



## Pioneering open source

**The sendfile syscall** has been redesigned to prevent applications from blocking on disk I/O. This implementation is unique to FreeBSD and brings significant performance benefits without requiring any changes to existing applications that make use of the sendfile API. Netflix achieved a 40% improvement in per-machine throughput by deploying this technology for their service, which represents more than 1/3 of North American consumer ISP traffic.

**Broader wireless networking support** is now part of the 11.0 release and includes support for 802.11n drivers for additional Intel, Broadcom, Realtek and Qualcomm wireless adaptors.

**Improved NUMA (Non-Uniform Memory Access) support** through the addition of an initial NUMA affinity/policy configuration for threads and processes.

**Native PCI-express HotPlug support** allows peripheral devices to be inserted and removed while FreeBSD is running.

**Linux Binary Emulation Layer improvements** add 64 bit Linux compatibility and enables support for newer Fedora and CentOS frameworks.

**Network stack support for Network RSS (Receive Side Scaling)** which enables the efficient distribution of received network packets so that they can be processed across multiple CPUs in multiprocessor systems.

**CloudABI enhances security** by making it safe to run arbitrary third-party binaries without requiring explicit hardware virtualization (bhyve) or namespace virtualization (jails). It builds upon the Foundation-sponsored Capsicum framework in FreeBSD.

## FreeBSD Project

FreeBSD provides a copy-free modern operating system that is up-to-date and scalable. It offers high performance, security, and advanced networking. Use it for personal workstations, Internet servers, embedded devices, routers, and firewalls. The FreeBSD packages collection includes popular software like: Apache and NGINX web server, GNOME, KDE, X.org, Python, Firefox and over 26,000 software packages. FreeBSD is online at [freebsd.org](http://freebsd.org).

## FreeBSD Foundation

The FreeBSD Foundation is a 501(c)(3), US based, non-profit organization dedicated to supporting and promoting the FreeBSD Project and community worldwide. Funding comes from individual and corporate donations and is used to fund and manage projects, fund conferences and developer summits, and provide travel grants to FreeBSD developers.

The Foundation purchases hardware to improve and maintain FreeBSD infrastructure and publishes FreeBSD white papers and marketing material to promote, educate, and advocate for the FreeBSD Project.

The Foundation also represents the FreeBSD Project in executing contracts, license agreements, and other legal arrangements that require a recognized legal entity.

**The FreeBSD Foundation is entirely supported by donations. More information is online at [freebsd.foundation.org](http://freebsd.foundation.org)**



# FreeBSD® 11.x

Secure

Stable

High Performance

Arm-Ready

Power to Serve



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## Enhanced virtualization solutions

FreeBSD pioneered operating system-level virtualization with the Jail facility in 2000. The new release brings about further enhancements to allow users even greater flexibility for provisioning a virtualized solution that matches their workflow.

In particular the **BSD Hypervisor**, bhyve has seen a number of improvements in FreeBSD 11 including:

- Ability to boot Windows Vista, 7, 8 and 10, as well as Windows Server versions 2008, 2012 and 2016
- Ability to boot Illumos clients
- Native graphics support
- Netmap support

The new release now also includes support for running FreeBSD as an amd64 Xen host.



## New architecture support

The FreeBSD Project continues to expand and enhance the platforms which run FreeBSD. This versatility makes it an essential tool for using FreeBSD as a research platform and provides practitioners with the opportunity to work with the architecture that best suits their needs.

New architectures include:

**The FreeBSD/arm64 port is now available**, thanks to the FreeBSD Foundation's collaboration with ARM and Cavium. The reference platform for the FreeBSD/arm64 port is Cavium's ThunderX System on Chip (SoC).

**The POWER8 hypervisor environment.** FreeBSD is bootable and includes initial support for the Power ISA "Vector-Scalar Extensions" instruction set.

**Support for the reference platform RISC-V**, an open-source Instruction-Set Architecture (ISA) suitable for direct native hardware implementation that will become a standard open architecture. FreeBSD is the first operating system release to have bootable in-tree support for RISC-V.

**Support for Raspberry Pi, Raspberry Pi 2 and Beaglebone Black** out-of-the box with SD card images available.



## Taking storage to the next level

The FreeBSD Project continues to further its position as a leader in storage technologies with the many new features and performance improvements in FreeBSD 11.0 including:

**A new zfsd daemon** manages hot spares and replacement drives.

The **Mellanox implementation of iSER (iSCSI Extensions for RDMA)** has been imported to improve performance using hardware offload.



## Developer friendly

FreeBSD 11 contains updated third-party software and tool chain components in order to provide a great out-of-the-box experience.

**Clang/LLVM, the libc++ standard C++ library** and other components have been updated to version 3.8.0.

Utilities for inspecting and modifying binary objects, executables and libraries have been switched to those from the **ELF Tool Chain suite**.

**The base system is now built with debug symbols**, available at initial installation time or later for post-mortem debugging.



“*FreeBSD 11.0 represents years of hard work by volunteers in the FreeBSD community, developers employed by companies using FreeBSD, academics, and FreeBSD Foundation staff members and grant recipients. I'm proud of what we've accomplished and am confident FreeBSD 11.0 will provide an excellent choice in the world of open source operating systems.*”

**Ed Maste**  
Director of Project Development  
FreeBSD Foundation

A complete list of features in the new release can be found at [freebsd.org/releases/11.0R/relnotes.html](https://www.freebsd.org/releases/11.0R/relnotes.html)