Mainframe a la mode:

Developer resources for porting your Linux app to IBM Z and LinuxONE

Elizabeth K. Joseph, Developer Advocate
@pleia2
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
• 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.
Announced at the Linux Foundation’s LinuxCon 2015, IBM released the first Linux-only mainframe, the IBM LinuxONE.

Today’s LinuxONE is in its third iteration, with the LinuxONE III released in September 2019.
IBM Z has an open source legacy!

- In 1955, the volunteer-run SHARE Inc was founded.
- 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" 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\_\(\text{computing}\)
Are other projects porting their apps?

Yep!
Growing IBM Z & LinuxONE Open Source Ecosystem

Linux Distributions & Virtualization
- Red Hat
- Ubuntu
- SUSE
- KVM
- OpenSUSE
- Fedora
- Alpine
- ClefOS

Cloud & Container Services
- docker
- LXD
- openstack
- Kubernetes
- Minikube
- Helm
- Istio
- OpenShift
- OpenJ9
- OpenJDK

Languages & Runtimes
- Java
- JavaScript
- Ruby
- Scala
- Go
- Node
- Python
- Erlang
- R
- PHP
- Clojure
- Terraform

DevOps/Automation
- Chef
- Ansible
- Puppet
- Jenkins
- Travis CI
- ATG
- NTLR
- Maven
- SonarQube
- Gradle
- SaltStack

Community Versions

Networking & Monitoring
- NGINX
- HAProxy
- Marathon
- Docker Compose
- Docker
- Compose
- Apache Tomcat
- Hyperledger Fabric
- TensorFlow
- WildFly
- Zabbix
- ZooKeeper
- etcd

Big Data, Observability, Analytics
- Flink
- Spark
- Kafka
- Fluentd
- Logstash
- Grafana
- Elasticsearch
- Kibana

Middleware
- CouchDB
- Redis
- Cassandra
- MySQL
- MariaDB
- Postgres

Databases
- Couchbase
- MongoDB
- MongoDB
- Couchbase
- RethinkDB

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

Linux Distributions
- alpine
- ubuntu
- ClefOS
- fedora

Cloud, Web, Languages & Runtimes
- docker
- pypy
- python
- Ruby
- jRuby
- Open Liberty
- Go
- node
- Perl
- php
- OpenJDK

Networking & Monitoring
- REDMINE
- Red Hat
- HAPROXY
- ownCloud
- BusyBox
- Apache Tomcat
- WordPress
- ghost

DevOps/Automation
- Maven
- Gradle
- Matomo
- Fluentd
- Apache Solr
- PHPMyAdmin

Big Data, Observability, Analytics
- Apache ZooKeeper
- BASH
- MySQL
- Flink

Middleware
- RabbitMQ
- mosquitto
- express gateway
- ghost

Databases
- MongoDB
- Postgres SQL
- Redis
- Adminer

Memcached

hub.docker.com
Finding Open Source Software for Linux

- Go directly to the project, do they have s390x builds?
- Ask your vendor, is there a port they maintain?
- Open Mainframe Project Landscape: [https://landscape.openmainframeproject.org/](https://landscape.openmainframeproject.org/)
- DockerHub (IBM Z search): [https://hub.docker.com/search?type=image&architecture=s390x](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](https://www.openmainframeproject.org/projects/software-discovery-tool)
• Full project hosting, including code, and mailing lists
• Blogs and podcasts of general interest to the open source mainframe community
• Slack and forums for communication among participants
• Project support for 3rd party open source projects seeking infrastructure (VMs, CI/CD services)
• New in 2020: Annual conference!
"The IBM LinuxONE Community Cloud is a no-charge, 24 x 7, enterprise-grade, open access, shared public cloud environment on IBM's LinuxONE platform. Developers, students, professors, entrepreneurs, or anyone from all over the world can sign up for 120-day access to a virtual server with full access to develop, test, or run open source applications on LinuxONE, or to access any of the other services offered."


And join the LinuxONE Community Cloud Community at [https://www.ibm.com/community/z/linuxone-cc/](https://www.ibm.com/community/z/linuxone-cc/)
Ubuntu Personal Package Archives (PPAs) on Launchpad.net

Documentation: https://help.launchpad.net/Packaging/PPA
A fast compressor/decompressor library

Snappy is a compression/decompression library. It does not aim for maximum compression, or compatibility with any other compression library; instead, it aims for very high speeds and reasonable compression. For instance, compared to the fastest mode of zlib, Snappy is an order of magnitude faster for most inputs, but the resulting compressed files are anywhere from 20% to 100% bigger. On a single core of a Core i7 processor in 64-bit mode, Snappy compresses at about 250 MB/sec or more and decompresses at about 500 MB/sec or more.

Do NOT submit it to factory without asking or the package will be yours to maintain.
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)

Documentation: https://docs.travis-ci.com/user/multi-cpu-architectures/
So, any programming language?
Programming Language Tips

• Source code across architectures will generally be identical, but it needs to be compiled (C, C++), or otherwise interpreted (Python, Node.js) for this architecture.

• That means you need a compiler or an interpreter built for the mainframe.

• The mainframe architecture is big-endian, but most of the supported architectures today are little-endian.

• Your code will probably build and run, give it a try!

• If not, note that the higher level a language is, the more luck you'll have. Lower level languages like C do more hardware-specific operations, higher level languages like Node.js have much of that abstracted away.