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## A Utility to Use Core-Resident Tasks in Overlay Structure

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A utility has been programmed for PF U-400 system. It enables us to use groups of core-resident tasks in so-called "overlay" structure and improves the efficiency of memory usage for core-residence region.

**KEY WORDS:** Utility Programs/ Core-Resident Tasks/ Overlay Structure/  
Efficient Memory Usage/

### 1. INTRODUCTION

Recent on-line computer system has to facilitate demands of sophisticated nuclear physics experiments; handling of multiparameter data with various modes according to aims of experiments. The needs increase the number and the size of tasks to be run as core-residence in response to interruptions from the external instruments. As a result, the region for the core-resident tasks becomes larger and larger.

One method to shorten the area of core-residence is to assign the tasks as disk-residence. However, in this case, it takes a longer time to respond to the interruption. Such a method is not suitable for usual experiments with a high counting rate in data taking.

The other method is to prepare a group of core-resident tasks suited to the experiment and, to store the whole programming system onto a disk cartridge. Each type of experiment has its own disk cartridge. This is a convenient method. However, it cannot be applied to the computer system equipped with no removable disk cartridge as in our PF U-400 system.<sup>1)</sup>

The third method is: sort the tasks and store them on disk files in such a way that a file may correspond to a type of experiment. At the start of the experiment load one of the files onto the memory and set tables so that they may work as core residence.

When only the core-resident tasks which are to be used by the present experiment are loaded onto the memory, it is possible to shorten the size of the core-residence region and to improve the efficiency of memory usage.

For such a purpose a utility has been programmed for the PF U-400 data-taking computer system in SF cyclotron at the Institute for Nuclear Study.

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2. FUNCTION

To handle the above utility, the following items have to be carried out:

1. Prepare executive binary (EB) programs to be used as core residence.
2. Assign them to core residence according to a type of experiments.
3. Carry out IPL (initial program loading), and the tasks are loaded to the memory as core residence according to the assignment in step 2.
4. Store all the core-resident tasks and their tables onto the disk as a file. The file contains all the core-resident tasks and tables necessary to the experiment.
5. Save the file on a magnetic tape. The magnetic tape is used as backup files.
6. At the beginning of an experiment push one of the function keys on the control panel. The key corresponds to a type of experiment. Then the tasks and tables on the selected file are loaded onto the memory so as to work as core-resident tasks. During this operation external interruptions are inhibited.

Steps 1, 2 and 3 are standard functions in a PF U-400 system. The utilities in steps 4, 5 and 6 are programmed by authors.

A program "INCORE" was prepared for the items 4 and 5 in Fig. 1. Figure 2 shows detailed functions of the program. Items a, b, ... f mean the following functions:

- a. Load tasks and tables on a file to the memory from disk or magnetic tape so that they may work as core residence. During this operation, external interruptions are inhibited.
- b. Put tasks on the core-residence region and their tables on the monitor region onto a file of disk or magnetic tape.
- c. List tables of the present core residence onto a line printer.
- d. Copy files on disk to magnetic tape.
- e. Copy files on magnetic tape to disk.
- f. List files of core-resident tasks onto a line printer.

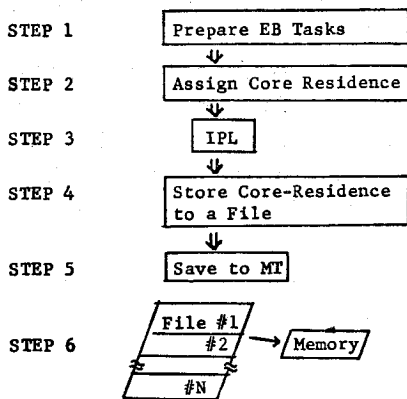


Fig. 1. Diagram of a utility for control of core-resident tasks in overlay mode. See the explanation in the text.

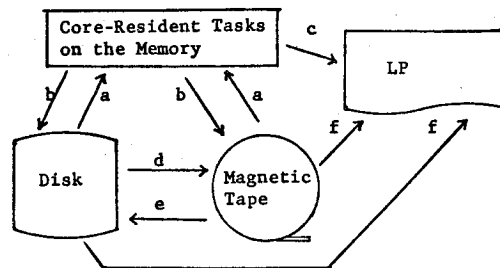


Fig. 2. Diagram of functions of a program "INCORE". See the explanation in the text.

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The program "INCORE" can run as a batch task and is suited to editing files of a group of core-resident tasks. Communication between an operator and the program is carried out through teletype commands.<sup>2)</sup> The commands have a format: COMMAND N1 N2 N3. N1, N2 and N3 are integer sub-commands.

For usual operators who want only to load the core-resident tasks necessary to their experiment, it is convenient to operate with keys on the control panel.<sup>1)</sup> In this case, the process a. in Fig. 2 has to be carried out by a real-time task. A subroutine "LOADPG"<sup>2)</sup> was programmed so that the task which was triggered by the interruption from the control panel can perform the function item 6.

### 3. DISCUSSION

The executive programs on the memory and their task tables such as priority, status and memory address *etc.*, can be treated as data to be saved to a file and to be reloaded from the file onto the memory. Hence the core-resident tasks can be exchanged without performing IPL (initial program loading). In the PF U-400 computer, the IPL is always necessary to exchange them. By applying the above method, however, they can be replaced easily and quickly without IPL operation. This characteristic is a key point for the computer to be applied to the sophisticated data-taking system such as for the nuclear physics experiments.

A category for a word "overlay" has been applied to disk-resident tasks so that they may work in a smaller working memory area. However, if task tables are controlled, it was found that the core-resident tasks can also work in overlay structure and that the usage of the core-residence area can be improved. Besides, the utility makes the exchange of a group of the core-resident tasks easier and provides better circumstances to debug them.

### REFERENCES

- (1) M. Yasue and K. Omata, INS Annual Report 18 (1979).
- (2) Details of these commands and subroutines are to be published in INS-TL.