



Opinion

And Then There Were Three: POWER, x86 and z

Executive Summary

There is a major shakeout underway in the midrange/high-end server market place as sales of Sun SPARC/CMT (cellular multi-threading) and Hewlett-Packard Itanium-based servers decline significantly — and as a new, more powerful versions of Intel's Xeon and IBM's POWER micro-architectures come to market.

Clabby Analytics observes that:

- Sun server sales are slumping badly (Sun's revenue from new products in its fiscal first quarter dropped 33% — and server sales declined by 41%);
- Sun customers are abandoning SPARC/CMT servers and migrating to other platforms (Hewlett-Packard [HP] has migrated about 100 Sun customers to its platforms over the past six months; IBM has migrated over 170 in Q2 and Q3 2009 Sun customers to POWER during the equivalent time frame); and,
- HP Itanium-based server sales are floundering (sales were down 30% last quarter in HP's business critical systems group) — and sales of HP's HP/UX operating system are also appear to be on the decline.

Meanwhile, Intel has released a powerful new 8-core Xeon-class — and *Clabby Analytics* expects IBM to launch its new POWER7 processor in 2Q10.

The downturn in SPARC and Itanium sales — combined with the introduction of powerful new class of Xeon processors, as well as the introduction of a more powerful version of IBM's POWER architecture — signal that there is a major realignment underway in the midrange server marketplace.

The remainder of this *Opinion* discusses some of the shifts and changes taking place in the midrange and high-end of the server marketplace, including:

- Reasons for Sun's server sales decline and the impact of the Oracle acquisition on the Sun customer base;
- Intel's Itanium predicament — and the future of Itanium given the introduction of a new challenger from within Intel (the new Nehalem-class Xeon processors);
- HP's predicament given the drop in HP Integrity (Itanium-based server) sales and the overlap/encroachment of Xeon-based processors within its own product line;
- Migration trends (as Sun and HP customers opt out of SPARC and Itanium-based servers);
- The forthcoming release of IBM's POWER7 architecture (expanded processing power combined with the virtualization capabilities of this microarchitecture);
- The planned release of Xeon EX (Intel's "Becton" microarchitecture) — an x86-based architecture that offers a new growth path for Linux and Windows users; and,

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- The new mainframe server positioning given the mounting challenges poised by POWER7 and future Xeon-class servers as they scale into the high-end server market place.

Based upon these trends, Clabby Analytics believes that, over the next few years, the midrange/high-end market segment of the computer market place will gravitate toward three microprocessor/server architectures (Xeon, POWER, and z). If Oracle can't right the Sun UltraSPARC/ chip multi-threading (CMT) ship (and we think it won't) — and if Intel's Itanium architecture continues to struggle (and we think it will) — then Sun and HP midrange/high-end customers will have little choice but to move to IBM POWER-, IBM z-, or Intel Xeon-based servers.

Information technology (IT) executives who don't recognize that this shift is underway — and who continue to invest in Itanium- and UltraSPARC/CMT-based servers — may find that they have wasted their precious information systems hardware budgets on dead-ended server architectures and operating environments.

A Requiem for Sun

Starting out as a maker of Unix workstations, Sun's greatest success in the computer market came by being in the right place at the right time. In the late 1990s, Sun was perfectly positioned with small Unix-based just as the need for small Web servers took off. (At the time, both IBM and HP had positioned their Unix servers for the midrange/high-end Unix market). And, as the need for more powerful Unix servers grew in order to address enterprise resource planning (ERP), customer relationship management (CRM), and supply chain management (SCM) requirements, Sun was able to build on its success by acquiring Cray Business Systems' Starfire server — an extremely well designed SPARC-based server that proved ideal for addressing Sun's mission critical computing needs.

But since 2001, when the Internet bubble burst, Sun has been unable to return to its former glory. Sun's inability to get products out the door in a timely fashion (as illustrated by the tardiness of its Niagara processors) — and the delays in the release of its CMT architectures — started to erode customer confidence in Sun server hardware schedules and deliverables. Discontent with Sun's inability to deliver up-revs of its micro-architectures and systems led numerous Sun customers to migrate to other platforms.

Oracle's Acquisition Bid

Unable to regain its footing after the Internet bubble burst, Sun eventually became a take-over candidate. In a move that surprised Sun customers, information technology (IT) research analysts, and the computer press, on April 20, 2009 Oracle Corporation (an application/database software maker) tendered an offer to buy Sun for \$7.4 billion. From Oracle's perspective, buying Sun would enable Oracle to become a full service hardware, software, and services company — a company that could compete head-on with IBM, HP, and other computer manufacturers.

From a financial perspective, Oracle has stated publicly that it expects the Sun acquisition to be accretive to Oracle's earnings by at least 15 cents on a non-GAAP basis in the first full year after closing (\$1.5 billion in year one; and over \$2 billion in year two). But *Clabby Analytics* does not believe that Oracle can meet these goals, and here's why:

1. Since Oracle's initial bid, the company has run into major regulatory barriers — forestalling Oracle's takeover while crippling Sun's ability to do business. According to Oracle, Sun is losing \$100,000,000 per month due to regulatory delays. Huge revenue losses such as this undermine Sun's market value while

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eroding its customer base. Oracle will be hard pressed to recover this lost revenue — as well as lost customers. And accordingly, Oracle will be hard pressed to meet its stated accretive earnings goals.

2. Instead of saving Sun and its installed base, Oracle's acquisition plan has had quite the opposite effect. Sun customers, left in acquisition limbo, have started to migrate away from Sun platforms en masse — moving in some cases to HP servers, but in the majority of cases to IBM POWER servers.
3. By some estimates, it takes about a half-a-billion dollars to design, test, and manufacture a commercial server microprocessor architecture. And, unless Oracle can defray this cost (by finding some other vendor to assume this cost, as HP had done by getting Intel to take over Itanium design and manufacture), Oracle will be stuck with about a half-a-billion to a billion dollars worth of microprocessor R&D, testing, manufacturing, and integration costs (costs related to packaging, integrating, and optimizing Oracle's software products on Sun hardware). And given the erosion of the Sun base (described earlier), Oracle will have to find a lot of new customers for its Oracle/Sun-based solutions in order to justify this expenditure. Given this scenario, we don't see how Oracle can meet its financial goals without both a heavy investment in Sun hardware and what frankly would have to be close to a miracle cure for recovering lost customers and attracting new ones.
4. Sun has recently laid-off (made redundant) 3,000 of its employees (and may have lost others through attrition) — in the process losing valuable engineering, sales, and marketing talent. This "brain-drain" does not bode well for a company that: a) must improve its servers from an engineering perspective; b) must perform outstanding customer service in order to preserve its existing base; and c) must find new customers (hard to do when sales and pre-sales employees have been laid off).

Given the amount of money that Oracle will need to invest in Sun SPARC/CMT to make it more competitive; and given Oracle's large bid of \$7.4 billion for Sun — Clabby Analytics doubts that Oracle will move forward with its acquisition bid under the current circumstances. If Oracle's acquisition bid collapses, Clabby Analytics does not see a recovery scenario for Sun. Sun assets will be slowly sold off and its customer base will slowly dissipate (similar to the way Wang Laboratories collapsed in the late 1980s through early 1990s).

The Failed Itanium Experiment

Explicitly parallel instruction computing (EPIC), the computing basis for the Itanium processor, was the brainchild of HP back in 1989. At that time, HP engineers believed that, by preprocessing instructions (using the EPIC approach), they could build a computer architecture that was superior to the reduced instruction set computing (RISC) products offered by IBM, Sun, and even HP itself — and by so doing, they would be able to create a distinct competitive advantage for HP. In fact, HP was so confident in this new approach to computing that it even embarked on a schedule to kill its own RISC processor (PA-RISC) in favor of Itanium.

In 1994, HP partnered with Intel in an attempt to position Itanium as "the industry standard chip" for 64-bit computing. Unfortunately for Intel, computer buyers didn't take to Itanium, partially because Itanium releases were consistently late to market — often by months or even years — while constantly dropping features. As examples, consider:

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- Itanium was conceived in 1989 — but didn't make it to market until 2001 — after substantial delays due to structural problems, processor count challenges, and compiler issues (amongst several other issues). Intel and HP had targeted 1998 for the first release of Itanium — so its 2001 release date was almost three years late;
- This lateness trend continues even today. The next build of Itanium, codenamed Tukwila, was originally due in the middle of 2009, then moved to the end of 2009, and is now scheduled for 2010).
- From a “dropped features” perspective, one of the most important features dropped in Itanium design was the chip's ability to handle 32-bit computing. During the course of its development, 32-bit emulation mode was removed from the Itanium feature set, making it impossible for IT buyers to run their existing 32-bit applications on the Itanium 64-bit processor. And to make matters worse, Intel was slow to make its own 32-bit Xeon-class processors capable of running 64-bit applications. So, as an IT buyer, *if you wanted 64-bit computing, you had to buy Itanium* (in effect, Intel precluded a clean migration path to 64-bit computing). AMD, seizing this opportunity, built a highly successful 32-bit/64-bit architecture, ultimately forcing Intel to build 32-/64-bit hybrid Xeon class machines.

By enabling Xeon architecture to run 64-bit applications, Intel has now made it possible for IT buyers as well as IT vendors to deploy 64-bit solutions on an architecture that is considered an industry standard: Xeon. And Intel has, in effect, created a competitor for Itanium within its own product line. This internal competition works strongly against Itanium from an economics perspective as Xeons are high-volume/low-cost processors whereas Itanium is a high-cost/low-volume processor. Low sales volumes mean that Intel needs to charge heavily for Itanium microprocessors in order to recoup its investment; whereas high volume Xeon processors generate lots of money and can thus be sold at lower price points. Accordingly, if Xeon continues to encroach on the Itanium camp — and if Itanium sales volumes stay static or decline, this question needs to be asked: “how will Intel pay for the continued development of Itanium?” Perhaps this is why the Itanium roadmap gets a little “vague” after two years...

Failing to meet delivery schedules not only impacts customer plans, but it also disrupts vendor system build cycles — a circumstance that may cause IT vendors to start looking elsewhere for other microprocessor solutions. And, accordingly, an interesting vendor loyalty situation is developing in the Itanium camp. If the small handful of vendors can obtain Xeon-class servers at a far lower price point than Itanium-based servers — and if IT buyers are showing a clear preference for Xeon — then why should these vendors continue to build Itanium-based servers? One example of this phenomenon is SGI (formerly Silicon Graphics) — a vendor that has, to date, invested heavily in Itanium architecture from a systems design perspective. With Itanium arriving late (again), and with low-cost Xeon processors readily available, SGI could choose to start using Xeon-class processors in its high-end servers. If this happens, and if other Itanium vendors chose to follow suit — HP would essentially be the only vendor continuing to push Itanium solutions.

The Future of Itanium at HP — What Might Happen

From a systems perspective, HP is a two platform company: Itanium and Xeon. HP sells Itanium-based servers to address mission critical computing requirements, while Xeon servers are positioned for general business use. But, Xeon's move into multi-core processing combined with its expanded reliability, availability, and security (RAS) features and capabilities have now enabled Xeon to encroach on HP's Itanium midrange.

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Sometimes internal competition can be good (it can encourage innovative thinking and new product designs) — but *Clabby Analytics* does not see this particular internal conflict as good for HP in the long run. Here's why:

- There is considerable overlap in the types of applications that can be run on HP/UX on Itanium versus Linux on Xeon. If the same applications are available on two different platforms — and if the Xeon platform costs significantly less than the Itanium platform — which platform are customers likely to choose? (Answer: Linux on Xeon); and,
- HP could counter argue that IT buyers are paying for better RAS if those buyers purchase Itanium-based solutions. But that would imply that HP's Xeon-based solutions offer less RAS than their Itanium solutions — hardly an enviable claim — especially when considering that Dell and IBM compete with HP Xeon offering on the basis of RAS...

Xeon's advance into the midrange/high-end of the computer market has created a Catch 22 for Hewlett-Packard. To claim that Itanium is superior to its Xeon offerings demeans its Xeon offerings; to claim that Xeon is superior to Itanium will weaken its Itanium sales.

Adding to HP's internal conflict woes are developing migration trends away from Unix toward Linux. Unix market revenues have been flat over the past several years due to competition from Linux as it moves upscale in the enterprise. Over the past three years, HP has been losing market share in Unix to IBM. After looking closely at this trend, we think that this loss of Unix market share is a sign that HP/UX customers are opting for other operating environments rather than adopting HP/UX on Itanium. HP customers whose PA-RISC machines are reaching their end-of-life appear to be gravitating toward IBM AIX (Unix) on POWER (a RISC platform alternative) — or to Linux (but not necessarily Linux on Itanium). And, when Intel's Beckton processor is released, we expect HP customers to move toward Linux on x/86 much more aggressively.

Now consider this:

- HP's business critical systems group has just reported a significant drop in sales;
- HP lost market share in Unix in Q1 (down 1.2%) and Q2 (down 1.6%);
- HP's NonStop and OpenVMS environments that also run on Itanium do not appear to be growing;
- Only the Linux operating environment appears to be growing on HP's Itanium-based servers — and this may not continue when Beckton servers make the scene (the market has shown clear and definite preference for Linux on x86 architecture).

Given these points, it is clear to Clabby Analytics that HP's Itanium-based servers are about to be marginalized. Xeon-class architecture costs less than Itanium architecture; 8-core and beyond Xeon systems will be able to challenge HP's Itanium-based Integrity servers; and several of HP's operating environments have been negated by Linux. These data point indicate that HP needs to think long and hard about how much longer it may wish to continue to invest in Itanium systems design, testing, and deployment.

One scenario that will enable Itanium to live a longer life involved the design and deployment of Itanium specialty processors. HP has defrayed the cost of building Itanium

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microprocessors by passing the Itanium design and manufacturing job to Intel. But HP is still on the hook to take Intel's Itanium processors and build systems environments around them. Building systems involves research and design work, systems integration of a myriad of components, and extensive testing — a major investment for any company that builds systems environments. One way to ensure that Itanium can survive the forthcoming Xeon onslaught would be to find a way to reduce system/platform design costs. And one way to do that would be to make blade servers the hosting environment for Itanium servers.

Blade servers are a brilliant design. They share components (such as fans and power supplies) as well as communications backplanes — and they can host many different types of processors as long as those processors are mounted on server form factors that can fit into a given blade chassis. *Clabby Analytics* believes that, over time, as Itanium sales give way to Xeon sales, HP will need to consider deploying Itanium as a specialty processor environment that will run inside of blade enclosures. Because HP already offers such enclosures, its system design costs for Itanium would be limited to designing Itanium-based servers that can fit into its blade chassis designs.

In the end, the Itanium experiment can be adjudged a failure. This architecture (the most expensive venture of its kind in the history of computing) has been consistently late to market, while dropping features. Its attempt to become the industry standard for 64-bit computing failed. And with new competition from within Intel, from our perspective Itanium is likely to become a specialty architecture sold primarily in blades.

The New Xeon Class

Nehalem is the codename for the class of Xeon multi-core, multithreading processors that succeeded Xeon Intel Core microarchitecture. The first Nehalem processor was designed to provide advanced desktop support, and was released in November 2008 as Intel's Core i7 processor. Xeon 55xx-class servers followed Core i7, and servers that use these processors are available today from several systems makers.

Nehalem class processors are different from predecessor Intel Core processors in the areas of multi-core support, memory management, interconnect, and hyper-threading capabilities. With Nehalem, Intel has introduced an integrated memory controller that can support up to three memory channels of DDR3 SDRAM or four FB-DIMM channels. Intel has also introduced "QuickPath" on Nehalem, a new point-to-point processor interconnect. And threading capabilities have been improved in Nehalem-class processors.

From *Clabby Analytics* perspective, the first generation Nehalem EP processors are interesting because they show that Intel is now serious about playing in the server market high-end with an architecture that can scale well and that can perform a substantial amount of thread processing. But Nehalem-class servers become much more interesting in their second revision (a class of processors codenamed "Beckton" or "Nehalem EX"— an 8 core design due to ship sometime in the 2010 timeframe). This processor will have at least four QuickPath interfaces, and will be able to support a lot more standard memory (up to 16 standard DDR 3 DIMMS).

Clabby Analytics will produce a Nehalem EX critique when it is released. But, for now, be aware that that we expect that this Intel environment will create significant price pressure on other 64-bit systems.

IBM's POWER 7:

Intel's new Nehalem-class Xeon servers (previous section) will, over time, challenge IBM's POWER architecture and even mainframes for share in the server market midrange and high-end. But, in order to move up the server ladder, Xeon will have a lot of catching up to do — especially in the areas of processing power, virtualization facilities, and systems software. In the mean time, IBM's soon-to-be-released POWER 7 architecture will set the competitive bar for Unix/Linux servers in midrange and high-end commercial, scientific, and super computer markets.

The POWER 7 design ranges from 2-8 cores per processor — with each core providing 32 gigaflops. An 8-core unit would thus provide 256 gigaflops of computing capability and run twice as fast as its predecessor, the highly successful POWER 6 architecture. IBM will build POWER 7 into advanced systems designs that range from water-cooled and air-cooled towers, through distributed supercomputer designs, all the way to blades.

From a competitive perspective, if the premise contained in the *Opinion* is correct (that SPARC and Itanium are “troubled” architectures), POWER 7 should find itself in a class-by-itself, virtually unchallenged in the Unix market — and difficult to challenge in the Linux market based on sheer computing capacity. In addition to its impressive computing capacity, IBM had also focused on improving interconnect speeds, graphics handling, and virtualization capabilities — further distancing POWER 7 from Itanium and SPARC.

POWER 7's virtualization capabilities serve as an excellent barometer to illustrate how much work lies ahead for Xeon as it attempts to move upscale in the midrange/high-end server market place. Some of the advanced virtualization/provisioning features found in POWER 7 architecture and systems designs include:

- Fine-grained dynamic sharing of processors, memory and I/O;
- Resources may be dedicated;
- Shared, dedicated processors;
- Extreme scalability and robustness (especially when compared with x86 virtualization offerings);
- Integrated firmware hypervisor;
- Virtual I/O servers layer;
- Hardware enforced isolation;
- LPARs and WPARs;
- DLPAR and Processor folding;
- Capacity-on-demand functionality; and,
- Partition Mobility.

It should also be noted that IBM Systems Director, as well as IBM's advanced Tivoli management products, offer rich systems/applications management facilities — as well as additional provisioning and process management facilities. This combination of further distances IBM POWER Systems from its competitors.

Changes in the Mainframe Space

Mainframes have been around for almost fifty years — and despite a recent 26% drop in sales (due to the coincidence of an off-cycle [no new mainframe delivered] year and the

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economic decline), mainframes are not about to fade into the distance. Unlike Itanium, mainframes are core to servers in almost every major bank throughout the world, as well as in leading retail and financial institutions. Although pundits have forecast the end of the mainframe for over two decades, the demise of the mainframe is just plain not going to happen in the foreseeable future.

The mainframe does, however, have some weak points in the areas of price and perception. Because the mainframe has been around for almost fifty years, some IT executives consider mainframes “old technology”. And many IT executives find mainframes to be expensive.

From an “old technology” perspective, IT executives should know that:

- IBM System z mainframes are considered “the gold standard” in the computing industry for **virtualization and provisioning** — the model server that all vendors want to beat, allowing customers to consolidate several hundred servers onto a single mainframe;
- Offer the highest level of **security** of any commercial server in the IT marketplace (EAL Level 5), plus advanced encryption/public key facilities.
- Networking — instead of having to rely on external switches, routers, and cabling - **processors are networked using a switched backplane** within the System z). This greatly simplifies System z deployment while reducing networking hardware acquisition and cabling costs and associated network latency issues.
- **MTBF and high-availability** — over the last five decades, IBM has gotten very proficient in the design of highly reliable, highly-available systems design (mainframes can provide 99.999 per cent or greater high availability).
- **Manageability** — fewer people are needed to manage mainframes as contrasted with equivalently configured distributed systems environments;
- **Near-linear scalability** — IBM’s System z design along with Parallel Sysplex enables near linear processor scalability (as additional processors are added they perform at nearly 100% of their capacity). Other system designs (such as some SMP designs) can see processor scalability drop by as much as 50% as new processors are added to a system.
- **Floor space** — IBM’s System z packs a lot of processing power into a relatively small footprint (as compared to the floor space dozens of networked SMP or PC servers might occupy if equivalently configured). And, finally,
- **Energy efficiency** — When comparing the System z to an equivalently powerful distributed computing environment, the System z uses far less power and cooling to deliver the same amount of computing power.

From a cost perspective, IT executives should know that IBM has recently undertaken several pricing actions to help reduce mainframe costs including the creation of lower cost business class mainframes; the introduction of coprocessors and specialty engines (lower cost processors that operate in mainframes); and Solution Edition pricing (see <http://www-03.ibm.com/systems/z/solutions/editions/> for further details on this pricing action).

Clabby Analytics believes that IBM is undertaking these price reduction measures to close the gap between mainframes and midrange/high-end Unix/Linux servers to attract new workloads to the platform.

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Summary Observations

Information technology executives and strategic planners need to pay very close attention to what is happening in the commercial server market — both from a microprocessor architecture and system design perspective. Over the next few years, *Clabby Analytics* believes that three microprocessors will come to dominate the midrange/high-end server market: the mainframe “z” microprocessor; the reduced instruction set POWER architecture; and Intel 8-core and beyond Xeon-class chip complex. Sun’s RISC processors will fade into the woodwork when Oracle realizes that it is not a hardware company; and Intel’s Itanium-class architecture will implode due to internal competition from Intel 8-way and beyond Xeon-based processors.

Failure to grasp these changes could result in the purchase of dead-ended servers and operating environments — and the loss of valuable IT investment funds.

Some readers may also wonder why *Clabby Analytics* believes that IBM POWER Systems make the cut — while Itanium and SPARC did not. From our perspective, it will take several years (if not a decade) to enrich post-Nehalem Intel Xeon processors to a point where Xeon can compete head to head with IBM’s POWER architecture and mainframes. POWER and mainframe architectures are way ahead of Intel Xeon in virtualization, memory management, RAS, and other mission critical features. Still, even though Xeon servers are far behind mainframes and POWER Systems in these areas, they will meet the needs of a large segment of the server market (a segment some people call the “good-enough” computing segment) — and they will definitely create new dynamics in the midrange/high-end server market.

Some readers of this document may believe that *Clabby Analytics* has been unnecessarily hard on HP and Sun. We understand that many of our readers have devoted their careers to deploying SPARC and Itanium solutions from these companies — and the arguments put forward in this opinion may be hard to take. For those who wish to respond directly to Joe Clabby, President of *Clabby Analytics*, regarding the content and arguments put forward in this article, please send an email jclabby1@AOL.com.

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