FreeBSD in the Enterprise

An Introduction for Linux Users

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- **Freely available Unix- like operating system**
- **Runs on x86, Alpha, Sparc64, IA- 64, AMD64 architectures**
- **Over 11,000 software packages available**
- **Many commercial users**
- **Thousands of developers around the world contributing to it**
- **Used as an operating systems research platform**
- **So far, so Linux…**

- **BSD developed at University of California, Berkeley, as alterations to AT&T Unix**

- **Initial implementation of key Unix concepts, such as sockets, virtual memory, and TCP/IP**

- **386BSD developed to implement BSD Unix on x86 architecture in early 1990s**

- **FreeBSD developed from 386BSD project (as did NetBSD)**

- **Now has 350+ active developers, and 1,000's of contributors**

- **Powering websites**
  - Yahoo!
  - Sony Japan
  - Netcraft
  - NTT/ Verio
- **"Grunt work"**
  - Disney
  - Manex VFX
  - NASA
- **ISPs**
  - UUNet, Pair, Demon, EasyNet, …

- **Embedded Systems**
  - IBM
  - Intel
  - Nokia
  - Checkpoint
  - Juniper Networks
  - Coyote
- **Other operating systems**
  - Mac OS X
  - Embedded

Enterprise Use

- **FreeBSD is used by some of the largest banks in the world to process over 1.5 trillion US Dollars (43,500,000,000,000 Rubles) of business to business transactions per year.**

- **Perl, Apache, X11, and other Open Source software also used in this application.**

- **FreeBSD Jails used for system security.**

Factors that Help

- **Stability**
- **Source availability for helping understand and fix problems that occur (having the source to the system helps you understand why your application does not do what you expect)**
- **Excellent performance**
- **Easy hardware upgrade paths**
- **The application is spread over many servers. Need more power in one part? Add more FreeBSD boxes.**
- **PC hardware sometimes is less than perfect, but at PC hardware prices, hot spares are practical.**

- **BSD has existed since the last 1970's and was the testbed and reference implementation for TCP/IP.**

- **The Internet Software Consortium (ISC) uses FreeBSD exclusively for f-root domain servers (in 21 cities now, usually with 3 servers per city).**

- **Modern FreeBSD is extremely refined and mature.**

- **FreeBSD consistently placed at the top of the "uptime" lists produced by Netcraft to measure the stability of the world's busiest websites.**

Differences from Linux

- **FreeBSD distributed under "2 clause" BSD license**

- **Copyright © [year] [name]**
  All rights reserved
  Redistribution in source and binary forms, with or without modification, are permitted, provided that the following conditions are met:

  1.   Redistribution of source code must retain the above copyright notice, this list of conditions,   and the disclaimer.
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- **Don't claim that you wrote the code**
- **Don't blame us if the code doesn't work**
- **Apart from that, do anything you want with the code**

- **The GPL mandates that source code be disclosed**

- **The BSD License allows source code changes to be kept secret**

- **GPL is often categorised as "Copyleft", as distinct from "Copyright"**

- **BSD License is "Copycentre". We actively encourage third parties to use the source code.**

- **Donating changes back is purely at the discretion of the party making the changes**

Source Code Control

- **The entire source code for FreeBSD is stored in a CVS repository**

- **The logs, and individual changes for each file can be traced back to 1994.**

- **The source tree can be checked out at any state, or corresponding to any release**

- **CDs are available taking the history back a further 20 years**

- **Changes to the FreeBSD tree are available in a number of ways (CVS, CVSup, CTM (e- mail), Web)**
- **It is possible to maintain a local mirror of the complete CVS tree**
- **You can 'tag' a local copy of the tree as buildable, and then selectively include changes from FreeBSD**

- **FreeBSD Source Code**
  - Available on CD (freebsdmall.com, others)
  - Can be downloaded from ftp.freebsd.org
- **Changes to the source code**
  - Can be updated using CVS
  - Can be updated using CVSup (faster CVS)
  - Changes can be automatically e-mailed in, and integrated with your local source tree
- **Can be browsed, with history, on the web, at http://www.freebsd.org/cgi/cvsweb.cgi**

- **Two layers of FreeBSD organization**
- **The committers, and everyone else**
- **Committers have write access to the source tree**
- **Everyone else submits patches or bug reports using FreeBSD's problem reporting system, and waits for a committer to commit the change**
- **Individuals who submit many patches (that work) are invited to become committers**
- **9 committers form the elected "core team", for dispute resolution**

Thousands of contributors

9 core team

Source code
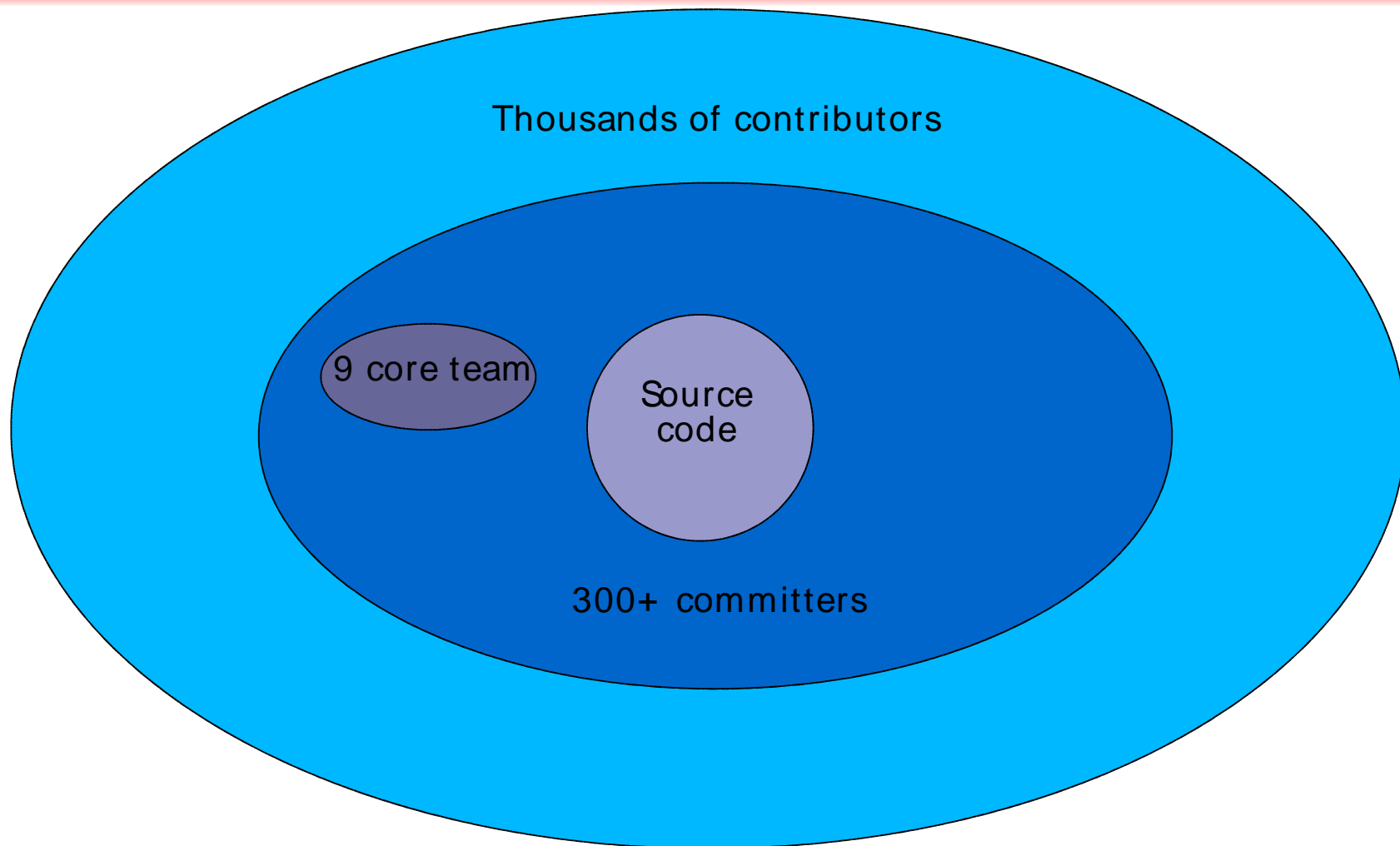
300+ committers

- **FreeBSD consists of all the components needed for a complete operating system**
  - kernel
  - compiler
  - include files
  - libraries
  - user-land utilities
- **Kernel and userland are kept synchronized, and can be built, from source, as a unit**
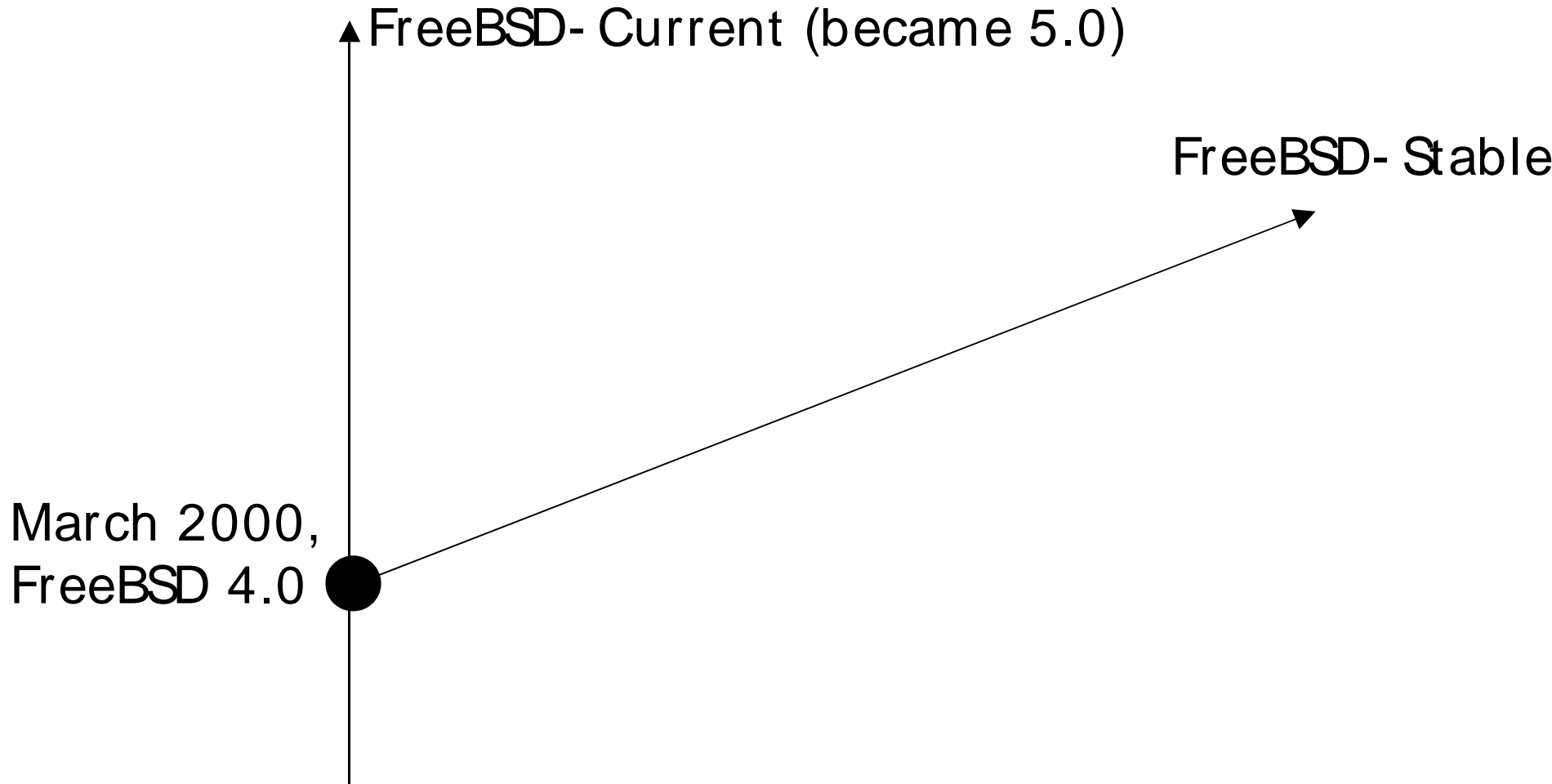
- **FreeBSD releases maintained using CVS branches**
- **Head of the tree (- current) is now FreeBSD 6.0**
- **When 4.0 came out, a branch was created for "4- STABLE" and minor releases up to 4.11 happened every 4 months.**
- **These minor releases (4.1, 4.2, etc) consist of bug fixes backported from - CURRENT, and new features in - CURRENT that have been extensively tested**
- **5.0 process was a little different, and was not declared 5- STABLE until 5.3, due to the number of advanced new features and reimplementation of SMP introduced in FreeBSD 5**
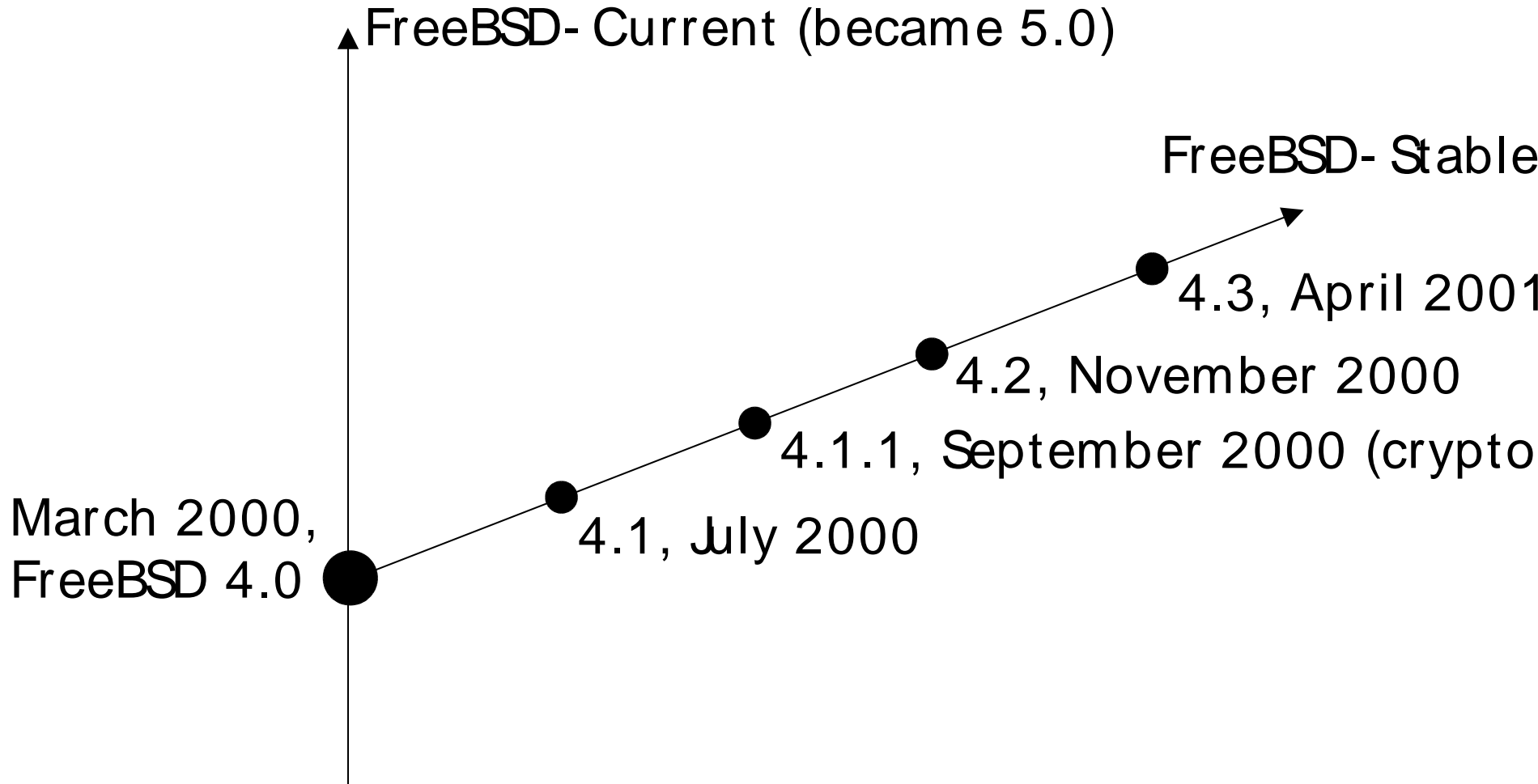
March 2000,
FreeBSD 4.0 ●

FreeBSD Release Model

FreeBSD-Current (became 5.0)

FreeBSD-Stable

March 2000,
FreeBSD 4.0 ●

FreeBSD- Current (became 5.0)

FreeBSD- Stable

4.3, April 2001

4.2, November 2000

4.1.1, September 2000 (crypto

4.1, July 2000

March 2000,
FreeBSD 4.0

- **FreeBSD has over 11,000 applications available as binary packages**
- **Linux has similar number of applications available in a number of different binary formats (RPM, Deb, and others, depending on the distribution).**
- **Packages are built from the "ports tree" of which more later**
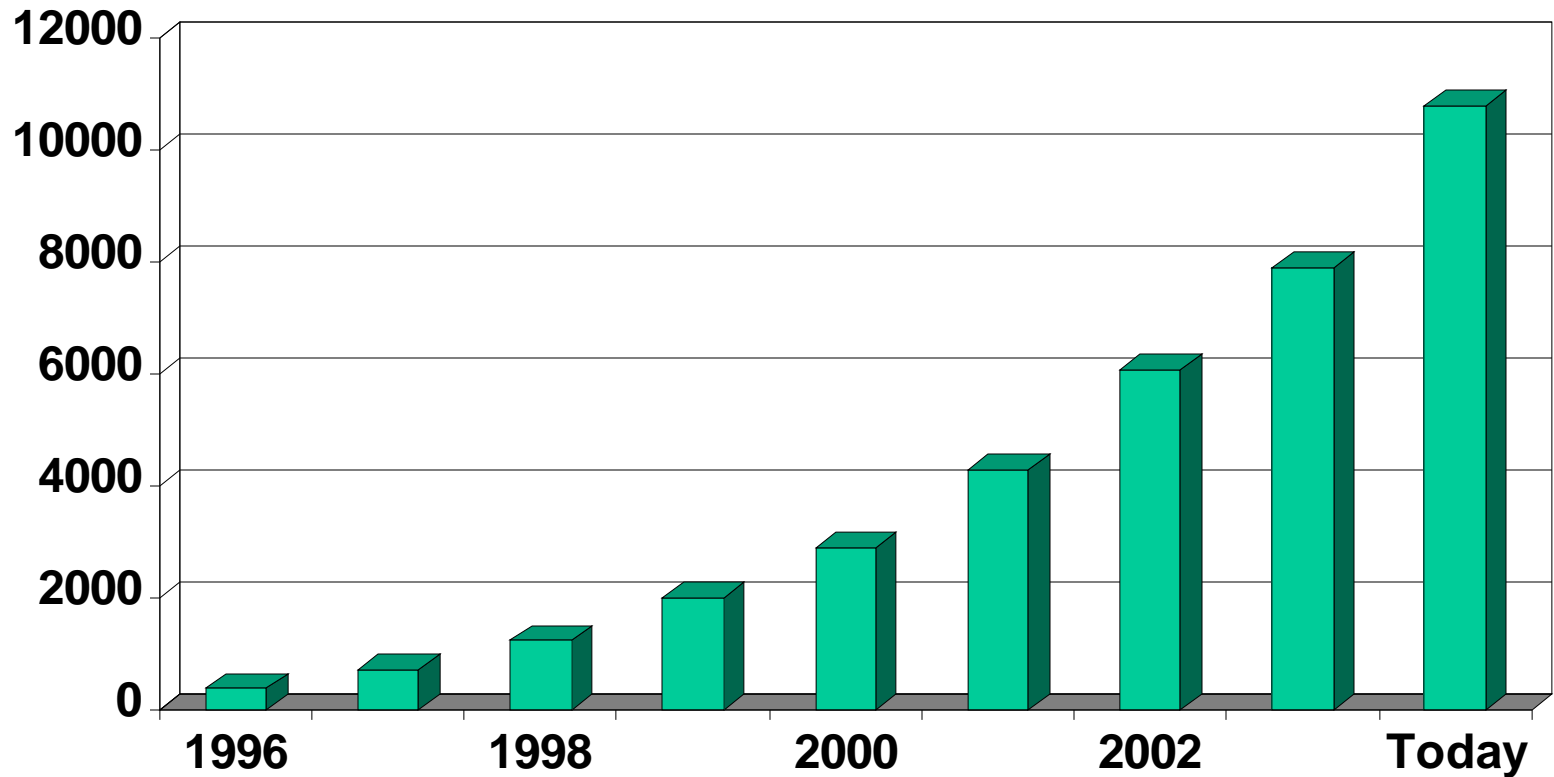- **FreeBSD and Linux roughly equal in this respect…**

Ports Tree Growth

- **FreeBSD runs 95%+ of Linux binary applications unchanged**
  - Oracle
  - VMWare
  - Netscape
  - RealPlayer
  - Flash
  - NetBackup
  - Quake III
  - …

- **The source code is a great reference**
- **Run standard development tools**
  - gcc
  - gdb
  - ddd
  - (x)emacs
  - make

- **A great server OS is a great desktop OS**
- **FreeBSD runs all the desktop apps you're familiar with**
  - **GNOME**
  - **KDE**
  - **StarOffice / OpenOffice**
  - **Mozilla / Firefox**
  - **WordPerfect**
  - **VMWare**

  - **GIMP**
  - **XMMS**
  - **CD recording**
  - **MP3 ripping**
  - **Gnutella**
  - **Afterstep / Enlightenment / Sawfish / BlackBox / IceWM …**

FreeBSD Technologies

- **The Build System / Release System**
- **The Ports System**
- **NDISulator (Windows Driver Compatability)**
- **Linux Compatability**
- **Netgraph**
- **… and more**

The Build System

- **The entire operating system, including all libraries and utilities can be built with a single command : "make world"**

- **The source code for the system is placed in /usr/src during installation.**

- **Much easier to secure a system if a bug is found in a key library like OpenSSL.**

- **More information in build(7) and Handbook.**

- **You can even build a complete release of FreeBSD, including FTP install directories, floppy images, and ISO images for CDROMs with one command.**

- **"make release" is used by many large companies to produce special versions of FreeBSD with special patches or additional software installed by default.**

- **It is also the well documented way in which the release engineering team makes all official releases of FreeBSD.**

- "make release" makes it much easier to deploy thousands of systems pre-configured for a specific environment.
- The release engineering team for FreeBSD publishes schedules, identifies QA issues that must be resolved before release, and publishes documents to help other people build FreeBSD based products.
- See release(7) and www.freebsd.org/releng

Linux Compatability

- **Code like**

  fd = open("/etc/passwd", O_RDONLY);

- **Becomes**

  syscall(5, ...)

- **Kernel knows it's a FreeBSD binary, uses freebsd_syscalls[] array**

  freebsd_syscalls[5] = freebsd_open(...);

- **File is opened**

- **Code like**
  fd = open("/etc/passwd", O_RDONLY);

- **Becomes**
  syscall(5, ...)

- **Kernel knows it's a Linux binary, uses linux_syscalls[] array**
  linux_syscalls[5] = linux_open(...);

- **File is opened**

- **All Linux file operations redirected to /compat/linux first**

- **No slowdown; this is *not* emulation**
- **Efficiency of TCP/IP and VM system means some Linux apps run *faster***
- **SCO (ibcs2) compatibility handled in the same way**

NDISulator

Windows Network Device Driver Compatability

- **Compatability layer for NDIS Windows Driver Kernel API.**

- **Allows driver .inf and .sys files to be turned into FreeBSD loadable kernel modules.**

- **Can load and unload windows network device drivers in FreeBSD!**

- **Some wireless hardware vendors refuse to release specifications, so this is the only method to use such cards with an open source operating system.**

- **More information in ndis(9).**

- **http://www.freebsd.org**
- **http://www.freebsd.org/docs.html**
- **FreeBSD Handbook (Russian translation available)**
- **Local User Groups, Mailing lists**

Questions?

http://www.freebsd.org

FreeBSD

FreeBSD:The Power To Serve