Fedora CoreOS

What's Now, What's Next

Dusty Mabe - Red Hat
Principal Software Engineer

dusty@dustymabe.com
https://dustymabe.com
dustymabe on freenode.net

Today's Talk

- What Was
  - Container Linux
  - Atomic Host
- What's Now
  - Fedora CoreOS
    - What is it?
    - What are the features?
    - What is the philosophy?
  - How does Fedora CoreOS Relate to Other Projects?
- What's Next
  - Coming Features and Community Engagement
- Questions!
- Demo!

What Was

What Was

- Container Linux
  - Container Focused Operating System
  - Based on Gentoo
  - A/B partition image based update strategy
  - Used Ignition for Provisioning

- Atomic Host
  - Container Focused Operating System
  - Based on Fedora/RHEL, used RPMs as input
  - Used rpm-ostree technology for updates
  - Used Anaconda/Cloud-init for provisioning

What's Now

Fedora CoreOS - Emerging Fedora Edition

- Came from the merging of two communities:
  - CoreOS Inc's Container Linux
  - Project Atomic's Atomic Host
- Incorporates Container Linux
  - Philosophy
  - Provisioning Stack
  - Cloud Native Expertise
- Incorporates Atomic Host
  - Fedora Foundation
  - Update Stack
  - SELinux Enhanced Security

Philosophy behind Container Linux

- Automatic updates
  - no interaction for administrators
  - staying up to date -> security fixes applied
- All nodes start from ~same starting point
  - Use Ignition to provision a node wherever it's started
    - bare metal and cloud based instances share provisioning
- Immutable infrastructure
  - Need a change? Update configs and re-provision.
- User software runs in containers
  - Host updates are more reliable

Fedora CoreOS Features

dusty@dustymabe.com

fedora

Features: Automatic Updates

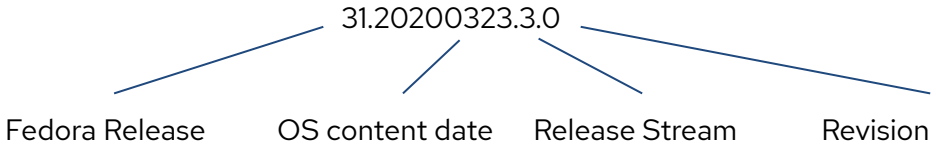
- Fedora CoreOS features Automatic Updates by default
  - Automatic updates → Reliable updates
    - Extensive tests in automated CI pipelines
    - Several update streams to preview what's coming
      - Users run various streams to help find issues
    - Managed upgrade rollouts over several days
      - Halt the rollout if issues are found
  - For when things go wrong
    - rpm-ostree rollback can be used to go back
    - future: automated rollback
      - based on user specified health checks

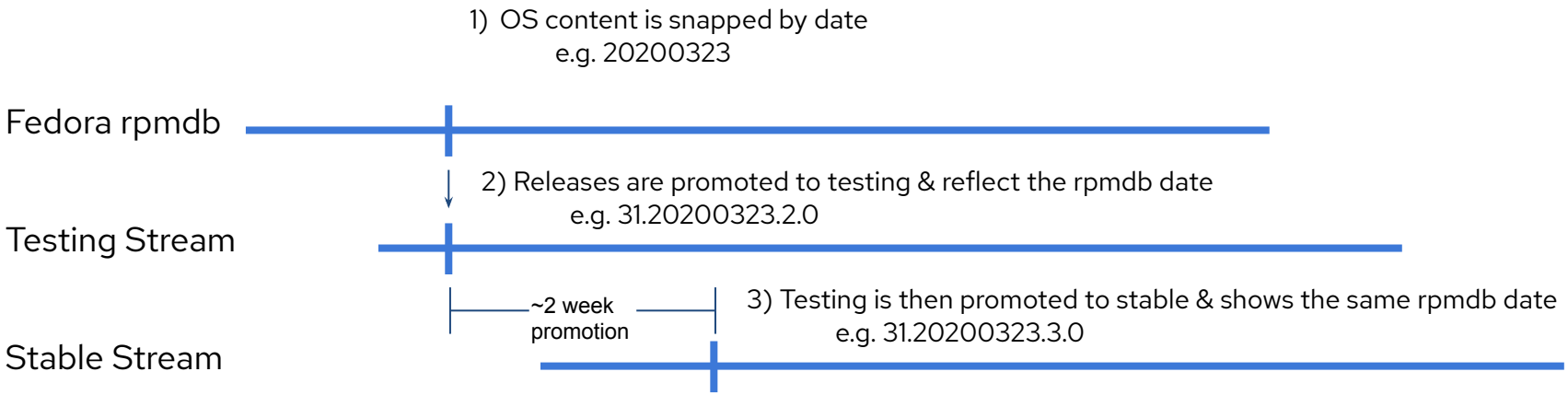
Multiple Update Streams

- Offered update streams with automatic updates
  - ***next*** - experimental features, Fedora major rebases
  - ***testing*** - preview of what's coming to stable
    - point in time snapshot of Fedora stable rpm content
  - ***stable*** - most reliable stream offered
    - promotion of testing stream after some bake time
- Goals
  - Publish new releases into update streams every two weeks
  - Find issues in next/testing streams before they hit stable

Fedora CoreOS Release Promotion

Release Nomenclature





dusty@dustymabe.com

Features: Automated Provisioning

- 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: Details

Ignition configs

- Declarative JSON documents provided via user data
- Runs exactly once, during the initramfs stage on first boot
- Can write files and systemd units, create users and groups, partition disks, create RAID arrays, format filesystems
- If provisioning fails, the boot fails (no half provisioned systems)
- Ignition configs are machine-friendly (JSON), currently spec v3

Writing Configs

- Fedora CoreOS Config Transpiler to translate to Ignition spec
  - Configs are Human friendly (YAML)
  - Ignition semantics, plus sugar for common operations
  - Transpiler catches common errors at build time

```
{
 "ignition": {
  "config": {},
  "timeouts": {},
  "version": "3.0.0"
 },
 "passwd": {
  "users": [
   {
    "name": "core",
    "passwordHash":
"$6$43y3tkl...",
    "sshAuthorizedKeys": [
     "key1"
    ]
   }
  ]
 },
 "storage": {},
 "systemd": {}
}
```

dusty@dustymabe.com

fedora

Features: Cloud Native & Container Focused

- Software runs in containers
  - podman or moby engine container runtimes
- Ready for clustered deployments
  - Spin up 100 nodes and have them join a cluster
    - Ignition configs used to automate cluster join
  - Spin down nodes when no longer needed
  - Spin up nodes again when load increases
- Offered on (or for) a plethora of cloud/virt platforms
  - Alibaba, AWS, Azure, DigitalOcean, Exoscale, GCP, Openstack, Vultr, VMWare, QEMU/KVM

Features: OS Versioning & Security

- Fedora CoreOS uses rpm-ostree technology
  - “Like git for your Operating System”
    - 32.20200615.2.0 - 86c0246
    - A single identifier tells you all software in that release
  - Uses read-only filesystem mounts
    - Prevents accidental OS corruption (rm -rf)
    - Prevents novice attacks from modifying system
- SELinux enforcing by default
  - Prevents compromised apps from gaining further access

What's in the OS?

- Latest Fedora base components (built from RPMs)
- Hardware support
- Basic administration tools
- Container engines: podman, moby
- No python

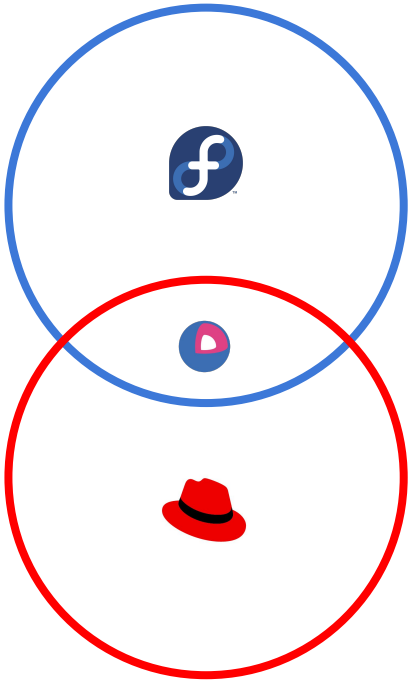
Fedora CoreOS used in Other Projects

- OKD
  - Cluster controls OS upgrades with machine-config-operator
  - Upgrades are provided as machine-os-content containers
    - includes Fedora CoreOS + cluster dependencies
  - Cluster can manage and bring up new machines automatically
- Typhoon
  - Base OS option for community typhoon k8s distribution
- OpenStack Magnum
  - Base OS for the Magnum project that delivers kubernetes to Openstack users.

Fedora CoreOS and RHEL CoreOS

Common tooling & components - different scope and purpose

- RHEL CoreOS is not intended as a standalone OS
  - Based on RHEL package set
  - Component of OpenShift
  - Updates and configuration controlled by cluster operators
- Fedora CoreOS
  - Based on Fedora package set
  - Shares components and tooling with RHEL CoreOS
  - Standalone OS with auto-updates



What's Next

What's Next

- More Cloud Platforms
- Multi-arch support (aarch64, ppc64le, s390x)
- More FCCT human friendly helper functions
- Host extensions (more reliable package layering)
- More/improved documentation
- Tighter integrations with OKD

Get involved!

- Web: https://getfedora.org/coreos
- Issues: https://github.com/coreos/fedora-coreos-tracker/issues
- Forum: https://discussion.fedoraproject.org/c/server/coreos
- Mailing list: coreos@lists.fedoraproject.org
- IRC: freenode #fedora-coreos

Questions

dusty@dustymabe.com

fedora

Demo

Thank you!

dusty@dustymabe.com

fedora