

Anti-Virus Comparative



Performance test (AV Products)

Impact of Anti-Virus Software on System Performance

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Introduction

We want to make clear that the results in this report are intended to give only an indication of the impact on system performance (mainly by the real-time/on-access components) of the various Anti-Virus products in these specific tests. Users are encouraged to try out the software on their own PC's and form an opinion based on their own observations.

Tested products

The following products were evaluated (with default settings) in this test (November 2011)¹:

| | |
|---------------------------------|---|
| avast! Free Antivirus 6.0 | McAfee AntiVirus Plus 2012 |
| AVG Anti-Virus 2012 | Microsoft Security Essentials 2.1 |
| AVIRA Free Antivirus 2012 | Panda Cloud Antivirus Free 1.5.1 |
| Bitdefender Antivirus Plus 2012 | PC Tools Spyware Doctor with Antivirus 2012 |
| eScan Anti-Virus 11 | Qihoo 360 Antivirus 2.0 |
| ESET NOD32 Antivirus 5 | Sophos Endpoint Security 9.7 |
| F-Secure Anti-Virus 2012 | Symantec Norton AntiVirus 2012 |
| G DATA AntiVirus 2012 | Trend Micro Titanium Antivirus Plus 2012 |
| K7 Antivirus Plus 11.1 | TrustPort Antivirus 2012 |
| Kaspersky Anti-Virus 2012 | Webroot SecureAnywhere Antivirus 2012 |

Please note that the results in this report apply only to the products/versions listed above (e.g. 64-Bit versions, product version, etc.). Also, keep in mind that different vendors offer different (and differing quantities of) features in their products.

The following activities/tests were performed under Windows 7 Professional SP1 64-Bit:

- File copying
- Archiving / Unarchiving
- Encoding / Transcoding
- Installing / Uninstalling applications
- Launching applications
- Downloading files
- PC Mark 7 Professional Testing Suite

¹ We used the latest available product versions available at time of testing.

Test methods

The tests were performed on an Intel Core i5 2.67 GHz machine with 4GB of RAM and SATAII hard disks. The performance tests were done on a clean Windows 7 Professional SP1 64 Bit system (English) and then with the installed Anti-Virus software (with default settings). The tests have been done with an active internet connection to simulate real world impact of cloud services/features.

The hard disks were defragmented before starting the various tests, and care was taken to minimize other factors that could influence the measurements and/or comparability of the systems. Optimizing processes/fingerprinting used by the products were also considered – this means that the results represent the impact on a system which has already been used by the user for a while. The tests were repeated several times (with and without fingerprinting) in order to get mean values and filter out measurement errors. After each run the workstation was defragmented and rebooted. We simulated various file operations that a computer user would execute: copying² different types of clean files from one place to another, archiving and unarchiving files, encoding and transcoding³ audio and video files, converting DVD-Files to iPod format, downloading files from Internet, launching applications, etc. We also used a third-party industry recognized performance testing suite (PC Mark 7 Professional) to measure the system impact during real-world product usage. Readers are invited to evaluate the various products themselves, to see how they impact on their systems (such as software conflicts and/or user preferences, as well as different system configurations that may lead to varying results).

Security products need to load on systems at an early stage to provide security from the very beginning – this load has some impact on the time needed for a system to start up. Measuring boot times accurately is challenging. The most significant issue is to define exactly when the system is fully started, as many operating environments may continue to perform start-up activities for some time after the system appears responsive to the user. It is also important to consider when the protection provided by the security solution being tested is fully active, as this could be a useful measure of boot completion as far as the security solution is concerned. Some Anti-Virus products are loading their services very late (even minutes later) at boot (users may notice that after some time that the system loaded, the system gets very slow for some moments), so the system looks like loading very fast, but it just loads its services later and makes the system also insecure/vulnerable. As we do not want to support such activities, we still do not measure boot times.

² We used 4GB data of various file categories (pictures, movies, audio files, various MS Office documents, PDF files, applications/executables, Microsoft Windows 7 system files, archives, etc.).

³ Converting MP3 files to WAV, MP3 to WMA, AVI to MPG and MPG to AVI, as well as iPod format

Side notes and comments

The on-access/real-time scanner component of Anti-Virus software runs as a background process to check all files that are accessed, in order to protect the system continuously against malware threats. For example, on-access scanners scan files as soon as they are accessed, while (e.g.) behaviour-blockers add a different layer of protection and monitor what the file does when it is already executed/running. The services and processes that run in the background to do these tasks also require and use system resources. Suite products have usually a higher impact on system performance than Anti-Virus-only products, as more services/features are included and running in the background.

Security products need to be active deep in the system in order to protect it and e.g. to scan processes and so on that are already active during the system start-up, to identify rootkits and other malware. Those procedures add some extra time and thus a delay in system boot/start up.

If a product takes up too many system resources, users get annoyed and may either disable or uninstall some essential protective features (and considerably compromise the security of their system) or may switch to security software that is less resource-hungry. Therefore, it is important not only that Anti-Virus software provides high detection rates and good protection against malware, but also that it does not degrade system performance or trouble users.

While this report looks at how much impact various Internet Security products have on system performance, it is not always just the security software which is the main factor responsible for a slow system. Other factors also play a role, and if users follow some simple rules, system performance can be improved noticeably. The next sections address some of the other factors that may play a part.

A few common problems observed on some user PCs:

- **Old hardware:** If a PC already runs at a snail's pace because it has ten-year-old hardware, using modern (security) software may make it unusable.
 - o If possible, buy a new PC that at least meets the minimum recommended requirements of the software you want to use. Multi-Core processors are preferable.
 - o Adding more RAM does not hurt. If you use Windows XP or Windows 7, you should use a minimum of 2GB of RAM. If you use Vista switch to Windows 7. 64-Bit systems are preferable, as especially software which is optimized for such systems will run faster.
 - o Make sure you have only ONE Anti-Virus program with real-time protection. If your new PC came with a trial Anti-Virus program, remove this before installing a different AV program.

- **Keep all your software up-to-date:** Using an Anti-Virus version from e.g. 2009 does not protect you as well as the newer version would, even though you may still be able to update the signatures. Please visit <http://update.microsoft.com> regularly and keep your operating system up-to-date by installing the recommended patches. Any software can have vulnerabilities and bugs, so keep all the software installed on your PC up-to-date: this will not only protect you against many exploits and vulnerabilities, but also give you any other application improvements that have been introduced.

- **Clean up the content of your hard disk:**
 - o If your hard disk is almost full, your system performance will suffer accordingly. Leave at least 20% of your disk space free and move your movies and other infrequently accessed files to another (external) disk. If money is not an issue, consider buying solid state drives (SSDs).
 - o Uninstall unneeded software. Often, the slowdown that users notice after installing an Anti-Virus product is due to other software on the PC running in the background (that is, due to software conflicts or heavy file access by other programs, each access requiring anti-virus scanning).
 - o Remove unneeded entries/shortcuts from the Autostart/start-up folder in the program menu
 - o if your PC is already messed up by residual files and registry entries left over by hundreds of applications you installed and uninstalled after trying them out over the past years, re-install a clean operating system and install only software you really need (fewer software installations, fewer potential vulnerabilities and conflicts, and so on) and use e.g. an image/backup tool in order to ensure that you do not have to reinstall everything manually in future.

- **Defragment your hard disks regularly:** A fragmented hard disk can have a very big impact on system performance as well as considerably increasing the time needed to boot up the system.

- **Fingerprinting/Optimization:** most Anti-Virus products use various technologies to decrease their impact on system performance. Fingerprinting is such a technology, where already scanned files do not get rescanned again for a while (or more rarely) or are whitelisted. This increases the speed considerably (esp. after some time the PC was used), but also adds some little potential risk, as not all files are scanned anymore. It is up to the user to decide what to prefer. We suggest performing regularly a full-system scan (to be sure that all files are at least currently found as clean and to further optimize the fingerprinting).

- **Be patient:** a delay of a few additional seconds due to Anti-Virus is not necessarily a big deal. However, if even with the suggestions above the performance of your PC still annoys you, for instance, after you have installed the Anti-Virus you should consider trying out another Anti-Virus product. (If you only notice a slow-down after using the Anti-Virus for a long time, there are probably other factors behind the slowdown). Never reduce your security by disabling essential protection features, just in the hope of gaining a slightly faster PC!

Test cases

File copying

Some Anti-Virus products do not scan all kind of files by design/default (e.g. based on their file extensions), or use fingerprinting technologies, which may skip already scanned files in order to increase the speed (see comments on page 6). We copied a set of different file types which are widespread at home and office workstations from one physical hard disk to another physical hard disk.

Archiving and unarchiving

Archives are commonly used for file storage, and the impact of Anti-Virus software on the time taken to create new archives or to unarchive files from existing archives may be of interest for most users. We archived a set of different file types which are widespread at home and office workstations from one physical hard disk to another physical hard disk and unzipped them after this again on a third physical hard disk. The results already consider the fingerprinting/optimization technologies of the Anti-Virus products, as most users usually make archives of files they have on their disk.

Encoding/transcoding

Music files are often stored and converted on home systems, and converting such files takes system resources. Due that, many home users may be interested to know if their Anti-Virus product imposes a slowdown while converting multimedia files from one format to another. We encoded and transcoded some multimedia files with FFmpeg, and for the iPod conversion we used HandBrakeCLI. The impact during FFmpeg and iPod converting was almost the same.

Installing/uninstalling applications

We installed several programs (like e.g. Visual C++, .NET Framework, etc.) with MSI installers, and then uninstalled them and measured how long it took. We did not consider fingerprinting, because usually an application is only installed once.

Launching applications

Office document files and PDF files are very common. We opened some large document files in Microsoft Office (and closed it) and some large PDF files in Adobe Acrobat Reader (and closed it). Before each opening, the workstation was rebooted. The time taken for the viewer or editor application to open and a document to be displayed was measured. Although we list the results for the first opening and the subsequent openings, we consider the subsequent openings more important, as normally this operation is done several times by users, and optimization features of the Anti-Virus products take place, minimizing their impact on the systems.

Downloading files

Files are commonly downloaded from the internet. All products were "very fast" in this test.

Test results

These specific test results show the impact on system performance that Anti-Virus products have, compared to the other tested Anti-Virus products. The reported data just give an indication and are not necessarily applicable in all circumstances, as too many factors can play an additional part. As we noticed that delivering percentages gets easily misinterpreted by users (as well as misused by marketing departments or the press) and percentages would need adjustments when other hardware specifications are being used, we grouped the results by clustering them. The impact within those categories does not statistically differ, also considering error measurements. The categories were defined by the testers by consulting statistical methods like hierarchal clustering and taking into consideration what would be noticed from user's perspective or compared to the impact of the other security products.

Overview of single AV-C performance scores

| Vendor | File copying | | Archiving/ unarchiving | Encoding/ transcoding | Installing/ uninstalling applications | Launching applications | | | | Downloading files |
|-------------|--------------|--------------------|---------------------------|--------------------------|---|------------------------|--------------------|--------------|--------------------|----------------------|
| | | | | | | Open Word | | Open PDF | | |
| | On first run | On subsequent runs | | | | On first run | On subsequent runs | On first run | On subsequent runs | |
| Avast | | | | | | | | | | |
| AVG | | | | | | | | | | |
| AVIRA | | | | | | | | | | |
| Bitdefender | | | | | | | | | | |
| eScan | | | | | | | | | | |
| ESET | | | | | | | | | | |
| F-Secure | | | | | | | | | | |
| G DATA | | | | | | | | | | |
| K7 | | | | | | | | | | |
| Kaspersky | | | | | | | | | | |
| McAfee | | | | | | | | | | |
| Microsoft | | | | | | | | | | |
| Panda | | | | | | | | | | |
| PC Tools | | | | | | | | | | |
| Qihoo | | | | | | | | | | |
| Sophos | | | | | | | | | | |
| Symantec | | | | | | | | | | |
| Trend Micro | | | | | | | | | | |
| Trustport | | | | | | | | | | |
| Webroot | | | | | | | | | | |

Key: slow mediocre fast very fast



PC Mark Tests

In order to provide an industry-recognized performance test, we used the PC Mark 7 Professional Edition⁴ testing suite. Users using PC Mark 7 should take care to minimize all external factors which could affect the testing suite and follow strictly at least the considerations/suggestions documented inside the PC Mark manual, in order to get consistent and valid/useful results. Furthermore, the tests should be repeated several times to verify them. For more information about the various consumer scenarios tests included in PC Mark, please read the whitepaper on their website⁵.

“Without AV” is tested on a baseline⁶ system which scores 2024 in the PC Mark test.

| | PC Mark score | Points |
|-------------------|---------------|--------|
| <i>without AV</i> | 2024 | - |
| K7 | 2020 | 99,8 |
| ESET | 2019 | 99,8 |
| Symantec | 2018 | 99,7 |
| Avast | 2017 | 99,7 |
| F-Secure | 2015 | 99,6 |
| Microsoft | 2014 | 99,5 |
| eScan | 2008 | 99,2 |
| Sophos | 2007 | 99,2 |
| AVIRA | 2006 | 99,1 |
| Kaspersky | 2001 | 98,9 |
| AVG | 1996 | 98,6 |
| Panda | 1993 | 98,5 |
| Webroot | 1987 | 98,2 |
| Qihoo | 1985 | 98,1 |
| G DATA | 1984 | 98,0 |
| Bitdefender | 1982 | 97,9 |
| McAfee | 1975 | 97,6 |
| TrendMicro | 1972 | 97,4 |
| Trustport | 1972 | 97,4 |
| PC Tools | 1908 | 94,3 |

⁴ For more information, see <http://www.pcmark.com/benchmarks/pcmark7/>

⁵ http://www.pcmark.com/wp-content/uploads/2011/05/PCMark7_Whitepaper.pdf (PDF)

⁶ Baseline system: Intel Core i5 (2.67 GHz) machine with 4GB of RAM, ATI Radeon HD4500 (512 MB)

Summarized results

Users should weight the various subtests according to their needs. We applied a scoring system in order to sum up the various results.

For “file copying” we took the mean values, as well as for “launching applications” (on subsequent runs). Like in previous performance reports, “very fast” gets 15 points, “fast” gets 10 points, “mediocre” gets 5 points and “slow” gets zero points. This leads to the following results:

| | AV-C Score | PC Mark Score | TOTAL |
|-------------|-------------------|----------------------|--------------|
| ESET | 90 | 99,8 | 189,8 |
| K7 | 90 | 99,8 | 189,8 |
| Avast | 90 | 99,7 | 189,7 |
| Symantec | 90 | 99,7 | 189,7 |
| F-Secure | 90 | 99,6 | 189,6 |
| AVIRA | 90 | 99,1 | 189,1 |
| Kaspersky | 90 | 98,9 | 188,9 |
| AVG | 90 | 98,6 | 188,6 |
| Microsoft | 88 | 99,5 | 187,5 |
| Sophos | 88 | 99,2 | 187,2 |
| Panda | 88 | 98,5 | 186,5 |
| Webroot | 88 | 98,2 | 186,2 |
| eScan | 78 | 99,2 | 177,2 |
| McAfee | 75 | 97,6 | 172,6 |
| Trend Micro | 75 | 97,4 | 172,4 |
| G DATA | 70 | 98 | 168,0 |
| Bitdefender | 70 | 97,9 | 167,9 |
| Qihoo | 63 | 98,1 | 161,1 |
| Trustport | 60 | 97,4 | 157,4 |
| PC Tools | 60 | 94,3 | 154,3 |

Award levels reached in this test

The following award levels are for the results reached in this performance test report. Please note that the performance test only tells you how much impact an Anti-Virus product may have on a system compared to other Anti-Virus products; it does not tell you anything about the effectiveness of the protection a product provides.

| AWARDS | PRODUCTS ⁷ |
|---|---|
|  | <ul style="list-style-type: none"> ✓ ESET ✓ K7 ✓ Avast ✓ Symantec ✓ F-Secure ✓ AVIRA ✓ Kaspersky ✓ AVG ✓ Microsoft ✓ Sophos ✓ Panda ✓ Webroot |
|  | <ul style="list-style-type: none"> ✓ eScan ✓ McAfee ✓ Trend Micro ✓ G DATA ✓ Bitdefender |
|  | <ul style="list-style-type: none"> ✓ Qihoo ✓ Trustport ✓ PC Tools |

The above awards have been given based on our assessment of the overall impact results with default settings under Windows 7 Professional SP1 64 Bit.

⁷ We suggest considering products with the same award to be as good as the other products with same award.

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