

Developing for the Modern Mainframe

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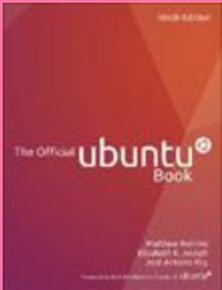
Silicon Valley Code Camp

Elizabeth K. Joseph (@pleia2)

Developer Advocate, IBM Z

(I talk to techies, I don't know how to sell you a mainframe 🙄)

Debian / Ubuntu



OpenStack



Apache Mesos



Linux on Z



What is a mainframe?



IBM System 360 (s/360), 1964



IBM z15, 2019

What is a mainframe?

Depends on who you ask.

Traditionally runs z/OS, but increasingly Linux too.

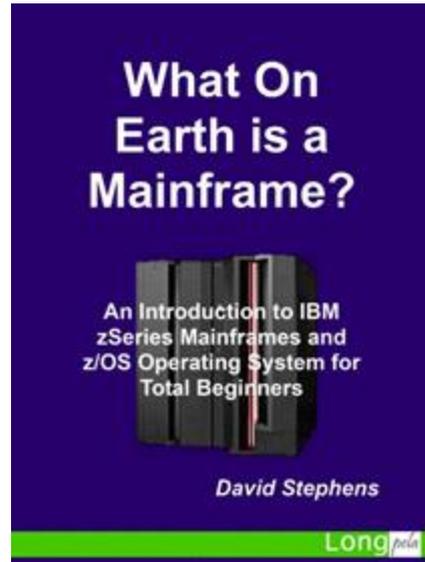
Data, data, data.

Batch processing!

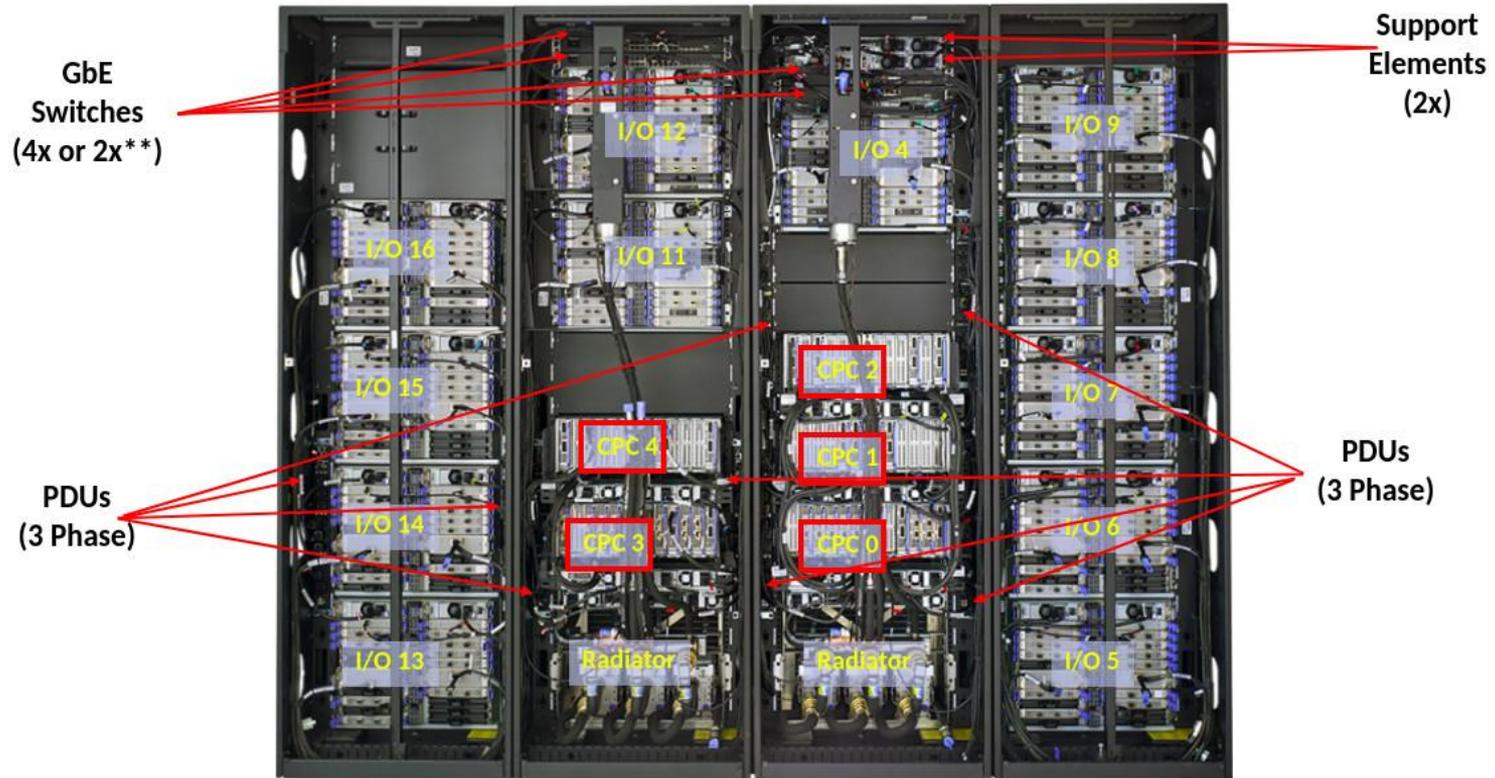
Enterprise-grade hardware
and external storage.

Virtualization? Solved!

Networking? Solved!



What is a mainframe?



Storage - DS8900F

The highest end model, the IBM DS8950F Model 996 has nearly 5.9 PB (5,898 TB) maximum physical capacity



So, what runs on it?

z/OS

z/OS, a widely used mainframe operating system, is designed to offer a stable, secure, and continuously available environment for applications running on the mainframe.

z/VM

As a control program, z/Virtual Machine (z/VM) is a hypervisor because it runs other operating systems in the virtual machines it creates.

z/VSE

z/Virtual Storage Extended (z/VSE) is popular with users of smaller mainframe computers. Some of these customers eventually migrate to z/OS when they grow beyond the capabilities of z/VSE.

z/TPF

The z/Transaction Processing Facility (z/TPF) operating system is a special-purpose system that is used by companies with very high transaction volume, such as credit card companies and airline reservation systems.

Linux for System z

Several (non-IBM) Linux distributions can be used on a mainframe.

Source:

https://www.ibm.com/support/knowledgecenter/zosbasics/com.ibm.zos.zmainframe/zconc_opsysintro.htm

Modern mainframes run
Linux!

...and they have for 20 years

LinuxONE

2019, LinuxONE III (z15 with IFLs)



Distributions

Hypervisors

PaaS / IaaS

Languages

Runtimes

Management

Database

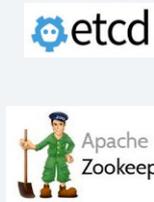
Analytics



LPA
R



Community Versions



DPM



SCYLLA



Db2



Already have software?

Build it for the
mainframe!

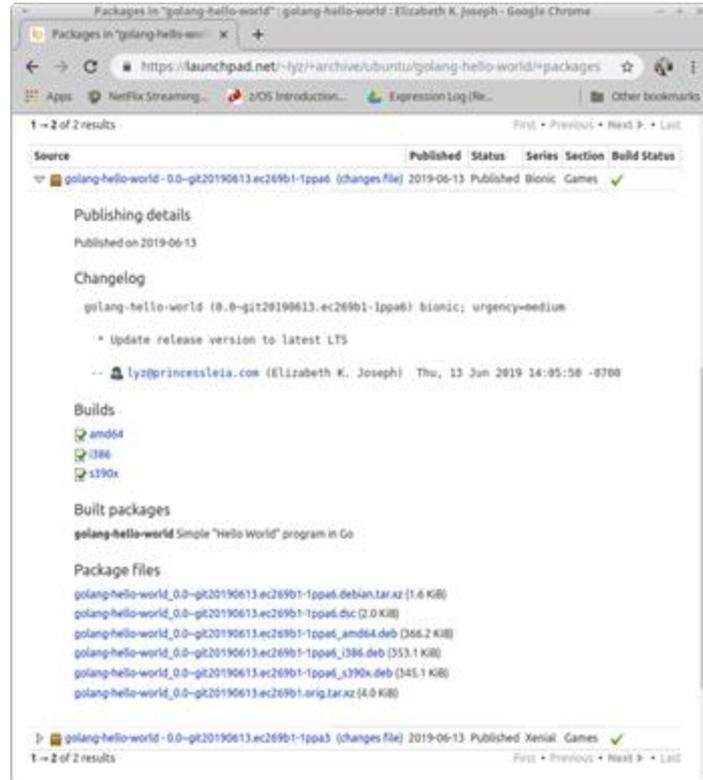
LinuxONE Community Cloud

The IBM LinuxONE Community Cloud provides a no charge, self-provisioned SUSE or Red Hat virtual machine on an IBM LinuxONE Enterprise Server (s390x architecture) to develop, test, and run your apps.

<https://developer.ibm.com/linuxone>



Self-Service s390x: Ubuntu PPAs



See: <https://princessleia.com/journal/2019/06/building-a-ppa-for-s390x/>

Self-Service s390x: openSUSE Build Service

The screenshot shows the openSUSE Build Service web interface for the 'snappy' project. The page includes a navigation bar with links for Downloads, Support, Community, and Development. The main content area is divided into several sections:

- Overview:** A section titled "A fast compressor/decompressor library" with a description of Snappy's performance and a warning not to submit it to the factory without asking.
- Source Files:** A table listing source files with columns for Filename, Size, Changed, and Actions. The files listed are 1.1.7.tar.gz, baselibs.conf, snappy-pcfile.patch, snappy.changes, and snappy.spec.
- Build Results:** A section showing build results for various architectures and systems, including x86_64, aarch64, s390x, and i586. The results are categorized by SLE version and system type.

Filename	Size	Changed	Actions
1.1.7.tar.gz	1.04 MB	2018-02-08	Download
baselibs.conf	11 Bytes	2015-07-29	Download
snappy-pcfile.patch	2.43 KB	2018-02-08	Download
snappy.changes	4.53 KB	2018-02-08	Download
snappy.spec	3.07 KB	2018-02-08	Download

Build Results	System	Architecture	Status
SLE_12_SP2	x86_64	failed	
	aarch64	successful	
	ppc64le	successful	
	s390x	successful	
	x86_64	successful	
SLE_12_SP4	aarch64	successful	
	ppc64le	successful	
	s390x	successful	
SLE_15	x86_64	successful	
	s390x	successful	
openSUSE_Factory	i586	successful	
openSUSE_Factory_ARM	x86_64	successful	
	armv7l	successful	
openSUSE_Factory_PowerPC	aarch64	successful	
	ppc64	successful	
openSUSE_Factory_zSystems	ppc64le	successful	
	s390x	successful	
openSUSE_Leap_15.0	x86_64	successful	
openSUSE_Leap_15.1	x86_64	successful	
openSUSE_Leap_42.3	x86_64	successful	

Source: <https://build.opensuse.org/>

Working with z/OS

Expected Programming on z/OS

The most widely used computer languages supported by z/OS:

- **Assembler**
- **COBOL**
- **PL/I**
- **C/C++**
- **Java**
- **CLIST**
- **REXX™**

More programming on z/OS

To this list, we can add the use of **shell script** and **Perl** in the z/OS UNIX System Services environment.

See: https://www.ibm.com/support/knowledgecenter/zosbasics/com.ibm.zos.zappldev/zappldev_23.htm

Additionally, **Node.js** <https://developer.ibm.com/mainframe/2018/01/19/reasons-host-node-js-applications-zos/>

And **Swift** <https://developer.ibm.com/mainframe/products/ibm-toolkit-swift-z-os/>

Traditional interaction: ISPF

(Interactive System Productivity Facility)

```
Menu Utilities Compilers Options Status Help
-----
ISPF Primary Option Menu
Option ==> [ ]

0 Settings      Terminal and user parameters      User ID . . : Z51005
1 View          Display source data or listings   Time . . . : 14:42
2 Edit          Create or change source data      Terminal . : 3278
3 Utilities     Perform utility functions         Screen . . : 1
4 Foreground   Interactive language processing   Language . : ENGLISH
5 Batch         Submit job for language processing Appl ID . . : ISR
6 Command      Enter TSO or Workstation commands TSO logon : DBPROCBG
7 Dialog Test  Perform dialog testing            TSO prefix: Z51005
8 LM Facility  Library administrator functions   System ID  : S0W1
9 IBM Products IBM program development products MVS acct. : FB3
10 SCLM        SW Configuration Library Manager  Release .  : ISPF 7.3
11 Workplace   ISPF Object/Action Workplace

----- Other Functions -----

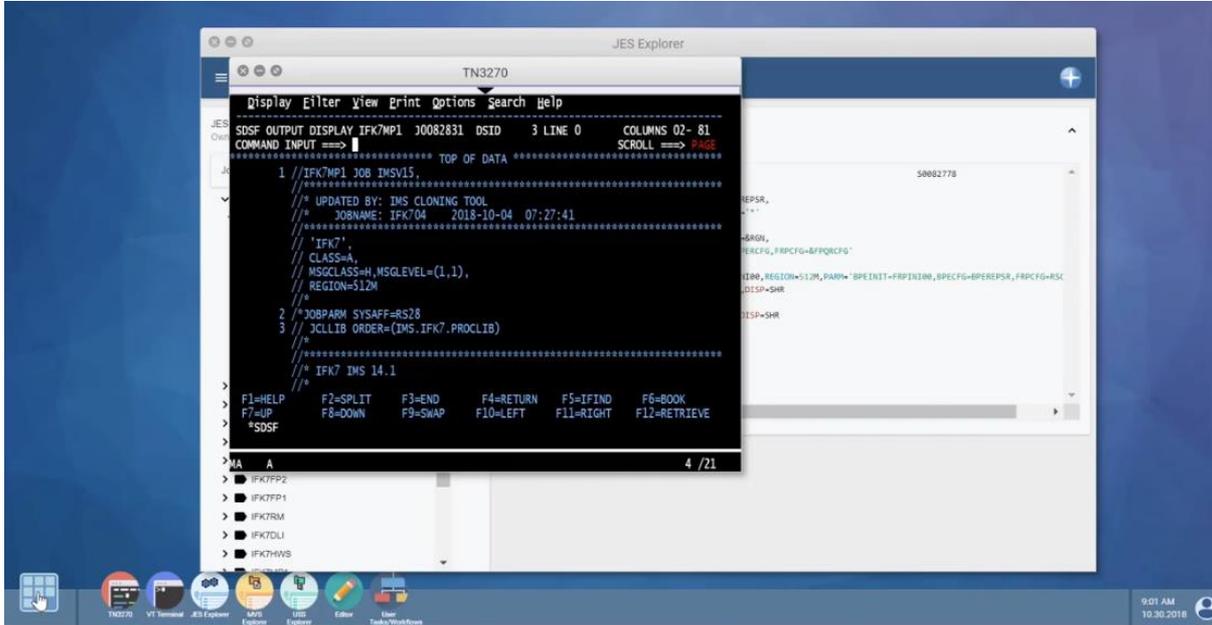
SD SDSF        View output
U  Unix        Unix Shell Prompt
UF Unix Files  Unix Services
D2 DB2I        DB2 Interactive functions
DM DB2ADM     DB2 Administration
F  File Manager File Manager for z/OS
IS ISMF       Disk Storage Management
SM SMP/E      Software Installation and Management
IP IPCS        Debug System Dumps and Traces
HC HCD        System Device Management
FD FM/DB2     File Manager/DB2
FI FM/IMS     File Manager/IMS

Enter X to Terminate using log/list defaults

F1=Help      F2=Split      F3=Exit      F7=Backward  F8=Forward  F9=Swap
F10=Actions  F12=Cancel

TCP00446      004/014
```

Modern interaction: Zowe Web Desktop



- Desktop-like environment, in your web browser
- Includes a 3270 terminal
- Provides GUI-based explorers for files and datasets with ways to manipulate data

Modern interaction: Zowe CLI

Modern command line tool

- Execute zowe commands from standard MacOS/Linux terminal
- Includes core commands for interacting with mainframe-specific needs (TSO, batch processing)
- Extendable for your specific needs, or those of vendors who wish to offer support for their tooling

Can build IDE extensions, a Visual Studio Code extension already exists.

Automation and scripting, including CI/CD pipelines!

Example usage, Using the Zowe CLI to edit a data set:

<https://docs.zowe.org/stable/user-guide/zowe-getting-started-tutorial.html#using-the-zowe-cli-to-edit-a-data-set>

Modern interaction: Zowe API

API gateway that can abstract out the various number of services running on the mainframe that you may wish to interact with: job services, dataset services, and more

Open source and vendor products are now leveraging the API for new products that interact with the mainframe

Open Mainframe Resources



Open Mainframe Project projects:

<https://www.openmainframeproject.org/projects>



Zowe website: <https://www.zowe.org/>

Zowe Overview (November 2018):

<https://www.youtube.com/watch?v=NX20ZMRoTtk>

Zowe Webinar (22 February 2019):

<https://www.youtube.com/watch?v=XixEltbRmds>

Questions?

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Visit our booth for a copy of LinuxONE for Dummies and other IBM Z goodies!

