Exinda How To Guide:

ToS and DiffServ

Exinda ExOS Version 7.4.3

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Using this guide

Before using this guide, become familiar with the Exinda documentation system.

Documentation conventions

These documentation conventions apply across all of the Exinda documentation sets. All instances of the following may not appear in this documentation

Typographical conventions

- **bold** - Interface element such as buttons or menus. For example: Select the **Enable** checkbox.
- *italics* - Reference to other documents. For example: Refer to the *Exinda Application List*. Also used to identify in the various procedures the response the systems provide after applying an action.
- **>** - Separates navigation elements. For example: Select **File > Save**.
- `monospace text` - Command line text.
- `<variable>` - Command line arguments.
- `[x]` - An optional CLI keyword or argument.
- `{x}` - A required CLI element.
- `|` - Separates choices within an optional or required element.

Links

With the exception of the various tables of contents, all links throughout the documentation are **blue**. Most links refer to topics within the documentation, but there may be links that take you to web pages on the Internet. In this documentation we differentiate between these types of links by **underlining** only the external links.

Tips, Notes, Examples, Cautions, etc.

Throughout this manual, the following table styles are used to highlight important information:

- **Tips** include hints and shortcuts. Tips are identified by the light blub icon.

TIP

text

- **Notes** provide information that is useful at the points where they are encountered. Notes are identified by the pin and paper icon.

NOTE

Text

- **Important** notes provide information that is important at the point where they are encountered. Important notes are identified by the amber triangle.

IMPORTANT

Text

- **Cautions** provide warnings of areas of operation that could cause damage to appliances. Cautions are identified by the orange triange.

CAUTION

Text

- **Examples** are presented throughout the manual for deeper understanding of specific concepts. Examples are identified by a pale green background.

EXAMPLE

Text

- **Best Practices** are identified by the "thumbs-up" icon.

Best Practice:

It is a best practice to

Table of Contents

ToS and DiffServ

Exinda appliances can read and write ToS/DSCP marks in packets, allowing users fine-grained control and classification of applications that are marked with Tos/DSCP values as well as applying marking policies to ensure traffic is treated appropriately by onward network equipment.

Used in conjunction with Exinda's superior classification techniques, including advanced layer 7 detection, users have complete control over how traffic is marked, and subsequently treated in the WAN cloud.

The ToS/DiffServ Field

The ToS (type of service) or DiffServ (differentiated services) field in the IPv4 header, and the Traffic Class field in the IPv6 header are used to classify IP packets so that routers can make QoS (quality of service) decisions about what path packets should traverse across the network. For example, users may want to ensure that VoIP utilizes high quality, low latency (and expensive) links, or, they might want to ensure email or recreational traffic uses cheaper (but less reliable) links.

Previously, there were 5 different categories that users could classify their traffic with using the IP ToS field (see RFC 791).

- Normal Service
- Minimize Cost
- Maximize Reliability
- Maximize Throughput
- Minimize Delay

These have since been replaced by a new set of values called DSCP (DiffServ Code Points, see RFC 2474). A DSCP is a 6-bit number. This provides 64 possible DSCP combinations, of which, only a portion have been standardized and are listed below.

IPv6 contains an 8 bit Traffic Class field. The 6 most significant bits are treated the same as IPv4 DSCP. The least 2 significant bits are not modified by the appliance.

DSCP Class Name	Binary Value	Decimal Value
BE (best effort, default)	000000	0
AF11 (assured forwarding, see RFC 2597)	001010	10
AF12	001100	12
AF13	001110	14
AF21	010010	18
AF22	010100	20
AF23	010110	22

DSCP Class Name	Binary Value	Decimal Value
AF31	011010	26
AF32	011100	28
AF33	011110	30
AF41	100010	34
AF42	100100	36
AF43	100110	38
CS1 (class selector)	001000	8
CS2	010000	16
CS3	011000	24
CS4	100000	32
CS5	101000	40
CS6	110000	48
CS7	111000	56
EF (expedited forwarding, see RFC 2598)	101110	46

How Exinda Uses the ToS/DiffServ Field

All Exinda products can read and write the ToS/DiffServ field, allowing users to:

- Match packets with a ToS/DSCP value and apply optimizer polices to this traffic.
- Mark the packets with a ToS/DSCP value based on source/destination host/subnet, source/destination port, layer 7 application, time of day, vlan id, etc.

Match Packets to ToS/DSCP Values

When defining Optimizer Policies on the Exinda appliance, there is a ToS/DSCP drop down that allows users to match only those packets with the specified ToS/DSCP value.

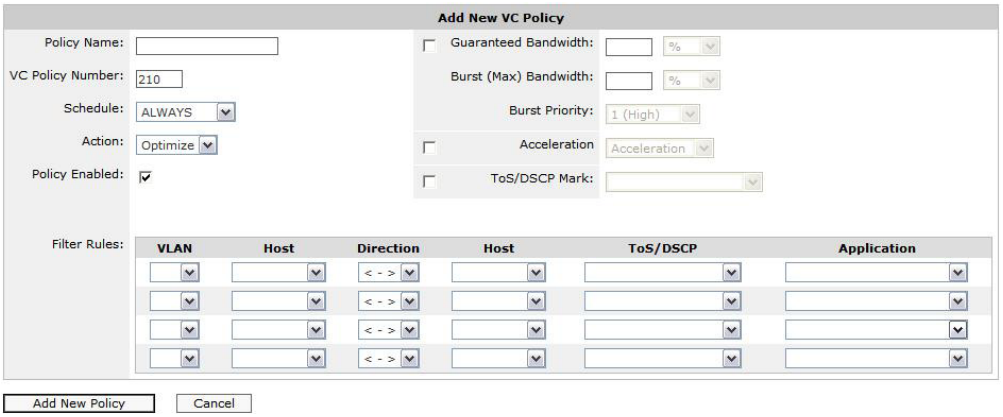

Figure 1: Optimizer Policy configuration page.

Users can select the appropriate DSCP/ToS value from this drop down field and any packets that match this ToS/DSCP value will be applied to this policy.

EXAMPLE

VoIP equipment in a user's network may be configured to mark all outgoing packets as DSCP EF (decimal 46). VoIP is a real-time application and the user wishes to prioritize this with a high priority policy that guarantees VoIP a certain amount of WAN bandwidth. To achieve this, the user selects 'DSCP 46' from the ToS/DSCP drop down and configures the appropriate bandwidth allocation in this policy.

Mark Packets with ToS/DSCP Values

Users may want to mark certain packets with a ToS/DSCP value so that external routers can treat the traffic appropriately. The same policy configuration screen above (see Figure 1) allows users to configure such an action.

When the policy action is set to 'Optimize', several options are available on the right-hand side, one of which is the 'ToS/DSCP Mark' checkbox. Users will need to enable this feature by checking the box and selecting the appropriate ToS/DSCP mark from the drop down.

Any traffic that matches the corresponding filter rules is then marked with the specified value and should be treated appropriately by routing equipment down the line.

EXAMPLE

Service Providers may provide users with a table similar to the one below (example only). Each class has different guaranteed service and pricing levels. This information should be used in conjunction with optimizer policies to implement and ensure quality of service. See Table 1 to convert the DSCP Settings to a decimal value that can be used in the Optimizer Policies.

Traffic Priority Class	IETF DiffServ Traffic Priority Class	DSCP Setting
Real Time (Gold)	Expedited Forwarding	EF
Mission Critical (Silver High)	Assured Forwarding	AF31
Business Critical (Silver Low)	Assured Forwarding	AF32/33
General Business (Bronze)	Best Effort	BE