED, on page 5
- Additional References, on page 5
- Feature Information for DiffServ Compliant WRED, on page 6

Information About DiffServ Compliant WRED

Differentiated Services for WRED

Differentiated Services is a multiple service model that can satisfy differing Quality of Service (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. The DiffServ Compliant WRED feature enables WRED to use either the 6-bit differentiated services code point (DSCP) or the IP Precedence setting in IP packets when it calculates the drop probability for a packet. The DSCP value is the first six bits of the IP type of service (ToS) byte.

Usage Guidelines for DiffServ Compliant WRED

To configure the DiffServ Compliant WRED feature, first specify the policy map, add the class, and configure the bandwidth or shape for the class. If you want WRED to use the DSCP value when it calculates the drop probability, use the *dscp-based* argument with the **random-detect** command to specify the DSCP value and then use the **random-detect dscp** command to modify the default minimum and maximum thresholds for the DSCP value. If you want WRED to use the IP Precedence value when it calculates the drop probability, use

the *precedence-based* argument with the **random-detect** command to specify the IP Precedence value. This configuration can then be applied wherever policy maps are attached (for example, at the interface level, the per-VC level, or the shaper level).

Remember the following points when using the commands included with this feature:

- If you use the *dscp-based* argument, WRED will use the DSCP value to calculate the drop probability.
- If you use the *precedence-based* argument, WRED will use the IP Precedence value to calculate the drop probability.
- The *dscp-based* and *precedence-based* arguments are mutually exclusive.
- If you do not specify either argument, WRED will use the IP Precedence value to calculate the drop probability (the default method).

How to Configure DiffServ Compliant WRED

Configuring DiffServ Compliant WRED

This example configures DiffServ Compliant WRED to use the DSCP value to calculate the drop probability for a packet.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface** *type number* [**name-tag**]
4. **class-map** *class-map-name*
5. **match** *match-criterion*
6. **policy-map** *policy-map-name*
7. **class** {*class-name* | **class-default**}
8. **bandwidth** {*kbps* | **remaining** *percentage* | **percent** *percentage*}
9. **random-detect** [**dscp-based** | **precedence-based**]
10. **random-detect dscp** *dscp-value min-threshold max-threshold* [*mark-probability-denominator*]
11. **exit**
12. **exit**
13. **interface** *type number* [**name-tag**]
14. **service-policy output** *policy-map-name*
15. **end**
16. **show policy-map interface** *type number*
17. **exit**

DETAILED STEPS

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**interface** *type number* [**name-tag**] **Example:** `Device(config)# interface GigabitEthernet 0/0/0`	Configures an interface type and enters interface configuration mode. • Enter the interface type and number.
Step 4	**class-map** *class-map-name* **Example:** `Device(config-if)# class-map diffservclass`	Specifies the name of the class map to be created and enters QoS class-map configuration mode.
Step 5	**match** *match-criterion* **Example:** `Device(config-cmap)# match any`	Configures the match criteria for a class map.
Step 6	**policy-map** *policy-map-name* **Example:** `Device(config-cmap)# policy-map diffservpm`	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy, and enters QoS policy-map configuration mode.
Step 7	**class** {*class-name* | **class-default**} **Example:** `Device(config-pmap)# class diffservclass`	Specifies the name of the class whose policy you want to create or change or specifies the default class (commonly known as the class-default class) before you configure its policy. • Enters QoS policy-map class configuration mode.
Step 8	**bandwidth** {*kbps* | **remaining** *percentage* | **percent** *percentage*} **Example:** `Device(config-pmap-c)# bandwidth percent 30`	Specifies the bandwidth allocated for a class belonging to a policy map.

	Command or Action	Purpose
Step 9	**random-detect** [**dscp-based** | **precedence-based**] **Example:** `Device(config-pmap-c)# random-detect dscp-based`	Configures WRED for a class in a policy map.
Step 10	**random-detect dscp** *dscp-value min-threshold max-threshold* [*mark-probability-denominator*] **Example:** `Device(config-pmap-c)# random-detect dscp af11 10000 30000 25`	Changes the minimum and maximum packet thresholds for the differentiated services code point (DSCP) value.
Step 11	**exit** **Example:** `Device(config-pmap-c)# exit`	Exits QoS policy-map class configuration mode.
Step 12	**exit** **Example:** `Device(config-pmap)# exit`	Exits QoS policy-map configuration mode.
Step 13	**interface** *type number* [**name-tag**] **Example:** `Device(config)# interface GigabitEthernet 0/0/0`	Configures an interface type and enters interface configuration mode. • Enter the interface type and number.
Step 14	**service-policy output** *policy-map-name* **Example:** `Device(config-if)# service-policy output policy1`	Attaches a policy map to an output interface. • Enter the policy map name. **Note** Policy maps can be configured on ingress or egress routers. They can also be attached in the input or output direction of an interface. The direction (input or output) and the router (ingress or egress) to which the policy map should be attached varies according your network configuration. When using the **service-policy** command to attach the policy map to an interface, be sure to choose the router and the interface direction that are appropriate for your network configuration.
Step 15	**end** **Example:** `Device(config-if)# end`	Returns to privileged EXEC mode.

	Command or Action	Purpose
Step 16	**show policy-map interface** *type number* **Example:** `Device# show policy-map interface GigabitEthernet 0/0/0`	(Optional) Displays the traffic statistics of all classes that are configured for all service policies either on the specified interface or subinterface or on a specific PVC on the interface. • Enter the interface type and number.
Step 17	**exit** **Example:** `Device# exit`	(Optional) Exits privileged EXEC mode.

Configuration Examples for DiffServ Compliant WRED

Example: DiffServ compliant WRED

The following example enables WRED to use the DSCP value 8 for the class c1. The minimum threshold for the DSCP value 8 is 24 and the maximum threshold is 40. The last line attaches the traffic policy to the output interface or VC p1.

```
Device(config)# class-map c1
Device(config-cmap)# match ip precedence 1
Device(config-cmap)# policy-map p1
Device(config-pmap)# class c1
Device(config-pmap-c)# bandwidth 48
Device(config-pmap-c)# random-detect dscp-based
Device(config-pmap-c)# random-detect dscp 8 24 40 (bytes/ms)
Device(config-if)# service-policy output p1
```

Additional References

Related Documents

Related Topic	Document Title
Cisco IOS commands	Cisco IOS Master Commands List, All Releases
QoS commands	*Cisco IOS Quality of Service Solutions Command Reference*
MQC	*QoS: Modular QoS: Command-Line Interface Configuration Guide*

Standards and RFCs

Standard/RFC	Title
RFC 2474	*Definition of the Differentiated Services Field (DS Field) in the IPv4 and IPv6 Headers*
RFC 2475	*An Architecture for Differentiated Services Framework*
RFC 2597	*Assured Forwarding PHB*
RFC 2598	*An Expedited Forwarding PHB*

MIBs

MIB	MIBs Link
CISCO-CLASS-BASED-QOS-MIB CISCO-CLASS-BASED-QOS-CAPABILITY-MIB	To locate and download MIBs for selected platforms, Cisco software releases, and feature sets, use Cisco MIB Locator found at the following URL: http://www.cisco.com/go/mibs

Technical Assistance

Description	Link
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.	http://www.cisco.com/cisco/web/support/index.html

Feature Information for DiffServ Compliant WRED

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 Compliant WRED

Feature Name	Releases	Feature Information
DiffServ Compliant WRED	Cisco IOS XE Release 3.6S	DiffServ Compliant WRED extends the functionality of WRED to enable support for DiffServ and AF per-hop behavior. In Cisco IOS XE Release 3.6S, support was added for the Cisco ASR 903 Router. The following commands were introduced or modified: **random-detect**, **random-detect dscp**, **random-detect precedence**.