PassMark
SOFTWARE

Internet Security Products Performance Benchmarking (2010)

Vista/Dual Core Hardware

September 2009

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REVISION HISTORY

Revision	Revision History	Date
Draft 1	Initial version of this document. Includes results for 2010 Internet Security products that have been released and some 2009 Internet Security products.	4 September 2009
Edition 1	Small corrections made to the draft. First public release.	9 September 2009
Edition 2	Trend Micro Virus Buster 2010, Trend Micro Internet Security 2010 and SourceNext Virus Security Zero results added. Some corrections made to graphs and raw data.	21 September 2009

REFERENCES

Ref #	Document	Author	Date
1	What Really Slows Windows Down	O. Warner, **The PC Spy**	2001-2008

Executive Summary

Internet Security products are tools which offer their users protection against viruses, spyware and malware from the Internet and other external sources. Some security features offered by these products include protection against zero-day threats, phishing, anti-spam, root kit detection, a personal firewall or web content scanning.

Internet Security products are often criticized for negatively impacting on system performance. Our report aims to objectively benchmark products based on their impact on system performance.

PassMark® Software has executed objective, performance benchmark testing on ten Internet Security products from various vendors between July 2009 and September 2009. Where they have been made available to the public, we have tested new versions (2010) of Internet Security products. Subsequent editions of this report will include more 2010 products as they are released.

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

- Boot Time;
- Scan Speed;
- Scan Speed on Solid State Drives (SSD);
- User Interface Launch Speed;
- Memory Usage while Idle;
- Browse Time Test;
- Internet Explorer Launch Speed;
- Installation Size;
- Installation Time;
- Registry Key Count;
- Copying, Moving and Deleting different types of common files;
- Installation of Third Party Applications;
- Network Throughput Test (previously named "Binary Download Test")
- File Format Conversion;
- File Compression and Decompression; and
- File Write, Open and Close.

No attempt was made to measure the effectiveness of threat detection, as this aspect is covered by other industry benchmarks. 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.

Overall Ranking

In the following tables, the products have been ranked by their overall score in comparison to other products we have tested.

Product Name	Score
Norton Internet Security 2010	146
ESET Smart Security 4	131
Kaspersky Internet Security 2010	119
G Data Internet Security 2010	110
SourceNext Security Zero 2010	101
AVG Internet Security 8.5	90
Panda Internet Security 2010	89
Trend Micro Internet Security 2010	77
F-Secure Internet Security 2009	65
McAfee Internet Security 2009	69
Trend Micro Virus Buster 2010	59

Product Versions Tested

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

Manufacturer	Product Name	Product Version	Date Tested
Symantec Corporation	Norton Internet Security 2010	17.0.0.136	Sep 09
G Data Software	G Data Internet Security 2010	20.0.2.1	Jun 09
AVG Technologies	AVG Internet Security 8.5	8.5.339	Jun 09
Panda Security	Panda Internet Security 2010	9.00.00	Aug 09
ESET	ESET Smart Security 4	4.0.437.0	Jul 09
Kaspersky	Kaspersky Internet Security 2010	9.0.0.459	Jul 09
Trend Micro	Trend Micro Internet Security 2010	17.50.1366	Sep 09
McAfee	McAfee Internet Security 2009	9.15.126	Aug 09
F-Secure Corporation	F-Secure Internet Security 2009	9.00.148	Aug 09
Trend Micro	Trend Micro Virus Buster 2010 (Japanese)	17.50.1366	Sep 09
SourceNext Corporation	SourceNext Virus Security Zero (Japanese)	9.16.210	Sep 09

Performance Metrics

We have selected this set of metrics to provide a comprehensive and realistic indication of the product's performance in a number of areas which impact system performance for users. All metrics are objective. Our test methods and results can be replicated by third parties using the same environment.

Benchmarks 11 through to 16 comprise of a script-based "performance obstacle course". Each of these benchmarks was 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 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. Security software is generally launched at Windows start-up, adding an extra amount of time to the boot time of the machine. Our aim was to measure the additional time added to the boot process as a result of installing a security product. 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 – Scan Speed of Solid State Drives

This test measured how fast a product could scan the same set of test files, but on a Solid State Drive (SSD). Solid State Drives use solid state memory to store files and data, are low-noise and generally have faster data-read speeds.

Benchmark 4 – User Interface Launch Speed

This test objectively measures how responsive a security product appears to the user. It measures the amount of time it takes for a product's user interface to launch from Windows. To allow for caching effects by the operating system, both the initial launch time and the subsequent launch times were measured. Our final result is an average of these two measurements.

Benchmark 5 – Browse Time Test

It is common for security products to scan data for malware as it is downloaded from the internet or intranet. This behavior may negatively impact browsing speed as products scan web content for malware. This test measures how long it takes a set of popular internet sites to consecutively load from a local server in a user's browser window.

Benchmark 6 – Memory Utilization

For this metric, we measured the amount of RAM used by the product while the machine and product were in an idle state. All processes used by the product were identified and the total RAM usage calculated. Better performing products used less RAM while the machine was in an idle state. By measuring the RAM used in an idle state (as opposed to RAM used while actively

scanning), we can measure what system resources are being consumed by the product on a permanent basis.

Benchmark 7 – Internet Explorer launch Speed

This test is one way to objectively measure how much a security product impacts on the responsiveness of the system. This metric measures the amount of time it takes to launch the user interface of Internet Explorer 8. To allow for caching effects by the operating system, both the initial launch time and the subsequent launch times were measured. Our final result is an average of these two measurements.

Benchmark 8 – 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 9 – 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 10 – 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 11 – 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 12 – Installing Third Party Applications

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

Benchmark 13 – Network Throughput Speed

The metric measured the amount of time required to download a variety of files through HTTP. 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. This metric was named the "Binary Download Speed" in last year's report; we have changed the name to more accurately reflect the test.

Benchmark 14 – 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 15 – 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 16 – 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 #1: 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

In the following charts, we have highlighted the results we obtained for Norton Internet Security 2010 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 over three cycles) for each Internet Security product we tested. Products with lower boot times are considered better performing products in this category.

Boot Time in seconds
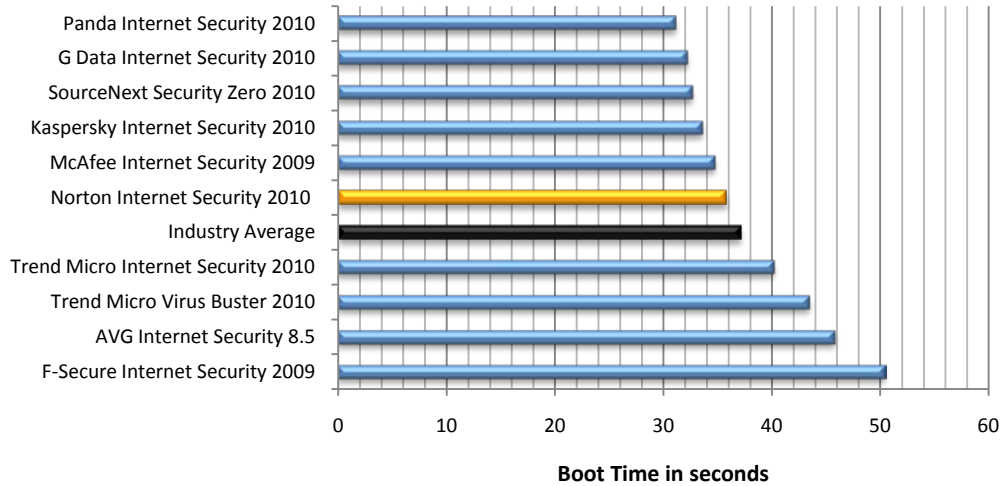
* **Trend Micro Internet Security 2009** appeared to cause operations within the first minute of operating system start-up to lock up the system. We consider this product to have failed the boot time test as it was impossible to accurately and fairly record a boot time using our methodology. For this reason, it has not been included it in the above chart.

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.

Average Scan Speed in seconds
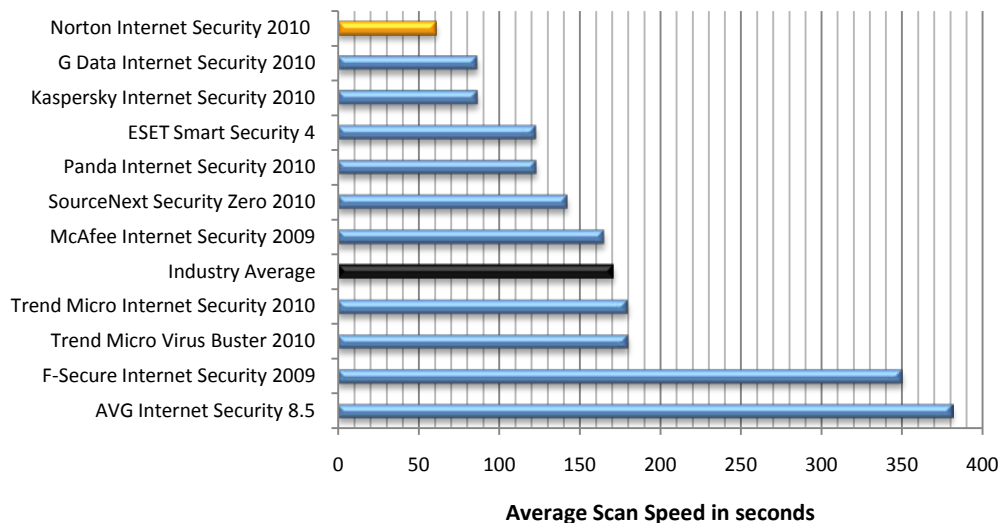
Benchmark 3 – Scan Speed of a Solid State Drive

The following chart compares the average scan time of 6159 files (totaling 982MB) on a Solid State Drive 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.

Scan Speed of a Solid State Drive in seconds
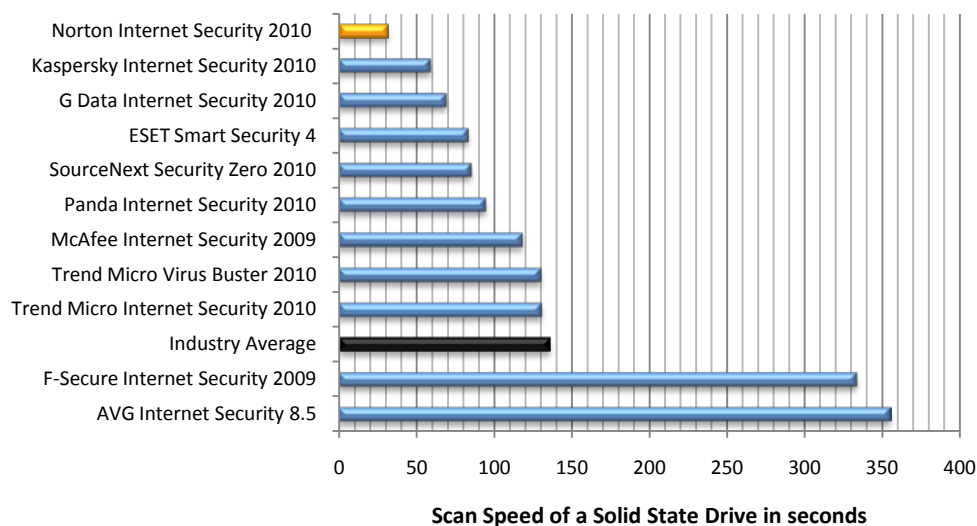
Benchmark 4 – User Interface Launch Speed

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.

Average User Interface Launch Speed in milliseconds
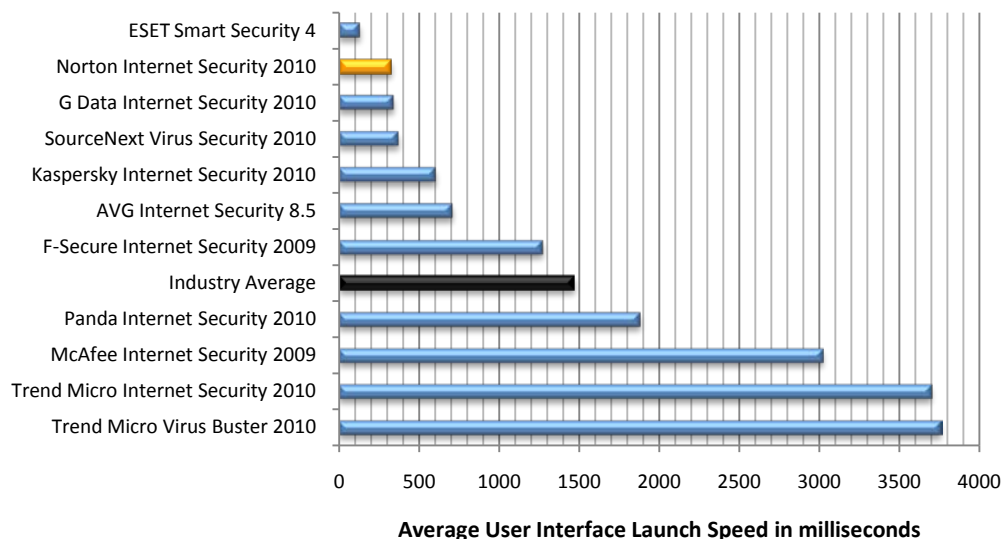
Benchmark 5 – Memory Usage while Idle

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.
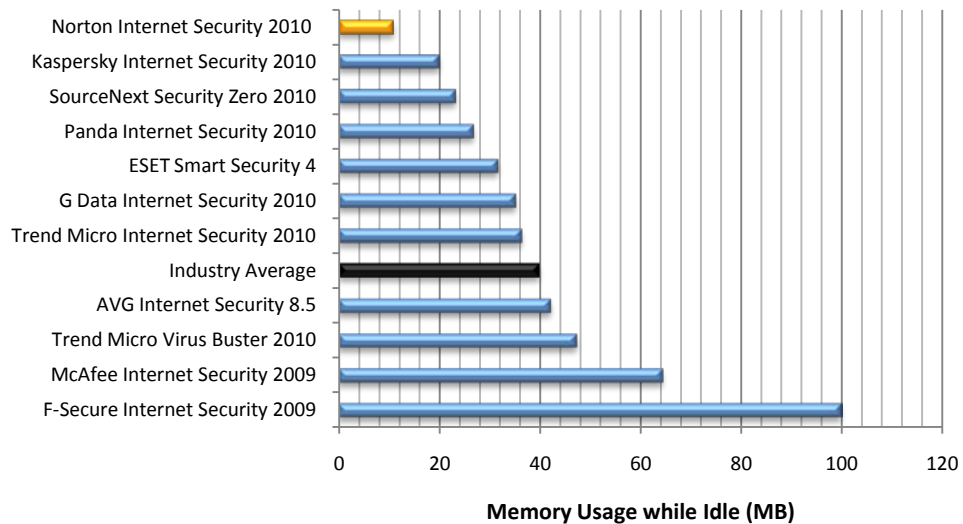
Benchmark 6 – Browse Time Test

The following chart compares the average time taken over five cycles for Internet Explorer to successively load a set of popular websites through the local area network from a local server machine. Products with lower browse times are considered better performing products in this category.
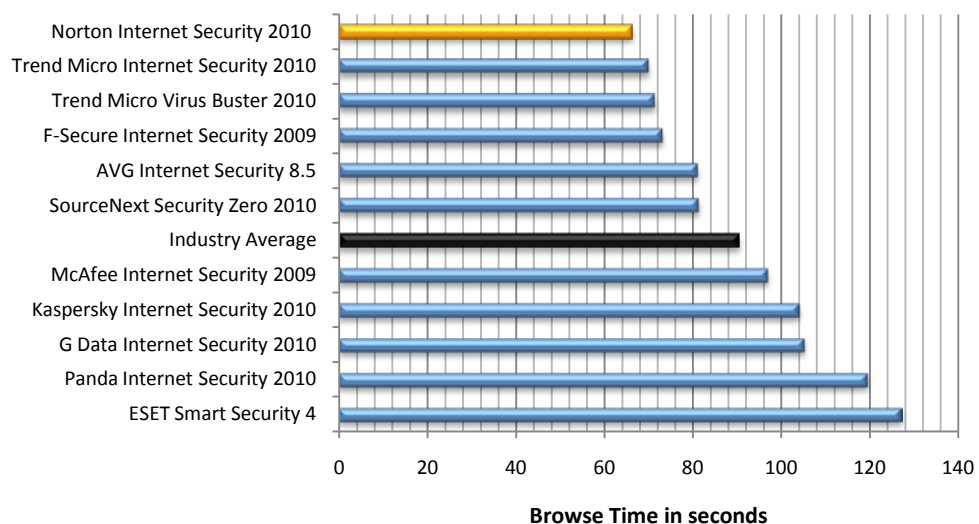
Benchmark 7 – Internet Explorer Launch Speed

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.

Average Internet Explorer Launch Speed in milliseconds
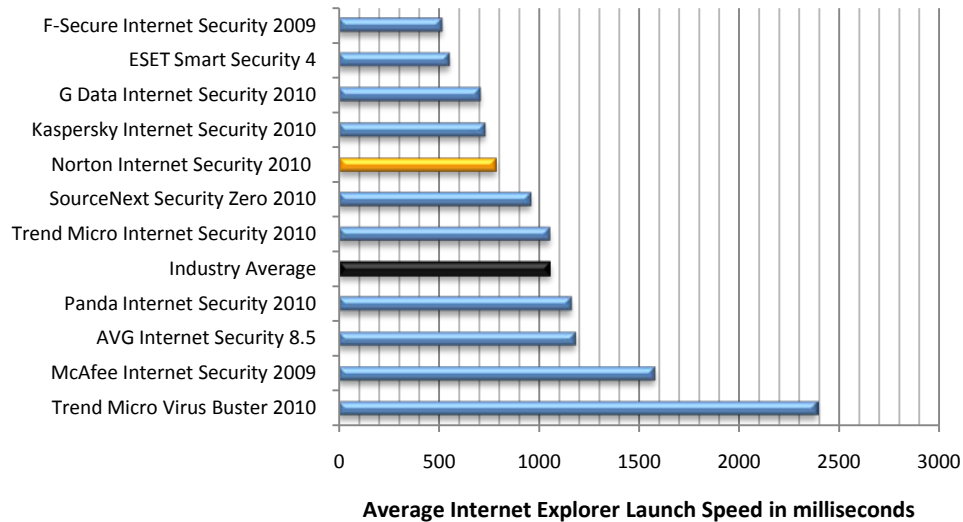
Benchmark 8 – Installation Time

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.

Installation Time in seconds
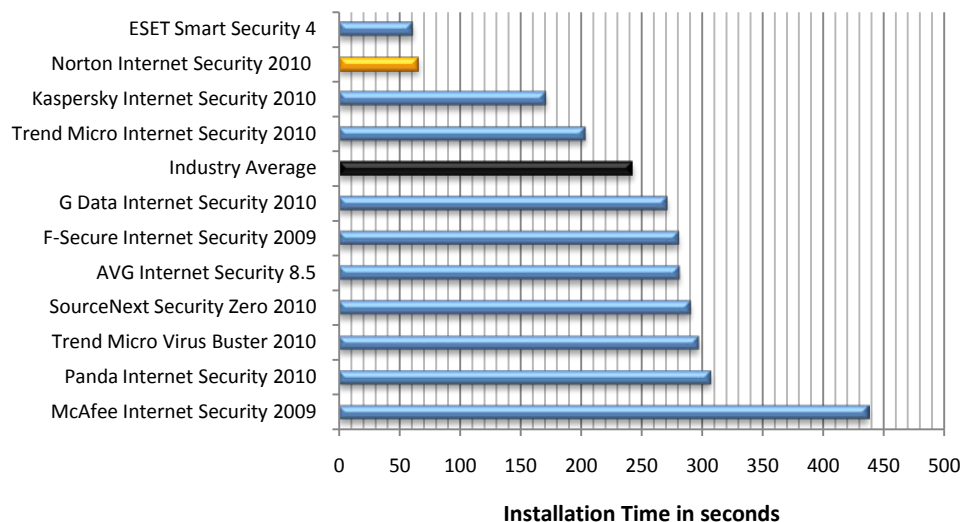
* Our results for **McAfee Internet Security 2009** and **SourceNext Virus Security Zero** include time taken for the installer to download components as part of the installation process.

Benchmark 9 – 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.

Total Size of Files Added during Installation (MB)
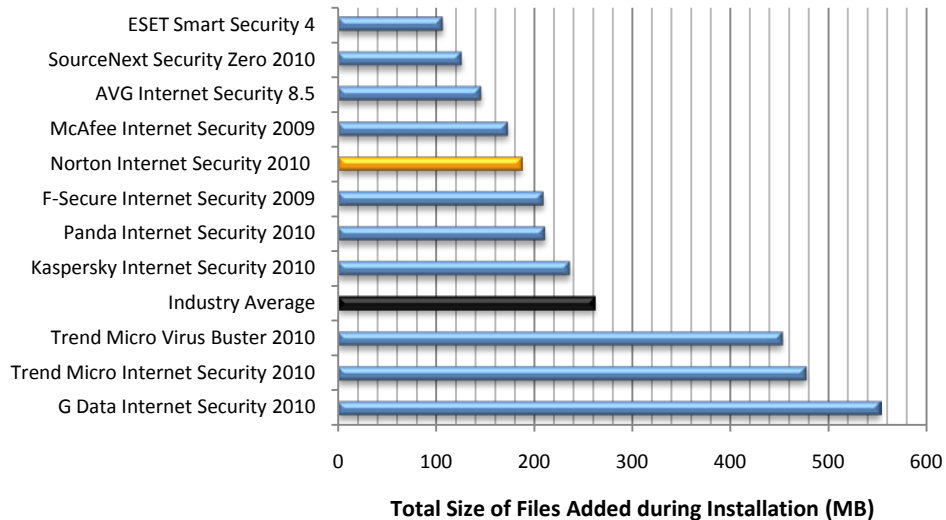
Benchmark 10 – Registry Key Count

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.

Number of Additional Registry Keys after Installation
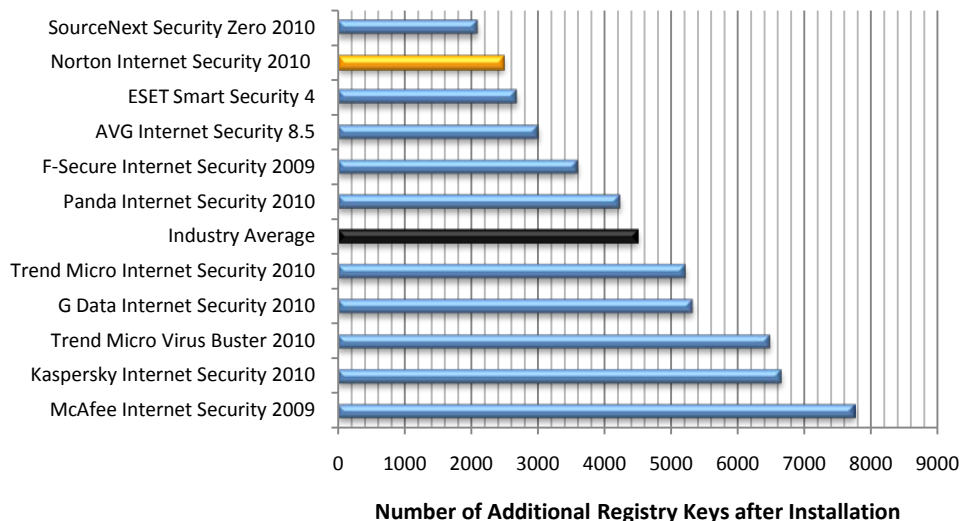
Benchmark 11 – File Copy, Move and Delete

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.

Time taken to perform File Copy, Move and Delete test in seconds
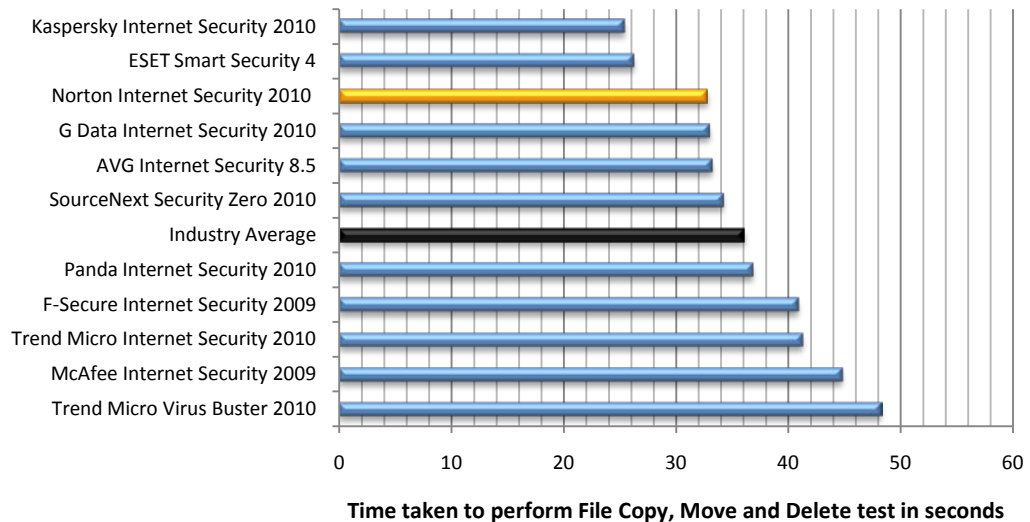
Benchmark 12 – Installation of Third Party Applications

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.

Time taken to perform a Third Party Installation in seconds
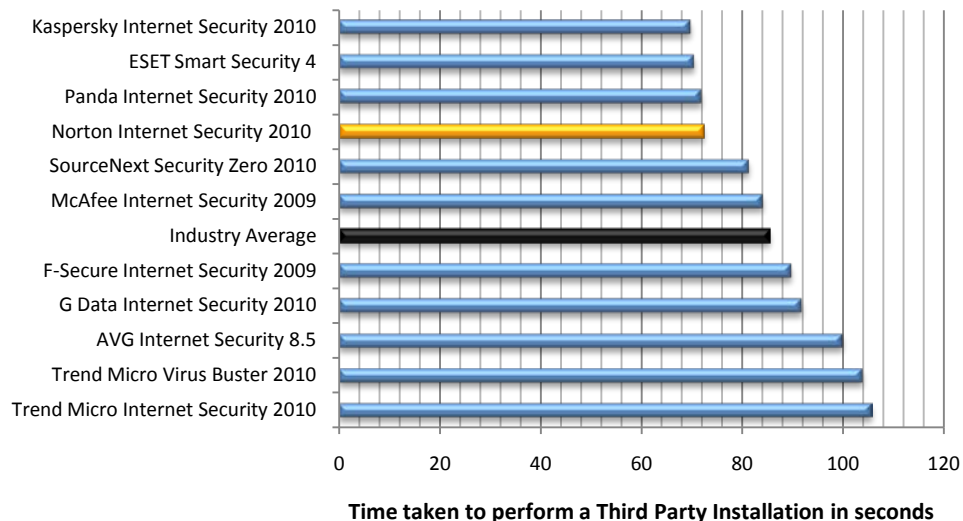
Benchmark 13 – Network Throughput Test

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.


Time taken to perform Network Throughput test in seconds
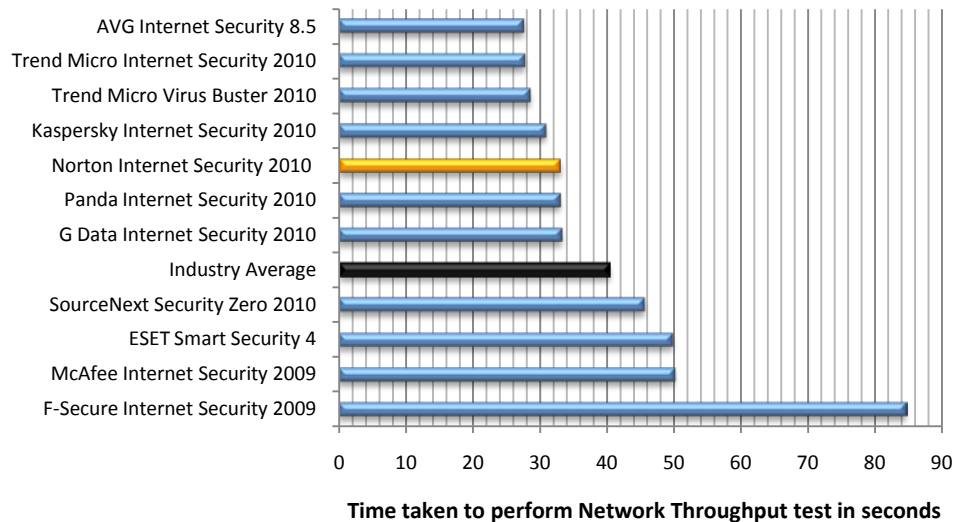
Benchmark 14 – File Format Conversion

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.

Time taken to perform File Format conversation in seconds
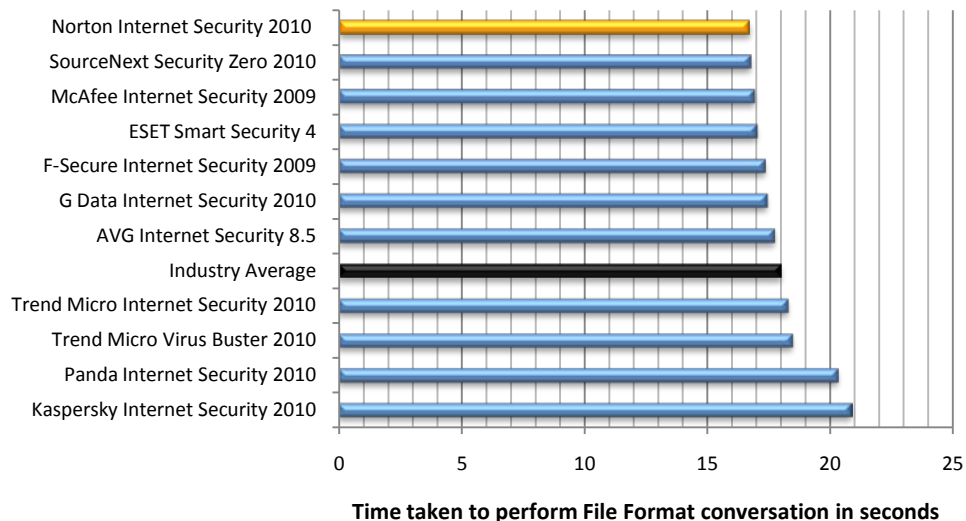
Benchmark 15 – File Compression and Decompression

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.

Time taken to perform File Compression test in seconds
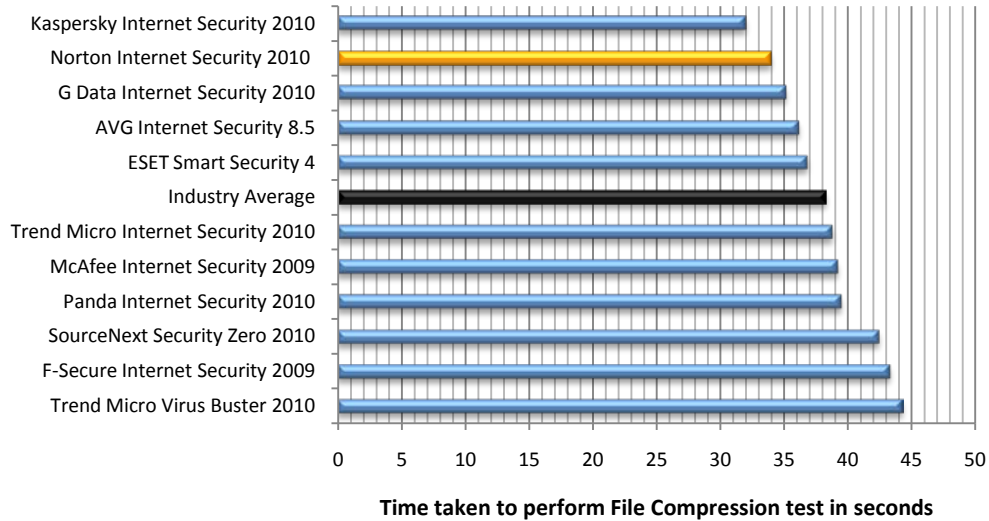
Benchmark 16 – File Write, Open and Close

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.

Time taken to perform File Write, Open and Close test in seconds

* F-Secure Internet Security 2009 performed extremely poorly in this category when compared to other products (over 63,000 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. **SourceNext Virus Security Zero** also performed poorly (over 3,300 seconds on average to execute this test) but has been included in the average despite falling outside the graph.

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 is covered by other industry benchmarks.

The metrics used for this report cover a number of key performance areas. We have chosen these metrics because they are objective and their results can be reproduced by third parties.

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 and Disclosure

This report only covers versions of products that were available at the time of testing. The tested versions are as noted in the "Product Versions Tested" section of this report. 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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http://www.passmark.com/avreport

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 mandatory Windows Updates up until **Service Pack 2**.
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. To increase the reliability of boot time testing on Windows Vista, we performed three runs containing five reboots each, leaving a five minute wait time between each cycle. Our final result is the average of 15 boot time samples taken.

We have defined the start of the boot process to be the end of the BIOS initialization. Further, we have defined the end of the boot process to be when the CPU was idle for five continuous seconds.

Windows has various functions to optimize the boot process. For this metric, we have forced optimization of the system with the product installed with *ProcessIdleTasks* on five consecutive reboots. For the duration of this test, we have removed the network cable to eliminate the possibility of network activity interfering with result.

Benchmark 2 – Scan Speed

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

.h	13	<1MB	.js	12	1MB	.acm	9	1MB
.vsd	12	2MB	.zip	11	25MB	.wav	7	5MB
.scr	12	2MB	.lex	9	10MB			
.aw	12	2MB	.ppt	9	4MB			

This scan was run without launching the product's UI, by right-clicking the test folder and choosing the "Scan Now" option. To record the scan time, we have used product's built-in scan speed timer or reporting system. Where this was not possible, scan speed samples were taken manually with a stopwatch.

For each product, five samples were taken with the machine rebooted before each sample to clear any caching effects by the operating systems.

Compared to last year, we noticed many more products showing a substantial difference between the initial scan speed (first scan) and subsequent scan speed (scans 2 - 5). We believe this behavior is due to products themselves caching recently scanned files.

As a result of this mechanism, we have averaged the four subsequent scan times to obtain an average subsequent scan time. Our final result for this test is an average of the subsequent scan average and the initial scan time.

Benchmark 3 – Scan Speed of Solid State Drive

This methodology used for this test is identical to the above Scan Speed test with one key difference - the sample file set is located on a Solid State Drive (SSD) and scanning will take place from this drive.

The Solid State Drive we are testing on is a 64GB Corsair Extreme Series X64 drive.

The file set used is identical to the file set used in **Benchmark 2 – Scan Speed**. Details about this file set can be found above in the previous section.

The methodology we have used for this benchmark is also identical to that of Benchmark 2.

Benchmark 4 – User Interface 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 for a total of fifteen samples, with a reboot before each set to clear caching effects by the operating system. 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.

We have averaged the subsequent launch times to obtain an average subsequent launch time. Our final result for this test is an average of the subsequent launch average and the initial launch time.

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 the measurement from *AppTimer* appeared inaccurate, we have taken the time manually with a stop watch.

Benchmark 5 – Memory Usage while Idle

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 6 – Browse Time Test

We used a script in conjunction with *HTTPWatch* to record the amount of time it takes for a set of 106 'popular' websites to load consecutively from a local server. Our script feeds a list of URLs into *HTTPWatch*, which instructs the browser to load pages in sequence and monitors the amount of time it takes for the browser to load all items on one page.

For this test, we have used *Internet Explorer 8* (Version 8.0.6001.18783) as our test browser.

The set of websites used in this test include front pages of high traffic pages. This includes shopping, social, news, finance and reference websites.

The Browse Time test is executed five times and our final result is an average of these five samples. The local server is restarted between different products and one initial 'test' run is conducted prior to testing to install *Adobe Flash,* an add-on which is used by many popular websites.

Benchmark 7 – Internet Explorer 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 five sets of three launches for a total of fifteen samples, with a reboot before each set to clear caching effects by the operating system. 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.

For this test, we have used *Internet Explorer 8* (Version 8.0.6001.18783) as our test browser.

We have averaged the subsequent launch times to obtain an average subsequent launch time. Our final result for this test is an average of the subsequent launch average and the initial launch time.

Benchmark 8 – 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** consists of file extraction, the EULA prompt, product activation and user configurable options for installation.

- The **File Copy phase** occurs when the product is being installed; usually this phase is indicated by a progress bar.

- The **Post-Installation phase** 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 Internet Security Product).

Installation time includes the time taken by the product installer to download components required in the installation. 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). We have noted in our results where a product has downloaded components for product installation.

We have excluded product activation times due to network variability in contacting vendor servers or time taken in account creation.

Benchmark 9 – 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 10 – 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 these two registry key totals.

Benchmarks 11-16 – 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 11 – 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
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

File format	Category	Number	Size (bytes)
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 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 12 – 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 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 13 – Network Throughput Test

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

File format	Category	Number	Size (bytes)
ZIP	Documents	4	6,295,987
7Z	Documents	1	92,238
	Total	484	553,638,694

This test was conducted 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 14 – 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 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 15 – 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 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 16 – 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 #1: 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 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) with Service Pack 2.

The Solid State Drive we are testing on is a 64GB Corsair Extreme Series X64 drive.

Appendix 3 – Internet Security Raw Results

For ease of comparison of Raw Results, we have highlighted the results we obtained for Norton Internet Security 2010 in orange. Industry averages are highlighted in silver.

Boot Time

Product Name	Time (sec)
F-Secure Internet Security 2009	50.39
AVG Internet Security 8.5	45.76
Trend Micro Virus Buster 2010	43.44
Trend Micro Internet Security 2010	40.18
Industry Average	37.14
Norton Internet Security 2010	35.76
McAfee Internet Security 2009	34.74
Kaspersky Internet Security 2010	33.59
SourceNext Security Zero 2010	32.67
G Data Internet Security 2010	32.21
Panda Internet Security 2010	31.15
ESET Smart Security 4	28.65

Scan Speed

Product Name	Time (sec)
AVG Internet Security 8.5	381.00
F-Secure Internet Security 2009	349.88
Trend Micro Virus Buster 2010	180.00
Trend Micro Internet Security 2010	179.80
Industry Average	170.75
McAfee Internet Security 2009	165.07
SourceNext Virus Security Zero 2010	142.33
Panda Internet Security 2010	123.13
ESET Smart Security 4	122.88
Kaspersky Internet Security 2010	86.75
G Data Internet Security 2010	86.63
Norton Internet Security 2010	60.83

Scan Speed of a Solid State Drive

Product Name	Time (sec)
AVG Internet Security 8.5	355.00
F-Secure Internet Security 2009	333.38
Industry Average	135.65
Trend Micro Internet Security 2010	130.80
Trend Micro Virus Buster 2010	130.24
McAfee Internet Security 2009	118.45
Panda Internet Security 2010	94.91
SourceNext Virus Security Zero 2010	85.59
ESET Smart Security 4	83.63
G Data Internet Security 2010	69.50
Kaspersky Internet Security 2010	59.38
Norton Internet Security 2010	31.25

User Interface Launch Speed

Product Name	Time (ms)
Trend Micro Virus Buster 2010	3760.00
Trend Micro Internet Security 2010	3699.00
McAfee Internet Security 2009	3023.00
Panda Internet Security 2010	1881.78
Industry Average	1466.22
F-Secure Internet Security 2009	1273.89
AVG Internet Security 8.5	709.93
Kaspersky Internet Security 2010	606.03
SourceNext Virus Security 2010	373.63
G Data Internet Security 2010	342.77
Norton Internet Security 2010	325.51
ESET Smart Security 4	132.85

Memory Usage while Idle

Product Name	RAM Usage (MB)
F-Secure Internet Security 2009	99.81
McAfee Internet Security 2009	64.36
Trend Micro Virus Buster 2010	47.32
AVG Internet Security 8.5	42.17
Industry Average	39.81
Trend Micro Internet Security 2010	36.39
G Data Internet Security 2010	35.21
ESET Smart Security 4	31.70
Panda Internet Security 2010	26.86
SourceNext Virus Security Zero 2010	23.27
Kaspersky Internet Security 2010	20.01
Norton Internet Security 2010	10.85

Browse Time Test

Product Name	Time (sec)
ESET Smart Security 4	127.12
Panda Internet Security 2010	119.41
G Data Internet Security 2010	105.21
Kaspersky Internet Security 2010	104.01
McAfee Internet Security 2009	96.93
Industry Average	90.53
SourceNext Virus Security Zero 2010	81.30
AVG Internet Security 8.5	81.08
F-Secure Internet Security 2009	73.12
Trend Micro Virus Buster 2010	71.37
Trend Micro Internet Security 2010	70.00
Norton Internet Security 2010	66.27

IE Launch Speed

Product Name	Time (ms)
Trend Micro Virus Buster 2010	2389.64
McAfee Internet Security 2009	1579.70
AVG Internet Security 8.5	1184.16
Panda Internet Security 2010	1163.23
Industry Average	1057.23
Trend Micro Internet Security 2010	1055.88
SourceNext Virus Security Zero 2010	960.99
Norton Internet Security 2010	782.54
Kaspersky Internet Security 2010	732.63
G Data Internet Security 2010	709.17
ESET Smart Security 4	554.23
F-Secure Internet Security 2009	517.39

Installation Time

Product Name	Time (se)
McAfee Internet Security 2009*	437.05
Panda Internet Security 2010	307.00
Trend Micro Virus Buster 2010	296.90
SourceNext Virus Security Zero 2010*	290.36
AVG Internet Security 8.5	281.10
F-Secure Internet Security 2009	280.49
G Data Internet Security 2010	271.20
Industry Average	242.33
Trend Micro Internet Security 2010	203.52
Kaspersky Internet Security 2010	171.10
Norton Internet Security 2010	65.76
ESET Smart Security 4	61.20

* Our result for the products **McAfee Internet Security 2009** and **SourceNext Virus Security Zero** include time taken for the installer to download components as part of the installation process.

Installation Size

Product Name	Size (MB)
G Data Internet Security 2010	552.43
Trend Micro Internet Security 2010	476.88
Trend Micro Virus Buster 2010	452.82
Industry Average	261.73
Kaspersky Internet Security 2010	236.13
Panda Internet Security 2010	211.17
F-Secure Internet Security 2009	209.52
Norton Internet Security 2010	187.20
McAfee Internet Security 2009	173.39
AVG Internet Security 8.5	146.03
SourceNext Virus Security Zero 2010	126.38
ESET Smart Security 4	107.05

Registry Key Count

Product Name	Keys
McAfee Internet Security 2009	7750
Kaspersky Internet Security 2010	6652
Trend Micro Virus Buster 2010	6479
G Data Internet Security 2010	5318
Trend Micro Internet Security 2010	5215
Industry Average	4502
Panda Internet Security 2010	4233
F-Secure Internet Security 2009	3597
AVG Internet Security 8.5	3009
ESET Smart Security 4	2687
Norton Internet Security 2010	2489
SourceNext Virus Security Zero 2010	2098

File Copy, Move and Delete

Product Name	Time (sec)
Trend Micro Virus Buster 2010	48.24
McAfee Internet Security 2009	44.77
Trend Micro Internet Security 2010	41.26
F-Secure Internet Security 2009	40.88
Panda Internet Security 2010	36.84
Industry Average	36.08
SourceNext Virus Security Zero 2010	34.20
AVG Internet Security 8.5	33.19
G Data Internet Security 2010	32.99
Norton Internet Security 2010	32.80
ESET Smart Security 4	26.25
Kaspersky Internet Security 2010	25.43

Third Party Program Installation

Product Name	Time (sec)
Trend Micro Internet Security 2010	105.63
Trend Micro Virus Buster 2010	103.76
AVG Internet Security 8.5	99.84
G Data Internet Security 2010	91.65
F-Secure Internet Security 2009	89.62
Industry Average	85.46
McAfee Internet Security 2009	84.02
SourceNext Virus Security Zero 2010	81.24
Norton Internet Security 2010	72.37
Panda Internet Security 2010	71.83
ESET Smart Security 4	70.40
Kaspersky Internet Security 2010	69.71

Network Throughput Speed

Product Name	Time (sec)
F-Secure Internet Security 2009	84.64
McAfee Internet Security 2009	50.16
ESET Smart Security 4	49.86
SourceNext Virus Security Zero 2010	45.65
Industry Average	40.43
G Data Internet Security 2010	33.34
Panda Internet Security 2010	33.10
Norton Internet Security 2010	32.96
Kaspersky Internet Security 2010	30.95
Trend Micro Virus Buster 2010	28.63
Trend Micro Internet Security 2010	27.81
AVG Internet Security 8.5	27.67

File Format Conversion

Product Name	Time (sec)
Kaspersky Internet Security 2010	20.86
Panda Internet Security 2010	20.32
Trend Micro Virus Buster 2010	18.46
Trend Micro Internet Security 2010	18.29
Industry Average	17.99
AVG Internet Security 8.5	17.74
G Data Internet Security 2010	17.43
F-Secure Internet Security 2009	17.36
ESET Smart Security 4	17.02
McAfee Internet Security 2009	16.91
SourceNext Virus Security Zero 2010	16.77
Norton Internet Security 2010	16.72

File Compression and Decompression

Product Name	Time (sec)
Trend Micro Virus Buster 2010	44.24
F-Secure Internet Security 2009	43.25
SourceNext Virus Security Zero 2010	42.39
Panda Internet Security 2010	39.43
McAfee Internet Security 2009	39.16
Trend Micro Internet Security 2010	38.74
Industry Average	38.29
ESET Smart Security 4	36.78
AVG Internet Security 8.5	36.12
G Data Internet Security 2010	35.11
Norton Internet Security 2010	33.96
Kaspersky Internet Security 2010	31.97

File Write, Open and Close

Product Name	Time (sec)
F-Secure Internet Security 2009	63663.16
SourceNext Virus Security Zero 2010	3342.74
Trend Micro Virus Buster 2010	1103.69
Trend Micro Internet Security 2010	1090.62
McAfee Internet Security 2009	871.24
Industry Average	672.34
ESET Smart Security 4	94.87
Kaspersky Internet Security 2010	57.72
Norton Internet Security 2010	54.38
Panda Internet Security 2010	46.44
AVG Internet Security 8.5	31.71
G Data Internet Security 2010	30.00

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