

# IBM CICS Tools: Discovery and Optimization for the Next Generation



January 2013



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## Executive Summary

The mainframe or IBM System z platform continues to play a vital role within organizations across North America and abroad as new and varied workloads are added. As customers continue to plan ahead for the next generation of systems and resources, each must take every opportunity to evaluate new options in cutting unnecessary costs, and in further reducing their processing requirements, including the tuning of existing applications. Optimization in this regard is crucial and can help postpone processor upgrades and with it, the expense of additional software licensing costs.

Of the same vein, the continued increase in new workloads puts tremendous demand and strain on existing system and application programmer staff. Supporting this group with the right tools can help by allowing them to complete their tasks more quickly and efficiently, ultimately decreasing the need for additional, increasingly expensive and difficult to find resources.

The continued challenges expressed by organizations experiencing these growing pains have prompted Branham to reinvestigate and see if the way organizations are addressing these challenges has changed over the last few years. In this update Branham looked at the most ubiquitous application for System z, the IBM CICS Transaction Server, being deployed in almost every mainframe environment. This ubiquity allowed Branham to focus on the solutions that would provide the widest possible value for System z customers.

With the ability to provide hardware, software, and services through a single vendor solution, Branham once again took a look at the latest CICS tools that are available from IBM. In co-operation with IBM, Branham was able to interview several existing (new and old) IBM CICS Tools customers that had evaluated or are current customers of such offerings as IBM CICS Interdependency Analyzer, CICS Performance Analyzer, CICS Configuration Manager, the newer CICS Deployment Assistant as well as those using the CICS Explorer graphical interface.

Of the customers that were interviewed, it was clear that IT environments and overall customer experiences continued to be largely unique. However, there again were several common value propositions for System z customers that were well evident. Overall, the most significant value continues to be derived from the conversion to threadsafe

applications. The following provides a view into some of the savings that these customers realized through the use of the latest CICS tools:

- » A reduction from weeks to hours for the discovery and documentation of existing CICS topologies.
- » 75% time savings for the identification, coding, and testing of CPSM rules, in some cases equating to the recovery of a whole month in time savings for a major affinity.
- » Upwards of 90% time savings to identify and validate typical performance issue related changes.
- » An average of 66% less time to administer CICS Service Definition changes, which happen on a daily basis.
- » A 75% reduction in time to recover from a major issue related outage.
- » Upwards of 80% time savings to identify, code, and test applications when converting to threadsafe.
- » A 50% reduction in the time it takes to identify application code and files (and DB2 Table-Views) that are no longer used and can be decommissioned.

Whether replacing existing vendor tools or homegrown solutions, these customers continue to find additional value and savings that “alone justify the cost of the IBM CICS tools.” This report includes a summary of some of the potential cost savings based on real world experiences, and can assist in providing some added insight to those that are tasked with improving operational efficiencies in their CICS environment for the next generation.

## Introduction

The mainframe, or IBM System z platform, has been an integral part of the business fabric for many years and continues to prove its worth for cost control and reliability, amongst many other factors. Continued interest in the platform is in stark contrast to the practice of migrating to distributed systems for a “perceived” cost delta. In recent years, as distributed systems have grown in size and complexity, users have started to see an escalation in personnel hours, maintenance requirements, and environmental costs. With the introduction of new workflows, this has only compounded the issue, where the mainframe has helped organizations to significantly reduce some of the associated expenditures. While not void of maintenance related costs, studies continue to show that the number of personnel hours is often significantly less in a mainframe environment.

Similarly, the mindset towards application development and systems management for the System z platform can be quite different from that of its distributed counterpart. Specifically, in a distributed or even cloud-based environment, inefficient programming that results in slow performing applications will often simply have additional resources thrown at it to improve response times. While the addition of hardware may be inexpensive, it again increases the operational cost of the system, namely the costs associated to personnel, power, maintenance and management; and potentially cloud related infrastructure fees as well.

In contrast, the frame of mind towards mainframe application development is to tune applications for optimal performance, thus reducing hardware requirements and application response times. Similarly, the continued advancement of management tools has also helped to relieve the amount of time associated with application and system management, so application developers and system managers can focus on new business initiatives, even with shrinking budgets.

In conjunction with mainframe implementations, many large organizations have been using the IBM Customer Information Control System (CICS) since the early 1970s. In fact, CICS has a dominant presence, being installed at almost every System z site. Used for developing, running and managing transaction applications on the mainframe, these systems have grown and evolved with the business over time.

The purpose of this report is to provide customers with insight into some of the intricacies of the mainframe, while helping identify areas where applications can be tuned and productivity benefits realized. This discussion will focus on the CICS platform in particular, and look towards areas where customers can further reduce costs through system optimization.

## Mainframe Cost Benefit Factors

It's no surprise that businesses continue to push a "do more with less mentality". With the number of mergers and acquisitions in which the largest organizations partake, this way of thinking becomes increasingly difficult to support. Add the growing demands of regulatory compliance while maximizing system availability and performance, and the demands placed on the IT staff are significant.

Organizations need to know that they have taken every opportunity to optimize their applications in efforts of controlling the costs associated with hardware upgrades and third party software. The following outlines a variety of areas that should be considered as part of a cost mitigation strategy for not only a CICS environment, but also the broader mainframe.

### Cost Considerations

- » **CPU Time:** Some organizations may already have a value associated with CPU time in their environment. This is often simply the cost of the CPU lease per month. The ability to tune applications to help decrease CPU usage during peak times can have significant value, particularly if it helps postpone pending new processor purchases, which themselves would also have added software licensing costs. Important to note is that CPU savings are only realized if the saved processing time could be used for something else. Specifically, saving 10 minutes of CPU time from a job that runs at 3 am in a site where the nightly batch cycle completes an hour before needed is not really saving anything. However, saving this time from peak period transactions in a CICS region that is constrained at 11am can provide significant savings.

### Even Small Changes Can Lead to Big Savings

When applications are tweaked to reduce response times and CPU consumption, even the smallest changes can equate to significant savings. For example, a large US banking institution stated that ***"one CICS transaction that was tuned only saved fifteen seconds from the original, except that 15-20 tellers in 500 branches executed this transaction every hour. So 20 times 500 equals 10,000 transactions per hour, times 15 seconds equals 150,000 seconds every hour. Over an 8 hour day, that's 5.5 hours in CPU savings!"***

- » **Software:** Many organizations are uncomfortable with the thought of the increased costs that are associated to third party software when CPU upgrades are required. While these costs may be fairly difficult to determine without a lot of effort, it is very important for organizations to do so. Software costs may be one of the most significant savings that can be achieved. In some sites, this amount is equal to the CPU costs, while in others it may be up to double the CPU costs. Even as a percentage of the overall CPU costs, these costs should



not be ignored, as the savings can often easily justify the costs associated with the tools used to postpone the perceived necessary processor upgrades. Delaying a processor upgrade can save organizations thousands of dollars in delayed software costs.

- » **Personnel:** While hardware costs continue to decrease, personnel costs continue to rise. Providing application and system programmers with the tools necessary to complete their tasks more productively not only helps to reduce the demands on these personnel, but also helps them fulfill various requests, such as system changes, more rapidly. Similarly, users waiting for these changes to be implemented can get back to work sooner. While the intention may not be to eliminate personnel, providing them with more efficient graphical user interfaces could allow them to put more focus on new business initiatives, thus leading to increased competitive advantage. Where subcontracts or new staff are involved, shortening the times to learn an existing environment can also produce significant savings.

### How Much Does An Outage Really Cost?

Average downtime costs vary considerably across industries. Information Management magazine estimates this cost can range from \$90,000 per hour in the media sector to about \$6.46 million per hour for large online brokerages. According to the IT Process Institute, resolution time per outage averages 200 minutes. **An international Managed Healthcare Company was able to reduce the time to resolve even the most major issue by 75% with IBM CICS Performance Analyzer.** Even cutting down the suggested typical 200 minutes by 55% for minor issues could mean millions less in financial impact.

- » **Outages:** Making changes to applications without understanding their relationships with, and effects on, related applications is a recipe for failure, which can subsequently lead to application outages. Downtime for large organizations can be quite expensive, and the ability to eliminate or reduce their duration is significant. Many may not understand the magnitude of such outages. Taking into consideration consequences such as lost user productivity, lost IT staff productivity, lost revenue, overtime payments, wasted goods and material, and imposed fines or penalties, average

hourly impacts due to outages can be upwards of millions of dollars depending on the industry. Tools that help automate system changes and quickly back out of erroneous changes can significantly help reduce unplanned outages based on human error.

- » **Customer Value:** Customer satisfaction and user time as a further cost consideration, while more of an esoteric savings, is difficult to measure. In many cases, organizations will be able to find enough savings in the hard resources to justify most optimization efforts and may not need to investigate the requirement to put a dollar value on customer savings. However, depending on the type of business and the nature of the competition, this may be a requirement. Stories abound about customers leaving their brokerage firms, or banks, or Internet providers, etc., because of poor response times. Customers today have more options and less patience. In short, the primary goal of optimization may not be the delaying of a processor upgrade, but rather an improvement related to response times during peak hours to keep and attract new customers.

### Licensing Considerations

IBM has continued to innovate and maintain the relevancy of the System z platform, while trying to help reduce costs for its customers through advancements in not only the technology itself, but also how it is licensed. The advent of the Workload License Charge provides sub-capacity software pricing where fees are linked to the actual capacity used by software within the LPAR where it runs. This ensures customers pay only for the software they actually use. Unfortunately, customers may still be paying too much, and optimizing applications can still have a dramatic effect on overall software costs even when paying through this sub-capacity pricing model. To help provide a better understanding of this important note, a clear understanding of Variable Workload License Charges (VWLC) is required and how it compares to the licensing of the entire capacity of a Central Processing Complex (CPC). Specifically, it's important to understand what "CPU usage" means.

**Note:** With the release of the z196, IBM introduced a new Advanced Workload License Charge (AWLC) that in short, further lowers prices per tier, offering improved price performance as compared to VWLC for all customers above 3 MSUs.

For VWLC, CPU usage is calculated based on the MSU measurement unit. Every 5 minutes the Workload Manager (WLM) inside each LPAR calculates a 4-hour rolling MSU average. At the beginning of each month, the Sub-Capacity Report Tool (SCT) provides the LPAR usage, being the highest sum of the measured 4-hour rolling MSU average for the LPARs in the CPC. Charges are not based on the product CPU usage in the LPARs, but rather on the sum of the usage of all the LPARs where the products were running.

Table 1 shows an example of how the SCRT calculates the LPAR utilization capacity for different products and LPAR combinations.

The MAX value is the highest usage determined from the sum of the utilization for all LPARs in which a particular product ran in a given hour. It is not the sum of the highest usage for individual LPARs in which a particular product ran during different hours.

In this example, the peak value of the month for z/OS is in hour 4. It is the sum of the z/OS usage across all the LPARs during hour 4, or 520 MSUs. The peak value for CICS is in hour 718. IMS ran only in the first part of the month in LPAR2 so its usage value is 402 MSU.

In the above example, note that running IMS in the same partition as CICS also increases the IMS usage in that LPAR, making it more expensive because IMS will be paid for on its own consumption plus the MSU already used by CICS. In this case, reducing CICS related overhead will also decrease the consumption costs related to IMS, reducing costs not only for CICS, but also other VWLC software running in the same LPARs which might include DB2, WebSphere MQ, IMS, Lotus Domino, and z/OS itself.

With a clear understanding of the Workload License Charge, organizations will further understand how application tuning and optimization can have dramatic cost savings for organizations whether paying for full capacity and delaying processor upgrades, or if paying for only what they use through VWLC. Similarly, helping application and system programmers be more productive can also help organizations invest less in the maintenance of existing assets and spend more time on new innovative initiatives. While there are many areas these optimizations might be applicable, one of the most common areas is around CICS based applications.

## Mainframe Optimization with CICS Tools

In efforts of further understanding some of the current cost considerations and challenges that customers are facing in a mainframe environment, Branham Group spoke with a variety of IBM CICS customers to assess their ongoing use of the tool sets and what steps they had taken in efforts of realizing productivity improvements and ultimate cost savings.

Two major themes are evident: reduced CPU cycles through conversion to threadsafe applications, and increased productivity through added time savings. The conversion of CICS applications to threadsafe was noted to provide the most significant cost benefit for customers, while increased productivity was also experienced, incorporating a number of different perspectives and esoteric benefits not as easily calculable.

Table 1: LPAR Utilization

4-hour rolling average			z/OS			CICS			IMS		
Hour	LPAR1	LPAR2	LPAR1	LPAR2	SUM	LPAR1	LPAR2	SUM	LPAR1	LPAR2	SUM
1	100	333	100	333	433	0	333	333	0	333	333
2	120	321	120	321	441	0	321	321	0	321	321
3	112	345	112	345	457	0	345	345	0	345	345
4	118	402	118	402	<b>520</b>	0	402	402	0	402	<b>402</b>
.	.	.	.	.	.	.	.	.	.	.	.
718	127	348	127	348	475	127	348	<b>475</b>	0	0	0
719	133	299	133	299	432	133	299	432	0	0	0
720	122	300	122	300	422	122	300	422	0	0	0
<b>MAX</b>					<b>520</b>	<b>475</b>			<b>402</b>		

## Reduced CPU Cycles through Conversion to Threadsafe Applications<sup>1</sup>

This particular topic may be one of the simplest yet most significant changes that organizations can make, providing some of the largest benefits when optimizing the performance of their CICS applications. Although some will be familiar with this topic, many may not understand the tremendous value that the movement of CICS applications toward threadsafe may provide (see sidebar “Converting To Threadsafe Saves Millions”). To really portray this value, a little parallel education is required.

A Task Control Block (TCB) is a z/OS control block that represents a dispatchable unit of work. In short, TCBs represent tasks such as an executing user program. CICS has only one TCB referred to as the quasi-reentrant (QR) TCB that is shared by all CICS tasks. This facilitates “free” serialization to share resources such as files, data sources, etc. It means that although the same program can be executed by multiple CICS tasks, only one of those CICS tasks is active at any one point in time. Processing these applications in parallel could cause issues.

## IBM CICS Tools

**IBM CICS Interdependency Analyzer (IA) v5.1** for z/OS is a runtime tool that automatically builds a comprehensive database of CICS resource relationships. It enables development teams to understand quickly and easily which transactions, programs, maps, and other resources will be affected by planned changes. Inexperienced users can quickly understand what a CICS region contains, what resources a transaction needs in order to run; which programs use which resources; and which resources are no longer used.

**IBM CICS Performance Analyzer (PA) v5.1** is an offline reporting tool that complements real-time monitoring solutions, analyzing a wide range of System Management Facilities (SMF) records to produce comprehensive reports on all aspects of CICS system performance. Whether planning, building, managing, or deploying complex mainframe CICS applications, CICS Performance Analyzer makes it easier to improve CICS related system performance and more quickly recover from unplanned outages when they occur.

**IBM CICS Configuration Manager (CM) v5.1** wraps a software solution around CICS resource definitions and the migration of these definitions so that they can be managed in a controlled and audited fashion. Working equally well with CICS CSDs and Data Repositories under CICSplex System Management (CPSM), it can migrate changes seamlessly between these environments. It also integrates with change management software that may be in place by using a batch interface to migrate the resource definitions.

**IBM CICS Deployment Assistant (DA) v5.1** enables organizations to quickly discover existing CICS regions and subsystems; including DB2 and WebSphere MQ. It provides policy driven automation for the creation, deployment, customization, and control of CICS regions (e.g., start/stop and clone regions). Users can visually navigate from CICSplex to Managed regions, CMAS, and the Web User Interface.

It should be noted that with the release of CICS Transaction Server v5.1, IBM has synchronized the tool versions bringing them to the v5.1 level as well. This helps to alleviate some confusion and better illustrate which versions of the tools are required to capitalize on the optimal feature set. However, newer releases of the tools are still backwards compatible with older versions of CICS TS.

## Universal Management Environment

**IBM CICS Explorer** provides an Eclipse-based systems management environment for application programmers, system programmers, and other operations staff. Available as a free download (no individual seat charges apply), it provides a modern interface to CICS that is highly customizable and can be integrated with information from additional third party tools, providing users with a single Master Terminal.

1. The IBM Redbook “Threadsafe Considerations for CICS” provides a comprehensive guide to threadsafe concepts and implementation for IBM CICS (<http://www.redbooks.ibm.com/abstracts/SG246351.html>)

## Converting To Threadsafe Saves Millions

A large US based Health Insurance Company recently converted a number of their applications to threadsafe providing them with a significant savings. This particular environment is home to 600 applications, over 1000 platforms, and sees 60 million transactions a day. While the majority of the applications were converted over a 6-7 month period, over the span of a year the company was able to save upwards of 2 billion switches and saw a savings of 1300 MIPS during peak hours.

Depending on the hardware (the cost per MIPS drops with each generation) and the software stack (e.g., z/OS, DB2, CICS, MQ, COBOL, NetView) costs per MIPS can vary drastically. Being conservative, some estimate the average cost to be anywhere from \$1,500 to \$3,000 annually per MIPS (some estimates range from \$2K to over \$12K), illustrating that this particular customer could have saved an estimated \$1.95 million to \$3.9 million or more.

These savings can be further accelerated with tools like IBM CICS Interdependency Analyzer, which provides reports for which applications are prime candidates for threadsafe conversion. For example, one customer interviewed saw an average **65% reduction in the time it took to identify, code and test threadsafe applications** compared to not having the tool. Given the number of applications this company converted, this equated to years of recovered developer hours.

To protect against issues, application code was “automatically” serialized because it had to be dispatched on the single QR TCB. Since there could not be multiple application programs running simultaneously within CICS, the QR TCB provided the protection mechanism for shared resources. However, this limited the multi-processing capacity of CICS to specialized functions and in many installations, the QR TCB reflected 80 to 95% of the total CPU used by the CICS address space.

Through the advent of open TCBs, CICS applications can now be dispatched to run in parallel (simultaneously) with the QR TCB providing a possible reduction in CPU usage and increased transaction throughput. This parallelism now presents the situation where two different tasks running simultaneously on separate TCBs could require access to the same resources. If there is no synchronization, the result could produce invalid results or compromise data integrity.

A threadsafe program requires built in mechanisms (e.g., ENQ/DEQ) to ensure serialized access to a shared resource to avoid data integrity problems. It is important to understand that a single program that operates without the agreed-upon serialization technique(s) can affect the predictability and integrity of an entire system of otherwise threadsafe programs. Therefore, an application system cannot be considered threadsafe until all programs that are sharing common resources implement appropriate standards.

If not defined as threadsafe, then a TCB switch from the open TCB to the QR TCB must occur in order for the application to continue, and there is a CPU price to pay for this switch. Specifically, a TCB switch costs around 2,000 instructions.

CICS will automatically switch to the QR TCB for a non-threadsafe command. With a high percentage of threadsafe commands within a threadsafe application, the thread of execution can remain on an open TCB for longer and so improve the performance of the system.

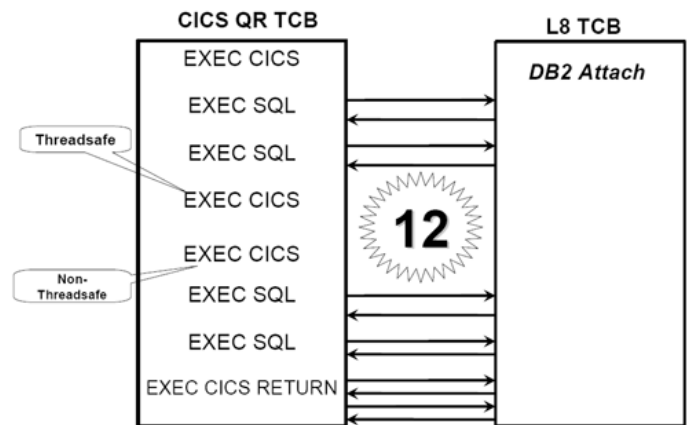


Figure 1: TCB Switches for CICS Apps Not Yet Defined as Threadsafe

To better illustrate the impact of this cost, consider that if a task was executing on the QR TCB when a DB2 (or IMS as of CICS TS 4.2) request was made, then a switch to an open TCB is made at a cost of 2,000 instructions. Once the request has completed, the program returns to the QR TCB where the program issues another CICS API command, incurring further cost in CPU instructions. The reason that the request is assigned to the open TCB is so that it can handle the request and communication with DB2 (or WebSphere MQ or IMS), and the QR TCB can continue to dispatch other work.

### Not a One and Done Operation

As one customer noted, CICS Interdependency Analyzer is “not a one and done tool.” Specifically, while the combination of CICS PA and CICS IA help accelerate the identification and isolation of opportunities for threadsafe conversion, there are often updates that increase what can be converted to threadsafe. For example, with the release of CICS TS 3.2, WebSphere MQ requests could be made threadsafe. Similarly, the release of CICS TS 4.2 saw the addition of IMS requests, and Transient Data as of CICS TS 5.1. In short, with each upgrade, customers have an opportunity to go back and see what additional switching can be eliminated for further cost savings. Specifically, customers may be able to achieve new performance gains not possible with the previous version of CICS TS and the CICS Tools.

A round trip from the QR TCB to the open TCB and back would represent around 4,000 instructions. The same could apply to many exits in use by the CICS system. Therefore, it is imperative that all exits be converted to threadsafe or the CPU utilization may increase.

“By making only one major application threadsafe we were able to save 700 MIPS”

- Major US Bank

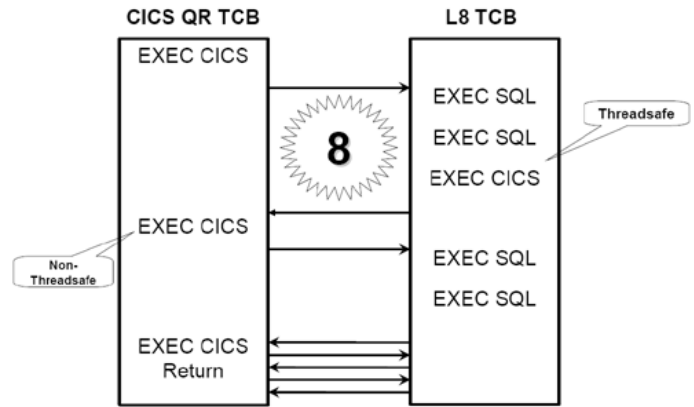


Figure 2: Reduced TCB Switches for CICS Apps Defined as Threadsafe

More importantly, further performance improvements to CICS response time and throughput without processor upgrades can be achieved through the use of threadsafe programming, as more and more API and SPI commands are made threadsafe with each new release. Processing as many tasks as possible on the open TCBs will remove constraints on the QR TCB and reduce the response times of both threadsafe and non-threadsafe transactions. Please note, that it is highly recommended that threadsafe enablement should be completed with proper analysis to avoid any potential program conflicts and/or outages.

How important is this? Based on the z196 redbook value, one (1) million TCB switches waste 2.3 CPU seconds, and for one (1) billion switches, over 38 CPU minutes are wasted.

### Calculating Wasted CPU

Interested in calculating your wasted CPU due to TCB switching? The average number of TCB switches per transaction is available through SMF 110 (CICS CMF) records, obtainable through any tool that reports on SMF data. The TCB switch information is obtained from group DFHTASK, class 248. The field name for this class is CHMODECT before CICS TS 3.1 and DSCHMDLY for CICS TS 3.1 and higher.

To complete the calculation, the following assumptions must be made: a z196 and EC12 process is .192 and .178 nanoseconds per cycle respectively (for reference, z9 and z10 are 0.58 and 0.23 nanoseconds respectively); the average instruction required 6 cycles; and each TCB switch requires 2,000 instructions. This leaves only two variables required: the number of TCB switches per transaction; and the number of times that transaction is executed in a single day. The calculation is as follows:

$$\frac{2000 \text{ Instructions}}{1 \text{ switch}} \times \frac{6 \text{ cycles}}{1 \text{ instruction}} \times \frac{.192\text{ns (or .178ns)}}{1 \text{ cycle}} \times \frac{1 \text{ second}}{1000000000\text{ns}} \times \frac{1 \text{ minute}}{60 \text{ seconds}} \times \frac{\# \text{ TCB switches}}{1 \text{ transaction}} \times \frac{\# \text{ transactions}}{1 \text{ day}} = \frac{\text{wasted CPU minutes}}{\text{day}}$$



Similarly, one billion TCB switches on an EC12 processor will waste over 35 CPU minutes (z9 and z10 waste 116 and 46 CPU minutes respectively for 1 billion switches). In one example, a customer had ½ billion TCB switches in their environment every day, which provided significant return on investment when designating their CICS applications as threadsafe. An average projection is a savings between 2% – 15%.

Figure 3 provides an example of a leading brokerage firm and its documented CPU savings when converting four of its modules to threadsafe.

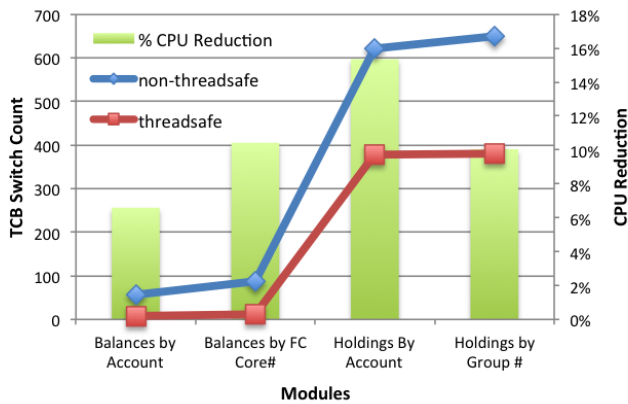


Figure 3: Brokerage Industry Threadsafes Conversion Savings

To help organizations convert their CICS applications to threadsafe in a reliable and timely manner (vs. a manual approach), IBM CICS Interdependency Analyzer provides insight into existing programs and their relationships with other transactions and resources. It provides the facilities to assist in the movement to a threadsafe environment by analyzing the application to uncover data integrity exposures, show which programs can be made threadsafe immediately, determine which exits are threadsafe, and to ensure application changes do not cause an ABEND or regress an already defined threadsafe environment. Similarly, IBM CICS Performance Analyzer can provide answers to questions such as: Which TCBS a transaction used? How many TCB switches occurred? What was the switch delay time? How much Dispatch and CPU time did they use? Why did my transaction take so long?, etc.

For many customers, the financial cost of running their applications is related directly to the amount of CPU consumed. Under these circumstances, the CPU savings gained by migrating appropriate applications to a threadsafe environment can equate to a significant financial saving.

### IBM CICS VSAM Transparency (VT)

One customer interviewed had over 50,000 programs that accessed VSAM files. In some cases, the core files were referenced by 80% of the applications. *“We simply don’t have the resources to convert so many applications at once. CICS VT allows us to break the work down into smaller pieces.”* In short, CICS VT allows CICS program to continue to use the VSAM programming interface to access data, while the data is more sharable through DB2. CICS VT files become eligible for threadsafe tuning because of the DB2 physical access while providing potential improvements in performance via DB2 buffering (caching).

### Increased Productivity through Added Time Savings

While the conversion of CICS applications to threadsafe can provide a calculable benefit to customers, Branham’s interviews also revealed a number of additional benefits that provide cost savings in other ways, including productivity benefits, the virtual elimination of errors, help with meeting new governance requirements, and more. Some of the more commonly noted examples included the following:

- » **Affinities and CPSM Rules:** CICS transactions use many different techniques to pass data from one to another. Some techniques require that the transactions that are exchanging data must execute in the same CICS region and therefore impose restrictions on the dynamic routing of transactions. If transactions exchange data in ways that impose such restrictions, there is said to be an affinity between them. IBM CICS Interdependency Analyzer will identify affinities that would prevent the combining of CICS regions and/or the movement of resources to a different CICS region. CICS Interdependency Analyzer also provides the facilities to generate the necessary CICSplex System Manager (CPSM) rules required to activate transaction routing while maintaining the existing transaction affinities. For a site moving to dynamic transaction routing, this feature can reduce the time to production while eliminating the risk of transaction abends. In fact, during the Branham interviews, customers noted a **savings upward of 75%** for the time required to identify, code, and test CPSM rules. For a process that can take several business days for major affinities, this provided customers with significant time savings.

### Major Affinity Example Savings

The average time required for a system programmer to identify, code, and test CPSM rules for a major affinity can take upwards of 200 hours. For reference, major affinity rules apply to transactions with resources that exist for a unit of work, plus system or transaction affinities for persistent resources such as a user login state. A 75% savings based on this 200 hours is a 150 hour reduction. That's approximately a month or 20 work days that a system programmer now has available to focus on other initiatives. For a paid consultant, at a rate of \$65/hr, this one example could provide a savings of almost \$10,000.

» **Performance Tuning and Analysis:** IBM CICS Performance Analyzer provides the facilities for performance bench marking before and after changes to validate improved optimization. On average, this tool provided over 70% time savings when system programmers were tasked with the identification and validation of performance related changes. For example, simple performance analysis could be reduced from 4 hours to 1. Similarly, complex performance related issues were reduced from 48 hours to 12 hours. And **in some cases customers saw upwards of a 90% decrease in the time required to identify and validate performance changes.** Using IBM CICS Performance Analyzer, customers were "better able to improve performance" and "better able to diagnose the root cause" of performance issues after a recovery had been achieved.

» **Automated Subsystems Management:** Every CICS region refers to a set of resource definitions. Typically, organizations maintain each of their CICS regions in at least three separate environments: development, test, and production. Changes to resource definitions are migrated from development to test, and then from test to production. As shown in Figure 4, even if each environment contains only one CICS region, this means three sets of resource definitions, and two migrations are needed to move each change into production. IBM CICS Configuration Manager is designed specifically to help reduce the time required to migrate changes to CICS System Definition (CSD) files, and provides the ability to track and back out changes if the results are not satisfactory.

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“In the past year, we were able to save over an estimated 2 months worth of man-hours when identifying and validating performance issues through the use of CICS PA.”

- Sylvie Constans, System Engineer at CA-SILCA, IT production subsidiary of Groupe Credit-Agricole

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Several of the customers that were interviewed had implemented IBM CICS Configuration Manager. Interesting to note was that many of these customers already had home grown solutions to help ease the complexity of migrating CSDs. While the average IBM CICS Configuration Manager customer saw a time

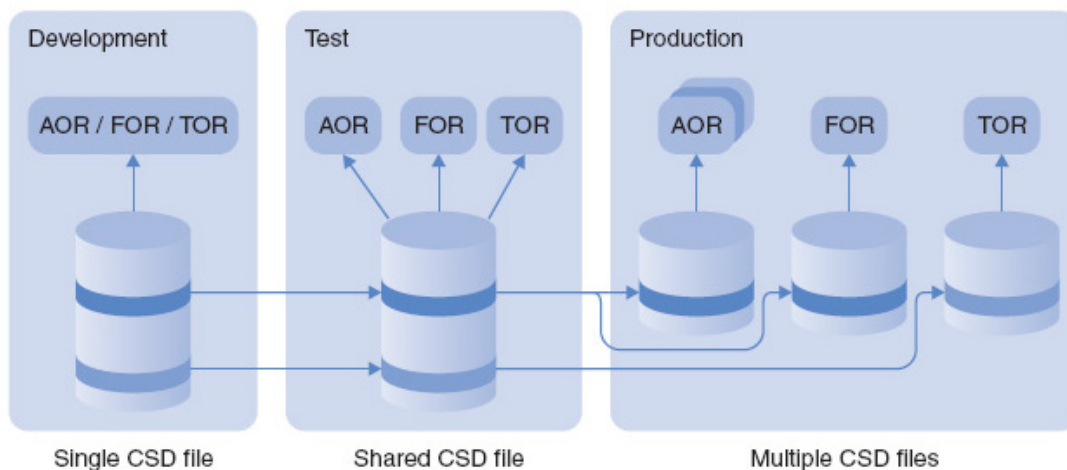


Figure 4: Migration of CSDs

savings of about 3:1, those customers with home grown solutions or existing vendor products did not see this time savings. So why the purchase?

Beyond the initial time savings provided by CICS Configuration Manager, or its cost savings when used to replace an existing vendor implementation, many of these customers were after, or found value in, the additional facilities. Specifically, a number of customers

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“A real differentiator for us came through CICS Configuration Manager’s auditing and control capabilities.”

- Large Financial Institution

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interviewed looked specifically at the auditing and control capabilities. Customers noted that this provided “the biggest bang for the buck” with regards to purchasing CICS Configuration Manager. It provided value on a number of fronts including, but not limited to, compliance related requirements, tight and transparent control over changes, the ability to quickly compare proposed changes for accepting/declining self-service requests, and the reduction in errors and downtime by rolling back erroneous modifications. Some customers admittedly have found tremendous value in the rollback feature “more than once.” Based on the already discussed costs associated with downtimes, this can provide significant value in and of itself, regardless of the time savings associated with definition migrations.

- » **Eased Learning Curves:** Customers noted that the IBM tools help them with respect to reducing learning curves in a couple of ways. For example, CICS Deployment Assistant and CICS Interdependency Analyzer help

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“CICS DA discovery reduces learning times from weeks to hours or a day, saving organizations significant expense when using subcontractors. Where subcontractors can run 50 – 100 euros per hour, it represents big savings for customers when they can provide all the information about their environment to the contractors when they arrive. Where more and more companies are using subcontractors, this represents significant value. For example, at a European customer with 300+ CICS regions on 8+ LPARs it took several weeks to discover the topology with the CICS interconnections, DB2, IMS, and WebSphere MQ connections, workloads, and applications, etc. With CICS DA, in conjunction with CICS PA and CICS IA, this could have been reduced to 1 maybe 2 hours.”

- Jean Paul Caron, Independent CICS Consultant

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“unravel the complexity” allowing new or inexperienced developers to quickly learn existing environments and applications, including the relationships between the different components. Features such as the CICS IA Command Flow allow individual developers to quickly capture all the CICS, DB2, MMQ, and IMS commands that are issued by a transaction in chronological order.

CICS Performance Analyzer includes over 200 reports (that can be exported to PDF) designed to meet a customers reporting and analysis objectives. Customers can easily tailor these reports to their specific analysis requirements or create their own. These prebuilt reports and the ability to easily create custom reports were reported across the board as being easier than alternatives such as SAS, MXG, etc. Specifically, there was a significantly shorter learning curve.

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“Through CICS Performance Analyzer we were able to become more capable in things like tracking transactions, that were otherwise frustrating, with other third party tools.”

- Large Financial Institution

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The newer IBM CICS Deployment Assistant (DA) enables users to quickly discover existing CICS regions and subsystems, manage a CICS topology, and automate the creation, deployment, customization, and control of CICS regions through a graphical user interface. One of the most valuable components of CICS DA was noted to be the discovery phase, helping subcontractors when learning systems that typically have little or dated documentation.

It is also important to qualify what is discovered. For example, is a connection actually used, or even if there are lots of connections to a region how high or low is the activity during the day? Through integration with CICS IA and CICS PA, users can drill down into the discovered topology displaying in context details provided by CICS IA and CICS PA.

» **CICS Explorer:** When the original version of this paper was put together, CICS Explorer had only just been released for production environments. Even then, customers were already noting the perceived benefits of this new interface. Now that it has been available for a few years, Branham had the opportunity to reinvestigate the value this Eclipse-based graphical interface for CICS tools provided.

Overall, Branham was impressed with the number of customers that are trying to, or are encouraging its use. As an Eclipse-based solution, there is no Microsoft Windows installer, or any requirements for Windows administrative authority, which one customer noted as

helpful. In short, they can simply point to a shared drive since getting the permission to install applications in their highly secure environment proved difficult.

Some customers are looking at CICS Explorer as an opportunity to augment existing seasoned staff with less-experienced staff thanks to its youthful and dynamic interface. Where seasoned staff are adopting CICS Explorer over ISPF, many note its productivity gains. For example, it saves “time jumping from one tool to another in a single view.” Customers can use “Performance Analyzer to uncover a performance problem. From the CICS Explorer graphical display, one click can link to Interdependency Analyzer data to show what resources are used in the poor performing transaction. Selecting a resource can link to Configuration Manager to view the resource definitions,” which can then be updated with Configuration Manager. To further boost productivity, in addition to CICS tools, Explorer supports CICS runtime, CICS Connectors, Problem Determination Tools, plus other IBM and third party software products, reducing the need to switch between multiple interfaces.

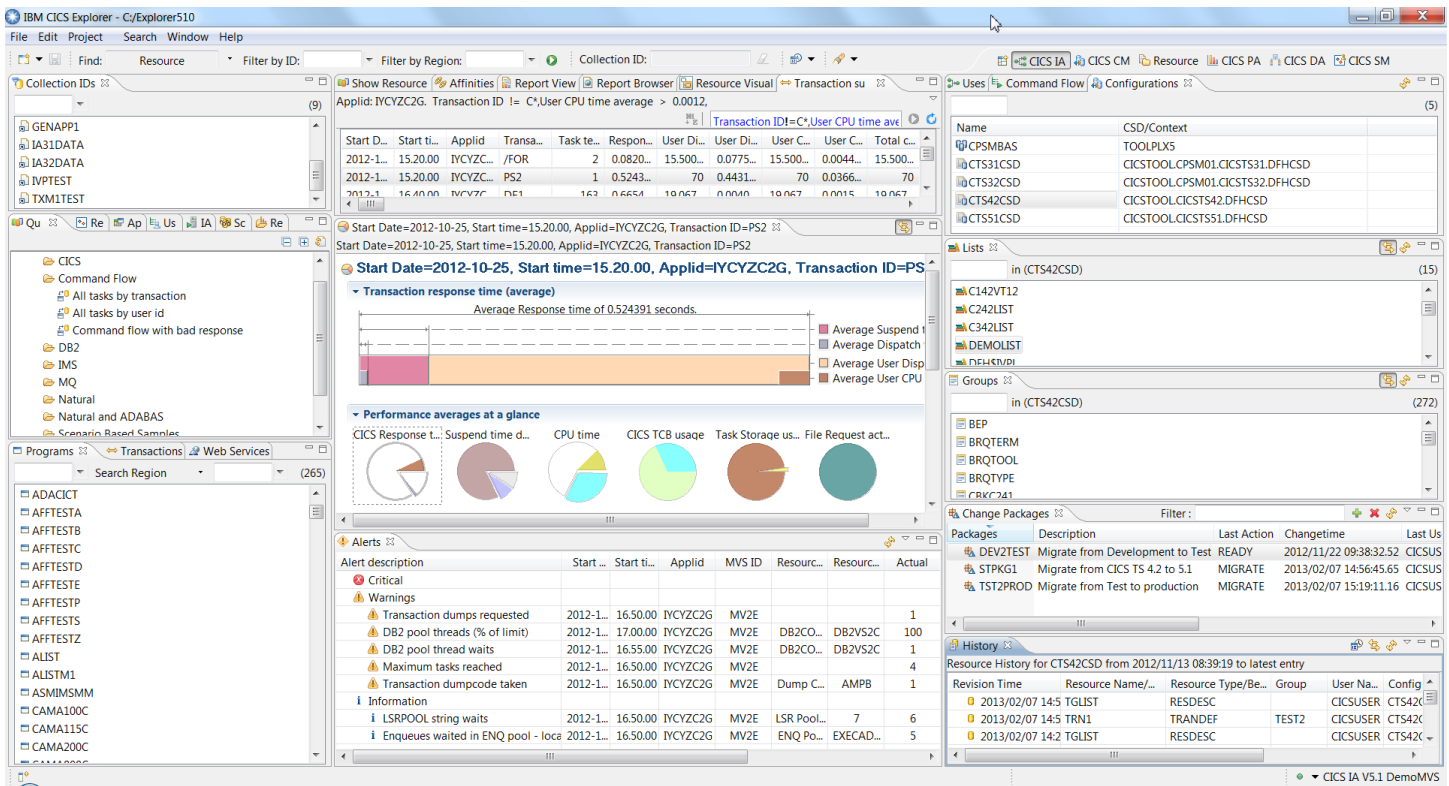


Figure 5: IBM CICS Explorer with CICS Tools<sup>2</sup>

2. Detailed demo videos are available at the YouTube channel <http://youtube.com/CICSexplorer>.



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“We plan to roll out CICS Explorer with CICS IA and CICS PA to the performance team so they can create, slice and dice reports on their own during development and QA; freeing up our time.”

- Large Insurance Provider

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Inevitably, there were some mixed reviews with respect to this new graphical interface. In some cases, more seasoned users continued to prefer the known ISPF interfaces for the more commonly performed tasks, particularly where function keys have been customized. In cases where users were still using older versions, there were some instances where they would “fall back” to the ISPF interface where tasks were not yet fully implemented in CICS Explorer. However, as one customer noted, this happens less frequently with each release of the corresponding CICS tools plugins. Additionally, customers are encouraged to join the Request For Enhancement (RFE) community to help IBM address any individual gaps that matter to customers, or help streamline common processes to reduce steps.

During Branham’s interviews, it was often found that customers purchased CICS Tools for a specific task (e.g., CICS IA for threadsafe reporting, CICS CM for audit and control, etc.). Once implemented however, the additional benefits provided by the tools were not always investigated leaving tremendous value on the table. More than once, Branham heard “we’re not using it to its full potential.” And in a couple instances customers “didn’t know it did that,” being introduced to helpful features they already owned.

Where the IBM CICS Tools provide enough value to justify their purchase, customers have an opportunity to investigate the additional benefits that come with them to increase the value and productivity even further. For example, customers that purchase CICS PA and CICS IA specifically for the purpose of converting applications to threadsafe, now have an opportunity for additional performance tuning, application decommissioning, and the reduction of outage duration. Further, IBM reports a high renewal rate for its Software Subscription and Support, which means these customers have access to updated products with the latest feature sets and added cost benefits.

“In using CICS Interdependency Analyzer we have realized upwards of a fifty percent reduction in the time it takes to identify application code and files (and DB2 Table-Views) that are no longer used. Decommissioning code will continue to contribute to cost savings through alleviated maintenance costs long after these tools have paid for themselves.”

- International Health Insurance Provider

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“From an ROI perspective, the predominate justification for bringing in CICS IA was the threadsafe rollout because of gained throughput and MIPS reduction, helping us save money overall. While it was brought in mainly for this purpose, we also enjoy the benefits of the cross-referencing capabilities and command flow. Using the cross referencing, we identified potential single points of failure and were able to migrate them to high availability and scalability.”

- US-based Health Insurance Provider

## Summary

Owing to its ubiquitous nature, CICS provides mainframe customers with significant opportunity for cost restraint and increased productivity gains. Tuning these mainframe applications can provide dramatic savings, when these modifications help to postpone CPU upgrades or reduce CPU utilization. The savings associated with charges for third party software can be tremendous. Even those organizations licensing software based on Variable Workload License Charges still have a significant opportunity to reduce associated software costs.

One of the most cost effective techniques with respect to optimization and cost control can be the conversion of CICS applications to threadsafe. This allows the use of parallel processing to decrease CPU consumption, simultaneously helping satisfy impatient users and/or customers through reduced response times.

CICS Tools such as IBM CICS Deployment Assistant, CICS Interdependency Analyzer, CICS Performance Analyzer, and CICS Configuration Manager also help to increase overall productivity. Some examples articulated in this report include the automation of processes such as the generation of CICSplex System Manager rules, comprehensive CICS topology discovery, or the automated migration of CSD alterations between CICS environments. Similarly, organizations can offload actual CSD change requests to application programmers, alleviating load from System Programmers, while still maintaining control of changes through an approval process, all while supporting compliancy auditing.

Finally, new interfaces such as those provided by IBM CICS Explorer provide a younger inexperienced generation of operational personnel with more familiar tools helping to ease learning curves. New users are provided with the facilities to quickly get up to speed with existing applications, and/or deal with resource changes in a timely manner; all through a single interface. This intuitive visualization helps developers modify or extend CICS applications with confidence.

Organizations need to know that they have done everything they can to optimize their existing applications to help postpone the added costs that come with new hardware purchases. This tuning can also have significant ramifications with respect to additional software purchases. Organizations need to know that end customers are being provided with the best response times possible to help prevent the defection to competitors.

In efforts of assessing your current state and whether there may be areas of improvement or cost savings, consider the following as you plan ahead:

- Are you still using applications that could benefit from conversion to threadsafe?
- Do your programmers spend an inordinate amount of time tuning applications?
- Are you using more contractors or new staff? What more can be done to reduce learning curves and optimize their value?
- Are you paying heavily to maintain outdated applications that should be decommissioned?
- Have you considered moving data contained in VSAM to DB2 for better accessibility?
- Are you anticipating new processor purchases as a result of continued growth?
- Have you considered how to Web Service enable your CICS applications?
- Are your programmers and support staff using the latest features to maximum benefit? Are you aware of the most recent updates and how they can help?

As a final thought, organizations should consider the latest in IBM's CICS tooling as part of any investment plans for the future. There is significant value that can be achieved through these types of tools, with an immediate return on the investment. Based on real world examples with broad relevance, it is clear that there are many benefits to working with the latest in IBM's CICS tooling.



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