Java in a Container world

what we've done and where we're going

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Red Hat

History

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Java

- "Write once, run anywhere"

- Provide entire runtime environment

- JARs *(& WARs, etc.)*: redeployable packages

- Managed runtime, Java Servlet specification, sandboxing

Linux Containers

- **Bundle** entire runtime environment

- Open Container Initiative Image Specification

- OCI Runtime spec

3

Cloud Enablement (2015–18)

Containerizing Middleware Applications
jdowland@redhat.com
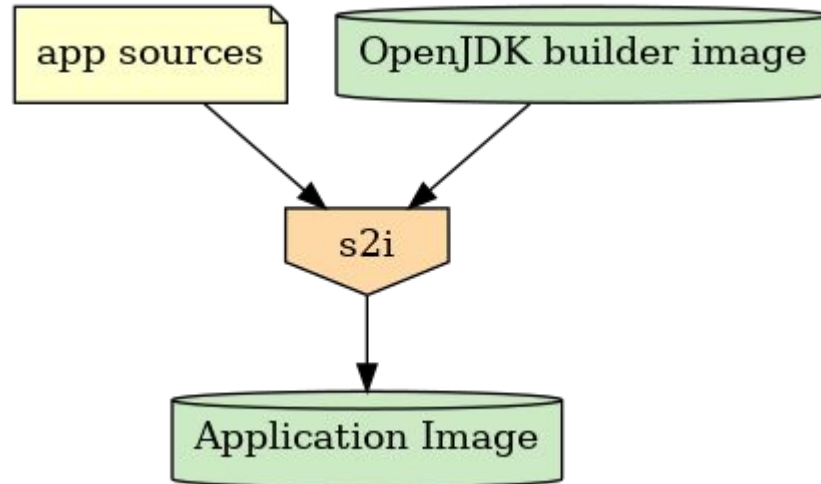2018-03-23

https://cekit.io/

Resource sizing

Shell wrapper script

Configured by environment variables

```
 java -XX:+UseParallelGC -XX:MinHeapFreeRatio=10
-XX:MaxHeapFreeRatio=20 -XX:GCTimeRatio=4
-XX:AdaptiveSizePolicyWeight=90 -XX:+ExitOnOutOfMemoryError -cp "."
-jar /deployments/spring-boot-sample-simple-1.5.0.BUILD-SNAPSHOT.jar
```

https://docs.openshift.com/container-platform/3.11/dev_guide/application_memory_sizing.html#sizing-openjdk

OpenShift Source To Image (S2I)

https://github.com/openshift/source-to-image/blob/master/docs/builder_image.md

Now

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OpenJDK container limit awareness

JDK 9, 2017:

Initially requiring

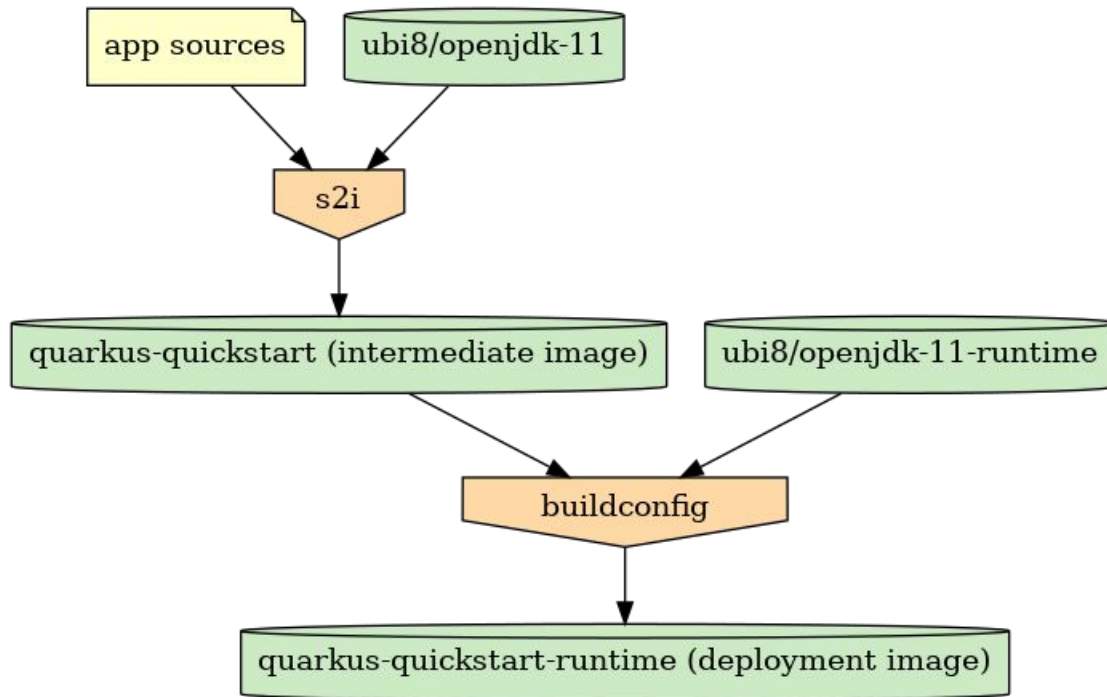`-XX:+UseCGroupMemoryLimitForHeap`

Backported in Red Hat OpenJDK 8

JDK 11, 2018:

Enabled by default

`-X:-UseContainerSupport` to turn it off

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OpenShift BuildConfigs

https://red.ht/3oObZls

What time is it?

A case study

```
🔴 podman run --rm $IMG ls -l /etc/localtime
lrwxrwxrwx 1 root root 29 Oct 14 01:34 /etc/localtime ->
../usr/share/zoneinfo/Europe/London

🔴 podman run --rm --tz Europe/Prague $IMG ls -l
/etc/localtime
-rw-r--r--. 1 root root 2338 Nov 29 17:55 /etc/localtime
```

JVM warm-up times

AOT / Native Image

- GraalVM (Oracle Labs)

- JEP 295: Ahead-of-Time Compilation
  - added in JDK9 (2017)
  - removed again in JDK17 (2021)

- Quarkus - quarkus.io

- Mandrel
  red.ht/2XASwIQ

Checkpoint/restore

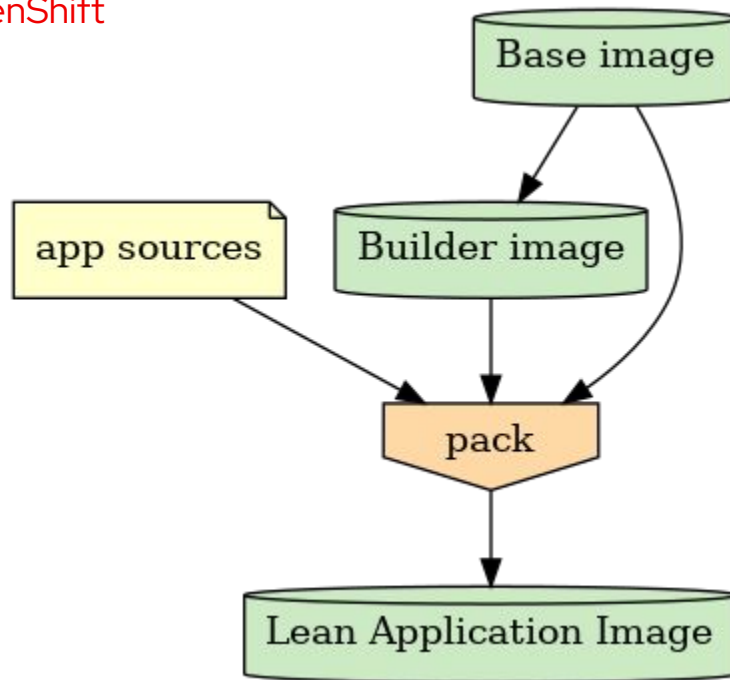CRIU – criu.org

Project CraC

wiki.openjdk.java.net/display/crac

Future

Cloud-native Buildpacks

In OpenShift

https://buildpacks.io/

Separate builder/runner images

Bespoke OpenJDK runtime via Java Modules

Red Hat

Thank you

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