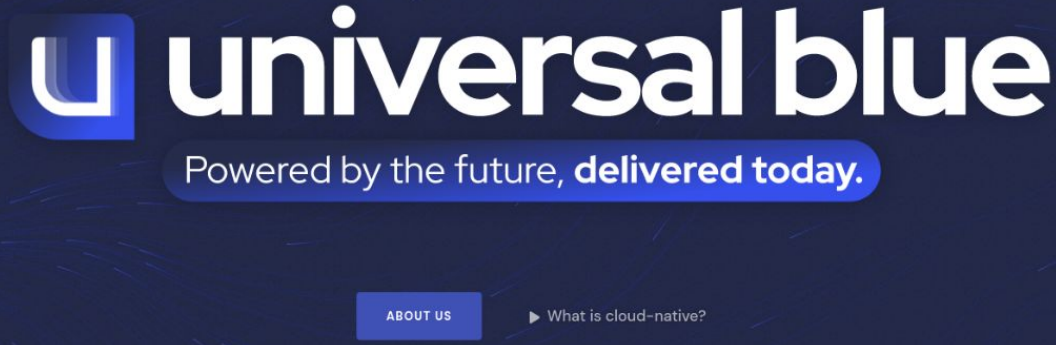

universal blue
Powered by the future, delivered today.
ABOUT US
What is cloud-native?

About Jorge!

- Ops background from an .edu
- 20+ years as an OSS Community Manager
  - Canonical
  - VMware/Heptio
- OSS Projects
  - Ubuntu
  - Kubernetes
  - Kubeflow
  - Cloud Custodian
- Currently at the CNCF working for
  - Our 184(!) projects
  - And thousands of OSS contributors

About Colin

- Emacs startup screen contributed to me being here
- Debian, GNOME, Red Hat, OpenShift, Fedora, ostree, bootc
- Somehow ~20+ years later working on the operating system in the FOSS space is still fun!

One unified model for Linux

The desktop/client as an example use case

Universal Blue: Year One

- KubeCon | CloudNativeCon NA 2022
- Passion Project
  - Jorge, Marco, Adam, and Wayne
  - I already had a “fix it script”
- Initial prototype finished in a weekend
  - Podman in a for loop!
- “It looks like a community manager wrote this.”

> The team behind Bluefin has taken care to make the project lightweight from a contribution perspective, fully automating much of the maintenance work, thus allowing developers to focus on innovation rather than upkeep.

Steven J. Vaughan-Nichols - The New Stack

Universal Blue: Year Two

- The Nvidia moment
  - Thanks Josh Stone (Red Hat) and Alex Diaz (Independent)
- Splitting into base layers, more contributors
- Focused on growth and covering lots of use cases
- SREs/sysadmins rewrite things
- Hyper focus on automation, “punch above our weight”
- Finding our target audience

> “I’ve seen what the future of operating systems at scale could be, and it starts with Project Bluefin.

Scott McCarty - RHEL Server Senior Principal Product Manager, for InfoWorld

Universal Blue: Going GA (General Availability)

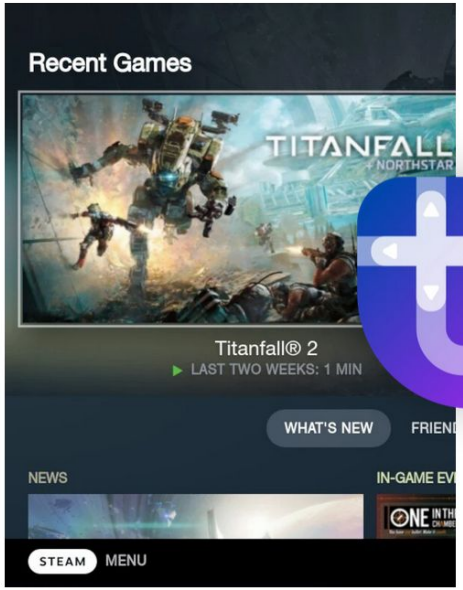
- Redirecting users away from base images and custom tooling
- Removing low-use images
- Focusing on infrastructure and contributor sustainability
- Automation and explicit removal of tech debt
- Focus on end user experiences instead of “a slightly better Fedora”

> When I experimented with Universal Blue over the weekend, I was reminded of just how cool the Linux operating system is. All of a sudden, I felt like I was back in the late 90s or early 2000s and was seeing the future of operating systems before my eyes.

Jack Wallen – ZDNET

Users don’t want images they want experiences

They will insist that they want images



bazzite

The next generation of Linux Gaming for all of your devices - including your favorite handheld.

Play Your Favorites

Bazzite comes ready to rock with Steam and Lutris pre-installed, Steam Game Mode, HDR support for AMD GPUs, and numerous community-developed tools for your gaming needs.

Expanded Hardware Support

Support for handhelds PCs, Nvidia drivers and the latest Mesa for AMD & Intel pre-installed, and numerous tweaks applied as needed to ensure your games just work.

project Bluefin

The next generation Linux workstation, designed for reliability, performance, and sustainability.

For You

Bluefin is a custom image of Fedora Silverblue offering the best of both worlds: The reliability and ease of use of a Chromebook and the power of a GNOME desktop.

For Developers

Container focused workflows to get you started depending on where you're coming from, or bring your own. Wield the industry's leading tools at your fingertips.

Aurora

Aurora is a clean and reliable desktop operating system, with so much stuff built-in you'll never get configuration fatigue again.

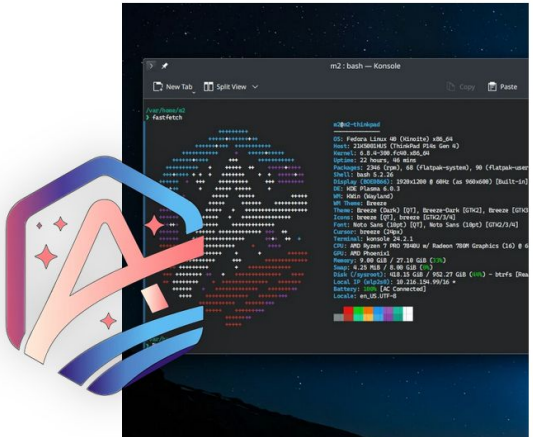
Simply delightful.

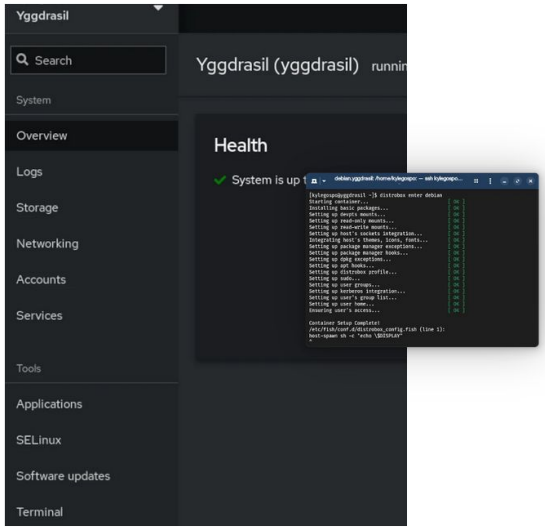
Aurora features a vanilla KDE Plasma 6 desktop experience that can be customized indefinitely. Super smooth and delightful.

Zero Maintenance

Install the system once and forget about maintenance. Updates are automatic. Upgrade your system in one-click, including all your apps.

VISIT WEBSITE





uCore

An OCI base image of Fedora CoreOS with batteries included; a lightweight server image including most used services or the building blocks to host them.

Server-grade

Ready for running containerized workloads on either bare metal or virtual machines, with tools like wireguard, firewalld, cockpit, tailscale, ZFS support, and more.

Compute-ready

Optional support for Nvidia hardware, including containerized CUDA workloads.

VISIT WEBSITE

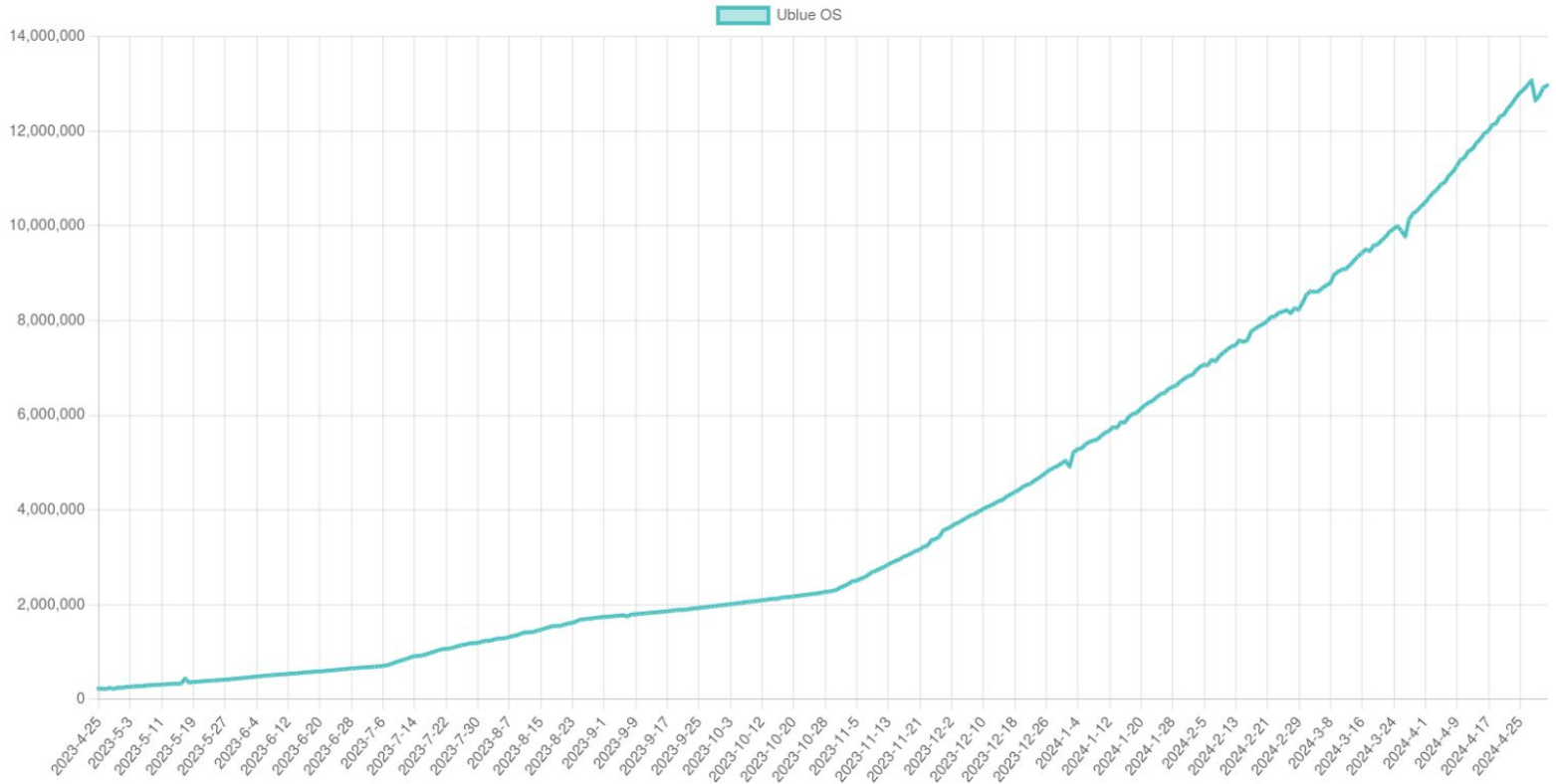
project Bluefin

The next generation Linux workstation, designed for reliability, performance, and sustainability.

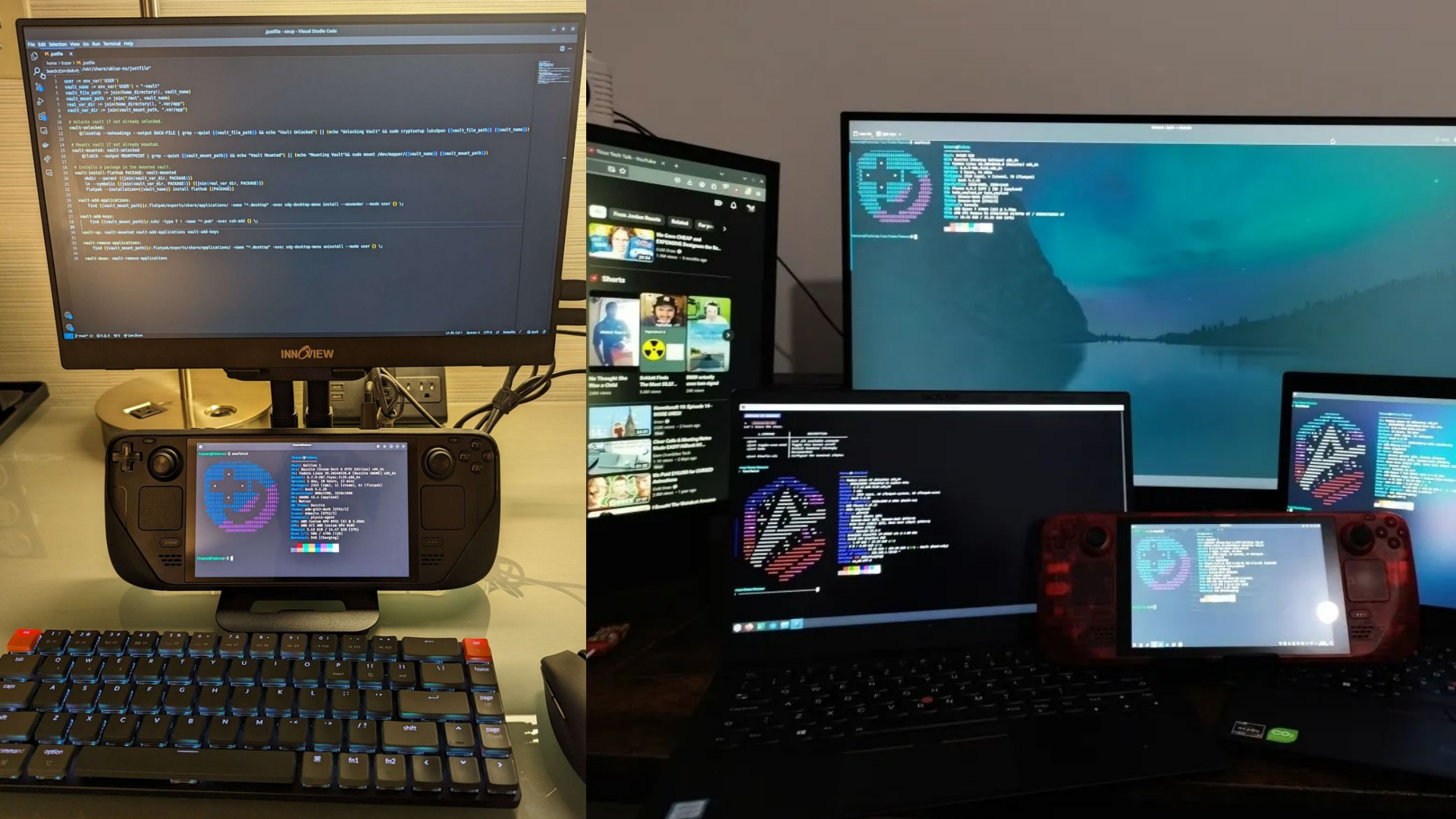
Discover | Try Out

Pulls

Total



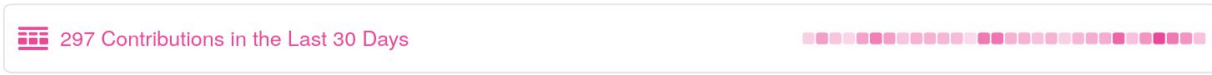
This charts image pulls of Universal Blue images.
Pulls are not indicative of users, just successful image updates.


Justfile - soup - Visual Studio Code
INNOVIEW

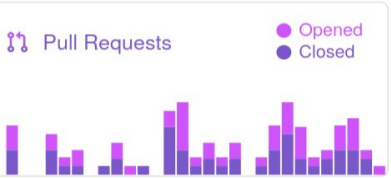
ARREST
ASCENT
ASSETTO CORSA
BATTLEFIELD V
BEACH INVASION
BeamNG drive
BIOSHOCK
14:32
FILTER
SORT BY
OPTIONS
SELECT
BACK
lucian@lucianyt:~$ sudo ufw allow 22
Rules updated
Rules updated (v6)
lucian@lucianyt:~$ sudo ufw enable
Command may disrupt existing ssh connections. Proceed with operation (y|n)? y
Firewall is active and enabled on system startup
lucian@lucianyt:~$ sudo ufw status
Status: active
Action From
To
22
22 (v6)
lucian@lucianyt:~$ sudo ufw allow 15777
Rule added
Rule added (v6)
lucian@lucianyt:~$ sudo ufw status
Status: active
Action From
To
22
15777
22 (v6)
15777 (v6)
lucian@lucianyt:~$ su - sfserver
Password:
sfserver@lucianyt:~$ screen -S

Bazzite

297 Contributions in the Last 30 Days



1.54 Opened/Closed Issue Ratio	48 Pull Requests Opened	550 Commits
-0.16 (-9.56%) ↓ past month	+21 (77.78%) ↑ past month	+455 (478.95%) ↑ past month

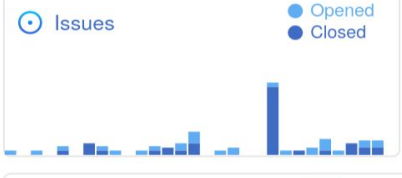


Top Contributors: KyleGospo, github-action, noelmiller, HikariKnight, bsherman

Bluefin

347 Contributions in the Last 30 Days

0.69 Opened/Closed Issue Ratio	103 Pull Requests Opened	69 Commits
-1.72 (-71.35%) ↓ past month	+52 (101.96%) ↑ past month	+39 (130%) ↑ past month



Top Contributors: m2Giles, castrojo, p5, noelmiller, EyeCantCU

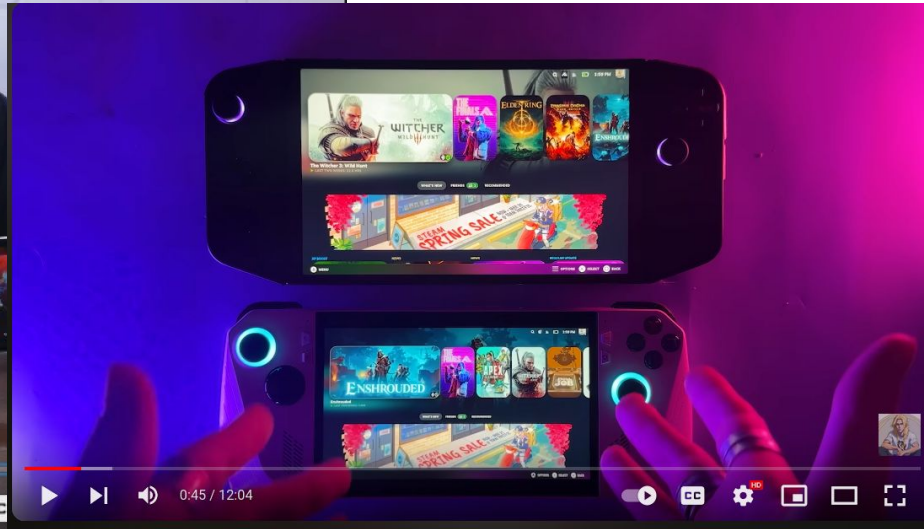
Installing Linux on Apple's Stupid Trashcan

Action Retro
113K subscribers

Join | Subscribe | 11K

344K views 7 months ago #MacPro #Linux
Use the exclusive code YTB930 to buy FlexiSpot E7 now for the best price!

US: https://bit.ly/3L3013r ...more

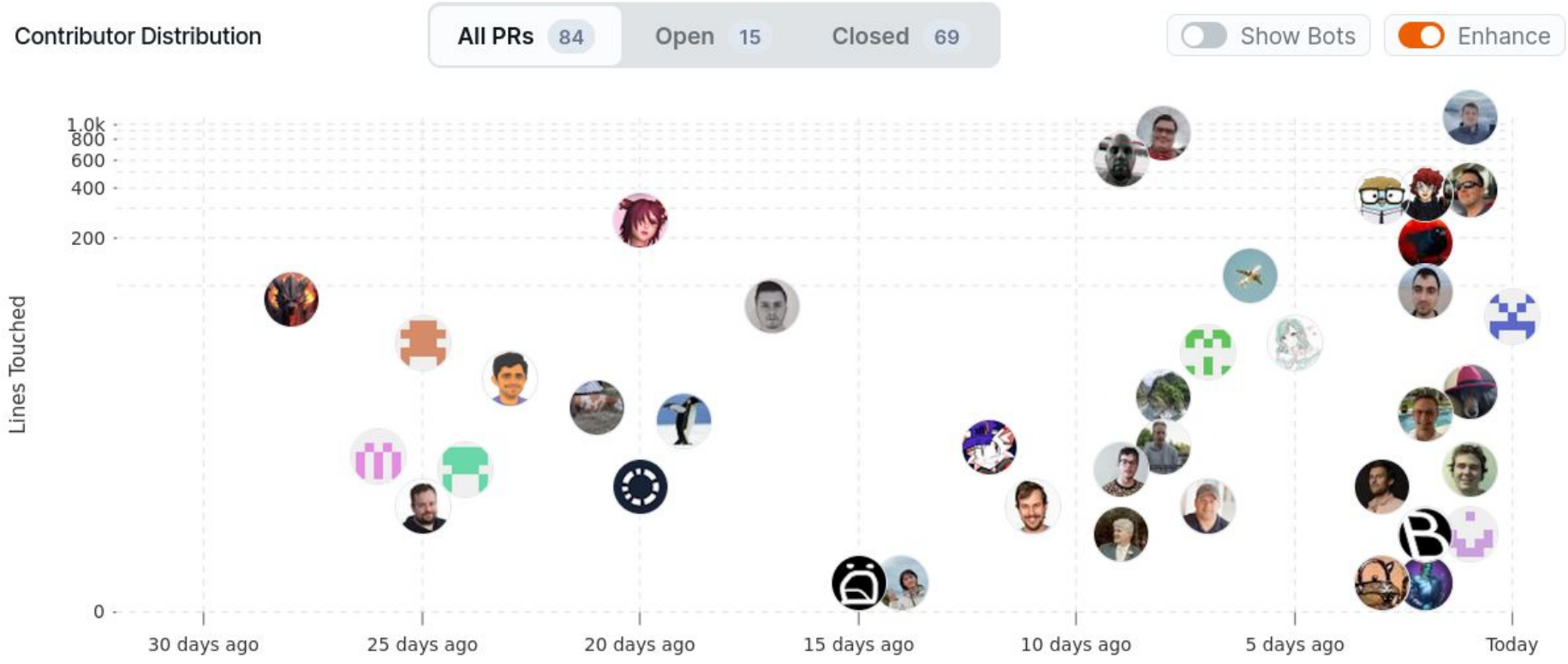


SteamOS is AMAZING on Rog Ally and Legion Go. BazziteOS battery test, Benchmarks, etc...

Cyber Dopamine
11.7K subscribers

Subscribed | 1.8K | Share | Download

57K views 1 month ago
LEGION GO DUALBOOT GUIDE I FOLLOWED (Aru)
• Dual Boot Guide - BazziteOS and Windo...
...more



Thanks opensauced.pizza

fedora

Universal Blue: The Basics

FROM scratch AS config

- Service units, udev rules, shared justfiles

FROM fedora AS main

- Ingest multiple GUI desktops + QoL

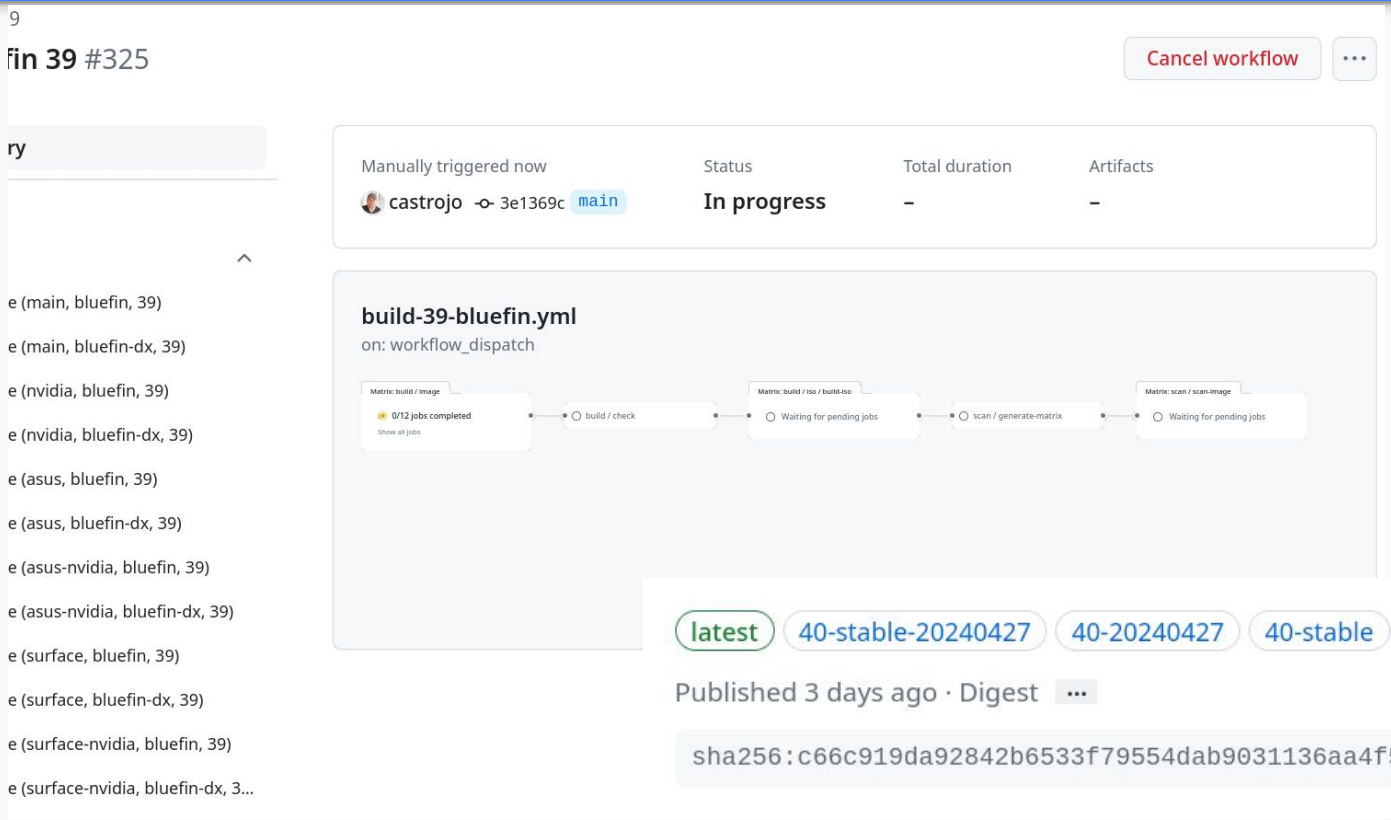
FROM main AS bluefin

- Strongly opinionated image for general use cases

FROM bluefin AS bluefin-dx

- “The perfect UNIX workstation”

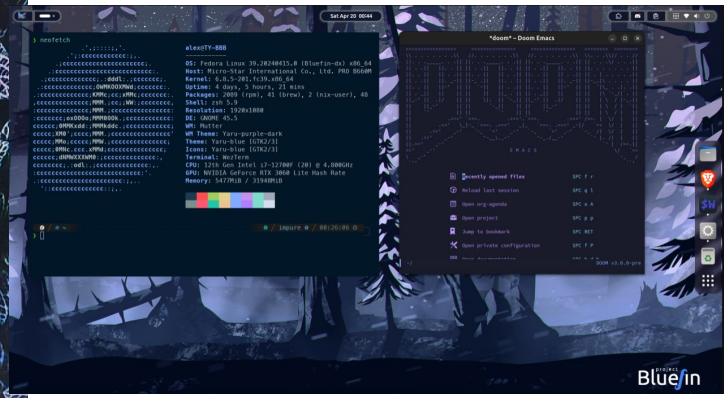
Universal Blue: The GitHub Actions

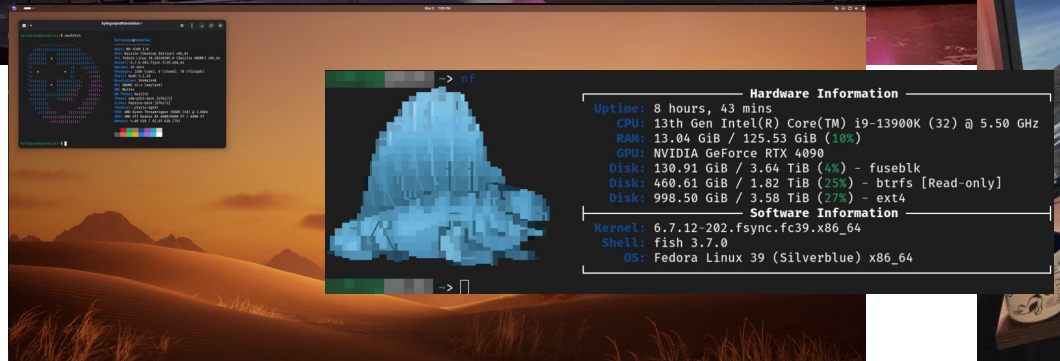


Thanks @bsherman, @KyleGospo, @p5, @m2, and others …

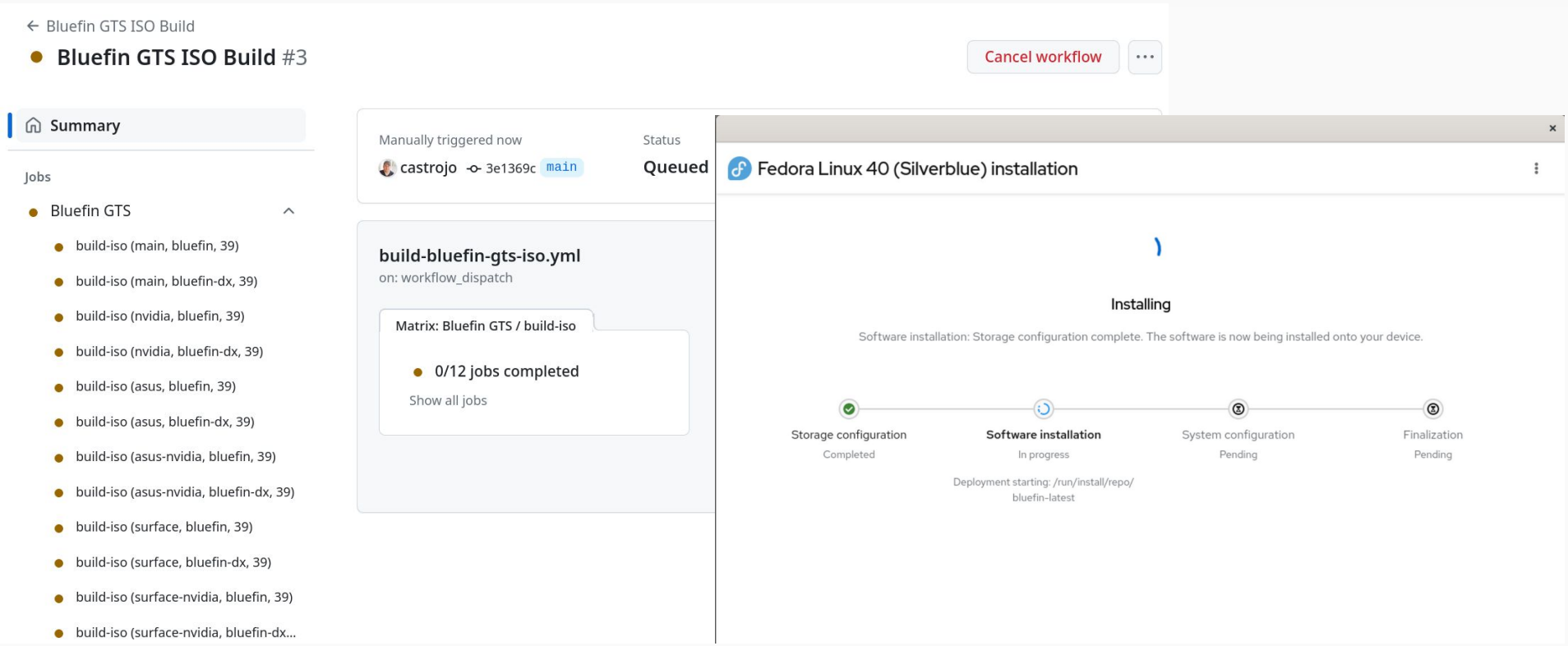
Universal Blue: Applying application container patterns to OS images

IMAGE	TAG
`fedora-coreos` - *stable*	`stable-nvidia`, `stable-zfs`, `stable-nvidia-zfs`
`fedora-coreos` - *testing*	`testing-nvidia`, `testing-zfs`, `testing-nvidia-zfs`
`ucore-minimal` - *stable*	`stable`, `stable-nvidia`, `stable-zfs`, `stable-nvidia-zfs`
`ucore-mimimal` - *testing*	`testing`, `testing-nvidia`, `testing-zfs`, `testing-nvidia-zfs`
`ucore` - *stable*	`stable`, `stable-nvidia`, `stable-zfs`, `stable-nvidia-zfs`
`ucore` - *testing*	`testing`, `testing-nvidia`, `testing-zfs`, `testing-nvidia-zfs`
`ucore-hci` - *stable*	`stable`, `stable-nvidia`, `stable-zfs`, `stable-nvidia-zfs`
`ucore-hci` - *testing*	`testing`, `testing-nvidia`, `testing-zfs`, `testing-nvidia-zfs`


Bluefin


Hardware Information
Uptime: 8 hours, 43 mins
CPU: 13th Gen Intel(R) Core(TM) i9-13900K (32) @ 5.50 GHz
RAM: 13.04 GiB / 125.53 GiB (10%)
GPU: NVIDIA GeForce RTX 4090
Disk: 130.91 GiB / 3.64 TiB (4%) - fuseblk
Disk: 460.61 GiB / 1.82 TiB (25%) - btrfs [Read-only]
Disk: 998.50 GiB / 3.58 TiB (27%) - ext4
Software Information
Kernel: 6.7.12-202.fsync.fc39.x86_64
Shell: fish 3.7.0
OS: Fedora Linux 39 (Silverblue) x86_64

Universal Blue: The ISO Generator Action



Thanks Noel Miller (Red Hat) and Jason Nagin (Red Hat)

Speaking of experiences …

Building off of base images let’s us focus

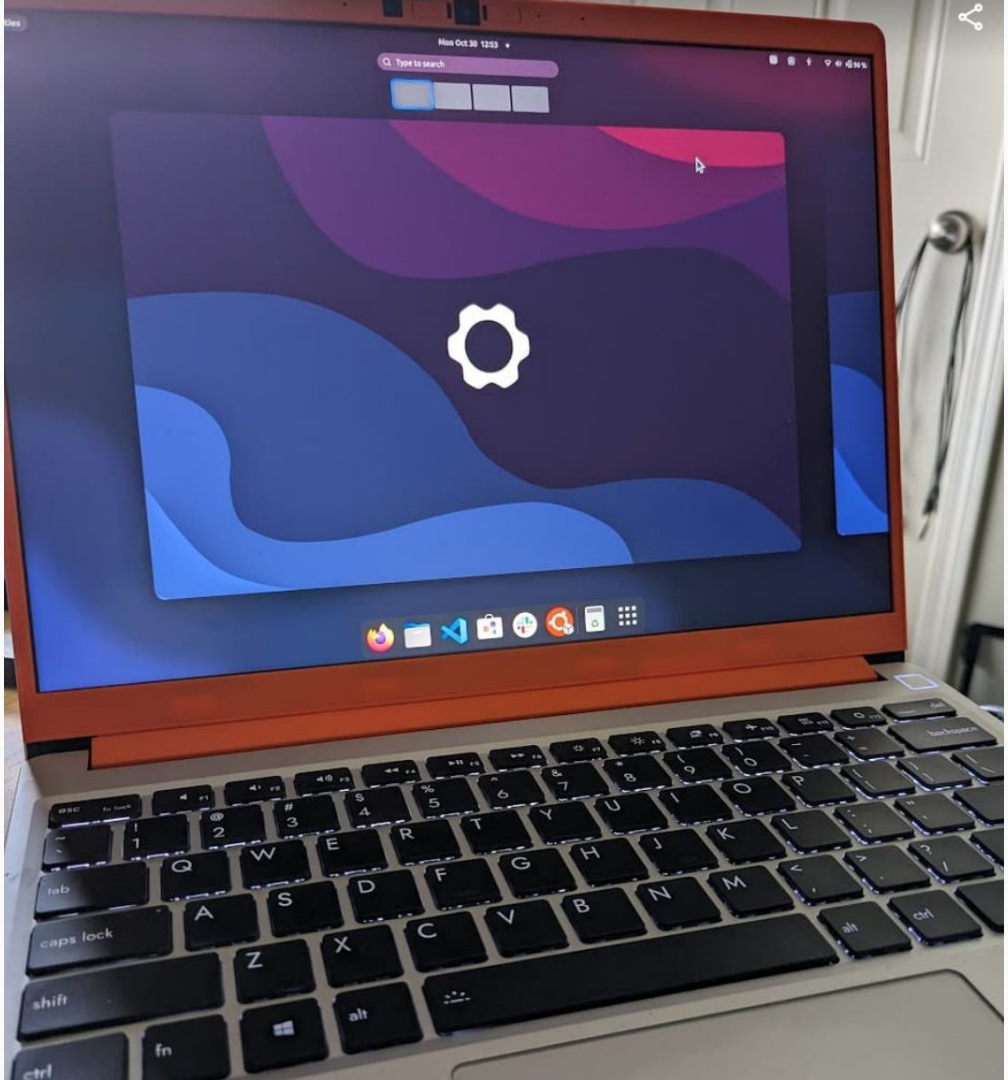
framework

Pre-existing relationship with Fedora

We polish the minutia

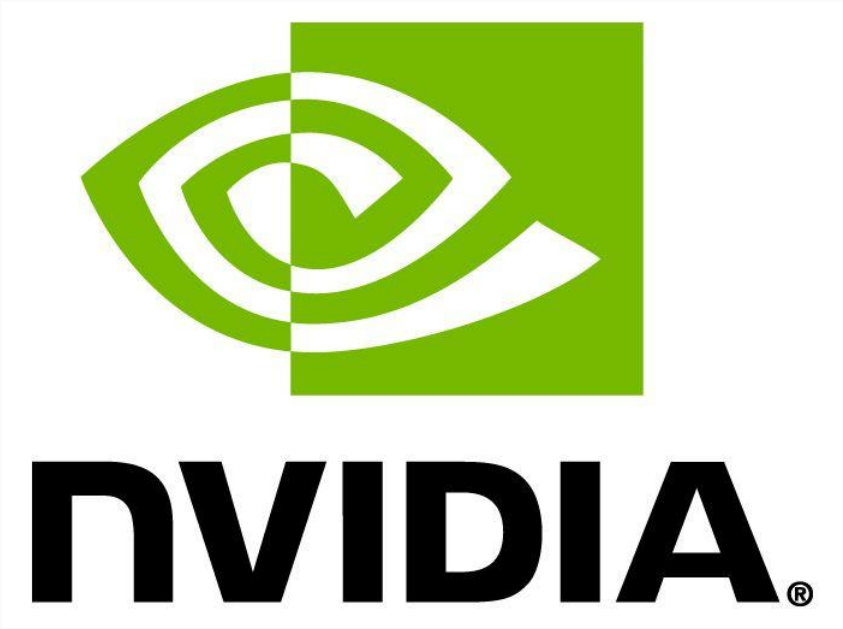
The reliability of a Chromebook with the power of Fedora

A viable alternative to MacOS for systems engineers

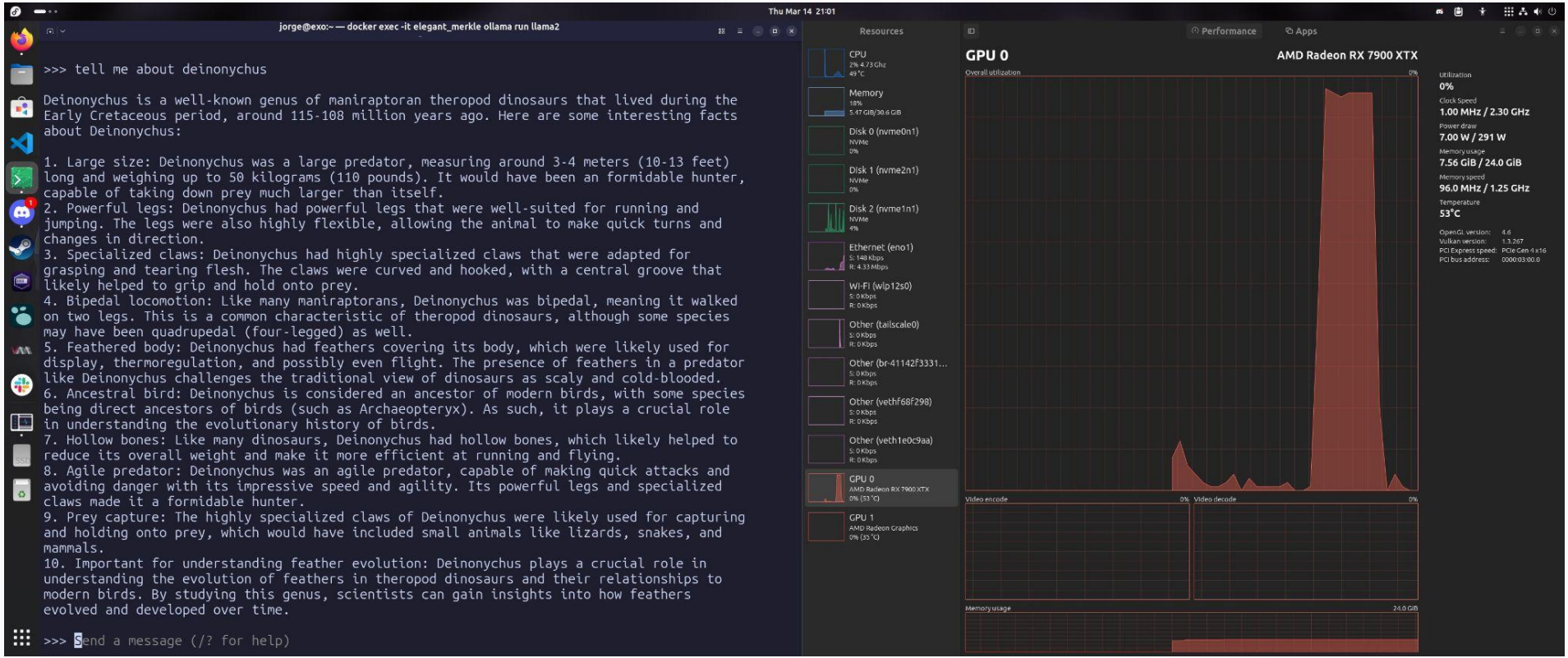


Podman on the Metal

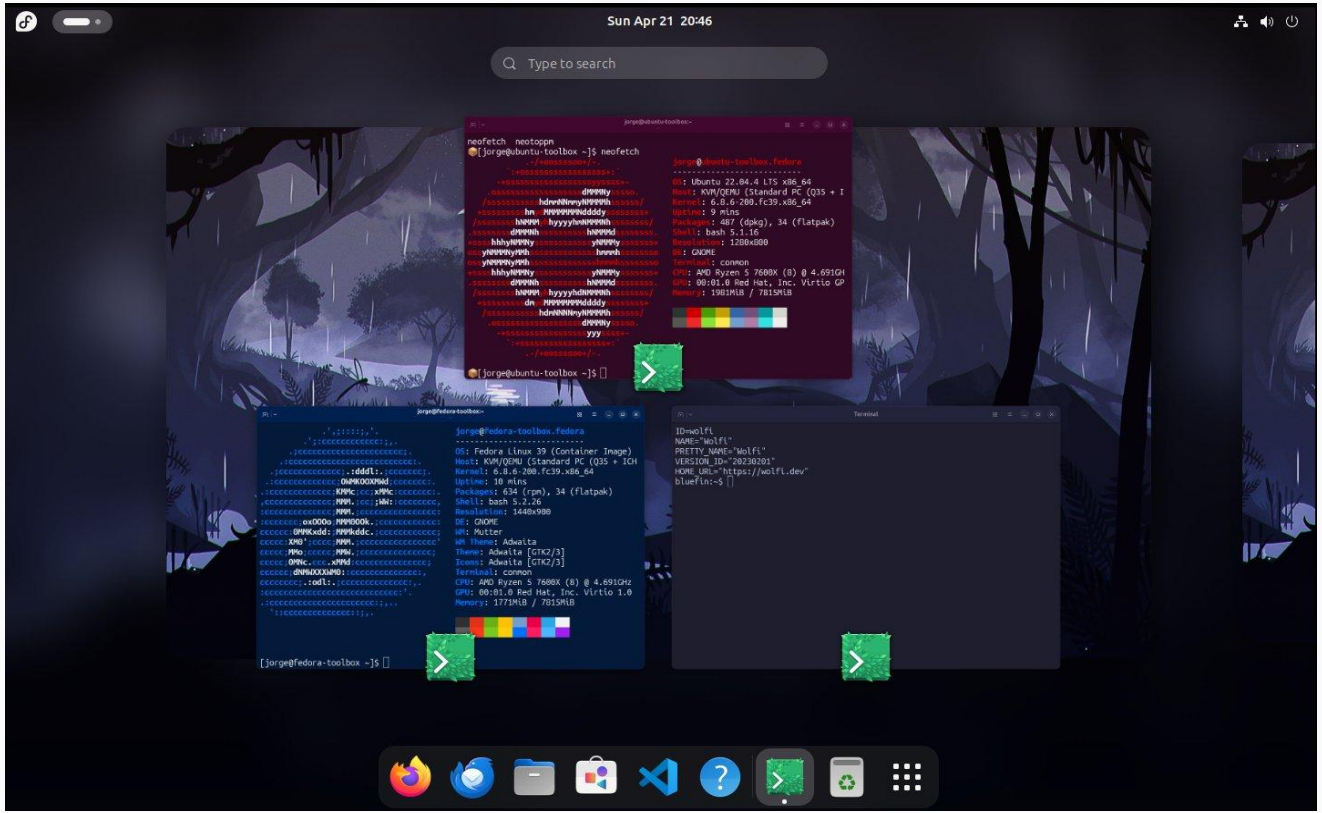
Prototype faster: Include drivers on your custom image

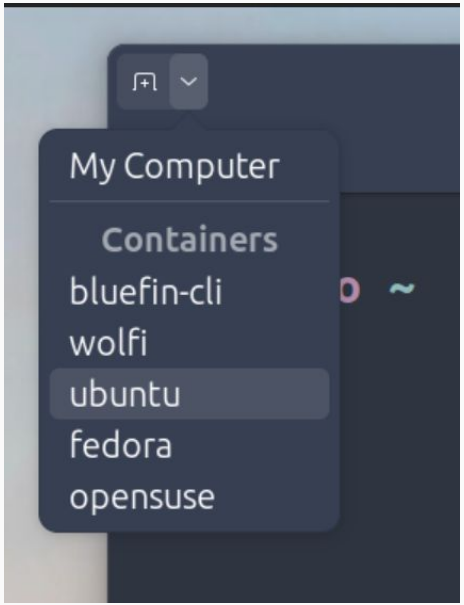


Prototype faster: ollama integration



Prototype Faster: Ptyxis Terminal and Podman



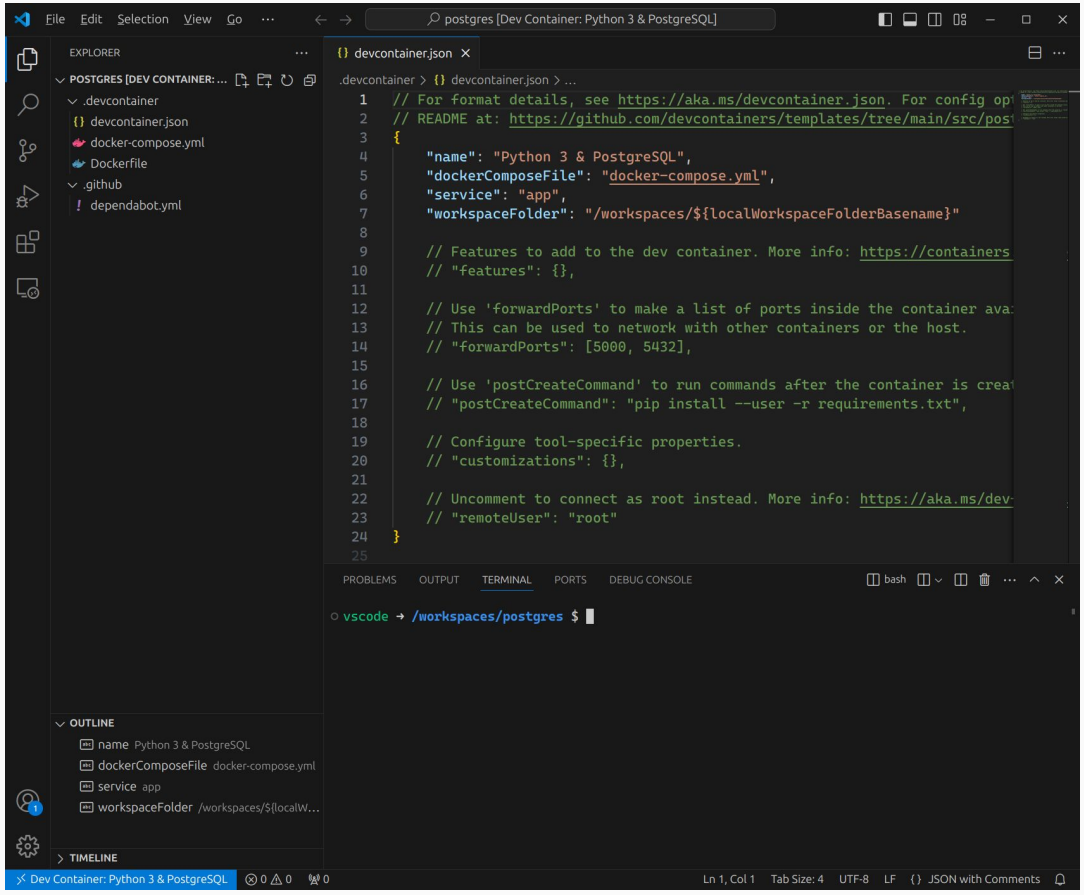


Thanks Luca di Maio (Independent) and Christian Hergert (Red Hat)

Prototype Faster: The “Developer Experience” Pattern

```
jorge@exo ~
❯ ujust devmode
Developer mode is currently enabled
Enable or Disable developer mode
> Enable
  Disable
```

- Built in k8s, QEMU/KVM
- VSCode with devcontainers
- Tailscale
- Homebrew
- Docker
- Virt-manager
- Great monospace fonts
- Quick-fire setup for jetbrains, pytorch, etc.



Prototype Faster: Swapping out kernels

```
# Install kernel-fsync, if needed
RUN rpm-ostree cliwrap install-to-root / && \
    if [[ "${KERNEL_FLAVOR}" =~ "fsync" ]]; then \
        echo "will install ${KERNEL_FLAVOR} kernel from COPR" && \
        curl -Lo /etc/yum.repos.d/_copr_sentry-kernel-fsync.repo https://copr.fedorainfracloud.org/coprs/s
        rpm-ostree override replace \
        --experimental \
        --from repo=copr:copr.fedorainfracloud.org:sentry:kernel-fsync \
            kernel \
            kernel-core \
            kernel-modules \
            kernel-modules-core \
            kernel-modules-extra \
            kernel-uki-virt \
            kernel-headers \
            kernel-devel \
```

Future directions: Alignment with dnf

```
RUN if [[ KERNEL_FLAVOR = “fsync” ]];
then dnf -y install kernel-fsync && dnf
clean all; fi
```

Stay Safe: Live mitigation of upstream regressions

```
22 + # # Workaround for podman issue upstream - https://github.com/containers/podman/issues/20872
23 + RUN if [ "$FEDORA_MAJOR_VERSION" = "39" ]; then \
24 +         rpm-ostree override replace https://bodhi.fedoraproject.org/updates/FEDORA-2023-00c78aad58; \
25 +     fi
26 +
```

Strongest Patterns

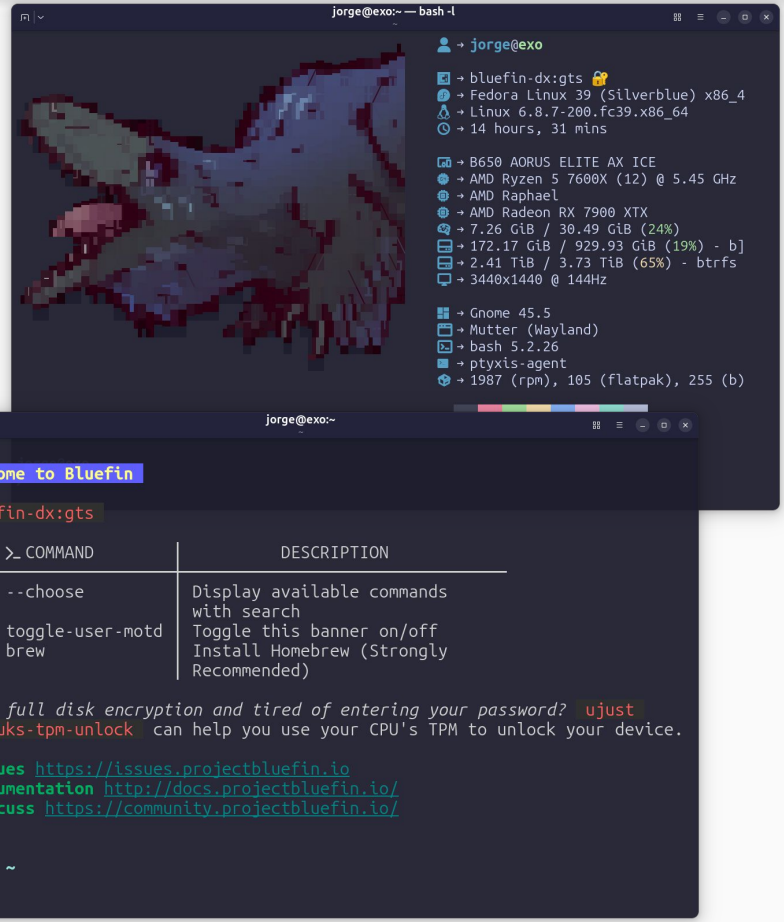
- One common language between dev and ops
- Sharing base images leads to efficiency
- Consistent image to the end user
- Hardware Enablement
  - ASUS, Framework, Lenovo, and Valve hardware
  - We ship newer kernels to the Steam Deck than Valve
- Gating regressions at the image level, not needing to do OS/distro work

Purposeful Simplicity

- Admins can go so far with `bash` and a little Python
- Explicit non-scope mission statements
- Encourage more innovation outside of Universal Blue
- “Not a distro” forces people to go fix deeper technical issues in Fedora itself
- “We are not Bitnami”

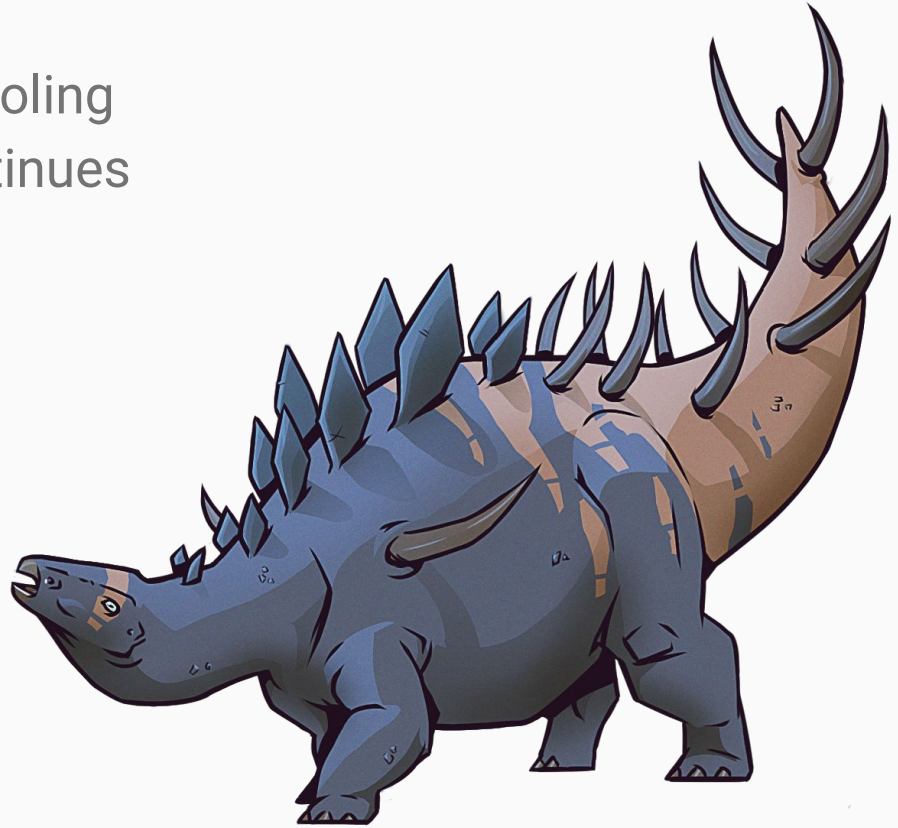
Silly UNIX tricks

- Shared community aliases via `just`
- Dynamic MOTD
- `ujust update`
- `ujust toggle-nvk`
- `ujust setup-cockpit`
- `ujust changelogs`
- `ujust device-info`
- Non-trivial amount of effort in terminal artwork. 😀



Challenges: The Linux Desktop's Docker Moment (powered by Podman)

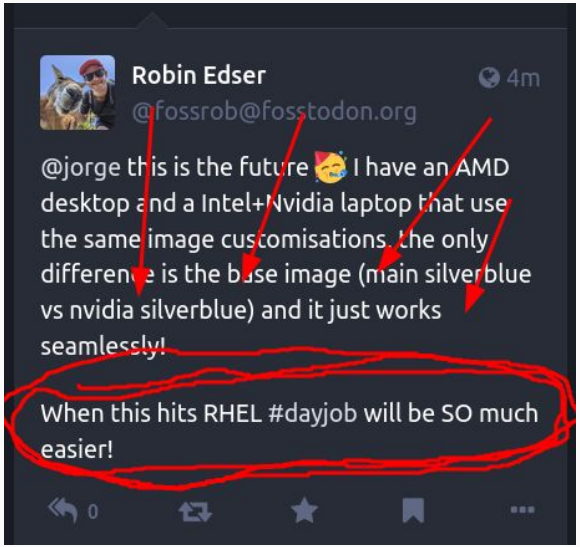
- Runtime --> build time customization
- Cloud Native tooling v. distribution tooling
- Container-focused development continues to challenge new users
  - Podman Desktop
  - Devcontainers
- Sigstore and SBOMs

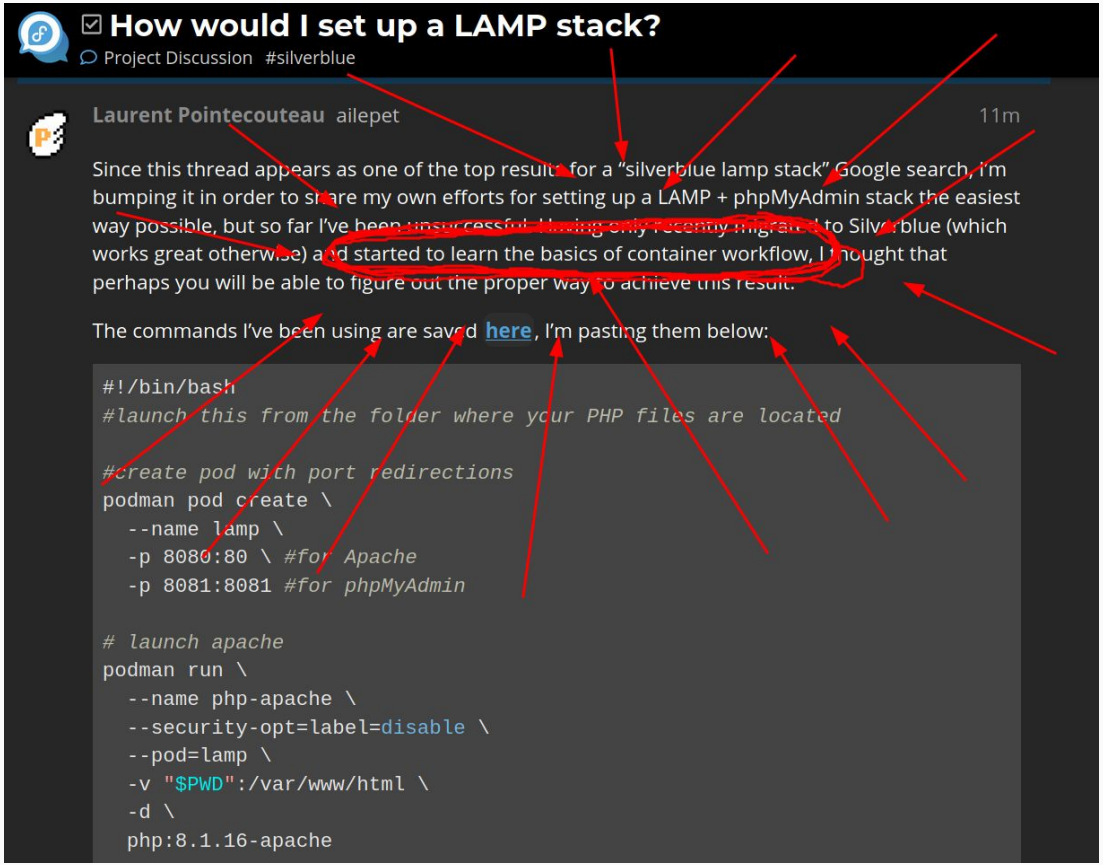


Things we'd love to see in container native Fedora

- Container diffs
  - The whole industry needs this
- More consumption of cloud native tooling
- Better automated testing
- Gating kernels via CoreOS cadence
- Command Line experience in general
- Management of `/etc`

Benefits for experts AND new explorers





Safety switches lead to positive interactions between users and OSS Contributors in our issue trackers.

They deserve that.

Intermission

There’s lots of Linux out there

- Gitlab CI, GitHub Action
- Servers: virthost-bos01…08.examplecorp.com
- Cloud
- Desktops
- Edge/IoT

Image-based/Immutable vs General purpose

- (Title is a **false dichotomy** but we'll get to that later)
- Brief history:
  - …
  - RHEV Image based hypervisor ISO (rhel6, ~2011)
  - …
  - Docker invented
  - …
  - (CoreOS) Container Linux
  - RHEL Atomic Host (rhel7)
  - RHEL CoreOS (rhel8+9)
  - Lots more around: Flatcar, Ubuntu Core, etc.

Why has OSTree stayed around?

- Fancy wrapper around link(), plus bootloaders: But it works
- Mutable /etc 3 way merge is not perfect, but better than alternatives
- Filesystem based adds a ton of flexibility
- Network-efficient static deltas

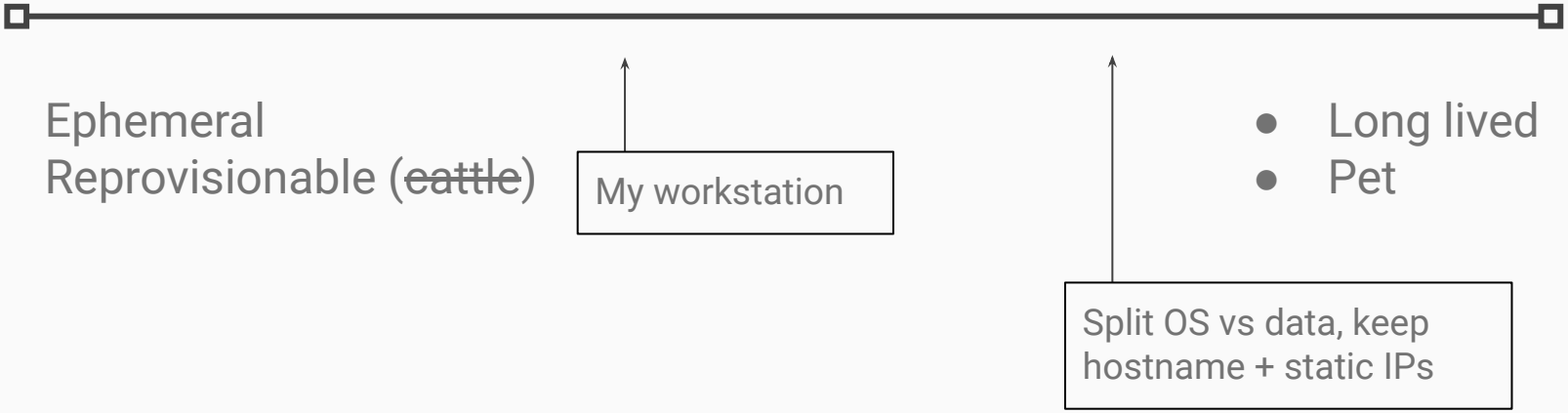
Lots of comp/co-opetition in the ecosystem

- Ubuntu Core
- SUSE ALP
- Balena
- Systemd: DDIs
- Kairos
- Flatcar
- Yocto generating images
- Google COOS
- NixOS (and Guix)
- Amazon Bottlerocket
- Fedora CoreOS/RHCOS
- Also Fedora Atomic Desktops + ublue
- Talos
- Docker LinuxKit
- Lots more

virthost-bos01…08 needs good tools

- https://grahamc.com/blog/erase-your-darlings/ “There are lots of cases in which immutable infrastructure *doesn’t* work, and the dirty secret is those servers need good tools the most.”
- Atomic Host and kernel-debug; throwaway or not

Reality is: there's a spectrum



CoreOS/Atomic and rpm-ostree

- ostree is a teenager: AuthorDate: Sun Oct 9 17:03:08 2011 -0400 (predates docker, etc.); goal was “image based” by default w/transactional updates
- **Yes, you *can* “rpm-ostree override replace kernel-debug.rpm” on virthost01, but you can *also* confidently reset back to the “golden image”; having your cake and eating it too**
- High level config (CRDs, Kube driven) vs Ignition vs machine-specific state
- *…vs deeper OS customization and agents*

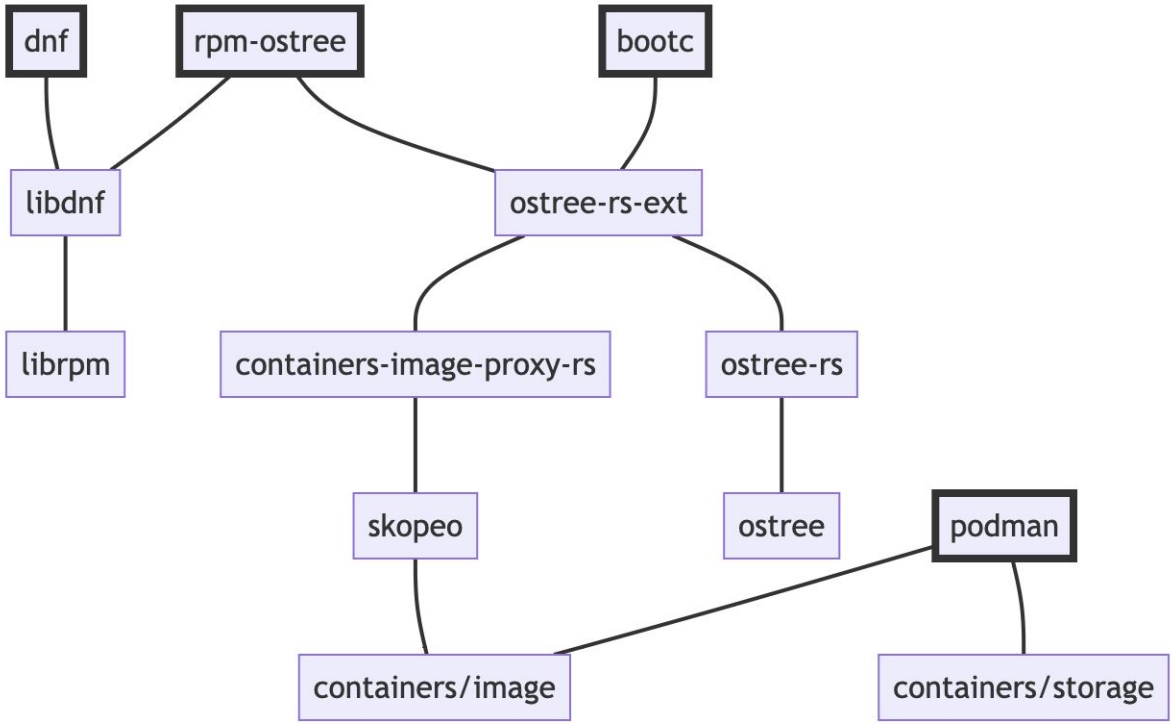
rpm-ostree learned containers!

- Let’s talk about that deep customization
- FROM quay.io/fedora/fedora-coreos:stable or FROM quay.io/fedora/fedora-silverblue:40
- OCP CoreOS Layering
- Enabled Universal Blue
- But… *but…*

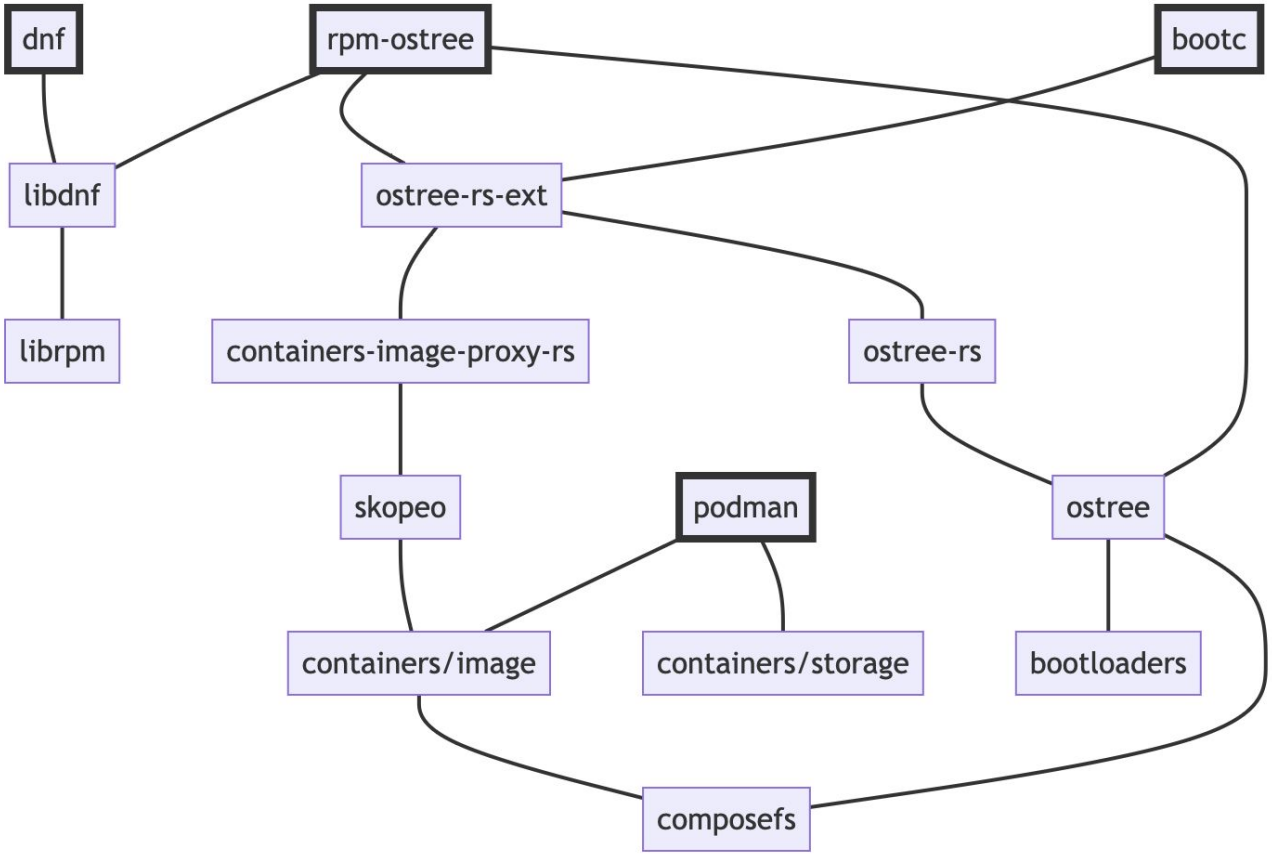
Changing engines is hard

- Gasoline vs electric ⇔ package vs ostree/container
- The name rpm-ostree is very literal and *no longer makes sense*
- Creation of http://github.com/containers/bootc that is all-in on containers but allows **seamless switch from prior ostree-oriented system**
- Thinking hard about a future where we have dnf + bootc, less rpm-ostree

Architecture diagram



More realistic architecture diagram



Demo: local builds w/bootc

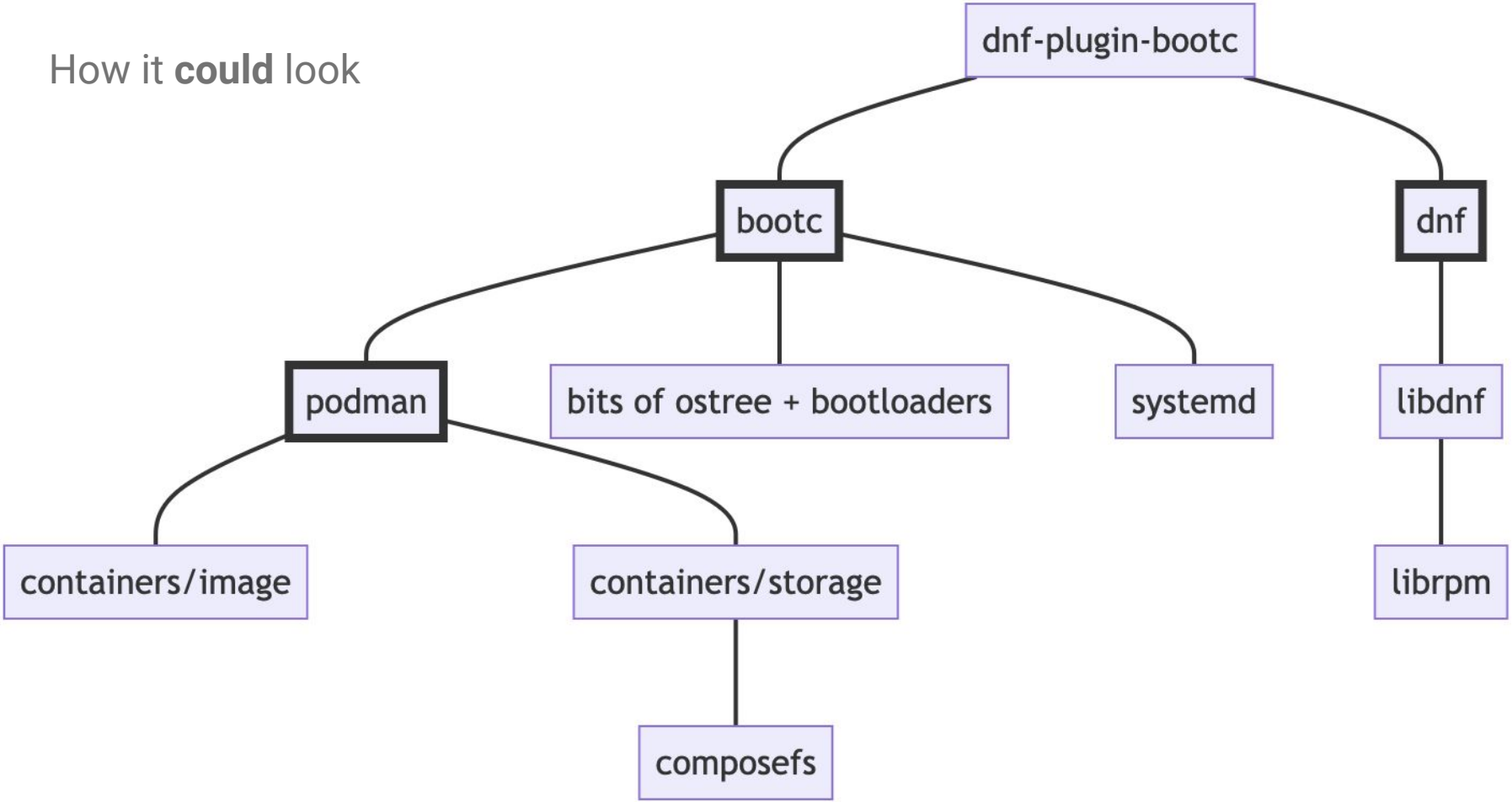
Next: Containers and Fedora

- Goal: Containers are an equal center of gravity for Fedora derivatives
- But: rpm packages continue to exist; also continue to adopt good ideas from other communities/projects
- Also Kubernetes vs standalone continues to exist.

Next: Deeper binding bootc+podman

- Deltas!
    - Req: https://github.com/containers/bootc/pull/215
- bootc+podman “lifecycle bound” images
- “System extensions” continuation (systemd-sysext binding/frontend)
- Host-toolbox idea

How it **could** look



Building an ecosystem

- CoreOS is super opinionated: **Thou shalt use Ignition**
- https://github.com/coreos/layering-examples/tree/main/ansible-firewalld
- What if we built an Ansible Galaxy like thing for this?
- What if it was **just normal** to boot Fedora Linux and derivatives as a container?

Next: Time to do a fedora+centos-bootc?

- bootc has been a side project until recently, we are working to start to build out a fedora-bootc in Fedora+derivatives, look for that soon!

Sustainability in Open Source