The FreeBSD operating system

What’s new in FreeBSD 12

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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?
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**

**Licence**
- 2-clause BSD licence
- Does not restrict what you can do with your own code!
Online documentation
• Installed by default
• Primarily Unix man pages

Cookbook-style FreeBSD Handbook

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
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
- Journaled Soft Updates

**ZFS**
- Filesystem and volume manager in one
- RAID (many options)
- Fully up to date and supported in 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
• 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)
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
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