Wait, People Run Kubernetes on Mainframes?

Elizabeth K. Joseph, IBM
@pleia2
Once upon a time...

I worked on distributed systems.

I thought mainframes were old, legacy, and out-dated technology.
Once upon a time...

When I spoke with customers and community members, the story was typical:

A new "DevOps team" was brought in to "modernize the platform" and do away with the mainframe...
Once upon a time...

The mainframe team continues to be sequestered in their own space in the technology organization.
18 months later, the "modernization" project has microservice-d a lot of things, but it "stalled" without replacing the mainframe.
Elizabeth K. Joseph, IBM

Linux Systems Administrator

Open Source Contributor

Developer Advocate

Author
What is a mainframe?

IBM System 360 (s/360), 1964

IBM z15, 2019
What is a mainframe?

A big computer. (but not as big as they used to be)

40TB of RAM, and 60 PCIe control units across 12 PCIe I/O drawers.

22 dedicated I/O offload processors (SAPs) pre-allocated and up to 85 Logical partitions (LPARs).
What is a mainframe?

Not x86.

(IBM Z | zArchitecture | s390x)

190 5.2 ghz processor units, with 12 cores per chip.
What is a mainframe?
What is a mainframe?

Plus storage.

(measured in Petabytes!)
**What is a mainframe?**

*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**

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

Source:

So, you have a mainframe

...but you want some of that latest, shiny, whiz-bang DevOps stuff! And containers! Some Kubernetes, too!
Once upon a time...

Why did that "modernization" effort conclude the way it did?
Mainframes are quite nice!

No-fuss, enterprise-grade storage, and fast access to that storage.

Fastest commercially-available processors.

Unmatched hardware reliability and 99.999% uptime.

Fast, pre-configured communication between VMs.

Hardware-driven cryptography.

Security through the highest rated HSM (Hardware Security Module).
They run Linux

...and they have for 20+ years.

Community efforts to port Linux to the mainframe were made public in 1998.

IBM released the first set of kernel patches in December 1999.

In October of 2000, SUSE Enterprise Linux was released for the mainframe (the x86 version didn't come until April 2001!)
Did you see that? Kubernetes!

And there are binaries released by the project.

### Client Binaries

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<thead>
<tr>
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<th>sha512 hash</th>
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<tr>
<td>kubernetes-client-darwin-386.tar.gz</td>
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### Server Binaries

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</table>
So, who does this?

SUSE Enterprise Linux

https://developer.ibm.com/storage/2019/03/01/kubernetes-1-12-on-suse-linux-using-kubeadm/
So, who does this?

Red Hat Enterprise Linux with OpenShift
So, who does this?

Ubuntu with the Canonical Distribution of Kubernetes
https://ubuntu-on-big-iron.blogspot.com/2019/08/deploy-cdk-on-ubuntu-s390x.html
CDK Infrastructure

LXD example, here with 10 systems total

business / user workload

runtime for user workload

kubernetes infrastructure, here CDK

machine / system infrastructure, here LXD

but can be: LPAR, KVM, MAAS, public Clouds, OpenStack, etc.

CRI (containerd)
So, who does this?

Sine Nomine Associates with OpenShift Origin
https://www.sinenomine.net/products/linux/OpenShift
ICU IT Services

"ICU is a services and solutions company and we are helping our clients with integrating their traditional zOS environments with new (private) cloud environments."
The same reasons we all use Kubernetes! Strong orchestration, huge ecosystem.
Integration with traditional z/OS environments, such as running containerized workloads close to their large data environments (DB2 on z/OS or Oracle on Linux on z) to reduce latency.
...for?

End-to-end, hardware-driven, pervasive encryption.
Secured container environments for blockchain workloads.
And Hybrid Cloud!

Run the same workloads, with the same tools, on premises and in the cloud.

There is strength in diversification of architectures – you can shift your workloads to different architectures when something like Meltdown or Spectre hits.
Once upon a time...

Get the mainframe team out of hiding, even if they don't like it.

Remember that the mainframe is very good at certain things and use them for those strengths.

Integrate the mainframe into your plans.

Use open source tooling such as projects from the Open Mainframe Project.
Thank you!

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