

# Vanilla OS 3

Immutable and Reproducible Operating System

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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?

Working on updates  
30% complete  
Don't turn off your computer



Your PC ran into a problem and needs to restart. We're just collecting some error info, and then we'll restart for you.

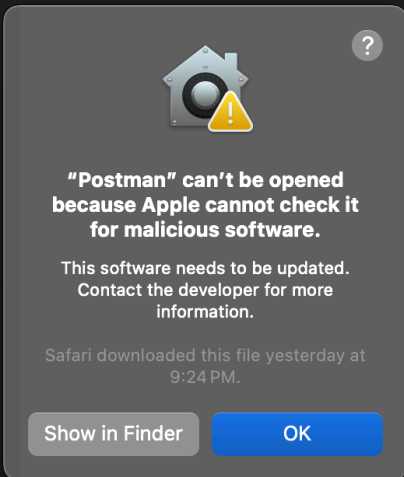
20% complete



For more information about this issue and possible fixes, visit <https://www.windows.com/stopcode>

If you call a support person, give them this info:  
Stop code: CRITICAL\_PROCESS\_DIED

# 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



## Welcome to Vanilla OS!

- Install
- Install Custom Image (Advanced)
- Recovery
- Power Off

## Language

Select your language

Search languages

<input type="radio"/>	Abkhazian (Georgia)	ab_GE.UTF-8
<input type="radio"/>	Afar (Djibouti)	aa_DJ.UTF-8
<input type="radio"/>	Afrikaans (South Africa)	af_ZA.UTF-8
<input type="radio"/>	Akan (Ghana)	ak_GH.UTF-8
<input type="radio"/>	Albanian (Albania)	sq_AL.UTF-8
<input type="radio"/>	Amharic (Ethiopia)	am_ET.UTF-8

## VM Tools

Choose whether to install VM Tools for better compatibility and performance

## Install Location

Select the disk where you want to install Vanilla OS. Alternatively, you can select one or more disks to configure manually.

vda  
50.0 GB

Show removable disks

## Device Encryption

Vanilla OS encrypts your disk to protect your personal information

Encrypt Device

Use a memorable password to encrypt your data

Password

Confirm Password

```
[18/111] 59a98e5ffc9a: 40%
[18/111] 9ff70622af04: 8%
[18/111] d8418f6a86f1: 38%
[18/111] f33488b1145c: 83%
[18/111] 9b779edh3205: 53%
[18/111] 59a98e5ffc9a: 41%
[18/111] 9ff70622af04: 8%
[18/111] d8418f6a86f1: 38%
[18/111] 9b779edh3205: 54%
[18/111] f33488b1145c: 84%
[18/111] 59a98e5ffc9a: 41%
[18/111] 9ff70622af04: 10%
[18/111] d8418f6a86f1: 39%
[18/111] 9b779edh3205: 56%
[18/111] f33488b1145c: 85%
[18/111] 59a98e5ffc9a: 42%
[18/111] 9ff70622af04: 12%
[18/111] d8418f6a86f1: 39%
```

Installing



# Vanilla First Setup



欢迎

Make your choices, this wizard will take care of everything

Start

Accessibility



## Create User

Provide details for your user account

Name

Username

Password

Confirm Password



Finished!

Login to your new user

Login Now

## Color Scheme

Choose a color scheme for your system



Light



Dark



## Applications

Choose which applications to install.

- Core Applications**  >  
Essential GNOME apps like Calendar or Document Viewer
- Browsers**  >  
Essential GNOME apps like Calendar or Document Viewer
- Common Utilities**  >  
Useful utilities to enhance your desktop experience
- Office**  >  
The LibreOffice suite

### Select Applications

Apply

Select the applications you want to install

- Firefox
- Google Chrome
- Chromium
- Brave Browser
- Floorp  >
- LibreWolf  >
- Zen  >
- Microsoft Edge  >
- Vivaldi



**Flathub**

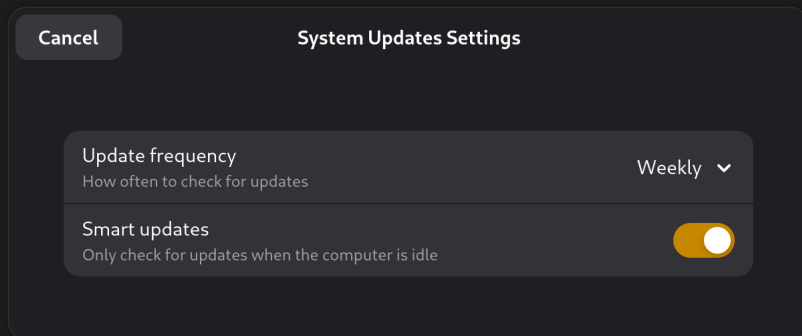
The App Store for Linux



# 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.



### Rollback is possible

It appears you booted to the previous root. Do you want to rollback to this state?

No

Yes

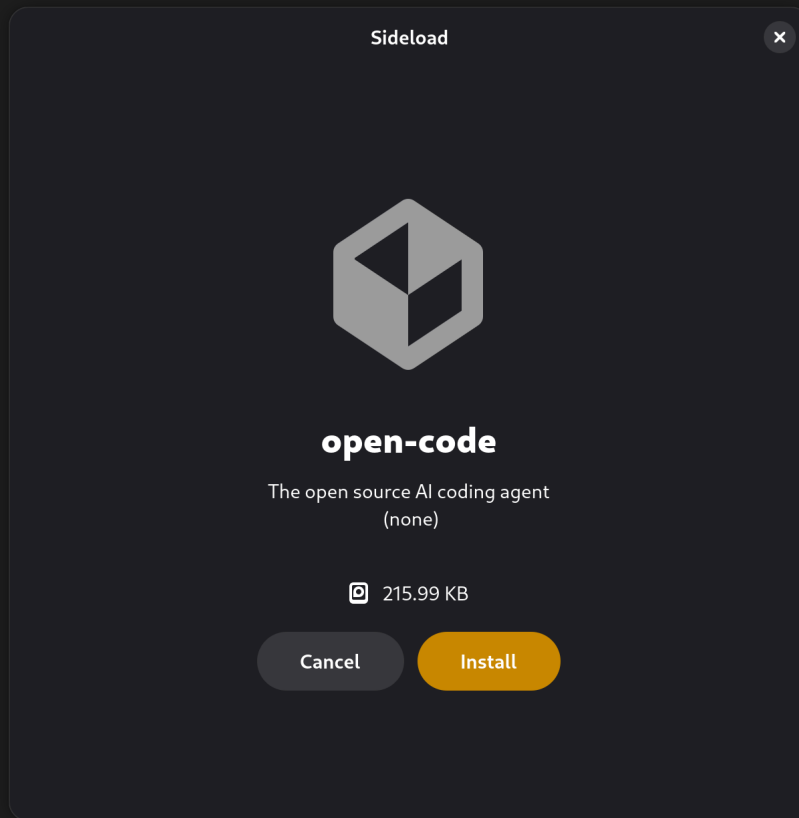


# VSO (Vanilla System Operator)



## Vanilla Sideload Utility

- Though the host system is immutable, you can still install `.deb` packages directly via sideloading.
- VSO installs them into a special containerized 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.

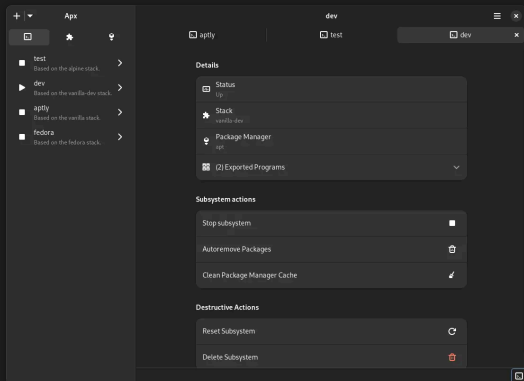
If something goes wrong, simply run `reset-vso` to recreate the subsystem container.

## Fully Customizable

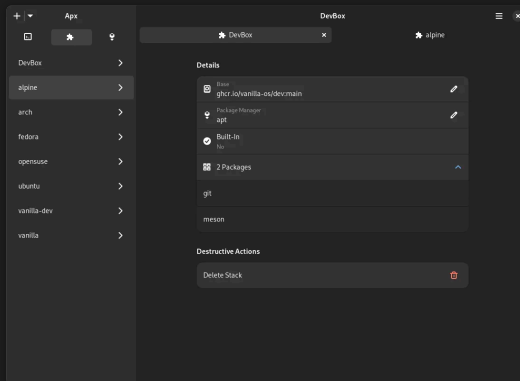
Customize the host system, switch between different system images, or even create a new system of your own!



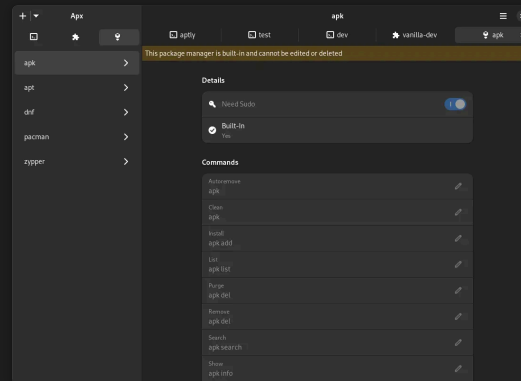
- Create custom subsystems using any Linux distribution and package manager, powered by Distrobox.
- Export applications and commands for seamless integration with the host system.
- Manage everything through the Apx GUI or directly via the Apx CLI.



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

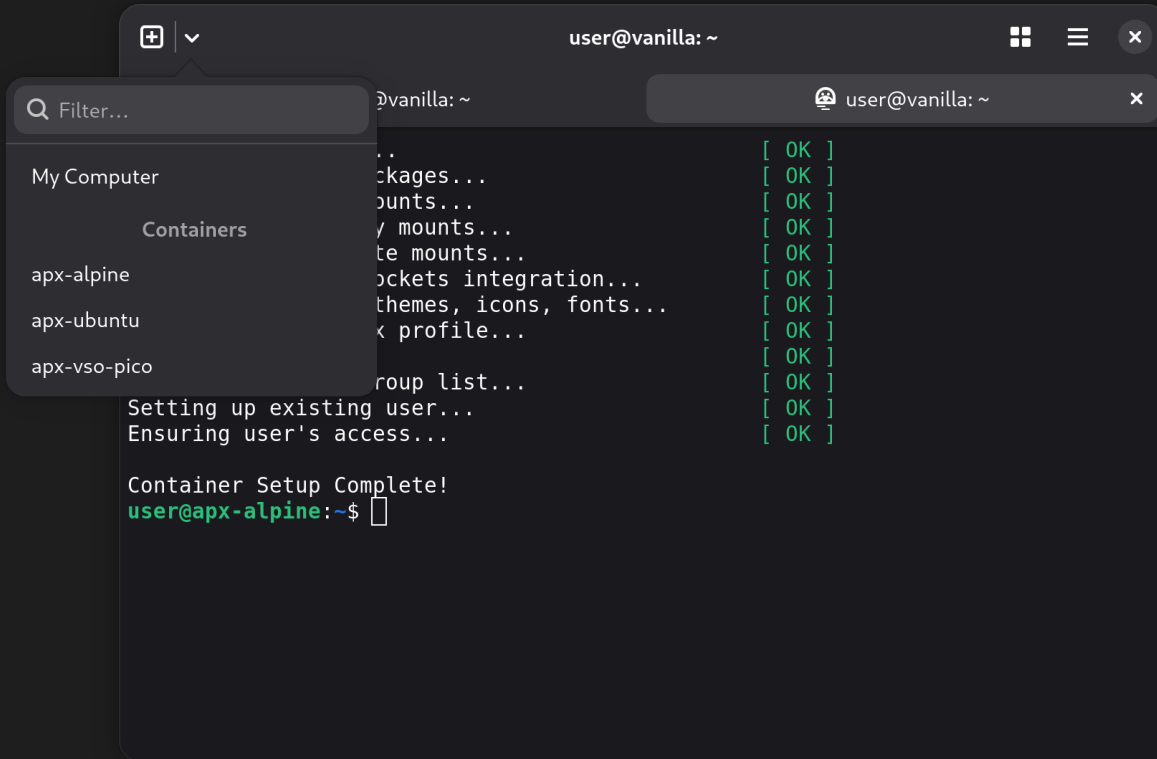


**Stack:** Defines the base image, with a **package manager** and pre-installed packages.



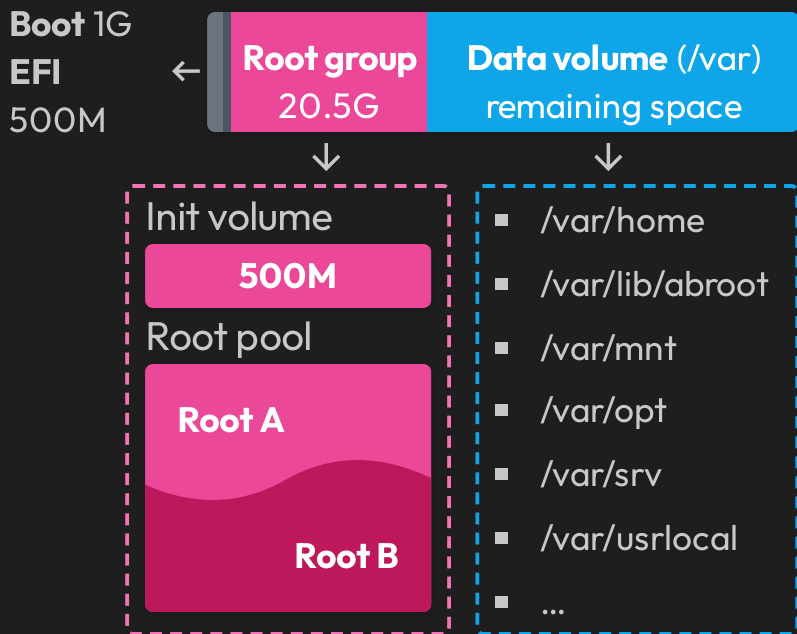
**Package manager:** Specifies the commands to install, update and remove packages.

# 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

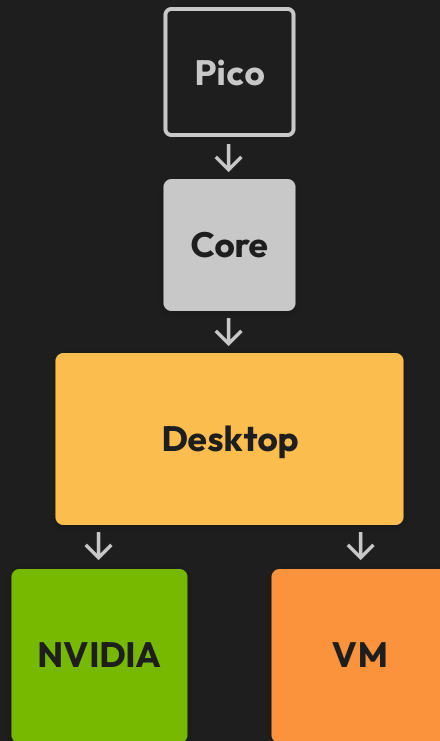
Switching the base image is straightforward:

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

# Vib (Vanilla Image Builder)

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

```
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

Cancel

GPU Profile Management (PRIME) Utility

## Active Profile

Select the PRIME profile to use.

### Discrete GPU

Use the discrete GPU for all applications.

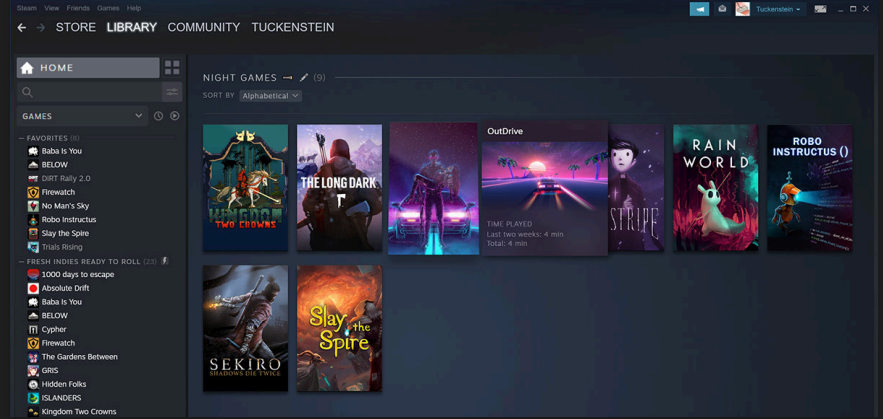
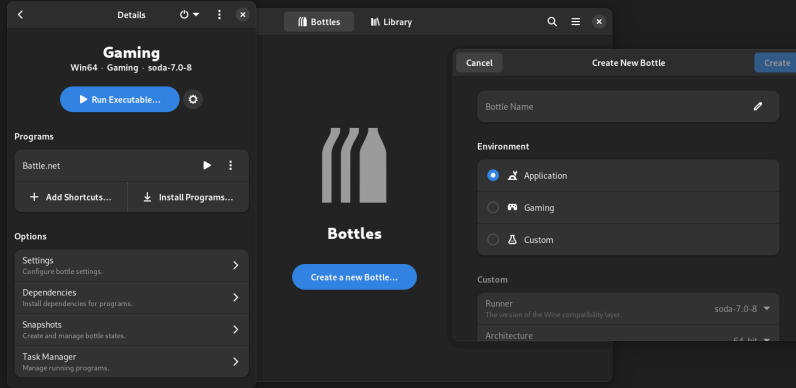
### Integrated GPU

Use the integrated GPU for all applications.

### On-demand

Use the integrated GPU for all applications, and the discrete GPU on demand.





As of October 2025, nearly 90% of Windows games 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



buildah

*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

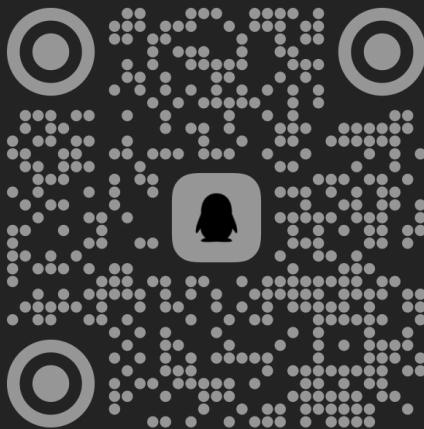
Fully free and open source, everything is transparent, verifiable and reproducible

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



Vanilla OS 中文交流群

群号: 1091353788



扫一扫二维码，入群聊

# Special Thanks To fabricators

All **Vanilla OS** Contributors

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And Our Entire Community