

# What's in a container?

## The OCI Answer

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# A short agenda

- **Why?**
- **Who?**
- **What?**
- **How?**

# A short agenda

- **Why?** ... does OCI exist
- **Who?** ... is working on OCI
- **What?** ... are the OCI standards
- **How?** ... can you play with OCI



**OPEN** CONTAINER  
INITIATIVE



# OPEN CONTAINER INITIATIVE

AN OPEN GOVERNANCE STRUCTURE FOR THE  
EXPRESS PURPOSE OF CREATING OPEN INDUSTRY  
STANDARDS AROUND CONTAINER FORMATS AND  
RUNTIME

**Why?** ... does OCI exist

# Why? ... does OCI exist

- Define **what a container is** in **an open way** so everyone can implement it
  - How to package, annotate, distribute, run, ...
  - Facilitate independent, interoperable tools

# Why? ... does OCI exist

- Define **what a container is in an open way** so everyone can implement it
  - How to package, annotate, distribute, run, ...
  - Facilitate independent, interoperable tools
- Unify the best ideas from Docker, appc, etc
  - Content addressability, composability, signing
  - End the so-called "Container Wars"

**Who? ... is working on OCI**



# Who? ... is working on OCI

- OCI projects have maintainers from:

Huawei

Red Hat

OpenSUSE

CoreOS

Docker

Microsoft

Google

**What?** ... are the OCI standards

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Two separate but connected specifications

# What? ... are the OCI standards

Two separate but connected specifications

- **image-spec**: what's in a container
  - [github.com/opencontainers/image-spec](https://github.com/opencontainers/image-spec)
  - [github.com/opencontainers/image-tools](https://github.com/opencontainers/image-tools)

# What? ... are the OCI standards

Two separate but connected specifications

- **image-spec**: what's in a container
  - [github.com/opencontainers/image-spec](https://github.com/opencontainers/image-spec)
  - [github.com/opencontainers/image-tools](https://github.com/opencontainers/image-tools)
- **runtime-spec**: how to run a container
  - [github.com/opencontainers/runtime-spec](https://github.com/opencontainers/runtime-spec)
  - [github.com/opencontainers/runc](https://github.com/opencontainers/runc)

# OCI Image Spec

- Portable archive format
  - "The thing to distribute"
  - Structured tarball and JSON metadata

# OCI Image Spec

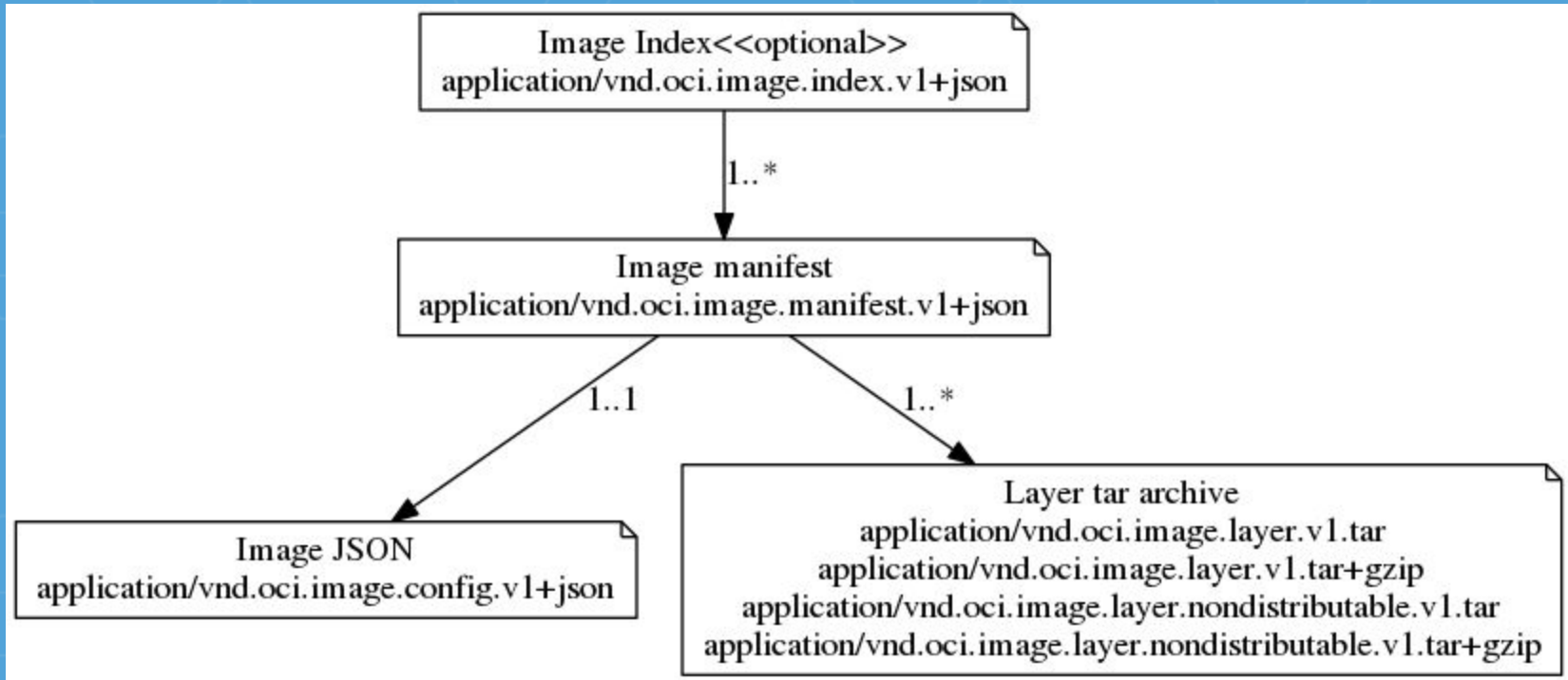
- Portable archive format
  - "The thing to distribute"
  - Structured tarball and JSON metadata
- Core concept: cryptographic addressability
  - All components of an image are content-addressable
  - Linked via *descriptors*

# OCI Image Spec media types

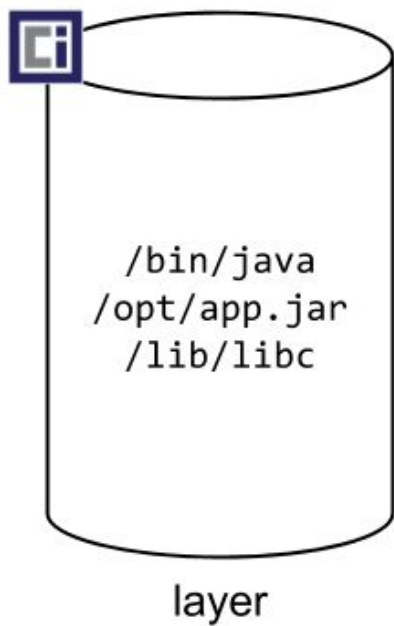
- **application/vnd.oci.image.index.v1+json**
  - Generic "entry point", referencing one or more...
- **application/vnd.oci.image.manifest.v1+json**
  - ...platform/architecture-specific image
- **application/vnd.oci.image.config.v1+json**
  - Runtime configuration (command line, user, etc)
- **application/vnd.oci.image.layer.v1.tar{.gzip}**
  - Container root filesystem layer(s)



# OCI Image media types



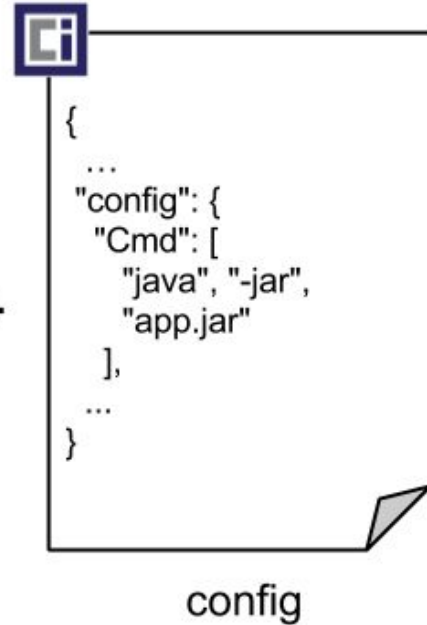
# Anatomy of an OCI Image



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# OCI Image Spec

- Backwards-compatible with Docker:
  - Taking the *de facto* standard Docker v2.2 format and writing it down for everyone to use
- Shared starting point for future innovation in container image format and distribution
- Intended to interoperate with Runtime Spec
  - Define conversion process from image --> runtime

# OCI Runtime Spec

- On-disk layout of a container ("bundle")
  - Extracted root filesystem and configuration, ready to run
- Lifecycle verbs
  - create, start, kill, delete, state
- Multi-platform support
  - Shared general configuration
  - Windows/Solaris/Linux-specific bits

# OCI Runtime Spec

## Example: container state

```
{  
  "ociVersion": "v1.0.0-rc2",  
  "id": "oci-container1",  
  "status": "running",  
  "pid": 4422,  
  "bundlePath": "/containers/redis",  
  "annotations": {  
    "myKey": "myValue"  
  }  
}
```

# How? ... can you play with OCI

- Demo time!
  - Pulling images
  - Unpacking images
  - Modifying images
  - Repacking images
  - Running images
  - Looking at container state
  - ???
  - Profit

# Demo tooling recap

- **projectatomic/skopeo** to fetch/push images
- **openSUSE/umoci** to manipulate
- **opencontainers/runc** to execute
- See also: **opencontainers/image-tools**,  
**projectatomic/buildah**,  
**cooljt0725/docker2oci**, etc

# What's left?

- Now that 1.0 is out, core spec has settled down
- Growing ecosystem of tools supporting both specs
- Preliminary support in major image registries (Amazon ECR, Google GCR, Artifactory, Quay)
- "Ready to use"



# What's left?

- Elephant in the room: **distribution**
  - Still (unilaterally) controversial :-(
- Some proposals in progress:
  - [github.com/xiekeyang/oci-discovery](https://github.com/xiekeyang/oci-discovery)
  - [github.com/cyphar/parcel](https://github.com/cyphar/parcel)

# What's left?

- OCI Image Spec 1.0+
  - Image signatures  
<https://github.com/opencontainers/image-spec/issues/400>  
<https://github.com/opencontainers/image-spec/issues/22>
  - Image distribution  
<https://github.com/opencontainers/image-spec/issues/15>
  - Image dependencies  
<https://github.com/opencontainers/image-spec/issues/102>

# What's left?

- OCI Runtime Spec 1.0+
  - Live container updates?  
<https://github.com/opencontainers/runtime-spec/issues/17>  
<https://github.com/opencontainers/runtime-spec/issues/305>
  - Virtualisation support?  
<https://github.com/opencontainers/runtime-spec/pull/405>

# Join us!

All OCI standards work happens in the open

- GitHub:
  - <https://github.com/opencontainers/image-spec>
  - <https://github.com/opencontainers/runtime-spec>
- Email:
  - [dev@opencontainers.org](mailto:dev@opencontainers.org)

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**Thank you!**