

---

# This one goes up to 11! (11.2 actually)

---

Dhananjay Balan  
mail@dbalan.in  
@notmycommit

# Who am I?

---

- Likes operating systems
- Hacks on FreeBSD

# What is FreeBSD?

---

Complete Operating System

Tools and source code

More than 24,000 3rd party open source software packages

Complete documentation

An open source community

# Who uses FreeBSD?

---

NetApp

Dell/EMC/Isilon

Dell/KACE

Panasas

Apple

Limelight Networks

Swisscom

Sentex

Microsoft

WhatsApp

Juniper Networks

Verisign

Perseus Telecom

Sony

XipLink

McAfee

NYI

Yahoo

# Why use FreeBSD?

---

Great tools

Mature release model

Excellent documentation in many languages

- [https://www.freebsd.org/doc/zh\\_CN/books/handbook/](https://www.freebsd.org/doc/zh_CN/books/handbook/)

Business friendly licence

Open community

# Produce a whole system

---

Operating system

Device drivers

Compilers and associated tools

Debugging tools

Editors

Packaging system

Ready for coding when install is done

# Changes in (recent?) years

---

FreeBSD 11.2 (2018) is not FreeBSD 4.11 (2005)!

- New package manager: `pkg(8)`
- Easy to use package building tool: `poudriere(8)`
- Binary system updates: `freebsd-update(8)`
- Many performance improvements (SMP, jemalloc, etc...)
- Many new features (ZFS, Capsicum, pf, etc...)
- Many improvements to old favourites (`jail(8)`, `rc.conf(5)`, etc...)

# Improvements to filesystems

---

FreeBSD now includes two very mature and time-proven filesystems

## **UFS**

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

## **ZFS**

- Zetabyte File System (originally from Sun)
- Filesystem and volume manager
- RAID (many options)
- Fully up to date in FreeBSD!



# Jails

---

Light-weight virtualisation: run multiple tenants on a single kernel

- Separate filesystem namespace
- ZFS delegation features
- VIMAGE network stacks

# Jail use cases

---

- Web-based virtual hosting
- Email hosting
- Service isolation with micro-services

# The FreeBSD network stack

---

TCP/IP was originally developed on BSD and FreeBSD.

FreeBSD is still the reference implementation for many network protocols.

- Full support for IPv4 and IPv6
- Active development on TCP with pluggable congestion control
- Reference implementation of SCTP

# Firewalls

---

- IPFW: "native" FreeBSD firewall
- pf: fork of the OpenBSD packet filter
- ipfilter: for fans of legacy firewalls

All three firewalls are well-documented in the FreeBSD Handbook and online manual pages included with the operating system.

# More networking

---

- Multi-IP jails (IPv4 and IPv6)
- VIMAGE for multi-tenant routers
- Your choice of firewalls: ipfw, pf, (ipfilter)
- Multiple FIBs for complex routing
- Zebra, Quagga, BIRD, OpenBGPD, OpenOSPFd packages

# VIMAGE

---

- Multiple network stacks for multi-tenant systems
- Combine with jails for very light-weight virtualisation
- Each VIMAGE jail gets (among other things):
  - Choice of firewall
  - Multiple FIBs
  - All the security features of jails

# Virtualisation

---

## Ready to use images

- VMWare
- Virtual Box
- qemu
- HyperV

## bhyve

- Native hypervisor
- Runs Linux, Windows and FreeBSD images
- Also used on Mac OS (xhyve)
- BSD Licensed

# Other security features

---

In addition to jails, FreeBSD sports many other exciting security features

## MAC and Audit frameworks

- Who did what and when?
- Much more in-depth than merely logging
- Send audit trails to remote machines

## Capsicum

- Better than privilege separation
- Capabilities for UNIX
- Sandboxing



# System call translation

---

"Linux personality disorder" / "Linuxolator"

Natively run a substantial subset of Linux ELF binaries

Often runs Linux binaries faster than Linux [\*]

Use cases: not invented here binaries for Linux, databases, CAD tools,...

Known to work: Oracle, Eagle CAD, Mentor, many others!

[\*] Usual disclaimers apply. Batteries not included. May contain traces of nuts. Etc.

# Some highlights of 11.x-RELEASE

---

- Many improvements to ZFS
- Broadcom Wi-Fi driver improvements
- bhyve features for ARMv7
- Ported bhyve to ARMv8

# You too can join the FreeBSD community!

---

Join the mailing lists

Clone or checkout the code

- [svn.freebsd.org](http://svn.freebsd.org)
- [github/freebsd](https://github.com/freebsd)

Submit patches

- [reviews.freebsd.org](http://reviews.freebsd.org)

Get a mentor

Get proposed to core@

Granted a commit bit (all commits ReviewedBy)

Be freed from mentorship

Find a mentee

# Learn more about FreeBSD

---

Website: [www.freebsd.org](http://www.freebsd.org)

FreeBSD Foundation: [www.freebsd.foundation.org](http://www.freebsd.foundation.org)

GitHub: [github.com/freebsd](https://github.com/freebsd)

Mailing Lists

Forums

FreeBSD Handbook

IRC

