the Execute List; if insufficient space is available, it may be possible for another smaller job on the Active List to fit into the space available. Certain other requests are allowed to by-pass this main queue; these are the types of requests which ask for single blocks at relatively infrequent intervals, and if the request is not granted some part of the computing system would be halted; i.e. if a request for input-well space is not granted then a peripheral may be halted.

The ordering of the space request queue is important because low priority requests for a large amount of space should not be allowed to block small, relatively high priority requests. Of course, care must be taken that a request is not always by-passed, and if it has been in the queue for more than a certain length of time it is allowed to begin to reserve space. Also, the priority of most requests will be proportional to the length of time that they have been in the queue.

There are two types of information in main store. The first is information which has no copy on magnetic tape, i.e. programs being executed. In order to free this type of space it is necessary to dump the information on the dump tape. This can take a long time and owners in this class have a fairly high rating. However, the second class is information which is duplicated on magnetic tape, i.e. compilers; space belonging to these owners is overwritten and freed almost instantaneously.

It is a complicated task to keep track of the information in the store and on the dump tape, but a directory system has been devised which makes it possible to overwrite peripheral-stream information in units of one block. However, for other information it is necessary to dump or overwrite it in reasonably sized sections; i.e. even if only a few blocks are needed an entire document might be overwritten.

The actual routines which do this work are in two sections. One section is in the fixed store, and this is sufficient to take care of most requests for space. The other section is in the main store, and this contains the longer routines which deal with dumping and retrieving information. These space allocation routines, and in fact the whole supervisor, have been written in such a manner that it is possible to overwrite the major part of the main store routine, leaving virtually the entire store available to the user.

Conclusion

It must be emphasized that the system outlined above is suitable for any type of Atlas installation, and is independent of the configuration of peripherals, core store, and drum store, apart, of course, from changes in essential parameters at different installations. However, the scheduling system has been designed in two parts. Routines called into action most frequently are held in the fixed store, and these will be the same on all installations. They are called into action, and effectively controlled, by routines in the core and drum store and by parameters in the subsidiary working store, which can be changed in the light of experience, and to meet any particular requirements.

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References

1. KILBURN, T., HOWARTH, D. J., PAYNE, R. B., and SUMNER, F. H. (1961). "The Manchester University Atlas Operating System Part I: Internal Organization," *The Computer Journal*, Vol. 4, p. 222.
2. HOWARTH, D. J., PAYNE, R. B., and SUMNER, F. H. (1961). "The Manchester University Atlas Operating System Part II: User's Description," *The Computer Journal*, Vol. 4, p. 226.
3. KILBURN, T., PAYNE, R. B., and HOWARTH, D. J. "The Atlas Supervisor," *Proc. E.J.C.C.*, December 1961.

Editorial Note:

A Summary of the above paper was presented at the **Interdata Exhibition** in Munich, Germany, on 30 August 1962 by P. D. Jones, with parallel French and German translation. The German version of this paper appeared in *Elektronische Rechenanlagen*, Heft 4, 1962 (Oldenbourg Verlag, Munich), and a French version has been submitted to *Chiffres* (AFCALTI, Paris). The original text, as above in English, was received by the honorary editors of this *Journal* on 21 June 1962. Overseas readers may find these references of interest.