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Future of Unix

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The Future of UNIX

issued by
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1.   INTRODUCTION

Preamble

This is a report of a set of presentations by Sun staff given at a public meeting. None of the information in this report is confidential.

The meat of the report describes

1.   some details of and motivation behind the deal recently announced between SUN and AT&T,

2.   the SUN/AT&T re-implementation of Unix to take it into the 1990s as a multi-processor, distributed, secure, real-time product which will dominate the world market.

This report has been produced from the NoteCards (Xerox hypertext) version of the notes I took at the meeting. As I am at the start of the hypertext learning curve, I apologise for the scrappy nature of the prose. I have taken the view that early delivery is more important than style!

Agenda

SUN Seminar, Fairmont Hotel, San Jose
Tue Dec 8th 1987

1.   Larry Hambly, Director Western Area Sales
      "Sun corporate and product overview"

2.   Wayne Rosing, VP of Advanced Development
      "Significance of the new SPARC architecture"

3.   Bill Joy, VP of R&D
      "The impact of one UNIX standard"
      About SUN

Sun was founded in 1982.   (The IBM PC came out in 1981.)

By June 1987 Sun had sold 40,000 systems worldwide.

Sun are currently shipping new systems at a rate of 3,000 per month.

Revenue for FY86/7 was $500M(actual)
Revenue for FY87/8 will be $1000M(prediction)

Sun spends 13-15% of revenue per annum on R&D.

An average product lasts 18 months. Sun has produced 4 generations of workstation in 5 years (Sun-1 to Sun-4).

Sun is committed to 'open systems computing'. This means industry standards and OAA below

2.   OPEN SYSTEMS STRATEGY

OAA
Open Applications Architecture

Sun's philosophy is that customers want open systems so customers can
a. mix and match different components from different vendors.
b. take advantage of second sourcing
c. ensure competition reigns in the market place.

Sun are confident that they can maintain their market leadership in the face of such increased competition.

SUN's main platform for this open applications architecture is, not surprisingly, Unix.

The SUN and ATT deal is aimed at producing a complete architecture definition from processor architecture (Sparc), binary code format, network standards, operating system standard(Unix) and upwards to the applications level which will include a user interface standard.

OAA:
    user i/f (standard "look and feel" definition)
    binary code portability (ABI - see below)
    source code portability
    Unix
    hardware (Sparc - see below)

OAA will enable source code portability via Unix and standard language compilers.

Sun wants there to be a single Unix standard, and a single source code implementation of it, hence Sun's deal with ATT

Sparc will be the basis for the binary standard, called ABI(below).

ABI

Applications Binary Interface

Joy feels that a major weakness of Unix is the lack of a broad software applications product market, which is such a strength of the IBM PC.

The whole point of the ABI binary standard is to enable Unix to get into the volume applications business which is currently dominated by the PC. ABI will enable spreadsheet vendors etc to ship 'binary only' products which will run on wide range of systems (all running same binary format) from multiplicity of vendors just like the today's PC market.

Thus ABI is intended to be the delivery technology for "shrink wrapped" applications so vendors can deliver binary like PC market vendors.

Joy said in answer to a question that the ABI format would be IBM PS/2 floppies, but it was not clear if he meant this as a fact or an analogy. Clearly the binary code which will be on such floppies will be 'Sparc code' not PS/2, unless they are hoping to sign up IBM to Sparc!

The Sparc architecture standard will form the technical basis for ABI.

SPARC

The Sparc architecture has been designed for C, Fortran and Lisp but definitely not Assembler.

Some instructions have been specifically put in to support Lisp

Sparc is intended to be implementable at different powers from lap top micro through to Cray type supercomputer.

Sparc implementations:

1. gate array CMOS
   Fujitsu
   available now
   10 mips

2. sub micron CMOS
   Cypress Inc
   available 2Q88
   20 mips

3. ECL
   Bipolar Integrated Technology Inc
   available ?89?
   50 mips

4. GaAs
   long term

Bill Joy made it clear that SUN's ambition is to double workstation processor power every 12 months. This can be done in part by 1-4 above, but missing milestones could be inferred as being achieved by multi-processor versions of 1-4 implementations above, but this was not stated by anyone from Sun. Joy said 'no comment'.

3 ..PC AND JOY TO ALL MANKIND...
SUN/AT&T deal

Microsoft Xenix, SunOs and AT&T SVID will converge to single common source base. This is the subject of contracts between AT&T and Microsoft, and between AT&T and Sun. Both contracts already signed. This is what Sun announced at same time as the Xerox deal about Xerox backing Sparc.

A date for the achievement of a common source for Unix has not been announced because it's a lot of work, but this work is well under way already.

Sun/AT&T are hoping to produce the standard user interface definition/implementation next year. It will include the definition of a standard "look and feel" for user interfaces, so Unix applications can achieve Mac style consistency (presentation manager analogy). All applications builders will be encouraged to comply.

AT&T and Sun jointly will produce the ABI binary standard based on Sparc architecture (this is second key part of the Sun/AT&T deal, the first being the common source for Unix).

The unification of Xenix, SVID and BSD/SunOs will be called Enhanced SVID.

Enhanced SVID will include the following:
    SVID + BSD/SunOs
    shared libraries
    dynamic linking
    networking
    Ansi C
    POSIX compatible
    X/OPEN CAE compatible
    Window system (X.11 & NeWS)
    User interface (look and feel standard)
    standard graphics packages (gks, phigs etc)
    ABI
    NFS & RFS

There will be only one form of each type of feature so that where ATT and Sun have different ones today, they will pick one and drop the other hence e.g. sockets will be dropped in favour of ATT streams in E-SVID.

However, two known execptions to this unification are file systems and window managers. Enhanced SVID will contain both NFS and RFS (however both will be dropped in phase 3(below)). Both X-windows and NeWS will be supported in Enhanced SVID (see appendix).

After the unification of the current Unix variants into the single Enhanced SVID version, Sun and AT&T will make available a completely new implementation of the Unix kernel. This joint Sun/AT&T Unix development programme has 3 phases:

Phase 1 - Mid 88
Sun will release Enhanced SVID on Sun-4 only (for development customers only ie oem)

Phase 2 - Late 89
AT&T ships Unix from common source base with full ABI, and with both source and binary licenses available to all customers.

Phase 3 - Late 90/91
Completely new advanced SVID kernel to be released by AT&T/Sun (see below).

This will be fully backwards compatible with the phase 2 Enhanced SVID and ABI. It will be a distributed implementation of Unix and will include multi-processor workstation support.

Some other snippets which came out included:

ATT and General Motors are currently working on a real-time version of Unix which is likely to be released before Enhanced SVID.

A new disk standard (IPI) is coming along, based on the IBM channel, which will increase disk bandwidth. This is likely to be incorporated into OAA.

No database standard anticipated in OAA.
New Phase 3 Kernel

Bill Joy, Sun staff and AT&T are currently designing a completely new Unix kernel. This work is being done here in California. (phase 3 above).

The new kernel will be implemented in C++ not C.
This is to exploit the information hiding properties of C++because C is not good enough in this respect (said Joy).

The new kernel will include support for multi-processor machines, concurrency, distributed Unix systems etc

From outset new kernel will be/include:
   Secure (in the military sense)
   Real time
   Transaction processing and data base support
   Fault tolerance
   Very large multi user systems (ie big mainframe performance ok)

The whole aim of this exercise is for ATT and Sun to make Unix the dominant operating system for the 90s.

The new kernel design will be optimised for the Sparc architecture and will be targetted to run on everything from a lap top to a CRAY type supercomputer.

NFS and RFS will both be dropped in phase 3 re-implementation for something completely new.

The new kernel will have a completely new I/O architecture to cope with concurrency etc.

Joy said this not a research project, but product development. The designers will learn from existing work done in universities on distributed, concurrent systems etc. Joy didn't mention any by name but presumably he was talking about Mach, Newcastle Connection and Locus as will as multi-processor, shared memory systems (Dana, Dragon, etc.)

The new kernel is being designed by Joy (and ATT); they will get it
reviewed by outside experts; then it will be published. Joy will not
submit the new kernel to any standards process until after it has been
released as a product, nor will he let other vendors take part in the
re-design of kernel (because committees will take too long etc he said,
but it was clear that this kernel re-implementation is his current
passion in life).

Interestingly Joy said that the contract between Sun and ATT means that
ATT has the final say in all matters ie it is ATT that will have the
final shot in any dispute about the design (so Joy does not have complete
control).

4. APPENDIX

X.11 & NeWS

Here is some more information about the NeWS/X merge. It comes from David
Rosenthal of Sun who is the driving force behind NeWS.

There has been some discussion recently of the need to extend X11 to
support   documentation graphics''.   I believe that what people need is,
in effect,   access to both the X11 and the PostScript (TM Adobe Systems)
language imaging models.

The implications of the recent deal between Sun and AT&T are relevant to
this debate. As part of the deal, Sun will be supplying to AT&T, and
AT&T including in their Unix source licensing program, a merged server
supporting both X11 and NeWS protocols. If you are a Unix licensee, you
will be getting this code as part of the normal AT&T source
distributions, and it will, therefore, be a part of "standard Unix".
No license with Sun will be required.

Robin Schaufler will discuss the details of the implementation of the
merged server at the X conference at MIT in January. Briefly, it will
support:
        - Vanilla X11 clients
        - Vanilla NeWS clients
        - A single window tree accessible to both
        - A single event distribution mechanism accessible to both
        - The use of PostScript programs and operators to image onto X11
          windows.

The C source code will include:

        - X11 protocol interpreter
        - PostScript language interpreter, with NeWS extensions
        - Window tree and event management core shared by both
        - A complete implementation of the high-performance imaging library
          that supports them both, for memory framebuffers. (This is an
          improved version of the imaging library that currently supports the
          NeWS product)

The intention behind this arrangement is to ensure that those who need the PostScript language imaging model will have it available. There will be no reason not to support this capability for those who are Unix licensees, since they will be getting it, already integrated with X11, as part of their Unix source distribution. Almost all significant companies in the computer industry are Unix licensees.

I hope that this will reassure those who need "documentation graphics" that the X11 servers they talk to are likely to support the capabilities they need, and that there is no need to design new extensions to address this area.

Miscellany

1. Can plug PC/AT board into VME bus on Sun and use PC/Dos in a Sun window.

2. CASE (computer aided software engineering) new product to be called NSE for network software engineering. Mid 88 for NSE network software engineering product.

3. X.11 is due out in 6-9 months from now. NeWS is available now.

4. Thinking Machines have built a 36 drive unit (5 1/4" disks) operating as one big parallel disk drive to get i/o performance up (said Joy).