

# Queuing and ATM Traffic Shaping on the Cisco 827 Router

Document ID: 12904

---

## **Introduction**

### **Before You Begin**

Conventions

Prerequisites

Components Used

### **IP Shaping**

GTS

Rate-limit

PQ/CBWFQ

VC-Shaping

### **Related Information**

---

## **Introduction**

This document describes the types of queuing and ATM traffic shaping mechanisms that the Cisco 827 router supports.

## **Before You Begin**

### **Conventions**

For more information on document conventions, see the Cisco Technical Tips Conventions.

### **Prerequisites**

There are no specific prerequisites for this document.

### **Components Used**

This document is not restricted to specific software and hardware versions.

## **IP Shaping**

### **GTS**

GTS is not currently supported on an ATM interface.

### **Rate-limit**

Rate-limit is not currently supported on an ATM interface.

## PQ/CBWFQ

### General Configuration

For general information about configuring PQ/CBWFQ, please see Sample Configuration: Per-VC Class-Based, Weighted Fair Queuing (Per-VC CBWFQ) on the Cisco 7200, 3600, and 2600 Routers.

### PQ/CBWFQ on PPPoA

PQ/CBWFQ on PPPoA is not currently supported but should be available in Cisco IOS® Software Release 12.1(4). Other voice features will also be available in this release.

### VC-Shaping

**Note:** The Cisco 827 performs shaping in the software; the Cisco 1400 performs shaping on the SAR chip.

Before entering the shaping arena, determine the upstream rate. This rate influences your calculation, as explained in this document. If you want to look at the upstream rate currently used on the Cisco 827, issue the **show controller atm** command.

In this case the Digital Subscriber Line Access Multiplexer (DSLAM) is configured for upstream 640, downstream 640.

	Interleave	Fast	Interleave	Fast
Speed (kbps)	640	0	640	0

### UBR

The UBR configuration option allows you to define the Peak Cell Rate (PCR). There is no burst size that limits the number of cells transmitted at the PCR. Coupled with the coarse granularity of PCR, it causes the Unspecified Bit Rate (UBR) to continuously send data above PCR.

If you are configuring this, make sure the PCR value does not exceed the value configured on the ATM switch. The value you configure here influences the size of the shaping queue (granularity) and the delay at which the cells arrive at the ATM switch.

For example, when PCR = 499 and line rate = 575, the upstream transmit rate is 575.

The formula to calculate granularity is as follows, where X is the upstream rate:

$$\frac{X}{Y+1} < \text{PCR (configured)} \leq \frac{X}{Y}$$

Suppose you configure the following and the upstream rate is 640.

```
interface ATM0
ip address 14.0.0.4 255.255.0.0
no ip directed-broadcast
no atm ilmi-keepalive
pvc 3/45
ubr 240
```

In this case, the PCR granularity equals 320.

$$\frac{640}{2+1} < 240 \leq \frac{640}{2} = 320$$

There is no burst size to limit the number of cells transmitted at the PCR. The Cisco 827 transmits 320 cells because the shaping table has been set to 320.

Look at the example of a PCR = 499 and upstream rate = 575. In this case the Y value = 1 to satisfy the following equation:

$$\frac{X}{Y+1} < \text{PCR (configured)} \leq \frac{X}{Y}$$

$$\frac{575}{1+1} < 499 \leq \frac{575}{1} = 575$$

This means the transfer rate will be 575, which is equal to the upstream rate.

**Note:** The above behavior was true for all the c820 images prior to Cisco IOS Software Release 12.2(8)T . After this release, the UBR and VBR granularity should be scheduled accurately in both shaping modes.

## ABR

The Cisco 827 does not support Available Bit Rate (ABR) or the three modes when using ABR. These modes are:

- EFCI marking mode The switch can set the EFCI state in the headers of forward data cells to indicate congestion. The destination receiving an EFCI flag set marks the congestion indication (CI) bit in the backward RM cells to indicate congestion and sends the cells back to the source.
- RR marking mode The switch can set CI = 1 in forward and/or backward RM cells to indicate congestion.
- Explicit rate (ER) marking mode The switch can reduce the ER field of the forward or backward RM cells to their "fair share" for each ABR connection to explicitly convey the rate by which the switch is willing to receive.

For additional information, please see the white paper titled, LightStream 1010 Switch Architecture and Traffic Management.

## VBR-XX

In VBR the sustainable cell rate (SCR) is introduced, which causes the Cisco IOS® Software to build another shaping table. The granularity of this table is set to 1000, which is valid for VBR-RT and for VBR-NRT. The PCR does not reserve any cells in this table. PCR granularity is determined using the same calculation used in the UBR examples.

Note that in VBR a burst size (bs) is used, and a credit value is calculated from the burst size.

Fill the SCR shaping table according to the configured value of SCR. This determines the number of cells reserved in the table for transmission at the SCR. For example:

```
interface ATM0.4 point-to-point
pvc 3/34
vbr-rt 575 500 50
```

The table is built as follows:

$$\frac{\text{SCR} * 1000}{\text{PCR}} = \text{SCR place in table}$$

In the example:

$$\frac{500 * 1000}{575} = 869$$

This means the SCR fills the table with 869 cells, leaving 131 for burst (remember the table has a granularity of 1000). The 131 unreserved cells can be used for the PCR, which is the maximum value for credit.

In the example, the limit is 50. The equation is:

$$\text{bs} = \frac{(\text{UC} + 1) * \text{PCR}}{\text{PCR} - \text{SCR}} \quad \text{UC reflects the unreserved cells in the table}$$

In this case, use 131, the maximum value.

$$\text{bs} = \frac{(131 + 1) * 575}{575 - 500} = 1012$$

In the example:

$$\text{bs} = \frac{(50 + 1) * 575}{575 - 500} = 391$$

The burst size determines the number of cells to be transmitted at the PCR before lowering the transmit rate to the SCR. The credit is the number of cells that can be transmitted at the PCR.

$$\text{Credit} = \text{bs} - \frac{\text{bs} * \text{SCR}}{\text{PCR}} - 1$$

In this case, you should get the following credit:

$$\text{Credit} = 1012 - \frac{1012 * 500}{575} - 1 = 131 \quad (\text{which confirms the maximum credit})$$

In the same manner, you will get a credit of 50 cells, as configured in the example.

**Note:** The burst size never exceeds the PCR.

When PCR=SCR, the burst calculation is ignored and the credit is set to 1, regardless of the burst size. For example:

```
interface ATM0.4 point-to-point
pvc 3/34
vbr-rt 499 499 50
```

This reserves 867 cells  $((499 * 1000) / 575)$  for SCR (evenly distributed) in a traffic shaping table of 1000 cells.

The burst size configured is ignored in the calculation. Transmit rate is 499 (or very close) and the cells are evenly distributed. You would never have 867 cells, 133 idle.

## **CBR**

The Constant Bit Rate (CBR) connection is a static amount of bandwidth allocated for the duration of the connection. The bandwidth is characterized by the PCR value in the configuration.

The system is simple, allocate cell time in the connection (this bandwidth is reserved).

```
interface ATM0.4 point-to-point
pvc 3/34
cbr 160
```

Cell rate is  $160000/(53*8)$ , which is an allocated value for the PVC. The cell delay variation is easy to calculate in this case. For example, the upstream is 640 so you use 1 of 4 cells for this PVC:  $640/160 = 4$ . You send 1 cell and then have a 3 inter-cell delay.

**Note:** Data can never exceed the PCR, so CBR is not adequate for a burst application.

---

## **Related Information**

- **Cisco DSL Product Support Information**
- **Technical Support – Cisco Systems**

---

[Contacts & Feedback](#) | [Help](#) | [Site Map](#)

© 2008 – 2009 Cisco Systems, Inc. All rights reserved. [Terms & Conditions](#) | [Privacy Statement](#) | [Cookie Policy](#) | [Trademarks of Cisco Systems, Inc.](#)

---

Updated: Feb 26, 2008

Document ID: 12904

---