A Tour of Open Source on the Mainframe
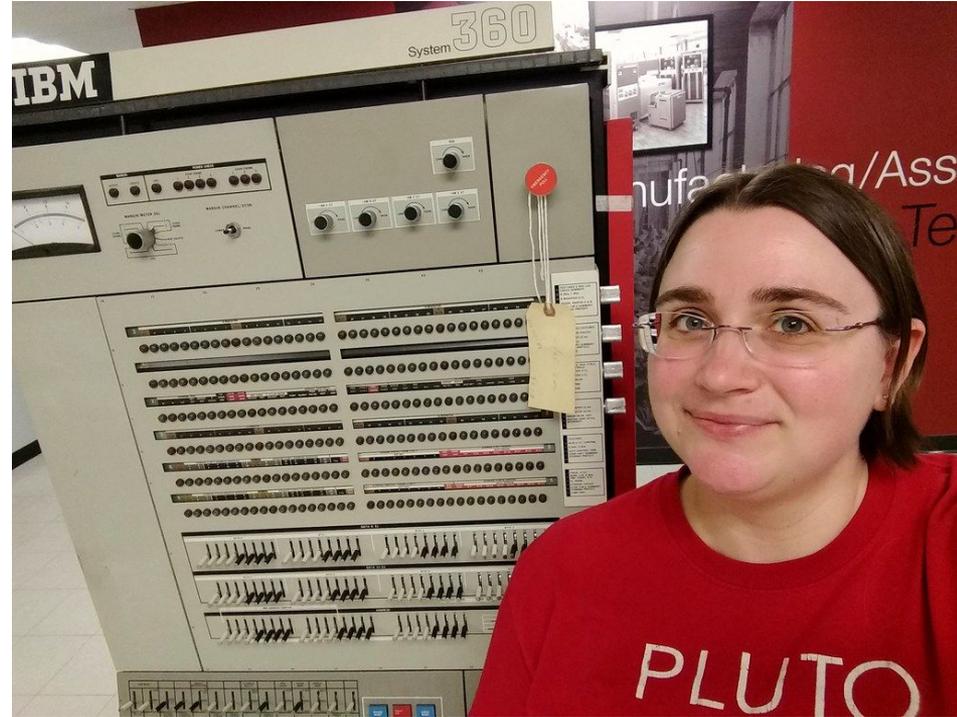
Elizabeth K. Joseph, IBM
20 October 2020

$ whoami

Elizabeth K. Joseph, @pleia2

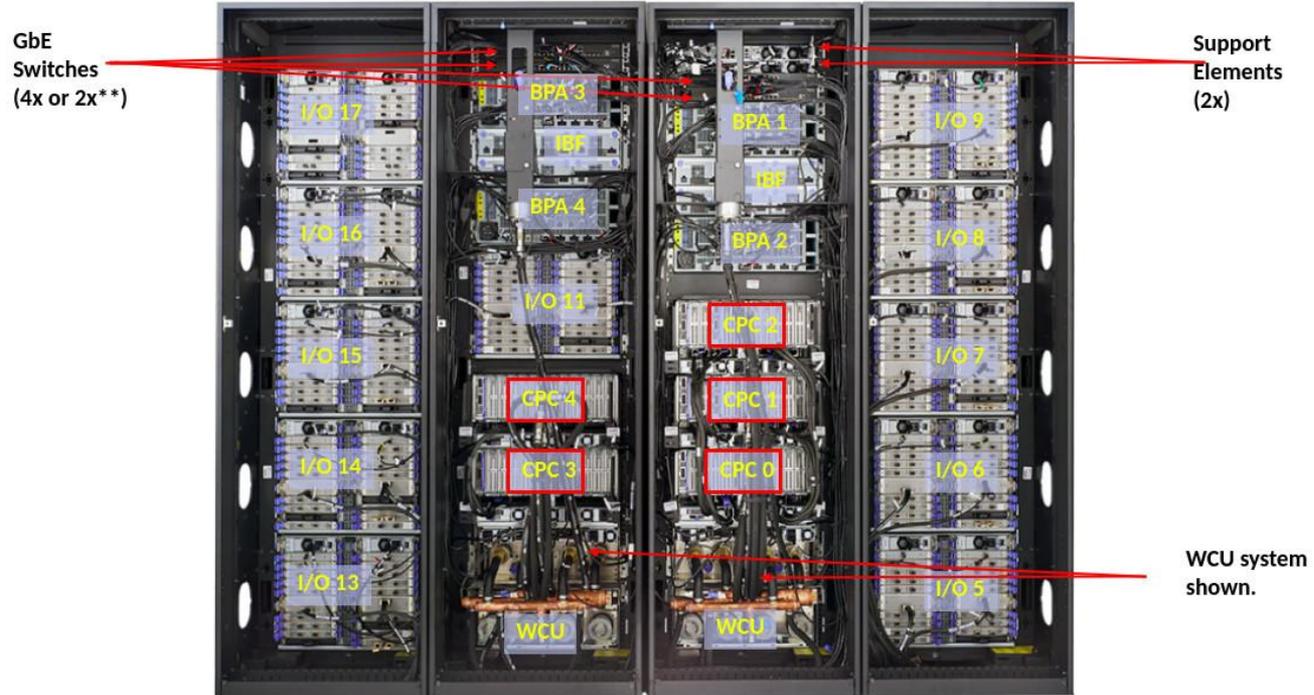*I did on-prem things, then cloud things, now I do mainframe things… which are also on-prem and cloud things!*

- Author: Official Ubuntu Book & Common OpenStack Deployments
- Linux Systems Administrator
- Developer Advocate for IBM Z

What is a mainframe?

What is a mainframe?
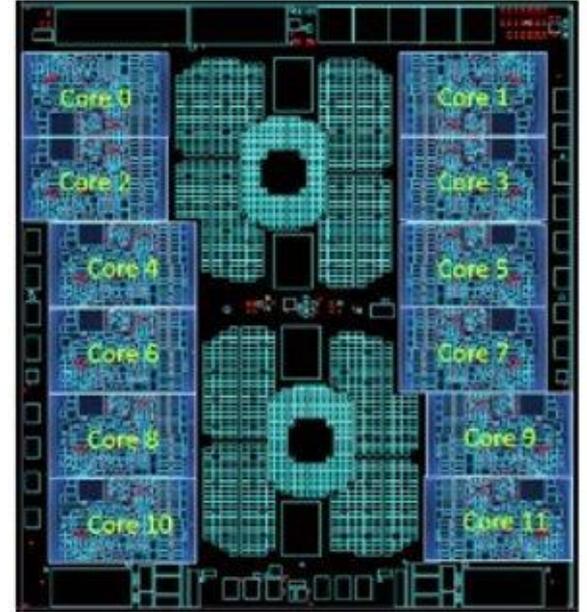
What is a mainframe?

Not x86.

(it's s390x!)

190 5.2ghz processor units (PUs), with 12 cores per chip

But also...

- 40TB of RAM
- 60 PCIe control units across 12 PCIe I/O drawers
- 22 dedicated I/O offload processors (SAPs) pre-allocated per system

What runs on a mainframe?

- Linux!
  - SLES, RHEL, and Ubuntu, plus Debian, ClefOS, openSUSE, Fedora, & Alpine
  - Linux with KVM for virtualization (alternative to z/VM, below)
- Several proprietary mainframe operating systems, including:
  - z/OS
  - z/VSE
  - z/TPF
  - Z/VM

Open Source Legacy: SHARE

In 1955, the volunteer-run SHARE Inc was founded by users of the IBM 701.

A key resource for this organization was the SHARE library of software that systems programmers would share among their peers, freely.

In 1959, SHARE released the SHARE Operating System (SOS), one of the first true "operating systems"[1] and Wikipedia says of SOS:

"SOS was one of the first instances of "commons-based peer production" now widely used in the development of free and open-source software such as Linux and the GNU project."

[1] https://en.wikipedia.org/wiki/SHARE_(computing)

Elizabeth K. Joseph
@pleia2

TIL that SHARE (en.m.wikipedia.org/wiki/SHARE_(co...), the user group for IBM mainframes founded in 1955, laid the groundwork for IBM's first operating system.

via Emerson W. Pugh's "Building IBM"

and running of application programs. The company's first operating system was a direct outgrowth of the pioneering activities of these members of SHARE. Developed for the IBM 709 computer and introduced in 1959, its origin is suggested by its name, SOS, an acronym for SHARE Operating System.[15]

6:36 PM · Apr 5, 2019 · Twitter for Android

SHARE

EDUCATE · NETWORK · INFLUENCE

Open Source Legacy: VM

Collaboration between organizations, including companies, universities, and government entities has continued through the decades in communities like VM[1].

In Melinda Varian's VM and the "VM Community: Past, Present, and Future"[2] paper, she highlights key moments in VM history and the parties involved.

Psst, IBM was not always on board with virtualization, but the VM community was, in the 1970s.

[1] https://en.wikipedia.org/wiki/VM_(operating_system)
[2] http://www.leeandmelindavarian.com/Melinda/

Open Source Legacy: Linux

Started out as the "Bigfoot" (i370) port by several community members in 1998-99.

IBM released the first Linux kernel patches to support s390x in December 1999.

In October 2000, SUSE Linux Enterprise Server became the first, still in production, enterprise Linux to support s390x.

Red Hat quickly followed as the second, still in production, enterprise Linux for the mainframe.

Ubuntu support was announced in 2016 and began with Ubuntu 16.04.
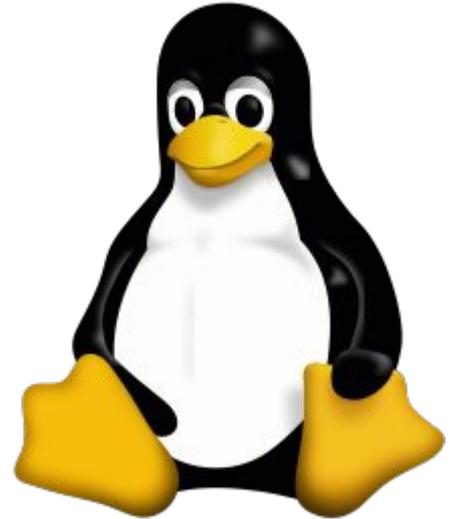
Linux Today

In 2015, IBM released the first Linux-only mainframe, the IBM LinuxONE. It was announced at the Linux Foundation's LinuxCon 2015.

Today's LinuxONE is in its third iteration, with the LinuxONE III released in September 2019.

(Don't worry, I'm not here to sell you one, but I can get you free access... stay tuned!)

2015: LinuxONE Emperor & Rockhopper   2017: LinuxONE Emperor II & Rockhopper II   2019: LinuxONE III

Growing IBM Z & LinuxONE Open Source Ecosystem

www.ibm.com/community/z/open-source-software/

IBM Z & LinuxONE Official Docker Images

Open Source Software available in Docker Hub as Official Docker Images   hub.docker.com

Linux Distributions

Cloud , Web, Languages & Runtimes

BusyBox

DevOps/Automation

Big Data, Observability, Analytics

Networking & Monitoring

Middleware

Flink

Databases

Memcached

Open Source Hardware Support on Linux

How do I get to those crypto goodies on the mainframe in Linux?

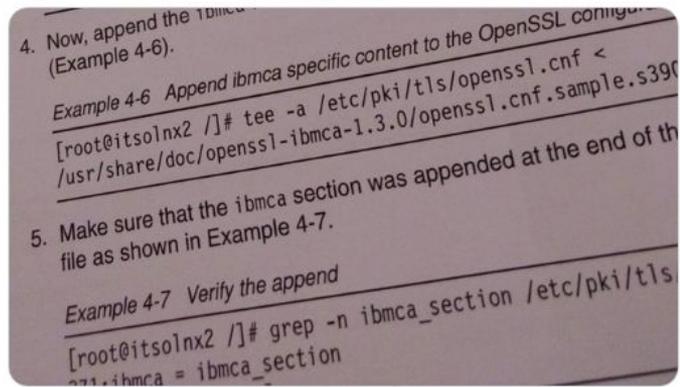It's just the standard open source libraries and tools we know and love!

- dm-crypt
- OpenSSL and libcrypto (including for ssh, scp, sftp, Apache mod_ssl...)
- IPSec
- libica crypto library for s390x (https://github.com/opencryptoki/libica)
- aes for Go (https://golang.org/pkg/crypto/aes/)

Elizabeth K. Joseph @pleia2 · Jun 17, 2019
One of the reasons I hopped on board with this #LinuxONE adventure was how integrated the tooling was with existing open source solutions.

Want to use the in-processor crypto? It's not an awkward, bolted-on, IBM-only solution. You just configure #OpenSSL to use it. #IBMZ

4. Now, append the ibmca (Example 4-6).

Example 4-6 Append ibmca specific content to the OpenSSL config
[root@itsolnx2 /]# tee -a /etc/pki/tls/openssl.cnf < /usr/share/doc/openssl-ibmca-1.3.0/openssl.cnf.sample.s390

5. Make sure that the ibmca section was appended at the end of th file as shown in Example 4-7.

Example 4-7 Verify the append
[root@itsolnx2 /]# grep -n ibmca_section /etc/pki/tls/
271:ibmca = ibmca_section

Open Source Resources for Linux

Finding software

- Go directly to the project, do they have s390x builds?
- Verified Software List from IBM https://www.ibm.com/community/z/open-source-software/
- DockerHub (IBM Z search): https://hub.docker.com/search?type=image&architecture=s390x
- Open Mainframe Project Software Discovery Tool (in development!)

  https://www.openmainframeproject.org/projects/software-discovery-tool

Open Source Resources for Linux

Porting your own open source project

- Ubuntu Personal Package archives on Launchpad.net https://help.launchpad.net/Packaging/PPA
- OpenSUSE build service https://build.opensuse.org/
- Jenkins instance for s390x maintained by the Oregon State University Open Source Lab (OSU OSL): https://osuosl.org/services/ibm-z/
- TravisCI build service for s390x (Beta trial for open source projects): https://docs.travis-ci.com/user/multi-cpu-architectures/
- LinuxONE Community Cloud: https://developer.ibm.com/linuxone
  - *This is that free access to LinuxONE I was talking about!*

Cool, Linux.

What about z/OS?

Open Source Software on z/OS

ANSIBLE	Ansible is an automation tool for configuration and deployment of software	Contributions: https://github.com/ansible/ansible Download: https://www.ansible.com/integrations/infrastructure/ibm-zos
APACHE Spark	Apache Spark is an analytics engine for large-scale data processing	Contributions: https://github.com/IBM/Spark-on-zOS Download: https://developer.ibm.com/javasdk/downloads/spark/
CONDA	Package, dependency and environment management	Download: https://anaconda.org/IzODA/repo
cics-bundle-maven	Maven plugin to build CICS bundles	Contributions: https://ibm.github.io/cics-bundle-maven/ Download: ibm.github.io/cics-bundle-maven
cics-bundle-common	Gradle plugins to build CICS bundles	Contributions: https://github.com/IBM/cics-bundle-gradle Download: https://github.com/IBM/cics-bundle-gradle

Open Source Software on z/OS

Zowe	Zowe, modern interfaces to interact with z/OS, allows to work with z/OS in a way that is similar to what you experience on cloud platforms today	Contributions: https://github.com/zowe/community/blob/master/README.md Download: https://www.zowe.org/download.html
galasa	Galasa is an integration test framework	Contributions: https://galasa.dev/ Download: https://github.com/galasa-dev
node	JavaScript runtime built on Chrome's V8 JavaScript engine	Download: https://github.com/ibmruntimes/node
python	Open Enterprise Python is an industry-standard Python interpreter for z/OS	Download: https://developer.ibm.com/mainframe/2020/06/22/python-for-zos-now-available/
Java	Popular object-oriented programming language	Download: https://developer.ibm.com/javasdk/support/zos/
Perl	Perl is a general-purpose, interpreted, dynamic programming language	Download: https://www.rocketsoftware.com/zos-open-source

Open Source Software on z/OS

php	PHP is a server-side scripting language, offering a simple and universal solution for easy-to-program dynamic Web pages	Download: https://www.rocketsoftware.com/zos-open-source
R	R is a functional language for primarily for data analytics	Download: https://www.rocketsoftware.com/product-categories/mainframe/r-for-zos
git	Git is a version control system (VCS) for tracking changes in computer files and coordinating work on those files among multiple people	Download: https://www.rocketsoftware.com/zos-open-source/tools
Open Liberty	A lightweight open framework for building fast and efficient cloud-native Java microservices	Contributions: https://github.com/OpenLiberty/open-liberty Download: https://openliberty.io
zECS	Enterprise Caching System (zECS) is a cloud enabled distributed key/value pair caching service	Download: https://github.com/walmartlabs/zECS
BASH THE BOURNE-AGAIN SHELL	Bash is an sh-compatible shell providing users a command-line interpreter	Download: https://www.rocketsoftware.com/zos-open-source/tools

Open Mainframe Project

OpenMainframeProject.org

- Project Hosting
- Project support (VMs, CI)
- Events (Summits! Mini-summits!)
- Communication (Chat, mailing lists, forums)

Check out John Mertic's talk at 4:30PM today!

Session: Creating a Sustainable Open Source Ecosystem for Mainframe Through the Open Mainframe Project

The Open Mainframe Project was established in 2015 with the aim of pulling the various efforts of ensuring mainframe is a first class citizen for open source into a unified focus. Since that time there has been an uptick in not only new open source projects on mainframe, but also broad open source project supporting mainframe.

In this talk, Open Mainframe Project Director John Mertic will talk about the impacts of mentorships, supporting open source projects, focus on creating a more diverse and inclusive mainframe community, and tooling created to grow and sustain the open source projects on mainframe.

But I have to talk about Zowe

- Zowe On The Go: A Mobile Application For Modern Mainframers by Jessielaine Punongbayan (Broadcom) - https://medium.com/zowe/zowe-on-the-go-a-mobile-application-for-modern-mainframers-6f4eb849ff57
- Interact with z/OS using a mobile device with Zowe and Flutter by Mehmet Alp Sümer (IBM) - https://developer.ibm.com/tutorials/interacting-with-zos-using-mobile-device-with-zowe-and-flutter/
- Trash Eavesdropping Alexa with a Secure Open Source Alternative by Yongkook Kim (Vicom Infinity) - https://thenewstack.io/trash-eavesdropping-alexa-with-a-secure-open-source-alternative/
- Z is for Zowe – the Open Path to Mainframe DevOps by Peter Wassel (Broadcom) - https://devops.com/z-is-for-zowe-the-open-path-to-mainframe-devops/

...and DevOps!

A lot of time has been spent bringing DevOps tools to z/OS.

Now we're seeing more discussion about People and Process.
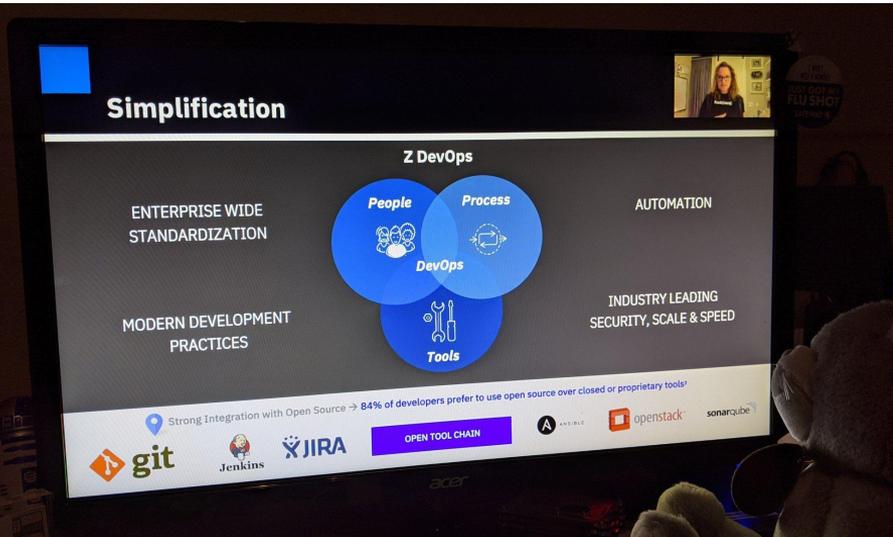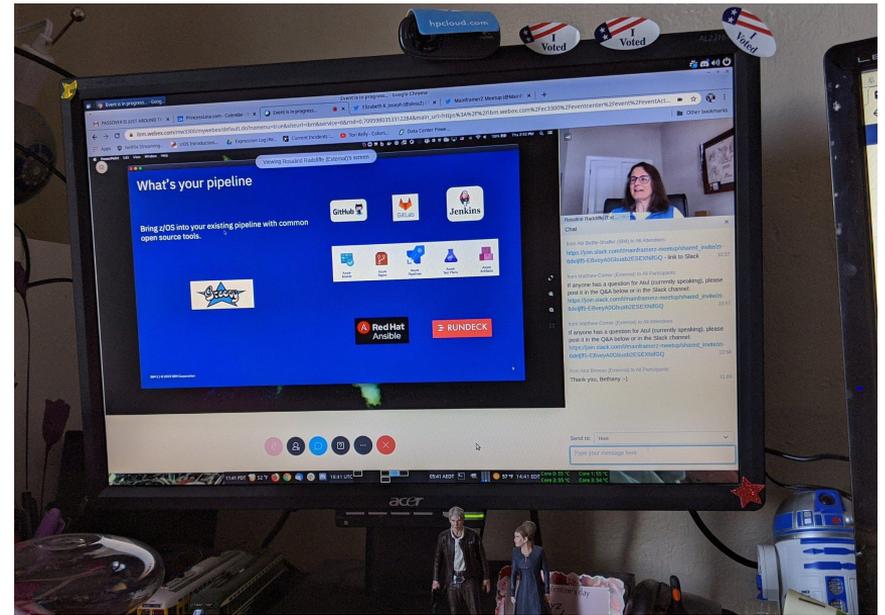
on a platform tha[t]
ient and scalable. "It's not a matter of your developers adapting to IBM Z. The IBM Z platform has already been updated to adapt to you," says Dotson.

Open source in the enterprise

Some parting thoughts for open source types

Questions?

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Thank you!

Photo Copyright@IBM via Andreas Weßling.
More pretty glass model pictures at:
http://ibm.biz/IBMCCBOE_z15T02_pictures