

Engineering

Jim Leighton

The NMFEC engineering group currently consists of 12 people. Cliff Cordova, Gordon Jones, and Viki Moldenhauer are principally involved in designing new hardware where a required capability is not commercially available. Tom Whitney supervises the technician group of Bill Callovini, Jim Gagliardi, Tony Hain, Steve Herrick, and Jim Morton. This group is always busy in the areas of hardware maintenance, system integration, and communications network installations. Loyd Davis and Linda Doyle are facility coordinators whose broad capabilities take care of all the details the rest of us "specialists" don't know how to get done. They let me do whatever is left over.

Maintenance

The technician group, along with Cliff, provides maintenance coverage on a 24-hour per day, on-call basis. The maintenance effort currently covers: the network PDP-11/44s; the NMFEC, HEDL, and M-Division communications control processors; the CRAY communications front ends; a large amount of Computer Standard Interface Channel (CSIC) hardware; the FILEM Memorex Disk Farm system; the CDC 38500 Mass Store facility; the terminal concentrator, and the alternate (operator terminal) concentrator, the local RUSS systems, the Operations Monitor, and the Network Statistics Monitor.

MFE Network

This year was a major one in terms of network growth, as we continued the network upgrade that began in 1981 with changeover to the satellite 56-kbit/sec links. During 1982 we activated the alternate satellite link to each major site so that now PPPL, ORNL, LANL, and GA all have dual 56-kbit communications. We replaced the two PDP-11/50 minicomputers at the NMFEC with a pair of newer PDP-11/44s, each handling one of the satellite links. PPPL and ORNL were upgraded with new PDP-11/24 communication processors, operating in parallel with the current PDP-11/40s. All this effort doubles the bandwidth to each major site and significantly enhances the availability of communications.

Seemingly simultaneously with the above activity, the network growth continued. Many new network installations are turn-key, with the engineering group ordering the equipment, assembling and testing it at Livermore, shipping to the customer site, and traveling to install it. Other sites desire more local involvement, and the group interacts to whatever degree is required. New sites added this year were:

1. MIT: NAP-VAX
2. PPPL: NAP-VAX
3. University of Maryland: RUSS
4. Auburn: RUSS

5. UCLA: Experimental port
6. Cornell: Experimental port
7. NMFEC: New Tymnet engine

Other related activity including upgrading the University of Texas and University of Wisconsin sites from 4800 bit/sec to 9600 bit/sec and SAI from 56 kbit/sec to 9600 bit/sec (some upgrade!). A similar upgrade for UCLA is in the works, i.e., lost in the phone company. The PDP-11/40 communication processors were all upgraded with a memory management option and additional memory as part of a continuing effort to install more memory than the programmers can fill up.

Personal Computers

A new area of interest at the NMFEC was precipitated by the Office of Fusion Energy (OFE) interest in installing a number of personal computers. When they asked for NMFEC help in selecting, procuring, and installing a number of systems, Jim Morton was the last to take one step backwards. Fortunately, he has an impressive knowledge of the subject, and has done an excellent job of getting OFE online with several Northstar Advantage personal computers, peripherals, and appropriate software.

Graphics

CUAC representatives have, for several years, strongly requested the NMFEC to develop "better" online graphics capabilities than Tektronix 40XX capability. We have developed a new graphics hardware system affectionately called GUSS. This system has medium resolution (512 x 512 points), quick(er) response (about 5-10 sec per frame), and a low cost (between \$1 and \$2k per monitor). The system consists of a hardware board set installed in a PDP-11 RUSS and supporting 4 to 16 independent TV monitors connected via coax cable. Text, compressed raster, and Tektronix data formats are supported.

An initial "starter kit" of four monitors each was installed at LLL, ORNL, GA, LANL, and PPPL. Plans for next year include additional channels at each major site and four-channel systems at a few university sites. Some major sites will also be upgraded with a hardware controller that supports features such as local multiple-frame buffering, split screen, a cursor, 200-frame quasi-movies, and quick local frame comparison.

Design

Viki Moldenhauer started with us, fresh out of Carnegie-Mellon in March, eager to do hardware design, so we put her to work writing software. She spend a couple of months writing a generic (user-definable) microcode cross-assembler on the CRAY. She is now busy developing the mixer portion of a cursor for the GUSS. This resides near the PDP-11 board set and mixes a cursor cross-hair with the video signal after determining the cursor x-y position. Cliff has finished the sender portion (joystick and control) that

derives the cursor position information and sends it to the mixer. Tom Whitney designed the hardware printed circuit board set that resides in the PDP-11 and contains the video refresh buffers. The refresh board uses 64-k memory chips to squeeze four channels onto one board. Tony Hain and I are developing the hardware controller mentioned previously.

Gordon Jones is developing a PDP-11/21-based printer controller that will offload the data decompression of graphics plots from the PDP-11 RUSS and will also contain the printer driver. This will allow us to substitute a (cheaper) printer for the de facto standard Versatec without affecting RUSS software.

Summary

It has obviously been a very busy year, and in hindsight a very productive one. We anticipate 1983 will continue to be just as busy with new network upgrades, new user sites to be added, and the large effort planned for installing GUSS systems.