Data Management

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Main topics of data management in 1986 were:

* completion of the replacement of the Mass Storage System IBM 3850 (MSS) by magnetic disks IBM 3380 and Memorex 3680 and tape cartridges IBM 3480
* reorganisation of space management by DFHSM (Hierarchical Storage Manager) - backup and migration - to reflect the new device configuration

In 1986 the remaining 600 HSM MSS backup volumes were moved to HSM backup disks. This movement was accomplished by HSM itself by means of a GSI developed facility to generate appropriate HSM control records. Additionally 200 user MSS volumes have been emptied or moved to HSM migration disks.

New space management strategies were necessary due to the MSS replacement. MSS was operating without manual intervention during night time and weekends. For tape devices however manual intervention is required to mount or demount tape volumes. HSM itself has no facility to recognize unattended operating, and unfortunately HSM is designed to move data sets to tape during night time. To prevent tape mounts during unattended operation, an exit in the Message Processing Facility of MVS was coded to give negative response to HSM tape requests.

The movement of migrated data sets from disk volumes (HSM migration level 1) to tape volumes (HSM migration level 2) has been solved by introducing a buffer migration level 2 disk volume. After this buffer volume is filled during HSM automatic tasks, it can be emptied to tape by a HSM command.

HSM's backup concept is based on spill processing, i.e. the newest backup copy is kept on disk volumes, older backup copies are moved to tape volumes. At GSI this would imply the movement of approximately 2000 - 3000 data sets to tape every night. Our concept is to keep backup copies on disk volumes, as long as their originals are on disk volumes. If the original data set migrates to tape the appropriate HSM control records are generated to initiate the movement of the backup copies to tape. So only 200 - 400 backup copies have to be moved every day. Further more if data sets have to be recovered it is assured that backup copies are fast accessible.

Besides the computing systems data set catalogs the HSM control data sets contain important information about the volume on which a data set or a copy of it resides. The system catalogs are backed up by HSM twice a day. The HSM control data sets are backed up by HSM once per day and by non HSM system services once a day. By the aid of the HSM Maintenance and Recovery Utility it is possible to reconstruct the HSM migration control data set even if it is lost and all backups of it are damaged (however the migrated data sets must still exist). This utility is also used to fix bad records in the migration control data set and the backup control data set.

The actual data management configuration is as follows:

No.	Volumes	capacity in GB	space mgmnt.	backup
7	USERxx	6,25	mig	yes
3	VSAMxx	3,75	mig	yes
36	SERVxx	27,50	dba	no
24	system disks	15,75	no	yes
16	mig l1 disks	20,00		
2	mig l2 disks	2,50		
64	mig l2 tapes	12,80		
43	backup disks	53,75		
187	backup tapes	37,40		

mig = migration, dba = delete by age, l1 = level 1, l2 = level 2.

HSM control data sets and utility data sets reside on two disk volumes with 1,25 GB capacity.

Computing systems catalogs contained 99100 NonVSAM and 3400 VSAM data set entries at the end of 1986. 90 per cent NonVSAM and 94 per cent VSAM data sets are migrated. The growth compared to 1985 is 13 per cent. 2000 data sets reside on SERVxx volumes, and 2000 mail clusters are registered.
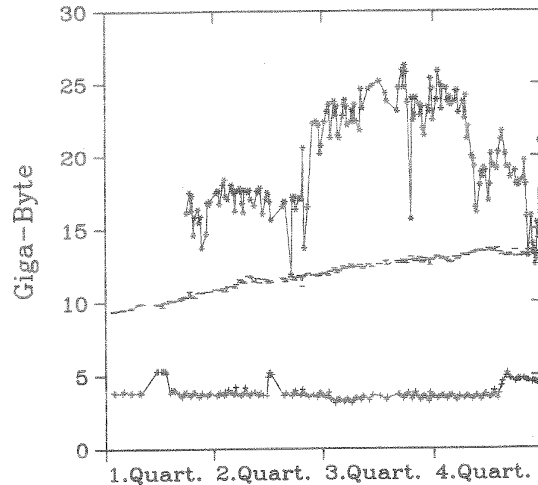
Space used on GSI storage devices 1986

+ GB-Real
- GB-Migrated
* GB-SERV

The figure shows the used space during 1986. Space allocation is kept constant during long periods on USERxx disks (see 'GB-Real'). The amount of migrated data space is constantly growing by about 40 per cent during 1986 (see 'GB-Migrated'). Allocation of temporary data sets varies according to the experimenter's needs (see 'GB-SERV').

The average work load of HSM per day is as follows:

function	data sets	Mega-Byte
Backup	2000 - 2800	1200 - 1800
Recovery	0 - 5	0 - 3
Migration	500 - 1500	250 - 650
Recall	200 - 1000	200 - 700

An ISPF space management panel was installed to make HSM easier to handle by users. The panel gives detailed information of data sets including those on HSM migration volumes. HSM commands can be entered as line commands for selected data sets. A GSI developed command HMIGF can migrate data sets even if JES3 has set a 'prevent migration date' for this data set. A small guide 'Dateienverwaltung - Benutzerleitfaden' is available for GSI computing system users, to give an overview on data management commands.

The PDSMAN software was tested if it is suitable for GSI needs in partitioned data set management. PDSMAN software offers the capability to keep directory information of data sets in main memory, gives statistics about member usage of system and user data sets, and makes it possible to reuse space in partitioned data sets. However a final installation was not recommended due to an unsuitable design.

Guidelines to activities in 1987 may be the following: Removal of all data management authorization checking since RACF covers all these functions. Especially some functions of PCF (Programm Control Facility) in TSO must be replaced by a dynamic allocation exit. Also the operating system preallocation exit has to be reworked.