

CREWES Project computer system design

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ABSTRACT

The CREWES Project at the University of Calgary has a broad array of dedicated hardware and software in use. Hardware and software are available for many areas of geophysical research, especially seismic. The computer systems are being used to make models, load data, process data, interpret results, graph, analyse, display, print, and plot.

The main processing system is an IBM 4381 with IBM peripherals and an MVS/XA operating system. Western Geophysical Canada's complete processing system is in use. Associated machines include two IBM RT workstations, a SUN workstation, a Cyber 205, a Perkin-Elmer, PC's, and MAC's. The SUN workstation is networked to a Myrias parallel processor. The 2D and 3D Landmark interpretation package is available on an IBM RT. UNISEIS and SIERRA are two of the modeling packages in use. Most code development is being done in FORTRAN on various systems, but C is available. Many additional communication, graphing, windowing, analysing, wordprocessing, and geophysical tools are also in use.

HARDWARE

IBM Canada Ltd. has donated, through a joint-venture agreement, most of the hardware and system software of the CREWES Project's central processor system. There is an IBM Uni-processor with two attached array processors. The current processor is a 4381-P02 which will be upgraded to a 4381-R14 in 1990. The new 4381-R14 will run at twice the speed, with twice the number of high speed channels and twice the memory of the current processor. The 4381-R14 runs at 6 MIPS, it has 12 channels, and 32 megabytes of main storage.

A program can run on either of the two associated array processors without impacting the workload on the central processor. There is an IBM 3838 array processor and an FPS 5605 array processor.

There are approximately 15 gigabytes of high-speed disk data storage in the form of IBM 3380's attached to the system. Each of the two strings is attached to an IBM 3880 control unit.

There are four IBM 3480 double unit cartridge drives so a total of eight cartridges can be loaded simultaneously. The cartridge drives are easier to load, hold slightly more data, and have been found to be more reliable than the regular round-reel tape drives. There are two IBM 3420 tape drives with an IBM 3803 heading the string. The round-reel drives are available for loading seismic field tapes into the system.

Terminals communicate with the system through an IBM 3174 control unit. There are four IBM 3299 multiplexers attached to the control unit, allowing up to 32 terminals and printers to be set up in the Earth Sciences building and attached to the central processor located in the Math Sciences building. Currently, there are six IBM 3192G color graphics terminals attached. Each terminal has a mouse and is capable of displaying a seismic

section. There are an additional twelve IBM 3279 color graphics terminals for programming and processing.

In addition to the 32 terminal and printer connections available on the IBM 3174 control unit, an AEA adapter has been installed in the control unit to allow modem connections. Three telephone lines have been installed and connected to three high speed IBM 5853 modems. CREWES Project sponsors and CREWES Project members can use IBM's FTTERM software to log directly onto the IBM via a modem.

There are two low-speed IBM 3287 printers and a channel attached IBM 3203 printer. A near letter quality IBM 4234 printer is located in the Earth Sciences building and attached to the central processor.

A 42" VERSATEC 8242 model A plotter is located in the Earth Sciences building. A Logic Science Auscom Interface attaches the plotter to the IBM channel and an HSR 11A rasterizer offloads most of the work of plotting from the central processor.

There is an IBM RT 6150 with 330 megabytes of disk space, 16 megabytes of memory, a high speed RISC processor, and a graphics display terminal. The RT is attached to the University Ethernet and is connected to the IBM processor for data transfer and cross logon through the control unit.

There is an IBM 8232 LAN that will eventually provide a direct link between the central processor and Ethernet.

The system has been exceptionally reliable since it was tested and made available to users in May 1989. The only incidents affecting availability have been the occasional power failure, and a terminal error which brought down the controller for half an hour. Excluding periods of scheduled maintenance, the system availability has been over 99%.

SOFTWARE

The system software of the central processor is IBM's MVS/XA version 2.2 and the job entry system is JES2 version 2.2. IBM and Western Geophysical have provided excellent system support. The system software is upgraded every six months and the Western software is upgraded every month.

Western Geophysical's complete geophysical processing system is installed on the central IBM processor. Processing for three component data, 2D data, 3D data, and VSP data is available. Other available features include processing well logs, data conversion, some modeling and various utilities. Western's IQueue (Interactive Queue) and XED (Expert EDitor) allow completely interactive processing, parameter selection, plotting, and data conversion. Most types of data can also be interactively displayed on the graphics terminals. Complete online documentation is available for batch processing and for every aspect of the interactive system.

An IQueue programming template is used so the main requirement is some knowledge of FORTRAN to add a program to the interactive IQueue processing system. The handling of memory management, trace headers, input data formats, data output, and plotting of output data are all done by documented subroutine calls or by the existing interactive IQueue system.

The IBM supplied RT has a compatible FORTRAN compiler so code developed with the tools of a Unix type environment can be moved to the MVS/XA large system. The tools available on the RT include X Windows, graPHIGS, Usability Services, program and data communication with MVS/XA, and Ethernet applications.

LANDMARK

A second IBM RT has been made available to the CREWES Project by Landmark Graphics Corp. under their University Industry Partnership Program. The system is comprised of a high speed IBM RT with 16 megabytes of main memory and 990 megabytes of available disk space. There is a 1/2" round reel tape drive, a color plotter, a printer, a mouse, and two megapixel color graphics screens. Landmark's interactive 2D Plus and 3D Plus workstation software is available on IBM's UNIX based AIX operating system. Data processed with Western's software on the main IBM processor can easily be loaded onto the Landmark for interpretation. FORTRAN and C compilers are available for code development on the IBM RT. The UNISEIS modeling package can be used to generate models for later processing and interpretation. Crosshole, VSP, and multicomponent seismic have all been modeled on UNISEIS and later processed by CREWES.

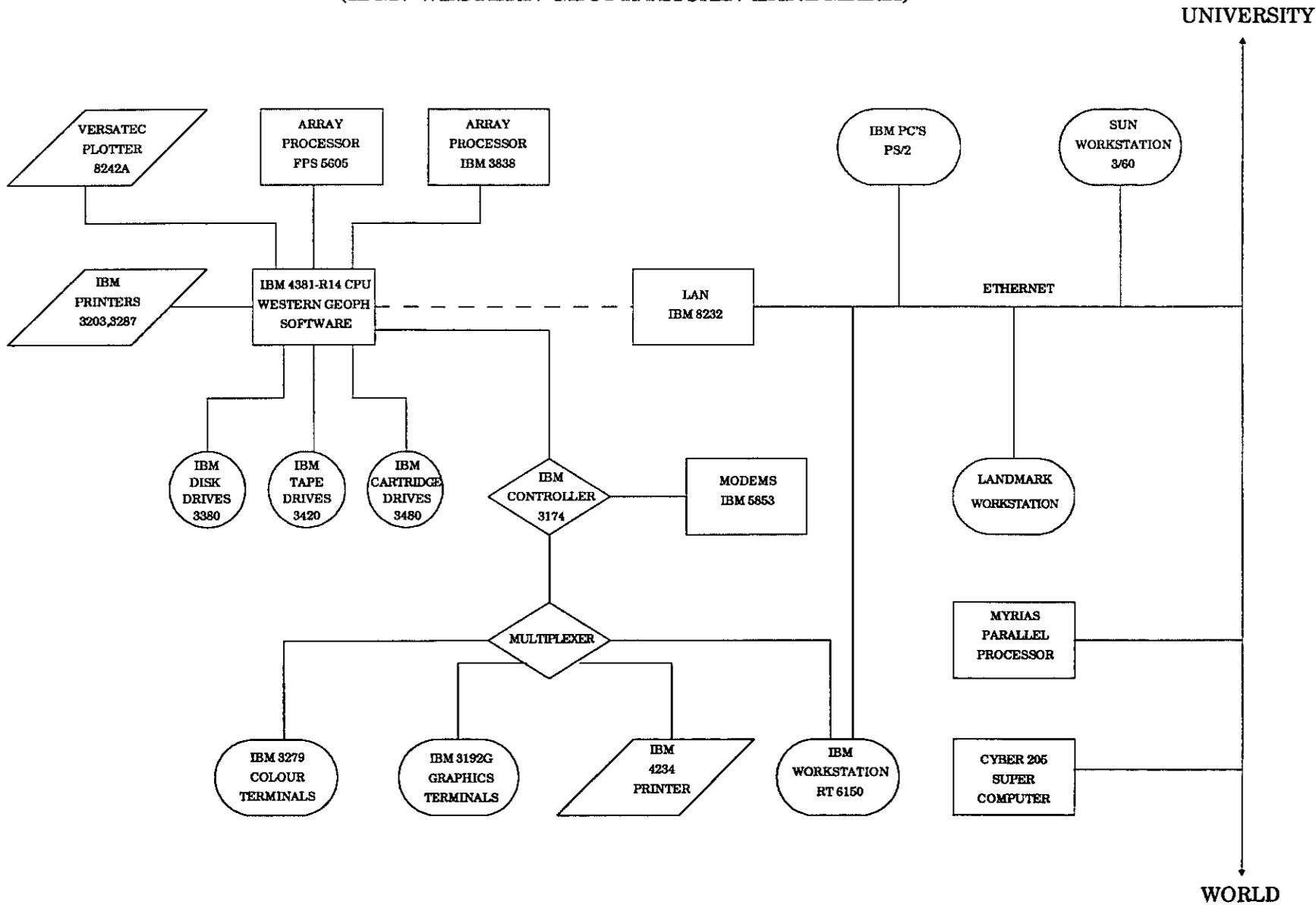
MYRIAS

The Alberta Research Council has made available a SUN 3/60 workstation with 12 megabytes of main memory, 327 megabytes of disk space, a 1/4" tape drive, and a B/W megapixel display. An important purpose of the SUN is to run the Myrias Programmer's workbench. Programs can be written on the SUN in parallel FORTRAN, and then compiled and loaded using the Programmer's Workbench. By using Ethernet, the programs can then be run on the Myrias parallel computer located in the Math Sciences building.

The Myrias computer is a parallel processor with 64 parallel nodes. Each node has 4 megabytes of memory for a total of 256 megabytes. Each node is a Motorola 68020 with a 68881 floating point coprocessor capable of several hundred kiloflops. The gain in speed from a parallel processor is impressive for code that is truly parallel, but can be severely reduced by any portion of sequential code. The Myrias is an excellent computer on which to learn parallel programming and should have an exciting future with higher speed Motorola processors.

CREWES COMPUTER SYSTEM

(IBM / WESTERN GEOPHYSICAL / LANDMARK)



SUMMARY OF HARDWARE AND SOFTWARE

SOFTWARE

IBM

MVS/XA
JES2
RACF
ISPF/PDF
VTAM
SNA
AIX

GEOPHYSICAL

Western Geophysical processing software
SIERRA
UNISEIS
Landmark 2D Plus and 3D Plus
Hampson-Russell AVO
SIS Vista
GMA

HARDWARE

IBM	4381-R14	central processor
IBM	3838	array processor
FPS	5605	array processor
IBM	3880	disk head of string
IBM	3380	15 gigabytes of disk space
IBM	3480	8 cartridge drives
IBM	3420	2 tape drives
IBM	3287	2 low speed printers
IBM	3203	channel attached printer
IBM	4234	near letter quality printer
IBM	3174	communications controller
IBM	3192G	6 graphics terminals each with a mouse
IBM	3278	12 color terminals
IBM	8232	LAN (local area network)
IBM	6150	2 IBM work stations
SIGMA INFORMATION SYSTEMS		tape drive
VERSATEC		8242A and a thermal color plotter
SUN 3/60		workstation
MAC Plus		
MAC II		
Zenith Z-248	PC AT	