

Technical white paper

Asset Manager 9.5x Deployment Sizing Guide



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Introduction

Information on performance is derived from tests performed on released versions only and is therefore intended for reference only. This guide applies only to the Asset Manager 9.50 releases.

Guides for older versions of Asset Manager as well as updated versions of this guide can be found at the following HP website:

<https://softwaresupport.hp.com>

The reference configuration data supplied in this document is based on an Asset Manager out-of-box (OOB) environment, which includes the Web Tier, Web Service and Automated Process Manager (APM).

Individual implementations may consume more resources or require more resources to perform in an acceptable manner. This includes running an implementation on top of tailored version of Asset Manager.

Before going online, a performance test simulating the concurrent user load and transaction rate of actual daily system usage for the tailored application in a test environment is highly recommended. Ignoring this step may result in an environment that is not large enough to support your requirements.

The recommendations described in this document should be considered the minimum requirements that are needed to run Asset Manager effectively.

Asset Manager sizing questions

The following list of questions is designed to gather the information that is required to make recommendations about the overall system architecture that you need for your Asset Manager environment.

Note:

Although not all of the information requested here is required to size the environment, it is useful information to obtain for a thorough architecture recommendation.

1. What kind of environment will be used?
 - A. An on-premise solution administered by internal IT
 - B. An in-house solution administered by HP
 - C. Software as a service
2. What is the expected hardware and software environment?
 - A. Do you plan to operate in separate development, test, and production environments to ensure quality?
 - B. Do you have any disaster recovery, or high availability requirements?
 - C. Do you plan to operate in a virtual environment or on physical machines?
3. Is there any existing hardware to be reused?
 - A. What operating systems are you using? Are these 32-bit or 64-bit operating systems?
 - B. How many CPUs are there per machine?
 - C. How much RAM is available per machine?
 - D. What relational database management system is used currently?
 - E. If the answer to D is yes, is it a cluster environment?
4. Can you provide a Microsoft Visio diagram of your network with minimum latency and bandwidth values?
5. Do you plan to use any of the following integrations together with Asset Manager? If so, which ones?
 - A. Messaging system: SMTP, MAPI or SMTP
 - B. Active Directory (LDAP) integration or single sign-on
 - C. Data import of persons or organizations from an HR or other environment
 - D. Integration to Universal Configuration Management Database (UCMDB)/CMS
 - E. Integration to other HP Software solutions
 - F. Imported configuration items (CIs)
 - G. Others
6. Do you have requirements for any of the following components and modules?
 - A. Additional languages. If yes, which languages do you expect to operate?

- B. IT specialists (Technicians, Administrators). If yes, what is the overall number of IT specialists? (Technicians, Administrators)
 - C. Named/Floating Users. If yes, how many of them should have guaranteed access to Asset Manager?
 - D. What are your module-level user requirements for Asset Manager?
7. How many users will have access to Asset Manager Web Tier?
 8. What is the geographical breakdown of your web user base in workday bandwidth (7x24)?
 9. What is the **concurrent** users of Asset Manager Web Tier / windows client?
 10. What is the concurrent user number of Asset Manager based on each module?
 11. What are your expected data volumes (including attachments) for the following modules?
 - A. Cable and Circuit
 - B. Contracts
 - C. Financials
 - D. Portfolio
 - E. Procurement
 - F. Reconciliation Proposal
 - G. Software Assets
 12. What are your expected increasing speed of data volumes for the above modules? (e.g.: 50 procurement requests per day / 300 software installations per day)
 13. Will you keep history in Asset Manager? (In Asset Manager, the history of changes made to the fields and links of a table can be tracked and recorded.)
 14. What are your reporting requirements?
 - A. The bundled Crystal Reports solution
 - B. In-tool reporting
 - C. An external reporting solution
 - D. Data replication into a data warehouse
 15. Which browser are you using?
 16. Do you use Citrix in your network?

Note:

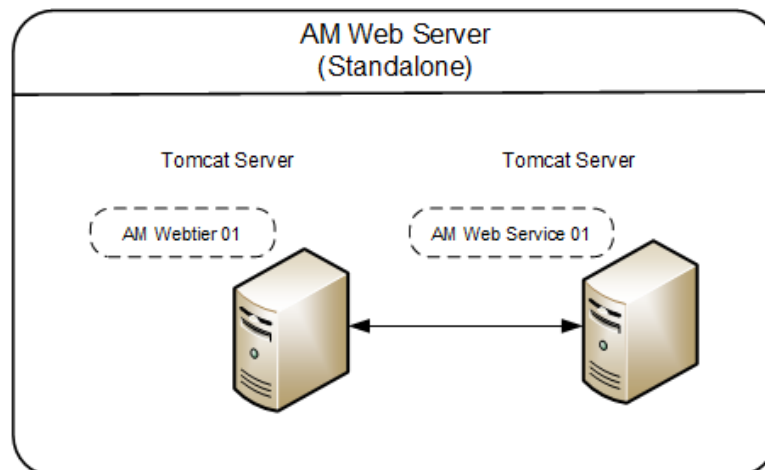
Use the calculation in the "Rules of thumb" section to estimate the ratio of Self Service users to concurrent users.

Asset Manager deployment sizing

Asset Manager Deployment models

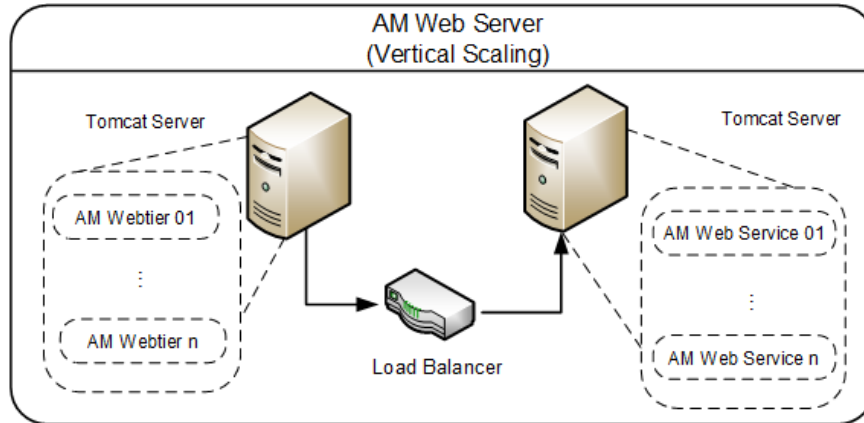
Standalone mode

The Asset Manager standalone model comprises only one Asset Manager Web Tier configured on a Tomcat server and connecting with one Asset Manager Web Service on another Tomcat server. This is the simplest deployment model; you may consider it the base model.



Vertical scaling mode

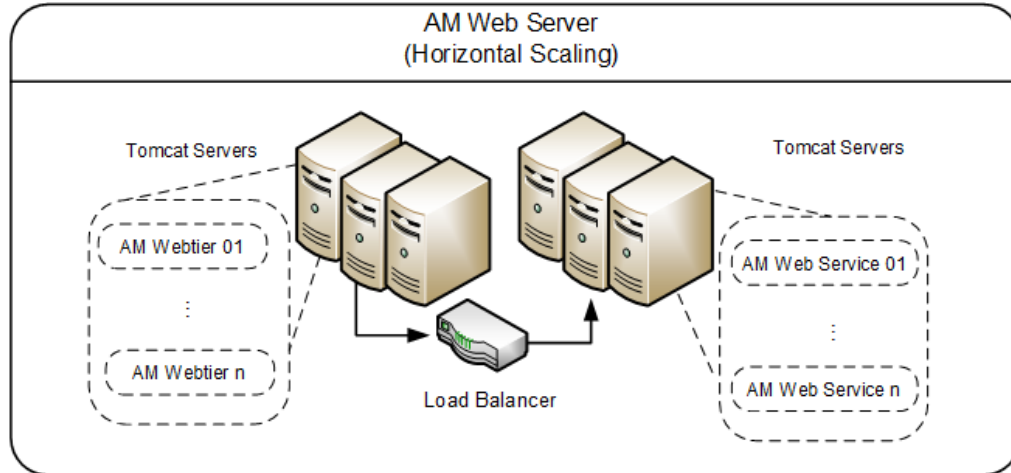
The Asset Manager vertical scaling model comprises multiple Asset Manager Web Service and multiple Asset Manager Web Tier. Each Web Tier and Web Service sits in a single Tomcat instance. This implementation is typically used in small to medium-sized environments where hardware system resources are limited. This implementation supports as many client connections as the Asset Manager Web Server has available system resources.



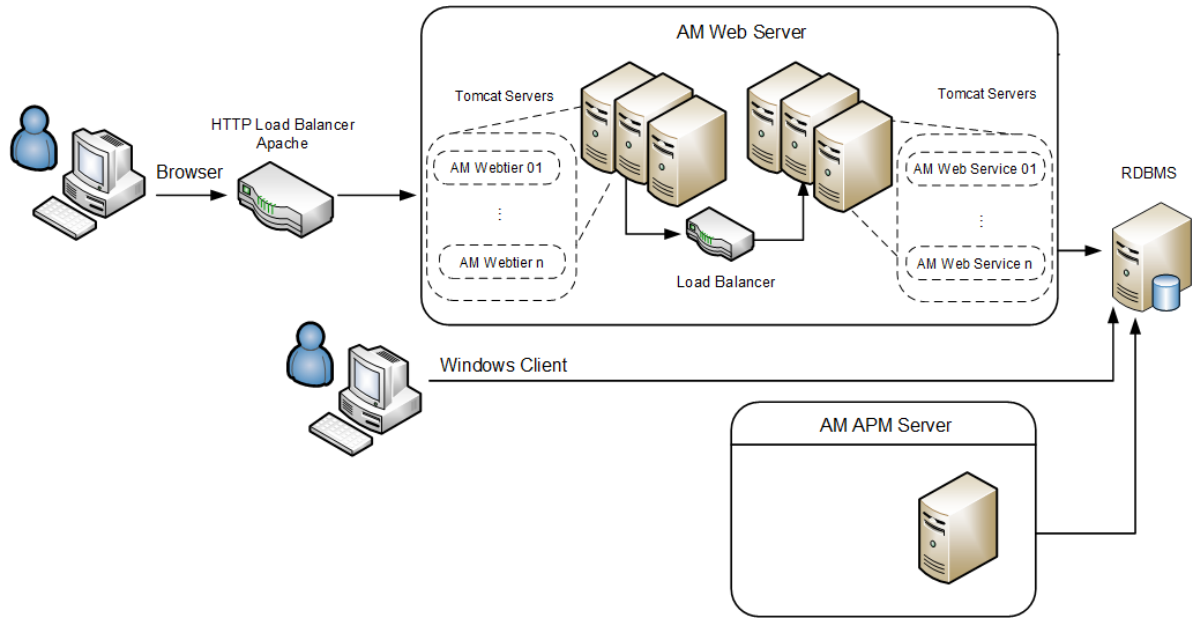
Horizontal scaling mode

The Asset Manager horizontal scaling model comprises multiple Asset Manager Web Service and multiple Asset Manager Web Tier. Each Web Tier and Web Service sits in a single Tomcat instance. And the Tomcat instances are running on multiple servers.

A horizontal scaling implementation is typically used in large environments in which system scalability and resilience are concerned. A horizontal scaling implementation can support as many client connections as the sum of the individual Asset Manager instances can support. For example, if each instance can support 250 client connections and there are 4 instances, the system can support 1000 client connections. A horizontal scaling implementation has improved resilience features, such as the ability to stop and start the load balancer process without causing a total system outage and the ability to add a new servlet container process to a virtual group when the system is running.



Sample Asset Manager deployment diagram



In this diagram, the following events occur:

- The Asset Manager Windows® client (GUI) connects directly to the RDBMS server.
- Web browser connects to the Asset Manager Web Tier server. The Web Tier server connects to the Web Services server. Notice that some custom-made, end-user applications could connect directly to the Web Services server.
- The Asset Manager Web Tier and Web Services logical servers can be installed on the same physical server or on different servers. There can be one or multiple instances of each Web Tier and Web Services logical server.
- The Asset Manager Automated Process Manager (amsrv, aka: APM Server) connects directly to the RDBMS server. There is no direct connection between the Asset Manager Windows GUI or Web Client and the Asset Manager Automated Process Manager.

Asset Manager Web Service and Web Tier Server

Minimum required reference configurations

The following hardware is used to obtain the memory and CPU minimum values. This hardware is not intended to provide a specific recommendation, but is intended as a guideline.

Resources required for the RDBMS server, such as CPU and memory, are very dependent on the implementation. Factors that may impact required hardware resources in Asset Manager systems can include custom access restrictions, configuration of the lists, custom code for scripts, and wizard implementation. Refer to the Asset Manager Tuning Guide for further information on those topics.

Note: The sizing recommendations given here are for Asset Manager version 9.50.

- All in one (0-100 concurrent users)
We recommend that small customers (that is, customers that have fewer than 100 concurrent users) use a small environment deployment in a Windows environment. In a small environment deployment, the following products can be deployed on a single machine: Web Service, Web Tier and the database.

Windows and Linux

All in one Server: HP DL360 – 16 CPU cores, 32GB RAM, 4 x 146GB RAID 10

- Small (100-250 concurrent users)

Windows and Linux

Asset Manager

Web Service and Web Tier: HP BL460c – 6 CPU cores, 16GB RAM, 70GB HD

RDBMS: HP DL585 – 6 CPU cores, 16GB RAM, 4 ~ 6 x 146GB RAID 10

- Medium (250 – 500 concurrent users)

Windows and Linux

Asset Manager

Web Service and Web Tier: HP BL460c – 12 CPU cores, 24GB RAM, 120GB HD

RDBMS: HP DL585 –12 CPU cores, 24GB RAM, 6~8 x 146GB RAID 10

- Large (500 – 1,000 concurrent users)

Windows and Linux

Asset Manager

Web Service and Web Tier: HP BL460c – 24 CPU cores, 32GB RAM, 120GB HD

RDBMS: HP DL585 – 24 CPU cores, 32GB RAM, 8 x 300GB RAID 10

- Very Large (more than 1,000 concurrent users)

At this size, we recommend that you run Asset Manager on multiple machines in vertical or horizontal scaling mode.

Virtualization

To efficiently run all Asset Manager components in a virtual environment, add at least 30% to their recommended sizing.

Asset Manager help server

- HP DL360 – 2 CPU cores, 2GB RAM, 55GB HD, see "Rules of Thumb."

Asset Manager Automated Process Manager (amsrv)

- HP DL360 – 2 CPU cores, 4GB RAM, 55GB HD, see "Rules of Thumb."

Asset Manager Automated Process Manager with Connect-It on a shared server

- If you plan to use Connect-It with several scenarios:
HP DL360 – 4 CPU cores, 8GB RAM, 70GB HD, see "Rules of Thumb."
- If you plan to use Connect-It intensively with many scenarios running in parallel:
HP DL360 – 8 CPU cores, 16GB RAM, 70GB HD, see "Rules of Thumb."

Rules of thumb

(All the web related application servers in this section, if not mentioned, are of 64-bit.)

Asset Manager Web Service Server

A standard Web Service Server with 250 concurrent users on Tomcat web application server requires approximately 4GB of RAM, which is distributed in the following way:

- 1.75 GB for Java Virtual machine (JVM), 1.5 GB is set as initial and max heap size.
- 700~900 MB for the process overhead and cache (see the note below)
- 5~10 MB per connection (see the note below)

Asset Manager Web Service uses connection pool to utilize the database connection in a highly efficient way. Connections in the connection pool will be released after each atomic transaction such as getting a list, getting a record detail, regardless the user profile. So the maximum size of connection pool (CnxPoolMaxSize in aamapi.ini) becomes a key parameter to control the capacity of Asset Manager Web Service Server.

In test environment, we recommend that you start with lower value of max size of connection pool (CnxPoolMaxSize) in order to identify the actually connection pool required by the specific customer and scenario.

In production environment, on any 64-bit operating system that is listed in the Asset Manager compatibility matrix, we recommend that you start with about double size of your planned size for the max size of connection pool (E.g.: 500 for a standard Web Service Server with 250 concurrent users). Also, to reduce the performance impact of allocating and releasing memory after each atomic transaction, we recommend to set the idle connection pool size (CnxPoolIdleSize) to a value slightly smaller than max size of connection pool (CnxPoolMaxSize - 5).

Sample configuration for production environment:

Concurrent User Count	CnxPoolIdleSize	CnxPoolMaxSize
250	CnxPoolMaxSize - 5	500 or higher

For more configuration details of connection pool, please find in the help server shipped with Asset Manager 9.50.

The Web Service configuration that was used to determine the sizing recommendations is based on a Tomcat web application server with four processes running 1.5GB of heap size each, and an Apache web server for load balancing the network traffic to each instances (by using the Apache software load balancer.) To support additional users and higher loads, add machines that have additional Tomcat Java virtual machines to create a web farm as required.

Although 64-bit version of Asset Manager Web Service supports more than 1,000 concurrent users on a single Tomcat instance, for high availability and resilience consideration, we recommend that you use a vertical scaling model or horizontal scaling model to deploy several small sized Web Service on separate Tomcat instances.

Notes:

- Increases in cache and user connection memory usage may be caused by exporting or handling large volume of data. These activities have a direct effect on the number of maximum connections that each Web Service Server can support.
 - Most UNIX-like operating systems, including Linux and HP-UX, provide ways to limit and control the usage of system resources such as threads, files, and network connections on a per-process and per-user basis. These limits prevent single users from using too many system resources. Sometimes, these limits have low default values that can cause a number of issues if there is a high number of concurrent users. We recommend that you use the **ulimit -a** command to check the resource limit in the operating system, and ensure that the resources are sufficient for Asset Manager Web Servers. We recommend that the value set by the **ulimit -d** command is over 2GB or “unlimited” mode.
 - The network latency between Asset Manager Web Service and the database server has a significant impact on the overall system performance. For example, every 5ms latency between the Asset Manager Web Service server and the database server will double the login time. Therefore, we highly recommend that the network latency between the Asset Manager Web Service server and the database server is less than 1ms.
 - If you are using horizontal scaling mode, we highly recommend that the network latency between each Asset Manager Web Server is less than 1ms.
-

Asset Manager Web Tier

The Asset Manager Web Tier configuration that was used to determine the sizing recommendations is based on a Tomcat web application server with four processes running 2.5 GB of heap size each, and an Apache web server for load balancing the network traffic to each instances (by using the Apache software load balancer.) . To support additional users and higher loads, add machines that have additional Tomcat Java virtual machines to create a web farm as required.

For Java virtual machine versions, compared to Java 8, Java 7 has been proven to work more stably with the latest Asset Manager. So Java 7 is recommended for deployment in production environment.

For memory consumption, there are also two additional settings need to be cared:

- The default Java virtual machine perm size is not enough, please at least start with 128 MB.
`-XX:PermSize=128M`
- From 9.50 release, in order to enhance front end performance in high latency environment, Asset Manager Web Tier starts to combine separate javascript files and css files into single files. To make your web servers more consistent on performance, prepare background scheduled jobs to clean the old combined javascript and css files in the following path every two days at least:
`\tomcat\webapps\AssetManager\granulecache\`

For CPU utilization, Web Tier consumes about 2~3 times of Web Service Server for the same number of concurrent users. (For example: 250 concurrent users.) Therefore, CPU utilization need to be considered if you want to implement Web Tier on a separate server.

Asset Manager Record Search

We strongly recommend that you deploy the Asset Manager Record Search on separate Tomcat servers for stability, high availability, and performance consideration.

Asset Manager Help server

We recommend that you deploy the Asset Manager Help server on the Apache web server or Internet Information Service (IIS). Additionally, we recommend that you configure the Help server to run on one of the machines that hosts the Web Tier, although you should ensure that the Help server is accessible from all Asset Manager clients. You can also configure the Help server to run on a standalone machine that uses a small machine configuration.

RDBMS server

The RDBMS server sizing that is specified above represents the configurations that were used during the benchmarking runs on the OOB Asset Manager system. You should plan the storage requirements of the actual servers that you will use in a production environment based on expected data volumes, including attachments. See “appendix_” for more details on disk usage. The CPU and memory requirements for the selected database should be based on the recommendations of the database vendor.

Asset Manager Windows Client and connection to database

As a traditional tool, Windows Client does not require too much resource on client side.

But there are several considerations while using Windows Client:

- The network latency between Asset Manager Windows Client and the database server has a significant impact on the overall system performance. The impact is similar to the network latency between Web Service server and database server. Therefore, we highly recommend that the network latency between the Asset Manager Windows Client and the database server is less than 1ms.
- Modern RDBMS support different process models to provide higher capacity with little trade off on response time:
 - For SQL Server, see “max worker threads” to get more details.
 - For Oracle, see “About Dedicated and Shared Server Processes” to get more details.

Asset Manager Automated Process Manager (amsrv)

In any case, HP recommends that you use a dedicated server machine, or a machine shared with HP Connect-It.

From AM 9.50, ‘stats’ scheduler is removed from amsrv. We recommend that you gather statistics with the utilities provided by RDBMS to achieve better performance.

Virtualized environment (VMware)

Asset Manager can be deployed in both physical and virtualized environments. As long as the sizing guidelines are followed, there is no significant performance impact.

The Asset Manager applications server, the Asset Manager software load balancer, and the Web Tier can be deployed in a virtualized environment if you follow the sizing that is described in the “Virtualization” section. To deploy a virtualized environment, we recommend that you make the following configurations:

- Upgrade to vSphere5 or later version.
- Assign dedicated resources (such as vCPU, memory, and disk I/O) to a guest operating system that acts as an Asset Manager server.
- Deploy all Asset Manager servers in the same virtualization resource pool.

All in one (Small Environment Deployment)

In a small environment deployment, we recommend the following best practices for the best performance:

- Although the database can be deployed on the same machine as the Asset Manager server, we strongly suggest that you deploy the database on a separate machine. However, the server and database should in the same subnet and have a latency lower than 1ms.
- You can implement small environment deployments on virtual machines or on physical machines, as long as you provide sufficient hardware resources.
- We strongly suggest that you use a solid state drive (SSD) instead of a hard disk drive (HDD). An SSD significantly increase the speed of disk I/O operations.
- We recommend that you deploy the Web Service and Web Tier on separate Tomcat instances, we recommend the following startup options in the Java virtual machine instance:

```
-Xms1024m -Xmx1024m
```

- For high availability (HA) and fail-over capabilities in the Web Tier and Web Service, we recommend that you deploy the each application on two Tomcat instances, and configure an Apache server in front of the instances as a software load balancer to avoid a single point of failure.

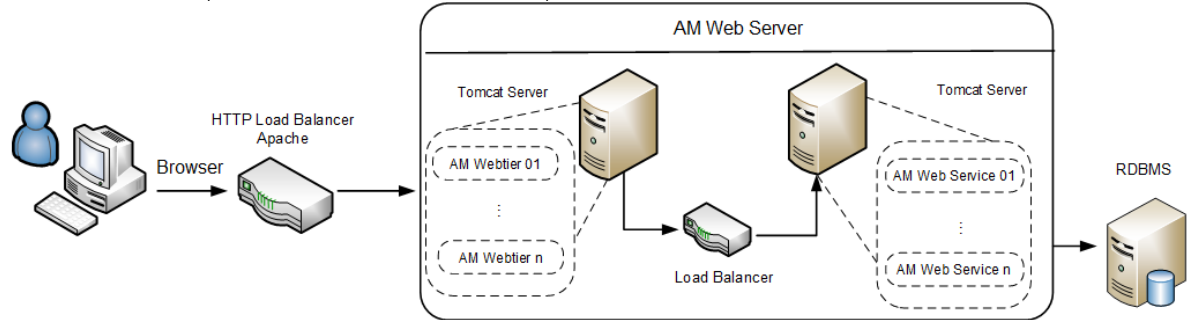
Appendix A: Asset Manager normal benchmark sample performance (1,000 users) test results

Asset Manager 9.50 normal benchmark performance testing results (1,000 users)

The goal of the benchmark test was to determine the system performance with 1,000 concurrent users.

Deployment diagram

For 1,000 concurrent users, our test environment contains 4 Asset Manager Web Service servers and 4 Asset Manager Web Tier servers sit in 8 separate Tomcat instances and two Apache instances on one machine, and one database machine.



Hardware

Performance tests are executed on physical machines.

The following table describes the configurations of these servers for the 1,000 user benchmark test.

ID	Usage	Operating system	CPU	Memory
1	AM Server	Windows 2008 64-bit	Inter Xeon X5660@2.8GHZ *24	32G
2	Database server	Windows 2008 64-bit	Inter Xeon X5660@2.8GHZ *24	32G
3	LoadRunner	Windows 2008 64-bit	Inter Xeon X5660@2.8GHZ *24	32G

Software

All tests were run on the following software set:

- HP Load Runner – 11.52.0.0
- Apache Tomcat – Apache Tomcat 7.0.54 64 bit
- Apache – Apache 2.2.25 / Mod_jk 1.2.40
- JDK – JRE 1.7.0_51 64-bit
- Asset Manager 9.50 Release Build
- Oracle Database - Oracle Database 11g Enterprise Edition Release 11.2.0.4.0 – 64 bit Production

Setup and Tuning

Tuning made before test:

Please find in “appendix” for more details.

Test Data

Test data includes:

Data type	Data volume	Comments
Asset	00B	The quantity of all kinds of asset managed in AM.
Portfolio	1M	One million portfolio records.
Employee	306K	6K admin user, 50K floating user, 250K guest.

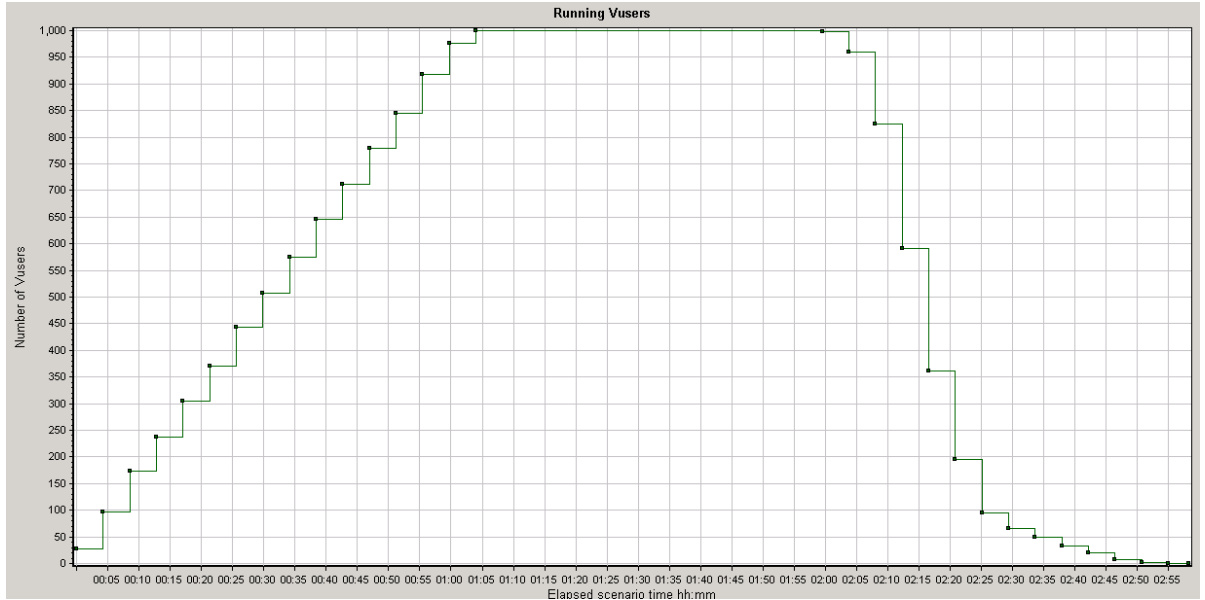
Load Test Scenario Setting

- Test will be executed for more than 120 minutes.
- Detailed scenario setting:

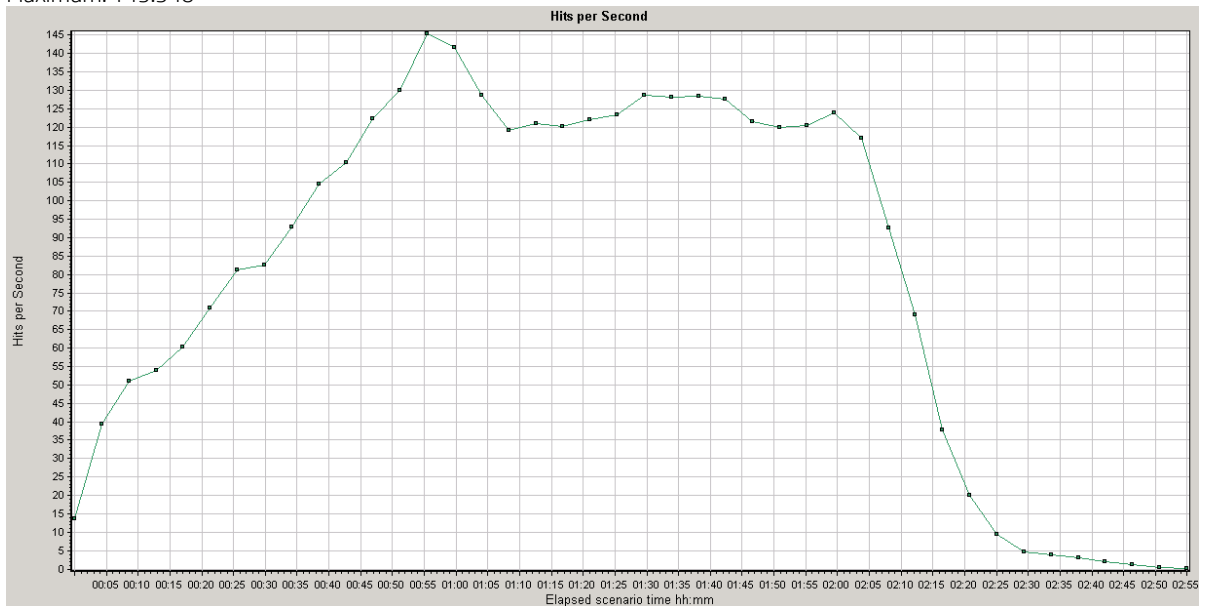
User Scenario	User Count	Peak Duration	Start Time	Think Time	Ramp-up Rate
Viewing Employee	800	60 min	+0:00:00	48.75 ~ 130s, random	4 users every 15 seconds (shared with all scenario)
Writing Computer	200	60 min	+0:00:00	48.75 ~ 130s, random	4 users every 15 seconds (shared with all scenario)

Test statistics for 1,000 concurrent user tests

Maximum running Vusers: 1,000

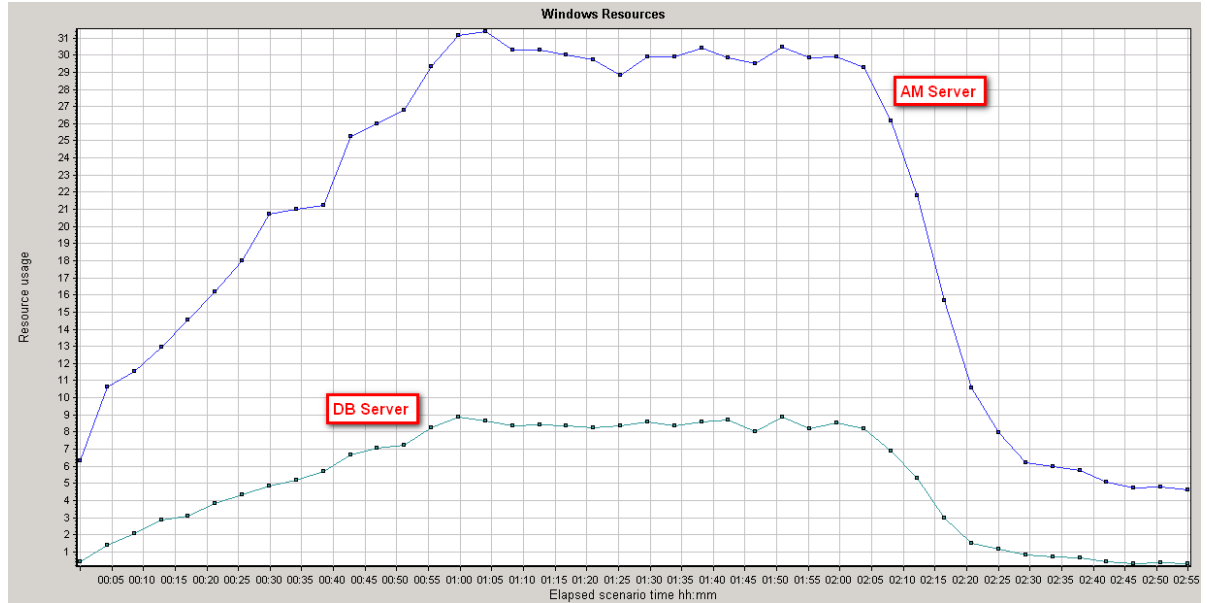


Average Hit Per Second: 81.257
Maximum: 145.348



System resource consumption during 1,000 concurrent user tests

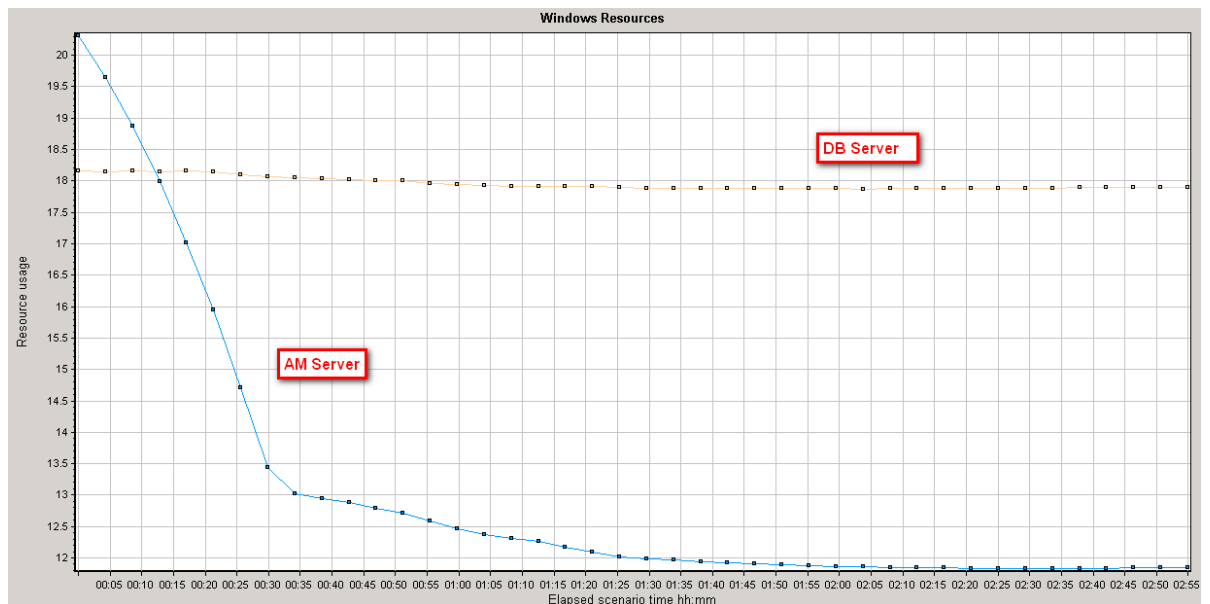
CPU



CPU utilization (%)	Minimum	Average	Maximum
AM Server (Web Service and Web Tier)	3.082	20.579	59.22
DB Server	0	5.261	18.35

*The graph is printed with granularity more than 128 seconds, thus some of the peak numbers may not present in the graph.

Memory



Memory available (in MB)	Minimum	Average	Maximum
AM Server (Web Service and Web Tier)	11827	17957.53	18173
DB Server	11827	13098	20385

Performance testing results

Summary test result:

Maximum Running Vusers:	1,000
Average Throughput (bytes/second):	3,919,125
Average Hits per Second:	81.257
No. of View Employee Transaction processed	5432
No. of View Employee Transaction per hour per user	2.26
No. of Write Computer Transaction processed	550
No. of Write Computer Transaction per hour per user	0.91

Detailed test results:

For the UI operation steps of each transaction, please find in "appendix".

Transaction Name	Average	90 Percent	Pass	Fail
Computer_T03_CWCmenu	0.027	0.026	550	0
Computer_T04_ComputerVM	4.407	4.742	550	0
Computer_T05_GetFilterScr	0.455	0.521	550	0
Computer_T06_DoFilter	2.009	2.174	550	0
Computer_T07_CPUdetail	0.692	0.789	550	0
Computer_T08_User	0.545	0.617	550	0
Computer_T09_Back	0.696	0.78	550	0
Computer_T10_Applications	0.717	0.884	550	0
Computer_T11_Win2K	0.444	0.525	550	0
Computer_T12_Back2Main	0.586	0.663	550	0
Computer_T13_Duplicate	0.67	0.748	550	0
Computer_T14_SaveDuplicate	5.236	5.617	550	0
Computer_T15_General	0.305	0.355	550	0
Computer_T17_ModifyLocation	0.89	1.027	550	0
Computer_T18_TreeView	0.403	0.473	550	0
Computer_T19_ExpandTreeLv1	0.146	0.183	550	0
Computer_T20_ExpandTreeLv2	0.147	0.183	550	0
Computer_T21_ExpandTreeLv3	0.141	0.168	550	0
Computer_T22_ChooseLocation	1.736	1.887	550	0
Computer_T23_Integration	0.295	0.35	550	0
Computer_T24_SaveModify	2.478	2.688	550	0
Computer_T25_General	0.263	0.318	550	0
Computer_T26_Applications	0.515	0.602	550	0
Computer_T27_Win2K	0.397	0.469	550	0
Computer_T28_Back2Main	0.582	0.66	550	0
Computer_T29_Logout	0.025	0.036	550	0
Employee_T03_DeployOrg	0.02	0.023	5,432	0
Employee_T04_Empl	2.215	2.423	5,432	0

Employee_T05_Hartke	0.332	0.388	5,432	0
Employee_T06_HartkeDpt	0.42	0.501	5,432	0
Employee_T07_HartkeDptLoc	0.435	0.514	5,432	0
Employee_T08_EmplDept	2.167	2.366	5,432	0
Employee_T09_GetFilterScr	0.247	0.299	5,432	0
Employee_T10_DoFilter	0.479	0.554	5,432	0
Employee_T11_Demo	0.531	0.605	5,432	0
Employee_T12_Demo_Groups	0.38	0.484	5,432	0
Employee_T13_Logout	0.054	0.079	800	0
T01_GetLoginScr	0.071	0.095	1,350	0
T02_DoLogin	1.839	1.995	1,350	0

Conclusion

Asset Manager performed acceptably during testing and demonstrated good scalability. All of the response time goals, up to the maximum tested concurrent user level of 1000 users, were met. Additionally, there was a significant margin for increased workload.

Appendix B: Asset Manager processing capability test results

Introduction

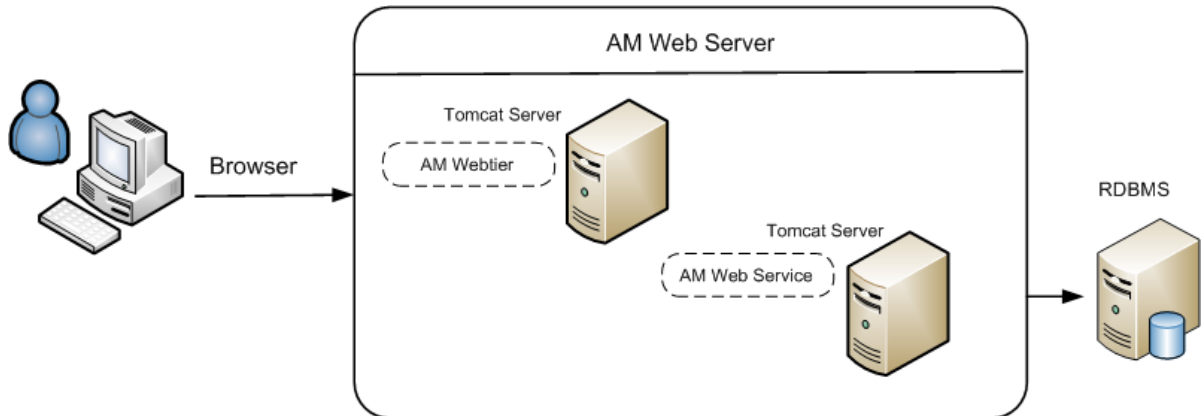
As an online transaction processing systems, the processing capability based on business scenarios are always concerned by most customers. The results below presents the view and write capability of Asset Manager Web environment with one million populated test data set.

For the detailed UI operation steps of each scenario, please find in “appendix”.

Result Summary

User Scenario	No. of Server Instances	Process capability (complete scenarios per second)	Comments
Viewing Employee	1 WT+ 1 WS	1.05	
Writing Computer	1 WT+ 1 WS	0.68	
Viewing Employee	2 WT+ 2 WS	2.00	
Writing Computer	2 WT+ 2 WS	1.01*	CPU utilization bottleneck reached
Viewing Employee	4 WT+ 4 WS	2.68*	CPU utilization bottleneck reached
Writing Computer	4 WT+ 4 WS	1.03*	CPU utilization bottleneck reached

Deployment topology



Hardware

Performance tests are executed on physical machines.

ID	Usage	Operating system	CPU	Memory
1	AM Server	Windows 2008 64-bit	Inter Xeon X5660@2.8GHZ *24	32G
2	Database server	Windows 2008 64-bit	Inter Xeon X5660@2.8GHZ *24	32G
3	LoadRunner	Windows 2008 64-bit	Inter Xeon X5660@2.8GHZ *24	32G

Software

All tests were run on the following software set:

- HP Load Runner – 11.52.0.0
- Apache Tomcat – Apache Tomcat 7.0.54 64 bit
- Apache – Apache 2.2.25 / Mod_jk 1.2.40
- JDK – JRE 1.7.0_51 64-bit
- Asset Manager 9.50 Release Build
- Oracle Database - Oracle Database 11g Enterprise Edition Release 11.2.0.4.0 – 64 bit Production

Setup and Tuning

Tuning made before test.
Please find in “appendix” for more details.

Test Data

Test data includes:

Data type	Data volume	Comments
Asset	00B	The quantity of all kinds of asset managed in AM
Portfolio	1M	One million portfolio records.
Employee	306K	6K admin user, 50K floating user, 250K guest.

Load Test Scenario Setting

- Test will be executed for more than 10 minutes for each user count.
- Detailed scenario setting:

User Scenario	User Count	Peak Duration	Start Time	Think Time	Ramp-up Rate
Viewing Employee	1, 16, 32, 64	10 min	+0:00:00	0	2 users every 3 seconds
Writing Computer	1, 16, 32, 64	10 min	+0:00:00	0	2 users every 3 seconds

Test results

Processing speed details

User Scenario	No. of Server Instances	Total scenarios processed (in 10 minutes)	Process capability (complete scenarios per second)
Viewing Employee	1 WT+ 1 WS	634	1.05
Writing Computer	1 WT+ 1 WS	408	0.68
Viewing Employee	2 WT+ 2 WS	1202	2.00
Writing Computer	2 WT+ 2 WS	610	1.01
Viewing Employee	4 WT+ 4 WS	1613	2.68
Writing Computer	4 WT+ 4 WS	618	1.03

Conclusions

The processing capability of Asset Manager is about 1.05 view scenarios and 0.68 write scenarios per second on a standalone model. This is a quite large throughput number while being put in an hour duration: 3780 view and 2448 write scenarios. Also, the capability can be increased as you add more additional server instances. For higher capability or scaling related performance issues such as locking or dead locking, please refer to the tuning section in Help Server.

Appendix C: Asset Manager sample deployment configuration and tuning for benchmark performance testing

Apache Loadbalancer (In front of Web Tier)

http.conf

...

```
<IfModule mpm_winnt.c>
```

```
ThreadLimit 9000
```

```
ThreadsPerChild 3000
```

```
MaxRequestsPerChild 0
```

```
</IfModule>
```

...

```
LoadModule jk_module modules/mod_jk.so
```

...

```
JkMount /AssetManager loadbalancer
```

```
JkMount /AssetManager/* loadbalancer
```

```
JkMount /jkmanager/* jkstatus
```

```
<Location /status/>
```

```
    JkMount jkstatus
```

```
    Order deny,allow
```

```
    Deny from all
```

```
    Allow from 127.0.0.1
```

```
</Location>
```

```
JkWorkersFile conf/workers.properties
```

```
JkLogFile logs/mod_jk.log
```

```
JkLogLevel info
```

...

workers.properties

```
worker.list=loadbalancer,jkstatus
```

```
worker.tomcat71b.port=18009
```

```
worker.tomcat71b.host=16.16.16.16
```

```
worker.tomcat71b.type=ajp13
```

```
worker.tomcat71b.lbfactor=1
```

```
worker.tomcat72b.port=19009
```

```
worker.tomcat72b.host=16.16.16.16
```

```
worker.tomcat72b.type=ajp13
```

```
worker.tomcat72b.lbfactor=1
```

```
worker.tomcat73b.port=20009
worker.tomcat73b.host=16.16.16.16
worker.tomcat73b.type=ajp13
worker.tomcat73b.lbfactor=1

worker.tomcat74b.port=21009
worker.tomcat74b.host=16.16.16.16
worker.tomcat74b.type=ajp13
worker.tomcat74b.lbfactor=1

worker.loadbalancer.type=lb
worker.loadbalancer.balance_workers=tomcat71b, tomcat72b, tomcat73b, tomcat74b
worker.jkstatus.type=status
```

Asset Manager Web Tier

JVM:

```
-Xms2048m
-Xmx2048m
-XX:PermSize=128M
```

Server.xml

```
<!-- No Specific Configuration -->
```

Apache Loadbalancer (In front of Web Service)

http.conf

```
...
<IfModule mpm_winnt.c>
ThreadLimit 9000
ThreadsPerChild 3000
MaxRequestsPerChild 0
</IfModule>
...
LoadModule jk_module modules/mod_jk.so
...
JkMount /AssetManagerWebService loadbalancer
JkMount /AssetManagerWebService/* loadbalancer
JkMount /jkmanager/* jkstatus

<Location /status/>
    JkMount jkstatus
    Order deny,allow
    Deny from all
```

```
    Allow from 127.0.0.1
</Location>

JkWorkersFile conf/workers.properties
JkLogFile logs/mod_jk.log
JkLogLevel info
...
workers.properties
worker.list=loadbalancer,jkstatus

worker.tomcat71a.port=8009
worker.tomcat71a.host=16.16.16.16
worker.tomcat71a.type=ajp13
worker.tomcat71a.lbfactor=1

worker.tomcat72a.port=9009
worker.tomcat72a.host=16.16.16.16
worker.tomcat72a.type=ajp13
worker.tomcat72a.lbfactor=1

worker.tomcat73a.port=10009
worker.tomcat73a.host=16.16.16.16
worker.tomcat73a.type=ajp13
worker.tomcat73a.lbfactor=1

worker.tomcat74a.port=11009
worker.tomcat74a.host=16.16.16.16
worker.tomcat74a.type=ajp13
worker.tomcat74a.lbfactor=1

worker.loadbalancer.type=lb
worker.loadbalancer.balance_workers=tomcat71a, tomcat72a, tomcat73a, tomcat74a
worker.jkstatus.type=status
```

Asset Manager Web Service

JVM:

```
...
-Xms1536m
-Xmx1536m
-XX:PermSize=128M
-XX:+UseParNewGC
```

```
-XX:+UseConcMarkSweepGC
-Djava.library.path=C:\PROGRA~2\HP\AS3D26~1.50E\x64
-Dsun.lang.ClassLoader.allowArraySyntax=true
```

...

Server.xml

```
<Connector port="8009" protocol="AJP/1.3" redirectPort="8443"
    maxThreads="1000"
        minSpareThreads="500"
        acceptCount="1000"
    connectionTimeout="20000" disableUploadTimeout="true" maxKeepAliveRequests="1000"
    keepAliveTimeout="1000"
    />
```

...

Aamapi95.ini

```
[Option]
/Advanced/CnxPoolMinSize=10
/Advanced/CnxPoolIdleSize=512
/Advanced/CnxPoolMaxSize=512
```

...

Oracle database tuning

There are several indices missing for AM 9.50, adding those will boost the login and other employee related performance

```
create index am950.AMEMPLDEPT_USERLOGIN_ADMINR on am950. amEmplDept("USERLOGIN", "BADMINRIGHT");
```

```
create index am950.AMEMPLDEPT_DEPT_DEPTID on am950. amEmplDept("BDEPARTMENT", "LEMPLDEPTID");
```

-- function based index is a workaround here, please consider rewrite the SQL if possible.

```
create index AM950.F_AMEMPLDEPT_USERLOGIN on AM950.AMEMPLDEPT(LOWER("USERLOGIN"));
```

```
exec dbms_stats.gather_index_stats('am950', 'AMEMPLDEPT_USERLOGIN_ADMINR');
```

```
exec dbms_stats.gather_index_stats('am950', 'AMEMPLDEPT_DEPT_DEPTID');
```

```
exec dbms_stats.gather_index_stats('am950', 'F_AMEMPLDEPT_USERLOGIN');
```

Appendix D: Database volume size of sample deployment

Database volume size

The following table presents the disk usage of data sets on different database types.

- All the databases are using default character set. Converting to UTF may add more disk usage.
- Disk usage may be various as per the usage on various set of customer data.
- Disk usage for supporting usage, such as temporary space and database system level disk usage, are not included.

Database Type	Data Set	Disk Usage
SQL Server 2008	OOB data + 1M Portfolios + 306K Employees	4027M
SQL Server 2008	OOB data + 2M Portfolios + 306K Employees	7704M
Oracle 11g	OOB data + 1M Portfolios + 306K Employees	2780M
Oracle 11g	OOB data + 2M Portfolios + 306K Employees	4950M

Appendix E: Links

Useful links

- [Asset Manager Tuning Guide](#)
- [Asset Manager Support matrix](#)
- Tuning Section in Help Server
- [Asset Manager Adapter Parallel Push Tuning](#)
- [Asset Manager Deployment Sizing Guide \(Up-to-date version of this document\)](#)

Appendix F: LoadRunner Script actions

Viewing Employee

Transaction Name	Steps in UI
T01_GetLoginScr	Get login page of AssetManger Web
T02_DoLogin	Click log in button
Employee_T03_DeployOrg	Click Organization Management-Organization to expand tree node
Employee_T04_Empl	Click Organization Management -Employees
Employee_T05_Hartke	Click Hartke on Name column list
Employee_T06_HartkeDpt	Click "Administration" link on Department
Employee_T07_HartkeDptLoc	Click "/San Mateo site/Building 02/2nd Floor/" link on Location
Employee_T08_EmplDept	Click Organization Management -Employees and Department
Employee_T09_GetFilterScr	Click "Name, First Name" on Filters drop list
Employee_T10_DoFilter	Enter "Demo" on Name text field and click Apply filter button
Employee_T11_Demo	Click "Demo" link on Name column list
Employee_T12_Demo_Groups	Click "Groups" tab
T13_Logout	Click "Logout" button and click ok button on popup window

Writing Computer

Transaction Name	Steps in UI
T01_GetLoginScr	Get login page of AssetManger Web
T02_DoLogin	Click log in button
Computer_T03_CWCmenu	Click Portfolio management-- IT equipment to expand tree node
Computer_T04_ComputerVM	Click Portfolio management-- Computers and virtual machines
Computer_T05_GetFilterScr	Click "Full name" on Filters drop list
Computer_T06_DoFilter	Enter "%224%" on Name text field and click Apply filter button
Computer_T07_CPUdetail	Click "CPU000224" link on Name column list
Computer_T08_User	Click "Bernard, Cathy" on User
Computer_T09_Back	Click "Back" link
Computer_T10_Applications	Click "Applications" tab
Computer_T11_Win2K	Click "Windows 7" link on Model column list
Computer_T12_Back2Main	Click "Back to main document" link
Computer_T13_Duplicate	Click "Duplicate" button
Computer_T14_SaveDuplicate	Click "Save" button
Computer_T15_General	Click "General" tab
Computer_T16_Modify	Click "Modify" button
Computer_T17_ModifyLocation	Click choose a value for the link icon
Computer_T18_TreeView	Click tree view icon
Computer_T19_ExpandTreeLvl1	Expand "Ariane Building" node
Computer_T20_ExpandTreeLvl2	Expand "31st floor" node
Computer_T21_ExpandTreeLvl3	Expand "026 -- Office" node
Computer_T22_ChooseLocation	Choose "026B -- Office"
Computer_T23_Integration	Click "Integration" tab
Computer_T24_SaveModify	Click "Save" button
Computer_T25_General	Click "General" tab

Computer_T26_Applications	Click "Application" tab
Computer_T27_Win2K	Click "Windows 7" link on Model column list
Computer_T28_Back2Main	Click "Back to main document" link
T29_Logout	Click "Logout" button and click ok button on popup window

Appendix G: Abbreviation and Terminology used in this document

Abbreviation and Terminology

AM: Asset Manager

DB: Database

WS: Web Service

WT: Web Tier

More information

For more information, please visit the HP Management Software support website:

<https://softwaresupport.hp.com>

This website provides contact information and details about the products, services, and support that HP Management Software offers.

HP Management Software online software support provides customer self-solve capabilities. It provides a fast and efficient way to access interactive technical support tools needed to manage your business. As a valued customer, you can benefit by being able to:

- Search for knowledge documents of interest
- Submit and track progress on support cases
- Submit enhancement requests online
- Download software patches
- Manage a support contract
- Look up HP support contacts
- Review information about available services
- Enter discussions with other software customers
- Research and register for software training

Note:

Most of the support areas require that you register as an HP Passport user and sign in. Many also require an active support contract.

To find more information about support access levels, go to the following website:

http://www.hp.com/managementsoftware/access_level

To register for an HP Passport ID, go to the following website:

<http://www.managementsoftware.hp.com/passport-registration.html>

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