Sun Microsystems, Inc.

Software TECH Bulletin

Bulletin Number: NETW-0001   **Document Control Number:** 812-0001

Date: 10 / 23 / 85   **Page** 1 of 4

Product(s) Affected: 2.0 and up software releases

Symptoms / Topic: Poor Network Performance

Problem / Background: Excessive collision rates on network

Current Solution: Effective Maintenance of Hardware

Permanent Solution: Effective Maintenance of Hardware

Other Information:

Ethernets, unlike other local area networks, are designed to keep working despite the possible failure of one or more of the computers on the net. While this is an admirable feature, it does not mean that an ethernet is entirely immune to the behavior of individual computers or stations. There are times when a malfunction in one machine can affect the performance of the entire network.

Recently, such a phenomenon was observed on the Sun Customer Support network. Service in general was very poor. All the machines were running too slowly, with the greatest impact being felt by the diskless clients. Processes were timing out, not because the servers were down, but because response time was so slow. From the viewpoint of individual clients, it often appeared as if, in fact, their server had died.

Through the use of netstat and perfmeter, high collision rates were detected on the net. For some time the cause of this problem was not clear. Eventually it was discovered that one machine was the source of the trouble. It had a short in its internal ethernet cable that resulted in a failure to detect carrier presence.

When a station on the ethernet wants to broadcast something it first checks the net for a carrier signal. The presence of carrier indicates the use of the net by someone else. Normally, the station in question would wait a randomly determined period of time before attempting a re-broadcast. A collision occurs whenever two or more machines try to broadcast at the same time, or when one machine has the net and another tries to use it. A collision causes all stations to stop broadcasting and to retry later. Ideally, collision rates are very low, below 1%. Rates higher than a few percent mean that stations are spending too much time trying to broadcast messages and/or waiting for answers. The main implication of this carrier detection scheme is that control of an ethernet is distributed among the constituent stations. There is no centralized arbiter analogous to a bus master.

In effect, one workstation was ignoring the ethernet arbitration method and broadcasting whenever it had a packet ready.The result was an 85% collision rate for this rogue machine and lower, but still very high, rates for all the others. The culprit was found by running a simple shell script, as root, from a machine with an entry in the /.rhosts file of every other machine on the net.

Some information on the organization of the Customer Support network may be helpful here. The net is fairly homogeneous in the sense that all machines on it are Suns. However, it is heterogeneous in terms of the individual machine configurations. There are 80 Suns on the net. Many are diskless 50's and 100's being served by 170's. Some are 100's or 120's with their own local disks, using some NFS services. Most, but not all, are running 2.0, and most of these are running yellow pages.

The script *netbugs*, with comments and sample output, is included here.

```
#!/bin/sh
#
# usage: netbugs netnumber [Mtu value]
#
# Netbugs runs the command 'netstat -i' on all the machines on a local
# network and directs the output to a file called 'results'. This file
# is then used as input to a grep|awk|sort pipeline which writes to
# standard output. The form of the output is a 4 column table.  Each
# row contains, in order, the host name, the number of output packets,
# the number of collisions and the percentage of collisions.  The table
# is sorted by collision percentages, in descending order.
#
# Netbugs requires at least one argument and may take an optional second
# one. The first argument is that part of an internet number which is
# specific to the domain you wish to search. For example, given the
# argument '192.9', netbugs will try to run on every host known to my
# yp server. Given '192.9.4', netbugs will try to run on every host on
# the support net. Finally, given '192.9.4.80', netbugs will only run on
# my machine, aurora, (inefficient, but allowable).
#
# The second, optional, argument is the Mtu number (Maximum transmission
# unit). This is the largest allowable size for the data segment of an
# Ethernet packet. This may be installation specific. The default value
# is 1500, the Mtu on Sun's network.
#
# All sorts of error messages show up on the final output if the machine
# from which netbugs is run is not known to the target machines.
#
#
```

```
case $# in
  0) echo "Usage: netbugs netnumber [Mtu value] " ; exit 1 ;;
  1) netnum=$1 ; Mtu=1500 ;;
  2) netnum=$1 ; Mtu=$2 ;;
  *) echo "netbugs: too many arguments" ; exit 1
esac
:
rm results
:
for i in `ypcat hosts|grep $netnum|awk '{print $2}'`
do
  echo 'Host: ' $i >>results
  rsh $i -n netstat -i 2>&1 >>results
  echo 'Done: ' $i >>results
done
:
echo "        Host          Opkts      Collis      %" ; echo ""
  grep $Mtu results|\
  awk '{printf("\t%-12s%10d%10d%10.1f%%\n",$4,$7,$9,(($9/$7)*100))}'|\
  sort +3n -r
```

Here is some sample output generated from the Customer Support Network by the command 'netbugs 192.9.4'. The list is relatively short because the script cannot access all the machines on the support net from my machine.

Host	Opkt	Collis	%
arrakis	17220	1174	6.8 %
brahe	140170	4178	3.0 %
perle	75349	1850	2.5 %
mtbsc	210085	4539	2.2 %
sunview	17059	3814	2.2 %
doctor	175955	3696	2.1 %
fedora	130391	2751	2.1 %
ufo	43351	903	2.1 %
cos	80143	1636	2.0 %
nebadon	151019	3025	2.0 %
terrapin	9989	198	2.0 %
dojo	98547	1878	1.9 %
junior	166796	3152	1.9 %
polar	253375	4810	1.9 %
stellar	278984	5412	1.9 %
daedalus	95878	1726	1.8 %
mabstoa	151642	2449	1.6 %

shogun	200312	3245	1.6 %
kuma	116195	1763	1.5 %
sunstorm	231093	3353	1.5 %
aurora	578814	6185	1.1 %
helios	186373	2004	1.1 %
ray	317618	3447	1.1 %
sunbow	369949	4109	1.1 %
delmar	11770	123	1.0 %
sundial	326012	3282	1.0 %
vfree	1066755	10353	1.0 %
jazz	186185	1602	0.9 %
sunburst	1763686	14717	0.8 %
celestial	40860	306	0.7 %
sundew	12002	71	0.6 %
prophet	60021	274	0.5 %
hades-bb	90508	49	0.0 %
sundew-hp	2153	0	0.0 %

Originator: Michael Kamerick   **Organization:** Customer Support Engineering

SUN
USER GROUP

25 February 1985

Dear Sun User Group Member:

Thank you for your interest in the Sun User Group Donated Software Distribution. As you may know, it is our intention to collect and distribute software programs written by our members that can be shared with others. Conceivably, some of this software might contain licensed software that has distribution restrictions. We have made application to AT&T for permission to distribute any software containing UNIX source code to those members with AT&T UNIX source licenses.

However, since this licensing issue remains unresolved, we will be collecting ONLY unlicensed software for the first distribution targeted for release April. If you have any software program, utility, game, tool etc. that you would like to contribute to this first release, simply follow the instructions below.

Some of you may already know that you would like to contribute licensed software. Though it cannot be included on this first release, we will certainly want to have it on the second release. Please notify us that you have such software and we will be sure to contact you when the licensing issues have been resolved.

If you do not have any software to contribute, but would like a copy of the distribution, complete and return the Sun User Group Donated Software Distribution Request Form and License with your payment.

How to contribute software:

1. Complete the "Software Contributor Release Form and License" with required information and authorized signature.

2. Provide your software on either a 1/4" or 1/2" tape made in tar format. You may also send it electronically to !sun!users. If you *do* send it over the network, include for all listings a checksum [SUM(1)] of the files being sent.

3. Each program should be in a separate directory and include the following:

    a) a "READ_ME" file

        i.   author information: name, address, phone (optional)

        ii.   copyright information (if applicable)

        iii. program size (binary form) and block size

    b) a makefile

    c) a brief on-line manual page (written in standard UNIX manual documentation format -- see sample attached or can be found in User Manual for the Sun Workstation, Section 7 MAN(7).

4. Since this is an unsuppported tape, inclusion of your name and phone number is optional. Be sure to note on the "Software Contributor Release Form and License" whether or not you wish to have this information on the tape.

5. This form and accompanying software must be received by the Sun User Group no later than **March 15, 1985** for inclusion in the 85.1 Software Distribution which will be ready in April.

How to order the Donated Software Distribution:

1. Complete the "Donated Software Distribution Request Form and License" with required information and authorized signature.

2. Attach a check for $100 made payable to "Sun User Group" drawn on a U.S. bank and in U.S. dollars. Sun User Group does not invoice. Checks must be identified with the name of the member and/or membership number or they will be returned.

Address all correspondence to:

Sun User Group
2550 Garcia Avenue M/S 5-12
Mountain View, CA 94304

Attn: Laura Tong

NAME
>   man – macros to typeset manual

SYNOPSIS
>   **nroff** **−man** file ...
>
>   **troff** **−man** file ...

DESCRIPTION
>   These macros are used to lay out pages of this manual. A skeleton page may be found in the file /usr/man/man0/xx.
>
>   Any text argument *t* may be zero to six words. Quotes may be used to include blanks in a 'word' If *text* is empty, the special treatment is applied to the next input line with text to be printed. In this way .I may be used to italicize a whole line, or .SM followed by .B to make small bold letters.
>
>   A prevailing indent distance is remembered between successive indented paragraphs, and is reset to default value upon reaching a non-indented paragraph. Default units for indents *i* are ens.
>
>   Type font and size are reset to default values before each paragraph, and after processing font and size setting macros.
>
>   These strings are predefined by −**man**:
>
>   *R   ' ', '(Reg)' in *nroff*.
>
>   *S   Change to default type size.

FILES
>   /usr/lib/tmac/tmac.an
>   /usr/man/man0/xx

SEE ALSO
>   troff(1), man(1)

BUGS
>   Relative indents don't nest.

REQUESTS

Request	Cause Break	If no Argument	Explanation
.B *t*	no	*t*=n.t.l.*	Text *t* is bold.
.BI *t*	no	*t*=n.t.l.	Join words of *t* alternating bold and italic.
.BR *t*	no	*t*=n.t.l.	Join words of *t* alternating bold and Roman.
.DT	no	.5i 1i...	Restore default tabs.
.HP *i*	yes	*i*=p.i.*	Set prevailing indent to *i*. Begin paragraph with hanging indent.
.I *t*	no	*t*=n.t.l.	Text *t* is italic.
.IB *t*	no	*t*=n.t.l.	Join words of *t* alternating italic and bold.
.IP *x i*	yes	*x*=""	Same as .TP with tag *x*.
.IR *t*	no	*t*=n.t.l.	Join words of *t* alternating italic and Roman.
.LP	yes	-	Same as .PP.
.PD *d*	no	*d*=.4v	Interparagraph distance is *d*.
.PP	yes	-	Begin paragraph. Set prevailing indent to .5i.
.RE	yes	-	End of relative indent. Set prevailing indent to amount of starting .RS.
.RB *t*	no	*t*=n.t.l.	Join words of *t* alternating Roman and bold.
.RI *t*	no	*t*=n.t.l.	Join words of *t* alternating Roman and italic.
.RS *i*	yes	*i*=p.i.	Start relative indent, move left margin in distance *i*. Set prevailing indent to .5i for nested indents.
.SH *t*	yes	*t*=n.t.l.	Subhead.
.SM *t*	no	*t*=n.t.l.	Text *t* is small.
.TH *n c x v m*	yes	-	Begin page named *n* of chapter *c*; *x* is extra commentary, e.g. 'local', for

| | | | page foot center; v alters page foot left, e.g. '4th Berkeley Distribution'; m alters page head center, e.g. 'Brand X Programmer's Manual'. Set prevailing indent and tabs to .5i. |
| .TP i | yes | i=p.i. | Set prevailing indent to i. Begin indented paragraph with hanging tag given by next text line. If tag doesn't fit, place it on separate line. |

* n.t.l. = next text line; p.i. = prevailing indent

SUN
USER GROUP

Sun Microsystems User Group, Inc.

DONATED SOFTWARE DISTRIBUTION

Contributor Release Form and License

(Unlicensed Software)

Name of Submitter: _____

Institution: _____

Address: _____

_____

Phone: (   ) _____

Network Address: _____

Circle one: Please include/don't include the above information in the tape.

I have submitted the materials identified below (hereinafter referred to as the MATERIALS) to the Sun User Group for inclusion in the "Sun User Group Donated Software Distribution" (hereinafter referred to as the SOFTWARE). I hereby grant to the Sun User Group a license to use the MATERIALS and to redistribute them to its members.

Identification or description of the MATERIALS:

Approximate size of the program (binary): _____ Block size: _____

I declare that, to the best of my knowledge, the proprietary rights to the MATERIALS:

( ) are in the Public Domain

or ( ) remain with _____.
(owner)

_____   _____   _____

Authorized Signature   Name (Printed)   Date

Please return form to: Sun User Group   Attn: Laura Tong
2550 Garcia Avenue M/S 5-12
Mountain View, CA 94043

SUN
USER GROUP

To: Sun User Group Member

From: Sun User Group Technical Committee

Re: Product Survey

As the first project for the Technical Committee, we have composed the following product survey in order to have input to Sun's current and future product development. Please take a few minutes to complete this survey and return it to the Sun User Group office.

I. General User Information

Optional: We can get all general user information from the Sun User Group database if you provide us with your member number (see enclosed directory).

Member Number: _____

Application:

CAD/CAM/CAE _____ CIM _____ CASE _____ AI _____ CAP _____ O/A _____

Graphics _____ Academic _____ Science/Research _____ Other _____

II. Software

1. What release are you running? 1.0 _____ 1.1 _____ 1.2 _____ 1.3 _____ other _____

2. What software packages have you purchased from the Catalyst Program?

3. What software do you need that is not currently offered through the Catalyst Program?

III. Networks/Communication

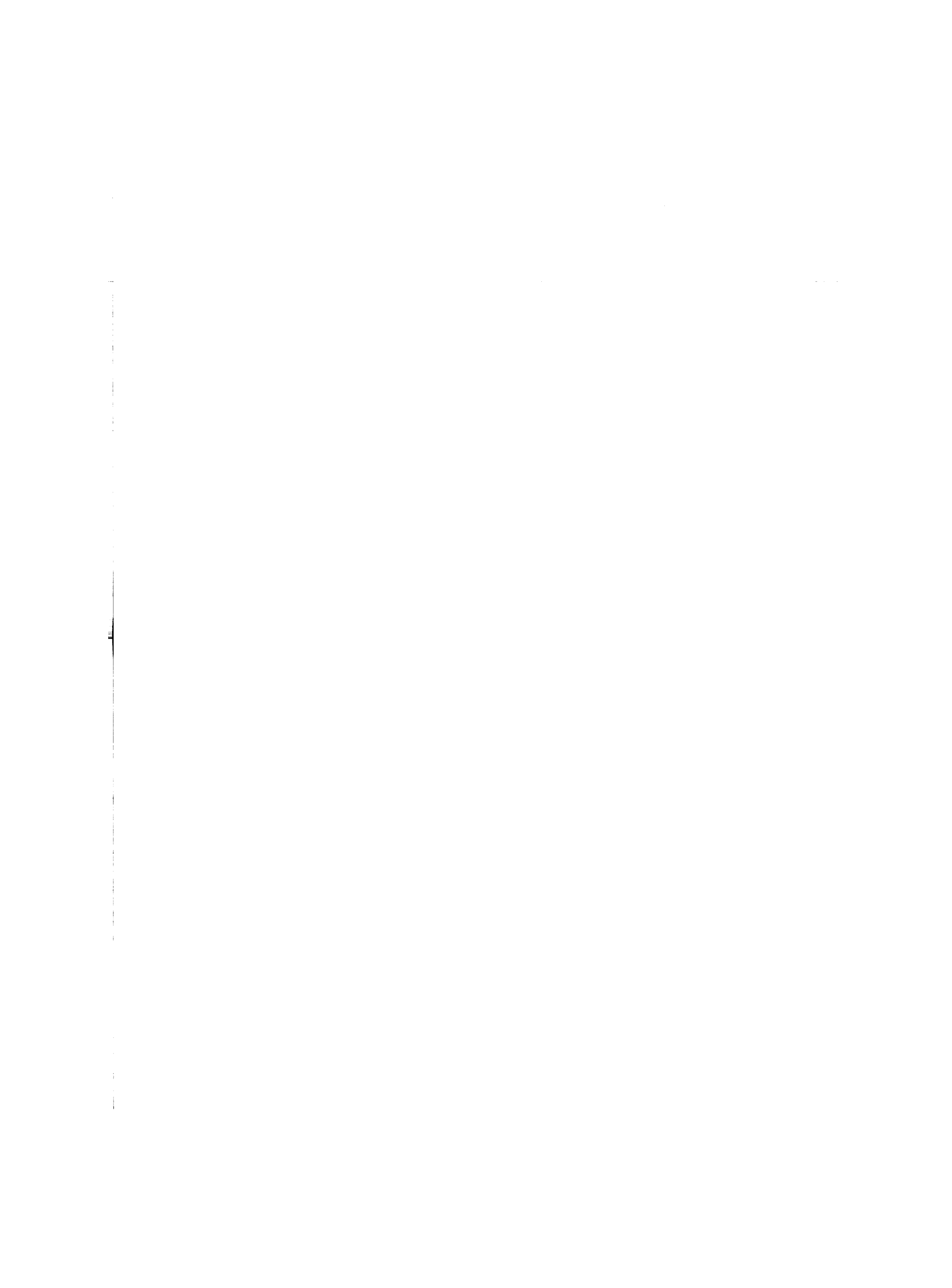1. Do you need to plug into the IBM mainframe world?

   yes _____ no _____ SNA 3270 _____ X.25 _____ X.21 _____ Other _____

2. What percentage of your workstations need this? _____%

3. Are your workstations on a network? yes _____ no _____

4. If yes, what is the number of nodes in your network?

   < 4 _____ 5-10 _____ 10-30 _____ 30-100 _____ > 100 _____

5. How many workstations per fileserver? _____

6. How much fileserver disk space is needed per workstation? _____MBytes

7. Do you need local storage on a workstation that is on a network with a fileserver?

   yes _____ no _____

8. If yes, why?

9. How important do you consider the NFS (Network File System)?

   extremely _____ fairly _____ not at all _____

IV. Performance

1. What level of graphics performance do you require?

   vector draw rate _____ 2D & 3D transform clip & scale rate _____

   area fill rate _____ other performance requirements? _____

2. What level of cpu performance do you require? _____mips

3. How do you measure/evaluate performance (benchmarks)?

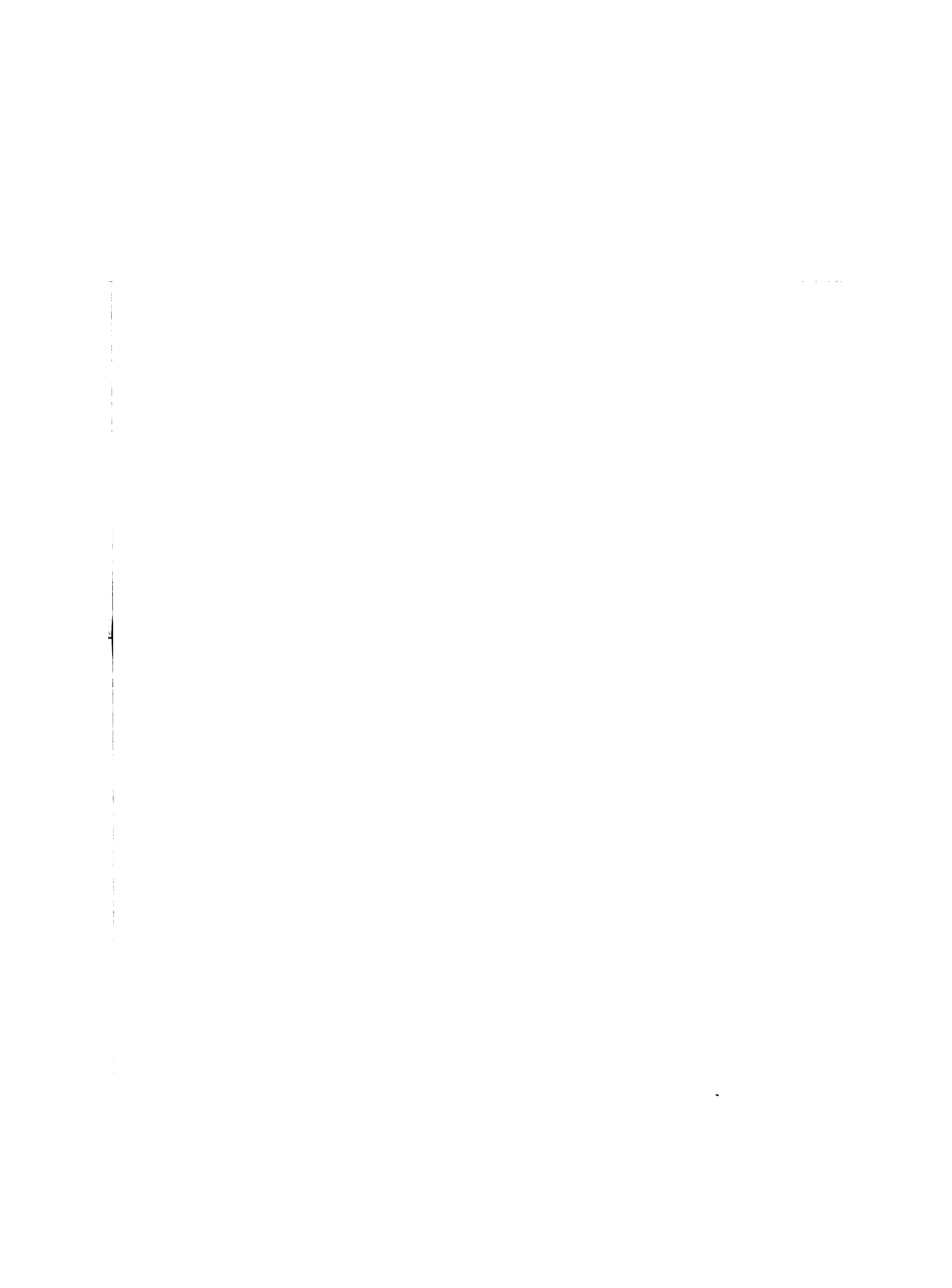4. What level of networking performance do you require?

V. Peripherals

Disks:

1. How much disk capacity do you need on a standalone workstation? _____MBytes

2. How much disk capacity do you need on network a fileserver? _____MBytes

Tape:

1. In what % of your workstations do you need

   1600bpi 1/2" tape _____% 6250bpi (GCR) 1/2" tape _____%

   20MByte 1/4" tape _____% 45MByte 1/4" tape _____%

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Laser Disks:

1. Do you have an interest in laser disks of 1GByte capacity? (write once, no erase)

   yes _____ no _____

Floating Point Processors:

1. Do you need a floating point accelerator? yes _____ no _____

2. If yes, what is a reasonable price for a 5x improvement? $_____ 20x improvement? $_____

3. Do you need an array processor? yes _____ no _____

VI. Graphics and Display

Black and White:

1. What size display do you require? 14" _____ 15" _____ 17" _____ 19" _____

2. What resolution do you require? 640x480 _____ 896x700 _____ 1024x800 _____

   1152x900 _____ 1000x1000 _____ 1280x1000 _____ other _____.

Color:

3. Do you need color? always _____ sometimes _____ never _____

4. What size display do you require? 13" _____ 15" _____ 17" _____ 19" _____

5. What resolution do you require? 640x480 _____ 896x700 _____ 1024x800 _____

   1152x900 _____ 1000x1000 _____ 1280x1000 _____ other _____

VII. General Hardware

1. For file servers, which packaging do you prefer? rackmount _____ deskside pedastal _____

2. For workstations, which packaging do you prefer?

   rackmount _____ deskside pedastal _____ desktop _____

3. Do you add your own or 3rd party boards to Sun workstations? yes _____ no _____

4. If yes, can you change to VME? yes _____ no _____

5. If yes, is it easy? yes _____ no _____

02/25/85

SUN
USER GROUP

BIOGRAPHIES OF NOMINEES

March 1985

WILLIAM BENT - Bill has worked for Compugraphic for the last 18 months as a Project Leader. His responsibilities include hardware development on Sun based equipment and technical liaison between Compugraphic and Sun in regards to hardware questions. Bill previously worked for ECRM, a manufacturer of electronic processing camera laser scanners and recorders. He graduated in 1978 from North Eastern University and is now pursuing his Masters in Business Administration. He is a member of IEEE. He has a special interest in Graphic Arts, especially computer generated graphics.

NICK CERCONE - Since 1980, Nick has been chairman of the Computing Science Department at Simon Fraser University in Burnaby, BC. He has designed and implemented a new computing science instructional laboratory for his department, based on a network of Sun systems, which is being used by 21 faculty and 63 graduate students. Nick received his PhD from the University of Alberta and has strong research interests in A.I., software engineering and instructional technology. He is co-editor of a new international journal on A.I., published by the National Research Council of Canada, has served as past president of the Canadian A.I. Society and is currently a nationally elected member of the steering committee for the Canadian Society for Fifth Generation Research.

DAVID R. MARK - Dave is a long-time UNIX enthusiast and early supporter of Sun Microsystems. He recently moved to the Washington D.C. area where he works for INCO (a defense contractor) as the manager of a project which will select a standard workstation for the Air Force. (Dave is hoping this will be Sun workstations). Prior to INCO, Dave worked at TRW for 4-1/2 years where he was involved in such areas as systems services, software productivity analysis, message handling network design and artificial intelligence. He has a B.S. in Math and Psychology from Carnegie-Mellon University and a M.S. in Computer Science and Computer Engineering from Stanford. Dave is seriously committed to advancing the information sharing between Sun users and would like to help deepen the involvement between Sun users and Sun. He is Chairman of the local Sun User Group chapter in Washington D.C. and also a member of USENIX and /usr/group.

MARLEEN MARTIN - Marleen is Manager of End User Marketing at Sun and is responsible for the Sun User Group. She has been a founder of Gnostic Concepts, a marketing research company, and the UNIX /usr/group, for which she served as the first Executive Vice President and Program Chair, helping UNIX gain commercial acceptance. Marleen was Western Regional Manager at 3COM before joining Sun in March of 1983. In addition to consulting for numerous companies, on product design requirements and marketing strategies, she remains active in IEEE, USENIX and /usr/group. She would like to see Sun User Group really take off in the coming year, and to that end would provide liasion to Sun Microsystems.

NORM SEETHOFF - Norm has been working with Sun systems for two years at the John Fluke Manufacturing Company in Seattle (which makes test and measurement equipment such as hand-held multimeters). He has been a beta site for Sun networking and has used his Sun's to augment his VAX-UNIX systems. If elected to the board, he would be particularly interested in working on distribution tapes.

WILLIAM TOTH - Bill has worked as the Division System Programmer since August 1980 for the Center for Astrophysics at Harvard College Observatory Smithsonian Astrophysical Observatory. The computers at the Solar and Stellar Physics Division have operated under UNIX continuously since January 1978. Bill feels that if you're serious about solar research you need a Sun. The division became a Sun customer in August 1983. He is a member of ACM, DECUS UNIX Special Interest Group and USENIX.

MARK WALLEN - Mark is a principal programmer for the Cognitive Science Laboratory at UC San Diego. He has been involved with UNIX since 1976 (back in his PDP 11/45 days). The Cognitive Science Lab now has 16 Suns and a VAX 750, all on UCSD's Ethernet backbone. The Suns are being used for studies in "Human Machine Interaction" and "Parallel Distributed Processing" in large numerical models of neurological processes.

BALLOT

March 1985

This ballot is to elect three (3) additional members to the Board of Directors of the Sun User Group for the term July 1, 1985 - June 30, 1987. This election will bring the total number of directors to seven (7).

VOTE FOR THREE:

Mark choice one (1), choice (2) and choice (3):

_____ **William Bent**
Compugraphic

_____ **David R. Mark**
INCO

_____ **Norm Seethoff**
John Fluke Manufacturing

_____ **Mark Wallen**
University of California,
San Diego

_____ **Nick Cercone**
Simon Fraser University

_____ **Marleen Martin**
Sun Microsystems, Inc.

_____ **William Toth**
Harvard University,
Center for Astrophysics

Current Board Members:

(Note: The term for the current board expires June 30, 1986)

Robert Judd, President
Lawrence Livermore National Laboratory

Richard Morin, Secretary/Treasurer
Canta Forda Computer Laboratory

Keith Cooper, Vice-President
Rice University

Gary McGreal, Director
USC-ISI

Philip Wood, Director (term expires June 30, 1985)
Los Alamos National Laboratory

*   *   *

Please return this ballot in the envelope provided. Must be received by **April 15, 1985** to be counted in this election.
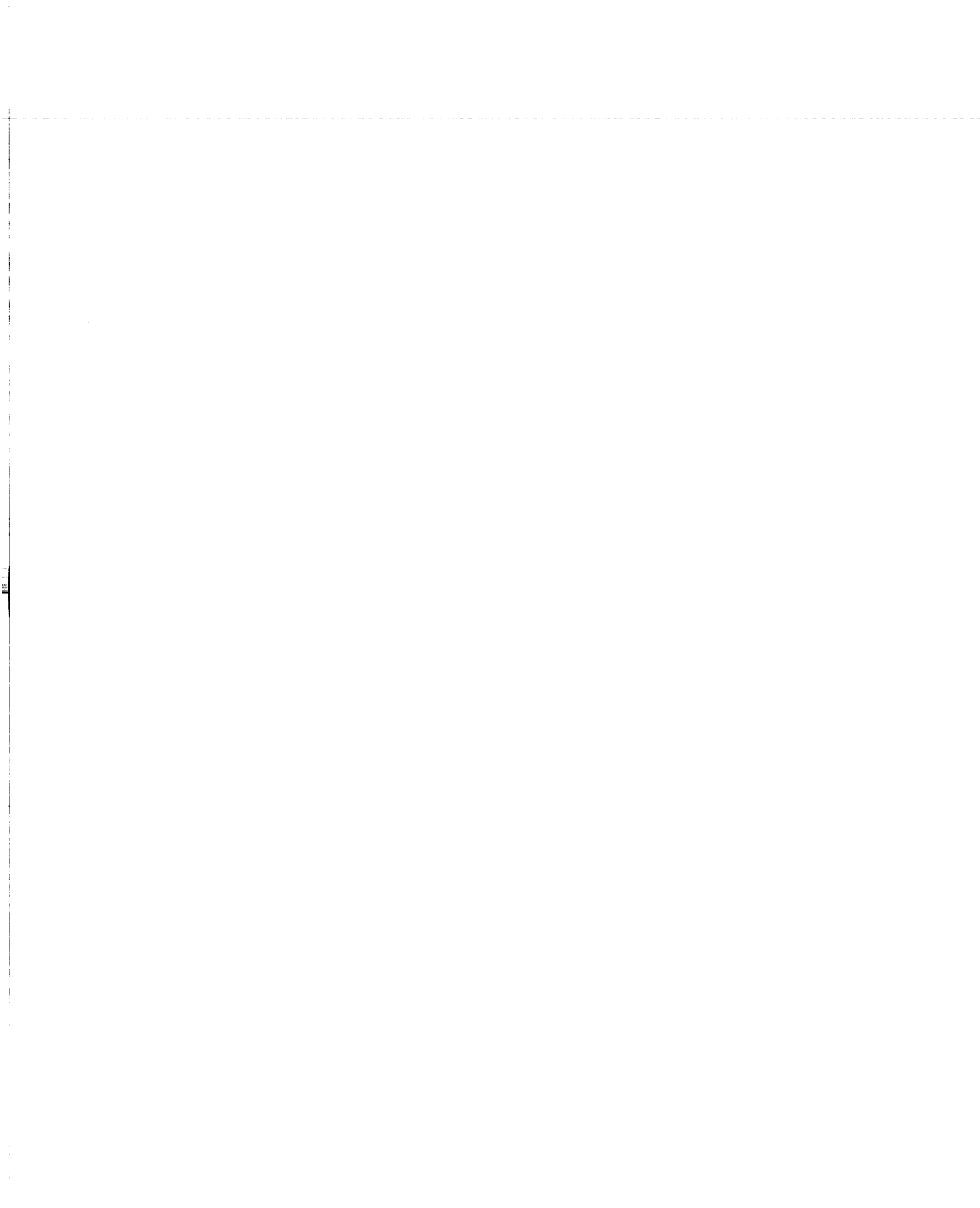
Sun Microsystems User Group, Inc.

DONATED SOFTWARE DISTRIBUTION

Request Form and License

(Unlicensed Software)

As a member of the Sun User Group, I wish to receive the 85.1 Software Distribution (hereafter referred to as the SOFTWARE). By virtue of this signed release form, I agree to the following Terms and Conditions governing the use of any and all SOFTWARE sent to me.

(1) **Neither the Sun User Group, its officers, employees, and agents, nor the authors nor submitters of the SOFTWARE (hereafter referred to as the ABOVENAMED) make any representation or warranty, expressed or implied, as to the accuracy, completeness or usefulness of the SOFTWARE or the contents thereof for any purpose whatsoever.**

(2) To the extent permitted by law, I hereby hold harmless the ABOVENAMED from any claims, costs, damages and liability whatsoever with respect to the SOFTWARE.

(3) No ownership rights with respect to the SOFTWARE shall transfer to me. The SOFTWARE shall remain the property of the Sun User Group or the person or persons who previously possessed that property.

(4) The licensing of my use of the SOFTWARE by the Sun User Group is limited to those materials for which the Sun User Group is authorized to do so. The Sun User Group has attempted to verify that it has the right to distribute the SOFTWARE, but it cannot guarantee that it has such right. In the event that any dispute arises as to the distributed materials, I agree that the Sun User Group may direct me to erase all or part of the SOFTWARE and that I will remove said materials from the SOFTWARE, destroy all copies thereof, and make no claim against the ABOVENAMED for any action arising out of the use or the destruction of the SOFTWARE.

(5) I agree that this license grants me no rights to subdistribute any or all of the SOFTWARE, except for use at the address designated below or on my membership form. This license grants me no rights to incorporate any of the SOFTWARE in a commercial product, and I agree that, if such materials are not in the public domain, I will secure such rights from the owner of the property before redistributing or incorporating any of the SOFTWARE in a commercial product.

In consideration of the mutual promises contained herein, I release and discharge the ABOVENAMED from any claims, causes of action, costs or demands of whatever nature, whether anticipated or unanticipated, and whether known or unknown, which I have, may claim to have, or at any time heretofore have had against the above mentioned individuals and entities, or against any of them, including but not limited to, any and all claims, demands or causes of action which are contained in or may arise out of the circumstances set forth in this agreement.

The parties hereto acknowledge that they are familiar with the provisions of Section 1542 of the California Civil Code and expressly agree that the Release set forth above constitutes a waiver and release of any rights or benefits that they may have under California Civil Code Section 1542, which provides that: "A general Release does not extend to claims which the creditor does not know or suspect to exist in his favor at the time of executing the release, which if known by him must have materially affected his settlement with the debtor."

Subject to the above conditions, the Sun User Group grants and I hereby accept a **personal, nonexclusive limited license to use** the SOFTWARE at the address given below

PLEASE PRINT:

Member Name : _____

Member Number (*if known*): _____

Institution: _____

Mailing Address:

_____

_____

_____

Phone: (   ) _____

Network Address: _____

Tape format required (*specify choice*): 1/4"(1600 bpi) _____   1/2" (1600 bpi) _____

Authorized Signature: _____

Date: _____

Sun User Group Authorized Signature: _____

Date: _____

*   *   *

Enclose payment in the form of check only in U.S. dollars drawn on a U.S. bank to the address below. Sun User Group does not invoice. Checks must be identified with the name of the member or membership number or they will be returned.

Please sign and return **two** *copies of both pages of this form to:*

<div align="center">

Sun User Group
2550 Garcia Avenue M/S 5-12
Mountain View, CA 94043

Attn: Laura Tong

</div>

PART NUMBER: 850-1030-01

MNL ASSY 2.3 UPGRADE SUNBIN   (EA)   SOURCE: M   REV: A

DATE?   *

                                AS OF   6/04/86

850-1030-01   REV: A   MNL ASSY 2.3 UPGRADE SUNBIN
MODEL:
ECO NO: 2315
DATE OF LAST ECO: 3/20/86

| | | | QTY PER | | | REFERENCE | | |
PART NUMBER	DESCRIPTION	ITM	ASSEMBLY	UM	SC	DESIGNATOR	EFF DATE	OBS DATE
800-1235-10	READ THIS F	1	1.000	EA	B		4/01/86	99/99/99
800-1256-04	MNL,SUN CGI	3	1.000	EA	B		4/01/86	99/99/99
800-1380-04	MNL,S/W,REL	2	1.000	EA	B		4/01/86	99/99/99

ASSEMBLY PART NUMBER?