

European Centre
for Medium Range Weather Forecasts

COMPUTER NEWSLETTER

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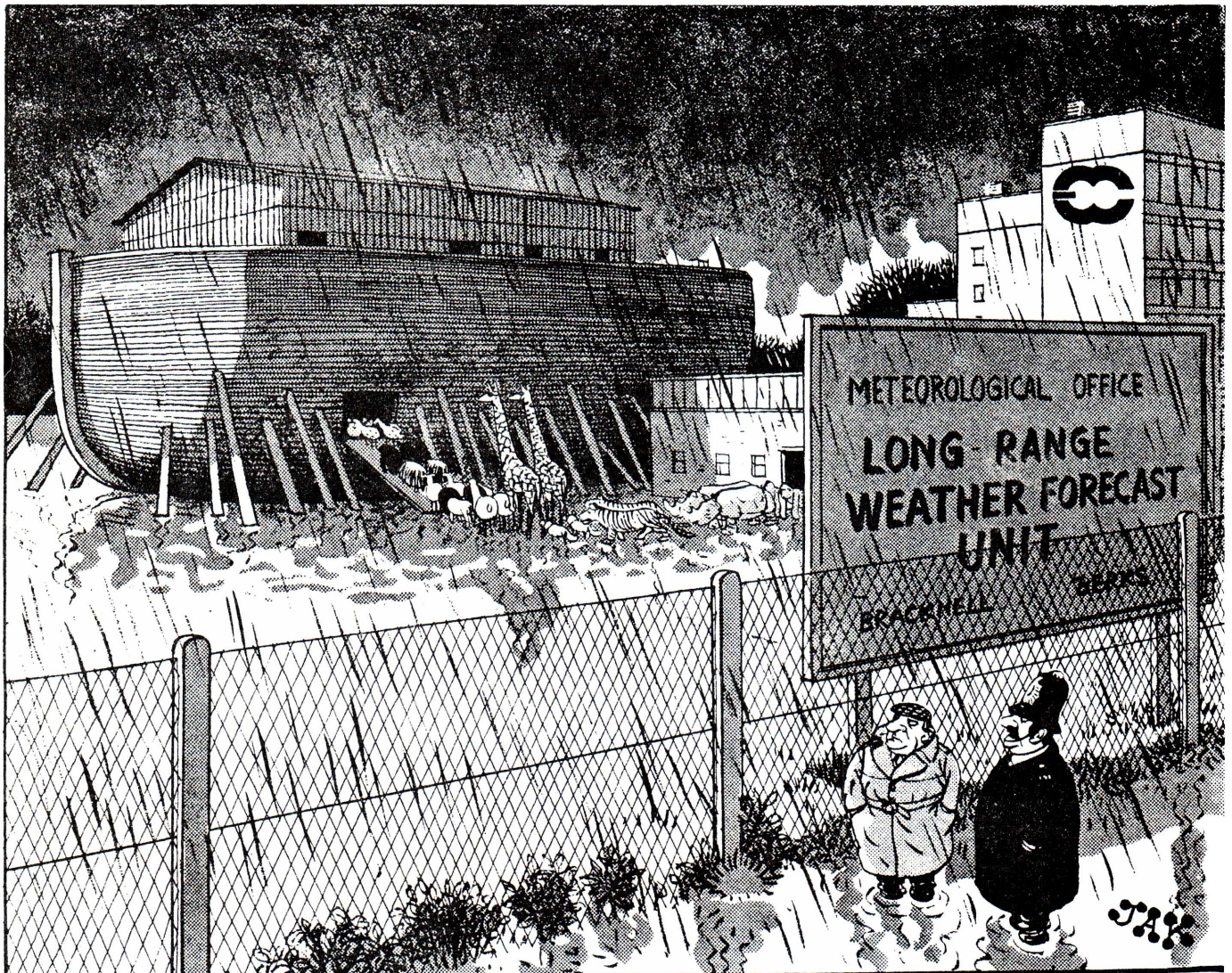
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Edited and Produced by User Support Section, Brandon House, ext. 286



"I don't like the look of that!"

Random Notes from Minneapolis and Boulder Visits

Peter Gray reports on his recent (1 - 16 August) trip to Cray Research, Control Data and NCAR:

CDC, Minneapolis

CDC announced support of upper/lower case, 95 character set ASCII 595-6 print train for central site line printers. The operating systems will now support these printers.

Intercom 5 is to be released by June 1978. Intercom 4 will continue to be supported (probably for 1-2 years). Intercom 4 and 5 cannot co-exist in the same mainframe. Intercom 5 will not support 667x multiplexors. Intercom 5 is designed to handle 25 9.6KB RJE's on 2552, giving significant performance improvement over Intercom 4.

Terminal Independent Interactive Graphics System (TIIGS) was presented and appears to be too comprehensive for ECMWF's requirements. UNIPLOT 2.0 (new version) was also presented which would appear to satisfy ECMWF's needs. Two copies of the UNIPLOT 2.0 manual were brought back to ECMWF.

CRAY Research, Minneapolis

Don Luger (Cray's Head of Training) and David Judd will probably give the courses at ECMWF in October. The timing of operator training depends on the availability of the new Eclipse software but will probably be late September/early October.

The Cray staff responsible for writing the Eclipse station software are Dave Smith and Jim Bravato. Cray intend to complete the new station by September so it will be used on Serial 1 at Rutherford.

There are no plans to implement tape staging on the Eclipse, nor demand file staging. Cray have not yet defined the job card deck structure for the new station; they were requested to allow CDC compatible separators and terminators.

The current status of the Cray Operating System, with reference to the milestone chart of 19 July '77, is as follows:

- Rollin/rollout available (just). Required for NCAR acceptance.
- Memory management due end August (includes super scheduler).
- Deadstart involving permanent file recovery OK.
- Deadstart with I/O queue recovery untested.
- Deadstart permanent file being coded.
- UPDATE not yet ready.
- BUILD utility coded but not checked.
- System directory working. (ACCESS for CFT no longer needed.)
- New station protocol coded, partly checked.
- Random I/O working (just).
- EXTRACT subset working.
- System log extensions to be coded.

It is clear that lack of machine time at Minneapolis and Chippewa hampered development. However, Cray has around 12-16 hours software development time at NCAR and great steps forward are currently being made.

Also the default buffer size for I/O files has to be changed down from 22000B to about 2000B words. And it will be possible to recover \$OUT dataset on disc (but not the part left in memory).

Dick Nelson is responsible for the Fortran compiler, CFT. The state is as follows:

- BUFFERIN/OUT fully working.
- ENCODE/DECODE fully working.
- No FORTRAN random I/O yet. FORTRAN-77 specification will probably be followed.
- COMPLEX/DOUBLE fully working.
- 64 bit integer arithmetic is highest priority modification. Should be available by end 1977. Not sure whether long integers will be implicitly or explicitly specified.
- NAMELIST I/O could be provided by July '78.
- No schedule for improved cross reference maps.
- No operating system facility for handling I/O errors; if provided will probably use FORTRAN-77 standard.
- Instruction scheduling next highest priority after 64 bit integers. Expects 20% improvement in speed of scalar arithmetic code.

.../cont.

- PARAMETER statement not working.
- Implied DO loops in DATA statements not working.
- All I/O conversion routines use double precision arithmetic which should give totally accurate single precision results.
- No DOUBLE PRECISION COMPLEX committed.
- Computed GOTO follows FORTRAN-77 (next statement if out of range).
- Subprogram calling sequence problem causing program overwrite on calls with too many arguments unlikely to be resolved.
- No ENTRY statement scheduled.

Of the 3 engineers coming to Rutherford, one has been with serial 1 at Los Alamos since it was installed; one is from the Chippewa commissioning team; one is new to Cray, having had extensive CDC experience at the U.S. Navy Fleet Numerical Weather Centre (Monterey, California). There will be two full-time Cray software analysts, hopefully recruited from the U.K., though tight time schedules will make U.S. support necessary in the early months. Finally, Cray is open to suggestions to form a user group among Cray-1 installations.

NCAR, Boulder, Colorado

NCAR is very keen to have a Cray user group formed and suggested the preliminary meeting should precede or follow the Spring '78 VIM (CDC user group in the U.S.) meeting in Albuquerque, New Mexico.

NCAR is using a non-standard 7600 system as an interim front-end to the Cray. It is intended that the 7600 be replaced by the Cray and a number of mini-computers.

NCAR's expectations of the Cray are much lower than ours. They are less well advanced than ECMWF with regard to installing models on the Cray, and they have not produced any special codes for acceptance, intending to rely on transporting some of their 7600 workload to the Cray for the trial. Their acceptance trial has been delayed for 1 month and is now due to start 1 October 1977.

Cray Usage

While at NCAR, we had some hands on exposure to Cray:

- The reliability of the Eclipse station software was appalling. However, Cray is rewriting the Eclipse station basing it on a new RDOS release from Data General. This should be available by October and should be much more reliable than the present software.
- The Cray operating system seemed moderately robust with about 1 hour MTBF. Most of the problems seemed due to incorrect setting up of the system, though we detected several regressions in the software.
- While at NCAR we experienced a short power cut. The Cray came up immediately without problems. One (of 16) DD-19 discs took a couple of hours to repair. The 7600 took several hours to repair.
- There were no memory parity errors or other hardware problems during our use.
- It is apparent that Cray regression testing on both the compiler and operating system is inadequate.

-- Peter Gray

CDC/CRAY Training Courses

Due to CDC personnel problems, the CDC course schedule printed in the previous Newsletter has been delayed by two weeks. The latest complete schedule is as follows:

- | | | |
|----------------------------|------|---|
| 3 - 8 October | CRAY | user overview; architecture and operating system; JCL, utilities, file organisation, link principles, assembly language, Cray Fortran, vectorisation. |
| 31 October -
4 November | CDC | user overview; Cyber architecture, operating system, JCL, utilities, file organisation and Record Manager, link. |

The following additional classes are intended for systems staff, but may be of interest to users as well (however space is severely limited):

- | | | |
|-----------------|------|---|
| 10 - 15 October | CRAY | systems internals and maintenance, assembly language. |
| 7 - 18 November | CDC | Cyber CPU and PPU assembly language, NOS/BE system internals and maintenance. |

.../cont.

Classes will be held in the conference room at Fitzwilliam House, with the first meeting (October 3) being at 10am. A complete meeting schedule will be posted outside the room.

Research staff should register with Rex. Gibson.

-- Richard Friedman

Advisory Service

Our initial attempt at providing a regular programming advisory service daily in John Scott House has been abandoned for the time being, due to the low demand encountered.

Presently, advice for distressed programmes (and programmers) is available in Brandon House, ext. 286, daily from 0930 - 1200 and 1400 - 1630. Problems too complicated for the telephone should be brought directly to room 102.

This will probably persist at least until the move to Rutherford. It is still too early to determine the nature of the service to be provided from that point, and we are open to suggestions.

-- User Support
(R.Friedman, M.Lewis)

Computer Service Liaison and User Feedback

In addition to the various informal methods of making your views known about the computer service (e.g. beating an operator about the head; buying drinks for the whole computer systems group, etc.) there is also a more formal way via the Computer Service Liaison Committee. This committee, which tries to meet every two or three weeks, is composed of representatives from Research, Computer Operations, Operating Systems and User Support who review recent problems with the computer service and communicate future requirements.

Currently, the members of the committee are Rex Gibson, Eric Walton, Peter Gray, and Richard Friedman. If you have a complaint or comment to raise, please raise it with one of us. Minutes are taken and are available from Eric Walton's office.

-- Peter Gray

Computer Service at Rutherford

For some time now rumours and discussions have been going on about the type of service to be provided on the computers at Rutherford. A meeting will be held on 7 October, 1400hrs., Fitzwilliam House, Conference Room, during which the planned arrangements, as far as they are finalized yet, for the service will be presented and discussed. Topics include : job submission, terminals, transport, shift schedules, advisory service, etc.

-- Rob Brinkhuysen

Interim Computer Facilities at Rutherford Lab.

Good progress is being made in preparing the computer facilities at Rutherford Laboratory. The Centre has been allocated 200m² for the computer installation within a 600m² room. The remainder of the room will be divided between some Rutherford RJE stations and an electron beam lithography experiment. We anticipate being allocated further space in the same room to meet our general service requirements.

At present electrical wiring and plumbing for the cooling system is being installed; some items have already been completed. There is a possibility of a two week delay in completing the installation work, due to late delivery of the Cray condensing unit and some vital elements for the refrigerant pipework.

-- Eric Walton

Interim CRAY/CYBER Job Transfer System

It is anticipated that a system for transferring jobs and output between mainframes (via magnetic tape) can be provided to be available for use shortly after the installation of the interim CRAY/CYBER configuration at Rutherford. (Link hardware and software to directly interconnect the mainframes is not expected to be fully operational until after the Shinfield Park installation).

It has also been established that we can provide an automatic permanent file transfer service (also via tape) between the Cray and Cyber, albeit restricted to formatted files.

-- Peter Gray

FORTRAN 77 is Coming

Most current FORTRAN compilers adhere to, or extend the scope of the last American National Standards Institute (ANSI) FORTRAN language definition of 1966, known as X3.9-1966. Now, after eleven years, the ANSI X3J3 committee responsible for the FORTRAN standard has arrived at another definition informally known as FORTRAN 77 (or formally as ANS X3.9-1977 FORTRAN). The X3J3 committee met 62 times and consumed 4127 meeting man-days during this time. The public were not forgotten and during the public review period that began March 1, 1976 and ended September 28, 1976, 289 people and organisations sent 1225 pages of comments! It is expected that the new standard will become official during November 1977.

As an introduction to FORTRAN 77, there follows a copy of a text that highlights the major differences between the old and new standards. The text was taken from the latest "FOR-WORD" (Fortran Development Newsletter - August 1977) which in turn, obtained it from the "ANS X3.9 FORTRAN Revision - Final Report" by the X3J3 Chairman, Frank Engel, Jr.

Major Differences between FORTRAN 77 and the Previous Standard, ANS X3.9-1966

NOTE: An extremely important consideration in the development of FORTRAN 77 was the minimization of conflicts with the previous standard. The differences listed here represent (with only two exceptions) extensions to, rather than conflicts with, ANS X3.9-1966. It should also be noted that FORTRAN 77 consists of full language and a subset; differences noted in this list refer to the full language.

1. "Structured" branching statements. The following statements have been added to the language:

```
IF (e) THEN
ELSE IF (e) THEN
ELSE
END IF
```

For each IF-THEN statement, there must be a corresponding END IF statement. Between the IF-THEN and the corresponding END IF there may appear any number of ELSE IF-THEN statements, and at most one ELSE (which must not precede any of the ELSE IF-THEN statements). Groups of statements delimited by IF-THEN and END IF must be properly nested, both with respect to other such groups and with respect to DO loops. Transfer of control into such groups is prohibited.

2. Character data type. A new data type, consisting of character strings of fixed declared length, has been added to the language. Included are character constants, character variables, and arrays of character data. Operations on character data include concatenation and designation of substrings. Intrinsic functions for conversion between single characters and small integers, for pattern matching, and for determining the length of a string are included.

The Hollerith data type of ANS X3.9-1966 has been deleted. Because this introduces a conflict with the previous standard, it is anticipated that some processors will wish to retain Hollerith data as an extension to FORTRAN 77; accordingly an appendix has been included with recommendations for the form such an extension should take.

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3. DO loop changes. A DO statement specifying a terminal parameter whose value is less than that of the initial parameter is no longer prohibited. If the incrementation value is positive, such a statement specifies a loop to be executed "zero times". Negative increments are also permitted. The DO variable remains defined at completion. Transfer of control into a DO loop is prohibited (in conflict with the previous standard).
4. List-directed input and output. A form of input and output is provided, which does not require an explicit format specification. The form of the external representation is determined by the input or output list item.
5. Expressions. An arithmetic expression may include subexpressions of more than one type. (If an operator has two operands of different types, the operand whose type differs from that of the result is converted before the operator is applied.) A subscript expression may be any integer expression. A DO parameter may be any expression of integer, real, or double precision type.
6. Compile-time constants. A PARAMETER statement has been provided, which declares the value corresponding to the symbolic name of a constant. Such a name may be used in an expression, in a DATA statement, or in following PARAMETER statements.
7. Implicit type declaration. An IMPLICIT statement may be used to declare implicit types for variables and array names beginning with certain letters.
8. Generic intrinsic functions. Many intrinsic (predefined) functions produce a value whose type depends upon the type of the function arguments.
9. Subprogram reference. Subroutines and functions may contain ENTRY statements, and subroutines may have alternate returns.
10. Array bounds. An array declaration may include both upper and lower dimension bounds; if the lower bound for a dimension is not specified the default is one. Arrays may have up to seven dimensions. The upper bound for the last dimension of a dummy argument array may be an asterisk, designating that the size of the array is to be determined from the actual argument.
11. Computed GO TO default. If the control expression of a computed GO TO is out of range, execution continues with the statement following the computed GO TO.
12. Input and output statements. The following features have been included:
 - An output list may contain constants and expressions.
 - An input or output statement may contain a character string to be used as the format specification.
 - End and error condition control for input and output are provided.
 - Tab format edit descriptors have been added.
 - Direct access input and output are provided.
 - A character array may be used as an internal file.
 - OPEN, CLOSE, and INQUIRE statements are provided.
13. SAVE statement. Values of entities in a subprogram may be preserved during the time when the subprogram is no longer being referenced, if their names are specified in a SAVE statement.
14. Fortran character set. The apostrophe and the colon are added to the Fortran character set. The collating sequence is only partly specified.
15. Comment lines. An asterisk or a C in column 1 designates a comment line.

-- Mostyn Lewis

Technical ITT's

The following Invitations to Tender (ITT) recently issued by the Operations Division of interest to the technical staff are currently in process:

	<u>closing date</u>
Telecommunications System	Sept. 16
Alphanumeric and Graphical VDU's	Sept. 16
Electrostatic Plotters	Oct. 10
Remote Job Entry Terminals	Sept. 16

-- Keld Petersen

IFIP Congress 77

Rob Brinkhuysen and I attended the congress of the International Federation for Information Processing, in Toronto from 8 - 12 August 1977, and I would like to inform you what was going on there:

Maybe it is best to start by explaining the importance this congress has for the computer world. As many of you are Meteorologists, one can compare it with the congress of the International Association of Meteorology and Atmospheric Physics (IAMAP). 34 countries send professional or technical societies to IFIP, and since it was founded in 1959, under the auspices of UNESCO, congresses have been held every three years.

This year's congress was attended by 2800 people and to organise the meeting of such a crowd is not an easy task. To make things worse, the Canadian Air-Traffic Controllers happened to go on strike just one day before the opening. So, a lot of people, myself included, had to fly to the nearest U.S. city and then take a bus or a train. Fortunately, Toronto is not Edmonton, and so I was 'only' one day late ...

At the registration you receive the proceedings of the congress: a 1000 page book, containing over 150 papers, which will be presented on nearly 100 sessions. (A copy is held in Rob's office and in my office). As ECMWF is going to implement a data network with fairly advanced technology, my interest was concentrated on communication and network topics. Not to bore you with technical details I will give you only my general impression here:

In the above mentioned fields, people are aware that the gap between what is technologically possible and what can be implemented is getting even bigger. So, for instance, can ECMWF's daily data dissemination to Sweden be performed with a three minute international telephone call using a 56K bit digital PCM channel. But the present tariff blocks such an application. Standardisation is vital, and though the international time-table to achieve this will go well into the eighties, ECMWF can be an important pace-setter for having experience with international standards. The Centre's contribution to the International Network Working Group (INWG), which it joined recently, can be best seen in this way.

The panel discussion about "The Impact of Computerisation on Employment Level", I was particularly eager to attend. A Canadian Union Official gave also one reason for the above mentioned gap: the union in Canada will fight any computerisation (e.g. the implementation of an Electronic Mail System nationwide), when it is clear, that more people will become redundant than will find new jobs. And this is not only true for Canada. In Britain it is already practice and the German fellow Unionist expressed the same opinion at this panel discussion.

Less controversial, but under the surface still quite politically influenced, was the computer chess tournament. 16 chess programmes played in 4 rounds in the "Swiss League" system against each other for the World Computer Chess Champion title. Though the tension was already less after the first round, when the Russian programme KAISSA (former title holder) lost, it was however not clear if a programme bug, introduced when transferring the programme to a local IBM 370/168, caused the defeat. But after the American programme CHESS 4.6 won the tournament, and the special arranged fight against KAISSA, and after later analysis of the games, it became quite evident that the defeat was not due to a bug, and that, at the moment, the Americans are stronger in Computer Chess.

The exhibition, which was running concurrently, didn't show any technical breakthroughs, but did indicate that everything is getting smaller, faster, and more sophisticated, and that the business climate wasn't too bad...

At the exhibition the Institut de Recherche d'Informatique et d'Automatique (IRIA) gave a demonstration of their CYCLADES network. It was for this demonstration that the Canadian packet-switched network DATAPAC and the French networks RCP and CIGALE were switched together for the first time. As CIGALE was connected to the European Informatic Network (EIN), I saw D.L.A. Barber from the National Physics Lab. (Teddington) sitting quite cheerfully, having an interactive session with his home-node.

So much for the official part of the Congress. But one should not underestimate the impact of the social part. As the weather was mostly hot and the air highly humid, one was glad for the outdoor and (air-conditioned) indoor evenings, which included a Wine and Cheese Social, a Picnic, Cruise/Dance and a Dinner. It was at these events where one could relax from those problems which seemed so important during the day...

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The week passed too quickly, and suddenly you were sitting in the closing ceremony realising that everything was now over. The only consolation left during those last speeches was to look forward to 1980, when the IFIP 80 Congress will be held on two continents: 3½ days in Japan, and 3½ days in Melbourne, Australia, with a 4 day break for travel in between....

-- Klaus Wilke

6600 Performance Statistics

<u>Week ending</u>	31/7	7/8	14/8	21/8	28/8	4/9
Jobs Central Site	822	810	1022	1049	1093	867
Jobs Remote	153	185	219	349	390	335
Plots	95	64	82	138	96	124
CP hours	34	69	67	96	78	117
MTBF (hours)	34	168	168	84	168	56
Scheduled availability (%)	99.6	100	100	98.7	100	98.7
Overall availability (%)	95.3	95.3	96.4	94.0	95.8	94.0

MTBF : mean time between failures

The scheduled availability is the ratio between the time available for the user and the scheduled time; the difference between the two is the time, the computer is not available due to hardware or software problems.

The overall availability is the ratio between the time available to the user and the maximum time available per week (168 hours); the difference between the two figures is the downtime plus time spent on maintenance of hardware and software.

-- Eric Walton

6600 Operations Notes

Once again, all users are kindly requested to observe the 100 RB limit on disk space.

One of the card punches at John Scott House has been designated as a "5 MINUTE" punch. If queueing persists, the use of a second punch will be limited to 5 minutes as well. A punch operator is available during normal hours. The use of this service is encouraged.

-- Alex van Tricht

The Cray-1 Use in Minneapolis

Further to Andrew's report on Cray-1 software (Newsletter No. 1) I should like to add some comments. There are 3 areas of difficulty facing the user at Minneapolis:

1. Cray-1 Hardware
2. Cray-1 Software
3. Front-end inadequacies

1. Evidence from LASL and NCAR suggests that, on site, the Cray-1 hardware will be very reliable. However, we are normally obliged to use a machine which is not fully checked out. Consequently, there may be problems due to hardware faults.

2. COS, the Cray-1 operating system has not directly given us much trouble. However, system restart with recovery of permanent files has only very recently become available and throughout the summer we have been obliged to reload all of our permanent files from the front-end whenever the system crashed. This is not a big overhead except when large datasets are involved, such as the forecast model's initial data which takes about 1½ minutes to stage onto the Cray-1 disk.

CFT, the Fortran compiler, is still under development and as Andrew pointed out, has had a number of problems. However, there has been a vast improvement over the last 5 months and most simple arithmetic codes will now compile correctly. Of the bugs listed by Andrew, only outstanding problems remain in the area of statement functions.

.../cont.

The combination of potential hardware, compiler and user errors has meant that program debugging has been rather more 'interesting' than usual!

3. Apart from the annoyance and time wasting aspect of software crashes on the Eclipse, disk space has been the greatest difficulty facing users. In fact, our initial dataset for the forecast model has been the largest file in existence at Cray Research. This should become less of a problem now that permanent files can be kept on the Cray-1 disk and with the new station software running in the Eclipse, life should be rather easier at the Rutherford installation.

-- David Dent
