

SURPRISES WITH SCO UNIX/386

BY SIMSON L. GARFINKEL

It's really hard to write good software, and the people at The Santa Cruz Operation have earned a well-deserved reputation for their excellent ports of Unix software to industry-standard 286 and 386 platforms. When I heard that SCO was offering AT&T Unix System V release 3.2, it was enough to convince me to replace my old 286 box with an AST Premium 386C computer so I could run the new operating system.

I was in for a lot of surprises.

For nearly two months I've wrestled with SCO's System V/386 release 3.2. The verdict from the front lines is that while the operating system may be a good product for Unix system hackers or product developers, it is not yet ready for the general Unix community.

Unix System V/386 is real Unix on a PC. It is also real System V, which I don't like because it is filled with many arbitrary restrictions. Niceties such as file names longer than 14 characters, symbolic links, and job control are missing or only partially implemented in the current release, 3.2. AT&T plans to incorporate these and other features from Berkeley Unix in its release 4.0. SCO plans to have them in 3.2 by the second half of 1990, according to David R. Bernstein, SCO's manager of Unix product marketing.

INSTALLATION IS LESS THAN SMOOTH

My first surprise with Unix System V/386 was its size: the operating system comes on 29 1.2-Mbyte floppy disks. This takes up 73.5 Mbytes of hard drive, including swap space — and that's without application software.

When I started, I already had a 30-Mbyte DOS partition on my 210-Mbyte SCSI hard disk. SCO's installation procedure was very careful to prevent me from overwriting it. I patiently fed my computer the disks as they were requested. Then came a media error on disk B6 — I had a bad distribution disk. I continued the installation anyway to see what would happen. The install program crashed in a few minutes because I was missing important files (on disk B6) that are required to set up a password for the root user. Without a password for root, I was locked out of my new Unix system.

In two days I received a good B6 disk from SCO. But when I tried to reinstall V/386 — Surprise! — the boot program discovered a valid Unix operating system on the hard disk and tried to run it. Unfortunately, it was the Unix operating system I had made but couldn't use.

I couldn't find any instructions on what to do in this situation, even from SCO's technical support. I was finally reduced to deleting the Unix partition and starting over. But you need Unix to delete Unix partitions. The only way I could find to salvage my hard disk was to perform a low-level format.

With the new B6 disk and the newly formatted hard disk, the installation went smoothly until I tried to log in. My version

of Unix, determined by the serial number and activation key, was set up to support only two users at a time. But the initialization file started login programs for 12 terminals: instant lock-out. I called SCO and got a new number and key that solved my problem.

A FAST OPERATING SYSTEM

This Unix is *fast*.

Being a true 386 operating system, Unix, unlike 16-bit DOS, lets my computer run at its full speed. By virtue of being Unix, it lets me take advantage of more than 15 years of operating system technology, such as posted disk writes, streams support, and some exceptionally powerful (and efficient) programmer's tools.

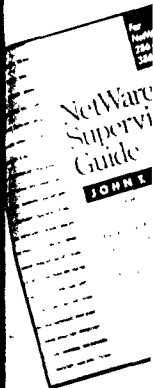
SCO has added a lot of functionality to AT&T's vanilla Unix. First is SCO's "multiscreen" system, which turns my keyboard and console into 12 virtual terminals. Simply by pressing Alt with a function key, I switch to another virtual terminal with its own login: prompt. Multiscreen is not a window system, but I have a dozen 80 × 25 terminals at my instant disposal. And they are all very fast, thanks to SCO's amazing screen I/O drivers.

C2-level security is another feature SCO has brought to System V/386 release 3.2. "We believe security is not an add-on; it is an integral part of the system," says Bernstein, adding that B1 security, with access control lists and mandatory access control parameters, will be available sometime this year.

SCO has made it very easy to relink the Unix kernel and add new device drivers. For example, you only have to type `mkdev streams`, and the streams package is automatically compiled and linked into the kernel, and the new kernel is ready to boot.

But my favorite SCO enhancement to Unix is native support of DOS file systems. The kernel implements a file system switch that allows non-Unix file systems (such as networks and write-once optical disks) to be linked into the Unix kernel and accessed transparently. A DOS switch lets me mount my entire DOS partition. I like this much better than the DOS disk utilities because the

SCO Unix System
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for PCs,
but it's still
buggy



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switch allows Unix programs to access DOS files transparently. The DOS utilities are still available if you want them. The only bug I have found with the DOS file system is that 'sh' does not do wild-card matching, although 'csh' does it just fine.

SYSTEM V LACKS JOB CONTROL

Berkeley Unix has the ability to suspend the process that you are running and return control to the shell, restart a suspended process, or start up a new pro-

cess, but there is apparently no way to restart it. Furthermore, the console is left in raw mode with echo turned off. When I discussed the problem on the phone with SCO, I was told to type `Ctrl-J stty saneCtrl-J` to restore the console (which it did). But this command is neither elegant nor intuitive, which means that it is a potential problem for non-gurus.

SECURITY CAN BE DANGEROUS

A friend at Wang Laboratories described C2 security under Unix as "running with a loaded gun pointed at your head." For example, if the system discovers that an unauthorized change has been made to the password file, it will assume that the system has been compromised and not let anybody log in.

Editing the password file, changing a user's login shell, and other functions must be done through the new system administration shell, 'sysadmsh'. Unfortunately, 'sysadmsh' sometimes leaves the trusted computing base files inconsistent with the password and group files. I didn't believe my friend until I tried to add a new account to my system on the morning I was finishing this review. I got messages telling me the file control database was inconsistent.

I've scanned the documentation, but I can't figure out how to rebuild the database to restore consistency. And since I can't edit the files by hand without shutting myself out, I'm effectively barred from adding new users (or changing existing ones) on my system, now that the 'tcb' is corrupted.

TWO COMPILERS FOR FLEXIBILITY

The Unix/386 development system comes with two C compilers: Microsoft's compiler (named 'cc') and the AT&T System V compiler (named 'rcc').

The Microsoft compiler generates Xenix-format object files that are automatically converted to Unix COFF (Common Object Format Files) through a program called 'cvtomf'. There are several bugs in the included 'cvtomf' that prevent it from converting large object files with debugging information. However, SCO was happy to send me a fixed version of 'cvtomf'.

I used both cc and rcc to compile the Free Software Foundation's programmer's editor, 'gnuemacs', and the FSF's C compiler, 'gcc'. Generally, rcc emitted code that was smaller and faster than cc. (gcc's code was smaller and faster yet. Unfortunately, since gcc requires include files in order to operate, you must pur-

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cess. The only limit on the number of processes is the system-wide process limit. System V doesn't provide this. Instead SCO implements a travesty of process control abstraction called the Shell Layer Manager ('shl'), which allows the user to spawn multiple shells; each shell, in turn, is used to run a single user program.

The maximum number of shells that 'shl' can control at one time is a constant built into the 'shl' device driver, which you must build into the kernel. The default is six, but you can change that and rebuild the driver. A further problem, for me anyway, is that the default 'switch' character is NULL (Ctrl-@ or ASCII 0). Although SCO's documentation claims that setting the 'switch' character to NULL makes the kernel recognize Ctrl-Z, that doesn't work. I recommend using multi-screens rather than 'shl'.

If you type Ctrl-@ while in 'vi' and 'shl' is not installed, the kernel will suspend

Support for System V/386

If you want to ask SCO for technical support after you've gotten your Unix up and running, be warned that you'll have to pay for it.

"We sell our software through a network of distributors, resellers, and VARS," says Jeff Hill, SCO's manager of services marketing. "One of the things that we feel is very important is that the resellers and VARS who sell our software to end users provide the front line of support. Therefore, we require them to take training from us and obtain priority support contracts with us, and our first priority in providing support is to support a reseller."

SCO gives warranty support for the first 30 days after an end user registers a software product. At 30 days, a user can purchase SCO's SoftCare technical support or pay \$100 for each question asked (SCO takes credit card numbers over the telephone). The annual SoftCare fees for the V/386 and the development system are \$475 and \$575, respectively, more than 50 percent of the list prices of \$895 and \$995. SoftCare includes a subscription to SCO's bimonthly magazine *Discover*, a 25 percent discount on updates, and a 20 percent discount on training.

There's no charge to call SCO and report a bug, but SCO decides what is a bug and what isn't. Straight bug fixes are provided free, says Hill, in the form of Support Level Supplements. Depending on how serious the bug is, "there have been instances in the past when we have issued complete new releases at no charge." New releases are publicized on SCO's electronic bulletin board, in *Discover*, and posted to usenet.

FLASHDISK

FAST. With an access speed of *240 nanoseconds* and a data transfer rate of 2048 kilobytes per second, FLASHDISK can boot up your software in a flash.

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FLASHDISK can be removed and returned to a system without data loss or corruption.

ROWS. (Read Often Write Seldom) describes FLASHDISK which is perfect for software programs and data bases that are read intensive and may require occasional updating but need to be safe from system crashes. Write Seldom is descriptive because the write times are 1 megabyte per minute, and the chips have only been tested from one hundred thousand to one million rewrites without failure.

EASY. Any IBM compatible 16 bit computer can use a FLASHDISK. Installation is simple and no new commands must be learned because FLASHDISK uses *standard DOS commands*. The only exception is that once data is intentionally deleted, it is truly erased.

PRICE. FLASHDISK's retail price is \$1500.00 for a 2 megabyte unit, \$2700.00 for a 4 megabyte unit, and \$4900.00 for an 8 megabyte unit; each unit comes with a one year warranty.

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PROVING GROUND

chase SCO's development system to run gcc.) Both compilers that came with the system appear to be solid and reliable. But the Microsoft compiler has limited macro expansion space, which means that cc will fail on some large macros where gcc will not.

One hidden surprise is in AT&T's new 'include' files, where a number of symbols are defined that break with established convention. One example is that the symbol FFS is now defined in param.h. Any program that includes param.h and uses the symbol FFS will fail, as two programs that I ported did.

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Another surprise awaits you in the installation procedure. If you should use the 'custom' program to remove the development system and then attempt to reinstall it, one of the file permission lists is silently deleted. According to SCO, this problem was known at release time, but the company decided to ship anyway.

VP/ix

Although Unix is a 32-bit multitasking operating system, there are many DOS applications that are far more sophisticated (and cheaper) than anything Unix has to offer. I regularly use some of these programs — a word processor, an accounting package, and a powerful spreadsheet. VP/ix lets me run DOS programs from within Unix.

Exploring XSight and Motif

In January, SCO began shipping Open DeskTop, its graphical Unix environment that incorporates the MIT X11 Window System. ODT includes Motif, an X-based toolkit and window manager developed by the Open Software Foundation. Motif also provides a desktop metaphor for launching applications and a file manager. The whole package runs on Hercules, EGA, and VGA video adapters; SCO is currently planning to add support for high-resolution adapters. Installation of X, which SCO also calls XSight, is relatively straightforward. Simply typing `startx` runs the window system.

I evaluated the beta release of XSight 2.0. A lot of bugs were present, although I'm told that the deliverable version will run better. The window system would frequently freeze up for no apparent reason. Its `xterm TERMCAP` entries were incomplete. This early version of X also made many errors in handling inverted text on my Hercules display.

For those who are used to the X Window System, the Motif defaults may be distracting and uncomfortable. In traditional X, a window is activated simply by moving the mouse into it; with the Motif defaults, you have to click the mouse on the window before typing there — which has the side effect of raising the window. I finally found out how to change this, but the configuration files can be a nightmare for the novice. Motif also adds a thick border around the X terminal (also configurable), which eats up valuable screen real estate. Since the DOS simulator `VP/ix` runs under `xterm`, rather than creating its own X window, the `Alt` and function keys were not properly handled.

The real problem with ODT, however, is that 720×350 or even 800×600 pixels is just not enough for a window system that was developed for displays of 1024×1024 and up. X isn't useful until you can have several X windows on the screen at a time, each one doing something different. This is a problem that will be solved only with higher-resolution adapters.

`VP/ix` uses virtual 8086 machines. Each machine is set up with 640 Kbytes of RAM and supports a maximum of 2 Mbytes of EMS-style memory. `VP/ix` creates a redirector, which intercepts all DOS I/O calls and maps them to the appropriate Unix calls. This way the DOS applications have full access to all the Unix devices, including files. Multiscreens allow you to run multiple DOS applications simultaneously. You can even run a DOS application over a modem line.

Thanks to the environment variable, `DOSPATH`, you can run a DOS application simply by typing its name, without having to run `VP/ix` first. `VP/ix` version 1.2 will allow users to have DOS as a login shell, bypassing Unix entirely. It's truly an impressive product. I reviewed `VP/ix` versions 1.1.1 and 1.2.

I had a little trouble with the installation. `VP/ix` is a Xenix application, not Unix, and its tests for the 'terminf' and 'csh' packages failed even though the products were properly installed. When the installation script attempted to add new Xenix users, the program went into

an infinite loop (it's a bug in a shell script). The program for manually administering `VP/ix` ran fine, however.

There was a bug in the `VP/ix` redirector that prevented one of my applications, `XyWrite III Plus`, from running properly. SCO ships `VP/ix` with a list of programs that have been tested with it and are known to work. If you are interested in `VP/ix`, you should consult the list before purchasing the product.

There is also a bug in `VP/ix`'s support of the Hercules graphics adapter. Exiting `VP/ix` leaves the screen in a funny state that must be reset with the `vidi m80x25` command. `VP/ix` can be run in an `xterm` X window, but the support is very flaky. The `xterm` appears as a serial terminal to `VP/ix`, not as a PC keyboard and screen.

While I have found several bugs in `V/386`, I should say that SCO has been eager to hear of them and provide fixes.


Documentation is up to SCO's high standards, although the complete set took up two of my bookshelves. Because of the bulk of the documentation, it is often

difficult to find what you are looking for. A permuted index helps somewhat, but it doesn't cover all the books. There are a few features not documented at all — for example, the file-system switch and the SCSI driver. "We are making this a new chapter in our Device Driver Writer's Guide," says Bernstein. "For now it is still a guru issue."

STILL ROUGH AROUND THE EDGES

SCO's Xenix earned the company the reputation of being able to produce a turnkey Unix-like operating system. "Xenix was a very mature product that realized ease of use, compactness, and performance . . . by not rushing to follow the latest AT&T release every 10 or 12 months," says Bernstein. "We were heavily pressed by the market to push out SCO Unix 3.2, and I think it shows a little around the edges, to be quite frank, but it is still far above the other relatively naked Unix versions out there." It's also worth noting that other users of Unix System V release 3.2 have not reported as many problems as I found.

Although I await release 4.0, many of the features I want may be available in SCO release 3.2 later this year. SCO says it will address each and every feature in 4.0 in its release 3.2. "In the second half of 1990," says Bernstein, "we will have a release that addresses 4.0 features, including symbolic links and long names. We will also have an evaluated B1 secure revision."

In its present state, however, `V/386` is really usable only by people who have detailed Unix experience and are willing to put up with the trials and tribulations of the first release of a new operating system revision. 

— *Simson L. Garfinkel is a freelance writer and computer consultant in Cambridge, MA.*

PRODUCT INFORMATION

SCO Unix System V/386
Operating system, \$895
Developer's kit, \$995

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