

APPLE MAC OS X

The story of Apple's *nix choice in platform and how it relates/compares to Linux

APPLE MAC OS HISTORY

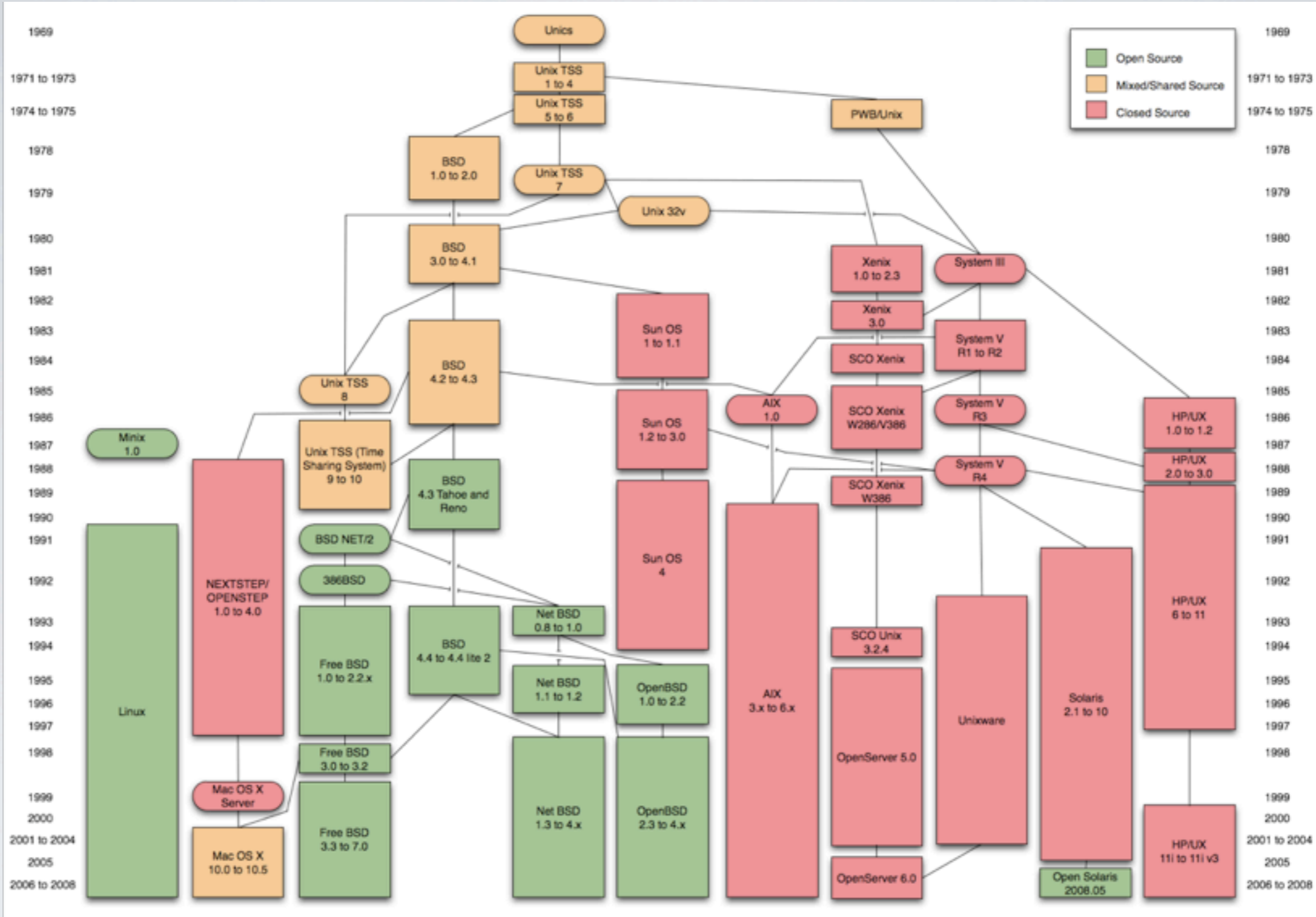
- Star Trek (1992 - 1993)
 - Apple & Novell work to port Mac OS to x86
- Raptor
 - Axed try at a microkernel
- NuKernel (early '90s)
 - Respawned several times -- an attempt to create a more modern kernel.
 - Built on concepts from Mach 3.0
- TalOS (1990)
 - Apple & IBM start Taligent. Ended up being more of an object-oriented framework than an OS.

APPLE MAC OS HISTORY

- Copland (1994)
 - Planned to be a modern OS 8 to compete with Windows. Did not deliver.
- Gershwin
 - Finish copeland features. Never worked on.
- BeOS
 - Apple nearly purchased Be after considering NT and Solaris kernels to build a new operating system on.
- up NeXT...

NEXT

- Started by Steve Jobs in 1985, when he was forced out of Apple.
- Goal was to create the perfect research computer.
- Framework named NEXTSTEP
- Apple partnered with Sun to create OPENSTEP platform for everyone to use.
- Kernel based on Mach



UNIX HISTORY

MACH HISTORY

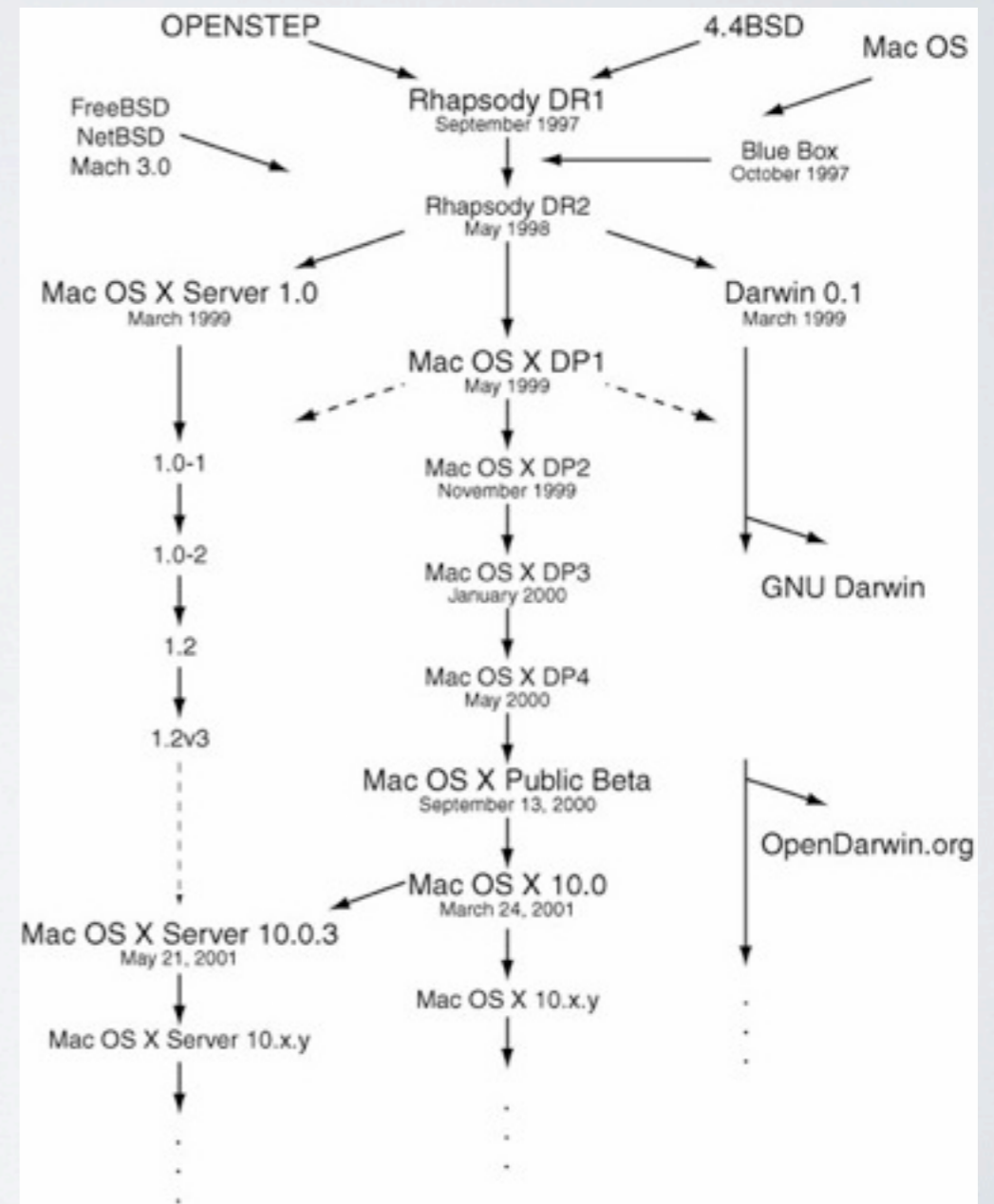
- Rochester's Intelligent Gateway
 - Started in 1975
 - Kernel build on IPC through "ports"
 - Suffered from: small 2KB messages, no virtual memory, network problems, no port isolation, no memory protection
- Accent, 1979
 - Many RIG engineers moved to Carnegie Mellon.
 - 4GB per process virtual memory
 - Copy-on-write memory mapping to allow for larger messages

MACH

- Successor to Accent at CMU, Started in 1984.
- Intended to be UNIX compatible.
- The RISC approach to operating system design.
- Full support for multiprocessing.
- More of a VM than a Kernel.
 - Abstract away hardware, like: memory, processors, and networking.
 - Intentions were that all other modern kernels would be built to run atop Mach.

OS X

- Apple worked on MkLinux and MachTen after deciding Mach was the future.
- Apple purchased NeXT in 1996. This brought Steve Jobs back to lead Apple into the future.
- Apple worked to extend the work done by NeXT. This would become OS X in the future.
- OS X is basically a BSD kernel running on top of a Mach VM.



OS X VS LINUX

- Apple Mac OS X
 - Hybrid Kernel
 - Better at graphics
 - Controlled over hardware. Knowing potential hardware means it's going to work.
- Linux
 - Monolithic Kernel
 - Better with memory
 - PC Hardware -- not standard. Nature of OSS means most hardware is supported.

PROGRAMMING

- Apple Mac OS X
 - IDE: xCode
 - Implements standard Unix interfaces like POSIX
 - Uses gcc with Apple modifications.
 - Binary Format: Mach-O
- Linux
 - IDE: Eclipse, vi, emacs, KDevelop, Anjuta, ...
 - Implements Unix interfaces like POSIX but is uncertified.
 - Binary Format: ELF

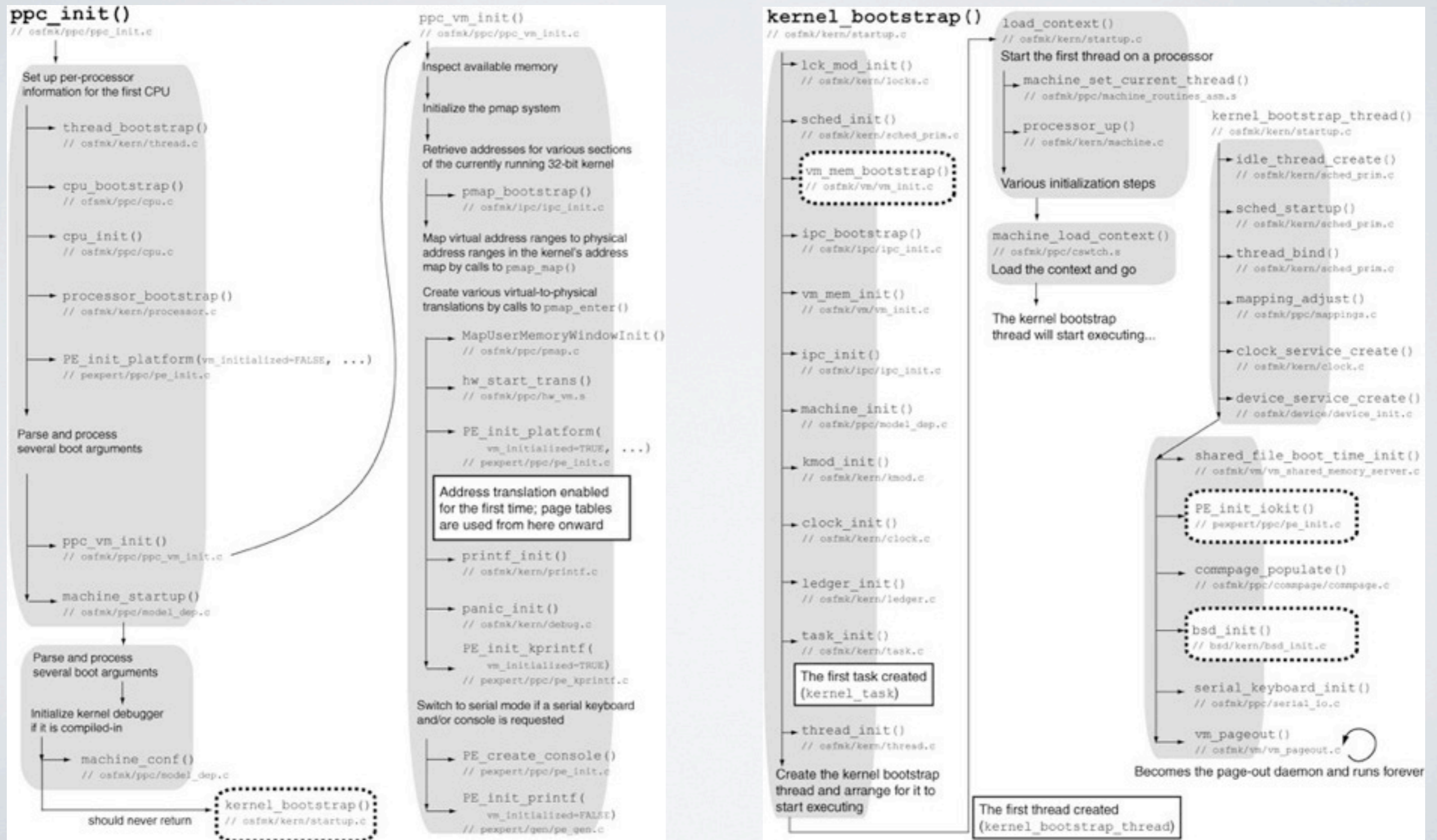
MACH-O

- Original binary and library format for Mach.
- Not used on GNU Hurd
- Only current major implementation is OS X.
- OS X links all binaries against `/usr/lib/libSystem.dylib` which contains `libc`, `libdbm`, `libdl`, `libinfo`, `netinfo`, `libkvm`, `libm`, `libpol`, `libpthread`, `librpcsvc`, `libdyidapis`, `libkeymgr`, `liblaunch`, `libmacho`, `libnotify`, `libstreams`, `libunc`.
- Mach-O allows for multiple binary payloads joined into a “multi-architecture binary”.
- The system inherits static library conventions from BSD, with the library stored in a `.a` file, and can use `.so`-style dynamically-linked libraries (with the `.dylib` suffix instead). Most libraries in Mac OS X, however, consist of “frameworks”, placed inside special directories called “bundles”, which wrap the library's required files and metadata. -- Wikipedia

FAT / UNIVERSAL BINARIES

- “Fat Binary” was used for the 68k to PPC transition
- Apple calls dual-architecture binaries for OS X “Universal Binaries”
 - Mach-O facilitates mixed binary payloads (PPC, PPC 64, x86, x86_64, ...)
- Apple not afraid to abandon technology in order to advance their product. (Windows 3.1 API anyone?)

MAC OS X BOOT PROCESS



LAUNCHD

- Master bootstrap daemon as of 10.4
- Manages system and user daemons
- One tool to replace init, cron, and inetd
- Launches daemons based on conditional rules
- Runs BSD style `/etc/rc` as well as `/System/Library/LaunchDaemons/`, `/Library/LaunchDaemons/`, `/System/Library/LaunchAgents/`, `/Library/LaunchAgents/`, and `~/Library/LaunchAgents/`
- Manages daemon configuration through `.plist` files

UNIX



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UNIX 03

Registration No: P1190

Mac OS X Version 10.5 Leopard
on Intel-based Macintosh computers

Date of first issue: 18 May 2007

Next renewal date: 18 May 2008

License No: L3064

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Allen Bram

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- OS X has BSD origins.
- This provided a Unix type environment.
- Apple pushes further into server market by seeking Unix certification for OS X 10.5 Leopard.

APPLE OPEN-SOURCE

- OpenDarwin
 - Founded in 2002 by Apple and ended on July 25, 2006
 - Continued in PureDarwin, started 2007
- WebKit (Safari)
 - Basically a fork of KHTML and KJS
 - First included in OS X 10.3
- Current contributors: Apple, Nokia, KDE project, Google, and others
- First browser to pass both acid2 and acid3 tests
- Apple releases the source of a lot of its operating system.
<http://opensource.apple.com/>
- Apple uses many OSS projects: amvisd-net, Ant, apache2, apr, apr-util, autoconf, automake, awk, bash... 235 more you can find the full list at
<http://www.apple.com/opensource/>

SHARED PROGRAMS

- Much of OS X is built on top of FOSS software (Apache, Samba, gcc, ...)
- Apple provides X11 server.
 - Gimp and others run under Apple's X11 on Mac OS X
- MacPorts
- Fink

MACPORTS

- The project formerly known as DarwinPorts.
- Repository of UNIX software ported to run on Mac OS X
- Started by Apple as part of the OpenDarwin project.
- Similar to the BSD ports system.
- Hosted by Apple as part for the Mac OS Forge initiative.
- Method of installation:
 - `port install packagename`
 - grab a snack and wait for compilation. **mmm**
 - <http://www.macports.org/>

FINK

- “Fink is a project that wants to bring the full world of UNIX Open Source software to Darwin and Mac OS X.” -- Fink website
- Started December 2000
- Fink is primarily a binary repository through an APT type system.
- Two interfaces for installing packages:
 - `fink install packagename`
 - `apt-get install packagename`
- <http://www.finkproject.org>