What’s new in containerd 2.0

Phil Estes, Principal Engineer, AWS
Containerd project core maintainer
Containerd usage growth

CONTAINERD ADOPTION HAS MORE THAN DOUBLED IN THE LAST YEAR

Source: Datadog

https://www.datadoghq.com/container-report/
Community growth
New maintainers

Laura Brehm  
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kiashok · she/her

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Iceber

Krisztian Litkey
klihub

Henry Wang
henry118

Ruiwen Zhao
ruiwen-zhao

Akhil Mohan
akhilerm
containerd adoption in K8s distros

- Alibaba Cloud Container Service for Kubernetes
- Amazon Elastic Kubernetes Service
- Azure Kubernetes Service
- Google Kubernetes Engine
- Huawei Cloud Cloud Container Engine
- IBM Cloud Kubernetes Service
- Rancher K3s
- VMware Tanzu
- Volcengine Kubernetes Engine
Built for Extensibility

Extend containerd with clients (nerdctl), snapshotters (lazy loading), shims (WASM), and various pluggable interfaces
### Containerd Clients

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ctr</strong></td>
<td>Command-line dev tool, part of core containerd project</td>
</tr>
<tr>
<td><strong>nerdctl</strong></td>
<td>Non-core containerd project, Docker-like CLI</td>
</tr>
<tr>
<td><strong>crictl</strong></td>
<td>A CLI for the CRI API; a Kubernetes project (cri-tools)</td>
</tr>
<tr>
<td><strong>docker(moby)</strong></td>
<td>Further integration with containerd image store</td>
</tr>
</tbody>
</table>

- **developer platforms using containerd** -
  - **Colima** - container runtimes on macOS (and Linux) with minimal setup
  - **Finch** - Docker-like CLI for MacOS
  - **Rancher Desktop** - Docker-like experience on MacOS, Windows, and Linux
Snapshotters

Extendable via proxy plugins

**Built In/Core Snapshotters**
- overlayfs (Linux)
- devmapper (Linux)
- btrfs (Linux)
- native (Linux/Unix/Windows)
- blockfile (New! Linux/Unix)
- zfs (Linux/Unix)
- LCOW (Windows)
- Windows (Windows)

**Remote Snapshotters**
- stargz (Filesystem, non-core project)
- overlaybd (Block, non-core project)
- nydus (Filesystem, non-core project)
- SOCI (Filesystem, OSS vendor project)
- GKE image streaming (Filesystem, vendor project)
Runtimes & Shims

**OCI Runtimes**
- **runc** - default Linux OCI runtime
- **crun** - alternative Linux OCI runtime in C
- **youki** - alternative Linux OCI runtime in Rust
- **runj** - experimental FreeBSD OCI runtime

**External Shim Projects**
- **hcsshim/runhcs** – shim and OCI runtime for Windows
- **runwasi** – (New! Non-core project) – WASM shim
- **Kata Containers** – hypervisor-based isolation for pods
- **gVisor/runsc** – independent kernel for isolation
- **firecracker-containerd** – hypervisor-based isolation for containers based on Firecracker
- **inclavare-containers** – shim for hardware-assisted Trusted Execution Environment (TEE)
- **kuasar** – shim supporting multiple sandbox techniques
- **embedshim** – An ebpf-based container task runtime manager
### Supported Releases

<table>
<thead>
<tr>
<th>Release</th>
<th>Status</th>
<th>Start</th>
<th>End of Life</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5</td>
<td>End of Life</td>
<td>May 3, 2021</td>
<td>February 28, 2023</td>
</tr>
<tr>
<td>1.6</td>
<td>LTS</td>
<td>February 15, 2022</td>
<td>max(February 15, 2025 or next LTS + 6 months)</td>
</tr>
<tr>
<td>1.7</td>
<td>Active</td>
<td>March 10, 2023</td>
<td>max(March 10, 2024 or release of 2.0 + 6 months)</td>
</tr>
<tr>
<td>2.0</td>
<td>Next</td>
<td>TBD</td>
<td>TBD</td>
</tr>
</tbody>
</table>
containerd v1.6 - first LTS!

- Supported at least until Feb 2025
- Project has **expanded scope** for backports to LTS line:
  - updating library dependencies
  - stay with supported toolchain versions (Go releases)
  - keeping compatibility with current Kubernetes versions
- Will move to Active release with stricter backport criteria ~ Aug 2024
containerd v1.7 - last 1.x release

- **Sandbox Service and API** (New! - Experimental)
  - Shim-level API to support groups of containers
  - Preview CRI Plugin v2 - `ENABLE_CRI_SANDBOXES=1`
- **Node Resource Interface** (Updated - Experimental)
  - Extensions for OCI-compatible container runtimes
  - TTRPC
- **Transfer Service** (New! - Experimental)
  - Support to transfer artifact objects between any source and destination
- **CRI User-Namespace Support** (New! - Experimental)
- **gRPC Shim Support** (New! - Experimental)
## v2.0 - Release Plan

<table>
<thead>
<tr>
<th>Component</th>
<th>Initial Release</th>
<th>Target Supported Release</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sandbox Service</td>
<td>containerd v1.7</td>
<td>containerd v2.0</td>
</tr>
<tr>
<td>Sandbox CRI Server</td>
<td>containerd v1.7</td>
<td>containerd v2.0</td>
</tr>
<tr>
<td>Transfer Service</td>
<td>containerd v1.7</td>
<td>containerd v2.0</td>
</tr>
<tr>
<td>NRI in CRI Support</td>
<td>containerd v1.7</td>
<td>containerd v2.0</td>
</tr>
<tr>
<td>gRPC Shim</td>
<td>containerd v1.7</td>
<td>containerd v2.0</td>
</tr>
<tr>
<td>CRI Runtime Specific Snapshotper</td>
<td>containerd v1.7</td>
<td>containerd v2.0</td>
</tr>
<tr>
<td>CRI Support for User Namespaces</td>
<td>containerd v1.7</td>
<td>containerd v2.0</td>
</tr>
</tbody>
</table>
# v2.0 - Removed Features

<table>
<thead>
<tr>
<th>Component</th>
<th>Deprecation release</th>
<th>Target release for removal</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Runtime V1 API and implementation (\text{io.containerd.runtime.v1.linux})</td>
<td>containerd v1.4</td>
<td>containerd v2.0</td>
<td>Use \text{io.containerd.runc.v2}</td>
</tr>
<tr>
<td>Runc V1 implementation of Runtime V2 (\text{io.containerd.runc.v1})</td>
<td>containerd v1.4</td>
<td>containerd v2.0</td>
<td>Use \text{io.containerd.runc.v2}</td>
</tr>
<tr>
<td>config.toml version = 1</td>
<td>containerd v1.5</td>
<td>containerd v2.0</td>
<td>Use config.toml version = 2</td>
</tr>
<tr>
<td>Built-in aufs snapshotter</td>
<td>containerd v1.5</td>
<td>containerd v2.0</td>
<td>Use overlayfs snapshotter</td>
</tr>
<tr>
<td>Container label \text{containerd.io/restart.logpath}</td>
<td>containerd v1.5</td>
<td>containerd v2.0</td>
<td>Use \text{containerd.io/restart.loguri} label</td>
</tr>
<tr>
<td>\text{cri-containerd-*.tar.gz} release bundles</td>
<td>containerd v1.6</td>
<td>containerd v2.0</td>
<td>Use containerd-*.tar.gz bundles</td>
</tr>
<tr>
<td>Pulling Schema 1 images (\text{application/vnd.docker.distribution.manifest.v1+json})</td>
<td>containerd v1.7</td>
<td>containerd v2.0</td>
<td>Use CRI v1</td>
</tr>
<tr>
<td>CRI v1alpha2</td>
<td>containerd v1.7</td>
<td>containerd v2.0</td>
<td>Disabled by default in 2.0 in favor of core sandboxed CRI plugin (use \text{DISABLE_CRI_SAN BOXES=1} to fallback to prior CRI podsandbox implementation)</td>
</tr>
<tr>
<td>Legacy CRI implementation of podsandbox support</td>
<td>containerd v2.0</td>
<td>containerd v2.1</td>
<td></td>
</tr>
</tbody>
</table>
Future & In-Development

- **Transfer Service in CRI (in development)**
  - Credential Management
  - Image Validation
- **Shim Plugins (in development)**
- **Higher level image service**
  - Replace CRI image cache
  - Simplify clients such as nerdctl and Moby
- **Higher level container service**
  - Simpler interface for starting containers
  - Use of streaming service for IO through the API
Getting involved

- #containerd and #containerd-dev channel on
  - CNCF Slack (https://slack.cncf.io)
- Community Meeting on the 2nd and 4th Thursday of every month
  - See CNCF Calendar for your timezone (https://cncf.io/calendar)
- Build something in the ecosystem!
- Discussion, issues and pull requests welcome!
  - https://github.com/containerd/containerd