z/VSE: 45 Years of Progress

The New Frontier for Cryptography on Linux on System z
This z/OS Is for You! A Look at z/OS V1.12
Diagnosing CICS Problems Using No-Charge Supplied Facilities
Extending Rexx for CICS on z/VSE
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First Customer Shipments of zEnterprise Begin

As I write this, I’m well aware that in just two days (Sept. 10, 2010), IBM will begin shipping its powerful new zEnterprise 196 mainframe to customers. What’s most fascinating is the fact that powering the zEnterprise 196 is the world’s fastest microprocessor at 5.2 GHz.

IBM technicians spent more than three years collaborating with some of IBM’s very largest customers around the world and more than $1.5 billion in research and development to create the new zEnterprise technology. By way of comparison, the new zEnterprise System provides 60 percent more capacity while using approximately the same amount of electricity as its immediate predecessor, the System z10.

According to IBM: “From a performance standpoint, the zEnterprise 196 system is the most powerful commercial IBM system ever. The core server in the zEnterprise 196 system contains 96 of the world’s fastest, most powerful micro-processors, capable of executing more than 50 billion instructions per second. That’s roughly 17,000 times more instructions than the Model 91, the high-end of IBM’s popular System/360 family, could execute in 1970.”

The zEnterprise 196’s blazing processor speed is necessary for today’s businesses, such as banks and retailers, which have demands for huge workloads that will only explode over the next five years to handle the tremendous increase in data-intensive business transactions. And since the 50 largest banks in the world and 24 of the largest 27 retailers in the world now rely on IBM mainframe computer systems, the new zEnterprise System should be shipping just in time.

I hope you enjoy this issue of z/Journal.


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(z/Journal ISSN 1551-8191)
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System z customers run some of the most secure workloads in the world. To architect these secure workloads, they must have the building blocks necessary to integrate their business requirements into an end-to-end secure solution. This requires hardware and software to interact flawlessly to make use of the latest technologies available to System z.

Such solutions may cross from an application server in one Logical Partition (LPAR) to a data server in a separate LPAR. They may run locally, >
“Sure, I’ve done some dumb things...

...but in spite of the hype, buying the wrong performance monitor for our IBM System z wasn’t one of them!”

I knew when it was time to get performance and capacity planning tools for z/VM and Linux that we would need a solution which installed in minutes; not days or weeks.

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crossing multiple security zones—as seen in a classic Demilitarized Zone (DMZ)—or span the globe, moving millions of dollars in currency from one international bank to another. One thing is common in all these cases: A security policy is an integral part of the solution and is an extension or expression of the intellectual property that separates one solution from another implemented and deployed at a different customer site. Both applications may ultimately provide the same general functionality, but the security path is likely different.

A good security policy includes many disciplines and elements that must come together to provide a secure solution:

- Networking requirements
- Deployment of firewalls and intrusion detection or prevention systems
- Monitoring and auditing
- Authentication requirements
- Authorization rules for access control.

Various regulations, such as the Payment Card Industry Data Security Standard (PCI DSS) and Health Information Portability and Accountability Act (HIPPA), will also play important roles in guiding the security policy.

Data is often thought of as a client’s most important asset, and it must be protected while at rest (e.g., stored on a hard drive or backup media), in transit (e.g., while in-flight over the Internet or intranet), and in use (e.g., while processing a credit card transaction). Cryptography, another critical element of the security policy, often provides this protection. The business and security requirements of each application should influence where and when to apply cryptography and which algorithms to use.

Effective use of cryptography on System z exploits hardware cryptographic accelerators. In some cases, secure functions require data to be protected at the application level, meaning the data must not be stored in memory in an unencrypted state. In other cases, cryptographic algorithms can’t be performed in software due to use of secure cryptographic keys. By definition, secure keys must not be stored in memory unencrypted. Doing so weakens the security of the end-to-end cryptography and the integrity of the solution. Advances in cryptographic hardware are one of the compelling factors that make moving to newer System z hardware releases more attractive.

New Frontiers for Secure Key

The IBM CEX3C Common Cryptographic Architecture (CCA) Support Program for Linux on System z 4.0.0 (the CCA host library) works with a CryptoExpress2 (CEX2C) or CryptoExpress3 (CEX3C) PCI card configured as a co-processor to provide applications with the secure cryptographic algorithms needed to meet the most rigorous end-to-end enterprise solutions. Together, the CCA host library and crypto card provide robust functionality that can be integrated into custom applications to meet the cryptographic needs of traditional industries such as banking and finance, insurance, and government. Any industry or solution with security needs that requires a Hardware Security Module (HSM) can now turn to Linux on System z with the CCA host library and a CEX2C or CEX3C to meet their needs.

This new version of the CCA host library has been greatly enhanced and provides access to new functions, new hardware, and a new programming language. The new library can recognize a CEX2C or CEX3C card assigned to a Linux image or guest and provide applications running in that image access to all the functions available from that hardware generation.

Support for new algorithms and expanded features and functions was a priority with the new CCA host library. The addition of Advanced Encryption Standard (AES) support provides applications with the next generation of symmetric cryptographic algorithm needed to meet challenging solution requirements. Functional improvements include new verbs, such as control vector translate, cryptographic variable encipher, random number generate long, symmetric algorithm decipher and more, which have been added to extend the capability and utility of secure key applications deployed on Linux on System z. In addition, existing verbs now have extended parameter lists to more closely align with CEX3C capabilities and z/OS functionality, using more keywords and parameter choices than previously available to Linux on System z.

Requirements vary across applications; some will require Federal Information Processing Standards (FIPS)-certified crypto functions for processing highly sensitive credit card data. Other application requirements might make performance a higher priority. On System z10 or zEnterprise hardware, the new CCA host library supports protected key CPACF instructions as an alternative for applications running on Linux on System z. Toggling a simple environment variable redirects cryptographic operations to protected key instructions, providing higher throughput when needed. Algorithms such as TDES and AES can be performed in the traditional secure, tamper-resistant confines of the CEX3C card or via the new high-performance protected key CPACF instruction, depending on application requirements.

When CCA was first released, it didn’t support Java. As use increased, this requirement quickly rose in importance due to various secure key requirements for end-to-end solutions, spurred by regulatory requirements and the ever-growing consolidation of distributed workloads on System z. The use of Java on Linux on System z is now more common, Java skills are more readily available, and Linux on System z applications requiring sophisticated cryptography can now use the CCA host library via the new Java Native Interface (JNI). If the function is available to an application written in C, it’s available from JNI, too, including all the keywords and key types.
Automatically Harden the Security Configuration of Your Linux Virtual Machines

Linux virtual servers on System z leverage comprehensive virtualization technology and intelligent workload management. But improper, inconsistent Linux virtual machine (VM) security configurations can leave you vulnerable. Security Blanket® automatically hardens the security configurations of your Red Hat® Enterprise Linux VMs on System z, saving time, money, and providing peace of mind.

Try it for free at www.trustedcs.com/SecurityBlanket or call us at 1-866-230-1317 for more information.
The CCA host library is available free at http://ibm.com/security/cryptocards/; select PCIe Cryptographic Coprocessor from the navigation bar on the left side of the page for more information or to download the CCA package. The host library provides the tools necessary to manage secure master keys and build applications in C or Java that can exploit the diverse array of cryptographic functions available with CEX2C and CEX3C.

A Peek Under the Covers

All these new features are great, but you have to jump in and move some bits and bytes around. Building successful solutions requires understanding what the application must do from a cryptographic standpoint and creating a specification that identifies the algorithms and functions required. In addition, you must determine how keys will be managed in accordance with the security policy. Then it's a simple matter of picking the right verb and parameters to create the crypto building blocks needed. The CCA verbs are similar in format, so crypto components can be built quickly. The following explains how to implement one of the verbs based on a specification.

The Java entry points for each verb are similar to the C entry points and are distinguished by adding the letter “J” to the C entry point name. For example, CSNBKGN is the C entry point for the key generate verb, and CSNBKGNJ is the Java entry point for the same verb. Figures 1 and 2 show simple examples that generate a single length data key. These examples aren't complete solutions or programming style guides; they're code samples for simple key generate verbs in C and Java.

Incorporating cryptography into an application can be a daunting task, but hopefully these examples show how simple it can be when each part is built step by step. The examples generate a single length key (an 8-byte value) which can be used later to encrypt a data string using the Data Encryption Standard (DES) algorithm. The key isn't imported or exported; it's generated and used as an operational key only. It may be useful to download the Programmer's Guide from www-03.ibm.com/security/cryptocards/; the keywords are described on pages 132 to 139.

In the examples, an operational key (keyword: OP) is needed. Other options, such as a pair of operational keys (keyword: OPOP), some other pair of keys

```java
public class des {
    public static void main (String args[]) {
        byte [] exitData   = new byte [4];
        byte [] key_form   = new byte [4];
        byte [] key_length = new byte [8];
        byte [] key_type_1 = new byte [8];
        byte [] key_type_2 = new byte [8];
        byte [] kek_key_id_1 = new byte [64];
        byte [] des_key_id_1 = new byte [64];
        byte [] des_key_id_2 = new byte [64];

        // Set up initial values for Key Generate call
        hikmNativeInteger returnCode = new hikmNativeInteger(0);
        hikmNativeInteger reasonCode = new hikmNativeInteger(0);
        hikmNativeInteger exitDataLength = new hikmNativeInteger(0);
        hikmNativeInteger key_form = new String("DATA ").getBytes();
        hikmNativeInteger key_length = new String("SINGLE ").getBytes();
        hikmNativeInteger key_type_1 = new String("OP ").getBytes();
        hikmNativeInteger key_type_2 = new String("DATA ").getBytes();
        hikmNativeInteger kek_key_id_1 = new byte [64];
        hikmNativeInteger des_key_id_1 = new byte [64];
        hikmNativeInteger des_key_id_2 = new byte [64];

        // Generate an operational key
        CSNBKGNJ(returnCode, reasonCode, exitDataLength, exitData,
                  key_form, key_length, key_type_1, key_type_2,
                  kek_key_id_1, kek_key_id_2, des_key_id_1, des_key_id_2);

        // Check the return/reason codes and terminate if there is an error.
        if (returnCode != 0 || reasonCode != 0) {
            System.out.println ("Key Generate failed.");
            System.out.println ("reason_code = %ld.", reason_code);
            System.out.println ("return_code = %ld, ", return_code);
            if (return_code != 0 || reason_code != 0) {
                System.out.println ("Key Generate failed.");
            } /* end main */

        } /* end main */
    }
}
```

Figure 1: Code Example for the Key Generate Verb

```java
public class des {
    public static void main (String args[]) {
        byte [] exitData   = new byte [4];
        byte [] key_form   = new byte [4];
        byte [] key_length = new byte [8];
        byte [] key_type_1 = new byte [8];
        byte [] key_type_2 = new byte [8];
        byte [] des_key_id_1 = new byte [64];
        byte [] des_key_id_2 = new byte [64];

        // Set up initial values for Key Generate call
        hikmNativeInteger returnCode   = new hikmNativeInteger(0);
        hikmNativeInteger reasonCode   = new hikmNativeInteger(0);
        hikmNativeInteger exitDataLength = new hikmNativeInteger(0);
        hikmNativeInteger key_form = new String("DATA ").getBytes();
        hikmNativeInteger key_length = new String("SINGLE ").getBytes();
        hikmNativeInteger key_type_1 = new String("OP ").getBytes();
        hikmNativeInteger key_type_2 = new String("DATA ").getBytes();

        // Generate an operational key
        NEW HIKM(returnCode, reasonCode, exitDataLength, exitData,
                 key_form, key_length, key_type_1, key_type_2,
                 kek_key_id_1, kek_key_id_2, des_key_id_1, des_key_id_2);

        // Check the return/reason codes and terminate if there is an error.
        if (returnCode != 0 || reasonCode != 0) {
            System.out.println ("Key Generate Failed.");
            System.out.println ("returnCode = " + returnCode + "; reasonCode = " + reasonCode);
        } else {
            System.out.println ("Key Generated successfully.");
        }
    }
}
```

Figure 2: Java Code Example for the Key Generate Verb
Stretch Your Network Visibility. And Your Budget.
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VNAC VIP

One painless way to reduce expenses is to eliminate little-used legacy products such as NetView™ and NetMaster™ for SNA, then replace them with SDS’s new VitalSigns software: VitalSigns for Network Automation and Control and VitalSigns for IP.

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Managing the Key

As applications running on Linux on System z generate requirements for using secure key functionality, the need for key management must be addressed. This raises two separate issues. First, the keys the application uses must be managed over the life of the application, taking into consideration the persistence requirements of the keys for the application or end-to-end solution. Second, the master keys the card uses must be part of a rigorous security policy to ensure data is available when needed. This includes managing encrypted data across master key changes and any requirements to access encrypted data that persists over time, such as backup tapes. If a process isn’t in place, archived data may be useless after master keys are changed. The application key(s) must be part of the application specification; master key management must be part of the enterprise security policy. The CCA solution provides an enterprise with three key management options. Enterprises should consider their environment and existing security policy when selecting one of the options.

The master keys can be managed as follows:

1. **IBM’s Trusted Key Entry (TKE) workstation** provides a robust, remote solution that can be used to manage crypto domains on multiple cards across many separate System z environments. This remote solution is a priced product.
2. An existing z/OS environment can be used to manage the keys stored in a domain. The crypto card can be assigned to z/OS; the keys can be loaded using an existing security policy. Then, the crypto domain can be reassigned to a Linux on System z environment for use.

The Big Picture

Figure 3 shows how the various hardware, operating system, and software components fit to make a secure solution using the CCA host library. The hardware is shown in the three gray boxes at the bottom of the diagram. To communicate with the CEX2C or CEX3C cards, the Linux kernel uses a device driver, pictured in blue. The new CCA host library, identified in green, is where the hardware comes together to decide, based on the application requirements and configuration, which interface to use. Key management is also shown in green and must be addressed early in the application specification since it’s an integral part of the solution. Finally, sitting on top of the CCA host library at the top of the diagram is the application, shown in yellow. There can be one application or many applications, written in C or Java, that will bring together the business logic that becomes the end-to-end vendor or client solution.

This release brings some exciting new enhancements, including new language support, new hardware support, and new functions. If you’re interested in cryptography on Linux on System z, download the Programmer’s Guide and explore the expanded set of functions. Give Crypto and CCA a try on Linux on System z. 

Peter Spera is a senior software engineer with IBM Corp. Although he is focused on security for Linux on the System z platform, he’s also involved with other areas such as system integrity and vulnerability reporting for System z.

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What Is a Mainframer?

When I first started working on the mainframe as a CICS systems programmer in 1987, the mainframe had already been around for 23 years and had a well-established culture surrounding it. In fact, the culture was actually older than the mainframe itself, having begun to self-assemble around the time of the emergence of business computers in the ’50s. One of the first significant manifestations of its existence was the arrival of SHARE in 1955 in response to the IBM 701. Consequently, much of the pre-existing culture of the folks who first joined SHARE became foundational to the mainframe culture.

A strict sense of responsibility and a dogged pursuit of solutions to very challenging technical problems became a hallmark of this culture. At the same time, although very technically focused, mainframers have always been business people. No matter how deeply buried we are in the technology we support, it’s inescapable. Corporate culture, bottom line, departmental politics: It’s all part of the world of the mainframer. In that context, over the past 46 years, the various roles on the mainframe have emerged, built on this basic culture, and added its own facets.

So, in June 1987, after spending four years at the university learning about UNIX and PCs, I came face-to-face with a technology and culture that were completely different from anything I’d ever experienced before.

Among the first things I learned about were 3270-type terminals, 80-column-wide text members in partitioned data sets, 132-column-wide printouts (actually, 133 if you counted carriage control), 44-character, all-uppercase file names, and controllers that took everything you typed on your terminal and sent it all at once to the mainframe when you hit Enter. I also learned about the Reset key, or, as one of my colleagues once labeled it, the “I’m sorry” key, because if you typed when or where you weren’t supposed to, you weren’t allowed to type any further until you hit this special key to apologize for doing it wrong.

I also learned the culture, including just how careful you had to be before changing anything. It didn’t take long for change control to become a standard part of my existence.

That was half the mainframe’s lifetime ago, and many of the generation I learned the mainframe culture from are still keeping the mainframe running today. They’re also encountering a growing number of new mainframers who are ready to learn all about the technology and culture.

What will make this new generation “mainframers”? For the first time, I’d say it won’t be having to work with technology that seems obscure to anyone not steeped in it, thanks to the new, leading-edge graphical workspaces that are now becoming available. Instead, I’d say it’s that culture of scrupulous responsibility, of being a business person and not merely a technologist, that will define future mainframers. In fact, let me be the first to suggest that, ideally, “mainframer” may become a word something like “gentleman,” which used to designate a particular role, but came to represent the conscientious and considerate behavior associated with that role, no matter who played it.

This is particularly relevant with the merging of platforms implicit in IBM’s recently announced zEnterprise server. Suddenly, the “traditional” mainframer, who has likely already learned UNIX with USS, PCs with terminal emulators, and often Linux (both PC and mainframe versions), will have the opportunity to work with platforms not traditionally associated with the mainframe as part of that context. Of course, this means we’re going to need more mainframers. So, who will they be and what will they be doing in the future?

It’s likely, except perhaps in the largest mainframe shops, that each mainframer will have many distinct roles to cover—sort of like being a general practitioner. But, if a new mainframer starts by being a “jack of all trades,” he or she will certainly be likely to master many of them over time. However, time is no longer a luxury (if it ever was) that will be afforded to new arrivals on the mainframe space, so doing things the hard way will not be an option.

For that reason, we can expect fewer local customizations, as organizations look to reduce loose ends that could tangle up new mainframers. While in the early days of the mainframe, homegrown SVCs, exits, and various and sundry kludges were the order of the day, today’s mainframe management software offers a wealth of functionality that makes such exceptions unnecessary. This is especially true of leading-edge graphical workspaces.

However, none of this will change the need for key mainframers to be intelligent, knowledgeable, experienced, and possess strong work ethics. In other words, to be true professionals. And that professionalism, already tried-and-proven in today’s IT world, would appropriately be the dividing line between those who are given the opportunity to prove their worth as real mainframers and those who are encouraged to consider other career directions.

The future of the mainframe is brighter than ever, and I’m looking forward to knowing and working with the outstanding people who will be known as tomorrow’s mainframers.

REG HARBECK is product management director for Mainframe Strategy at 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. Email: reg.harbeck@ca.com
In this age of budget-challenged IT resources, many sites are finding it necessary to use facilities readily available and shipped with the product rather than turning to outside sources that usually come with a monthly or yearly license fee. While those products are certainly admirable and usually provide function not available with the supplied facilities, they may be beyond the reach of some shops' budgets.

With that in mind, it may be worth reviewing facilities that you may not have known were available or may have forgotten were updated and shipped with every new release. The CICS developers in Hursley, U.K., spend a great deal of resources and effort to keep these facilities current, and provide support for new product enhancements that come with every release. There may be a time when Hursley resources, just as our own, are stretched and decisions must be made whether to continue support for some of these facilities.

The CICS Operations Guide
The CICS Operations Guide is one of two publications that document the facilities and the proper syntax for using them. Updated with every release, the CICS Operations Guide uses a vertical bar (|) to show whether a facility has been added or changed with that particular release. While these facilities aren't “CICS Supplied Transactions,” they're modules or utilities shipped to assist customers with diagnosing CICS problems and support issues. Make sure you use the publication that matches the version of CICS you're running. While this publication contains a great deal of information, this article will cover three components:

- DFHEISUP: the load module scanner
- DFHDUnnn: the transaction dump formatter
- DFHPDnnn: the system dump formatter.

The “nnn” in the module name refers to the particular version/release of CICS you're using. Every version must be formatted with its own module; for example, DFHDU640 would format dumps from CICS TS 3.2. These modules ship with every release and refer to control blocks specific to that release.

Load Module Scanner
The load module scanner, DFHEISUP, is a utility that helps you identify which load modules in your CICS load libraries contain specific Application Program Interface (API) or Serial Peripheral Interface (SPI) commands you've listed or identified. For example, if you know a command should be changed to take advantage of a new feature in CICS, you can use the load module scanner to identify all the program modules that contain that command. For example, you could look for threadsafe or non-threadsafe commands. The list of API commands that aren't threadsafe is well-documented and can be used with this utility to determine if applications currently running are viable candidates. Many customers can't find (or don't have) the source to some of the old legacy programs, so this utility could be used without source code, scanning only the module from the existing load library.

Transaction Dump Formatter
The transaction dump utility program, DFHDUnnn, formats transaction dumps written to DFHDMPA or DFHDMPB, whichever is specified in the batch job. These dump data sets are retained across a restart of CICS, but once opened a second time, the contents are rewritten and the previous contents are removed. If you wish to retain any history of these dumps, a process should be created to regularly copy them to files so they can be referenced. There are several program products that format these dumps and retain the output, but again, if your installation is budget-constrained, this utility is available and shipped free with the product.

A sample job stream for this utility is well-documented in the CICS Operations Guide. Simple and straightforward, it

By Phyllis Donofrio
must run in two steps—one to scan the contents of the data set containing the dumps, and once the dump in the list is identified, to actually format the single dump selected. However, it's important to remember that with this utility the dump you're processing isn't currently being written to by the CICS region, so it's recommended if you're diagnosing a problem in a currently running region that you "switch" the open dump data set to begin writing to the alternative data set via the CEMT SET DUMPDS SWITCH command. The current data set will then be closed for you to process while the alternate data set continues capturing any new dumps.

Once the dump is formatted, the utility provides relevant information, including registers, module information, abort information, and trace entries. The trace entries are especially relevant since they relate to this specific transaction and what the sequence, logic, and data values are during execution of the application. Also extremely relevant would be the *EXC* trace entry since the dump was produced as a result of a program abend and that entry would contain error information at the time of the abend. A good technique would also be to follow the logic of the program from back to the *EXC* entry and review the preceding entries to determine if any other exception conditions may have occurred that would have resulted in the abend.

**System Dump Formatter**

This utility was first shipped with CICS many years ago in response to customer requirements for some supported way to format CICS SDUMPS (system dumps). CICS previously produced its own formatted dumps, which were difficult to use for diagnosis and usually had to be printed to review. Finally, CICS began writing system dumps to the SYS1.DUMPnn data sets that were previously reserved for OS (now z/OS) dumps. The problem, however, was that these dumps could be reviewed only by a facility called Interactive Problem Control System (IPCS) that was shipped by the operating system folks, who knew nothing about CICS internals. For that reason, CICS system programmers were resigned to using publications called CICS Data Areas (licensed materials) that had formats of all CICS internal control blocks. They then had to "chase" the control block contents and pointers to determine their values. This was difficult and time-consuming. Finally, IBM agreed to ship a module with CICS that could be used with IPCS to format the data areas; each release was updated with a new module that contained new data areas, control blocks, etc. The process to support this utility is now well-documented in each version-specific CICS Operations Guide. The documentation recommends including a similar member in your z/OS SYS1.PARMLIB member DFHIP CSP, depending on the release:

```
EXIT EP(DFHPD648) VERB(CICS648) ABSTRACT(+
 'CICS Version 3 Release 2 analysis')
```

This lets IPCS connect the module DFHPD640 with the IPCS VERBEXIT CICS640 in the utility. The same can be accomplished by merely using the module name DFHPD640 as the VERBEXIT command. The CICS library containing this module must be available at execution time, however, so your z/OS systems programmer must include it in default library concatenations or in the allocations of the Time Sharing Option (TSO) session. Review the documentation for installation to decide which is best for your shop.

There are several products that format these dumps and retain the output, but again, if your installation is budget-constrained, this utility is available and shipped with the product free.

Since CICS dumps are now written to SYS1.DUMPnn data sets, they can be migrated or copied to retain them for future reference. In addition, while these dumps are produced automatically in case of abends, they can be produced "on demand" if you wish to review a CICS region that's experiencing problems but not producing any dumps. The MVS console command to produce these dumps is in the format:

```
//DUMP COMM=(CICS Region PRD01 Dump)
```

where the contents of COMM become the title in the dump for identification purposes.  

z/OS will reply with a message asking for options and a reply number (NNN) to which you enter:

```
//NNN, JOBNAME=PR081. END
```

where NNN is the reply number and JOBNAME is the CICS region name you wish to dump. This will produce a snapshot of the region at the time of the command for later review.

The CICS Operations Guide for all versions contains a section titled “A Summary of System Dump Formatting Keywords and Levels.” This will identify all the components and domains that can be formatted and which levels contain which data. As new domains are introduced into each version, their appropriate keywords are added.

**CICS Supplied Transactions**

CICS Supplied Transactions is another publication containing several transactions that can be used to diagnose problems and is readily available free. While there haven't been many new transactions shipped recently, there are always updates to the existing ones for each version or release. Again, the vertical bar on the side of the entry indicates there's been an update or function added to this transaction.

A few especially useful transactions are:

- CETR: the CICS trace facility
- CLER: the CICS Language Environment (LE) formatter
- CMAC: the CICS Messages And Codes (CMAC) viewer.

**CICS Trace Facility**

This transaction has been around a long time, but enhancements are made in every release to support new domains and new functions in existing domains. One of several enhancements, JVM Trace Options, may be interesting to customers using Java applications. You can view or change these trace options by using the PF6 key from the main CETR options screen. If you aren't sure what options to use for diagnosing problems in an application, use the HELP panel (option 1). You'll see the information shown in Figure 1.

This helps explain some of the options and how to override the defaults from the System Initialization Table (SIT). These traces are helpful in diagnosis, but remember, turning extended tracing on to any application can produce excessive CPU utilization and should be used with caution, especially in production.

The CEMT INQ/SET JVMPOOL command was introduced in CICS TS V3.2 with several other Java-related resources, so reference this publication for more information. CETR is powerful in problem determination, especially in combination with the DFHPDnnn utility to selectively format certain tasks, or certain domains that would be the
most covering CETR includes important topics that examine how to manage CICS component trace options and viewing only certain task- or terminal-related data in the trace to minimize the output.

CICS LE Formatter

This transaction debuted many versions ago when customers were converting from the “old” COBOL to the new LE COBOL. It was confusing to determine what COBOL options to use and which were active in any CICS region since the z/OS systems programmer determines and specifies these options, not the CICS programmer. Finally, Hursley introduced this transaction that enables you to view what settings are active and actually change some online. Since LE options are specified in z/OS parameters, most of the documentation is in z/OS Language Environment Debugging Guide and Run-Time Messages for the version/release of z/OS you’re running.

CLER will produce a screen that contains each LE (CICS) option and what the current value is set to. Use the PFS screen to view all LE options and scroll down (with the PF7 key) to continue more settings and their current values. The options you can change dynamically are highlighted; for any other setting, you make changes using the z/OS parameters; they won’t be active until that CICS region is recycled. You need to tune the size of HEAP and STACK storage needs for a CICS environment, so ensure your settings conform to those recommended. Reference these publications for the version/release of z/OS you’re running:

- z/OS Language Environment Customization
- z/OS Language Environment Debugging Guide.

Also, APAR PK86791 contains information required to implement CLER and how it affects automatic installation of modules.

CICS Messages and Codes Viewer

This transaction was introduced years ago to supplement the publications customers received with the product but had to keep current by adding or replacing physical pages in the manuals. The transaction displayed abend code and message information online, but you had to be logged into a CICS region to view the information. It was well-received as an alternative to print manuals.

Customers who choose to implement CMAC must load all the abend and message information into a VSAM data set that each region can share. During installation, Hursley provides a library, CICS.SDFHMSGS (Messages), for the CMAC transaction. You would then load the data in this library into your VSAM file via the DFHCMACJ job.

If you’ve already implemented CMAC, when you install maintenance to your CICS system, you need to run CMAC data set update job DFHCMACU (CMACUPD) to ensure your abend and message data is current with the new release. Maintenance could have created new ones. For this reason, and others highlighted in the following paragraphs, many customers are finding this process may not be cost-effective.

There’s an APAR - PM15175 (still open as of this writing) titled “Catchup CMAC APAR” to update all the new abends and messages that need to be included in CMAC.

The Internet’s effect on CMAC has been significant. There are now easier and more efficient ways to research abend and CICS message content. IBM has provided support and free access to all publications via the Information Center. This link gives customers access to all publications, Redbooks, and white papers for each supported release of CICS. IBM maintains it so you know you will get the most current data for any release. If you haven’t yet used it, visit www.ibm.com/software/htp/cics/library/.

If you want to search for any particular problem, any of the existing search engines from any browser will provide access to information that may be available free from several sources.

With these and other access methods, CMAC has appeared to outlive its lifecycle. Hursley spends considerable time and effort to support this facility; that time may now be better spent on other facilities. It wouldn’t be surprising if this CICS transaction was removed from support in some future release.

Another fairly recent feature that IBM provides for free is the CICS Explorer. It’s being incorporated into many existing CICS facilities to give “browser-like” access to otherwise 3270 images. To learn more, see the z/Journal December/January 2010 article “Exploring the New Face of CICS” by Joe Winchester at www.mainframezone.com/it-management/exploring-the-new-face-of-cics.

Summary

These facilities may not be new, but they’re available, supported, and free. Customers are constantly challenged to do more with less, and these utilities and transactions can be part of that plan. Again, there are many products that have similar and even more functions than the ones described here. Usually, however, they’re licensed and fee-based so they sometimes aren’t an option. At least customers have a choice.

PHYLLIS DONOFRIO is president and owner of her own consulting services company, which has been providing CICS and network expertise for more than 25 years. She is the author of three books, many technical articles, and was a regular speaker at past SHARE and IBM CICS and Messaging Technical Conferences. She and her husband Brian live in Florida.

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PHylliS Donofrio
PLAN A: Rewrite OS/VS COBOL

PLAN B: Installed MacKinney’s VS/Cobol Interpreter

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If you are currently licensed for another product that allows you to run macro-level programs on CICS Transaction Server, you can save thousands of dollars by converting to Macro-Level Interpreter. You get the same function for a fraction of the cost of competing products like CICS/Comet.

Also available from MacKinney Systems is MacKinney Batch to CICS software that quickly - very quickly - sends commands from your batch jobs to your CICS regions to open and close VSAM files, dynamically enable or disable programs and transactions, kick off transactions, send terminal messages and more.

“We had mandates to move forward with upgrades on new systems software that would obsolesce our existing COBOL programs. VS/Cobol Interpreter allowed us to go forward with the upgrades and allow our application folks to schedule a rewrite or upgrade modification of these programs at some point in the future. Our deadline wasn’t necessarily theirs so they could do their part in the future long after we were through and moved on to the next project. We were able to meet deadlines that otherwise would not have been possible.”

Dennis Jiles, IT Project Coordinator, LSU Health Science Center, Shreveport, LA

Visit www.mackinney.com or call 417 882 8012 for your free no-obligation trials
Five Storage and I/O Networking Trends to zWatch

Here are some common enterprise trends I routinely hear from IT professionals:

- There’s a continued awareness around the importance of data protection and preservation.
- The realization that Data Footprint Reduction (DFR) extends across the enterprise and it isn’t just about dedupe.
- Fibre Channel over Ethernet (FCoE) is in your future; the question is when, where, and how.
- Efficiency means flexibility, performance, availability, and capacity utilization.
- Mainframes, Hard Disk Drives (HDDs), and tape are still very much alive.

Protect, preserve, and serve data applications as well as other IT resources: Here we’re seeing continued, if not renewed, awareness around data and information protection, including Business Continuance (BC) and Disaster Recovery (DR), backup/restore, archiving (data preservation), and logical and physical security. There are more options and greater flexibility for multi-site data protection using various mediums to overcome local and long-distance latency. Also, there’s been a shift from passive BC/DR to active/active where alternative sites are being used for production and testing, as well as other useful work is being shifted from cost center to production enabler.

Countering expanding data footprint impact: The trend is shifting from either doing nothing/avoidance to enablement; after all, there’s no such thing as a data or information recession. Not all data can be deleted, and more data is finding value online or by being readily accessible. The result is to leverage various time-tested techniques, including data management, archiving and compression—in addition to dedupe and thin provisioning—across all applications or technology tiers.

Consequently, there’s an opportunity to examine online or primary storage for DFR. However, the focus isn’t just on reduction ratios as much as it is about maintaining or enhancing transfer rates with some capacity or space reduction. For more inactive or idle data, the focus is less about transfer rates and more about reduction ratios.

Connectivity convergence for storage, I/O and networking: If you haven’t heard about FCoE and its sibling Data Center Bridging (DCB), and marketing names such as Converged Enhanced Ethernet (CEE), Data Center Ethernet (DCE) or Converged Networking Architecture/Adapter (CNA), you should keep your eyes and ears open. Note that I didn’t say TCP/IP, as FCoE is about grafting Fibre Channel (FC) frames—including SCSI_FCP and FICON packets—natively on to Ethernet. This is unlike iSCSI, which maps SCSI onto IP, or FCIP, which maps FC frames onto IP for distance. Meanwhile, FC has a future with 16Gb (16GFC) in the wings and 32GFC out on the horizon.

Efficiency means flexibility, performance, availability, and utilization: These days, efficiency is often perceived to be that of driving up resource utilization, thus lowering per unit cost at the expense of Quality of Service (QoS), response time, or other service delivery experiences. The trend is a growing awareness that efficiency also means boosting productivity, which has been a hallmark staple characteristic of System z environments for decades.

Mainframes, HDDs and tape are very much alive: For those of you who are still using or increasing your reliance on mainframes, I don’t have to tell you they’re very much alive. Likewise, some of you have used various forms of SSD- (RAM or flash) based storage in the past perhaps extending their use while also continuing to rely on spinning brown rust or HDDs. Heat Assisted Magnetic Recording (HAMR) is a new technique that should enable tens of terabytes of capacity for HDDs in the future. Another area to watch is Hybrid HDDs that combine RAM and flash (e.g., SSD) within an HDD.

For HDDs, there’s been a shift from FC for performance to SAS, as well as some higher capacity HDDs from SATA to SAS interface. Higher performance 15.5K RPM HDDs will continue to shift from FC toward the smaller 2.5-inch SAS small form factor. With new roadmaps released showing higher native capacity, better compression, and durability combined with a shifting role of preservation, tape also has a continued future.

Here are a couple of closing thoughts: What’s old is new, what’s new is maturing, aggregation can cause aggravation, and if you don’t have good instruments or situational awareness management tools when traveling in clouds, you might have an accident! Z

Greg Schulz is founder of the Server and StorageIO group (StorageIO), an independent IT industry advisory consultancy firm, and author of the books The Green and Virtual Data Center (CRC) and Resilient Storage Network (Elsevier). Learn more at www.storageioblog.com and www.storageio.com or on twitter @storageio.
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IT budgets are shrinking, but businesses are generating more data than ever, and must make sense of it faster than ever—turning information into insight. Business expectations are growing and every company faces the challenge of doing more with less.

How can managers make the right business decision with confidence? Companies must get smarter about themselves, their markets, and their customers. Analytic Business Intelligence (BI) solutions are designed to help them. Successful businesses understand they must use information to drive innovation to change the way they do business and differentiate themselves from competitors.

Many companies have taken a data warehousing approach and stacked data. Of course, this presents some issues, such as dedicated servers and storage, that result in siloed data stores run and managed separately from operational systems. Mostly, this data is wildly distributed in the company. This causes challenges for those who need a clear, enterprisewide view. As these discrete systems populate across an organization, inconsistencies, complexities, and indecisiveness set in.

While the trend to put information in the hands of decision-makers has powerful momentum, successful deployments require data warehouse changes that involve the underlying enterprise information infrastructure. Data warehouses must deliver information into operational transactions, portals, and other tools to provide the necessary insight to the right people, at the right time, in the right context.

The latest system technology is creating a more integrated approach to deliver near-real-time, actionable intelligence in an easy-to-digest format for desktops, laptops, and handheld devices—allowing managers, wherever they are, to make better, smarter business decisions with greater confidence than ever before, faster than ever before. What’s occurring is a paradigm shift from isolated, application-focused systems to an enterprisewide information infrastructure. Instead of continually moving the data to the users, organizations now can locate their business processes next to the operational data to simplify the infrastructure.

Now, companies can eliminate the complexities of existing systems to deliver an integrated environment to meet their data warehouse processing requirements. The inefficiencies inherent in having multiple, distributed copies of data across systems can be eliminated by proposing a new model that streamlines a business infrastructure. The newest offering is the IBM Smart Analytics Optimizer, which lets businesses integrate BI into their environment.

IBM Smart Analytics Optimizer
Revolutionary Technology for Data Warehouse and Business Intelligence Workloads
By Patric Becker and Cuneyt Goksu
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By combining operational and BI workloads, you can bring together your business systems, data, and decision-makers to deliver enterprisewide insights that enable more informed decisions. Consider how much simpler it would be to add a workload optimized resource to a central processing complex that shares data and work in a way that matches the appropriate resource to the characteristics of the work. How much easier would it be to create and manage a central environment designed to integrate, not separate, your business processes?

With IBM Smart Analytics Optimizer, you can deploy a BI environment that manages queries based on their characteristics, routing them to the right resources without having database professionals manually manage the flow. Instead of dispersed data silos, IBM Smart Analytics Optimizer offers a consolidated, centralized view of business data.

Data warehousing and BI queries are typically complex and often ad hoc in nature. There’s a common concern about the cost of running these highly resource-intensive workloads in a native z/OS environment. Additionally, data warehousing and BI applications increasingly require fast response times, regardless of the query complexity. IBM Smart Analytics Optimizer augments IBM DB2 for z/OS into an enterprise data warehouse by accelerating selected queries by orders of magnitude. In addition to providing Online Transaction Processing- (OLTP)-like performance for Online Analytical Processing- (OLAP)-type queries, IBM Smart Analytics Optimizer also significantly alleviates the need for typical performance tuning activities.

**What Will Change for DBAs?**

Parallel query processing and advanced storage-subsystem technologies, together with optimized database management systems, have significantly improved the speed by which data can be accessed and evaluated. However, physical limits with traditional approaches call for more radical steps to satisfy current and future business requirements. BI queries are complex and sometimes hard to tune because of their unpredictable design. Expression on indexes, Materialized Query Tables (MQTs), de-normalization and aggregation techniques, and a large variety of tools and features are available for DBAs’ use. The IBM Smart Analytics Optimizer reduces the need for complex query tuning. Designed to deploy and scale with ease, IBM Smart Analytics Optimizer is an integrated, sustainable solution that can take your existing BI environment to a whole new level of performance.

In today’s data processing environment, mixed with OLTP and BI workloads, some query patterns can’t be executed immediately because of excessive resource consumption. They’re scheduled for a less busy time interval. With IBM Smart Analytics Optimizer, those patterns can be reconsidered for a production environment. Real-time, slice-and-dice “cube applications” can also benefit from the IBM Smart Analytics Optimizer and speed up analysts’ tasks.

**The Technical Solution**

OLAP queries typically scan large amounts of data—from gigabytes to terabytes—to come up with answers to business questions. These questions have been transformed to SQL and passed to DB2 for z/OS, typically involving dynamic SQL. In traditional environments, DBAs, application programmers, IT architects, and system engineers have done a tremendous job of tuning their environments. But the challenge is still coming into your system as ad hoc queries scanning huge amounts of data and consuming large amounts of resources, both in CPU and I/O capacity.

Usually, these queries can’t be screened before they’re submitted to the system, resulting in entirely unknown resource consumption. The spinning speed of DASD devices becomes a limiting factor when scanning terabytes of data. For the moment, we can simply look at these limits as dictated by the laws of physics. The Smart Analytics Optimizer addresses this unknown resource consumption and the need for faster ad hoc OLAP queries.

A research project called Blink (see www.almaden.ibm.com/cs/projects/blink/) laid the foundation for development of the Smart Analytics Optimizer. With Blink, IBM developed a solution to provide consistent query response times for a given amount of data, regardless of the structure of a query accessing the data. Achieving that performance-oriented goal required implementing leading technology trends: hybrid row/column stores in main memory and predicate evaluation on compressed data, combined with multi-core and vector-optimized algorithms.

The IBM Smart Analytics Optimizer is like an appliance to the extent that it adds another Resource Manager to DB2 for z/OS, just like the Internal Resource Locking Manager (IRLM), Data Manager (DM), or Buffer Manager (BM). It’s a highly integrated solution and the data continues to be managed and secured by the reliable database platform, DB2 for z/OS. No changes are required to existing applications; the applications don’t have to be aware of its existence to benefit from the capabilities it offers.

Whenever queries are eligible for processing by the IBM Smart Analytics Optimizer, users will immediately benefit from performance improvements. The SMART Performance Advisor leverages a machine learning model to observe real-time data about the state of the environment and automatically tune the environment on a per-query basis. Additionally, the SMART Performance Advisor predicts the cost of running new queries and suggests alternative execution plans. With IBM Smart Analytics Optimizer, users will immediately benefit from the enhanced performance and reduced cost of their BI environment.

**Figure 1: DB2 Integration Within zHybrid Architecture**
from shortened response times without any further actions. Both users and applications continue to connect to DB2 for z/OS while being entirely unaware of the IBM Smart Analytics Optimizer’s presence. Instead, the DB2 for z/OS optimizer is aware of an IBM Smart Analytics Optimizer’s existence in a given environment and can execute a given query either on the IBM Smart Analytics Optimizer or by using the already well-known access paths in DB2 for z/OS. Due to cost-based decisions for any query-routing, all queries are executed in their most efficient way, regardless of their type (OLAP vs. OLTP).

The IBM Smart Analytics Optimizer consists of a specific number of blades attached to a System z. Each IBM Smart Analytics Optimizer consists of a large number of processors and main memory that can hold up to thousands of gigabytes of raw data. The number of blades connected gives you the total real storage and processing capacity for the IBM Smart Analytics Optimizer. There’s no communication with the IBM Smart Analytics Optimizer from anywhere outside your System z machine; it’s fully integrated into System z technology and fenced from the outer world. Even if it’s physically located outside a System z chassis, the solution is designed to be extremely robust and to guarantee the established Service Levels Agreements (SLAs) (see Figure 1).

**How It Works With DB2**

The first step is identifying long-running queries and the data accessed by those queries in your data warehouse. A set of tables related to each other (either from a logical point or by referential constraints) can be referred to as a mart. A mart is in the sweet spot of the IBM Smart Analytics Optimizer if it consists of one large fact table and more smaller dimension tables, as is typically true for star or snowflake schema data models.

Once a mart is identified, a snapshot of those tables is redundantly stored and loaded in the IBM Smart Analytics Optimizer by using UNIX System Services pipes. The unload process can be controlled either by the IBM Smart Analytics Optimizer studio, a Graphical User Interface (GUI), or IBM Smart Analytics Optimizer’s administrative stored procedures.

From a logical view, there are two different types of blades inside the IBM Smart Analytics Optimizer. From a physical perspective, all blades are iden-
tical. Most available blades are referred to as worker nodes, while a smaller number are brought up as coordinator nodes. The worker nodes actually store the data while the coordinator nodes act as an interface to DB2 for z/OS. During the unload process, the data flows to the coordinator nodes and is distributed to available worker nodes.

While being loaded in the IBM Smart Analytics Optimizer, the data is compressed and distributed among available blades, allowing for massive parallel processing of those queries accessing the data. While the data is stored in main memory, it’s also stored on a separate storage unit for failover purposes. Once the offloading process completes, the mart is ready to be queried (see Figure 2).

According to an International DB2 Users Group (IDUG) study, most data warehouses are refreshed once a day or less. Regarding this information, for most OLAP applications, querying data stored on an IBM Smart Analytics Optimizer can deliver breakthroughs in terms of performance and reduce the time needed to complete today’s business processes.

Here’s the interesting question: Are there any business questions or business cases relying on SQL statements that just didn’t complete in an appropriate time and you never moved these applications to production? It might be time to reconsider these applications.

What happens if a query accesses the data that’s also available in a mart? Because of the IBM Smart Analytics Optimizer’s deep integration into DB2 for z/OS, the optimizer makes a cost-based decision if a query will be routed to the IBM Smart Analytics Optimizer for execution or whether it will be processed in the traditional way by accessing the data pages, either if they’re located in the buffer pool or must be retrieved from DASD.

Queries being routed to the IBM Smart Analytics Optimizer are expected to benefit from a significant acceleration. Results from an early beta customer experience, presented at the Information On Demand Conference 2009 in Las Vegas, have shown a query acceleration by a factor of more than 370 for a given query. But mileage will vary, depending on individual data and queries to access the data. Internally, the IBM Smart Analytics Optimizer can be looked at as kind of an MQT. But the biggest differentiator is that MQTs are designed to satisfy a limited set of queries. These queries need to match the MQT definition in regard to possible restriction, projection, grouping, and aggregation operators while the IBM Smart Analytics Optimizer matches a much larger scope of queries because they don’t assume any of these operations.

What happens if most users can work with a snapshot, but some users definitely need to query original data since important updates must be honored? If a defined mart hasn’t been refreshed to contain the most recent data, queries can be routed to DB2 for z/OS traditional data access methods by setting CURRENT REFRESH AGE special register to 0. On the other hand, a value of ANY allows for IBM Smart Analytics Optimizer processing, giving you maximum flexibility.

A query can consist of one or more query blocks. Typical queries eligible for IBM Smart Analytics Optimizer processing access data in a large (fact) table, including inner joins or left outer joins with smaller (dimension) tables. If only one or more query blocks of a given query use the structure previously described, queries can also partially benefit from the IBM Smart Analytics Optimizer since DB2 for z/OS routes one query block at a time to the IBM Smart Analytics Optimizer for execution. To predict the possible amount of queries that can be routed to the IBM Smart Analytics Optimizer for execution in a DB2 for z/OS environment using dynamic SQL, IBM offers an assessment of DB2 for z/OS OLAP workloads (see Figure 3).
Offloading Queries to the IBM Smart Analytics Optimizer

DBAs can identify which query blocks will be routed to the IBM Smart Analytics Optimizer before execution, so they don’t need to apply any of the aforementioned performance practices for those types of query blocks. Additionally, it’s easy to understand if a query will be executed using a mart stored inside the IBM Smart Analytics Optimizer by obtaining the new information that will be available in a new explain table named DSN_QUERYINFO_TABLE. The explain function is enhanced to populate this table. If column TYPE = ‘A’ and the REASON_CODE = 0 after executing explain for a given query, a query block successfully qualifies for offloading with the Accelerated Query Table (AQT) specified in QINAME1 and QINAME2.

High Availability

To fully protect System z and DB2 for z/OS SLAs, the IBM Smart Analytics Optimizer has its own built-in failover mechanisms. DB2 for z/OS is fully fenced against possible accelerator failures. The main memory of the worker nodes contains data of one or more marts. If a blade fails, a coordinator node takes the content of the failing blade’s memory from the storage where it has also been stored during the offload process and continues processing. After the failing node has been brought up again, it’s now referred to as a coordinator node.

If, for some reason, the entire IBM Smart Analytics Optimizer has been disabled and DB2 for z/OS realizes that the IBM Smart Analytics Optimizer is no longer available for query processing, it simply uses a fallback access path and accesses the data.

System Setup and Availability

The IBM Smart Analytics Optimizer is a combined solution of both new hardware and software. It runs on the new IBM zEnterprise BladeCenter Extension (zBX). The IBM Smart Analytics Optimizer software is shipped as SMP/E installable for the DB2-related stored procedures, and the acceleration software is installed on the zBX via the System z Service Element using a product DVD. Once installed, updates to the software are implemented as PTFs, which are then propagated to the blades by calling a stored procedure. The GUI to identify any marts needs to be installed on a client machine. The software prerequisite for the IBM Smart Analytics Optimizer is DB2 9 for z/OS. IBM Smart Analytics Optimizer will be GA on Nov. 19, 2010.

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Looking back, 1965 was a milestone year for computing. It marked the formal first release of System 360 DOS (Disk Operating System). Fast forward 45 years, and today we celebrate the anniversary of DOS, currently known as System z/z/VSE.

In observance of the 45th anniversary of z/VSE, we asked eight individuals who have a long history with z/VSE to relate an interesting event, happening, coincidence, or factoid that involves z/VSE. This request produced some interesting historical references, thoughtful observations, and insightful views into the z/VSE community.

From the Early Years

Thurman O. Pylant, software architect at Sterling Commerce, Inc., recalled the ever-popular spooler in z/VSE, POWER:

“DOS (z/VSE) was only about two years old when I joined IBM as a systems engineer and most of my accounts were DOS users. Soon after, Larry Whitney wrote POWER [Priority Output Writers, Execution processors and Readers] in his garage and it was released as a Type 3 program.

“POWER was a SPOOLing program [Simultaneous Peripheral Operations On-Line] for DOS that allowed the overlap of actual printing with the running of programs that produced the printed data (a radical concept at that time). I thought this would be perfect for my grocery warehouse customer, who produced large amounts of printed output.

“We decided to do a benchmark with and without POWER. I had predicted a 25 percent improvement in work performed in the same time. We worked on setting up the benchmark, ran it, and then compiled the results. We only achieved a 24.70 percent improvement; the customer just said, ‘close enough.’

“This early experience with POWER made me want to do more with POWER: improving the RJE [Remote Job Entry] support, providing Source Library Inclusion [SLI] support, making it run virtual, working with [IBM] Development on VSE/POWER, putting VSE/POWER into its own address space, etc. It’s been a long-time love affair with software and with the VSE operating system itself.

“Improving efficiency and getting more out of existing hardware has always been an important focus for DOS, DOS/VS, DOS/VSE, VSE/SP, VSE/ESA, and now z/VSE. Happy birthday!”

Peter M. Horbach of B.O.S. Software Service GmbH remembers how early many of us started and the level of commitment seen in the z/VSE community:

“My first contact with VSE or DOS, as it was called then, was in 1970 and I’ve been working ever since with VSE and, most important, enjoying every minute.”

Andy Engels, systems programmer, expressed his appreciation for two components from the early years of z/VSE: Performance Tool (PT) and Interactive Computing and Control Facility (ICCF):

“I recall working with PT to capture data for a modeling session at the SNAPSHOT facility in Raleigh. It turned out the data and modeling facility were excellent. We tuned the model to match...”
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our installed system. The model's response time came out to exactly what we had in real life. From there, we were able to run comparable samples using other machines and operating systems to project future needs and future growth.

"At my first VSE shop, we didn't have CICS, so we ran TTF [Terminal Transaction Facility] so we could utilize ICCF. We had a requirement for an online program, but no real environment. We wrote an interactive RPG program to run in an ICCF interactive partition. Strange solution, but it ran fine until we upgraded to full CICS."

The Later Years
Mike Moore, IT manager for the Alabama Judicial Datacenter, looked back on the middle years and spoke about installation, upgrades, performance, user modifications, support, and relationship building:

"I first got involved with VSE in 1981. I had worked with DOS/VS, so I was familiar with POWER and a few of the things VSE could do. Our first machine was a 4331, and this was the first shop I had seen without a real card reader and punch. Everything was spoiled or in ICCF. I was familiar with the systems side of CICS, so our director got me involved in the rest of the systems programming work.

"I remember the mystical, magical world of SIPO and doing system updates over the course of several weekends. We had 8809 tape drives (we referred to them as the 'Maytags') that took forever to do volume backups and even longer to do volume restores. If you made a mistake in the update process, you were two to three hours away from restoring the system to a functioning version just to correct a simple error. Needless to say, we didn't do a lot of updates! Now, I can load a fast service upgrade in an hour, test for a couple of hours, and have the old system restored in minutes. This has made it incredibly easy to load updates as well as test new versions of VSE. Life is so much better these days!

"I also remember some folks who came up with patches for VSE that would let us expand the address spaces and partitions. This was my first dive into 'messing' with the system and I have to say it was a lot of fun and a great benefit. Just having more places to run things helped us a lot and I remember thinking, why would anyone ever need more than 15 partitions or three address spaces? These days we have 12 static and 54 dynamic partitions defined in 66 address spaces. My, how things have changed!

"Along with changes to VSE, I’ve seen a huge change in the way IBM interacts and works with users. I remember the 'old days' when you never knew the names of software developers and getting to Level II Support was about as close as you would come to the gurus on the mountaintop. Now, we can interact with developers through emails and user conferences such as WAVV [World Alliance of VSE VM Linux]. They're genuinely interested in your feedback and suggestions. IBM has changed, along with all of us.

"From the first days of VSE, when the scrawny cat was barely holding up the flag, to these days where we have a real tiger of an operating system, VSE has grown up and matured. I hope the drive to continue to make VSE more of a full player across all platforms continues, and it becomes more and more of a viable option for users when they determine their IT needs."

Klaus Goebel, IBM System zPDT leader and z/VSE systems manager, recounted an event about z/VSE availability with some unintended consequences:

"I remember a situation some years ago with a VSE system that processed coupons. The company that processed the coupons employed more than 500 hard-working women. Unfortunately, this VSE system went into 'hard wait' at least once, sometimes twice a day. The boss of the company wasn't happy because IPL-ing a VSE system back in those days took approximately half an hour with the recovery of CICS, ICCF, VTAM, and all the other subsystems.

"The ladies who worked for 16 hours each day entering these coupons in the system were happy because they got an unscheduled break.

"And what about IBM? IBM couldn't find the problem. There just wasn't enough documentation provided for debugging, and the error was unique. After a few days searching for the problem, IBM decided to send one of its best people to work on the problem. A trap was set to catch the cause of the hard wait.

"One of the ladies had found a key stroke combination that caused the VSE system to enter hard wait. A simple fix was installed and the customer was pleased, but the ladies weren't happy. They had known about this key stroke combination, and every time they wanted an additional break in their busy day, they gave a secret sign to the women who pressed the terminal keys.

"This is just one example of how businesses around the world rely on the nearly 100 percent availability of z/VSE."

Additional Perspectives
Former IBM staff member Jerry Johnston shared his thoughts about 45 years of effort and dedication by the community to shape the evolution of z/VSE:

"Recalling the first 45 years of VSE, it's clear that the 'how' of IT underwent enormous changes. In 1965, 'how' included DOS/360 with an IBM System 360 Model 30. Configurations might include a .03 MIPS processor, 16KB main storage, plus a pair of 2311 disks with 14.5MB total capacity.

"In 2010, 'how' includes z/VSE V4 with an IBM System z10. Configurations might include 600-plus MIPS processor(s), more than 32GB main storage, and DS 6100 disk storage with perhaps more than 1TB total capacity.

"VSE technology evolved incrementally. Sometimes, the pace was aggressive. At other times, it was tentative at best. Still, the cumulative transformation is simply jaw-dropping.

"Evolution of the 'what' of IT may be even more astonishing. In 1965, 'what' often involved automation of existing manual punched card processes. One salesperson I knew made a successful proposal for the IBM S/360 Accounting Machine. He correctly reasoned that 'accounting machines' sounded less intimidating than 'computers.'

"In 2010, integrated environments based on z/VSE, z/VM, Linux, and System z are capable of what that would have stunned anyone 45 years earlier.

"IT justification in 1965 focused on lower cost, faster processing, and higher capacity. In 2010, IT routinely provides added value in operational optimization, increased sales, better management decisions, improved customer service, etc.

"Whether I consider changes in 'how' or 'what,' progress over these first 45 years has been remarkable."

Dietmar Schrenk of Infologica GmbH was succinct in describing how far we've come from System 360 to System z:

"After 45 years of experience with the
mainframe operating systems, we have to recognize these facts:

- The mainframe has reached its highest quality.
- The quality of operating systems is better than ever.
- The meantime between failure is less than 0.01 percent.
- The lifecycle of unchanged mainframe programs is unparalleled.

Charles Rice, IT manager for Hirschfeld Industries, commented on the significant benefits of user groups and online forums for z/VSE and its users:

“User groups have played an important part in the life of VSE and my career over the last 47 years. The primary focus was GUIDE in the ’70s, ’80s, and early ’90s, and then WAVV took over and continues today. These groups have helped direct the development of VSE, provided a forum for the VSE community to share ideas and meet the experts, and sparked the development of some of the most useful tools we continue to use today such as the VSE-L forum on the Internet.”

Denny Yost, associate publisher of z/Journal and Mainframe Executive, addressed the numerous unique individuals involved in the success of z/VSE and the z/VSE community:

“The VSE market was and continues to be one of my favorites. It’s not so much the technology, the technology’s ability to process thousands of transactions at low cost, the evolution of the technology over the years, or how well VM and VSE seem to be made for each other. What makes it a favorite of mine is the people who work with VSE. From the new systems programmer trying to learn the best practices to those more seasoned, it was and continues to be a joy to be around and talk with the people who work with VSE. It seems like VSE professionals are always open to learning, determining how to do something better, sharing their knowledge with others, and getting every last ounce of performance from each computing dollar spent. I can’t imagine a better group to have had the pleasure of being involved with.”

Our special thanks to these nine individuals who took time from their personal pursuits to share their excellent, thoughtful responses with us.

As an operating system, DOS could never have become what it is today, z/VSE, without the dedicated commitment of many individuals. Those individuals’ actions were often above and beyond the strict call of duty and often transcended what was perhaps considered prudent or wise. z/VSE is the deliverable for those commitments and the reward for those jobs well done. So, to all those individuals and to z/VSE, happy birthday!

For additional information on where z/VSE is going during its next 45 years, please read the “Pete Clark on z/VSE” column in this issue. It contains the latest information from the z/VSE laboratory on z/VSE 4.3.

And thanks for reading this article. We’ll see you at the 50th anniversary celebration!

PETE CLARK works for CPR Systems and has spent more than 40 years working with VSE/ESA in education, operations, programming, and technical support positions. It is his privilege to be associated with the best operating system, best users, and best support people in the computer industry. Email: pclark@cprsystems.com

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Cost containment is important for today’s IT departments. Every decision regarding your computer resources is weighed based on the value they can deliver to your organization as well as their cost to procure, implement, and maintain. And, in most cases, if a positive ROI can’t be calculated, the software won’t be adopted or the hardware won’t be upgraded.

An often overlooked opportunity for cost containment comes from within the realm of your capacity planning group. Capacity planning is the process of determining the production capacity needed by an organization to meet changing demands for its products. But capacity planning is perhaps a misnomer, because this group should not only be planning your capacity needs but also managing your organization’s capacity. Actively managing your resources to fit your demand can reduce your IT department’s software bills—especially in a mainframe environment.

The total cost of mainframe computing continues to be high, and software is the biggest portion of that cost. The pricing model for most mainframe software remains based on the capacity of the machine on which the software will run. Note that this pricing model reflects the potential usage based on the capacity of the machine, not the actual usage. Some vendors offer usage-based pricing.

IBM offers Variable Workload License Charges (VWLC) for many of its popular software offerings, including z/OS, DB2, IMS, CICS, WebSphere MQ, and COBOL. It’s a monthly license pricing metric designed to more closely match software cost with its usage. Benefits of VWLC include the ability to:

- Grow hardware capacity without necessarily increasing your software charges
- Pay for key software at LPAR-level granularity
- Experience a low cost of incremental growth
- Manage software cost by managing workload utilization.

Basically, with VWLC, your MSU usage is tracked and reported by LPAR. You’re charged based on the maximum Rolling Four-Hour (R4H) average MSU usage; R4H averages are calculated each hour, for each LPAR, for the month. Then you’re charged by product based on the LPARs in which it runs. This information is collected and reported to IBM using the Sub-Capacity Reporting Tool (SCRT). So, you pay for what you use … sort of. You actually pay based on LPAR usage. What if you have DB2 and CICS both in a single LPAR, but DB2 is only minimally used and CICS is used a lot? Since they’re both in the LPAR, you’d be charged for the same amount of usage for both. But it’s still better than being charged based on the usage of your entire Central Processing Complex (CPC), right?

Soft Capping

Soft capping is a way of setting the capacity for your system so you aren’t charged for the entire capacity of your CPC, but at some lower defined capacity. Without soft capping, you’re charged the maximum R4H average per LPAR; by implementing soft capping, your charge by LPAR is based on the maximum R4H average or the defined capacity you set, whichever is lower.

The downside to soft capping is that you’re setting limits on the usage of your hardware. Even though your machine has a higher capacity, you’ve set a lower defined capacity, and if the R4H average exceeds the defined capacity, your system is capped at the defined capacity level.

Sites that avoid soft capping usually do so because of concerns about performance or the size of their machines. This is usually misguided because soft capping coupled with capacity management can result in significant cost savings for many sites. As of z/OS 1.9, you can set a Group Capacity Limit, which sets a capacity limit for a single LPAR as well as a group of LPARs. This can minimize the impact of capping, but may not help minimize your cost.

Of course, it can be complicated to set your defined capacity appropriately, especially when you get into setting it across multiple LPARs. There are tools to automate the balancing of your defined capacity setting and thereby manage your R4H average. The general idea behind these tools is to dynamically modify the defined capacity for each LPAR based on usage. The net result is that you manage to a global-defined capacity across the CPC, while increasing and decreasing the defined capacity on individual LPARs. If you’re soft capping your systems but aren’t seeing the cost-savings benefits you anticipated, such a tool can pay for itself rather quickly.


Websites: www.craigsmullins.com; www.softwareonz.com

Z
For most DBAs, the question, “Do application requirements affect the database design?” has an obvious answer: Of course!

Regrettably, important things are forgotten or ignored during data modeling and database design. This article discusses common post-implementation issues that can be avoided by giving them proper consideration during the design process.

**Database Design Practices**

Database design flows from business rules, application requirements, and your data modeling standards such as normalization and referential integrity enforcement.

What about a set of tables implemented to augment a current batch system? These will probably be fully normalized per current database design standards. Is this a new database in an enterprise data warehouse? Most likely, the design will include fact, dimension, and key tables with star join access paths. Will this new data support a mission-critical application with tens of thousands of users? Perhaps there will be some denormalization of the design for performance reasons.

DBAs tend to design databases based primarily on functionality and performance. Will the database support the business rules of the application? Will it perform based on the Service-Level Agreement (SLA)?

This prioritization is backward. There are just as many, if not more, important issues that should be addressed during database design. Factors such as recoverability and data availability are either missed or given lower priority.

After implementation, when recovery and availability issues >
arise, DBAs and application support staff find themselves in the unenviable position of considering a database re-design—usually accompanied by an extended application outage.

By prioritizing these issues in order of their importance during the database design phase, we can greatly reduce the need for re-design after implementation.

Following are some common post-implementation issues broken into sections corresponding to the laws of database administration (see "The Laws of Database Administration" by Lockwood Lyon, which appeared in the October/November 2006 issue of z/Journal, at www.mainframezone.com/applications-and-databases/the-laws-of-database-administration). Database design practices that respect the first law (data must be recoverable) come first, followed by the remaining laws in priority order.

**Design for Recoverability**

Recoverability means the ability to recover a specific subset of application data to a specified point in time. Reasons for such a recovery vary from large-scale disasters (such as loss of a data center) to undoing incorrect data updates caused by an application.

In the case of disaster recovery, the DBA must take into consideration that total recovery time begins with physical data/media recovery, availability of the operating system, tape and recovery resources (if applicable), and DB2 subsystem or group recovery. Once DB2 is available, any utilities in-flight may need to be terminated and in-doubt threads resolved. In a data sharing environment, failed members may hold retained locks. Once these items are addressed, the DBA can review remaining application data recovery issues.

Database design must account for the required application data recovery service level for all scenarios.

Are there new tables in the design? Many of these must be added to recovery scripts. Are tables being expanded, or will there be an increase in data or transaction volume? Perhaps this will affect the total recovery time; the DBA may need to revisit existing recovery procedures. Figure 1 lists some things to consider during database design that may affect the DBA’s ability to recover the application’s data.

**Design for Availability**

After recovery, data availability is the next highest priority. Here, the DBA

<table>
<thead>
<tr>
<th>Recovery Issue</th>
<th>DB Design Considerations</th>
<th>Potential Fixes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increased number of RI-connected tables</td>
<td>Is there a current/stale data split?</td>
<td>Consider separate tables, or partitioning by staleness; recover current data first</td>
</tr>
<tr>
<td>Small recovery footprints (e.g., a single bad table)</td>
<td>Require recovery of the entire RI-connected table set</td>
<td>Consider designing tables in subsets; each subset to be recovered separately</td>
</tr>
<tr>
<td>Increase in table size (rows or columns)</td>
<td>Total size of application data increases</td>
<td>Implement table space data compression (in DB2 9 index compression) and/or implement image copies of indexes</td>
</tr>
<tr>
<td>Recovery processes increase in complexity</td>
<td>Complexity increases chances for errors</td>
<td>Consider vendor recovery tools; pre-build recovery jobs; automate recovery processes</td>
</tr>
<tr>
<td>Synchronous recovery required with non-DB2 or non-DBMS resources</td>
<td>Possible frequent recovery or backout at the transaction level</td>
<td>Implement audit processes (tables, triggers, etc.) to simplify error detection and correction</td>
</tr>
</tbody>
</table>

**Figure 1: Database Design Considerations Related to Application Data Recovery**

**Figure 2: Horizontal Partitioning Strategies and Their Usefulness**

<table>
<thead>
<tr>
<th>Horizontal partitioning strategy</th>
<th>Useful for:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Partition by date range</td>
<td>Easy archival or purge of stale data</td>
</tr>
<tr>
<td>Partition by ascending key range</td>
<td>Assigning all newly inserted keys to last (most recent) partition</td>
</tr>
<tr>
<td>Partition by (random) surrogate key</td>
<td>Spreading row inserts evenly across pagespace, minimizing hot spots</td>
</tr>
<tr>
<td>Partition by dimension (geography, organization hierarchy, etc.)</td>
<td>Increasing opportunities for parallelism during joins and aggregations</td>
</tr>
<tr>
<td>Multiple similiary structured tables</td>
<td>SQL against specific tables; custom indexes</td>
</tr>
</tbody>
</table>

**Figure 3: Vertical Partitioning Strategies and Their Usefulness**

<table>
<thead>
<tr>
<th>Vertical partitioning strategy</th>
<th>Useful for:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Separate columns by volatility (e.g., updatable columns in Table A, unchanging columns in Table B)</td>
<td>Performance, as changed data is now limited to a smaller table. Backup and recovery, as tables will have different backup frequencies. Auditing, as audit change history will only be implemented for Table A.</td>
</tr>
<tr>
<td>Separate columns by application</td>
<td>Allowing parallel updates by multiple simultaneous applications.</td>
</tr>
<tr>
<td>Separate columns by security authorization</td>
<td>Simplifying security implementation, auditing, or change history.</td>
</tr>
<tr>
<td>Separate (or replicate) columns to Table B that are required for high availability</td>
<td>Create multiple performance indexes on Table B permitting high-speed or index-only access.</td>
</tr>
<tr>
<td>Segregate compound VARCHAR columns (where contents contain structure or internal information, such as XML.)</td>
<td>Create separate table for VARCHAR column; for large columns this may also provoke a performance benefit, as &quot;long&quot; data is removed from the original table, making it smaller.</td>
</tr>
</tbody>
</table>
is concerned with minimizing locking and contention issues and providing current data to applications as quickly as possible.

There are several scenarios where an application requires high data availability; those that call for high-speed data update and retrieval (perhaps in a 24x7 environment), include a data archiving or data retention process, or require coordinated DB2 utility execution with SQL access.

In each of these cases, there are database design choices that may alleviate future contention problems. The most common design solutions involve combinations of horizontal and vertical data partitioning with a method of assigning clustering keys. Such a solution helps avoid data hot spots, which are areas in memory and on DASD where multiple I/Os from multiple transactions may cause contention or locking issues.

Horizontal partitioning is the separation of table rows into two or more physical data sets. It may be accompanied by a similar physical partitioning of some indexes. DB2 partitioned tables let the designer choose a row storage strategy based on the partitioning. Horizontal partitioning will affect the database backup and recovery methods and elapsed times. Figure 2 lists some strategies and their usefulness.

Vertical partitioning involves splitting a table vertically—designating some columns to remain in the table while others are moved to another table or tables. In this way, a single table is denormalized into two or more tables, each containing a subset of columns from the original. This is usually accompanied by replicating the primary key of the original table across all the resulting tables. To re-create an original row, the tables must be joined on their primary key columns. The DBA usually chooses vertical partitioning for performance reasons; Figure 3 lists additional decision-making factors.

Key clustering is a technique the DBA uses to ensure inserted rows don't create hot spots in the data. One common way this happens is when new records are assigned a key based on a sequentially ascending value (such as an identity column or a sequence) and the table is clustered on this key. The result is that newly inserted rows are added at the physical end of the table.

Assuming the DBA implements page-level locking, a row insert requires an exclusive lock on the page where the row is placed, and the lock is kept until
the transaction issues a commit. Until the commit, the page is locked, preventing SQL access to rows on that page.

If transaction volume is low enough, or commits happen immediately after inserts are complete, then this may not be a problem. However, for a high-volume, critical business application, this may not be possible. Instead, the DBA has several options for spreading inserts across the pagset to minimize hot spots.

One possibility is to cluster the table based on a column other than the key. Indeed, this is typical for many applications since clustering is best used in instances where SQL statements access many rows, allowing DB2 to use prefetch to increase performance.

Another possibility is to cluster by a surrogate key; chosen semi-randomly. Some choices include:

• Using the microseconds portion of the CURRENT TIMESTAMP special register
• Using the RAND function
• Creating a trigger that populates the value of the key upon row insert based on a user-defined function.

You can also use these methods of key value creation to assign rows to partitions, assuming table horizontal partitioning is accomplished using the key column.

The DBA must coordinate such key clustering techniques with index choice because physical clustering of the table is dependent on designating one of the indexes as the clustering index. Since adding a surrogate key to a table to cluster it necessarily means creating a clustering index for that key, this may affect the total number of indexes for the table; it could increase recovery time or decrease SQL insert performance.

The last issue confronting the DBA in the area of data availability is coordinating SQL access and transaction commits with utility execution, especially the reorg utility. Reorg with the sharelevel change option allows concurrent execution with SQL insert, update, and delete statements. However, at the end of reorg execution, the utility enters the switch phase. In this phase, the utility attempts to drain all table partitions involved in the reorg. (A drain is the act of acquiring a locked resource by quiescing access to that object.) Since concurrent SQL statements acquire locks on tables, the reorg utility needs these locks released to complete the switch phase. If the utility doesn’t acquire the drain in a certain amount of time, it fails.

The result is that long-running transactions or transactions that delay commits can negatively impact reorg utility execution. The DBA may need to take this into account during database design. Apart from ensuring that long-running transactions don’t occur, the most common method of mitigating this issue is implementing a sufficient number of horizontal partitions so each partition that’s reorged has only a small footprint. Another alternative to avoid this type of contention is implementing third-party tools or utilities that offer more efficient switching options.

Excessive horizontal partitioning may affect recovery processes and also increase the number of open data sets. This may increase the amount of logical and physical data set closings or openings DB2 does to avoid hitting the maximum number of data sets that may be open (specified by the system parameter DSNUM).

Design for Security

Security concerns are divided into three levels: prevention, detection, and correction. We usually prefer to prevent security breaches; if this can’t be done thoroughly, then we require methods of detecting and eventually correcting them.

DB2 security mechanisms, such as authorization-ids and the ability to grant read and write authorities at the table or column level, are usually sufficient to limit application access to authorized users. Therefore, prevention and correction of unauthorized access is best handled by external security packages or a security administrator.

Database designs involving security considerations typically address the second level—detection—by implementing a change history accumulation process. The DBA may include table columns for audit trail purposes such as LastUpdateDate and UpdateByUser. Another common design might include an audit history table, which would contain rows of before and after images of changed data.

More elaborate schemes of gathering change history include:

• Message queues with either transactional data, changes, or both
• Special mirror tables defined similarly to base tables that would contain before images of data
• Third-party vendor software with the ability to scan DB2 transaction logs and gather who-changed-what information.

Vendor software provides another advantage, as these products are more difficult to circumvent than most database design strategies. If your environment has strict compliance requirements or is subject to a certification or governing body, then standard vendor solutions may provide the best answer.

Design for Performance

Many database design alternatives that enhance application performance are well-known and have appeared in previous articles. The most common arise when dealing with resource constraints; the DBA documents current constraints, analyzes possible trade-offs, and makes design decisions that take the constraints into account while ensuring compliance with the first three laws (recoverability, data availability, and security).

For example, assume that I/O throughput and application elapsed time are constrained. A possible design change to alleviate the constraints is to add indexes that support search predicates and join predicates, perhaps even providing index-only access. The DBA would first ensure that adding new indexes wouldn’t compromise data recoverability (additional indexes add to recovery time) or negatively affect data availability (the new indexes may create hot spots).

Summary and Best Practices

The following is a list of best practices for database design when considering application requirements:

• Since recoverability is the first and highest priority, you should include recovery review during database design. Don’t consider backup processes; the recovery requirements will dictate these. Instead, concentrate on the disaster recovery requirements of the application and data, potential recovery times, and integration with the enterprise disaster recovery plan. Most of the database design choices (partitioning, indexes, keying) involve changes to data volumes, data set sizes, number of data sets, and recovery methods.
• Partitioning is usually based on major I/O activity (purge, mass insert, avoiding hot spots). For example, in a DB2 subsystem where many batch jobs execute in a limited batch window, batch application elapsed time (i.e., throughput) is a constraint, and the DBA will consider partitioning to
relieve potential throughput issues. Meanwhile, the DBA must balance recoverability and data availability.

- Key clustering techniques may be new to you. If so, ensure that any technique you develop or use is thoroughly tested, documented, reviewed with all database designers and administrators, and approved. Develop multiple ways your technique can be automatically included in object documentation. For example, if you define a surrogate key whose sole purpose is for random clustering, add a note in either the table or column remarks (using the SQL COMMENT statement). This note should supplement documentation of the key's use in your standard data dictionary or other metadata repository.

- Maximizing data availability is tightly linked to locking. Reducing data availability constraints is usually accomplished by improving transaction design by either shortening transaction lengths, decreasing the amount of data locked per transaction, avoiding locks (i.e., using uncommitted read), and so forth. It may be useful to consider partitioning that increases availability (avoiding hot spots, minimizing locking) by spreading data throughout multiple partitions. This has the disadvantage of increasing I/Os and possibly affecting throughput, however.

DBAs and data modelers traditionally considered performance issues when developing database designs. They were influenced by several factors, including limited access path choices, few high-performance hardware or software options, and unsophisticated SQL optimizers. Today, hardware, software, and database management systems have matured; databases can potentially grow to multi-terabyte size, and enterprises are implementing critical applications whose recovery and data availability now assume much more importance. Database designers must consider these factors. If they don’t, they risk implementing databases that are unrecoverable or that require expensive and time-consuming redesign.

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IMS and Cloud Computing

By Trevor Eddolls

With Microsoft now involved in cloud computing, via Office Web Apps and Facebook integration, and Google working with VMware to develop a new operating system for the cloud, you may wonder where the mainframe fits into this exciting new world. You might also be curious about the role of IBM’s venerable Information Management System (IMS). Well, that’s what we’re going to explore.

According to Wikipedia, “Cloud computing is Internet-based computing, whereby shared resources, software, and information are provided to computers and other devices on-demand, like the electricity grid.” Wikipedia further suggests that: “Cloud computing describes a new supplement, consumption, and delivery model for IT services based on the Internet, and it typically involves the provision of dynamically scalable and often virtualized resources as a service over the Internet.”

So, you can look at cloud computing as a way of delivering hosted services over the Internet. The accompanying sidebar, “Cloud Computing Origins and Evolution,” offers further insight on the types of cloud computing that have emerged, but again, our focus is on how IBM and IMS support the concept.
Big Blue and the Cloud

IBM has embraced cloud computing. The company’s Website indicates that providers of cloud services, whether private (intra-enterprise) or public, strive to:

- Enable economies of scale supporting large volumes of users at increasingly lower costs
- Create an affordable and available supply of virtualized assets
- Maintain a “green footprint” in the face of energy regulations and constraints
- Meet Service Level Agreements (SLAs) in spite of increased automation
- Secure the cloud, protecting user privacy and integrity within shared system services.

IBM assures us that the mainframe “is a trusted repository for highly secure information and an open platform supporting anything from Web 2.0 agile development environments with RESTful interfaces to enterprise class middleware.” (REST stands for Representational State Transfer.) We’re all familiar with the mainframe’s resilience and ability to meet customer SLAs.

In terms of scalability, a sysplex allows multiple processors to be joined into a single unit to become a single logical system running on one or more physical systems. IBM mainframes also use a scalable clustering technology called Parallel Sysplex that provides a hugely horizontally scalable architecture, allowing multiple systems to execute jobs in parallel. There’s also Geographically Dispersed Parallel Sysplex (GDPS), which takes the same concept and makes it work across sites that can be some distance apart.

What makes mainframes so much better than Windows-based platforms is their security. It’s taken for granted, but it’s important because any data in one partition can’t be read by anything running in a different partition. System z even has an encryption co-processor—Crypto Express2—as well as system-level facilities for encrypting data sets. Mainframes also have security software with features that support digital certificates and Public Key Infrastructure (PKI) services, which makes them well-suited for cloud computing.

IBM has developed the world’s largest private smart analytics cloud computing platform, code named Blue Insight, which combines the resources of more than 100 separate systems to...
Cloud Computing Origins and Evolution

Where did the term “cloud” come from? Mature mainframers remember the diagrams that people used to show on their overhead projectors where links from computers went into a cloud that represented the telephone system and more links came out to terminals. The “cloud part” came to represent the Internet on numerous PowerPoint slides. Now, that cloud has taken on a life of its own. In fact, if you search the Internet, you’ll find that Feb. 24, 2007 is the day the term “cloud computing” was coined.

Not all clouds are necessarily public clouds. A public cloud would be one that sells services to anyone on the Internet (like Amazon Web services). A private cloud would be used by an organization to supply hosted services to people within the organization. There’s one slight complication to this simple dichotomy: It’s possible for a private cloud to be made available using public cloud resources. The result is referred to as a virtual public cloud.

What is meant by a service? Services can be divided into three categories:

- Infrastructure-as-a-Service (IaaS)
- Platform-as-a-Service (PaaS)
- Software-as-a-Service (SaaS).

These services can be distinguished from traditional hosting because they’re sold on demand; users purchase as much of a service as they want, when they want it. Also, the service is managed by the provider.

The SaaS model involves deploying the software over the Internet. The vendor provides the software, any databases, and the servers it uses. The user accesses the service, usually through a browser. Available services range from invoicing to email to database processing. The user (subscriber) simply pays for what they use. The user could get a similar service from a different provider if they were to choose to do so.

The IaaS model occurs when an organization outsources the equipment it needs for its IT infrastructure, including storage, servers, and networking components. A service provider owns all the hardware and must maintain it. Users are given an IP address and access to the supplier’s API to use their virtual hardware. The advantage of this kind of computing is that organizations pay only for the computing power they use; it also allows them to get more as necessary.

The PaaS model facilitates deployment of applications without a need to purchase and manage the underlying hardware and software. Developers may use APIs or software installed on their computer by the vendor to develop Web applications and services. (A Web application is basically an application accessed over the Internet, or, possibly, an intranet. Web applications are convenient and available through a Web browser client. There’s no need for an organization to continually update its software because the Web application used is always the latest version. The responsibility for updating and testing the Web application lies with the provider.

Gartner Research is a big fan of cloud computing, telling us that: “The use of cloud computing in general has been spreading rapidly over the past few years, as companies look for ways to increase operating efficiency and data security. The cloud industry, which is in its infancy, will generate $3.4 billion in sales this year.” Similarly, Merrill Lynch predicts that by 2011 the cloud computing market will reach $160 billion, including $95 billion in business and productivity applications.

Most industry journals and conferences are focusing on Microsoft’s Windows Azure, an environment for development, service hosting, and service management based on the cloud. It’s designed to allow developers to compute, host, scale, store, and manage the Web applications they create. Windows Azure relies on the global network of Microsoft data centers to offer the services; it lets developers use Microsoft Visual Studio, along with SOAP, REST, XML, and PHP.

Finally, Google has a partnership with VMware to develop a new operating system for the cloud. This partnership is designed to enable users to avoid being tied down to a single supplier by ensuring that applications are portable. Companies will be able to build and maintain their own applications to run in a VMware environment on any infrastructure compatible with Java standards. Google has said it will provide cloud-based database and secure transaction services this year.

— TE
create one large, centralized repository of business analytics. According to IBM, “cloud computing represents a paradigm shift in the consumption and delivery of IT services.” Blue Insight has helped IBM eliminate multiple Business Intelligence (BI) systems that were performing more or less the same Extract-Transform-Load (ETL) processes for different user groups.

Also, IBM has announced a program designed to help educators and students pursue cloud computing initiatives and better utilize collaboration technology. They call it the IBM Cloud Academy. IBM provides the cloud-based infrastructure for the program, with some simple collaboration tools.

**Role of IMS**

Although IBM’s IMS, 42 years old this year, runs on System z mainframes, it’s outward-looking and supports the Java programming language, Java Database Connectivity (JDBC), XML, and Web services. It has data management and transaction processing components. Built in to IMS are several different and fast hierarchical database types, including full-function databases, fast-path databases, and high-availability fast-path databases. The transaction management system provides a mechanism for users to access the information stored in the databases as quickly as possible. The transaction manager component uses messaging and queuing. An IMS control program receives a transaction that was entered on a 3270 terminal or from a Web browser. The database can be queried or amended, and then a response is returned.

Virtually any application type you can think of can run under IMS. Users of IMS include banks and insurance companies and many other large organizations. Whenever you use an Automated Teller Machine (ATM) to get money from your bank account, it involves an IMS transaction. But how can these incredibly fast, reliable IMS transactions be made available to users sitting at their laptops working through their browsers?

In the past, 3270 terminal emulation software provided the easiest way to Web-enable IMS applications, but what became known as the screen-scraping method suffered from performance limitations and little or no support for human interaction via a browser. Communication between mainframe and other server-side applications requires integration at the Application Program Interface (API) level. This is where middleware, using application adapters, came in. Application adapters are typically bi-directional and have two components—one running on a Java 2 Enterprise Edition (J2EE) or Windows server and one running on the mainframe.

Today, organizations use Service-Oriented Architecture (SOA), which provides an excellent strategy for extending and reusing mainframe-resident business functions. SOA is a design that breaks down a problem into modular, distributable, shareable, and loosely coupled components. It usually comes associated with Simple Object Access Protocol (SOAP) and Web Services Description Language (WSDL). There are tools that can help organizations SOA-enable their IMS transactions. You can access a list of IMS-related tools at www.virtualims.com/tools.html. Some of these products make the process of exposing mainframe applications as secure Web services much easier while allowing mainframe applications to consume Web services.

The problem many people experience is that the WSDL specification can be difficult to understand, is domain-specific, and can be difficult to extend or adapt. In addition, SOAP messages can be complex and difficult to understand without some knowledge of the services involved. The Universal Description Discovery and Integration (UDDI) specification defines a way to publish and discover information about Web services.

Web-Oriented Architecture (WOA) is a SOAP alternative that’s like SOA on steroids; it offers a way of building large-scale Web services. Gartner defines WOA as SOA plus the World-Wide Web plus REST. WOA is advantageous because it uses existing technologies; a WOA interface can be used from any Web-enabled programming language. Simple, scalable and extensible, it conveys all the benefits of HTTP, such as using PUT, GET, POST and DELETE requests, and promotes use of semantically rich representations.

The use of REST is the big difference between traditional SOA and WOA, though WOA is usually considered a subset of SOA. The use of REST and SOA puts the focus on Web resources rather than services.

Another way of getting IMS data off the mainframe and available to people through their browser is to use it in a mashup. Some mashups simply display data in a different way, while others combine information or capabilities from two or more separate sources to deliver new functions and insights.

Mashups are typically built on WOAs, like REST or SOAP, and leverage lightweight simple integration techniques such as Asynchronous JavaScript and XML (AJAX), Really Simple Syndication (RSS), and JavaScript Object Notation (JSON). The result should be the fast creation of rich, desktop-like Web applications. It’s possible to convert an IMS asset into an IMS RESTful service, which has the ability to consume and be consumed by other Web 2.0 services. IMS customers could then remix and mash up their data rapidly with IBM Info 2.0 tools to extend their business logic without the need to write a single line of code.

There are available products that can go beyond merely making IMS applications available on the Web; certain products simplify the process of “Webifying” applications so users see familiar Web-based facilities such as drop-down menus, etc.

**Conclusion**

Users aren’t concerned about what happens behind the scenes; they just want reliable applications and the ability to use them through their browser—and they want it now! Mainframers, with all their years of experience, might balk at a system that, for some users, could rely on cable modems, ISPs, and restricted bandwidth! However, putting that to one side, it’s obvious that a mainframe can play an important part in both public and private cloud computing environments. It can tick all the boxes and meet all the criteria for cloud computing laid out in this article. A mainframe is a player when it comes to cloud computing.

In addition, IMS is able to reliably and securely store and retrieve data and make its applications available as Web applications to users requiring such services. IMS really does have an important role to play in cloud computing.
**z/VSE 4.3 Enhancements**

**z/VSE 4.3** is almost here! Based on IBM’s statement of direction and information released with the latest IBM hardware announcement, my best guess is that it will be released in November or December.

A very important reminder: CICS/VSE doesn’t ship with z/VSE 4.3; only CICS Transaction Server (TS) is shipped with z/VSE 4.3. Certainly everyone has made plans for this long-announced eventuality!

**News From z/VSE Development**

On July 22, when the new IBM zEnterprise System was presented to the public, there was a major preview of z/VSE 4.3. This preview described how z/VSE 4.3 will provide additional capacity by exploiting certain features of the IBM System z10 and zEnterprise 196.

**Hardware exploitation highlights:** z/VSE 4.3 supports the following IBM System z servers: zEnterprise 196 (z196), z10 Enterprise Class (z10 EC), z10 Business Class (z10 BC), z9 Enterprise Class (z9 EC), z9 Business Class (z9 BC), and eServer zSeries 990, 890, 900, and 800.

z/VSE 4.3 supports and takes advantage of the new hardware in several ways. The ability to dynamically attach logical CPUs will allow additional CPU resources to be allocated to a z/VSE system without any processing interruption. CPUs not in use can be released from one z/VSE system for use by another z/VSE system.

Large page (1MB page) support for data spaces speed access to data, thereby improving processor exploitation and performance.

The fast path to Linux on System z (Linux Fast Path) allows selected TCP/IP IPv4 applications to communicate with the TCP/IP stack on Linux on System z without using the TCP/IP stack on z/VSE. Linux Fast Path requires that both z/VSE 4.3 and Linux run as z/VM guests on the same z/VM system.

z/VSE 4.3 supports the Crypto Express3 card in both coprocessor and accelerator mode. The Crypto Express3 card is also supported with z/VSE 4.2 and PTF UD53485.

z/VSE 4.3 will exploit TS7700 WORM volumes, but COPY EXPORT isn’t supported.

**Software exploitation highlights:** The new z/VSE functions have been designed to be as transparent as possible, thus enabling you to easily move applications to z/VSE 4.3 and take full advantage of the new functionality.

As with prior releases, z/VSE 4.3 contains additional Virtual Storage Constraint (VSCR). Selected programs and buffers have been moved from 24-bit storage to 31-bit storage. As in the past, the amount of VSCR relief will depend on the functions required by each user’s system. The more functionality used improves the VSCR.

CUU support for “four-digit device addresses” is included to simplify the infrastructure of mixed environments consisting of z/VSE, z/VM, Linux on System z, and/or z/OS. Additional floating point support allows use of all floating point registers for floating point operations.

DOS/VS RPG II now supports CICS TS for VSE/ESA. This support will also be available on z/VSE 4.2 via APAR. Installation of the support on 4.2 will allow sites to migrate from CICS/VSE to CICS TS before installing z/VSE 4.3, if needed. This support is necessary since CICS/VSE 2.3 will no longer be part of the z/VSE 4.3 package and the CICS coexistence environment has been removed.

A new DL/I 1.12 release is supplied with z/VSE 4.3, which provides virtual storage constraint relief and replaces the DL/I 1.10 and DL/I 1.11 releases.

The Basic Security Manager will include DTSECTAB resources in SMF logging and reporting.

z/VSE 4.3 systems running in a z/VM guest environment will be able to use z/VM Queue I/O (QIO) performance assist for real networking devices. z/VSE V4.3 exploits this performance assist for OSA Express adapters (CHPID type OSD) and HiperSockets (CHPID type IQD).

z/VSE 4.3 will provide a monitoring agent that allows SNMP V1 clients to retrieve z/VSE-specific system and performance data.

IPv6/VSE is an optional product of z/VSE 4.3. IPv6/VSE can also be used with z/VSE 4.2. When used with z/VSE 4.2.2, the minimum required service level is APAR DY47077 or z/VSE 4.2.2.

Please note that these are just some of the enhancements provided by z/VSE 4.3, which is planned to be available in the fourth quarter of 2010. Additional information is available at www.ibm.com/vse; follow the link to the z/VSE 4.3 preview announcement. The latest z/VSE APAR status information can be obtained by subscribing to the z/VSE family at https://www.ibm.com/support/mynotifications; follow the link to System z.

Thanks for reading this column; see you all in the next issue! **Z**

**Pete Clark**

works for CPR Systems and has spent more than 40 years working with VSE/ESA in education, operations, programming, and technical support positions. It is his privilege to be associated with the best operating system, best users, and best support people in the computer industry. Email: pclark@cprsystems.com
Extending Rexx for CICS on z/VSE

By Ken Ripple

Rexit for CICS, which IBM provides free as part of CICS Transaction Server for VSE/ESA V1.1.1, is a powerful application development resource. Think of it as a development environment, not just a tool.

To understand the features and functions of Rexx for CICS on z/VSE, you may wish to read >
the article “Rexx for CICS,” by Rich Smrcina in the June/July 2007 issue of z/Journal. Available at www.zjournal.com/pdfIssue/pdfArticle/Smrcina.z.June-July07.pdf, the article provides a great introduction to Rexx for CICS. If you also experiment with it, as our site did, you’ll quickly start to see its power.

The Basics of Rexx for CICS

As Rich described in his article, Rexx for CICS includes a hierarchical file system, the Rexx File System (RFS), that’s implemented in a set of VSAM Keyed Sequence Data Set (KSDS) files. Each set of VSAM VSAM clusters is referred to as a filepool and the IBM-provided Rexx for CICS start-up refers to the first filepool as “POOL1” (other filepools can be defined to expand the file system as needed). The RFS hierarchical file system provides for directories and files to be created in a manner similar to working in an MS-DOS file system on a PC.

The RFS also provides basic security over the directories and files in the file system. Directories and files can be marked as “private” (only the original creator of the file has access), “public” (any user has access), or “secured” (access is controlled by a security exit called CICSECX2). See Appendix G of the IBM CICS Transaction Server for VSE/ESA Rexx Guide for more information.

Along with the RFS, there are three CICS-supplied transaction definitions; REXX, FLST, and EDIT. The REXX transaction provides an interactive execution environment where any of the Rexx for CICS commands can be executed manually. The FLST transaction provides a CMS FILELIST-like environment for accessing the files in the RFS.

The Rexx for CICS RFS support automatically generates a “users” directory in the default filepool (i.e., POOL1: USERS) and a user’s “home” directory in the users directory on first use of any of the CICS-supplied Rexx for CICS transactions. The edit transaction provides a CMS FILELIST-like environment for accessing the files in the RFS.

Rexx for CICS provides a perfect environment for developing Rexx-based CICS applications; it supports most CICS command-level Application Program Interfaces (APIs) as well as Basic Mapping Support (BMS). It also provides a powerful Rexx procedure debugging feature that allows single stepping through the execution of your Rexx for CICS procedures via the TRACE command. In addition, it includes “panel” support that gives you a simple way to develop application screens; it’s similar to the panel support provided in ISPF on MVS, OS/390, and z/OS.

Extending Rexx for CICS

Unfortunately, as provided, you can’t really use the Rexx for CICS support for anything but developing Rexx applications in CICS. Nevertheless, the FLST transaction and Xedit-like editor appear to be a desirable place to do more z/VSE work. At my shop, we went to work to extend it to provide a platform for doing more of our daily tasks. We quickly identified two main features as not being included: a way to print files in the RFS and submit Job Control Language (JCL) members (stored in the RFS) for execution in the z/VSE system’s batch partitions.

Since Rexx for CICS provides support for the CICS command-level commands (SPOOLOPEN, SPOOLWRITE, and SPOOLCLOSE), it was fairly straightforward to develop additional functions to extend Rexx for CICS. Figure 1 contains a basic PRINT proce-

/* TITLE: PRINT Author: Ken Ripple */
ARG in
"RFS DISKR 'in"
CALL spool_print in
RETURN 0
spool_print: /* Procedure to spool DATA. stem to POWER */
ARG jname
rpt_name = USERID(); rpt_form = ‘L21’; rpt_token = ‘’
rpt_title = ‘User:‘USERID()’ RFS File:‘in
rpt_class = ‘A’; rpt_disp = ‘H’; rpt_priority = ‘3’; rpt_dest = USERID()
rpt_linelength = 132; rpt_lines = 59
rpt_head = ‘====== RFS Fileid: ‘in ‘=== User: ‘USERID() ‘=’
/* Code to process PRINT.PROFILE goes here */
‘CICS SPOOLOPEN REPORT(rpt_name) TOKEN(rpt_token) FORMS(rpt_form)’
‘HEAD(rpt_head) CLASS(rpt_class) PRIORITY(rpt_priority)’
‘DESTINATION(rpt_dest) LINES(rpt_lines) HEADNUM NOSEP LOGICAL’
DO i = 1 TO DATA.0
’ DATA.i = LEFT(DATA.i,rpt_linelength,’’)
’ ‘CICS SPOOLWRITE FROM(DATA.i) TOKEN(rpt_token)’
END
’ ‘CICS SPOOLCLOSE REPORT(rpt_name) TOKEN(rpt_token) DISP(rpt_disp)’
SAY ‘File ‘in’ printed.’
RETURN 0
insert_data_line: /* Procedure to insert stem element in DATA. stem */
ARG afterline newdata
startline = DATA.0 + 1
lastline = afterline + 1
DO ln = startline TO lastline BY -1
prev_ln = ln - 1
DATA.in = DATA.prev ln
END
DATA.lastline = newdata
DATA.0 = startline
RETURN 0
procedure that works quite well. It provides support for the individual user to maintain an optional PRINT.PROFILE member in their RFS "home" directory to control their default POWER spool options (see Figure 2).

Note: The code examples in this article have been abridged for space consideration. Full, unabridged versions of the code will be available when this article is posted on the www.MainframeZone.com Website.

You can invoke this new PRINT procedure from the FLST transaction either on the command line (i.e., PRINT TEST MEMBER) or in the FLST CMD prefix area to the left of the filename on the FLST display simply by typing "PRINT" to the left of the filename.

Developing the "submit" process took a bit more effort. In our z/VSE environment, we run with batch security enabled and the CICS SPOOLOPEN/ WRITE/CLOSE functions don't directly support this. We decided the Job Entry Control Language (JECL) job card security parameter would be the best way to handle the process of passing the user's credentials to POWER so job execution would be properly authenticated against VSE security.

Our SUBMIT procedure prompts the user to enter his or her password to generate a JECL security parameter on the JECL job card of the JCL being submitted. Beyond this, the only basic syntax rule we must follow is that the JCL must contain a validJECL job card.

In addition to the basic process of spooling your JCL to the power reader queue, this SUBMIT procedure also includes added support for /INCLUDE processing. Your JCL can contain /INCLUDE statements, which are resolved from within your RFS "home" directory and inserted into the generated JCL jobstream before it's spooled to POWER. The /INCLUDE process defaults to an RFS filetype of JCL (i.e., filename INCLUDE.JCL), or your /INCLUDE statement can include the qualified name in the format "/INCLUDE filename.filetype". Figure 3 contains an abridged version of the basic SUBMIT procedure.

Like the PRINT procedure, the SUBMIT procedure can be invoked from within the FLST transaction either on the command line or in the FLST CMD prefix area.

The PRINT and SUBMIT procedures can be tailored for your environment; that's the power of Rexx. You could easily tailor the SUBMIT procedure to include logic to enforce specific JCL standards, if necessary. On our system, for example, we've added z/VSE Basic Security Manager- (BSM) facility class definitions to control access to these added functions so we can control the ability to invoke the "print" and "submit" commands. Our PRINT and SUBMIT procedures have added logic to perform a 'CICS QUERY SECURITY' command to validate whether the user has read authority to the BSM- defined facility classes "CICSREXX.PRINT" and "CICSREXX.SUBMIT" (see Figure 4).

Installing PRINT and SUBMIT on Your System

The PRINT and SUBMIT procedures are simple to install. Appendix K of the IBM CICS Transaction Server for VSE/ESA Rexx Guide covers the post-installation steps necessary to complete the configuration of the Rexx for CICS environment. Section K.4 covers copying the IBM-provided Rexx for CICS "PROC" members to a VSE sublibrary of your choice. To install the PRINT and SUBMIT procedures, simply catalog them in this same VSE sublibrary as PRINT.PROC and SUBMIT.PROC; they'll be available to any user of the FLST transaction.

Conclusion

Hopefully, this article has provided some insight into the possibilities for using the Rexx for CICS feature. Consider using the PRINT and SUBMIT procedures as useful extensions to the Rexx for CICS environment—a powerful tool you can use in a variety of ways.

Figure 3: The Basic SUBMIT Procedure

```
/* TITLE: SUBMIT Author: Ken Ripple */
ARG in
'RFSDISKR' i
CALL process_jobcard
CALL valid_jcl
CALL spool_jcl member
RETURN 0

process_jobcard:
SAY 'Please enter your password:'
PARSE EXTERNAL password
password = STRIP(password,'$')
from = 'FROM=USERID()',
dest = 'DEST=USERID()',
sec = 'SEC=USERID()',
readable = '+0000000035'
/* Code to build full JECL jobcard goes here */
RETURN 0

spool_jcl: /* Procedure to spool JCL using CICS SPool API */
ARG jname
ruptoken = ''
'CICS SPOOLOPEN REPORT('jname') JCL TOKEN(ruptoken)' DO i = 1 TO DATA.0
'CICS SPOOLWRITE FROM(DATA.i) LINE TOKEN(ruptoken)' END
'CICS SPOOLCLOSE REPORT('jname') TOKEN(ruptoken) RELEASE'
RETURN 0

valid_jcl: /* Procedure to process JCL INCLUDE and validate JCL syntax */
/* Code to validate and process JCL goes here */
RETURN 0
```

Figure 4: CICS QUERY SECURITY Example

```
log = '+00000000555'
readable = '+00000000035'
res = 'FACILITY'
resid = LEFT('CICSREXX.SUBMIT',246,' ') 'CICS QUERY SECURITY RESCLASS(res) RESID(resid) RESIDLENGTH(246)
READ(cvda) LOGMESSAGE(nolog)
IF cvda <> readable THEN DO
SAY 'User not authorized */
RETURN 0
END
```

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In these days of highly accountable environments, it’s important for CICS customers to know where and when CICS transactions have been executed. CICS Transaction Server (TS) exploits the z/OS System Management Facility (SMF) to a considerable degree, but part of the data interrogation process must occur offline. Occasionally, it’s useful for a user to know what happened to transaction “WXYZ,” which ran in the past minute or so, without waiting for the transactional SMF data to be cut and extracted.
With that reporting time latency in mind, the CICS Transaction History record was implemented several years ago—and fitted as far back as CICS TS version 2.2. It was originally exposed as part of the CICS Performance Monitor (PM) tool. However, when CICS PM was withdrawn, the task history views were integrated directly into the standard CICS TS Web User Interface (WUI). This article demystifies the Transaction History Recorder set-up process and highlights some of its pitfalls. >
How the History Recorder Operation Works

Although the raw task data is provided by CICS, the recording and reporting functions of the History Recorder are subcomponents of CICSPlex SM. If you want to view the statistics data for recently completed tasks, you must implement CICSPlex SM. If you understand CICS, the task history recording process won’t be rocket science, and a little black magic will help you be a power user!

Users who currently record task SMF data will know that CICS regions cut CICS task performance records to SMF as they complete. The History Recorder function simply grabs a copy of these records and stores them in a reportable data set that’s cyclically reused. This means that data recorded in the CICS history data set must be considered transient and isn’t permanent. Each region that’s required to report task history must have at least two recorder data sets allocated; their Data Definition (DD) names will be EYUHISTA and EYUHISTB. Additional data sets may be allocated, and their DD names must follow in alphabetic sequence from EYUHISTC all the way to EYUHISTZ.

CICS will fill each data set with completed task data. As each data set fills up, CICS will flip to the next available data set in alphabetic sequence and then flip back to data set A when the last available data set is filled. Clearly, there’s a trade-off here between maximizing History Recorder performance and keeping the history records viewable for as long as possible before a data set switch occurs.

Where disk space is at a premium for history data recording, you can section an area into more than two data sets:

- When only two data sets are available, 50 percent of your recorded data will be erased each time a switch occurs; however, system performance won’t be denigrated by repeated data set switching.
- When 10 data sets are defined, 10 percent of your recorded data will be erased each time a data set switch occurs, but you may notice slower performance with the more regular suspensions for switching.
- If data retention is a priority, you could allocate 25 history data sets. In that instance, only 4 percent of your history data will be overwritten with each switch, but clearly, data set switching will be occurring much more often than in the two previous instances.

It isn’t necessary to allocate history data sets with the same size. In terms of usability of the function, it makes more sense to have them identically allocated. However, the recorder function won’t restrict you from varying file size allocation.

History Recorder JCL Configuration

The starting point to implementing the History Recorder is to allocate at least two recorder data sets in each region where recording is required. The sample Job Control Language (JCL) to allocate...
these files is in the EYUHIST member of the CICS-supplied DFHINST data set.

Always allocate the files using the member pertaining to the CICS release you're setting up. Generally, the record size of these data sets enlarges with each successive CICS version, so don't simply re-specify the data sets for an earlier CICS version to the new configuration. You can migrate the history records from an earlier CICS release to a new CICS version, but given the transient nature of the history records, it seems hardly worth the effort.

After allocating the data sets, identify them in your CICS JCL with the EYUHISTx DD statements, ensuring that you specify DISP=OLD. This is necessary to allow recycling. The other JCL change is to ensure the appropriate CICS System Initialization (SIT) parameters are set so CICS generates the required performance monitoring data. This is achieved with these overrides:

- MN=ON…switch on CICS monitoring
- MNPER=ON…switch on performance class monitoring.

The History Recorder is a CICSPlex SM function that provides an exit that captures task monitoring data from CICS. This data was originally used to feed the CICSPlex SM task-monitoring function. When the History Recorder was implemented, it grabbed a copy of this data to feed to the task history recording process. So, a requirement was introduced to users who previously didn't require CICSPlex SM task monitoring data to be extracted from their Local Managed Application System (LMAS). To suppress this requirement for users who don't use CICSPlex SM for monitoring, a new EYUPARM was introduced: HISTONLY=YES…don't gather CPSM MON data.

This EYUPARM has the effect of discarding the performance data record before needlessly copying it into the CICSPlex SM monitoring data cache. Of course, if you currently record and display CICSPlex SM task monitoring data, then don't include this EYUPARM attribute, as it will nullify your CICSPlex SM task monitoring function.

In terms of CICS JCL configuration, preparation for CICS task history recording is complete. If you restart your CICS region at this point, you should see your history data sets in the local files view for the region. If you drill down into the “history” item from the WUI main menu and select “task history collection,” the item for the current region will show “inactive” but with a reason of OK. This is expected; the recorder won’t activate until it captures the first performance data record for any of the transactions selected for recording. Now you need to configure CICSPlex SM to indicate which transaction codes you wish to record.

### History Recorder Definition Configuration

CICSPlex SM needs to be told which transactions to record; there’s no default “record everything” option. There’s a reason for this. The file I/O payload of recording the completion (and SYNCPOINT) of every running task would potentially grind the transactional throughputs of a CICS region to a halt. You’re forced to explicitly designate which transactions to record to ensure you take into account any degradation in performance that occurs due to this history recording. The mechanism required to elect a transaction for recording is the CICSPlex SM monitor definition resource table—known as a MONDEF. These may be defined using customer-written applications that exploit the CICSPlex SM Application Program Interface (API), but a more convenient starting point is the CICSPlex SM WUI. Assuming you’re accessing the WUI through the standard IBM-supplied WUI view, the location path for defining a monitor definition is:

Administration > Monitor Administration > Definitions

If this is your first attempt at creating a MONDEF, you’ll be presented with an empty list of MONDEFS, and you’ll have to use the “create” button to enter the monitor definition data entry panel. If you’ve already created some MONDEFS, they should be present in the view. You can create a new one based on the content of an existing object by ticking the selection box of an existing MONDEF and using the create button.

We’re going to create a monitor definition for a CICS transaction. For clarity, you may wish to give the MONDEF item the same name as the transaction you want to record. Let’s assume you want to track all instances of the CICS master terminal transaction, CEMT. Enter CEMT as both the MONDEF name and object name you want to monitor. The object type is a transaction (Mtran) for FATSCOPY…

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“inclusion in CICSPlex SM monitoring option,” but not in “resource status facility population,” which is for populating the now unsupported OS/2 RODM function. **Note:** Although not mandatory, completion of data in the description field is sometimes a handy way of spotting the definition you want to work with if you’re defining a substantial list of monitor definitions (see Figure 1).

Upon completion of the MONDEF details, use the yes button to file the entry to the CICSPlex SM data repository and return to the MONDEF list view, which should now include the entry you’ve just defined (see Figure 2).

Now you may choose to install this definition directly into a running LMAS, which will cause the History Recorder to activate and begin recording instances of the CEMT transaction. However, installing directly at this level will cause the recording designation to be lost when that CICS region is restarted.

To permanently assign the recording instruction to a CICS region or group of CICS regions, you’ll have to create a MONGROUP as a parent to the CEMT MONDEF and then create a MONSPEC to act as a parent to the MONGROUP, specifying which CICS regions are to receive the assignments controlled by the MONSPEC. Once the MONSPEC/MONGROUP/MONDEF relationship is defined, the MAP command should confirm that you’ve successfully associated the definition elements (see Figure 3).

### History Recorder Activation

When all the required transaction IDs are defined with MONDEFS, they must be installed to the CICS regions from which task history is required. You can do this by installing MONDEFS individually, but it’s tedious and time-consuming. The smart way to manage the installation of your MONDEFS is collectively through a parent MONSPEC. By doing so, you’re asserting that all the definitions relating to the MONSPEC must be automatically reinstalled whenever the region restarts. After installation, the MVS job logs for the regions being monitored should report:

```
+EVUNIT81781 mymas801 History Recorder has been activated.
```

This means a new CICSPlex SM long-running task has been initiated in the CICS regions and is waiting to capture completed transaction data. So, you’ll see that the active task count for those regions being recorded will be increased when this message is displayed. If you return to the CICSPlex SM WUI, you’ll see the last entry of the main menu is “History.” By clicking on this link, you’ll be presented with a set of complete task queries according to time selection parameters and an item named “task history collection” under the “Control” subheading. Use this link to display the history recorder status of your CICSPlex.

Figure 4 shows a simple CICSPlex with just two regions running and with task history recording in the first region. The recorder isn’t active in the second region because it’s the WUI server. If you aren’t interested in recording the completion of tasks to complete WUI queries (and you shouldn’t be), don’t bother defining any history data sets for that region.

Looking at the first row, we can see that the recorder is employing two recorder data sets, with data set A currently used for recording. The data set isn’t large, as there’s space for only 50 records. Task history records aren’t small; just over 3,500 bytes at the CICS Transaction Server 4.1 level, so you don’t want to occupy large amounts of disk space when you’re interested only in the completion of recently executed tasks. Remember, having fewer large history data sets will reduce the performance impact when the recorder switches to a new data set, but the history records will wrap more often.

### Reviewing Completed Tasks

As with most query mechanisms, the key to finding the data you require is to use parameters in your request appropriately. The “history views” menu provides four predefined query links that should cover most users’ requirements:

- **Recent**
- **By interval**
- **By time**
- **Recent filtered by association data.**

Each link comprises parameters to identify what region completed which tasks at what time. The task and scope identification parameters are reasonably obvious to most users who have previously used the WUI. The time identification parameters let users specify the chronoscope of the query—that is, the time band to apply to the history data sets when scanning history records. If you have extensive history data sets defined, limiting the chronoscope of the query will substantially improve the query performance and reduce the impact of the query on the CICS region as a whole. Users have four types of query to specify their query chronoscope:

- **Recent queries** request a scan of all records that have completed in the period specified by the “recent completions” query parameter value. This value is specified in seconds, with the maximum being 99999999—or 1,157 days,
nine hours, 46 minutes, and 39 seconds! A few special keywords are available for the recent value: HISTSECS (default value if the parameter is left empty) specifies that the value specified by the CICS region’s HISTSECS EYUPARM setting, and NOLIMIT means scan the history back as far as it goes. You may also specify a value of 0. This is a special case value requesting that the task history is displayed for tasks currently active. How can an active task show history? The history records are derivations of CICS DFMNTDS data. CICS may cut one of these records when a SYNCPOINT or ROLLBACK command is issued. Sometimes “active task” records are handy for monitoring progress of any long-running tasks.

- **Queries by interval** request a scan of records on the basis of a task completion time and a scan period in seconds. The start time is specified as a date and time pair. If no date is supplied, then today’s date is assumed. If no start time is specified, the query is assumed to begin at the previous midnight. The interval value has the same syntax as the “recent” value—except that the 0 (active tasks) parameter value isn’t applicable.

- **Queries by time** request a scan of records for an explicit time band. Both the start time and stop time may be specified as date/time pairs. Empty parameters work the same as for queries by interval with the addition that if no end time is specified, the query is assumed to end one second before the next midnight.

- **Recent queries with association filters** are functionally the same as the normal recent query, but several additional parameter filters are provided to help users locate history data for tasks related by their association attributes.

Try not to be cavalier about your chronoscope settings. If you know your history files have the capacity for thousands of records, beware of using the RECENT(NOLIMIT) settings. You’ll be forcing your query to scan every available record in your history data sets, then copying them into a CICSPlex SM response queue, which will exist until you’ve terminated the current WUI query. This has a direct performance impact on queried CICS region and your CICSPlex as a whole. You’ve been warned!

**History Recorder Control**

If you need only record task history at certain periods of the day, you may actively suspend and resume history recording in a region using the “Task History collection” view (available on the “History views” menu). The SUSPEND command will instruct the recorder to disregard all subsequent task completion data from CICS until a RESUME command is issued. While suspended, you can still interrogate the stored history data of a CICS region without any restrictions. This can be a handy tool for allowing history data to be collected for diagnosis purposes on a temporary basis. Unfortunately, there isn’t yet a mechanism to allow a region to automatically start its recorder from a suspended state; you must suspend it manually after startup if you want to preserve the latent history records in the files.

**Summary**

Please keep these tips in mind:

- To enable the History Recorder, you must first define at least a pair of history data sets to a CICS region. Then you must ensure the correct CICS system initialization parameters are set to enable performance monitor data to be issued by CICS.

- Select the transactions you wish to record using CPSM monitor definitions. To record them automatically, you must associate the monitor definitions with a group and a specification. The monitor specifications must be associated with each CICS region whose history you want to record.

- History Recorder activation may be monitored in the MVS job log of the CICS region and in the “Task history collection” view for that region. Collection may be suspended and resumed for a CICS region using the same view.

- When making queries, try to make the query chronoscope as short as possible to reduce the performance impact of the query on the CICS region and your CICSPlex.

**Dave Williams** is part of the CICSPlex SM development team working in IBM’s development laboratory in Hursley, U.K. His career began in 1974, when he was one of the computer operators responsible for starting the CICS region run by his employer at the time (a major international bank). In 1978, his career shifted into applications development, writing CICS applications in IBM Assembler. Since then, he’s been writing CICS code in Assembler and has covered most systems and development roles involving CICS—working with almost every release since version 3.1. He has been part of the CICSPlex SM development team since 1997 and doesn’t plan to retire anytime soon.

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Cloud computing represents a disruptive paradigm shift that will eventually shake most IT organizations to their roots. New platforms, new applications, and a new generation of tech-savvy business users will put enormous pressure on IT, requiring them to weave together the best of traditional IT with the best of what's available in the cloud to deliver business value to their organizations.

There's a striking parallel between IT's transition to cloud computing and manufacturing organizations migrating from a factory model to a supply chain model. In the past, manufacturers typically ran closed, standalone factories—raw materials in, finished products out. Now, successful manufacturers leverage a global supply chain, selecting components from a variety of sources according to cost, availability, and quality requirements. The base components remain important, but the organization ultimately creates value by building products using a diverse mix of sources, both internal and external. Systematic supply chain management techniques improve agility and quality while reducing cost, translating into competitive advantage.

Today, most IT organizations also work according to a factory model—assembling, deploying and managing most IT services in their own data centers. In contrast, cloud computing is a fresh new approach—one that's much more about running a dynamic IT supply chain. The transition from IT as factory to IT as supply chain represents a new, different way to think about IT's role; it promises substantially increased efficiency and agility, just as manufacturers found with supply chains.

Although the journey to cloud computing might sound a long way off, business users are already making the first moves toward building an IT supply chain—sometimes even outside of the IT department's control. Sophisticated business users understand there are alternatives beyond the IT factory, and they're increasingly selecting cloud-based solutions rather than traditional ones. Modern cloud applications usually offer adequate capabilities, even though IT might express concern about certain issues such as security. They're often priced so low as to skip past traditional corporate procurement processes. And, being cloud-based, there's also an important sense of instant gratification where the user can be up and running almost instantly. These alternatives lead some business users to envision a future where the complexity and cost of running a large data center becomes someone else's problem. In this way, they hope to reap drastic benefits in agility, quality, and cost.

New and emerging organizations are also responsible for accelerating the trend toward cloud computing. Today, few start-ups build an internal data center. Rather, they turn to cloud email, financial and human resource applications, relying on non-traditional partners such as so-called Managed Service Providers (MSPs). Over time, the increased agility and lower cost of cloud approaches become the weapons emerging organizations wield against more established competitors. Today's organizations must adapt, or risk increasing threats from a new, formidable breed of competitor.

Faced with these realities, IT organizations frequently respond by attempting to act more cloud-like, promising internal business users the same flexibility and cost advantages found in the cloud on their internal systems. Larger organizations often have adequate scale to compete against many external cloud providers. IT also understands that although cloud services are often extremely attractive from a cost or agility perspective, they're often suspect in terms of quality of service, security, and risk. These factors create an opportunity for various internal, or private cloud initiatives.

Cloud computing also fosters a tendency toward a sober rationalization of IT capabilities vs. business value. Cloud computing offers many new possibilities, enabling IT to choose the right quality of service for the job. For example, not all services require “five nines” availability; sometimes “good enough” is truly good enough. This thinking permits the organization to mix and match, using potentially more costly internal capacity for the most critical services, while adopting cloud for less important applications. Unlike prior generations of outsourcing, cloud is infinitely flexible this way; you only outsource selected services where there’s some gain to be had, not the whole operation.

The availability of new and good enough cloud capabilities, combined with pressure both from inside and outside IT, creates a sense of urgency to discover an optimum balance of internal and cloud services. Doing so allows IT to address the organization’s needs, while simultaneously seeking out cost-efficiency, agility, and quality advantages. In effect, CIOs are balancing the often-conflicting needs of the organization by juggling suppliers—becoming supply
chain managers in the process.

Meanwhile, the mainframe fills a unique place in large organizations, and IBM’s new zEnterprise system takes the mainframe’s traditional strengths even further.

Most textbooks on supply chain management would explain that a key requirement is having a disciplined, systematic way to understand and monitor supply chain components. Immature practitioners focus exclusively on cost metrics, but learn that a more balanced approach is necessary, and metrics such as quality, risk and other capabilities are quickly included. On any matrix including risk and quality of service, mainframes excel.

Consider also that few cloud providers are likely to want to tackle the extreme quality of service attributes associated with the most strategic mainframe applications. Applications that exploit the mainframe’s unique high availability and quality of service features (such as Sysplex, advanced security, etc.) will prove challenging to re-host using public cloud alternatives. Although this will likely change over time, today’s sweet spot in the cloud is all about high-value and rapidly deployed capabilities with good enough qualities of service. Again, this speaks well for ongoing mainframe participation in cloud initiatives.

Also, even sites with strong commitments to cloud computing are hesitant to surrender too much control, especially to emerging, unproven cloud providers. In these cases, organizations typically lean toward hybrid approaches where some capabilities remain traditionally hosted, while others move to the cloud. While the largest cloud providers achieve mainframe-class qualities of service through enormous scale and sophistication, hybrid solutions are often much more fragile on the client side of the equation. It does little good to have all the redundancy and scale of a cloud provider’s enormous data center if critical data remains on-premise, stored behind unhardened servers. What’s needed is a self-contained, on-premise system that can be as resilient, scalable, and robust as the more massive infrastructure on the other end of the pipe—and the mainframe is ideal in this role.

As organizations increasingly turn to private cloud and hybrid models, the zEnterprise system makes an attractive cloud in a box platform, thanks to these specific capabilities:

- **Flexible capacity.** Cloud applications tend to be variable and dynamic in terms of capacity requirements. The zEnterprise system is based on ultra-fast 5.2 GHz processor cores, giving it unmatched capacity to host large workloads. Also, the system is dynamically configurable, enabling customers to add (or remove) capacity as needed to meet workload demands. Unlike competing platforms, zEnterprise also allows for dynamic, non-disruptive upgrades to devices and channels, network paths, memory and so forth—not just processor capacity.

- **Workload diversity.** More than any other system, zEnterprise excels at running mixed workloads, no matter how diverse. While it’s completely at home running traditional mainframe workloads, it’s equally effective running large-scale Linux deployments using z/VM virtualization technology. The zEnterprise BladeCenter Extension (zBX) will give mainframe users a simple way to connect mainframe and Intel-POWER7-based servers in a single logical server—truly a data center in a box. Unlike other private cloud approaches, this permits sites to run complex, multi-tier applications side-by-side in a single system. Not just a convenience factor, this approach also has a variety of performance, reliability, and security advantages.

- **Energy and cost efficiency.** For a given workload, zEnterprise can be more than 90 percent energy efficient than alternative platforms, translating into direct and substantial savings over the life of the system. Likewise, because it’s always easier to manage and secure a few large systems than hundreds of small ones, staff and systems administration costs are typically much less on zEnterprise. With impressive reliability and availability, zEnterprise can usually run the most demanding applications at much lower cost than many cloud alternatives.

Up until now, the missing part of the puzzle has been a cloud platform capable of spanning mainframe and other systems, whether internal or external. Part of the challenge has been that emerging cloud platforms tend to deliver applications in the form of virtual machine images, and this isn’t a particularly useful construct for mainframes. Sites prefer to have a more granular approach that might let you deploy different application and middleware components on the optimum architecture, depending on business priorities, resource availability, and quality of service needs.

Consider this example. A site might have an application that requires a Web server, an application server and a database, but if packaged into a single virtual machine, deployment flexibility is limited. While the application could be deployed as a monolith to an internal cloud or to an external service such as Amazon EC2, the optimal solution might be different. Perhaps the Web server is best deployed on commodity Intel platforms, the application server on zEnterprise WebSphere, and the database on IBM DB2 for z/OS. The optimal deployment could change seasonally, depending on business conditions. A virtual machine-centric packaging approach makes this sort of flexibility difficult. Returning to the supply chain metaphor, it would be like an automotive factory only delivering complete cars, rather than enabling different factories optimized for engines, bodies, and electronics.

Software vendors are seeking to permit customers to leverage the full power of all platforms for private clouds—internal, external, and mainframes. The more sophisticated emerging products offer fine-grained control of complex applications in a cloud platform. Customers can visually compose applications by selecting components from a catalog of available services that are completely abstracted from the underlying hypervisor or platform. This level of abstraction makes it easy for any application developer or architect to create a virtual data center in a self-service way. It then becomes just as easy to work with internal private clouds as with external providers. Although limited to Intel architectures today, there are plans to extend these concepts to the mainframe in the future.

A high percentage of the world’s most important commercial data resides on the mainframe, making it imperative for new generations of cloud-deployed applications to accommodate the mainframe. zEnterprise and emerging cloud approaches promise to change the mainframe perception dramatically, propelling it into a new role as the platform of choice for future private cloud deployments.

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IBM has often taken an ambiguous stance toward small mainframes. The 4300 machines of the early ’80s were the first physically small mainframes, but still required traditional raised floor and separate peripherals.

Introduced in 1986, the 9370 systems were intended to be “VAX-killers,” serving as departmental machines—a niche now filled by Windows and Linux Intel-based servers. What distinguished the 9370s was their (relatively) low price and power as well as their integrated capability machines were curiosities at the time. IBM also tinkered with a single-user mainframe with the IBM Personal System/390, which evolved from a research project by IBM Fellow Bill Beausoleil’s group. These were true mainframe systems, which were “real” mainframes in that they used the same central processor as the 9672 G5 systems. Ranging from 3.5 to 125 MIPS, the Multiprise machines were the next step up from a P/390, and were beloved among vendors and small shops alike.

All of the systems previously mentioned implemented 24-bit System/370 or 31-bit System/390 (ESA) architecture. When 64-bit z/Architecture was announced in 2000, the Multiprise and P/390 machines were suddenly obsolete. That doesn’t mean they stopped working; IBM supported 31-bit operating systems for several more releases, but when the zSeries announcements didn’t include a Multiprise follow-on, small shops started to wonder what their next step would be.

And what about non-IBM mainframe solutions? The last of the OEMs—Amdahl and Hitachi—exited the market in 2000 after the z/Architecture announcement, claiming that the technology investment for 64-bit was prohibitive. IBM’s 1956 consent decree requiring sharing of technology with OEMs expired in 1997, and that, presumably, was a factor in Amdahl and Hitachi’s decision. IBM no longer had a legal requirement to help them compete.

For many years, the small systems gap was filled by FLEX-ES, a product from Fundamental Software that provided System/390 emulation on Intel hardware. Starting in 1993, IBM allowed small commercial installations to license the 31-bit version of FLEX-ES. By 2002, there was also a 64-bit z/Architecture version, but IBM only allowed its use by ISVs. Fundamental had a good relationship with IBM, but was a casualty of the Platform Solutions Inc. (PSI) fight: IBM’s lawyers apparently felt it couldn’t continue with FLEX-ES while fighting PSI, so 64-bit FLEX-ES licenses weren’t renewed after 2007, although 31-bit customers with perpetual licenses continue.

From 2005 to 2008, PSI offered an Itanium-based System z alternative, but PSI was unable to get IBM to agree to license its software on its platform. After more than a year of mutual name-calling and lawsuits, IBM ended the dispute by acquiring PSI, and the product was withdrawn.

IBM recently introduced its zPDT (Personal Development Tool), an emulator logically similar to FLEX-ES (albeit in no way derived from it). Originally available only to ISVs, zPDT has recently been made available to anyone who wants to develop software on z/OS using the IBM Rational products. It offers decent power on modern commodity hardware, suitable at least for development, if perhaps not for serious production (due to its lack of support for Parallel Sysplex, CPU sharing, and other Reliability, Availability and Serviceability [RAS] features of true System z hardware).

Enter Hercules

Meanwhile, an open source project called Hercules (not to be confused with the announced but never released CMOS machines from Hitachi) had been cooking along since 1999. Started by Roger Bowler, Hercules also emulates IBM mainframe architecture on commodity Intel hardware, running as a task under either Windows or Linux. Hercules made the jump from 31-bit to 64-bit, and actually provides legacy support for 24-bit, something current IBM hardware doesn’t do. As a vibrant, robust open source solution, Hercules is popular with hobbyists and small vendors. Even IBMers have been rumored to use it internally, although since the PSI fracas, this is no longer true, at least publicly.

IBM has mostly taken a “don’t-ask, don’t-tell” approach toward Hercules use by vendors and hobbyists, but has never officially allowed licensing of current IBM software on the platform. So while there are surely dozens—maybe...
even hundreds—of copies of z/OS, z/VM, z/VSE, and perhaps even z/TPF running on Hercules boxes, they're technically doing so illegally and certainly aren't supported by IBM.

Subscribers to the Hercules mailing list (hercules-390@yahoogroups.com) frequently bemoan their inability to run current IBM software legitimately. Their thesis is that "tall oaks from little acorns grow." They assert that by explicitly enabling Hercules use by hobbyists and small ISVs, IBM would be encouraging development of both skills and products for System z, helping ensure its future.

This is a difficult argument to refute, since it's based on assumptions about what might happen in the future. Nevertheless, it has thus far fallen on deaf ears with IBM. This may reflect a combination of factors:

- IBM's wish to avoid stirring up legal issues à la PSI
- The unknown cost of support for such users (who, even if a nominal license fee were charged, could hardly be seen as a profit center for IBM)
- Rumors of zPDT availability beyond ISVs.

Over the last decade, as Hercules has evolved, so has Intel hardware—to the point that a Hercules machine can now offer decent power, albeit without many of the traditional System z RAS features.

In mid-2009, Bowler decided to monetize Hercules. While continuing as traditional open source, his company, TurboHercules, was incorporated in France to offer formally packaged and supported Hercules systems. The idea was that such machines would be sold, at least initially, for backup only, so sites could have inexpensive Disaster Recovery (DR) machines, perhaps at distributed locations, ready to run at a moment's notice. The fact that a Hercules system is more portable than a true System z is a helpful factor here. The backup system could be configured and tested on the raised floor next to the System z, then shipped to the DR site.

TurboHercules seemed like a fine idea, and although it didn't solve any of the traditional licensing issues for hobbyists or small vendors, the community was cautiously optimistic it would help convince IBM that Hercules wasn't a threat, but rather something to be enthusiastic about.

Bowler's intention was to be straight-forward, so he approached IBM about licensing its operating systems for TurboHercules. IBM's response was anything but positive. Instead, a letter from Mark Anzani, VP and CTO, IBM System z, stated that "... mimicking IBM's proprietary, 64-bit System z architecture requires IBM intellectual property; that Hercules isn't innovative, and that it doesn't contribute to IBM business. Citing IBM's existing offerings in detail, it essentially said, "Don't do this," but stopped short of actually threatening legal action should TurboHercules dare to offer a commercial product.

In response, TurboHercules filed an antitrust lawsuit in the European Union (EU), where laws on software patents are far less clear than in the U.S. (see wikipedia.org/wiki/Software_patents_under_the_European_Patent_Convention for details). The suit joins a pending action from T3 Technologies, as well as a pair in the U.S. and EU courts from NEON Enterprise Software. All allege to various degrees that IBM is abusing its de facto monopoly in the mainframe business.

IBM's position is that it has earned that monopoly, spending billions on development to keep the mainframe competitive against evolving distributed platforms, and that the competitors who dropped out (Amdahl, Hitachi, and others) prove that competition is allowed. Whether the courts agree with this thesis remains to be seen.

Far more interesting to watch so far has been the outcry from the open source community. From Eric Raymond, former president of the Open Source Initiative, to Florian Müller, founder of the NoSoftwarePatents campaign, on down, many open source advocates saw IBM's response as an attack on open source and a reneging on their promise not to use patent protection against open source projects.

The focus of their ire was IBM's list of patents possibly infringed by TurboHercules, which included two of the patents they had pledged not to use against open source software back in 2005.

This outcry appears to be, as the British would say, patent nonsense: IBM is making a clear and reasonable distinction between Free and Open Source Software (FOSS) and For-Profit Open Source Software (FPROSS), and should be free to protect its intellectual property from the latter. Some wiser heads, including Pamela Jones of Groklaw and Jim Zemlin of the Linux Foundation, have remained rational on this; journalist Steven J. Vaughan-Nichols quite correctly pointed out that, "A company can be both open source and try to defend one of its core businesses."

Some of the hubbub, as well as TurboHercules' legal response, has focused on the difference between U.S. and EU patent law. One forum post noted that, in at least some of the EU, contract terms violating the letter or spirit of the law can be declared to be unenforceable, and that if folks believe IBM's action is in this category, that the legal action will resolve it, and that the public hand-waving is useless.

The reaction ties back to a widespread hostility among technicians toward software patents in general. U.S. law is more favorable to such patents, so, again, the EU is the beachhead for resolving the issue—and is possibly one reason TurboHercules is based in France.

Rumors and misinformation abound. IBM says that "TurboHercules is a member of organizations founded and funded by IBM competitors such as Microsoft to attack the mainframe." This appears to refer to the Computer & Communications Industry Association (CCIA, ccianet.org), whose members include Red Hat, Google, Oracle and Facebook, as well as Microsoft and others. Whether this makes the group anti-mainframe or not is unclear; their stated purpose and vision is to foster innovation.

Others have said that Microsoft has invested in TurboHercules, which the company denies.

Summary

So, once again, IBM finds itself going to court to defend its investment in mainframe technology. In this case, while IBM probably has the legal right to stop TurboHercules (at least in the U.S.), it seems foolish to do so in the long term for the continued success of System z. But given the vagaries of legal actions, it's quite possible IBM's stance is entirely dictated by its legal team. As usual, the only solution is to wait and watch!
Integrate IT Into the Business

For your business to be competitive, you must do more than align IT with your business objectives; you must integrate IT with the business and allow the business investments to fuel innovation through IT.

A business generates value by developing and selling goods or services. The ability to create these goods or services is dependent on supporting physical, intellectual, and IT processes. Underlying applications, automated processes, and end-user interactions must all work together to make the business successful. For example, banks depend on a number of related tasks and business applications to process online bill payments; the end user initiates payment, the bank transfers payment to the entity that issued the bill, and the bank updates the user’s account balance.

How can you tell if IT is integrated with the business? You need to understand what’s happening and how business and IT work together.

**Monitoring Isn’t Enough**

Business application monitoring enables you to see how business and technical activities work together to affect both business and IT operational performance. The focal point for monitoring and measurement is the business application. When you correlate business, application and technical information, you enable multi-disciplinary management teams to make decisions and solve problems accurately and quickly. Business-integrated IT demonstrates the value of the IT organization to the business and proves that IT costs aren’t just overhead, but rather IT can drive innovation for the business.

Because business, application, and technical operations depend on separate silos of information, you must monitor applications from both a business and an IT perspective. Transactions provide the value the business derives from the application, such as a user who pays a bill online. Technology components process transactions (issue payment) and convey them to related activities (update the user’s account balance). To provide a complete picture of business application performance, you must correlate transaction value and latency—the time it takes the technology component to process and convey transactions.

How can you synchronize this disparate information? To measure Key Performance Indicators (KPIs), you must focus on the application and its execution. It is difficult, if not impossible, to continually consolidate and correlate this data from independent monitoring tools, particularly when you’re processing thousands of transactions per second across multiple platforms and environments. You need a tool that provides a framework for transforming data and delivering synchronized information to stakeholders who have varied needs. While these stakeholders measure performance differently, the metrics must come from a common source—the transaction flow through an application. This type of framework provides cause-and-effect information much faster than typical business intelligence or independent IT monitoring systems.

**Better Decisions Lead to Higher Value**

Synchronized information is critical for better multi-disciplinary, decision-making processes. When you implement a structure that turns data into information, you transform IT from an overhead expense to an integral component of the business that provides value through investment, cost reductions. Your business depends on IT to innovate and support new initiatives that will help the bottom line. Truly business-integrated IT organizations provide visibility into the relationships that affect all levels of the business.

**Business-Integrated IT in Practice**

Here’s an example of how business-integrated IT worked in a recent merger. Two large North American banks merged. One bank had been using messaging middleware to transport transactions and messages between its distributed systems and mainframe. Until the merger, this bank monitored its complex middleware environment with homegrown scripts and discrete monitoring tools, which provided minimal event notification and no compliance documentation or business dashboard views. Proactive business service management was impossible with this model.

The other bank used a tool that monitored the business applications providing consolidation of technical, application and business information in a common tool framework. The consolidated bank chose the integrated solution. Living up to the old adage that the whole is greater than the sum of its parts, the bank now has complete visibility into business applications and it has the information it needs to realize the value of business-integrated IT. When there are latency issues or technology outages, IT understands the business impact and can prioritize and respond to situations appropriately. The end result? Stable operations and maximum efficiency.

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Modern, highly scaled CICS applications can make use of resources across many individual CICS regions running on multiple Logical Partitions (LPARs) even in different time zones. Real-time monitoring of such infrastructures has become suboptimal, given the way they’re now used. Service outages can have a devastating impact on business and must be minimized.

CICS systems programmers and other support personnel at large CICS sites become concerned when asked to investigate operational issues if they’re only given the name of the CICS application that needs attention. The problem is this doesn’t pinpoint the infrastructure involved.

Consider, for example, an application initiated via one of several instances of CICS Transaction Gateway (CTG) executing on several different z/OS LPARs. The CICS transactions involved could be started in any one of many CICS regions where the application code executes and is sent to CICS over Logical Unit 6.2 (LU6.2) connections. These could call on programs or resources in other specific and connected CICS regions or from one of a group of CICS regions. The resources used could include DB2 data, in which case the DB2 connection and suitably configured DB2 entries and DB2 transaction resources may be needed in those regions. The application programs may access VSAM files, either locally in the same CICS region or remotely in a File Owning Region (FOR); perhaps special CICS Temporary Storage Queues (TSQs) are used. Maybe when the application has a problem, it habitually abends with a certain known transaction abend code; if the application uses the services of WebSphere MQ, then the MQConnection needs to be active in the CICS region or regions. Figure 1 shows the basic CICS infrastructure that might be involved in such an application.

It’s also often true that an accurate, timely diagram or document describing the CICS resources an application uses isn’t readily available when it’s most needed. Even if this information is available, the traditional CICS monitors can only show a small subset of the CICS infrastructure to the support analyst at one time.

Considerable time can elapse while support personnel try to understand just what should be inspected; this is frustrating for all involved. Service-impacting incidents aren’t resolved as
quickly as they could be and this has a negative effect on the overall service provided.

Occasionally, there will be something obviously amiss in the CICS regions involved and the traditional CICS monitors, in situ, may provide the insight needed to begin the investigation and recovery. Just as often, the traditional CICS monitors offer no immediate clues. Even with a starting point, it can take time to understand the flow and use of CICS resources involved in the problem application.

Where problems regularly occur, the CICS support areas may start to keep some informal notes about what to look for in relation to a given application name. However, these notes must be referenced quickly and by the whole team, not just the individual who made them. It’s vital that the CICS support area, the application support team, and anyone else who is expected to support CICS-based business applications, know exactly what to look at when calls come in about a problem with an application. That knowledge often resides in informally held knowledge bases that individuals use.

What’s needed is a complete guide to the resources a given application uses and the ability to observe individual components using a CICS monitor solution. Ideally, an automated means of presenting this information should be available—one that can show the status of all aspects of the infrastructure in one easy-to-use view.

Tools available to the support staff should collect and display application-specific monitoring data for immediate use where it’s needed. The traditional monitors in use at most sites are only able to associate a user-chosen or application name with transaction response time type data. This is inadequate, but may at least provide a crude starting point, though typically the systems programmer needs to log on to the specific monitor that will provide this information and visibility may only be provided on one specific CICS region even though the resources may be spread across multiple CICS regions.

In summary, the operational processes for addressing CICS-related application issues are suboptimal at many sites. In the heat of an incident, support personnel don’t know and can’t visualize the entire CICS footprint of the named application reported to be having problems. Time is wasted and service-impacting incidents are prolonged.

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z196: Long-Term Plans and Short-Term Pricing

Since the July 22 announcement of the zEnterprise 196, the new mainframe has already been discussed, analyzed, dissected, and reflected upon from every angle—well, most angles. There was plenty of indisputable detail in the announcement letters. The system offers 96 cores (80 available to the user), running at an impressive 5.2 GHz and delivering up to a 60 percent improvement in performance per core; it provides double the z10’s memory up to 3TB, and contains 100 new machine code instructions. There was also some fascinating “watch this space” technology announced, such as the zEnterprise BladeCenter Extension (zBX) and the zEnterprise Unified Resource Manager.

These latter products lay the groundwork for the mainframe’s emerging role as a consolidation platform for complex data centers and as a next-generation hypervisor and policy manager for heterogeneous environments, including POWER7 and System x. These multi-platform functions have defined the z196 as the first in a new generation of mainframes, and the months and years ahead will see IBM and ISVs rolling out new products to enhance and extend these capabilities.

In the meantime, users’ immediate focus will be on the cost of the z196. As always, the most visible and easily demonstrable cost benefits will come from new workloads and specialty processors. To assess the cost per MIPS (or per MSU) of traditional workloads takes a little more analysis, as these costs can vary significantly from one user to the next (particularly in the absence of a price list). While launching the new range, System z marketing vice president Karl Freund said the pricing per mainframe engine for the z196 would be exactly the same as it was on the System z10, which suggests a very significant reduction in cost per MIPS. Early indications are that this claim may be somewhat over-optimistic, but time will tell as we gather more information from users’ individual deals.

What will make a substantial cost difference, particularly for larger users, is the new Advanced Workload License Charge (AWLC). Among other things, AWLC adds pricing tiers for all MLC products. This means software prices will continue to decline around 16,000 MIPS, compared with the existing Variable Workload License Charge (VWLC) scheme where the lowest prices were at the 7,000 MIPS level (except for z/OS itself). Larger users will see this change as a genuine attempt to correct an anomaly that has been causing serious concern for some time.

Legal Action Hanging Over IBM

Despite the long-term potential of the z196, IBM will need to work fast to turn mainframe revenues around, following a significant dip this year (probably in anticipation of the new system). What might make this upturn harder to achieve is the mounting legal interest in IBM’s practices around its mainframe technology.

Only days after the unveiling of the new processors, it was revealed that the European Commission (EC) has initiated formal anti-trust investigations against IBM concerning two cases of alleged infringements of European Union rules. These reported violations concern the tying of the z/OS operating system to the hardware as a way of keeping emulator vendors out of the market and restricting the availability of spare parts to third-party maintenance companies. The first of these actions is being driven by separate complaints from T3 Technologies and TurboHercules, both which argue that IBM is undermining their ability to offer mainframe applications on non-IBM hardware. For its part, IBM claims that T3 partner Microsoft is behind the complaints, and that it shouldn’t be forced to open up its intellectual property to competitors who had no part in the initial investment.

Meanwhile, NEON Enterprise Software has been granted an early court hearing by the Texas district court, which has moved the ISV’s anti-trust hearing forward to June 2011.

Around the Vendors

CA Technologies announced a new release of CA XCOM, reportedly offering up to 40 percent performance improvements on z/OS file transfers, support for CA MSM, which can deliver an 85 percent savings in XCOM installation and maintenance time, and enhanced health check features.

While confirming full support for the z196, EMC announced a range of products to help mainframe users take advantage of private clouds. These include EMC Solutions Enabler Support of Linux on System z, which supports virtual provisioning and virtual Logical Unit Number (LUN) migrations for multiple Linux images running on a System z; and EMC z/OS Migrator, which helps avoid application downtime and maintain disaster recovery readiness during technology refreshes through non-disruptive data migration.

Demonstrating that mainframe management is still at the bleeding-edge of consumer technology, William Data Systems announced a version of its ZEN network monitoring software for the Apple iPad. According to the vendor, in the future, the AJAX/XML-based client for monitoring z/OS network performance will be easily ported to other platforms such as BlackBerry and iPhone.

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IBM previews a new release of z/OS early every year, announces it later that year, and then makes it available on the last Friday in September. And so it is for z/OS Version 1 Release 12—previewed Feb. 8, announced July 22, and available Sept. 24, 2010. It sounds like business as usual, but is it?

z/OS V1.12 is like no other prior release; it has significant performance, availability, networking, usability, and productivity enhancements that many will find valuable. Together with the new IBM zEnterprise System, it may change the way you do business.

**Performance**

With new VSAM Control Area (CA) reclaim capability, applications that use VSAM Key-Sequenced Data Sets (KSDS) can benefit from improved performance, minimized space utilization, and improved application availability. Such applications include CICS VSAM, VSAM RLS, IMS VSAM, and Catalog processing. In the IBM labs, VSAM workload performance improved by up to 44 percent. Actual results can vary, depending on the degree of data fragmentation. In addition, you benefit from avoiding outages that used to be required to defragment and reorganize this data.

XML is an increasingly important standard used for data interchange and you can exploit this new standard with z/OS. With z/OS XML System Services, validation parsing performance improvement is anticipated to be between 30 and 50 percent, depending on the amount of data being parsed and schema complexity.

z/OS also introduces a revolutionary new fragment validation parsing capability. By revalidating only the fragments being updated, DB2 10 for z/OS pure-XML can avoid the costly revalidation of entire XML documents, which otherwise can take many times longer. As of z/OS V1.10, all validating and non-validating parsing performed by z/OS XML System Services is eligible for the System z Application Assist Processor (zAAP) or System z Integrated Information Processor (zIIP) specialty engines. XML on z/OS is both smart and economical.

With z/OS V1.12, there are significant performance enhancements expected for other types of workloads, too. For example, SVC dump capture time can be reduced by up to 90 percent, though this benefit will depend on the amount of data being captured and how much of that is dumped from auxiliary storage.

Network throughput is improved, too. CPU overhead for applying secure Application Transparent - Transport Layer Security (AT-TLS) will be up to 30 percent less, with the precise benefit dependent on the amount of data transmitted, whether the workload is interactive or streaming, and overall z/OS image utilization. Network throughput for interactive, streaming, and Sysplex Distributor workloads can be improved by using new Open Systems Adapter (OSA) Express 3 Inbound Workload Queuing (IWQ), available on the IBM System z10 and the new IBM zEnterprise 196 server.

**Availability**

z/OS also provides terrific availability enhancements. One valuable function mentioned earlier is VSAM CA reclaim, which gives you the ability to avoid planned outages due to VSAM data set reorganizations. Now you don’t need to take down your applications for VSAM defragmentation, avoiding a task you may currently be doing frequently (e.g., weekly).

You can also avoid additional potential outages with the z/OS Predictive Failure Analysis (PFA) capability. With PFA, z/OS learns from its own environment and tracks system trends, predicting system abnormalities and alerting you to potential problems before they occur. You can use PFA on live systems or even earlier, during application development and testing, to identify previously unknown potential problem areas and respond before they become serious issues. If you can address sick systems faster and more accurately, you can preclude a small incident from cascading into a larger one.

If a system problem occurs, a new base component, z/OS Run Time Diagnostics (RTD), is designed to quickly analyze key indicators on a running system and help identify the root causes of system problems and degradations. RTD does what an experienced operator might do, but in a fraction of the time. It will run in as little as one minute to return results fast enough to help you choose between alternative corrective actions quickly and effectively.

Parallel Sysplex is many clustering solutions in one; it’s used for scalability, availability, software migrations, and disaster recovery. It, too, will benefit greatly from enhancements in z/OS V1.12. The Sysplex Distributor (which manages Sysplex TCP/IP traffic) now has a hot standby capability. You can configure a preferred server and one or more hot standby servers with automa-

By Gita Grube Berg
tion that can switch between the two. In the event of a Coupling Facility (CF) incident, z/OS can now capture CF data non-disruptively, allowing the CF to continue operating and helping to improve Parallel Sysplex availability. This benefit is available with z196 servers and CF control code Level 17. You can also secure your TCP connections easily with less CPU consumption using the new trusted connections capability.

Productivity
This release of z/OS boasts impressive productivity improvements. The new z/OS FICON Discovery and Auto Configuration (zDAC) can simplify configuration of FICON-connected disk and tape. zDAC can automatically discover new or updated devices. It can then propose channel configurations based on high-availability best practices, existing configurations, and even taking into account Parallel Sysplex symmetric configurations. This function can save you hours of configuration time and is available only with the new IBM zEnterprise 196 server. zDAC works with any FICON-attachable, fabric-attached storage (disk or tape) that registers with the FICON name server.

The z/OS Management Facility, the new face of z/OS, can shave hours off system management tasks. With its embedded guidance and wizards, reflecting built-in best practices, new systems programmers can be productive in weeks, not years! It has never been easier to:

- Capture, analyze, package, and send incident (dump) data
- Configure TCP/IP network settings
- Configure, update, and implement z/OS Workload Management (z/OS WLM) policies
- Monitor z/OS performance status and data.

Taking Advantage of a New Dimension of Computing
z/OS exploits the new IBM zEnterprise System, a revolutionary direction in multi-tier, multi-system, multi-workload management and coordination. zEnterprise is beneficial for all System z workloads, but it’s especially ideal for z/OS workloads. zEnterprise provides terrific scalability, availability, and performance for z/OS workloads while improving integration with and management of distributed environments—bringing them close to your core z/OS data.

z/OS is designed to integrate seamlessly with the new zEnterprise System. At a high level, the zEnterprise System is comprised of the IBM zEnterprise 196 server (z196), the IBM zEnterprise BladeCenter Extension (zBX), and the IBM zEnterprise Unified Resource Manager (zManager). Most z196 function is available on z/OS V1.10 (with support as far back as z/OS V1.7). Some z196 functions, such as zDAC and the OSA Express-3 IQW, are exclusive to z/OS V1.12. Only a handful of new networking configuration settings are needed to connect z/OS to the zManager. A new agent in z/OS V1.12 enables you to send basic z/OS WLM information to the zManager. Also, DB2 9 for z/OS (part of the IBM Smart Analytics Optimizer for DB2) is the first resource that exploits the new zBX class of optimizers. The IBM Smart Analytics Optimizer can send CPU-intensive queries to execute on the zBX, returning the data warehousing results in a fraction of the time.

Customers have found in early tests that z/OS, combined with zEnterprise System, can provide:

- End-to-end workload monitoring with z/OS WLM and zManager
- High speed and highly secure networking via use of the physically isolated data and service networks
- Infrastructure simplification with fewer hops, devices, servers, and processors that can complicate today’s data centers
- The ability, when paired with the IBM Smart Analytics Optimizer and the zBX, to implement real-time data warehousing and reporting capabilities from their central z/OS operational data—avoiding the complexity of maintaining many isolated copies of data.

z/OS V1.12 strengthens its core value by delivering advanced real-time capabilities designed to provide higher performance, improved productivity, new levels of data availability, and fewer disruptions to z/OS and the business applications that rely on it. The zEnterprise delivers new management and control capabilities to the servers and technologies that rely on z/OS. Together, they represent a new era of management, monitoring, and resiliency for your critical multi-tier workloads.

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The following is an example of a WHO grid.

![WHO Grid Example]

Your goal is to know whether this specific suggestion or requirement applies to groups other than yours, and whether it's an IT-focused activity or something that also applies to business users. This is important to know because it tells you whether there's the possibility of flexibility; for example, will other groups satisfy compliance in a manner different from you? Next, ask WHAT the requirement applies to (see below).

![WHAT Grid Example]

Finally, ask WHEN the activity should take place (see above). Is it one time, ongoing, or both? Will it be part of planned processes, ad hoc activities, or both?

By now, you should have the WHO-WHAT-WHEN-WHERE-WHY information you need to understand your stakeholders' actual needs. You're in a better position to suggest a HOW that will meet those needs and satisfy your own, as well.

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n the beginning, IT ran on one platform—the mainframe. Workloads were predictable and stable, and we could schedule accordingly. But then came UNIX, AS/400, Windows, and many other platforms, all with accompanying workloads. The Internet and the need for non-stop availability changed the workload model; “stable and predictable” flew out the window. Yet the data center kept the same goal: to manage the workloads to provide the highest level of service at the lowest cost.

The best way to provide optimal service at a reasonable cost is to automate, but automating the data center is easier said than done. Over the years, you’ve adopted a variety of platforms, applications, tools, and processes that may have worked well independently but don’t necessarily work efficiently together. Ever-changing workloads present challenges we couldn’t have imagined a few years ago. You may realize the tools and processes you have are costly in terms of overhead, and it’s hard for your organization to grow and remain competitive when you’re burdened with extra costs.

Adding more people to handle more work isn’t always the answer; eventually, you reach a point of diminishing returns. At what point does automation become less expensive than current tools, processes, and people?

**Dynamic Workload Management**

Workload automation has evolved from traditional job scheduling based on date/time criteria and static business needs to a dynamic model based on fluctuating workloads and changing business needs. Effective workload automation coordinates varied workload types with complex dependencies across multiple operating systems and platforms—in real-time. While date/time dependencies still drive some workloads, real-time IT processing brings a new set of workload challenges. Some IT organizations have been trying to meet these challenges by adding more people, but if you add people without also implementing intelligent automation, you can quickly reach the point of diminishing returns.

To automate cost-effectively, you need a single workload automation scheme and framework that meets the needs of your applications, your multi-tiered infrastructure, and your business. Effective dynamic workload management:

- Supports all platforms and applications in your enterprise
- Provides a consistent look and feel for managing platforms and jobs
- Shows how workloads affect your business goals and Service Level Agreements (SLAs)
- Enables planning and provisioning.

Let’s look at each of these areas more closely.

**Support all platforms:** How many platforms does your IT organization support today? How many applications touch multiple platforms? What integration points do you have? How much have all these changed in the past year? You need a solution that provides enterprise-wide, end-to-end workload management.

The different platforms aren’t the only issue; processes often differ between platforms. Enterprise Resource Planning (ERP) and custom applications add more complexity. The nature of batch production itself has changed from a date/time model to an event and transaction model. Standardizing and automating across platforms, applications, and the batch jobs being processed can be a gargantuan task. Adding to these complications, mergers and acquisitions require IT to quickly absorb or integrate varied, geographically dispersed infrastructures.

An effective, dynamic workload automation solution integrates management of critical workload processes from a single point of control. Cross-application and cross-platform scheduling capabilities (such as job dependencies, workload balancing, and event-based job execution) enable business growth and prevent scheduling problems from developing into business problems. An effective dynamic workload management solution eliminates the need for multiple schedulers, providing a higher level of integration and a lower learning curve. It enables integration of applications, including legacy, ERP, Customer Relationship Management (CRM), Java, Web services, and more.

Consider one example: An online retailer/service bureau maintains a database of more than 6 billion records. They use multiple platforms (Windows, Linux, and VMS), and updates come from hundreds of sources daily. Batch processing jobs keep the databases current by incorporating new information gleaned from these many disparate sources. The volume of updates drove
the need to automate. The retailer needed a dynamic workload management solution that could monitor its email and File Transfer Protocol (FTP) systems for requests, start the appropriate batch job automatically when a file arrives, and deliver the resulting output to the requester or to other downstream jobs. The solution the company chose integrated their platforms and automated the process. The company realized the importance of implementing a tool with a consistent look and feel across all platforms. It increased the number of jobs from 12,000 to more than 85,000—at more than 13,000 locations—and used fewer people to manage the workload. The manufacturer found it could deploy workload automation to any platform and any application with only minor effort. This consistency and scalability helped the manufacturer reduce and shorten outages.

The business impact: Knowing a job has failed is one thing, but knowing what that means to the business is a different ballgame. For example, an operator monitoring workloads may get an alert such as “Job x57xa3 failed.” But what does this mean? This failure could set off a chain of events where many people get involved—some unnecessarily—and use time and resources to determine what the error means and how to fix it. This cryptic alert doesn’t show the business impact of the job failure.

A more meaningful alert would say “Payroll checks due on 6/15 are delayed because job x57xa3 failed. You have two hours to fix it before payroll process will be late.” A robust alert shows the failure, the impact it has on other processes, and offers recommended solutions. Because this type of intelligence provides visibility into business process, it lets you set priorities and correct the most important problems first.

It’s important to fix a problem correctly the first time and ensure that a fix on application A doesn’t cause a failure on application B. Intelligent, dynamic workload management solutions can provide this information, so you reduce the risk of failures and save the time and effort of correcting problems multiple times.

An online retailer needed to understand the impact of batch jobs on its ability to meet SLAs. The company needed to be able to define and manage batch flows on a business process level instead of the job level. It chose a solution that monitors the progress of each batch job, watching for conditions that might cause a failure or degrade performance in a way that would jeopardize service levels; the solution alerts staff when intervention is required. By implementing dynamic workload automation and batch impact solutions, the company reduced manual tasks by 40 to 50 percent in the first two years and was able to absorb a rapidly expanding workload without hiring many people.

All the company’s revenue-generating activities occur electronically, so when the IT systems are down, operations aren’t profitable. Outages also have a ripple effect because partners and users also can’t do business when the company has an outage. Staff members can see the business impact of events, so they have the situational awareness that helps them quickly identify which events threaten to disrupt services. Technical personnel can prioritize their actions, addressing the most critical issues first to ensure the company can deliver its product to consumers and business partners.

Planning & provisioning: Workloads fluctuate. Sometimes, you can predict when workloads will rise, but planning for dynamic workloads can be challenging. Intelligent, dynamic workload management solutions provide forecasting information based on prior workloads, supporting the use of “what-if” scenarios. For example, a cable television provider can use such scenarios to determine what resources they need for the hour preceding a pay-per-view event.

The IT environment for a large discount retailer with thousands of stores and an online shop became so complex it could implement changes to systems, applications, and processes only once annually, during a two-week window around Easter. The retailer couldn’t determine the impact of these changes on related systems and applications, and it typically had 18 unplanned outages each year after the Easter change. Unplanned outages are costly for online retailers because customers can simply click to another Website. By implementing a dynamic workload management solution, the retailer was able to assess the impact of planned changes and adjust them before implementation. Unplanned outages evaporated in the first year of system use. The value of impact assessment is clear; preventing problems is much easier and cheaper than fixing them.

Dynamic Workload Management Implementation Obstacles

Often, existing job scheduling software lingers, even if it doesn’t provide intelligence and automation, because of the fear of the costs and risks of conversion. When you move to dynamic workload management, choose a vendor that will provide the necessary support. Select a solution that’s modular, easy to use, and provides the criteria discussed here. The rewards are high: rapid integration between change management, event management, workload automation, problem management, and impact management, as well as higher efficiency, availability, and visibility of IT processes.

Dynamic workload automation brings efficiency, agility, and cost savings. It lets you replace complex, enterprise-wide IT processes with measured, cost-effective, low-risk initiatives.

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Season of Disasters

There's a tendency to think of disasters in seasonal terms. In Florida, where I'm based, June 1 is the date assigned as the beginning of hurricane season, despite the fact the really disastrous weather events seem to be coming later and later in the year—from September all the way through December. Elsewhere in the country, we hear worries of another active winter storm season, though this is also an imprecise bracketing of ice storms and blizzard events, which last year clung like ice to the roof gutters in much of the country until well into spring. And, while less weather-related than geophysical, we're now hearing that the West Coast is “overdue” for the Big One—an earthquake that might someday give Nevada its own ocean-front vistas—based on historical intervals between tectonic events.

Truth be told, most disasters—which I define in the context of business technology as “any unplanned interruption of normal access to data for whatever constitutes an unacceptable period of time”—don't fall into the category of “smoke and rubble” events with broad geographical impact. Statistically, these disasters comprise less than 5 percent of the total interruption pie chart.

In our world, disruption events tend to emanate from four primary sources: planned downtime, software glitches, hardware failures, and user errors. Trend lines are upward for the last three and downward for the first. These days, a lot of maintenance activity is being postponed (hence the downward trend in planned downtime) for lack of time and resources, which actually contributes to the upward trend in hardware- and software-related outages. Some call these types of interruption events “crises” that can, in theory, be resolved more rapidly than cataclysmic outages stemming from earthquakes, floods, hurricanes, and the like.

In truth, however, the recipe for recovering from any outage is the same. You need to re-platform the application, re-connect the application to its data, and re-connect users to the application.

Mainframers know this drill well, and their data center operations procedures manuals usually feature one of several methods for accomplishing these tasks in response to any interruption event. For those firms with deep pockets, there's usually a second data center, either owned by the company or leased from a commercial hot site provider, waiting to pick up the workload from the primary data center should it become impaired or isolated. The less well-heeled tend to take a more winding road to recovery: backup to tape, store tapes offsite and, in the event of an emergency, rely on a combination of service bureau processing, just in time discovery of alternative space, and next-box-off-the-line delivery of new or off-lease gear.

Virtual Tape Libraries (VTLs) are being increasingly used; in crude terms, they're simply disk buffers that front-end tape libraries. While some vendors offer VTLs as special storage hardware appliances that are capable of prestaging tape volume for later writes, they also provide a means to replicate their data to a remote site. The gotcha is that usually the gear receiving the write remotely must be the same brand as the VTL appliance used in the primary site—doubling the cost of the solution and locking the consumer into a particular vendor's stuff.

A better alternative is to go with a software-based VTL. The strengths of a software-based approach are many. One benefit is that you can use your own DASD rather than paying a huge markup on otherwise commodity disk to store your tape volumes. Moreover, if you're replicating some or all of your data over a network, this approach frees you from a vendor lock-in on hardware, increasing your flexibility.

If you go the software route, be sure to select a product that 1) facilitates network-based communication without a lot of hassle; 2) gives you the flexibility to alter the size of the cache of disk; and 3) leverages all LPAR and CPU enhancements, including dynamic allocation of DASD (so you can grow and shrink your storage pool as needed) and System z Integrated Information Processor (zIIP) eligibility for the VTL application and its workload (so you can offload processing).

Also, make sure your virtual tape supports, well, tape. In my experience, disasters know no season, and for all the talk about disk-to-disk replication replacing tape, I keep hearing that Sony ad replay in my mind: There are only two kinds of disk—those that have failed and those that are about to.

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loy·al·ty
1. the quality of being faithful.

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