Reliance Sets Server Standard

New ServerSet III Supplants Intel's 450NX as Server Core Logic of Choice

by Peter N. Glaskowsky

Reliance Computer Corp. (RCC) has been around since 1995, designing and selling PC server chip sets to Tier 1 OEM customers such as Compaq, IBM, and NEC. In just two product generations, the company has sold over two million chip sets for Intel-based PC workstations and servers. Reliance has avoided the public eye, but the company's reliance on silence is ending with the introduction of its latest chip sets. RCC expects to expand its share of two- and four-way server sales from today's 30% to about 60%, edging out Intel (which licenses its P6 bus to RCC) as the key chip-set provider for this crucial—and lucrative—market.

RCC's newest chip set, the ServerSet III (née Champion 3.0), should dominate the market for two- and four-way server designs in 1999 and 2000. The new products support a 133-MHz front-side bus, PC133 SDRAM, and multiple PCI buses. They include versions for Pentium III and Xeon. RCC offers Entry, Departmental, and Enterprise ServerSets to cover a wide range of system prices and performance. RCC has no immediate plans, however, to compete with Intel's eight-way Profusion chip set (see MPR 8/23/99, p. 22).

The choice of PC133 memory may be enough to explain RCC's anticipated success. Intel's competing product, the 840, is expected to have two Direct RDRAM interfaces. Though these interfaces offer high throughput, Direct RDRAM is expensive and has a maximum array size of just 768M per channel unless expensive and slow DRDRAM repeater or SDRAM translator chips are added. Today's Direct RDRAMs also lack the simple redundancy features of PC133 arrays, though Rambus has announced plans to add such features to future DRDRAMs. Intel's current 450NX avoids these problems, but relies on older, slower—and now more expensive—EDO DRAM.

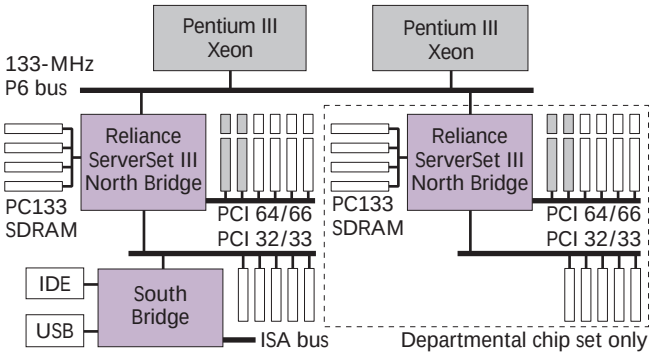

Figure 1. The Entry and Departmental ServerSet products are based on the same chip set. The 64-bit PCI buses support two slots at 66 MHz or six slots at 33 MHz.

Entry-Level ServerSet Raises the Performance Bar

Many entry-level servers today share their architectures with mainstream PCs. A north bridge connects the CPU front-side bus to a PCI bus, while a south bridge provides some I/O plus an ISA-bus interface. This structure limits scalability; servers that need more than a few PCI devices must use PCI–PCI bridge chips that add cost and cut throughput.

RCC's newest entry-level ServerSet solution, meant for systems built with one or two Pentium III processors, mimics the four-port architecture of the latest desktop PCs. Servers have no need for high-performance graphics, of course, so the Entry ServerSet III provides a 64-bit 66-MHz PCI bus instead of an AGP interface. This bus is bridged internally to the conventional 32-bit 33-MHz PCI bus that connects to the chip set's south-bridge device, but each bus has its own port to the memory controller.

RCC believes most OEMs will choose to run the 64-bit PCI bus at 33 MHz, at which speed it will support up to six slots and provide 266 MBytes/s of peak bandwidth. Some OEMs may use the 66-MHz mode to provide 533 MBytes/s of bandwidth for up to two add-in cards. This option should prove more useful over time as multichannel Gigabit Ethernet and Ultra-2 SCSI cards, which need more than 266 MBytes/s, are adopted in the entry-level server space.

The new chip sets are all designed to use low-latency PC133 SDRAM. RCC contributed to the PC133 standardization effort (an effort Intel avoided at first but recently decided to support for use on future desktop chip sets), and RCC has validated DRAMs from multiple vendors. The chip set can use up to four double-sided registered DIMMs. DIMMs with up to 1G are now available for a maximum complement of 4G, but these are expensive. RCC expects the more affordable 256M and 512M DIMMs to see wide use, giving even low-end servers up to 2G of memory.

Midrange Product Shows ServerSet Scalability

The Departmental ServerSet III, RCC's new midrange chip set, doubles the I/O capacity of the Entry ServerSet III. The Departmental chip set supports one or two Pentium III Xeon processors on a 133-MHz bus.

Instead of creating a new north bridge for the Departmental chip set, RCC designed the Entry north-bridge chip to support a configuration with two north bridges on the same processor bus, as Figure 1 shows. Each north bridge handles up to 2G of PC133 memory—4G total being the physical addressing limit of 32-bit operating systems—and provides two PCI-bus interfaces. One of the two 32-bit PCI buses connects to the south bridge, which is the same as in the Entry set.

Price & Availability

RCC has priced the Entry ServerSet III chip set at $85 in quantity. The Departmental set is $150, while the Enterprise product is $300. All are available now.

Inquiries should be directed to the Santa Clara, Calif., company via email at *product_info@rccorp.com*, or by telephone at 408.492.1915.

The two north-bridge chips can communicate over the processor bus when PCI devices on one side access main memory or other PCI peripherals on the other side. This bridging adds processor-bus traffic that can reduce throughput between processors and memory, but it ensures that all PCI devices can communicate with each other—a significant benefit for Intelligent I/O (I2O) controllers that make heavy use of peer-to-peer PCI transfers.

The two memory banks are interleaved on cache-row boundaries to give the best possible bandwidth for the dual north-bridge architecture. In this arrangement, the peak throughput of the memory subsystem is twice that of the processor bus, while sustained throughput should be somewhat higher than that of the Entry chip set.

Enterprise ServerSet Features New Architecture

To meet the needs of four-way servers, RCC offers a chip set based on a new and unique architecture. The Enterprise ServerSet III illustrates the challenges involved in designing four-way servers based on the Pentium III Xeon. Signal-quality issues limit four-way servers to a 100-MHz front-side bus, giving these systems less overall processor bandwidth than is available on two-way servers. Customers expect more throughput from a four-way system, however. Multiple CPU buses, as found in the Profusion chip set, would add more cost than a four-way system can tolerate. Memory and I/O architectures offer the only other opportunities for performance enhancement.

RCC's solution to this problem, as Figure 2 shows, returns to a single north bridge—but one with much more available bandwidth than the chip used in the Entry chip set. The memory port on the Enterprise set's north bridge implements a 100-MHz 144-bit (128 bits plus ECC) bus that connects to four parallel memory banks driven by separate memory-interface chips. Though these banks provide an aggregate of 3.2 GBytes/s of peak bandwidth, SDRAM data-access delays reduce the sustained performance of the memory subsystem to about half of the peak rating.

The Enterprise north bridge also provides a pair of proprietary unidirectional 500-MByte/s interfaces to its dual-bus PCI bridge. Each of these PCI buses is 64 bits wide and can operate at 33 or 66 MHz. A separate 32-bit 33-MHz PCI controller on the north bridge can be used for low-performance PCI peripherals, and it connects to the same south-bridge chip used in the Entry and Departmental chip sets. While the Enterprise ServerSet has just three total PCI buses, compared with the four PCI buses on the Departmental product, the Enterprise's improved memory design gives it more total I/O bandwidth.

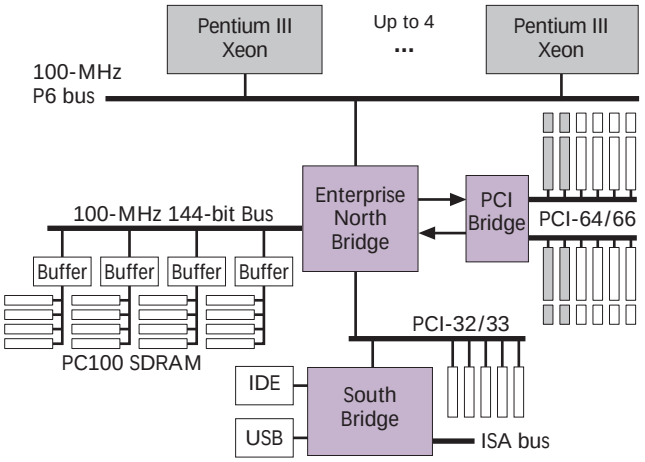

Figure 2. The Enterprise ServerSet III supports up to four Pentium III Xeon processors, 16G of PC100 SDRAM, and three PCI buses.

The Enterprise's I/O buses communicate directly with main memory through the single north-bridge chip, eliminating the overhead of a multiple-north-bridge design. With close to 1.6 GBytes/s of sustained memory bandwidth from the memory subsystem, the processors and I/O devices can access main memory without excessive contention.

Each of the four memory banks supports four DIMMs. With a 1G DIMM in each slot, the Enterprise ServerSet III can handle 16G of main memory. Currently, only a few Unix-based operating systems offer the 64-bit addressing needed to access so much memory. Next year, Microsoft will offer 64-bit extensions to Windows 2000, enabling wider use of large memory configurations.

Even with 256-Mbit DRAMs, a 16G array with ECC consists of 576 memory devices. Reliability becomes a critical issue in a system with so many chips. Many end users require so-called "chip-kill" support—the ability to continue operating even if an entire DRAM chip fails—for their mission-critical servers.

The PC133 memory controllers in all the new Reliance chip sets are designed to detect and disable a single bad DRAM on any DIMM. The Enterprise ServerSet goes one step further: it can be configured to keep a spare DIMM in each bank that can be enabled if another DIMM in the same bank fails.

These features show RCC's careful attention to the needs of the server marketplace. The ServerSet III family offers the right combination of features and performance for two-way and four-way servers in the coming year. Despite its history as the silent partner to some of the industry's most successful server OEMs, RCC may yet become a household name among server buyers. M