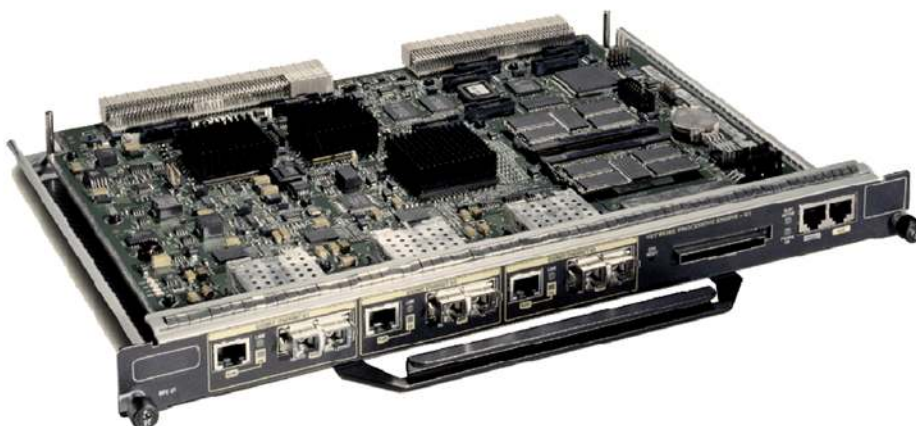


Cisco 7200 Series Network Processing Engine NPE-G1

The Cisco 7200 Series has become one of Cisco's most successful router lines. By offering customers a tremendous breadth of interfaces and features as well as full modularity, the Cisco 7200 Series meets customer's current and future needs. One of the key selling points of the Cisco 7200 Series has been the investment protection feature. With port adapter, power supply, input/output (I/O) controller, and processor modularity, customers have a clear path for steadily increasing the performance, features, and flexibility of their investments without a complete hardware upgrade. The Cisco 7200 Series Network Processing Engine NPE-G1 (NPE-G1) is the latest Cisco 7200 Series processing engine that enables customers to maximize performance.

Figure 1. Cisco 7200 VXR NPE-G1

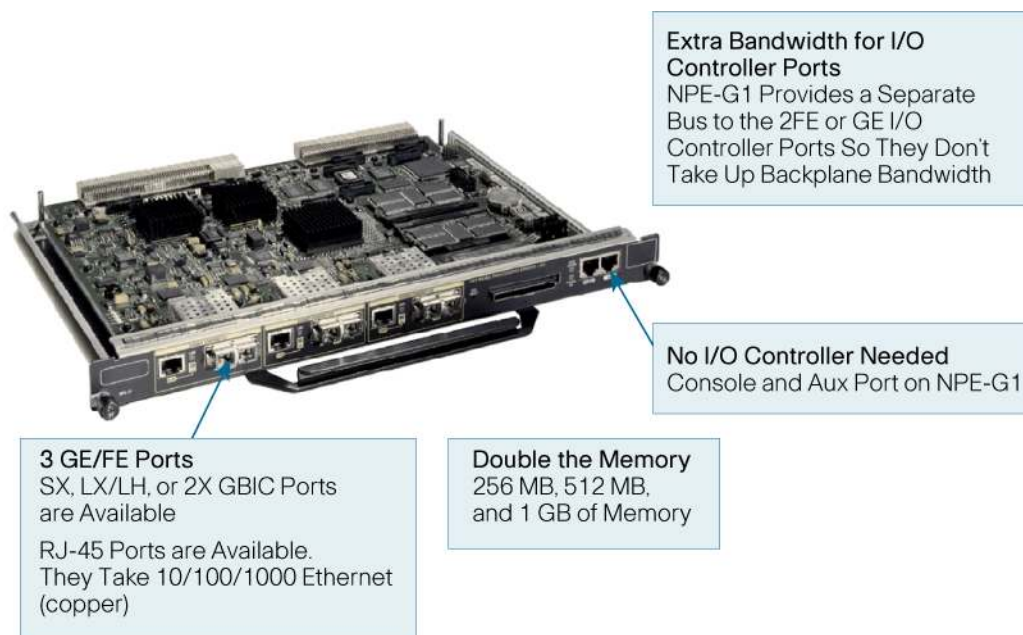


Technological Advancements

The NPE-G1 takes advantage of the latest developments in microprocessors specifically designed for data networking applications. These chips combine many of the critical components of a network device onto a single piece of silicon. This conglomeration of components means that many parts of the system can now run at much faster speeds because they are located on the same chip instead of spread across several inches on a printed circuit board. For example, the NPE-G1 processor integrates functions such as the memory controller, system controller, Non-volatile Random Access Memory (NVRAM), console and auxiliary ports, and flash storage device controller all on the same chip as the system CPU. That means that these devices are now integrated into a single network processor. Another important technical feature of the NPE-G1 processor to note is that it also includes three Ethernet interfaces as part of the system CPU. These interfaces, which can run at any speed from 10-Mbps Ethernet to 1000-Mbps Gigabit Ethernet, are also on the same piece of silicon as the system CPU. That means that there is no bus bottleneck because the interfaces feed directly into the CPU at extremely fast internal chip speeds. This also means that high-speed LAN interfaces which once had to share peripheral

component interconnect (PCI) bus bandwidth with other port adapters and I/O controllers can be moved to the processor to free up bus bandwidth for WAN port adapters or service adapters.

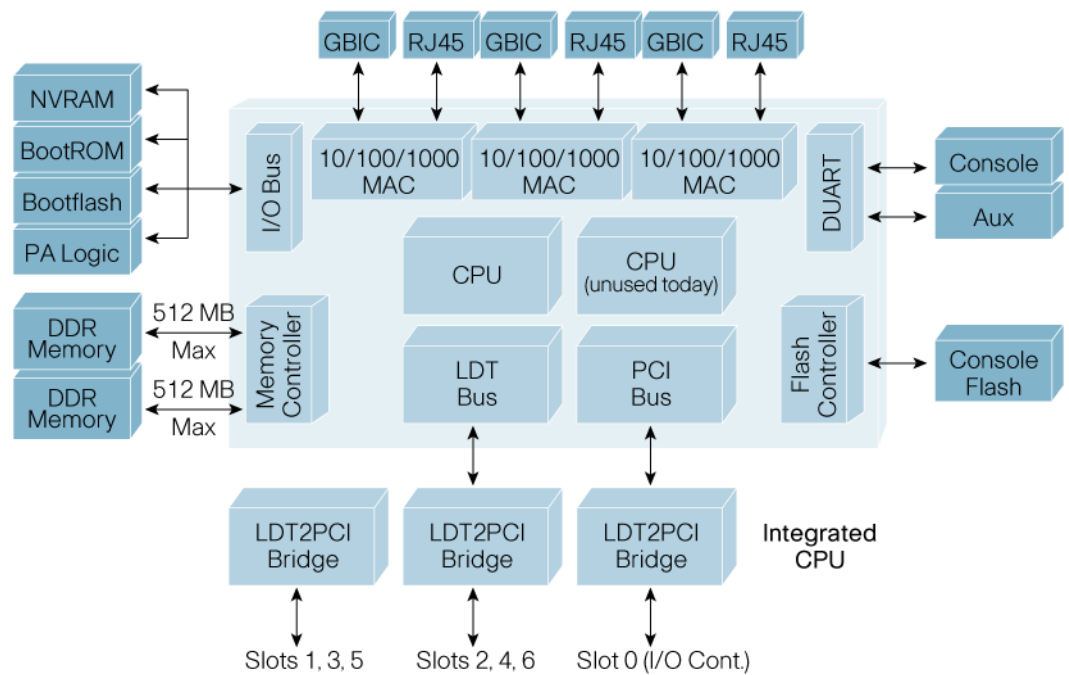
Figure 2. Major Features of the NPE-G1



The integrated CPU in the NPE-G1 has one more technical feature of considerable interest. The NPE-G1 begins to introduce a new bus technology to the Cisco 7200 Series. The Cisco 7200 Series and all port adapters use industry-standard PCI bus technology. PCI technology helps guarantee that port adapters will be compatible with any system using an industry-standard PCI bus. Using such a standardized and well-known technology has led to other products from Cisco, such as the Cisco 5500, 7500, and 7600 series, and uBR family of routers, all of which use port adapters designed for the Cisco 7200 Series. Recently, PCI standards have led to the development of a new standard bus technology known as Lightning Data Transport (LDT) or HyperTransport.

NPE-G1 Hardware Advantages

To remain compatible with all Cisco 7200 Series VXR chassis already in production, the NPE-G1 provides the same functionality as previous network processing engines. That is, the NPE-G1 functions as the central forwarding and management engine for the Cisco 7200 Series VXR system. It connects to the chassis midplane through an industry-standard PCI bus. Because of these standardized connections, the NPE-G1 provides a seamless upgrade path for customers wishing to maximize the performance of their existing Cisco 7200 Series VXR system. For many existing users, the choice to upgrade to an NPE-G1 will be a simple choice of performance. Even if users do not take advantage of any of the new built-in interfaces on the NPE-G1, they will still benefit from a dramatic improvement in forwarding rates with an NPE-G1 as well as the increase in maximum memory to 1 GB.

Figure 3. NPE-G1 Block Diagram

More PCI Buses

The NPE-G1 interfaces to the Cisco 7200 Series VXR chassis through the same PCI bus interfaces as previous network processing engines. To a typical port adapter, the NPE-G1 looks just like any other network processing engine. However, the NPE-G1 user will receive an additional benefit from three PCI buses per chassis in comparison to the two PCI buses with previous network processing engines.

With other network processing engines, two PCI buses share the load of the 4- or 6-port adapter slots. In addition, the I/O controller also shares connectivity with one of those PCI buses (slots 1, 3, and 5). In an NPE-G1-enabled system, the I/O controller sits on its own dedicated PCI bus independent from all port adapter slots. That means that any interfaces on the I/O controller will no longer consume bandwidth from any port adapters and the user is given more freedom to install high-speed port adapters where they may have previously been limited by the bandwidth consumed by the I/O controller. When doing bandwidth point calculations, the I/O controller no longer needs to be included in an NPE-G1 system.

Built-In LAN Interfaces

The NPE-G1 also includes another benefit to help customers maximize the deployment of port adapters in a Cisco 7200 Series VXR system. The NPE-G1 is the first network processing engine to deliver fixed LAN interfaces on the network processing engine. Previous network processing engines have had no physical interfaces. They simply connected to the Cisco 7200 Series VXR system through the midplane assembly. The NPE-G1 provides three 10/100/1000-Mbps Ethernet interfaces that connect directly into the system CPU. Not only does the system instantly get three high-speed interfaces, but these interfaces are available without consuming any PCI bandwidth from the port adapter slots. Because these interfaces connect directly to the system CPU, they do not use any PCI resources and so do not need to be included in any bandwidth point calculations. They are essentially “free” interfaces in an NPE-G1-enabled system.

The concept of 10/100/1000-Mbps Ethernet interfaces is a fairly new one. The three interfaces on the NPE-G1 can each independently run at any of the three speeds. Each interface also has an independent choice of physical medium. There is one RJ-45 connection and one gigabit interface converter (GBIC) connection for each interface for a total of three Ethernet RJ-45 and three Gigabit Ethernet GBICs on the NPE-G1 faceplate, any three of which may be active at any time. The RJ-45 interfaces have the option of running at 10-Mbps Ethernet, 100-Mbps Fast Ethernet, or 1000-Mbps Gigabit Ethernet over copper. No additional media interface unit is required, just plug in the correct copper cable and the interface is ready. For customers wishing to run an interface at Gigabit Ethernet speeds over fiber, they have the choice of installing an industry-standard SX, LX/LH, or ZX GBIC in one or more of the GBIC slots. These GBIC connections can only operate at 1000 Mbps and are not included in the NPE-G1 base price.

Eliminating the I/O Controller

One exciting new option available with an NPE-G1-enabled system is the option of operating with or without an I/O controller. Existing Cisco 7200 Series VXR customers will have the option of upgrading to an NPE-G1 system and retaining the functionality of their I/O controller. That means that the console, auxiliary port, NVRAM, and bootflash on the I/O controller will be used for the system. Any interfaces on the I/O controller will still be functional as well as any PCMCIA flash media.

However, new systems ordered with an NPE-G1 (or existing customers who wish to eliminate an I/O controller) will have the option of running without any I/O controller at all. A blank port cover, much like a port adapter blank, can be ordered separately as a spare to cover the I/O controller slot. The NPE-G1 includes console, auxiliary port, NVRAM, and bootflash media for standalone use without an I/O controller. These components are activated whenever the system boots without an I/O controller installed. In this way, existing systems can be upgraded with an NPE-G1 without needing to cable any management connections again while new installations can function without any I/O controller.

The NPE-G1 also includes a single compact flash for removable flash storage. While less than half the size of previous PCMCIA devices, the compact flash media is available in sizes from 64 to 256 MB. They are also formatted using the Advanced Technology Attachment (ATA) standard file system format so they can be read in other ATA routers and PC systems with a simple compact flash to PCMCIA adapter module or compact flash reader.

NPE-G1 Software

The NPE-G1 will be available in a wide variety of Cisco IOS® Software releases. The initial release of the NPE-G1 will be through the Cisco IOS Software Release 12.2B Broadband train. This train includes most of the features available in Release 12.2T. Soon after the product is shipping, the NPE-G1 will also be available in releases 12.2T, 12.2S, and 12.2SE. The wide variety of feature trains available with the NPE-G1 should allow customers to find an image that meets their needs when using an NPE-G1.

The NPE-G1 supports all standard Cisco IOS features of the specific software image that is running on it. That means that customers can upgrade to an NPE-G1 without any loss of functionality. The only thing they will notice is a dramatic increase in maximum forwarding performance. However, the NPE-G1 does not include hardware acceleration for specific features via Parallel Express Forwarding (PXF). Currently, the NSE-1 is the only processor option for the Cisco 7200 Series VXR with support for PXF-accelerated features. The NPE-G1 achieves its

forwarding improvement through an increase in CPU horsepower, dedicated I/O controller bus, and fixed 10/100/1000-Mbps interfaces which feed directly into the system CPU.

The NPE-G1 is the next generation in the continuing evolution of the Cisco 7200 Series. Over the years, customers have grown to rely on the wide range of features, robust functionality, and proven investment protection as the Cisco 7200 Series has grown along with the needs of their network. The NPE-G1 stretches the performance curve of the midrange router even further through the use of integrated system components, newer high-speed bus technologies, and dedicated LAN interfaces with direct connections to the system CPU.



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