

## Chapter 12

# Configuring Compound Shared Shaping of Traffic

This chapter provides information for configuring compound shared shaping of traffic on the E-series router.

QoS topics are discussed in the following sections:

- Compound Shared Shaping Overview on page 101
- Configuring Compound Shared Shaping on page 102
- Compound Shared Shaping Configuration Examples on page 104

### Compound Shared Shaping Overview

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Compound shared shaping is a hardware-assisted mode that can control bandwidth for all scheduler objects associated with the subscriber logical interface. Thus it can manage voice and video queues in addition to data queues, so that the shared rate cannot be exceeded.

Compound shared shaping responds to changes in traffic rates more rapidly than simple shared shaping, in the order of milliseconds.

### Supported Hardware for Compound Shared Shaping

You can configure compound shared shaping on a line module with the EFA2 or TFA hardware.

The EFA2 implementation is different from the EFA ASIC, which does not implement compound shared shaping. Issue the **show qos shared-shaper** command to determine whether compound shared shapers are supported for the line module. Contact your Juniper Networks account representative for more information about line modules with the EFA2 ASIC.

The TFA hardware is only available on the ES2 10G LM on the E120 router and the E320 router.

If you configure a compound shared shaper on hardware that does not support it, the CLI displays the following message:

```
host1(config)#ERROR 02/08/2005 14:06:36 qos: line card in slot 11: EFA2
hardware not installed. 1 compound shared shaper(s) converted to simple.
```

QoS automatically converts the compound shared shaper to a simple shared shaper.



**NOTE:** Compound shared shaping is not supported by the frame forwarding ASIC (FFA).

### **Bandwidth Allocation for Compound Shared Shaping**

The compound shared-shaper mechanism actively allocates the bandwidth it receives from the hierarchical scheduler to each active constituent, based on its own rules, independent of the hierarchical scheduler. Constituents are either *priority* constituents or *weighted* constituents. These attributes are specified using the **shared-shaper-constituent** command.

Compound shared-shaper scheduling allocates bandwidth as follows:

1. Priority constituents consume as much of the shared bandwidth as they can, subject to the bandwidth allocated to them by the hierarchical scheduler.
2. Priority constituents are ordered according to their priority.
3. The weighted constituents subdivide the remaining shared bandwidth in proportion to their shared weights, again subject to the bandwidth allocated to them by the hierarchical scheduler.

### **Related Topics**

- For a list of shared shaper terms, see *Shared Shaping Overview* on page 71
- Configuring Compound Shared Shaping on page 102

### **Configuring Compound Shared Shaping**

Compound shared shaping requires that you set a shared-shaping rate in a scheduler profile associated with a best-effort node or queue.

Before you configure compound shared shaping:

- Configure the traffic classes and traffic-class groups.

See *Configuring Traffic Classes That Define Service Levels* on page 15 and *Configuring Traffic-Class Groups That Define Service Levels* on page 15.

To configure compound shared shaping:

1. Create the scheduler profile.

```
host1(config)#scheduler-profile compound
```

2. Configure the compound shared shaper.

```
host1(config-scheduler-profile)#shared-shaping-rate 128000 burst 32767
compound explicit-constituents
```

The range for the shared-shaping rate is 1000–1000000000 bps (1 Kbps–1000 Kbps); the default is no shaping rate.

Use the *operator* and *operandValue* variables to specify the shared shaping rate as an expression.

Burst is the catch-up number associated with the shaper; the range is 0–522240 (0–510 KB). Specifying 0 enables the router to select an applicable default value.

By default, shared shaping is set to **auto**, where the router selects the type of shared shaping that is configured, depending on the line module. You must specify the **compound** keyword to actively shape voice and video traffic so that the shared rate cannot be exceeded, and shape data queue rates to the value of the shared rate minus the combined voice and video traffic rate. An error message is generated if you specify **compound** for line modules that do not support it, and the router applies simple shared shaping.

3. Configure the QoS profile and reference the scheduler profile.

```
(config)#qos-profile compound
(config-qos-profile)#atm-vc node
(config-qos-profile)#atm-vc node group AF
(config-qos-profile)#atm-vc node group EF
(config-qos-profile)#atm-vc queue traffic-class best-effort scheduler-profile
shared-1mbps
(config-qos-profile)#exit
```



**TIP:** The scheduler profile that you configured with the shared-shaping rate must be referenced in the best-effort queue or the best-effort scheduler node.

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4. Attach the profile to the interface.

```
(config)#interface atm 11/0.10
(config-subif)#qos-profile subscriber-default-mode
(config-scheduler-profile)#exit
```

## Related Topics

- Compound Shared Shaping Overview on page 101
- Guidelines for Configuring Simple and Compound Shared Shaping on page 74

- For more information about specifying an expression that you can reference within a scheduler profile, see *Using Expressions for Bandwidth and Burst Values in a Scheduler Profile* on page 49
- Compound Shared Shaping Configuration Examples on page 104
- Constituent Selection for Shared Shaping Overview on page 111
- **node** command
- **qos-profile** command
- **queue** command
- **scheduler-profile** command
- **shared-shaping-rate** command
- **traffic-class** command
- **traffic-class-group** command
- **shared-shaping-rate** command

## Compound Shared Shaping Configuration Examples

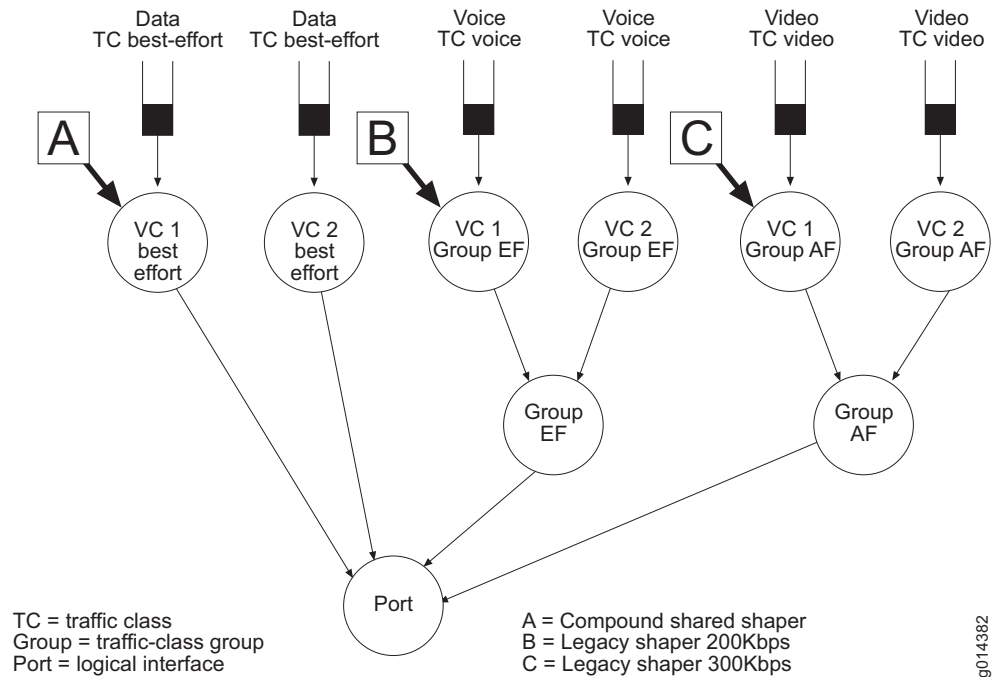
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This section provides configuration examples for compound shared shaping.

### VC Compound Shared Shaping Example

Figure 27 illustrates a typical DSL triple-play configuration, involving voice, video, and data traffic. In this example, a total of 1 Mbps of bandwidth is allocated to voice, video, and best-effort data traffic associated with the VC 1 logical interface.

The voice queue in the EF traffic-class group for VC 1 is a strict constituent that has first claim on up to 200 Kbps of the shared bandwidth. The video queue in the AF traffic-class group is a strict constituent that can claim up to 300 Kbps of the remaining 800–1000 Kbps of shared bandwidth. The best-effort queue for logical interface VC 1 is a strict constituent that has the last claim to the remaining 500–1000 Kbps of shared bandwidth.

**Figure 27: VC Compound Shared Shaping Example**

To configure VC compound shared shaping:

1. Configure the traffic classes, traffic-class groups, and additional scheduler profiles.
2. Configure the scheduler profile that defines the shared shaper and the profiles that apply the legacy shaper.

```
host1(config)#scheduler-profile shared-1Mbps
host1(config-scheduler-profile)#shared-shaping-rate 1000000 burst 32768 auto
host1(config)#scheduler-profile 300Kbps
host1(config-scheduler-profile)#shaping-rate 300000
host1(config)#scheduler-profile 200Kbps
host1(config-scheduler-profile)#shaping-rate 200000
```

3. Configure the QoS profile.

```
host1(config)#qos-profile vcSharedShaping
```

4. Create group nodes.

```
host1(config-qos-profile)#atm group AF scheduler-profile default
host1(config-qos-profile)#atm group EF scheduler-profile default
```

5. Create VC nodes for each group and for traffic in the default group.

```
host1(config-qos-profile)#atm-vc node
host1(config-qos-profile)#atm-vc node group AF
host1(config-qos-profile)#atm-vc node group EF
```

6. Create queues for the best-effort, video, and voice traffic. Apply the scheduler profile that defines the shared-shaping rate to the best-effort queue. Apply the legacy shaper profiles to the voice and video traffic queues.

```

host1(config-qos-profile)#atm-vc queue traffic-class best-effort scheduler-profile
shared-1mbps
host1(config-qos-profile)#atm-vc queue traffic-class video scheduler-profile
300Kbps
host1(config-qos-profile)#atm-vc queue traffic-class voice scheduler-profile
200Kbps
host1(config-qos-profile)#exit

```

7. Attach the QoS profile to an ATM subinterface.

```

host1(config)#interface atm 11/0.1
host1(config-interface)#qos-profile vcSharedShaping
host1(config-interface)#exit

```

In this example, the constituents of the VC shared shaper are the VC 1 best effort node, the VC 1 Group EF node, and the VC 1 Group AF node. The available bandwidth is strictly allocated in the following order:

1. VC 1 EF group node
2. VC 1 AF group node
3. VC 1 best effort node

To display the sample shared shaper configuration:

```
host1#show shared-shaper atm 11/0.1
```

interface	shared shaping rate	current shaping rate	resource	shaping rate
atm-vc ATM11/0.1	1000000	compound	best-effort atm-vc queue	
			atm-vc best-effort node	
			EF voice atm-vc queue	200000
			AF video atm-vc queue	300000
atm-vc ATM11/0.2	1000000	compound	best-effort atm-vc queue	
			atm-vc best-effort node	
			EF voice atm-vc queue	200000
			AF video atm-vc queue	300000
Total shared shapers: 2				
Total constituents: 8				
Total failovers: 0				

## VP Compound Shared Shaping Example

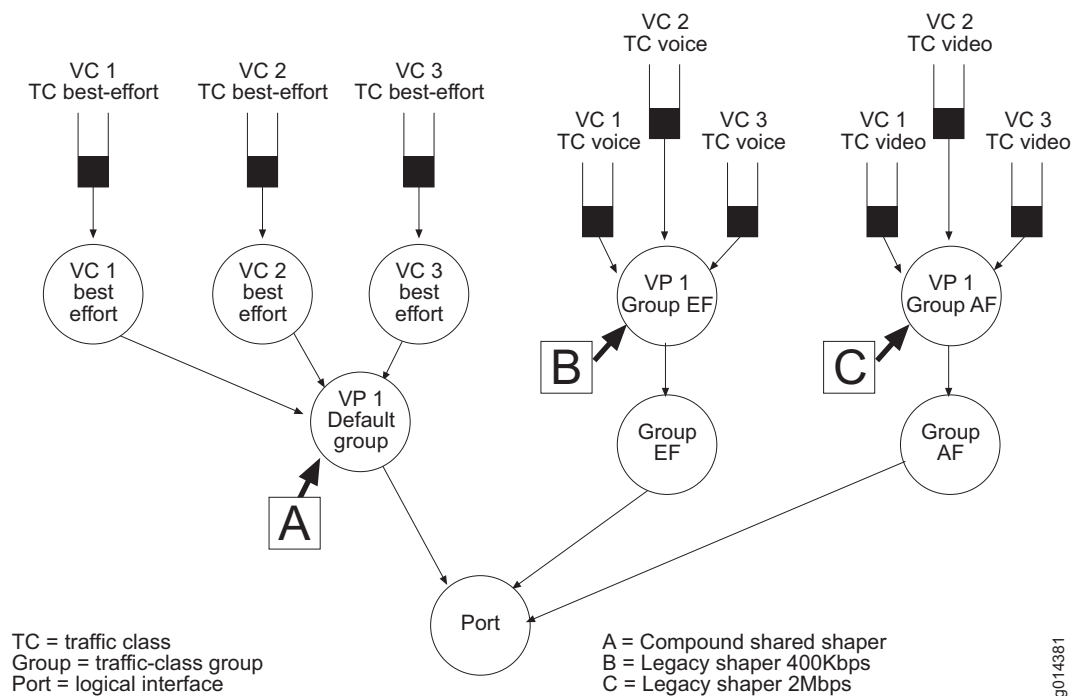
Figure 28 shows a compound shared shaper for a VP interface. VP shared shaping enables a shared shaper to apply to all the aggregate rates of all VCs within the VP.

In this example, the VP is shaped to a compound shared rate of 5 Mbps. The voice traffic gets strict priority scheduling for up to 400 Kbps of the shared rate on the VP. The video traffic gets up to 2 Mbps of the remaining 4.6–5 Mbps on the VP. Finally, the data traffic has the last claim to the remaining 2.6–3 Mbps of shared VP bandwidth.

This configuration enables data traffic to flow at 2.6 Mbps when voice and video are both using their limit. When both voice and video are quiescent, data can flow at the full 5 Mbps shared rate.

The QoS profile used in this example is appropriate for low-CDV mode. If the provider configures a shapeless VP tunnel in the SAR, QoS sets the SAR shaper for the VP to match the 5 Mbps shared-shaping rate, and the CDV is bounded for the VP tunnel. VP-level queuing does not guarantee fairness to the voice and video for each VC.

**Figure 28: VP Compound Shared Shaping Example**



To configure VP compound shared shaping:

1. Configure the traffic classes, traffic-class groups, and additional scheduler profiles.
2. Configure the scheduler profile that defines the shared shaper and the profiles that apply the legacy shaper.

```
host1(config)#scheduler-profile shared-5Mbps
host1(config-scheduler-profile)#shared-shaping-rate 5000000 burst 32768 auto
host1(config-scheduler-profile)#exit
```

3. Configure the scheduler profile for AF (video) traffic.

```
host1(config)#scheduler-profile 2Mbps
host1(config-scheduler-profile)#shaping-rate 2000000
```

4. Configure the scheduler profile for EF (voice) traffic.

```
host1(config)#scheduler-profile 400Kbps
host1(config-scheduler-profile)#shaping-rate 400000
host1(config-scheduler-profile)#exit
```

5. Configure the QoS profile.

```
host1(config)#qos-profile vpSharedShaping
```

6. Create group nodes.

```
host1(config-qos-profile)#atm group AF scheduler-profile default
host1(config-qos-profile)#atm group EF scheduler-profile default
```

7. Create VP nodes for each group and for traffic in the default group. The scheduler profile containing the shared-shaping rate is applied to the VP node that is in the default group and contains the best-effort queue.

```
host1(config-qos-profile)#atm-vp node scheduler-profile shared-5Mbps
host1(config-qos-profile)#atm-vp node group AF scheduler-profile 2Mbps
host1(config-qos-profile)#atm-vp node group EF scheduler-profile 400Kbps
```

8. Create a VC node for the default group.

```
host1(config-qos-profile)#atm-vc node
```

9. Create queues for the best-effort, video, and voice traffic.

```
host1(config-qos-profile)#atm-vc queue traffic-class best-effort
host1(config-qos-profile)#atm-vc queue traffic-class AF
host1(config-qos-profile)#atm-vc queue traffic-class EF
host1(config-qos-profile)#exit
```

10. Attach the QoS profile to an ATM subinterface.

```
host1(config)#interface atm 11/0.1
host1(config-interface)#qos-profile vpSharedShaping
```



In this example, the constituents of the VP shared shaper are the VP 1 default group node, the VP 1 Group EF node, and the VP 1 Group AF node. The available bandwidth is strictly allocated in the following order:

1. VP1 EF group node
2. VP1 AF group node
3. VP1 default group node

### ***Related Topics***

- [Configuring Compound Shared Shaping on page 102](#)
- [Compound Shared Shaping Overview on page 101](#)

