

Anti-Virus Comparative



Performance test

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 PCs and form an opinion based on their own observations.

Tested products

The following products, which were available in mid December, were evaluated (with default settings) in this test:

avast! Free ¹ 5.0	Kaspersky Anti-Virus 2010
AVG Anti-Virus 9.0	Kingsoft Antivirus 9 Plus
AVIRA AntiVir Premium 9.0	McAfee VirusScan Plus 2010
BitDefender Antivirus 2010	Microsoft Security Essentials 1.0
eScan AntiVirus 10.0	Norman Antivirus & Anti-Spyware 7.30
ESET NOD32 Antivirus 4.0	Sophos ² Anti-Virus 9.0.1
F-Secure Anti-Virus 2010	Symantec Norton AntiVirus 2010
G DATA AntiVirus 2010	TrustPort ³ Antivirus 2010

Please note that the results in this report apply only to the products/versions listed above and should not be assumed comparable to (e.g.) the versions provided by the above listed vendors as part of a product suite. Also, keep in mind that different vendors offer different (and differing quantities of) features in their products.

The following activities/tests were performed:

- File copying
- Archiving / Unarchiving
- Encoding / Transcoding
- Installing / Uninstalling applications
- Launching applications
- Downloading files
- Worldbench Testing Suite

¹ Version chosen by the vendor.

² Sophos is an enterprise product.

³ TrustPort was tested with only two engines (AVG and Bitdefender)

Test methods

The tests were performed on an Intel Core 2 Duo E8300 machine with 2GB of RAM and SATAII hard disks. The performance tests were first done on a clean Windows XP Professional SP3 system (English) and then with the installed Anti-Virus software (with default settings).

The hard disk was 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 (network, temperature, etc.). 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: copying⁴ different types of clean files from one place to another, archiving and unarchiving files, encoding and transcoding⁵ audio and video files, converting DVD-Files to IPOD format, downloading files from Internet, launching applications, etc. In previous tests we used a batch testing script to automate those activities. This time we used a windows automation software to replicate the activities and measure the times.

We also used a third-party industry recognized performance testing suite (Worldbench 6) 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).

We did not test boot-times on purpose. Anti-Virus 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. To test this is almost impossible. Some vendors let the user choose if he wants a safe or fast start. We recommend to use the safe start, the user will only lose a few seconds but get more security. Furthermore, 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, and considering that in most cases a workstation is powered on only once a day, we decided to do not measure boot times.

⁴ We used 2GB data of various file categories (pictures, movies, music, various MS Office 2003 and 2007 documents, PDF files, applications/executables, Windows XP system files, archives, etc.).

⁵ 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.

Anti-Virus 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 Anti-Virus products have on system performance, it is not always just the Anti-Virus 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 (Anti-Virus) 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.
 - 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, use at least 3GB.
 - o Make sure you have only ONE antivirus program with real-time protection. If your new PC came with a trial Anti-Virus program, remove this before installing a different AV program.
- **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.
 - 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

- 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.
- **Keep all your software up-to-date:** Using an Anti-Virus version from 2003 does not protect you as well as the newer version would, even though you may still be able to update the signatures. 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.
- **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 to perform 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 your PC still needs a considerably longer time to boot up, 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.). Do not reduce your security by disabling essential protection features, just in the hope of gaining a slightly faster PC.

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 marketing departments of AV vendors), we grouped the results in four categories, as the impact within those categories can be considered almost equal, also considering error measurements. The categories were defined by the testers, based on what would be felt/noticed from user's perspective (e.g. "slow" means that the user would notice and label the added slowdown as too high, also compared to the impact of other security products).

File copying

Some Anti-Virus products do not scan all kind of files by design/default (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.

+0% to +25%	very fast
+25% to +50%	fast
+50% to +100%	mediocre
over +100%	slow

	On first run	On subsequent runs (with fingerprinting, if available)
Avast	very fast	very fast
AVG	mediocre	fast
AVIRA	fast	fast
Bitdefender	fast	very fast
eScan	slow	mediocre
ESET	fast	fast
F-Secure	slow	very fast
G DATA	slow	very fast
Kaspersky	fast	very fast
Kingsoft	very fast	very fast
McAfee	fast	very fast
Microsoft	slow	very fast
Norman	mediocre	mediocre
Sophos	fast	fast
Symantec	fast	very fast
Trustport	slow	very fast

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 below already consider the fingerprinting/optimization technologies of the Anti-Virus products, as most users usually make archives of files they have on their disk.

+0% to +20%	very fast
+20% to +40%	fast
+40% to +80%	mediocre
over +80%	slow

Avast	very fast
AVG	fast
AVIRA	very fast
Bitdefender	very fast
eScan	very fast
ESET	very fast
F-Secure	very fast
G DATA	very fast
Kaspersky	very fast
Kingsoft	very fast
McAfee	very fast
Microsoft	very fast
Norman	very fast
Sophos	very fast
Symantec	very fast
Trustport	fast

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 products 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.

+0 to +15% very fast
 +15 to +30% fast
 +30 to +50% mediocre
 over +50% slow

Avast	very fast
AVG	very fast
AVIRA	very fast
Bitdefender	very fast
eScan	very fast
ESET	very fast
F-Secure	very fast
G DATA	very fast
Kaspersky	very fast
Kingsoft	very fast
McAfee	very fast
Microsoft	very fast
Norman	very fast
Sophos	very fast
Symantec	very fast
Trustport	very fast

All tested Anti-Virus products added less than 15% slowdown (very fast) to the process and would add almost unnoticeable impact while encoding/transcoding normal multimedia files.

Installing/uninstalling applications

We installed several programs (like 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.

+0% to +25%	very fast
+25% to +50%	fast
+50% to +100%	mediocre
over +100%	slow

Avast	fast
AVG	mediocre
AVIRA	very fast
Bitdefender	slow
eScan	very fast
ESET	very fast
F-Secure	very fast
G DATA	slow
Kaspersky	fast
Kingsoft	fast
McAfee	mediocre
Microsoft	very fast
Norman	fast
Sophos	very fast
Symantec	fast
Trustport	slow

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.

+0% to +50%	very fast
+50% to +100%	fast
+100% to +200%	mediocre
over +200%	slow

	Open Word		Open PDF	
	On first run	On subsequent runs (with fingerprinting, if available)	On first run	On subsequent runs (with fingerprinting, if available)
Avast	very fast	very fast	mediocre	mediocre
AVG	mediocre	very fast	fast	very fast
AVIRA	very fast	very fast	fast	fast
Bitdefender	mediocre	very fast	fast	very fast
eScan	mediocre	very fast	very fast	very fast
ESET	mediocre	mediocre	very fast	very fast
F-Secure	mediocre	very fast	fast	very fast
G DATA	mediocre	fast	slow	mediocre
Kaspersky	mediocre	fast	mediocre	very fast
Kingsoft	very fast	very fast	very fast	very fast
McAfee	mediocre	fast	slow	very fast
Microsoft	very fast	very fast	very fast	very fast
Norman	mediocre	mediocre	mediocre	mediocre
Sophos	fast	fast	fast	fast
Symantec	very fast	very fast	very fast	very fast
Trustport	slow	fast	slow	fast

Some optimization features may not take place in some products (or not reduce enough the impact), as documents and PDF files are common infection targets and therefore are anyway scanned when opened. Nevertheless, the fingerprinting would take place in on-demand scans.

Downloading files from the Internet

Files are commonly downloaded from the internet. To avoid external influences, we used an in-house Apache web server (wget) connected with 1GB LAN and measured the download time. We tested using large files/archives.

+0% to +25%	very fast
+25% to +50%	fast
+50% to +100%	mediocre
over +100%	slow

Avast	fast
AVG	slow
AVIRA	very fast
Bitdefender	slow
eScan	very fast
ESET	fast
F-Secure	very fast
G DATA	slow
Kaspersky	very fast
Kingsoft	very fast
McAfee	mediocre
Microsoft	very fast
Norman	very fast
Sophos	very fast
Symantec	fast
Trustport	slow

WorldBench Tests

In order to provide an industry-recognized performance test, we used the WorldBench⁶ testing suite of PCWorld. WorldBench⁶ is a leading application-based real-world performance benchmark.

Popular applications are each a component of the final WorldBench score. The WorldBench score (higher is better) is compared against a baseline⁷ system. The individual application test times are given in seconds (lower is better).

WorldBench may be a system to show reproducible results, but it is for us some kind of black box, as it was not developed by us and we do not know all details⁸. Furthermore, using a known test system increases the potential risk of vendors optimizing their products specifically to score well in such standard tests. Therefore, the results of WorldBench may in some few cases differ from our tests on previous pages.

	WB score
<i>without AV</i>	<i>116</i>
AVIRA	114
Avast	113
Sophos	112
F-Secure	112
Kingsoft	111
McAfee	111
AVG	111
Symantec	110
Kaspersky	110
ESET	108
Microsoft	107
Norman	104
G DATA	104
Bitdefender	96
Trustport	90
eScan	64

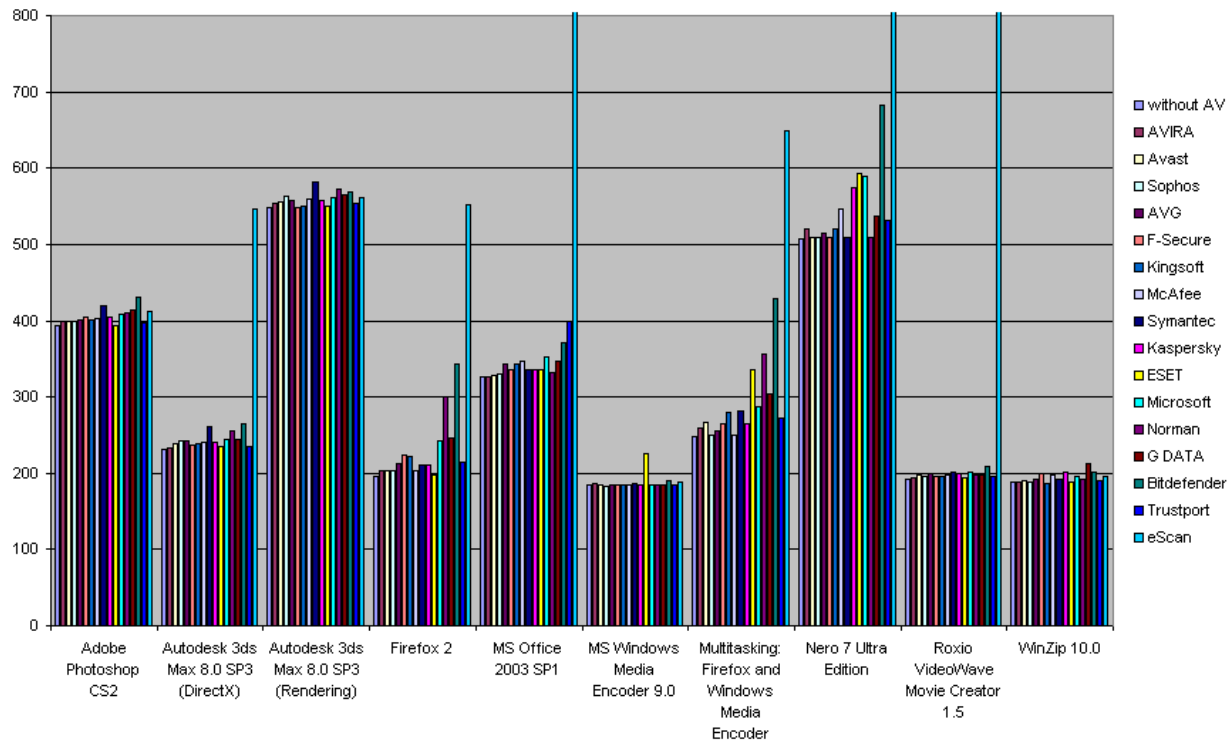
The WorldBench testing Suite consists of the following ten tests, simulating real-world usage: Adobe Photoshop CS2, Autodesk 3ds Max 8.0 SP3 (DirectX), Autodesk 3ds Max 8.0 SP3 (Rendering), Mozilla Firefox 2, Microsoft Office 2003 with SP1, Microsoft Windows Media Encoder 9.0, Multitasking: Mozilla Firefox and Windows Media Encoder, Nero 7 Ultra Edition, Roxio VideoWave Movie Creator 1.5 and WinZip 10.0

⁶ For more information, see <http://www.worldbench.com> or <http://en.wikipedia.org/wiki/WorldBench>

⁷ The Worldbench baseline system (score 100) is an Intel Core 2 Duo E6600, with 2GB RAM. The AV-Comparatives baseline system (score 116) is an Intel Core 2 Duo E8300, with 2GB of RAM.

⁸ We did not find any help or documentation file, and the contacted support did not reply to our inquiries.

Below you can see a graph showing the time needed (in seconds) by the various products in the various WorldBench6 tests (lower bars are better). As it can be seen, in most cases there is not much difference between the products, except in few cases, where the difference on system impact is higher (and can be clearly seen).



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.

	File copying (mean value)	Archiving / unarchiving	Encoding / transcoding	Installing / uninstalling	Download	Launching applications	WorldBench	TOTAL
AVIRA	fast (10)	very fast (15)	very fast (15)	very fast (15)	very fast (15)	very fast (15)	114	199
Kingsoft	very fast (15)	very fast (15)	very fast (15)	fast (10)	very fast (15)	very fast (15)	111	196
F-Secure	very fast (8)	very fast (15)	very fast (15)	very fast (15)	very fast (15)	very fast (15)	112	195
Sophos	fast (10)	very fast (15)	very fast (15)	very fast (15)	very fast (15)	fast (10)	112	193
Kaspersky	very fast (13)	very fast (15)	very fast (15)	fast (10)	very fast (15)	very fast (15)	110	193
Microsoft	very fast (8)	very fast (15)	very fast (15)	very fast (15)	very fast (15)	very fast (15)	107	190
Avast	very fast (15)	very fast (15)	very fast (15)	fast (10)	fast (10)	fast (10)	113	188
Symantec	very fast (13)	very fast (15)	very fast (15)	fast (10)	fast (10)	very fast (15)	110	188
ESET	fast (10)	very fast (15)	very fast (15)	very fast (15)	fast (10)	fast (10)	108	183
McAfee	very fast (13)	very fast (15)	very fast (15)	mediocre (5)	mediocre (5)	fast (10)	111	174
Norman	mediocre (5)	very fast (15)	very fast (15)	fast (10)	very fast (15)	mediocre (5)	104	169
AVG	fast (8)	fast (10)	very fast (15)	mediocre (5)	slow (0)	very fast (15)	111	164
Bitdefender	very fast (13)	very fast (15)	very fast (15)	slow (0)	slow (0)	very fast (15)	96	154
G DATA	very fast (8)	very fast (15)	very fast (15)	slow (0)	slow (0)	fast (10)	104	152
eScan	mediocre (3)	very fast (15)	very fast (15)	very fast (15)	very fast (15)	fast (10)	64	137
Trustport	very fast (8)	fast (10)	very fast (15)	slow (0)	slow (0)	mediocre (5)	90	125

Certification levels reached in this test

We provide a 4-level ranking system: Tested, STANDARD, ADVANCED and ADVANCED+. All products were quite good, and reached at least the STANDARD level.

The following certification 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 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. To determine, for example, how the detection rates of the various Anti-Virus products are, please refer to our other tests, available at www.av-comparatives.org

<u>CERTIFICATION LEVELS</u>	<u>PRODUCTS⁹</u>
	<ul style="list-style-type: none"> ✓ AVIRA ✓ Kingsoft ✓ F-Secure ✓ Sophos ✓ Kaspersky ✓ Microsoft ✓ Avast ✓ Symantec ✓ ESET ✓ McAfee
	<ul style="list-style-type: none"> ✓ Norman ✓ AVG ✓ BitDefender ✓ G DATA
	<ul style="list-style-type: none"> ✓ eScan ✓ Trustport

The above awards have been given based on our assessment of the overall impact results with default settings.

⁹ We suggest to consider products with same the award to be as good as the other products with same award.

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