The Risc-V Journey Thru Containers to the Cloud

Carlos Eduardo de Paula
Cloud Architect
Red Hat
@carlosedp
What are containers?

- A standardized unit of software
- Packs all application requirements into a distribution image
- Runs everywhere. Developer laptop, QA server, production cloud with no changes

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Can we have containers and cloud-native applications on Risc-V?
Yes, we can!

carlosedp/echo-riscv  ⭐
By carlosedp  •  Updated 3 months ago

Latest
Last updated 3 months ago by carlosedp

Tags
Overview

Welcome to the RISC-V Summit, a gathering of developers and enthusiasts dedicated to the RISC-V instruction set architecture. In this session, we'll explore how to build and run a simple echo server using Docker and RISC-V.

To begin, ensure you have Docker installed on your system. Then, navigate to the Docker Hub page for carlosedp/echo-riscv:

carlosedp/echo-riscv

Once there, follow these steps to build and run the container:

1. Pull the container image:

```
docker pull carlosedp/echo-riscv
```

2. Build the container image:

```
docker build -t carlosedp/echo-riscv .
```

This command will also print out the build process details, which you can see in the image.

3. Run the container:

```
docker run --name hello -d -p 8085:8080 carlosedp/echo-riscv
```

This will expose port 8080 on the host system and run the container in detached mode.

4. Verify the container is running:

```
curl localhost:8085
```

This command should return a message indicating the server is running.

5. Stop and remove the container:

```
docker stop container-name

docker rm container-name
```

This will stop and remove the container you just ran.

Remember, Docker is an excellent tool for building and running applications quickly and easily. Whether you're developing for RISC-V or any other architecture, Docker can streamline your workflow. Thank you for joining us at the RISC-V Summit; we hope you've found this session informative and engaging!
And Container Orchestration?
Orchestration Works on Risc-V too!

Inm OpenFaaS running on Kubernetes in Risc-V

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Container Image list is growing!

Base Container Images

- Debian Sid -> carlosedp/debian:sid
- Debian Sid Slim -> carlosedp/debian:sid-slim
- Busybox (1.31.0) -> carlosedp/busybox:1.31
- Go 1.13 (Multiarch) -> carlosedp/golang:1.13

Prometheus

- Prometheus -> carlosedp/prometheus:v2.11.1-riscv64
- AlertManager -> carlosedp/alertmanager:v0.18.0-riscv64

Traefik

- traefik v2 -> carlosedp/traefik:v2.0-riscv64
- Whoami (Traefik demo) -> carlosedp/whoami:riscv64

Kubernetes

- kube-apiserver -> carlosedp/kube-apiserver:1.16.0
- kube-scheduler -> carlosedp/kube-scheduler:1.16.0
- kube-controller-manager -> carlosedp/kube-controller-manager:1.16.0
- kube-proxy -> carlosedp/kube-proxy:1.16.0
- pause -> carlosedp/pause:3.1
- flannel -> carlosedp/flannel:v0.11.0
- etcd (v3.5.0) -> carlosedp/etcd:3.3.10
- CoreDNS (v1.6.3) -> carlosedp/coredns:v1.6.3

Kubernetes images are multi-arch with manifests to arm, arm64, amd64, riscv64 and ppc64le.

Misc Images

- Echo demo -> carlosedp/echo-riscv
- CoreDNS v1.3.0 -> carlosedp/coredns:v1.3.0-riscv64

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How we got there? Golang first!

- First working version around may/19
- Passes all tests
- Expected upstreaming in 1.14

Tree kept in:
https://github.com/4a6f656c/riscv-go
Container Runtimes / Orchestrators

Docker / Podman

- Daemon
- Cli
- Containerd
- Runtime - Crun

Kubernetes

- Containers
  - cloud-controller manager
  - kube-controller-manager
  - kube-scheduler
  - kube-proxy
  - Additional Services

- System Services
  - etcd
  - Container Runtime
  - kubelet
  - kube-apiserver

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### Some Pull Requests later

<table>
<thead>
<tr>
<th>Project</th>
<th>Description</th>
<th>Pull Request</th>
<th>Upstream</th>
</tr>
</thead>
<tbody>
<tr>
<td>go/net</td>
<td>ipv4, ipv6, internal/socket: add riscv64 support</td>
<td><a href="https://github.com/golang/net/pull/43">https://github.com/golang/net/pull/43</a></td>
<td>✓</td>
</tr>
<tr>
<td>go/sys</td>
<td>unix: add riscv64 tag to endian_little.go</td>
<td><a href="https://github.com/golang/sys/pull/38">https://github.com/golang/sys/pull/38</a></td>
<td>✓</td>
</tr>
<tr>
<td>mattn/go-isatty</td>
<td>Update x/sys to support Risc-V</td>
<td><a href="https://github.com/mattn/go-isatty/pull/39">https://github.com/mattn/go-isatty/pull/39</a></td>
<td>✓</td>
</tr>
<tr>
<td>creack/pty</td>
<td>Add riscv64 support</td>
<td><a href="https://github.com/creack/pty/pull/81">https://github.com/creack/pty/pull/81</a></td>
<td>✓</td>
</tr>
<tr>
<td>docker/cli</td>
<td>Add riscv64 to manifest annotation and bash completion</td>
<td><a href="https://github.com/docker/cli/pull/2084">https://github.com/docker/cli/pull/2084</a></td>
<td>✓</td>
</tr>
<tr>
<td>opencontainers/runc</td>
<td>Bump x/sys and update syscall for initial Risc-V support</td>
<td><a href="https://github.com/opencontainers/runc/pull/2123">https://github.com/opencontainers/runc/pull/2123</a></td>
<td>✓</td>
</tr>
<tr>
<td>moby/moby</td>
<td>bump x/sys to fix riscv64 epoll</td>
<td><a href="https://github.com/moby/moby/pull/3972">https://github.com/moby/moby/pull/3972</a></td>
<td>✓</td>
</tr>
<tr>
<td>moby/moby</td>
<td>Update modules to support riscv64</td>
<td><a href="https://github.com/moby/moby/pull/3942">https://github.com/moby/moby/pull/3942</a></td>
<td>✓</td>
</tr>
<tr>
<td>moby/moby</td>
<td>allow dockerd builds without cgo - Tonis</td>
<td><a href="https://github.com/moby/moby/pull/3943">https://github.com/moby/moby/pull/3943</a></td>
<td>✓</td>
</tr>
<tr>
<td>containerd/containerd</td>
<td>bump x/sys to fix riscv64 epoll</td>
<td><a href="https://github.com/containerd/containerd/pull/3526">https://github.com/containerd/containerd/pull/3526</a></td>
<td>✓</td>
</tr>
<tr>
<td>containerd/containerd</td>
<td>Update x/sys, x/net and bbolt modules to support Risc-V architecture</td>
<td><a href="https://github.com/containerd/containerd/pull/3328">https://github.com/containerd/containerd/pull/3328</a></td>
<td>✓</td>
</tr>
<tr>
<td>docker/cli</td>
<td>bump x/sys to fix riscv64 epoll</td>
<td><a href="https://github.com/docker/cli/pull/2042">https://github.com/docker/cli/pull/2042</a></td>
<td>✓</td>
</tr>
<tr>
<td>docker/libnetwork</td>
<td>bridge: add riscv64 build tags - Tonis</td>
<td><a href="https://github.com/docker/libnetwork/pull/2389">https://github.com/docker/libnetwork/pull/2389</a></td>
<td>✓</td>
</tr>
<tr>
<td>LK4D4/vndr</td>
<td>add riscv64 support</td>
<td><a href="https://github.com/LK4D4/vndr/pull/80">https://github.com/LK4D4/vndr/pull/80</a></td>
<td>✓</td>
</tr>
<tr>
<td>vishvananda/netns</td>
<td>add riscv64 architecture</td>
<td><a href="https://github.com/vishvananda/netns/pull/34">https://github.com/vishvananda/netns/pull/34</a></td>
<td>✓</td>
</tr>
<tr>
<td>containers/libpod</td>
<td>build: allow to build without cgo on RISC-V</td>
<td><a href="https://github.com/containers/libpod/pull/3437">https://github.com/containers/libpod/pull/3437</a></td>
<td>✓</td>
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<td>---------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
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</tr>
<tr>
<td>kubernetes/kubernetes</td>
<td>Bump x/sys and opencontainers/runc to support Risc-V architecture</td>
<td><a href="https://github.com/kubernetes/kubernetes/pull/82349">link</a></td>
<td>❌</td>
</tr>
<tr>
<td>kubernetes/kubernetes</td>
<td>Bump gonvml module and remove CGO dependency</td>
<td><a href="https://github.com/kubernetes/kubernetes/pull/82342">link</a></td>
<td>✓</td>
</tr>
<tr>
<td>etcd-io/etcd</td>
<td>vendor: update x/sys and x/net modules to support Risc-V</td>
<td><a href="https://github.com/etcd-io/etcd/pull/10834">link</a></td>
<td>✓</td>
</tr>
<tr>
<td>prometheus/prometheus</td>
<td>Riscv support</td>
<td><a href="https://github.com/prometheus/prometheus/pull/5621">link</a></td>
<td>✓</td>
</tr>
<tr>
<td>prometheus/promu</td>
<td>Update x/sys and x/net modules to support Risc-V</td>
<td><a href="https://github.com/prometheus/promu/pull/146">link</a></td>
<td>✓</td>
</tr>
<tr>
<td>containous/traefik</td>
<td>Update x/sys and x/net modules to support Risc-V</td>
<td><a href="https://github.com/containous/traefik/pull/5245">link</a></td>
<td>✓</td>
</tr>
<tr>
<td>nats-io/nats-streaming-server</td>
<td>Update x/sys and etcd/bbolt modules to support Risc-V</td>
<td><a href="https://github.com/nats-io/nats-streaming-server/pull/891">link</a></td>
<td>✓</td>
</tr>
<tr>
<td>openfaas/faas-swarm</td>
<td>Update x/sys and x/net modules to support Risc-V</td>
<td><a href="https://github.com/openfaas/faas-swarm/pull/52">link</a></td>
<td>✓</td>
</tr>
<tr>
<td>alexellis/inlets</td>
<td>Update x/sys and x/net modules to support Risc-V</td>
<td><a href="https://github.com/alexellis/inlets/pull/78">link</a></td>
<td>✓</td>
</tr>
<tr>
<td>openfaas/faas-cli</td>
<td>Update x/sys module to support Risc-V</td>
<td><a href="https://github.com/openfaas/faas-cli/pull/667">link</a></td>
<td>✓</td>
</tr>
<tr>
<td>debuerreotype/debuerreotype</td>
<td>Add support to debian ports by passing --ports flag</td>
<td></td>
<td></td>
</tr>
<tr>
<td>labstack/gommon</td>
<td>Update x/sys module to support Risc-V</td>
<td><a href="https://github.com/labstack/gommon/pull/32">link</a></td>
<td>✓</td>
</tr>
<tr>
<td>labstack/echo</td>
<td>Update x/sys and x/net modules to support Risc-V</td>
<td><a href="https://github.com/labstack/echo/pull/1344">link</a></td>
<td>✓</td>
</tr>
<tr>
<td>github/hub</td>
<td>Update x/sys module to support Risc-V</td>
<td><a href="https://github.com/github/hub/pull/2153">link</a></td>
<td>✓</td>
</tr>
<tr>
<td>google/go-jsonnet</td>
<td>Update x/sys to a newer version that supports Risc-V architecture</td>
<td><a href="https://github.com/google/go-jsonnet/pull/284">link</a></td>
<td>✓</td>
</tr>
</tbody>
</table>
# Still Pending

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<thead>
<tr>
<th>Project</th>
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<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>SECCOMP</td>
<td>Add Risc-V Seccomp support to Linux Kernel</td>
<td>Planned for Kernel 5.5</td>
</tr>
<tr>
<td>Libseccomp</td>
<td>Upstream libseccomp patch</td>
<td>Pending Kernel SECCOMP support</td>
</tr>
<tr>
<td>Kubernetes bump</td>
<td>Update dependencies for upstream</td>
<td>Planned for Kubernetes 1.17</td>
</tr>
<tr>
<td>Golang CGO</td>
<td>Go extension for importing C code</td>
<td>Pending implementation</td>
</tr>
<tr>
<td>Runc</td>
<td>Container Runtime in C</td>
<td>Depends on CGO. CRUN is an alternative now.</td>
</tr>
<tr>
<td>Golang SQLite</td>
<td>File database libraries</td>
<td>Depends on CGO</td>
</tr>
<tr>
<td>Official Images</td>
<td>Build and publish official images</td>
<td>Depends on distro support (Debian, Alpine, Fedora)</td>
</tr>
<tr>
<td>Most projects</td>
<td>Build and distribute binaries and/or images</td>
<td>Changes on CI/CD and official images</td>
</tr>
</tbody>
</table>

Thanks!

Contact me:
https://twitter.com/carlosedp

Read me:
https://medium.com/@carlosedp

Follow up progress on:
https://github.com/carlosedp/riscv-bringup
https://hub.docker.com/u/carlosedp