How the FreeBSD Project Works

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FreeBSD Project

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Introduction

- What is FreeBSD?
- What is the FreeBSD Project?
- How does the FreeBSD Project work?
- And does it all depend on who you ask?
  - Caveat: kernel developer!

Introduction to FreeBSD

- Open source BSD UNIX-derived OS
- ISP server network server platform
  - Yahoo!, Verio, NY Internet, ISC, ...
- Appliance/product/embedded OS foundation
  - Juniper JunOS, Nokia, Panasas, Timing Solutions,...
  - VXWorks, Mac OS X, ...
- One of most successful open source projects
- Focus on storage, networking, security

Introduction to FreeBSD (cont)

- Active development community
  - Central source repository and revision control
  - Extensive online community
  - Over 300 active developers
- Liberal Berkeley open source license
  - Designed to maximize commercial reuse
  - No requirement that derived works be open source
  - Extensive use in commercial, research systems

What do you get with FreeBSD?

- Complete, integrated UNIX system
  - Multi-processing, multi-threaded kernel
    - Intel/AMD 32/64-bit, Itanium, sparc64, ARM, PPC
  - UNIX, POSIX, BSD programming interfaces
  - Multi-protocol network stack
    - IPv4, IPv6, IPX/SPX, AppleTalk, IPSEC, ATM, Bluetooth, 802.11, SCTP, ...
  - Standard and embedded build/integration targets
  - Extensive documentation
- Over 16,000 third party software packages

The FreeBSD Project

- One of the most successful open source projects in the world
  - Can't throw a stone without hitting FreeBSD
    - Root name servers
    - Major web hosts, search engines
    - Routing infrastructure
    - Foundation for major commercial operating systems
  - And much more...
- But the FreeBSD Project is more than software

What the Project Is Depends on Who You Ask

- FreeBSD Core Team Member
- FreeBSD src Developer
- FreeBSD portmgr Member
- FreeBSD Documentation Team Member
- FreeBSD Users

FreeBSD Project

- Global community of developers and users
  - FreeBSD.org web site, mailing lists
- Developer community
  - Core team
  - Committers
  - Ports maintainers
  - Contributors
- User communities
  - Some more or less involved in global community

FreeBSD Foundation

- Non-profit organization based in Boulder, CO
- Sponsored development
  - Intellectual property, contracts, licensing, legal
  - Developer travel grants
  - Event sponsorship (EuroBSDCon!)
  - Hardware purchase
  - Collaborative R&D agreements
- Support the FreeBSD Project – consider a donation today!

What the Project Produces

- FreeBSD kernel, user space
- Security officer, release engineering
- FreeBSD ports collection, binary packages
- FreeBSD releases
- FreeBSD manual, handbook, web pages, marketing material
- Technical support, debugging, etc.
- A variety of user/community events

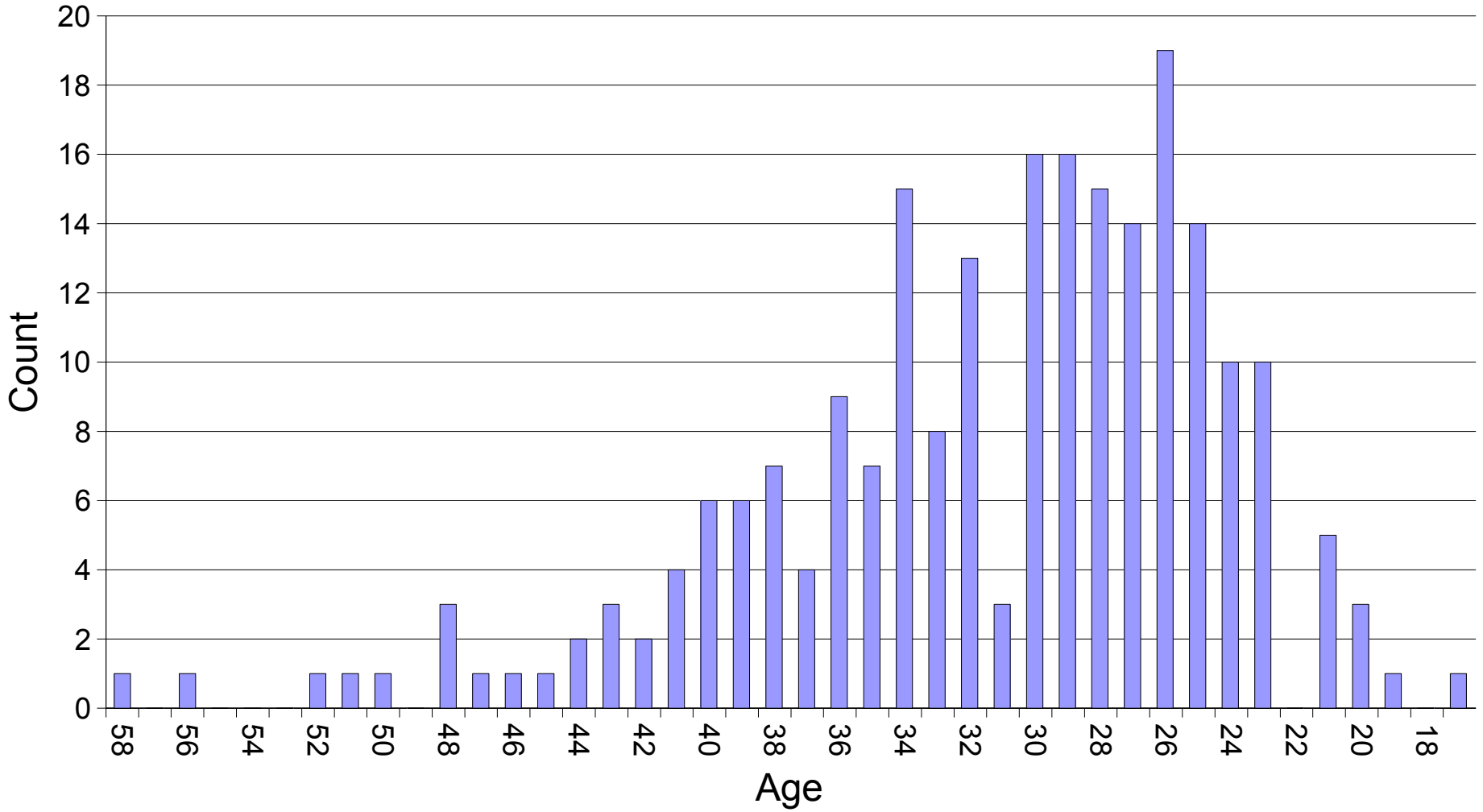
Things We Consume

- Beer, soda, chocolate, and other vices
- Donated and sponsored hardware
  - Especially in racks, with hands
- Bandwidth in vast and untold quantities
- Travel grants, salaries, contracts, grants
- Thanks, user testimonials, appreciation, good press
- Yet more bandwidth

Who are the Developers? (May 2006)

- Locations
  - 34 countries
  - 6 continents
- Ages
  - Oldest (documented) committer born 1948
  - Youngest (documented) committer born 1989
  - Mean age 32, median age 30, stddev 7.2
- Professional programmers, hobbyists, consultants, university professors, students ...

FreeBSD Developer Age Distribution (May 2006)



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FreeBSD Processes

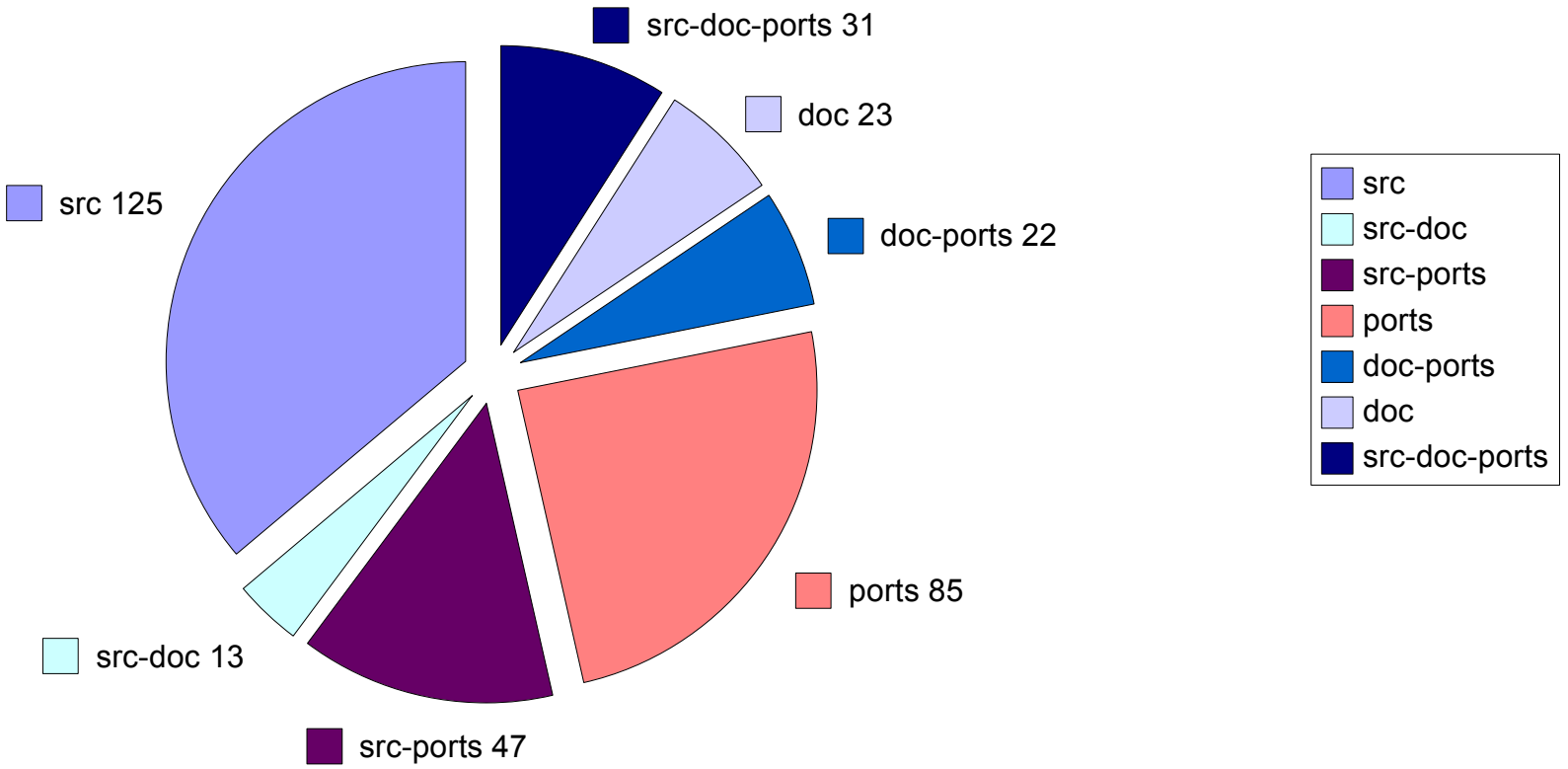
- Committer life cycle and commit bits
- Core Team
- Mailing Lists
- Web pages, documentatoin
- Groups/projects
- Derived projects
- Events
- Development cycle
- Release Cycle
- CVS and Perforce
- Clusters
- Conflict resolution

FreeBSD Committers

- Committer is someone with CVS commit rights
- Selected based on key characteristics
  - Technical expertise
  - History of contribution to the FreeBSD Project
  - Ability to work well in the community
  - Having made these properties obvious!
- Key concept: mentor
  - Mentor proposes to core@ (portmgr@, doceng@)
  - Guide through first few months of committing

Distribution of Commit Bits (May 2006)

346 Total Committers



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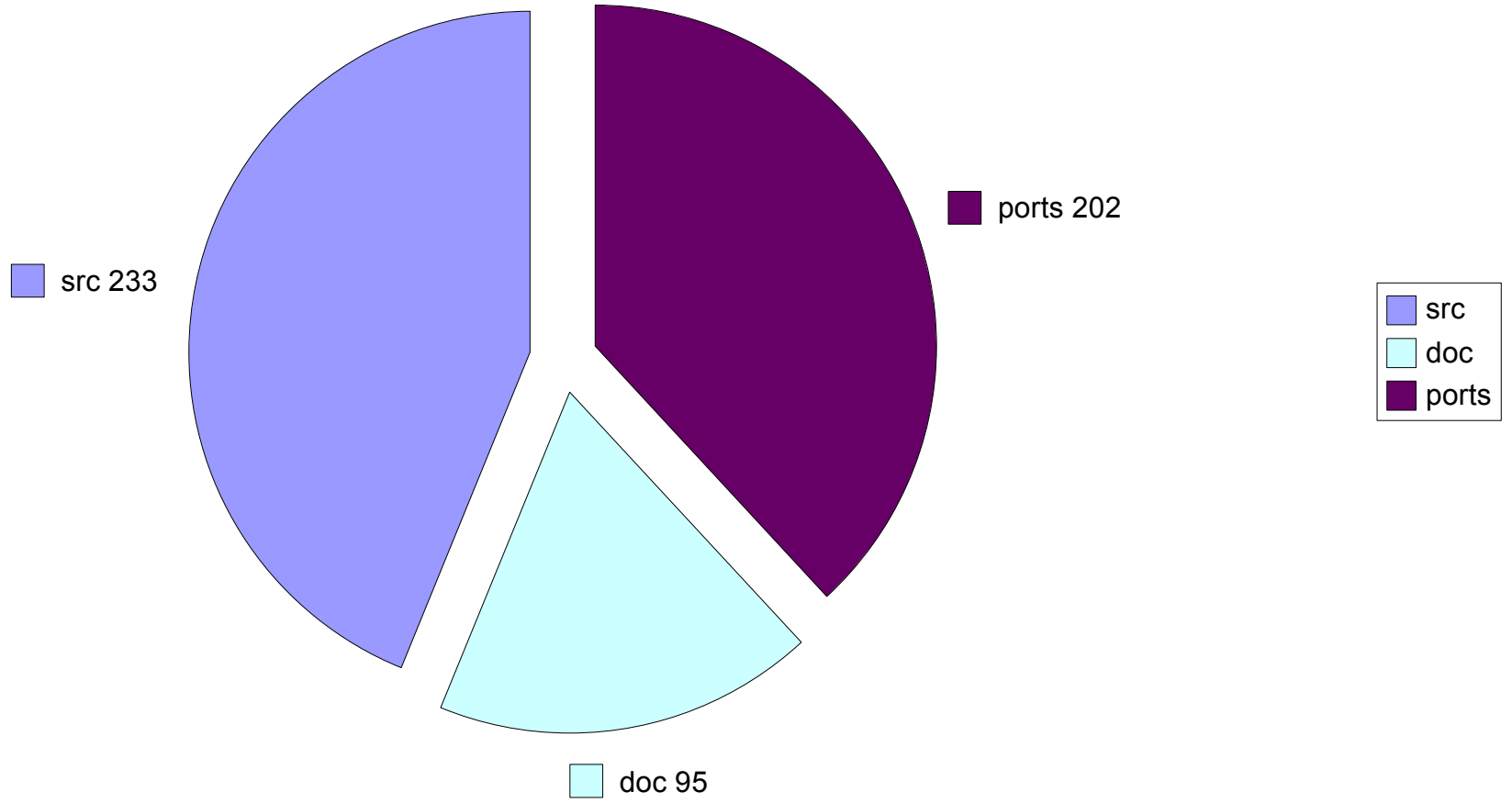
Number of Commit Bits by Type (May 2006)



FreeBSD Core Team

- 9-member elected management body
  - Votes and candidates from the full set of active FreeBSD committers
  - Core secretary
- Responsibilities
  - Administrative (commit bits, hats, team charters)
  - Strategic (project direction, coordination, cajoling)
  - Rules, conflict resolution, enforcement

Ports Committers, Maintainers

- Slightly stale data, of course (May-Nov 2006)
  - 158 ports committers
  - Over 1,500 ports maintainers
  - Over 16,000 ports
- Averages
  - 85 ports/committer
  - 9 ports/maintainer
  - 8 maintainers/committer

Groups and Projects

- Source Developers
- Core Team
- Core Team Secretary
- Release Engineering Team
- Release Engineering Build Teams
- Security Officer
- Security Team
- Donations Team
- Marketing Team
- Perforce Admins
- CVS Admins
- Postmaster
- Foundation Board of Directors
- Foundation Operations Manager
- Doceng Team
- Documentation Team
- Ports Team
- Port Managers
- FreeBSD.org admins@
- FreeBSD.org webmaster
- Sentex cluster admins
- ISC cluster admins
- Vendor Relations Team
- Mirrors Team

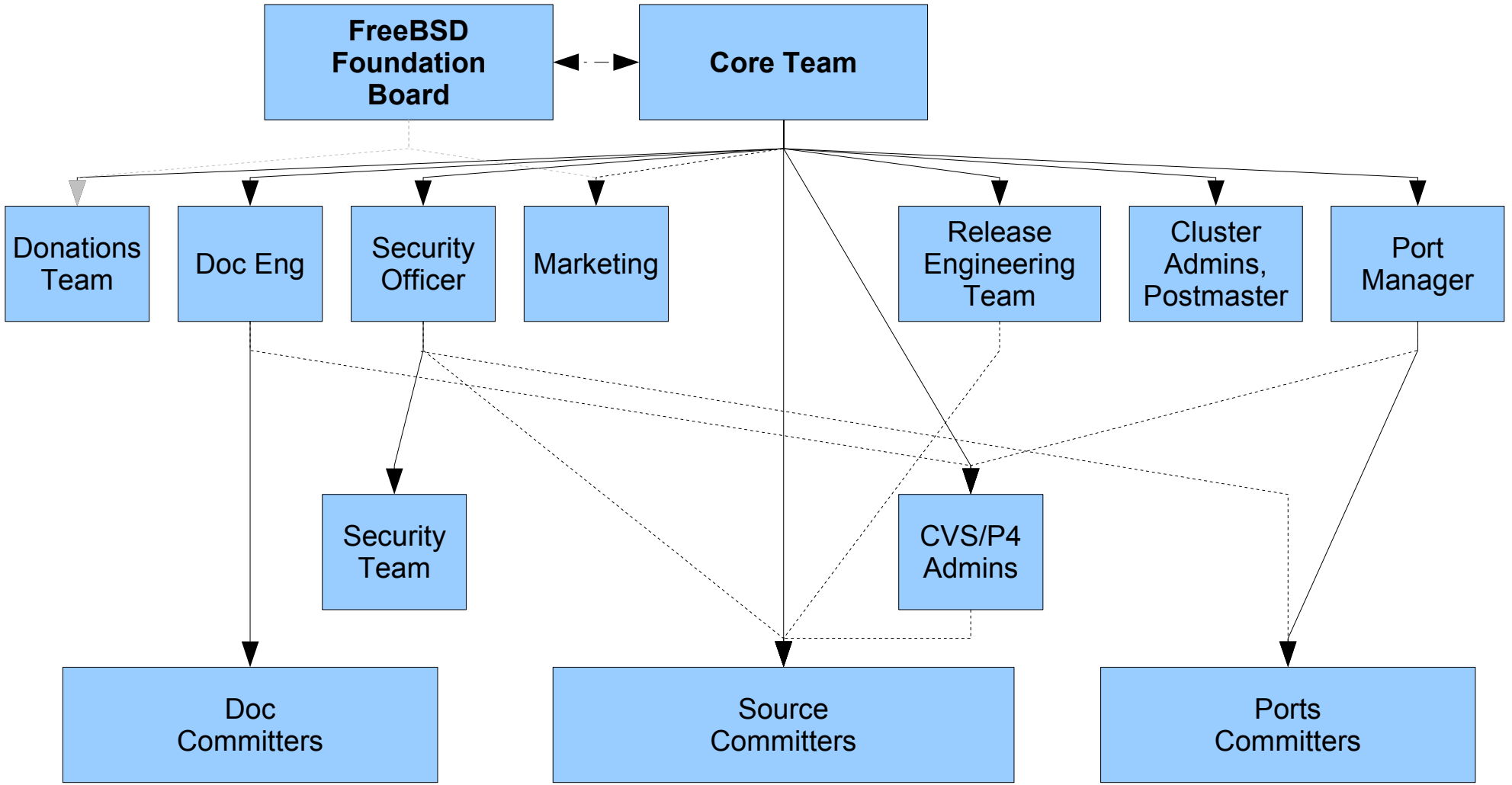
Wait, I'm Not Done Yet!

- CVSUP Team
- Perforce Contributors
- Questions Subscribers
- FreeBSD GNOME Project
- FreeBSD KDE Project
- Mono on FreeBSD
- OpenOffice.org on FreeBSD
- BSDCan
- EuroBSDCon
- AsiaBSDCon
- KAME Project
- Netperf Project
- TrustedBSD Project
- Stress Testing
- FreeBSD Tinderbox
- FreeBSD Standards
- Java Team
- SoC Mentors
- Monthly Status Reports
- Coverity Team

Derived Projects and Organizations

- Interesting and important growth in ecosystem
- Projects that consume FreeBSD but produce something new and different
  - FreeSBIE, pfSense, PC-BSD, Darwin, DesktopBSD, DragonflyBSD, FreeNAS, ...
  - Features to flow up- and down-stream
  - Avoid stepping on toes of derived projects, while fostering their growth
- Shows scalability of community model

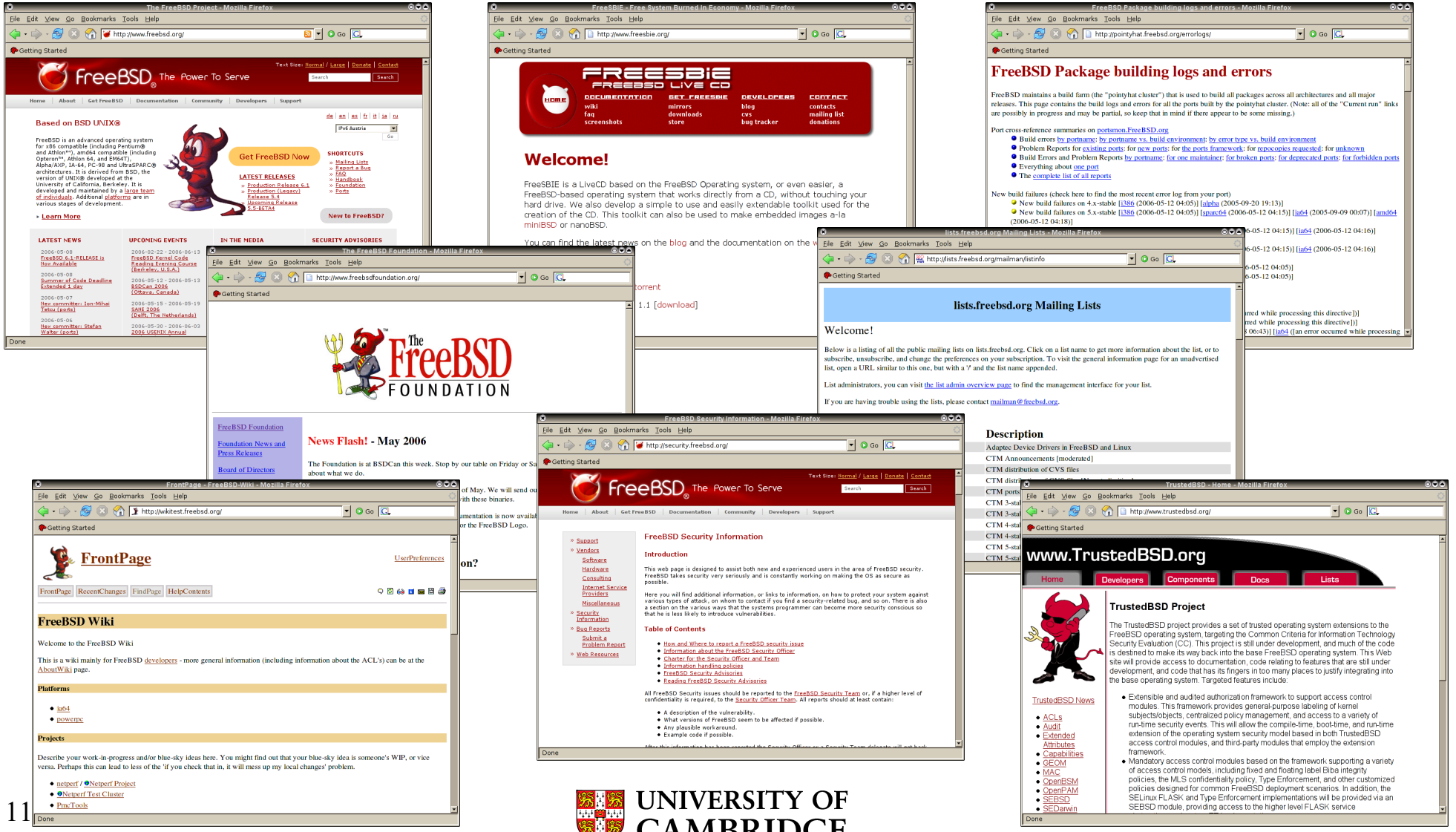
FreeBSD Project Org Chart (Sort of)



Mailing Lists

- Over 40 active mailing lists
- Mostly public
  - Some exceptions (core, re, so, portmgr, ...)
- Organized loosely by topic
  - -announce, -current, -arch, cvs-all, -security, ...
  - -chat, -hackers, -questions...
- Place where vast majority of FreeBSD discussion and planning takes place
  - Both developer and user

FreeBSD Project Web Pages (Just a few)



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Events

- Conferences
  - USENIX ATC
  - BSDCan
  - BSDCon
  - EuroBSDCon
  - AsiaBSDCon
  - NYCBSDCon
  - MeetBSD
- Developer Summits
  - Two day events, often associated with conferences

FreeBSD Developer Summit
BSDCan May 2006

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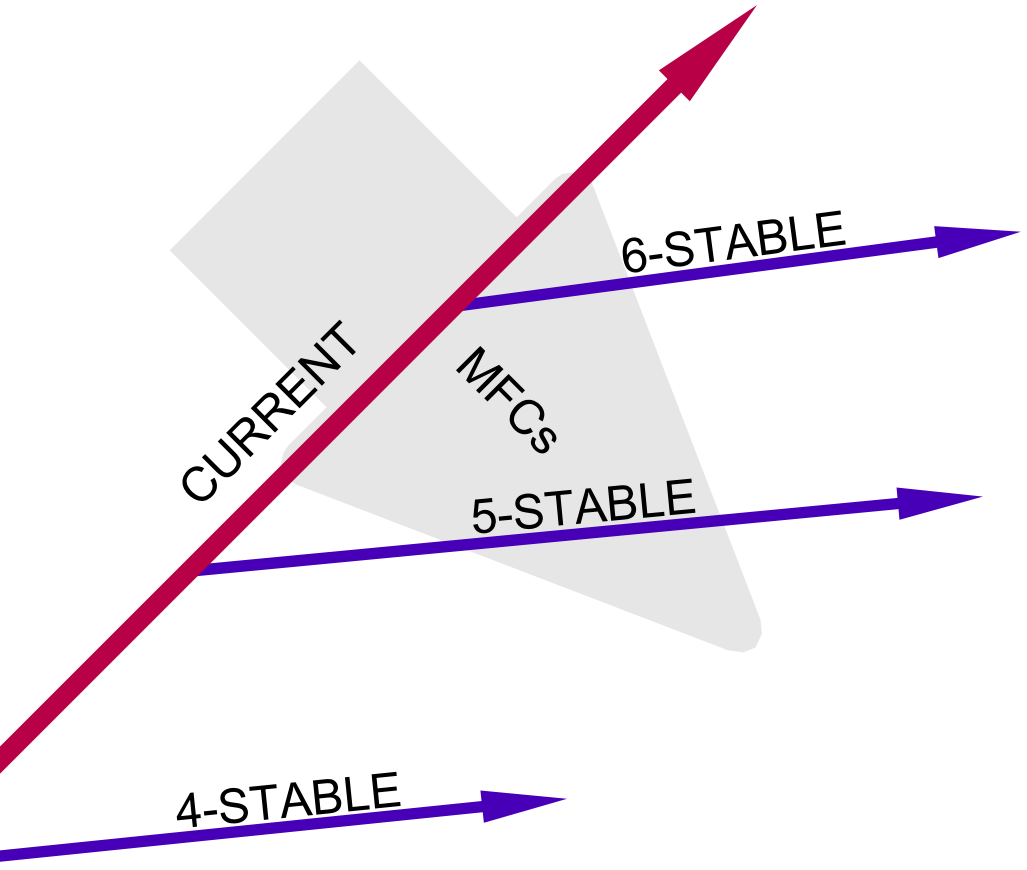
A Few Highlights
Developer Summits, 2006

- Virtualization
- Xen, Sun4v
- SCTP
- 32-processor systems
- Multi-threaded, multi-processor network stack performance
- Interrupt filters
- GCC4
- FreeBSD/embedded
- FreeSBIE 2
- FreeBSD 802.11
- Ports
- TrustedBSD
- ZFS, GJournal
- Atomic operations
- Revision control

FreeBSD Development Cycle

- Branched development model
  - 7-CURRENT – Cutting edge development
  - 6-STABLE – Active development with releases
  - 5-STABLE – Legacy branch with releases
  - 4-STABLE – Legacy branch
- Goal
  - 18 month major “dot zero” releases (6.0, 7.0, ...)
  - 4-6 month minor “dot” releases (5.5, 6.1, 6.2, ...)
- Balance is tricky but important

Development Branches



- Simultaneous parallel development
- Divergence based on feature maturity
- “MFC” merges changes from CURRENT to STABLE branches

FreeBSD Releases

- Three active development branches in CVS
  - 4.x – Legacy release series
  - 5.x – Large scale feature expansion
  - 6.x – Refinement of 5.x feature platform
- Most recent releases FreeBSD 5.5, 6.2
  - Project releases at http://www.FreeBSD.org/
  - CDs/DVDs from several vendors
  - Derived systems (PC-BSD, DesktopBSD, et al).

FreeBSD Release cycle

- Most of the time open development
- Release cycle on STABLE branches
  - Code slush
  - Code freeze
  - Beta series, branching
  - Release candidate series
  - Release
  - Errata/Security advisories
- Big “dot zero” releases less frequently

CVS

- Primary revision control system
  - Almost all project activity is in CVS
  - 10+ year revision history
  - Technical limitations becoming more apparent
- repoman.FreeBSD.org
  - /home/ncvs – FreeBSD src cvs
  - /home/pcvs – FreeBSD ports cvs
  - /home/projcvs – FreeBSD project cvs
  - /home/dcvs – FreeBSD documentation cvs

Perforce

- Secondary revision control system
  - Supports heavily branched development
  - FreeBSD developers
  - Guest accounts and project accounts
- Active project include
  - SMPng, TrustedBSD Audit, TrustedBSD MAC
  - TrustedBSD SEBSD, Alan Cox Superpages, uart
  - ARM, Summer of Code, dtrace, Xen, Sun4v
  - GEOM, GJournal, ZFS, CAM locking, netperf, ...

Revision Control: the Future

- Heavy use of Perforce a symptom of CVS weaknesses
  - Need lightweight branching, history-aware merging
  - Need access control
- Every few years, consider options
  - Cost of migration very high – interrupt development, retrain developers, high risk
- Currently evaluating several of revision control systems to see if any meet requirements

FreeBSD.org Cluster

- Hosted at Yahoo!
  - Mail servers (hub, mx1, mx2)
  - Distribution (ftp-master, www)
  - Shell access (freefall, builder)
  - Revision control (repoman, spit, ncvsup)
  - Ports cluster (pointyhat, gohans, blades)
  - Test systems (sledge, pluto, panther, beast)
  - Name server (ns0)
  - NetApp filer (dumpster)

Other Clusters

- Korean Ports Cluster
- allbsd.org
  - Multiprocessor Sun hardware for testing
- Sentex Cluster
  - Security officer
  - Network, SMP performance, storage work
- ISC Cluster
  - ftp.freebsd.org, Coverity, test systems, ports

Conflict Resolution

- Developers generally characterized by:
  - Independence
  - Cooperation
  - Common sense
- Facilitated by intentional avoidance of overlap
- Strong technical disagreements, personality conflicts, etc, do occur
- When they get out of hand, generally mediated by a member of core

What Is a Bikeshed, Anyway?

- A very special kind of conflict
- Not specific to FreeBSD, but one of our favorites
- Strong opinions easier to have on unimportant details

Conclusion

- FreeBSD Project one of the largest, oldest, and most successful open source projects
  - Hundreds of committers, thousands of contributors
  - Millions of lines of code
  - Tens of millions of deployed systems
- Highly successful community model makes this possible
- Join this community!