



# 25 Years of FreeBSD

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DEB GOODKIN – EXECUTIVE DIRECTOR



# Who Am I?

- Joined FreeBSD Foundation in August, 2005
- Technical background – 20 years in storage development as firmware engineer, logic designer, applications engineer, technical marketing and technical sales
- Growing my FreeBSD skills so I can teach others how to use FreeBSD



# Goals

- Share FreeBSD's long history
- Why people use FreeBSD
- Why you should use and/or contribute to FreeBSD!

# The FreeBSD World

FreeBSD is an open source Unix-like **operating system** descended from the Unix 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 organization** registered in Colorado, USA in 2000 dedicated to supporting the FreeBSD Project, its development and its community.



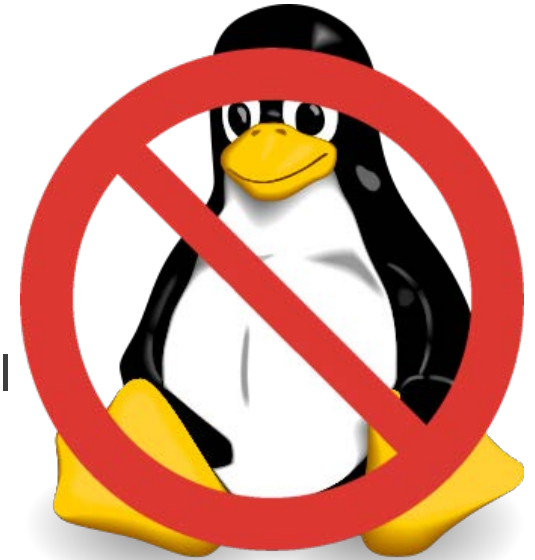
# What is FreeBSD?

It's not a Linux Distribution!

One of the oldest (1993), largest, and most successful open source projects in the world

Complete operating system including kernel, userland, documentation, and tools

Over 30,000 3rd Party Open Source Packages



# What is FreeBSD?

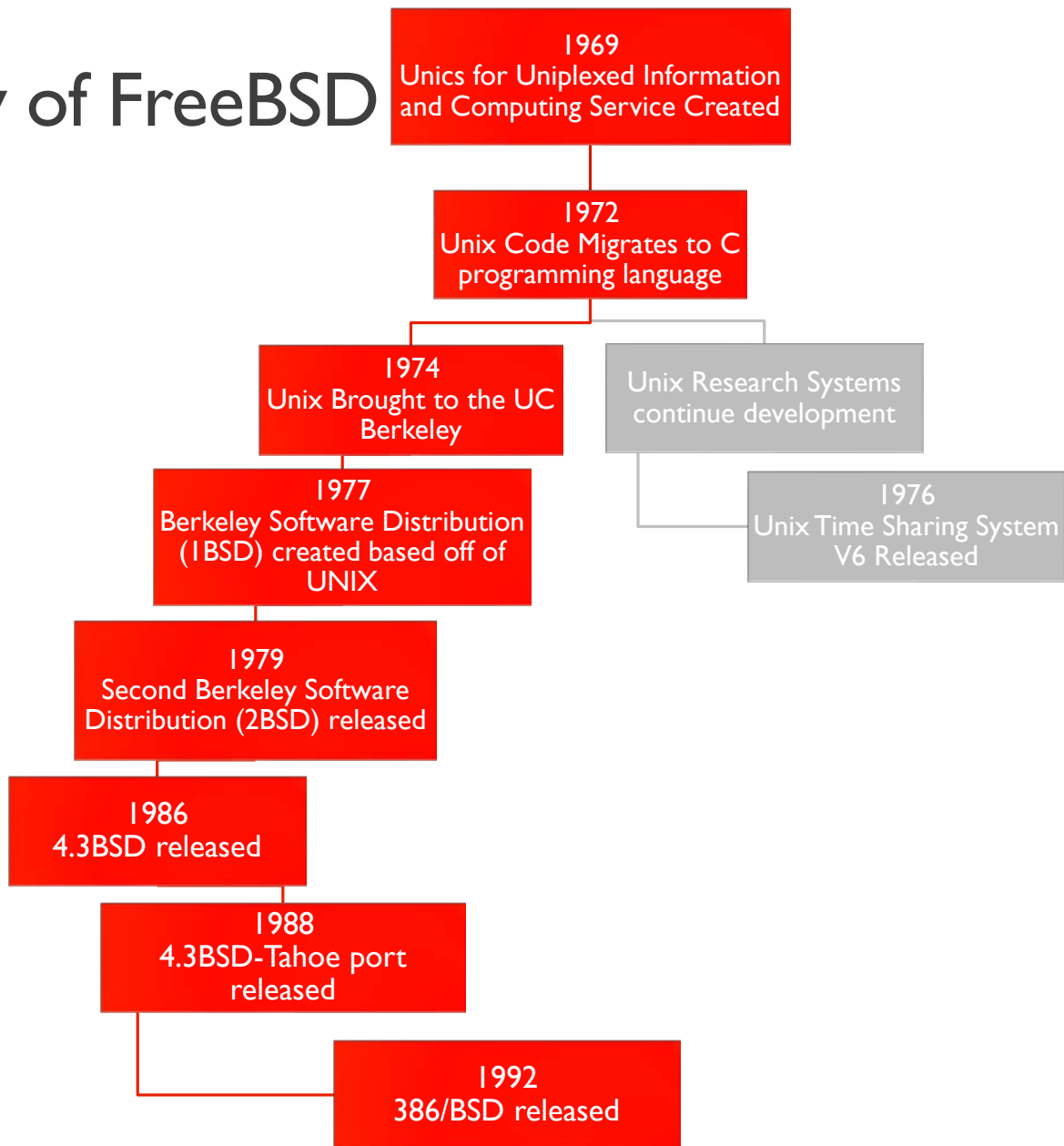
Created and distributed by a community of highly technical and committed contributors (Over 400 active developers and thousands of contributors)

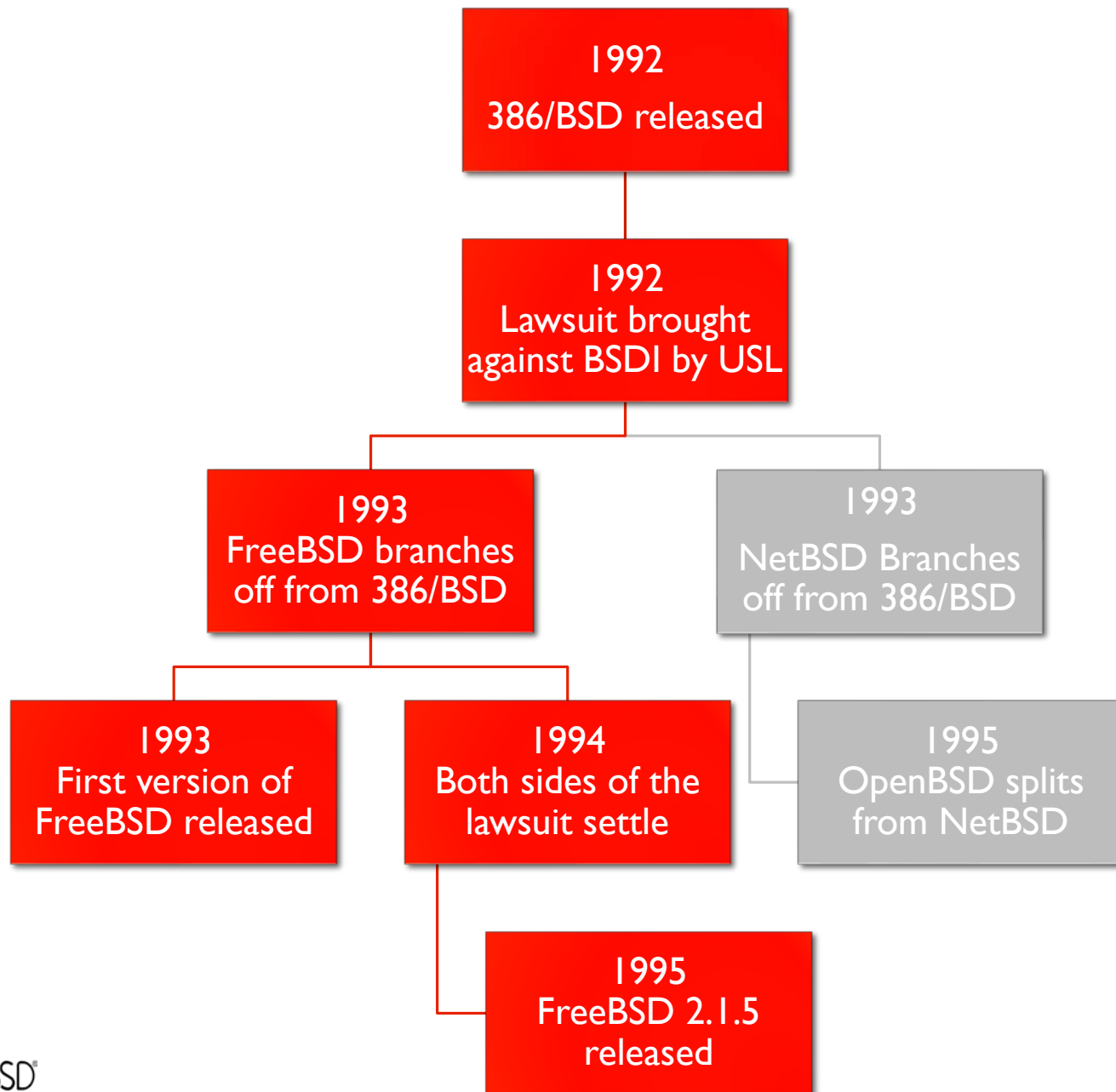
Works on Intel / AMD x86 32 and 64bit, 32 and 64 bit ARM, RISC-V, PowerPC, Sparc64, MIPS, AWS, Azure, GCP, ...

10s of millions of deployed systems



# History of FreeBSD







1995  
FreeBSD 2.1.5 released

2000  
FreeBSD jails are introduced

1994  
FreeBSD ports begin appearing

2005  
jemalloc came into use as the FreeBSD libc allocator

2004  
Libarchive vastly expands port accessibility

2008  
Z File System (ZFS) introduced

2008  
Substantial port of Dtrace added to FreeBSD

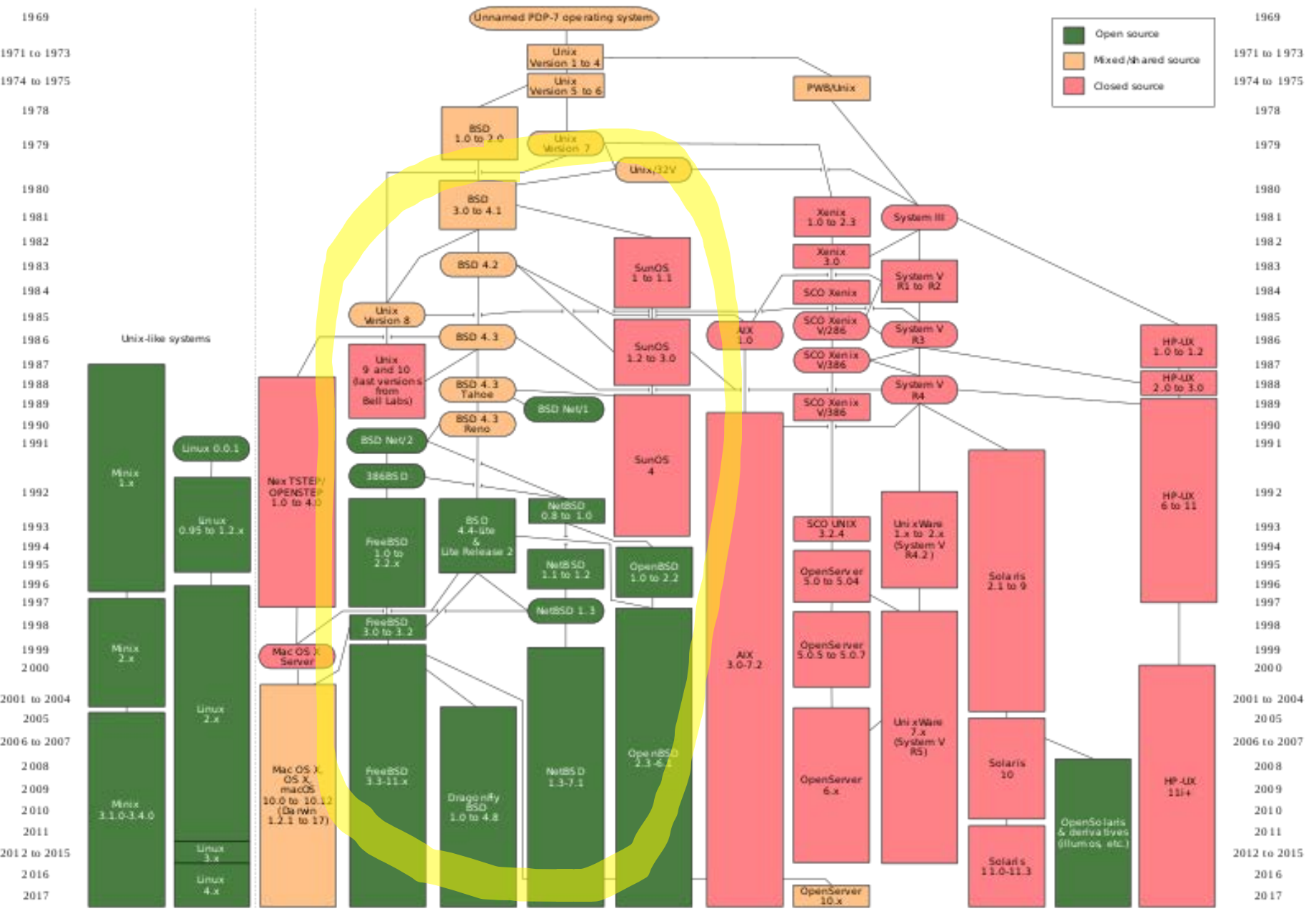
2009  
Clang/LLVM introduced

2010  
Capiscum capability-based security added

2012  
Capability Hardware Enhanced RISC Instructions (CHERI) Implemented

World-leading networking performance







Ken Thompson (sitting) and Dennis Ritchie working together at a PDP-11

1969

## UNIX

Before Bell Labs left the Multics project, Dennis Ritchie and Ken Thompson got a taste of what Multics could be capable of. They secured funding from the Bell Labs Legal department to purchase a more powerful PDP-11/20 machine. In 1969 Ken Thompson, Dennis Ritchie and others started working on a new program that utilized the full capabilities of the more powerful computer. This program was called Unics (Uniplexed Information and Computing Service).



MULTICS



UNIX CODE  
MIGRATES TO C



Timeline JS

1960

1970

1980



UC Berkeley

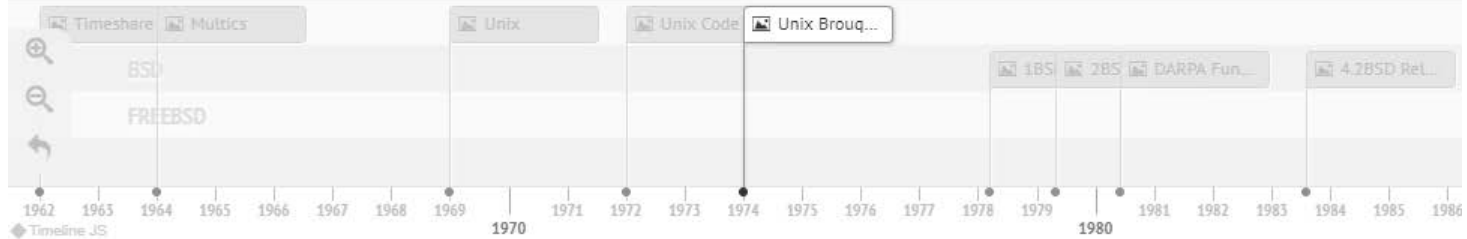
1974

## UNIX BROUGHT TO UC BERKELEY

In 1974, Professor Bob Fabry of the University of California, Berkeley, acquired a UNIX source license from AT&T. Bob Fabry had previously seen UNIX 4 at the ACM Symposium (Association for Computing Machinery) on Operating System Principles in 1973 and was interested in bringing it to the University. The Computer Systems Research Group started to modify and improve AT&T Research Unix. They called this modified version "Berkeley Unix" or "BSD".

UNIX CODE  
MIGRATES TO C

BSD RELEASE



```

Booting from Floppy...
Seek error 126, req = 0, at = -1
unit 0, type 0, sector 18, blknum 17
386BSD Release 0.1 by William and Lynne Jolitz. 10.1.24 02/14/92 19:07
Copyright (c) 1989,1990,1991,1992 William T. Jolitz. All rights reserved.
Based in part on work by the 386BSD User Community and the
BSD Networking Software, Release 2 by UCB EECS Department.
pc<color> at 0x60 irq 1 on isa
com1 fifo at 0x3F8 irq 4 on isa
com2 fifo at 0x2F8 irq 3 on isa
wd0 <ST1102AT> at 0x1F0 irq 14 on isa
fd0 drives 0: 1.2M at 0x3F0 irq 6 dpy 2 on isa
ne0 ethernet address fe:f0:de:ad:be:ef at 0x300 irq 9 on isa
npx0 at 0xf0 irq 13 on isa
changing root device to fd0a

warning: no swap space present (yet)
386BSD Distribution Installation Floppy (Tiny 386BSD) Release 0.1

Please read the installation notes (type 'zmore INSTALL.NOTES')
and registration information (type 'more REGISTRATION') before use.
To install on hard disk drive, type 'install'.

erase '?', werase 'H', kill 'U', intr '^C'
#

```



4.386BSD-TAHOE

William and Lynne Jolitz

Screenshot of the 386BSD Release 0.1 operating system installer

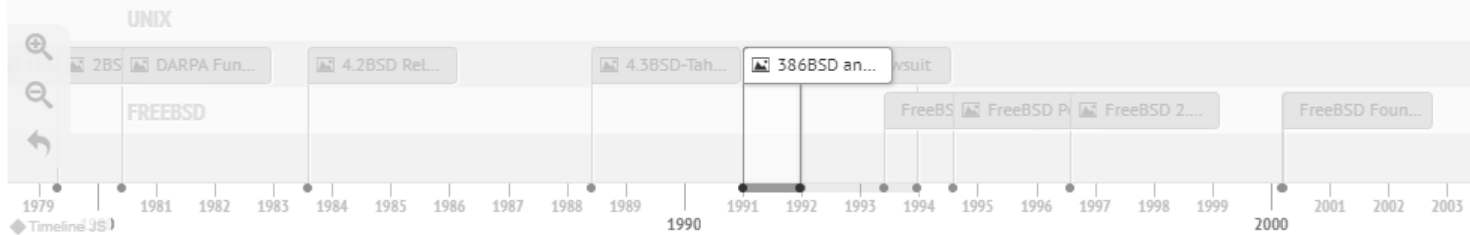
1991 – 1992

## 386BSD AND NET/2

Keith Bostic started a project to reimplement most of the standard Unix utilities without using the AT&T code. The result was the release of Networking Release 2 (Net/2), a nearly complete operating system that was freely distributable. Net/2 was the basis for two separate ports of BSD to the Intel 80386 architecture: the free 386BSD by William Jolitz and the proprietary BSD/386 (later renamed BSD/OS) by Berkeley Software Design (BSDi). 386BSD itself was short-lived, but became the initial code base of the NetBSD and FreeBSD projects that were started shortly thereafter.



USL LAWSUIT



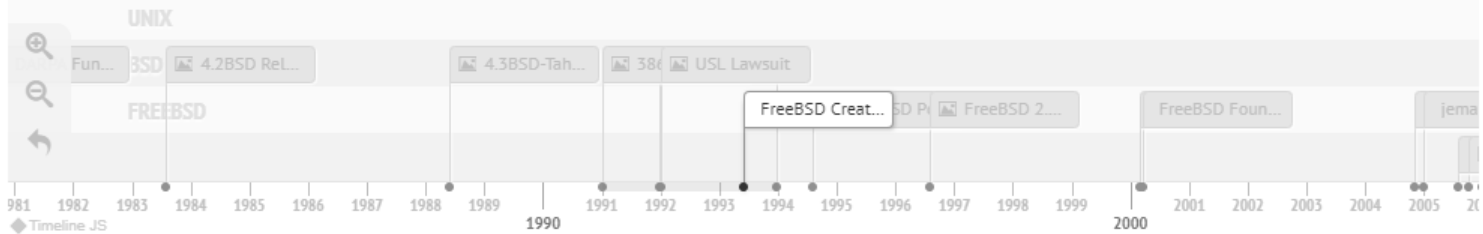


Walnut Creek CD-ROM cover for FreeBSD 1.1

JUNE 1993

## FREEBSD CREATED

The development flow of 386BSD was slow and after a period of neglect, a group of 386BSD users decided to branch out on their own and create FreeBSD so that they could keep the operating system up to date. On 19 June 1993, the name FreeBSD was chosen for the project. The first version of FreeBSD was released on November 1993.





Peter Adams

AUGUST 1994

## FREEBSD PORTS

The FreeBSD Ports and Packages Collection offers a simple way for users and administrators to install applications. The ports collection now offers over 34,000 ports, they started appearing in 1994 after Jordan Hubbard committed "port make macros" to the FreeBSD CVS repository to compliment his package install suite "Makefile".

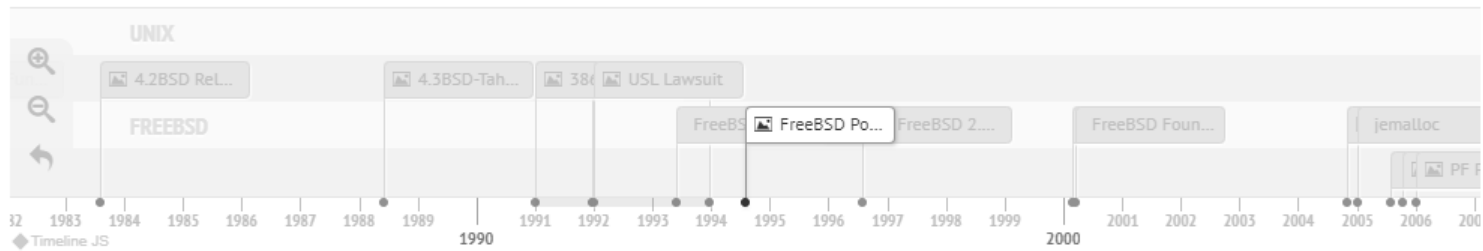


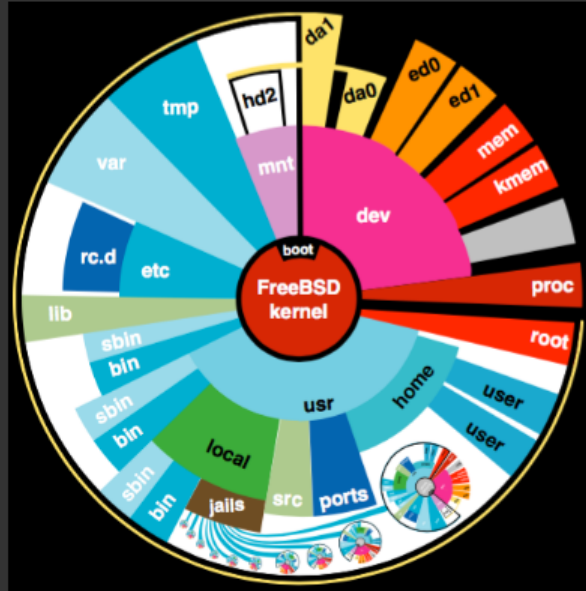
FREEBSD CREATED



FREEBSD 2.1.5

Jordan Hubbard, San Jose, CA, 2015





MARCH 2000

# FREEBSD JAILS

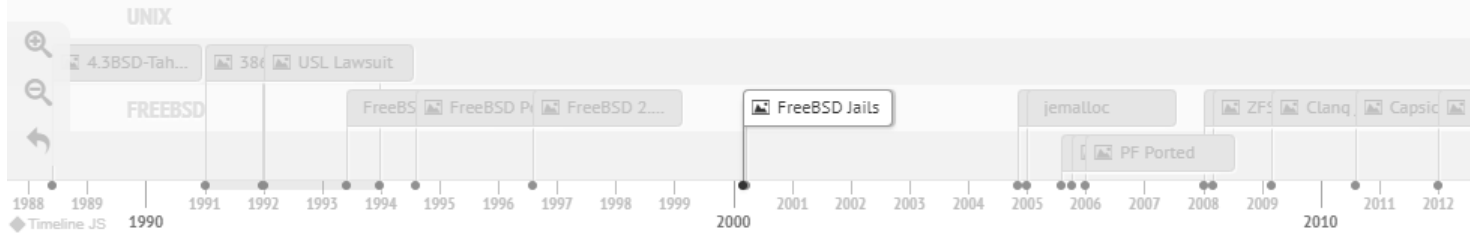
FreeBSD Jails were released with FreeBSD 4.X in early 2000. The jail mechanism is an implementation of operating system-level virtualization which allows system administrators to partition a FreeBSD system into several independent min-systems or "Jails". This gave sys admins much more power to secure and optimize their FreeBSD systems.



FreeBSD 2.1.5



FreeBSD  
FOUNDATION  
FOUNDED





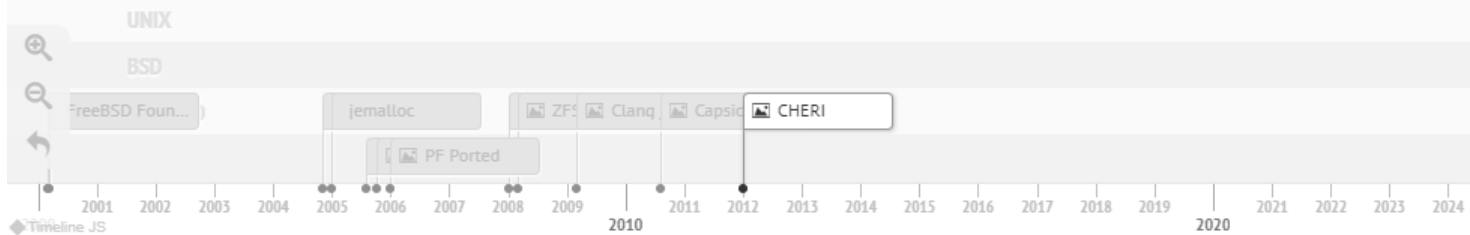


CheriBSD running on a ChERI processor.

2012

## ChERI

In 2012, the University of Cambridge started developing Capability Hardware Enhanced RISC Instructions (ChERI), an outgrowth based off of the earlier Capsicum project. ChERI transposes the Capsicum hybrid capability model into the CPU architecture space, allowing fine-grained compartmentalisation within process address spaces – while continuing to support current software designs.



# Who Uses FreeBSD



**NETFLIX**



**JUNIPER**  
NETWORKS®



**SONY**  
**NGINX**

**vmware**  
**arm**

**trivago**®

**GROUPON**®

**FlightAware**  
Live Flight Tracking



**VERISIGN**®



# Most Likely You Use FreeBSD!



iPhone or Apple computer

Streaming Netflix

**NETFLIX**



Messaging someone over Facebook's WhatsApp application

Sony PlayStation 4



FlightAware



# Why Use FreeBSD?

- Friendly and Approachable Community
- Excellent Documentation
- Good Tooling and Modern Compilers
- Consistent Development and Release Processes
- Wide Variety of Architectures Supported
- Secure
- It's the cool operating system to use! (Heard from many students)



# Why Companies Use FreeBSD?

- History of innovation
- Great tools
- ABI stability within major releases
- Mature release model
- Excellent documentation
- Business Friendly License
- ZFS
- Open Community



# How the Project Works

Independent of the FreeBSD Foundation

Developer Elected Core Team

Mentorship for Commit Bit

Functional Teams (core, release engineering, security, ports, documentation,...)

Collaborative Development Environment



# FreeBSD core team

Historically “key” developers but now...

...9-member elected management body

- Votes and candidates from the full set of active committers
- Co-opted non-voting core team secretary

## Responsibilities

- Administrative (commit bits, hats, team charters)
- Strategic (project direction, coordination, cajoling)
- Rules, conflict resolution, enforcement

We have no “benevolent” dictators for life!



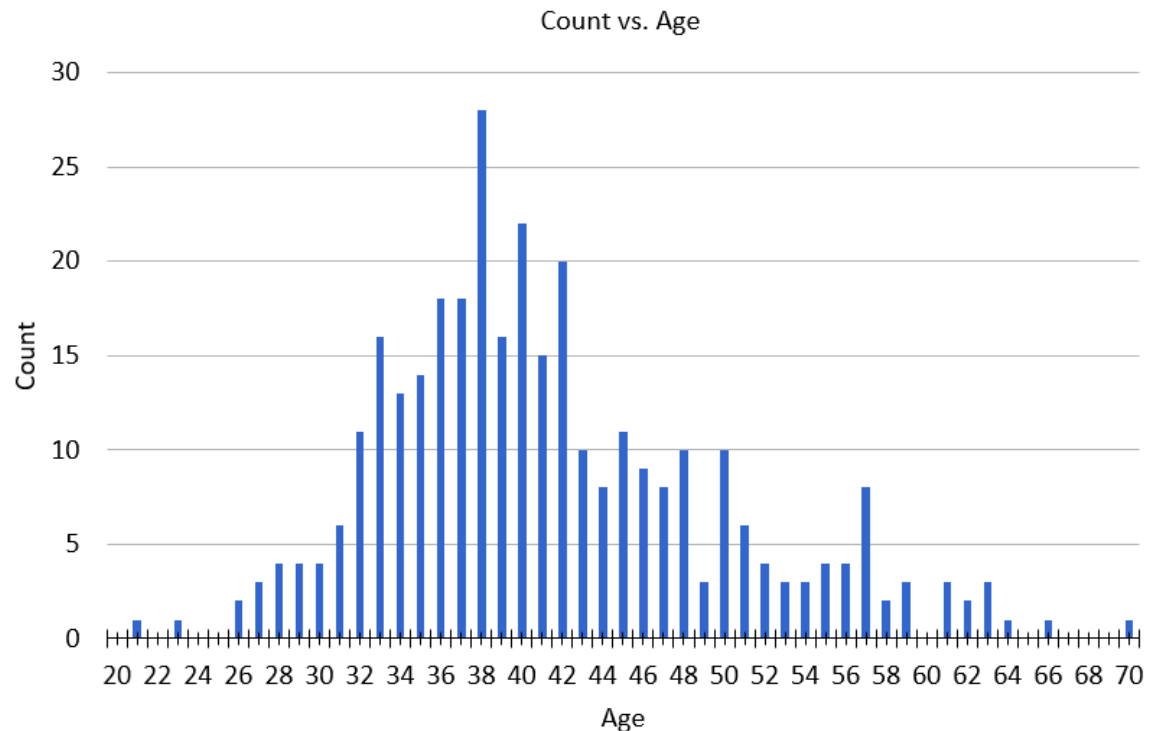
# Who are the FreeBSD committers

## Locations

- 34 countries
- 6 continents

## Ages

- Oldest (documented) committer born in 1948
- Youngest (documented) committer born in 1997
- Average age 39.5
- Data from circa Nov 2017





# Applications

Netflix – High performance content delivery

Sony Playstation 4 - Embedded

NetApp ONTAP – FreeBSD based enterprise storage

Groupon and WhatsApp - Datacenter applications

Apple - Uses large portions of FreeBSD in their Mac OS and iOS

Citrix Netscaler

Microsoft – Supports FreeBSD in the cloud environment

**NETFLIX**



Citrix **NetScaler**



# Where FreeBSD Stands Out

Embedded Systems

Video CDN/Streaming

Security

Research

Cloud and Virtualization

Storage

Networking

High Performance

Data Centers

Servers

Co-Location Facilities



# The FreeBSD Foundation

Founded in March 2000

501(c)3 (non-profit public charity)

Based in Boulder, Colorado

100% Funded by donations



# Why Get Involved in FreeBSD?

Gain marketable skills like:

Communication – How to ask questions – Distributed team

Collaboration

Tools – Repositories, bug reporting, IRC, ...

Best Practices

Technologies – Operating Systems, File Systems, Networking, Storage



# Why Get Involved in FreeBSD?

- Be part of an inclusive and welcoming community
- Learning opportunities from experts
- Opportunities to work in areas you're interested in
- Resume building - highlight skills in public forum
- Have fun working with like minded individuals
- Learn from reading real operating system code!



# How You Can Contribute To FreeBSD

## Get Involved Today!

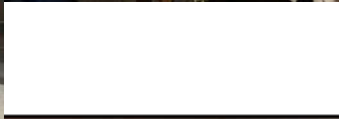
Report or fix a bug

Documentation - i

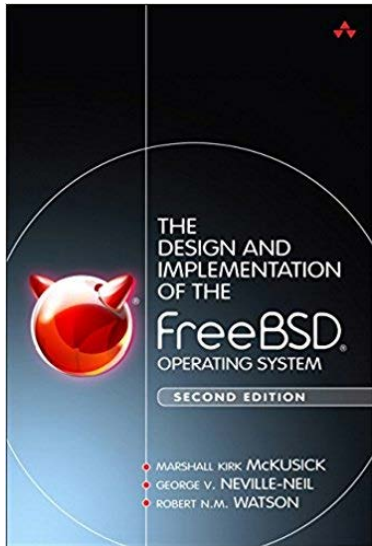


Education

social media



# Resources



Amount Raised: \$1,332,398  
Goal: \$1,250,000  
Donors: 979

FreeBSD FOUNDATION

ABOUT WHAT WE DO JOURNAL GET INVOLVED DONORS NEWS & EVENTS FREE

## How-To Guides

FREEBSD.ORG WHO USES FREEBSD PRODUCTS FROM FREEBSD HOW-TO GUIDES INSTALLFEST

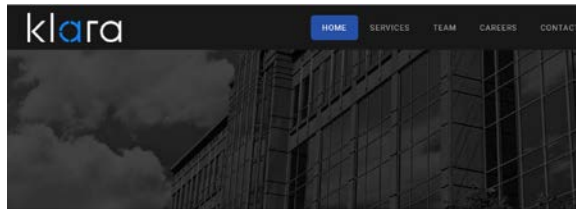
OCTOBER 2018 FREEBSD DEVELOPER SUMMIT FREEBSD DAY TIMELINE

## Getting Started with FreeBSD

As part of the FreeBSD Foundation's education initiative, we've worked with community members and new recruits to develop guides that make getting started with FreeBSD a straight forward process. For an overview, see our *FreeBSD Quickstart Guide*. Stay tuned for more how-tos as they become available.

### FreeBSD Installation Guides:

- [Installing FreeBSD with VirtualBox \(Mac/Windows\)](#)
- [Installing a Desktop Environment on FreeBSD](#)
- [Installing FreeBSD for Raspberry Pi](#)
- [Installing PC-BSD as a Primary Operating System](#)



## FreeBSD Professional Services and Support

[Our Mission](#) [Our Specialty](#) [Our Advantage](#)

<https://www.mckusick.com/history/>  
<https://www.freebsd.org/doc/handbook/deb@freebsd.foundation.org>

