

# Traffic Shaping with the Cisco 4000 Router Series E3/DS3/OC3 ATM Network Processor Modules

Document ID: 23446

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## Introduction

This document describes how the ATM E3, T3 and OC-3 network processor modules (NPMs) shape ATM traffic on the Cisco 4000 router series. The Cisco 4000 Series Router includes these platforms:

- Cisco 4000
- Cisco 4000-M
- Cisco 4500
- Cisco 4500-M
- Cisco 4700
- Cisco 4700-M

These NPMs are also included:

- NP-1A-E3
- NP-1A-DS3
- NP-1A-SM
- NP-1A-MM
- NP-1A-SM-LR

For background information on how these modules work with Cisco 4000 router series, see the Related Information section of this document.

## Prerequisites

### Requirements

Readers of this document need to be knowledgeable of these topics:

- ATM configuration. Refer to Configuring ATM for additional information.
- ATM Traffic Shaping configuration and troubleshooting. Refer to the ATM Traffic Management

Technical Support pages for additional information.

## Components Used

The information in this document is based on these software and hardware versions:

- **Hardware:** Cisco 4000 router series with a NPM NP-1A-MM.
- **Software:** Cisco IOS® Software Release 12.0(3)T with the service provider feature set. The image name is c4000-p-mz.120-3.T.bin.

The information in this document was created from the devices in a specific lab environment. All of the devices used in this document started with a cleared (default) configuration. If your network is live, make sure that you understand the potential impact of any command.

## Conventions

Refer to Cisco Technical Tips Conventions for more information on document conventions.

## Features and Benefits

The NPMs listed in the Introduction section have these features:

- Requires an IOS "Plus" or Service Provider "p" feature set.
- Module support for up to 1024 active Virtual Circuits (VCs) for ATM Adaption Layer 5 (AAL5).
- Provides hardware support for non-real time variable bit rate (VBR-nrt), unspecified bit rate (UBR), and unspecified bit rate plus (UBR+) service classes.
- Support per-virtual circuit (VC) traffic shaping.
- The NP-1A-SM-LR module requires Cisco IOS Software Release 11.2(9)P or later. Full traffic shaping requires Cisco IOS Software Release 11.1(17), 11.2(12)P or 11.3(2)T or later.
- Traffic shaping in Cisco IOS Software Releases 11.1(17), 11.2(12)P, and 11.3(2)T in Q1'98. Up to four user-definable peak rate queues are used to limit the peak rate of cells transmitted, in addition to user-definable average rate and burst size limits for each virtual connection (VC).
- Does not support Generic Traffic Shaping (GTS). These ATM modules support ATM traffic shaping through the use of UBR, UBR+, and VBR-nrt.
- MBS value defaults to 95 cells if not configured.

## Traffic Types

The ATM network modules listed in the Introduction section only support these traffic types:

- UBR
- VBR-nrt
- UBR+

Configure these traffic types with the help of the command line interface (CLI) commands under the permanent virtual connection (PVC) submode. Some examples are shown in these sections.

**Note:** Cisco 2600 and 3600 router series support all traffic types. For more information, refer to Traffic Shaping with the Cisco 2600 and 3600 Router Series E3/T3/OC3 ATM Interfaces.

## UBR

This traffic category has the lowest priority. The hardware schedules all UBR connections on a round robin basis.

```
router(config)#interface atm 0.5 point-to-point
router(config-subif)#ip address 100.100.100.1 255.255.255.0
router(config-subif)#pvc 5/55
router(config-if-atm-vc)#ubr ?
<56-155000> Peak Cell Rate(PCR) in Kbps
router(config-if-atm-vc)#ubr 15000
router(config-if-atm-vc)#end
```

**Note:** If a peak cell rate (PCR) is not specified, the system sets the PCR to 155 Kbps by default on the OC-3 network module. For E3 and T3 network modules, this is based on the line rate of the T3 and E3 cards.

## VBR-nrt

This traffic type has a higher priority than UBR, but lower than VBR-rt. The hardware uses a dual leaky bucket algorithm to schedule this traffic type.

```
router(config-subif)#pvc 5/55 ?
router(config-if-atm-vc)#vbr-nrt ?
<56-155000> Peak Cell Rate(PCR) in Kbps
router(config-if-atm-vc)#vbr-nrt 40000 ?
<1-40000> Sustainable Cell Rate(SCR) in Kbps
router(config-if-atm-vc)#vbr-nrt 40000 30000 ?
<1-65535> Maximum Burst Size(MBS) in Cells
<cr>
router(config-if-atm-vc)#vbr-nrt 40000 30000 500
router(config-if-atm-vc)#end
```

**Note:** If you do not configure the MBS value, it defaults to 95 cells.

The recommended values of PCR for VBR are listed here:

### PCR Values in Kbps

119999, 117024, 114122, 111291, 108532, 105840, 103216, 100656, 98160, 95726, 93352, 91037, 88779, 86578, 84431, 82337, 80295, 78304, 76362, 74469, 72622, 70821, 69065, 67353, 65683, 64054, 62466, 60917, 59406, 57933, 56497, 55096, 53730, 52397, 51098, 49831, 48596, 47391, 46216, 45070, 43952, 42863, 41800, 40763, 39752, 38767, 37805, 36868, 35954, 35063, 34193, 33345, 32519, 31712, 30926, 30159, 29412, 28682, 27971, 27278, 26601, 25942, 25299, 24672, 24060, 23463, 22882, 22314, 21761, 21222, 20695, 20182, 19682, 19194, 18718, 18254, 17802, 17361, 16930, 16510, 16101, 15702, 15313, 14934, 14563, 14203, 13851, 13507, 13172, 12846, 12527, 12217, 11914, 11619, 11331, 11051, 10777, 10510, 10249, 9995, 9748, 9506, 9270, 9040, 8817, 8598, 8385, 8178, 7975, 7777, 7585, 7397, 7214, 7035, 6861, 6691, 6525, 6364, 6206, 6052, 5902, 5756, 5613, 5474, 5339, 5206, 5077, 4951, 4782, 4619, 4461, 4308, 4161, 4019, 3882, 3749, 3621, 3497, 3378, 3262, 3151, 3043, 2939, 2839, 2742, 2648, 2557, 2470, 2386, 2304, 2226, 2150, 2076, 2005, 1937, 1871, 1807, 1746, 1686, 1629, 1573, 1519, 1467, 1417, 1369, 1322, 1277, 1234, 1192, 1151, 1112, 1074, 1038, 1003, 969, 936, 904, 873, 843, 814, 787, 760, 734, 709, 685, 662, 639, 618, 597, 577, 557, 538, 520, 502, 485, 468, 453, 437, 423, 408, 395, 382, 369 357, 345, 333, 322, 311, 301, 290, 281, 271, 262, 253, 245, 237, 229, 221, 214, 207, 200, 193, 187, 181, 175, 169, 163, 158, 153, 147, 143, 138, 133, 129, 125, 121, 117, 113, 109, 106, 103, 99, 96, 93, 90, 87, 84, 81, 79, 76, 74, 72, 69, 67, 65 or 63 Kbps.

## UBR+

Under non-congested traffic conditions, UBR+ behaves in the same way as the UBR default. However, under heavy traffic, UBR+ guarantees the minimum cell rate (MCR).

```
router(config-subif)#interface atm 0.5 point-to-point
router(config-subif)#pvc 5/55
router(config-if-atm-vc)#ubr+ ?
    <56-155000> Peak Cell Rate(PCR) in Kbps
router(config-if-atm-vc)#ubr+ 3505 ?
    <0-3505> Minimum Guaranteed Cell Rate(MCR) in Kbps
router(config-if-atm-vc)#ubr+ 3505 2300
router(config-if-atm-vc)#end
```

## Related Information

- [Traffic Shaping with the Cisco 2600 and 3600 Router Series E3/T3/OC3 ATM Interfaces](#)
- [Identifying Your Model in the Cisco 4000 Family of Products](#)
- [Network Processor Module in Cisco 4000 Series](#)
- [Cisco 4000 Series Product Support page](#)
- [Cisco 4000 Series Documentation](#)
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Updated: Dec 12, 2005

Document ID: 23446

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