The Open Source Renaissance in Mainframe Technology

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What is a mainframe?
What is a mainframe?

Max setup in a 4-frame system:
- 4 Central Processor Complex (CPC) drawers
  - 200 processor cores
  - 40TB of memory
- 12 I/O drawers
What is a mainframe?

- IBM Telum chip
  - New on-chip Integrated Accelerator for AI
  - On-chip Compression/decompression
  - CP Assist for Cryptographic Functions (CPACF) in each core
  - Fully redesigned cache system (and it's BIG!)

2 IBM Telum chips on an IBM z16 Dual Chip Module (DCM)
Some *just* run Linux: IBM LinuxONE

LinuxONE (2015), LinuxONE II (2017), LinuxONE III (2019), & LinuxONE 4 2022 (rack mount 2023)
"SHARE began as the first-ever enterprise IT user group back in 1955, and continues to deliver important avenues of professional growth for the industry today." [https://www.share.org/About/About-Us](https://www.share.org/About/About-Us)

**SHARE Operating System**

The **SHARE Operating System (SOS)** is an operating system introduced in 1959 by the SHARE user group. It is an improvement on the General Motors GM-NAA I/O operating system, the first operating system for the IBM 704. The main objective was to improve the sharing of programs.

The SHARE Operating System provided new methods to manage **buffers** and **input/output** devices. Like GM-NAA I/O, it allowed execution of programs written in **assembly language**.

SOS initially ran on the IBM 709 computer and was then ported to its transistorized successor, the IBM 7090. A series of articles describing innovations in the system[1] appears in the April 1959 Journal of the **Association for Computing Machinery**.

[1](https://en.wikipedia.org/wiki/SHARE_Operating_System)
The VM & the VM Community

Some of the first community-driven work was around time-sharing and virtualization, including the first Virtual Machine (VM) software!

A wonderful history of time-sharing and virtualization technologies has been compiled by Melinda Varian: "VM and the VM Community: Past, Present, and Future" at https://www.leeandmelindavarian.com/Melinda/

Sidebar captured from https://en.wikipedia.org/wiki/VM_(operating_system) Nov 2023
Let's collab on...

"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."

https://www.cbttape.org/

"The roots of the open source movement trace back to SHARE but much of that initial collaboration came together with the CBT (Connecticut Bank and Trust) Tape in 1975. Arnold Casinghino established the CBT Tape when people started using Multiple Virtual Storage (MVS)" https://openmainframeproject.org/projects/cbt-tape/
2015: The Open Source Renaissance begins

- Open Mainframe Project is launched
- IBM LinuxONE announced at LinuxCon North America in Seattle
The Open Mainframe Project was founded in 2015, as a focal point for deployment and use of Linux and Open Source in a mainframe computing environment.
"Zowe is a new open source software framework that provides solutions that allow development and operations teams to securely, manage, control, script and develop on the Mainframe like any other cloud platform. Zowe is the first open source project based on z/OS." [https://www.zowe.org/](https://www.zowe.org/)
"The COBOL Programming Course is an open source initiative that offers educational COBOL materials and hands-on experience with modern tooling." [https://openmainframeproject.org/projects/cobol-programming-course/](https://openmainframeproject.org/projects/cobol-programming-course/)
"The Linux Distributions Working Group oversees the health and maintenance of the various Linux distributions s390x ports and to ensure that it is a supported architecture for all available Linux distributions in the community."

https://openmainframeproject.org/our-projects/working-groups/linux-distributions/
Open Mainframe Project Interactive Landscape

- [https://landscape.openmainframeproject.org/](https://landscape.openmainframeproject.org/)

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Beyond the OMP
"The z/OS Open Tools community is here to provide popular Open Source tools and to encourage z/OS Open Source tools development. We currently host 120+ z/OS Open Source projects"

https://zosopentools.github.io/meta/##/
"Downloads for the z/OS platform"

"This repository contains sample programs and other resources that might be useful to the z/OS® operating system community. Here you will find tools for exploring the various capabilities of z/OS."

https://github.com/IBM/IBM-Z-zOS/
zigi

"Git repository management from ISPF: Manage your datasets (FB/VB, PS/PO, any LRECL) with a git backend."

https://zigi.rocks/

Linux for S/390: Began when "IBM published a collection of patches and additions to the Linux 2.2.13 kernel on December 18, 1999, to start today's mainline Linux on Z. Formal product announcements quickly followed in 2000" https://en.wikipedia.org/wiki/Linux_on_z_Systems
Linux is Linux

The same Linux as you're already familiar with!

- SUSE Linux Enterprise Server
- Red Hat Enterprise Server
- Ubuntu

Just built for another hardware architecture (s390x).
Run everything! But better ✨

OpenSSL – but use on-chip crypto!

gzip – but use on-chip compression/decompression!

Want to stash your cryptographic keys somewhere secure? Use a Crypto Express Card!

Fast interaction between your VMs? There's a bus for that.

Integrate with your existing libvirt environment? No problem, you can use KVM on an LPAR! (though z/VM is pretty amazing)

Using machine learning inferencing? That's built into the CPU too. AND it uses ONNX (Open Neural Network Exchange), the open standard for machine learning interoperability.
Search for open source software across various distributions, versions, and z/OS via: https://sdt.openmainframeproject.org/

Run your own! https://github.com/openmainframeproject/software-discovery-tool

Or just browse our data sources: https://github.com/openmainframeproject/software-discovery-tool-data
Monthly updates from IBM and beyond


- Community at: [https://www.ibm.com/community/z/open-source/](https://www.ibm.com/community/z/open-source/)

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**Linux on IBM Z and LinuxONE Open Source Software Report: October 2023**

**Open Source for IBM Z and LinuxONE** by Elizabeth K. Joseph | Posted on 11/09/2023

Linux on IBM Z and IBM LinuxONE use the s390x hardware architecture, so for some applications a little work sometimes has to be done so they compile and run as expected. This work is often done as a collaboration between the open source projects themselves...
We largely collaborate via mailing list and monthly team meetings to discuss:

- Outstanding issues of note that may impact others
- Efforts and strategies to resolve issues
- Sharing of patches
- Help with infrastructure requirements
- Porting efforts at IBM from various tools teams

https://wiki.openmainframeproject.org/display/LinuxDistrosWG
For example...

At a team meeting, Sarah Julia Kriesch of openSUSE brought up a build issue, Dan Horák of Fedora has a patch!

- Remote desktop xrdp client isn’t building on openSUSE:
  (the server is fine, which is the more common use case)
  - Ulrich checked - upstream claims to support it, a patch went in in March 2021
  - FYI Fedora patch: https://src.fedoraproject.org/rpms/xrdp/blob/rawhide/f/xrdp-0.9.16-arch.patch
Linux on mainframe developer resources

As a developer of an open source software project, there are technical resources available free of charge for developers seeking to build for Linux on IBM Z.

- Linux VMs from IBM (temporary and permanent)
- Jenkins service from the OSU OSL
- Travis CI build service
- CircleCI self-hosted runner binaries
- GitLab self-hosted runner binaries
- openSUSE Build Service
- Launchpad Personal Package Archives

https://openmainframeproject.org/news/developer-resources-for-linux-on-s390x/
Questions?

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