



## **HP Walks the Walk with AMD — Proliferates Dual-Core Opteron Across ProLiant**

Analyst: David Reine

### **Management Summary**

We are always looking for the shortcut; anything that will help us do our jobs better, making our lives more efficient, giving us additional leisure time. We look for the multi-purpose tool for our workrooms – the interchangeable screwdriver that will work with both standard and Phillips headed screws – and for our kitchens – the appliance that slices, blends, and purees at the touch of a button. We look for the single appliance that can do multiple jobs – even better if they can do them at the same time. However, convenience is not the complete story. Cost is always an important factor. The tool or appliance must be rationalized. In business terms, it must fit into the budget.

The same philosophy applies in the Information Technology (IT) arena. The CIO of every enterprise, whether Fortune 500 or start-up, is looking for solutions that will simplify the data center, improve performance, and reduce the total cost of ownership, thus improving the bottom line. The data center staff is looking for the solution that will provide a high-performance transaction capability for mission-critical database applications and a high-performance communications capability for file and print services, as well as Internet connections. One answer, increasing the speed of the microprocessor, only goes so far to improve cost efficiency, due to the physical limitations of miniaturization, the heat being generated, and the power being consumed. Companies such as IBM and Sun decided to take their server solutions in another direction. They upgraded their *Power* and *SPARC* systems with dual-core CPUs. Power and SPARC, however, are proprietary RISC architectures that do not run the *Windows* applications that are ubiquitous throughout every enterprise. AMD addressed that problem for servers by creating a dual-core x86 environment for their 64-bit *Opteron* architecture, while Intel has chosen to address the workstation world first, starting with a dual-core Pentium D. Companies such as IBM and Sun have “dipped their toe” into the dual-core x86 pool with nominal announcements to address the *Windows* and *Linux* environments: for IBM, dual-processor rack and blade configurations, and for Sun, dual- and quad-processor rack servers. One company, Hewlett Packard, with no real proprietary agenda to protect, has decided to enter the fray from the high-board, diving in to the deep end, with dual-core at the heart of a broad range of servers designed for reliability, availability, and serviceability.

Earlier this year, HP announced a quad-processor blade and quad-processor rack-mount dual-core configurations. They have now followed those introductions with a full array of products for enterprises at the lower end of the requirements scale: a pair of dual processor rack servers in 1U and 2U configurations and another pair of blade servers with differing configuration parameters. To determine whether HP will sink or swim with this decision, please read on.

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## Improving Data Center TCO

Of all of the problems facing the CIO of every enterprise, reducing the total cost of ownership (TCO) for the IT investment in the data center is high on the top ten. While being asked to implement new applications and to improve the performance of the old ones, the CIO is faced with a budget that is constantly shrinking. The data center staff has to find a new server solution that will improve performance and increase capacity without adding to the complexity of the architecture or increasing the drain on environmental resources, which all add to the TCO. A new architecture is required, whether it is tower, rack, or blade. You cannot make money if you do not spend money, but you must spend it wisely.

Adding additional dual-processor systems to an already complex infrastructure is not always the solution; additional systems require more physical space and administrators would be required to manage an already convoluted network. Upgrading dual processor servers to quad-processors, to improve performance, may not be viable because of the additional heat generated, requiring additional A/C that simply adds to the environmental costs for the infrastructure. Sun and IBM have a history with platforms that take advantage of two compute cores on a single microprocessor – a dual-core architecture<sup>1</sup> – with SPARC and Power, while Dell has opted for a Pentium D response in an entry-level server.

Dual-core has many advantages.

- Reducing the number of processors required almost in half;
- Reducing the complexity of the network;
- Reducing the licensing costs for both operating system and many mission-critical applications;
- Reducing the heat generated and air conditioning required; and
- Eliminating some of the system administration headaches.

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<sup>1</sup> A dual-core processor consists of two complete execution cores in one physical processor, both running at the same frequency. Both cores share the same packaging and the same interface with memory. This offers a way of delivering more capabilities while balancing power requirements.

Furthermore, dual-core processors have entered the market at the same cost structure as their single-core predecessors.

Unfortunately, both Power (IBM) and SPARC (Sun) are RISC architectures running variants of UNIX (AIX and *Solaris*, respectively). **While these servers do support *Linux*, this does not provide a viable alternative for the open system data center relying upon commodity *Windows* applications to help reduce the overall TCO of the data center.** The open systems server alternative has been provided by AMD in the form of the dual-core *Opteron* microprocessor, while the industry waits for Intel to introduce their *Xeon* dual-core response.

## AMD x86 Dual-Core Opteron

The AMD Opteron processor established the benchmark for 32/64-bit compatibility for x86 applications. Opteron is designed to run legacy 32-bit applications with outstanding performance, while, at the same time, enabling a simplified migration path for 64-bit computing. A 64-bit architecture also extends application memory addressability from 4GB to 256TB, greatly enhancing the performance of applications that hold large datasets in memory. By implementing a memory controller on the chip, AMD's *Direct Connect Architecture*, Opteron improved performance for open systems applications by dramatically increasing bandwidth and reducing memory latency, providing a more linear symmetrical multiprocessing environment. Now, AMD has extended the Direct Connect Architecture by connecting two CPUs on one die and improving system performance and efficiency in multi-processing environments or for compute-intensive, multi-threaded applications. The Opteron processor is offered in three families: the *100* family for mono-processor systems, the *200* family for dual-processor servers, and the *800* family for 8-way processors, enabling significant scalability.

Additionally, AMD has implemented an improved power consumption technology for Opteron, *PowerNow!*, with Optimized Power Management (OPM). This technology can decrease the overall power required to run an enterprise IT environment by optimizing *performance-on-demand*. Combined with dual-

core, this greatly improves the performance/watt efficiency of any server configured with AMD dual-core architecture. PowerNow also protects the investment that the enterprise has made in cooling and ventilation systems by reducing the strain on these facilities. PowerNow! is a power management solution that dynamically adjusts the power required based upon CPU utilization, allowing the server to run at optimum performance and power levels, reducing electrical costs and preserving the IT budget. PowerNow! can reduce CPU power draw at idle by up to 75%.

With all of these features together in a single package, Opteron provides the ideal basis for a high-performance, open systems platform that can lower the TCO of any data center. While IBM and Sun have begun to introduce some Opteron models, HP has now begun to proliferate Opteron throughout its ProLiant line of x86 dual- and quad-processor solutions, parallel to their *Xeon DP* and *Xeon MP* servers.

### HP Dual-Core Solutions

In addition to a pair of quad-processor Opteron servers announced this past spring<sup>2</sup> – the HP *ProLiant DL585* for rack-mount and the HP *ProLiant BL45p* blade server – HP has now announced a full range of dual-processor, dual-core solutions for both blade and rack environments:

- The HP *ProLiant BL25p* and *ProLiant BL35p* for the HP *BladeSystem*; and
- The HP *ProLiant DL145 G2* and the HP *ProLiant DL385* rack-mount servers.

All four of these solutions may be configured with one or two AMD Opteron microprocessors, either single or dual-core. There are four single-core models and three dual-core versions to choose from, as listed in Exhibit 1, above. All of the dual-core speeds are available in any of the dual-processor servers; however, the single-core options are limited, as described below.

The dual-core Opteron processors are all configured with the PowerNow! feature for

<sup>2</sup> See **The Clipper Group Navigator** dated April 21, 2005, entitled *HP Extends 4-Way Choices to ProLiant Servers* and available at <http://www.clipper.com/research/TCG2005024.pdf>.

### Exhibit 1 – Opteron 200 w/1MB Cache

#### Single Core –

- Model 246 at 2.0 GHz
- Model 248 at 2.2 GHz
- Model 250 at 2.4 GHz
- Model 252 at 2.6 GHz

#### Dual Core -

- Model 265 at 1.8 GHz
- Model 270 at 2.0 GHz
- Model 275 at 2.2 GHz

enhanced compute performance. In addition to the savings from reduced electrical requirements, the optimized power consumption enables the entire server to run cooler and quieter, lowering the total cost of ownership for the data center. The data center can integrate, maintain, and troubleshoot all of the new dual-core servers with industry standard management tools, including HP's *Systems Insight Manager*. (See Exhibit 2 on the next page.)

### *ProLiant BL25p*

The modular architecture of the ProLiant BL25p server blade enables it to reduce operational costs and protect the IT investment made by the enterprise previously, sharing the same infrastructure as all other *p-class* server blades, i.e., the HP *BladeSystem*. Designed for enterprise performance and scalability for front-end and mid-tier computing, the BL25p is an ideal clustering tool for multi-server applications, such as web hosting, application server, and media streaming. It comes with a SAN storage capability and four 1Gb PCI-X NICs integrated within the blade, and an optional Fibre Channel capability. Using the features of the BL25p, the data center can achieve improved data availability and realize management cost savings from consolidating disk resources.

In addition to the dual-core variants, the BL25p also supports the Model 250 and 252 single-core versions. Eight BL25p blades fit into a 6U rack space with each blade supporting up to 16GB of ECC memory, up to 600GB of hot-plug SCSI disk capacity, and a

## Exhibit 2 – ProLiant Remote Management Options

### Lights-Out 100i – Entry-level option

- Provides essential integrated remote management including power control, environmental monitoring, and text console to reduce downtime and minimize operating costs;

### iLO Standard – Small Enterprise/Department Version

- Provides basic management functions and diagnostics with essential lights-out functionality to maximize server availability; enables the data center to conserve IT resources through use of a standard web browser; features includes:
  - Full remote control of the server power button;
  - Remote text console;
  - Access to serial port applications;
  - Activation of Static Low Power or Dynamic Power Save modes.

### iLO Advanced – Enterprise-level features (by license key)

- Provides maximum remote control of system resources located in the data center or remote site; features include ability to manage installation and configuration, and monitor, update, and troubleshoot ProLiant servers via a standard web browser.

*Smart Array 6i Plus* RAID controller. The BL25p has *iLO (Integrated Lights Out) Advanced* remote management (see Exhibit 2, above) via an embedded 10/100 iLO NIC. In addition, the BL25p carries a three-year on-site warranty for parts and labor.

### ProLiant BL35p

As with the BL25p, the modular design of the BL35p delivers maximum compute density and breakthrough power efficiencies for the high performance data center. Utilizing special dual-core Opteron processors running at 68 watts, rather than the standard 95-watt implementation, the BL35p provides outstanding performance per watt scalability, with 16 blades installed in a 6U rack space, consuming resources similar in scope to a like number of single-core processors<sup>3</sup>. A single industry-standard rack can support up to 96 blades with 192 dual-core Opteron 200 CPUs, twice as many as the BL25p. Each BL35p is configured with 8GB of memory, dual embedded Gigabit Ethernet adapters, and an optional pair of 60GB ATA drives. The BL35p uses the same iLO Advanced remote management as the BL25p and comes with a three-year warranty on parts and a one-year warranty for on-site labor. Both blades have redundant, hot-plug

power.

This ultra-dense design, available only from HP, makes the BL35p an ideal server for a variety of high-performance applications, such as financial, geo, life, and materials sciences, electronic design automation, and high-end film and video editing.

### ProLiant DL145 G2

With the acceptance of the ProLiant DL585 as the initial dual-core Opteron rack-mounted solution, HP has now introduced the second generation of DL145, the DL145 G2, as a low cost, 1U, scale-out node for compute-intensive environments, such as high-performance computing and electronic design automation. Configurable with any of the single-core or dual-core Opteron 200 models, the DL145 G2 can be installed with one or two CPUs, 16GB of advanced ECC memory, and up to two SATA or SCSI drives (not hot-pluggable). The SATA drives are supported by an integrated dual-channel SATA controller. An optional SCSI adapter in a PCI slot supports the SCSI drives. The DL145 G2 has two 133Mhz PCI-X slots and an optional PCI-Express slot for x16 configuration flexibility and high-speed I/O performance. The DL145 G2 does not have redundant or hot-swap power. It has a one-year warranty on parts and remote management support is provided by HP's embedded *iLO 100i*.

<sup>3</sup> The ProLiant BL35p supports the Model 250 single-core option, only.

With the high-speed compute performance provided by a pair of dual-core Opterons at speeds of up to 2.2GHz, PC3200 ECC memory, and the high speed I/O provided by PCI-Express, the DL145 G2 provides the application versatility required for an HPC cluster or a multi-tiered web environment.

### ***ProLiant DL385***

For enterprises that have a need for more internal disk support in their dual-core platform, HP has introduced the ProLiant DL385. With the capability to scale to six hot-pluggable SCSI drives, or eight small form factor, hot-pluggable SAS drives on dual-core models only, this server can support up to 1.8TB of internal disc. The DL385 can be configured with any of the Opteron 200 dual-core models<sup>4</sup>, with up to 16GB of advanced ECC memory. The SCSI models come with an integrated Smart Array 6i RAID controller, while the SAS models require a Smart Array P600 in a PCI slot. Because of the additional disk capacity, the DL385 comes in a 2U format and has redundant power supplies and fans, with optional hot-plug capability in a tool-free environment, for full enterprise-class availability features. The DL385 comes with a full three-year on-site warranty for both parts and labor and uses iLO Standard functionality, with advanced features available via an optional upgrade.

### **Conclusion**

HP appears to be listening to the marketplace. Despite their long-standing relationship with Intel, HP has not merely gone into partnership with AMD, but they appear to be committing a sizeable portion of their ProLiant family to the dual-core capability developed by AMD for the x86 community. Quite clearly, dual-core appears to be one answer to the data center dilemma of continuing to lower the TCO of its server investments. However, there is more to lowering the TCO than simply adding an additional core to Opteron.

HP has addressed the complete range of enterprise server infrastructure with a variety of offerings. ProLiant can now address high-performance computing environments with

very dense dual-core configurations, up to 16 blades in a 6U chassis, and applications with large addressability requirements, with 16GB of memory per system. They have addressed cluster and consolidation needs with an integrated SAN capability and high-speed I/O with PCI-Express. They have also addressed the human resource aspect with the inclusion of a lights-out remote management capability to the existing management features of the Systems Insight Manager.

Dual-core has reached the mainstream of open systems solutions with HP's broad commitment to AMD's Opteron microprocessor. HP is justifiably proud of the ten million ProLiant servers that they have shipped to date. From their actions of late, it would appear that they are intent on attacking the next ten million as soon as possible, with the help of a new partner and innovative technology for the open systems market.

If your strategic plan calls for improved performance for enterprise x86 applications, while lowering the IT TCO, take a look at HP's Opteron-based server set. There may be a solution there that will enable you to ride the crest of the incoming wave.



<sup>4</sup> The DL385 supports the 2.4 and 2.6 GHz single-core models.

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### ***About the Author***

***David Reine*** is Director, Enterprise Systems for The Clipper Group. Mr. Reine specializes in enterprise servers, storage, and software, strategic business solutions, and trends in open systems architectures. He joined The Clipper Group after three decades in server and storage product marketing and program management for Groupe Bull, Zenith Data Systems, and Honeywell Information Systems. Mr. Reine earned a Bachelor of Arts degree from Tufts University, and an MBA from Northeastern University.

- ***Reach David Reine via e-mail at [dave.reine@clipper.com](mailto:dave.reine@clipper.com) or at 781-235-0085 Ext. 123. (Please dial “123” when you hear the automated attendant.)***

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