Sharing Is Caring! Push Your Cloud Application to an OCI Registry

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KubeCon | CloudNativeCon
Europe 2020
Virtual

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Outline:
- How registries work
- Case Study

Part 1 - How registries work

What is container registry?

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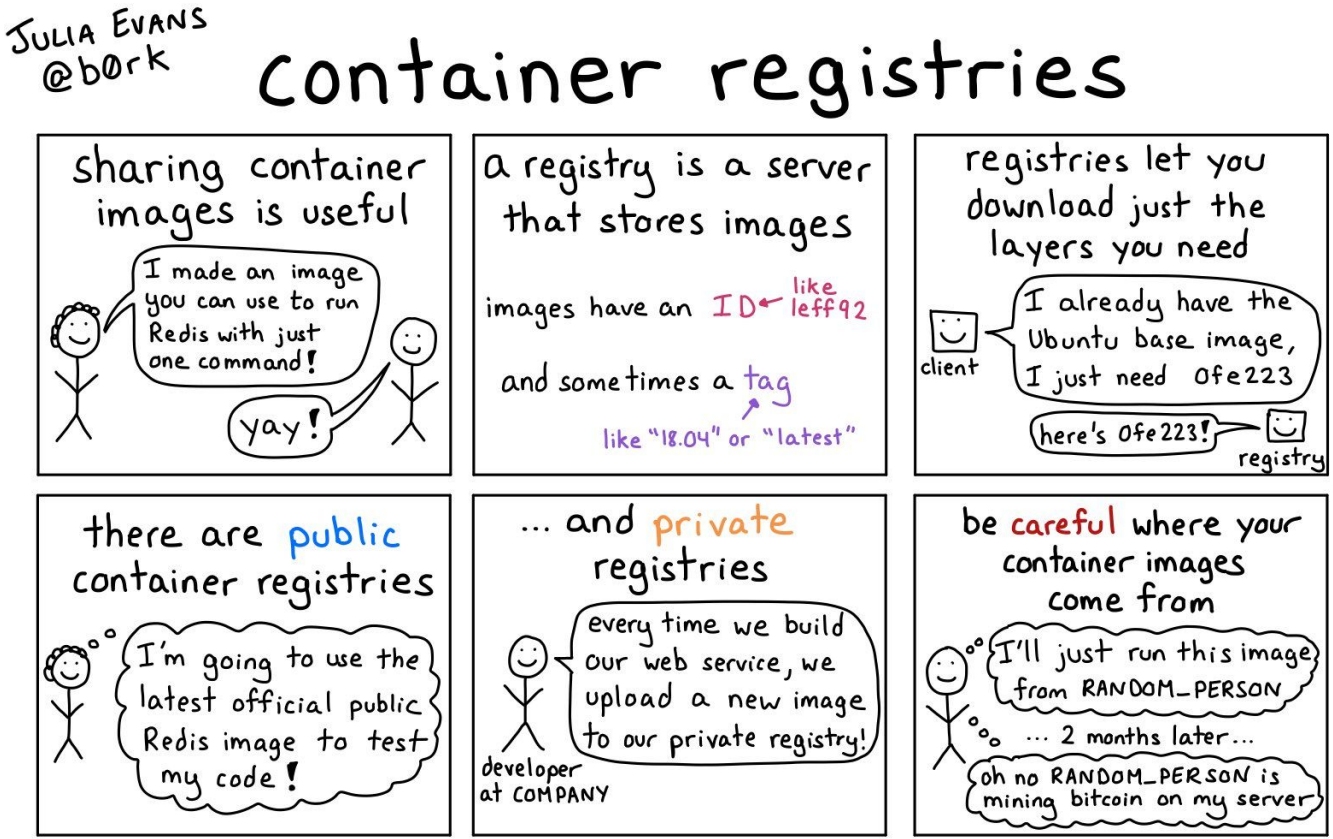


wizardzines.com
@b0rk

OCI specifications 101

Established in 2015 under the Open Container Initiative (OCI) organisation

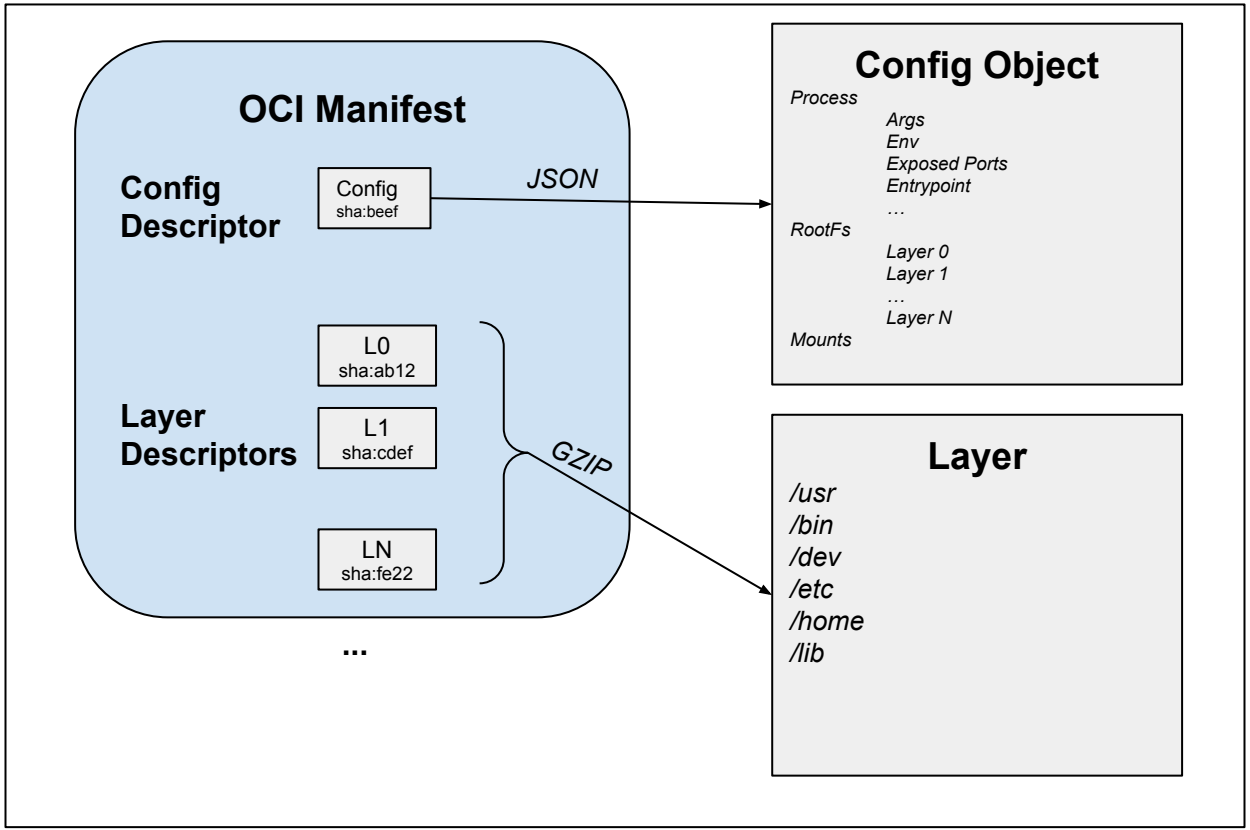
Split into three specifications (github.com/opencontainers)

- Distribution (v1.0.0-rc0 / 2019-02-14)
- Image (v1.0.1 / 2017-11-08)
- Runtime (v1.0.1 / 2017-11-08)

Also under the OCI organisation

- runc
- go-digest

What is an OCI image?



What is an OCI image? Manifest

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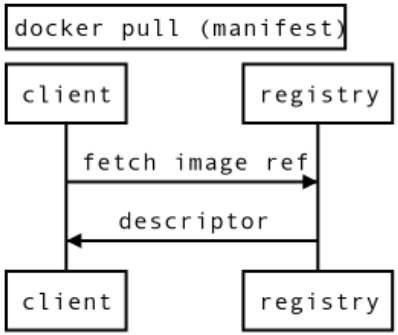
```
{
  "schemaVersion": 2,
  "config": {
    "mediaType": "application/vnd.oci.image.config.v1+json",
    "size": 7023,
    "digest": "sha256:b5b2b2c507a0944348e0303114d8d93aaaa081732b86451d9bce1f432a537bc7"
  },
  "layers": [
    {
      "mediaType": "application/vnd.oci.image.layer.v1.tar+gzip",
      "size": 32654,
      "digest": "sha256:9834876dcfb05cb167a5c24953eba58c4ac89b1adf57f28f2f9d09af107ee8f0"
    },
    {
      "mediaType": "application/vnd.oci.image.layer.v1.tar+gzip",
      "size": 16724,
      "digest": "sha256:3c3a4604a545cdc127456d94e421cd355bca5b528f4a9c1905b15da2eb4a4c6b"
    },
    {
      "mediaType": "application/vnd.oci.image.layer.v1.tar+gzip",
      "size": 73109,
      "digest": "sha256:ec4b8955958665577945c89419d1af06b5f7636b4ac3da7f12184802ad867736"
    }
  ]
}
```

What happens when I pull an image?



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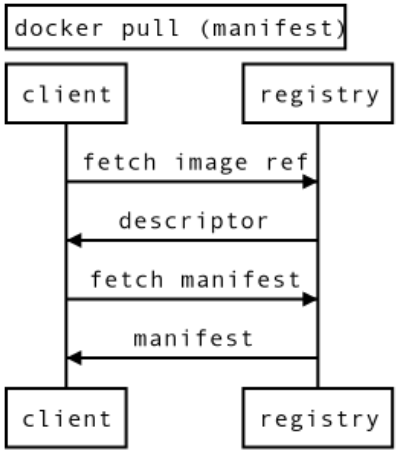

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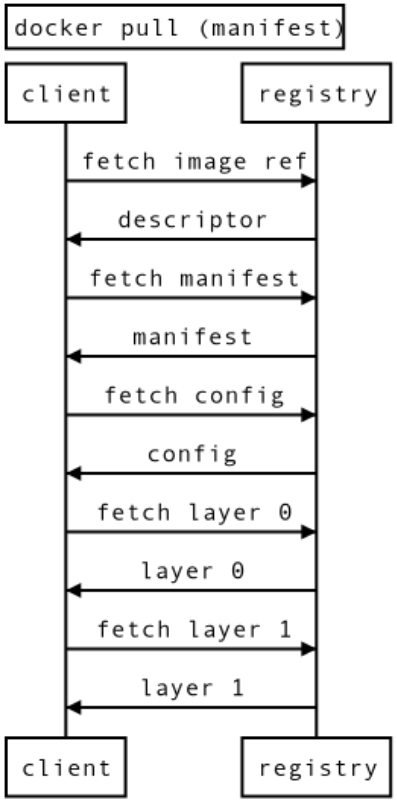

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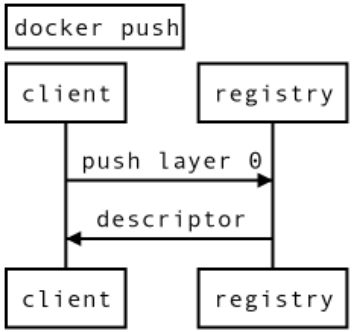

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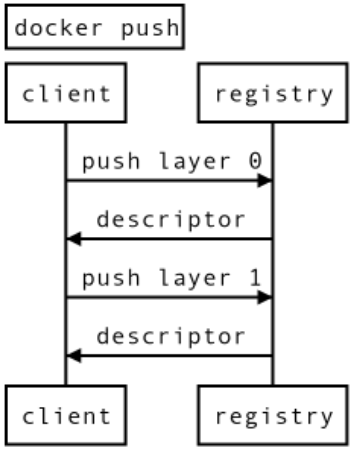

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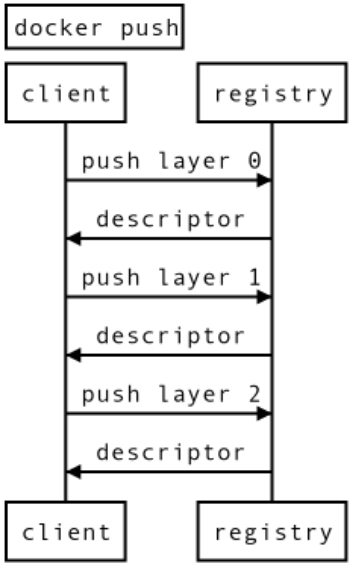

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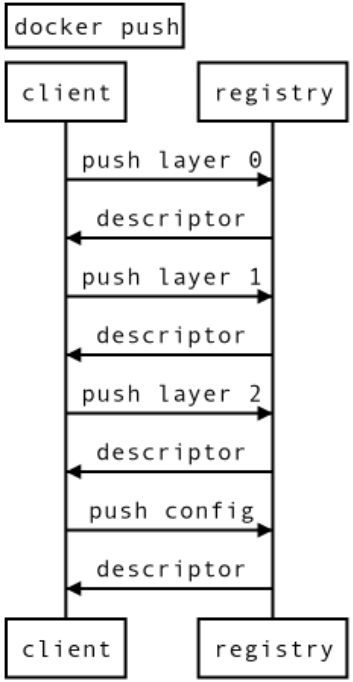

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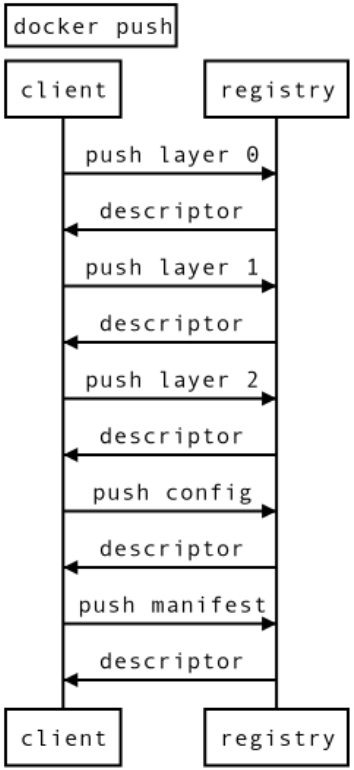
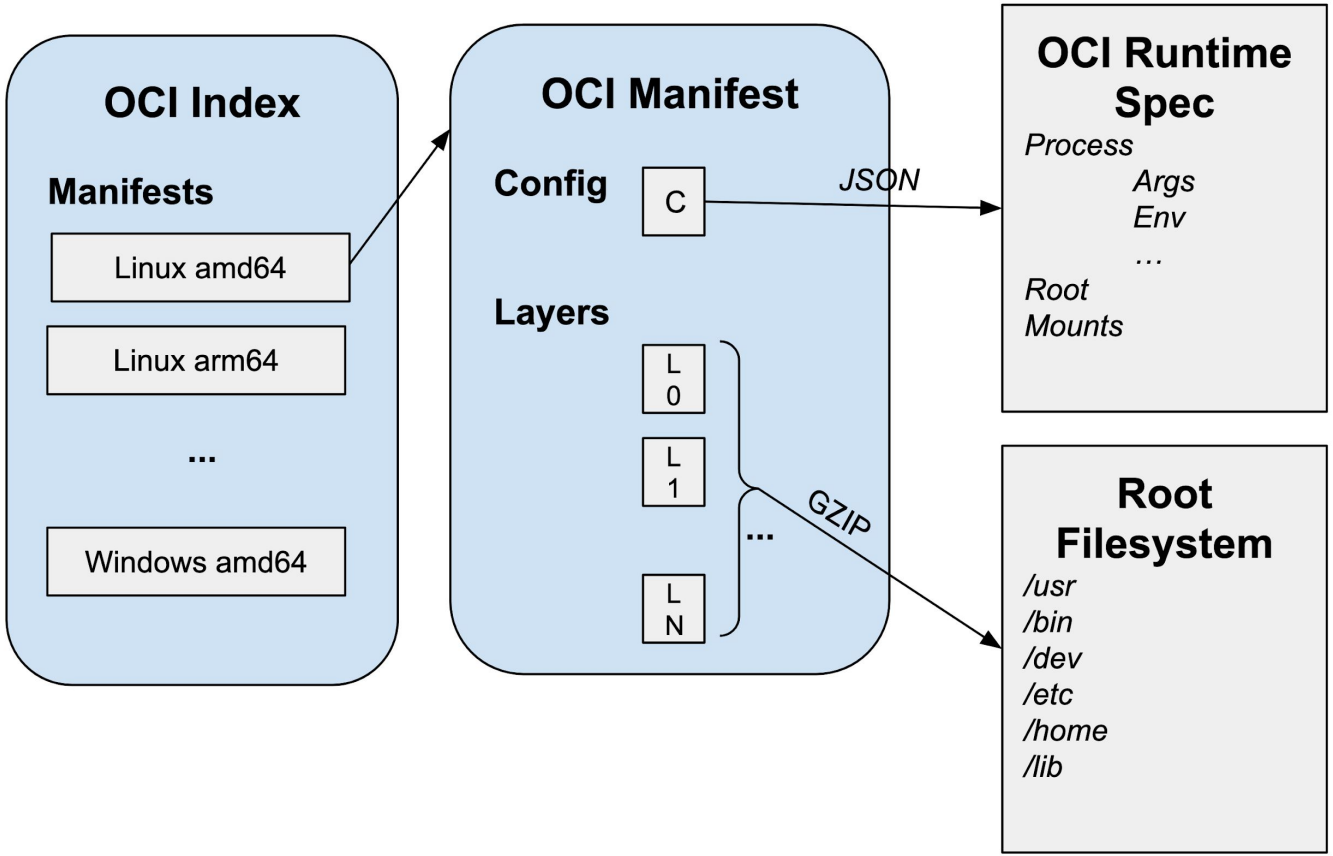


What is a multi-arch OCI image?



What is an OCI image? Index

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```
{
  "schemaVersion": 2,
  "manifests": [
    {
      "mediaType": "application/vnd.oci.image.manifest.v1+json",
      "size": 7143,
      "digest": "sha256:e692418e4cbaf90ca69d05a66403747baa33ee08806650b51fab815ad7fc331f",
      "platform": {
        "architecture": "ppc64le",
        "os": "linux"
      }
    },
    {
      "mediaType": "application/vnd.oci.image.manifest.v1+json",
      "size": 7682,
      "digest": "sha256:5b0bcabd1ed22e9fb1310cf6c2dec7cdef19f0ad69efa1f392e94a4333501270",
      "platform": {
        "architecture": "amd64",
        "os": "linux"
      }
    }
  ]
}
```

What is a repository?

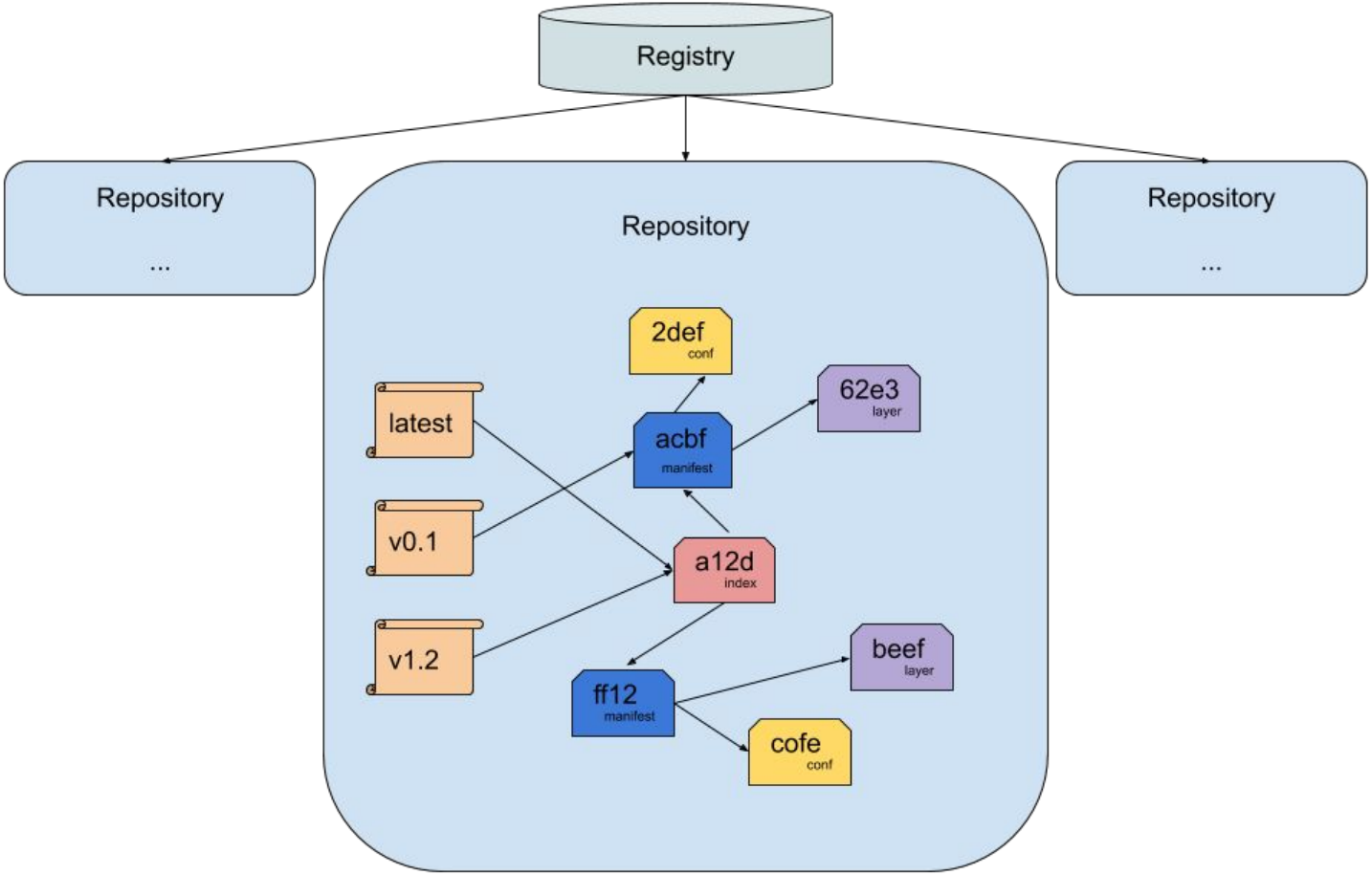


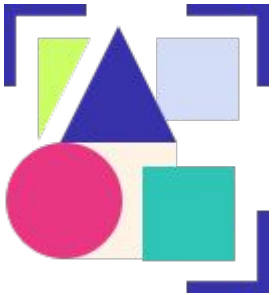
Image reference vs tag vs digest

Syntax	Example
(1) repository	nginx => docker.io/library/nginx:latest
(2) namespace/repository	docker/dcl2020 => docker.io/docker/dcl2020:latest
(3) registry:port/namespace/repository	example.com:5000/user/repo => example.com:5000/user/repo:latest
(4) registry:port/namespace/repository:tag	example.com:5000/user/repo:v1.0.0
(5) registry:port/namespace/repository@algorithm:digest	example.com:5000/user/repo@sha256:38cfa07247...
(6) registry:port/namespace/repository:tag@algorithm:digest	example.com:5000/user/repo:v1.0.0@sha256:38cfa07247… => example.com:5000/user/repo@sha256:38cfa07247…

Part 2 - Case study
Push a CNAB using OCI building blocks

What is a CNAB?

"CNAB is a standard packaging format for multi-component distributed applications. It is not a platform-specific tool, and developers can bundle applications targeting environments spanning IaaS (like OpenStack or Azure), container orchestrators (like Kubernetes or Nomad), container runtimes (like local Docker or ACI), and cloud platform services (like object storage or Database as a Service)."



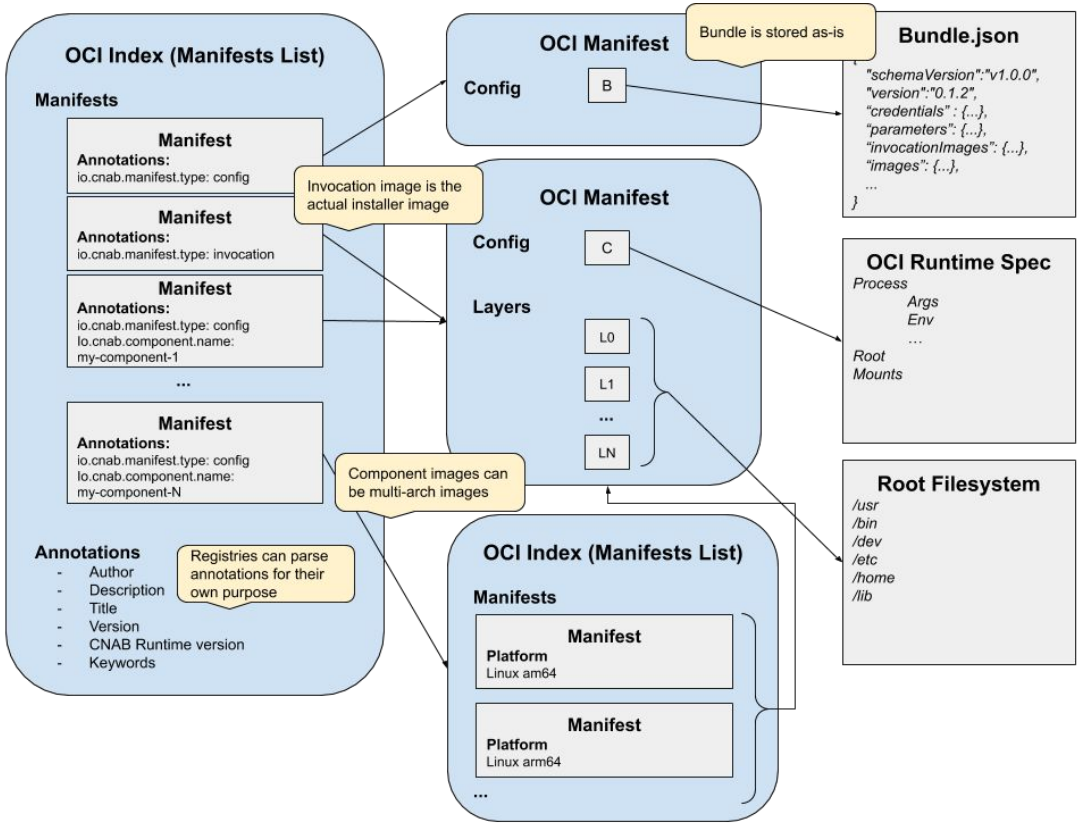
```
$ porter build <bundle>
$ porter publish <bundle>
$ docker app install <bundle>
$ duffle uninstall <bundle>
```

github.com/cnabio/cnab-spec for more information

What is a bundle.json?


```
{
  "name": "helloworld",
  "description": "An example hello world Cloud-Native Application Bundle",
  "invocationImages": [
    {
      "contentDigest": "sha256:c00ffee...",
      "image": "example/helloworld:0.1.0",
      "imageType": "docker"
    }
  ],
  "images": {
    "my-microservice": {
      "contentDigest": "sha256:deadbeef....",
      "description": "my microservice",
      "image": "example/microservice:1.2.3"
    }
  },
  "credentials": {
    "hostkey": {
      "env": "HOST_KEY",
      "path": "/etc/hostkey.txt"
    }
  },
  "parameters": {
    "backend_port": {
      "definition": "http_port",
      "description": "The port that the back-end will listen on",
      "destination": {
        "env": "BACKEND_PORT"
      }
    }
  },
  "definitions": {
    "http_port": {}
  }
}
```

Push a bundle as an OCI index



Demo !

Battle scars with the registry landscape

Registry	CNAB compatible
ACR	Yes
Artifactory	No
Docker Hub	Yes
Digital Ocean	Yes
ECR	No
GCR	Yes
Github Packages	No
Nexus	No
Quay	No

Main issues discovered:

- OCI Index not supported, only Docker Manifest lists format (Docker Hub before 2019)
- Could not push without tagging (ECR)
- Can't mix Manifest lists with OCI Indexes (bundle using service images from multiple vendors)
- Empty or no layer (for storing config object) (GCR)
- No multi-arch support (Nexus)
- Custom Mediatype forbidden

Future of OCI Specifications

- OCI conformance tests https://conformance.opencontainers.org/
- Artifacts

Tools and libraries to play with images

- github.com/docker/distribution
- github.com/containerd/containerd
- github.com/google/go-containerregistry
- github.com/wagoodman/dive to check what's inside an image
- github.com/cnabio/cnab-to-oci

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