Can your app run on a mainframe?

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Linux Application Summit 2020
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
Popular Hardware Architectures

- **amd64** – 64-bit x86 (typical laptop, desktop, server)
- **arm / armhf** – 32-bit ARM (older cellphones, Raspberry Pi 1 & 2)
- **arm64** – 64-bit ARM (modern cellphones, Raspberry Pi 3 & 4)
- **ppc64(le)** – 64-bit PowerPC (IBM POWER servers, Wii U, PS3, Xbox 360)
- **s390x** – IBM Z (mainframes)
Open Source Legacy: SHARE

- 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_(computing)
Linux on IBM Z

- 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 on Z Today

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.
So, you have an app!

Here's a few things to know.

• Graphical app? Sorry, you probably won't get very far.
• Server-side apps? We were made for you!
• Data-driven apps? No seriously, mainframes were literally made for you.
• Dependent upon encryption and encryption? You need to check out the cryptographic hardware in these things!
Are other projects porting their apps?

Yep!
Growing IBM Z & LinuxONE Open Source Ecosystem

- Linux Distributions & Virtualization
- Cloud & Container Services
- Languages & Runtimes
- DevOps/Automation
- Big Data, Observability, Analytics

Community Versions
- Red Hat
- SUSE
- Ubuntu
- KVM
- Debian
- openSUSE
- ClefOS
- Fedora
- Alpine
- NGINX
- HAProxy
- Mesos
- Prometheus
- Zabbix
- Apache ZooKeeper
- etcd

Networking & Monitoring
- Docker
- LXD
- OpenStack
- Kubernetes
- Minikube
- Helm
- Istio
- Kafka
- Fluentd
- Logstash
- Grafana
- Elasticsearch
- Kibana

Cloud & Container Services
- Docker
- LXD
- OpenStack
- Kubernetes
- Minikube
- Helm
- Istio

Languages & Runtimes
- Java
- Python
- Go
- Ruby
- Scala
- Node
- PHP
- Go
- Erlang
- Pypy
- Ruby
- Python
- Scala

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

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

Middleware
- CouchDB
- Redis
- Couchbase
- Cassandra
- HBase

Databases
- MongoDB
- MariaDB
- MySQL
- PostgreSQL
- couchbase
- Cassandra
- HBase

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
- alpine
- ubuntu
- ClefOS
- debian
- fedora

Cloud, Web, Languages & Runtimes
- docker
- pypy
- python
- Ruby
- jRuby
- Open Liberty
- Go
- node
- Perl
- php
- OpenJDK
- Apache
- HTPer
- REDMINE
- HAPROXY
- ownCloud
- BusyBox
- Java
- OpenEuler
- WordPress
- ZooKeeper
- BASH
- Joomla
- Drupal

Networking & Monitoring
- Nginx
- Memcached

DevOps/Automation
- Maven
- Gradle
- Matomo
- fluent
- Apache
- Solr
- ETL
- Storm

Big Data, Observability, Analytics
- Flink
- Memcached

Middleware
- RabbitMQ
- RabbitMQ
- Mosquitto
- Express Gateway
- Express Gateway

Databases
- MongoDB
- Postgres
- Redis
- Adminer
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/
- 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
• 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 modes of gzip, 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 17 processor in 64-bit mode, Snappy compresses at about 250 MB/second and decompresses at about 500 MB/second 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/
• Source code across architectures will generally be identical, but it needs to be compiled (C, C++), or otherwise interpreted (Python, Node.js) for the 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.
• In a perfect world, high-level languages will work flawlessly
• ...in reality, complicated dependencies are my nemesis, but don't let that scare you off!
Thank you!

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