LUND PERFORMANCE SOLUTIONS

WHAT YOU NEED TO KNOW. WHEN YOU NEED TO KNOW IT.

Reporting on Performance and Resource Utilization

Kate Billera

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WHAT YOU NEED TO KNOW, WHEN YOU NEED TO KNOW IT.

Concepts to Govern Performance

- What is the impact to the interactive user activity?
- Is the activity completing in a timely manner?
- Use a fair and reasonableness test by visiting the user workstation to feel and measure their pain.
- One persons' pain is another persons' blessing.
- Squeaky wheel expects to get the oil, but does it really need it? Maybe just attention is needed not tuning.

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Process to Migration

- Understand your environment
- Identify hardware / application alternatives
- Manage the project
- Code and Data conversion
- Capacity Plan the new environment

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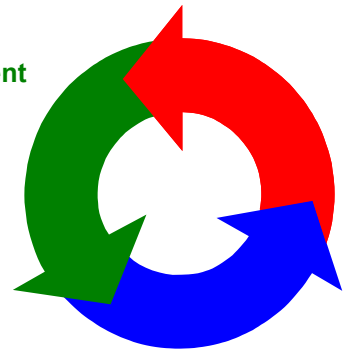
Performance – Analysis Process

Monitor Environment
Set a Baseline



Implement a
Single Change

Analyze the Data
Create a Plan of Action

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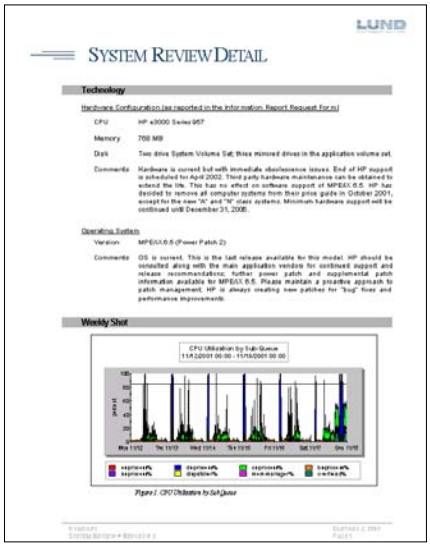
Regular System Reporting



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SYSTEM REVIEW DETAIL

Technology

Hardware Configuration (as reported in the Information Report Request For.m)

CPU HP e3000 Series 957

Memory 768 MB

Disk Two drive System Volume Set; three mirrored drives in the application volume set.

Comments Hardware is current but with immediate obsolescence issues. End of HP support is scheduled for April 2002. Third party hardware maintenance can be obtained to extend the life. This has no effect on software support of MPE/iX 6.5. HP has decided to remove all computer systems from their price guide in October 2001, except for the new "A" and "N" class systems. Minimum hardware support will be continued until December 31, 2008.

Operating System

Version MPE/iX 6.5 (Power Patch 2)

Comments OS is current. This is the last release available for this model. HP should be consulted along with the main application vendors for continued support and release recommendations; further power patch and supplemental patch information available for MPE/iX 6.5. Please maintain a proactive approach to patch management. HP is always creating new patches for "bug" fixes and performance improvements.

Weekly Shot

CPU Utilization by Sub-Queue

11/1/2001 00:00 - 11/10/2001 00:00

Figure 1. CPU Utilization by Sub-Queue

- Evaluate the current condition of the system
- Compare to previous periods of analysis
- Relate to projections of the future system growth
- Initiate planning process
- Provide management with valuable information to make decisions
- Always know where you are, where you came from, and where you're going

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WHAT YOU NEED TO KNOW, WHEN YOU NEED TO KNOW IT.

Regular System Reporting

- How often is often enough?
  - Monthly
  - Quarterly
  - Semi-annually
  - Annually
- Always know where you *are*, where you came *from*, and where you're *going*

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Reporting Requirements

- The data collector is running continuously, and the appropriate time period is selected for analysis and reporting
- The data collection interval is set properly, typically 5 minutes
- The Applications / Workloads are properly defined (not too many)

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Requirements

- A thorough analysis of the data has been completed
- Templates have been created for each resource with the appropriate metrics
- The population of the charts has been automated (desirable)
- A standard reporting format has been selected
- The report needs to include trending data
- The placement of the charts in the reporting medium has been automated (desirable)

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Requirements - Report Format

- There should be a “report card”, that is a visual summary of the report
- There should be an executive summary
- There should be a section for each resource
- Anomalies should be identified on individual charts

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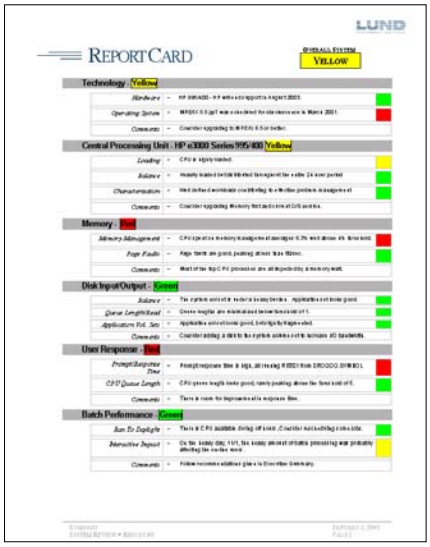
WHAT YOU NEED TO KNOW, WHEN YOU NEED TO KNOW IT.

System Report Card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REPORT CARD

OVERALL SYSTEM: YELLOW

Technology - Yellow

Central Processing Unit - HP e3000 Series 995/400 Yellow

Memory - Red

Disk Input/Output - Green

User Response - Red

Batch Performance - Green

- Address all of the major areas of performance in your environment
- This is a sample but other categories may be appropriate
- Disc Locality
- Database Efficiency
- Home Grown Application
- 3rd Party Application
- Business Partner
- Entity within Company

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Executive Summary


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EXECUTIVE SUMMARY

- Evaluate the current condition of the system
- Compare to previous periods of analysis
- Relate to projections of the future system growth
- Initiate planning process
- Provide management with valuable information to make decisions
- If you don't measure it, how can you manage it.
- Leads to better business decisions

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WHAT YOU NEED TO KNOW, WHEN YOU NEED TO KNOW IT.

Technology

HP e3000

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WHAT YOU NEED TO KNOW, WHEN YOU NEED TO KNOW IT.

Technology

Technology - Yellow			
Hardware	–	HP 995/400 - HP will end support in August 2003.	
Operating System	–	MPE/iX 5.5 pp7 was scheduled for obsolescence in March 2001.	
Comments	–	Consider upgrading to MPE/ix 6.5 or better.	

- Hardware – Remain current, allow adequate time for budget, quotes, capital appropriation, installation, testing, and migration of data.
- Software – Multiple releases, 3rd party software relation, power patch, individual patches, bleeding versus trailing edge
- Feature sets may accelerate the need or require waiting
- Set up 1 year change control schedule
  - Follow year end close, testing, development, production
  - Prior to year end freeze, hit major patches in prep for stability

Always check the HP web site for current schedules

www.hp.com

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WHAT YOU NEED TO KNOW, WHEN YOU NEED TO KNOW IT.

Central Processing Unit

Central Processing Unit - HP e3000 Series 995/400	Yellow
Loading – CPU is highly loaded.	
Balance – Heavily loaded but distributed throughout the entire 24 hour period	
Characterization – Well defined workloads contributing to effective problem management	
Comments – Consider upgrading Memory first and current O/S version.	

- Heart of the computers ability to perform work
- Performance Priority – What activity must complete at sacrifice of all others
- "TUNE" the system to uniqueness of the environment
- Balance the activity over time to optimize the resource
- Characterization leads to better business decisions
- Operating system versions and 3rd party software can adversely affect the overall performance of the computer

The HP e3000 has been designed to operate at 100% for sustained periods of time

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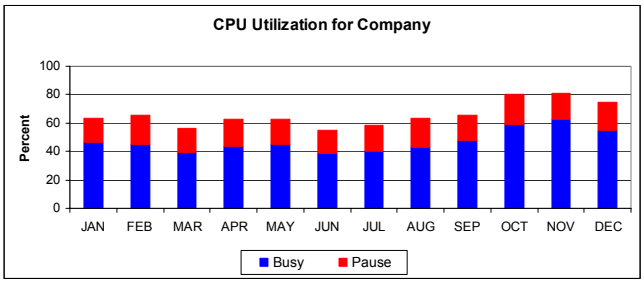
WHAT YOU NEED TO KNOW, WHEN YOU NEED TO KNOW IT.

Central Processing Unit - CPU Summary



- Data Average
  - Each data point is generated from one month of data
  - Monday – Friday; 8:00 a.m. to 5:00 p.m.; excluding weekends and holidays
- Current Observations
  - Entire period
- Anomalies Contributed
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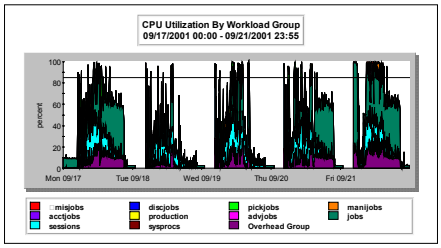
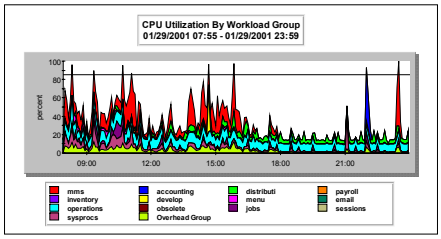
WHAT YOU NEED TO KNOW, WHEN YOU NEED TO KNOW IT.

Central Processing Unit - Loading



- First look at a greater period of time for fair and reasonableness
- Then move to daily representation for drill down
- Tuesday and Wednesday are lower, the other days are more typical



- Batch consumes moderate amount of excess CPU
- Primary and off-shift interactive activity
- Workload definitions are critical to anomaly identification

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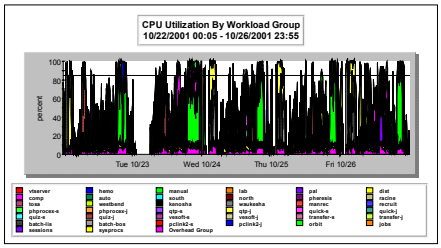
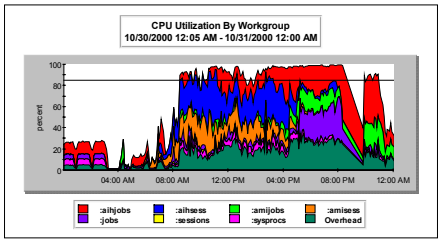
WHAT YOU NEED TO KNOW, WHEN YOU NEED TO KNOW IT.

Central Processing Unit - Loading



- Continuous heavy activity
- One week view is too cluttered to understand
- Represents high activity is normal thru entire sample
- High number of definitions blend together in one week view



- Batch consumes majority of excess CPU
- Primary and off-shift interactive activity
- Extremely HIGH overhead

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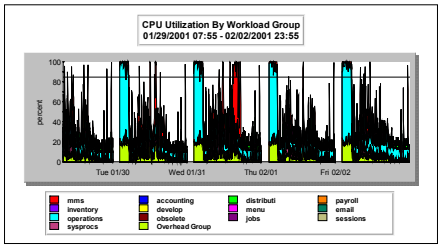
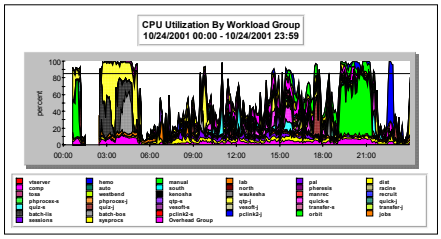
WHAT YOU NEED TO KNOW, WHEN YOU NEED TO KNOW IT.

Central Processing Unit - Balance



- Utilizing the CPU for the entire 24 hour period
- Proper scheduling of batch to meet deadlines
- Setting the expectations up front with the user community



- Use of all queues for priority
- Identification of “lull” periods
- Checks and Balance on operations monitoring of system
- Service Level Management to address expectations

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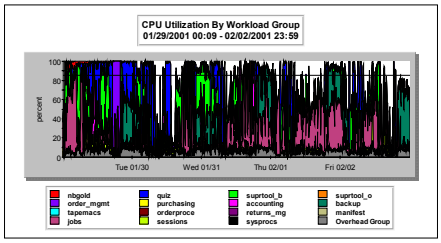
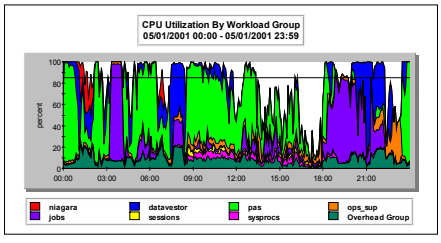
Central Processing Unit - Balance



- Virtually no bandwidth available
- No room for growth or special requests
- The entire week is heavy
- The upgrade process is long over due or the use of the system is highly efficient



- Good mix through the day
- Heavy batch, although it consumes the excess, can still impact interactive users
- Batch reports are often thought of as critical as interactive

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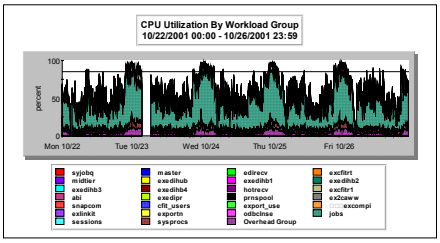
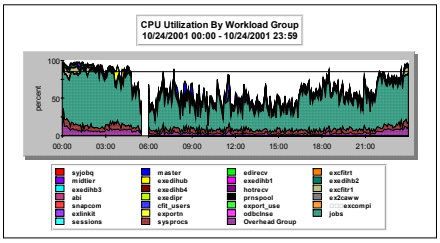
Central Processing Unit - Characterization



- Large number of workload groups defined
- Can switch between multiple configurations based on need
- Stay away from configs where most of the processing in Jobs



- Leverage activity to make better business decisions
- Not excessive number
- One environments uses 200 definitions for uniformity across all systems

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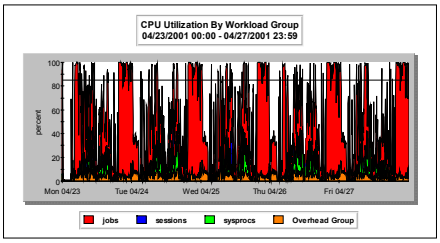
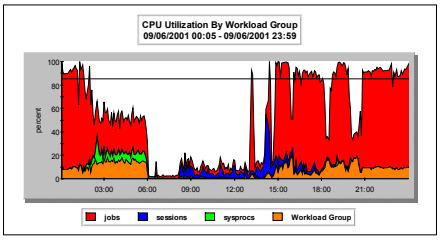
Central Processing Unit - Characterization



- Primarily a batch environment
- More MPE shops are running batch controller jobs for the interactive access of the system
- How can you determine the growth?



- Very little interactive user sessions utilization
- Very little primary shift activity
- Missed opportunity for better business decisions

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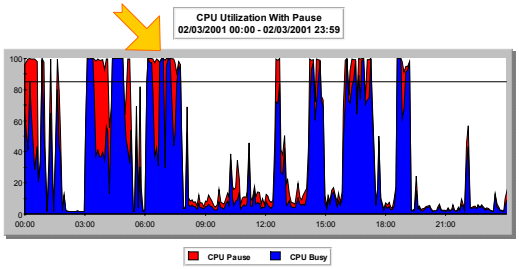
Central Processing Unit - Drill Down



Process Information (Tbl)

12/18/2000 04:15.00 AM	PIN	J/S#	Session/User Name	Cmd/Program	CPU%	Pri Q	Pri	#Rd	
process_1	438.0	J516	COPYMV,MGR.TEST	SUPRTOOL	16.2	DS	216.0	0.0	
process_2	235.0	J507	GETFILES,MGR.FRAS	GETFILES	4.9	CS	200.0	4569.0	14
process_3	518.0	J535	LOADDC,MGR.D6410	LDDC	4.3	DS	202.0	19357.0	
process_4	368.0	J520	DJCLLRPT,MGR.D6410	LOANRPT	4.0	DS	203.0	24029.0	
process_5	596.0	J455	PRDPURCH,MGR.W3030	EARNPRE	4.0	DS	202.0	-23476.0	
process_6	359.0	J454	DJCLRAL0,MGR.D6410	EARNPRE	2.7	DS	202.0	28517.0	
process_7	2.0	<sys>	<system process>	LOAD	0.8	BL	142.0	7.0	
process_8	411.0	J376	SOSMONJ,MGR.LPS	DISCFREE	0.6	--	0.0	0.0	
process_9	267.0	<sys>	<system process>	CI	0.5	--	0.0	72.0	
process_10	3.0	<sys>	<system process>		0.4	BL	100.0	0.0	

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WHAT YOU NEED TO KNOW, WHEN YOU NEED TO KNOW IT.

Memory

Memory - Red

Memory Management	–	CPU spent on memory management averages 6.3% well above 4% threshold.
Page Faults	–	Page faults are good, peaking at less than 80/sec.
Comments	–	Most of the top CPU processes are all impeded by a memory wait.

- Memory Management is overhead associated with tracking status of data in limited and valuable space (states)
- Page Faults are many times referred to as the Performance Death indicator – When the process was ready to launch, the resources were no longer memory resident and a request to read from disc was made
- Memory reads are desirable – hundreds to thousand times faster than disk reads
- New limits under MPE/iX 6.5 and new P8xxx chip server models

MORE MEMORY IS BETTER

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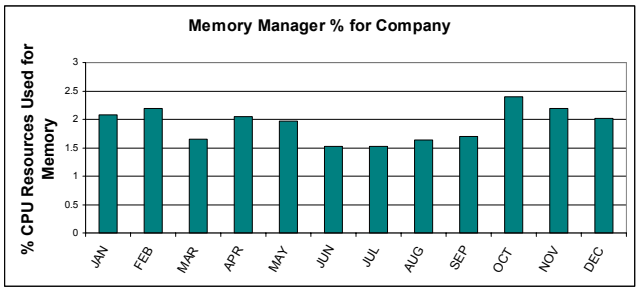
WHAT YOU NEED TO KNOW, WHEN YOU NEED TO KNOW IT.

Memory - Memory Summary



- Data Average
  - Each data point is generated from one month of data
  - Monday – Friday; 8:00 a.m. to 5:00 p.m.; excluding weekends and holidays
- Current Observations
  - Entire period
- Anomalies Contributed
  - Anything not explained above

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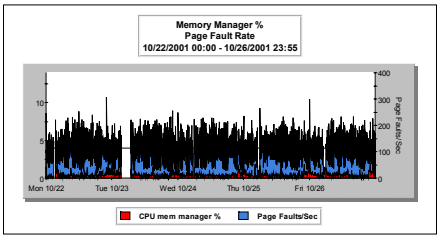
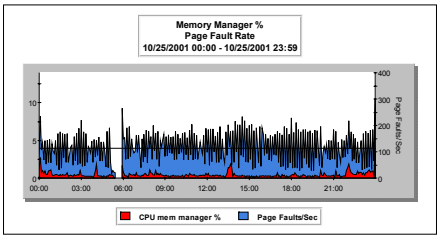
WHAT YOU NEED TO KNOW, WHEN YOU NEED TO KNOW IT.

Memory - Memory Management



- Bad to worse more quickly when out of memory
- Large amount of time determining busiest pages
- MPE/iX is crippled by a memory shortage



- Procure more than you need
- Clock rate, swaps per launch, page faults
- Mitigate physical disk writing activity

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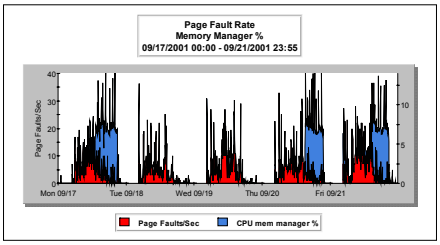
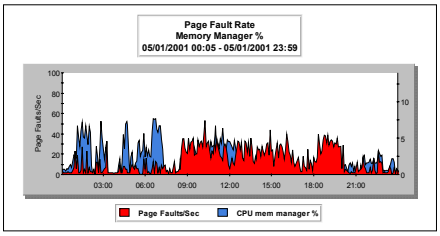
WHAT YOU NEED TO KNOW, WHEN YOU NEED TO KNOW IT.

Memory - Page Faults



- Page faults are processor dependent
- Page faults cause a physical I/O due to data not being present in memory
- Some analyst call page faults the kiss of death for performance



- Adequate or large memory configurations retain data for longer periods of time reducing the probability that the data has been swapped to disk for another process

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WHAT YOU NEED TO KNOW, WHEN YOU NEED TO KNOW IT.

Disk Input/Output

Disk Input/Output - Green			
Balance	–	The system vol set is under a heavy burden. Application set looks good.	
Queue Length/Read	–	Queue lengths are minimal and below threshold of 1.	
Application Vol. Sets	–	Application vol set looks good, but slightly fragmented.	
Comments	–	Consider adding a disk to the system volume set to increase I/O bandwidth.	

- Disk I/O is the slowest of all the primary performance resources due to the dependency on physical mechanical devices
- Unbalanced activity forces more thru and already restricted and limiting resource
- Data archival, free space, and transient space monitoring
- Time to recovery for data in disaster recovery situation

Regular disk and data maintenance activity is critical in a dynamic environment

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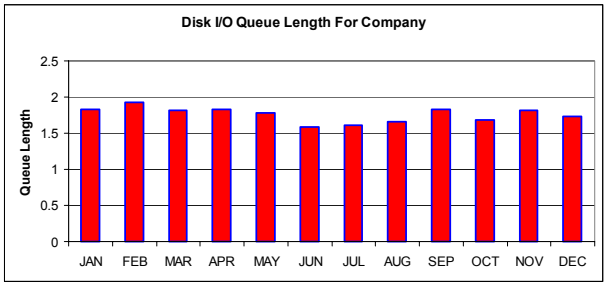
WHAT YOU NEED TO KNOW, WHEN YOU NEED TO KNOW IT.

Disk Input/Output - Summary



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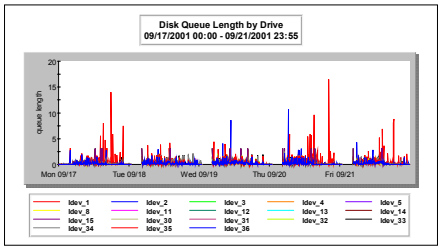
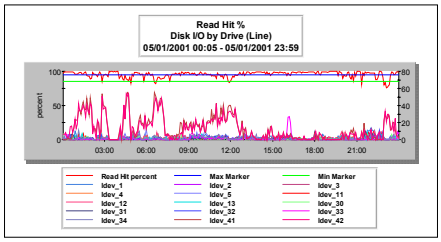
WHAT YOU NEED TO KNOW, WHEN YOU NEED TO KNOW IT.

Disk Input/Output - Balance



- Severe imbalance between ldev's 1, 2, and 3
- Inefficient use of resources
- Always look at the Y-axis



- Severe imbalance
- Over 50 I/Os on some and less than 10 on others
- Multiple metrics on same chart can demonstrate cause and effect

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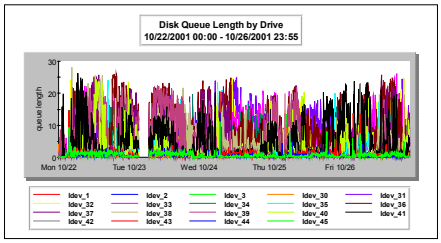
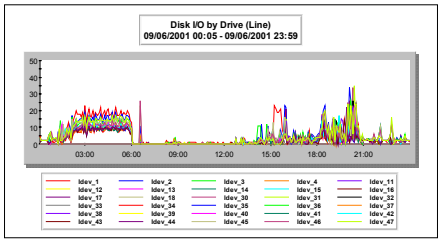
Disk Input/Output - Balance



- When there are many drives, filtering by volume set can be effective
- Look for even usage of all drives
- File reports can aid in file location and I/O issues



- Unequal balance across all drives by time of day and activity
- Easy to see the backup at 2:00

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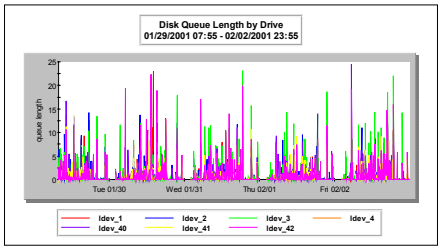
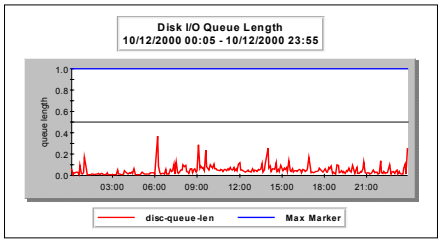
WHAT YOU NEED TO KNOW, WHEN YOU NEED TO KNOW IT.

Disk Input/Output - I/O Queue Length



- The greater the queue length, the greater the wait time
- I/O queues over 1 are bad
- Either balance is poor or not enough memory



- This is a typical NORMAL system
- Evenly distributed
- Several spikes but all below the warning of .5

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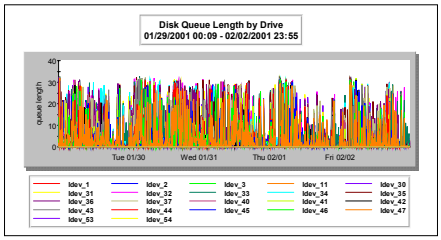
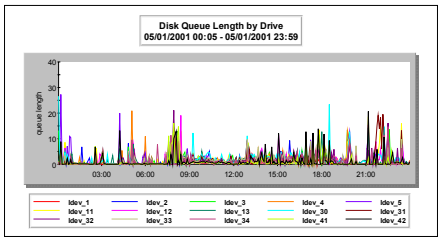
WHAT YOU NEED TO KNOW, WHEN YOU NEED TO KNOW IT.

Disk Input/Output - I/O Queue Length



- Heavily queued
- Probably severe impact to both interactive and batch performance
- I/O can not keep up with the demand of the processor

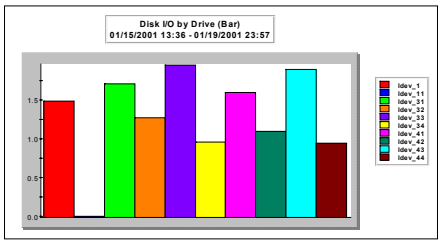


- Problem is not constant across all periods of time
- Probably job dependant
- Investigate the activity and file access at the time of the spikes
- Discount off-shift if completing in a timely manner

LUND PERFORMANCE SOLUTIONS

WHAT YOU NEED TO KNOW, WHEN YOU NEED TO KNOW IT.

Sample - Mirroring



- Benefit reads to either of two devices
- Writes must go to master
- Masters in volume set always have higher I/O due to XM activity

```
/SYS/PUB: dstat all
   LDEV-TYPE     STATUS      VOLUME (VOLUME SET - GEN)
   ----------    --------    -------------------------
    1-ST39175     MASTER      MEMBER1          (MPEXL_SYSTEM_VOLUME_SET-0)
   31-ST39173     MASTER-MD   MEMBER1          (SG_APPL_VOLUME_SET-0)
   32-ST39173     MEMBER-MD   MEMBER2          (SG_APPL_VOLUME_SET-0)
   33-ST39175     MEMBER-MD   MEMBER3          (SG_APPL_VOLUME_SET-0)
   34-ST39236     MEMBER-MD   MEMBER4          (SG_APPL_VOLUME_SET-0)
   41-ST39173     MASTER-MD   MEMBER1          (SG_APPL_VOLUME_SET-0)
   42-ST39173     MEMBER-MD   MEMBER2          (SG_APPL_VOLUME_SET-0)
   43-ST39236     MEMBER-MD   MEMBER3          (SG_APPL_VOLUME_SET-0)
   44-ST39236     MEMBER-MD   MEMBER4          (SG_APPL_VOLUME_SET-0)
```

LUND PERFORMANCE SOLUTIONS

WHAT YOU NEED TO KNOW, WHEN YOU NEED TO KNOW IT.

User Response

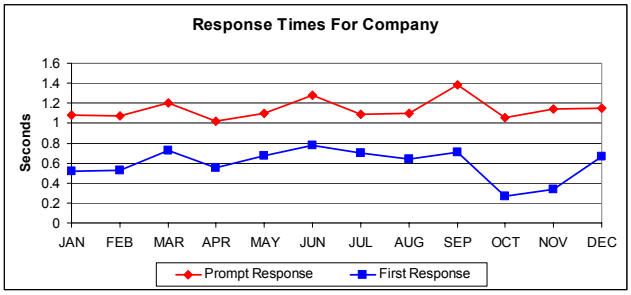
User Response - Red			
Prompt/Response Time	–	Prompt response time is high, all running RE801 from DROGOG.SYMBOL	
CPU Queue Length	–	CPU queue length looks good, rarely peaking above the threshold of 5.	
Comments	–	There is room for improvement in response time.	

- Best indicator of performance on the system
- Usually, first indicator of problems
- "Squeaky wheel gets the oil"

LUND PERFORMANCE SOLUTIONS

WHAT YOU NEED TO KNOW, WHEN YOU NEED TO KNOW IT.

User Response - Summary

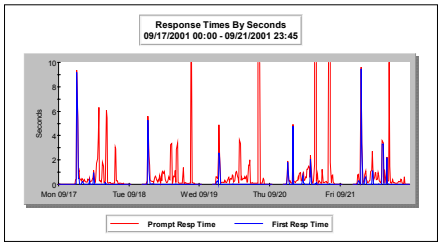


- Data Average
  - Each data point is generated from one month of data
  - Monday – Friday; 8:00 a.m. to 5:00 p.m.; excluding weekends and holidays
- Current Observations
  - Entire period
- Anomalies Contributed
  - Anything not explained above

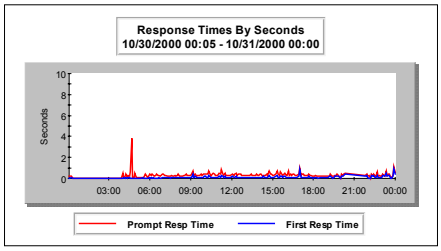
LUND PERFORMANCE SOLUTIONS

WHAT YOU NEED TO KNOW, WHEN YOU NEED TO KNOW IT.

User Response - Time to Prompt



- Averages are usually used in Service Level Agreements
- Most environments might see this as off the chart
- Some environments might see this as a goal

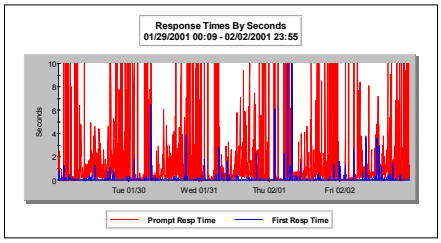


- Virtually all activity during prime shift is acceptable
- Some spikes in off-shift due to batch launch

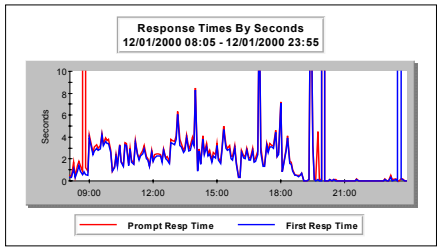
LUND PERFORMANCE SOLUTIONS

WHAT YOU NEED TO KNOW, WHEN YOU NEED TO KNOW IT.

User Response - Time to Prompt



- Watch for collection errors from the Hewlett-Packard MI in the JSMAIN and Job processes
- Some interfaces do not release control of the terminal until completion of critical activity (like Print)



- Memory and data locality can benefit or adversely affect interactive response times.

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LUND PERFORMANCE SOLUTIONS

WHAT YOU NEED TO KNOW, WHEN YOU NEED TO KNOW IT.

User Response - Time to Prompt

Untitled - Reflection for HP

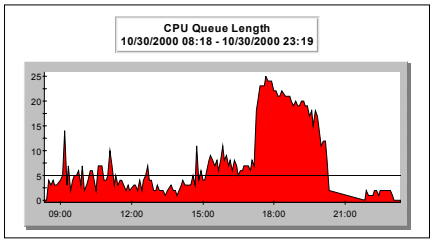
File Edit Connection Setup Script Window Help

```
S08/3000 F.03d(c) LPS   THU, NOV  2, 2000, 11:39 AM   E: 00:34:04   I: 00:24
                    * * * Response Time Distribution * * *
Time          Prompt Response Time                 Time          First Response Time
(Sec)          Percentage          Count           (Sec)          Percentage          Count
<  .5          82.7[ 88]      405[35663]           <  .5          99.8[100]      489[40460]
< 1             2.2[  4]       11[ 1491]           < 1             .2[  0]        1[   31]
< 1.5           1.2[  1]        6[  536]           < 1.5           .0[  0]        0[   15]
< 2             1.2[  1]        6[  444]           < 2             .0[  0]        0[    4]
< 3             1.2[  1]        6[  380]           < 3             .0[  0]        0[   10]
< 4              .6[  1]        3[  236]           < 4             .0[  0]        0[    3]
< 5              .2[  0]        1[  194]           < 5             .0[  0]        0[    5]
<10             4.9[  2]       24[  655]           <10             .0[  0]        0[   14]
<20             4.1[  2]       20[  643]           <20             .0[  0]        0[    6]
>=20            1.6[  1]        8[  311]           >=20            .0[  0]        0[    5]

        Percentage of Responses (sec)                Percentage of Responses (sec)

Average Prompt Response  1.3[   .7]          Average First Response   .<[   .0]

Total Transactions       490[40553] (1247/min)
Other Terminal Reads    1558[*****]
Enter Command:

 LIST HARDCOPY | FREEZE DISPLAY | HELP | GRAPHIC DISPLAY | RESET TOTALS | MPE/iX COMMAND | SCREEN MENU | MAIN SCREEN

22, 15   HP70092 -- 1-800-842-4241 via Modem
```

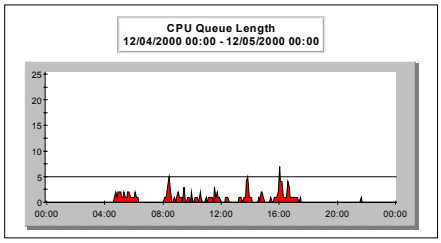

LUND PERFORMANCE SOLUTIONS

WHAT YOU NEED TO KNOW, WHEN YOU NEED TO KNOW IT.

User Response - CPU Queue Length



- Primary shift was green under threshold
- Off-shift spike when batch production launched
- Probably too many jobs executing at the same time

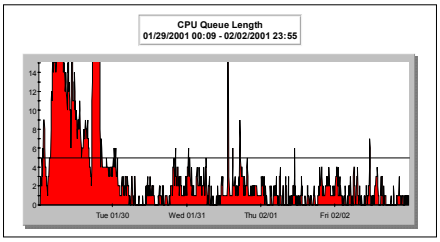


- Entire sample period is below threshold
- Job LIMIT settings
- TUNE queue settings

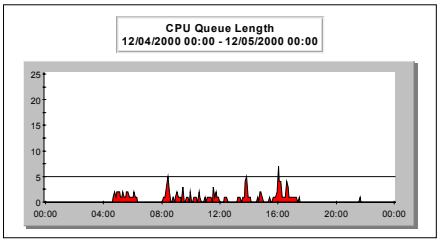
LUND PERFORMANCE SOLUTIONS

WHAT YOU NEED TO KNOW, WHEN YOU NEED TO KNOW IT.

User Response - CPU Queue Length



- Primary shift was green under threshold, except Monday
- Off-shift spike when batch production launched



- Entire sample period is below threshold
- Job LIMIT settings
- TUNE queue settings

LUND PERFORMANCE SOLUTIONS

WHAT YOU NEED TO KNOW, WHEN YOU NEED TO KNOW IT.

Batch Performance

Batch Performance - Green			
Run To Daylight	–	There is CPU available during off hours, Consider rescheduling some jobs.	
Interactive Impact	–	On the heavy day, 11/1, the heavy amount of batch processing was probably affecting the on-line users.	
Comments	–	Follow recommendations given in Executive Summary.	

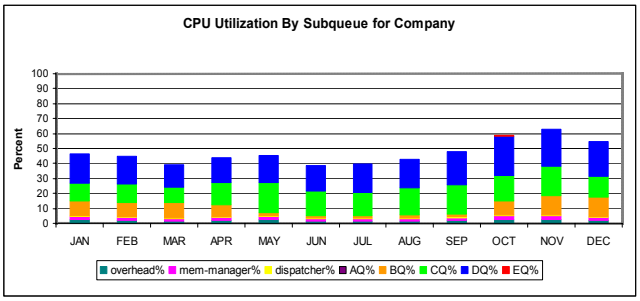
- "Run to Daylight" – system resources need to be fully available to interactive users, when nightly batch production continues to encroach upon complete availability for users
- Interactive Impact – Is the batch activity during user access affecting the users ability to perform work

- User time is most valuable asset in business
- Batch is less important but required for user to complete work
- Many applications batch all report printing
- Job schedulers can be used to balance ADHOC job requests

LUND PERFORMANCE SOLUTIONS

WHAT YOU NEED TO KNOW, WHEN YOU NEED TO KNOW IT.

Batch Performance - Summary

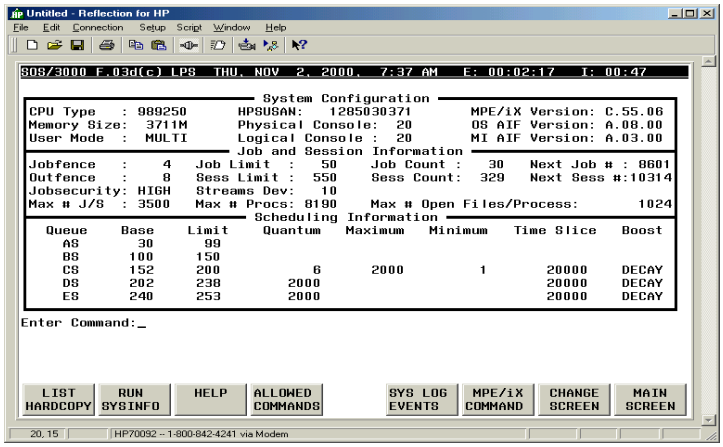


- Data Average
  - Each data point is generated from one month of data
  - Monday – Friday; 8:00 a.m. to 5:00 p.m.; excluding weekends and holidays
- Current Observations
  - Entire period
- Anomalies Contributed
  - Anything not explained above

LUND PERFORMANCE SOLUTIONS

WHAT YOU NEED TO KNOW, WHEN YOU NEED TO KNOW IT.

Batch Performance

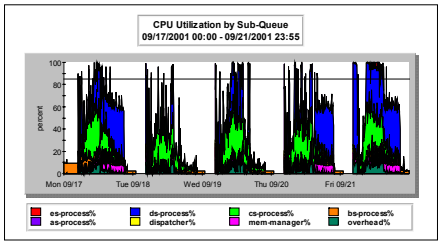


- Interactive Analysis to “hand hold” critical production through the cycle, typically operations or production control activity

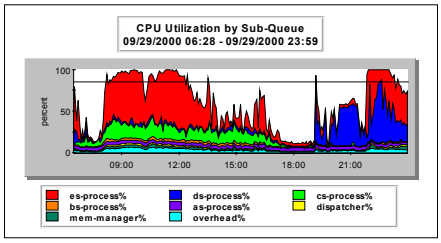
LUND PERFORMANCE SOLUTIONS

WHAT YOU NEED TO KNOW, WHEN YOU NEED TO KNOW IT.

Batch Performance - Run to Daylight



- When can/does the activity start (Midnight?)
- Does the activity flow into primary shift

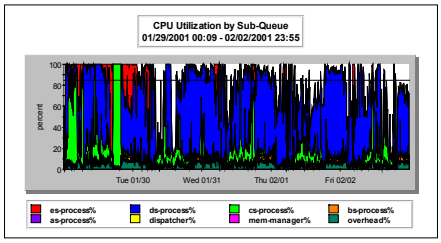


- Large amount of ES queue processing starts at primary shift
- DS and ES queue processing tapers off well before primary shift

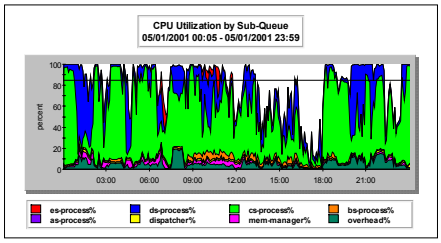
LUND PERFORMANCE SOLUTIONS

WHAT YOU NEED TO KNOW, WHEN YOU NEED TO KNOW IT.

Batch Performance - Run to Daylight



- There is no daylight here
- Heavy batch processing environment
- Look at queue settings to insure that interactive users have minimal delays

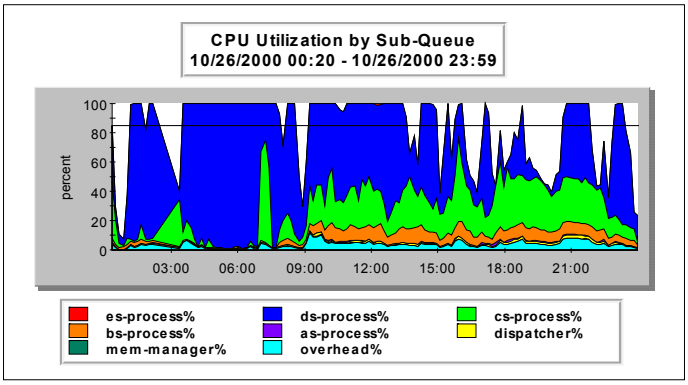


- Although the majority of the activity is in the default interactive queue, is there batch activity also utilizing this queue
- Nice use of ES queue – rarely used by system managers
- ES can also be High priority

LUND PERFORMANCE SOLUTIONS

WHAT YOU NEED TO KNOW, WHEN YOU NEED TO KNOW IT.

Batch Performance - Interactive Impact



- SUSTAINED activity during high levels of interactive use
- Not just user response time - If users are waiting for batch and batch is delayed, then batch has an interactive impact

LUND PERFORMANCE SOLUTIONS

WHAT YOU NEED TO KNOW, WHEN YOU NEED TO KNOW IT.

Data Summary

- Regular Maintenance is REQUIRED
- Schedule and Automate
- Disk Maintenance
  - Disk Fragmentation
  - File Fragmentation
  - Available Free Space
- Data Maintenance
  - IMAGE Databases
  - KSAM Databases

LUND PERFORMANCE SOLUTIONS

WHAT YOU NEED TO KNOW, WHEN YOU NEED TO KNOW IT.

Disk Fragmentation

* * * Disc Space Utilization * * *

	----Used---		---Avail---		--Max %---		--------Contiguous Free Space--------					
Dev	Trans	Perm	Trans	Perm	Trans	Perm	Largest	<100	<1000	<10K	<100K	100K+
2	1078K	16M	586K	586K	100	100	10976	50592	426K	88288	21216	0
3	1082K	16M	587K	587K	100	100	6560	49648	399K	138K	0	0
4	953K	16M	585K	585K	100	100	6144	45984	411K	127K	0	0
5	955K	16M	587K	587K	100	100	10240	49200	394K	133K	10240	0
13	1081K	16M	587K	587K	100	100	2048	57840	417K	112K	0	0
14	953K	16M	587K	587K	100	100	4096	42160	411K	133K	0	0
15	948K	16M	587K	587K	100	100	8192	48464	397K	141K	0	0
16	963K	16M	584K	584K	100	100	6144	46912	415K	122K	0	0
17	1028K	16M	587K	587K	100	100	12288	50080	398K	126K	12288	0

- No large free space available
- System will have to work harder to find candidate locations for new files and extents
- Possible prevention of file placement
- System domain volume set, could be consumed by SPOOL
- If there is no transient space available, system will halt or hang

LUND PERFORMANCE SOLUTIONS

WHAT YOU NEED TO KNOW, WHEN YOU NEED TO KNOW IT.

Fragmentation - Before Shot

```
Ldev   16:   (Each chunk represents 1,261 pages, or 4.9 MB)
    [PppppppppPPPPpppPPppPpPPPPPPPPpppppPPpppppPPppppppPpPPPPPpppppPp]  0
    [PppPPppppppppppPPPPPPppPPPPpPPPpppPPPPPPppppppppPPppppPPpppppppppp]  1
    [ppppppppppppppppppppppppppppppppPpppppppppppPPPppppppppppPppPPPPPp]  2
    [ppppppppPpPPPppppppppPpppppPpppppppppppppppPpPPpPppppPPppppPPPPpppp]  3
    [pPppppppppppppppppppppppPppppPPppppppppppppppPpppppppppPPPPPPPpPPPp]  4
    [pppPppPPPPppppPppPpPppPPPPPPPPPPpppppppPPpppppPPPPPpppPppppppppp]  5
    [PPPPpppPPPPPpppppppppppppppppPppppPPPPPPPPPPPPPPPPPppppPPpPPpppppPPp]  6
    [ppppppPpppPPpppppPpPPPPpppppPpppppppPppppPpppppPPppppPPpppppppppP]  7
    [ppPpPPPPPPPPpppppppppPpppppPppppppppPppppppppPpppppppppppPPppppppP]  8
    [ppppppppppppppppppPppppppppppppppppPppppPppppPPpppPpPppppppppppPPPP]  9
    [ppppppPPPpPpPpppppPpppppPpppppppPpppPPPPPPpPppPppPPpPPpPPppPPppPP] 10
    [pPPPPPPPPPPPPPPppPppppppppPPpPPPPPppPppPp*pPp**pPPppPppPPPPPppPp] 11
    [*pPp*pPPp**pPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPpPPPPPPp] 12
 Col[0....+....10...+....20...+....30...+....40...+....50...+....60..] Row
 Available Permanent Disk: 464 MB (1,904,064 sectors); (disk size: 4,095 MB)
```

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LUND PERFORMANCE SOLUTIONS

WHAT YOU NEED TO KNOW, WHEN YOU NEED TO KNOW IT.

Fragmentation - After Shot

```
Ldev   16:   (Each chunk represents 1,261 pages, or 4.9 MB)
    [PPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPP]  0
    [PPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPP]  1
    [PPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPP]  2
    [PPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPP]  3
    [PPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPP]  4
    [PPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPP]  5
    [PPPPpppPPPPPpppppppppppppppPppppPPppPPPPPPPPPPPPPpppPPppPppppppPPP]  6
    [pppppppppppPPppppPppPPPppppppppPPppppppPPpPPppppppPpppPPpPppPPpppp]  7
    [ppPppPpPpPPpppppppPppPPPpppPppPppppPppppppppppppppppppppppPppppppP]  8
    [ppPPPpppppppppppppPPppppppppppPppPPppppPpPpPPPppPpPppppPPPppPPPPP]  9
    [pppppppPpPPppPpppppppPp*pPPPPPPPPPPPPPpPPPPPPPPPPPPPPPPPpPPPpPPPPPP] 10
    [PPPPPPPPPPPPPPPPPpPPPppPPPPPPPPPPPPPPPPPPPPPPp********************] 11
    [**************************************************************] 12
 Col[0....+....10...+....20...+....30...+....40...+....50...+....60..] Row
 Available Permanent Disk: 484 MB (1,984,336 sectors); (disk size: 4,095 MB)
```


LUND PERFORMANCE SOLUTIONS

WHAT YOU NEED TO KNOW, WHEN YOU NEED TO KNOW IT.

Fragmentation - Results

TRIM Results

As you can see from the summary statement below, there were 919 files that were “trimmed” producing a large disc and I/O efficiency savings. A complete list of trimmed files has not been provided in this report but is available upon request.

```
Trimmed 919 files (out of 74,647), saved: 30,699 pages (119.9 MBs)
 (found 1,490 files that should not be trimmed)
 (Failed to open 2,394 files for trimming)
```

LUND PERFORMANCE SOLUTIONS

WHAT YOU NEED TO KNOW, WHEN YOU NEED TO KNOW IT.

Robelle's HowMessy

HowMessy/XL (Version 2.5) **Data Base: DB.DB.DV** Run on: THU, NOV 30, 2000, 6:10 PM
for IMAGE/3000 databases By Robelle Consulting Ltd. Page: 2

Data Set	Type	Capacity	Entries	Load Factor	Secon-daries (Highwater)	Max Blks	Blk Fact	Search Field	Max Chain	Ave Chain	Std Dev	Expd Blocks	Avg Blocks	Ineff Ptrs	Elong-ation
ADDR-WHO-A	**Ato**	**1250003**	**990303**	**79.2%**	**31.1%**	**13**	**51**	**ADDR-WHO**	**10**	**1.45**	**0.71**	**1.00**	**1.46**	**35.2%**	**1.46**
ADDRTYPE-WHO-A	Ato	1467581	1066065	72.6%	28.9%	1	87	ADDRTYPE-WHO	8	1.41	0.67	1.00	1.30	23.2%	1.30
AFFILIATION-A	Ato	270001	123199	45.6%	27.4%	0	94	AFF#	7	1.38	0.65	1.00	1.37	29.3%	1.37
AGECATDEF-A	Ato	5639	42	0.7%	0.0%	0	60	AGECATDEF	1	1.00	0.00	1.00	1.00	0.0%	1.00
AGEKEY-A	Ato	5639	25	0.4%	0.0%	0	50	AGEKEY	1	1.00	0.00	1.00	1.00	0.0%	1.00
ALT-KEY-A	Ato	750019	594628	79.3%	31.2%	4	105	ALT-KEY	8	1.45	0.71	1.00	1.23	17.9%	1.23
AUTH-DETAIL-A	**Ato**	**1354127**	**1077907**	**79.6%**	**31.1%**	**18**	**19**	**DETAIL-AUTH#**	**9**	**1.45**	**0.71**	**1.00**	**1.44**	**33.7%**	**1.44**
AUTH-TEMPLATE-M	Man	5639	189	3.4%	0.0%	0	18	TEMPLATE#	1	1.00	0.00	1.00	1.00	0.0%	1.00
AUTHORIZATION-A	Ato	765857	560255	73.2%	29.2%	6	26	AUTHORIZATION#	7	1.41	0.68	1.00	1.39	30.6%	1.39
BENEFIT-M	Man	5639	1850	32.8%	14.8%	2	10	BENEFIT	4	1.17	0.44	1.00	1.01	1.1%	1.01
BENEFIT-PKG-M	Man	5639	70	1.2%	0.0%	0	16	BENEFIT-PKG	1	1.00	0.00	1.00	1.00	0.0%	1.00
BOARDCERT-A	Ato	5639	11	0.2%	0.0%	0	53	BOARDCERT	1	1.00	0.00	1.00	1.00	0.0%	1.00

LUND PERFORMANCE SOLUTIONS

WHAT YOU NEED TO KNOW, WHEN YOU NEED TO KNOW IT.

Image Statistics

```
SOS/3000 X.000(c) LPS  WED, MAR 28, 2001,  2:33 PM   E: 00:08:34   I: 00:14
                        Turbo Image Database Detail
DB ID 615   Database Name DB9.DAT.SHADTST              DS Hog M-PRODUCT
        Key Stats for Database                  Key Stats for Hog Dataset
CPU 4.420[3.784]% CPU/I .8534[.8305]ms  CPU 4.095[.<   ]% CPU/I 1.161[.2930]ms
I/s 13.86[12.56]  Ela/I .0009[.0011]s   I/s 9.438[.<   ]  Ela/I .0012[.0019]s
                  Activity Against Database by Intrinsic
            Get     Update      Lock      Open      Begin     XBegin      Find      Ctrl
            Put     Delete    Unlock     Close       End       XEnd      Info  Rollback
CPU/I   .90[.81] 2.4[2.4] .18[.26] .< [.< ] .16[.18] .< [.< ] .< [.< ] .< [.< ]
       2.4[2.2] 2.0[1.9] .20[.21] .< [.< ] .16[.14] .< [.< ] .< [.< ] .< [.< ]
Ela/I   .< [.< ] .< [.< ] .< [.< ] .< [.< ] .< [.< ] .< [.< ] .< [.< ] .< [.< ]
        .< [.< ] .< [.< ] .< [.< ] .< [.< ] .< [.< ] .< [.< ] .< [.< ] .< [.< ]
Int/s   2.3[2.1] 1.1[1.0] 3.5[3.1] .< [.< ] .43[.42] .< [.< ] .< [.< ] .< [.< ]
       1.2[1.0] 1.1[1.0] 3.5[3.1] .< [.< ] .43[.42] .< [.< ] .< [.< ] .< [.< ]
                  Activity Against Database by Process
PIN      #DS  I OK%    CPU%   Int/s   Put/s   Del/s Lock/s  Get/s   Upd/s   Oth/s
 84        1 10.00    .4610  1.306   .1452   .0726  .3630  .2178   .1452   .3630
 90        1 10.00    .5966  1.597   .1452   .1452  .4356  .2904   .1452   .4356
 93        1 10.00    .4068  1.089   .0726   .0726  .2904  .2178   .1452   .2904
 98        1 10.00    .4610  1.524   .1452   .0726  .3630  .2178   .1452   .5808
TOTAL   10 LOGGED PROCESSES.

Enter Command:
 LIST      FREEZE     HELP     DATABASE     PROCESS    MPE/iX     SCREEN     MAIN
 HARDCOPY  DISPLAY             MAIN         DETAIL     COMMAND    MENU       SCREEN
```

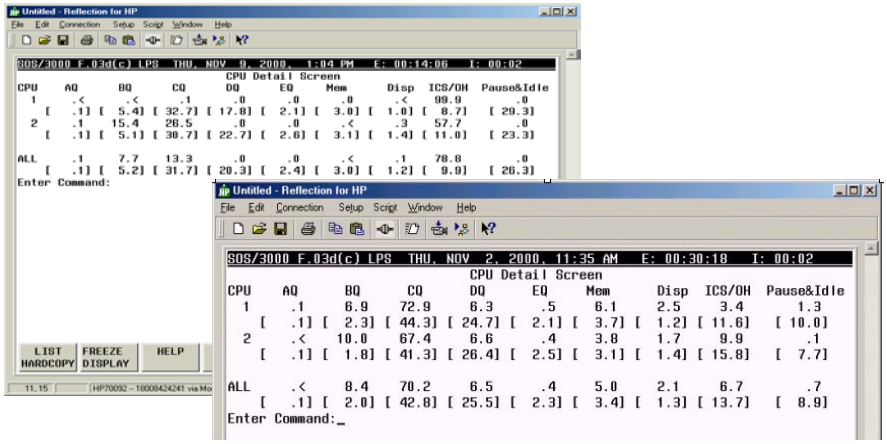
Get - DBGET
Put - DBPUT
Update - DBUPDATE
Delete - DBDELETE
Lock - DBLOCK
Unlock- DBUNLOCK
Open - DBOPEN
Close - DBCLOSE
Begin - DBBEGIN
End - DBEND
XBegin - DBXBEGIN
XEnd - DBXEND
Find - DBFIND
Info - DBINFO
Ctrl - DBCONTROL
Rollback - DBXUNDO

- Review IMAGE/3000 process statistics
- Slight overhead in collection for log file info, switch on

LUND PERFORMANCE SOLUTIONS

WHAT YOU NEED TO KNOW, WHEN YOU NEED TO KNOW IT.

Extreme Overhead - XM writes



- Dual Processor system, normal activity for ICS/OH 3% to 6%
- Peaks every two minutes, as high as 99.9 on one processor

LUND PERFORMANCE SOLUTIONS

WHAT YOU NEED TO KNOW, WHEN YOU NEED TO KNOW IT.

Conclusion

- Know your environment → what activity must complete at sacrifice of all other?
- Begin measurement NOW to set baseline
- Always evaluate performance from all perspectives
  - Interactive
  - Reactive
  - Proactive
- Avoid potential disasters