17781: Mainframe Skills – the Myth and the Reality

David Rhoderick, IBM

Updated with SHARE survey results
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 looks at the facts and try to understand the real picture
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 (65%) stated that they are putting added MIPS. This is even more apparent when we look at the perceived change in company’s mainframe workloads over the next 5 years.

**Figure 3** Perceived Change in Company’s Mainframe Workloads Over the Next 5 Years

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

ibmsystemsmagmainframedigital.com/MFSkills
Eagle studies validate that adding workload to mainframes reduces labor cost per unit of work

Study of 17 customers shows labor costs tail off in a predictable, scalable, and economic manner

Formula = 5 FTE to start + 1 FTE for every 625 MIPS

Source: IBM Eagle Team
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

U.S. customer:
- 75 VMs/FTE for Linux on z
- 55 VMs/FTE for VMware

Source: Solitaire Interglobal Ltd., 2013
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 2005-13
- Some number of today’s personnel will retire by 2020, increasing that demand

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

**FIGURE 1** Percentage of Individuals in Organization Currently Working on or Maintaining IBM Mainframe Applications Who Will be Retiring Over the Next 5 Years

Source: IBM's 2013 System z Tracker
**computerworld.com/s/article/9225099/Cobol_brain_drain_Survey_results?taxonomyId=154&pageNumber=1**
STEM skills shortage is universal – projected mainframe issue is 10% of all Information Technology requirements

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

... *development of a talent plan should cover all platforms within the data center, and not just the mainframe*

Source: US Bureau of Labor Statistics (2013 Occupational Outlook, March 2013); IBM CPO
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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

![Image of z/OSMF interface and z/OSMF application with HTTP(S) protocol]
IBM Competitive Project Office

**z/OS administrators can work on an Eclipse-based integration platform**

- Runs on a workstation; common base for many z/OS tools
- Foundation for a workbench of plug-ins with which to develop/test z/OS applications and manage related sub-systems
- Extendable to accommodate user’s roles and responsibilities using Eclipse-based plug-ins

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

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**Eclipse workstation**
For example, CICS Explorer eases CICS management

- View and control the CICS runtime and its resource definitions
- Easily create and manage CICS regions, tasks, files, transactions, events, etc.

CICS Explorer is especially useful when managing across a CICSpex (CICS Parallel Sysplex)

Because it’s Eclipse-based, other tools can be integrated into the same view (MQ Explorer)
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
Additional GUI-based tools enable efficient management of the entire enterprise

Tivoli Enterprise Portal

Navigate among objects

Monitor CPU usage

Monitor central storage frame count and fixed storage

View address space CPU utilization

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Errors can be handled quickly and intelligently

Tivoli Enterprise Portal

Graph showing duration times for each job that has executed

Thresholds on Status states

(Tivoli Enterprise Portal was used in the demos in modules 1 and 4)
COBOL continues to be alive and well!

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

http://www.computerworld.com/s/article/9225099/Cobol_brain_drain_Survey_results?taxonomyId=154&pageNumber=1
College students learning COBOL make more money

Yes, you read the title of this column correctly. College students who take COBOL as an elective course as part of their college studies were hired at a higher starting salary than their peers.

I had the great pleasure of speaking with Professor Leon Kappelman, Ph.D. He is the Director Emeritus, Information Systems Research Center in the Information Technology and Decision Sciences Department (ITDS) at the College of Business, University of North Texas (UNT).

Just by chance, Prof. Kappelman saw my ITworld blog titled COBOL will Outlive Us All and contacted me to tell me about a joint venture that UNT has with IBM and how his graduates get high-paying jobs with major US corporations that have COBOL based applications running within their data centers.

As funny as it sounds, if you are looking for a job in IT that will most likely exist for a very long time, learn to program in COBOL. The companies with these COBOL-based systems are very smart, well run IT shops. They know that this issue exists or will exist soon. As a result, some are outsourcing the maintenance of these systems to other companies in other countries. Some companies, at great expense, are once again trying to replace or rewrite them using newer technologies. Finally, other companies will make the decision to recruit and, if needed, train a new generation of programmers.

In the early 1980s, I was told that COBOL was going away and that I should quickly move toward other programming languages. Well, thirty years later, COBOL is alive and well and living in large companies everywhere.
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

“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

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

- Supports all major languages (COBOL, PL/I, ASM, C/C++, Java)
- Supports all major runtimes (IMS, CICS, Batch, USS, DB2, WAS, Linux, Cloud)
- Web Services/JSON functionality, plugins for code analysis, debugging, and more
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
Grow and enhance the skills set of development teams through use of multi-faceted, integrated tools

- Features in RDz enable cross-pollination of development skills
- RDz makes it easy for Java developers to also contribute to COBOL applications
- Build for z/OS, for Linux on z, for a cloud of Linux on z servers

Use the Remote System Explorer perspective to see Partition Data Sets on z Systems

Switch to the z/OS Projects perspective to edit COBOL files
Switch to the Java perspective to edit Java files

Mainframe skills - the myth and the reality
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
- Debugging application with Debug Tool
- Developing System z application with RDz

Applications under Debug

- Java
- ... (more languages)
- COBOL

- IBM Debug Tool
- IBM File Manager
- IBM Fault Analyzer

- z/OS
- VSAM
- ABEND Logs

- End-to-end debug
- Edit VSAM data
- Analyze ABEND logs!
RDz v9.1 new 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
New REST/JSON capabilities make access to CICS apps easy for non mainframe programmers

- z/OS Connect interfaces to back end
- MobileFirst platform supports mobile
- BlueMix, DataPower Gateway
- API Management
- As well as SOAP and XML

Source: Integrating the Mainframe With Other Platforms: THE METHODS  
Pranab Pyne, Niroj Pradhan, Stanly Babu  
Agile compilation and unit test can be done off-platform to reduce costs and simplify operations

Rational Development and Test (RD&T)

- 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
- Free up mainframe development MIPS for production workload

No interruptions to mainframe operations
Tools enable a DevOps approach for continuous development, operations and integration across the enterprise

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

Systems of Engagement (SoE) Apps

Develop and Test → Deploy → Operate → Rapid Releases → AppStore

Web Apps

Databases → Integration Test → Production Environment

Frequent Releases

Systems of Record (SoR) Apps

Databases → Fewer Releases
DevOps capabilities for mobile applications with enterprise systems

Accelerate mobile application development

_Rational Test Workbench_
IBM MobileFirst Platform
IBM UrbanCode Deploy
Rational Developer for the Enterprise

Construct, debug, and test mobile and Web applications

Design
Code
Deploy
Test

Refactor and extend existing logic as mobile-consumable services

Continuous Delivery

Open Lifecycle and Service Management Integration Platform

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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

Source: IBM
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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

Program Investment
$10M+ over in 10 years

Growth
68K+Students
Over 1K Schools in 67 countries

Corporate Engagement
360+ companies actively recruiting

Professional Connections
9 Communities

Job Candidates
Over 4,200 Job Seekers

Mainframe skills - the myth and the reality
# IBM Academic Initiative

## Major Academic Institutions and Key Recruiters

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The Solution

- Develop cohesive recruiting strategy
- Develop compelling and consistent messaging
- Partner with universities
- Think fun
- Select tools that students recognize
- Leverage their strengths

Source: Dave Dischiave, Syracuse University
Reach Millennials Where they Live

- Adopt the new tools
- Sell the value of your organization
- Sell the value of the mainframe
- Join the IBM Academic Initiative
- Develop strong and lasting relationships with universities
- Most of all think “fun”

Teaching Mainframe since 2007 and learned students …

- Hate Java
- Love COBOL
- Love the mainframe

Let’s capitalize on the momentum

Source: Dave Dischiave, Syracuse University
The Academic Initiative is also partnering to offer mainframe-focused Massive Open Online Courses (MOOCs)

**MARIST**

“An Introduction to Enterprise Computing”
https://mooc.marist.edu/web/ecc

**SYRACUSE UNIVERSITY**

“Enterprise Computing Strategies”
http://ischool.syr.edu/contact/forms/ecsmooc.aspx

**THE LINUX FOUNDATION**

“Introduction to Linux”
https://www.edx.org/course/introduction-linux-linuxfoundationx-lfs101x-2
Master the Mainframe competition is helping a new generation find opportunity in the mainframe

A three-part contest of increasing difficulty offered to students around the world

Coming soon, the “2016 z Systems Master the Mainframe World Championship”

http://www.ibm.com/systems/z/education/academic/masterthemainframe/

68,000+ Participants since 2005!
Use the IBM z Systems Job Connector to find needed skills

Welcome to the IBM z Systems Job Connector!
The IBM z Systems platform is at the heart of what organizations everywhere depend upon to drive enterprise level cloud, mobile, and analytic solutions - all with unmatched security. The IBM z Systems Job Connector website has been designed to support employers and candidates interested in filling/finding enterprise computing jobs that require skills and familiarity with IBM z Systems mainframe technology. Start your z connections right here today!

Employers
- Post a Job
- View Resumes
- Products and Pricing
- Access Your Recruiter Account

Job Seekers
- Search Jobs
- Post a Resume
- Set up an Email Job Alert
- Access Your Job Seeker Account

Featured Jobs
Office Manager/EA
New York, NY
MarketShare

Mainframe Systems Programmer
Harrisburg, PA
PHEAA

http://systemzjobs.com
But ... maybe “The STEM Crisis Is a Myth” – a counter view from IEEE Spectrum

http://spectrum.ieee.org/at-work/education/the-stem-crisis-is-a-myth
“Critical thinking and discipline, not skills, that are important”

- STEM not well defined
- 57% STEM workers don’t have STEM degrees
- 75% STEM graduates work outside of STEM
  - 1/3rd of computer science grads
- Market place doesn’t show a shortage
- “alarm, boom, bust”
- Most important - “ability to think broadly, and read and write clearly”
  - Lockheed Martin ex-CEO

A Matter of Supply vs. Demand: Every year U.S. schools grant more STEM degrees than there are available jobs. When you factor in H-1B visa holders, existing STEM degree holders, and the like, it’s hard to make a case that there’s a STEM labor shortage.
Is demographics the real issue?

**FIGURE 2** Top Challenges Within Company Regarding a Skills Gap

- **Retirement/Attrition**: 67%
- **Shortage of new workers**: 34%
- **Limited financial resources**: 29%
- **Modernization**: 26%
- **Lack of variety of things being taught**: 18%
- **Other**: 4%
- **None of the above**: 5%
Suggestions to prevent skills shortages

1. Align **long-term** talent plan with strategic architecture plan
   – Replenish in advance

2. Hire brains not skills
   – Ability to learn on the job is key
   – Self-learning is strong quality

3. Hire in cohorts for improved retention
   – Don’t shop for skills, self-learn or retrain (49% of the skills survey)
   – Leverage IBM Academic Initiative & Job Connector when possible

4. Use latest tools and technologies
   – As appropriate
See “Mainframe Modernization and Skills: The Myth and the Reality message… please distribute!

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.
thank you!