

OPT/3000 - What It Is & What It Does

by Tom Idema

I. Introduction

A. What is OPT/3000?

OPT/3000 is Hewlett-Packard's On-line Performance Tool for use with HP3000 computers using the MPE operating system. Its primary uses include performance measurement, system utilization and tuning. As a package, OPT/3000 consists of two interdependent products, the OPT/3000 Software and OPT/3000 System Performance Training Course. It is designed to be interactive, although it has certain batch capabilities and on-line help capabilities as well. OPT/3000 is a powerful tool to aid the trained user in monitoring and improving the performance of the HP3000.

B. How does OPT/3000 help me?

OPT/3000 is an invaluable tool which allows the system manager to look deep inside the HP3000 and monitor almost everything going on. OPT/3000 is used in our facility for collecting system utilization data and for characterizing system performance by charting and comparing current data with previous samples over time. I've found OPT/3000 to be far superior to the old "crystal ball" approach, (which was about all that was available to system

managers prior to the introduction of OPT/3000 as a product), especially when it comes to isolating problem areas, be it disc I/O, memory, or whatever.

In the area of system management, OPT/3000 is used to monitor the system performance and assist with system fine tuning. It helps with the identification of processing bottle necks, helps improve overall system performance and helps in the area of capacity planning. For instance, prior to the introduction of MPE IV, our HP3000 Series III was showing signs of saturation with an average CPU utilization of around 50% during a 24 hour work day as shown in Figure 1; and, indications were that a more powerful CPU would be needed in the near future. After installing MPE IV on this (*) machine, however, the performance data obtained from OPT/3000 indicated a CPU utilization of slightly over 25%, which meant that the replacement of the current operating equipment could be postponed for some time (See Figure 2). (*)

Although this is only one example, it should be noted that with OPT/3000 almost all aspects of the HP3000 can be monitored and it allows you to consider your system as a whole.

II. OPT/3000 Functions

OPT/3000 can generate over twenty unique displays, each showing a different aspect of system performance data. These are grouped into six major categories or functions which will be discussed briefly.

A. Globals

The Globals function shows summary level information describing present CPU usage, memory utilization, disc I/O rates (Figure 3),

and a summary of jobs and sessions currently running (Figure 4). (*)

These are two Global displays which allow you to quickly identify potential problem areas or to monitor general system activity and determine trends in resource usage. For instance, current CPU utilization can be found by adding CPU Busy and the Overhead percentages. Figure 5 shows a HP3000 series 44 that is 86% busy with 14% of Overhead...100% current CPU utilization. (*)

However, there was a problem program running at this time which was in a hard loop. Figure 6 shows the same CPU only 16% busy seven minutes later after the problem program was aborted. (*)

A hard copy summary report is also available within the Global function which provides an overall view of the system (See Figure 7). (*)

This can be generated interactively or in batch mode. It is from 1/2 hour summary reports generated on a random 24 hour basis that I plot the average CPU utilizations such as shown in Figure 8; in this case an HP3000 series 64 with 4MB of memory and over 35 interactive terminals. (*)

After consulting the Global displays, which are presented first when executing OPT/3000, more detailed displays from the other functional areas can be used for isolation or verification of potential performance problems.

B. Memory

The Memory function has displays which provide information about the usage of memory and its segmentation. These displays provide not only the use and contents of memory, but histograms as to the size and distribution of code segments, stack data, etc. The entire contents of memory can be displayed, or that of a specific bank, according to your needs.

Figure 9 shows the summary usages of all memory, linked memory and code, stack and data segments. Should a high percentage of linked memory be locked or frozen, then the memory manager could have problems finding space, depending on the location of the frozen area. (*)

Memory contents shown in Figure 10 provide a clearer picture of overall memory content and usage. Note the frozen areas in Bank 01 indicated by the "///'s". In this case they present no problem due to location. (*)

Should a detailed image of a specific bank of memory be required, Figure 11 provides an example. (*)

Figure 12 displays three of the histograms available for analysis of code, stack and extra data segments. If the charts indicate a large number of segments over 10K in size, the memory manager may have problems in satisfying requirements for absent segments. (*)

C. CPU-Memory Manager

This function provides information related to CPU usage and memory management activity as percentages of time in various states and process execution rates. The various rates include CPU time for execution, memory management, overhead processing, waiting and CPU idle time.

Notice in Figure 13, the CPU Usage Display, that "paused for swap" is not present, indicating that memory is not a problem at this time, but that the "paused for disc" is greater than the 10% optimum range indicating that disc I/O may, indeed, be a problem and bears watching. (*)

The other displays, Figures 14 & 15, support the fact that memory is probably sufficient for the current workload on the system. (*)

D. I/O Function

The I/O displays provide disc I/O completion rates and data relative to printer and tape activity as well. The I/O completion rate for each type of device is displayed for both the current and overall time intervals. Information can be displayed down to a specific device and allows you to determine the balance of your I/O load across devices.

The I/O Activity Report provides an overall I/O summary by device type as shown in Figure 16. In this case only user disc I/O, at the rate of 54 per second, is taking place. (*)

A closer look at disc drives, 1 through 4 in Figure 17, shows both the overall performance and the Read/Write activity currently taking place on the listed devices. Here it is important to look at the distribution of the I/O load to see if certain devices are getting all of the activity, and then to see what applications or files are in use to determine if better file placement might decrease disc contention, etc. (*)

E. Processes

The Process function provides information about process and program activity on the system, including file names, file sizes, program segments, number of users and working set data. Detailed information regarding each process is also available including process stack and space utilization.

The Program File Display in Figure 18 identifies all program files which are allocated or currently in use. The "#PS" in this case shows the number of process sharing a given program file. Figure 19, the User Summary Display gives the detail with (*) regard to these same processes. Note PIN #115; this is the process with the 28K stack as shown in figure 12 displayed earlier. (*)

The Process State Report summarizes the information about all processes known to the system as shown in Figure 20. Here, if the dispatch wait lists are greater than 5, it is possible to have CPU contention; disc contention if the short wait list is greater than 5. (*)

The Process Display, Figure 21, is the most detailed of the process function displays. In this

A. An HP Requirement

Hewlett Packard requires that at least one person from a site attend their eight day course at initial installation of the OPT/3000 package.

B. The Course Covers

The eight day System Performance Training Course required by Hewlett Packard is conducted by an HP Performance Specialist, and covers the internals of the MPE operating system and the techniques of performance analysis. Proper interpretation of OPT/3000 data requires an understanding of the MPE

display stack utilization, system status, files, data segments and even stack marker information can be analyzed. (*)

F. System Tables

The System Tables function has two displays which provide both the current and maximum utilization of all configurable system tables.

These displays give you an opportunity to see what the present and past table utilization has been, and from that establish an optimum set for your system which minimizes both memory usage and the risk of system failures caused by tables configured too small.

Tables, (See Figure 22), which consistently have low utilization of thirty percent or less over a lengthy period of time, could possibly be reconfigured smaller, and thereby free up real memory. However, peak loads must be considered before reduction of table sizes. Conversely, tables with consistently high rates of utilization (over ninety percent), could cause poor performance and probably should be made larger in order to improve system performance. (*)

Figure 23, shows a graphic representation of the table usages and provides a quick and dirty indication of present and peak usages shown in detail in Figure 22. (*)

III. System Performance Training Course

operating system that can only be obtained through such a course.

The internals course is required because OPT/3000 presents detailed information which often must be analyzed or interpreted by the System Manager. The operating system and processes, their tables, relationships and uses are covered in great detail along with the memory manager, scheduler, dispatcher and system I/O.

Time is also spent on the functions of the file system and in performance measurement where system configurations, scheduling and operation management are covered, along with tuning, upgrade planning, software evaluation and general control of system resources.

IV. Conclusion:

A. Cost

1. OPT/3000 software 32238A.....\$6,400
2. System Performance Training 22809B.....\$1,640

B. Is It For You ?

HOW'S YOUR SYSTEM PERFORMANCE ??

Personally, I'd be lost without OPT/3000. I maintain all three of my HP3000's on a regular basis, and as a result, have been able to keep them quite well tuned; and my performance has been good. But, OPT/3000 has also helped me to isolate and/or avoid various problems before they have become serious and caused the system to degrade.

OPT/3000 is just one tool and by itself will not substitute for the regular and deliberate application of "system management" functions such as disc management, scheduling, housekeeping, and good application design. But, with OPT/3000, the System Manager has one very powerful tool with which to "manage and monitor" the HP3000 computer systems.

(*) Pertains to diagrams for the document.

Biographical Information

of

Tom Idema

Tom Idema is Manager of MIS Technology Services for the Furniture Systems Division of Westinghouse Electric Corporation. He is a graduate of Ole Miss, with an MBA from Western Michigan University. Tom served with the Marines and flew jets in Viet Nam before launching his data processing career first with General Foods, and later with Hewlett-Packard, prior to joining Westinghouse. He has served as President of both the Westinghouse Corporate HP Users' Group and the Lake Michigan Regional Users' Group which serves the western Michigan area.

Tom is a member of the faculty of Grand Rapids Junior College, and has taught data processing classes for the past nine years. He has also had several articles published in a national data processing journal.

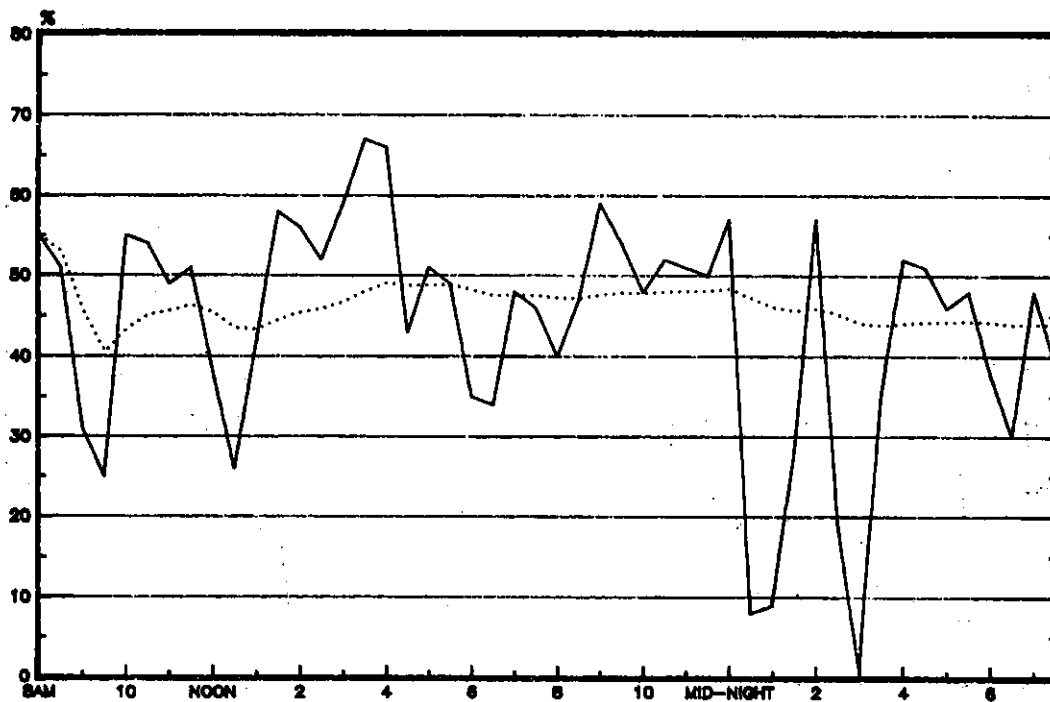
For the past two years he has served as a member of the HPIUG Affiliate Council.

M.I.S. TECHNICAL SERVICES

SYSTEM "A" CPU UTILIZATION

PERCENT
BUSY

AVG. PCT.
BUSY



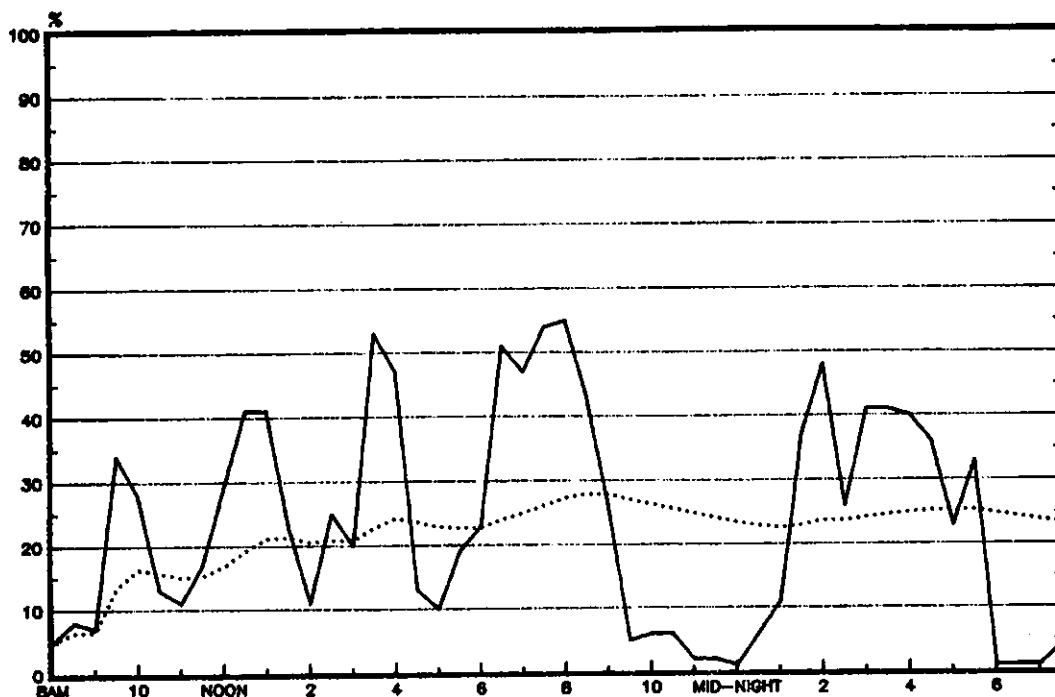
MAY 18, 1982

M.I.S. TECHNICAL SERVICES

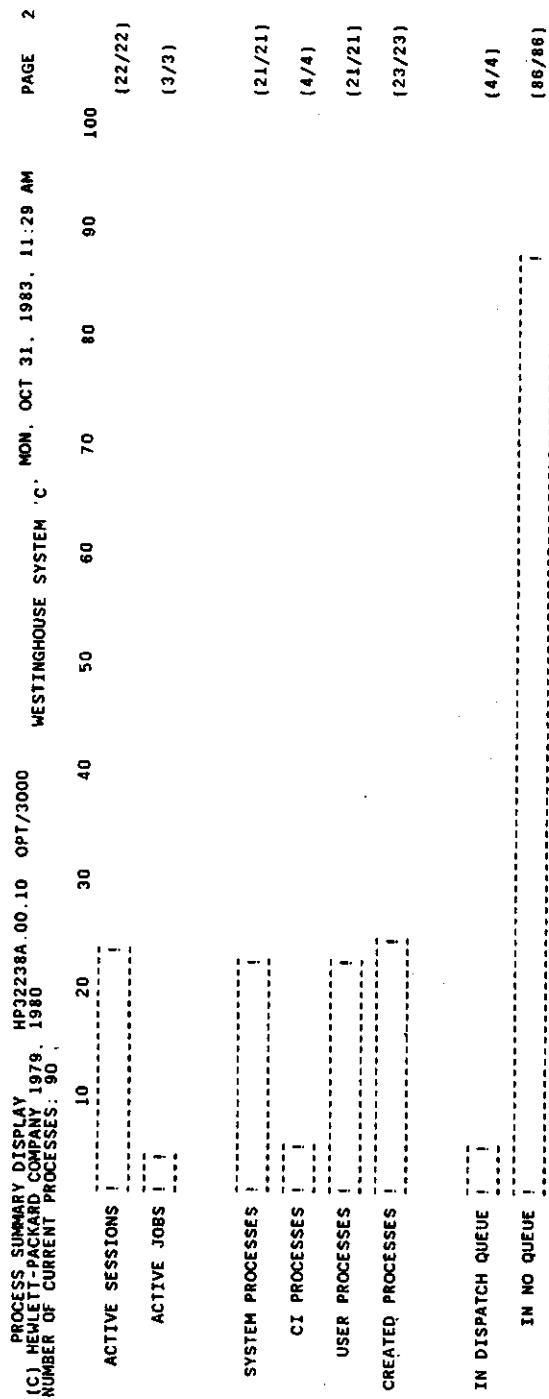
SYSTEM "A" CPU UTILIZATION

PERCENT
BUSY

AVG. PCT.
BUSY



NOVEMBER 10, 1982



LEGEND: [] CURRENT COUNT

[/] MAXIMUM OBSERVED WHILE IN THIS DISPLAY

RESOURCE USAGE DISPLAY HP22238A.00.10 OPT/3000 MON. OCT 31. 1983. 11:29 AM PAGE 1
 (C) HEWLETT-PACKARD COMPANY 1979, 1980 WESTINGHOUSE SYSTEM 'C'
 CURRENT INTERVAL: 11.7 SECONDS OVERALL INTERVAL: 105.6 MINUTES

ACTIVITY IN CURRENT INTERVAL

	10	20	30	40	50	60	70	80	90	100%
MEMORY USAGE MMC-----										
CPU STATE B-----										
DISC I/O ACTIVITY U-----										

ACTIVITY OVER ALL INTERVALS

	10	20	30	40	50	60	70	80	90	100%
CPU STATE B-----										
DISC I/O ACTIVITY U-----										

MEMORY USAGE LEGEND:
 M Resident MPE
 C Code segments
 S Stack segments
 D Data segments

CPU STATE LEGEND:

B Busy on processes
 P Paused for user and/or memory management disc I/O
 I Idle
 G Garbage collection
 O Memory allocation and ICS overhead

DISC I/O ACTIVITY LEGEND:

U User disc I/O
 M Memory management disc I/O

RESOURCE USAGE DISPLAY HP32238A.00.10 OPT/3000 PAGE 1
 (C) HEWLETT-PACKARD COMPANY 1979, 1980 SHPHUNG
 CURRENT INTERVAL: 15.9 SECONDS OVERALL INTERVAL: 5.3 MINUTES
 FRI, SEP 9, 1983, 5:57 PM

ACTIVITY IN CURRENT INTERVAL

ACTIVITY	10	20	30	40	50	60	70	80	90	100%
MEMORY USAGE MMC	10	20	30	40	50	60	70	80	90	100%
CPU STATE B	10	20	30	40	50	60	70	80	90	100%
DISC I/O ACTIVITY UU	10	20	30	40	50	60	70	80	90	100%
ACTIVITY OVER ALL INTERVALS	10	20	30	40	50	60	70	80	90	100%
CPU STATE B	10	20	30	40	50	60	70	80	90	100%
DISC I/O ACTIVITY U--U	10	20	30	40	50	60	70	80	90	100%

MEMORY USAGE LEGEND:
 M Resident MPE
 C Code segments
 S Stack segments
 D Data segments

CPU STATE LEGEND:

B Busy on processes
 P Paused for user and/or memory management disc I/O
 I Idle
 G Garbage collection
 O Memory allocation and ICS overhead

DISC I/O ACTIVITY LEGEND:

U User disc I/O
 M Memory management disc I/O

RESOURCE USAGE DISPLAY HP32238A.00.10 OPT/3000 SHPHUNG PAGE 4
 (C) HEWLETT-PACKARD COMPANY 1979, 1980 FRI, SEP 9, 1983, 6:04 PM
 CURRENT INTERVAL: 3.8 SECONDS OVERALL INTERVAL: 12.1 MINUTES

ACTIVITY IN CURRENT INTERVAL

ACTIVITY	10	20	30	40	50	60	70	80	90	100%	PERIOD
MEMORY USAGE MNC	10	20	30	40	50	60	70	80	90	100%	(2/34/22/14)
CPU STATE B	10	20	30	40	50	60	70	80	90	100%	I (16/88)
DISC I/O ACTIVITY UU	10	20	30	40	50	60	70	80	90	100%	(2)
ACTIVITY OVER ALL INTERVALS	10	20	30	40	50	60	70	80	90	100%	
CPU STATE B	10	20	30	40	50	60	70	80	90	100%	O (90/2/2/6)
DISC I/O ACTIVITY U	10	20	30	40	50	60	70	80	90	100%	(14)

MEMORY USAGE LEGEND:
 M Resident MPE
 C Code segments
 S Stack segments
 D Data segments

CPU STATE LEGEND:

B Busy on Processes
 P Paused for user and/or memory management disc I/O
 I Idle
 G Garbage collection
 O Memory allocation and ICS overhead

DISC I/O ACTIVITY LEGEND:

U User disc I/O
 M Memory management disc I/O

SUMMARY REPORT
(C) HEWLETT-PACKARD COMPANY 1979, 1980 HP32238A.00.10 OPT/3000
INTERVAL LENGTH: 1045.867 SECONDS (17.4 MINUTES)
MON, OCT 31, 1983, 11:48 AM WESTINGHOUSE SYSTEM 'C' REPORT 9

CPU ACTIVITY SUMMARY					MEMORY ALLOCATION SUMMARY				
CPU STATE	MEAN	MAX	LENGTH	COUNT	TOTAL TIME	RESULT	MEAN	COUNT	
CPU BUSY	5%	71%	.006	107426	605.737	RECOVERY	1%	2	
PAUSE DISC & SWAP	1%	5%	.023	314	7.219	FREE SPACE	99%	372	
PAUSE DISC	17%	54%	.019	9397	181.895	OVERLAY CAND	0%	0	
PAUSE SWAP	0%	0%	.020	8	.163	GIVE UP	0%	0	
PAUSE IDLE	2%	30%	.064	404	25.771	HARD REQUEST	0%	0	
GARBAGE COLLECTION	0%	0%	0	0	0.000				
MEMORY ALLOCATION	0%	1%	.003	444	1.473				
ICS OVERHEAD	21%				223.609				

LAUNCH ACTIVITY AND ADDITIONAL MEMORY MANAGEMENT ACTIVITY SUMMARY					MM I/O				
PROCESS	LAUNCHES	PROCESS SWAP-INS	PREEMPTS	ALLOCS	REQUESTS	MM I/O READS	MM I/O WRITES	RELEASE DATA SEG	RELEASE CODE SEG
COUNT	107426	444	33863	373	175	371	115	0	0
RATE	102.7	.4	32.5	.4	.2	.2	.1	0	0
MAX RATE	128	2	46	2	1			0	0

SUMMARY OF DISC ACTIVITY					COUNT/RATE				
ALL I/O	READS	WRITES	CONTROL OPS		READS	WRITES	CONTROL OPS		
ALL DISC	24488/ 23.4	17247/ 16.5	6768/ 6.5	475/ .5	33/ 2	12/ 1	2/ 0	2	
DISC 1 (LDEV 1)	3427/ 3.3	3027/ 2.9	365/ .3	34/ .0	19/ 0	2/ 0	1/ 0	1	
DISC 2 (LDEV 2)	2567/ 2.5	1892/ 1.7	642/ .6	33/ .0	5/ 0	4/ 0	0/ 0	0	
DISC 3 (LDEV 3)	2998/ 2.9	1796/ 1.7	1155/ 1.1	47/ .0	14/ 1	3/ 1	0/ 0	0	
DISC 4 (LDEV 4)	7550/ 7.2	6391/ 6.1	1068/ 1.0	91/ .1	22/ 1	2/ 0	0/ 0	1	
DISC 5 (LDEV 5)	2001/ 1.9	877/ .8	1072/ 1.0	52/ .0	2/ 0	2/ 0	0/ 0	0	
DISC 6 (LDEV 6)	1406/ 1.3	727/ .7	608/ .6	71/ .1	4/ 0	2/ 0	0/ 0	1	
DISC 7 (LDEV 7)	2805/ 2.7	1535/ 1.5	1188/ 1.1	82/ .1	17/ 0	3/ 0	0/ 0	1	
DISC 8 (LDEV 8)	1734/ 1.7	1002/ 1.0	667/ .6	65/ .1	12/ 0	1/ 0	0/ 0	0	

SUMMARY OF LP ACTIVITY					COUNT/RATE				
ALL I/O	READS	WRITES	CONTROL OPS		READS	WRITES	CONTROL OPS		
ALL LP	0/ .0	0/ .0	0/ .0	0/ .0					

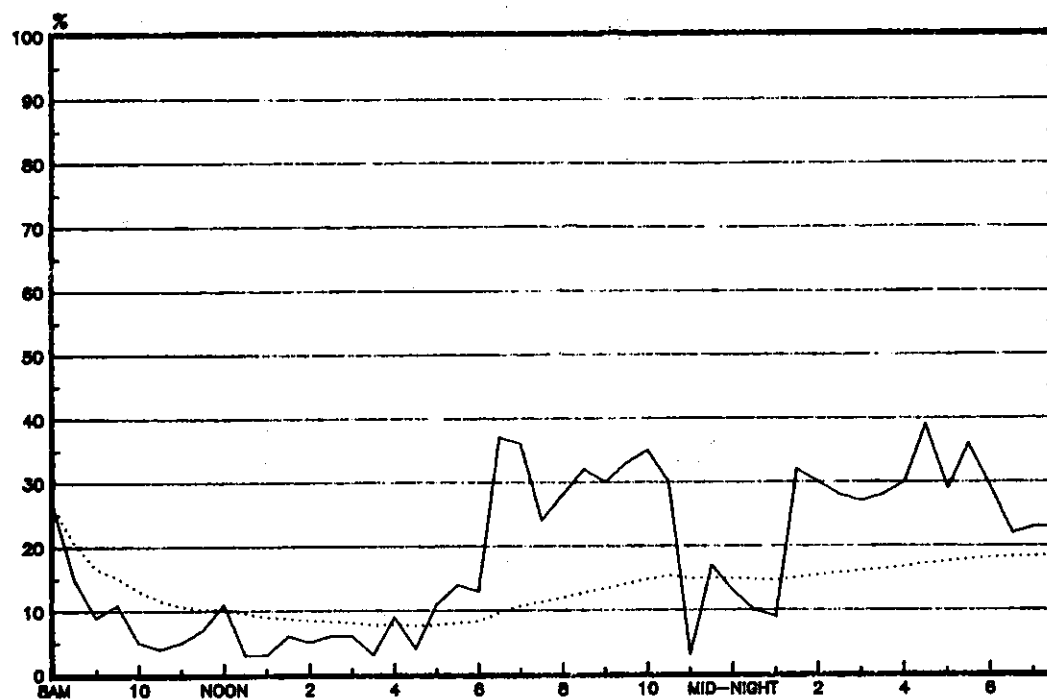
SUMMARY OF TAPE ACTIVITY					COUNT/RATE				
ALL I/O	READS	WRITES	CONTROL OPS		READS	WRITES	CONTROL OPS		
ALL TAPE	61/ .1	0/ .0	61/ .1	0/ .0					
TAPE 1 (LDEV 7)	61/ .1	0/ .0	61/ .1	0/ .0					

M.I.S. TECHNOLOGY SERVICES

SYSTEM "A" CPU UTILIZATION

PERCENT
BUSY

AVG. PCT.
BUSY



AUGUST 8, 1983

LEGEND:

ALL MEMORY - Includes all of memory

M C S D
Resident MPE
Code Segments
Stack Segments
Extra Data Segments

LINKED MEMORY - All memory except for Resident MPE

A Active Segments
O Overlay Candidates
F Frozen, Locked, or I/O Frozen Segments

CODE, STACK, & EXTRA DATA SEGMENTS

U	User Segments	
S	System Segments	
P	Program Segments	
C	Code Segments	
C	Constant Segments	
M	Non-special Extra Data Segments	(usage unknown)
F	File System Segments	
J	Job Management Segments	
I	Image Segments	
K	KSAM Segments	
T	System Table Segments	(only those that are in I)

MEMORY CONTENTS DISPLAY HP32238A.00.10 OPT/3000 MON, OCT 31, 1983, 11:35 AM PAGE 13
(C) HEWLETT-PACKARD COMPANY 1979, 1980 WESTINGHOUSE SYSTEM 'C'

LEGEND AND SUMMARY STATISTICS

Each space represents 1K words of memory (rounded to the nearest 1K words, with segments smaller than 1K always rounded up to 1K)
Lower case denotes a system segment

SYMBOL	SEGMENT COUNT	% OF LINKED MEMORY	DESCRIPTION
S	48	19.4	Stack
C	14	4.3	Code Segment from CST
P	52	8.3	Code Segment from Program File
F	4	3.1	System Table Data Segment
J	71	3.1	File System Data Segment
I	11	1.1	Job Management Data Segment
K	47	1.9	Image Data Segments
D	4	2.4	KSAM Data Segments
*	50	2.9	Data Segment (usage unknown)
.	301	42.6	Active Segment
/	0	0	Segment on Overlay Candidate List
	12	2.5	Segment that is Frozen, Locked or I/O Frozen
%			
OF MEMORY ACTIVE IN EACH BANK:			
BANK 0:	100.0	BANK 1:	99.6
BANK 10:	97.7	BANK 11:	89.0
		BANK 12:	70.9
		BANK 13:	86.1
		BANK 14:	99.2
		BANK 15:	77.7
		BANK 16:	99.2
		BANK 17:	100.0
		BANK 18:	93.0
		BANK 19:	97.1
		BANK 20:	97.1

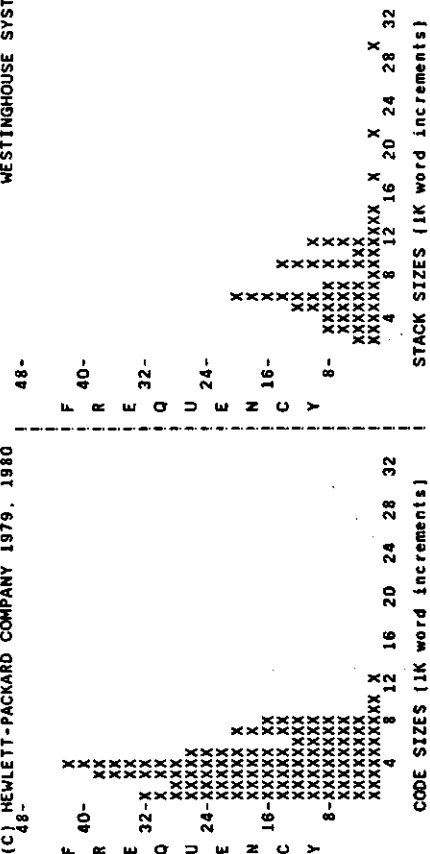
BANK CONTENTS DISPLAY										WESTINGHOUSE SYSTEM 'C'										MON. OCT 31, 1983, 11:39 AM										PAGE 15																																																																					
BANK NUMBER 5										BANK NUMBER 5										BANK NUMBER 5										BANK NUMBER 5																																																																					
0001	0002	0003	0004	0005	0006	0007	0008	0009	0010	0011	0012	0013	0014	0015	0016	0017	0018	0019	0020	0021	0022	0023	0024	0025	0026	0027	0028	0029	0030	0031	0032	0033	0034	0035	0036	0037	0038	0039	0040	0041	0042	0043	0044	0045	0046	0047	0048	0049	0050	0051	0052	0053	0054	0055	0056	0057	0058	0059	0060	0061	0062	0063	0064	0065	0066	0067	0068	0069	0070	0071	0072	0073	0074	0075	0076	0077	0078	0079	0080	0081	0082	0083	0084	0085	0086	0087	0088	0089	0090	0091	0092	0093	0094	0095	0096	0097	0098	0099	0100
0001	0002	0003	0004	0005	0006	0007	0008	0009	0010	0011	0012	0013	0014	0015	0016	0017	0018	0019	0020	0021	0022	0023	0024	0025	0026	0027	0028	0029	0030	0031	0032	0033	0034	0035	0036	0037	0038	0039	0040	0041	0042	0043	0044	0045	0046	0047	0048	0049	0050	0051	0052	0053	0054	0055	0056	0057	0058	0059	0060	0061	0062	0063	0064	0065	0066	0067	0068	0069	0070	0071	0072	0073	0074	0075	0076	0077	0078	0079	0080	0081	0082	0083	0084	0085	0086	0087	0088	0089	0090	0091	0092	0093	0094	0095	0096	0097	0098	0099	0100
0001	0002	0003	0004	0005	0006	0007	0008	0009	0010	0011	0012	0013	0014	0015	0016	0017	0018	0019	0020	0021	0022	0023	0024	0025	0026	0027	0028	0029	0030	0031	0032	0033	0034	0035	0036	0037	0038	0039	0040	0041	0042	0043	0044	0045	0046	0047	0048	0049	0050	0051	0052	0053	0054	0055	0056	0057	0058	0059	0060	0061	0062	0063	0064	0065	0066	0067	0068	0069	0070	0071	0072	0073	0074	0075	0076	0077	0078	0079	0080	0081	0082	0083	0084	0085	0086	0087	0088	0089	0090	0091	0092	0093	0094	0095	0096	0097	0098	0099	0100
0001	0002	0003	0004	0005	0006	0007	0008	0009	0010	0011	0012	0013	0014	0015	0016	0017	0018	0019	0020	0021	0022	0023	0024	0025	0026	0027	0028	0029	0030	0031	0032	0033	0034	0035	0036	0037	0038	0039	0040	0041	0042	0043	0044	0045	0046	0047	0048	0049	0050	0051	0052	0053	0054	0055	0056	0057	0058	0059	0060	0061	0062	0063	0064	0065	0066	0067	0068	0069	0070	0071	0072	0073	0074	0075	0076	0077	0078	0079	0080	0081	0082	0083	0084	0085	0086	0087	0088	0089	0090	0091</									

(C) HEWLETT-PACKARD COMPANY 1979, 1980 HP32238A.00.10. OPT/3000 MON, OCT 31, 1983, 11:39 AM PAGE 16
WESTINGHOUSE SYSTEM 'C'

LEGEND AND SUMMARY STATISTICS

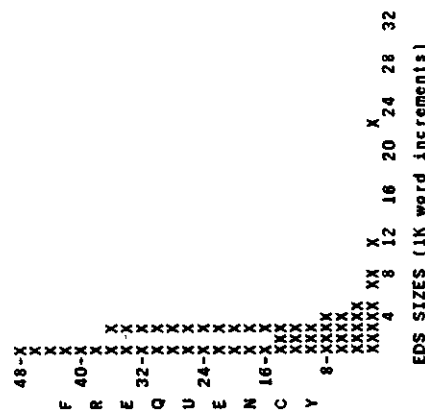
Each position represents 64 words of memory. The starting and ending address of the segment are rounded to the nearest 64 word increment, so that the numbers above and to the left of the display specify the starting address of each segment. Lower case denotes a system segment

SYMBOL	SEGMENT COUNT	% OF LINKED MEMORY	DESCRIPTION
S	2	23.2	Stack Segment from CST
C	2	16.6	Code Segment from Program File
P	6	22.1	System Table Data Segment
T	0	0.0	File System Data Segment
J	11	9.2	Job Management Data Segment
I	11	8.4	Image Data Segments
K	0	0.0	KSAM Data Segment (usage unknown)
D	4	7.8	Active Segment
*	37	87.5	Segment on Overlay Candidate List
/	0	0.0	Segment that is Frozen, Locked or I/O Frozen
X	4	12.5	Free Area



TYPE	COUNT	MEAN	MAX	# IN MEMORY
CODE	216	3608	12184	216
STACK	90	6950	28860	90
EDS	359	850	22432	359

PRESENT
*
ONLY



```

CPU USAGE DISPLAY      HP32238A.00.10  OPT/3000      MON. OCT 31. 1983. 11:31 AM      PAGE 3
(C) HEWLETT-PACKARD COMPANY 1979, 1980      WESTINGHOUSE SYSTEM 'C'
CURRENT INTERVAL: 11.7 SECONDS      OVERALL INTERVAL: 1.3 MINUTES

CURRENT CPU STATE B      10      20      30      40      50      60      70      80      90      100%
OVERALL CPU STATE B      10      20      30      40      50      60      70      80      90      100 per second
                                BPPD      8PPD
PROCESS LAUNCHES      10      20      30      40      50      60      70      80      90      100 per second
                                (77/86)
PROCESS REQUESTS      10      20      30      40      50      60      70      80      90      100 per second
                                (19/20)

```

CPU STATE INFORMATION		AVG TIME IN STATE(MS)		STATE PERCENTAGES		AVERAGE CPU	
		CURRENT	OVERALL	CURRENT	OVERALL	TIME PER	
CPU BUSY		22	6	46	2	TRANSACTION	
PAUSED FOR SWAP		20	22	37	5	OF INTERACTIVE	
PAUSED FOR DISC			19		3	PROCESSES	
PAUSED FOR SWAP					0		
IDLE					0		
GARBAGE COLLECTION					0		
MEMORY ALLOCATION					0		
		3	3		2	CURRENT:	116 MS
						MAXIMUM:	267 MS

LEGEND FOR PROCESS LAUNCHES AND PREEMPTS:

---	! ! CURRENT RATE	---	! ! MAXIMUM RATE	---	! * ! OVERALL RATE
-----	------------------	-----	------------------	-----	--------------------

CPU STATE LEGEND:

B	P	D	S	I	G	M	O
Busy on process	Paused for disc	Paused for disc	Paused for disc	Idle	Garbage collection	Memory allocation	ICS overhead

MAM ACTIVITY DISPLAY HP32238A.00.10 OPT/3000 MON. OCT 31. 1983. 11:31 AM PAGE 4
 (C) HEWLETT-PACKARD COMPANY 1979, 1980 WESTINGHOUSE SYSTEM 'C'
 CURRENT INTERVAL: 6.0 SECONDS OVERALL INTERVAL: .4201755C donds
 CURRENT MM ACTION F-----100%
 OVERALL MM ACTION RRF-----F (6)
 (67)
 10 20 30 40 50 60 70 80 90 100 per second
 10 20 30 40 50 60 70 80 90 100 per second
 (1/1)
 (1/1)
 (1/1)
 (1/1)
 MM I/O READS *
 MM I/O WRITES *
 MEMORY ALLOCATIONS *
 PROCESS SNAP-INS *
 RELEASE DATA SEG
 RELEASE CODE SEG
 SPECIAL REQUESTS- CURRENT: .67/second
 PERCENT: 25.84% OVERALL: .25/second
 CLOCK CYCLE RATE- CURRENT: .00/second
 OVERALL: .00/second
 LEGEND FOR EVENT RATES:
 CURRENT RATE 1/1 MAXIMUM RATE 1/1 OVERALL RATE 1/1
 MM ACTION LEGEND:
 R Recovered overlay candidate
 F Found free region
 O Made overlay candidates
 G Give up
 H Hard request

CPU-NAM REPORT DISPLAY HP32238A.00.10 OPT/3000 MON, OCT 31, 1983, 11:31 AM PAGE 5
 (C) HEWLETT-PACKARD COMPANY 1979, 1980 WESTINGHOUSE SYSTEM 'C'
 CURRENT INTERVAL: 5.8 SECONDS OVERALL INTERVAL: 1.8 MINUTES

	10	20	30	40	50	60	70	80	90	100 per second
PROCESS LAUNCHES										(76/94)
PROCESS SWAP-INS										(1/1)
MEMORY ALLOCATIONS										(1/1)
CURRENT CPU STATE	B									100%
OVERALL CPU STATE	B									O (54/29/18) O (50/2/30/18)
CURRENT MM ACTION	F									F
OVERALL MM ACTION	RRF									F (2) (72)

LEGEND FOR LAUNCHES, SWAP-INS, AND MEMORY ALLOCATIONS:

--- CURRENT RATE 1/1 MAXIMUM RATE 1*1 OVERALL RATE ---

CPU STATE LEGEND:

B Busy on process
 P Paused for disc and swap
 D Paused for disc
 S Paused for swap
 I Idle
 G Garbage collection
 M Memory allocation
 O ICS overhead

MM ACTION LEGEND:

R Recovered overlay candidate
 F Found free region
 O Made overlay candidates
 G Give up
 H Hard request

I/O ACTIVITY REPORT DISPLAY HP32238A.00.10 OPT/3000 MON, OCT 31, 1983, 11:32 AM PAGE 6
 (C) HEWLETT-PACKARD COMPANY 1979, 1980 WESTINGHOUSE SYSTEM 'C'
 CURRENT INTERVAL: 13.5 SECONDS OVERALL INTERVAL: .2 MINUTES
 ACTIVITY IN CURRENT INTERVAL
 DISC I/O ACTIVITY U-----U
 TAPE I/O ACTIVITY
 PRINTER ACTIVITY
 ACTIVITY OVER ALL INTERVALS
 DISC I/O ACTIVITY U-----U
 TAPE I/O ACTIVITY
 PRINTER ACTIVITY

LEGEND FOR DISC I/O ACTIVITY:
 U User disc I/O
 M Memory management disc I/O

DISC ACTIVITY DISPLAY HP22238A.00.10 OPT/3000 PAGE 10
 (C) HEWLETT-PACKARD COMPANY 1979, 1980 MON. OCT 31, 1983, 11:33 AM
 CURRENT INTERVAL: 4.3 SECONDS WESTINGHOUSE SYSTEM 'C' 100 per second
 OVERALL INTERVAL: 1.2 MINUTES (68)
 (44/10)

	10	20	30	40	50	60	70	80	90
CURRENT ALL DISC R	---	---	---	---	---	---	---	---	---
OVERALL ALL DISC R	---	---	---	---	---	---	---	---	---
CURRENT LDEV 1 R	---	---	---	---	---	---	---	---	---
OVERALL LDEV 1 R	---	---	---	---	---	---	---	---	---
CURRENT LDEV 2	---	---	---	---	---	---	---	---	---
OVERALL LDEV 2	---	---	---	---	---	---	---	---	---
CURRENT LDEV 3	---	---	---	---	---	---	---	---	---
OVERALL LDEV 3 R	---	---	---	---	---	---	---	---	---
CURRENT LDEV 4 R	---	---	---	---	---	---	---	---	---
OVERALL LDEV 4 R	---	---	---	---	---	---	---	---	---

MAXIMUM RATES: ALL LDEV 1 LDEV 2 LDEV 3 LDEV 4
 READS 33/1 15/0 1/0 4/1 22/0
 WRITES 8/1 1/0 1/0 1/1 2/1
 CONTROL 1 0 0 0 1

LEGEND FOR I/O OPERATION RATES:

R Read operation
 W Write operation
 C Control operation

MAXIMUM RATES FOR READ AND WRITE OPERATIONS ARE SHOWN IN THE FORM 'USER I/O / MEMORY MANAGEMENT I/O'

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WESTINGHOUSE SYSTEM 'C'

HP32238A.00.10 OPT/3000

PROGRAM FILE DISPLAY HP32238A.00.10 OPT/3000

PROGRAM FILE DISPLAY

PROGRAM FILE DISPLAY		CODE		SEG		INFO		COMBINED WORKING SET INFORMATION				11:43 AM	
NAME OF PROGRAM FILE		COUNT	SIZE	#PS	CST	PROG	DST	STACK	TOTAL SIZE				

1	SYSTEM PROCESSES			21	6	0	4	0	18	40	17	194180	
2	COMMAND INTERPRETER			2	0	0	0	0	23	23	2	71244	
3	1*DMON. PUB	3	344	2	1	0	0	0	10	10	2	45300	
4	2*GRND003P. PRODUCTN. MKETING	3	7344	9	0	0	0	0	16	16	9	13068	
5	3*MPKON. PUB	8	2304	3	0	0	0	0	14	14	3	55616	
6	4*LRISPIP. PRODUCTN. MKETING	8	15332	1	0	0	0	0	6	6	1	36920	
7	5*GRSC060P. PRODUCTN. MKETING	8	15332	1	0	0	0	0	6	6	1	36920	
8	6*LRIS090P. PRODUCTN. MKETING	8	20784	1	0	0	0	0	6	6	1	36920	
9	7*LRIS070P. PRODUCTN. MKETING	1	4916	1	0	0	0	0	7	7	1	36296	
10	8*LRIS070P. PRODUCTN. MKETING	2	14116	13	3	0	0	0	35	35	13	181516	
11	9*SAMPLER. PUB	6	1448	1	0	0	0	0	2	2	1	4044	
12	10*LRIS080P. PRODUCTN. MKETING	9	8604	10	0	0	0	0	3	3	10	7464	
13	11>User Program File	8	10136	1	0	0	0	0	3	3	1	108752	
14	12*OPT. PUB	38	125664	1	0	0	0	0	4	4	1	24144	
15	13*PO3P180A. PUB	1	448	1	0	0	0	0	3	3	1	11392	
16	14*GRSC050P. PRODUCTN. MKETING	11	17928	1	0	0	0	0	3	3	1	20416	
17	15>User Program File	4	1796	1	0	0	0	0	4	4	1	21296	
18	16*LRIS070P. PRODUCTN. MKETING	4	6252	1	0	0	0	0	4	4	1	6348	

PIN	USER	ACCT	PROGRAM NAME (command)	CPU	%	PRI	CSZS	STKS	DSTSZ
11	USER	MARKETING	LRI5P71P. PRODUCTN. MARKETING	60784	0	152	0	8948	34140
17	USER	MARKETING	LRI5P71P. PRODUCTN. MARKETING	21356	2	152	1932	8948	3880
20	USER	MARKETING	LRI5P71P. PRODUCTN. MARKETING	37452	0	152	0	8948	26084
21	USER	MARKETING	LRI5P71P. PRODUCTN. MARKETING	14711	0	152	10856	8948	25752
29	USER	MARKETING	LRI5P71P. PRODUCTN. MARKETING	18984	2	152	0	8948	724
30	USER	MARKETING	LRI5P71P. PRODUCTN. MARKETING	15188	0	152	0	8948	724
31	USER	MARKETING	LRI5P71P. PRODUCTN. MARKETING	24186	0	152	0	8948	5928
32	USER	MARKETING	LRI5P71P. PRODUCTN. MARKETING	34382	0	152	0	8948	724
33	USER	MARKETING	LRI5P71P. PRODUCTN. MARKETING	47002	0	152	4392	8948	724
34	MANAGER	SYS	USEF.P09ram file	1241	0	149	448	1584	836
36	PILOT	MARKETING	LRI5P08P. PRODUCTN. MARKETING	23242	0	152	0	1584	1842
39	PILOT	MARKETING	LRI5P08P. PRODUCTN. MARKETING	1658	0	152	0	2804	3792
41	PILOT	MARKETING	LRI5P08P. PRODUCTN. MARKETING	30732	0	152	0	6080	7760
42	PILOT	MARKETING	LRI5P08P. PRODUCTN. MARKETING	752	0	152	0	6080	110
43	PILOT	MARKETING	LRI5P08P. PRODUCTN. MARKETING	855	1	152	0	4072	3712
45	MANAGER	SYS	USEF.P09ram file	225	0	152	0	6080	8948
46	PILOT	MARKETING	GRM0003P. PRODUCTN. MARKETING	5507	2	152	0	10388	4420
47	PILOT	MARKETING	LRI5P08P. PRODUCTN. MARKETING	177	0	152	3080	4200	3712
49	PILOT	MARKETING	LRI5P08P. PRODUCTN. MARKETING	6914	0	152	0	8948	5948
50	PILOT	MARKETING	GRM0003P. PRODUCTN. MARKETING	1134	0	152	0	11872	4628
51	USER	MARKETING	LRI5P08P. PRODUCTN. MARKETING	52783	0	152	0	6080	16344
53	PILOT	MARKETING	LRI5P08P. PRODUCTN. MARKETING	181	0	152	3080	4200	3712
54	PILOT	MARKETING	LRI5P08P. PRODUCTN. MARKETING	131175	2	194	0	10388	4392
55	PILOT	MARKETING	GRM0003P. PRODUCTN. MARKETING	2360	0	152	0	10388	4260
56	PILOT	MARKETING	GRM0003P. PRODUCTN. MARKETING	179653	0	152	2724	5168	3712
60	USER	MARKETING	GRM0003P. PRODUCTN. MARKETING	1729	0	152	0	10388	4260
61	USER	MARKETING	GRM0003P. PRODUCTN. MARKETING	2560	0	152	0	10388	4260
63	PILOT	MARKETING	LRI5P71P. PRODUCTN. MARKETING	29103	0	152	0	8948	5944
72	USER	MARKETING	LRI5P71P. PRODUCTN. MARKETING	13241	2	152	0	8948	5944
76	USER	MARKETING	LRI5P71P. PRODUCTN. MARKETING	13368	0	152	0	10388	4260
82	USER	MARKETING	LRI5P71P. PRODUCTN. MARKETING	14652	0	152	0	10388	4260
87	MANAGER	SYS	USEF.P09ram file	276	0	152	0	10388	4260
97	MANAGER	SYS	USEF.P09ram file	1011	0	152	8116	12788	1178
102	PILOT	MARKETING	GRM0003P. PRODUCTN. MARKETING	18148	4	200	0	10388	4260
107	USER	MARKETING	OPT. PUB. SYS	13148	0	152	0	10388	4260
108	MANAGER	MARKETING	USEF.P09ram file	19389	4	152	0	14824	1180
111	SHPOUT	SHPOCTR	LRI5P11P. PRODUCTN. MARKETING	5084	2	152	0	28850	8080
115	PILOT	MARKETING	USEF.P09ram file	3480	0	152	0	13720	7576
116	SHPTN	SHPOCTR	LRI5P70P. PRODUCTN. MARKETING	26308	0	152	0	2124	1320
126	USER	MARKETING	LRI5P71P. PRODUCTN. MARKETING	26308	0	152	0	8948	26084

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WESTINGHOUSE SYSTEM 'C'
DISPATCH QUEUE: 4
NO QUEUE: 87

HP32238A.00.10 OPT/3000
PROCESS STATE REPORT DISPLAY
(C) HENLETT-PACKARD COMPANY 1979, 1980
SESSIONS: 23
JOBS: 3
IN BREAK: 0
CREATED PROCESSES: 24
USER PROCESSES: 20
SYSTEM PROCESSES: 21
DISPATCH PROCESSES: 21

DISTRIBUTION OF PROCESS STATES

	DISPATCH QUEUE	NO QUEUE
SHORT WAIT	1	71
LONG WAIT	1	40
TERM READ WAIT		40
BLOCKED I/O WAIT		5
I/O WAIT		
MEMORY WAIT		1
SON WAIT		25
FATHER WAIT		7
MIN WAIT		
SIN WAIT		
IMPEDED		4
SCHED ATTN REQ		

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WESTINGHOUSE SYSTEM 'C'

OPT/3000

HP32238A.00.10

TABLE INFORMATION DISPLAY
(C) HEWLETT-PACKARD COMPANY 1979, 1980

CODE	CONFIGURED ENTRIES	CURRENT IN USE	USAGE UTIL	OBSVD	MAXIMUM IN USE	USAGE UTIL	ENTRY SIZE
CODE SEGMENT TABLE	192	149	77.6%	149	150	78.1%	4 W
DATA SEGMENT TABLE	512	173	33.8%	173	173	33.8%	4 W
DATA PROCESS TABLE	1024	497	48.5%	497	510	50.3%	16 W
I/O QUEUE TABLE	128	92	71.9%	92	97	73.8%	16 W
DISC REQUEST TABLE	160	52	32.5%	52	72	41.0%	16 W
TERMINAL BUFFERS	120	4	3.3%	4	14	11.7%	16 W
ATP TERM BUFFERS	255	32	12.5%	32	54	21.2%	32 W
SYSTEM BUFFERS	24						
SNAP TABLE	24						
CST BLOCK TABLE	750	549	73.2%	549	549	73.2%	129 W
PRIMARY MSG TABLE	58	27	46.6%	27	28	48.3%	1 W
SECONDARY MSG TABLE	25	1	4.0%	1	1	4.0%	5 W
SPECIAL ROST TABLE	25	1	4.0%	1	1	4.0%	5 W
INTERRUPT CTL STK	1024	1	0.1%	1	375	36.6%	1 W
UCOP REQUEST QUEUE	48						
TIMER REQUEST LIST	60						
BREAK POINT TABLE	80	24	40.0%	24	33	55.0%	2 W
JOB PROC CTL TABLE	84	28	43.8%	28	28	43.8%	VAR
JOB PROC CTL TABLE	45	26	57.8%	26	26	43.8%	2 W
VIRTUAL MEMORY	30	18	60.0%	18	19	63.3%	1 B
SPOOLER DISC SPACE	100	5	5.0%	5	5	5.0%	1024 S

TABLE UTILIZATION DISPLAY										HP32238A 00 10 OPT/3000		WESTINGHOUSE SYSTEM 'C'		MON. OCT 31. 1983. 11:40 AM		PAGE 18					
(C) HEWLETT-PACKARD COMPANY 1979, 1980																					
	10	20	30	40	50	60	70	80	90	100%											
CODE SEGMENT TABLE											(30/38)										
EXTENDED CST											(17/18)										
DATA SEGMENT TABLE											(24/25)										
PROCESS TABLE											(36/38)										
I/O QUEUE TABLE											(15/23)										
DISC REQUEST TABLE											(3/6)										
TERMINAL BUFFERS											(7/11)										
SYSTEM BUFFERS											(0/2)										
SWAP TABLE											(37/37)										
CST BLOCK TABLE											(23/24)										
PRIMARY MSG TABLE											(2/2)										
SECONDARY MSG TBLE											(2/2)										
SPECIAL RQST TABLE											(2/2)										
INTERRUPT CTRL STK											(0/18)										
UCOP REQUEST QUEUE																					
TIMER REQUEST LIST											(20/27)										
BREAK POINT TABLE																					
RIN TABLE											(22/22)										
JOB PROC CNT TABLE											(28/28)										
VIRTUAL MEMORY											(30/32)										
SPOOLER DISC SPACE											(3/3)										
LEGEND:																					
	--- CURRENT UTILIZATION																				
	/ MAXIMUM UTILIZATION																				