systems performance

VS1
CICS
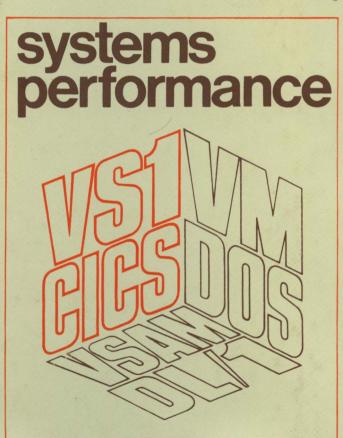VM
DOS
VSAM
DL/1

IBM

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Systems
Center

Intermediate Systems —
Systems Performance

by B.P. Miller
   W.J. Watt
   W.C. Worthington
   L.R. Halvorsen
   J.W. Hoyt
   S.J. Raitt
   N.J. Nucci
   J.T. Casey
   Palo Alto Systems Center

INTERMEDIATE SYSTEMS

SYSTEMS PERFORMANCE

INTRODUCTION

The Intermediate Systems - Systems
Performance Pocket Reference is designed
to be a quick and easy to use reference
for the I/S Systems Engineer. It
provides comprehensive and consolidated
performance and tuning guidelines in
checklist format for the major
Intermediate Systems SCP and DB/DC
products.

The Systems Performance Pocket Reference
is divided into six major sections:
VM/370, OS/VS1, DOS/VS, VSAM, CICS/VS
and IMS/VS DB and DL/I DOS/VS. Each
product section contains information on
how to use the checklist, currency and
prerequisites, a performance and tuning
bibliography, and the performance
checklist for the product. For each
performance and tuning item on the
checklist, the effect on the major
system resources (e.g., CPU Cycles,
Paging, I/O, Real Storage) is shown.
Thus, users who have identified their
major bottleneck or constraint can look
down the appropriate resource columns
for items to help alleviate the
situation.

The recommendations contained in this
document have not been subjected to any
formal test or review and should,
therefore, be individually evaluated for
their applicability to a particular
installation.

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SYSTEMS PERFORMANCE

Use of the information presented in this
document in a customer installation must
adhere to the Guidelines for Systems
Engineering Services.

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To order this document from
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        o Binder   ZZ20-2859
        o Tabs   ZZ20-2860
        o Contents   ZZ20-2861

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VM/370

PERFORMANCE CHECKLIST

VM/370

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PERFORMANCE CHECKLIST

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PERFORMANCE CHECKLIST

INTRODUCTION

Purpose Of This Document

This document is intended for new users
of VM/370 whose accounts run DOS,
DOS/VS, VS1, or a combination under
VM/370 for testing and/or production.
The intent is to provide a rather
comprehensive checklist of performance
items for consideration that will aid in
making maximum use of the standard
unmodified hardware and software. While
some of the items on the list are
obvious and not new, they can sometimes
be overlooked.

The recommendations contained in this
document have not been subjected to any
formal test or review and should,
therefore, be individually evaluated for
their applicability to a particular
installation. Use of the information
presented in this document in a customer
installation must adhere to the
Guidelines for Systems Engineering
Services.

How To Use This Document

The first section of the checklist
contains tuning items related to CP and
CMS and will be of general interest.
The second and more lengthy section
pertains to running Intermediate System
Control Programs and Customer
Information Control System in a virtual
machine.

The tuning items fall into two major
categories. One category includes items
which are potentially beneficial to all
virtual machines. Some will be easy to
implement while others may be judged as
not providing enough potential benefit
to be worth the cost of implementing on
a particular system.

The other category contains trade-off
items which are marked with a 't' in the
left-most column. The trade-off may
favor one type of user over another.
For example, improving CICS response
while degrading CMS response, or
improving CMS response while degrading
batch throughput.

The effect on the four major system
resources (CPU Cycles, Paging, I/O, Real
Storage) is shown for each performance
and tuning item. Users who have
identified their major bottleneck or
constraint can look down the appropriate
column for items to help alleviate the
situation.

The tuning items with the greatest
potential for performance improvement

are indicated by a double asterisk (**).
Other high potential items are indicated
by a single asterisk(*).

The contents of the checklist should
also be reviewed prior to:

1. The installation of a new VM/370
    system.

2. The installation of a new release
    of VM/370.

3. A major change in the hardware
    environment.

4. The installation of a new major
    application.

Most items on the list contain
references to other documents where
further information may be obtained.
The lack of a reference implies only
that no further explanation is needed or
available. Whenever possibile, SRL's
are referenced in the checklist because
they contain much current performance
related information. Don't overlook the
VM/370 Feature Supplement (GC20-1757);
although it may not be updated as
frequently as the VM/370 Publications,
it does contain in-depth material on the
workings of VM.

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Currency

  •    Release 5 of VM/370 which became
       available February 1978.

  •    VM/System Extensions Program
       Product 5748-XE1 (SEPP) available
       March 1978.

  •    VM/Basic System Extensions Program
       Product 5748-XX8 (BSEPP) available
       May 1978.

  •    VM/370 System Installation
       Productivity Option available for
       Release 5, PLC 07 and BSEPP.

Prerequisites

  •    Experience installing, generating
       and using VM/CMS.

  •    A basic understanding of how the
       system functions:

            VM/370 Implementation Class
            VM/370 Advanced Topics

  •    Access to the documents on the
       bibliography list.  And as a
       minimum, the SRLs.

  •    Highly recommended, Chapter IV of
       VM/370 Performance/Monitor Analysis
       FDP Program Description/Operations
       Manual (SB21-2101).
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VM/370
PERFORMANCE AND TUNING
BIBLIOGRAPHY

1. GC20-1801 VM/370 Planning and System Generation Guide
2. GC20-1807 VM/370 System Programmer's Guide
3. GC20-1819 VM/370 CMS User's Guide
4. GC20-1821 VM/370 Operating Systems in a Virtual Machine
5. GC20-1757 VM/370 Features Supplement
6. SC33-0071 CICS/VS V1 R3 System Programmer's Guide (OS/VS)
7. ZZ20-3755 VM/370 Predictor (VMPR)
8. ZZ05-0073 VM/370 AP Support Installation Experiences
9. ZZ05-0066 VM/370 Attached Processor Support
10. ZZ20-2852 VM/370 Planning for Basic System Extensions
11. ZZ05-0060 VM System Extensions Program Product Performance
12. GG22-9008 An APL Performance Benchmark
13. GG22-9012 VM/370 Planning for Release 4
14. ZZ10-9855 VM/370 IMS/VS System Study
15. ZZ10-9853 VM/370 Model 148 Intermediate Systems Guide
16. ZZ05-0039 VM/370 Interactive Benchmark on S370 148
17. G320-2121 An Analytic Model of the VM/370 System
18. SB21-2101 VM/370 Performance/Monitor Analysis FDP

VM/370
PERFORMANCE AND TUNING
BIBLIOGRAPHY
(continued)

19. ZZ10-9859 A VS1-CICS/DLI SNA Based
             System Performance Report
20. G321-5040 Service Levels
21. G320-2111 A Characterization of
             VM/370 Workloads
22. ZZ20-3905 138/48 Marketing Guide
23. ZZ10-9833 138/48 System Selection
             Guide (VS1)
24. ZZ10-9832 138/48 System Selection
             Guide (DOS/VS)
25. ZZ10-9829 VM/370 Tuning and
             Installation Cookbook
26. ZZ05-0026 VM Performance Evaluation
             and Tuning Guidelines
27. G320-2108 An Experimental Approach
             to Systems Tuning
28. G321-5022 Performance Analysis of
             Virtual Memory
             Timesharing Systems
29. ZZ05-0004 VM/VS1 Handshaking-158
             Batch Requirements
30. ZZ77-5018 Performance Guidelines
             for VM/370
31. G321-5008 VM/370 Performance Tools
32. ZZ05-0007 CMS on a 370 Model 135
33. ZZ05-0001 CMS on a 370 Model 145
34. G320-2099 Predicting Working Set
             Sizes
35. ZZ77-4028 Performance Measurement
             on a 145 in a Student
             Environment

NOTE: G320 documents can only be
       ordered from:

       Cambridge Scientific Center
       545 Technology Square
       Cambridge, MA   02139

VM/370 PERFORMANCE CHECKLIST

CP GENERAL

			TUNING EFFECT		
ITEM	COMMENTS	REFERENCE DOCUMENTS	CPU	PAGING	I/O	REAL STORAGE
* System Packs	Use minimum of two system packs. Paging should be split over multiple packs. If all systems packs are the same device type, don't designate any as preferred for paging.			Reduce wait	Balance paging/ spooling load	
	Split system packs over channels. Where machine configuration permits, an attempt should be made to spread the VM and batch system packs evenly across available channels.	4-Sect. 7 5-Ch. 35		Sustain higher rate	Balance paging/ spooling load	

CP GENERAL (continued)			TUNING EFFECT			
ITEM	COMMENTS	REFERENCE DOCUMENTS	CPU	PAGING	I/O	REAL STORAGE
Placement of Page and Spool Areas	Allocate TEMP space for paging and spooling as close to the center of the packs as possible.	5-Ch. 20		Reduce wait	Reduce device busy	
Placement of TDisk and MDisks	Minimize DASD arm movement by placing high activity mini-disks near center of pack.				Reduce wait	
Machine Assists	Use QUERY SASSIST, ASSIST, and CPASSIST to insure that all microcode assists are activated.	4-Sect. 7 5-Ch. 35	Reduce overhead			
* Fixed Head DASD	Place highly used files under fixed heads. CHKPT and the Directory (if frequent logons or links) are some examples.				Reduce wait and device busy	

VM/370 PERFORMANCE CHECKLIST

CP GENERAL (continued)

ITEM	COMMENTS	REFERENCE DOCUMENTS	TUNING EFFECT			
			CPU	PAGING	I/O	REAL STORAGE
* Mixed DASD Types	CP's order of preference in allocating TEMP space for paging and spooling is 2305, 3330, 3340, 3350, and 2314. For example, with default, the 3330 will be used before the faster 3350. This default order can be changed by reordering the DCs after label DMKPGTP5 in DMKPGT.			Reduce wait		
* Accounting Records	Punch accounting records out on frequent basis by starting class C punch. Don't generate a punch on systems without them. SEPP or BSEPP can eliminate problem with support of accounting records to disk.	1-Part 2 5-Ch. 15		Decrease rate		Increase available Page Pool

VM/370 PERFORMANCE CHECKLIST

CP GENERAL (continued)			TUNING EFFECT			
ITEM	COMMENTS	REFERENCE DOCUMENTS	CPU	PAGING	I/O	REAL STORAGE
Alternate Path DASD	If alternate path hardware exists, consider defining some devices without alternate path and some strings with a different primary path. To help evaluate the effectiveness of using alternate paths the monitor should be enabled to also collect seek data. In addition to VMAPs DASTAP report, display 16 bytes at external label DMKIOSNM. See DMKIOS source code for explanation of these four fields.				Reduce device busy and wait	

VM/370 PERFORMANCE CHECKLIST

CP GENERAL (continued)			TUNING EFFECT			
ITEM	COMMENTS	REFERENCE DOCUMENTS	CPU	PAGING	I/O	REAL STORAGE
Resident Nucleus	The resident nucleus can be reduced is support for 370X, 3270 Remote, 3270 Local, or 3340 alternate track support is not required.	1-Part 1		Decrease rate		Increase available Page Pool
Virtual Address of High Speed TP Lines	Waiting for I/O on channel zero causes machine to be dropped from queue. Avoid problem by changing virtual device address.	5-Ch. 20	Reduce wait	Reduce wait		
Virtual Channels, Control Units and Storage	Every virtual channel & control unit requires a 40 byte control block in Free Storage. Virtual Machine size should be limited to reduce real storage requirements.					Increase available Page Pool

VM/370 PERFORMANCE CHECKLIST

ITEM	COMMENTS	REFERENCE DOCUMENTS	TUNING EFFECT			
			CPU	PAGING	I/O	REAL STORAGE
CP GENERAL (continued)						
* 3340/44 MDisk Allocation	To reduce arm movement, mini-disks on 3340 should begin on even numbered cylinders. For 3344, use cylinders ending with 0 to 5. Do not use 3344 for CP paging if possible.				Reduce wait	
* 3330 Emulation on 3350	Avoid using 3330 emulation for CP owned or CMS volumes. Emulating a single Model 11 is preferable to two Model 1s. ISAM is a particularly poor performer with emulation because of 3 to 2 cylinder mapping.				Reduce wait	

VM/370 PERFORMANCE CHECKLIST

CP GENERAL (continued)				TUNING EFFECT		
ITEM	COMMENTS	REFERENCE DOCUMENTS	CPU	PAGING	I/O	REAL STORAGE
Device Addresses	Avoid placing 'selector' channel devices, such as tape or 2314s, on the same real or virtual channel as 'block multiplexor' devices.	1-Part 2			Reduce wait	
Format/ Initialize DASD	Format/initialize DASD off shift. CP's Format/Allocate, CMS Format, and IBCDASDI all use long CCW strings without RPS and therefore will tie up the channel.				Reduce channel busy	
Virtual Console Address	Address of 009 is preferable to 01F because 009 will use the same virtual control block as 00C, 00D, 00E.					Increase available Page Pool

ITEM	COMMENTS	REFERENCE DOCUMENTS	TUNING EFFECT			
			CPU	PAGING	I/O	REAL STORAGE
Number of Virtual Machines	To prevent overcommitment of resources, the maximum allow-able number of users can be specified by placing a value at label DMKSYSMA in module DMKSYS, reducing demand for free storage.					Increase available Page Pool
3270 Local	Place on lower virtual channel than tape so that if interrupts get stacked, 3270 interrupts will be presented before tape.				Reduce channel busy	
VNET vs. RSCS	VM/370 Networking PRPQ (5799-ATA) is more efficient for CP to CP communication than RSCS.		Reduce overhead			

CP GENERAL (continued)

VM/370 PERFORMANCE CHECKLIST

CP GENERAL (continued)

ITEM	COMMENTS	REFERENCE DOCUMENTS	TUNING EFFECT			
			CPU	PAGING	I/O	REAL STORAGE
Resource Management Facilities	If drum or fixed head DASD is installed, consider using the page migration and page-able SWAP/PAGE table features of SEPP to reduce page wait.		Slight increase in overhead	Migration of least used pages		Increase available Page Pool
Real Storage	Insufficient real storage is a very common problem and easy to detect by observing a Storage Contention Ratio consistently over 1.0. Another symptom is erratic response times. Adding additional storage will allow an increased level of multi-programming and may also reduce paging and overhead.		Reduce CP overhead	Reduce rate		Reduce wait

CP GENERAL (continued)			TUNING EFFECT			
ITEM	COMMENTS	REFERENCE DOCUMENTS	CPU	PAGING	I/O	REAL STORAGE
** Free Storage (t)	Insure that there is enough free storage to avoid extending. Display 8 bytes at DMKFRENP as in the sample EXEC in Appendix I. The first word contains a hex count of the number of dynamic free storage pages obtained. The next word contains the number released. Consider increasing the number of fixed free storage pages in the SYSCOR macro by the difference.	1-Part 2 2-Part 2	Reduce overhead			Decrease Page Pool

VM/370 PERFORMANCE CHECKLIST

CP GENERAL (continued)			TUNING EFFECT			
ITEM	COMMENTS	REFERENCE DOCUMENTS	CPU	PAGING	I/O	REAL STORAGE
SET SRM Facilities of the Fair Share Scheduler	Fair Share Scheduler favors interactive users. The degree of favoring can be reduced by reducing the Interactive Bias from its default setting of 2. SET SRM IB to 0 to help batch machine(s).		Reduce wait			Reduce wait
(B)SEPP	This scheduler considers both CPU and storage resource consumption of virtual machines. The default paging bias of 40 causes paging to be weighted by up to 40% and therefore CPU by at least 60%. The paging bias only has an effect when an eligible list		Control allocation			Control allocation
(t)	is present.					

CP GENERAL (continued)

ITEM	COMMENTS	REFERENCE DOCUMENTS	TUNING EFFECT			
			CPU	PAGING	I/O	REAL STORAGE
Other System Resource Management Facilities	Set Paging defaults to 4 and can be used to affect the level of multiprogramming. A smaller number will reduce the level of multiprogramming by increasing projected working set size.			Control rate		Control utilization
(B)SEPP (t)	MAXWSS is primarily useful in preventing nonfavored batch machines with large working sets from being blocked or blocking other machines in a storage constrained environment.			Increase rate		Reduce wait

VM/370 PERFORMANCE CHECKLIST

CMS				TUNING EFFECT		
ITEM	COMMENTS	REFERENCE DOCUMENTS	CPU	PAGING	I/O	REAL STORAGE
Fair Share Scheduler	The improved scheduler in SEPP and BSEP will provide moreconsistent response times with more active CMS users. Under heavy loads, trivial response times will improve.		Decrease overhead	More control		Better utiliza-tion
CMS System Disk	Reduce search time and stor-age requirements for the active file directory by (1) using auxiliary direc-tories, (2) removing files not necessary for normal sys-tem operation, (3) using the access command to restrict the files referenced.	2-Part 3	Decrease overhead			

VM/370 PERFORMANCE CHECKLIST

CMS (continued)			TUNING EFFECT			
ITEM	COMMENTS	REFERENCE DOCUMENTS	CPU	PAGING	I/O	REAL STORAGE
Diagnose Assist	Enhanced ECPS on 370/138 & 148 is supported by SEPP or BSEPP.		Decrease overhead			
CMS/DOS COBOL	Increase default workfile blocksize to multiples of 800 bytes (BUF option in CBL statement). Other compile options that affect performance: NOLIB, SUPMAP, SYNTAX.		Decrease overhead			
CMS/DOS Programs	Catalog programs in DOS CIL instead of CMS phase library for better fetch performance.	2-Part 3	Decrease overhead			
Global Command	Specify proper search order for Macro and DOS libraries.	3-Sect. 9	Decrease overhead			

VM/370 PERFORMANCE CHECKLIST

CMS (continued)

ITEM	COMMENTS	REFERENCE DOCUMENTS	TUNING EFFECT			
			CPU	PAGING	I/O	REAL STORAGE
Virtual Machine/ DOSPART Size	Use DOSPART option of the Set command to control partition size. Some programs run better in small partitions.	3-Sect. 9		Decrease wait	Possible increase in wait	
* File Structure	Specify fixed length for EXECs & CMS files being read randomly. CMS uses an algorithm to calculate record position for fixed length files.		Decrease overhead		Decrease SIOs	
CMS Batch Facility	Use instead of batch operating system where possible.		Decrease overhead			
	Can be used to control the number of concurrent compilations.			Decrease wait		

VM/370 PERFORMANCE CHECKLIST

CMS (continued)

ITEM	COMMENTS	REFERENCE DOCUMENTS	TUNING EFFECT			
			CPU	PAGING	I/O	REAL STORAGE
VSAM	Specify SHAREOPTIONS 3 in the Access Method Services Define statements so that CMS does not try to execute code that reserves and releases system resources. SHAREOPTION facilities are not supported in CMS/VSAM.	4-Ch. 25	Decrease overhead			
Set Blip Off	Use the CMS Set Command to turn blip off so that non-interactive machines are kept out of Q1. In addition, using the CP SET TIMER OFF will also reduce overhead.		Reduce overhead	Reduce unnecessary paging		

VM/370 PERFORMANCE CHECKLIST

CMS (continued)

ITEM	COMMENTS	REFERENCE DOCUMENTS	TUNING EFFECT			
			CPU	PAGING	I/O	REAL STORAGE
Directory Options	Option ECMode is not needed for CMS.		Reduce overhead			
	If User Priority is defaulted it will remain at 50 until the DIRECT command is used after (B)SEPP is installed. Then it will be 64.	1-Part 2	Discriminate more			Discriminate more
Remote 3270 Consoles	Use the Network command to disable lines when not in use. Also use to adjust the negative poll delay to the maximum value that will still provide acceptable response.		Decrease overhead			

CMS (continued)			TUNING EFFECT			
ITEM	COMMENTS	REFERENCE DOCUMENTS	CPU	PAGING	I/O	REAL STORAGE
Discontiguous Saved Segments	If multiple users have requirements for the same code, use discontiguous Saved Segments if possible to have one shareable copy. In addition to CMS itself, VSAM, VS/APL, and EDGAR are candidates. Note: This system IPO provides pregenerated DMKSNT entries for this purpose.	2-Part 2 1-Part 2	Slight overhead increase	Reduce paging load	Possibly reduce I/O load	Reduce requirement
Display Editing System IUP (EDGAR)	This full screen editor for 3270 (5796-PJP) can reduce I/O interrupts & data transmitted & improve response times for remote 3270s.		Decrease load		Decrease terminal I/O	

VM/370 PERFORMANCE CHECKLIST

CMS (continued)

| ITEM | COMMENTS | REFERENCE DOCUMENTS | TUNING EFFECT | | | |
			CPU	PAGING	I/O	REAL STORAGE
CMS Sort FDP	Although not compatible with OS or DOS Sort, this FDP (5798-BDW) is basically an in-storage sort & more efficient than SORT command.				Decrease I/O requirement	

VM/370 PERFORMANCE CHECKLIST

GENERAL BATCH CONSIDERATIONS

ITEM	COMMENTS	REFERENCE DOCUMENTS	TUNING EFFECT			
			CPU	PAGING	I/O	REAL STORAGE
* Spooling	Use spooling in the virtual machine to reduce number of SIOs CP will have to handle. Double spooling is a better performer than unblocked unit record I/O from the virtual machine.		Reduce CP overhead greatly		Increase DASD I/Os	Slightly increased working set
I/O Blocking	Raise I/O blocking factors where possible for sequentially access data sets.	4-Sect. 7 5-Ch. 35	Decrease batch overhead		Reduce SI/Os	Slightly increased working set
** Directory Options (BMX)	Be sure to specify virtual block multiplexor channels in directory (OPTION BMX) so that multiple SIO requests can be processed by CP.	1-Part 2 4-Sect. 8			Reduce wait	

VM/370 PERFORMANCE CHECKLIST

GENERAL BATCH CONSIDERATIONS (continued)			TUNING EFFECT			
ITEM	COMMENTS	REFERENCE DOCUMENTS	CPU	PAGING	I/O	REAL STORAGE
Directory Options (ISAM)	Use OPTION ISAM only for those OS machines where it is required.	4-Sect. 8 5-Ch. 15	Decrease overhead			
ISAM INDICES	If ISAM must be used try to use incore indices. VSAM is a better performer than ISAM under VM.	5-Ch. 35	Decrease overhead	Slight increase	Decrease SIOs	
SET RUN ON	Use to continue batch operations following interruptions for CP communications.	5-Ch. 15	Increase thruput			

GENERAL BATCH CONSIDERATIONS (continued)			TUNING EFFECT			
ITEM	COMMENTS	REFERENCE DOCUMENTS	CPU	PAGING	I/O	REAL STORAGE
** Number of Partitions/ Initiators	Consider reducing to improve total batch thruput. Or if using VM/VS handshaking, SET PAGEX OFF to let CP adjust level of multiprogramming in the virtual machine suitable for the available storage.			Reduce paging load		Reduce working set
** Shadow Table Maintenance	DOS/VS's new program check PSW has the dynamic address translation bit off which causes the shadow table to be purged. If SEPP is installed, set of STBYPASS NNNNNK should be used. If running DOS/VS/AF or VS1 in nonpaging mode specify virtual machine size for NNNNNK.	4-Sect. 7	Reduce overhead			

GENERAL BATCH CONSIDERATIONS (continued)

ITEM	COMMENTS	REFERENCE DOCUMENTS	TUNING EFFECT			
			CPU	PAGING	I/O	REAL STORAGE
Tape Switching	If one of the tape switching features is installed on the 3803, switching can be defined in either the guest operating system or in CP. To define in DMKRIO specify ALTCU in the RDEVICE macro (see 'Alternate Path DASD' above for evaluation suggestions). To then support more than one concurrent tape I/O from a virtual machine, define some drives on one virtual channel and some on another.				Reduce wait	

GENERAL BATCH CONSIDERATIONS (continued)			TUNING EFFECT			
ITEM	COMMENTS	REFERENCE DOCUMENTS	CPU	PAGING	I/O	REAL STORAGE
Clear Option of IPL	Using the clear option of the IPL command and will eliminate the need for CP to do a page-in each time a page is referenced on other than the first IPL in a virtual machine.		Reduce overhead	Reduce paging load		
* MDisk vs. Dedicated Disks	On systems without SIOF implemented where real DASD is shared between CPUs, use dedicated disks where minidisk sharing is not required. A device busy condition will be reflected to the virtual machine only if device is dedicated.		Possible increase in number of CCW Translations		Possible decrease in wait	

VM/370 PERFORMANCE CHECKLIST

GENERAL BATCH CONSIDERATIONS (continued)			TUNING EFFECT			
ITEM	COMMENTS	REFERENCE DOCUMENTS	CPU	PAGING	I/O	REAL STORAGE
* Start I/O No Wait	CP will suspend execution after a SIO until the real SIO is executed and the resulting condition code can be presented to the virtual machine. With SEPP or BSEPP, CP will not suspend execution if the first CCW to a DASD device is a Seek. The fix to APAR VM08290, contained in LTR505, removes the SIONW implemented in (B)SEPP DMKVSI modules because of a problem with dedicated DASD in a multi-CPU environment.				Reduce wait for DASD	

			TUNING EFFECT			
ITEM	COMMENTS	REFERENCE DOCUMENTS	CPU	PAGING	I/O	REAL STORAGE
Priority (t)	Giving high priority (0 is highest) to a virtual machine will cause the scheduler to favor that machine. This facility has greater impact when SEPP or BSEPP is installed.	2-Part 2 5-Sect.20	More CPU cycles given to preferred machine			Reduce wait (if not Favored)
* SET FAVORED without Percent (t)	This option will usually keep a virtual machine in queue and is highly recommended when running virtual operating systems under VM. Use of this option for too many virtual machines can cause an overcommitment of real storage.	2-Part 2 4-Sect. 3	Reduce overhead	Less for favored machine		Eliminate storage wait

GENERAL BATCH CONSIDERATIONS (continued)

VM/370 PERFORMANCE CHECKLIST

GENERAL BATCH CONSIDERATIONS (continued)

ITEM	COMMENTS	REFERENCE DOCUMENTS	TUNING EFFECT			
			CPU	PAGING	I/O	REAL STORAGE
* SET FAVORED with Percent	This option will cause CP to attempt to assure the virtual machine a fixed percent of the CPU resource. With (B)SEPP installed, multiple machines may be favored with percent but CP will not keep the machine in queue unless it is also SET FAVORED.	2-Part 2 4-Sect. 3	More cycles for the favored machine			

GENERAL BATCH CONSIDERATIONS (continued)			TUNING EFFECT			
ITEM	COMMENTS	REFERENCE DOCUMENTS	CPU	PAGING	I/O	REAL STORAGE
SET PAGEX ON (t)	When using handshaking, PAGEX can be set on after IPL of the virtual machine to assist VS1 or DOS in only stopping the partition where the page fault occurred rather than the whole machine. When the batch operating system has a low multiprogramming level, leave PAGEX off.	4-Sect.10	Increase in CP and Operating System overhead	Increase paging load		Increase working set
Lock Pages (t)	Specific pages of a V=V machine may be locked. This should be carefully experimented with as it can be counter-productive for other virtual machines.	4-Sect. 3 2-Part 2		Increase paging load for other machines		Decrease available Page Pool

VM/370 PERFORMANCE CHECKLIST

GENERAL BATCH CONSIDERATIONS (continued)		TUNING EFFECT			
ITEM	COMMENTS	REFERENCE DOCUMENTS	CPU	PAGING	I/O	REAL STORAGE
Reserve Pages (t)	Using SET RESERVE may be necessary for online systems to maintain acceptable response when transaction rate falls off. This option can only be used for one machine. Be careful using reserved pages because the effect is not always the intended one.	4-Sect. 3 2-Part 2		Increase paging load for other machines		Decrease available Page Pool
V=R Jobs	If not using handshaking, running jobs V=R will avoid level of CCW translation. This will not be possible for DOS jobs requiring VSAM and is mutually exclusive with RPS in DOS/VS.		Reduce batch overhead			

ITEM	COMMENTS	REFERENCE DOCUMENTS	TUNING EFFECT			
			CPU	PAGING	I/O	REAL STORAGE
V=R Machine (t)	V=R can only be used for one virtual machine. Use of handshaking (nonpaging mode) is preferable. If using V=R, be sure to SET NOTRANS ON after the IPL command. With SEPP installed, also use SET STBYPASS VR.	2-Part 2 4-Sect. 7	Decrease CP overhead	Increase paging load for other virtual machines		Decrease available Page Pool
* Multiple Machines (t)	If real storage and operational considerations permit, generate multiple virtual machines with special purpose supervisors rather than a single machine with many active initiators or partitions.	4-Sect. 7	Possible increase in total thruput	Increase paging load		More required

GENERAL BATCH CONSIDERATIONS (continued)

VM/370 PERFORMANCE CHECKLIST

DOS/VS WITH VM/370			TUNING EFFECT			
ITEM	COMMENTS	REFERENCE DOCUMENTS	CPU	PAGING	I/O	REAL STORAGE
** Use VM Linkage	VM/VS handshaking is a system generation option (VM=YES) of DOS/VS Advanced Functions Program Produce 5746-XE2.		Decrease overhead			
	DOS/VS/AF should be at PUT level 3408 or have fix for APAR DY13973 installed.		Decrease overhead	Reduce rate and wait		
* Partition Balancing	It is usually not advisable to use partition balancing when operating under VM link-age. Therefore, don't use equal partition priorities unless it can't be avoided.		Decrease CP and DOS overhead			

DOS/VS WITH VM/370 (continued)			TUNING EFFECT			
ITEM	COMMENTS	REFERENCE DOCUMENTS	CPU	PAGING	I/O	REAL STORAGE
POWER/VS	Use of POWER/VS will greatly reduce the number of SIOs which CP will have to handle. Use as large a DBLK value as possible and a single buffer for all reader/writer tasks.	4-Sect. 7	Decrease CP overhead		Decrease SIOs	Slight increase in working set
	Consider installing the 3800 ICR for Release 34 even without a 3800 printer installed. A dummy 3800 assigned to a batch partition will greatly reduce the number of SVC and the associated privileged instructions.		Reduce DOS and CP overhead			

VM/370 PERFORMANCE CHECKLIST

DOS/VS WITH VM/370 (continued)			TUNING EFFECT			
ITEM	COMMENTS	REFERENCE DOCUMENTS	CPU	PAGING	I/O	REAL STORAGE
* Display Consoles	If using DOC=125D or 3277, consider applying suggested fix for APAR DY13561 to eli- minate fetching of transients for console operations. Caution, this fix is known to cause problems when DOS/VS is run native.		Reduce overhead	Possible increase in rate	Reduce DOS SIOs	
Console Buffering	If using virtual 3210, 3215, or 1052 console, eliminate console buffering option of supervisor. CP will do the buffering.		Decreases DOS/VS overhead			

DOS/VS WITH VM/370 (continued)

ITEM	COMMENTS	REFERENCE DOCUMENTS	TUNING EFFECT			
			CPU	PAGING	I/O	REAL STORAGE
SEND, ALLOC and ALLOCR	Adjust the DOS/VS supervisor end address and both real and virtual partition boundaries as well as the size parameter in the exec statement so that they are all on 4K intervals. This can reduce VM paging by insuring that program loading starts on a 4K boundary.	4-Sect. 7		Slight decrease in paging load		Slight decrease in working set
BLKMPX	Avoid seek separation in the FOPT macro. With 3000 series DASD specify BLKMPX in PIOCS macro.	4-Sect. 7	Reduce overhead		Decrease wait	

DOS/VS WITH VM/370 (continued)			TUNING EFFECT			
ITEM	COMMENTS	REFERENCE DOCUMENTS	CPU	PAGING	I/O	REAL STORAGE
RSIZE	When using VM linkage, the real storage specified in the DOS/VS supervisor should be the minimum required. POWER/VS, however, still requires a real allocation. Another means of reducing supervisor size is to default the specification for copy blocks. They are not needed except to contain initialization code.			Slight decrease in paging load		Slight decrease in working set

DOS/VS WITH VM/370 (continued)			TUNING EFFECT			
ITEM	COMMENTS	REFERENCE DOCUMENTS	CPU	PAGING	I/O	REAL STORAGE
** Unnecessary TCH In- structions	TCH instructions before SIOs serve no useful purpose with virtual machines. Use CP trace SIO to find and NOP, making sure to also change the BC instruction following the TCH. This modification is particularly beneficial on machines without VM ECPS.	4-Sect.10	Reduce overhead			

VM/370 PERFORMANCE CHECKLIST

			TUNING EFFECT			
DOS/VS WITH VM/370 (continued)						
ITEM	COMMENTS	REFERENCE DOCUMENTS	CPU	PAGING	I/O	REAL STORAGE
Unnecessary TCH In- structions (cont.)	When using a VM/VS hand- shaking supervisor generated with Job Accounting and the CPU not specified as a 138 or 148, six additional TCH instructions are inserted to improve resolution of the virtual interval timer. If JA's reporting of CPU cycles is not important, they can all be NOP'ed; otherwise, three of them can be elimi- nated without sacrificing any accuracy (two in the external interrupt routine, and the remaining one inserted after changing the interval time value - label SYSTIMER).	4-Sect. 7	Reduce overhead			

VM/370 PERFORMANCE CHECKLIST

DOS/VS WITH VM/370 (continued)			TUNING EFFECT			
ITEM	COMMENTS	REFERENCE DOCUMENTS	CPU	PAGING	I/O	REAL STORAGE
Saved Systems	Because of the time required to IPL DOS/VS/AF under VM/370, consider saving the DOS system. One logical place in the IPL routine is at the point where AUTOPOLL is set on via a diagnose instruction. Another time is at the end of each day but make sure to set autopoll on again (and pagex also if desired) after IPL'ing the saved system.	2-Part 2 4-Sect. 1 5-Ch. 35	Reduce overhead			
SLD and PSLD	Insure that sufficient Second Level Directory entries are specified in FOPT macro to cover all directory tracks.	4-Sect. 7			Reduce DOS SIOs	

VM/370 PERFORMANCE CHECKLIST

DOS/VS WITH VM/370 (continued)			TUNING EFFECT			
ITEM	COMMENTS	REFERENCE DOCUMENTS	CPU	PAGING	I/O	REAL STORAGE
BTAM Autopoll	Use Autopoll/Wraplist option of BTAM to reduce SIOs. If using DOS/VS/AF, the IPL routine will automatically SET AUTOPOLL ON. This feature will reduce the I/O interrupts CP must handle.	4-Sect.10 5-Ch. 35	Reduce CP and DOS overhead			
* SDL (t)	Make extensive use of the System Directory List in the Shared Virtual Area to eliminate DOS I/O to directory for heavily used transients and program phases.	4-Sect. 7		Possible increase in paging load	Reduce DOS SIOs	

DOS/VS WITH VM/370 (continued)			TUNING EFFECT			
ITEM	COMMENTS	REFERENCE DOCUMENTS	CPU	PAGING	I/O	REAL STORAGE
2314 Devices	Use seek separation in the DOS supervisor even though CP will unchain seeks on 2314.	4-Sect. 7 5-Ch. 20	Increase overhead		Reduce wait	
(t)	Always specify SEEKSEP=NO if using 2314 emulation on 370/135 or 138.		Decrease overhead			
* RPS (t)	For installations which have DASD that will support this function, consider specifying RPS=YES in DOS supervisor, especially for 148 CPUs and above where DASD I/O is heavy.		Increase DOS/VS overhead		Reduce channel busy	

VM/370 PERFORMANCE CHECKLIST

OS/VS1 WITH VM/370			TUNING EFFECT			
ITEM	COMMENTS	REFERENCE DOCUMENTS	CPU	PAGING	I/O	REAL STORAGE
Use VM Handshaking	Run VS1 in nonpaging mode so that CP will do all paging and CCW translation. The VS1 system must be generated with the VM option. This will require a full VS1 system generation.	4-Sect.10 1-Part 1	Reduce VS1 overhead			
BTAM Autopoll	Use Autopoll/Wraplist option of BTAM to reduce SIOs. If on VS1 Rel. 6 with VM option and VM Rel. 3.8 or above, VS1 will automatically SET AUTOPOLL ON and notify CP when CCWs are modified. This will reduce the number of I/O interrupts CP must handle.	4-Sect.10 5-Ch. 35	Reduce VS1 and CP overhead			

VM/370 PERFORMANCE CHECKLIST

			TUNING EFFECT			
OS/VS1 WITH VM/370 (continued)						
ITEM	COMMENTS	REFERENCE DOCUMENTS	CPU	PAGING	I/O	REAL STORAGE
JES	Reader and writer intervals (RDR=Y= and WRT=Z=) should be high to cut down I/O requests. Writer blocksize (WTR=B=) should be large to reduce VS1 I/O operations.		Reduce CP and VS1 overhead		Reduce VS1 SIOs	Slight increase in working set
	There is little or no advantage in specifying multiple buffers for readers or writers.					Decrease working set

OS/VS1 WITH VM/370 (continued)			TUNING EFFECT			
ITEM	COMMENTS	REFERENCE DOCUMENTS	CPU	PAGING	I/O	REAL STORAGE
* CTIMERS	By specifying EXCLUDE in CENPROCS SYSGEN macro the overhead of simulating the SET and STORE CPU Timer Instructions will be eliminated. The other consideration is that SMF results will be less accurate due to use of a simulated interval timer on machines other than 370/138 and 148.	4-Sect. 7	Decrease overhead			
Sequence of Resident SVC List	Place most frequently used modules last in Resident SVC list because supervisor searches list starting from the end.		Reduce VS1 overhead			

OS/VS1 WITH VM/370 (continued)			TUNING EFFECT			
ITEM	COMMENTS	REFERENCE DOCUMENTS	CPU	PAGING	I/O	REAL STORAGE
Resident Modules	Make as much as possible resident, and preferably fixed rather than pageable, to reduce VS1 I/O. Modules which can be made resident are SVCs, selected Error Recovery routines, Access Methods, various LINKLIB members, BLDL, and any other re-entrant modules.		Reduce overhead	Slight increase in paging rate and wait	Decrease VS1 SIOs	
SWA	It is better to use the in-core Scheduler Work Area than the disk resident Scheduler Work Area Data Set. Paging I/O is faster than VS1 I/O. VS1 partition sizes must also be increased.		Slight overhead decrease	Increase paging load	Reduce VS1 SIOs	

VM/370 PERFORMANCE CHECKLIST

OS/VS1 WITH VM/370 (continued)			TUNING EFFECT			
ITEM	COMMENTS	REFERENCE DOCUMENTS	CPU	PAGING	I/O	REAL STORAGE
* Eliminate Unnecessary Privileged Operations	The PTLB instruction is not needed when VS1 is run in nonpaging mode. The PTF to APAR OX21631 removes it.		Reduce overhead			
Time Slicing	Try to avoid this option if it is not really needed. It is, however, preferrable to using dynamic dispatching.		Decrease overhead	Decrease paging load		Decrease working set
Dynamic Dispatching	Avoid the use of DDG in the CPRLPROG macro. This option will probably not yield the desired results under VM/370. It can be turned off at IPL time.		Decrease overhead	Decrease paging load		Decrease working set

VM/370 PERFORMANCE CHECKLIST

| OS/VS1 WITH VM/370 (continued) | | | TUNING EFFECT | | | |
ITEM	COMMENTS	REFERENCE DOCUMENTS	CPU	PAGING	I/O	REAL STORAGE
SAM Options	Consider using Chained Scheduling (OPTCD option in DCB) for Sequential Access Methods to reduce SIOs possibly at the expense of locking out other I/O on the same channel. Also use Search Direct (OPTCD=Z) or Fixed Standard to reduce channel busy.		Reduce CP overhead		Decrease SIOs	
	Consider decreasing I/O buffers in a storage constrained system.					Decrease demand

VM/370 PERFORMANCE CHECKLIST

OS/VS1 WITH VM/370 (continued)			TUNING EFFECT			
ITEM	COMMENTS	REFERENCE DOCUMENTS	CPU	PAGING	I/O	REAL STORAGE
SMF	Don't collect more information than needed. Consider generating without EXCP counts, Page-in counts, EVA and ESV.		Reduce VS1 overhead			
DDR	Consider eliminating Dynamic Device Reconfiguration (OPTIONS=NODDR) in CTLGPROG sysgen macro.		Reduce VS1 overhead			
I/O Load Balancing	Consider not using this option in the SCHEDULR sysgen macro because VS1 is only aware of its own I/O and virtual addresses.		Reduce VS1 overhead			

VM/370 PERFORMANCE CHECKLIST

OS/VS1 WITH VM/370 (continued)			TUNING EFFECT			
ITEM	COMMENTS	REFERENCE DOCUMENTS	CPU	PAGING	I/O	REAL STORAGE
Console Logging	If VS1 virtual console is 1052, 3210, or 3215, generate SCHEDULR macro with NOLOG and let CP spool the console.		Reduce overhead		Reduce VS1 SIOs	
Internal Trace	To eliminate VS1 internal trace which is somewhat re-dundant with CP internal trace, generate zero trace entries or place X'FF' into location X'54' at run time.		Reduce overhead			
VS1 ECPS	Not always helpful when running under VS in a V=V virtual machine with hand-shaking. Most of the assist functions are handled by CP anyway.		Could decrease overhead			

VM/370 PERFORMANCE CHECKLIST

CICS WITH VM/370			TUNING EFFECT			
ITEM	COMMENTS	REFERENCE DOCUMENTS	CPU	PAGING	I/O	REAL STORAGE
Program Control Table	Specifying Anticipatory Paging (ANTICPG) when using VM/VS Handshaking will result in unnecessary Page In/Out SVCs being issued by CICS. Use of this option should probably be avoided. The only advantage in using ANTICPG is that multiple pges will be released with a single SVC.		Decrease overhead			
Terminal Control	Specify Autopoll and Wrap-list=Yes in DFTRMLST macro when applicable to reduce the number of SIOs.		Decrease overhead	Reduce paging load		Reduce working set

CICS WITH VM/370 (continued)			TUNING EFFECT			
ITEM	COMMENTS	REFERENCE DOCUMENTS	CPU	PAGING	I/O	REAL STORAGE
ALT and NLT	Make all or most programs resident to eliminate fetch I/O.		Decrease overhead	Slight increase in paging	Decrease I/O load	
	Use Application and Nucleus Load Tables to specify load order of modules. Align on 4K boundaries.			Reduce paging load		Reduce working set
System Initiali- zation	Interval Control Value (ICV) should be set to at least one second to minimize interrupts from interval timer.	6-Ch. 2,4	Decrease overhead			
	Specify PGSIZE=4096 so that CICS will manage the dynamic area with 4K rather than 2K pages.			Reduce paging load		Reduce working set

VM/370 PERFORMANCE CHECKLIST

			TUNING EFFECT			
CICS WITH VM/370 (continued)						
ITEM	COMMENTS	REFERENCE DOCUMENTS	CPU	PAGING	I/O	REAL STORAGE
TP Balancing	This feature of CICS/VS/DOS has no effect in a VM/VS handshaking environment. Therefore, the TPIN TPOUT SVCs can be NOP'ed in CICS.		Decrease DOS/VS overhead			
Remove Unnecessary SVCs	Storage management SVCs such as Page In/Out and Page Fix/ Free serve no useful function in a virtual machine.		Decrease operating system overhead			
Journaling	Disk journaling is preferable to tape because the virtual machine is nondispatchable when the real tape channel is busy.				Reduce wait	

ITEM	COMMENTS	REFERENCE DOCUMENTS	TUNING EFFECT			
			CPU	PAGING	I/O	REAL STORAGE
Partition Priority	CICS should be run at a higher priority than JES/ POWER. For VS1, this can be accomplished by specifying a dispatching priority for JES rdr/wtrs in the parm field of the EXEC statement in the cataloged procedure.		Reduce wait			
Realtimer	Be sure to specify this directory option so that the virtual interval timer continues to decrement when the virtual machine loads a Wait State PSW.	5-Ch. 20	Reduce voluntary wait			

CICS WITH VM/370 (continued)

VM/370 PERFORMANCE CHECKLIST

CICS WITH VM/370 (continued)			TUNING EFFECT			
ITEM	COMMENTS	REFERENCE DOCUMENTS	CPU	PAGING	I/O	REAL STORAGE
Favored Execution	Always use for production machine to keep dispatchable. With (B)SEPP it may also be necessary to Set Favored with Percent. Setting percent too high will severely impact response time of interactive users.		Reduce wait			Eliminate wait
User Priority (t)	Important to set high priority (low number) for CICS Virtual Machine. If using Set Favored Percent with (B)SEPP, the user priority of the CICS machine has no effect. May be possible to improve CICS response by lowering other users priorities.	2-Part 2 5-Sect.20	Reduce wait			

CICS WITH VM/370 (continued)			TUNING EFFECT			
ITEM	COMMENTS	REFERENCE DOCUMENTS	CPU	PAGING	I/O	REAL STORAGE
Fair Share Scheduling	Consider using SEPP or BSEPP to improve thruput and response time.		Less overhead			Better utiliza-tion
** Reserve Pages (t)	Can be used to retain a mini-mum number of pages in real storage during periods of low activity. To insure that mainline DOS and CICS pages are marked reserved: Stop batch partitions is possible, SET FAVORED off and PAGEX OFF, SET RESERVE, then set FAVORED again and PAGEX also if desired.			Reduce wait		

VM/370 PERFORMANCE CHECKLIST

CICS WITH VM/370 (continued)			TUNING EFFECT			
ITEM	COMMENTS	REFERENCE DOCUMENTS	CPU	PAGING	I/O	REAL STORAGE
Lock Pages (t)	Can be used to fix specific 4K pages in real memory. Page zero is gook candidate.			Reduce wait		
V=R Machine (t)	Use of this feature is not recommended. VM/VS handshaking will provide performance at least as good for CICS and better overall.					Can limit allocation for CICS
** PAGEX (t)	Leaving PAGEX off is usually best for CICS. If batch is run in the same virtual machine, it may be necessary to SET PAGEX OFF to maintain acceptable CICS response during peak periods. Doing so may impact batch thruput.		Reduce overhead and wait	Reduce rate		

CICS WITH VM/370 (continued)			TUNING EFFECT			
ITEM	COMMENTS	REFERENCE DOCUMENTS	CPU	PAGING	I/O	REAL STORAGE
Multiple Machines (t)	If real storage, operational & application considerations permit, run CICS is a separate virtual machine. This will allow better control of resource allocation between CICS, batch and CMS. A separate virtual machine for CICS/VS/DOS will also reduce transient area contention.	4-Sect. 7	Possible increase in total thruput	Increase paging load		Increase total working set and free storage required

VM/370
PERFORMANCE CHECKLIST

APPENDIX I: PERFORMANCE MEASUREMENT
              TECHNIQUES-TOOLS

Basic Measurements

VM is unique in its ability to·report
some rather fundamental load and
performance data upon request; such as,
CPU and storage utilization, level of
multiprogramming, paging rate and wait.
Daily monitoring of these basic
indicators is good installation
management practice. The commands
(INDICATE LOAD, QUERY PAGING, INDICATE
QUEUE, INDICATE USER) can be issued on a
regular basis by an EXEC as shown, from
an autologged (disconnected) virtual
machine with privileged class E.

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Sample Indicate Exec

```
&CONTROL OFF
CP SPOOL CONSOLE START
CP DISCONN
-BEGIN
CP QUERY TIME
CP QUERY NAMES
CP DCP Address of DMKFRENP.8
&SPACE 1
&LOOP -ENDLOOP 12
&TIME ON
CP SLEEP 5 MIN
&TIME OFF
CP INDICATE LOAD
CP QUERY PAGING
CP INDICATE QUEUES
CP INDICATE USER & 1
&SPACE 1
-ENDLOOP
CP CLOSE CONSOLE
&GOTO -BEGIN
```

Selecting a Performance Tool

There are two types of techniques for
extracting information maintained by the
system. One technique requires a
virtual machine (TVMON). The other uses
data produced by CP's Monitor facility
(VMAP, VMPR). Although the first
approach can immediately report
available data for real-time analysis,
there are a number of inherent
disadvantages, namely:

   1. No event derived data. (Less
       detail.)

   2. More overhead. (Distorts system
       being measured.)

   3. Measurements biased. (Sampling
       interval only approximate. Must be
       running during observation.)

Tools Available

VMAP: VM/370 Performance/Monitor
            Analysis, Extended Support FDP
            5798-CPX

TVMON: VM/370 Graphic Monitor, IUP
            5796-PDT

VM/370 PERFORMANCE CHECKLIST
READER'S COMMENT FORM

Comments on the usefulness of this
document are appreciated. Please
suggest additions, deletions, revisions
that would make this more useful to you.
If you have additional items that you
feel make VM/370 perform better, please
send them also.

Please give the following information:

Name:_____
Location:_____
Address:_____
        _____
Telephone number:
      TIE line 8/_____-_____,
      Outside (_____)_____-_____

General rating of this document:

o Extremely useful   o Marginally useful
o Very useful   o Of no value
o Useful

Additional comments may be written on
the back of this form.

Send comments to: B. P. Miller
                    IBM Corporation
                    Palo Alto Systems Center
                    1501 California Avenue
                    Palo Alto, CA   94304

VM/370 PERFORMANCE CHECKLIST
READER'S COMMENT FORM

OS/VS1

PERFORMANCE CHECKLIST

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OS/VS1

PERFORMANCE CHECKLIST

January 1979 Edition

A form for reader's comments has been
included at the end of this document.
If it has been removed, please send any
comments or additional performance items
to:

     B. P. Miller
     IBM Corporation
     Palo Alto Systems Center
     1501 California Avenue
     Palo Alto, CA 94304

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OS/VS1
PERFORMANCE CHECKLIST

<u>CONTENTS</u>

OS/VS1
PERFORMANCE CHECKLIST

INTRODUCTION

Purpose Of This Document

This document is intended to provide a
quick reference for VS1 Systems Engineer
who wants to help more finely tune a
customer's VS1 system. The intent is to
provide a rather comprehensive list of
performance items for consideration that
will aid in making maximum use of what
the standard unmodified hardware and
software has to offer. This document
represents a best effort to supply a
list of those items which have proven to
provide a performance improvement in a
majority of instances.

The recommendations contained in this
document have not been subject to any
formal test or review and should
therefore be individually evaluated for
their applicability to a particular
installation. Use of information
presented in this document in a customer
installation must adhere to the
Guidelines for Systems Engineering
Services.

OS/VS1
PERFORMANCE CHECKLIST

How To Use This Document

The following checklist assumes that the
user has access to the documents listed
in the bibliography section of this
document.

For ease of use, the VS1 Performance
Checklist is divided into eight
sections:

        General Configuration
             Considerations
        Residency Lists
        System Data Sets
        JES
        System Generation/Parmlib Options
        Operational and Programming
             Considerations
        RES
        VTAM

The effect on the four major system
resources (CPU cycles, Paging, I/O and
Real Storage) is shown for each
performance and tuning item on the
checklist. Users who have identified
their major bottleneck or constraint can
look down the appropriate columns for
items to help alleviate the situation.

OS/VS1
PERFORMANCE CHECKLIST

The contents of the checklist should
also be reviewed prior to:

1. The installation of a new VS1
    system.

2. The installation of a new release
    of VS1.

3. A major change in the hardware
    environment.

4. The installation of a new major
    application.

OS/VS1
PERFORMANCE CHECKLIST

Currency

This document is current through the
current release of OS/VS1 at the date of
publication.

Prerequisites

- Experience installating, generating
  and using VS1.

- A basic understanding of how the
  system functions.

- Access to the documents on the
  bibliography list.

GENERAL

 1. GC24-5090 OS/VS1 Planning And Use
               Guide
 2. GC26-3791 OS/VS1 System Generation
               Reference
 3. ZZ20-2363 OS/VS1 Performance
               Evaluation - Release 6
 4. ZZ20-2349 Introduction To System
               Performance Evaluation -
               Virtual Storage Systems
 5. ZZ05-0005 VS1 TP Response Time
               Tuning In A Low Message
               Rate Environment
 6. ZZ10-9833 138/148 System Selection
               Guide - OS/VS1
 7. ZZ10-9853 S/370 Model 148
               Intermediate Systems
               Guide
 8. ZZ10-9850 A VS1-CICS-DL/I SNA Based
               System Performance Report
 9. 77-51   Palo Alto Systems Center
               Flash - VS1 RSVC List For
               Improved Performance For
               Display Commands
10. ZZ20-3698 IBM Direct Access Storage
               Device Switching Concepts
11. ZZ77-5012 Planning For Shared DASD
12. ZZ77-3043 Whip Up Your 3330 For
               Free
13. --------- SHARE Presentation:
               Effective Use of DASD -
               11/75, B. Maxwell
14. ZZ05-0300 A DASD Tuning Refresher
15. ZZ77-2036 Programming For
               Performance In Virtual
               Storage

AIDS AND TOOLS

16. ZZ20-3499 VS1 Performance Tool
(VS1PT) Marketing Guide
(5796-PGL)
17. SH20-1831 VS1 Performance Tool
(VS2PT) Program
Description and Operation
Manual (5796-PGL)
18. SB21-2143 GTFPARS Program
Description and Operation
Manual (5798-CQ2)
19. SB21-1405 VS1 Utilization Monitor
Program Description and
Operation Manual
(5798-CAK)
20. SB21-2247 VTAMPARS Program
Description and Operation
Manual (5798-CTW)
21. GB21-9880 VS/REPACK General
Information Manual
(5796-POZ)
22. SH20-1669 VS/REPACK Program
Description and Operation
Manual (5796-PDZ)

<u>RES</u>

23. GC28-6878 OS/VS1 RES Systems
             Programmer's Guide
24. 78-13   Palo Alto Systems Center
             Flash - VS1 RES For 3770
             and 3790 Communications
             Systems
25. G320-6014 3770 RJE SNA Installation
             Guide
26. ZZ05-0061 3790 RJE Installation and
             Operations Guide

OS/VS1 PERFORMANCE CHECKLIST

| GENERAL CONFIGURATION | | TUNING EFFECT | | | |
ITEM	COMMENTS	CPU	PAGING	I/O	REAL STORAGE
Balance DASD activity	For better performance, data set placement should be analyzed and optimized to balance the DASD activity for the system. The objective is to spread the I/O requests as evenly as possible across devices and channels and to minimize arm movement on each device.	Better CPU utilization possible through increased I/O and CPU overlap	Reduce wait	Balance I/O. Minimize device, channel busy, and wait.	
Split system packs across channels	Where machine configuration permits, an attempt should be made to spread the VS1 system packs evenly across available channels.	Better CPU utilization possible	Reduce wait	Reduce wait. Sustain higher rate. Balance I/O.	

OS/VS1 PERFORMANCE CHECKLIST

GENERAL CONFIGURATION (continued)		TUNING EFFECT			
ITEM	COMMENTS	CPU	PAGING	I/O	REAL STORAGE
Use at least two system packs	For better performance, the VS1 System Data Sets should normally be spread across a minimum of two packs, since in most instances the System Data Sets are more consistently heavily used then User Data Sets. Heavily used data sets should be separated. Additionally, the system packs should be on priority-queued devices.	Better CPU utilization possible through increased I/O and CPU overlap	Reduce waits	Reduce device busy, wait	
Fixed Head DASD	Place highly used files under fixed heads.	Better CPU utilization possible	Reduce wait	Reduce device busy, wait	

OS/VS1 PERFORMANCE CHECKLIST

GENERAL CONFIGURATION (continued)		TUNING EFFECT			
ITEM	COMMENTS	CPU	PAGING	I/O	REAL STORAGE
Alternate Path	When alternate path is generated, the sequence in which IOS tries the various paths is dependent upon the I/O configuration generated during SYSGEN, regardless of actual hardware attached. NOTE: * When a set of devices is generated with alternate path to 2 or more channels and one or more other devices is generated on one of the channels, IOS will try the channel with no other devices on it first.	Slight increase		Reduce device busy and wait. Balances channel usage.	

GENERAL CONFIGURATION (continued)		TUNING EFFECT			
ITEM	COMMENTS	CPU	PAGING	I/O	REAL STORAGE
Alternate Path (cont.)	NOTE: (cont.) * When a set of devices is generated with alternate path to 2 or more channels and each channel or neither channel has other devices, IOS will rotate selection of the channel, that is, IOS will alternate the primary and secondary as the first path tried. ALSO NOTE: * Generation of alternate paths when no real alternate path exists to a device causes needless increased CPU overhead.				

OS/VS1 PERFORMANCE CHECKLIST

GENERAL CONFIGURATION (continued)		TUNING EFFECT			
ITEM	COMMENTS	CPU	PAGING	I/O	REAL STORAGE
Shared DASD	Consider the following performance implications when running in a Shared DASD environment:			Can increase contention and lockout problems	
	* Slower CPUs or equal CPUs running different SCPs with longer IOS path lengths may be at a decided disadvantage in competing for busy components.				
	* The DEVICE RESERVE command is used to prevent access by another CPU to a spindle to synchronize critical system update activity.				

OS/VS1 PERFORMANCE CHECKLIST

GENERAL CONFIGURATION (continued)		TUNING EFFECT			
ITEM	COMMENTS	CPU	PAGING	I/O	REAL STORAGE
Shared DASD (cont.)	Configurations must be sensitive to contention on volumes expecting high activity from: Linkage Editor output DASDM routines Catalog management User RESERVE macros				
	* Note that shared DASD could have a significant negative impact on response in a TP environment.				

OS/VS1 PERFORMANCE CHECKLIST

RESIDENCY LISTS		TUNING EFFECT			
ITEM	COMMENTS	CPU	PAGING	I/O	REAL STORAGE
Standard RSVC List	Using the default standard module list rather than no list at all.	Decreases		Decreases	Increases
Large or Full RSVC List, optimized for the environment	Full merit of RSVC is gained. Significant performance improvement possible, depending on the use of SVCs. Installation-dependent, heavily used modules can be determined with VS1PT or GTF. Second loads can be determined from the Storage Estimates Manual.	Decreases	Increases but SVC loads will be reduced.	Can significantly reduce load on SVCLIB	Some additional increase of real storage usage. 50K-90K typical.

RESIDENCY LISTS (continued)		TUNING EFFECT			
ITEM	COMMENTS	CPU	PAGING	I/O	REAL STORAGE
Large or Full RSVC List (cont.)	NOTE: * Heavily used modules should be at the end of the list because the list SCAN starts at the end of the list. * Loading of modules at IPL time will be lengthy, as more modules are added to the list. * More virtual storage in the pageable supervisor will be required. * A good RSVC list is very important for good system performance.				

OS/VS1 PERFORMANCE CHECKLIST

RESIDENCY LISTS (continued)		TUNING EFFECT			
ITEM	COMMENTS	CPU	PAGING	I/O	REAL STORAGE
Standard RAM List	Using the default standard module list rather than no list at all. Note that modules on the RAM list must be re-entrant. Any module not in this list will be loaded in each requestor's partition.	Better CPU utilization possible	Should decrease since modules will be shared	Decreases	Real storage usage increases slightly due to the contents supervisor control blocks for the resident modules.

OS/VS1 PERFORMANCE CHECKLIST

RESIDENCY LISTS (continued)		TUNING EFFECT			
ITEM	COMMENTS	CPU	PAGING	I/O	REAL STORAGE
Standard RAM List (cont.)	Virtual storage use decreases since only one copy of the module will be in virtual storage at one time.				But over-all real storage usage could de-crease in instances where a module is simulta-neously used by two or more tasks.

OS/VS1 PERFORMANCE CHECKLIST

RESIDENCY LISTS (continued)		TUNING EFFECT			
ITEM	COMMENTS	CPU	PAGING	I/O	REAL STORAGE
Standard RAM List (cont.)					If frequently used modules are not in the RAM list, real storage use can increase.
Extended RAM List	Add any access method module likely to be used by more than one task at a time. Order list by reverse frequency of use.	Better CPU utilization possible	Could decrease since modules shared	Decreases access to SVCLIB	Same as above

RESIDENCY LISTS (continued)		TUNING EFFECT			
ITEM	COMMENTS	CPU	PAGING	I/O	REAL STORAGE
Resident Link Library Modules	Add re-entrant link library modules likely to be used by more than one task at a time to list IEAIGG02. Order list by reverse frequency of use.	Better CPU utilization possible	Could decrease since modules shared	Decreases access to LINKLIBs	Same as above

OS/VS1 PERFORMANCE CHECKLIST

RESIDENCY LISTS (continued)		TUNING EFFECT			
ITEM	COMMENTS	CPU	PAGING	I/O	REAL STORAGE
Extended BLDL List	All frequently used modules not in the RSVC and RAM list should be added to the pageable BLDL list. At least 2K of storage will be used regardless of the number of entries in the list. To make full use of this page, specify up to 51 entries from SVCLIB, or 64 entries from LINKLIB. For better performance, specify more entries. Make the list fixed in storage if necessary.	Better CPU utilization possible		Decreases access to SVCLIB and LINKLIBs	Increases slightly

OS/VS1 PERFORMANCE CHECKLIST

SYSTEM DATA SETS		TUNING EFFECT			
ITEM	COMMENTS	CPU	PAGING	I/O	REAL STORAGE
System Pack(s) VTOC Placement	Locate in the middle of the pack with the data sets accessed most often closest to the VTOC.	Better CPU utilization possible		Decreases arm movement, etc.	
SYS1.SVCLIB Placement	Usually very important when the default RSVC list is used. Place next to and before the VTOC. The load on SVCLIB and the importance of its location decreases as the RSVC list is optimized.	Better CPU utilization possible		Decreases arm movement, etc.	

OS/VS1 PERFORMANCE CHECKLIST

SYSTEM DATA SETS (continued)		TUNING EFFECT			
ITEM	COMMENTS	CPU	PAGING	I/O	REAL STORAGE
SYS1.LINKLIB Placement	Highly important in most environments. Even more so when PCI fetch is not used and many small jobs are being processed. Place next to and after VTOC. Use large Linkage Editor blocking for modules and ensure full track blocking.	Better CPU utilization possible		Decreases arm movement, etc.	
SYSCTLG near VTOC	Still a highly important data set. If possible, place on same cylinder as VTOC.			Decreases arm movement, etc.	

SYSTEM DATA SETS (continued)		TUNING EFFECT			
ITEM	COMMENTS	CPU	PAGING	I/O	REAL STORAGE
SYS1.SYSPOOL placement on a dedicated drive	Placement of SYSPOOL depends on how heavily it is used. For large SYSIN/SYSOUT processing and heavy spool load, consider placing on a low-usage or dedicated device. Never put a highly used data set on the SPOOL drive.	Better CPU utilization possible		Decreases arm movement, etc.	
SYS1.SYSPOOL placement on multiple devices	To improve SPOOL processing and performance, it may be better to split the SPOOL across multiple devices and channels since JES has automatic performance balancing built into its SPOOL space allocation algorithm. But remember to never put a highly used data set on a SPOOL drive.	Better CPU utilization possible		Faster SPOOL I/O processing	

OS/VS1 PERFORMANCE CHECKLIST

SYSTEM DATA SETS (continued)		TUNING EFFECT			
ITEM	COMMENTS	CPU	PAGING	I/O	REAL STORAGE
SYS1.PAGE Placement	Optimize the Page Data Set placement depending on the amount of paging occurring in the installation. Note that Page Supervisor requests are always priority queued to the page device to prevent paging I/O from being delayed by I/O requests of an I/O bound task.	Better CPU utilization possible		Faster I/O processing due to reduced contention	
Splitting SYS1.PAGE over several devices	In environments where the paging rate is relatively high (e.g., 10-15 per second on 3330), the page data set should be split across at least two devices. It is also desirable to have the devices on different channels if possible.	Reduced. Also, better CPU utilization possible.	Can sustain higher rate	More I/O initiated simultaneously	

SYSTEM DATA SETS (continued)		TUNING EFFECT			
ITEM	COMMENTS	CPU	PAGING	I/O	REAL STORAGE
SYS1.PAGE on a dedicated drive	This is desirable when Real Storage Loads are critical. In this case, use the fastest device availalbe. Note that one page data set on a low use faster device or fixed head device often gives better performance than splitting the page data set.	Decreases Page management CPU overhead slightly. Better CPU utilization possible.		Decreases arm movement, etc.	Decreases slightly
Combining PAGE and SPOOL on one drive	Usually not recommended.			Increases depending on volumes	Slight increase

OS/VS1 PERFORMANCE CHECKLIST

SYSTEM DATA SETS (continued)		TUNING EFFECT			
ITEM	COMMENTS	CPU	PAGING	I/O	REAL STORAGE
Combining SPOOL and User Data Sets	Usually undesirable. Useful for low use, permanently required data sets (if they exist).			Increases depending on volumes	
SYS1.SYSJOBQE Placement	Less critical than in MFT. Job and step scheduler tables, which were formerly held in JOBQ are now held in the resident job list and SWA/SWADS. However, for systems that run many small jobs or have a high level of multiprogramming, the location of the JOBQ becomes more important and it should be separated from other system data sets.	Better CPU utilization possible		Decreases	

SYSTEM DATA SETS (continued)		TUNING EFFECT			
ITEM	COMMENTS	CPU	PAGING	I/O	REAL STORAGE
SWA	The scheduler work area (SWA) option enables scheduler tables held in SWADS to be placed into virtual storage. It is better to use the incore SWA rather than SWADS since paging I/O is faster than VS1 I/O. Note that this eliminates the need to allocate SWADS data set but requires that the partition size be increased to a size large enough to hold the scheduler tables.	Decreases	Increases	Decreases	Increases

OS/VS1 PERFORMANCE CHECKLIST

SYSTEM DATA SETS (continued)		TUNING EFFECT			
ITEM	COMMENTS	CPU	PAGING	I/O	REAL STORAGE
SYS1.SWADS Location	Separate the SWADS for the most active partitions from JOBQ and other system data sets and try to allocate to low usage volumes. If possible, allocate to permanently mounted private volumes.	Better CPU utilization possible		Decreases	
SMF Buffer size	Specify as at least 2K bytes. Place near VTOC if MANX/MANY heavily used. Large SMF buffer size reduces the number of I/O accesses to MANX/Y data sets, thus relieves CPU load.	Less CPU overhead in IOS	Could increase	Decreases	Increases

SYSTEM DATA SETS (continued)		TUNING EFFECT			
ITEM	COMMENTS	CPU	PAGING	I/O	REAL STORAGE
High SYS1.PROCLIB blocking	This is essential for all except one partition systems which have critical real storage loads. A size of about 4000 bytes is recommended for minimum PROCLIB accesses and least waste. Pick a size near 4K that is optimal for the device.	Better CPU utilization possible	Could increase	Decreases	Increases slightly

OS/VS1 PERFORMANCE CHECKLIST

JES		TUNING EFFECT			
ITEM	COMMENTS	CPU	PAGING	I/O	REAL STORAGE
JES Number of buffers	Use the NUMBUF parameter to specify the number of buffers in the central JES buffer pool. You should overspecify the number of buffers that are needed to prevent buffer pre-emption. Never use the default value.	Decreases JES overhead		Decreases	Increases only if the excess buffers are accessed
JES Buffer size	To optimize the transfer of SYSIN/SYSOUT data to a page size, specify a size of 1904 bytes. In cases of large installations, use double page size, i.e., 3952 bytes.	Decreases JES overhead	Could increase	Decreases	Increases

OS/VS1 PERFORMANCE CHECKLIST

| JES (continued) | | TUNING EFFECT | | | |
ITEM	COMMENTS	CPU	PAGING	I/O	REAL STORAGE
Using very large JES buffer size	Should be considered where both very high JES Spool volumes and low real storage loads exist. In such cases, select a buffer size that is optimized for the device track size rather than for page size.	Decreases JES overhead	Increased page overhead possible	Decreases	Increases
JES Control Intervals	Increasing Unit Record I/O chaining decreases CPU overhead and allows performance improvement where heavy JES loads exist. At least double the default values.	Decreases JES overhead	Could increase	Faster I/O	Increases

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OS/VS1 PERFORMANCE CHECKLIST

JES (continued)		TUNING EFFECT			
ITEM	COMMENTS	CPU	PAGING	I/O	REAL STORAGE
IEFJES Order	To maintain the real storage requirements and paging activity of JES, the IEFJES load module should remain ordered as specified on Stage I output listing.		Not increased		Not increased
Scheduling JES activities	JES can impose heavy real storage and CPU overheads. Schedule high volume SYSIN/ SYSOUT jobs and high proportion JCL SYSIN streams in off peak periods.	More even		More even	More even

OS/VS1 PERFORMANCE CHECKLIST

JES (continued)		TUNING EFFECT			
ITEM	COMMENTS	CPU	PAGING	I/O	REAL STORAGE
Reader/ Writer priority	For TP systems, performance and response can generally be improved when the dispatching priority in the RDR/WTR catalogued procedures are set to one less than the TP partition but higher than the batch partitions.	Makes the CPU more available to the TP partition			
JES writer checkout interval	Increasing the value of this optional parameter will decrease the amount of check-point I/O required for each data set the writer is processing. It is important to increase this value for a high performance printer such as the 3800.	Decreases JES overhead		Decreases	

OS/VS1 PERFORMANCE CHECKLIST

SYSTEM GENERATION/PARMLIB OPTIONS		TUNING EFFECT			
ITEM	COMMENTS	CPU	PAGING	I/O	REAL STORAGE
Minimum SYSGEN options (No LOG, no spare, etc.)	This approach is necessary on small machines or when real storage loads are critical. Options requiring excess storage should be limited to free the load and attain efficient operation.	Decreases	Decreases Page management overhead	Probably increases	Decreases
VS1 assist	Use the hardware assist on CPUs that support it. Specify ECPS in the CTRLPROG macro and at IPL.	Supervisor CPU time decreases	Could decrease (see Real Storage column)		Decreases if ECPS SCP code is not generated into the nucleus

OS/VS1 PERFORMANCE CHECKLIST

SYSTEM GENERATION/PARMLIB OPTIONS (continued)		TUNING EFFECT			
ITEM	COMMENTS	CPU	PAGING	I/O	REAL STORAGE
I/O priority queueing	System packs should be on priority queued devices to improve system performance. Often it is desirable to generate all disk addresses as priority queued.	Better CPU utilization possible		Less wait for critical system functions	
I/O ordered queueing	Will be helpful in environments where excessive arm movement impacts performance.			Reduces arm movement	
I/O Load balancing	This allows selection of fastest and least loaded channel/device for non-specific data set allocation and is a SYSGEN option only. Generally favorable in environments with mixed types of devices.	Reduces. Actually shortens the path length through allocation.		Improved balancing	Slight overhead

OS/VS1 PERFORMANCE CHECKLIST

SYSTEM GENERATION/PARMLIB OPTIONS (continued)		TUNING EFFECT			
ITEM	COMMENTS	CPU	PAGING	I/O	REAL STORAGE
Dynamic Dispatching	This option increases supervisor CPU busy time. If CPU utilization is high, system may not be able to absorb the additional overhead caused by Dynamic Dispatching. Only of value on 512K and larger systems with 3 or more initiators in DDG. The best jobs are those with unknown or varying I/O-CPU ratios. Don't include heavy or unstable real storage usage jobs.	Better CPU utilization possible through increased I/O and CPU overlap	Usually increases due to higher real storage requirements for more jobs		1K control table plus higher job requirements due to improved CPU time allocation between the partitions

SYSTEM GENERATION/PARMLIB OPTIONS (continued)		TUNING EFFECT			
ITEM	COMMENTS	CPU	PAGING	I/O	REAL STORAGE
Using PCI Fetch	PCI fetch is generally of no value for 370/145 or lower CPUs. It is larger than standard fetch and is fixed while STD fetch is pageable. It requires 1600 bytes in PQA or SQA for each use. LINKLIB, etc., accesses can be reduced by PCI fetch and throughput will increase. Use where hardward permits and real storage loads are low. If CPU is not a bottleneck and I/O is, PCI Fetch may be beneficial. Will significantly save elapsed time and channel if PCI reconnect is successful. Will lose some cycles if it is not.	Better CPU utilization possible. CPU time decreases.	Could increase	Can heavily reduce accesses to LINKLIB and other LOAD LIBs	Increases by 6K to 10K

OS/VS1 PERFORMANCE CHECKLIST

SYSTEM GENERATION/PARMLIB OPTIONS (continued)		TUNING EFFECT			
ITEM	COMMENTS	CPU	PAGING	I/O	REAL STORAGE
MAXIO	Specify a relatively large number if the system is more I/O-bounded than CPU-bounded.	Decreases	Slightly increases		Increases
WTOBFRS	System slows down if not enough buffers specified. Make it at least 50. A good way to find out what is needed is to use JESPARMS to try out various numbers.		Can increase slightly	Improved	Slightly increases
WTLRCDS	Specify a large number, e.g., 9000, in the JES macro if the master console is a graphi device. This reduces overhead and degradation due to end-of-log-segment processing.	Decreases			

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SYSTEM GENERATION/PARMLIB OPTIONS (continued)		TUNING EFFECT			
ITEM	COMMENTS	CPU	PAGING	I/O	REAL STORAGE
Trace Table	When real storage loads are critical, generate the trace table with a small number of entries. Savings of 16 bytes for each entry. (When needed, the number of entries can be increased at IPL.)		May decrease if trace table was large		Reduces slightly
	Furthermore, to eliminate internal trace and its CPU time overhead, specify TRACE=0 in response to message IEAI01A at IPL. (Note that turning off trace will have a negative impact on problem determination capability.)	Decreases if TRACE=0 specified			

OS/VS1 PERFORMANCE CHECKLIST

SYSTEM GENERATION/PARMLIB OPTIONS (continued)		TUNING EFFECT			
ITEM	COMMENTS	CPU	PAGING	I/O	REAL STORAGE
SQA storage considera- tions	If insufficient real storage is specified for SQA at SYSGEN (CTRLPROG macro) or NIP (reply to message IEAI01A) time, later expansion of the SQA could reduce contiguous available storage for V=R requests.	Decreases for handling V=R requests			Real storage fragmen- tation if SQA specifi- cation insuffi- cient
DEB Validity Checking	Consider eliminating DEBCHECK when CPU utilization is very high.	Reduces			

OS/VS1 PERFORMANCE CHECKLIST

SYSTEM GENERATION/PARMLIB OPTIONS (continued)		TUNING EFFECT			
ITEM	COMMENTS	CPU	PAGING	I/O	REAL STORAGE
Not using full SMF	Reduces accounting and systems monitoring facilities. May be helpful when real storage loads are critical.	Slight CPU overhead decrease	Could decrease slightly		Decreases by 6K
DDR	Consider eliminating DDR when real storage loads are critical.	Reduces VS1 overhead	Could decrease slightly		Decreases by 2K

OS/VS1 PERFORMANCE CHECKLIST

OPERATIONAL & PROGRAMMING CONSIDERATIONS		TUNING EFFECT			
ITEM	COMMENTS	CPU	PAGING	I/O	REAL STORAGE
Keep paging activity to a minimum	We often forget that paging is a vehicle to support virtual storage, but that virtual storage and paging are no substitutes for real storage. To improve or maintain overall system performance and online response in many environments, an effort should be made to keep the page rate low.	Reduces paging overhead	Reduces paging overhead	Reduces page I/O	Decreases

OS/VS1 PERFORMANCE CHECKLIST

OPERATIONAL & PROGRAMMING CONSIDERATIONS (cont.)		TUNING EFFECT			
ITEM	COMMENTS	CPU	PAGING	I/O	REAL STORAGE
Sufficient Real Storage	Insufficient real storage is a common problem and the easiest to detect by observing excessive paging rates, task deactivation, and erratic response. Adding more storage or reducing multi-programming will reduce paging and overhead.	Reduces CPU overhead	Reduces		Reduces Wait
Using a low level of Multi-programming	Consider reducing level of multiprogramming to improve total batch throughput. This is necessary where real storage loads are high. It is often better to allocate storage to tuning and functional items than to run an additional partition.	Varying factors apply. Dispatching overhead decreases with less multipro-gramming.	Decreases	Decreases	Decreases

OPERATIONAL & PROGRAMMING CONSIDERATIONS (cont.)		TUNING EFFECT			
ITEM	COMMENTS	CPU	PAGING	I/O	REAL STORAGE
Avoid the impact of disabled code	Disabled code can have a significant negative impact on response and throughput. The following should be avoided when TP response is critical: * Command chaining * QSAM chained scheduling * COMTASK (includes operator commands like: d a, d u, d n, etc.) * DASD-type utilities such as IEHDASDR and IEBCOPY * GETMAIN/FREEMAIN SVC	Better CPU utilization possible. Makes the CPU more available to CICS and other users.			
Data set allocation	Always allocate sequentially accessed data sets by cylinders rather than tracks.	Reduces		Reduces time	

OS/VS1 PERFORMANCE CHECKLIST

OPERATIONAL & PROGRAMMING CONSIDERATIONS (cont.)		TUNING EFFECT			
ITEM	COMMENTS	CPU	PAGING	I/O	REAL STORAGE
Blocking Sequential Data Sets	Blocking is one of the best and most useful methods known for improving throughput. Use blocking factor of 10 to 15. Make blocksize equal or just less than a multiple of 2K bytes, and less than 8K, if CPU is bottleneck. Consider DASD track size and RPS. When I/O time is critical (e.g., DASD contention or lost time due to tape IBG), consider specifying even higher blocksizes - up to full track for DASD and up to 5 inches for tape.	Decreases. Can be up to 500% decrease.	May increase	Decreases	Increases

OPERATIONAL & PROGRAMMING CONSIDERATIONS (cont.)		TUNING EFFECT			
ITEM	COMMENTS	CPU	PAGING	I/O	REAL STORAGE
Improving TP response	Increasing the values specified for PAGEMEAS via the PAGETUNE command will cause pages to migrate more slowly toward the level 0 queue and often improves TP response in low message rate environments. Note: This may increase batch deactivation.	Reduces page migration overhead			Keeps CICS pages in real storage longer
Deactivation Reactivation	Increasing the values specified for STOP via the PAGETUNE command will cause deactivation to happen less often. However, specifying an excessive value could induce suspension of the deactivation functions and possibly even cause page thrashing.	Increases	Increases. Thrashing likely to occur.	Page I/O increases	Increases

OS/VS1 PERFORMANCE CHECKLIST

OPERATIONAL & PROGRAMMING CONSIDERATIONS (cont.)		TUNING EFFECT			
ITEM	COMMENTS	CPU	PAGING	I/O	REAL STORAGE
Defining additional partitions	Two or three additional partitions can be defined for added flexibility. Real storage use will be slight if they are defined with zero virtual storage until needed.				Increases Slightly
Dedicated (pre-allo-cated) Data Sets	Essential where high volumes of small, similar jobs exist. Savings of 6-10% in elapsed times, 8-9% in channel time, and 3-4% in CPU time can be achieved.	Decreases. Better CPU utili-zation possible.		Decreases	

OS/VS1 PERFORMANCE CHECKLIST

OPERATIONAL & PROGRAMMING CONSIDERATIONS (cont.)		TUNING EFFECT			
ITEM	COMMENTS	CPU	PAGING	I/O	REAL STORAGE
Virtual Chained Scheduling for sequential data sets	In combination with large blocksize and large buffer number, this can be very useful for the reduction of CPU time and the improvement of throughput.	Decreases	Increases	Decreases	Increases
	Note though, that in many environments, increased blocksizes are better than chained scheduling for overall systems performance.	Reduces disabled CPU code. CPU more available.		Reduces channel lockout potential	
ISAM indices	If ISAM must be used, try to use incore indices. VSAM is a better performer than ISAM under VS1.	Decreases	Slightly increases	Decreases	

OS/VS1 PERFORMANCE CHECKLIST

OPERATIONAL & PROGRAMMING CONSIDERATIONS (cont.)		TUNING EFFECT			
ITEM	COMMENTS	CPU	PAGING	I/O	REAL STORAGE
Other SAM options	Use Search Direct (OPTCD=Z) or Fixed Standard (RECFM=FBS) to reduce channel busy.			Decreases SIOs	
Using STARTF command	Using STARTF to start readers and writers whenever possible could shorten the processing time and drastically improve performance.	Decreases		Decreases	Decreases for start processing period
Eliminating CCW overheads by running V=R	This is seldom desirable.	Eliminates CCW translation overhead (5-39%)	Will increase usually		Heavily increases usually

OS/VS1 PERFORMANCE CHECKLIST

OPERATIONAL & PROGRAMMING CONSIDERATIONS (cont.)		TUNING EFFECT			
ITEM	COMMENTS	CPU	PAGING	I/O	REAL STORAGE
Monitoring for Deactivation	When deactivation of one task is regularly and continually observed, the level of multi-programming or the options and functions active should be decreased immediately. A good rule of thumb is that when the sum of deactivation for all the partitions exceeds 150%, one partition should be cut back.	Eliminates expensive overhead	Decreases		Decreases
Programming Techniques	Locality and validity of reference in heavily used code is vital. Apply to new or modified applications.	Increases		Decreases Paging I/O	Signifi-cantly decreases (up to 80%)

OS/VS1 PERFORMANCE CHECKLIST

OPERATIONAL & PROGRAMMING CONSIDERATIONS (cont.)		TUNING EFFECT			
ITEM	COMMENTS	CPU	PAGING	I/O	REAL STORAGE
Re-entrant Coding	Re-entrant (read only) coding eliminates pageouts. Re-entrant modules can be shared by placing them in the resident re-entrant area.	Decreases	Decreases	Decreases	Decreases (when shared in re-entrant area)
Overlays	In general, overlays should be removed from user programs since Page I/O is more efficient than overlay handling and loading.		Could increase	Varies	Increases
	In cases where many large overlays exist that may not be executed at all, it may be better to leave the overlays in the programs.	Decreases	Decreases	Decreases	

OS/VS1 PERFORMANCE CHECKLIST

OPERATIONAL & PROGRAMMING CONSIDERATIONS (cont.)		TUNING EFFECT			
ITEM	COMMENTS	CPU	PAGING	I/O	REAL STORAGE
Impact of APF application	Examine the APF authorized applications in the system very closely. It is possible to have a negative performance impact from a user application or a program product that changes the means of system dispatching (e.g., CIRB, CHAP request), or paging algorithm (e.g., PGLOAD, PGRLSE), or resource management (e.g., ENQ/DEQ, RESERVE).				

OS/VS1 PERFORMANCE CHECKLIST

OPERATIONAL & PROGRAMMING CONSIDERATIONS (cont.)		TUNING EFFECT			
ITEM	COMMENTS	CPU	PAGING	I/O	REAL STORAGE

Use more virtual storage work areas	Certain types of programs (i.e., SORT, ASSEMBLER, LINKAGE EDITOR) normally improve performance when the amount of storage assigned to them is increased. This can be controlled by:
	 * The size parameter or
	   buffer size, or by
	 * Enlarging the partition's
	   virtual address space.
		Decreases overhead	Increases	Decreases	Increases

OS/VS1 PERFORMANCE CHECKLIST

OPERATIONAL & PROGRAMMING CONSIDERATIONS (cont.)		TUNING EFFECT			
ITEM	COMMENTS	CPU	PAGING	I/O	REAL STORAGE
Controlling unstable real storage loads	Certain types of programs (i.e., MPSX, linear programming) with unstable real storage loads are best controlled by: * Setting size parameters * Limiting the partition's virtual address space * Running at lowest priority	Decreases page management overhead	Decreases	Increases	Decreases

RES

ITEM	COMMENTS	TUNING EFFECT			
		CPU	PAGING	I/O	REAL STORAGE
MXINTBR	Specify MXINTBR=1K, preferably 2K. Reduces task switch overhead.	Decreases	Could increase	Decreases	Increases slightly
VBUF	SNA only. Optimum specification is VBUF=14. This yields faster terminal print speed and reduced RTAM and VTAM overhead.	Decreases	Could increase		Increases
Compression and Compaction	Note that compaction is for SNA only. Use these two options to improve printer performance and reduce RTAM and VTAM overhead.	Can increase. Might decrease.		Reduces	

OS/VS1 PERFORMANCE CHECKLIST

RES (continued)		TUNING EFFECT			
ITEM	COMMENTS	CPU	PAGING	I/O	REAL STORAGE
STBUFNO	Performance of inbound console commands could be improved by increasing the number of sub-task buffers. This reduces the unnecessary task switches between RTAM and its subtask and the internal waits within RTAM.	Decreases			Increases
NUMBUFS in JESPARMS	Each additional remote printer/reader started requires a JES spool buffer.	Decreases			Increases
SYS1.UADS placement	For high volume LOGON processing with passwords, place the UADS data set near the VTOC.			Reduces arm movement	

RES (continued)		TUNING EFFECT			
ITEM	COMMENTS	CPU	PAGING	I/O	REAL STORAGE
LOGON performance	To improve LOGON performance: * Use STARTF to start remote readers and writers. * Put LOGON modules in BLDL list. * Use NONOTICES and NOMAIL. * Start only required devices.	Decreases		Decreases	

OS/VS1 PERFORMANCE CHECKLIST

VTAM		TUNING EFFECT			
ITEM	COMMENTS	CPU	PAGING	I/O	REAL STORAGE
VTAM buffer pools	In storage-contrained environments, specification of too large a VTAM buffer pool results in higher paging and longer response times. Decrease the number of buffers.	Reduces	Reduces		Reduces
	Too few buffer pools result in VTAM slow-down and poor response. Increase the value.	Reduces			Increases

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PERFORMANCE CHECKLIST

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A form for reader's comments has been
included at the end of this document.
If it has been removed, please send any
comments or additional performance items
to:

     B. P. Miller
     IBM Corporation
     Palo Alto Systems Center
     1501 California Avenue
     Palo Alto, CA 94304

ZZ20-2861

DOS/VS
PERFORMANCE CHECKLIST

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DOS/VS
PERFORMANCE CHECKLIST

INTRODUCTION

Purpose Of This Document

This document is intended to provide a
quick reference for the DOS/VS Systems
Engineer who wants to more finely tune a
customer's DOS/VS system. It is not an
all-inclusive list of tuning knobs which
will result in a better performing
DOS/VS system. It does represent a best
effort to supply a list of those items
which have proven to provide a
performance improvement in a majority of
instances.

The recommendations contained in this
document have not been subject to any
formal test or review and should
therefore be individually evaluated for
their applicability to a particular
installation. Use of information
presented in this document in a customer
installation must adhere to the
Guidelines for Systems Engineering
Services.

How To Use This Document

The following checklist assumes that the
user has access to the document listed
in the bibliography section of this
document. For ease of use, the items in
the checklist are broken into four
categories. The first represents those
areas that can result in system
improvements with minimal efforts. The
next category requires a greater
investment in time and effort, etc.

The effect on the three major system
resources (CPU Cycles, Paging and I/O)
is shown for each performance and tuning
item on the checklist. Users who have
identified their major bottleneck or
constraint can look down the appropriate
column for items to help alleviate the
situation.

The contents of the checklist should
also be reviewed prior to:

1. The installation of a new DOS/VS
    system.

2. The installation of a new release
    of DOS/VS.

3. A major change in the hardware
    environment.

4. The installation of a new major
    application.

DOS/VS
PERFORMANCE CHECKLIST

Currency

This document is current through the
current release of DOS/VS and DOS/VS
Advanced Function at the date of
publication.

Prerequisites

- Experience installing, generating
  and using DOS/VS.

- A basic understanding of how the
  system works.

- Access to the documents on the
  bibliography list.

DOS/VS
PERFORMANCE AND TUNING
BIBLIOGRAPHY

GENERAL

1.	ZZ20-2850	Advanced Functions – DOS/VS and DOS/VS Release 34 Implementation Considerations
2.	ZZ05-0022	RPS with DOS/VS
3.	ZZ20-2349	Introduction to Systems Performance Evaluation Virtual Storage Systems
4.	ZZ20-3306	DOS/VS Performance Evaluation
5.	ZZ20-3309	DOS/VS Performance Predictor User's Guide
6.	ZZ20-3737	Intermediate Systems Handbook
7.	73-19	Poughkeepsie Systems Center Bulletin – DOS/VS Notebook
8.	74-04	Poughkeepsie Systems Center Bulletin – 370/125 Performance
9.	74-06	Poughkeepsie Systems Center Bulletin – 370/115 Performance
10.	74-20	Poughkeepsie Systems Center Bulletin – 370/115 Performance
11.	76-07	Palo Alto Systems Center Flash – RPS With DOS/VS
12.	76-11	Palo Alto Systems Center Flash – Comments On Paging
13.	76-18	Palo Alto Systems Center Flash – Shared DASD
14.	76-30	Palo Alto Systems Center Flash – Monitoring DOS/VS Paging Activity

15. 77-08   Palo Alto Systems Center
             Flash - VM/370 Linkage
             Enhancements
             Clarification On Job
             Accounting
16. 77-18   Palo Alto System Center
             Flash - Advanced
             Functions - DOS/VS and
             DOS/VS Release 34
             Implementation
             Considerations
17. 77-20   Palo Alto System Center
             Flash - Console Support
             for 370/138, 148 under ·
             VM/370
18. 77-23   Palo Alto Systems Center
             Flash - 3277 Display
             Operator's Console
             Support
19. 77-32   Palo Alto Systems Center
             Flash - A Comparison of
             138/148 Console Mode and
             the 3215 Printer Keyboard
20. 77-45   Palo Alto Systems Center
             Flash - Advanced
             Functions - DOS/VS
             Partition Balancing
             Algorithm
21. 77-48   Palo Alto Systems Center
             Flash - Support For The
             Operator's Console
22. 76-09   Palo Alto Systems Center
             Flash - Fast CCW
             Translate Measurements
23. 75-05   Installation Newsletter -
             Disk/Tape File
             Operational
             Considerations

24. 75-10   Poughkeepsie Systems
                Center Flash -
                Reactivation Control

AIDS AND TOOLS

25. ZZ20-3495 DOS/VS Performance Tool -
                Marketing Guide
26. SH20-1836 DOS/VS Performance Tool -
                Program Description and
                Operation Manual
27. G320-5679 DOS/VS Performance Tool

POWER/VS

28. ZZ05-0010 Power/VS Tuning
                Considerations
29. 76-14   Palo Alto Systems Center
                Flash - Forms Control
                Buffer Loading
30. 76-26   Palo Alto Systems Center
                Flash - 3770/3740
                Diskette Labeling For RJE
31. 76-29   Palo Alto Systems Center
                Flash - RJE
                Clarifications
32. 76-30   Palo Alto Systems Center
                Flash - Release 33
                Working Sets
33. 77-42   Palo Alto Systems Center
                Flash - 3790 RJE
                Clarifications
34. 78-02   Palo Alto Systems Center
                Flash - Clarification Of
                The Timeout Specification

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PERFORMANCE AND TUNING
BIBLIOGRAPHY
(continued)

| 35. | 78-17 | Palo Alto Systems Center Flash - Cross-Partition Communications Macro Restriction |
| 36. | 78-17 | Palo Alto Systems Center Flash - SNA-RJE Installation Checklist - 3770 |

DOS/VS PERFORMANCE CHECKLIST

SYSTEM GENERATION OPTIONS		TUNING EFFECT			ADVANCED
ITEM	COMMENTS	CPU	PAGING	I/O	FUNCTIONS
FASTTR	Enables user to use a fast path through the CCW translation routines. Generally aids smaller CPU user.	Shorter path		Same	No
RPS	Includes support for rotational position sensing.	Increases DOS/VS overhead		Reduces channel usage	No
	Can be used to reduce program size by using IOCS modules in shared virtual area instead of in user program.		Reduces	Reduces channel usage	
JA(LIOCS)	Includes support for job accounting.	Increases system overhead			No

DOS/VS PERFORMANCE CHECKLIST

SYSTEM GENERATION OPTIONS (continued)		TUNING EFFECT			ADVANCED
ITEM	COMMENTS	CPU	PAGING	I/O	FUNCTIONS
SKSEP	Causes all seeks to disk to be done as standalone seek.			Reduces channel tie-up	No
DASDFP	Causes DOS/VS to verify all seek addresses before the seek is allowed to ensure that the seek remains within the specified extent. (Useful only for DAM files and user-written channel programs.) Do not use if only SAM, ISAM, and VSAM files.	Increases super-visor path length			No
IDRA	Provides an independent directory read-in area so that directory search does not require logical transient area for directory search during fetch.	Improves system overlap			No

DOS/VS PERFORMANCE CHECKLIST

SYSTEM GENERATION OPTIONS (continued)		TUNING EFFECT			ADVANCED FUNCTIONS
ITEM	COMMENTS	CPU	PAGING	I/O	
BLKMPX	Causes block multiplexing support to allow channel to disconnect during seek on block multiplex channel with 33XX devices. (Remember to specify 3340R if using 3340 or 3344.)			Reduces channel tie-up	No
SYSFIL	Support for allowing SYSRDR, SYSIPT, SYSPCH, and SYSLST files to be accessed on a disk file. Required for procedures with imbedded data. Causes extended path through supervisor when doing any I/O to a system file, regardless of file's being on disk or not.	Increases super-visor path length			No

DOS/VS PERFORMANCE CHECKLIST

SYSTEM GENERATION OPTIONS (continued)		TUNING EFFECT			ADVANCED
ITEM	COMMENTS	CPU	PAGING	I/O	FUNCTIONS
PTO	Causes fetch of physical ($$A) transients to release control to a dispatchable partition during error recovery.	Increases degree of multi-programming			No
DOC=125D =3277	Put hardcopy file on low activity volume when there is moderate console message activity.			Reduces disk arm movement	No
	Include $$BOCRTx names in system directory list. Remember, there are at least 6 transients fetched for each line of output to the display console.			Reduces time to fetch the transient	No

DOS/VS PERFORMANCE CHECKLIST

SYSTEM GENERATION OPTIONS (continued)		TUNING EFFECT			ADVANCED
ITEM	COMMENTS	CPU	PAGING	I/O	FUNCTIONS
Partition Balancing	Causes balanced group of partitions to share CPU cycles on a scheduled basis (MSECS=). Specify this on systems which may have CPU-bound steps being scheduled into random partitions.	Increases super- visor paths on intervals specified in MSECS	May increase		Yes

DOS/VS PERFORMANCE CHECKLIST

| OTHER PERFORMANCE OPTIONS | | TUNING EFFECT | | | ADVANCED |
ITEM	COMMENTS	CPU	PAGING	I/O	FUNCTIONS
Page Data Set	Keep on low activity volume.		Less arm movement	Less arm movement	No
	Put in fixed head area. (Only background partition will probably be under fixed heads.)		Reduces seek time	Less arm movement	
Shared Virtual Area (SVA)	Place all VSAM, DL/I, RPS, etc., in SVA. Allows programs to share frequently used subroutines, etc.		Common routines will stay resident		No
System Directory List	Use PDAID fetch/load trace to determine frequently referenced phases. Then create "tuned" SDL.			Reduces CIL search time	No

DOS/VS PERFORMANCE CHECKLIST

ITEM	COMMENTS	CPU	PAGING	I/O	ADVANCED FUNCTIONS
Hardcopy File (IJSYSCN)	Place on limited use volume to reduce time to store console messages. Remember to place the console transients in the SDL also. There are 6 transients fetched for each line on the display console.			Reduces disk arm movement	No
TPBAL	In systems with CICS/VS (or others using TPIN/TPOUT macros), causes immediate deactivation of batch partition when page fault occurs while CICS running. Requires TP support in SUPVR macro. This is an Attention Routine command.		Reduces thrashing		No

OTHER PERFORMANCE OPTIONS (continued)

TUNING EFFECT

DOS/VS PERFORMANCE CHECKLIST

OTHER PERFORMANCE OPTIONS (continued)

| ITEM | COMMENTS | TUNING EFFECT | | | ADVANCED FUNCTIONS |
		CPU	PAGING	I/O	
Linkage Editor	Improved techniques used by Advanced Functions LNKEDT such as double buffering, full track read, improved directory search mechanism, etc.	Increases	May increase slightly	Reduced	Yes

DOS/VS PERFORMANCE CHECKLIST

PERFORMANCE OPTIONS REQUIRING MORE EFFORT		TUNING EFFECT			ADVANCED
ITEM	COMMENTS	CPU	PAGING	I/O	FUNCTIONS
Data File Blocking	Increase tape block sizes to occupy approximately five (5) inches of tape.	Increase in cycles available to user program	Increases due to larger working set	Reduced	No
Disk File Blocking	Increase disk block size to equal track capacity.	Increase in cycles available to user program	Increases due to larger working set	Reduced	No

DOS/VS PERFORMANCE CHECKLIST

PERFORMANCE OPTIONS REQUIRING MORE EFFORT (cont)		TUNING EFFECT			ADVANCED
ITEM	COMMENTS	CPU	PAGING	I/O	FUNCTIONS
Install 3800 ICR (see Blue Letters P77-56 and P77-216)	This will allow those users who output to 3800s to utilize the larger blocking capability. This requires that programs run V=V, have a SIZE= parameter on the EXEC statement, and enough partition GETVIS space for the updated PRMODs and 4K to contain the 3800 I/O buffer. POWER/VS should also be used so that the conversion of the 3800 CCWs are handled by POWER/VS. Otherwise, a 3800 is required for actual printing.	Reduces super-visor SIO processing by issuing start I/O requests on a less frequent basis due to 4K blocking	May increase slightly	Reduced	No

DOS/VS PERFORMANCE CHECKLIST

| POWER/VS TUNING | | | TUNING EFFECT | | ADVANCED |
ITEM	COMMENTS	CPU	PAGING	I/O	FUNCTIONS
DBLK	This specifies the size of the unit of data transmission. It should be optimized for the DASD device being used. Specify the following: 　DASD Type　　DBLK 　　3330　　　　2008 　　3340　　　　1966 　　3350　　　　1954		May increase due to larger block sizes	Reduced I/O due to better blocking	No
TRACKGP	Impacts the way POWER/VS allocates cylinder space. Specify small number for system where jobs produce limited printout volumes. Specify large number for system where jobs produce volume printout on average. (Remember POWER/VS allocates one track group even for one line of printout).			May cause less arm movement	No

DOS/VS PERFORMANCE CHECKLIST
READER'S COMMENT FORM

Comments on the usefulness of this
document are appreciated. Please
suggest additions, deletions, revisions
that would make this more useful to you.
If you have additional items that you
feel make DOS/VS perform better, please
send them also.

Please give the following information:

Name:_____
Location:_____
Address:_____
        _____
Telephone number:
     TIE line 8/_____-_____,
     Outside (_____)_____-_____

General rating of this document:

o Extremely useful   o Marginally useful
o Very useful   o Of no value
o Useful

Additional comments may be written on
the back of this form.

Send comments to: B. P. Miller
                   IBM Corporation
                   Palo Alto Systems Center
                   1501 California Avenue
                   Palo Alto, CA 94304

DOS/VS PERFORMANCE CHECKLIST
READER'S COMMENT FORM

VSAM

PERFORMANCE CHECKLIST

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VSAM
PERFORMANCE CHECKLIST

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PERFORMANCE CHECKLIST

INTRODUCTION

Purpose Of This Document

This document is intended to provide a
quick reference for the System Engineer
who wants to help his customer more
finely tune VSAM in the system. It is
not an all-inclusive list of tuning
knobs which will result in better
performing VSAM. It does represent a
best effort to supply a list of those
items which have proven to provide a
performance improvement in a majority of
instances.

The recommendations contained in this
document have not been subject to any
formal test or review and should
therefore be individually evaluated for
their applicability to a particular
installation. Use of information
presented in this document in a customer
installation must adhere to the
Guidelines for Systems Engineering
Services.

How To Use This Document

The following checklist assumes that the
user has access to the documents listed
in the bibliography section of this
document.

For ease of use, the items on this
checklist are divided into four
sections:

>   General Allocation and Placement
>   Considerations
>   Indexes, Control Intervals and
>   Buffers
>   Other Performance Items and Options
>   Catalog Considerations

The effect on the seven major system
resources/performance factors (CPU
cycles, working set, channel
utilization, operating system overhead,
I/O response time, throughput, DASD
space) is shown for each performance and
tuning item on the checklist. Users who
have identified their major bottleneck
or constraint can look down the
appropriate columns for items to help
alleviate the situation.

VSAM
PERFORMANCE CHECKLIST

The contents of the checklist should
also be reviewed prior to:

1. The initial installation of VSAM on
    a system.

2. The installation of a new level of
    VSAM.

3. A major change in the hardware
    environment.

4. The installation of a new major
    application.

Most items on the list contain
references to other documents where
further information may be obtained.
The lack of reference implies only that
no further explanation is needed or
available, or that the information may
be in multiple documents. Wherever
possible, SRLs are referenced in the
checklist because they contain the most
current performance-related information.

All the tuning items in this checklist
apply to both VS1 and DOS/VS VSAM unless
specifically stated otherwise.

VSAM
PERFORMANCE CHECKLIST

<u>Currency</u>

This document is current through the
current levels of OS/VS1 VSAM and DOS/VS
VSAM that are available with their
respective SCPs at the date of
publication.

<u>Prerequisites</u>

* Experience installing, generating,
  and using VSAM.

* A basic understanding of how VSAM
  works.

* Access to the documents on the
  bibliography list.

VSAM
PERFORMANCE AND TUNING
BIBLIOGRAPHY

VS1 VSAM

1.	ZZ20-2363	OS/VS1 Performance Evaluation Release 6
2.	ZZ10-9833	138/148 Systems Selection Guide - OS/VS1
3.	GC26-3838	OS/VS VSAM Programmers Guide
4.	GC26-3799	OS/VS VSAM Planning Guide
5.	GC26-3842	Planning for Enhanced VSAM under OS/VS
6.	GC26-3819	OS/VS VSAM Options for Advanced Applications
7.	GC26-3840	OS/VS1 Access Method Services
8.	SY35-0008	OS/VS1 Access Methods Services Logic
9.	SY26-3841	OS/VS1 VSAM Logic
10.	SY35-0003	OS/VS1 Catalog Management Logic
11.	SJD2-2118	VSAM Fiche-Component Listings
12.	SJD2-2114	IDCAMS Fiche-Component Listings
13.	GC28-6794	Guide to PL/S II
14.	GC38-1001	OS/VS1 System Messages
15.	GC26-3835	OS/VS VSAM System Information
16.	GC24-5094	OS/VS Storage Estimates
17.	PA75-009	(VSAM Flash) VSAM Resource Sharing
18.	PA75-013	(VSAM Flash) VSAM Application Design and Implementation
19.	G321-0038	IBM Systems Journal "VSAM Data Set Parameters" 1974
20.	ZZ05-0067	VSAM Performance Study (ISAM vs VSAM)

21. ZZ20-2841 VSAM Catalog Structures
              and Comparison of VSAM
              Catalogs
22. 76-002   (WTSC-PA Flash) How to
              Get Rid of VSAM Catalog
23. 75-029   (WTSC-PA Flash) Some Not
              Too Obvious VSAM Catalog
              Restrictions
24. ZZ10-9840 Practical Experiences in
              Recovering a VSAM
              Recoverable Catalog
25. ZZ05-0011 OS/VS Backup and Recovery
26. 76-008   (VSAM Flash) Catalog
              Recovery Area Size
              Restriction
27. 76-003   (VSAM Flash) Enhanced
              VSAM Feature and
              CICS/OS/VS
28. 75-008   (VSAM Flash) Storage
              Estimates in OS/VS VSAM
              Version 2
29. G320-5774 VSAM Primer (DOS/VS, VS1,
              MVS)
30. SCF-7841   (VSAM Flash) Recovering
              Files with Recovery
              (Load) Mode
31. SCF-7850   (VSAM Flash) VS1/VSAM CI
              Split Integrity PTF
              Available
32. ZZ20-2732 VSAM on 3350 (Fixed
              Heads) Newsletter 76-08
33. GC29-5099 OS/VS1 JCL Reference
34. GC26-3791 OS/VS1 System Generation
              Reference
35. SY26-3837 OS/VS1 DADSM Logic
36. ZZ20-3698 DASD Switching Concepts
37. WSCF-7707 OS/VSAM Questions and
              Answers

VSAM
PERFORMANCE AND TUNING
BIBLIOGRAPHY
(continued)

38. G320-6015 OS/VS VSAM Sharing – A
               Technical Discussion
39. GC28-1818 CMS Command and Macro
               Reference – Appendix C

<u>VS1</u> <u>VSAM</u> <u>AND</u> <u>SHARED</u> <u>DASD</u>

40. GC24-5096 OS/VS1 Planning and Use
               Guide – Section C
41. GC26-3799 OS/VS VSAM Planning Guide
42. GC26-3842 Planning for Enhanced
               VSAM Under OS/VS
43. ZZ77-5012 Planning for Shared DASD
44. ZZ05-0300 A DASD Tuning Refresher

<u>VS1</u> <u>VSAM</u> <u>WITH</u> <u>IMS/VS</u> <u>DB</u>

45. ZZ20-2806 VSAM Performance in
               IMS/VS
46. ZZ10-9872 HDAM Randomizing
               Algorithms
47. ZZ20-2732 IMS Topical Index for
               PARSC Newsletter (see
               VSAM)
48. ZZ19-0279 Writing Randomizing
               Modules for HDAM
49. GH20-9069 IMS/VS Fast Path Feature
               General Information

```
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                    BIBLIOGRAPHY
                    (continued)
```

<u>VSAM FLASH AND NEWSLETTER INDEXES</u>

```
50.  ZZ20-2735  PARSC Newsletter Index
                1973-76 (Newsletter
                76-11)
51.  SCF-7849   PASC and WSC Document
                Index - 1975-1978
52.  ZZ10-9842  WTSC Bibliography to
                Weekly Distribution 1976
53.  ZZA0-9869  WTSC 1978 Weekly
                Distribution (Microfiche)
                (plus TNL ZZA0-9878)
54.  ISF-76-22  Intermediate Systems
                Flash Index 1976
55.  INL-75-21  VSAM Bibliography 1973-75
```

<u>DOS/VS VSAM</u>

```
56.  INL-75-01  VSAM Data Set Design
                Considerations
57.  INL-75-07  DOS/VS VSAM NRES
                Parameter
58.  INL-75-09  DOS/VS COBOL and VSAM RBA
59.  INL-76-02  AMS VSAM Catalog Reload
                Restrictions
60.  76-04      (VSAM Flash) DOS/VS DB/DC
                Design and Tuning
                Checklist
61.  76-06      (VSAM Flash) Specifying
                the Number of Index
                Buffers
62.  76-06      (VSAM Flash) VSAM Buffer
                Usage
63.  76-08      (VSAM Flash) VSAM
                Time-Stamping
64.  76-09      (VSAM Flash) DOS/VSAM on
                3350
```

65. 76-19   (VSAM Flash) Using VSAM
                IIP With ISAM Unblocked
                Records
66. 77-11   (VSAM Flash) VSAM Catalog
                Recovery
67. 77-11   (VSAM Flash) VSAM and
                Release 33
68. 77-14   (VSAM Flash) VSAM
                Alternate Index
69. 77-51   (VSAM Flash) DOS/VS VSAM
                3330-11 and 3350
                Migration
70. 74-11   VSAM Performance on
                370/115 - Poughkeepsie
                Bulletin
71. ZZ05-0016 VSAM User's Guide
72. ZZ33-6025 DOS/VS Release 31 VSAM
                Performance
73. ZZ10-9840 Practical Experience
                Recovering a VSAM
                Recoverable Catalog
74. ZZ77-4070 DOS/VS VSAM Questions and
                Answers
75. ZZ77-3047 A VSAM Analytic Model for
                Data Set Design
76. ZZ20-2841 VSAM Catalog Structures
77. GC33-5382 DOS/VS Access Method
                Services User's Guide
78. GC33-5404 DOS/VS Vsam Planning
                Guide
79. SY33-8562 DOS/VS LIOCS Vol. 4 -
                VSAM Logic
80. SY33-8564 DOS/VS AMS Logic
81. ZZ20-2858 DOS/VS Tuning and ISAM to
                VSAM Conversion Guide

VSAM PERFORMANCE CHECKLIST

GENERAL ALLOCATION & PLACEMENT CONSIDERATIONS			*TUNING EFFECT ON PERFORMANCE FACTORS						
ITEM	COMMENTS	REFERENCE DOCUMENTS	CPU UTIL	WORK SET	CHAN UTIL	SCP O.H.	RESP TIME	THRU PUT	DASD SPACE
Place VSAM indexes under fixed heads	Do not IMBED index. Adjust BUFNI.	32, 35	0	–	0	0	–	–	0
Place indexes and data components on separate volumes	Allows VSAM to gain access to an index and to data at the same time. Do not IMBED.	3, 5, 81, 29	*	0	0	*	–	–	0
Force cylinder CA allocation	Do not use less than a cylinder's worth of allocation for either the primary or secondary allocation. Not applicable to very small files.	3, 7, 81, 29	*	0	–	–	*	–	–

* See Codes at end of Checklist

VSAM PERFORMANCE CHECKLIST

GENERAL ALLOCATION & PLACEMENT CONSIDERATIONS (continued)		*TUNING EFFECT ON PERFORMANCE FACTORS						
ITEM	COMMENTS	REFERENCE DOCUMENTS	CPU UTIL	WORK SET	CHAN UTIL	SCP O.H.	RESP TIME	THRU PUT	DASD SPACE
Reorganize KSDS when statistics indicate file is no longer contiguous	This may be because a large number of CA splits have occurred or many secondary allocations have occurred.	7	0	0	*	*	-	-	-

VSAM PERFORMANCE CHECKLIST

INDEXES, CONTROL INTERVALS, & BUFFERS			*TUNING EFFECT ON PERFORMANCE FACTORS						
ITEM	COMMENTS	REFERENCE DOCUMENTS	CPU UTIL	WORK SET	CHAN UTIL	SCP O.H.	RESP TIME	THRU PUT	DASD SPACE
Replicate INDEX-NOIMBED	When Index and Data are on separate volumes.	3, 4, 18	0	-	0	0	-	*	+
IMBED index	For larger CA sizes.	3, 4, 18	0	0	0	*	-	*	+
Increase index CISZ	Use if you suspect poorly compressed keys.	3, 4, 18, 81, 29	*	+	*	*	-	-	-
Increase data CISZ. Decrease index CISZ	This can be used as an indirect way of increasing BUFNI for a small BUFSPACE. Useful for random requests.	3, 4, 18, 81, 29	*	0	*	*	-	-	*

VSAM PERFORMANCE CHECKLIST

INDEXES, CONTROL INTERVALS, & BUFFERS (continued)			*TUNING EFFECT ON PERFORMANCE FACTORS						
ITEM	COMMENTS	REFERENCE DOCUMENTS	CPU UTIL	WORK SET	CHAN UTIL	SCP O.H.	RESP TIME	THRU PUT	DASD SPACE
Increase data CISZ	Should improve processing for sequential requests.	3, 4, 18, 81	*	+	−	−	−	−	*
Increase BUFNI	Appropriate for random requests and multi-string processing.	3, 18, 81, 33, 29	*	+	−	*	−	−	0
Increase BUFND	Appropriate for sequential requests and multi-string processing.	3, 18, 81, 33, 29	*	+	−	*	−	−	0
Use Assembler or PL/I to specify BUFND and BUFNI exactly (DOS/VS only)	To override the default data and index allocation of buffers, specify it in ACB.	6, 7	*	0	*	*	−	−	0

VSAM PERFORMANCE CHECKLIST

INDEXES, CONTROL INTERVALS, & BUFFERS (continued)			*TUNING EFFECT ON PERFORMANCE FACTORS						
ITEM	COMMENTS	REFERENCE DOCUMENTS	CPU UTIL	WORK SET	CHAN UTIL	SCP O.H.	RESP TIME	THRU PUT	DASD SPACE
Use spanned records - decrease data CISZ	Applicable when small percentage of variable length records exceed a smaller CISZ.	7, 27	*	-	-	*	*	*	-
ALTER CI free space upwards	Applicable when larger number of inserts are expected.	3, 4, 7	0	0	*	-	-	-	+
ALTER CA free space upwards	Applicable when inserts are expected within existing key groups.	3, 4, 7	0	0	*	-	-	-	+
Increase BUFSPACE as opposed to BUFND or BUFNI	Do when buffer usage is unpredictable.	3, 4, 7, 18, 81, 29, 33	*	+	-	*	-	-	0

VSAM PERFORMANCE CHECKLIST

OTHER PERFORMANCE ITEMS & OPTIONS		*TUNING EFFECT ON PERFORMANCE FACTORS						
ITEM	COMMENTS	REFERENCE DOCUMENTS	CPU UTIL	WORK SET	CHAN UTIL	SCP O.H.	RESP TIME	THRU PUT	DASD SPACE
Use local shared resources	Use when job has several VSAM files that may be logically related in access (as in IMS/VS) or the file requirements of the job are dynamic and unpredictable.	3, 5, 6, 17, 28, 38	*	—	0	*	—	—	0
Specify realistic string number value in ACB (VS1 only)	Avoid dynamic string allocation as it fragments page references.	3, 29, 27	—	—	0	—	—	—	0
Specify SPEED for loading	However, it will not be possible to resume loading if an ABEND occurs.	3, 7, 30	—	0	—	—	—	—	0

VSAM PERFORMANCE CHECKLIST

OTHER PERFORMANCE ITEMS & OPTIONS (continued)			*TUNING EFFECT ON PERFORMANCE FACTORS						
ITEM	COMMENTS	REFERENCE DOCUMENTS	CPU UTIL	WORK SET	CHAN UTIL	SCP O.H.	RESP TIME	THRU PUT	DASD SPACE
Use SHAREOPTION 4 only when necessary	However, it is necessary for read integrity and some write with user coding responsibilities.	3, 4, 5, 81, 29	-	0	-	-	-	-	0
Use DDNAME or DSNAME sharing for ACBs that point to the same file or for files that are logically related (VS1 only)	An example of files that should share control blocks are a base and its path to an alternate index cluster when used in the same program.	3, 27, 33	*	-	*	-	-	-	0
Avoid the GENCB method of creating blocks	The performance penalty is severe for the flexibility and "release" independence.	3, 6	-	+	0	-	-	-	0

VSAM PERFORMANCE CHECKLIST

OTHER PERFORMANCE ITEMS & OPTIONS (continued)			*TUNING EFFECT ON PERFORMANCE FACTORS						
ITEM	COMMENTS	REFERENCE DOCUMENTS	CPU UTIL	WORK SET	CHAN UTIL	SCP O.H.	RESP TIME	THRU PUT	DASD SPACE
Use CINV processing when feasible	Assembler only. The user has responsibility for maintaining VSAM's control field.	3, 6, 81, 29	–	*	0	*	–	–	0
Use RBA retrieval when feasible	User has responsibility of keeping track of RBA changes (from updates, CI splits, etc.), for later retrieval of records.	3, 5, 81, 29	–	0	0	–	–	–	0
Avoid CA splits	Use statistics to monitor file growth, reorganize before significant number of splits occur.	3, 7	–	–	–	–	–	–	*

VSAM PERFORMANCE CHECKLIST

CATALOG CONSIDERATIONS

ITEM	COMMENTS	REFERENCE DOCUMENTS	*TUNING EFFECT ON PERFORMANCE FACTORS						
			CPU UTIL	WORK SET	CHAN UTIL	SCP O.H.	RESP TIME	THRU PUT	DASD SPACE
Use recoverable catalogs only when necessary	It is not usually necessary, for example, for the master catalog if it only contains pointers to USERCATALOGS.	3, 7	−	−	−	−	*	*	−
Use USERCATALOGS	Not only for recovery but to avoid catalog contention.	3, 7, 18	*	+	*	+	−	−	+
NRES specified too small (DOS/VS only)	With many user catalogs it is possible to run out of resource usage records.		*	0	*	−	+	+	0

VSAM PERFORMANCE CHECKLIST

TUNING EFFECT CODES (for the general case):

-     Performance Factor should decrease

\+   Performance Factor should increase

*   Effect cannot be directly predicted

0   No effect

VSAM PERFORMANCE CHECKLIST
READER'S COMMENT FORM

Comments on the usefulness of this
document are appreciated. Please
suggest additions, deletions, revisions
that would make this more useful to you.
If you have additional items that you
feel make VSAM perform better, please
send them also.

Please give the following information:

Name:_____
Location:_____
Address:_____
         _____
Telephone number:
     TIE line 8/_____-_____,
     Outside (_____)_____-_____

General rating of this document:

o Extremely useful   o Marginally useful
o Very useful   o Of no value
o Useful

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the back of this form.

Send comments to: B. P. Miller
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                   Palo Alto Systems Center
                   1501 California Avenue
                   Palo Alto, CA 94304

VSAM PERFORMANCE CHECKLIST
READER'S COMMENT FORM

CICS/VS

PERFORMANCE CHECKLIST

CICS/VS

PERFORMANCE CHECKLIST

CICS/VS
PERFORMANCE CHECKLIST

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CICS/VS
PERFORMANCE CHECKLIST

CICS/VS
PERFORMANCE CHECKLIST

INTRODUCTION

Purpose Of This Document

The purpose of this document is to
assist in the installation and tuning of
CICS/VS systems. This checklist is not
an all-inclusive list of tuning knobs
that will result in better performing
CICS. It does represent a best effort
to supply a list of those items which
have proven to provide a performance
improvement in a majority of instances.

The recommendations contained in this
document have not been subject to any
formal test or review and should
therefore be individually evaluated for
their applicability to a particular
installation. Use of information
presented in this document in a customer
installation must adhere to the
Guidelines for Systems Engineering
Services.

CICS/VS
PERFORMANCE CHECKLIST

Here To Use This Document

The following checklist assumes the user
has access to the documents listed in
the bibliography section of this
document.

For ease of use, the items on this
checklist are divided into four
sections:

    System Generation
    Table Considerations
    Operational Parameters
    Program Considerations

The effect on the three major system
resources (CPU cycles, Real Storage and
I/O) is shown for each performance and
tuning item on the check list. Users
who have identified their major
bottleneck or constraint can look down
the appropriate columns for items to
help alleviate the situation.

CICS/VS
PERFORMANCE CHECKLIST

The contents of this document should be
reviewed prior to:

1. The installation of a new CICS/VS
    system.

2. The installation of a new release
    of CICS/VS.

3. A major change in the hardware
    environment.

4. The installation of a new major
    application.

Most of the information presented here
relates to selection of installation
parameters, which properly selected,
will proclude the necessity for going
back and tuning the system.

Currency

This document is current through the
current release of CICS/VS, at the date
of publication which is CICS/VS Release
1.4.   The items on the checklist also
apply to Release 1.3, unless stated
otherwise.   A few items on the checklist
apply either to Release 1.3 or 1.4 and
not to both releases, and these items
are so specified.

As of the date of publication of this
document, user experience with Release
1.4 has been limited.   Because of that,
this checklist may need to be further
updated for Release 1.4 performance in
the future.

Prerequisites

*   Experience installing, generating
    and using CICS/VS.

*   A basic understanding of how the
    system functions.

*   Access to the documents on the
    bibliography list.

CICS/VS
PERFORMANCE CHECKLIST
BIBLIOGRAPHY

PALO ALTO-RALEIGH SYSTEMS CENTER
NEWSLETTERS

1. 76-03   CICS/VSAM Storage
            Requirements and Tuning
2. 76-07   CICS/DOS/VS Critical
            Performance and
            Functional Support
            Checklist
3. 76-09   CICS/DOS/VS 1.1.1
            Performance Tip - ICV
4. 76-11   CICS/DOS/VS 1.1.1
            Anticipatory Paging
5. 76-13   CICS/VS Table Generation
            Tips
6. 76-17   CICS/VS VSAM
            Considerations

CICS/VS PUBLICATIONS

7. SC33-0069 System Programmers
             Reference Guide
8. SC33-0070 System Programmers Guide
             (DOS/VS)
9. SY33-6030 Problem Determination
             Guide

CICS/VS PERFORMANCE CHECKLIST

SYSTEM GENERATION			TUNING EFFECT		
ITEM	COMMENTS	ENVIRON- MENT	CPU	REAL STORAGE	I/O
Stage-One	Generate only those facilities required by the production system. Excess facilities needlessly increase the working set and page reference pattern of CICS and cause excessive CPU and storage to be used as well as increased paging.	All	Decreases	Decreases	Decreases

CICS/VS PERFORMANCE CHECKLIST

TABLE CONSIDERATIONS			TUNING EFFECT		
ITEM	COMMENTS	ENVIRON-MENT	CPU	REAL STORAGE	I/O
Program Control Table	Sequence by activity.	All	Decreases (Rel 1.3)	Decreases	
	Anticipatory paging.	Paging	Increases	Shift	
	Set task class equal long.	All	Decreases	Shift	
Processing Program Table	Sequence by program use.	All	Decreases (Rel 1.3)	Decreases	
Nucleus Load Table	Define partition layout for CICS/VS management modules.	All		Decreases	
	Pagein/pageout (DOS/VS only).	Low volume	Increases	Shift	

CICS/VS PERFORMANCE CHECKLIST

TABLE CONSIDERATIONS (continued)			TUNING EFFECT		
ITEM	COMMENTS	ENVIRON-MENT	CPU	REAL STORAGE	I/O
Application Load Table	Define partition layout for application modules.	All		Decreases	
	Pagein/pageout for very low volume applications only. (DOS/VS only).		Increases	Shift	
Terminal Control Table	Sequence and balance by volume.	All			
	WRAPLIST/AUTOPOLL.	All	Decreases		
	Terminal areas (INAREAL TIOAL).	All		Decreases	
	User areas (TCTUAL).	All		Decreases	

CICS/VS PERFORMANCE CHECKLIST

ITEM	COMMENTS	ENVIRON-MENT	CPU	REAL STORAGE	I/O
TABLE CONSIDERATIONS (continued)			TUNING EFFECT		
File Control Table	VSAM strings and buffers.	VSAM		Decreases	Decreases
	Shared resources.	VSAM		Decreases	
	ISAM core index.	ISAM		Increases	Decreases
	ISAM LOGICMOD (DOS/VS only).	ISAM		Increases	Decreases
Journal Control Table	Buffer size selection.	All		Decreases	

CICS/VS PERFORMANCE CHECKLIST

OPERATIONAL PARAMETERS			TUNING EFFECT		
ITEM	COMMENTS	ENVIRON- MENT	CPU	REAL STORAGE	I/O
Max Task	Set at 999.	All	Decreases		Decreases
Max Active Task	Set for CPU and memory environment.	All	Decreases	Decreases	
ICV	Operating system wait interval. Set above one second.	All	Decreases		
ICVSD	Terminal table scan delay.	All	Decreases		
Storage Cushion	Set high enough to ensure storage availability.	All	Decreases		Decreases
Trace	Set off in production system.	All	Decreases	Decreases	
Recovery	Use only the facilities required by a tested recovery system.	All	Decreases	Decreases	Decreases

CICS/VS PERFORMANCE CHECKLIST

PROGRAM CONSIDERATIONS

ITEM	COMMENTS	ENVIRON- MENT	TUNING EFFECT CPU	REAL STORAGE	I/O
Exclusive Control	See Table B for resource ownership application lock outs.	All			
Program Size & Reference Pattern	Minimize real storage required to provide application function.	All		Decreases	
Modularize (XCTL LINK)	Avoid modularity for program size reasons only.	All	Decreases	Decreases	
Conversa- tional Programs	Provide proper operating environment and avoid long resource ownership.	All			
Temporary Storage	Avoid the use of temporary storage mainly for large tables.	All		Decreases	

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CICS/VS PERFORMANCE CHECKLIST

			TUNING EFFECT		
PROGRAM CONSIDERATIONS (continued)					
ITEM	COMMENTS	ENVIRON-MENT	CPU	REAL STORAGE	I/O
Transient Data	Avoid use for temporary data saving with Release 1.3. With Release 1.4, Transient Data with VSAM has much less overhead.	All	Decreases (Rel. 1.4)		
Terminal Message Size	Avoid sending redundant information and do not initialize with blanks.	Remote			

CICS/VS PERFORMANCE CHECKLIST
READER'S COMMENT FORM

Comments on the usefulness of this
document are appreciated. Please
suggest additions, deletions, revisions
that would make this more useful to you.
If you have additional items that you
feel make CICS/VS perform better, please
send them also.

Please give the following information:

Name:_____
Location:_____
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        _____
Telephone number:
     TIE line 8/_____-_____,
     Outside (_____)_____-_____

General rating of this document:

o Extremely useful   o Marginally useful
o Very useful   o Of no value
o Useful

Additional comments may be written on
the back of this form.

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                   Palo Alto, CA 94304

CICS/VS PERFORMANCE CHECKLIST
READER'S COMMENT FORM

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IMS/VS DB AND DL/I DOS/VS

PERFORMANCE CHECKLIST

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IMS/VS DB AND DL/I DOS/VS

PERFORMANCE CHECKLIST

January 1979 Edition

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IMS/VS DB and DL/I DOS/VS
PERFORMANCE CHECKLIST

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IMS/VS DB and DL/I DOS/VS
PERFORMANCE CHECKLIST

IMS/VS DB and DL/I DOS/VS
PERFORMANCE CHECKLIST

INTRODUCTION

Purpose of This Document

This document is intended to provide a
quick reference for the Systems Engineer
who wants to help his customer more
finely tune IMS/VS Data Base or DL/I
DOS/VS in the system. It is not an
all-inclusive list of tuning knobs which
will result in better performing IMS.
It does represent a best effort to
supply a list of those items which have
proven to provide a performance
improvement in a majority of instances.

The recommendations contained in this
document have not been subject to any
formal test or review and should
therefore be individually evaluated for
their applicability to a particular
installation. Use of information
presented in this document in a customer
installation must adhere to the
Guidelines for Systems Engineering
Services.

IMS/VS DB and DL/I DOS/VS
PERFORMANCE CHECKLIST

How To Use This Document

The following checklist assumes that the
user has access to the documents listed
in the bibliography section of this
document.

Since nearly all the tuning items in
this checklist apply to both IMS/VS and
DL/I DOS/VS data base products,
subsequent reference to DL/I in this
document applies to both IMS/VS DB and
DL/I DOS/VS, unless specifically stated
otherwise.

For ease of use, the items on this
checklist are divided into eight
sections:

        General Performance Considerations
        Segment/Hierarchical Design
        Logical Relationship And Secondary
            Index
        DL/I Access Methods
        DL/I Calls
        HD Pointer Options
        Program Isolation
        Execution Time Parameters

The effect on the four major system
resources (CPU cycles, I/O, Real
Storage, and DASD Space) is shown for
each performance and tuning item on the
checklist. Users who have identified
their major bottleneck or constraint can
look down the appropriate columns for
items to help alleviate the situation.

IMS/VS DB and DL/I DOS/VS
PERFORMANCE CHECKLIST

The contents of the checklist should
also be reviewed prior to:

1. The installation of a new IMS or
    DL/I system.

2. The installation of a new release
    of IMS or DL/I.

3. A major change in the hardware
    environment.

4. The installation of a new major
    application.

IMS/VS DB and DL/I DOS/VS
PERFORMANCE CHECKLIST

Currency

This document is current through the
current release of IMS/VS Data Base and
DL/I DOS/VS at the date of publication.

Prerequisites

- Experience installing, generating,
  and using IMS/VS DB or DL/I DOS/VS.

- A basic understanding of how the
  respective data base system
  functions.

- Access to the documents on the
  bibliography list.

IMS/VS DB AND DL/I DOS/VS
PERFORMANCE AND TUNING
BIBLIOGRAPHY

1. SH12-5413 DL/I DOS/VS System/Application Design Guide
2. SH12-5412 DL/I DOS/VS Utilities And Guide For The System Programmer
3. SH24-5001 DL/I DOS/VS Guide For New Users
4. ZZ20-4275 Understanding System And Application Growth Environment - Marketing Program
5. G320-6001 DL/I DOS/VS Version 1, Release 3 Planning Guide
6. ZZ20-2823 DOS/VS DB/DC Design And Tuning Guide
7. 78-14 Palo Alto Systems Center FLASH - Loading Large DL/I DOS/VS Data Base - Correction And Clarification Of Flash 78-01
8. 78-01 Palo Alto Systems Center FLASH - Loading Large DL/I DOS/VS Data Base
9. 77-51 Palo Alto Systems Center FLASH - DL/I DIS/VS Dynamic Transaction Backout Hint
10. 77-50 Palo Alto Systems Center FLASH - DL/I DOS/VS Program Isolation Deadlock Considerations
11. 77-45 Palo Alto Systems Center FLASH - "Batch Only" MPS Performance Considerations

12. 77-39   Palo Alto Systems Center
                FLASH - GIS/DOS/VS Using
                SPMOL II
13. 77-28   Palo Alto Systems Center
                FLASH - DL/I DOS/VS MPS
                With CICS/DOS/VS Dynamic
                Transaction Backout
14. 77-26   Palo Alto Systems Center
                FLASH - DL/I DOS/VS MPS
                Support And GIS/DOS/VS
15. 77-19   Palo Alto Systems Center
                FLASH - DL/I DOS/VS Data
                Base Prefix Resolution
                Utility Warning
16. 76-25   Palo Alto Systems Center
                FLASH - Loading DL/I
                DOS/VS Data Bases With
                Logical Relationships
17. 76-25   Palo Alto Systems Center
                FLASH - Sort Work Area
                For Prefix Resolution
18. 76-24   Palo Alto Systems Center
                FLASH - DL/I DOS/VS
                Buffer Pool
                Characteristics Report
19. 76-12   Palo Alto Systems Center
                FLASH - DL/I DOS/VS
                Consideration For Loading
                A HDAM Data Base
20. 76-11   Palo Alto Systems Center
                FLASH - DL/I Segment
                Intent Propagation
21. 76-01   Palo Alto Systems Center
                FLASH - Potential
                Performance Degradation
                In Hidam Data Base
                Processing

IMS/VS DB AND DL/I DOS/VS
PERFORMANCE AND TUNING
BIBLIOGRAPHY
(continued)

22. 75-63   Palo Alto Systems Center
                FLASH - Writing And
                Analyzing HDAM
                Randomizing Modules For
                DL/I DOS/VS
23. 75-53   Palo Alto Systems Center
                FLASH - DOS/VS DL/I
                Multi-Partition Access
24. G320-6009 The IMS/VS Data
                Base/Application Design
                Review
25. G320-1004 IMS/VS Performance And
                Tuning Guide
26. S320-5767 IMS/VS Primer
27. SH20-9029 IMS/VS Utilities - DB
                Monitor
28. G320-6004 IMS Performance
                Monitoring And Tuning
                Guide

IMS/VS DB AND DL/I DOS/VS PERFORMANCE CHECKLIST

GENERAL PERFORMANCE CONSIDERATIONS		TUNING EFFECT			
ITEM	COMMENTS	CPU	I/O	REAL STORAGE	DASD SPACE
Avoid shared DASD	Shared DASD can result in I/O times in excess of one second. Mean IWAIT time in DB monitor report will indicate excessive I/O wait times.		Reduced contention of I/Os		
Avoid page faults	Page faults are expensive in online environment. Paging in online environment should be minimized. Paging has a very significant impact on performance.	Decreases CPU	Reduced		

IMS/VS DB AND DL/I DOS/VS PERFORMANCE CHECKLIST

GENERAL PERFORMANCE CONSIDERATIONS (continued)		TUNING EFFECT			
ITEM	COMMENTS	CPU	I/O	REAL STORAGE	DASD SPACE
Avoid batch type processing in online environment	Avoid sequential scans of data bases since they generate lots of I/Os and tie up resources.	Help reduce CPU load	Help reduce number of I/Os		
Optimize size of data base buffer pools	Data base buffer pools that are too large or too small can cause performance problems. Pools that are too small cause excessive I/Os. Pools that are too large cause excess in paging. Optimize the pools.	Reduce CPU by reducing number of I/Os	Reduce I/Os		

IMS/VS DB AND DL/I DOS/VS PERFORMANCE CHECKLIST

GENERAL PERFORMANCE CONSIDERATIONS (continued)		TUNING EFFECT			
ITEM	COMMENTS	CPU	I/O	REAL STORAGE	DASD SPACE
Use DB monitor in IMS for determining program profile	1) DL/I call summary report is used for I/Os per call. Use for data set placement determination.				
	2) Data base buffer pool stats is used to estimate buffer pool sizes.		Minimize I/Os		
	3) VSAM buffer subpools report is used to size VSAM buffer pools.		Minimize I/Os		

IMS/VS DB AND DL/I DOS/VS PERFORMANCE CHECKLIST

GENERAL PERFORMANCE CONSIDERATIONS (continued)		TUNING EFFECT			
ITEM	COMMENTS	CPU	I/O	REAL STORAGE	DASD SPACE
Optimize data set placement	1) Separate indexes from data bases. 2) Use data set groups to isolate large or small segments (IMS only). 3) Balance I/O activity.		Reduce I/O contention		

IMS/VS DB AND DL/I DOS/VS PERFORMANCE CHECKLIST

SEGMENT/HIERARCHICAL DESIGN		TUNING EFFECT			
ITEM	COMMENTS	CPU	I/O	REAL STORAGE	DASD SPACE
Avoid duplication of data	A field in a dependent segment which may occur multiple times under a parent and is thus repeated for every occurrence of that dependent segment, should be promoted into the parent segment.	Can reduce number of calls	Can reduce number of calls		Reduced
Separate optional and required fields into separate segment types	If optional and required fields are placed into the same segment and where the optional fields are not present, that portion of the segment is unused DASD space.	Can increase number of calls			Reduced

SEGMENT/HIERARCHICAL DESIGN (continued)		TUNING EFFECT			
ITEM	COMMENTS	CPU	I/O	REAL STORAGE	DASD SPACE
Include sequence or key field in every segment	By including this type of field, the segment can be uniquely retrieved with one DL/I call, thereby simplifying the application programming.	Reduced since only one call to retrieve		Reduced since less application code	
Avoid over-segmentation	Too many small segments add unneeded complexity	Can reduce number of calls			
Frequently accessed segments should be kept as close to the root as possible	More frequently referenced segments should be kept to the left of the hierarchy.	Reduced path length by reducing I/Os	Reduced		

IMS/VS DB AND DL/I DOS/VS PERFORMANCE CHECKLIST

SEGMENT/HIERARCHICAL DESIGN (continued)		TUNING EFFECT			
ITEM	COMMENTS	CPU	I/O	REAL STORAGE	DASD SPACE
Avoid wide range of segment lengths	By keeping all segments approximately the same length, better DASD space utilization when inserting. For IMS/VS DB, use data set groups.	Shorter path through insert	Reduced		Reduced
Protect sensitive data by placing in separate segment	This technique should be used only when there is a definite requirement to protect sensitive or confidential data in the data base.	Increases since more DL/I calls to retrieve data base record	May possibly increase	Increases size of control block and applica- tion code	Increases

SEGMENT/HIERARCHICAL DESIGN (continued)		TUNING EFFECT			
ITEM	COMMENTS	CPU	I/O	REAL STORAGE	DASD SPACE
Keep hierarchical design as simple as possible	Combine segments at the same level or promote a segment to the level above and combine with parent whenever possible.	Reduced since less DL/I calls	Reduced	Reduced. Smaller control blocks and less application code.	Reduced
Keep logically related segments close together	Remember that application processing within a data base record is from top to bottom, left to right, and that hierarchical layout should be reflecting this for high activity application programs or transactions.	Reduced since shorter path through retrieve	Reduced		

IMS/VS DB AND DL/I DOS/VS PERFORMANCE CHECKLIST

SEGMENT/HIERARCHICAL DESIGN (continued)		TUNING EFFECT			
ITEM	COMMENTS	CPU	I/O	REAL STORAGE	DASD SPACE
Use variable length segments only if segments do not increase in size	Replacement of a variable length segment with a larger version may result in splitting of prefix and data. The result of this may require 2 I/Os for subsequent retrieves.	Reduction of path length due to reduction in I/Os	Reduced I/Os		
Performance analysis	The hierarchical structure should be analyzed with the high activity processing program and transaction requirements in mind, prior to settling on the final data base design.				

LOGICAL RELATIONSHIP & SECONDARY INDEX		TUNING EFFECT			
ITEM	COMMENTS	CPU	I/O	REAL STORAGE	DASD SPACE
Use unidirectional logical relationships whenever possible	Unidirectional logical relationships imply less overhead in DL/I than bidirectional logical relationships and should be used when you need a relationship in one direction between one data base and another. When bidirectional relationships must be used, avoid sequence of VLC, use insert rule first.	Reduced. Less pointer mainte- nance.	Reduced. Less pointer mainte- nance.		

IMS/VS DB AND DL/I DOS/VS PERFORMANCE CHECKLIST

LOGICAL RELATIONSHIP & SECONDARY INDEX (cont.)		TUNING EFFECT			
ITEM	COMMENTS	CPU	I/O	REAL STORAGE	DASD SPACE
Use DL/I to provide logical relationship	User implemented logical relationship is typically done by storing keys.	Reduced since less DL/I calls	Reduced. Direct RBA.		Reduced. Key not stored twice.
Placement of the real logical child	1) Place the real logical child in the data base in which the most activity to that logical child exists.	Reduced. Shorter path to do DL/I functions.	Reduced		
	2) The real logical child should be placed in the data base in which the largest number of twins occur.				

LOGICAL RELATIONSHIP & SECONDARY INDEX (cont.)		TUNING EFFECT			
ITEM	COMMENTS	CPU	I/O	REAL STORAGE	DASD SPACE
Secondary indexes should be used for random processing only	Avoid sequential processing of a data base via a secondary index since it can be a very slow process.	Decreases	Decreased I/Os		
Long twin chains are a major cause of poor performance	Each segment accessed in a logical twin chain will probably result in an I/O. Use a dummy parent segment containing only the high-order portion of the segment key. Long twin chains can be identified by referencing HD unload statistics.	Reduced path length	Reduced		Increases

IMS/VS DB AND DL/I DOS/VS PERFORMANCE CHECKLIST

LOGICAL RELATIONSHIP & SECONDARY INDEX (cont.)		TUNING EFFECT			
ITEM	COMMENTS	CPU	I/O	REAL STORAGE	DASD SPACE
Use of symbolic pointer (IMS only) or direct pointer	For frequently retrieved concatenated segments, use a direct pointer to locate logical parent in HIDAM. If logical parent is in HDAM, use symbolic.	Reduced index processing	Reduced I/Os		
Source segment of a secondary index should be stable in occurrence and content	If the source segment of a secondary index has high insert activity or the source field of a secondary index has high replace activity, then DL/I index maintenance will become excessive.	Reduced	Reduced		

LOGICAL RELATIONSHIP & SECONDARY INDEX (cont.)		TUNING EFFECT			
ITEM	COMMENTS	CPU	I/O	REAL STORAGE	DASD SPACE
Use duplicate data for non-volatile fields to satisfy inquiries	The secondary index can be processed as a data base without accessing the target.	Reduced path length	Reduced I/Os		
Do not specify INDICES= in the SENSEG statement of the PCB (IMS only)	Segments are retrieved by the primary sequence and the secondary index is also accessed to determine if a pointer points to the candidate segment. Much more efficient to use a search field.	Reduced path length due to reduced I/Os	Reduced I/Os		

IMS/VS DB AND DL/I DOS/VS PERFORMANCE CHECKLIST

DL/I ACCESS METHODS		TUNING EFFECT			
ITEM	COMMENTS	CPU	I/O	REAL STORAGE	DASD SPACE
Use HDAM	Use HIDAM only if an application requires sequenced processing of root segments and no way is found to satisfy this requirement using HDAM.	Reduced. No index processing.	Reduced. No index processing.	Reduced. No KSDS requirement.	May be reduced. Careful randomization will aid good segment packing. No index requirement.

DL/I ACCESS METHODS (continued)		TUNING EFFECT			
ITEM	COMMENTS	CPU	I/O	REAL STORAGE	DASD SPACE
Process HDAM data bases sequentially	Insert the randomizing routine into a sort exit and sort in rap sequence. Significantly increases the number of buffer hits and reduces seek time.	Reduced cycles due to reduced I/O	Reduced I/Os and reduced I/O time		

IMS/VS DB AND DL/I DOS/VS PERFORMANCE CHECKLIST

DL/I CALLS		TUNING EFFECT			
ITEM	COMMENTS	CPU	I/O	REAL STORAGE	DASD SPACE
Use path calls and fully qualified SSAs	Can significantly reduce the number of calls.	Reduced path length by reducing calls			
Save data in temporary storage	Temporary storage should be used to hold data over a conversation rather than a re-read of data base. For cases where data might be changed since the last read by some other task, the data will have to be re-read.	Reduced path length	Reduced I/Os		

DL/I CALLS (cont.)		TUNING EFFECT			
ITEM	COMMENTS	CPU	I/O	REAL STORAGE	DASD SPACE
Do not issue GET CALL prior to insert to check for prior existence	By issuing the insert initially and checking the return code for duplicate, redundant processing can be eliminated.	Savings in path length due to less calls issued			

IMS/VS DB AND DL/I DOS/VS PERFORMANCE CHECKLIST

HD POINTER OPTIONS		TUNING EFFECT			
ITEM	COMMENTS	CPU	I/O	REAL STORAGE	DASD SPACE
Physical Twin Backward (PTB)	1) Always specify for root segment of HIDAM data base.	Reduced for sequential. No index processing.	Eliminates index processing time		Increased
	2) Specify on dependent segments that have a long twin chain and high delete activity.	Reduced. Shorter path for delete.	Reduced. Less I/O to do pointer maintenance.		Increased
	3) Do not use for HDAM root.				Decreased

IMS/VS DB AND DL/I DOS/VS PERFORMANCE CHECKLIST

HD POINTER OPTIONS (continued)		TUNING EFFECT			
ITEM	COMMENTS	CPU	I/O	REAL STORAGE	DASD SPACE
Physical Child Last (PCL)	Physical Child Last pointers are used only for non-sequenced segments or when the sequence field value may not be unique and the insert rule is last.	Reduced	Reduced		Increased
Logical Twin Backward (LTB)	The Logical Twin Backward pointer should be used if many deletions take place when a long logical twin chain exists.	Reduced. Shorter path for delete.	Reduced. Less I/O to do pointer maintenance.		Increased

IMS/VS DB AND DL/I DOS/VS PERFORMANCE CHECKLIST

PROGRAM ISOLATION		TUNING EFFECT			
ITEM	COMMENTS	CPU	I/O	REAL STORAGE	DASD SPACE
Avoid contention for a single data base record by concurrent transactions.	This situation usually occurs during access of a single control record. Look for the opportunity to increase the number of roots.				

IMS/VS DB AND DL/I DOS/VS PERFORMANCE CHECKLIST

EXECUTION TIME PARAMETERS		TUNING EFFECT			
ITEM	COMMENTS	CPU	I/O	REAL STORAGE	DASD SPACE
Imbed and replicate should be specified for KSDSs when it is not possible to ensure a high probability of sequence set CIs being resident	These options reduce I/O time by reducing rotational delay.		Reduced I/O time		Increased space
Initial load of KSDS HISAM data bases will be faster if speed is specified in VSAM define	Faster VSAM processing.	Reduced	Reduced		

IMS/VS DB AND DL/I DOS/VS PERFORMANCE CHECKLIST

EXECUTION TIME PARAMETERS (continued)		TUNING EFFECT			
ITEM	COMMENTS	CPU	I/O	REAL STORAGE	DASD SPACE
Sort batch transactions by root key	Increase chances of buffer hits and reduces I/Os and I/O time.	Reduced path length due to I/O savings	Reduced I/Os and I/O time		
Use the DLISPACE aid to determine best CI size or blocksize	DLISPACE will calculate average data base record size.		Can be used to provide I/O prob-abilities		Provides efficient space utili-zation
PSB and DBM pools should be fixed (IMS only)	Small PSB and DMB pools that are fixed are better than large pageable pools. Reduced page faults in CICS.			Increases real storage usage	

IMS/VS DB AND DL/I DOS/VS
PERFORMANCE CHECKLIST
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