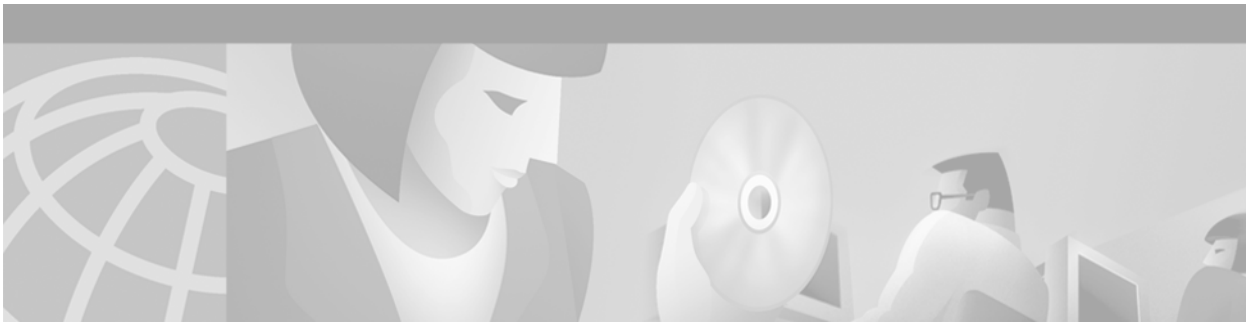

Network Services Engine

This document describes how to configure the network services engine (NSE) on Cisco 7200 VXR series routers. It includes the following sections:

Feature Overview

The network services engine (NSE) is the latest processor engine for Cisco 7200 VXR series routers. The NSE delivers wire rate OC-3 throughput while running concurrent high-touch WAN edge services. It is the first Cisco processing engine to offer integrated hardware acceleration increasing Cisco 7200 VXR series system performance by 50 to 300% for combined “high touch” edge services. The NSE takes advantage of a new technology called Parallel eXpress Forwarding (PXF).

Benefits

Accelerated Services

The following features are accelerated on the NSE: Network Address Translation (NAT), weighted fair queuing (WFQ), and NetFlow for both enterprise and service provider customers.

PXF Field Upgradable

Parallel eXpress Forwarding (PXF) is based on microcode and can be upgraded with new software features in future IOS releases.

The PXF processor enables IP parallel processing functions that work with the primary processor to provide accelerated IP Layer 3 feature processing. The PXF processor off-loads IP packet processing and switching functions from the Route Processor (RP) to provide accelerated and highly consistent switching performance when coupled with one or more of several IP services features such as access control lists (ACLs), address translation, quality of service (QoS), flow accounting, and traffic shaping.

PXF offers the advantage of hardware-based switching power, plus the flexibility of a programmable architecture. The PXF architecture provides future-proofing—if additional features are added in the future, an application-specific integrated circuit (ASIC) will not be required. New features for accelerated services can be added by reprogramming the PXF processor.

System Requirements

An NSE-1 can be used on existing Cisco 7200 VXR series routers with Cisco IOS Release 12.1(1)E or later version of Cisco IOS Release 12.1 E.

High Performance

Network layer services such as traffic management, security, and QoS benefit significantly from NSE-1 high-performance. NSE-1 is the first Cisco processing engine to offer integrated hardware acceleration increasing Cisco 7200 VXR series system performance by 50 to 300 percent for combined “high-touch” WAN edge services.

Restrictions

Normal IOS packet debugging facilities are not enabled while PXF is configured. To enable IOS packet debugging facilities, disable PXF using the **no ip pxf** configuration command to disable PXF.

Related Documents

- *Network Processing Engine* feature module
- *Network Processing Engine and Network Services Engine Installation and Configuration*
- For configuration information and support, refer to the modular configuration and modular command reference publications in the Cisco IOS software configuration documentation set that corresponds to the software release installed on your Cisco hardware.

Note You can access Cisco IOS software configuration and hardware installation and maintenance documentation on the World Wide Web at http://www.cisco.com, http://www-china.cisco.com, or http://www-europe.cisco.com.

Supported Platforms

- Cisco 7204 VXR
- Cisco 7206 VXR

Supported Standards, MIBs, and RFCs

Standards

None

MIBs

- CPU-FLOO-NSE1

For descriptions of supported MIBs and how to use MIBs, see the Cisco MIB web site on CCO at http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml.

RFCs

None

Prerequisites

Before enabling the PXF processor, you must have IP routing and IP Cisco Express Forwarding (CEF) switching turned on.

Configuration Tasks

The PXF processor is turned on by default. If it is ever disabled, you must enable it to take advantage of IP packet switching and feature acceleration.

Note Before enabling the PXF processor, you must have IP routing and IP CEF switching turned on.

See the following sections for configuration tasks. Each task in the list indicates if it is optional or required:

- Configuring the Network Services Engine (Required)
- Verifying the Network Services Engine (Optional)

Configuring the Network Services Engine

	Command	Purpose
Step 1	`Router# configure terminal`	Enters global configuration mode.
Step 2	`Router(config)# [no] ip pxf`	Enables PXF processing.

Verifying the Network Services Engine

Enter the **show pxf accounting** command to view all interfaces.

```
Router# show pxf accounting ?
  ATM           ATM interface
  Ethernet      IEEE 802.3
  FastEthernet  FastEthernet IEEE 802.3
  Hssi          High Speed Serial Interface
  Null          Null interface
  POS           Packet over Sonet
  Serial        Serial
  summary       PXF summary statistics
```

Troubleshooting Tips

Use the following workarounds if you encounter an error message:

Error Message	Workaround
WARNING:PXF Exception:mac_xid=0x10000 *** IHB watchdog timer expired 6d16h:%PXF-2-EXCEPTION:pxf exception on pxf tmc.	Run the **show pxf crash** command to obtain more information.
PXF processor hang and error message: WARNING:PXF Exception:mac_xid=0x8 *** External Memory Column 3 exception, type = 20	This error message indicates that the PXF processor has been left in HALT state. During boot up, the PXF processor is in error state and cannot be brought up. To workaround this problem, reload the router.
PXF processor crash and error message: 00:49:37:Fatal pxf interrupt, int_reg=0x80, int_mask=0xFFFF, config=0x1FF4000 00:49:37:-Traceback= 6055B9CC 60530D10	This message indicates the PXF processor encountered a serious error and crashed. To workaround this problem, reload the router.

Monitoring and Maintaining the NSE

Command	Purpose
Router# **show pxf accounting**	Displays PXF switching statistics for all interfaces.
Router# **show pxf accounting** *ethernet*	Displays PXF switching statistics for ethernet interfaces.
Router# **show pxf accounting** *null*	Displays PXF switching statistics for NULL interfaces.
Router# **show pxf accounting** *pos*	Displays PXF switching statistics for packet OC-3 interfaces.
Router# **show pxf accounting** *serial*	Displays PXF switching statistics for serial interfaces.
Router# **show pxf accounting** *summary*	Displays a summary of PXF switching statistics.
Router# **show pxf crash**	Displays PXF crash information.

Command	Purpose
Router# **show pxf feature cef**	Displays PXF routing feature tables for CEF.
Router# **show pxf feature nat**	Displays PXF routing tables for NAT.
Router# **show pxf interface**	Displays a summary of the interfaces in the router and the PXF features and capabilities are enabled on these interfaces.

Configuration Examples

This section provides two configuration examples using **show** commands:

- Use the **show version** command to display the configuration of the system hardware, including the NPE or NSE and the software version. The following example shows an NSE installed in a Cisco 7206 VXR router:

```
Router# show version
Cisco Internetwork Operating System Software
IOS (tm) 7200 Software (C7200-JS-M), Version 12.1(3a)E
Copyright (c) 1986-2000 by cisco Systems, Inc.
Compiled Wed 22-Mar-00 08:37 by Biff
Image text-base:0x60008900, data-base:0x6141C000

  (display text omitted)

cisco 7206VXR (NSE-1) processor (revision A) with 122880K/8192K bytes of memory.
R7000 CPU at 262Mhz, Implementation 39, Rev 1.0, 256KB L2 Cache6 slot VXR midplane,
Version 2.0
  (display text omitted)

PXF processor tmc is running.
6 FastEthernet/IEEE 802.3 interface(s)
10 Serial network interface(s)
2 HSSI network interface(s)
2 Channelized T3 port(s)
125K bytes of non-volatile configuration memory.
```

- Use the **show c7200** command to obtain information about the router.

```
Router# show c7200
Network IO Interrupt Throttling:
throttle count=0, timer count=0
active=0, configured=0
netint usec=4000, netint mask usec=200

C7200 Midplane EEPROM:
Hardware revision 2.0           Board revision A0
Serial number     16061833      Part number    73-3223-05
Test history      0x0           RMA number     00-00-00
MAC=00b0.4aae.4000, MAC Size=1024
EEPROM format version 1, Model=0x6
EEPROM contents (hex):
0x20:01 06 02 00 00 F5 15 89 49 0C 97 05 00 B0 4A AE
0x30:40 00 04 00 00 00 00 00 00 01 13 50 00 00 FF 00
```

```
C7206VXR CPU EEPROM:
Hardware revision 1.2           Board revision A0
Serial number     15053437      Part number    73-3453-04
Test history      0x0           RMA number     00-00-00
EEPROM format version 1
EEPROM contents (hex):
0x20:01 C2 01 02 00 E5 B2 7D 49 0D 7D 04 00 00 00 00
0x30:50 00 00 00 00 01 14 00 00 00 FF FF FF FF FF FF

C7200 PE EEPROM:
Hardware Revision         :1.0
Top Assy. Part Number     :800-05272-04
Part Number               :73-4068-02
Board Revision            :A0
PCB Serial Number         :12342775
RMA History               :00
Fab Version               :02
Fab Part Number           :28-3146-02
Product Number            :NSE1
EEPROM format version 4
EEPROM contents (hex):
0x00:04 FF 40 00 DE 41 01 00 C0 46 03 20 00 14 98 04
0x10:82 49 0F E4 02 42 41 30 C1 8B 31 32 33 34 32 37
0x20:37 35 20 20 20 04 00 02 02 85 1C 0C 4A 02 CB 84
0x30:4E 53 45 31 FF FF FF FF FF FF FF FF FF FF FF FF
0x40:FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
0x50:FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
0x60:FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
0x70:FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
```

Command Reference

This section documents a new command. All other commands used with this feature are documented in the Cisco IOS Release 12.1 command reference publications.

- **show pxf interface**

show pxf interface

To show a summary of the interfaces on the router and the PXF features or capabilities enabled on these interfaces use the **show pxf interface** command.

show pxf interface

Syntax Description

This command has no arguments or keywords.

Defaults

No default behavior or values.

Command Modes

EXEC

Command History

Release	Modification
12.1(3a)E	This command was introduced.

Examples

The following is sample output from the **show pxf interface** command:

```
Router# show pxf interface
 Intf  i/f #  Attributes
Fa0/0    3    Raw, Encap, QoS(Cr 0, Thrsh 2, Max 101)
Et1/0    4    Raw, Encap
Et1/1    5    Raw, Encap, QoS(Cr 0, Thrsh 2, Max 13)
Et1/2    6    Raw, Encap
Et1/3    7    Raw, Encap
Se2/0    8    Raw, Encap, QoS(Cr 0, Thrsh 2, Max 5)
Se2/1    9    Raw, Encap, QoS(Cr 0, Thrsh 2, Max 5)
Se2/2    10   Raw, Encap, QoS(Cr 0, Thrsh 2, Max 5)
Se2/3    11   Raw, Encap, QoS(Cr 0, Thrsh 2, Max 5)
Fa3/0    12   Raw, Encap
PO4/0    13   Raw, Encap
AT5/0    14   Raw, Encap
```

Related Commands

Command	Description
show pxf feature	Displays the PXF routing feature tables for enabled PXF features.