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.

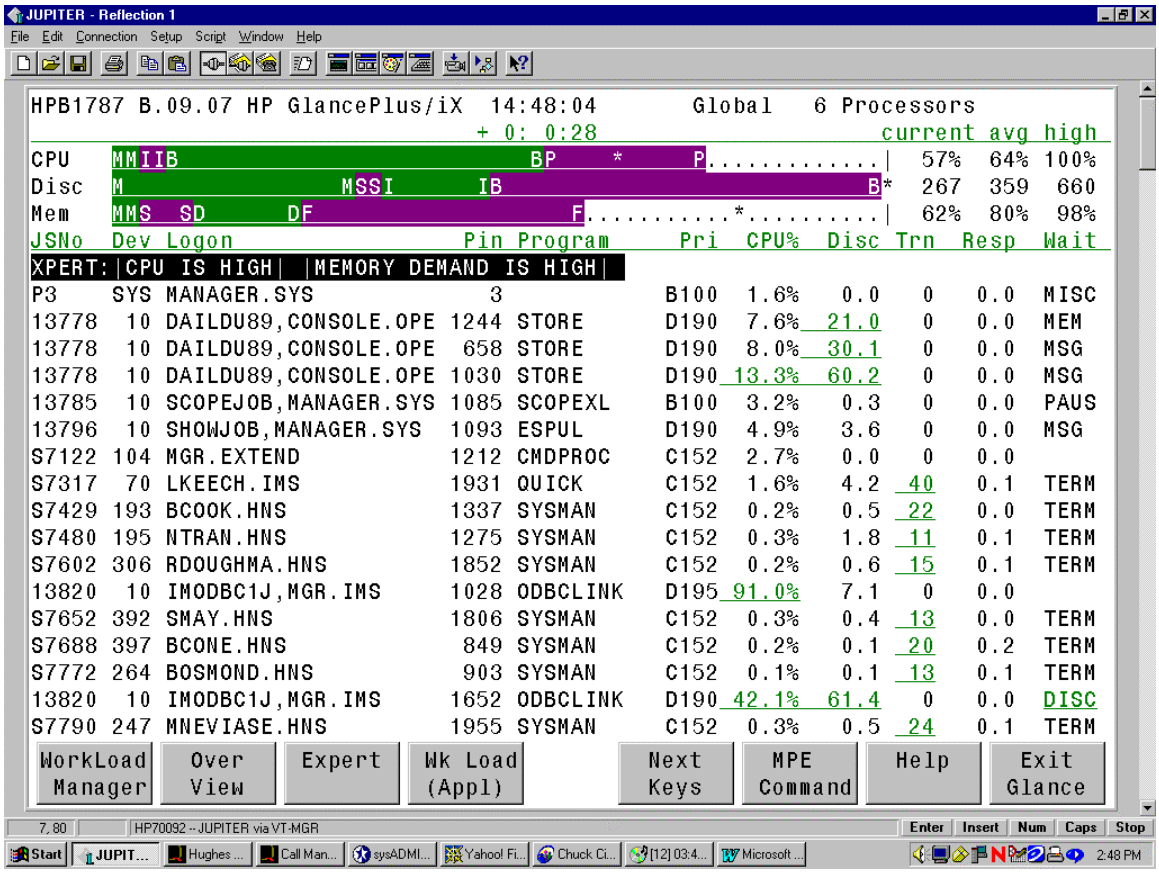
System performance, in my opinion, is your systems ability to do multiple tasks in an acceptable time period. This time period is determined by your customer's expectations as to what is acceptable. This general definition works well with both on-line transactions and batch processing. As to how we measure 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.

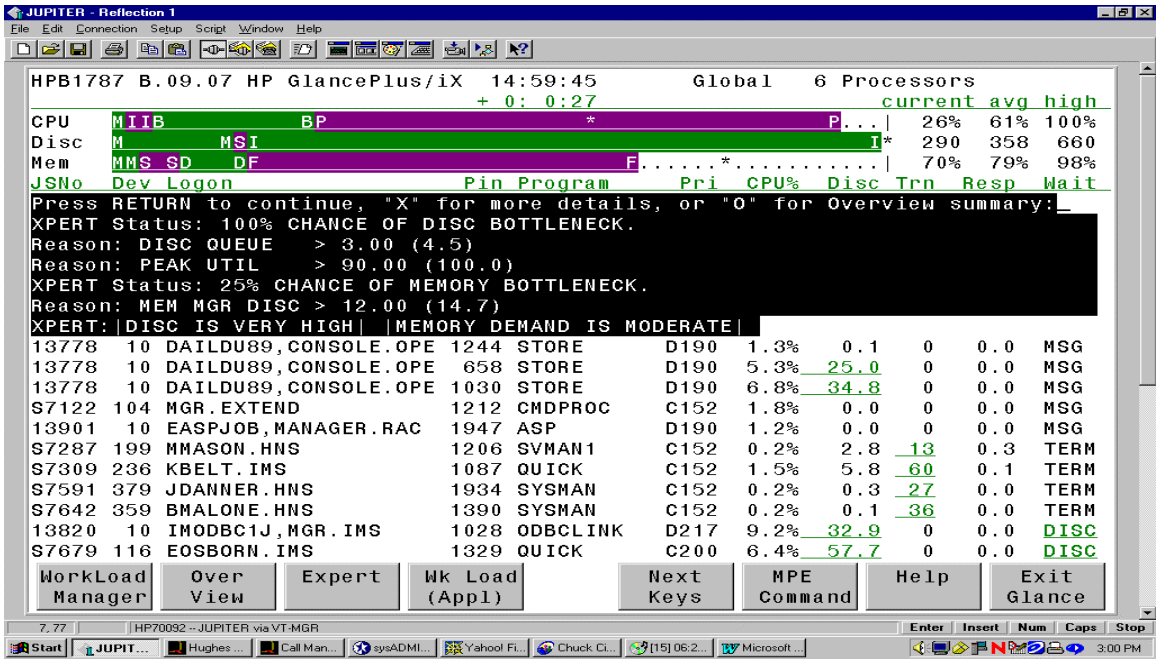
The following is an example of a Glance screen.

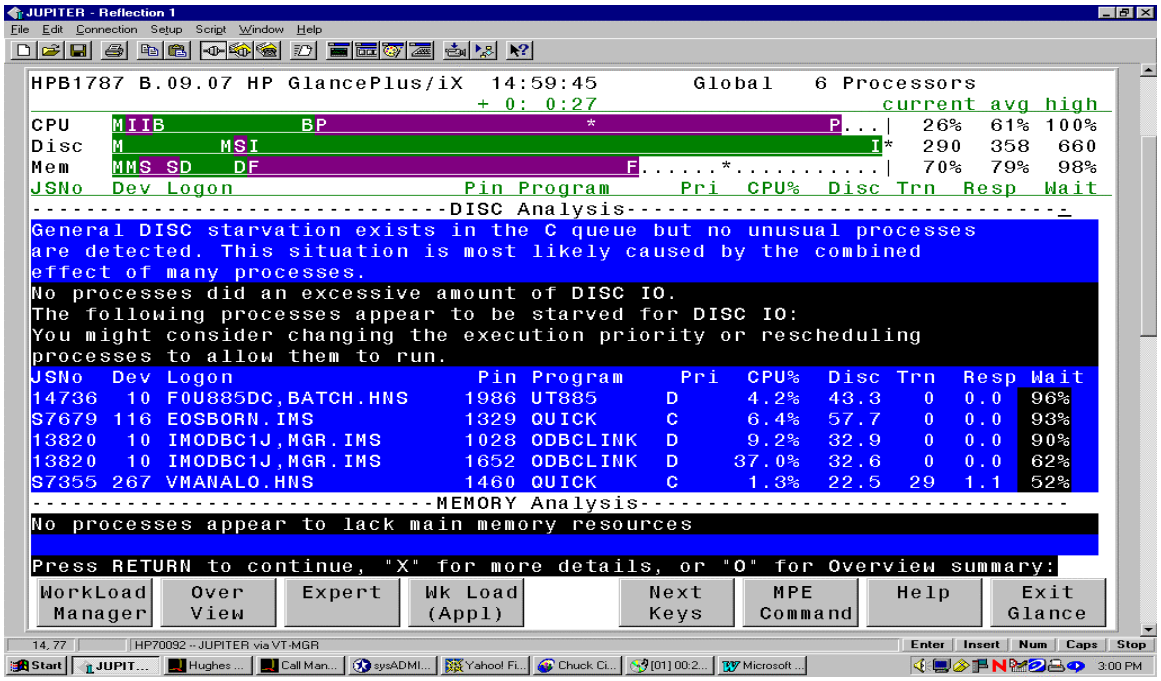


As indicated earlier, the screen consists of two major elements. These elements, the global reporting area and process information describe exactly what is being done. In the above example, as you can see, the reporting section is divided into three parts, GLOBAL CPU, MEMORY and DISC. It should be noted 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





CPU Detail Screen

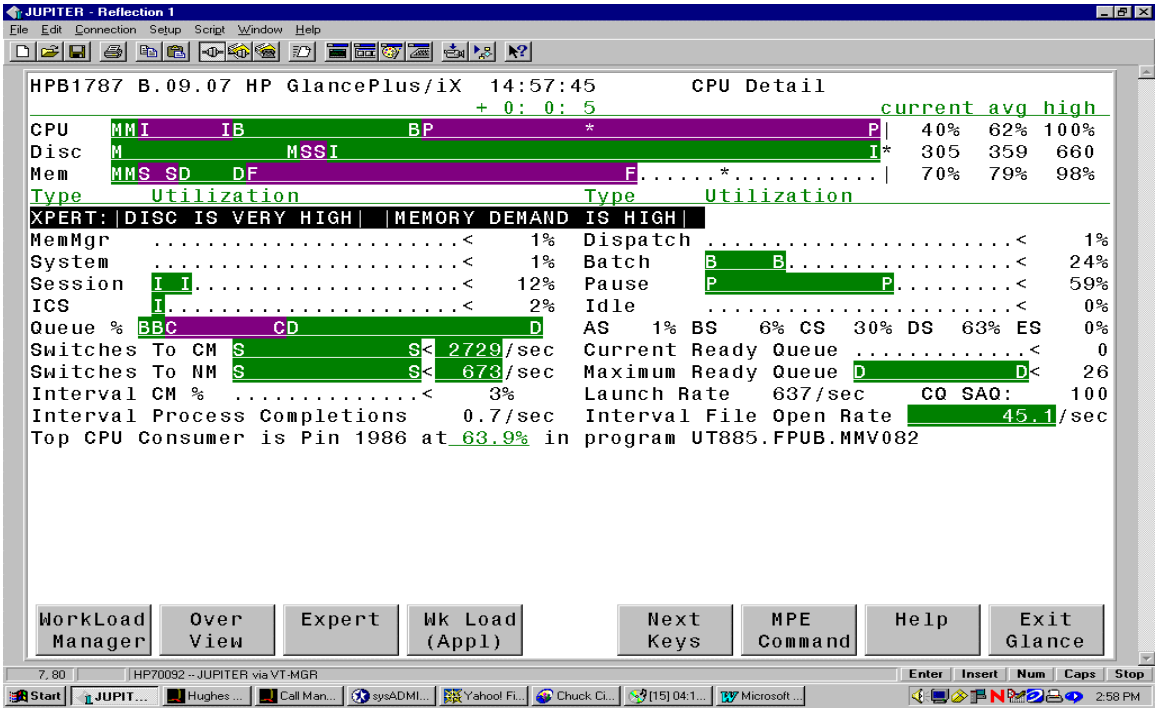
The following screen is Glance's CPU Detail screen. It identifies several key aspects of what your processor is actually doing. It is this authors opinion that several key performance elements are displayed here. These elements are MemMgr, queue utilization, 'switch' utilization, and Current ready queue. 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 a as 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.

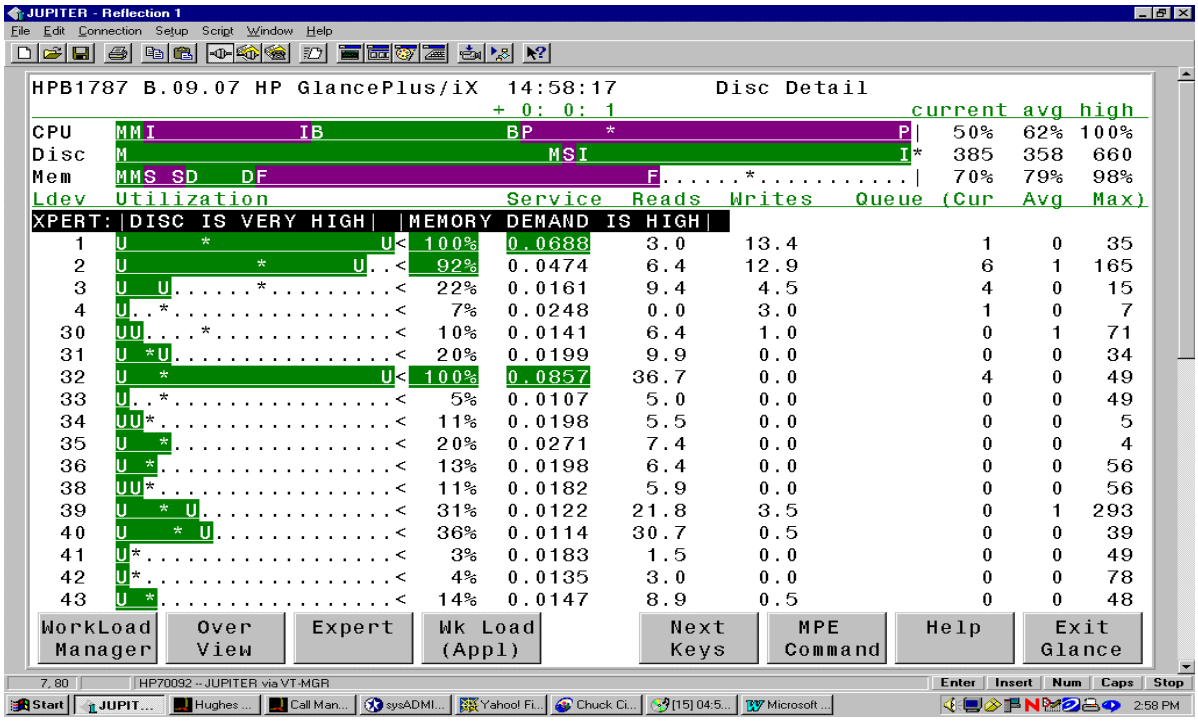
Queue utilization defines your workload, interactive or batch. Each system is different and application dependent. The motto here is 'Know your Applications'.



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.

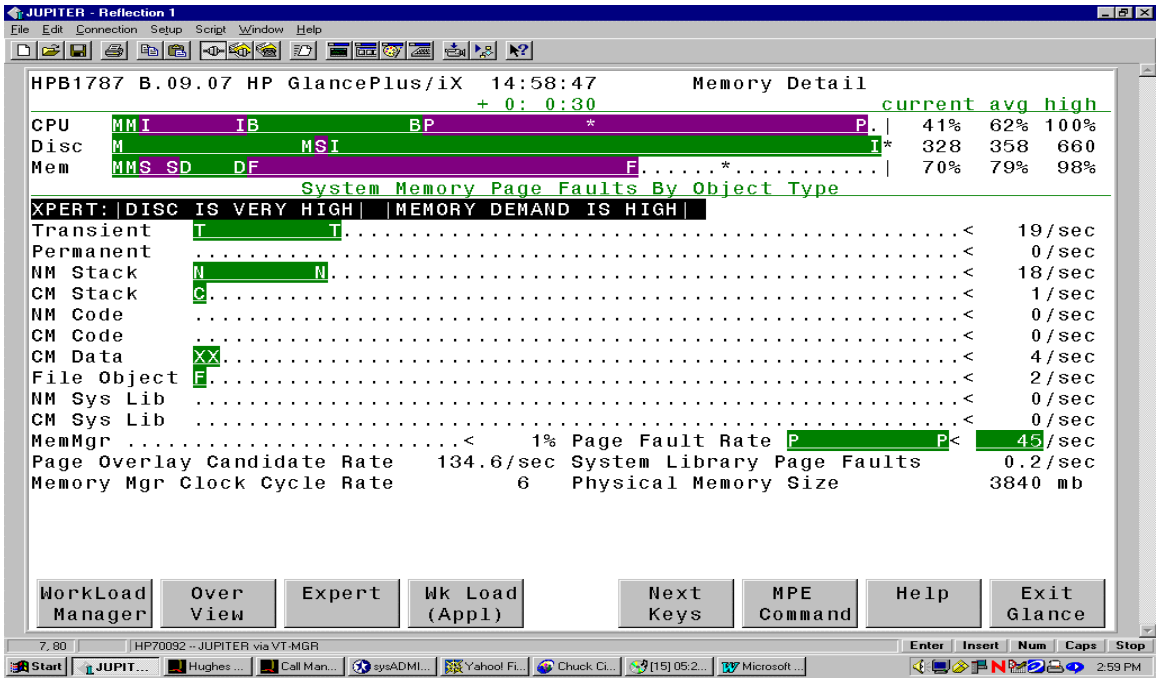
Several items, which could be added to the screen for additional value, would be the size of each disc, the distribution of permanent/transient space, and the percentage of free space on the drive. Of course, these are available through :DISCFREE.



Memory Detail

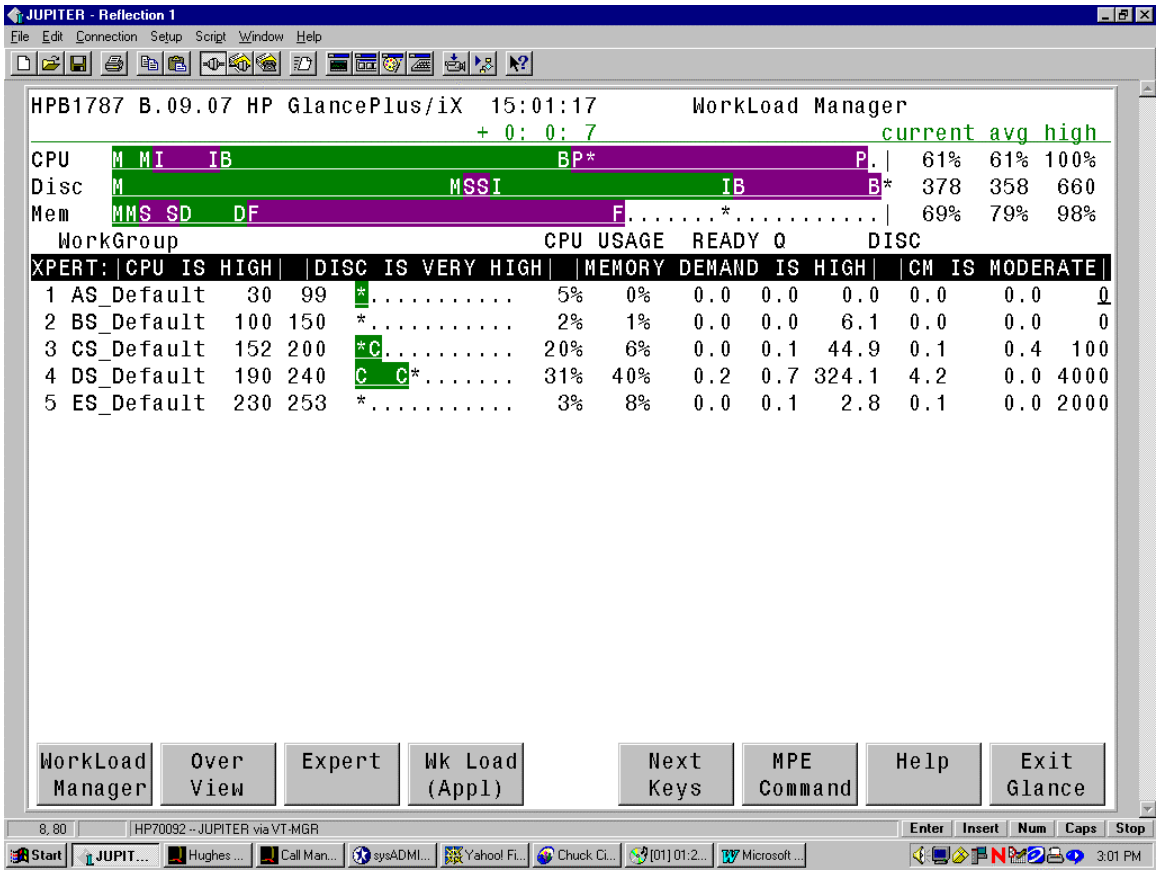
The memory detail screen is again a measurement of your I/O capacity and how much work the CPU must do to control I/O. In the example below, the CPU is working less than 1 percent to control memory and disc I/O. HP defines ten types of data elements for memory utilization

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.



Workload manager

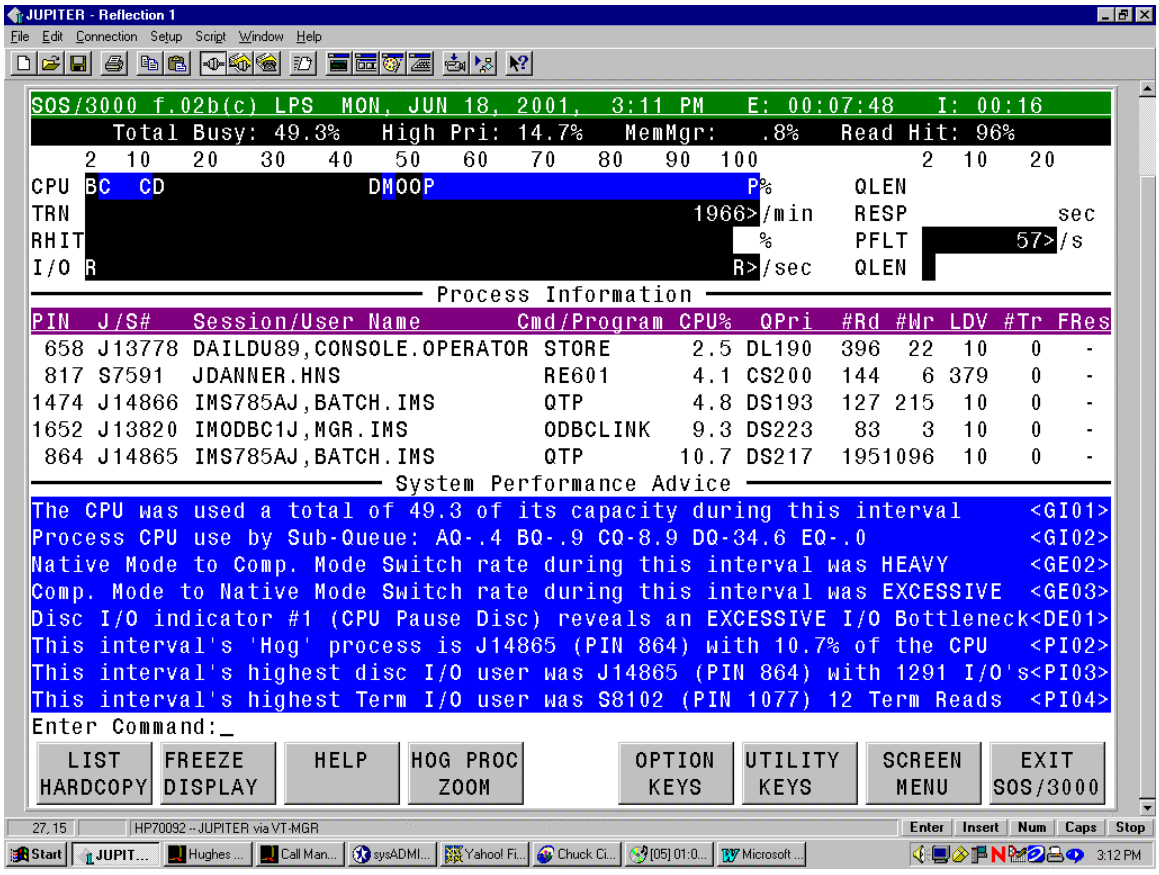
The ‘Workload Manager’ screen identifies how your system process queues are structured and how much work is being done within each queue.



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.

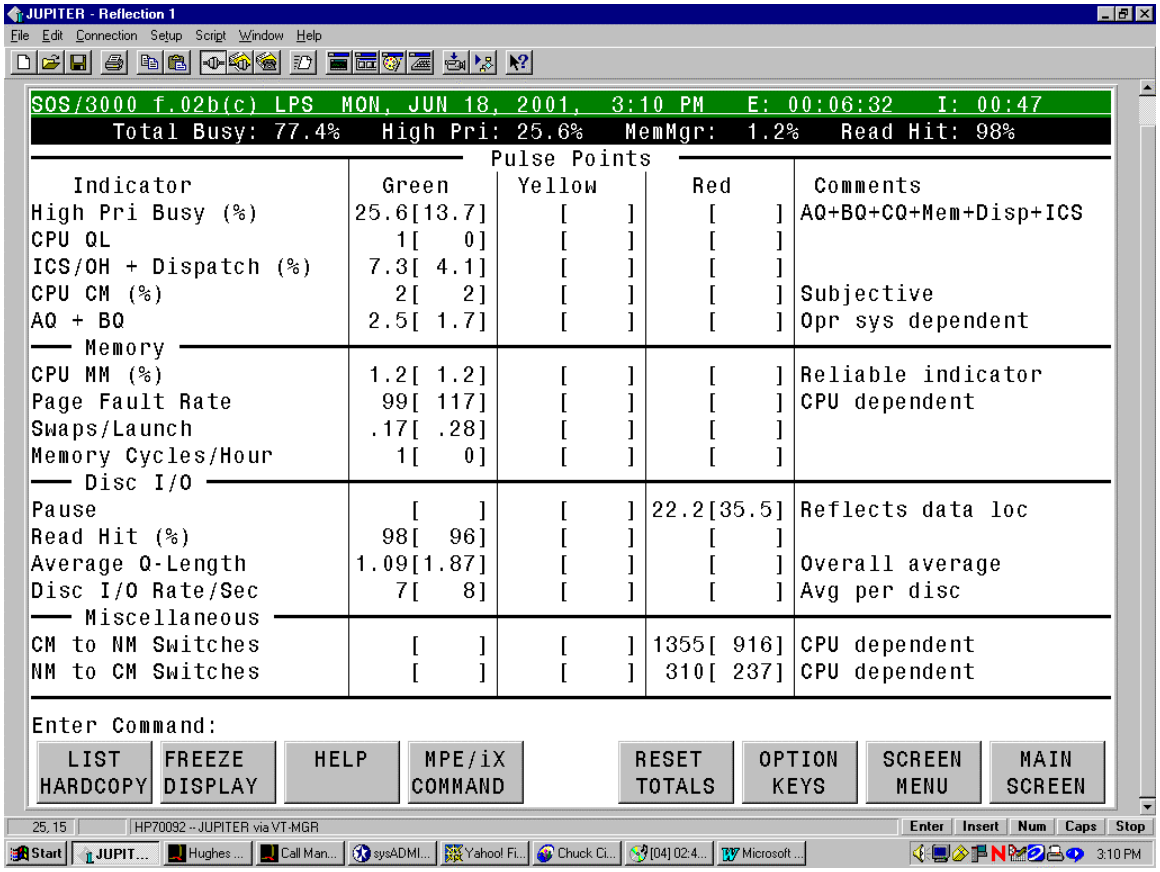
SOS from Lund

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.

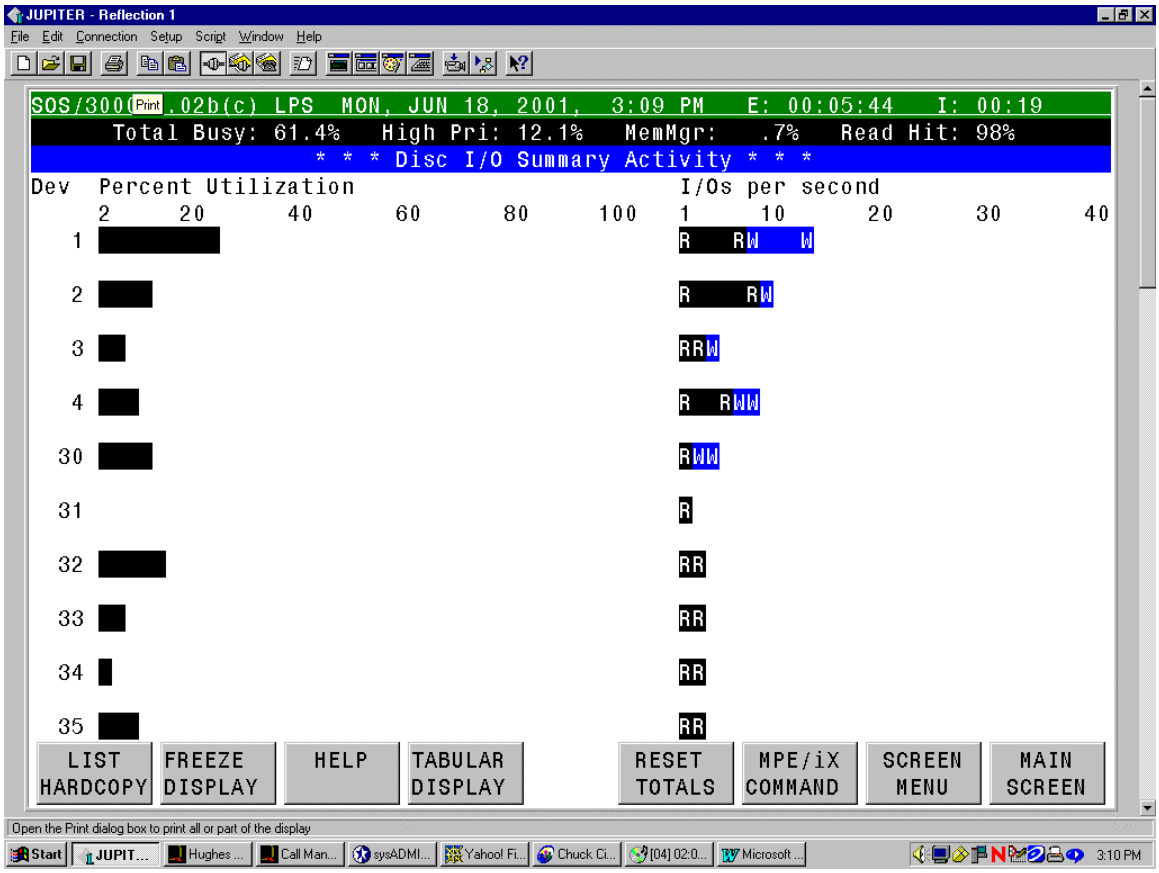


Lund has also consolidated CPU utilization onto a 'highlight' bar, which also identifies memory utilization shown at the top of the screen image. Another feature, in my opinion is the addition of general response and page fault information. For performance 101, the advice section is the most important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

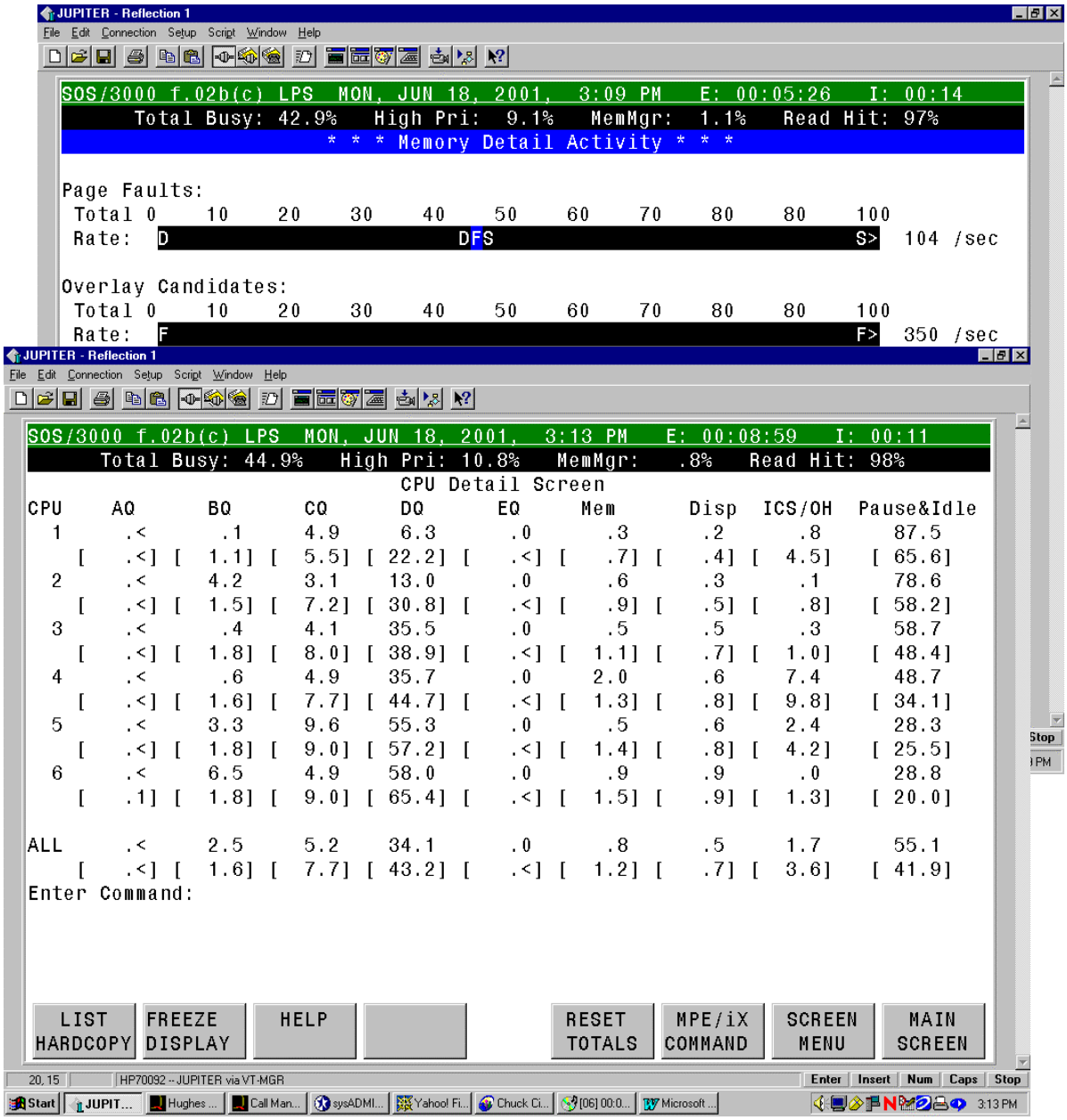
In the screen below, Lund captures and illustrates what they call ‘Pulse Points”. These are in Lund’s opinion, the key factors and indicators of your systems performance. All of these factors are machine dependent and will vary from system to system and application to application.



The 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.

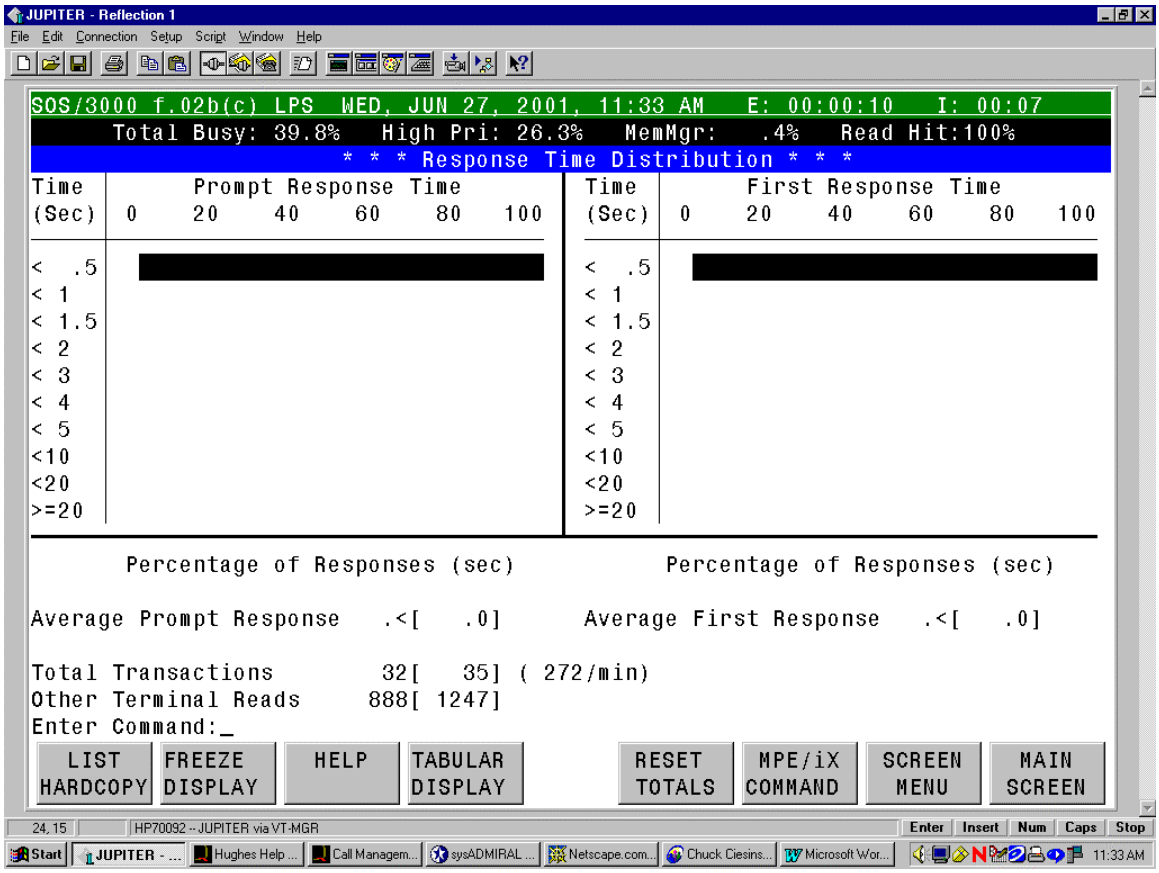


The following screen is the LPS illustration of how your main memory is being utilized. As with Glance, it highlights page fault activity, which has the highest impact on your memory utilization and disc I/O.

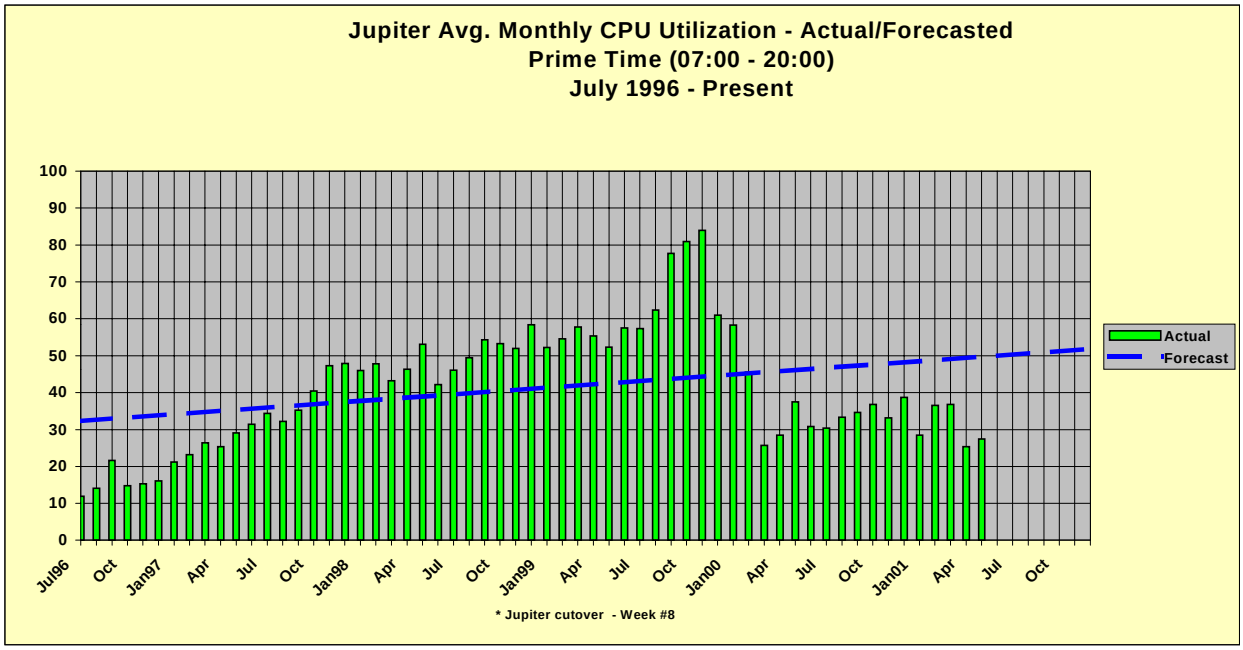


The CPU detail screen from Lund is very different than Glance. This screen identifies what each CPU is doing and in what process queue, managing of memory, and interrupts. It is this screen and Lund's response screen which provide, in my opinion a, an advanced performance management aspect.

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 import. HP provided LaserRX as a historical reporting tool and Lund provides Performance Gallery Gold as it's 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 it's 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.