White Paper

Cisco uBR7200-NPE-G1 Network Processing Engine for the Cisco uBR7246VXR Universal Broadband Router

The Cisco uBR7200 Series Universal Broadband Router is the most widely deployed cable modem termination system (CMTS) in the Cable Industry. The Cisco uBR7246VXR is one of two Cisco next-generation communications grade CMTSs. By offering customers a choice of routing engines, interfaces, and features, the Cisco uBR7246VXR meets customers' current and future needs and offers unparalleled investment protection. With line card port adapter, power supply, input/output controller, and processor modularity, customers have a clear path for steadily increasing performance, density, and features without a complete system upgrade. The Cisco uBR7200-NPE-G1 Network Processing Engine is the latest Cisco uBR7200 Series network processing engine (NPE) that maximizes performance.

Technological Advancements

The Cisco uBR7200-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 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. This means that these devices are now integrated into a single network processor.

Another important technical feature of the Cisco uBR7200-NPE-G1 is that it 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. There is no bus bottleneck because the interfaces feed directly into the CPU at extremely fast internal chip speeds. High-speed LAN interfaces that 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.

Figure 1
Cisco uBR7200-NPE-G1

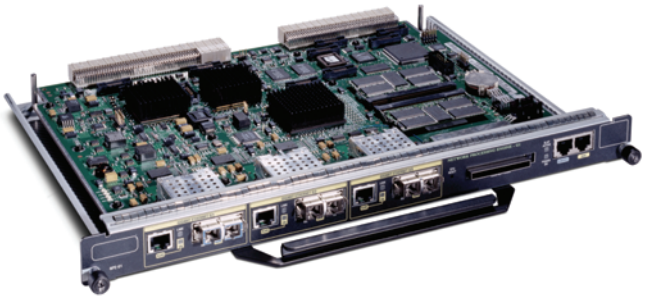
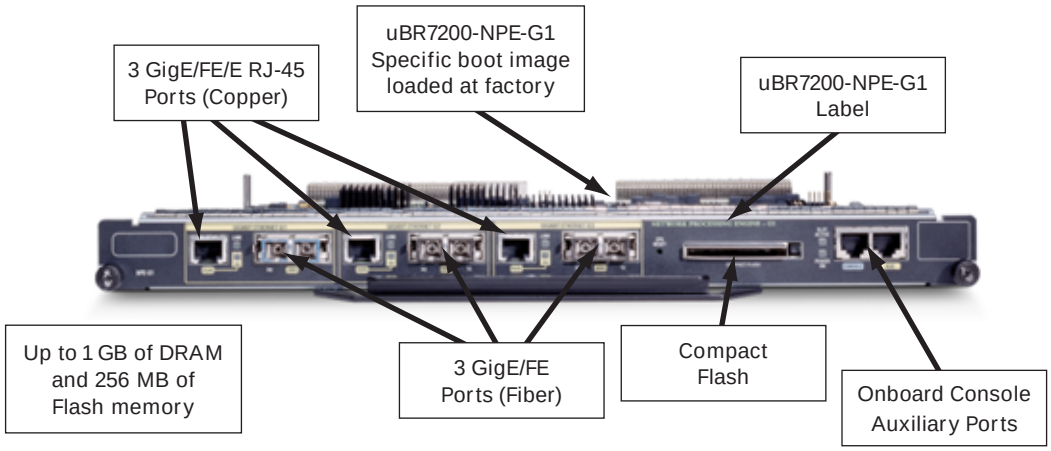


Figure 2
Major Features of the Cisco uBR7200-NPE-G1

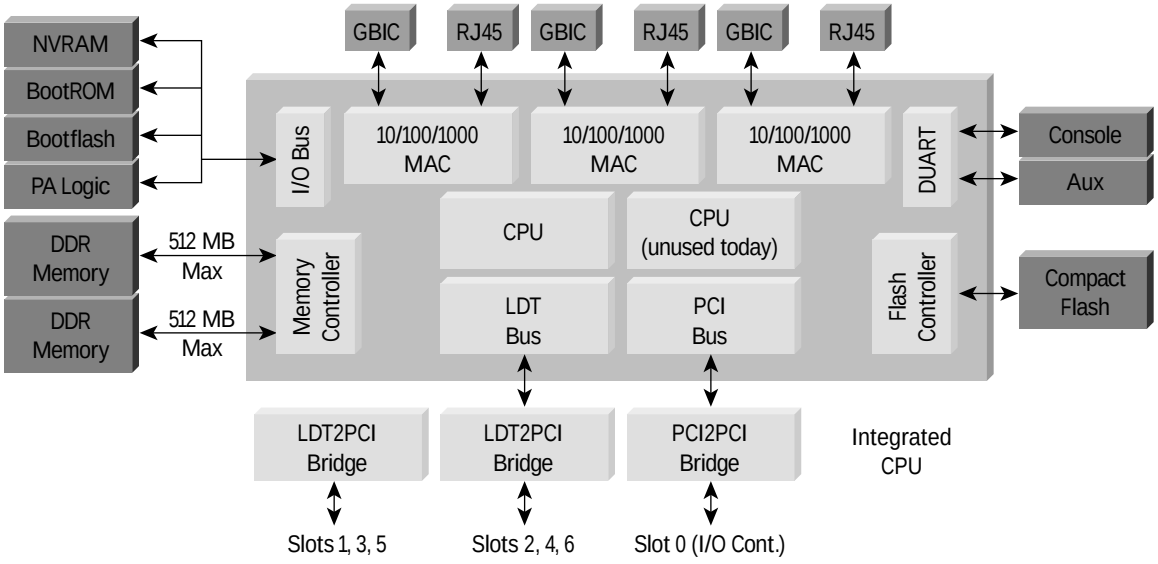


The integrated CPU in the Cisco uBR7200-NPE-G1 has one more technical feature of considerable interest. The Cisco uBR7200-NPE-G1 introduces a new bus technology to the Cisco uBR7200 Series. The Cisco uBR7200 Series and all port adapters use industry-standard PCI bus technology. PCI technology helps guarantee 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 7200, 7500, and 7600 series, all of which use port adapters supported on the Cisco uBR7200 Series. Recently, PCI standards have led to the development of a new standard bus technology known as Lightning Data Transport (LDT) or HyperTransport.

Cisco uBR7200-NPE-G1 Hardware Advantages

To remain compatible with already deployed Cisco uBR7246VXR chassis, the Cisco uBR7200-NPE-G1 provides the same functionality as previous network processing engines. That is, the Cisco uBR7200-NPE-G1 functions as the central forwarding and management engine for the Cisco uBR7246VXR. It connects to the chassis midplane through an industry-standard PCI bus. Because of these standardized connections, the Cisco uBR7200-NPE-G1 provides a seamless upgrade path for customers wishing to maximize the performance of an existing Cisco uBR7246VXR. For many existing users, the choice to upgrade to a Cisco uBR7200-NPE-G1 will be a simple choice of performance. Even if users do not take advantage of the new built-in interfaces on the Cisco uBR7200-NPE-G1, they will still benefit from a dramatic improvement in forwarding rates with a Cisco uBR7200-NPE-G1, as well as the increase in maximum memory to 1 GB.

Figure 3
Cisco uBR7200-NPE-G1 Block Diagram



More PCI Buses

The Cisco uBR7200-NPE-G1 interfaces to the Cisco uBR7246VXR chassis through the same PCI bus interfaces as previous network processing engines. To a typical line card or port adapter, the Cisco uBR7200-NPE-G1 looks just like any other network processing engine. However, the Cisco uBR7200-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 line card or adapter slots. In addition, the I/O controller also shares connectivity with one of those PCI buses (slots 1, 3, and 5). In a Cisco uBR7200-NPE-G1-enabled system, the I/O controller sits on its own dedicated PCI bus independent from all line card or 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 line card or 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 a Cisco uBR7200-NPE-G1 system.

Built-In LAN Interfaces

The Cisco uBR7200-NPE-G1 also includes another benefit to help customers maximize the deployment of port adapters in a Cisco uBR7246VXR. The Cisco uBR7200-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 uBR7246VXR through the midplane assembly. The Cisco uBR7200-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 line card or 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 a Cisco uBR7200-NPE-G1-enabled system.

The concept of 10/100/1000-Mbps Ethernet interfaces is a fairly new one. The three interfaces on the Cisco uBR7200-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 Cisco uBR7200-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 Cisco uBR7200-NPE-G1 base price.

Eliminating the I/O Controller

One exciting new option available with a Cisco uBR7200-NPE-G1-enabled system is the option of operating without an I/O controller. The Cisco uBR7200-NPE-G1 contains an onboard I/O controller. Existing Cisco uBR7246VXR customers can upgrade to the Cisco uBR7200-NPE-G1 and eliminate the I/O controller.

New systems ordered with a Cisco uBR7200-NPE-G1 run without any I/O controller at all. Instead, a blank port cover, much like a port adapter blank, is provided to cover the I/O controller slot. The Cisco uBR7200-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 a Cisco uBR7200-NPE-G1 without needing to cable any management connections again, while new installations can function without any I/O controller.

The Cisco uBR7200-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.

Cisco uBR7200-NPE-G1 Software

At release, the Cisco uBR7200-NPE-G1 is supported using Cisco IOS Software Release 12.2(11)CX. After the product ships, the Cisco uBR7200-NPE-G1 is available in cable’s leading-end IOS trains. This allows customers to find an image that meets their needs when using the Cisco uBR7200-NPE-G1.

The Cisco uBR7200-NPE-G1 supports all standard Cisco IOS features of the specific software image that is running on it. Customers will notice a dramatic increase in maximum forwarding performance.

The Cisco uBR7200-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 Cisco uBR7200-NPE-G1 is the next generation in the continuing evolution of the Cisco uBR7246VXR. Over the years, customers have grown to rely on the wide range of features, robust functionality, and proven investment protection as the Cisco uBR7246VXR has grown along with the needs of their network. The Cisco uBR7200-NPE-G1 stretches the performance curve of the Cisco uBR7246VXR 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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