

Mac Operating System

7.1 Introduction **Mac OS** is a series of graphical user interface-based operating systems developed by Apple Inc. for their Macintosh line of computer systems.

The original operating system was first introduced in 1984 as being integral to the original Macintosh, and referred to as the "System". Referred to by its major revision starting with "System 6 and "System 7", Apple rebranded version 7.6 as "Mac OS" as part of their Macintosh clone program in 1996. The Macintosh, specifically its system software, is credited with having popularized the early graphical user interface concept.

Macintosh operating systems have been released in two major series. Up to major revision 9, from 1984 to 2000, it is historically known as Classic Mac OS. Major revision 10, from 2001 to present, is branded OS X (originally referred to as Mac OS X). Major revisions to the Macintosh OS are now issued as point revisions, such that, for example, 10.2 is substantially different from 10.5. Both series share a general interface design, and there has been some overlap with shared application frameworks and virtual machine technology for compatibility; but the two series also have deeply different architectures

OS X, introduced as **Mac OS X** in 2001 and renamed **OS X** in 2012, is the latest version of Apple's operating system. Although it is officially designated as simply "version 10" of the Mac OS, it has a history largely independent of the earlier Mac OS releases.

The operating system is the successor to Mac OS 9 and the "classic" Mac OS. It is however a Unix operating system, based on the NeXTSTEP operating system and the XNU kernel which Apple acquired after purchasing NeXT Computer—with its CEO Steve Jobs returning to Apple at that time. OS X also makes use of the BSD code.^[9] There have been ten significant releases of OS X, the most recent being OS X 10.9, referred to as Mavericks. Prior to 10.9 came 10.8 ("Mountain Lion"), 10.7 ("Lion"), 10.6 ("Snow Leopard"), 10.5 ("Leopard"), 10.4 ("Tiger"), 10.3 ("Panther"), 10.2 ("Jaguar"), 10.1 ("Puma"), and 10.0 ("Cheetah").

OS X also had six significant releases as **OS X Server**. The first of these, Mac OS X Server 1.0, was released in beta before the client version in 1999. The server versions are architecturally identical to the client versions, with the differentiation found in their inclusion of tools for server management, including tools for managing OS X-based workgroups, mail servers, and web servers, amongst other tools. As of the name change to OS X, OS X Server is no longer sold as a separate

operating system product. The server tools could then be added to the singular OS X product, giving the same functionality.

OS X Server is available as an operating system to-order on Mac Mini and Mac Pro computers as a part of a server package. Unlike the client version, OS X Server can be run in a virtual machine using emulation software such as Parallels Desktop and VMware Fusion.

OS X is also the basis for iOS, (previously iPhone OS) used on Apple's iPhone, iPod Touch, iPad, and Apple TV.

7.2 Star Trek

Star Trek (as in "to boldly go where no Mac has gone before") was a relatively unknown secret prototype Apple started work on in 1992, whose goal was to create a version of the classic Mac OS that would run on Intel-compatible x86 personal computers. The project was instigated by Novell, Inc., who were looking to integrate their DR-DOS with the Mac OS UI as a retort to Microsoft's Windows 3.0. The Apple/Novell team (four from Apple, four from Novell) was able to get the Macintosh Finder and some basic applications, like QuickTime, running smoothly on the x86 architecture. Some of the code from this effort was reused later when porting the Mac OS to PowerPC.

The project was canceled only one year later in early 1993. There are two theories for the project's short life: the first is that Apple's board canceled further development upon realizing that going with Star Trek would mean an entirely new business model and one that would likely see a notable drop in Apple's lucrative hardware sales; and the second is that an x86 Mac OS was not commercially viable in the early nineties because Microsoft's contracts for Windows 3.1 forced PC manufacturers to pay a royalty to Microsoft for every computer shipped, regardless of what operating system it contained. Thus, widespread support for a new operating system with relatively few applications available was unlikely.

A further complication was that Star Trek was designed to be source-level compatible, not binary compatible, with the Mac OS. Mac applications would therefore have to be recompiled or rewritten by their developers to run on the x86 architecture, and there was much skepticism as to exactly how much work this would entail.

Fifteen years after Star Trek, support for the x86 architecture was officially included in Mac OS, and then Apple transitioned all desktop computers to the x86

architecture. This was not the direct result of earlier Project Star Trek efforts. The Darwin underpinning used for OS X 10.0 and later included support for the x86 architecture. The remaining non-Darwin portion of OS X (based on OPENSTEP, which ran on Intel processors) was released officially with the introduction of x86 Macintosh computers. In fact, Steve Jobs said that Mac OS X was "leading a secret double life" during the introduction of the x86 transition.

68000 emulation

Although the Star Trek software was never released, third-party Macintosh emulators, such as vMac, Basilisk II, and Executor, eventually made it possible to run the classic Mac OS on Intel-based PCs. These emulators were restricted to emulating the 68000 series of processors, and as such most couldn't run versions of the Mac OS that succeeded 8.1, which required PowerPC processors. Most also required a Mac ROM image or a hardware interface supporting a real Mac ROM chip; those requiring an image are of dubious legal standing as the ROM image may infringe on Apple's intellectual property.

A notable exception was the Executor commercial software product from Abacus Research & Development, the only product that used 100% reverse engineered code without the use of Apple technology. It ran extremely quickly but never achieved more than a minor subset of functionality. Few programs were completely compatible and many were extremely crash-prone if they ran at all. Executor filled a niche market for porting 68000 classic Mac applications to x86 platforms; development ceased in 2002 and the source code was released by the author in late 2008.^[12]

Emulators using Mac ROM images offered near complete Mac OS compatibility and later versions offered excellent performance as modern x86 processor performance increased exponentially.

Most of the Mac user base had already started moving to the PowerPC platform that offered backward compatibility on 8.xx & 9.xx operating systems along with faster PowerPC software support. This helped ease the transition to PowerPC-only applications while prematurely obsolescing 68000 emulators and the Classic-only applications they supported well before these emulators were refined enough to compete with a real Mac.

PowerPC emulation

At the time of 68000-emulator development, PowerPC support was difficult to justify not only due to the emulation code itself but also the anticipated wide performance overhead of an emulated PowerPC architecture vs. a real PowerPC based Mac. This would later prove correct with the start of the PearPC and project even years later despite the availability of 7th & 8th generation x86 processors employing similar architecture paradigms present in the PowerPC.^[citation needed] Many application developers were also creating and releasing both 68000 Classic and PowerPC versions concurrently helping to negate the need for PowerPC emulation. PowerPC Mac users who could technically run either obviously chose the faster PowerPC applications. Soon Apple was no longer selling 68000-based Macs and the existing installed base started to quickly evaporate. Despite the eventual excellent 68000-emulation technology available they proved never to be even a minor threat to real Macs due to their late arrival and immaturity even several years after the release of much more compelling PowerPC based Macs.

The PearPC emulator is capable of emulating the PowerPC processors required by newer versions of the Mac OS (like OS X). Unfortunately, it is still in the early stages and, like many emulators, tends to run much slower than a native operating system would.

During the transition from PowerPC to Intel processors, Apple realized the need to incorporate a PowerPC emulator into OS X in order to protect its customers' investments in software designed to run on the PowerPC. Apple's solution is an emulator called Rosetta. Prior to the announcement of Rosetta, industry observers assumed that any PowerPC emulator running on an x86 processor would suffer a heavy performance penalty (e.g., PearPC's slow performance). Rosetta's relatively minor performance penalty therefore took many by surprise.

Another PowerPC emulator is SheepShaver, which has been around since 1998 for BeOS on the PowerPC platform, but in 2002 was open sourced with porting efforts beginning to get it to run on other platforms. Originally it was not designed for use on x86 platforms and required an actual PowerPC processor present in the machine it was running on similar to a hypervisor. Although it provides PowerPC processor support, it can only run up to Mac OS 9.0.4 because it does not emulate a memory management unit.

Other examples include ShapeShifter (by the same programmer that conceived SheepShaver), Fusion and iFusion. The latter ran classic Mac OS with a PowerPC "coprocessor" accelerator card. Using this method has been said to equal or better the speed of a Macintosh with the same processor, especially with respect to the

m68k series due to real Macs running in MMU trap mode, hampering performance.

Macintosh clones

Several computer manufacturers over the years have made Macintosh clones capable of running Mac OS, notably Power Computing, UMAX and Motorola. These machines normally ran various versions of classic Mac OS. Steve Jobs ended the clone-licensing program after returning to Apple in 1997.

In 2008, a manufacturing company in Miami, FL called Psystar Corporation announced a \$499 clone that comes with a barebones system that can run Mac OS X 10.5 Leopard. Threatened with legal battles, Psystar originally called the system OpenMac and have since changed it to Open Computer. Apple filed a lawsuit with the company and asked that Psystar be ordered to stop producing clone systems, recall every system sold, and pay monetary damages.^[13] Eventually, Apple prevailed in court, and the Open Computer's production was ceased. Psystar itself appears to be defunct now, as the company's website is gone.

A/UX

In 1988, Apple released its first UNIX-based OS, A/UX, which was a UNIX operating system with the Mac OS look and feel. It was not very competitive for its time, due in part to the crowded UNIX market and Macintosh hardware lacking high-end design features present on workstation-class computers. A/UX had most of its success in sales to the U.S. government, where POSIX compliance was a requirement that Mac OS could not meet.

MAE

The Macintosh Application Environment (MAE) was a software package introduced by Apple Computer in 1994 which allowed users of certain Unix-based computer workstations to run Apple Macintosh application software.

MAE used the X Window System to emulate a Macintosh Finder-style graphical user interface. The last version, MAE 3.0, was compatible with System 7.5.3.

MAE was available for Sun Microsystems SPARCstation and Hewlett-Packard systems. It was discontinued on May 14, 1998.

MkLinux

Announced at The 1996 World Wide Developers Conference (WWDC), MkLinux is an open source computer operating system started by the OSF Research Institute and Apple Computer in February 1996 to port Linux to the PowerPC platform, and thus Macintosh computers. In the summer of 1998, the community-led MkLinux Developers Association took over development of the operating system. MkLinux is short for "Microkernel Linux," which refers to the project's adaptation of the Linux kernel to run as a server hosted atop the Mach microkernel. MkLinux is based on version 3.0 of Mach.

Mac OS on non Apple-labeled computers

Although a violation of Apple's EULA, running OS X operating systems compiled for x86 or x86_64 ("Intel 64") on a non-Apple PC is possible using several approaches. If the processor is an Intel Core 2 or later, but not an Intel Atom, Apple's standard `mach_kernel` is sufficient.¹ If the processor is an Atom, the user-supported "legacy" `mach_kernel_atom`, derived from the appropriate `mach_kernel`, is required. If the processor is a pre-Core 2 Intel, e.g., a late Pentium 4 either with or without EM64T, but usually with H-T, the user-supported "legacy" `mach_kernel_non-atom`, derived from the appropriate `mach_kernel`, is required.

Installation of Mac OS X requires a Mac OS X *Installer emulator*, the most straightforward of which is a USB flash drive-type Installer emulator. Once the installation has been successfully completed to the hard drive, the hard drive may be booted using the *emulator* portion of the USB flash drive as a "helper" and a *boot loader Installer* may be downloaded and used to place the boot loader on the hard drive's boot blocks. Thereafter, Mac OS X may be booted from the hard drive alone; the installed boot loader takes care of any required device injection and/or kernel patching.

Mac OS X is generally compatible with any Intel desktop-based system or Intel-based motherboard, ICH6 or later, however compatibility past Snow Leopard cannot be assured with ICH6. Compatibility with ICH7 and with Lion and 945 (G)MCH has already been demonstrated and proven. Compatibility with ICH7 or later and any associated MCH/(G)MCH is quite good, certainly including Lion, and possibly also including Mountain Lion.

Mac OS X compatibility with Intel laptop- or netbook-based systems is quite variable but has been successful on a few Intel Atom-based netbooks.