AppSense®

Appsense Environment Manager

User Personalization Performance & Scalability (version 8.0.732)

Technical Overview

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APPSENSE ENVIRONMENT MANAGER

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This report details the results of the internal performance and scalability testing performed by AppSense on Environment Manager 8.0 SP2 User Personalization.

The testing covers three aspects:

1. The scalability of an individual Personalization Server in terms of number of users per server.
2. The overall capacity of the Personalization Database.
3. Network bandwidth requirements

All results reflect a 'worst case' scenario where there is no data cached on either the database or on any endpoints.

Contents

Personalization Server Scalability

The scalability of the Personalization Server (PS) is measured by the number of requests it can process per second.

In these tests, the throughput placed on the PS is increased until the performance on the client becomes unacceptable. (response time >1 second)

It is assumed that each user will:

> Log on in the morning.

> Open a number of applications within the first few minutes.

> Open and close several applications during the day.

> At end of day, close all applications and logoff.

The number of applications a user will start is highly variable; for the purpose of these tests it is assumed that the user will open 10 applications (see appendix for details) at the start of day. The biggest hit of the day will be at logon, as desktop settings and application profiles (when demanded) are downloaded. At logoff only updates are uploaded to the database.

Two physical machines were used for the Personalization Server testing. The specification of these being:

LowSpec Dual Core AMD Athlon, Windows 2003 (32-bit) 4GB RAM

MedSpec 2 * Quad Core Intel Xeon X5405 (2GHz), Windows 2003 (32-bit) 4GB RAM

The maximum throughput for a single PS will be obtained when only this PS is connected to the Personalization Database. Therefore each server listed above was tested in isolation. When additional PSs are utilized and the database performance has started to degrade, the capacity of each PS will decrease. This database degradation is illustrated later in this document.

The database hardware for the PS scalability testing was the same specification as the MedSpec PS.

The MedSpec server was set up as both a physical machine and as a VMware ESX box (ESX Server 3i version 3.5.0). On the physical box only a single CPU core was enabled, this allowed a direct comparison of performance to that of a single core VM on the VMware ESX setup. On the LowSpec server both CPU cores were utilized.

The following experiments were performed:

1. The scalability of the PS on the LowSpec physical machine
2. The scalability of the PS on the MedSpec Physical machine
3. The scalability of the PS on the VM when there were no other VMs using the ESX box (MedSpec)
4. The scalability of the PS on the VM when there were 7 other VMs using the ESX box (MedSpec), assigned to different cores, with high CPU and network I/O
5. The scalability of the PS on the VM when there were 7 other VMs using the ESX box (MedSpec), assigned to different cores, with high CPU and network I/O and when an additional VM was contending for the resources on the PS assigned core (CPU at 100%).

Table 1 shows the results for the number of users the Personalization Server can support without delays being apparent to the end user.

Period over which 95% of users logged on*	Number of users the Personalization Server can support without delay**				
	LowSpec (physical)	MedSpec (physical)	MedSpec (VM)	MedSpec (VM) (with 7 other VMs on ESX)	MedSpec (VM) (with contention for CPU)
30 minutes	3150	7200	6300	5900	2700

Table 1

* As users logon in a 'normal distribution', 95% is 2 standard deviations from the mean, therefore eliminating outliers.

** Delay is defined as an increase in Application Start time of over a second.

Personalization Database Performance

The performance of the Personalization Database (DB) is a measure of the total number of users that can be supported, measured in terms of logons and application starts per second.

The database performance was based solely on a database stressing tool (DTM DB Stress [1]). The actual input parameters used to stress the database were obtained from a cloned real user. These input parameters mimicked what the Personalization Server would request.

All tests were run using SQL Server 2005 Enterprise edition (64-bit only) on Windows 2003 Enterprise edition.

[1] DTM DB Stress is a database stressing tool produced by SQLEDIT. http://www.sqledit.com/stress

Tests

Microsoft SQL Server has the capability to split the main database .mdf file over multiple disk arrays. This allows a DBA to increase the I/O (or storage) capacity of a database by simply attaching an extra array, and then ensuring any increase in user data is stored on this disk. Additional arrays can be added until the CPU capacity of the server is reached.

The hardware used for these tests was:

HighSpecDB 2 x (4 core) Intel Xeon X5450 @ 3.00 GHz, 16.0GB RAM, (local hard disks (RAID 5 – 5 disks)

HighSpecDB + extra disk array 2 x (4 core) Intel Xeon X5450 @ 3.00 GHz, 16.0GB RAM, (local hard disks (RAID 5 – 5 disks) + Dot Hill 2730 Storage System, (RAID 5 - 12 disks)

These tests used a cloned profile of 35 applications and desktop settings. (size 812k, see appendix for details)

For each test the database was pre-populated with cloned copies of this profile. Three sets of tests were performed

1. 25,000 users loaded onto the local disk (log and archive on local disk)
2. 25,000 users loaded onto the array (log and archive on local disk)
3. 25,000 users loaded onto the local disk and 25,000 users loaded onto the array (log and archive on local disk)

The assumption in this test is that a user will log on and start 10 applications over a 30 minute period.

Figure 1 shows how the processing time for application starts varies depending upon the number of requests and where the main database file is stored. The red line illustrates how splitting the database over an extra disk increases the throughput capacity of the database.

Graph to show how much application start database processing time varies with load

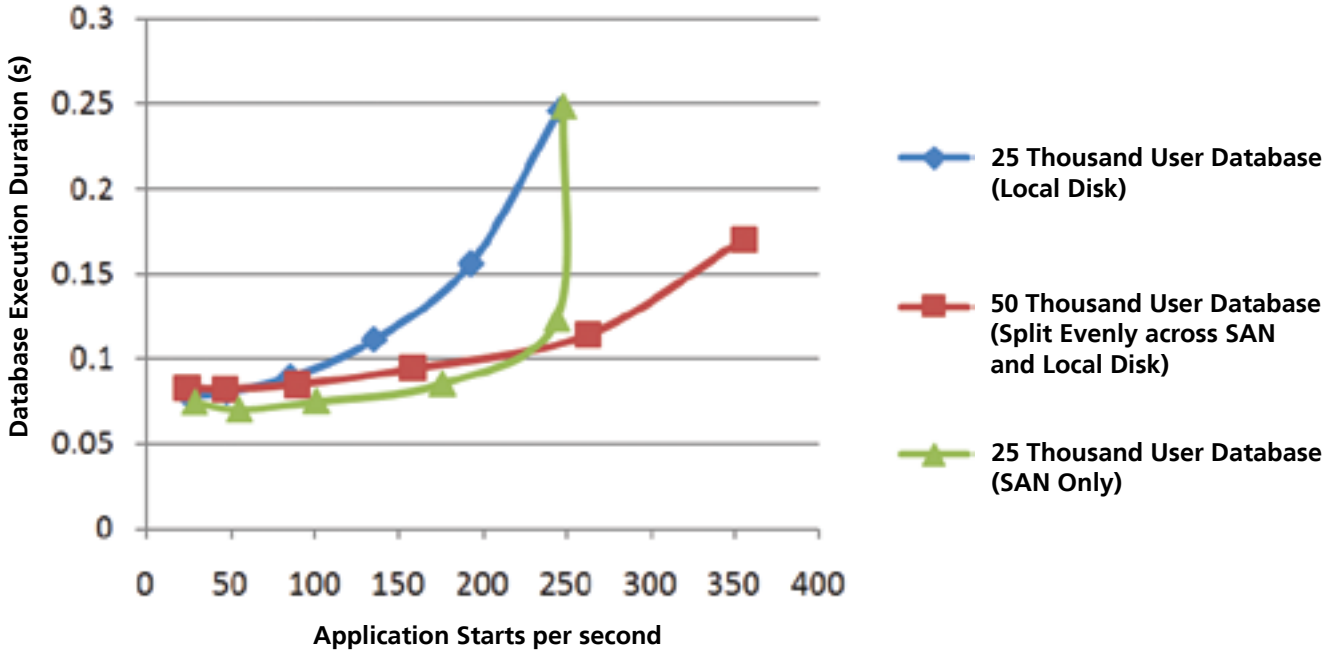

Figure 2 shows how the processing time for logons varies depending upon the number of requests and where the main database file is stored. The red line illustrates how splitting the database over an extra disk increases the throughput capacity of the database.

Graph showing how Logon database processing time varies with load

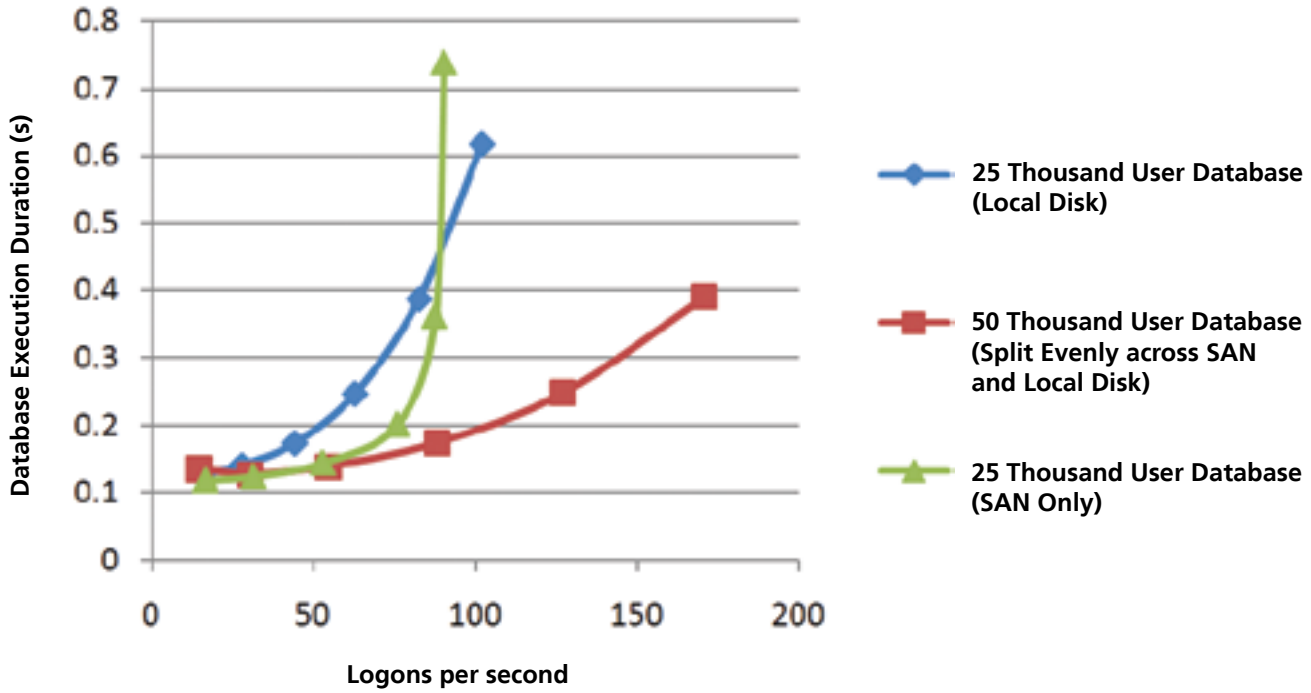

Figure 2

Table 2 shows the maximum number of logon and application start events that can be achieved simultaneously. Response times will have started to increase at this point. Adding more PSs will no longer give increased scalability when these values are reached.

Number of user profiles loaded into the database	25000 (just array)	25000 (just local disk)	50000 (local disk + array)
HighSpecDB			
Logons/sec	26	20	35
App Starts/sec	252	204	353

Table 2

Network Bandwidth

The bandwidth requirements of Environment Manager Personalization can be split into two main sections.

1. Bandwidth requirements of a personalization server
2. Bandwidth requirements of the database

The bandwidth requirements of endpoints are minimal. For an average user profile size of 278k (desktop setting and 10 applications), the start of day (30 minute window) band width requirements would be 278/1800 = 154 bytes/sec + packet overhead.

The following bandwidth requirements were measured using the physical **MedSpec** Personalization Server and a database of similar specification. The profile size for a single user was 0.278MB. This included desktop settings and 10 applications.

Throughput	(4 logons +40 app starts) / sec
Database	
Bytes sent/sec	1.19MB
Bytes received/sec	0.059MB
Personalization Server	
Bytes sent/sec	1.96MB
Bytes sent/sec	1.47MB

Summary

Personalization Server Results

The Personalization Server tests show that a single medium spec physical server is capable of supporting 7200 users. If the server is placed on a VM with other VMs on the same ESX box, the capacity reduces to 5900 users.

Database Results

The tests, run using a user profile of 35 apps + desktop settings, shows that the

HighSpecDB + extra disk array will support a throughput of 35 users/sec.

As users are assumed to logon onto the network at the start of day in a normal distribution, during peak load the throughput will be 50% higher than the 30 minute average. Therefore 35 users/sec, equates to 42,000 users logging on over a 30 minute period [2].

[2] There are 1800 seconds in 30 minutes. (35users/sec) *1800secs = 63,000 users. Less the 50% At peak load = 42,000 users

Extra performance can be achieved by placing the SQL Server log and Archive files on separate disks, and by increasing the number of arrays which the main database file is split over. This strategy increases the disk I/O capacity of the database. During the above test the CPU consumption was at an average of 20%.

To work out how many Personalization Servers are required for a set amount of users:

For Personalization Servers as VMs - before the database performance starts to degrade (which can be alleviated with extra disks), the administrator can divide the number of users required by the capacity of a single PS. i.e. 43,000 / 5900 = 7.3 PSs. Then divide this figure by the efficiency of their web server load balancing solution. For example if the load balancing solution is 75% efficient the number of servers required would be 7.3/0.75 = 9.7 single core VM Personalization Servers.

For Personalization Servers as Physicals - if we assume that capacity of physical IIS server scales linearly with increasing CPU cores, a single 8 core physical should easily cope with 43,000 users. (7200*8 = 57600)

Network Bandwidth Results

For 7200 users logging on and starting 10 applications in the first 30 minutes of the day the network bandwidth requirements for the PS would be 3.43MB/sec. For the database the network bandwidth would be 1.78MB/sec. The database figures would be expected to increase linearly with increased load. (All figures are based on a single user extracting 0.278MB of data from the database)

These results are intended to give an indication of the performance levels that can be achieved with this software. Customer's systems will vary in terms of the specification and configuration of the hardware and this will in term yield different results to those presented here.

Appendix

The sizes of application profiles are extremely variable. The size depends upon what applications are used and what interaction the user has had with these applications. Below is a set of applications (which have had specific changes applied to the profiles) which we use to compare our products performance between releases. Customers may have a different application profile footprint than stated here.

EMP PERSONALIZATION SERVER TESTS

Application (or desktop settings)	Cache Size (Largest to Smallest)	
Internet Explorer	114.0	KB
Microsoft Word	34.7	KB
Adobe Reader	28.9	KB
Microsoft Publisher	18.0	KB
Microsoft PowerPoint	16.8	KB
Microsoft Excel	16.3	KB
InfoPath	14.4	KB
Desktop Settings*	13.3	KB
Microsoft Access	8.71	KB
Notepad ++	6.51	KB
Windows AddressBook	6.26	KB
Total =	277	KB

* Note - as Terminal Servers were used to load the Personalization Server, no desktop wallpaper was set. This reduces the desktop setting size considerably.

EMP DATABASE STRESS TEST PROFILE

Application (or desktop settings)	Cache Size (Largest to Smallest)	
Desktop Settings**	174	KB
Internet Explorer	124	KB
Opera	71.4	KB
Mozilla Sunbird	69.3	KB
Nero 7	35.0	KB
Adobe Reader	34.1	KB
Apple Quick Time	31.8	KB
MS Outlook	30.1	KB
Windows Media Player	24.3	KB
MS Word	23.8	KB
Avant Browser	20.3	KB
Skype	16.7	KB
Smart FTP	14.9	KB
Firefox	14.2	KB
MS Powerpoint	13.8	KB
MS Access	13.5	KB
MS Excel	13.5	KB
MS Publisher	13.1	KB
MS InfoPath	12.0	KB
WinAmp	9.20	KB
Apple Safari	7.85	KB
FileZilla	4.53	KB
WinZip	4.51	KB
Notepad++	4.49	KB
Mozilla Thunderbird	4.49	KB
WinRaR	4.35	KB
PowerISO	3.92	KB
MagicISO	3.52	KB
MS Paint	3.50	KB
Wordpad	3.18	KB
Windows Address Book	2.30	KB
Notepad	1.88	KB
Certificates	1.64	KB
Audacity	1.50	KB
Putty	0.87	KB
MS Calculator	0.87	KB
Total =	812	KB

** Note - desktop wallpaper was set. This increases the desktop setting size.

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