CLABBY ANALYTICS

Research Brief

IBM's System z: Technology Update

Introduction

Just to set the record straight, we hear only three "issues" raised when discussing System z with information technology (IT) executives. These issues are:

- Mainframes are too expensive (in terms of cost of acquisition of hardware and software as well as ongoing maintenance fees);
- Difficult to staff (due to limited administrative expertise available in many markets around the world); and are comprised of
- Old technology (dinosaurs).

In our recent *Research Brief* ("*Does System z Offer Better TCO than Scale-up, Distributed Unix and Linux Servers?*" — November, 2006), we stated our belief that if prospective buyers examine System z total-cost-of-ownership (TCO), they will likely find that the System z offers better TCO and return-on-investment when compared to many scale-up, distributed systems configurations.

In our recent *Research Brief* ("*System z: The Skill Set Issue*" — November, 2006), we articulated our position that finding mainframe skill sets is a legitimate concern. But we also observed that IBM has over two hundred educational institutions involved in helping solve this problem; and that the company has embarked on a program called the "Mainframe March to Simplification" — a program focused on helping reduce the time it takes to learn systems management and programming in mainframe environments from years to a few months (IBM is spending $100 million in this effort.

In this *Research Brief, Clabby Analytics* examines the market misperception that mainframes are old technology. And what we find is that IBM's System z has been completely rearchitected and rejuvenated over the past five years — and now offers some of the most advanced computing technologies on the planet.

Market Perceptions

It's hard to believe, but mainframe technology has been with us for almost fifty years. In the early days, mainframes were essentially very large calculators that were used to replace armies of accountants as enterprises automated their financial systems. In the 1970s, mainframes became large transaction engines. In the mid 1970s and throughout the 1980s mainframes broadened their reach to include all major enterprise business applications (such as financial, sales, manufacturing, distribution, and human resource functions). But the 1980s also ushered in a new class of mainframe challengers in the form of departmental minicomputers.

By the end of the 1980s and into the 1990s, clusters of distributed minicomputers were able to challenge mainframes in terms of overall processing power while offering lower acquisition costs (by using standard components and standardized operating environments). The acquisition cost advantages manifest with distributed minicomputers even caused some analyst firms to herald the "death" of the mainframe. IT executives in the 1990s heard this mainframe death knell. Mainframes were labeled "proprietary" technology; mainframe sales began to flatten — and even decline. Accordingly, IT buyers formulated opinions that mainframes were more expensive than distributed systems environments due to high acquisition costs. Further, many IT executives came to believe that mainframe systems were becoming antiquated…

These IT buyers were right — the total-cost-of-acquisition for mainframe technologies (including hardware, operating environments, applications, services, and support) often far exceeded the cost for minicomputer clusters. Further, mainframes remained locked in the position of servicing aging COBOL and transaction processing workloads — contributing to the perception of the mainframe as "old" technology.

As mainframes languished, Windows- and Unix-driven minicomputers proliferated on college campuses and in business environments. As a result, IT professionals focused on developing expertise on Windows/Unix platforms — not on mainframe platforms. And accordingly, the available pool of mainframe-trained administrators began to shrink…

The perception of the mainframe as aging, proprietary technology was deserved. Although the mainframe's ability to handle more-and-more MIPS (millions of instructions per second) constantly improved throughout the 1990s, the mainframe's ability to handle new workloads (beyond aging COBOL transaction processing and traditional batch applications) improved little. And the failure to modernize the mainframe resulted in schools and technical institutions abandoning mainframe education in favor of providing classes on Unix/Linux operating environments and associated hardware. Mainframe vendors were in a world of hurt…

Today's Market Reality

The 2000s have brought major changes in mainframe technology. Earlier this decade IBM recognized that its mainframe base would wither and decline unless a major refresh were to take place. IBM determined that to grow mainframe revenues, the mainframe would have to be able to run new types of workloads. The growing acceptance of Linux as a viable, open source operating environment — and the growing use of service-oriented architecture (SOA) — presented IBM with an opportunity to introduce these new workloads on its mainframe hardware and revitalize the mainframe market.

Repositioning the Mainframe

In the early 2000s IBM started its port of Linux onto its mainframe hardware — repositioning its System z as a massive, powerful Java/Linux applications engine. By hosting the Linux operating environment, the System z was repositioned to run thousands of modern Linux instances — expanding its application range to a myriad of Java-based applications ranging from simple mail and messaging services through complex, custom, data-intensive applications. Further, by integrating IBM and open source infrastructure

components, IBM has been able to position its System z as a central hub capable of providing Web, SOA, security, data, and systems/storage management services to attached devices and programs.

In its new position as an application/infrastructure server, the System z (thanks to its raw processing power and virtualization capabilities) is now capable of handling:

- **Bulk data processing requirements such as large batch files, decision support, business intelligence, scientific, statistics processing, and the like;**
- **Business applications (such as enterprise resource planning, customer relationship management, and supply chain management); and,**
- **Transaction processing applications.**

Technological Leadership

In addition to broadening its workload base, IBM also focused on expanding its technological leadership in mainframe systems design, security, networking, performance, and environmentals (power/cooling characteristics). Some of IBM's advanced technologies include:

1. ***Virtualization capabilities*** — The System z and its predecessors have set the industry tone in virtualization for the past forty years. Virtualization involves the pooling of resources to enable systems to adapt to dynamically changing workloads. And this ability to dynamically and rapidly adjust to changing workloads enables mainframe administrators to greatly increase the systems utilization rate on mainframe hardware as compared with distributed SMP and PC servers. (Industry statistics show that IBM's mainframes generally operate in the 70-90% utilization range, while distributed SMP/PC servers usually operate at less than 20% of their capacity). Better utilization results in more efficient use of existing computing resources — which can serve to forestall the need to acquire additional computing systems.
2. ***Security*** — Like virtualization, the System z also sets the competitive bar in terms of information systems security (System z mainframes are the only servers in the world to achieve Common Criteria EAL5 level of security). And IBM's System z holds the top hardware rating for its compliance with the FIPS 140 standard (the Federal Information Standard 140). More on IBM's System z security positioning can be found at http://www-03.ibm.com/systems/z/security/features.html. While other operating environments and computer systems have been plagued by security incidents, the System z has provided super-strong cryptographic and encryption services unrivaled in the computer industry for decades. Tightened security can reduce operations costs — as well as limit major liabilities that can result from security breaches;
3. ***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;

4. ***MTBF and high-availability*** — Over the past sixty years of mainframe development IBM has gotten very proficient in the design of highly reliable, highly-available systems design (mainframes can provide 99.999 per cent high availability). Mainframe application availability is reportedly the highest in the industry (through the use of IBM's Parallel Sysplex technology and Geographical Dispersed Parallel Sysplex which mask planned and unplanned outages and provides both local and remote disaster recovery). In fact, one IBM customer claims that they kept a specific application continuously available for a decade (10 years)! IBM's low meantime between failure (MTBF) rate on mainframes is extremely low — and as a result, some industries are able to avoid service shutdowns and save millions of dollars per hour that otherwise could be lost due to equipment failure.
5. ***Manageability*** — Again, over the past sixty years, IBM has worked diligently to lower the complexity and cost to manage its mainframe systems. IBM does this by automating route functions (such as backup/restore, user provisioning, etc.) — as well as by streamlining administrator user interfaces by graphically enabling its management software. The more IBM is able to simplify management, the more IBM is able to drive down management costs. Current estimates in terms of labor related savings using management facilities on a System z versus those in distributed systems environments show that it takes only five mainframe people to manage the same amount of resources that it takes twenty-five people to manage in a distributed computing environment!
6. ***Coprocessors/specialty engines*** — IBM makes use of coprocessors within its System z chassis to assist in specialized application processing for specific environments. IBM's zAAP environment is a low-cost workload engine designed to reduce software deployment, integration, and tuning costs for specific enterprise applications (BI, ERP, CRM, etc.). IBM's zIIP environment focuses on centralizing data from multiple sources on a mainframe such that BI, CRM, or ERP applications can use that data to derive the answers to business queries, or use that data for enterprise reporting. And IBM intends to introduce several additional "specialty engines" over time. Also noteworthy is IBM's Integrated Facility for Linux (IFL) – a central processor designed specifically to process Linux workloads (this processor has met with solid acceptance and plays a big part in allowing the System z to process "modern" Linux and Java workloads).
7. ***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.
8. ***Floor space*** — For IT buyers concerned about floor space, the 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,
9. ***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.

In short, the System z has been repositioned as a versatile application processor for varied workloads. This versatility makes the System z a good choice for handling large, complex applications as well as for consolidating multiple, smaller applications within a single processing environment. And with its solid infrastructure services, the System z can be used as a centralized clearinghouse to provide security and management services – as well as data management services – for devices and programs within a heterogeneous information infrastructure.

Summary Observations

IBM mainframe architecture lost its way in the 1990s. Throughout the 1990s IBM steadily added more processing power — but failed to address issues related to cost, training, and workload modernization. IT managers formulated the opinion that mainframe architecture was only suited to run aging Cobol and transaction processing applications — or worse, that mainframe computing was a dying architecture.

To revitalize the mainframe, IBM has made it possible to host the Linux environment on its System z. And, IBM built a SOA infrastructure on System z — making it possible to run modern J2EE applications on this allegedly dying architecture. Further, IBM improved System z security, virtualization, energy efficiency, networking capabilities — and added specialty engines — reestablishing the System z as the technology leader in the computing marketplace. Now, IBM claims that the System z is now a leading edge architecture — a claim we think is accurate — and we point to its leadership position in security, specialty engines, and virtualization as proof. IT executives who think that the System z is a dinosaur might want to take a closer look at this technology — and rethink their outdated opinions.

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