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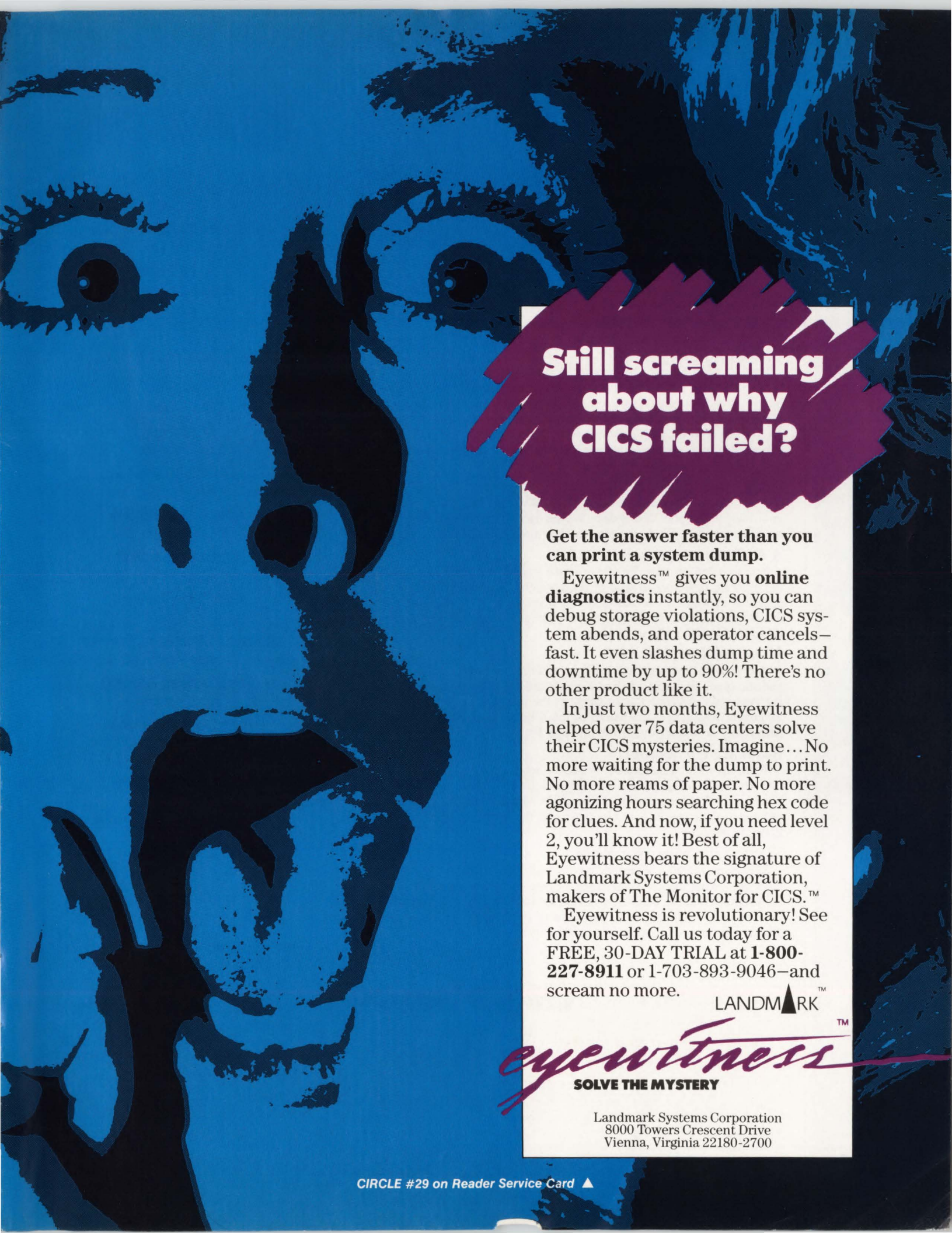
COVER:

Envision IBM's Enterprise Systems Architecture (ESA) in the 1990s that will encompass a new architecture and a new operating system to equip large installations for handling increased processing demands. While expanded storage may not be required, it should be available in ample abundance to take full advantage of hiperspaces, IBM's word for high performance dataspaces. See article on page 20. Photography by The Image Bank.

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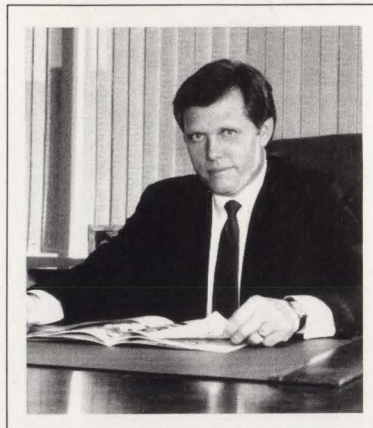
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Robert H. Thomas

One Man's Story

Pete Clark in his article on page 95 finds bargains that more than meet his expectations at GUIDE meetings. He poses the question, "How much money would you save if you were able to resolve even half of your current top six integrity, performance or functional problems?" If you bring those six situations to GUIDE and actively pursue solutions, he says you could come away with solutions to more than half. From his viewpoint, there is a "wealth" of informed, technical and practical experience at GUIDE.

Kill Two Birds With One Stone

If the cost of converting from VSE to MVS has had a domino effect on your budget and your disk space, Wayne Meriwether can bail you out with his five-step plan. Study the plan to save money and space on page 42.

A Different Approach

Brandt Allen on page 79 offers a new strategy to make IS a contributor to corporate resources instead of dead weight. It is called the profit-center approach in which IS is managed as a division or operating unit and plays an integral part in the corporation's strategic plans. Changing directions could "pay off" for your company.

If the Job Fits, Take It!

Are you the investigative, artistic, social, enterprising, conventional or realistic type? According to Ted Keller's article, "Managing Data Processing Personalities," one theory suggests the dominant features of a job environment may reflect the nature of those in the environment. See if your personality is suited to your job on page 10.

Beam Me Up Scottie!

Team up with "Enterprise" Systems Architecture (ESA) as you journey into the realm of expanded storage and hiperspace in the next decade. Experience IBM's vision for the future in Michael Haupt's first in a series of articles exploring ESA and its impact on the IBM mainframe community. Zoom to page 20.

Starting the New Year Right

This issue marks a milestone in the magazine's history — its third anniversary. What makes "year three" cause for celebration is that MAINFRAME JOURNAL will be published monthly instead of bi-monthly. The decision to go monthly is in response to overwhelming reader requests. Thank you for your support and continuing interest!

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The Missing DB2 Dataset

Recently we came across an interesting condition in our shop. A programmer was accessing one of his tables with a SELECT statement via SPUFI and found that DB2 aborted his thread. During his investigation, he found the tablespace had been placed in STOPE mode (stopped due to an error). He issued a -START DATABASE with ACCESS(FORCE), assuming that someone may have executed a DB2 utility against his tablespace that had aborted. This started the tablespace and the programmer then issued the same SELECT statement via SPUFI with the same results.

The programmer realized that he would have to perform a more in-depth investigation. The MVS system log showed that DB2 had issued error messages and a SVC dump. The error messages stated that there was an MVS LOCATE error for a VSAM dataset. The VSAM dataset was the dataset that contained the programmer's tablespace. The programmer searched for the VSAM dataset in the catalog and did not find it.

The programmer was at a loss as to how the VSAM dataset containing his tablespace disappeared. He came to us for help.

Our first task was to see what DB2 really knew about the programmer's objects. We searched through the DB2 catalog (using Platinum's RC/Query) and found everything to be in order. DB2 knew about the programmer's database with the correct tablespace containing one table.

The programmer gave us the following SQL statements:

```
CREATE STOGROUP PTISG1
VOLUMES(PTIPK1) VCAT PTI;

CREATE DATABASE PTIDB1
STOGROUP PTISG1
BUFFERPOOL BPO;

CREATE TABLESPACE PTITS1 IN
PTIDB1 USING STOGROUP
PTISG1;

CREATE TABLE PTITB1
(COL1 INTEGER,...) IN
PTIDB1.PTITS1;
```

Since nothing looked wrong from DB2's standpoint, we widened our search. We checked with our systems programmer and found the following packs had not been restored to a prior backup:

- The pack that was supposed to contain the VSAM dataset
- The pack containing our DB2 catalogs
- The pack containing the system catalog that was supposed to contain the catalog entry for the VSAM dataset.

At this point, we went back to the programmer to report our findings. We came to the conclusion that someone had deleted the dataset with the IDCAMS DELETE command. He could not believe that someone would delete the VSAM dataset, since it was only used for testing.

Now that DB2 was out of sync with no VSAM dataset for his DB2 tablespace, the programmer had to use an IDCAMS DEFINE command to recreate the VSAM dataset. He was then able to drop and recreate his DB2 objects.

The programmer came back the next day with the same problem. We performed the same quick investigation and found nothing new.

This time we grilled the programmer as to what he had done prior to the problem. He said that he had done nothing with his old DB2 objects but he was performing some test-

ing in the newly installed DB2 Version 2 Release 1 subsystem. He had used the same SQL statements to create the same objects and after he was done testing, he dropped them.

With this knowledge, we decided to perform the same type of test. We created some objects in one DB2 subsystem and then in the other DB2 subsystem. We received no SQL errors when the second set of objects was created in the DB2 2.1 subsystem. Since we were using a storage group and letting DB2 create our VSAM datasets, we thought DB2 would detect the old dataset and issue the following SQL error: -601 "The name of the object to be created is identical to the existing name VSAM dataset name of the object type dataset".

If we were using explicitly created VSAM datasets, we could understand why DB2 would use the existing VSAM dataset. In *The DB2 SQL Reference Manual* (DB2 V1.3 SC26-4346, page 109; DB2 V2.1 SC26-4380, page 143), the sentence: "The VSAM catalog used for the storage group must NOT contain an entry for the first dataset of the tablespace" implies that if the dataset exists, then an error would be issued.

At this point in time, we had two different DB2 subsystems with the same objects sharing one VSAM dataset. We dropped the objects from the DB2 2.1 subsystem and found that the corresponding VSAM dataset was deleted! Now we had the other DB2 subsystem containing objects without the corresponding VSAM dataset. When we tried accessing the table with a SELECT statement, DB2 issued the MVS LOCATE error message.

After we created another VSAM dataset and dropped the objects from the first DB2 subsystem, we performed another test. We created the same objects in a DB2 1.3 test subsystem, a DB2 1.3 production subsystem and in the DB2 2.1 test subsystem. All SQL statements ran without any problems and there was only one VSAM dataset being shared by three DB2 subsystems. After dropping the objects from one of the DB2 1.3 subsystems, the VSAM dataset was deleted and the other two DB2 subsystems were out of sync with no supporting VSAM dataset.

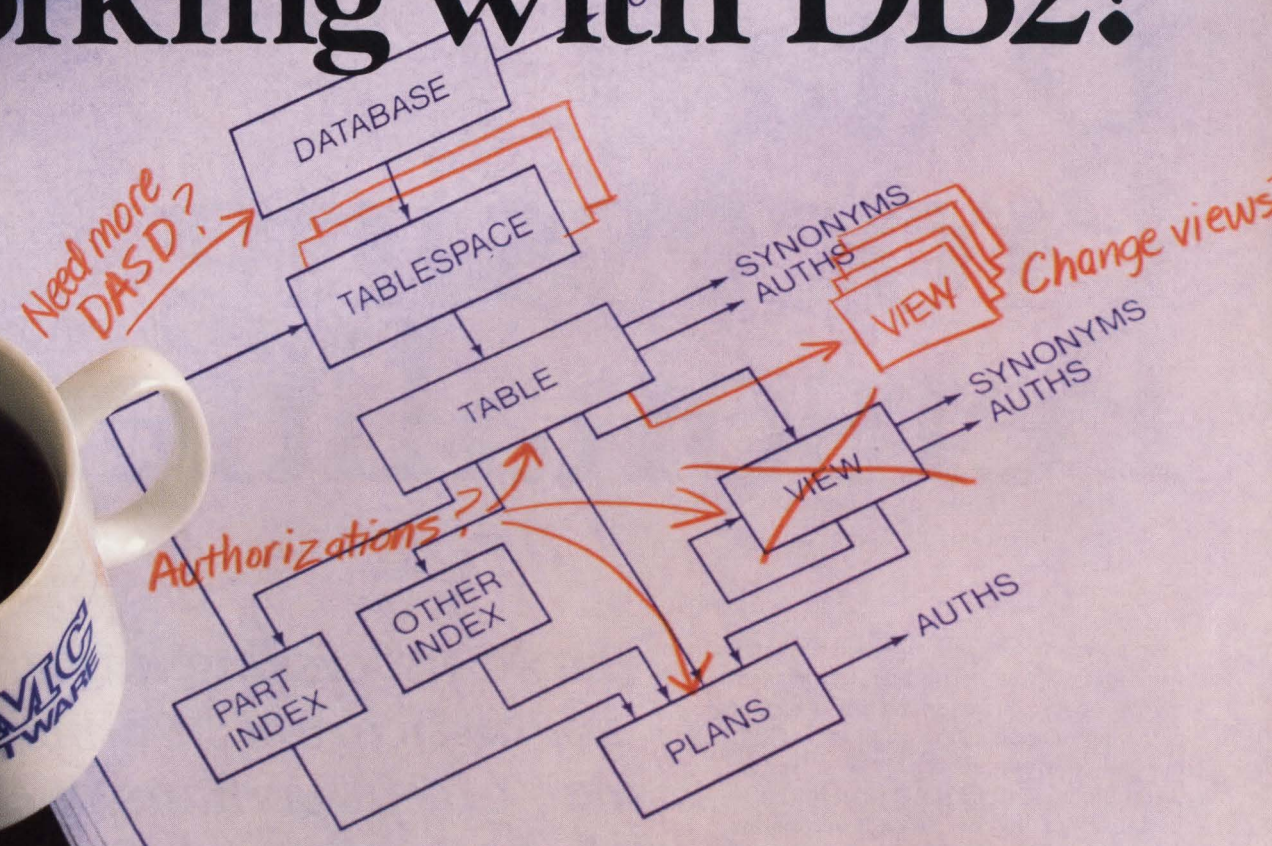
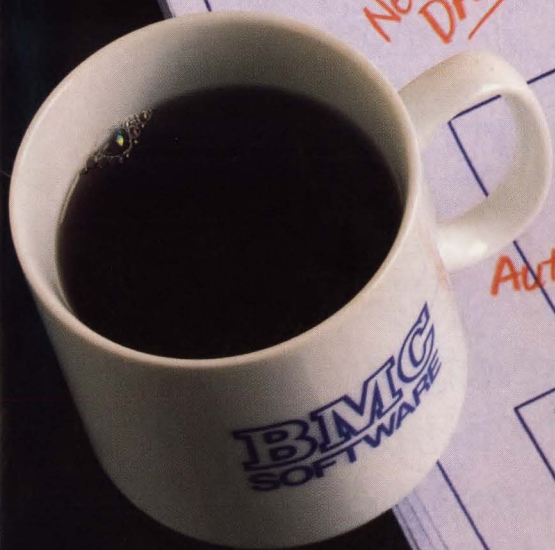
After cleaning up our other DB2 subsystems, we concluded that the current releases of DB2 (1.3 and 2.1) do not recognize that an existing VSAM dataset may have been created and used by a different DB2 subsystem. We now realize that more caution should have been exercised in creating the second set of objects. Each of our storage groups should have specified a different and unique VSAM catalog alias name. This would have prevented our DB2 subsystems from using the same VSAM dataset.

However as a Database Management System (DBMS) that manages its own datasets, one would expect DB2 to realize that it could not create a VSAM dataset since it already exists. One would not expect DB2 to use an existing dataset when DB2 should create a new dataset. With the enhancements to the way DB2 2.1 handles storage groups, more users may use storage groups and let DB2 maintain their VSAM datasets. This will increase the chances of the above problem.

It should be noted that using explicitly defined VSAM datasets only prevents DB2 from deleting the VSAM datasets when the corresponding objects are dropped. Multiple DB2 subsystems could still end up pointing to one VSAM dataset for their objects. ☹

Keith Callis & Steve Donovan
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Managing Data Processing Personalities

Imagine, if you will, a small cluttered work space about 2 a.m. Intensely perched amidst open technical manuals, stacks of computer output and a well-worn CRT, our subject works feverishly to solve one last problem and bring his project to life. Furiously racing his fingers across the keyboard, he then waits impatiently those seemingly endless seconds it takes the processor to respond. Idea after idea, line after line he merges his life and mind into synergistic harmony with his electronic partner. Hours pass in an instant as his ideas become molded into complex interactions. And then finally it happens. It works. It was all worthwhile. Having received another stroke for his ego, he can once again return to mortal behavior. Exhausted but exhilarated he can again partake in those inconvenient habits of eating, sleeping and communicating. Momentarily recharged, life will go on until the next challenge.

Sound like anyone you may know? Those of us who have been around long enough can easily recall many old-timers like this. Those who have worked in data processing for a while can probably recall the times when they were a bit like this. Remember the "good old days?" Things were really different then.

The "good old days," yes, remember them. Times were truly different as were people. It took a different type of person to survive then. Not just anyone would be able to pit the fierce challenge of mind over machine. Not anyone could grasp the

Data processing has grown in sophistication in almost every way except perhaps one: people. While one type of person thrived in the fast moving days of yesterday, this type of person may be starved for satisfaction in today's more structured workplace.

By Ted Keller

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intricate abstractions so necessary to get close enough to the system to really make anything happen. And not just anyone would do that well in data processing.

Although most of the earliest programmers and technical-types were not quite as intense as the person in the example, most displayed some common characteristics that would fit a type or general pattern. Most tended to be cognitively oriented. They were deeply involved with their work both intellectually and emotionally. They were probably somewhat intense, inquisitive and even at times, aloof. Programmers, as a rule, had a flair for the unusual and systems programmers even more so. Quite often job satisfaction consisted of getting something new to work for the first time or of finding a quasi-legitimate use for some arcane instruction or command. The world of data processing was an open arena and these were the gladiators destined to be victorious.

Times have changed, though, and with these changes have come new ways of doing things. More than this, new emphases are found in many job environments. And this has led to a new breed of data processing professionals.

Theory of Personalities and Jobs

One of the more popular career-related theories today is that of John Holland (Holland, 1973). Summarized in his book published in 1973, the theory states that most people have a pattern of strengths and preferences that may be described in terms of one of six basic personality types. Most people, the theory states, will exhibit characteristics and preferences primarily of one type but will usually show traits of one or two other types as well. Holland labels these types as investigative, artistic, social, enterprising, conventional and realistic. We will discuss each of these types shortly.

Most job environments can also be described in terms of their personalities. According to the theory, the physical, mental and stress requirements of various types of jobs tend to attract certain types of people. In general, the dominant features of a job environment commonly reflect the nature of those in the environment. Certain types of people are more likely to choose certain types of job environments.

Investigative

Of Holland's six personality types, perhaps the *investigative* type has been most common in data processing. This type of person prefers activities that involve observational, symbolic, systematic and

creative investigation of physical phenomena in order to understand and control such phenomena. This type of person also usually has an aversion to persuasive, social and repetitive activities but would be oriented toward mathematical, scientific or, in our case, technical pursuits. The investigative type tends to be a problem-solver and perceives himself as scholarly and intellectually self-confident, according to Holland. More than likely, the investigative type will be analytical, critical, methodical, curious, independent, introverted and somewhat difficult to work with. Programmers and systems programmers of the past have commonly shown many of these characteristics.

Artistic

The *artistic* type, according to Holland, prefers ambiguous, free, unsystematized activities and is interested in artistic creation. These individuals tend to dislike explicit, systematic and ordered activities. They are usually strong in creative activities and weak in clerical or routine functions. The artistic personality will usually be expressive, original, nonconforming, independent, impulsive and a bit disorderly. In bygone days, when programming was more of an art than a science, data processing specialists often possessed many of these traits. At one time, programs were seen as works of art and many programmers did not care to be "bound" by structures or standard methods. They often resented them as limitations to their artistic freedom.

Social

The *social* personality type has a propensity to be people-oriented. His concerns lie in developing relationships and working with people. They usually are friendly, cooperative, understanding and helpful but shy away from systematic processes. Those of this personality type value social activities and are usually genuinely concerned with helping others. These characteristics are generally desirable, but are not necessarily related to success in data processing. Those with this primary orientation will probably not find great satisfaction in most data processing jobs. In many people-oriented installations, though, it is not uncommon to find individuals with this as a secondary personality orientation.

Enterprising

Holland's *enterprising* type prefers to use interpersonal skills to achieve organizational or personal goals. This type of person is generally ambitious, aggressive,

persuasive, domineering and adventure-some. Generally disliking systematic or cognitively intense activities, these individuals will usually show strengths as salesmen or politicians. An enterprising type person would probably feel out of place as a programmer or technician but might do well as a marketing representative or other position in which influencing people is important.

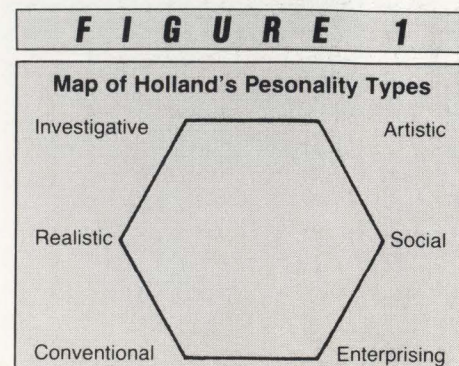
Conventional

The *conventional* personality enjoys doing things that are explicit or systematic. He prefers to follow existing plans or procedures and has an aversion to ambiguous or unsystematized functions. This type of person is generally conscientious, conforming, efficient, orderly and practical. Usually not as imaginative or inquisitive as the artistic or investigative types, this type of person prefers tasks with more structure and detail. A person with these qualities might do well in many of the more structured data processing environments of today.

Realistic

Holland's remaining personality type is *realistic*. This type of person enjoys performing physical tasks. His preference is working with tools, machines and objects. The realistic type tends to have an aversion to educational activities. This type of person may project a "macho" image and typically will not care to work in an office. As a result, those with this primary orientation seldom choose to enter most data processing careers.

Holland's personality types have often been mapped in a hexagon to help show the relationships among them (see Figure 1). Those types that are adjacent are the most closely related; those that are opposite each other share the fewest common traits. As can be seen in Figure 1, the realistic and artistic personality types are most similar to the investigative type (they share the most common characteristics and preferences) while the enterprising type is most dissimilar. Also no-





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tice that the conventional type is somewhat distant from the investigative type.

Job Personalities in Data Processing

During the 1960s and early 1970s, research and exploration were often as much a part of system design and programming as the processes of analysis or coding. Hardware and software documentation was typically skimpy and what was available seldom seemed to explain facilities well enough to be useful. There were numerous surprises and even simple tasks often required disproportionate amounts of specialized experimentation. In many shops, the atmosphere was more one of applied research than of developing business processes. Users were not as sophisticated and technical issues often were more significant than business processes.

In those days, the stars of the system typically displayed strong investigative personality tendencies. They enjoyed intense mental challenges and thrived on overcoming stubborn system problems. These were individuals who could live at the brink of frustration but whose self-confidence and persistence allowed them to find solutions to challenging problems. Heavily cognitive in orientation, they excelled at overcoming the impossible and doing things no one else thought possible. They enjoyed challenges and found deep satisfaction in their accomplishments. The more challenging the task, the greater the sense of accomplishment. In many ways, the work itself was the reward.

In time, though, the nature of the data processing environment has changed. Hardware has become more powerful and software more sophisticated. Users have become more demanding and more powerful infrastructures have been developed. With all this came understanding and structure. Once problems had been solved numerous times, standard techniques began to emerge. Structured programming became a major issue in the early 1970s and has led the way to the numerous structured methodologies of today.

Most large shops now have fairly well-defined design and programming standards. They tend to be more business oriented using established techniques and proven methods. The emphasis is on solving business problems in a cost effective manner. Systems are often large and complex. Programming typically involves applying well-defined procedures to increasingly complex business processes. The work now requires individuals who are

conscientious, efficient and orderly.

While programmers were once looked upon as pioneers or scientists, much has changed. There are still cognitive challenges. However they are related to solving business problems with business solutions. Where the challenges of the past required highly technical specialists with a penchant for creating new technology, the challenges of today require methodical, organized individuals who can sort out business complexities and develop well-structured systems. While those with a predominantly investigative personality were once the mainstay, those with conventional personalities are becoming prevalent.

Job satisfaction plays a large part in all of this. Though there still are many investigative individuals in the work place, there are fewer and fewer situations requiring the cognitive intensity they have to offer. There is less work available providing avenues for creative research. While many still seek the stimulating work of the "good old days," there is not nearly enough of this kind of work to provide satisfaction for all of them. Smaller and smaller percentages of the work can provide the technical stimulation these individuals find so satisfying.

Those with primarily conventional personality orientations have been emerging as the new stars of data processing. Not necessarily desiring to change the world or recast proven methods, these individuals are willing to build upon the work of others. With a willingness to manage details and complexity, conventional individuals are able to put together massive systems. They find considerable satisfaction in developing products and providing services within the scope of existing structures and methodologies.

Systems Programming

While the nature of the work performed by programmers and analysts has been changing, so has that of systems programmers only much more slowly. While it was easier to dispel most of the early myths of artistic necessity in programming, systems programming functions have traditionally been seen as more complex and specialized and more difficult to define. Even though standard procedures have become a way of life for those developing application systems, management has generally allowed systems programmers to operate in a less structured mode to support less well-defined systems functions.

Since systems programming has typically been more technically challenging than application development, this has been the preferred path for the cognitively oriented investigative person. With less structure and more opportunity to explore new technologies, investigative individuals can continue to find satisfaction as systems programmers. Since most systems programming managers were at one time systems programmers themselves, they usually have understood the preferences and motivation of investigative individuals. Systems programming has tended to remain the last bastion for those stars of yesterday. As a result, systems programming groups have commonly been structured to provide a work environment capable of providing satisfaction for investigative individuals.

Within this context, structure and standard methodologies have eluded most systems programming groups. With a primarily investigative, artistic orientation, systems programmers find little joy in paperwork and little satisfaction in performing repetitive tasks or using standardized procedures. From managers down, there has been a tendency to resist structure and allow things to be done as they had been for years.

Routine work-suits conventional type

Times are changing and work is becoming more routine. Over the past few years the number of software packages, new releases and maintenance updates being installed each year has become staggering. Much time now is spent performing similar tasks over and over again. While at one time it took a great deal of experimentation to get most new products to work, with more standardized systems and more reliable software, much of the work now has become more standardized. A large percentage of the work performed by systems programmers has become relatively repetitive.

As a result, many systems programming managers have begun to manage projects and use structured mechanisms in much the same way their application development counterparts have for years. They are beginning to develop standard ways of doing things and requiring that work be organized into projects with realistic estimates. Systems programming functions that have been largely unstructured are now becoming subject to order, standards and structure. While the investigative individual was once the only logical choice in systems programming, the

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more organized conventional person now has a better chance of doing well and finding satisfaction with much of the work available.

Performance Analysts and Capacity Planners

In all but a few of the largest shops, true performance analysis and capacity planning functions have been a relatively recent occurrence. For years, planning for performance and capacity was at best a part-time responsibility. Only in the past six to eight years have most larger data processing installations recognized the need for trained specialists to fill this need. In most cases, the significance of performance management and capacity planning has been tied to the increased importance of on-line applications. As data processing has shifted emphasis from batch processing to interactive services, the need for more sophisticated planning has become apparent.

Traditionally, the first individuals assigned the task of analyzing computer performance and estimating capacity needs were systems programmers. The top systems programmers, especially those who had worked on tuning systems, were considered the ideal candidates for this type of work because of the depth of knowledge they had of software and hardware. It was thought that performance and capacity planning were closely tied to tuning. Typically those selected for these planning functions were cognitively intense investigative individuals who were intimately familiar with the system and who had done a lot of tuning.

When opportunities in systems programming to be cognitively expressive began to diminish, performance-related work became quite attractive to those few investigative individuals lucky enough to have this opportunity. Often lacking any clear direction or specific charter, these individuals found themselves in "hog heaven." They could research and investigate and tune to their heart's content. At times they sincerely believed that they could continue to tune a system forever. Only when all tuning possibilities would be exhausted did they see a need to start planning. Manipulating performance groups, domains and other such parameters — the opportunities for investigative job satisfaction were endless.

However over the past few years, the roles of performance analysts and capacity planners have been changing. While the need for tuning and other such highly

technical explorations still exists, performance and capacity planning have come to be seen as business functions as much as technical ones. Although performance analysts must still understand technical issues, they must now be able to relate technical data to user services and business needs. Even though there are still plenty of opportunities to make use of specialized technical skills, the emphasis has moved from measurement techniques to planning results.

Planning and order prevail

As has happened in most other jobs in data processing, planning and order have come to predominate the specialties of performance analysis and capacity planning. With a growing base of knowledge and literature to guide practitioners, functions are becoming more standardized. Tools of the trade are also becoming more powerful. Expert systems are being developed to sort through complex statistical data and provide meaningful information. Some analysis that may have taken days to complete only a few years ago can now be done in a matter of minutes. Much of the need for intense digging and research has given way to the use of more sophisticated tools, planning and organizing.

As times have changed, management has become more aware of the nature of performance management and capacity planning functions and requirements have changed. At one time the role of a performance analyst was that of a super system tuner but it is now more that of a planner and management consultant. Management is expecting performance and capacity plans to mesh with higher level business plans and functions.

Performance management requires individuals who desire to remain close to the inner workings of the processor. For some time to come, there will be a need for those who enjoy researching intricate technical details. However as operating systems become more sophisticated and performance tools more powerful, the need for this type of research will diminish. Even though performance techniques are becoming more standardized, it is not likely this specialty will lose its technical flavor too quickly. But as time goes on, performance analysts will become less and less involved in technical exploration and more involved in planning. Perhaps in as few as three or four years, technology will have advanced to a point that intense research will be needed only occasionally

and performance functions will become relatively clearly defined.

Of course, it is worth mentioning that there is a distinct difference between performance analysis and capacity planning. As has been pointed out in numerous Computer Measurement Group (CMG) presentations over the past several years, capacity planning involves considerable involvement with management. Much of the work done by capacity planners is involved more with business plans than with technical exploration. Those who need to pursue technical exploration to achieve job satisfaction will probably not enjoy performing true capacity planning functions. Instead, those who enjoy organizing, planning and communicating will probably do well in this kind of work.

Putting it all Together

Over the past two decades the nature of our industry has changed. Programming environments were once the domain of Holland's investigative individuals. In 1973, when Holland's work was published, programming jobs were rated as "IRC" that is, primarily Investigative with Realistic and Conventional secondary characteristics. In theory, those with these traits would have a good chance of doing well and finding job satisfaction in programming. This is not to say that others with different personalities could not function as programmers. It would be likely that most people entering and remaining in the field would share many of these common traits and preferences.

I agree completely with Holland's assessment. During the early 1970s, this type of person was common. Programmers at that time tended to be curious and research-oriented but could accept structure and a certain amount of repetitive tasks.

Prior to that time, though, it was not unusual to find investigative individuals with strong artistic tendencies as well. By the early 1970s, this type of person was becoming less common. As structure was becoming a way of life, those with strong artistic tendencies either found other work to do, found considerably less satisfaction in their work or eventually learned to find satisfaction in a changed work environment.

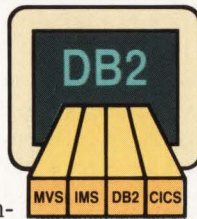
The nature of programming has continued to change, particularly in larger shops. Programming jobs today require individuals whose primary personality strengths and preferences are conventional along with secondary investigative and social

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preferences. In Holland's terminology, this would be a rating of CIS (Conventional, Investigative, Social) — personality characteristics similar to other professions such as certified public accounting. Today there is very much a need for those who are primarily orderly, conforming and attentive to details but who can research and solve problems when they need to.

Personality traits of the typical systems programmer have also changed but more slowly. The investigative, artistic individual continued to be common into the early and even mid-1980s. Systems programmers retained an ego commitment to their work for quite some time after programming had generally overcome this. As available software became more powerful and there became less of a need to tailor or develop software, the need for artistic qualities diminished. The majority of the work could be better performed by investigative individuals with some conventional traits.

While research has traditionally been a large part of systems programming, many functions have become somewhat repetitive or routine. This has been the trend and presently a large percentage of the work done by systems programmers in larger shops is now relatively structured and repetitive. Since some intense research continues to be necessary, it would seem that the ideal staffing for many systems programming groups would include a majority of individuals with conventional personality orientations and a few with primarily investigative tendencies.

Performance analysts

Most performance analysts today have come through the ranks of programming and systems work. A few have entered the field directly as performance analysts with degrees in computer science, modeling or other advanced planning. Those who have come from the data processing path have tended to find enjoyment working on things they have known and understood. Detailed research into the operating system and systems data generally appeals to them. Their personalities tend to be primarily investigative but over time they have usually acquired many conventional personality qualities and preferences. If there is still any remnant left of the old investigative, artistic type, this is where they might be found.

Those performance analysts entering the field directly from college tend to have different preferences and strengths. Understanding the fundamentals of organization and theory, these individuals have

been able to work without the ego commitment so common to many of their predecessors. Planning and professionalism are their strong points. With primarily conventional personality orientations, these individuals can develop dispassionate plans. Prepared to use the tools of tomorrow, this type of individual may become the performance analyst of the future.

Capacity planners tend to be planners and analysts first and technicians second. In a job requiring the ability to communicate with management, these individuals need to be highly organized and efficient. While a technical knowledge base is important, planning and interpreting information is more important than exploring and conducting research. Almost without exception, the ideal capacity planner must show strong conventional personality tendencies with some investigative and enterprising features. As many shops learned early in their capacity planning history, successful capacity planners needed to be more business related and less technology oriented. While still needing to have a good understanding of technical issues, the capacity planner should be the kind of person who does not need to receive strokes from technical processes.

Managing Data Processing Professionals

In the long run, much of the complexity of most managers' jobs depends upon how well they match prospective employees with the type of work they will be performing. If an employee enjoys what he or she is doing, there is a good chance he or she will put out a good effort and do well. If the type of work does not match the individual preferences and personality strengths, the individual may not find satisfaction, do well or last long. What happens in the work place is important to most people and has a lot to do with their sense of identity, image and self-worth.

As data processing managers hire new employees, it would seem worthwhile to review the nature of the work available and anticipate which personality types would do well and be able to find rewards. If the nature of the work demands structure and consistency with little room for original research or creative thinking, chances are that individuals with strong conventional tendencies and some investigative traits would do well. If, on the other hand, much of the work involves deep research or intensive technical ex-

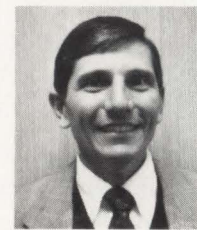
ploration, it would be appropriate to select primarily investigative individuals. And if the shop were small and largely unstructured, you might even be inclined to hire investigative individuals with strong artistic characteristics.

It is amazing how much investigative, artistic individuals can accomplish when they become addicted to their work. Unfortunately, though, these individuals are often at odds with the standards and structure in most larger shops. If there is a mix of work opportunities, there might be wisdom in selecting staff with differing personality types to satisfy different portions of the work.

Realizing that managers do not always have the option to select all those who work for them, it is sometimes necessary to manage work and personalities that do not match. It may require considerable imagination to manage artistic individuals in a conventional environment (or vice versa) and such extreme mismatches will often cause either the workers' or managers' transfer to other areas. In most cases, though, mismatches will not be so extreme and there is a good chance that different portions of the available work can be reasonably matched to the strengths and preferences of various individuals in the group. Work requiring attention to detail may be suited for those with more conventional orientations. Work of a highly technical nature may be more the domain of an investigative individual. And with a little creativity, some work can be presented such that it can be seen as either.

While there are many factors other than personality orientations that can affect a manager's success, having an understanding of the various types and preferences can make the job of managing a data processing group a little easier. ☺

ABOUT THE AUTHOR



Ted Keller is the manager of a group responsible for CICS systems support, performance management and capacity planning at Yellow Freight System, Inc., Overland Park, KA. He has worked in various data processing jobs for more than 21 years. This article received the Best Management Paper Award at the recently held CMG '88 in Dallas, TX.

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ESA Is On The Way

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By Michael Haupt

Last April, IBM introduced its vision for the 1990s: Enterprise Systems Architecture (ESA). This new vision encompasses a new architecture and a new operating system based on the architecture. ESA's purpose: to equip large installations to cope with processing requirements of the next decade. This is the first in a series of articles in which I will explore the realm of ESA and its impact on the IBM mainframe community.

Enterprise Systems Architecture/370 (ESA/370) is an outgrowth of 370 Extended Architecture (370/XA). ESA/370 removes impediments limiting the development of large applications.

The new operating system, MVS/ESA, dramatically expands virtual addressing while improving operational characteristics. Like MVS/XA, MVS/ESA consists of two parts (see Figure 1). MVS/System Product (MVS/SP) Version 3 is the base control program. MVS/Data Facility Product (MVS/DFP) controls the I/O and storage interfaces.

Interwoven with MVS/ESA is a new facility that streamlines data administra-

tion and simplifies dataset usage. Data Facility Storage Management Subsystem (DFSMS) is built on Version 3 of MVS/DFP. The full effects of system managed storage require the addition of the other Data Facility products as shown in Figure 2.

Why a New Architecture?

When IBM introduced its last architectural development, 370/XA, many shops sighed in relief. Help was long overdue as System/370 Architecture had been around for a decade and was stretched to its limits.

During that time, installations added more processing systems and complexity increased, forcing many installations to drastically restructure their workload. To fit virtual storage constraints, CICS and IMS regions were splintered into numerous smaller regions. Virtual storage restrictions also forced systems programmers to detune their systems, moving LPA modules back to disk, limiting the CSA size, reducing buffers and so on. However 370/XA with extended addressing

and channel configuration solved those problems for the most part.

Data Processing's New Environment

Now barely seven years later, ESA/370 arrives. Few installations have ever even nudged XA's outer bounds. Is ESA merely a marketing gimmick to increase revenue or does it satisfy real needs not yet fully realized? To answer this question, I will examine changes taking place within data processing.

Transaction Complexity

As data processing moves out of the back room into the front office, its mission becomes more critical and individual transactions become larger and more complicated. The days are long gone when a transaction simply located a single record in a master file. Most transactions use multiple files or databases. Requirements for current, complete information make on-line updates the norm rather than the exception.

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ities for each transaction. Security checking, journaling and encryption are commonplace. As information systems become more integrated, transaction complexity spirals and its path length increases.

Data Storage

Naturally, as transaction complexity increases, so does the amount of data it accesses. Single item queries are being supplemented by browsing scores of items and on-line reporting often summarizes dozens or even hundreds of items. Relational data structures simplify unplanned queries that often trigger substantial data searches.

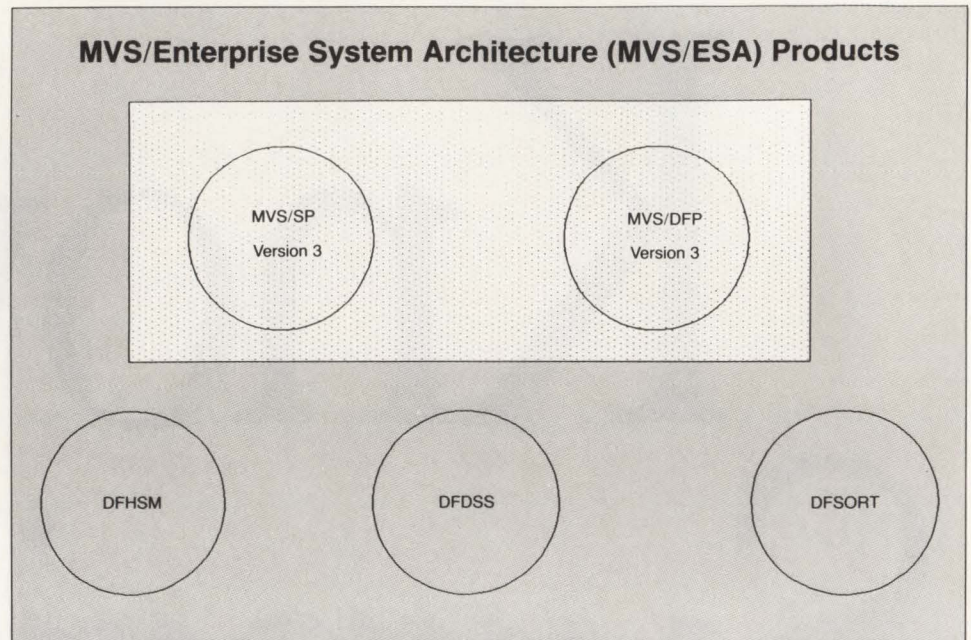
Even more massive data is required for a growing number of applications. The full text of many large documents is stored for electronic publishing and information retrieval applications. Graphics, with their storage demands, are more frequently incorporated into applications.

Looming on the horizon are image processing, digitized voice and expert systems all with insatiable data appetites. Making matters worse, storage technology has been unable to keep pace with processing and semiconductor memory as the difference between processor and storage access speed is expanding.

Program Development

Techniques for developing applications are undergoing substantial changes. In years gone by, a program's efficiency was of major concern both to the programmer and to the DP manager. Small, finely crafted programs were honed to squeeze

FIGURE 1



the most out of an installation's configuration. Recently the backlog in applications is forcing installations to explore alternatives.

A variety of tools are emerging to assist application development. Report writers, query products, code generators and fourth-generation languages all have their role in fulfilling the corporate needs. However they are all costly in program efficiency when compared with traditional techniques.

Ancient programs, designed for another era, continue to run with few mod-

ifications. Even code known to be inefficient or totally unused is usually left unchanged. The potential efficiency gains do not offset either the development time or the risk of breaking something that already works.

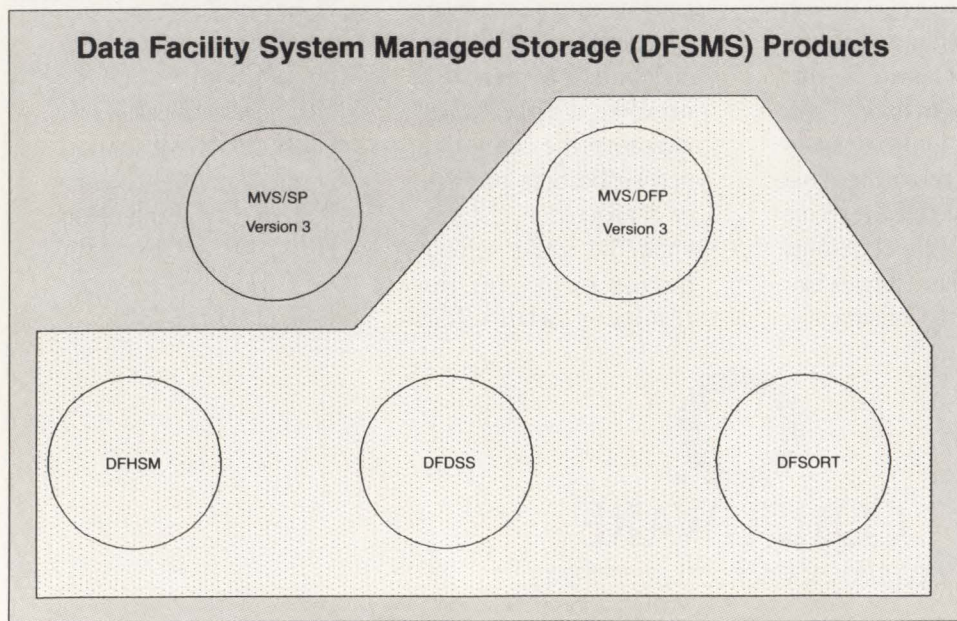
Developer's techniques and tools have also changed. Earlier, programming revolved around paper: drawing flowcharts, correcting listings, pondering dumps and writing run books. A person's time is now seen to be more precious than the computer's. Extensive desk checking and exhausting dump reading are giving way to computer-assisted debugging. A host of tools provide the developer with "pretty" listings, extensive cross-references, test data,abend analysis and interactive execution. Similarly, managers use another set of tools to estimate, track, control and report on development projects.

Computer-Aided Software Engineering (CASE) is gaining momentum. CASE tools span the entire life of the system from conception through maintenance. Many tools incorporate extensive graphics accompanied by narrative descriptions. As the new development environment grows, so does its burden on the system.

Data Communications

The predominance of batch processing has given way to on-line. Interactive and transaction processing applications are no longer accessories added on a batch system. They have become primary, aided by a few batch programs.

FIGURE 2



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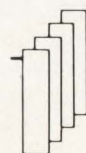
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As on-line systems proliferate, the nature of user dialogs also changes. Short messages, characterized by cryptic commands and abbreviations, are fading. Current on-line dialogs require much larger volumes of data to be communicated. Screen formats contain a great deal of supplementary data such as titles, instructions and eye movement guides. More textual information such as help and tutorial guides is being incorporated into applications.

Contemporary dialogs include menu structures or interactive prompts and these simplify the user's task but require more terminal interactions to produce the desired result.

Not only is the communication volume increasing, the terminal user's patience is decreasing. Typical response times of three to five seconds are not tolerated. More users are demanding the productivity promises of sub-second response times. Data communications requirements continue to escalate with no end in sight.

New Operations Environment

Computer operations management is also undergoing a transformation. Round-the-clock availability is no longer an unfulfilled wish but a corporate demand. Outages, planned or unplanned, impact the corporate mission and cannot be tolerated. Configuration changes, both hardware and software, must be made dynamically without bringing the system down.

As the volume of operations activity is moving beyond human ability, human operators are hard pressed to keep up with the console. Even if they could physically respond fast enough, it is impossible to thoroughly understand the ramifications of every possible situation encountered. The need for timely response removes the option of searching written documentation for the correct response. Automating operations, the inevitable solution, is extremely difficult with today's systems.

ESA to the Rescue

ESA is a key element in IBM's solution to address these issues because it handles vast quantities of data. New hardware facilities enable applications to address 16 trillion bytes (terabytes or TB) of virtual storage.

The new architecture more easily facilitates complex environments, spanning multiple address spaces. To maximize speed, the architecture keeps active data as close to the processor as possible (see sidebar: Relative Processing Speed). Expanded storage assumes a more crucial

task. It now functions as a data storage device as well as being a fast paging mechanism.

Improvements in MVS continue to advance it towards the goal of providing a high-performance, continuously available environment. Major extensions in the data facilities products, known as Data Facility System Managed Storage (DFSMS), automate many storage management tasks. The mainframe components of SAA, as might be expected, build on the ESA architecture. As SAA matures into IBM's distributed processing plan, ESA will handle the pivotal functions for large systems.

Summary

MVS/ESA has a lot to offer. It does, however, have definite costs. To start with, software charges are more expensive than with MVS/XA.

Hardware will also cost more. Most processors will need to be upgraded just to run MVS/ESA. To get the most out of it requires still more optional hardware. Expanded storage, while not absolutely required, should be in ample abundance

to take full advantage of hiperspaces which are high-performance data spaces. Multiple address space environments are sluggish without a multiprocessor.

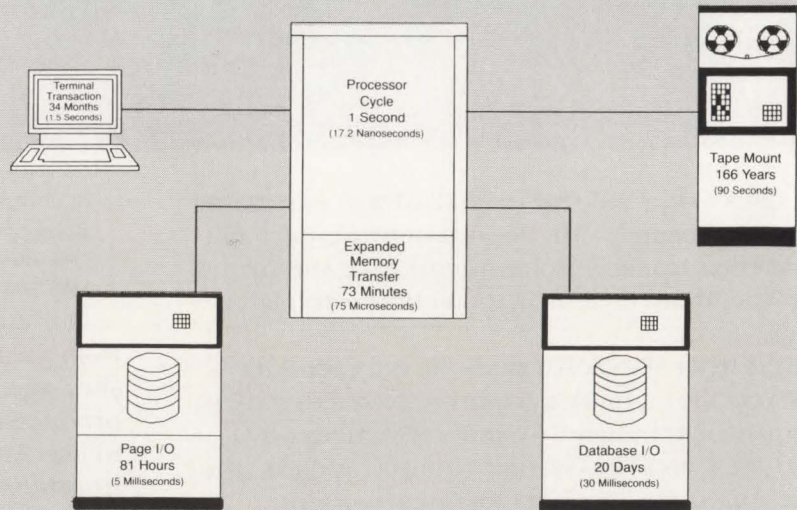
In the short term, installations needing the performance boost of continuous operations will be among the first to implement ESA.

Other installations will delay implementation for a time. However MVS/ESA has many features attractive to a broad range of shops. Forthcoming releases of CICS, IMS and DB2 take advantage of MVS/ESA and that will make it almost irresistible for most large shops. ☉

ABOUT THE AUTHOR

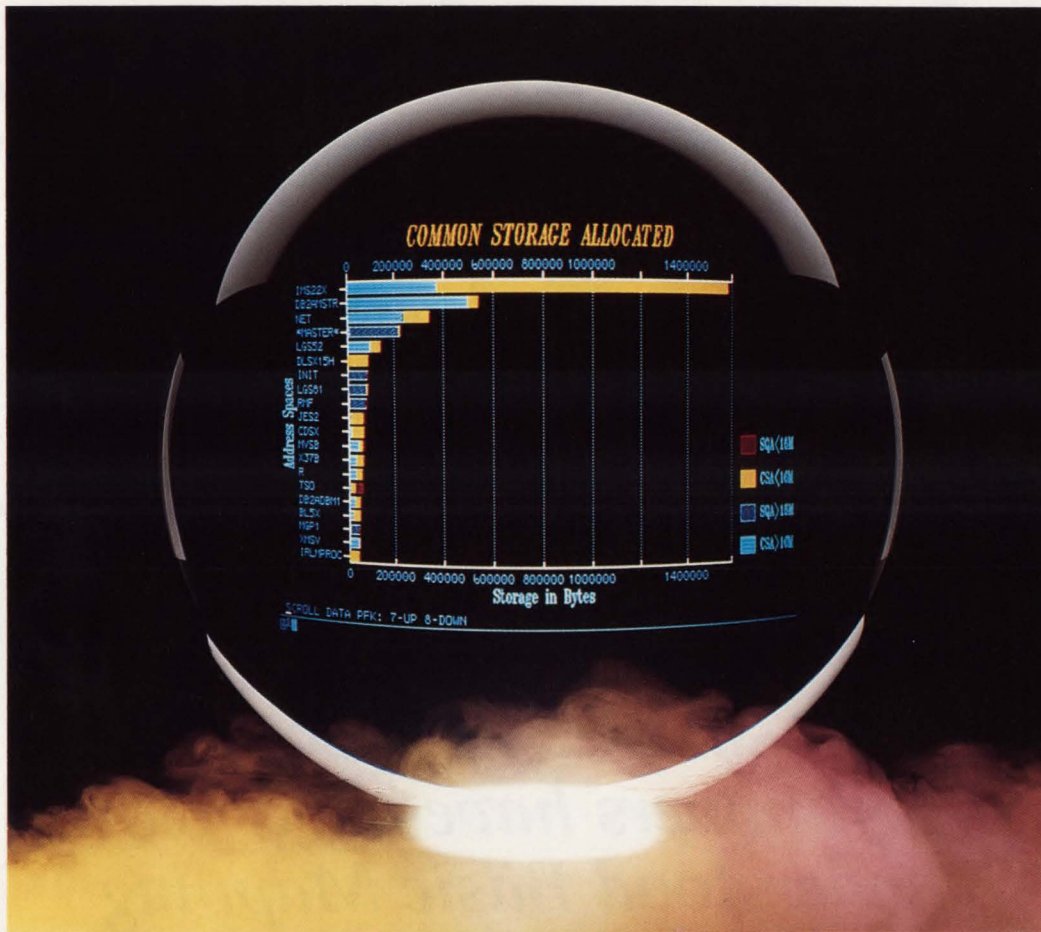
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Relative Processing Speeds



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Streamlining BMS Data Flow

Most CICS application programmers have never really understood Basic Mapping Support (BMS).

By Paul Henken

Terminal I/O is inherently one of the slowest operations in on-line data processing. And the problem is at least a magnitude worse for remote terminals due to the bottleneck created by the communications lines. One transaction with inefficient terminal I/O makes little impact. However a number of inefficient transactions running simultaneously can significantly degrade response time.

One of the major contributors to inefficient terminal I/O is the amount of data moved between the terminal and the program: the more data moved, the more impact on response time. Since the application program initiates the amount of data

moved, CICS performance is not just a systems programmer concern. The design and coding of CICS Command Level COBOL programs can have a major impact on program performance in the 3270 environment.

Most CICS installations use Basic Mapping Support (BMS) to convert application program data to or from a 3270 data stream. BMS simplifies coding since the application programmer does not need to understand 3270 protocol. Unfortunately, BMS does its work with no evaluation of the resultant data stream. Without a minimum data flow strategy, it is easy to unknowingly code or "clone" a

program that maximizes rather than minimizes data flow.

However with a little knowledge and planning, it is possible to use the terminal interface to advantage. This article discusses the operation of BMS, CICS and the 3270 data stream. Sample CICS Command Level COBOL code shows how techniques can be implemented to streamline BMS data flow.

Understanding BMS Data Flow

BMS is a terminal I/O interface between an application program and CICS. BMS converts an incoming 3270 data

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stream into fields in a COBOL record layout called the Symbolic Map. BMS also converts data in the Symbolic Map into an outgoing data stream that the hardware displays on the terminal.

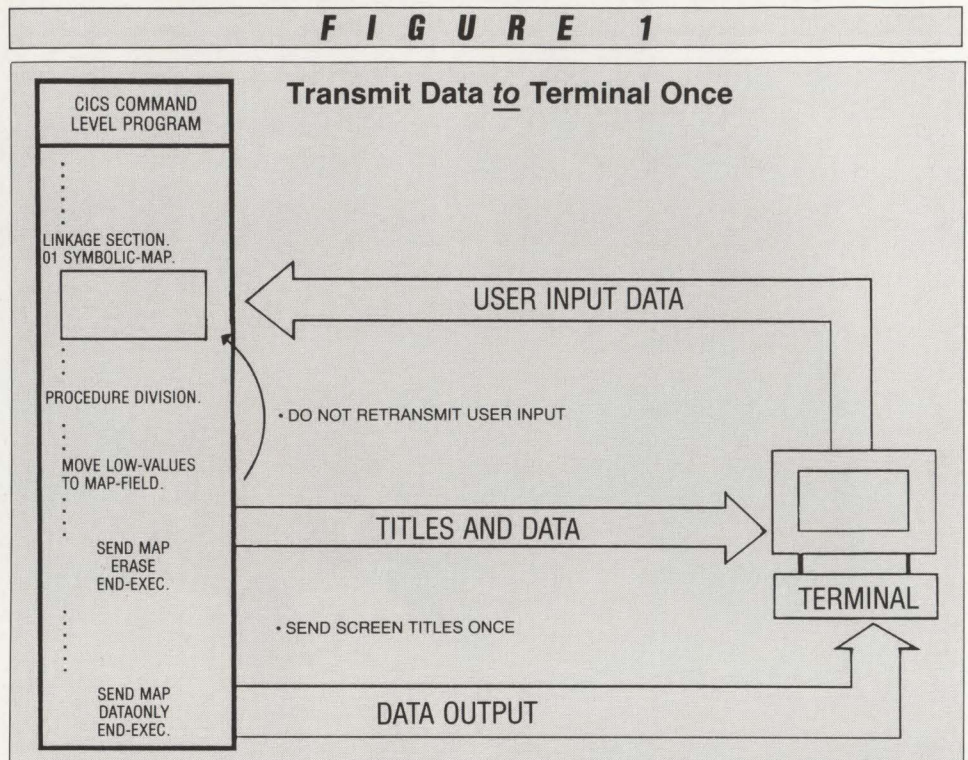
Data displayed on a 3270 terminal remains displayed until changed. The source of the data, whether program or keyboard, does not matter. The display remains on the screen whether or not existing data is actually being sent between the terminal and the program. Response time is reduced when techniques are used to transmit data once, and only once, between the application program and the terminal.

Minimize Data Flow

Two techniques permit a program to minimize data flow to the 3270 terminal: sending screen titles once and not retransmitting user input (see Figure 1). These techniques leave the program in total control of data sent to the screen. Nothing is sent inadvertently. The program sends only data intended to change the display already on the screen.

Send Screen Titles Once

The BMS mechanism to display program data on the terminal uses a Symbolic Map and the SEND MAP command. An optional parameter on the SEND MAP determines whether screen



and field titles are sent by themselves (MAPONLY) or the data is sent alone (DATAONLY). If neither option is used, both titles and data are displayed on the terminal.

Two things need to happen with the first SEND MAP: clear the screen and display new screen titles. Data already on the screen is removed with the ERASE

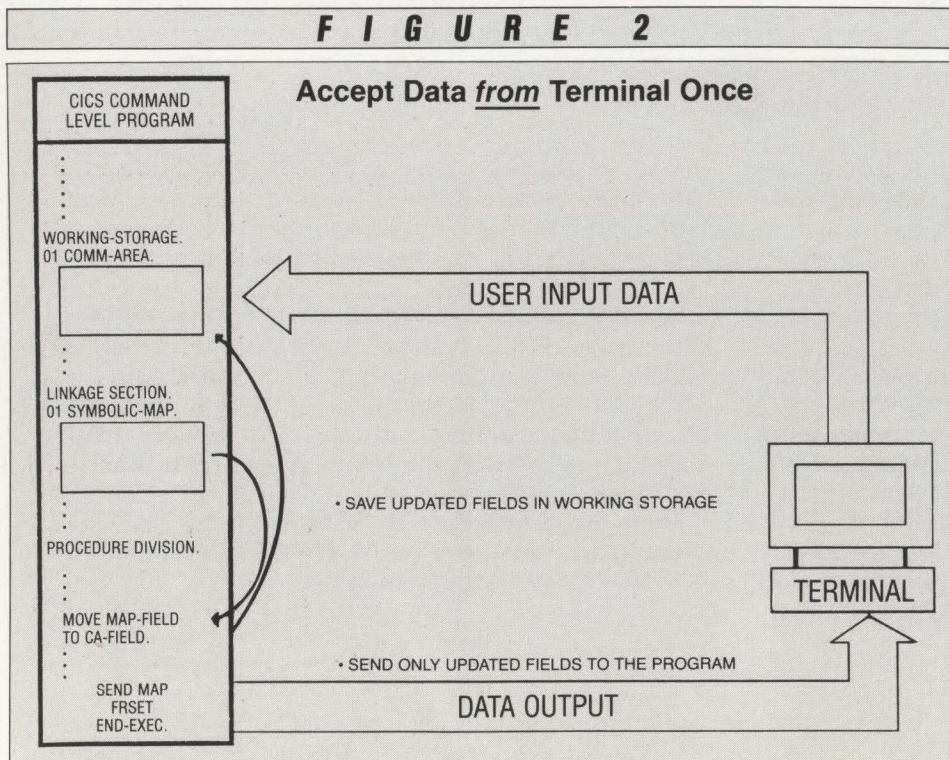
option. Screen and field titles defined as initial data in the Physical Map are transmitted either alone (MAPONLY) or, more commonly, together with data (neither MAPONLY nor DATAONLY specified).

After the titles have been displayed, any subsequent SEND MAPS should omit the ERASE and use the DATAONLY option. Omitting the ERASE parameter retains all prior data on the screen. The DATAONLY option updates the screen with data in the Symbolic Map, that is, error messages or error highlight. Once the user transaction is complete, an additional SEND MAP option ERASEAUP (ERASE All Un-Protected) will clear all user input fields.

Do Not Retransmit User Input

Since data displayed on the screen will remain until changed, there is no good reason to send user input back to the terminal. An I/O field within the Symbolic Map is sent to the 3270 terminal if it contains data (anything other than LOW-VALUES). Thus, user input must be removed from the Symbolic Map after the RECEIVE MAP to avoid sending the input back to the terminal with the next SEND MAP.

A field in the Symbolic Map is removed by moving LOW-VALUES to the field. There are alternate methods to move LOW-VALUES to a field depending on the terminal I/O mode. In Move Mode, in which the map is contained in WORKING-STORAGE, the entire map can be



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```
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COMMAND ==> count all labels; go                               SCROLL ==> CSR
Next Logical Instruction is TRIMAINA.41
-----+-----1-----+-----2-----+-----3
SAME=> INREC      DS 0CL80                                ==> 345
-----
000031          BZ   ENDIT
000032          ZAP  TYPEI,=P'0'
000033          ZAP  TYPEII,=P'0'
000034          ZAP  TYPEIII,=P'0'
000035          ZAP  TYPEIV,=P'0'
=====> AGAIN    GET  INDCB,INREC                          A
000041          MVI  TYPE,C'0'                               ZERO OUT FIELD 'TYPE'
ab 042          CALL TRITSTA,(TYPE)                          CALL SUBORDINATE PROGRAM
000054          CLI  TYPE,C'1'                               IS TYPE = 1?
000055          BE   EQUAL
000056          CLI  TYPE,C'2'                               IS TYPE = 2?
000057          BE   ISOS
000058          CLI  TYPE,C'3'                               IS TYPE = 3?
a 0059          BE   SCALEN
GPREGS R0 ==> 0006F1CA R1 ==> 0006F1CA R2 ==> 800AEBFC R3 ==> 0006C108
R4 ==> 026709D0 R5 ==> 00076070 R6 ==> 00000000 R7 ==> 026709D0
R8 ==> 000B6740 R9 ==> 00000000 R10 ==> 00045460 R11 ==> 0006F118
R12 ==> 0006F030 R13 ==> 0006F118 R14 ==> 4006F07C R15 ==> 00D07000
```

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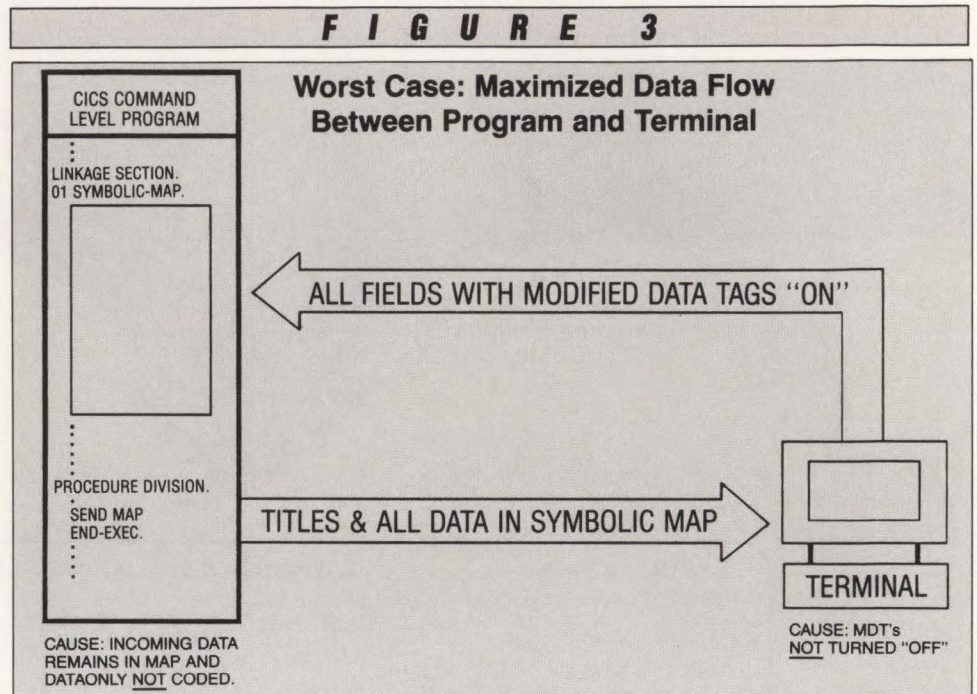
cleared with a single MOVE instruction. Locate Mode, the alternative to Move Mode, is more complicated.

Locate Mode, the preferred approach for minimum response time, is faster and takes less storage because screen fields are not duplicated in WORKING-STORAGE. In Locate Mode the Symbolic Map is contained in the LINKAGE SECTION and points to the actual Terminal Input Output Area (TIOA). Care must be taken not to overlay the TIOAPFX, the 12 bytes of CICS accounting data at the beginning of the map. In Locate Mode moving LOW-VALUES to each field separately avoids retransmitting the field and protects the TIOAPFX.

Whichever method is used, the "trigger" that sends data to the terminal is deactivated. The result is that the only data sent is data that is intentionally placed in the Symbolic Map by the program.

How to Accept Data from the Terminal Once

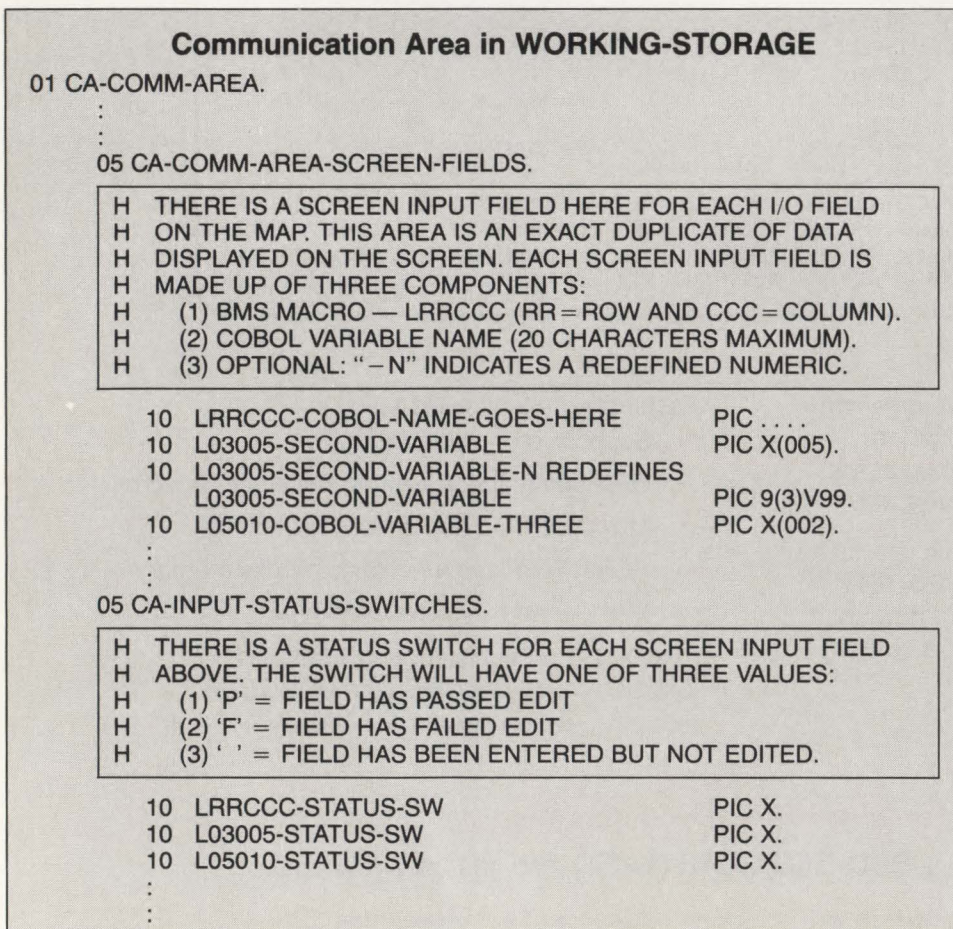
Two techniques permit a program to accept data from the 3270 terminal once:



sending only updated fields to the program and saving updated fields in WORKING-STORAGE (see Figure 2).

These techniques place the user in total control of data sent to the program. Nothing is sent inadvertently. The only data sent to the program are fields that were modified by the user.

FIGURE 4



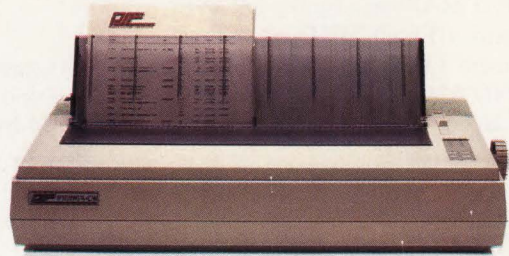
Send Only Updated Fields

In order to minimize data flow from the terminal to the program, it is critical to understand the function of the Modified Data Tag (MDT). The MDT is the 3270 mechanism to indicate that a field has been updated. The MDT is a bit switch in the attribute byte, the byte preceding each field on the 3270 terminal. If the MDT is set ON, the field is included in the data stream sent to the application program when ENTER or a function key is pressed. In this sense the MDT is a "trigger," analogous to inserting data into the Symbolic Map to display the data on the terminal.

A field's MDT can be set ON in a number of ways. FSET in the BMS Map or moving an MDT attribute to the Symbolic Map in the program will turn MDTs ON but are not recommended methods. The other alternative, user input, is important. The Minimum Data Flow Strategy described here depends on handling only those fields actually updated by the user.

Once the MDT is ON, the screen field will be retransmitted from the terminal to the program each time ENTER or a function key is pressed. This cycle must be broken to minimize data flow. MDTs must be turned OFF.

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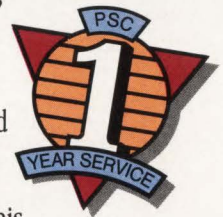
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F I G U R E 5

Cross-reference of Minimum Data Flow Strategy to Implementation in CICS Command Level COBOL

MINIMUM DATA FLOW STRATEGY	COBOL PROCEDURE	
	"Save" (Fig. 6)	"Edit" (Fig. 7)
TRANSMIT DATA TO TERMINAL ONCE:		
Send Screen Titles Once	-->	X
Do Not Retransmit User Input	--> X	
ACCEPT DATA FROM TERMINAL ONCE:		
Send Only Updated Fields to Program	-->	X
Save Updated Fields in Working-Storage	--> X	

The Field ReSET (FRSET) parameter turns OFF all MDTs for the map. FRSET may be coded in the SEND MAP or the DFHMSD macro in the map; although, the SEND MAP is usually preferred because the parameter is then under program control. FRSET is not needed on the first SEND MAP because the ERASE option will turn OFF all MDTs as well as clear the screen. FRSET is coded on subsequent SEND MAPs to ensure that only user modified fields are sent back to the terminal.

Save Updated Fields in WORKING-STORAGE

Frequently, when an on-line program is editing user input, the program will go back to the user for correction when an error is detected. If MDTs are turned OFF, fields that have not yet been edited can become "lost data." The value will continue to appear on the screen (since data once displayed will remain displayed). However the value will be lost to the program since it will not be in the Symbolic Map. This is not acceptable since program logic normally depends on the avail-

ability of previously entered fields to continue edit processing.

A common solution to the problem of "lost data" is to FSET all the fields in the map, then data on the screen will always be sent and available to the program in the Symbolic Map. While this approach reduces coding and simplifies maintenance, it drastically increases the amount of data movement. Figure 3 shows a worst case scenario. Data entered by the user, plus all titles, will be retransmitted

back and forth between terminal and program for the duration of the transaction.

A more efficient way to avoid "lost data" when MDTs are turned OFF is to save *all* updated fields before *any* fields are edited. This approach keeps an exact image of the data displayed on the terminal in WORKING-STORAGE. Updated fields are stored in the Communication Area (CA) so that values will be saved from one pass of the program to the next. Field editing is a completely separate procedure with this approach. When an error is discovered, the program can go back immediately to the terminal with no data lost.

F I G U R E 6

COBOL Code to Save Screen Field (LOCATE Mode).

```

NOTE
:
:
1000-SAVE-SCREEN-FIELDS.
:
(1)  IF L05010L = ZERO
(2)    IF L05010F = LOW-VALUES
        NEXT SENTENCE
        ELSE
(3)      MOVE SPACES TO L05010-COBOL-VARIABLE-THREE
(4)      MOVE LOW-VALUES TO L05010F
(5)      IF L05010-STATUS-SW = 'F'
        NEXT SENTENCE
        ELSE
            MOVE SPACE TO L05010-STATUS-SW
        ELSE
(6)      MOVE L05010I TO L05010-COBOL-VARIABLE-THREE
(5)      MOVE LOW-VALUES TO L05010I
(5)      IF L05010-STATUS-SW = 'F'
        NEXT SENTENCE
        ELSE
            MOVE SPACE TO L05010-STATUS-SW.
:
:

```

- (1) The length sub-variable (where the last character is 'L') equal to zero means that no data was sent from the terminal.
- (2) The flag sub-variable (where the last character is 'F') equal to X'80' means the ERASE EOF key was pressed to clear the field; otherwise, the flag sub-variable is X'00'.
- (3) When ERASE EOF is pressed, spaces or zeros are stored in the CA field depending on the type of variable.
- (4) Low-values clears the X'80' from the attribute byte.
- (5) The variable status flag is set to a blank to cause an edit of the field value (an 'F' status, which also causes an edit, is retained in order to remove the error highlight once edit is passed — see PASSED-EDIT in the Edit Shell, Figure 7).
- (6) Low-values removes the input field from the Symbolic Map. Low-values is alphanumeric and may not be moved to a numeric field. This precludes the use of the PICIN parameter on the DFHMDF BMS Macro.

Coding the Minimum Data Flow Strategy

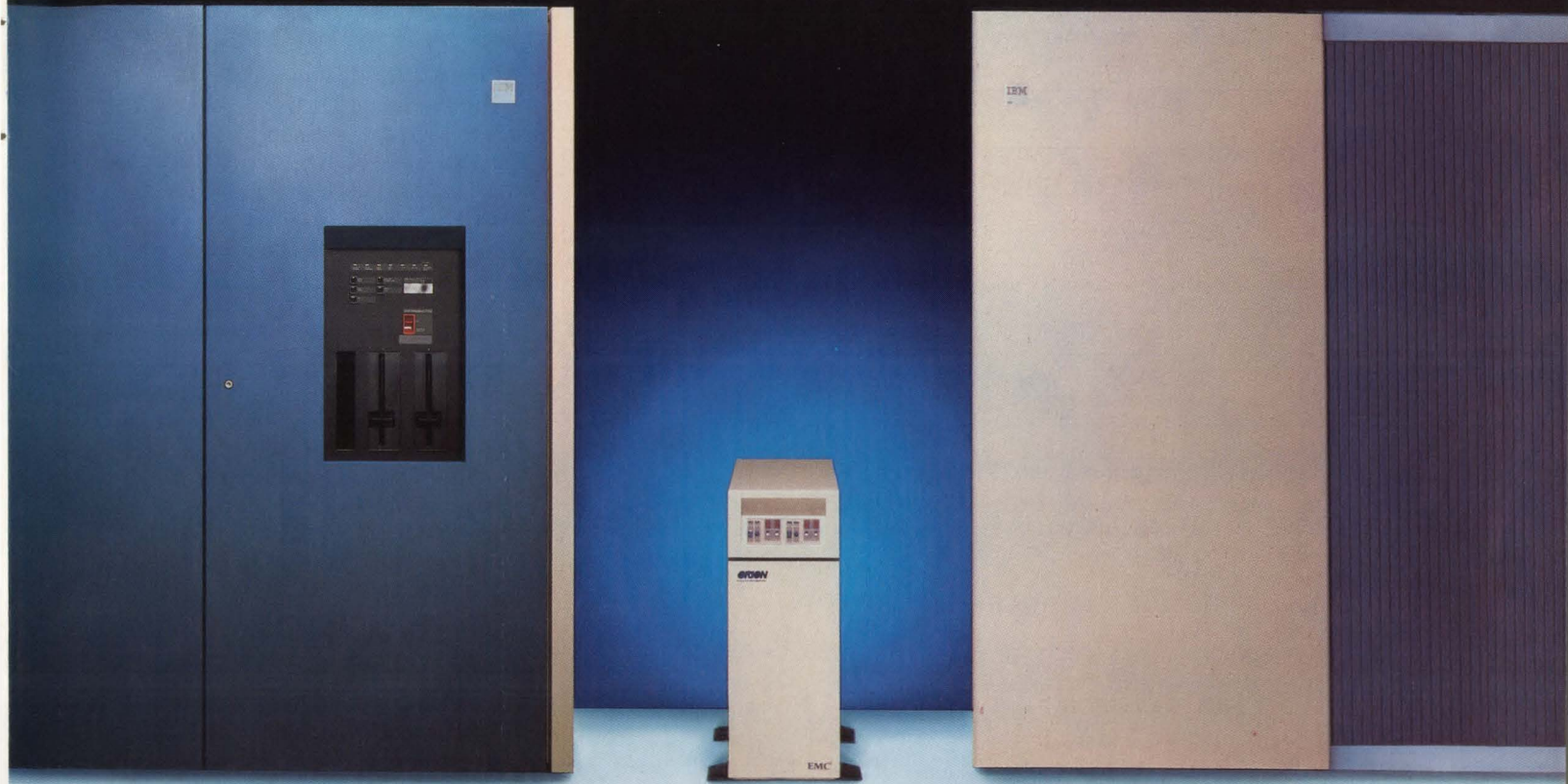
The CICS Command Level COBOL code to minimize data flow is a direct implementation of the techniques discussed above. The basis is WORKING-STORAGE. Each screen field is assigned a corresponding field and status flag in the CA. The Procedure Division has code to first "Save" all updated fields and then "Edit" each field which has not already been validated. Edit processing is controlled by the field's status flag.

WORKING-STORAGE Section

Figure 4 shows part of a WORKING-STORAGE CA. The CA contains a corresponding variable for each input field on the screen. The CA variable is alphanumeric and the same size as the screen field in order to hold whatever the user may enter.

Numeric variables in the CA are redefined so the field will have the correct number of leading zeroes and implied decimal positions. This allows a numeric field to be stored both BEFORE and AFTER edit. The BEFORE edit field may

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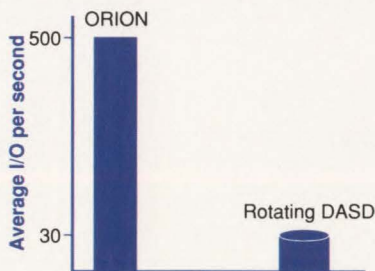
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have alphanumeric characters such as leading blanks or an embedded decimal point. The AFTER edit field is in numeric format with leading zeroes and an implied decimal ready to be written to a file.

Variable edit status flags are in a separate table below the input fields. The purpose of an edit status flag is to avoid re-editing each field each time an AID

key is pressed. Each edit status flag can take one of several values: (1) blank (2) 'P' or (3) 'F'. A blank status flag indicates a field updated by the user but not yet edited. A 'P' indicates a field that has passed edit. An 'F' identifies a field that previously failed validation and must be re-edited.

One of the major benefits of the edit

status flag is the ability to allow the user to re-enter a field that has already passed edit. In this case the 'P' status is replaced by a blank when the re-entered field is saved in WORKING-STORAGE. The flag remains blank until the new value is edited. Once edited, the blank is converted to either a 'P' or an 'F'.

Procedure Division

The Procedure Division contains modules to save data entered by the user and edit updated fields. The COBOL code here incorporates the techniques previously discussed. Figure 5 shows a cross-reference of the minimum data flow strategy to the COBOL procedures.

Notes to the "Save," Figure 6, and the "Edit," Figure 7, describe points of logic. Additional comments have been included here to discuss how modules interrelate and explain workings not obvious from the code itself.

Save Data Entered by the User

Figure 6 shows COBOL code to store an updated field and flag the field for edit. The complete "Save" for each field is one sentence.

Notice that an 'F' in the status flag is *not* overlaid. The status 'F', that indicates a previous edit failed, acts like blank — only a status 'P' will bypass the edit. The 'F' is retained so it can be used after the field has passed edit to change a BRIGHT attribute that highlights the error back to NORMAL.

Edit Updated Fields

The COBOL edit shell to handle CA fields is shown in Figure 7. The edit shell is structured to allow maximum flexibility in editing. Editing may proceed by detecting either correct and/or incorrect conditions.

Edit processing will replace the "EDIT GOES HERE" comment. The edit may be simple such as checking if the field is numeric. The edit may be complex including other fields, various computations, loops and/or file lookups.

Once control is passed to the error routine, options on the SEND MAP ensure a minimum data flow. DATAONLY transmits only data in the Symbolic Map to the terminal. FRSET turns MDTs OFF, so only user-entered data will be sent back to the program from the terminal.

Once an error has been displayed, it is the user's responsibility to correct the field. The edit shell assumes that the user's typical response will be to correct the field in error. However even if the erroneous field is not updated, the status 'F' will

FIGURE 7

Screen Field Edit Shell and Terminal Output

```
NOTE      :
          :
1030-EDIT-L05010.
(1)      IF L05010-STATUS-SW = 'P'
          GO TO 1030-EXIT.

          L05010-COBOL-VARIABLE-THREE
          EDIT GOES HERE

1030-PASSED-EDIT.
(2)      IF L05010-STATUS-SW = 'F'
(3)      MOVE NORMAL-ATTRB TO L05010A.
          MOVE 'P' TO L05010-STATUS-SW.
          GO TO 1030-EXIT.
1030-FAILED-EDIT.
(4)      MOVE 'ERROR MESSAGE GOES HERE' TO MAPMSGO.
(5)      MOVE - 1 TO L05010L.
          MOVE 'F' TO L05010-STATUS-SW.
(6)      MOVE BRITE-ATTRB TO L05010A.
          GO TO 1950-SHOW-EDIT-ERROR.
1030-EXIT.
          :
          :
          :
1900-SHOW-TRANS-ACCEPTED.
          MOVE 'SUCCESS MESSAGE GOES HERE' TO MAPMSGO.
          SEND MAP
              DATAONLY
              ERASEAUP
          END-EXEC.
          GO TO 1990-RETRN-TO-SCREEN.
1950-SHOW-EDIT-ERROR.
          SEND MAP
              DATAONLY
              FRSET
          END-EXEC.
1990-RETRN-TO-SCREEN.
          EXEC CICS RETURN
              TRANSID ('TRAN')
              COMMAREA (CA-COMM-AREA)
              LENGTH (CA-LENGTH)
          END-EXEC.
          :
          :
```

- (1) A 'P' indicates the field previously passed edit.
- (2) An 'F' indicates the field previously failed edit.
- (3) BMS allows a field attribute to be sent to the screen without sending data. NORMAL-ATTRB is set up in WORKING-STORAGE.
- (4) MAPMSGO is the field in the map for messages to the user.
- (5) Positions cursor to this field on the map.
- (6) BRITE-ATTRB is set up in WORKING-STORAGE.

continue to flag the field for edit. In this case the edit will be redone and the same error message will be sent to the terminal.

Benefits of the Minimum Data Flow Strategy

The most important benefit of minimized data flow is better response time for remote terminals. Since line usage is reduced, all applications on the line benefit. In some cases rewriting an existing program may be justified. The effect on local terminals is less dramatic. However locals sometimes become remotes due to moves, transfers or reorganizations.

There is another benefit as well. The minimum data flow strategy can serve as a shop standard to handle terminal I/O and edit errors. The additional cost to incorporate the minimum data flow strategy when the program is originally written is insignificant. The COBOL coding is neither difficult to learn nor complicated to use. Once accomplished, a common architecture reduces the cost of modifying CICS screens to meet changing user requirements.

While the benefits are real, the mini-

mum data flow strategy is not necessarily the only solution or the total solution to improved response time. Numerous options and variations to the techniques presented here are available to the application programmer. Also the CICS systems programmer has additional tools for CICS performance tuning such as data stream compression. Nevertheless, understanding and using the BMS terminal interface is a good place to start when better response time is important. ☺

ABOUT THE AUTHOR



Paul Henken is a programmer analyst with the Technical Services Section of the Computer Services Department for the City of Tucson. He has more than 12 years of experience in data processing including positions of computer programmer, systems analyst and EDP auditor.

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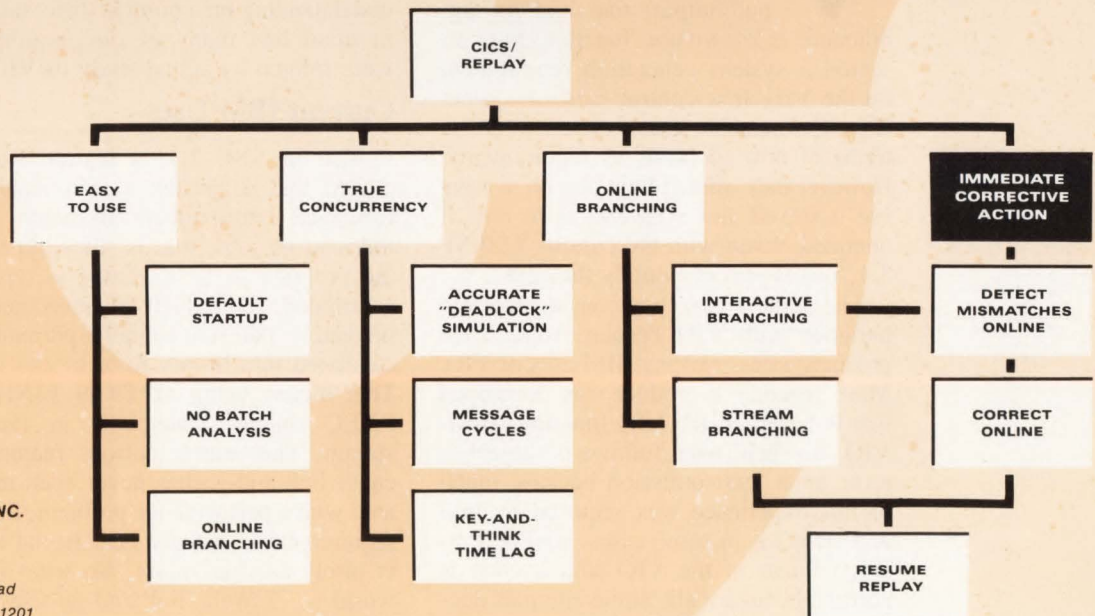
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VSE/SP VIO

Definition: VIO is a significant extension to VSE/SP virtual storage that is accessed via special macros.

By Bennett I. Moyle and Steven W. Huggins

VSE/SP Version 2 Release 1 included a somewhat obscure feature called VIO (Virtual Input/Output) that had no significance to known user functions but presented a system generation requirement on the very first control card of system IPL. The manuals made reference to it in terms of how to fulfill its requirements. However they offered little clue as to what use it served and even less as to how it operated. Even with the current VSE/SP 3.1, this is still essentially the case.

The authors have had considerable experience with VIO because some BIM products access existing IBM uses of VIO. More recently a product was developed that is based on the VIO function, BIM-VIO. As such, what follows is subject to error or at least omission because much of this experience was acquired by trial and error (or in some cases, trial and REPL). Some of the VIO source code is accessible but not all. Some internals documentation is available but it is both

sketchy and intensely complex at the same time. However we think we captured the general idea pretty well. If the reader's understanding on a point is different, bear in mind that many of *our* assumptions were refuted by actual study of VIO.

Current IBM Uses

Also in VSE 2.1, a feature was included that suggested a significant performance improvement in batch mode link-and-go jobs; that is, those in which the program to be executed is typically assembled, link-edited and executed immediately but not actually permanently cataloged in a library prior to execution. This means using OPTION LINK and EXEC (blank) statements in the job stream. This was a curious feature because link-and-go has never been associated with a performance problem, its time requirement is usually near trivial and it is rarely used anymore. So what in the world . . . ? Well, link-and-go uses VIO and in VSE/SP 2.1 it was, in point of

fact, the ONLY use of VIO; presenting the seeming anomaly that considerable effort (VIO is large and intense code) was generated to fix something that was not broken and was not being used anyway.

VSE/SP 3.1 (VSE/AF 2.1.6), however, ended that quizzical situation because meaningful use of VIO was introduced. It seems likely that the link-and-go usage was simply a test case for VIO. It did mean that the new system librarian (LIBR), also introduced with VSE/SP 2.1, was not required to provide a disk space mechanism for temporary link edits. The VIO implementation was limited to single phase (most of them, in practice) link-edits and multiple phase links were barred from link-and-go with 2.1 because the VIO implementation is not optional. Multiple phase link edits must always be cataloged.

This is a good time to point out that the link-and-go support of VIO is really incorrectly described. It is OPTION LINK that uses VIO, not the EXEC (blank). Thus if a program is compiled and link-edited only using OPTION LINK, the VIO requirements and limitations apply. Trial link-edits such as that are probably more

common than true link-and-go runs. They will fail with some obscure message if insufficient VIO is available or if multiple phase.

VSE/SP 3.1 included POWER/VSE 2.3 and CICS 1.7. Both use VIO. The POWER implementation uses VIO effectively. CICS is another "you've-got-to-be-kidding" situation.

CICS stores its messages in VIO but the implementation of VIO currently means that one copy of the messages must be stored for each CICS running; whereas, using the SVA only one copy would be needed. In any case, the message table (DFHMGTT) only uses 60K so it is inconsequential in comparison to CICS partition requirements generally. Presumably CICS developers are also just learning how to spell V-I-O and will hopefully do more with it in the future.

POWER 2.3 redesigned the structure of its Queue (index) and Data (job content) spool files considerably. An essential element of the queue change was storing a copy of the queue records in VIO. BIM could have done without this particular improvement. This is because our BIM-PDQ product does that for prior releases

of POWER. Several other software vendors, ourselves included, lost a few month's sleep in maintenance of other products that directly access the queue, since the class chain pointers in the disk copy of the queue are not kept current and access to the VIO copy is complicated (understatement). However the improvement to VSE/SP from the POWER changes, and specifically the use of VIO to store the queue, is dramatic for most sites. (Less so for shared spooling sites since the class chain pointers do have to be updated in order to be accessible between systems.)

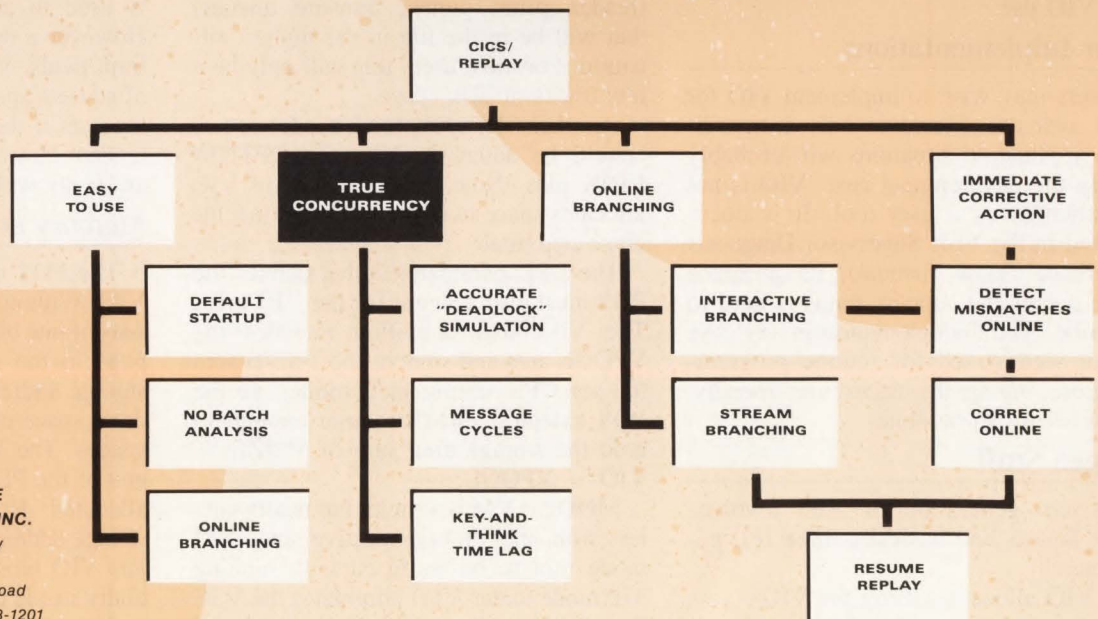
Currently IBM is only using VIO for link-and-go, CICS message table storage and POWER spooling performance enhancement. Only the latter is significant.

Possible Future IBM Uses

What of the future? It is speculation but it is likely that IBM will continue to enhance the use of VIO in future enhancements of subsystems such as CICS or even application products. A complication is that IBM cannot require it unless the product release is to be barred from use

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on VSE Version 1. Also, there are other limitations of VIO that may dictate that use of VIO must be an alternate rather than an only way of doing something.

The system control functions themselves can do more along the lines of what POWER has done with the queue. A likely candidate would be the VSE Label Area that is heavily accessed in many sites. It could be used to address virtual storage constraint problems in large and sometimes not-so-large VSE sites, in effect creating a VSE/XA without true 31-bit support. Sort of.

The SVA program MOVE function could be implemented there for the same reason. Temporary files could be handled by enhancement to VSAM or other access methods. Compiler work files would be an obvious target.

MVS has a function named VIO also, perhaps implemented similarly, and it appears to be used *only* for intra-job temporary files. A VSAM implementation of VIO for temporary files would seem like a high probability. On the other hand, IBM has already announced VSE/SP releases 3.2, 4.1.0 and 4.1.1 to be delivered 12/88, 06/89 and 12/89 (this announcement overlap is most unusual). None of the enhancements in those releases suggests VIO usage, so it would not seem that anything will happen soon.

Non-IBM Vendor Use

Other vendor products, especially those that are performance oriented or for which their own performance is a necessary or competitive element, will likely incorporate VIO use.

User Implementations

Users may wish to implement VIO for their own use. However only extraordinary application situations will probably justify the development cost. VIO is not documented as a user tool. It is documented in the VSE Supervisor Diagnosis Reference (logic manual); its presence there means the support status is hard to describe. The documentation in any case is not well suited for routine programming use, nor are the macros very friendly. However it can be done.

Sysgen Stuff

System generation of VIO involves three factors and basically three IPL parameters:

- VIO allocation using the VIO = parameter on initial IPL control card

- VPOOL allocation using the VPOOL = parameter on the IPL card

- Page Dataset (PDS) allocation using the DPD IPL card.

The implementation is different and the parameters as well, depending on whether the system is running a MODE = 370 (VAE), MODE = E or MODE = VM Supervisor.

MODE = 370 and MODE = E are only different in that allocations are in 32K increments for E mode and 64K for 370 mode. The VIO parameter specifies the size of the VIO area itself. VPOOL specifies the size of the area used to access parts of the VIO area by applications (that is, POWER, CICS) momentarily. The total space required, at least for POWER and CICS, is currently nominal; the default amounts of 32K should be sufficient. The VIO requirement is the sum of all concurrent users of VIO. Currently that means 64K per active CICS plus enough space for the POWER Queue file.

The POWER space should be calculated by multiplying the number of Queue file (IJQFILE) logical records by 256 bytes per record. Divide the result by 1,024 to get the bytes in K, then use that amount adjusted upward to 64K boundary (32K in E mode). Note the reference to logical records, not the 4K queue file blocks. The number of blocks is of course determined by its effect on the VIO requirement, this extent should be limited; so that it is just big enough to hold one record per job (reader, print, punch, transmit queues) that will be in the file in the highest situation. For most users this will only be a few tracks of disk space.

Another 64K (32K for E mode) or two should be added to VIO for OPTION LINK jobs. Note that each user of VIO allocates space in 64K (32K), not just the combined total.

The DPD parameter(s) that defines the PDS must also account for the VIO area. The VIO area definition includes the VPOOL area and so does the VSIZE area (or per CPU setting in E mode); so the PDS extent(s) must be large enough to hold the storage area sum of VSIZE + VIO - VPOOL.

MODE = VM is simpler but nearly useless from the VIO perspective since VM mode (not to be confused with running 370 mode under VM) eliminates the VSE Page Manager and VIO is implemented as an extension of paging. VIO per se is

not supported by VM. The entire allocation required by VIO applications must be included in the VPOOL size. The VIO = and DPD parameters are invalid for MODE = VM. Because the VPOOL comes out of the VSE address range that is limited to 16MB in MODE = VM, the VIO implementation comes at the expense of address space for the rest of the VSE system and thus is impaired. In effect, the VIO area is just like another SVA area.

The degree of impairment of VIO utility in MODE = VM is severe enough to suggest that VIO will have to be substantially extended to accommodate MODE = VM. We assert that more than likely MODE = VM's days are numbered.

The size limit of VIO is 40MB in 370 and E modes but is limited in theory to something less than 16MB in MODE = VM. As a practical matter only, 2MB or much less is only available in such systems. Note that the 40MB limit for 370 mode is *not* the same 40MB limit of VAE operation. The fact the numbers are the same is essentially coincidence and misleading. The 40MB has no particular significance. (Probably some IBM developer turned 40 during the decision process. If so, I guess it is fortunate he or she was not younger.) With the now famous Pete Clark of Olan Mills modification (Editor's note: see January/February 1988 issue of MAINFRAME JOURNAL) to provide more than three address spaces and 128MB of address range, the VIO also extends to 128MB because the same field is used to control the allocation limit. However a recent PTF separates the two limit fields. VSE 3.2 will support 128MB of address spaces but it is uncertain at this moment if the VIO limit will also be extended. However, if not, Clark (and BIM) are ready with the modification.

Memory and PDS Layout

The PDS layout is changed by use of VIO. Without VIO, the PDS simply consists of one block for every virtual storage page in the system. Each has a virtual storage address, either in the Shared Address space or one of the private address spaces. The VIO area is added on to the end of the PDS, one block for each page allocated. However there are no virtual storage addresses assigned to these blocks, just VIO block numbers. None of us actually needs to know that.

Since VIO is on the back of the PDS, it is generally pictured as being above the

SVA area in a virtual storage map. VPOOL has been shown as occupying an area that is common to VIO and the SVA but that does not describe the operation well. In operation, VIO pages are "assigned" VPOOL addresses as needed.

They concurrently still have their VIO block numbers. They are not actually relocated or shuffled within the VIO area to be next to the SVA pages. We do not really need to know that, either.

A VIO page thus may be in the VPOOL or not, but it is always in VIO by definition. It may also, like any "normal" virtual storage page, be in real storage regardless of VPOOL status.

VIO provides access to a large pool of virtual storage without requiring virtual storage addresses to be assigned, running into the 16MB 24-bit limitation that we all know and hate. Also, VIO provides for large amounts of data to be left in real memory, if available, rather than always being accessed in memory or always being accessed on disk and the user does not have to manage which way. That is a normal description of virtual storage paging. When coupled with the fact that this access is beyond the normal address space

range, it offers significant performance potential.

Note, however, that the amount of VIO which can be accessed in a single instant is limited by the VPOOL size. The VPOOL is limited by address space characteristics, so VIO is not a complete escape from the 16MB address space problem.

Macro Parameters and Implications

VIO use begins with a VIO OPEN function. This indicates the number of bytes in the area and that is reserved for the requestor. To access parts of the VIO area reserved, the user issues VIO MOVE or POINT functions. What they do is somewhat esoteric. MOVE actually does a POINT internally and then services the request to move data to or from the storage area in the requestor's partition. The "address" used for the VIO area, whether moving to or moving from, is specified as a relative byte offset from the beginning of the VIO area. The POINT function, whether explicitly requested or implicit in a MOVE request, actually causes

the VIO area indicated to be placed in the VPOOL. This is affected by assigning a virtual storage address to it. At that point, the requestor has access to it much like any other virtual storage page in its partition. The user is effectively given access to 64K of its specific VIO area. The next POINT or MOVE request provides access to a different part of the VIO area and loses reference to the area of the prior POINT or MOVE. When a CLOSE is issued, the area is effectively erased.

There may be a tendency to assume that VIO movement is always directly from the PDS to the user area or vice versa. However that is not correct (and, if it were, would not be of much value), the movement is from real storage to real storage, the same as any other data movement within virtual storage addresses. The virtual pages referenced may or may not be in real storage and, if not, will be paged in. In other words, VIO pages compete for real storage just like all other virtual pages.

It should be noted that since VIO resides on the PDS, when the lights go out, so does VIO data. The PDS is effectively erased when VSE is IPLed. Thus it is only

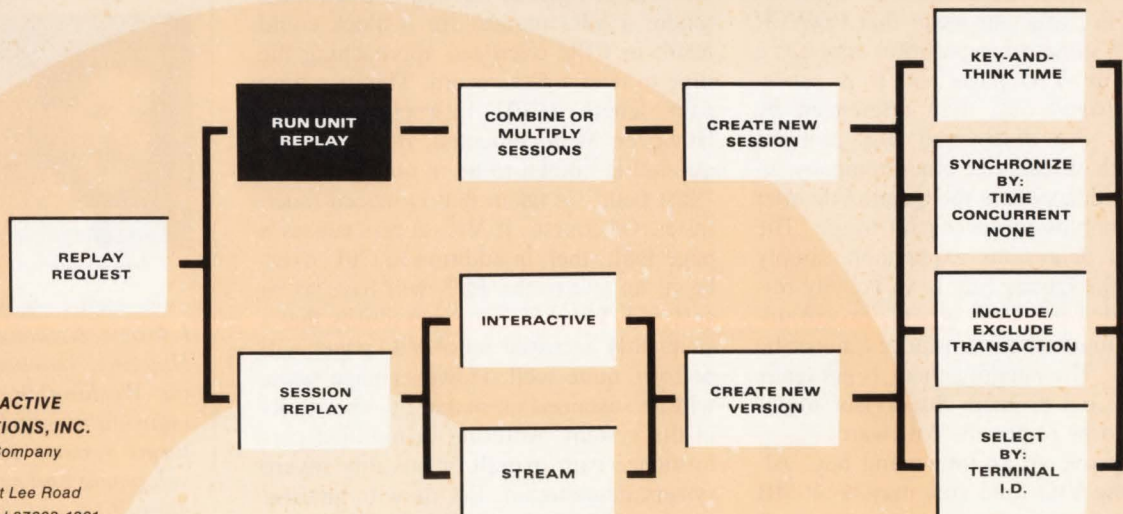
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suitable for files used temporarily and discarded at the end of a job or for copies of permanent files such as the POWER queue implementation or the CICS message table (that resides as library member). In fact, for other reasons, VIO is not retained beyond a job boundary.

Current Limitations and Problems

VIO seems to have some dubious design limitations and some problems at this writing.

First, the design clearly is intended for the creator and the user of a VIO area to be in the same partition. No passing of data between partitions is intended, including creation by one partition and access by another. This inhibits uses such as putting a commonly accessed table in VIO at system startup and having multiple partitions use it. It also means that if a system function is in VIO, no other task of the system or user application can get at the data involved except by some means which is satisfied by the "owning" partition. Thus, in theory, non-IBM vendors who wanted to access the POWER 2.3 Queue File in VIO had to use the POWER-supplied macros to do that.

Unfortunately the access macros impose some functional and performance limitations, so some vendors, including BIM, developed ways to get around the limitation. This is arguably necessary but also arguably not a healthy situation. We also discovered that the VSE Supervisor Page Manager contains an "integrity check" whereby if a VIO page is brought in and the owner is found not to be the same as the requestor, the latter gets abended. In the case of the POWER Queue File, this can mean that POWER abends if some other partition accesses a Queue File VIO page and it is subsequently paged out, then referenced by POWER. We discovered this problem along with at least one other company involved with access to the Queue File after several months of successful usage. The discovery delay was explainable simply because the Queue File is so heavily referenced that its pages would, except under very unusual circumstances, never be paged out. The integrity check is not really necessary but requires Supervisor modification to be removed. Awkward.

We discovered an interesting bug. Although the VIO total area may be 40MB in size and no restriction is imposed on the size of an individual VIO data area, an instruction in the Supervisor was found too by arbitrarily forcing the high-byte of

a VIO RBA (Relative Byte Address) to zero. Thus if an RBA of hexadecimal 0100A800 was used in a VIO request, the value would be changed to 0000A800. This could have caused any manner of strange result but, in fact, it happened to result in a loop because of another error that would otherwise be benign. Clearly VIO was never tested by the developers with an RBA above 16MB. To some extent this is understandable since there is no way that the current IBM uses of CICS messages and POWER Queue File could exceed 16MB. Still, normal testing practice usually includes exercising the boundaries of a function.

At this writing, APAR number DY37768 has been assigned by IBM but no PTF is available yet. It should not be too difficult to fix, since we provided the fix in the initial call to the Support Center (that was quite frankly much fun to do) and it is a single instruction change. (So why has it been two months . . .)

Another limitation is that a VIO area is released at either end of step (EXEC) or end of job, based on a parameter of the VIO OPEN macro. This means that a VIO area cannot be retained even within a partition after a job ends.

Thus access to a VIO area is essentially limited by current design to a single program. Hopefully this will be changed, since it prohibits a number of possible uses of VIO that are potentially valuable or forces modification.

Performance Considerations

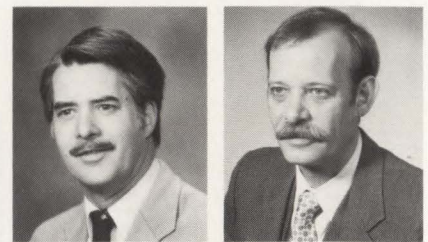
VIO performance is interesting. Our experience has shown that on a small CPU (4331-2, .50 MIPS) running in 370 (VAE) mode, a VIO request for a block could result in CPU overhead approaching the time to read a disk record. That is a long path length (CPU instruction count). However, as documented, if the area requested is known to be in real storage, a "fast path" is taken that is indeed much faster. Of course, if VIO access causes a page fault, then in addition to CPU overhead, an I/O to the PDS will have to be suffered. There is also a possibility that a frequently accessed set of VIO pages will perform quite well. However page faults will be sustained en masse by other tasks in the system, resulting in nullified performance gain overall or possibly severe system degradation. So, as with any use of virtual storage, caution must be exercised to keep it realistic for the real storage available. On the other hand, where the CPU is fast and real memory copious,

use of VIO has been shown to result in elapsed time reductions to a small fraction of doing the same thing without VIO.

Summary

- VIO is a significant enhancement to VSE/SP although it is used effectively within the VSE system to date only by POWER spooling.
- It could be used to address virtual storage constraint further by IBM along the lines of Extended Addressing (XA) without actually providing 31-bit address support.
- VIO could also be used as an I/O enhancement by permitting temporary files to be accessed in VIO through extensions to VSAM or other disk access methods.
- There are a number of system generation parameters that affect VIO implementation, as detailed earlier.
- MODE = VM impairs the utility of VIO considerably, since the entire VIO area must be in the VPOOL that is in the address space.
- VIO can only be accessed by special macros (or via programs or products that use them) that are documented only in the VSE Supervisor Diagnosis Reference, suggesting they are not intended for general use.
- A VIO area is limited to use within an individual job.
- VIO has a fairly long path length, so effectiveness depends on CPU speed and it may also aggravate a heavy paging situation. ☹

ABOUT THE AUTHORS



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Steven W. Huggins

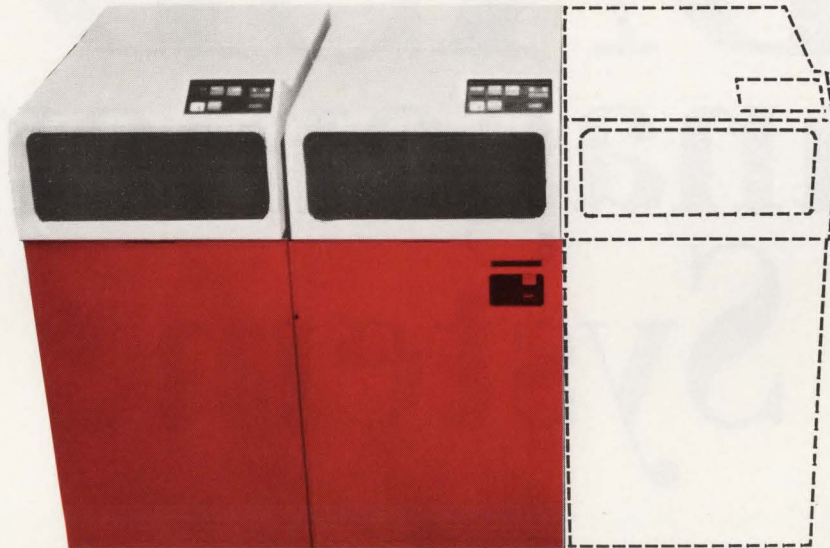
Bennett I. Moyle is principal of B I Moyle Associates, Inc. Steven W. Huggins, independent consultant in the Washington, D.C. area, is the main author of BIM-VIO. BIM performs systems software product development and systems programming consulting with emphasis on VSE. B I Moyle Associates, Inc., 5788 Lincoln Dr., Minneapolis, MN 55436, (612) 933-2885.

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Poor Man's DASD Management System

By Wayne Meriwether

You are reeling from shock at the cost of MVS software. It seemed like a good idea at the time — convert from DOS to MVS. The vendor assured you that it was “an investment in the future” . . . would “position MIS to take advantage of new opportunities . . .” and it all seemed so right.

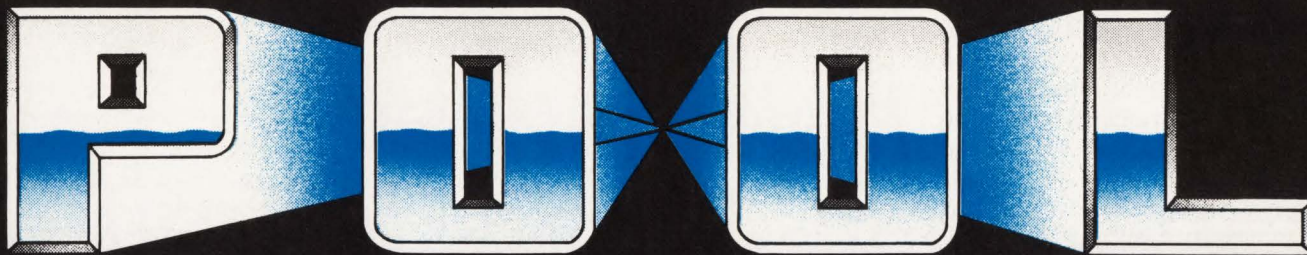
Now, six months later, MVS is consuming disk space like a cancer and there is no money in the budget for one of those fancy, high-priced DASD management systems.

Here is an approach you can take that will get you by until next year's budget. Granted, it has some flaws but if you use this approach and are careful you will not have applications running out of disk space in the middle of the night. You must take the following steps:

1. Set up the correct DASD configuration
2. Publish DASD usage standards
3. Implement MVS exits to enforce standards
4. Implement DASD volume scrubbing jobs
5. Monitor carefully.

A review of some basic MVS terminology is necessary before examining the principles behind this methodology.

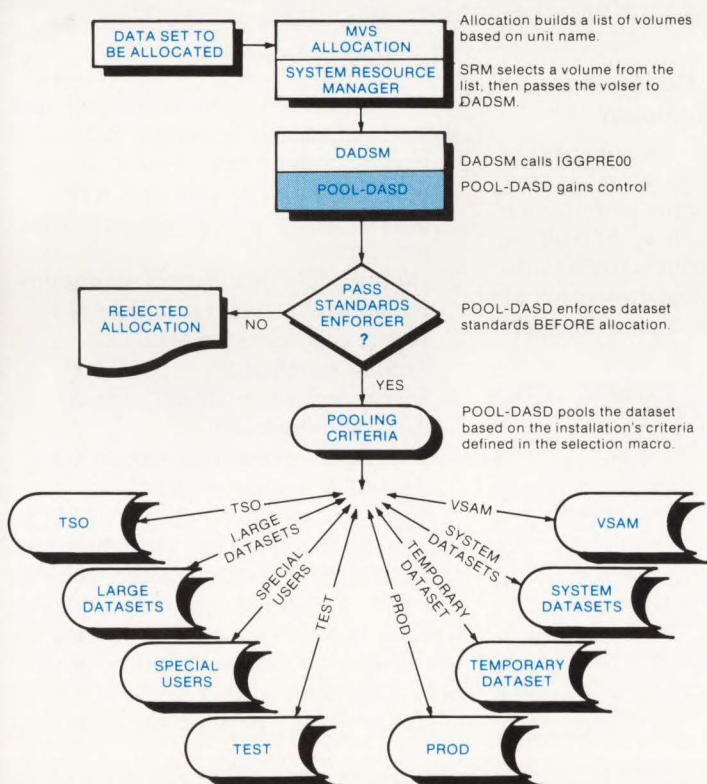
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The Terms

Disk Volume MOUNT Attributes

MVS will mount a disk volume in one of three ways: storage, public or private. Public is the lowest level of control; it allows any disk file to be allocated on it without specifying a volume serial number. It is typically used for work datasets.

Storage will accept allocation requests for only permanent disk files (that is, not a “&&” temporary dataset) with or without a volume serial number specified.

Private will allow allocation of a new dataset only if the volume serial number has been specified via TSO or on the DD statement. Temporary datasets or permanent datasets in which a volume serial number has not been specified will not be allocated on a private volume.

Esoteric or Generic Device Names

MVS supports a technique called an esoteric or generic device name. Instead of coding the actual device type (that is, 3350, 3370, 3380) or the actual device address (that is, X'260', X'3A0' and so on), you can use a more friendly or meaningful name such as UNIT=WORK or UNIT=PROD or UNIT=TEST and so on to describe a volume or range of volumes.

Disk Dataset Naming Convention

It is absolutely imperative that a reasonable, practical naming convention be developed and enforced. The naming

FIGURE 1

Sample MVS Dataset Naming Convention

Code the MVS dataset name as follows:

```
hiqual.aann.ttt.descript   where . . .
    hiqual = hi-level alias, qualifier or TSO userid
    aa = 2-character application I.D.
    nn = 2-digit number for uniqueness
    ttt = 3-character file organization code
    VSK = ICF/VASM key-sequenced dataset
    VSE = ICF/VSAM entry-sequenced dataset
    VSR = ICF/VSAM relative-record dataset
    VSL = ICF/VSAM linear dataset
    PDS = partitioned dataset
    SEQ = sequential dataset
    descript = dataset description
```

convention should identify the following:

- What type of dataset it is
- Who owns the dataset (that is, an application, programmer and so on)
- Whether it is a test or production dataset.

You must take the time up front to develop the standard, work out a method for enforcing it and then educate users on what is legal and what is illegal. Figure 1 has a sample dataset naming convention you may wish to adapt.

DASD Subsystem Performance vs. DASD Space Economy

No matter what you are told, being economical with disk space and getting excellent DASD subsystem performance are mutually exclusive. It is difficult, if not impossible, to configure a DASD subsystem that is economical in its use of disk space and that is also a top performer.

Someone is going to have to decide what is more important: conserving disk space or getting the best possible performance out of the DASD subsystem.

If your objective is to get the very best possible performance out of the DASD subsystem regardless of how much disk space it uses, do not bother reading any further. However, if you want reasonably good performance and you *must* conserve disk space, read on; it gets better.

The Methodology

The methodology for managing disk space is based on five simple rules:

1. Configure the correct mix of storage, public and private volumes, with generic names to segregate test from production
2. Do not allow disk dataset allocations on the wrong class of volume
3. Detect and delete uncataloged datasets immediately
4. Detect and delete illegally-named datasets immediately
5. Use the last-referenced date to select datasets to migrate to tape.

Begin by diagraming all the DASD requirements in your shop. Determine how many storage volumes, public volumes and private volumes you will need. Determine how much space is needed for test datasets and how much for production. Determine which physical device addresses should be used for each class of storage. Develop a DASD configuration similar to the one in Figure 2 and use this as the basis for an MVS I/O generation or EDT generation.

Enforcing the class of volume for allocating disk space or the dataset names standard is not really that difficult. Given that you have subdivided your available DASD into categories or classes (some call them storage pools), it is fairly simple

FIGURE 2

Sample DASD Configuration

160-167	PAGE & DLIB	PROD VSAM	PROD VSAM	PROD VSAM	PROD VSAM	PROD VSAM	PROD VSAM	PROD NVSAM	PROD NVSAM
260-267	PAGE & DLIB	SRES & BKUP	TEST	TSO	TEST	TSO	WORK	WORK	
360-367	PAGE & DLIB	SCAT & BKUP	PROD D/B	PROD D/B	PROD D/B	PROD D/B	PROD NVSAM	PROD NVSAM	
460-467	PAGE & DLIB	BKUP BKUP	PROD LIBR	PROD LIBR	BKUP	BKUP	PROD NVSAM	PROD NVSAM	

09-NOV-88
09:42:47
SCAN #14
#4466213541



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to ensure that any dataset allocation uses the correct unit name for that class of dataset. There are at least four ways to do this:

1. MVS DADSM allocation exit
2. TSO dynamic allocation exit
3. SMF JOB verification exit
4. Dataset naming convention.

The MVS allocation exit, IGGPRE00, is preferable because it does not allow illegal allocation to take place. The IBM technical manual, *MVS/XA SPL: User Exits GC28-1147*, gives fair documenta-

tion on how to code the exit. In addition, there is an older IBM Washington Systems Center bulletin that gives more information — publication number GG22-9270. Information can also be found in *DF/DS: User's Guide & Reference SC26-3952* and in *DF/DS: DADSM Installation Exits GG22-9270*. If you belong to GUIDE or SHARE, there is a sample in the program library.

When a batch job attempts to allocate a disk dataset, the exit gains control. The exit has at its disposal dozens of data ele-

ments (that is, DSNAME, JOB name, program name, JFCB and so on). It can examine the appropriate elements and allow or disallow the allocation.

If you use TSO, you will also need to control disk dataset allocations that occur via the TSO allocate command or SVC99. The IGGPRE00 exit mentioned above will work for batch jobs or TSO. The TSO dynamic allocation service (SVC 99) also supports a user exit, IEFDB401. Again, there are ample data elements available to enforce DASD standards. You will need to consult two IBM manuals for more information: *MVS/XA SPL: User Exits GC28-1147* and *MVS/XA SPL: System Macros & Facilities GC28-1150*.

The SMF job verification exit, IEFUJV, may be adequate for your shop to enforce DASD management standards. However, this exit has the disadvantage in that not all JCL statements are available to the exit. If a cataloged procedure is used, your exit will only see the EXEC statement for the procedure, not the DD statements inside the procedure. There is excellent documentation on how to code and implement the SMF exits in the IBM manual *MVS/XA SPL: System Management Facilities GC28-1153*.

A batch job combined with a manual process using the dataset naming convention is an after-the-fact method for ensuring that disk datasets are allocated on the correct disk volume. Each day a batch job may be run that scrutinizes all the datasets on each volume looking for misnamed or incorrectly placed datasets. The batch job can read a print-image file output from IEHLIST or some other utility that lists the VTOC. The batch job generates control statements to move and/or delete any dataset that does not belong there. The sample job in this article (see Figure 3) can be customized to accomplish this.

The Next Step

With a dataset naming convention in place, good DASD usage standards and the exits in place to enforce them, all is well, right? Not quite because there are still some loopholes and subtle "gotchas" that need to be looked after.

A common problem that exists when there are many new users of TSO and MVS is that of uncataloged datasets. If a dataset is not cataloged at the time it is allocated, odds are pretty good the owner will never find it again. However, the disk space the dataset occupies will not be released by MVS automatically. In addition, illegally named datasets such as those

FIGURE 3

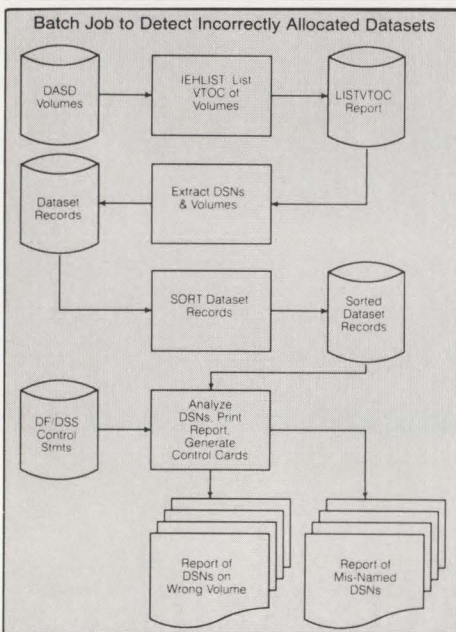
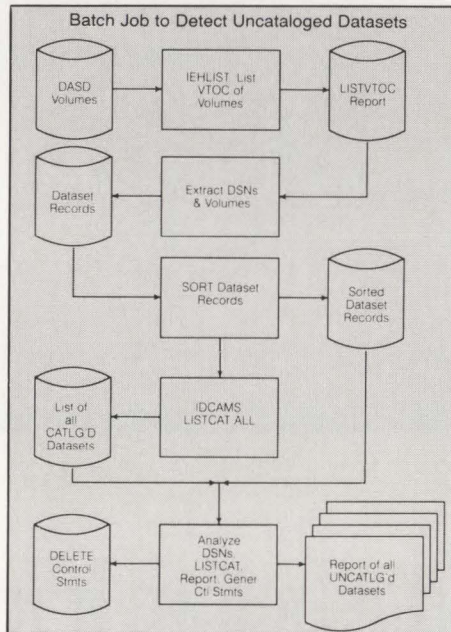


FIGURE 4



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with the wrong hi-level qualifier or no qualifier at all may clutter the disk volumes.

There is a simple way to monitor the situation. Develop a job that is run daily, weekly or monthly that will analyze the output from a VTOC listing program and generate control statements to migrate those datasets to tape and delete them. It is a good idea to publish the list of datasets that are likely to be deleted and wait a short period of time before running the delete steps. Figure 4 contains a sample jobstream to accomplish this.

To find those datasets that are not cataloged, compare the output from the VTOC listing and the output from a catalog listing. COBOL or BAL programs can be developed fairly easily to do the analysis. (Two sample programs coded in BAL that could be used as the basis for this job are available upon written request from MAINFRAME JOURNAL. Follow the instructions at the end of this article.)

Monitoring Obsolete Datasets

One last problem remains that could get you phone calls in the middle of the night: datasets that have valid names and that are cataloged. However, they are old and obsolete, have not been used for some time and probably will never be referenced again. MVS updates the last date a dataset was referenced in the VTOC entry for that dataset. This can be used as the basis for making a decision whether to migrate an obsolete dataset off disk to tape.

Using our simple batch job mentioned above, we can add some logic to the programs and look at the date datasets were last referenced. If a time period can be agreed to and published, such as 20 days or 30 days, then all datasets not referenced within that time period can be flagged as candidates for migration to tape. Again, control statements can be generated and the datasets put on a list that is published. One week later, or whatever time interval you establish, the obsolete datasets can be moved in mass to tape.

Summary

As we mentioned at the outset, this technique does have flaws. Most MVS shops eventually employ an automated DASD management system that will handle all of the problems mentioned above and more in an efficient manner.

However, if your software budget is constrained but you have some "people time" to devote to the problem, these

ideas can be used to develop semi-automated safeguards and controls to ensure there is always enough disk space to support the enterprises' key applications.

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ABOUT THE AUTHOR

Wayne Meriwether is an independent consultant in the Los Angeles and

Orange County areas. He has more than 15 years experience in the technical support and computer operations areas. Meriwether is the founder and president of Computer Enterprises whose clients include MVS shops in county government and the private sector. Computer Enterprises, 16311 Magellan Lane, Huntington Beach, CA 92647, (714) 847-2915.



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Software Queuing Considerations

Accessing DB2 From CICS

By Steven R. Hackenberg

Strong consideration needs to be given to DB2 and CICS priorities because of DB2's CPU exploitation.

Relational databases such as DB2 by the nature of their structure and capabilities have a tendency to exploit CPU resources heavily. Because of CICS' architectural limitations, CPU consumption carries with it serious considerations for prioritization of DB2 functions and CICS. Coupled with this is the consideration of DB2 architecture and processing techniques that bring up issues beyond the traditional approach of assigning a database to a performance group above its associated drivers. This article suggests approaches that can be used to limit the interference of DB2 transactions on native CICS transactions along with the best CPU configuration for the environment.

Software Queuing in Review

Software queuing within CICS may have a significant impact on response time and deserves some review. The issue of software queuing is important because of the CICS architectural limitation of multiple requestors for a single server resource.

The basic structure is illustrated in Figure 1. An on-line TCB is attached for processing all application programs. Additional specialized TCBs are attached to act as server elements for specific CICS management functions such as file OPEN/CLOSE, VSAM request processing and logging records to a journal file. The vast majority of CPU consumption by CICS will occur while under the control of on-line TCB.

The reason for the extensive use of the single on-line TCB is due to basic CICS design. All transactions being processed by CICS will be represented as a unit of work by the creation of (or more correctly, the attachment of) a Dispatch Control Area (DCA). The DCA at any instant in time will have an indicator representing the current status of each task. An application program is given control when its DCA sta-

tus shows being ready to run and it is the highest ready DCA on the dis-

patch chain. Control will be given to the task as an MVS unit of work under the umbrella of on-line TCB.

When the application program begins (or resumes) its processing, it will start with normal activities such as moving data about in storage, comparing things or adding numbers — things that eat up dollars spent for MIPS. Eventually the application will request some service even if it is nothing more than a request to terminate.

Next, build some understanding of how CICS will handle a request for service. Assume our application program has issued a request to file control for retrieval of a record. At this point the CICS File Control Program (FCP) will take over and begin to validate the request on behalf of the application. Is there a record level enqueue conflict in existence? Are there any available strings? Is the file enabled? All these housekeeping chores are performed on behalf of the application as an MVS unit of work under on-line TCB.

Not until CICS FCP has made the final decision that all is good will the ball be put into the court of VSAM TCB. Then it becomes part of a new unit of MVS work that can be dispatched on an engine in a CPU complex. In the meantime, a great deal of work has been performed within an application and on its behalf *all under the same on-line TCB*. While TCB exploitation is occurring, activity on behalf of some other DCA or task may have completed essentially putting the task in a ready status. The net result is two tasks available to monopolize on the on-line TCB: one actually executing and the other waiting for the on-line TCB. Software queuing is the expression of the concept that someone has and someone wants ac-

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2 LA Sales	Red	Yellow	Green
3 NY Purch	Green	Green	Green
4 DC Rsrch	Green	Green	Green
5 SF Sales	Green	Green	Green
6 MIS Test	Green	Green	Green
7 DB2 Test	Green	Green	Green

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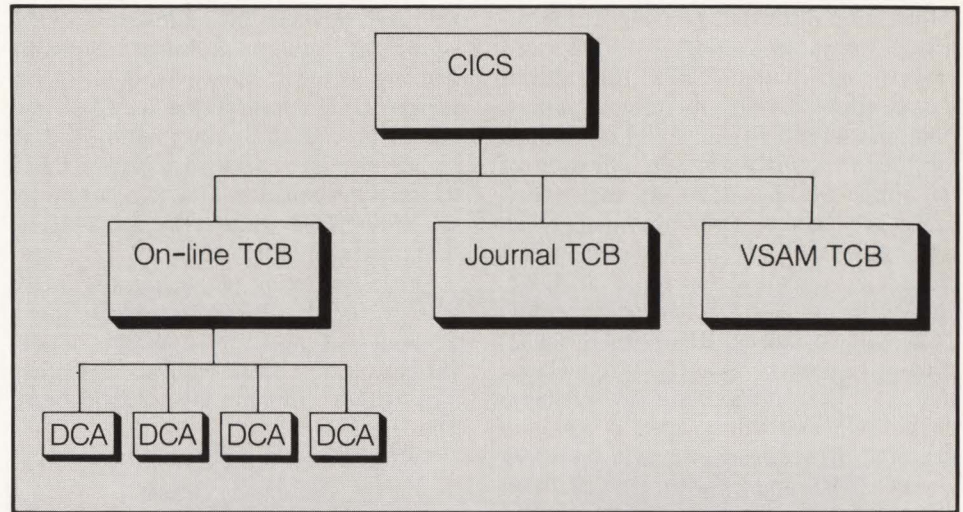
cess to this single server element that was created as a result of design limitations.

Experience has shown the point at which software queuing becomes a concern, known as the acceleration point, is when the aggregate CPU consumption for CICS and higher priority workloads approaches a level of 50 percent utilization for the CPU complex depending on transaction execution profiles and mix. The rate at which response time erodes once the acceleration point has been reached will be dependent on the capacity of the CPU as illustrated in Figure 2. This percentage of delay can be expressed in an analytic model taking into account factors such as the number of CPU engines, aggregate CPU consumption above CICS, average CPU consumption of each transaction, average transaction arrival rate and so on, but this goes beyond the scope of this article (and this author!).

DB2 Architecture

Basic architecture uses the concept of a thread for requesting access to DB2 regardless of whether access is from CICS, IMS or TSO. Within the address space of these requestors there will be at least one TCB attached for the sole purpose of initiating DB2 requests through a thread. There can be more threads generated than actual TCBs to drive them from. For our purpose here it is sufficient to say that all DB2 calls from CICS will be driven from a TCB (or TCBs) separate from the on-line TCB. Within CICS the specifications

FIGURE 1

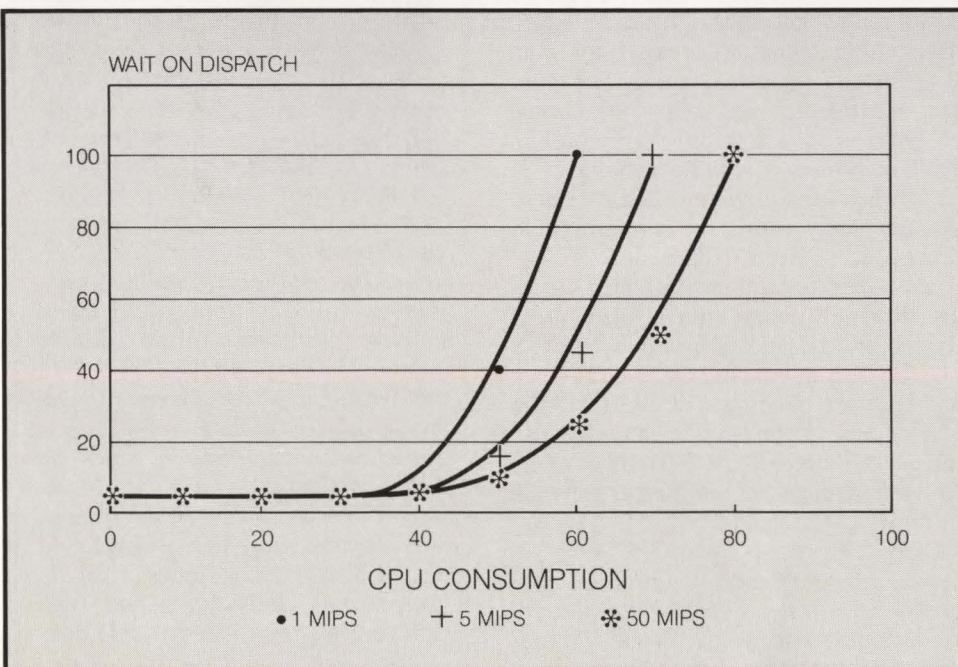


for threads and TCBs are done through generating the Resource Control Table (RCT). The attachment of additional TCBs for processing DB2 requests within CICS ultimately represents the creation of additional work units that can be dispatched on a separate engine in a CPU complex.

Another fact about DB2 architecture is the vast majority of CPU cycles consumed when a DB2 request is initiated (90-95 percent by some estimates although formal studies are not readily available) are billed to the requesting address space because of its extensive use of Cross Memory Services (CMS). This presents some interesting advantages, the least of which is for purposes of charge

back, more accurate and direct billing can be accomplished. More importantly, DB2 address spaces can truly be treated as a server and put at a high dispatching priority. Then, because requestors will execute at their assigned priority by design of CMS, it becomes easy to prioritize DB2 activity by the initiating users when a mixed processing environment exists. Effectively, TSO DB2 accessors can be run at a lower dispatching priority than CICS accessors. The actual time spent executing in the DB2 address spaces (DBAS, SSAS and IRLM) performing DB2 functions will be minimal. Therefore, the impact they have on software queuing will be of little or no significance.

FIGURE 2



Dedicated DB2 Environments

Certainly it goes without saying that those installations that have all their transactions written as DB2 applications running under CICS, in general, simply need to size their CPU at a level in which response time is at an acceptable level. Another option is to buy a 3090/600E in which case they would have to accept whatever response time they can get.

Normal basic tuning would be done with no consideration made for software queuing. Tuning efforts would center around things like DASD, storage, log buffers, data buffers and numbers of threads. Granted, this is no easy task, but the point is that little can be done to influence the degree of software queuing other than controlling the aggregate CPU consumption occurring above CICS.

Mixed Application Environments

The real significance of this article is understanding the options available when

running a mixed environment of DB2 and native CICS transactions. Based on the information discussed previously, the situation would be as follows. DB2 transactions and native CICS transactions would all be coming in from terminals. Their associated DCAs would be chained together to compete for the attention of the single on-line TCB. As each transaction is executed, it will eventually reach a point where it issues a normal CICS request or a request for access to DB2. Having received a DB2 request, on-line TCB will go through the normal house-keeping chores of assuring available resources, most particularly an available thread TCB that will be used to drive the function. This thread TCB will represent a ready MVS unit of work that can then be dispatched on an available engine. Given a significant workload, there will be significant competition for engine(s) to exploit the CPU resource. DB2, by the nature of its capability, can use a lot of CPU and that creates a serious concern for understanding the degree at which software queuing is occurring.

Controlling Software Queuing

Obviously, the first item that must be agreed upon by a data center is what priority will DB2 transactions be given on a global basis (that is, CICS transaction priority has little effect on software queuing). If DB2 applications are the highest priority, then it becomes a moot point. Beyond basic tuning, software queuing must be minimized by controlling the size of the CPU complex.

In a mixed application environment, probably the most common, users will want to protect the degree at which DB2 can interfere with native CICS transactions. The greatest opportunity for restricting exploitation of resources is through parameter specifications in the RCT gen. The most important one is illustrated below:

```
DSNCRCT TYPE = INIT,
DPMODI = HIGH/EQ/LOW
```

or

```
DSNCRCT TYPE = ENTRY
DPMODE = HIGH/EQ/LOW
```

The implication of this parameter is that the DB2 thread TCBs will be CHAPed above (HIGH) or below (LOW) the CICS TCBs in priority. The EQ specification will have the identical effect of LOW because no CHAP would be performed, in which case the TCB priority will be in the order of attachment. Since the thread TCBs are

attached after the CICS TCBs, the on-line TCB will always be higher in priority. The net result of using this philosophy is DB2 would have little or no impact. Software queuing would remain a function of aggregate CPU consumption for CICS minus the thread TCB consumption and all higher priority workloads. Native CICS transactions would be free to compete for the on-line TCB without the possibility of being hammered by DB2.

Other restricting parameters lie in the area of threads. There are several specifications that can limit the number of concurrently active DB2 requests and priorities within different DB2 applications. They are:

```
DSNCRCT TYPE = INIT,
THRDMAX = integer
```

```
DSNCRCT TYPE = ENTRY,
THRDM = integer
THRDA = integer
THRDS = integer
```

These parameters provide SOME control over the amount of software queuing due to DB2. The lower the number of concurrent users, the less chance DB2 has of exploiting the CPU resource. A more appropriate use of these parameters would be to limit the ability of DB2 to dominate the entire CPU. In any case, our DB2 requests would now wait on threads rather than wait on a CPU engine.

Multi-engine CPUs

In the traditional server-driver relationship, the server consumes little CPU and is therefore placed above the driver in priority. Because of low overhead the server causes little CPU delay in the driver. Thus, little opportunity exists for it to contribute to software queuing. The problem is DB2 does not follow the normal (if there is such a thing) server profile. DB2 consumes a significant amount of CPU when used in volume and it does so predominantly within the requestor's address space under a dedicated TCB.

In a uniprocessor environment, users are inevitably faced with a dilemma. If the DB2 thread TCBs run above the CICS on-line TCB in priority, CICS CPU delay and software queuing will occur even in a moderately loaded system. Putting DB2 thread TCBs below CICS TCBs in priority will reduce or eliminate software queuing. DB2 thread TCBs will most assuredly fall prey to some CPU delay. A server that consumes a significant proportion of a driver's CPU will ultimately cause someone to queue for the CPU resource because they are working hand in

hand, not totally independent of each other.

The conclusion is simple. Significant DB2 activity begs for a multi-engine CPU complex. The DB2 thread TCBs can be dispatched on engines while the CICS on-line TCB is dispatched on a different one. The multi-engine environment is probably the single most valuable asset in controlling software queuing while still providing the best possible response time for DB2 applications.

Summary

IBM has created a monster in the sense that the DP industry has begged for years to have a fully relational database and now we have it. By its nature and design it cannot help but consume a significant amount of CPU. CICS has architectural limitations that leave it vulnerable to severe software queuing when aggregate CPU consumption for CICS and higher priority workloads exceed 50 percent of the CPU complex. Fortunately for us, IBM has done an excellent job of providing us with a great deal of flexibility to not only control DB2's effect on CICS, but also to control the rest of the complex. Executing most of the CPU for each DB2 call from within the requestor's address space and allowing for control of priority within CICS provides us with the mechanism to truly represent the objectives of a data center. ☺

ABOUT THE AUTHOR



Steven R. Hackenberg has been in data processing for more than 18 years. Prior to joining Candle Corporation in 1982, he was involved in applications programming, performance analysis and software development at Electronic Data Systems, Inc. While at Candle Corporation, he has been a technical support representative for Candle products in areas of MVS, CICS, IMS and VTAM. He recently moved from his position as manager of customer support services division which he began in 1984 to join the Candle Expert Team as a consulting systems engineer reporting to the director of technical marketing support. Candle Corporation, 1999 Bundy Dr., West Los Angeles, CA 90025, (213) 442-4150.

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Change Control And Configuration Management

By Lynne M. Stanton

Change control is essential in software development and maintenance environments. However, change control alone is not enough.

The inability to control and track changes to all software components (that is, source and object code, executables, job control language, procedures, documentation, test data) and the need to manage the interrelationships between changes are the most costly and disruptive problems facing any software development or maintenance effort.

The disciplines of change control and

configuration management have emerged to provide for the orderly initiation, review, testing, approval and integration of changes.

Change control provides recording and tracking of changes to components of an application.

Configuration management, a well-known discipline in the hardware arena, is coming of age for software development and maintenance. It is the discipline

that provides a definition of the change cycle, release cycle and functional responsibilities necessary to control an application in all phases of its life cycle. With configuration management, all components of a given product or application can be organized, managed and tracked as a unit.

Most software applications are now so large with changes and new configurations produced at such a rapid pace that manual or semi-automated change control procedures cannot adequately keep up. Change control is essential in software development and maintenance environments. However, change control alone is not enough. To properly control the evolution and release of software products, change control must be integrated with configuration management and the entire process automated.

Two of the common issues of change control and configuration management in MVS environments are the turnover of information from one stage in its life cycle to the next and the control of access to the information being changed.

Procedures

An organization develops procedures to address change and configuration management issues. The nature of these procedures depends on the organization, the environment and the information to be controlled. The design of these procedures is something of an art and the procedures need to be able to provide control without negatively impacting productivity. Unfortunately, many organizations still attempt to control software development and maintenance with only manual or semi-automated change control procedures that are rarely sufficient.

A first step in managing a software application is identifying all of its components. To ensure that all of these components are carried along as the product evolves, some means of managing the product as a whole is necessary. Both manually and with systems that control changes only, this is often done by attempting to maintain a list of release components. One of the difficulties with this method is the lack of a versioning capability in IBM MVS libraries. Variations of member names or even separate datasets are required for the establishment of versions. This makes keeping release lists up-to-date difficult and error-prone.

Once all of the components have been identified, it is necessary to control access to them. In the standard MVS environ-

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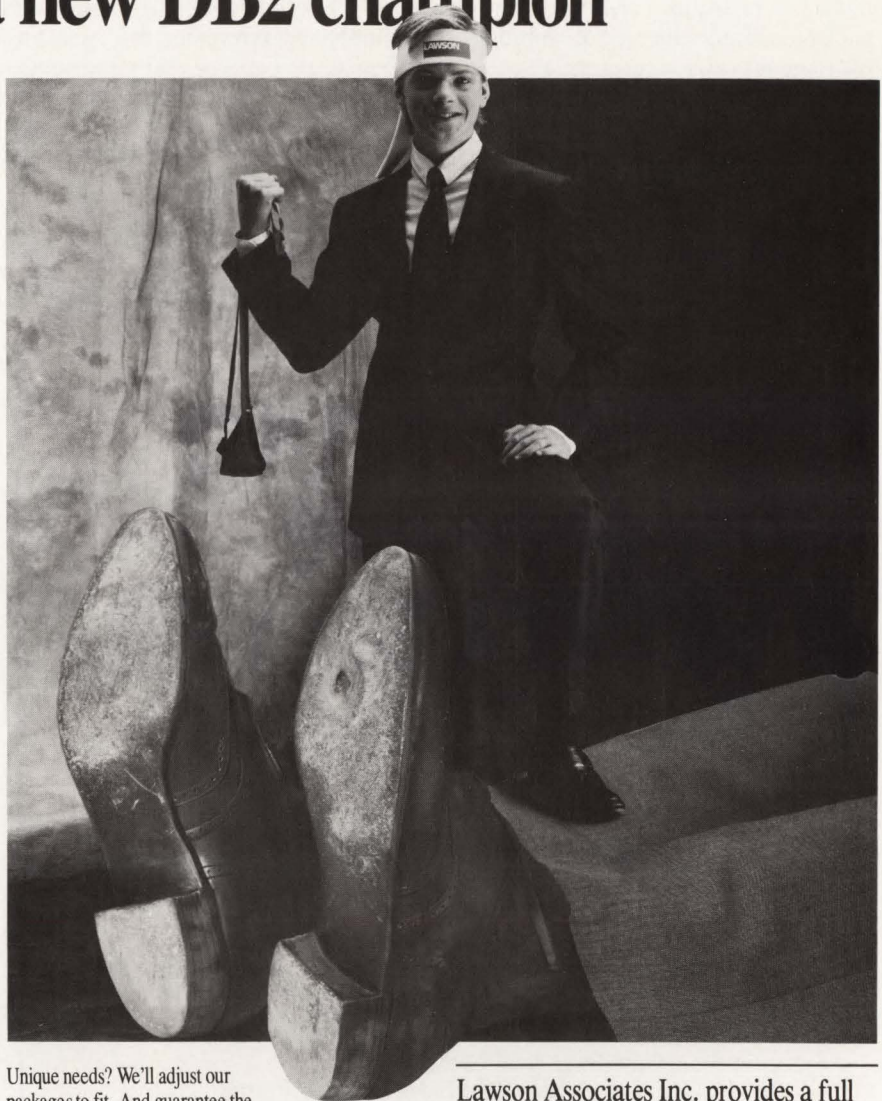
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ment, this control is usually established through the use of security packages. Security packages require the use of naming standards to generically control the access of groups or classes of users to groups of software components.

Finally, a means of notifying different users responsible for different activities is essential to minimize confusion and its consequences.

The chief problems, then, with turnover of product versions and control of

access are keeping all the product components up-to-date, passing these up-to-date components from one life cycle stage to the next as a group, assigning specific enough access to accurately control the modification of components and proper and timely notification of impacted developers and managers.

Manual Change Control

The following paragraphs provide an example that describes the turnover of

versions and the access controls used in a typical manual or semi-automated system of change control.

Consider a software application that includes source code, executable code, COPYBOOKs, database accessories, JCL and PROCs. All of these units of information are stored in PDS (Partitioned Datasets). Procedures have been developed to manage change to these units. This example discusses the flow of the change cycle and the procedures used to control it.

All units currently in production libraries are stored in a PDS by type (that is, COBOL, PL/I, LOAD, PSB, DBD, ACB, JCL). The production partitioned datasets are protected by a security package and may be updated only by those users who are defined as being part of the production control group. Read access for each PDS is defined for a librarian who is a member of the technical support group for the software application. Upon receipt of a change request, the librarian copies the appropriate units of information to the assigned developer's user libraries. When the developer is finished making the necessary changes, the librarian copies the changed units to the system testing libraries.

When system testing is completed, the units of information are moved by the librarian to the acceptance libraries for user testing and approval. Upon receipt of user approval, the librarian moves the approved units to a staging library from which they are later moved to production.

This example illustrates the need to manually manage five sets of libraries (user, system test, acceptance, stage and production). Management of these libraries includes defining them to the security package for access control, storage control (allocation of space, compression and backup) and documentation of what libraries exist and how they may be accessed. Each data type requires a separate PDS; therefore, a set of libraries includes one PDS for each type of data to be controlled. Procedures are normally automated to do the storage management, but access control and documentation are labor intensive issues and are thus error-prone and costly.

Communication between groups involved in the change process is another issue requiring a great deal of manual effort. Initially, one must communicate the necessity for change. This usually involves filling out a change request form. The change request form then becomes the vehicle by which the librarian is in-

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formed about which routines need to be moved to the developer libraries for modification. The developer must then communicate when the changed routines are ready to be moved to the system test libraries. In its turn, system test must communicate when tests are completed and the routines may be moved to the user acceptance libraries. Upon approval, communication is necessary to move the routines to the stage libraries and then to production.

Each of these movements of information between libraries is normally communicated through the use of separate paperwork or by additional signatures on the original change request form. Movement between libraries is often automated, but change request passing and manual input of the routines to be moved is required.

At some point in the cycle, reports are run to verify exactly what changed in each routine involved in the change request. Manual input is again required to specify which routines to compare. This requires a list of routines to be manually maintained and passed on to the verification personnel.

Change control issues are further complicated by:

- Double maintenance for separate distribution
- Maintenance of shared or common data
- Simultaneous update for multiple change requests.

All of these issues require additional procedures and a commitment to coordination of changes.

In this brief example, the amount of time and energy spent controlling what is changed and tracking changes through the development process is evident. Whether the procedures are manual or partially automated, a large quantity of resources is spent designing and implementing change control procedures. Even with these procedures, human errors can be easily introduced leading to delays, increased costs and a loss of product integrity. Configuration management in this example has been rudimentary, consisting only of identification of the product components, placing those components in libraries and manually maintaining a list of components that constitute the product.

Automated Change Control and Configuration Management

For the example just completed, an automated system of integrated change control and configuration management may

be implemented to reduce manual efforts and increase productivity and software integrity while minimizing costs, effort and errors. The following paragraphs describe a sample automated system.

To automate configuration management, a single control area is defined for storage of all components of the product. Within this defined area, different versions of the product are maintained for separate user activities (that is, development or maintenance, system testing, pro-

duction). Access controls are specified for particular product versions or components of these versions. The proper access privileges (defined by management) are required to modify information within the control area. All activities and data movement within the control area are automatically recorded and can be reported at any time.

Components to be changed are grouped according to the work being done (that is, assigned to satisfy a change request). As-

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sociation of statuses with components in different stages of modification drives an automatic notification scheme that informs appropriate users when changes are made.

With the definition of the control area and assignment of specific access controls, authorized users move assigned components into their own libraries for modification, then copy modified components back to the storage area. Versions

of each component are automatically maintained and associated with the applicable change request. A complete audit trail is available to keep management informed of how the software achieved its present state and comparison of versions allows automatic reporting of all changes. The configuration management system automatically changes the status of the component making it available for the next step.

Groups of related components such as those associated with a particular change request are moved through the life cycle (development through testing and into production). This sort of movement also permits backing out of changes in the event of problems. Turnover is automated based on component status.

Since all the up-to-date components of the software product are stored in a single control area, the entire product can evolve as a unit eliminating the chance of creating a production release that lacks important pieces.

Conclusions

As the number of changes to a product increases, controlling the evolution of the product becomes more complex. This increasing complexity leads to problems such as more paper to manage, increased manual communication efforts and extensive maintenance. The solution to these problems is automated change control and configuration management.

There are tools available to automate this solution. A change control tool is ideally a set of command-driven utilities to compare versions of components and manage their storage in the form of deltas of change. A configuration management tool is an integrated product that implements a configuration management discipline through a menu-driven interface.

Automated configuration management in particular provides control over complete products as well as controlling the relationships of a product's components to each other. With automated configuration management, all components of a given product or application can be organized, managed and tracked as a unit.

Any organization attempting to control the evolution of software with change control alone is spending resources unnecessarily. An automated system of integrated change control and configuration management enhances an organization's ability to produce quality software within schedules. ☸

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See Product Sidebar next page

ABOUT THE AUTHOR

Lynne M. Stanton is a member of the technical support staff of Softool Corporation, a firm specializing in automated change and configuration control products. Softool Corporation, 340 S. Kellogg Avenue, Goleta, CA 93117, (805) 683-5777.



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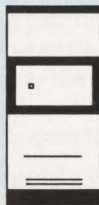
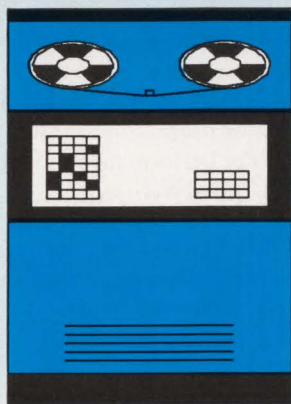
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Product Sidebar

Change Control & Configuration Management Software Sampler				
Product	Vendor	Brief Product Description	Environment	Information
PM/SS	Adpac Corporation 340 Brannan Street San Francisco, CA 94107 (415) 974-6699	PM/SS allows users to easily maintain their COBOL and PL/4 applications by producing automated documentation of source and JCL; structure analysis of individual programs and complete systems; impact analysis; code maintainability analysis; and monitoring of data naming standards.	MVS	CIRCLE 300
RD/CHANGE	BlueLine Software, Inc. 1500 S. Lilac Drive Suite 340 Minneapolis, MN 55416 (800) 826-0313	RD/CHANGE automates change and problem management in development and data center environments. It allows an installation to track, manage and report problems and changes in other systems. RD/CHANGE provides on-line recording, modification and display of both problems and changes, as well as a full complement of management reports for tracking of status.	VM	CIRCLE 301
ENDEVOR	Business Software Technology, Inc. 114 Turnpike Road Westborough, MA 01581 (508) 870-1900	ENDEVOR provides an automated software management foundation that supports the entire application development and operations life cycle. The system's components address the critical areas of software inventory and library management, change control, configuration management and release management.	MVS, VSE, VM	CIRCLE 302
LIB/CCF	Computer Associates Int'l Rt. 206 & Orchard Road Princeton, NJ 08540 (800) 237-9273	The LIBRARIAN Change Control Facility (LIB/CCF) manages and controls application development tasks in ISPF/TSO, ISPF/CMS, ROSCOE and VOLLIE environments. LIB/CCF ensures source-to-load synchronization in the production environment and controls the movement of source code between production and test environments.	MVS, VSE, VM	CIRCLE 303
Change Man	Optima Software, Inc. 1010 Hurley Way, Suite 300 Sacramento, CA 95825 (916) 646-3800	Change Man is a comprehensive library change management and configuration control system that automates the entire process of managing software changes from development to production. It is ISPF-driven, runs all releases of MVS, interfaces to all security systems and has support for DB2.	MVS	CIRCLE 304
LCS/CMF	Pansophic Systems, Inc. 709 Enterprise Drive Oak Brook, IL 60521 (800) 323-7335	Library Control System/Change Management Facility (LCS/CMF) provides management control of the source program environment, integration of ISPF interface, integrity of production programs, complete source auditability, source-to-load cross referencing and management of load libraries.	MVS, VSE	CIRCLE 305
CCC	Softool Corp. 340 S. Kellogg Goleta, CA 93117 (805) 683-5777	Change and Configuration Control (CCC) software automates software change and configuration management. It manages changes to any machine-readable units of information through well-defined access controls, change identifications, extensive change and difference reports and audit histories.	MVS, VM	CIRCLE 306
COMPAREX	Sterling Software 11050 White Rock Road Rancho Cordova, CA 95670 (916) 635-5535	COMPAREX is a utility that will compare any two datasets, files, libraries, library directories or databases and highlight all the differences with optional masking. In the change control environment, it is used to first compare PDS directories and then to compare the actual members.	MVS, VSE, VM	CIRCLE 307

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VM Capacity Planning

For MVS Performance Analysts

By Dr. Tim Grieser

During the past 10 years capacity planning has become well established at many large MVS installations. In typical installations, MVS capacity planners have become familiar with both principles and practice of performance measurement and performance prediction to assure adequate performance and timely hardware upgrades to meet ever-increasing user demands.

Modern techniques typically include workload characterization, workload forecasting and performance prediction using analytic modeling tools so that "what if" questions concerning the effects of workload growth and alternative hardware upgrades can be answered.

Today, the rapidly growing use of VM on large mainframes, especially 3080s and 3090s, means increasing needs for VM capacity planning. In many cases, MVS capacity planners are being called upon to take on VM capacity planning responsibilities even though they are not VM experts or even VM knowledgeable. This article introduces VM performance and

capacity planning principles to an audience already familiar with MVS performance and capacity planning.

The rapidly growing use of VM on large mainframes means increasing needs for VM capacity planning often by MVS analysts with little or no VM experience.

Capacity Planning Requirements

In order to adequately perform capacity planning for a given computer system environment, the analyst should have a basic understanding of several key areas that should include the following items:

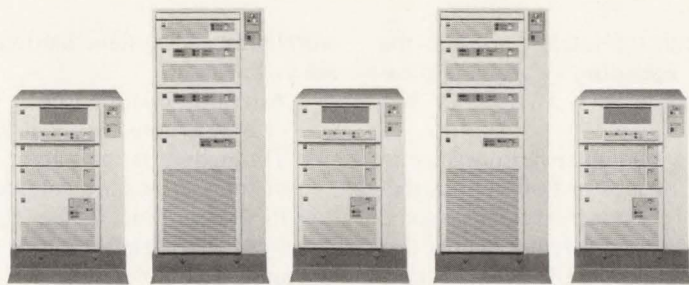
- A conceptual framework for understanding computer performance and capacity planning based on jobs, transactions, workloads and basic performance measures
- Characteristics of hardware devices such as CPU, memory and DASD

- Operating system software characteristics that determine how work is organized and controlled
- Measurement software including key performance measures
- Workloads including key applications and major users
- Using computer performance models for "what if" analysis.

In this article, each of the major items is addressed. Wherever possible, the approach is to first present the topic from an MVS perspective followed by the VM counterpart.

Workload Concept

In order to provide a consistent approach to understanding computer performance, it has become standard to use the workload concept. A workload may be defined as a group of jobs or on-line transactions that have similar requirements for computer service. For example, a workload might consist of all users of a particular CICS application. Often, workloads are divided by intensity of re-



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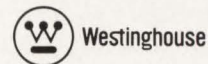
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source usage such as forming individual workloads for "light," "moderate" or "heavy" use of a particular application.

The following examples illustrate typical workloads for MVS and VM systems:

MVS: TSO Trivials
Batch Jobs
CICS Transactions

VM: CMS Trivials
PROFS Functions
Guest SCPs

In capacity planning practice, it is typical to look at performance *per workload*. This permits the performance analyst to understand service demands, current system performance and future requirements from a perspective that reflects the use of key applications or system functions by major classes of users. This allows performance planning in a manner that corresponds to the business needs served by the computer installation.

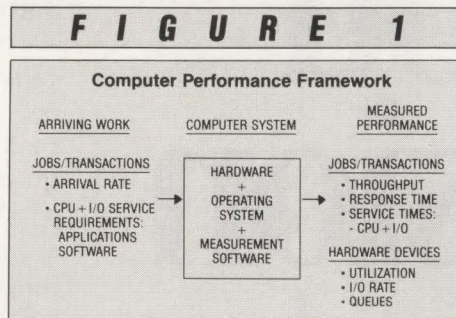
Computer Performance Framework

Using the workload concept, we can establish a convenient framework for understanding and evaluating computer performance. As shown in Figure 1, key sys-

tem components of interest include the hardware, the operating system and measurement software such as RMF or VM Monitor.

We can view computer performance in terms of a set of jobs or transactions that "arrive" at a computer system at some average rate with work requirements that need to be accomplished. We normally consider arriving jobs on a per workload basis. The magnitude of service required by each job or transaction depends on the type of application software and the intensity of use. Measurement software allows the analyst to determine the actual performance of workloads and system hardware devices during system operating intervals.

Some key performance measures for



workloads and system hardware devices are as follows:

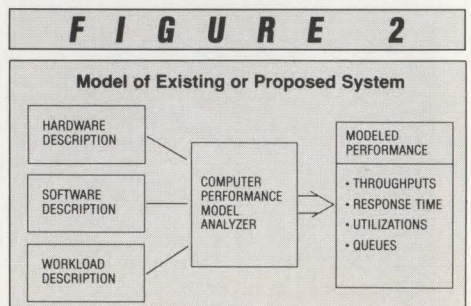
- Arrival rate is the rate at which jobs or transactions arrive at the system
- Throughput is the rate at which jobs or transactions are completed
- Response time is the elapsed time from submitting a job or transaction until it completes
- Service time is the amount of CPU execution time or I/O device processing time used by a transaction
- Utilization is the average percent busy of the CPU or an I/O device during an operating interval
- I/O rate is the rate at which I/O operations are completed at a device
- Queues are the average number of transactions in service or waiting for service at a device. Long queues are indicators of bottlenecks that may be degrading response time.

Capacity Planning Framework

To perform capacity planning, you must be able to start with initial workloads, project workload growth, predict the performance impact of growth and ask "what if" questions about the effect of alternative hardware upgrades. The preferred method for meeting these requirements is to use a capacity planning modeling software package to mathematically predict performance under alternative "what if" conditions.

In Figure 2, the input to a capacity planning modeling package is a model of a proposed or existing system. A model consists of parameters that describe the hardware, software and workloads for the system. The model analyzer mathematically calculates system performance and provides reports showing the calculated performance measures such as throughputs and response times.

A model of an existing system built from measurement data gathered during a representative operating interval is called a *baseline model*. A baseline model represents today's performance on an existing system. To perform "what if" anal-



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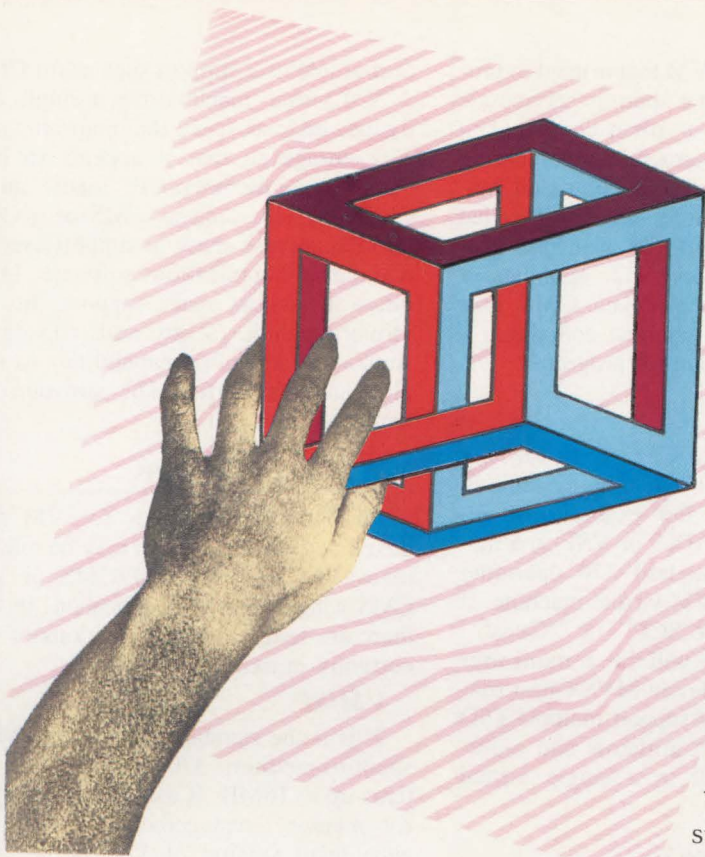
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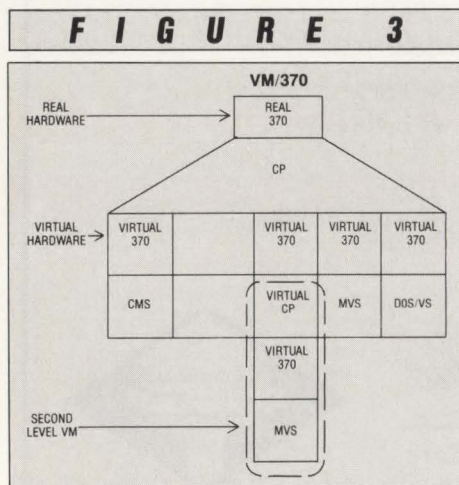
ysis, changes can be made by varying model parameters or by using commands that affect the actions of the model analyzer. Most commonly, changes will be made to reflect workload growth, new workloads and hardware upgrades. Performance is calculated for the modified system and results are examined to determine whether they meet the installation's performance objectives.

Basic VM Concepts

Having introduced some basic performance and capacity planning concepts, I will now address the specific area of VM capacity planning. Our objective is to understand key aspects of hardware, the operating system, measurement software and workloads for typical VM environments. We will start by providing some basic VM definitions.

VM/370

The letters VM stand for Virtual Machine facility. The base component of VM is called CP for Control Program. CP is a software control program that creates and manages virtual machines. In VM terms, a virtual machine is a simulation of a complete 370 hardware system including CPU, memory and I/O devices. To a user running in a virtual machine it appears that he has a hardware system identical to a "real" 370 *except for performance*. A VM-created "virtual" 370 is slower than a "real" 370 due to the overhead of simulation. In addition, each "virtual" 370 must compete with others for CPU and I/O resources, thus further slowing down the performance of virtual machines (see Figure 3).



CMS

Each virtual machine must "contain" software in order to perform useful work.

The component of VM that is used to provide interactive time-sharing services is called CMS. CMS is often compared to TSO, the MVS interactive time-sharing facility. CMS delivers a command language, a file structure, an editor called XEDIT and support for standard programming languages and applications packages. In concept, each CMS user "owns" a virtual machine containing a copy of the CMS control program.

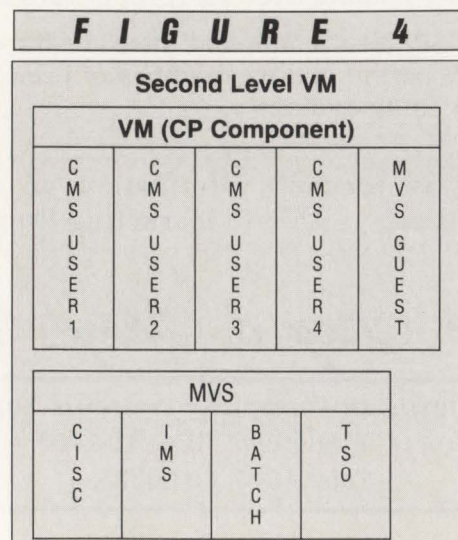
Guest SCPs

The alternative to CMS is to run any of the standard 370 operating systems in a virtual machine. For example, an installation may run MVS or VSE in a machine. When a standard 370 operating system is run in a VM virtual machine, it is called a "Guest SCP" or "Guest." Typically, a Guest will be a multi-user system. For example, an MVS Guest running under VM may support multiple TSO users, several batch initiators and multiple CICS users all in a single virtual machine.

Second Level VM

A special Guest situation occurs when a copy of VM itself is run in a virtual machine. This is referred to as "VM under VM" or "second-level VM." A second-level VM supports its own virtual machines, CMS and Guests but with further reduced performance.

From the MVS perspective, it is useful to compare a VM virtual machine to an MVS address space. An MVS address space is a virtual storage containing system, private and common areas. An MVS address space may contain single user support such as for an individual TSO user



or multiple user support such as for CICS. A VM virtual machine has a single contiguous address space that maps an entire 370 storage so that it appears to be a "real" main memory. CP "loads" an operating system such as CMS or a Guest into the address space to support user operations and applications software. In addition to address space support, the VM virtual machine facility adds I/O device simulation and other capabilities to simulate an entire virtual 370 hardware system (see Figure 4).

VM System Versions

Various generic names for VM have developed. A VM system may be referred to as VM, VM/370, CP/CMS or VM/CMS without further qualification. In fact, there are several distinct versions of VM currently in existence.

VM/SP

This is the standard version of VM for small-to-medium 370 architecture systems up to 16MB. It uses demand paging for memory management. A packaged entry-level version of VM/SP is called VM/IS.

VM/HPO

This is the High Performance Option version of VM for medium-to-large 370 architecture systems. HPO is added to a VM/SP base system to provide extended performance. HPO supports a form of swapping and logical swapping and has some above 16MB line capabilities.

VM/XA SF

This is basic 370/XA architecture support for VM virtual machines. VM/XA SF provides both 370 mode and 370/XA mode virtual machines so that both XA and non-XA Guests can be run on a single 370/XA capable hardware. Its original purpose was to provide a migration aid for MVS to MVS/XA conversions. VM/XA SF provides only a very limited CMS that does *not* support most major applications. VM/SP and VM/HPO can be run as second level Guests under VM/XA SF.

VM/XA SP

This is the evolving full 370/XA support for VM. VM/XA SP1 is currently available and VM/XA SP2 is announced for December, 1988, delivery. VM/XA SP is on a development path intended to bring full VM capabilities to the XA environment. The most significant feature of VM/XA SP is a newly written *Bi-Modal* CMS that supports both 370 mode and 370/XA mode operations for CMS users. The ul-

timate objective of *Bi-Modal* CMS is to provide functional parity with the CMS supported by VM/HPO, increase performance levels and permit users to exploit extended 370/XA hardware capabilities.

MVS and VM Hardware Support

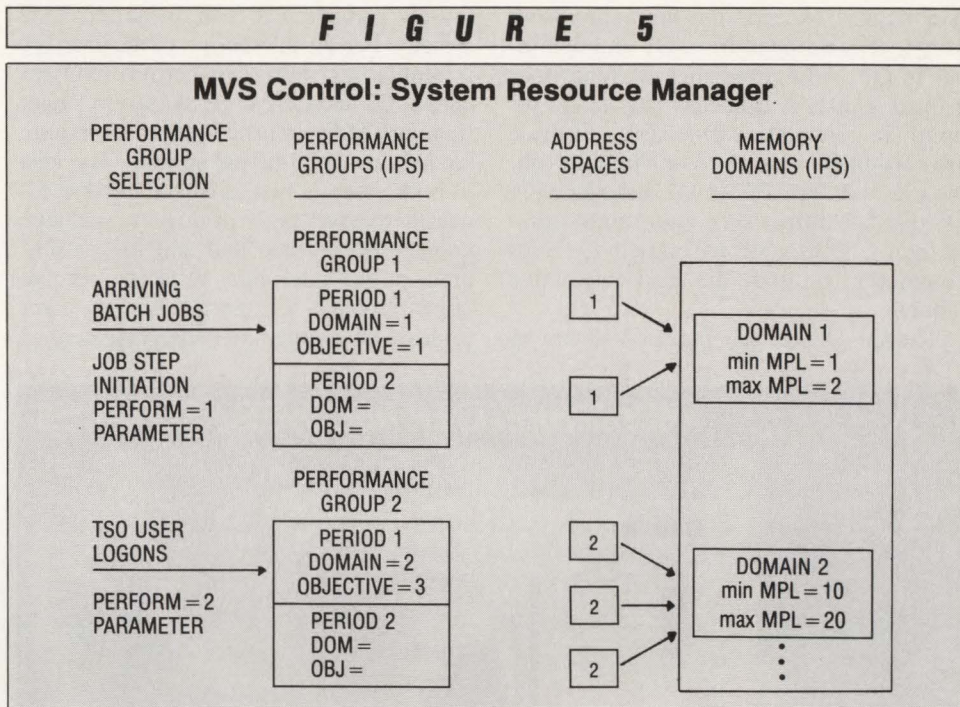
I will begin the direct comparison of MVS and VM capacity planning with hardware. For the MVS analyst experienced with standard 370 hardware, VM supports most of the same familiar devices. VM in its various versions spans the entire range of 370 and 370/XA CPUs. VM/SP is similar to non-XA MVS in terms of the processors supported. These include the non-XA capable CPUs. VM/HPO supports some of the larger CPUs. VM/XA is the principal system for the largest E- and S-series machines. In terms of I/O devices, VM supports the standard DASD devices and controllers familiar to the MVS analyst. Thus the knowledge of hardware devices and hardware performance characteristics already gained by the MVS analyst is easily transferrable to the VM environment.

Performing Work in MVS and VM

One of the keys to understanding a system environment is learning how work is performed. In MVS, the basis for work is *address spaces plus tasks*. An address space is an MVS virtual storage in which programs are loaded and executed. As observed previously, an MVS address space can contain programs for a single user or multiple users. An MVS task is an element that can compete for active system resources such as CPU time. In order to execute, a program must be loaded into an address space and must become an active task.

For VM, the basis for performing work is virtual machines plus System Control Programs (SCPs). Virtual machines are created, managed and assigned active resources such as CPU time by CP. Each virtual machine "contains" a system control program such as CMS for interactive time-sharing or a Guest SCP such as MVS. The SCP in turn loads and manages applications software.

From the user perspective, a VM virtual machine is identified by a VM USERID. When a user logs on to VM, he does so with an assigned USERID similar to an MVS TSO logon ID. When running under VM, it is possible to list the virtual machines actively running using



various system commands such as QUERY and INDICATE. The response to these and other commands is a list of USERIDs with appropriate summary information. Hence it is customary to refer to virtual machines by their USERIDs. For a CMS user, each user will have his own unique USERID identifying the virtual machine he is using. For a Guest SCP, the Guest itself will run with a single USERID. Various VM performance data such as CPU time used and I/O activity can be listed by USERID (see Figure 6).

FIGURE 6

USERID	VM USERID CPU TIME (SECS)		
	TOTAL	CP	PROB
MVS	30.56	17.72	12.84
OPERATOR	0.01	0.01	0.00
SYSTEM	2.21	2.21	0.00
USER001	0.64	0.43	0.21
USER002	46.56	4.28	42.27
USER003	0.12	0.10	0.01
USER004	20.01	5.44	14.57

Controlling Work in MVS and VM

One of the most important aspects of operating system architecture affecting performance is the way the system controls the flow of work. In MVS there are major system facilities that define and control work on a workload basis. MVS batch jobs and TSO terminal sessions are assigned to performance groups. Performance groups are defined in a standard IPS dataset and contain various MVS re-

source management parameters that are used to control resources used by address spaces. MVS performance analysts are familiar with such entities as performance periods, domains and service objectives. Overall resource management in MVS is controlled by the System Resources Manager (SRM) that monitors the rate at which address spaces receive resources and periodically make adjustments to achieve service objectives. Another characteristic feature of MVS control is the use of normalized "service units" to measure CPU, I/O and main storage resource consumption (see Figure 5).

For VM/SP and VM/HPO systems, the system for controlling work is simpler and more directly related to the physical resources consumed by active virtual machines. VM does not have the elaborate scheme of workload management supported by MVS. For example, VM does not have an IPS or equivalent nor does it support performance groups, performance periods or domains. As stated earlier, the CP component of VM creates and manages virtual machines. Virtual machines are assigned physical resources such as CPU time, main memory space and access to I/O devices.

VM manages work through a series of queues called Q1, Q2 and Q3. When a CMS terminal user enters an interactive request, the user is placed in Q1 to receive a small amount of CPU time. As long as a user's interactive requests remain small they will be serviced in Q1.

If a request exceeds the time slice limit of Q1, it is dropped from Q1 and continues in Q2. A Q2 time slice is eight times as long as Q1. A user may stay in Q2 for up to six consecutive time slices. If these are consumed without completing the job, the job is dropped from Q2 and placed in Q3 that has a time slice value eight times as long as Q2. A job will stay in Q3 until completion or until the next interactive request.

The Q1-Q2-Q3 scheme for VM can be

loosely compared to a multi-period TSO system. For an interactive CMS user Q1 is similar to short first-period TSO requests. Q2 and Q3 can be likened to longer running TSO transactions that require second- and third-period service. The idea in both cases is that small interactive requests receive high priority to achieve good response time and that longer running more batch-like requests receive larger amounts of service but at lower priority. Of course, the underlying control

mechanisms are quite different between the systems.

Some other aspects of work control for MVS and VM can be summarized. Both systems support a CPU priority scheme that can be used to give certain jobs higher priority. In the case of VM, zero is the highest priority while 99 is the lowest (external) priority. Standard default priority is 64. Some VM controls are *set priority*, *set favor* and *set SRM percent*. The first control can be used to assign a priority to a user while the latter two controls attempt to give a user a fixed percentage of CPU resources. In fact, the working of *set favor* is complex as it is possible to over define CPU percentages.

Another area of contrast between MVS and VM occurs in scheduling the use of memory (see Figure 7). Unlike MVS, VM does not support a system of domains. Instead, most VM users compete for placement in main memory based on memory availability and their projected working set size. Some further refinements exist in VM memory management such as mechanisms for fixing pages, $V = R$ and special provisions for logically swapped CMS users in HPO 3.4.

FIGURE 7

VM Control: CP Scheduler

- NO DIRECT EQUIVALENT TO MVS SRM — NO SERVICE UNITS OR WORKLOAD MANAGEMENT — NO IPS
- CP SCHEDULER PERFORMS CPU, I/O, MEMORY PHYSICAL RESOURCE MANAGEMENT
- USES PHYSICAL MEASURES, CPU TIME, WKSET, ETC.
- CP SCHEDULER QUEUES FOR VIRTUAL MACHINES:
 - Q1 - INTERACTIVE, SMALL TIME SLICES 5-20 MILLISECONDS
 - Q2 - BATCH-LIKE, LONGER TIME SLICES (8 X Q1)
 - Q3 - LONG RUNNING (8 X Q2)
- CPU PRIORITIES: 0 = HIGH, 64 = AVERAGE, 99 = LOW
- CPU SET FAVOR % - TRY TO GIVE CPU % TO USERID
- CP SCHEDULER CALCULATES A DEADLINE PRIORITY TO DETERMINE POSITION IN QUEUE
- MEMORY SCHEDULING
 - MEMORY TREATED AS ONE LARGE POOL - NO DOMAINS
 - PROJECTED WORKING SET MUST FIT
 - IF NOT, PLACED ON ELIGIBLE LIST = ELIST

Measurement Facilities in MVS and VM

We now consider the standard measurement software available in MVS and VM. Both systems have facilities for accounting. In MVS this facility is the System Measurement Facility (SMF) that provides job, job step and TSO session accounting. SMF records contain such

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data as CPU time, EXCPs and service units consumed together with identifying information such as job name, step name and account number (see Figure 8).

FIGURE 8

MVS Measurement Tools

- SMF - SYSTEM MEASUREMENT FACILITY
- JOB, JOB STEP, TSO SESSION ACCOUNTING
 - TYPES 4, 5 AND 34
 - CPU TIME, EXCP'S, SERVICE UNITS PER JOB STEP
 - CONTAINS JOB NAME, STEP NAME, ACCOUNT NUMBER
 - USE AS BASIS FOR TRANSACTION COUNTS

VM also supports a standard accounting facility that collects basic information for CMS terminal sessions and CMS batch jobs. VM accounting records contain identifying information such as the USERID and account number. VM accounting data is considerably less detailed than SMF but does include such variables as CPU time, connect time and I/O counts. One useful aspect of the VM accounting system is the ability to cut additional installation-defined accounting records. This facility has been used to provide supplemental information about resource usage (see Figure 9).

FIGURE 9

VM Measurement Tools

- VM ACCOUNTING - STANDARD VM COMPONENT
- COLLECTS BASIC INFORMATION FOR CMS TERMINAL SESSIONS AND CMS BATCH JOBS
 - RECORDS CONTAIN USERID AND ACCOUNT NUMBER
 - DATA INCLUDES CPU TIME, CONNECT TIME, I/O COUNTS
 - SUPPORTS USER CREATED RECORDS - CAN USE THIS FOR APPLICATION IDENTIFICATION

The major measurement facility for MVS is the Resource Management Facility (RMF). RMF is a system-wide timer and event-driven performance monitor that

FIGURE 10

RMF - Resource Measurement Facility

- SYSTEM-WIDE TIMER AND EVENT-DRIVEN PERFORMANCE MONITOR
- CPU ACTIVITY - CPU WAIT IN INTERVAL
- DASD, TAPE, CHANNEL I/O ACTIVITY
- PAGING, SWAPPING AND LOGICAL SWAPPING ACTIVITY
- WORKLOAD ACTIVITY - USES SRM MEASURES
 - DATA BY PERFORMANCE GROUP, PERIOD, AND DOMAIN
 - INTERVAL SERVICE BY SERVICE UNITS: IOC, CPU, MSO, SRB
 - SRM WORKLOAD THROUGHPUTS, RESPONSE TIMES, AVG. MPLS

provides comprehensive information about the use of system devices and the performance of workloads. RMF records CPU activity, DASD, tape and channel I/O activity as well as memory management subsystem activity including paging, swapping and logical swapping performance measures. RMF tracks SRM workload activity including workload data by performance group, performance period and domain. RMF shows interval service-by-service units for CPU, IOC,

MSO and SRB services. Workload measures also include throughputs, response times and average multi-programming levels for SRM workloads (see Figure 10).

For VM the major measurement facility analogous to RMF is the VM Monitor. The VM Monitor is a standard component for VM/SP and VM/HPO. Note that VM/XA SF does *not* have a VM Monitor. Note further that VM/XA SP has a newly designed VM/XA Monitor with enhanced capabilities but producing different record



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types and record formats than the original VM Monitor. The following description of the VM Monitor refers *only* to the original non-XA Monitor (see Figure 11).

FIGURE 11

VM Measurement Tools

VM MONITOR - STANDARD VM COMPONENT EXCEPT FOR VM/XA SF

- COLLECTS OVERALL CPU AND I/O DEVICE UTILIZATIONS
- COLLECTS DATA PER VM USERID
- ACTIVATED WITH CP MONITOR COMMAND
 - CONTROLS MEASUREMENT INTERVALS
 - WRITES MEASUREMENT DATA TO DISK OR TAPE

(VM/XA SP WILL INTRODUCE A NEW VM MONITOR WITH DIFFERENT RECORDS AND FORMATS)

The VM Monitor is a comprehensive system-wide timer and event-driven performance monitor. It collects basic hardware performance data such as the overall utilization of the CPU, I/O devices and channels. Data is also recorded by VM USERIDSs such as CPU and I/O usage per USERID. VM Monitor data is written to disk or tape for post-processing. Some of the basic timer-driven Monitor records include system performance, user per-

formance and I/O performance. These are written once per minute. Event-driven records are written per event and include terminal I/O events, scheduler Q information, swapping and paging plus some instruction simulation events. A particularly powerful feature of the VM Monitor

FIGURE 12

VM Monitor Classes

- CLASSES CORRESPOND TO TYPES OF EVENTS - GENERATE DIFFERENT RECORD TYPES
- TIMER-DRIVEN RECORDS - WRITTEN ONCE PER MINUTE
- EVENT-DRIVEN RECORDS - WRITTEN PER EVENT

CLASS	NAME	EVENTS
0	PERFORM	TOTAL CPU BUSY, IDLE, WAIT TOTAL PAGING
4	USER	USER CPU AND PAGING
6	DASTAP	DISK AND TAPE I/O ACTIVITY
1	RESPONSE	TERMINAL I/O EVENTS - TIME STAMPS
2	SCHEDULE	Q1 AND Q2 EVENTS - TIME STAMPS
3	SWAP	LOGICAL AND PHYSICAL SWAPPING
5	INSTRIM	PRIVILEGED INSTRUCTION SIMULATION
7	SEEKS	DASD ACCESSES BY USERID
8&9		SUPPLEMENTAL DATA

is the *seeks facility* that allows the installation to track the referencing of individual VM disks by USERID (see Figure 12).

VM Workloads

Unlike MVS, VM does not have an intrinsic definition of workloads. With this in mind, there are two basic approaches to forming VM workloads. The first approach is to form workloads based on collections of virtual machines or USERIDs. This approach can be accomplished by processing the information contained in VM Monitor data. The idea is to group together similar virtual machines, such as all CMS users, and build workloads based on similar usage of these machines, such as a trivial interactive CMS workload and a non-trivial long-running CMS workload. Thus the basic rule for workload formation becomes "like users of like virtual machines." If the installation can associate individual USERIDs with departments or other administrative units then "like users" might become "all members of the programming department" (see Figure 13).

FIGURE 13

VM Workloads

APPROACH 1: LOOK AT VIRTUAL MACHINES

- CAN DO THIS USING VM MONITOR DATA
- GROUP LIKE VIRTUAL MACHINES TOGETHER
- CMS TRIVIAL AND NON-TRIVIAL WORKLOADS
- GUEST CPU PLUS I/O WORKLOADS

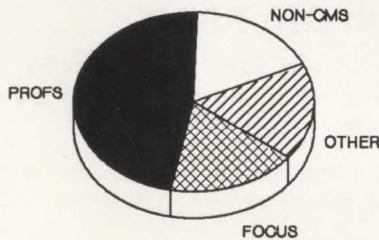
EXAMPLE:

ALL CMS TRIVIALS - 1 WORKLOAD
 ALL CMS NON-TRIVIALS - 1 WORKLOAD
 GUEST MVS CPU - 1 WORKLOAD
 GUEST MVS I/O - 1 WORKLOAD

For Guest SCPs, a number of additional considerations apply. From the VM Monitor perspective a Guest SCP is seen as a single USERID having an overall resource consumption but with no information about what is going on inside the Guest. In terms of workload formation at this level, only very summary activities are possible which usually include breaking the Guest usage into CPU and I/O components.

The second major approach to forming VM workloads is to "look inside" virtual machines to obtain additional levels of detail. For CMS users, this means using the VM Monitor plus additional data sources such as user-defined accounting records to furnish such information as what applications packages are being used. This allows the formation of workloads by application as for example workloads

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for PROFS or SQL. The use of workloads by application allows the installation and its users to more precisely estimate the rate of workload growth and to evaluate the performance and capacity implications of growth (see Figure 14).

FIGURE 14

Sample Applications Report

RESOURCE CONSUMPTION SUMMARY
DATE: 11/12/88 TIME 14:00:00 TO 15:00:00

APPLICATION	PROPORTION OF TOTAL		NUMBER OF	
	CPU	I/Os	USERS	TIMES
SAS	14.14%	15.64%	4	7
PROFS	13.52%	9.48%	19	24
SQLDS	11.72%	12.31%	12	28
SCRIPT	7.36%	9.78%	7	34
GDDM	7.09%	10.57%	6	6
APPLIC1	8.00%	2.89%	6	13
APPLIC2	6.40%	9.11%	3	3
OTHERCMS	20.77%	30.22%	37	
IDLE_CPU	11.13%			

For Guest SCPs "looking inside" means supplementing VM Monitor data with measurement data from within the Guest such as RMF data from a Guest MVS system. It must be immediately pointed out that there are a number of problems with using "second level" measurement data. Some measurements taken from within a Guest SCP will have a distorted view of performance since the Guest measurement facility does not "understand" the VM environment. (Remember that VM provides virtual machines functionally equivalent to "real" 370s *except for performance*). Special techniques are required for understanding and using some of the Guest measures. None the less, the idea of "looking inside" a Guest means forming separate workloads for Guest activities such as TSO and batch (see Figure 15).

FIGURE 15

VM Workloads

APPROACH 2: LOOK INSIDE VIRTUAL MACHINES

- NEED CMS AND GUEST MEASUREMENTS IN ADDITION TO VM MONITOR DATA
 - CMS APPLICATION DATA
 - MVS SMF AND RMF DATA
- NEED SPECIAL TECHNIQUES FOR GUEST MODELING

EXAMPLE:

CMS PROFS - 1 WORKLOAD
CMS SQL - 1 WORKLOAD
CMS FOCUS - 1 WORKLOAD
OTHER CMS - 1 WORKLOAD
MVS GUEST - CPU AND I/O WORKLOADS
SEPARATE MODEL FOR TSO, BATCH, ETC.

VM Capacity Planning

With the background developed in this article, it should be possible for the ex-

perienced MVS capacity planner to address VM capacity planning with a reasonable understanding of basic VM concepts. The steps to be performed in a VM capacity planning study will generally conform to the following outline.

(1) Identify time periods and workloads of interest. Pick high usage hours such as late morning or late afternoon to observe system behavior during peak periods.

(2) Gather VM Monitor data, Guest measurement data and CMS applications data for the same one-hour operating interval.

(3) Using appropriate software tools, build a baseline model of the VM system for the measured operating interval.

(4) Evaluate the baseline model with a mathematical modeling package. Compare measured system performance with modeled performance for the same interval. Check to see if model results closely approximate the measured values. Perform model validation procedures if necessary.

(5) Understand the service level objectives per workload that are required such as the maximum allowable interactive response time.

(6) Project workload growth for future time periods.

(7) Model the effects of workload growth. Will service level objectives be met at higher workload volumes?

(8) Model alternative strategies for meeting service objectives such as tuning moves or alternative upgrade strategies.

(9) Make recommendations to management and keep your users happy! ☺

ABOUT THE AUTHOR

Dr. Tim Grieser is vice president for VM Products and Special Products at BGS Systems, Inc. His previous positions at BGS include Director of Development, Product Manager and Capacity Planning Consultant.

He holds a doctorate in mathematical models of computer performance. He has taught and lectured extensively and has addressed numerous computer user groups and the Computer Measurement Group (CMG).

Dr. Grieser has been heavily involved with VM and OS/MVS systems since the early 1970s. He has been both a systems programmer and managed systems programming support in a large mainframe environment.

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VSAM

Optimization and Design

Control Interval/Control Area Sizes And Splits

By Eugene S. Hudders

Sometimes it is hard to believe that VSAM was announced almost 15 years ago. Despite the years, VSAM continues to be one of IBM's premier access methods. Organizational options, flexibility and performance are some of the reasons why VSAM is a widely-used access method today. In addition, VSAM is relatively compatible between operating systems, especially at an external level. This article will concentrate on optimization and design around a Key Sequence Dataset (KSDS) due to its wide use in an on-line environment.

In this series of articles, I will concentrate on several areas that are important to good VSAM design and performance. The major areas to be addressed are:

- Control Interval (CI) Size for Data and Index
- Control Area (CA) Size and Definition
- CI/CA Splits and Their Effect on Processing
- Free Space Selection
- I/O Buffer Allocation
- Space Allocation
- Index Options
- CICS/VS and On-line VSAM Processing
- Miscellaneous Considerations.

For this article, I will cover CI Size for data and index, CA Size and definition and CI/CA Splits and their effect on processing.

Control Interval Size

The CI Size is an important tuning option for a VSAM dataset. The correct selection will depend on the particular user environment. If disk space is a problem, then a small CI Size is not a solution because the disk gaps will waste a lot of space. For example on a 3380 type device, the overhead is 480 bytes for each physical record; thus, a 512-byte CI will result in 480 bytes of overhead which is almost as large as the CI. Lost space in this case amounts to almost 50 percent of the track. MVS/XA 2.2 Data Facility Product (DFP) has made a major improvement to the physical record size versus the CI Size selected. Prior to this release, the physical record size selected was the highest multiple of 512, 1,024, 2,048 or 4,096 bytes that would fit evenly into the selected CI Size (that is, no remainder). This caused certain CI Sizes to be

inefficient, specifically those that resulted in a 512-byte physical record. In MVS/XA 2.2, the physical record size can be larger than 4K and will generally be set to equal the CI Size.

One consideration for the selection of the CI Size depends on the mode of processing. For sequential processing, a large CI Size is recommended. With larger CI Sizes, more data can be read or written with one I/O operation. A 4K-8K CI Size is an adequate size for sequential processing. VSAM also provides a means for chained I/O operations where multiple CIs can be read or written with only one SIO(F)/SSCH. This area will be reviewed later when buffering is discussed.

For direct operations, a small CI Size is usually recommended. However this may cause poor disk space utilization while not necessarily providing any performance improvement. Two main issues

FIGURE 1

3380 vs. 2311 Sample Timings				
	2311		3380 AJ4	
OPERATION	TIME	% OF TOTAL	TIME	% OF TOTAL
SEEK	75.0 ms	74.6	12.0 ms	57.1
SEARCH	12.5 ms	12.4	8.3 ms	39.5
READ	13.1 ms	13.0	.7 ms	3.3
TOTAL	100.6 ms		21.0 ms	

have to be considered. The first deals with the amount of system resources and time required to read the desired record into storage. A certain amount of virtual storage can be saved (maybe) by using a small CI (that is, 512 bytes vs. 4K bytes). VSAM buffers are allocated on a page boundary. If the CI Size selected does not cover the entire page, the unused space is lost. This is also true for real storage, as a 4K page will have to be fixed to read/write either a 512-byte or 4K-byte CI. The total access time will be different, but will it make a big difference? The high transfer rates of disk units today almost negates any improvement that can be achieved from small CI Sizes. This was of more concern when DASD units had slower transfer rates. Figure 1 demonstrates the timings for a 2K CI on a 2311 disk unit (1965) vs. a 3380. For ease of comparison, protocol and RPS misses have been omitted.

As can be seen in Figure 1, the different timing components have improved with the transfer time being improved by a factor of 19. A 4K CI on a 3380 would take approximately 1.4 ms to transfer which is fast for an operator to note. The important issue is that the longest part of the operation deals with the mechanical motions (seek and rotation). These are the same regardless of the CI Size, so any improvement will really only be in the transfer time.

The second factor deals with the number of records that can be held in exclusive control when updating a CI. This is a valid concern, especially for small datasets such as those that contain accumulated totals. With large datasets, one has to consider the probabilities of two or more tasks trying to access the same CI at the same time. The lower the probabilities of exclusive control contention, then the larger the CI Size can be made. For small datasets, the probabilities for exclusive control conflict are higher and would require a smaller CI, preferably one logical record per CI. Based on the above, I believe that a larger CI Size such as 4K would be an adequate size for most directly processed datasets.

The index CI Size also merits some attention, specifically, the Sequence Set Index (SSI). The SSI should be large enough to accommodate all the high level keys of each CI in a CA. VSAM computes the default index CI Size based on the number of data CIs in a CA. This does not always take the key size into consideration. The size selected as a default is usu-

F I G U R E 2

CI Fragmentation				
REC1	REC2	REC3	FSPC FRAG	VSAM CTL
—>550<— bytes	—>550<— bytes	—>550<— bytes	—>388<— bytes	—>10<— bytes

ally adequate. However in some cases it could happen that the index CI Size is not large enough to accommodate all of the high keys in a CA. When the SSI record

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- VSAM FILES EXIST BUT CANNOT BE SCRATCHED BECAUSE THEIR CATALOG ENTRIES ARE MISSING.
- A CATALOG MUST BE RECOVERED
- VSAM FILES ARE OVERALLOCATED AND YOU NEED THE UNUSED VSAM DASD SPACE NOW.
- A PDS MEMBER HAS INADVERTENTLY BEEN DELETED OR A PREVIOUS VERSION OF AN UPDATED PDS MEMBER MUST BE RECOVERED.
- VSAM FILE INTEGRITY ERRORS HAVE YOUR ONLINE SYSTEM OFFLINE.
- YOU GUESS AT THE CI SIZE AND THE AMOUNT OF DASD SPACE TO ALLOCATE WHEN DEFINING A VSAM FILE.
- POORLY BLOCKED FILES ARE USING UP YOUR CPU CYCLES
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F I G U R E 3

Effect of CA Size on Indices

CHARACTERISTICS	EXAMPLE A	EXAMPLE B
ALLOCATION	TRACKS (6 1)	TRACKS (6 6)
CA SIZE	1 TRACK	6 TRACKS
SEQ. SET RECORD(S)	6 RECORDS	1 RECORD
INDEX SET RECORD(S)	1 RECORD	—
TOTAL INDEX RECORD(S)	7 RECORDS	1 RECORD
INDEX LEVEL(S)	2 LEVELS	1 LEVEL

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gets full, VSAM stops filling up the CA leaving empty CIs without use. This is caused by a problem with key compression. No warning message is given. The only indication that this has occurred is that the dataset may take up more space than estimated (that is, additional extents) or that there is an unusually high amount of free space bytes reflected in a LIST-CAT. If this condition exists, then the index CI Size has to be increased by specifying a size in the cluster definition.

Another area that might affect the selection of a CI Size is the amount of fragmentation (unusable free space) left over in a CI after accommodating all the records. Figure 2 demonstrates this in a 2K CI using logical records of 550 bytes in length.

The fragmentation in Figure 2 is more than half a logical record length. If the CI Size is doubled to 4K, then seven logical records can fit in the CI with a reduction in the total fragmentation. This change more than doubles the number of records that can fit into the CI. Increasing the CI Size may fix the fragmentation but may cause the selection of a physical record size that may be less effective than the amount lost to fragmentation. Care must be taken in this process.

Control Area Size

A Control Area (CA) is the term used to refer to a collection of Control Intervals (CIs). A CA can be as small as one track and as large as one cylinder for Count Key Data devices (CKD). The CA Size is determined by VSAM based on several factors with the main factor being the primary and secondary space allocation. The main objective is to make the CA Size as large as possible. Remember that there is one SSI record per CA. If the allocation is selected in cylinders, then the CA Size will be equal to the maximum size of one cylinder.

The main problem arises when the allocation is made in tracks or records which is converted to tracks. The key to the CA Size in these cases usually lies in the secondary allocation. If the selection request of primary and secondary is large (that is, more than one cylinder), then the CA Size will usually be set to one cylinder. If any of the selections is less than one cylinder, then VSAM will compute the CA Size by calculating the highest multiple that will evenly divide (no remainder) into both requests. This is similar to finding the least common denominator in arithmetic but instead the highest multiple is used. In

some cases, VSAM may increase the primary or secondary request. For example, if IMBED is specified and the CA is less than one cylinder, one track is added to the primary request.

Generally, if the space required is more than a cylinder, then request the space in cylinders when defining the cluster. When requesting space for datasets that are less than one cylinder, make the primary and secondary request *equal*. This will assure the largest CA possible and reduce the number of index records and index levels. Figure 3 details this observation.

Note that it makes no sense to specify IMBED for a small dataset that is properly defined because only one index is created and it should be in storage after the first access.

CI/CA Splits

Splits usually occur when there is not enough space to accommodate an insertion or record expansion in a CI. This will cause a CI split. VSAM will search within the CA for a free CI to move part of the records in the filled CI. The actual number of records moved depends on the mode of processing. If a free CI is found, then only a CI split occurs. If a free CI is not found, then a CA split and CI split will occur.

The major problem with splits is that performance can be affected during the split. The dataset's integrity is also in jeopardy during this period until the index or indices are updated. On-line response can be affected up to several seconds during a CA split. Free space is the best defense against splits. The other defense is dataset reorganization. Generally, CI splits are not necessarily bad but do serve as a warning that CA splits may be near. CA splits are not good because they take longer to move data during the split, can cause secondary allocations (almost equivalent to the opening of a dataset) and will get the dataset out of physical sequence for processing. This can cause some overhead in sequential processing. However, more important is that splits can create free space that may never be used, thus wasting space. Note that splits can occur in the index as well as the data. When the dataset starts getting CA splits, it is time to plan or perform a reorganization. Also, a review of the free space parameter should be made. ☺

In the next issue, the following areas will be covered: free space selection, I/O buffer allocation, space allocation and index options.

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Eugene S. Hudders is currently the president of Multiple Computer Services, Inc. (MCS). In 1983 he became a Certified Data Processor (CDP) and Certified Computer Programmer (CCP). He has an accreditation as a Certified Systems Professional (CSP). He was an IBM employee for more than 15 years, having occupied po-

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Display Operator Console Support

DOCS Makes Operating VSE Simple

By John Kador

Have you noticed a line of people around the DOS/VSE operator console? Do operators log miles walking between tape and disk drives and the solitary console available? Do your programmers make routine and disruptive pilgrimages to the data center to monitor jobs? If you operate your DOS/VSE data center from just one central console, all of the above will surely sound familiar.

Display Operator Console Support (DOCS) from Smartech Systems in Dallas, TX offers enhanced console support for DOS/VSE and VSE/SP. DOCS allows you to operate your VSE or MVT system from up to 48 true consoles — local or remote. That means your staff can monitor jobs from their desks instead of trekking to the data center. And because DOCS can be accessed from multiple terminals, you can set up the computer room with less concern for the placement of a single VSE console. Operators do not have to return to the central console after mounting tapes, disks or changing printer paper, creating a more organized computer room.

DOCS permits anywhere from one to 48 display units and printers to be used as a SYSLOG device. It operates independent of CICS, ICCF or CMS; but any DOCS console can be shared with CICS or ICCF. Display units may be mixed by both type and screen size. It supports all models of 3270-type terminals except the Model 1.

With multiple consoles, operator workload can be redistributed rather than having numerous operators crowding or competing for a single console. DOCS lets programmers access the console from their desks — eliminating frequent and disruptive trips to the machine room.

DOCS operates as the standard CRT system task, thus permitting it full use of the facilities of the supervisor with standard interface techniques. None of the standard operating system components is altered, renamed or physically replaced by DOCS. It uses a unique scheduling and handling technique to process SYSLOG I/O requests.

The Device on Loan Facility permits application programs to borrow a display unit from DOCS. It allows a single display device to serve the dual roles of application program display and system console. DOCS display consoles may be "loaned" to any user program, in-

cluding those that use either BTAM or ACF/VTAM. The loan facility is automatic and occurs when a user program issues an I/O command for a DOCS display console. (Users may restrict devices from being loaned by setting a DOCS parameter.)

Central Command Area

Steve Sullivan, assistant vice president for DOS/VSE and CICS Systems Programming at Irving Trust Company, New York, says the bank acquired DOCS when it set up a central command area, remote from the data center. The bank wanted to include its pre-VSE/SP systems along with the worldwide MVS and IMS systems. The bank now operates native VSE 4361s and 4381s under VSE/SP.

Once VSE/SP came out, it considered eliminating DOCS because of the console support provided by SP. However the operations people balked because SP did not offer dynamic systems status display. SP requires the operators to refresh the screen. DOCS allows operators to monitor the system continuously without having to hit a PF key to redisplay the screen. Another advantage of DOCS over SP is in printing the system log. IBM does not time stamp every line on the system log. The DOCS print utility *does* which makes it easy to locate any type of problem if the operator knows what time it happened.

DOCS reduces the number of consoles needed to run VSE under VM. DOCS treats CP like a VSE partition and allows operators to perform CP functions from any DOCS console. Unlike IBM console support, the reply from CP is posted on the console combined with other VSE information, as well as being posted to the DOCS Hard Copy file.

Unattended Operations

Clarke Industries in Springdale, AR is the largest manufacturer of powered cleaning equipment in the country. It operates an IBM 4381 under VM/VSE. By all accounts, it is among the most creative users of DOCS especially in the area of unattended operations. With some custom coding, Clarke Industries uses DOCS as a substitute for an automated operator package. *According to Dave Clark, systems programmer, the use of DOCS enabled the company to bypass using a separate automation package for unat-*

tended operations as well as the \$7,500 license fee.

Because DOCS has a secondary user facility, Clarke was able to write a disconnected CMS service machine controlling the secondary user traffic. The company is now able to respond to certain situations automatically through programmed EXECs without requiring operator intervention. Some VSE systems run themselves unattended with DOCS monitoring events occurring in the system and responding to each event automatically, according to instructions programmed in REXX.

DOCS also provides other utilities that Clarke did not have to purchase. For example, DOCS has allowed Clarke to close CICS files from batch. Here's how Clarke did it. In JCL, the programmer can code a comment line. The secondary user machine saves the comment line when it detects the CEMT command. When the pause occurs, it issues the message and checks the response. If the response is normal, it releases the batch partition for normal execution. If not, it submits a message to the operator console that the CEMT process failed and operator intervention is required. It can also issue POWER commands. With VSE/SP 2.1.6, you can issue POWER release commands. With DOCS, the company can issue any POWER commands by using the secondary user method, including the CP command from JCL. "We're really going to town on it," Clarke says.

Clarke Industries originally installed DOCS for its multiple console support. It was quickly and pleasantly surprised by how it improved overall system operating efficiency, as well. It need not have been. Smartech promises significant performance improvements. Because DOCS eliminates the relatively inefficient IBM console interface code, everything — especially jobs that consume a lot of console I/O and logging SYSLOG information — should go noticeably faster and, according to Clarke, it has. The company is looking forward to the next release of DOCS that promises to provide accessibility to DOCS from a CMS machine without having to dial into the VSE machine.

PF Key Flexibility

Operators can assign values to the Programmable Function (PF) keys to per-

form multiple tasks with DOCS. Included are such Operator Communication (OC) tasks as Start a partition terminated by a JCL STOP command or an idle state; Activate a partition awaiting work under POWER/VSE; or Activate a STXIT macro in a user program (that is, in place of the MSG command).

The PF keys may also be used to store SYS-LOG data. This stored data is called a canned command. Canned commands may be stored on an overall system basis, they may be stored uniquely by device, or they may be stored by operator profile. Canned commands may also be updated on-line from each DOCS console.

In the area of VSE console management, DOCS competes with such products as FAQS (Goal Systems, Columbus, OH), Conman-E (Jason Data Services, El Toro, CA) and Logout (Macro 4, Mount Freedom, NJ). Says Pete Clark, systems programmer and data communications manager at Olan Mills, Chattanooga, TN, "There are major differences between the packages in this area. In fact, direct comparisons are almost impossible. You really have to pay attention not only to the console management functions, but also to the additional functions, as well."

Replacement for IBM Console

Eastman Kodak Company based in Rochester, NY has been a DOCS user since 1982 when it selected the product as a console replacement for IBM's console management package. Glenn Fadner, supervisor of Mid-range System Services, recalls that Kodak wanted to get around some of the performance problems of the IBM console manager. "If you paged back with a bad argument you could spend three days waiting for it to come back to you," Fadner recalls. At the time, IBM did not provide alternate console support as DOCS did. IBM has since remedied that limitation.

With a staff of six programmers, Fadner supports about 20 VSE systems scattered around the country. Kodak has a number of distributed DOS/VSE applications, all of which are critical. The most mission-critical system on which DOCS runs is the Repair Parts Ordering System.

From the first day, Kodak's experience with DOCS has been positive. In fact, according to Fadner, "The first day we put DOCS in for testing, it saved us an IPL." When Kodak was testing the new system, he recalls, several partitions locked up. One of the partitions held the LTA. "With DOCS's Dynamic System Status Display (DSSD), we were easily able to determine which one it was. It saved us having to shut the system down," he adds. DSSD is used to allow an operator to instantly recognize the current status of each partition on the system or each logical reader and writer task under the control of POWER/VS.

Kodak also uses DOCS to provide alternate console support. Fadner and his programmers have access to the console through VTAM. Application programmers get read only access. It also runs some VSE systems unat-

tended on weekends. The capability for some operations people to dial into the system from home and to use DOCS for problem resolution has been helpful. "DOCS offers enhanced capabilities for the operator: much better scrolling and improved display capabilities. These features have become true operator productivity tools. The operators would try to crucify me if I tried to take it away from them," Fadner says.

Fadner's wish list is for Smartech to beef up DOCS's security features. While Kodak requires all operators to logon, he would like some improvements in protecting passwords within DOCS. At this time, all the passwords and signons are stored in a PROC which any programmer with a little intelligence can access. Thus it is not very secure. He would prefer to see such data stored in an encrypted file. "The passwords should be easy to change from a signon screen without having to recatalog the PROC," he says.

At any rate, Kodak does not provide restricted access beyond "you can look but you can't update." There is no call to restrict people to look at a specific number of partitions. The shops Kodak supports are basically single-user shops. "Smartech has done a real good job handling some complex problems and bird-dogging them until they're solved which is essential with anything that has hooks into the operating system," Fadner concludes.

DOCS is available on a perpetual lease (at \$10,600) or several lease plans. The monthly cost for a one-year lease is \$312. Discounts for 9370 users and multiple CPUs are available. All monthly and yearly payment options include free maintenance for the life of the term. DOCS runs on IBM 370, 4300, 308X

and 3090 computers, running either VSE/SP or DOS/VSE. Smartech Systems offers a 30-day no-obligation trial. For more information, contact Smartech Systems, Inc., 10015 West Technology Blvd., Dallas, TX 75220, (800) 537-6278. ☐

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In the September/October issue of the Tech Advisor we provided an answer to the question listed above. Our response generated the following letter from Christopher Frank of Western Life Insurance in Woodbury, MN. His letter offered another opinion on this problem and we felt it was worth passing on.

Q We are an IBM 4381 shop running VSE 2.1, VTAM and CICS. The CICS shutdown statistics entry TIMES STORAGE RECOVERY ENTERED is consistently around 3,000 while the "NO STORAGE VIOLATIONS" message is displayed below. I understand that CICS believes it recovered any broken storage chains but I feel that there is some corrupted storage left from the recovery. How can I identify the transaction(s) that is causing this? I should add that the total number of storage acquisitions/releases is averaging 5.5 million and total tasks average 220,000 per day.

A The feature, *Answers from the Tech Advisor*, published in the September/October issue contained a reply to a question about CICS storage recovery, suggesting that storage recovery can be driven when CICS goes through Program Compression. Assuming the question was printed in its entirety, I disagree with the responder's hypothesis. I have worked with systems that would frequently go through Program Compression and have never seen it interpreted as a possible storage violation. Program Compression is a normal function of CICS and it does not cause storage recovery to be driven. Increasing the size of the DSA will have no effect on such a problem and if it did, I would call IBM support and open an APAR on it. For the responder to say that this problem "should not cause any storage corruption" was premature and misleading.

The reason for the disparity between the TIMES STORAGE RECOVERY ENTERED and the NUMBER OF STORAGE VIOLATIONS is clearer if you change the wording a little bit. The TIMES STORAGE RECOVERY ENTERED should be read as NUMBER OF TIMES CICS STORAGE CONTROL ENCOUNTERED A PROBLEM. There are many things that can cause CICS to think a problem exists. You can find a list in the Failure Analysis Structure Table for DFH0501 in the back of the manual, *CICS Messages and Codes*. DFHSCR is given control at that time. It increments a counter in the PAM (PAMSRCNT), then attempts to determine who caused the storage corruption and attempts recovery if the SVD = option in the SIT specifies that it should. The number in PAMSRCNT is the number you see as TIMES STORAGE RECOVERY ENTERED.

The NUMBER OF STORAGE VIOLATIONS (or in this case NO STORAGE VIOLATIONS) is based on the sum of all the storage violation counts maintained in each PCT entry (for tranids) and TCT entry (for termids). DFHSCR will do its best to determine what transaction caused the violation or at least the terminal in which the violating transaction was entered. Thus this message could be read as NUMBER OF STORAGE VIOLATIONS CICS COULD BLAME ON SOMEONE. If it cannot determine the transaction or terminal involved, it obviously cannot increment a count in a PCT or TCT entry. If all of the violations are of this type, you will see no storage violations detected, despite the fact that storage recovery was entered.

Often this situation is caused by CICS Storage Control getting confused about something and handing the problem over to DFHSCR whose job it is to figure out such things. For example, the GETMAIN and FREEMAIN accumulators CSASCAR and CSASCFI were four-byte packed decimal fields and as such would "roll over" when these counts reached 10 million. Storage Control gets confused when this happens and

calls DFHSCR which ignores the condition but still increments the TIMES STORAGE RECOVERY ENTERED count. I believe this is fixed in CICS 1.7 but is one possibility.

Another more likely cause is that an invalid FREEMAIN was issued by one of the CICS management modules like KCP or TCP. This is common if you have an application that treats non-terminal storage like a TIOA. When CICS attempts to free it at end-of-task, a "storage violation" occurs. DFHSCR could abend CICS but instead just ignores it and tries to go on, usually with no harm. However the TIMES STORAGE RECOVERY ENTERED count was again updated. This is most likely the problem; some task is overlaying its own storage or losing addressability to one of its storage areas and KCP is detecting it at end-of-task. CICS (who does not normally perform storage validation until the task ends by the way) is unable to attribute it to the offending transaction. In such a case there is usually no way to tie the violation back to a specific task.

Also, if a free area is being corrupted, keep in mind how CICS so-called storage recovery works. CICS does not really "recover" storage . . . it usually just rechains the FAQEs around it, effectively shrinking the DSA. Thus the concern of the user that storage was being lost is valid and the suggestion of the responder to just increase the size of the DSA is no solution. Were the problem due to overlaid FAQEs, increasing the DSA may possibly reduce the number of times DFHSCR is entered, since a larger DSA may result in more widely dispersed FAQEs. However this is certainly not a fix to the problem.

What to do? Well, if the problem is an invalid FREEMAIN, there should be ASCF transaction dumps. Also be sure you use the SVD= option in the SIT. The default for this is SVD=0 which will *not* produce a dump. Specify SVD=1 to get a dump and see if you can identify the culprit. If you have a value for SVD= already and are not getting a dump, it could be because CICS is detecting the problem while a system task like KCP or TCP is in control and, as stated above, in such a case DFHSCR ignores the problem and it will not produce a dump. Another possible approach would be to try Aux Trace. The question stated that storage recovery was entered about 3,000 times a day and that they ran about 220,000 transactions per day, so there appears to be about one of these "events" every 75 or so transactions. Turn on Aux Trace and monitor the system for a short time; you should be able to trap one of these events easily. You will see a x'CA' trace record written each time storage recovery is entered. This entry will contain the active TCA address in the DATA1 field and DATA2 will contain the address in SCP where the error was detected. Watch for several occurrences and see if you can spot a transaction that always appears just before the error occurs. Also, you could turn the CSFE DEBUG trap on. This will activate a trap built into the CICS trace program that will validate one or all of the storage subpool FAQE chains every time the trace program is driven. The violation may be detected earlier this way before the task causing the problem has ended. This transaction is documented in the manual, *CICS-Supplied Transactions*. Be careful with it because it will likely cause a significant increase in CPU and storage utilization.

This is probably not a serious problem as long as CICS continues to report NO STORAGE VIOLATIONS. But that does not mean you should ignore it. Anyone with such a problem should be careful before "blaming" storage violations on Program Compression. This is an incorrect conclusion and the suggestion to just throw more storage at the problem was ill-advised. This could be a potentially serious problem; it should be investigated and resolved properly. ☹

Make Information Services Pay Its Way

*Most companies can use
and benefit from a
profit-center approach.*

By Brandt Allen

It is no secret that companies can use information technology as a key to competitive advantage. However the computer key cannot unlock the competitive door if Information Services (IS) functions — or rather malfunctions — as it does today in many companies. Top managers routinely rate their computer departments dead last among staff functions. Not only is IS slow and inefficient, they complain, but it is also expensive and unresponsive to inside customers.

If IS is to achieve a strategic end, companies must manage it as a productive part of the organization. The best way to do this is to run IS as a business within a business, as a profit center with a flexible budget and a systematic way to price its services. In companies that have already turned their IS systems into profit centers, the results have been impressive: the top management complaints are greatly reduced and the expected efficiencies have materialized. When organizational shackles are lifted, IS can and does serve a strategic purpose.

Many managers are openly skeptical about the profit-center concept. They continue to view IS as a drain on, rather than a contributor toward, corporate resources. These managers are wedded to a past in which computer departments were part of the controller's organization. They were treated as cost centers with fixed budgets and were not expected to generate revenues. Many managers thus dismiss the

computer department as part of overhead, the company's dead weight.

I find it helps to understand the importance of the profit-center approach if you look at the spectrum of ways that companies control and manage IS. At one end of the spectrum, IS is just another corporate staff function and its strategic importance is usually nil. At the other end, IS is managed as a division or operating unit and plays an integral part in the corporation's strategic plans.

The *classically centralized* computer department is completely subsumed in corporate overhead. Companies in which decisions about applications, priorities and technical solutions are made only at the top prefer this approach. IS does not allocate costs (chargeout) to customers but may still publish them to make users aware of their magnitude.

Under *bureaucratic* control, IS managers and users of IS services share decisions about everything from applications to budgets, usually through a steering committee. IS operates as a fixed-budget center with established measures of service; chargeout is a matter of costing, not pricing.

The *profit-center* department is different. Budgets are variable. The center sells services to users at a price. Users assume most of the responsibility for decisions about computer use and choice of technology.

I have broken down these three ap-

proaches into eight levels based on how costs are allocated. Levels I and II are centralized approaches; levels III through VI, bureaucratic approaches; and levels VII and VIII, profit-center approaches. Each approach has its advantages and disadvantages. The first section of this article details the eight levels and their differences. The second section answers the questions about the profit-center approach most often asked by management skeptics. Those managers who wish to understand the logical progression to the profit-center approach should start with the first section. Those who wish simply to understand the theory and practice of profit centers should begin with the second.

Levels of Control

In a chargeout system, computer department costs are assigned to users — the various departments and divisions within a company that benefit from or consume computer services. There are almost as many approaches to cost allocation, or chargeout, as there are companies, but they all essentially fit into one of the following eight basic levels.

Level I

No chargeout: "We don't believe in it." Some organizations simply do not allocate computer department costs either for applications development (design, programming and maintenance) or for pro-

cessing (computer operations). Instead, they simply treat these costs as part of corporate overhead. Users are never billed for their share of the computer charges.

Level II

Charge included in corporate overhead allocation: "It's in your G&A." Some companies allocate the costs of corporate overhead, including computer department costs, to divisions or departments based on some criterion such as revenue, assets or head count. Although a portion of these allocated costs includes computer costs, the allocations are not related to use.

Level III

Memo record: "We don't do it, but if we did . . ." A memo-record system has no interdepartmental accounting entries and users do not have to budget for computing. Companies do, however, prepare estimates of what the cost would have been. This system is sometimes called "let's pretend chargeout" or "show-back accounting." It gives users cost information even though they do not pay the costs. Companies can use memo-record accounting for both operations and systems development. It is an essential first step toward implementing a chargeout system. Some companies take this step by treating the computer charges as "non-controllable" or "below the line" — charges that appear on users' operating statements but for which they are not held accountable.

Level IV

Classic chargeback: "We'll let you know at the end of the year." Companies commonly make a first stab at computer costing by end-of-period cost allocation or book balancing. If a department consumes 37 percent of the computer resources and 40 percent of the development and maintenance hours, it is assigned these shares of each cost. Sometimes the corporate office may subsidize a certain proportion of the costs. The chief drawback of this classic system is that companies make no charge until the year is over. Users rightly complain that they never know what the charge is until it is too late to do anything about it. They must guess at the cost implications of their decisions. This approach is also called zero-balance cost recovery. I call it bookkeeping run amok.

Level V

Break-even rates with year-end adjustments: "We reserve the right to adjust

everything in December." Some companies go beyond the classic system and predict the rate of consumer use from budgeted costs and forecasted volumes; they bill for usage at estimated rates. Unfortunately such forecasting results in under- or overbooked costs at year's end. Leftover funds go back to the users in proportion to their computer charges over the year — hence the name "the Christmas present" method of chargeout. Development costs are handled the same way; users get estimates of a project's total cost but developers are not bound by the estimates. By adroitly combining frequent rate changes and end-of-year accounting shuffles, companies break even using this system — more or less.

Level VI

Budgeted rates: "Our rates are set for the year." With this approach, companies may actually set the rates they charge users so that the system will theoretically break even. At year's end, the company neither allocates leftover costs back to users nor rolls them forward to the next period. Typically, they treat them as an overhead expense. The estimates made for development projects are like contract prices; the user and IS department often share cost overruns.

Level VII

Standard rates and negotiated prices: "We use standard costs." This is the first level in which companies explicitly recognize that cost and price are two different things. For applications development, IS charges contracted prices (perhaps with penalties or savings sharing). For computer operations, a company either takes a break-even approach or bases rates on standard costs, costs plus a markup, outside market prices or some negotiated rate. Charges at this level operate in a fashion similar to other interdivisional transfer prices in the company.

Level VIII

Functional pricing: "We use transaction pricing." In levels III through VII, companies divide IS charges into cost pools (processor, disks, printers, tapes). Companies using functional pricing base prices on a completed task or attribute rather than the machine units necessary to produce it and attach the charge to what the user sees, receives or causes — a report or a transaction, for example. Thus a user might be charged \$3.25 for a report, \$12.50 for a payroll check, \$17.00 a transaction for order processing or

\$27.80 per month per employee. Companies choose tasks or attributes that are meaningful to the user while at the same time approximating the cost of the service provided. The users readily understand what they are buying.

With functional pricing, the computer department still needs a system to know just what each of its tasks costs and some applications must still be costed in the traditional machine-rate fashion. However much of what is produced in computer departments today can easily be task priced. For example, banks charge their branches so much per month for customer checking accounts as well as so much per item (a check or a deposit).

Why Do Chargeout?

In theory, companies have four objectives in doing cost allocation or chargeout. In practice, however, they may adopt only one or two.

Cost Assignment

Although you often hear that "chargeout recovers costs," it really assigns the cost of information processing directly to the departments and divisions that used the services. Departments can analyze the full costs of their own products and services, including IS costs, and the company can do better departmental profit-and-loss accounting. If the trust department of a bank consumes \$1 million of IS resources, for example, the organization must find some way to assign that million to the department. The department must know what each of its services really costs and the bank must have some way to measure the overall performance of the trust department. Chargeout costing methods (Levels IV through VI) all accomplish this objective.

Control

The company either wants users to act responsibly when consuming IS resources or would like to hold both users and IS management accountable for their actions, typically by using a chargeout figure other than actual cost, like standard rate or negotiated price (Level VII).

Incentives

To steer the organization toward certain technologies or methods and away from others, a company may subsidize an emerging technology while penalizing the use of outmoded options.

Budgeting

Organizations taking a variable-operating-budget approach use chargeout to

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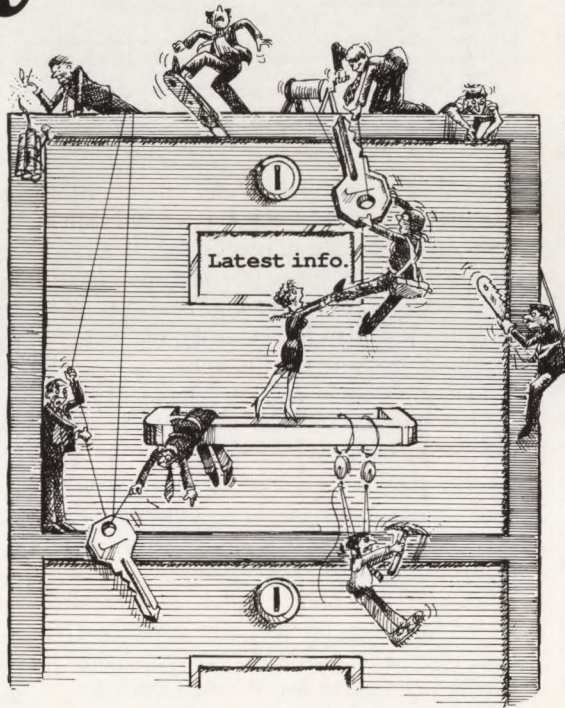
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determine the overall level of IS spending. The chargeout (transfer price) serves to clear or level supply and demand between IS and the users. Under centralized and bureaucratic control, a company sets computer rates after predicting the volume and setting the spending budget. Under a variable budget, a company sets a chargeout price first; that price then determines the demand or volume. Flexible-budget IS centers are sensitive to demand. The price or rate for computer services indirectly determines spending (Levels VII and VIII).

To be effective, a chargeout system must:

- Be understandable to the user — many schemes couch their charges in technical terms few managers understand
- Be predictable so that managers know the cost consequences of their decisions in advance
- Reflect economic reality. Chargeout should lead managers to make the right decisions about computer use — from the perspective of their own department and when judged by the interests of the whole company. An advanced chargeout system, designed to encourage both the users and the providers of computer services to make wise decisions, lays the groundwork for the smooth operation of IS as a profit center.

Profit-center Potential

Despite the commonsense appeal of the profit-center approach, managers often resist adopting it in their corporation. Their main objection is that information-processing costs are fixed. In their view, chargeout is simply a bookkeeping exercise; it is funny money. Besides, since IS serves internal company users, it should be a cost center. Managers believe running the computer department as a profit center is impractical if not impossible and probably unfair. In fact, the profit-center approach is decidedly fair, unquestionably possible and undeniably practical. To show how and why, I will deal in turn with some of the issues raised by skeptics, beginning with the basis of their skepticism.

Aren't Computer Costs Fixed?

Years ago, computer costs behaved much differently from the way they do today. Departments were smaller and growth rates lower. Hardware was the big cost item. Orders for new capacity were

FIGURE 1

Company A's Computer Budget and Capacity Summary

Cost pool	Annual budget thousands	Current capacity	Type of cost	The next increment		
				Capacity	Cost	Delivery time months
Staff	\$25,400	971 people	Variable over short term	<1%	<1%	2
Terminals	2,010	1,304 terminals	Variable over short term	<1	<1	1
Communication lines	9,694	795 circuits	Variable over short term	1	1	3
Disk storage	1,508	218 spindles	Variable over short term	1	1	4
Tape storage	271	33 drives	Variable within six months	3	2	4
Printers	163	4 printers	Variable within six months	4	13	4
Communications equipment	619	11 units	Variable within six months	20	29	5
Mainframe processors*	5,254	2,243 units	Variable within six months	15	8	6
Equipment maintenance	2,195	n.a.	Mostly variable	—	—	—
Occupancy, overhead	8,351	n.a.	Managed cost	—	—	—
Software†	1,315	n.a.	Fixed	—	—	—
Total	\$56,780					

*Processing capacity is measured using industry standard units wherein the IBM 370/158-3 equals 45 units. The next increase in capacity would be to upgrade an IBM 3083J to a 3081K.

†Software includes IBM operating systems, utilities and third-party packages.

usually large and took a long time to fill. Companies could achieve significant economies of scale in processing. Understandably, many managers saw the computer department as one big fixed cost; at anything less than full capacity, the incremental costs were next to zero.

In today's environment, computer reality has shifted. Annual growth rates in processing capacity can run as high as 30 percent; disk storage rates are even higher. Data center managers have limitless options and do not have to wait long to implement new ideas. Economies of scale in processing no longer exist; two small mainframes can produce job costs lower than one large mainframe. Even though average computer use is often considerably lower than a company's theoretical capacity, it is still a cost that should be borne by the users.

To appreciate the variability of the costs of a typical computer department in a large company today, it helps to look at its budget and capacity summary (see Figure 1). Company A, a \$3 billion company, operates 78 plants, is a leader in its industry and is widely respected for its computer management expertise. With 971 employees, the company's IS department oper-

ates large IBM mainframes and a substantial telecommunications network; its computer processing capacity is growing by about 35 percent per year. Figure 1 shows the annual budget, current capacity, cost of additional capacity and expected delivery time.

Only \$1.3 million or 2 percent of the company's costs are truly fixed including costs for software, particularly operating systems, as well as costs for database managers and compilers. Another \$8.3 million or 15 percent are for occupancy or "managed costs" and are a function of space requirements for the staff. More than \$25 million of the total budget or 45 percent is for people. That, together with the costs of terminals and communication lines, brings the total for clearly variable costs to 64 percent. The speed of delivery for new capacity is also striking. The company can add disk and tape drives and printers within four months. The item with the longest lead time is a mainframe processor that requires a six-month order cycle. The additional processor would add 15 percent to processing capacity but only .7 percent to the total budget.

In short, IS costs are not really fixed. They can be made to vary with volume



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or demand over as short a time frame as one quarter. They can be managed even if there are constraints on the manageability. To succeed in this environment, IS managers must get closer to their customers (the users), anticipate their needs and plan for contingencies.

How Does a Profit Center Work?

A profit center must have three conditions to work properly. One is a way to price or value computer services at some figure other than cost. Another is the authority to incur costs and to acquire resources to meet demand. Senior management must delegate responsibility for selecting what level of computing users may request. User demand drives a flexible or variable operating budget.

The third condition is an objective that its revenue must equal or exceed cost. The center must measure both its input (cost) and output (revenue) in financial terms. Implied is a customer who purchases the information services and an IS management that encourages products whose revenues will exceed costs and discourages those whose revenues do not. Managing the difference between these two figures is the essence of profit-center control.

By the same token, the profit center need not become an independent service bureau with outside customers. Nor does the center need to make a big profit or for that matter any profit at all. As a practical matter, most data centers will continue to have expenses and revenues that are more or less equal because they lower prices to keep revenues in line with costs. Actual levels of profit or loss will not change the way IS functions or is viewed by the organization. The combined controls of variable budgets, chargeout prices and profit-center measures will.

Finally, the profit center does not imply a lack of control over IS spending. It implies only that budget and financial controls work much differently than they would in a cost center. The computer department must still compete for capital funds but its operating budget is no longer fixed by management fiat. It is indirectly set by the users. Profit-center budgets reflect management's plans to meet demand under various forecasts.

Who Controls Spending?

When IS is run as a cost center, senior managers control the funding for computing and are responsible for monitoring the efficiency of the IS department. Most find this a tough assignment; few have much confidence in their ability to do it

well. Because the computer department's overall performance is difficult to measure, senior managers periodically cut the budget to force IS management to be careful about spending.

Establishing the computer department as a profit center transfers control of funding to those who use the services. Users are the source of funds and they judge IS efficiency. When the data center is efficient and responsive, it gets more work. When it is not competitive, users are free to seek alternate solutions like departmental computers, micros, purchased packages and service bureaus or they can simply pressure IS for rate reductions and service enhancements.

What Are the Advantages?

A profit-center approach benefits the organization and encourages the use of information processing when the overall value to the department of using the service exceeds the cost of the service and when the price received by IS for the service exceeds its cost.

IS profit-center management has five key advantages over cost- or service-center control. First, when managed as a profit center, IS provides better service because it is rewarded for successfully responding to the demands of users. When companies manage data centers as fixed-budget cost centers, the departments have neither the budgetary flexibility nor the performance measures necessary to be truly responsive to customers and the computer service erodes. A profit-center approach encourages responsiveness, high-quality service, innovation and cost control.

Second, the IS budget-setting problem disappears for the corporation because users determine their own budget limits. Users, not the hapless IS director, must justify the IS budget.

Third, the IS function becomes more efficient because the profit-center approach provides a basis for measuring both its efficiency and its effectiveness. The chargeout price reflects the cost of a service and what it "ought to cost." It really is the wholesale value of the service. The application may have retail value to the user but that is for the user to decide. To the user an application may mean greater sales, better market analysis or a quicker product introduction. However to the computer department it represents so much disk storage used, so many computer cycles turned and so on. When IS is set up as a cost center, its managers act as if they were selling a commodity. The em-

phasis is not on efficiency. Rather, if they can turn over their actual costs to users, they will — whether these costs represent great efficiency or outrageous extravagance on the part of IS.

Think of IS as a manufacturing division; companies do not let individual plants charge their actual costs to the plant that uses their components. Instead, companies use standard costs (what the cost should be) or standard cost plus a markup or a transfer price (reflecting perhaps a market price). You can treat information services in the same way. Once management has a dollar figure to associate with the results of IS (other than cost), it can compare the costs of IS with its results.

Fourth, users make better decisions about how to use and acquire information services. Typically, a cost-based chargeout system results in distorted "funny money" figures. You often hear an IS justification like, "Yes, I know that we charged you \$400,000 for that job last year and, yes, you could probably do it on your own model X machine for \$250,000, but that doesn't mean the company would save \$150,000. Actually, we figure switching to the local machine would cost the company an extra 50 grand." Such statements quickly destroy the confidence managers might otherwise have in both the chargeout system and the IS organization and drive them to alternate computing services, even when no one knows whether such alternatives would be in the company's best interests. When IS is a profit center, the transfer price becomes *real money* — IS is willing to provide the service at that figure. If the user has a better alternative that still meets the corporation's security and strategic policies, it is best for all parties (the user, IS and the company) for the user to pursue it.

Fifth, companies introduce new technology sooner and with better results. Users can better evaluate and acquire new systems, software and information-processing technology than can a central IS function. In general, companies using a profit-center system have more advanced technology and fewer failures than those using cost centers. One reason is that the managers who benefit from the new technology can justify the expense and pay for the service. They do not have to depend on central budget approval. There is less game playing, greater trust and a more harmonious relationship between IS and the users.

The most common failures with the

profit-center approach occur when management overrides the variable budget with caps or constraints. Under profit-center control, it is the users who can best decide, application by application, where to cut costs. Companies also have problems when data centers sell services both inside and outside. Unless the data center is especially well run and efficient, the inside business subsidizes the outside contracts and the situation becomes intolerable. Insiders then seek alternatives.

Do Companies Really Do This?

Several sophisticated companies have instituted profit centers although each has a different twist. The complex approach of a U.S. automotive manufacturer in which several data centers provide services gives data-center managers two budgets instead of one. A net budget covers the planned activities for which there is to be no cost allocation such as corporate-office systems support, computing activities for research and development or any purpose with no single, clearly defined owner. All other information processing is sold or charged to the users at a fair price. A total spending or gross budget is not fixed but is instead a function of what the users require. The demands of users change during the year as the level of activity in their plants changes and as decisions about micros, plant computers, service bureaus and software purchases change. IS operates as an internal service bureau (actually, as several because each data center operates this way).

The IS division of a large electronics company has a profit objective and an ROI target. The IS division, that provides services only to other company divisions and headquarters departments, is run just like any other profit-center division. The reasoning is that if component divisions produce and sell various components to other divisions within the company and the company treats those component divisions as profit centers, why not treat computer services the same?

One of the most advanced and best managed U.S. government agency data centers operates as a variable-budget, full-chargeout profit center although the agency downplays its profit-making dimension. While the agency calls it a "cost-recovery center," it behaves as a profit center. No central authority approves or appropriates the funds. The profit-center managers can change their plans and the budget as needed; they can spend what they sell. The excess of rev-

enues over expenses just is not called profit. (Actually, the center shows little profit because it keeps lowering its rates.) The center aims to increase revenues and reduce expenses. Additional expenses are expected to result in additional revenues. The center has been run this way for 20 years and is known for having the lowest costs and the highest service levels of any government data center.

At the profit center of one of the world's largest chemical companies, the IS bud-

get divides all expenses into two categories: budgeted (that includes costs for administration and related overhead) and forecasted (that includes computer rentals, operations and systems development and other demand-sensitive expenditures). IS management must live within the budget authorization but does not have to adhere to the forecasted guidelines although it must recoup those funds through user charges. Small end-of-the-year variances are expected and absorbed into a

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A European corporation has set up IS as a separate corporation owned by the company's subsidiaries. As a profit center with a flexible budget, IS charges for its services at competitive rates while a headquarters committee approves pricing policies. The company chose an independent legal entity to separate the concept of ownership from use. Some subsidiaries felt strongly about the advantages of a shared data center and provided the starting capital. These subsidiaries realize the profits and losses of the IS company in proportion to their ownership; users buy services and pay a competitive price in proportion to their use.

How Do You Protect Users?

Ironically, companies using a cost-center approach have more problems with unfair charging than do companies with profit centers. Users can negotiate with profit-center management if they believe the prices are out of line and, in general, have a good sense of what a reasonable charge would be. In cost centers, arguments about cost never stop.

What Will Technology Do?

The increasing decentralization of computing to divisional and departmental data centers and the growth of end-user computing will not make the corporate data center obsolete. In fact, as micro-computers proliferate, corporate data centers will house corporate databases or at least keep track of databases throughout the organization. They will be busy supporting the users' micros and work stations with networking capabilities, data subsets and other support tools. Even in decentralized organizations, company-wide or global systems will exist for which costs must be assigned to users. As large companies operate five or six times the computing capacity and perhaps 10 to 20 times the storage capacity in their central computer departments, they will need a well-conceived approach to data-center control.

Where Do Profit Centers Fit?

The requirements for controls like chargeout and profit centers vary over the experience cycle of a technology. Chargeout can inhibit a company in the early phases of a new technology but become more advantageous in the later stages when effective controls are essential.

Profit-center control fits best when users decide how much computing to use, how to use it and in what form. Because users

have funding responsibility, they must have the experience and judgment to assume such responsibility.

The most important requirement for a successful profit center is that senior management believes that control over computing belongs with the users. If executives view computing as a specialist's task best controlled by corporate IS with top management oversight, then profit-center control is not for them.

The profit-center approach is not a panacea for technologically backward, costly and poorly managed departments unless the company wishes to spark a wholesale flight to decentralized or outside computing. It fits those operations that are already competitive with outside service bureaus. Indeed, many large corporate data centers claim cost levels half that of the well-known national service bureaus. The only reason these centers are not competitive internally is that they lack a service orientation.

Profit-center control can dramatically improve the way information services are provided within a corporation. It may not be an appropriate technique for all organizations but when it fits, the results are dramatic. Given the size and growth of information systems spending, the increase in end-user computing and decentralization and the changing economics of computing, most companies can use and benefit from a profit-center approach.

Computer managers often understand this and are aware of the need for changes but lack the authority to make them. Adoption of profit-center controls requires top management backing and some organizational changes. To perform as most managements wish, IS should not only have development and operations responsibilities but also must market and sell, conduct research and manage its human resources. Without a profit center, many companies will find their IS function becoming their primary strategic weakness rather than their strength. ☹

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Capacity Planning

For VM/VSE Systems

By Duncan Cheung

This article presents a tutorial approach to conducting a capacity study for VM/VSE systems. It takes a "how to" approach and concentrates on building a model to represent your workload requirement. In addition, it presents a method by which various CPU models from different vendors can be compared with respect to your unique environment. Unfortunately, the scope of this article is limited to VM/VSE systems due to my own personal experience. On the other hand, I am sure MVS analysts and planners can adopt this model for their own use.

There are two major sections in this article. The first deals with current batch workload and its forecasts. CPU capacity is then expressed in CPU hours to match against the batch forecast. The second section uses a different approach to capture the on-line workload. Similarly, CPU power is converted to on-line CPU hours and matched against the on-line requirement.

Batch Workload

Perhaps batch workload is the easiest to determine since there are many job accounting packages available in the DOS/VSE environment. Even though each accounting report is different, they invariably

contain at least the following fields:

- Job name
- Number of runs
- Duration
- CPU-time
- Number of total SIOs
- Number of disk SIOs
- Number of tape SIOs.

The most important field is CPU-time since this will indicate the raw CPU cycles (in units of CPU seconds, minutes or hours) consumed for each job. At this point, no overhead from any operating system is considered.

Once you have ensured that job accounting is running accurately, the next task will be to group your batch jobs into application systems. This could be the most time-consuming and tedious task since every batch job must be accounted for.

Talking to the right people is also important. The systems and operations staffs are probably good starting points. Then, the individual responsible for each application system should be consulted for any anomaly. Specifically, the number of runs as referenced in the list above would be a good indicator of whether reruns were made.

Figure 1, a simplified version of a real case, provides an example of some applications common to most intermediate systems.

Once you have defined the group of applications to account for each batch job, the next major task is to decide when to capture the batch workload, that is, the peak period. Peak period is highly dependent on your processing environment and demands your familiarity with the batch system. However a good starting point would be weekly, month-end or year-end processing. For this example, I will use month-end processing to illustrate a few points.

In Figure 1, it is apparent from the daily totals that month-end processing is finished by the end of day three. In fact, it took three nights to complete this particular month-end. If one of the objectives is to finish the month-end processing within the same time period, then the month-end total will be the sum of three nights of processing for each application and the average per night will be the sum divided by three. Figure 1 also features the use of percentage of daily totals. This column acts as a "reasonableness" check for the amount of CPU consumed by each application. The prime objective is to ensure that the data collected is a fair representation of the current workload.

Batch Workload Forecast

Figure 2 illustrates the current month-end workload summary and a five-year forecast for each application. The number of years to forecast is purely arbitrary; it depends on how long you plan for your CPU to last. Most people would have a good idea of what is going to happen in the next two years. After that, the accuracy of the forecast diminishes. Forecasting workload is therefore an iterative process and use of electronic worksheets is a tremendous aid.

The application systems individuals can see the effect of their forecast in the worksheet and revise their projection through iterations until they agree with their intuition. In my opinion, forecasting is done to express the individual's intuition on paper. With a capacity plan model, any forecast changes in the future can be updated in the model. It seems apparent that forecasting is an ongoing process; it should be reviewed once a month to ensure the projects are proceeding as planned.

In Figure 2, both A/P and G/L have heavy activities in year one, probably due to conversion of an old system to a new package. Then the growth rate diminishes to five percent in the last two years. This illustrates that the forecast is probably more accurate in the next two years than in the following two. Another point is that a plan is in place to double the development staffs in three years. This is represented as a 33 percent increase over the next three years.

CPU Capacity for Batch Workload

Figure 3 represents the batch workload over the next five years. The next task is to determine how many CPU hours are available from the current processor. Let us assume that our CPU is an IBM 4381-13.

The formula to calculate CPU hours:

$$\text{User CPU hours} = \frac{\text{Elapsed time} \times \text{CPU speed} \times \text{Average utilization}}{\text{VM Overhead}}$$

The formula used to calculate CPU hours is from the article, "4300 Configuration and Performance Considerations," by Ken Harvey, president of CSP. Assume in our case that batch processing starts at five in the evening and ends at eight the next morning. Total elapsed time would therefore be 15 hours. Using our current CPU as the point of reference, we

FIGURE 1

Current Batch Workload										
COMPANY	XXX									
Applications	Day 1		Day 2		Day 3		Day 4		Month-end	
	CPU min	% Total	CPU min	% Total	CPU min	% Total	CPU min	% Total	Total	% Total
A/P	47.5	17%	17.9	7%	24.8	9%	24.6	25%	90.2	11%
G/L	47.2	17%	54.1	21%	61.3	23%	32.2	33%	162.6	20%
A/R	8.8	3%	4.5	2%	54.3	20%	5.2	5%	67.6	9%
INVENTORY	78.2	29%	76.3	30%	53.6	20%	8.6	9%	208.1	26%
FINANCIAL	34.2	12%	8.3	3%	7.6	3%	6.6	7%	50.1	6%
MARKETING	7.8	3%	11.3	4%	9.6	4%	5.6	6%	28.7	4%
PAYROLL	28.1	10%	52.1	21%	29.8	11%	6.8	7%	110	14%
DEVELOPMENT	22.4	8%	28.7	11%	25.4	10%	6.9	7%	76.5	10%
Subtotal	274.2	100%	253.2	100%	266.4	100%	96.5	100%	793.8	100%
CPU Hours	4.6		4.2		4.4		1.6		13.2	

FIGURE 2

Batch Workload Forecast											
COMPANY	XXX										
Applications	Month-end										
	Average	Yr 1 +%	CPU min	Yr 2 +%	CPU min	Yr 3 +%	CPU min	Yr 4 +%	CPU min	Yr 5 +%	CPU min
A/P	30.1	300%	120.3	15%	138.3	15%	159.1	5%	167.0	5%	175.4
G/L	54.2	400%	271.0	15%	311.7	15%	358.4	5%	376.3	5%	395.1
A/R	22.5	30%	29.3	5%	30.8	5%	32.3	5%	33.9	5%	35.6
INVENTORY	69.4	30%	90.2	5%	94.7	5%	99.4	5%	104.4	5%	109.6
FINANCIAL	16.7	-100%	0.0	0%	0.0	0%	0.0	0%	0.0	0%	0.0
MARKETING	9.6	30%	12.4	5%	13.1	5%	13.7	5%	14.4	5%	15.1
PAYROLL	36.7	10%	40.3	15%	46.4	15%	53.3	5%	56.0	5%	58.8
DEVELOPMENT	25.5	33%	33.9	33%	45.1	33%	60.0	0%	60.0	0%	60.0
Total CPU min	264.6		597.4		679.9		776.2		812.0		849.6
Total CPU Hours	4.4		10.0		11.3		12.9		13.5		14.2

can equate the CPU speed parameter to be "1," even though the rating of a 4381-13 is around 3.7 MIPS.

The next two variables require VMAP reports to confirm their values. VM overhead can be picked up from the "user's

summary" report where the VSE virtual machine is running. If you do not have access to VMAP, a "best guess" number to use would be 27 percent for batch.

Average utilization is the maximum utilization achievable in the VSE environ-

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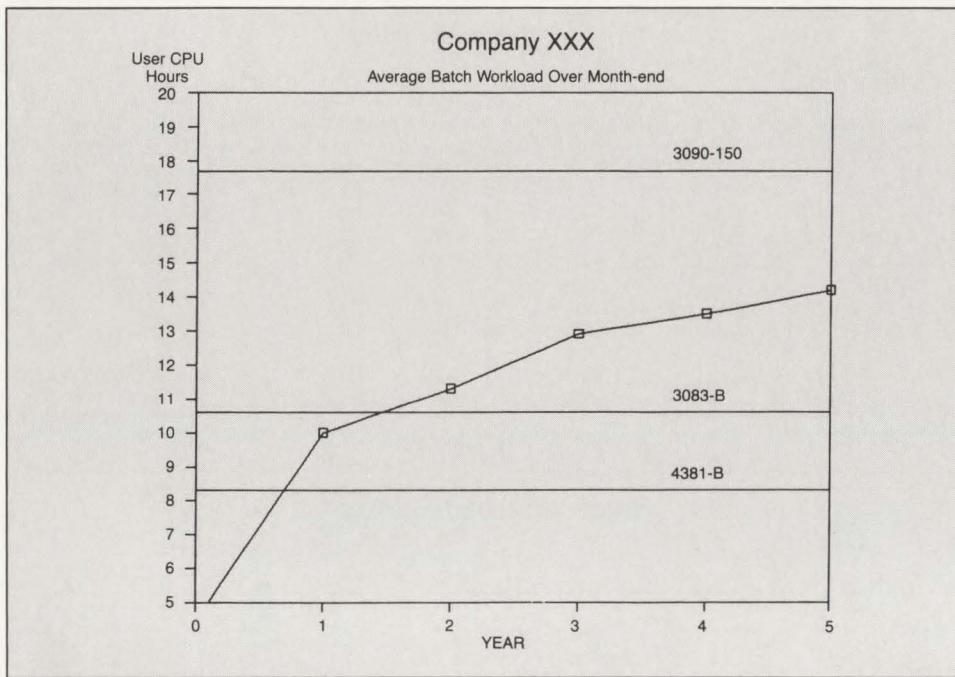
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FIGURE 3



ment in which the batch jobs are run. "Achievable" in this context means the average utilization that can be sustained over the batch processing period. The actual number depends on the VSE release level and the efficiency in your operational environment. The range could be anywhere from 70 percent to 90 percent. In this example, we shall use 70 percent. If you do not know the utilization in your system, I suggest that you talk to your vendor for any benchmark results that may help you to determine it.

Matching CPU Capacity to Batch Requirement

Using Harvey's formula once again, you can calculate the CPU hours available from each CPU model that you want to consider. Figure 4 presents the various CPU models and their batch CPU hours relative to the base machine which is the 4381-13. You will notice the VM overhead of the other CPUs differs from the base machine since each CPU may have a different level of VM microcode support. For example, the 308X and 309X series do not have VM/ECPS microcode support. This is reflected in their VM overhead that is twice that of the 4381-13. It is also apparent that MIPS is not an accurate measure of CPU power, since doubling the MIPS does not always mean you can do twice the amount of workload as before.

CPU processors from other vendors can also be similarly compared if they provide

information about the extent of their microcode support. In addition, you can request benchmark results to confirm the VM overhead for a specific model from other vendors. I have intentionally removed non-IBM processors from the table in order to be absolutely impartial in this article.

With the various CPU models' capacity overlaid on the same graph as the batch workload as shown in Figure 3, you can

make a logical choice as to the best CPU model for your requirement.

On-line Workload & Forecast

The methodology for on-line is quite similar to that of batch. However the unit of measure is quite different. Instead of capturing CPU time for each job, on-line uses transactions for each application. The first task, in this case, is to collect on-line transactions for at least one week. The reason for doing this is to ensure that the data you are looking at is a good representation of the norm. Then you must obtain daily transaction volume, as well as its transaction rate, for each hour.

The prime objective is to capture on-line transaction volume during a peak hour. In addition, the ratio of the daily transaction volume compared to that of the peak hour can be confirmed. The importance of this ratio will become more evident when the on-line formula is discussed.

Now look at Figure 5 that is a continuation of the batch system. Current on-line workload consists principally of CICS transactions that are divided into A/P and G/L. New applications coming next year include SQL into A/R and Inventory systems. In addition, an old inquiry system will be phased out by a 4GL for senior management.

One important field in Figure 5 is the Complexity Ratio that reflects the path-length of a transaction. Since we are fa-

FIGURE 4

CPU Model	MIPS	VM OVH	Batch CPU Hrs	VMA	VM/ECPS		
					[EVMA	CPA	VITA]
4381-13	3.7	27%	8.3	Y	Y	Y	Y
3083-B	6.0	60%	10.6	Y	N	N	N
3081-GX	11.9	60%	21.1	Y	N	N	N
3090-150	10.0	60%	17.7	Y	N	N	N
3090-180	17.0	60%	30.2	Y	N	N	N

FIGURE 5

COMPANY XXX		Daily	Complex	CPU												
On-line Applications	Transaction	Ratio	Hours	Yr 1 +1	CPU Hrs	Yr 2 +1	CPU Hrs	Yr 3 +1	CPU Hrs	Yr 4 +1	CPU Hrs	Yr 5 +1	CPU Hrs			
CICS :																
A/P	29,400	1.0	2.6	751	4.5	151	5.2	51	5.4	51	5.7	51	6.0			
G/L	7,250	1.0	0.6	151	0.7	151	0.8	151	1.0	51	1.0	51	1.1			
INQUIRY	1,400	10.0	1.2	-1001	0.0	01	0.0	01	0.0	01	0.0	01	0.0			
NEW :																
A/R SQL	9,408	1.5	0.0	01	1.2	151	1.4	151	1.6	51	1.7	51	1.8			
Inventory SQL	5,880	1.5	0.0	01	0.8	151	0.9	151	1.0	51	1.1	51	1.1			
4th GL INQ	100	40.0	0.0	01	0.3	151	0.4	151	0.5	51	0.5	51	0.5			
Total CPU Hours				4.4	7.6	8.7	9.5	10.0	10.5							

miliar with the CICS A/P and G/L transactions, we will assign them a complexity ratio of "1." In fact, both transactions are quite similar in pathlength and complexity. Any new on-line transaction in the future can use these as a base to gauge the complexity ratio. For example, the new SQL A/R and inventory transactions are estimated to be 50 percent more complex than the current.

The next field in Figure 5 is CPU hours. To calculate this field, we need to know how many transactions can be processed in a CPU hour. Since we know the transaction volume and complexity ratio of each application, on-line CPU hours can be derived. Again, this is not taking into consideration any VM overhead into the calculation. In our case, the CICS reports show the average CPU time consumed for each transaction is 0.31 second.

The formula converting transactions into a CPU hour:

$$\text{CPU hour} = \frac{\text{Xaction Volume} / \text{\# of Xactions per CPU hour}}{\text{\# of Xactions per CPU hour} = \frac{1}{(0.31 \times \text{Complexity}) \times 3600}}$$

CPU Capacity for On-line Workload

The formula used to calculate on-line CPU hours available per day is again taken

FIGURE 6							
CPU Hours Available for On-line							
CPU Model	MIPS	VM OVH	On-line CPU Hrs	VMA	[EVMA	CPA	VITA]
4381-13	3.7	32%	3.4	Y	Y	Y	Y
3083-B	6.0	64%	4.4	Y	N	N	N
3081-GX	11.9	64%	8.8	Y	N	N	N
3090-150	10.0	64%	7.4	Y	N	N	N
3090-180	17.0	64%	12.6	Y	N	N	N

from Ken Harvey's article mentioned previously.

The formula to calculate available CPU hours:

$$\text{On-line CPU hours} = \frac{\text{Average Utilization} / \text{Peak Hour \%} \times \text{CPU speed} / \text{VM Overhead Ratio}}$$

Average Utilization is the achievable CPU utilization during peak hour under VM. In this case, we use 90 percent as confirmed by VMAP reports. CPU speed is the same parameter as in the batch formula and is calculated by dividing the MIPS rating of the CPU in question by the base machine (the 4381-13 in this case). Peak Hour Percentage represents the percentage of transactions that occurred during the peak hour over the total daily transaction volume. This was discussed earlier. In this case, we found 19 percent

of the daily transaction volume occurred during the peak hour, a pattern that is indicative of the 80/20 rule.

The last field requiring explanation is the VM overhead that is similar to the batch formula, except that I was surprised to find that the overhead during on-line hours is different from that during batch hours. In our case, it was 32 percent rather than 27 percent. Again, for CPUs without the benefit of VM/ECPS microcode, the VM overhead is twice the amount of 4381-13. The results of CPU on-line capacity are summarized in Figures 6 and 7.

Conclusions

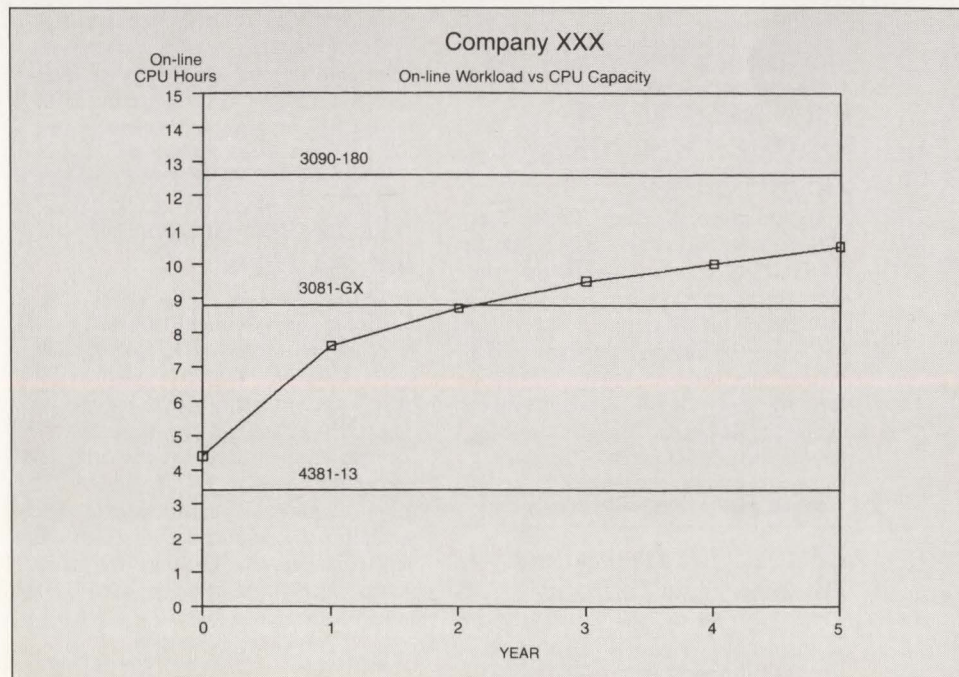
With both on-line and batch graphs on hand, it is apparent that on-line workload is the driving force for a CPU decision. From Figure 7, you can see that while a 3090-150 is more than enough for batch, it will last only a year for on-line. This may not always be obvious unless you have gone through a similar exercise. Another interesting point to notice from the graph is that on-line workload has exceeded the capacity of the 4381-13. In fact, the on-line hours have to be extended beyond the normal 8 a.m. to 5 p.m. period in order to process all the daily transactions.

The purpose of this article is not to build an all-inclusive model for capacity planning. To cover all the conceivable situations and variables would be an impossible task. However I hope you will find the framework presented useful and that you will expand it for your own environment. ☺

ABOUT THE AUTHOR

Duncan Cheung is a systems engineer for National Advanced Systems. He has 15 years of experience in systems engineering including areas of system configuration, capacity planning and peripheral performance analysis.

FIGURE 7



New Automation Facilities Product from Candle

AF/REMOTE, Candle Corporation's (Los Angeles, CA) newest automation facilities product, allows data center operations to be controlled from a remote location using a simple PC interface. AF/REMOTE users can access and control hardware consoles, operating system consoles, VTAM applications and even non-VTAM applications. Up to four consoles and/or applications can be accessed from a single terminal at a time with AF/REMOTE. Users can switch from one system to another with a single keystroke.

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DASD Advisor Improves User's Ability to Detect DASD Performance

DASD ADVISOR, from Boole & Babbage (Sunnyvale, CA), has been significantly enhanced to greatly improve users' ability to detect DASD performance problems in real time. The latest release, DASD ADVISOR 1.1.0 also enables users to tailor expert system recommendations to user-defined DASD workload pools. It diagnoses I/O performance bottlenecks at the channel, control unit, head-of-string and device levels of the I/O subsystem.

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New Approach to Automating System Availability

CheckOut/VM is a new product from Duquesne Systems (Pittsburgh, PA) that verifies the availability of both hardware and software components in a VM system configuration. It is designed to provide higher system availability by

automatically probing the VM system for down components, restarting the down components it finds and notifying designated support staff of component failure. It also creates historical logs of component failure.

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BIM-VIO Creates "Virtual Disk Drive"

BIM-VIO is a new product from B I Moyle & Associates (Minneapolis, MN) that creates a "virtual disk drive" in the VIO area of VSE/SP systems. Any non-permanent file may be relocated to this virtual disk drive so that it may be accessed at CPU speeds. A built-in feature of BIM-VIO is that the standard label area is relocated to the virtual disk (or may be optionally accessed directly in the SVA).

*For more information
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MVS Automated Operations Product Reduces Help Desk Calls

MVS Software, Inc. (Houston, TX) has announced the addition of the "End-User Automation Facility" to the company's MVS Automated System Operations product, OPS/MVS. With this facility, routine tasks that typically must be handled by the help desk or computer room operators can be delegated to end users. It is estimated that one-half to two-thirds of all help desk calls will be eliminated. This product makes it possible to automate, on behalf of the requesting end user, any function that previously required an operator to use MVS, JES3, IMS MTO or NetView console.

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CICS BROADCAST/COMNET Marketed by Design Strategy

Design Strategy Corp. (New York, NY) is now marketing CICS BROADCAST/COMNET, a facility that presents to the user a consistent and flexible means of communicating to the CICS user community important information that had previously been handled by less reliable or standardized methods. Electronic mail is also featured at no additional cost.

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DB2 ALTER Incorporates Powerful New Features

DB2 ALTER Version 1.2 from BMC Software, Inc. (Houston, TX) now has a powerful MIGRATE function and a

multi-level global change facility. In addition, DB2 ALTER is now a comprehensive utility for changing, copying and migrating DB2 data structures. The new MIGRATE function allows migration of an entire application's data structures by specifying only a database name.

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IPL Introduces Two-Gigabyte Cartridge Tape Subsystem

Users of 4300 and 9370 systems now have access to a high-density cartridge tape backup subsystem, the 6860 Tape Subsystem from IPL Systems, Inc. (Waltham, MA). This unit permits the storage of 2.3 gigabytes of data on a single 8mm tape cartridge, drastically reducing the time and costs associated with backing up data on standard, low-density tape reels. A single, high-density cartridge is capable of holding the equivalent of 12 or more standard 10.5 inch reels of tape.

*For more information
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New Utility for Reorganizing Information in SQL/DS

VMSQL/REORG is a new full-function utility for reorganizing information stored in SQL/DS. Recently announced by VM Software, Inc. (Reston, VA), VMSQL/REORG improves DBA productivity by reducing the amount of time it takes to perform routine database management functions such as: maintenance and service of databases, DBSPACES and tables and indexes. By automating database management functions, VMSQL/REORG improves SQL/DS performance, creates a more efficient data storage scheme, helps maintain control over data and reduces database locking and maintenance time.

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CACHE MAGIC XA/LF, a VM performance improvement product, has been announced by SDI (San Mateo, CA). CACHE MAGIC XA/LF improves system performance by caching the VSE Lockfile in processor storage for instantaneous access, eliminating the contention caused by multiple VSE guests requiring constant access. This streamlined Lockfile access results in accelerated on-line response times, reduced batch run durations and a boost in overall system processing capacity.

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As a technical service company, DTA provides technical and applications support, consultation and training to MIS managers, programmers and technicians. The company also provides systems software products that improve productivity and efficiency. DTA provides services to companies that operate IBM mainframes of all sizes from the largest 3090 system operating MVS/XA and VM to the smallest system operating DOS/VSE.

Professional services provided by DTA include: technical design and development support, for application environments; systems software installation and ongoing support; and operations management planning and support. Other services the company provides are: network planning, design and support; capacity planning; documentation; educational services on-site or in DTA classrooms; and MIS management and operations consulting.

Operations support includes operations analysis, problem management, change management, production control, operator training, environmental planning and help desks. Operating system support for MVS, VSE and VM includes planning, installation and maintenance, conversions, capacity planning, standards and procedures, third-party software, performance measurement and tuning, hardware configuration planning, DASD and

TAPE management, product evaluation and CICS support.

Today DTA has a staff of 75 innovative employees with an average experience of 16 years. Atypical of the industry, DTA experiences an extremely low rate of employee turnover. "Our consultants find that fulfilling the needs of a diverse clientele is challenging, professionally satisfying and enjoyable," says Charles Davis, executive vice president.

In addition to support services and training, DTA has a wide variety of software products designed to handle many of the operational needs of MIS organizations. The products, marketed nationally and internationally, provide solutions to many complex problems.

DTA/PRINT, a CICS remote viewing and printing facility, allows users (local or remote) to view and print reports based at the host computer site. DTA recently developed a version of DTA/PRINT for VM.

DTA/RECOV is a CICS/VS VSAM forward/backward recovery package that allows MIS to fully recover a VSAM file after a disaster. When coupled with the journaling support of DTA/JOURNAL, DTA provides a recovery system designed to recover missing or corrupted VSAM datasets updated through CICS or batch transactions.

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In addition to its other services, DTA offers its clients and other interested parties education in a variety of subjects. Classes, either on-site or in DTA's classroom, provide learning experiences in the following areas: CICS command level programming; CICS debugging; VSAM concepts, facilities, and tuning; MVS JCL and Utilities; and ISPF.

Network support is one of the fastest-growing areas for the skilled consultants of DTA's Data Communications Services team. The communications staff has experienced many different approaches to solving various communications puzzles. "We know that network problems can be identified and solved, because we know how to do it," says Thomas.

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"Our consultants work with client staffs to secure 'partnered' solutions to network problems. Through remote support, we provide the care and feeding of the major operating system so clients can concentrate on managing critical business functions," Thomas points out.

Whenever an IBM mainframe end user needs system support or software, applications management or education, DTA has a solution.

"Our business is service. Our company has skillful, trained, experienced and innovative people who focus on implementing solutions, not just identifying problems. Whenever we tackle a project for a large DP shop or a small one, we set our standards high and won't quit until the client is satisfied. We want our customers to be successful. We can help them be successful by providing the unique, unsurpassed services of our expert consultants," Thomas points out.

DTA is now the largest technical support services company in the Midwest. "We have looked at the aspects of our business which have made us successful and have cloned them into our new office in Oak Brook near Chicago, IL," says Thomas. Because of DTA's size and philosophy, our staff there can also deliver the specialized technical expertise that a DP shop needs — when they need it. "That and a consistent high level of performance are what the customers are interested in," he concludes. ■

Vendor Profile is a regular forum whereby a vendor is given the opportunity to introduce the company and its products to MAINFRAME JOURNAL readers.

GUIDE International: A User's Perspective

By Pete Clark

First of all, I am not an official GUIDE spokesperson. I am just a regular GUIDE attendee who happens to have a positive image of GUIDE and the GUIDE experience. It is not my intent to "sell" anyone on GUIDE. I simply wish to supply information that I believe supports my contention that membership is a necessity.

I will explain what GUIDE is, how it works and how to obtain information on GUIDE. In addition, I will acquaint you with several deliverables of GUIDE, try to convince you that you should be an attendee and give you some information to help justify attendance.

GUIDE is a not-for-profit association for users of IBM mainframe computers. The requirement for membership is an IBM 9370, 43XX, 308X or 3090 series processor. GUIDE meets three times a year to conduct forums, project and general sessions and other GUIDE business.

Forums and general sessions are typically user panels, discussions or presentations dealing with data processing topics. Project sessions are usually working

sessions for specific purposes. GUIDE is currently comprised of nine divisions that cover the entire range of data processing activities. The divisions are divided into groups that are composed of projects with related interest.

For the purpose of this article, I will discuss my experience with the VSE group of the Systems Division. It has become apparent to me that while my experience may be concentrated within the VSE group, it is representative of how GUIDE functions in general.

GUIDE Deliverables

There are at least two important deliverables that are developed by GUIDE attendees and presented to IBM. The primary focus of these two deliverables is to identify areas of user concern and user need.

Deliverable number one is titled a *requirement*. A requirement is typically a specific request for a change in function and it may address a functional problem, a product deficiency or a new functional

extension to a product.

Requirements consist of three areas of information: a statement of what is required, a statement of justification and (optionally) a suggested solution. Each requirement submitted by the VSE group is presented following discussion of the requirement. It is then voted on by the group to determine a priority and finally submitted to IBM. IBM will study the requirement and respond at the next GUIDE meeting.

I am certain that VSE users unaware of GUIDE have often wondered how a new function becomes part of the product set. One way is through GUIDE. In the past, I have seen numerous requirements processed by GUIDE that have become part of the VSE functional product set. As I examine the latest announcements for VSE products, I can easily identify GUIDE requirements. You should reference the VSE/SP 4.1 and VSE/SP 4.1.1 announcements.

VSE/POWER 4.1 contains time-event scheduling, highest priority constraint re-

removal, output exit, parallel asynchronous task, highest priority constraint removal and 14 logical printer and 14 punch support. All of these enhancements were either requirements submitted at GUIDE to IBM or were areas of intense user interest at GUIDE conferences.

VSE/VSAM 1.4 contains extended open/close error messages, enhanced buffer allocation, improved logical unit block usage, enhanced output format of IDCAMS and prior GUIDE requirements.

VSE/DL1 1.8 contains read integrity for GO procopt, GO procopt complete without abend, date and time stamp HD unload, increased control interval size and all prior GUIDE requirements. It is fairly easy to identify some of the changes GUIDE has been involved in by examining the User Group Requirements section of IBM announcements.

During the past few years, several of the more "glamorous" new features have been supported by GUIDE through requirements. Some of these have been improved channel switching, additional real memory support above 8MB for 370-type processors, support of larger uni-processors, improved GETVIS management, support for more than four sharing CPUs and other features too numerous to list.

Many would say, "Gee, that is just a PASR." Yes, in some ways that is true; in others it is not. Both are requests to IBM but a PASR is from just one account. A requirement is discussed and voted on by one, two or three hundred accounts and it is my perception that it carries the weight of one, two or three hundred PASRs. I have submitted more than just a few PASRs and requirements and, believe me, requirements typically get better responses and seem to be implemented more quickly.

The message is that the requirements, process at GUIDE *works*. It works for the user and it works for IBM. Users get additional function and restriction relief. IBM gets input from the users for future facilities, products, hardware and software.

Deliverable number two is GUIDE *Strategy Papers*. These are somewhat more global and futuristic than requirements. Strategy Papers are produced by a GUIDE task force attached to a project, group or division, depending upon where the issue should be addressed.

One Strategy Paper that quickly comes to mind is the VSE Futures of which there have been two. Many of the improve-

ments that were announced in VSE/SP 2.1 were addressed either within the Futures Task Force Paper or with requirements produced from the paper. A second VSE Futures Task Force has completed another Strategy Paper and presented it to IBM. A response is scheduled for the November meeting of GUIDE.

The Virtual Storage Constraint Relief Task Force was formed in the early 1980s. The visible results of the Task Force for VSE were the multiple address spaces of VSE/SP 2.1. Initially there were three address spaces and now there are nine address spaces with VSE/SP 3.2.

Another Task Force that may be of interest is the VSE/MVS Impediments Task Force. I believe that because of this task force and the VSE group at GUIDE, a new, more mutually acceptable relationship exists between IBM and its VSE user base.

The Strategy Paper process has been of significant value to the user and to IBM in identifying present and future trends and requirements. Yes, it works and I am certain that in the future the process will be even more effective.

GUIDE and You

It is not my position that GUIDE provides the only input to the IBM decision-making process. I simply believe that GUIDE is an active supplier and contributor of information to this process. I am certain there are other factors that IBM considers, but I believe that GUIDE users furnish significant input including current trends, future directions and justifications. In my opinion, IBM listens attentively when GUIDE speaks.

An old saying goes, "If you are not part of the solution, then you are part of the problem." If you are not a member of GUIDE and participating in the process (solution), then you are part of the problem. IBM and GUIDE, as with any other vendor/customer relationship, must maintain a forum that is truly representative of the entire user base in order to have credibility. To maintain this credibility, GUIDE needs the users of IBM data processing facilities to be members and active participants. That means you!

I realize that it may seem difficult to justify the expense of GUIDE membership and its attendance, so I offer a few observations and suggestions.

How much money would you save if you were able to resolve even half of your current top six integrity, performance or functional problems. Bring those six sit-

uations to GUIDE and actively pursue solutions. I will be amazed if you do not get solutions to more than half. It has been my experience that there is a wealth of informed, technical and practical experience at GUIDE.

Every GUIDE meeting has a large IBM contingent of extremely technically competent individuals representing every IBM product line. Through the years IBM has been generous in supplying GUIDE with support personnel and, believe me, GUIDE and its membership is *very* grateful to IBM for its support.

In addition, at every GUIDE there is an extremely competent group of users in attendance. All are willing to offer assistance in resolving difficulties. Do not be surprised to discover other users with the solution to your problems or at least actively pursuing the solution. There really is no need for all of us to "re-invent the wheel." Shared solutions will make all of us more effective members of the DP community. GUIDE is an excellent vehicle for this type of user/vendor interaction.

Several GUIDE projects support and distribute a "contributed facilities" vehicle that is a collection of user patches, hints, helps, aids and documentation designed to assist members. Many of the more popular VSE modifications and programs have been associated with the "VSE Contributed Facilities" such as the 16MG patch, the GETVIS patch, MSHP on-line display, CICS DL1 open/close program, the original DOS monitor and VTAM documentation for the first time installer. And, of course, contributions are always welcome.

Additional justifications for attendance are the many excellent user and vendor presentations on a variety of subjects at every GUIDE. Presentations may be on any product, topic and/or issue that has sufficient user interest. It is GUIDE policy that presentations must be technical in content and not sales oriented.

For example, a year and a half ago in July, 1987, GUIDE VSE members knew that the three-address space limit had been extended, that there would be a detailed technical presentation on the subject at the November meeting and that copies of the patch would be available. The extension would not become common knowledge until January, 1988, and not available to the general public until later.

At the last GUIDE, users presented methods to reduce compile times by 50 to 70 percent, techniques to reduce CICS

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startup times by four minutes plus and ways to reduce I/Os by as much as 50 percent. IBM presented a VSAM Tips and Techniques presentation that should be required attendance by every DP person. IBM also presented a NCP/VTAM Storage Management Tuning session that received rave reviews because of its purely technical content. These are only a few examples of the presentations. There were many others.

I do not ever remember meeting a first-time attendee who did not have a positive experience at GUIDE and did not wish to continue attending. However several did indicate that management might not approve continued attendance for some reason. As GUIDE attendees, I believe that it becomes our responsibility to demonstrate to management the overwhelming benefits of continued GUIDE attendance. As attendees, it is our responsibility to return to our company with as many demonstrable benefits as possible to ensure continued attendance.

It is my belief that GUIDE provides tremendous benefits. Attendees who are not able to convince their management of the importance of continued attendance need to prepare better, more detailed trip reports of GUIDE's benefits. Management

has every right to expect a GUIDE attendee to obtain as much information as possible and to utilize this to the benefit of the company. I believe that if we fulfill this requirement, then attendance becomes a necessary business function and justification is accomplished simply because "we did our job."

The technical expertise of the users and IBM presentors is worth the price of attendance and membership alone. Additionally the educational value should certainly be considered in justifying the cost of GUIDE attendance and membership. Performance presentations are always popular in every area of GUIDE and several are offered at every conference by users and IBM. The value of these presentations can be astounding and the benefits continue into the future.

Attend a GUIDE conference, pay close attention, ask questions, make notes on solutions, return to your DP shop and use this information to resolve problems, improve performance and, in general, do a better job. We should always attend GUIDE with this thought in mind, "I must justify my GUIDE attendance by bringing home something of greater value than my cost of attendance." I believe that you will find this very easy to do.

Personally Speaking

On a more personal level, GUIDE is a voluntary organization and participation in the GUIDE process offers an individual an unprecedented opportunity for personal growth. While I believe that this offers substantial benefit to your company, it may be difficult to use as cost justification. However it should not be ignored.

If I cited a dollar figure of savings as a direct result of GUIDE attendance, many would say, "He is crazy," some would say, "It is impossible" and a few might say "It is not true." I dare say no one would believe it. Yet, as I look back over the years and do just a simple mathematical calculation, the dollar evaluation seems astronomical. I am not sure that even I believe it and as I continue to consider it, the value continues to grow. Perhaps it would be simpler and more believable to say that as things currently stand, my cost justification for GUIDE attendance is accomplished well past my projected life span just on basic evaluations, not including cumulative benefits.

GUIDE offers to all of its attendees the opportunity to participate in the direct management of its projects, groups, divisions and governing board by attending and becoming an active voluntary participant. The more you participate and the deeper you become involved, the greater the personal and corporate benefits.

I speak from experience. I became involved and committed to GUIDE more than ten years ago and I have never regretted the decision. Within GUIDE you will find an opportunity for achievement, growth and commitment. The rewards far outweigh the effort required. If you want to "make a difference" in the data processing world, GUIDE is certainly the place to be.

Hope to see all of you at the next GUIDE conference. ☺

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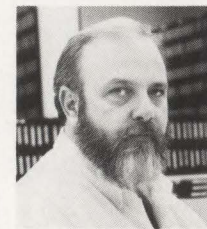
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ABOUT THE AUTHOR



Pete Clark has been in data processing for 25 years, the last 11 with Olan Mills, Chattanooga, TN. Clark is a recognized authority on the VSE operating system. He has worked many years to extend the limits of VSE.



Lee Veal On VSE Console Support...

"Anything IBM gives you, DOCS makes five to ten-fold better."



With 17 years systems software experience, Lee Veal, Software Support Supervisor for The City Of Garland, Texas, has seen a lot of software come and go. But there's one product Lee won't let go—DOCS (Display Operator Console Support) from SMARTECH Systems. And here's why...

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Plus DOCS allows the terminals to be shared back and forth between CICS or any other on-line software. They can be dual purpose—and we need those terminals for other functions.

On DOCS security features...

DOCS allows us to use password securities and "read only" type securities whenever the DOCS consoles come up. We can even include or exclude partitions on each individual console. We use these features in the programmer area—for the terminals that the programmers have access to.

How DOCS Dynamic System Status Display (DSSD) increases efficiency...

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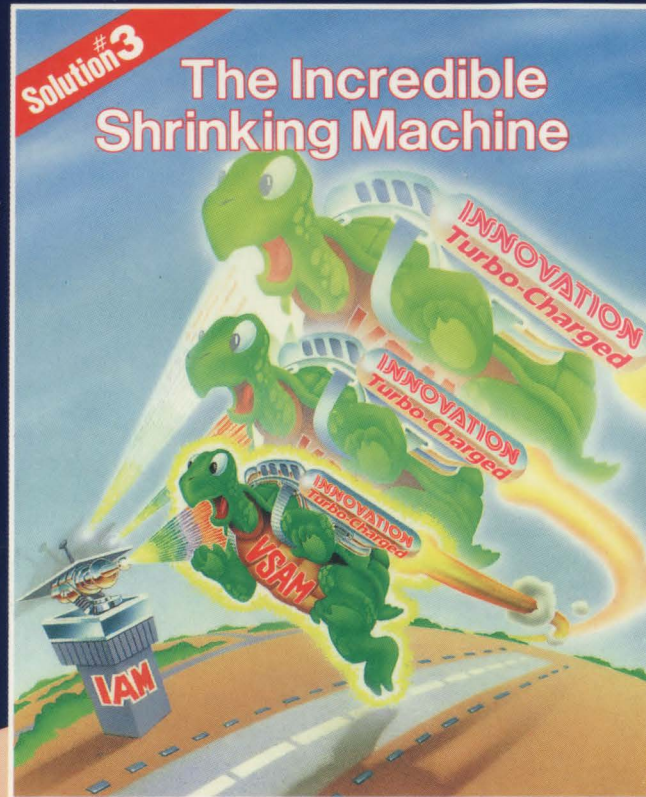
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	ALLOC	USED	STD	COMPR	STD	COMPR			
BIG.CLUSTER	37155	37155	27855	15600	25	58	4754670	233 502	580
CICS.FILE.MASTER. TABLE.CLUSTER	21000	19005	12720	9495	33	50	5068165	150 150	150
NAME.ADDRESS.FILE	9315	8985	6465	1875	28	79	428529	680 2090	2090

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