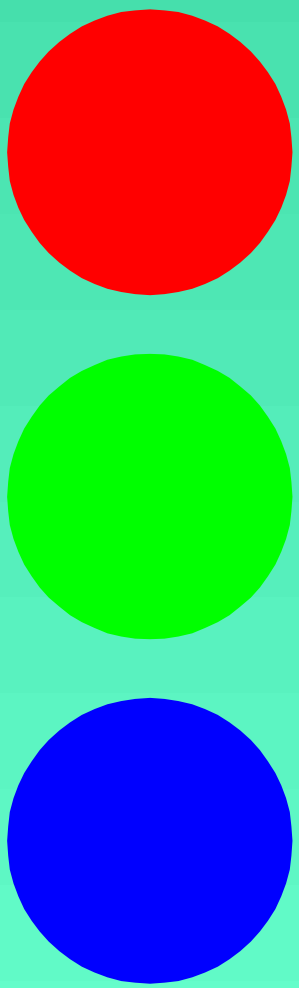
November 1993 Volume 1 Number 1

Meta



linus torvalds

wiring the backwoods

inchoate millenium

Meta

November 1993—Volume 1, Number 1

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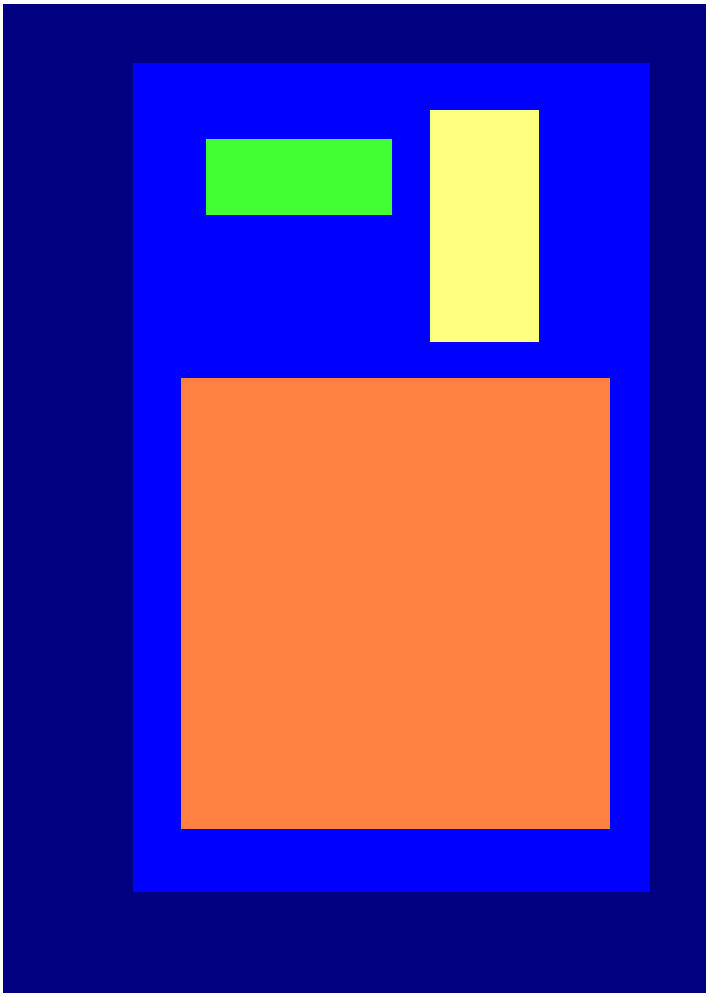
From the Publisher



Why *Meta*?

Meta is one of those word-roots that few people have a firm grasp of, yet it seems vaguely cool, so everyone abuses it. Consider all the buzzwords, companies and products with *Meta* in their names: "Metanoia," "Metaware" and Windows "Metafiles," to name only three. Now, whenever you see one of these, you will be reminded of this magazine.

Why *Meta*?

The idea of publishing *Meta* came to me in March of this year. It was a simple and obvious idea: a high-quality, freely redistributable periodical in electronic format, with paid writers to ensure quality, and revenues generated from advertising. So simple, so obvious, and yet it hadn't already been done. But then, the factors that permit a magazine like *Meta* have only appeared very recently:

- A portable document format. ASCII, of course, can be considered a "portable document format," but I couldn't see including line-printer style artwork for advertisers. PostScript has been around for years, but only recently have PostScript printers become affordable. More important, freely available PostScript interpreters and viewers have become available, most notably GhostScript and GhostView—now anyone can view these files with only a minimal time investment.

As useful as GhostScript and GhostView are, they are also large, sluggish and amount to little more than page-turners. New software that is specifically designed for viewing electronic documents offers improvements on all three counts. You may be reading this in Farallon's Replica, one of these electronic document software packages. Common Ground is another electronic document package. *Meta* should appear in No Hands Software's Common Ground format in December, if No Hands releases Common Ground for MS-Windows on schedule. Acrobat,

Adobe's much-touted document format, is more sophisticated than Replica or Common Ground. However, Adobe's viewing program isn't freely redistributable, so making *Meta* available as an Acrobat document is a fairly low priority at the moment. Still, expect to see an Acrobat version of *Meta* sometime next year.

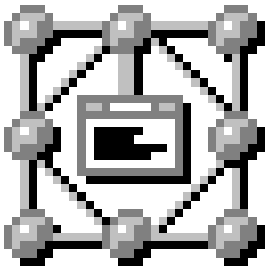
- A suitable method of distribution. Disk magazines have been tried, but were never very successful. If you are going to ship a periodical through the mail, why not use paper and forget the limitations of the digital format? Until recently, modems were not fast enough and there were not enough people on the Internet to make distribution via purely electronic means viable. Now that fast modems are ubiquitous and millions of people are on the Internet, electronic distribution can become a reality.
- A large audience. To interest advertisers, a periodical needs a large or highly targeted audience, but the audience for an electronic magazine has been very limited up to this point. But again, with millions of people on the Internet and with fast modems, most of whom can view electronic documents, the potential audience for an electronic magazine has finally become large enough, and growing very fast.
- Someone with the vision (ha), capital (ha, ha), and diligence (ha, ha, ha) to pull it off. That's me.

It does not take an econometrics Ph.D. to figure out that electronic publishing is going to explode over the next few years. The traditional publishers don't yet understand the technology or the Internet and don't have the vision, so right now, net-aware entrepreneurs have a unique opportunity.

Of course, the novelty of electronic publishing wears off very quickly. The rules have changed, albeit very slightly. Content is still all-important. So what is *Meta* really about?

Meta is aimed squarely at the net community. It focuses on issues and stories that are of particular interest to everyone on the Internet, especially issues that are underreported or misrepresented

S O O N



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by the mainstream media, such as cryptography, electronic publishing, free software development, intellectual property, Internet commercialization and privacy.

This issue focuses on free software development. We interview Linus Torvalds, the primary developer behind what is probably the fastest-growing operating system today: Linux. Linux is a freely redistributable, full-featured and viable Unix for the ’386 and compatibles, developed in a very decentralized manner by volunteers.

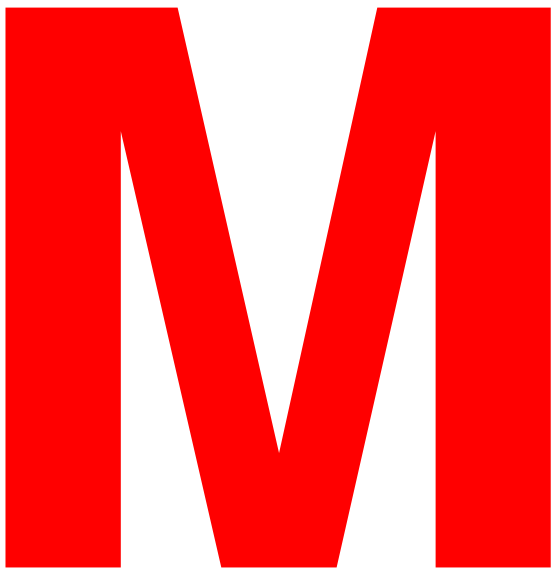
Like *Meta*, Linux probably could not have existed a few years ago, because the factors that made it possible came into being only recently. The future looks bright!

Oh, welcome to the first issue of Meta. I hope you enjoy it, but whatever the case, your feedback is appreciated.

You can be of particular help in two ways: fill out the reader survey on the last page, and—most of all—support the advertisers!

Till next month,

Mike Linksvayer
Editor and Publisher, *Meta*



news

Cryptography and its applications have been in the news frequently in recent months and there does not look to be any sign of a letup. The Clinton Administration has proposed a National Security Agency (NSA) designed algorithm called Skipjack for general usage. The problem with Skipjack is that the algorithm has not been published (and could have backdoors) and that all users would be required to keep their key in a government escrow. That means your privacy is secure from everyone but the NSA and the US government and anyone they decide needs to know—probably just the people you want to protect your privacy from. ◆◆ ViaCrypt, Inc. (70304.41@compuserve.com, 1-602-944-0773) has released a commercial version of Pretty Good Protection (PGP), a public-key encryption package. You can get PGP for free from the net, but if you are concerned about legality you may wish to purchase ViaCrypt PGP. ◆◆ Meanwhile, Phil Zimmermann, author of the freeware PGP, is being investigated by the U.S. government for violating cryptography export regulations. ◆◆ Specialized processors costing about $1 million have been developed which can break a DES (a widely used encryption algorithm) key in a day. This is not the threat that some of the more paranoid net citizens have taken it to be: the hardware is still far too slow and expensive to be used in anything but the most selective cases, and "triple-DES," which is virtually impossible to decrypt with today's technology, can be used when needed. ◆◆ Cypherpunks (cypherpunks-request@toad.com), a mailing list for crypto-activists, is considering requiring that messages sent to the list be signed digitally, in hopes of jump-starting the use of digital signatures. ◆◆ A project that may be of interest to many net denizens is Oceania (oceania@world.std.com). This planned ocean platform and new country with a libertarianesque constitution may provide a place where high-tech entrepreneurs that can conduct their business offshore may live free of established governments. However, there are many doubts about Oceania's economic, military and political viability. Oceania organizers did not impress anyone when they put hundreds of unsuspecting people on an

unmoderated Internet mailing list. For several days, everyone so unlucky to find themselves on the "new.country" list was bombarded by "How do I get off this list?" messages. ◆◆ Hurd, an operating system that has been under development for several years at the Free Software Foundation, is apparently finally ready to accept a select few outside volunteer developers. ◆◆ Other freeware operating systems are developing rapidly. Wine, a package that will allow MS-Windows binaries to run under Linux, is under development. Windows Solitaire is reportedly barely playable under Wine, but a useful product is not expected for a year. Others are working to ensure that Wine will also run under NetBSD. ◆◆ Version 1.0 of Wabi, a commercial package developed by Sun to run MS-Windows binaries under various commercial Unixes was released recently, and is reportedly very buggy. ◆◆ A "production" version 1.0 of FreeBSD was released November 1. ◆◆ XFree86 2.0, a freeware X-Windows for several versions of Intel-based Unix and Unix-like operating systems, was released October 31, with improved speed, support for more hardware and better documentation. ◆◆ A well-known developer of Unix spreadsheets is apparently interested in porting their commercial product to Linux. ◆◆ Although the V.34 (formerly "V.fast") high-speed modem standard hasn't been finalized yet, Microcom and Hayes have released 28.8kbps modems at $499 and $599 respectively. ◆◆ There hasn't been a new issue of *Mondo 2000* in months, but at least one new publication is looking to fill that "void." The premier issue of *Axcess*, a self-described "visual and mental trip through the information age" looks and feels exactly like *Mondo*. If you care to read another interview with Ice-T, *Axcess* has that. **M**

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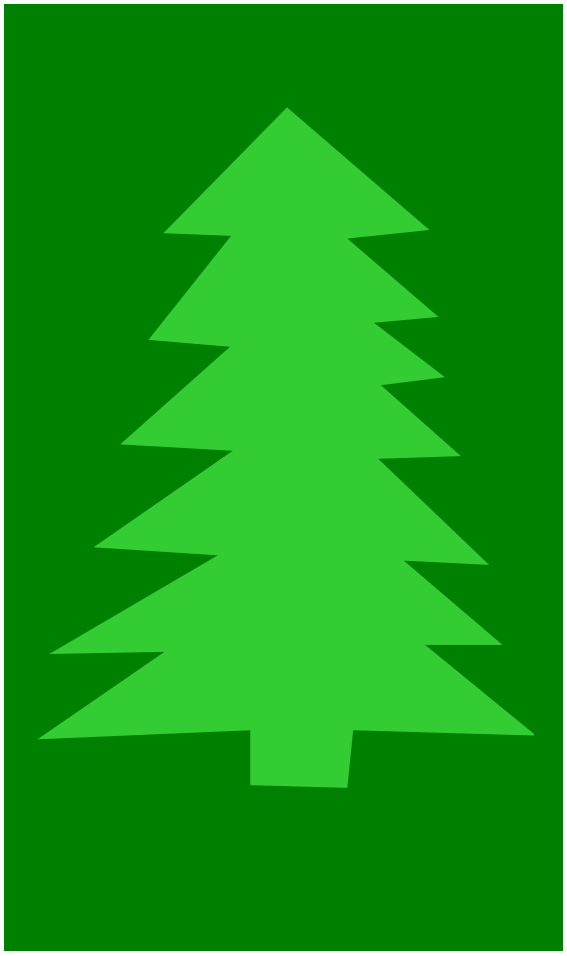
talk

Like the articles you'd find in a USENET talk.* newsgroup, the observations and reviews in this section of *Meta* represent the opinions of their authors and everyone who agrees. You should probably adopt these opinions.

Wiring the Backwoods

by R. David Murray

There are considerably more rural and impoverished places than Keene, New Hampshire. But Keene is not New York, nor is it Philadelphia. It isn't even Springfield, Massachusets, the nearest city with an Internet provider point of presence.



Moving from Philadelphia to Keene was like moving from the Outer Beyond of Vernor Vinge's *A Fire Upon the Deep* into the Slow Zone. 2400bps is the fastest it gets, and when I arrived the only way to get an account reachable by a local phone call was to either be a student at Keene State College, or work there.

I chose the latter.

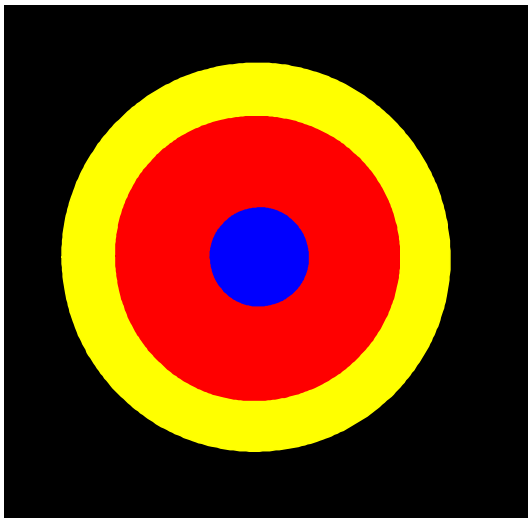
The absence of a full service Internet node in Keene could have meant one of two things: either there was a market opportunity there, or there wasn't. To my relief, I made my move at just the right time: demand for Internet services has just reached critical mass. It's kind of like being a catalyst dropped into a supersaturated solution.

There are two conflicting philosophies slugging it out for control of networking in Keene.

One faction believes there is a moral duty to bring networking to Main Street America, that Keene should make itself a showcase and through government funding, bring networking to the masses at a "socially conscious" price. The other faction just wants to get connected.

This industry moves fast. Government funding agencies tend to move slow. A funded node might get its act together by some time next year. Companies interested in getting connected *now* could have the technology in place by the end of this year. And the World, a Boston based service providing Internet accounts to the general public, has demonstrated that low-cost access for the individual (access at a lower price per month than cable TV) is profitable.

In my mind there is no doubt that it will be the profit-driven companies that will wire the backwoods. I actually live not in Keene, but in a small town nearby. Six months ago cable finally made it to my house. Soon, I'm going to have an Internet link to my home office. Even if I have to start the company that will provide it. **M**



3DOA by Mike Linksvayer

Is 3DO destined to be a mere footnote in the history of consumer electronics? Probably, but largely not due to its obvious competitors.

Nintendo and Sega aren't in 3DO's class when it comes to price (less than $100 versus $700), or performance—this year.
Philips' CD-I is seen as an also-ran, with good reason. Its performance as a game machine does not match its high price ($500), and its sales in the past year have been pathetic.

Commodore's CD32 is more capable and less pricey ($400) than CD-I. However, Commodore is a relatively small and troubled company, and CD32 is not being backed by anyone else of significance.

Atari's Jaguar may have the most impact on the sales of 3DO-licensed machines. Although the Jaguar does not have a built-in CD-ROM drive, it is relatively cheap ($250) and has spectacular graphics. However, Atari's

performance since it dominated the game market with the 2600 has been dismal. Atari's ability to market, distribute and attract developers to the Jaguar is in doubt.

If Atari, Commodore and Philips are not effective competition, then 3DO-licensees, with the high-end game market all to themselves, should sell many units, right? No. Three reasons:

- The market for $700 game consoles will be tight, competitors or not.
- By the time the price does come down, there will be *plenty* of competition.

Nintendo and Sega are working with SGI and Hitachi, respectively, on 64-bit game consoles. Sony recently announced that it is developing a high-end game machine, which it will back with its media empire. All three should be shipping in 1995.

- At $700, 3DO's real competition (other than cars, mortgages and vacations) has a twelve year running record of zero defeats and numerous knockouts. A formidable opponent indeed. Meet the PC.

A PC for $700? You bet. Take a look at 386SX system prices. Laugh if you must, but a $700 386SX is almost certainly more capable than what you bragged about five years ago.

3DO-licensed units and other high-end game consoles do have one advantage over PCs—the ability to create certain stunning visual effects, useful for arcade-style games. However, this is 3DO's only advantage (all other alleged capabilities are vaporware at this point), and stunning visual effects do not necessarily translate into games that are more enjoyable to play.

The PC's advantages are numerous: The ability to connect to online services, thousands of available (not to mention piratable) titles, also known as software, the ability to play complex and long-running games that are not possible on a game console, the ability to run a business, write letters and learn marketable skills.

These facts will not be lost on the average consumer. Numerous computer companies with models aimed at the home market, including Packard Bell, Tandy, Acer, IBM (PS/1), Compaq (Presario) and Apple (Performa) will be spending lots of money to make sure you don't forget. **M**

The Value of Advertising

by R. David Murray

O'Reilly and Associates has started a new network service: the Global Network Navigator; GNN for short. GNN is an on-line, hypertext magazine, and

includes a section called the GNN Marketplace. In this section companies may include information they think might be useful to potential customers. They pay for this privilege, and this allows O'Reilly and Associates to offer GNN as a free service to the Internet community.

I visited the GNN Marketplace, and was disappointed. There were only two real advertisers for one thing, but more important than that was the content. An article (I can only call it that) from ZCode software consisted, basically, of a well done tutorial and sales job for MIME. Well, I know what MIME is, and I pretty well know its advantages. The single glimpse of one ZCode product screen image was like a teaser. What I really wanted when I entered that marketplace was a more thorough presentation about ZCode's products (for example) than I could get from a magazine add or the glossy brochures returned in response to a reader service form.

NOT AN ADVERTISEMENT

Which lead me to reflect on why ZCode might think a tutorial/sales job on MIME was an appropriate "advertisement" to pay to include in the GNN Marketplace.

I wish various loud members of the Internet community would get off this "advertising is bad" kick. What you are looking for determines whether given advertising is useful or useless. In the same way, what you are looking for determines whether non-advertising information is useful or useless. The problem of "good advertising" from the consumer's point of view (finding out quality information about products you need when you need it) is no different from the other information discovery problems the Internet community has been grappling with for years. Let's stop lambasting advertising as some great evil, and start treating it as what it is: potentially valuable information.

That way we can work toward increasing its quality, both intrinsically, and by making it accessible when and only when the customer wants it. For the producers and for the consumers that will be, as is so often the case in the free market, a win-win situation. **M**

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The Linux CD-ROM
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A snapshot of the linux archive from tsx-11.mit.edu taken 20 September 1993. Includes kernel version 0.99.12. All files have been uncompressed and all tar files extracted. This disc will be updated at two (2) month intervals and will have additional material included as users suggest to us. It is in ISO-9660 format with Rock Ridge extensions.

Standards CD-ROM
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A comprehensive collection of domestic and international communications standards and documentation. ITU/CCITT networking, telecommunications and data communications standards including the ISO X series, ISDN, SS7 and modem character encoding. IEEE standards for POSIX and SCSI are also provided. Internet materials include the complete IEN's and RFC's (through July '93), Netinfo directories and templates, the Network Resource Guide, IETF & IESG minutes and charters, network maps and much more. Exclusive InfoMagic bonus: RFC's and Windows Sockets API documentation in HyperText for Microsoft Windows. ISO-9660 format.

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UNIX(tm) CD-ROM
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Complete sources and binaries for three public domain UNIX(tm) implementations for the 386/486. NetBSD & 386BSD are based on the Berkeley Net/2 tape and are supplied in uncompressed tar files. LINUX (version 0.99.10) is supplied in fully expanded form. All three systems include X-Windows and TCP/IP networking including client and Server NFS. ISO-9660 format with Rock Ridge extensions.

Source Code CD-ROM
$40.00

A wealth of source code including: The Berkeley Net/2 tape, MACH, GNU software, InterViews, X11R5 (base MIT distribution, fixes 1-25 and contributed software), Andrew windowing and XFree86, ports of GNU EMACS for DOS (DEMACS and WINEMACS), djgpp (DOS port of GNU GCC C/C++), Modula-3, Windows NT(tm) software and more. ISO-9660 with Rock Ridge extensions.

USENET CD-ROM
$20.00

Assorted archives of the USENET news groups, including the following comp.sources groups: misc, games, reviewed, sun, unix, x containing source code for UNIX(tm), Sun, and X-Windows. Also includes the FAQ (Frequently Asked Questions Lists) for many other groups. ISO-9660 format with Rock Ridge extensions.

Curl Up With an E-Book?

by Mike Linksvayer

I'm not easily impressed by CD-ROM products. Most are utterly worthless—they are so tedious that someone would have to pay me large sums to use them. But ClariNet Communications (the people who sell USENET feeds of NewsBytes and UPI) has put together a great value.

Electric Science Fiction is an anthology containing all of the science fiction works nominated for this year's Hugo Awards (five novels, numerous short stories and novellas and artwork), and much more, including but not limited to: fan art, fanzines, fan writing, rec.humor.funny archives and samples from the five Campbell Award nominees for best new writer.

According to the CD-liner, the original publishers' prices for everything on the CD that is available separately amount to over $230. ClariNet is selling ESF for $29.95.

That's great, but is it worthwhile to read novels on CD-ROM—or would someone have to pay me to go through the trouble? I have not read any of the novels in ESF (with the exception of *A Fire Upon the Deep* by Vernor Vinge, which I had previously read in paperback), but I did read all of the short stories and novelettes. The experience was surprisingly pleasurable. It is quite possible to curl up in a big chair and read from the monitor with a minimum of fuss. Occasionally pressing an arrow or PageDown key is the only movement required, and that really isn't any worse than turning pages.

I credit ESF's high readability to ClariNet's keeping with a simple design. The MS-Windows Help system is used as a browser (there is also a Macintosh version). Once you start reading, there are no superfluous on-screen buttons to push or needless layers to navigate. Multimedia is limited to very brief and tasteful video clips of authors introducing some of the stories.

A Fire Upon the Deep, which won the Hugo for best novel, is provided in a special hypertext version, with over 500k of author's notes. While this is nice information to have, fortunately it can be ignored when doing a normal reading.

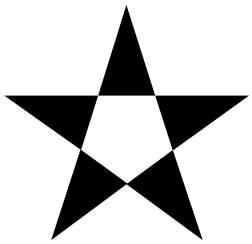
ESF is highly recommended reading for science fiction fans—and CD-ROM developers. For more information, send E-mail to info-sf@clarinet.com or call 1-800-USE-NETS. **M**

The Choice of a GNU Generation

Linus Torvalds, a computer science student at the University of Helsinki in his early twenties, took his first course on Unix and C in the Fall of 1990. In the Spring of 1991 Linus was running Minix (a small Unix-like operating system designed for teaching) at home on his new '386. What was to become Linux started in the Summer of 1991 as a basic protected mode system that evolved from a "Hello World" program into a terminal program. By October 1991 Linux 0.02 was announced to the world. In two years, through the hard work of Linus and many other people, Linux, currently at version 0.99, has become an extremely useful and popular operating system. The comp.os.linux.* hierarchy is among USENET's busiest and there are several companies selling Linux and providing professional support. All this in such a short time, yet Linux is available for free, and development has almost entirely been done by volunteers. *Meta* interviewed Linus via E-mail to probe his mind about Linux's future and the environment it is developing in. The results follow....

Meta: Do you agree that without the net to facilitate collaboration and a base of preexisting free software (e.g., the GNU tools), Linux would not be nearly as developed as it is?

Linus: No question about it. Without net access, the project would never have even gotten off the ground; having access to gcc and the other GNU tools was very important. I was also able to get in contact with some people like Bruce Evans (author of the Minix-386 patches and the 16-bit assembler that is still used to



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assemble the Linux 16-bit startup code), and we had some interesting discussions by E-mail.

Aside from getting me started, net access also kept the development going and accelerating: up to about version 0.12 or so, I wrote most of the code myself, but in the current kernel, only about 50% of the code is mine or very closely related to code written by me. The SCSI drivers, the networking code and the new floating-point emulator code is completely written by others.

Even when people haven't sent in patches or new code, just the fact that I've had access to a lot of testers has meant a lot for Linux development; they've found bugs I wouldn't have noticed myself, and have suggested features that I might not have otherwise cared for, but that have turned out to be very useful indeed. One extreme example is the memory manager: I originally implemented demand-loading and swapping to disk mostly because people who used the early versions of Linux thought it might be useful.

M: Probably the most frequent complaint about Linux is the lack of certain applications. With the net, free development tools and a free Unix with source code all in place, what do you think are the prospects for free end-user applications being developed in a similar decentralized manner?

L: While Linux has a very reasonable development environment and a lot of programmers that would potentially be able to write a good word processor or spreadsheet or whatever, there are some problems which make me doubtful that it will happen soon. Right now, I think there is a better chance of getting a word processor by being binary compatible with Windows or some "real" '386 Unix (both of which are being worked on).

The programs that have "made it" through a decentralized network development have usually had a few things in common:

(a) Somebody (usually one person) wrote the basic program to the state where it was already usable. The net community then takes over and refines and fixes problems, resulting in a much better program than the original, but the important part is to get it started (and channeling the development some way). The net works a bit like a committee: you'll need a few dedicated persons who do most of the stuff or nothing will get done.

(b) You need to have a project that many programmers feel is interesting: this does not seem to be the case with a lot of the application programs. A program like a word processor has no "glamour": it may be the program that most users would want to see, and most programmers would agree that it's not a simple thing to write, but I also think they find it a bit boring.

BSD—Another Free Unix

Linux is not the only free Unix. 386BSD, FreeBSD and NetBSD are all based on Berkeley Networking Release 2 (Net/2).

William and Lynn Jolitz developed 386BSD first, but due to conflicting visions and a closed development process, 386BSD has not been updated in a long time. The current release is 0.1.

FreeBSD and NetBSD are both based on 386BSD and are being actively developed in an open manner. FreeBSD and NetBSD are very similar, and may one day merge, but for now they have slightly different goals.

FreeBSD is closer to 386BSD than is NetBSD, and has stability on '386 and compatible systems as its primary goal. The current version of FreeBSD is 1.0, and it is available for ftp from freebsd.cdrom.com.

NetBSD is also a stable system, but it aims to support multiple hardware platforms and stay currrent with BSD 4.4 developments. NetBSD has been ported to several platforms, including the Amiga and HP300. 0.9 is the current version of NetBSD, available from agate.berkeley.edu.

In Europe, 386BSD, FreeBSD and NetBSD are all available at grasp.insa-lyon.fr.

I think it's entirely possible that the Linux community (or some other group of net.persons) will get a good word processor going, but while having net access helps some parts of development a lot, it's certainly not enough in itself.

M: Could you comment on the effort to make Linux binary compatible with "real" Unixes and speculate on the effect Linux is having on the Unix market, especially on Coherent and lower-tier System V vendors?

L: This one is hard for me to really say much about: I haven't been in contact with any real i386-Unix users, and have only once seen a Xenix system being run on a friend's machine (that one was converted to Linux, but that doesn't really count when I know him personally). I have gotten various mails and seen some newsgroup messages about persons who have switched over already or would like to switch over once Linux is able to run commercial binaries, but at least so far, I doubt Linux has dented the "real unix" market very much.

Coherent might have a bit more problems competing with Linux. While Coherent is commercial, it doesn't carry the same "real Unix" stamp as SCO and the other major PC Unix providers, so a potential Coherent user is also likely to chose Linux, if he has access to it. And the superior performance and features of Linux may well be (and has been in many cases) reason enough to chose Linux despite the reportedly good documentation and support of Coherent.

Being binary-compatible with SVR3 and SVR4 might change the picture a lot: it would make it possible to reasonably easily mix Linux machines into an existing machine park, and would make Linux much more viable in some situations. The current kernel can load ELF binaries, and COFF support is available as patches. The actual binary code emulation is still being worked on, but there seems to be no major obstacles. If the Wine project (running Windows binaries under Linux and X11) also works out, the picture changes again.

M: What is your opinion of 386BSD?

L: Actually, I have never even checked 386BSD out; when I started on Linux it wasn't available (although Bill Jolitz' series on it in *Dr. Dobbs' Journal* had started and were interesting), and when 386BSD finally came out, Linux was already in a state where it was so usable that I never really thought about switching. If 386BSD had been available when I started on Linux, Linux would probably never had happened.

I also have very limited computer resources (right now I have 160MB of disk space—the original Linux development was done in 40MB), so I haven't tried to set up 386BSD just to "see what the competition does." This means that I have only

followed the 386BSD discussion and development from the side. As far as I can tell, it's a good port of BSD that is plagued by some problems (mostly non-technical).

One of the major problems with 386BSD seems to be the lack of co-ordination: that may sound weird coming from the Linux background, but in fact the 386BSD project seems to suffer from a lot of people working on the same thing due to the long release cycle (I think there are *three* different and incompatible keyboard/console drivers for 386BSD). A long release cycle is the way to go in a controlled environment (i.e., commercial development), but I think it hurts the "free" development that results from a lot of unconnected persons having access to sources and doing lots of modification. The NetBSD project may be a step in the right direction, but I think 386BSD has been hurt by the way it has been developed.

Note that others that know more about the actual 386BSD development may disagree and think the Linux releases have been very chaotic (which is also true, but differently). Also, 386BSD has had different starting points and different goals, so any real comparison may not really be valid. In any case, I usually ignore Linux/386BSD comparisons: I've not let any 386BSD considerations change the way I work, but just done things the way I want them done and hoping it works out. I have gotten a few mails like "we're considering changing over to 386BSD, as Linux doesn't do..." but I refuse to be blackmailed by things like that. I've also gotten mails from people who have changed the other way, so it's obviously a matter of taste.

M: Some people, particularly Peter MacDonald of SLS, have been criticized for trying to make money on free software. What is your opinion of this?

L: The people who criticize Peter are usually persons who have written none of the kernel, or even user-level code, and I hope Peter (and others) just ignore the monetary issues raised by some. Peter not only has written code for Linux (he worked on the original pty and VC code, which was adapted by me, and he is still making suggestions and patches to the kernel), but the SLS release has been of immense value for the Linux community. SLS has its share of problems (which also get criticized), but there is no question about the fact that it was one of the things that made Linux really available for "Joe User."

The fact that others make money by selling Linux is something that I find mostly amusing, and something which does my ego no end of good. Frankly, I wouldn't want to bother personally, so if somebody else does it, it doesn't hurt me.

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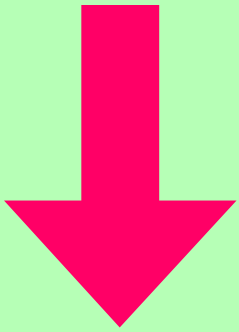

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It's also quite legal by the copyright, and so far I haven't seen any major developer stand up and say he doesn't like his code being sold, so I don't see the problem.

M: There seems to be a perception that Linux is very tied to the '386 architecture and would be very hard to port to others, yet there are apparently projects underway to port Linux to the Amiga and MIPS. What's the real story?

L: The early releases of Linux were indeed very tightly coupled to the '386, both with memory management and process handling. This is still somewhat true, but it has gotten a *lot* better in later versions. It's still the case that porting is very much non-trivial, but the 68k port is getting along (reportedly running some binaries already), and the first port to a new architecture is always the hardest one. I hope that I'll be able to correct the worst portability issues once I see what the biggest problems for the 68k port were. Currently I'm ignoring all but the grossest portability problems; I don't want to really work on it before I have something to go by.

Of course, porting Linux is never going to be easy as just doing a "make" on the new architecture: the drivers in particular usually have to be re-written mostly from scratch anyway, and memory management is another area that tends to need lots of work when moving from one processor to another. But I no longer think it's doomed to fail—back in the time of Linux 0.12 or so, I felt that porting Linux was essentially impossible.

M: What are your short- and long-term goals for Linux?

L: This is one of those questions I don't have an answer to. I hate to admit it, but Linux development has never had any real well-defined goals. Problems have been solved as they come up, and features have been added when somebody has been interested enough to write the code (and I've felt the result was "worthy").

There are naturally some short-term goals: things people have started on or things I'm not really happy with in the current kernel. The Windows emulator is one of these: it needed additional code to let the kernel handle multiple segment signal handlers etc., but I hope the kernel issues are resolved now. iBCS2 is still being worked on, and the memory management will need a few updates still in the near future. Getting the networking stable is a short-term goal as well — and has been for a long time.

The long-term goals are just general platitudes like "stability," "POSIX conformance" (which is pretty good already as far as POSIX.1 and POSIX.2 is concerned, but POSIX.4 might be interesting) and "portability"—the kind of words that would make any marketing division proud.

In fact, the main goal of Linux might be called "usability." I want the kernel to remain clean as far as the implementation is concerned, but when it really matters, a kind of pragmatic approach has generally been the main design issue: the most important thing is that it works well and people (which most emphatically includes me) want to use it. As an example, I've always wanted Linux to be POSIX, but that wasn't really as much a goal as a way to make porting user-level software easy. POSIX is just a small part of that—the POSIX standards don't really cover a lot of details that people expect from a Unix system.

M: When can we expect version 1.0 to be released, and what needs to be done to get to that point?

L: You don't expect a serious answer to this one, I hope? Frankly, I've wanted to make a 1.0 for a *long* time. Every now and then I get mail from Linux "old-timers" that reminisce about the times when Linux was at version 0.12. I said that it's so close to 1.0 that I'll rename it 0.95 (which I did: there never was anything between 0.12 and 0.95).

The main stumbling block right now is the networking. The rest of the kernel is in my opinion stable enough for a 1.0 release (and has been for some time—the rest of the kernel has also gotten better lately, but it's been "good enough" for several months). I still hope to get it out in a few months, but judging by past performance.... **M**

Where to Find Linux

Linux's home is nic.funet.fi. In the U.S., major sites include tsx-11.mit.edu and sunsite.unc.edu. For those without Internet access, a list of BBSes with Linux files is posted regularly to comp.os.linux.announce. There are also Linux user groups in some areas.

Another option is to purchase Linux on CD-ROM, disk or tape from a reseller. This is the preferred distribution for many people, as downloading a complete system could take days with a slow modem, and setting up a new system is not always a trivial task. You can find a few Linux resellers by examining the advertisements in this magazine.

Internet Services News

net

This section of *Meta* is dedicated to the coverage of Internet providers and online services. Each issue will have news about Internet services and profiles of Internet providers and services.

Netcom On-line Communications, in an attempt to expand beyond its California base, has installed local Points of Presence (POPs) in a number of non-California cities in recent months. What has raised the eyebrows of other service providers is that Netcom has been expanding into already highly competitive markets such as Boston, Washington DC, and the most recently announced POP, New York City. But some Netcom users have also been raising their eyebrows at increasing sluggishness and busy signals, spurring speculation as to whether Netcom is expanding too fast to adequately maintain its *current* POPs. ■■ Speaking of New York City, Panix was down (and made the mainstream media) for a few days early this month. Someone used Panix to run a "sniffer" program, which captured passwords from Panix telnet sessions. A large number of systems around the world may have been compromised. ■■ Prodigy will spend $6 million in the next six weeks in a national television campaign. 110 of the 280 planned commercials will be *live*, and related to the programs on which they air. Perhaps some of the Internet's technoshamen will channel some negative energy at Prodigy during one of the live commercials and cause it to crash. Nahhhhhh—shamen that powerful refuse to show off. ■■ At least three projects are underway to create advanced MUD-like environments on the Internet. Two of these projects are calling themselves "Virtual Cities." One of them, based in Urbana, Illinois and run by Objective Communications (busey@obj.com, 1-800-OBJ-COMM) will supposedly be running in a few weeks. The environment is said to be MUD-like, although an Objective representative claims that all coding was done by Objective from the ground up. Like the other two projects mentioned here, Objective will be selling

virtual office spaces within their Virtual City. The Objective Virtual City will be text-based, although specialized Mac and PC clients are planned for next year. ■■ The other project claiming the name Virtual City (this one claims to have trademarked the name) is being developed by the Virtual City Network (vc@virtual.net). This Virtual City will be based on LambdaMOO. Unlike Objective's service, the Virtual City Network will be free to access for individuals and has been designed for multimedia from the ground up. Virtual City Network developers are planning to have a basic system running by the beginning of next year for a Virtual New Years' Party. ■■ The only one of these systems currently running is Illuminati Online (io.com). Illuminati Online includes a MOO called "metaverse" in which a few organizations and companies have already set up offices. Steve Jackson, who started Illuminati Online after recovering from a Secret Service raid that shut his company down (he was cleared of all charges), describes the service as "a WELL for gamers." ■■ JS McBride & Company (listinfo@netmail.com, 1-415-949-4295) is creating an Internet "white pages" directory of names and email addresses. Apparently names and addresses will only be included in the directory if permission is given to do so. ■■ Extropians (extropians-request@extropy.org), a mailing list dedicated to topics ranging from anarchocapitalism to uploading, is in the process of instituting list fees. **M**

How Big are Internet Service Providers?

Small, by comparison to traditional on-line services such as CompuServe and Prodigy. Netcom (netcom.com) and World (world.std.com), two of the largest services that offer Internet access and Unix shells, have close to 10,000 and 7,000 accounts respectively. According to recent reports, the largest traditional services are CompuServe (1.4 million accounts), Prodigy (950,000), America On-Line (450,000), GEnie (400,000) and Delphi (70,000). Of these five, only Delphi offers full Internet connectivity, while all but Prodigy offer Internet email. HoloNet, a smaller service that offers Internet connectivity and no Unix shell, only has a few thousand accounts.

Most smaller internet service providers have customers that are not reflected in the number of accounts statistic. Many services prodvide email and Usenet feeds to companies, BBSes and individuals who may not have regular accounts.

(continued next page)

The Voting of Reality (LambdaMOO)

by R. David Murray

Multimedia interfaces to fancy virtual realities present interesting challenges for researchers and developers. But right now the text based virtual realities are grappling with an equally (or more) important aspect of virtual realities: the social dimension.

Take LambdaMOO, for example. LambdaMOO is the MOO developed and maintained by Pavel Curtis (and others) at the Xerox Palo Alto Research Center. The technology developed at PARC has significantly transformed the world of text based virtual realities, improving it in significant ways. But just as important, LambdaMOO itself is being run as an experiment in social dynamics and electronic democracy.

LambdaMOO used to be run by the "wizards," the people who had the keys to the code and could enforce their will upon the virtual world. At LambdaMOO, the wizards have renounced their right to rule. Instead, LambdaMOO is being run as an electronic democracy. It has a system of petitions and votes to decide the "laws of the land," and a system of arbitration to decide cases of conflict. The wizards are pledged to implement the will of the community whenever practical. (This

(continued from previous page)

Help us find out...

Unlike the large traditional on-line services, many internet service providers are not very forthcoming about the number of accounts on their system. Fortunately collecting this information is simple for any user with a shell account on most Unix-based systems. Enter the command:

```
wc -l /etc/passwd
```

This returns the number of lines in the system's /etc/passwd file, which should approximately correspond to the number of accounts on the system. Actual passwords are encrypted, so executing this command is not a security risk. If the number returned is very small, the system may actually be a network of computers, in which case you will have to use a different command to count the lines in the main password file:

```
ypcat passwd | wc -l
```

Please try these commands, and help *Meta* build a better picture of the internet service provider market by sending your results to:

internet-count@bitdance.mv.com

applies to social mechanisms only, of course. Technical issues, of neccesity, remain in the hands of the wizards.)

The LambdaMOO petition process in brief:

Any character that isn't a wizard, a guest, or a "second character," and who has been in existence for at least thirty days, can vote on petitions or submit a petition to the community. A character can have at most one petition at a time. Each petition also gets a mailing list the community will use to discuss the petition. If a petition can get the signatures of at least 10 other voters within 14 days, then the wizards will take a look at it. They can send it back for rewrite if it isn't precise enough, and can reject it if they can't see any reasonable way to implement it, or if it would violate the technical integrity of the MOO, or if it would bring the wizards into conflict with 'real-world' laws or regulations.

If the wizards don't reject the petiton, the submitter gets to collect more signatures. This time 10% of the elegible voters active within the past 30 days are required. The submitter has 90 days to collect signatures. If the petition gets enough signatures, then it goes to a general vote.

Once a petition (now called an open ballot) is up for vote, voting lasts two weeks. Voting is by secret ballot, and vote totals are not known until the voting closes. A ballot passes if and only if there are at least twice as many votes for it as against it.

Once it passes, the wizards implement it.

Does it work? Probably at least as well as our non-electronic democracy works. So far the ballots that have passed have mostly dealt with modifications to the petition process itself. (The most recent successful ballot added the time limitations mentioned in the description above.) More important than the passage of ballots seems to be the discussion of petitions. Petitions can be (and have been) started for both lofty purposes (e.g., improve the petition system) and low purposes (e.g., take revenge on someone whose expressed attitudes you dislike). The attitudes of the community are exposed by the resulting discussion. So far, at least, only issues of real importance have gone to actual vote, and not very many of them (only five ballots so far).

Is it the best way to run a virtual world? Probably not. But along with LambdaMOO, there are scores of other text-based virtual worlds, each running its own little expeiment in the social dynamics of shared virtual worlds. Each has a unique purpose, its own unique situation, and will develop its own unique solutions. And each will learn from the others: where they fail, and where they succeed.

When the fancy graphics virtual worlds become affordable, there will already be a significant store of practical knowledge about how (and how not to) run virtual worlds. There will also be a significant segment of the market who will already have experience interacting with virtual worlds. In fact, today's text based virtual worlds are probably defining some of the standards and social conventions that will determine the characteristics of tomorrow's more fully realized virtual worlds. And today's virtual worlds are one primary place where the research is being done to build tomorrow's virtual worlds. Xerox PARC is the site of some interesting work in adding multicast audio and real-time video to its text based virtual world code.

If you want a glimpse of the coming virtual reality, you could do worse than sign on to LambdaMOO and poke around. Telnet to lambda.parc.xerox.com port 8888. You can wander around as a "guest" character, or use the `@request` command to request a permanent character through an automatic character creation process.

Tell 'em BitDancer sent you. **M**

alt.ernate realities by Lucy Martek

When I see a story about online services or the Internet, the WELL, more often than not, is the only smaller service that is mentioned. That's understandable—the WELL is an easy story.

Some WELL users are under the illusion that they possess above average intelligence and that the WELL is a cutting edge virtual community. Neither is true of course, but these WELL users are more than happy to share their dual illusions with media types.

Reporters, who seem eager to cover any Internet-related story, gobble it up. What a bunch of turkeys.

This Thanksgiving I'll be savoring the thought of a day when cyberspace is finally safe from antisocial types, thanks to Skipjack.

Not!

However, if fascists with do-gooder smiles warm your heart, you'll be pleased to learn that the chip Skipjack is implemented in will use an ARM RISC core for processing.

Most likely neither Apple nor 3DO has anything to do with this.

What are we having for Thanksgiving? I don't give Jack Skip.

Send rants, rumors, and your thoughts about WELL users to Lucy anonymously at an48392@anon.penet.fi (you will be assinged an anonymous ID) or non-anonymously at na48392@anon.penet.fi.

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Inchoate Millenium

The Legacy of Unix

by Ken McGlothlen

In each issue of Meta, a different author will boldly set forth their predictions and visions for life in the year 2001. Potential topics include aesthetics, economics, politics and science, as well as computers and networking.

I'm running quite late on this column. It's been awfully hard for me to concentrate on the year 2001, because of some rather annoying things about computing and networking in 1993. (Suffice it to say that I've already cursed Intel to utter oblivion several times over every day for the last three weeks, along with Dell Computers, the inventor of the ISA and EISA busses, Steve Jobs, Bill Gates, a certain Japanese resin-plant fire suppression system, and whoever decided that sixteen IRQs was enough for a computer.)

Part of my current frustration is just bad timing—there are a lot of changes going on right now in computing, and very few signs that anything will settle down anytime soon.

But I'm hopeful. There are indications that the computing world is finally having to come to terms with the legacy of Unix:

- Actual, honest-to-goodness multiple processes: though SCO Unix has been around for a long time, Intel machines now have a choice of Linux, MS-Windows NT, NEXTSTEP, Solaris, and several other operating systems that can actually do more than one thing at once.
- Uniform peripheral interfaces: SCSI has finally been accepted into the micro world, first by Macintosh, and now is supported in a variety of cards for the Intel boxes as well, meaning that the same peripherals that worked on your Unix box can work on box Macs and PCs as well.
- More Internet support: Even though it had its roots in the Department of Defense's ARPAnet, the success of the Internet and its TCP/IP base can be attributed mostly to Unix. Proprietary networking systems like BITnet, DECnet, and AppleTalk are slowly going away. We might actually end up with everyone talking the same networking language.

- Freedom from architectures: NEXTSTEP has been ported to the Intel 80x86 architecture, MS Windows NT has been ported to DEC's Alpha processor, and the Macintosh OS has reportedly been ported to a RISC CPU. More ports are in the works.

Of course, this new architecture-independent world isn't exactly *new*, in spite of what the marketing hype says: Unix users have been enjoying a certain amount of compatibility between systems for years now. But by 2001, this may have caught on to such an extent that the common operating systems will be mostly written in machine-independent code. And I think we owe that, in part, to Unix.

I remember one of the things that impressed me the most about Unix when I first saw it. I'd been heavily involved with other operating systems for some years, and porting software had taken up more hours of effort than I even care to think about. I wasn't looking forward to learning a rather opaque operating system until a friend took the time to grab over a megabyte of source code (developed on an IBM RT) from a remote ftp site, and after a minimum of tweaking for a Sun 3, typed `make` and—it compiled.

(Keep in mind: I'd just spent the last few years on VMS systems, so this was astonishing. Even more incredible, it ran exactly the same way on a VT-100 and a Heathkit H-19 terminal. And to top it all off, it had a graphical interface that ran exactly the same way on the Sun 3 under X, and on an NCR X terminal at the next table.)

This level of portability was amazing to me—and in many respects, it still is. Even though squabbling between Unix camps has prevented complete portability, it's still possible with some care to write an application which configures fairly easily to a wide variety of Unix flavors.

This has been a long time in coming to the microcomputer world. But we're finally beginning to see the first few examples: at least three library packages have come out that allow programmers to write applications which are fairly portable between MS Windows and MacOS. With any luck, those who write operating systems will actually get together and work on a portable base library for each of their GUIs. While I don't believe that operating systems will become one homogenous mass of uniform libraries with slightly different graphical appearances, it *is* nice to think about being able to write something for one camp and be able to port it to the other one in just a few days. There's nothing wrong with diversity, but Unix helped forge the path, and showed that it was possible—even desirable—for vendors to make a cooperative effort to standardize.

By 2001, the line between Unix workstations and microcomputers will probably be one huge grey blur, separated only by a few remaining capabilities. In some ways, microcomputers may even surpass the legacy of Unix-based systems.

For example, depending on how sensible manufacturers get, we may yet see some cross-platform standardization of *internal* busses. This would make things much more convenient for both expansion-card manufacturers and consumers. It's hard to get one's hopes up for this, though—greed has a tendency to get in the way of compatibility, as the audio industry has shown several times over the years. (Witness 45-rpm records, 8-track tapes, and the two-inch minidisk.) Still, with Apple's adoption of PCI, we may see this happen yet.

As far as major advances go, though, we probably won't see any in the next decade. While we do have rudimentary pen-based and speech-based technology, only incremental progress is likely until more advances in AI and inference engines come about. Virtual reality will still have some major problems by the next millenium: input is still extremely crude, tactile feedback is downright primitive (when it exists at all), and while stereo sound is very good at this point, visual displays are still plagued by depth-of-field and convergence problems.

But things will still be pretty good by 2001. Machines running at 100 MIPS will be fairly commonplace. It will be hard to find hard drives smaller than 500MB. If we're extremely lucky, we'll have a unified video standard for both computers and high-definition television. Communication speeds will *start* at 56kbps, and most systems will actually be able to *talk* to each other easily.

It'll be fun, partly because of the power that standardization gives us, both as programmers and users, and partly because of the infrastructure that already exists. And Unix pioneered much of that. **M**

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Thank you for your time and effort. Your feedback is *greatly* appreciated.

Mike Linksvayer
Publisher, *Meta*