SPS/ACC/MC

30 January 1979

CONSULTATIVE COMMITTEE ON CONTROL COMPUTERS (400)

Minutes of the 15th Meeting held on 18 December 1979

Present:

J. Altaber, P. Andersen, B. Angerth, F. Beck (Chairman), L. Burnod
M. Clayton, M. Collins (Secretary), M.C. Crowley-Milling, E. d'Amico,
B. de Raad, B. Flockhart, R. Rausch, G. Shering.

The meeting was opened by F. Beck who outlined the agenda.

1. NORD-10M - Hardware Aspects

Collins described briefly the hardware arrangement of the new NORD-10M computer. All hardware elements except the memory management card and the special bootstrap card were undergoing preproduction tests, and NODAL-SYNTRON tests on a 64K computer had given satisfactory results. Some I/O bus compatibility problems had been discovered when testing a TITN satellite data link in Norway. Efforts were being made to find a solution. A new power supply would be used and the first production unit had successfully undergone extensive testing at CERN.

The proposed installation of the new computer in auxiliary buildings was described. Essentially a low profile five-bay cabinet will house up to three 10M computers with the top providing a working surface for video displays, hard copy terminals and a floppy disk unit.

Although initial deliveries were late and not expected until end January 1979, it was hoped that if there were any teething problems these could be quickly resolved by the CPU designer who would shortly be arriving at Norsk Data in Ferney-Voltaire for a period of one year.

2. Software

Altaber reported that work was now proceeding on the system software for the NORD-10M. Normal operation would rely 100% on data link access to LIBRARY computer files. A floppy disk based system and filing scheme would be developed for local stand-alone use when the control centre was down. Some modifications to the existing LIBRARY would be necessary to allow the passage of extended bootstrap messages.

The 128K memory of the NORD-10M would be allocated as:

-BANK 0 (64K) - system + NODAL buffers + resident code
-BANK 1 (64K) - 2K coreloads accessed via the memory management system.

Similar techniques were already used on the EA and SERV1 computer systems.

Fears had been expressed that the proposals for memory ROLL IN/ ROLL OUT would lead to out of date data tables or corruptions in the case of power cuts. Altaber insisted that the use of 'memory only' systems would give the same and no more or less security for the local data base than the existing systems.

The development of the new system would provide a chance to improve the tools for saving and retrieving data tables. A meeting would be held soon to discuss exactly what was needed.

Furthermore it was intended to introduce automatic system generation facilities. For such a system to be efficient it must work for all computer systems.

3. Technology Exhibition

The current status was reported by Beck. A simple console would be interfaced via a computer and data link to the SPS control network. Because the software protection scheme has not been fully implemented in all data module subroutines (DMS), the use of such a console could present a serious danger to the smooth operation of the accelerator. It had been decided that no effort could be spared to modify existing programs. Consequently only a limited demonstration tree would be available during normal exhibition hours. On special occasions a remote software switch could be thrown by a responsible person for a given period of time and with the knowledge and permission of the EIC.

De Raad thought that the operation of a console in this way could lead to a waste of manpower.

Andersen proposed the installation of tree terminals which could be arranged to provide adequate exhibition displays.

De Raad suggested that the tree terminal would be a suitable device for demonstrating the control system to important visitors in the Main Control Room.

4. CIMBUS Progress

Rausch described recent progress on the CIMBUS system and presented the new CIMBUS documentation which was now available from Den Herder and Peron (AES).

A joint development was proceeding on instrumentation for the new vacuum system.

AMR Group have already built a prototype local microprocessor system which will shortly be connected via the MPX interface to the control system. ACC Group were also providing a CIMBUS responder and test software.

Rausch reported that a Ferranti F100/CIMBUS interface set was being developed consisting of three 40 pin packages. The interfacing problem for designers would therefore be greatly reduced.

Flockhart described the Motorola 6800 microprocessor system which was being developed for switching and monitoring of the sublimation pumps necessary for planned improvements to the vacuum system. He mentioned that the basic system contained 8K EPROM memory and only 256 words of RAM memory. An extra 16K RAM memory card was available and input/output and digital voltmeter modules were being developed for the interface to the sublimation pumps.

Flockhart concluded by saying he was pleased at the way the CIMBUS system was developing. A prototype system was already controlling relays in his laboratory.

Altaber was interested to know if the MC6800 processor card had been developed specifically for the vacuum system or whether it was of general interest for other designers.

Flockhart indicated that the design had been kept as general as possible. Part of the circuit card had been reserved for customised applications and other teams might be able to benefit from such a design.

Rausch described the current state of the CIMBUS motherboard. Den Herder was actively working on a multilayer board. Initial supplies would be available shortly.

Rausch went on to discuss the ARBITER module which organizes the INPUT/OUTPUT, INTERRUPT and DMA transfer requests from several microprocessors on the same CIMBUS. A prototype of the module was presented.

Beck mentioned that the problem of LOCAL control must not be forgotten. The control system must be able to function without the conventional LOCAL/REMOTE switch. The ARBITER would have to organize priorities so that LOCAL and REMOTE control were possible simultaneously. It was imperative that increased LOCAL microprocessing did not mean additional LOCAL control rooms.

Altaber feared free use of local control, but Angerth said that the proposed system would be an improvement because local control at the present time meant loss of central control. With the proposed microprocessor instrumentation he saw that the efficiency of local interventions would be greatly improved.

Beck saw that attempts to enforce rigid rules would be too restrictive. System designers and operators would have to learn how to interface and use their new systems correctly so that all operations from the Main Control Room were still viable.

Altaber proposed an early meeting to bring together all CIMBUS users and clarify the requirements for LOCAL/REMOTE facilities.

Rausch remarked that it takes years to set up good standards. A fairly successful start had been made.

5. ACC Controller

Rausch reported on the progress of the CAMAC auxiliary crate controller (ACC). Several pre-series modules were now operating in the PS Division. A tendering procedure was in progress for an order of 70 modules (50 for PS, 20 for SPS).

The ACC contained a 16 bit Texas TMS9900 microprocessor and would be available in four different configurations:

1) Standard single card microprocessor
2) Standard card + full LAM grader
3) Srandard card + intelligent DMA controller
4) Standard card + autonomous crate controller.

In response to a question from Crowley-Milling, Rausch said that the ACC was foreseen for two SPS projects at the present time:

1) EBP project for local control on the CAMAC serial loop,
2) AMR project for automatic analysis of vacuum system measurments.

Beck thought it essential that microprocessors used to solve applications oriented problems must be programmed in a high level language.

6. Repeaters

Rausch reported that a very long single multiplex link had now been installed all around the CERN site using the first delivery of the new NOVELEC repeaters. Tests have been completely successful and plans to connect essential accelerator equipment on the long distance MPX link to the ACCESS computer would go ahead during the January shutdown.

7. List Search Device

Rausch explained that this device had been developed to replace software table search procedures and would be used to speed up NODAL. The prototype device consisted of 2 CAMAC modules and used a bit slice microprocessor and fast associative memory. First measurements showed that a speed-up factor from 2 to 50 could be expected depending upon the length of the table to be searched.

Discussions were now taking place with Norsk Data with a view to incorporating the device as a standard ND product into the manufacture of the 10M computers. There were numerous operational advantages to such a move.

8. Software projects

New system facilities

Altaber reported the following recent extensions to the SINTRON system:

- floppy disk filing scheme
- file transfer limit increased to 8 MB
- spooling system for SERV1 (offshoot of recently installed NODILER).

Bootstrap post mortem

The facility for automatic boostraping of computers when something was wrong was of course good for SPS operation but bad for the ACC Group as no computer diagnostics could be made under such conditions.

It has been proposed to make a dump of the faulty memory image before bootstraping. A post mortem diagnostic could then be made at a later time.

With the new 10M computers on-line diagnostics will be possible via the long distance MPX link to the ACCES computer.

Beck hoped that messages such as "CALL COMPUTER EXPERT BEFORE RESTARTING" would soon be a thing of the past.

NODILER

Altaber stated that practical experience with the NODILER had now been obtained on the SERV1 computer. Shering stated that the gain in speed was appreciated but use of the NODILER might generate more requirements for file space. He also mentioned that machine object code was now being passed over the data links whereas originally messages were transmitted in ASCII and this gave a certain safety factor when interpreted by NODAL at the remote host computer.

Altaber replied that link reliability was generally good. Jeanneret would be asked to study the statistics of link REPEAT messages.

9. NODAL compiler for ACC

Rausch had proposed that NODAL should be available on the ACC controller. Altaber had studied the problem and had defined a subset of NODAL which could be compiled for typical microprocessor applications. This subset may be briefly outlined as:

(a) No Input/Output communication is allowed except via the CIMBUS,
(b) No TYPE or ASK commands are available,
(c) All equipment is to be accessible from the Nord 10 as well as by the local microprocessor,
(d) The debug and test phases are to be executed using a NODAL terminal on a host computer.
When the program has been developed it is then compiled and allowed to run autonomously on the local microprocessor.

Altaber stressed that some form of protection or management of CIMBUS calls was envisaged. A NODAL compiler to meet these requirements could be available in three months. This would consist of:

i) A NODAL compiler to intermediate level code,
ii) A package for each target processor.

The TEXAS 9900 had already been decided on, but packages for the MOTOROLA MC6800, the National PACE and the Ferranti 100 were possibilities for the future. There was even an idea in the air to make a package of this kind for the Nord, opening the door to all kinds of possibilities, such as the direct compilation of data modules.

At this point d'Amico expressed worry about the possibility of achieving the current level of real-time response if data modules were compiled in this way. Altaber replied that he was planning to make a convincing demonstration of such techniques in the near future.

Rausch stressed the homogeneity of this entire approach, with CIMBUS processors, the CAMAC ACC controller, and the NORD computer all using the same development facilities on the MACS terminal or in the designer's own lab.

10. Analog switching

Shering made a detailed report of the status of the existing analog switching system and explained why he had been asked to look into the possibility of making improvements.

One of the major disadvantages was that a console was needed every time a new signal was selected. Much of the trouble was due to the way in which the software had originally been arranged, and effective improvements had been made in this direction, however a hardware approach was also considered necessary.

Consequently improvements were now being implemented which consisted of adding console independent control panels for selecting analog signals. It had been proposed to interface these panels as logical devices via CAMAC Teletype Interfaces on the DISPLAY computer. The major part of this interface would be based on existing CAMAC modules but required the building of a special intelligent crate controller. Such a system could then be operated independently of remote data bases on the LIBRARY or DISPLAY computers. Beck asked if the problem could have been solved by using components which already exist (ACC for the applications program and DICO for display), but Shering had ruled this out on the grounds that two microprocessors in one crate would result in too low a level of reliability.

After some further discussion of these proposals the meeting rose at 13.15.