Where's the Space

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INTRODUCTION

The management of space is crucial to any system. Most of us have had to learn about space management on the run and when we were short of disc space.

It is not difficult to manage free space. You can even delegate if your procedures provide good written instructions. A few minutes daily is all it takes.

I am not planning to unveil great new ideas. What I am writing about is methods that I have used that eliminate the "surprises". The key is to plan ahead and have your policies in writing.

This paper brings together many ideas learned from a wide array of sources. Hopefully it will help everyone eliminate hearing "where's the space?"

GLOBAL SPACE MANAGEMENT

Space management includes three equally important components that must be monitored on a regular schedule. These three components are:

1. The management of free space on all disc drives.
2. The management of image data set capacities.
3. The management of KSAM and MPE file capacities.

Failure to monitor these components on a regular schedule can lead to a variety of system problems. These "surprises" can vary in severity from annoying to devastating. Some examples of the problems caused by the failure to monitor system space regularly are:

1. Slow down of response time.
2. Programs abort due to insufficient sort space.
3. Your month end update program aborts because a crucial data set filled up.
4. MPE shuts the spooling system down.

There are many ways to manage each component. The only incorrect way is failure to monitor each component regularly.

The single most important step is to plan ahead and develop policies and procedures. It is much easier to evaluate all of the ways to manage space when you have both time and space available.

A good space management program contains written policies that are distributed to all users. The policies should be backed by upper management. They should be reviewed and revised as necessary on at least an annual basis. This will bolster user relations by preventing misunderstandings and by enforcing the management of space consistently across the entire user base.

Internal step by step procedures that detail all aspects of space management should include the "how to" to enforce the policies. The procedures will guide your staff on the proper steps of effective space management. These are procedures that cannot be left on a shelf to gather dust. No matter how much free space you have now it will mysteriously disappear in a relatively short time. Then everyone will yell "Where's the Space?" and point fingers at the system manager. Be prepared by planning ahead and following all steps of your space management program regularly.

It would be ideal to have pre-determined levels of free space that can are considered "urgent" and "critical". This would make everyone aware of the levels to watch for in numbers of sectors. It can even go deeper and identify levels by device. This would help point out the need to move files from one device to another.

One of the building blocks to easier space management is to implement and enforce a policy of naming conventions. All accounts, groups, and files should be named according to a master plan. Be sure that you can identify "test" data and "one time" programs and files. INTEREX has simple but effective naming conventions for the CSL file.

An archiving policy needs to be developed. Each group of files needs to have a plan for archiving that includes the type of files, the time frame, and the medium used. An internal step by step procedure also needs to be developed and followed to enforce the policy.

MANAGING DISC FREE SPACE

MPE allows the system manager to limit the amount of space that each user and each account can use. The NEWACCT, NEWUSER, ALTACCT, and ALTUSER commands have a parameter that limits the number of sectors allowed for each user and account. This is the most effective way of planning for future needs as well as managing current space. It is very simple to implement. It works well in a stable environment; however, in a fast paced environment it could cause more problems than it solves. If used, the MPE security must be enforced so that only the proper people have access to the NEWACCT, NEWUSER, ALTACCT, and ALTUSER commands.

There are many tools available for managing disc free space. The contributed library has several, third party software vendors have several and MPE commands and utilities round out the vast array of tools available.

There are simple and painless tasks using contributed library programs that conserve free space (and speed backup). You can SQUISH source code files (or any other files) using the program SQUISHER from the TECH account of the contributed library. This will save about fifty percent of the space. Large MPE or KSAM files can be re-blocked to a more space efficient blocking factor. There are several programs available in the contributed library to calculate blocking factors. These are just two from the contributed library - there are many more.

Third party software vendors have a wide array of utilities. MPEX by Vesoft is one of the most well known. MPEX can re-block files to the most efficient blocking factor and squeeze them to eliminate wasted space past the EOF. There are other third party programs that will compress data and many other space saving manipulations.

MPE offers FREE5, STORE, and REPORT as space management tools. Each of these have their place in effective management of disc free space. FREE5 is the essential tool - a report of all disc free space. REPORT can help pinpoint what group/account has grown rapidly. This is particularly useful if you have historic REPORT listings to use for comparison. STORE is effective in archiving files to tape and when used with the PURGE parameter can delete the files from the system after archiving to tape.

An MPE utility that is essential for effective space management is VINIT. Using the COND command, all disc drives should be CONDensed on a regular basis. CONDensing re-packs free space and eliminates fragmentation. This will enhance system response time and help keep the free space in the best format possible - large chunks of contiguous space.

After system failures a Coolstart and a Recover Lost Disc Space should be done. This recovers space that the system no longer recognizes due to the system failure. If a recover lost disc space is not done regularly after system failures thousands of sectors can be lost. LOSTDISC from the contributed library is a program that analyzes how much "lost" space will be recovered when a recover lost disc space is executed. This is a valuable program because it can help you decide whether it will be worth doing a recover lost disc space.

The one tool that system managers hesitate to use for space management is a reload. Granted this is a last resort; however, you should plan to do reloads regularly. I schedule reloads every six to nine months to eliminate fragmentation that VINIT CONDenses cannot re-pack. A reload packs the data and leaves the free space in large contiguous chunks.

Management of Data Set Capacities

The management of data set capacities will prevent many problems and enhance overall system free space. This component of space management must be monitored daily to eliminate "surprises" ranging from inconvenient to critical.

Failure to maintain data sets at their proper capacities can reduce overall free space if the capacities are too high. If the capacities are set too low then performance suffers and there is an increased risk of filling up a data set. Filling up data sets usually happen at a bad time during the most critical jobs and wreak havoc.

Monitoring on a daily basis will catch those data sets that are filling up fast. These can sneak up on you and be full in a few days.

The single most important tool to monitor data sets is a QUERY FORM SETS listing for each active data base. This listing shows each data set, the current capacity, and the current entry count. There are contributed library programs that enhance this listing; however, the FORM SETS listing is all that is needed to monitor data sets. It is a very simple task and takes only a few minutes. Write a procedure for you operators, and they can do this task daily for you.

There are third party programs available that will create a data base from the data in the FORMS SETS listing. This allows for trends and comparisons. This type of program would be helpful for an environment with many data bases.

There are third party programs that will help manage data set capacities. Many have features that allow background processing for the actual setting of the capacities. These programs make the management a little easier and offer other capabilities as well.

Management of MPE and KSAM File Capacities

The management of MPE and KSAM files is the most time consuming of the three space management components. This is due both directly and indirectly to the volume of MPE and KSAM files on the system.

MPE and KSAM files must be built with the proper blocking factor, the proper number of extents, the correct number of extents initially allocated, and a reasonable number of records. A written policy has to be developed and enforced. Staff who build MPE files and/or KSAM files must follow a plan for building files; otherwise, human nature will take over and files will be built very large and with poor blocking factors.

A review of these factors for both MPE and KSAM files should be done on a regular basis. There are programs in the contributed library that will help you with this task. Vast numbers of sectors can be saved when files have been built without regard to space considerations. Special attention should be made to files with a blocking factor of 1 and to files that have all extents initially allocated. These are two potential space hogs that can be identified easily from a LISTF,2 listing.

KSAM files need to be re-organized on a regular basis to remove the records marked for deletion. KSAM files need to be evaluated for activity to determine how often they need to be re-organized. Not only will the re-organization potentially save disc space it will also enhance performance for the file.

Both KSAM and MPE files need to be evaluated for correct capacities to prevent files from filling up during update processing. Naming conventions will help here to determine which files actually are processed for updates. With a LISTF,2 listing for that fileset a quick review will determine if capacities need to be revised.

Conclusion

Space management is not difficult nor is it time consuming. A few minutes daily is all it takes.

The most elemental part of a space management program and the most difficult is developing policies and procedures. They both provide the framework for the remainder of your program. Without both written policies and written proceedures your space management program will be alot more difficult, if not impossible, to manage.

The policies, proceedures, and daily monitoring will eliminate surprises. The system manager will keep abreast of all the space management components and no one will ask "where's the space?"

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* DATA PROCESSING PROCEDURE MANUAL *
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S A M P L E

Subject: CONDensing DISC DRIVES

Policy: To enhance response time and pack freespace all disc drives will be CONDensed weekly. The CONDenses will be done on weekends. Check the CONDense log to determine which drives need to be CONDensed.

Prodedure:

I. Do a full back-up per usual procedure.

II. After back-up set the limit to 0,0.

III. Print a FREE5 listing.

1. Label printout "BEFORE COND" and list the drives that are being CONDensed.
2. Log off all other terminals except console.

IV. Type "VINIT" and at the ">" prompt type "COND n".

*** NOTE: n = LOGICAL DEVICE NUMBER FOR DISC BEING CONDensed

V. Warning messages will display on console.

A. At the beginning of each CONDense "HH:MM/$Snnn/nn/WARNING*System logging disabled while CONDensing (PVWARN 179)".
B. At the end of the CONDense "HH:MM/$Snnn/nn/WARNING* system logging enabled by CONDense (PVWARN 180)".

VI. After the appropriate drives have been CONDensed successfully:

A. Repeat step IV-E if time permits more drives to be CONDensed.
B. Exit the VINIT UTILITY.
C. Record CONDenses in the CONDENSE LOG.
D. Run a FREE5 listing.
1. Label printout "AFTER COND", and list the drives that were CONDensed.
2. Send FREE5 listings to DATA Processing Supervisor.