

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**

## Three things to keep in mind

1

**The IT skill shortage actually extends far beyond the mainframe**

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).

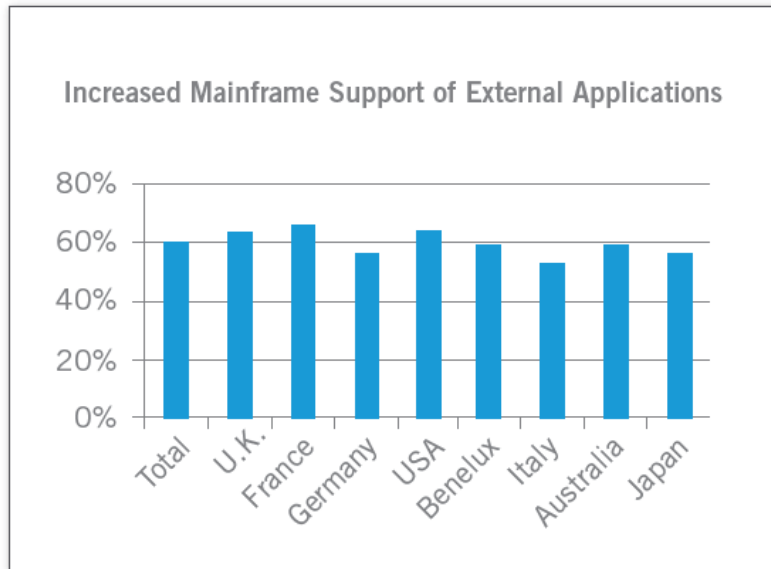


Chart 9: 62 percent of companies are using their mainframes to support external applications, such as online banking.

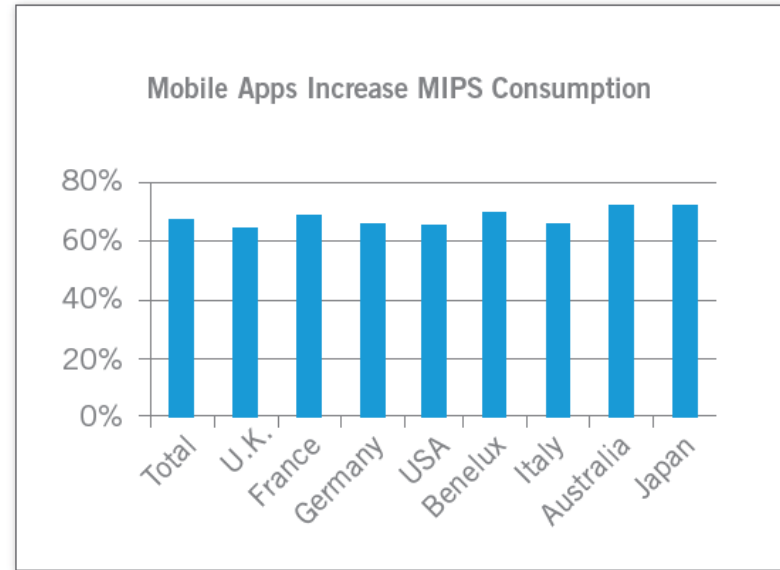
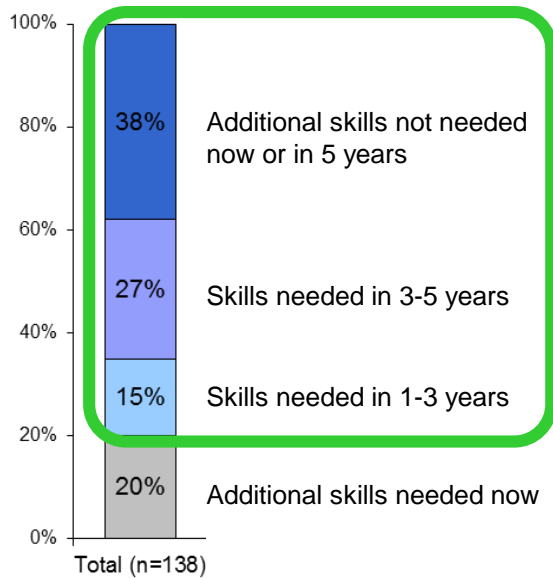


Chart 10: 68 percent of respondents believe that the increase in mobile applications is driving higher MIPS usage.

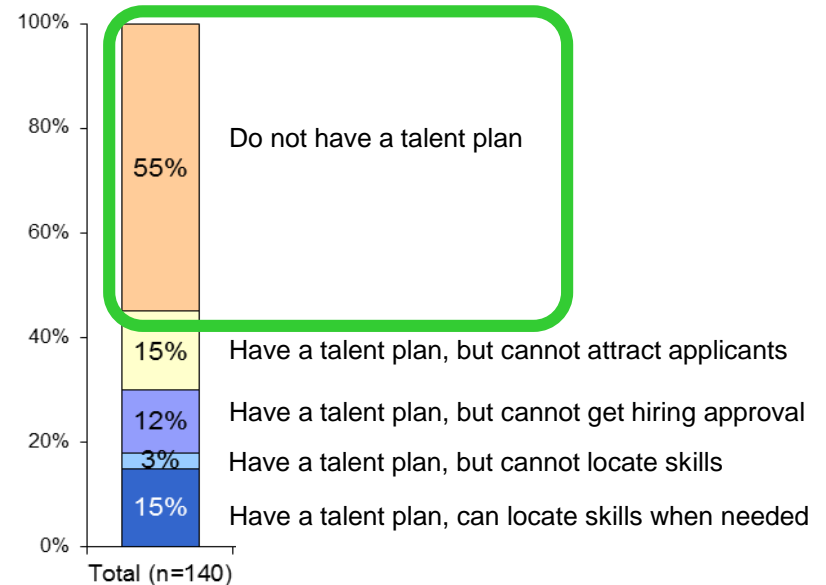
Compuware commissioned Vanson Bourne to study the impact of new IT trends and models. In September 2012, the independent research firm interviewed 520 CIOs from large enterprises across a range of industries in the U.S., Europe & Asia.

# 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,”*

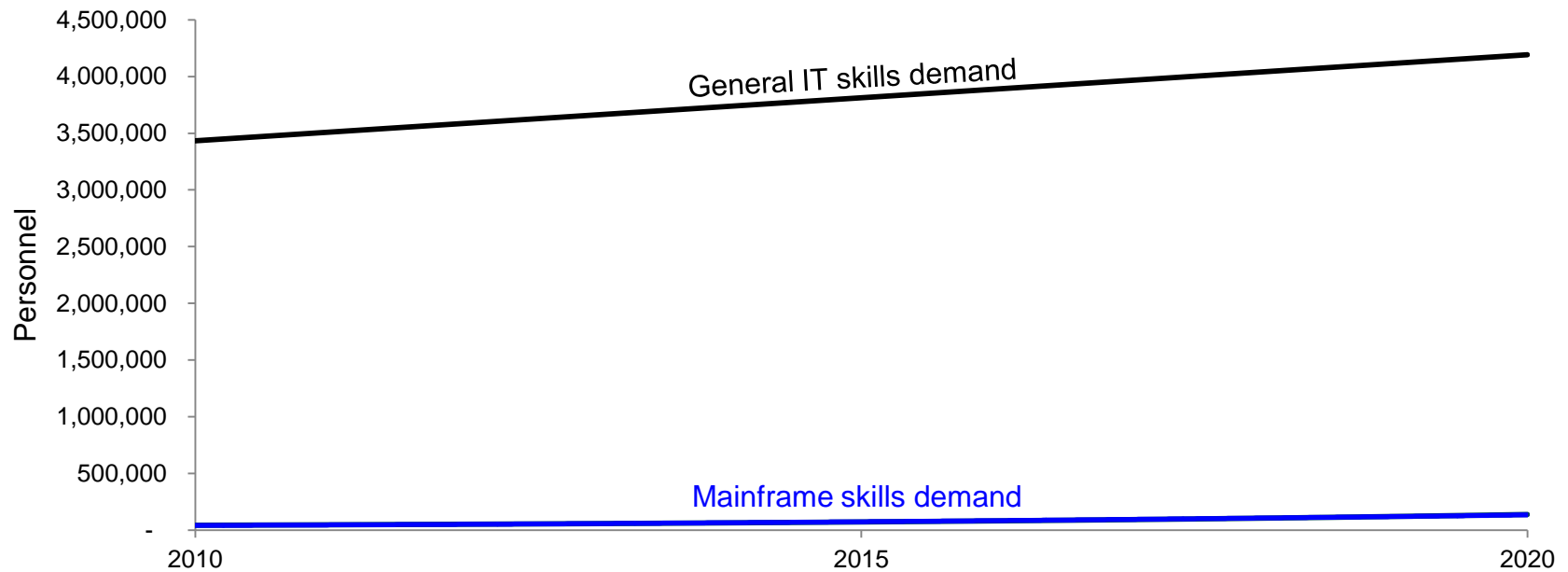
— David Brown, managing director of BNY Mellon's IT transformation group\*\*

Source: IBM's 2013 System z Tracker

\*\*[http://www.computerworld.com/s/article/9225099/Cobol\\_brain\\_drain\\_Survey\\_results?taxonomyId=154&pageNumber=1](http://www.computerworld.com/s/article/9225099/Cobol_brain_drain_Survey_results?taxonomyId=154&pageNumber=1)

## The potential mainframe skills shortage is being fixed by IBM *It's insignificant relative to the general IT skills shortage*

- IBM-CPO projects 80,000 additional mainframe positions needed WW by 2020 (35,000 in US)
  - 25,000 mainframe jobs filled from 2005-13
  - IBM Academic Initiative has trained 64,000 since 2003



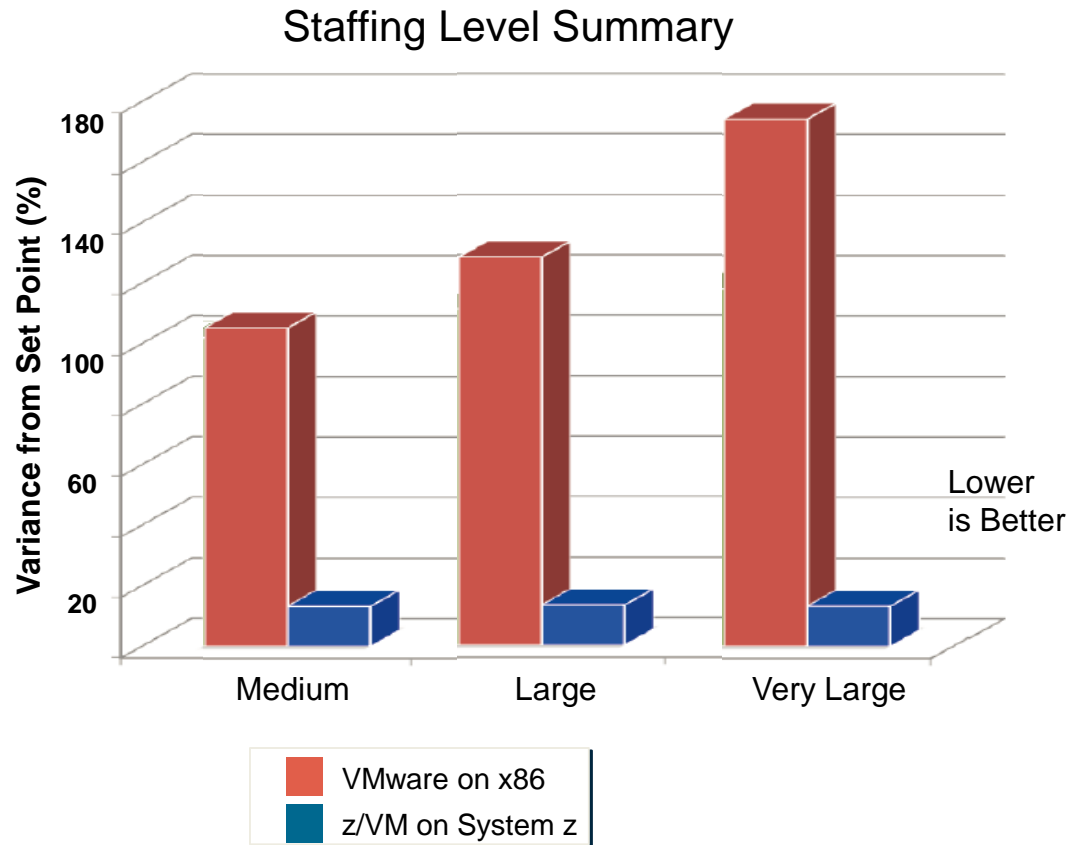
- BUT US government predicts **2M new IT jobs needed by 2020** in the US alone
  - Many retiring from non-mainframe IT
  - Far more jobs than graduates forecasted

***Mainframe skills are <2% of the full problem – and being addressed***

## Mainframe administration costs are typically less than distributed administration costs

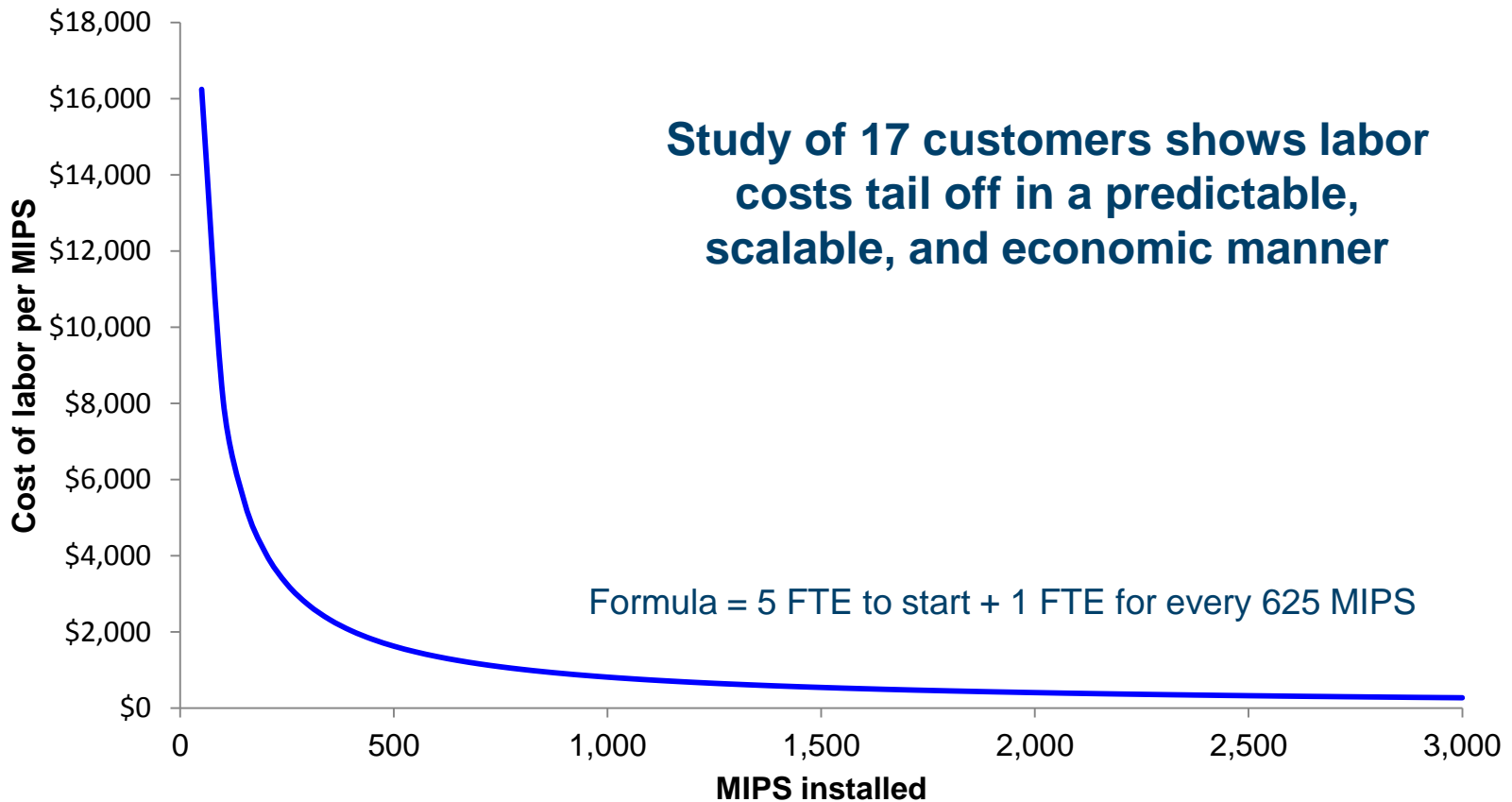
Staffing levels required to maintain a “gold standard”:

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



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

## Labor cost per mainframe MIPS





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

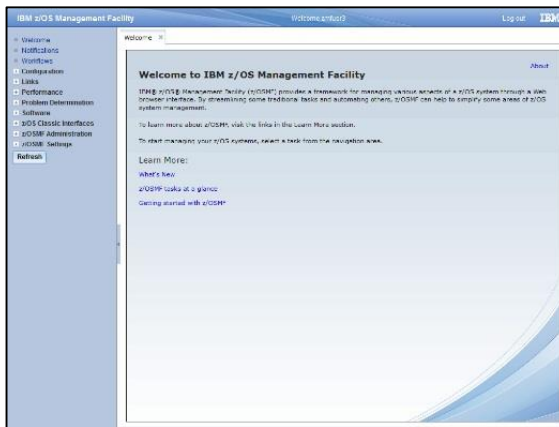
3

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

# 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)*

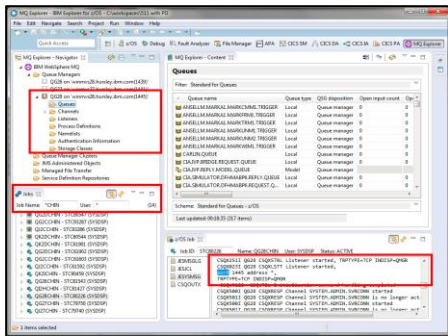


# z/OS administrators work from an Eclipse-based integration platform

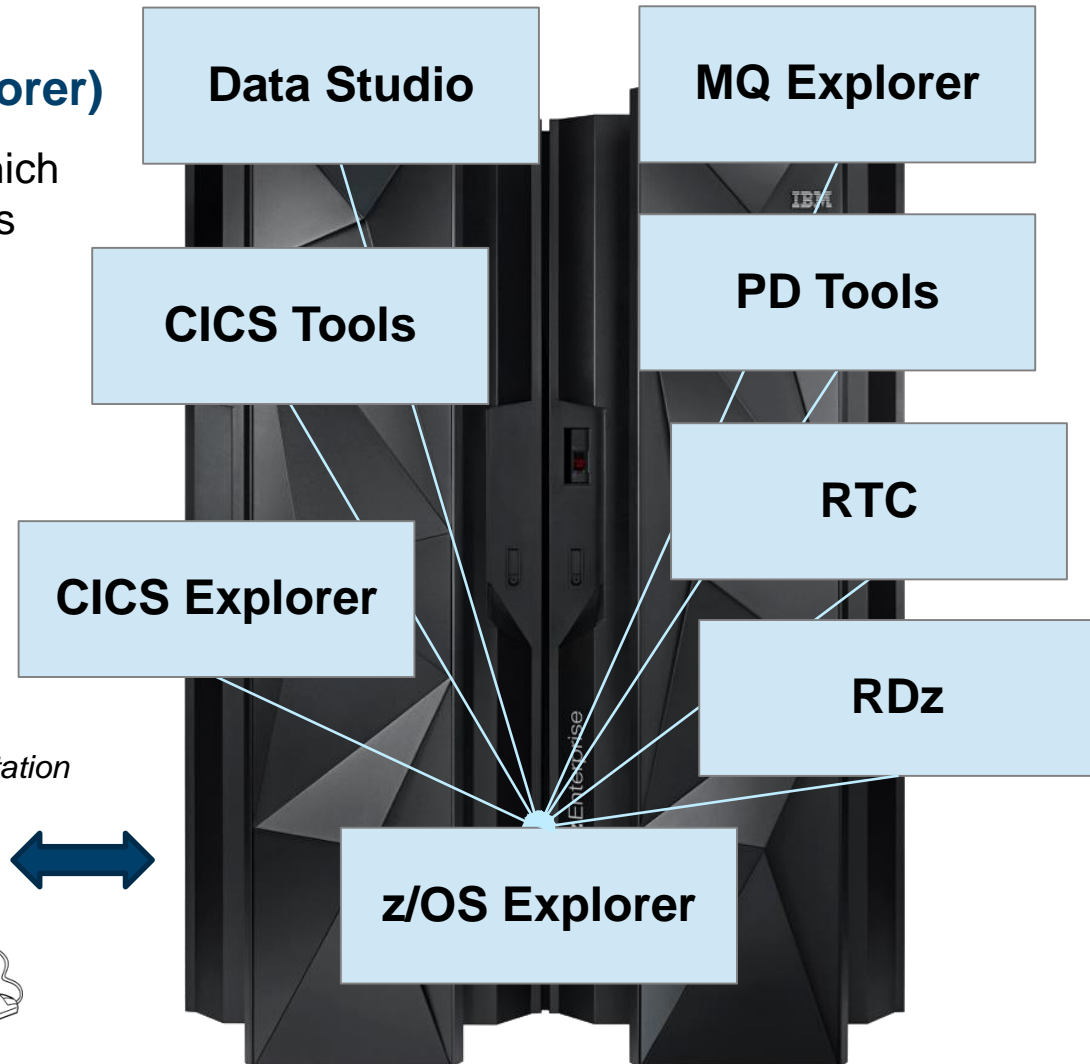
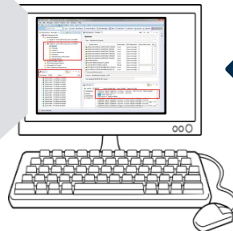
## IBM Explorer for z/OS (z/OS Explorer)

- 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*



# An entire enterprise can be efficiently managed with intuitive, GUI-based capability

## Tivoli Enterprise Portal

The screenshot displays the Tivoli Enterprise Portal interface. On the left, a tree view shows the system hierarchy: Enterprise > New Tables for IMS Systems > PFWOLER > Windows OS > Prototype::TWS > TWS\_Job\_Detail (Prototype). The main area features a 3D bar chart titled 'Job Duration' showing execution times in seconds for jobs HOR50005, HOR50007, and HOR50001. A callout box points to the chart with the text: 'Graph showing duration times for each job that has executed'. Below the chart is a table titled 'Tivoli Workload Scheduler Detailed Job Status' with columns for Timestamp, Job Description, Application Identifier, Job Name, Operation Number, WS Identifier, Descriptive Text, Actual Start Time, Actual End Time, Duration, Error Code, and Job Status. A callout box points to the 'Job Status' column with the text: 'Thresholds on Status states'. The table shows various job statuses including Complete, Error, Started, Waiting, Ready, and Active.

Timestamp	Job Description	Application Identifier	Job Name	Operation Number	WS Identifier	Descriptive Text	Actual Start Time	Actual End Time	Duration	Error Code	Job Status
02/10/06 16:33:39	HOR50DAY	HOR50DAY	HOR50005	005	CPU	Operation 005	08:39:30	08:45:15	00:05:45	-	Complete
02/10/06 16:33:39	HOR50DAY	HOR50DAY	HOR50007	007	CPU	Operation 007	08:45:15	08:45:20	00:00:05	MCP	Error
02/10/06 16:33:39	HOR50DAY	HOR50DAY	HOR50006	006	CPU	Operation 006	08:45:20	00:00:00	00:00:00	-	Started
02/10/06 16:33:39	HOR50DAY	HOR50DAY	HOR50030	030	CPU	Operation 030	00:00:00	00:00:00	00:00:00	-	Waiting
02/10/06 16:33:39	HOR50DAY	HOR50DAY	HOR50010	010	CPU	Operation 010	00:00:00	00:00:00	00:00:00	-	Ready
02/10/06 16:33:39	HOR50DAY	HOR50DAY	HOR50035	035	CPU	Operation 035	00:00:00	00:00:00	00:00:00	-	Waiting
02/10/06 16:33:39	HOR50DAY	HOR50DAY	HOR50020	020	CPU	Operation 020	00:00:00	00:00:00	00:00:00	-	Waiting
02/10/06 16:33:39	HOR50DAY	HOR50DAY	HOR50025	025	CPU	Operation 025	00:00:00	00:00:00	00:00:00	-	Waiting
02/10/06 16:33:39	HOR50DAY	HOR50DAY	HOR50015	015	CPU	Operation 015	00:00:00	00:00:00	00:00:00	-	Ready
02/10/06 16:33:39	HOR50DAY	HOR50DAY	HOR50011	011	CPU	Operation 011	00:00:00	00:00:00	00:00:00	-	Waiting
02/10/06 16:33:39	HOR50DAY	HOR50DAY	HOR50001	001	CPU	Operation 001	00:00:00	00:01:40	00:01:40	-	Complete
02/10/06 16:33:39	HOR50DAY	HOR50DAY	HOR50004	004	CPU	Operation 004	00:00:00	00:00:00	00:00:00	-	Active
02/10/06 16:33:39	HOR50DAY	HOR50DAY	HOR50021	021	CPU	Operation 021	00:00:00	00:00:00	00:00:00	-	Waiting
02/10/06 16:33:39	HOR50DAY	HOR50DAY	HOR50012	012	CPU	Operation 012	00:00:00	00:00:00	00:00:00	-	Waiting
02/10/06 16:33:39	HOR50DAY	HOR50DAY	HOR50031	031	CPU	Operation 031	00:00:00	00:00:00	00:00:00	-	Waiting
02/10/06 16:33:39	HOR50DAY	HOR50DAY	HOR50022	022	CPU	Operation 022	00:00:00	00:00:00	00:00:00	-	Waiting

(Tivoli Enterprise Portal was used in the demos in modules 1 and 4)

## 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](http://get.syr.edu/news_alt.aspx))

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

### COBOL's use

- 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 you need to get programmers to learn a language quickly and that the resulting code needs to be readable by non-programmers
- not 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%

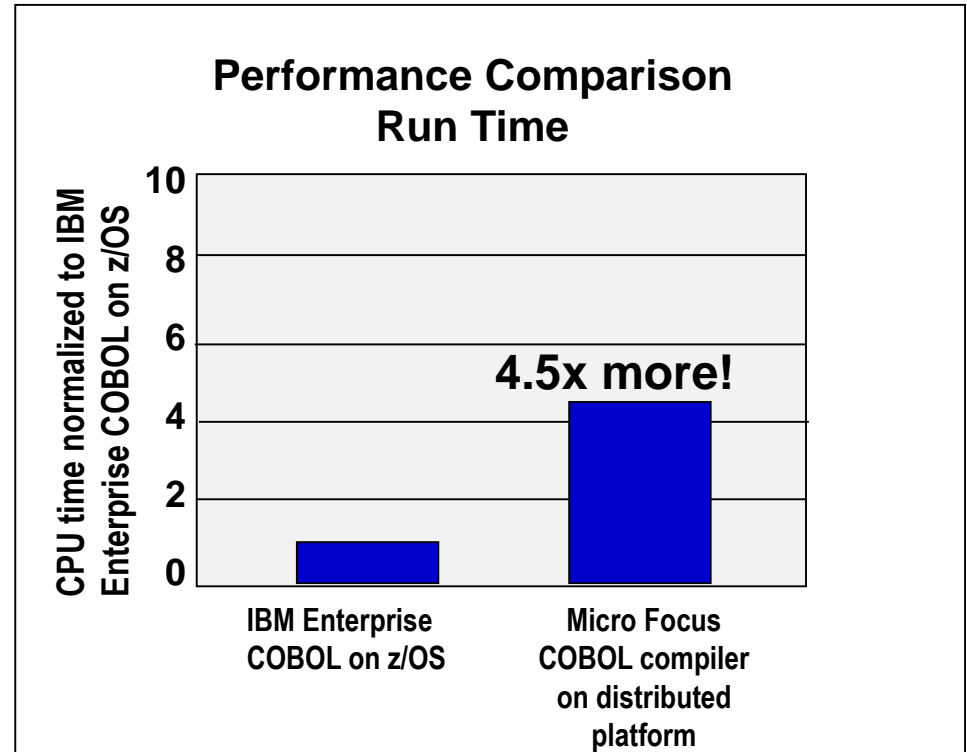
Base: 131 IT professionals

## Jettisoning CICS/COBOL can be problematic, risky and expensive

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

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

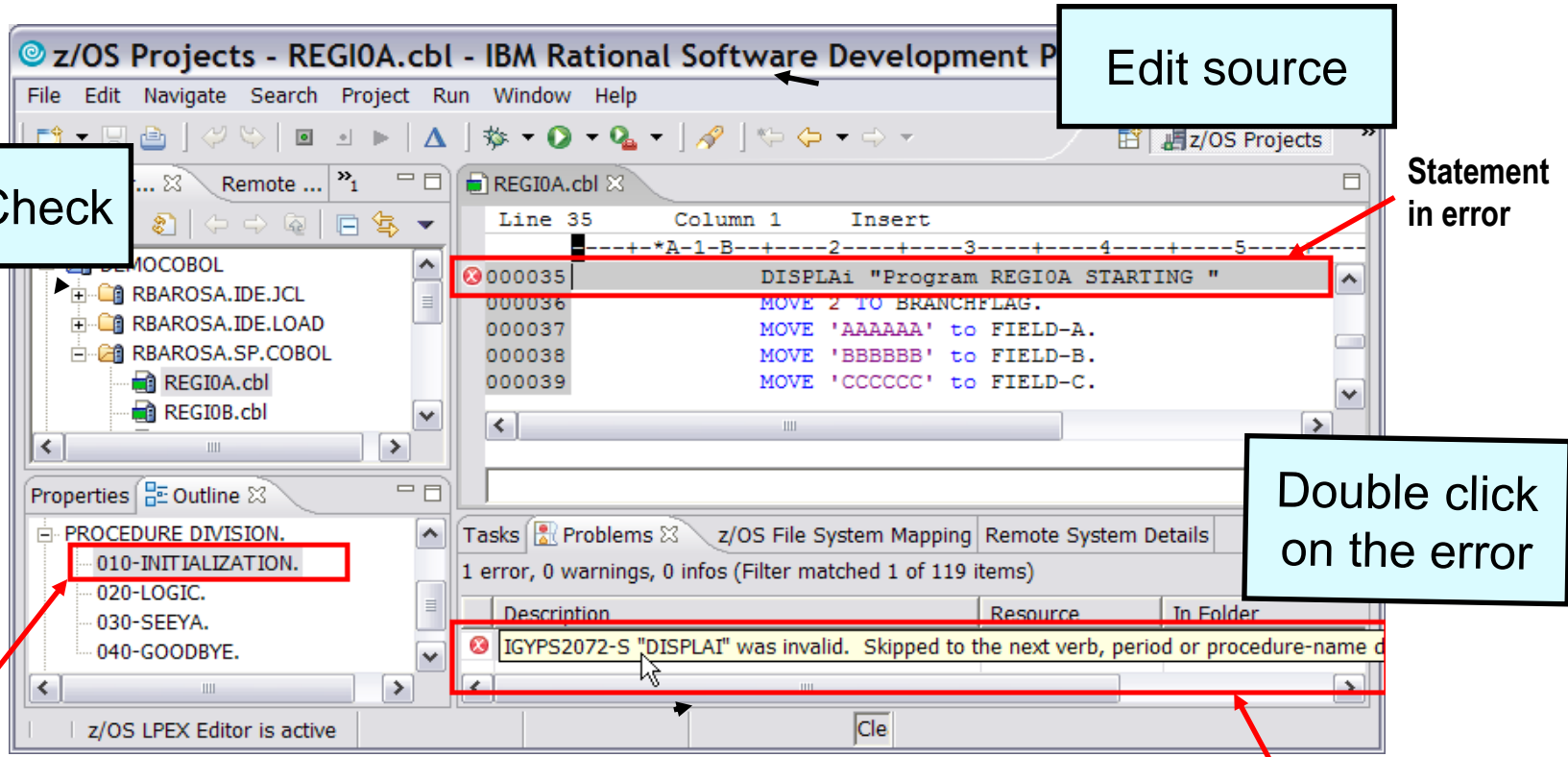
*David Brown managing director of the IT transformation group at BNY Mellon*



“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



Outline view presents COBOL structure

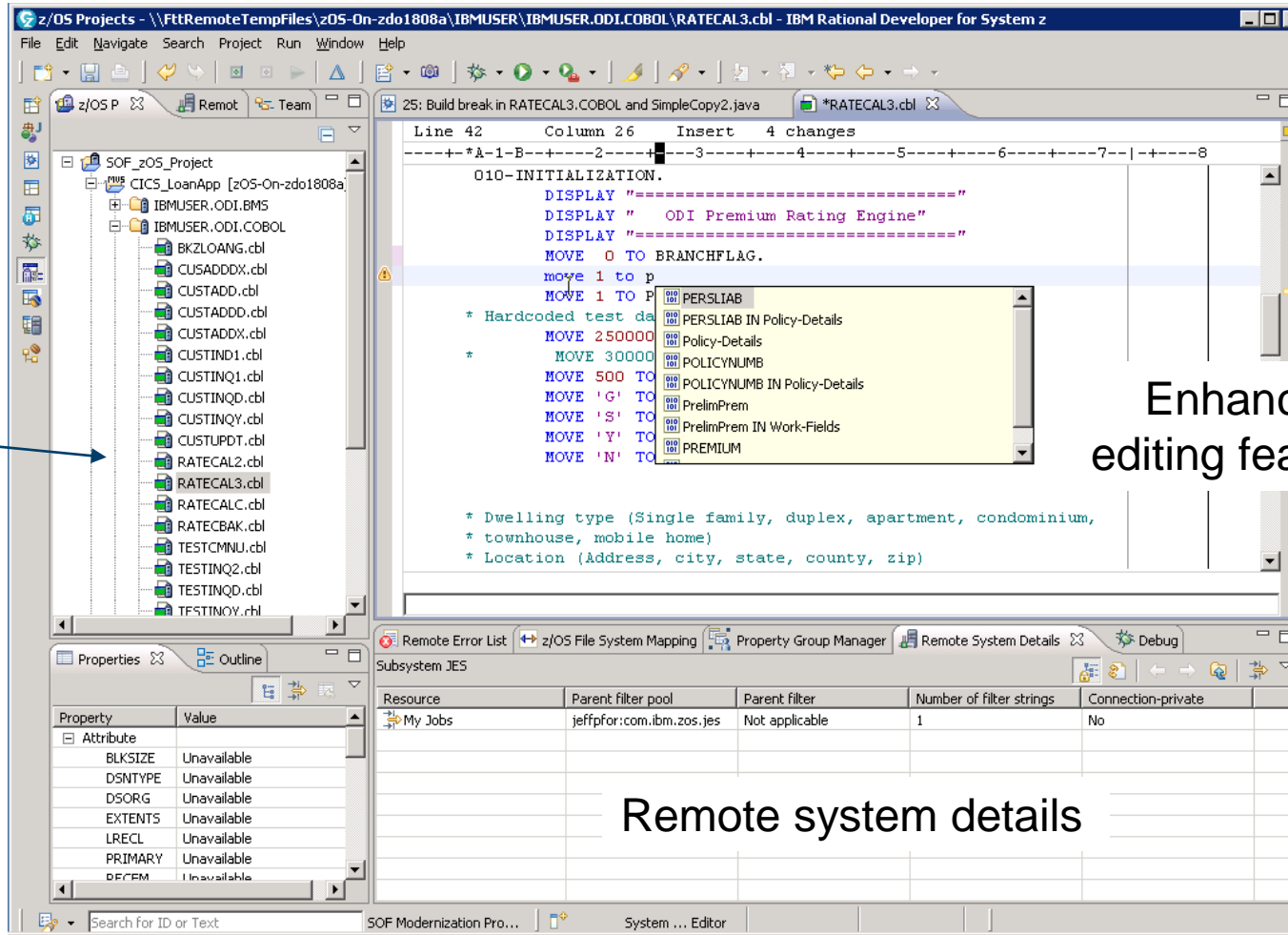
Rational Developer for System z (RDz)

Error list in Tasks view



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

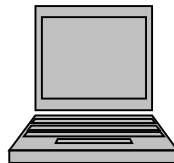
COBOL files



# Use a single, rich, integrated interface for all zEnterprise development

## Rational Developer for System z

- 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:

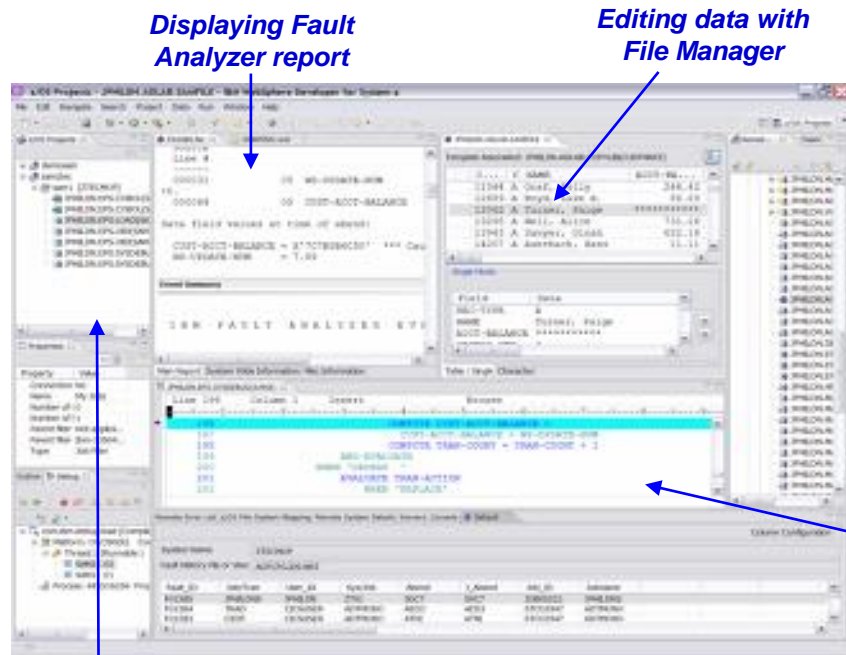
- Disconnected -vs- Connected:** A purple arrow points to the 'Remote Systems' tree on the left, which shows a tree structure for 'CTFMS07' with sub-nodes for 'MVS Files', 'USS Files', 'USS Shells', and 'JES'. A purple arrow points to the 'MVS PDS members' node.
- Configurable Editor:** A purple arrow points to the main editor window showing a JCL program with fields for Line, Column, and Insert.
- USS Command Shell:** A purple arrow points to the 'Remote System Details' window, which shows 'z/OS File System Mapping' and 'Remote Shell'.
- TSO Command Shell:** A purple arrow points to the 'Command Shell - Running' window, which prompts the user to 'Specify a TSO command to run'.
- JES sub-system view:** A purple arrow points to the 'Remote System Details' window, which shows a list of JES jobs with columns for Job Filter, Name, and Status.
- Data set characteristics:** A purple arrow points to the 'Properties' window, which shows a table of properties for the selected data set.

Property	Value
Context	
Name	TSO-CTFMS08
Number of children	0
Status	Running
Type	Command Shell

**RDz Eclipse interface**

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

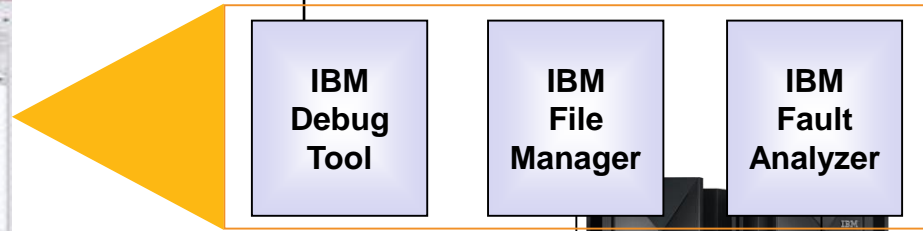
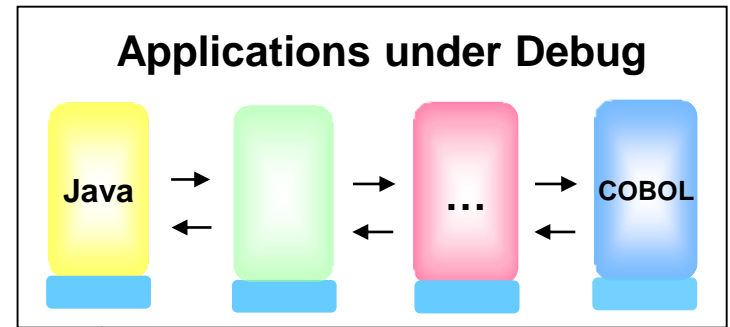
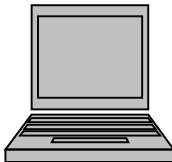
- Easily debug and step through multi-tier applications



*Displaying Fault Analyzer report*

*Editing data with File Manager*

*Developing System z application with RDZ*

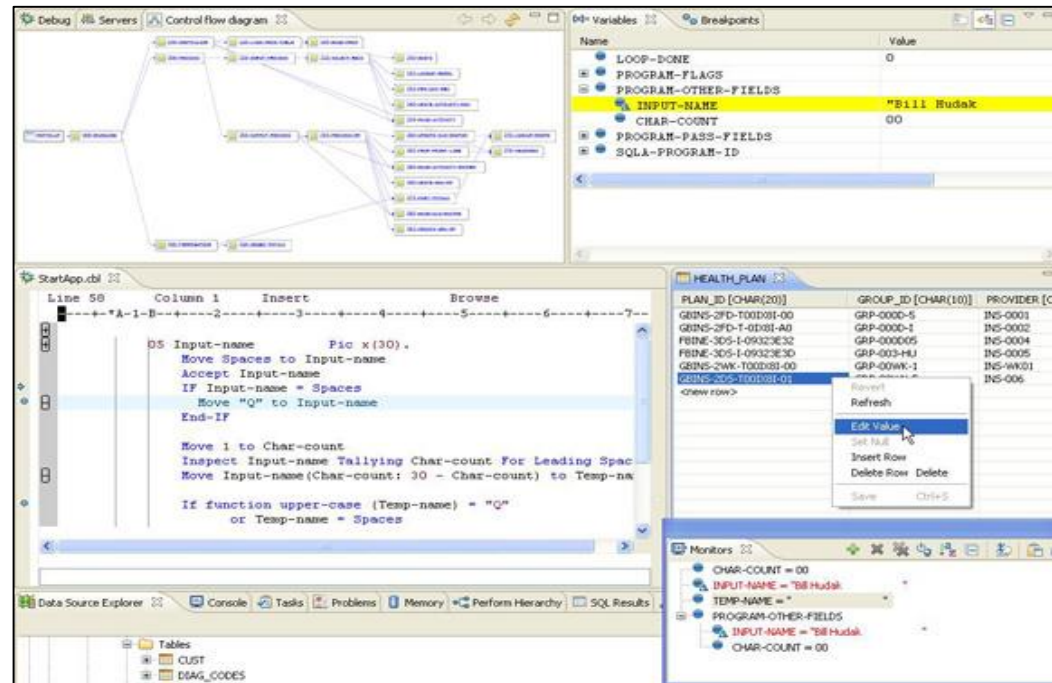


*Debugging application with Debug Tool*

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

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

- RDz makes it easy for Java developers to also contribute to COBOL applications
- Features in RDz enable cross-fertilization of development skills
  - Results in more unified team, back-filling capabilities, enabling future growth
  - Reduces overhead and cost of multiple tool sets



The screenshot displays the RDz IDE interface with several key components:

- Control flow diagram:** A graphical representation of the program's execution logic, showing various nodes and their interconnections.
- Variables window:** A table showing the current state of program variables.
 

Name	Value
LOOP-DONE	0
PROGRAM-FLAGS	
PROGRAM-OTHER-FIELDS	
INPUT-NAME	"Bill Hudak"
CHAR-COUNT	00
PROGRAM-PASS-FIELDS	
SQLA-PROGRAM-ID	
- Source Editor:** Displays COBOL code for the program 'StartApp.cbl'. The code includes logic for handling input names, such as moving spaces to the input name and tallying character counts for leading spaces.
 

```

DS Input-name      Pic x(30).
Move Spaces to Input-name
Accept Input-name
IF Input-name = Spaces
  Move "Q" to Input-name
End-IF

Move 1 to Char-count
Inspect Input-name Tallying Char-count For Leading Spac
Move Input-name(Char-count: 30 - Char-count) to Temp-na

If function upper-case (Temp-name) = "Q"
  or Temp-name = Spaces

```
- HEALTH\_PLAN Table:** A data table with columns for PLAN\_ID, GROUP\_ID, and PROVIDER. A context menu is open over the table, showing options like Refresh, Edit Value, and Delete Row.
 

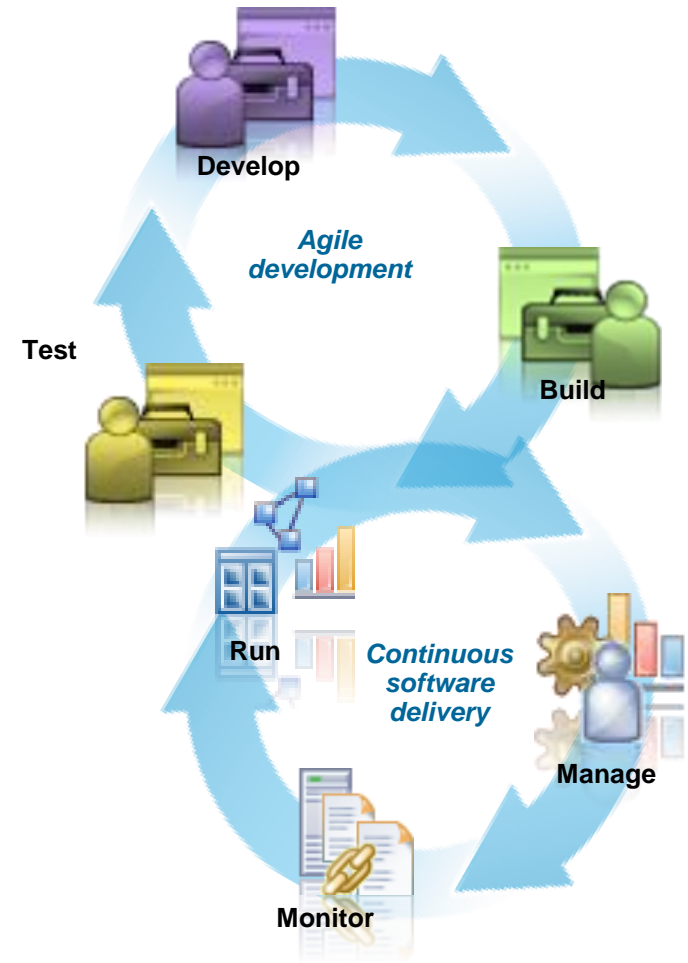
PLAN_ID [CHAR(20)]	GROUP_ID [CHAR(10)]	PROVIDER [CH...
GEINS-2FD-T00D01-00	GRP-0000-5	INS-0001
GEINS-2FD-T-0D01-A0	GRP-0000-1	INS-0002
FBINE-305-I-0932CE32	GRP-000005	INS-0004
FBINE-305-I-0932CE30	GRP-003-H-I	INS-0005
GEINS-2WK-T00D01-00	GRP-00WK-1	INS-WK01
GEINS-205-T00D01-01		INS-006
- Monitors:** A window showing the current state of variables during execution, including CHAR-COUNT = 00, INPUT-NAME = "Bill Hudak", and TEMP-NAME = "".

## zEnterprise has tools that enable a DevOps approach for continuous development and operations

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



# Rational solution packages for zEnterprise help to automate the development and testing cycles for DevOps agility

## For development teams...

### Integrated Solution for System z Development

*Rational Developer for System z*

*Rational Asset Analyzer*

*Rational Team Concert*

*Rational Development and Test*



## For test teams...

### Continuous Integration Solution for System z

*Rational Team Concert*

*Rational Development and Test*

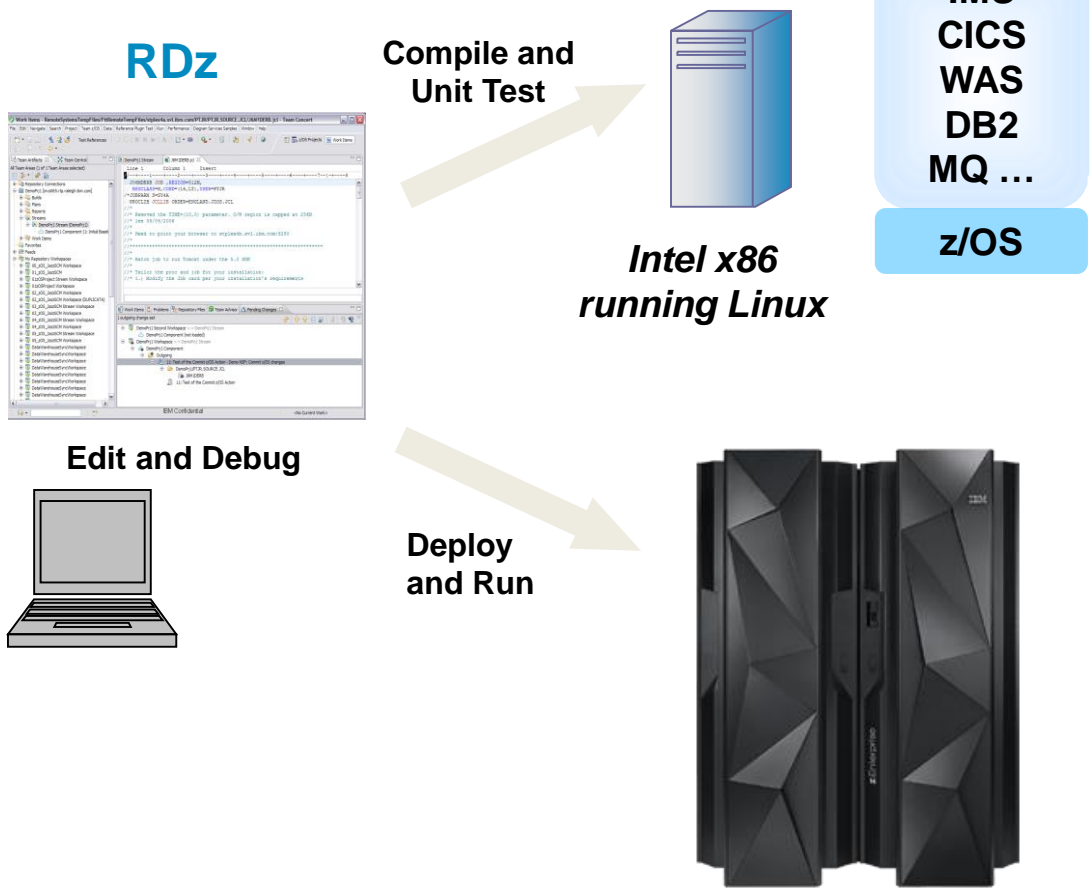
*Rational Quality Manager*

*Rational Test Workbench*



# 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

## Using the right tools can yield significant business benefits

<b>Business challenge</b>	<b>Business benefit of Rational Development &amp; Test</b>
Application quality issues	Highest-fidelity environment (vs. simulators provided by competitors)
Cost of mainframe development	Development and Test MIPS can be re-allocated for higher value production workloads
Developer productivity affected by test system availability	More control in hands of developers – reduces dependency on test personnel
Slow time-to-market	Reduces delays, faster debugging, improves testing speed and accuracy
Competitive development costs at scale	Brings System z development and test in line with Unix and Windows
Different skill sets required for mainframe and distributed	Use of a common IDE and processes eliminates need for cross-training – skills are immediately unleashed



## 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



## Three things to keep in mind

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The IT skill shortage actually extends far beyond the mainframe

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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 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>

**Professional Connections**  
9 Communities

**Corporate Engagement**  
360+ companies actively recruiting

**Job Candidates**  
Over 4,200 Job Seekers

**Program Investment**  
\$10M+ over in 10 years

**Growth**  
64K+ Students  
Over 1K Schools  
in 67 countries



# IBM zEnterprise Academic Initiative

## Major Academic Institutions and Key Recruiters



**Recruiters**

**Cigna  
Compuware  
EMC  
Fidelity  
JP Morgan Chase**



**UNIVERSITY OF  
ARKANSAS**

**Recruiters**

**Baldor  
BB&T  
Dillards  
JB Hunt  
Walmart**

**EBERHARD KARLS  
UNIVERSITÄT  
TÜBINGEN**



**Recruiters**

**Daimler  
Dt. Bank  
SAP**



**Recruiters**

**CROC  
Lusoft  
Rosoboronexport**



**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 collage students and offered around the world



Patricio Reynaga

## A 2010 winner (college)

Comp. Science major from West Texas A&M University, and first year hire at Fidelity Investments as z/OS Systems Prog.

## A 2012 winner (high school)

Four-time participant, currently a sophomore majoring in Comp. Science at University of Central Florida



Jovanna Marquez



40 students will be chosen from contests around the world (1,000+ institutions from 67 countries) to compete in New York City

**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](mailto: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**  
Manage your job posts through your My Recruiting account.
- **Access your account**  
Log in to your free My Recruiting account.

<http://systemzjobs.com>

# Every mainframe IT manager should know...

## The Academic Initiative!

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