

HP Operations Manager for UNIX 9.0 Administration UI

Performance and Scalability Guide

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Conventions

Font Style	Explanation
Boldface	Words in boldface type represent programs and commands.
Capitalization	Capitalized first letters represent company or product names.
Computer font	Words in computer font represent file or path names, command syntax statements, prompts or messages that appear on your screen or text you should type on your workstation or terminal.
<i>Italics</i>	Words in italics represent variables in syntax statements or words that are emphasized in the text.
{ }	Represents required elements in a syntax statement. When several elements are separated by the symbol you must select one of the elements.
[]	Represents optional elements in a syntax statement.

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1 Introduction

Overview

Your company's business success relies on high-quality IT services and IT infrastructure agility. To keep your IT services available and performing well, you need a proven operations management solution that gives you control over your ever-changing IT infrastructure. That solution is HP Operations Manager for UNIX (HP OM/U).

Operations for UNIX discovers, monitors, controls and reports on the availability and performance of your heterogeneous, large-scale IT environment. It consolidates information for all IT components that control your business: network, systems, storage, databases, and applications. With its service-driven approach, it shows what IT problems affect your business processes, helping you to focus on what's most important for your company's business success.

For a general overview about HP OM/U's feature set, refer to the HP Operations Manager Concepts Guide (UNIX), which is available in PDF format on the HP product manual website (see below).

About this Document

The Performance and Scalability Guide provides information and recommendations about designing and configuring the environment to run Administration UI.



Check the following web site periodically for the latest versions of this and other HPOM/UNIX manuals:

<http://support.openview.hp.com/selfsolve/manuals>

Select "Operations Manager for UNIX" and version 9.0.

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2 Architecture & Influencing Factors

Architecture

- The Administration UI acts as a replacement of the old OSF/MOTIF GUI. As the Administration UI is web-based and uses the Oracle DB only for reading, and the official HP OM/U server API for changing elements as well as the `opccfgupld` command line tools, there are some restrictions and performance hits to be expected:
- The OSF/MOTIF GUI sometimes directly accessed the database for modifications of the configuration and did not rely on the API. The API on the other hand has to do more checks, to prohibit users in creating illegal or inconsistent configuration data. Administration UI relies solely on the official APIs for modification operations.
- With HP OM/U 9 the policy handling changed. Before the policies were stored as tables and attributes in the Oracle Database, but with HP OM/U 9 the policies are now stored as blobs. Efficient Queries to retrieve, for example only one condition, etc. cannot be used, but the whole policy has to be accessed each time. With HP OM/U 8, the OSF/MOTIF GUI was able to only locally modify one condition within the DB directly. This is no longer possible. Always the complete policy has to be modified. This is extremely hitting performance, when handling policies with a large number of conditions.
- The Administration UI supports multiple administrators and a role-based access control. Thus adding to the response times, as with each request the rights for a user have to be calculated. Also a locking had to be implemented, that checks for changes from another user, before overwriting them. Database locks cannot be used, due to the web-based UI. A user editing (and locking an object) could just terminate the browser keeping the lock dangling forever. The OSF/MOTIF GUI had only one `opc_adm` admin user and thus could handle things differently. A role-based model was not possible in the old GUI (apart from the policy administrators of course).
- Due to the web-based UI and the multiple administrators, caching is not implemented, thus every time, for example a list of message groups or such is required, the information is directly retrieved from the database and is therefore always up-to-date.

Influencing Factors

Many factors influence the performance of the Administration UI, apart from the obvious (RAM, CPU, IO performance). These influences will be discussed in detail here. The next chapter will then show, what improvements can be made, and what one could expect from different hardware configurations.

CPU

Administration UI is a heavily multi-threaded JAVA application. Since every thread may allocate a separate CPU, additional CPUs may improve performance, particularly if many users work with the system. Each user request will be allocated to a new thread, therefore if a separate CPU is available, this will mean the request will run independently from any other user requests as long as no shared resources are accessed.

A detailed view on how the number of CPUs influences the performance can be seen in [Chapter 3, Sizing Recommendations](#).

Clusters

Using Administration UI in a HA/Cluster environment does not influence the performance.

Network Bandwidth

Network communication happens at multiple places between Administration UI components:

- Web Browser and Administration UI.
- Administration UI and Oracle DB, if the database is remotely installed.

Depending on the amount of transmitted data, the network speed may impact performance, however with modern networks of $\geq 100\text{Mbit/s}$, the impact should not be significant.

Secure communication (using HTTPS) will cause additional network and CPU load on both sides. However, here as well, the impact should be minimal. Most influence is probably caused by other applications sharing the same network and competing with Administration UI communication.

Administration UI makes use of AJAX technologies to update information in the browser without updating the whole page. This will lead to more requests as traditional web applications, but the requests are smaller. Also the filtering, sorting and paging is done on the backend server, thus reducing the amount of data to be transferred to the web application server and therefore browser.

Physical Memory

Generally, the more physical RAM a system has, the better. However, no matter how much physical RAM a system has, the Java JRE will use only a certain (configurable) maximum amount. This amount is specified in the file

```
/opt/OV/OMU/adminUI/conf/servicemix/wrapper.conf
```

for example:

```
# Initial Java Heap Size (in MB)
wrapper.java.initmemory=64
# Maximum Java Heap Size (in MB)
wrapper.java.maxmemory=512
```

In this example, the JRE will not consume more than 512 MB RAM for the heap (as the JRE itself also consumes memory, so this might show as about 800 MB in top or such). If the system contains a lot of physical RAM, increasing the JRE limit may improve performance *significantly* since the JRE needs to perform garbage collection less often.

The JRE has a hard-limit on 4 GB, thus giving the virtual machine more than 4 GB will not help.

Changing the initial heap size has almost no effect at all.

Beyond that limit, additional physical RAM will not have any further direct effect on the JRE. However, more RAM may still improve performance, because other processes on the system compete less with the MIDAS JRE and swapping might not occur. Also bear in mind, that the JAVA virtual machine takes control of the memory management, so for example top might show, that the java process takes up 800 MB, but internal only 200MB are used.

To determine the current situation, use the top command as in the following example:

```
# top
System: lego                               Mon Jun 23 15:10:41
2008
Load averages: 0.05, 0.04, 0.04
192 processes: 133 sleeping, 59 running
Cpu states:
CPU   LOAD   USER   NICE   SYS   IDLE   BLOCK   SWAIT   INTR   SSYS
 0    0.04   0.0%   0.0%   0.0% 100.0%   0.0%   0.0%   0.0%   0.0%
 1    0.06   0.0%   0.0%   0.0% 100.0%   0.0%   0.0%   0.0%   0.0%
---   ---   ---   ---   ---   ---   ---   ---   ---   ---
avg   0.05   0.0%   0.0%   0.0% 100.0%   0.0%   0.0%   0.0%   0.0%
System Page Size: 4Kbytes
Memory: 1245184K (737428K) real, 3701844K (2628568K) virtual, 14732K
free Page# 1/8
CPU TTY   PID USERNAME PRI NI   SIZE   RES STATE   TIME %WCPU %CPU
COMMAND
 0  ?    2236 root      152 20  1209M   466M run     17:43  5.11  5.11
java
 0  ?    2609 root      152 20   878M 94864K run     0:39  0.32  0.32
java
 0  ?      63 root      191 20   2160K  1920K run     0:17  0.29  0.29
vxfsd
```

```

0 ? 1956 root 152 20 100M 3484K run 0:21 0.29 0.29
ovcd
[...]
# ps -ef | grep midas
root 2236 2230 0 08:41:37 ? 17:48 /opt/OV/OMU/adminUI/
jre/bin/IA64N/java -server -DbesId=midas_server -Dclassworlds.conf=/
opt/OV/OMU/adminUI/conf/servicemix/ser
root 2230 1956 0 08:41:36 ? 0:14 /opt/OV/OMU/adminUI/
wrapper /opt/OV/OMU/adminUI/conf/servicemix/wrapper.conf
wrapper.syslog.ident=midas_server wrapper.pidfile=
# swapinfo -t

```

	Kb	Kb	Kb	PCT	START/	Kb		
TYPE	AVAIL	USED	FREE	USED	LIMIT	RESERVE	PRI	NAME
dev	4194304	1105660	3088644	26%	0	-	1	/dev/vg00/
lv012								
reserve	-	1376164	-1376164					
memory	1989760	700948	1288812	35%				
total	6184064	3182772	3001292	51%	-	0	-	

In this example, the MIDAS JRE (process 2236) consumes 466 MB RAM (with 1029 MB including all text pages etc). Since the system has about 2 GB physical RAM and only 35% are currently used, the maximum amount of RAM given to the JRE could be increased.

To see the details of the memory usage, either a JMX Console can be used, or the file `/opt/OV/OMU/adminUI/logs/memory.log` where the details of the memory usage are dumped periodically:

```
2009-02-02 15:18:09,842;494;63;47;16;118
```

(The format is “time;max;committed;used;free;activeCount”).

This means, that Administration UI uses at most **494** Mbytes of RAM, 63 MB are currently committed from the OS for use, **47** Mbytes are in use, 16 MB are free and **118** threads are currently in use.



RECOMMENDATION: Increase the `wrapper.java.maxmemory` (Maximum Java Heap Size) to 1 Gigabyte and check that your machine has at least 4 Gigabytes or RAM.

User/Kernel Limits

Certain operation systems restrict the usage of system resources per user, for example UNIX systems have settings set per ulimit or kernel parameters. Please, check that the following values are high enough:

- Open files: Should be at least set to 512.
- Thread count: Should be at least set to 512.

Virtual Memory

Virtual memory (physical memory plus swap space) affects the amount of memory all processes on the system may allocate. There must be enough swap space to satisfy all processes, but performance-wise more swap space does not improve anything.

However, the process of paging in and out itself may affect performance a lot (because the OS has to do it), but the key metric here is the amount of physical memory again – the more RAM the less swapping.

Finally, file systems used for swap devices should be on fast physical disks.



RECOMMENDATION: Have at least 4 Gigabytes of RAM.

Other Applications

Other processes like backup, may also significantly influence the performance of Administration UI because these application compete with the MIDAS processes for OS resources like CPU, RAM or disk throughput.



RECOMMENDATION: Do not run other applications on the HP OM/U server system. It might be useful to have a remote ORACLE DB.

Number of concurrent Users

The more users are using Administration UI, the more requests have to be performed. Sometimes the different users compete for the same resource, for example the users want to get a list of configuration data and that is taken from the ORACLE DB. Connections to the ORACLE DB and to the HP OM/U API are limited. If the connection pools are large enough, then the users only compete for CPU time. As Administration UI is threaded, having more CPUs will help.



RECOMMENDATION: The number of parallel users is not restricted, but we recommend not having more than 20 administrators working in parallel. You can of course have more administrator accounts, as long as they do not work all at the same time.

Load of the HP OM/U Server due to Message Storms

The operational part of the HP OM/U server will impact the performance of the Administration UI. If a message storm arrives, the ORACLE DB and the HP OM/U servers will produce a high load on the system. This will of course slow Administration UI down. There is nothing that can be done about that.

Complexity of the User Roles

The user roles, that can be defined within the Administration UI will also impact the performance, as depending on complexity, multiple filters have to be applied on each request.

Configuring user roles may also impact performance in a way, that data objects have to be filtered against these user roles to determine which objects a user is allowed to see and which operations the user will be able to perform with these objects. Complex user roles in combination with large sets of objects (for example, list all policies) will slow down Administration UI. The user roles filters will be evaluated for every single operation, not just once at log-on.

In most cases, user roles filters itself can be defined using the operations:

- **“is”** (equals) meaning an exact string match.
- **“contains”** meaning the user role specifies a sub-string which must be contained in the object attribute.
- **“matches”** meaning the object attribute must match an expression.

Naturally, evaluating expressions is more effort than just performing string comparisons. The more complex the expression is, the more time it will take. Wherever possible, try to avoid expressions in user roles and prefer “is” or “contains” filter.



RECOMMENDATION: Keep the roles simple and try to avoid using user groups with multiple roles. Also avoid using the “matches” filters which is the most ineffective.

Tasks the Users perform

Different tasks a user performs, will lead to different internal request being handled, thus leading to different response times dependent on the task:

- Listing objects is one of the easiest operations, and involves retrieving the data from ORACLE and then filtering it against the user role and filters set in the GUI, also paging has to be applied. In most cases the filters are directly broken down into parts of the SQL query, thus leaving the work to the DB, which handles these queries most efficiently.
- Getting an object is one of the shortest operations. The only difference is that retrieving a policy requires more time, as the complete policy has to be extracted from the DB and then it is parsed into an XML file internally. Depending on the policy size, this will take some time.
- Modifying an object will involve multiple requests:
 - Get the object first (normally from the DB directly, except for policies).
 - Store the modified object back using the HP OM/U API.

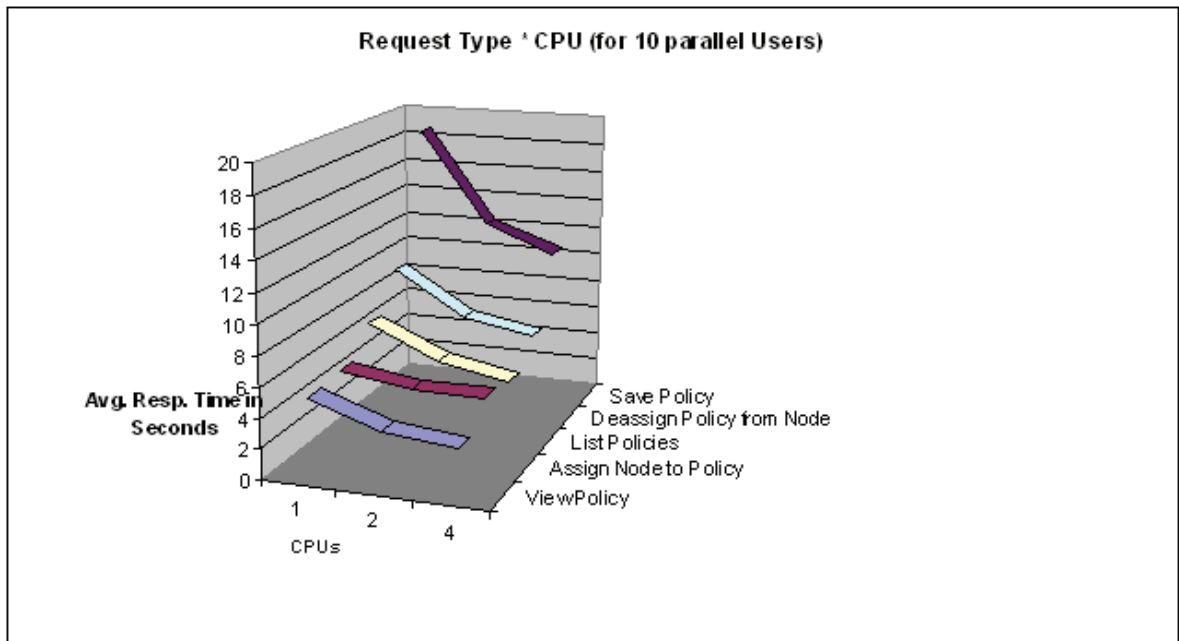
During the modify also the original object and the current object in the DB are compared, to prohibit changes from other users that happened in between to go unnoticed.

Modifying policies and responsibility matrices are the operations that involve a large amount of data and therefore might take considerable amounts of time.

- Comparing two large policies will also put considerable amount of strain to the system.
- Operations like assignments, deletes etc. are fast.

The following chart, shows the response times for a virtual machine test system with 10 parallel users doing the same workflow over and over again.

Figure 1 Duration of Different Operations



Tracing and Logging

Normally Administration UI has some extensive logging enabled, which to an extent also has an impact on the performance. Administration UI uses log4j for logging for errors and debug data. The same mechanism and configuration applies as described for auditing.

Changing the log level can be done without the need to restart MIDAS servers. The logging configuration will be checked regularly (default interval 1min) and re-read if changed.



RECOMMENDATION: Generally, it is recommended to not change the logging configuration unless instructed by product support. Do not disable logging altogether, the absolute minimum log level is ERROR. The log level of WARNING is usually most suitable. Do not use a log level of DEBUG unless needed for troubleshooting purposes. Otherwise the amount of log data may grow quickly and it will slow down the application considerably.

Auditing

Administration UI supports auditing in a way, that all processed requests and their results are logged into files. The logged data differs significantly depending on the audit level:

- **INFO** (default): For each request, one single line with summary data is logged, including who did what and when, for example “at 19:06, user *tge* successfully created a log-file policy named *tge-pol*”.
- **DEBUG**: Complete request and response objects are logged. This yields much more information about what exactly has happened, e.g. the contents of the created policy.

This may impact performance:

- The actual data I/O including all formatting consumes OS resources.
- The amount of audit data stored on disk.

In DEBUG mode, the amount of data may grow by factor 100 or more depending on the size of objects.



RECOMMENDATION: Do not change the audit log level except for debugging purposes.

Memory Log

Per default the `memory.log` which logs the usage of the java VMs memory is currently set to appear once an hour. If the interval is changed, this might impact performance as well.



RECOMMENDATION: Do not change the log interval except for debugging purposes.

Size of Configuration Objects

Large configuration objects like policies with hundreds or thousands of conditions or user responsibility matrices with a large number of message group/node group combinations have an impact on the performance when viewing or editing such objects. If these objects are not touched often, the performance will of course not be impacted.

Generally try to reduce to number of conditions per policy, as they get easier to maintain and also will put less stress on the agents. For example checking whether certain conditions ever generate messages might give a hint on unused conditions. Also checking for unused OIDs in SNMP policies might help find trap conditions for devices that do not (or no longer) exist.

The response time for policies is almost linear, e.g. if loading a policy with 50 conditions will take about 0,5 seconds, than loading a policy with 3000 conditions will take 60 times as long.

If a policy is loaded in the policy editor, not all conditions are loaded at once, but only on request, thus this will reduce the response time.



RECOMMENDATION: Try to reduce the number of conditions per policy.

Database Connections

The number of parallel DB connections used by the Administration UI server is configurable. Technically, a pool of concurrent connections is used to perform DB operations. The larger this pool, the faster the DB access assuming that the Oracle server itself is able to perform the requested operations in parallel, for example if many users work at the same time. This again involves topics like locking of DB objects (e.g. if accessing the same tables) and parallelization (threading). Also, re-using DB connections avoids the overhead of opening/closing connections all the time.

The maximum number of concurrent DB connections used by the Administration UI can be configured in by setting the following parameter in `conf/ovo*.properties`:

```
ovodb.connectionPool.maxActive=<n>
```

here are additional settings for parameters related to detecting idle connections etc., these are very advanced though and normally not needed to touch.

Setting the maximum number of DB connections can be done for multiple components (Table 1 on page 11):

Table 1

Component	Description	Default Value
ovoappl.properties	Responsible for starting HP OM/U Application Desktop items	2
voconfig.properties	Main HP OM/U configuration access	8
ovoinstall.properties	Agent and Sub-agent installation	2

Note, that not all of these configuration files exist by default and/or do not contain this property (then, the default values as stated above apply). The adaptor, which handles by far the most operations, is ovoconfig – thus it will yield the most benefit.

Make sure, that the Oracle server is able to handle that many parallel sessions (Each connection will lead to one oracle process). Consider, that the HP OM/U server itself, Java Operator GUI sessions, HP OM/U commands etc. also will access the HP OM/U DB.

If the Oracle DB server is located on a remote system, the speed of the network connection affects overall performance.

By default, the Administration UI server connects to the Oracle DB using the standard SQL*Net protocol (via JDBC). Alternatively, a secure DB connection can be used, which will cause some additional CPU and network load.



RECOMMENDATION: Increase the number of DB connections of the ovoconfig component, if many MIDAS users work at the same time and the Oracle server is powerful enough.

Disk Space

Administration UI does not store major amounts of data by itself, it rather operates on data belonging to HP OM/U. Therefore, regarding disk space needs:

- The Administration UI software itself requires a certain amount of disk space.
- During the installation, temporary disk space will be needed to unpack the installation packages, that can be freed after the installation has finished.
- Administration UI will produce data files and logfiles:
 - Log files (in `/opt/OV/OMU/adminUI/logs`).
 - Data files (downloaded files in clipboard), which remain persistent, unless cleaned up.
 - Temporary files (cache, intermediate files) cleaned up automatically.

The disk space used by Administration UI has to be available within the Administration UI installation direction (for example `/opt/OV/OMU/adminUI/`).



NOTE: In a HA cluster set-up, the Administration UI installation has to be on a shared file system switching along with the HA package.

After the installation the following files could be removed:

- The installer leaves a temporary directory on HP-UX Itanium, that can be removed:
`/tmp/install.dir.*`
- Two logfiles from the installer. These can be removed if the installation was successful.
 - `/opt/OV/OMU/adminUI/*_InstallLog.log`
 - `/opt/OV/OMU/adminUI/installation.log`

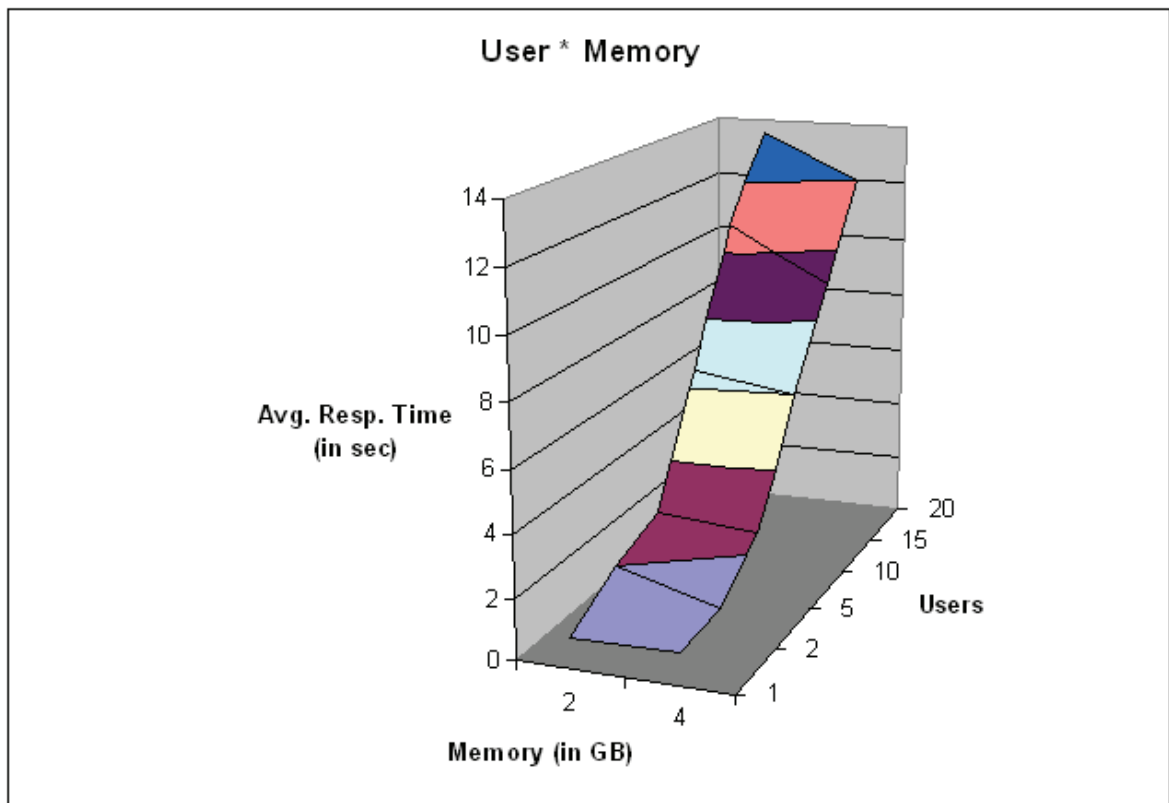
During the runtime of the product, logfiles will grow and also logfile roll around will be used. To configure the logfiles size and verbosity please refer to the Administration and Configuration Guide, chapter 4 "Log Files and Trace Levels".

3 Sizing Recommendations

To see the effects of the CPU and Memory on the performance, tests were made. The test machine was an HP Integrity rx6600 Server with 2 Processor-Module Itanium Arch. 64 Bits 1594 Mhz (4x2 Cores) and 24GB of RAM. The tests ran within a virtual machine with different CPU and memory settings.

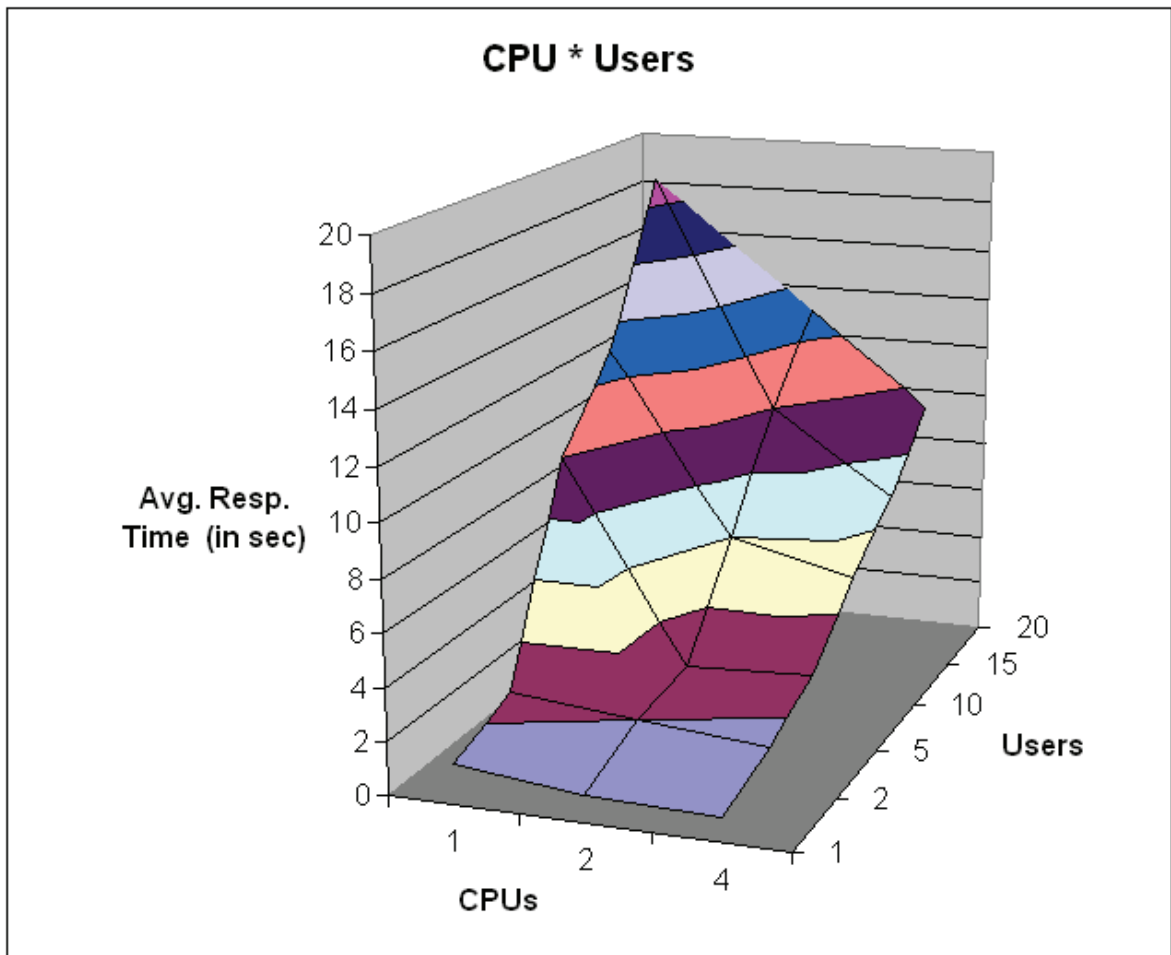
In the first test case, the number of memory for the virtual machine and the number of users were increased to see the average response times. The requests performed by the different users were listing the first 20 policies on the server (The server had 2800 policies on it).

Figure 2 Average Response Time: User * Memory



In the second scenario the number of parallel CPUs for the virtual machine was increased and the number of users. The number of CPUs was only increased up to 4 CPUs, due to a limitation of the VM Integrity software.

Figure 3 Average Response Times: CPU * Users



With these results, the following recommendations can be made:

- The increase of memory for the system does have not a real impact on the performance. For the Administration UI at least 1GB of **free** RAM should be available. So probably 2-4 GB of RAM are sufficient.
- To get acceptable response times, the following rules of thumb apply:
 - 1 CPU for 1- 3 parallel users
 - 2 CPUs for 4-8 parallel users
 - 4 CPUs for 9-16 parallel users