Research Report

IBM's New z114: A Replacement for SPARC/Itanium Servers?

Introduction
IBM's new zEnterprise 114 (z114) is a capacity reduced, cost reduced version of its popular System z196 mainframe designed to serve mid-market systems buyers. The z114 is based on the same z microprocessor core as the z196; it can access up to 256 GB of main memory (this includes 8 GB of fixed memory for HSA); and it offers the same Qualities-of-Service (QoS). New design aspects/features include a new microprocessor core design (same as on the z196), a modular two drawer system design (that is similar to the "processor book" structure of the z196); a new, standards-based input/output subsystem — all implemented to help drive down systems cost.

> *What impresses us most about this new "baby mainframe" is its improved platform economics. IBM has driven down cost barriers-to-entry with a new software curve, reduced hardware maintenance pricing, lowered prices for "specialty engines" (such as IBM's zIIP, zAAP, ICF, and IFL specialty processors — described later), reduced memory prices, and enticing upgrade packages.*

By our estimates, information technology (IT) buyers will still pay about a *10-20% premium* over the cost of equivalently-configured HP Superdome (Itanium-based) and their Oracle T3 UltraSPARC servers — but what these buyers get in return for this premium is:

- ***Higher utilization*** — mainframes have the strongest, most mature virtualization facilities in the industry — enabling System z buyers to get more work done on a mainframe. (Mainframes can run at 100% of capacity for sustained periods of time — meaning that the premium could be recovered by increased utilization alone!) Further, higher utilization leads to higher core consolidation ratios (this leads to improved efficiency and lowers software costs — as we describe in this report at: http://www.clabbyanalytics.com/uploads/z_VirtualizationFINALRev.pdf);
- ***Super-strong security*** — IBM System z is the only server to have ever achieved an Evaluation Assurance Level (EAL) level 5 (an international standard security rating) security certification. (Consider what a security breach costs and then decide if the mainframe premium is worth the investment — we suspect it will be);
- ***The highest meantime-between-failure (MTBF) in the industry*** — measured in decades between failures. (Think about what a failure costs — and again, the 10-20% premium could be recovered on this feature alone…); and,
- ***Hybrid computing*** — the ability to now integrate and manage workloads that span z/OS, Linux on System z, z/VM, AIX on POWER, Linux on System x, and eventually Microsoft Windows operating environments in a single unified system. By integrating these workloads — and by running them on the systems architecture best suited to execute a given workload, enterprises can save BIG MONEY in system acquisition and operational costs (this concept is called "workload

optimization" — and details on potential cost savings can be found in our report at: http://www.workloadoptimization.com/uploads/WhyWrkloadOptimization.pdf);

- *A platform with a future* *Clabby Analytics* believes that Itanium architecture is essentially dead — and we have little faith in Oracle's roadmap for SPARC architecture (see http://www.clabbyanalytics.com/uploads/Itanium_Fire_CIO_Update.pdf and http://www.clabbyanalytics.com/uploads/SPARCfinal.pdf for further details on these perspectives). Meanwhile, IBM continues to invest heavily in mainframes and has a fully believable roadmap. Mainframes will be around for a long time...

> *The zEnterprise 114 has the ability to run the same parallel, serial, and data-intensive applications as are run on Itanium- and SPARC-based servers. So, we've got to ask: "if your organization is considering moving away from SPARC or Itanium — are you considering moving to a mainframe?"*

In this *Research Report*, *Clabby Analytics* describes why we believe that an IBM z114 mainframe makes an ideal replacement for Itanium- and SPARC-based servers.

A Closer Look at the z114

The way we see it, IBM's z114 is an entry-level mainframe (its pricing starts in the $75K range, 25% lower than its predecessor). But, even at this reduced cost, it can run all of the same workloads at the same QoS level that its big brother (the IBM z196) can run!

The primary differences between the two systems are in:

1. **The processor modules** (the z196 uses a multi-chip module [MCM] while the z114 uses a single chip module [SCM] design). This single chip design helps lower production costs — leading to an overall reduction in system cost;
2. **The clock speed** — the clock speed on the z114 has been turned down to help save on power usage and better serve the needs of the market that it is addressing. The z196 runs at 5.2 GHz; the z114 runs at 3.8 GHz;
3. **Capacity range** (z196 = 240 to 52286 MIPS; z114=26-3,139 CP MIPS). It should also be noted that zIIP and zAAP specialty processors can be leveraged for additional capacity. And, the z114 allows the use of up to 10 IFLs (integrated facility for Linux) to serve Linux capacity needs; and,
4. **Cooling design** — the z114 is a single frame air cooled system vs. the z196 which is a double frame air OR water cooled system.

Two Models

The z114 is offered in two models: 1) the M05 (a single central processing drawer model); and, 2) the M10 (a two drawer model that provides additional flexibility for I/O and coupling expansion and/or increased specialty engine capability). IBM examined how customers used the previous generation z10BC mainframe and found that some customers were only partially using the resources available. So what IBM did was halve the number of resources in a drawer – creating a "container" with 5 configurable engines, a single storage control module, and 10 memory DIMMS in each container. The MO5 is this configuration. The M10 doubles this configuration (making it comparable to its predecessor, the z10BC). These cores can be configured as general purpose processors (CPs), Integrated Facilities for Linux (IFLs), System z Application Assist Processors

(zAAPs), System z Integrated Information Processors (zIIPs), Internal Coupling Facilities (ICFs), additional System Assist Processors (SAPs), or used as additional spares. The M10 also offers up to two "dedicated" spares, a first for this midrange product offering.

> *Note: the use of these specialty engines changes the personality of a mainframe. Using these processors, a mainframe can become a Linux consolidation engine or an expedited Java processing engine or an expedited data processing engine. Or a general workload processor with the ability to run specialty jobs on separate processors. Mainframes are extremely versatile server environments…*

Driving Down Cost: Hardware

As we evaluated the z114, we found three design elements that we believe contribute greatly to its reduced cost:

1. The z processor module redesign (MCM vs. SCM designs — described earlier);
2. The new two drawer design for CPU cores and related componentry. Adding more and more space for multiple drawers (for expansion purposes) drives up costs and increases a system's footprint. By optimizing to a two drawer server, IBM has been able to condense this mainframe into a smaller server at a lower cost as compared with its larger, more expandable System z196 high-end system.
3. The new standards-based I/O subsystem that can help lower cost by enabling more granular networking/communications purchase increments — and through improved energy efficiency. The z114 uses the same I/O adaptors as the z196 — but the new backbone/communications link between the processors and I/O drawers is based on PCIe. Potential cost savings come from the granularity in the drawers, and the cost of the adaptors in the new design. These new connectivity options are described in greater detail in Figure 1 (next page).

Figure 1 — The New System z114 Connectivity Options

In addition to these cost-saving design changes, IBM has also reduced costs for certain components on the z114 — namely the cost for specialty engines such as IBM's zIIP, zAAP, ICF and IFL processors (where IBM has reduced prices by 15% to 27% on specialty engines [with an introduction of an upgrade charge similar to the charge introduced on the z196]), and for IBM's RAIM memory modules (where IBM has reduced memory prices by 75% [again, with the introduction of an upgrade charge when customers choose to expand their System z's]).

> *The net effect of these cost reductions is that <u>cost barriers-to-entry are greatly reduced</u> — making it affordable for enterprises to purchase their first mainframe. And we think that once these enterprises get over the initial cost barrier-to-entry, more and more applications will find their way to mainframe systems due to the ability of the mainframe to provide balanced, high-performance workload processing.*

Driving Down Costs: Software

From a software perspective, IBM has taken three actions to lower software costs on the z114. These actions include:

1.) The creation of a new "software slope" (a means to discount software on the z114);
2.) Lowering of the PVU value for the z114 (explained below); and,
3.) A 5% pricing increase on older z10 BC, z9 BC, and z890 servers (in order to encourage user to move to the new z114.

IBM's new software slope is called AEWLC (advanced entry workload license charge) that can reduce monthly licensing charges for software such as the operating environment, the DB2 database, the message queue series, and so on by 4-18%. The z10 BC also featured a software slope called the EWLC (entry workload license charge) — the AEWLC betters this slope by approximately 5%.

> *This monthly license fee can be a big number — and 5% can make a huge difference in software cost.*

IBM's IFL specialty engine essentially makes the scale up z114 a consolidation environment for hundreds of Linux virtual machine engines. IBM bases its licensing charges for such a distributed environment on what it calls a "processor value unit" or PVU for short. The z10 BC PVU rating is 120. And the more powerful z114 should have been much higher (somewhere in the 140-150 range) — but instead IBM has rated the z114 at 100 PVUs (the z196 remains at 120 PVUs).

> *So, customers that buy a z114 are getting a much more powerful server with a significantly reduced software price. What this shows, yet again, is that IBM is highly interested in capturing new workloads on the new System z114 — and its pricing policy reinforces this strategy.*

Finally, it should further be noted that IBM has also announced a 5% EWLC (entry level workload license charges) general price increase (to go into effect in January, 2012) on older z10 BC, z9 BC, and z890 servers — a move that we see as a means to "encourage" customers to move up to the new z114 architecture.

Maintenance

To further encourage migration to the z114, IBM is also announced a 5% maintenance price/performance technology dividend. In essence, if the z10 BC user moves to a z114 M05 (assuming no capacity growth), that user will see the maintenance cost decrease. Further, IBM reduced its IFL maintenance cost by 48% (which is exactly what it did when it introduced the z196 last year).

> *The message: IBM is reducing IFL costs to continue to make it attractive to deploy a mainframe as a consolidation server — and to continue to attract new workloads onto the platform.*

Even With These Cost Reductions and Well Known Operational Efficiencies, Some Enterprises Continue to Resist Mainframe Adoption…

As we stated at the outset of this report, we believe that IBM's zEnterprise offerings can readily handle workloads that run on Itanium- and SPARC-based servers. For packaged applications (such as SAP's business application suite), the transition is fairly straightforward because the same suites running on Itanium- and SPARC-based servers also run on the mainframe (and usually much more efficiently). Migrating custom applications is a tad more tricky because it involves moving from HP/UX or Solaris to Linux on the mainframe. IBM's Migration Factory (an application porting professional services organization) has experience, tools and methodologies that can assist in this type of migration.

> *For enterprises that are looking for external migration expertise, we suggest looking at IBM's Migration Factory — a professional services organization that has over two decades of migration experience. These service professionals have access to advanced migration tools; they know the comparative and sizing metrics; they have already automated much of the migration process; they have established processes; and they have strong project management skills for migrating from Itanium and SPARC-based processors to other server environments. And, most importantly, they have loads of experience!*

Still, even though IBM has conducted thousands of migrations away from HP/UX and Solaris — there continues to be resistance to the adoption of mainframes within many enterprises. As we travel around the world we hear three common objections to the adoption of mainframe technology. They are:

1. Mainframes are old technology;
2. Mainframes cost too much; and,
3. Where are we going to find mainframe skills?

Each of these objections can be easily overcome by doing some simple research.

Mainframes Are Old Technology?

This objection is based on the belief that mainframes are transactional/batch processing servers using older programming languages such as Assembler, PL1, and COBOL.

For those who think of mainframes in this manner, we ask you to consider:

- That mainframes now run the Linux operating environment and use modern programming languages including Java;

- That mainframes offer the most advanced and sophisticated virtualization facilities in the industry. Mainframe systems design returns unused virtual resources to the system pool more quickly than distributed computing architectures (including x86-, Itanium, and SPARC servers). This means that IT buyers who use mainframes can achieve much higher utilization rates from mainframe architecture as compared with distributed system approaches.
- There is no other commercially available system that is more secure than a System z. IBM's System z has achieved EAL level 5 security — the only computer system in the marketplace to have done so.
- System z mainframes offer sophisticated management tools that can govern an entire enterprise cloud computing environment. Again, there is no other commercially available system that can offer the level of advanced management that a System z mainframe offers.
- The new hybrid computing model is arguably the most significant new systems architecture in 20 years. It extends the mainframe's unique capabilities to integrate and manage multi-tier workloads running on specialized optimizers and select IBM blades. The hybrid environment allows clients to collapse and streamline infrastructures, optimize workloads, and take action based on real-time analytics.

Modern operating environments and languages; the most advanced in the industry virtualization facilities; world's strongest available commercial security; and the most advanced cloud management environment make the System z the most modern server technology in the industry. For naysayers, kindly show us how your distributed systems are superior to a mainframe in terms of Linux consolidation, virtualization, security, and management…

Mainframes Cost Too Much

We often hear this objection — and it's usually based in comparing the total cost of acquisition (TCA) of mainframe hardware, software, and maintenance as compared with commodity x86 architectures. The fallacies in this argument are that:

- Software costs are usually tied to per-core pricing. And because System z cores are so fast — and because the System z does a better job of virtualizing resources than any other architecture in the industry — System z buyers get their work processed more quickly and get more work done using a mainframe.

The mainframe hardware environment described in the hyperlink on page 1 cost about $1,000,000 as compared with about $330,000 for the x86 environment. But when the cost of software for both environments was added, the total cost for the mainframe in this example was about $3 million — and the total cost of the x86 environment was about $4.5 million.

- Systems management is the single largest operating expense in most data centers. And the biggest cost within systems management is related to human labor. We frequently see mainframe environments that are managed by about five people. Equivalent x86 server environments can require 20 or more people. Let's say that a typical mainframe manager costs about $125,000 (fully burdened) — and that an x86 Windows/Linux manager costs about $75,000 (fully burdened). In this example, it cost $625,000 in human labor to manage a mainframe environment; and $1.5 million to manage an equivalent Window/Linux environment. And with

the ability to manage mainframe and distributed resources with the same tools, techniques and resources, from a single point of control, this provides an opportunity to further reduce the range of skills needed to manage the today's computing silos.

> *As can be seen using these two examples, the mainframe costs picture changes significantly when adding just software and human labor costs. Tremendous savings can also be achieved in power consumption, in networking costs (because far fewer hubs, bridges, and routers are needed in a mainframe environment), and in storage utilization. And, less tangible are the cost savings related to high-availability (System z offers the highest mean time between failure [MTBF] in the industry [often measured in decades]; and System z offers the strongest security in the industry [enterprise IT executives need to ask themselves how much a security breach costs their respective companies]).*

The Skills Set Issue

The mainframe skill set objection is usually based on the notion that local resources cannot be found to manage a mainframe environment. This objection is usually compounded by vendors whose products compete with IBM System z (these vendors promote the idea that there is an impending doom skills shortage about to transpire as the current aging, gray-haired generation of mainframers retire).

As for the notion that local resources cannot be found to manage mainframe environments, IT managers need to consider that there is an overall, industry-wide shortage of technology skills in all segments of the computing marketplace. So, to single out the mainframe for skill shortages, to us, is pretty narrow-minded…

What we see when we visit mainframe accounts all around the world — even in off-the-beaten-path places like Fort Smith, Arkansas (see this report: http://www.clabbyanalytics.com/uploads/BaldorFINAL.pdf), or Gubbio, Italy (see this report: http://www.clabbyanalytics.com/uploads/Colacem_Case_Study_Final_Final.pdf), or Lugano, Switzerland (see this report: http://www.clabbyanalytics.com/uploads/CornerBankFinal.pdf) is that mainframe management resources can be found or grown internally.

It should also be noted that there are over 900 colleges and universities teaching mainframes skills courses around the world. These schools are always looking to establish relationships with businesses in order to help place their students. Finally, IBM now operates a mainframe jobsite known as www. System z jobs.com that focuses specifically on matching job-seeking individuals with mainframe skills with enterprises that need those skills. So far, 1,200 individuals are registered on the site (it has been open for less than a year) — and we expect a survey to be completed shortly that will indicate how much success prospective employees have had in matching their skills to enterprise needs.

The z114 — New Use Cases

Early on in this report we pointed out that most IT professionals think of the mainframe as a master transaction/batch processing engine. But, over the past three years we've seen mainframes progress beyond the stereotype into other areas of computing.

We now see great growth potential for mainframes that are deployed as:

- *An enterprise master switch* — along with the introduction of the z196, IBM introduced a hybrid architecture known as "zEnterprise". This architecture uses the System z mainframe as a master switch that can control, govern and serve attached Power Systems and System x (x86) blades. This architecture has the potential to reduce enterprise computing costs by millions of dollars annually (depending on workloads). There are no other architectures in the industry that can compete with this zEnterprise hybrid.
- *A huge business analytics server* — with the z196, IBM doubled the amount of memory (up to 3TB) that a System z mainframe can address — while at the same time introducing the industry's fastest processor (a quad core 5.2 GHz microprocessor complex). Add to these technological improvements the billions of dollars IBM has invested in business analytics software — and there is no other system in the market that can rival a mainframe in terms of business analytics capacity and speed.
- *The most scalable Linux consolidation server in the industry* — offering information technology (IT) buyers the ability to deploy and manage hundreds of Linux virtual machines on a mainframe at a cost that is significantly less than other server types (such as x86 multi-core solutions). We explain why this is the case in the following report: http://www.clabbyanalytics.com/uploads/z_VirtualizationFINALRev.pdf.

Summary Observations

In this *Research Report*, *Clabby Analytics* has explained why we believe that IBM's new z114 makes an ideal replacement for Oracle SPARC and Hewlett-Packard Itanium-based servers. In short, we believe that:

> **IBM's z114 is capable of running existing HP/UX and Solaris workloads at a higher QoS level than offered by Hewlett-Packard and Oracle.**

We also noted that there is a 10-20% premium in z114 pricing as compared with equivalent Itanium-and SPARC-based servers — a premium that we believe is easily recovered by:

- *Outstanding utilization rates* — The z 114 can run at 100% capacity on a sustained basis (enabling more work to be done on a z114 than on equivalent Unix servers);
- *Security* — the new z114 is the same architecture that has achieved an EAL level 5 security rating (the highest in the industry). *We suggest that enterprises consider what the cost of a security breach is — and then decide if the premium is worth it…*
- *MTBF* — Mainframe architecture offers the highest meantime-between-failure in the industry. We suggest that enterprises consider how much downtime outages cost in terms of lost opportunity and employee lost productivity — and then decide if the premium is worth it; and,
- *Hybrid computing* — for enterprises that are willing to focus on workload optimization, tremendous savings can be achieved using mainframe architecture; and,

Investment protection

- **Investment protection** — IBM invests heavily in mainframe architecture (to the tune of about $1-1.5 billion for every new major mainframe architecture design). With this level of investment (combined with constantly increasing market demand for more mainframe MIPS), the mainframe will continue to be around for a long time. Further, there is something positive to be said for how the mainframe has continued to protect its customer's investments over decades…

This report also spent a lot of time describing the pricing actions that IBM has undergone to entice Itanium and SPARC users to use mainframe architecture. It is clear that IBM wants to capture Itanium and SPARC business as those platforms fail — and is presenting an almost irresistible alternative to IT executives willing to evaluate a new, well-established, proven platform.

We acknowledge that some IT buyers have certain predispositions about mainframes that inhibit mainframe adoption (the "old technology" argument; the "costs-too-much" argument; and the alleged skill sets issue). We recommend that these IT buyers reexamine the mainframe in the context of workload optimization. We think that many IT managers who have resisted mainframe adoption will be shocked to see how advanced this architecture has become — and how cost-effective it is.

Our final comment is as follows

The new z114 aggressively attacks the "mainframes are too expensive" argument with significantly reduced hardware, software, and maintenance pricing — and with bundled Solution Edition pricing. It has loads of capacity; it offers the highest quality-of-service level in the industry; and it has the ability to efficiently handle workloads now found on Itanium and SPARC servers. For these reasons, we believe IT executives considering migrating away from Oracle's SPARC- and Hewlett-Packard (HP) Itanium-based servers should look very closely at IBM's new z114!

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