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Junos<sup>®</sup> OS

## CoS Features and Limitations on Services PICs

Release  
13.1



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Published: 2013-02-11

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13.1

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## Documentation and Release Notes

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## Supported Platforms

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

- T Series
- M Series
- MX Series

## Using the Examples in This Manual

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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
<b>Bold text like this</b>	Represents text that you type.	To enter configuration mode, type the <b>configure</b> command:  user@host> <b>configure</b>
Fixed-width text like this	Represents output that appears on the terminal screen.	user@host> <b>show chassis alarms</b> 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"> <li>Introduces or emphasizes important new terms.</li> <li>Identifies book names.</li> <li>Identifies RFC and Internet draft titles.</li> </ul>	<ul style="list-style-type: none"> <li>A policy <i>term</i> is a named structure that defines match conditions and actions.</li> <li><i>Junos OS System Basics Configuration Guide</i></li> <li>RFC 1997, <i>BGP Communities Attribute</i></li> </ul>
<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@# <b>set system domain-name</b> <i>domain-name</i>
<b>Text like this</b>	Represents names of configuration statements, commands, files, and directories; configuration hierarchy levels; or labels on routing platform components.	<ul style="list-style-type: none"> <li>To configure a stub area, include the <b>stub</b> statement at the [edit protocols ospf area area-id] hierarchy level.</li> <li>The console port is labeled <b>CONSOLE</b>.</li> </ul>
< > (angle brackets)	Enclose optional keywords or variables.	<b>stub &lt;default-metric metric&gt;;</b>
(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.	<b>broadcast   multicast</b>  <i>(string1   string2   string3)</i>
# (pound sign)	Indicates a comment specified on the same line as the configuration statement to which it applies.	<b>rsvp { # Required for dynamic MPLS only</b>
[ ] (square brackets)	Enclose a variable for which you can substitute one or more values.	<b>community name members [ community-ids ]</b>
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.	
<b>J-Web GUI Conventions</b>		
<b>Bold text like this</b>	Represents J-Web graphical user interface (GUI) items you click or select.	<ul style="list-style-type: none"> <li>In the Logical Interfaces box, select <b>All Interfaces</b>.</li> <li>To cancel the configuration, click <b>Cancel</b>.</li> </ul>
> (bold right angle bracket)	Separates levels in a hierarchy of J-Web selections.	In the configuration editor hierarchy, select <b>Protocols&gt;Ospf</b> .

## Documentation Feedback

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

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- 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:  
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- 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

- [CoS on Services PICs on page 3](#)



## CHAPTER 1

# CoS on Services PICs

- [Overview of CoS on Services PICs on page 3](#)
- [Output Packet Rewriting on page 5](#)
- [Multiservices PIC ToS Translation on page 5](#)
- [Fragmentation by Forwarding Class Overview on page 5](#)

## Overview of CoS on Services PICs

---

On Adaptive Services (AS) PICs and Multiservices PICs with **lsq-** interfaces, there are additional features you can configure. One such feature is an additional method of classifying traffic flows based on applications, for example stateful firewalls and network address translation (NAT).

Application-based traffic flow classification enables you to configure a rule-based service that provides DiffServ code point (DSCP) marking and forwarding-class assignments for traffic transiting the AS PIC. The service enables you to specify matching by application, application set, source, destination address, and match direction, and uses a similar structure to other rule-based services such as stateful firewall. The service actions allow you to associate the DSCP alias or value, forwarding-class name, system log activity, or a preconfigured application profile with the matched packet flows.



**NOTE:** If you configure a forwarding class map associating a forwarding class with a queue number, these maps are not supported on Multiservices link services intelligent queuing (**lsq-**) interfaces.

To configure class-of-service (CoS) features on the Adaptive Services PIC or Multiservices PIC, include the **cos** statement at the **[edit services]** 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;
  }
}
}
rule rule-name {
  match-direction (input | output | input-output);
  term term-name {
    from {
      application-sets [ set-names ];
      applications [ application-names ];
      destination-address (CoS) address;
      destination-address-range low minimum-value high maximum-value <except>;
      destination-prefix-list list-name <except>;
      source-address address;
      source-address-rangesource-address-range low minimum-value
        high maximum-value <except>;
      source-prefix-list list-name <except>;
    }
    then {
      application-profileprofile-name;
      dscp (alias | bits);
      forwarding-class class-name;
      syslog;
      (reflexive | reverse) {
        application-profile profile-name;
        dscp (alias | bits);
        forwarding-class class-name;
        syslog;
      }
    }
  }
}
}
rule-set rule-set-name {
  [ rule rule-names ];
}
}
```



## Output Packet Rewriting

On M Series routers, you can configure rewrite rules to change packet header information and attach it to an output interface. Because these rules can possibly overwrite the DSCP marking configured on the AS PIC, it is important to create system-wide configurations carefully.

For example, knowing that the AS PIC 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 rewrite rules in the output interface.
- Configure the output interface to include the most important mappings.

## Multiservices PIC ToS Translation

By default, all logical (**lsq-**) interfaces on a Multiservices PIC preserve the type-of-service (ToS) bits in an incoming packet header.

However, you can use the **translation-table** statement at the **[edit class-of-service]** hierarchy level to replace the arriving ToS bit pattern with a user-defined value.

This feature follows exactly the same configuration rules as the Enhanced IQ PIC. For configuration details, see Configuring ToS Translation Tables.

## Fragmentation by Forwarding Class Overview

For Adaptive Services (AS) Physical Interface Card (PIC) link services IQ (LSQ) and virtual LSQ redundancy (**rlsq-**) interfaces, you can specify fragmentation properties for specific forwarding classes. Traffic on each forwarding class can be either multilink fragmented or interleaved. By default, traffic in all forwarding classes is fragmented.

If you do not configure fragmentation properties for particular forwarding classes in multilink Point-to-Point Protocol (MLPPP) interfaces, the fragmentation threshold you set at the **[edit interfaces *interface-name* unit *logical-unit-number* fragment-threshold]** hierarchy level is used for all forwarding classes within the MLPPP interface. For multilink Frame Relay (MLFR) FRF.16 interfaces, the fragmentation threshold you set at the **[edit interfaces *interface-name* mlfr-uni-nni-bundle-options fragment-threshold]** hierarchy level is used for all forwarding classes within the MLFR FRF.16 interface. If you do not set a maximum fragment size anywhere in the configuration, packets are still fragmented if they exceed the smallest maximum transmission unit (MTU) of all the links in the bundle.

To configure fragmentation by forwarding class, include the following statements at the **[edit class-of-service]** hierarchy level:

```
[edit class-of-service]
fragmentation-maps {
  map-name {
    forwarding-class class-name {
```

```
    drop-timeout milliseconds;  
    fragment-threshold bytes;  
    multilink-class number;  
    no-fragmentation;  
  }  
}  
}  
interfaces {  
  interface-name {  
    unit logical-unit-number {  
      fragmentation-map map-name;  
    }  
  }  
}
```

**Related  
Documentation**

- [Configuring Fragmentation by Forwarding Class on page 19](#)
- [Associating a Fragmentation Map with an MLPPP Interface or MLFR FRF.16 DLCI on page 21](#)
- [Example: Configuring Fragmentation by Forwarding Class on page 20](#)
- [Example: Configuring Drop Timeout Interval by Forwarding Class on page 21](#)
- [fragmentation-map on page 28](#)
- [fragmentation-maps on page 29](#)

## PART 2

# Configuration

- [CoS Rule Configuration on page 9](#)
- [CoS Configuration on Multiservices PICs on page 17](#)
- [CoS Configuration on Adaptive Services PICs on page 19](#)
- [Configuration Statements on page 23](#)



## CHAPTER 2

# CoS Rule Configuration

- [Configuring CoS Rules on page 9](#)
- [Configuring CoS Rule Sets on page 13](#)
- [Example: Configuring CoS Rules on page 14](#)

## 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-names ];
      applications [ application-names ];
      destination-address (CoS) address;
      destination-address-range low minimum-value high maximum-value <except>;
      destination-prefix-list list-name <except>;
      source-address address;
      source-address-range source-address-range low minimum-value high maximum-value
        <except>;
      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.

In addition, 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 Services PIC. When a packet is sent to the Services 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 Services 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 Services PIC, the packet direction is **output**. For more information on inside and outside interfaces, see the Junos Services Interfaces Configuration Release 12.3.

On the Services 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.

The following sections describe CoS rule content in more detail:

- [Configuring Match Conditions in a CoS Rule on page 10](#)
- [Configuring Actions in a CoS Rule on page 11](#)

## Configuring Match Conditions in a CoS Rule

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

```
[edit services cos rule rule-name term term-name]
from {
  application-sets [ set-names ];
  applications [ application-names ];
  destination-address (CoS) address;
  destination-address-range low minimum-value high maximum-value <except>;
  destination-prefix-list list-name <except>;
  source-address address;
  source-address-range source-address-range low minimum-value high maximum-value
  <except>;
```

```

    source-prefix-list list-name <except>;
}

```

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 Firewall Filters Configuration Guide.

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 that you have configured at the **[edit applications]** hierarchy level; for more information, see the Junos Services Interfaces Configuration Release 12.3.

- 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 a statement 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 a CoS Rule

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**—Marks the packet with the specified DiffServ code point (DSCP) value or alias.
- **forwarding-class**—Assigns the packet to the specified forwarding class.

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 on page 12](#)
- [Configuring Reflexive and Reverse CoS Actions on page 13](#)

---

### Configuring Application Profiles

---

You can optionally define one or more application profiles for inclusion in CoS actions. To configure, 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 Actions

It is important to understand that 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. The difference is that a forward, reverse, or forward-and-reverse CoS action is associated with each flow. You should bear in mind that the flow in the opposite direction might end up having a CoS action associated with it, which you have not specifically configured.

To control the direction in which service is applied, separate from the direction in which the rule match is applied, you can configure the **reflexive** or **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. If nothing is specified, data flows inherit the CoS behavior of the forward control flow.

- **reflexive** causes the equivalent reverse 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.

## 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. You then specify the order of the rules by including the **rule-set** statement at the **[edit services cos]** hierarchy level:

```
[edit services cos]
rule-set rule-set-name {
  rule rule-name1;
  rule rule-name2;
  rule rule-name3;
  ...
}
```

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 match the packet, the packet is dropped by default.

## 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 {
  application-profile cosprofile {
    ftp {
      data {
        dscp af11;
        forwarding-class 1;
      }
    }
  }
  application-profile cosrevprofile {
    ftp {
      data {
        dscp af22;
      }
    }
  }
  rule cosrule {
    match-direction input;
    term costerm {
      from {
        source-address {
          any-unicast;
        }
        applications junos-ftp;
      }
      then {
        dscp af33;
        forwarding-class 3;
        application-profile cosprofile;
        reverse {
          dscp af43;
          application-profile cosrevprofile;
        }
      }
    }
  }
}
stateful-firewall {
  rule r1 {
    match-direction input;
    term t1 {
      from {
        application-sets junos-algs-outbound;
      }
      then {
        accept;
      }
    }
  }
}
```

```
    }  
    term t2 {  
      then {  
        accept;  
      }  
    }  
  }  
  service-set test {  
    stateful-firewall-rules r1;  
    cos-rules cosrule;  
    interface-service {  
      service-interface sp-1/3/0;  
    }  
  }  
}
```



## CHAPTER 3

# CoS Configuration on Multiservices PICs

- [Allocating Excess Bandwidth Among Frame Relay DLCIs on Multiservices PICs on page 17](#)

### Allocating Excess Bandwidth Among Frame Relay DLCIs on Multiservices PICs

---

By default, all logical (**lsq-**) interfaces on a Multiservices PIC share bandwidth equally in the excess region (that is, bandwidth available once these interfaces have exhausted their committed information rate (CIR)).

However, you can include the **excess-rate** statement to control an independent set of parameters for bandwidth sharing in the excess region of a frame relay data-link connection identifier (DLCI) on a Multiservices PIC. Include the **excess-rate** statement at the **[edit class-of-service traffic-control-profile *traffic-control-profile-name*]** hierarchy level.

```
[edit class-of-service traffic-control-profile traffic-control-profile-name]  
excess-rate percent percentage;
```

There are several limitations to this feature:

- The excess bandwidth comes from bandwidth not used by any DLCIs (that is, bandwidth above the CIR). Therefore, only FRF.16 is supported.
- Only CIR mode is supported (you must configure a CIR on at least one DLCI).
- Only the **percent** option is supported for **lsq-** interfaces. The **priority** option is not supported for DLCIs.
- You cannot configure this feature if you also include one of the following statements in the configuration:
  - **scheduler-map**
  - **shaping-rate**
  - **adaptive-shaper** (valid on J Series Services Routers only)
  - **virtual-channel-group** (valid on J Series Services Routers only)
- If you oversubscribe the DLCIs, then the bandwidth can only be distributed equally.

- The **excess-priority** statement is not supported. However, for consistency, this statement will not result in a commit error.
- This feature is only supported on the Multiservices 100, Multiservices 400, and Multiservices 500 PICs.

This example configures excess bandwidth sharing in the ratio of 70 to 30 percent for two frame relay DLCIs. Only FRF.16 interfaces are supported.

#### Configuring the Frame Relay DLCIs

You must configure the per-unit scheduler.

```
[edit interfaces]
lsq-1/3/0:0 {
  per-unit-scheduler;
  unit 0 {
    dlc1 100;
  }
  unit 1 {
    dlc1 200;
  }
}
```

#### Configuring the Traffic Control Profile

Only the **percent** option is supported.

```
[edit class-of-service]
traffic-control-profiles {
  tc_70 {
    excess-rate percent 70;
  }
  tc_30 {
    excess-rate percent 30;
  }
}
```

#### Applying the Traffic Control Profiles

Only FRF.16 is supported.

```
[edit interfaces]
lsq-1/3/0 {
  unit 0 {
    output-traffic-control-profile tc_70;
  }
  unit 1 {
    output-traffic-control-profile tc_30;
  }
}
```

## CHAPTER 4

# CoS Configuration on Adaptive Services PICs

- [Configuring Fragmentation by Forwarding Class on page 19](#)
- [Example: Configuring Fragmentation by Forwarding Class on page 20](#)
- [Associating a Fragmentation Map with an MLPPP Interface or MLFR FRF.16 DLCI on page 21](#)
- [Example: Configuring Drop Timeout Interval by Forwarding Class on page 21](#)

### Configuring Fragmentation by Forwarding Class

---

For AS PIC link services IQ (lsq-) interfaces only, you can configure fragmentation properties on a particular forwarding class. To do this, include the **fragmentation-maps** statement at the **[edit class-of-service]** hierarchy level:

```
[edit class-of-service]
fragmentation-maps {
  map-name {
    forwarding-class class-name {
      drop-timeout milliseconds;
      fragment-threshold bytes;
      multilink-class number;
      no-fragmentation;
    }
  }
}
```

To set a per-forwarding class fragmentation threshold, include the **fragment-threshold** statement in the fragmentation map. This statement sets the maximum size of each multilink fragment.

To set traffic on a particular forwarding class to be interleaved rather than fragmented, include the **no-fragmentation** statement in the fragmentation map. This statement specifies that an extra fragmentation header is not prepended to the packets received on this queue and that static link load balancing is used to ensure in-order packet delivery.

To change the resequencing interval for each fragmentation class, include the **drop-timeout** statement in the forwarding class. The interval is in milliseconds, and the default is 500 ms for link speeds of T1 or greater and 1500 ms for links slower than T1

speeds. You must also include a **multilink-class** value for resequencing fragments. If you include these statements, you cannot configure **no-fragmentation** for the forwarding class; they are mutually exclusive.

For a given forwarding class, include either the **fragment-threshold** or **no-fragmentation** statement; they are mutually exclusive.

**Related  
Documentation**

- [Fragmentation by Forwarding Class Overview on page 5](#)
- [Associating a Fragmentation Map with an MLPPP Interface or MLFR FRF.16 DLCI on page 21](#)
- [Example: Configuring Fragmentation by Forwarding Class on page 20](#)
- [Example: Configuring Drop Timeout Interval by Forwarding Class on page 21](#)
- [fragmentation-map on page 28](#)
- [fragmentation-maps on page 29](#)

---

## Example: Configuring Fragmentation by Forwarding Class

---

Configure two logical units on an LSQ interface. The logical units use two different fragmentation maps.

```
class-of-service {
  interfaces {
    lsq-1/0/0 {
      unit 1 {
        fragmentation-map frag-map-A;
      }
      unit 2 {
        fragmentation-map frag-map-B;
      }
    }
  }
  fragmentation-maps {
    frag-map-A {
      forwarding-class {
        AF {
          no-fragmentation;
        }
        EF {
          no-fragmentation;
        }
        BE {
          fragment-threshold 100;
        }
      }
    }
    frag-map-B {
      forwarding-class {
        EF {
          fragment-threshold 200;
        }
      }
    }
  }
}
```



```

    BE {
        fragment-threshold 200;
    }
    AF {
        fragment-threshold 200;
    }
}
}
}
}

```

## Associating a Fragmentation Map with an MLPPP Interface or MLFR FRF.16 DLCI

To associate a fragmentation map with an MLPPP interface or MLFR FRF.16 DLCI, include the **fragmentation-map** statement at the **[edit class-of-service interfaces *interface-name* unit *logical-unit-number*]** hierarchy level:

```

[edit class-of-service interfaces]
lsq-fpc/pic/port {
    unit logical-unit-number { # Multilink PPP
        fragmentation-map map-name;
    }
    lsq-fpc/pic/port:channel { # MLFR FRF.16
        unit logical-unit-number {
            fragmentation-map map-name;
        }
    }
}

```

For configuration examples, see the Junos Services Interfaces Configuration Release 12.3.

## Example: Configuring Drop Timeout Interval by Forwarding Class

For **LSQ** interfaces configured for multiclass MLPPP, you can change the drop timeout interval that the interface waits for fragment resequencing by forwarding class. This feature is mutually exclusive with the **no-fragmentation** statement configured for a forwarding class.

You can also disable the fragment resequencing function altogether by forwarding class. You do this by setting the **drop-timeout** interval to 0.

The **drop-timeout** interval can also be set at the bundle level. When the **drop-timeout** interval is set to 0 at the bundle level, *none* of the individual classes forward fragmented packets. Sequencing is ignored also, and packets are forwarded in the order in which they were received. The **drop-timeout** interval value configured at the bundle level overrides the values configured at the class level.

This example configures a logical unit on an LSQ interface with a fragmentation map setting different drop timeout values for each forwarding class:

- Best effort (BE)—The value of 0 means that no resequencing of fragments takes place for BE traffic.
- Expedited Forwarding (EF)—The value of 800 ms means that the multiclass MLPPP waits 800 ms for fragment to arrive on the link for EF traffic.

- Assured Forwarding (AF)—The absence of the timeout statements means that the default timeouts of 500 ms for links at T1 and higher speeds and 1500 ms for lower speeds are in effect for AF traffic.
- Network Control (NC)—The value of 100 ms means that the multiclass MLPPP waits 100 ms for fragment to arrive on the link for NC traffic.

```
class-of-service {
  interfaces {
    lsq-1/0/0 {
      unit 1 {
        fragmentation-map Timeout_Frag_Map;
      }
    }
  }
  fragmentation-maps {
    Timeout_Frag_Map {
      forwarding-class {
        BE {
          drop-timeout 0; # No resequencing of fragments for this class
          multilink-class 3;
          fragment-threshold 128;
        }
        EF {
          drop-timeout 800; # Timer set to 800 milliseconds for this class
          multilink-class 2;
        }
        AF {
          multilink-class 1;
          fragment-threshold 256; # Default timeout in effect for this class
        }
        NC {
          drop-timeout 100; # Timer set to 100 milliseconds for this class
          multilink-class 0;
          fragment-threshold 512;
        }
      }
    }
  }
}
```

## CHAPTER 5

# 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 CoS Rules

## application-sets (Services CoS)

---

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

## applications (Services CoS)

---

<b>Syntax</b>	<code>applications [ <i>application-name</i> ];</code>
<b>Hierarchy Level</b>	[edit services cos rule <i>rule-name</i> term <i>term-name</i> from]
<b>Release Information</b>	Statement introduced in Junos OS Release 8.1.
<b>Description</b>	Define one or more applications to which the CoS services apply.
<b>Options</b>	<i>application-name</i> —Name of the target application.
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"><li>• <a href="#">Configuring Match Conditions in a CoS Rule on page 10</a></li><li>• <a href="#">Configuring CoS Rules</a></li></ul>

## data (FTP)

---

<b>Syntax</b>	data { dscp ( <i>alias</i>   <i>bits</i> ); forwarding-class <i>class-name</i> ; }
<b>Hierarchy Level</b>	[edit services cos <a href="#">application-profile</a> <i>profile-name</i> ftp]
<b>Release Information</b>	Statement introduced in Junos OS Release 9.3.
<b>Description</b>	Set the appropriate <b>dscp</b> and <b>forwarding-class</b> value for FTP data.
<b>Default</b>	By default, the system will not alter the DSCP or forwarding class for FTP data traffic.
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li>• <a href="#">Configuring Application Profiles on page 12</a></li> <li>• <a href="#">video (Application Profile) on page 42</a></li> <li>• <a href="#">voice (Application Profile) on page 42</a></li> </ul>

## destination-address (CoS)

---

<b>Syntax</b>	destination-address ( <i>address</i>   any-unicast) <except>;
<b>Hierarchy Level</b>	[edit services cos rule <i>rule-name</i> term <i>term-name</i> from]
<b>Release Information</b>	Statement introduced in Junos OS Release 8.1. <b>address</b> option enhanced to support IPv4 and IPv6 addresses in Junos OS Release 8.5.
<b>Description</b>	Specify the destination address for rule matching.
<b>Options</b>	<b>address</b> —Destination IPv4 or IPv6 address or prefix value.
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li>• <a href="#">Configuring Match Conditions in a CoS Rule on page 10</a></li> <li>• <a href="#">Configuring CoS Rules</a></li> </ul>

## drop-timeout (Forwarding Class)

---

<b>Syntax</b>	<code>drop-timeout <i>milliseconds</i>;</code>
<b>Hierarchy Level</b>	[edit class-of-service <a href="#">fragmentation-map</a> <i>map-name</i> <a href="#">forwarding-class</a> <i>class-name</i> ]
<b>Release Information</b>	Statement introduced in Junos OS Release 8.2.
<b>Description</b>	Disable or set the resequencing timeout interval for each forwarding class of a multiclass MLPPP.
<b>Default</b>	If you do not include this statement, the default sequencing timeouts for T1 speeds (500 ms) or lower (1500 ms) apply.
<b>Options</b>	<b><i>milliseconds</i></b> —Time to wait for fragments. A value of 0 disables the resequencing logic for that forwarding class. <b>Range:</b> 0 through 500 milliseconds for bundles with bandwidths or T1 speeds or higher or 1500 ms for bundles with bandwidths of less than T1 speeds.
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"><li>• <a href="#">Example: Configuring Drop Timeout Interval by Forwarding Class on page 21</a></li></ul>

## dscp (AS PIC Classifiers)

---

<b>Syntax</b>	<code>dscp (<i>alias</i>   <i>bits</i>);</code>
<b>Hierarchy Level</b>	[edit services cos <a href="#">application-profile</a> <i>profile-name</i> ( <a href="#">ftp</a>   <a href="#">sip</a> ) ( <a href="#">data</a>   <a href="#">video</a>   <a href="#">voice</a> )], [edit services cos rule <i>rule-name</i> term <i>term-name</i> <a href="#">then</a> ], [edit services cos rule <i>rule-name</i> term <i>term-name</i> then ( <a href="#">reflexive</a>   <a href="#">reverse</a> )]
<b>Release Information</b>	Statement introduced in Junos OS Release 8.1.
<b>Description</b>	Define the Differentiated Services code point (DSCP) mapping that is applied to the packets.
<b>Options</b>	<b><i>alias</i></b> —Name assigned to a set of CoS markers. <b><i>bits</i></b> —Mapping value in the packet header.
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"><li>• <a href="#">Configuring Actions in a CoS Rule on page 11</a></li></ul>

## forwarding-class (AS PIC Classifiers)

<b>Syntax</b>	<code>forwarding-class <i>class-name</i>;</code>
<b>Hierarchy Level</b>	[edit services cos application-profile <i>profile-name</i> ( <code>ftp</code>   <code>sip</code> ) ( <code>data</code>   <code>video</code>   <code>voice</code> )], [edit services cos rule <i>rule-name</i> term <i>term-name</i> <code>then</code> ], [edit services cos rule <i>rule-name</i> term <i>term-name</i> <code>then</code> ( <code>reflexive</code>   <code>reverse</code> )]
<b>Release Information</b>	Statement introduced in Junos OS Release 8.1.
<b>Description</b>	Define the forwarding class to which packets are assigned.
<b>Options</b>	<i>class-name</i> —Name of the target application.
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li>• <a href="#">Configuring Actions in a CoS Rule on page 11</a></li> </ul>

## forwarding-class (Fragmentation)

<b>Syntax</b>	<pre>forwarding-class <i>class-name</i> {   drop-timeout <i>milliseconds</i>;   fragment-threshold <i>bytes</i>;   multilink-class <i>number</i>;   no-fragmentation; }</pre>
<b>Hierarchy Level</b>	[edit class-of-service <code>fragmentation-maps</code> <i>map-name</i> ];
<b>Release Information</b>	Statement introduced before Junos OS Release 7.4.
<b>Description</b>	<p>For AS PIC link services IQ interfaces (<b>lsq</b>) only, define a forwarding class name and associated fragmentation properties within a fragmentation map.</p> <p>The <b>fragment-threshold</b> and <b>no-fragmentation</b> statements are mutually exclusive.</p>
<b>Default</b>	If you do not include this statement, the traffic in forwarding class <i>class-name</i> is fragmented.
<b>Options</b>	<p><i>class-name</i>—Name of the forwarding class.</p> <p>The remaining statements are explained separately.</p>
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li>• <a href="#">Configuring Fragmentation by Forwarding Class on page 19</a></li> </ul>

## fragmentation-map

---

<b>Syntax</b>	<code>fragmentation-map <i>map-name</i>;</code>
<b>Hierarchy Level</b>	[edit class-of-service interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ]
<b>Release Information</b>	Statement introduced before Junos OS Release 7.4.
<b>Description</b>	For AS PIC link services IQ ( <b>lsq</b> ) and virtual LSQ redundancy ( <b>rlsq</b> ) interfaces, associate a fragmentation map with a multilink PPP interface or MLFR FRF.16 DLCI.
<b>Default</b>	If you do not include this statement, traffic in all forwarding classes is fragmented.
<b>Options</b>	<i>map-name</i> —Name of the fragmentation map.
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"><li>• <a href="#">Fragmentation by Forwarding Class Overview on page 5</a></li><li>• <a href="#">Configuring Fragmentation by Forwarding Class on page 19</a></li><li>• <a href="#">Associating a Fragmentation Map with an MLPPP Interface or MLFR FRF.16 DLCI on page 21</a></li><li>• <a href="#">Example: Configuring Fragmentation by Forwarding Class on page 20</a></li><li>• <a href="#">Example: Configuring Drop Timeout Interval by Forwarding Class on page 21</a></li><li>• <a href="#">fragmentation-maps on page 29</a></li></ul>



## fragmentation-maps

<b>Syntax</b>	<pre> fragmentation-maps {   map-name {     forwarding-class class-name {       drop-timeout milliseconds;       fragment-threshold bytes;       multilink-class number;       no-fragmentation;     }   } } </pre>
<b>Hierarchy Level</b>	[edit class-of-service]
<b>Release Information</b>	Statement introduced before Junos OS Release 7.4.
<b>Description</b>	For AS PIC link services IQ ( <b>lsq</b> ) and virtual LSQ redundancy ( <b>rlsq</b> ) interfaces, define fragmentation properties for individual forwarding classes.
<b>Default</b>	If you do not include this statement, traffic in all forwarding classes is fragmented.
<b>Options</b>	<p><b>map-name</b>—Name of the fragmentation map.</p> <p>The remaining statements are explained separately.</p>
<b>Required Privilege Level</b>	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li>• <a href="#">Fragmentation by Forwarding Class Overview on page 5</a></li> <li>• <a href="#">Configuring Fragmentation by Forwarding Class on page 19</a></li> <li>• <a href="#">Associating a Fragmentation Map with an MLPPP Interface or MLFR FRF.16 DLCI on page 21</a></li> <li>• <a href="#">Example: Configuring Fragmentation by Forwarding Class on page 20</a></li> <li>• <a href="#">Example: Configuring Drop Timeout Interval by Forwarding Class on page 21</a></li> <li>• <a href="#">fragmentation-map on page 28</a></li> </ul>

## from

---

<b>Syntax</b>	<pre>from {   applications [ <i>application-name</i> ];   application-sets [ <i>set-name</i> ];   destination-address (CoS) <i>address</i>;   source-address <i>address</i>; }</pre>
<b>Hierarchy Level</b>	[edit services cos rule <i>rule-name</i> <b>term</b> <i>term-name</i> ]
<b>Release Information</b>	Statement introduced in Junos OS Release 8.1.
<b>Description</b>	Specify input conditions for a CoS term.
<b>Options</b>	The remaining statements are explained separately.
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"><li>• <a href="#">Configuring CoS Rule Sets on page 13</a></li></ul>

## ftp (Class-Of-Service)

---

<b>Syntax</b>	<pre>ftp {   data {     dscp (<i>alias</i>   <i>bits</i>);     forwarding-class <i>class-name</i>;   } }</pre>
<b>Hierarchy Level</b>	[edit services cos <b>application-profile</b> <i>profile-name</i> ftp]
<b>Release Information</b>	Statement introduced in Junos OS Release 9.3.
<b>Description</b>	Set the appropriate <b>dscp</b> and <b>forwarding-class</b> value for FTP.
<b>Default</b>	By default, the system does not alter the DSCP or forwarding class for FTP traffic.
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"><li>• <a href="#">Configuring Application Profiles on page 12</a></li><li>• <a href="#">sip (Application Profile) on page 37</a></li></ul>

## interfaces

```
Syntax  interfaces {
    interface-name {
        classifiers{
            dscp(classifier-name | default) {
            }
            ieee-802.1 (classifier-name | default) vlan-tag (inner | outer | classifier-name);
            inet-precedence (rewrite-name | default);
        }
        input-scheduler-map map-name;
        input-shaping-rate rate;
        irb {
            unit logical-unit-number {
                classifiers {
                    type (classifier-name | default);
                }
                rewrite-rules {
                    dscp (rewrite-name | default);
                    dscp-ipv6 (rewrite-name | default);
                    exp (rewrite-name | default) protocol protocol-types;
                    ieee-802.1 (rewrite-name | default) vlan-tag (outer | outer-and-inner);
                    inet-precedence (rewrite-name | default);
                }
            }
        }
        member-link-scheduler (replicate | scale);
        rewrite-rules {
            dscp (rewrite-name | default);
            ieee-802.1 (rewrite-name | default) vlan-tag (outer);
            inet-precedence (rewrite-name | default);
        }
        scheduler-map map-name;
        scheduler-map-chassis map-name;
        shaping-rate rate;
        unit logical-unit-number {
            classifiers {
                type (classifier-name | default) family (mpls | inet);
            }
            forwarding-class class-name;
            fragmentation-map map-name;
            input-shaping-rate (percent percentage | rate);
            input-traffic-control-profile profile-name shared-instance instance-name;
            output-traffic-control-profile profile-name shared-instance instance-name;
            per-session-scheduler;
            rewrite-rules {
                dscp (rewrite-name | default);
                dscp-ipv6 (rewrite-name | default);
                exp (rewrite-name | default) protocol protocol-types;
                exp-push-push-push default;
                exp-swap-push-push default;
                ieee-802.1 (rewrite-name | default) vlan-tag (outer | outer-and-inner);
                inet-precedence (rewrite-name | default);
            }
        }
    }
}
```

```

    }
    scheduler-map map-name;
    shaping-rate rate;
    translation-table (to-dscp-from-dscp | to-dscp-ipv6-from-dscp-ipv6 | to-exp-from-exp
    | to-inet-precedence-from-inet-precedence) table-name;
  }
}
interface-set interface-set-name {
  excess-bandwidth-share;
  internal-node;
  output-traffic-control-profile profile-name;
  output-traffic-control-profile-remaining profile-name;
}
}

```

**Hierarchy Level** [edit class-of-service]

**Release Information** Statement introduced before Junos OS Release 7.4.  
Interface-set level added in Junos OS Release 8.5.

**Description** Configure interface-specific CoS properties for incoming packets.



**NOTE:** The `dscp-ipv6` and `ieee-802.1ad` classifier types are not supported on ACX Series routers. For further information about support on ACX Series routers, see [Understanding CoS CLI Configuration Statements on ACX Series Universal Access Routers](#).

**Options** 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**

- Overview of BA Classifier Types
- Configuring Rewrite Rules
- Understanding CoS CLI Configuration Statements on ACX Series Universal Access Routers

## match-direction

<b>Syntax</b>	<code>match-direction (input   output   input-output);</code>
<b>Hierarchy Level</b>	<code>[edit services cos rule <i>rule-name</i>]</code>
<b>Release Information</b>	Statement introduced in Junos OS Release 8.1.
<b>Description</b>	Specify the direction in which the rule match is applied.
<b>Options</b>	<p><b>input</b>—Apply the rule match on the input side of the interface.</p> <p><b>output</b>—Apply the rule match on the output side of the interface.</p> <p><b>input-output</b>—Apply the rule match bidirectionally.</p>
<b>Required Privilege Level</b>	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li>• <a href="#">Configuring CoS Rules on page 9</a></li> </ul>

## multilink-class

<b>Syntax</b>	<code>multilink-class <i>number</i>;</code>
<b>Hierarchy Level</b>	<code>[edit class-of-service <a href="#">fragmentation-maps</a> <i>map-name</i> <a href="#">forwarding-class</a> <i>class-name</i>]</code>
<b>Release Information</b>	Statement introduced before Junos OS Release 7.4.
<b>Description</b>	<p>For link services IQ (<b>lsq</b>) interfaces only, map a forwarding class into a multiclass MLPPP (MCML).</p> <p>The <b>multilink-class</b> statement and <b>no-fragmentation</b> statements are mutually exclusive.</p>
<b>Options</b>	<p><b>number</b>—The multilink class assigned to this forwarding class.</p> <p><b>Range:</b> 0 through 7</p> <p><b>Default:</b> None</p>
<b>Required Privilege Level</b>	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li>• Configuring CoS Fragmentation by Forwarding Class on LSQ Interfaces</li> <li>• Configuring Multiclass MLPPP on LSQ Interfaces</li> <li>• <a href="#">Configuring Fragmentation by Forwarding Class on page 19</a></li> <li>• Junos Services Interfaces Configuration Release 12.3</li> <li>• multilink-max-classes on page 306</li> </ul>

## no-fragmentation

---

<b>Syntax</b>	no-fragmentation;
<b>Hierarchy Level</b>	[edit class-of-service fragmentation-maps forwarding-class <i>class-name</i> ]
<b>Release Information</b>	Statement introduced before Junos OS Release 7.4.
<b>Description</b>	<p>For link services IQ (<b>lsq</b>) interfaces only, set traffic on a particular forwarding class to be interleaved, rather than fragmented. This statement specifies that no extra fragmentation header is prepended to the packets received on this queue and that static-link load balancing is used to ensure in-order packet delivery.</p> <p>Static-link load balancing is done based on packet payload. For IP version 4 (IPv4) and IP version 6 (IPv6) traffic, the link is chosen based on a hash computed from the source address, destination address, and protocol. If the IP payload is Transmission Control Protocol (TCP) or User Datagram Protocol (UDP) traffic, the hash also includes source port and destination port. For MPLS traffic, the hash includes all MPLS labels and fields in the payload, whether the MPLS payload is IPv4 or IPv6.</p>
<b>Default</b>	If you do not include this statement, the traffic in forwarding class <i>class-name</i> is fragmented.
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"><li>Configuring CoS Fragmentation by Forwarding Class on LSQ Interfaces</li></ul>

## (reflexive | reverse)

---

<b>Syntax</b>	<pre>(reflexive   reverse) {   application-profile <i>profile-name</i>;   dscp (<i>alias</i>   <i>bits</i>);   forwarding-class <i>class-name</i>;   syslog; }</pre>
<b>Hierarchy Level</b>	[edit services cos rule <i>rule-name</i> term <i>term-name</i> <a href="#">then</a> ]
<b>Release Information</b>	Statement introduced in Junos OS Release 8.1.
<b>Description</b>	<p><b>reflexive</b>—Applies the equivalent opposing CoS action to flows in the opposite direction.</p> <p><b>reverse</b>—Allows you to define CoS behavior for flows in the reverse direction.</p> <p>The remaining statements are explained separately.</p>
<b>Required Privilege Level</b>	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
<b>Related Documentation</b>	<ul style="list-style-type: none"><li>• <a href="#">Configuring CoS Rules on page 9</a></li><li>• <a href="#">Configuring Reflexive and Reverse CoS Rule Actions</a></li></ul>

## rule

---

Syntax	<pre>rule rule-name {   match-direction (input   output   input-output);   term term-name {     from {       applications [ application-names ];       application-sets [ set-names ];       destination-address (CoS) address;       source-address address;     }     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 <b>rule-set</b> 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	<b>rule-name</b> —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"><li>• <a href="#">Configuring CoS Rules on page 9</a></li></ul>



## rule-set (Services CoS)

<b>Syntax</b>	<code>rule-set <i>rule-set-name</i> { [ rule <i>rule-name</i> ]; }</code>
<b>Hierarchy Level</b>	[edit services cos]
<b>Release Information</b>	Statement introduced in Junos OS Release 8.1.
<b>Description</b>	Specify the rule set the router uses when applying this service.
<b>Options</b>	<i>rule-set-name</i> —Identifier for the collection of rules that constitute this rule set.
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li>• <a href="#">Configuring CoS Rule Sets on page 13</a></li> </ul>

## sip (Application Profile)

<b>Syntax</b>	<code>sip {   video {     dscp (<i>alias</i>   <i>bits</i>);     forwarding-class <i>class-name</i>;   }   voice {     dscp (<i>alias</i>   <i>bits</i>);     forwarding-class <i>class-name</i>;   } }</code>
<b>Hierarchy Level</b>	[edit services cos <b>application-profile</b> <i>profile-name</i> ]
<b>Release Information</b>	Statement introduced in Junos OS Release 9.3.
<b>Description</b>	Set the appropriate <b>dscp</b> and <b>forwarding-class</b> value for SIP traffic.
<b>Default</b>	By default, the system will not alter the DSCP or forwarding class for SIP traffic.
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li>• <a href="#">Configuring Application Profiles on page 12</a></li> <li>• <a href="#">ftp (Class-Of-Service) on page 30</a></li> </ul>

## source-address (Services CoS)

---

<b>Syntax</b>	source-address <i>address</i> ;
<b>Hierarchy Level</b>	[edit services cos rule <i>rule-name</i> term <i>term-name</i> from]
<b>Release Information</b>	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.
<b>Description</b>	Source address for rule matching.
<b>Options</b>	<i>address</i> —Source IPv4 or IPv6 address or prefix value.
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"><li>• <a href="#">Configuring Match Conditions in a CoS Rule on page 10</a></li><li>• <a href="#">Configuring Match Conditions In CoS Rules</a></li></ul>

## syslog (Services CoS)

---

<b>Syntax</b>	syslog;
<b>Hierarchy Level</b>	[edit services cos rule <i>rule-name</i> term <i>term-name</i> <a href="#">then</a> ], [edit services cos rule <i>rule-name</i> term <i>term-name</i> <a href="#">then (reflexive   reverse)</a> ]
<b>Release Information</b>	Statement introduced in Junos OS Release 8.1.
<b>Description</b>	Enable system logging. The system log information from the Adaptive Services or Multiservices PIC is passed to the kernel for logging in the <code>/var/log</code> directory. This setting overrides any <b>syslog</b> statement setting included in the service set or interface default configuration.
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"><li>• <a href="#">Configuring Actions in a CoS Rule on page 11</a></li><li>• <a href="#">Configuring Actions in CoS Rules</a></li></ul>

## term (AS PIC Classifiers)

```
Syntax  term term-name {
        from {
            applications [ application-names ];
            application-sets [ set-names ];
            destination-address (CoS) address;
            source-address address;
        }
        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 9](#)

## then

---

**Syntax**    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* term *term-name*]

**Release Information**    Statement introduced in Junos OS Release 8.1.

**Description**    Define the CoS term actions.

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 Actions in a CoS Rule on page 11](#)
- Configuring Actions in CoS Rules

## unit

**Syntax** `unit logical-unit-number {`  
     `classifiers {`  
         `type (classifier-name | default) family (mpls | all);`  
     `}`  
     `forwarding-class class-name;`  
     `fragmentation-map map-name;`  
     `input-traffic-control-profile profile-name shared-instance instance-name;`  
     `output-traffic-control-profile profile-name shared-instance instance-name;`  
     `per-session-scheduler;`  
     `rewrite-rules {`  
         `dscp (rewrite-name | default);`  
         `dscp-ipv6 (rewrite-name | default);`  
         `exp (rewrite-name | default) protocol protocol-types;`  
         `exp-push-push-push default;`  
         `exp-swap-push-push default;`  
         `ieee-802.1 (rewrite-name | default) vlan-tag (outer | outer-and-inner);`  
         `inet-precedence (rewrite-name | default);`  
     `}`  
     `scheduler-map map-name;`  
     `shaping-rate rate;`  
`}`

**Hierarchy Level** [edit class-of-service [interfaces](#) *interface-name*]

**Release Information** Statement introduced before Junos OS Release 7.4.

**Description** Configure a logical interface on the physical device. You must configure a logical interface to be able to use the physical device.

**Options** *logical-unit-number*—Number of the logical unit.

**Range:** 0 through 16,384

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**

- Overview of BA Classifier Types
- Configuring Rewrite Rules

## video (Application Profile)

---

<b>Syntax</b>	<pre>video {     dscp (alias   bits);     forwarding-class class-name; }</pre>
<b>Hierarchy Level</b>	[edit services cos <a href="#">application-profile</a> <i>profile-name</i> sip]
<b>Release Information</b>	Statement introduced in Junos OS Release 9.3.
<b>Description</b>	Set the appropriate <b>dscp</b> and <b>forwarding-class</b> values for SIP video traffic.
<b>Default</b>	By default, the system will not alter the DSCP or forwarding class for SIP video traffic.
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"><li>• <a href="#">Configuring Application Profiles on page 12</a></li><li>• <a href="#">voice (Application Profile) on page 42</a></li></ul>

## voice (Application Profile)

---

<b>Syntax</b>	<pre>voice {     dscp (alias   bits);     forwarding-class class-name; }</pre>
<b>Hierarchy Level</b>	[edit services cos <a href="#">application-profile</a> <i>profile-name</i> sip]
<b>Release Information</b>	Statement introduced in Junos OS Release 9.3.
<b>Description</b>	Set the appropriate <b>dscp</b> and <b>forwarding-class</b> values for SIP voice traffic.
<b>Default</b>	By default, the system will not alter the DSCP or forwarding class for SIP voice traffic.
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"><li>• <a href="#">Configuring Application Profiles on page 12</a></li><li>• <a href="#">video (Application Profile) on page 42</a></li></ul>

## PART 3

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