

Class-of-Service Properties



Published: 2013-08-29

Juniper Networks, Inc.
1194 North Mathilda Avenue
Sunnyvale, California 94089
USA
408-745-2000
www.juniper.net

This product includes the Envoy SNMP Engine, developed by Epilogue Technology, an Integrated Systems Company. Copyright © 1986-1997, Epilogue Technology Corporation. All rights reserved. This program and its documentation were developed at private expense, and no part of them is in the public domain.

This product includes memory allocation software developed by Mark Moraes, copyright © 1988, 1989, 1993, University of Toronto.

This product includes FreeBSD software developed by the University of California, Berkeley, and its contributors. All of the documentation and software included in the 4.4BSD and 4.4BSD-Lite Releases is copyrighted by the Regents of the University of California. Copyright © 1979, 1980, 1983, 1986, 1988, 1989, 1991, 1992, 1993, 1994. The Regents of the University of California. All rights reserved.

GateD software copyright © 1995, the Regents of the University. All rights reserved. Gate Daemon was originated and developed through release 3.0 by Cornell University and its collaborators. Gated is based on Kirton's EGP, UC Berkeley's routing daemon (routed), and DCN's HELLO routing protocol. Development of Gated has been supported in part by the National Science Foundation. Portions of the GateD software copyright © 1988, Regents of the University of California. All rights reserved. Portions of the GateD software copyright © 1991, D. L. S. Associates.

This product includes software developed by Maker Communications, Inc., copyright © 1996, 1997, Maker Communications, Inc.

Juniper Networks, Junos, Steel-Belted Radius, NetScreen, and ScreenOS are registered trademarks of Juniper Networks, Inc. in the United States and other countries. The Juniper Networks Logo, the Junos logo, and JunosE are trademarks of Juniper Networks, Inc. All other trademarks, service marks, registered trademarks, or registered service marks are the property of their respective owners.

Juniper Networks assumes no responsibility for any inaccuracies in this document. Juniper Networks reserves the right to change, modify, transfer, or otherwise revise this publication without notice.

Products made or sold by Juniper Networks or components thereof might be covered by one or more of the following patents that are owned by or licensed to Juniper Networks: U.S. Patent Nos. 5,473,599, 5,905,725, 5,909,440, 6,192,051, 6,333,650, 6,359,479, 6,406,312, 6,429,706, 6,459,579, 6,493,347, 6,538,518, 6,538,899, 6,552,918, 6,567,902, 6,578,186, and 6,590,785.

Class-of-Service Properties

Copyright © 2013, Juniper Networks, Inc.
All rights reserved.

The information in this document is current as of the date on the title page.

YEAR 2000 NOTICE

Juniper Networks hardware and software products are Year 2000 compliant. Junos OS has no known time-related limitations through the year 2038. However, the NTP application is known to have some difficulty in the year 2036.

END USER LICENSE AGREEMENT

The Juniper Networks product that is the subject of this technical documentation consists of (or is intended for use with) Juniper Networks software. Use of such software is subject to the terms and conditions of the End User License Agreement ("EULA") posted at <http://www.juniper.net/support/eula.html>. By downloading, installing or using such software, you agree to the terms and conditions of that EULA.

Table of Contents

	About the Documentation	vii
	Documentation and Release Notes	vii
	Supported Platforms	vii
	Using the Examples in This Manual	vii
	Merging a Full Example	viii
	Merging a Snippet	viii
	Documentation Conventions	ix
	Documentation Feedback	xi
	Requesting Technical Support	xi
	Self-Help Online Tools and Resources	xi
	Opening a Case with JTAC	xii
Part 1	Overview	
Chapter 1	Class of Service	3
	Class of Service Overview	3
	Restrictions and Cautions for CoS Configuration on Services Interfaces	3
Part 2	Configuration	
Chapter 2	Configuration Tasks	7
	Configuring CoS Rules	7
	Configuring Match Direction for CoS Rules	8
	Configuring Match Conditions In CoS Rules	8
	Configuring Actions in CoS Rules	9
	Configuring Application Profiles for Use as CoS Rule Actions	10
	Configuring Reflexive and Reverse CoS Rule Actions	11
	Example: Configuring CoS Rules	11
	Configuring CoS Rule Sets	12
Chapter 3	Example	13
	Examples: Configuring CoS on Services Interfaces	13
Chapter 4	Configuration Statements	15
	application-profile	15
	application-sets (Services CoS)	16
	applications (Services CoS)	16
	data (FTP)	17
	destination-address (CoS)	17
	destination-prefix-list (Services CoS)	18
	dscp	18
	forwarding-class	19

	from (Services CoS)	19
	ftp (Class-Of-Service)	20
	match-direction	20
	(reflexive reverse)	21
	rule	22
	rule-set (Services CoS)	23
	services (COS)	23
	source-address (Services CoS)	24
	source-prefix-list	24
	syslog (Services CoS)	25
	term (Services CoS)	26
	then	27
	video (Application Profile)	27
	voice (Application Profile)	28
Part 3	Administration	
Chapter 5	CoS Services Operational Mode Commands	31
	show services cos statistics	32
	clear services cos statistics	35
Part 4	Index	
	Index	39

List of Tables

	About the Documentation	vii
	Table 1: Notice Icons	ix
	Table 2: Text and Syntax Conventions	ix
Part 3	Administration	
Chapter 5	CoS Services Operational Mode Commands	31
	Table 3: show services cos statistics Output Fields	32

About the Documentation

- Documentation and Release Notes on page vii
- Supported Platforms on page vii
- Using the Examples in This Manual on page vii
- Documentation Conventions on page ix
- Documentation Feedback on page xi
- Requesting Technical Support on page xi

Documentation and Release Notes

To obtain the most current version of all Juniper Networks[®] technical documentation, see the product documentation page on the Juniper Networks website at <http://www.juniper.net/techpubs/>.

If the information in the latest release notes differs from the information in the documentation, follow the product Release Notes.

Juniper Networks Books publishes books by Juniper Networks engineers and subject matter experts. These books go beyond the technical documentation to explore the nuances of network architecture, deployment, and administration. The current list can be viewed at <http://www.juniper.net/books>.

Supported Platforms

For the features described in this document, the following platforms are supported:

- M Series
- T Series
- MX Series

Using the Examples in This Manual

If you want to use the examples in this manual, you can use the **load merge** or the **load merge relative** command. These commands cause the software to merge the incoming configuration into the current candidate configuration. The example does not become active until you commit the candidate configuration.

If the example configuration contains the top level of the hierarchy (or multiple hierarchies), the example is a *full example*. In this case, use the **load merge** command.

If the example configuration does not start at the top level of the hierarchy, the example is a *snippet*. In this case, use the **load merge relative** command. These procedures are described in the following sections.

Merging a Full Example

To merge a full example, follow these steps:

1. From the HTML or PDF version of the manual, copy a configuration example into a text file, save the file with a name, and copy the file to a directory on your routing platform.

For example, copy the following configuration to a file and name the file **ex-script.conf**. Copy the **ex-script.conf** file to the **/var/tmp** directory on your routing platform.

```
system {
  scripts {
    commit {
      file ex-script.xml;
    }
  }
}
interfaces {
  fxp0 {
    disable;
    unit 0 {
      family inet {
        address 10.0.0.1/24;
      }
    }
  }
}
```

2. Merge the contents of the file into your routing platform configuration by issuing the **load merge** configuration mode command:

```
[edit]
user@host# load merge /var/tmp/ex-script.conf
load complete
```

Merging a Snippet

To merge a snippet, follow these steps:

1. From the HTML or PDF version of the manual, copy a configuration snippet into a text file, save the file with a name, and copy the file to a directory on your routing platform.

For example, copy the following snippet to a file and name the file **ex-script-snippet.conf**. Copy the **ex-script-snippet.conf** file to the **/var/tmp** directory on your routing platform.

```
commit {
  file ex-script-snippet.xml; }
```


2. Move to the hierarchy level that is relevant for this snippet by issuing the following configuration mode command:

```
[edit]
user@host# edit system scripts
[edit system scripts]
```

3. Merge the contents of the file into your routing platform configuration by issuing the **load merge relative** configuration mode command:

```
[edit system scripts]
user@host# load merge relative /var/tmp/ex-script-snippet.conf
load complete
```

For more information about the **load** command, see the *CLI User Guide*.

Documentation Conventions

Table 1 on page ix defines notice icons used in this guide.

Table 1: Notice Icons





Icon	Meaning	Description
	Informational note	Indicates important features or instructions.
	Caution	Indicates a situation that might result in loss of data or hardware damage.
	Warning	Alerts you to the risk of personal injury or death.
	Laser warning	Alerts you to the risk of personal injury from a laser.

Table 2 on page ix defines the text and syntax conventions used in this guide.

Table 2: Text and Syntax Conventions

Convention	Description	Examples
Bold text like this	Represents text that you type.	To enter configuration mode, type the configure command: user@host> configure
Fixed-width text like this	Represents output that appears on the terminal screen.	user@host> show chassis alarms No alarms currently active

Table 2: Text and Syntax Conventions (*continued*)

Convention	Description	Examples
<i>Italic text like this</i>	<ul style="list-style-type: none">Introduces or emphasizes important new terms.Identifies guide names.Identifies RFC and Internet draft titles.	<ul style="list-style-type: none">A policy <i>term</i> is a named structure that defines match conditions and actions.<i>Junos OS CLI User Guide</i>RFC 1997, <i>BGP Communities Attribute</i>
<i>Italic text like this</i>	Represents variables (options for which you substitute a value) in commands or configuration statements.	Configure the machine's domain name: [edit] root@# set system domain-name <i>domain-name</i>
Text like this	Represents names of configuration statements, commands, files, and directories; configuration hierarchy levels; or labels on routing platform components.	<ul style="list-style-type: none">To configure a stub area, include the stub statement at the [edit protocols ospf area area-id] hierarchy level.The console port is labeled CONSOLE.
< > (angle brackets)	Enclose optional keywords or variables.	stub <default-metric <i>metric</i> >;
(pipe symbol)	Indicates a choice between the mutually exclusive keywords or variables on either side of the symbol. The set of choices is often enclosed in parentheses for clarity.	broadcast multicast (<i>string1</i> <i>string2</i> <i>string3</i>)
# (pound sign)	Indicates a comment specified on the same line as the configuration statement to which it applies.	rsvp { # Required for dynamic MPLS only
[] (square brackets)	Enclose a variable for which you can substitute one or more values.	community name members [<i>community-ids</i>]
Indentation and braces ({ })	Identify a level in the configuration hierarchy.	[edit] routing-options { static { route default { nexthop <i>address</i> ; retain; } } }
;(semicolon)	Identifies a leaf statement at a configuration hierarchy level.	
GUI Conventions		
Bold text like this	Represents graphical user interface (GUI) items you click or select.	<ul style="list-style-type: none">In the Logical Interfaces box, select All Interfaces.To cancel the configuration, click Cancel.
> (bold right angle bracket)	Separates levels in a hierarchy of menu selections.	In the configuration editor hierarchy, select Protocols>Ospf .

Documentation Feedback

We encourage you to provide feedback, comments, and suggestions so that we can improve the documentation. You can send your comments to techpubs-comments@juniper.net, or fill out the documentation feedback form at <https://www.juniper.net/cgi-bin/docbugreport/>. If you are using e-mail, be sure to include the following information with your comments:

- Document or topic name
- URL or page number
- Software release version (if applicable)

Requesting Technical Support

Technical product support is available through the Juniper Networks Technical Assistance Center (JTAC). If you are a customer with an active J-Care or JNASC support contract, or are covered under warranty, and need post-sales technical support, you can access our tools and resources online or open a case with JTAC.

- JTAC policies—For a complete understanding of our JTAC procedures and policies, review the *JTAC User Guide* located at <http://www.juniper.net/us/en/local/pdf/resource-guides/7100059-en.pdf>.
- Product warranties—For product warranty information, visit <http://www.juniper.net/support/warranty/>.
- JTAC hours of operation—The JTAC centers have resources available 24 hours a day, 7 days a week, 365 days a year.

Self-Help Online Tools and Resources

For quick and easy problem resolution, Juniper Networks has designed an online self-service portal called the Customer Support Center (CSC) that provides you with the following features:

- Find CSC offerings: <http://www.juniper.net/customers/support/>
- Search for known bugs: <http://www2.juniper.net/kb/>
- Find product documentation: <http://www.juniper.net/techpubs/>
- Find solutions and answer questions using our Knowledge Base: <http://kb.juniper.net/>
- Download the latest versions of software and review release notes: <http://www.juniper.net/customers/csc/software/>
- Search technical bulletins for relevant hardware and software notifications: <https://www.juniper.net/alerts/>

- Join and participate in the Juniper Networks Community Forum:
<http://www.juniper.net/company/communities/>
- Open a case online in the CSC Case Management tool: <http://www.juniper.net/cm/>

To verify service entitlement by product serial number, use our Serial Number Entitlement (SNE) Tool: <https://tools.juniper.net/SerialNumberEntitlementSearch/>

Opening a Case with JTAC

You can open a case with JTAC on the Web or by telephone.

- Use the Case Management tool in the CSC at <http://www.juniper.net/cm/>.
- Call 1-888-314-JTAC (1-888-314-5822 toll-free in the USA, Canada, and Mexico).

For international or direct-dial options in countries without toll-free numbers, see <http://www.juniper.net/support/requesting-support.html>.

PART 1

Overview

- [Class of Service on page 3](#)

CHAPTER 1

Class of Service

- [Class of Service Overview on page 3](#)
- [Restrictions and Cautions for CoS Configuration on Services Interfaces on page 3](#)

Class of Service Overview

The CoS configuration available for the AS PIC enables you to configure Differentiated Services (DiffServ) code point (DSCP) marking and forwarding-class assignment for packets transiting the AS PIC. You can configure the CoS service alongside the stateful firewall and NAT services, using a similar rule structure. The component structures are described in detail in the *Junos OS Class of Service Library for Routing Devices*.

Standards for Differentiated Services are described in the following documents:

- RFC 2474, *Definition of the Differentiated Services Field (DS Field) in the IPv4 and IPv6 Headers*
- RFC 2475, *An Architecture for Differentiated Services*



NOTE: CoS BA classification is not supported on services interfaces.

Related Documentation

- [Restrictions and Cautions for CoS Configuration on Services Interfaces on page 3](#)
- [Configuring CoS Rules on page 7](#)
- [Configuring CoS Rule Sets on page 12](#)
- [Examples: Configuring CoS on Services Interfaces on page 13](#)

Restrictions and Cautions for CoS Configuration on Services Interfaces

The following restrictions and cautions apply to CoS configuration on services interfaces:

- The adaptive services interface does not support scheduling, only DiffServ marking and queue assignment. You must configure scheduling at the **[edit class-of-service]** hierarchy level on the output interface or fabric.
- In the default configuration, queues 1 and 2 receive 0 percent bandwidth. If packets will be assigned to these queues, you must configure a scheduling map.
- You must issue a **commit full** command before using custom forwarding-class names in the configuration.
- Only the Junos standard DiffServ names can be used in the configuration. Custom names are not recognized.
- On M Series routers, you can configure rewrite rules that change packet headers and attach the rules to output interfaces. These rules might overwrite the DSCP marking configured on an AS or MultiServices PIC. It is important to keep this adverse effect in mind and use care when creating system-wide configurations.

For example, knowing that the AS or MultiServices PIC can mark packets with any ToS or DSCP value and the output interface is restricted to only eight DSCP values, rewrite rules on the output interface condense the mapping from 64 to 8 values with overall loss of granularity. In this case, you have the following options:

- Remove the rewrite rules from the output interface.
- Configure the output interface to include the most important mappings.

**Related
Documentation**

- [Class of Service Overview on page 3](#)
- [Configuring CoS Rules on page 7](#)
- [Configuring CoS Rule Sets on page 12](#)
- [Examples: Configuring CoS on Services Interfaces on page 13](#)

PART 2

Configuration

- [Configuration Tasks on page 7](#)
- [Example on page 13](#)
- [Configuration Statements on page 15](#)

CHAPTER 2

Configuration Tasks

- [Configuring CoS Rules on page 7](#)
- [Configuring CoS Rule Sets on page 12](#)

Configuring CoS Rules

To configure a CoS rule, include the **rule** *rule-name* statement at the **[edit services cos]** hierarchy level:

```
[edit services cos]
rule rule-name {
  match-direction (input | output | input-output);
  term term-name {
    from {
      application-sets set-name;
      applications [ application-names ];
      destination-address (CoS) address;
      destination-prefix-list list-name <except>;
      source-address address;
      source-prefix-list list-name <except>;
    }
    then {
      application-profile profile-name;
      dscp (alias | bits);
      forwarding-class class-name;
      syslog;
      (reflexive | reverse) {
        application-profile profile-name;
        dscp (alias | bits);
        forwarding-class class-name;
        syslog;
      }
    }
  }
}
```

Each CoS rule consists of a set of terms, similar to a filter configured at the **[edit firewall]** hierarchy level. A term consists of the following:

- **from** statement—Specifies the match conditions and applications that are included and excluded.

- **then** statement—Specifies the actions and action modifiers to be performed by the router software.

The following sections explain how to configure the components of CoS rules:

- [Configuring Match Direction for CoS Rules on page 8](#)
- [Configuring Match Conditions In CoS Rules on page 8](#)
- [Configuring Actions in CoS Rules on page 9](#)
- [Example: Configuring CoS Rules on page 11](#)

Configuring Match Direction for CoS Rules

Each rule must include a **match-direction** statement that specifies the direction in which the rule match is applied. To configure where the match is applied, include the **match-direction** statement at the **[edit services cos rule rule-name]** hierarchy level:

```
match-direction (input | output | input-output);
```

If you configure **match-direction input-output**, bidirectional rule creation is allowed.

The match direction is used with respect to the traffic flow through the AS or Multiservices PIC. When a packet is sent to the PIC, direction information is carried along with it.

With an interface service set, packet direction is determined by whether a packet is entering or leaving the interface on which the service set is applied.

With a next-hop service set, packet direction is determined by the interface used to route the packet to the AS or Multiservices PIC. If the inside interface is used to route the packet, the packet direction is input. If the outside interface is used to direct the packet to the AS or Multiservices PIC, the packet direction is output. For more information on inside and outside interfaces, see *Configuring Service Sets to be Applied to Services Interfaces*.

On the AS or Multiservices PIC, a flow lookup is performed. If no flow is found, rule processing is performed. All rules in the service set are considered. During rule processing, the packet direction is compared against rule directions. Only rules with direction information that matches the packet direction are considered.

Configuring Match Conditions In CoS Rules

To configure CoS match conditions, include the **from** statement at the **[edit services cos rule rule-name term term-name]** hierarchy level:

```
from {  
  application-sets set-name;  
  applications [ application-names ];  
  destination-address (CoS) address;  
  destination-prefix-list list-name <except>;  
  source-address address;  
  source-prefix-list list-name <except>;  
}
```

The source address and destination address can be either IPv4 or IPv6. You can use either the source address or the destination address as a match condition, in the same way

that you would configure a firewall filter; for more information, see the *Routing Policy Feature Guide for Routing Devices*.

Alternatively, you can specify a list of source or destination prefixes by configuring the **prefix-list** statement at the **[edit policy-options]** hierarchy level and then including either the **destination-prefix-list** or **source-prefix-list** statement in the CoS rule. For an example, see *Examples: Configuring Stateful Firewall Rules*.

If you omit the **from** term, the router accepts all traffic and the default protocol handlers take effect:

- User Datagram Protocol (UDP), Transmission Control Protocol (TCP), and Internet Control Message Protocol (ICMP) create a bidirectional flow with a predicted reverse flow.
- IP creates a unidirectional flow.

You can also include application protocol definitions you have configured at the **[edit applications]** hierarchy level; for more information, see *Configuring Application Protocol Properties*.

- To apply one or more specific application protocol definitions, include the **applications** statement at the **[edit services cos rule rule-name term term-name from]** hierarchy level.
- To apply one or more sets of application protocol definitions you have defined, include the **application-sets** statement at the **[edit services cos rule rule-name term term-name from]** hierarchy level.



NOTE: If you include one of the statements that specifies application protocols, the router derives port and protocol information from the corresponding configuration at the **[edit applications]** hierarchy level; you cannot specify these properties as match conditions.

Configuring Actions in CoS Rules

To configure CoS actions, include the **then** statement at the **[edit services cos rule rule-name term term-name]** hierarchy level:

```
[edit services cos rule rule-name term term-name]
then {
  application-profile profile-name;
  dscp (alias | bits);
  forwarding-class class-name;
  syslog;
  (reflexive | reverse) {
    application-profile profile-name;
    dscp (alias | bits);
    forwarding-class class-name;
    syslog;
  }
}
```

The principal CoS actions are as follows:

- **dscp**—Causes the packet to be marked with the specified DiffServ code point (DSCP) value or alias.
- **forwarding-class**—Causes the packet to be assigned to the specified forwarding class.

For detailed information about DSCP values and forwarding classes, see [“Examples: Configuring CoS on Services Interfaces” on page 13](#) or the *Junos OS Class of Service Library for Routing Devices*.

You can optionally set the configuration to record information in the system logging facility by including the **syslog** statement at the **[edit services cos rule *rule-name* term *term-name* then]** hierarchy level. This statement overrides any **syslog** setting included in the service set or interface default configuration.

For information about some additional CoS actions, see the following sections:

- [Configuring Application Profiles for Use as CoS Rule Actions on page 10](#)
- [Configuring Reflexive and Reverse CoS Rule Actions on page 11](#)

Configuring Application Profiles for Use as CoS Rule Actions

You can optionally define one or more application profiles for inclusion in CoS actions. To configure application profiles, include the **application-profile** statement at the **[edit services cos]** hierarchy level:

```
[edit services cos]
application-profile profile-name {
  ftp {
    data {
      dscp (alias | bits);
      forwarding-class class-name;
    }
  }
  sip {
    video {
      dscp (alias | bits);
      forwarding-class class-name;
    }
    voice {
      dscp (alias | bits);
      forwarding-class class-name;
    }
  }
}
```

The **application-profile** statement includes two main components and three traffic types: **ftp** with the **data** traffic type and **sip** with the **video** and **voice** traffic types. You can set the appropriate **dscp** and **forwarding-class** values for each component within the application profile.



NOTE: The `ftp` and `sip` statements are not supported on Juniper Network MX Series 3D Universal Edge Routers.

You can apply the application profile to a CoS configuration by including it at the `[edit services cos rule rule-name term term-name then]` hierarchy level.

Configuring Reflexive and Reverse CoS Rule Actions

CoS services are unidirectional. It might be necessary to specify different treatments for flows in opposite directions.

Regardless of whether a packet matches the input, output or input-output direction, flows in both directions are created. A forward, reverse, or forward-and-reverse CoS action is associated with each flow. Bear in mind that the flow in the opposite direction might end up having a CoS action associated with it that you have not specifically configured.

To control the direction in which service is applied, as distinct from the direction in which the rule match is applied, you can configure the `(reflexive | reverse)` statement at the `[edit services cos rule rule-name term term-name then]` hierarchy level:

```
[edit services cos rule rule-name term term-name then]
(reflexive | reverse) {
  application-profile profile-name;
  dscp (alias | bits);
  forwarding-class class-name;
  syslog;
}
```

The two actions are mutually exclusive:

- **reflexive** causes the equivalent opposing CoS action to be applied to flows in the opposite direction.
- **reverse** allows you to define the CoS behavior for flows in the reverse direction.

If you omit the statement, data flows inherit the CoS behavior of the forward control flow.

Example: Configuring CoS Rules

The following example show a CoS configuration containing two rules, one for input matching on a specified application set and the other for output matching on a specified source address:

```
[edit services]
cos {
  rule my-cos-rule {
    match-direction input-output;
    term term1 {
      from {
        source-address 10.1.3.2/32;
        applications sip;
      }
    }
  }
}
```

```
    }
    then {
        dscp ef;
        syslog;
    }
}
term term2 {
    from {
        destination-address 10.2.3.2;
        applications http;
    }
    then {
        dscp af21;
    }
}
}
```

**Related
Documentation**

- [Class of Service Overview on page 3](#)
- [Restrictions and Cautions for CoS Configuration on Services Interfaces on page 3](#)
- [Configuring CoS Rule Sets on page 12](#)
- [Examples: Configuring CoS on Services Interfaces on page 13](#)

Configuring CoS Rule Sets

The **rule-set** statement defines a collection of CoS rules that determine what actions the router software performs on packets in the data stream. You define each rule by specifying a rule name and configuring terms. Then you specify the order of the rules by including the **rule-set** statement at the **[edit services cos]** hierarchy level with a **rule** statement for each rule:

```
rule-set rule-set-name {
    rule rule-name;
}
```

The router software processes the rules in the order in which you specify them in the configuration. If a term in a rule matches the packet, the router performs the corresponding action and the rule processing stops. If no term in a rule matches the packet, processing continues to the next rule in the rule set. If none of the rules matches the packet, the packet is dropped by default.

**Related
Documentation**

- [Class of Service Overview on page 3](#)
- [Restrictions and Cautions for CoS Configuration on Services Interfaces on page 3](#)
- [Configuring CoS Rules on page 7](#)
- [Examples: Configuring CoS on Services Interfaces on page 13](#)

CHAPTER 3

Example

- [Examples: Configuring CoS on Services Interfaces on page 13](#)

Examples: Configuring CoS on Services Interfaces

To make settings consistent across Juniper Networks routers, you configure many CoS settings at the **[edit class-of-service]** hierarchy level to be used on services interfaces. When you commit this configuration along with what you configure at the **[edit services cos]** hierarchy level, these properties are applied to the AS or MultiServices PIC.

The following configuration examples at the **[edit class-of-service]** hierarchy level can be applied on services interfaces. For more information, see the *Junos OS Class of Service Library for Routing Devices*.



NOTE: The first two configurations, mapping forwarding-class name to forwarding-class ID and mapping forwarding-class name to queue number, are mutually exclusive.

**Mapping
Forwarding-Class
Name to
Forwarding-Class ID**

Map forwarding-class names to forwarding-class IDs:

```
[edit class-of-service]
forwarding-classes {
  forwarding-class fc0 0;
  forwarding-class fc1 0;
  forwarding-class fc2 1;
  forwarding-class fc3 1;
  forwarding-class fc4 2;
  forwarding-class fc5 2;
  forwarding-class fc6 3;
  forwarding-class fc7 3;
  forwarding-class fc8 4;
  forwarding-class fc9 4;
  forwarding-class fc10 5;
  forwarding-class fc11 5;
  forwarding-class fc12 6;
  forwarding-class fc13 6;
  forwarding-class fc14 7;
  forwarding-class fc15 7;
}
```

**Mapping
Forwarding-Class
Name to Queue
Number**

Map forwarding-class names to queue numbers:

```
[edit class-of-service]
forwarding-classes {
  queue 0 be;
  queue 1 ef;
  queue 2 af;
  queue 3 nc;
  queue 4 ef1;
  queue 5 ef2;
  queue 6 af1;
  queue 7 nc1;
}
```

**Mapping Diffserv Code
Point Aliases to DSCP
Bits**

Map alias names to DSCP bit values. The aliases then can be used instead of the DSCP bits in adaptive services configurations.

```
[edit class-of-service]
code-point-aliases {
  (dscp | dscp-ipv6 | exp | ieee-802.1 | inet-precedence) {
    alias | bits;
  }
}
```

Here is an example:

```
code-point-aliases {
  dscp {
    my1 110001;
    my2 101110;
    be 000001;
    cs7 110000;
  }
}
```

**Related
Documentation**

- [Class of Service Overview on page 3](#)
- [Restrictions and Cautions for CoS Configuration on Services Interfaces on page 3](#)
- [Configuring CoS Rules on page 7](#)
- [Configuring CoS Rule Sets on page 12](#)

CHAPTER 4

Configuration Statements

application-profile

Syntax application-profile *profile-name* {
 ftp {
 data {
 dscp (*alias* | *bits*);
 forwarding-class *class-name*;
 }
 }
 sip {
 video {
 dscp (*alias* | *bits*);
 forwarding-class *class-name*;
 }
 voice {
 dscp (*alias* | *bits*);
 forwarding-class *class-name*;
 }
 }
 }

Hierarchy Level [edit [services](#) cos],
 [edit services cos [rule](#) *rule-name* [term](#) *term-name* [then](#)],
 [edit [services](#) cos [rule](#) *rule-name* [term](#) *term-name* [then](#) ([reflexive](#) | [reverse](#))]

Release Information Statement introduced in Junos OS Release 8.1.

Description Define or apply a CoS application profile. When you apply a CoS application profile in a CoS rule, terminate the profile name with a semicolon (;).

Options *profile-name*—Identifier for the application profile.

 The remaining statements are explained separately.

Required Privilege Level interface—To view this statement in the configuration.
 interface-control—To add this statement to the configuration.

Related Documentation • [Configuring Application Profiles for Use as CoS Rule Actions on page 10](#)

application-sets (Services CoS)

Syntax	<code>applications-sets <i>set-name</i>;</code>
Hierarchy Level	[edit services cos rule <i>rule-name</i> term <i>term-name</i> from]
Release Information	Statement introduced in Junos OS Release 8.1.
Description	Define one or more target application sets.
Options	<i>set-name</i> —Name of the target application set.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring Match Conditions In CoS Rules on page 8

applications (Services CoS)

Syntax	<code>applications [<i>application-name</i>];</code>
Hierarchy Level	[edit services cos rule <i>rule-name</i> term <i>term-name</i> from]
Release Information	Statement introduced in Junos OS Release 8.1.
Description	Define one or more applications to which the CoS services apply.
Options	<i>application-name</i> —Name of the target application.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring Match Conditions in a CoS Rule• Configuring Match Conditions In CoS Rules on page 8

data (FTP)

Syntax	data { dscp (<i>alias</i> <i>bits</i>); forwarding-class <i>class-name</i> ; }
Hierarchy Level	[edit services cos application-profile <i>profile-name</i> ftp]
Release Information	Statement introduced in Junos OS Release 9.3.
Description	Set the appropriate dscp and forwarding-class value for FTP data.
Default	By default, the system will not alter the DSCP or forwarding class for FTP data traffic.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none"> • <i>Configuring Application Profiles</i> • video (Application Profile) on page 27 • voice (Application Profile) on page 28

destination-address (CoS)

Syntax	destination-address (<i>address</i> any-unicast) <except>;
Hierarchy Level	[edit services cos rule <i>rule-name</i> term <i>term-name</i> from]
Release Information	Statement introduced in Junos OS Release 8.1. address option enhanced to support IPv4 and IPv6 addresses in Junos OS Release 8.5.
Description	Specify the destination address for rule matching.
Options	address —Destination IPv4 or IPv6 address or prefix value.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none"> • <i>Configuring Match Conditions in a CoS Rule</i> • Configuring Match Conditions In CoS Rules on page 8

destination-prefix-list (Services CoS)

Syntax	<code>destination-prefix-list <i>list-name</i> <except>;</code>
Hierarchy Level	[edit services cos rule <i>rule-name</i> term <i>term-name</i> from]
Release Information	Statement introduced in Junos OS Release 8.2.
Description	Specify the destination prefix list for rule matching. You configure the prefix list by including the prefix-list statement at the [edit policy-options] hierarchy level.
Options	<i>list-name</i> —Destination prefix list. except —(Optional) Exclude the specified prefix list from rule matching.
Usage Guidelines	See “ Configuring Match Conditions In CoS Rules ” on page 8.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• <i>Routing Policy Feature Guide for Routing Devices</i>

dscp

Syntax	<code>dscp (<i>alias</i> <i>bits</i>);</code>
Hierarchy Level	[edit services cos application-profile <i>profile-name</i> ftp data], [edit services cos application-profile <i>profile-name</i> sip (video voice)], [edit services cos rule <i>rule-name</i> term <i>term-name</i> then], [edit services cos rule <i>rule-name</i> term <i>term-name</i> then (reflexive reverse)]
Release Information	Statement introduced in Junos OS Release 8.1.
Description	Define the Differentiated Services code point (DSCP) mapping that is applied to the packets.
Options	<i>alias</i> —Name assigned to a set of CoS markers. <i>bits</i> —Mapping value in the packet header.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring Actions in CoS Rules on page 9.

forwarding-class

Syntax	<code>forwarding-class class-name;</code>
Hierarchy Level	[edit services cos application-profile <i>profile-name</i> ftp data], [edit services cos application-profile <i>profile-name</i> sip (video voice)], [edit services cos rule <i>rule-name</i> term <i>term-name</i> then], [edit services cos rule <i>rule-name</i> term <i>term-name</i> then (reflexive reverse)]
Release Information	Statement introduced in Junos OS Release 8.1.
Description	Define the forwarding class to which packets are assigned.
Options	<i>class-name</i> —Name of the target application.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none"> • Configuring Actions in CoS Rules on page 9.

from (Services CoS)

Syntax	<pre> from { application-sets <i>set-name</i>; applications [<i>application-names</i>]; destination-address (CoS) <i>address</i>; destination-prefix-list <i>list-name</i> <except>; source-address <i>address</i>; source-prefix-list <i>list-name</i> <except>; } </pre>
Hierarchy Level	[edit services cos rule <i>rule-name</i> term <i>term-name</i>]
Release Information	Statement introduced in Junos OS Release 8.1.
Description	Specify input conditions for a CoS term.
Options	<p>For information on match conditions, see the description of firewall filter match conditions in the <i>Routing Policy Feature Guide for Routing Devices</i>.</p> <p>The remaining statements are explained separately.</p>
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none"> • Configuring CoS Rules on page 7

ftp (Class-Of-Service)

Syntax	<pre>ftp { data { dscp (alias bits); forwarding-class class-name; } }</pre>
Hierarchy Level	[edit services cos application-profile <i>profile-name</i> ftp]
Release Information	Statement introduced in Junos OS Release 9.3.
Description	Set the appropriate dscp and forwarding-class value for FTP.
Default	By default, the system does not alter the DSCP or forwarding class for FTP traffic.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• <i>Configuring Application Profiles</i>• <i>sip (Application Profile)</i>

match-direction

Syntax	match-direction (input output input-output);
Hierarchy Level	[edit services cos rule <i>rule-name</i>]
Release Information	Statement introduced in Junos OS Release 8.1.
Description	Specify the direction in which the rule match is applied.
Options	input —Apply the rule match on the input side of the interface. output —Apply the rule match on the output side of the interface. input-output —Apply the rule match bidirectionally.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• <i>Configuring CoS Rules</i>

(reflexive | reverse)

Syntax	<pre>(reflexive reverse) { application-profile profile-name; dscp (alias bits); forwarding-class class-name; syslog; }</pre>
Hierarchy Level	[edit services cos rule rule-name term term-name then]
Release Information	Statement introduced in Junos OS Release 8.1.
Description	<p>reflexive—Applies the equivalent opposing CoS action to flows in the opposite direction.</p> <p>reverse—Allows you to define CoS behavior for flows in the reverse direction.</p> <p>The remaining statements are explained separately.</p>
Required Privilege Level	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> • Configuring CoS Rules • Configuring Reflexive and Reverse CoS Rule Actions on page 11

rule

Syntax	<pre>rule rule-name { match-direction (input output input-output); term term-name { from { application-sets set-name; applications [application-names]; destination-address (CoS) address; destination-prefix-list list-name <except>; source-address address; source-prefix-list list-name <except>; } then { application-profile profile-name; dscp (alias bits); forwarding-class class-name; syslog; (reflexive reverse) { application-profile profile-name; dscp (alias bits); forwarding-class class-name; syslog; } } } }</pre>
Hierarchy Level	[edit services cos], [edit services cos rule-set rule-set-name]
Release Information	Statement introduced in Junos OS Release 8.1.
Description	Specify the rule the router uses when applying this service.
Options	rule-name —Identifier for the collection of terms that constitute this rule. The remaining statements are explained separately.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring CoS Rules on page 7

rule-set (Services CoS)

Syntax	<code>rule-set <i>rule-set-name</i> { [rule <i>rule-name</i>]; }</code>
Hierarchy Level	[edit services cos]
Release Information	Statement introduced in Junos OS Release 8.1.
Description	Specify the rule set the router uses when applying this service.
Options	<i>rule-set-name</i> —Identifier for the collection of rules that constitute this rule set.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none"> • Configuring CoS Rule Sets

services (COS)

Syntax	<code>services cos { ... }</code>
Hierarchy Level	[edit]
Release Information	Statement introduced in Junos OS Release 8.1.
Description	Define the service rules to be applied to traffic.
Options	<i>cos</i> —Identifier for the class-of-service set of rules statements.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none"> • Configuring CoS Rules on page 7

source-address (Services CoS)

Syntax	source-address <i>address</i> ;
Hierarchy Level	[edit services cos rule <i>rule-name</i> term <i>term-name</i> from]
Release Information	Statement introduced in Junos OS Release 8.1. <i>address</i> option enhanced to support IPv4 and IPv6 addresses in Junos OS Release 8.5.
Description	Source address for rule matching.
Options	<i>address</i> —Source IPv4 or IPv6 address or prefix value.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring Match Conditions in a CoS Rule• Configuring Match Conditions In CoS Rules on page 8

source-prefix-list

Syntax	source-prefix-list <i>list-name</i> <except>;
Hierarchy Level	[edit services cos rule <i>rule-name</i> term <i>term-name</i> from]
Release Information	Statement introduced in Junos OS Release 8.2.
Description	Specify the source prefix list for rule matching. You configure the prefix list by including the prefix-list statement at the [edit policy-options] hierarchy level.
Options	<i>list-name</i> —Destination prefix list. except —(Optional) Exclude the specified prefix list from rule matching.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring CoS Rules on page 7• Routing Policy Feature Guide for Routing Devices

syslog (Services CoS)

Syntax	syslog;
Hierarchy Level	[edit services cos rule <i>rule-name</i> term <i>term-name</i> then], [edit services cos rule <i>rule-name</i> term <i>term-name</i> then (reflexive reverse)]
Release Information	Statement introduced in Junos OS Release 8.1.
Description	Enable system logging. The system log information from the Adaptive Services or Multiservices PIC is passed to the kernel for logging in the /var/log directory. This setting overrides any syslog statement setting included in the service set or interface default configuration.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring Actions in a CoS Rule• Configuring Actions in CoS Rules on page 9

term (Services CoS)

Syntax `term term-name {`
 `from {`
 `application-sets set-name;`
 `applications [application-names];`
 `destination-address (CoS) address;`
 `destination-prefix-list list-name <except>;`
 `source-address address;`
 `source-prefix-list list-name <except>;`
 `}`
 `then {`
 `application-profile profile-name;`
 `dscp (alias | bits);`
 `forwarding-class class-name;`
 `syslog;`
 `(reflexive | reverse) {`
 `application-profile profile-name;`
 `dscp (alias | bits);`
 `forwarding-class class-name;`
 `syslog;`
 `}`
 `}`
 `}`

Hierarchy Level [edit [services](#) cos [rule](#) *rule-name*]

Release Information Statement introduced in Junos OS Release 8.1.

Description Define the CoS term properties.

Options *term-name*—Identifier for the term.

The remaining statements are explained separately.

Required Privilege Level interface—To view this statement in the configuration.
 interface-control—To add this statement to the configuration.

Related Documentation • [Configuring CoS Rules on page 7.](#)

then

Syntax	<pre> then { application-profile profile-name; dscp (alias bits); forwarding-class class-name; syslog; (reflexive reverse) { application-profile profile-name; dscp (alias bits); forwarding-class class-name; syslog; } } </pre>
Hierarchy Level	[edit services cos rule rule-name term term-name]
Release Information	Statement introduced in Junos OS Release 8.1.
Description	<p>Define the CoS term actions.</p> <p>The remaining statements are explained separately.</p>
Required Privilege Level	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> • <i>Configuring Actions in a CoS Rule</i> • Configuring Actions in CoS Rules on page 9

video (Application Profile)

Syntax	<pre> video { dscp (alias bits); forwarding-class class-name; } </pre>
Hierarchy Level	[edit services cos application-profile profile-name sip]
Release Information	Statement introduced in Junos OS Release 9.3.
Description	Set the appropriate dscp and forwarding-class values for SIP video traffic.
Default	By default, the system will not alter the DSCP or forwarding class for SIP video traffic.
Required Privilege Level	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> • <i>Configuring Application Profiles</i> • voice (Application Profile) on page 28

voice (Application Profile)

Syntax	<pre>voice { dscp (<i>alias</i> <i>bits</i>); forwarding-class <i>class-name</i>; }</pre>
Hierarchy Level	[edit services cos application-profile <i>profile-name</i> sip]
Release Information	Statement introduced in Junos OS Release 9.3.
Description	Set the appropriate dscp and forwarding-class values for SIP voice traffic.
Default	By default, the system will not alter the DSCP or forwarding class for SIP voice traffic.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• <i>Configuring Application Profiles</i>• video (Application Profile) on page 27

PART 3

Administration

- [CoS Services Operational Mode Commands on page 31](#)

CHAPTER 5

CoS Services Operational Mode Commands

show services cos statistics

Syntax	<pre>show services cos statistics <brief detail extensive> <diffserv forwarding-class> <interface <i>interface-name</i>> <service-set <i>service-set-name</i>> <summary></pre>
Release Information	Command introduced in Junos OS Release 8.1.
Description	Display the mapping of class-of-service (CoS) code point aliases to corresponding bit patterns and the mapping of forwarding class names to queue numbers as configured in CoS services for the AS PIC.
Options	<p>none—Display all services CoS statistics.</p> <p>brief detail extensive—(Optional) Display the specified level of output.</p> <p>diffserv forwarding-class—(Optional) Display only the selected information, either DiffServ codepoints or forwarding classes.</p> <p>interface <i>interface-name</i>—(Optional) Display statistics for the specified interface only.</p> <p>service-set <i>service-set-name</i>—(Optional) Display statistics for the specified service set only.</p> <p>summary—(Optional) Display summary of statistics on a per-interface basis.</p>
Required Privilege Level	view
List of Sample Output	show services cos statistics on page 33 show services cos statistics brief on page 34 show services cos statistics detail on page 34 show services cos statistics extensive on page 34
Output Fields	<p>Table 3 on page 32 describes the output fields for the show services cos statistics command. Output fields are listed in the approximate order in which they appear.</p>

Table 3: show services cos statistics Output Fields

Field Name	Field Description	Level of Output
Interface	Name of interface.	All levels
Service set	Name of service set.	All levels
DSCP	DiffServ code point bit pattern.	All levels
Packets in	Number of packets received.	All levels

Table 3: show services cos statistics Output Fields (*continued*)

Field Name	Field Description	Level of Output
Packets out	Number of packets transmitted.	All levels
Forwarding class	Forwarding class queue number.	All levels

Sample Output

show services cos statistics

```

user@host> show services cos statistics
Interface: sp-1/0/0, Service set: scos
DSCP          Packets in      Packets out
000000          0              0
000001          0              0
000010          0              0
000011          0              0
000100          0              0
000101          0              0
000110          0              0
000111          0              0
001000          0              0
001001          0              0
001010          0              0
001011          0              0
001100          0              0
001101          0              0
001110          0              0
001111          0              0
010000          0              0
010001          0              0
010010          0              0
010011          0              0
010100          0              0
010101          0              0
010110          0              0
010111          0              0
011000          0              0
011001          0              0
011010          0              0
011011          0              0
011100          0              0
011101          0              0
011110          0              0
011111          0              0
100000          0              0
100001          0              0
100010          0              0
100011          0              0
100100          0              0
100101          0              0
100110          0              0
100111          0              0
101000          0              0
101001          0              0
101010          0              0

```

101011	0	0
101100	0	0
101101	0	0
101110	0	0
101111	0	0
110000	0	0
110001	0	0
110010	0	0
110011	0	0
110100	0	0
110101	0	0
110110	0	0
110111	0	0
111000	0	0
111001	0	0
111010	0	0
111011	0	0
111100	0	0
111101	0	0
111110	0	0
111111	0	0
Forwarding class	Packets in	Packets out
0	0	0
1	0	0
2	0	0
3	0	0
4	0	0
5	0	0
6	0	0
7	0	0
8	0	0
9	0	0
10	0	0
11	0	0
12	0	0
13	0	0
14	0	0
15	0	0

`show services cos statistics brief`

The output for the **show services cos statistics brief** command is identical to that for the **show services cos statistics** command.

`show services cos statistics detail`

The output for the **show services cos statistics detail** command is identical to that for the **show services cos statistics** command.

`show services cos statistics extensive`

The output for the **show services cos statistics extensive** command is identical to that for the **show services cos statistics** command.

clear services cos statistics

Syntax	<code>clear services cos statistics</code> <code><interface <i>interface-name</i>></code> <code><service-set <i>service-set-name</i>></code>
Release Information	Command introduced in Junos OS Release 8.1.
Description	Clear statistics for class-of-service (CoS) code point bit patterns and forwarding classes as configured in CoS services for the AS PIC.
Options	none —Clear all services CoS statistics. interface <i>interface-name</i> —(Optional) Clear statistics for the specified interface only. service-set <i>service-set-name</i> —(Optional) Clear statistics for the specified service set only.
Required Privilege Level	view
List of Sample Output	clear services cos statistics on page 35
Output Fields	When you enter this command, you are provided feedback on the status of your request.

Sample Output

clear services cos statistics

```
user@host> clear services cos statistics
```


PART 4

Index

- [Index on page 39](#)

Index

Symbols

#, comments in configuration statements.....	x
(), in syntax descriptions.....	x
< >, in syntax descriptions.....	x
[], in configuration statements.....	x
{ }, in configuration statements.....	x
(pipe), in syntax descriptions.....	x

A

application-profile statement.....	15
usage guidelines.....	10
application-sets statement	
CoS.....	16
usage guidelines.....	8
applications statement	
CoS.....	16
usage guidelines.....	8

B

braces, in configuration statements.....	x
brackets	
angle, in syntax descriptions.....	x
square, in configuration statements.....	x

C

clear services cos statistics command.....	35
comments, in configuration statements.....	x
conventions	
text and syntax.....	ix
CoS	
action statements.....	9
applications.....	8
example configuration.....	11
match conditions.....	8
rules.....	12
CoS services	
clear statistics.....	35
mapping, displaying	
code point aliases to bit patterns.....	32
curly braces, in configuration statements.....	x

customer support.....	xi
contacting JTAC.....	xi

D

data statement.....	17
usage guidelines.....	10
destination-address statement	
CoS.....	17
usage guidelines.....	8
destination-prefix-list statement	
CoS.....	18
documentation	
comments on.....	xi
dscp statement.....	18
usage guidelines.....	9

F

font conventions.....	ix
forwarding classes, displaying.....	32
forwarding-class statement.....	19
usage guidelines.....	9
from statement	
CoS.....	19
usage guidelines.....	7
ftp statement.....	20
usage guidelines.....	10

M

manuals	
comments on.....	xi
match-direction statement	
CoS.....	20
usage guidelines.....	8

P

parentheses, in syntax descriptions.....	x
--	---

R

reflexive reverse statement.....	21
usage guidelines.....	11
rule statement	
CoS.....	22
usage guidelines.....	7
rule-set statement	
CoS.....	23
usage guidelines.....	12

S

services statement	
CoS.....	23
show services cos statistics command.....	32
sip statement	
usage guidelines.....	10
source-address statement	
CoS.....	24
usage guidelines.....	8
source-prefix-list statement	
CoS.....	24
support, technical See technical support	
syntax conventions.....	ix
syslog statement	
CoS.....	25
usage guidelines.....	9

T

technical support	
contacting JTAC.....	xi
term statement	
CoS.....	26
usage guidelines.....	7
then statement	
CoS.....	27
usage guidelines.....	7

V

video statement.....	27
usage guidelines.....	10
voice statement.....	28
usage guidelines.....	10