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Shelter Insurance consolidates on z114 PAGE 26

Internal TRANSFORMATION

Smarter computing initiative saves IBM $100 million PAGE 32

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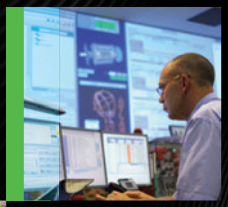

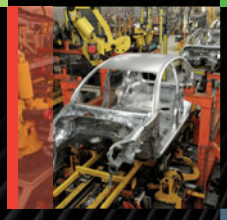

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IBM Systems magazine

Inside

Mainframe JULY/AUGUST 2012

26

32

CASE STUDY

Taking Shelter From the Storm ➥ 26

Shelter Insurance employs a measured approach in adopting Linux on zEnterprise 114

By Jim Utsler

COVER STORY

Internal Transformation ➥ 32

System z is at the center of IBM's smarter computing initiative, which has saved the company $100 million so far

By Simon Hares • Cover illustration by Peter Crowther

38

FEATURE

Large Memory Tames Big Data ➥ 38

The System z stack evolves to deliver business value from more memory

By Peter Sutton

DEPARTMENTS

16

Mainframe Evangelist David Rhoderick

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Mainframe edition

IBM Systems magazine

We asked our contributors: In a smartphone showdown, do you pick iPhone, Android, Windows or BlackBerry?

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Inside this month's issue

The Taste of Success

PHOTOGRAPH BY TRAVIS ANDERSON

Being the first to try something new is never easy. No matter how tempting or tasty a new product looks, prudent people—and children, especially—want to see how others react to it before taking a bite themselves.

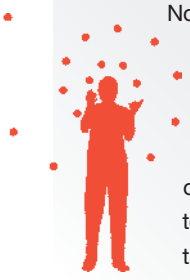
This reluctance to embrace the unknown played out in the iconic '70s Life cereal commercial. (For those not old enough to remember it, watch the video at http://bit.ly/hmZBTV.) In it, two older boys discuss who will try the new cereal first, before pushing it off to the younger Mikey to see how he likes it. When he rapidly devours the bowl of cereal, they immediately know it must be good and follow suit.

Similarly, when IBM began evangelizing the merits of smarter computing and its tenant, IT optimization, some organizations were cautious, taking a wait-and-see approach. But with its own transformation project, IBM took a bite of its own cooking—and liked it. The consolidation of thousands of servers in IBM's internal data centers has saved the company about $100 million so far. In our cover story, "Internal Transformation" on page 32, we focus on the pivotal role of System z* technology in this ongoing effort.

Building on the optimization theme, our Trends article (page 10) outlines the benefits of a zEnterprise* BladeCenter* Extension (zBX) over do-it-yourself, piecemeal projects when it comes to optimizing workloads in a hybrid environment. And we sit down with David Rhoderick, mainframe evangelist with IBM Software Group's Competitive Project Office, to learn how an accurate total cost of ownership analysis demonstrates mainframe's true value versus distributed servers. Read about it on page 16.

In this issue's case study on page 26, we see how Shelter Mutual Insurance Co. also underwent its own transformative IT project. The Columbus, Mo., firm migrated multiple Linux* workloads from Intel* servers to a zEnterprise 114 platform, which improved efficiency and enabled the insurer to avoid an expensive data center remodeling project to address server sprawl.

When it comes to IT optimization and smarter computing, there's no need to wait any longer, so grab a spoon and dig in. Z



Mike Westholder,
Managing Editor

Contact Mike at mwestholder@msptechmedia.com

CONTRIBUTORS

Tracy Powell

Twice bitten

After toiling in a San Antonio savings and loan in the '80s, Tracy Powell joined the Peace Corps. Two years into a service stint in Honduras, he was bitten by the "photo bug." Today, the Boston-based editorial photographer—who shot IBM's David Rhoderick for the Q&A on page 16—still enjoys traveling overseas. He's putting together a show consisting of photographs from a recent visit to India.

Joe Temple

Generations of jugglers

For IBM Distinguished Engineer and Master Inventor Joe Temple, juggling is a family tradition. The Tech Corner author (page 43) learned juggling from his father, also Joe, a former IBM field manager, who learned it from his great uncle, John Nessen, a retired vaudevillian. After college, the younger Temple toured with a local circus troupe and performed a comedic juggling act at nightclubs. Not long after joining IBM, Temple retired from professional juggling. However, father and son came out of retirement in 2009 to perform at a church talent show.

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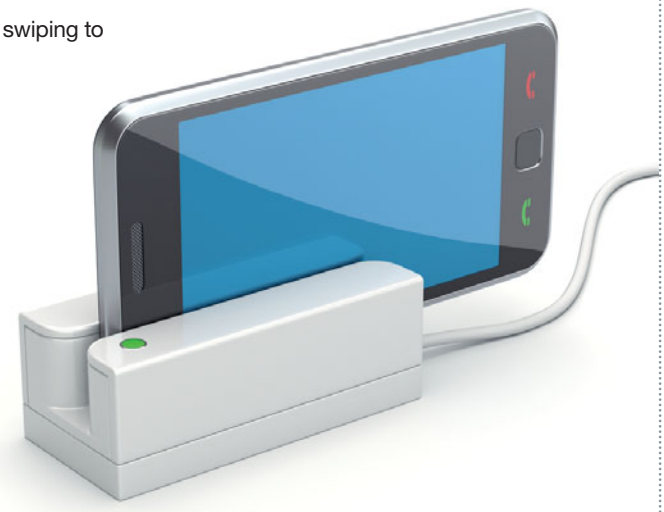
Pay by Phone

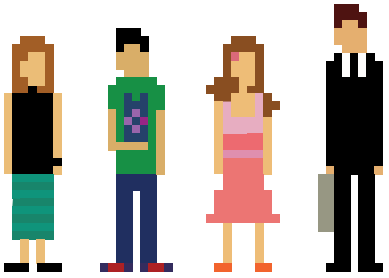
By 2020, carrying cash or credit cards will be old-fashioned, according to **65 percent** of respondents in a recent survey. Instead, most people will use smart-device swiping to make purchases—rendering credit cards and cash unnecessary. The survey queried 1,021 technology stakeholders and critics in the mobile-payment industry.

SOURCE: PEW RESEARCH CENTER'S INTERNET AND AMERICAN LIFE PROJECT AND ELON UNIVERSITY'S IMAGINING THE INTERNET CENTER



Current Conditions

With an estimated 2.9 million plug-in vehicles expected to be on the road by 2017, the drain on the world's power supply will need to be mitigated. American Honda Motor Co. and Pacific Gas and Electric Co. have teamed up with IBM for a pilot project enabling communication between electric vehicles and the power grid. The goal is to test an electric vehicle's ability to receive and respond to charge instructions based on grid conditions and the vehicle's battery level. SOURCE: IBM



DIGITAL PERSONALITIES

As more consumers adopt digital devices, four distinct personalities are emerging, according to a recent IBM study, "Beyond Digital" (www.ibm.com/services/us/gbs/thought-leadership/ibv-beyond-digital.html), which surveyed 3,800 consumers in six countries. The personalities are:

- **EFFICIENCY EXPERTS** who use devices and services to simplify daily activities
- **CONTENT KINGS** who play online games, download music, movies and watch TV on their devices
- **SOCIAL BUTTERFLIES** who emphasize social interaction and require instant access to friends
- **CONNECTED MAESTROS** who take an advanced approach to media consumption by using mobile devices and apps to access games, music and video, or to check the news, weather or sports

SOURCE:IBM

Work **Without** Boundaries

The ubiquitous presence of smartphones, mobile devices and social networking has dissolved workplace boundaries. Nearly all business executives—**98 percent**—polled by Gyro and Forbes Insights said they send work-related emails on nights and weekends. In addition, **63 percent** of the 543 execs who took part in the @Work State of Mind study said they check work email every one or two hours. Only **3 percent** said they never send or receive work emails or have business discussions while on vacation. SOURCE: GYRO

The Performance of Many, the Efficiency of One

Optimization is a necessity in today's data centers. When you consider the entirety of some data centers, the maze of connections can result in underutilization, high power usage, large footprints, excessive software licensing costs and the need for more people to manage the complexity.

The easy fix of adding a few servers here and a few more there—too often considered a data center norm—drives rising IT costs. Ultimately, the ends don't justify the means.

Given the focus on reducing IT costs and simplifying our environment, we can all agree we'd like to optimize our data centers, but how?

The answer is simple. It boils down to having the right technology.

To achieve optimization, IT must first be flexible. This can be achieved through a hybrid design that supports multiple workloads and architectures, yet is managed as one system. Through such an environment, we can achieve the highest utilization of resources and match the right workload with the right platform.

Second, we need the capability to share resources—processors, memory and channels—to drive higher resource utilization. This can free up IT managers' time and allow them to focus on developing additional services for customers. Centralized management and automation result in an efficient and adaptive systems infrastructure.

Finally, IT needs to be responsive. Virtualization technologies can allow the IT team to respond to requests faster than ever before—from automatically scaling up or down to quick provisioning of services and resources.

Arguably, only one solution on the market can deliver this type of an IT-optimized, secure, cloudlike environment: IBM's zEnterprise* System, with its combination of core System z* capabilities, Power Systems* and System x* blades in the zEnterprise BladeCenter* Extension, and accelerators like the IBM DB2* Analytics Accelerator and the DataPower* appliance.

Virtualization technologies can allow the IT team to respond to requests faster than ever before.

This year, IBM celebrates the 40th anniversary of z/VM* virtualization technology, which can run hundreds to thousands of Linux* servers on a single mainframe running with or without other OSs. The z/VM virtualization technology extends unique business value to organizations by integrating applications and data while maintaining exceptional levels of availability, security and operational ease.

The zEnterprise environment exploits a unique set of capabilities and technologies to deliver smaller server footprints—and with that, lower energy costs—reduced storage cost, improved flexibility, savings as a result of lower downtime and simplified management.

The bottom line is that we achieve IT optimization—or a perfect, effective and functional state—when we implement the right kind of technology to lower IT costs and deliver higher business value.

Greg Lotko,
Vice President and Business Line Executive for System z

PHOTOGRAPHY BY BOB MARTUS

A Smarter Path to Workload Optimization

Why zBX outperforms DIY when deploying a hybrid infrastructure

By Vic Leith

Editor's note: *Dave Hayslett, Fehmina Merchant, David Rhoderick, Emily Farmer and the System z Competitive Project Office contributed to this article.*

Flat budgets, demand to support evolving business objectives, and constant pressure to do more, faster have IT administrators and technology decision makers looking for any advantage. Workload optimization can help ease this burden. By matching applications with the best OS or hardware platform for specific jobs and service requirements, organizations can improve efficiency, lower operational costs and better align technology with business requirements.

One optimization approach is to reject bundled technology solutions in favor of a do-it-yourself (DIY) strategy for infrastructure evolution. After all, wouldn't you save money by building your own customized solution from an a la carte menu of component parts?

It's possible, but unlikely. Although a DIY approach to workload optimization might deliver some measure of savings, several additional questions need to be asked when evaluating this strategy:

- How much will you really save over time?
- Have you considered aspects of a packaged solution that go beyond pricing and benchmarks?
- What are you giving up?

The Need for Smarter Computing

As our planet grows smarter and becomes more connected, new technologies frequently burst onto the scene, enabling—and often necessitating—new business models. Organizations are awash in a flood of largely unstructured data pouring in from intelligent objects and sensor grids, across social and mobile networks, through customer interactions, and from points all along the supply chain.

Forward-thinking organizations are using innovative technologies to glean insight from this data. Many are embracing the key principles of smarter computing, implementing IT infrastructures and technologies designed for data so they can leverage advanced analytics to unlock insights and drive better business outcomes. They're creating infrastructures tuned to the task with workload-optimized systems such as the IBM zEnterprise* BladeCenter* Extension (zBX) infrastructure. Many have turned to the zEnterprise System and the zBX component to handle transactional computation and distributed computation within a single workflow. Implemented correctly, these systems enable organizations to deliver services faster, with higher quality and superior economics.

Can't I Do It Myself?

Today's diverse workloads often require different CPU engines and specialty appliances capable of optimized algorithmic processing and high-speed data manipulation. Some IT departments might need to run combinations of platforms for these workloads, such as z/OS*, Linux* on System z* or System x*, Microsoft* Windows*, and AIX* software.

One key issue facing DIYers is a lack of integrated network and virtualization management, which can affect efficiency and increase the time and effort staff spends on mundane chores. Combining disparate vendor technologies into a home-brewed solution can also introduce costly complications as staff scrambles to find the root cause of service or performance issues that can result from conflicts, inefficient interactions or other technological quirks. Also, poor network latency can become a serious challenge as IT struggles to make heterogeneous components communicate more efficiently.

REAL-WORLD SAVINGS

For evidence of the benefits of zEnterprise* BladeCenter* Extension (zBX) in action, consider the following examples:

To manage operations, the European Organization for the Safety of Air Navigation, or Eurocontrol, had deployed six mainframes and 20 RISC servers, a setup that was both complex to manage and expensive to run. IBM consolidated the organization's administrative applications onto just three zEnterprise Systems. These featured a zBX infrastructure and BladeCenter servers, along with other IBM components, as part of a virtualized private-cloud solution.

The result? Eurocontrol realized a significant cost savings through reduced operations and energy use as well as a dramatically smaller footprint. This included lower licensing costs for the IBM stack while delivering better reliability and easier management through a single administrative console.

A second example comes from the utilities industry, where SAP applications had been running on a Nehalem-based VMware installation that drew data from an IBM competitor's database housed on IBM Power Systems* hardware. The implementation was replaced by a zEnterprise System featuring the zBX infrastructure, four IBM BladeCenter PS701 Express* blades, a 10 Gbps connection, and IBM DB2* software running z/OS* in a zEnterprise 196 backed by four general-purpose processors and three specialty System z* Integrated Information Processor engines.

In a three-year total cost assessment, IBM found costs declined from $16.15 to $4.59 per bill per processing hour—a savings of more than 71 percent. At the same time, billing speed improved from approximately 200,000 to 261,000 bills generated per hour—an improvement of more than 30 percent.

—V.L.

zBX Enables Smarter Computing

A "system of systems," the zEnterprise platform integrates several IBM technologies into a cohesive stack, joining multiple platforms under a single, unified management structure. It enables high-performance hybrid-computing capabilities on proven platforms such as mainframes, Linux and UNIX* OSs, and x86 systems, while extending the security, scalability, reliability and virtualization capabilities of mainframes to multiplatform environments. These capabilities have been developed and enhanced over time using lessons learned from thousands of engagements worldwide.

The zBX platform benefits from IBM's legacy of innovation in blade technologies. Space requirements can be reduced through denser packing. Built-in back-plane switching helps provide redundant connectivity, reduce the need for wiring and increase resiliency. The 10 Gb private Ethernet makes for faster network connections. Shared power supplies are designed to reduce energy consumption and further increase resiliency. The zBX platform allows hot swapping and provides failure prediction capabilities to help make servicing easier.

Consisting of IBM blade servers and workload optimizers, the zBX system leverages zEnterprise Unified Resource Manager (zManager) software for integrated governance and systems management. It extends System z service and management capabilities through a security-rich, high-performance private network featuring integrated, high-performance specialty processors for workload-specific tasks. zManager enables a host of additional features, including the ability to define, comprehensively track and dynamically correct performance goals. Most importantly, it helps reduce the need to overprovision, which can improve operational efficiency and resource utilization.

As with any deployment, DIYers considering a custom workload-optimization solution should look at how the components are integrated. It's possible to spend too much time and money attempting to get the pieces to work together efficiently.

Other Blade Systems

The zBX infrastructure provides pretested, preintegrated IBM-certified components. Hardware redundancy has been built in at multiple points, such as at the power infrastructure, in the rack-mounted network switches and through cabling for support and data connections. This means far less effort and support are typically needed before, during and after deployment as compared to homegrown solutions.

zBX supports multiple server architectures for specific workload assignments, including Power* blades, x86 blades and a special-purpose optimizer. Competing offerings may be limited to a single architecture, which hampers flexibility and performance. Dual

power domains and dual DC supply lines enable higher availability, whereas others might provide only a single power domain and DC supply line. Performance management features dynamically adjust resources, as needed, for greater efficiency, and automated zManager facilities help reduce labor through supplied interfaces designed to allow service tools to automatically discover, monitor and provision heterogeneous resources. These preintegrated capabilities might not be available in other offerings.

Cost Control Through zManager

A key part of the zBX infrastructure is zManager, which is designed to provide critical points of differentiation for workload-optimized systems—benefits that DIYers will likely be unable to easily recreate.

zManager helps deliver a structured approach to workload consolidation. It's designed to track transaction performance comprehensively and can be used to identify and isolate performance bottlenecks. It collects historical performance data for each virtual server and then can be configured to use that data to dynamically adjust processor entitlements on a per-hypervisor basis to improve performance. For z/VM* guests, zManager automatically adjusts CPU allocations according to priority

IBM compared provisioning requirements for zManager with those of a DIY setup over a three-year period. The cost of each mixed workload per year for DIY systems was $30,700, whereas the cost for a zEnterprise and zBX workload was $27,900—a difference of more than 9 percent, with an average

38 PERCENT LOWER LABOR COST.

Figure 1

Typical DIY Distributed Management Practices vs. Unified Resource Manager

	Deployment management	Capacity and performance management	Asset management	Security management	Change management
DIY	Manual configuration of hypervisor and physical setup, and configuration of networks	• Passive monitoring • No comprehensive transaction monitoring • Manual monitoring of virtual machine performance and adjustment of resources to meet performance goals	• Discovery of assets with ad hoc manual methods • Manual entitlement management	Multiple, disparate user access management	No visibility into the effect of changes, and no standardized procedure to retrieve and apply firmware changes
zBX with Unified Resource Manager	Automated deployment of hypervisor and out-of-the-box, physically isolated networks	• Active and continuous monitoring for faster issue resolution • Comprehensive transaction monitoring to isolate and fix issues • Automatic workload resource adjustments for easier achievement of performance goals	Automated discovery and management of asset entitlement	Centralized, fine-grain user access management	• Visibility into the effect of changes • Retrieval and application of firmware changes in a standardized fashion

and performance requirements as needed. This reduces the need to overprovision resources to deal with occasional spikes in usage.

IBM compared provisioning requirements for zManager with those of a DIY setup for a combination of more than 70 Web-facing and 20 data-processing workloads. The DIY setup required 62 blades in three BladeCenter racks with 10 percent overprovisioning, whereas the zEnterprise required 56 blades in two zBX racks to achieve the same throughput. Some additional findings reveal even greater savings potential through zManager. For a further comparison, see Figure 1 (above).

Proving the Case

Labor cost modeling can reveal whether you will actually save money and improve performance in real-world applications. Using the previous example, IBM ran a three-year simulation, taking into account such relevant factors as the cost of hardware and software acquisition; labor needed to deploy, operate and manage the servers; costs and time frames required for updates and maintenance; and other requirements.

Over this period, the cost of each mixed workload per year for DIY systems was $30,700, whereas the cost for a zEnterprise and zBX workload was $27,900. That's a difference of more than 9 percent, with an average 38 percent lower labor cost.

What's more, zBX can provide higher performance, easier deployment, fewer administration requirements and deeper integration with other zEnterprise elements. For organizations seeking to cut costs while still delivering needed performance, the zBX offering might make the most sense. Z

Vic Leith is a senior software engineer in the IBM Software Group's Competitive Project Office. He has more than 30 years of experience in the IT field.

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Mainframe evangelist David Rhoderick, shown near his home office on Martha's Vineyard, Mass., helps give customers a better picture of the true cost of System z.

PHOTOGRAPHY BY TRACY POWELL

Mainframe Vs. Distributed

Accurate TCO analysis demonstrates the true value of System z

By Mike Westholder

When organizations consider investing in technology, the allure of cheap commodity servers can seem attractive, but it's shortsighted to focus on sticker price alone without looking at the total cost of ownership (TCO).

However, even when calculating TCO, many organizations fail to find a true apples-to-apples comparison of distributed servers versus the System z* mainframe.

Inaccurate equivalence comparisons, imperfect IT accounting practices, overlooked expenses and other factors can skew the results. To get an accurate accounting, many analysts recommend focusing on the

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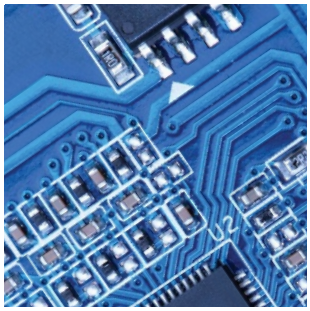

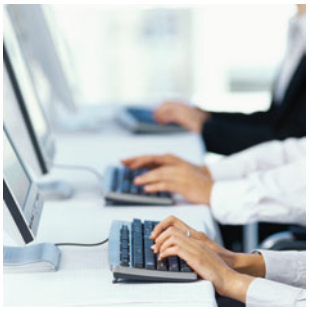

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cost per transaction, which gets to the true TCO and puts mainframe investments in a clearer—and price-competitive—light. To learn more about the methodology and challenges of calculating TCO for mainframe, *IBM Systems Magazine* spoke with David Rhoderick, mainframe evangelist with IBM Software Group's Competitive Project Office. He and his eight-person team analyze competition for IBM software and hardware, focusing largely on zEnterprise* technologies.

Q. From a strategic perspective, what's the mission of your competitive project group?

A. Our aim is to help customers understand the value of the System z platform and its true cost. We spend a considerable amount of time talking about TCO and investigating how the mainframe compares with other platforms.

Q. What's the biggest challenge in educating organizations about System z TCO?

A. It's reaching non-System z people. In the IT world, there are System z proponents (usually those who run the systems) and then there's everyone else who doesn't understand it very well—and never the two shall meet, it often seems. A successful approach has been to help our friends in the System z shops educate their colleagues. I'm really talking about bridging the gap to the non-System z constituency and helping them understand various components of TCO.

Rule of Three

The cost of deploying a new application will usually be less on a mainframe if:

1. It's an incremental workload on an existing mainframe.
2. It can make use of a specialty processor.
3. Disaster recovery is required.

Q. Once you begin a dialogue with this constituency, is the first step getting them to look beyond the initial investment?

A. Yes, sticker shock is clearly a factor here. Mainframe costs are not very widely known and understood. When you purchase a System z server, you're investing in an infrastructure that's designed and configured to grow incrementally with your needs. Once you've built the initial configuration, it becomes simple and easy to expand—and also very cost-effective.

Additionally, we find that the System z costs are often overinflated. That's because the IT accounting process used to "chargeback," as it's called, is often imprecise for distributed systems but very precise for the mainframe. Many organizations also include all sorts of unrelated expenses with the mainframe, which obviously makes its perceived cost even larger.

Q. How about an example?

A. We discovered that one customer was including its billing center and call center expenses in the System z chargeback when, in fact, those two organizations are totally independent of whatever platform you're using. Because the billing center and call center costs were being borne only by the people who paid for the System z platform, users of the distributed systems were getting use of them at no cost.

Clearly, this isn't a good way to run a system or manage the IT accounting of a large corporation. The lesson learned is that customers, in general, need to have a much better handle on what really is a mainframe cost. While the situation

"Accurate TCO measurement and analysis will lead to better decision making that's focused on BUSINESS GROWTH."

—David Rhoderick, IBM

in this example was not intentional and evolved over time, it illustrates the issue of accurate chargeback. We've even heard of a couple of customers who included the corporate jet in their mainframe costs!

Q. Besides the inexact science of chargebacks, what common mistakes do organizations make when comparing a mainframe to distributed servers?

A. They don't consider the other associated costs once the system is in place, especially labor costs and all of the other various physical aspects of running IT. For example, there's networking, electricity, cooling, raised-floor space, firewalls, physical security, printing paper, enterprise license agreements; we could go on and on.

Q. Expanding on the labor issue, how does the mainframe stack up to distributed systems?

A. It's one of the two primary System z advantages; labor is an ongoing expense

that's often overlooked. The mainframe tends to use fewer people per unit of work than distributed systems. This is because many System z operational components and controls are automatic—they're built into the operating system and the systems management software, thus reducing the number of people needed to run a mainframe.

Q. What's the other primary advantage?

A. The other—and arguably more important—advantage is the ability to drive tremendous amounts of workload out of one core or one CPU— i.e., one unit of hardware. People forget that you can drive a mainframe at up to 100 percent utilization, which means if it's only at 60 percent today and you need to grow the business and do more work, you don't need more hardware. In contrast, as you grow on a distributed platform, you would have to add more and more hardware. And that means more and more cores, software licenses, power, real estate and so on. Being able to grow very effectively over time is often overlooked.

Q. Speaking of software, is that another cost-saving area?

A. Right. A lot of the software that people use on System z can be used by multiple people. With DB2*, for example, you might only have one license, but it can serve five or six different business applications. With distributed servers, you'd have to buy five or six copies of the software for the database—and of course five or six hardware servers.

Q. What about energy costs?

A. Whatever measure you use, the power consumption per transaction on System z is almost always significantly less than the equivalent distributed system. Distributed systems spend more than 50 percent of the time waiting for work—that is, doing nothing. They're still churning away and staying hot and requiring cooling.

Q. What about when it's time to upgrade? Don't companies have to spend even more money?

A. In terms of replacement costs, when you upgrade a mainframe you only pay for the additional capacity. It's like if you bought a car and upgraded it from 200 horsepower to 300 horsepower, you'd only pay for the additional 100

horsepower. With a mainframe, you only pay for the new capacity you're getting. The existing capacity is paid for, even though you get a completely new box.

With distributed technology, when you replace a server, you have to buy a complete new piece of hardware with no rebate or trade-in value from the old system. That may apply to the software as well.

Q. With so many factors in play, your team recommends companies perform a workload analysis to determine the true TCO. Why do you feel that's the most accurate approach?

A. There's a direct linkage between IT workload and revenue, and hence profit; so accurate TCO measurement and analysis will lead to better decision making that's focused on business growth. To do that, it's essential to analyze workloads and their costs. Almost all companies we deal with have different situations and costs, so an individual analysis makes the most sense.

Q. What are the steps in calculating actual TCO?

A. First of all, establish the company's true workload measurements—whether they're transactions per second, reports per hour, messages per second, or whatever. Now you've got a common metric. If you're comparing a mainframe with a distributed server, they both have to achieve this same workload measurement. Then design or configure how big those systems need to be and determine all of the components of those configurations. This is what we call TCA—total cost of acquisition—how much hardware and software you need. But that's only the first step.

The next step is to figure out how much floor space, labor, networking, power, cooling and so on are required. Then you need to decide if disaster recovery capabilities are needed. When all of these steps are completed, you've derived the TCO for each alternative.

"We've even heard of a couple of customers who included the CORPORATE JET in their mainframe costs!"

—David Rhoderick

Q. Another key part of this process involves analyzing a company's platform utilization. Why is that so important?

A. Platform utilization exposes efficiency. In particular, if you drive your systems at 100 percent utilization, the cost per unit of work comes down dramatically. Because PCs can't run at 100 percent, you need a lot more PCs and infrastructure to come close to the mainframe's capacity. And that drives up overall costs.

Q. For organizations beginning this kind of an analysis, where's the best place to start?

A. At IBM, we have the Eagle team, which can be engaged very quickly. These experts can come in and help customers understand all of the aspects that I've explained in terms of the total cost of ownership. It's what I call the true TCO analysis. These analyses are provided at no cost to the customer—typically in four weeks. That's where I think they should start.

Q. So the customers set the parameters and the Eagle team conducts the study based on their requirements?

On the Web

Eagle Eye

IBM's Eagle Studies provide a clear view of true technology costs

www.ibmsystemsmag.com/mainframe/Business-Strategy/ROI/total_cost_of_ownership

Tipping the Scale

Labor expenses should influence IT acquisition decisions

www.ibmsystemsmag.com/mainframe/Business-Strategy/ROI/mainframe_TCO

Hurdling Barriers to Success

IBM demonstrates how Cognos on System z is less expensive than x86 deployments

http://ibmsystemsmag.com/mainframe/Business-Strategy/BI-and-Analytics/Hurdling-Barriers-to-Success

System z10 and the Data Center

Mainframe helps the data center achieve lower TCO and less power consumption

www.ibmsystemsmag.com/mainframe/trends/z-os/System-z10-and-the-Data-Center

A. Yes, and because the studies are customer-tailored, we only look at the factors the clients chose. So if a customer says, "I don't want to include labor," we won't include labor. In this way, they know the results won't be skewed because the customer provides the data and the parameters in advance. There's nothing hidden there. Also, when certain costs aren't known, Eagle team members have extensive industry-average data they can draw on.

Q. How does IBM's fit-for-purpose approach apply to workload deployment on the zEnterprise platform?

A. Clearly, certain workloads are better on some systems than others. Running a mainframe at 10 percent capacity isn't cost-effective. Workloads, like creating a PDF from a printout and taking some existing data and making it into an email, can be done really well on PCs. This is work that can be batched up very cost-effectively. The same goes for user-interface workload. On the other hand, high-velocity workload that has massive variability and huge demands on read/write I/O fits much better on a mainframe. Fit-for-purpose and workload optimization are all about matching the right workload to the right computer environment.

Q. By and large, what have the TCO analyses concluded?

A. Over the more than 200 Eagle studies completed, with only a few where the results preferred a distributed deployment, the conclusion is that most existing workloads are best suited to the mainframe. And our customers are very satisfied with that outcome. Z

Mike Westholder is managing editor of *IBM Systems Magazine, Mainframe edition*.

The (Modern) Art of Application Development

IBM's integrated solution for System z streamlines software delivery

By Tim Hahn

Mainframe enterprise application developers face a host of challenges when seeking to develop and test multiplatform software applications. Customers expect to interact and do business through any means they choose, which might require rapid, cost-effective transformation of applications that oftentimes have been created through years of development investment.

Delivering innovative software within the time frame business demands requires sufficient, skilled resources. As experienced mainframe developers retire and new talent joins the team, it's important to enable these members to quickly make accurate updates to business-critical applications.

Fortunately, IBM has a solution for enterprise application developers. The IBM Integrated Solution for System z* Development is an automated environment for mainframe development that enables organizations to more easily implement applications containing IBM System z and zEnterprise* components.

This solution can improve the speed of software delivery, increase the accuracy of change, and allow teams to move quickly across projects that use multiple languages, systems and application runtime environments. To make that possible, it supports CICS* technology, the IMS* database management system,

DB2* and IBM WebSphere* Application Server software for efficient development of mainframe and cross-platform applications. It provides an environment for change management, analysis, development, team collaboration, unit testing and configuration management of mainframe software.

Some Assembly Required

Successful enterprise application development efforts start with clear, definable and quantifiable goals. These can include:

- Increasing velocity of software delivery
- Reducing costs
- Improving accuracy
- Responding more quickly to requirements
- Enabling the organization to better adapt to marketplace or regulatory changes
- Making better use of internal skills—or addressing the lack thereof
- Enhancing overall agility

Whatever the effort's specific goals are, the first steps toward achieving them are to crystallize a vision of where you want to be, and then assemble and deploy the most effective tools and processes for bringing that vision to life.

What's needed is appropriate and flexible project-planning tools. These should enable you to track the work being done, and find out where additional support might be needed—even before the development staff asks for that help. Code-management capabilities should allow you to coordinate the efforts surrounding contributing, reviewing and approving code creation for a shared-release development environment. Modern tools to efficiently edit, compile and debug code are required. And you'll need application lifecycle management tools that provide automated enforcement of agreed-upon development policies and processes, as well as a testing environment that quickly and inexpensively resolves issues. Finally, you'll want to create an environment that enables flexible testing so you can provide quicker feedback to development team members about the quality of changes and enhancements they create.

Many organizations don't have these types of tools in place or the expertise to efficiently create them. And because many of these processes have traditionally been performed manually, the time frames required for software delivery can be excessive, which

HOW IBM POWERS THE APPLICATION-DELIVERY FACTORY

IBM recognizes the challenges mainframe enterprise application developers face and has responded with the IBM Integrated Solution for System z* Development. It has several key components, including:

- **IBM Rational Team Concert*** (RTC) software is a collaborative lifecycle management solution based on the IBM Jazz* technology. It provides a common platform for agile, formal and hybrid planning and reporting. Planning templates are included for traditional project phases, and RTC software enables a single instance to support teams working on virtually all platforms, simple, role-based user licensing, and complimentary server software. In addition, it includes software configuration management capability designed for easier collaboration with multiple lines of business and outside suppliers that must share component code changes.

- **IBM Rational* Developer for System z** is an integrated development environment (IDE) based on Eclipse that enables the rapid development and deployment of enterprise applications, including support for IBM WebSphere* testing environments, Java* Platform, Enterprise Edition development, Web services development, cloud applications and portal development. It integrates seamlessly with RTC, providing an integrated view of development projects.

- **IBM Rational Development and Test Environment for System z** is a low-cost mainframe-based testing environment that harnesses the processing power and availability of distributed systems.

- **IBM Rational Asset Analyzer** software is a source-code analysis solution that delivers deep insight into an application's structure, including the relationships between applications and data, and the effects and risks of changes to those relationships from development activities.

These building blocks, coupled with skilled people using the tools and following the configured processes, create an application-development factory. They provide a range of benefits for application developers, including the ability to enhance collaboration and cross-pollination across systems and languages, while enabling more nimble development through an integrated solution that has been optimized for mainframe development usage scenarios.

—T.H.

delays deployment of new or enhanced services, and can significantly impede an organization's competitiveness.

Application-Delivery Factory

One strategy forward-thinking companies employ is to build what is essentially an application-delivery factory, an environment in which development efforts are coordinated and automated. Within this environment, individuals' knowledge, expertise and innovation are leveraged and combined with automated processes so that human input, such as code creation, can be utilized to run application components in the shortest possible time.

An analogy can be drawn to a manufacturing assembly line where operators oversee the automated elements, making adjustments as necessary but leaving the mundane chores to the automated processes, such as myriad administrative tasks surrounding development, starting and stopping builds or running the same set of tests repeatedly. This gives staff more time to devote to high-value activities, such as coding, creating new test cases and innovating.

One strategy forward-thinking companies employ is to build what is essentially an application-delivery factory, an environment in which development efforts are coordinated and automated.

The Solution in Action

Consider the following hypothetical situation: A multinational financial organization is seeking to improve its customer experience and boost profitability. As part of its application-modernization efforts, which include making additional account-management operations available directly to customers, it plans to mask account numbers for security reasons. Because customers can manage accounts online on their devices of choice, the project will require modifications to existing COBOL code for character-based access, as well as to the current Java* code for Web access.

Internal players, including the team leader, a business analyst, and COBOL and Java developers, will be involved in the project. They use IBM Integrated Solution for System z Development to orchestrate and implement the needed modifications. The following represents the steps the team could follow in making required changes:

1 Project status and task review

IBM Rational Team Concert* (RTC) software brings together project planning, source control, work items and build management into a unified application that provides the team with a comprehensive, dynamic view of ongoing activities. The team will also rely on Rational* Asset Analyzer software to determine and visually highlight the potential effect of modifications on other application components. Armed with insight into the interactions of the application with business data, the team can be confident that changes being made won't negatively affect the business. Rational Asset Analyzer software can also integrate with the Eclipse environment of Rational Developer for System z (RDz) software, giving the team access to this shared application knowledge in the integrated development environment, throughout the project lifecycle.

2 Viewing, editing and testing the code

The Integrated Solution for System z Development makes it possible to view COBOL code from the software configuration management repository in RTC software through the RDz editor interface.

RDz software offers a single solution for developing, debugging, testing and deploying an enterprise application—such as the display of HTML and Web application logic at the mid-tier, and Web services that extend CICS or IMS business logic to DB2 database access on the mainframe. This environment integrates well into traditional mainframe development practices while allowing for a transition to a modern development suite. Productivity improves because everything needed to do the job is easily accessible, and many of the tasks will be automated.

Once changes are made, the developer can move the code to the IBM Rational Development and Test Environment for System z for unit testing. This virtual System z architecture environment enables mainframe OSs, middleware and software to run on Intel* and Intel technology-compatible platforms rather than using the System z hardware.

Validating and testing the application is also faster because developers can make changes directly to the testing environment without waiting for programmers to evaluate and approve system changes that might affect the shared test environment.

This could cut weeks from the delivery cycle. Also, these changes can be tested in a development environment prior to being deployed into production systems so that defects can be found earlier in the cycle, which helps reduce costs. This integrated environment can be especially helpful to less-experienced mainframe developers.

3 Code review

Development processes at many organizations require code created by less-experienced developers be reviewed before it can be delivered to quality assurance. Built-in enforcement in RTC helps ensure the process is followed. Through the RTC software configuration management capability, a team lead can visually verify the changes that are about to be delivered to quality assurance.

4 Web application changes, code reviews and final tasks

Through RTC software, subtasks can be delivered to quality assurance together, where the changes are tested. Thus, both the COBOL and Java code is delivered together. Should a problem arise, developers can use the RDz integrated debug environment to resolve the issue. After testing, the application is delivered to production, where the project manager and auditors can use RTC software to trace all changes made as a result of the original requirement, which includes verifying whether the code review was done and viewing the changes that were made.

Modernizing Application Lifecycle Management

IBM Integrated Solution for System z Development is designed for mainframe application-development teams that need to more quickly develop, test and implement applications that feature System z and zEnterprise components. Built to address the challenges of maintaining, enhancing, modernizing and creating today's multiplatform, multilanguage, multichannel enterprise applications, it enhances team collaboration, eases unit testing and analysis, and can dramatically accelerate development of rich enterprise applications. Z

Tim Hahn is an IBM Distinguished Engineer and the chief architect for enterprise modernization tools within the IBM Software Group Rational organization.

Mike Giglio, systems programmer with Shelter Mutual Insurance Co., says migrating from Intel servers to a zEnterprise 114 saved his company from server sprawl.

TAKING SHELTER FROM THE STORM

Shelter Insurance employs a measured approach in adopting Linux on zEnterprise 114

By Jim Utsler • Photography by Kevin Manning

Ask people why they decide to consolidate one-off servers to a mainframe, and they're likely to say something like, "Those PC boxes are simply too expensive to maintain. You have to hire people to administer them, and they suck up a lot of juice."

Shelter Mutual Insurance Co., though, may have had the granddaddy of all reasons. "Our server sprawl was simply out of control, and we were having problems with air flow and rack space," recalls Mike Giglio, systems programmer with Shelter. "A few years ago, we had to rebuild our entire data center, and it wasn't cheap. We had to redesign our layout, add new racks, a new ceiling and new floors. We even added new heating and ventilation and power distribution."

As is often the case when data centers are revamped, even more servers were added—eating into the new, valuable and expensive real estate. To counter this trend, Shelter decided it could move many of its applications to Integrated Facility for Linux* (IFL) processors running on its mainframe, thereby slowing the proliferation rate of the existing Intel* technology-based boxes, if not getting rid of them entirely. As an added bonus, the company's applications are now running faster on its zEnterprise 114 (z114) platform than they had in the past.

"Our server sprawl was simply out of control, and we were having problems with air flow and rack space."

— Mike Giglio, systems programmer, Shelter Mutual Insurance Co.

PROOF OF CONCEPT

Based in Columbia, Mo., Shelter is a do-it-all insurance company with a presence in 14 states. It not only offers auto insurance to the tune of some 1.2 million policies, but also homeowners and life insurance, as well as coverage for boats, recreational vehicles and motorcycles.

Beyond that, it has two business divisions, Shelter Reinsurance Co. and Shelter Financial Bank. Shelter Reinsurance is an insurance company for insurance companies. For example, if another provider wants to hedge against a big payout in the event of a natural disaster, it can take out a policy with Shelter Reinsurance to insure against any associated losses.

As Giglio explains, "Another insurance company located where we don't have any policyholders, such as in California, will pay us premiums to insure against unexpected events where it has to pay a large number of policyholders. So if, for example, a reinsured customer has to pay out $5 million, it may cover $3 million, and we'll take up the other $2 million. That way, it won't be totally wiped out."

Shelter Financial Bank, despite its name, doesn't offer traditional checking and savings accounts. Instead, it offers its policyholders a variety of other financial services, such as CDs, money-market accounts and mortgages. As with its insurance offerings, these are handled by the company's agents, who help people find ways to manage their finances. "Some of our customers simply feel more comfortable dealing with someone they already have a relationship with and trust," Giglio adds.

A host of applications support Shelter's multitude of missions. Many of the applications have been developed with and delivered by IBM WebSphere* solutions. Its online e-commerce solution, for example, is based on the WebSphere Application Server (WAS). Initially developed around 10 years ago, it's now one of the company's largest applications, and is used by all of its agents to serve customer accounts. Although still hosted on a cluster of Intel-based servers, it has ties to many of Shelter's back-end mainframe services, including DB2* for z/OS*.

Other applications run directly on the company's z114 (which replaced a System z10* server in February). One, an indexing application that tracks both its policyholders and 1,400 or so agents, was ported to Linux on System z* from an Intel box about a year and a half ago. "That was when we were starting to look at Linux on System z a little more seriously," Giglio says. "And because it was a pretty straightforward application, we chose to go with that one. We wanted to make sure it was successful and that we could make it work. It was a proof of concept, of sorts."

UP CLOSE

Customer: Shelter Mutual Insurance Co.

Headquarters: Columbia, Mo.

Business: Insurance and financial services

Challenge: Avoiding another expensive data center remodel

Solution: Taking a step-by-step approach to migrating Linux workloads from Intel servers to a zEnterprise 114

Hardware: IBM zEnterprise 114

Software: DB2 for z/OS, WebSphere Application Server, WebSphere MQ, SUSE Linux Enterprise Server for System z

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THE TECHNOLOGY PERFORMANCE COMPANY

THE z114 UMBRELLA

Notably, this was after the company embarked on its data center overhaul, when it decided it couldn't keep throwing one-off servers into the mix to host its many applications. In fact, it already had about 400 to 500 such boxes in operation, and it didn't necessarily want to add to those numbers and face yet another expensive data center expansion. "By virtualizing, we thought we could kind of save us from our own growth," Giglio says.

"By virtualizing, we thought we could kind of save us from our own growth."

— Mike Giglio

Since then, Shelter Insurance has been doing just that, slowly but surely. It started with its indexing application and moved on to new applications that didn't run on Intel boxes, including two recently developed WebSphere services applications. One of those is a messaging system that verifies if people's insurance is current.

"If you get pulled over somewhere, you hand your proof of insurance over to the police," Giglio explains. "They can then, using a computer in their patrol car, send a message to our application, which is running on Linux, to confirm that your insurance is up to date and hasn't lapsed or been canceled. The information would include your name and policy number, which is matched to what we have in DB2. A return message is then created and sent to the patrol car."

Of course, Shelter is also eyeballing existing Linux environments currently running on Intel, hoping to put even more under the z114 SUSE Linux Enterprise Server for System z umbrella. The company is taking a very deliberate approach to this, starting with nonproduction loads, including, development, testing and staging. After that, it will move to some light production systems.

Giglio is hoping to retire about a half-dozen Intel servers in this first stage. "If you do that two or three times a year, you're eventually talking about retiring a fairly significant amount of hardware," he adds. "But right now, we're just looking at the low-hanging fruit—the things that are easiest to move and are running on geriatric servers. As you can tell, we move at a very deliberate pace."

VALIDATING THE WORK

Shelter wants to ensure it gets things done precisely and not necessarily just quickly in a big-bang approach. This is, in part, because of technological and cultural hurdles that must be overcome. More specifically, the company's IT staff had to become knowledgeable about Linux and virtualization. Giglio had some experience in this, but when he came to Shelter around six years ago, the company itself didn't. "It was all Windows* and z/OS," he recalls.

But when Shelter chose to do a mainframe CPU upgrade, it seized the opportunity and also implemented an IFL. At the time, however, the intention was to test the waters to see if running Linux in a virtualized environment on the mainframe made sense.

One of Shelter's first tests was with its e-commerce site. It made a copy of the "monolithic application," as Giglio describes it, and began running an offline instance of it with the assistance of IBM and Sirius computing, which also supplies its hardware. This proved to be somewhat successful, but there were a few important caveats.

"If we could move our biggest, most demanding application to this environment without a whole lot of hassles, we thought, 'Hey, this is viable.' The largest challenge, though, wasn't getting WebSphere to run in that environment, but getting everything hooked up with the HTTP server and DB2," Giglio remarks. "So our thinking moving forward was to make sure we had a quality-of-service environment before we could move production applications to Linux on System z. And what I mean by that are performance, availability, capacity, backup and recovery, and security."

Over the course of the next couple of years, reaching that quality of service became Giglio's goal. To that end, he began assembling a team focusing on just that. He and other staff members began learning the ins and outs of Linux and virtualizing on the mainframe, both on their own and in classroom settings. He also brought storage and backup people on board to lend their expertise to the enterprise.

"I wanted to make sure the infrastructure was 100 percent in place before we started deploying any apps," Giglio says. "Now, from having nothing in the way of z/VM* or Linux infrastructure, we've since built a hardware environment based on existing System z processors, existing DASD and the existing network infrastructure. When you think about it from a hardware point of view, the only things we had to add were the IFLs. We had everything else."

And this included the support of IBM and Sirius, both of which offered to lend a hand when needed. An IBM zVM expert, for example, lives only an hour from Shelter's data center and would come in to help where needed—and still comes in so IT staff can "pick his brain," Giglio says. To review what Shelter had done, Sirius also sent an expert, who made only a few minor suggestions. "It was reassuring to have someone come in and validate our work," Giglio remarks.

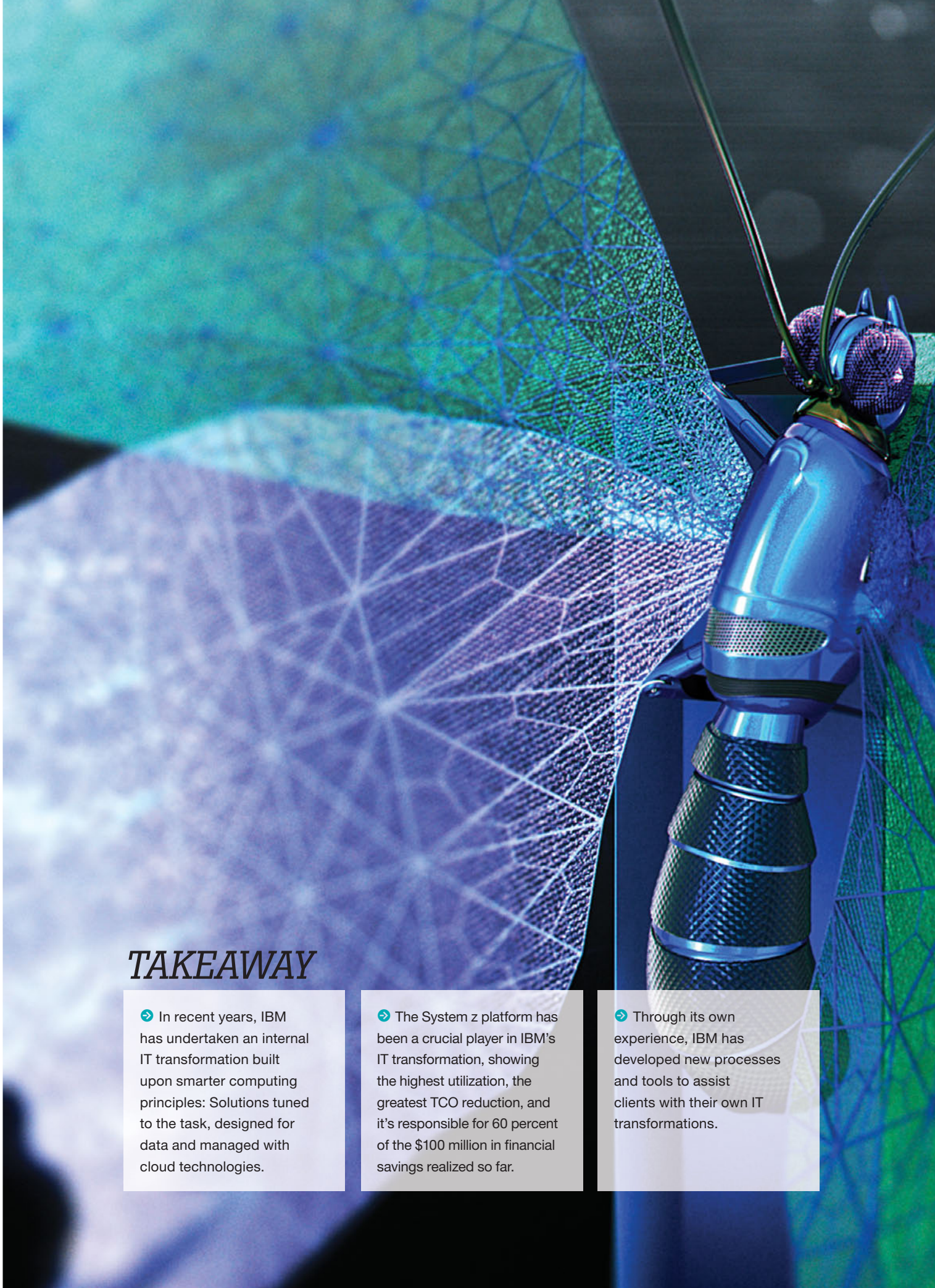
AVOIDING WORST PRACTICES

Although Giglio—who won an award for his paper, "The Penguins Have Landed: Getting Started with Linux on System z," from the Computer Measurement Group—says the company has been "slow yet deliberate" toward wider adoption of Linux on the z114, Shelter has made great strides without putting its production systems at risk. This is all part of his larger philosophy, which de-emphasizes best practices in favor of avoiding worst practices.

"Best practices are really too expensive," he says. "Instead, I prefer to avoid worst practices and say, 'That's not working out so well. Let's stop doing it.' In my book, that's the best way to do things—which, come to think of it, is a best practice of sorts. But that's for another day."

Whatever the case, it's clear that Shelter has taken the right road when it comes to deploying Linux applications on its z114. It could've hurriedly taken the big-bang route, but that might have ended in disaster. Now, with all of the proper skills and infrastructure in place, it can deliberately decide what it wants to move to the mainframe and when, without having to worry about another costly data center makeover. Z

Jim Utsler, *IBM Systems Magazine* senior writer, has been covering technology for nearly 20 years.



TAKEAWAY

- In recent years, IBM has undertaken an internal IT transformation built upon smarter computing principles: Solutions tuned to the task, designed for data and managed with cloud technologies.
- The System z platform has been a crucial player in IBM's IT transformation, showing the highest utilization, the greatest TCO reduction, and it's responsible for 60 percent of the $100 million in financial savings realized so far.
- Through its own experience, IBM has developed new processes and tools to assist clients with their own IT transformations.

Internal Transformation

System z is at the center of IBM's smarter computing initiative, which has saved the company $100 million so far

By Simon Hares • Illustration by Peter Crowther

In 2007, IBM announced project Big Green, designed to address the ever-increasing number of servers deployed in IBM's internal data centers that support core business operations. This project included consolidating the workloads of about 3,900 distributed servers to about 30 System z* servers. The objectives were substantial financial savings and a large reduction in energy consumption and floor-space requirements.

Five years later, this project has evolved into a full-scale IT transformation, positioning IBM's internal data centers on the path to smarter computing. As this transformative process progresses, System z technology plays a key role in the new infrastructure.

Smarter computing helps organizations address today's IT challenges—an explosion of data, inflexible IT silos, and sprawling server and storage footprints—while overcoming constraints, such as flat budgets, to transform IT economics. This approach creates an infrastructure that exhibits three fundamental characteristics:

- It's tuned to the task, optimizing performance and economics by matching workloads to the best platform to meet specific workload requirements.

- It's designed for data, delivering insights in seconds through systems built to process a variety of data at scale.
- It's managed with cloud technologies, improving service quality, speed of delivery and efficiency.

IBM is utilizing these principles to deliver significant financial savings for businesses while establishing an environment for value creation.

Tuned to the Task

The decision to undertake a full IT transformation has dramatically changed the focus of the initial project. The scope has been extended to all 15,000 servers within the IBM internal account, giving the company the opportunity to assess what action should be taken with every workload. It also enables a location view of the infrastructure to systematically assess every server in any data center and decide where the workload should be located. This allows entire data centers to be decommissioned, which can provide a new level of savings.

Creating an optimized infrastructure requires each workload be deployed on the most appropriate platform, its characteristics assessed and then aligned with platform attributes. The assessment extends beyond the technical requirements of the workload to include the cost of deployment and its strategic priority to the business and the service level required. The workloads assessed so far have been deployed across various System z, Power* and System x* platforms, with about half being deployed on System z and 40 percent on Power Systems*.

While significant benefits can be realized by migrating workloads to their best-fit platforms, those migrations also include associated costs. As part of this expanded project, IBM developed a better understanding of when to migrate and created tools and methodologies to reduce migration costs.

Of the roughly 10,000 servers assessed through 2011, 6,500 migrations have occurred. Between 2008 and 2011, new practices have changed the average System z hardware migration from 200

BY THE NUMBERS

So far, **50 PERCENT** of workloads have been deployed to System z platforms and **40 PERCENT** to Power Systems.

Nearly **74,000** square feet of data center floor space has been freed up.

Average total cost of ownership has dropped **70 PERCENT.**

Energy consumption has been cut by more than **30,000 MEGAWATT HOURS** annually.

To date, IBM's internal smarter computing efforts have saved the company about $100 million.

New practices have changed the average migration to System z hardware from **200 DAYS AND $43,000 PER SERVER TO 90 DAYS AND $12,000 PER SERVER.**

System z technology is responsible for **60 percent** of the project's savings so far.

Of the roughly 10,000 servers assessed through 2011, 6,500 migrations have occurred.

Average server utilization has increased from less than **10 percent to 60 percent.**

days and $43,000 per server to 90 days and $12,000 per server.

At the end of 2011, IBM was roughly two-thirds through the transformation, which has an expected 2014 completion date. The project has delivered significant results:

- Savings to date of about $100 million
- Reduced energy consumption by more than 30,000 megawatt hours per year, roughly equivalent to the total annual power requirements of a town of 3,000
- 74,000 square feet of floor space freed up, including the closing of several data centers, delivering substantial additional infrastructure savings
- Increased average server utilization from less than 10 percent to 60 percent, and an average total cost of ownership (TCO) reduction of 70 percent

The System z platform has been a crucial player in IBM's IT transformation. It shows the highest utilization, the greatest TCO reduction and is responsible for 60 percent of the financial savings in the project so far.

Designed for Data

IBM is experiencing substantial growth in the volumes of data it has to manage. Within its internal systems, data is growing at more than 25 percent, compounded each year, and the challenge is to manage that growth on a flat budget. No single answer will address this issue. It requires a balanced approach to dealing with storage, and IBM is looking to significantly improve the efficiency of data storage through a set of key technologies.

First, IBM is focused on reducing the amount of data it stores, utilizing compression and deduplication to minimize storage requirements. Second, it's seeking to improve storage efficiency by using thin provisioning and virtualization to increase the utilization of storage devices. Finally, IBM is looking to move data to the most appropriate storage to create the right balance between efficiency of data access and storage cost.

This final area of automated storage-tiering provides significant opportunity for savings, certainly within a single device, but also by moving data from expensive tier 1 storage to lower-cost tier 2 or tier 3 storage, and eventually, to tape for long-term storage. In an ideal

environment, the most valuable and frequently accessed data would be on the higher-cost storage, with other data stored on lower-cost options, creating a tiered storage model.

However, achieving this optimal placement of data is extremely resource-intensive, and frequently, its associated costs can outweigh the benefits. IBM Research has been developing new technologies and methodologies to enable automation of this process. In a recent test using new tools, the time taken to create a tiered environment for a large 57 TB database was reduced from 235 hours to just six. These advancements are making the prospect of data tiering a reality and will help deliver significant cost savings.

While the growth of data is a huge challenge to IT, it's also a tremendous opportunity for the business. The ability to harness all available information for better insight is considered essential to most business leaders, and advanced analytics and business intelligence are the key to success. IBM is leading the development of innovative technologies for analytics, and it's exploiting them within its internal account to drive value to the business.

IBM Blue Insight is the world's largest private cloud computing environment for business analytics. Deployed on System z hardware, it consolidates information from nearly 100 different information warehouses and data stores—in total, more than a petabyte of data. This data is then made available through a set of analytics tools with IBM Cognos* on Linux* on System z to drive new insight from a single view of data across the enterprise. The benefits of this project have been substantial:

- In excess of $20 million in savings is anticipated over five years.
- Reports that had been months in planning can now be produced in a few hours.

IBM has developed a better understanding and knowledge of IT transformations, which has led to new tools, methodologies and practices that IBM can bring to its clients.

- More than 200,000 IBMers utilize Blue Insight to deliver insight through 35 applications with another 30 in the works.

IBM is looking to further strengthen Blue Insight with new technologies. It's currently in pilot mode with the IBM DB2* Analytics Accelerator. This will enable IBM to process complex queries up to 100 times faster and allow insight to be delivered in real time.

Managed With Cloud Technologies

IBM has been utilizing cloud technologies within this project as part of three coexisting service delivery models. These include traditional enterprise IT, private clouds and public clouds. System z, Power and System x resources are being deployed on a best-fit basis across all of these delivery models. Within the IBM internal account, the majority of implementations have been private cloud examples. These are dedicated to the enterprise, and in most cases, sit inside IBM firewalls. They drive improvements in efficiency, increased standardization and best practices for improved service to the business while retaining a high degree of customization, control and security.

In addition to Blue Insight, another private cloud implementation is the LotusLive* collaboration cloud from IBM. This, too, has been deployed on the System z platform and is IBM's primary Web-conferencing capability for meetings among staff, clients and business partners. In 2011, meetings totaled 500 million minutes, and the adoption rate continues to grow, with 85 percent of IBM's current meeting minutes provided through LotusLive.

Several other cloud implementations within the IBM internal account have provided significant benefits:

- Development and Test Cloud can reduce server setup from five days to one hour.
- Storage Cloud has automated provisioning of file storage for 130,000 IBMers globally.

Not only is IBM exploiting technologies to improve service delivery, it's also focused on improving management over the lifetime of a service, from initial development of the service through deployment, ongoing maintenance, and retirement of the service and releasing its resources.

One important aspect of this activity is a shift in focus from a view of individual applications or workloads handled on a one-off basis to a focus on standardized services that can be reused many times as new business requirements

surface. IBM's objective is to support 80 percent of the application portfolio with standard services in a single catalog. This will dramatically reduce the amount of effort involved in maintaining and updating the application portfolio within the business.

A second aspect is ensuring IBM applies appropriate service and support for each workload. To do this, it has assessed every workload in terms of how crucial it is to the business today and its strategic value for the future. Workloads are ranked in tiers from 1 to 5, with tier 5 being least important to the business. For tiers without redundancy and availability, support and monitoring is provided on a minimal best-effort basis. IBM has found 80 percent of applications fall into tiers 3, 4 or 5, and as a result, its service and support costs are dramatically reduced with this managed approach.

Smarter Computing at IBM

The evolving project to date has met great success, but beyond the specific results, three key points can be ascertained:

1 While consolidation can deliver savings, an IT transformation will deliver truly dramatic benefits to the business. By utilizing the best-fit storage and server platforms for each workload, it's possible to deliver incremental savings to the business and create a highly efficient optimized infrastructure.

2 Deploying the latest cloud technologies and advanced analytics enables IT to be far more responsive to the changing demands of the business. More importantly, new intelligence delivered in real time allows the business to innovate for value creation and new revenue opportunities.

3 This project has been a team effort for IBM, involving systems, storage, software, services and R&D. Together, the team developed a better understanding and knowledge of IT transformations, which has led to new tools, methodologies and best practices that the company can bring to its clients to help them accelerate their own IT transformation and maximize the benefits to their businesses.

Simon Hares is the IBM System z marketing manager for IBM sales and distribution.

LARGE MEMORY TAMES BIG DA

The System z stack evolves to deliver business value from more memory

By Peter Sutton • Illustration by Douglas Smith

Editor's Note: *IBM Distinguished Engineer and IMS Chief Architect Betty Patterson, Senior Technical Staff Member Marcel Mitran, IBM Distinguished Engineer Chris Crone, IBM Distinguished Engineer John Campbell and Senior Technical Staff Member Akiko Hoshikawa co-authored this article.*

As a real-time data and transaction processing host, the z/OS* software stack provides data for up-to-the-minute requests both inside and outside the enterprise. Response times are critical to productivity and meeting business goals.

With advanced mixed-workload capabilities, z/OS can host batch processing on both live and time-consistent views of the data served for transactions. Like transaction processing, batch processing is time sensitive. Large memory and z/OS can enable new business value by processing more data in shorter elapsed time at lower CPU cost. Shorter elapsed processing

TAKEAWAY

- The balance between business requirements, software capabilities and technology roadmaps has shifted in favor of large memory.

- Previously unsolvable business problems are now solved in real time through advances in database systems and analytics software. Cross-platform workload deployment continues to place new demands on response time. Tighter service-level agreements drive minimally disruptive diagnostics and first failure data capture at extreme rates.

- The common thread? Mainframe customers are deploying more memory on System z servers to help deliver consistent performance and high availability. Its stack is evolving to give more value to systems with large memory.

time could allow users to move from quarterly to monthly—or even daily—close cycles. Reduced CPU consumption could enable deeper analysis to detect new sales opportunities.

Physical memory on the server helps determine both the response time of transactions, and the elapsed time and CPU cost of batch workloads. Today, System z* servers support up to 3 TB of real memory per server shared across all of its partitions. Each partition can use up to 1 TB of memory. Large z/OS partitions typically are configured with 100 to 300 GB of real memory—some even larger. Many z/OS stack users have completed the migration to 64-bit systems and are deploying the software stack needed to gain value from very large real memory.

Technology supports an increased role for large real memory. Dynamic RAM (DRAM), the current building block for memory, has industry roadmaps showing substantial scaling past 20 TB per server despite current DRAM scaling issues. Real memory per image in a System z server can approach the size of some databases, enabling in-memory database optimization.

Memory Shift

Big insights, big data and the demand for real-time analytics in combination with low-latency transactions place high demands on data access, and it's becoming increasingly challenging for modern I/O subsystems to deliver. The need to improve latency has fallen on application and middleware developers as well as system providers. The industry, therefore, is seeing a shift in application and middleware programming models, persistency systems, and application-development frameworks. At the same time, we see the evolution of in-memory databases and analytics, large-scale distributed caching systems such as WebSphere* Extreme Scale, and object-relational mapping libraries for persistency such as Java* Persistence API.

As a result of this shift, modern Java Runtime Environments, such as IBM J9 Virtual Machine, include incremental garbage collection (GC) technology (like the balanced GC policy) to address increasing heap storage to thread performance ratios. Java users are reacting to these changes by configuring servers, including System z servers, with much larger amounts of real memory. Large memory is necessary to support the evolving Java environment for paging avoidance, for example, and to enable CPU-saving technology such as 1 MB large pages.

The Benefits of Larger Buffer Pools

Users of DB2* for z/OS are reassessing the relationship between CPU, storage and synchronous I/O resource consumption for their critical workloads. Noting software license fees and physical memory costs, users are shifting their investment toward additional real storage to support larger buffer pools. Supporting these buffer pools with larger real storage can:

- Improve the user response times
- Increase transaction throughput
- Reduce CPU resource consumption

The November 2011 IBM Information on Demand whitepaper, "Save CPU Using Memory," showed that the IBM Relational Warehouse Workload (IRWW) had a 40 percent response-time reduction and a 5 percent CPU performance improvement by exploiting increased buffer-pool sizes. DB2 can also exploit larger real memory in the coupling facility (CF). Data access from the CF can be 10 to 50 times faster than getting the equivalent data from disk. Support in z/OS improves DB2 CF data caching by cooperatively managing data placement during utility processing.

DB2 10 for z/OS, supported by larger real memory, has tremendous potential to improve performance and scalability. Additional real memory is required to gain the full potential of DB2 10 for improved performance

DATA ACCESS FROM THE COUPLING FACILITY CAN BE 10 TO 50 TIMES FASTER THAN GETTING THE EQUIVALENT DATA FROM DISK.

—IBM Information on Demand whitepaper, "Save CPU Using Memory"

Research shows a 5 to 10 percent improvement in CPU performance in DB2 10 versus DB2 9 through better memory management for remote/local applications.

REDUCE, SECURE, MOVE & STORE
YOUR DATA

Across the enterprise and with partners

In any computing environment

In motion and at rest

Drive Mainframe Efficiencies

Leverage a native implementation and exploit System z® hardware capability to minimize CPU usage and reduce elapsed time.

Today, more than 30,000 global corporations and 200 government agencies worldwide rely on PKWARE to help protect against security breaches, reduce the risk of non-compliance and safeguard sensitive data. PKWARE stands alone as the one solution that handles structured and unstructured data across the extended enterprise—regardless of varying platforms, applications and formats, in any mix of cloud, virtual, and physical systems—with guaranteed data security.

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and cost reduction. Most organizations can measurably improve performance by:

- Rebinding application packages using the REBIND command
- Using 1 MB real storage page frames
- Making more use of persistent threads with the RELEASE(DEALLOCATE) option

Examples of persistent threads include both protected CICS* ENTRY threads and high-performance database-access threads (DBATs) for distributed applications. This is a classic trade-off, with increases in real memory consumption leading to reduced CPU-resource consumption and a smaller monthly license charge for DB2 and the entire z/OS software stack.

In addition, research showed a 5 to 10 percent improvement in CPU performance in DB2 10 versus DB2 9 through better memory management for remote/local applications. It also indicated up to a 10 percent improved CPU performance using high-performance DBAT, and a 26 percent CPU savings for SAP workloads by tuning the MAXKEEPD subsystem parameter.

IMS Implications

IMS* users are taking advantage of larger real memory by page-fixing blocks and buffers. Just as with DB2, increasing fixed blocks and database buffers can cut down on I/O delays by keeping the data IMS needs in memory.

When you couple the IMS 12 capability to dynamically resize database buffer pools with IMS Buffer Pool Analyzer's view of buffers by total buffer life, clients can see measurable CPU savings and performance improvement. By page-fixing buffers, IMS gains internal efficiencies and reduces the load on the entire z/OS system by avoiding paging spikes.

One example is a client with an IMS program specification block (PSB) pool with large, infrequently used PSBs. During application scheduling, a PSB is read into the pool. If there's no room, space must be reclaimed. Removing a paged-out PSB results in page faults and delays. Using large real memory and page-fixing the pool can improve performance. IMS 12 can use large memory for IMS log buffers to improve online logging throughput.

Another log-related process where large real memory is useful is during dynamic database backout. As the archived log data is read, it's cached in data spaces. Using larger real memory to increase resources to back the data spaces could allow the read process more frequent success, thus reducing the need for batch backout.

Peak Performance and Availability

The System z stack excels at continuous availability. Large memory not only enables improved availability via faster recovery times but also poses new challenges like the collection of first-failure data-capture information. The stack rollout for high-performance diagnostics has been ongoing for years. Key developments have included high-performance SAN Volume Controller dump code in z/OS 1.12 and the secure parallel data transfer tool that can move large files quickly from clients to IBM.

Today, DRAM-based real system memory is king, and large memory is the way to improve performance. Future memory technology will augment current real memory usage. Storage-class memory will bridge the gap between current real memory and disk subsystems. Technologies like flash memory, which fill a role in the disk I/O hierarchy, are too slow to provide the benefits of large real memory. The fastest flash memory deployed is still 5 to 30 times slower than accessing data in the coupling facility and orders of magnitude slower than DRAM.

In the future, the memory hierarchy will be reshuffled as new high-performance storage-class memory technologies are discovered. In the meantime, large real memory remains the most cost-effective way to improve the latency and eliminate the CPU cost associated with I/O activity. It provides the necessary glue that allows deployment of big insights, big data and real-time analytics. Z

IN A FLASH

Technologies like flash memory, which fill a role in the disk I/O hierarchy, are too slow to provide the benefits of large real memory. The fastest flash memory deployed is still 5 to 30 times slower than accessing data in the coupling facility and orders of magnitude slower than DRAM.

LARGE REAL MEMORY PROVIDES THE NECESSARY GLUE THAT ALLOWS DEPLOYMENT OF BIG INSIGHTS, BIG DATA AND REAL-TIME ANALYTICS.

Peter Sutton is an IBM Distinguished Engineer.

Beyond the Standard Benchmark

A more effective comparison starts with relative capacity

By Joe Temple

When comparing technology platforms, most turn to standard benchmarking practices. Unfortunately, these rely on an inadequate representation of user workloads and neglect the continuous change and evolution of machine design. There must be a better model.

Before conducting extensive benchmarking, what's needed is an understanding of relative machine capacity using commonly available design parameters. Such a model should be relatively robust as technology evolves.

Relative Capacity is Multidimensional

No single design element determines the throughput a system can deliver, but three cover most aspects of capacity:

- **Parallelism:** The number of concurrent threads the machine can run
- **Serial speed:** How fast each thread will process instructions, given that data is available
- **Cache:** How much data is available close to each thread

We can also represent three elements of machine design, commonly reported as part of the machine specifications:

- **Parallelism:** Thread count
- **Serial speed:** Thread speed
- **Cache:** Cache per thread

Thread count is the threads per core multiplied by the number of cores per machine. Cache per thread is the amount of cache in the machine divided by the thread count. For single threaded cores, thread speed is very closely tracked to clock speed, which is usually specified. However, when a core is multithreaded, the thread speed is the clock speed times the throughput gain from threading, divided by the threads per core. The sockets in Table 1 (page 44)

were chosen to represent the range available in IBM servers.

Figure 1 (below) shows the zEnterprise* System has fewer but faster threads and more cache than the others. Because of four-way symmetric multithreading (SMT4) and the ability to share Level 3 cache even when cores are disabled, Power Systems* Enterprise servers span from turbo machines approaching System z* servers to the maximum-threads Power* 780, which is positioned near the blades in thread count.

Note that even within the Power 780, machine cache and speed must be swapped to gain thread count. Because of packaging, cooling and economics, the PureSystems* compute nodes and blades run at lower speed but retain the cache and thread count of the POWER7* socket. The Intel* machines are positioned near the fully threaded Power machines but have lower thread count because they have two threads per core instead of four.

A Fool's Errand

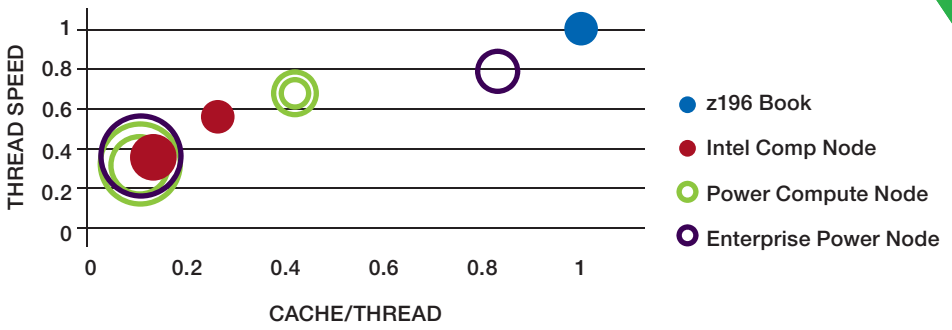
The definition of capacity and performance by the observer will affect the perception of relative capacity for these machines. Workloads can stress all three axes of this space. Thus, benchmark-based performance metrics can never be universally valid. This renders the reliance on standard benchmarks to generate a common metric, seemingly a fool's errand.

It's important to understand the common practice of sizing servers other than System z using metrics such as Transaction Processing Performance Council-Type C (TPC-C), Standard Performance Evaluation Corporation Based on Integers (SPECint), Relative Performance (rPerf) and IDEAS International Relative Performance Estimates (RPEs), which are only good when comparing machines at similar positions on the Figure 1 chart. For this reason, IBM stopped using these raw metrics to measure System z performance long ago. Instead, a floating IDEAS International RPE per multiprocessor specification (MPS) ratio, based on workload factors, has been used by System z for more than a decade.

Because of the spread across Figure 1, Power

Figure 1

Positioning Compute Nodes in Fitness Space
Bubble Size Is Thread Count



This bubble chart shows how servers are positioned in the Fitness Space.

Table 1

IBM Server	Specifications
zEnterprise Central Processing Complex	• 4 core, 5.2 GHz, 38.4 MB L4 share, z196
zBX Power Blade	• 8 core, 3 GHz, 32 MB L3, POWER7
zBX Intel Blade	• 10 core, 2.4 GHz, 30MB L3, Westmere
PureSystems Power Compute Node	• 8 core, 3.4 GHz, 32MB L3, POWER7
PureSystems Intel Compute Node	• 8 core, 2.7 GHz, 20 MB L3, Sandy Bridge
Max Threads Enterprise Power	• 8 core, 3.44 GHz, 32 MB L3, POWER7
Max Cache Enterprise Power	• 4 core, 4.1 GHz, 32 MB L3, POWER7

machines need a similar effective RPE per rated RPE workload factor set when comparing enterprise-class machines to blades and information technology elements (ITEs). This is especially true when the workload stress speed and cache indicate use of a turbo machine. In turn, this will affect Power core to System z core ratios. Generally speaking, workloads that exploit max cache Power Enterprise servers will do well on System z, but we must be more conservative when considering the core ratio of Enterprise max cache machines to System z.

Area Metrics

It's difficult to visualize multidimensional spaces, which is why we chose three dimensions for our discussion of positioning. This is difficult to quantify even in a clearly understood model. In fact, businesspeople love the idea of a single, common metric that can only work for machines clustered near each other in our chart. Here, we move toward a clearer two-dimensional model.

We start by noting that the maximum throughput achieved by a multithreaded machine is the sum of the work done by all of the threads over time. If we can keep all of the threads busy and ignore serializing events and delays such as locks and cache misses, throughput would scale linearly and be represented by the thread count times the thread speed. Thus, maximum throughput is calculated as:

Throughput = Threads x Thread Speed

In virtualized systems, a number of applications or virtual machines are sharing each hardware thread. To get the most from this situation, you must have a fast thread, because you're

running pieces of work sequentially. You also need high cache per thread because now multiple-memory working sets are in the overall workload. Thus, the core capacity is given by clock speed times cache per core. We use cache per core because one thread can "own" a core when necessary:

Core Capacity = Cache/Core x Thread Speed

Finally, note that total cache is a useful concept given by cache per thread multiplied by the number of threads. This metric is called size because it gives an indication of the size of the workload the machine can hold without regard to the dynamics of speed. It is related to the number of sockets in the machine, but can give an indication of technology used in each machine. For example, a System z L4 share socket size is 9.6 MB x 4 threads = 38.4 MB, a Sandy Bridge socket is 1.25 MB x 16 threads = 20 MB, and a POWER7 socket size is 1 MB x 32 Threads = 32 MB. Note that without the external L4 cache the System z socket size is 24 MB.

Weighting Workloads

Most workloads depend on some combination of maximum throughput and thread capacity to meet performance goals. Even if workloads can run in parallel most of the time, they usually have some element of improved performance with more cache per thread and have some serialized sections around locks. It's the balance of those needs that causes the relative capacity of System z and other machines to have a wide variation.

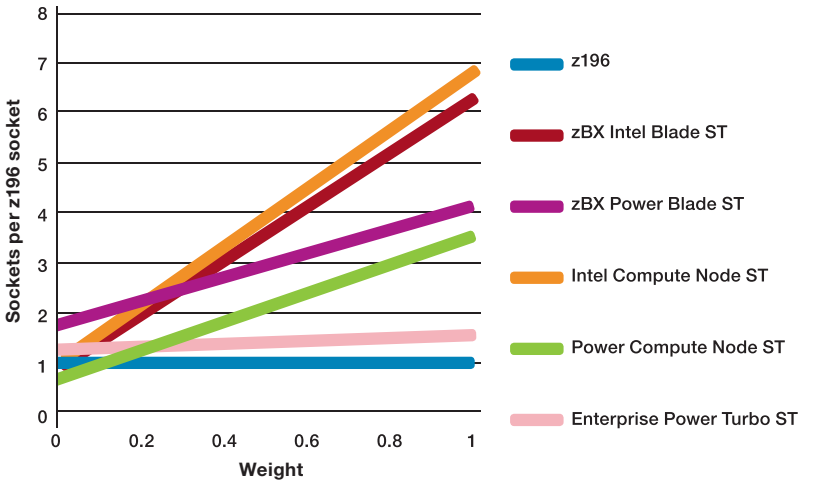
Examples of workloads with high weight are mixed workloads with fine grain (either many applications stacked in an image or many small virtual machines), highly serialized applications, or applications with significant thread interaction. Low-weight workloads include highly scaled analytics, highly scaled ERP application servers, applications with low-thread interaction or data sharing, and some Web server and other infrastructure workloads.

For both high- and low-weight workloads, usage patterns, service levels and utilization design points will increase or reduce these ratios significantly.

Accordingly, the relative capacity varies depending on the weight of particular workloads. Therefore, to

Figure 2

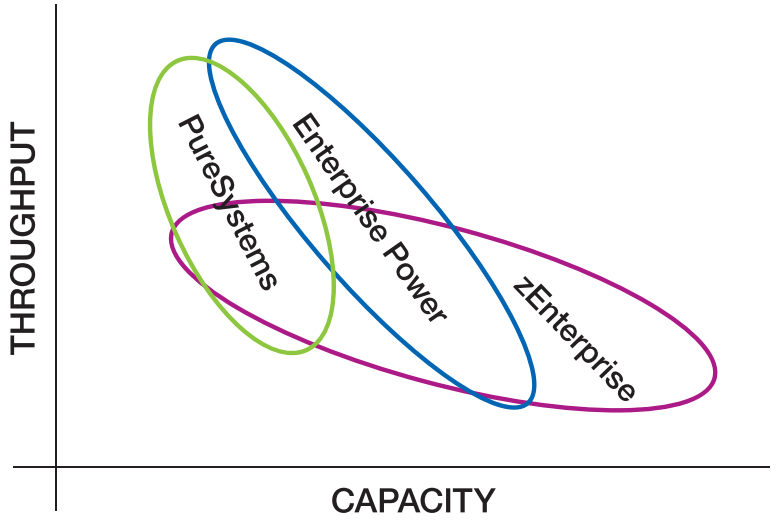
Single Threaded Socket Ratio



System z has the advantage for many workloads, but not for those with very low weight.

Figure 3

Platform Comparison



Before conducting extensive benchmarking, what's needed is AN UNDERSTANDING OF RELATIVE MACHINE CAPACITY using commonly available design parameters.

obtain a more accurate and useful comparison of platforms, you must consider the weight of the workload (see Figure 2, page 46).

If the workload is unable to exploit multithreading, the best capacity for machines comes from single threaded mode. With the exception of Power Systems Enterprise turbo max cache machines, the others show significantly higher raw core ratios as thread capacity gains in weight for max throughput. This means that except for very low-weight workloads, System z servers hold an advantage.

Weighing the Platforms

Workloads requiring sustained throughput without being gated by thread capacity through data sharing, resource sharing or a lack of parallelism in the code create a significant price and performance disadvantage for the System z socket. These low-weight workloads are the kind that leverage multithreading, which further compounds the disadvantage. If the scale required from each node is large enough, the advantage will go to Enterprise and PureSystems solutions.

However, low-weight loads can often be partitioned onto relatively small nodes. At reasonable scale, they can be implemented well on the Intel or Power blades of a zEnterprise BladeCenter* Extension (zBX). Because of this, the zEnterprise platform can be a robust solution for a variety of workload types. Examples are workloads that require the integration of low-weight analytic or application-serving components with high-weight components such as existing z/OS* workload or other work that's consolidated to create a high-weight load running in a virtualized Linux* on System z environment. To illustrate this, Figure 3 (page 46) maps out the three IBM machines on a throughput versus capacity chart.

Joe Temple is an IBM Distinguished Engineer, Master Inventor and Senior Certified IT professional with more than 35 years at IBM.

The Wonders of z/OS Spool Migration

JES2 helps expedite the relocation of data volumes

By Tom Wasik, Alexei Pytel and Kevin Kathmann

Editor's note: *This overview of Job Entry Subsystem 2 (JES2) spool migration, included in z/OS release 13, is the first article in a four-part series. Successive articles cover more technical details and can be found at www.ibmsystemsmag.com.*

IBM JES2 team members Steve Simonson, a senior software engineer, and Bruce Talbott, an advisory software engineer, also contributed to this article.

Does your spool configuration contain volumes residing on an antiquated DASD? Would you like to merge those volumes and place them on a DASD using the latest and greatest technology? Spool migration allows an installation to consolidate such volumes in a nondisruptive and expeditious manner.

Similar efforts, which previously might have taken weeks, can now be accomplished in a few hours. During and after migration, applications can seamlessly read from and write to migrating volumes without interruption. Applications need not be quiesced during migration. Job Entry Subsystem 2 (JES2) automatically handles and maps existing spool addresses (MTTR/MQTRs) during and after the migration. Once completed, all migrated data exists on the target volume, and the source volume data sets can be removed.

Start With the Basics

The following example covers premigration planning, migration phases, post migration, and mapped volume status. Spool migration is a simple way to quickly move data onto new hardware with new features. Many scenarios exist for using spool migration. In this one, we'll walk through the simple case of migrating an existing volume, SPOOL2, into another, SPOOL5.

First, identify the DASD volumes you wish to migrate. These are potential source volumes for the spool-migration command. Next, identify the DASD volumes that will contain the migrated data, or the potential target volumes. We want to migrate data on SPOOL2 to the data set on SPOOL5. Once participating volumes have been identified, you must verify space requirements. Use the JES2 command $D SPL with the MIGDATA parameter:

```
$D SPL(SPOOL2),MIGDATA
```

MIGDATA displays two pieces of information. The first, SPACE_USED, indicates the highest used track in the SPOOL2 data set. This is the high-water mark of spool usage on SPOOL2, and it defines the size of the data within

the data set that will be considered for migration. To determine the total free space required on the target volume, add four tracks to the SPACE_USED value to account for JES2 structures that are temporarily stored along with the migrating data. Spool migration looks for in-use tracks in the source volume data set to migrate, from the beginning of the data set to the track identified by SPACE_USED.

Now determine the available space on target volume SPOOL5 by issuing the command:

```
$D SPL(SPOOL5),MIGDATA
```

This time, look at the second piece of MIGDATA, LARGEST_FREE, which reports the size in tracks of the largest contiguous free space on the volume. The LARGEST_FREE for SPOOL5 must be greater than or equal to SPACE_USED for SPOOL2 plus four tracks. If the criteria is met, then SPOOL5 can become a TARGET VOLUME for SPOOL2 migrated data. Rerun these MIGDATA commands immediately before starting the migration to ensure the space requirements haven't changed. Figure 1 (page 50) illustrates SPACE_USED and LARGEST_FREE as part of the overall migration process.

Next, consider improving the performance of your spool migration by reducing the amount of data to migrate and the competition for the volumes involved. One way is to place the source volume in DRAINING state by using the JES2 command $P SPL. Doing so will prevent jobs from making new allocations to the volume, reducing contention for the volume and the data to be migrated.

You can also set the volume as RESERVED. A reserved volume is similar to one in DRAINING state in that work can be selected on the volume but new space cannot be acquired. Reserving the source volume reduces the competition of jobs accessing it. Reserving the target volume keeps processing other than the spool migration from using the free space found earlier with MIGDATA. To reserve SPOOL2, use the command:

```
$T SPL(SPOOL2),RESERVED
```

And for SPOOL5, use:

```
$T SPL(SPOOL5),RESERVED
```

Depending on the size of your spool data set, its migration will take roughly the same amount of time as writing the same-sized data set on your system. Informal IBM laboratory testing typically migrated a million-track data set in a few hours, however, your results may vary.

Crank 'Er Up!

With preparations made and space requirements confirmed, it's time to migrate. Use this command to start:

```
$M SPL(SPOOL2),TARGET=SPOOL5
```

The console will indicate migration has started and the first phase, INITIALIZING, has begun:

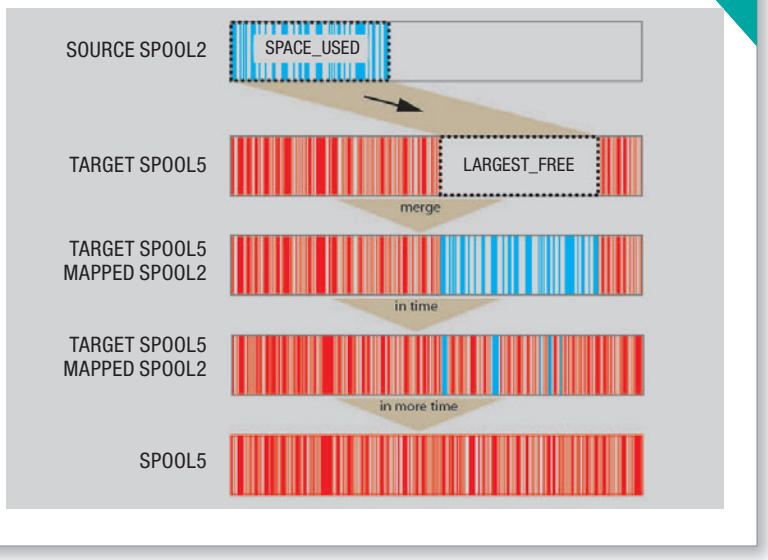
```
$HASP808 Migration of
SOURCE=SPOOL2 volume to
TARGET=SPOOL5 volume
RC=9 -- Migration INITIAL-
IZING phase started.
```

Spool migration involves six key phases:

- PENDING—Migration cannot start right away.
- INITIALIZING—General configuration work is being done.
- SETUP—This puts all multi-access spool (MAS) members on the same page.
- COPY—Allocated tracks from the source volume's data set are copied to the target volume. This takes the most time.
- CATCHUP—Tracks that applications changed on the source volume during the COPY phase are recopied to the target volume. Time spent in this phase will depend on the amount of nonmigration activity that occurs on the source volume during copying.

Figure 1

Migrating Data Using Spool Migration



- CLEANUP—General cleanup is conducted at the end of the migration.

Normally, console messages will only indicate the beginning and end of the migration, but the beginning and end of each phase will be written to SYSLOG. These messages can be routed to the console by running:

```
$T DEBUG,VERBOSE=YES
```

The $D SPL command can also provide status and progress information. During active migration, the source volume has a STATUS of MIGRATING. Using the PHASE parameter will display the current phase active in the migration. A better progress indicator, however, is the MPERCENT parameter, which displays the approximate percentage completed. It's particularly useful during the COPY phase.

Are We There Yet?

At the conclusion of the migration, the console will state:

```
$HASP808 Migration of
SOURCE=SPOOL2 volume to
TARGET=SPOOL5 volume
RC=33 -- Migration pro-
cessing completed. Migra-
tion was successful.
```

So the migration was successful, but is it really done? Well, the data that once resided in a SPOOL2 data set now exists in a SPOOL5 data set. So you can delete the data set on the source volume, and as far as JES2 is concerned, you can power off that DASD.

In our example, jobs still think they have space allocations on SPOOL2. The command $D SPL:

```
$DSPL(spool2,spool5),stat
us,percent
$HASP893 VOLUME(SPOOL2) S
TATUS=MAPPED,AWAITING(JOB
S),PERCENT=97
$HASP893 VOLUME(SPOOL5)
STATUS=ACTIVE,PERCENT=49
$HASP646 51.6330 PERCENT
SPOOL UTILIZATION
```

STATUS = MAPPED means a logical control block exists representing SPOOL2 (a DAS). The migration moved SPOOL2 data—track by track—without understanding its usage

or pointers within that data (MTTR/MQTR), etc. Jobs and applications still reference SPOOL2 data, and JES2 automatically remaps their old SPOOL2 MTTR/MQTR pointers to the new location in the SPOOL5 data set using the SPOOL2 DAS mapping information.

So when does JES2 no longer require the MAPPED SPOOL2 DAS? When the last job that thinks it has space allocations on SPOOL2 goes away, the logical representation of SPOOL2 will also go away. The $DJQ,SPOOL=VOL=SPOOL2 command shows jobs that think they have space allocations on SPOOL2. Keep in mind the target volume SPOOL5 cannot itself be migrated until all volumes mapped to it are gone.

Digging Deeper

We've only touched on the basics of spool migration. More information can be found online (www.ibm.com/systems/z/os/zos/jes2_spoolmigration.html). Be sure to check out the FAQ link, which covers many basic questions. A link to the migrating spool volumes overview in the JES2 commands section is also a must-read.

The second installment of this series at ibmsytemsmag.com/mainframe/adminstrator/migration/spool_part2, explores how the migration is coordinated among all MAS members, in particular, the COPY and CATCHUP phases.

On the Web For more on this topic, see Part 2 in this series: "How JES2 Manages a Smoother Spool Migration," at www.ibmsystemsmag.com/mainframe/administrator/migration/spool_migration_part2.

Tom Wasik is the team leader in JES2 design and development at IBM Rochester. He's spent 28 years working on JES2 at IBM.

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Kevin Kathmann is an advisory software engineer working in JES2 development since 2008. He's worked with IBM for more than 20 years.

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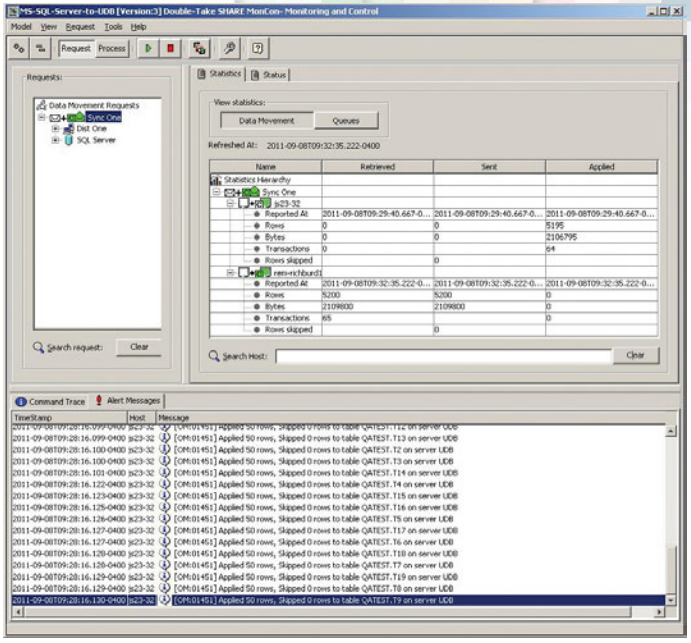

Double-Take Share 5.0

Vision Solutions Inc.

Vision Solutions Inc. releases Double-Take Share 5.0 (formerly Replicate1), its solution for on-demand data sharing between leading database types in real time. Based on open standards and Java* technology, Double-Take Share's table-based GUI comes with more than 60 prebuilt transformations and requires no programming, reducing administrative time. Key features include:

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→ Expanded support for data types and data properties with support for expressions (i.e., a combination of identifiers, values and operators) in Unicode target columns, as well as by extension of the supported length of IBM i characters to 32K, the maximum length now supported by DB2*

→ Enhanced flat-file support that allows multiple delimiters of up to 10 characters.

OS SUPPORT: z/OS* 1.11-1.8, IBM i 7.1-5.4, AIX* 7.1-5.3, HP-UX, Solaris, Linux*, Windows*
PRICE: Variable
URL: www.visionsolutions.com

Vanguard Security and Compliance Solutions

Vanguard Integrity Professionals

The newest release of Vanguard Security and Compliance Solutions includes support for IBM z/OS* 1.13, improved operational security management, expanded reporting capabilities and optimized performance enhancements. The new release is designed to provide more granular control and detailed reporting capabilities, enabling customers to achieve better security and respond to evolving regulatory requirements. Enhanced capabilities include:

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→ Vanguard Administrator provides a new user certificate report, which captures and reports on digital certificate information.

OS SUPPORT: z/OS 1.13
PRICE: Variable
URL: www.go2vanguard.com

MegaCryption DB

Advanced Software Products Group

MegaCryption DB, provides comprehensive encryption of sensitive and private data for DB2*, customizable at the table level. It can be used as a standalone product, encrypting data at the DB2 table level, or in conjunction with MegaCryption z/OS* to protect data across the enterprise—including z/OS, UNIX*, Linux*, Windows* and DB2. Features include:

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→ Transparent transcription to applications/users requiring no changes to applications

→ An interactive system productivity facility front end allowing for simple administration

→ Integrated cryptographic services facility not required

OS SUPPORT: z/OS 1.10, 1.12, 1.13

PRICE: Starting at $7,000.

URL: www.aspg.com

ASG-TMON for DB2

ASG Software

The redesigned release of the performance management offering, ASG-TMON for DB2, provides support for the latest version of IBM DB2* 10. This release, version 5, is designed to leverage the latest monitoring interfaces provided by IBM, allowing IT personnel to quickly and accurately target the root cause of any DB2 performance issue. The new release:

→ Facilitates the ever-increasing need for performance monitoring of DB2 for z/OS* for businesses due to the proliferation of access to applications via devices such as laptops, smartphones and tablets

→ Enables organizations to track and evaluate the performance of all DB2 subsystems through a single view

→ Offers the ability to improve overall DB2 availability by proactively managing applications and critical resource

OS SUPPORT: z/OS 1.10 and above, DB2 10

PRICE: Tiered pricing starting around $20,000

URL: www.asg.com

Reflection Suite for X

Attachmate

Attachmate Reflection Suite for X 2011 R2 allows Windows* users to securely access text- and graphics-based applications on UNIX* and Linux* systems, as well as legacy applications on IBM System z* mainframes and IBM i midrange servers. Inclusion of the latest X server technologies, next-generation terminal emulation software and a secure file-transfer client in a single deployment package enables enterprises to meet all of their host access needs during the Windows 7 migration. The latest release provides access to key applications from Windows, Linux, and Mac desktops, and includes groundbreaking technologies that enable optimal performance of X client applications over remote connections and application sharing with distributed workers who must collaborate on projects.

As part of the R2 release, Reflection Suite for X has achieved VMware Ready* status. New capabilities include:

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→ Terminal emulation to securely connect to an IBM mainframe (3270), IBM i (5250) or UNIX/Linux system

OS SUPPORT: Windows, Linux, Mac, IBM i, UNIX, z/OS*
PRICE: Variable
URL: www.attachmate.com

Orchestrated IT

Serena Software

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PRICE: Starting at $12,500 for 250 users
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John Eells examines the exterior of the U-352 submarine, which was sunk off the coast of North Carolina during World War II.

Taking the Plunge

Wreck diving brings IBMer face to face with lost history

By Mike Westholder

About 130 feet beneath the waves rests U-853, the last German U-boat sunk as World War II ended. It's off the East Coast of the U.S. about seven miles from Block Island, R.I., and not far from another wreck, the SS Black Point, a commercial collier the U-853 torpedoed a day earlier, May 5, 1945, at the Battle of Judith Point.

John Eells has seen both wrecks. A certified technical diver, he's a member of IBM's z/OS* technical marketing and strategy team in Poughkeepsie, N.Y. In his spare time, he wreck dives mostly in the North Atlantic along the coasts of New York, Connecticut, Rhode Island and New Jersey.

First certified to scuba dive in 1972 at the age of 15, Eells took a long hiatus from diving until about eight years ago. "Then my youngest son—he was about 15 at the time—came down from the attic one day with my old gear and said, 'What's all this stuff?' " The teen was eager to learn and earned his recreational diving certification soon after.

The father and son's first wreck dive was the Raleigh, a steamer that sank in 1911 in Lake Erie near Port Colborne, Ontario. It remains the oldest wreck Eells has explored—and the shallowest, at about 25-30 feet under water.

PHOTOGRAPHY BY DAN WRIGHT

"I just got hooked."

—John Eells, IBM mainframer and certified technical diver

"I just got hooked," he recalls. "People had walked the deck of this ship. To see and touch it firsthand was remarkable." To dive much deeper wrecks, Eells and his son underwent further training and earned a variety of technical diving certifications.

U-boats, however, hold a particular interest for Eells. He wants to dive the U-869 wreck, which was sunk off the coast of New Jersey and rests at a depth of about 240 feet. Previously believed to have been sunk near Gibraltar, the wreck of the U-869 was initially nicknamed U-Who because its identity was in question. Then in 1997, wreck diver John Chatterton discovered an artifact that verified its true identity. The events were documented in several books, including the "The Last Dive" in 2000, and "Shadow Divers" in 2004.

"It's definitely on my bucket list," Eells notes. It would be among the deepest wrecks he's attempted. "My certification limit is 330 feet," he says.

To go that deep, divers often use applications to help calculate decompression time, how much gas they will need, and when to change the mix of oxygen, nitrogen and helium they breathe. At certain depths, the percentage of oxygen in air becomes toxic, Eells explains, which is one reason divers must adjust the gas mixes during a dive. Also, they often need to make decompression stops as they ascend to avoid decompression sickness, which can be fatal.

In addition to specialized equipment and careful preparation before a dive, you must plan for contingencies, Eells says. "Also, in technical diving, you have to get comfortable with the idea that many important things are not truly absolute, and that you must often rely on approximations. It takes a certain mindset."

So why do it?

"Just curiosity," Eells says. "It's like when people ask, 'Why climb Mount Everest?' It was there." Z

Mike Westholder is managing editor of *IBM Systems Magazine, Mainframe Edition*.

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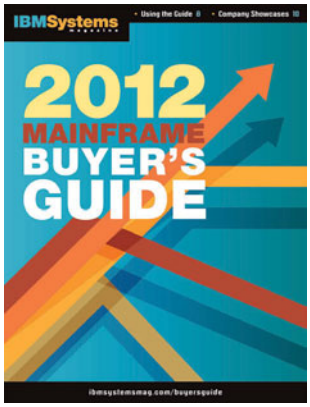

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