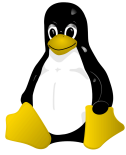


UNIX, Linux and BSD: a re-examination of my of 09/00 BLU “A Short UNIX History” talk

Clement T. Cole
Witch Doctor
Intel & USENIX

clemc@usenix.org



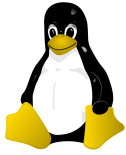


Biography: Clem Cole



clemc@ccc.com

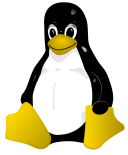
- ◆ an old school hacker and “Open Sourcer” with more than 30 years of free and open source system development experience.
- ◆ has held most every position in the computer field from operator, programmer, designer to VP of Eng and CTO and startup founder
- ◆ first encountered the early editions of UNIX while a university student, writing a variety of device drivers, kernel enhancements, and microprocessor support tools for the early 4- and 8-bit CPUs
- ◆ has been designing and developing Operating Systems and Technical Computing Systems ever since
- ◆ currently @ Intel leading an international team of engineers building super computers and super computer systems
- ◆ degrees in EE, Math, & CS from CMU and UCB, with the usual multi-page list of publications and talks to his credit
- ◆ helped to write one of the original TCP/IP implementations in the late 1970’s
- ◆ is also known as one of the authors of the precursor to IM, the UNIX talk program, as well as other more humorous and notorious hacks
- ◆ is honored to be the current President of the USENIX Association



Usual Legal Stuff



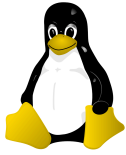
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 - ❑ My education at CMU and UCB,
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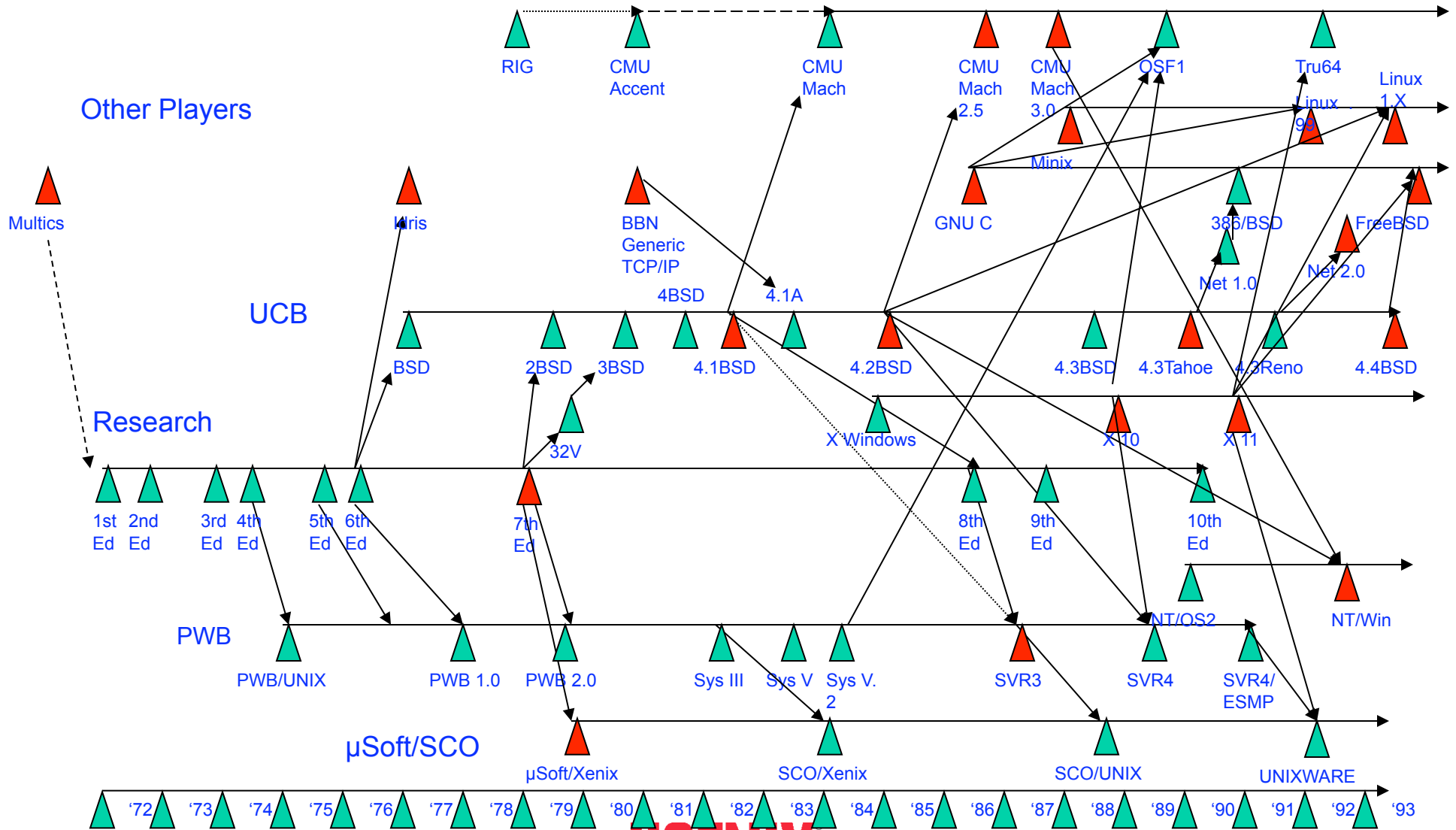
Agenda



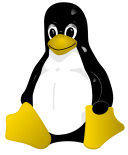
- ◆ Quick Review
- ◆ UNIX Market Update
- ◆ BSD Market Update
- ◆ Linux Market Update
- ◆ The New name for UNIX Market is OSS



A UNIX Family History 1st 25 Yrs



4/14/09

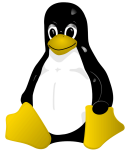


Observation on Software Ecosystems



“The reason closed [source] software forks into incompatible versions is so that one company can differentiate its version from everyone else’s.”

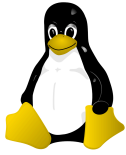
Eric S Raymond, Business Week, April 27, 1999.



Themes from Sept 2000



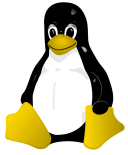
- ◆ **Something new is really something old**
- ◆ **The Open Source Culture predates UNIX and Linux**
- ◆ **Evolution is good**
- ◆ **Fighting is not always bad, but we all need to learn when it's good enough and stop fighting**



Conclusion: Sept 2000

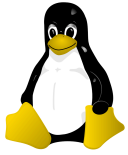


- ◆ Standards are an agreement that it's time to stop fighting
- ◆ BSD & Linux both bring much to the table, they are complements
- ◆ We have a standard (UNIX/POSIX), let's not create a new one
- ◆ If Open Source is to succeed, the BSD/Linux rift must stop
- ◆ *The issues are really elsewhere ... let's all work together*



We are all around the same fire...

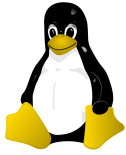




Agenda



-
- ◆ Quick Review
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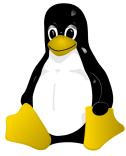


UNIX and the CS Community

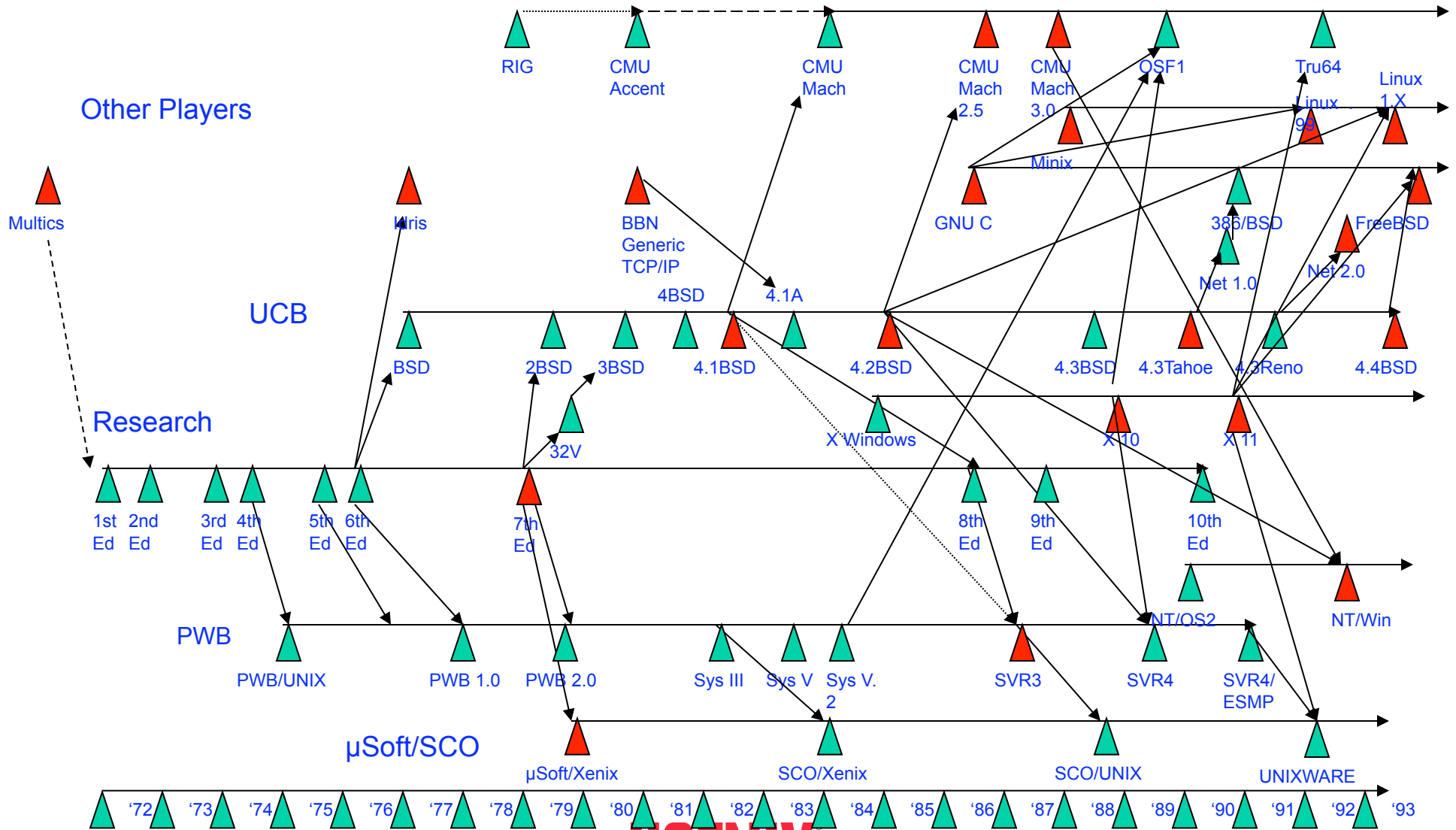


“UNIX became the Intellectual High Ground of the CS community .”

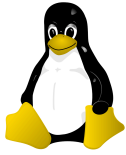
Dennis M. Ritchie, private communication, 2000.



A UNIX Family History 1st 25 Yrs



4/14/09

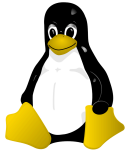


Where is UNIX in 2009?



◆ The final commercial UNIX players

- ❖ Sun (Open) Solaris
- ❖ IBM AIX
- ❖ HP UX
- ❖ Apple Mac OS X



Solaris / Open Solaris



◆ Basic Heritage

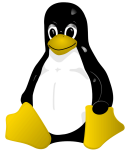
- ❖ Merge of AT&T System V4 adding in BSD 4.2 plus new IP

◆ Market Reputation

- ❖ Solaris is the “Gold Standard” for Enterprise Computing on SPARC
 - Just works
 - Huge ISV base, particularly in commercial applications
 - Replaced System 360 and family as the “nobody got fired for buying ..”
- ❖ Solaris/386 – huh?
 - Sun does not convince the market that they were serious about Intel processors
 - Roadrunner (Sun 386 system) was an extremely short lived product
- ❖ Open Solaris does runs on x86 and INTEL® 64, although only small market penetration of same
 - Even though Sun now (again) produces Intel based product
- ❖ The Volvo Truck of the industry

◆ Largest/Lasting Innovation

- ❖ NSF, NIS (aka YP)
- ❖ SMP Enhancements
 - SMP scaling of enterprise codes
- ❖ Solaris Threading Model used by lots of ISVs
 - not pthreads



AIX



◆ Basic Heritage

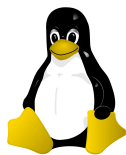
- ❖ System V.3, with lots of BSD

◆ Market Reputation

- ❖ Mainline product is Enterprise class
 - although sluggish and “less cool” than Solaris
- ❖ The Oldsmobile of the Commercial UNIX Implementations

◆ Largest /Lasting Innovation

- ❖ Commercially available exotic configurations and structures
 - Clusters and Federations for HPC
 - SP2 family
 - Cell
 - TCF – Transparent Computing Facility (SSI clusters on AIX/x86 & AIX/370)



UX



◆ Basic Heritage

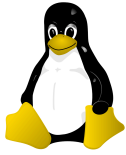
- ❖ BSD Kernel, with System V.3 and V.4 APIs added

◆ Market Reputation

- ❖ Rock Solid
- ❖ Not sexy like Solaris
- ❖ Reasonable Scaling
- ❖ The Ford F150 of the Commercial UNIX Implementations

◆ Largest /Lasting Innovation

- ❖ UX + IPF can handle hardware failures
- ❖ Forced SPARC, PPC and Intel® 64 to be better as commercial systems



OSX



◆ Basic Heritage

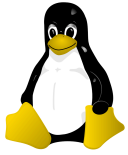
- ❖ Mach 3.0 (OSF uKernel), BSD 4.4, System V & Solaris as needed

◆ Market Reputation

- ❖ Best desktop system of any OS
- ❖ Cool
- ❖ Just works, “virus proof” (not actually reality – but is the rep)
- ❖ Even safe for corporate environments, the commercial alternative to Windows
- ❖ BMW M5 of the industry

◆ Largest/Lasting Innovation

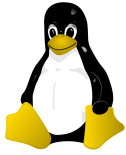
- ❖ Mainstream Window/GUI admin of a UNIX system
 - Jamie Cameron’s Webmin predates this but was not as wide spread
- ❖ Superb integration of certification and security keys
- ❖ Excellent integration of a “server” system as a desktop



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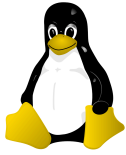


Original Observation on BSD

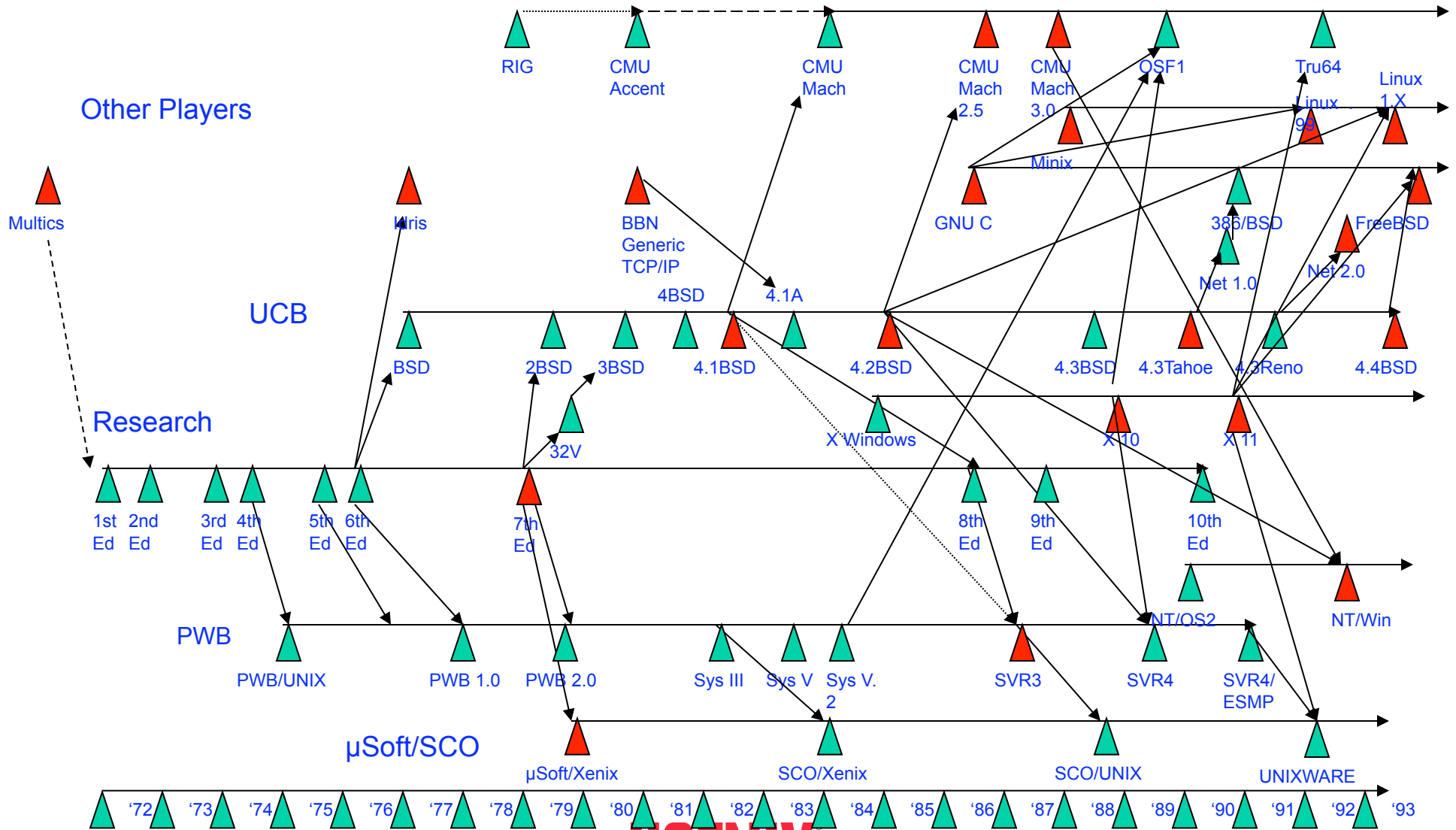


“BSD 4.2 just like UNIX, only different.”

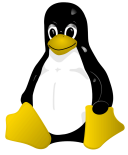
Henry Spencer, University of Toronto in a net.news posting circa 1982.



A UNIX Family History 1st 25 Yrs



4/14/09

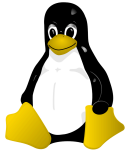


Where is BSD in 2009?



◆ The final BSD players

- ❖ FreeBSD
- ❖ OpenBSD
- ❖ NetBSD
- ❖ Darwin / Mac OS X



Free BSD



◆ Basic Heritage

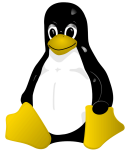
- ❖ BSD 4.4 + 386BSD
- ❖ The original “Freely available” UNIX for an x86

◆ Market Reputation

- ❖ Just works
- ❖ Used by large and small ISPs
- ❖ Scales well
- ❖ Best Solaris/SPARC alternative for 32-bit x86 system
 - Gold Standard of traditional BSD on Intel platforms

◆ Largest /Lasting Innovation

- ❖ Simple (PC style) install
- ❖ Free (as in beer) UNIX on x86/PC hardware



Net BSD



◆ Basic Heritage

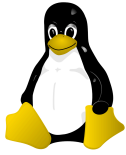
- ❖ BSD 4.4

◆ Market Reputation

- ❖ University / research tool to explore ideas

◆ Largest /Lasting Innovation

- ❖ Runs on almost any 32-bit hardware platform with a reasonable memory system
- ❖ Was the system Linux had to displace in research community for experimentation



Open BSD



◆ Basic Heritage

- ❖ BSD 4.4 – derivative of NetBSD

◆ Market Reputation

- ❖ Security by design and vigilance

- Try to break in .. Really
- We bet none of you can

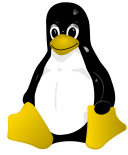
- Anytime anything has been exposed, Open BSD closes it in hours. Most issues are in user space and come from the security conferences when people consider new attacks.

◆ Largest /Lasting Innovation

- ❖ Security by code review of everything

- Kernel and user space

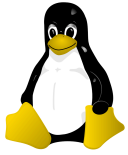
- ❖ Very small... if you can not demonstrate why it needs to be there, it's not



Darwin



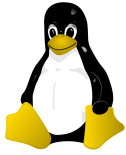
- ◆ **Basic Heritage**
 - ❖ Mach 3.0 uKernel + some Apple-isms
- ◆ **Market Reputation**
 - ❖ What's Darwin?
- ◆ **Largest /Lasting Innovation**
 - ❖ ?? Maybe the Hackintosh



Agenda



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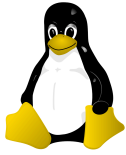


Observation on Linux

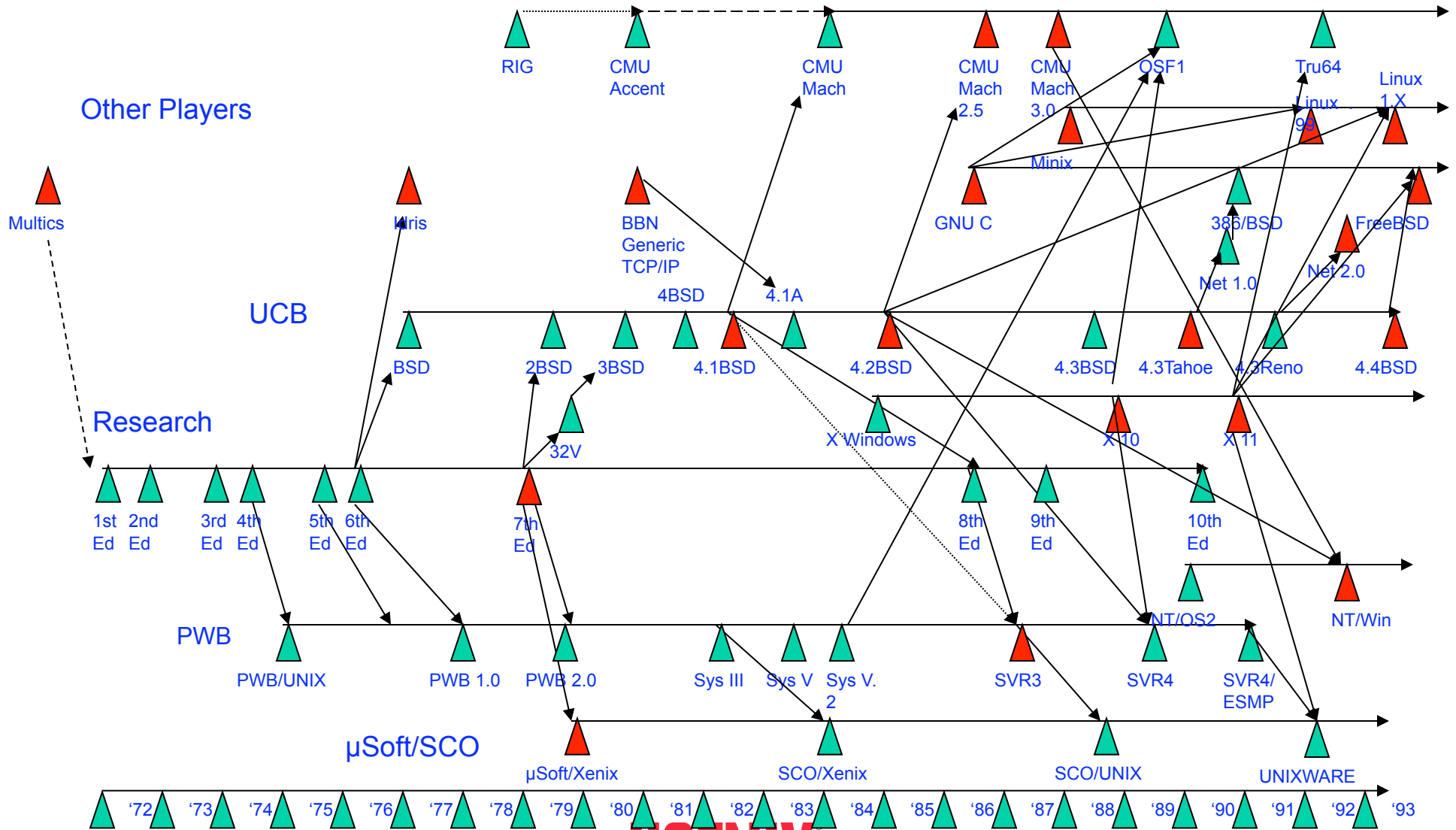


“Linux is just like UNIX, only names have been changed to protect the guilty.”

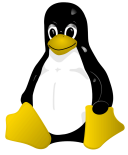
Clem Cole, in an evaluation report on Linux for Locus Computing Corp circa 1991.



A UNIX Family History 1st 25 Yrs



4/14/09

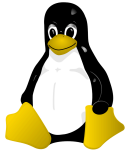


Observation on Linux's Success

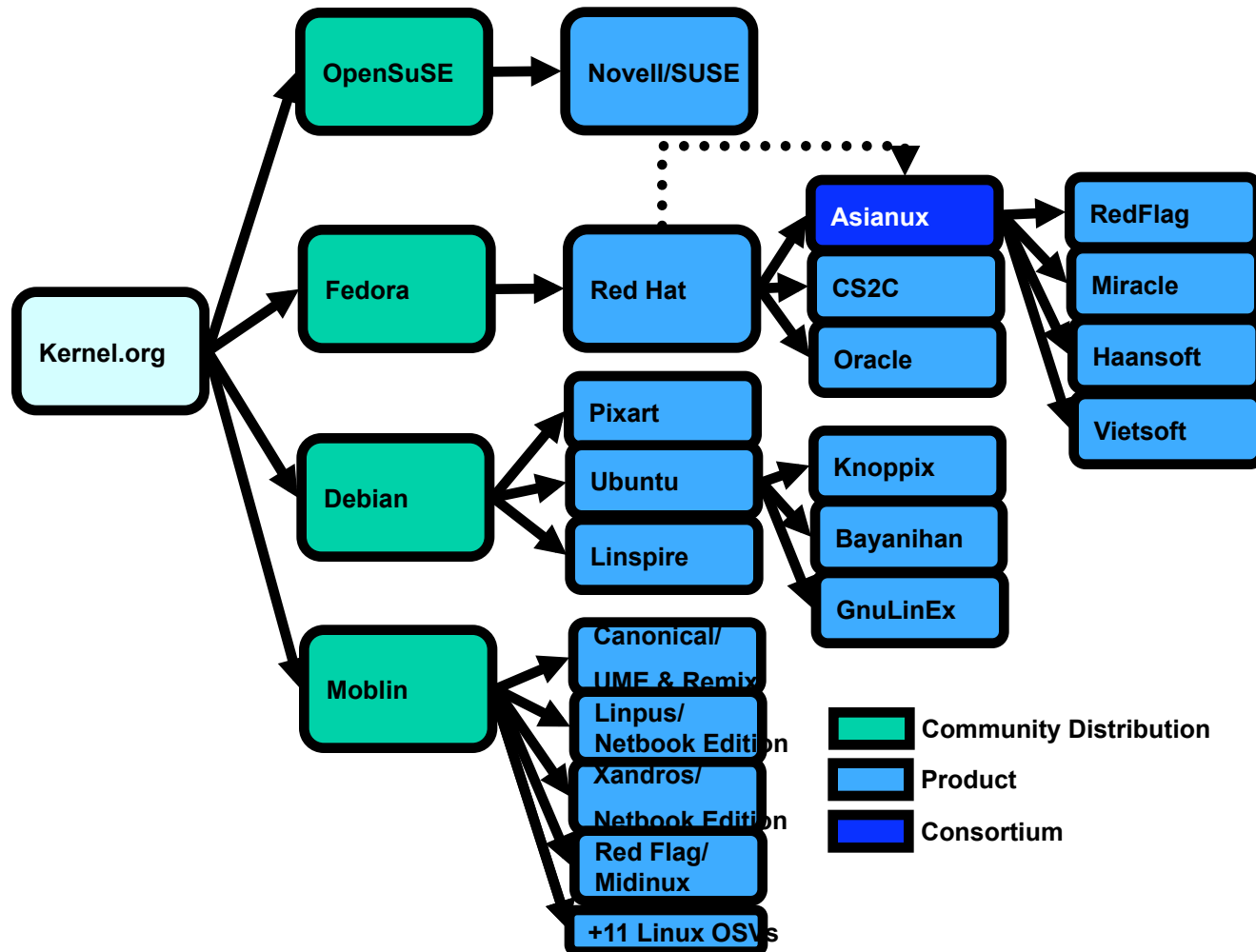


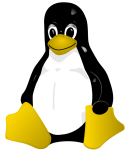
“The reason closed software forks ... Anybody that does do that will see their product quickly die because there's no reason anyone else would want to use it. ”

Eric S Raymond, Business Week, April 27, 1999.



Simplified Linux Family Tree, circa '09



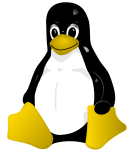


Where is Linux in 2009?



◆ The current main stream Linux Distros

- ❖ RH
- ❖ SuSE
- ❖ Canonical
- ❖ Asianux
- ❖ Moblin



RH



◆ Basic Heritage

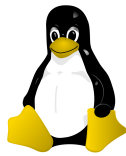
- ❖ kernel.org main line, with System V API and applications from GNU, BSD et al.
- ❖ RH added value add, such as RPM, their installer and packaging

◆ Market Reputation

- ❖ In USA, RH = Linux
 - When ISVs talk about porting to Linux, they mean RHEL
 - RHEL is considered the enterprise Linux
- ❖ Excellent market presence but many find working with them difficult
 - MSFT of the Linux world (tries to be just as controlling)
- ❖ Expensive

◆ Largest/Lasting Innovation

- ❖ Linux can work in the enterprise



SuSE



◆ Basic Heritage

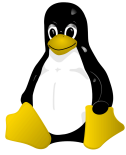
- ❖ kernel.org main line, with System V API and applications from GNU, BSD et al.
- ❖ SuSE added value add, first workable Linux installer and packaging

◆ Market Reputation

- ❖ In EMEA, SuSE = Linux
 - Mostly likely mean SLES
- ❖ OK market presence but great engineering team
 - Avis to RH's Hertz
- ❖ Continues to innovate ahead of RH, and adopts latest technology fastest
- ❖ Willing to sell their soul to Redmond

◆ Largest /Lasting Innovation

- ❖ First and best non-English distro
- ❖ Enterprise wide NDIS/LDAP (much cleaner than Windows)
- ❖ Mail from Novell, that competes favorably with Outlook/Exchange



Ubuntu/Canonical



◆ Basic Heritage

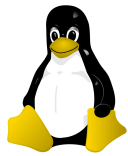
- ❖ kernel.org main line, with System V API and applications from GNU, BSD et al.
- ❖ Debian - GNU/Linux

◆ Market Reputation

- ❖ Workers of the World Unite
 - Will always be free
- ❖ Closest to the GNU Manifesto of any Linux
- ❖ Excellence in engineering an award winning simplified user experience
 - But questionable if they can survive
- ❖ A desktop that can compete with Windows/Home
 - Thank the Lord that Sun continues to invest in OpenOffice
- ❖ Support for >40 languages
- ❖ Unwilling to sell their soul to anyone
- ❖ Some of Kernel Community resent lack of OS or subsystem contributions

◆ Largest /Lasting Innovation

- ❖ Most PC-like install yet
- ❖ Extremely simple update scheme



Asianux



◆ Basic Heritage

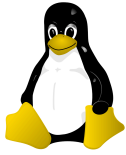
- ❖ RH

◆ Market Reputation

- ❖ Don't enter Asia's market with out it

◆ Largest /Lasting Innovation

- ❖ Extremely good support for Asian character sets
- ❖ Easy to do business, like minded
- ❖ Proved an consortium can work in the Linux market, even after the United Linux failure



Moblin



◆ Basic Heritage

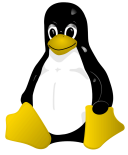
- ❖ kernel.org main line, with System V API and applications from all over
- ❖ Integrating lessons-learned from Puppy, DSL, et al
- ❖ Community project with a complete stack
 - Kernel, driver, OS+UI+Apps, Infrastructure

◆ Market Reputation

- ❖ I've heard of it, but I'm not sure what it is
- ❖ It's not in there
 - Trying to be as light/small as possible
- ❖ Why is Intel behind a distro?
 - It's not – it's a community like Fedora, but Intel is shepherding it since its targeted to MIDS, Netbooks, embedded, automotive etc...

◆ Largest/Lasting Innovation

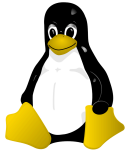
- ❖ Linux really aimed at mobile device
 - Optimized for power, performance and footprint



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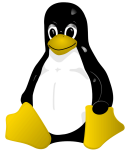


My Observation on Linux's Future



“...the Linux environment will fork (just as traditional Unix did) if it really becomes a commercial success. The reason is because to be a real business, product differentiation is the key to each firm's success!”

Clem Cole – BLU talk Sept 2000 on an e-mail exchange I had earlier with ESR



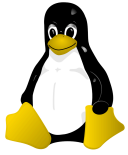
The Great Fork Debate



- ◆ **If Linux is limited to the kernel.org and what Linus and Alan Cox control, ESR's prediction is correct**
 - ❖ We have one basic kernel stream
 - Although the distros are never in sync with it
 - Most commercial SW does not use it

- ◆ **Since Linux really is more than just the kernel, Linux has forked even more than UNIX ever did ... sigh**

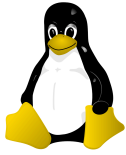
- ◆ **This is the observation that Apple and Microsoft are betting their businesses upon**



A word on Licenses...



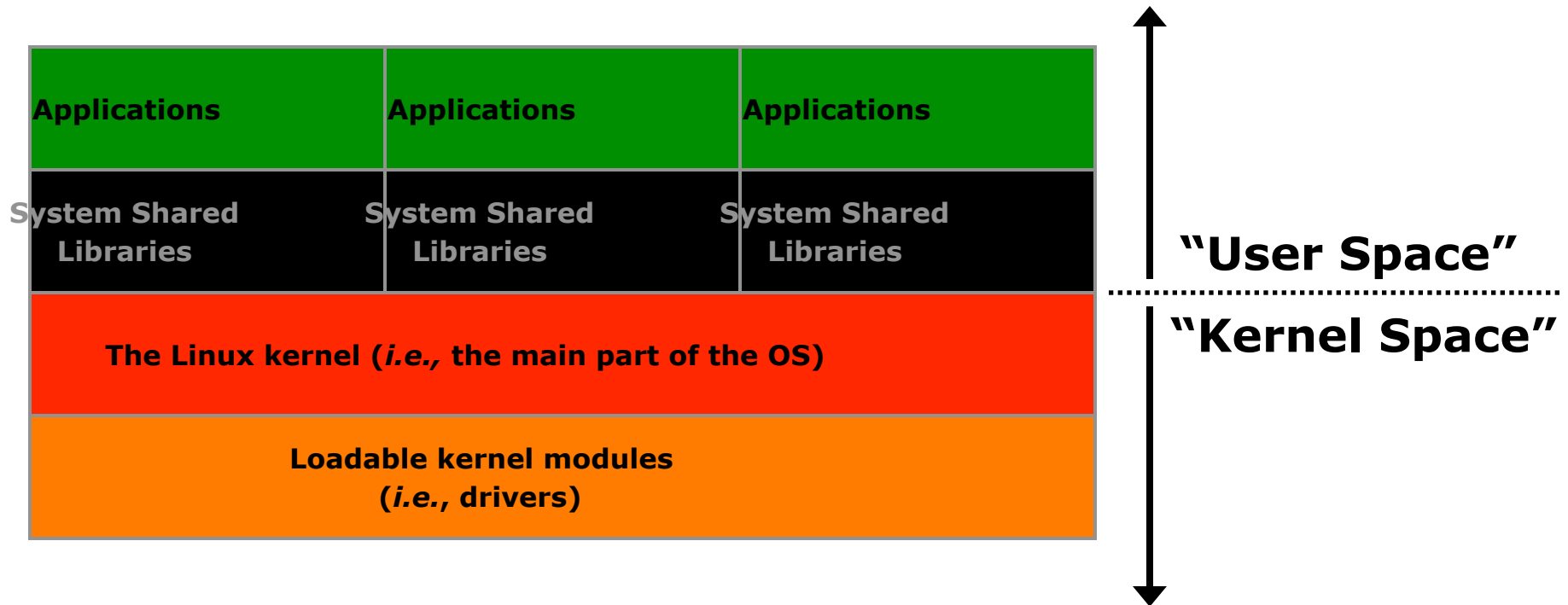
-
- ◆ I Believe, I Believe
 - ◆ OS is great, so should to GPL everything and life will be good.... Read the Source Luke....
 - ◆ (Well maybe not....)



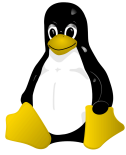
Linux & My Code



Community: "It may be OK to not be open here"



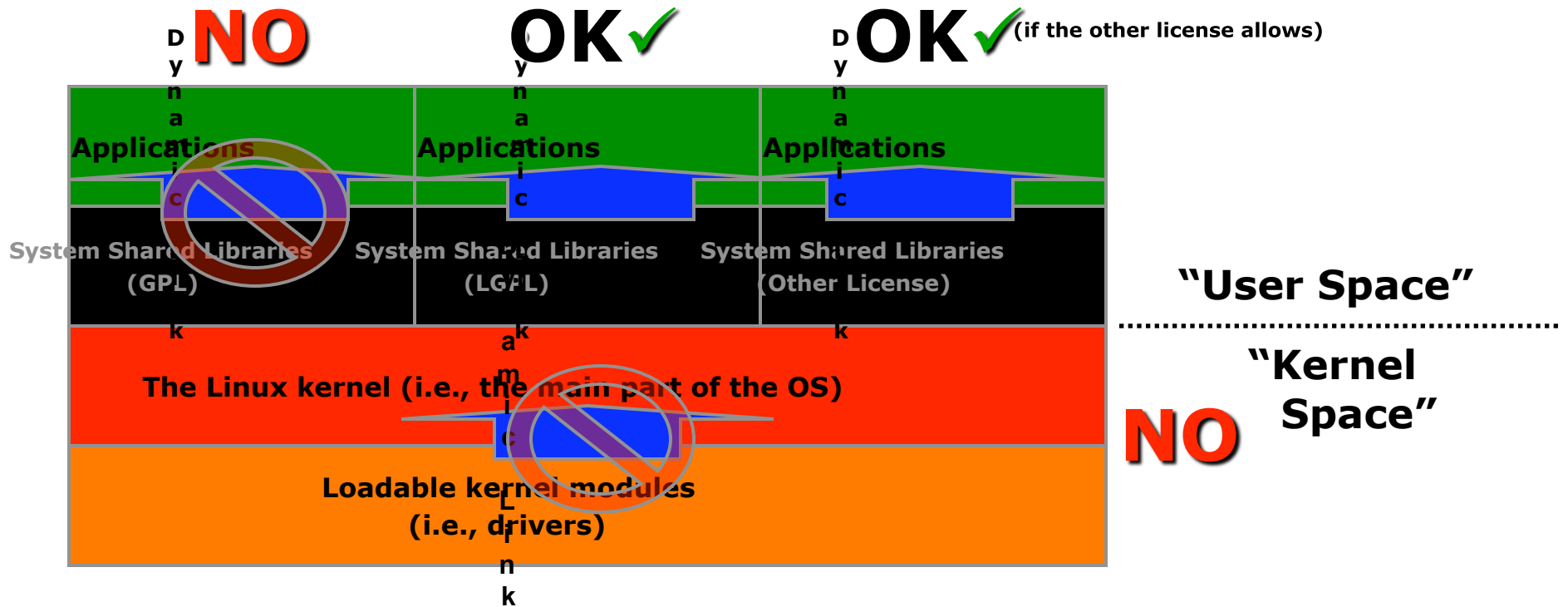
Community: "This really should be open under GPL"

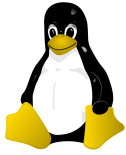


Linux & My Code, cont.



Community DOs and DON'Ts for dynamic linking of non-GPL code



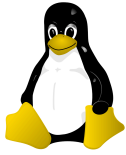


Open Source License Comparison



	GPL	BSD	Apache	EPL, CDDL
Copyleft (sources must be released)	Yes	No	No	Yes
Spreads by linking	Yes	No	No	No
Clear patent license	V2- No V3 - Yes	No	Yes	Yes
"GPL compatible"	V2 & V3 incompatible	Yes	V2 - No V3 - Yes	No

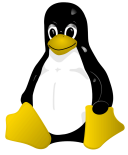
Each license has pluses & minuses: your mileage may vary, check with your own legal advisors



Why Does Open Source Work?



- ◆ Traditional UNIX was Open Source by ESR's definition
- ◆ Linux is working and has displaced UNIX in many areas
- ◆ Why is the “new” model an old one and why does it work?
 - ❖ It's all about how revenue is taken and money is made

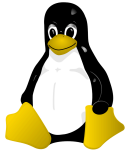


The Seeds of Open Source



“If I sell the software, I go in the front door like any other salesman, if I give it away as my research, I get to walk in the backdoor and see their secrets.”

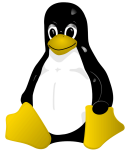
Donald O. Peterson, private communication



Open Source Software



- ◆ **Donald O. Peterson (a.k.a. dop) father of the EE CAD begets “Open Source”**
 - ❖ dop *et al.* are funded by Government and mostly industry, but the university is not in competition with any of them
 - ❖ UCB’s job is push out the State-of-the-Art
- ◆ **In early 1970’s EE already gave away its EE tools: SPICE, SPLICE, MOTIS, etc.**
- ◆ **CS Div. is part of the EE department at UC Berkeley**
- ◆ **The “give away” the open source culture and processes were already in place**
 - ❖ Mag Tapes (DVDs of the day ;-) were distributed
 - ❖ Internet distribution just made this easier



OSS Business Models



- ◆ **OSS vendors sell any of, or a combination, of the following**
 - ❖ Standard ISV revenue streams: Subscription based software, Services, Licensed software and/or runtime licenses
 - Some offer a mix of proprietary and OSS
- ◆ **Each customer that uses code is a lead**
 - ❖ New product technology risks are reduced because people use the product
 - ❖ Web-based lead management becomes the key to sales
- ◆ **Sales theories for OSS software**
 - ❖ ~3X price advantage with similar function advantage over competition
 - ❖ ~4X sales cycle compression due to rapid market share acquisition via downloads
- ◆ **As OSS moves from early adopter to mainstream adoption, revenues increase**
- ◆ **OSVs have moved to applications and on-line marketplaces**
 - ❖ Red Hat announced RHX which hopes to be “Amazon” for OSS

New low cost model = low overhead + scale

How To Spot A Successful Open Source Project

A 9-point checklist before considering using open source.

A thriving community

A handful of lead developers, a large body of contributors, and a substantial--or at least motivated--user group offering ideas.

Disruptive goals

Does something notably better than commercial code. Free isn't enough.

A benevolent dictator

Leader who can inspire and guide developers, asking the right questions and letting only the right code in.

Transparency

Decisions are made openly, with threads of discussion, active mailing list, and negative and positive comments aired.

Civility

Strong forums police against personal attacks or niggling issues, focus on big goals.

Documentation

What good's a project that can't be implemented by those outside its development?

Employed developers

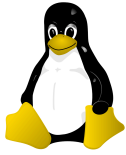
The key developers need to work on it full time.

A clear license

Some are very business friendly, others clear as mud.

Commercial support

Companies need more than e-mail support from volunteers. Is there a solid company employing people you can call?

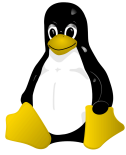


A Word on Programmers



“Good programmers write good programs. Great programmers start and build upon other great programmer’s work.”

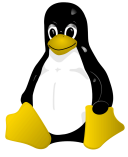
Unknown origin, often attributed to Fred Brooks.



Conclusion



- ◆ UNIX is alive today
- ◆ UNIX still looks a lot like it did under the covers
- ◆ Lots of new faces and names
- ◆ The fight is not over, so let's work together

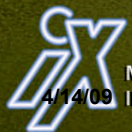


Questions?



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