

A decorative graphic in the top left corner consists of several overlapping circles of various colors (yellow, orange, red, purple, blue) that are divided into segments, resembling a stylized sunburst or a cluster of data points.

The Gold Standard for Enterprise Computing

Mainframe Skills – The Myth and the Reality

There's a perception of a mainframe skills shortage...

- ... which might discourage companies from deploying new workload on the platform
- ... or lead others to consider moving off the mainframe altogether



**...Let's look at the facts
and try to understand the real picture**

See IBM Redbooks Point of View: “Mainframe Modernization and Skills: The Myth and the Reality”

<http://www.redbooks.ibm.com/abstracts/redp5115.html?Open>

Mainframe Modernization and Skills: The Myth and the Reality

An IBM Redbooks Point-of-View publication

By **Emily Farmer**, Senior Software Engineer, and **Michael Casile**, Senior Software Engineer

Highlights

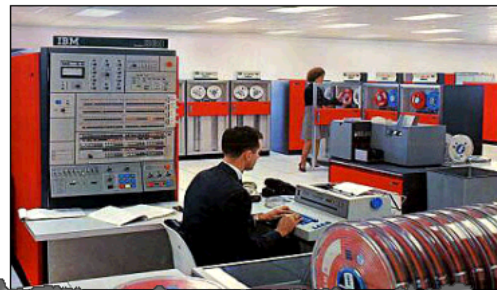
- ▶ Defying predictions, the IBM mainframe is not only alive today, running much of the world's business, but its usage continues to grow. So to prepare for future resource needs, mainframe customers must adopt plans to onboard the new developers and administrators that will be needed in the future.
- ▶ Attracting qualified talent to work on mainframes is not the challenge some might think. IBM has developed a wealth of modern, GUI-based mainframe tools, making the platform more interesting to a new generation and, just as important, more comfortable for those now working in distributed environments who are thinking of making a switch.
- ▶ IBM is investing heavily in training a new supply of mainframe resources. More than 360 companies are participating in these initiatives, with some 68,000 people, and counting, trained to date.



Is the mainframe a *modern* platform?

In April 2014, IBM® celebrated the 50th anniversary of the first mainframe computer, the System/360 (see Figure 1). Growth over that time has been such that today, much of the world's business runs on IBM mainframes, including 97 of the world's top 100 banks¹. Yet perhaps because it has been around as long as it has, the mainframe is seen by some as not modern enough for today's demands.

Many in business still assume that the only interface to mainframes is through the traditional *green screen*, that administration is cumbersome and difficult, and that the only people with the skills to administer and develop applications on mainframes are those who grew up with the platform, that is, post-World War II baby boomers. As these boomers approach retirement, some business leaders fear an impending skills shortage, and distributed server vendors have been known to use this fear to promote migrating off the mainframe to more “modern” platforms. A 2011 ComputerWorld study² even found that some younger IT professionals were reluctant to focus on the mainframe, seeing it as a stagnant environment.



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... *please
distribute!*

Three things to keep in mind

1

Numerous indicators show mainframe usage continuing to grow for the foreseeable future

2

IBM has made considerable investment in intuitive, GUI-based tools for mainframe administration and development

3

IBM continues to invest heavily in development of mainframe skills for the next generation

Mainframe usage is growing and is projected to continue

Finally, despite regular declarations that “the mainframe is dead,” the research shows this has never been further from the truth. In reality, the mainframe is working harder than ever. Almost two-thirds of respondents (62 percent) are now using mainframe applications, which were initially designed to perform back-end functions, to now support external-facing services, such as e-commerce (chart 9). This is putting added pressure on the mainframe and, in turn, increasing MIPS. This is evidenced by the fact that 68 percent of respondents believe that the increase in mobile applications is driving higher MIPS usage (chart 10).

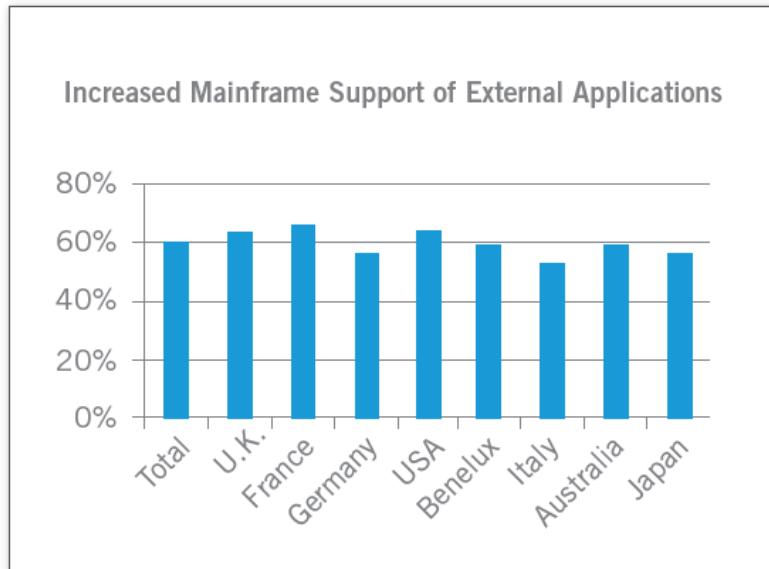


Chart 9: 62 percent of companies are using their mainframes to support external applications, such as online banking.

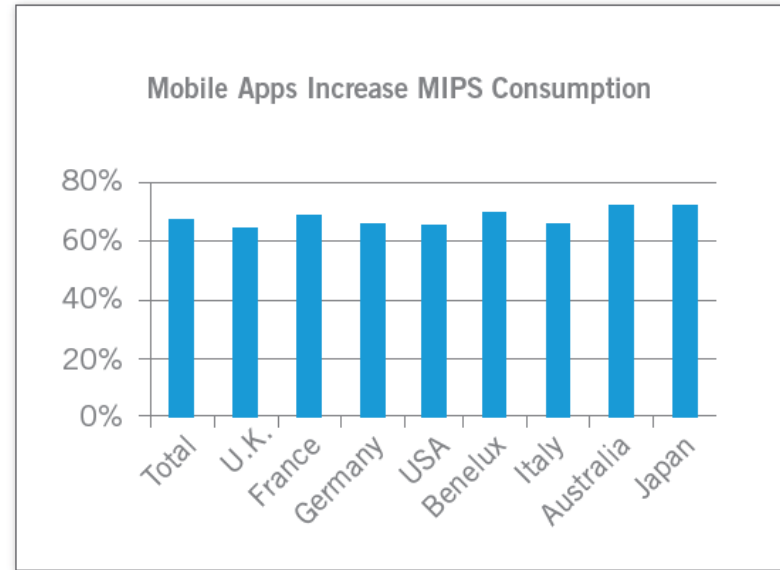
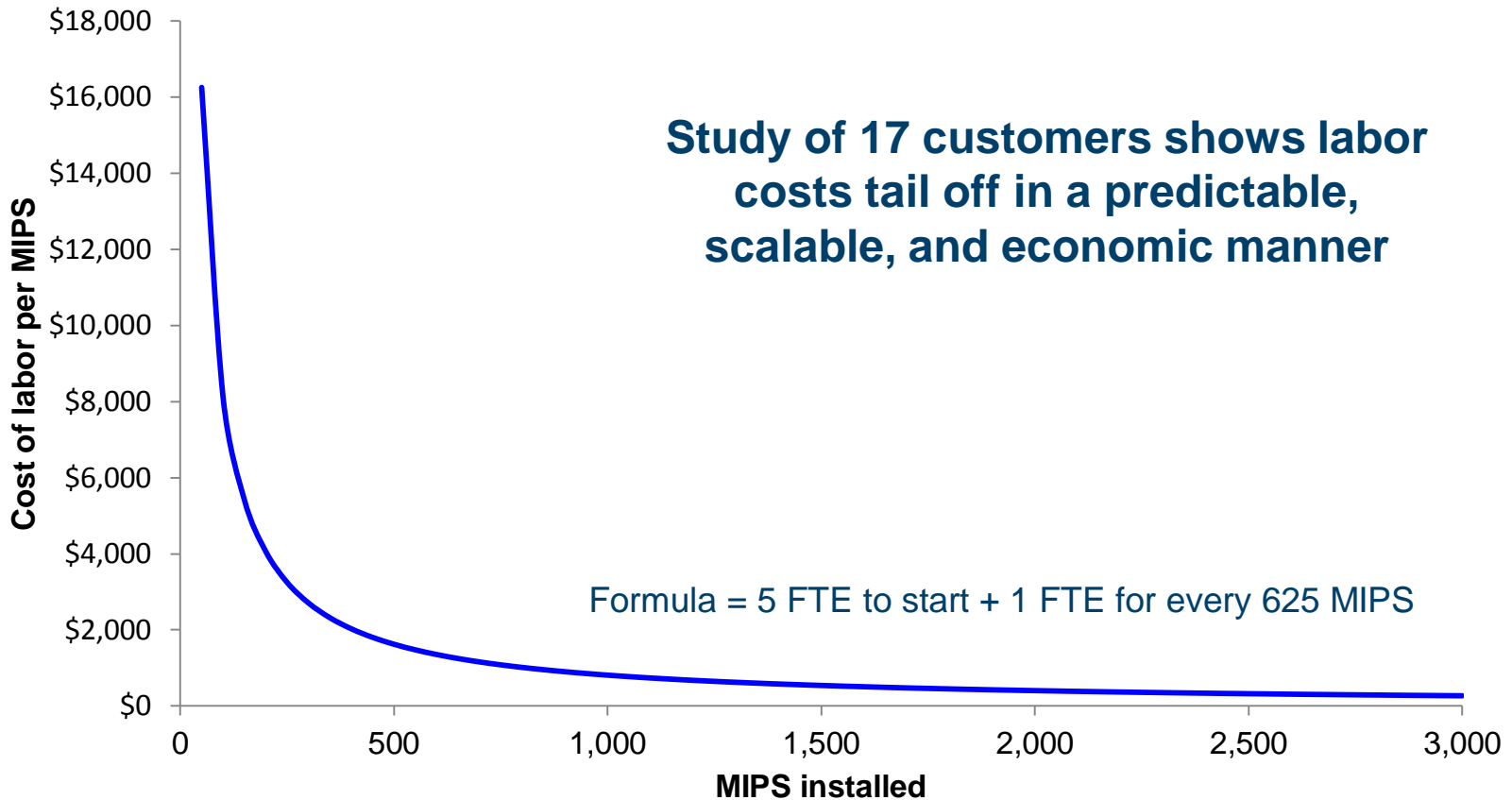


Chart 10: 68 percent of respondents believe that the increase in mobile applications is driving higher MIPS usage.

Compuware commissioned Vanson Bourne to study the impact of new IT trends and models. In September 2012, the independent research firm interviewed 520 CIOs from large enterprises across a range of industries in the U.S., Europe & Asia.

Eagle studies validate that adding workload to mainframes *reduces* labor cost per unit of work

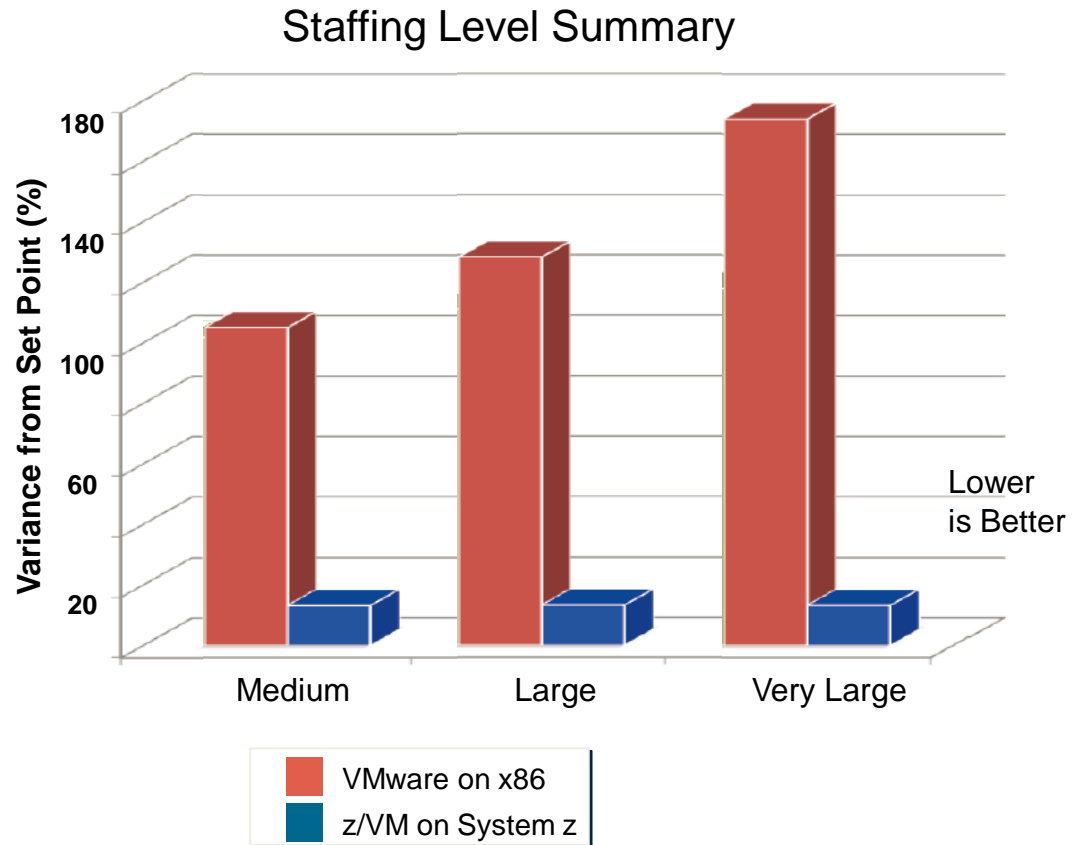
Labor cost per mainframe MIPS



Independent analysis shows that mainframe administration requirements are typically less than for distributed platforms

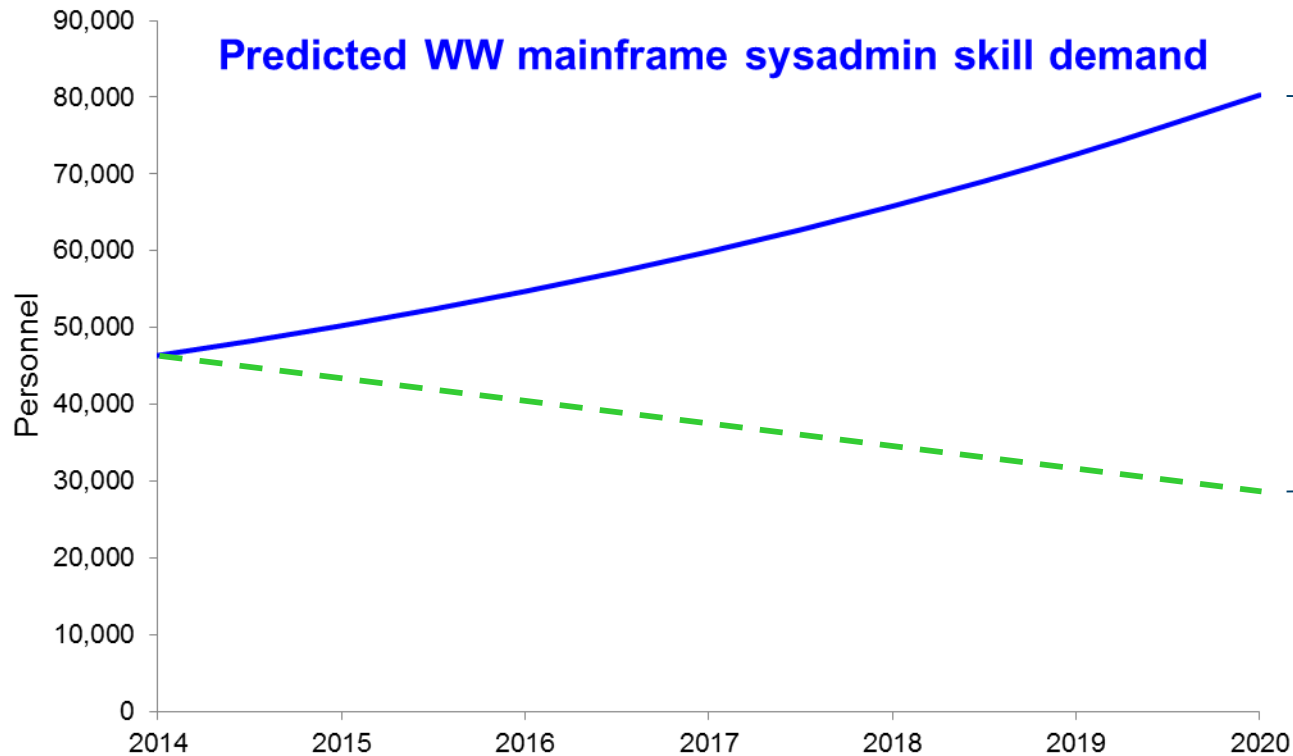
Staffing levels required to maintain a “gold standard”:

- Normalized to VMWare in Medium sized environment
- Staffing levels for z/VM was as much as 13x smaller



Estimation of the potential mainframe skills demand over the next six years

- IBM CPO projects 37,200 additional mainframe positions needed WW by 2020
 - Projection based on mainframe MIPS growth from 2005-2013
- Some number of today's personnel will retire by 2020, increasing that demand



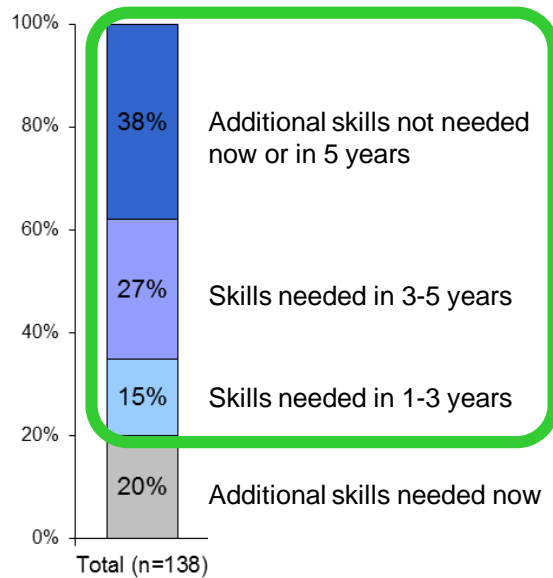
IBM programs such as the Academic Initiative are targeted to meet this demand

(Academic Initiative trains on average 6,400 annually)

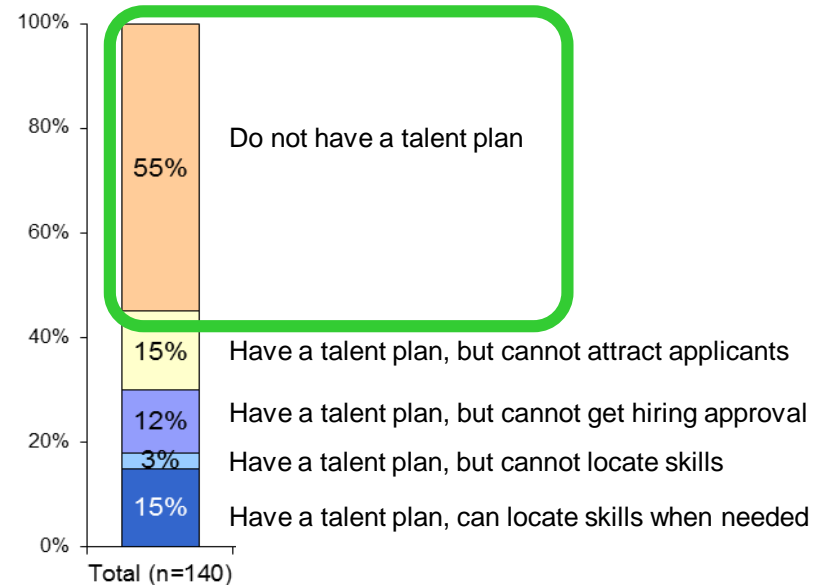
Source: IBM CPO estimations based on IBM data and assuming current productivity levels

Most companies say they are OK now, but many need a talent replenishment plan

80% of System z customers don't have a skills issues now



55% of System z sites don't have a talent plan for mainframe skills



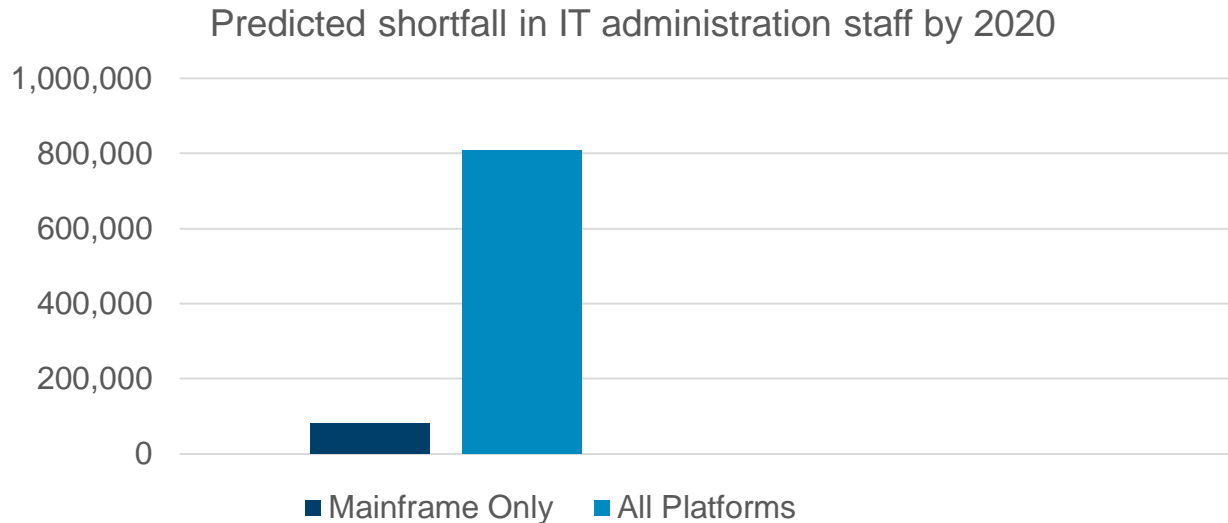
“Right now, it's pretty easy to hire programmers, and if they understand Java I can bring them back to procedural languages like Cobol,”

— David Brown, managing director of BNY Mellon's IT transformation group**

Source: IBM's 2013 System z Tracker

**http://www.computerworld.com/s/article/9225099/Cobol_brain_drain_Survey_results?taxonomyId=154&pageNumber=1

The shortage of mainframe skills projected is only about 10% of a greater problem...



- US government predicts that approximately **810,000** new and replacement administrative personnel will be needed across *all* platforms by 2020

...the requirements for development of an aggressive talent plan should cover all platforms within the data center, and not just the mainframe

Don't panic — do *plan*

- mainframes are still a critical technology
 - Especially as back-end servers for mobile computing
 - Critical assets require resource planning
 - Enterprise computing is a different mind-set

- Mainframers often stay in their job their whole career
 - Baby-boomers retiring exacerbates the skills challenge
 - Many learned on the job – often without ANY formal technology-training
 - 10,000 hour rule-of-thumb → on-the-job learning can take 3-5 years

- Get good people
 - Be careful with skill specification
 - Cross-train existing technologists
 - Learn the business first
 - Hire in cohorts

- Modernize your tools and processes....



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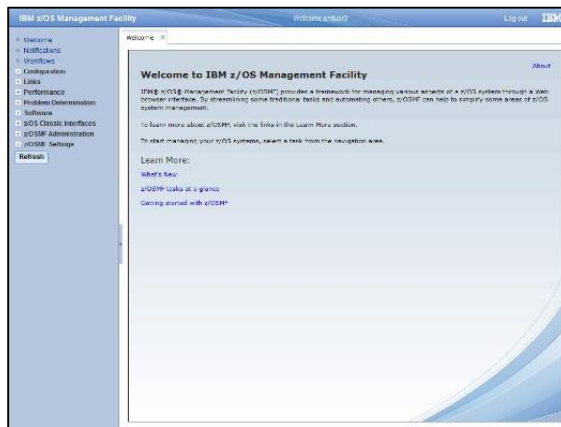
3

IBM continues to invest heavily in development of mainframe skills for the next generation

Today, mainframe system administrators use the latest workstation-based tools

IBM z/OS Management Facility (z/OSMF) - a modern, browser-based console for management of day-to-day operations and administration

- Maximizes productivity of a diversified workforce
 - Simplification of tasks
 - Enhanced collaboration
 - Reduced learning curve
- Role-based, scenario-based
- Integrates with other tools



z/OSMF

*Browser
(Windows IE
Firefox)*



↔
HTTP(S)



z/OSMF (Jobs and Resources -> SDSF section)

Active Jobs Statistics Common and table filters applied

System: P03 (Local) [View text](#)

System Activity Percent Busy

LPAR 0%

MVS/SRM 3%

Demand Paging Rate: 0

Top CPU Percentages

Job Name	CPU Percentage
ZMFDEV1	1.33%
RMF	0.67%
XCFAS	0.33%
WLM	0.17%
OMPROUD	0.17%
PROUD	0.17%
S2MON	0.17%

Active Jobs

Common Filters

JOBNAME	StepName	ProcStep	JobID
<input type="checkbox"/> DEBUG15	STEP1		S00002
<input type="checkbox"/> IGVDGNMN	IGVDGNMN	IGVDGNMN	S00002
<input checked="" type="checkbox"/> HZPENG	PROCDB	SP0TC001	T00002
<input type="checkbox"/> P00SVR2S	P00SVR2S	STEP1	S00002
<input type="checkbox"/> HZPENG	STEP1		S00012
<input type="checkbox"/> DEBUG12	*OMVSEX		S00012
<input type="checkbox"/> DEBUG12	STEP1		S00012

Total: 344, Selected: 1

Page 1 of 4

Properties of HZPENG

Properties are more current than table data.

Type to filter properties

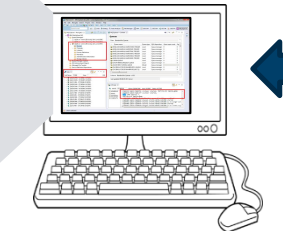
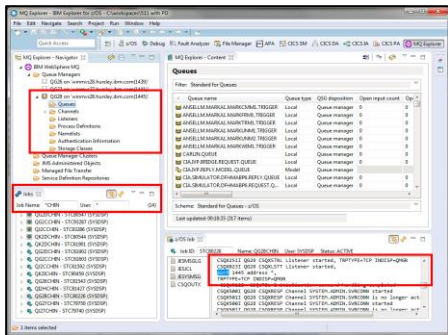
- General**
- Advanced**
- Performance**
- Scheduling**
 - C: FF
 - DP: TSOHIGH
 - ResGroup: TSOHIGH
 - RptClass: 1
 - SrvClass: TSOHIGH
 - Workload: TSO_WLD
- Security**
- Status**

z/OS administrators work from an Eclipse-based integration platform

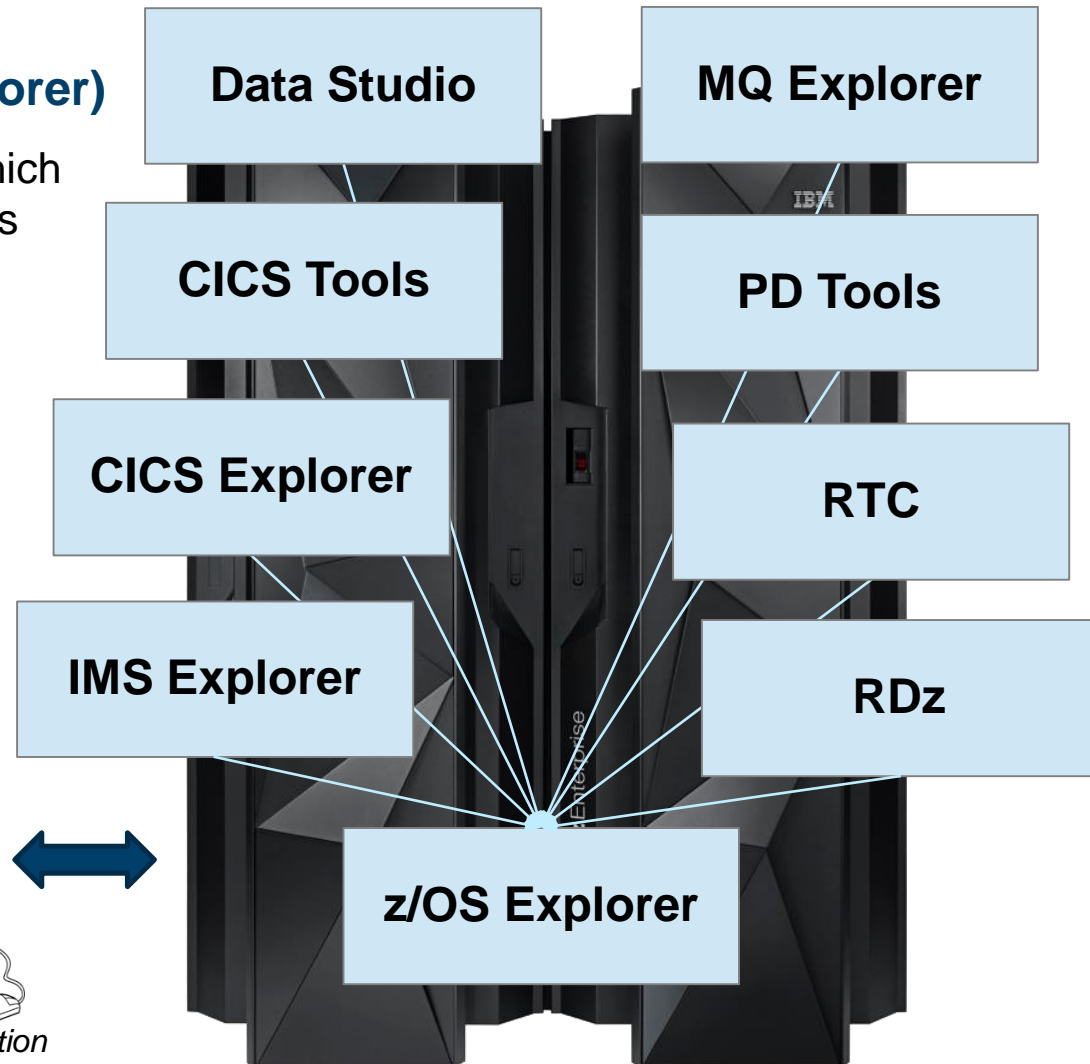
IBM Explorer for z/OS (z/OS Explorer)

- Provides a single workbench from which to develop, and test z/OS applications and manage related sub-systems
- Common base for many z/OS tools
- Extendable to accommodate user's roles and responsibilities

MQ Explorer plug-in in z/OS Explorer – showing Queues and Jobs



Eclipse workstation



Business Connexion, Ltd. (South Africa) – Services company simplifies its IT to better meet customer requirements

A committed CICS service provider looking to continue delivering strong value proposition

Business challenge:

- Customers consistently requesting “more for less”
- Required easier-to-use interfaces into its CICS systems

Solution:

- Reinvented their IT with the CICS Explorer, CICSplex System Manager (CPSM), Events Processing and ATOM feeds features
- Enhanced CICS resources to populate a business operations dashboard – highlights all the CICS events in the system

Benefits:

- Made system administration more intuitive and user friendly
- Provides greater control and monitoring, helping customers better react to situations

"The CICS Explorer is a non-chargeable Eclipse based tool that provides our clients views of their resource state and information across multiple CICS Systems - it's simple to deploy and simple to use and should make it easier for our new staff to become competent on our CICS systems more quickly"

- Rob Loyd, data center services manager

**Business
Connexion**
Creating value together

COBOL continues to be alive and well!

Is Cobol being used in your organization to develop new business applications?

Yes: 53%



No: 44%



Don't know: 3%



Base: 131 IT professionals

To what extent do your organization or systems use these programming languages?

Language name	A lot	A little	None
Cobol	48%	16%	37%
JavaScript	41%	41%	19%
Java	39%	40%	22%
C#	26%	25%	50%
VB.net	25%	38%	38%
Visual Basic	22%	49%	30%

Base: 202 IT professionals.

Percentages may not add up to 100 because of rounding.

- See ***“Leaving the Myth business to the ancient Greeks and Romans: COBOL is dead ... seriously?”*** (http://get.syr.edu/news_alt.aspx)

Languages should be selected using “fit-for-purpose”

Use COBOL for:

- ☑ Building mission critical applications in the business logic and data management layers
- ☑ Where records are processed and calculated
- ☑ Where performance is important in delivering high service levels
 - Sub-second response time is needed
- ☑ Where programmers must learn a language quickly, and the resulting code needs to be readable by non-programmers

Don't use COBOL for:

- ☒ The presentation layer where chasing a mouse around a screen is required

Compared to more modern programming languages such as Visual Basic, C#, C++ and Java, how does Cobol rate for these characteristics:

Function	Much better/ Somewhat better	About the same	Worse/ Much worse
Batch processing	82%	12%	4%
Transaction processing	65%	24%	9%
Handling business-oriented features	55%	21%	19%
Run-time efficiency	54%	33%	8%
Security	39%	38%	15%
Reporting	45%	37%	17%
Development cost	39%	32%	17%
Maintenance cost	43%	29%	18%
Ability to hire programmers	13%	25%	55%
Agility	15%	33%	45%

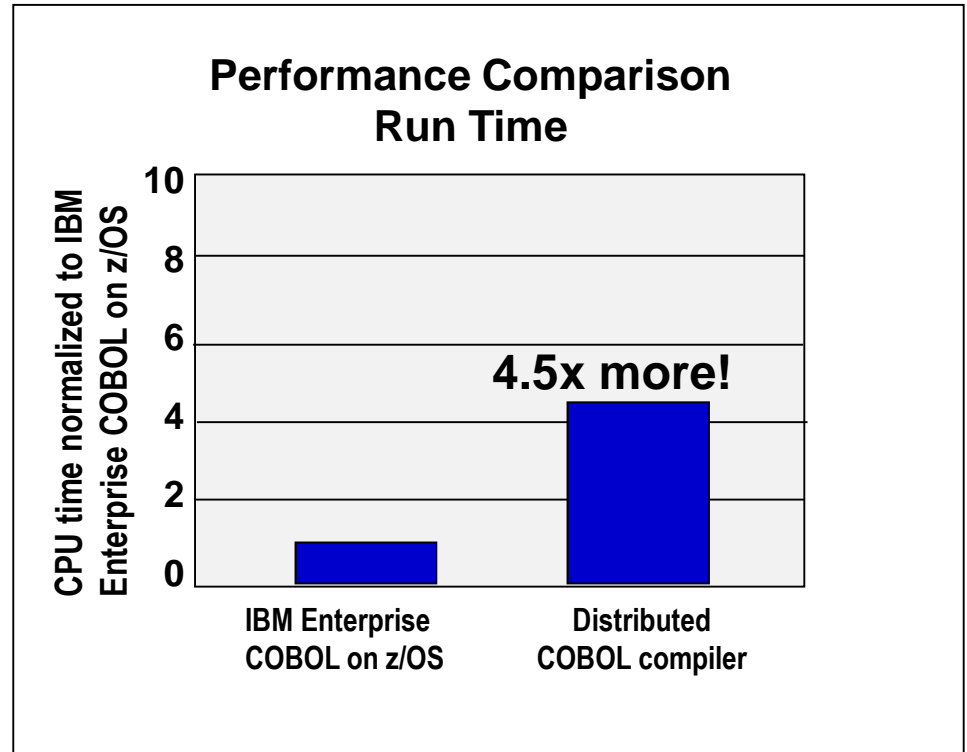
Base: 131 IT professionals

Jettisoning CICS/COBOL can be problematic, risky and expensive

- Moving applications off the mainframe with a distributed compiler can lead to significant performance issues
- HP (a major rehosting competitor) estimates that 20% of COBOL lines will need to be rewritten when rehosting

“COBOL and the mainframe run well together, and that's where I want to keep it.”

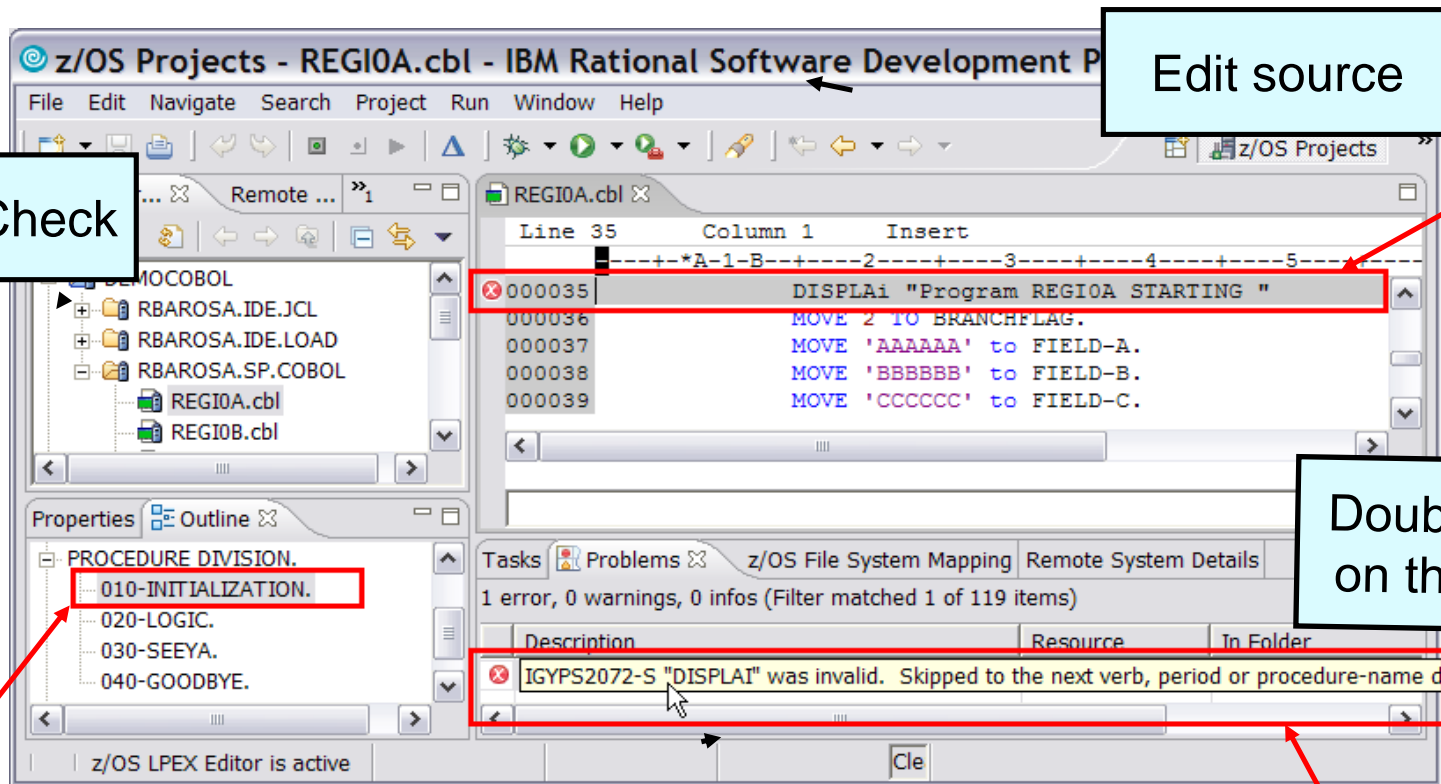
*David Brown managing director
of the IT transformation group
at BNY Mellon*



“Millions of users unknowingly activate CICS every day, and if it were to disappear the world economy would grind to a halt.”

Phil Manchester, Personal Computer Magazine

Today, COBOL application development is simplified using Eclipse-based graphical editing tools



Syntax Check

Edit source

Statement in error

Double click on the error

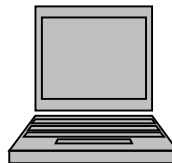
Outline view presents COBOL structure

Rational Developer for System z (RDz)

Error list in Tasks view

Rational Developer for System z is a single, rich, integrated interface for all zEnterprise development

- Supports all mainframe languages (COBOL, PL/I, C/C++, ASM, Java, etc.) and runtimes (CICS, IMS, Batch, USS, DB2, WAS, etc.)
- Fully supports development and reuse of all mainframe assets
- Connected and disconnected modes
 - Connect to z/OS for debug, job generation, etc.
 - Disconnect and reduce mainframe MIPS usage and costs
- Includes Web Services and JSON wrappers



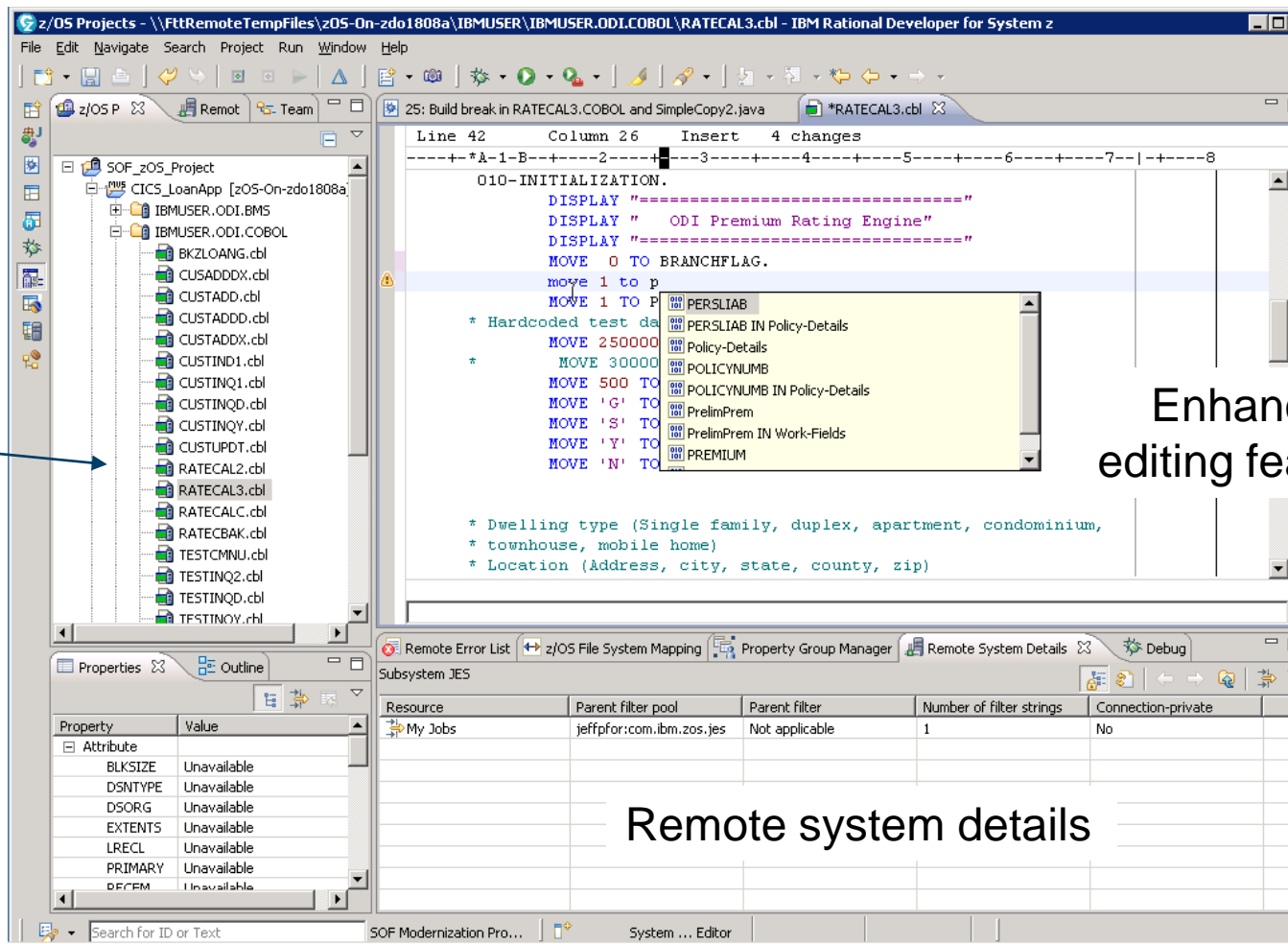
The screenshot displays the RDz Eclipse interface with several key components highlighted by blue arrows and text:

- Disconnected -vs- Connected:** A label in the top-left pane indicating the connection status of the remote system.
- Configurable Editor:** A label pointing to the main code editor window displaying JCL code.
- USS Command Shell:** A label pointing to the USS shell interface at the bottom of the editor.
- TSO Command Shell:** A label pointing to the TSO shell interface at the bottom of the editor.
- JES sub-system view:** A label pointing to the JES job status window at the bottom right.
- MVS PDS members:** A label pointing to the tree view of PDS members on the left.
- Data set characteristics:** A label pointing to the Properties window at the bottom left.

RDz Eclipse interface

DEMO: COBOL development using state-of-the-art Eclipse-based tools

COBOL files



Enhanced editing features

Remote system details

Grow and enhance the skills set of development teams through use of multi-faceted, integrated tools

- Features in RDz enable cross-fertilization of development skills
- RDz makes it easy for Java developers to also contribute to COBOL applications

The screenshot displays three overlapping windows from IBM Rational Developer for System z:

- Remote System Explorer:** Shows a tree view of remote systems. A red arrow points to the 'z/OS UNIX Files' folder with the annotation: "Use the Remote System Explorer to see PDS".
- z/OS Projects:** Shows a project tree for 'SOF_zOS_Project'. A red arrow points to the 'RATECAL3.cbl' file with the annotation: "Switch to the z/OS Projects to edit COBOL files".
- Java Editor:** Shows the source code for 'SimpleCopy2.java'. A red arrow points to the project tree in the background with the annotation: "Switch to the Java perspective to edit Java files".

```

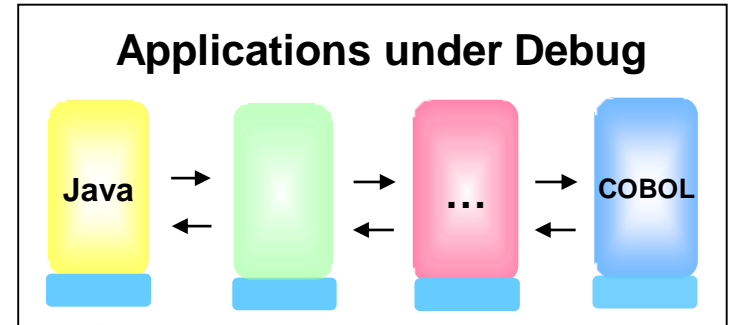
package sof;
import java.io.File;

public class SimpleCopy2 {
    public static final String TEMP_FILE = "io.tmp";
    public static final int BUFFER_SIZE = 4096;

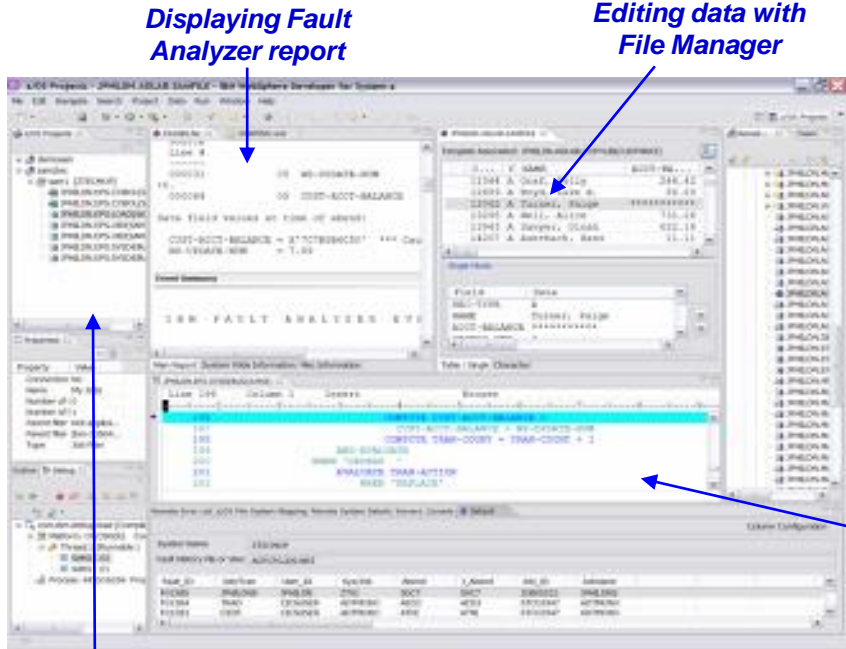
    public static void main(String[] args) throws IOException {
        // ...
    }
}
    
```


Mainframe Problem Determination Tools (PDT) are integrated into the workstation development environment

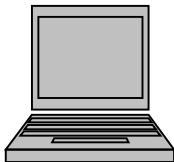
- Easily debug and step through multi-tier applications



- End-to-end debug
- Edit VSAM data
- Analyze ABEND logs!

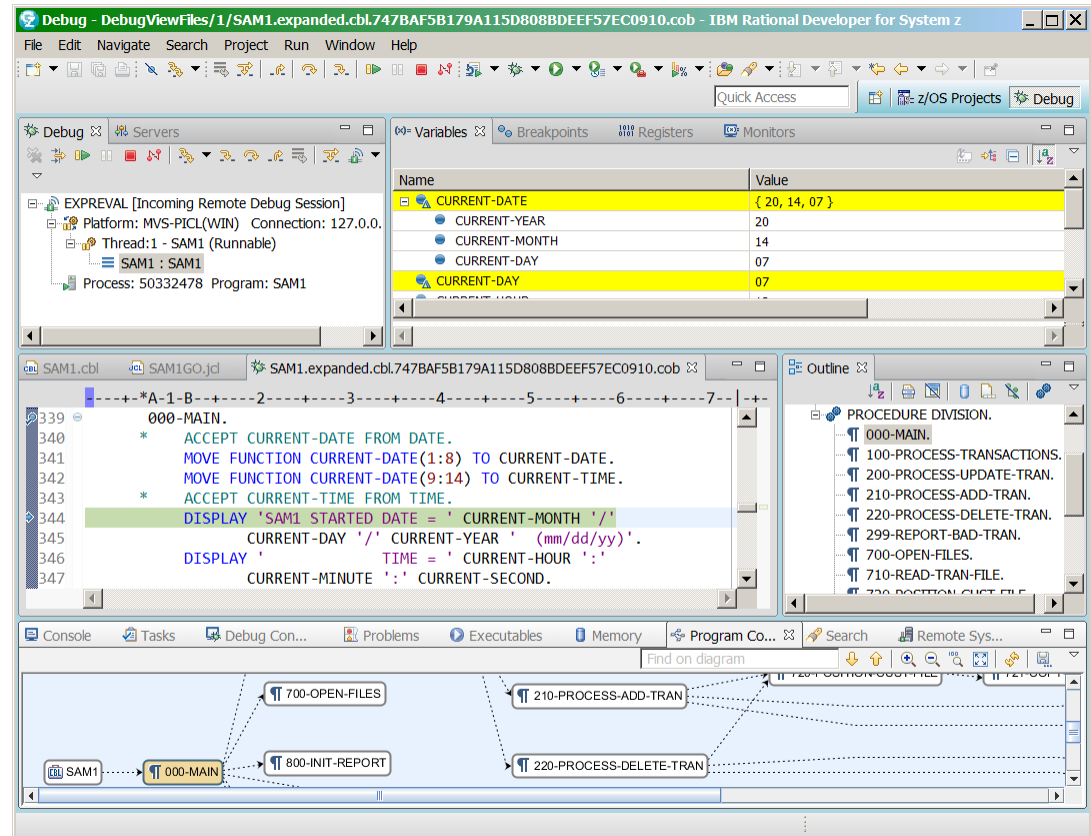


Developing System z application with RDz



DEMO: New RDz v9.1 Integrated Debugger

- Leverages the workstation CPU with smaller mainframe footprint
- Has tighter integration with other views
- Multi-language support
- New breakpoints types can be saved across debugging sessions
- View memory in different formats
- Watch complex variables and see all occurrences of a variable in the code
- New Code Coverage analysis to see what's executed and what's not



Businesses reap the benefits of modernizing with RDz



By implementing IBM Rational Developer for System z software, UBS produced better quality code that led to fewer deployments into test environments. UBS also gained standard interfaces that allowed them to follow a DevOps strategy toward continuous testing.



By implementing an array of IBM Rational software (including RDz, Enterprise COBOL, and Enterprise PL/1), Citigroup significantly raised developer productivity – and can now plan, budget and forecast in a much more efficient way.



By deploying IBM Rational Solution for Collaborative Lifecycle Management (including RDz), TSYS successfully moved to agile software development and accelerated the delivery of business value while reducing the risks associated with software development

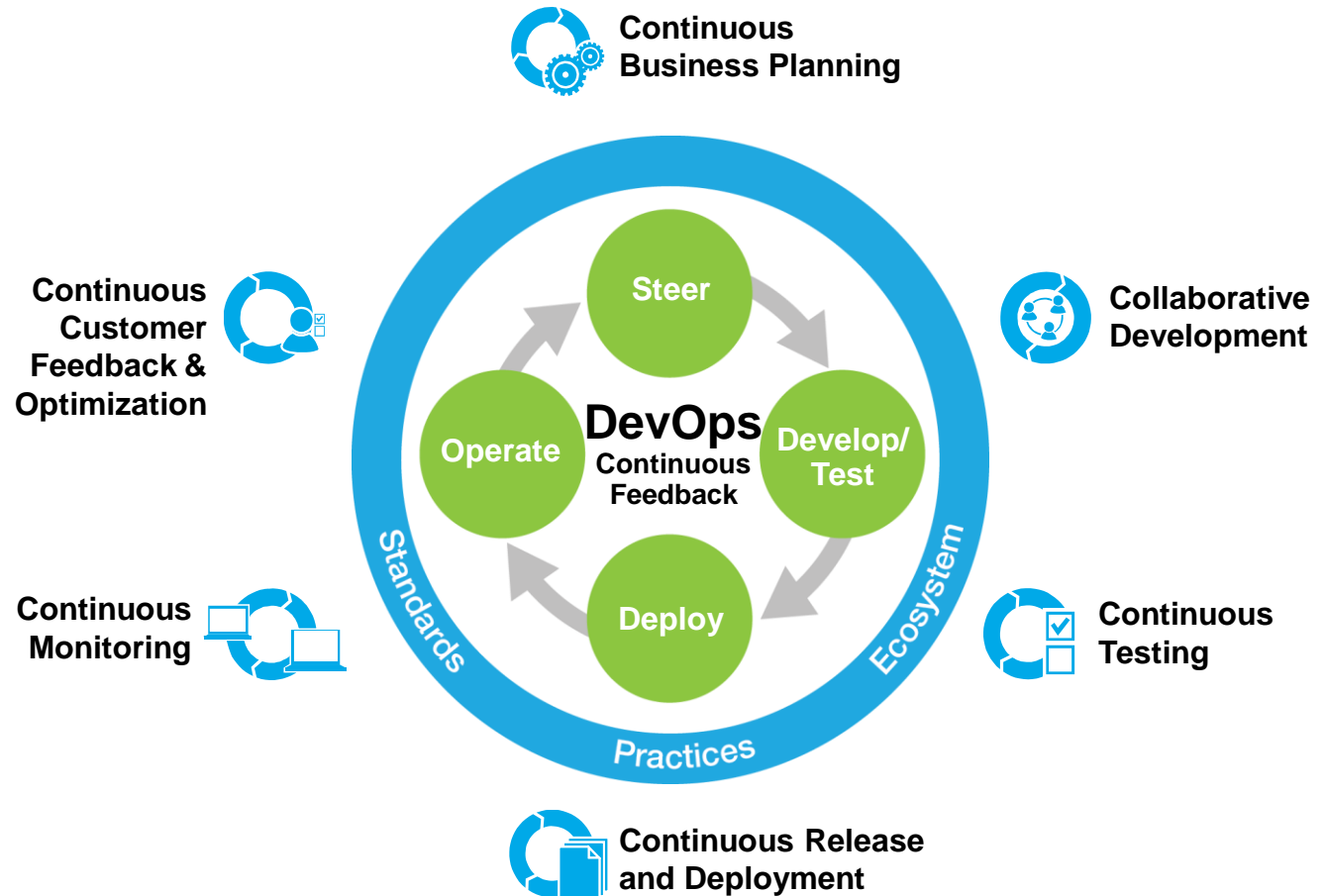
IBM DevOps point of view

Enterprise capability to improve efficiency and effectiveness

Accelerate software delivery – for faster time to value

Balance speed, cost, quality and risk – for increased capacity to innovate

Reduce time to customer feedback – for improved customer experience

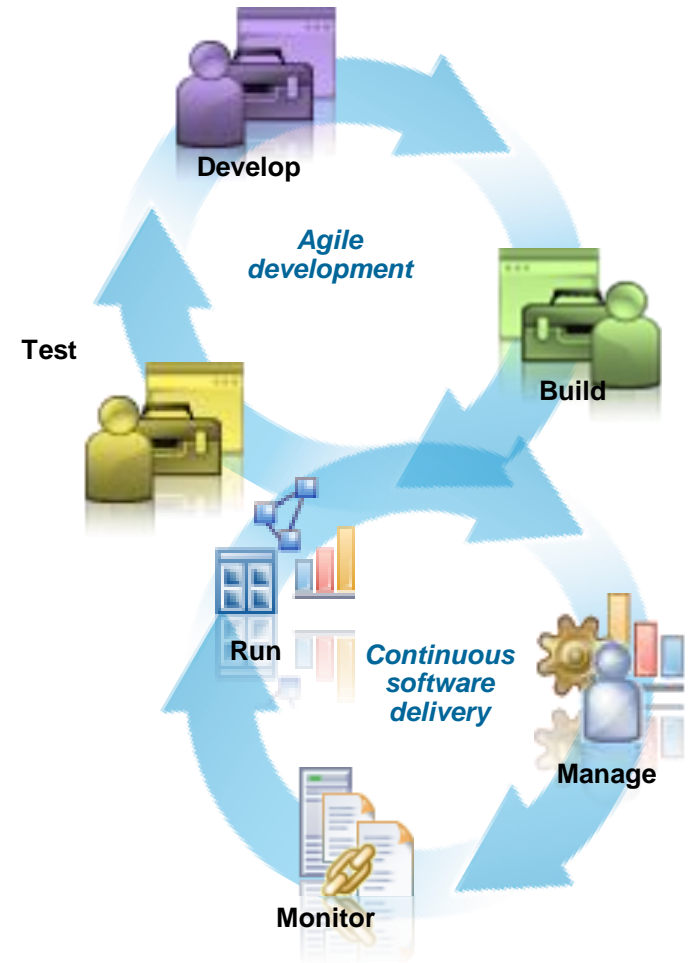


Tools enable a DevOps approach for continuous development and operations on zEnterprise

Today, customers expect **better product quality** and **shorter release cycles**. Businesses must meet this challenge, while **keeping costs low**

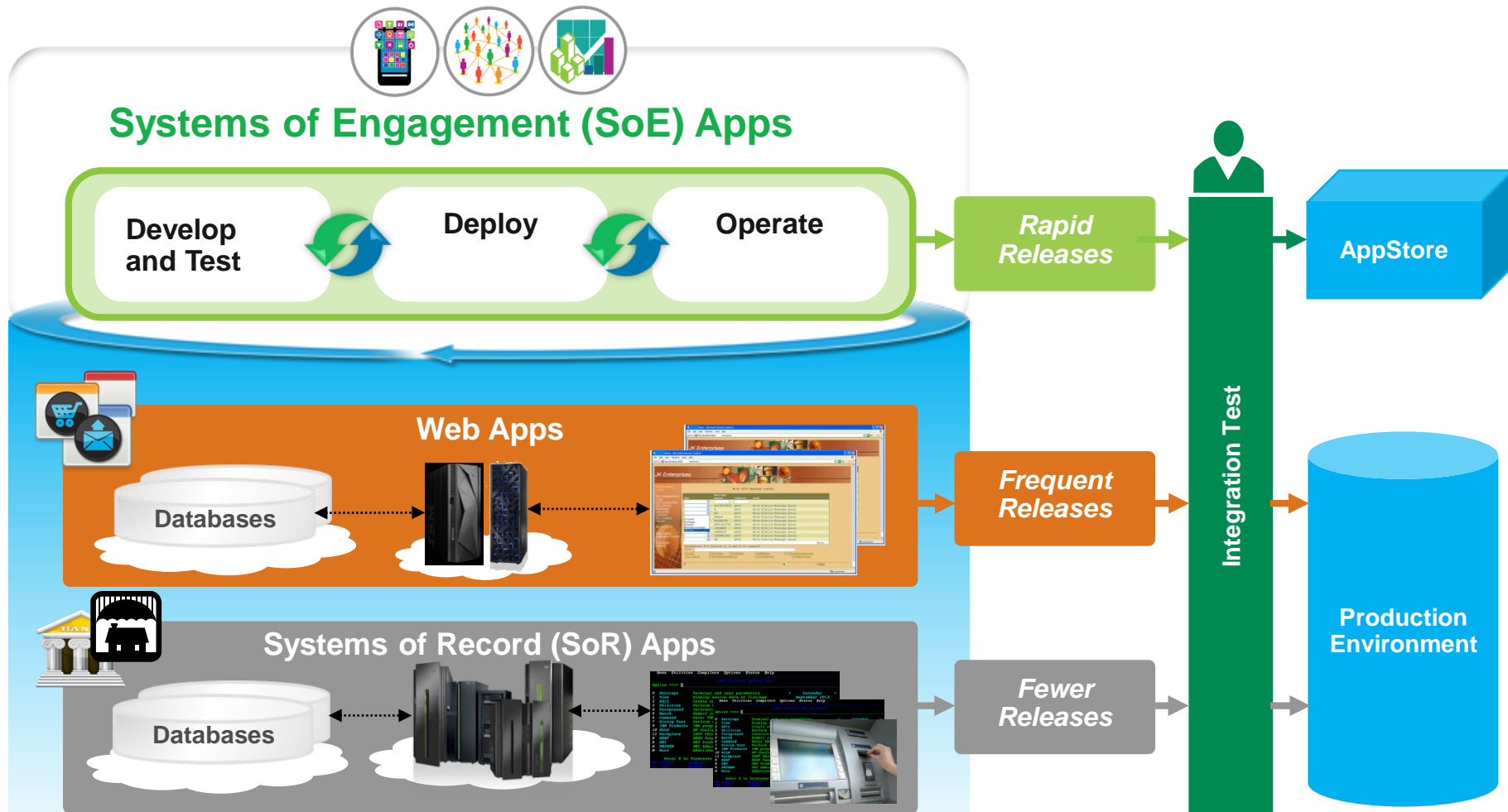
DevOps:

- A process that addresses this challenge
- Unites Development and Operations around a continuous and agile delivery model
- Enables Testers to have production-like environments
- Ensures an integrated view to govern and manage end-to-end delivery pipeline



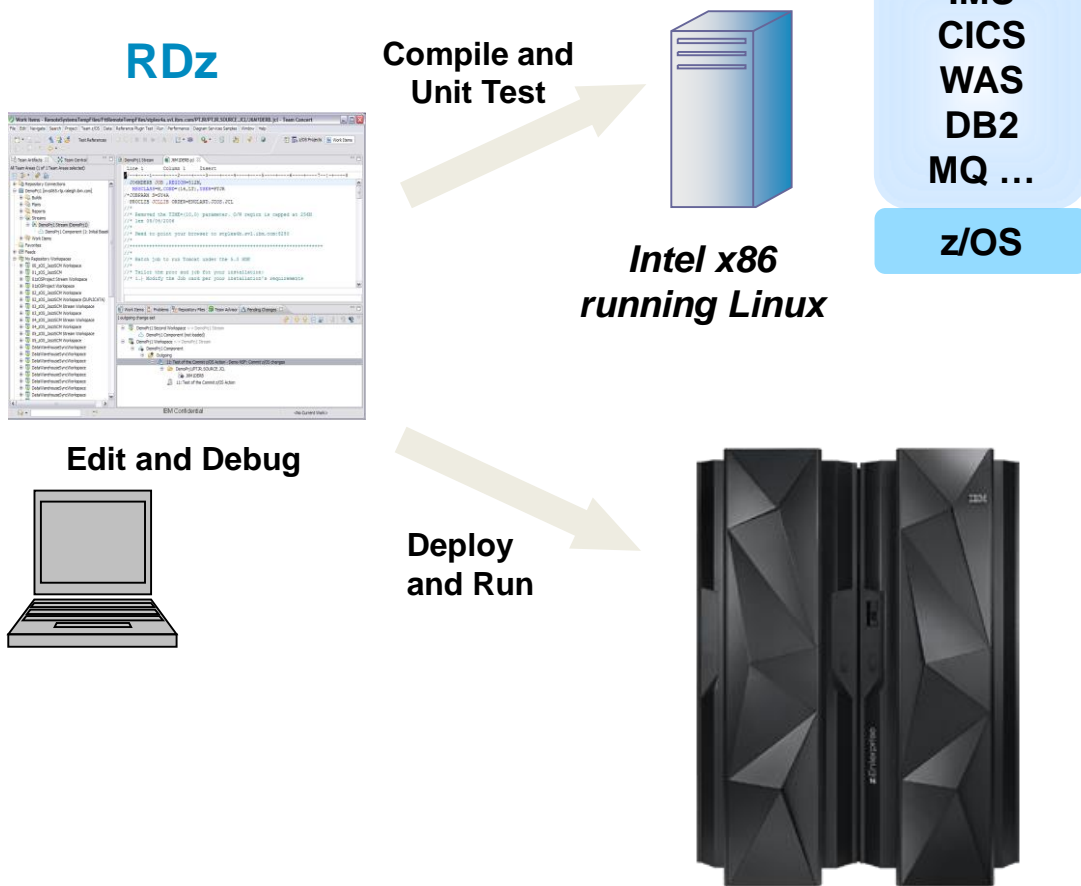
Integrate Systems of Engagement with Systems of Record

By bringing together the culture, processes, and tools across the entire software delivery lifecycle – spanning mobile to mainframe platforms



Agile compilation and unit test can be done off-platform to reduce costs and simplify operations

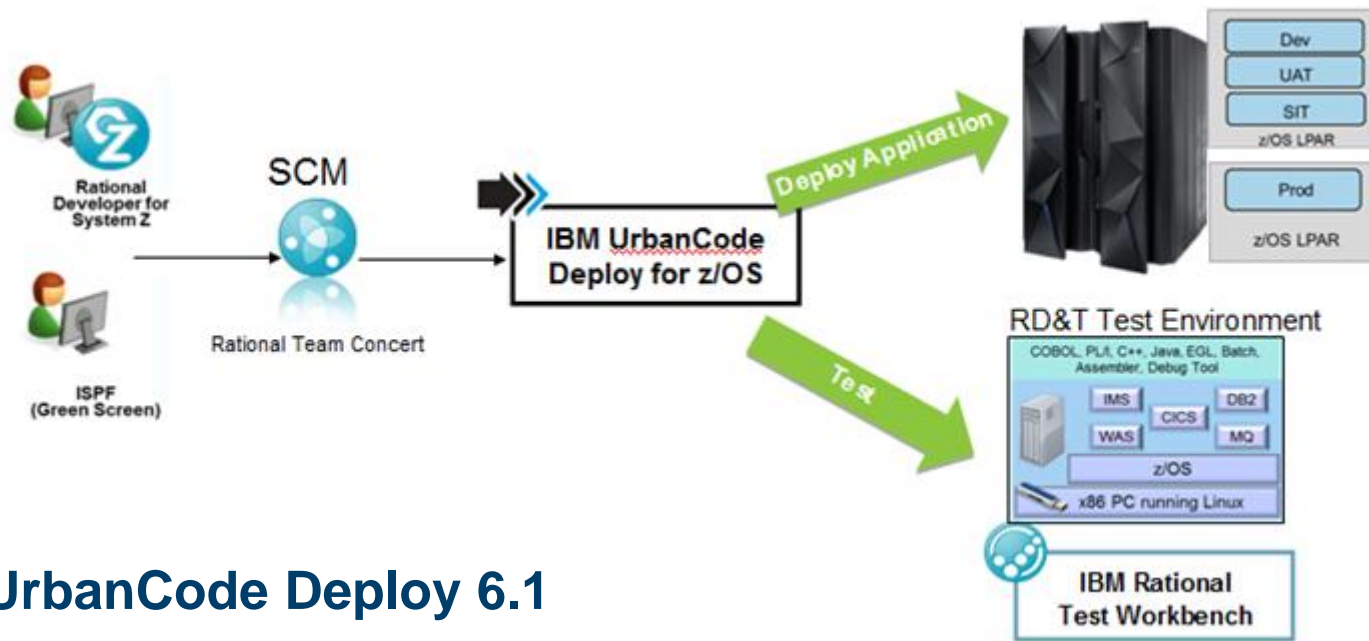
Rational Development and Test (RD&T)



No interruptions to mainframe operations

- Compile and Unit Test on an Intel x86 server running Linux
- RD&T server runs z/OS and all mainframe software
- Continuously updated to emulate the latest releases of zEnterprise hardware and software
- Enables developers to rapidly prototype new applications
- Eliminates costly delays by reducing dependencies on operations staff

Extend DevOps support to back-end Systems of Record



IBM UrbanCode Deploy 6.1

- Deploy component to IBM z/OS data sets with enhancements to display partitioned data set members in component versions
- Set up artifact repositories in agent relays that cache downloaded artifacts

IBM Rational Test Workbench 8.6

- New Application Topology Discovery feature to quickly discover services used by the system under test
- Full range of features aimed at service testing and virtualization in SAP environments

DevOps capabilities for mobile applications with enterprise systems

Accelerate mobile application development



- Rational Test Workbench
- IBM MobileFirst Platform
- IBM DevOps services for Bluemix
- Rational Application Developer
- IBM UrbanCode Deploy
- Rational Developer for the Enterprise
- CICS Interdependency Analyzer
- CICS Performance Analyzer

Enabling you to...

- Quickly design, code, build, test, and deploy mobile apps that run on wide variety of mobile platforms
- Refactor and extend existing back-end services to provide optimal mobile experience
- Stub out back-ends to simplify test and development
- Automate testing for native and hybrid mobile apps

Nationwide embraces DevOps to drive continuous delivery across platforms and improve speed to market

50% increase
in software **quality**
over the last three years

90% on-time delivery
vs. 60% previously

70% decrease
in user downtime

58% of developers moved
to industry top quartile
in **productivity measures**



“We’re more agile as a business and more responsive to our customers. Collaboration has become an expected part of our culture.”

— Steve Farley, Vice President,
Application Development Center, Nationwide



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IBM has made considerable investment in intuitive, GUI-based tools for mainframe administration and development

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IBM continues to invest heavily in development of mainframe skills for the next generation

Through the Academic Initiative, IBM is working to train new mainframe developers and administrators

- Since its inception in 2003, the program has grown significantly benefiting schools, students, and clients
- Market place demand for enterprise systems resources over the last decade has remained strong
- Our clients have expressed continued interest in expanding the program to ensure a healthy ecosystem

<http://www.ibm.com/university/systemz>

Corporate Engagement
360+ companies actively recruiting

Professional Connections
9 Communities

Job Candidates
Over 4,200 Job Seekers

Growth
64K+ Students
1,000+ Schools
in 70 countries

Program Investment
\$10M+ over
in 10 years



IBM zEnterprise Academic Initiative

Major Academic Institutions and Key Recruiters



UNIVERSITY OF
ARKANSAS

EBERHARD KARLS
UNIVERSITÄT
TÜBINGEN



Recruiters

Cigna
Compuware
EMC
Fidelity
JP Morgan Chase

Recruiters

CROC
Lusoft
Rosoboronexport



l'École
d'ingénierie
informatique

Recruiters

HSBC
Tivit

Recruiters

China Construction
Bank

Recruiters

Citi

Recruiters

Bull
Groupama

Master the Mainframe competition is helping a new generation find opportunity in the mainframe

A three-part contest of increasing difficulty, open to high school and college students and offered around the world



43 students from **23** countries



Yong-Siang Shih - 1
Score: 3407
National Taiwan University
Taiwan



Rijnard van Tonder - 2
Score: 3329
Stellenbosch University
South Africa



Philipp Egli - 3
Score: 3186
University of Brighton
United Kingdom



Mugdha Kadam - 4
Score: 3031
University of South Florida
United States

GENERATION Z.
They will create the future.

Use the Job Board to find needed skills



Welcome to the System z Job Board

Are you looking to hire talented System z professionals?
Are you seeking a career with System z technology?

Then you've found the right place! This web site connects IBM System z clients, partners and businesses with students and professionals seeking System z job opportunities.

Special limited-time offer! Employers who hire a candidate through Systemzjobs.com and agree to publicize their hiring success can receive a voucher to send an employee to an instructor-led [online System z course](#) (valued at \$1,200). Once you make a connection through Systemzjobs.com, simply send an email to zskills@us.ibm.com to request your voucher. First-come, first-served!

Job Seekers

- **View Job Opportunities**
Browse the hottest new jobs in the enterprise computing industry.
- **Receive job alerts**
Set up a job agent so that jobs matching your search will be emailed to you.
- **Create a free account**
Store job openings and manage your job search through your My Career account.
- **Access your account**
Log in to your free My Career account.

Employers/Recruiters

- **Post a job**
Post your System z job here to attract the most qualified candidates from universities and industry.
- **Create a free account**
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- **Access your account**
Log in to your free My Recruiting account.

<http://systemzjobs.com>


Every mainframe IT manager should know...

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- Partner with IBM **to build new skills for your business**
zskills@us.ibm.com
- Advertise job opportunities **to students and experienced professionals**
systemzjobs.com
- Use resources **to assist with building employees skills (internal training programs)**
www.ibm.com/systems/z/education/skills_coursematerials.html
- Build credentials **through the Mastery Test**
www.ibm.com/certify/mastery_tests/ovrZ05.shtml
- *Online mainframe education (certificates)*
www.idcp.org/learnzos.html
- Stay connected **with through communities and social media. “Like” us on Facebook.**

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