



Session 5500

Overview of the Linux Operating System

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What is Linux?



- Free Unix-like operating system written by Linus Torvalds, beginning in 1991.

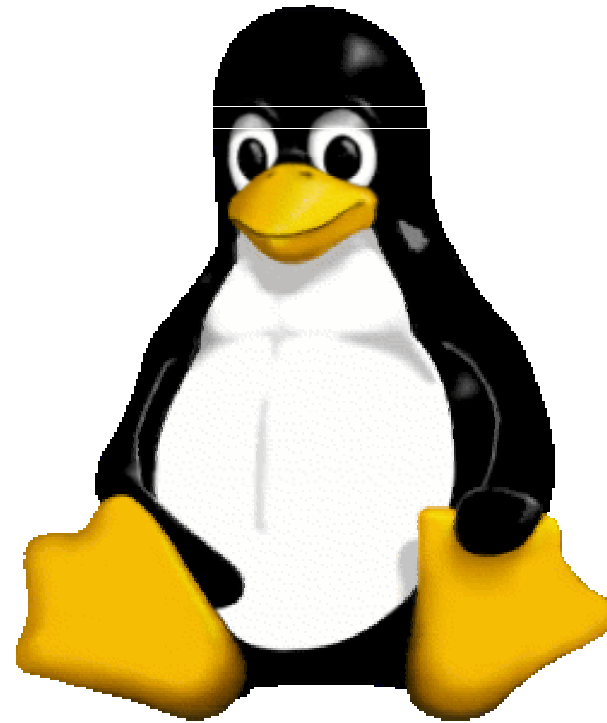


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What else is Linux?

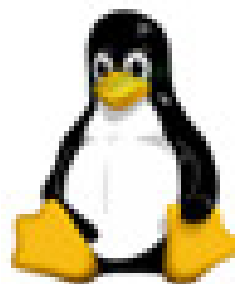


- Preferred platform of a horde of rabid Open Source developers, with a cuddly mascot named Tux.



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What else is Linux?



Powered by
LINUX

- Focus of \$1B initiative from IBM
 - Think of this as the 1964 System/360 push, only at the OS rather than the hardware level

Did you say “Free?”



- Two kinds of freedom are meant
- In Linux Culture, usually referred to as:
 - Free Speech
 - Free Beer
- What do these mean, and what’s the difference?

Free Speech



- Linux kernel is covered under the GNU Public License (GPL)
 - Must make source available for GPLed programs at no or nominal (media) cost
 - If you make changes and distribute the changed program, you must make those changes available too
 - Programs that contain GPL code must be available under GPL's terms

GPL and Open Source



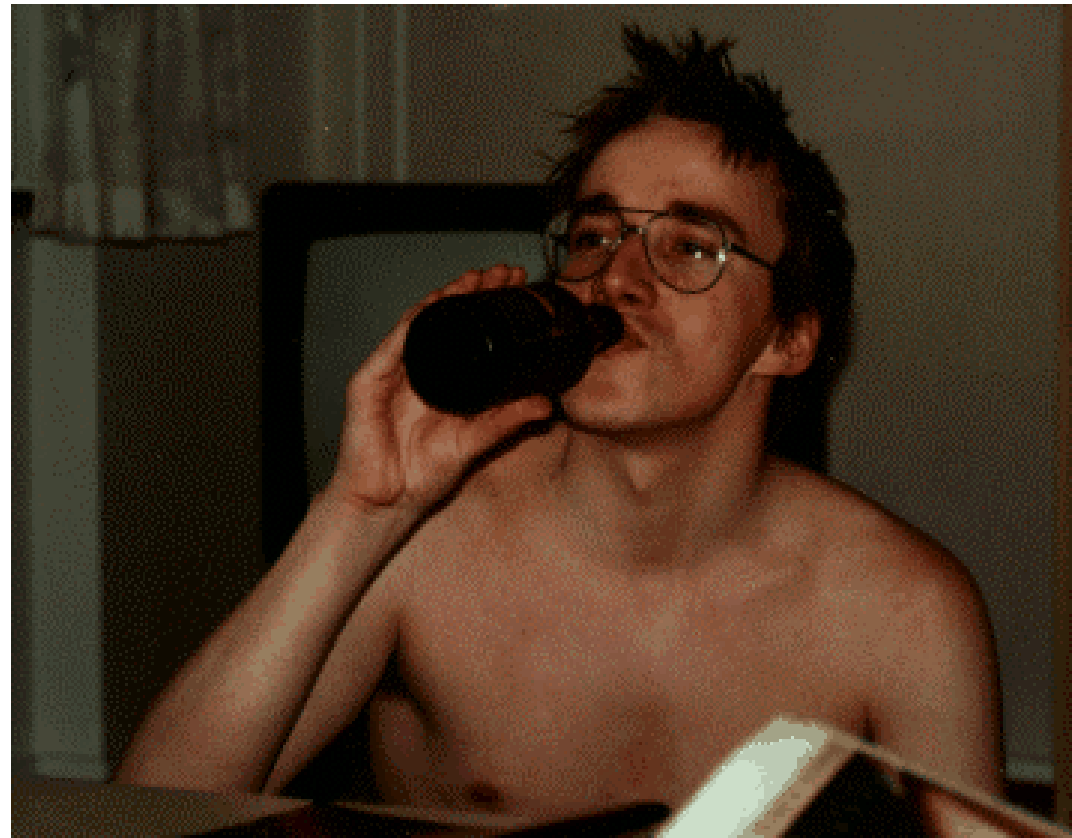
- GNU Public License is probably the most common Open Source license, but not the only one
- Some others are less “viral”
- BSD, Artistic License, QPL
- IBM Public License
- GPL vs. LGPL
 - L (“Lesser”) GPL lets you link against it even in a closed-source project



Free Beer



- Zero cost
- Often a more pragmatic consideration
- Not as political as “Free Speech,” but not without advantages



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What's “Unix-like” in Linux?



- Conforms to Unix APIs
 - In fact, offers POSIX.1 compliance
- Why is it not Unix, then?
 - Unix TM is a trademark of AT&T Bell Labs
 - Only SysV-derived systems are “really” Unix in a technical, genealogical sense
- Effectively, it *is* Unix

ISV support



- All significant Open Source infrastructure runs on Linux (most architectures just need recompilation)
- Most major server apps have been ported, at least to Linux/Intel
 - Oracle, SAP, Websphere, etc., etc.
 - The obvious exception is “all Microsoft products”
- Linux on other platforms not as well supported

“Lack of Desktop Support”



- There's very little you can do under Windows that you *can't* under Linux
- But would you want to?
- Windows is definitely a more comfortable desktop for most users
- Linux can certainly function as a desktop
 - GNOME vs. KDE
 - Star Office, Applix, GNUCash, etc.

Is Linux a fad?



- There's obviously a strong market need for a freely-licensed Unix-like system of some kind, so in that sense, no
- But why Linux rather than OpenBSD or NetBSD?
 - Mindshare: Linux has a larger, more rabid development community
 - Linux got a leg up from BSD's legal troubles in the early '90s

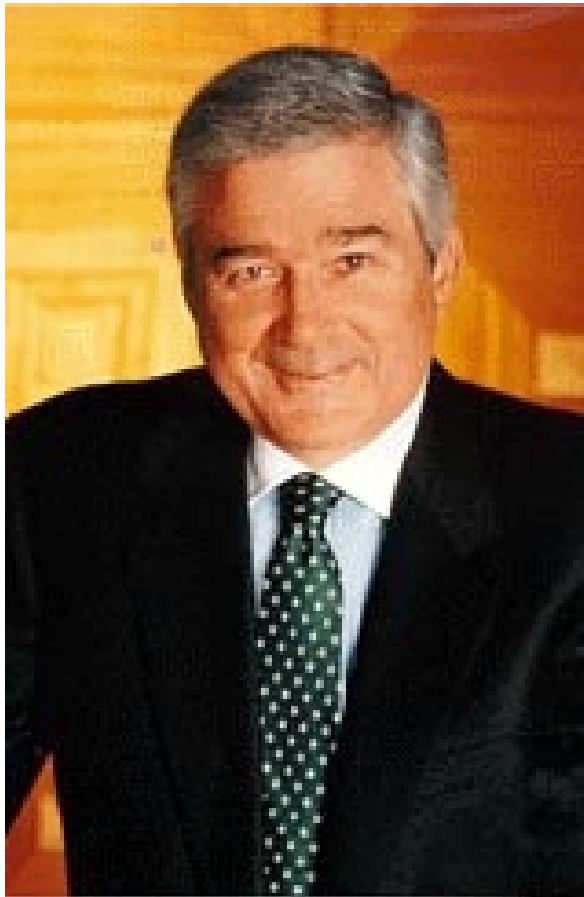
Is Linux hype?



- The Gorilla Has Spoken: \$1B is a lot of money
- Even among commercial Unix vendors (SGI, HP, Sun) it's becoming supported
 - Linux represents a reunification of Unix, not under any single vendor's control
 - Distribution differences are not the big deal they're made out to be

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Culture Clash?



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Technology - Connections - Results
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Question of Motivation



- Why do programmers write code?
- Traditional commercial answer:
 - Money
- Open source answer:
 - Ego
- Enough coders are more motivated by ego than money that Open Source will remain strong

Commercial vs. Open Source

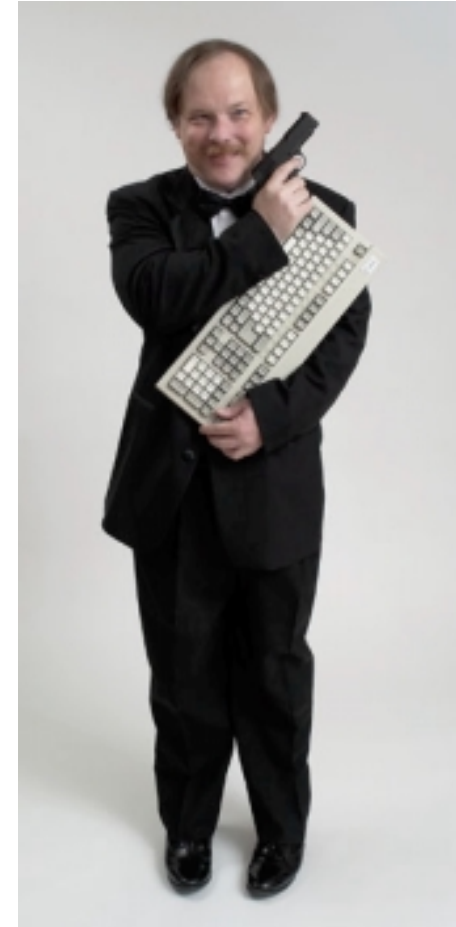


- Commercial software vendors like revenue from their products
- Open Source means letting your competitors have your source code
- Mundie, Ballmer, Microsoft: Open Source is anti-capitalist and un-American! A cancer on the body politic!
 - Open Source is not just Stallman and the GPL (much as he'd like it to be); even if it were....

Commercial vs. Open Source



- Eric S. Raymond: Open Source is a more efficient, more productive, more profitable business model. It is, in fact, the epitome of the free market.
 - Raymond is as libertarian as Stallman is socialist
- Is there a necessary culture clash here?



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Culture Clash?



- Richard Stallman clashes with everyone
- Stallman aside, Open Source does not fundamentally conflict with the concept of intellectual property
- Using Open Source tools can dramatically reduce your cost of ownership and operations, even if you want to develop proprietary software
 - But you may be excluded from using some libraries and tools that would facilitate development

Linux and Open Source



- The kernel must stay Open Source
- No requirement for applications to be Open Source
 - Unless they're developed with Open Source components under a GPL-like license
- Loadable device drivers can be OCO
 - But creates ill-will and maintenance nightmares (viz. LCS drivers)

Making Money in Open Source



- Move to a services model
 - Don't sell your software, sell support
- IBM has been a service company since its inception
- Model that Linux distributors (Red Hat, SuSE, TurboLinux, etc.) use
- Alternatively, use Open Source product as a loss leader for a more polished full version
 - Requires BSDish, rather than GPLish, license

Making Money with Linux



- Unless you're modifying the kernel, you do not need to go Open Source
- The application business model does not change
 - You can still charge for apps
- You get cross-platform compatibility very cheaply
 - Linux at the application API level is identical across platforms (modulo word sizes and endianness)
- Development tools are mostly free

What can Linux do for me?



- What it can do for IBM: give you a common cross-platform API to write to
 - Potentially greatly expand your target market
- Allow to you hire developers with more common (therefore less expensive) skill sets
- Provide a lower-cost, easily-maintained base for your infrastructure
- Cut development and maintenance costs

IBM's Linux Strategy



- Put Linux on *everything*
 - Low-end: embedded systems
 - High-end: zSeries
 - Everything in between
- Single API for user-level (application) code, across platforms
- IBM doesn't need to foot OS development bill, gains portability



IBM and Linux



- xSeries: Linux/Intel
 - Robust, stable, well supported
- iSeries: Linux/PPC
 - LPAR-enabled, still in its infancy
- pSeries:
 - Roll neat features of AIX into Linux; AIX 5L points to future convergence.
- zSeries

Linux for System/390 and zSeries



- Linux for System/390 first announced Dec. 18, 1999
- 31-bit and 64-bit flavors
- SuSE and TurboLinux; Red Hat and Debian in beta
- Thinking Objects GMBH makes Red Hat-derived 64-bit distribution



Why Linux for zSeries?



- Ease of supporting/deploying infrastructure
 - Apache is ubiquitous, well-understood, and has a huge module codebase
 - MTAs: Sendmail, Postfix, qmail, plus procmail for spam filtering
 - ISC's named (Bind 4.x, 8.x, 9.x)
 - INN
- All simply recompile on Linux for zSeries

Why Linux for zSeries?



- Manage services under Linux for zSeries just as you do under any other Linux or Unix; leverage common development and admin skills
- However: it's an expensive way to run a single Linux image
 - Useful in LPAR as web server/MTA front end
 - However, z/VM is the real value-add

Resources



- First and foremost: the LINUX-390 mailing list:
 - linux-390@vm.marist.edu
- <http://penguinvm.princeton.edu>
- <http://penguinvm4.princeton.edu> (64-bit starter system)
- <http://www.ibm.com/linux>
- <http://oss.software.ibm.com/developerworks/opensource/linux390/>

Linux under VM



- Server consolidation
 - 97,943 concurrent instances
 - Several thousand are actually practical
 - LCDS
 - <http://www-1.ibm.com/servers/eserver/zseries/os/linux/lcds/index.html>

Linux under z/VM or VM/ESA



- You get a (virtual) hardware debugger for free
- Offload tasks that are easier under Linux to virtual Linux guests, one per machine
 - Spam filtering
 - Routing
 - Packet firewall

Consolidation with VM



- Dramatic TCO reduction
 - Reduced footprint
 - Reduced staffing costs
 - Reduced power requirements
 - Reduced HVAC requirements
- Go see David Boyes's talk, Session 5538/9202, Wednesday at 4:30

Should I run *Linux* on my System/390?



- To invoke Bill Bitner: “It depends.”
- Are there functions that would be easier to do under Linux?
 - Web hosting
 - Mail filtering
 - Mail delivery
- Are there infrastructure functions Unix machines are performing?

Should I run Linux on my *System/390*?



- “It depends.”
- Are you running an appropriate workload?
 - High I/O, low CPU consumption
 - Usenet news
 - Mail delivery
 - DNS

Should I run Linux native?



- No.

C'mon, really: should I?



- Not unless you have an absolutely idle S/390 sitting around
 - Not a bad use of an old P/390 or IS, I guess
 - In those circumstances, you'd probably be better off with Hercules
 - A new Intel box running Hercules is cheaper and higher-performance than a used P/390
 - Go see Jay Maynard's session 2880, also Wednesday at 4:30.

Should I run Linux via LPAR?



- Probably not.
 - This is still a very expensive way to run Linux; the only way it makes sense is if you're using Linux to front-end your OS/390 (or z/OS) functions.
 - For instance, a web interface to an existing DB/2 database
 - Or if you want to play with Linux, and have a small test LPAR to spare

Well, how about VIF?



- With recent changes to VM licensing, there's really no point in VIF; just get VM instead
- Unless, of course, you're in some place that spent oodles of money getting off VM, in which case, use VIF and sooner or later end up on VM again
 - VIF does not give you instrumentation and performance knobs that VM does
 - Eventually, you will need them

So, I should run under z/VM (or VM/ESA)?



- Yes.
- You get all the benefits of Linux *plus* all the benefits z/VM gives you:
 - Huge numbers of guest machines
 - Easy hardware-level debugging
 - Fine-grained resource management and instrumentation

Drawbacks of Linux for zSeries



- Not much ISV application support yet
 - Getting better, slowly
 - Write your ISVs! Let them know!
- Not cost-effective for CPU-intensive jobs
- No direct channel-attached printer support
 - Use lpr and lpd under z/OS or z/VM
 - Come see Session 5540, Wed. 1:30

How do I convince my boss?



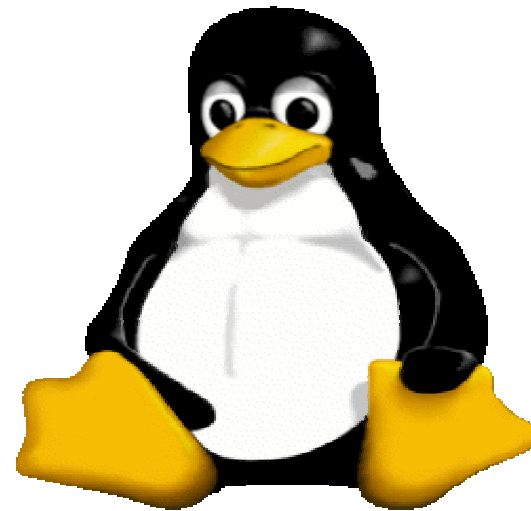
- Software licensing costs
- If consolidation is an option, TCO
- Size of development community
 - Speed to fix issues with code
 - Auditable fixes
- Future direction for IBM and other Unix vendors
- <http://www.sinenomine.net/downloads/vmvse/>

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The real reason for Linux/VM



- Teddy bears and penguins look great together

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