

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).

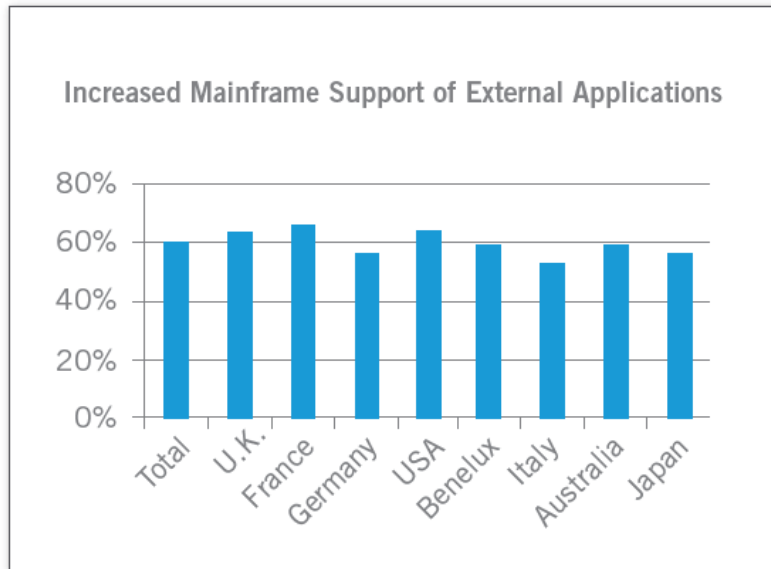


Chart 9: 62 percent of companies are using their mainframes to support external applications, such as online banking.

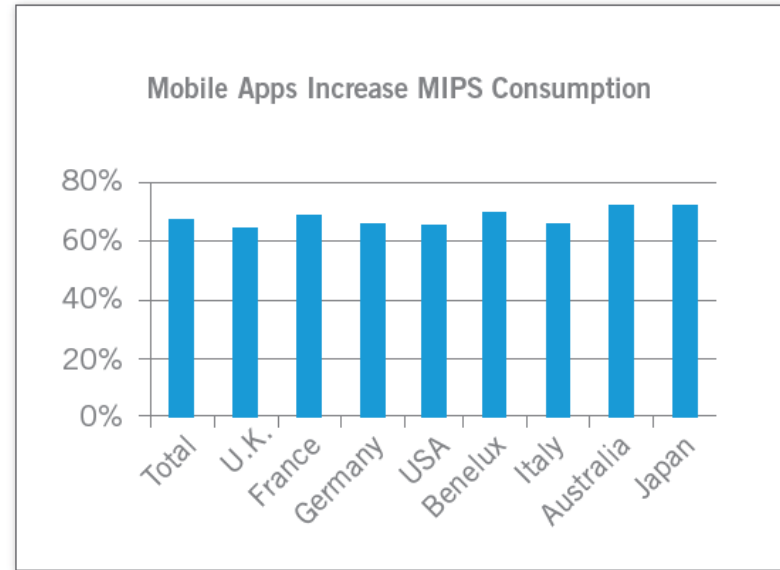
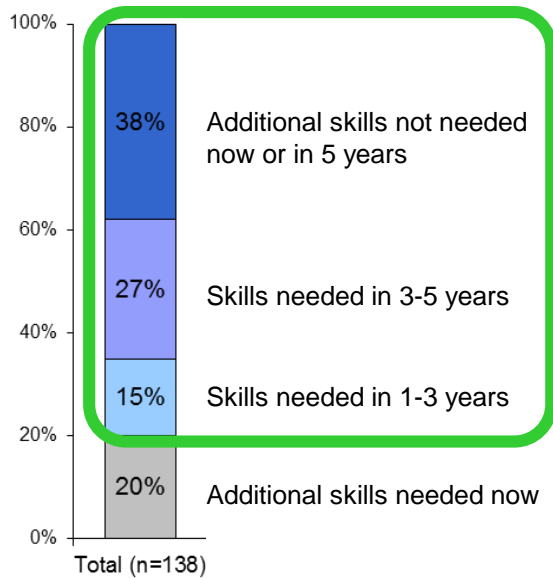


Chart 10: 68 percent of respondents believe that the increase in mobile applications is driving higher MIPS usage.

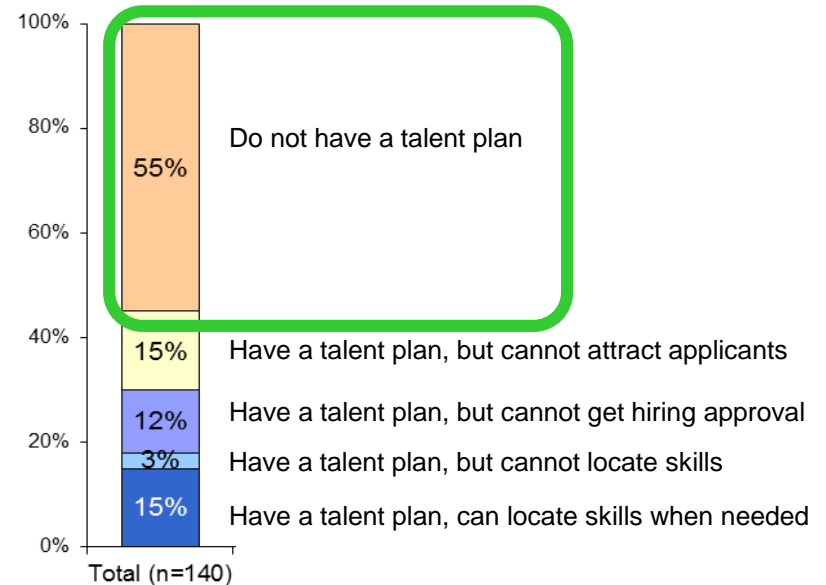
Compuware commissioned Vanson Bourne to study the impact of new IT trends and models. In September 2012, the independent research firm interviewed 520 CIOs from large enterprises across a range of industries in the U.S., Europe & Asia.

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,”

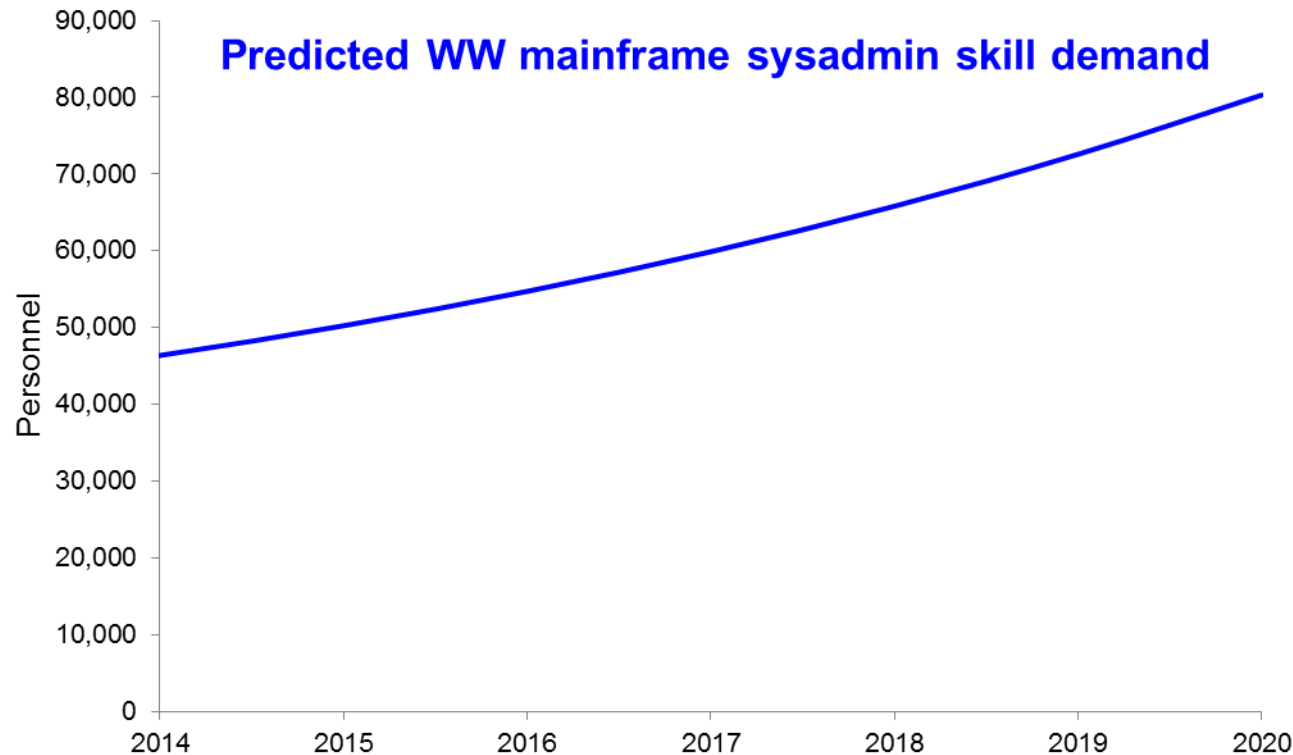
— David Brown, managing director of BNY Mellon's IT transformation group**

Source: IBM's 2013 System z Tracker

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

Estimation of the potential mainframe skills shortage

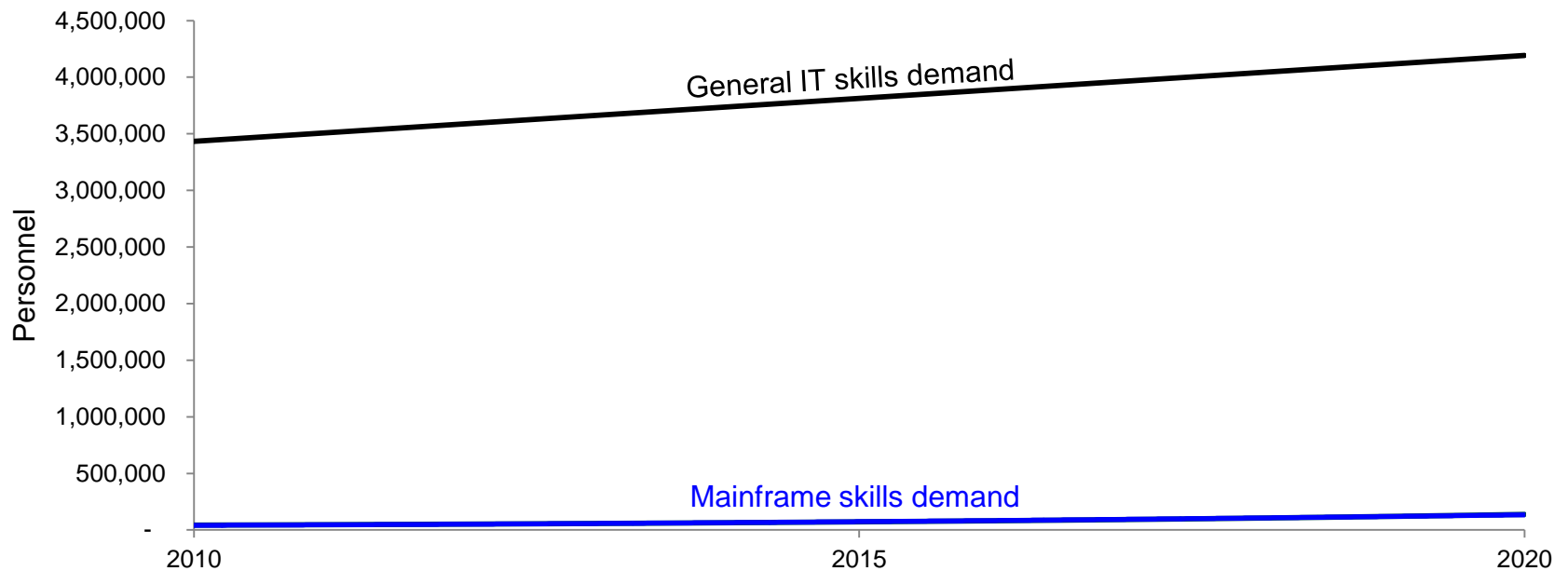
- IBM-CPO projects 37,200 additional mainframe positions needed WW by 2020 (17,000 in US)
 - 11,700 mainframe skills growth, 2005-13
 - IBM Academic Initiative trains on average 6,400 annually
 - 42,300 downloads of top IBM system programmers Redbook in 2013



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

The estimated mainframe skills shortage is minor compared to the general IT skills shortage

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



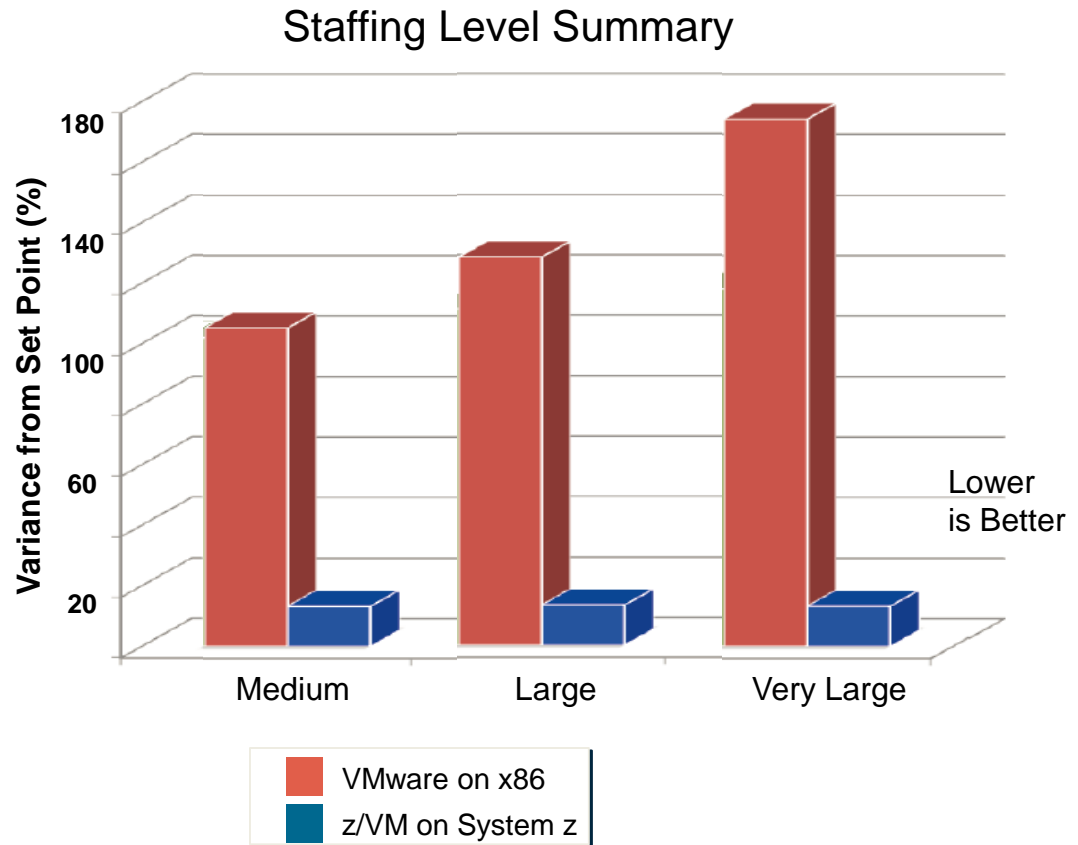
✓ **Mainframe skills are <2% of the full problem – and being addressed**

? **What about the 98% problem – Windows, Linux and Unix?**

Mainframe administration costs are typically less than distributed administration costs

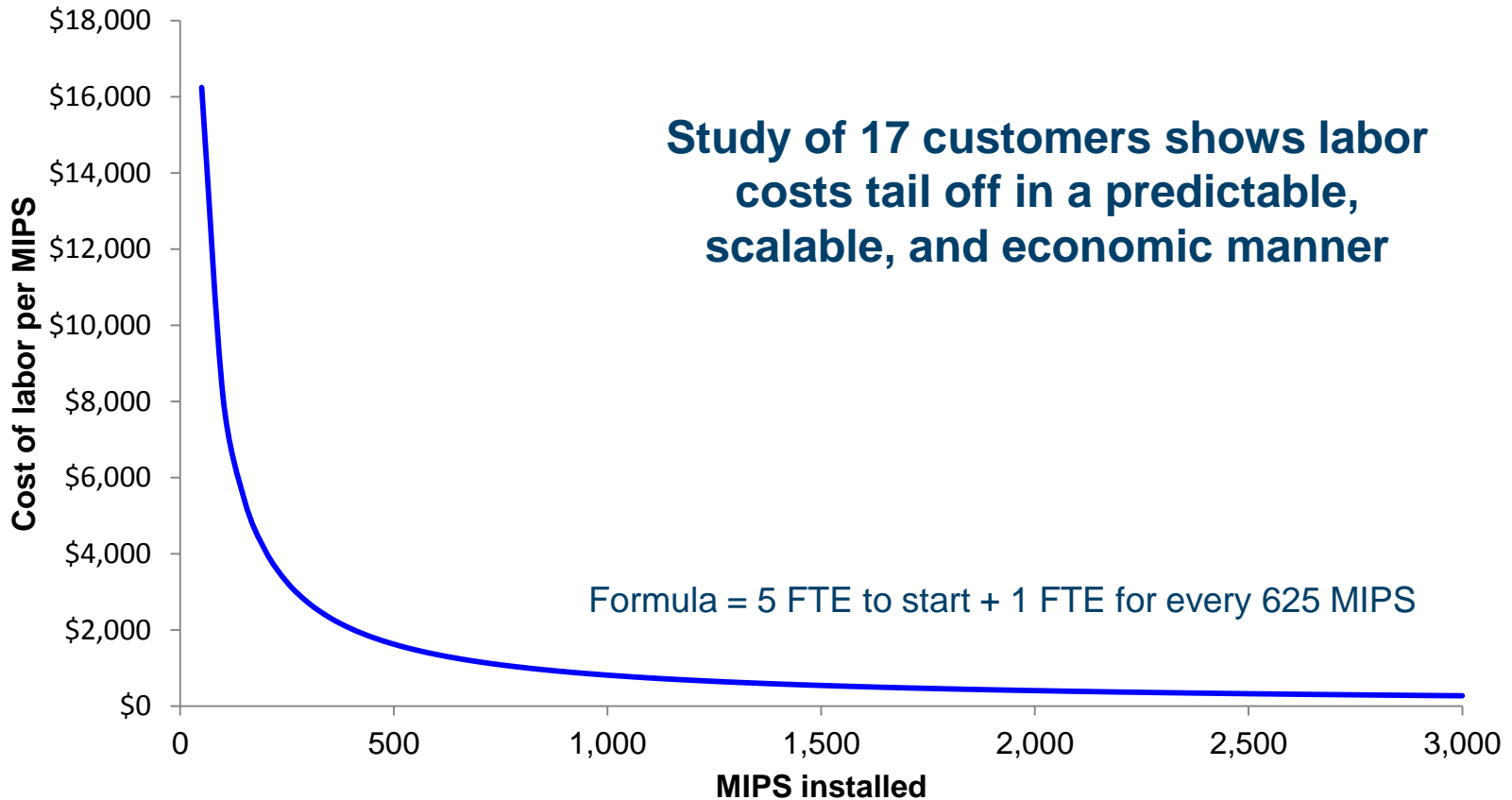
Staffing levels required to maintain a “gold standard”:

- 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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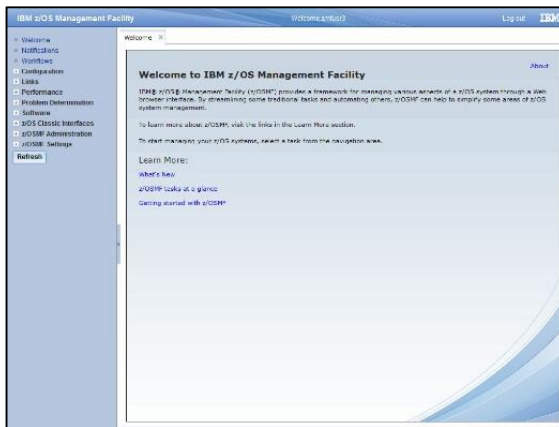
3

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)

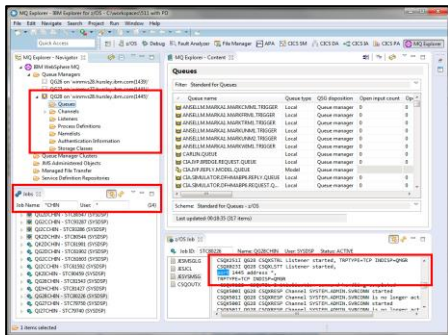


z/OS administrators work from an Eclipse-based integration platform

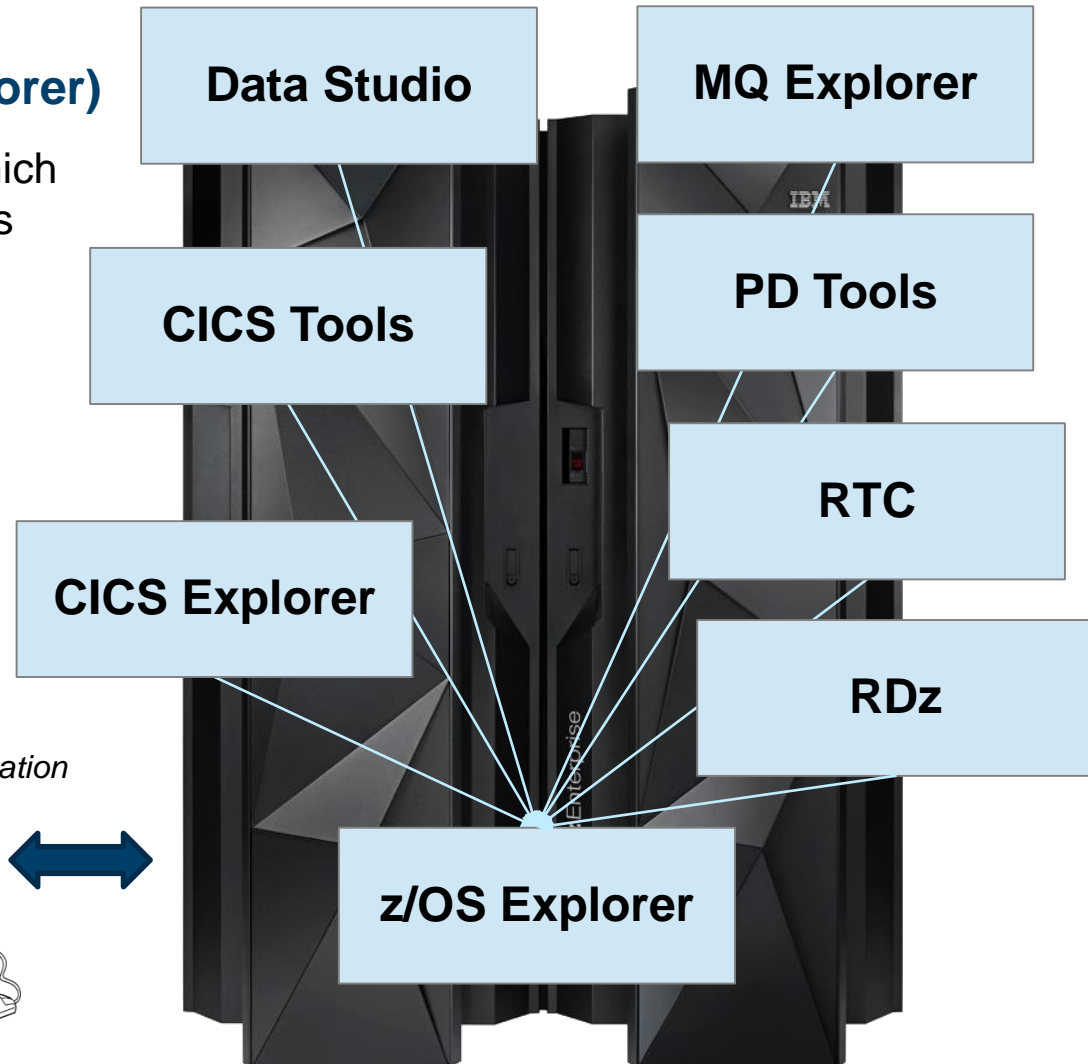
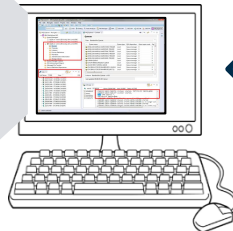
IBM Explorer for z/OS (z/OS Explorer)

- 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. At the top, a navigation pane shows a tree view of the system structure, including 'Enterprise', 'New Tables for IMS Systems', 'PFWOLER', 'Windows OS', 'Prototype::TWS', and various job-related tables. The main area is split into two parts: a 3D bar chart titled 'Job Duration' and a table titled 'Tivoli Workload Scheduler Detailed Job Status'.

The 'Job Duration' chart shows three bars representing the duration of jobs in seconds. The y-axis is labeled 'Seconds' and ranges from 0 to 400. The x-axis lists job identifiers: HOR50005, HOR50007, and HOR50001. Job HOR50005 has the highest duration, exceeding 300 seconds. Job HOR50007 has a very low duration, and job HOR50001 has a duration around 100 seconds.

The 'Tivoli Workload Scheduler Detailed Job Status' table provides a detailed view of job execution. The table has the following columns: 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. The Job Status column uses color coding: Complete (green), Error (red), Started (orange), Waiting (grey), Ready (blue), and Active (yellow).

Two callout boxes provide additional context:

- A callout box pointing to the bar chart states: "Graph showing duration times for each job that has executed".
- A callout box pointing to the 'Job Status' column in the table states: "Thresholds on Status states".

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)

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%

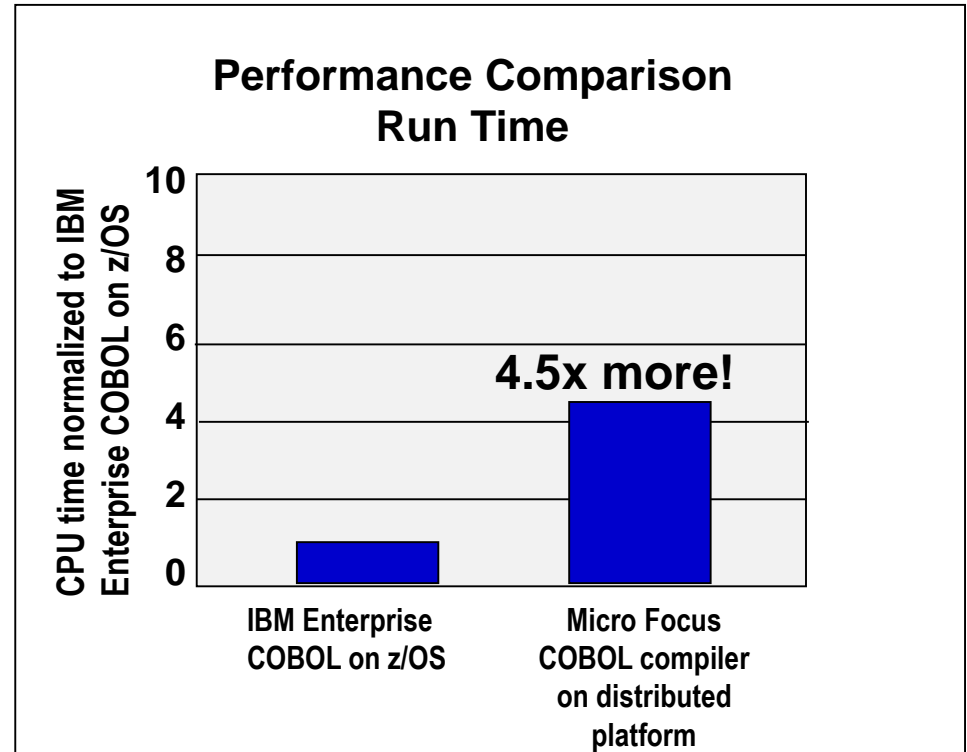
Base: 131 IT professionals

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.”

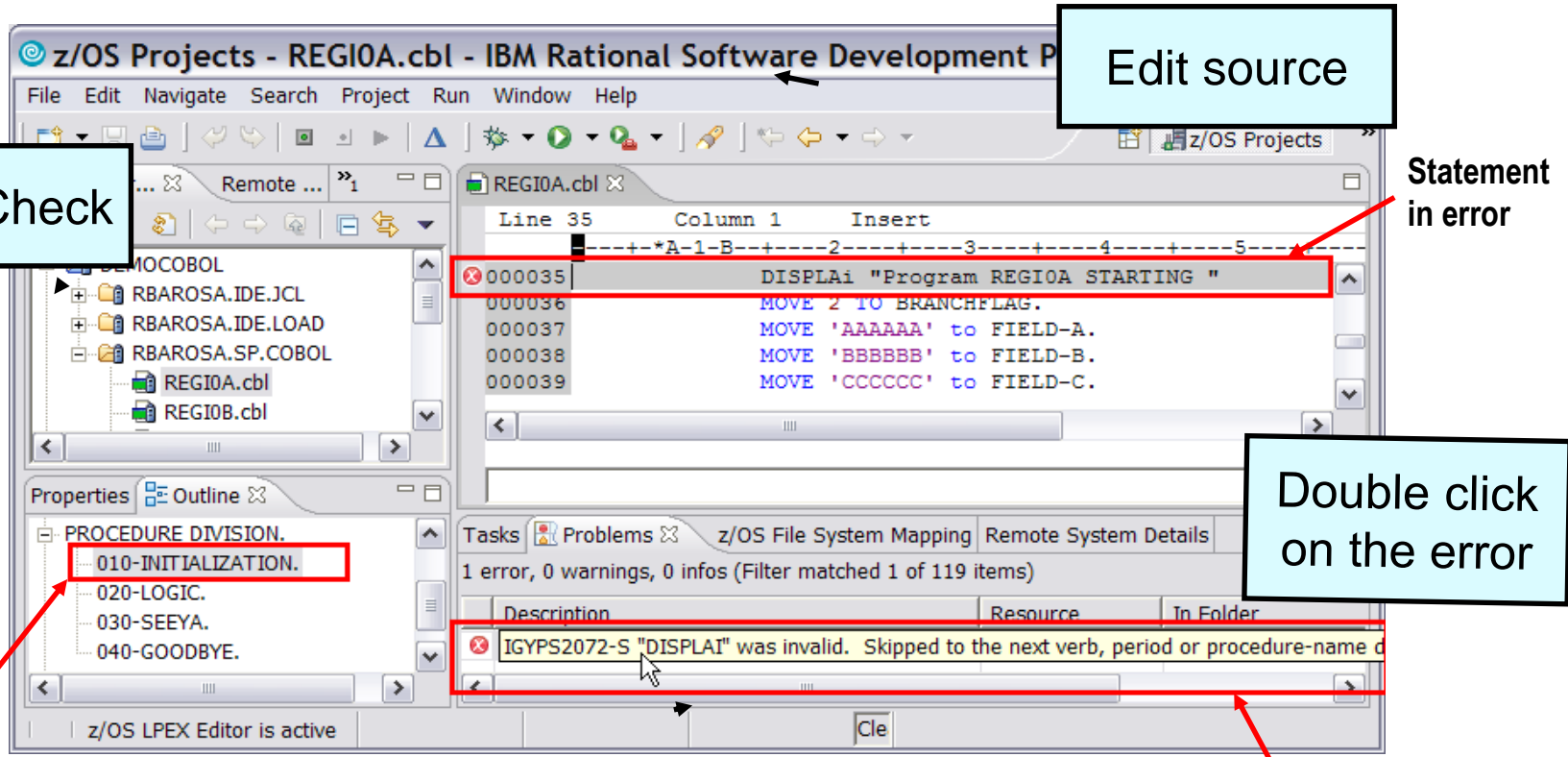
*David Brown managing director
of the IT transformation group
at BNY Mellon*



“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



Syntax Check

Edit source

Statement in error

Double click on the error

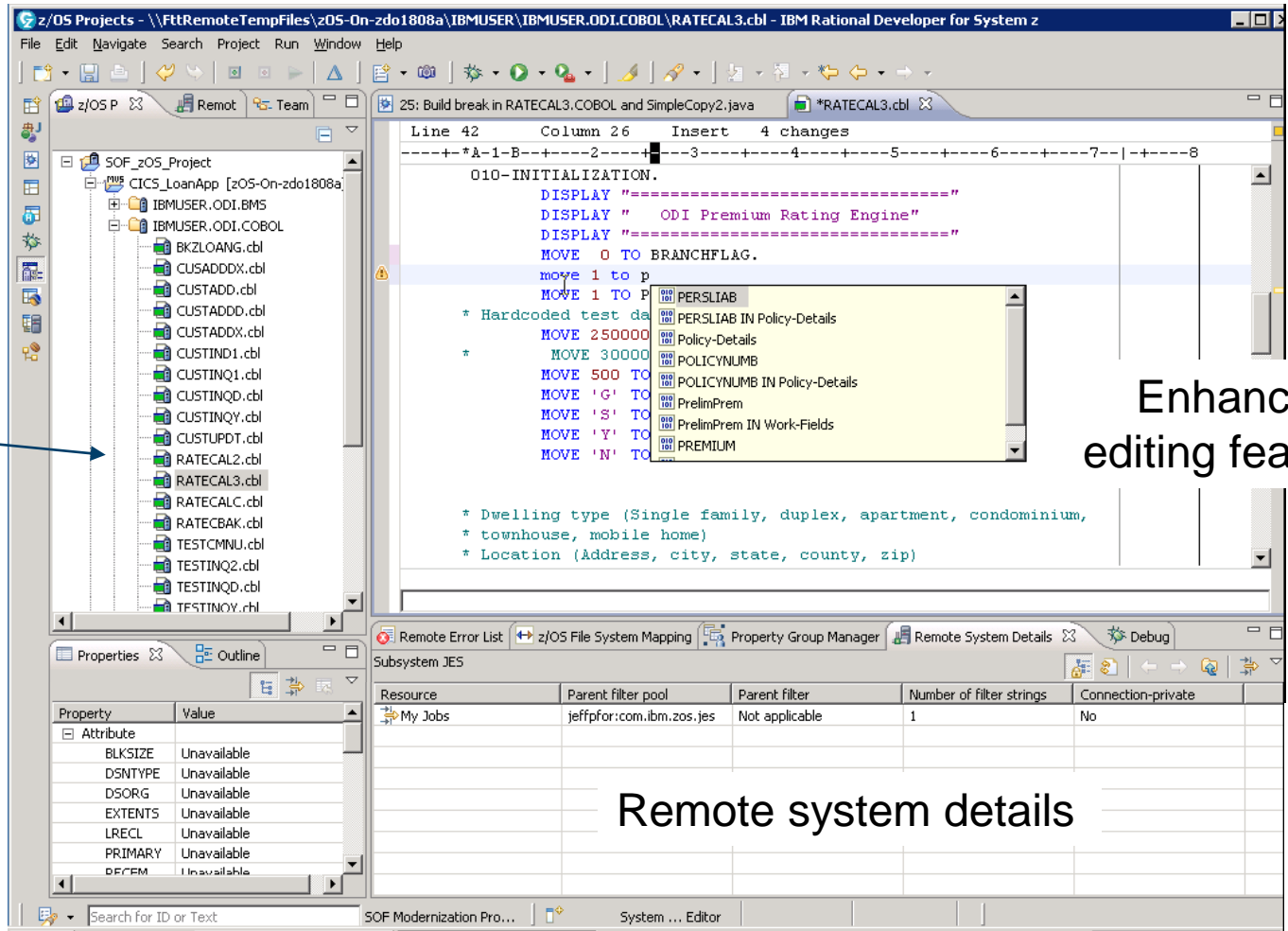
Outline view presents COBOL structure

Rational Developer for System z (RDz)

Error list in Tasks view

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

COBOL files



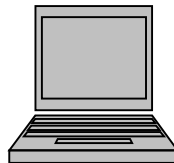
Enhanced editing features

Remote system details

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



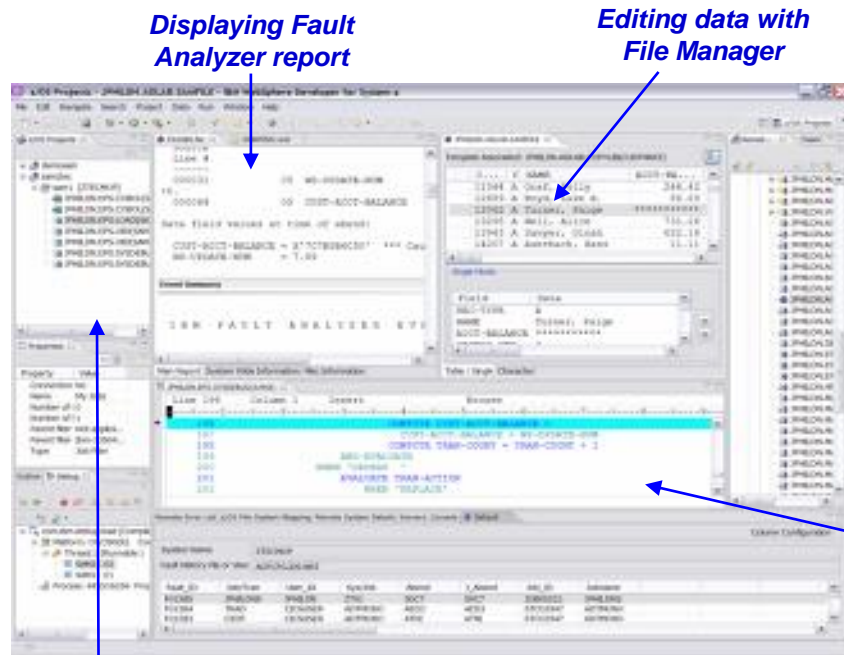
The screenshot displays the RDz Eclipse interface with several key components highlighted by blue arrows and text:

- 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 annotations like 'Configurable Editor'.
- USS Command Shell:** A purple arrow points to the 'USS Command Shell' window at the bottom.
- TSO Command Shell:** A purple arrow points to the 'TSO Command Shell' window at the bottom.
- JES sub-system view:** A purple arrow points to the 'JES sub-system view' window at the bottom.
- Data set characteristics:** A purple arrow points to the 'Properties' window at the bottom left, which shows details for a data set like 'TSO-CTFMS08'.

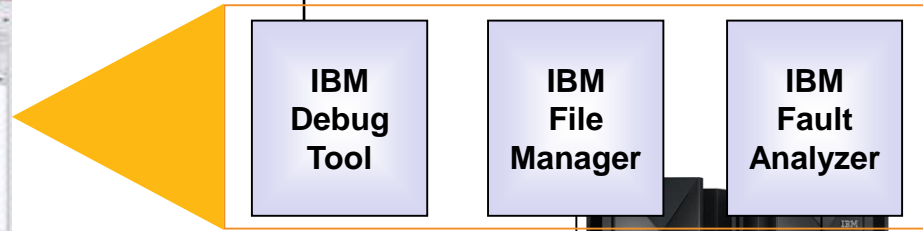
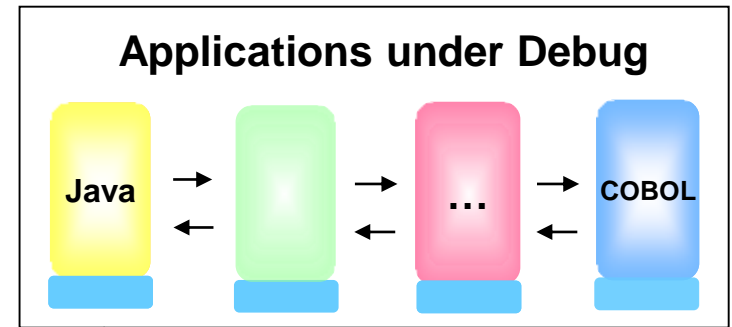
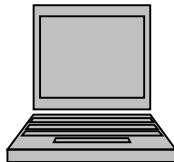
RDz Eclipse interface

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

- Easily debug and step through multi-tier applications



Developing System z application with RDZ



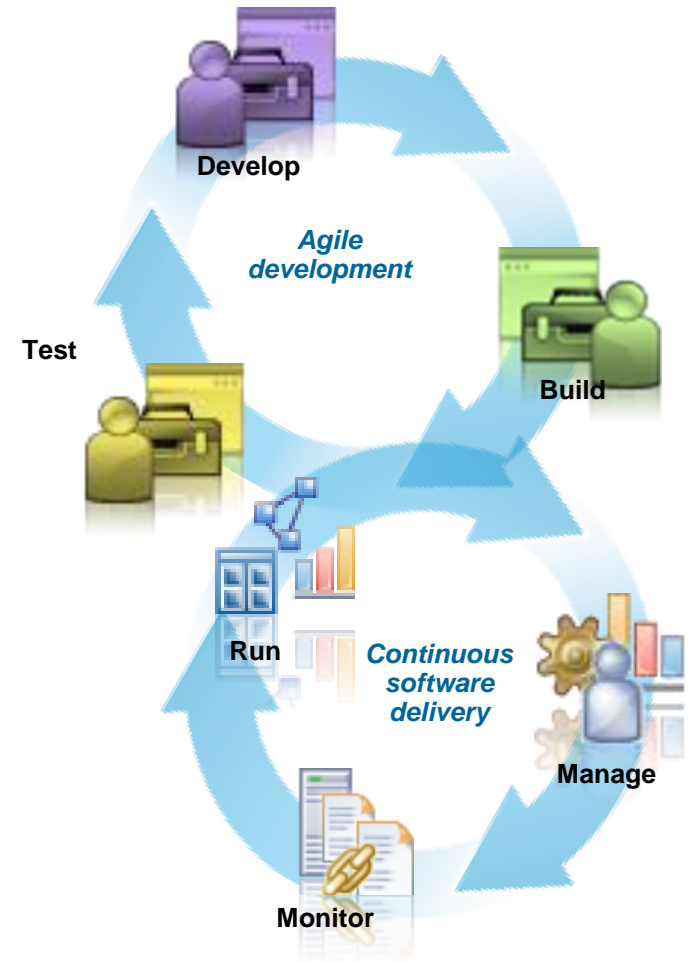
- End-to-end debug
- Edit VSAM data
- Analyze ABEND logs!

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

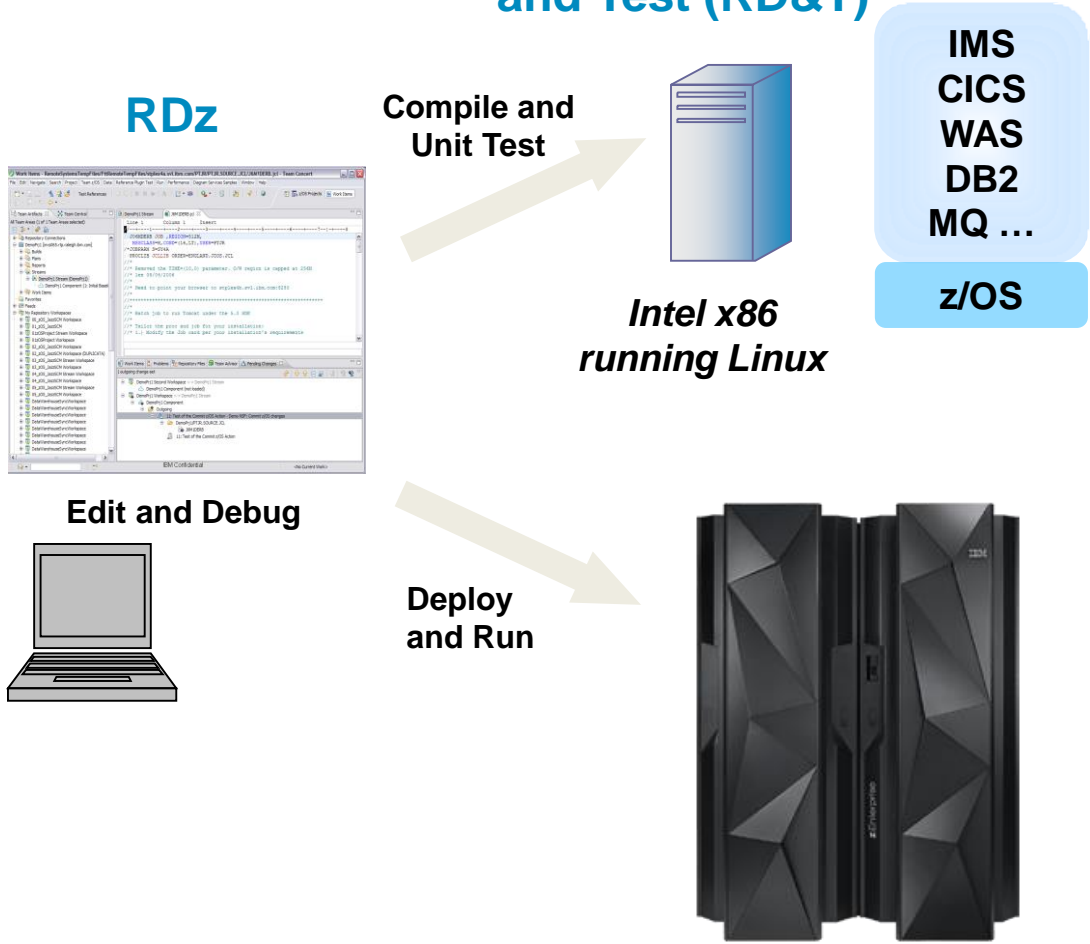
Rational Development and Test

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

Business challenge	Business benefit of Rational Development & Test
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



Nationwide®
On Your Side™

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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



EPI l'École
d'ingénierie
informatique

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 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
- 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.**