



DOS, IBM's Disk Operating System, has been time-proven where it counts...in the computing rooms of multitudes of users.

Now, this highly regarded performer has been extended to encompass a new range of capabilities. The result is DOS/VS ... Disk Operating System/Virtual Storage ... powerful new system control programming for IBM System/370 models upward through the 158 (except for 155s installed on a monthly rental basis). Purchased 155s can be operated with DOS/VS if they are field-converted into 155 lls by installation of the Dynamic Address Translation facility.

DOS/VS gives you far more than its predecessor...more flexibility...more capability ... more features.

As a result, you can run larger programs than you ever could before.

Handle more multiprogramming applications.

And process those big jobs that you always thought only a large system could handle.

In short, DOS/VS helps you to unleash the power and potential of your System/370 ... and is intended to help your people work more productively.

DOS/VS contains a number of compatible. System/370-based enhancements to DOS ... many of which have been made in direct response to customer and user aroup requirements. Most of these improvements have been made to help reduce many of the planning, programming, and operational problems encountered in advanced applications.

But the basic structure of DOS remains unchanged. Even its new name, DOS/VS. was selected to emphasize this continuity. The simple modes of operation have been retained, most object programs will continue to run without change, and the same partition concept and priorities have been maintained-even though DOS/VS offers more optional partitions than DOS did.

As a result, DOS/VS users will be able to benefit from the new capabilities without having to make extensive changes to existing programs, and without major disruptions to processing activities.

The enhancements introduced with DOS/VS are an integral part of the system . Increase or change your hardware concontrol programming and are available at no charge. And because most of these enhancements are system options, you need use only the ones that satisfy the needs of your particular computing system.

Let's look now at these enhancements.

The relocating loader is an optional facility which, depending on the other supervisor options included, can add a minimum of 1,100 bytes of additional core storage capacity to the resident supervisor. This function in DOS/VS allows a program to be stored in the core image library in a format that enables it to be loaded and executed in any available storage location.

With DOS, most object programs had to be stored in the core image library in a format that necessitated their always being executed in the same fixed storage location. Thus, the DOS/VS relocating loader, combined with virtual storage support, provides a significant improvement to the storage management facilities of DOS.

This loader can help to minimize disruption of your computing system whenever installation and growth activities occur. That's because the DOS/VS supervisor size generally changes whenever you:

- Move into various forms of multiprogramming activities.
- figuration.
- Add performance options to the supervisor.

As soon as programs are stored in relocatable format in the core image library, they can be run with different supervisor sizes without the need for recompilation or additional linkage edit runs. As a result,

you can accommodate changes in supervisor size without affecting your current core image program library.

The relocating loader, in combination with the private core image library, can significantly reduce the time it takes to do a system generation. This facility also lets you quickly benefit from new hardware, new software functions, and new applications.

For example, the transparent supervisor option that improves loader times can be used as soon as a new supervisor is assembled. And programs residing in the DOS/VS program library do not have to be changed for the increased supervisor size.

For users who want to operate in a multiple batch mode, a single copy of the program can be executed in any partition. Program maintenance and program library space are reduced, too, because additional copies of the same program are no longer required before you can execute the program in more than one partition.With this capability, your data processing staff need not be concerned over which copy of the program should be used for the run. And this lets you realize the benefits of the new storage capacity as soon as the hardware and the new supervisor have been installed. As a system generation option, DOS/VS offers from one to five batch job partitions. Depending on other supervisor options, the addition of a fourth and fifth partition can add a minimum of 550 bytes per partition to a three-partition resident supervisor.

If you're a user who requires one or two more DOS partitions, DOS/VS gives you the ability to move into new applications without a major conversion effort. The inclusion with DOS/VS of up to five partitions gives you plenty of room to grow.

Multitasking support also has been increased from 12 total tasks to 15 total tasks (both main tasks and subtasks) for the five partitions.

Your computer might now be running a single stacked job stream that includes both native mode operation as well as some emulation jobs. You could realize significant performance and operational benefits by going to a second partition and running the POWER spooling program there.

Operating in this manner, you would generate a multiprogramming supervisor and use two partitions. By using the relocating loader with a single partition, you would be able to more quickly utilize the spooling program. And after becoming operational with the spooling program, you could even be in a position to perform online data entry. In order to do this, you would need to expand your system to three partitions. And after installing and becoming operational with the data entry application, you then might want to provide a continuous inquiry capability.

So now you would be using four partitions in order to maximize the availability of the data entry and inquiry facilities. The inquiry program could then be expanded into an online inquiry and update facility.

And what would five partitions let you do?

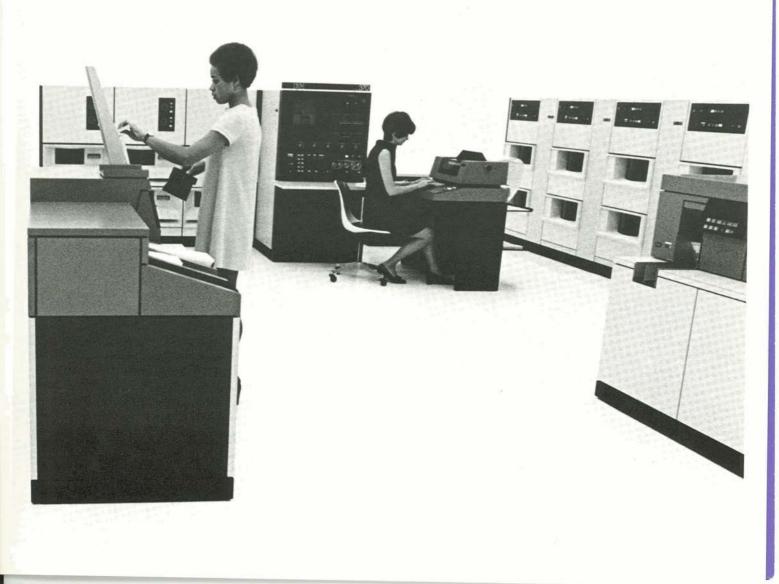
You could execute more production jobs.

Or provide a partition to increase your programmers' rate of testing.

You could even build in a capability for high-priority production jobs so that you could accommodate unscheduled needs.

To some, five partition usage may seem more like conjecture than reality. But since you now can have more partition facilities, you can begin to make long-range plans for your System/370. Multiprogramming, for example, can help you increase the availability of your system without forcing you to dedicate the entire CPU to only one application. And since multiprogramming is transparent to your programs, you are able to realize its benefits without reprogramming.

Photographs show design models



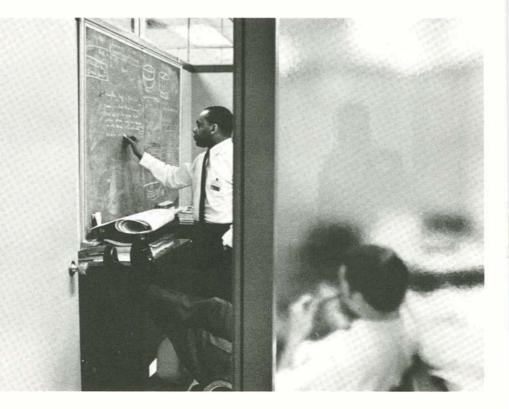
POWER, an IBM Type III program for DOS that's been widely accepted by its users, is now a standard component of DOS/VS.

POWER is an automatic spooling and priority scheduler program that uses direct access disk storage devices for intermediate storage of card and print images. No changes in DOS object programs or job control procedures are generally required to run the POWER program, and it can be readily installed and used.

POWER will be distributed along with the system control programming, and will be documented in the DOS/VS system library publications.

POWER can support up to four real or virtual storage partitions, and also can work with the new System/370 input/output devices such as the 3330 disk subsystem, the 3505 card reader, and the 3525 card punch.

Operating in tandem with the basic POWER program, the remote option of POWER lets you submit jobs via remote IBM 2780 or 2770 terminals for processing by the central computing system. This remote option allows batch data to be remotely submitted simply by placing job control cards in front of and behind data. Jobs may also be entered from a remote card reader with output destined for another remote user. And inasmuch as the full facilities of DOS/VS are now available to all of your remote users, the POWER program's capability allows you to bring your central computer's processing capability to any location throughout your organization, regardless of its distance from the system.*



A standard feature of DOS/VS is the support it provides for the virtual storage capability that is now standard with most IBM System/370s. Virtual storage provides up to 16 million bytes of storage space in which the programmer can place code and data.

With this capability, programs can be written that are far larger in size than the actual amount of real storage space available in your computing system. Programs that use the virtual storage capability may be stored on disk, and DOS/VS will automatically bring in the program's parts as they are required for execution.

As a result, the programmer can now code applications more productively without concern for exceeding main storage or having to segment his job into several computer runs. Virtual storage frees him from some of the most time-consuming and least productive parts of his job. He can now think not just in terms of a partition in storage, but of the total application, and the most efficient solution.

Now, DOS/VS handles what the programmer previously had to do when he was coding to a limited storage space. When jobs are to be executed on the computer, they may be brought in from the program library to another area of disk which appears to be a huge memory. But this is not the system's memory...it's the system's virtual storage. From this huge virtual storage area, parts of the programs are taken into the system's real storage for execution by DOS/VS. And inasmuch as the programs were written with little or no concern for the actual size of real storage, they may or may not entirely fit. To accommodate this fact, DOS/VS brings in the parts of the programs in units of 2,048 bytes each. These 2,048 byte units are called pages. The number of pages in real storage for any one program at execution time depends on things like the number of other programs executing concurrently, the size of real storage, and the relative priority of the programs.

These factors, as well as the frequency with which DOS/VS brings in new or additional pages for execution, may affect the performance of the system when processing some types of jobs.

DOS/VS has many advantages, however, which tend to offset any performance reductions that may be encountered.

For example, you are able to run large programs with less real storage capacity than you would ordinarily need.

You can run programs in two partitions which you couldn't do before with DOS due to real storage limitations.

You can add to existing programs without restructuring them or changing real storage size.

Your programs can now utilize additional real storage as it becomes available—without having to be rewritten or reorganized. That's because DOS/VS can bring more parts of a program into real storage at the same time. This could even let you add a whole new application to your job stream —simply because DOS/VS puts the unused space in your storage partitions to work.

And when adding on to your present computing system, you can get new jobs operational before additional real storage or a new CPU arrives. This is a valuable assist when responding to the always present demand to run additional jobs on the system.

By providing a virtual partition for rush jobs, your data processing operations staff can get these programs going at almost any time. And even if there is no area open in CPU storage, the job can run and DOS/VS will bring parts of it in to be executed by reducing the total area available to other lowerpriority jobs. All jobs will continue to run, although they might run somewhat slower. When the on-demand job is finished, the lower-priority jobs can then be expanded again to use the freed-up space. This gives you the fullest and most efficient use of your CPU, and also lets you use a smaller system to back up a larger system.

Features for go-power and grow-power

The DOS/VS multiple timer facility can concurrently satisfy the timer requests of all partitions. An option of the supervisor, it requires approximately 1,200 bytes of resident storage.

With the multiple timer, you can run many key applications without worrying about scheduling problems or reduced availability of the application. Many IBM Program Products make use of timer requests—ITF and CICS—to name but a few. Now, the DOS/VS multiple timer lets them all operate concurrently in the same computer system *without* any special programming or operating procedures. As a result, you can get these and other new applications running sooner.

The POWER program's optional source library inclusion facility and the new DOS/VS cataloged procedures facility allow data on punched cards to be permanently stored on disk. DOS/VS cataloged procedures allow the user to store DOS job control and certain other kinds of data in the procedure library. POWER's source library inclusion facility allows the user to store all kinds of 80column card images into the system or private source statement library. Once in disk storage, this card data can be included in your job stream without actually having to go through the card reading operation. Disk file maintenance facilities are provided by the DOS/VS maintenance and service programs, and temporary add, delete, and replace capability can be accomplished at the same time the job is being executed.

These library facilities combine to ease many burdensome data processing procedures such as changes in disk file locations, and allow system growth with little disruption.

Variable partition priority, a standard facility with DOS/VS, lets you display and vary the task dispatching priorities of your partitions. These priorities are initially established at system generation time, and then can be dynamically altered by your operator whenever necessary.

The variable partition priority facility is especially useful whenever unscheduled or "hot" jobs must be run. Such jobs can be run in the first free partition that has sufficient I/O devices available, and its task dispatching priority can be based on whether the job is I/O- or CPU-bound.

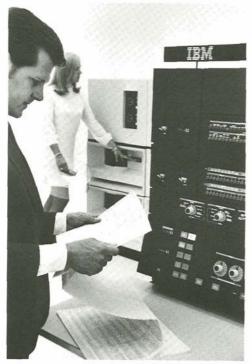
Because this DOS/VS facility is transparent to the programmer, its usefulness can be realized as soon as DOS/VS is installed, and with no change to your existing programs.

DOS/VS also introduces a new disk access method called VSAM (Virtual Storage Access Method) which is especially useful for online inquiry and update applications. Designed with virtual storage concepts in mind, VSAM permits DOS/VS, OS/VS1 and OS/VS2 users to interchange disk packs because full data compatibility is provided. A special virtual partition capability is used by VSAM to store its code, I/O areas, and control blocks. This capability allows the VSAM area to be dynamically allocated without affecting the operation or logic of the user program.

This new capability can be used immediately by current ISAM (Indexed Sequential Access Method) programs. No reprogramming or recompilation is necessary because minor job control changes are used to notify VSAM that an ISAM program is going to process a VSAM file.

A special routine called an ISAM compatibility interface is used to dynamically map user ISAM requests into VSAM input/ output requests. This routine is automatically loaded with VSAM into the special dynamic area of the virtual storage partition. Full DASD device independence is provided by VSAM and the ISAM compatibility interface facility. This facility lets ISAM programs written for one type of direct access storage device be run on 3330s or other disk devices without reprogramming or recompilation. As a result, the user can quickly realize the online capability and improved performance of his new system.

To reduce the efforts associated with data conversion and installation of new direct access devices, a multifunction service program is included with VSAM that physically converts current 2311, 2314, and 3330 SAM and ISAM files to 2314 or 3330 VSAM files. If desired, files can be reblocked to allow the optimum block size to be used as the data is being converted.



VSAM also improves the integrity of the I/O areas, inasmuch as they are located in the special dynamic area of the virtual partition. VSAM also provides increased recovery facilities by allowing the index to be separated from the data, and by providing service routines that verify the contents of the catalog. And because batch and online applications are able to concurrently process the same data file, VSAM also provides a data set sharing capability.

With VSAM, you get data set sharing at the track level, utilizing the supervisor's track hold option. Reprogramming of batch programs is not required to provide continuous availability of the online program, and data files can always be up to date because batch programs are able to constantly update the same VSAM data file.

Some online applications occasionally require that a variable length support capability be included in the data management support used to directly process records. You get this capability with VSAM so that variable length records can be added with no need for any special programming by the user. In addition, existing records can be lengthened or shortened based on the needs of the application. VSAM also offers you the catalog benefits that were previously available only to the OS user. This catalog is basically a contents directory or index of all VSAM data files. It contains sufficient information about each file so that password protection, automatic space allocation support, and direct access storage device independence can now be provided to the DOS/VS user. The benefits afforded by this catalog can considerably ease conversion, as well as disk device management and recovery.

Move up to DOS/VS

An action program for your computing system

DOS/VS is system control programming available to users of IBM equipment at no charge. All components such as access methods, control programs, POWER, and emulators are included.

A new System/370 assembler also is provided as part of DOS/VS to assist you in system and program generation. This compatible, high-performance System/370 assembler can handle all DOS-supported input/output devices.

All DOS/VS-related IBM Program Products, Type II programs, Type I languages, Type I sorts and Type I utilities are distributed separately. A natural outgrowth of the familiar IBM Disk Operating System, DOS/VS complements and supports most of the data processing advances inherent in the IBM System/370 product line.

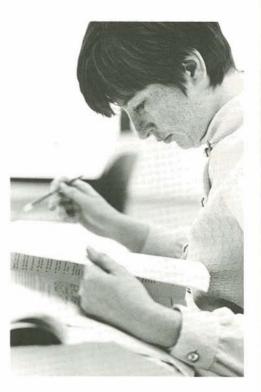
With this powerful combination of system control programming and advanced computing system, your entry into the spectrum of advanced applications can be made with surprising ease and efficiency.

The familiar features and tried and true operating advantages of DOS have not only been retained, but enhanced by the new capabilities provided with DOS/VS.

Capabilities that can let your programmers concentrate on the business problems of your applications instead of on the storage and data management problems of the programs themselves.

Capabilities that let your data processing operations people consider larger jobs than you could previously handle.

We've only touched upon the highlights of DOS/VS on these pages. Let your IBM representative show you what DOS/VS can mean in terms of new operating efficiency for your data processing system and the people that work with it.



IBM

International Business Machines Corporation Data Processing Division 1133 Westchester Avenue, White Plains, N.Y. 10604 (USA only)

IBM World Trade Corporation 821 United Nations Plaza, New York, N.Y. 10017 (International)