



## BALANCING THE WORKLOAD, PART 1

### First of a two-part series

Gary R. McClain  
*Manager, Marketing Publications*

During peak hours of system activity, when multiple online users simultaneously make demands on the limited resources of the system, the result can be excessive paging by CP, and poor system response time. In non-peak hours, on the other hand, the same system may be underutilized. Through workload balancing, CPU resources can be better managed through scheduling and batch operations, and peaks and valleys in the system load can be leveled. This article examines the workload balancing issues, and discusses scheduling and batch options for better workload control.

#### THE OVERLOADED CPU

The major issue in workload balancing is trying to get the most out of the information resources, twenty-four hours per day. It is not uncommon for an organization to utilize its information resources only when employees are on site. The work of a twenty-four hour period is "scrunched" into an eight-hour shift, and the computer sits idle during the other sixteen hours of the day.

This is often referred to as a "double hump" level of CPU utili-

zation. There is a peak at 10 a.m., when users are hitting their morning stride, and then another peak at 2 p.m. after lunch. From 8 p.m. until 8 a.m. the next morning, there is very little use.

To meet the demands of peak performance periods, at 10 a.m. and again at 2 p.m., an organization may seek to purchase a CPU that is more powerful than the one currently in use. This, however, is a realistic option only if the CPU is in peak use around the clock. Most likely, an upgrade is not needed. The organization already has additional computing resources available, namely the resources that are untapped during non-peak hours.

Computing power is very much like electricity in that it cannot be "stored up." If it is not used when it is available, it is gone. An organization whose computing resources are untapped during non-peak periods is wasting these resources and, hence, wasting money. When a CPU upgrade is made solely on the basis of current peak demand, what is purchased in addition to this capability is potentially, additional

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## BALANCING THE WORKLOAD

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capacity that will remain largely unused. Thus, even more money is wasted. If a large organization already has the CPU with the most capacity then users will have to be divided among multiple machines. This creates a whole new set of problems.

A better solution is to level out the double humps over the twenty-four hours of the day, to supplement the computing power of the peak periods with the underutilized computing power of the non-peak periods. This is the job of workload balancing. At the departmental levels, workload balancing may also be a means of spreading work out among departmental machines for even more effective utilization. By optimizing the current use of the machine, effective workload balancing can delay a hardware upgrade or even reduce the hardware requirements of an organization.

### Obstacles to Workload Balancing

Lack of excessive controls over users is both the beauty and curse of VM, the negative side being that one user has the potential of "taking over" the system. Native VM does not really offer much in the way of workload balancing because, again, VM was not originally designed for a heavy production environment. In fact, VM is not really very fail safe in terms of preventing a user from "nailing" the system.

There are many subtle ways in which a single user can dominate the system. A user with a memory-intensive application can cause the system to page heavily. This paging can increase to the point that other users on the system will not be able to run their tasks. And so the other users sit. A heavily looped program, depending on the scheduling algorithm gener-

ated for the machine, has the potential of taking over the machine.

One user's need to complete a task may very well be at the expense of another user. Thus, the freedom from control available to users in the VM environment, coupled with the potentially excessive demands generated during times of peak usage, can result in VM being "brought to its knees." Then everybody loses.

### OPTIONS FOR WORKLOAD BALANCING

Rather than going into the system and making complex adjustments in algorithms, balancing workloads through job scheduling is basically a function of system software. Batch operations can be performed either through VM system software or a guest operating system.

#### Scheduling

VM does not offer much in the area of scheduling for multiple online users. Once users are logged on, VM has excellent facilities for handling the sharing of the CPU among these users. What native VM does not offer is a user-friendly facility for doing work on a user's behalf while that user is still logged on, or for doing repetitive work. For example, a user cannot initiate a lengthy database search, send it off to be completed and then continue on with another task. His virtual machine is "tied up" until the database search is completed.

It is for this reason that native VM is considered rather limited when it comes to being a production environment. An example of standard production environment tasks might be a financial report that must be produced weekly, or the bi-weekly running of the corporate payroll. These tasks can be accomplished under native VM, but only if an individual physically logs on to the system, and

initiates the job on a virtual machine. These tasks will not run automatically on a continual basis unless manually initiated each time they are needed.

Currently, repetitive work such as that described above must be handled manually. Even if standard tasks are built into a CMS EXEC, which is a series of commands grouped together and used like a macro (a group of command statements grouped together and identified by a name), the user still must logon and invoke the EXEC in order to perform the task. This is a workable solution until the person responsible for this task misses a day of work, or forgets to invoke the EXEC that initiates the task. The result is that the job does not get done.

In addition to these standard repetitive tasks there is a large amount of work that is done during standard working hours that does not necessarily have to be completed during that time, the large database search being an example. Work that is not needed until the next day can be put off, through a scheduling capability, to the second or third shifts when in most cases the machines are sitting idle. The work can be completed during this time and will be waiting for the users when they arrive at work the next morning.

Once an installation has the job stream up and running, scheduling is generally an area that is often ignored. The reasons for ignoring the potential of scheduling can be summarized as a desire to leave well enough alone:

- The applications are running adequately.
- There is a lack of expertise on how to redesign the system flow.
- Users are comfortable with the flow, even with poor response time.

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# MANAGING CADAM UNDER VM

Donna Vaswani  
Marketing Writer

CADAM® — an innovative computer-aided design and manufacturing system developed by Cadam, Inc. in Burbank, California — is being implemented by an increasing number of organizations. CADAM is one of many computer-aided design/computer-aided manufacturing products ideally suited to run under VM. Why VM? Because the objective of implementing CADAM is consistent with that of running VM: to increase productivity.

CADAM shortens the design cycle while improving accuracy. The result is less wait time between customer demand and delivery of the product, fewer errors, reduced development costs, and improved product quality. However, potential problems do exist. For example, backing up and restoring CADAM files is difficult and labor intensive. The area of tape management presents some challenges, with a frequent necessity to span tapes. Requirements that CADAM drawings be retained for as long as 10 years result in massive DASD consumption.

Successful implementation of CADAM under VM requires systems software that addresses these issues while making the entire system run more efficiently. VM Software, Inc. offers tools that specifically address CADAM needs.

Although CADAM itself has utilities for backing up and restoring drawings, they can be tedious and time consuming — and they require knowledge of CADAM itself. CADAM backups must be done separately from standard VM system backups, which means special training for the operations staff. There is often a lack of multi-volume tape support, so if the backup spans more than one tape, the

Select Files Backed Up Since 9/30/88						
Type R next to each file you want to restore. After specifying all your requests, press ENTER.						
Req	Filename	Filetype	Vaddr	Last Revised	Records	Backup Date/Time
	GROUP 1	D880731	0191	08/23/88	38	09/30/88 23:05
	GROUP 2	D880423	0191	03/08/88	46	09/30/88 23:05
	GROUP 3	D880304	0191	04/22/88	13	10/04/88 22:30
	GROUP 4	D880716	0191	09/19/88	54	10/04/88 22:30
	GROUP 5	D881013	0191	10/01/88	21	10/04/88 22:30
PF1 = Help	2 =	3 = End	4 = Stype	5 = Sdate	6 = Sname	
7 = Backward	8 = Forward	9 = Submit	10 =	11 = Print	12 = Cursor	
===>						

Figure 1. VMCENTER II's full screens simplify the restore process.

operator must split the job into several smaller jobs. In addition, because CADAM data is so critical, many organizations require offsite storage of backups, so at least two copies of each backup tape must be made: one for onsite and one for offsite. This means running each backup job twice, which consumes more time and more tapes.

VMCENTER II's backup system solves these problems and offers additional benefits. VMCENTER II can be used for CADAM backups as well as system backups, so the operations staff isn't required to learn a new procedure. Sites with limited systems personnel benefit from VMCENTER II's simplicity, while those running many applications have one consistent method for all their backups. With VMCENTER II's ability to span tapes, there's no requirement to split large backup jobs into several smaller ones. And VMCENTER II saves even more time by automatically creating as many as four duplicate tapes of each backup — providing for offsite storage in case of a data center disaster.

Of course, an efficient backup procedure means nothing without an easy way to restore

backed up drawings. But in a design environment, it can be difficult to restore individual drawings. Because CADAM creates one large CMS file containing numerous drawings, restoring one drawing would mean restoring all the drawings residing in that file — so a user could spend hours waiting for one drawing to be restored.

VMCENTER II offers the ability to restore individual drawings. Once CADAM utilities have helped to convert drawings to CMS file format for backup, individual drawings can easily be restored (see Figure 1).

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## ISSUES IN VM



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Gary R. McClain, Editor

Reprints of Issues in VM are available by contacting the Editor.

## VMCENTER II RELEASE 2.0 NOW AVAILABLE

Donna Vaswani  
*Marketing Writer*

VMCENTER II, VM Software, Inc.'s flagship product, has been enhanced with many new features that customers have been enjoying since late September. VMCENTER II Release 2.0 includes enhancements to each VMCENTER II component, as well as to the installation/maintenance procedure and DASD utilities. In addition, all components, except VMMONITOR, offer support for VM/XA SP Release 1.0. This support allows customers to upgrade their systems to IBM's strategic operating system while continuing to use VM Software products to enhance system productivity.

The benefits provided by VMCENTER II's Release 2.0 enhancements include those described below.

### INSTALLATION/MAINTENANCE PROCEDURE

Installation and upgrade is much easier now, with all VMCENTER II administrator functions consolidated onto one screen. This saves valuable system programmer time and

decreases training costs. New functions on the Administrator Screen — including an on-line facility providing tips on VMSI products — simplify installation, maintenance, and administration even more. In addition, a centralized CPUID file allows all component CPUIDs to be upgraded simultaneously. This saves system programmer time and simplifies CPUID maintenance, reducing the level of expertise required.

VMCENTER II increases system security while saving CPU and people resources. By examining the CP nucleus to build component minidisks, VMCENTER II no longer requires access to the current CP source directory and CP tail-

oring files. This means less time is spent setting up access to CP resources and less CPU utilization is required during installation.

### DASD UTILITIES

Customers receive more timely information on DASD because VMCENTER II's data gathering utility reads the CP on-line directory instead of the source directory. Also, CPU utilization is decreased when DASD reports are run because the System DASD Analysis Utility uses the CP nucleus and data areas instead of the DMK source files to gather information.

Enhancements have also been added to each of the VMCENTER II components with Release 2.0. For additional information, contact a VM Software sales representative at (703) 264-8000. ■

### VMCENTER II TRAINING OFFERED

VM Assist, Inc., a San Francisco company specializing in training and consulting for the VM environment, is offering Accelerated Learning Courses in VMCENTER II and individual components. Currently, VM Assist is offering a 25% discount to all sites who register within three months of licensing a VM Software product. For more information, contact Paul Davis at VM Assist at (415) 362-3310. ■

### BALANCING THE WORKLOAD

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The result of this avoidance is the type of CPU utilization illustrated on page 6 with variations of extremes between over-utilization and under-utilization.

System software that performs the scheduling function accomplishes this through automatically logging on the user's virtual machine through the CP AUTOLOG command, and then executing the request that the user scheduled. Thus, the work

is being done through the user's virtual machine, but without the user having to be present while this occurs.

The request is scheduled through the system software product, and sent to a service virtual machine. This is a virtual machine that is under the control of the system software product. The request is stored in a log file and executed at the appropriate time by a process in which the service machine auto-logs the user's virtual machine and initiates the request for the user.

Scheduling capability, offered through scheduling utilities from IBM, as well as system software through third party vendors, offers various options. Some of these options include being able to indicate the date and time at which the request should be initiated, and depending on the product offering, options for the automatic rescheduling of the request, on a bi-weekly basis for example.

The monthly payroll run would be an example of an application for a scheduling

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# ANNOUNCING VMSPPOOL RELEASE 2.0

Release 2.0 of VMSPPOOL, VM Software's spool information and management system, became available in November.

VMSPPOOL Release 2.0 includes several new features, most notably its full spool backup and restore facility. Using this flexible backup capability, sites can define, schedule, and execute the combination of full and incremental spool backups that best meets their needs.

Compatibility with SPTAPE means sites can implement VMSPPOOL backups immediately, with no conversion. VMSPPOOL can catalog and restore from SPTAPE backup tapes, and SPTAPE can restore from VMSPPOOL backup tapes.

With VMSPPOOL, files can be restored from a full-screen listing of all backed up spool files — no more scanning through numerous tape volumes trying to find the tape that contains the needed file. VMSPPOOL will

even automatically issue the required tape mount requests. And through support of standard labels, VMSPPOOL automatically verifies tape mount requests. An optional interface to VMTAPE simplifies the process even more, with VMTAPE automatically allocating tape drives and managing tape pools.

The need for operator intervention is reduced through VMSPPOOL's ability to manage multiple volume backups. The operator simply mounts the new tape when requested, and VMSPPOOL automatically continues the backup at the correct place. The backup facility also includes an option that allows sites to automatically purge all files that are safely backed up, freeing even more disk space.

By allowing incremental backups, VMSPPOOL saves tape resources and time. Only those files not already backed up are copied to tape. This means sites

can back up the spooling system as often as necessary without having to run long, resource-consuming, full backups. Multiple tape drive support makes VMSPPOOL's backup process even more efficient.

Additional enhancements available with VMSPPOOL Release 2.0 include a macro facility that allows users to write XEDIT-type macros in REXX. This powerful feature means users can use one command to do virtually anything done from full screens. For example, a site may write a macro to generate daily reports on the status of the spooling system. This information could then be used to better manage spool space and for capacity planning. VMSPPOOL's macro facility saves time and ensures that routine tasks are completed as necessary.

Also available with the new release of VMSPPOOL is support for VM/XA SP Release 1.0.

For more information about VMSPPOOL, contact a VM Software sales representative at (703) 264-8000. ■

## JACK BARRY APPOINTED VM SOFTWARE, INC. PRESIDENT

John (Jack) J. Barry has been elected President and Chief Operating Officer of VM Software, Inc., effective January 1, 1989. The departure at that time of current President and Chief Operating Officer Richard L. Earnest will mark the culmination of his personal plans to relocate to the west coast.

In making the announcement, VM Software Chairman and CEO Robert E. Cook noted that "during the five years that Dick Earnest has been with the company, both revenues and profits have risen dramatically. He



John (Jack) J. Barry    Richard L. Earnest

leaves with a proud record of leadership and continuing results." Cook emphasized that Earnest will assist with the transition and continue actively

in his current position through the end of the year. Earnest will thereafter continue to serve as a director of the company.

Barry is currently President of The Systems Center, Inc. of Irving, Texas, which merged with VM Software on October 21, 1988. He has served in this role since 1984. Previously, he was Vice President of Marketing/Information Terminals Group with Harris Corporation, a producer of advanced communications and information processing equipment. Prior to that time, Barry served as Manager, Information Processing Strategic Business Unit with Xerox Corporation, and also spent 13 years with IBM in sales, sales management, and marketing management. ■

## VMMONITOR VM/XA SP SUPPORT PLANNED

VM Software is committed to providing support for VM/XA SP in the areas of performance and monitoring. We intend to deliver Release 2.0 of VMMONITOR, with support for VM/XA SP, during the fourth quarter of 1989. In response to requests from our current customers, major enhancements included in Release 2.0 are summarized as follows:

Enhanced historical data collection, with more efficient and comprehensive reporting.

Enhanced interface with

VMARCHIVE, so that performance monitoring data may be archived more efficiently for subsequent analysis. This enhancement also features an efficient approach for storing archived monitoring data.

More comprehensive data collection, building upon the availability of additional sources of performance data.

Significantly more efficient use of DASD for the storage of collected performance data.

More flexibility in establishing user-defined threshold condi-

tions in DASD monitoring, including the ability to assess seek patterns on a given volume.

Enhanced interface with VMSECURE, providing faster movement of high use minidisks, in order to position them for optimal performance.

When Release 2.0 of VMMONITOR becomes available, it will be shipped to all VMCENTER II and VMMONITOR customers who are eligible at that time for Product Support and Enhancement. For those who are eligible for receipt of Release 2.0 of VMMONITOR, there will be no additional charge for VMMONITOR VM/XA SP support. ■

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product. Parameters are entered which specify the request, the time that the request is to be run, and when the request should be rescheduled for execution. This task would normally be scheduled for a time during which the requesting user is not logged on, 3 a.m. for example.

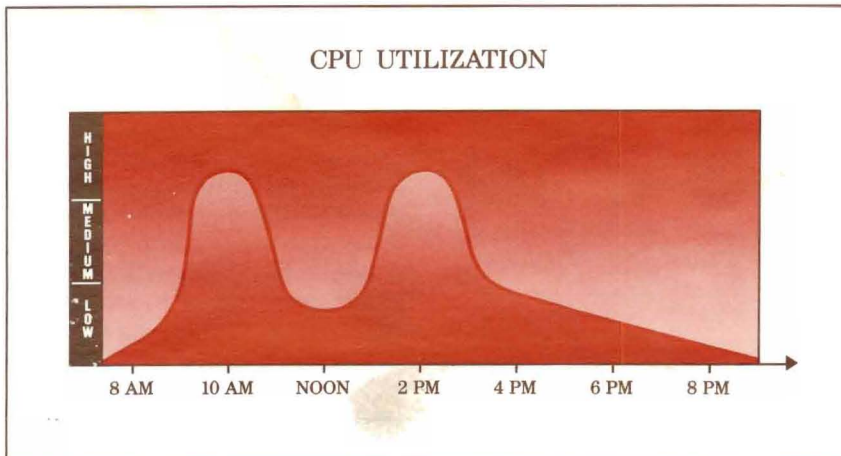
A drawback to scheduling is that the task may not be performed if the user is currently logged on, because it is the

user's virtual machine that is autologged for the performance of the task. If the user in the above example were to work a late night to complete an emergency job, causing him to still be logged on at 3 a.m. on the night of the standard payroll run, then this task would not be completed. The task would also not be completed if the user disconnects instead of logging off. Also, if the user forgets to log off at the end of the day, the virtual machine would still be technically under his control and the task would not be initiated.

Some software products solve this problem by indicating to the user that a request is about to be initiated, if the user is logged on (which the user may cancel), or continue attempts to initiate the request until it is feasible. Also, some installations create virtual machines that are used for one task only, with a userid called PAYROLL, for example. This virtual machine is then autologged by the scheduler.

With scheduling capabilities these resource-consuming functions are offloaded to the times when demand is lowest on the CPU. The double humps are leveled.

Part two of this series will discuss options for batch processing under VM. This article was excerpted from VM and Departmental Computing, by Gary R. McClain (Published by McGraw-Hill, 1988). ■



The daily CPU utilization cycle

## MANAGING CADAM UNDER VM

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Auditing or legal procedures at many organizations require long-term retention of CADAM drawings — in some cases, as long as 10 years. In addition, users may need access to these files after completion of a project. But if numerous CADAM drawings are kept online for an extended period of time, DASD costs will skyrocket.

VMCENTER II, working with CADAM utilities, offers a simple method for end users to archive individual CADAM drawings to offline storage and still have an easy way to recall them. After CADAM drawings are converted into CMS files, users simply specify which ones they would like to archive. These drawings are then automatically copied to alternate storage and, after successful completion of the archive, erased from the CADAM database. VMCENTER II's archiving feature also allows users to add comment lines to archived files and thus easily distinguish between multiple versions of one drawing. This makes it easy when it comes

time to recall a specific version of a drawing — the comments are displayed on VMCENTER II's full-screen list of archived files (see Figure 2).

In addition to backup and archival of CADAM drawings, there are several other issues to consider, including productivity, resource tracking, and security. VMCENTER II offers tools to help in all these areas. Its comprehensive batch processing, accounting, and security systems ensure smooth operation

of the CADAM environment, and its full-screen operations management system provides windows into tape drive status, spooling system status, and batch worker machine status. This offers a complete, up-to-the-minute picture of all system activity.

VMCENTER II offers many additional capabilities and benefits for the CADAM environment. For more information, call your VM Software sales representative at (703) 264-8000. ■

CADAM is a registered trademark of CADAM Inc.

CMS Files Previously Archived For: CDMMGR									
Cmd	Filename	Filetype	Cuu	Date	Time	Refrn	Recs	Expdt	Status
	GROUP 1	DRAWING	191	05/08/88	11:54	23076	113	05/08/98	OFF
	...*C THIS IS GROUP 1'S FINAL DESIGN FOR PROJECT A								
	GROUP 1	DRAWING	191	08/02/88	17:16	23981	120	08/02/98	OFF
	...*C THIS IS GROUP 1'S PROJECT A PRELIMINARY DESIGN								
	GROUP 1	DRAWING	191	11/04/88	14:30	27544	110	11/04/98	OFF
	...*C THIS IS GROUP 1'S DESIGN FOR PROJECT B								
PF1 = Help	2 = Refresh	3 = Quit	4 = Stype	5 = Sdate	6 = Sname				
7 = Backward	8 = Forward	9 = Q F/n	10 = Recall	11 = Sexpdt	12 = Cursor				
===>									

Figure 2. Descriptive comments enable a user to identify different versions of the same file.

## INFORMATION/ ADDRESS CHANGE FORM

Please send me the following:

- User Conference Registration Packet
- Information on VM Software Products

### CHANGING ADDRESS?

Please help us to ensure that you receive *Issues in VM* in a timely manner. If you have changed your address, or are planning to, just clip this out and send it, with your new address to the Editor, *Issues in VM*, VM Software, Inc., 1800 Alexander Bell Dr., Reston, VA 22091 ■

- Please add the following individual to your mailing list
- Delete me from your mailing list
- Change my address

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STATE \_\_\_\_\_

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( ) \_\_\_\_\_

PHONE \_\_\_\_\_

CPU MANUFACTURER/MODEL \_\_\_\_\_

41VM8812



# ANNUAL USER CONFERENCE PLANNED

EXPANDING THE LIMITS

The 1989 VM Software Annual User Conference, "Expanding the Limits,"

is planned for June 4-7, 1989. The site for the conference is the Crystal Gateway Marriott in Washington, D.C.

The program includes a full complement of technical sessions, with opportunities to

exchange ideas with other users, VM Software's technical staff and industry experts.

A highlight of the conference will be concurrent sessions for users of the Network DataMover products, recently added to VM Software's product family through a merger with The Systems Center, Inc., of Irving, Texas. All attendees will have

the option of attending VM Software and Network DataMover product sessions.

Optional training will be offered after the conference, with classes held on Thursday and Friday, June 8-9.

All users of VM Software products are invited to attend. For further information about the Annual User Conference, write or call Richard Smith, Corporate Meeting Planner, VM Software, Inc., 1800 Alexander Bell Drive, Reston, Virginia 22091. The telephone number is (703) 264-8000. ■

## CALL FOR PAPERS . . .

Presentations by users are an integral part of the VM Software Annual User Conference, serving as a platform for the sharing of ideas, and a catalyst for further interaction.

Proposals for user presentations are currently being sought for the 1989 conference. Topics should relate to the use of one or more VM Software products, focusing on a unique application of

a product feature that would be of general interest to other users.

The time frame for the presentation is 20 minutes, to be given once during the conference. Presenters should plan to illustrate their material with overheads. Handouts are also recommended.

Interested presenters should write a brief proposal that includes the title of the presentation, a description of the

topic and a list of major points to be discussed. Proposals, and questions, can be directed to Gary R. McClain, Manager Marketing Publications, at VM Software. He may be reached at (703) 264-8000.

Proposals should be submitted by March 31, 1988. Those selected will have their conference registration fee waived. ■



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