

BIM – BERKELEY IN MUNICH
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PRESENTS:

BSD

BERKELEY SOFTWARE DISTRIBUTION

This leaflet aims to give an overview of the three open source representatives of the family of BSD computer operating systems:

FreeBSD <http://www.freebsd.org/>
NetBSD <http://www.netbsd.org/>
OpenBSD <http://www.openbsd.org/>

Deutsch übersetzung auch erhältlich:

<http://berklix.org/bim/leaflet/>

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What Is BSD ?

This leaflet aims to give the most important answers, plus starting points to get you asking more questions that go deeper than this leaflet covers.

Many BSDs - One Philosophy

BSD originated at the University of Berkeley, California. Today's BSD Systems are direct descendants from "4.4BSD Lite2", the last official BSD version from Berkeley.

The origins of BSD go back to the 1970s, and the history is too complex to roll out here, but one can say:

- There's over 30 years development work in BSD systems, in that the software has been continually improved to modern requirements, but without ever throwing out the entire thing and starting completely anew. As a result BSD derivatives are mature and stable without teething troubles.
- Over time, multiple loosely coupled branches of BSD have evolved, each following their own objectives, but remaining very similar and through cross porting of interfaces, drivers and applications remaining interchangeable.
- Today, derivatives include: FreeBSD, NetBSD, OpenBSD, and BSDi; Other BSD derivatives also exist, but aren't covered here for lack of space: Darwin (from Apple), DragonflyBSD; plus commercial BSD derivatives: BSDi from Wind River, and Mac OS-X from Apple.
- None of the BSDs is a "Linux Distribution" - Linux and the BSDs are similar insofar as they use much of the same software, eg Gcc etc.) but kernel, licence, and development models are markedly different.

Why Use BSD ?

All BSDs have the following attributes and conditions in common.

BSD Licence

The majority of the source code of the BSD operating systems is available under the standard BSD licence. In contrast to the GPL licence used by the Linux Kernel, BSD licences allow distribution of binaries without accompanying sources, which is important for commercial products, which are based on BSD code but for which companies want to release either no, or only partial sources.

From One Mould

Each BSD encompasses not just the kernel, but also a number of system libraries (libc, libpam...), user programs (ls, more, find, sort, lpr...) and system administrator commands (ifconfig, chown, cron, dump, restore...) as well as build tools (gcc, make, ld) as the "operating system", that are regarded as a unified whole, and maintained as such. Upgrades to the kernel and tools interfacing to it are synchronised and released together as a cohesive whole.

The entire operating system including the kernel can be rebuilt from the sources with just a few commands. A strict separation between operating system and supplementary applications (eg Apache, Netscape, OpenOffice etc) prevails, implemented in separate source hierarchies. In consequence application programs can be updated separately, which increases the longevity of installations.

Professional Development

All BSDs maintain their complete operating system source code in a CVS repository. Thus all changes can be reconstructed, reviewed and if necessary also reversed. A release engineering team controls the entire integrated product.

Tight Organisation

The BSD projects are not undisciplined heaps of code, in which many dabble, but form professional organisations similar to commercial software projects. Each has a "Steering Committee", called *Core*, which overviews programming sub projects etc. Around the core teams there are numerous sub projects of developers - called *Committers* - responsible for addition and maintenance of documentation, kernel, driver, networking, applications and 3rd party package sources etc.

Software Galore !

All BSDs can compile and run software available from eg <http://freshmeat.net>, and there are usually also pre-compiled binary packages (Gimp, KDE, teTeX etc).

ABIs (Application Binary Interfaces) allow Linux programs to run on the BSDs, for cases where the only binary package available is for Linux. Thus further programs can be run on BSD even if the latest version is only available for Linux, (eg Acrobat-Reader, Netscape 7, Quake 3, StarOffice 6.0 etc.). There's no noticeable speed impact. The quality and functionality of the Linux ABIs is however not equally well developed on all BSDs - FreeBSD has the most functionality.

Stable File System

The UFS file system has been highly valued for years and offers very high performance. The *Softupdates* option enhances performance, and secures data integrity in the unlikely event of a crash. The FreeBSD 5.x series also provides faster booting: File systems are safely mounted even before asynchronous checking later ! (Attractive for corporate systems with large disc arrays). Raid is supported, both hardware and software.

Ports/ Packages System

Much free software is only available in source format, or has licencing restrictions on distribution in binary *Package* format, (the BSD equivalent of Linux RPMs). The *Ports Framework* covers such contingencies. It consists of a hierarchy of Make-files and where necessary patches, which unpack generic source packages, compile and install them. The Ports System can fetch and apply sources and binaries it needs from the Internet, or from CDROM, including building and installing any dependencies.

Individual BSDs In Detail:

FreeBSD - <http://www.freebsd.org>

On normal PCs (Intel i386 derivative Hardware) FreeBSD is the most frequently encountered representative of the BSD family. This is probably because it offers the broadest hardware support for this platform, and is best optimised for it. Also it tends more than the other two to "functional comfortable-ness" as experienced on other desk top systems. Thus it is more attractive for

newcomers, also offering the biggest collection of ported software, with over 10000 packages. FreeBSD no longer regards itself just as a pure server system for skilled administrators, but aims itself also at end users, particularly newcomers from Windows and Linux. FreeBSD 5.0 (released Jan 2003) now supports a variety of computer architectures: AMD 64/Opteron, DEC Alpha/AXP), Intel Itanium, Intel Pentiums etc, Pc98 (Japan), Sun UltraSparc-III, Power PC and StrongARM ports are in progress, but not available yet. FreeBSD alone of the three offers matured SMP multi processor support.

NetBSD - <http://www.netbsd.org>

NetBSD is slightly older than FreeBSD. Its most outstanding characteristic is the large and growing number of hardware platforms it supports - far more architectures than any other operating system. The list would exceed space here, and would quickly be incomplete and obsolete so refer to the NetBSD web page. In many cases the decision to go NetBSD is easy, as it's the only one available which runs on the hardware. If one has such exotic hardware, that none of the three BSD systems run on it so far, the chance is greatest with NetBSD that a port can be achieved with acceptable effort. Although not much older than FreeBSD, NetBSD happily portrays itself as the "big brother" of open source BSDs. It tends more than the other two to maintain traditional BSD characteristics. This conservative behavior also has quite a positive, compensatory effect on the other BSD systems. Due to modular hardware and driver infrastructure NetBSD is attractive for embedded applications, on Strongarm, PPC etc)

OpenBSD - <http://www.openbsd.org>

OpenBSD split from NetBSD in 1996, and is the youngest of the three. Although it inherited a lot of platform-ports from NetBSD, some of the rarer platforms have become stunted due to lack of resources.

"OpenBSD's" emphasis is on "Security". Though FreeBSD and NetBSD have also not neglected this, it's where OpenBSD shines. This doesn't mean that OpenBSD is a "Security Software Stew", rather "Security" in OpenBSD also means *Correctness*. The team led by Theo de Raadt has performed a complete line by line source code audit of the operating system to

weed out any bugs and detect and remove possible vulnerabilities. (Naturally FreeBSD and NetBSD also profited from this, as corrections were adopted, where appropriate). OpenBSD's support for security also means extensive support for cryptography. Prominent here is the unique support for several hardware crypto accelerator cards and the broad integration of strong cryptography in the OS. As Theo de Raadt lives in Canada, these algorithms are not encumbered with USA export restrictions.

— Extra Info —

The English leaflet is maintained in parallel with the German version, but as English is more compact, there's space below for extra info.

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