PASSMARK
SOFTWARE

Antivirus, Internet Security and Total Security Products Performance Benchmarking (2009)

Vista/Dual Core Hardware

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REVISION HISTORY

Revision	Revision History	Date
Draft 1	Initial version of this document. Major items missing from this draft are: the high level result summary, some raw results and some of the detailed descriptions of the metrics used.	29 August 2008
Draft 2	Added missing raw results, methodology descriptions of the metrics used and notes about results. Corrected minor cut/paste errors, some refinement of wording. Missing high level results summary.	2 September 2008
Edition 1	First public release of this document. Added Overall Ranking of Products by Category and updated graphs/raw results. Corrected minor formatting errors.	8 September 2008
Edition 2	Follow-up release of this report. Addition of results for several newly released 2009 AV products; and exclusion of results for products which have been superseded by newer releases. Also includes previously omitted HTTP download test as full test results were not available at the public release of Edition 1.	11 November 2008
Edition 3	New methodology used to test the Installation Size of all products. The new methodology produces more reproducible results by removing as many Operating System and disc space random variables as possible. The results are revised in accordance to this new testing methodology.	6 February 2009

REFERENCES

Ref #	Document	Author	Date
1	Antivirus Performance Report for Windows Vista (Edition 2)	D. Wren and M. Fryer, **PassMark Software**	6 June 2008
2	What Really Slows Windows Down	O. Warner, **The PC Spy**	2001-2008
3	Antivirus, Internet Security and Total Security Products Performance Benchmarking (2009) (Edition 1)	K. Lai and D. Wren, **PassMark Software**	September 2008

Executive Summary

PassMark has executed performance benchmark testing on forty-seven Antivirus, Internet Security and Total Security products from various vendors between July 2008 and October 2008. The results within this document are intended as an update on previous test results collected by PassMark for Symantec in March 2008 (please see ***Reference #1: Antivirus Performance Report for Windows Vista, Edition 2***) and July-August 2008 (Please see ***Reference #3: Antivirus, Internet Security and Total Security Products Performance Benchmarking (2009) (Edition 1)***) on products released in 2008.

The second edition of this report focuses on results obtained from recently released products for 2009. PassMark has conducted performance benchmark testing on new versions of products which were included in the previous edition of this report, as well as a few additional products which have not previously been tested. Where we have executed benchmark testing on a newer version of a product, the result for the newer version will supersede our results for the outdated version.

PassMark will continue to execute performance benchmark testing on selected new versions of Antivirus, Internet Security and Total Security products in January 2009. A follow-up report comparing the findings in this report with our new results will be released next year.

Testing was performed on all products using seventeen performance metrics. These performance metrics are as follows:

- Boot time.
- Total Scan speed.
- UI launch speed (initial and subsequent).
- Memory utilization.
- HTTP download test.
- IE launch speed (initial and subsequent).
- Installation Size.
- Installation Time.
- Registry Key Count.
- Copying, moving and deleting different types of common files.
- Installing third party applications.
- Downloading binary files from websites.
- File format conversion.
- File compression and decompression.
- File write, open and close.

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 (*http://www.virusbtn.com*) and AV Comparatives (*http://www.av-comparatives.org*). This report is solely focused on measuring how responsive the applications are and how extensively the applications utilize the resources of the machine.

Testing was performed on a dual core Vista machine; the same machine used in previous testing. The products we have tested can be divided into three categories:

- **Antivirus (AV)** products are defined in this report as products which are primarily focused on detecting and remediating viruses and spyware.

- **Internet Security (IS)** products provides all the virus and spyware removal features of an AV, as well as additional functions to provide greater Internet protection. These features may include protection against phishing, root kit detection, firewalls and scanning of web pages and HTTP data.

- **Total Security (TS)** products provide data migration and backup features on top of all security features common to IS products.

Overall Ranking by Product Category

In the following tables, the products have been ranked by their overall score in comparison to other products from that category. The Best Possible Score represents a category's maximum score, i.e. the score of a hypothetical product which has ranked first in every test in that category. This figure varies between categories because different amounts of products were tested for each category, for example, in the Internet Security category, the best possible score is 204 (12 products x 17 tests).

Internet Security (IS) Products

Internet Security Products	
Product Name	**Score**
Norton Internet Security 2009	156
ESET Smart Security 2008	152
Kaspersky Internet Security 2009	140
AVG Internet Security 2008	116
G-Data Internet Security 2009	115
SourceNext Virus Security ZERO 2009	115
Panda Internet Security 2009	104
ZoneAlarm Internet Security Suite 2009	96
F-Secure Internet Security 2009	89
Trend Micro Internet Security 2009	91
McAfee Internet Security 2009	77
Trend Micro VirusBuster 2009	74
Best Possible Score	204

AntiVirus (AV) Products

AntiVirus Products	
Product Name	**Score**
ESET NOD32 Antivirus 3.0	137
Norton Antivirus 2009	131
Avira AntiVir Free AV 8	127
Avast! Antivirus 4.8	113
Sunbelt VIPRE AV and AS	113
AVG Free AV&AS 2008	102
Kaspersky Antivirus 2009	97
Rising Security Antivirus	94
G-Data Antivirus 2009	91
Trend Micro Antivirus 2009	63
McAfee VirusScanPlus 2009	54
Best Possible Score	187

Products Tested

This report compares our results for the following versions of products:

Internet Security (IS) Products

Manufacturer	Product Name	Product Version	Date Tested	Test type
Symantec Corporation	Norton Internet Security 2009	16.0.0.125	Sep 08	Full
Kaspersky Labs	Kaspersky Internet Security 2009	8.0.0.357	Jul 08	Full
McAfee Inc	McAfee Internet Security 2009	9.0.286	Oct 08	Full
AVG Technologies	AVG Internet Security 2008	8.0.138	Jul 08	Full
Trend Micro Ltd.	Trend Micro Internet Security 2009	17.0.1179	Oct 08	Full
Trend Micro Ltd	Trend Micro VirusBuster 2009	17.0.1262	Oct 08	Full
G Data Software	G Data Internet Security 2009	19.0.0.49	Oct 08	Full
ESET	ESET Smart Security 2008	3.0.650.0	Aug 08	Incremental
F-Secure	F-Secure Internet Security 2009	9.00.148	Oct 08	Full
Panda Security	Panda Internet Security 2009	14.00.00	Oct 08	Full
CheckPoint	ZoneAlarm Internet Security Suite 2009	8.0.020.000	Oct 08	Full
SourceNext Corp.	SourceNext Virus Security ZERO 2009	9.5.0295	Oct 08	Full

Antivirus (AV) Products

Manufacturer	Product Name	Product Version	Date Tested	Test type
Symantec Corporation	Norton Antivirus 2009	16.0.0.125	Sep 08	Full
Kaspersky Labs	Kaspersky Antivirus 2009	8.0.0.357	Jul 08	Full
McAfee Inc.	McAfee VirusScanPlus 2009	9.0.286	Oct 08	Full
AVG Technologies	AVG Free AV&AS 2008	8.138.1332	Jul 08	Full
Trend Micro Ltd.	Trend Micro Antivirus 2009	17.0.1179	Oct 08	Full
G Data Software	G-Data Antivirus 2009	19.0.0.49	Oct 08	Full
ESET	ESET NOD32 Antivirus 3.0	3.0.667.0	Jul 08	Full
Avira gmbH	Avira AntiVir Free AV 8	8.1.0.326	Jul 08	Full
ALWIL Software	Avast! Antivirus 4.8	4.8.1229	Jul 08	Full
Beijing Rising Int. Software Co.	Rising Security Antivirus	20.55.11	Jul 08	Full
Sunbelt Software	VIPRE Antivirus and Antispyware	3.1.2315	Oct 08	Full

Original Set of Metrics – Criteria Measured

This set of metrics was used in the original testing. These metrics were selected because they provided an indication of the product's performance in a number of key areas which impacted on the user experience. All metrics are objective and can be replicated and reproduced by third parties if required.

Please see ***'Appendix 1 – Test method – How did we conduct these tests?'*** for detailed test methodologies.

Benchmark 1 – Boot Time

The time taken for the machine to boot was measured. It is typical for antiviral or security suite applications 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 indicate 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 – HTTP Download

Antivirus products commonly scan data for malware as it is downloaded from the local network or internet. This test measures what impact the product has on HTTP downloads across a local network. A Gigabit NIC and switch were used in this test.

Benchmark 5 – 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 6 – IE launch 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.

New Set of Metrics – Criteria Measured

Introduced in the first edition of this report, this additional set of metrics was selected to supplement and extend the initial set of metrics in testing to a user's experience of a software product. These new benchmarks include installation speed, the amount of installation space a product will occupy on a user's hard drive and the amount of keys added to the Registry after installation.

Benchmarks 9 through to 14 comprise of a script-based "performance obstacle course". Each of these benchmarks were designed to provide performance results in the context of the end user experience by mimicking performance of tasks that end users may perform on a real-time or daily basis.

Please refer to ***'Appendix 1 – Test method – How did we conduct these tests?'*** for detailed test methodologies.

Benchmark 7 – Installation Time

It is important that a user has good first impressions of a product. The speed and ease of the installation process will strongly impact this initial experience. This test measures the minimum Installation Time a product requires to be fully functional and ready for use by the end user. Lower times represent products which are quicker for a user to install.

Benchmark 8 – Installation Size

In offering new features and functionality to users, software products tend to increase in size with each new release. Although new technologies push the size limits of hard drives each year, the growing disk space requirements of common applications and the increasing popularity of large media files (such as movies, photos and music) ensure that a product's installation size will remain of interest to home users.

This metric aims to measure a product's total installation size. This metric has been defined as the total disk space consumed by all new files added during a product's installation.

Benchmark 9 – Registry Key Count

A large registry increases a machine's use of resources. This is likely to negatively impact system performance, especially on much older machines. This test measures the amount of keys and values added to registry, after rebooting the test machines, following a successful product installation. Lower numbers mean that a product has had less impact on the registry.

Benchmark 10 – File Copy, Move and Delete

This metric measured the amount of time required to move, copy and delete a sample set of files. The sample file set contains several types of file formats that a Windows user would encounter in daily use. These formats include documents (e.g. Microsoft Office documents, Adobe PDF, Zip files, etc), media formats (e.g. images, movies and music) and system files (e.g. executables, libraries, etc).

Benchmark 11 – Installing Third Party Applications

This metric measured the amount of time required to install and uninstall third party programs.

Benchmark 12 – Binary File Download Speed

The metric measured the amount of time required to download a variety of binary files through HTTP. Binary files used in this test include file formats that users would typically download from the web such as images, archives, music files and movie files.

Benchmark 13 – File Format Conversion

This test measures the amount of time required to convert an MP3 file to a WAV and subsequently, convert the same MP3 file to a WMA format.

Benchmark 14 – File Compression and Decompression

This metric measures the amount of time required to compression and decompression of different types of files. Files formats used in this test included documents, movies and images.

Benchmark 15 – File Write, Open and Close

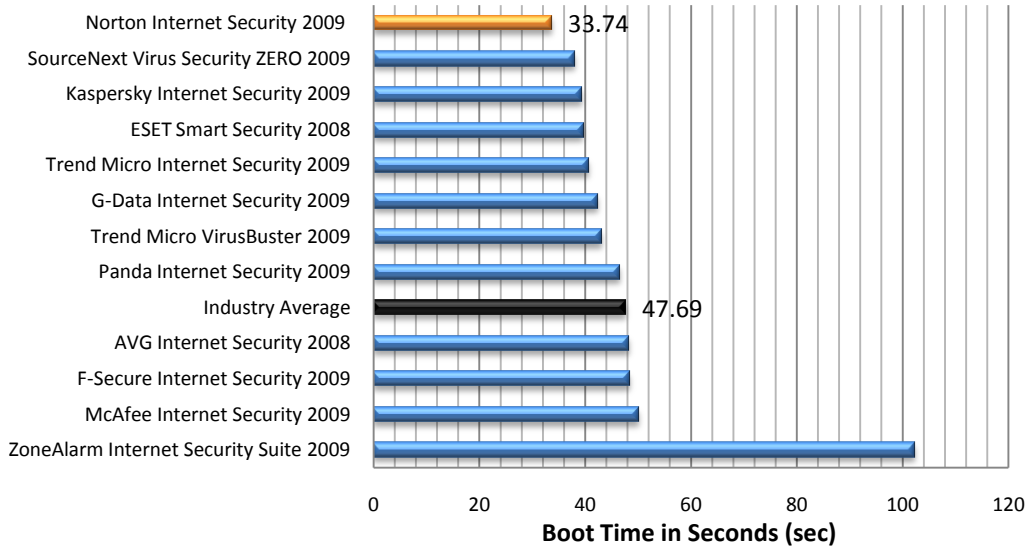
This benchmark was derived from Oli Warner's File I/O test at http://www.thepcspy.com (please see ***Reference #2: What Really Slows Windows Down***). This metric measures the amount of time required for the system to write a file, then open and close that file.

Test Results – Internet Security (IS) Products

In the following charts, we have highlighted the results we obtained for Norton Internet Security 2009 in orange. For ease of comparison, we have also highlighted industry averages in black.

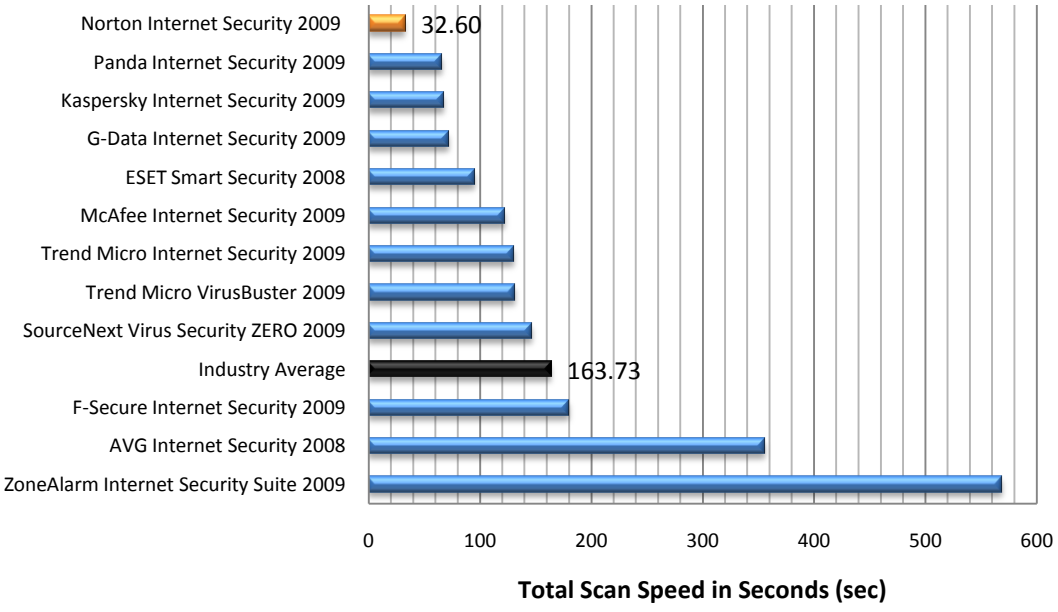
Benchmark 1 – Boot Time

The following chart compares the average system boot time (from a sample of 15 boots) for each Internet Security product we tested. Products with lower boot times are considered better performing products in this category.



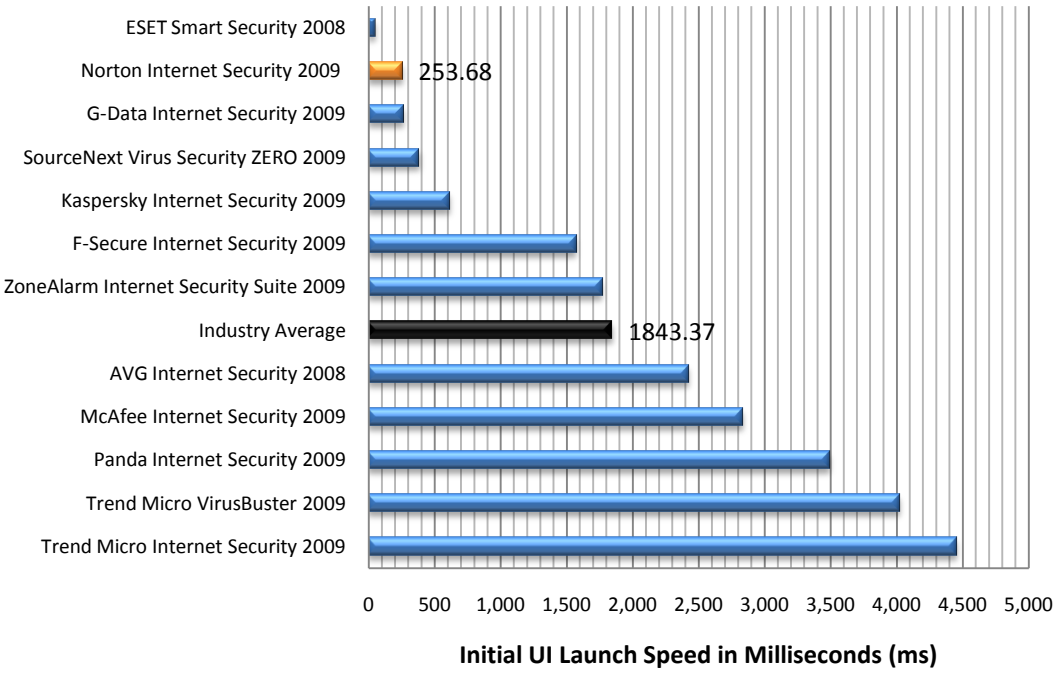
Benchmark 2 – Scan Speed

The following chart compares the average scan time of 6159 files (totaling 982MB) for each Internet Security product we tested. This time is calculated by averaging the initial (Run 1) and subsequent (Runs 2-5) scan times. Products with lower scan times are considered better performing products in this category.



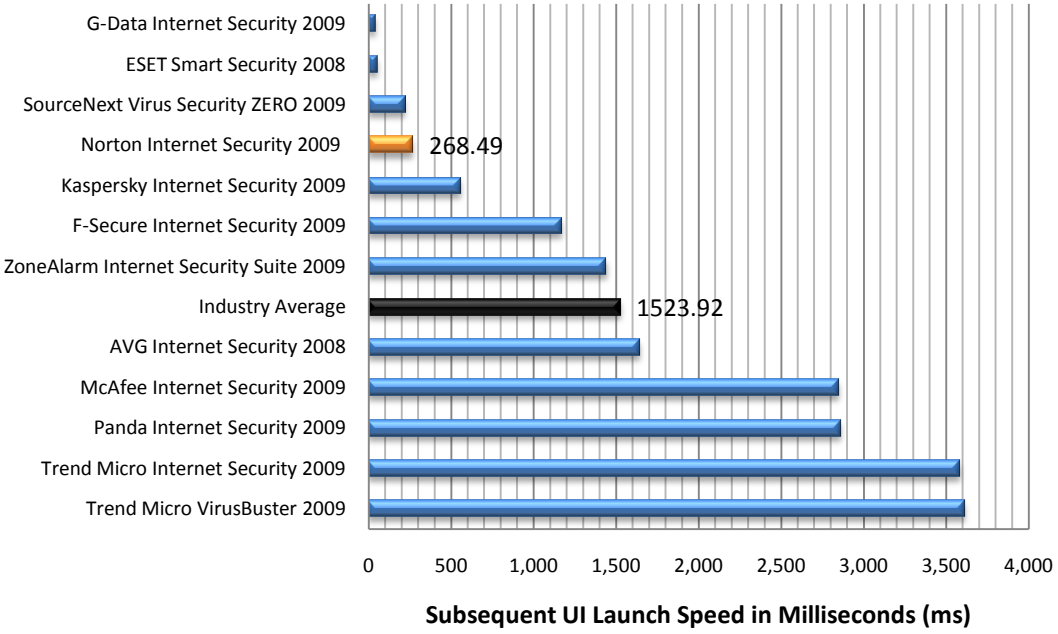
Benchmark 3a – Initial UI Launch Time

The following chart compares the average launch times of the User Interface (after rebooting the machine) for each Internet Security product we tested. Products with lower UI launch times are considered better performing products in this category.



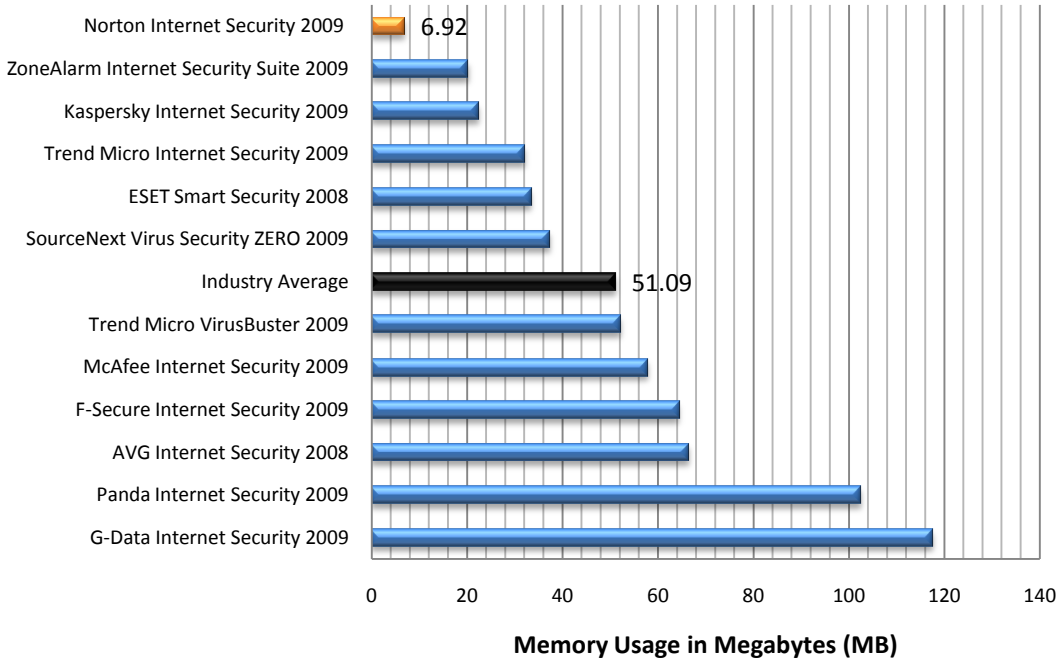
Benchmark 3b – Subsequent UI Launch Time

The following chart compares the average launch times of the User Interface by restarting the Internet Security application (without rebooting the machine) for each Internet Security product tested. Lower times are better. Products with lower UI launch times are considered better performing products in this category.



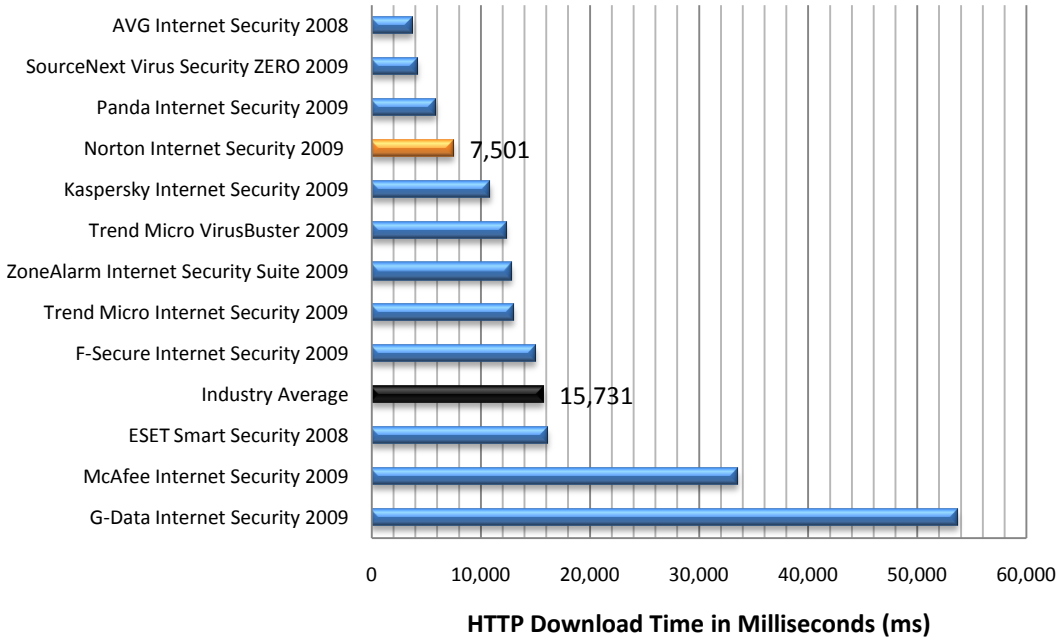
Benchmark 4 – Memory Utilization

The following chart compares the average amount of RAM used while idle for each Internet Security product tested. This average is taken from a sample of ten memory snapshots taken at roughly 60 seconds apart after reboot. Products with lower idle RAM usage are considered better performing products in this category.



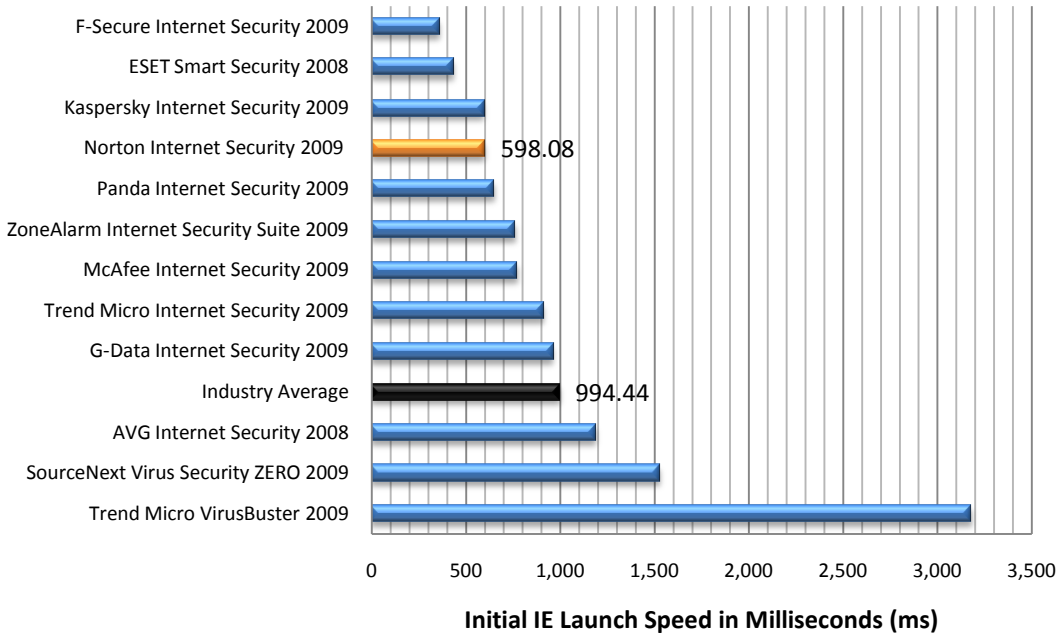
Benchmark 5 – HTTP Download

The following chart compares the average time taken over fifteen cycles for the file set to be downloaded through the local area network from the server machine. Products with lower download times are considered better performing products in this category.



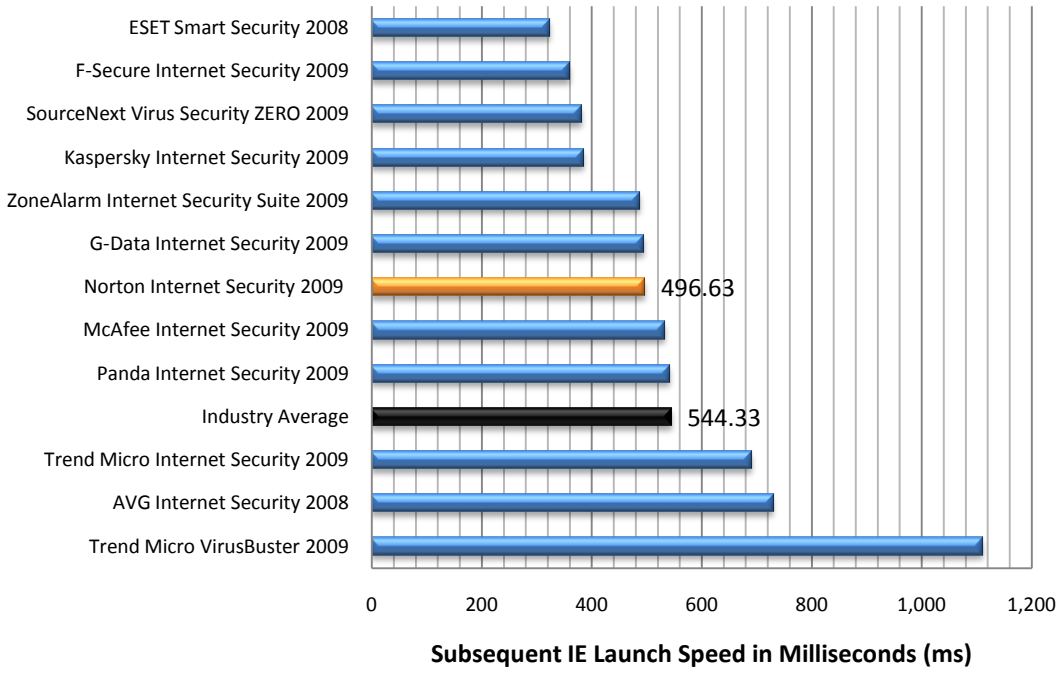
Benchmark 6a – Initial IE Launch Time

The following chart compares the average launch times of Internet Explorer after rebooting the machine for each Internet Security product we tested. Products with lower IE launch times are considered better performing products in this category.



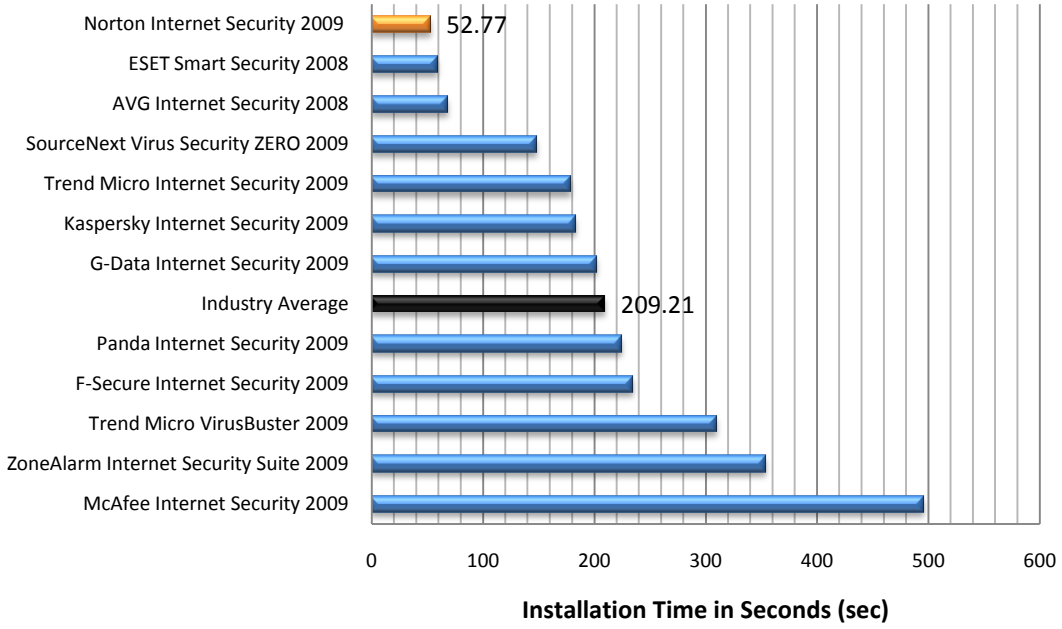
Benchmark 6b – Subsequent IE Launch Time

The following chart compares the average launch times of Internet Explorer after application restart (without rebooting the machine) for each Internet Security product we tested. Products with lower IE launch times are considered better performing products in this category.



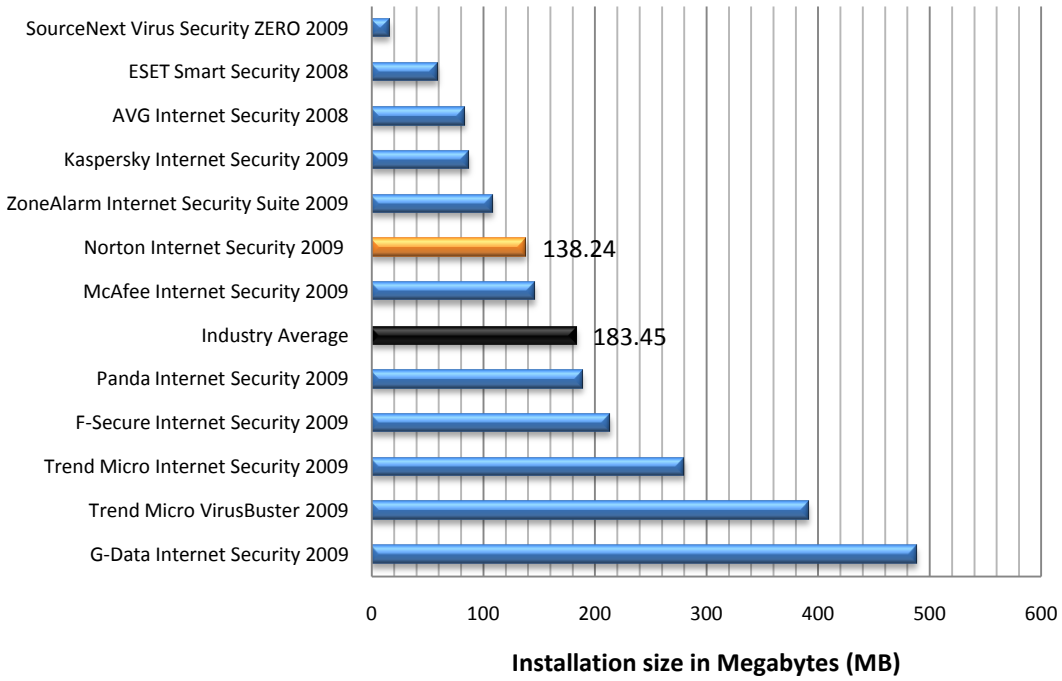
Benchmark 7 – Installation Time

The following chart compares the minimum installation time it takes for Internet Security products to be fully functional and ready for use by the end user. Products with lower installation times are considered better performing products in this category.



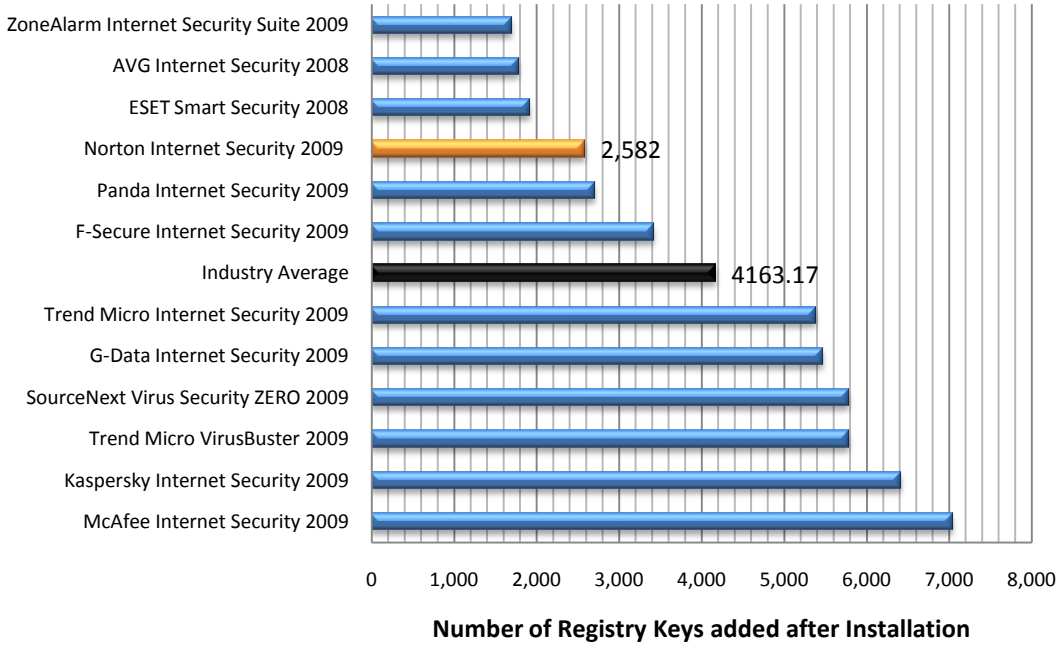
Benchmark 8 – Installation Size

The following chart compares the installation sizes of Internet Security products. Products with lower installation sizes are considered better performing products in this category.



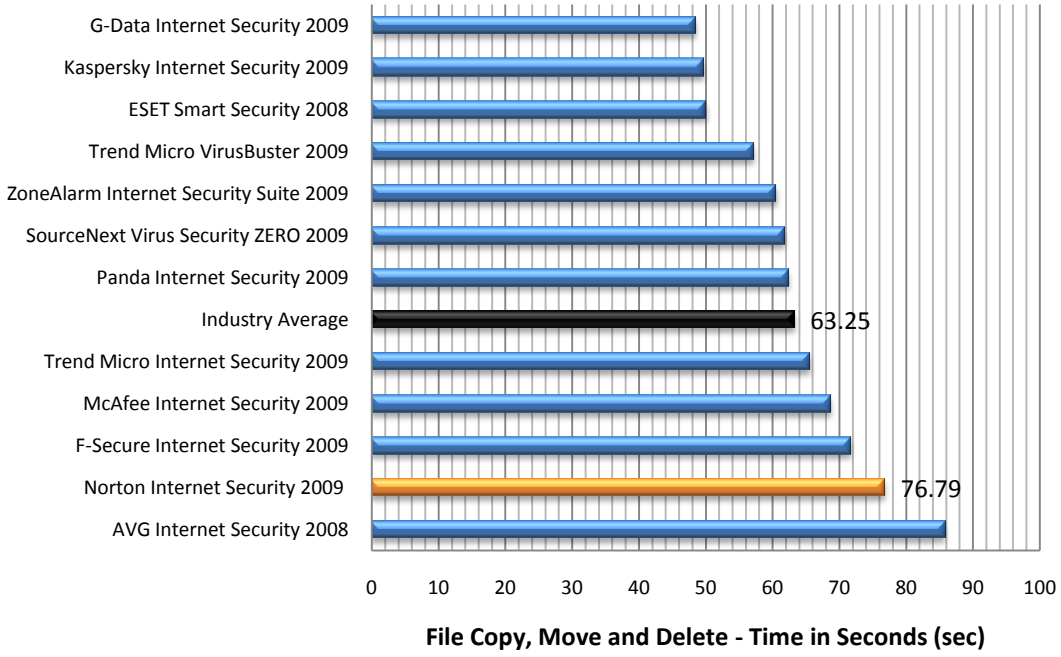
Benchmark 9 – Registry Key Count

The following chart compares the amount of Registry Keys created during product installation, for each Internet Security product we tested. Products with lower key counts are considered better performing products in this category.



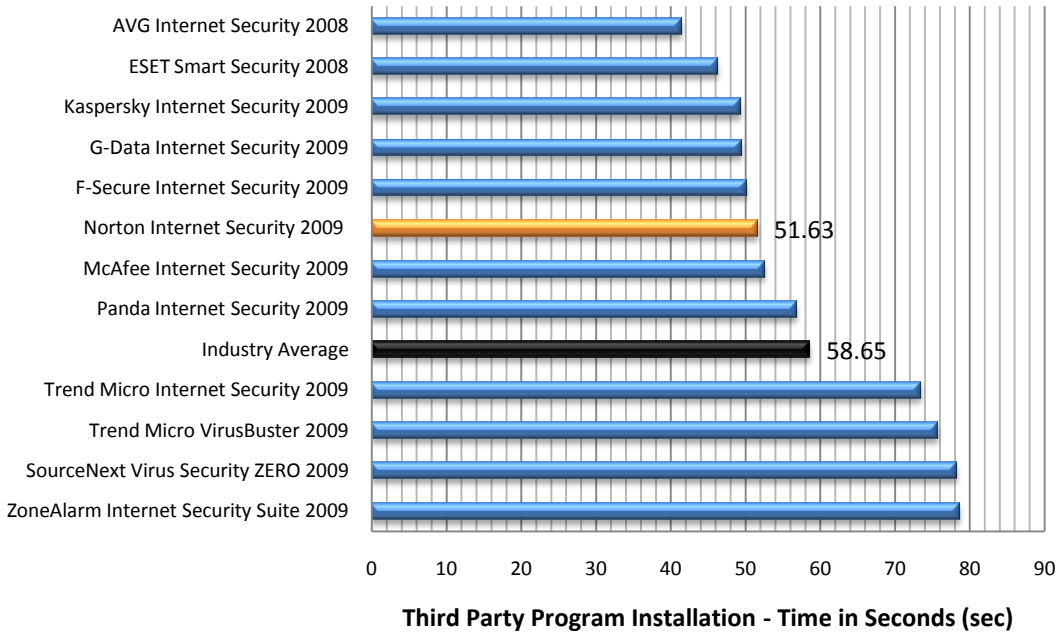
Benchmark 10 – File Copy, Move and Delete

The following chart compares the average speed of file copying, moving and deleting for each Internet Security product we tested. Products with lower times are considered better performing products in this category.



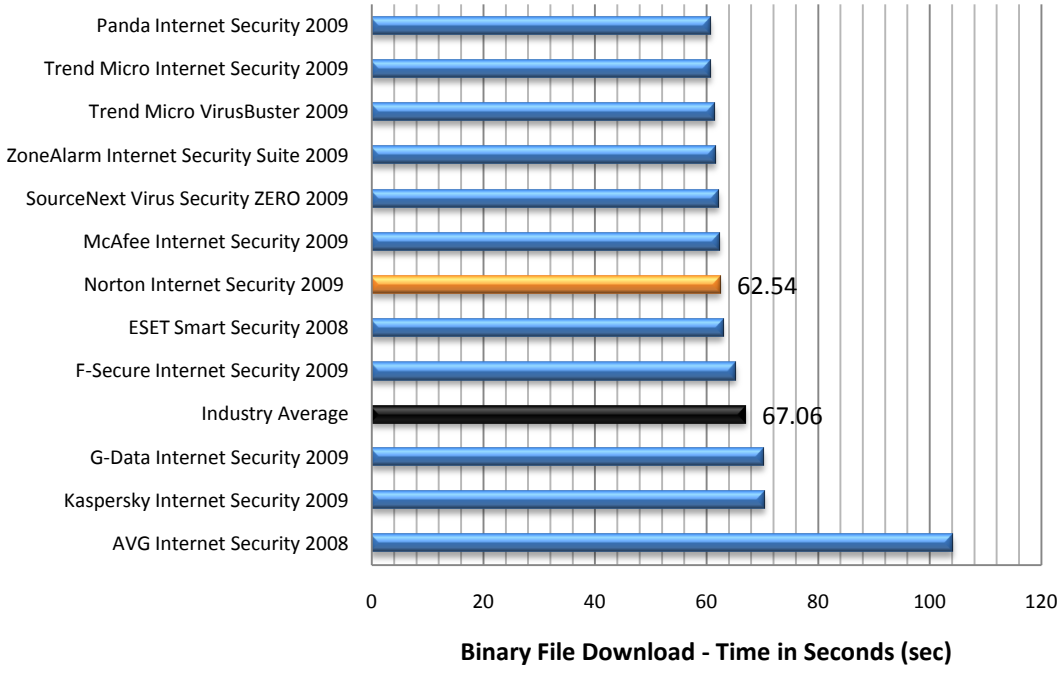
Benchmark 11 – Installation of Third Party Applications

The following chart compares the average speed of installation of third party applications for each Internet Security product we tested. Products with lower times are considered better performing products in this category.



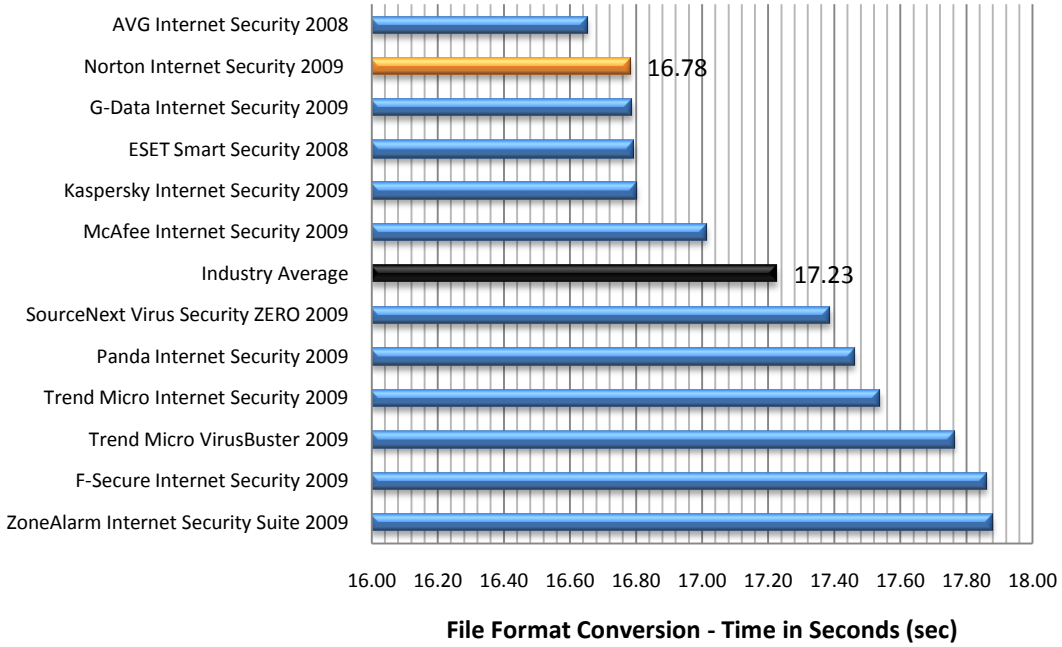
Benchmark 12 – Binary File Download Speed

The following chart compares the average speed of HTTP downloads of common file types for each Internet Security product we tested. Products with lower times are considered better performing products in this category.



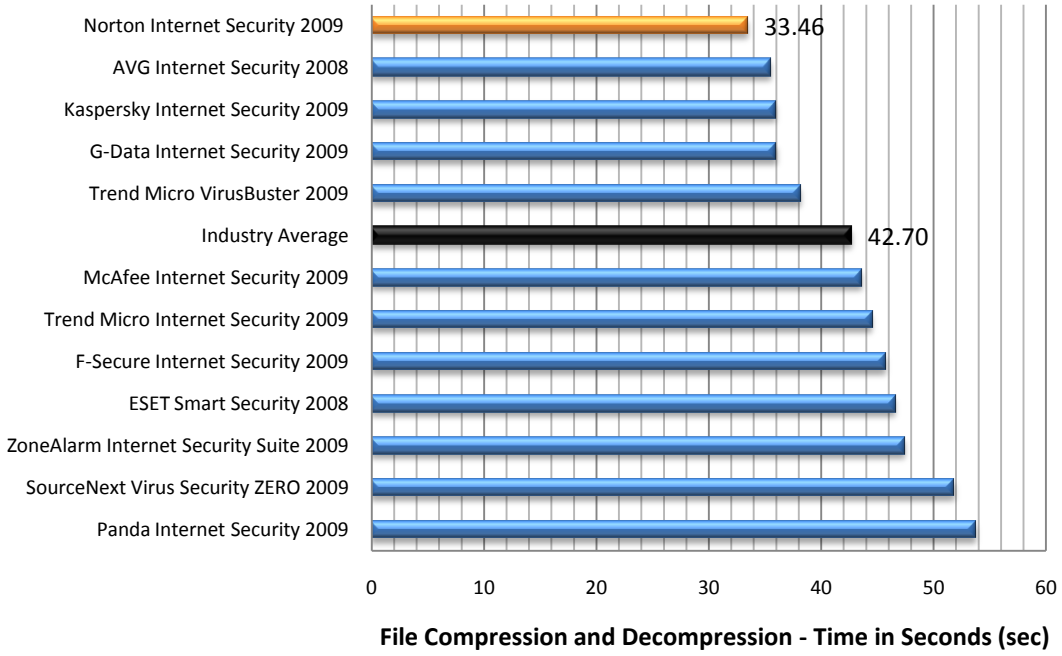
Benchmark 13 – File Format Conversion

The following chart compares the average speed at which files can be converted from one file format to another (MP3↔WMA, MP3↔WAV) for each Internet Security product we tested. Products with lower times are considered better performing products in this category.



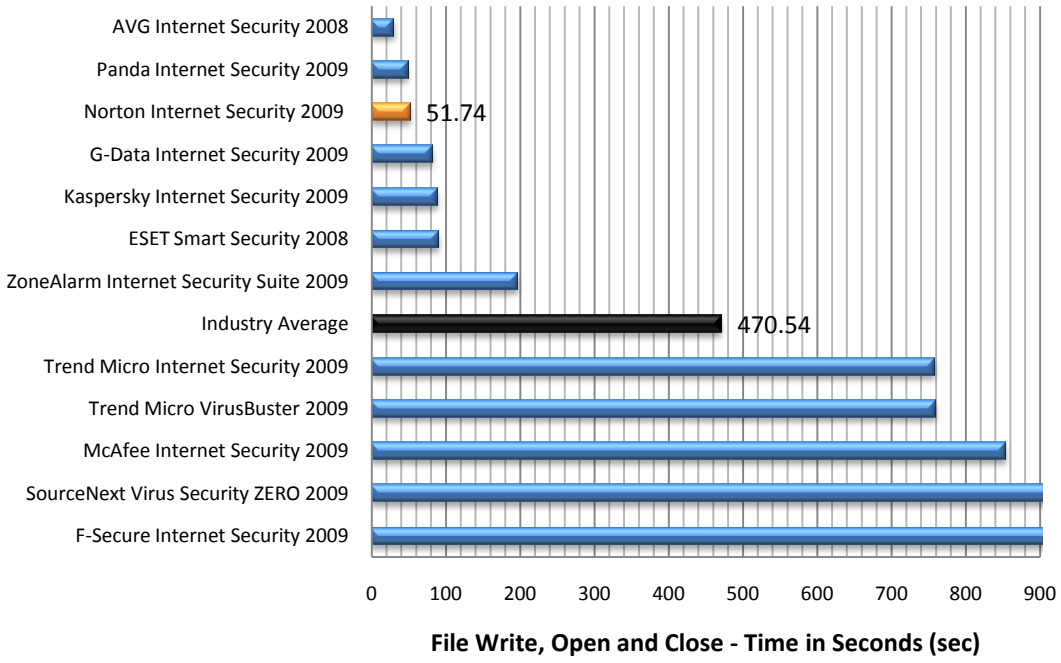
Benchmark 14 – File Compression and Decompression

The following chart compares the average speed at which files can be compressed and decompressed for each Internet Security product we tested. Products with lower times are considered better performing products in this category.



Benchmark 15 – File Write, Open and Close

The following chart compares the average speed at which a file can be written to the hard drive, then opened and closed, for each Internet Security product we tested. Products with lower times are considered better performing products in this category.



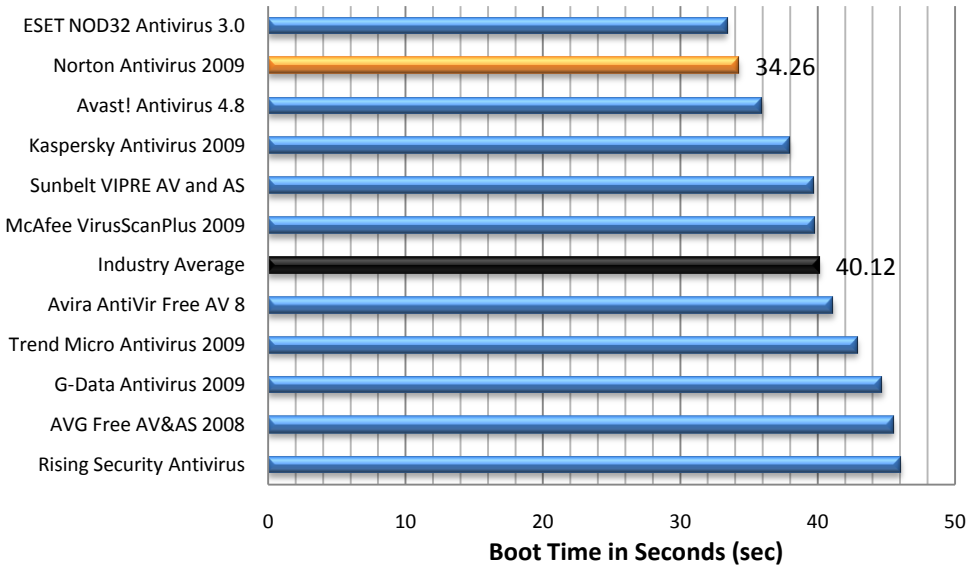
*** F-Secure Internet Security 2009** performed extremely poorly in this category when compared to other products (over 20,618 seconds on average to execute the test). The industry average excludes this result and the chart has been rescaled to emphasize the differences between the remaining products. While **SourceNext VirusSecurity ZERO 2009** has not been excluded from the industry average, it has also performed relatively poorly in this category when compared to other products (taking 2,215 seconds on average to execute the test).

Test Results – Antivirus (AV) Products

In the following charts, we have highlighted the results we obtained for Norton Antivirus 2009 in orange. For ease of comparison, we have also highlighted industry averages in black.

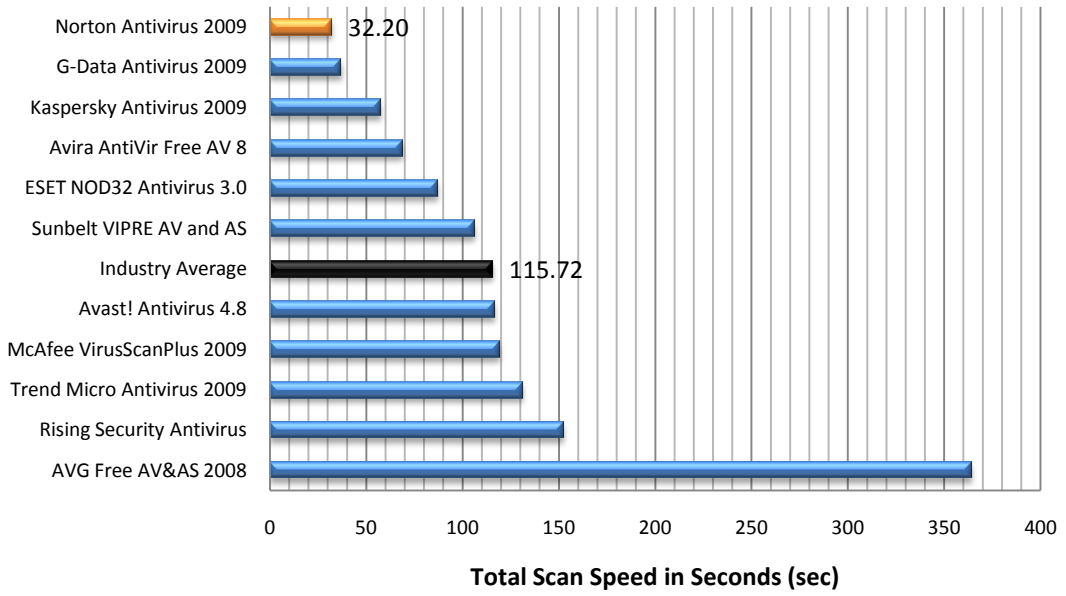
Benchmark 1 – Boot Time

The following chart compares the average system boot time (from a sample of 15 boots) for each Internet Security product we tested. Products with lower boot times are considered better performing products in this category.



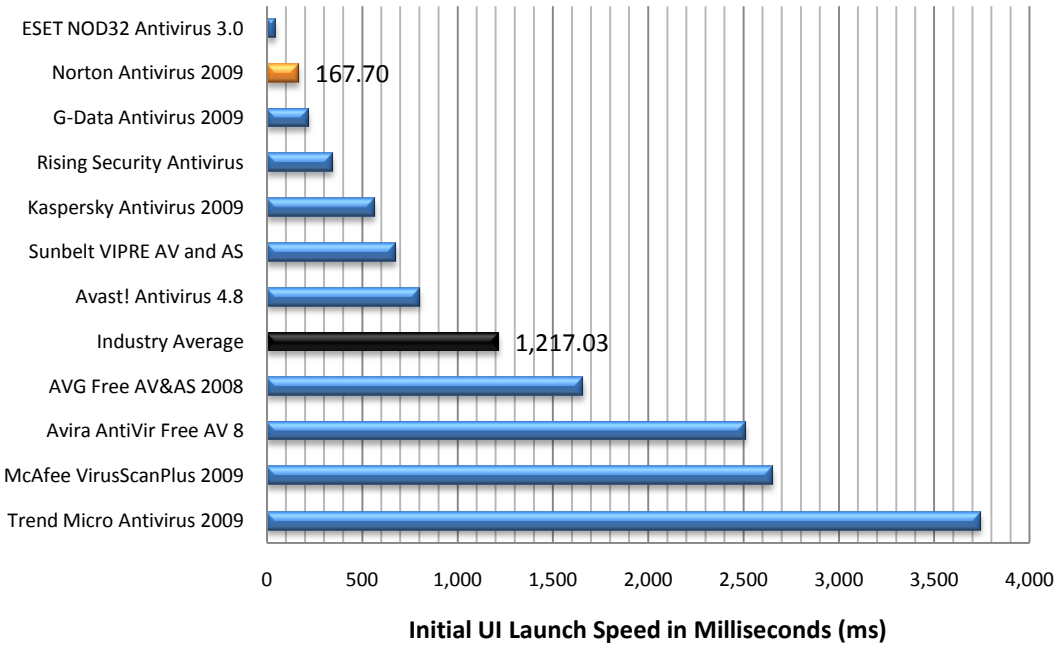
Benchmark 2 – Scan Speed

The following chart compares the average scan time of 6159 files (totaling 982MB) for each Internet Security product we tested. This time is calculated by averaging the initial (Run 1) and subsequent (Runs 2-5) scan times. Products with lower scan times are considered better performing products in this category.



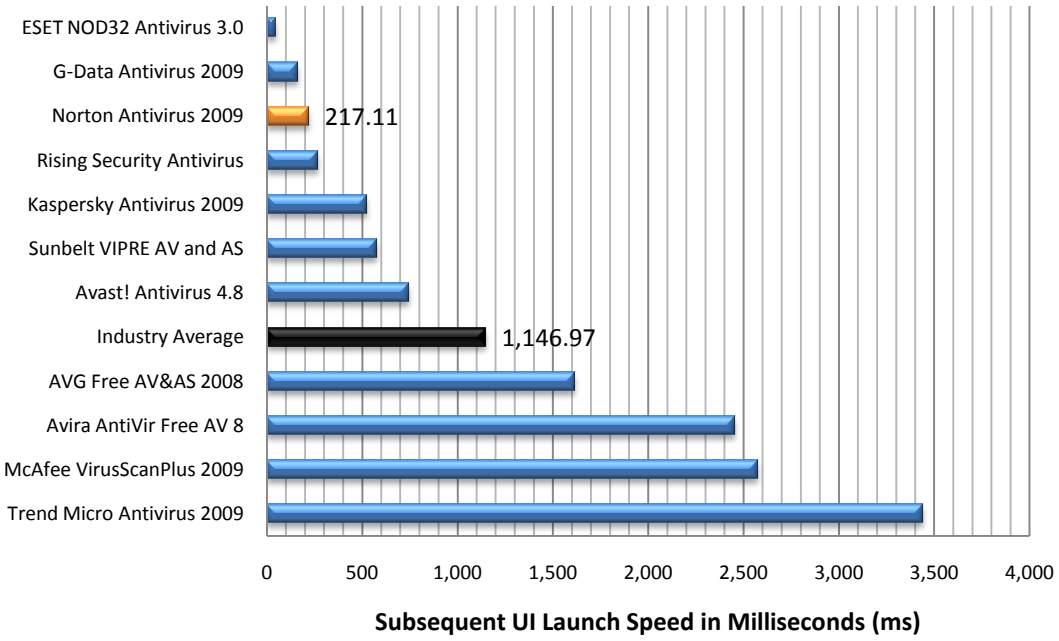
Benchmark 3a – Initial UI Launch Time

The following chart compares the average launch times of the User Interface (after rebooting the machine) for each Internet Security product we tested. Products with lower UI launch times are considered better performing products in this category.



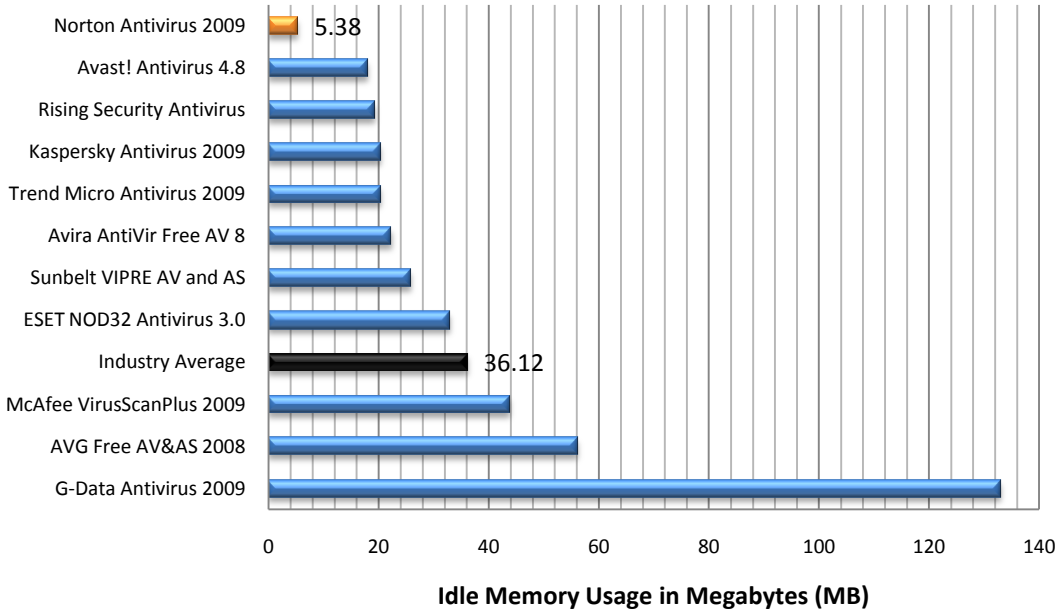
Benchmark 3b – Subsequent UI Launch Time

The following chart compares the average launch times of the User Interface by restarting the Internet Security application (without rebooting the machine) for each Internet Security product tested. Lower times are better. Products with lower UI launch times are considered better performing products in this category.



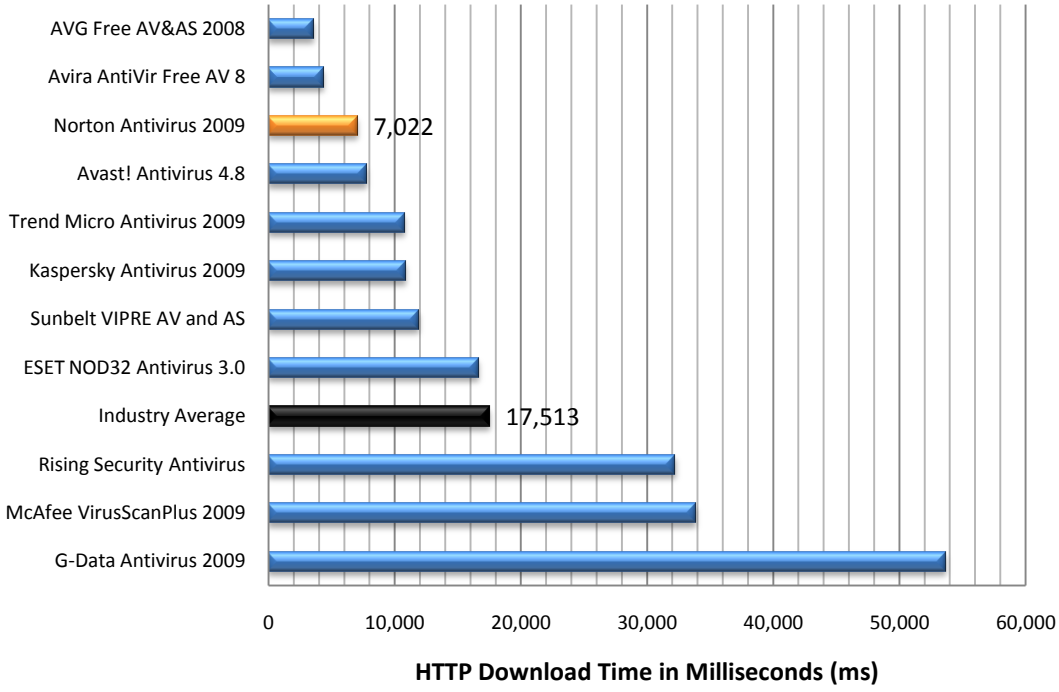
Benchmark 4 – Memory Utilization

The following chart compares the average amount of RAM used while idle for each Internet Security product tested. This average is taken from a sample of ten memory snapshots taken at roughly 60 seconds apart after reboot. Products with lower idle RAM usage are considered better performing products in this category.



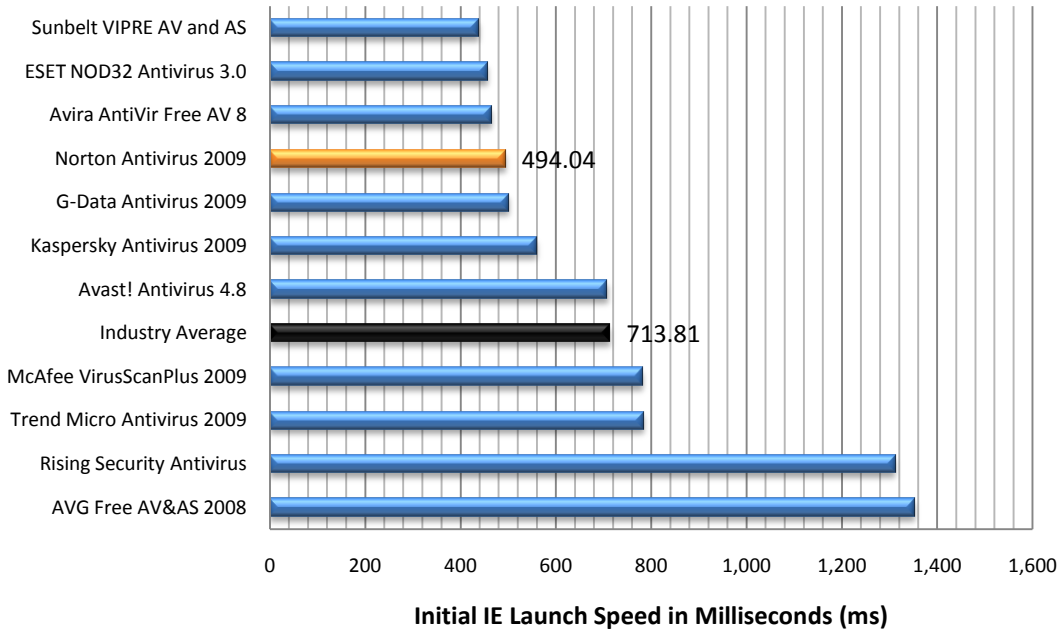
Benchmark 5 – HTTP Download

The following chart compares the average time taken over fifteen cycles for the file set to be downloaded through the local area network from the server machine. Products with lower download times are considered better performing products in this category.



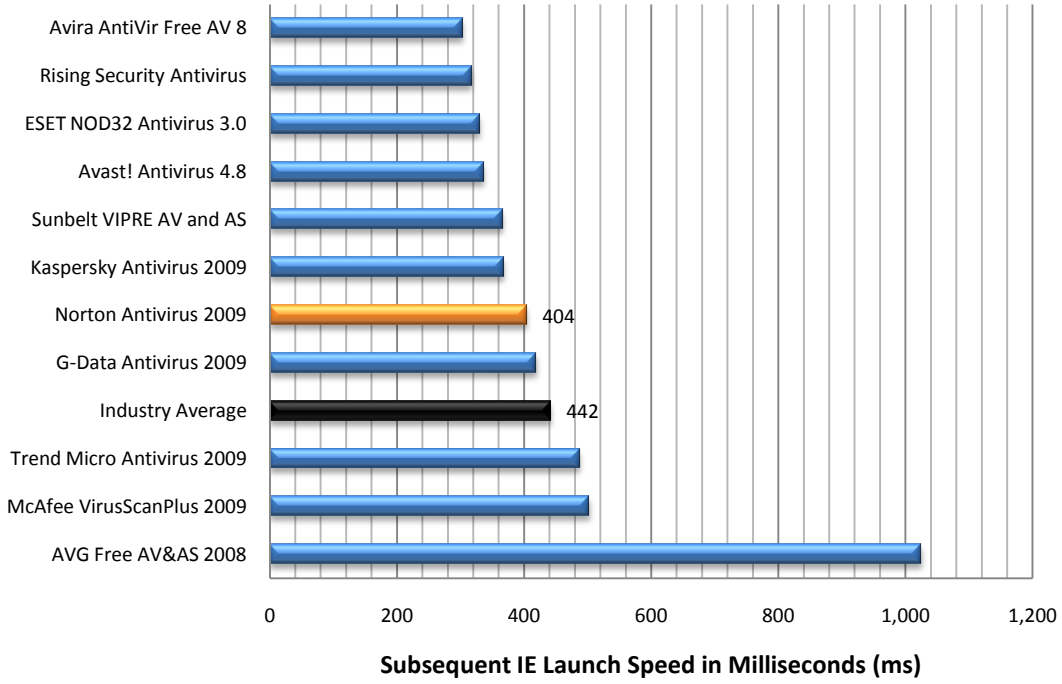
Benchmark 6a – Initial IE Launch Time

The following chart compares the average launch times of Internet Explorer after rebooting the machine for each Internet Security product we tested. Products with lower IE launch times are considered better performing products in this category.



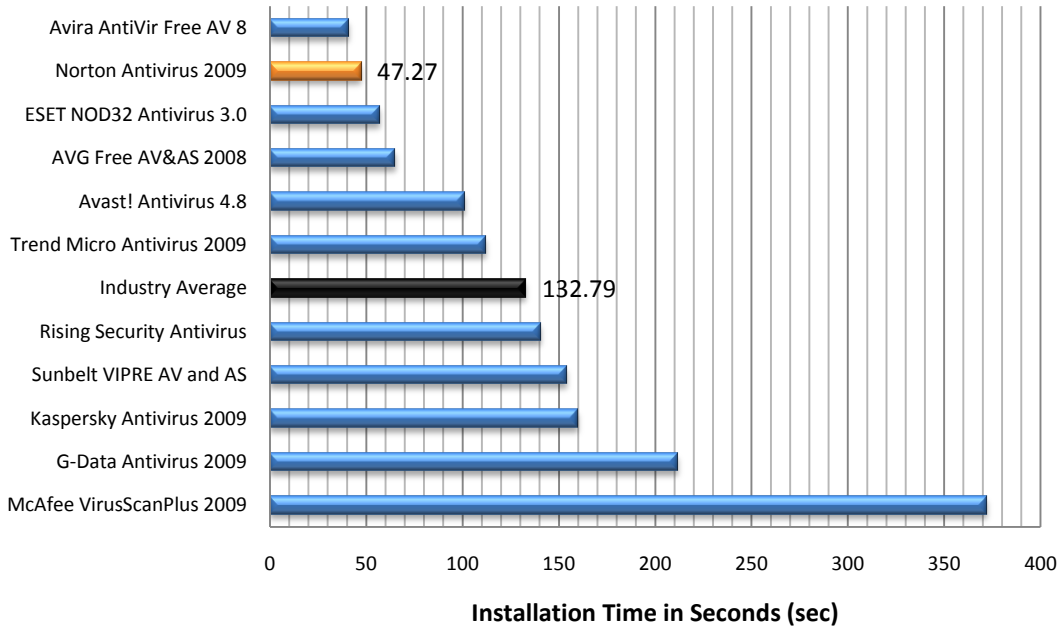
Benchmark 6b – Subsequent IE Launch Time

The following chart compares the average launch times of Internet Explorer after application restart (without rebooting the machine) for each Internet Security product we tested. Products with lower IE launch times are considered better performing products in this category.



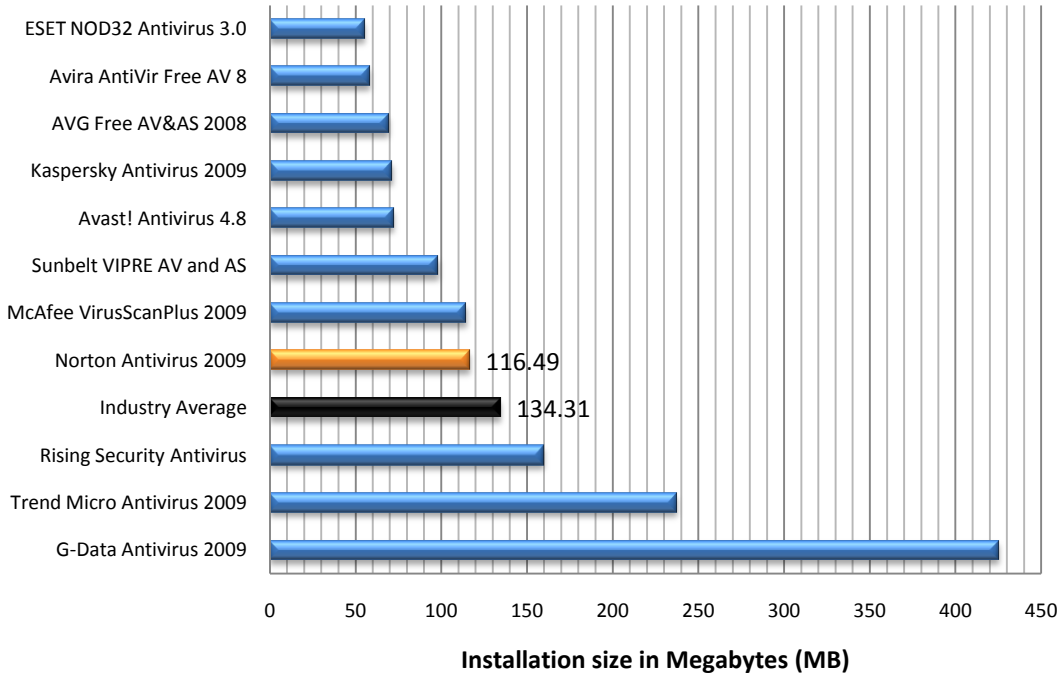
Benchmark 7 – Installation Time

The following chart compares the minimum installation time it takes for Internet Security products to be fully functional and ready for use by the end user. Products with lower installation times are considered better performing products in this category.



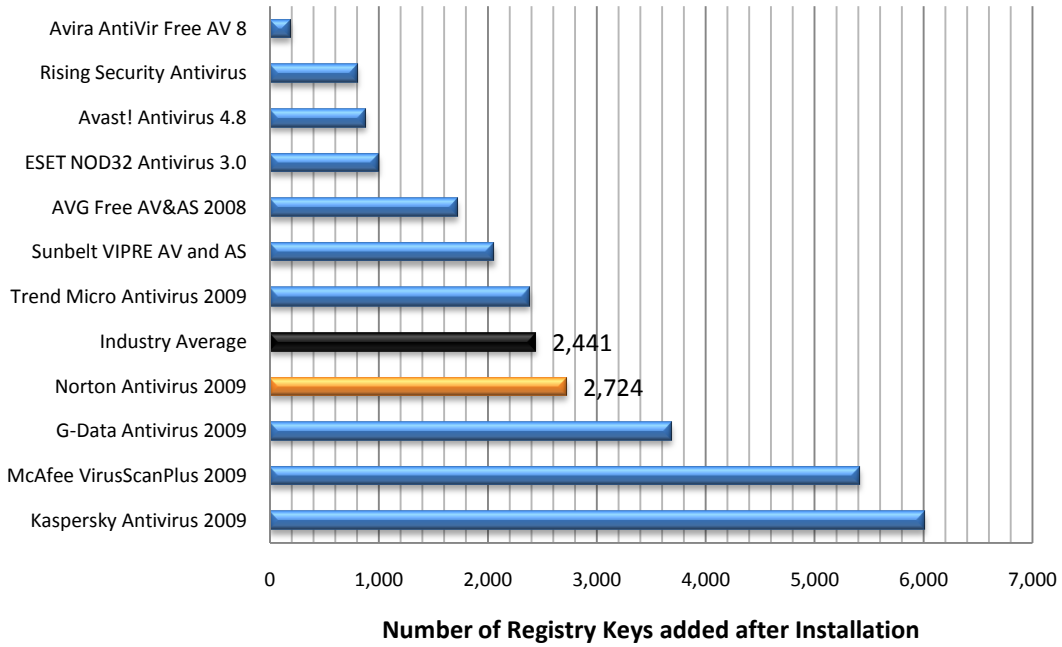
Benchmark 8 – Installation Size

The following chart compares the installation sizes of Internet Security products. Products with lower installation sizes are considered better performing products in this category.



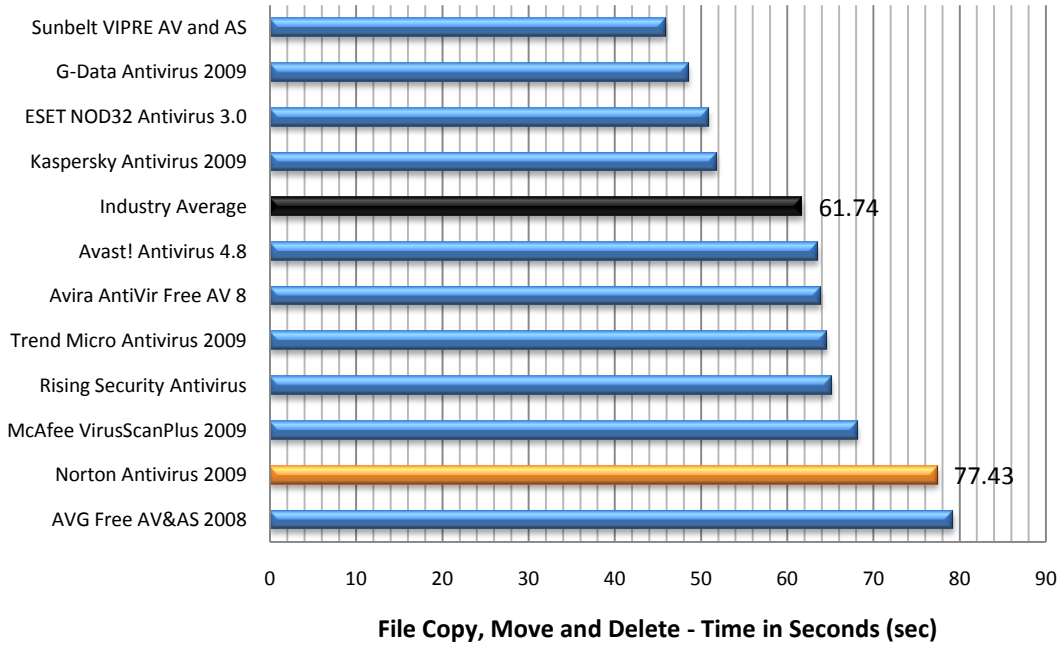
Benchmark 9 – Registry Key Count

The following chart compares the amount of Registry Keys created during product installation, for each Internet Security product we tested. Products with lower key counts are considered better performing products in this category.



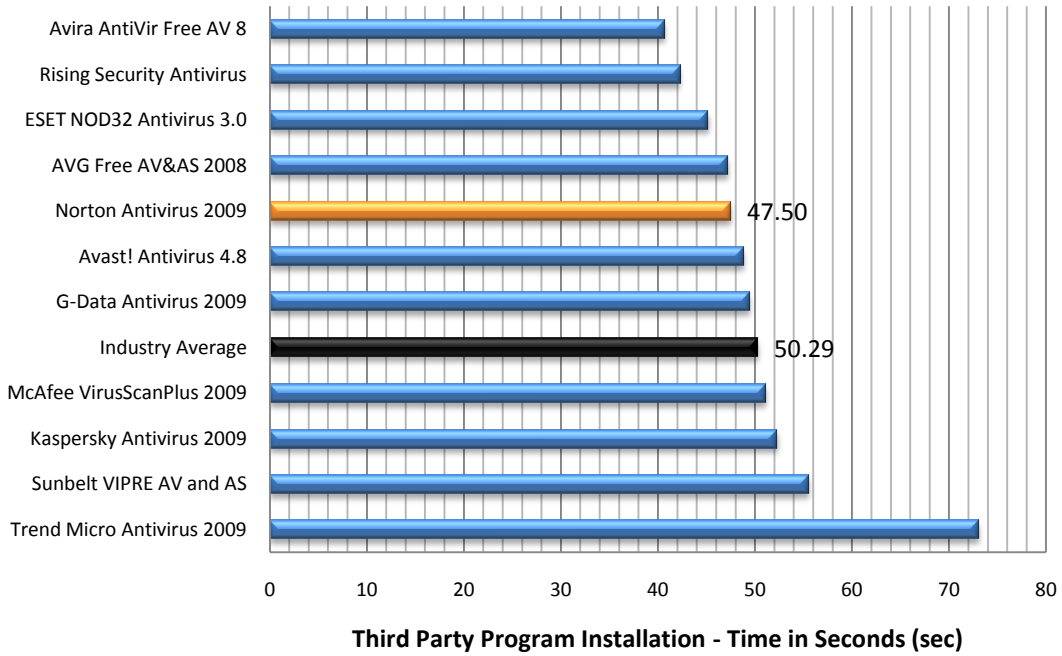
Benchmark 10 – File Copy, Move and Delete

The following chart compares the average speed of file copying, moving and deleting for each Internet Security product we tested. Products with lower times are considered better performing products in this category.



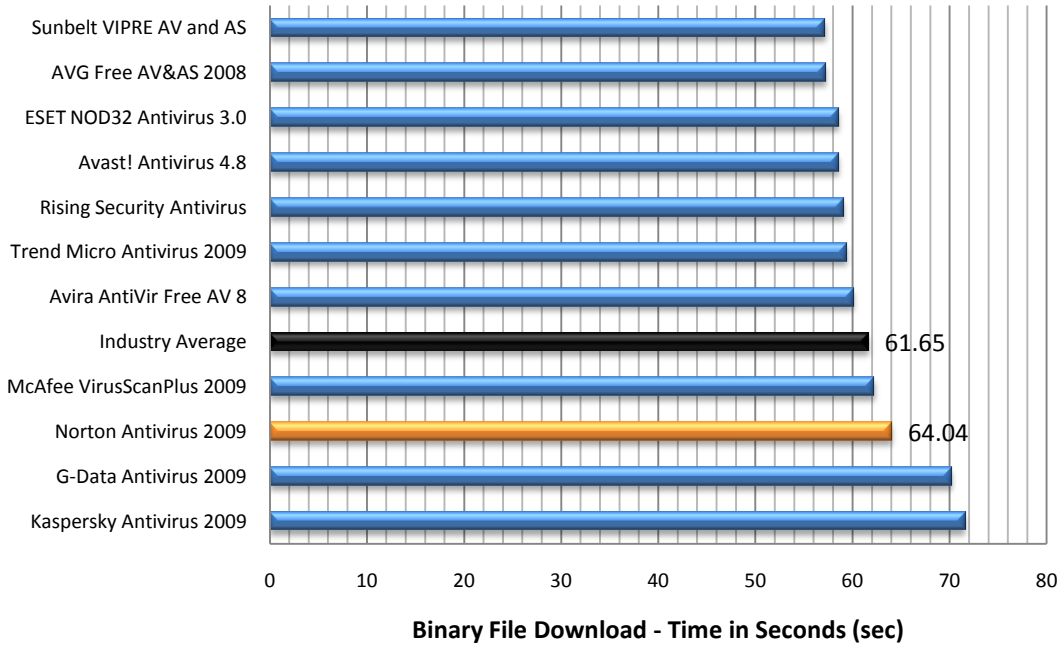
Benchmark 11 – Installation of Third Party Applications

The following chart compares the average speed of installation of third party applications for each Internet Security product we tested. Products with lower times are considered better performing products in this category.



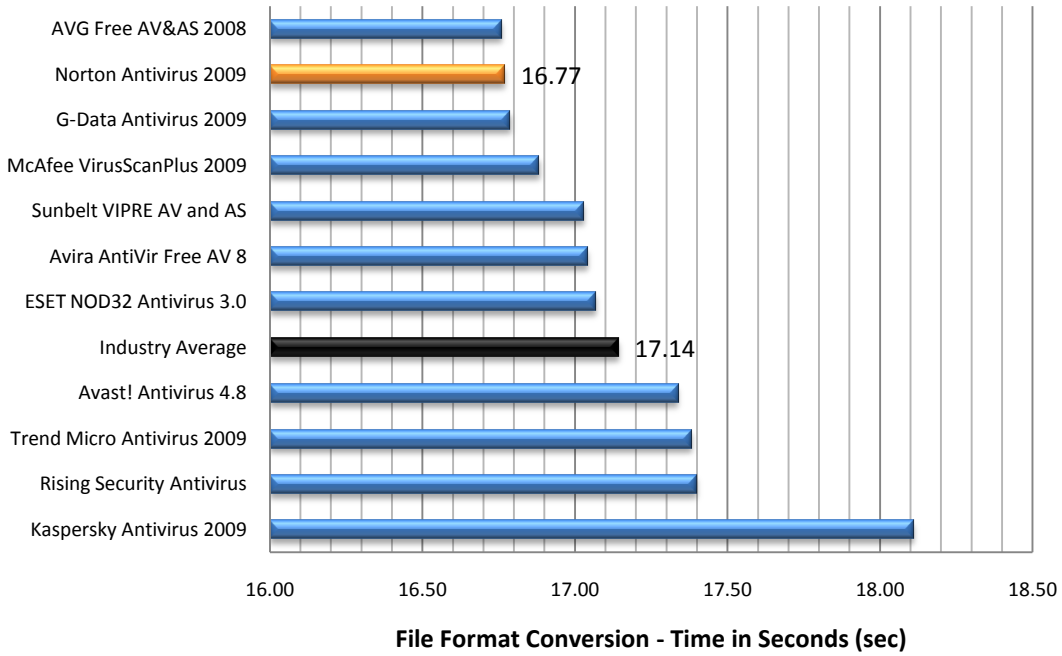
Benchmark 12 – Binary File Download Speed

The following chart compares the average speed of HTTP downloads of common file types for each Internet Security product we tested. Products with lower times are considered better performing products in this category.



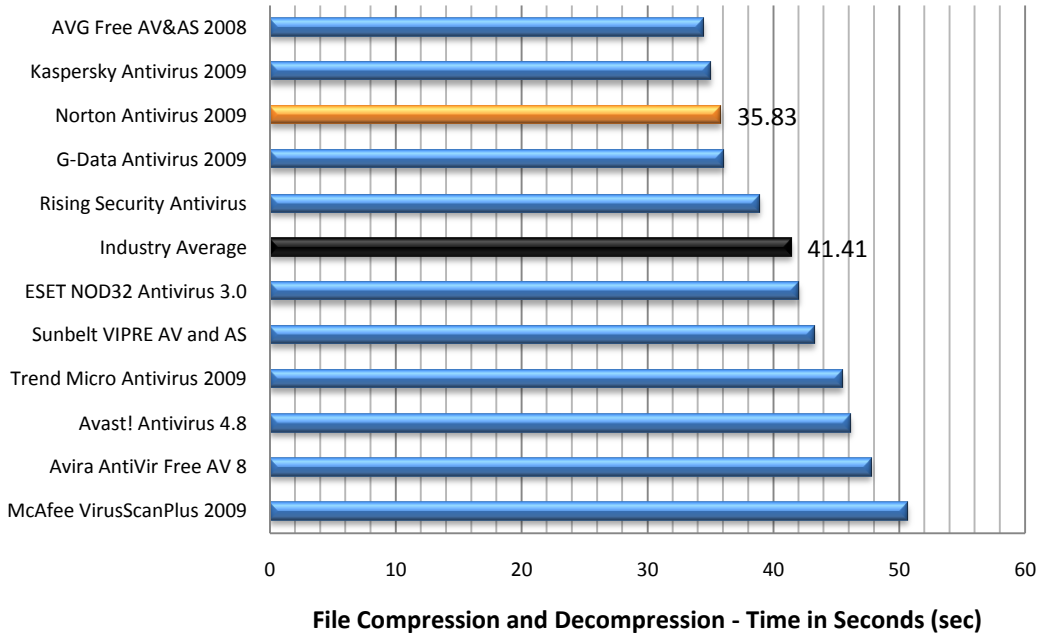
Benchmark 13 – File Format Conversion

The following chart compares the average speed at which files can be converted from one file format to another (MP3↔WMA, MP3↔WAV) for each Internet Security product we tested. Products with lower times are considered better performing products in this category.



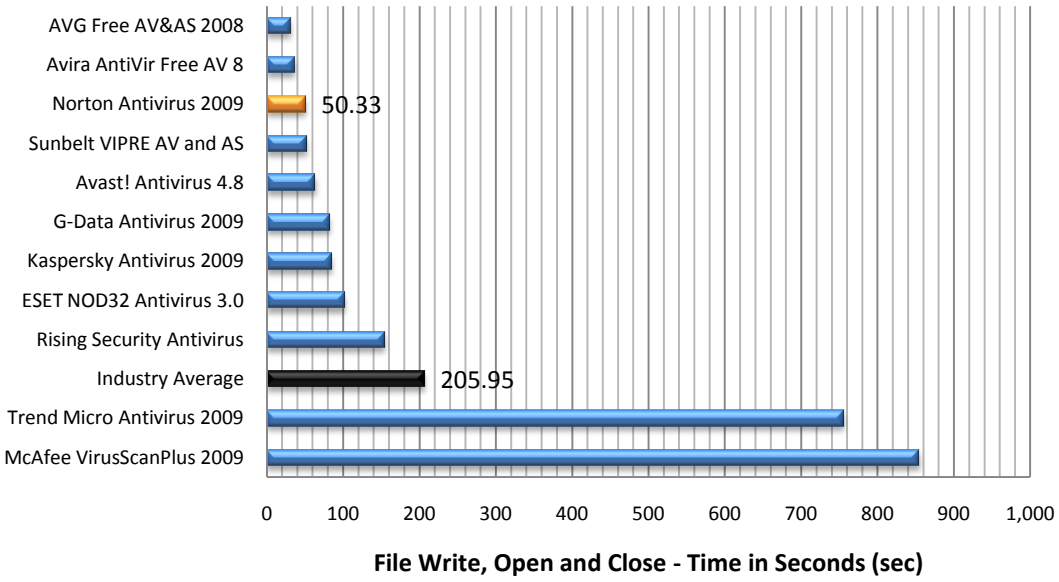
Benchmark 14 – File Compression and Decompression

The following chart compares the average speed at which files can be compressed and decompressed for each Internet Security product we tested. Products with lower times are considered better performing products in this category.



Benchmark 15 – File Write, Open and Close

The following chart compares the average speed at which a file can be written to the hard drive, then opened and closed, for each Internet Security product we tested. Products with lower times are considered better performing products in this category.



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* (http://www.virusbtn.com) and *AV Comparatives* (http://www.av-comparatives.org).

The metrics used for this report cover a number of key performance areas and are metrics that can be replicated and reproduced by third parties, if required.

However there are a number of areas that this report doesn't attempt to cover. These areas 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 and hibernation times.
- The time a product takes to uninstall.
- "Out-of-the-box" virus signature update times.
- Impact on e-mail receiving and sending times.
- Speed of the products UI when performing common tasks.
- Impact on system stability.
- Testing on 64-bit operating systems with 64-bit 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 revisit this list during any future tests with a view to adding additional metrics.

Disclaimer & Disclosure

This report only covers versions of products that were available as at 11 November 2008. The products we have tested are not an exhaustive list of all products available in these very competitive product categories.

Disclaimer of Liability

While every effort has been made to ensure that the information presented in this report is accurate, PassMark Software Pty Ltd assumes no responsibility for errors, omissions, or out-of-date information and shall not be liable in any manner whatsoever for direct, indirect, incidental, consequential, or punitive damages resulting from the availability of, use of, access of, or inability to use this information.

Disclosure

Symantec Corporation funded the production of this report and supplied some of the test scripts used for the tests (See ***Appendix 1 – Test method – How did we conduct these tests?*** below).

Trademarks

All trademarks are the property of their respective owners.

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An electronic copy of this report can be found at the following location:
http://www.passmark.com/ftp/antivirus_09-performance-testing-ed2.pdf

Appendix 1 – Test method – How did we conduct these tests?

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. Close and disable "start at run" on the Vista sidebar to avoid some background activity.
7. Disable the Windows firewall.
8. Install Ghost.
9. Disable ghost taskbar icon from auto startup in msconfig.
10. Disable windows defender from startup in msconfig.
11. Optimize booting with *ProcessIdleTasks* (repeated several times).
12. Disable Vista admin prompts to allow for better test automation.
13. Reboot and tell msconfig not to start again.
14. Create image using Norton 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 five continuous seconds.

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

Benchmark 2 – Total 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	.ime	35	5MB	.tsp	14	1MB
.exe	695	102MB	.drv	31	1MB	.com	14	<1MB
.sys	332	23MB	.txt	31	1MB	.xsl	14	<1MB
.gif	302	1MB	.chm	30	6MB	.h	13	<1MB
.doc	281	64MB	.cpl	29	4MB	.vsd	12	2MB
.wmf	185	2MB	.mfl	29	3MB	.scr	12	2MB
.png	149	2MB	.inf	26	2MB	.aw	12	2MB
.html	126	1MB	.hlp	22	3MB	.js	12	1MB
.nls	80	6MB	.imd	20	18MB	.zip	11	25MB
.jpg	70	1MB	.py	20	<1MB	.lex	9	10MB
.ini	59	2MB	.msc	18	1MB	.ppt	9	4MB
.ico	58	<1MB	.vbs	18	1MB	.acm	9	1MB
.mof	43	6MB	.xml	18	1MB	.wav	7	5MB
.ax	39	4MB	.rtf	16	62MB			
.xls	38	3MB	.ocx	16	4MB			

For each product, five samples were taken with the machine rebooted before each sample to clear any caching effects. Our result is an average of these five samples.

Where possible, *PerfScan++* was used to automate the testing process. Additionally, if possible, the scan was run without launching the product's UI. Where it was not possible to use *PerfScan* or the product's in-built scan speed timer, the samples were taken manually with a stopwatch.

For some of these products, we noticed a substantial difference between the initial scan speed and subsequent scan speed, due to residual 'caching' effects. We executed an additional Initial Scan Speed test on the Vista machine for the Internet Security products that exhibited this behavior. These products were Norton Internet Security beta 116, Kaspersky Internet Security 2009 and ESET Smart Security.

The Initial Speed test comprised of three to five samples taken after re-imaging to a clean disk and newly installing each product (including a reboot). The average of these Initial Scan Speed samples is taken as the initial scan result (i.e. Scan 1) and averaged with four subsequent scan times to obtain the average Total Scan Speed result.

Benchmark 3 – UI Launch Speed

The launch speed of the product's user interface was tested using *AppTimer*. Each product was tested for five sets of three 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 15 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 – HTTP Download Test

For this test PerfBench was used to download a set of files from a server running Windows Server 2008 and IIS 7. The client machine and the server were placed on an isolated network segment and PerfBench would download the file set fifteen times consecutively.

Before the first test both the server and client were rebooted (but not in between subsequent samples). The file set used was a partial copy of CNN.com. The total size of the sample retrieved was 24,313,141 bytes and the total number of files was 422. Files from the CNN web site were selected as being a typical set of HTML files.

Benchmark 6 – IE Launch 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.

Benchmark 7 – Installation Time

This test measures the minimum Installation Time a product requires to be fully functional and ready for use by the end user. Installation time can usually be divided in three major phases:

- The **Extraction and Setup** phase (green) consists of file extraction, the EULA prompt, product activation and user configurable options for installation.
- The **File Copy** phase (yellow) occurs when the product is being installed; usually this phase is indicated by a progress bar.
- The **Post-Installation phase** (tan) is any part of the installation that occurs after the File Copy phase. This phase varies widely between products; the time recorded in this phase may include a required reboot to finalize the installation or include the time the program takes to become idle in the system tray.

To reduce the impact of disk drive variables, each product was copied to the Desktop before initializing installation. Each step of the installation process was manually timed with a stopwatch and recorded in as much detail as possible. Where input was required by the end user, the stopwatch was paused and the input noted in the raw results in parenthesis after the phase description.

Where possible, all requests by products to pre-scan or post-install scan were declined or skipped. Where it was not possible to skip a scan, the time to scan was included as part of the installation time. Where an optional component of the installation formed a reasonable part of the functionality of the software, it was also installed (e.g. website link checking software as part of an IS).

Installation time includes download components which have been integrated into the installation process and are non-optional. This may include minor updates (e.g. Microsoft Live OneCare) or the delivery of the application itself from a download manager (e.g. all McAfee products, Zone Alarm).

Benchmark 8 – Installation Size

A product's Installation Size was previously defined as the difference between the initial snapshot of the Disk Space (C: drive) before installation and the subsequent snapshot taken after the product is installed on the system. Although this is a widely used methodology, we noticed that the results it yielded were not always reproducible in Vista due to random OS operations that may take place between the two snapshots. We improved the Installation Size methodology by removing as many Operating System and disk space variables as possible.

Using PassMark's OSCheck, we created initial and post-installation disk signatures for each product. These disk signatures recorded the amount of files and directories, and complete details of all files on that drive (including file name, file size, checksum, etc) at the time the signature was taken.

The initial disk signature was taken immediately prior to installation of the product. A subsequent disk signature was taken immediately following a system reboot after product installation. Using OSCheck, we compared the two signatures and calculated the total disk space consumed by all (and only) new files added during product installation. Our result for this metric reflects the total size of all newly added files during installation.

The scope of this metric includes only an 'out of the box' installation size for each product. Our result does not cover the size of files downloaded by the product after its installation (such as engine or signature updates), or any files created by system restore points, pre-fetch files and other temporary files.

Benchmark 9 – Registry Key Count

This test measures the amount of keys and values added to registry, after rebooting the test machine following a successful product installation. The test was conducted using *RegistryCounter.exe*, an application which conducts a count of all keys, errors and values under HKEY_LOCAL_MACHINE and HKEY_USERS.

Two Registry Key counts are taken, one prior to installation and a second immediately following a reboot after installation. To obtain our result, we calculated the difference between the two registry key totals

Benchmarks 10-15 – Real-Time Performance

We used a single script in testing Benchmarks 10-15. The script first defragments the disk volume (where defragmentation is higher than 15%) and then consecutively executes tests for Benchmarks 10-15. The script times each phase in these benchmarks using *CommandTimer.exe* and appends results to a log file.

Benchmarks 10 – File Copy, Move and Delete

This test measures the amount of time required for the system to copy, move and delete samples of files in various file formats. This sample was made up of 812 files over 760,867,636 bytes and can be categorized as documents [26% of total], media files [54% of total] and PE files (i.e. System Files) [20% of total].

The breakdown of the main file types, file numbers and total sizes of the files in the sample set is shown in the following table:

File format	Category	Number	Size (bytes)
DOC	Documents	8	30,450,176
DOCX	Documents	4	13,522,409
PPT	Documents	3	5,769,216
PPTX	Documents	3	4,146,421
XLS	Documents	4	2,660,352
XLSX	Documents	4	1,426,054
PDF	Documents	73	136,298,049
ZIP	Documents	4	6,295,987
7Z	Documents	1	92,238
JPG	Media	351	31,375,259
GIF	Media	6	148,182
MOV	Media	7	57,360,371
RM	Media	1	5,658,646
AVI	Media	8	78,703,408
WMV	Media	5	46,126,167
MP3	Media	28	191,580,387
EXE	PE	19	2,952,914
DLL	PE	104	29,261,568

File format	Category	Number	Size (bytes)
AX	PE	1	18,432
CPL	PE	2	2,109,440
CPX	PE	2	4,384
DRV	PE	10	154,864
ICO	PE	1	107,620
MSC	PE	1	41,587
NT	PE	1	1,688
ROM	PE	2	36,611
SCR	PE	2	2,250,240
SYS	PE	1	37,528,093
TLB	PE	3	135,580
TSK	PE	1	1,152
UCE	PE	1	22,984
EXE	PE	19	2,952,914
DLL	PE	104	29,261,568
AX	PE	1	18,432
CPL	PE	2	2,109,440
CPX	PE	2	4,384
DRV	PE	10	154,864
ICO	PE	1	107,620
MSC	PE	1	41,587
NT	PE	1	1,688
ROM	PE	2	36,611
SCR	PE	2	2,250,240
SYS	PE	1	37,528,093
TLB	PE	3	135,580
TSK	PE	1	1,152
UCE	PE	1	22,984
	Total	**812**	**760,867,636**

This test was conducted three to five times to obtain the average time to copy, move and delete the sample files, with the test machine rebooted between each sample to remove potential caching effects.

Benchmark 11 – Third Party Program Installation

This test measured how much time was required to install and uninstall a third party application. For this test, *CommandTimer.exe* timed how long it took to install and uninstall the Microsoft .NET Framework 2.0 (*.msi) application on the test machine.

This test was conducted three to five times to obtain the average time to install/uninstall a third party program, with the test machine rebooted between each sample to remove potential caching effects.

Benchmark 12 – Binary File Download Speed

This benchmark measured how much time was required to download a sample set of binary files of various sizes and types over an isolated segment of the network. The files were hosted on a server machine running Windows Server 2008 and IIS7. *CommandTimer.exe* was used in conjunction with *GNU Wget* to time and conduct the download test.

The complete sample set of files was made up of 553,638,694 bytes over 484 files and two file type categories: media files [74% of total] and documents [26% of total]. The breakdown of the file types, file numbers and total sizes of the files in the sample set is shown in the following table:

File format	Category	Number	Size (bytes)
JPEG	Media	343	30,668,312
GIF	Media	9	360,349
PNG	Media	5	494,780
MOV	Media	7	57,360,371
RM	Media	1	5,658,646
AVI	Media	8	78,703,408
WMV	Media	5	46,126,167
MP3	Media	28	191,580,387
PDF	Documents	73	136,298,049
ZIP	Documents	4	6,295,987
7Z	Documents	1	92,238
	Total	**484**	**553,638,694**

This test was conducted three to five times to obtain the average time to download this sample of files, with the test machine rebooted between each sample to remove potential caching effects.

Benchmark 13 – File Format Conversion (MP3 → WAV, MP3 → WMA)

This test measured how much time was required to convert an MP3 into a WAV file and subsequently, convert the same MP3 sample into a WMA file. The sample MP3 used was 3,375,104 bytes in size.

To encode the MP3 into another format, we used an application called *ffmpeg.exe*. The format conversion process was timed using *CommandTimer.exe*.

This test was conducted three to five times to obtain the average conversion speed between these formats, with the test machine rebooted between each sample to remove potential caching effects.

Benchmark 14 – File Compression and Decompression

This test measured the amount of time required to compress and decompress a sample set of files. For this test, we used a subset of the media and documents files used in the ***File Copy, Move and Delete*** benchmark. *CommandTimer.exe* recorded the amount of time required for *7zip.exe* to compress the files into a *.zip and subsequently decompress the created *.zip file.

This subset comprised 404 files over 277,346,661 bytes. The breakdown of the file types, file numbers and total sizes of the files in the sample set is shown in the following table:

File format	Category	Number	Size (bytes)
DOC	Documents	8	30,450,176
DOCX	Documents	4	13,522,409
PPT	Documents	3	5,769,216
PPTX	Documents	3	4,146,421
XLS	Documents	4	2,660,352
XLSX	Documents	4	1,426,054
JPG	Media	351	31,375,259
GIF	Media	6	148,182
MOV	Media	7	57,360,371
RM	Media	1	5,658,646
AVI	Media	8	78,703,408
WMV	Media	5	46,126,167
	Total	**404**	**277,346,661**

This test was conducted three to five times to obtain the average file compression and decompression speed, with the test machine rebooted between each sample to remove potential caching effects.

Benchmark 15 – File Write, Open and Close

This benchmark was derived from Oli Warner's File I/O test at http://www.thepcspy.com (please see ***Reference #2: What Really Slows Windows Down***).

For this test, we developed *OpenClose.exe*, an application that looped writing a small file to disk, then opening and closing that file. *CommandTimer.exe* was used to time how long the process took to complete 180,000 cycles.

This test was conducted three to five times to obtain the average file writing, opening and closing speed, with the test machine rebooted between each sample to remove potential caching effects.

Appendix 2 – Test Environment

IBM/Lenovo A55 ThinkCentre Desktop, Core2 6300, 1GB of RAM, 220GB Hard Disk Drive. Vista Ultimate (32-bit).

(N.B. At the time of previous testing performed for Symantec, this machine was considered to be reasonably high end.)

Appendix 3a – Internet Security Raw Results

In the following tables, the column titled "Average" compares a product's performance to the industry average (marked in gray). Products with negative values have performed better than industry average, while products with positive values have performed worse than average. For example, the raw results from our Boot Time test indicate that Norton Internet Security 2009 has performed 20.51% better than the industry average in that category.

For ease of comparison, we have highlighted the results we obtained for Norton Internet Security 2009 in orange. Industry averages are highlighted in silver.

Boot Time

Product Name	Time (Sec)	Average
ZoneAlarm Internet Security Suite 2009	102.23	114.39%
McAfee Internet Security 2009	50.21	5.28%
F-Secure Internet Security 2009	48.29	1.27%
AVG Internet Security 2008	48.16	1.00%
Industry Average	***47.69***	***0.00%***
Panda Internet Security 2009	46.59	-2.29%
Trend Micro VirusBuster 2009	43.17	-9.46%
G-Data Internet Security 2009	42.30	-11.29%
Trend Micro Internet Security 2009	40.56	-14.94%
ESET Smart Security 2008	39.59	-16.97%
Kaspersky Internet Security 2009	39.28	-17.62%
SourceNext Virus Security ZERO 2009	38.09	-20.11%
Norton Internet Security 2009	33.74	-29.26%

Scan Speed

Product Name	Time (Sec)	Average
ZoneAlarm Internet Security Suite 2009	568.32	247.10%
AVG Internet Security 2008	355.80	117.30%
F-Secure Internet Security 2009	179.60	9.69%
Industry Average	***163.73***	***0.00%***
SourceNext Virus Security ZERO 2009	145.97	-10.85%
Trend Micro VirusBuster 2009	130.99	-20.00%
Trend Micro Internet Security 2009	130.41	-20.35%
McAfee Internet Security 2009	121.68	-25.68%
ESET Smart Security 2008	94.90	-42.04%
G-Data Internet Security 2009	71.40	-56.39%
Kaspersky Internet Security 2009	67.33	-58.88%
Panda Internet Security 2009	65.80	-59.81%
Norton Internet Security 2009	32.60	-80.09%

Initial UI Launch Speed

Product Name	Time (ms)	Average
Trend Micro Internet Security 2009	4450.00	141.41%
Trend Micro VirusBuster 2009	4024.00	118.30%
Panda Internet Security 2009	3490.00	89.33%
McAfee Internet Security 2009	2834.00	53.74%
AVG Internet Security 2008	2425.50	31.58%
Industry Average	***1843.37***	***0.00%***
ZoneAlarm Internet Security Suite 2009	1,766.00	-4.20%
F-Secure Internet Security 2009	1570.00	-14.83%
Kaspersky Internet Security 2009	612.40	-66.78%
SourceNext Virus Security ZERO 2009	382.58	-79.25%
G-Data Internet Security 2009	262.30	-85.77%
Norton Internet Security 2009	253.68	-86.24%
ESET Smart Security 2008	50.00	-97.29%

Subsequent UI Launch Speed

Product Name	Time (ms)	Average
Trend Micro VirusBuster 2009	3611.00	136.95%
Trend Micro Internet Security 2009	3579.00	134.85%
Panda Internet Security 2009	2858.00	87.54%
McAfee Internet Security 2009	2847.00	86.82%
AVG Internet Security 2008	1642.11	7.76%
Industry Average	***1523.92***	***0.00%***
ZoneAlarm Internet Security Suite 2009	1,441.00	-5.44%
F-Secure Internet Security 2009	1170.00	-23.22%
Kaspersky Internet Security 2009	556.59	-63.48%
Norton Internet Security 2009	268.49	-82.38%
SourceNext Virus Security ZERO 2009	220.26	-85.55%
ESET Smart Security 2008	51.70	-96.61%
G-Data Internet Security 2009	41.93	-97.25%

Memory Utilization

Product Name	RAM (MB)	Average
G-Data Internet Security 2009	117.61	130.21%
Panda Internet Security 2009	102.56	100.74%
AVG Internet Security 2008	66.46	30.08%
F-Secure Internet Security 2009	64.34	25.94%
McAfee Internet Security 2009	57.74	13.03%
Trend Micro VirusBuster 2009	52.05	1.88%
Industry Average	***51.09***	***0.00%***
SourceNext Virus Security ZERO 2009	37.35	-26.90%
ESET Smart Security 2008	33.38	-34.66%
Trend Micro Internet Security 2009	32.09	-37.19%
Kaspersky Internet Security 2009	22.38	-56.19%
ZoneAlarm Internet Security Suite 2009	20.19	-60.48%
Norton Internet Security 2009	6.92	-86.45%

HTTP Download

Product Name	Time (ms)	Average
G-Data Internet Security 2009	53,678	241.24%
McAfee Internet Security 2009	33,568	113.39%
ESET Smart Security 2008	16,148	2.66%
Industry Average	***15,731***	***0.00%***
F-Secure Internet Security 2009	15,050	-4.32%
Trend Micro Internet Security 2009	13,034	-17.14%
ZoneAlarm Internet Security Suite 2009	12,831	-18.43%
Trend Micro VirusBuster 2009	12,316	-21.71%
Kaspersky Internet Security 2009	10,861	-30.96%
Norton Internet Security 2009	7,501	-52.31%
Panda Internet Security 2009	5,859	-62.75%
SourceNext Virus Security ZERO 2009	4,201	-73.30%
AVG Internet Security 2008	3,718	-76.37%

Initial IE Launch Speed

Product Name	Time (ms)	Average
Trend Micro VirusBuster 2009	3,179.55	219.73%
SourceNext Virus Security ZERO 2009	1,529.22	53.78%
AVG Internet Security 2008	1,187.25	19.39%
Industry Average	***994.44***	***0.00%***
G-Data Internet Security 2009	961.50	-3.31%
Trend Micro Internet Security 2009	909.90	-8.50%
McAfee Internet Security 2009	771.70	-22.40%
ZoneAlarm Internet Security Suite 2009	760.60	-23.51%
Panda Internet Security 2009	648.48	-34.79%
Norton Internet Security 2009	598.08	-39.86%
Kaspersky Internet Security 2009	594.25	-40.24%
ESET Smart Security 2008	433.00	-56.46%
F-Secure Internet Security 2009	359.76	-63.82%

Subsequent IE Launch Speed

Product Name	Time (ms)	Average
Trend Micro VirusBuster 2009	1,110.01	103.92%
AVG Internet Security 2008	729.45	34.01%
Trend Micro Internet Security 2009	690.33	26.82%
Industry Average	***544.33***	***0.00%***
Panda Internet Security 2009	540.78	-0.65%
McAfee Internet Security 2009	532.81	-2.12%
Norton Internet Security 2009	496.63	-8.76%
G-Data Internet Security 2009	495.17	-9.03%
ZoneAlarm Internet Security Suite 2009	487.43	-10.45%
Kaspersky Internet Security 2009	384.90	-29.29%
SourceNext Virus Security ZERO 2009	381.36	-29.94%
F-Secure Internet Security 2009	359.86	-33.89%
ESET Smart Security 2008	323.20	-40.62%

Installation Time

Product Name	Time (Sec)	Average
McAfee Internet Security 2009	495.89	137.04%
ZoneAlarm Internet Security Suite 2009	353.90	69.16%
Trend Micro VirusBuster 2009	310.04	48.20%
F-Secure Internet Security 2009	234.80	12.23%
Panda Internet Security 2009	224.25	7.19%
Industry Average	***209.21***	***0.00%***
G-Data Internet Security 2009	201.63	-3.62%
Kaspersky Internet Security 2009	183.17	-12.44%
Trend Micro Internet Security 2009	178.60	-14.63%
SourceNext Virus Security ZERO 2009	148.43	-29.05%
AVG Internet Security 2008	68.04	-67.48%
ESET Smart Security 2008	58.94	-71.83%
Norton Internet Security 2009	52.77	-74.78%

Installation Size

Product Name	Size (MB)	Average
G-Data Internet Security 2009	488.48	234.64%
Trend Micro VirusBuster 2009	391.62	168.28%
Trend Micro Internet Security 2009	280.25	91.98%
F-Secure Internet Security 2009	213.87	46.51%
Panda Internet Security 2009	188.66	29.24%
Industry Average	***183.45***	***0.00%***
McAfee Internet Security 2009	145.97	0.00%
Norton Internet Security 2009	138.24	-5.30%
ZoneAlarm Internet Security Suite 2009	108.39	-25.75%
Kaspersky Internet Security 2009	86.89	-40.48%
AVG Internet Security 2008	83.83	-42.57%
ESET Smart Security 2008	58.68	-59.80%
SourceNext Virus Security ZERO 2009	16.53	-88.67%*

*** SourceNext Virus Security ZERO 2009** added an additional 27MB of files where software and virus definitions were updated via the web.

Registry Key Count

Product Name	Keys	Average
McAfee Internet Security 2009	7,043	69.17%
Kaspersky Internet Security 2009	6,413	54.04%
Trend Micro VirusBuster 2009	5,779	38.81%
SourceNext Virus Security ZERO 2009	5,779	38.81%
G-Data Internet Security 2009	5,466	31.29%
Trend Micro Internet Security 2009	5,380	29.23%
Industry Average	***4163.17***	***0.00%***
F-Secure Internet Security 2009	3,411	-18.07%
Panda Internet Security 2009	2,706	-35.00%
Norton Internet Security 2009	2,582	-37.98%
ESET Smart Security 2008	1,916	-53.98%
AVG Internet Security 2008	1,782	-57.20%
ZoneAlarm Internet Security Suite 2009	1,701	-59.14%

File Copy, Move and Delete

Product Name	Time (Sec)	Average
AVG Internet Security 2008	85.78	35.62%
Norton Internet Security 2009	76.79	21.40%
F-Secure Internet Security 2009	71.76	13.45%
McAfee Internet Security 2009	68.69	8.60%
Trend Micro Internet Security 2009	65.64	3.77%
Industry Average	***63.25***	***0.00%***
Panda Internet Security 2009	62.45	-1.26%
SourceNext Virus Security ZERO 2009	61.82	-2.25%
ZoneAlarm Internet Security Suite 2009	60.60	-4.18%
Trend Micro VirusBuster 2009	57.18	-9.59%
ESET Smart Security 2008	50.09	-20.81%
Kaspersky Internet Security 2009	49.68	-21.46%
G-Data Internet Security 2009	48.52	-23.28%

Third Party Program Installation

Product Name	Time (Sec)	Average
ZoneAlarm Internet Security Suite 2009	78.60	34.01%
SourceNext Virus Security ZERO 2009	78.27	33.44%
Trend Micro VirusBuster 2009	75.73	29.12%
Trend Micro Internet Security 2009	73.47	25.26%
Industry Average	***58.65***	***0.00%***
Panda Internet Security 2009	56.82	-3.12%
McAfee Internet Security 2009	52.57	-10.37%
Norton Internet Security 2009	51.63	-11.97%
F-Secure Internet Security 2009	50.17	-14.47%
G-Data Internet Security 2009	49.44	-15.71%
Kaspersky Internet Security 2009	49.38	-15.81%
ESET Smart Security 2008	46.30	-21.06%
AVG Internet Security 2008	41.45	-29.33%

Binary Download Speed

Product Name	Time (Sec)	Average
AVG Internet Security 2008	104.15	55.31%
Kaspersky Internet Security 2009	70.42	5.01%
G-Data Internet Security 2009	70.20	4.68%
Industry Average	***67.06***	***0.00%***
F-Secure Internet Security 2009	65.26	-2.69%
ESET Smart Security 2008	62.96	-6.11%
Norton Internet Security 2009	62.54	-6.74%
McAfee Internet Security 2009	62.38	-6.98%
SourceNext Virus Security ZERO 2009	62.17	-7.29%
ZoneAlarm Internet Security Suite 2009	61.68	-8.03%
Trend Micro VirusBuster 2009	61.46	-8.35%
Trend Micro Internet Security 2009	60.79	-9.34%
Panda Internet Security 2009	60.70	-9.48%

File Format Conversion

Product Name	Time (Sec)	Average
ZoneAlarm Internet Security Suite 2009	17.88	3.78%
F-Secure Internet Security 2009	17.86	3.67%
Trend Micro VirusBuster 2009	17.77	3.13%
Trend Micro Internet Security 2009	17.54	1.81%
Panda Internet Security 2009	17.46	1.36%
SourceNext Virus Security ZERO 2009	17.39	0.93%
Industry Average	***17.23***	***0.00%***
McAfee Internet Security 2009	17.01	-1.24%
Kaspersky Internet Security 2009	16.80	-2.47%
ESET Smart Security 2008	16.80	-2.51%
G-Data Internet Security 2009	16.79	-2.55%
Norton Internet Security 2009	16.78	-2.57%
AVG Internet Security 2008	16.65	-3.33%

File Compression and Decompression

Product Name	Time (Sec)	Average
Panda Internet Security 2009	53.76	25.90%
SourceNext Virus Security ZERO 2009	51.82	21.35%
ZoneAlarm Internet Security Suite 2009	47.44	11.08%
ESET Smart Security 2008	46.57	9.05%
F-Secure Internet Security 2009	45.69	6.99%
Trend Micro Internet Security 2009	44.50	4.21%
McAfee Internet Security 2009	43.60	2.10%
Industry Average	***42.70***	***0.00%***
Trend Micro VirusBuster 2009	38.15	-10.67%
G-Data Internet Security 2009	36.02	-15.65%
Kaspersky Internet Security 2009	35.92	-15.87%
AVG Internet Security 2008	35.52	-16.83%
Norton Internet Security 2009	33.46	-21.65%

File Write, Open and Close

Product Name	Time (Sec)	Average
F-Secure Internet Security 2009	20,618.08	4281.79%
SourceNext Virus Security ZERO 2009	2,215.27	370.79%
McAfee Internet Security 2009	853.59	81.41%
Trend Micro VirusBuster 2009	759.29	61.37%
Trend Micro Internet Security 2009	758.43	61.18%
Industry Average	***470.54***	***0.00%***
ZoneAlarm Internet Security Suite 2009	196.89	-58.16%
ESET Smart Security 2008	90.79	-80.71%
Kaspersky Internet Security 2009	88.46	-81.20%
G-Data Internet Security 2009	82.11	-82.55%
Norton Internet Security 2009	51.74	-89.00%
Panda Internet Security 2009	48.84	-89.62%
AVG Internet Security 2008	30.51	-93.52%

*** F-Secure Internet Security 2009** has performed poorly, relative to other products in this category. Therefore, it has been excluded from the industry average.

Appendix 3b – Antivirus Raw Results

In the following tables, the column titled "Average" compares a product's performance to the industry average (marked in gray). Products with negative values have performed better than industry average, while products with positive values have performed worse than average. For example, the raw results from our Boot Time test indicate that Norton Antivirus 2009 has performed 14.07% better than the industry average in that category.

For ease of comparison, we have highlighted the results we obtained for Norton Antivirus 2009 in orange. Industry averages are highlighted in silver.

Boot Time

Product Name	Time (Sec)	Average
Rising Security Antivirus	46.06	14.78%
AVG Free AV&AS 2008	45.51	13.42%
G-Data Antivirus 2009	44.70	11.41%
Trend Micro Antivirus 2009	42.92	6.96%
Avira AntiVir Free AV 8	41.13	2.52%
Industry Average	***40.12***	***0.00%***
McAfee VirusScanPlus 2009	39.76	-0.90%
Sunbelt VIPRE AV and AS	39.70	-1.07%
Kaspersky Antivirus 2009	37.98	-5.35%
Avast! Antivirus 4.8	35.97	-10.36%
Norton Antivirus 2009	34.26	-14.62%
ESET NOD32 Antivirus 3.0	33.39	-16.79%

Scan Speed

Product Name	Time (Sec)	Average
AVG Free AV&AS 2008	364.20	214.73%
Rising Security Antivirus	152.40	31.70%
Trend Micro Antivirus 2009	131.31	13.48%
McAfee VirusScanPlus 2009	119.31	3.11%
Avast! Antivirus 4.8	116.87	0.99%
Industry Average	***115.72***	***0.00%***
Sunbelt VIPRE AV and AS	106.40	-8.05%
ESET NOD32 Antivirus 3.0	86.80	-24.99%
Avira AntiVir Free AV 8	68.80	-40.54%
Kaspersky Antivirus 2009	57.60	-50.22%
G-Data Antivirus 2009	37.00	-68.03%
Norton Antivirus 2009	32.20	-72.17%

Initial UI Launch Speed

Product Name	Time (ms)	Average
Trend Micro Antivirus 2009	3744.00	207.63%
McAfee VirusScanPlus 2009	2654.00	118.07%
Avira AntiVir Free AV 8	2509.20	106.17%
AVG Free AV&AS 2008	1659.98	36.40%
Industry Average	***1,217.03***	***0.00%***
Avast! Antivirus 4.8	803.10	-34.01%
Sunbelt VIPRE AV and AS	674.78	-44.56%
Kaspersky Antivirus 2009	565.40	-53.54%
Rising Security Antivirus	343.70	-71.76%
G-Data Antivirus 2009	218.53	-82.04%
Norton Antivirus 2009	167.70	-86.22%
ESET NOD32 Antivirus 3.0	47.00	-96.14%

Subsequent UI Launch Speed

Product Name	Time (ms)	Average
Trend Micro Antivirus 2009	3440.00	199.92%
McAfee VirusScanPlus 2009	2573.00	124.33%
Avira AntiVir Free AV 8	2452.70	113.84%
AVG Free AV&AS 2008	1614.01	40.72%
Industry Average	***1,146.97***	***0.00%***
Avast! Antivirus 4.8	743.56	-35.17%
Sunbelt VIPRE AV and AS	574.80	-49.89%
Kaspersky Antivirus 2009	523.78	-54.33%
Rising Security Antivirus	268.49	-76.59%
Norton Antivirus 2009	217.11	-81.07%
G-Data Antivirus 2009	162.26	-85.85%
ESET NOD32 Antivirus 3.0	47.00	-95.90%

Memory Utilization

Product Name	RAM (MB)	Average
G-Data Antivirus 2009	133.00	268.18%
AVG Free AV&AS 2008	56.06	55.18%
McAfee VirusScanPlus 2009	43.80	21.24%
Industry Average	***36.12***	***0.00%***
ESET NOD32 Antivirus 3.0	32.95	-8.79%
Sunbelt VIPRE AV and AS	25.91	-28.27%
Avira AntiVir Free AV 8	22.30	-38.27%
Trend Micro Antivirus 2009	20.35	-43.67%
Kaspersky Antivirus 2009	20.34	-43.69%
Rising Security Antivirus	19.23	-46.77%
Avast! Antivirus 4.8	18.05	-50.03%
Norton Antivirus 2009	5.38	-85.11%

HTTP Download

Product Name	Time (ms)	Average
G-Data Antivirus 2009	53,678	206.50%
McAfee VirusScanPlus 2009	33,846	93.26%
Rising Security Antivirus	32,220	83.97%
Industry Average	***17,513***	***0.00%***
ESET NOD32 Antivirus 3.0	16,610	-5.16%
Sunbelt VIPRE AV and AS	11,939	-31.83%
Kaspersky Antivirus 2009	10,864	-37.97%
Trend Micro Antivirus 2009	10,754	-38.59%
Avast! Antivirus 4.8	7,786	-55.54%
Norton Antivirus 2009	7,022	-59.90%
Avira AntiVir Free AV 8	4,346	-75.18%
AVG Free AV&AS 2008	3,581	-79.55%

Initial IE Launch Speed

Product Name	Time (ms)	Average
AVG Free AV&AS 2008	1,352.86	89.53%
Rising Security Antivirus	1,311.43	83.72%
Trend Micro Antivirus 2009	784.88	9.96%
McAfee VirusScanPlus 2009	781.94	9.54%
Industry Average	***713.81***	***0.00%***
Avast! Antivirus 4.8	707.75	-0.85%
Kaspersky Antivirus 2009	559.60	-21.60%
G-Data Antivirus 2009	500.25	-29.92%
Norton Antivirus 2009	494.04	-30.79%
Avira AntiVir Free AV 8	464.80	-34.88%
ESET NOD32 Antivirus 3.0	456.80	-36.01%
Sunbelt VIPRE AV and AS	437.56	-38.70%

Subsequent IE Launch Speed

Product Name	Time (ms)	Average
AVG Free AV&AS 2008	1,024.66	132.07%
McAfee VirusScanPlus 2009	502.23	13.75%
Trend Micro Antivirus 2009	486.60	10.21%
Industry Average	***441.53***	***0.00%***
G-Data Antivirus 2009	419.16	-5.07%
Norton Antivirus 2009	403.73	-8.56%
Kaspersky Antivirus 2009	367.60	-16.74%
Sunbelt VIPRE AV and AS	365.72	-17.17%
Avast! Antivirus 4.8	335.71	-23.97%
ESET NOD32 Antivirus 3.0	330.30	-25.19%
Rising Security Antivirus	316.97	-28.21%
Avira AntiVir Free AV 8	304.10	-31.13%

Installation Time

Product Name	Time (Sec)	Average
McAfee VirusScanPlus 2009	371.94	180.10%
G-Data Antivirus 2009	211.46	59.25%
Kaspersky Antivirus 2009	159.82	20.36%
Sunbelt VIPRE AV and AS	153.93	15.92%
Rising Security Antivirus	140.58	5.87%
Industry Average	***132.79***	***0.00%***
Trend Micro Antivirus 2009	111.80	-15.80%
Avast! Antivirus 4.8	101.17	-23.81%
AVG Free AV&AS 2008	64.97	-51.07%
ESET NOD32 Antivirus 3.0	56.91	-57.14%
Norton Antivirus 2009	47.27	-64.40%
Avira AntiVir Free AV 8	40.80	-69.27%

Installation Size

Product Name	Size (MB)	Average
G-Data Antivirus 2009	425.21	216.58%
Trend Micro Antivirus 2009	237.28	76.66%
Rising Security Antivirus	159.57	18.80%
Industry Average	***134.31***	***0.00%***
Norton Antivirus 2009	116.49	-13.27%
McAfee VirusScanPlus 2009	114.50	-14.75%
Sunbelt VIPRE AV and AS	98.19	-26.89%
Avast! Antivirus 4.8	72.35	-46.13%
Kaspersky Antivirus 2009	71.45	-46.81%
AVG Free AV&AS 2008	69.05	-48.59%
Avira AntiVir Free AV 8	58.23	-56.65%
ESET NOD32 Antivirus 3.0	55.11	-58.97%

Registry Key Count

Product Name	Keys	Average
Kaspersky Antivirus 2009	6,010	146.16%
McAfee VirusScanPlus 2009	5,412	121.67%
G-Data Antivirus 2009	3,683	50.85%
Norton Antivirus 2009	2,724	11.57%
Industry Average	***2,441.45***	***0.00%***
Trend Micro Antivirus 2009	2,382	-2.44%
Sunbelt VIPRE AV and AS	2,058	-15.71%
AVG Free AV&AS 2008	1,719	-29.59%
ESET NOD32 Antivirus 3.0	994	-59.29%
Avast! Antivirus 4.8	884	-63.79%
Rising Security Antivirus	801	-67.19%
Avira AntiVir Free AV 8	189	-92.26%

File Copy, Move and Delete

Product Name	Time (Sec)	Average
AVG Free AV&AS 2008	79.24	28.35%
Norton Antivirus 2009	77.43	25.41%
McAfee VirusScanPlus 2009	68.16	10.40%
Rising Security Antivirus	65.17	5.56%
Trend Micro Antivirus 2009	64.59	4.61%
Avira AntiVir Free AV 8	63.83	3.39%
Avast! Antivirus 4.8	63.55	2.93%
Industry Average	***61.74***	***0.00%***
Kaspersky Antivirus 2009	51.81	-16.09%
ESET NOD32 Antivirus 3.0	50.91	-17.54%
G-Data Antivirus 2009	48.52	-21.41%
Sunbelt VIPRE AV and AS	45.91	-25.63%

Third Party Program Installation

Product Name	Time (Sec)	Average
Trend Micro Antivirus 2009	73.09	45.35%
Sunbelt VIPRE AV and AS	55.51	10.39%
Kaspersky Antivirus 2009	52.30	4.01%
McAfee VirusScanPlus 2009	51.10	1.61%
Industry Average	***50.29***	***0.00%***
G-Data Antivirus 2009	49.44	-1.68%
Avast! Antivirus 4.8	48.84	-2.87%
Norton Antivirus 2009	47.50	-5.54%
AVG Free AV&AS 2008	47.22	-6.10%
ESET NOD32 Antivirus 3.0	45.18	-10.15%
Rising Security Antivirus	42.24	-16.00%
Avira AntiVir Free AV 8	40.73	-19.01%

Binary Download Speed

Product Name	Time (Sec)	Average
Kaspersky Antivirus 2009	71.58	16.10%
G-Data Antivirus 2009	70.20	13.85%
Norton Antivirus 2009	64.04	3.87%
McAfee VirusScanPlus 2009	62.27	1.00%
Industry Average	***61.65***	***0.00%***
Avira AntiVir Free AV 8	60.11	-2.50%
Trend Micro Antivirus 2009	59.37	-3.70%
Rising Security Antivirus	59.05	-4.23%
Avast! Antivirus 4.8	58.59	-4.96%
ESET NOD32 Antivirus 3.0	58.52	-5.09%
AVG Free AV&AS 2008	57.29	-7.07%
Sunbelt VIPRE AV and AS	57.17	-7.27%

File Format Conversion

Product Name	Time (Sec)	Average
Kaspersky Antivirus 2009	18.11	5.64%
Rising Security Antivirus	17.40	1.49%
Trend Micro Antivirus 2009	17.38	1.40%
Avast! Antivirus 4.8	17.34	1.14%
Industry Average	***17.14***	***0.00%***
ESET NOD32 Antivirus 3.0	17.07	-0.44%
Avira AntiVir Free AV 8	17.04	-0.58%
Sunbelt VIPRE AV and AS	17.03	-0.66%
McAfee VirusScanPlus 2009	16.88	-1.51%
G-Data Antivirus 2009	16.79	-2.06%
Norton Antivirus 2009	16.77	-2.17%
AVG Free AV&AS 2008	16.76	-2.24%

File Compression and Decompression

Product Name	Time (Sec)	Average
McAfee VirusScanPlus 2009	50.69	22.40%
Avira AntiVir Free AV 8	47.76	15.32%
Avast! Antivirus 4.8	46.14	11.41%
Trend Micro Antivirus 2009	45.49	9.84%
Sunbelt VIPRE AV and AS	43.27	4.50%
ESET NOD32 Antivirus 3.0	41.98	1.38%
Industry Average	***41.41***	***0.00%***
Rising Security Antivirus	38.91	-6.04%
G-Data Antivirus 2009	36.02	-13.02%
Norton Antivirus 2009	35.83	-13.49%
Kaspersky Antivirus 2009	34.99	-15.50%
AVG Free AV&AS 2008	34.46	-16.80%

File Write, Open and Close

Product Name	Time (Sec)	Average
McAfee VirusScanPlus 2009	854.32	314.82%
Trend Micro Antivirus 2009	755.06	266.63%
Industry Average	***205.95***	***0.00%***
Rising Security Antivirus	154.07	-25.19%
ESET NOD32 Antivirus 3.0	102.17	-50.39%
Kaspersky Antivirus 2009	84.52	-58.96%
G-Data Antivirus 2009	82.11	-60.13%
Avast! Antivirus 4.8	63.64	-69.10%
Sunbelt VIPRE AV and AS	51.92	-74.79%
Norton Antivirus 2009	50.33	-75.56%
Avira AntiVir Free AV 8	36.18	-82.43%
AVG Free AV&AS 2008	31.13	-84.88%

Appendix 3c – Total Security Raw Results

In the following tables, the column titled "Average" compares a product's performance to the industry average (marked in gray). Products with negative values have performed better than industry average, while products with positive values have performed worse than average. For example, the following Boot Time table shows that Windows OneCare has performed 46.68% worse than the Industry Average.

As this report reflects the most up to date products, Norton 360 v2 has been removed as the new release (v3) is currently in beta. This report will be updated when the new release can be tested.

For ease of comparison, industry averages are highlighted in silver.

Boot Time

Product Name	Time (Sec)	Average
BitDefender Total Security 2009	277.99	173.45%
Industry Average	***101.66***	***0.00%***
McAfee Total Protection 2009	48.66	-52.13%
Trend Micro IS Pro 2009	42.06	-58.63%
Windows OneCare 2.5	37.93	-62.69%

Scan Speed

Product Name	Time (Sec)	Average
Windows OneCare 2.5	182.38	32.77%
Industry Average	***137.36***	***0.00%***
Trend Micro IS Pro 2009	132.22	-3.74%
McAfee Total Protection 2009	123.19	-10.32%
BitDefender Total Security 2009	111.65	-18.71%

Initial UI Launch Speed

Product Name	Time (ms)	Average
Trend Micro IS Pro 2009	4005.00	77.61%
McAfee Total Protection 2009	3054.00	35.44%
Industry Average	***2254.91***	***0.00%***
Windows OneCare 2.5	1734.00	-23.10%
BitDefender Total Security 2009	226.65	-89.95%

Subsequent UI Launch Speed

Product Name	Time (ms)	Average
Trend Micro IS Pro 2009	3590.00	81.94%
McAfee Total Protection 2009	2734.00	38.56%
Industry Average	***1973.15***	***0.00%***
Windows OneCare 2.5	1431.00	-27.48%
BitDefender Total Security 2009	137.59	-93.03%

Memory Utilization

Product Name	RAM (MB)	Average
McAfee Total Protection 2009	57.13	20.47%
Trend Micro IS Pro 2009	53.21	12.20%
Industry Average	***47.42***	***0.00%***
BitDefender Total Security 2009	40.04	-15.57%
Windows OneCare 2.5	39.31	-17.10%

HTTP Download

Product Name	Time (ms)	Average
McAfee Total Protection 2009	34,180	105.58%
BitDefender Total Security 2009	16,849	1.34%
Industry Average	***16626.14***	***0.00%***
Trend Micro IS Pro 2009	12,248	-26.34%
Windows OneCare 2.5	3,227	-80.59%

Initial IE Launch Speed

Product Name	Time (ms)	Average
Trend Micro IS Pro 2009	3777.94	157.24%
Industry Average	***1468.62***	***0.00%***
McAfee Total Protection 2009	964.17	-34.35%
BitDefender Total Security 2009	582.06	-60.37%
Windows OneCare 2.5	550.30	-62.53%

Subsequent IE Launch Speed

Product Name	Time (ms)	Average
Trend Micro IS Pro 2009	1274.07	74.28%
Industry Average	***731.06***	***0.00%***
McAfee Total Protection 2009	590.81	-19.18%
Windows OneCare 2.5	550.30	-24.73%
BitDefender Total Security 2009	509.06	-30.37%

Installation Time

Product Name	Time (Sec)	Average
McAfee Total Protection 2009	964.34	118.25%
Industry Average	***441.85***	***0.00%***
Windows OneCare 2.5	334.36	-24.33%
BitDefender Total Security 2009	250.12	-43.39%
Trend Micro IS Pro 2009	218.57	-50.53%

Installation Size

Product Name	Size (MB)	Average
Trend Micro IS Pro 2009	385.81	29.06%
BitDefender Total Security 2009	336.04	12.41%
Industry Average	***298.93***	***0.00%***
Windows OneCare 2.5	197.79	-33.83%
McAfee Total Protection 2009	151.01	-49.48%

Registry Key Count

Product Name	Keys	Average
BitDefender Total Security 2009	14,878	47.93%
Windows OneCare 2.5	12,252	21.82%
Industry Average	***10,058***	***0.00%***
McAfee Total Protection 2009	7,224	-28.17%
Trend Micro IS Pro 2009	5,877	-41.57%

File Copy, Move and Delete

Product Name	Time (Sec)	Average
McAfee Total Protection 2009	66.78	12.49%
Windows OneCare 2.5	64.39	8.45%
Industry Average	***59.37***	***0.00%***
Trend Micro IS Pro 2009	56.38	-5.04%
BitDefender Total Security 2009	49.93	-15.90%

Third Party Program Installation

Product Name	Time (Sec)	Average
Trend Micro IS Pro 2009	72.83	41.44%
Industry Average	***51.49***	***0.00%***
McAfee Total Protection 2009	46.97	-8.78%
Windows OneCare 2.5	44.67	-13.25%
BitDefender Total Security 2009	41.50	-19.41%

Binary Download Speed

Product Name	Time (Sec)	Average
McAfee Total Protection 2009	71.82	10.27%
BitDefender Total Security 2009	68.53	5.23%
Industry Average	***65.13***	***0.00%***
Trend Micro IS Pro 2009	62.23	-4.44%
Windows OneCare 2.5	57.93	-11.05%

File Format Conversion

Product Name	Time (Sec)	Average
Windows OneCare 2.5	38.24	68.89%
Industry Average	***22.64***	***0.00%***
Trend Micro IS Pro 2009	17.56	-22.44%
BitDefender Total Security 2009	17.42	-23.06%
McAfee Total Protection 2009	17.35	-23.39%

File Compression and Decompression

Product Name	Time (Sec)	Average
McAfee Total Protection 2009	42.23	7.11%
Industry Average	***39.42***	***0.00%***
Trend Micro IS Pro 2009	39.14	-0.71%
Windows OneCare 2.5	38.24	-3.00%
BitDefender Total Security 2009	38.08	-3.40%

File Write, Open and Close

Product Name	Time (Sec)	Average
BitDefender Total Security 2009	3,268.72	391.12%
McAfee Total Protection 2009	817.90	22.89%
Trend Micro IS Pro 2009	759.88	14.17%
Industry Average	***665.57***	***0.00%***
Windows OneCare 2.5	418.93	-37.06%

*** BitDefender Total Security 2009** has performed poorly, relative to other products in this category. Therefore, it has been excluded from the industry average.