DEPARTMENT OF THE INTERIOR

U.S. GEOLOGICAL SURVEY

A NETWORKED COMPUTER CONFIGURATION FOR SEISMIC MONITORING OF VOLCANIC ERUPTIONS

By

Gail D. March[1]

John Power[2]

[1]Alaska Division of Geological & Geophysical Surveys
3700 Airport Way
Fairbanks, Alaska 99709

[2]U.S. Geological Survey
Alaska Volcano Observatory
Geophysical Institute
University of Alaska
Fairbanks, Alaska 99775

Open-File Report 90-422

INTRODUCTION

The Alaska Volcano Observatory (AVO) in Fairbanks, Alaska is using a combination of local area networks of IBM PC compatible computers and Sun workstations to record, process, store, exchange, and archive seismic data from a network of seismometers on Redoubt Volcano, Alaska. Data from this seismic network is used in forecasting eruptive activity at the volcano. The computer network allows the collection and rapid processing of the large amounts of seismic data that generally accompany a volcanic eruption. Most of the seismic data acquisition and accompanying analysis software was developed elsewhere and adapted for use at AVO in response to the 1989-90 eruption of Redoubt Volcano. The development of the system has benefited by input from a number of people involved in the response to the eruption. Our intent here is to describe the present computer network and programs developed at AVO to facilitate the transfer, processing, and storage of volcano-seismic data.

SYSTEM OVERVIEW

The system used by AVO in Fairbanks consists of 3 IBM-compatible 386 computers and 1 IBM-compatible 286 computer, linked by a Lantastic local area network, and a Sun Sparcstation 1, connected using Sun's Network File System (NFS) networking software and Ethernet to one of the 386's as well as to several other Sun systems used for processing regional earthquake data collected by the Alaska Earthquake Information Center (see Figure 1). Information on the hardware used in the individual systems is given in Appendix A. Software used is cataloged in Appendix B.

Event-detected earthquake data are recorded using an IBM-compatible 386 computer running the program MDETECT, developed by Lee, U.S. Geological Survey (Lee, Tottingham, and Ellis, 1988; Lee, 1989). Earthquake locations are determined on a Sun computer using the program XPICK, developed by the University of Alaska Geophysical Institute (Robinson, 1990) in conjunction with HYPOELLIPSE, developed by the U.S. Geological Survey (Lahr, 1989). Data transfer from the PC to the Sun is accomplished via two network connections, using a batch file running on an IBM-compatible 386. Continual real-time seismic amplitude data is recorded using a Tandy 100 in conjunction with an IBM-compatible AT system, as developed by Murray and Endo, U.S. Geological Survey (Murray and Endo, 1989). Examination and analysis of the data is done on two IBM-compatible 386 computers attached to the data acquisition machines over a local area network and a Sun SparcStation. A summary of the primary uses of each machine on the networks is given below:

COMPUTER	TYPE	FUNCTION
willie	IBM-Compatible 386	data collection with MDETECT
rsam	IBM-Compatible 286 collection	real-time seismic amplitude data
tom	IBM-Compatible 386	data analysis, usually RSAM, plotting programs, word processing, FAX
jps	IBM-Compatible 386	"mission control", data transfer from PC to Sun, data analysis, word processing
Kiska	Sun SparcStation 1	data analysis and storage

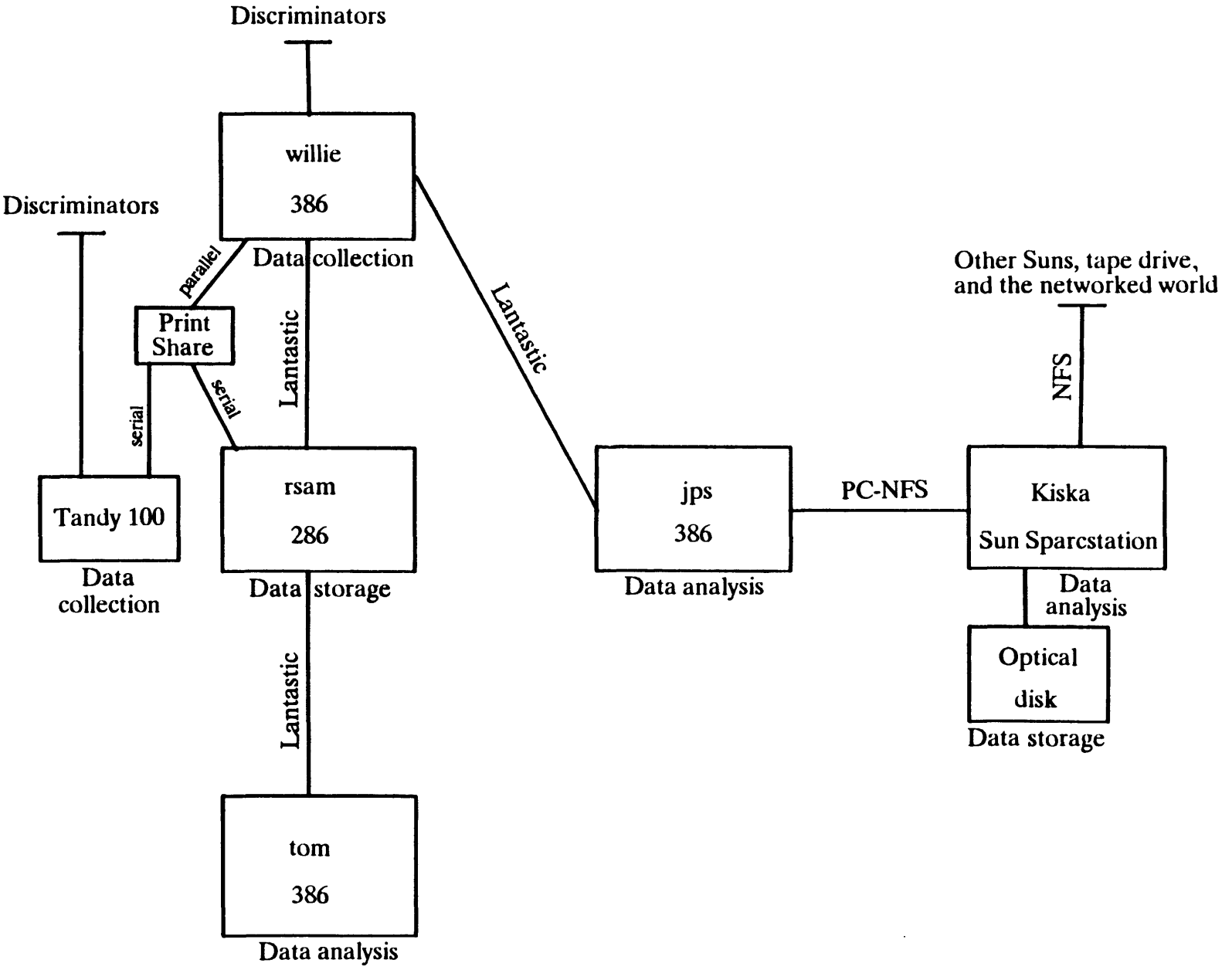

Figure 1. Schematic overview of the Alaska Volcano Observatory, Fairbanks, computer network configuration. Hardware configurations are listed in Appendix B.

EARTHQUAKE DATA

Data Acquisition and Transfer

MDETECT, the data acquisition software on "willie", collects and stores several types of data, distinguishable by their filename extensions. These include event-detected earthquake data (with extension .WVA), files which record triggering parameters (.LOG), files which keep track of how many events have occurred in a day (.IXA), and fast Fourier transform files (.FFT) used for tracking power (Lee and others, 1988; Lee, 1989). The "willie" system also collects calibration data transmitted by the various seismic stations that use USGS A1 VCO's (Rogers and others, 1980) and stores them in files with a .W?C extension, where ? stands for the input channel number of the analog-to-digital converter board (ranging from 1 to H). .W?C files are created when the characteristic calibration tone for each station is detected by the system .WVA files are created as events are detected by the system.. .FFT, .LOG, and .IXA data are collected in daily files which are updated periodically.

A DOS batch file, PC2SUN.BAT, is used to translate and transfer the earthquake and other associated data via two different networks to a Sun workstation for processing, storage, and archival. This batch file does the following:

1. renames calibration files
1. converts and transfers the .WVA and calibration (.W?C) files to Sun directories of the same name using the USGS program PC2SUN4 (Rogers, 1989, unpublished)
2. copies .FFT, .IXA, and .LOG files no longer being updated to the Sun for storage
3. copies the .WVA and .W?C files to the Sun for storage
4. deletes all the copied files from the hard disk on "willie"
5. generates a checklist for processing individual earthquakes.

This batch file is listed in Appendix C, with associated batch files and programs listed in Appendix D.

Calibration files are collected daily with MDETECT, but names are changed only every 10 days, causing files to overwrite for 10 day periods. This scheme results in four calibration files per station per month. Names assigned by MDETECT include the year (first 2 digits) and month (third and fourth digits) collected, an identifier indicating in which 10-day period of the month the file was collected (eighth digit; 0 for days 1-9, 1 for days 10-19, and so on), and a channel code in the extension (0 through H). An example file name is 90020001.W8C, written between February 10 and February 19, 1990 for channel 8. The Alaska Volcano Observatory chose to preserve calibration files on a daily basis, so PC2SUN.BAT renames the calibration files to reflect the date collected. The convention used for the renaming substitutes the day the file was made for the fifth and sixth digits (formerly 00). An example of a renamed calibration file is 90021401.W8C.

PC2SUN.BAT resides on an IBM-compatible 386 (designated "jps"). This computer employs two local area networks, a Lantastic (from Artisoft) PC network and a Sun NFS Ethernet, to access "willie"'s disk and a disk on the Sun workstation Kiska as though they were both local disks on "jps". The Lantastic network allows either a server-workstation or a server-server relationship among PC's. Any machine on the network can be a server to or a workstation on any other machine on the network. The "willie" system is set up as a server on the network so that its data can be accessed by jps and transferred to the Sun using DOS commands. Data can be transferred with little interruption in recording (see Known Problems) and can easily be retrieved for later use.

Data Processing and Archival

At AVO, earthquake solutions are determined on the Sun system using the programs Xpick (Robinson, 1990) to identify phase arrival times and Hypoellipse (Lahr, 1989) to calculate solutions. Notes are collected on a checklist produced by PC2SUN.BAT. Phase arrival times can also be identified using the program XPLAY (Lee and others, 1989) on the 386 "jps", though this method is slower.

Processing of continuous FFT data is still under development as of this writing. Two channels of data are transferred to "rsam" through a serial port sharer to facilitate near real-time access. The data are transferred to the Sun workstation disk for storage by PC2SUN. Several analysis and plotting routines are presently being developed by various workers.

Following analysis, data collected on "willie" is stored on read-write optical disks in both .WVA and AH formats. AH is a format developed by Lamont Geological Observatory for storing demultiplexed binary trace data. The Xpick program reads data in this format. The .WVA files are usable by PC systems as well as providing backup for the AH data. All data on the Sun system is written to tape for backup and for transfer to other sites.

REAL-TIME SEISMIC AMPLITUDE DATA

Data Acquisition

In parallel with event-triggered earthquake data collection, the Alaska Volcano Observatory in Fairbanks also operates a real-time seismic amplitude monitoring system (RSAM). This system was developed to address the problem of continuous seismic-amplitude measurements under conditions where individual events are difficult to recognize and tabulate (Endo and Murray, in press). Continuous amplitude measurements have proven to be an invaluable monitoring aid at active volcanos where seismic signals of a continuous nature such as tremor and explosive events are often present. These continuous signals are not usually recorded by the event detection system, as they are not detected as discrete events.

AT AVO, RSAM data are collected using a Tandy model 100, as outlined by Murray and Endo (1989). Data are transferred from the Tandy to an IBM-compatible 286 computer (designated "rsam") via the RS232 port for storage. Data stored on "rsam" are available on the Lantastic local area network. Analysis and plotting of RSAM data is done over the network on an IBM-compatible 386 computer (designated "tom") using the software package BOB (Murray, 1990).

KNOWN PROBLEMS

At the time of this writing, MDETECT often crashes while DOS is copying files from "willie" to the Sun. This apparently occurs when MDETECT writes to the FFT file while DOS commands are being executed. Because of this problem, MDETECT must be restarted after PC2SUN is finished.

Although AVO is using high quality shielded cable in the ceiling, the Lantastic network appears to be affected by failing fluorescent lighting. During data transfers, the network quits at unpredictable times, emitting continuous beeps. The failing lights need not be directly under the cable, but anywhere in the vicinity.

CONCLUSIONS

The networked system used at AVO offers several advantages over individual stand-alone computers performing single tasks and over a single more powerful computer performing several tasks simultaneously. While RSAM data could be collected and analyzed using one computer running multitasking software, event-detected earthquake data requires the total resources of a PC to operate. Analysis using this latter machine would require stopping data collection. We have found the use of two computers for each set of data to be a more viable use of resources.

The four PC systems provide versatility, as well as providing some redundancy in capabilities. Critical software can easily be duplicated across the network. Presently at AVO, acquisition software on "willie" and "rsam" also resides on "jps" and "tom". Should either of the acquisition machines fail, they can quickly be replaced. The two systems used for data analysis are also used for additional tasks such as electronic communication, word processing, program development, and, in the case of "jps", as an additional terminal to the Sun Sparcstation. The Sparcstation provides fast computer processing of earthquake data using more sophisticated software than is presently available on DOS-based machines, as well as providing larger storage media for data.

The widespread use of DOS-based machines has generated a large pool of individuals who are familiar with the operating system and various software packages. During periods of increased activity, it is possible to find personnel who can step in to assist with system and data management tasks. These machines require little in the way of computer personnel support as compared to larger minicomputer systems. They also offer a price advantage over these larger machines.

APPENDICES

Appendix A

Hardware used at AVO, Fairbanks, includes:

"Willie"
- IBM-compatible 386
- Math coprocessor
- A/D board - Data Xlation
- DSP board
- 4 mb RAM
- 130 mb hard disk
- Lantastic board
- 5 1/4" floppy drive

"jps"
- IBM-compatible 386
- Math coprocessor
- 4 mb RAM
- 120 mb hard disk
- Lantastic board
- 3Com Ethernet board
- 5 1/4" floppy drive
- 3 1/2" floppy drive

"rsam"
- IBM-compatible 286
- Math coprocessor
- 640 kb RAM
- 40 mb hard disk
- Lantastic board
- 2 5 1/4" floppy drives

"tom"
- IBM-compatible 386
- Math coprocessor
- 4 mb RAM
- 2 40 mb hard disks
- Lantastic board
- 2 5 1/4" floppy drives
- Complete FAX

Sun Sparcstation 1
- 8 mb RAM
- 700 mb hard disk
- 600 mb Symtec optical drive

Tandy 100
- 32 kb RAM
- A/D processor board (Murray and Endo, 1989)

Appendix B

Software used for volcano monitoring at AVO in Fairbanks includes:

Program	Source	What it does
MDETECT	U.S.G.S.	Collects event-detected seismic data
PC2SUN.BAT	U.S.G.S.	Transfers data from PC to Sun
PC2SUN4	U.S.G.S.	Converts data from PC format to Sun format
EXCEL	Microsoft	Spreadsheet used for checklists
XPICK	Univ. of Alaska	Earthquake trace analysis
HYPOELLIPSE	U.S.G.S.	Earthquake location
STORE	U.S.G.S.	RSAM data collection
BOB	U.S.G.S.	Time series plotting
LANTASTIC	Artisoft	PC network
PC-NFS	Sun	Sun-PC network
WARMBOOT	Public Domain	Soft PC reboot

Appendix C

These files, with the single command PC2SUN.BAT, do the following to transfer data from "willie" to the Sun via the processor on "jps":

1. reboot "jps" with the two networks in memory
1. rename calibration files
1. convert and transfer the .WVA and calibration (.W?C) files to Sun directories of the same name using the USGS program PC2SUN4
2. copy .FFT, .IXA, and .LOG files no longer being updated to the Sun for storage
3. copy the .WVA and .W?C files to the Sun for storage
4. delete all the copied files from the hard disk on "willie"
5. generate a checklist for processing individual earthquakes.

PC2SUN.BAT

```
c:
cd\
copy autoexec.nfs autoexec.bat
copy config.big config.sys
warmboot
echo off
:SET TZ=AST1
PATH
   c:\fortran\bin;c:\;c:\util;c:\xtpro;c:\dos;c:dv;c:mouse1;C:\WORD5;C:\NFS;c:\lantasti;d:\
   pc2sun4;d:\iaspei;d:\edt;d:\wp50
mode com1: 2400,n,7,1
prompt $p$g
SET LIB=C:\FORTRAN\LIB
SET TMP=C:\FORTRAN\TMP
SET INCLUDE=C:\FORTRAN\INCLUDE
SET INIT=C:\FORTRAN\BIN
d:\iaspei\prtscrn
c:\util\ced
dimmer/10
numoff
share
call serveron
call onwillie
call runnfs
d:
cd\pc2sun4
call nfslan.bat
```

CONFIG.BIG

```
shell=c:\command.com /e:2064 /p
device=c:\qemm.sys EXCLUDE=D800-DFFF RAM
device = dmdrvr.bin
DEVICE=ETH503.SYS/I:2
break=on
DEVICE=C:\UTIL\ATIVIDEO.SYS
DEVICE=C:\DOS\ANSI.SYS
DEVICE=C:\NFS\PCNFS.SYS
DEVICE=C:\NFS\SOCKDRV.SYS
DEVICE=C:\DRIVERS\VECIE6.SYS /i2
DEVICE=C:\NFS\NFSVEC.SYS
```

```
DEVICE=LOADHI.SYS C:\MOUSE.SYS
buffers=30
FILES=50
FCBS=16,8
LASTDRIVE=N
```

NFSLAN.BAT

```
echo off
REM This batch file dumps files from the Willie Lee AT via PC2SUN4.EXE to
REM the Sun Sparcstation Kiska.
REM G.D. March, 1/90
REM
REM Move to the AT via the Lantastic and change calibration file names to
REM  reflect the date made.
REM
e:
cd\data
dir *.w?c | find " W" > pc2sun.cal
del chname.bat
chname
call chname
REM
REM Make a list of files to convert to Sun format.
REMdir *.w*>pc2sun.lst | sort
REM
REM Run the PC2SUN4 program using the parameters stored in ANSWERS.DAT.
REM
pc2sun4<d:\pc2sun4\answers.dat
REM
REM Make and run a batch file that copies files in PC format to the Sun for
REM storage.
REM
type pc2sun.lst | find " W" > pc2sun.tmp
del copy_at.bat
d:\pc2sun4\wvalist
call copy_at.bat
REM Copy the list of files for later use in making a checklist.
copy pc2sun.lst f:\wva
copy pc2sun.lst d:\windows\redoubt
REM
REM Make and run a batch file that deletes transferred files from the AT.
REM
del del_at.bat
d:\pc2sun4\filelist
call del_AT.bat
REM
REM Make a checklist of transferred files using Excel.
REM This command reboots the 386.
REM
mkform
```

Appendix D

CHNAME.FOR, called from PC2SUN.BAT, takes its input from a list of calibration files (pc2sun.cal) and creates a batch file that changes the names of the calibration files according to the date they were created.

CHNAME.FOR

```
C Program to rename calibration files to date names on the Willie Lee AT
C  G. March  1/90

      CHARACTER*7 filename
      CHARACTER*3 ext
      CHARACTER*2 day,year
      CHARACTER*1 week,month1,month2
      INTEGER bytes
      OPEN (UNIT=1,FILE='PC2SUN.CAL',STATUS='OLD')
      OPEN (UNIT=3,FILE='CHNAME.BAT',STATUS='NEW')
10    READ (1,100,END=20) filename,week,ext,bytes,month1,month2,day,year
100   FORMAT(A7,A1,1X,A3,3X,I6,2X,A1,A1,1X,A2,1X,A2)
     IF (month1 .EQ. ' ') THEN
            month1='0'
            ENDIF
            WRITE (3,400) filename,week,ext,year,month1,month2,day,week,ext
400         FORMAT('rename ',A7,A1,'.'A3,' ',A2,A1,A1,A2,'0',A1,'.',A3)
      GO TO 10
20    CLOSE (1)
      CLOSE (3)
      RETURN
      END
```

ANSWERS.DAT is the input file of responses to the program PC2SUN4, which transfers .WVA files to AH format on the Sun. The responses indicate:

1. The list of files to be transferred is named "pc2sun.lst".
2. The path to the data to be transferred.
3. The path to which the data will be transferred.
4. The location of the data (Fairbanks).

ANSWERS.DAT

```
y
2e:\data\
f:\
f
```

WVALIST.FOR, called from PC2SUN.BAT, uses the file listing "pc2sun.tmp" which includes WVA and calibration files, as input and produces a batch file made up of copy commands that copy these files to the Sun disk.

WVALIST.FOR

```
C Program to convert PC2SUN.LST to a list of copy commands for use in
C  copying files to the Sun from the Willie Lee AT
C  G. March  1/90
C
      CHARACTER*8 filename
      CHARACTER*3 ext
```

```
      CHARACTER*2 day,year
      CHARACTER*1 month1,month2
      INTEGER bytes
      OPEN (UNIT=1,FILE='PC2SUN.TMP',STATUS='OLD')
      OPEN (UNIT=2,FILE='COPY_AT.BAT',STATUS='NEW')
   10  READ (1,100,END=20) filename,ext,bytes,month1,month2,day,year
   100 FORMAT(A8,1X,A3,3X,I6,2X,A1,A1,1X,A2,1X,A2)
      IF (ext .EQ. 'WVA') THEN
            WRITE (2,200) filename,ext
   200            FORMAT('copy ',A8,'.'A3,' f:\wva')
      ELSE
            WRITE (2,300) filename,ext
   300            FORMAT('copy ',A8,'.'A3,' f:\calib')
      ENDIF
      GO TO 10
   20  CLOSE (1)
      CLOSE (2)
      RETURN
      END
```

FILELIST.FOR, called from PC2SUN.BAT, uses "pc2sun.tmp" to produce a batch file of delete commands that delete WVA and calibration files from "willie".

FILELIST.FOR

```
      C Program to convert PC2SUN.LST to a list of delete commands for use in
      C  deleting files already copied to Sun from the Willie Lee AT
      C  G. March 1/90
      C
      CHARACTER*8 filename
      CHARACTER*3 ext
      OPEN (UNIT=1,FILE='PC2SUN.TMP',STATUS='OLD')
      OPEN (UNIT=2,FILE='DEL_AT.BAT',STATUS='NEW')
   10  READ (1,100,END=20) filename,ext
   100       FORMAT(A8,1X,A3)
      WRITE (2,200) filename,ext
   200       FORMAT('del ',A8,'.'A3)
      GO TO 10
   20  CLOSE (1)
      CLOSE (2)
      RETURN
      END
```

DATAMOVE.BAT, called from PC2SUN.BAT, moves all FFT, LOG, and IXA files that are not presently being written to over to the Sun for storage.

DATAMOVE.BAT

```
REM  This batch file moves FFT, LOG, and IXA files older than the current open
REM   file to the Sun.
REM  G.D. March, 3/90
REM
g:
cd\data
del pc2sun.fft
del pc2sun.log
```

```
del pc2sun.ixa
dir | find " FFT" | sort > pc2sun.fft
dir | find " LOG" | sort > pc2sun.log
dir | find " IXA" | sort > pc2sun.ixa
del copy_fft.bat
del copy_log.bat
del copy_ixa.bat
del del_fft.bat
del del_log.bat
del del_ixa.bat
d:\pc2sun4\fftlist
d:\pc2sun4\loglist
d:\pc2sun4\ixalist
call copy_fft.bat
call copy_log.bat
call copy_ixa.bat
call del_fft.bat
call del_log.bat
call del_ixa.bat
```

FFTLIST.FOR, called from DATAMOVE.BAT, uses a directory listing of FFT files to produce a batch file that copies FFT files to the Sun for storage. The batch file does not include the most current FFT file, the one that MDETECT is still writing to.

FFTLIST.FOR

```
C Program to make a list of FFT files to copy to Sun from the Willy Lee AT
C  G. March 3/90
C
   CHARACTER*8 filename
   CHARACTER*3 ext
   INTEGER count,times
   OPEN (UNIT=1,FILE='PC2SUN.FFT',STATUS='OLD')
   OPEN (UNIT=2,FILE='COPY_FFT.BAT',STATUS='NEW')
   OPEN (UNIT=3,FILE='DEL_FFT.BAT',STATUS='NEW')
10  READ (1,100,END=20) filename,ext
   count=count+1
    GO TO 10
220  REWIND (1)
   DO 500 times=1,(count-1)
    READ (1,100,END=20) filename,ext
100        FORMAT(A8,1X,A3)
   WRITE (2,200) filename,ext
200        FORMAT('copy ',A8,'.'A3' k:\fft')
C                  WRITE (2,300) filename,ext
C          300     FORMAT('copy ',A8,'.'A3' j:\data\fft')
   WRITE (3,400,ERR=500) filename,ext
400        FORMAT('del ',A8,'.'A3)
500  CONTINUE
   CLOSE (1)
   CLOSE (2)
   CLOSE (3)
   RETURN
   END
```

LOGLIST.FOR, called from DATAMOVE.BAT, uses a directory listing of LOG files to produce a batch file that copies log files to the Sun for storage. The batch file does not include the most current log file, the one that MDETECT is still writing to.

LOGLIST.FOR

```
C Program to make a list of LOG files to copy to Sun from the Willy Lee AT
C  G. March 3/90
C
   CHARACTER*6 filename
   CHARACTER*3 ext
   INTEGER count,times
   OPEN (UNIT=1,FILE='PC2SUN.LOG',STATUS='OLD')
   OPEN (UNIT=2,FILE='COPY_LOG.BAT',STATUS='NEW')
   OPEN (UNIT=3,FILE='DEL_LOG.BAT',STATUS='NEW')
10  READ (1,100,END=20) filename,ext
   count=count+1
    GO TO 10
20  REWIND (1)
   DO 500 times=1,count-1
   READ (1,100,END=20) filename,ext
100       FORMAT(A6,3X,A3)
   WRITE (2,200) filename,ext
200       FORMAT('copy ',A6,'.'A3' k:\log')
   WRITE (3,400) filename,ext
400       FORMAT('del ',A6,'.'A3)
500 CONTINUE
   CLOSE (1)
   CLOSE (2)
   CLOSE (3)
   RETURN
   END
```

IXALIST.FOR, called from DATAMOVE.BAT, uses a directory listing of IXA files to produce a batch file that copies ixa files to the Sun for storage. The batch file does not include the most current ixa file, the one that MDETECT is still writing to.

IXALIST.FOR

```
C Program to make a list of FFT files to copy to Sun from the Willy Lee AT
C  G. March 3/90
C
   CHARACTER*6 filename
   CHARACTER*3 ext
   INTEGER count,times
   OPEN (UNIT=1,FILE='PC2SUN.IXA',STATUS='OLD')
   OPEN (UNIT=2,FILE='COPY_IXA.BAT',STATUS='NEW')
   OPEN (UNIT=3,FILE='DEL_IXA.BAT',STATUS='NEW')
10  READ (1,100,END=20) filename,ext
   count=count+1
    GO TO 10
20  REWIND (1)
   DO 500 times=1,count-1
    READ (1,100,END=20) filename,ext
100       FORMAT(A6,3X,A3)
   WRITE (2,200) filename,ext
```

```
200       FORMAT('copy ',A6,'.'A3' k:\ixa')
   WRITE (3,400) filename,ext
400       FORMAT('del ',A6,'.'A3)
500   CONTINUE
   CLOSE (1)
   CLOSE (2)
   CLOSE (3)
   RETURN
   END
```

MKFORM.BAT, called from PC2SUN.BAT, copies special autoexec.bat and config.sys files (listed below)into the root directory, then reboots the system to make a checklist of events for processing.

MKFORM.BAT

```
c:
cd\
copy autoexec.trn autoexec.bat
copy config.trn config.sys
warmboot
```

AUTOEXEC.TRN, a special autoexec.bat file used by MKFORM.BAT, brings up the controlling 386 with no networks configured, runs Microsoft Excel to make a checklist for processing using an Excel macro listed below, then reboots the computer using the network autoexec.bat and config.sys.

AUTOEXEC.TRN

```
echo off
SET TZ=AST1
PATH
   c:\;c:\util;c:\xtpro;c:\dos;c:dv;c:mouse1;c:\FORTRAN\BIN;C:\WORD5;C:\NFS;c:\lant
   asti;d:\iaspei;d:\edt
mode com1: 2400,n,7,1
prompt $p$g
d:\iaspei\prtscrn
d:
cd\windows
REM  Run Microsoft Excel in the subdirectoy REDOUBT and bring up
   CKFORM.XLS. This spreadsheet runs an autoexec macro that makes the checklist.
excel redoubt\ckform.xls
REM  Copy autoexec and config files and reboot.
big
```

FILLFORM, an Excel macro that automaticaly runs when CKFORM.XLS is opened, uses PC2SUN.LST to make and print a checklist of events copied to the Sun. It requires mouse input to close Excel, first asking whether the user wishes to save new versions of the files. The answer to this is NO.

FILLFORM

```
"=ACTIVATE(""CKFORM.XLS"")"
"=SELECT(""R3C1"")"
"=FOPEN(""REDOUBT\PC2SUN.LST"",2)"
"=FPOS(A4,102)"
"=FOR(""pages"",1,3,1)"
```

```
"=FOR(""count"",1,36,1)"
=FREADLN(A4)
"=IF(ISERROR(A8),Endfile(),FORMULA(A8))"
"=SELECT(""R[1]C"")"
=NEXT()
"=SELECT(""R[3]C"")"
=NEXT()
=RETURN()

Endfile
=FCLOSE(A4)
"=PAGE.SETUP("""","""",0.5,0.5,0,2.5,FALSE,FALSE)"
"=PRINTER.SETUP(""Epson FX-80 on LPT1:"")"
"=SELECT(""R3C1:R38C1"")"
"=PARSE(""[90010000 W3C  ][476160][  1-04-90 ][ 8:09p]"")"
"=SELECT(""R3C2:R38C4"",""R38C4"")"
=FILL.LEFT()
"=SELECT(""R3C3:R38C4"")"
=CLEAR(3)
"=SELECT(""R42C1:R77C1"")"
"=PARSE(""[90010000 W3C  ][476160][  1-04-90 ][ 8:09p]"")"
"=SELECT(""R42C2:R77C4"",""R77C4"")"
=FILL.LEFT()
"=SELECT(""R42C3:R77C4"")"
=CLEAR(3)
"=SELECT(""R81C1:R116C1"")"
"=PARSE(""[90010000 W3C  ][476160][  1-04-90 ][ 8:09p]"")"
"=SELECT(""R81C2:R116C4"",""R116C4"")"
=FILL.LEFT()
"=SELECT(""R81C3:R116C4"")"
=CLEAR(3)
"=IF(ISBLANK(CKFORM.XLS!$A$42),PRINT(2,1,1,1,FALSE,FALSE,1),(IF(ISBL
   ANK(CKFORM.XLS!$A$80),PRINT(2,1,2,1,FALSE,FALSE,1),PRINT(1,,,1,FALS
   E,FALSE,1))))"
=FILE.CLOSE()
"=ALERT(""To exit Excel, click on File, then on Exit.  Please wait until printing is
   complete."",2)"
=HALT()
```

CONFIG.TRN is the config.sys file used to make the Microsoft Excel checklist.

```
CONFIG.TRN22
    shell=c:\command.com /e:2064 /p
    device=c:\qemm.sys
    DEVICE=ETH503.SYS/I:2
    buffers=25
    break=on
    DEVICE=C:\UTIL\ATIVIDEO.SYS
    FILES=20
```

BIG.BAT, called by MKFORM.BAT, copies the network versions of the autoexec.bat and config.sys files, then reboots the system.

```
BIG.BAT
    c:
    cd\
    copy autoexec.big autoexec.bat
    copy config.big config.sys
    warmboot
```

AUTOEXEC.BIG, called by BIG.BAT, is the network version of autoexec.bat, used to bring up the Lantastic network and PC-NFS.

```
AUTOEXEC.BIG
    echo off
    :SET TZ=AST1
    PATH
       c:\fortran\bin;c:\;c:\util;c:\norton;c:\xtpro;c:\dos;c:dv;c:mouse1;C:\WORD5;C:\NFS;c:\l
       antasti;d:\pc2sun4;d:\iaspei;d:\edt;c:\mtn_tape
    mode com1: 2400,n,7,1
    prompt $p$g
    SET LIB=C:\FORTRAN\LIB
    SET TMP=C:\FORTRAN\TMP
    SET INCLUDE=C:\FORTRAN\INCLUDE
    SET INIT=C:\FORTRAN\BIN
    d:\iaspei\prtscrn
    c:\util\ced
    dimmer/10
    numoff
    share
    call serveron
    call onwillie
    call onrsam
    call ontom
    call runnfs
```

CONFIG.BIG, called by BIG.BAT, is the network version of config.sys.

```
CONFIG.BIG
    shell=c:\command.com /e:2064 /p
    device=c:\qemm.sys EXCLUDE=D800-DFFF RAM
    device = dmdrvr.bin
    DEVICE=ETH503.SYS/I:2
    break=on
    DEVICE=C:\UTIL\ATIVIDEO.SYS
    DEVICE=C:\DOS\ANSI.SYS
    DEVICE=C:\NFS\PCNFS.SYS
    DEVICE=C:\NFS\SOCKDRV.SYS
    DEVICE=C:\DRIVERS\VECIE6.SYS /i2
    DEVICE=C:\NFS\NFSVEC.SYS
    DEVICE=LOADHI.SYS C:\MOUSE.SYS
    buffers=30
```

```
FILES=50
FCBS=16,8
LASTDRIVE=N
```

REFERENCES

Endo, E.T., and Murray, T.L., in press. Real-time Seismic Amplitude Measurement (RSAM): A volcano monitoring and prediction tool, Bulletin of Volcanology.

Lahr, J.C., 1989, HYPOELLIPSE/Version 2.0: A computer program for determining local earthquake hypocentral parameters, magnitude, and first motion pattern. U.S. Geol. Surv. Open-file Report 89-116.

Lee, W.H.K., Tottingham, D.M., and Ellis, J.O., 1988. A PC-based seismic data acquisition and processing system, U.S. Geol. Surv. Open-file Report 88-751, 31 pp.

Lee, W.H.K. (Editor), 1989. Toolbox for seismic data acquisition processing and analysis, IASPEI Software Library, Vol. 1, Seismological Society of America, El Cerrito, 284 pp.

Murray, T.L., 1990. A user's guide to the PC-based time-series data management and plotting program BOB, U.S. Geol. Surv. Open-file Report 90-56, 53 pp.

Murray, T.L., and Endo, E.T., 1989, A real-time seismic amplitude measurement system (RSAM), U.S. Geol. Surv. Open-file Report 89-684, 26 pp..

Robinson, M. 1990, XPICK user's manual v2.7, Seismology Lab, Geophysical Institute, University of Alaska, 93 pp.

Rogers, J.A., Maslak, Sam, and Lahr, J.C., 1980, A seismic electronic system with automatic calibration and crystal reference, U.S. Geol. Surv. Open-file Report 80-324, 130 pp.

Tottingham, D.M., 1989, User manual for XPLAY, in: Lee, W.H.K. (Editor), Toolbox for seismic data acquisition processing and analysis, IASPEI Software Library, Vol. 1, Seismological Society of America, El Cerrito, 284 pp.