Oracle® Hyperion Financial Management Virtualization Whitepaper

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TABLE OF CONTENTS

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OVERVIEW

The purpose of this document is to explain the usage and benefits of virtualization technologies on an Oracle® Hyperion Financial Management (HFM) deployment. This document is not intended to be a source of best practices nor a recommendation for application deployment. It is intended to provide a solid foundation of technical information regarding virtualization deployment solutions.

Virtualization has become a key technology,enabling organizations to deploy their enterprise application more quickly and manage it more efficiently. With multiple virtual machines running on a single set of hardware, it supports scalable, highly efficient and lower-cost deployments.

Historically, and typically, virtualized environments were ideal for Development or Test environments. Simple reinstallation by re-deploying a formerly saved image or template after each test run is a key driver for these test environments. However, many Production environments are beginning to take advantage of virtualization.

When deciding on the environment configuration, many customers tend to separate the Production environment from the Test environment. In a typical Production environment configuration, dedicated clusters and servers are used to ensure that specified resources (CPU and RAM) are guaranteed at the individual server level. During peak loads, additional resources can be allocated and managed to ensure maximum performance and utilization.

In most cases, the Production environment would have active load balancing with 100% full server redundancy. In a typical Test environment, since high availability is seldom needed, a shared single physical server with no redundancy may be sufficient.

Various system virtual machine software solutions are available in the market now. Among them are Oracle VM, VMware, and Microsoft Virtual Server, all providing virtualization technology. Oracle VM is a leading server virtualization software supporting both Oracle and non-Oracle applications. Oracle VM is the only software based virtualization solution that is fully supported and certified for Oracle Real Application Clusters.

BENEFITS

In most virtualization environments there are fewer large physical machines with ample amounts of memory used to configure many virtual machines. This allows for full leverage of the investment made in the computer hardware by consolidating multiple servers as separate virtual machines. The cost savings associated with having fewer physical servers is an important benefit.

Ease of installation and configuration from one virtual server to another simplifies maintenance, reduces IT complexity and minimizes IT support resources.

By allowing multiple operating systems to run concurrently on a host computer, the potential problem of interference when different services are run separately is avoided.

During peak loads, additional resources can be allocated from one server to another to guarantee maximum performance and utilization. In the typical Hyperion Financial Management application environment, most HFM customers are heavy peak users during their financial closing cycle. Therefore they can easily allocate additional resources from one virtual server to another during peak load to maximize performance and concurrent usage. The ease of resource reallocation in a virtual environment is a major benefit for HFM users.

Rapid provisioning allows for reduction in deployment time. Deployment templates are often used to simplify the deployment process. It also can respond more rapidly to business changes. The increase in ROI will also reduce lifetime total cost of ownership.

With Server Consolidation in virtualization, fewer physical servers need to be backed-up and replicated on a regular basis. Complete backups can be managed on a daily basis while full disaster recovery can easily be done in a short period of time. This provides a faster backup procedure and a simpler, more reliable recovery process of critical applications.

Virtualization is not simply an extension of physical infrastructure but instead can bring a host of extra benefits to data protection. This is extremely important for HFM applications as HFM is a data sensitive application where prompt and reliable disaster recovery process is mission critical. Virtualization provides the extra benefits to data protection needed for the HFM customers.

HFM VIRTUALIZATION TESTING

To ensure that Hyperion Financial Management will also take advantage of the benefits offered in virtualization, various testing was done using both the HFM 11.1.1 release and HFM 11.1.2 release.

HFM 11.1.1 TEST RESULTS

The first test set was done by configuring an HFM application to run under the Oracle VM environment. The test was completed by deploying one physical server with 4-CPU hosting two Oracle Virtual Machines –Windows 2003 and Linux server – each configured with 4 GB RAM.

Testing features included Data Load, Journals, Web Grid, Web Form, Financial Report and consolidation. Various processes were invoked for duration of 5 hours to ensure that the target of 40 concurrent users was reached before the next iteration began.

The target CPU usage was at 75% to 80% with 40 concurrent users mark. Increasing the concurrent users to 50 increased the CPU usage to 90%+. Hence, to avoid overloading the CPU, the test was kept at the target CPU usage with the 40 concurrent users in the system.

The test results showed that most of the tasks were performed within 1 to 3 seconds. Only a few tasks took longer than 5 seconds to perform. The memory usage remained stable during the entire test. A Windows VM with 4 GB memory was able to comfortably run 40 mixed-workload interactive users with CPU utilization within the 75% to 80% range.

HFM 11.1.2 TEST RESULTS

The second test set was performed on a 2-tier EPM configuration over 2 physical servers. Both servers were configured using OVM 2.2.1. The application server is a virtual server with 2 dual-core 64-bit CPU and 7GB of memory. The database server, hosting the Oracle DB 11gR2, is a virtual server with 2 dual-core 64-bit CPU and 4 GB of memory.

The HFM application used for testing was based on a customer application with 1000+ entities and 2000+ accounts. Testing features included read and write operations on Web Form, Web Grid and Consolidation.

There were 42 concurrent virtual users included as part of the testing process. The system was set with pacing intervals and concurrency to represent a 100-user system. In a typical HFM application environment, a concurrent usage of 30-40% is expected. Therefore, the 42 virtual user test mimicked a workload equivalent to a real-world 100-user system at peak time.

The test results showed that HFM was able to perform properly with acceptable performance under the OVM environment. Memory usage was stable with acceptable throughput for the entire process. There is no functional regression under the OVM environment. (See Appendix for details)

The virtual servers can be easily configured based on HFM customer's IT policies and management requirements. The flexibility of reconfiguration to use more CPU / memory during peak loads to maximize performance and concurrent usage is a major benefit for HFM users.

SUMMARY

Both sets of test results confirmed that HFM applications were able to take advantage of virtualization technologies by running properly with a moderate number of concurrent users within an OVM environment. There is no functional regression using virtualization. The use of virtualization would definitely reduce the total cost of ownership for any HFM system. However, it is still possible to overload hardware by having too many users for the number of virtual machines which will degrade performance and efficiency to unacceptable levels.

HFM CUSTOMER APPLICATION DEPLOYMENT CASE STUDIES

As the adoption of virtualization technology increases, enterprise's of all sizes embrace virtualization to consolidate resources, increase server utilization and reduce the overall cost of ownership. Among the HFM customer application deployments, all have experienced the benefits of major reductions in the physical server count and less need for IT support resources while continuing to maximize business system uptime.

One HFM customer Production environment uses 7 of their 15 virtual servers to maximize performance in one data center, while 5 virtual servers are used for both their Testing and Disaster Recovery environments at a different data center. If they had not used virtual servers, they would have required 12 additional physical servers to support both the Production and Testing environments.

In their virtualized environment they use dedicated VMware cluster with 3 dedicated ESX host servers each with 64 GB RAM. Their Production Environment supports all Applications and Web tiers. CPU and RAM resources are guaranteed at each virtual server level. Additional resources are allocated during peak loads to maximize CPU and RAM utilization.

Their key driver for virtualization was server scalability and high availability that would maximize business performance while minimizing IT support.

Another HFM customer implemented virtual machines for their Testing environment and saved approximately $4200 / server for 6 servers with a total cost saving of $25,200. Going forward, their plan is to use virtual machines in all of the environments including Production, Testing and Disaster Recovery. A total of 20 virtual servers will be used with a projected cost saving of $84,000.

Many other HFM customers have felt the push from their IT department for virtualization. The rationale for implementing a virtualized environment is no longer just for efficiency, server consolidation, disaster recovery and cost saving, it has become standard IT policy.

One HFM customer has benefited from their standard IT policy to implement HFM and FDM v9.3.1 running under VMWare for both of their Production and Testing environments with the same configuration. Although they do not run a dedicated VM host for the Oracle EPM applications, they have not encountered any technical issues directly attributed to virtualization. They use VMWare vMotion for Load Balancing. For Disaster Recovery solution, they simply use block replication of all VMs to a secondary site. They recognized the flexibility provided from virtualization and claimed that it would be as simple as just a click of a button to add more RAM as needed. Depending on the application, they will allocate the appropriate number of CPU and RAM to achieve maximum performance. In the case of the HFM application, they only needed to allocate 2 CPUs and 8 GB

RAM which typically provided them more than 90-95% efficiency with regard to capacity utilization. This increased hardware efficiency is another part of the total cost savings along with the administrative overhead reduction savings. Given their positive experience with virtualization they would highly recommend a virtualized approach to other HFM users.

CONCLUSIONS

Adoption of virtualization technology is expected to increase in future implementations. In a typical EPM environment, HFM users can often take advantage of the simple reallocation of resources during heavy peak load of their financial close cycle to achieve maximized efficiency. Data sensitive applications such as HFM application can surely benefit from the reliable disaster recovery process offered by virtualization. The projected cost savings stemming from reductions in hardware purchase and maintenance costs has prompted many HFM customers to switch. The key driver for virtualization is the powerful combination of maximization of business performance and minimizing of IT support. HFM customers can truly enjoy the benefits of virtualization.

APPENDIX

Additional details are provided below related to the HFM 11.1.2 testing and configuration:

Test Environment

The testing was performed on a 2-tier EPM configuration, where the components were spread over 2 servers. All tiers are Windows 2003 R2 Enterprise x64 Edition based, fully patched at the OS level. All servers (physical & virtual) are connected via 1Gb switched network.

EPM Software Tier (all 64bit)

Foundation (Workspace & Shared Services) 11.1.2 - web/application components.
Financial Management (HFM) 11.1.2 - client, web/application & services components.
Oracle DB Client 11gR2 (11.2.0.1.0)

Database Tier (all 64 bit)

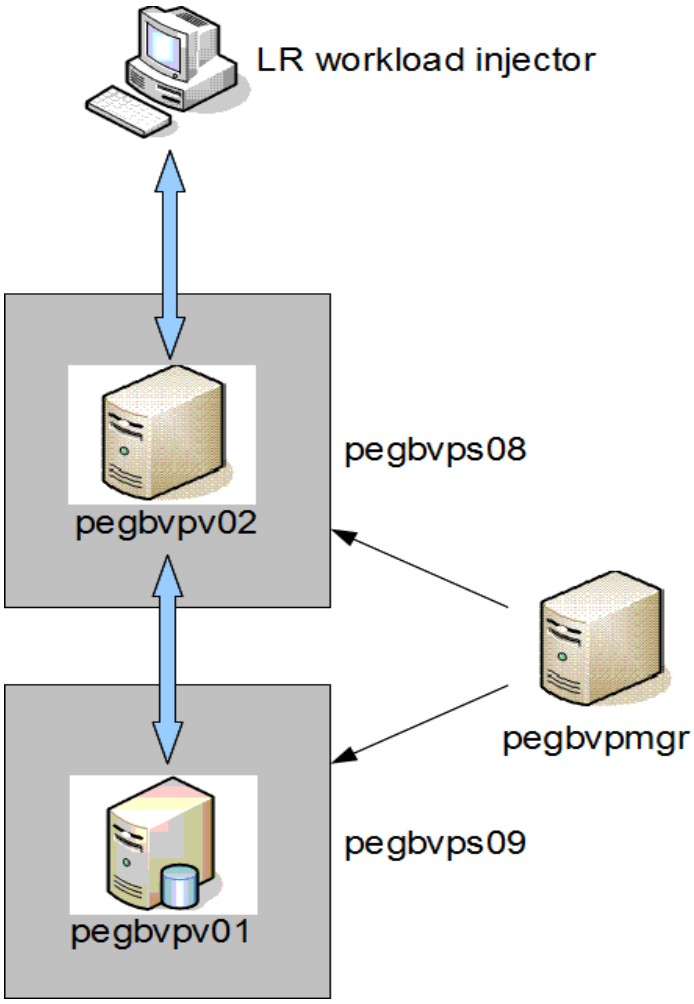
Oracle DB 11gR2 Enterprise

VIRTUAL MACHINE ENVIRONMENT CONFIGURATION

Virtual Server	Physical / Virtual	CPU / Memory	Tier
pegbvpv02	virtual	4 vCPUs / 7 GB	EPM software tier
pegbvpv01	virtual	4 vCPUs / 4 GB	Database Tier
pegbvps08	physical	4 CPUs / 8 GB	Runs pegbvpv02
pegbvps09	physical	4 CPUs / 8 GB	Runs pegbvpv01
pegbvpmgr	virtual	2 vCPUs / 2 GB	OEL 5.2 based OVM Manager node, runs inside another virtual environment

One "CPU" or virtual CPU (vCPU) = one CPU processing core.

Figure 1
Hardware Configuration



Tuning

The following Oracle DB initialization parameters were changed from their defaults:

cursor_sharing = FORCE
nls_length_semantics = CHAR
open_cursors = 5000
processes = 400 (setting sessions to 624)

HFM server-wide memory settings:

MaxNumRecordsInRAM = 10,000,000
MaxDataCacheSizeInMB = 1,500

LoadRunner Test Details

The test set consists of the following scripts:

s01	read-only web form, each vuser working through the same list of 485 base-level entities per iteration.
s02	read large grid, each vuser working though the same list of 12 periods per iteration.
s03	read large grid & submit 10 values, each of the max. 12 vusers using same unique period per iteration.

The main combined workload mix used to create the result sets included the following:

s01	20 vusers
s02	10 vusers
s03	12 vusers
Total	42 concurrent vusers

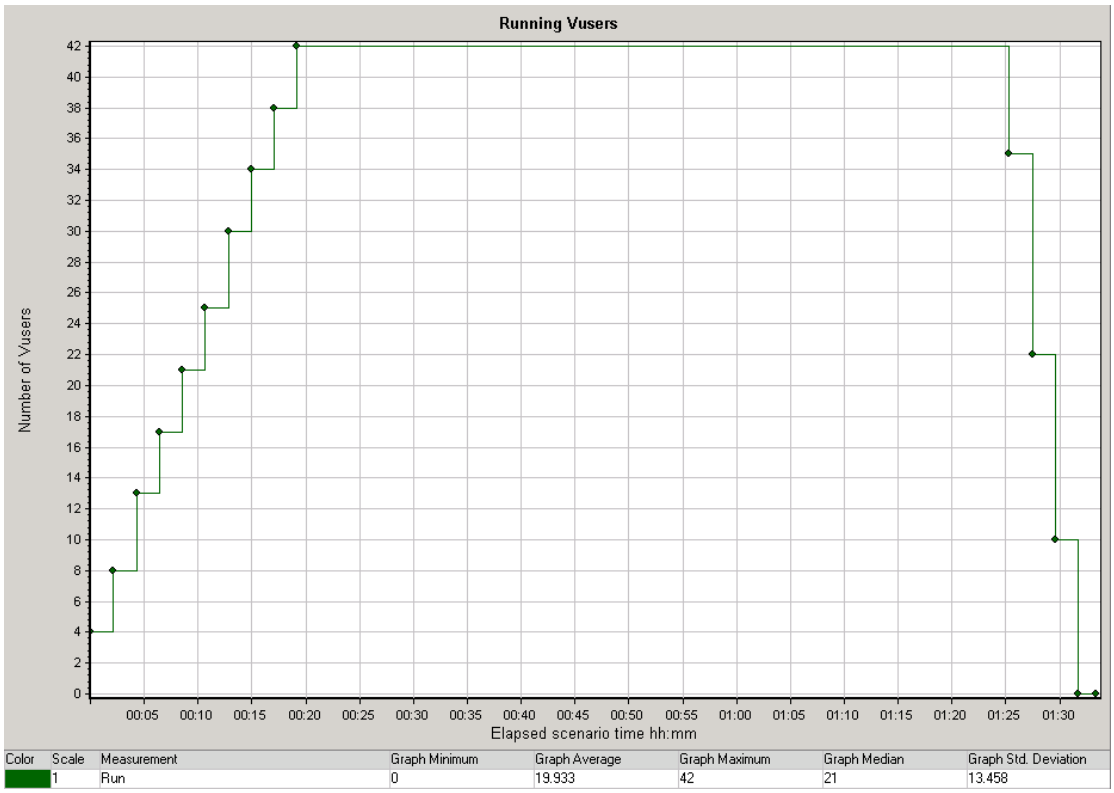
All vusers were set as follows:

1 – 3 second thing time; except s03 commit data step, which was 3-9 seconds
60 – 90 second pacing between iterations
30 second per vuser ramp up
10 second per vuser ramp down

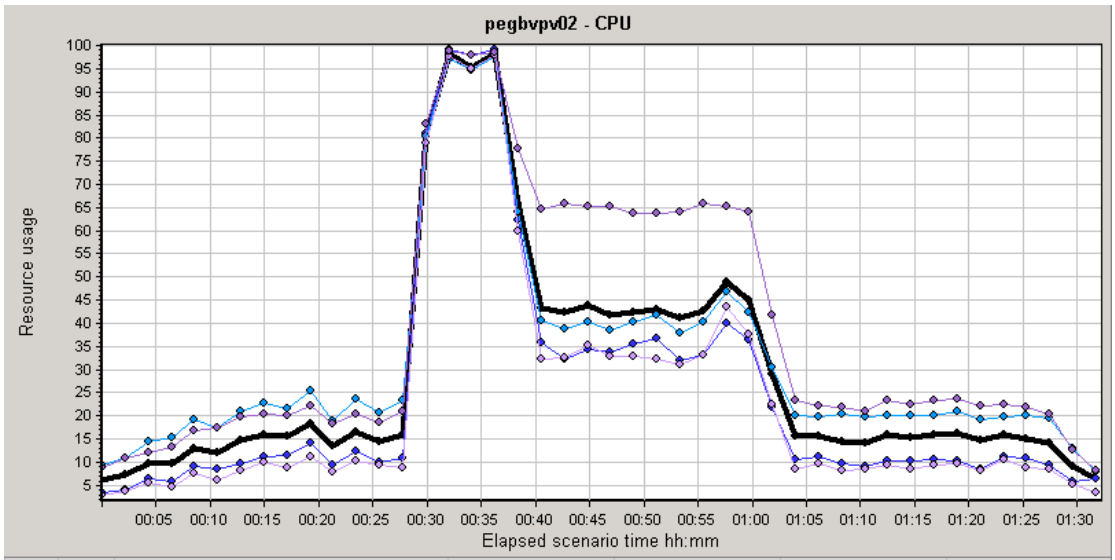
The above setup for users counts, pacing & concurrency represents a **100 user** system.

Test Results

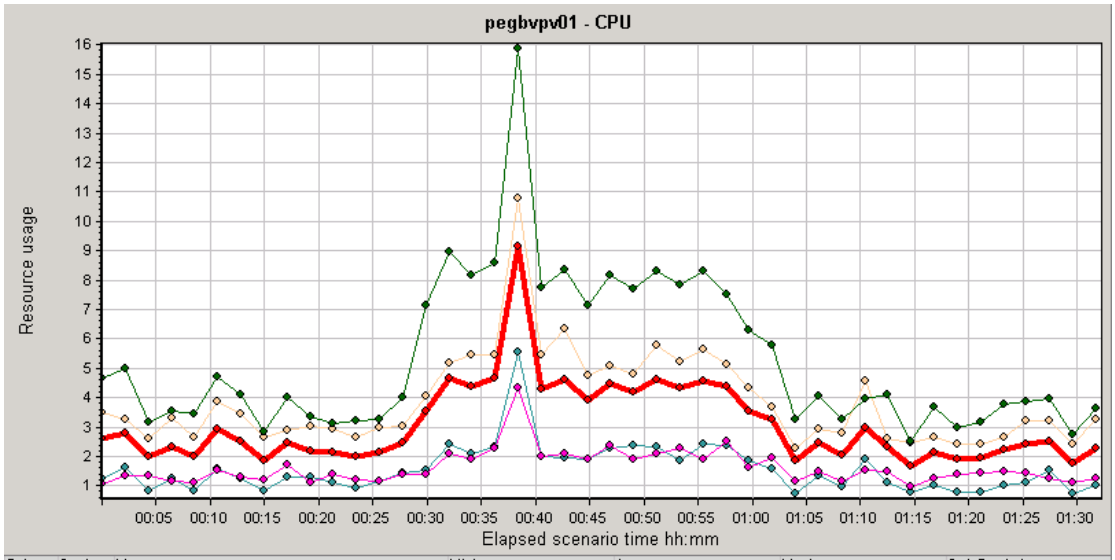
Period:	30/03/2011 05:08:49 - 30/03/2011 06:42:10
Results in Session:	simple_v02_0330_0508.lrr
Duration:	1 hour, 33 minutes and 21 seconds.
Maximum Running Vusers:	42
Total Throughput (bytes):	608,070,832
Average Throughput (b/sec):	108,545
Total Hits:	50,481
Average Hits per Second:	9.011
Total Passed:	7,174
Total Failed:	0
Total Stopped:	0



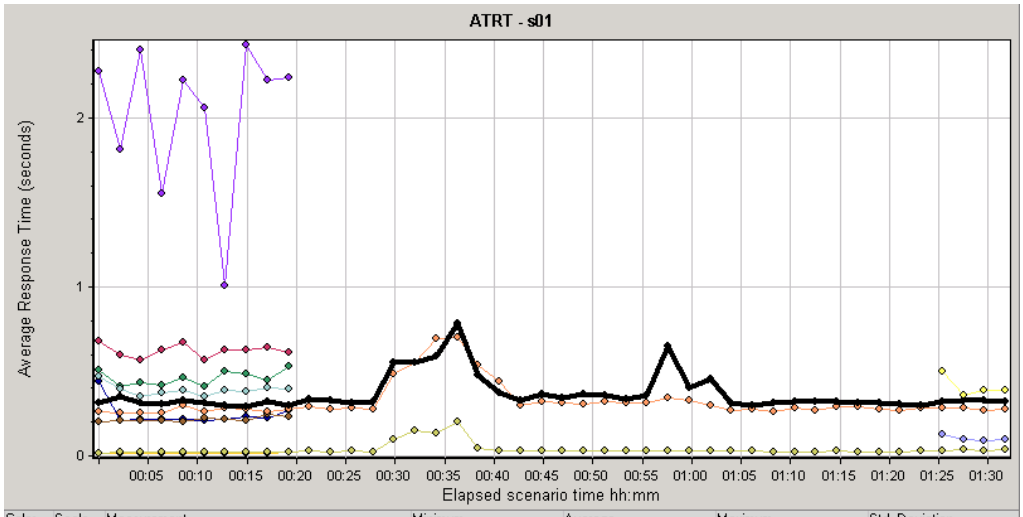
Color	Scale	Measurement	Graph Minimum	Graph Average	Graph Maximum	Graph Median	Graph Std. Deviation
	1	Run	0	19.933	42	21	13.458



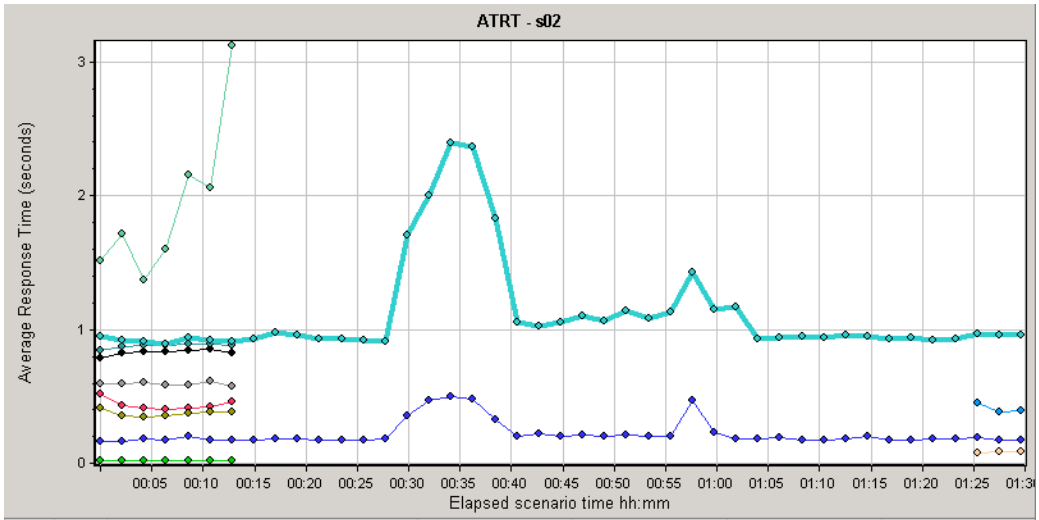
Color	Scale	Measurement	Minimum	Average	Maximum	Std. Deviation
	1	% Processor Time (Processor _Total):pegbvpv02.uk	0	29.287	100	26.779
	1	% Processor Time (Processor 0):pegbvpv02.uk.ora	0.521	24.448	100	27.846
	1	% Processor Time (Processor 1):pegbvpv02.uk.ora	0	31.855	100	25.163
	1	% Processor Time (Processor 2):pegbvpv02.uk.ora	0	23.255	100	27.865
	1	% Processor Time (Processor 3):pegbvpv02.uk.ora	0.521	38.128	100	29.102



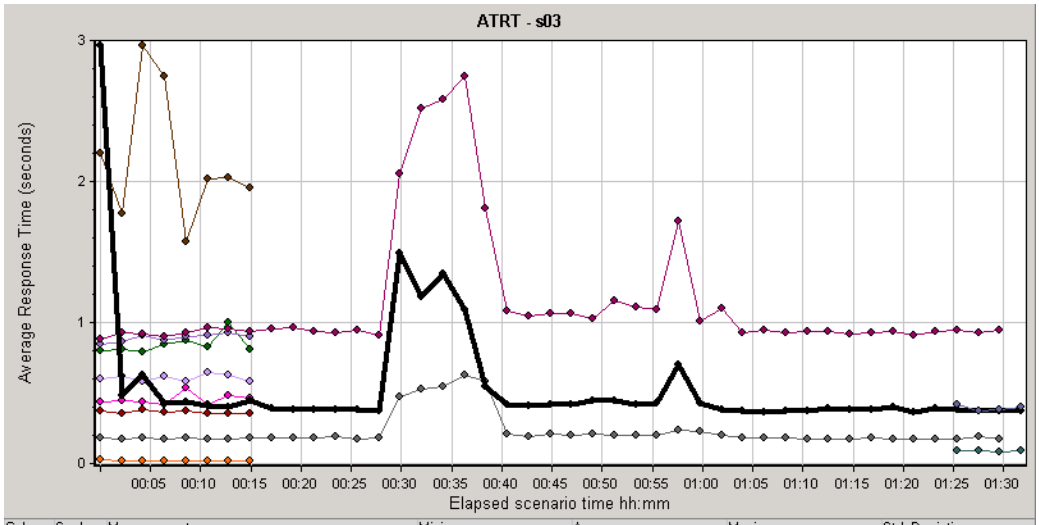
Color	Scale	Measurement	Minimum	Average	Maximum	Std. Deviation
	1	% Processor Time (Processor _Total):pegbvpv01.uk	0	3.087	31.901	3.002
	1	% Processor Time (Processor 0):pegbvpv01.uk.ora	0	1.563	28.125	2.267
	1	% Processor Time (Processor 1):pegbvpv01.uk.ora	0	3.869	36.979	4.204
	1	% Processor Time (Processor 2):pegbvpv01.uk.ora	0	1.62	21.354	1.604
	1	% Processor Time (Processor 3):pegbvpv01.uk.ora	0	5.312	44.271	5.155



Color	Scale	Measurement	Minimum	Average	Maximum	Std. Deviation
	1	s01_001_home	1.009	2.143	2.848	0.432
	1	s01_002_logon	0.404	0.469	0.765	0.085
	1	s01_003_hfm	0.552	0.626	0.731	0.046
	1	s01_004_nav	0.017	0.019	0.04	0.005
	1	s01_005_wdef	0.198	0.252	0.673	0.101
	1	s01_006_pov	0.339	0.394	0.591	0.059
	1	s01_007_povok	0.202	0.223	0.329	0.028
	1	s01_100_pov	0.229	0.337	3.464	0.202
	1	s01_101_find	0.018	0.043	1.819	0.074
	1	s01_102_wdef	0.255	0.377	5.634	0.257
	1	s01_900_blank	0.084	0.101	0.213	0.027
	1	s01_901_logout	0.316	0.401	0.814	0.101



Color	Scale	Measurement	Minimum	Average	Maximum	Std. Deviation
	1	s02_001_home	1.016	1.873	3.125	0.556
	1	s02_002_logon	0.396	0.438	0.611	0.06
	1	s02_003_hfm	0.566	0.59	0.648	0.023
	1	s02_004_nav	0.017	0.018	0.02	0.001
	1	s02_005_grid	0.783	0.829	0.863	0.026
	1	s02_006_pov	0.342	0.367	0.412	0.021
	1	s02_007_povok	0.842	0.875	0.889	0.015
	1	s02_100_pov	0.152	0.223	3.293	0.177
	1	s02_101_povok	0.853	1.132	8.075	0.581
	1	s02_900_blank	0.073	0.08	0.087	0.005
	1	s02_901_logout	0.348	0.4	0.487	0.045



Color	Scale	Measurement	Minimum	Average	Maximum	Std. Deviation
	1	s03_001_home	1.466	2.049	2.964	0.445
	1	s03_002_logon	0.398	0.463	0.633	0.065
	1	s03_003_hfm	0.565	0.603	0.685	0.034
	1	s03_004_nav	0.016	0.018	0.021	0.002
	1	s03_005_grid	0.786	0.854	1.132	0.09
	1	s03_006_pov	0.336	0.362	0.384	0.014
	1	s03_007_povok	0.842	0.896	0.937	0.031
	1	s03_100_pov	0.152	0.232	3.403	0.209
	1	s03_101_povok	0.847	1.174	11.032	0.817
	1	s03_102_submit	0.342	0.5	5.434	0.401
	1	s03_900_blank	0.076	0.087	0.103	0.008
	1	s03_901_logout	0.344	0.383	0.424	0.025

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