

BSD: The other Open Source OS

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- The Computer Sciences Research Group (CSRG) at the University of California Berkeley (UCB) wrote much new code.
- The code was released on tapes called “Berkeley Software Distribution”, or BSD.

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- DARPA gave the contract to BBN and UCB.
- The first operating system to support the Internet Protocols was 4.2BSD.

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- In the late 80's, the CSRG worked to extricate the Berkeley code from the UNIX code.
- The results were released as the “Berkeley Networking Tapes”, Net/1 and Net/2.
- They were not complete operating systems.

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- BSDI marketed a commercial operating system called BSD/386, later BSD/OS.
- Bill Jolitz wanted a free version, and created 386BSD.
- Later, other people used this basis to create NetBSD (April 1993), FreeBSD (December 1993) and OpenBSD (October 1995).

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- BSD lawsuit scared people off.

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- People are still afraid of litigation.

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- Continuous development in the `CURRENT` branch, for developers only.
- Regular releases, called `RELEASE`.
- Separate bug fixes to releases in the `STABLE` branch.

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- Sources maintained by CVS, allowing easy updating and backout of changes.
- Sources include the complete operating system, not just the kernel.
- CVS allows access to any version of any file in a single tree.
- Clear development model: complete project history is available.

A CVS log: *sys/kern/kern_exec.c*

```
RCS file: kern_exec.c,v
Working file: kern_exec.c
head: 1.110
branch:
locks: strict
access list:
symbolic names:
  RELENG_4_0_0_RELEASE: 1.107
  RELENG_4: 1.107.0.2
  RELENG_4_BP: 1.107
  RELENG_3_4_0_RELEASE: 1.93.2.3
  RELENG_3_3_0_RELEASE: 1.93.2.3
  RELENG_3_2_PAO: 1.93.2.1.0.2
  RELENG_3_2_PAO_BP: 1.93.2.1
  RELENG_3_2_0_RELEASE: 1.93.2.1
  POST_VFS_BIO_NFS_PATCH: 1.99
  PRE_VFS_BIO_NFS_PATCH: 1.99
  POST_SMP_VMSHARE: 1.99
  PRE_SMP_VMSHARE: 1.99
  POST_NEWBUS: 1.97
  PRE_NEWBUS: 1.97
  RELENG_3_1_0_RELEASE: 1.93
  RELENG_3: 1.93.0.2
  RELENG_3_BP: 1.93
  RELENG_2_2_8_RELEASE: 1.47.2.12
```

A CVS log (2)

total revisions: 138; selected revisions: 138
description:

revision 1.110

date: 2000/04/26 20:58:39; author: **dillon**; state: Exp; lines: +38 -29

Fix #! script exec under linux emulation. If a script is exec'd from a program running under linux emulation, the script binary is checked for in /compat/linux first. Without this patch the wrong script binary (i.e. the FreeBSD binary) will be run instead of the linux binary. For example, #!/bin/sh, thus breaking out of linux compatibility mode.

This solves a number of problems people have had installing linux software on FreeBSD boxes.

revision 1.109

date: 2000/04/18 15:15:18; author: **phk**; state: Exp; lines: +1 -2

Remove unneeded <sys/buf.h> includes.

Due to some interesting cpp tricks in lockmgr, the LINT kernel shrinks by 924 bytes.

revision 1.108

date: 2000/04/16 18:53:09; author: **jlemon**; state: Exp; lines: +6 -1

Introduce kqueue() and kevent(), a kernel event notification facility.

Another CVS log

```
revision 1.152  
date: 1997/10/06 09:58:11; author: jkh; state: Exp; lines: +41 -13  
Hooboy!
```

Did I ever spam this file good with that last commit. Despite 3 reviewers, we still managed to revoke the eBones fixes, TCL 8.0 support, libvgl and a host of other new things from this file in the process of parallelizing the Makefile. DOH! I think we need more pointy hats - this particular incident is worthy of a small children's birthday party's worth of pointy hats. ;-)

I certainly intend to take more care with the processing of aged diffs in the future, even if it does mean reading through 20K's worth of them. I might also be a bit more careful about asking for more up-to-date changes before looking at them. ;)

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- A good choice for embedded systems.

The team

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- *Committers* are developers with direct write access to the source tree.
- *Contributors* are developers without direct write access to the source tree.
- Many committers work on more than one BSD project.

Project coordination

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- Source update with *CVSup* or *sup*.

The NetBSD project

- Founded in April 1993.

Goals:

- Architecturally clean.
- Highly portable.
- Highly interoperable.
- State-of-the-art security.
- Core group of 5 members.
- Over 150 committers with direct access to source tree.
- How many users?

The FreeBSD project

- Founded in December 1993.
- Core team of 9 members, elected by the committers.
- Over 200 committers with direct access to source tree.
- Over 2 million users.
- 4 releases per year.
- 4,000 applications in the "Ports Collection".
- Release 4.2 in mid-November 2000.

The OpenBSD project

- Derived from NetBSD in 1995.
- “Benevolent Dictatorship” under leader Theo de Raadt.
- Approximately 115 committers with direct access to the source tree.
- How many users?

OpenBSD

- Portability.
- Standardization.
- Correctness.
- Proactive security.
- Integrated cryptography.
- Largely developed by non-Americans.
- Has proven to be a testbed for “cryptography inside an operating system”.

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- Apple computer (MacOS X)
- Who knows? (other embedded systems)

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- Apple Developers have commit access to FreeBSD source tree.

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- IPsec (OpenBSD was the first operating system to include it).
- Each team has a security officer.
- Regular security advisories.

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- Linux applications software runs on BSD unchanged.
- Apple's MacOS X is based on BSD.

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- All three projects produce high performance, portable, secure systems, but...
- FreeBSD for performance: “The power to serve”.
- NetBSD for portability: “Of course it runs NetBSD”.
- OpenBSD for security: “Three years without a remote hole in the default install”.

Current releases

- FreeBSD 4.1 was released in July 2000.
- FreeBSD 4.2 will be released in November 2000.
- NetBSD 1.4.2 was released in March 2000.
- NetBSD 1.5 in beta test.
- OpenBSD 2.7 was released in June 2000.
- OpenBSD 2.8 to be released soon.

Who supports BSD?

- Linuxcare and BSDi support FreeBSD.
- Linuxcare and Wasabi Systems support NetBSD.
- Linuxcare supports OpenBSD.

For more information

- <http://www.FreeBSD.org/>
- <http://www.NetBSD.org/>
- <http://www.OpenBSD.org/>
- <http://www.apple.com/>
- <http://www.linuxcare.com/>
- <http://www.bsdi.com/>
- <http://www.wasabi.com/>

This talk and slides are available at:

<http://echunga.lemis.com.au/KL/>.

Acknowledgements

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- Jordan Hubbard <jkh@FreeBSD.org>
- Luke Mewburn <lukem@NetBSD.org>
- Theo de Raadt <theo@cvs.OpenBSD.org>