

## MPE/iX System Performance Techniques – 101 Paper #242

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System performance. What is it? How do we measure system performance? These questions have long been a question facing HPe3000 system managers. This paper will identify and examine some of the performance tools available for HPe3000 system managers and illustrate what I believe are some pros and cons of each of the tools from a users perspective.

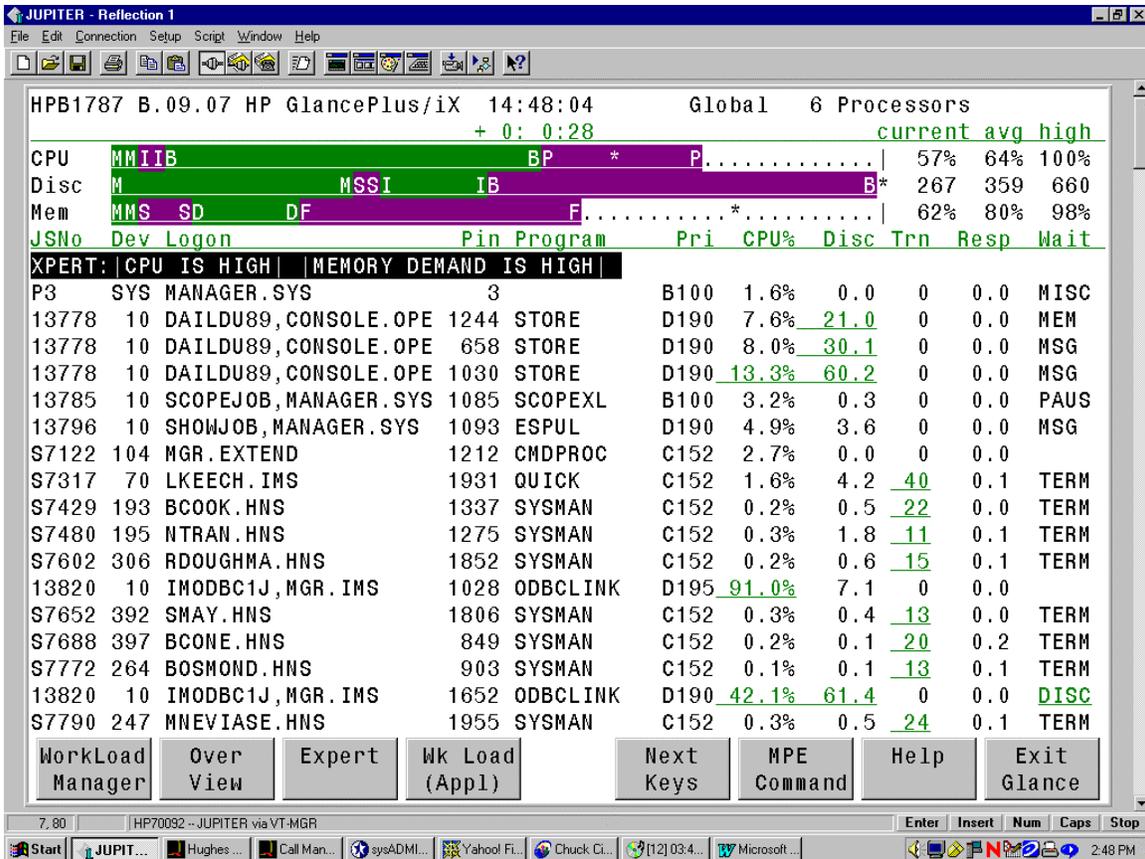
System performance, in my opinion, is your systems ability to do multiple tasks in an acceptable time period. This time period is determined by your customer's expectations as to what is acceptable. This general definition works well with both on-line transactions and batch processing. As to how we measure performance, well we can look at how long a batch process takes to complete and how long a transaction takes to complete. As long as your HPe3000 meets the test of meeting your customer's expectations, your phone and your managers should be quiet. But what happens when the phone rings? Your manager wonders "what's the problem with the system" and why has the performance of the system gone bad? This paper seeks to provide you ways to look at, measure, record, and recommend ways to answer both your managers and customer's questions.

### Performance Tools

In today's HPe3000 marketplace, the author is aware of three primary sources of system performance monitoring tools. These sources are Hewlett-Packard (HP), Lund Performance Solutions (LPS), and Triolet Systems, Inc. Hewlett-Packard provides Glance/iX and Laser/RX complete with an interface into PerfView. Lund provides two main tools, SOS and Performance Gallery. Triolet Systems provides a tool called Probe/iX. The primary tools discussed in the paper will be those from HP and Lund due to the author's familiarity with those products. A description and history of previous tools, can be found in the 1989 Interex Proceedings in a paper by Mark Michael entitled MPE Performance Tool – A Chronology.

Glance/iX or Glance (for those us who still call it by it's original name) is HP's performance tool which allows a system manager to see and experience what is occurring on his or her system at that specific moment. It is composed of several parts, which report on CPU utilization, memory utilization, disc utilization, and workload utilization. Glance starts out reporting what it considers a 'Global Screen'. Elements of this screen are a general reporting area followed by a listing of processes currently on your system.

The following is an example of a Glance screen.



As indicated earlier, the screen consists of two major elements. These elements, the global reporting area and process information describe exactly what is being done. In the above example, as you can see, the reporting section is divided into three parts, GLOBAL CPU, MEMORY and DISC. It should be noted that when Glance was originally developed, it was for a single system processor and that it now reports on multi-processor systems. The system here is a 989/650 system with six processors. As your eye travels to the process section, you'll observe that processes total over 100%. This is what I feel is one of Glance's biggest downfalls for multi-processor systems; you don't see what the process is in relation to all of the processors.

GlancePlus/iX has been enhance to contain an 'Expert' screen which summarizes and provides an analysis of what potential problem areas may be exiting on your system. This screen also provides the interactive user with some corrective suggestions based on HP factory settings. The following two screens represent HP's complete expert screen.

## Expert Screens

JUPITER - Reflection 1

HPB1787 B.09.07 HP GlancePlus/iX 14:59:45 Global 6 Processors  
+ 0: 0:27 current avg high

CPU **MIIB** **BP** \* P... | 26% 61% 100%  
Disc **M** **MSI** I\* | 290 358 660  
Mem **MMS** **SD** **DF** F.....\*..... | 70% 79% 98%

JSNo Dev Logon Pin Program Pri CPU% Disc Trn Resp Wait

Press RETURN to continue, "X" for more details, or "0" for Overview summary: \_

XPERT Status: 100% CHANCE OF DISC BOTTLENECK.  
Reason: DISC QUEUE > 3.00 (4.5)  
Reason: PEAK UTIL > 90.00 (100.0)  
XPERT Status: 25% CHANCE OF MEMORY BOTTLENECK.  
Reason: MEM MGR DISC > 12.00 (14.7)  
XPERT: | DISC IS VERY HIGH | MEMORY DEMAND IS MODERATE |

JSNo	Dev	Logon	Pin	Program	Pri	CPU%	Disc	Trn	Resp	Wait
13778	10	DAILDU89,CONSOLE.OPE	1244	STORE	D190	1.3%	0.1	0	0.0	MSG
13778	10	DAILDU89,CONSOLE.OPE	658	STORE	D190	5.3%	25.0	0	0.0	MSG
13778	10	DAILDU89,CONSOLE.OPE	1030	STORE	D190	6.8%	34.8	0	0.0	MSG
S7122	104	MGR.EXTEND	1212	CMDPROC	C152	1.8%	0.0	0	0.0	MSG
13901	10	EASJOB,MANAGER.RAC	1947	ASP	D190	1.2%	0.0	0	0.0	MSG
S7287	199	MMASON.HNS	1206	SVMAN1	C152	0.2%	2.8	13	0.3	TERM
S7309	236	KBELT.IMS	1087	QUICK	C152	1.5%	5.8	60	0.1	TERM
S7591	379	JDANNER.HNS	1934	SYSMAN	C152	0.2%	0.3	27	0.0	TERM
S7642	359	BMALONE.HNS	1390	SYSMAN	C152	0.2%	0.1	36	0.0	TERM
13820	10	IMODBC1J,MGR.IMS	1028	ODBCLINK	D217	9.2%	32.9	0	0.0	DISC
S7679	116	EOSBORN.IMS	1329	QUICK	C200	6.4%	57.7	0	0.0	DISC

WorkLoad Manager | Over View | Expert | Wk Load (Appl) | Next Keys | MPE Command | Help | Exit Glance

JUPITER - Reflection 1

HPB1787 B.09.07 HP GlancePlus/iX 14:59:45 Global 6 Processors  
+ 0: 0:27 current avg high

CPU **MIIB** **BP** \* P... | 26% 61% 100%  
Disc **M** **MSI** I\* | 290 358 660  
Mem **MMS** **SD** **DF** F.....\*..... | 70% 79% 98%

JSNo Dev Logon Pin Program Pri CPU% Disc Trn Resp Wait

-----DISC Analysis-----

General DISC starvation exists in the C queue but no unusual processes are detected. This situation is most likely caused by the combined effect of many processes.  
No processes did an excessive amount of DISC IO.  
The following processes appear to be starved for DISC IO:  
You might consider changing the execution priority or rescheduling processes to allow them to run.

JSNo	Dev	Logon	Pin	Program	Pri	CPU%	Disc	Trn	Resp	Wait
14736	10	F0U885DC,BATCH.HNS	1986	UT885	D	4.2%	43.3	0	0.0	96%
S7679	116	EOSBORN.IMS	1329	QUICK	C	6.4%	57.7	0	0.0	93%
13820	10	IMODBC1J,MGR.IMS	1028	ODBCLINK	D	9.2%	32.9	0	0.0	90%
13820	10	IMODBC1J,MGR.IMS	1652	ODBCLINK	D	37.0%	32.6	0	0.0	62%
S7355	267	VMANALO.HNS	1460	QUICK	C	1.3%	22.5	29	1.1	52%

-----MEMORY Analysis-----

No processes appear to lack main memory resources

Press RETURN to continue, "X" for more details, or "0" for Overview summary: \_

WorkLoad Manager | Over View | Expert | Wk Load (Appl) | Next Keys | MPE Command | Help | Exit Glance

## CPU Detail Screen

The following screen is Glance's CPU Detail screen. It identifies several key aspects of what your processor is actually doing. It is this author's opinion that several key performance elements are displayed here. These elements are MemMgr, queue utilization, 'switch' utilization, and Current ready queue. Each of these elements is important to how your system is running and how work is being performed.

MemMgr utilization pretty much defines how hard your CPU(s) are working to control disc I/O. The lower the percentage, the more efficient your I/O is, conversely, the higher the percentage, your I/O is inefficient and therefore your CPU cannot do user work. This is generally recognized as a shortage of main memory.

Percentage of switches is a notation of the usage of compatibility versus native mode code. The more switching between code types, the more potential for problems. This, however, in my opinion is very processor and application dependent.

The 'Current Ready Queue' identifies the number of processes waiting for the CPU. Lower is better, however, once again, this is both processor and application dependent.

Queue utilization defines your workload, interactive or batch. Each system is different and application dependent. The motto here is 'Know your Applications'.

The screenshot shows the JUPITER CPU Detail screen. At the top, it displays the system name 'HPB1787 B.09.07 HP GlancePlus/iX' and the time '14:57:45'. The title is 'CPU Detail'. Below this, there are several rows of data with colored bars representing utilization levels. A warning banner reads 'XPERT: DISC IS VERY HIGH | MEMORY DEMAND IS HIGH'. The main data section includes metrics for MemMgr, System, Session, ICS, Queue %, Switches To CM, Switches To NM, Interval CM %, Interval Process Completions, and Top CPU Consumer. A control panel at the bottom contains buttons for WorkLoad Manager, Over View, Expert, Wk Load (App1), Next Keys, MPE Command, Help, and Exit Glance. The Windows taskbar at the bottom shows the Start button, several open applications, and the system tray with the time '2:58 PM'.

	current	avg	high
CPU	40%	62%	100%
Disc	305	359	660
Mem	70%	79%	98%

Type	Utilization	Type	Utilization
MemMgr	< 1%	Dispatch	< 1%
System	< 1%	Batch	< 24%
Session	< 12%	Pause	< 59%
ICS	< 2%	Idle	< 0%
Queue %	AS 1%	BS 6%	CS 30%
Switches To CM	< 2729/sec	DS 63%	ES 0%
Switches To NM	< 673/sec	Current Ready Queue	< 0
Interval CM %	< 3%	Maximum Ready Queue	< 100
Interval Process Completions	0.7/sec	Launch Rate	637/sec
Top CPU Consumer	Pin 1986 at 63.9%	Interval File Open Rate	45.1/sec

## Disc Detail

The following screen, Disc Detail, identifies your disc utilization. It highlights the utilization of your discs in percentage of requests against that drive. Service indicates the average time it takes to perform a single I/O in seconds. In the illustration below, the longest service time is 8 one-hundredths of a second. Queue identifies the total number of I/O's currently Queued for each drive. In our example, Ldev 2 has the largest queue.

Several items, which could be added to the screen for additional value, would be the size of each disc, the distribution of permanent/transient space, and the percentage of free space on the drive. Of course, these are available through :DISCFREE.

HPB1787 B.09.07 HP GlancePlus/iX 14:58:17 Disc Detail  
+ 0: 0: 1 current avg high

Ldev	Utilization	Service	Reads	Writes	Queue (Cur Avg Max)
1	100%	0.0688	3.0	13.4	1 0 35
2	92%	0.0474	6.4	12.9	6 1 165
3	22%	0.0161	9.4	4.5	4 0 15
4	7%	0.0248	0.0	3.0	1 0 7
30	10%	0.0141	6.4	1.0	0 1 71
31	20%	0.0199	9.9	0.0	0 0 34
32	100%	0.0857	36.7	0.0	4 0 49
33	5%	0.0107	5.0	0.0	0 0 49
34	11%	0.0198	5.5	0.0	0 0 5
35	20%	0.0271	7.4	0.0	0 0 4
36	13%	0.0198	6.4	0.0	0 0 56
38	11%	0.0182	5.9	0.0	0 0 56
39	31%	0.0122	21.8	3.5	0 1 293
40	36%	0.0114	30.7	0.5	0 0 39
41	3%	0.0183	1.5	0.0	0 0 49
42	4%	0.0135	3.0	0.0	0 0 78
43	14%	0.0147	8.9	0.5	0 0 48

WorkLoad Manager Over View Expert Wk Load (Appl) Next Keys MPE Command Help Exit Glance

## Memory Detail

The memory detail screen is again a measurement of your I/O capacity and how much work the CPU must do to control I/O. In the example below, the CPU is working less than 1 percent to control memory and disc I/O. HP defines ten types of data elements for memory utilization

Two key pressure indicators are the Page Fault Rate and the number of clock cycles. Page fault rate is, in my opinion machine and application dependent. Memory clock cycles should always be low as possible. This number is a per hour check.

The screenshot shows the JUPITER - Reflection 1 interface. The main window displays the following information:

```
HPB1787 B.09.07 HP GlancePlus/iX 14:58:47 Memory Detail
+ 0: 0:30
CPU MMI IB BP * P. | 41% 62% 100%
Disc M MSI T* | 328 358 660
Mem MMS SD DF F.....*..... | 70% 79% 98%
```

System Memory Page Faults By Object Type

Object Type	Page Fault Rate
Transient	19/sec
Permanent	0/sec
NM Stack	18/sec
CM Stack	1/sec
NM Code	0/sec
CM Code	0/sec
CM Data	4/sec
File Object	2/sec
NM Sys Lib	0/sec
CM Sys Lib	0/sec
MemMgr	< 1% Page Fault Rate
Page Overlay Candidate Rate	134.6/sec
System Library Page Faults	0.2/sec
Memory Mgr Clock Cycle Rate	6
Physical Memory Size	3840 mb

XPERT: DISC IS VERY HIGH | MEMORY DEMAND IS HIGH

Buttons: WorkLoad Manager, Over View, Expert, Wk Load (App1), Next Keys, MPE Command, Help, Exit Glance

Taskbar: Start, JUPIT..., Hughes..., Call Man..., sysADM..., Yahoo! Fi..., Chuck Ci..., [15] 05:2..., Microsoft..., 2:53 PM

## Workload manager

The 'Workload Manager' screen identifies how your system process queues are structured and how much work is being done within each queue.

The screenshot displays the HP Workload Manager interface. At the top, it shows system information: HPB1787 B.09.07 HP GlancePlus/iX, time 15:01:17, and a timer at + 0: 0: 7. The title is 'WorkLoad Manager'. Below this, there are three rows of colored bars representing CPU, Disc, and Mem usage, with labels like M, MI, IB, MSS, SD, DF, F, and P. To the right of these bars are columns for 'current', 'avg', and 'high' values.

WorkGroup	CPU USAGE	READY Q	DISC
XPERT:   CPU IS HIGH   DISC IS VERY HIGH   MEMORY DEMAND IS HIGH   CM IS MODERATE			
1 AS_Default	30 99	*.....	5% 0% 0.0 0.0 0.0 0.0 0.0 0.0
2 BS_Default	100 150	*.....	2% 1% 0.0 0.0 6.1 0.0 0.0 0
3 CS_Default	152 200	*C.....	20% 6% 0.0 0.1 44.9 0.1 0.4 100
4 DS_Default	190 240	C C*.....	31% 40% 0.2 0.7 324.1 4.2 0.0 4000
5 ES_Default	230 253	*.....	3% 8% 0.0 0.1 2.8 0.1 0.0 2000

At the bottom of the window, there are several buttons: 'WorkLoad Manager', 'Over View', 'Expert', 'Wk Load (Appl)', 'Next Keys', 'MPE Command', 'Help', and 'Exit Glance'. The taskbar at the very bottom shows the Start button, several open applications, and the system clock at 3:01 PM.

So far, we have seen the basic reporting screens supported by HP. It should be noted that in each screen, the help facility does provide a generic answer to what is being identified.

## SOS from Lund

Next we will examine several of the output screens from Lund Performance Solutions. The first screen will be the overview screen. Like GlancePlus/iX, it is divided into logical parts for the user to digest. However, Lund has chosen to incorporate more data on this screen as illustrated below. This screen has three segments, an overview of what Lund considers to be main sources of performance information, overall, process, and advice. Lund's advice is based on a file which is can be customized to your system.

The screenshot shows a terminal window titled "JUPITER - Reflection 1" with a menu bar (File, Edit, Connection, Setup, Script, Window, Help) and a toolbar. The main content is as follows:

```

SOS/3000 f.02b(c) LPS MON, JUN 18, 2001, 3:11 PM E: 00:07:48 I: 00:16
Total Busy: 49.3% High Pri: 14.7% MemMgr: .8% Read Hit: 96%
 2 10 20 30 40 50 60 70 80 90 100 2 10 20
CPU BC CD DM00P P% QLEN
TRN 1966>/min RESP sec
RHIT % PFLT 57>/s
I/O R R>/sec QLEN
  
```

**Process Information**

PIN	J/S#	Session/User Name	Cmd/Program	CPU%	QPri	#Rd	#Wr	LDV	#Tr	FRes
658	J13778	DAILDU89,CONSOLE.OPERATOR	STORE	2.5	DL190	396	22	10	0	-
817	S7591	JDANNER.HNS	RE601	4.1	CS200	144	6	379	0	-
1474	J14866	IMS785AJ,BATCH.IMS	QTP	4.8	DS193	127	215	10	0	-
1652	J13820	IMODBC1J,MGR.IMS	ODBCLINK	9.3	DS223	83	3	10	0	-
864	J14865	IMS785AJ,BATCH.IMS	QTP	10.7	DS217	1951096	10	0	0	-

**System Performance Advice**

```

The CPU was used a total of 49.3 of its capacity during this interval <GI01>
Process CPU use by Sub-Queue: A0-.4 B0-.9 C0-8.9 D0-34.6 E0-.0 <GI02>
Native Mode to Comp. Mode Switch rate during this interval was HEAVY <GE02>
Comp. Mode to Native Mode Switch rate during this interval was EXCESSIVE <GE03>
Disc I/O indicator #1 (CPU Pause Disc) reveals an EXCESSIVE I/O Bottleneck<DE01>
This interval's 'Hog' process is J14865 (PIN 864) with 10.7% of the CPU <PI02>
This interval's highest disc I/O user was J14865 (PIN 864) with 1291 I/O's<PI03>
This interval's highest Term I/O user was S8102 (PIN 1077) 12 Term Reads <PI04>
Enter Command:_
  
```

At the bottom, there are several buttons: LIST HARDCOPY, FREEZE DISPLAY, HELP, HOG PROC ZOOM, OPTION KEYS, UTILITY KEYS, SCREEN MENU, and EXIT SOS/3000.

Lund has also consolidated CPU utilization onto a 'highlight' bar, which also identifies memory utilization shown at the top of the screen image. Another feature, in my opinion is the addition of general response and page fault information. For performance 101, the advice section is the most important function Lund's SOS provides.

In the screen below, Lund captures and illustrates what they call 'Pulse Points'. These are in Lund's opinion, the key factors and indicators of your systems performance. All of these factors are machine dependent and will vary from system to system and application to application.

The screenshot shows the JUPITER - Reflection 1 application window. At the top, a green status bar displays system information: **SOS/3000 f.02b(c) LPS MON, JUN 18, 2001, 3:10 PM E: 00:06:32 I: 00:47**. Below this, a black bar shows key performance indicators: **Total Busy: 77.4% High Pri: 25.6% MemMgr: 1.2% Read Hit: 98%**.

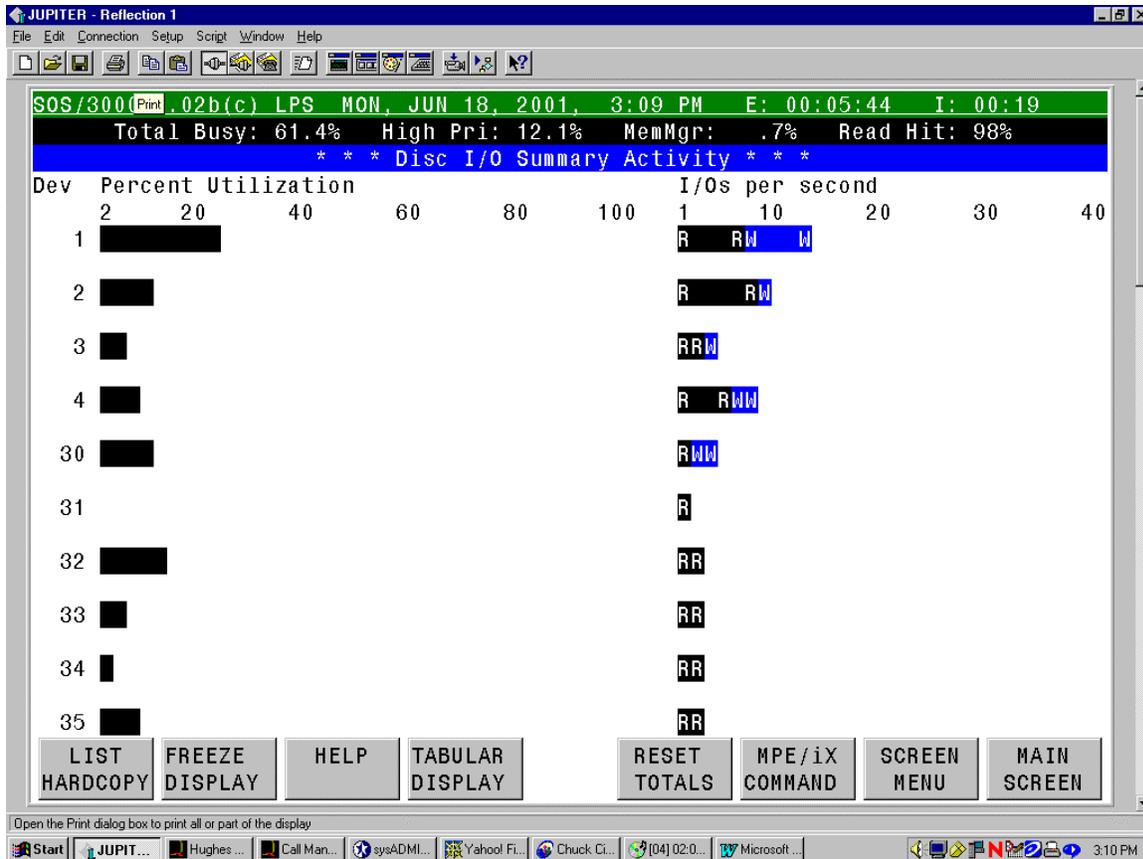
The main display area is titled "Pulse Points" and contains a table with the following data:

Indicator	Green	Yellow	Red	Comments
High Pri Busy (%)	25.6[13.7]	[ ]	[ ]	AQ+BQ+CQ+Mem+Disp+ICS
CPU QL	1[ 0]	[ ]	[ ]	
ICS/OH + Dispatch (%)	7.3[ 4.1]	[ ]	[ ]	
CPU CM (%)	2[ 2]	[ ]	[ ]	Subjective
AQ + BQ	2.5[ 1.7]	[ ]	[ ]	Opr sys dependent
<b>Memory</b>				
CPU MM (%)	1.2[ 1.2]	[ ]	[ ]	Reliable indicator
Page Fault Rate	99[ 117]	[ ]	[ ]	CPU dependent
Swaps/Launch	.17[ .28]	[ ]	[ ]	
Memory Cycles/Hour	1[ 0]	[ ]	[ ]	
<b>Disc I/O</b>				
Pause	[ ]	[ ]	22.2[35.5]	Reflects data loc
Read Hit (%)	98[ 96]	[ ]	[ ]	
Average Q-Length	1.09[1.87]	[ ]	[ ]	Overall average
Disc I/O Rate/Sec	7[ 8]	[ ]	[ ]	Avg per disc
<b>Miscellaneous</b>				
CM to NM Switches	[ ]	[ ]	1355[ 916]	CPU dependent
NM to CM Switches	[ ]	[ ]	310[ 237]	CPU dependent

Below the table, there is an "Enter Command:" section with several buttons: LIST, FREEZE, HELP, MPE/iX, RESET, OPTION, SCREEN, and MAIN. The buttons are arranged in two rows: LIST, FREEZE, HELP, MPE/iX in the first row; HARDCOPY, DISPLAY, COMMAND, RESET, OPTION, SCREEN, MAIN in the second row.

The bottom of the window shows a Windows taskbar with the Start button, several open applications (JUPIT..., Hughes..., Call Man..., sysADMI..., Yahoo! Fi..., Chuck Ci..., [04] 02.4..., Microsoft...), and the system tray with the time 3:10 PM.

The following illustration is Lund's graphical illustration of disc drive utilization. Again as in Glance, the information is important in understanding how your discs are being utilized.



The following screen is the LPS illustration of how your main memory is being utilized. As with Glance, it highlights page fault activity, which has the highest impact on your memory utilization and disc I/O.

The screenshot shows two windows of the JUPITER - Reflection 1 application. The top window displays system statistics and memory activity, while the bottom window shows a detailed CPU usage screen.

**Top Window: Memory Activity**

```

SOS/3000 f.02b(c) LPS MON, JUN 18, 2001, 3:09 PM E: 00:05:26 I: 00:14
Total Busy: 42.9% High Pri: 9.1% MemMgr: 1.1% Read Hit: 97%
*** Memory Detail Activity ***

Page Faults:
Total 0 10 20 30 40 50 60 70 80 80 100
Rate: D DFS S> 104 /sec

Overlay Candidates:
Total 0 10 20 30 40 50 60 70 80 80 100
Rate: F F> 350 /sec
  
```

**Bottom Window: CPU Detail Screen**

```

SOS/3000 f.02b(c) LPS MON, JUN 18, 2001, 3:13 PM E: 00:08:59 I: 00:11
Total Busy: 44.9% High Pri: 10.8% MemMgr: .8% Read Hit: 98%

CPU Detail Screen
CPU  AQ  BQ  CQ  DQ  EQ  Mem  Disp  ICS/OH  Pause&Idle
1    .<  .1  4.9  6.3  .0  .3  .2  .8  87.5
 [ .<] [ 1.1] [ 5.5] [ 22.2] [ .<] [ .7] [ .4] [ 4.5] [ 65.6]
2    .<  4.2  3.1  13.0  .0  .6  .3  .1  78.6
 [ .<] [ 1.5] [ 7.2] [ 30.8] [ .<] [ .9] [ .5] [ .8] [ 58.2]
3    .<  .4  4.1  35.5  .0  .5  .5  .3  58.7
 [ .<] [ 1.8] [ 8.0] [ 38.9] [ .<] [ 1.1] [ .7] [ 1.0] [ 48.4]
4    .<  .6  4.9  35.7  .0  2.0  .6  7.4  48.7
 [ .<] [ 1.6] [ 7.7] [ 44.7] [ .<] [ 1.3] [ .8] [ 9.8] [ 34.1]
5    .<  3.3  9.6  55.3  .0  .5  .6  2.4  28.3
 [ .<] [ 1.8] [ 9.0] [ 57.2] [ .<] [ 1.4] [ .8] [ 4.2] [ 25.5]
6    .<  6.5  4.9  58.0  .0  .9  .9  .0  28.8
 [ .1] [ 1.8] [ 9.0] [ 65.4] [ .<] [ 1.5] [ .9] [ 1.3] [ 20.0]

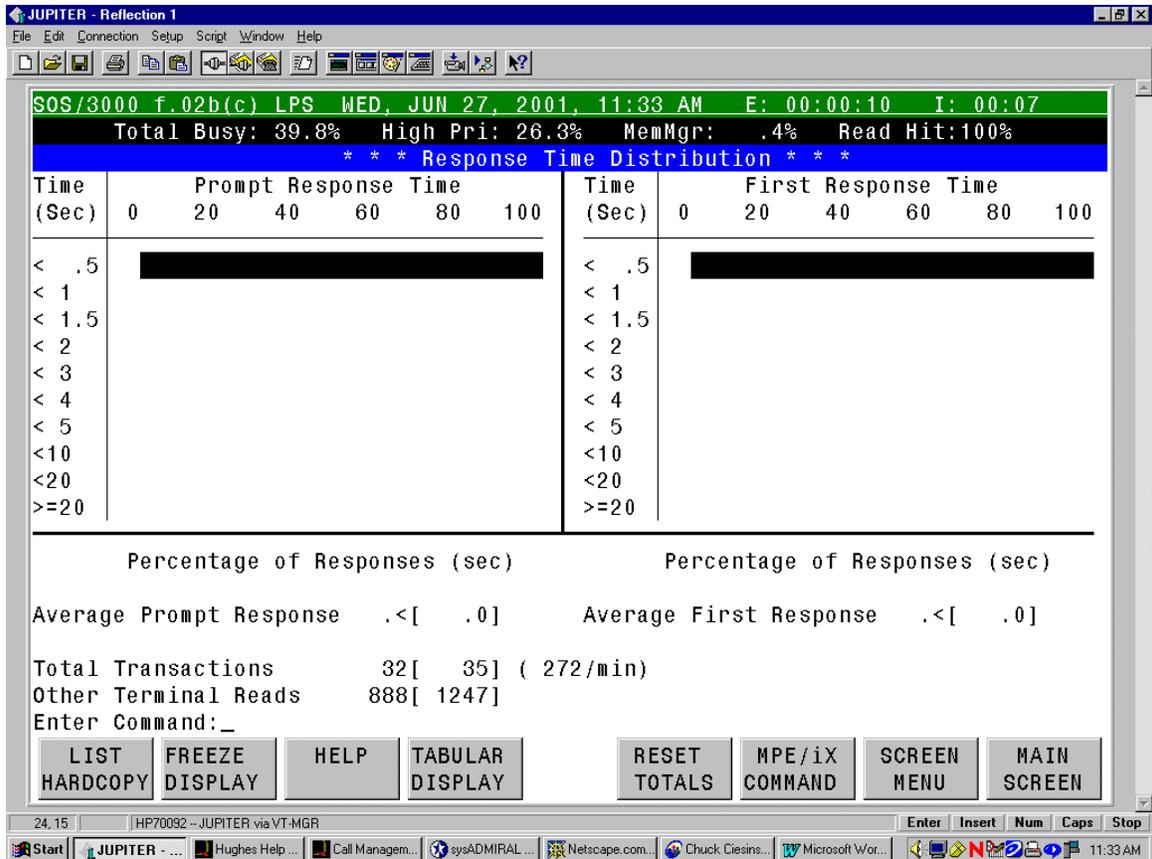
ALL  .<  2.5  5.2  34.1  .0  .8  .5  1.7  55.1
 [ .<] [ 1.6] [ 7.7] [ 43.2] [ .<] [ 1.2] [ .7] [ 3.6] [ 41.9]

Enter Command:
  
```

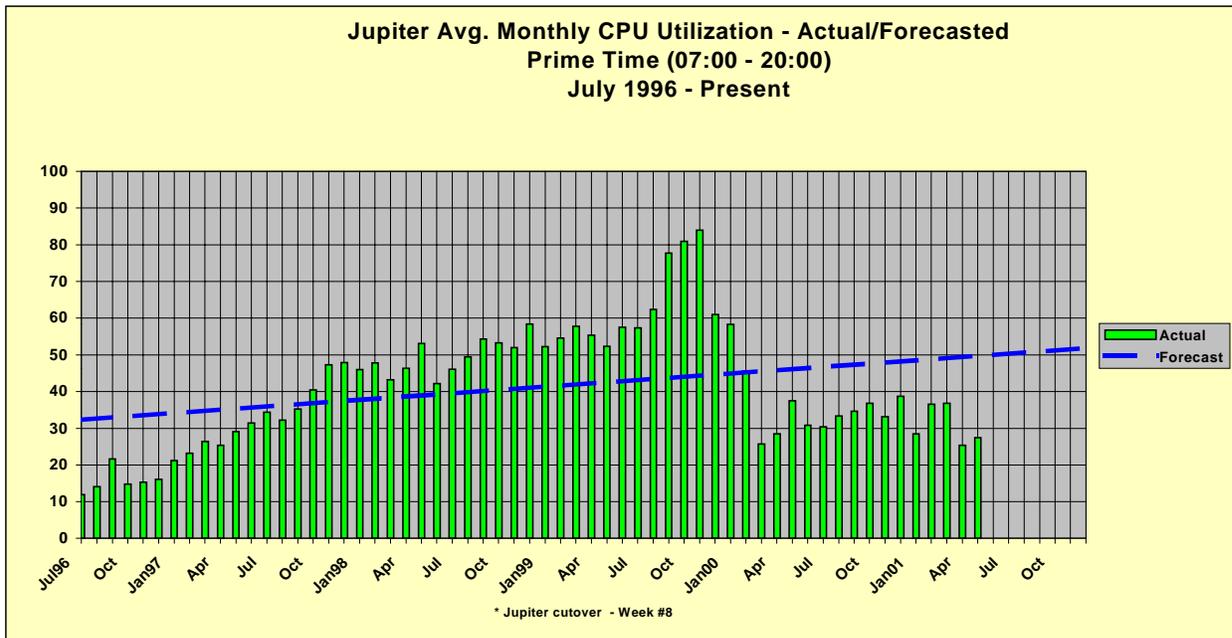
At the bottom of the application window, there are several control buttons: LIST HARDCOPY, FREEZE DISPLAY, HELP, RESET TOTALS, MPE/iX COMMAND, SCREEN MENU, and MAIN SCREEN. The Windows taskbar at the bottom shows the system clock at 3:13 PM and several open applications.

The CPU detail screen from Lund is very different than Glance. This screen identifies what each CPU is doing and in what process queue, managing of memory, and interrupts. It is this screen and Lund's response screen which provide, in my opinion a, an advanced performance management aspect.

Response is one of my definitions of performance. The following screen identifies how well, or not how well the CPU is doing in completing tasks and responding to your on-line transactions. This screen is especially important if the majority of your customers are on a network. It helps to identify where potential bottlenecks, if any network, problems may exist.



Having a history of where you've been is extremely important. HP provided LaserRX as a historical reporting tool and Lund provides Performance Gallery Gold as its historical tool. Historical records can and do illustrate how your system has been utilized. Historical data



can be used to develop trend charts for your management so that they can be aware of your companies needs for improvements and upgrades. The chart above shows several years of data collection. It is a 'living document' we use to project utilization trend and upgrade requirements. We used this chart, along with statistics measuring the increase in number of jobs and sessions to assist in justifying a CPU upgrade in the year 2000.

As you've seen, there are many ways to measure the various aspects of your systems technical performance, i.e., CPU utilization, memory utilization, disc utilization, response times and each has its value. Each category is subject to what unique application you are running on your system. If you understand your application, you can manage the expectations of your customers and provide them with the service they expect. After all, performance, like beauty, is in the eye of the beholder.