



OSF/1

OSF/1 is a variant of the Unix operating system developed by the Open Software Foundation during the late 1980s and early 1990s. OSF/1 is one of the first operating systems to have used the Mach kernel developed at Carnegie Mellon University, and is probably best known as the native Unix operating system for DEC Alpha architecture systems.

In 1994, after AT&T had sold UNIX System V to Novell and the rival Unix International consortium had disbanded, the Open Software Foundation ceased funding of research and development of OSF/1. The Tru64 UNIX variant of OSF/1 was supported by HP until 2012.

OSF/1

Developer	<u>Open Software Foundation</u>
OS family	<u>Unix</u>
Working state	Discontinued
Initial release	January 1992
Available in	<u>English</u>
Platforms	<u>MIPS</u> , <u>DEC Alpha</u> , <u>PA-RISC</u>
Kernel type	Hybrid, ^[1] <u>Microkernel</u> ^[2]

Background

In 1988, during the so-called "Unix wars", Digital Equipment Corporation (DEC) joined with IBM, Hewlett-Packard, and others to form the Open Software Foundation (OSF) to develop a version of Unix named OSF/1. The aim was to compete with System V Release 4 from AT&T Corporation and Sun Microsystems, and it has been argued that a primary goal was for the operating system to be free of AT&T intellectual property.^[3] The fact that OSF/1 is one of the first operating systems to have used the Mach kernel is cited as support of this assertion. Digital also strongly promoted OSF/1 for real-time applications, and with traditional UNIX implementations at the time providing poor real-time support at best, the real-time and multi-threading support can be interpreted as having been heavily dependent on the Mach kernel. At the time of its introduction, OSF/1 became the third major flavor of UNIX together with System V and BSD.

OSF/1 at its inception combined Mach 2.5 with a large part of the BSD kernel (based on the 4.3-Reno release) to implement the UNIX API,^{[4]:451} with this monolithic kernel arrangement continuing through the OSF/1 1.2 release, although the adoption of a microkernel had already been foreseen.^[5] OSF/1 1.3 introduced such a microkernel in the form of Mach 3.0, hosting Unix system services separately in user space to provide the existing OSF/1 functionality.^[2]

Vendor releases

DEC's first release of OSF/1 (OSF/1 Release 1.0) in January 1992 was for its line of MIPS-based DECstation workstations,^[6] however this was never a fully supported product. DEC ported OSF/1 to their new Alpha AXP platform as DEC OSF/1 AXP Release 1.2, released in March 1993. OSF/1 AXP is a full 64-bit operating system, preserving the kernel architecture based on Mach 2.5 and 4.3BSD components.^[1] From OSF/1 AXP 2.0 onwards, UNIX System V compatibility was also integrated into

the system, but the architecture remained centred on the Mach 2.5 modular kernel, unlike later OSF versions of the system.^[7] Although OSF/1 2.0 was also developed for DECStation MIPS systems, it was "never officially released or sold".^[8] Subsequent releases are named Digital UNIX, and later, Tru64 UNIX.

Upon its acquisition of Apollo Computer in 1989, HP announced plans to introduce OSF/1 on both companies' products by late 1990.^[9] HP released a port of OSF/1 to the early HP 9000/700 workstations based on the PA-RISC 1.1 architecture. This was withdrawn soon afterwards due to lack of software and hardware support compared to competing operating systems, specifically HP-UX.^[10]

As part of the AIM alliance and the resulting PowerOpen specification, Apple Computer intended to base A/UX 4.0 for its PowerPC-based Macintoshes upon OSF/1,^[11] but the project was cancelled and PowerOpen deprecated.

IBM used OSF/1 as the basis of the AIX/ESA operating system for System/370 and System/390 mainframes.^[12]

Intel Paragon supercomputers used a version of OSF/1 featuring the Mach 3.0 kernel.^[13]

OSF/1 was also ported by Kendall Square Research to its proprietary microarchitecture used in the KSR1 supercomputer.

OSF MK

The Open Software Foundation created OSF MK, an evolution of OSF/1, incorporating the OSF Mach kernel (or OSF Microkernel^[14]) based on Mach 3.0 along with a variety of other functionality including the OSF/1 Single Server providing the Unix system personality. The complete system in the form of MK 5.0 was made available under commercial terms to OSF/1 licensees in April 1993.^[15] In contrast to the OSF/1 server, which was encumbered by proprietary Unix licensing, the microkernel itself remained freely available for adoption by other projects.^[16] In OSF MK, it contains applicable code from the University of Utah Mach 4 kernel (such as the "Shuttles" modification used to speed up message passing) and applicable code from the many Mach 3.0 variants that sprouted off from the original Carnegie Mellon University Mach 3.0 kernel.^{[17][18]} It also consists of improvements made by the OSF such as built-in collocation capability, realtime improvements, and rewriting of the IPC RPC component for better performance.^[15]

OSF/1 AD

OSF/1 AD (*Advanced Development*) was a distributed version of OSF/1 developed for massively parallel supercomputers by Locus Computing Corporation.^[19] Variants of OSF/1 AD are on several such systems, including the Intel Paragon XP/S and ASCI Red, Convex Exemplar SPP-1200 (as *SPP-UX*) and the Hitachi SR2201 (as *HI-UX MPP*).

OSF/2

OSF/2, a successor to OSF/1, was described as being based on the TMach system developed by Trusted Information Systems.^[20] TMach, or Trusted Mach, was an operating system architecture incorporating the OSF Mach MK++ kernel, introducing a trusted computing base layer consisting of trusted server components, hosting an application layer in which untrusted programs would run.^[21] In 1989, HP announced plans to merge the software platforms of its own products and those of newly acquired Apollo Computer to form a single OSF/2-compliant platform to be delivered by 1992.^[9]

Other interpretations of the OSF/2 name were associated with various plans to remove AT&T-licensed code from early forms of OSF/1 and the Mach kernel in particular,^[22] leading to speculation that a system based on the Chorus microkernel might supplant Mach entirely and become OSF/2 itself.^[23] With such a Chorus-based architecture having been rejected in favour of the Mach 3.0 microkernel, the OSF/2 designation persisted in reporting of this particular form of OSF/1.^[24]

References

1. Chang, Chran-Ham; Flower, Richard; Forecast, John; Gray, Heather; Haive, William R.; Ramakrishnan, K. K.; Nadkarni, Ashok P.; Shikarpur, Uttam N.; Wilde, Kathleen M. (Winter 1993). "High-performance TCP/IP and UDP/IP Networking in DEC OSF/1 for Alpha AXP" (https://archive.org/details/bitsavers_decdtjdtjv_9453190/page/n45/mode/2up). *Digital Technical Journal*. **5** (1). Digital Equipment Corporation: 44–61. Retrieved 24 January 2024. "DEC OSF/1 operating system version 1.2 for Alpha AXP systems is an implementation of the Open Software Foundation (OSF) OSF/1 version 1.0 and version 1.1 technology. The operating system is a 64-bit kernel architecture based on Carnegie-Mellon University's Mach version 2.5 kernel. Components from 4.3 BSD are included, in addition to UNIX System Laboratories System V interface compatibility."
2. Varhol, Peter D. (January 1994). "Small Kernels Hit It Big" (https://archive.org/details/eu_BY_TE-1994-01_OCR/page/n153/mode/1up). *Byte*. pp. 119–120, 122, 124, 126, 128. Retrieved 24 January 2024.
3. Salus, Peter H. (1994). *A Quarter Century of UNIX*. Reading, Mass: Addison-Wesley Pub. Co. p. 217. ISBN 0-201-54777-5.
4. Zajcew, Roman; Roy, Paul; Black, David; Peak, Chris; Guedes, Paulo; Kemp, Bradford; LoVerso, John; Leibensperger, Michael; Barnett, Michael; Rabii, Faramarz; Netterwala, Durriya (1993). "An OSF/1 UNIX for Massively Parallel Multicomputers" (<https://archive.org/details/1993-proceedings-winter-san-diego/page/449/mode/1up>). *Proceedings of the Winter 1993 USENIX Conference*. USENIX Association: 449–468. Retrieved 23 January 2024.
5. *Design of the OSF/1 Operating System Release 1.2* (https://archive.org/details/bitsavers_osfDesignostemRelease1.21990_25637674/page/n36/mode/1up). P T R Prentice-Hall Inc. 1993. pp. 1–12. Retrieved 24 January 2024. "Currently, OSF/1 integrates the core kernel services with the system services into one monolithic kernel. In future versions, the kernel will contain only the primitive objects and operations provided by a microkernel; most of what is now contained in the system services will be moved into its own, separate address space."

6. Ellen Minter (1992-01-28). "Press Release — OSF/1" (<https://groups.google.com/group/bit.listserv.esl-l/msg/b099f187095ca972?dmode=source&hl=en>). Newsgroup: bit.listserv.esl-l (news:bit.listserv.esl-l). Usenet: 9201282310.AA15415@enet-gw.pa.dec.com (news:9201282310.AA15415@enet-gw.pa.dec.com). Archived (<https://web.archive.org/web/20121102123154/http://groups.google.com/group/bit.listserv.esl-l/msg/b099f187095ca972?dmode=source&hl=en>) from the original on 2012-11-02. Retrieved 2007-08-21.
7. Chang, Yu-Ming (1996). *UNIX-Based Operating Systems Robustness Evaluation* (https://archive.org/details/nasa_techdoc_19960034349/page/n25/mode/1up) (Technical report). University of Illinois at Urbana-Champaign. p. 10. Retrieved 26 January 2024.
8. Digital Equipment Corporation (July 1992). "DEC OSF/1 X2.0-8 (Rev. 155) for MIPS" (<http://web-docs.gsi.de/~kraemer/COLLECTION/OSF1/X20-8/readme>). Retrieved 22 June 2024.
9. "HP Announces Plans For Apollo Division" (https://archive.org/details/HP-Professional_Vol_03_No_07_Jul_1989/page/16/mode/1up). *HP Professional*. Vol. 3, no. 7. July 1989. p. 16. Retrieved 15 April 2024.
10. "OSF/1 on PA-RISC" (https://www.openpa.net/osf_1_mkpa_pa-risc.html). *OpenPA.net*. Archived (https://web.archive.org/web/20110723233438/http://openpa.net/other.html#hp_osf1) from the original on 23 July 2011. Retrieved 29 December 2022.
11. Corcoran, Cate (4 November 1991). "Apple reveals plans for updated A/UX, PowerOpen Unix development alliance" (<https://books.google.com/books?id=Xz0EAAAAMBAJ&pg=PA1>). *InfoWorld*. pp. 1, 115. Archived (<https://web.archive.org/web/20200726125525/https://books.google.com/books?id=Xz0EAAAAMBAJ&pg=PA1>) from the original on 26 July 2020. Retrieved 11 February 2019.
12. "IBM announces AIX/ESA mainframe version of Unix" (https://web.archive.org/web/20060224133234/http://www.findarticles.com/p/articles/mi_m0NEW/is_1992_April_1/ai_12162157). 1992-04-01. Archived from the original (http://www.findarticles.com/p/articles/mi_m0NEW/is_1992_April_1/ai_12162157) on 2006-02-24. Retrieved 2008-03-28.
13. *Intel Paragon Supercomputers* (https://archive.org/details/bitsavers_intelsupergonXPSXPEB-rochureOct93_4860969/page/n3/mode/1up). Intel Corporation. October 1993. p. 4. Retrieved 26 January 2024.
14. Wells, Douglas M. (February 1996). "Using Object Frameworks to Enable Real-Time and Dependability in a Modular Operating System" (https://archive.org/details/proceedingsofwork0000work_y7j9/page/186/mode/2up). *Proceedings of WORDS'96 The Second Workshop on Object-Oriented Real-Time Dependable Systems*: 186–190. Retrieved 24 January 2024.
15. Douglas M. Wells (1994). *A Trusted, Scalable, Real-Time Operating System Environment* (<https://web.archive.org/web/20170822053715/https://pdfs.semanticscholar.org/03ac/1296f530719497b49d7580b55a2d9b8353ab.pdf>) (PDF). 1994 IEEE Dual-Use Technologies and Applications Conference. S2CID 5205380 (<https://api.semanticscholar.org/CorpusID:5205380>). Archived from the original (<https://pdfs.semanticscholar.org/03ac/1296f530719497b49d7580b55a2d9b8353ab.pdf>) (PDF) on 2017-08-22.
16. Morin, Rich (1998). *MkLinux: Microkernel Linux for the Power Macintosh* (<https://archive.org/details/mklinux00rich/page/143/mode/1up>). Prime Time Freeware. p. 143. ISBN 1-881957-24-1. Retrieved 24 January 2024.
17. Archived at Ghostarchive (<https://ghostarchive.org/varchive/youtube/20211212/ggnFoDqzGMU>) and the Wayback Machine (<https://web.archive.org/web/20181031185303/https://www.youtube.com/watch?v=ggnFoDqzGMU&gl=US&hl=en>): Jim Magee. *WWDC 2000 Session 106 – Mac OS X: Kernel* (<https://www.youtube.com/watch?v=ggnFoDqzGMU>). 12 minutes in.
18. "MK++: A High Performance, High Assurance Microkernel" (https://web.archive.org/web/20170822055033/http://www.db.opengroup.org/ar/technologies/mk-dbleplus/white_paper.htm). Archived from the original (http://www.db.opengroup.org/ar/technologies/mk-dbleplus/white_paper.htm) on 2017-08-22.

19. Zajcew, Roman; et al. (1993). *An OSF/1 UNIX for Massively Parallel Multicomputers* (ftp://ri-bot1.ac.upc.es/pub/archives/gso/mach.OSF/os_coll_papers/osf1ad_usenix.ps) (PostScript). USENIX Winter 1993 Technical Conference (<http://www.usenix.org/publications/library/proceedings/sd93/>).
20. Anthes, Gary H. (14 May 1990). "Move over, Unix: Here comes Mach!" (<https://archive.org/details/computerworld2420unse/page/97/mode/1up>). *Computerworld*. pp. 97–98. Retrieved 15 April 2024.
21. Schneider, Edward A.; Feustel, Edward A.; Ross, Ronald S. (November 1997). *Assessing DoD Goal Security Architecture (DGSA) Support in Commercially Available Operating Systems and Hardware Platforms* (https://archive.org/details/DTIC_ADA349992/page/66/mode/2up) (Technical report). Institute for Defense Analyses. pp. 66–67. Retrieved 15 April 2024.
22. "OSF Solidifies Plans to Purge AT&T Code" (<https://archive.org/details/UnigramX1990263-313/page/n128/mode/1up>). *Unigram/X*. 14 May 1990. p. 1. Retrieved 25 July 2024.
23. "Micro-Kernel, Real-Time Chorus is "Future of Unix" AT&T and Open Software Foundation Talks in Progress" (<https://archive.org/details/UnigramX1990263-313/page/n230/mode/1up>). *Unigram/X*. 3 September 1990. p. 1. Retrieved 25 July 2024.
24. O'Gara, Maureen (27 May 1991). "AT&T code-free Mach 3.0 is now shipping to computer vendors" (<https://archive.org/details/UnigramX1991314-365/page/n131/mode/1up>). *Unigram/X*. p. 2. Retrieved 25 July 2024.

Retrieved from "<https://en.wikipedia.org/w/index.php?title=OSF/1&oldid=1236615321>"