PASSMARK
SOFTWARE

Antivirus & Internet Security Performance Benchmarking (Vista & Dual Core hardware)

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REVISION HISTORY

Revision	Revision History	Date
1	Initial version of the document. Based on the previous 2007 benchmark report, which was only on XP and Single core CPUs	4/June2008
2	Corrected a number of typos	6/June/2008

REFERENCES

Ref #	Document	Author	Date
1	Measuring Performance in Windows Vista http://www.microsoft.com/whdc/system/sysperf/Vista_perf.mspx	Microsoft	July 13 2007
2	Symantec RFP, Ed 1- 3	**Dora Karali,** Symantec Corporation	8/Aug/2007 - 22/Aug/2007
3	Performance Testing Methodologies 2007 + Symantec test cases	**Global Performance Unit** Symantec Corporation	9/Aug/2007

Executive Summary

System Impact Performance benchmark testing was carried on twenty-four Antivirus and Internet Security products from various vendors between September and November 2007. The current generation of products, available as of October 31 2007, were tested. Early in 2008 three additional products were tested during February, to make a total of twenty seven products tested. These new results have been included in this version of the document.

Measurements were made against five different metrics on a current generation Dual Core , PC running Vista. The performance metrics measured were:
- Boot time
- Scan speed
- UI launch speed
- Memory utilization
- IE launch / browsing speed

No attempt was made to measure the effectiveness of threat detection, as this aspect of the products is covered by other industry benchmarks such as Virus Bulletin and AV-Comparatives.org. This report is solely focused on measuring how responsive the applications are and by how extensively the applications utilize the resources of the machine.

The products were divided into two groups, AntiVirus products (AV) and Internet security products (IS). AV products are defined in this report as products which are primarily focused on detecting and remediating viruses & spyware. IS products typically add additional functions to provide comprehensive internet protection, such phishing detection, firewalls, scanning of web pages and the HTTP data.

Each product was then given a score of 1 to 5 for each metric and then an overall combined score was calculated, to rank the performance of each product relative to the other products.

The following three Antivirus products proved to be the best performing: Norton Antivirus 2008, Avira AV, Webroot SS AV/AS 5.5.

The following two Internet Security products proved to be the best performing: Norton Internet Security 2008, Norton 360.

All of the above mentioned products scored the same 5 star rating.

Products tested

The list of products under test in this report are:

Manufacturer	Product Name	Product Version	Date Tested
Alwil Software	Avast!	4.7	4th Oct '07
Avira	Personal Edition Classic	7.06	5th Oct '07
BitDefender	BitDefender Antivirus	2008	9th Oct '07
BitDefender	BitDefender Total Security	2008	9th Oct '07
Check Point Software	ZoneAlarm Antivirus	7.0	3rd Oct '07
Check Point Software	ZoneAlarm Internet Security Suite	7.0	3rd Oct '07
F-Secure	F-Secure Anti-Virus 2008	2008	10th Oct '07
F-Secure	F-Secure Internet Security 2008	2008	10th Oct '07
G DATA	G DATA AntiVirus	2008	5th Nov '07
G DATA	G DATA Internet Security	2008	7th Nov '07
Grisoft	AVG Free	7.5	19th Sept '07
Kaspersky Lab	Kaspersky Anti-Virus	7.0	12th Sept '07
Kaspersky Lab	Kaspersky Internet Security	7.0	11th Sept '07
McAfee	McAfee Total Protection (*)	2008	25th Oct '07
McAfee	McAfee VirusScan Plus Firewall and AntiSpyware (*)	2008	25th Oct '07
Microsoft	Windows Live OneCare	2.0	18th Feb '08
Panda Security	Panda Antivirus	2008	20th Sept '07
Panda Security	Panda Internet Security	2008	27th Sept '07
Symantec	Norton Antivirus	2008	5th Sept '07
Symantec	Norton Internet Security	2008	6th Sept '07
Symantec	Norton 360 V2	2008	29th Feb '08
Trend Micro	Trend Micro AntiVirus + AntiSpyware	2008	8th Oct '07
Trend Micro	Trend Micro PC-cillin Internet Security	2008	8th Oct '07
Trend Micro	Trend Micro Internet Security Pro	2008	18th Feb '08
Webroot Software	Webroot Spysweeper	5.5	19th Sept '07

(*) McAfee products are "version-less" subscriptions.

Metrics – Criteria measured

The metrics used for this report were selected because they provide an indication of the product's performance in a number of key areas which impact on the user experience. They are also objective metrics that can be replicated and re-produced by 3rd parties if required. See Appendix 1 for specific test methodologies.

Benchmark 1 - Boot time

The time taken for the machine to boot was measured. It is typical for protection applications of this genre to be launched at Windows start up. This typically adds some amount of time to the boot time for the machine. Our aim was to measure the additional time added to the boot process as a result of installing these applications. Shorter boot times are better and indicates that the application has less impact on the normal operation of the machine.

Benchmark 2 - Scan speed

All these products have functionality designed to detect viruses and various other forms of malware by scanning files on the system. This test measured the amount of time required to scan a typical set of clean files. The sample set used against all products was 1.2GB worth of data, made up of typical Window's files from the Windows system folder and Office files.

Benchmark 3 – User Interface launch speed

The time taken to start the User Interface of the product was measured. This is one measure of how responsive an application appears to a user. Both the initial launch time and the subsequent launch times, to allow for caching effects, were measured. For simplicity only the more critical initial times are used in this report.

Benchmark 4 - Memory utilization

The amount of RAM used by the product was measured while the machine and product were in an idle state, running in the background. All processes used by the application were identified and the total RAM usage calculated. The less RAM an application uses while resident in the background the better. Idle state measurements were made, as opposed to RAM used while actively scanning, because it is easier to measure the stable idle state and the aim was to see what resources were being used on a permanent basis.

Benchmark 5 - IE launch / browsing speed

The time taken to start the user interface of Internet Explorer was measured. This is one measure of how the product impacts on the responsiveness of the system. Both the initial launch time and the subsequent launch times, to allow for caching effects, were measured. For simplicity only the more critical initial times are used in this report.

Test results – Antivirus Products

Percentage rankings

	Boot Time	Scan Time	UI Initial	Memory	IE Initial
Avast	94%	100%	85%	85%	20%
AVG Free	94%	34%	0%	70%	93%
Avira AV	97%	93%	90%	89%	94%
BitDefender AV 2008	100%	88%	60%	100%	0%
F-Secure AV 2008	80%	65%	79%	43%	80%
G-Data AV 2008	87%	56%	85%	22%	72%
Kaspersky AV 7	95%	0%	93%	74%	67%
McAfee AV 08	82%	62%	79%	46%	76%
Norton AV 2008	95%	90%	100%	97%	91%
Panda AV 2008	84%	97%	36%	0%	100%
Trend Micro AV/AS 2008	92%	86%	16%	64%	89%
Webroot SS AV/AS 5.5	64%	81%	98%	63%	87%
ZoneAlarm AV 7.1	0%	68%	74%	76%	79%

The percentage of range indicates where the product performed on a single test in comparison to the other products. The range is the difference between the best performing product and the worst performing product. All products were scored against this range. A score of 100% indicates the best performance and a score of 0% indicates the worst performance. Unlike a simple ranking, this method test does not negatively impact products that had similar ★performance near the top of the range.

Quintiled Star Ranking

	Boot Time	Scan Time	UI Initial	Memory	IE Initial
Avast	★★★★★	★★★★★	★★★★★	★★★★★	★★
AVG Free	★★★★★	★★	★	★★★★	★★★★★
Avira AV	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
BitDefender AV 2008	★★★★★	★★★★★	★★★	★★★★★	★
F-Secure AV 2008	★★★★★	★★★★	★★★★	★★★	★★★★
G-Data AV 2008	★★★★★	★★★	★★★★★	★★	★★★★
Kaspersky AV 7	★★★★★	★	★★★★★	★★★★	★★★★
McAfee AV 08	★★★★★	★★★★	★★★★	★★★	★★★★
Norton AV 2008	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Panda AV 2008	★★★★★	★★★★★	★★	★	★★★★★
Trend Micro AV/AS 2008	★★★★★	★★★★★	★	★★★★	★★★★★
Webroot SS AV/AS 5.5	★★★★	★★★★★	★★★★★	★★★★	★★★★★
ZoneAlarm AV 7.1	★	★★★★	★★★★	★★★★	★★★★

The Quintiled Percentage of Range provides a score to each vendor depending on the score of the Percentage of Range (see above). Each range is in 20 point increments starting with 1 (0

to 20%) to 5 (80 to 100%). Once again, this rewards vendors who consistently perform at the top of each category.

Overall star score - Antivirus Products

The Quintile Scores above are averaged and then rounded to create the overall "Star Score" (below)

	Overall Star Score
Avast	★★★★
AVG Free	★★★
Avira AV	★★★★★
BitDefender AV 2008	★★★★
F-Secure AV 2008	★★★★
G-Data AV 2008	★★★★
Kaspersky AV 7	★★★★
McAfee AV 08	★★★★
Norton AV 2008	★★★★★
Panda AV 2008	★★★★
Trend Micro AV/AS 2008	★★★★
Webroot SS AV/AS 5.5	★★★★★
ZoneAlarm AV 7.1	★★★

Three Anti-virus products had high enough performance across the five test metrics to average 5 stars, Norton Antivirus 2008, Avira AV, Webroot SS AV/AS 5.5.

Test results – Internet Security Products

Percentage rankings

	Boot Time	Scan Time	UI Initial	Memory	IE Initial
BitDefender Total Security 2008	93%	90%	50%	100%	67%
F-Secure IS 2008	87%	62%	69%	47%	64%
G-Data IS 2008	89%	57%	66%	22%	48%
Kaspersky IS 7	99%	0%	95%	79%	74%
McAfee TP 08	97%	65%	69%	37%	65%
Microsoft OneCare	95%	58%	66%	75%	86%
Norton 360	97%	92%	100%	71%	62%
Norton IS 2008	100%	90%	99%	96%	54%
Panda IS 2008	78%	100%	45%	0%	88%
Trend Micro IS 2008 Pro	96%	89%	18%	41%	0%
Trend Micro IS 2008	97%	85%	0%	51%	100%
ZoneAlarm IS 7.1	0%	71%	76%	80%	82%

See the corresponding Antivirus test above for details about how the percentage values were derived from the raw results.

Quintiled star ranking

	Boot Time	Scan Time	UI Initial	Memory	IE Initial
BitDefender Total Security 2008	★★★★★	★★★★★	★★★	★★★★★	★★★★
F-Secure IS 2008	★★★★★	★★★★	★★★★	★★★	★★★★
G-Data IS 2008	★★★★★	★★★	★★★★	★★	★★★
Kaspersky IS 7	★★★★★	★	★★★★★	★★★★	★★★★
McAfee TP 08	★★★★★	★★★★	★★★★	★★	★★★★
Microsoft Onecare	★★★★★	★★★	★★★★	★★★★	★★★★★
Norton 360	★★★★★	★★★★★	★★★★★	★★★★	★★★★
Norton IS 2008	★★★★★	★★★★★	★★★★★	★★★★★	★★★
Panda IS 2008	★★★★	★★★★★	★★★	★	★★★★★
Trend Micro IS 08 Pro	★★★★★	★★★★★	★	★★★	★
Trend Micro IS 2008	★★★★★	★★★★★	★	★★★	★★★★★
ZoneAlarm IS 7.1	★	★★★★	★★★★	★★★★★	★★★★★

See the corresponding Antivirus test above for details about how the star values were derived from the raw results.

Overall star score - Internet Security Products

	Overall Star Score
BitDefender Total Security 2008	★ ★ ★ ★
F-Secure IS 2008	★ ★ ★ ★
G-Data IS 2008	★ ★ ★
Kaspersky IS 7	★ ★ ★ ★
McAfee TP 08	★ ★ ★ ★
Microsoft Onecare	★ ★ ★ ★
Norton 360	★ ★ ★ ★ ★
Norton IS 2008	★ ★ ★ ★ ★
Panda IS 2008	★ ★ ★ ★
Trend Micro IS 08 Pro	★ ★ ★
Trend Micro IS 2008	★ ★ ★ ★
ZoneAlarm IS 7.1	★ ★ ★ ★

Only two Internet Security products had high enough performance across the five test metrics to average 5 stars, Norton Internet Security 2008, Norton 360.

What this report doesn't cover

This report focused on performance measurements such as execution speed and resource usage. No attempt was made to measure the effectiveness of threat detection, as this aspect of the products is covered by other industry benchmarks such as Virus Bulletin &, AV-Comparatives.org.

The metrics used for this report cover a number of key performance areas and are metrics that can be replicated & re-produced by 3rd parties if required.

However there are a number of areas that this report doesn't attempt to cover. These include,

- CPU usage during local file scanning
- Impact on multitasking foreground tasks while scanning is in progress in the background
- RAM usage during scanning
- Impact on shutdown & hibernation times
- Installation & Un-installation times
- Out of the box virus signature update times
- Impact on E-mail receive and send times
- Speed of the products UI when performing common tasks
- Impact on system stability
- Testing on 64bit operating systems with 64bit hardware.

Some of these items are subjective and / or not easily measured, others such as signature update times are likely to change from one week to the next.

It might be of interest to re-visit this list during any future tests with a view to adding additional metrics.

Disclaimer & Disclosure

This report only covers products that were available up until available as at Feb 2008. And even then is not a exhaustive list of all products available in these very competitive product categories.

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Disclosure

Symantec Corporation funded the production of this initial version of the report and supplied some of the test scripts used for the tests (See appendix 1 'test methods' below).

Trademarks

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Appendix 1 - Test method – How we tested

Common methodology

Norton Ghost was used to create images of the O/S and these clean images were restored before the test of each product.

Image creation steps

1. Install and Activate Windows
2. Download and Install Windows Updates
3. Disable Automatic Updates
4. Turn off windows security notifications
5. Disable windows defender automatic scans to avoid unexpected background activity
6. If testing on Vista, close and disable "start at run", Vista sidebar to avoid some background activity
7. Disable windows firewall
8. For XP install .NET 2.0 as this is required by Ghost (and probably by several of the products under test).
9. Install Ghost
10. Disable ghost taskbar icon from auto startup in msconfig
11. Disable windows defender from startup in msconfig
12. Optimize bootup with ProcessIdleTasks (repeated several times)
13. If testing on Vista, disable Vista admin prompts to allow for better test automation
14. Reboot and tell msconfig not to start again.
15. Create image using Ghost

Benchmark 1 - Boot time

The machines were rebooted in a cyclic manner. Averages of 15 boot times were taken for each product on each machine. The start of the boot process was taken to be the end of the BIOS initialization and the end of the boot process was taken to be when the CPU was idle for 5 continuous seconds.

Windows has various functions to optimize the boot process. So it is important to force optimization of the system before starting the test (with ProcessIdleTasks) and delete the Windows pre-fetch folder.

Benchmark 2 - Scan speed

The time it took for each product to scan a set of sample files. The sample used was identical in all cases and contained a mixture of system files and Office files. In total there were 6159 files whose combined size was 982MB. Most of these files come from the Windows system folders. As the file types can influence the scan speed, the breakdown of the main file types, file numbers and total sizes of the files in the sample set is given here.

.dll	2589	490MB	.mof	43	6MB	.py	20	<1MB
.exe	695	102MB	.ax	39	4MB	.msc	18	1MB
.sys	332	23MB	.xls	38	3MB	.vbs	18	1MB
.gif	302	1MB	.ime	35	5MB	.xml	18	1MB
.doc	281	64MB	.drv	31	1MB	.rtf	16	62MB
.wmf	185	2MB	.txt	31	1MB	.ocx	16	4MB
.png	149	2MB	.chm	30	6MB	.tsp	14	1MB
.html	126	1MB	.cpl	29	4MB	.com	14	<1MB
.nls	80	6MB	.mfl	29	3MB	.xsl	14	<1MB
.jpg	70	1MB	.inf	26	2MB	.h	13	<1MB
.ini	59	2MB	.hlp	22	3MB	.vsd	12	2MB
.ico	58	<1MB	.imd	20	18MB	.scr	12	2MB

.aw	12	2MB	.lex	9	10MB	.wav	7	5MB
.js	12	1MB	.ppt	9	4MB			
.zip	11	25MB	.acm	9	1MB			

For each product 5 samples were taken with the machine rebooted before each sample to clear any caching effects.

Where possible, PerfScan++ was used to automate the testing process. Additionally, if possible the scan was run without launching the product's UI. When it was not possible to use PerfScan the samples were taken manually with a stop watch.

Benchmark 3 - UI launch speed

The launch speed of the product's user interface was tested using AppTimer. Each product was tested for 5 sets of 3 launches, with a reboot before each set. When compiling the results the first of each set was separated out so that there was a set of values for the initial launch after reboot and a set for subsequent launches.

In some cases AppTimer did not correctly record the time taken for UI launch. For instance, some applications would open their window and look like they were ready, but then continued to be unresponsive. Where this was noticeable the measurement was taken manually with a stop watch.

Benchmark 4 - Memory utilization

The Perflog++ utility was used to record process memory usage on the system at boot, and then every minute for another fifteen minutes after. This was done only once per product and resulted in a total of 16 samples. However the first sample taken at boot was never counted.

Because this recorded the memory usage of all processes, the products processes needed to be identified before the results could be processed. For this a program called Sysinternals Process Explorer was used to create a more detailed record of all the processes, with information such as company name included. This was run immediately after Perflog finished.

Benchmark 5 - IE launch / browsing speed

The launch speed of Internet Explorer interface was tested using AppTimer. This test was practically identical to the UI launch test. Each product was tested for 5 sets of 3 launches, with a reboot before each set. When compiling the results the first of each set was separated out so that there was a set of values for the initial launch after reboot and a set for subsequent launches.

Appendix 2 - Test environment

System under test

IBM/Leveno A55 ThinkCentre Desktop, Core 2 6300, 1GB of RAM, 220GB Hard drive. Vista Ultimate 32bit.

This was a current high end machine at the time of testing.

Appendix 3 - Raw results

Boot time

Product	Seconds
AV Products	
Avast	36.65
AVG Free	36.83
Avira AV	33.85
BitDefender AV 2008	31.28
F-Secure AV 2008	49.08
G-Data AV 2008	43.23
Kaspersky AV 7	35.39
McAfee AV 08	47.01
Norton AV 2008	35.75
Panda AV 2008	45.22
Trend Micro AV/AS 2008	38.25
Webroot Spysweeper AV/AS 5.5	63.15
ZoneAlarm AV 7.1	120.84
Average result	47.43

Product	Seconds
IS Products	
BitDefender Total Security 2008	42.69
F-Secure IS 2008	48.49
G-Data IS 2008	46.87
Kaspersky IS 7	36.68
McAfee TP 08	39.24
Microsoft Onecare	41.30
Norton 360	39.28
Norton IS 2008	36.15
Panda IS 2008	57.62
Trend Micro IS 08 Pro	39.65
Trend Micro IS 2008	39.22
ZoneAlarm IS 7.1	133.27
Average result	50.04

Scan time

Product	Seconds
AV Products	
Avast	64.2
AVG Free	351.9
Avira AV	92.6
BitDefender AV v11	115.6
F-Secure AV 2008	217.8

G-Data AV 2008	255.4
Kaspersky AV 7	499.2
McAfee AV 08	227.8
Norton AV 2008	108.3
Panda AV 2008	77.6
Trend Micro AV/AS 2008	123.2
Webroot Spysweeper AV/AS 5.5	147.2
ZoneAlarm AV 7.1	202.8
Average result	191.0

IS Products	
Kaspersky IS 7	501.1
BitDefender Total Security 2008	120.2
F-Secure IS 2008	237.2
G-Data IS 2008	261.2
McAfee TP 08	227.8
Microsoft Onecare	256.8
Norton 360	113.8
Norton IS 2008	118.3
Panda IS 2008	78.0
Trend Micro IS 08 Pro	125.8
Trend Micro IS 2008	141.6
ZoneAlarm IS 7.1	199.5
Average result	198.44

User Interface Launch (Initial)

Product	Milliseconds
AV Products	
Avast	1037.60
AVG Free	4718.80
Avira AV	831.00
BitDefender AV v11	2137.40
F-Secure AV 2008	1284.00
G-Data AV 2008	1048.00
Kaspersky AV 7	708.60
McAfee AV 08	1284.00
Norton AV 2008	390.20
Panda AV 2008	3146.00
Trend Micro AV/AS 2008	4015.00
Webroot Spysweeper AV/AS 5.5	478.00
ZoneAlarm AV 7.1	1500.00
Average result	1736.82

IS Products	
Trend Micro IS 2008	4632.00

BitDefender Total Security 2008	2574.00
F-Secure IS 2008	1774.00
G-Data IS 2008	1912.00
Kaspersky IS 7	710.80
McAfee TP 08	1774.00
Microsoft Onecare	1914.00
Norton 360	488.75
Norton IS 2008	549.60
Panda IS 2008	2764.00
Trend Micro IS 08 Pro	3878.00
ZoneAlarm IS 7.1	1480.40
Average result	2037.63

Memory Usage

Product	MB Used
AV Products	
Avast	17.6
AVG Free	27.9
Avira AV	14.5
BitDefender AV v11	7.3
F-Secure AV 2008	46.1
G-Data AV 2008	60.3
Kaspersky AV 7	25.0
McAfee AV 08	44.2
Norton AV 2008	9.4
Panda AV 2008	75.5
Trend Micro AV/AS 2008	32.1
Webroot Spysweeper AV/AS 5.5	32.4
ZoneAlarm AV 7.1	23.4
Average result	31.97
IS Products	
BitDefender Total Security 2008	8.0
F-Secure IS 2008	54.0
G-Data IS 2008	75.6
Kaspersky IS 7	26.2
McAfee TP 08	62.4
Microsoft Onecare	29.7
Norton 360	33.3
Norton IS 2008	11.2
Panda IS 2008	94.5
Trend Micro IS 08 Pro	58.7
Trend Micro IS 2008	50.2
ZoneAlarm IS 7.1	25.2

Average result	44.08

IE Launch Initial

Product	Milliseconds
AV Products	
Avast	2384.4
AVG Free	692.0
Avira AV	661.0
BitDefender AV v11	2860.2
F-Secure AV 2008	990.2
G-Data AV 2008	1182.0
Kaspersky AV 7	1302.0
McAfee AV 08	1081.7
Norton AV 2008	726.4
Panda AV 2008	518.6
Trend Micro AV/AS 2008	765.5
Webroot Spysweeper AV/AS 5.5	811.8
ZoneAlarm AV 7.1	1006.2
Average result	1152.46

Product	Milliseconds
IS Products	
Trend Micro IS 08 Pro	3703.0
BitDefender Total Security 2008	1531.3
F-Secure IS 2008	1646.8
G-Data IS 2008	2153.2
Kaspersky IS 7	1330.0
McAfee TP 08	1615.3
Microsoft Onecare	926.0
Norton 360	1703.4
Norton IS 2008	1957.8
Panda IS 2008	881.4
Trend Micro IS 2008	481.0
ZoneAlarm IS 7.1	1053.2
Average result	1581.87