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SCIENCE AND ENGINEERING RESEARCH COUNCIL
RUTHERFORD APPLETON LABORATORY

COMPUTING DIVISION

D I S T R I B U T E D C O M P U T I N G N O T E 5 1 6

Report on visit to Carnegie-Mellon University and Three Rivers Computer Corporation, 9-16 November 1981

issued by
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23 November 1981

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10 November - Visit to CMU

Sam Harbison gave an overview of the IA meeting programme:

Thursday:
Accent (in code + Pascal)
Canvas
Spice Lisp
Multi Script - interim executive
CFS/SFS - spice File System

demonstations including drawing package.

Friday:
Accent in more detail

Butler - resource control process which accepts requests from network.

Expected participants from Xerox, Dec, Siemens, Olivetti, 3RCC.

We discussed our plans for Unix, briefly. Sam said that currently Accent does not have IO, but it is expected by the end of the month. 3RCC have a Pascal compiler which generates Accent Qcode. SEG and RUN file formats are very similar to POS, so the Linker should be unchanged. Sam mentioned that CMU are considering storing global data separately from the stack, to extend the address space. (See discussion with Rick Rashid below).

I talked to James Gosling about his work on a preliminary C compiler for the PERQ (sometimes referred to as Gosling's folly). This compiler was developed from the portable C compiler from an early release from Berkeley. It works without change in the latest version.

The "machine independent" portions (as defined by Bell) are unchanged. All the code for tree manipulation and template matching is used. This was intended to achieve compatibility with Fortran 77, and some Pascal which is rumoured to be available (possibly Berkeley?).

The compiler generates a symbolic form of Qcode, for which there is no assembler. "Eyeball debugging" was the term used. 80% of the code generation is done in the machine dependent routine which is called when all template matches fail.

Features:

working:
- expressions (but see below)
- statements
- structure assignments etc
- characters are stored as 16 bit words

not working:
- embedded assignments and similar side-effects
- switch statements
- variable numbers of arguments

outstanding problems:
- if characters are to be packed, character pointers must be 3 words long.
- C assumes a flat name space. Perq software has modular structure, and the compiler is expected to resolve addressing relative to a segment.

Rick Rashid: Accent

current state:
- user level code to fork, send messages is OK
- Gene Ball is doing IO code: rearranging Z80 driver code, rationalising generally, disk IO not running yet, expected around end November.
- All OS code written, but not completely tested. Some testing done in POS. Microcode has had 6 weeks debugging in running systems.
- Interim file system uses the same disk layout as POS, has calls compatible with Spice File system. Low level code will not change.
- Accent assumes a flat 32 bit address space. Segmentation is an artefact of Q code. If long integer computations are used for addressing, large arrays can be used. Code is segmented due to CALL Q code operation. Global and Own addressing Q codes imply segmentation, but need not be used.
- 3R have produced a Pascal compiler with longs, Accent Q code.

Mary Thompson has a program to automatically generate message sending procedures. (This is probably Matchmaker - see System Programmers Guide).

Rick says there is a small problem with Unix pipes in that in Accent only one process may receive from any one port, whereas Unix permits several.

Rick's student (one of?) implemented the Accent IPC for Vax/Unix which we may have, also code for a remote file server.

Robotics "have used 3RCC floating point microcode".

Serious applications will need the 1 Mbyte Perq.

11 November - 3RCC

Lee Harris is Don Scelza's replacement as software manager. Don has gone to Advanced Development, Working on 16K WCS CPU board (which has some CPU changes). Lee is new (5 weeks) and Don is still helping organise the D6 release. Software group is 6/7 people, mostly new. Brad Myers is probably the most experienced member. Diana Forgy is the only other one I know from August. John Strait is at advanced development doing design tools (currently schematic entry) plus some work on short term developments (megabyte memory?).

The D6 release is expected about the end of December and will contain:

- floating point and long integer in M code and compiler
- possibly paging code generation option in Pascal
- Q code optimiser developed by CMU under contract
- rationalised utilities - consistent interfaces
- 1 Mbyte memory support
- possibly pop-up windows in some utilities

The floating point microcode exists but has not been systematically tested. The compiler work is held up by the IO formatting routines - 3RCC do not have expertise in numerical analysis, and are taking care not to lose precision in IO by taking time to find out how to do it properly.

The virgil system has been suspended, but the Document program which takes formal comments out of code is in use. Some work is going on to develop tools to generate control structure documentation automatically from Pascal source. Brad is developing a generalised tree manipulation/display program for this.

3RCC are still hoping to adopt Accent as the basis for their standard system. They want to use the kernel, and write the user level code above that, rather than following CMU's plans which they feel to be too long term. Lee was a bit vague about what software development that would require. Preliminary release expected spring or early summer '82. It is rumoured that Raj Reddy has a Cobol compiler for Q code.

3RCC have someone called Dirk working on the Z80 code, using a Tektronix development system. This appears to be a rewrite to enable direct data flow from the Perq CPU to a peripheral, using a Z80 DMA channel to avoid passing bytes through the Z80. This should improve the performance greatly, so among other things, the speech would work. Theoretically one could obtain 1 Mbyte per sec throughput to say the GPIB. This development would require Perq U Code changes for the Perq-Z80 communications. The work is expected to take 3 months. Upgrade in the field should just be a matter of loading new Perq software, and changing proms on the IO board. A new IO board may at some time have ram instead of prom.

Generally the software department is small and not very experienced, so that it will take some time to clear up their software problems.

12-13 November - CMU Industrial Affiliates meeting

The technical presentations were mostly good, and mostly well summarised in the documents. Scott Fahlman's talk on Spice Lisp was highly entertaining. Several impressions came through.

Much of the Spice software is in the research stages, and will not be available for use for some time (as planned).

The graphics and user interface packages are not of the same standard as the bulk of spice. CMU acknowledge that they have little experience. I expect these things will change considerably with time.

Rick Rashid's ACCENT kernel is very elegant, and the preliminary version is very close to completion. This, with the interim file system, will constitute the soundest parts of spice 81. It is fortunate (but probably not accidental) that they are the parts we need to implement UNIX.

General Gossip. Company Confidential

3RCC advanced development group are working on two projects:

A cheap (possibly desktop) Perq, codenamed Teacup.
ICL may be sending people over to work with 3RCC.

An enhanced, more powerful Perq, codenamed Mars.

3RCC's main office are working on:

- 1 Megabyte memory board (prototype running)
- 16 KWCS and enhanced CPU board
- various flavours of IO boards and peripherals
  - see RWW trip report
- Colour Perq. This will have 2 Mbyte memory and 1280 x 1024 colour monitor in a separate package, interfaced via the current memory board slot, configurable as 4 or 8 bits/pixel, Rastero software-selectable to be plane-wise or pixel-wise, colour map: 10 bits in (8 pixel + 2 cursor), 3 x 10 bits out. Cursor 128 or 256 pixels square. Frame buffer is main memory. Raster Op will have more functions (eg add).

John Strait thinks that Spice software will not be of much use to 3RCC, at least for some time. 3RCC are considering making POS into a multi-process system (over a weekend!).

Raj Reddy (CMU Robotics) is building a video camera input for the Perq. CMU have devised a slave video system, useful for demonstrations.