

Open Source on the Mainframe in 1960, 1999, and Today

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SeaGL 2020



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

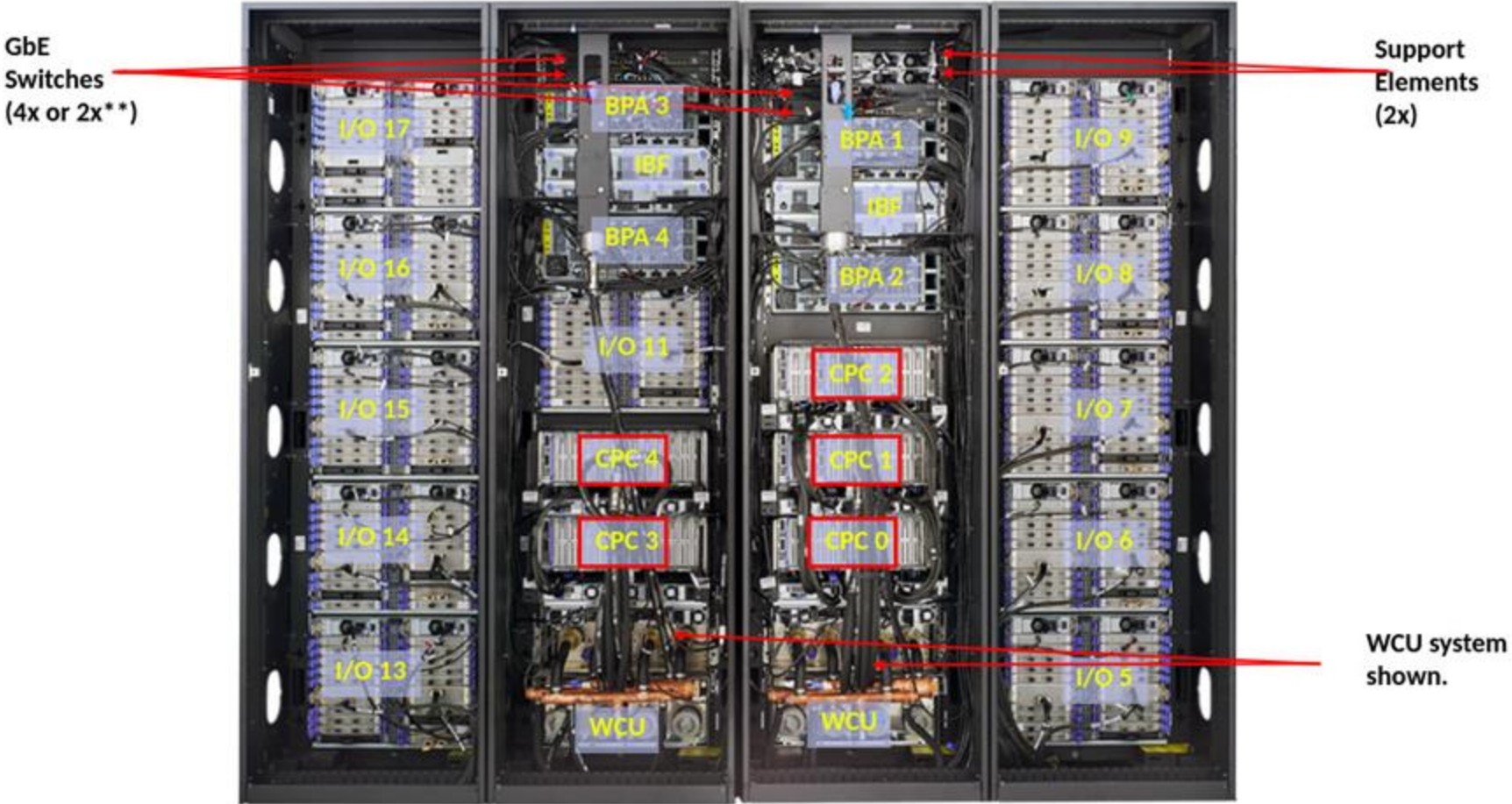
- Author: Official Ubuntu Book & Common OpenStack Deployments
- Linux Systems Administrator
- Developer Advocate for IBM Z



What is a mainframe?



What is a mainframe?

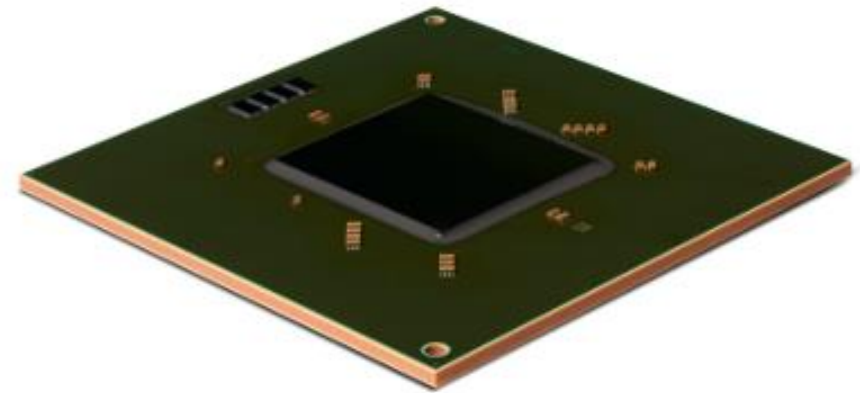
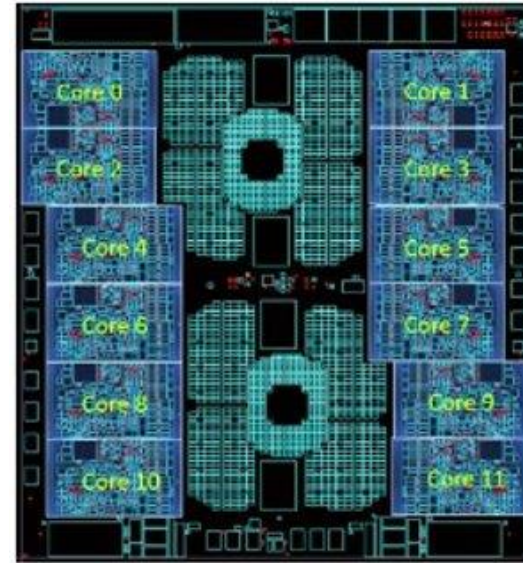


IBM Z / s390x / zArchitecture

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



Open source since when?

Lots of free and open
source software stories start with Unix.

This one doesn't.

SHARE-ing since 1955!

- In 1955, the volunteer-run SHARE Inc¹ 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."

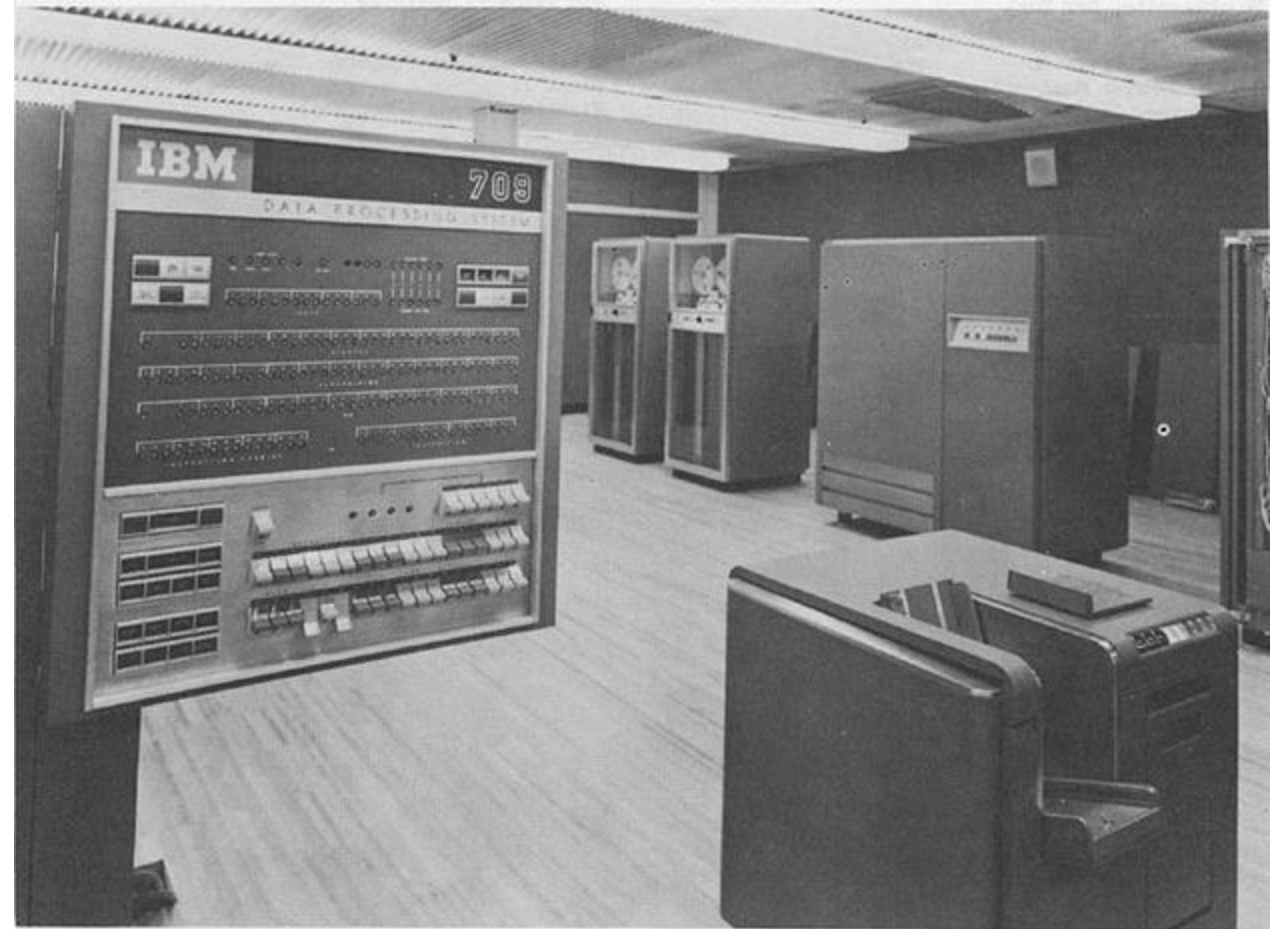
¹ <https://www.share.org/>

² [https://en.wikipedia.org/wiki/SHARE_\(computing\)](https://en.wikipedia.org/wiki/SHARE_(computing))



Computers didn't always have
time-sharing

Papers discussing time-sharing
were published as early as 1959,
but Compatible Time-Sharing
System (CTSS) was first demoed
by MIT on an IBM 709 in 1961.



What do you think about virtualization, 1972?

The first releases of VM¹ came as VM/370 in 1972.

They were the product of a collaboration between organizations, including companies, universities, and government entities has continued through the decades in the VM community.

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.

(Fun fact: IBM wasn't so convinced)

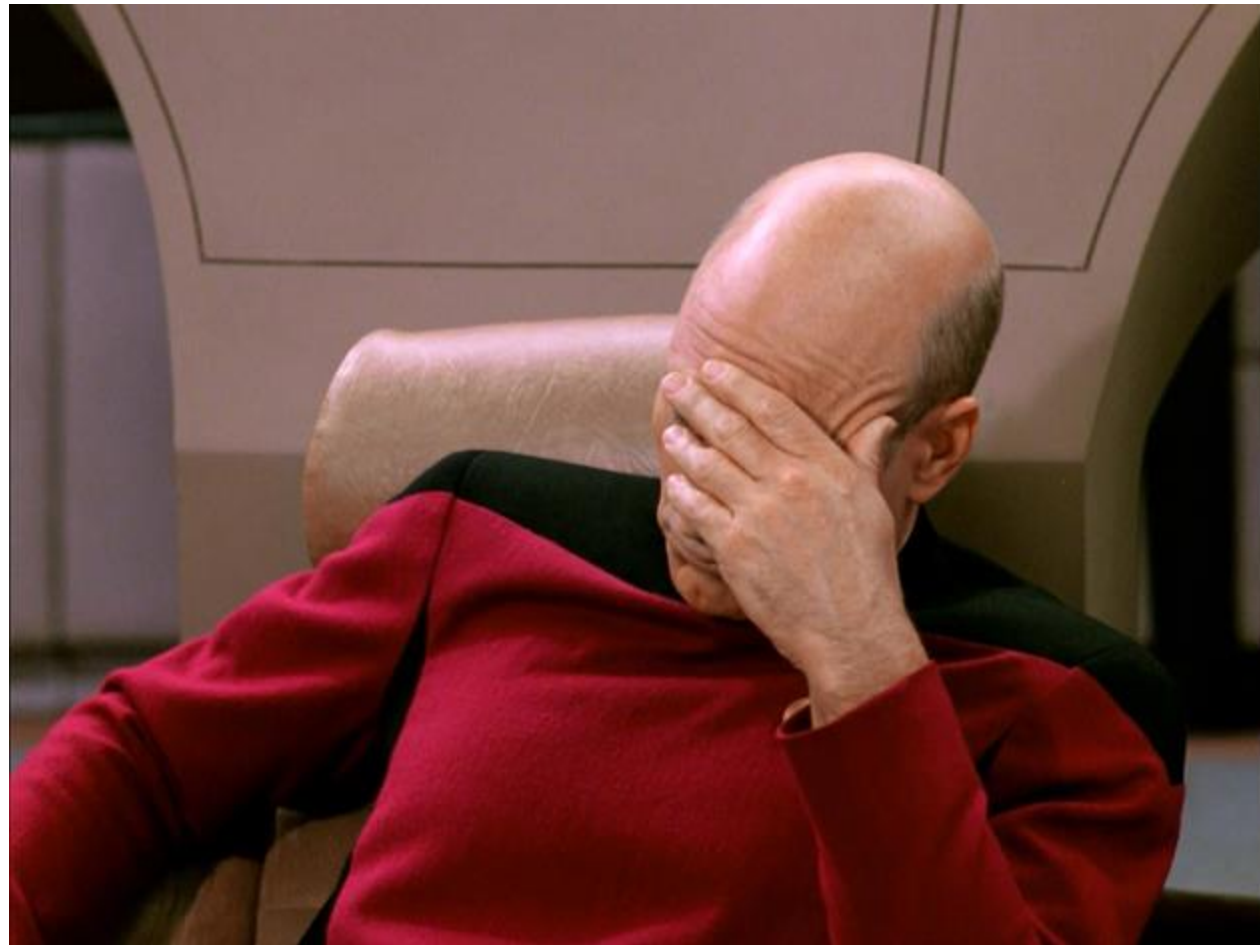
¹ [https://en.wikipedia.org/wiki/VM_\(operating_system\)](https://en.wikipedia.org/wiki/VM_(operating_system))

² <http://www.leeandmelindavarian.com/Melinda/>



IBM: “I don’t think anyone needs VMs” (paraphrased)

The Doubtful Decade.



But it got better!

The Doubtful Decade ended and VM community thrived, along with the technology and support from IBM.

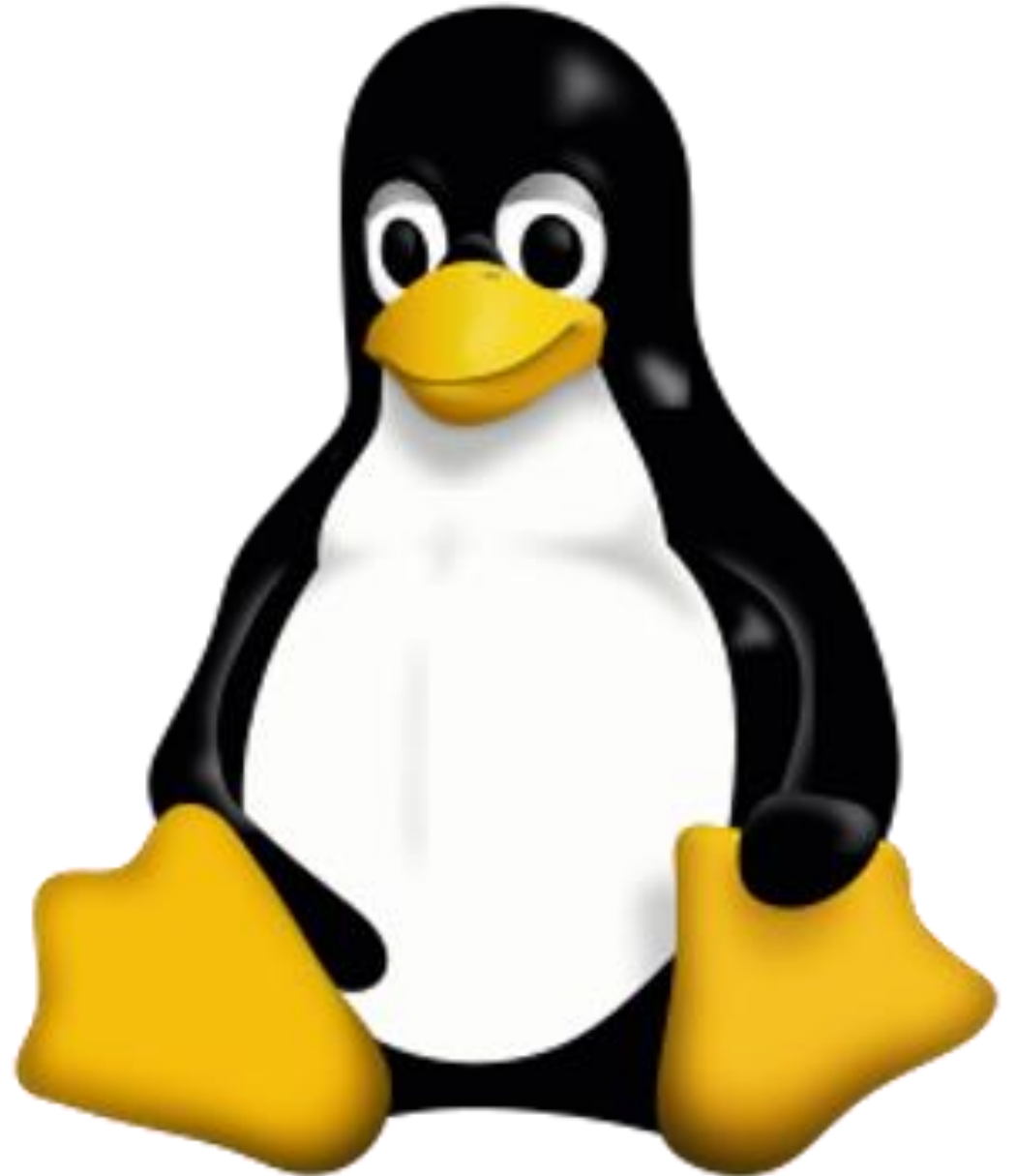
In 1994 experimental TCP/IP support was added to VM, adding a key component to supporting Linux 5 years later.

Linux Origins: Bigfoot

Development by Linus Vepstas in 1998-1999 as a community effort.

“the **Bigfoot (i370)** port was started first”

Source: Linus Vepsta’s site on Linux on s390
<https://linas.org/linux/i370.html>



Why did the community want it?

“Why? Good question. One we've asked ourselves many times. Why do you do the things you do? If you think about it, you can probably find a hundred rationalizations for what your gut makes you to do. Here's some of ours:

- Stunt
- To Learn
- Because Its There
- Because Its Knarly, Duude!
- I/O
- Address Spaces and Access Lists
- VM
- The Business Model”

Source: <https://linas.org/linux/i370-why.html>

The big kids want in!

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.

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Years of Linux on Z

5

Years of LinuxONE

1

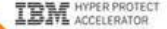
Year of Red Hat OpenShift for IBM Z and LinuxONE



IBM and Red Hat join forces to advance hybrid cloud



- IBM and Red Hat commit to bring OpenShift® to Z & LinuxONE
- IBM launches new IBM z15™ & LinuxONE III™ servers
- IBM Cloud™ Hyper Protect Services launched, built on LinuxONE
- IBM Hyper Protect Accelerator startup program launched



- Late night port of Linux to S/390® at Boeblingen
- IBM publishes collection of patches and additions to enable Linux® for System/390®

- Red Hat® to Deliver Linux Solutions for IBM's S/390 Mainframe Computer



- Biggest Linux on IBM eServer® zSeries® client now runs more than 290 IFLs



- IBM Big Green Consolidation of 3900 x86 servers to 30 Linux on Z



- IBM Enterprise Linux Server, based on IBM Z®

IBM celebrates 100 years of innovation – including support for Linux



- 3,000 ISV applications available for Linux on Z

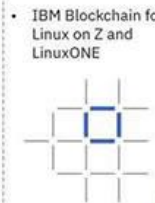
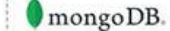


IBM LinuxONE

- Open Mainframe Project launched by Linux Foundation



- MongoDB announces support for IBM z Systems®



- IBM Blockchain for Linux on Z and LinuxONE



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- IBM unveils Linux Software and Services for S/390 Server



- IBM announces plan to invest \$1B in developing and marketing Linux
- SUSE Linux S/390 Released



- Major ISVs available for Linux on Z including SAP and Oracle 9i



- Linux on Z is used for mission-critical applications by clients



- 1,000 ISV applications available for Linux on Z



- Security and performance improvements with IBM System z10®



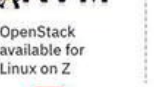
- 400 IBM software products now available for Linux on Z



- IBM Systems™ Magazine special edition about Linux on Z



- KVM available for Linux on Z



- OpenStack available for Linux on Z



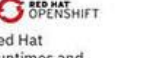
- Ubuntu 16.04 LTS for IBM LinuxONE and IBM z Systems is now available



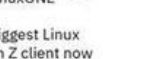
- IBM Cloud Private brings containers and Kubernetes to Linux on Z and LinuxONE



- Red Hat OpenShift available on Linux on Z and LinuxONE



- Red Hat Runtimes and IBM Cloud Pak for Applications 4.2 available on Linux on Z and LinuxONE



- Biggest Linux on Z client now runs more than 3,000 IFLs
- IBM advances IBM Cloud for Financial Services

IBM Z: An Open Platform

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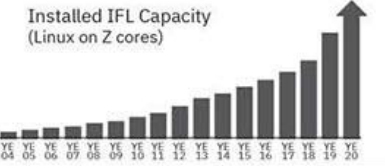
Years of Linux on Z

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Years of LinuxONE

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Year of Red Hat OpenShift for IBM Z and LinuxONE



52% of IBM Z enterprises have Linux

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Linux in 2015

At the Linux Foundation's LinuxCon 2015, IBM announced the first Linux-only mainframe, the IBM LinuxONE on the keynote stage.

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

Linux Distributions & Virtualization



Community Versions



Networking & Monitoring



Cloud & Container Services



Languages & Runtimes



DevOps/Automation



Big Data, Observability, Analytics



Databases

Open Source Resources for Linux: Finding

- Search in your distro!
- 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




- LinuxONE Community Cloud: <https://developer.ibm.com/linuxone>
 - *This is that free access to LinuxONE I was talking about!*
- 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/>
- Ubuntu Personal Package archives on Launchpad.net <https://help.launchpad.net/Packaging/PPA>
- OpenSUSE build service <https://build.opensuse.org/>









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/1zODA/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, 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 is an integration test framework	Contributions: https://galasa.dev/ Download: https://github.com/galasa-dev
	JavaScript runtime built on Chrome's V8 JavaScript engine	Download: https://github.com/ibmruntimes/node
	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/
	Popular object-oriented programming language	Download: https://developer.ibm.com/javasdk/support/zos/
	Perl is a general-purpose, interpreted, dynamic programming language	Download: https://www.rocketsoftware.com/zos-open-source

Open Source Software on z/OS

	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 is a functional language for primarily for data analytics	Download: https://www.rocketsoftware.com/product-categories/mainframe/r-for-zos
	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
	A lightweight open framework for building fast and efficient cloud-native Java microservices	Contributions: https://github.com/OpenLiberty/open-liberty Download: https://openliberty.io
	Enterprise Caching System (zECS) is a cloud enabled distributed key/value pair caching service	Download: https://github.com/walmartlabs/zECS
	Bash is an sh-compatible shell providing users a command-line interpreter	Download: https://www.rocketsoftware.com/zos-open-source/tools



OpenMainframeProject.org

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

<p>Ambitus</p> <p>Ambitus fosters a community that will help educate developers about all open source technologies on z/OS.</p>	<p>ADE</p> <p>Anomaly Detection Engine for Linux Logs (ADE)</p> <p>ADE detects anomalous time slices and messages in Linux logs (either RFC3164 or RFC5424 format) using statistical learning.</p>	<p>ATOM</p> <p>Language Syntax Highlighting for z/VM</p> <p>Atom language syntax highlighting for z/VM</p> <p>Helping connect the next generation with mainframe and open source, the Internship program has helped students over the past several years become contributors to open source on mainframe, as well as develop the skills for a long career in technology.</p>
<p>CBT Tape</p> <p>CBT Tape is an open library of free software distribution for the IBM mainframe Multiple Virtual Storage (MVS) and OS/390 and z/OS operating system environments that continues to evolve to meet today's modern needs.</p>	<p>COBOL</p> <p>Programming Course</p> <p>The COBOL Programming Course is an open source initiative under the Open Mainframe Project that offers introductory-level educational COBOL materials with modern tooling.</p>	<p>COBOL</p> <p>Working Group</p> <p>The COBOL Working Group aims to promote the language by changing its perception and making materials more accessible to help more developers and students learn it on their mainframe journey.</p>
<p>Feilong</p> <p>Feilong is an open source z/VM cloud connector project under the Open Mainframe Project umbrella that will accelerate the z/VM adoption, extending its ecosystem and its user experience.</p>	<p>GenevaERS</p> <p>The Single-Pass Optimization Engine</p> <p>GenevaERS is the single-pass optimization engine for data extraction and reporting on z/OS.</p>	<p>Education</p> <p>Mainframe Open Education</p> <p>Mainframe Open Education is a convenient, easy-to-use platform where experts share up-to-date materials and foster collaboration with the broader community.</p>
<p>MENTORSHIP</p> <p>Mentorship Program</p> <p>Helping connect the next generation with mainframe and open source, the mentorship program has helped students over the past several years become contributors to open source on mainframe, as well as develop the skills for a long career in technology.</p>	<p>Polycephaly</p> <p>Polycephaly</p> <p>Polycephaly enables developers to build z/OS source code files with Jenkins and Git.</p>	<p>Software Discovery Tool</p> <p>Software Discovery Tool</p> <p>The Software Discovery Tool matches developers with the best open source software that meets their needs.</p>
<p>TerseDecompress</p> <p>TerseDecompress</p>	<p>ZOROW</p> <p>Zorow</p>	<p>Zowe</p>

Working with 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

