Vanilla OS 3

Immutable and Reproducible Operating System

@NN708, Vanilla OS Developer

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Agenda

- What Kind of Operating System Do We Want?
- What Is Immutability?
- What Is Reproducibility?
- Who Is Vanilla OS Designed For?

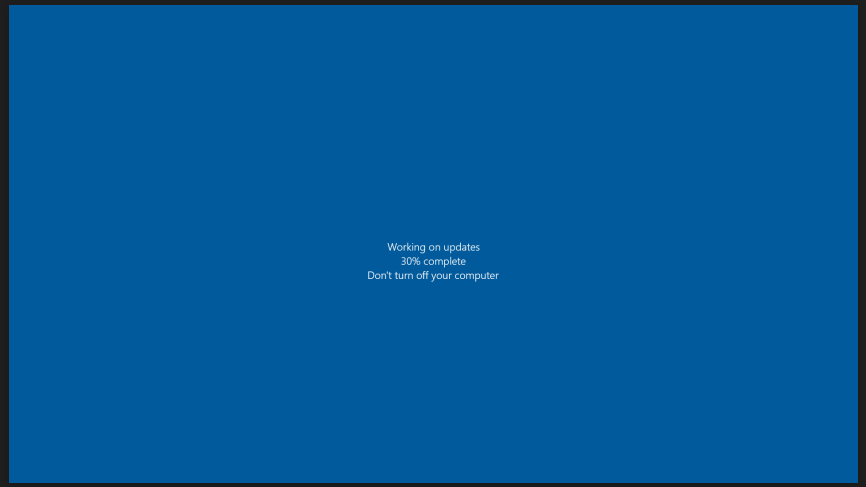
What Kind of Operating System Do We Want?

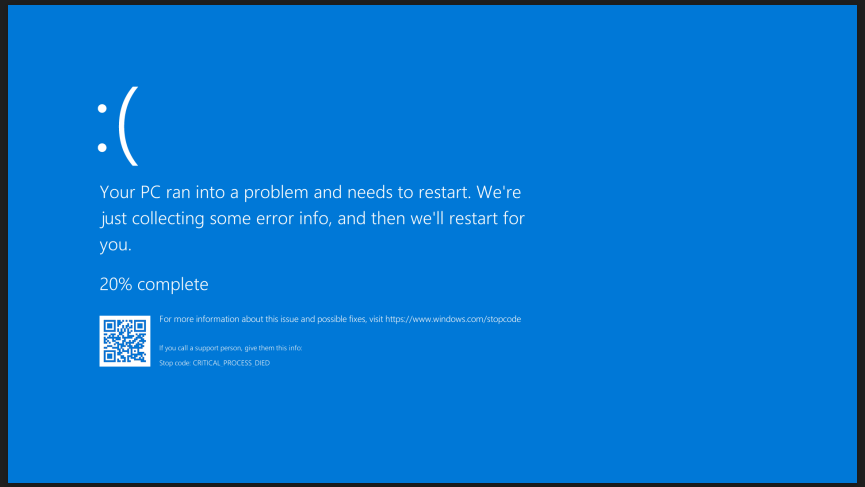
Windows

macOS

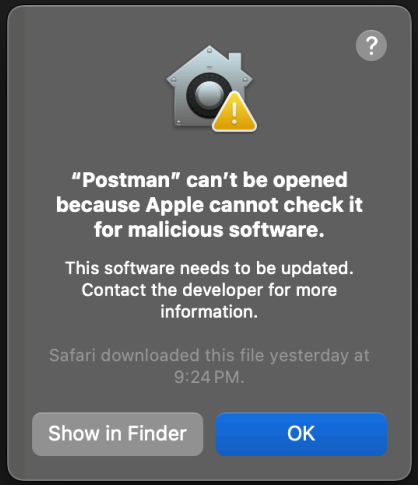
Linux

Why Not Windows?





Why Not macOS?



Can you install this
5-year-old program?

No, I can't!
This program is too old!

Can you install this
25-year-old program?

Yes, I can!
Installing... Done!

Can you install this
25-year-old program?

It's already installed.

Why Not Linux?

```
Gave up waiting for suspend/resume device
Gave up waiting for root file system device.  Common problems:
 - Boot args (cat /proc/cmdline)
    - Check rootdelay= (did the system wait long enough?)
 - Missing modules (cat /proc/modules; ls /dev)
ALERT! UUID=2afe7c2f-cf17-4e01-bc49-930ae6f1e62b does not exist.  Dropping to a shell!


Busybox v1.35.0 (Debian 1:1.35.0-4+b3) built-in shell (ash)
Enter 'help' for a list of built-in commands.

(initramfs) _
```

What Kind of Operating System Do We Want?

- As Compatible as Windows
- As Stable as macOS
- As Free as Linux

What Is Immutability?

Read-Only Root Filesystem (/)

Core system is read-only while running, preventing accidental changes.

Think of the host system as a container, with only specific directories mounted as writable for persistent data.

Atomic System Updates

Changes are applied to the entire core system, with the ability to safely roll back if something goes wrong.

Like a disk restore card, the system can always revert to a known good state.

Containerized Applications

Applications are installed separately from the host system, typically containerized.

How Vanilla OS Achieves Immutability?

Core System as an OCI Image

The entire OS is built as an OCI (Open Container Initiative) image, containing only essential components.

Proven in cloud computing, OCI images offer both flexibility in development and stability once published.

A/B System Updates

The OS runs from a read-only "present" partition, while updates are installed to a separate "future" partition.

After a successful update and reboot, the partitions are swapped.

Flatpak First

Most default applications are delivered as Flatpaks, giving users the freedom to choose what they need.

What Is Reproducibility?

Same Source + Same Build Environment = Same Binary

Reproducible builds allow any party to create bit-by-bit identical artifacts, given the exact same source and build environment.

How Vanilla OS Benefits From Reproducibility?

CVE-2024-54855

Hard-coded SSH host key, vulnerable to MITM (man-in-the-middle) attacks.

Reproducible builds eliminate all non-deterministic elements, preventing such vulnerabilities.

Supply Chain Security

No need to trust a single entity. Anyone can independently verify the authenticity of built system images.

Vanilla OS Release History

Though still a relatively young project, Vanilla OS has matured significantly over the past few years.

Version	Release date	Based on
Vanilla OS 22.10 Kinetic	2022-12-29	Ubuntu Kinetic
Vanilla OS 2 Orchid	2024-07-28	Debian sid
Vanilla OS 3 Reunion	Coming soon!	Debian snapshot archive of sid

Who Is Vanilla OS Designed For?

- Built for Beginners
- Built for Developers
- Built for Gamers
- Built for Everyone!

Vanilla OS Is Beginner Friendly

Rootless by Default

Say goodbye to `sudo`. Everyday tasks don't need root access.

Polkit (`pkexec`) provides fine-grained permission control when you truly need elevated privileges.

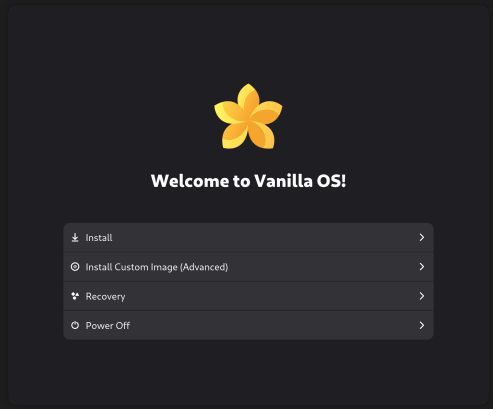
No Traditional Package Managers

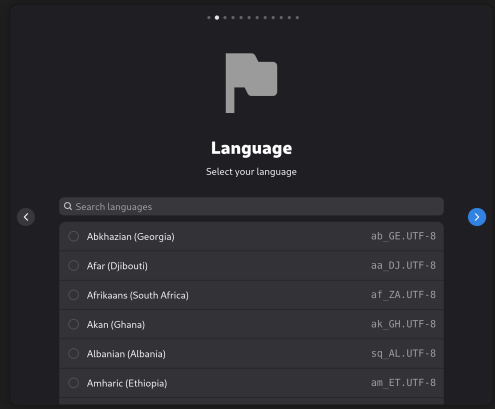
No more dependency hell or package conflicts.

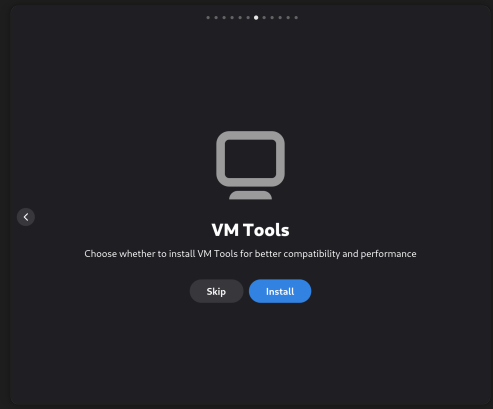
Automatic Maintenance

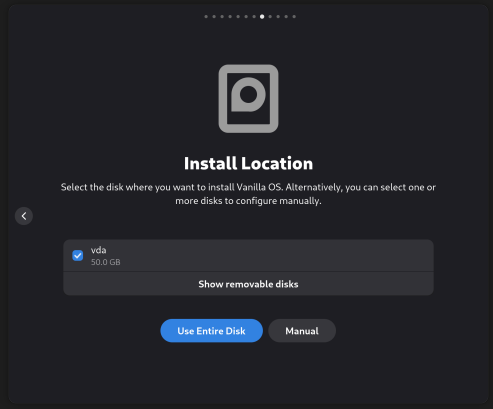
The system can take care of itself, even if you never touch the command line!

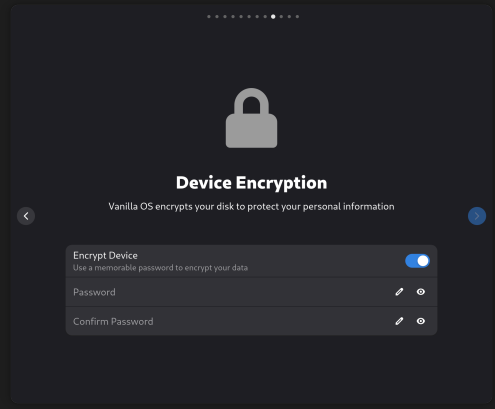
Vanilla Installer

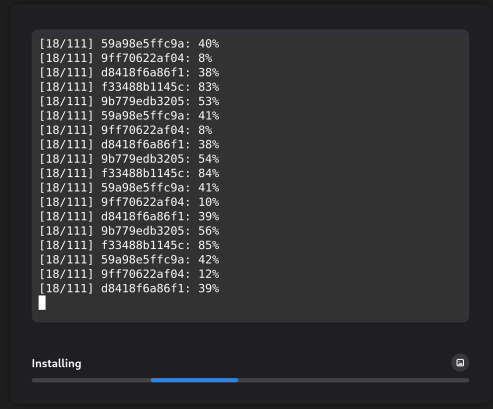




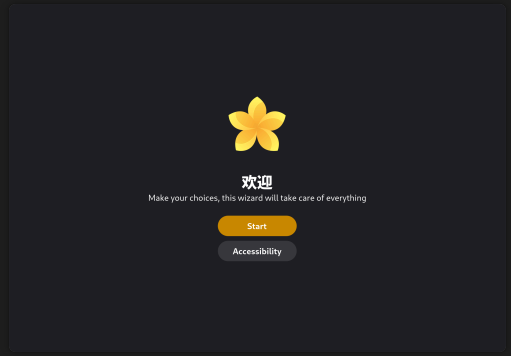


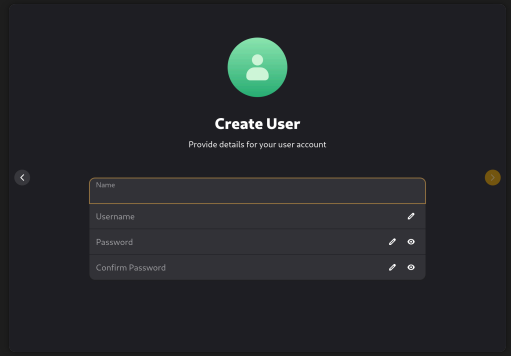


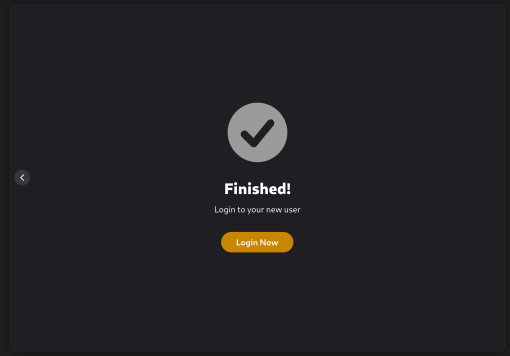


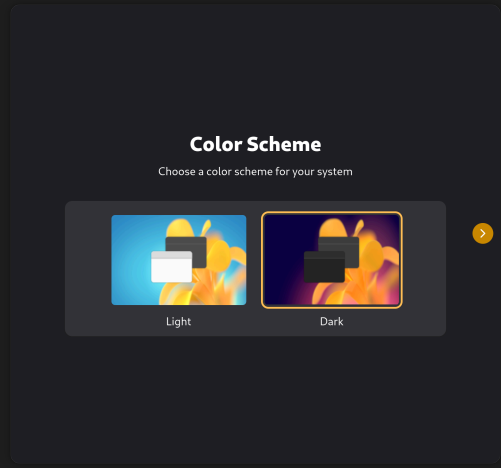


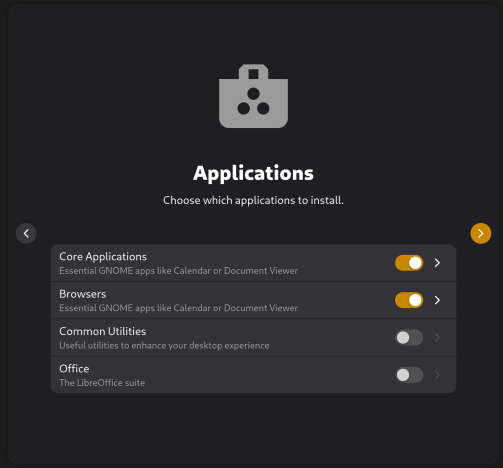
Vanilla First Setup

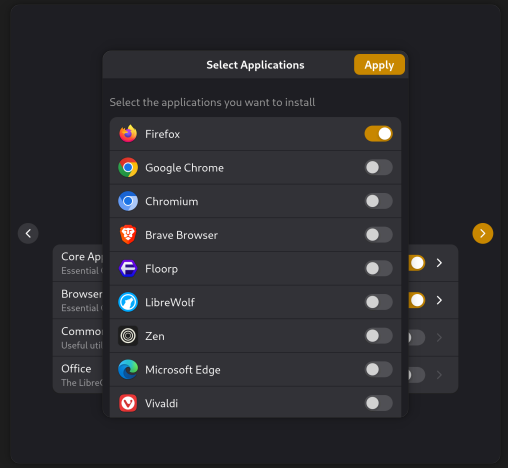








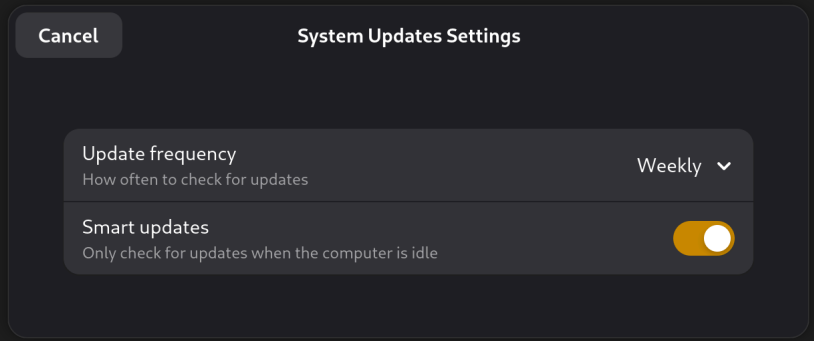


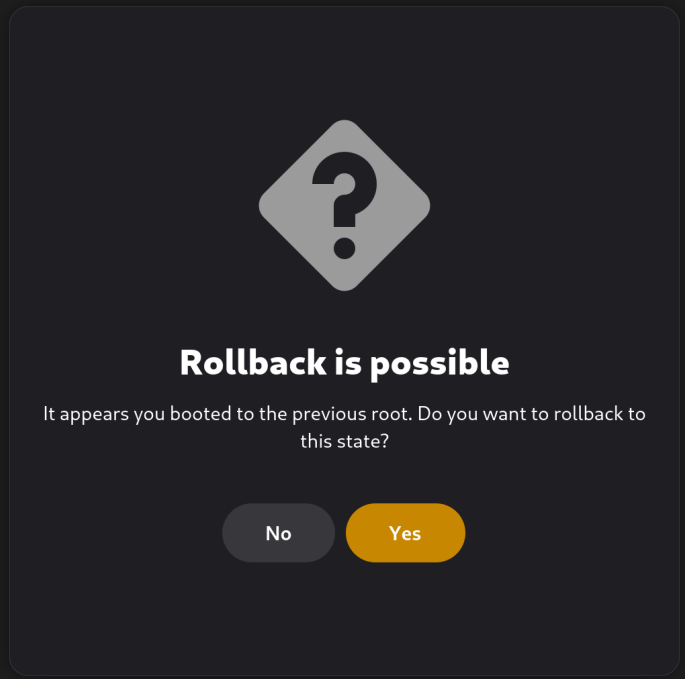



Flathub
The App Store for Linux

VSO (Vanilla System Operator)

Vanilla Updates Utility



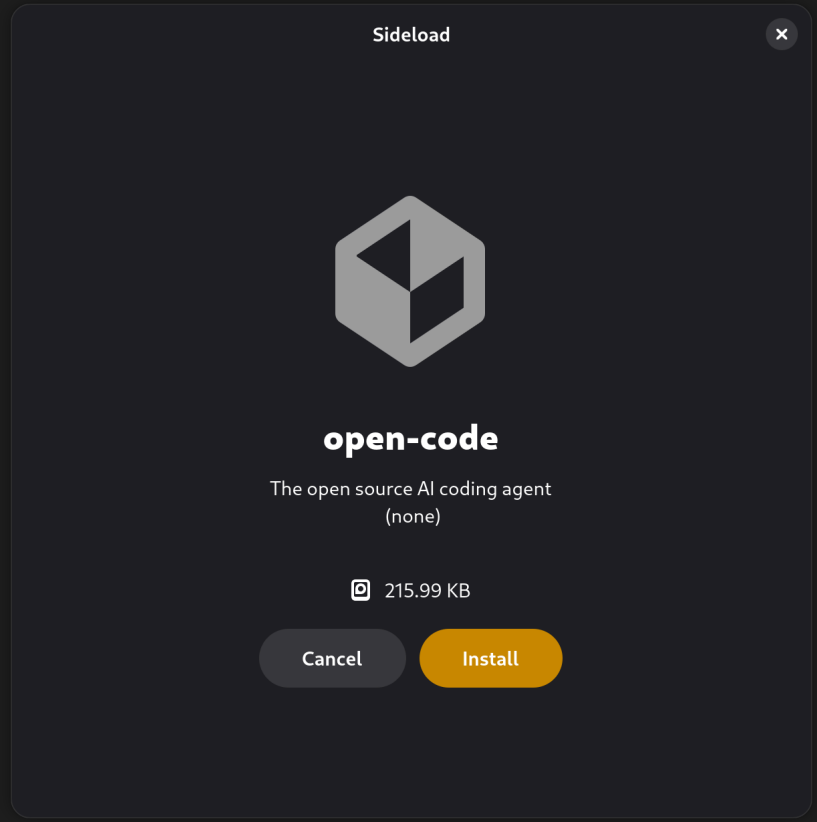


- VSO automatically updates the system in the background when the device is idle.
- A "↓" indicator in the top panel provides update status and controls during update process.
- The new version loads just after a standard reboot.

VSO (Vanilla System Operator)

Vanilla Sideload Utility

- Though the host system is immutable, you can still install `.deb` packages directly via sideloading.
- VSO installs them into a special containeried subsystem called `vso-apx-pico`.
- Sideloaded applications can be exported to the GNOME applications overview, allowing them to be run directly from the host system.



Vanilla OS Is Developer Friendly

Familiar Development Experience

The `vso-apx-pico` subsystem serves as the default terminal, where `sudo` and `apt` are available.

Easily create additional containerized development environments based on any Linux distribution.

Unbreakable Foundation

Experiment freely without any risk of breaking the host system.

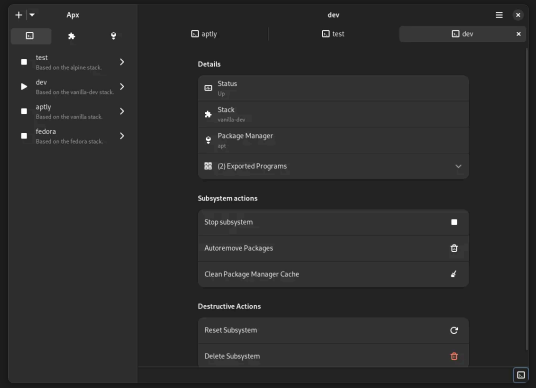
If something goes wrong, simply run `reset-vso` to recreate the subsystem container.

Fully Customizable

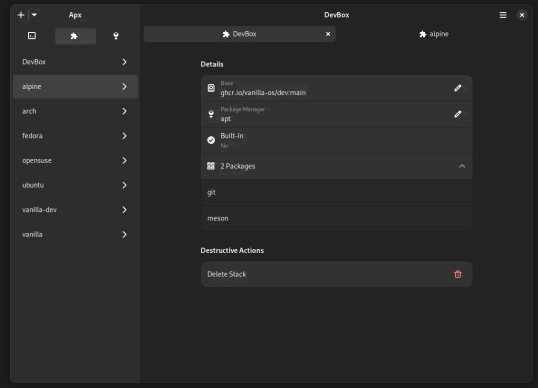
Customize the host system, switch between different system images, or even create a new system of your own!

Apx

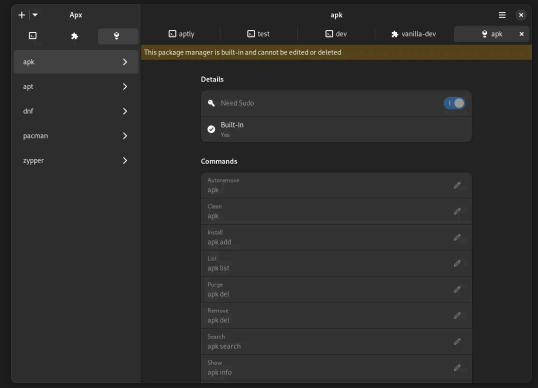
- Create custom subsystems using any Linux distribution and package manager, powered by Distrobox.
- Export applications and commands for seamless integration with the host system.
- Manage everything through the Apx GUI or directly via the Apx CLI.



Subsystem: A containerized development enviroment created from a **stack**.

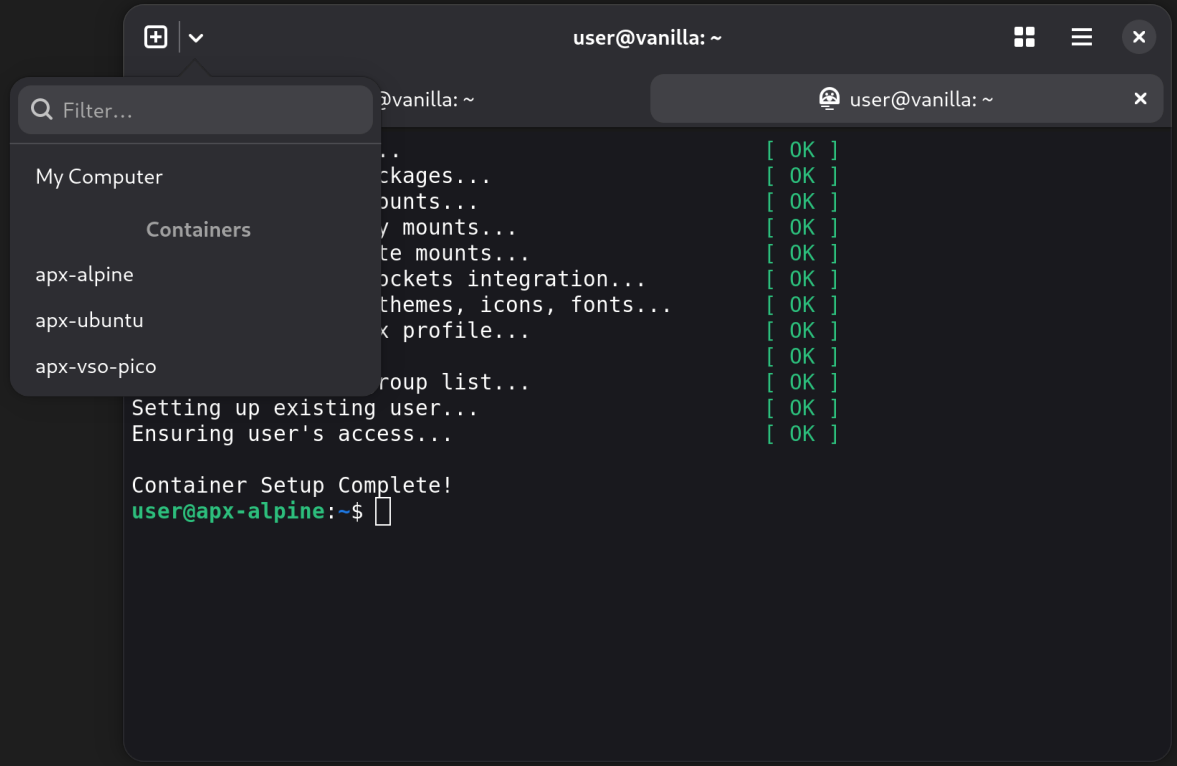


Stack: Defines the base image, with a **package manager** and pre-installed packages.



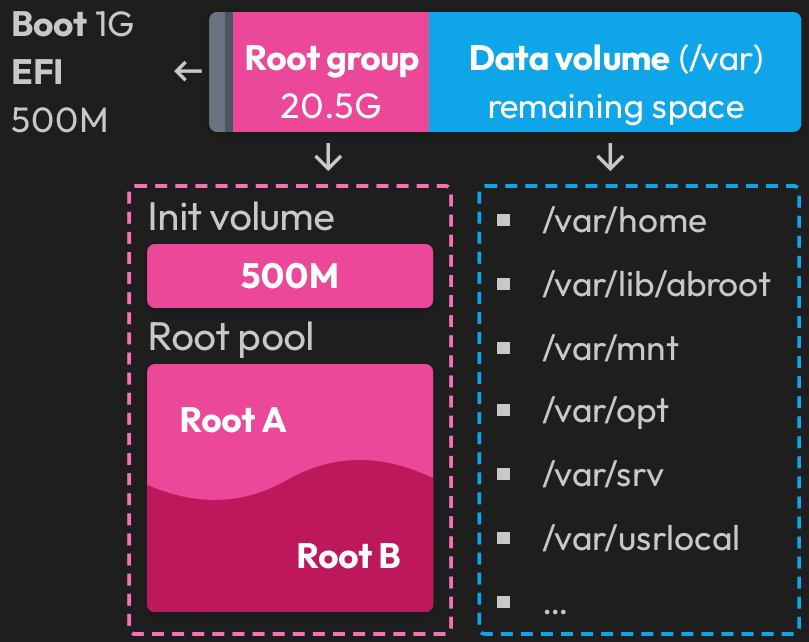
Package manager: Specifies the commands to install, update and remove packages.

Apx Support in Ptyxis



[A B] Root

Partitioning Structure



Installing Additional Packages

To install packages like specific drivers or alternative input methods on the host system:

```
$ abroot pkg add <pkg>
$ abroot pkg apply
```

A new OCI image is built locally with your selected packages, then deployed to the host system.

Switching Base Image

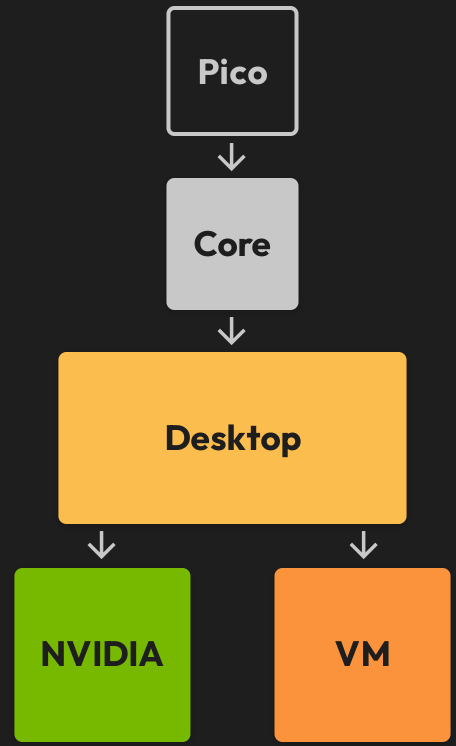
Switching the base image is straightforward:

```
$ abroot rebase <name>
```

Vib (Vanilla Image Builder)

An extensible Dockerfile pre-compiler for building OCI images using modular, readable YAML recipes.

```yaml
name: Vanilla Desktop
id: desktop
vibversion: 1.1.0
stages:
  - id: build
    base: gchr.io/vanilla-os/core:dev
    args:
      DEBIAN_FRONTEND: noninteractive
    cleanup:
      - /tmp/*
      - ...
modules:
  - name: packages-modules
    type: includes
    includes:
      - modules/00-vanilla-desktop-base.yml
      - ...
```



Vanilla OS Is Gamer Friendly

Lightweight Foundation

Though not specifically built for gaming, it provides a clean and reliable experience without the extra bloat.

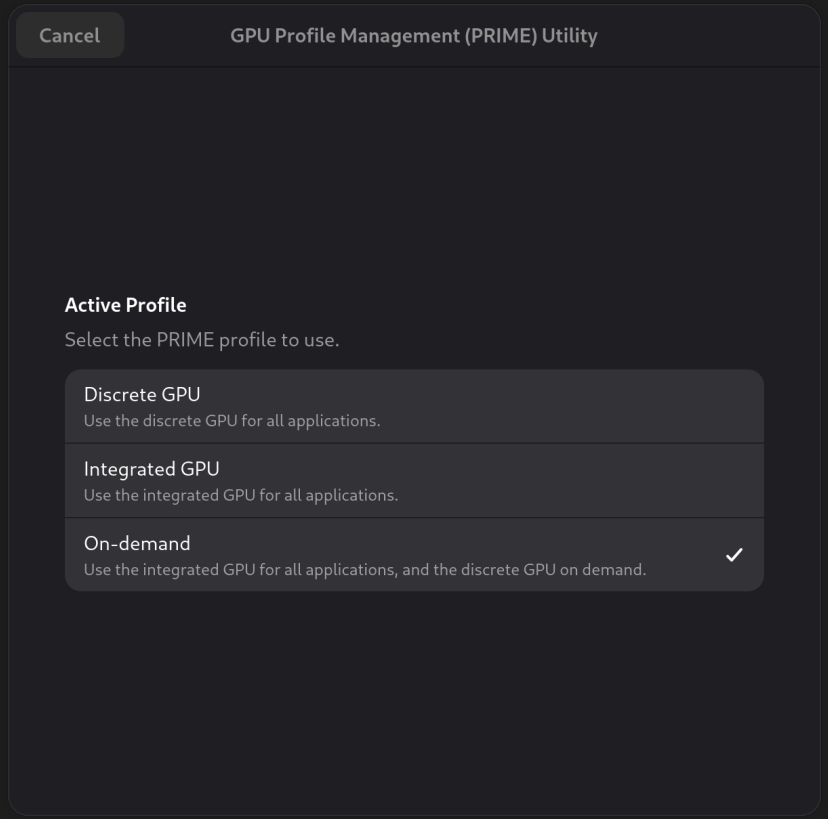
Up-to-Date Performance

By closely tracking Debian sid, Vanilla OS delivers cutting-edge kernel and graphics driver updates.

Seamless GPU Switching

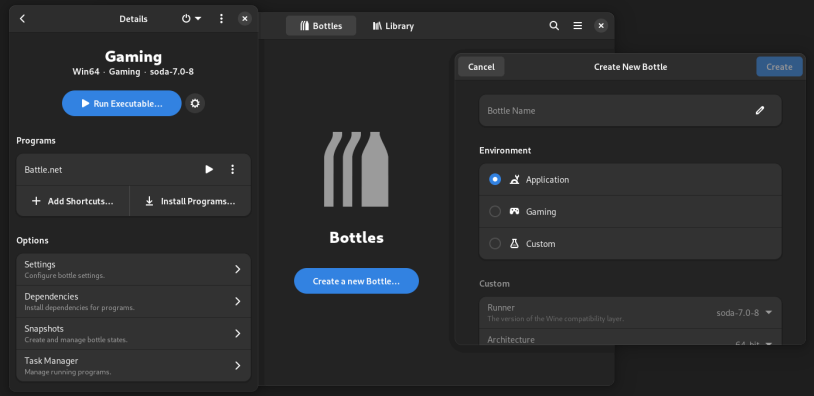
Switch between integrated and dedicated graphics effortlessly with our built-in PRIME utility.

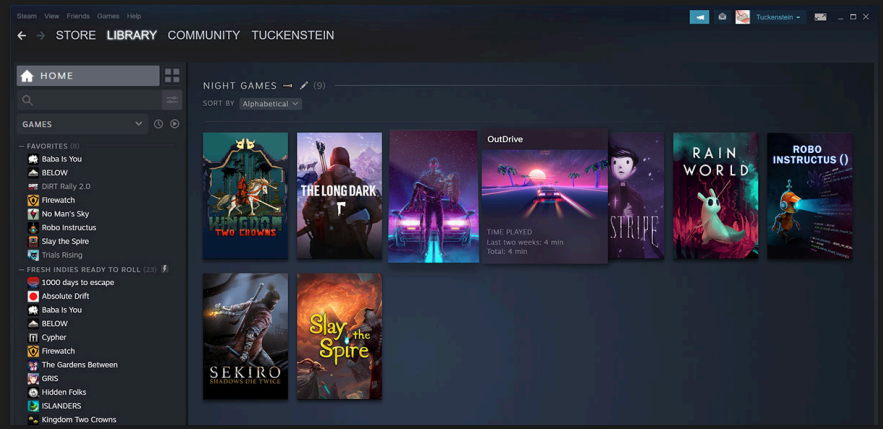
Vanilla PRIME Utility



Bottles

Steam





As of October 2025, nearly 90% of Windows games can now run on Linux. SOURCE: BOILING STEAM

Vanilla OS Is Hardware Friendly

Out-of-the-Box Experience

Comes with a large number of drivers pre-installed, ensuring most peripherals work immediately.

The installer detects your hardware configuration and recommends the suitable system image.

Native ARM64 Support

Vanilla OS now fully supports ARM64, delivering a seamless experience on low-power, high-efficiency SBCs (single board computers) and laptops.

- All system components compiled for ARM64
- Multi-architecture OCI images built natively for both AMD64 and ARM64

Technologies We Use


podman


Albius Eratosthenes Prometheus

Vanilla OS SDK

Collection of core libraries and tools to create system utilities and other applications for Vanilla OS.

Provides standardized solutions for CLI interactions, logging, notifications, system handling, and more.

Vanilla OS Is Your Next Operating System

Simple

Minimalist and intuitive design, delivers a clean and fast experience

Built with modular, distro-agnostic architecture for maximum flexibility

Stable

Cloud-native immutability brings proven container technology to your desktop

Obstruction-free experience, always up-to-date and easily recoverable

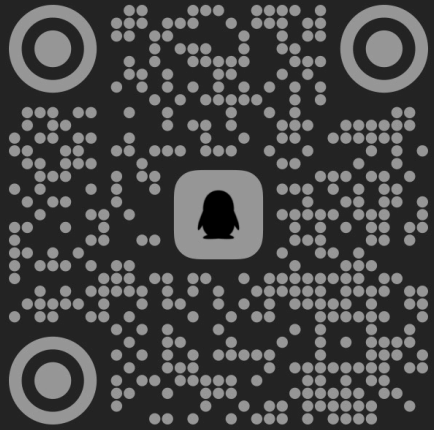
Secure

Fully free and open source, everything is transparent, verifiable and reproducible

Privacy by design with zero telemetry, ensuring your data stays yours

Vanilla OS 中文交流群

群号: 1091353788



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Special Thanks To

fabricators

All Vanilla OS Contributors

And Our Entire Community