Open Source Software (OSS)

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Outline

- Introduction to OSS
  - What is it?
  - Nearly all OSS is commercial off-the-shelf (COTS)
  - Typical OSS development model
- Value to government
  - Why would governments use or create OSS?
  - OSS Challenges
  - Examples of use
- Selecting COTS OSS: What’s the Same? Different?
- Starting OSS project
- Security
- Foolish vs. Sensible Policies
- Remarks

What is Open Source Software (OSS)?

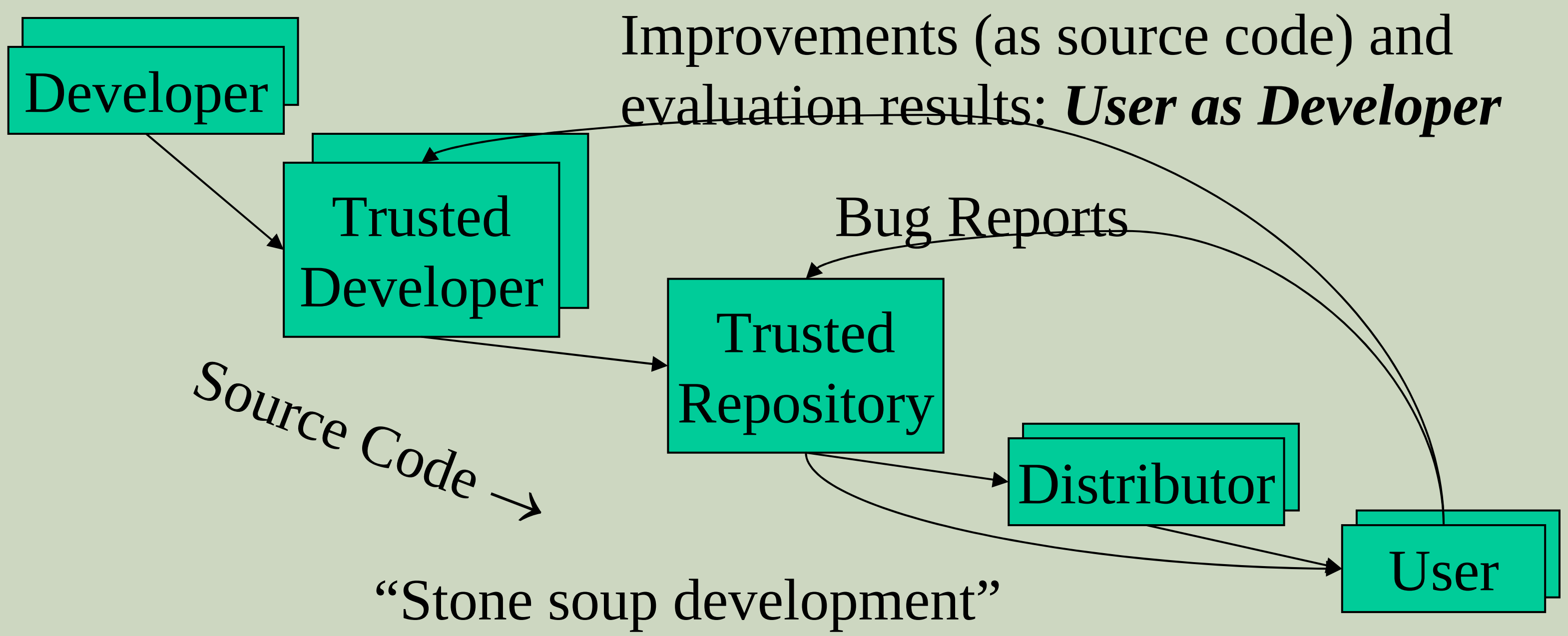
- OSS: software licensed to users with these freedoms:
  - to run the program for any purpose,
  - to study and modify the program, and
  - to freely redistribute copies of either the original or modified program (without royalties, etc.)
- Synonyms: libre software, Free software*, FOSS, FLOSS
- Antonyms: proprietary software, closed software
- Widely used; OSS #1 or #2 in many markets
  - "… plays a more critical role in the DoD than has generally been recognized." [MITRE 2003]
- <u>*Not* non-commercial…</u>

* The term "Free software" sometimes means OSS, and sometimes instead means "no charge"

Nearly all OSS is Commercial Off-the-Shelf (COTS)

- **Federal Acquisition Regulation (FAR) prefers COTS and NDI; commercial item = "licensed to general public":**
  - Agencies must "(a) Conduct market research to determine [if] commercial items or nondevelopmental items are available … (b) Acquire [them] when… available … (c) Require prime contractors and subcontractors at all tiers to incorporate, to the maximum extent practicable, [them] as components..."
  - Commercial item is "(1) Any item, other than real property, that is of a type customarily used by the general public or by non-governmental entities for purposes [not unique to a government], and (i) Has been <u>sold</u>, leased, or <u>licensed</u> to the general public; or (ii) Has been <u>offered</u> for <u>sale</u>, lease, or <u>license</u> to the general public... (3) [Above with] (i) Modifications of a type customarily available in the commercial marketplace; or (ii) Minor modifications… made to meet Federal Government requirements. "
  - True for nearly all off-the-shelf (OTS) OSS, so it's commercial item/COTS
- **OSS projects usually seek improvements = financial gain**
  - U.S. Code Title 17, section 101 defines "financial gain" as including "receipt, or expectation of receipt, of anything of value, <u>including the receipt of other copyrighted works</u>."
- **Many OSS projects supported by commercial companies**
  - IBM, Sun, Red Hat, Novell, Microsoft (WiX, IronPython, SFU, Codeplex site)
- **Often developers paid (2004: 37K/38K Linux changes)**
- **OSS licenses and projects approve of commercial support**
- **Use COTS/NDI because *<u>users share costs</u>* – OSS does!**

OSS Development Model



- OSS users typically use software without paying licensing fees
- OSS users typically pay for training & support (competed)
- OSS users are responsible for developing new improvements & any evaluations that they need; often cooperate/pay others to do so

Why would governments use or create OSS (value for government)?

- Can evaluate in detail, lowering risk
  - Can see if meets needs (security, etc.)
  - Mass peer review typically greatly increases quality/security
  - Aids longevity of records, government transparency
- Can copy repeatedly at no additional charge (lower TCO)
  - Support may have per-use charges (compete-able)
- Can share development costs with other users
- Can modify for special needs & to counter attack
  - Even if you're the only one who needs the modification
- *Control own destiny*: Freedom from vendor lock-in, vendor abandonment, conflicting vendor goals, etc.

In many cases, OSS approaches have the *potential* to increase functionality, quality, and flexibility, while lowering cost and development time

OSS Challenges

1. Ensuring OSS fairly considered in acquisitions
   - Some acquisition processes/policies not updated for OSS
   - Policy noncompliance (FAR's market research, "OSS neutral")
   - Many PMs unfamiliar with OSS: don't consider using or creating
   - Many COTS OSS projects ignore solicitations & RFPs
2. Different economics: Pay-up-front for improvements
   - Some policies presume proprietary COTS' pay-per-use model
   - Can pay in $ or time, can compete, can cost-share with other users
3. Transition costs if pre-existing system
   - Especially if dependent on proprietary formats/protocols/APIs
   - Use open standards so can switch (multi-vendor, no 'RAND' patents)
   - Web-based apps/SOA help if open stds (browser/platform-neutral)
   - Vendor lock-in often increases TCO; transition may be worthwhile
4. COTS support if no traditional vendor (compete-able)
5. License compliance (easier but different: education)
6. Cannot release classified code as OSS
   - Can build classified systems with/incl. OSS: tables, layers, licenses

Examples of OSS in U.S. Government

- Use – ***pervasive***
  - OSS "plays a more critical role in the DoD than has generally been recognized"; inc. Linux, Samba, Apache, Perl, GCC, GNAT, XFree86, OpenSSH, bind, and sendmail. [MITRE 2003]
  - "devIS saves its clients a minimum of $100,000 per contract by using OSS" [NewsForge]
  - Often unaware it's OSS
- Government-paid improvements of OSS
  - OpenSSL (CC evaluation), Bind (DNSSEC), GNAT, …
- Government-developed OSS
  - BSD TCP/IP suite, Security-Enhanced Linux (SELinux), OpenVista, Expect, EZRO, Evergreen (Georgia), …
- U.S. federal policies explicitly neutral: OSS, or not, is fine
  - OMB memo M-04-16, DoD memo "OSS in DoD"
  - Examine *all* licenses before commit (GPL fine)

Selecting COTS: What’s the Same? (OSS vs. Proprietary)

- Negotiate best options with all parties, *then* select
- Evaluate by winnowing out top candidates for your needs
  - *Identify* candidates, Read *Reviews, Compare* (briefly) to needs through criteria, *Analyze* top candidates
- Evaluation criteria - same
  - Functionality, total cost of ownership, support, maintenance/ longevity, reliability, performance, scalability, flexibility, legal/license (inc. *rights and responsibilities – OSS always gives right to view, modify, and redistribute*), mkt share, other
- Warranty & indemnification (“who do you sue?”)
  - Generally disclaimed by *both* proprietary & OSS licenses
- Pay for installation, training, support (time and/or money)
- Developer trustworthiness usually unknown
  - Mitigation: Can review OSS code & sometimes proprietary
  - Mitigation: Supplier due diligence; often main OSS developers and integrators determinable
  - Remember: Selling company often not developer

Selecting COTS: What’s Different? (OSS vs. Proprietary)

- Process/code openness means more&different sources of evaluation information for COTS OSS
  - Bug databases, mailing list discussions, …
  - Anyone (inc. you) can evaluate in detail
  - See http: //www.dwheeler.com/oss_fs_eval.html
- Proprietary=pay/use, OSS=pay/improvement
  - In OSS, pay can be time and/or money
- Support can be competed & changed
  - OSS vendors, government support contracts, self
- OSS can be modified & redistributed
  - New option, but need to know when to modify
  - Forking usually fails; generally work with community

Starting OSS Project

- Check usual project-start requirements
  - Is there a need, no/better solution, TCO, etc.
  - Examine OSS approach; similar to GOTS, with greater opportunity for cost-sharing, but greater openness
- Purpose is *cost-sharing*: remove barriers to entry
  - Use common license well-known to be OSS (GPL, LGPL, MIT/X, BSD-new) – *don't write your own license*
  - Establish project website (mailing list, tracker, source)
  - Document scope, major decisions
  - Use typical infrastructure, tools, etc. (e.g., SCM)
  - Maximize portability, avoid proprietary langs/libraries
  - *Must run* - Small-but-running better than big-and-not
  - Establish vetting process(es) before government use
    - Government-paid lead? Testing? Same issues: proprietary
- Many articles & books on subject

Security

- Neither OSS nor proprietary are *always* more secure
  - Many *specific* OSS programs *are* significantly more secure; see quantitative studies “Why…” at http://www.dwheeler.com
- OSS advantage: Open design principle
  - Saltzer & Schroeder [1974/1975], “Protection mechanism must not depend on attacker ignorance”
- Hiding source code doesn’t impede attacks
  - “Security by Obscurity” requires *real* secret-keeping: can’t give access to source code, executable program, or website
- Attackers can modify OSS *and* proprietary software
  - Trick is to get that modified version into supply chain
  - OSS: subverting/misleading/becoming the trusted developers or trusted repository/distribution, *and* none notice attack later
- OSS security requirements:
  - Developers/reviewers need security knowledge
  - People have to actually review the code: yes, it really happens!
  - Problems must be fixed, fixes deployed

Foolish vs. Sensible Policies

- **Foolish: “No OSS” or “No GPL”**
  - ***Tremendous*** **competitive/strategic disadvantage**
  - **Essentially the same idea as “no COTS” decades ago**
- **Often focused on General Public License (GPL):**
  - **~ “Someone given binary *must* get source code too”**
  - **GPL is most popular OSS license *by far* (52%-88%)**
  - **Some proprietary companies advocate “no GPL” as veiled anti-OSS campaign, to inhibit competition**
- **Sensible: “Examine OSS & proprietary options, then review *all* their licenses before including”**
  - **Ensure all licenses are compatible with intended use**
  - **Proprietary EULAs sometimes *worse* than OSS licenses**
  - **GPL often fine once considered in context**
  - ***Examine supplier*** **– again, for OSS *and* proprietary**

Concluding Remarks

- **OSS options should always be considered**
  - **Both choosing COTS OSS & creating new OSS project**
  - **Components or even whole project (depending on need)**
  - **Not always best choice, but foolish to ignore**
- **OSS can be very flexible & often lowers costs**
  - **Directly and as competition to non-OSS (keep options open!)**
- **OSS raises strategic questions for governments**
  - **How pool users to start OSS projects when appropriate?**
  - **Educating PMs on OSS, deploying fully open architectures**
  - **Research: default to OSS (with some common OSS license)**
  - **Eliminating software patents**
- **Projects should change to consider OSS approaches:**
  - **PM education: OSS differences, fears, *always consider option***
  - **Classified systems: separate data & program, layer programs**
  - **Open standards so can change later (e.g., browser-neutral)**
    - ***Require & operationally demonstrate* that can switch components**

Security Backup Slides

Extreme claims

- Extreme claims
  - “FLOSS is always more secure”
  - “Proprietary is always more secure”
- Reality: Neither FLOSS nor proprietary always better
  - Some *specific* FLOSS programs *are* more secure than their competing proprietary competitors
- Include FLOSS options when acquiring, then evaluate

FLOSS Security (1)

- **Browser "unsafe" days in 2004: 98% Internet Explorer, 15% Mozilla/Firefox (half of Firefox's MacOS-only)**
- **IE 21x more likely to get spyware than Firefox [U of Wash.]**
- **Faster response: Firefox 37 days, Windows 134.5 days**
- **Evans Data: Linux rarely broken, ~virus/Trojan-free**
- **Serious vulnerabilities: Apache 0, IIS 8 / 3yrs**
- **J.S. Wurzler hacker insurance costs 5-15% more for Windows than for Unix or Linux**
- **Bugtraq vulnerability 99-00: Smallest is OpenBSD, Windows largest (**Don't quintuple-count!**)**
- **Windows websites more vulnerable in practice**

Category	Proprietary	FLOSS
Defaced	66% (Windows)	17% (GNU/Linux)
Deployed Systems	49.6% (Windows)	29.6% (GNU/Linux)
Deployed websites (by name)	24.81% (IIS)	66.75% (Apache)

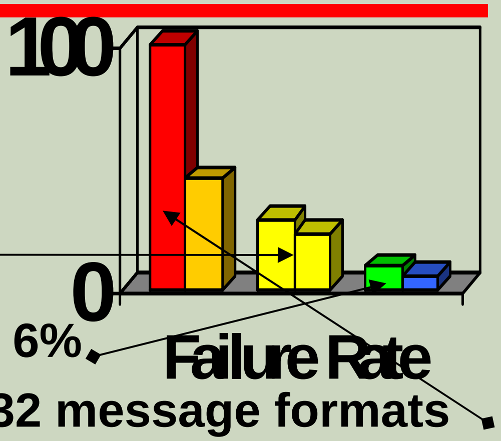
FLOSS Security (2)

- Unpatched networked systems: 3 months Linux, hours Windows (variance minutes ... months) [Honeynet.org, Dec 2004]
  - Windows SP2 believed to be better than previous versions of Windows
- 50% Windows vulnerabilities are critical, vs. 10% in Red Hat [Nicholas Petreley, Oct 2004]
- Viruses primarily Windows phenomenon
  - 60,000 Windows, 40 Macintosh, 5 for commercial Unix versions, 40 for Linux
- 91% broadband users have spyware on their home computers (proprietary OS) [National Cyber Security Alliance, May 2003] vs. ~0% on FLOSS

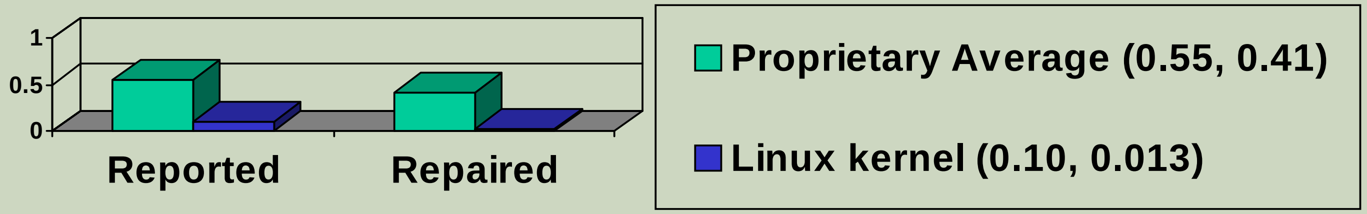
FLOSS Security (3)

- FLOSS systems scored better on security [Payne, Information Systems Journal 2002]
- Survey of 6,344 software development managers April 2005 favored FLOSS [BZ Research]

Reliability



- Fuzz studies found FLOSS apps significantly more reliable [U Wisconsin]
  - Proprietary Unix failure rate: 28%,23%
  - FLOSS: Slackware Linux 9%, GNU utilities 6%
  - Windows: 100%; 45% if forbid certain Win32 message formats
- GNU/Linux vs. Windows NT 10 mo study [ZDNet]
  - NT crashed every 6 weeks; both GNU/Linuxes, never
- IIS web servers >2x downtime of Apache [Syscontrol AG]
- Linux kernel TCP/IP had smaller defect density [Reasoning]



FLOSS Always More Secure?

- **No: Sendmail, bind 4**
- **Must examine case-by-case**
  - **But there *is* a principle that gives FLOSS a *potential* advantage…**

Open design: A security fundamental

- Saltzer & Schroeder [1974/1975] - Open design principle
  - the protection mechanism must not depend on attacker ignorance
- FLOSS better fulfills this principle
- Security experts perceive FLOSS advantage
  - Bruce Schneier: “demand OSS for anything related to security”
  - Vincent Rijmen (AES): “forces people to write more clear code & adhere to standards”
  - Whitfield Diffie: “it’s simply unrealistic to depend on secrecy for security”

Problems with hiding source & vulnerability secrecy

- Hiding source doesn't halt attacks
  - Presumes you can keep source secret
    - Attackers may extract or legitimately get it
  - Dynamic attacks don't need source or binary
    - Observing output from inputs sufficient for attack
  - Static attacks can use pattern-matches against binaries
  - Source can be regenerated by disassemblers & decompilers sufficiently to search for vulnerabilities
  - Secrecy inhibits helpers, while not preventing attackers
  - "Security by Obscurity" widely denegrated
- Hiding source slows vulnerability response
- Vulnerability secrecy doesn't halt attacks
  - Vulnerabilities are a time bomb and are likely to be rediscovered by attackers
  - Brief secrecy works (10-30 days), not months/years

Can “Security by Obscurity” be a basis for security?

- “Security by Obscurity” can work, but iff:
  - Keeping secret actually improves security
  - You can keep the critical information a secret
- For obscurity itself to give significant security:
  - Keep source secret from all but a few people. Never sell or reveal source to many. E.G.: Classify
  - Keep binary secret; never sell binary to outsiders
    - Use software protection mechanisms (goo, etc.)
    - Remove software binary before exporting system
  - Do not allow inputs/outputs of program to be accessible by others – *no Internet/web access*
- ***<u>Useless</u>* in most cases!**
  - Incompatible with proprietary off-the-shelf model
- Proprietary software can be secure – but not this way

FLOSS Security Preconditions (Unintentional vulnerabilities)

1. Developers/reviewers need security knowledge
   - Knowledge more important than licensing
2. People have to actually *review* the code
   - Reduced likelihood if niche/rarely-used, few developers, rare computer language, not really FLOSS
   - More contributors, more review
     - Is it *truly community-developed?*
   - Evidence suggests this really happens! (next)
3. Problems must be fixed
   - Far better to fix *before* deployment
   - If already deployed, need to deploy fix

Is FLOSS code ever examined? Yes.

- Most major FLOSS projects have specific code reviews; some have rewards
  - Mozilla Security Bug Bounty Program ($500)
  - Linux: hierarchical review, “sparse” tool
- Disseminated review groups (second check):
  - OpenBSD (for OpenBSD)
  - Debian-audit (for Debian Linux)
- Static analysis tool vendors test using FLOSS
- Vulnerability Discovery and Remediation, Open Source Hardening Project (DHS/Coverity/Stanford)
- Many independents (see Bugtraq, etc.)
- Business case: Must examine to change (*reason to review)*
- Users' increased transparency encourages examination & feedback

Evaluating FLOSS? Look for evidence

- First, identify your security requirements
- Look for evidence at FLOSS project website
  - User's/Admin Guides: discuss make/keep it secure?
  - Process for reporting security vulnerabilities?
  - Cryptographic signatures for current release?
  - Developer mailing lists discuss security issues and work to keep the program secure?
  - Active community
- Use other information sources where available
  - E.G., CVE… but absence is not necessarily good
  - External reputation (e.g., OpenBSD)
- See http://www.dwheeler.com/oss_fs_eval.html

Proprietary advantages… not necessarily

- Experienced developers who understand security produce better results
  - Experience & knowledge *are critical*, but...
  - FLOSS developers often very experienced & knowledgeable too (BCG study: average 11yrs experience, 30 yrs old) – often same people
- Proprietary developers higher quality?
  - Dubious; FLOSS often higher reliability,security
  - Market rush often impairs proprietary quality
- No guarantee FLOSS is widely reviewed
  - ***True!*** Unreviewed FLOSS may be very insecure
  - Also true for proprietary (rarely reviewed!). *Check it!*
- Can sue vendor if insecure/inadequate
  - Nonsense. EULAs forbid, courts rarely accept, costly to sue with improbable results, you want sw not a suit

Inserting malicious code & FLOSS: Basic concepts

- “Anyone can modify FLOSS, including attackers”
  - Actually, you can modify proprietary programs too… just use a hex editor. Legal niceties not protection!
  - Trick is to get result into user supply chain
  - In FLOSS, requires subverting/misleading the trusted developers or trusted repository/distribution…
  - *and* no one noticing the public malsource later
- Different threat types: Individual...nation-state
- Distributed source aids detection
- Large community-based FLOSS projects tend to have many reviewers from many countries
  - Makes attacks more difficult
  - Consider supplier as you would proprietary software
  - Risk larger for small FLOSS projects

Malicious attack approaches: FLOSS vs. proprietary

- **Repository/distribution system attack**
  - **Traditional proprietary advantage: can more easily disconnect repository from Internet, not shared between different groups**
    - **But development going global, so disconnect less practical**
  - **Proprietary advantage: distribution control**
  - **OSS advantage: Easier detection & recovery via many copies**
- **Malicious trusted developers**
  - **OSS slight advantage via review, but weak ("fix" worse!)**
  - **OSS slight advantage: More likely to know who developers are**
  - **Reality: For both, *check who is developing it!***
- **Malicious untrusted developer**
  - **Proprietary advantage: Fewer untrusted developers**
    - **Sub-suppliers, "Trusted" developers may be malicious**
  - **OSS long-term advantages: Multiple reviewers (more better)**
- **Unclear winner – No evidence proprietary always better**

Examples: Malicious code & FLOSS

- Linux kernel attack – repository insertion
  - Tried to hide; = instead of ==
  - Attack failed (CM, developer review, conventions)
- Debian/SourceForge repository subversions
  - Countered & restored by external copy comparisons
- Often malicious code made to look like unintentional code
  - Techniques to counter unintentional still apply
  - Attacker could devise to work around tools... but won't know in FLOSS what tools are used!
- Borland InterBase/Firebird Back Door
  - user: politically, password: correct
  - Hidden for 7 years in proprietary product
  - Found after release as FLOSS in 5 months
  - Unclear if malicious, but has its form

Security Preconditions (Malicious vulnerabilities)

- Counter Repository/distribution system attack
  - Widespread copies, comparison process
  - Evidence of hardened repository
  - Digitally signed distribution
- Counter Malicious trusted developers
  - Find out who's developing your system (*always!*)
- Counter Malicious untrusted developer
  - Strong review process
    - As with unintentional vulnerabilities: Security-knowledgeable developers, review, fix what's found
  - Update process, for when vulnerabilities found

High Assurance

- High assurance (HA) software:
  - Has an argument that could convince skeptical parties that the software will *always perform or never perform* certain key functions *without fail*... convincing evidence that there are *absolutely* no software defects. CC EAL 6+
  - Significant use of formal methods, high test coverage
  - High cost – requires deep pockets at this time
  - A few OSS & proprietary tools to support HA dev
  - Few proprietary, even fewer OSS HA at this time
- Theoretically OSS should be better for HA
  - In mathematics, proofs are often wrong, so only peer review of proofs valid [De Millo,Lipton,Perlis]. OSS!
- HA developers/customers very conservative & results often secret, so rarely apply "new" approaches like OSS... yet
  - Cannot easily compare in practice... yet

Can FLOSS be applied to custom systems?

- **Effective FLOSS systems typically have built a large development community**
  - **Share costs/effort for development & review**
  - **Same reason that proprietary off-the-shelf works: Multiple customers distribute costs**
- **Custom systems can be built from FLOSS (& proprietary) components**
- **If no pre-existing system, sometimes can create a generalized custom system**
  - **Then *generalized* system FLOSS, with a custom configuration for your problem**
  - **Do risk/benefit analysis before proceeding**

Bottom Line

- Neither FLOSS nor proprietary always better
  - But clearly many cases where FLOSS *is* better
- FLOSS use increasing industry-wide
  - In some areas, e.g., web servers, it dominates
- Policies must not ignore or make it difficult to use FLOSS where applicable
  - Can be a challenge because of radically different assumptions & approach
- Include FLOSS options when acquiring, then evaluate

Quantitative Studies - Backup Slides

Outline of Quantitative Information on OSS/FS

Quantitatively show “consider using OSS/FS software”:

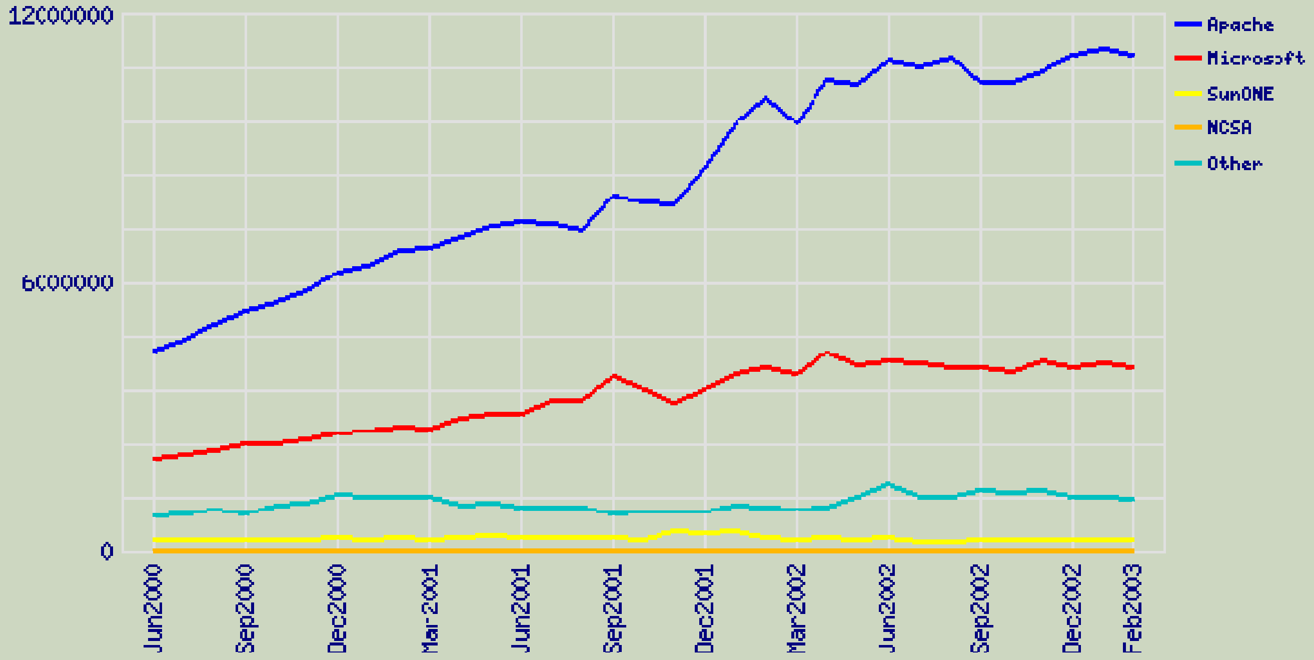
- Market Share
- Reliability
- Performance
- Scalability
- Security
- Total cost of ownership
- Non-quantitative

Numbers won't show OSS/FS always technically better

This presentation does not necessarily represent the views of the U.S. Government or U.S. DoD, & is based on personal work

Market Share: Web Servers

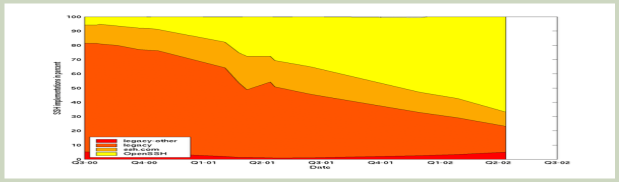
- **Active Sites: Apache 66.75%, Microsoft IIS 24.81% in Feb 2003 (counting by name; 35.86M sites)**



- **For SSL, Apache 53.97%, IIS 34.85% Sep02**

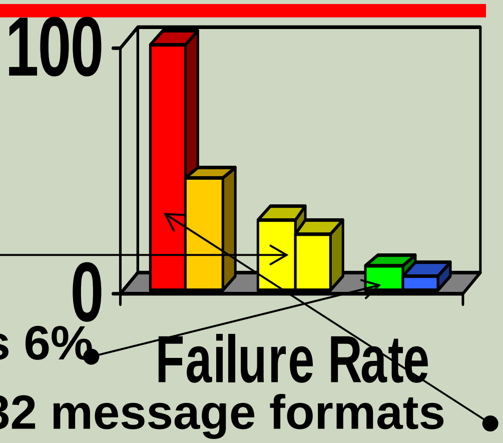
Other Market Share Examples

- GNU/Linux #2 webserver OS Jun01
  - GNU/Linux 29.6%, Windows 49.6%, BSDs 6.1%
- GNU/Linux #2 server OS sold 99, 00, 01 (24%, 27%, 25%)
- DNS: bind supports 95% of reverse-lookups
- PHP #1 server-side scripting language
- Sendmail #1 Email server
  - Sendmail 42%, Microsoft Exchange 18%
- OpenSSH #1 SSH (66.8% Apr02)



- Small (1.7-3.8%) 2002 desktop share
  - Microsoft 92% in 2000, but usable OSS/FS apps just released in 2002, so could change over time

Reliability



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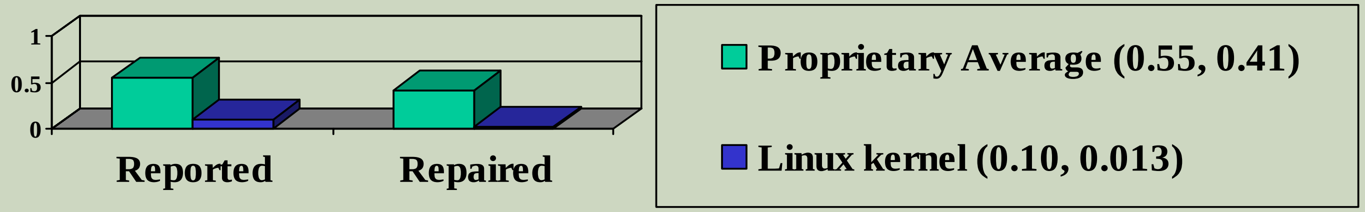

Performance

- Performance always varies by circumstance
- TPC-C: GNU/Linux faster than Windows
- PC Magazine: GNU/Linux with Samba faster fileserving at Windows' own file protocols
  - Nov 2001, top end, 130MB/sec vs. 78MB/sec
  - April 2002, performance 2x; 4x many clients
- Sys Admin: untuned GNU/Linux fastest

Measure	GNU/Linux	Solaris on Intel	FreeBSD	Windows 2000
Email (M msg/hr)	**1.3**	**1**	**0.9**	**0.9**
Disk I/O (seconds)	**542**	**3990**	**2398**	**613**

Scalability

- GNU/Linux and NetBSD support more hardware platforms & performance ranges
  - PC hardware, PDAs, mainframes, clusters, supercomputers
- OSS/FS can develop large software systems
  - Red Hat Linux 7.1 had 30million SLOC
  - Represents approximately 8,000 person-years
  - To re-develop proprietary, $1 Billion USD

Security

- **J.S. Wurzler hacker insurance costs 5-15% more for Windows than for Unix or Linux**
- **Windows websites disproportionately vulnerable**

Category	Proprietary	OSS/FS
Defaced	**66% (Windows)**	**17% (GNU/Linux)**
Deployed Systems	**49.6% (Windows)**	**29.6% (GNU/Linux)**
Deployed websites (by name)	**24.81% (IIS)**	**66.75% (Apache)**

- **Bugtraq vulnerability: Smallest is OpenBSD, Windows largest (**Don't quintuple-count!**)**
- **Worst vulnerabilities (takeover): Apache 0, IIS 8 (Jun98-Jun01)**
- **OSS/FS *not invulnerable!***

Total Cost of Ownership (TCO)

- TCO multifaceted & sensitive to circumstances
- OSS/FS costs less to acquire than proprietary
  - E.G., Web server, Windows $3610 vs. $156
- Some other factors also tend to be lower
  - Lower upgrade costs, can use cheaper hardware
  - Avoids license management & litigation
- Cybersource: TCO 24%-34% less w/OSS/FS
- InfoWorld Survey of CTOs:
  - 60% CTOs: >$50K/yr savings
  - 32% CTOs: > $250K/yr savings (inc. above)

Non-Quantitative

- To many, non-quantitative advantages of OSS/FS are more important
  - Social/ethical/moral reasons
  - Avoids risks of single source solutions
    - Reversible decision: can switch or self-support if vendor jacks up price, maliciously changes interface, drops support, …
  - (Can) avoid security risks of monocultures
  - Avoids license management and litigation
  - Supports domestic IT infrastructure
  - Many believe it encourages innovation
  - Greater flexibility
    - Can change software (or hire its change) to meet needs

Conclusions on Quantitative OSS/FS Information

- Many, many cases where OSS/FS programs have some measurable advantage over proprietary competition
- Consider using OSS/FS software when acquiring software
- For more detailed information, see http://www.dwheeler.com/oss_fs_why.html

Conclusions

- Many similarities and differences in acquisition for OSS
  - Need to know & handle differences, challenges
- Need to know how to evaluate OSS
  - General approach similar
  - Ways to acquire information differ
- Quantitative evidence that OSS is worth considering
  - I don’t think it’s *always* the right answer, but it’s *always* worth considering

Miscellaneous Backup Slides

Major OSS/FS Licenses

- **Many licenses, but 4 dominate**
- **BSD-new & MIT license: anything but sue**
  - **Can incorporate code into proprietary software**
  - **Financial incentive to use, but *not* aid project**
- **General Public License (GPL): “Copyleft”**
  - **If distribute, *must* distribute source code or provide written offer to do so**
  - **Cannot link (embed) into proprietary software**
- **Lesser/Library GPL - a compromise**
  - **Must distribute source code/written offer, but only of component itself**
  - ***Can* link into proprietary software**
- **Public domain is OSS/FS, but rare**

GPL Use Widespread

- GPL has widespread use, other licenses far less common
  - Freshmeat.net (2003): 69.66% GPL, 5.29% LGPL, 4.82% BSD licenses (combined)
  - SourceForge.net (2003): 71% GPL, 10% LGPL, 7% BSD
  - Red Hat Linux 7.1: 50.36% GPL solely (55.3% dual), 8.28% MIT, 7.64% LGPL
  - FSF free software directory (2002): 87.9% GPL, 6.6% LGPL, 2.0% BSD or BSD-like, 1.9% Artistic, 0.3% MIT
  - MITRE DoD survey (2003): 52% GPL, 6% BSD, 5% Apache, 4% various "Community“, 3% LGPL
- Many big OSS projects changed to GPL-compatible
  - Python, vim, Mozilla, Zope, BSD, Apache (?), Qt, Wine, Alfresco
- XFree86 project died trying to become GPL-incompatible
- Avoid GPL-incompatible OSS licenses (risk of failure)
- Use common compatible licenses for new OSS projects
  - In particular: GPL, LGPL, MIT/X, or BSD-new

Unnecessary Fears

- Will OSS/FS destroy intellectual property? No.
  - Usually, complaint is about GPL
  - GPL trades you the right to freely incorporate their code into your software in exchange for the right to freely incorporate your code [which incorporates their code] into theirs
  - Intellectual property traded for other intellectual property
  - Microsoft sells GPL'ed software

Unnecessary Fears

- Viewing and changing source code valuable for non-programmers? Surprisingly, yes.
  - “Would you buy a car with the hood welded shut? If not, what do you know about modern … engine technology?” [Bob Young]
  - Consumers demand this so they can have control over their products, instead of dealers
- Anti-Microsoft campaign? No, not by all.
  - Jun02, 831 projects use Visual Basic; 8867 projects work on Windows [SourceForge]
  - Microsoft has been repeatedly asked to join community
  - Microsoft sells GPL'ed software

Acronyms

- COTS: Commercial Off-the-Shelf (either proprietary or OSS)
- DoD: Department of Defense
- HP: Hewlitt-Packard Corporation
- JTA: Joint Technical Architecture (list of standards for the DoD); being renamed to DISR
- OSDL: Open Source Development Labs
- OSS: Open Source Software
- RFP: Request for Proposal
- RH: Red Hat, Inc.
- U.S.: United States

Trademarks belong to the trademark holder.

Interesting Documents/Sites

- “Why OSS/FS? Look at the Numbers!” http://www.dwheeler.com/oss_fs_why.html
- “Use of Free and Open Source Software in the US Dept. of Defense” (MITRE, sponsored by DISA)
- President's Information Technology Advisory Committee (PITAC) -- Panel on Open Source Software for High End Computing, October 2000
- “Open Source Software (OSS) in the DoD,” DoD memo signed by John P. Stenbit (DoD CIO), May 28, 2003
- Center of Open Source and Government (EgovOS) http://www.egovos.org/
- OpenSector.org http://opensector.org
- Open Source and Industry Alliance http://www.osaia.org
- Open Source Initiative http://www.opensource.org
- Free Software Foundation http://www.fsf.org
- OSS/FS References http://www.dwheeler.com/oss_fs_refs.html