Enterprise Modernization: Maintain, Extend, and Integrate with IBM Rational on System z

Branham

BRANHAM GROUP INC.

Contents

Introduction

In today's highly dynamic Internet age organizations are constantly looking for new and innovative ways to increase productivity and reduce costs across the enterprise IT ecosystem. More than ever, and given the economic times, those individuals responsible for steering their organizations IT direction are facing increased challenges in advancing their positions with reduced budgets while at the same time having to demonstrate even greater returns on their investments. In the quest to find further efficiencies in maintaining, extending and integrating enterprise assets, one such avenue that is garnering increased attention is that of enterprise modernization. The following will offer insight and perspective into this evolving facet of IT across the enterprise.

As a business matures, it integrates accumulated experiences and strategies into its existing core applications, which ultimately culminate into significant business value for the organization. If one were to simply abandon these applications, any competitive advantage innate to these existing assets would be lost. While distributed exponents evangelize the migration or re-engineering of these assets to distributed platforms, actual experiences are witnessing a reversal of this attitude with the increasing popularity of virtualization to minimize distributed related maintenance costs.

In today's environment, one of the most cost effective solutions is to preserve and renovate these critical business processes through the development of an incremental modernization roadmap. Such modernization efforts not only assist in reducing the operational and maintenance costs associated with the management of existing technology, but also open up applications to more progressive capabilities such as integration and Web Services.

Utilizing a roadmap to modernize applications, organizations can decrease maintenance costs, increase agility, and respond to prevailing business challenges. Through detailed analysis and assessment of existing applications, business managers are in a better position to further examine and isolate complex business rules and make accurate assessments with respect to the amount of resources necessary to implement each of the roadmap's options. In addition to understanding how IT systems can support new and existing business processes, executives can also get answers to many of the fundamental questions they have within their mandate: How can we …

…speed software delivery to meet organizational commitments?
…reduce software maintenance costs?
…increase developer productivity?
…deliver software projects to operations on time and on budget, with greater reliability?
…make time-critical market windows?
…improve software quality?
…improve efficiency, while reducing errors and security vulnerabilities?
…ensure that business-critical applications meet end-user requirements and performance criteria?
…comply with regulatory standards?
…integrate solutions across silos and simplify complexity?
…harvest and extend existing code and data for new services?
…use existing skill sets to leverage new technology like Web 2.0 and SOA?

New modernization tools are now coming of age to readily assist IT Managers in streamlining processes and further create internal efficiencies. With IBM Rational, System z customers can benefit from a comprehensive and modern suite of tools that are fully aligned with new versions of middleware and system software. These enhanced tool sets are more productive for building robust System z and Web based applications with a reduced development effort, helping decrease time for compiling, testing, and debugging applications compared to traditional mainframe development tools.

IBM Rational tools also help extend traditional development languages with integration and support for SOAs, Web Services and Java EE, while also enhancing the manageability, performance and security of all the System z platform's main pillars. Continued advancements in the platform's architecture provide customers with the traditional capabilities that have been proven throughout its existence in addition to offering the new capabilities that are expected in modern times.

Maintaining Core Assets

Enterprise applications help automate and govern core operations, having been developed, modified, and modified again over the course of years or even decades, in order to continue to be well aligned with the needs of the business and yield value. The resulting complexities however, have evolved to further obscure an organization's understanding of its existing portfolio's structure and its overall business function. Without deep insight into how these applications support the execution of operations, business managers and developers can't be expected to know how these applications need to be adjusted in the future. The increasing maintenance costs and a potential loss in perceived value can seemingly outweigh the project costs associated with migration or replacement using commercial off the shelf solutions.

Today, it is estimated that 70% to 80% of an organization's information systems budget is typically spent on current applications including maintenance. Choosing to maintain instead of improve an application means that the application continues to age. This not only increases maintenance, opportunity and inefficiency costs, but also the gap between the legacy application and current technologies. This age gap can also make improvements more costly, which in turn makes the organization more likely to choose the "as is" strategy.

Existing mainframe applications are invaluable to many core business processes that are critical to supporting an organizations intellectual competitive advantage. However, these applications are not flexible enough to facilitate rapid change or be leveraged as much as the business world might like. Inefficiency costs incurred as the failure to proactively upgrade causes crisis-mode and costly application fixes. This also feeds a vicious circle of lack of documentation and lack of ability to upgrade, leading to an increased risk of losing customers and dealing with regulatory issues. Finally, opportunity costs—those incurred as maintenance spending crowds out new application development, packaged application spending, and new customer acquisition initiatives—increase.

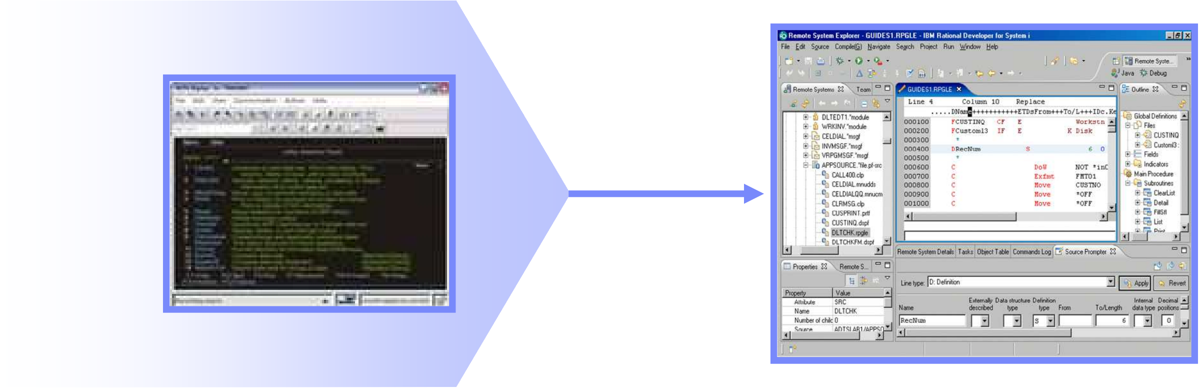
To help reduce business costs associated with ongoing maintenance and development, a new but proven breed of graphical tools is available. Replacing more traditional development tools, these workstation-based graphical drag and drop tools facilitate increased productivity not only from a development stand point, but also from the perspective of managing and discovering the impact changes may have. The facilitation of new insight into an organization's existing core assets may also help fuel and expedite the investigation of a modernization roadmap.

Productive Graphical Tools

Gone are the days of the requirements for more traditional mainframe tools through green screen, ISPF, and command line interfaces. IBM Rational offers System z customers a comprehensive and modern set of tools that are fully aligned with existing and new technology through continued refinements and enhancements. These graphical user interfaced tools make legacy code developers more efficient in their efforts to maintain a massive collection of mainframe code, which often required days of tedious analysis to invoke even the simplest changes and fixes. Similarly, these tools can also significantly reduce learning curves for new developers; getting them up to speed quickly.

IBM's Rational Developer for System z eases the creation of z/OS operating system-based applications including CICS, IMS, COBOL, PL/I, Java, EGL, Web, Web Services, and XML. Through a single integrated development environment, applications can support multiple types of user interfaces, including traditional 3270, HTML, JavaServer Faces (JSF), JavaSever Pages (JSP), Rich Internet Applications (RIA), and Web 2.0. Running on the Eclipse open source platform, this comprehensive support allows a single IDE to be used for many development environments through a graphical environment that significantly increases developer productivity in comparison to traditional ISPF text based tools, while also allowing developers to adapt, extend and customize their environment.

IBM's Problem Determination Tools for z/OS provide powerful functions and features to help developers modernize and transform existing System z applications. Adding additional value and productivity, IBM Rational Developer for System z is integrated with these tools to provide developers with a graphical user interface. In conjunction with Debug Tool for z/OS, developers can examine, monitor, and control the execution of application programs. Integration with Fault Analyzer for z/OS helps developers analyze and fix application and system failures through the gathering of information about an application and the surrounding environment. Further, File Manager for z/OS provides comprehensive user-friendly tools for working with z/OS data sets, DB2 data, CICS data, or IMS data using familiar browse, edit, and copy capabilities. In fact, a Branham Group study[1] found that Rational Developer for System z demonstrated higher productivity, particularly in the area of compile, test, and debug. Where coding and syntax errors existed, RDz was significantly more productive, being up to 44% faster than traditional IBM mainframe development tools.



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     .....DName+++++++++++ETDsFrom+++To/L+++IDc.Ke
000100       FCUSTINQ    CF   E              Workstn
000200       FCustom13   IF   E            K Disk
000300        *
000400       DRecNum              S             6  0
000500        *
000600       C                     DoW       NOT *inC
000700       C                     Exfmt     FMT01
000800       C                     Move      CUSTNO
000900       C                     Move      *OFF
001000       C                     Move      *OFF
```

Property	Value
Attribute	SRC
Name	DLTCHK
Number of chilc	0
Source	ADTSLAB1/APPSO

Line type: D: Definition

Name	Externally described	Data structure type	Definition type	From	To/Length	Internal data type	Decimal positions
RecNum			S		6		0

Figure 1: RDz provides developers with productive GUI tools as opposed to traditional Green Screen

Users are no longer required to rely on the more traditional text based tools for maintenance and developer efforts. Through multiple integrated facilities and graphical users interfaces, experienced and newly initiated developers can increase productivity and reduce learning curves by using more familiar drag and drop workstation based interfaces. Integrated debugging and troubleshooting tools help to more quickly isolate and correct errors, helping organizations address change requirements and meeting timelines and budgets.

Easy Asset Management

Admittedly, even with graphical user interfaces, existing System z applications can involve a maze of intertwined relationships and dependencies that can prolong the maintenance and development of existing and new applications. This, combined with poor documentation (if documented at all), has left the information systems staff fearful of making any changes because they can no longer predict the extensive impact even the subtlest of changes may have on an application. In any planning initiative, organizations need to know where they stand before they can plan where they want to go. This is especially true in today's environment where many businesses are acquired or merged, and the consolidation of each company's platforms, applications, data and processes needs full asset understanding before decisions are made to contain costs.

Tools such as IBM Rational Asset Analyzer (RAA) and Rational Transformation Workbench (RTW) help organizations understand these existing assets and interdependencies. With a significant reduction in effort, these tools allow IT personnel to discover and analyze existing applications, allowing the business to understand and gain intellectual control over the application relationships and structures. New developers can quickly get up to speed on these existing application relationships, while experienced developers can remove obsolete and dead code, restructuring or simplifying applications to lower future maintenance costs. Developers can better understand dependencies within and across applications and associated data across the organization; supporting both System z related as well as Java EE application related programs.

Through interactive textual and graphic reports, RAA captures the relationships between z/OS and distributed application assets whether they are in partitioned data sets (PDSs) on System z, directories on

[1] Developer Productivity Study: Comparing IBM WebSphere Developer for System z to Traditional IBM Mainframe Development Tools, November 2006, Branham Group Inc. http://www.branhamgroup.com/article.php?cat=reports&id=49

Windows or AIX systems, or in one of a number of source configuration management systems. A graphical web browser interface to a repository of application information shows the application information and interrelationships both graphically and in table format, helping developers, even new ones, better understand and update applications. Developers can limit the reporting scope to a particular area of interest, drilling down through relational diagrams of the relationships. Metrics also help identify the breadth and complexity of technologies used (i.e. how much Java, how much COBOL, cyclomatic complexity, etc.), allowing organizations to answer the question of whether or not their resources align with these trends, and support the decision making process with respect to which programs to modify.

IBM Rational Asset Analyzer also helps developers determine the scope of any changes, identifying any impacted artifacts to determine the risk of change. Through the web services interface provided by RAA, IBM Rational Transformation Workbench can download the artifacts identified by the RAA impact analysis to perform a more in-depth interactive analysis. Application visualizations help identify application artifacts (such as programs, screens, and transactions) that might otherwise be affected by proposed code or operational changes. The impact analysis feature identifies assets affected by a proposed change and helps developers make changes more quickly, confidently and with less risk.

IBM Rational Transformation Workbench provides developers and business users with an interactive environment in which they can navigate multiple synchronized views of the enterprise applications. Users can select from numerous views including source code, context parse tree, call maps, data and control flows, and many others. A simple click on an element updates the other views to help users quickly understand even the most complicated systems. Additionally, the IBM Rational Transformation Workbench Business Rules Extension provides a variety of ways to identify, document, and organize business rules and logic from monolithic code. Similarly, the Rational Transformation Workbench Architect Extension helps identify code that is no longer used allowing source files and applications to be simplified. It provides the facilities to extract, re-factor and slice code providing source files with the unused code removed.

Through web based and visual interfaces, IBM Rational tools can help minimize the ongoing management of mainframe applications, while also helping to uncover a collection of key business processes that are duplicated by several applications. Not only does this help to decrease costs associated with maintenance, but it may also fuel investigations on how to retire overlapping systems without negatively impacting the rest of the portfolio. Even more valuable, organizations may also find key processes deeply intertwined in existing applications that would make ideal candidates to modernize through SOA enablement.

Extending Value & Minimizing Costs

Despite advances in graphical tools, organizations that continue to use inefficient and outdated legacy applications and pre-relational databases, are finding that their ongoing maintenance costs continue to skyrocket. Through effective use of enterprise application modernization techniques, organizations are better positioned to reduce maintenance overhead while simultaneously providing better customer services and quality information systems. The ultimate results of enterprise application modernization are shared, non-redundant data, trusted strategic information, and reusable software components. Many experts agree that while migration can be a complex and sometimes costly undertaking, a well defined roadmap facilitates an incremental approach to modernization helping reduce maintenance costs while renovating systems.

An organization’s mainframe application portfolio represents assets critical to the success of the business; an asset that must adapt to shifts in business needs. By adopting an enterprise application modernization lifecycle approach to governing the portfolio, organizations will be better equipped to identity, select, and execute initiatives that yield more business value from these core applications.

In the past, many organizations tended to opt for a replacement strategy if a new technology had to be added; otherwise, they simply left the application alone. The risks of changing a business-critical application in any way were perceived as too great, and the task so daunting, that not touching existing applications was the preference. However, over the last few years, tools for upgrading applications in place (as opposed to migrating, regenerating, or replacing), especially for web service enablement on System z, are available and field proven.

Migration Risk and Cost Considerations

In the recent past, a new generation of distributed systems proliferated, initially viewed as less expensive to implement. These distributed systems also allowed organizations and departments to evaluate and manage servers, operating systems, databases, and development of applications, amongst others, from their own stand point in efforts of reducing central IT expenses. With the renewed surge in computing requirements along side a “do more with less” mentality, many distributed customers are now realizing that these earlier “cost cutting” measures are having longer term consequences with respect to total cost of ownership.

While there are multiple avenues for the modernization of applications, migration from the mainframe to distributed platforms can be a costly undertaking for a number of reasons. While there are many documented sources dedicated to weighing the challenges of migrating legacy assets towards the distributed platform, the following provides only a few considerations.

❑ *Resource Consolidation:* The movement to the distributed platform led to a profusion of servers, complex networking and infrastructure, high support costs, and increased difficulty when troubleshooting performance, security, and failure issues. In an attempt to reduce costs associated with these management and maintenance issues and a sprawling distributed platform ecosystem, virtualization has become a popular choice for consolidating machines, moving many smaller underutilized machines to larger communal machines.

Respectively, the System z platform, with its resource virtualization, support for the latest software standards, and superior economics, has reduced the need for multi-tier environments. Specifically, web serving workloads traditionally being run on commodity scale-out servers, are being consolidated to Linux virtual servers on System z. While not a requirement, some System z customers have gone to the extent of successfully combining all their workload types on the mainframe. In addition to simplified governance, considerably better performance, innate security benefits, higher reliability, higher hardware resource utilization, and higher quality of service, fewer staff are needed to deal with distributed maintenance issues.

The System z platform is more than a COBOL or z/OS play. It’s a bona-fide server consolidation platform, thanks to z/Linux. Consolidating Linux based distributed infrastructures on System z as opposed to larger distributed servers affords additional benefits such as leveraging the strength of security, backup and restore processes; capacity backup for emergency situations; and easier systems management through a single point of control.

❑ *Platform Migration:* The risks and costs of moving key mainframe applications to UNIX or Windows can be large. Mainframe applications, especially those highly tuned for performance, are often so customized for the mainframe that they cannot simply be copied from one machine to another; instead, those migrating the application must have a deep understanding of the application’s code and purpose. While COBOL, PL/I, and C/C++ compilers designed for moving mainframe applications to Windows do offer a high degree of language compatibility, they do not directly address issues concerned with batch processing, transaction processing or database environments. In some cases, migraters must rewrite much of the code in the application to run and deliver optimal performance on a very different type of computer; taking months or even years. Fueling additional cost, these types of one-time migrations may be better handled by specialists.

❑ *Data Stores:* For mainframe applications sharing a common data store, migrating or re-engineering applications can be even harder; if not impossible. Specifically, if the data for one application is moved to a new platform and database – perhaps to integrate with applications on the new platform – then all applications remaining on the mainframe will need modifications in order to access their data from the new database, or application code must be written to keep the two databases in sync.

For example, in an effort to reduce the load and cost associated with data servers on System z, some customers have attempted to move these workloads to distributed systems. While this initially appeared to provide cost savings, it has created additional issues that easily negate any such savings. Multiple copies of data have created issues with respect to security, backup and recovery, storage, administration and management, and consistency.

Instead of migrating performance-critical and similar existing applications towards distributed environments, System z makes it easier for the enterprise to web enable applications in place, adding cost effective internet connectivity and application deployment with minimal impact on existing production environments. New tools can increase developer productivity through a unified enterprise and distributed development environment, and ease the ability to compose multiple CICS transactions into high-level business services through visual modeling. In fact, analyst studies have found it five times less expensive to re-use existing applications than to write new applications.

Added Flexibility and Efficiencies for Growth

Upon finalizing the decision to reuse and modernize existing assets and intellectual capital, organizations need to build an articulate roadmap that assesses current assets and identifies which applications and components will provide the quickest return and largest value while simultaneously minimizing work and maintenance requirements. IBM Rational Asset Analyzer is one such product that provides organizations with the facilities to quickly clarify the maze of intertwined relationships and dependencies that could otherwise prolong the maintenance and development of existing and new applications. With this accelerated understanding of dependencies within and across the applications and associated data across the organization, IBM Rational Transformation Workbench is another offering that continues to accelerate strategic and tactical modernization initiatives. It enables development teams to quickly transform identified assets and discover reusable business logic. This facilitates the removal of dead code and the creation of reusable components that can be modernized and enabled as services within SOA for easier capitalization by disparate sources.

Without a requirement for access or modifications to application source code, tools such as IBM Rational Host Access Transformation Services (HATS) allow developers to quickly improve the user interfaces of green-screen System z applications. The end result can be easy-to-use Web-based applications including portlets, rich client applications and applications targeted for browsers on mobile devices. These new standards and easy-to-use GUIs help reduce training costs, simplify applications, and make it easier for new users to understand. In fact, the value provided by the process flows of these applications can be altered without changing the underlying application, allowing businesses to implement new workflows for increased productivity, without affecting existing applications. For example, customer services representatives can use a single web-based interface for customer interaction as opposed to multiple separate interfaces and applications for customer ID retrieval, product ID retrieval, and collection of ticket information pertaining to the customer interaction. A single interface amalgamating these separate workflow processes can have dramatic productivity and cost savings.

In order for a business to be responsive, it must be able to transform applications to address new opportunities and requirements quickly. As a modernization strategy, many organizations are moving towards Service Oriented Architectures (SOA), with which the System z platform plays an active role. For example, with CICS Transaction Server Version 3, IBM added the ability to use existing BMS maps (interface between CICS programs and terminals) and CICS programs, and make them available through a web services interface. Web Services allow IT departments to make legacy mainframe applications available not only to the entire organization, but also to a global customer and partner base of millions.

The structure of Web Services and Service Oriented Architectures allows a single backend service to provide for multiple front-end types of applications. At the same time, it provides abstraction between the different layers allowing the backend service to change in the future without requiring changes to be made to the multitude of applications accessing and relying on these services. Modernization of existing assets to Web Services should provide new flexibility but should not create new dependencies that will increase maintenance costs in the future. This also means that organizations are not now “stuck” with this newly modernized application. Specifically, if business requirements require the application to eventually be migrated to a new platform using new programming languages etc., as long as the *what* of a web service remains the same, the *how* is free to change without effecting the applications that rely on it.

IBM Rational Developer for System z offers three methods for Web Service generation from COBOL or PL/I through Enterprise Service Tools. These include; a “bottom up” approach which uses an existing application to generate the necessary converters/wrappers and standard Web Service artifacts (WSDL, WSBind, etc.); a “Top Down” approach which uses an existing web service definition (WSDL) to generate a skeleton application that would be completed by a developer; and a “Meet in the middle” approach that takes an existing web service definition and an existing application, and maps the inputs and outputs of the Web Service to those of the application. Pursuant to this, a Branham Group productivity report[2] was quick to note that “without Rational Developer for System z, the development of Web Services from a COBOL application would require a significant amount of hand coding or multiple third party tools. Rational Developer for System z significantly eased this operation through its Web Services generation wizard, without a requirement for manual coding.”

Repurposing or modernizing existing mainframe applications is both a financially sound and a time-tested approach to modifying existing assets so they can be included as part of a Web Services and Service Oriented Architecture. Enterprise Modernization helps to streamline processes which can also help to reduce personnel resource allowing them to focus on more important business initiatives.

Optimizing the Traditional and Contemporary

In connection with Web Services and Service Oriented Architectures (SOAs), the Internet has seen much advancement in recent years. Changing trends are expanding on Internet technologies, allowing users to interact in new ways such as via user-created applications. Several terms such as Mashups, Web 2.0, and Rich Internet Applications continue to proliferate, and all are relevant in the context of enterprise modernization.

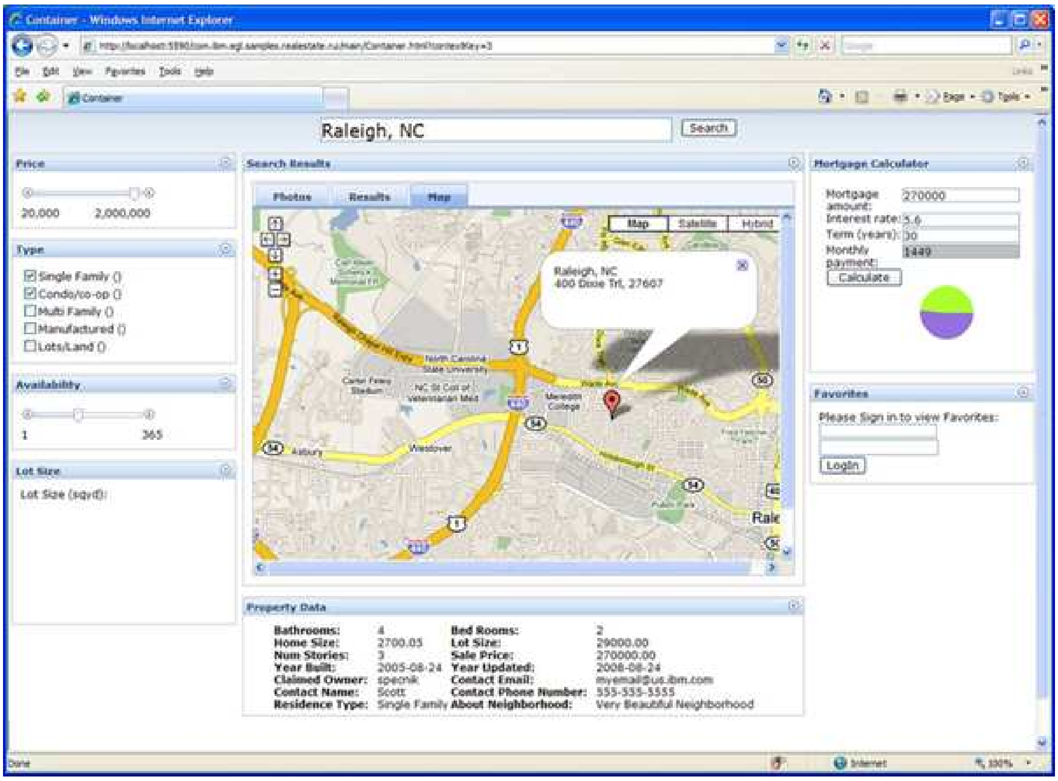
- ❑ *Mashups:* Consist of web based applications that take data from multiple sources combining them into a single tool. In the context of a mainframe environment, a mashup could constitute a web based application that integrates a mapping application with real estate listings residing on mainframe systems, helping residents better isolate and identify target areas.
- ❑ *Web 2.0:* Moving from times where websites were predominantly composed of static pages of content provided by a single provider, the advent of what is known as Web 2.0 consists of sites where pages are constructed more dynamically and can include content from the original provider, users, and other third parties. With Web 2.0, businesses can modernize and extend existing assets to deliver internal and external solutions that engage users more fully, thus increasing customer penetration and employee productivity.
- ❑ *Rich Internet Applications:* Provide users with web based interfaces that incorporate features, functionality, and the ease of use typically associated with traditional desktop applications. In fact, the line continues to blur allowing some of these web based applications to be extended to the desktop running local interfaces while retrieving up to date information dynamically via the web.

The issue however, is these new technologies quickly introduce new development models, languages and complexities to projects. Adding to this complexity is the fact that many organizations have traditionally managed mainframe development separately from other platform development, with each team maintaining its own set of development processes and tools. Tracing changes between these silos can be an expensive proposition not to mention the duplicate resources and infrastructures that would be involved.

The modernization of existing legacy applications helps to extend these applications beyond the enterprise, integrating them with customers and partners to provide significantly more value for all stakeholders. New releases of IBM Rational tools continue to focus on extending the integration and support of SOAs, Web Services and Java EE, while also enhancing and integrating new technologies such as Web 2.0, Rich Internet Applications, and Mashups. IBM Rational Developer for System z is one such tool that provides a complete, interactive, and workstation based environment for multiple languages bridging new and existing technology. Through the Enterprise Generation Language (EGL), it also

[2] Developer Productivity Study: Comparing IBM WebSphere Developer for System z to Traditional IBM Mainframe Development Tools, November 2006, Branham Group Inc. http://www.branhamgroup.com/article.php?cat=reports&id=49

facilities the generation of both back-end and front-end interfaces, including rich Web 2.0 style solutions, without a requirement to learn all the low-level techniques (AJAX, JavaScript, REST, JSON, RSS, etc) associated with these rich interfaces.



Raleigh, NC

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☑ Single Family ()
☑ Condo/co-op ()
□ Multi Family ()
□ Manufactured ()
□ Lots/Land ()

1 365

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Interest rate: 5.6
Term (years): 30
Monthly payment: 1449

Please Sign in to view Favorites:

Bathrooms:	4	**Bed Rooms:**	2
Home Size:	2700.03	**Lot Size:**	29000.00
Num Stories:	3	**Sale Price:**	270000.00
Year Built:	2005-08-24	**Year Updated:**	2008-08-24
Claimed Owner:	specnik	**Contact Email:**	myemail@us.ibm.com
Contact Name:	Scott	**Contact Phone Number:**	555-555-5555
Residence Type:	Single Family	**About Neighborhood:**	Very Beautiful Neighborhood

Figure 2: EGL Rich User Interface Technology combines Google Maps, a CICS Web Service and DB2 mainframe data to create a single powerful real estate application

Retooling Developers and Modernizing Skill Sets

In today's highly complex and diverse environments, projects that span mainframe, distributed, and web environments may include several programming languages. Some projects may include as many as four or five languages. Pursuant to this, most developers will not be proficient in all languages that may comprise the project, thus complicating the amount of effort involved in completing various tasks.

Furthermore, the debate also continues as to whether the supply of mainframe language skills is at risk as a result of the number of retirements that have and continue to occur. While surveys reveal that the average age of a COBOL programmer is 45, they predict a gradual decline in the number of those with COBOL experience over the next 15 to 20 years. This is not a crisis in global terms (though there may be localized shortfalls), and it is likely that business needs will create demand and fuel the required training, however leaders in the software development space, such as IBM Rational, are coming to market with tools to help mitigate this risk. New tooling is currently available that can help minimize learning curves, not only from the perspective of training new mainframe developers, but also as it relates to introducing experienced developers to more modern development practices.

IBM Rational Developer for System z comes in two offerings. The first, IBM Rational Developer for System z with Java provides a common integrated development environment for COBOL, PL/I, C, C++, Assembler, Java, JSF, HTML, Web Services and others. Based on the Eclipse platform, developers can add new tools and capabilities allowing them to maintain a single tool for development. Rational Developer makes System z application development, web development, and integrated mixed workload or composite application development faster and more efficient. Developers can build web services from existing CICS applications and IMS transactions, and aggregate multiple transactions into a high-level business process through visual modeling. Developers can generate JSF/Java EE web front ends and a COBOL backend running on System z, through the same tool. The single IDE provides debugging facilities for multiple runtimes allowing developers to debug end-to-end systems as they execute the runtime. These include CICS, IMS, DB2, batch, WebSphere Application Server, etc.

While the power of this single development environment allows the use of a single tool for mainframe and distributed development, this is only the initial step to consolidating and integrating developer resources. Thankfully, the concept of Model Driven Development can help further consolidate resources and simultaneously accelerate individual developer skills across both mainframe and distributed environments and multiple technologies.

Specifically, Model Driven Development provides a separation of the model from the code, supporting a platform independent model. Using a single language to build the application, the tools auto-generate the necessary code and plumbing for the target platform. This can include SQL database calls, COBOL, Java, or other platform specific code such as XML and JavaScript for Web clients. For example, IBM Rational Developer for System z can generate COBOL code from standard Unified Modeling Language (UML), which includes graphical notation techniques to create abstract models of systems. This can significantly reduce a large portion of the code that a developer is required to write.

The second offering, IBM Rational Developer for System z with EGL, further extends these capabilities. Also available through the stand alone Rational Business Developer, the Enterprise Generation Language (EGL) provides business-oriented developers that are accustomed to traditional procedural programming languages, with the tools necessary to build complex and powerful modern applications. Developers can create applications with Web 2.0, RIA, Web Services, character, or graphical user interfaces, or even create batch programs. Depending on the target platform, developers can generate the appropriate Java Code, or COBOL for IBM i and System z without knowing any Java code, COBOL, or the intricacies of the server. Code is 100% generated making development more agile, and allows distributed developers to generate COBOL code for mainframe related applications without a requirement for knowing COBOL itself. Smaller development groups can now deliver more agile applications with significantly more productivity.

Through this single language, EGL helps developers build cross-platform Web and service-oriented applications, designing, deploying, and testing these new solutions faster than with traditional programming languages. This approach provides a single language for rich internet applications with Web 2.0 interfaces to mainframe solutions that take advantage of legacy interoperability as well as new Web Services tools. Even developers with little or no experience with Java and Web technologies can use EGL to create enterprise-class services and applications quickly and easily. The need for separate mainframe and distributed development teams along with duplicate tools and processes are eliminated. Businesses now have the ability to offer innovative solutions for their staff and customers, better equipping them to stay competitive in today’s marketplace.

Team Amalgamation and Collaboration

Increasingly, development teams face significant challenges requiring the production of high quality software at unprecedented speeds. Software application requirements continue to grow more complex often with shorter and more frequent release cycles. A similar tool set for both mainframe and distributed architectures goes a long way to eliminate a duplication of tools and processes, where skills can be leveraged across the organization, and end-to-end communication and traceability are improved across the entire lifecycle. However, geographically distributed development teams present challenges related to effective teaming, parallel development and diverse platforms - these factors and more intensify the pressures of developing quality software.

The power provided by tools such as IBM Rational Asset Analyzer, Rational Transformation Workbench, Rational Host Access Transformation Services, Rational Developer for System z, and Rational Business Developer extends into the entire IBM Rational Software Delivery Platform. This is an open, flexible platform of integrated products and services based on best practices harvested from years of hands-on experience with software development organizations. It supports five aspects of software development: integrated requirements management; change and release management; quality management; architecture and construction; and process and portfolio management. Where applicable, tools are based on the eclipse platform and provide a shared development environment for both System z and distributed environments.

Solutions such as IBM Rational Team Concert and IBM Rational ClearCase provide communication tools for more efficient development between development teams and developers within a single team. Rational Team Concert provides a collaboration platform based on the Jazz technology platform for development including wikis, real-time reporting, chat, automated hand offs, custom dashboards, and eclipse plug-ins. The new Rational Team Concert for System z provides the same features as Rational Team Concert while hosting the repository on a System z platform.

Process, quality, change and release management tools such as IBM Rational ClearCase, ClearQuest and BuildForge help automate and enforce development processes and enhance collaboration and productivity across multiple operating platforms at every stage of the application lifecycle. Rational ClearCase provides both an out of the box activity-based usage model and a granular set of pre and post processing command capabilities. It provides complete merge history and auditing, bi-directional traceability, a complete view of all transactions that occur (i.e. identifying what change was made, by whom, where, when, and why), flexible choices for local or remote access, and broad cross platform support. IBM Rational ClearCase z/OS Extensions provide the facilities to interface with the mainframe while utilizing Rational ClearCase as the single repository for both the mainframe and distributed artifacts. This supports a single point of control and a single process of development for both platforms while allowing developers to use a familiar environment. IBM Rational ClearQuest can be integrated with Rational ClearCase to provide defect tracking and automation of software processes across the development lifecycle.

Developing quality software in a repeatable and predictable fashion requires managing and tracking development artifacts and the activities of the development team. Successful development teams utilize software configuration management and software change management tools such as those included in the IBM Rational tools portfolio to help manage the software development lifecycle.

Conclusions and Recommendations

Enterprise applications and related data represent significant investments to customers. The ability to efficiently utilize these existing assets can provide great value to customers. Given the current economy and cost cutting efforts, organizations expecting to maintain the status quo, at a minimum, owe it to themselves to investigate the tools available to help reduce these associated costs. Through graphical tools such as IBM Rational Developer for System z, organizations can still reduce maintenance and development costs. Similarly, tools such as IBM Rational Asset Analyzer and Rational Transformation Workbench help to ease the cost associated with the governance of existing assets. An incremental approach that starts with a minimum of reducing maintenance costs can still provide a substantial return on investment.

Through modernization, organizations can further leverage their existing investments to address today's changing business needs without unnecessary migration expenses. Five times more cost effective than migration, enterprise modernization allows organizations to capitalize on existing assets and intellectual capital, modifying them to participate in newer application and business processes. Business can increase the agility of these assets and responsiveness to customers and dynamic markets, and more. Solutions such as IBM Host Access Transformation Services allows business to add flexibility to existing processes without impacting existing applications that use the current workflows. Organizations have the opportunity to extend these important assets to partners and customers, providing more engaging interactions while simultaneously freeing up staff from maintenance burdens. Once these applications are modernized, they offer added flexibility, robustness, increased programmer productivity, and access from both in and outside the enterprise, comparable to those benefits as offered by today's applications.

Although modernization of applications may not be on the current roadmap, organizations still have an opportunity to significantly increase developer productivity when creating new workloads for the System z platform. IBM Rational Business Developer and EGL help developers address many facets of technology from COBOL and Java, to the rich user web based interfaces, not only from a single integrated development environment, but also from a single language. What's more, because the necessary database, backend, and Web 2.0 interfaces are automatically generated from EGL, future modernization efforts will be reduced allowing developers to use the same EGL to easily switch between Java and COBOL, or when introducing newer richer dynamic interface capabilities.

The opportunity to amalgamate and converge separate siloed mainframe and distributed development teams through a single integrated development environment and a single model driven development language, helps to dramatically alleviate costs associated with developer skill, development tool, and collaboration infrastructure redundancies. A software change and configuration management solution can provide further productivity, governance, and compliance gains to these amalgamated teams by providing a refined foundation for team development and visibility, process control, and secure storage of project assets. Tools such as IBM Rational ClearCase, Rational ClearQuest, Rational BuildForge, and Rational Team Concert allow organizations to know the exact state of a product in the software development lifecycle, while still allowing for the evolution of an organization's software delivery capabilities over time.

Finally, while the discussion of enterprise modernization has introduced a number of solutions, IBM offers organizations the opportunity to gain hands-on experience with these valuable System z enterprise modernization solutions with purchase commitments. Available through the ibm.com Web site (http://www.ibm.com/developerworks/downloads/emsandbox/systemz.html?S_TACT=105AGX28&S_CMP=EMSAND), these enterprise modernization virtual test-drives allow the evaluation of solutions in areas of: assets, architectures, processes and infrastructures, and skills. Each solution is based upon real customer experiences and offers a proven path to help organizations get started quickly and realize the benefits of their modernization projects.

For More Information

Contact your local IBM representative today for more information about how you can achieve business and development results well ahead of your competition.

Visit http://www.ibm.com/software/info/developer/solutions/em for more information about IBM System z enterprise modernization software and solutions.

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Software Group
Route 100
Somers, NY 10589
U.S.A.

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