

The FreeBSD operating system

What's new in FreeBSD 12

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freeBSD®

What is FreeBSD?

FreeBSD is an open source Unix-like **operating system** descended from patches developed at the University of California, Berkeley in the 1970s.

The FreeBSD Project is an active **open source community** since 1993 with hundreds of committers and thousands of contributors around the world.

The FreeBSD Foundation is a **non-profit organisation** registered in Colorado, USA in 2001 dedicated to supporting the FreeBSD Project, its development and its community.



Who uses FreeBSD?



NETFLIX



JUNIPER
NETWORKS



SONY

NGINX

vmware®

arm

trivago®

GROUPON®

FlightAware
Live Flight Tracking



VERISIGN®

Where FreeBSD excels

Community

- Friendly and professional
- Many active contributors and committers for 10+ and even 20+ years (and longer)

Mentoring

- Built into the Project's culture and processes

Documentation

- FreeBSD Handbook, FAQ, Developers' Handbook, Porters' Handbook, Unix manual pages

Licence

- 2-clause BSD licence
- Does not restrict what you can do with your own code!



Documentation everywhere

Online documentation

- Installed by default
- Primarily Unix man pages



Cookbook-style FreeBSD Handbook

<https://www.freebsd.org/doc/handbook/book.html>

FreeBSD Wiki

<https://wiki.freebsd.org/>

The FreeBSD operating system

- Multi-processing multi-threaded kernel with support for many hardware architectures
- Complete Unix userland
- Not just a kernel!



Kernel features

Multi-processing multi-threaded kernel

Support for many popular hardware architectures

- Intel/AMD x86/64, ARM, PowerPC, MIPS, sparc64

UNIX, POSIX, BSD programming interfaces

Multi-protocol network stack

- IPv4, IPv6, IPX/SPX, AppleTalk, IPSEC, ATM, Bluetooth, IEEE 802.11, SCTP,...
- Reference implementation for many protocols

Unified, coherent build-system across components

Extensive documentation



Network stack

TCP/IP was originally developed on BSD and FreeBSD remains the reference implementation for several network protocols.

- Full support for IPv4 and IPv6
- Active development on TCP with pluggable congestion control
 - New Reno, CUBIC and RACK in supported releases
 - BBR in -CURRENT (soon) for aggressively antisocial networking
- Reference implementation of SCTP



Robust filesystems

UFS

- Traditional Unix filesystem
- High performance
- Snapshots
- Journalized Soft Updates

ZFS

- Filesystem and volume manager in one
- RAID (many options)
- Fully up to date and supported in FreeBSD!



ZFS on FreeBSD

Boot environments

- Painless upgrades and testing
- Somewhat similar to familiar Windows “restore points” or macOS “Time Machine”
- See the `bectl(8)` manual

Active ZFS development

- Many new features from OpenZFS (formerly ZoL)
- Coming soon: expansion for raidz volumes



Userland features

- Complete, integrated Unix system
 - Expected tools are in the base installation – no extra packages needed
 - Build-time knobs to trim the system down for appliances
- Kernel and userland maintained together
 - Userland is always in sync with the kernel
 - New kernel features are immediately available in userland
- Strong focus on consistency



Pervasive security

- A jail(8) is a network-connected chroot(8)
 - With many nice extra features
 - VIMAGE provides a complete network stack to every jail
- Reduce the power of “root”
- Improved compartmentalisation of services with Capsicum
- Flexible configuration options
- Mandatory access controls and audit frameworks



Security highlights

- OpenSSL updated to 1.1.1a (LTS)
- OpenSSH updated to 7.8p1
 - Now with additional capsicum support
- Support for capsicum added to new architectures
 - Enabled on armv6 and armv7 by default
 - In addition to i386 and amd64
- ntpd runs as an unprivileged user with the new mac_ntp policy
- The pf packet filter can run in a jail with vnet
- bhyve hypervisor can be run from within a jail



The ports collection

- Download, patch, compile and package third-party software
- Closely tracks upstream development cycles
 - Not tagged to FreeBSD releases
 - No gratuitous modifications
- >35,000 ports (October 2018)



Binary packages

pkg.FreeBSD.org

- Latest and quarterly builds for Tier-1 supported platforms
- Best-effort latest and quarterly builds for Tier-2 platforms

Custom

- Build from ports locally
- Use Poudriere

Tier-1 platforms

- amd64
- i386
- (aarch64)

Tier-2 platforms

- armv6/armv7
- powerpc, powerpc64
- mips, mips64



Linux binary compatibility

System call translation

- Run Linux ELF binaries natively
- Sometimes faster than Linux!

- Known to work: Oracle, Eagle CAD, Mentor Graphics, ...



FreeBSD releases

- Time-based releases
- POLA: Principle Of Least Astonishment
 - Don't break things that work
 - Upgrades are generally painless
 - Even across major releases



Support model

- Stable branches (e.g. **12-STABLE**) are supported for five years after **X.0-RELEASE**.
- Individual point releases (e.g. **12.0-RELEASE**) are supported for three months after the next point release (e.g. **12.1-RELEASE**)



Get your hands dirty!

- FreeBSD images available from all major cloud providers
 - Amazon AWS
 - Microsoft Azure
 - Digital Ocean
 - Gandi
 - Vagrant
 - Etc...
- Or install in VMware / VirtualBox / ...



<https://www.FreeBSD.org/where.html>