Newsletter of the NeXT Programmer's Community

NeXT Users' journal

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WELCOME

Erica J. Liebman

Welcome to the *Extra* September issue. This issue is as big a mish-mash as you're likely to find anywhere. A number of regular columns are being revised and will appear spruced up in the next issue (mid to late October).

Anyway, all the new machines are out. Whee! I can't wait to get my hands on one of those 68040 upgrades with NeXT Dimension Color. (Donald Duck on the hand? Hah! Just wait until I have Keith Ohlfs dancing on my fingers!)

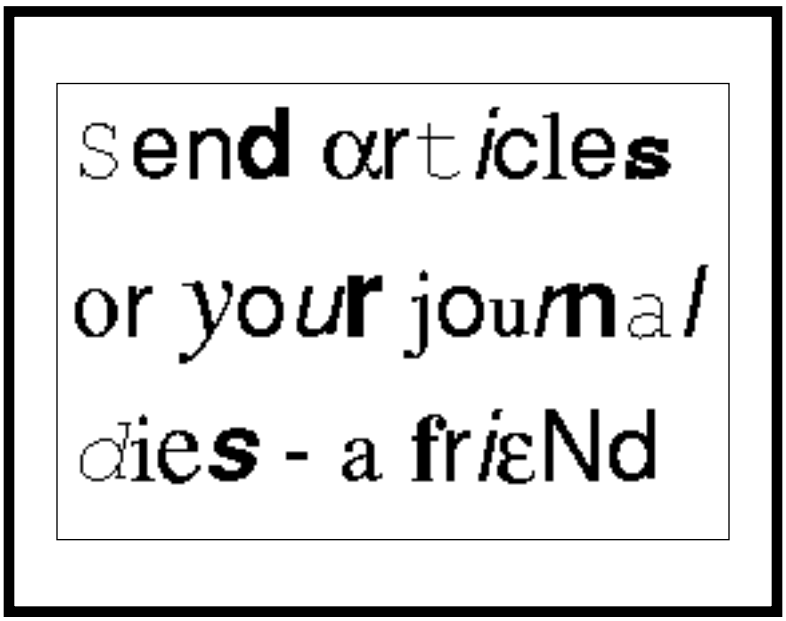
So Congratulations NeXT! Let's hope that this introduction has provided the incentive to keep the NeXT (and the Journal) going for lots more years.

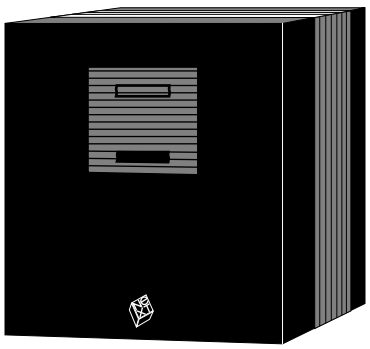
Speaking of which, this Journal is nothing without its contributors. The law of editing I have found is that lots of people are interested in writing articles, but only a few dedicated ones actually follow through. Yes, I this is a guilt trip.

I am counting on EVERY SINGLE ONE OF YOU over the next few months to submit articles, hints, feedback and whatever else you can to help support the BuzzNUG effort. I think this Journal is worth keeping and I hop that you do to.

So please take the following gentle request with at least a bit of humorous spirit!

Thanks Y'all! Happy 68040 Color to one and All -- Erica





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HEADLINE NEWS

•"The G-mark is an award given by the Ministry of International Trade and Industry (MITI) in Japan. Since 1957, MITI has awarded this mark to products available in Japan with outstanding appearance, functionality, quality, and safety. There are 13 major product categories including Audiovisual, Transportation, and Information Equipment.

Last year for instance, 744 companies submitted 3,787 products. Of these entries 1,146 products were awarded the G-mark. The Sony 8mm Handicam camera edged out the Nissan 300ZX for the overall Grand Prize Award as the best designed product of 1989.

The NeXT Computer system is the Grand Prize winner for 1990! This is the first time that a foreign company has ever won the Grand Prize." - *Conrad Geiger*

•Editorial Stuff

Articles for Buzzings are accepted in various forms, NeXT mail enclosures and Internet .wn.tar.Z forms are preferred but ascii text via the net, IBM and Mac Disks via USMail and (yikes) written text via the same USMail are happily accepted. We can guarantee no return of materials without SASEs, sorry. Our focus is how-to articles, especially with sample code. All articles are subject to editorial review.

We also welcome copies of new (and old) software for review from third party vendors. Again, we can not guarantee material return without SASE or guarantee publication dates, if at all, although we try to be prompt.

"Feedback from the Trenches" is open for comments/ letters of limited length from all readers. Please write and tell us what you liked and what you disliked.

Mailed subscriptions should start real soon now, with any luck. Please write for information.

Feature Submission Guidelines

If you have NeXT mail, simply drag your icon into next mail and post it off to me. Don't worry about tar'ing and compressing.

•Avoid passive voice. Please.

•Spellcheck.

•Wit is welcome, obscenity is not.

•Preformatting with the following guides will aid us ENORMOUSLY:

•Paragraphs: No tabs, single return at end of paragraph, no hard-returns at ends of lines

•Title on one line, author information on one line.

•Avoid blank lines between paragraphs. Use blank lines to denote sections.

•Start sections on first line after section header.

Editorial matters to:

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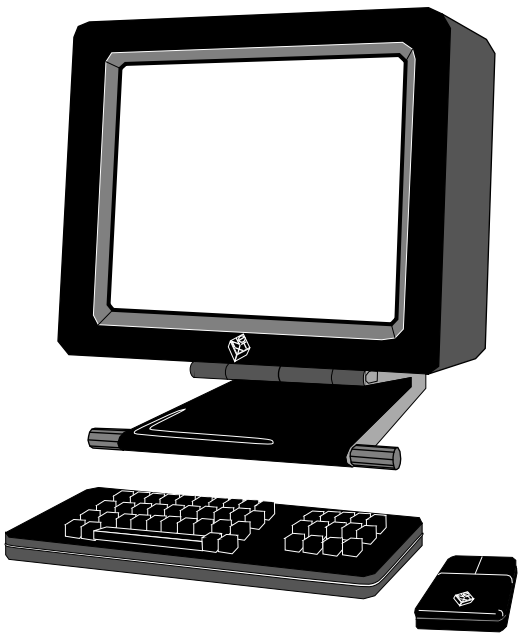
Atlanta, GA 30318.
1-404-352-5551.

There is always an answering machine, but please respect relatively normal hours. Long distance phone calls may not be returned by the impoverished student at the other end -- if you leave a message, indicate if it is acceptable to call you collect. Please send any deliveries of items that will not fit within a tiny mailbox care of the Leasing Office. To contact me directly for subscription information, corrections, requests, or just to say hi, write via internet: erica@kong.gatech.edu

This issue of NeXT Users' Journal was prepared in FrameMaker, generously donated by Frame.



Stone Age *n* (1864)

:the first known period of prehistoric human culture, characterized by the use of stone tools.

Moderated by
Andrew Stone

Doing Objects Right

(C) 1990 by

Andrew C. Stone

One of the most compelling features of writing software is that there are many ways to accomplish the same thing. This gives you a large lattitude for creativity, but also "the power to run off into the weeds" [I overheard an Apple Employee using this phrase] . In this article I present some guidelines for creating usable and reusable objects.

Our current project has 125 new objects, and about 40 nib (NeXT InterfaceBuilder) files. This granular structure makes it trivial and speedy to change one component, and has the added benefit of lazy loading of the nib files when needed. NeXT System Release 2.0 is said to have idle time loading of nibs, which will be a clever way to speed up what the user perceives as software performance.

1] Every .nib file should have an owner object which you say "new" to.

This means that a client needs to know only the object's name: this presents a simple interface. By separating the details of the class (such as the nib name) from its use,you obtain a cushion from changes in the object. Then your client code looks like this:

```
id aCoolObject= [CoolObject new];
```

In your CoolObject's +new method, you would have:

```
+new
{
        self = [super new];/* great name for a objc rag! */
        [NXApp loadNibSection:"CoolObject.nib" owner:self];
        /* place initialization code here */
        return self;/* don't ever forget this!  */
}
```

Moreover, the +new method provides a place to send initialization messages to your nib objects after they are guaranteed to exist,so that you can be sure these messages are not being sent to nil objects. This has bitten me before!

2] Name your .nib file the same as the owner's class

Your project directory will have three associated files: the .h, .m, and .nib for each object which has a visual representation. For understanding large projects, the naming of each class is one of the most important aspects of creating comprehensible,not reprehensible, code. The name should clearly and concisely describe the object's function. I like to include the superclass object as part of the name if my custom class is a subclass of a NeXT object, such SliderDualActing, which descends from Slider. Usually, nib owners will just descend from Object, so they can have more terse names, such as "AlignPanel", "Defaults","OpenAccessory".

If the owner's class name coincides with the nib file name, the following code will load a nib file based on that class name:

```
#import <appkit/Application.h>/* for NXApp */
#import <appkit/nextstd.h>/* for NX_MALLOC */
#import <strings.h>/* for strcpy,strcat */
#define NIB_SUFFIX ".nib"

+new
{
        char *name;
        self = [super new];
        NX_MALLOC(name,char,strlen([self name])+strlen(NIB_-
SUFFIX)+1);
        strcpy(name,[self name]);
        strcat(name,NIB_SUFFIX);
        if(![NXApp loadNibSection:name owner:self]) {
        printf("%s not linked\n",name); return [self free]; }
        NX_FREE(name);
        /* place other initialization code here */
        return self;
}
```

You can pre-write reusable code snippets like this one by including it in your .editdict file for automatic entry into an Edit file.

3] Reduce the number of global variables by caching the object in the method where it is being used.

Example: Let's say we have a globally used alignment panel (only need one of them) that any given view can use to configure its alignment parameters. In your application subclass or application delegate class, have a method like this:

```
- runAlignmentPanel:view
{
        static id alignPanel = nil;
        if (!alignPanel) alignPanel = [AlignPanel new];
        return [alignPanel runModalForView:view];
}
```

Your view might respond to a method named "setAlignment:sender" which gets sent by a menu itemto the

first responder:

```
- setAlignment:sender
{
        return [NXApp runAlignmentPanel:self];
}
```

To connect menu items to the first responder, you have to:

1] Open main nib, [ie the one with menus.]

2] Click on First Reponder in project window: it's the big 1 icon.

3] Select "Class" from Inspector pop-up.

4] Click on "Action" on the Outlet-Action button.

5] Enter the method names that your first responder responds to.

4] Subclass early, subclass often

The power and elegance of Objective C is exemplified by subclassing. It provides a way of testing changes to software without modifying an existing line of code, but by following Marvin Minsky's advice on correcting bugs: don't fix it, head it off with more code! From a design standpoint, it means you can create more general, resusable code which gets subclassed to provide extra functionality for a given project.

5] Document the object.

Bug NeXT for the text processing tools which take header files and turn them into the beautifully formatted WriteNow Objective C Class Specifications, and document what your object does and how it should be called.

6] Don't Panic

I guess this belongs in every list of guidelines!

Happy Hacking.

Erratum to Review of TopDraw in Issue 9

Dick Silbar

Note Added: In the subsection A Small, Super Story I mention some mysterious crashes and flashes of WriteNow when invoking "Place Graphic...". It turns out (again, thanks are due to Hal Roseman of Media Logic for this information) that the problem is a bug in TopDraw 1.0 for graphics having lines with arrowheads. The bug only shows up on exporting and importing and printing, not on the screen itself. The workaround (until version 2.0) is to draw your own arrowheads separately.

Search for Terrence Talbot

Terrence : I have lost your phone number & contact information. Please call me ASAP, Erica p.s. Media Logic says to send them a Disk and they'll send you TopDraw for review.

New Stuff

Care of Keith Edwards

NeXTstation monochrome
Case is roughly the size of a Sun SPARCstation (about 2" high)
M68040 CPU, 25 MHz (15 MIPS, 2 MFLOPS)
M56001 DSP, 25 MHz
8 to 32 MB memory
DSP memory now expandable to 576 KB
Monochrome (2-bit gray scale)
Cheapernet connector
Twisted-pair ethernet connector
3.5" 2.88 MB floppy (reads MS-DOS formats)
105 MB hard drive standard (optional 340 MB)
2 RS-423 serial ports

NeXTstation color
same as above, except:
16 bit/pixel color (4 bits each, RGB, plus 4 bits of alpha channel (opacity))
color monitor (same resolution as the monochrome monitor)

NeXTcube
Replaces the current 68030 cube.
M68040 CPU, 25MHz (15 MIPS, 2MFLOPS)
M56001 DSP, 25MHz
8 to 64 MB memory
DSP memory now expandable to 576 KB
Monochrome (2-bit gray scale)
Cheapernet connector
Twisted-pair ethernet connector
3.5" 2.88 MB floppy (reads MS-DOS formats)
Disk storage options now include 105, 240, 660, and 1400 MB disks, as well as internal CD-ROM drives.
2 RS-423 serial ports
3 slots

NeXTdimension color board + monitor
Requires one slot in a NeXTcube
Intel i860 33 MHz processor
Dedicated JPEG Image Compression Processor (C-Cube)
30,000 polygon/sec (gouraud shaded, triangular, meshed)
8 to 32 MB memory
1120 x 823 pixel resolution
32 bits/pixel (8 bits each, RGB, plus 8 bits ofalpha channel (opacity))
NTSC video input and output standard
Video output genlocked to input video source
Closed-caption, TeleText, and VITC support
Can do real-time video compression and decompression and storage on a hard disk.

Ask the Master Programmer

Ask the Master Programmer, a learning experience viathe Socratic method. (Although this column appears ina written form here, it is ideally absorbed via thespoken word. Unfortunately, certain word processing programsported from more primitive platforms do not as yet supportthe spoken word. Please feel free to get a groupof your associates together for a dramatic reading ofthese words in order to bring out their full meaning.)

Novice: In the Tao of PROGRAMMING, it says... "'And is the Tao in the DOS for a personal computer?'

"The master coughed and shifted his position slightly. 'The lesson is over for today,' he said."

So I would ask you, Master Programmer, is theTao in the NeXT?

Master Programmer: It would be imprecise to say the Tao is IN theNeXT, but rather the Tao IS the NeXT.

FaNaTiC:Wait a minute, hold the show. We at NeXT are decidedly NoT religious about our machine, like some other silicon mongers. It is improper to associate religious connotations to the NeXT, rather the appropriate way to pay homage, I mean to differentiate the NeXT is to use the NeXT capitalization rule: Capitalize the consonants in short words, leaving the vowels (especiallythe "e" in lower case). We would ask that you follow the capitalization rule whenever possible and avoid adjectivising the NeXT with decidedly religious verbiage. Of course the capitalization rule works fine for the written word,but the spoken words requires a bit more action onthe part of the speaker. What we at NeXT are inclined to do, is to gesticulate with fourth (ring) finger of the right hand when pronouncing the specially capitalized words. Still there is the problem of hearing the wordswhen the speaker is not physically present. For this situation, we like to put a little lilt in our voiceswhen speaking the special words. I think this covers all I have to say on the subject.

Novice: Whoa, that guy is a little intense, wouldn't yousay MP? (The Novice, being a little naive, attemptsa bit of familiarity with the Master Programmer.)

Master Programmer: Yes, N, one could say his direction is a bit intense, perhaps even a bit fanatic, but certainly not rElIgIOUs! What a silly man. Hrmmmph... Now wherewas I, oh yes, the Tao iS THe NeXT. While some other computers may exhibit Tao-like qualities, the NeXT iswhat the Tao would be if the Tao were a computer. This not a statement of religiousness. It is a statementof fact.

The NeXT FaNaTiC (or perhaps simply NeXTaTiC)does provide fodder from which I may make a point. Religiosity connotes a couple of negative qualities. First there is a certain blindness to the rest ofthe world, a sense of "we do everything right". We live in a world where all advances are made on the basis of what has come before us, that is, the innovators, technovators, and entrepreneurs whose vision and risk-taking have served to move our civilization out of dim,cold caves into the present age of science and technology. It is foolhardy to assume that any given stage or platform (double meaning intended) is an end in itself. We are part of a never ending process of learning from the mistakes of our past and synthesizing a new and brighter future. Our shared loved of computer technology is our Tao, our path. How we travel that path is the only thing of importance. The momentary flashes along the path while significant in the present are certainly going to be eclipsed by the more brilliant flashes of the future, assuming one does not become obsessed by any given milestone along the path and forgets to keep moving. Even the NeXT, as brilliant a flash as has been seen in our current moments, will certainly be but a dim but significant flash when viewed with future hindsight. But as it is important not to doddle along the path, it is also significant that we do not lose sight of the path through an inappropriate attentionon the future. The Tao is NoW and the NoW is silently persisting into the future nows.

The second negative connotation that silicon religiosity gives rise to is an unproductive notion of "us versus them". Not to dwell on this point now, let it be said simply, that fuel for the creative intelligence of our minds is to be found everywhere, not just around a particular campfire. [a pause]

Novice: Master Programmer (the Novice seems to be feeling a little less familiar now), how does one avoid the double folly of hesitation along the path and future fixation?

Master Programmer: Ahhhh. You wouldn't have any Twinkies I couldbuy from you...I mean raisons (I'm on a diet), do youhave any raisons?

Novice: Uh, sure. Here are some Twink... I mean raisons,$.50 should do it.

Master Programmer: Thank you, my blood sugar was getting a little low. The answer to your question is simple, but willtake a lifetime to implement. The idea of maintainingprogress along the path is matter of attention. Inwalking on a path along a beautiful mountainside you maintain your footing by attending to the path. By attention, I do not mean concentration, but a simple, effortless focus. You can observe the beauty of the mountain vistas all around you, but always there is this attention to the path, the loose dirt, therocks, the holes, the donkey doodoo, etc. In the same way the path of programming requires this simple butprofound attention. We observe, we take in what we can and retain what is useful to us.

Novice: But Master Programmer, how...

Master Programmer: Our dialogue flies along a tangent as the MasterEditor begins to twitch and fidget. Have you a question today?

Novice: In my study of the NeXT documentation and experimentationwith the Interface Builder, I have found it difficult to determine when certain initialization type functions take place. For instance, I was writing a little text editor application and could not figure out how to havethe application start with the insertion point blinkingin an empty text window. Can you offer some insight?

Master Programmer: The insight you are looking for is the ApplicationClass delegate method

```
-appDidInit:sender
```

Responds to a message sentto the delegate after the application has be launchedand initialized, but before it has received the firstevent. Delegates can implement this method to do anyfinal initialization necessary.

Here is a simple example of how one might use the "appDidInit:" method:

```
- appDidInit: sender
{
// your code goes here
}
```

Novice: Well that seems simple enough. But tell me, thereare so many methods for each class. How can one tell which ones might be of the most use to a programmer?

Master Programmer: Very well done, Novice. You have provided mewith the perfect transition to an ending point for todaysdialogue. Over the next few dialogues we will explainand show programming examples of how some the usefulmethods can be discovered and used.

Endeavor to observe, absorb and retain whatis useful. Do not attempt to understand everything all at one. The path is a process. The goal isto persist along the path. The NeXT is a spectacular tool for our use along the path. In future dialogues we will continue to draw attention to those sometimessubtle points that will accentuate and facilitate the use of this tool

The part of the Master Programmer is played by Jeff Fox.

The Novice plays himself. Which is to say, everyone is invited to play the Novice, or the not-so novice. All questions, comments, etc. are welcome. The Internet address for Ask the Master Programmer: 70165.1046@compuserve.-com

Third rmNUG Meeting

Brad Green and David "Mathman" Hieb

rmNUG - Rocky Mountain NeXT User Group

The third meeting of the Rocky Mountain NeXT Users Group (rmNUG) was a great success. We all enjoyed the chance to visit with other NeXT enthusiasts, try out some new hardware/software and hear a great presentation by our NeXT Campus Consultant, Brad Green.

Brad's special feature focused on "Music on the NeXT". Brad had just recently attended a national computer music convention and was able to talk with leading computer music developers and pick up some new software for the NeXT. He demonstrated everything from synthesizers to voice trainers and even a complete mixing station. [Thanks to the Denver office of NeXT Inc. for supplying the meeting room!]

I will be presenting Mathematica as the special feature at our next rmNUG meeting which is scheduled for the 18th of July. My presentation will be taken from a entry-level paper that I have been writing for an upcoming BuzzNUG issue. This meeting is for those of you who are interested in Mathematica and are either somewhat intimidated or just haven't taken the time to look at it closely.

I was very pleased to see several new faces at the meeting and I hope that each one of you enjoyed yourself. Make sure to bring your floptical disks to each meeting so that you can get any new software that you are interested in. Also bring any images/prints to our next meeting that you want scanned (Our friends at NeXT will have the new NeXT scanner on hand).

If you have any input, comments or questions about rmNUG, please call me (303)492-4316) or email me (davehieb@boulder.Colorado.EDU). This type of feedback is encouraged and necessary to any successful user group.

As always, I am very interested in future special features for rmNUG. Be thinking of how your specialization or project might be of interest to the group. So far we have the following tentatively scheduled:

1) A developer from Mathematica presenting the development of Mathematica.

2) An employee from NeXT Inc. presenting the Interface Builder.

3) A rmNUG member presenting Internet archive access and what is available for the NeXT.

4) A rmNUG consultant giving a Postscript tutorial.

5) A rmNUG businessman presenting Desktop Publishing on the NeXT.

Thanks for making this work!

David Hieb::davehieb@boulder.Colorado.EDU

Brad Green::Brad_Green@NeXT.COM

Call for Objects

Joe Freeman - joe_freeman@next.com

We are attempting to gather as many objects as possible for the object library. Their current state, besides functional, does not really matter. All types of objects are

welcome. We don't discriminate against objects that are not subclasses of View. The more we get, the more we can choose from. I will worry about cleaning them up later.

Put your name on them or not. Send a whole palate and we will make you famous or not. Anonymous donations welcome.

The concept of an object library holds the promise that custom objects can be used to solve problems that no commercial application can. This concept is viewed differently by programmers and end users.

Programmers think of the object library as collections of objects and kits, that can be used as functional building blocks. These would cooperate with the existing kits, appkit, music kit and sound kit. A programmer would acquire object libraries of tested objects that could be plugged together to create powerful applications.

End users think of object libraries as a tool they can use to create a custom application. A large enough library would empower users by allowing them to solve their problems through the creation of custom applications, rather than buying monolithic programs. Many folks are trapped in the paradigms forced on them by the applications they use. The object library has the potential to let users deal with their data in a way that makes sense to them. A good example is standard spreadsheets that force the user to think in terms of location dependent data.

The object library concept has been discussed since the Oct. 1988 introduction of the NeXT Computer, however it is only in the 2.0 release of the system software that it can start to approach reality. Interface Builder support for loadable palates first appears in this release along with dynamic loading.

Wolfram Research Sponsors Mathematica Graphics Competition

Care of Conrad Geiger

Wolfram Research, Inc. is sponsoring a competition to recognize outstanding graphics generated with Mathematica in 1990. Graphics can be two- or three-dimensional, black-and-white or color, abstract or representational. The only criterion is that they be produced with Mathematica.

Entries will be judged by an independent panel of leading designers and Mathematica users.

Winning entries will be published in the full-color 1991 Mathematica Calendar and may be included in other Mathematica material.

Competition prizes will include $1,000 for first place and free registration at the second annual Mathematica Conference in San Francisco, January 1991. All entries will be acknowledged, and all entrants will receive a complimentary gift.

RULES

All entries must be received by October 6, 1990

Entries must be submitted as Mathematica Notebooks or PostScript files. Electronic mail, or any standard disk or tape format is acceptable. All disks or tapes must be labeled with your name and title of work. Media will not be returned.

Each entry must be accompanied by a separate entry form (or facsimile), and must include a short description of how it was produced. Give Mathematica code when possible.

By submitting an entry to the competition, you are warranting that you are the owner of all rights associated with the entry, and you are granting to Wolfram Research the nonexclusive right to publish or exhibit your entry in any way.

Employees of Wolfram Research and their relatives are not eligibleto participate.

Send entries to:

Mathematica Graphics Competition/Wolfram Research, Inc./P.O. Box 6059/Champaign, Illinois 61826-6059, USA/Telephone: 217-398-0700/Fax: 217-398-0747/Email: competition@wri.com

New NeXT-Classroom User Group

Conrad Geiger

If you are interested in a NeXT courseware discussion group or if your customers are, please read on. The purpose of the group is to provide a discussion forum for those that have used the NeXT in a teaching environment and those that wish to. Certainly the group should encompass applications and experiences involving NeXT usage in classrooms. There should be a variety of diverse and inventive uses of the NeXT in teaching use.

The mechanics of joining the group: There has been set up "next-classroom" at Gustavus Adolphus College as a mailing list on MAILSERV@GAC.EDU.

To subscribe to the list:

1. send a message to "mailserv@gac.edu", or "mailserv@gacvax1.bitnet"

2. the subject of the message is ignored.

3. the body of the message should contain: subscribe next-classroom "full name" (or) help where "full name" is the real name of the person wishing to subscribe. Help would send back more information on using mailserv.

4. mailserv will send back a message confirming the addition of your address.

To send mail to the list: send your letter to "next-classroom@gac.edu" (or) next-classroom@gacvax1.bitnet"

Problems: send your problem to "postmaster@-gac.edu" or "postmaster@gacvax1.bitnet"

P.S. (The advantage of this mail server is that it allows those on bitnet - IBM sites- to participate easily.)

P.P.S A note from Dan - the administrator of the group... Gustavus has an anonymous FTP site, at FTP.-GAC.EDU (IP address 138.236.10.1). There is a submisions directory where people can leave files. I would then ask that a person send me a letter (to either FT-P@FTP.GAC.EDU or dan@gac.edu) or leave and ASCII doc file so that I know who submited the file, and what it does. I can also make the files in the anonymous FTP site available by mail through mailserv, for those who only have mail.

The NeXT and I

Charles L. Perkins

Charles' article started out as a letter. It was written to a few friends of his. Somehow this letter started spreading throughout the NeXT community, finally being posted to the net. The enthusiasm can't be denied. "Well try to tone it down just a little," said Charles over the telephone as I made last minute arrangements to get this article into the issue. "People have been trashing me about the overenthusiasm, especially at the end." Only a few typos have been changed here. For you BuzzNUGians without access to the net, I'm happy to present this as >the< quintessentially honest article about what we saw in San Francisco. And by the way, don't trash Charles or we'll send "Buzz" after you!

For me, the day begin at 5:15am setting up a breakfast we were hosting to "watch the dawn on a new era in computing." From about 6 to 8am, about 50 NeXT employees and enthusiasts came to watch the sun rise from the roof garden, and then I was off to Davies Symphony Hall for the Event.

Soon after 8, they let us in, and (having luckily gotten some press credentials from NeXTWORLD) I ran to the first row and sat closest to the podium (I knew I could almost touch the great man's shoes from there :-). During the tense minutes waiting for the presentation to begin, R. Perot (billionaire for many years and an investor in NeXT) came down the row, shaking everyone's hands and welcoming them. What a thrill! Two years ago to the day, Steve had, in this very same hall, first introduced the NeXT computer, and in that time I had gone from an admirer to a developer, reporter, and enthusiast here in "thefront ranks" of the crowd. I was thrilled but also worried someone would throw me out of there! :-)

Finally, the crowd was quiet and the lights came down, and Steve appeared.He began simply: "This is the future of NeXT." (A quite serious statement, since so much was riding on this introduction and the momentum it would produce.) He went on to begin his slow dance with the audience, using the gentle introduction of slides with more and more information to punctuate each point in his usual dramatic style. You could almost taste the anticipation in the room...

First, he began with the main thrust of the introduction: lessons learned. NeXT had listened to its customers and had in January of this year started a program code-named Warp 9 to correct their concerns. After only 9 months of effort, their new products were substantially complete and the new version of the system software was in place, quite a feat in itself, but within NeXT's lean/mean corporate reach. He then specifically pointed out the feedback, how users loved multitasking, UNIX, ease of use, Postscript, etc., but how they had four serious complaints:

(1) Too slow

(2) Too expensive

(3) Not enough applications

(4) No color

He then turned to address each of these in turn and explain how their new procucts, new software, and third party developers had solved them.

On the speed issue, NeXT has the first shipping 68040s in quantity and is very pleased with their speeds (note that the numbers below are at the LOWEST end of the range Motorola publishes about the 68040, so I think NeXT is being conservative (or realistic) about these numbers). A slide shows the Mac II ci and fx at about 4 and 7 MIPS (I'm trying to write this all from memory, so forgive silly errors), the average of the IBM and Compaq 386 and 486 PCs at around 7 and 12 MIPS, and the SPARC SLC and about 12 and the SPARC 1+ at about 15 MIPS. Now remember that NeXT wants to be a "Super PC" not a traditional workstation, thus the comparison to other PCs, and thus also its positioning at 15 MIPS -- equal to the SPARC 1+ and exceeding all other available PCs. (With more than 2 MFLOPS on-chip, this accelerates the NeXT integer ops by a factor of 3 and F.P. by 5-10 which makes all Postscript drawing 2-4 times faster (I've seen drawing speed on the 68040 myself)). As a final touch, NeXT points out in a subtle way that actual throughput is more than MIPS (remember those 12 DMA I/O controllers and separate paths?) but just showing a complex Mathematica 3-D color plot and how long it takes to procude it on the screen (mostly F.P. but some V.M. I/O and a little drawing): 250 seconds on the Mac II ci, about linearly less on the fx, 386, 486 according to MIPS, 50 secs. on the SPARC SLC,40 on the 1+, and ... 26 on the NeXT 68040. And that is on the smallest new model with minimum memory. So in summary, Steve believes they have turned "Too slow" into "Fast."

On the price issue, he showed the same MIPS slides with the prices written above them for comparison. I believe they were approx. $8k for the ci, $12k for the fx, about $7k and $10k for the 386/486 pair, $6500 for the SLC (allmachines had the cheapest disk added to them to get them up to the 105 MB included in the NeXT), and $9k (?) for the 1+. The lowest cost NeXT comes in at only $4995 retail price. This includes:

- 68040 with 8 MB RAM
- DSP 56001 / CD sound out
- 105 MB disk with 2.0 pre-installed

- MegaPixel 17" display
- SCSI-2 interface and connector
- 2 improved RS-423 ports
- Usual (LOTS) of bundled software
- Integrated microphone
- 2.88 MB floppy disk drive
- Twisted pair and BNC ethernet

These last two items were also user feedback -- the optical disk has become an option and the new 2.88 floppy is fully DOS and UNIX compatible for both 1.44 and 720k floppies, and the twisted pair on every NeXT means no rewiring for ethernet will be necessary throughout corporate offices. Considering once again the DSP, sound, and bundled applications, and noting that the SLC is $1.5k greater without any of these, I go along with Steve when he concludes "Too expensive" has been turned into "Low cost."

For the applications issue, there were four main thrusts. Steve presented the four areas of interest as: (1) business productivity apps (traditionally dominated by the PC market), (2) desktop publishing and layout apps (Mac), (3) custom-designed and tailored high-powered apps (Sun), and (4) To-be- discussed-later. I'll talk about each presentation in turn:

(1) By far my favorite part of the Intro was when Jim Manzi gave his talk about Lotus' new product. He began: "We are here today to try to answer some deep philosophical and theological questions. First, "Why?" <dramatic pause> Then, "Why the NeXT?" ... And finally, "Does Bill Gates exist?" <loud surprised laughter> My time does not allow me to explore the third question, but...." and then later in the talk: "Why did Lotus abandon compatibility and step back to reinvent from scratch the very meaning of the Spreadsheet? Because God told us to." It was a dry, understated, wonderfully cosmic-religious-comic introduction to the whole new approach Lotus had taken, delivered with brilliance and style. I hope someone was recording it.

The actual demo of Lotus (done I believe by the product manager), was just as stunning. It is hard to describe in words how simple and flexible Improv is... First, it has generalized formulas that use English, like "Net = Gross - Costs" which apply EVERYWHERE those catagories appear, it has catagories of rows and columns that organize and document the information (no numbers and letters), and if you view the grouping of these catagories dynamically as providing a multi-dimensional space of information, you can "flip" the axes of this information space by pulling category names around in real-time. It is impossible to describe how cool this is...imagine that you have your spread-sheet organized by product type and the subcategories for price, cost, etc.,then have columns that are Q1, Q2, Q3, etc. You can flip the x and y axes and have Q1 at the left with columns for the various products and sub-columns for the price, cost, etc. This reorganization takes the blink of an eye, and allows you to play with the many ways your data can be viewed, graphed, etc. in real time as easily as pulling it into the new form (literally). And for a final touch, Lotus announced that until the end of this year, all new machines and all 68040 upgrades will get a free copy of the product!! (it normally costs $695) This will be more impressive when I tell you about up-front sales later.

Also on the list of these apps was PowerStep, a traditional spreedsheet by Ashton-Tate, WingZ by Informix, various organizational and client tracking tools, etc. (Read the Fall 1990 product directory to see new shipping apps.)

(2) Next up was the head of WordPerfect who not only gave the talk for his product, but demo'ed it himself. This was one of only a few glitches in the seamless presentations -- he was a little nervous and messed up the demo, but later Steve seemed to have noticed and showed off a little more of it himself as part of his demos. The thing that WAS amazing about this presentation was the speed at which re-laying-out was occurring. For about a five-page document, he made it multiple columns, strecthed them, made it four columns, adjusted, changed to flush right, left, center, etc. and EVERYTHING took less than a blink. I literally could not seen any perceptible delay in any opera- tion reorganizing the document. So not only was typing perfect and fast, everything was. I thought this was a good demo of 68040 speed (and, I guess, good algs. developed by WordPerfect). Also in this category was Quark Xpress for the NeXT, new Framemaker, a new tool for precise layout of text by Glenn Reid (Mr. Postscript), 1500 new fonts available for the NeXT via The Font Company, Adobe announced Illustrator 3.0 will ship first for the NeXT, etc. In general, an impressive list of apps for this type of activity, all fully compatible with their PC or Mac cousins.

(3) Steve himself gave the example of how NeXT can do custom apps. (Though in the previous talk, Mr. WordPerfect said an amazing thing---they had STARTED their development effort for NeXT 6 months ago, and are going to be Beta this month and shipping in 3...an effort fully 50% shorter than they had planned for. Other developers site speed-ups as high as 3-to-1 in ports and much faster for new development. REALLY! I'm one of them!)

He began showing the new custom, dynamically loadable objects in Interface Builder. This allows your new Objective-C classes to be interpreted in realtime and tested in I.B. (like a simple interpretive environment), and then be placed in pallettes for other to use just like the standard buttons in I.B. The demo he gave was using some Database Kit objects NeXT had thrown together. Though simple in concept, if you stop to think what's happening in a COMMERCIAL not a reserach computer, this is exciting. He placed a browser for retrieving data and allowing selection, pulled down an icon representing the database,used the Inspector to set which database and what data field he wanted to view, connected the browser to the database, and then went into test mode. In seconds, the data popped up from the database

queries in the browser. He popped back into Edit mode and added some fields and an RTF scrollable text area for ancillary data and comments about the browser's current selection, attached them all to the browser, and then tested again. Now when he selected a browser entry, the various fields filled with their values from the database, including a full multi-font comment popping into the RTF text area. Obviously, editing, manipulating, etc. is now trivial.

The neat idea here was people selling large sets of pallettes, not just apps, so that other developers can leverage directly on each other's ideas and interface objects. Imagine a kit for Database, for Graphing, for Imaging in 3-D, added to the standard kits NeXT supplies for Music, Sound, Printing, etc. each as easy to use as pulling buttons off the pallette and connecting them together! This is the vision of fast, easy user and customer customization that NeXT provides: they hope to do what more traditional workstations have been doing but much, much better.

(4) Finally, Steve described a new area for applications he felt would be as important as the above three in the 90s: interpersonal computing. Claiming that in the 80s, personal computing solved most of an individual's productivity needs, that the 90s will solve more group and collaborative productivity needs. (This is the research we began in the Smalltalk group when I was there around '84/'85, we even used the same words... :-) The general concept here was one of providing the environment for small, focused applications tools to interact, creating a flexible set of services the user can call upon from anywhere, and allowing the free and easy trading of these apps and their documents over nets.

He began by demoing some of the new features that 2.0 provides towards such an environment. These ranged from a new FAX option (anything that can be printed can just as easily be FAXed now, and the receiver gets a MUCH nicer looking FAX since Postscript can image directly and avoid scanning errors; FAXes can also be received and filed automatically, examined and edited) to a whole dynamic structure for allowing applications to register as providing services to other apps--old apps and new apps alike will see the new services and will be able to take advantage of any future apps as well. Services pop- up automatically for all available applications in a menu of that name in each applications' main menu. One of the most powerful demos of these features was when Steve popped up a received FAX in TIFF format (bits), selected the service provided by a scanning app for OCR from the bitmap editor, requested conversion to text, and a few seconds later, the text popped back in a fully editable form!! This service would be available to any app that requested it.

The new workspace in 2.0 has a new "shelf" on which commonly used documents, apps, and directories can be placed...like the radio buttons in a car radio, these allow easy wandering and remembering of past locations (like pushd/popd). The browser also allows multi-threaded copy/move/delete so the browser is not tied up during long disk operations (it also shows progress in nice ways and gives more status information and more options in general than before---it is very nice). The Mail application has been improved and extended to live more closely with other mail systems and to allow Icons to be dragged in AND OUT of Mail. In general, 2.0 now allows any app to drag icons for files or for directories into and out of any view, and what happens is up to the app. ForMail, it does the tar/compress/uuencode on one side and uudecode/uncompresss/ un-tar on the other, so sound, music, graphics, bits, EPS, whole directory structures, etc. can be trivially transported. Combined with services, this is a powerful metaphor. One mail message suggested trying out some new legal files in somebody's home path...Steve workspace-browsed over the Net to the machine and the area suggested, messaged the Digital Librarian service to add the directory into it's targets, it popped up loaded with the new files, and he then searched around a little with it's standard full text search (which, by the way, was 3-5 times faster than before!! They've re-optimized the searching so it is almost blinding now.)

So, in summary, Steve said that "Not enough applications" had become "Great applications." And, to address the fourth complaint, no color, Steve saved the best for last. He introduced a version of the $4995 NeXTstation called NeXTstation Color (both of which look like Pizza boxes in black with a display on top). This moderate color workstation has 16 bits (12 color, 4 alpha channel) of depth per pixel, and uses the same Sony Trinitron awesome-sharpness 16" monitor that the really-cool thing I'll describe in a minute uses, 12 MB of memory, and costs only $7995. Note: all B&W and color NeXT products I'm telling you about here have fully interchangeable software environments---the SAME code running on the Postscipt above the depth 4 MegaPixel will work on the depth 16 color and the depth 32 color described below; they even do automatic dithering and other tricks to make it look better than you's expect. All the color machines use a TrueVu RAMDAC chip for window-by-window color depths, so for the 16-bit machine this means that ALL windows look good even if they have color maps with incompatible entries---true RGB goes out the back correctly! This "simple" color machine is obviously already better that the low-end Sun color (and blows away PCs and Macs of course), but wait there's more! The really exciting thing was that not only was there a new version of the Cube with floppy, etc. (updated to be like NeXTstation and about $8k), but that into this or any old cube could be added a NeXTdimension board. Now you might be tempted to say, Yeah, so it's another RGB color board. Well...listen up. NeXTdimension has 32 bits, with 8 bits of alpha, allowing all sorts of magic special effects in draw and layout programs (like air-brushing in a pattern behind a car and seeing THROUGH the car windows the pattern behind the car but modified suitably by the color of the glass!). These

are true 32 bits, no color tables. It has an Intel i860 built-in that does a minimum of 30,000 Gourand-shaded polygon fills per second, and that allows the standard NeXT U.I. to run as fast (and faster!) that the B&W U.I. even though it's pushing arount 8 times more data for every window! Full 32-bit color windows can be dragged around in real-time just like the B&W windows can. Steve showed all sorts of really striking color images, and when you look up close, it is truly photorealistic color like one of the best of the monitors at SigGraph.

Then came the section that brought the house down...-Steve was looking at door in B&W in the bitmap editor, and he pressed what looked like a large CD play button...the door was a frame from the Wizard of Oz just as Dorothy is about to enter Oz, and as we watched, it came to life and played full-motion color video in full-CD sound in real-time in the window. The Wizard of Oz ran and ran as people clapped and clapped. The damn NeXTdimension has real-time display of video on the screen, built-in JPEG compression in a VLSI chip that performs up to 100-to-1 reduction on the fly for I and O, it has two RCA video inputs (with an S-video slaved to one of them), and an RCA video output with S-video as well. Also RGB output. Also any color monitor can be used for output. Also, here's the price:

===> $ 3995 <===

When Steve announced that and then took a live video feed of himself, showed us it updating in real-time, captured a frame into the editor, and then composited in Donald Duck sitting on his hand, all in a few seconds, the crowd went wild. This was a moment of Myth. All of the hardware and software ideas of that momentous 1968 demo by Doug Engelbart were finally becoming available on an afforable platform, and we could feel the world changing around us. It was a feeling I won't soon forget.

Well, as you can tell from my reaction above, I am buying a NeXTdimension board and color monitor as soon as my budget allows. Along with my Digital Ears, this will give me full-motion, real-time editing in CD-sound to/from my VCR, any laserdisk, output to normal or S-video monitors, etc. I didn't mention, but developer and educational prices will be 30-35% LOWER than the above, so we are talking $3k for the cheapest NeXT and only $5.5 for the full upgrade to NeXTdimension for current NeXT cube owners (including the amazing Sony monitor). A brand new NeXTdimension LIST PRICE is $14k, about 1/3 to 1/4 the price of comparable ANYTHINGs, workstations, personal IRISes, PCs with all those extra boards, etc.

I think this really is the beginning of a new era, just as PCs brought down the price of individual computing, this will bring down the cost of individual multi-media, integrated environments that can as easily download and utilize the latest movie, MTV video, and local songwriter's MIDI performance info. as they can create their own programs, music, video, and movies. All information services can now begin to combine distribution channels, all forms of media can now be edited. I forget to mention, the NeXT also has a cheap CD-ROM. And don't forget the integrated networking, multi-media mail, and services. You can see the possibilities as well as I...it is an exciting time we live in.

Charles

FINAL Intro Press Release, 18 September 1990

NeXT ANNOUNCES FOUR NEW 68040 PRODUCTS

SAN FRANCISCO, September 18, 1990 P NeXT Computer, Inc., of Redwood City, Calif., today announced a family of new computer products, as well as Release 2.0 of its system software.

Specifically, the company introduced four products based on Motorola's 68040 microprocessor: NeXTstation, a more powerful and compact NeXT computer that costs less than $5,000; NeXTstation Color, a 16-bit, PostScript color version of NeXTstation; NeXTcube, an expandable NeXT computer with extremely flexible configuration options that can be used as a network server or high-end desktop computer; and NeXTdimension, a high-end, 32-bit PostScript color solution. NeXTstation and NeXTcube will begin shipping in early November, with the two color products scheduled to begin shipping in Q1 1991.

In separate announcements, a number of third-party developers introduced new software applications and peripheral products for the NeXT platform.

"We've listened carefully to our current and prospective customers," said Steven P. Jobs, president and CEO of NeXT, "and many have told us that our new products and suite of NeXTstep applications have exceeded their expectations. These customers have also applauded our decision not to quote artificially low prices for diskless or incomplete products. NeXT's low prices are for real, complete, high-performance computers.

"Based on these customer reactions, we expect to announce several large corporate relationships during the coming quarter," he said.

Shared Identity Across the Product Family

Constant among all the new products is their support for interpersonal computing: the concept of increasing individual and group productivity by improving people's ability to communicate and exchange information and ideas. Many of NeXT's decisions governing the design of the software and hardware for its computers were made with interpersonal computing goals in mind. As a result, an impressive number of capabilities are standard on all four new NeXT products.

Each NeXT computer includes the following

software features

* Release 2.0 system software - Release 2.0 is binary compatible with Release 1.0 and adds new features and capabilities, such as a more graphical Workspace, integrated fax support, plus support for color, DOS floppy disks, international versions of applications, the 68040 microprocessor, and both thin and twisted-pair Ethernet. Applications written for Release 1.0 run unmodified on Release 2.0, only faster, and Release 2.0 runs on 68030-based NeXT computers. Also, Release 2.0 maintains the outstanding features of Release 1.0, such as the NeXTstep interface, WriteNow, the Digital Librarian searching and indexing tool, and an on-line version of Webster'sNinth Collegiate Dictionary.

* NeXTstep - All NeXT computers have NeXT's graphical user interface and development environment, NeXTstep, which makes the power of the UNIX operating system accessible to all users. NeXTstep also helps software developers speed the development of applications with graphical user interfaces.Any software application that runs on one NeXT computer will run on any other NeXT computer, with absolutely no modification. This rule applies even to color: Although color images will not appear in color on a monochrome display, otherwise the application will function fully as designed, without user intervention. Also, an application designed to work in color will do so on any color NeXT machine (16-bit or 32-bit), adjusting automatically to the number of colors offered by the individual system.

* NeXTmail - NeXT's electronic mail (e-mail) application forms the underpinnings for interpersonal computing on NeXT computers. NeXTmail allows users to create messages that include text in a wide variety of fonts and styles as opposed to a single typewriter-style font plus graphics, entire documents from any application, voice annotation and music. The result is a form of electronic communication that better supports how people in an organization actually work. Release 2.0 of NeXT's system software has greatly enhanced NeXTmail by adding the abilities to show color, to adjust to users' personal mail habits and to send legible messages to non-NeXT systems.

* Display PostScript - NeXT was the first company in the computer industry to ship a computer incorporating Display PostScript, a unified imaging model that makes images on the screen appear just as they will look when printed. In Release 2.0 of NeXTstep, NeXT has included Adobe Type Manager, Kanji font support, a variety of performance improvements and a more flexible printing architecture.

The new NeXT computers also share certain hardware features, starting with the same microprocessor:

* 68040 - The top of Motorola's 68000 microprocessor line, the high-performance, high-speed 15 MIPS 68040 is the most highly integrated and sophisticated single processor available today. In addition to the memory management unit, the 68040 also includes an on-chip floating-point unit, for extremely fast mathematical calculations. The single-chip design is more reliable and costs less than multichip processors. In overall system performance, NeXT's 040-based computers are at least three times faster than the original, 030-based NeXT Computer.

* 2.88 MB floppy drive - In response to suggestions for a more convenient and lower-cost software distribution method, NeXT has made a floppy disk drive standard with all its computers. Not satisfied with existing drives, however, NeXT uses a 2.88 MB drive, which can store twice the data of a 1.44 MB floppy drive. The 2.88 MB drive, which is expected to replace 1.44 MB capacity as the industry standard, is compatible with 720K, 1.44 MB, MS-DOS and UNIX-formatted disks.

* Built-in networking - All NeXT computers now include both thin and twisted-pair (i.e., telephone line) industry-standard 10BaseT Ethernet networking. Twisted-pair Ethernet is an attractive option for many customers because twisted-pair wiring is already installed in most buildings. Also, the computers support TCP/IP, a popular standard network among academic and government institutions.

* DSP - In the new products, additional memory capability can be added to the Motorola 56001 DSP chip, making possible an even wider range of DSP applications that incorporate CD-quality sound, signal and image processing, and voice recognition.

* MegaPixel Display - Whether monochrome or color, every NeXT display is of megapixel quality (1120 x 832 resolution), which ensures crisp, clear images. Also, the NeXT monochrome monitor weighs less than the previous model and now has a built-in microphone so users can more easily include voice annotation and other recorded sounds in NeXT applications and documents.

With all NeXT computers, this extremely high level of functionality is standard. >From there, each model offers advantages that appeal to different kinds of customers and situations. Depending on their needs, many NeXT customers will use two, three or even all four of the new NeXT products in their organizations.

NeXTstation

With a suggested retail price of $4,995, NeXTstation is the most affordable NeXT computer. This price includes all the basic NeXT features described above, including a 2.88 MB floppy drive and 105 MB hard disk drive, Release 2.0 pre-installed on the hard drive and 8 MB of memory. Options include memory expansion to 32 MB and a 340 MB hard disk drive.

Although its price and ease of use put it in a class with personal computers, NeXTstation offers the performance of much higher-priced workstations, with its built-in standard networking capabilities, multitasking, and large screen size and storage capacity.NeXTstation is also the most compact NeXT computer. Its single-board, flat

case (14.4 inches by 15.7 inches by 2.5 inches high) fits comfortably under the MegaPixel Display. With its magnesium structure and plastic cover, the case weighs very little (14.5 pounds, including the hard disk) yet is strong enough to support large displays.

NeXTstation's combination of price and capabilities will probably make it the predominant NeXT model in most departments or organizations.

NeXTcube

NeXTcube offers users the greatest number of options within the NeXT family in terms of expandability, storage, memory and pathways to high-end color. One of its most important uses will be as a network file server.

NeXTcube is based on the one-foot cube that characterized the original NeXT Computer, but it has been updated and improved to reflect the most recent changes in the NeXT product line. Besides the 68040 microprocessor, 2.88 MB floppy disk drive, 105 MB hard drive and all the other standard NeXT computer features, the NeXTcube supports a variety of storage options, including 340 MB, 660 MB or 1.4 GB hard disk drives, 256 MB optical drive or CD-ROM drive. Memory can range from 8 MB to 64 MB.

With its wide variety of storage options, the NeXTcube can easily be configured as a low-cost, large-scale network file server, in which case it would include between 16 MB and 64 MB of memory. The optional 256 MB read/write/erasable optical drive provides an excellent option for conveniently storing or transporting large amounts of data, especially graphics and sound; for private, secure storage; and for backing up files.

The entire standard NeXT computer fits on a single board, leaving three NeXTbus expansion slots available on the NeXTcube for adding options such as color, accelerator boards or special-purpose I/O boards.

NeXT in Color: NeXTdimension and NeXTstation Color

NeXT's approach to color begins with its NeXTstep software environment and system software. For NeXT, color means full-color, device-independent PostScript; a Color Panel that is highly intuitive and, therefore, highly effective for allowing users to choose the precise colors they want; and software applications that work equally well on all NeXT computers, whether the computer has monochrome, 16-bit or 32-bit color capabilities. For now, according to Jobs, "We do 2D color better than anyone else because we have 32-bit color PostScript on the screen."

NeXT has implemented color solutions in two forms: NeXTdimension and NeXTstation Color. Each offers capabilities and a price to meet the color needs of a different segment of users.

NeXTdimension

NeXTdimension raises the expectations for 32-bit color in the desktop computing market. It provides demanding color users with an 1120 x 832 pixel (megapixel), 32-bit, true color display of more than 16 million colors. To drive this high-quality display, NeXTdimension includes a high-speed graphics accelerator that preserves the feel and performance of the NeXTstep interface. Furthermore, NeXTdimension's media-rich environment integrates a variety of media on a single platform, including real-time full-motion video; still and full-motion image compression and decompression, recording to disk and playback; CD-quality sound; and complete PostScript text and graphics.

Unlike other color systems, NeXTdimension integrates all these capabilities into a single system, where they work together naturally; the user need not coordinate a number of disparate pieces.

NeXTdimension was created for professional users who need high-end color P in areas such as publishing, graphic arts and design P and for individuals who develop and use programs that run in a media-rich environment P such as for training, image database analysis and scientific work.

NeXTdimension can be purchased as a board upgrade to a NeXTcube, or as an entire system. The board makes 32 bits-per-pixel true color possible P 24-bit color plus 8 bits of alpha channel (transparency control). It also includes 8 MB of RAM (expandable to 32 MB), an Intel i860 graphics accelerator, video input and output, real-time JPEG video compression and decompression, and fast color PostScript capabilities. The MegaPixel Color Display that NeXT offers with the system is based on Sony Trinitron technology, and features the same 1120 x 832 high resolution of the monochrome MegaPixel Display, but with more than 16 million colors.

To take advantage of NeXT's sound capabilities, NeXTdimension users need a Sound Box, a unit that integrates a speaker, a microphone, headphone jacks and RCA-style stereo output, plus keyboard and mouse interfaces. The Sound Box is also used when connecting the computer to larger-screen or multiple monitors.

NeXTstation Color

As its name implies, NeXTstation Color is a color version of the powerful, very low-cost NeXTstation. NeXTstation Color relies on the same fundamental NeXT system software as NeXTdimension, on a lower-priced platform. NeXTstation Color provides a 16-bit color solution that will meet most people's color needs. Its single board is configured for 12 bits of color plus four bits of alpha channel, for transparency, and the system displays 4,096 colors simultaneously.

NeXTstation Color uses the same MegaPixel Color Display as NeXTdimension, with the same crisp, clear resolution; it also uses the Sound Box.

Other Products Rounding Out the NeXT Family of Systems

Current NeXT Computer owners can now purchase an external 2.88 MB floppy drive, which connects to their

computer via the SCSI port. In this way, existing customers can reap the benefits of inexpensive and convenient software distribution. The floppy drive, offered by Peripheral Land Inc. (PLI), can be purchased directly from that company; contact PLI for information. Current owners can also upgrade to the 68040 board and to Release 2.0 of the system software for $1,495.

NeXT still offers its 400 dpi (dots per inch) Laser Printer, and has reduced the price to $1,795 (from $3,495). This price makes the NeXT printer the lowest priced PostScript laser printer in the industry, and even more affordable for individuals.

The company has expanded its keyboard options to include Kanji, UK English, French and German keyboards.

Price and Availability

The following chart lists the suggested retail prices and expected availability of the four new NeXT products, in their base configurations:

NeXTstation system$4,995November 1990

NeXTcube system$7,995November 1990

NeXTstation Color system$7,995Q1 1991

NeXTdimension board$3,995 Q1 1991

All NeXT products are available directly from NeXT or through Businessland in North America. Availability of the new products in the United Kingdom through Businessland UK and in Asia through Canon Inc. will closely follow the U.S. ship dates. NeXT products are also available through selected government and vertical-application VARs (value-added resellers); contact NeXT for specific information.

Higher education and developer customers can continue to purchase NeXT computers directly from NeXT or through higher education resellers at reduced prices; contact NeXT for specific information.

FRANZ TO OFFER ALLEGRO CL DIRECTLY TO NeXT CUSTOMERS

Press Release

SAN FRANCISCO, September 18, 1990--Franz Inc. today announced plans to directly provide Allegro CL (Common LISP) on Release 2.0 of NeXT's system software, for the new NeXTstation and NeXTcube computers. Atthe same time, Franz introduced a low-cost runtime option for delivering LISP-based customer applications on the NeXT platform.

Allegro CL is a powerful object-oriented programming tool for development and delivery of complex applications. With incremental compilation and powerful debugging facilities, Allegro CL is used to produce a wide range of commercial applications, including expert systems, CAD/CAM, and computer graphics. Allegro CL has a direct interface to NextStep's Objective-C, Interface Builder, and Application Kit, allowing the user to treat Objective-C objects as LISP objects.

"NeXT's customers will be pleased to hear that they can easily obtain Franz Allegro CL with NeXT's new computers," said Fritz Kunze, president of Franz. "We are committed to the NeXT platform, and we will continue to provide NeXT with powerful development tools." While Franz is making Allegro CL available to new users, NeXT will distribute a free upgrade to current Release 1.0 customers. Franz will provide software support to all Allegro CL users.

The new low-cost runtime option is a compact version of Allegro CL, without development features such as a compiler or debugger. NeXT developers pay a one time fee for the right to distribute, plus a per-copy fee equalling two percent of the delivered product's price. This means that commercial developers can minimize costs to include an optimized runtime LISP with their application. And educational, research, and government agencies will be able to distribute non-profit applications on a low-cost or no-cost basis.

"LISP is not only an excellent language for prototyping, but also for commercial deployment," said Kunze. "With the new runtime option, NeXT developers can take advantage of the sophisticated development environment of Allegro CL, and still have a clear path for delivering cost-effective applications."

Allegro CL 3.1 for NeXT is available now directly from Franz for $1,500. Next year, Franz will port Allegro CL 4.0 to the NeXT platform, including native CLOS (Common LISP Object System) and Allegro Presto, an automated runtime generator.

Franz Inc. is the leading vendor of LISP-based software tools on standard platforms. Franz Inc. was founded in 1984 by affiliates of the Computer Science Department at the University of California at Berkeley, including original developers of Franz LISP and BSD Unix. Allegro CL and companion products are sold and supported worldwide through Franz' direct sales force and distribution partners. Franz customers include universities, research institutions, and Fortune 1000 corporations.

For more information, contact Franz Inc., 1995 University Avenue, Berkeley, CA 94704, (415) 548-3600.

A Sound Editor for the NeXT

Phillipe

The NeXT is the perfect tool, to quickly and efficiently build short programs demonstrating the power of Object Oriented programming with. For certain reasons, the Sound Editor below does not use many tools available in the SoundKit bundle with the NeXT. This may be a drawback. I will show you what the App does, how it has been implemented, and what kind of improvements can be done.

The goal was to design a graphic sound editor, where

the final user could display the sound (waveform) to do operations on it: cut/paste/zoom. Since it use the microphone entry, the sound is somewhat not perfect. Of course it also gives to user a read/write capability. 3 Views appear in the main window: the wave sound signal (at the bottom), the Energy signal, and the Zoom view at the top. When you read a signal (from a file or through the microphone) it first appears in the Energy and Sound views. The zoom view is activate only when the user select a particular area of the Sound signal with the mouse and select the zoom_in button located under the Sound view.Within the zoom view, you can also do cut/paste operations. The signal is instantly re-displayed with its new shape. It is not possible to modify the frequency of the sound at an instant T, nor the sampling rate. A new release will bring to the user those capabilities. (but consider

that the sampling rate of the microphone is still low). To summarize, it s not possible to change the sound shape dynamically; only cut and paste operations are possible.

The Energy window does not display very interesting, but it is there because a teacher request it for programming purpose only. This module compute and display the global energy of the sound you re reading. It use a short sample period every 30 ms, and it compute the energy in each frequency band. In reality that window is not very useful...

The code as you could see is very clean, and is ninety-five percent purely ObjectiveC.

To construct the user interface, we need to call IB. Once loaded, select the "new" item in the file submenu. Because it is possible to open several windows at the same time, the Application has been split in two parts. The main .nib file and one module where windows will be generated (as in the example given in the IB tutorials).

The main .nib file contains only the "windowDistributor". Now, let s try to build the interface. First you must cut the window icon in the file window because that particular work will be done by the module. IB ask you if you really want to do that, answer yes. Then go to the Palette window (upper Right of the screen)and select the menu icon. Select a menu item by dragging it from the Palette to the main menu

of the -still- untitled1.nib file. When the item is included, give it the name "new". Thus the main menu must now contains a info, new, edit, hide and quit items(to

simplify we will not include the help menu available on the current App).

Next, we need to define either what outlet and action in order to "link" the main .nib file to the module, and so to associate an action to the "new" item we have defined in the main menu.

Open the classes icon in the file window. go to the Object class at the most left. be sure that only Object is selected. Then create a Subclass by selecting "subclass" in

the pop down menu of the File Window. Give it the name of SoundDistributor.

Go back to the Inspector Window. Choose the project item. Select the Add button down the window. include all the .m and .nib file. Then select the Parse item in the File

Window. Always in the same pop down menu, create an instance of the class you created by selecting Instantiate in the File Window Menu.Once the object is created, link the New item from your main menu to that object. That is it for the main .nib file.

Module creation.

select the "New Module" in the File menu.A panel ask you whether that module is of the Object or App subclass. Choose Object, and give it the name of SoundEditor. Again select the Parse item in the Menu of the File Window.

creation of the Interface.

Move 3 CustomView object from the Palette Window in your main Window.Title them Zoom, Energy and Signal (from Top to bottom). Make them as long as the window. Give them the SoundView properties by selecting SoundView in the Attributes item of the CustomView Inspector (therefore you must first include the SoundView.h file in the box classes within the files window).Then drag 3 buttons from the Palette Window to your main window. Locate them below the highest SoundView. Name them respectively, PlayAll play, ZoomOut. Again, drag 5 buttons and put them under the lowest SoundView. Name them Record, PlayAll, Play, Load, Save, ZoomIn.

Now you need to establish links. Start from the File's Owner icon in the File Window and drag it to the SoundView at the bottom (Signal). The File's Owner Inspector (set on connections) gives you the choice between four Outlets: Select SoundSignal and connect them together by selecting the Connect button in the Inspector Window. Do the same thing for the two other SoundView , with each its own Outlet (Outlet name related with the SoundView name).

Then start another connection from the File's Owner to the Title bar of the Main Window. Select the latest Outlet no yet connected in the Inspector Window, and connect them.

To connect All buttons, starts from each button to the File's Owner. Again, select the Action (displayed in the Inspector) with a related name with the one of the button you link with.

That's all. You just have to compile the stuff. If you have some trouble, i will send you the complete App (exec, IB files, sources...).

To run the App, you have the choice to get the sound from a sound file, or from a Microphone connected to the Cube. A wave form appears within the Signal SoundView. A sound file can be either created by saving a signal read from the microphone entry, or by loading a existing sound file bundle with the cube. You can cut, paste and copy pieces of that wave form. The Energy Window is not editable. Its only goal is to display the En-

ergy.

To "ZoomIn" in the Signal View, you must select a piece of the sound signal and then select the ZoomIn Button. The zoomed signal appear a few seconds after in the Zoom view at the top of the window. Here, you can also cut, copy and paste.

No modification will appears in the sound signal of the Signal View until you want to "ZoomOut". Then, the original selected piece of the wave form will change with the one of the Zoom View.

If you want to edit several sounds without loosinh the one you edit, select the New item in the main Window. Another Window will appears, give you the opportunity to load another sound , and then to mix sounds between windows. You can create as many windows -and so edit as many sounds- as you memory can.

What improvements can be done ?

Several. First, a good idea should be to display the sound in a ScrollSoundView. Currently the size of the wave form is proportional to its duration, thus if the sound you want to edit is quite long, its display will be small.

Then it will be great to dynamically design and change the wave form of the sound (ie by acting on the form with the mouse, you could change the frequence of the sound). That s definitively more difficult.

This program has been written by Alain Durand and Caroline Drouin.

A complete version will be find in major FTP sites in a few days. That app includes the on-line Help, and can show you how links are built if you re in trouble to make the connection by yourself. Have fun.

Phil

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```
/*
 *     Generated by the NeXT Interface Builder.
 */

#import <stdlib.h>
#import <appkit/Application.h>

void main(int argc, char *argv[])
{
    NXApp = [Application new];
    [NXApp loadNibSection:"SNDEditor.nib" owner:NXApp];
    [NXApp run];
    [NXApp free];
    exit(0);
}

/* Generated by Interface Builder */

#import <objc/Object.h>

@interface SoundDistributor:Object
{
  id newSoundEditor;
}

- CreateSoundEditor:sender;

@end

/* Generated by Interface Builder */

#import "SoundDistributor.h"
#import "SoundEditor.h"

@implementation SoundDistributor

- CreateSoundEditor:sender
{
                newSoundEditor = [SoundEditor new];
                [newSoundEditor Show:self];
    return self;
}


@end
```

```
/* Generated by Interface Builder */

#import <objc/Object.h>

@interface SoundEditor:Object
{
    id  SoundZoom;
    id  SoundEnergy;
    id  SoundWindow;
    id  SoundSignal;
                id  sndZoom;
                id  sndEnergy;
                id  sndSignal;
                char SignalFileName[100];
                char SignalDirName[256];
                char EnergyFileName[100];
                char EnergyDirName[256];
}

+new;

- setSoundZoom:anObject;
- setSoundEnergy:anObject;
- setSoundWindow:anObject;
- setSoundSignal:anObject;
- PlayAllZoom:sender;
- Play:sender;
- ZoomOut:sender;
- PlayZoom:sender;
- Record:sender;
- PlayAll:sender;
- Load:sender;
- ZoomIn:sender;
- Show:sender;
- Save:sender;
- ComputeEnergy;

@end

/* Generated by Interface Builder */

extern void energy();


#import "SoundEditor.h"

#import <appkit/View.h>
#import <appkit/appkit.h>
#import <soundkit/soundkit.h>
#import <strings.h>

@implementation SoundEditor

static newLocation(NXPoint *p)
{
    // compute the location of the new window
    // shifted to the botom-right
    static count = 0;
    p->x += (20.0 * count);
    p->y -= (25.0 * count);
    count = (count > 10)? 0 : count+1;
}


+new
{
  // create the new window
  // and initialize the different parameters
  self = [super new];
  [NXApp loadNibSection:"SoundEditor.nib" owner:self];

  // browser purpose
```

```
  strcpy(SignalFileName,"SoundEditor.snd");
  strcpy(SignalDirName,".");
  strcpy(EnergyFileName,"E.SoundEditor.snd");
  strcpy(EnergyDirName,"./");

  // view attributes
  [SoundSignal setAutodisplay:YES];
  [SoundSignal setAutoscale:  YES];
  [SoundZoom   setAutodisplay:YES];
  [SoundZoom   setAutoscale:  YES];
  [SoundEnergy setAutodisplay:YES];
  [SoundEnergy setAutoscale:  YES];
  [SoundEnergy setEnabled:    NO ];
  [SoundEnergy setDisplayMode:SK_DISPLAY_WAVE];

  // view defaults contents
  sndSignal = [Sound new];
  [SoundSignal setSound:sndSignal];
  sndZoom = [Sound new];
  [SoundZoom setSound:sndZoom];
  sndEnergy = [Sound new];
  [SoundEnergy setSound:sndEnergy];

  return self;
}


- setSoundZoom:anObject
{
    SoundZoom = anObject;
    return self;
}

- setSoundEnergy:anObject
{
    SoundEnergy = anObject;
    return self;
}

- setSoundWindow:anObject
{
    NXRect theFrame;
    SoundWindow = anObject;
    [SoundWindow getFrame:&theFrame];
    newLocation(&theFrame.origin);
    [SoundWindow moveTo:theFrame.origin.x :theFrame.origin.y];
    return self;
}

- setSoundSignal:anObject
{
    SoundSignal = anObject;
    return self;
}

- PlayAllZoom:sender
{
    // play the whole zoom sound
    id ZoomSound;
    ZoomSound = [Sound new];
    ZoomSound = [SoundZoom sound];
    [ZoomSound play];
    return self;
}

- Play:sender
{
    // play the current selection of the signal sound
    [SoundSignal play:sender];
    return self;
}
```

```
- ZoomOut:sender
{
    // zoom out from zoom sound to signal sound
                [SoundZoom selectAll:sender];
                [SoundZoom      copy:sender];
                [SoundSignal   paste:sender];
    [self ComputeEnergy];
    return self;
}

- PlayZoom:sender
{
    // play the current selection of the zoom sound
    [SoundZoom play:sender];
    return self;
}

- Record:sender
{
    // record from the microphone to the selected part of the signal sound
    static int state=0;
    state = (++state)%2;
    if (state) {
      [SoundSignal record:sender];
      }
    else {
      [SoundSignal stop:sender];
      [self ComputeEnergy];
      }
    return self;
}

- PlayAll:sender
{
    // play the whole signal sound
    id SignalSound;
    SignalSound = [Sound new];
    SignalSound = [SoundSignal sound];
    [self ComputeEnergy];
    [SignalSound play];
    return self;
}

- Load:sender
{
    id   theBrowser;
    id   aSound;
    int  result;
    char *slashPtr;

    // open a browser and load the selected file
    theBrowser = [OpenPanel new];
    [theBrowser setRequiredFileType: "snd"];
    [theBrowser setDirectory: SignalDirName];

    result = [theBrowser runModal];
    if (result) {
      aSound = [Sound new];
      strcpy(SignalFileName,[theBrowser filename]);
      strcpy(SignalDirName,SignalFileName);
      slashPtr = rindex (SignalDirName, '/');
      if (slashPtr) {
        *slashPtr = '\0';
        }
      [aSound readSoundfile:SignalFileName];
      [SoundSignal setSound:aSound];
      strcpy(EnergyFileName,"E.");
      strcat(EnergyFileName,strrchr(SignalFileName,'/')+1);
      [SoundWindow setTitle:strrchr(SignalFileName,'/')+1];
      [self ComputeEnergy];
      }
    return self;
```

```
}

- ZoomIn:sender
{
    // zoom in from the signal sound to the zoom sound
    int firstSample, sampleCount;
    id aSound;
    aSound = [Sound new];
    [SoundSignal getSelection:&firstSample size:&sampleCount];
    [aSound copySound:[SoundSignal sound]];
    if (firstSample) {
      [aSound deleteSamplesAt:0 count:firstSample-1];
      }
    if (sampleCount) {
      [aSound deleteSamplesAt:sampleCount count:[aSound sampleCount]];
      }
    [SoundZoom setSound:aSound];
    return self;
}

- Show:sender
{
    [SoundWindow makeKeyAndOrderFront:self];
    return self;
}

- Save:sender
{
    id  theBrowser;
    id  aSound;
    int result;

    // open a browser and save the selected file
    theBrowser = [SavePanel new];
    [theBrowser setRequiredFileType: "snd"];
    result = [theBrowser runModalForDirectory: SignalDirName
                    file: SignalFileName];
    if (result) {
      aSound = [Sound new];
      aSound = [SoundSignal sound];
      sndSignal = [SoundSignal sound];
      strcpy(SignalFileName,[theBrowser filename]);
      [aSound writeSoundfile:SignalFileName];
      [SoundWindow setTitle:strrchr(SignalFileName,'/')+1];
      }
    return self;
}

- ComputeEnergy
{
    // compute the energy of the signal sound
    // and store it in the energy view
    char newEnergy[100];
    char SystemCommand[200];
    id aSound;
    aSound = [Sound new];

    if ([[SoundSignal sound] sampleCount]) {
      [[SoundSignal sound] writeSoundfile: EnergyFileName];
      energy (EnergyFileName);
      strcpy(newEnergy, EnergyFileName);
      strcat(newEnergy, ".energy");
      [aSound readSoundfile:newEnergy];
      [SoundEnergy setSound: aSound];

      // cleanup purpose
      strcpy(SystemCommand, "rm ");
      strcat(SystemCommand, EnergyFileName);
      system ( SystemCommand );
      strcpy(SystemCommand, "rm ");
      strcat(SystemCommand, newEnergy);
      system ( SystemCommand );
```

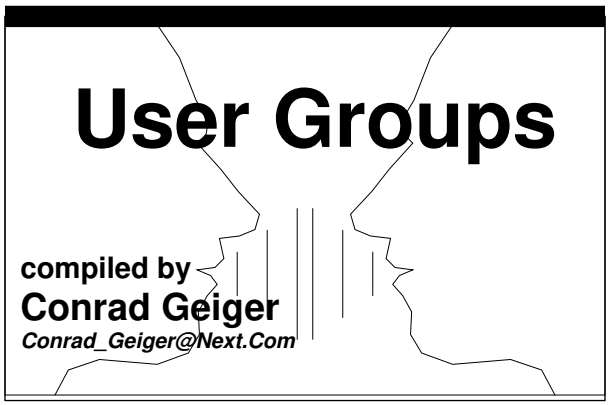
```
        }

    return self;

}


@end
# define FRAME_SIZE     80    /* 80 samples are about 10 msec */
# define ENERGY_GAP     0.55  /* energy < 0.55 * max  =>  silence */
# define MAX_SEQ_LEN    1     /*  max number of frames */
# define N_FEATURES     18    /* number of features per frame */
# define FFT_POWER      8
# define FFT_SIZE       256
# define NUM_BAND       17
# define QUIET          60.0  /* Max. energy should be greater than 60 dB */
#define SIZE    10000

# define  OK  0
# define FAIL 1
# define NEW 0
# define OLD 1
```



This is the official issue of the NeXT User Groups Directory of the 48 NeXT User Groups.

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Meetings held on the fourth Wednesday
of each month from 7 to 9PM

NeXus Memo, monthly newsletter

NeXT SPECIAL INTEREST GROUPS (SIG)

Classroom: NeXT Courseware SIG
Email: send the following text message to
MAILSERV@gac.edu -
"Subscribe next-classroom <your name>"

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NeXT Users' Journal, monthly newsletter
Editor-in-Chief, Erica Liebman
(Issues run forty to sixty pages)

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Other NeXT related User Groups

Mathematica Special InterestGroup
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FUN (Frame Users Network)
Email: framers-request@drd.com

Late addition:

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For further information on how to start your NeXT User Group, please email to the following address:

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BANG September 19th Meeting Summary

Ken Fromm

On September 19th, the Bay Area NeXT User Group held their sixth meeting. Presentations were given by NeXT, WordPerfect, Ashton-Tate and Lotus on their new products. Approximately 250 people attended.

The first speaker was Paul Vais, Director of Systems Engineering at NeXT Computer, Inc. He gave a shortened but lively rendition of the slide presentation given the day before at Davies Symphony Hall by Steve Jobs. He interspersed his presentation with humor, ("This is not my slide show. This is Steve's so bear with me."), trivia (the new monitors can be differentiated from the old by the curve of the base. The older monitors have an angular base) and technology (the 68040 has the floating point processor in silicon dramatically speeding up floating point operations - the Display PostScript systems usesfloating point operations extensively so there is a big win here).
Warm receptions were given by those in attendance at the announcement of the price, the fax capabilities, the real time video, the color and the OCR demonstration.
The next speaker was Royce Bybee, Product Manager for NeXT products at WordPerfect. The team from WordPerfect started out the presentation by flinging peanut M&M's into the crowd and rewarding hats for correct answers to WordPerfect corporate trivia. This reporter was unable to record the trivia questions because he was too busy dodging those errant yellow packages.
Mr. Bybee said that their WordPerfect word processor version for the NeXT would be out in beta form by the end of the year. He added that the port of the software took a year less than expected and was one of the easiest ports encountered so far. His demonstration of the product showed some very fast ruler and column formatting and wrapping of text around placed images. The WordPerfect product features merging capabilities, a speller and thesaurus, headers, footers and footnotes and much more. The suggested retail is $495 with a suggested educational price of $135 on 3.5" disks, $170 on an optical disk.
An attendee asked who would buy WordPerfect when WriteNow ships with the machine. His question was answered by the crowd when they began to laugh in a subdued but audible tone.
The next two speakers gave presentations on the PowerStep product from Ashton-Tate. Toby Corey, the Product Marketing Manager, and Joe Amaratto, one of the developers, introduced and demonstrated the product. PowerStep is a spreadsheet with a conventional interface. It appears very clean and unencumbered. The spreadsheet comes with a veritable bevy of charting options of which the presenters were more than happy to demonstrate. The lip service capabilities and the drawing features were also highlighted.

The last demonstration of the night turned out to be one of the best not because of humor or largess but because of a very fine and innovative product. Scott Andersen of Lotus introduced the Improv spreadsheet. The conventional approach to spreadsheets with its row and cell based formulas gave way to the use of "categories with meaning". In the words of the presenter, "Improv introduces a new language to spreadsheets... English." Indeed this statement seemed true enough as the demonstration of a spreadsheet proceeded from the ground up. The product was very well received by the crowd as was the announcement that the spreadsheet will ship for free with NeXT computers and upgrades sold between now and the end of the year. Beta should begin with two weeks.

The end of the meeting turned into a clothing free-for-all as 24 WordPerfect hats, 4 WordPerfect long sleeve polo shirts, 4 NeXT turtlenecks (black, of course) and 2 WordPerfect chairs (yes, chairs) were raffled off to those in attendance. Many thank you's to those who provided the materials. Special thanks also to Joe Barello, Rick Reynolds and Eric Ly of BANG and many of the people at NeXT for their efforts in making the night of the 19th an enjoyable and informative event.

Contacts

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NeXT Support Questions

Care of Doug Keislar

QA submitting new help NextAnswers (QA405)

Q: How is a new entry for NextAnswers submitted to NeXT?

A: The completed entry should be mailed to NextAnswers@NeXT.COM. We expect to distribute NextAnswers on a monthly basis. Externally submitted entries will be distributed at the same time. NeXT will only distribute verifiable QA pairs, and although we definitely appreciate all submissions, we can't guarantee that any particular one will be included. Please only submit complete entries. When submitting an entry to NeXT use the following format:

Keywords

Q: Question

A: Answer

Submitted by: Your name and phone number or Internet address

Omit the "QA#" line that you see at the bottom of the NextAnswers files; we will add this line with a unique number. Please also indicate whether you want the ™Submitted by line included in the distributed NextAnswers or not. You may submit any file which can be indexed by the Digital Library indexing software (e.g., plain text, rich text, WriteNow).

Q: What do error codes mean at power-up time? (QA475)

A: If you got an error message "EC81" when you turned on the machine, see NextAnswer hardware.442.

Here are all the System Test Diagnostics Error Codes, from the on-line document /NextLibrary/Documentation/NeXT/SysRefMan/17_ROM.wn:

This section lists error codes that might be returned if a system test diagnostic fails. When the system test fails while the animated boot icon is being displayed, you can display the text window containing the specific system test error message by typing the NMI key sequence (that is, by pressing the backquote key on the keypad while holding down both the left and right Command keys).

FPU Tests

Error CodeMeaning

41FPU data registers are faulty.

42FPU and CPU intraprocessor data transfer test failed.

43FPU arithmetic functional test failed.

SCC Channel Tests

Error CodeMeaning

51Port A SCC/DMA transmit interrupt didn't occur within 0.1 second.

52Port A SCC chip didn't receive the loopback character within 0.1 second.

53Port A loopback character doesn't match the character sent.

55Port B Tx buffer not cleared after waiting for 0.1 second.

56Port B non-DMA transmit not finished within 0.1 second.

57Port B non-DMA loopback character doesn't match the one sent.

SCSI Channel Tests

Error CodeMeaning

61FIFO count doesn't match the number of characters loaded.

62FIFO doesn't contain the data that was loaded.

63FIFO count doesn't match number of characters left in FIFO.

Tests that produce the following error codes are executed only if a SCSI drive is installed and the p command's ™SCSI test parameter is enabled.

Error CodeMeaning

64FIFO flush command failed.

65Cannot load counter with test pattern.

66Cannot load counter with inversed test pattern.

67Configuration register failed.

6853c90 doesn't generate interrupt on illegal command.

Ethernet Channel Tests

Error CodeMeaning

71Couldn't set physical address.

72Couldn't drain DMA receive buffer.

73Physical packet not received.

74Physical packet was garbled.

75Received a packet with wrong address.

76Broadcast packet not received.

77Broadcast packet was garbled.

MO Drive ECC Tests

Error CodeMeaning

81DMA transfer of raw data to ECC failed.

82DMA read of encoded data from the ECC failed.

83DMA transfer of corrupted data back to ECC failed.

84ECC error count is incorrect.

85DMA transfer of corrected data from ECC failed.

86ECC corrected data isn't correct.

Real-Time Clock Tests

Error CodeMeaning

91The RTC didn't tick after 0.3 seconds.

Two Bit Graphics Tests

Error CodeMeaning

a1Main memory TBG A*B function failed.

a2Main memory TBG ceiling(A+B) function failed.

a3Main memory TBG (1-A)*B function failed.

a4Main memory TBG A+B-A*B function failed.

a1Video memory TBG A*B function failed.

a2Video memory TBG ceiling(A+B) function failed.

a3Video memory TBG (1-A)*B function failed.

a4Video memory TBG A+B-A*B function failed.

System Timer Tests

Error CodeMeaning

c2The system timer can't be set.

c3The system timer interrupt doesn't work.

Event Counter Tests

Error CodeMeaning

d1The event counter didn't tick after 2 microseconds.

d2The event counter isn't accurate.

d3The event counter isn't ticking smoothly.

Sound-Out Tests

Error CodeMeaning

e1DMA sound-out start failed.

e2DMA transfer of sound-out data failed.