

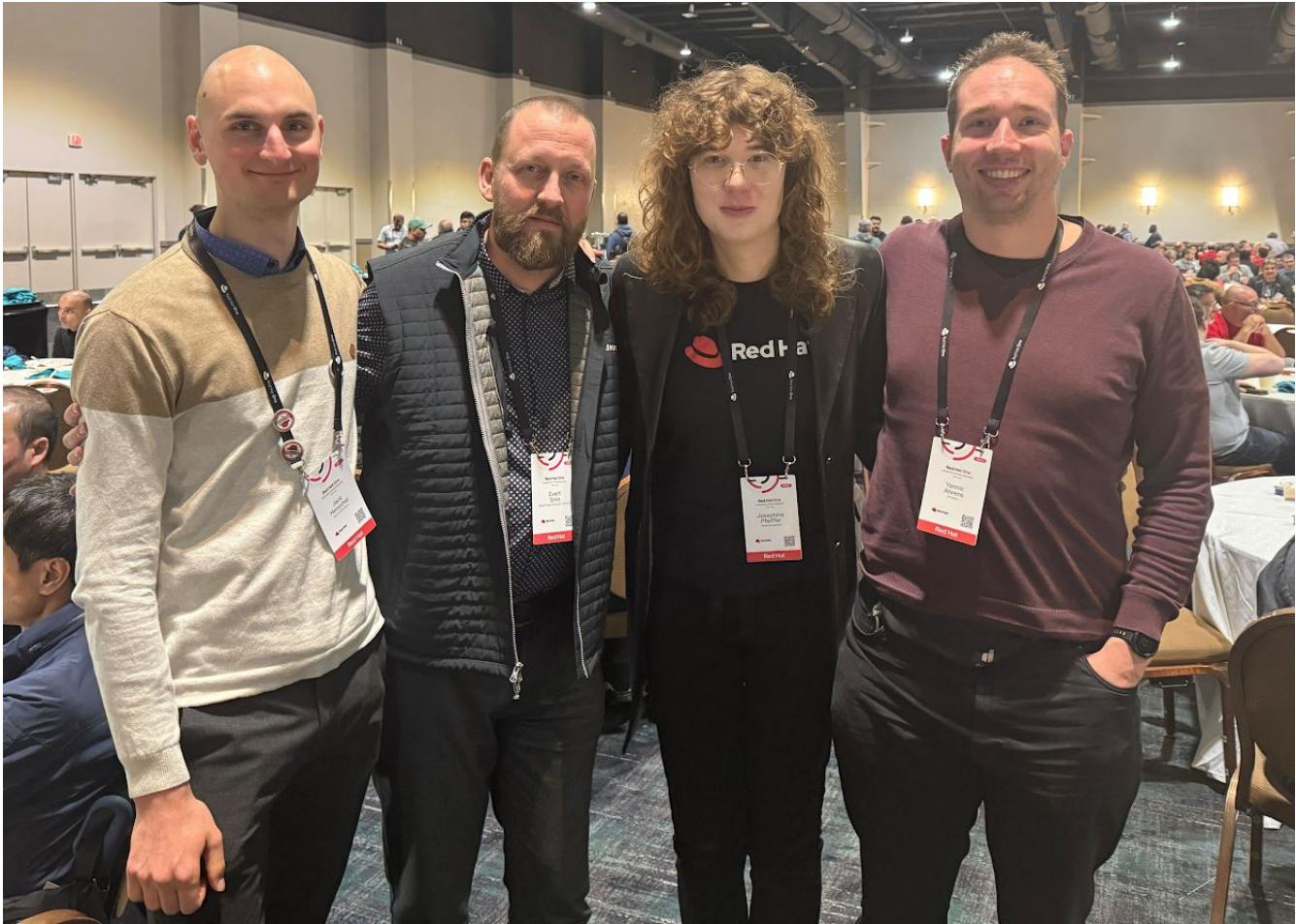
mainframes aren't dead, they're just running kubernetes now!

josephine pfeiffer, 06/2025



Czech & Slovak

shoutout ^^



questions I want to answer today

- what are mainframes?
- do they still matter?
- how do they work?
- why would you put containers on them?
- how do you put containers on them?



**aren't mainframes
legacy infrastructure?**

yes... but also no!

aren't mainframes just big, expensive servers?



90%

of all credit card
transactions are handled by
mainframes [1]

71%

of fortune 500 companies use
mainframes [1]

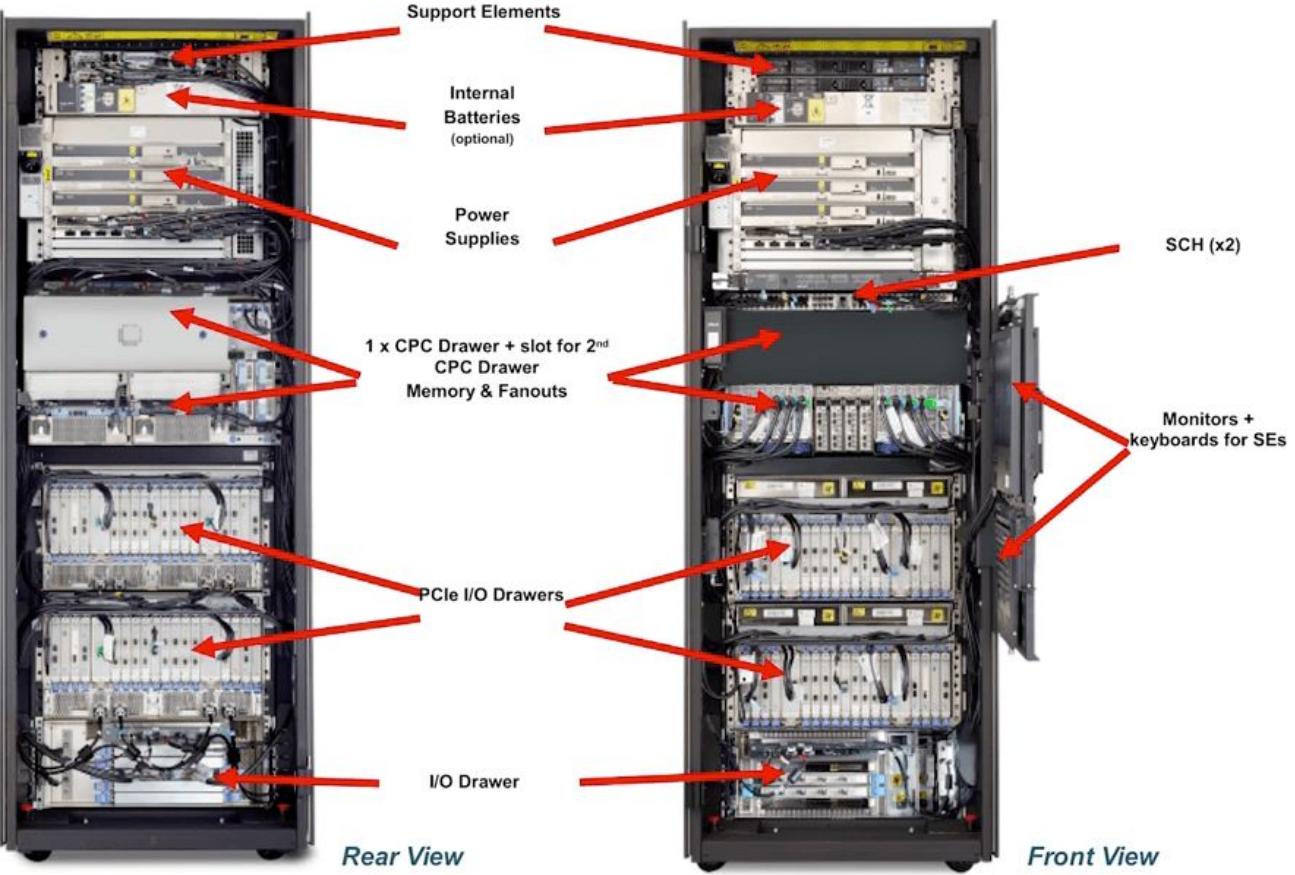
68%

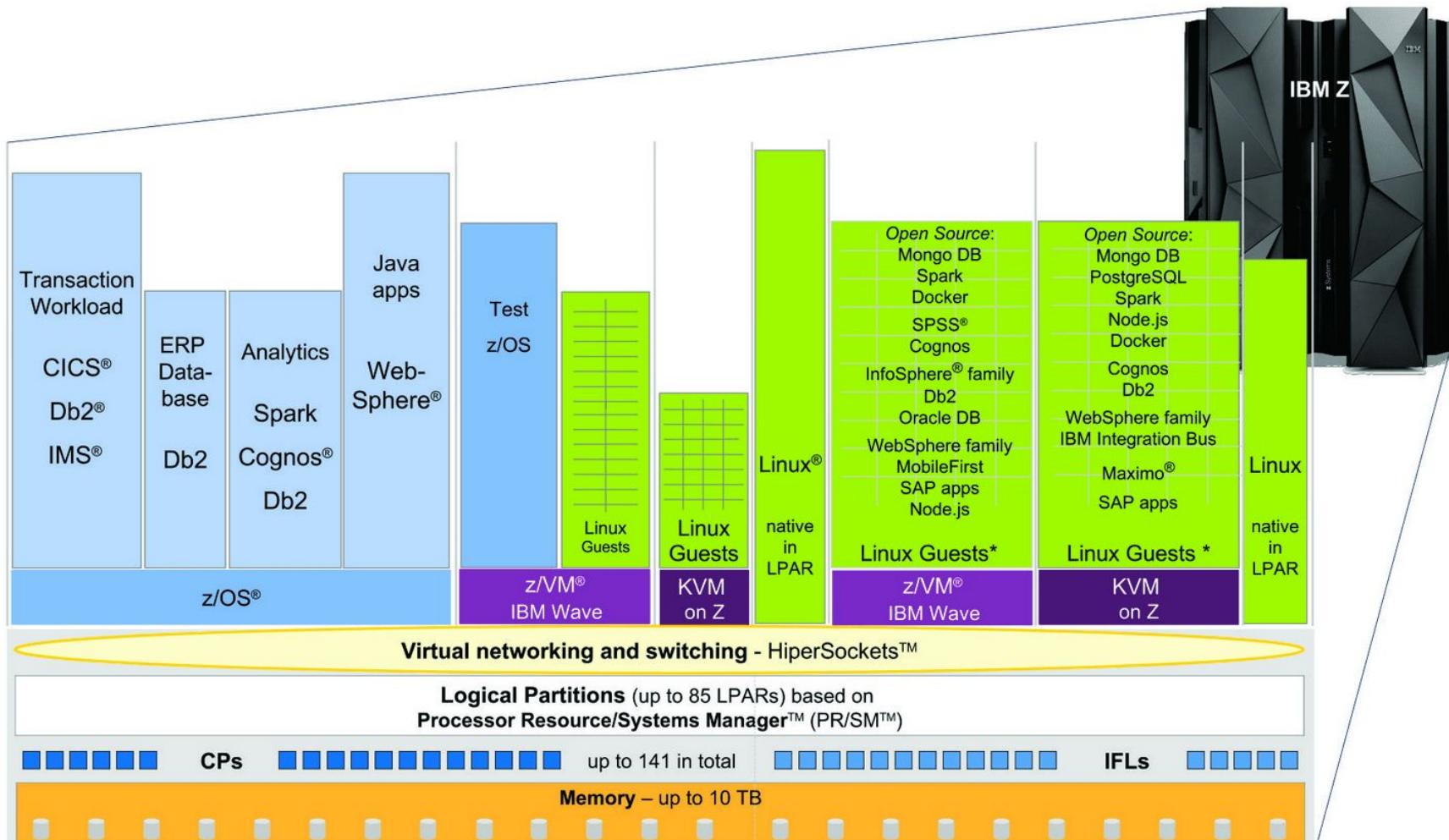
of the world's production
workloads run on
mainframes, yet they only
account for 6% of costs [2]

[1] <https://planetmainframe.com/2022/12/relevance-of-mainframe/>

[2] <https://www.precisely.com/blog/mainframe/mainframe-technology-trends-2023>

how do they work?

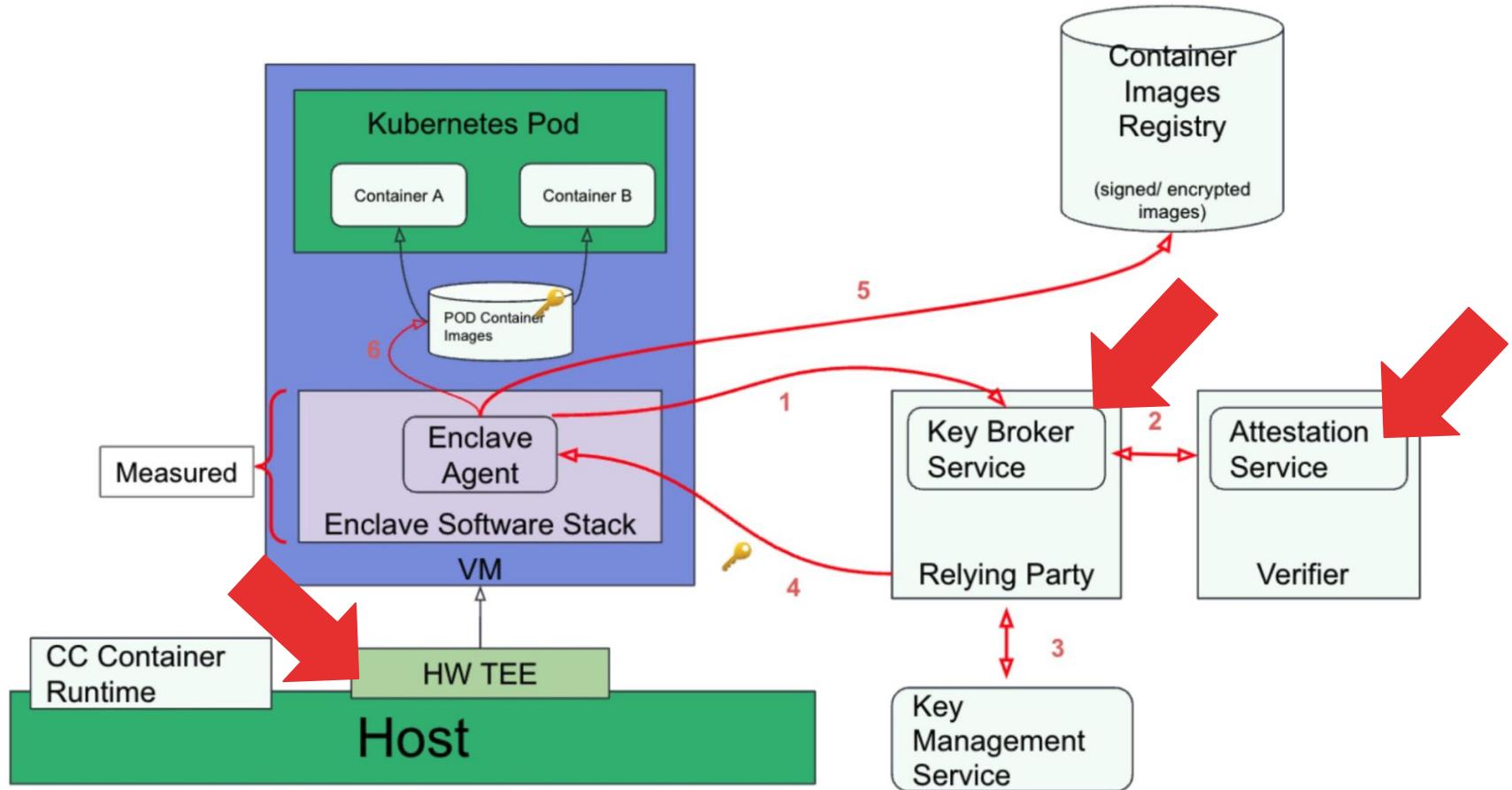




* some workload examples

**why would you put
containers on them?**





**how do you put
containers on them?**

s390x vs x86



x86 cluster

(bare metal)



2x ctl plane

1x worker

worker z/VM



it's easy, right?

yes :D

1 Node Details:

2 Architecture: s390x

3 Container Runtime Version: cri-o://1.33.0

4 Kubelet Version: v1.29.15

5 Kube-Proxy Version: v1.29.15

6 PodCIDR: 10.244.2.0/24

7 PodCIDRs: 10.244.2.0/24

	NAME	STATUS	AGE	VERSION	OS-IMAGE	KERNEL-VERSION	ARCH
1	k8s-master-1	Ready	2025-04-16	v1.29.15	Ubuntu 22.04 LTS	5.15.0-136-generic	amd64
2	k8s-worker-1	Ready	2025-04-16	v1.29.15	Ubuntu 22.04 LTS	5.15.0-136-generic	amd64
3	k8s-worker-2	Ready	2025-04-16	v1.29.15	Ubuntu 22.04.1 LTS	5.15.0-56-generic	s390x

```
1  Image:          s390x/postgres:latest
2  Image ID:       docker.io/s390x/postgres@sha256:<sha>
3  Port:           5432/TCP
4  Host Port:     0/TCP
5  State:          Running
6  Started:        Wed, 16 Apr 2025 21:28:56 +0200
```

x86 cluster

(bare metal)



3x ctl plane

3x worker



worker lpar



it's easy, right?

no :(

what's in an s390x iso?

```
1 tree rhcos
2 rhcos
3   └── boot.catalog
4   └── coreos
5     ├── features.json
6     ├── igninfo.json
7     ├── kargs.json
8     └── miniso.dat
9   └── generic.ins
10  └── images
11    ├── cdboot.img
12    ├── cdboot.prm
13    ├── genericdvd.prm
14    └── generic.prm
15      └── initrd.addrsize
16    └── pxeboot
17      ├── initrd.img
18      └── kernel.img
19      └── rootfs.img
20    └── redhat.exec
21
22 4 directories, 15 files
```



generic.ins

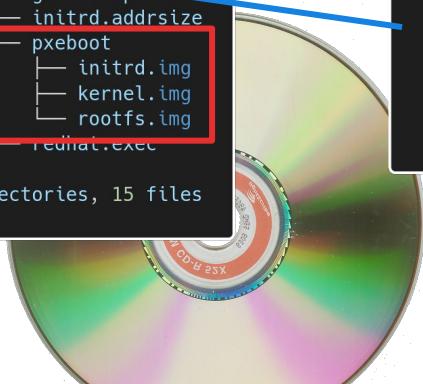
```
1 images/kernel.img 0x00000000
2 images/initrd.img 0x02000000
3 images/genericdvd.prm 0x00010480
4 images/initrd.addrsize 0x00010408
```

generic.prm

```
1 rd.neednet=1 console=ttySclp0 coreos.inst.install_dev=sda
2 coreos.live.rootfs_url=http://<HTTP_SERVER>/rhcos-416.94.202410211619-0-live-rootfs.s390x.img
3 coreos.inst.ignition_url=http://<HTTP_SERVER>/ignition/worker.ign ip=dhcp
4 nameserver=<DNS_IP> cio_ignore=all,!condev zfcp.allow_lun_scan=0
5 rd.zfcp=0.0.<FCP_DEV>,0x<WWPN>,0x<LUN>
```

what's in an s390x iso?

```
1 tree rhcos
2 rhcos
3   └── boot.catalog
4   └── coreos
5     ├── features.json
6     ├── igninfo.json
7     ├── kargs.json
8     └── miniso.dat
9   └── generic.ins
10  └── images
11    └── cdboot.img
12    └── cdboot.prm
13    └── genericdvd.prm
14    └── generic.prm
15    └── initrd.addrsize
16    └── pxeboot
17      └── initrd.img
18      └── kernel.img
19      └── rootfs.img
20    └── reuidat.exec
21
22 4 directories, 15 files
```



generic.ins

```
1 images/kernel.img 0x00000000
2 images/initrd.img 0x02000000
3 images/genericdvd.prm 0x00010480
4 images/initrd.addrsize 0x00010408
```

generic.prm

```
1 rd.neednet=1 console=ttySclp0 coreos.inst.install_dev=sda
2 coreos.live.rootfs_url=http://<HTTP_SERVER>/rhcos-416.94.202410211619-0-live-rootfs.s390x.img
3 coreos.inst.ignition_url=http://<HTTP_SERVER>/ignition/worker.ign ip=dhcp
4 nameserver=<DNS_IP> cio_ignore=all,!condev zfcp.allow_lun_scan=0
5 rd.zfcp=0.0.<FCP_DEV>,0x<WWPN>,0x<LUN>
```

what's in an s390x iso?

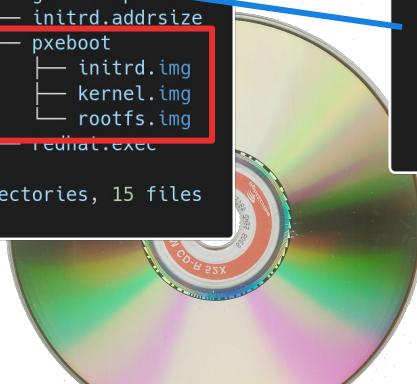
generic.ins

```
1 images/pxeboot/kernel.img 0x00000000
2 images/pxeboot/initrd.img 0x02000000
3 images/generic.prm 0x00010480
4 images/initrd.addrsize 0x00010408
```

```
1 tree rhcos
2 rhcos
3   └── boot.catalog
4   └── coreos
5     ├── features.json
6     ├── igninfo.json
7     ├── kargs.json
8     └── miniso.dat
9   └── generic.ins
10    └── images
11      ├── cdboot.img
12      ├── cdboot.prm
13      ├── genericdvd.prm
14      ├── generic.prm
15      └── initrd.addrsize
16    └── pxeboot
17      ├── initrd.img
18      ├── kernel.img
19      └── rootfs.img
20
21
22 4 directories, 15 files
```

generic.prm

```
1 rd.neednet=1 console=ttySclp0 coreos.inst.install_dev=sda
2 coreos.live.rootfs_url=http://<HTTP_SERVER>/rhcos-416.94.202410211619-0-live-rootfs.s390x.img
3 coreos.inst.ignition_url=http://<HTTP_SERVER>/ignition/worker.ign ip=dhcp
4 nameserver=<DNS_IP> cio_ignore=all,!condev zfcp.allow_lun_scan=0
5 rd.zfcp=0.0.<FCP_DEV>,0x<WWPN>,0x<LUN>
```



josie Thursday at 2:45 PM

we don't have that many mainframe customers I suppose ^^

Nikita Thursday at 2:45 PM

i even guess CoreOS+LPAR wasn't ever used

Partition Details - REDHATLPAR1

General

Status

Controls

Processors

Memory

Network

Storage

Cryptos

Partition links

Boot

- ▾ Boot

Boot from:

ISO Image

Secure Boot:



*.ISO image file: fixed-rhcos.iso

Browse

*.INS file: /generic.ins

Browse

Boot loader time-out (60-600s):

60

Uploading: 17%



Cancel

Home

Partition Details - REDHATL...



Partition Details - REDHATLPAR1

General

- ▾ Boot

Status

Boot from:

Controls



Processors

* Host name:

Memory

* User name:

Network

* Password:

Storage

* .INS file:

Cryptos

Partition links

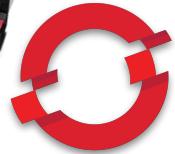


Boot

Boot loader time-out (60-600s): 

x86 cluster

(bare metal)



coreos.inst.ignition_url=
<https://<ip0>:22623/config/worker>

worker lpar

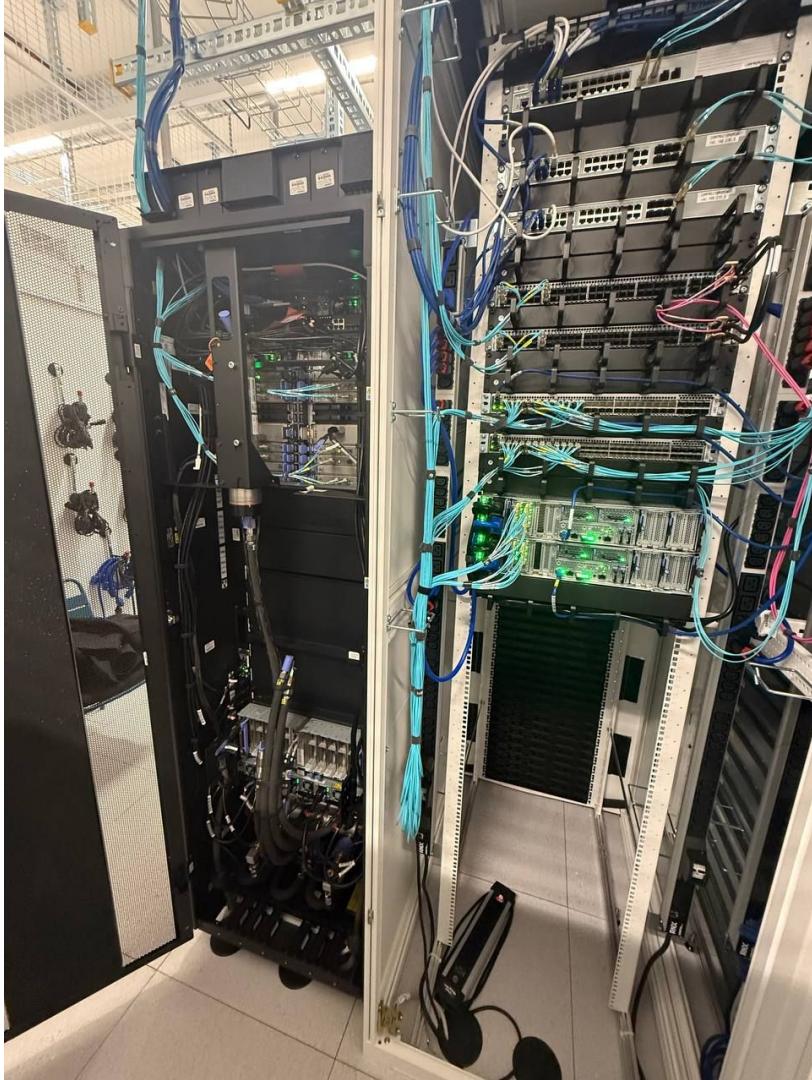


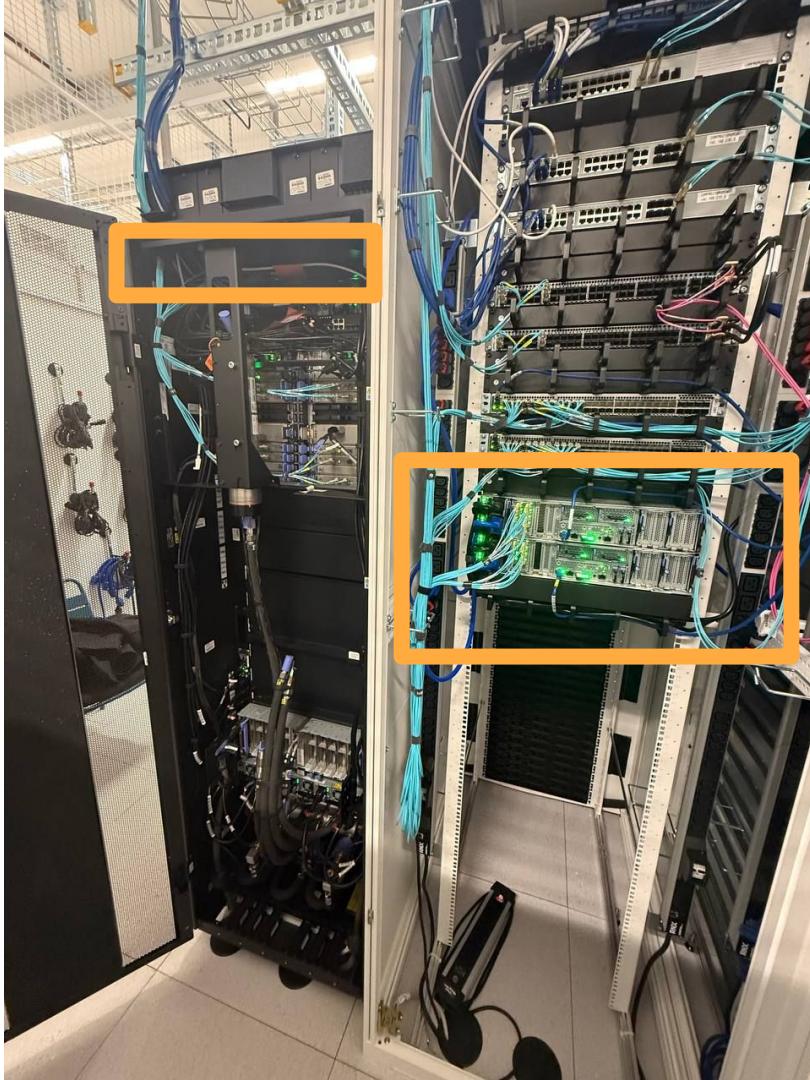
sftp server



storage system







**jumphost
+ x86 cluster**

Operating System Messages - CPCD:REDHATLP

Timestamp	Message	Priority
[93.426167]	systemd[1]: Closed udev Control Socket.	-
[93.426202]	systemd[1]: dracut-pre-trigger.service: Deactivated successfully.	-
[93.426224]	systemd[1]: Stopped dracut pre-trigger hook.	-
[93.426265]	systemd[1]: dracut-pre-udev.service: Deactivated successfully.	-
[93.426288]	systemd[1]: Stopped dracut pre-udev hook.	-
[93.426326]	systemd[1]: dracut-cmdline.service: Deactivated successfully.	-
[93.426348]	systemd[1]: Stopped dracut cmdline hook.	-
[93.426383]	systemd[1]: afterburn-network-kargs.service: Deactivated successfully.	-
[93.426409]	systemd[1]: Stopped Afterburn Initrd Setup Network Kernel Arguments.	-
[93.426443]	systemd[1]: dracut-cmdline-ask.service: Deactivated successfully.	-
[93.426465]	systemd[1]: Stopped dracut ask for additional cmdline parameters.	-
[93.426959]	systemd[1]: run-credentials-systemd\x2dtmpfiles\x2dsetup.service.mount: Deactivated successfully.	-
[93.427022]	systemd[1]: run-credentials-systemd\x2dsysctl.service.mount: Deactivated successfully.	-
[93.427412]	systemd[1]: run-ephemeral.mount: Deactivated successfully.	-
[93.427551]	systemd[1]: Unmounted /run/ephemeral.	-
[93.427919]	systemd[1]: sysroot-xfs-ephemeral-mkfs.service: Deactivated successfully.	-
[93.427943]	systemd[1]: Stopped sysroot-xfs-ephemeral-mkfs.service.	-
[93.427981]	systemd[1]: systemd-tmpfiles-setup-dev.service: Deactivated successfully.	-
[93.428004]	systemd[1]: Stopped Create Static Device Nodes in /dev.	-
[93.428114]	systemd[1]: kmod-static-nodes.service: Deactivated successfully.	-
[93.428142]	systemd[1]: Stopped Create List of Static Device Nodes.	-
[93.428177]	systemd[1]: systemd-sysusers.service: Deactivated successfully.	-
[93.428196]	systemd[1]: Stopped Create System Users.	-
[93.428425]	systemd[1]: run-credentials-systemd\x2dtmpfiles\x2dsetup\x2ddev.service.mount: Deactivated successfully.	-
[93.428465]	systemd[1]: run-credentials-systemd\x2dsysusers.service.mount: Deactivated successfully.	-
[93.446664]	systemd[1]: multipathd.service: Deactivated successfully.	-
[93.446833]	systemd[1]: Stopped Device-Mapper Multipath Device Controller.	-
[93.446935]	systemd[1]: systemd-udevd-kernel.socket: Deactivated successfully.	-
[93.446959]	systemd[1]: Closed udev Kernel Socket.	-
[93.446978]	systemd[1]: Startup finished in 3.095s (kernel) + 0 (initrd) + 1min 30.351s (userspace) = 1min 33.446s.	-
[?2004h:/#]		-

Total: 991 Selected: 0

Command: Priority message

Administrator

Home

Operators

Workloads

Networking

Storage

Builds

Observe

Compute

User Management

Administration

You are logged in as a temporary administrative user. Update the cluster OAuth configuration to

Nodes

Filter

Name

Search by name...

/



Name	Status	Roles	Pods	Memory	CPU
master-srv09d	Ready	control-plane, master, worker	36	11.91 GiB / 188.7 GiB	5.762 cores / 128 cores
master-srv10d	Ready			14.27 GiB / 188.7 GiB	1.442 cores / 128 cores
master-srv11d	Ready			18.3 GiB / 188.7 GiB	2.278 cores / 128 cores
worker-lpar01	Not Ready			-	-
worker-srv12d	Ready			9.63 GiB / 188.7 GiB	0.778 cores / 128 cores
worker-srv13d	Ready			6.3 GiB / 188.7 GiB	0.358 cores / 128 cores

Node status

Approval required

This node has a pending server certificate signing request. Approve the request to enable all networking functionality on this node.

Request

CSR csr-mzx6d

Created

May 23, 2025, 3:29 PM

Approve Deny

1	NAME	STATUS	ROLES	AGE	ARCH
2	master-srv09d	Ready	control-plane,master,worker	22d	amd64
3	master-srv10d	Ready	control-plane,master,worker	22d	amd64
4	master-srv11d	Ready	control-plane,master,worker	22d	amd64
5	worker-lpar01	Ready	worker	13d	s390x
6	worker-srv12d	Ready	worker	22d	amd64
7	worker-srv13d	Ready	worker	22d	amd64

yay :D

wrap up

further reading

porting FOSS to mainframe architecture
go.josie.lol/ambitus

IBM LinuxONE Community Cloud (play with z/VM)
go.josie.lol/linux1cc

OpenShift Sandboxed Containers
go.josie.lol/coco



q&a

 josie.lol

 josie@redhat.com

