CHAPTER 3

NPE-300 and NPE-400 Overview

This chapter describes the network processing engine (NPE) models NPE-300 and NPE-400 and contains the following sections:

Supported Platforms

The following NPEs support the Cisco 7200 VXR routers:

- NPE-300
- NPE-400

The following NPEs support the Cisco uBR7246VXR universal broadband router:

- NPE-300
- NPE-400

The following NPEs support the Cisco 7206VXR as a router shelf in the Cisco AS5800 Universal Access Router:

- NPE-300
- NPE-400

These NPEs are keyed to prevent insertion in the Cisco 7200 series routers (7202, 7204, 7206).

Software Requirements

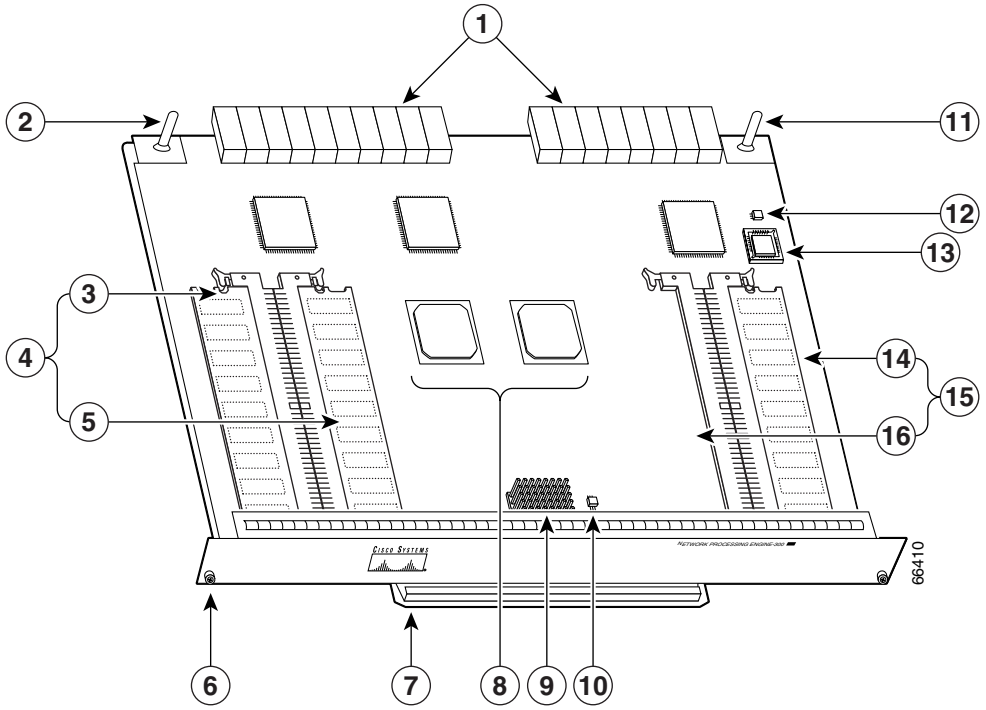
For hardware/software compatibility information, see the tables under the "Software Requirements" section on page 8-4.

NPE-300 and NPE-400 Description and Overview

This section contains information about the network processing engine components and the system management functions. The network processing engine maintains and executes the system management functions for the routers. It also shares the system memory and environmental monitoring functions with the I/O controller.

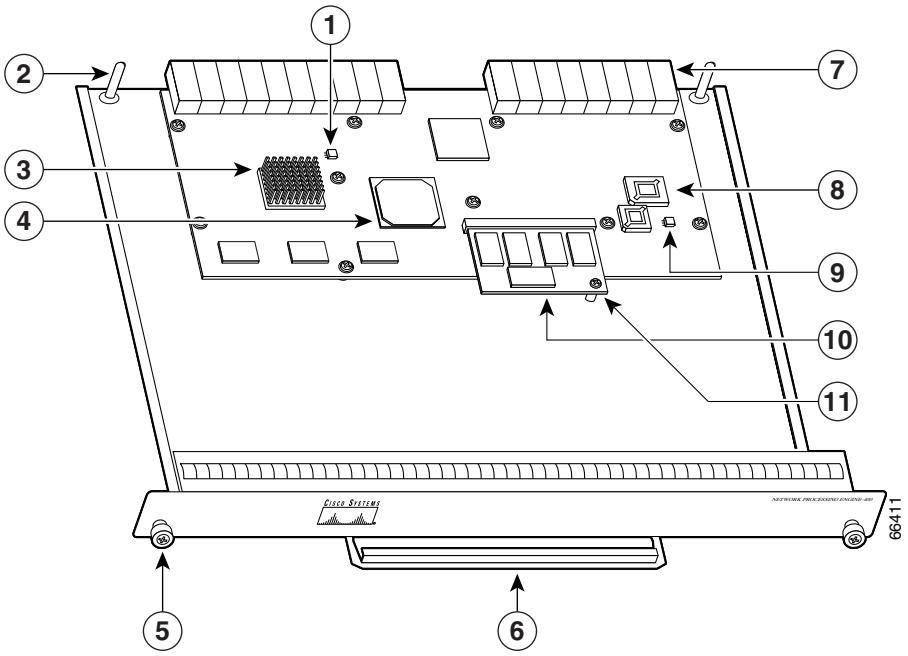
Components

Figure 3-1 NPE-300



1	Midplane connectors	**9**	RM7000 microprocessor
2	Keying post	**10**	Temperature sensor (U42)
3	DIMM 3 (U44)	**11**	Keying post
4	Bank 1 (user configurable)	**12**	Temperature sensor (U41)
5	DIMM 2 (U45)	**13**	Boot ROM (U1)
6	Captive installation screw	**14**	DIMM 0 (U16)
7	Handle	**15**	Bank 0 (fixed)
8	System controllers	**16**	U15 (never populated)

Figure 3-2 NPE-400



1	Temperature sensor (U31)	**7**	Midplane connectors
2	Keying post	**8**	Boot ROM (U7)
3	RM7000 microprocessor	**9**	Temperature sensor (U6)
4	System controller	**10**	SODIMM (J1)
5	Captive installation screw	**11**	Standoff and screw
6	Handle		

The network processing engines consist of the following components:

- Reduced instruction set computing (RISC) microprocessor
  - The NPE-300 uses an RM7000 microprocessor that operates at an internal clock speed of 262 MHz.
  - The NPE-400 uses an RM7000 microprocessor that operates at an internal clock speed of 350 MHz.
- System controller

  The system controller provides hardware logic to interconnect the processor, DRAM, and the PCI-based system backplane bus.
  - The NPE-300 has two system controllers that provide processor access to the midplane and single I/O controller PCI buses. The system controllers also allow port adapters access to SDRAM using any of the three PCI buses.
  - The NPE-400 has a single system controller that provides system access.

- Upgradable memory modules

  The NPE-300 and NPE-400 use SDRAM for storing all packets received or sent from network interfaces. The SDRAM also stores routing tables and network accounting applications.

  - On the NPE-300, two independent SDRAM memory arrays in the system allow concurrent access by port adapters and the processor; however, only one is upgradable.
  - On the NPE-400, one memory array is shared by port adapters and the processor.

- Cache memory

  The NPE-300 and NPE-400 have cache SRAM that functions as the tertiary cache for the microprocessor.

- Two environmental sensors for monitoring the cooling air as it leaves the chassis for both the NPE-300 and NPE-400
- Boot ROM for storing sufficient code for booting the Cisco IOS software

Note The NPE-300 and the NPE-400 do not have packet SRAM.

System Management Functions

The network processing engines perform the following system management functions:

- Sending and receiving routing protocol updates
- Managing tables, caches, and buffers
- Monitoring interface and environmental status
- Providing Simple Network Management Protocol (SNMP) management through the console and Telnet interface
- Accounting for and switching of data traffic
- Booting and reloading images
- Managing port adapters (including recognition and initialization during online insertion and removal)

Terms and Acronyms

- Cache—Memory with fast access and small capacity used to temporarily store recently accessed data; found either incorporated into the processor or near it.
- DIMM—dual in-line memory module
- DRAM—dynamic random-access memory
- Instruction and data cache—Instructions to the processor, and data on which the instructions work.
- Integrated cache—Cache that is built into the processor; sometimes referred to as internal cache. Cache memory physically located outside the processor is not integrated, and is sometimes referred to as external cache.
- OTP—one time programmable

- Primary, secondary, tertiary cache—Hierarchical cache memory storage based on the proximity of the cache to the core of the processor. Primary cache is closest to the processor core and has the fastest access. Secondary cache has slower access than primary cache, but faster access than tertiary cache.
- RAM—random-access memory
- RISC—reduced instruction set computing
- ROM—read-only memory
- SIMM—single in-line memory module
- SDRAM—synchronous dynamic random-access memory
- SDRAM-fixed—SDRAM of a fixed size or quantity; can be replaced, but not upgraded
- SODIMM—small outline dual in-line memory module
- SRAM—static random-access memory
- Unified cache—Instruction cache and data cache are combined. For example, a processor may have primary cache with separate instruction and data cache memory, but unified secondary cache.

NPE-300 and NPE-400 Memory Information

To determine the memory configuration of your NPE-300, use the **show version** command.

The following example of the **show version** command shows an NPE-300 installed in a Cisco 7206VXR router:

```
Router# show version
Cisco Internetwork Operating System Software
IOS (tm) 7200 Software (C7200-JS-M), Released Version 12.0(19980705:021501)
Copyright (c) 1986-1998 by cisco Systems, Inc.
Compiled Tue 25-Aug-98 04:01 by biff
Image text-base: 0x600088C4, data-base: 0x60FA6000

  (display text omitted)

cisco 7206VXR (NPE300) processor with 44x1024K/20480K bytes of memory.
R7000 CPU at 262Mhz, Implementation 39, Rev 1.0, 265KB L2, 2048KB L3 Cache
Six slot VXR midplane, Version 2.255

  (display text omitted)
```

The following example of the **show version** command shows an NPE-400 installed in a Cisco 7206VXR router:

```
Router# show version
Cisco Internetwork Operating System Software
IOS (tm) 7200 Software (C7200-P-M), Released Version 12.1(20000622:181759)
Copyright (c) 1986-2000 by cisco Systems, Inc.
Compiled Thu 22-Jun-00 11:18 by BIFF
Image text-base: 0x60008950, data-base: 0x60BD8000

  (display text omitted)
```

```
cisco 7206VXR (NPE400) processor (revision 0xFF) with 122880K/8192K bytes
of memory.
Processor board ID 8771013
R7000 CPU at 350Mhz, Implementation 39, Rev 2.1, 256KB L2, 4096KB L3 Cache
6 slot VXR midplane, Version 2.1

  (display text omitted)
```

Table 3-1 provides memory specifications, and Table 3-2 provides user replaceable memory configurations for the NPE-300. Table 3-3 provides memory specifications, and Table 3-4 provides memory configurations for the NPE-400.

Table 3-1 NPE-300 Memory Specifications

Memory Type	Size	Quantity	Description	Component Location on the NPE-300 Board
SDRAM-configurable	32 to 256 MB	1 configurable bank with 2 SDRAM slots	32-, 64-, or 128-MB DIMMs (based on maximum SDRAM required)	Bank 1: U45 and U44
Boot ROM	512 KB	1	OTP ROM for the ROM monitor program	U1[1]
SDRAM-fixed	32 MB	1	32-MB DIMM	Bank 0[2]: U16
Primary cache	16 KB (instruction), 16 KB (data)	—	RM7000 processor, integrated cache	U49
Secondary cache	256 KB (fixed)	—	RM7000 processor, unified, internal cache	U49
Tertiary cache	2 MB (fixed)	—	RM7000 processor, external cache	U7, U8, U9, U10, U17

1. Located on the processor engine board.
2. Socket U15 is never populated, although it is part of bank 0.

Table 3-2 NPE-300 SDRAM DIMM Configurations—Configurable Memory Only

Total SDRAM[1]	Bank 1[2]	Quantity	Product Number[3]
32 MB[4] + 32 MB	U45 (DIMM slot 2 only)	1 32-MB DIMM	MEM-SD-NPE-32MB
32MB[4] + 64 MB	U45 and U44 or U45	2 32-MB DIMMs or 1 64-MB DIMM	MEM-SD-NPE-32MB MEM-SD-NPE-64MB

Table 3-2 NPE-300 SDRAM DIMM Configurations—Configurable Memory Only (continued)

Total SDRAM[1]	Bank 1[2]	Quantity	Product Number[3]
32 MB[4] + 128 MB	U45 and U44 or U45	2 64-MB DIMMs or 1 128-MB DIMM	MEM-SD-NPE-64MB MEM-SD-NPE-128MB
32 MB[4] + 256 MB	U45 and U44	2 128-MB DIMMs	MEM-SD-NPE-256MB

1. Refer to the Cisco AS5800 Universal Access Server documentation listed in the "Related Documentation" section on page iii for Cisco AS5800 Universal Access Server SDRAM options.
2. There are two user-upgradable SDRAM slots in bank 1. (Bank 0 is used exclusively for packet memory and is set at a fixed configuration of 32 MB in the factory.)
3. These products are also available as SDRAM upgrades. To order an upgrade, add an equal sign (=) after the product number, for example, MEM-SD-NPE-128MB=.
4. This 32 MB is fixed memory in SDRAM bank 0, socket U16. Socket U15 is never populated.

Table 3-3 NPE-400 Memory Specifications

Memory Type	Size	Quantity	Description	Component Location on the NPE-400 Board
SDRAM-configurable	128, 256, or 512 MB	1	128-, 256- or 512-MB SODIMM	J1
Boot ROM	512 KB	1	OTP ROM for the ROM monitor program	U7
Primary cache	16 KB (instruction), 16 KB (data)	—	RM7000 processor, integrated cache	U38
Secondary cache	256 KB (fixed)	—	RM7000 processor, unified, internal cache	U38
Tertiary cache	4 MB (fixed)	—	RM7000 processor, external cache	U2, U26, U27, U28, U37

Table 3-4 NPE-400 Memory Configuration

Total SDRAM	Bank 1	Quantity	Product Number
128 MB	J1	1 128-MB SODIMM	MEM-NPE-400-128MB
256 MB	J1	1 256-MB SODIMM	MEM-NPE-400-256MB
512 MB	J1	1 512-MB SODIMM	MEM-NPE-400-512MB