NetBSD - An Operating System (not only) for Clusters and Embedded Applications

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What is NetBSD?

- Free
- Portable
- Unix/Linux-compatible
- Open Source
- Operating System

It‘s free!

- Open Source
  - full sources are available
  - updates are available in source (and binary)
  - old versions can be accessed for comparison
- BSD style license
  - no need to make changes public
  - allows proprietary products
  - perfect for commercial applications

Of course it runs NetBSD!

- **NetBSD is the world‘s most portable operating system**
- **13 CPU architectures by operating system, compiler and toolchain:**

  alpha arm hppa i386 m68k mips ns32k powerpc SH sparc sparc64 vax x86_64
- **60 hardware platforms supported:**

  acorn26 acorn32 algor alpha amiga amigappc arc arm atari bebox cats cesfic cobalt dreamcast evbarm evbmips evbsh3 evbsh5 hp300 hp700 hpc hpcarm hpcmips hpcsh hppa i386 luna68k m68k mac68k macppc mips mipsco mmeye mvme68k mvmeppc netwinder news68k newsmips next68k ofppc pc532 playstation2 pmax pmppc powerpc prep sandpoint sbmips sgimips sh3 sh5 shark sparc sparc64 sun2 sun3 sun68k vax walnut x68k x86_64

Where is NetBSD used today?

- Routers by Dynarc, Root Inc., etc.
- IPSiO network color copier/printer/fax machine
- Settop boxes by IBM
- NCs by (former) DEC
- The International Space Station (ISS)
- Numerous servers and desktop machines

... and of course it‘s secure!

- Integrated firewall: Darren Reed‘s IPfilter
- IPsec, Kerberos 4 & 5, OpenSSL (latest :-), ...
- OpenSSH based Secure Shell
- Code audits: printf format strings, etc.
- System information via sysctl, not setuid binaries
- Least number of incidents reported on Bugtraq

FAQ: ``What is the difference between Linux and BSD?“

- Linux is not all the world!
- Think Unix:

  FreeBSD, NetBSD, OpenBSD, BSDi, Solaris, SCO, Unix, HP/UX, Digital Unix, AIX
- Linux is considered The Solution to the Windows desaster by media, and get‘s attention as that solution.
- There is no „Linux“ Operating System.

FAQ: ``What is the difference between the various BSDs?“

- Compare features and pick your favourite OS
- Historic comparison:
  - BSD started at the University of California at Berkeley around 1979
  - When funding stopped, two projects emerged:
    * FreeBSD - PC-focussed, latest features supported
    * NetBSD - multiplatform, same functionality everywhere

FAQ: ``What is the difference between the various BSDs?“ (cont.)

- There was some personal problems between NetBSD developers, the result:
  * OpenBSD 1.0 - based on NetBSD, emphasis on security

A (biased :-) Recommendation

Use

- **FreeBSD for high performance SMP based PC servers**
- **OpenBSD for crypto hardware drivers or filtering bridge support**
- **NetBSD for everything else :)**

Components of the Operating System

- **Base system:**
  - **Kernel, Compilers, „Standard“ Unix utilities, Network services**
- **XFree 3 & 4**
- **The NetBSD Packages Collection:**
  - **Desktop software, Games, Software development, Web servers, Databases, Software Development**
  - **NetBSD 1.6 comes with >3.000 packages.**

Easy updating the base system

```
$ cd /usr/src
$ cvs update
$ cd usr.bin/ssh
$ make
$ su
# make install
```

Updating 3rd party software

```
$ cd /usr/pkgsrc
$ cvs update
$ cd www/mozilla
$ make
$ make deinstall
$ make install
$ make clean
```

NetBSD in an Embedded Environment

- Support for many CPUs, esp. ARM, MIPS, PowerPC, Xscale, SH3/4/5, ...
- Toolchain supports cross compiling
- Kernel can be crosscompiled easily
- Crosscompiling the whole OS is supported
- Release can be built for distribution

Example: Building a SGImips toolchain

```
$ ./build.sh -t -m sgimips
$ TOOLS=/usr/src/tools/obj.sgimips/tools.NetBSD-1.6-i386
$ ls $TOOLS/mipseb--netbsd/bin
ar     as     gcc    ld     nm     ranlib strip
$ ls $TOOLS/bin
mipseb--netbsd-cpp         nbconfig                 nbmkdep
mipseb--netbsd-gasp        nbgencat                 nbpax
mipseb--netbsd-mdsetimage  nbinstall                nbsoelim
mipseb--netbsd-objcopy     nbinstallboot            nbtexi2dvi
mipseb--netbsd-size        nbmake                   nbyacc
mipseb--netbsd-strings     nbmake-sgimips           nbzic
...
```

Example: Crosscompiling of a kernel

```
$ cd /usr/src/sys/arch/sgimips/conf
$ $TOOLS/bin/nbconfig-sgimips GENERIC
$ cd ../compile/GENERIC
$ $TOOLS/bin/nbmake-sgimips depend all
$ ls -l netbsd
-rwxr-xr-x  2 root  wheel  2753168 Sep 24 15:37 netbsd
```

Example: Cross-building the whole OS

```
$ ./build.sh -m sgimips -d \
      -D /usr/tmp/sgimips-root \
      -R /usr/tmp/sgimips-release
```

This will:

- **build a crosscompiler (etc.)**
- **crosscompile the whole operating system**
- **build a kernel**
- **build distribution sets & install media**

Where to get?

- **www.NetBSD.org**
- **ftp.NetBSD.org:/pub/NetBSD/NetBSD-1.6**
- **AnonCVS:**

```
% setenv CVS_RSH ssh
% setenv CVSROOT anoncvs@anoncvs.netbsd.org:/cvsroot
% cvs co src
```

- **Various bookshops and CD vendors, e.g. Wasabi Systems**