



Red Hat

Forensic Container Checkpointing and Analysis

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Agenda

Background

Use cases

Forensic Container Analysis

Future

Checkpoint/Restore in Userspace

CRIU

Multiple Integrations Exist

Container Live Migration

OpenVZ

Container Live Migration

Borg

Container Live Migration

LXC/LXD

Container Live Migration

Docker

Container Live Migration

Podman

Container Live Migration

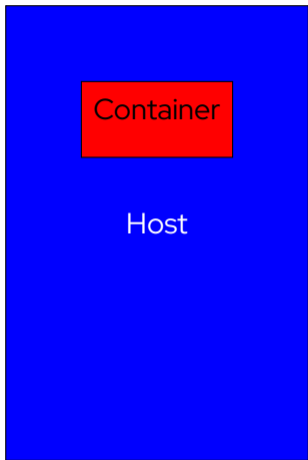
CRI-O

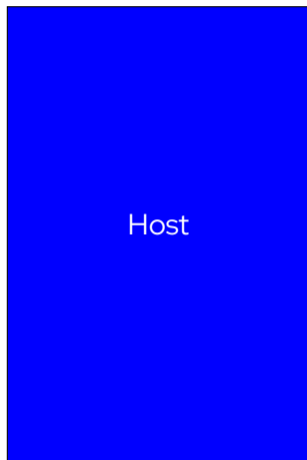
Forensic Container Checkpointing

- <https://github.com/kubernetes/enhancements/pull/1990>
- <https://github.com/kubernetes/enhancements/pull/3264>
- <https://github.com/kubernetes/kubernetes/pull/104907>
- <https://kubernetes.io/blog/2022/12/05/forensic-container-checkpointing-alpha/>
- <https://kubernetes.io/blog/2023/03/10/forensic-container-analysis/>
- <https://www.opensourcerers.org/2023/09/11/forensic-container-checkpointing-in-openshift>

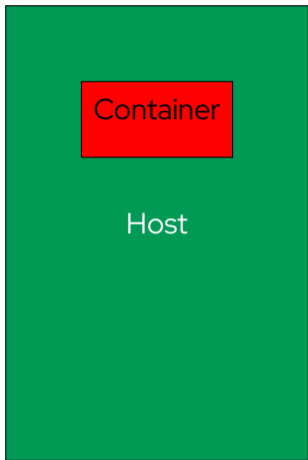
Use Cases

Reboot and Save State

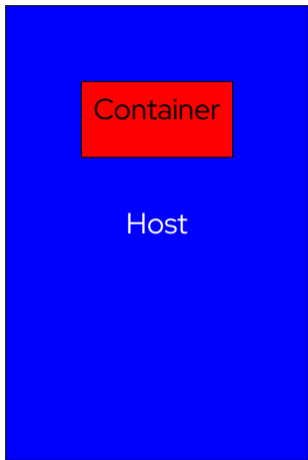


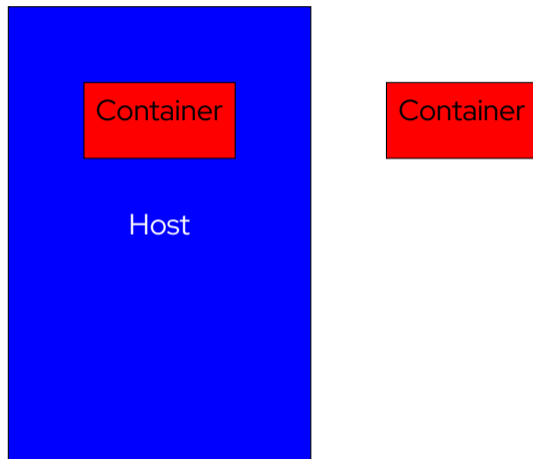


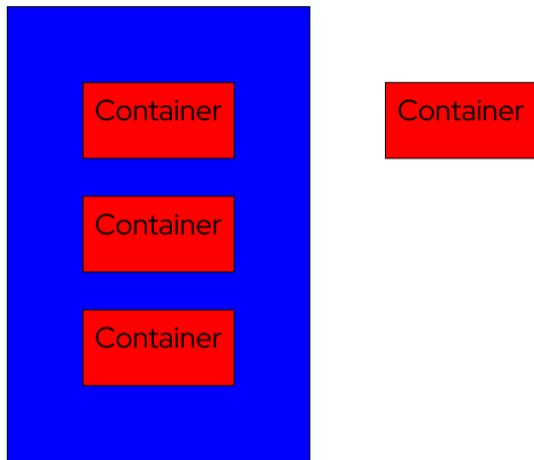
Container



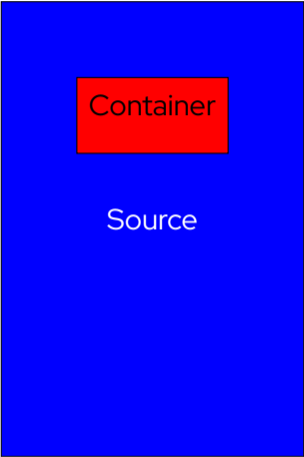
Quick Startup

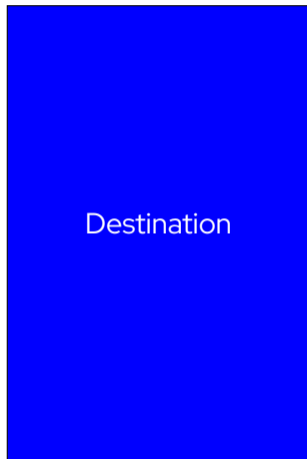
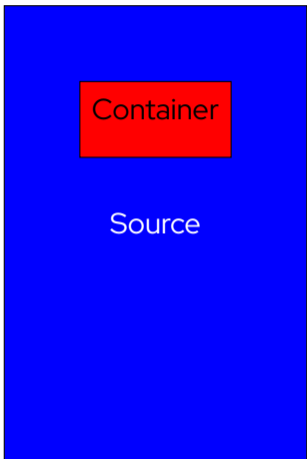


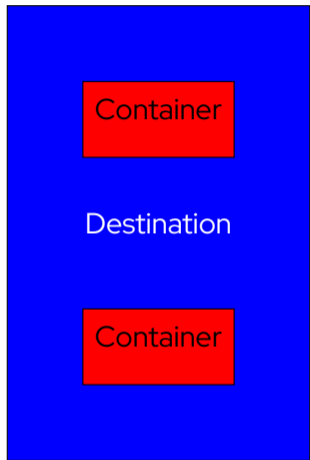
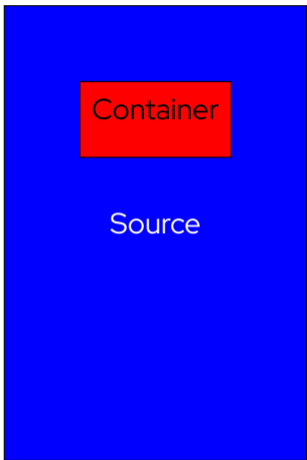




Container Live Migration







Spot instances

Forensic Container Analysis

Forensic Container Analysis

Stateful Container



Forensic Container Analysis

```
checkpointctl
```

Forensic Container Analysis

crit

Forensic Container Analysis

grep

Forensic Container Analysis

`gdb`

What's next?

kubectl checkpoint

Pod Checkpoint/Restore

```
kubectl migrate
```

Scheduler Integration

Checkpoint Image Standard

<https://github.com/opencontainers/image-spec/issues/962>

Summary

- CRIU can checkpoint and restore containers
- Integrated in different containers engines
- Used in production
- Reboot into new kernel without losing container state
- Start multiple copies
- Migrate running containers
- Spot instances
- Forensic container checkpointing (KEP #2008)



Thank you