
# Katello

# **Bootable Containers**

& other container features

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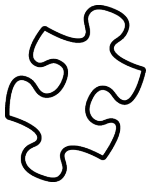
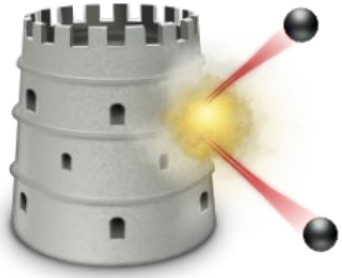
# The Stack

Foreman



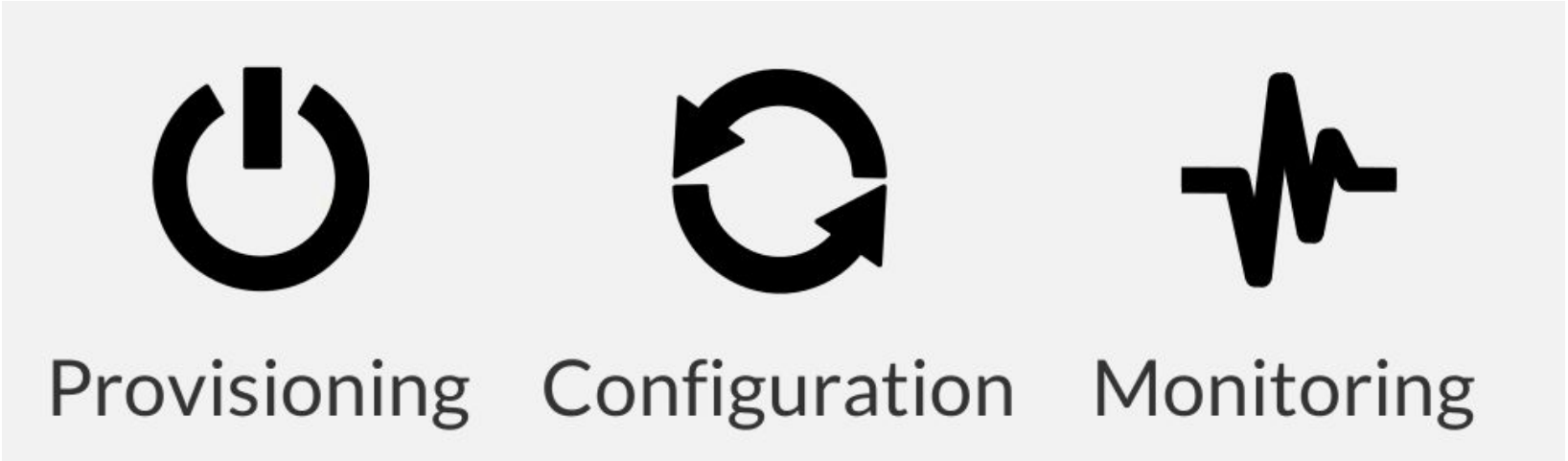


Katello

Candlepin


Pulp

# Foreman




# New Container Features

- OCI Flatpaks
- Bootable containers
  - Host registration
  - Booted container overview
  - Transient installation support
  - Transient package tracking *
- New container images UI
- Load balanced container content via smart proxies

* pending subscription-manager adoption

# Bootable Containers?

- Container images used to provision and update OSTree-based immutable machines
- Built to work with bootc


# Bootable Containers?

“The bootc documentation summarizes bootable containers as "transactional, in-place operating system updates using OCI/Docker container images". In other words, updates to the operating system (OS) are shipped by using container images. That implies that the Linux kernel, the bootloader, drivers, etc. are all part of the container image which renders the container image "bootable".”

- *https://docs.fedoraproject.org/en-US/bootc/getting-started/*

# Bootable Containers

"Bootc container images differ technically from application containers in two important ways:

- bootc images use OSTree inside the container
- A bootc image has a kernel and enough other packages to boot a physical or virtual machine."

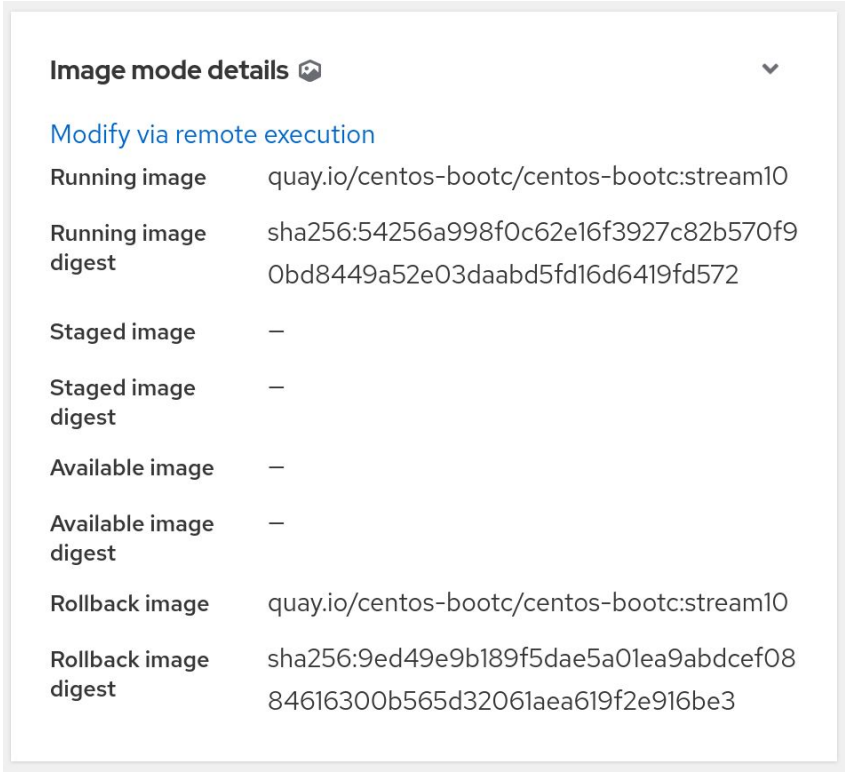
- *https://www.redhat.com/en/blog/image-mode-red-hat-enterprise-linux-quick-start-guide*

# Some bootc Facts

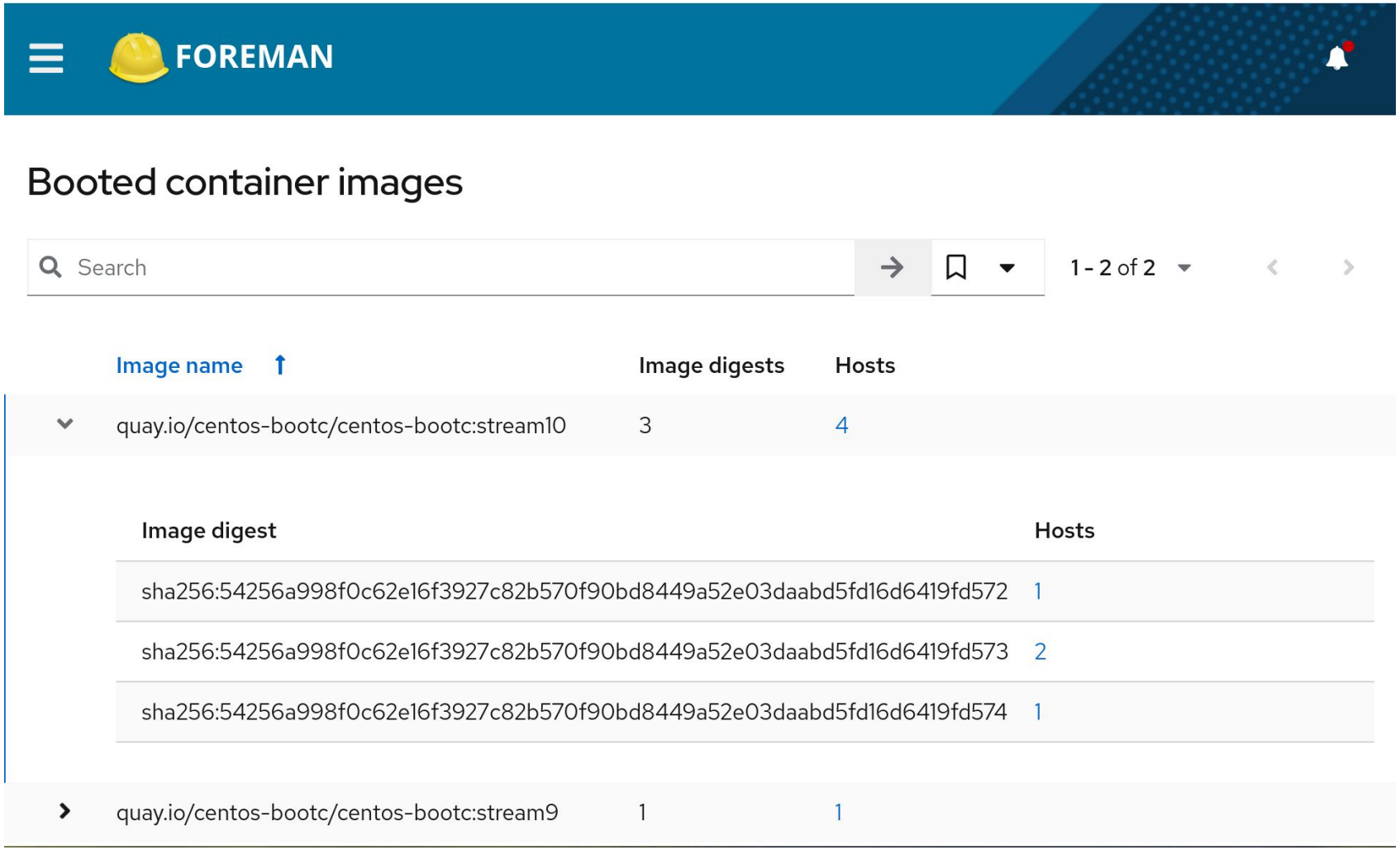
- bootc is the interface for managing bootable containers
- bootc install - provisions container to disk
  - Anaconda & other tools automate this
- bootc upgrade - pull new content with existing tag
  - Auto-updates by default
- bootc switch - switch to a different bootc container image
- bootc rollback - go back to the last image
- Install RPMs via `dnf --transient …`
  - If you dare! They will be gone at reboot.

# Bootable Containers in Foreman

- bootc data now in Foreman inventory
  - bootc facts uploaded via subscription-manager
- Overview of all booted container images
- Transient package installation support

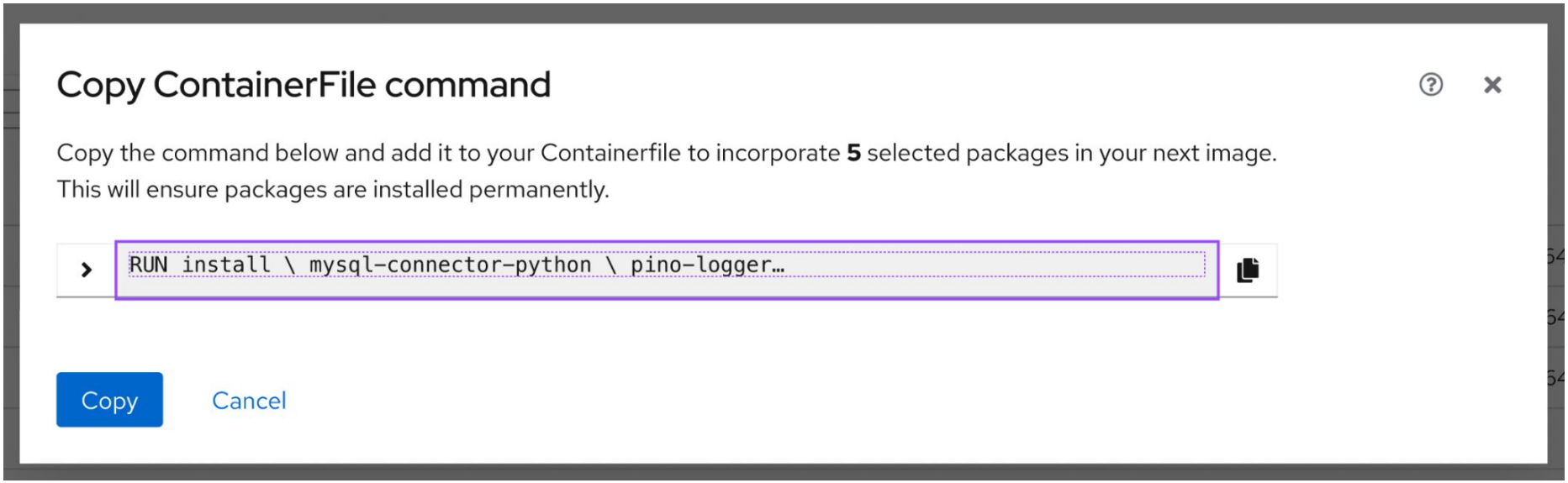



# Booted containers overview



# Transient RPM Package Tracking

- Pass DNF transience via subscription-manager profile
- Copy RUN install command from transient packages
- Future ideas TBD




# Transient RPM Package Tracking

Search | Status | Upgrade | 1 - 10 of 10 | 1

| Package name | Persistence | Status | Installed version | Upgradable to |
|---|---|---|---|---|
| 389-ds-base | Persistent | Upgradable | 32:9.11.4-19.P2.el7_8.2.x86_64 | 42:9.11.4-19.P2.el7_8.2.x86_64 |
| 389-ds-base-libs | Transient | Up-to-date | 32:9.11.4-19.P2.el7_8.2.x86_64 | - |
| abrt | Transient | Up-to-date | 32:9.11.4-19.P2.el8_8.2.x86_64 | - |
| abrt-addon-vmcore | Persistent | Upgradable | 0.301-4.el9.noarch | 0.301-4.el10.noarch |
| bash | Persistent | Upgradable | 5.1.8-5.el9.x86_64 | 5.1.8-9.el9.x86_64 |
| bzip2 | Transient | Up-to-date | 1.0.8-8.el9.x86_64 | - |
| c-ares | Transient | Up-to-date | 1.17.1-5.el9.x86_64 | - |
| dbus | Persistent | Upgradable | 1.12.20-6.el9.x86_64 | dbus-1.12.20-9.el9.x86_64 |
| device-mapper | Transient | Up-to-date | 1.02.185-3.el9.x86_64 | - |
| device-mapper-event | Persistent | Upgradable | 1.02.185-3.el9.x86_64 | 1.02.185-9.el9.x86_64 |

# Provisioning bootable containers

Options

1. Rely on Anaconda's ostreecontainer kickstart command
2. Create a disk image from a bootc container image via bootc-image-builder

# Kickstart solution

Image provisioning

- Create a kickstart script with `ostreecontainer`
- Assign bootc container via host parameters with variable in KS script
- Populate `kickstart_kernel_custom_options` with inst.stage2

Network provisioning

- Create a kickstart script with `ostreecontainer`
- Assign bootc container via host parameters with variable in KS script
- Populate `kickstart_kernel_custom_options` with inst.stage2

# Kickstart solution

## Image provisioning

- Associate KS script with operating system
- Use mkksiso to point image installation media at bootc kickstart script
- `"inst.ks.sendmac inst.ks=http://katello.com/unattended/provision"`

## Network provisioning

- Associate KS script with operating system
- Provision host following normal Foreman network provisioning documentation

# Kickstart solution

## Image provisioning

- Associate image with a compute resource via hypervisor
- Provision the host following normal Foreman image provisioning documentation

## Network provisioning

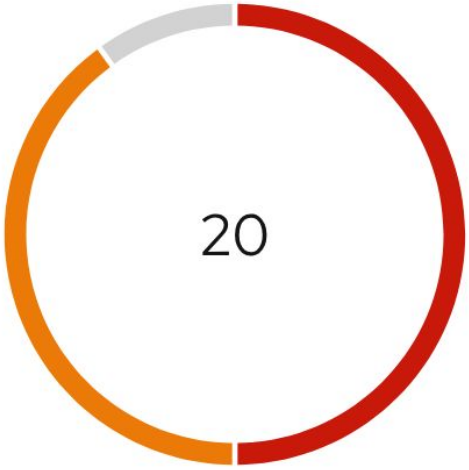
- …

# Future feature proposals

# Improved bootc Machine Provisioning

- Provisioning templates
  - Kickstart - `ostreecontainer` host parameter
  - Bootloader config - `inst.stage2`
    - Since `url` isn't supported with `ostreecontainer`
- Associating a host to a container image
  - API support for assigning container image
  - Host creation UI image selector
    - With auto-fill for synced bootc images?

# Container vulnerability tracking




## Quay Security Reporting has detected 20 vulnerabilities

Patches are available for 20 vulnerabilities

### Advisories

Filter Vulnerabilities... | Only show fixable | 1 - 20 of 20 | 1 of 1

| Advisory | Severity | Package | Current Ver... | Fixed in V... |
|---|---|---|---|---|
| GHSA-38jv-5279-wg99 | High | urllib3 | 1.26.5 | 2.6.3 |
| GHSA-gm62-xv2j-4w53 | High | urllib3 | 1.26.5 | 2.6.0 |

# Container vulnerability tracking

- Katello should not rely on upstream reporting
  - Only works when syncing, not pushing
- Idea: use Quay's Clair ?
  - Scans vulnerability databases like OSV and distributor DBs e.g. Debian & Red Hat.
  - Webhooks on DB updates
  - Returns vulnerabilities per container manifest

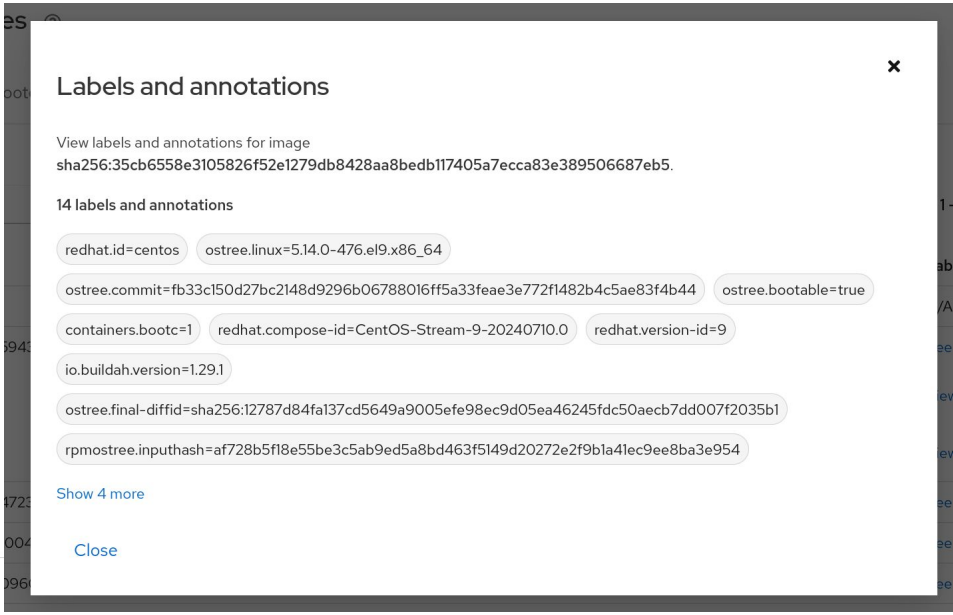
# Container vulnerability tracking

- Clair & Katello continued
  - Clair needs manifests on disk - no ‘on demand’
  - Vulnerability data on request?
    - Or computed asynchronously?
  - Deployment model
    - Ideally containerized
    - Communication through smart proxy?
      - “Smart proxies connect Foreman to services”

# Demo

# Other container features

# New Container UI




## Container images

Synced | Booted

Search

1 - 20 of 9541

| | Tag | Manifest digest | Type | Product | Labels \| Annotations |
|---|---|---|---|---|---|
| > | uclibc | sha256:44ed92a03339544d9c16da4c8d10354d8e6f7958168f40eeaee1e15a332bbda3 | List | Buttermilk Biscuits | N/A |
| v | stream9-1720594390 | sha256:0beb3d9e1760c44bfa7bbfd43c91ef53e84c62db3d37a397a05a997b9b294c7b | List | Buttermilk Biscuits | See child manifests |
| | | sha256:35cb6558e3105826f52e1279db8428aa8bedb117405a7ecca83e389506687eb5 | Bootable | | View here |
| | | sha256:2e2295283f13417c4ab997baa786e46554fbcf2f4451eda4f81fdd97830e27b6 | Bootable | | View here |
| > | stream9-1720472304 | sha256:e9d2dc79768fab8839eaecee47d6c99eb9d4ae8e88747394759edfdfe42fb6c7 | List | Buttermilk Biscuits | See child manifests |

# sha256:35cb6558e310

**Name**

stream9-1720594390

**Creation**

October 16, 2025 at 04:16 PM

**Repositories**

centos-bootc

**Modified**

October 16, 2025 at 04:16 PM

**Digest**

sha256:35cb6558e3105826f52e1279db8428aa8bedb117405a7ecca83e389506687eb5

**Type**

Bootable

Content views, lifecycle environments, pullable paths

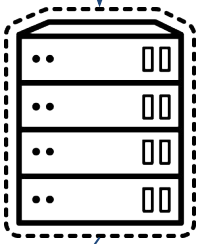
| Environment | Content view | Repository | Pullable path |
|---|---|---|---|
| Library | Default Organization View 1.0 | centos-bootc | centos9-katello-devel-2.porcino.example.com/default_organization/buttermilk_biscuits/centos-bootc:stream9-1720594390 |
| Library | Component 1 24.0 | centos-bootc | centos9-katello-devel-2.porcino.example.com/default_organization/library/component_1/buttermilk_biscuits/centos-bootc:stream9-1720594390 |

# Load-Balanced Registry

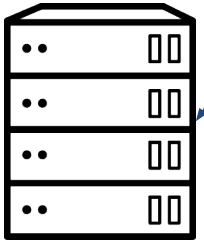
Client

podman pull loadbalancer.example.com

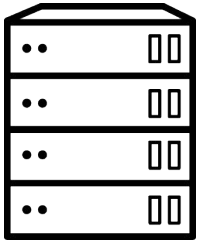
Requests are routed to the most available smart proxy



Load Balancer



Smart Proxy



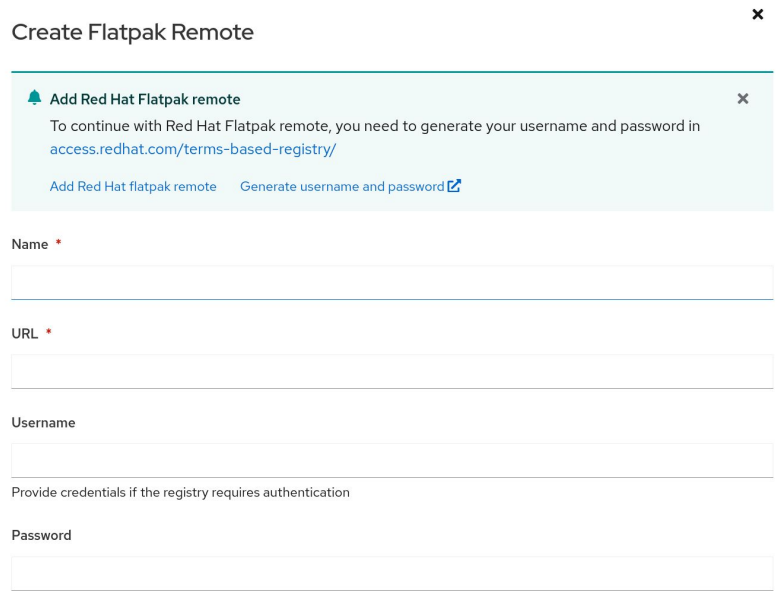
Smart Proxy

# LB Details

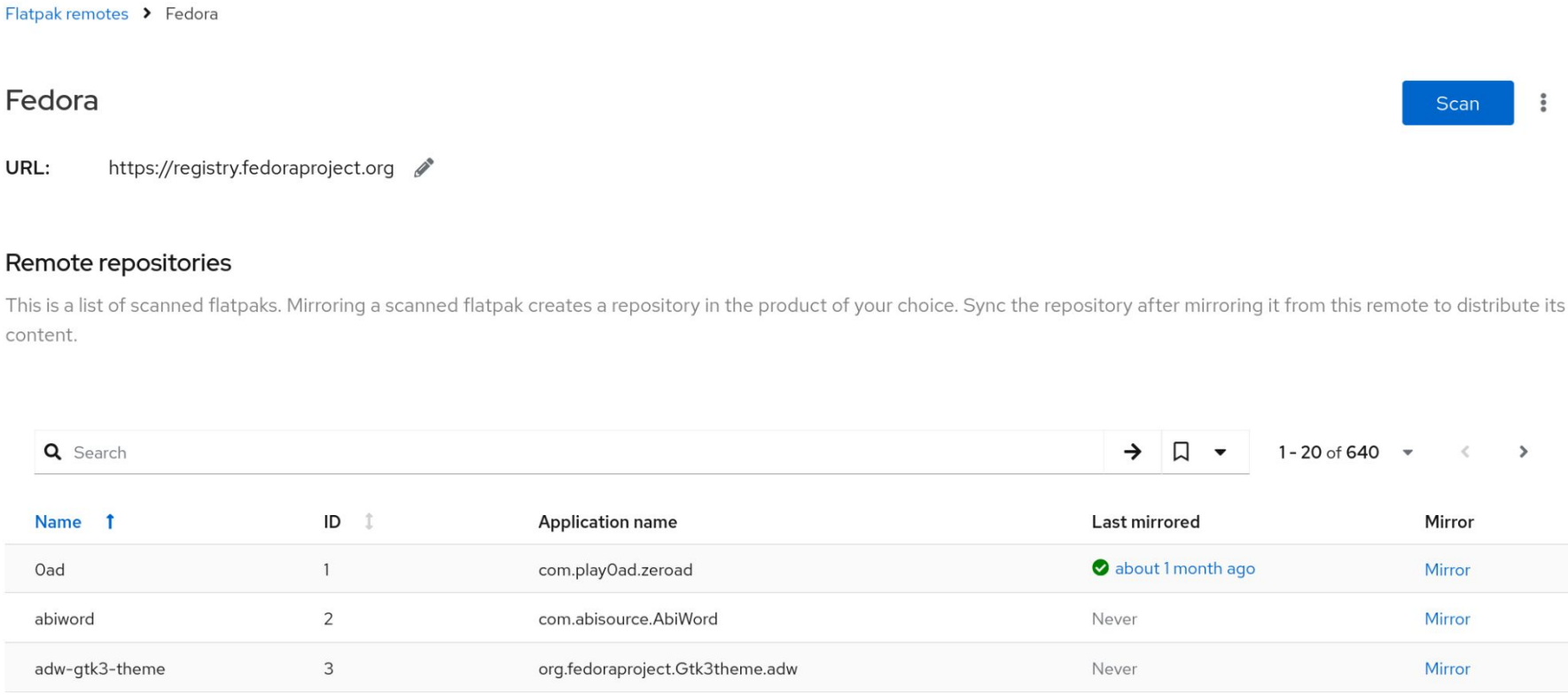
- Container content requests to smart proxies have redirects:
  - Client contacts Container Gateway
  - Container Gateway contacts Pulp
  - Pulp returns the content's **location**
  - Container Gateway redirects the client to that location
- Previously, the **location** tied redirects to one Pulp
- Now, the **location** is swapped out for the LB

# OCI Flatpaks

- Upstream remote scanning
- Create repositories from Flatpaks scanned upstream
- Host-specific index proxies
- Certificate authentication




# OCI Flatpaks





# Thanks!

https://theforeman.org
https://github.com/Katello/katello