

Anti-Virus and Internet Security Products Performance Benchmarking (2010)

Windows Vista – Dual Core Hardware

December 2009

Document: Internet Security Products Performance Benchmarking
Authors: K Lai, D Wren
Company: PassMark Software Pty Ltd (www.passmark.com)
Date: 9/Dec/2009
Edition: Edition 3.1
File: Anti-Virus_10-performance-testing-ed3.docx

TABLE OF CONTENTS

TABLE OF CONTENTS	2
REVISION HISTORY	4
REFERENCES	4
EXECUTIVE SUMMARY	5
OVERALL RANKING	6
INTERNET SECURITY SOFTWARE	6
ANTI-VIRUS SOFTWARE – COMMERCIAL	6
ANTI-VIRUS SOFTWARE – FREE EDITIONS	6
PRODUCT VERSIONS TESTED	7
INTERNET SECURITY SOFTWARE	7
ANTI-VIRUS SOFTWARE – COMMERCIAL	7
ANTI-VIRUS SOFTWARE – FREE EDITIONS	7
PERFORMANCE METRICS	8
BENCHMARK 1 – BOOT TIME.....	8
BENCHMARK 2 – SCAN TIME.....	8
BENCHMARK 3 – SCAN TIME OF A SOLID STATE DRIVE	8
BENCHMARK 4 – USER INTERFACE LAUNCH TIME	8
BENCHMARK 5 – BROWSE TIME.....	8
BENCHMARK 6 – MEMORY USAGE DURING SYSTEM IDLE.....	8
BENCHMARK 7 – INTERNET EXPLORER LAUNCH TIME.....	9
BENCHMARK 8 – INSTALLATION TIME	9
BENCHMARK 9 – INSTALLATION SIZE	9
BENCHMARK 10 – REGISTRY KEY COUNT.....	9
BENCHMARK 11 – FILE COPY, MOVE AND DELETE	9
BENCHMARK 12 – INSTALLING THIRD PARTY APPLICATIONS	9
BENCHMARK 13 – NETWORK THROUGHPUT.....	9
BENCHMARK 14 – FILE FORMAT CONVERSION	10
BENCHMARK 15 – FILE COMPRESSION AND DECOMPRESSION.....	10
BENCHMARK 16 – FILE WRITE, OPEN AND CLOSE	10
INTERNET SECURITY TEST RESULTS	11
BENCHMARK 1 – BOOT TIME.....	11
BENCHMARK 2 – SCAN TIME.....	11
BENCHMARK 3 – SCAN TIME OF A SOLID STATE DRIVE	12
BENCHMARK 4 – USER INTERFACE LAUNCH TIME	12
BENCHMARK 5 – MEMORY USAGE DURING SYSTEM IDLE.....	13
BENCHMARK 6 – BROWSE TIME.....	13
BENCHMARK 7 – INTERNET EXPLORER LAUNCH TIME.....	14
BENCHMARK 8 – INSTALLATION TIME	14
BENCHMARK 9 – INSTALLATION SIZE	15
BENCHMARK 10 – REGISTRY KEY COUNT.....	15
BENCHMARK 11 – FILE COPY, MOVE AND DELETE	16
BENCHMARK 12 – INSTALLATION OF THIRD PARTY APPLICATIONS	16
BENCHMARK 13 – NETWORK THROUGHPUT.....	17
BENCHMARK 14 – FILE FORMAT CONVERSION	17
BENCHMARK 15 – FILE COMPRESSION AND DECOMPRESSION.....	18
BENCHMARK 16 – FILE WRITE, OPEN AND CLOSE	18
FILE WRITE, OPEN AND CLOSE – DETAILED GRAPH.....	19
ANTI-VIRUS (COMMERCIAL AND FREE EDITIONS) TEST RESULTS	20
BENCHMARK 1 – BOOT TIME.....	20
BENCHMARK 2 – SCAN TIME.....	20
BENCHMARK 3 – SCAN TIME OF A SOLID STATE DRIVE	21
BENCHMARK 4 – USER INTERFACE LAUNCH TIME	21
BENCHMARK 5 – MEMORY USAGE DURING SYSTEM IDLE.....	22
BENCHMARK 6 – BROWSE TIME.....	22

BENCHMARK 7 – INTERNET EXPLORER LAUNCH TIME.....	23
BENCHMARK 8 – INSTALLATION TIME	23
BENCHMARK 9 – INSTALLATION SIZE	24
BENCHMARK 10 – REGISTRY KEY COUNT.....	24
BENCHMARK 11 – FILE COPY, MOVE AND DELETE	25
BENCHMARK 12 – INSTALLATION OF THIRD PARTY APPLICATIONS	25
BENCHMARK 13 – NETWORK THROUGHPUT.....	26
BENCHMARK 14 – FILE FORMAT CONVERSION	26
BENCHMARK 15 – FILE COMPRESSION AND DECOMPRESSION.....	27
BENCHMARK 16 – FILE WRITE, OPEN AND CLOSE	27
WHAT THIS REPORT DOESN'T COVER	28
DISCLAIMER AND DISCLOSURE.....	29
DISCLAIMER OF LIABILITY	29
DISCLOSURE.....	29
TRADEMARKS.....	29
CONTACT DETAILS.....	29
DOWNLOAD LINK.....	29
APPENDIX 1 – TEST METHOD – HOW DID WE CONDUCT THESE TESTS?.....	30
IMAGE CREATION STEPS	30
BENCHMARK 1 – BOOT TIME.....	30
BENCHMARK 2 – SCAN TIME.....	30
BENCHMARK 3 – SCAN TIME OF SOLID STATE DRIVE	31
BENCHMARK 4 – USER INTERFACE LAUNCH TIME	31
BENCHMARK 5 – MEMORY USAGE DURING SYSTEM IDLE.....	31
BENCHMARK 6 – BROWSE TIME	32
BENCHMARK 7 – INTERNET EXPLORER LAUNCH TIME.....	32
BENCHMARK 8 – INSTALLATION TIME	32
BENCHMARK 9 – INSTALLATION SIZE	33
BENCHMARK 10 – REGISTRY KEY COUNT.....	33
BENCHMARKS 11-16 – REAL-TIME PERFORMANCE.....	33
BENCHMARKS 11 – FILE COPY, MOVE AND DELETE	34
BENCHMARK 12 – THIRD PARTY PROGRAM INSTALLATION	35
BENCHMARK 13 – NETWORK THROUGHPUT.....	35
BENCHMARK 14 – FILE FORMAT CONVERSION (MP3 → WAV, MP3 → WMA)	36
BENCHMARK 15 – FILE COMPRESSION AND DECOMPRESSION.....	36
BENCHMARK 16 – FILE WRITE, OPEN AND CLOSE	37
APPENDIX 2 – TEST ENVIRONMENT.....	38
APPENDIX 3 – RAW RESULTS.....	39
BOOT TIME.....	39
SCAN TIME.....	39
SCAN TIME OF A SOLID STATE DRIVE	40
USER INTERFACE LAUNCH TIME	40
MEMORY USAGE WHILE IDLE.....	41
BROWSE TIME	41
INTERNET EXPLORER LAUNCH TIME.....	42
INSTALLATION TIME.....	42
INSTALLATION SIZE.....	43
REGISTRY KEY COUNT.....	43
FILE COPY, MOVE AND DELETE	44
THIRD PARTY PROGRAM INSTALLATION	44
NETWORK THROUGHPUT.....	45
FILE FORMAT CONVERSION.....	45
FILE COMPRESSION AND DECOMPRESSION.....	46
FILE WRITE, OPEN AND CLOSE	46

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
Edition 3	Added results for Anti-Virus products, plus results for newer (2010) versions of Internet Security products. Added Rising Internet Security 2010 (new product). Corrected the name of SourceNext's Internet Security product in graphs, product is now correctly referred to as "Virus Security Zero". Improvements on graph style for improved readability. Corrected minor grammatical errors.	3 December 2009
Edition 3.1	Corrected typographical error in 'File Compression and Decompression' raw results graph (p 46).	9 December 2009

REFERENCES

Ref #	Document	Author	Date
1	What Really Slows Windows Down	O. Warner, The PC Spy	2001-2009

Executive Summary

PassMark® Software conducted objective performance testing on Internet Security and Anti-Virus software from various vendors between July 2009 and November 2009. Where applicable, we have tested new versions (2010) of software. Subsequent editions of this report will include new versions of products as they are released.

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

- Boot Time;
- Scan Time;
- Scan Time of a Solid State Drive (SSD);
- User Interface Launch Time;
- Memory Usage during System Idle;
- Browse Time;
- Internet Explorer Launch Time;
- Installation Size;
- Installation Time;
- Registry Key Count;
- File Copy, Move and Delete;
- Installation of Third Party Applications;
- Network Throughput (previously named “Binary Download Test”)
- File Format Conversion;
- File Compression and Decompression; and
- File Write, Open and Close.

This report aims to objectively benchmark and compare products from two categories of software based on their impact on system performance. These categories are as follows:

- **Internet Security software** offers protection for computer users from viruses, spyware and malware from malicious sources on the Internet. While feature sets vary from product to product, some common security features include heuristic protection against “zero-day” threats, anti-phishing, anti-spam, root kit detection, a personal firewall, parental controls, identity protection or web content scanning.
- Compared to Internet Security suites, **Anti-Virus software** offers only basic protection for users from malware. This software category offers fewer security features and generally has less impact on system performance. Some vendors also offer free Anti-Virus solutions that have fewer features than some commercial Anti-Virus products.

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.

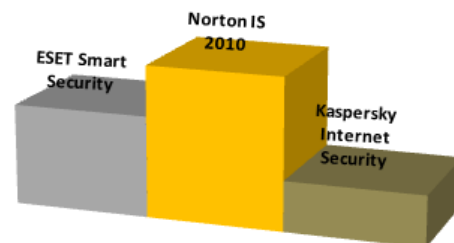
Testing was performed on a dual core Vista machine; the same machine used in previous testing.

Overall Ranking

In the following tables, software products have been ranked by score. This score provides an overall indication of that product's performance compared to other products we have tested in the same category.

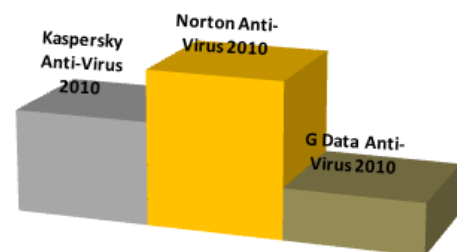
Internet Security Software

Product Name	Score
Norton Internet Security 2010	171
ESET Smart Security 4	149
Kaspersky Internet Security 2010	143
G Data Internet Security 2010	126
BitDefender Internet Security 2010	125
SourceNext Virus Security Zero	119
Rising Internet Security 2010	118
Panda Internet Security 2010	107
AVG Internet Security 9.0	101
F-Secure Internet Security 2010	86
Trend Micro Internet Security 2010	80
McAfee Internet Security 2010	74
Trend Micro Virus Buster 2010	57



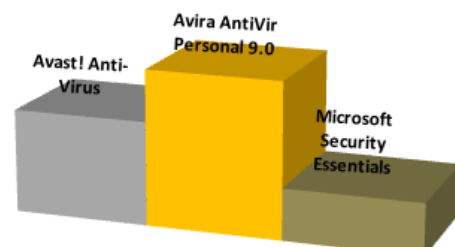
Anti-Virus Software – Commercial

Product Name	Score
Norton Anti-Virus 2010	112
Kaspersky Anti-Virus 2010	92
G Data Anti-Virus 2010	90
ESET NOD32 Anti-Virus 4	89
Panda Anti-Virus Pro 2010	59
Trend Micro Anti-Virus 2010	55



Anti-Virus Software – Free Editions

Product Name	Score
Avira AntiVir Free Anti-Virus 9.0	127
Avast! Anti-Virus	90
Microsoft Security Essentials	84
AVG Anti-Virus Free Edition 9.0	82



Product Versions Tested

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

Internet Security Software

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 9.0	9.0.633	Oct 09
Panda Security	Panda Internet Security 2010	9.00.00	Aug 09
ESET, LLC	ESET Smart Security 4	4.0.437.0	Jul 09
Kaspersky Lab	Kaspersky Internet Security 2010	9.0.0.459	Jul 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
Trend Micro	Trend Micro Internet Security 2010	17.50.1366	Sep 09
F-Secure Corporation	F-Secure Internet Security 2010	10.0.246	Oct 09
McAfee	McAfee Internet Security 2010	9.15.126	Oct 09
BitDefender	BitDefender Internet Security 2010	13.0.16.313	Oct 09
Beijing Rising International	Rising Internet Security 2010	22.00.01.81	Nov 09

Anti-Virus Software – Commercial

Manufacturer	Product Name	Product Version	Date Tested
Symantec Corporation	Norton Anti-Virus 2010	17.0.0.136	Sep 09
G Data Software	G Data Anti-Virus 2010	20.0.2.1	Jun 09
Panda Security	Panda Anti-Virus Pro 2010	9.00.00	Aug 09
ESET, LLC	ESET NOD32 Anti-Virus 4	4.0.437.0	Jul 09
Kaspersky Lab	Kaspersky Anti-Virus 2010	9.0.0.459	Jul 09
Trend Micro	Trend Micro Anti-Virus 2010	17.50.1366	Sep 09
Microsoft	Microsoft Security Essentials	1.0.1611	Oct 09

Anti-Virus Software – Free Editions

Manufacturer	Product Name	Product Version	Date Tested
Avira GmbH	Avira AntiVir Personal 9.0	9.0.0.403	Jul 09
ALWIL Software	Avast! Anti-Virus	4.8.1351	Aug 09
Microsoft	Microsoft Security Essentials	1.0.1611	Aug 09
AVG Technologies	AVG Anti-Virus Free Edition 9.0	9.0.686	Oct 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 Time

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 Windows files from the Windows system folder and Office files.

Benchmark 3 – Scan Time of a Solid State Drive

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 Time

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

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 the time taken to browse a set of popular internet sites to consecutively load from a local server in a user's browser window.

Benchmark 6 – Memory Usage during System Idle

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 Time

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 influence a user's 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

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

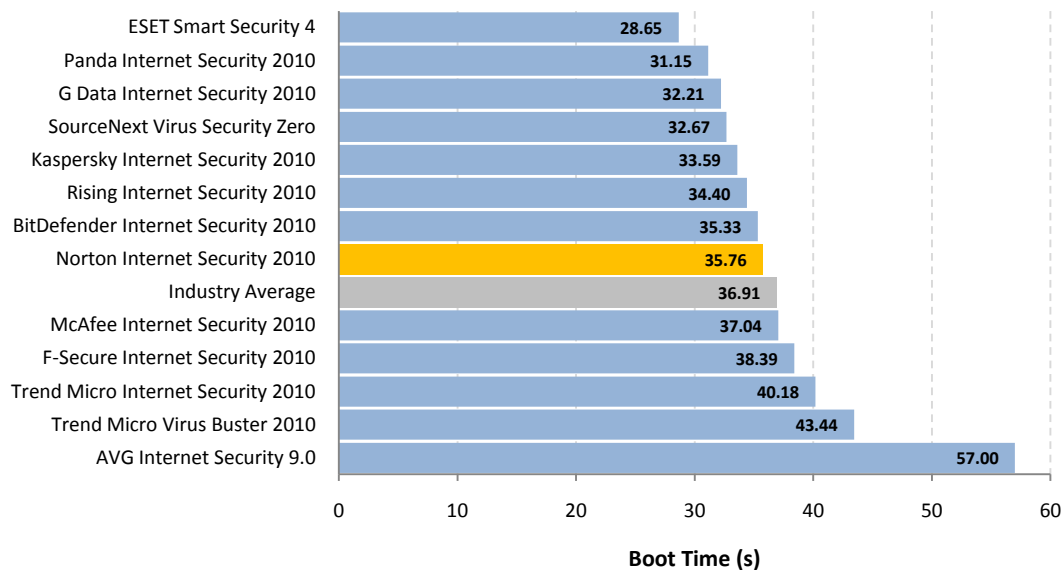
This benchmark was derived from Oli Warner's File I/O test at <http://www.thepcs Spy.com> (please see *Reference #1: What Really Slows Windows Down*). This metric measures the amount of time required for the system to write a file, then open and close that file.

Internet Security Test Results

In the following charts, we have highlighted the results we obtained for Norton Internet Security 2010 in orange. The industry average has also been highlighted in gray for ease of comparison.

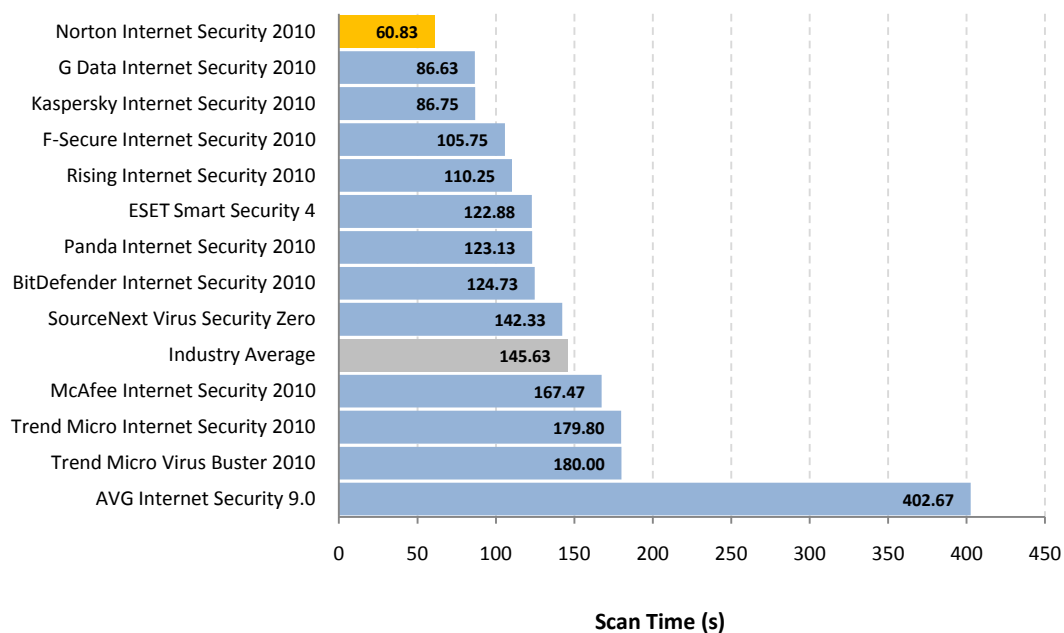
Benchmark 1 – Boot Time

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



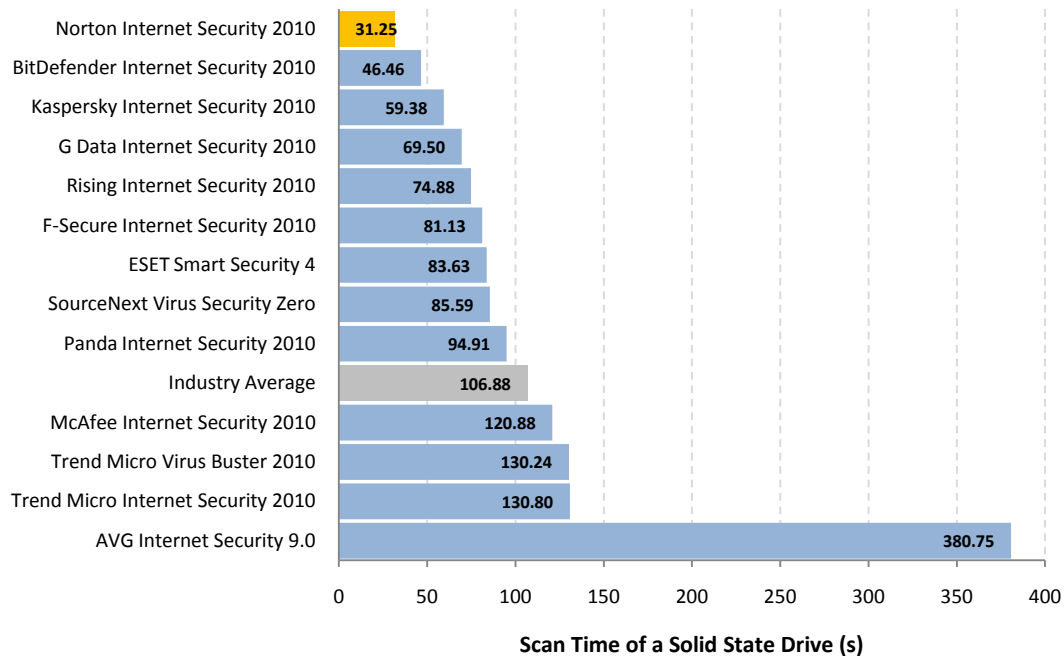
Benchmark 2 – Scan Time

The following chart compares the average time taken to scan a set of 6159 files (totaling 982MB) for each Internet Security product 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.



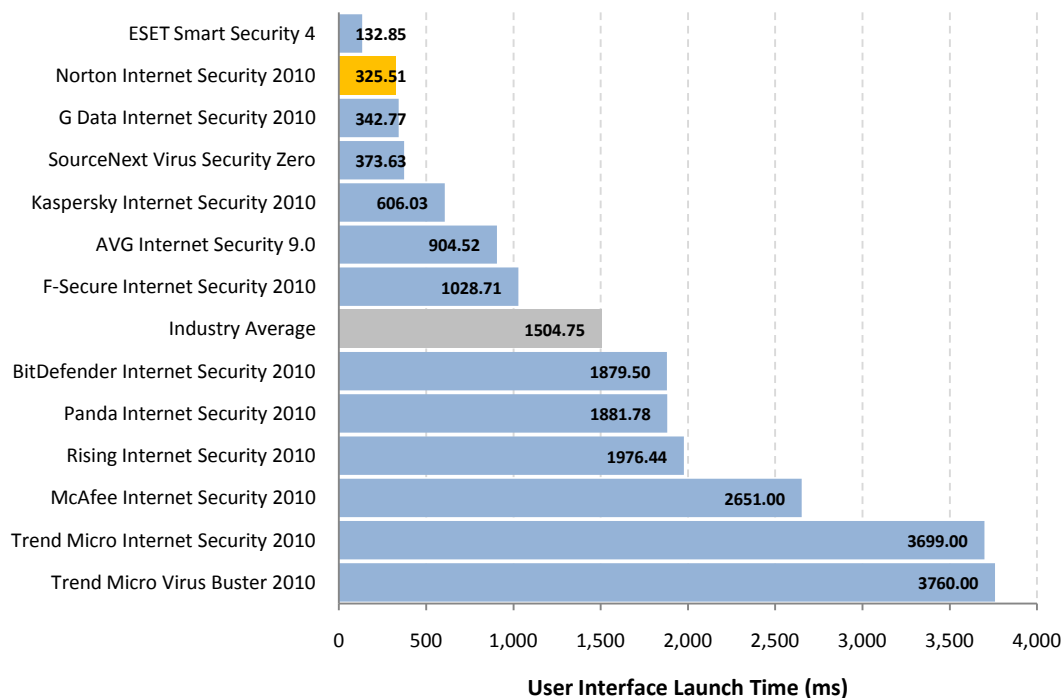
Benchmark 3 – Scan Time of a Solid State Drive

The following chart compares the average time taken to scan a set of 6159 files (totaling 982MB) on a Solid State Drive for each Internet Security product 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.



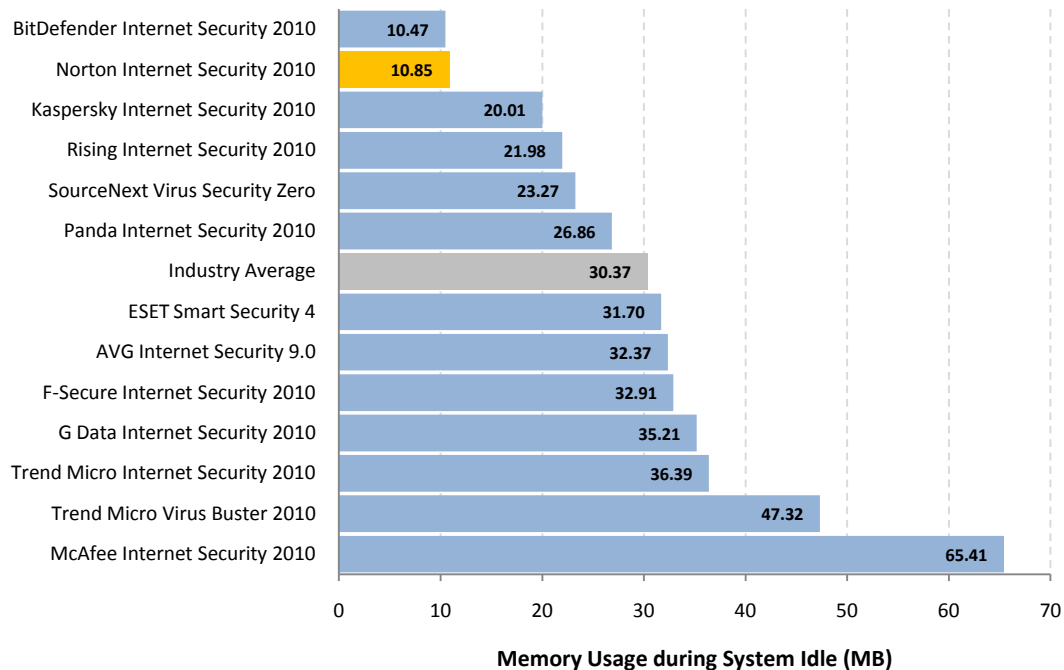
Benchmark 4 – User Interface Launch Time

The following chart compares the average time taken to launch a product's user interface. Products with lower launch times are considered better performing products in this category.



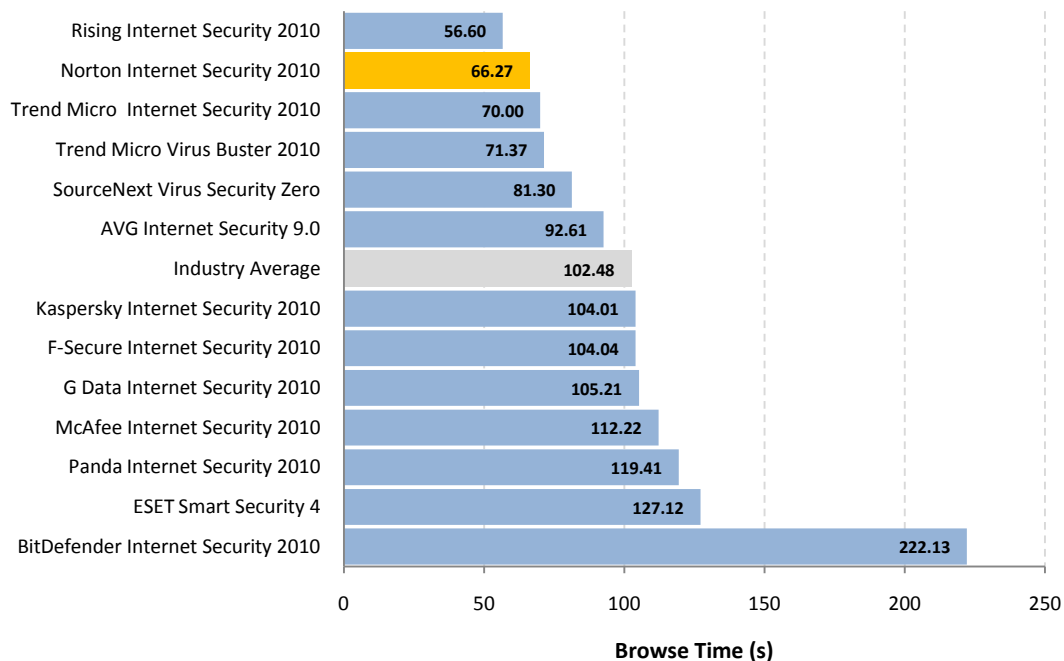
Benchmark 5 – Memory Usage during System Idle

The following chart compares the average amount of RAM in use by an Internet Security product during a period of system idle. 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.



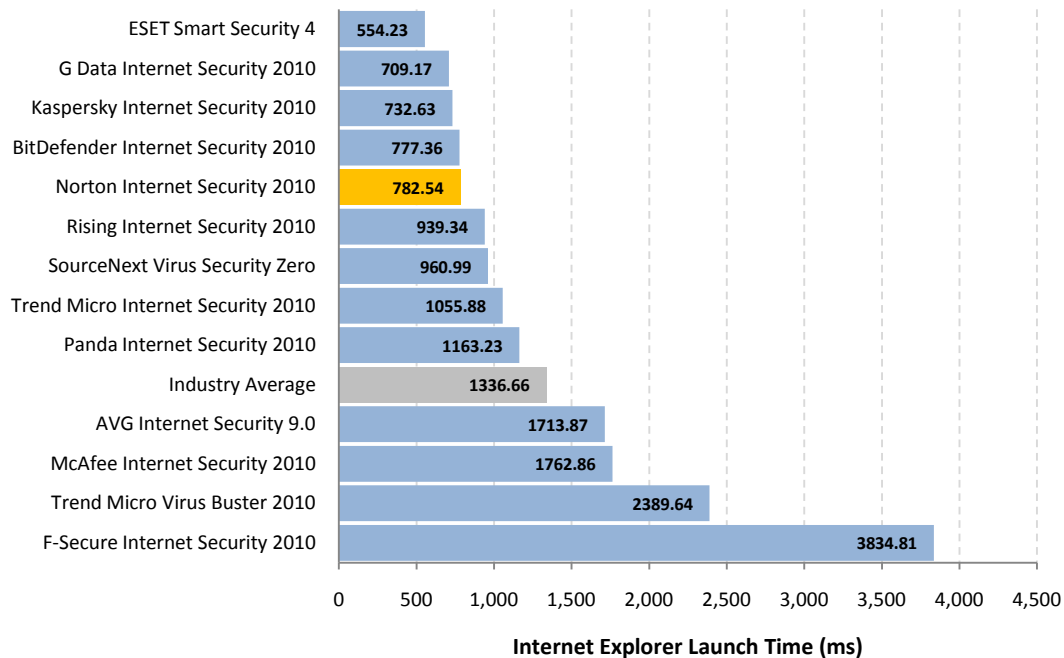
Benchmark 6 – Browse Time

The following chart compares the average time taken 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.



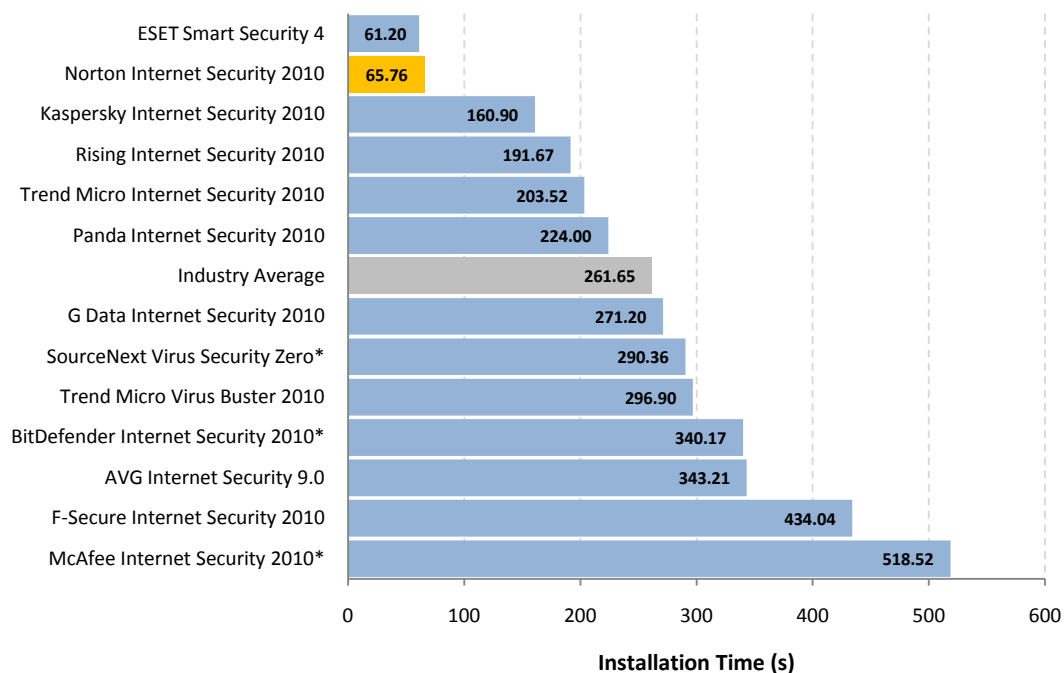
Benchmark 7 – Internet Explorer Launch Time

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 launch times are considered better performing products in this category.



Benchmark 8 – Installation Time

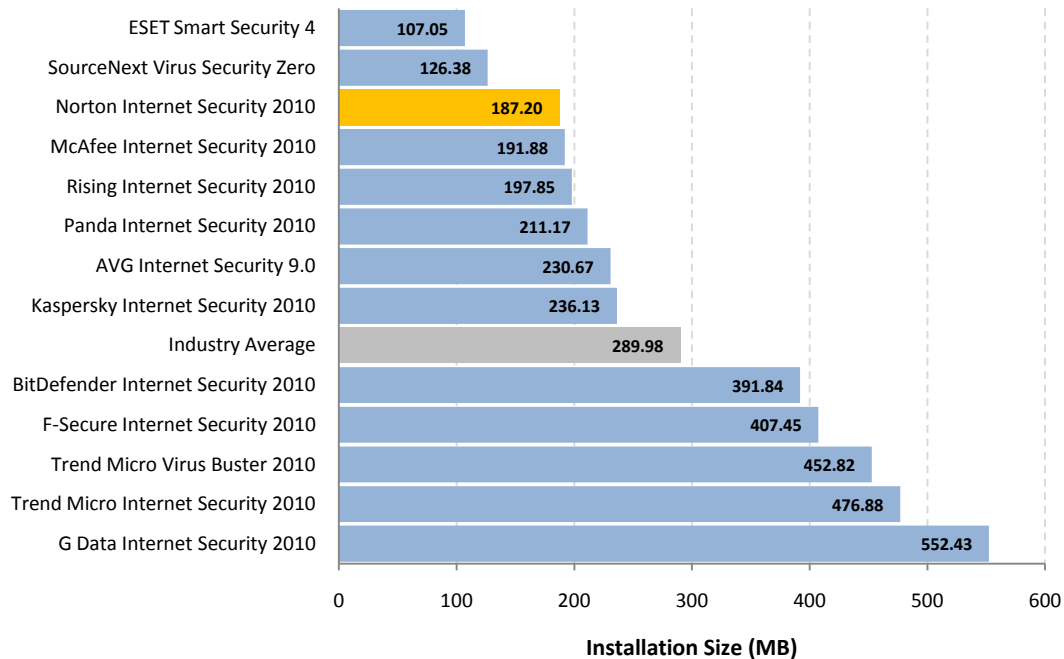
The following chart compares the minimum installation time it takes for Internet Security products to be fully functional and ready for use by the end user. Products with lower installation times are considered better performing products in this category.



* Our results for **McAfee Internet Security 2010**, **BitDefender Internet Security 2010** and **SourceNext Virus Security Zero** include time taken for the installer to download components as part of the installation process.

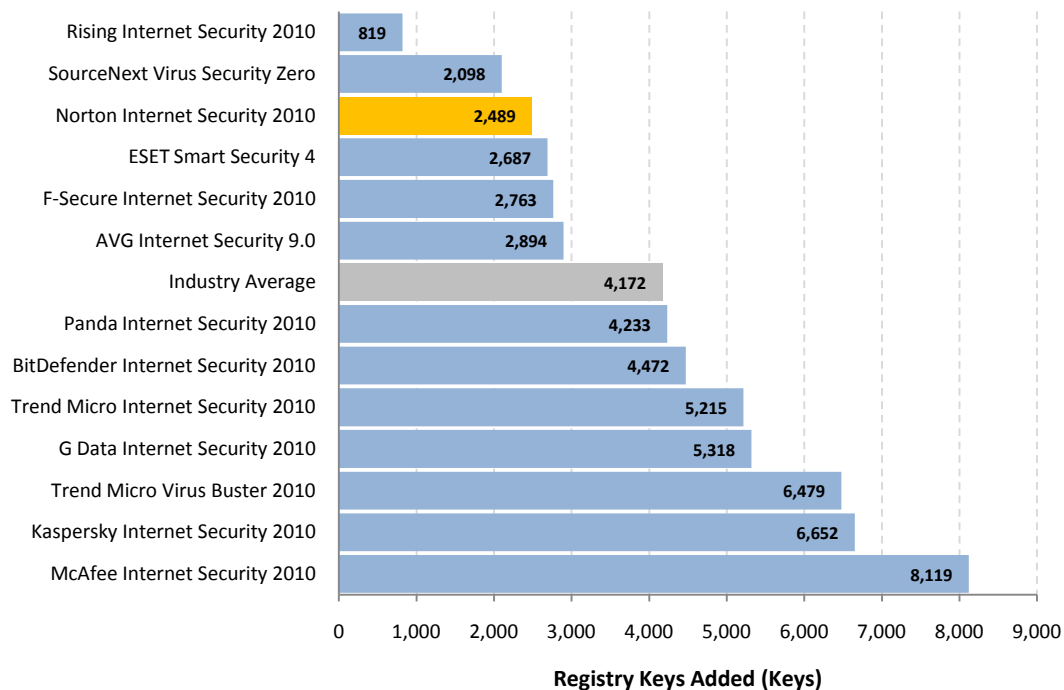
Benchmark 9 – Installation Size

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



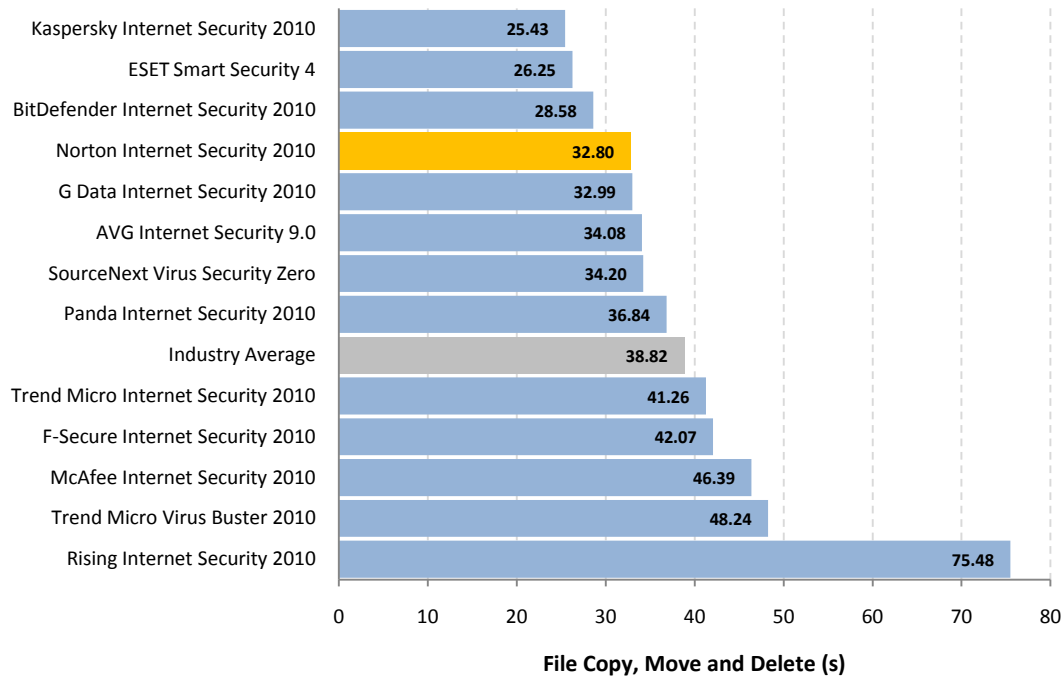
Benchmark 10 – Registry Key Count

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



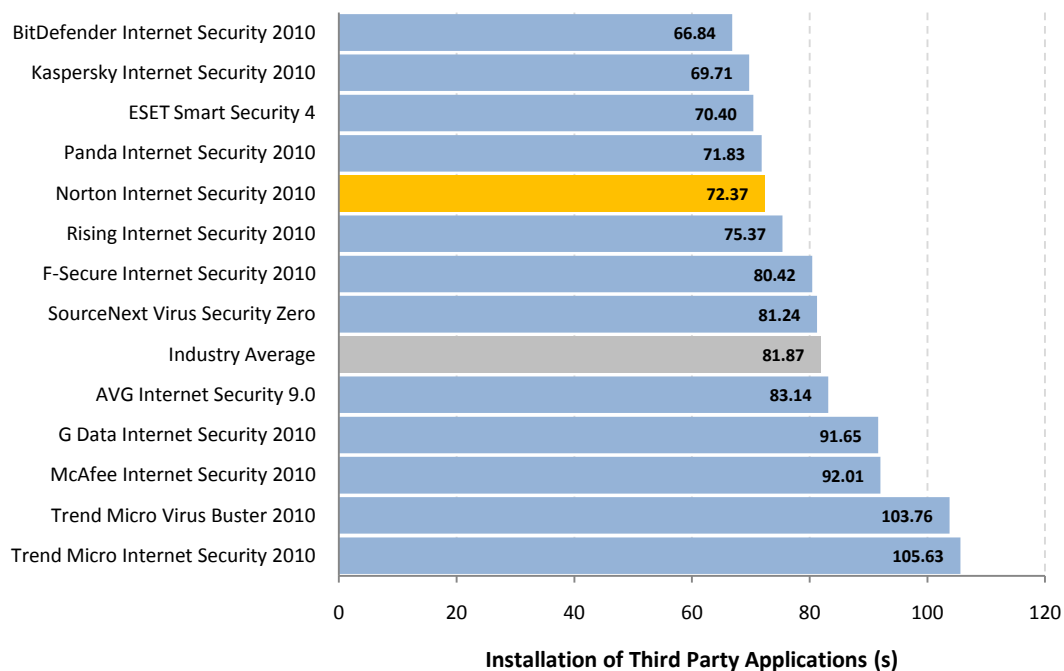
Benchmark 11 – File Copy, Move and Delete

The following chart compares the average time taken to copy, move and delete several sets of sample files for each Internet Security product tested. Products with lower times are considered better performing products in this category.



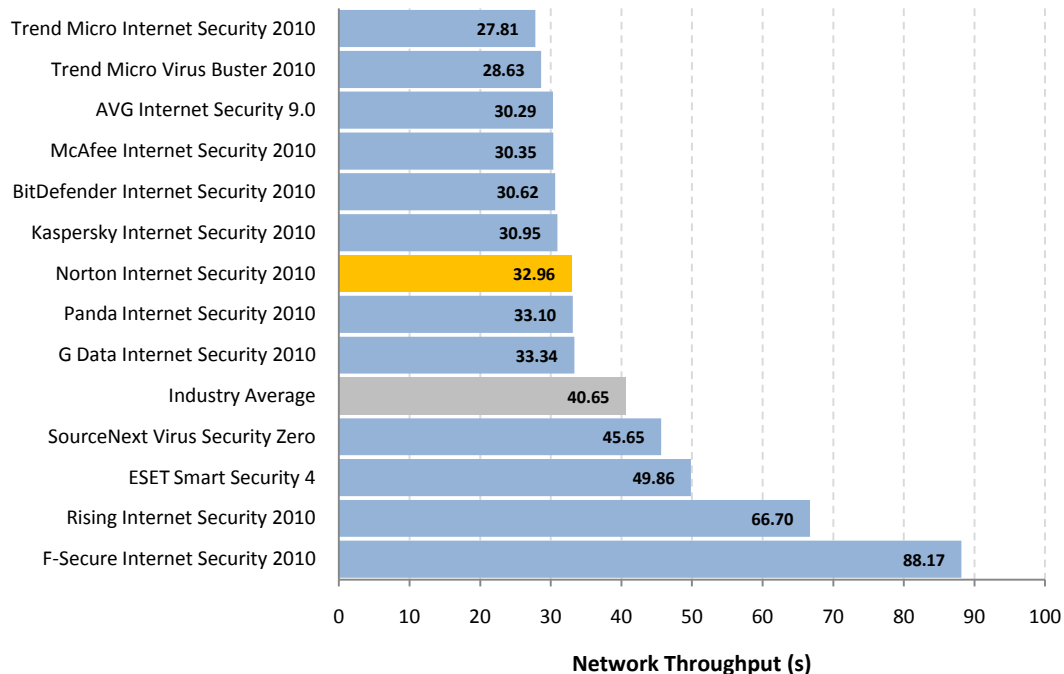
Benchmark 12 – Installation of Third Party Applications

The following chart compares the average time taken to install a third party application for each Internet Security product tested. Products with lower times are considered better performing products in this category.



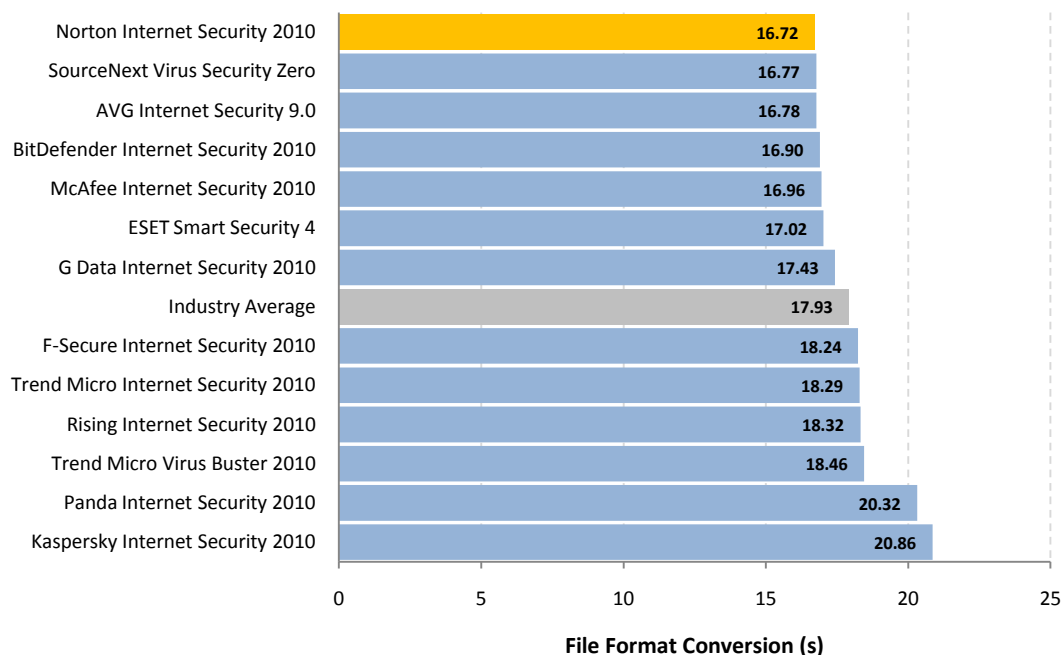
Benchmark 13 – Network Throughput

The following chart compares the average time to download a sample set of common file types for each Internet Security product tested. Products with lower times are considered better performing products in this category.



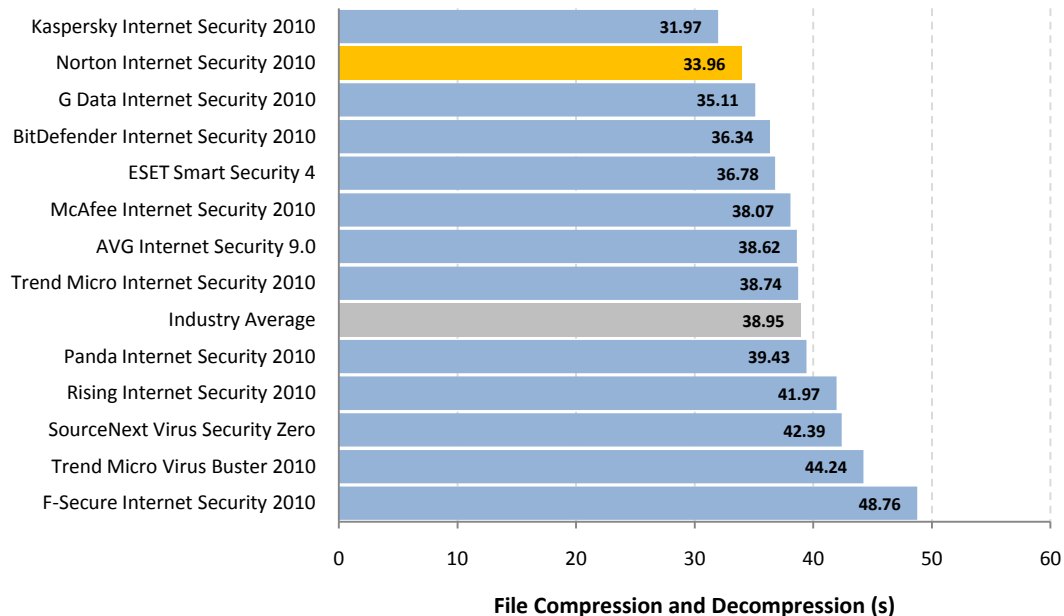
Benchmark 14 – File Format Conversion

The following chart compares the average time it takes for a sample file to be converted from one file format to another (MP3 ↔ WMA, MP3 ↔ WAV) for each Internet Security product tested. Products with lower times are considered better performing products in this category.



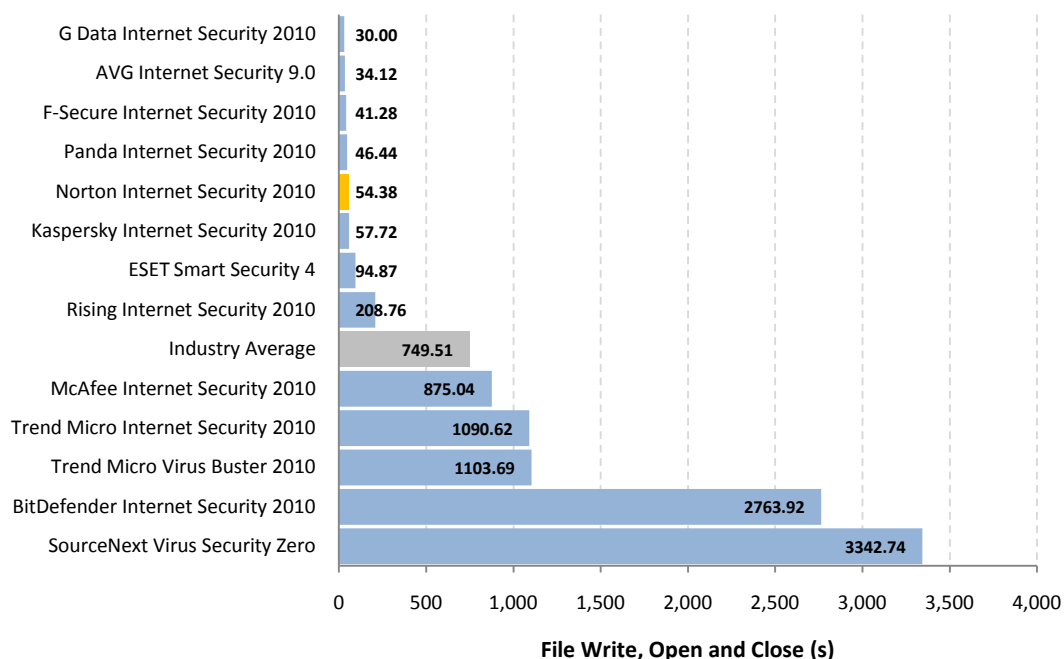
Benchmark 15 – File Compression and Decompression

The following chart compares the average time it takes for sample files to be compressed and decompressed for each Internet Security product tested. Products with lower times are considered better performing products in this category.



Benchmark 16 – File Write, Open and Close

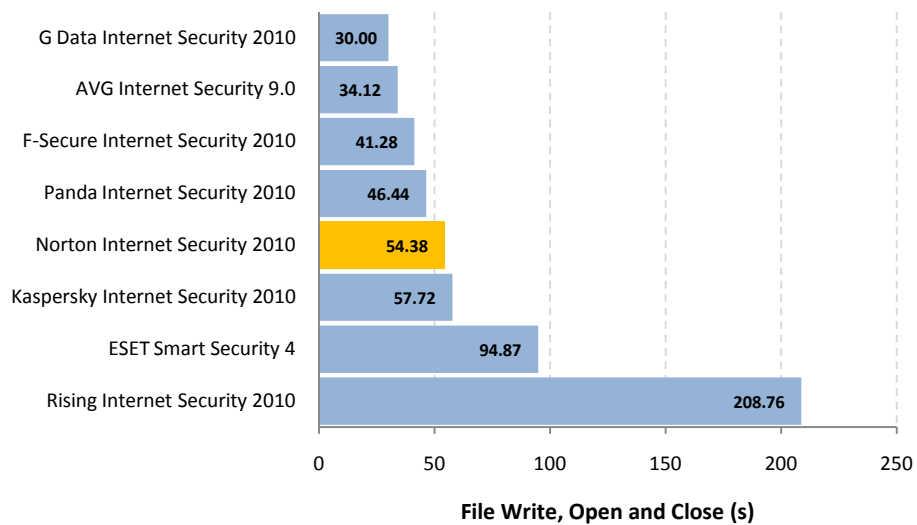
The following chart compares the average time it takes for a file to be written to the hard drive then opened and closed 180,000 times, for each Internet Security product tested. Products with lower times are considered better performing products in this category.



* **SourceNext Virus Security Zero** and **BitDefender Internet Security 2010** performed poorly (over 3,300 seconds on average to execute this test) but has been included in the average despite falling outside the graph.

File Write, Open and Close – Detailed Graph

The following graph shows products which performed better than the Industry Average in the File Write, Open and Close metric on a more detailed scale for ease of comparison.

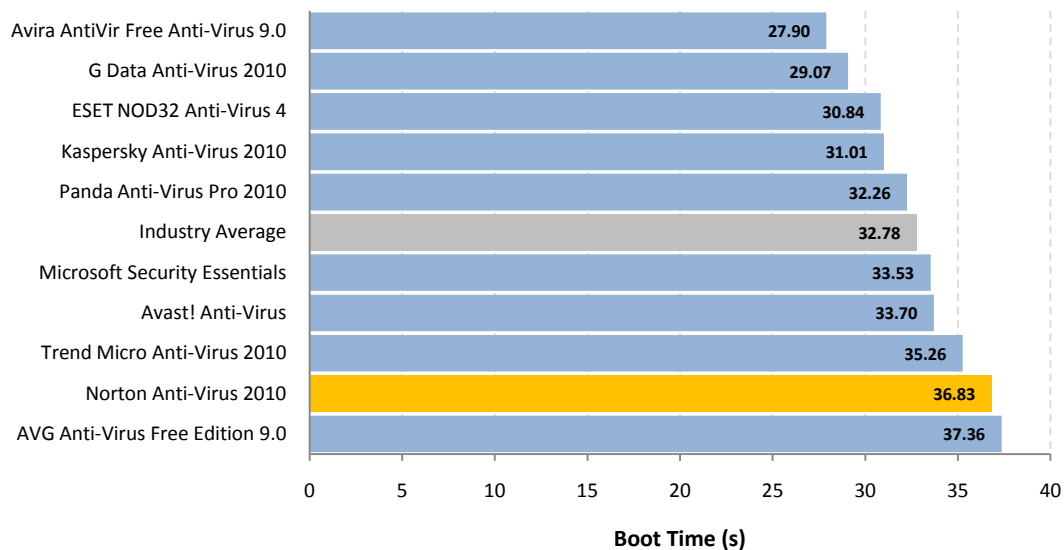


Anti-Virus (Commercial and Free Editions) Test Results

In the following charts, we have highlighted the results we obtained for Norton Anti-Virus 2010 in orange. The industry average has also been highlighted in gray for ease of comparison. These charts compare data for both commercial versions and free editions of Anti-Virus products.

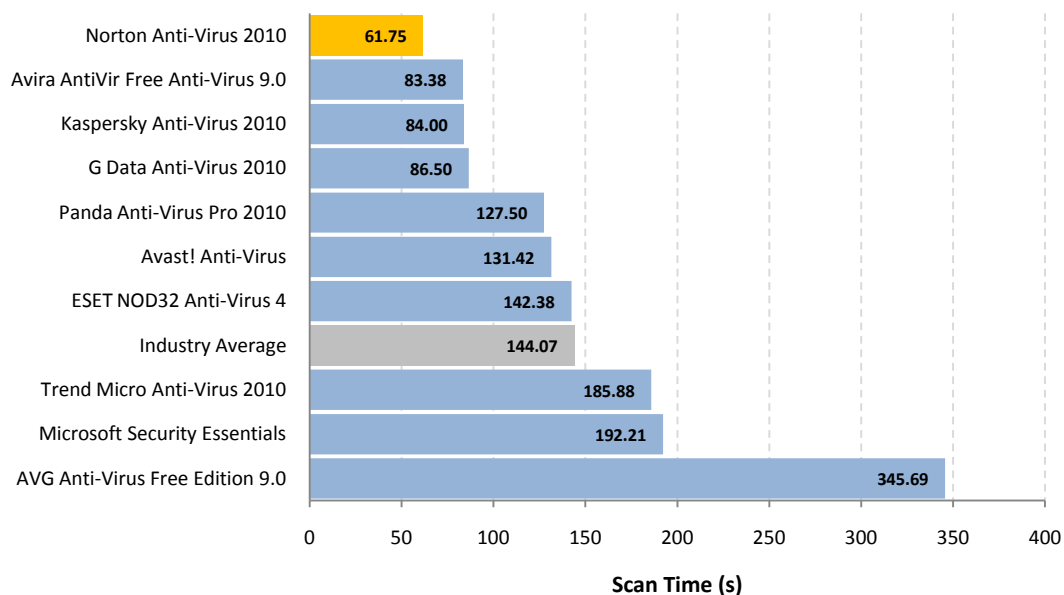
Benchmark 1 – Boot Time

The following chart compares the average time taken for the system to boot (from a sample of 15 boots over three cycles) for each Anti-Virus product tested. Products with lower boot times are considered better performing products in this category.



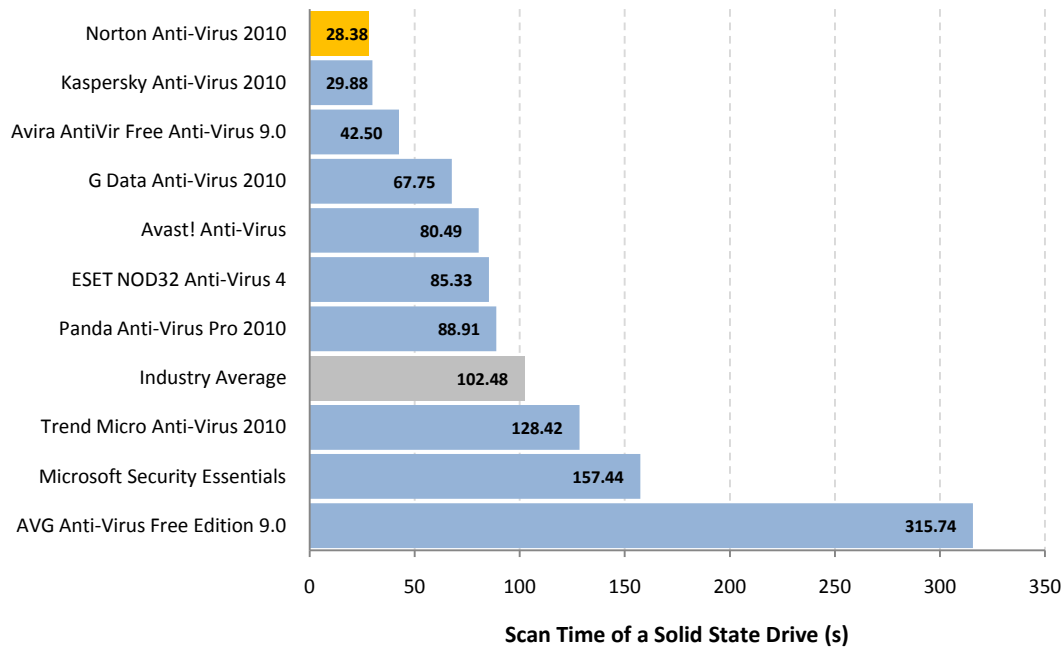
Benchmark 2 – Scan Time

The following chart compares the average time taken to scan a set of 6159 files (totaling 982MB) for each Anti-Virus product 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.



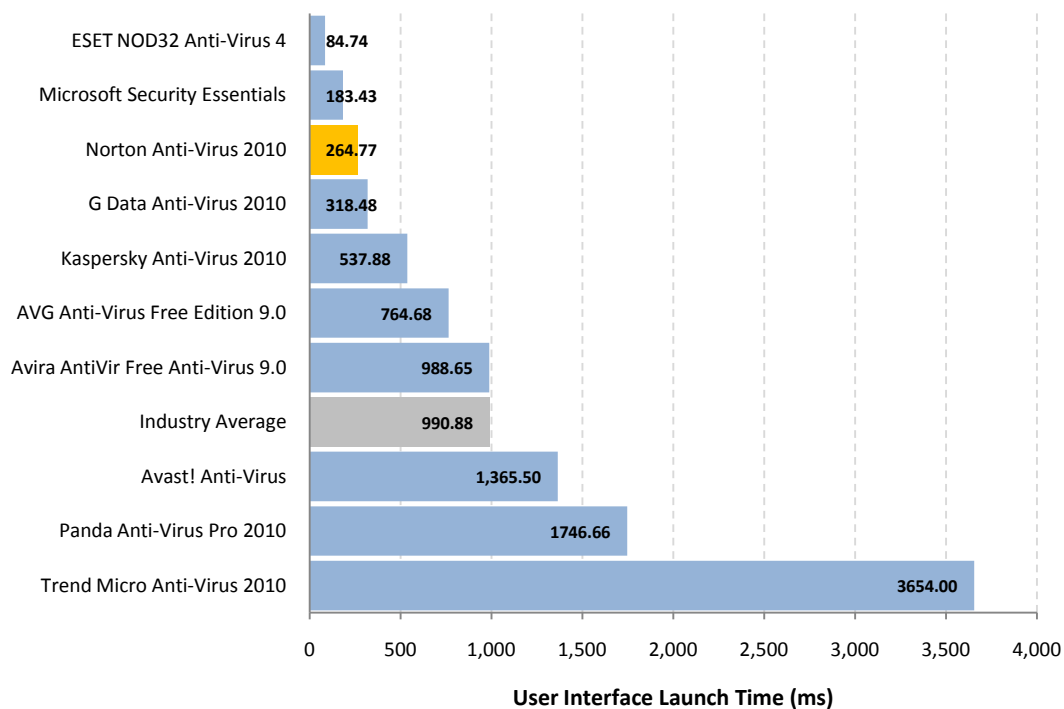
Benchmark 3 – Scan Time of a Solid State Drive

The following chart compares the average time taken to scan a set of 6159 files (totaling 982MB) on a Solid State Drive for each Anti-Virus product 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.



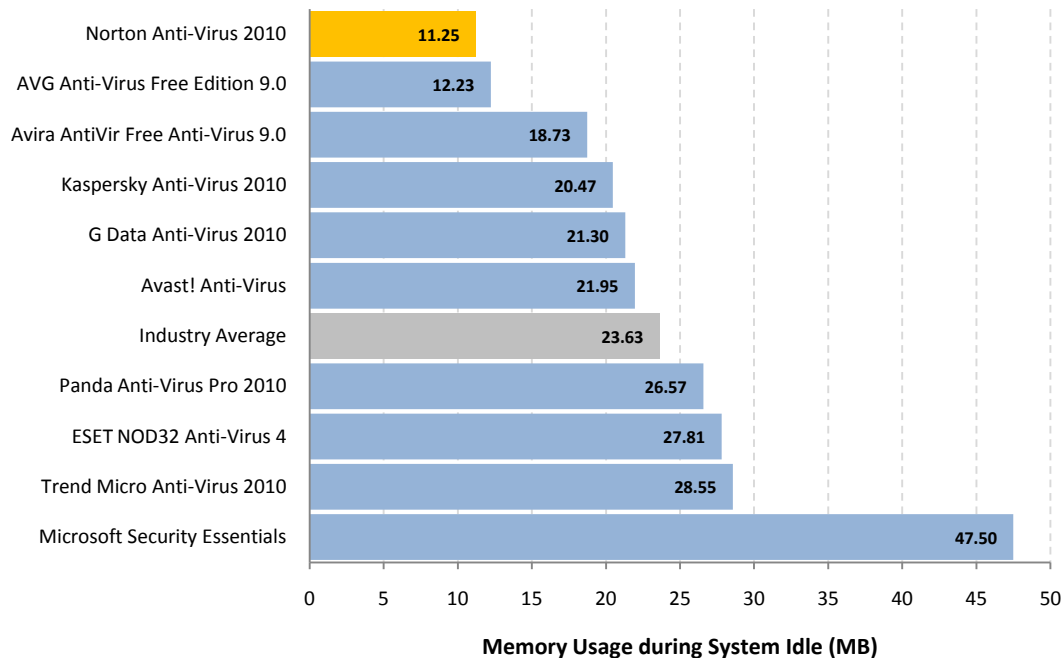
Benchmark 4 – User Interface Launch Time

The following chart compares the average time taken to launch a product's user interface. Products with lower launch times are considered better performing products in this category.



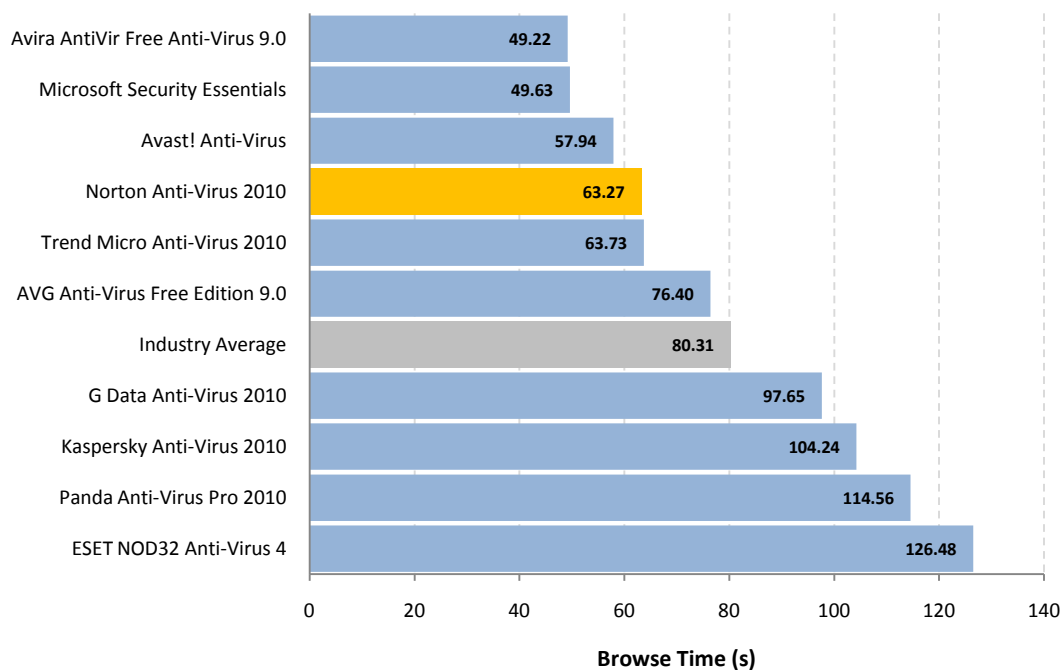
Benchmark 5 – Memory Usage during System Idle

The following chart compares the average amount of RAM in use by an Anti-Virus product during a period of system idle. 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.



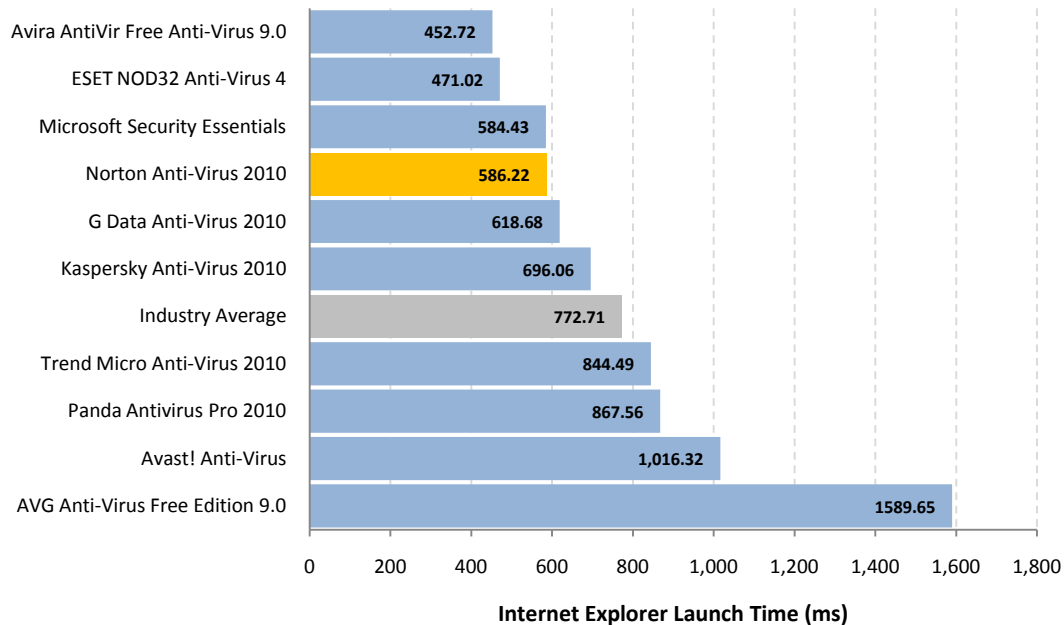
Benchmark 6 – Browse Time

The following chart compares the average time taken 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.



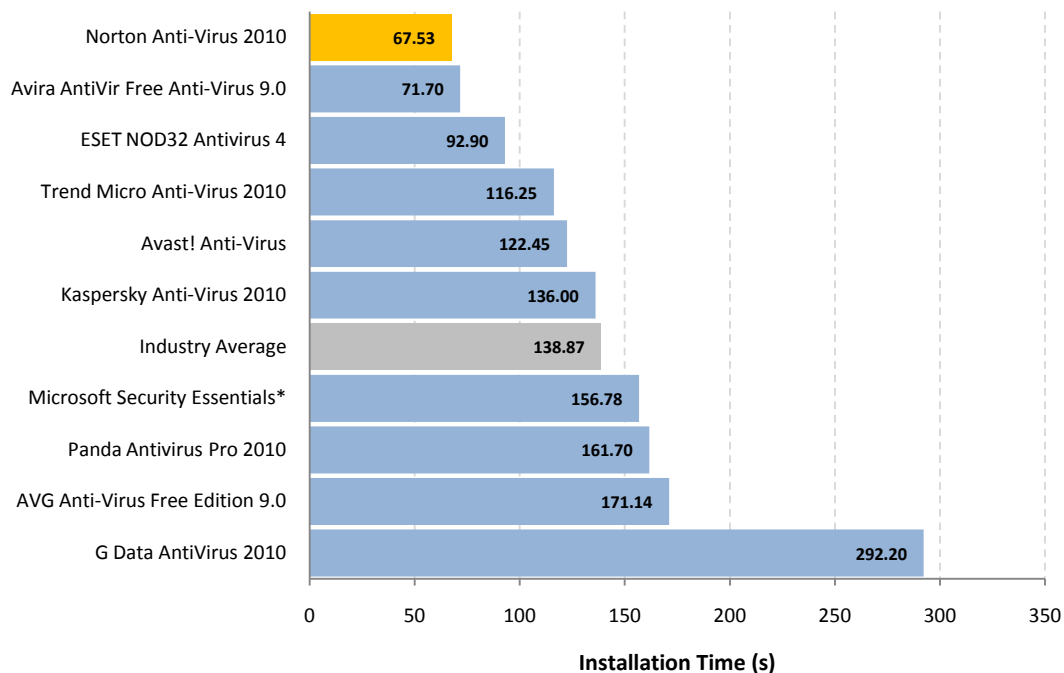
Benchmark 7 – Internet Explorer Launch Time

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



Benchmark 8 – Installation Time

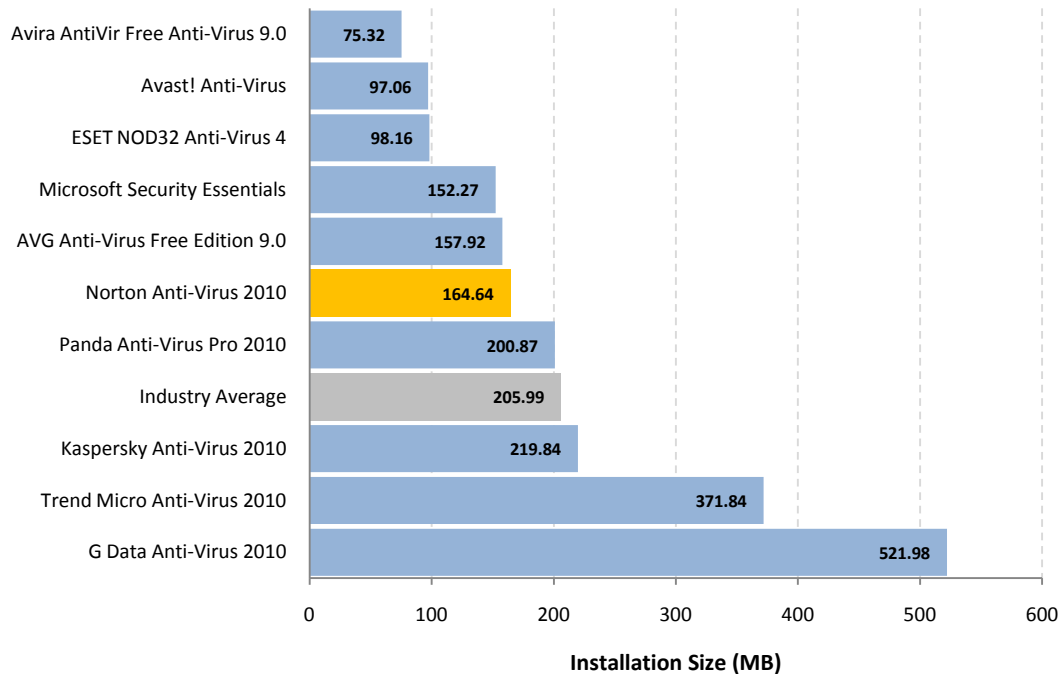
The following chart compares the minimum installation time it takes for Anti-Virus products to be fully functional and ready for use by the end user. Products with lower installation times are considered better performing products in this category.



* Our results for **Microsoft Security Essentials** include time taken for the installer to download components as part of the installation process.

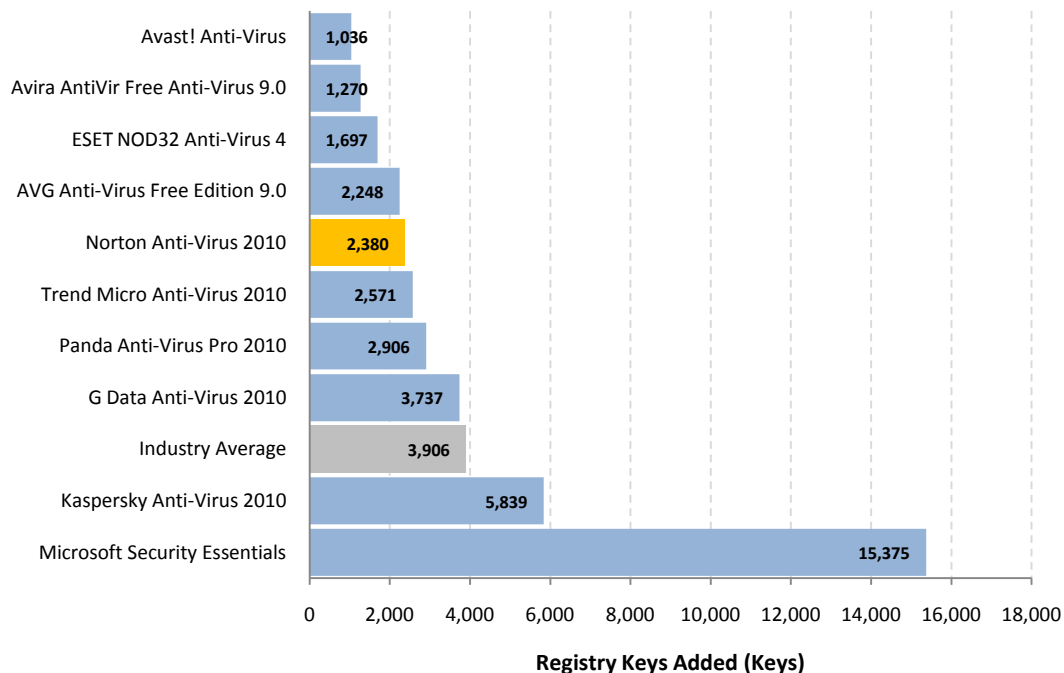
Benchmark 9 – Installation Size

The following chart compares the total size of files added during the installation of Anti-Virus products. Products with lower installation sizes are considered better performing products in this category.



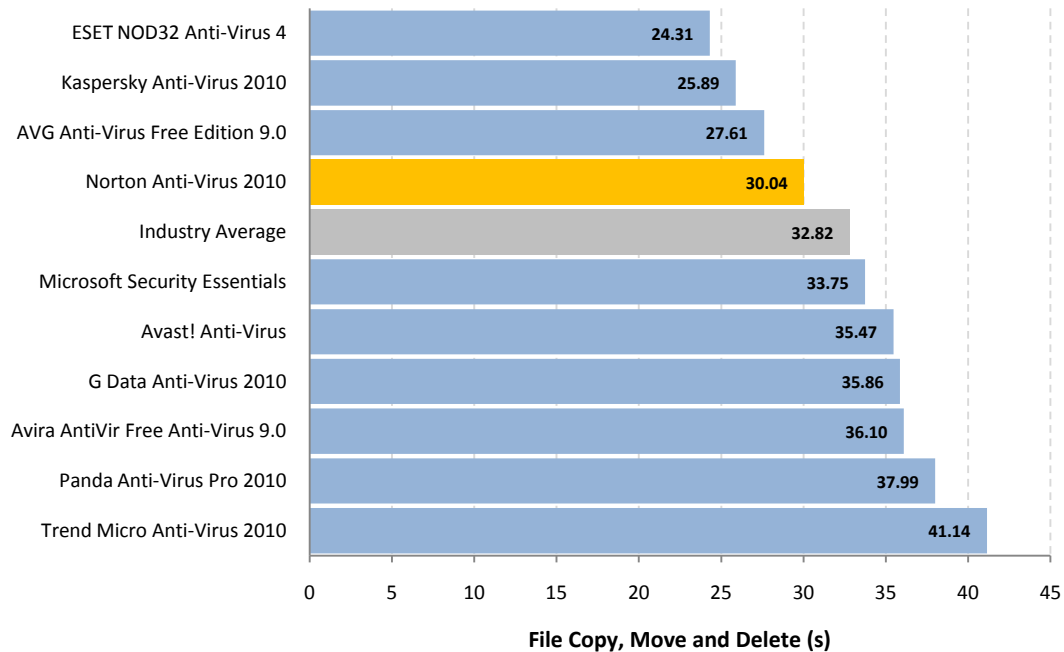
Benchmark 10 – Registry Key Count

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



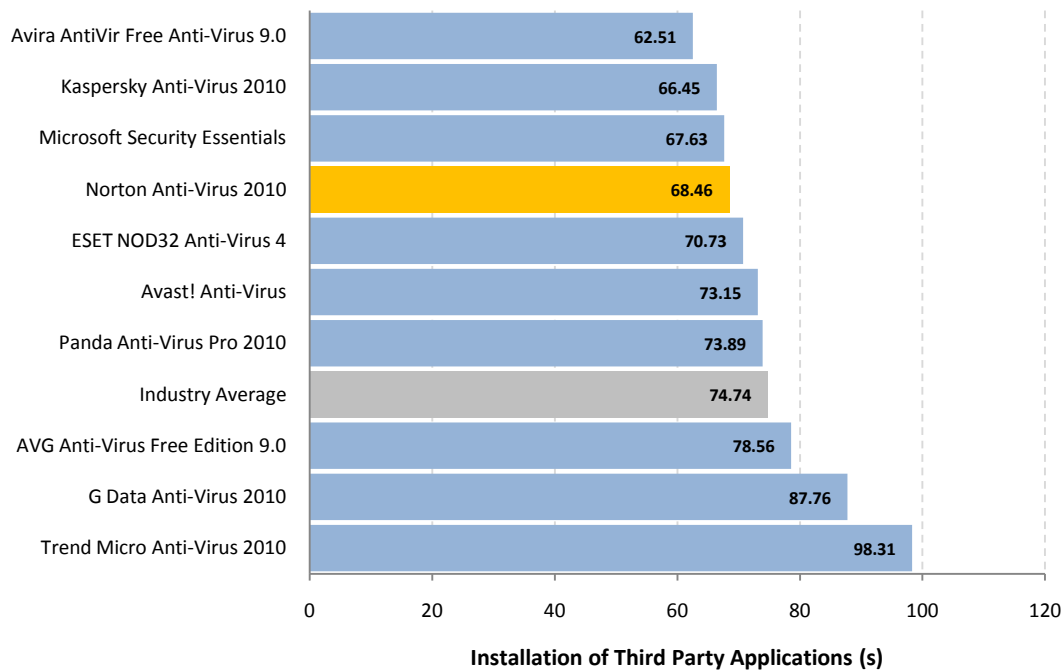
Benchmark 11 – File Copy, Move and Delete

The following chart compares the average time taken to copy, move and delete several sets of sample files for each Anti-Virus product tested. Products with lower times are considered better performing products in this category.



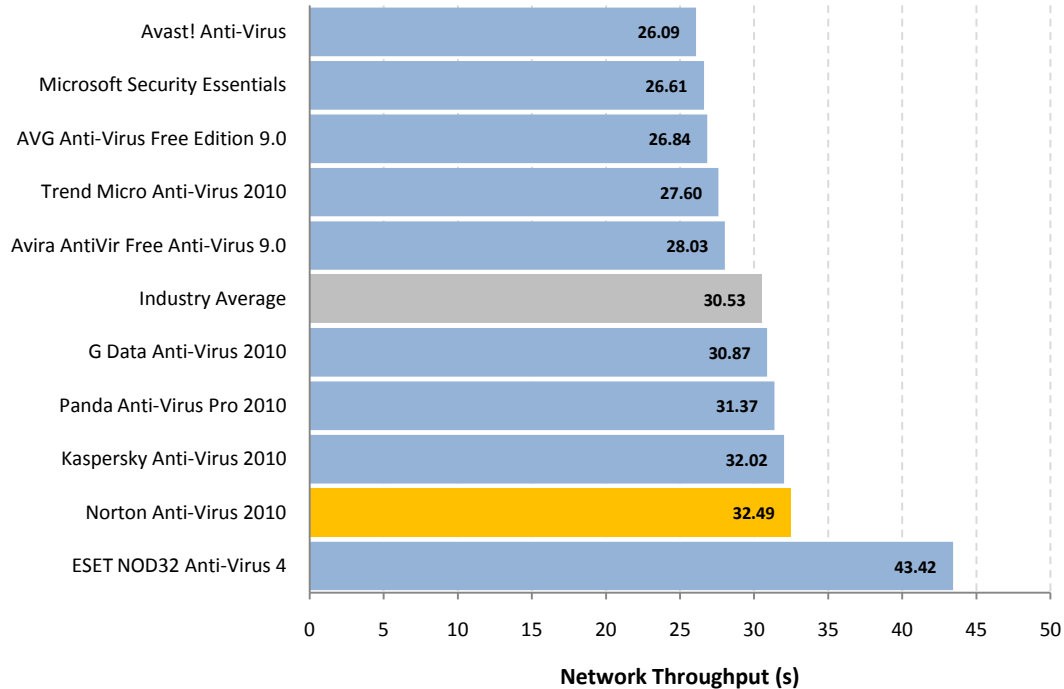
Benchmark 12 – Installation of Third Party Applications

The following chart compares the average time taken to install a third party application for each Anti-Virus product tested. Products with lower times are considered better performing products in this category.



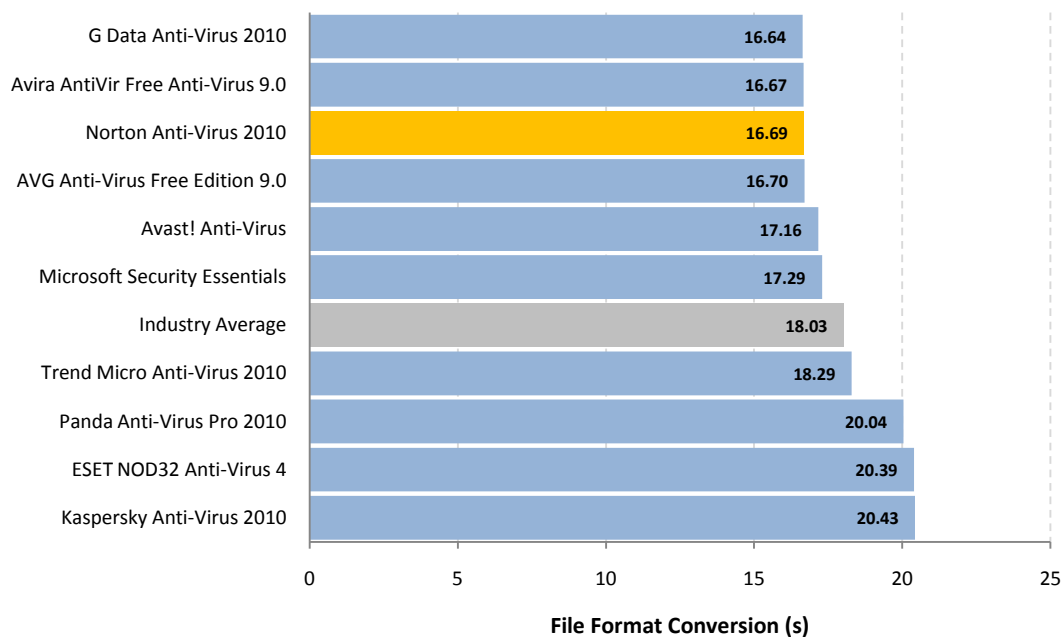
Benchmark 13 – Network Throughput

The following chart compares the average time to download a sample set of common file types for each Anti-Virus product tested. Products with lower times are considered better performing products in this category.



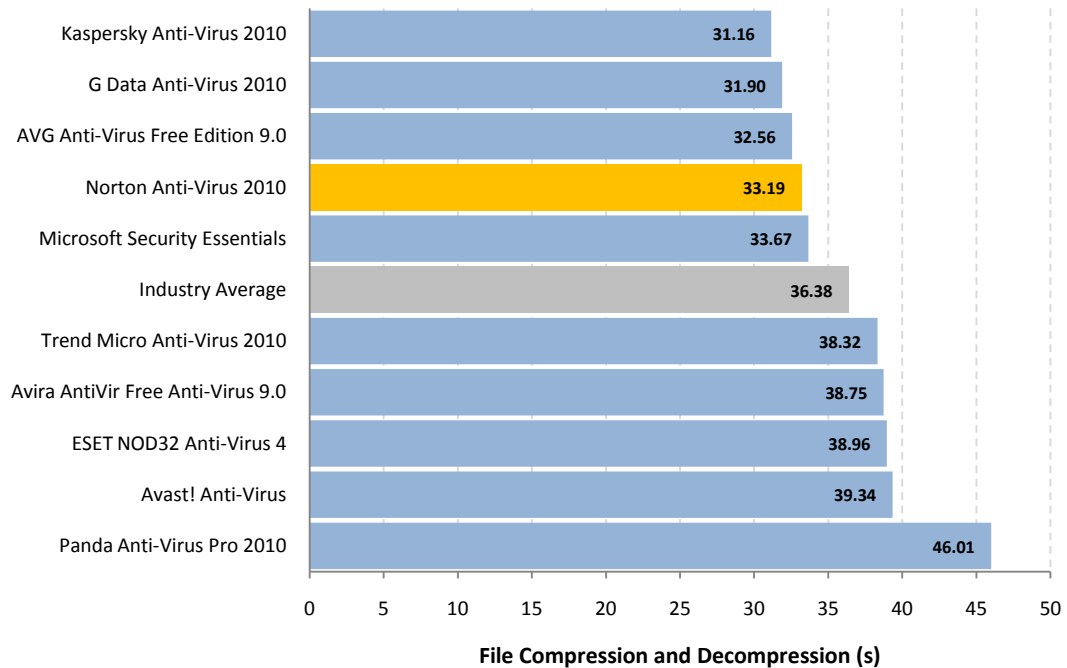
Benchmark 14 – File Format Conversion

The following chart compares the average time it takes for a sample file to be converted from one file format to another (MP3 → WMA, MP3 → WAV) for each Anti-Virus product tested. Products with lower times are considered better performing products in this category.



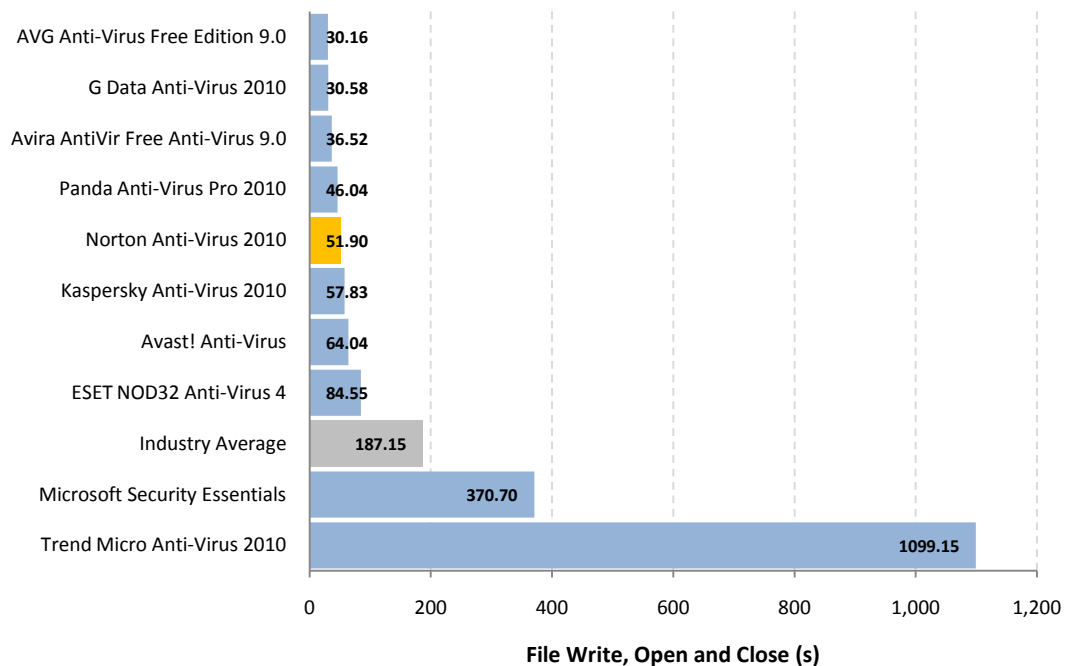
Benchmark 15 – File Compression and Decompression

The following chart compares the average time it takes for sample files to be compressed and decompressed for each Anti-Virus product tested. Products with lower times are considered better performing products in this category.



Benchmark 16 – File Write, Open and Close

The following chart compares the average time it takes for a file to be written to the hard drive then opened and closed 180,000 times, for each Anti-Virus product 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 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.

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.

Contact Details

PassMark Software Pty Ltd
Suite 202, Level 2
35 Buckingham St.
Surry Hills, 2010
Sydney, Australia

Phone + 61 2 9690 0444
Fax + 61 2 9690 0445
Web www.passmark.com

Download Link

An electronic copy of this report can be found at the following location:
<http://www.passmark.com/avreport>

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

Image Creation Steps

Norton Ghost was used to create a “clean” baseline image prior to testing. The baseline image was restored prior to testing of each different product.

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 Time

Scan Time 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 scanning 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			

This scan was run without launching the product's user interface, 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 timer or reporting system. Where this was not possible, scan times 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 time (first scan) and subsequent scan times (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 Time of Solid State Drive

This methodology used for this test is identical to the above Scan Time 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 Time**. 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 Time

The launch time of a product's user interface was taken using *AppTimer*. For each product tested, we obtained a total of fifteen samples from five sets of three UI launches, 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 during System 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. The first sample taken at boot is discarded.

The *PerfLog++* utility records memory usage of all processes, not just those of the anti-malware product. As a result of this, an anti-malware product's processes needed to be isolated from all other running system processes. To isolate relevant process, we used a program called *Process Explorer* which was run immediately upon the completion of memory usage logging by *PerfLog++*. *Process Explorer* is a Microsoft Windows Sysinternals software tool which shows a list of all DLL processes currently loaded on the system.

Benchmark 6 – Browse Time

We used a script in conjunction with *HTTPWatch* (Basic Edition, version 6.1) to record the amount of time it takes for a set of 106 ‘popular’ websites to load consecutively from a local server. This 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 Time

The average launch time of Internet Explorer interface was taken using *AppTimer*. This test was practically identical to the User Interface launch time test. For each product tested, we obtained a total of fifteen samples from five sets of three Internet Explorer launches, 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 mandatory updates (e.g. Microsoft Security Essentials) or the delivery of the application itself from a download manager (e.g. McAfee Internet Security 2010, BitDefender Internet Security 2010). 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

This benchmark measured how much time was required to download a sample set of binary files of various sizes and types over a 100MB/s network connection. The files were hosted on a server machine running Windows Server 2008 and IIS 7. *CommandTimer.exe* was used in conjunction with *GNU Wget* (version 1.10.1) 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 – Raw Results

For ease of comparison, we have highlighted the results we obtained for Norton Anti-Virus and Internet Security 2010 in orange. Industry averages are highlighted in silver.

Boot Time

Internet Security Products	Time (s)
AVG Internet Security 9.0	57.00
Trend Micro Virus Buster 2010	43.44
Trend Micro Internet Security 2010	40.18
F-Secure Internet Security 2010	38.39
McAfee Internet Security 2010	37.04
Industry Average	36.91
Norton Internet Security 2010	35.76
BitDefender Internet Security 2010	35.33
Rising Internet Security 2010	34.40
Kaspersky Internet Security 2010	33.59
SourceNext Virus Security Zero	32.67
G Data Internet Security 2010	32.21
Panda Internet Security 2010	31.15
ESET Smart Security 4	28.65

Anti-Virus Products	Time (s)
AVG Anti-Virus Free Edition 9.0	37.36
Norton Anti-Virus 2010	36.83
Trend Micro Anti-Virus 2010	35.26
Avast! Anti-Virus	33.70
Microsoft Security Essentials	33.53
Industry Average	32.78
Panda Anti-Virus Pro 2010	32.26
Kaspersky Anti-Virus 2010	31.01
ESET NOD32 Anti-Virus 4	30.84
G Data Anti-Virus 2010	29.07
Avira AntiVir Free Anti-Virus 9.0	27.90

Scan Time

Internet Security Products	Time (s)
AVG Internet Security 9.0	402.67
Trend Micro Virus Buster 2010	180.00
Trend Micro Internet Security 2010	179.80
McAfee Internet Security 2010	167.47
Industry Average	145.63
SourceNext Virus Security Zero	142.33
BitDefender Internet Security 2010	124.73
Panda Internet Security 2010	123.13
ESET Smart Security 4	122.88
Rising Internet Security 2010	110.25
F-Secure Internet Security 2010	105.75
Kaspersky Internet Security 2010	86.75
G Data Internet Security 2010	86.63
Norton Internet Security 2010	60.83

Anti-Virus Products	Time (s)
AVG Anti-Virus Free Edition 9.0	345.69
Microsoft Security Essentials	192.21
Trend Micro Anti-Virus 2010	185.88
Industry Average	144.07
ESET NOD32 Anti-Virus 4	142.38
Avast! Anti-Virus	131.42
Panda Anti-Virus Pro 2010	127.50
G Data Anti-Virus 2010	86.50
Kaspersky Anti-Virus 2010	84.00
Avira AntiVir Free Anti-Virus 9.0	83.38
Norton Anti-Virus 2010	61.75

Scan Time of a Solid State Drive

Internet Security Products	Time (s)
AVG Internet Security 9.0	380.75
Trend Micro Internet Security 2010	130.80
Trend Micro Virus Buster 2010	130.24
McAfee Internet Security 2010	120.88
Industry Average	106.88
Panda Internet Security 2010	94.91
SourceNext Virus Security Zero	85.59
ESET Smart Security 4	83.63
F-Secure Internet Security 2010	81.13
Rising Internet Security 2010	74.88
G Data Internet Security 2010	69.50
Kaspersky Internet Security 2010	59.38
BitDefender Internet Security 2010	46.46
Norton Internet Security 2010	31.25

Anti-Virus Products	Time (s)
AVG Anti-Virus Free Edition 9.0	315.74
Microsoft Security Essentials	157.44
Trend Micro Anti-Virus 2010	128.42
Industry Average	102.48
Panda Anti-Virus Pro 2010	88.91
ESET NOD32 Anti-Virus 4	85.33
Avast! Anti-Virus	80.49
G Data Anti-Virus 2010	67.75
Avira AntiVir Free Anti-Virus 9.0	42.50
Kaspersky Anti-Virus 2010	29.88
Norton Anti-Virus 2010	28.38

User Interface Launch Time

Internet Security Products	Time (ms)
Trend Micro Virus Buster 2010	3760.00
Trend Micro Internet Security 2010	3699.00
McAfee Internet Security 2010	2651.00
Rising Internet Security 2010	1976.44
Panda Internet Security 2010	1881.78
BitDefender Internet Security 2010	1879.50
Industry Average	1504.75
F-Secure Internet Security 2010	1028.71
AVG Internet Security 9.0	904.52
Kaspersky Internet Security 2010	606.03
SourceNext Virus Security Zero	373.63
G Data Internet Security 2010	342.77
Norton Internet Security 2010	325.51
ESET Smart Security 4	132.85

Anti-Virus Products	Time (ms)
Trend Micro Anti-Virus 2010	3654.00
Panda Anti-Virus Pro 2010	1746.66
Avast! Anti-Virus	1,365.50
Industry Average	990.88
Avira AntiVir Free Anti-Virus 9.0	988.65
AVG Anti-Virus Free Edition 9.0	764.68
Kaspersky Anti-Virus 2010	537.88
G Data Anti-Virus 2010	318.48
Norton Anti-Virus 2010	264.77
Microsoft Security Essentials	183.43
ESET NOD32 Anti-Virus 4	84.74

Memory Usage during System Idle

Internet Security Products	Size (MB)
McAfee Internet Security 2010	65.41
Trend Micro Virus Buster 2010	47.32
Trend Micro Internet Security 2010	36.39
G Data Internet Security 2010	35.21
F-Secure Internet Security 2010	32.91
AVG Internet Security 9.0	32.37
ESET Smart Security 4	31.70
Industry Average	30.37
Panda Internet Security 2010	26.86
SourceNext Virus Security Zero	23.27
Rising Internet Security 2010	21.98
Kaspersky Internet Security 2010	20.01
Norton Internet Security 2010	10.85
BitDefender Internet Security 2010	10.47

Anti-Virus Products	Size (MB)
Microsoft Security Essentials	47.50
Trend Micro Anti-Virus 2010	28.55
ESET NOD32 Anti-Virus 4	27.81
Panda Anti-Virus Pro 2010	26.57
Industry Average	23.63
Avast! Anti-Virus	21.95
G Data Anti-Virus 2010	21.30
Kaspersky Anti-Virus 2010	20.47
Avira AntiVir Free Anti-Virus 9.0	18.73
AVG Anti-Virus Free Edition 9.0	12.23
Norton Anti-Virus 2010	11.25

Browse Time

Internet Security Products	Time (s)
BitDefender Internet Security 2010	222.13
ESET Smart Security 4	127.12
Panda Internet Security 2010	119.41
McAfee Internet Security 2010	112.22
G Data Internet Security 2010	105.21
F-Secure Internet Security 2010	104.04
Kaspersky Internet Security 2010	104.01
Industry Average	102.48
AVG Internet Security 9.0	92.61
SourceNext Virus Security Zero	81.30
Trend Micro Virus Buster 2010	71.37
Trend Micro Internet Security 2010	70.00
Norton Internet Security 2010	66.27
Rising Internet Security 2010	56.60

Antivirus Products	Time (s)
ESET NOD32 Anti-Virus 4	126.48
Panda Anti-Virus Pro 2010	114.56
Kaspersky Anti-Virus 2010	104.24
G Data Anti-Virus 2010	97.65
Industry Average	80.31
AVG Anti-Virus Free Edition 9.0	76.40
Trend Micro Anti-Virus 2010	63.73
Norton Anti-Virus 2010	63.27
Avast! Anti-Virus	57.94
Microsoft Security Essentials	49.63
Avira AntiVir Free Anti-Virus 9.0	49.22

Internet Explorer Launch Time

Internet Security Products	Time (ms)
F-Secure Internet Security 2010	3834.81
Trend Micro Virus Buster 2010	2389.64
McAfee Internet Security 2010	1762.86
AVG Internet Security 9.0	1713.87
Industry Average	1336.66
Panda Internet Security 2010	1163.23
Trend Micro Internet Security 2010	1055.88
SourceNext Virus Security Zero	960.99
Rising Internet Security 2010	939.34
Norton Internet Security 2010	782.54
BitDefender Internet Security 2010	777.36
Kaspersky Internet Security 2010	732.63
G Data Internet Security 2010	709.17
ESET Smart Security 4	554.23

Anti-Virus Products	Time (ms)
AVG Anti-Virus Free Edition 9.0	1589.65
Avast! Anti-Virus	1,016.32
Panda Anti-Virus Pro 2010	867.56
Trend Micro Anti-Virus 2010	844.49
Industry Average	772.71
Kaspersky Anti-Virus 2010	696.06
G Data Anti-Virus 2010	618.68
Norton Anti-Virus 2010	586.22
Microsoft Security Essentials	584.44
ESET NOD32 Anti-Virus 4	471.02
Avira AntiVir Free Anti-Virus 9.0	452.72

Installation Time

Internet Security Products	Time (s)
McAfee Internet Security 2010*	518.52
F-Secure Internet Security 2010	434.04
AVG Internet Security 9.0	343.21
BitDefender Internet Security 2010*	340.17
Trend Micro Virus Buster 2010	296.90
SourceNext Virus Security Zero*	290.36
G Data Internet Security 2010	271.20
Industry Average	261.65
Panda Internet Security 2010	224.00
Trend Micro Internet Security 2010	203.52
Rising Internet Security 2010	191.67
Kaspersky Internet Security 2010	160.90
Norton Internet Security 2010	65.76
ESET Smart Security 4	61.20

Anti-Virus Products	Time (s)
G Data Anti-Virus 2010	292.20
AVG Anti-Virus Free Edition 9.0	171.14
Panda Anti-Virus Pro 2010	161.70
Microsoft Security Essentials*	156.78
Industry Average	138.87
Kaspersky Anti-Virus 2010	136.00
Avast! Anti-Virus	122.45
Trend Micro Anti-Virus 2010	116.25
ESET NOD32 Anti-Virus 4	92.90
Avira AntiVir Free Anti-Virus 9.0	71.70
Norton Anti-Virus 2010	67.53

* Our result for the products **McAfee Internet Security 2010**, **BitDefender Internet Security 2010**, **SourceNext Virus Security Zero**, **Microsoft Security Essentials** include time taken for the installer to download components as part of the installation process.

Installation Size

Internet Security Products	Size (MB)
G Data Internet Security 2010	552.43
Trend Micro Internet Security 2010	476.88
Trend Micro Virus Buster 2010	452.82
F-Secure Internet Security 2010	407.45
BitDefender Internet Security 2010	391.84
Industry Average	289.98
Kaspersky Internet Security 2010	236.13
AVG Internet Security 9.0	230.67
Panda Internet Security 2010	211.17
Rising Internet Security 2010	197.85
McAfee Internet Security 2010	191.88
Norton Internet Security 2010	187.20
SourceNext Virus Security Zero	126.38
ESET Smart Security 4	107.05

Antivirus Products	Size (MB)
G Data Anti-Virus 2010	521.98
Trend Micro Anti-Virus 2010	371.84
Kaspersky Anti-Virus 2010	219.84
Industry Average	205.99
Panda Anti-Virus Pro 2010	200.87
Norton Anti-Virus 2010	164.64
AVG Anti-Virus Free Edition 9.0	157.92
Microsoft Security Essentials	152.27
ESET NOD32 Anti-Virus 4	98.16
Avast! Anti-Virus	97.06
Avira AntiVir Free Anti-Virus 9.0	75.32

Registry Key Count

Internet Security Products	Keys
McAfee Internet Security 2010	8119.00
Kaspersky Internet Security 2010	6652.00
Trend Micro Virus Buster 2010	6479.00
G Data Internet Security 2010	5318.00
Trend Micro Internet Security 2010	5215.00
BitDefender Internet Security 2010	4472.00
Panda Internet Security 2010	4233.00
Industry Average	4172.15
AVG Internet Security 9.0	2894.00
F-Secure Internet Security 2010	2763.00
ESET Smart Security 4	2687.00
Norton Internet Security 2010	2489.00
SourceNext Virus Security Zero	2098.00
Rising Internet Security 2010	819.00

Anti-Virus Products	Keys
Microsoft Security Essentials	15,375.00
Kaspersky Anti-Virus 2010	5839.00
Industry Average	3905.90
G Data Anti-Virus 2010	3737.00
Panda Anti-Virus Pro 2010	2906.00
Trend Micro Anti-Virus 2010	2571.00
Norton Anti-Virus 2010	2380.00
AVG Anti-Virus Free Edition 9.0	2248.00
ESET NOD32 Anti-Virus 4	1697.00
Avira AntiVir Free Anti-Virus 9.0	1270.00
Avast! Anti-Virus	1036.00

File Copy, Move and Delete

Internet Security Products	Time (s)
Rising Internet Security 2010	75.48
Trend Micro Virus Buster 2010	48.24
McAfee Internet Security 2010	46.39
F-Secure Internet Security 2010	42.07
Trend Micro Internet Security 2010	41.26
Industry Average	38.82
Panda Internet Security 2010	36.84
SourceNext Virus Security Zero	34.20
AVG Internet Security 9.0	34.08
G Data Internet Security 2010	32.99
Norton Internet Security 2010	32.80
BitDefender Internet Security 2010	28.58
ESET Smart Security 4	26.25
Kaspersky Internet Security 2010	25.43

Anti-Virus Products	Time (s)
Trend Micro Anti-Virus 2010	41.14
Panda Anti-Virus Pro 2010	37.99
Avira AntiVir Free Anti-Virus 9.0	36.10
G Data Anti-Virus 2010	35.86
Avast! Anti-Virus	35.47
Microsoft Security Essentials	33.75
Industry Average	32.82
Norton Anti-Virus 2010	30.04
AVG Anti-Virus Free Edition 9.0	27.61
Kaspersky Anti-Virus 2010	25.89
ESET NOD32 Anti-Virus 4	24.31

Third Party Program Installation

Internet Security Products	Time (s)
Trend Micro Internet Security 2010	105.63
Trend Micro Virus Buster 2010	103.76
McAfee Internet Security 2010	92.01
G Data Internet Security 2010	91.65
AVG Internet Security 9.0	83.14
Industry Average	81.87
SourceNext Virus Security Zero	81.24
F-Secure Internet Security 2010	80.42
Rising Internet Security 2010	75.37
Norton Internet Security 2010	72.37
Panda Internet Security 2010	71.83
ESET Smart Security 4	70.40
Kaspersky Internet Security 2010	69.71
BitDefender Internet Security 2010	66.84

Anti-Virus Products	Time (s)
Trend Micro Anti-Virus 2010	98.31
G Data Anti-Virus 2010	87.76
AVG Anti-Virus Free Edition 9.0	78.56
Industry Average	74.74
Panda Anti-Virus Pro 2010	73.89
Avast! Anti-Virus	73.15
ESET NOD32 Anti-Virus 4	70.73
Norton Anti-Virus 2010	68.46
Microsoft Security Essentials	67.63
Kaspersky Anti-Virus 2010	66.45
Avira AntiVir Free Anti-Virus 9.0	62.51

Network Throughput

Internet Security Products	Time (s)
F-Secure Internet Security 2010	88.17
Rising Internet Security 2010	66.70
ESET Smart Security 4	49.86
SourceNext Virus Security Zero	45.65
Industry Average	40.65
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
BitDefender Internet Security 2010	30.62
McAfee Internet Security 2010	30.35
AVG Internet Security 9.0	30.29
Trend Micro Virus Buster 2010	28.63
Trend Micro Internet Security 2010	27.81

Antivirus Products	Time (s)
ESET NOD32 Anti-Virus 4	43.42
Norton Anti-Virus 2010	32.49
Kaspersky Anti-Virus 2010	32.02
Panda Anti-Virus Pro 2010	31.37
G Data Anti-Virus 2010	30.87
Industry Average	30.53
Avira AntiVir Free Anti-Virus 9.0	28.03
Trend Micro Anti-Virus 2010	27.60
AVG Anti-Virus Free Edition 9.0	26.84
Microsoft Security Essentials	26.61
Avast! Anti-Virus	26.09

File Format Conversion

Internet Security Products	Time (s)
Kaspersky Internet Security 2010	20.86
Panda Internet Security 2010	20.32
Trend Micro Virus Buster 2010	18.46
Rising Internet Security 2010	18.32
Trend Micro Internet Security 2010	18.29
F-Secure Internet Security 2010	18.24
Industry Average	17.93
G Data Internet Security 2010	17.43
ESET Smart Security 4	17.02
McAfee Internet Security 2010	16.96
BitDefender Internet Security 2010	16.90
AVG Internet Security 9.0	16.78
SourceNext Virus Security Zero	16.77
Norton Internet Security 2010	16.72

Anti-Virus Products	Time (s)
Kaspersky Anti-Virus 2010	20.43
ESET NOD32 Anti-Virus 4	20.39
Panda Anti-Virus Pro 2010	20.04
Trend Micro Anti-Virus 2010	18.29
Industry Average	18.03
Microsoft Security Essentials	17.29
Avast! Anti-Virus	17.16
AVG Anti-Virus Free Edition 9.0	16.70
Norton Anti-Virus 2010	16.69
Avira AntiVir Free Anti-Virus 9.0	16.67
G Data Anti-Virus 2010	16.64

File Compression and Decompression

Internet Security Products	Time (sec)
F-Secure Internet Security 2010	48.76
Trend Micro Virus Buster 2010	44.24
SourceNext Virus Security Zero	42.39
Rising Internet Security 2010	41.97
Panda Internet Security 2010	39.43
Industry Average	38.95
Trend Micro Internet Security 2010	38.74
AVG Internet Security 9.0	38.62
McAfee Internet Security 2010	38.07
ESET Smart Security 4	36.78
BitDefender Internet Security 2010	36.34
G Data Internet Security 2010	35.11
Norton Internet Security 2010	33.96
Kaspersky Internet Security 2010	31.97

Anti-Virus Products	Time (s)
Panda Anti-Virus Pro 2010	46.01
Avast! Anti-Virus	39.34
ESET NOD32 Anti-Virus 4	38.96
Avira AntiVir Free Anti-Virus 9.0	38.75
Trend Micro Anti-Virus 2010	38.32
Industry Average	36.38
Microsoft Security Essentials	33.67
Norton Anti-Virus 2010	33.19
AVG Anti-Virus Free Edition 9.0	32.56
G Data Anti-Virus 2010	31.90
Kaspersky Anti-Virus 2010	31.16

File Write, Open and Close

Internet Security Products	Time (s)
SourceNext Virus Security Zero	3342.74
BitDefender Internet Security 2010	2763.92
Trend Micro Virus Buster 2010	1103.69
Trend Micro Internet Security 2010	1090.62
McAfee Internet Security 2010	875.04
Industry Average	749.51
Rising Internet Security 2010	208.76
ESET Smart Security 4	94.87
Kaspersky Internet Security 2010	57.72
Norton Internet Security 2010	54.38
Panda Internet Security 2010	46.44
F-Secure Internet Security 2010	41.28
AVG Internet Security 9.0	34.12
G Data Internet Security 2010	30.00

Anti-Virus Products	Time (s)
Trend Micro Anti-Virus 2010	1099.15
Microsoft Security Essentials	370.70
Industry Average	187.15
ESET NOD32 Anti-Virus 4	84.55
Avast! Anti-Virus	64.04
Kaspersky Anti-Virus 2010	57.83
Norton Anti-Virus 2010	51.90
Panda Anti-Virus Pro 2010	46.04
Avira AntiVir Free Anti-Virus 9.0	36.52
G Data Anti-Virus 2010	30.58
AVG Anti-Virus Free Edition 9.0	30.16