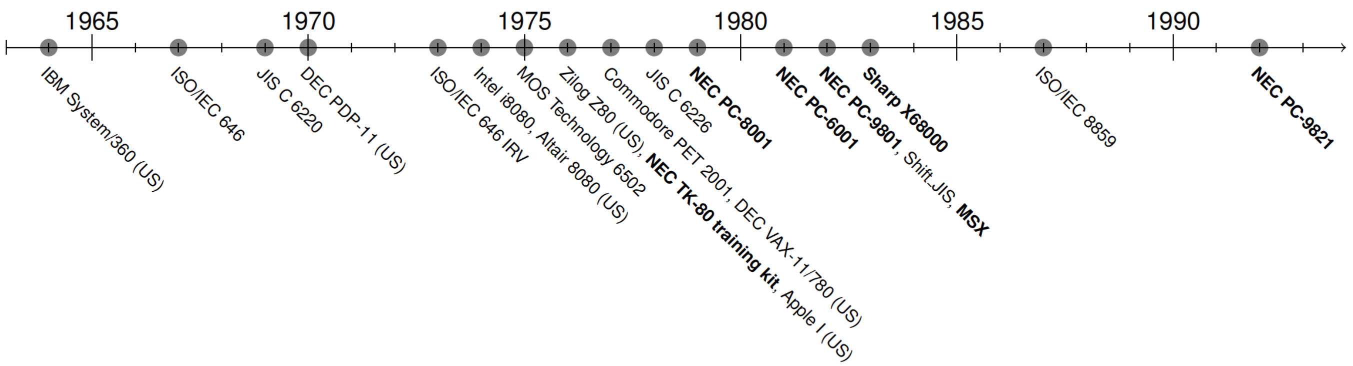
FreeBSD in Japan: A Trip Down Memory Lane and Today's Reality

BY HIROKI SATO

Japan is one of the regions where BSD and BSD-derived operating systems have been popular. Most of the evolution in computers and software technology has been in North America and Europe, however, Japan has had a significant domestic market for computers and ambitions toward the future backed by success in the semiconductor industry in the 1980s. In this same timeframe, commercialized Unix and BSD operating systems evolved. While much happened in the Japanese computer industry and user communities, these stories are rarely told because the records are only in Japanese, there are piles of failures, and there was less significant impact outside Japan.

Although the topic is dense, this article will focus on the history of BSD and Japan and the use of FreeBSD today. You will learn why and when Japanese people started using BSD and how they now feel about it.

1970-1980: Japanese-Domestic Computers



Mainframes and Large-Scale Computers

To understand Japan's computer industry, you must know how it has grown. In terms of commercial computers, mainframes were most popular in the US from the 1950s on. IBM System/360, in 1964, is one of the most famous models. Japanese companies started to develop computers after the research phase, and since the required technologies were premature in the 1960s, compatible models were developed under business partnerships with RCA, Honeywell, and General Electric. The players in Japan were Fujitsu, Hitachi, NEC, Toshiba, Mitsubishi, and Oki, and they were supported by funded projects from the Japanese government to develop the domestic industry. They are also known as "NTT family companies," which have developed communication equipment and infrastructure for some time.

In 1970, minicomputers such as DEC PDP-11 and VAX became popular as office computers in the US, and Japanese companies developed similar models. While imported minicomputers were used with UNIX and BSD as engineering workstations in universities, research institutes, and some software development companies, they gained a small market share because they were too tricky for office users and had relatively poor support service compared to the domestic models.

Personal Computers

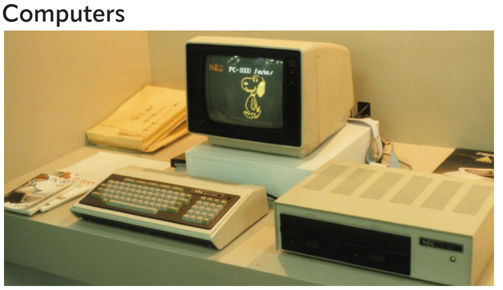


Figure 1: PC-8001 (a photo under CC-BY-2.0 taken by Tom West, a user of Flickr)

Personal computers also emerged in this timeframe. Japan obtained microprocessor technology in the 1970s, however, the microprocessor business was not going well except for calculators. People did not know what was good about it. In 1974, the Altair 8800 microcomputer was released in the US and is considered the spark that ignited the microcomputer revolution. Although it arrived in Japan in 1975, it was too expensive due to import fees and thus caused no major impact. In 1976, NEC released a TK-80 training kit, an Intel 8080-based microcomputer board. To be exact, the processor was NEC's uPD8080A, a software-compatible clone of Intel's 8080. It rapidly became quite popular and recorded sales of 17,000 units for a year. This motivated NEC to develop "personal computers" and the Japanese computer industry entered the personal computer era.

In the US, several companies—such as Commodore and Apple—released personal computers in 1977, and the 16-bit IBM PC was released in 1981. In Japan, NEC released PC-8001 in 1979. It was one of the first "made in Japan" personal computers that has a Z80-based processor, 16 kB RAM, and N-BASIC (enhanced version of Microsoft BASIC). PC-8001 recorded sales of 250,000 units for four years with 40% of the market share.

NEC released the PC-8000 series in 1979, the PC-6000 series in 1981, and the PC-9800 series in 1982, and was strongest in the market until 1997. The PC-8000 and PC-6000 are Z80-based, and the PC-9800 is Intel x86 from 8086 to Pentium II. These three series were independently developed in separate divisions of NEC. To avoid competition, PC-6000 was terminated, and PC-8000 and PC-9800 were refocused for hobbyists and business users respectively.

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Technical Differences: Japanese Language Support

A major difference from computers in the US is that Japanese computers must handle Japanese characters. The Japanese language uses three groups of characters: Hiragana, Katakana, and Kanji. The former two groups are phonetic lettering systems with about 100 characters and the latter is logographic. While there are about 100,000 Kanji characters, you need to understand at least 2,200 selected characters to read a newspaper—Japanese elementary schools teach 1,026 characters in 6 years. And glyphs for Kanji require at least 16 x 16 pixels on a display or paper. This means that a single character requires 16-bit encoding and displaying one requires 16 x 16 bitmap data.

Obviously, computers in the US market needed non-trivial modifications to support the Japanese language. However, having all Kanji characters challenging even for Japanese models at that time because it required a lot of memory. The first models supported only Katakana using a modified ASCII code as the single-byte encoding.

PC-8001 has 160 x 100 resolution and no Kanji support. PC-9801, which is designed for office use, has 640 x 400 and Kanji support. Kanji is mandatory for serious business machines. To support it, we had to develop an encoding for Kanji characters. A standard of character set JIS C 6226 was issued in 1978, four years before the release of PC-9800. C 6226 has 6,802 Kanji and non-Kanji characters and is split into Level-1 and Level-2 based on the frequency of use. Level 1 has 3,418 characters—the minimum requirement to support Kanji. And to encode them, encoding standards were developed; Microsoft, Digital Research, ASCII (a Japanese corporation), and Mitsubishi collaboratively developed "Shift JIS" encoding in 1982. The maximum number of characters this encoding scheme can hold is 11,438, and it was sufficient to support Kanji in the JIS C 6226 character set.

Another problem was Kanji font glyphs. If all Kanji in C 6226 Level 1 are supported, it consumes 14 kB of memory to hold the 16 x 16 bitmap font. The PC-9800 series has text VRAM with a Kanji character generator. VRAM is a dual-ported DRAM used as the frame buffer for graphics display. On the IBM-PC, displaying Japanese relied on software. Reading the glyph data and rendering them into the frame buffer takes much longer than hardware-assisted VRAM on the PC-9800 series.

These language-specific factors are part of the reason why the PC-9800 series was strong in the market before Windows 95. In 1987, the PC-9800 series had over 90% of the market sales of domestic, 16-bit, personal computers. They can be divided into the PC-9801 and PC-9821 series. The former series was manufactured from 1982 to 1995, and the latter was from 1992 to 2003. All models are basically compatible. ROM BASIC or disk BASIC was popular in the early phase, then MS-DOS, and eventually Microsoft Windows arrived. This sequence of events was like the IBM-PC in the US. In short, Japanese people also enjoyed Intel x86 machines with games and business software such as Lotus 1-2-3 as well as computer geek culture such as BBS using phone lines.

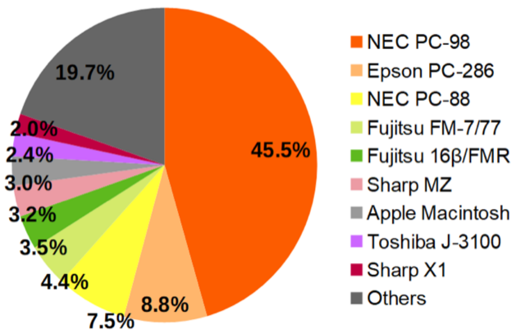
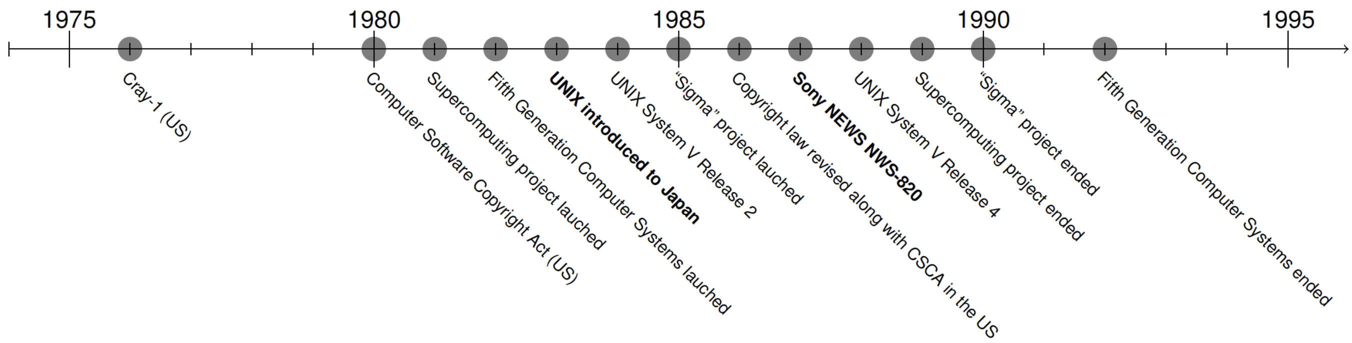


Figure 2: Usage share of personal computers at home as of 1989. 509 Japanese businessmen responded. Source: Nikkei Personal Computing Journal 1989-4-10 issue (a public domain chart from Wikipedia).

There were also exciting machines by other companies. Notable were MSX in 1983 and Sharp X68000 in 1987. They focused on hobbyists and quickly disappeared from the market. At BSD conferences, the author often asks, "what was your first computer?" Amiga 500? Sinclair ZX80? If you ever see me, please share your story.

The IBM-PC and PC-9800 are incompatible regarding the I/O port and memory mapping, but porting software is possible and straightforward except for handling the Japanese language. So, when 386BSD was released, some people were interested in porting to PC-9800.

1980-1990: National Software Projects



Before moving on to the 386BSD porting topic, let's see hardware and software technology in the Japanese industry at that time. In the 1980s, mainframes or minicomputers were still popular as larger-scale computers in Japan. Many applications written in FORTRAN or COBOL were used in government facilities, offices, banks, etc. and major electric companies partnered with US companies to learn the technology, including hardware and software. Until 1975, foreign companies were not able to enter the Japanese market. Fostering the industry was done under the protection of the Japanese government. Even after that, in 1979, Fujitsu surpassed IBM in sales in the domestic computer market and the companies gained technology comparable to the US.

Until 1980, all commercial computers in Japan were clones or slightly modified versions of computers from the US. Japan managed to get technology, but there needed to be more innovation and better originality. To overcome this situation, the Japanese government started software projects in the same manner as hardware and the major electric companies joined them. The motivation came from the fact that software businesses emerged in the US in the same timeframe. In 1980, US President Jimmy Carter signed the Computer Software Copyright Act into law and IBM started to dissolve the bundling of hardware and software and to sell software independently. The same law in Japan took effect in 1986, after lengthy discussion. Until that time, IBM's software was the source of software technology, and the code was available in the public domain. Japanese companies could learn everything from MVS for System/360, which is an operating system released in 1974 for the IBM mainframe System/360 series. They needed to pay software license fees if they were to continue to depend on IBM's software.

In 1982, a project called Fifth Generation Computer Systems (FGCS) launched. FGCS aimed at hardware and software for artificial intelligence. This was one of Japan's first attempts at developing original hardware and software technology. They stuck to Prolog, though LISP was popular in the field of AI outside Japan. Parallel computing and concurrent logic programming were the target technologies. This project ended in 1992 with processors, operating systems, and application software that were dedicated to logic programming. Then an article was published in International Herald Tribune, entitled *The Japanese Give Up on New Wave of Computers—Vaunted Threat to US Of a New Superiority Fails to Meet Its Goals*. FGCS produced no practical commercial impact, although the research results provided academic contributions. This decade-long project had yet to be able to displace the US leadership in super-computing.

In 1985, the Sigma Project launched. The government thought Japan needed a standard development platform to foster more software developers. The lack of programmers was believed to be a big problem in the 1990s as the number of computers and software business was rapidly growing. The Sigma platform was designed by companies involved in the mainframe business and transferring the accumulated technology to domestic office computers was the primary target.

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Sigma and UNIX Workstation Business

From the end-users' perspective, the derivations of this project were Sigma Workstation and Sigma OS. The goal was 32-bit 1 MIPS MPU, 4 MB RAM, 80 MB HDD, and IEEE802.3 (Ethernet). AT&T's UNIX System V 2.0 (SVR2) and some functionality of 4.2BSD for the OS. Sigma Workstation is a SysV UNIX workstation, but the OS is supposed to be a heavily modified version to fit the specific needs of Sigma Tools, which were supposed to be reusable, useful software distributed through the Sigma Project's network infrastructure.

The workstation and OS were being developed at companies independently—there were Sigma-compliant workstations and Sigma-compliant OSes. While the hardware of the Sigma workstation was a relatively easy target, the development of Sigma OS was chaotic. UNIX rapidly evolved in the same timeframe. SVR2 was released in 1984, SVR3 in 1986, and SVR4 in 1988. The project could not catch up with this release speed and their SVR2-based implementations became obsolete. Since Sigma OSes were developed independently, compatibility was also a big issue.

All the big companies already had UNIX workstations in their product lineups, so motivation to develop the Sigma OS was low. The market size of computers was 1.3 million units as of 1988. The workstation held only about 25,000 units. Sun, Apollo, and HP had already appeared and very few big companies considered Sigma very seriously.

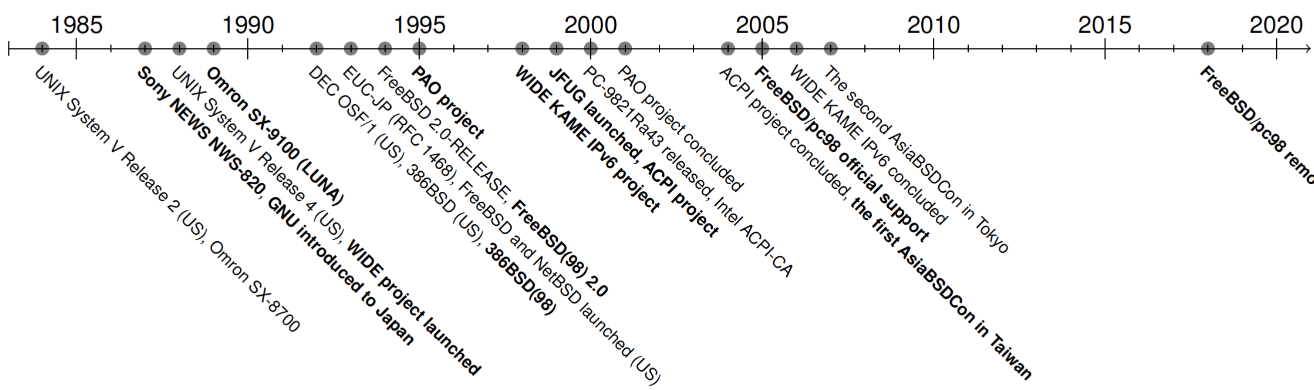
The project had only two years to implement the first version. Eventually, 199 companies were involved. In 1990, *Nikkei Computer*, a magazine covering the computer industry, summarized *"five years and one hundred million US dollars did not produce anything."* Developing the non-hardware part was too ambitious.

On the other hand, UNIX was introduced to Japan and Kouichi Kishida formed the Japan UNIX society. In 1983, two years before the Sigma project launched. Mr. Kishida was the founder of SRA (Software Research Associates, Inc., a private software company in Japan since 1967) and the first person to use UNIX in a commercial company in 1980. While the mainframers joined the Sigma project, some companies decided not to join and SRA and Sony were some of them. They started to develop a UNIX workstation named Sony NEWS, which has nothing to do with NeWS, Network extensible Window System.

Meanwhile, Sun Microsystems was founded in 1982 and they were selling Sun-3, 68k-based workstations with BSD when the Sigma project began. Sony wanted to develop their own workstations and thought making them a part of Sigma was a good idea. Mr. Kishida was disappointed with the plan of Sigma at the very early stage, and he and Sony agreed to go their own ways. The goal was to develop something better than Sun. The advent of Sony NEWS greatly impacted the Sigma project because NEWS was affordable and performant compared to Sigma workstations available at that time. The Japanese government reportedly requested a delay in the product release. UNIX users in Japan loved Sony NEWS.

At the end of the Sigma project, only four companies, NEC, Hitachi, Fujitsu, Omron, were selling Sigma workstations and they were just modified versions of their UNIX workstations. They work as Sigma if running Sigma OS and they also support SysV, BSD, or traditional OSes which they had for business purposes. It is believed that no innovative result was obtained, however, software engineers in Japan learned UNIX through Sigma.

1990-2000: BSD and FreeBSD in Japan



Sony NEWS

Figure 3: Sony NEWS workstation (a public domain photo from Wikipedia). As mentioned, many Japanese companies were involved in the workstation business. UNIX was the promising OS, but SysV vs BSD had cast a shadow over the market in a different way from the US because of Sigma. On the other hand, Sun's workstation gradually gained market share.

From a historical point of view, Sony NEWS and Omron LUNA were "made in Japan" machines that seriously considered porting BSD and were officially supported by 4.4BSD released in 1993. Other than those, the HP-9000 300 series, DECstation 3100/5000, and SPARCstation 1/2 were supported. CSRG at UC Berkeley was using the HP-9000 300 series as the reference machine then.

The first model of the Sony NEWS series was released in 1987. While the Sigma project stuck to System V because AT&T was driving it, developers at Sony and Mr. Kishida believed BSD was better. It was 68k-based until 1990, and the later models adopted MIPS R3000, R4000, and R10000. NEWS-OS 1.0 was a ported version of 4.2BSD and supported Shift JIS instead EUC-JP. Versions 2.0 to 4.0 were 4.3BSD-based. The final version was 6.1.2 in 1996, but it was switched to SVR4-based after 1993. WIDE project members used many Sony NEWS workstations as a research platform and had a collaborative project with Sony to port 4.3BSD and

4.4BSD. LUNA was 68k-based, like the HP-9000 300 series, and NEWS was MIPS-based similar to the DECstation 3100. Some of the source files in 4.4BSD were shared because of it.

The famous UNIX wars between OSF and UI were from 1988 to 1994. The above models were discontinued around 1993. There were few Japan-specific innovative developments during the time Japanese software engineers were involved in the porting efforts and the vendors caught up with the evolution in SysV and BSD through them.

Anyway, Japanese software engineers learned UNIX and BSD and there were engineering workstations that ran them. What's next?

FreeBSD(98) and FreeBSD/pc98

In 1992, 386BSD version 0.0 was released. Of course, it was for the IBM-PC/AT, so it did not run on PC-9800. Students at KMC (Kyoto University Micro Computer Club) with Internet access and Sun workstations ported it and released 386BSD(98) in 1992. The updated versions of 386BSD were distributed as patch kits and the KMC team released 386BSD(98)-0.1 based on the patch-kit 0.1.

The FreeBSD and NetBSD project started in 1993. FreeBSD 1.0 and NetBSD 0.8 were released in 1993 and based on 386BSD-0.1 and patch-kit 0.2.2. There was no porting effort for a while after 386BSD(98)-0.1. In 1994, four students were independently trying to port FreeBSD. They communicated via Netnews, and the result was eventually released as FreeBSD(98) 1.1.5.1.

The FreeBSD project was working on 4.4BSD-Lite-based FreeBSD as 2.0-RELEASE. It was released in November 1994. The FreeBSD(98) development team tried to catch up with it and released FreeBSD(98) 2.0-ALPHA in December 1994. After that, it was maintained until FreeBSD 5.4R-Rev01. From the 5.5-RELEASE and 6.0-RELEASE, the FreeBSD for PC-9800 series started to be released as an officially supported distribution named FreeBSD/pc98.

The differences between PC-9800 and IBM-PC/AT are bootstrap stages, memory layouts, I/O port mapping, and devices. It was easy to maintain the ported versions once routines to handle these hardware-dependent parts were written. Although it was actively maintained until 2010, it became Tier-2 at the point when FreeBSD dropped floppy disk support in the boot loader. Most of the models do not support bootstrap from a CD-ROM drive. Before the 12.0-RELEASE in 2018, the support was unfortunately removed.

Projects and User Groups of FreeBSD

As FreeBSD(98) was actively developed, there were BSD user and developer communities in Japan. UNIX users had BSD on workstations such as Sony NEWS and the SPARCstation with SunOS4. There were many developers in companies who knew BSD well. In 1988, Jun Murai, a professor at Keio University who is recognized as the father of Japan's Internet infrastructure, established WIDE, a research project having to do with the Internet and related technology. Many software engineers in companies and professors at universities have been involved, and BSD was the popular research platform. One of the notable projects was the IPv6 network stack started in 1998. It was called KAME, which means a turtle in Japanese. IIJ—Internet Initiative Japan, the first commercial ISP in Japan, NEC, Toshiba, Hitachi, Fujitsu, and Yokogawa Electric joined the project. Not only IPv6, but emerging technology such as mobile IP and IPsec have also been implemented and evaluated using BSD for eight years. They were also active on standardizing bodies, such as IETF, and took leadership in academic research and commercial network design in Japan. The results have been merged into FreeBSD, NetBSD, and OpenBSD.

In 1999, several Japanese FreeBSD committers formally established JFUG, Japan FreeBSD Users Group. They tried to organize the ongoing activities by Japanese users whom a company or university had not supported. The translated version of www.FreeBSD.org was hosted as www.jp.FreeBSD.org, and several companies donated the necessary infrastructure. The author was was one of the people who started to get involved in FreeBSD via JFUG around 2000, when he was an undergraduate student. Another group of people formed JNUG, Japan NetBSD Users Group. While both user groups have become inactive these days, the members are largely overlapped and still have. still have smaller-scale meetings to discuss BSD.

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One of the notable JFUG projects was PAO. It started by Tatsumi Hosokawa at Keio University (hosokawa@FreeBSD.org) around 1995 before JFUG was formed, and the goal was to improve mobile device support. At that time, IBM ThinkPad 535 and DEC HiNote Ultra were popular, and there were a lot of small gadgets in the Japanese market. Laptops (which Japanese people call "notebook" PCs) needed device drivers and frameworks to support power management, suspend/resume, battery, hot-plugging of PCMCIA cards, etc.

PAO was the distribution name which, interestingly, means a portable, rounded tent used by nomadic groups in Central Asia. Laptop users are nomads, and the PAO project provides them a safe dwelling!

Hosokawa began to work on 2.1.0 and led the PAO project. The results have been merged into the main tree, including various drivers and changes for dynamic resource allocation for kernel subsystems to support hot-plugging. 3.5.1-RELEASE was the last PAO snapshot release, and the project was concluded in 2001, as all the changes were merged to the 5.x and 4.x branches. The previous version of FreeBSD USB stack was also from a member of this project. The current version has been rewritten by Hans-Petter Selasky (hps@FreeBSD.org).

Another related project was ACPI. Takanori Watanabe (takawata@FreeBSD.org) and Mitsuru Iwasaki (iwasaki@FreeBSD.org) started this project in 1999 to implement the ACPI driver. While PAO was based on APM BIOS, newer models needed ACPI support because APM BIOS was being replaced with ACPI. The announcement to the FreeBSD project was made in October 1999. In 2000, Intel released ACPI CA (Component Architecture) as a reference implementation under a permissive license. It partially replaced their efforts and eventually merged into the main tree. Around 2004, most ACPI-related discussions were held on freebsd-acpi in English. Because of that, this JFUG project was concluded in 2005.

Linux eventually dominated the market in Japan.

The activities were more than just technical ones. Providing information about FreeBSD in Japanese was one of the critical roles of JFUG. The members actively worked on translating manual pages, the official website, and book-like documents, such as FreeBSD Handbook. Kazuo Horikawa (horikawa@FreeBSD.org) led the manual page translation, and Ryusuke Suzuki (ryusuke@FreeBSD.org) worked on the others.

However, this kind of contribution did not always go well. In the late 1990s, some Japanese BSD developers were working on the dynamic configuration of the kernel to support hot-plugging as described. A developer tried to extend BSD config(8) framework to support it. His implementation was named newconfig, which extended the bus framework to handle dynamic configurations in addition to the traditional static ones. It was merged into PAO, and PAO depended on it for a long time. The development group wanted to merge newconfig to the main tree. Meanwhile, new-bus was discussed in the FreeBSD project. The new-bus, what we have now in the main tree, was another implementation that can handle dynamic resource allocation. Technically speaking, the capabilities are similar. The challenge for the team was how to convince the FreeBSD project members to accept their patch.

Supporters of newconfig believed it was a less intrusive extension to the existing framework and also possible to maintain device driver compatibility with NetBSD. The new-bus was discussed in a closed mailing list, and they were frustrated to the unclear decision process. The team rewrote a lot of drivers and released snapshots to prove the usefulness and practicality. In the end, new-bus was committed and the team gave up newconfig. It was a sad thing that a substantial number of project members disappointed and went to NetBSD. PAO was rewritten as a new-bus based implementation before the merge happened.

From the author's perspective, JFUG had fulfilled the duty well for about five years. Over 50 people were active in social and technical contributions to JFUG activities. And at the same time, they recognized that Japanese-only groups did not work well for development. The members who were still interested joined the FreeBSD project directly. While JFUG was no longer active in and after 2005, the author was still one of the JFUG members and felt the user community was rapidly shrinking. To overcome this situation, he started to host AsiaBSDCon in Tokyo in 2007—with great help from George Neville-Neil (gnn@FreeBSD.org), one of the authors of *Design and Implementation of FreeBSD* and a columnist for *ACM Queue* magazine. The author had attended BSDCan and EuroBSDcon several times to learn from people outside Japan. BSD conferences are beyond the topics covered by this article, but AsiaBSDCon is one of the activities that has remained in Japan.

BSD in Business and Industry—Wide Adoption of Linux

So, what was it like after 2005, and how is it today?

The number of FreeBSD users around 2000 was the largest in the PC-UNIX market, partially because only FreeBSD had descent PC-9800 series support. Linux and NetBSD were also used but had no stable ported version. FreeBSD's user base was strong, even after IBM-PC/AT became popular. On the commercial front, FreeBSD and NetBSD were used for Internet servers and used to implement embedded systems such as a router box and an Ethernet board for printers. This happened because many software engineers were familiar with UNIX and BSD in the 1990s. Both hobbyist and business user communities were quite active and there were a lot of magazines, books, and conferences relating to FreeBSD and Linux.

On the other hand, Linux eventually dominated the market in Japan. During 2000 to 2010, a significant change occurred in the Japanese UNIX market. As mentioned, several big computer manufacturers were selling UNIX workstations. Whether SysV or BSD-based, the sales were descending because imported machines such as Sun Microsystems were strong and they were looking for a way to offload the development costs. On the other hand, in the 1990s, Internet companies such as Yahoo! started to use PC-UNIX and commodity hardware for their businesses. The future of expensive UNIX workstations became questionable, especially for vendors who were just following the US market.

In 2000, Toshiba, Hitachi, Fujitsu, and IBM Japan independently announced that they would support Linux as their business foundation. IBM Japan's move in May 2000 made a significant impact. Hitachi did this in September 2000, and Toshiba did it in October. By the end of the 1990s, their UNIX workstation business was based on commercial UNIX such as Solaris and HP-UX and not on domestic versions of SVR4 or BSD. After the announcements, each company started to build a business structure to adopt PC-UNIX and went for Linux-centric businesses. They have established Linux support companies and, more importantly, have collaboratively established a Linux education infrastructure.

Japan has a unique hiring practice when big Japanese companies hire new university graduates. It is called "simultaneous recruiting of new graduates." Most students hunt for jobs before graduation from university, seeking "formal letter of employment." The government controls this process, and companies are allowed to begin the selection process, usually in April. Attaining a position as a regular employee at any other time of year, or any later in life, is generally difficult in Japan. This means that most new employees have no business experience at the time of hiring and the companies are responsible for their education. Thus, the above big companies formed LPI-Japan (Linux Professional Institute Japan) as a non-profit offering the education service in a vendor-neutral manner. LPI (Linux Professional Institute, Inc.) is a Canadian non-profit organization founded in 1999 for Linux certifications. LPI-Japan was established as a Japan branch.

A substantial amount of investment by big companies was made to LPI to develop the Japanese version of the educational materials and exams. As a result, most new employees at big computer companies learn Linux as the reference platform. The number is more than 1,000 per year. Official adoption of Linux and this education system increased the user base, and young people had no chance to learn UNIX or BSD. This was one of the reasons why Japanese BSD user groups lost popularity. Older people still enjoy BSD, but there is no such motivation for younger generations. While FreeBSD was one of the most popular PC-UNIX in 1999, Linux became standard around 2005. All business sectors that used BSD, such as embedded system development, were also shifted toward Linux. Many old developers who used to work on BSD at companies have also left.

Sadly, this situation warrants no optimism about the future of FreeBSD in Japan. The FreeBSD Foundation continuously approaches enterprise FreeBSD users in Japan to bridge them with the FreeBSD project. Even with the nationwide movement toward Linux, several companies still use BSD. IIJ has been using NetBSD to build their router products, and Sony's famous gaming consoles, PlayStation 4 and 5, are using the FreeBSD kernel as the core component. The business use of FreeBSD has been changed from a complete OS to a component-level adoption. For example, FreeBSD's network stack is often used to implement TCP/IP functionality in various products. The author suggests that the FreeBSD project should recognize the demands for these use cases, and investment in them would be worth doing to reinforce its strength even after Linux became the standard choice.

Conclusion

This article has traced some aspects of a 50-year history of the domestic industry in Japan. Although the author tried to make this as accurate as possible by using various references and his own experiences, please let him know if you find anything in error.

The BSD community in Japan, including all flavors of BSD-derived operating systems, has been active for quite a long time. Since communication in English was always challenging, the activities were often invisible from places where the official BSD projects run. Regarding FreeBSD, many people outside Japan have helped communicate by visiting Japan. I would like to thank Jordan Hubbard (jkh@FreeBSD.org), one of the founders of the FreeBSD project, Warner Losh (imp@FreeBSD.org) an ex-FreeBSD Core Team member and long-term BSD contributor, Murray Stokely (murray@FreeBSD.org), a release engineer of 4.X-RELEASE, and George Nevile-Neil for their great support and, of course, AsiaBSDCon attendees over 15 years.

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