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NASA TECH BRIEF



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The Compatible Conversion System

The problem:

The conversion of production programs to process on a third generation computer system with files located on random access mass storage devices requires the solution of a number of problems: (1) Direct access to single records in a large file requires a procedure for generating a record address given some record identifier. (2) Mass storage files are usually updated in place, losing the old copy of a file. Extensive backup copies must be maintained (generally on tape, which is a time consuming process) as a precaution against loss of the file by mechanical or program failure. (3) In the absence of inquiry terminals, most files must be accessed serially from time to time to generate reports. (4) The operating systems being supplied by hardware vendors are typically poorly documented and inadequately checked out. Program conversion to interface directly with such an operation system involves a risk that changes in the operating system will lead to extensive reprogramming after conversion.

The solution:

The compatible conversion system is designed to centralize the solution of general problems arising from the use of direct access mass storage. It is also intended to provide a simple stable interface for the conversion of production programs. The system provides a complete mass storage file management system including data storage and retrieval, serial file access, logical structuring of records, and standard backup and recovery facilities.

How it's done:

The compatible conversion system is designed to store and retrieve data using FASTRAND II direct access mass storage devices as the primary storage medium. The data are stored in separate files

under user control. Data storage is always performed by writing single records containing an integer number of computer words into a user-specified file on the FASTRAND II. Each data record must be assigned an identifier by the user at the time the record is written. The record identifier is stored in a table along with the mass storage address of the corresponding data record. The identifier key determines the particular bin for this file which contains the identifier.

Data records may be retrieved in three different modes using the compatible conversion system. First, the record may read directly by specifying the record identifier, record pointer to the identifier in the system tables ("Record Identifier Pointer"), or the relative drum address of the data record ("Record Pointer to the Data Base"). Second, records within a file may be read in order of the collating value of their identifiers. Finally, records may be retrieved by references to other records through the logical data structuring capability provided by the compatible conversion system.

The Compatible Conversion System also supports a number of utility and file protection features. Among the utility functions are dynamic allocation of scratch mass storage files, retrieval of record information (length, amount of related logical structure), and maintenance of file accounting information (date and time of use, amount of space available). Access to each file is controlled by requiring that the potential user supply an entry key which is set up when the file is catalogued. Attempts to use a file without providing the correct entry key will result in termination of the offending run. Protection against file loss is provided by periodic dumping of the file to magnetic tape. Restoring the file from its backup copy causes the elimination of wasted space and physical

(continued overleaf)

rearrangement of records into the optimal order for sequential processing.

All files maintained by the compatible conversion system are stored in the same general format. At the time a file is catalogued with the system, an area on FASTRAND II is reserved to hold the data records and overhead required for the file. A vacant space in the middle of the file area is used as expansion space for both data records and system table overhead. The total area allocated is determined algorithmically from user supplied estimates of current file size and expected future size. The FASTRAND II mass storage device provides data storage in twenty-eight word blocks, called Sectors. All read and write operations must also end on sector boundaries. Since logical data records may vary widely in length the compatible conversion system includes a facility for packing logical records into sector length blocks. All tables maintained by the compatible conversion system (except those used to maintain link structure) are an integer number of sectors long. Thus accesses made to obtain system overhead items never require use of the sector alignment algorithms.

Notes:

1. This system is written in Assembly Language and FORTRAN V for use on the UNIVAC 1108 computer, under EXEC VIII, with at least one FASTRAND II mass storage device and scratch area on high speed drums.
2. Inquiries concerning this program should be directed to:

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Patent status:

No patent action is contemplated by NASA.

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