Fedora CoreOS and CentOS Stream CoreOS

OKD Foundations Video Series

Agenda

- What's Fedora CoreOS?
- Supported platforms and architectures
- Introduction to rpm-ostree
- Introduction to Ignition
- Fedora CoreOS streams (stable, testing, next)
- Fedora CoreOS and CentOS Stream CoreOS in OKD

What is Fedora CoreOS?

An official Fedora edition

- **Official Fedora edition** since Fedora 37!
- Focused on **single node** and **clusters** use cases
- Successor to two **container-first** OSes:
  - CoreOS Inc's Container Linux
  - Fedora Atomic Host (from Project Atomic)
- **Incorporates ideas** from both:
  - Provisioning stack & cloud native expertise (CL)
  - Fedora foundation, update stack & SELinux (FAH)

Philosophy behind Fedora CoreOS

- **Automatic updates** by default
  - No interaction for administrators
- **Automated provisioning**
  - All nodes start from **same starting point**
  - Use Ignition to provision a node on **first boot**
- **Immutable infrastructure**
  - **Automate** deployment and system configuration
  - Update configs and **re-provision** to apply changes

Supported platforms and architectures

Supported platforms

- Available for a plethora of **cloud/virt platforms**:
  - Alibaba, AWS, Azure, Azure Stack, DigitalOcean, Exoscale, GCP, IBM Cloud, OpenStack, Nutanix, Vultr, VirtualBox, VMware, QEMU/KVM
  - Directly launchable on AWS & GCP

- Several options for **Bare Metal**
  - Live ISO (automated or interactive installations)
  - PXE (network) boot
  - Raw and 4K native disk images

Supported architectures

- Multiple Architectures:
  - **x86_64**
  - **aarch64**
  - **s390x**
  - **ppc64le**

Introduction to rpm-ostree

rpm-ostree

- Hybrid image/package system with **atomic upgrades**
- Kind of like **Git** for your operating system
- Updates are **atomic**, **safe** and **easy to rollback**
- Client side **package layering** and overrides:
  - Add, remove or replace packages **locally**

OS versioning and filesystem layout

- A **single identifier** for a given system version
  - Example: 38.20230905.3.0
- Uses **read-only** filesystem mounts:
  - Prevents accidents, basic attacks and **real vulnerabilities**
- **Clear distinction** between:
  - **`/usr`** ⇨ distribution content (from packages)
  - **`/etc`** ⇨ system configuration (defaults from packages)
  - **`/var`** ⇨ all local system and user content

Introduction to Ignition

Automated provisioning on first boot

- Fedora CoreOS uses Ignition to **automate** provisioning
- Any logic for machine lifetime is **encoded** in the config
  - Very easy to automatically **re-provision** nodes
- **Same starting point** whether on bare metal or cloud
  - Use Ignition **everywhere** as opposed to kickstart for bare metal and cloud-init for cloud

Ignition configs

- **Declarative** JSON documents provided via user data
- Runs **exactly once**, during the initramfs stage on **first boot**
- Can write files, systemd units, create users, partition disks, format filesystems, etc.
- **If provisioning fails, the boot fails** (no half provisioned systems)
- Ignition configs are **machine-friendly** (JSON)

```
{
 "ignition": {
  "config": {},
  "timeouts": {},
  "version": "3.0.0"
 },
 "passwd": {
  "users": [
   {
    "name": "core",
    "passwordHash":
      "$6$43y3tkl...",
    "sshAuthorizedKeys": [
     "ssh-ed25519 ..."
    ]
   }
  ]
 },
 "storage": {
  ...
 },
 "systemd": {
  ...
 }
}
```

Butane configs

- **Butane** is a configuration transpiler
- **Converts** Butane configs to Ignition configs
- Butane configs are **Human friendly** (YAML)
- Ignition semantics, plus **sugar** for common operations
- Transpiler catches common errors at **build time**

```
variant: fcos
version: 1.5.0
passwd:
 users:
   - name: core
     ssh_authorized_keys:
       - ssh-ed25519 ...
systemd:
 units:
   - name: myscript.service
     enabled: false
     contents: |
       ...
storage:
 files:
   - path: /etc/chrony.conf
     overwrite: yes
     mode: 0644
     contents:
       local: chrony.conf
   - path: /etc/containers/...
     contents:
       local: foo.container
```

Fedora CoreOS streams (stable, testing, next)

Multiple Update Streams

Fedora CoreOS is available across 3 different release streams:

Stable

v 35.20220424.3.0
JSON — 2 days ago

The Stable stream is the most reliable version of Fedora CoreOS. Releases are battle-tested within the Testing stream before being promoted.

Show Downloads

Testing

v 36.20220505.2.0
JSON — 2 days ago

The Testing stream contains the next Stable release. Mix a few Testing machines into your cluster to catch any bugs specific to your hardware or configuration.

Show Downloads

Next

v 36.20220507.1.0
JSON — 2 days ago

The Next stream represents the future. It provides early access to new features and to the next major version of Fedora. Run a few Next machines in your cluster, or in staging, to help find problems.

Show Downloads

None of this happens without… Passing Tests!

✓	⚙	kola-aws	13 hr - #325	4 days 0 hr - #312	1 hr 11 min
✓	⚙	kola-azure	13 hr - #80	12 days - #57	45 min
✓	⚙	kola-gcp	13 hr - #169	3 days 14 hr - #164	15 min
…	⚙	kola-kubernetes	N/A	N/A	N/A
✓	☁	kola-openstack	13 hr - #340	1 day 10 hr - #337	45 min

- Every single build is **extensively tested in CI** before it's released
- Required to make automatic updates **safe**

Fedora CoreOS and CentOS Stream CoreOS in OKD

OKD and OKD-SCOS

- **OKD** comes in **two flavors**:
  - **OKD** based on **Fedora CoreOS (FCOS)**
  - **OKD-SCOS** based on **CentOS Stream CoreOS (SCOS)**

Difference between FCOS and SCOS?

- **Fedora CoreOS** is built from **Fedora packages**
  - + some small configuration changes
  - Closer to upstream releases and new features

- **CentOS Stream CoreOS** is built from **CentOS Stream packages**
  - + some small configuration changes as well
  - Closer to enterprise releases and slower paced changes

Enterprise Linux ecosystem

Fedora CoreOS in OKD

- OKD uses a **slightly modified version** of FCOS
  - Disables automatic updates (**managed by the cluster**)
  - Includes **CRI-O**, kubelet, oc, etc.
  - Removes moby (docker)

Get involved!

OKD: https://www.okd.io/

Fedora CoreOS:

https://fedoraproject.org/coreos/