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One Hundred Years Ago

A small number of hearty folks will celebrate their 100th birthday this year. In fact, 1911 was the starting year for quite a few other events worthy of mention:

- Chevrolet entered the automobile market
- Delhi replaced Calcutta as the capital of India
- Construction began on Boston’s Fenway Park
- London hosted the first public elevator
- First airplane crossing of the U.S. (took 84 days)
- The inaugural Indianapolis 500 auto race
- Debut of Crisco shortening.

However, another milestone of particular interest to me and our readers is an event that occurred on June 16, 1911. The company we now know as IBM was incorporated in the state of New York as the Computing-Tabulating-Recording Company. Thomas J. Watson, Sr. joined C-T-R in 1914, and in 1924 the company adopted the name International Business Machine Corporation.

Below is the progression of the IBM logo from 1911 to today:

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“It’s Over, Jim”

Just like Dr. McCoy and Captain Kirk in the “Star Trek” episodes where all hope seemed lost, from the doom and gloom of my last commentary, we move on to discuss the final acquisition of Novell by Attachmate. Yes, the heavy door of final approval has slammed shut on the formal approval of the deal by both companies, and the merger is complete. In a mass email to customers, the new management promised to continue to provide support for the SLES operating system and tools, and to maintain the support services familiar to Novell customers. So far, no major worries, right?

To some extent, no. The usual faces and phone numbers still answer, and customers are still able to submit problem reports and get answers. The part that concerns me is that Attachmate is doing a bit of housecleaning and redirection of resources; to wit, closing down less profitable parts of the operation, and trimming investments in others. A few days after the closure of the final deal, pink slips arrived on the desks of the Mono development team at Novell. If you haven’t followed Mono, it’s essentially an independent implementation of the Microsoft-promoted alternative to Java—.NET, an abstract virtual machine implementation to address the problem of writing portable software. Like Java, .NET code compiles to a pseudo-machine instruction set and features lots of nifty tools and development capabilities. However, the Linux community has had very slow uptake of the technology because of the link to the Microsoft “Evil Empire”; Microsoft has taken a path emphasizing .NET as a way to move to Windows, not away from or in parallel with Windows. The Mono team has developed and maintained an interpreter for the .NET pseudo-machine on multiple platforms (and with a little help from the ever-awe-inspiring Neale Ferguson), including System z. Code developed with .NET tools can be deployed on a Mono install on arbitrary platforms with little care to how it’s designed. Novell has been the principle backer of Mono, and its previous close relationship with Microsoft has somewhat protected the project from the rough and tumble of intellectual property issues.

The trouble now is what happens to Mono without the support of the majority of the development team? Should customers continue to pay the extra fee for Mono support that Novell generated when they split the Mono support away from the SLES support subscription, or will they defect to other providers?

Also related to the Novell acquisition, a court has ruled that Microsoft’s bulk patent purchases of Novell intellectual property pre-acquisition will have to be returned to Attachmate in exchange for cash and a perpetual license to use the technology. Time will tell how this strange matchup of “frenemies” will play out.

In our own labs, we’ve been working with the latest RHEL 5 release (5.6) and are finding it pretty stable. Some nice updates to Python support packages (a reasonably modern “twisted” package was a nice bonus) and some new reliability and stability improvements are included. It’s worth checking out if you aren’t ready to go all the way to RHEL 6 on all your non-z platforms. We’ve also started working on the SLES 11 SP2 beta packages—some significant bug fixes to YaST and a lot of updated work in device detection and SCSI FCP device management hit us pretty hard. We’ll have a more detailed report at GA for SP2.

In general news, there are a couple of interesting things you might find useful. First, a group of VM and Linux community members are attempting to revive the annual VM Workshop. In the past, the workshop was held at universities and provided a great, low-cost (under $500) way to get a VM education in a not-so-flashy setting—dorm rooms, college campuses, and cheap eats. It lapsed with IBM’s changes in license terms for VM, which made it much harder to keep VM systems at universities, but this round is sponsored by a set of volunteers. VM Workshop was the best value for the dollar in the past, and I think the new one promises to be just as good. Check out www.vmworkshop.org.

Second, the Website http://wiki.novell.com/index.php/Kernel_versions has come in handy for tracking kernel releases at various points in the Novell product line. It lists the kernel releases for each version of SLES 9, 10 and 11, including service pack releases. It’s helpful for tracking down what service and patches are available; those of you who do systems auditing will find it useful for determining if systems have important patches applied.

Until next time, best wishes for a great summer!

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End-to-end application management and visibility are toward the top of nearly every CIO’s list. Why is this such a pressing problem, and why has IT been unable to solve it?

One major challenge is achieving end-to-end visibility of an application that provides a single point of control and a unified view of the application, regardless of the tools that IT staff employ to check or resolve application performance. The need—and the potential—for complete application visibility is even more keenly felt with the introduction of zEnterprise-class computing, which provides firmware-level integration across the IBM Systems p, x (x86), and z platforms through the IBM zEnterprise Unified Resource Manager (zManager).

zManager makes significant progress in addressing IT pain points that include the need for:

- Application visibility across platforms in IT infrastructures that are highly heterogeneous
- A unified view of an application, regardless of who is tuning or troubleshooting it
- Effective, cross-team communications during times of application troubleshooting and problem resolution
- Performance optimization in the context of an entire, end-to-end transaction or process
- Meaningful production testing and feedback on the application for application development
- The ability to forecast capacity planning and predict when capacity limits will impact service delivery
- Monitoring system components and investments back to the business
- Tracking cost and Return on Investment (ROI).

Unfortunately, zManager alone can’t fulfill the quest for end-to-end application visibility in highly complex application environments. Instead, there’s a need for higher-level systems management software that can take advantage of the integration and Quality of Service (QoS) improvements that zManager delivers, leveraging these advantages into the higher levels of application abstraction needed to effectively manage transactions and applications end to end.

**Evolution of the Visibility Problem**

Over the past decade, companies have both virtualized and maintained physical computing assets in various architectures. Application development advances have enabled sites to acquire and develop applications that readily
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cross platform, network, and software boundaries on the way to delivering value to the business. These advances have made it easier for organizations to develop, modernize, and deploy applications, but they’ve also created a new set of business, operational, and cost challenges in end-to-end management of heterogeneous applications.

“Application visibility isn’t what it used to be,” says John McKenny, vice president of Worldwide Marketing at BMC Software. “Thirty years ago, it was easy to manage both visibility and application response time. All you needed to do was ask a CICS or IMS programmer to generate statistics for transactions, and the 3270 terminal gave you a direct window into what transaction response time was like from the standpoint of the end-user experience. There just weren’t a lot of ‘moving parts.’ Today, you’d be hard pressed to find IT folks who could tell you what the end-to-end flow of an application is. Once a customer clicks on an item in a Web browser, you can’t be sure what happens next. The transaction goes to a Web server and then might be routed to Oracle, middleware, DB2, IMS, or CICS. With the addition of many application components such as Web services, it’s usually even more complex than that.”

McKenny says applications are complex because there are many applications in a single organization and just as many different application architectures.

“Traditional tools for solving application problems are more silo-oriented, yet the need exists to consolidate information everywhere, whether it’s on the network, the front-end, or on the back-end of an application’s workflow,” he says. “An example is in insurance, where an application that supports policies has a significantly different architecture than one that processes claims. This means the tools and approaches to problem-solving will be different.”

Managing Applications in a Complex Environment

zManager is an exciting step forward in managing for complexity because it provides firmware-level integration and expanded compiler instruction sets that further integrate Systems z, p, and x resources in the “footprint” of a zEnterprise box. This provides a single point of management for cross-platform systems in IBM’s product lines and also a unified view of how these resources are performing.

zManager answers sites’ concerns about the zEnterprise world and the other IBM physical and virtual assets that revolve around it, but it still leaves unanswered the question of providing a unified, holistic view of the entire IT infrastructure, which includes not only zEnterprise but also many other heterogeneous open and distributed systems.

“zManager solves many of the over-arching quality of service and resource management issues that are centered around Systems z, p and Linux on System z integration,” says Mark Combs, distinguished senior vice president of Mainframe Business for CA Technologies. “It eliminates the need for IT to have to hook up its own network structure to accomplish the same thing because now there’s a secure and redundant backplane that’s highly dependable and no longer fragile. That’s powerful, because it simplifies disaster recovery and ensures security on data paths between these resources, a necessity for compliance with privacy and encryption laws. However, this is only part of the systems spectrum that complex applications have to traverse. In addition to interacting with DB2, CICS and Linux on System z, enterprise applications also have to work with Oracle databases, flat files, and different application servers on distributed systems. This is where systems management software with the ability to span both zEnterprise and other distributed systems delivers great benefit because it can manage across all environments.”

Systems Management Software Challenges and Approaches

The challenge, then, for systems management software has been to provide unified, end-to-end application visibility for enterprises with a diversity of application architectures that can’t be addressed with a single, generic solution.

“We recognize and embrace this complexity,” says BMC Software’s McKenny. “For many years, solutions providers tried to come up with ‘the holy grail’ end-to-end systems management solution that worked for everyone. The reality is, it doesn’t exist, because different sites have different application architectures and approaches. We have a full set of solutions that we draw from to assemble a ‘bundle’ of products that work for a particular customer’s application environment. For instance, a customer might have a front-end application that’s Java-oriented and then use middleware. On the back-end, the applications might access mainframe DB2 via CICS on the front-end. We can assemble a collection of products that provides full visibility for this environment. It sounds like a lot of pieces, but in the end, they all integrate and there’s both a top-level and drill-down capability for applications.”

CA Technologies’ Combs concurs. “We introduced a new mainframe offering for complex computing environments a year and a half ago,” he says. “The mainframe is a very target-rich environment with a diversity of back-end systems that applications are built on. These include different databases, different transaction monitors, and even variations of CICS that interact with Web-facing applications.”

Systems management software must be able to exploit new zManager capabilities while simultaneously addressing all the different IT infrastructures.

“Managing business service policies across domains from a single point of control will be important on zEnterprise,” says IBM’s Randy Scott, product manager for Tivoli Composite Application Manager Transactions.

Taking Systems Management to IT

In tackling end-to-end application visibility, systems management software providers understand that different IT organizations require visibility for different reasons. Some want visibility into application payloads, while others are focused on the customer experience. Still others are interested in detailed tracking of application ROI.

“The dialogue starts with the business services that the site wants to monitor,” says McKenny. “Common goals are to improve performance and resource consumption with
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**CICS Compatibility**

**VS/Cobol Interpreter**
Allows programs written and compiled with OS/VS COBOL to execute in CICS Transaction Server 3.1 and up. No program changes or recompiles are required.

**Macro Level Interpreter**
Allows running macro-level code in CICS TS environments without any coding changes.

**Debugging**

**Track**
CICS interactive debugger for COBOL, ALC, and PL1. Stop at any line, display/update fields, intercept abends, etc.

**Xray**
Interactive debugging for batch programs. Debug your batch program from a CICS terminal.

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easy problem-solving capabilities. From here, the discussion gets into application architecture and putting together a solution to address these priorities.”

Here are several examples of how zManager can be further exploited with higher-level systems management software for gains in application visibility:

**Configuration and resource allocation problems:**
Application configuration or resource allocation problems may not appear at the level of resource monitoring, but an end-to-end systems management software framework looks holistically at resources and applications and how they interact. “It's able to recognize, diagnose, and give visibility to 'hidden' problems,” says IBM's Scott. “These capabilities facilitate troubleshooting and performance tuning, save IT staff time, and improve application problem detection and resolution times.”

**Problem resolution:**
Poor end-to-end application visibility and the lack of a single source of “truth” about how an application is working, delay problem resolution, directly impacting the business. “A good example is where a company is running an online shopping cart and transactions are taking too long to complete,” says Scott. “Customers are abandoning the shopping cart. The applications group goes off to look at the application, while network specialists look at the network and the database administrator looks at the database. Everyone says things are looking good in their respective areas, so the finger-pointing begins. At this point, everyone is brought into a 'war room' until the problem can be solved. Meanwhile, customer service and fulfillment are impacted. This is a difficult and painful situation for everyone and it consumes some of IT's most expensive man hours, since these Subject Matter Experts (SMEs) are among the most highly paid IT personnel.”

The problem begins when everyone retreats into using their own individual toolsets, which yield their own views of the application and what might be wrong at the resource level. When this happens, the problem resolution team lacks a unified, end-to-end view of the application that includes views of both resources and application processes—and that can provide them with a common ground for discussion—and facilitate problem resolution.

“You find yourself in a conference room nightmare when this occurs, with everyone sticking with the results from his or her own individual toolset,” says Combs. “However, in the new systems management paradigm, you have a single tool that’s feeding data into customized dashboards, whether they’re being used by DBAs, network personnel, or application specialists. With the same set of data and tools, there’s no longer anything to argue about.”

**Holistic views of application performance across IT infrastructure:**
An end-to-end view of application performance visibility in production is especially useful in virtual environments because there’s a tendency to evaluate each virtual resource on its own performance, or in the context of its particular environment. With this approach, the effect of composite resource demand across all servers can be overlooked, and the fact that most existing toolsets are unable to capture a composite, unified view of performance doesn't ease the problem. The strength of systems management software that runs in concert with zManager is that sites can see historical production trend information on all server demands, whether they’re hosted in the distributed environment, Linux on System Z, or zBX. You can see the times of day or the month when servers collectively are under heavy loads. This aids capacity planning for virtual rollouts of servers that are provisioned to handle periods of peak demand.

**Performance optimization:**
A performance optimization problem that sites commonly face occurs when they create many virtual machines without the virtue of historical trending data for the new environment. Initially, they might use a 12GB RAM host server for four independent, virtual servers, with each virtual server set to use 4GB of RAM. In normal operation, each virtual machine is consuming only 1 or 2GB, but suddenly performance demands increase, and all four virtual servers each require 4GB of memory at once, over-taxing the host. Systems management software can see across all these virtual systems in total and automatically alert staff to potential performance issues before they become performance problems.

**Using Systems Management Software With zManager**

zManager delivers new levels of application integration and visibility across platforms, but there's still some confusion about where the “line of demarcation” is between it and a separate systems management software.

“Sites are concerned with being able to manage all their IT assets, whether they’re within the envelope of the zEnterprise 'box' that zManager addresses, or out in the distributed systems world,” says McKenny. “This is where systems management software comes in, because it’s able to deliver the total, end-to-end picture of an IT environment and the applications that run within it in a way that's entirely hardware-agnostic. Systems management software is also capable of abstracting systems management to higher levels than the network connections, operational controls, and energy environmentals that are addressed by zManager.”

End-to-end application views are further leveraged because new systems management software releases built for zEnterprise and integration with zManager also provide unified toolsets capable of addressing the needs of a heterogeneous IT staff, whether it’s the help desk and level-one or two troubleshooting personnel; the application, networking or database specialists; or an IT or end-business manager.

“You have the opportunity to optimize operations staffing,” says Scott. “Toolset ‘dashboards’ all use a uniform GUI [Graphical User Interface] technology that employs standard navigational rules and screen functions. Information viewed through these dashboards is and can be customized to the needs of the persons viewing the transaction, but all the information comes from a uniform application context. This eliminates staff communication
roadblocks and paves the way to faster application mean
time to repair.”

**Conclusion**

Today’s IT environments feature heterogeneous
technology infrastructures and heterogeneous staff who
develop and maintain these systems from a variety of
different system disciplines. More than ever, the ability to
see across an application from start to finish, regardless of
the platforms and system components that the application
uses, is requisite for ensuring both the health and the
success of IT assets and their ability to deliver superior value
to the business.

Enterprise CIOs understand this necessity—but they also
recognize that disparate toolsets and views of applications
make it virtually impossible to achieve a unified view of an
application, or to manage business service policies across
domains from a single point of control. This dilemma results
in lost productivity and higher IT expenses. It can potentially
dilute the value of IT investments to the end business.

With the firmware-level integration between Systems p, x
and z platforms now available with zManager, further
management of this hybrid environment—which systems
management software can supply—will be critical for
success. This same software can now deliver a unified view
of an application from start to finish. This helps IT staff
better coordinate with each other in terms of application
visibility, analysis, planning, and problem resolution.

“We’re focusing on zEnterprise with its ability to provide
more specialty engines that can run with fewer MIPS, which
customers find very exciting,” says McKenny. “We’re also
pleased with the greater zEnterprise integration provided by
zManager—but there’s still a lot of work beyond this in the
areas of network connection, database, and patch
management. These are the areas we’re continuing to develop,
and where we provide end-to-end application solutions.”

Scott adds: “End-to-end application visibility manages
application risks and systematically reduces the cost of both
deploying and maintaining applications. Most important,
the end-to-end application visibility made possible by new
releases of systems management software that take full
advantage of zEnterprise’s highly integrated, cross-platform
capabilities, facilitated by zManager, improves IT’s and end
business managers’ resources for monitoring IT investments
and ensuring maximum optimization of IT value for the
business.”

End-to-end application management and visibility
remain a pressing problem, but solutions are emerging that
could help IT solve it.

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Having helped major enterprises across the world for more than 40 years, CICS continues to innovate in the field of transaction processing, delivering new capabilities that address users’ needs. CICS Transaction Server for z/OS V4.2, announced April 5, 2011, with delivery slated for June, will help users compete in the marketplace, comply with standards and regulations, and control their business.

This new release addresses more than 50 customer requirements and will help:

• Architects looking to build systems to meet present and future line of business needs
• CIOs and IT managers looking to reduce costs and improve service levels
• Systems and applications programmers wanting to improve their own productivity and extend their skills.

CICS TS V4.2 provides value in the following five key technical areas:

• Event processing
• Java
• Connectivity
• Management
• Scalability.

Events

In June 2009, CICS TS V4.1 introduced the ability to generate application events in a non-invasive manner by defining their emission points using an event binding editor built into CICS Explorer and Rational Developer for System z. CICS TS V4.2 adds the ability to emit events to notify certain changes in the system as they happen, such as when VSAM files or DB2 connections fail unexpectedly or when transactions terminate abnormally. These new system events will help systems programmers track unusual conditions in CICS systems, without incurring the polling overhead inherent in the Real-Time Analysis (RTA) mechanism built into CICSplex System Manager. Like the application events, no changes are required to any application; it’s all managed using the event binding editor.

When application events are used to drive business processes rather than feed business analytics systems, it becomes more important that the events accurately reflect the state of the transaction data maintained by CICS. The new assured emission mode means events can be included in a single unit of work, so that if the event emission succeeds, the application will continue; however, if event emission fails and the event isn’t emitted, then the application transaction will roll back. To be effective, these assured events need to be generated using a reliable transmission medium, such as WebSphere MQ.

Even though CICS application events can be generated non-invasively (without the need to modify underlying programs), the event specifications and data formats still depend on the applications. If those applications change (e.g., if VSAM file record formats must be modified to reflect business changes), it’s then necessary to change the downstream consumers of the events. New search functions built into CICS Explorer make it easier to manage events when the applications that emit them change and evolve.

Java

Java is increasingly the language of choice for new applications, and CICS has kept pace with this trend. CICS TS V4.1 introduced the multi-threaded JVM Server environment to supplement the single-threaded JVM pools, which have been available in CICS since V1. Now, in CICS TS V4.2, the JVM servers are the preferred environment for...
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Java-based workloads. JVM servers use the newest IBM 64-bit Software Development Kit (SDK) for z/OS (Version 6 Release 0 Modification 1) and dramatically increase the capacity to run workloads implemented in Java using the multi-threaded model. This makes it much easier to run large workloads exploiting Java and System z Application Assist Processor (zAAP) engines in CICS. The JVM server has also been extended to support OSGi bundles, with the associated tooling integrated in the latest updates to the CICS Explorer, delivering an industry standard Java runtime, application packaging, and deployment environment in CICS.

The OSGi standard removes the need to manage complex class paths, and, with its application isolation, multi-version support, prerequisite checking, and simplified package redeployment, significantly improves the management of Java applications in CICS.

The CICS Explorer SDK, previously used to support the development of CICS Explorer plug-ins, now also supports the development of CICS Java applications. When used in conjunction with an Eclipse Integrated Development Environment (IDE), the documentation, examples, and wizards support the development and deployment of Java applications as OSGi bundles.

Connectivity

The past few CICS releases have seen the more traditional Systems Network Architecture (SNA) and Multi-Region Operation (MRO) connectivity protocols being supplemented with Internet Protocol Inter-Connectivity (IPIC). This latest release sees that journey approach its point of origin of CICS tasks and track them as they flow between CICS regions over a TCP/IP network using an IPIC connection. This lets more customers migrate their SNA networks to TCP/IP, achieving performance enhancements inherent with that technology and enabling the use of multi-threaded mirror programs, improved security, and simplified administration.

Customers can also benefit from a new Axis2 Java-based SOAP engine, which builds on the JVM Server support previously described. When enabled, inbound and outbound Web service requests, and related XML data conversion, are eligible for execution on zAAP processors, providing savings in software processing costs.

Management

CICS management is improved in several areas in V4.2:

• A new transaction tracking capability that can identify the point of origin of CICS tasks and track them as they flow through a CICSPlex will help identify hung tasks and other complex problem determination scenarios.

• New workload management algorithms that distribute transactions more evenly across local and remote systems can improve the efficiency and simplify the creation of highly available CICSPlex configurations.

• New support for password phrases (nine to 100-character strings of mixed-case letters, numbers, and special characters, including blanks) will offer improved system protection to customers with demanding security requirements.

The IBM CICS Explorer, first shipped with CICS TS V4.1, has been continuously updated with features such as the z/OS perspective, the ability to export and import system connection details, and the separation of connection definitions from user credentials. CICS Explorer V1.1, shipping in June with CICS TS V4.2, will be further enhanced to support many of the new capabilities described here.

Scalability

CICS TS V4.2 will improve scalability by extending its multi-processor exploitation and support for 64-bit architecture. The Open Transaction Environment (OTE), created in CICS TS V1.3, enables threadsafe application workloads to better exploit multi-processor System z hardware than applications limited to a single processor by the CICS quasi-reentrant environment. Threadsafe support is enhanced in three key areas in CICS TS V4.2:

• The CICS DBCTL interface, used to access IMS data from CICS, when used with IMS 12

• The CICS mirror programs, when used with IPIC connections, can be used to receive inbound function shipping requests.

• Several other CICS Application Program Interface (API) calls will now be threadsafe, enabling them to run on open Task Control Blocks (TCBs), leading to significant performance improvements. A new CONCURRENCY REQUIRED option can eliminate even more TCB switches.

CICS TS V4.2 further extends its support of the System z 64-bit architecture by moving trace tables and temporary storage into the 64-bit domain, increasing region capacity, reducing short-on-storage conditions, and improving first failure data capture. Increasing the number of Local Shared Resource (LSR) pools from eight to 255 will help customers optimize the performance and manageability of VSAM data.

Summary

CICS has been the vanguard of transaction processing for more than 40 years, and CICS TS V4.2 continues that tradition by delivering the new capabilities highlighted here as well as numerous others, which will be addressed in future articles. Z

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The journey to a bright future for the mainframe and large enterprise computing community is clearly under way! This realization hit me during SHARE in Anaheim this past February in the middle of a meeting with Dayton Semerjian, head of CA Technologies Mainframe business, and members of the SHARE board of directors, including SHARE president Janet Sun. One topic being discussed was initiatives to build and enable a new generation of mainframers.

At one point, Ray Sun (deputy director of Marketing for SHARE) referred us to a SHARE survey, sponsored by IBM and produced by Unisphere Research, titled “Closing the IT Skills Gap: 2011 SHARE Survey for Guiding University & College IT Agendas” (www.share.org/LinkClick.aspx?link=69&tTabId=36). Over half of the 376 companies surveyed indicated they’re planning to hire new mainframers straight out of college or university, but they have concerns that these employees won’t be fully prepared to take on mainframe responsibilities.

Of course, it would be easy to point to all the new, graphical, browser-based and role-based solutions available to respond to these concerns. But the fact is, you still need people to have a clear grasp of how the mainframe functions as a cornerstone of modern business. That includes an awareness of how the mainframe works, how to manage it, and of the culture of scrupulous computing that has been so essential to the qualities of service that we now take for granted. But new mainframers have to do more than think about it; they have to live it.

To help address these concerns, during his SHARE keynote in February, Semerjian announced a $1 million scholarship for SHARE to award to new mainframers so they can enhance their capabilities by attending CA Technologies Mainframe Academy, an accelerated, vendor-agnostic, eight-week immersion in mainframe essentials, concluding with a certification test (learn more at www.ca.com/lpg/mainframe-academy.aspx).

So, new mainframers are being hired, and there are opportunities for them to become quickly effective with programs such as the Mainframe Academy. The only missing piece is for them to become active participants in the global mainframe culture and community; they can do this by participating in associations like SHARE, to relate and learn about experiences that bring together best practices from around the world.

That’s why Janet confirmed that these new mainframers would be given a presentation about SHARE near the end of each Mainframe Academy session and offered the SHARE student discount to attend SHARE within one year of completing their training. Taking advantage of this would be another key step toward becoming fully integrated into the mainframe community.

Amazing progress has been made since the last Anaheim SHARE in 2005! Back then, I gave a presentation on the need to develop a new generation of mainframers, and also published a white paper and article in z/Journal on the topic. Since then, the SHARE zNextGen Project was formed to support the development of a new generation of mainframers, and many other initiatives have been undertaken to encourage and enable a new generation on the mainframe.

Now, six years later, the future is bright. Of course, the greatest part of the journey still lies ahead of us. Organizations must do the hiring and training they now recognize is needed, and those new mainframers need to take personal ownership of their roles in the future of this great community and platform.

But, as I look at the people who are already stepping up to take ownership of this bright future, such as John Noel and Regina Robbins, winners of the SHARE Academic Award for Excellence announced at the SHARE General Session in Anaheim, I know that journey is now solidly under way. I can’t wait to see the brilliant future of mainframe and large enterprise computing. And that’s the kind of data I like to see about the group that forms the new generation!”

Reg Harbeck works for CA Technologies. For more than two decades, he has worked with operating systems, networks, security, and applications across mainframes, UNIX, Linux and Windows, and traveled the world, presenting to IT management and technical audiences at numerous IBM, industry analyst, and user group events.

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Most application performance problems involve searching and scrolling. Once you find what you’re looking for, you generally can process it quickly. However, with increased use of automated interfaces, frameworks, and generic coding techniques and tools, this problem seems magnified. While changing programming techniques and >
customizing code is time-consuming, it's necessary if you want to save processing time and costs over the life of an application. Besides, you typically apply custom solutions as the exception, not the rule, when building an application.

The techniques presented here can help you solve performance issues when using DB2's searching and scrolling capabilities.

DB2 Built-In Support for Search and Scroll

DB2 has some built-in support for improving searching and scrolling; some features have been around awhile, but others are relatively new:

- Scrollable cursors (DB2 Version 7)
- Multi-row fetch (V8)
- Backward index scan (V8)
- Soundex function (DB2 9)
- Index on expression (DB2 9)
- Hash access (DB2 10)
- Temporal search (DB2 10)
- Improved in-list matching (DB2 10)
- Improved pagination optimization (DB2 10).

Most performance improvements don't come from these features, but from the proper coding of predicates or by leveraging the flexibility of SQL to obtain the desired performance.

Scrollable Cursors

Scrollable cursors let you move forward and backward through a result set using relative positioning. They can be static scrolling, which places results in a declared temporary table, or dynamic scrolling, which operates against a base table. They can also be sensitive, meaning changes to data during scrolling are visible, or insensitive, meaning changes to data during scrolling aren't visible to the cursor. Scrollable cursors let you position anywhere in the result set and move backward and forward.

Multi-Row Fetch

Multi-row fetch is a fantastic performance enhancement that should be a part of any design that fetches more than a handful of rows per cursor. For random access, multi-row fetch can be a great CPU saver. In some cases, it
has reduced our CPU utilization by as much as 25 percent for random cursors fetching around 20 rows. For sequential batch cursors, multi-row fetch has saved us as much as 60 percent CPU utilization, with a similar percentage savings in elapsed time processing for large result sets. You can fetch up to 32,768 rows in a multi-row fetch operation. However, IBM recommends about 100 rows for optimum performance vs. thread storage consumption. We usually recommend a maximum of 50 rows, or if you know how many rows your cursor will return, you can specify slightly more than that or 50, whichever is lower. You can get multi-row fetch automatically for read-only remote cursors, but for traditional batch and CICS programs, you must code it yourself.

**Soundex Function**

The soundex function was introduced with DB2 9 and provides built-in name search assistance. The soundex algorithm assists with the filing and searching of information based on a name. It converts a name into a four-character code. The first character is the first letter of the name. The remaining four characters are all numeric based on the remainder of the name. Vowels are usually ignored, as are repetitive consonants, but there are exceptions.

We can use the soundex algorithm for more complete searches when names are misspelled. In addition, the soundex value can be stored in the database and an index created on that stored column, or an index can be created on the soundex function itself. This will enable index matching access for executions of the soundex function.

**Index on Expression**

Another important feature built into DB2 9 enables you to create an index key based on an expression. This feature lets you compensate for predicates built on column expressions—normally stage-two predicates that can’t use an index. This is potentially a significant performance improvement for existing predicates and future designs. In the CREATE INDEX statement, an index is actually built on the result of a function, such as the soundex function, for every row in the table. So, the first key value of the index is the soundex result. A query can then use the soundex function as it is coded in the index of the table to search for someone with a specific soundex value. Now the predicate can use an index.

**Hash Access**

Hash access can be used to optimize data access to tables for commonly issued equals predicates that access a single row in a table. The hash access supports direct access to a row for these types of retrievals without using an index. Hash access can also be used to force uniqueness within a table without an index. Hash access for a table is enabled by specifying the ORGANIZED BY HASH clause of the CREATE TABLE or ALTER TABLE STATEMENT. This clause specifies column names be used as part of the hash key, and the hash key is used to determine the physical location of rows in the table. Hash access can provide a dramatic performance improvement for simple equals predicates on such things as primary keys. Avoiding a traverse of the index tree can reduce both elapsed time and CPU time for these types of searches. Be aware, however, that the hash space can as much as double the storage requirements for a table, and doesn’t necessarily guarantee you can eliminate an index.

**Temporal Search**

In DB2 10, system-period temporal tables automate the storage of current and history data in separate tables. With this built-in temporal design, you build a current table and a history table, then tell DB2 that the two tables are related in that manner. DB2 then moves data from the current table to the history table whenever there’s a
change to data in the current table.

DB2 also automatically supports querying data based on a timestamp. You can choose how to read the temporally related tables; you can read the current table for the current data and the history table for all historical queries. If you want to read data “as of” a given time, or time range, you can query the current table and specify a system time predicate in the query. DB2 will return the data from both the current and history tables relative to the time or period you requested. It does this by rewriting the query as a UNION ALL of a query against the current table and a query against the history table. While this approach may not be a high-performance solution, it relieves the application and DBA from a lot of extra work.

**Improved In-List Matching**

One of the optimization techniques available in DB2 10 is improved matching index access for multiple in-list predicates in a single query. In previous versions, if multiple in-lists were coded in a query, only one of them would be eligible for index matching. Now DB2 can build work files using the in-lists and then use those work files in a join to the target table.

**Improved Pagination Optimization**

DB2 10 also introduces range-list index scan. Search queries, especially those that use scrolling techniques to control pagination, can contain multiple OR predicates. In previous versions of DB2, multiple index access was used to avoid a non-matching index scan or table space scan. In DB2 10, a range-list index scan can be used; it will consume fewer RID list resources than multi-index access. DB2 can use a range-list index scan when a query meets these requirements:

- Every OR predicate refers to the same table.
- Every OR predicate has at least one matching predicate.
- Every OR predicate is mapped to the same index.

**Search Query Variations**

SQL advancements provide many
Query 1:
SELECT PERSON_ID
FROM PERSON_TBL
WHERE (LASTNAME = 'SMITH' OR LASTNAME = 'JONES') AND FIRST_INIT = 'A'

Query 2:
SELECT PERSON_ID
FROM PERSON_TBL
WHERE LASTNAME = 'SMITH' AND FIRST_INIT = 'A'
UNION ALL
(SELECT 'SMITH' FROM SYSIBM.SYSDUMMY1)

WITH PRSN_SEARCH(LASTNAME) AS
(SELECT 'JONES' FROM SYSIBM.SYSDUMMY1)

Query 3:
WITH PRSN_SEARCH(LASTNAME) AS
(SELECT 'JONES' FROM SYSIBM.SYSDUMMY1)
SELECT PERSON_ID
FROM PERSON_TBL
WHERE LASTNAME = 'JONES' AND FIRST_INIT = 'A'

Figure 1: Three Variations of a Search Query

SELECT *
FROM EMP A
WHERE HIREDATE BETWEEN ? AND ?
AND EDLEVEL BETWEEN ? AND ?
AND BONUS BETWEEN ? AND ?;

Figure 2: A Generic Search Query

Query 1:
SELECT *
FROM EMP A
WHERE BONUS BETWEEN ? AND ?
AND (HIREDATE, EDLEVEL) IN
(SELECT VALID_DATE, VALID_ED_LEVEL
WHERE VALID_DATE BETWEEN ? AND ?
AND VALID_ED_LEVEL BETWEEN ? AND ?);

Query 2:
SELECT *
FROM EMP A
WHERE BONUS BETWEEN ? AND ?
AND HIREDATE IN
(SELECT VALID_DATE
WHERE VALID_DATE BETWEEN ? AND ?)
AND EDLEVEL IN
(SELECT VALID_ED_LEVEL
WHERE VALID_ED_LEVEL BETWEEN ? AND ?);

Query 3:
WITH SEARCH(HIREDATE, EDLEVEL, N) AS
(SELECT VALID_DATE, VALID_ED_LEVEL, RAND()
WHERE VALID_DATE BETWEEN ? AND ?
AND VALID_ED_LEVEL BETWEEN ? AND ?)
SELECT A.*
FROM EMP A
INNER JOIN
SEARCH B
ON A.HIREDATE = B.HIREDATE
AND A.EDLEVEL = B.EDLEVEL
WHERE BONUS BETWEEN ? AND ?;

Figure 3: Fixed Domain Alternatives for Generic Search

choices for doing things such as complex searches. If we
must search for multiple conditions or values, we can
choose from several options.

The sample queries in Figure 1 search for two different
names using three different techniques. The first query uses
a compound predicate that might get multi-index access at
best under DB2 9, or perhaps range-list index access under
DB2 10. The second query uses a UNION ALL to perform
the search for each search condition, which has a better
chance of two-column index matching access, but executes
two query blocks. The third query builds a search table
using a common table expression and then uses relational
division (a join) to perform the complex search. Each of
these queries has merit; it’s best to code them all, EXPLAIN,
and benchmark test each of them.

Searching on Multiple Ranges

Figure 2 shows a typical generic search where a user sees
a screen with multiple search criteria they can enter. Often,
this criterion is in the form of upper and lower values for a
range search.

If there was an index on the three columns referenced in
the WHERE clause of this query, then in the case of range
predicates, DB2 can only match on the first indexed
column. At best, it can do index screening on the other
columns. The lower number of matching columns can result
in more of the index being accessed, especially for large
tables with many rows of data.

Often, the domain of the columns being searched is
finite and possibly quite small. This creates the opportunity
to use code tables that contain the entire domain of search
values and then perform the more expensive range searches
on these small tables. This accommodates an index match
on more columns of the target table. This technique can be
effective and efficient, especially for large tables and several
range predicates.

The first query in Figure 3 leverages a non-correlated
subquery and some code tables to generate a set of values to
power the search. The code tables are accessed first in this
query and then three-column matching index access is
attained for the table being searched. So, we apply the range
predicates to small code tables rather than the big table. The
less efficient index (or table) access is against a small table
instead of a big table. There’s a Cartesian join between the
code tables to provide all value combinations to the outer
portion of the query.

In the second query in Figure 3, the same query range
predicates are applied to our code tables in separate, non-
correlated subqueries. This avoids the potential for a large
work file due to the join in the previous example, but
introduces an additional query block. The access path again
has three-column matching index access for our search in
the outer portion of the statement, provided DB2 hasn’t
rewritten the query.

In the third query in Figure 3, a common table expression
is used with a Cartesian join using our range predicates to
build a set of values for the search. The table produced is
then joined to the table being searched. This can avoid the
large work file creation and a sort of the search values.
Again, the code tables are accessed first in the access path and we get three-column matching index access.

**Early Out**

Multi-table generic searches can be expensive because the optimizer has to pick only one path it thinks is the best access path. So, if the input is variable and optional, then the query may perform poorly if the values entered for predicates aren't against the first table accessed in the join sequence. Coding generic searches is easy and they provide flexible search screens. However, the performance of these queries is generic at best. Figure 4 shows a generic search on an employee number, department name, or project number.

There are many solutions to the generic search problem. Some include building the query on the fly and providing dynamic literal values to the input. Such a solution could take advantage of DB2 distribution statistics. DB2 run-time optimization is also a possibility and will give DB2 the opportunity to choose the access path at run-time, but the incremental bind during execution can add more CPU time than it saves.

There's a simple solution to the generic search if you know a little bit about how your users enter their search queries. Often, users know the common search criteria they enter. By simply coding two queries and a little programming logic, you can dramatically improve overall performance of the generic search. A study of user activity showed that users usually received an employee number for input, and were rarely given a different search value. With this knowledge, the application can be built so a search on only the employee table happens first (see the early-out query in Figure 4).

If the employee is then found, the search is over. If the employee isn't found, then the normal generic search executes. The generic query is then executed only if the early-out query produces no result. If two queries and application logic aren't desired, then you could potentially put your early-out logic directly in a single query. The combined query in Figure 5 behaves just like the two queries and
application logic in the early-out design combined. It does this by taking advantage of a DB2 during join predicate. DB2 join predicates are evaluated during the join operation, and the join is performed only if the join condition is true. If the join predicate is false, the join doesn’t happen. Here, if the employee number is found in the first join for just the employee table, then the second table expression doesn’t run (i.e., if A.EMPNO has a value, then the join doesn’t happen).

Figure 6 also has early-out logic built into the query via a COALESCE function. The COALESCE function returns the first non-null value in a list of two or more values. Those values can actually be expressions, and those expressions can be SQL statements. The drawback is that the COALESCE function can only return a scalar result. However, this technique can be effective for complex search operations with variable input, or for search input against several tables such as active vs. inactive tables.

Positioning and Restart

Often, when cursors are used for scrolling or restart, the queries are coded with compound predicates that facilitate the scrolling based on multiple columns. Unfortunately, these types of compound predicates typically lack Boolean term predicates, and DB2 needs Boolean term predicates to efficiently use indexes for queries. If your query lacks Boolean term predicates, then the best index access you’ll get (as of DB2 9) is multi-index access or non-matching index access. This can cause a lot of anxiety as you wait for what appears to be a simple scrolling cursor to scan through

<table>
<thead>
<tr>
<th>Query 1:</th>
<th>SELECT(columns) FROM V3FIXHDR WHERE (SEG &gt; :LOW-SEG OR (SEG = :LOW-SEG AND SUBSEG &gt;= :LOW-SUBSEG)) AND (SEG &lt; :HIGH-SEG OR (SEG = :HIGH-SEG AND SUBSEG &lt;= :HIGH-SUBSEG)) ORDER BY SEG, SUBSEG, CLMSSN, REC_ESTBT_DT1;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Query 2:</td>
<td>SELECT(columns) FROM V3FIXHDR WHERE (SEG &gt;= :LOW-SEG AND NOT (SEG = :LOW-SEG AND SUBSEG &lt; :LOW-SUBSEG)) AND (SEG &lt;= :HIGH-SEG AND NOT (SEG = :HIGH-SEG AND SUBSEG &gt; :HIGH-SUBSEG)) ORDER BY SEG, SUBSEG, CLMSSN, REC_ESTBT_DT1;</td>
</tr>
<tr>
<td>Query 3:</td>
<td>SELECT(columns) FROM V3FIXHDR WHERE (SEG, SUBSEG) IN (SELECT SEG, SUBSEG FROM SUBSEG_TBL WHERE (SEG &gt;= :LOW-SEG AND NOT (SEG = :LOW-SEG AND SUBSEG &lt; :LOW-SUBSEG)) AND (SEG &lt;= :HIGH-SEG AND NOT (SEG = :HIGH-SEG AND SUBSEG &gt; :HIGH-SUBSEG)) ORDER BY SEG, SUBSEG, CLMSSN, REC_ESTBT_DT1;</td>
</tr>
</tbody>
</table>

Figure 7: Scrolling Queries

<table>
<thead>
<tr>
<th>Query 1:</th>
<th>SELECT EMPNO, LASTNAME, FIRSTNAME, JOB, D.DEPTNAME FROM EMP E LEFT OUTER JOIN D ON E.WORKDEPT = D.DEPTNO ORDER BY LASTNAME, FIRSTNAME;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Query 2:</td>
<td>SELECT EMPNO, LASTNAME, FIRSTNAME, JOB FROM EMP E ORDER BY LASTNAME, FIRSTNAME;</td>
</tr>
</tbody>
</table>

Figure 8: Multi-Table Scrolling
an entire index before returning the few rows you require to fill a screen. So, it’s important to code Boolean term predicates. You can do this by maintaining separate search, scroll, and restart queries. You can also add redundant Boolean term predicates to a generic scrolling cursor to improve index access.

A typical scrolling cursor (see query 1 in Figure 7) reads data in a batch program for a range of leading key column values. Due to a lack of Boolean term predicates, it can do non-matching index access at best. Query 2 in Figure 7 is the same query as the typical scrolling cursor, but the predicates were changed so they’re Boolean term. The result is a single column match on the first key column.

Query 3 in Figure 7 is the same query, but combines the search positioning/restart with the technique of building keys from code tables. Here, a code table that contains all values for SEG and SUBSEG is accessed in a non-correlated subquery, where the range of values desired is applied. The result of the non-correlated sub-query is then evaluated in a row expression to get two matching index column access. This works only if the code table you build is relatively small. The code table in this example contained 200 rows of data while the main table had about 500 million rows.

DB2 10 may offer relief for these situations automatically with the introduction of range-list access.

### Scrolling Multi-Table Queries

A major issue with search and scroll is when it involves complex queries that access several tables that can return large quantities of data. You want to minimize the amount of work the database is doing, and often DB2 can do this for you. DB2 will do its best to avoid sorting or materializing the result so you only return the data needed to fill a screen. However, if DB2 must materialize the result, then the query could process a lot of data only to have the application throw most of it away when it gets control. When this happens, you should try to write a query that eliminates the materialization, but this isn't always possible. If materialization is unavoidable, you may be better off materializing the smallest amount of data in one query, then reverting to the database for the rest of the data later.

Query 1 in Figure 8 is a simple example of what's actually a problem with extremely large, complex queries used to fill screens with data. If the ORDER BY results in a sort, then the query can be quite expensive to operate for search and scroll. If we can’t avoid materialization, perhaps we can minimize it. The applications will read only the data required to avoid or reduce the materialization (with the appropriate supporting index), such as query 2 in Figure 8. Subsequent queries can collect related data using IN-List or programmatic join. An application can also store the required sort information in an array and only get screen data that was needed as the user paged through the screens. Remember, in these situations, we're expecting the screen or user to read only a limited amount of the data that qualifies.

### Summary

The goal of tuning search and scroll processes should be to balance the amount of work involved in coding these processes with the performance of the queries and program process. It's always good to reduce the number of indexes in the database. Don’t just try throwing an index at a performance issue. Instead, see if there's an alternative way to code the SQL statement that may yield a performance improvement. Many DB2 features and SQL coding techniques offer solutions. The SQL techniques presented here show alternative paths to the data. Consider testing these, including EXPLAIN and benchmark tests, to determine the best opportunity for your specific performance situation. Z

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[XML Thunder](www.xmlthunder.com)
On April 12, 2011, IBM provided a preview announcement of z/VSE Version 5.1. This announcement, which is available at http://www-03.ibm.com/systems/z/os/zvse/, outlines the major items that will be available in the next version.

It was interesting this announcement came just four and a half months after delivery of z/VSE 4.3, which also contained significant functionality. The announced delivery date for z/VSE 5.1 is fall 2011—just one year after z/VSE 4.3 became available.

New functions, new facilities, and major extensions within a year of each other—“throw me in the briar patch again.” Understand that no one is complaining, but z/VSE systems programmers certainly will have their hands full, absorbing and implementing the new releases and new functions. Someone, somewhere surely must have said, “better a challenge than stagnation.” No danger of that; maybe it was someone in the z/VSE development arena? It has been awhile since we’ve installed or FSUed new releases so rapidly. Again, not complaining; just noting, celebrating or both, whichever is appropriate.

Here are some highlights of the announcement:

z/VSE 5.1 will exploit IBM zEnterprise 196 technology by offering support for the Intraensemble Data Network (IEDN). IEDN is a private data network that connects elements of a zEnterprise System ensemble. z/VSE can connect as a z/VM guest through the z/VM VSWITCH to the IEDN or in LPAR mode through the OSA Express3 device configured as CHIPID type OSX.

z/VSE 5.1 is designed to offer enhanced IBM System Storage options, including FCP-attached SCSI devices, the IBM Storwize V7000 Midrange Disk System and the IBM XIV Storage System, and support the Copy Export function of the TS7700 Virtualization Engine for disaster recovery.

IPv6 support will be added to the Linux Fast Path (LFP) function. LFP allows selected TCP/IP applications to communicate with the TCP/IP stack on Linux on System z without requiring a TCP/IP stack on z/VSE. Both z/VSE and Linux on System z must run as guests on the same z/VM system because they connect to each other via the z/VM communication interface, IUCV.

Adding to the 64-bit real support that was delivered in z/VSE Version 4.3 is the inclusion in z/VSE 5.1 of 64-bit virtual storage addressing support. This will increase the virtual storage of an address space beyond 2GB. That is, it allows the address space to use virtual storage above the 2GB address (above the bar). In addition, 64-bit virtual support will help applications keep more data in memory and easily addressable by simply switching the addressing mode. The area above the bar can be used only for data. Instructions need to be executed below the bar.

z/VSE 5.1 will provide a new Application Programming Interface (API) to manage the virtual storage above the bar, the IARV64 macro, which will be ported from z/OS. IARV64 functionality supported by z/VSE will be fully compatible with z/OS.

IARV64 creates memory objects—chunks of virtual storage—for use within a single address space (private memory objects) or for shared use among multiple address spaces (shared memory objects). The virtual storage for memory objects can be restricted via configuration commands, if needed.

IPv6/VSE will also exploit 64-bit virtual with its new, large TCP window support. Large TCP windows can help reduce TCP window congestion.

IBM also provided a statement of general direction for CICS TS for VSE/ESA enhancements:

IBM intends to provide the CICS Explorer capabilities for CICS TS for VSE/ESA. The CICS Explorer is the new face of CICS and provides an integration point for CICS tooling, enabling you to monitor CICS terminals, files, and transactions. The CICS Explorer consists of a client and CICS TS server component. The client component is based on an Eclipse environment.

z/VSE 5.1 will implement a hardware architecture-level set, meaning that it will support only IBM System z9, z10, and IBM zEnterprise 196 servers.

Thanks for reading this column; see you all in the next issue.

Pete Clark on z/VSE

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The VM Workshop is a grassroots, non-profit organization comprised of customers, ISVs, and business partners with an interest in the use and growth of the z/VM platform and Linux on System z. The original VM Workshops were held during the ‘70s, ‘80s and ‘90s at universities around the U.S. and Canada.

This re-launch of the popular Workshops will provide the VM and Linux communities with a low-price, high-quality, tightly-focused forum that was so successful in the early days of VM.

All funds paid to the VM Workshop are used on the events and attendees. The goal is to provide a forum for z/VM education with topics that are relevant to customers supporting z/VM and Linux on System z in today’s IT environments.

The upcoming VM Workshop will be held at the Ohio State University Ohio Union facility in Columbus, Ohio, July 28-30. Threads will include VM and VM maintenance, networks and VM, tools for VM, labs covering introductions to VM and Linux on VM, and more.

Inexpensive dorm rooms and nearby hotel accommodations are available to make attending the VM Workshop one of the most cost-effective conferences around.

Whether you are new to z/VM or Linux on System z, or are an experienced master, don’t miss this great opportunity to take your skills to the next level for z/VM and Linux on System z!
Thanks to client involvement, the secure key and protected key cryptography on System z continue to expand to meet the needs of the most sophisticated applications.

Customers around the globe have helped guide the future of cryptography for System z. Customer Crypto Councils have become a regular forum for IBM to share information about cryptographic offerings while helping discover and respond to client pain points, individual requirements, regulatory hurdles, and future needs. Crypto Councils in Europe and the Americas have brought together IBM and numerous clients to evaluate what’s available today and what’s needed tomorrow.

This customer-driven approach is working and producing clear results; it’s guiding the future of the host library for Linux on System z, Integrated Cryptographic Service Facility (ICSF) for z/OS, and crypto hardware.

This article explores the list of new cryptographic functions available to applications deployed on Linux on System z; it’s an update to the article, “The New Frontier for Cryptography on Linux on System z,” which appeared in the October/November 2010 issue of z/Journal (www.mainframezone.com/it-management/the-new-frontier-for-cryptography-on-linux-on-system-z). It also highlights the new functionality available to applications that depend on either secure key or protected key cryptographic solutions. (The clear key cryptographic support that's already available to Linux on System z isn't addressed here.)

### What’s New for Secure Key

The third release of IBM’s Common Cryptographic Architecture (CCA) host library, formally known as the IBM CEX3C Common Cryptographic Architecture Support Program for Linux on System z 4.1.0, is available for download. This host library is commonly known as CCA 4.1. For compatibility, this new host library can be used in place of its predecessors, along with the necessary CryptoExpress2 or CryptoExpress3 PCI card, to provide the same functionality these cards previously provided. It’s the combination of the CCA host library and the crypto card, when configured in co-processor mode, that enables applications to solve complex cryptographic problems. This article examines the new host
library with the latest CryptoExpress3 card and expands on the four primary areas affected:

- Personal Identification Number (PIN) security was enhanced to implement the processing restrictions as described in the American National Standards Institute (ANSI) X9.8 standard.
- An additional key wrapping method was added for CCA keys.
- Hash Message Authentication Code (HMAC) was expanded with several new verbs.
- A new Elliptic Curve Cryptography (ECC) algorithm, which can be used for digital signature generation and verification, was added.

For more on what's new for Linux for System z in the 4.1.0 release of the CCA host library, see the latest version of the Secure Key Solution with the Common Cryptographic Architecture Application Programmer’s Guide (SC33-8294-02). You can access this book by selecting the Library tab at www.ibm.com/security/cryptocards/pciecc/overview.shtml. Here’s a brief description of the new functions and features available to both C and Java programs:

Enhanced PIN security mode: This was added to help block PIN attacks. This new support is needed to implement restrictions required by the ANSI X9.8 PIN standard to help block attacks that might come, for example, from rogue

Automated Teller Machine (ATM) transactions. It’s important to protect these kinds of transactions from well-documented attacks. The first step to enforcing these restrictions and thwarting such attacks is to enable three new access control points:

- ANSI X9.8 PIN—Enforce PIN block restrictions
- ANSI X9.8 PIN—Allow modification of PAN_01_0350
- ANSI X9.8 PIN—Allow only ANSI PIN block_01_0350.

These new access control points affect the Clear PIN Generate Alternate (CSNBCPA), Encrypted PIN Translate (CSNBPTR), and Secure Messaging for PINs (CSNBSPN) verbs.

CCA key wrapping using a new Cipher-Block Chaining (CBC) mode: While previously, Electronic Code Book (ECB) mode wrapping was the norm, enhanced key wrapping via the more secure CBC mode helps applications comply with current cryptographic standards that require key bundling. Both ECB and CBC mode key wrapping can coexist, letting existing applications expand to use the new CBC mode without sacrificing legacy data.

ECC support: As algorithms age and computing power increases, it’s constantly necessary to evaluate the viability of the current state of cryptography and security of cryptographic algorithms. It is clear there soon will be a
need for ECC. This support begins with the ability to perform key generation and digital signature generation and verification using the Elliptic Curve Digital Signature Algorithm (ECDSA). Digital signatures are commonly used to verify that a piece of data wasn’t changed between the time it was signed and the time it was used. Financial institutions do this to ensure a banking transaction initiated by a known customer wasn’t tampered with and can be trusted. Ensuring that a customer has chosen to transfer $10 as opposed to $10,000 is critical to the financial institution’s reputation. The addition of this new algorithm also requires a new Public Key Algorithm (PKA) key token for storing the ECC public key cryptographic keys and a new Asymmetric PKA (APKA) master key—a 32-byte key that complies with the Advanced Encryption Standard (AES) for wrapping an ECC key token. Extended support was also needed for the Master Key Process (CSNBMKP) verb.

**HMAC expansion:** With CCA 4.1, these verbs were added to enhance key generation and processing:

- The HMAC Generate (CSNBHMG) verb generates a keyed HMAC for the text string provided as input to this verb.
- The HMAC Verify (CSNBHMOV) verb verifies a keyed HMAC for the text string provided as input to this verb.
- The Key Generate2 (CSNBKGN2) verb is used to generate one or two HMAC keys. These keys are returned encrypted only, never in the clear. This verb returns a CCA key token.
- The Key Part Import2 (CSNKPI2) verb is used to enter and combine one or more clear key parts and return a complete key value. The key can be in a variable length, internal key token, or stored in a key file.
- The Key Test2 (CSNKFT2) verb is used to generate or verify a secure cryptographic verification pattern for keys contained in a key token.
- The Key Token Build2 (CSNBKT2) verb can build a variable length key token for all supported key types, including HMAC keys. The key token can be used as input to the Key Generate2, Key Part Import2, and Key Test2 verbs.
- The Key Token Change2 (CSNBKTC2) verb is needed to re-encipher a variable-length HMAC key from encryption under an old master key to encryption under a current (new) master key. When master keys are changed as part of the enterprise security policy, it’s necessary to re-encipher HMAC keys under the new master key within the boundaries of the physically secure hardware.
- The Key Translate2 (CSNBKTR2) verb is used to move an HMAC key from encryption under one key to encryption under another key. This verb uses one key-encrypting key to decipher an input HMAC key in the secure hardware environment, then enciphers the HMAC key using a different key-encrypting key—producing an output key, never letting the clear HMAC key leave the secure boundary of the hardware. Only the encrypted input and output HMAC keys are available outside the hardware.
- The Restrict Key Attribute (CSNBRKA) verb is used to modify an exportable internal or external variable-length HMAC key token so its key can no longer be exported.
- The Symmetric Key Import2 (CSNDSYI2) verb is used to import an HMAC key that has been previously formatted and enciphered under an RSA public key by the Symmetric Key Export (CSNDSYX) verb and is contained in an external variable length symmetric key token. The recovered HMAC key is re-enciphered in the physically secure crypto hardware under the AES master key and returned in an internal variable-length symmetric key token.

**The Future With ECC**

The ECC algorithm is a public key cryptographic approach similar in use to the RSA algorithm. (RSA stands for Rivest, Shamir and Adleman, who first publicly described it.) This new approach uses the algebraic structure of elliptic curves over finite fields. Several protocols were adapted to use elliptic curves, and in this release of the CCA host library, the ECDSA was implemented and can be used for digital signature solutions. From the list of curves available, IBM chose to support the Brainpool and Prime curves.

ECC has been gaining momentum recently and has been recognized internationally by financial institutions as the follow-on to the currently pervasive RSA algorithm. These organizations have been marching toward a timeline when all public key solutions must be switched over to ECC. This process will take years, so it was important that the ECC capability was provided in a timely fashion to ensure a smooth, seamless transition. In the U.S., the National Security Agency (NSA) developed Suite B, which is a group of algorithms they deem worthy to protect our national secrets. Suite B mandates ECC for digital signature generation and key exchange. With that in mind, it’s time to start thinking about ECC and develop a plan for exploiting this new algorithm with new applications. Depending on a client’s security policy or the security requirements for their data and/or process, the client should give consideration to migrating current solutions from their existing RSA implementation to use ECC.

**Conclusion**

The CCA host library provides several exciting new enhancements. Whether the requirement is for support of sophisticated ECC, extensions to HMAC, or the new CBC mode key wrapping, options are now available to new or existing applications deployed on Linux on System z. With this new support, the host library available to Linux on System z takes another step closer to supporting the robust set of functions available to z/OS applications via ICSF.

The CCA host library can be located by selecting the Software Downloads tab at www.ibm.com/security/cryptocards/pciec/overview.shtml. There’s no charge for the CCA host library for Linux on System z. The documentation mentioned is an in-depth source of information for getting started and creating both C and Java-based applications to meet the demanding cryptographic needs of today’s secure key solutions.

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A business provides value by meeting the needs of its customers. To deliver better service to customers, both the business and the IT department must understand the impact of any problems that occur with technology components or applications. When an application or technology component experiences a performance issue or a failure, how does the business or the IT department know exactly what business process or business transaction was affected and what impact it had on the business?

When your business and IT department are truly integrated, you can maximize the value of the information technology, which, in turn, advances the business. However, when business, application, and technical operations use silos of information, the result is unknown cause-and-effect relationships.

Monitoring your applications and technology components holistically will help you understand how everything works together and its impact on business operations.

The value of a transaction lies in its contents; for example, an individual customer order contains information about who is ordering what item, and this data is used to fulfill the order and update inventory. Technology components process each transaction and send it on its way to a downstream activity. The latency of the transaction, or the time it takes the technology component to do this work, is an important measure of performance. The transaction location within the IT infrastructure provides the location of potential performance problems. To effectively solve problems and make decisions, you need to know the transaction value and latency, and you need to be able to pinpoint the location of the transactions. However, you also need to have a layer of intelligence that synchronizes all this disparate data into useful information.

Demand for better information has led to the development of monitoring frameworks for transforming data and delivering synchronized information to the individual business and IT stakeholders who are making business, application, and technical decisions. A cohesive framework that correlates and consolidates related information about a transaction provides valuable information much faster than typical, independent business intelligence or technology monitoring systems.

Having the information you need, when you need it, is critical. Without a cohesive monitoring framework, it’s difficult, if not impossible, to understand complex and ambiguous information. Transactions are the common denominator across all business applications, and monitoring transaction flow through applications becomes one of the key indicators and sources of information for assessing business, application, and technology performance. Business application monitoring is one of many sources of information, and it’s important to ensure that pertinent information is structured and available to appropriate users involved in the problem-solving and decision-making processes.

When you implement a cohesive monitoring framework, you’re taking one step in transforming the IT department from an expense center to an integrated part of the business. In information-driven businesses, the IT department is an innovator. However, to be an effective innovator, the IT department must be integrated with the business. Integration provides visibility into the cause-and-effect relationships that affect business, application, and technical performance with appropriate and timely information. When the IT department and the business aren’t integrated, it’s difficult for IT to be innovative and difficult for the business to be competitive.

To ensure information technology is integrated with the business in your environment, exploit an intelligent monitoring framework that shows the cause and effect of transactions. When you can measure the impact of transactions and find and fix problems quickly, you provide true value to the business.

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The mainframe has most certainly defied the predictions of industry pundits; in fact, in the past 10 years, most mainframe shops have grown their MIPS capacity by 15 to 25 percent per year. This increase reflects both more work and new kinds of work. The “new workloads” may be z/OS transactions arriving from outboard distributed servers or UNIX applications now running under Linux on System z on Integrated Facility for Linux (IFL) processors. The result is a significantly larger mainframe presence than the pundits anticipated.

Systems management strengths, disciplines and tooling that have grown up with the mainframe, have contributed to its resilience. Systems »
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This annual technical education offers both stand-up lecture and hands-on-labs delivered by experts from the System z technical community. Come to Miami and see why attendees return year after year. With more than 300 sessions focused on System z Technical Strategies and Architectures, plus a new track aimed at CTOs and IT Management, you can’t afford to miss it!

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management encompasses configuration management, change management, problem management, performance management, and capacity management. A successful IT organization must formalize these practices through documented processes covering who does what, when, and how. Clearly defined processes provide a consistent methodology for how this work is performed, even when personnel change, and ensures the organization's high-level goals reflect the way systems are managed.

Systems management methods vary widely. Capacity management (i.e., capacity planning) stands out as the least formalized, most problematic practice, and unfortunately, lags the other disciplines; this article describes capacity planning best practices.

The Capacity Planner’s Role

Despite capacity planning’s importance, most shops don’t have people dedicated to it. Often, it’s considered a part-time function, assigned to the same people doing performance management. Capacity planning is less well-defined than performance management, and many IT shops don’t clearly define what they want capacity planners to do. However, effective capacity planning includes knowing how to determine when the system is out of capacity, what reports to produce, and how often.

The capacity planner must tell upper management when the company’s IT systems will no longer be able to provide acceptable service to end users. Since this is a planning function, it’s assumed this information will be made available before the event occurs. This job includes many sub-functions that support this kind of analysis, including workload tracking and trending, setting and monitoring Service Level Agreements (SLAs), and evaluating different upgrade scenarios.

Defining Out of Capacity

Capacity planning requires a clearly defined and agreed upon definition of what it means to be out of capacity, though this is often overlooked. Without a clear definition, how can the capacity planner develop a plan acceptable to management? The definition must be agreed to by all parties and must be the trigger that requires action to be taken.

Consider some of the out of capacity definitions we’ve heard from IT managers:

- “I don’t want performance to be any worse than it is today.”
- “I don’t want the phone to ring and the caller is someone I care about.”
- “We wait until the pain affects our profitability.”

These definitions share a lack of formality and a clear linkage between high-level business goals and how IT resources should be managed. Today, many shops will say they have SLAs in place, but these are often negotiated between the operations staff and users. If SLAs are missed, a meeting often occurs to address the problem. The result might be a plan to look into tuning the system or
application, but missing the SLA is a long way off from requiring a processor upgrade.

A proper definition for out of capacity must be one that absolutely requires problem resolution, even if it means adding capacity. While processor capacity is the focus of most capacity planners, all IT components—including disk, tape, network, or any component that affects your ability to meet your definition of out of capacity—must be included in the planning process.

**Performance Management vs. Capacity Management**

While performance management and capacity management look similar on the surface, they’re different practices and must be treated as such. Performance management involves responding to performance problems that can pop up anytime without warning. Capacity management involves a much larger component of planning. The goal is to anticipate when performance will become unacceptable and to have a plan to fix the problem before it occurs. Though the differences between the two practices are significant, most shops assign both performance and capacity planning to the same people. That makes it easy to confuse your role when constructing a capacity plan.

Here’s an example of where you can mix these roles. A capacity planner reports that, based on his analysis, the system will be out of capacity in six months. He also reports that, based on previous tuning results, he believes he can tune around the problem. This is the case of the capacity planner wearing his performance management hat while performing capacity planning. If the tuning doesn’t yield expected results, this shop may find itself out of capacity with no plan in place. Capacity planners must always begin by assuming the current system is the starting point. If tuning activities change the system, then the changes must be factored into the plan. A capacity plan is a living plan; it must be updated regularly, ideally at least once a month. Since the person doing the tuning may also be the person asked to provide the capacity plan, he must understand the differences in the two functions.

**Understand Your Pain Points**

Most shops will have more than one definition for out of capacity. These will depend on where and when the pain occurs. For example, you might have a pain point that occurs during prime shift, between 9 a.m. and 4 p.m. The pain point might be online response times for your production CICS applications. For this shop, a definition of out of capacity might be, “We’re out of capacity when the 95th percentile response times for our production CICS systems exceeds two seconds between 9 a.m. and 4 p.m.”

This same shop might have a batch window pain point that occurs each night. This might require another
definition such as, “We’re out of capacity when the nightly batch job stream doesn’t complete by 7 a.m.” Some financial institutions have a 10-minute window each morning at market open time. They must process all the queued stock transactions during this brief window or pay penalties.

Understanding your pain points greatly simplifies the capacity planning process. It directs you to where you need to focus your data collection and tracking systems. It also lets you ignore activities irrelevant to predicting when you’ll be out of capacity.

Develop Tracking and Reporting Systems

Once you’ve defined your key pain points and out-of-capacity definitions, you can begin to develop tracking and reporting systems. These should focus on building the databases used for historic trending. Many shops use tools that capture lots of metrics and store them in databases that statistical analysis programs can manipulate. Many shops lack a clear view of how these metrics are related, including which ones will indicate when performance will cross the knee of the curve.

Again, understanding your pain points will help you focus on the key metrics during the times they’re important. For example, if your pain point is CICS performance during prime shift, you need to track metrics for those periods. Further, tracking systems must include both workload volume metrics (i.e., CICS transaction rates) and performance metrics (i.e., 95th percentile CICS response times). If your pain point is nightly batch Window performance, you should be tracking metrics such as average Window completion times each night, number of disk I/Os completed during these times, average disk response times, and total CPU utilization.

These metrics will support trending and predict changes in workload volumes. They also help you understand the relationships between workload volume and performance. For example, you might see a correlation developing between CICS performance degrading whenever CICS transaction rates exceed a specific value. This can lead to further exploration and hopefully result in a better understanding of how resource contention affects CICS performance. But this kind of analysis requires you to have historical data that’s relevant. Once you begin to build these tracking systems and do some performance correlation, you’ll see that some metrics are irrelevant while others are missing. It’s an iterative process. The goal is to construct a tracking and reporting system that shows where you’ve been and where you’re going. Moreover, this system lets you focus on your specific pain points.

Predict Performance Changes

The goal for capacity planning is to predict when you’ll run out of capacity before it happens. If you tell upper management you’re out of capacity today, or even next week, you aren’t planning; you’re reacting. Advances in mainframe technology, including the ability to provide capacity on demand in minutes, makes the need for capacity planning less important. But even short-term increases in capacity can increase costs, and permanent upgrades can have a dramatic impact on the IT budget. While hardware costs continue to decrease, software costs associated with available capacity are still the largest component (along with people costs) of the Total Cost of Ownership (TCO). While recent advances in adding capacity make it easier to react to peak loads or unexpected changes, they don’t reduce the sting of unexpected changes to the IT budget.

Perhaps the biggest reason capacity planning is difficult is that the key metric for predicting out of capacity is performance, and predicting changes to workload performance is hard to do. While workload volume changes can be tracked, trended, and forecast with reasonable accuracy, performance is subject to queuing effects. Figure 1 shows the relationship between performance and utilization; it’s based on a simple queuing model involving a single queue and single server. This curve shows that performance has a non-linear relationship with server utilization. The message is that performance may remain on the flat part of the curve as utilization grows, then quickly degrade as you pass the knee of the curve. Things can go bad in a hurry.
with little warning, and trying to predict when that will happen is difficult.

Compounding the problem is the fact mainframes run more than one kind of workload, and they run at different priorities. Figure 2 presents a similar curve as Figure 1, but shows the relationships between different workload types running at different priorities. Even at high utilization, some workloads may still be on the flat part of the curve while others are clearly broken. The difficulty for the capacity planner is to understand these relationships and predict the shapes of these curves. One approach is to track utilization and performance metrics over time and look for patterns that indicate when performance crosses the knee of the curve. This approach has led many shops to develop rules of thumb that define out of capacity in terms of utilization; for example, “We’re out of capacity when prime shift utilization exceeds 95 percent.”

There are numerous problems with these kinds of definitions. Most were developed years ago and passed down without modification, even as personnel changed. They tend to be outdated and too conservative, and call for upgrades much sooner than they’re really needed. For most companies, workloads and systems have changed dramatically since these rules were developed.

New mainframe workloads tend to be CPU-intensive compared to older legacy applications; many are delivered as packaged solutions. Examples include Enterprise Resource Planning (ERP) applications such as those from SAP and PeopleSoft. One characteristic of these workloads is that they often contain a dynamic element that lets the user construct ad hoc queries and reports. These ad hoc requests often initiate a complete scan of one or more databases. These requests can easily drive CPU utilization to 100 percent and keep it there for minutes or hours. Since these transactions are allowed to run for long periods, there’s no need to upgrade the processor simply because they drive utilization to 100 percent. A capacity planning rule of thumb that simply looks at total CPU utilization won’t work well with systems running these new workloads.

### Performance Modeling Tools

The answer to the problems inherent with predicting changes to workload performance is a modeling tool. These tools let you define your configurations and workloads as inputs. Modeling outputs should include resource utilization and workload performance. A good modeling tool must be able to account for non-linear queuing effects. To be effective, these tools must be able to model metrics that correspond to your out of capacity definitions. For example, if your definition is based on CICS response times, your modeling tool must be able to predict changes to CICS response times. Similarly, for a definition based on batch job stream completion times, the tool must be able to predict...
those times. There are several mainframe modeling tools available and lots of differences between them in capabilities and ease-of-use; these differences are beyond the scope of this discussion.

Despite the availability of modeling tools, most shops don’t use them for capacity planning. Some say they purchased a tool years ago, but the people who were trained to use it no longer work at the company. Or, they say they looked at purchasing a tool, but couldn’t justify the high cost. The overwhelming majority of shops today don’t use modeling tools for capacity planning. You should perform a cost/benefits analysis and examine your individual circumstances to determine whether you can justify a modeling tool for capacity planning. The key questions to ask include:

• How well is your current methodology working?
• Do you frequently fail to meet SLAs, and at what cost?
• Do you often install more capacity than needed, and at what cost?
• Do you often run into unexpected performance problems?

Many shops can easily justify the purchase of a modeling tool if they do a proper cost/benefits analysis, but it isn’t necessary for every shop to buy these tools. If your current methodology works, keep using it.

**Processor Sizing**

At some point in the capacity planning process, you’ll be required to project your requirements against different configuration alternatives. Usually, this will be an evaluation of different processor models and will certainly require an evaluation of the processor’s price and capacity. While processor capacity analysis seems fairly simple and straightforward, this is one of the most problematic parts of the capacity planning process. The following describes how to improve this critical function and avoid some common pitfalls.

For many shops, processor sizing relies on tables of MIPS ratings—some provided by industry consultants and some by the vendor—where a rating is assigned to every processor model, spanning old and new generations. All these tables have a common flaw—they contain a single MIPS rating for each processor. Also, no one, including IBM, measures MIPS today. IBM measures relative capacity between its different processor models. Often referred to as the Internal Throughput Rate Ratio (ITRR), this is a measure of the relative capacity between different processors. If the ITRR between two models is 2:1, it means the first model has twice the capacity as the second (i.e., if both machines were running at 100 percent busy, the first machine would be processing twice the workload). IBM measures these ratios between all its processor models and publishes the results in the IBM Large System Performance Ratios (LSPR) tables.

If you were to look at these tables today (available at no cost through an IBM Website), you’d see several columns of numbers, depending on different workload types. That’s because different workloads perform differently on different

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Major changes to the kinds of work running on the mainframe today have invalidated many of the capacity planning rules of thumb developed years ago and still in use today.
processors. But relative capacity will also change based on
the specific configuration you install and the specific
Logical Partition (LPAR) configuration you run.

IBM LSPR tables show the impact of different workload
types, but don’t show the impact of configuration or LPAR
differences. The only tool that shows the true impact of all
these differences is the IBM z Processor Capacity Reference
tool. The z/PCR tool was an IBM proprietary tool until 2005
when it was made available, free of charge, to IBM
customers. z/PCR uses the IBM LSPR tables as a reference
point but factors in the impact of workload type, hardware
configuration, and LPAR definitions to calculate the true
ITRR between different processor models. A highly accurate
way to compare the relative capacity between different
processor models in a real configuration, z/PCR should be
part of your capacity planning process.

Beyond the Mainframe

While this discussion is directed to the mainframe, the
principles discussed here can be successfully applied to
other platforms. Infrastructure simplification and server
consolidation mean the days of adding another box when
performance degrades are quickly disappearing. Mainframe
capacity planning has always been years ahead of its
distributed systems counterparts, but the gap is closing. Best
practices require a common set of processes be implemented
across all platforms. One of the biggest impediments to this
goal is a lack of tooling that can
span multiple platforms. Recent
advances, such as the IBM
ZEnterprise BladeCenter Extension
(zBX) system and Unified
Resource Manager (zManager),
demonstrate that vendors
recognize the need to provide a
single management perspective
across all platforms. This is
especially true with applications
that span multiple platforms.
While we’re a long way from this
objective, this trend bodes well for
systems management and capacity
planning.

Summary

Mainframe capacity planning
is the least formalized and
rigorous practice under the
systems management umbrella.
Major changes to the kinds of
work running on the mainframe
today have invalidated many of
the capacity planning rules of
thumb developed years ago and
still in use today. Workload
performance, not utilization, is
the key metric that determines
when the phone rings, and that’s
hard to predict.

Effective capacity planning requires:

• A clearly defined job description for the capacity planner,
spelling out what kinds of reports to produce and when
• A definition of out of capacity that’s measurable,
predictive, and accepted by all parties
• Tracking systems that capture and report on metrics
relevant to your pain points
• Modeling capabilities to help predict when you’re out of
capacity before it happens
• A methodology that assumes the current system is the
base from which changes will be modeled
• A capacity plan that’s updated at least monthly to ensure
it’s current.

Capacity planning is an essential activity for all IT
shops; the costs associated with doing a poor job can be
enormous. Z

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The Problem With Impressions

The English village of Bucklebury, which lies about two miles from my home, has achieved instant fame as the family home of Kate Middleton, Prince William’s new wife and the U.K.’s future queen. In the weeks leading up to the royal wedding, the village was besieged by journalists and paparazzi of every nationality, as well as curious sightseers and coach trippers, all anxious to catch a glimpse of the duck ponds, quaint shops, and thatched roofs that reportedly characterized the princess's idyllic existence. Bucklebury provided all the ingredients for a Disney-esque, fairy-tale romance, and the media and PR specialists molded them into a tasty dish for worldwide distribution.

Now, I don’t wish to shatter any illusions. I loved the wedding celebrations as much as the next guy and Bucklebury is a very pleasant village. But I doubt that Kate Middleton used to dance around the Maypole on her way to school in quite the way dramatizations might suggest. This is an example of the power of the media to create impressions—impressions that last and become ingrained in the subconscious in a way that becomes difficult to dispute.

The image of the mainframe has been similarly (but not so positively) molded by the industry gurus and wordsmiths, and the many negative myths surrounding the platform continue to hamper those who see real business advantage in running new System z workloads. During a “scheduled chat” at CA Technologies’ recent May Mainframe Madness virtual conference, which I was invited to attend with my associate Trevor Eddolls, co-author of the Arcati Mainframe Yearbook, I was reminded just how many organizations face this challenge every day. Users taking part in the discussion recounted their experiences of running 100-plus Linux on System z images on a single box, consolidating numerous distributed processors with associated manageability, power and space benefits—not to mention dramatic cost improvements. But winning the confidence of managers and budget holders, persuading them that System z is the way to go, remains a slow, painstaking process.

One user said she had been given the go-ahead to port just one application to Linux on System z. On the strength of this very successful implementation, she was gradually winning the support of managers who had been brought up on Windows and UNIX, dispelling their strongly held belief that the System z is an excessively expensive and complex platform.

All too rarely, the business media decides to put a positive spin on migrations to the mainframe (as in the case of Allianz in Australia, which moved its whole server farm to Linux on System z in a weekend last year with negligible outage). But most commentators are happier to reinforce the legacy myth that has endured for years—and in so doing, they put obstacles in the way of those who are making a concerted effort to bring imaginative cost and efficiency savings to their businesses.

A great CA Technologies online conference, by the way!

Around the Vendors

American Express must be feeling like a million dollars, and that’s exactly what they’ve won as a grand prize in Compuware’s Mainframe Cost Savings Program. Participants in the program were offered a free cost-savings assessment, which identified current opportunities and provided a roadmap for future operational cost-savings for the mainframe. AmEx came out on top as the company that had achieved the greatest savings with the help of Compuware tools. “The more efficiently we operate, the more savings we have to invest in growth opportunities,” says the company’s senior vice president Matthew Robinson.

Canadian mainframe performance optimization specialist DataKinetics has released a Java to DB2 Optimizer. The product, originally developed for a bank that was experiencing unexpected increases in data access request time, promises to offer a very significant improvement in Java application performance within a DB2 environment.

Pioneering z/OS network management company William Data Systems has introduced a “peek” function with Version 4.7 of its ZEN TRACE & SOLVE product. The function provides in-flight viewing of active IP traces. This means that it’s now possible to view an active trace while it’s still running, tracking its progress in-flight, and then stopping it when the condition being sought in the trace is detected. This, says the vendor, can save considerable CPU costs and user time.

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Software enables us to implement automation, which makes it possible to quickly respond to alerts and problems, freeing up technical staff to do more complex, strategic tasks. Automation helps IT move from firefighting mode to proactive management. With the adoption of automated alert processing and REXX programming standards, the problem resolution forecast in your z/OS data center is for clear skies. This article demonstrates how to define standards and then use the REXX programming language to set up the automation.

Automation Alert Processing Standards
Creating automation alerts is a basic, primary goal of any data center. These alerts can occur as a result of a successful or failed process, and may >
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be generated as informational alerts to a mainframe console. Most shops have a significant number of automation rules that scan millions of lines of z/OS message traffic, firing only on the events that have been determined to warrant a warning based on data center needs.

Automation standards can be a huge asset and provide a way to ensure consistency in how alerts are presented, their clarity, and the ability for IT staff to identify their coding relationships. They significantly reduce the challenge in responding to events and alerts in a timely fashion. Here are some recommendations:

When setting up alert thresholds, you can define rules based on your experience and expertise, minimizing the number of problems you must handle manually. But this isn't enough because you aren't the only person interacting with the system, solving problems, and managing your data center. When developing standards, you need to take into account all the operational requirements to support users.

Generating a unique message prefix, such as “OPSNTFYxxx,” for every message issued lets you create a common look and feel, which is of paramount importance for this type of standardization. Many software products use a specific message suffix or prefix range to identify messages, such as DFH for CICS; your unique automation message should, too.

For example, you might decide to use “OPSNTFYxxx” and then define “xxx” as noted in Figure 1. Then, any administrator would immediately know which component was involved and the right person could easily be directed to handle the problem. The following shows an example of what these types of automation alert messages look like:

```
OPSNTFY100 Job 46343 (RUN123) exceeding defined class C init threshold. Job cancelled. OPSNTFY055 You are not authorized to stop production controlled tasks.
```

Make sure this is documented in print and on an intranet or SharePoint site, so the entire IT team can understand and exploit the common language.

Ideally, if you’re using an automation product that provides a tool to easily generate multi-line messages, you can create “flower-box”-style alerts. Generating such alerts will cause them to stand out easily on a console and in system log data when you’re debugging system problems. You can set up standardized alerts using REXX to enhance automation and provide a common look and feel. Ask your automation software vendors if they support it.

Another good standard is to create a Partitioned Data Set (PDS) that will document the alert msgids you will create using the aforementioned methodology; let’s call it SYS2.AUTOAMATN.ALERTS. This PDS will contain individual members that correspond to each automated alert your automation generates, using the message suffix as the member name. Use a member naming convention of NTFYxxx that maps to the alerts generated from the previous example:

```
SYS2.AUTOAMATN.ALERTS (NTFY001-099) - STC related
SYS2.AUTOAMATN.ALERTS (NTFY100-199) - JES2 related
SYS2.AUTOAMATN.ALERTS (NTFY200-299) - Sysplex related
SYS2.AUTOAMATN.ALERTS (NTFY300-399) - CICS related
SYS2.AUTOAMATN.ALERTS (NTFY400-499) - DB2 related
SYS2.AUTOAMATN.ALERTS (NTFY500-599) - TCPIP related
SYS2.AUTOAMATN.ALERTS (NTFY600-699) - FTP related
SYS2.AUTOAMATN.ALERTS (NTFY700-799) - Hardware related
SYS2.AUTOAMATN.ALERTS (NTFY800-899) - Anything you want it to be
```

**Figure 1: An Alert Message Mapping**
Figure 2 shows a sample PDS containing a member that points to a problematic resource that, when viewed, will provide certain descriptive elements to enable support personnel to better understand what’s occurring, what REXX exec issued the alert, how best to resolve the problem, etc. This could be expanded to include additional elements, such as recommended solutions or approaches, if known.

IT might also look at Web-enabling the PDS. This could involve setting up the appropriate entries in a Hierarchical File System (HFS) and “mapping” the URL to the PDS so it could be displayed in a browser session. In either case, a central repository that contains descriptive resolution elements relative to your automation alert message generation strategy is an important component in any automation standards toolkit.

Since many different constituents support your critical business applications and have different preferences for how this information can be accessed, again, make sure this is documented not only in the PDS, but also on an intranet or SharePoint site, so all can understand and exploit the common language.

**REXX Programming Standards**

As you select an automation product, you particularly want to ensure that it can exploit the robust REXX programming language. Along with the other capabilities of the product, this offers you the ability for more complete customization, which is key to creating the most effective, efficient automated applications. You should also employ common coding guidelines (upper- or lowercase, comment blocks, number of spaces to indent, etc.) when creating automation rules and/or REXX programs.

Another best practice you should consider is designing a template to be used as a beginning comment block in all programs and rules (see Figure 3). Include informative data fields such as purpose, related program rules, logic outline, change history, notes, etc. Again, standardization makes these more usable across multiple groups and geographies.

When building the template, bear in mind that, unless your IT team is very small, these comments will need to be understandable by a wide range of people.

Create uniform comment blocks to be used before instructions or logic. A number line as a last comment line assists when indenting for wraparound lines or specific instructions such as a DO...END. Use mixed case in your comment descriptions. Optionally, provide comment “block” sections of code such as “Main processing” or “Subroutineroutines” (see Figure 4).

Simple variables will be used widely across all your automated applications. Begin by creating meaningful names for the variables based on the data assigned to them. The more descriptive the names, the easier it will be to maintain the code. Be consistent when you create variable names; taking the time early on ensures that as your
automation grows and changes, it remains easily understandable to all (see Figure 5).

In addition, pick your case standard for coding REXX or Time Sharing Option/Extensions (TSO/E) REXX functions, such as making all function names and optional required arguments uppercase. If a variable name is used in a function argument, then use the same case it was created in. For example:

device = WORD(SUBSTR(record.device_loc),1)

Case guidelines should be established for host environment commands. Consider mixed case when coding the keywords of the host environments to enhance readability (see Figure 6). Be consistent in the case style you choose for REXX instructions, such as:

• “if.then..else” or “If..Then..Else”
• “do..end” or “Do..End”
• “select..when..otherwise”, or “Select..When..Otherwise”
• “parse var msgtxt . 'ABEND' abend’ or ‘Parse Var msgtxt’

Additionally, for “do..end” instructions, keep uniform the number of spaces you indent to begin the instruction and the number of spaces you indent each instruction in the loop. Also, be sure to line up the “end” instruction with the associated “do” instruction. This is especially helpful in nested “do..end” loops. Another coding aid helpful for program maintenance is to place a comment with the “end” instruction to identify what loop is ending (see Figure 7). The same rules apply to the “select..when..otherwise” instruction.

Conclusion

Applying automation alert processing and REXX programming standards to your mainframe environment will enable support personnel to react quickly and efficiently in resolving issues in the data center relative to overall automation policies and procedures. It will accelerate troubleshooting, which is critical to maintaining high levels of systems availability. And more important, it makes it much easier for you to continue to automate and document in a way that works best for your enterprise.

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Securing TCP/IP

Here we consider TCP/IP under z/OS, a path into the system we need to control for effective security. Using tools provided with z/OS, this can be the most secure TCP/IP you’ll find anywhere. We’ll summarize how TCP/IP works under z/OS, discuss its security risks, and examine how you can manage those risks. References to security software here mean RACF, ACF2, or TopSecret.

Each TCP/IP message contains an IP address used for routing. The IP address is like a phone number and often corresponds to one computer and often one Domain Name Server (DNS) name; for example, www.ibm.com.

Each TCP/IP message also contains a port number that corresponds to one application, such as email or File Transfer Protocol (FTP). When a message is routed to your mainframe based on its IP address, the TCP program on the computer uses the port number of the message to decide which program to hand the message to. So, if the port number is for the FTP program, then TCP/IP hands the message to the FTP application program. (The User Datagram Protocol [UDP] also uses IP addresses and port numbers, and can be secured with many of the tools used for TCP.)

Each such application program is called a daemon. Under z/OS, each daemon is a started task, with its own JCL, userid, program load module, and often its own control file where the administrator specifies the options.

Here are some security risks associated with TCP/IP. Someone could:

- Read unencrypted data on the Internet
- Write a program that opens an unused port and then listens for requests for the program to take some unauthorized action
- Modify the control files, JCL, or actual program for TCP/IP or one of its daemon programs to do improper things under the identity of that program
- Attempt a Denial of Service (DoS) attack either by flooding the server with messages or buffer overflow
- Access the system by spoofing (falsely assuming someone else's identity)
- Hijack a session; that is, seize control of a conversation between your mainframe and, for example, a client using Internet Explorer to send his credit card number to your company. Take advantage of flaws or improper configuration of daemon programs.

These steps will help you provide effective security for your mainframe TCP/IP network. See if you can match them with the aforementioned risks:

1. Know what TCP/IP programs are executing. The TSO command NETSTAT will tell you the to- and from- IP addresses, the to- and from- port numbers, and the name of the program for each connection. Review the TCP/IP control file to see what ports and daemons are defined.
2. Control who can use which IP addresses, both inbound and outbound. These addresses are defined in the control file for TCP/IP and can be named so you can control them in your security software using the SERVAUTH resource class.
3. Control who can use which ports. In the control file for TCP/IP, you can restrict all the commonly used ports (with the RESTRICTLOWPORTS operand); reserve ports so they can’t be used (with the RESERVED operand) until your standards group authorizes their use; or define them to the security software so you can protect them (with the SAF operand in the port definition and the SERVAUTH resource class in the security software).
4. Determine what encryption is in place for each link. The z/OS system supports all the standard encryption methods and makes it easy for applications to invoke them.
5. Determine for each connection how “who is that user?” is answered. This could be done using an encrypted password, Secure Sockets Layer (SSL), Transport Layer Security (TLS) client authentication, Kerberos, or other means, including settings in the control files for the daemons. In the security software, use the BPX.DAEMON, BPX.SERVER, and BPX.SUPERUSER rules to control the ability of some programs to assume other people’s identities.
6. Determine access controls, quality assurance, and change control over the programs, their JCL, and their control files.
7. Consider using external firewalls or the Policy Agent software you get with TCP/IP to provide firewall-like functions such as intrusion detection, Virtual Private Network (VPN), and packet filtering.
8. Use digital certificates stored in your security software to prevent session hijacking.
9. Discover particular security issues for each daemon. For example, FTP on the mainframe can upload and download both MVS and USS files as well as submit batch jobs, browse printouts, and access DB2, depending on your security settings. DB2, when called by a program connected to the Internet, may be subject to SQL injection attacks, if the application isn’t well-designed.

The next column will examine how to secure another path into your z/OS system.
MS High Availability Large Databases (HALDBs) offer many advantages, including virtually unlimited space and the promise of near-continuous availability. HALDBs give you an opportunity to review existing IMS database reorganization strategies because you can reorganize one or more partitions while the other partitions are still online and available for processing. This article reviews database maintenance best practices for HALDBs and is geared toward an audience already familiar with the concepts of HALDB.

**What to Reorganize**

Reorganization is a necessary evil for all IMS database types, including an HALDB. Before deciding what to reorganize, it’s important to determine why an HALDB needs reorganization. Because HALDBs can be huge, it can take a long time and significant resources to reorganize all partitions. An HALDB might need to be reorganized to:

- Improve performance
- Address insufficient space in one or more partitions
- Reduce the number of partitions
- Make randomizer or other partition-level parameter changes
- Make structural or other Database Description (DBD)-level changes
- Rebalance the entire HALDB.

Independent Software Vendor (ISV) tools make the maintenance process easier by monitoring HALDBs, identifying partitions that need reorganization, and recommending the appropriate solutions.

**Improve Performance**

Reorganizing partitions to improve performance is the simplest reorganization scenario. You can perform a traditional, multi-step reorganization on one partition or any subset of partitions. During the reorganization, other partitions are available for updates. The HALDB Online Reorganization (OLR) function can be used in this scenario, and it keeps the partition available for updates during the reorganization process, thus increasing your data availability. During the OLR process every database record is moved—hence logged—so you should plan for extra logging. Because all records are moved during an OLR process, consider the recovery time necessary after an OLR completes. An image copy isn’t necessary after an OLR process, but consider how long you can go before you must take an image copy of the partition to meet recovery Service-Level Agreements (SLAs). ISV tools let you complete the reorganization of individual partitions in a single step with minimal or no outage. ISV tools also allow for intelligent online reorganizations that don’t require reading, rewriting, and logging the entire partition.

**Insufficient Space**

Each HALDB partition is limited to 4GB of data. As the data grows and a partition approaches the 4GB limit, you can rebalance the data across adjacent partitions or split an existing partition into multiple, new partitions. When
rebalancing the data across adjacent partitions, it’s important to identify all the affected partitions and include them in the reorganization process. As soon as the high key definitions are changed in the RECONs, the Partition INIT Needed flag is turned on for all affected parts. If all partitions haven’t been unloaded, there’s the potential for data loss. For example, assume you have three partitions with these key ranges:

- PARTAA: High Key 22222
- PARTAB: High Key 44444
- PARTAC: High Key X’FF’

If a CHANGE.PART command is issued against PARTAA to change its high key from 22222 to 11111, the Partition INIT Needed flag will be turned on for both PARTAA and PARTAB. Both partitions must be part of the reorganization. Instead of balancing the data across the two partitions, it might be necessary to add a new partition, such as PARTAD with a high key of 11111. In this case, it’s sufficient to unload PARTAA and reload PARTAA and PARTAD. Both approaches require a traditional reorganization; OLR can’t be used.

**Reduce Number of Partitions**

Because data growth in all partitions isn’t likely to be uniform, it might be beneficial to collapse partitions that contain little to no data. Usually, you can reorganize the affected partitions without affecting the rest of the HALDB; however, be careful how you collapse the partitions. Consider the scenario given previously. The easiest way to combine PARTAA and PARTAB is to eliminate PARTAA. However, eliminating PARTAB and changing the high key of PARTAA will require a reorganization of all three partitions. This requires a traditional reorganization; OLR can’t be used.

When data is moved from one partition to the next, the reorganization number (REORG#) becomes important. Every segment in an HALDB has a unique identifier, called an Indirect List Key (ILK). The reorganization number is part of the ILK and helps make the ILK unique. A data integrity issue involving duplicate ILKs has been identified when partition boundaries are changed and the partitions have been reorganized a different number of times. To avoid this problem, issue the following command against the RECON data sets:

```
CHANGE RECON REORGV
```

If you’re on a version of IMS prior to Version 10, be sure to apply APARPAQ97357 for IMS V9 or PQ97356 for IMS V8 and issue the CHANGE.RECON REORGV command to avoid the aforementioned problem.

**Randomizer or Partition-Level Parameter Changes**

It might be necessary to tune randomizing parameters or free space parameters for individual partitions. Because this information is saved in the RECON by partition, you can reorganize at a partition level by following a traditional reorganization approach. ISV solutions let you complete this in a single step. This requires a traditional reorganization; OLR can’t be used.

**Pointers**

For all three reorganization scenarios previously described, the Extended Pointer Set (EPS) pointers won’t be “healed” at the end of the reorganization process. Usually, this isn’t a problem because IMS will heal these pointers at first access. However, if this data isn’t accessed by a Program Specification Block (PSB) with update intent, the pointers will never be healed permanently. One possible solution is to read the database with a PSB with an update PROCOPT. ISV tools provide solutions to count EPS pointers that aren’t healed, validate the pointers, and heal them as part of the reorganization process.

**Structure or DBD-Level Changes**

When it becomes necessary to change the structure of an...
HALDB, you must reorganize all partitions. Depending on the size and number of partitions, you could have a huge amount of data to reorganize and this can put a strain on system resources. If you aren't changing key ranges, you can break the reorganization into multiple jobs or job steps, limiting the amount of system resources required at any time. ISV solutions can accelerate this process considerably. OLR can't be used for this process.

**Rebalance the Entire HALDB**

You may need to rebalance the entire HALDB when application restrictions don't allow new partitions to be added to an existing HALDB scheme. To counter data growth, you can balance the data across all existing HALDB partitions. Because the high key definition of almost all partitions changes during this process, it isn't possible to break this type of reorganization into a subset of partitions to save system resources. In this case, the system resource requirement for reorganizing a Partitioned Hierarchical Direct Access Method (PHDAM) database is usually much greater than for a Partitioned Hierarchical Indexed Direct Access Method (PHIDAM) database. The greater resource requirement for PHDAM is driven by the need to sort all records for all partitions during this type of reorganization. OLR can't be used for this process.

**Considerations for Partition Definition Maintenance**

Keep these tips in mind when changing HALDB partition definitions. It's advisable to address these steps while changing partition definitions:

- Back up your RECONs before making any changes to the partition definition.
- Try out the changes on a test RECON so it's easy to start over.
- Review how your definitions look in the RECON after making any changes by issuing the following command:

  \`
  LIST.DB DBD(name) DBDS
  \`

  Once you're satisfied with your changes, follow the exact same sequence of commands for your production RECONs. The result might be different if the same commands are executed in different sequence.

**Disable vs. Delete**

If you need to eliminate an existing HALDB partition, you can delete or disable it. Each partition is assigned a unique partition ID when it's first defined to the RECON. Once a partition is deleted from a RECON, it can't be redefined with the same partition ID. This can be a problem if you need to fall back to the older definition. Before deleting partition information from RECON, it's best to disable it. When a partition is disabled, its definition and the recovery information for the data sets in the partition, such as image copy records and ALLOC records, remain in the RECONs. To disable a partition, issue this command:

  \`
  CHANGE.DB DBD(name) PART(part name) DISABLE
  \`

You can enable disabled partitions. When they're enabled, the partitions again become part of the database definition. Disabling a partition helps with fallback scenarios, which aren't available if the partition is deleted. Once you're satisfied with the change, you can delete the partition.

**Stage RECON Changes**

As we know, a portion of the HALDB definition is stored in the RECON. While changing HALDB definition parameters in the RECON, it's important to stage them properly. You must implement definition changes in the RECON after the affected partitions are offline, the pre-reorganization image copy has completed, and the partitions have been unloaded. Implement the changes before the reload step starts. If these changes aren't staged correctly, you could damage the database.

**HALDB Tips**

Keep these facts in mind while working with HALDBs:

- Every /STA action must match the previous /DBR action.
  If a DBR is issued against an HALDB partition, then the start must also be issued against the HALDB partition.
- Stopping individual partitions and issuing the start against the master HALDB won't start the individual partitions.
- The partition initialization utility and the pre-reorganization utility are run against the master HALDB. However, this affects only the partitions for which the INIT Needed flag is set to “yes.”
- Initializing a partition turns on the image copy needed flag for that partition.
- Changing any partition definition parameter in the RECON turns on the INIT Needed flag for the partition. Manually turning the flag off could damage the database.

**HALDB and Test Environment**

HALDB poses a big challenge for the test environment because Database Recovery Control (DBRC) is required for HALDBs. This means every application programmer must have access to a RECON. One way to avoid using DRBC is to do most testing with a Hierarchical Indexed Direct Access Method (HIDAM) or Hierarchical Direct Access Method (HDAM) version of the same database structure. This is possible only if the application program isn't testing for special features such as a partition being offline, accessing a single partition, processing a secondary index, and so on. ISV solutions can eliminate the DBRC requirement for HALDBs in test environments.

**Conclusion**

HALDBs can provide near-continuous availability through partition independence. It's important to maintain HALDBs for optimal performance. Consider what you need to reorganize and how to maintain availability during the reorganization.

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It was a turning point in my career. My department had a new director, and he was looking for good ideas to champion during those all-important first 100 days in office. I had a great idea I thought would help us meet contractual compliance requirements with additional positive effects. I told him my idea, and he nodded thoughtfully. “Interesting,” he said. “I have to run to a meeting, but come back tomorrow with your strategy. Email it to me in advance.”

My internal “hip, hip, hooray!” quickly gave way to panic. A strategy document? What was he expecting? A paragraph? A page? Ten pages? How should it be organized? I’d just told him what I wanted to achieve and how we could get there. What else did he expect?

I don’t really remember what I emailed him. Even though he accepted it and we went on to tackle a project that was good for the company and even better for my career, what I remember most was that I felt like I was “faking it” with the strategy document; that I should have been aware of some sort of standard structure and format.

I thought of this a few months ago when I met with a group of about 50 director-level data managers who shared an interest in developing formal data strategies. They were a diverse group; some had burning compliance needs, some were interested in better data quality, some needed data governance, and some needed a strategy for maturing their operations. They all had three things in common. They:

• Needed a formal, written strategy
• Felt like they knew what they wanted to do, but
• Hadn’t been able to find an easy way to capture their ideas in a structured document.

We tested formats together and then I had the chance to field-test the results. A client needed a detailed, documented strategy—fast—with a one-page executive summary. Three members of the team and I constructed a 20-plus page strategy in a single day. Yay!

Many of you may find yourself in this situation. You’ll recommend an approach to dealing with a compliance requirement. It will be obvious to you, but perhaps not to everyone else. Here’s a fill-in-the-blanks data strategy outline that might help you start a first draft.

Executive Summary (One Page)

• 1st heading: “The primary information problem we’re trying to solve” followed by a single-sentence description of the problem and a paragraph putting it in context.
• 2nd heading: “Root causes” followed by bullet points describing the conditions leading to the problem.
• 3rd heading: “Primary objectives” followed by a list of conditions that should be met by this strategy. If satisfied, these objectives should solve or reduce the impact of the problem within the stated context.
• 4th heading: “Strategy elements” followed by three to 12 key activity threads.

Long Version

This will be the executive summary plus a section on each of the strategy elements. For each element, you’ll zero in on the strategy, being more specific about the issues, conditions, and root causes this strategy element is addressing, specific objectives, and success criteria. You’ll also note cross-dependencies between this element and business processes, projects, ongoing business practices, different data management disciplines, technology strategies, and existing/planned applications and data stores. You’ll finish by clearly describing alignment requirements with project management, information security, privacy, access management, data governance, and compliance.

What should those three to 12 elements be? Most of them will be the “usual suspects”—making adjustments to 1) organizational bodies, 2) specific roles and responsibilities, 3) decision rights, 4) policies/standards/rules, 5) processes, 6) technology controls, 7) automated/manual process controls, 8) data storage, movement, or transformation, or 9) monitoring/reporting/statusing.

The others? Well, those are your secret sauce, your career-making ideas. You’ll know what they are when the time is right.

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If you’re planning an upgrade to DB2 10 for z/OS, you’ll want to be aware of the changes to DB2’s subsystem initialization parameters, better known as DSNZPARM members. The keywords on this set of macros control many aspects of DB2’s behavior. This article reviews DSNZPARM changes in DB2 10. DSNZPARMs should be reviewed as part of your upgrade plan to avoid any surprises with DB2’s behavior.

For insight on DSNZPARMs, how changes are made and implemented to them, and their evolution before DB2 10, see these previous z/Journal articles:

- “Just the Good This Time: More DB2 DSNZPARM Keywords” (www.mainframezone.com/applications-and-databases/just-the-good-this-time-more-db2-dsnzp parm-keywords).

**Keyword Categories**

DSNZPARM keywords fall into three categories: externalized, hidden, and opaque:

- **Externalized**: Described in the Installation Guide (see sidebar), these keywords are by far the most documented. You’re notified if they’re added, deprecated or removed from DB2, their defaults change, or value characteristics are altered. When just about anything happens to an externalized DSNZPARM, it’s documented somewhere.
- **Hidden**: These DSNZPARMs are hidden for a reason; no one should be messing around with them without direction from IBM. They’re often put in place as service aids and can help DB2 Level 2 support gather information about a problem or devise a short-term solution until the Authorized Program Analysis Report (APAR) is closed and a Program Temporary Fix (PTF) is prepared.
- **Opaque**: Although these keywords aren’t completely documented in the manuals, they aren’t completely hidden, either. The term emerged because more DSNZPARMs were being delivered via APARs, often in the form of switches that enabled or disabled features. These APARs often explained much of the detail around the new DSNZPARM keyword. Like hidden DSNZPARMs, they aren’t meant for general use, but, like an external DSNZPARM, they’re well-documented.

**Deprecated DSNZPARMs**

The following subsystem initialization parameters have
nothing in their future but to someday be removed from DB2:

- **DISABSCL** on DSN6SPRM macro by default (NO) sets SQLWARN1 and SQLWARN5 for non-scrollable cursors on OPEN and ALLOCATE CURSOR. It was introduced in DB2 Version 7 by APAR PQ65622 as an opaque DSNZPARM.

- **OJPERFEH** on DSN6SPRM macro by default (YES) enables several performance enhancements in outer joins. Overriding the default by specifying NO disables the enhancements. Almost always, this value should be set to YES. This opaque parameter was introduced using a hidden DSNZPARM in DB2 V5 and later updated to an opaque DSNZPARM. APARs PQ29780 and PQ48485 have additional details.

- **OPTIOWGT** on macro DSN6SPRM enables support for an improved formula for balancing the costs of I/O and CPU speeds. This support was added in DB2 9 via APAR PK61277. ENABLE is the default as of APAR PK75643.

- **OPTIXIO** on macro DSN6SPRM is an opaque parameter that can improve I/O with significantly less sensitivity to buffer pool and object size when the current default (ON) is used. This function was delivered in DB2 V8 via APAR PK12803; the default was changed to ON with APAR PK26613.

- **PTCDIO**, an opaque parameter on macro DSN6SPRM, is a switch to turn off a change made to determine the cost of using an index by APAR PQ86763 in DB2 V7. The actual DSNZPARM parameter was added via APAR PQ97866 with a default of OFF. You shouldn’t enable this parameter without guidance from IBM support.

- **RETVLCFK** is an opaque parameter on macro DSN6SPRM. If this parameter is set to its default, NO, VARCHAR data isn’t returned from an index. However, setting this parameter to YES enables index retrieval of VARCHAR data and that data is padded to the full column length. Although improved performance might be realized with index-only access if specifying YES, you would have to ensure all applications could handle the extra trailing characters. If running DB2 9 or later, an alternate solution is to use NOT PADDED indexes. This parameter was introduced in DB2 V5 by APAR PQ10465.

- **SEQCACH** on the macro DSN6SPRM controls whether DB2 prefetch uses sequential access for reading the cache on a 3990 controller. The default in DB2 10, SEQ, prompts use of sequential access. BYPASS tells DB2 prefetch to bypass the cache.

- **SEQPRES** on macro DSN6SPRM affects how long a utility scan leaves the data in the cache. The default value in DB2 10 is YES; this setting leaves DB2 utility
prefetch reads in cache longer.

• **SMSDCFL** and **SMSDCIX** parameters on macro DSN6SPRM support specifying a DFSMS data class for a table space and indexes. The default is a blank string. These parameters were introduced in DB2 V7 by APAR PQ32414. As of DB2 V9 NFM, DATACLAS, MGMTCLAS, and STORCLAS are included as syntax on the SQL statements CREATE/ALTER STOGROUP and should be used rather than the DSNZPARM parameter.

• The **STATCLUS** parameter, also on macro DSN6SPRM, specifies the type of clustering statistics RUNSTATS collects. The default is ENHANCED clustering statistics, which should result in an improved CLUSTERRATIO formula. STATCLUS was added to DB2 V9 on installation panel DSNTIP6 and removed from the install panel in DB2 10, resulting in an opaque parameter.

**Removed DSNZPARGS**

When you upgrade to DB2 10, some DSNZPARGS will be removed from your DB2 subsystem. The following provides two lists of DSNZPARGS—one for a DB2 9 to DB2 10 upgrade and the second for a DB2 V8 to DB2 10 upgrade, listing which subsystem parameters are being removed. Be careful with a skip-level migration because you’re eliminating two sets of DSNZPARGS.

For a DB2 9 to DB2 10 upgrade, these subsystem parameters are removed:

• **EDMBFIT** is no longer needed. Since DB2 V7, the single Environmental Descriptor Manager (EDM) pool was divided into four separate pools. You should use the default, NO, for EDBMFIT and increase the EDM pool size to reduce latch class 24. This decreased the need to use EDBMFIT = YES, eliminating the need for this DSNZPARM.

• **LOGAPSTG** is the log apply buffer.

• **MAX_UTIL_PARTS** was introduced to DB2 V8 and DB2 9 by APAR PK51853 to control the number of compressed partitions LOAD or REORG can process. This subsystem parameter was removed in DB2 10 because the limit restriction was removed.

• **OPTHYBCST** (PK90334), **OPTIXOPREF** (PK68968), and **OPTOIRCPF** (PK89637) introduced optimization enhancements to DB2 V8 and DB2 9; the enhancements were incorporated into DB2 10. The APAR numbers provide details of what each parameter does.

• **PARTKEYU** provides the ability to update the partitioning key; it’s incorporated into DB2 10.

• **PREVALKEEP** was removed in DB2 10 to allow thread re-signon by a different user after COMMIT when NEXTVAL or PREVAL are used.

• **REORG_IGNORE_** when set to YES, used 0 (zero) for PCTFREE and FREEPAGE when data was reloaded into a table space.

• **SJMISSKY** enabled a star join performance enhancement in previous versions; it’s included in DB2 10.

• **XMLTABJPDP** is for an XML optimization enhancement delivered in DB2 9 by APAR PM05664; it’s incorporated in DB2 10; see the APAR to learn more.

A skip-level migration from DB2 V8 to DB2 10 will involve removal of these additional subsystem parameters:

• **DBPROTCL** is no longer supported; the DBPROTOCOL bind option is DRDA by default.

• **MAX_OPT_ELAP** specifies the maximum amount of elapsed time the DB2 optimizer can consume.

• **MORE_UNION_DISTRIBUTION** when set ON, can improve performance of queries using views defined with UNION ALL.

• **RELCURHL** is an option to hold a lock over a commit.

• **STORPROC** is the parameter for creating stored procedures.

• **SUPPRESS_TS_CONV_WARNING** is the option to turn off messages when DB2 converts a table space from index-controlled to table-controlled partitioning.

• **TABLES_JOINED_THRESHOLD** sets a limit (16) on table joins.

These ZPARMs would have been removed in a DB2 V8 to DB2 9 upgrade.

**Changed Defaults**

It’s important to be aware of which subsystem parameter default settings were changed in DB2 10. A failure to specify different options in the DSNZPARG parameters in your Assembler job means you accept the default settings. Consider whether there are benefits to using a different value. To facilitate your planning efforts, we’ve provided the default changes. See Figure 1 if you’re planning a skip-level migration from DB2 V8 to DB2 10.

<table>
<thead>
<tr>
<th>DSNZPARG Macro</th>
<th>Old Value (V9)</th>
<th>New Value (V10)</th>
<th>Install Panel Name</th>
</tr>
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<tbody>
<tr>
<td>BP8K0*</td>
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</table>

Figure 1: Default Changes for a Skip-Level Migration From DB2 V8 to DB2 10
migration from DB2 V8 to DB2 10. Refer to Figure 2 if you’re moving from DB2 9 to DB2 10.

**Changed Maximums**

You should also be aware of changes to maximum values for DSNZPARMs. For example, the big winners in DB2 10 are DSNZPARMs that deal with threads. The maximum number of user threads (CTHREAD), maximum batch threads (IDBACK), maximum foreground threads (IDFORE), and maximum DBATs or distributed threads (MAXDBAT) increased tenfold; CTHREAD, IDFORE, and IDBACK increased from 2,000 to 20,000, and MAXDBAT increased from 1,999 to 19,999.

These four increases are significant because they could reduce the dependency on data sharing. To achieve higher thread counts in previous releases, some users had to take advantage of data sharing. Those users may now be able to reconsider that decision.

MAXOFILR is another DSNZPARM that made a dramatic jump in size; the maximum number of data sets that can be open concurrently for processing Large Object (LOB) file references increased from 2,000 to 20,000.

DSSTIME, the interval in minutes DB2 waits before resetting the data set statistics for online performance monitors, dropped from a maximum of 1,440 to 60 minutes.

CACHEPAC and CACHERAC, the authorization caches for packages and routines, both increased from 5MB to 10MB, essentially doubling in size.

STATIME is the time interval in minutes between statistic records collection. The maximum value dropped from 1,440 to 60 minutes. That’s still a pretty large number, but the default was lowered to one. That’s good news because when statistics are collected at longer time intervals, you can’t report on any interval less than the interval used for collection. Sometimes, statistics collected at a granular interval are necessary to diagnose a performance problem.

STATIME and SYNCVAL, the interval used to sync up your data sharing members, in DB2 10 only apply to IFCIDs 0105, 0106, and 0199. IFCIDs 0001, 0002, 0202, 0217, 0225, and 0230 are now always written at a fixed, one-minute interval; they’re no longer affected by the STATIME value specified.

MONSIZE, the default buffer size used for monitor traces, was increased from 16MB to 64MB. The benefits should be apparent.

**Conclusion**

This article doesn’t cover the many new DSNZPARM keywords added in DB2 10; that will be the basis for a future article. Until then, enjoy your powerful DSNZPARMs. To learn more, visit the DB2 for z/OS Information Center at http://publib.boulder.ibm.com/infocenter/dzichelp/v2r2/index.jsp?topic=/com.ibm.db2z10.doc/db2z_10_prodhome.htm.

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**Leveraging the DB2 Installation Guide**

DB2 has listed some of the DSNZPARM keywords not included on the install panels in the *DB2 Installation Guide*. However, in DB2 9, that information was formalized in its own section called “Subsystem parameters that are not on installation panels” (currently in Chapter 4 in the DB2 9 and DB2 10 publications). This section was significantly enhanced in DB2 10 to include most DSNZPARMs not on the installation panels that could be of interest. As part of your migration to DB2 10, you should review this section to ensure the defaults are what you want and expect. As new opaque DSNZPARM keywords are introduced, they may or may not end up in this section of the documentation. What does appear there is useful and can make it easier to modify DB2.

—WF

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**Table:**

<table>
<thead>
<tr>
<th>DSNZPARM Macro Keyword</th>
<th>Old Value (V9)</th>
<th>New Value (V10)</th>
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</tbody>
</table>

**Figure 2:** Default Changes for Moving From DB2 9 to DB2 10

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Willie Favero
Partitioning Pros and Cons

Before deciding whether or not to use a DB2 partitioned table space, it’s wise to weigh the pros and cons. The following applies to partitioning in general and all types of partitioning, including index-controlled, table-controlled, and universal partition-by-range.

**Advantages of a Partitioned Table Space**

Each partition can be placed on a different disk volume to increase access efficiency. Of course, this is more difficult, if not impossible, to accomplish with RAID storage devices, so this doesn’t generally apply to shops using modern disk storage arrays.

Partitioned table spaces can be used to store large amounts of data. The maximum size of segmented table spaces is 64GB.

START and STOP commands can be issued at the partition level. By stopping only specific partitions, the remaining partitions are available to be accessed, thereby promoting higher availability.

Free space (PCTFREE and FREEPAGE) can be specified at the partition level, enabling the DBA to isolate data “hot spots” to a specific partition and tune accordingly.

Query I/O, CPU, and Sysplex parallelism enable multiple engines to access different partitions in parallel, usually resulting in reduced elapsed time. DB2 can access non-partitioned table spaces in parallel, too, but partitioning can optimize parallelism by removing disk contention.

Table space scans on partitioned table spaces can skip partitions that are excluded based on the query predicates. Skipping entire partitions can improve overall query performance for table space scans.

By mixing clustering and partitioning, you can design to decrease data contention. For example, if the table space will be partitioned by DEPTNO, each department (or range of compatible departments) could be placed in a separate partition. Each range of departments is in a discrete physical data set, thereby reducing inter-departmental contention due to multiple departments co-existing on the same data page.

You can further reduce contention by creating Data Partitioned Secondary Indexes (DPSIs). Prior to V8, some contention remained for data in non-partitioned indexes. Defining a Non-Partitioned Secondary Index (NPSI) on a table in a partitioned table space causes you to lose some of the benefits of partition-level independence for utility operations because access to an NPSI isn’t broken apart by the partitioning scheme.

DB2 creates a separate compression dictionary for each table space partition. Multiple dictionaries tend to cause better overall compression ratios. In addition, it’s more likely the partition-level compression dictionaries can be rebuilt more frequently than non-partitioned dictionaries. Frequent rebuilding of the compression dictionary can lead to a better overall compression ratio.

The REORG, COPY, and RECOVER utilities can execute on table spaces at the partition level. If these utilities are set to execute on partitions instead of on the entire table space, valuable time can be saved by processing only the partitions that need to be reorganized, copied, or recovered. Partition independence and resource serialization further increase the availability of partitions during utility processing.

Modifying partitioning details, changing partition key ranges, and rotating partitions is more flexible than ever with online schema change support.

**Disadvantages of Partitioning**

Only one table can be defined in a partitioned table space. This isn’t really a disadvantage, merely a limitation.

Prior to DB2 V8, updating the partitioning key was problematic. Before the limit key values could be updated, the PARTKEYU DSNZPARM parameter had to be set to YES. And if updates were allowed, it was likely they ran slowly. If PARTKEYU was set to NO, you had to DELETE the row and then re-INSERT it to change a value in a column of a partitioning key. But things have changed. As of V8, a partitioning index is no longer required. Furthermore, any partitioning key can be updated without worrying about the PARTKEYU parameter, which is no longer even supported.

The range of key values for which data will be inserted into the table should be known and stable before you create and define the limit keys for the partitioning index. These ranges should distribute the data throughout the partitions according to the access needs of the applications using the data. If you provide a stop-gap partition to catch all the values lower (or higher) than the defined range, monitor that partition to ensure it doesn’t grow dramatically or cause performance problems if it’s smaller or larger than most other partitions.

**Summary**

More and more of your DB2 table spaces will be partitioned because of the advent of universal table spaces and the deprecation of support for simple table spaces. Learn the benefits of partitioning and use them to your advantage.
RATIONAL DEVELOPER FOR
SYSTEM Z VERSION 8.0:

HARDENING THE GROOVE

By Jonathan Sayles

Rational Developer for System z (RDz), IBM’s z/OS Eclipse-based Integrated Development Environment (IDE), has been in widespread use for seven years. In that time, it’s simplified and improved the professional lives of z/OS programmers doing traditional application maintenance and enterprise modernization. It has made developers more productive and saved their companies a lot of money.

It did all that by streamlining and refactoring arcane z/OS development processes into structured, efficient analysis, editing and testing operations, sustained by modern Graphical User Interface (GUI) tools (Eclipse), wizards, and >
RDz has also empowered veteran Time Share Option (TSO) developers through faithful Interactive System Productivity Facility (ISPF) emulation and exceptional tooling for tough, everyday z/OS software maintenance and support tasks such as data flow analysis, control flow analysis, etc. Through its powerful, yet simple GUI tools, RDz has refurbished the skillsets of veteran TSO developers, growing them into effective, contributing project staff for today’s leading-edge application requirements such as Service-Oriented Architecture (SOA), Java 2 Enterprise Edition Component Architecture, Unified Modeling Language, etc.

In release after release, by complementing your trusted, reliable z/OS technologies and integrating best practices into your development, RDz has delivered incremental yet sizable benefits. It has even addressed more challenging data-file and database offloading, often such a time-consuming, complex, and daunting premise that it simply isn’t practical.

What makes RDz the preferred IDE for z/OS enterprise computing? Either you already know because you use RDz, or you’re probably glued to the same TSO/ISPF green-screen development facility that past generations used for PL/I, COBOL, and Assembler work. Back in the '70s, ISPF tools were state of the art. It certainly is a testimony to their quality and relevance (and longevity) that they’re still adequate for many of today’s tasks. However, the problem is that adequate is, well, no longer adequate.

Today’s business climate demands tools that provide functionality and coverage for modern requirements such as wizards for developing XML parsing routines, for developing and testing Web services and stored procedures, etc. It’s even more critical now that software tools do the best possible job of shortening the maintenance, support, and development lifecycles by eliminating routine tasks, significantly lowering the number of keystrokes needed, and making better use of screen “real estate” than the 3270 interface—which 20 years ago crested the famous technology innovation “S” curve and today simply can’t.

The “Groove”

The dedicated wizards in RDz enable you to reduce the amount of typing you do, and Eclipse-based tools let you make better use of screen real estate. RDz is a good choice for business application development, as it enables you to support and maintain existing applications and build and test future applications. (Note: For a more detailed understanding of the product, screenshots are available from the author; see contact information at the end of the article.)

Exactly how much groove RDz has was established by IBM in an IDE efficiency benchmark done at the beginning of 2010, with RDz V7.6.1 compared against ISPF Version 6 across a spectrum of roughly 100 traditional z/OS application maintenance tasks. (A copy of these results is available at http://mfzne.com/oudxz.) With V8, RDz hardens the groove, taking the established productivity and ROI benefits to new levels in three areas:

- Product installation and enterprise rollout management
- New (or enhanced) developer productivity features
- Code management and restructuring.

**Product Installation and Enterprise Rollout Management**

Installing RDz client has always been straightforward, managed via automated software configuration tools such as IBM’s Installation Manager. However, RDz server is a mainframe process, and to integrate with your company’s host systems’ unique infrastructure, security and software taxonomy, it must be installed and configured by systems programmers—as you would require of any product that runs on z/OS.

With every release, the IBM/Rational development team has been fine-tuning the documentation and recently added ISPF Host-Install panels to simplify and expedite this process. This release includes considerable improvements in this area.

As you propagate the RDz client across a development organization, you may find that it would be nice to bring both consistency and economies of scale to bear on some of the developer preferences and system definitions. RDz V8 provides options to define and share a single set of Eclipse/system definitions across a team. These definitions include:

- Eclipse preferences that include options for everything from look and feel to connections and behavior (i.e., how many rows to be downloaded in one operation for DB2 table editing, etc.)
- Remote system connections
- z/OS file system mappings that let you associate file extensions with data set patterns
- Property groups to define compilation data sets and other program settings.

Beginning in V8, you can configure RDz to automatically distribute product updates and updates to configuration files, preference settings, and remote system connections when client workstations connect to a remote system. RDz can distribute product installation and product configuration updates.

**Developer Productivity Features**

Here are a few of the many new productivity features:

**Fast data set retrieval**: For developers used to ISPF-style data set access, RDz V8 has extended its existing smart/remote data set access features with a retrieve data set option that provides immediate access to your files—similar to ISPF’s “DSLIST” panel (=3.4). This feature remembers which files you’ve opened and provides a combo-box populated link back to the data sets for even easier access. This feature also provides fast and combo-box-based retrieval for batch job output in JES.
Content assist for embedded SQL statements: The System z LPEX, COBOL, and PL/I editors now provide content assist and improved real-time syntax checking for EXEC SQL statements in COBOL and PL/I programs. When a database connection is available, the proposals provided account for the actual database elements being used (referenced) by the program, including table names, columns, and schemas.

File compare: An enhanced RDz file compare feature better compares the content of remote MVS files, including versions in your source code management system. The new compare emphasizes syntax highlighted sources and lets you drill down into the sections. The file compare works with Common Access Repository Manager (CARMA), CA Endevor, Rational Team Concert, ClearCase, and basic sequential files and data set members.

BMS editor: Functionality includes the ability to set auxiliary alignment hairlines for easier and more precise visual editing, grouping, moving, and aligning lists of controls. This enhancement also added guides to the design page. These guides can be created vertically or horizontally by simply clicking on the vertical or horizontal ruler. The fields can then be attached to these guides so they can be aligned. The guides can also be moved along the design page, which causes all the fields attached to the guide to move along with it.

C/C++ editing support: The following improvements were made:

- Support for the xlc compiler was added to the target environments for z/OS UNIX subprojects.
- Default build option sets for the xlc compiler are available for both debug and non-debug compilation.
- Show dependencies support was added to MVS subprojects for C/C++ files to ensure all necessary files are available to offline projects.
- The System z LPEX editor now supports Ctrl+O for quick outline when using the HLAsm and C/C++ parsers.
- The Remote C/C++ editor and System z LPEX editor now support source code formatting (Ctrl+F) for C/C++ files. You can define formatting options or use one of the pre-configured code styles to make C/C++ code easier to read.
- The Remote makefile editor supports open include to open nested makefiles.

COBOL and PL/I editor: New COBOL and PL/I editors are available and are built off the Eclipse framework, in addition to the existing LPEX editor framework. These new editors offer an extensible template mechanism and faster content-assist and real-time parsing. The new editors look and behave like Eclipse-Java style editors. They’re aimed at simplifying the onramp to COBOL and PL/I for the next generation of developers, who are used to the look and feel of Java-Eclipse. You can share preferences between the LPEX and new editors.

RDz overall usage-simplification enhancements: Substantial menu option reordering, wizard simplification, and more hot keys improve productivity and shorten the learning curve. Included are “run-time-focused options” where, based on the property page assigned to your project, IMS or CICS options may or may not appear in menus.

Measured improvement integration: V8 includes techniques that let you track RDz events such as local syntax checks. This can help you calculate productivity improvements and MIPS savings by performing development functions locally with RDz.

Remote Systems Explorer (RSE) enhancements: RSE is used to access mainframe resources through a windows development metaphor (folders, drag and drop, wizard functionality, etc.). New in V8:

- You can copy a load module from one library to another within the same remote system.
- You can add menus and actions created by using Menu Manager to the remote systems view.
- The properties view for the MVS files subsystem indicates whether SSL is in use for the remote system connection.
- The remote index search view has been re-engineered and extended for increased usability.
- Shortcut keys were added for many zIDE functions to improve usability and efficiency.
- A new tutorial teaches you how to assemble, link, and compile the Global Auto Mart sample, one of the sample applications delivered with RDz.

Menu Manager provides a simple method for integrating useful mainframe processes into RDz. In V8, Menu Manager supports menu creation for Linux on System z projects and z/OS UNIX files in RSE.

Projects and subprojects: You can associate an MVS subproject with a particular run-time environment so run-time-specific actions are appropriately enabled or disabled for the subproject. Batch, CICS, and IMS are supported run-time environments. A new setting in the z/OS system configuration file lets you disable the delete command on the pop-up menu for MVS subprojects. This configuration setting helps prevent users from inadvertently deleting remote system resources when their intention is to only remove a data set from a subproject.

Common Access Repository Manager: CARMA is used to integrate RDz with mainframe source control management systems such as CA Endevor, Serena ChangeMan, CA Panvalet, CA Librarian, etc. In RDz V8.0.1, new tutorials were added to the documentation for CARMA. These tutorials demonstrate customizations users can add by creating plug-ins that use various extension points. In particular, two exercises showcase the three new extension points for CARMA users: actionValidator,
parameterValidator, and customActionControl.

CA Endevor support: Related to CARMA-access but specific to support for CA Endevor, a new simple DISPLAY (view) wizard is now available. Also new for CA Endevor is sorting source members by type and hiding empty subsystems/types.

Compiled language debugger: In the breakpoints view, you can import and export breakpoints. In the debug editor, when you hover over the name of a variable, the compiled language debugger displays a small window and the structure of the variable. For variables that have a complex structure, the window displays the structure as a tree with nodes you can collapse and expand. The help for the compiled language debugger was updated to include a new “getting started” topic. Quick access is available in the Debug Tool for z/OS User’s Guide and Debug Tool for z/OS Reference and Messages (available at www-01.ibm.com/software/awdtools/debugtool/library/?S_CMP=rnav).

The Enterprise Service Tools component contains these new features:

- For both single-service projects and service-flow projects, the single-service project tools and the service-flow project tools run on the Linux operating system, with a few limitations.
- For single-service projects, a new top-down feature generates an Enterprise PL/I-based IMS Web service provider program supporting multiple operations from a single, multi-operation Web Services Description Language (WSDL) file.
- Along with this feature, four new APIs were introduced to simplify the task of sending and receiving the SOAP header language structure in the IMS message queue (IRZQGETS, IRZQSETS, IRZXGETS, IRZXSETS).

Related to the Enterprise PL/I for compiled conversion feature are these enhancements in mapping XML to Enterprise PL/I:

- The type xsd:boolean is mapped to PL/I BIT(1) ALIGNED.
- The types xsd:float and xsd:double are mapped to PL/I IEEE DFP (decimal floating point).
- Enterprise PL/I IEEE decimal floating point format is supported.

For PL/I, the maximum size of the buffer (XML structure) that a generated conversion program can use for sending or receiving data is increased to 1GB - 1 (that is, 230 - 1 or 1,073,741,823 bytes).

The performance of generated XML to COBOL conversion programs is improved.

The SCLM Developer Toolkit provides a set of RDz features and facilities for integrating your RDz desktop client with your mainframe Software Configuration and Library Management (SCLM) facility. V8 enhancements include:

- Additional member account information is now displayed in the properties window when you click on a member residing in the SCLM views. This additional and reformatted account information is also available when you right-click on a member and select “View/refresh SCLM status.”
- In the SCLM member view, you can now tailor your own display preferences with additional key account information.
- Performance improvements were made on various function requests, especially on “populate project filter view,” resulting in quicker response times.
- In the SCLM repository view, you can tailor your view. This may help with ease of identifying project filter selection with multiple project views.

Linux environment support: zlDE contains new features and provides support for Linux platforms. RDz now provides client and server components that operate on:

- SuSE Linux Enterprise Desktop (SLED) 10 and 11 (32-bit)
- Red Hat Desktop Linux 5 and 6
- Red Hat Enterprise Linux (RHEL) 5 and 6 (only 32-bit)
- SuSE Linux Enterprise Server (SLES) 10 and 11 (only 32-bit).

Code Management and Restructuring

Another new RDz V8 editor feature provides the ability to select contiguous lines of source code and direct RDz to build a paragraph out of the code. This structured programming and modularization direction is a major step toward deep support for business rules mining out of existing legacy production application logic.

Learn More

Now that you get RDz’s groove, you’re likely looking forward to exploring the product. To get started and learn more, you can visit the IBM Website and download and install a 60-day trial copy of RDz or take a test drive of RDz from the IBM/Rational Sandbox. You can visit the RDz landing page on IBM’s developerWorks site, read the RDz white papers and ask questions at the COBOL Café, or visit the IBM Education Assistant site. You can even get certified on RDz, obtain RDz distance learning or sign up for RDz classroom education, self-study, or find an RDz public class near you from IBM/Rational.
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Recently, I gave a talk on “hybrid mainframing,” which raised a few eyebrows. A few folks were confused regarding my use of the term hybrid.

Was I borrowing the term from trendy automobile commercials? You know the ones, where electric car owners smugly explain how they’re reducing their carbon footprint by abandoning gasoline in favor of dirty electrical power (40 percent of electricity is generated by dirty coal, after all). Was I talking about some sort of new application for chimeric gene splicing; taking strands of DNA from different plants or animals and combining them to produce a Frankenstein chicken that produces more eggs, or a Syfy Channel strawberry plant monster that produces much more fruit, while inadvertently changing insects into behemoths?

I tried to assuage their concerns by explaining what I meant this way: First, everything changes. When I first started my career, we called what we did “data processing,” not “information technology.” The former connotes a useful work process that’s immediately understood; we crunch numbers to provide information. The latter expression describes a domain of interest; there’s no such thing as information “technologizing.” IT was a hybrid term that described less what we did, than what we did it with. That was an application of hybridization gone terribly wrong. No wonder senior management can’t figure out whether IT matters!

My meaning was different. It referred to a need to innovate to keep mainframing viable and relevant. I pointed to the four problems that always seem to creep into discussions and articles about mainframes:

- The mainframer confronts a proliferation of software utilities with too little time to master any of them and too few fingers to operate them all.
- Mainframe staff sizes have shrunken and domain boundaries that used to exist have blurred substantially.
- New workload from the distributed side of the house is finding its way into mainframe LPARs or is being connected for centralized mainframe management and control on zEnterprise blade servers.
- New mainframers aren’t being produced in numbers sufficient to replace the current crop of aging Big Iron sysprogs, DBAs, and admins.

To cope with these challenges, we need to start innovating—which, of course, translates to borrowing concepts, processes, and technologies from anywhere we can to improve the mainframe experience. I’m not just talking about bolting on a pretty graphical user interface over a bland, text-based user interface that’s “just so day before yesterday.” This has been tried before.

What’s really needed is a workspace where we can pull together the disparate and non-integrated utility apps we’re using to handle both traditional and new workloads. Also, we need to capture what we do into structured workflows that will help us document our new “blended roles” more readily and transfer knowledge more effectively to the new mainframer. A lot of folks are working on this right now—from IBM to CA Technologies, BMC Software, and a lot of the other advertisers in this magazine.

The good news is there seems to be a growing recognition among mainframe software vendors I talk to that hybridization is the only way. We can disparage distributed and mobile computing all we want, but just look at iPhone and iPad sales over the past year! Clearly, there’s something to simplifying the technology experience overall, and nowhere is it needed more than in the mainframe world.

I just had a briefing on CA Technologies’ latest version of Mainframe Chorus, just to mention one example. One thing that jumped out at me was an easy-to-overlook feature that operators use to organize the workflows associated with tasks they perform. Behind this innocuous tab will ultimately reside a new definition of the role of the DBA (and later the storage administrator, the security administrator, etc.), customized for the company where the person works.

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