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Security Evaluation Test Report Home Anti-Malware



SE LABS tested a variety of anti-malware (aka 'anti-virus'; aka 'endpoint security') products from a range of well-known vendors in an effort to judge which were the most effective.

Each product was exposed to the same threats, which were a mixture of targeted attacks using well-established techniques and public email and web-based threats that were found to be live on the internet at the time of the test.

The results indicate how effectively the products were at detecting and/or protecting against those threats in real time.

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SE Labs is ISO/IEC 27001 : 2022 certified and BS EN ISO 9001 : 2015 certified for The Provision of IT Security Product Testing.



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Introduction



CEO Simon Edwards

If you spot a detail in this report that you don't understand, or would like to discuss, please contact us. SE Labs uses current threat intelligence to make our tests as realistic as possible. To learn more about how we test, how we define 'threat intelligence' and how we use it to improve our tests please visit our website and follow us on LinkedIn.

Is This Report Too Complicated?

Security testing can be easy to explain but hard to execute.

Testing can simplify life for organisations needing to buy cyber security products. It helps to create shortlists of competent products worth considering. It can also help explain why security is needed. A good test can demonstrate the sorts of threats real targets face and then show a solution.

But apparent simplicity is often the product of massive complexity. Security products and attacks are very complicated. This report simplifies an extremely thorough test to make life easier for businesses and individuals that need to buy cyber security protection but without the need to fully understand the nuts and bolts of it.

This is Simple?!

Our reports might come across as too complex. Are you really interested in diving deeply or do you just want the first three pages, with the awards and possibly a summary of the conclusion?

Do you really want to know exactly what happened in a test? How the false positive rates were calculated? Which attacks were targeted, and which threats randomly affect anyone in the world? Do you even know what a false positive is and why including tests for them is important in a security test? And is the concept of the full attack chain important to you?

Proving the Work

We don't really think most people care about the deep details, but we include them anyway because we've put a lot of effort into doing our due diligence for this test report. We've been thorough, ticked all the boxes that the industry requires of us, and ticked some extra ones we think are critical

The standard of our testing is world-leading and we want to prove to you that you can trust this test report — which is why there are explanations and charts for every part of the test. Even for bits you probably don't care about.

The data is so transparent that you could even create your own scoring system if you wanted. Not everyone has the same appetite for risk so, for example, if you care more about false positives than we do (or if you care less) you can use the basic results in this report and assign your own weightings and create your own personalised score.

Executive Summary

Product Names

It is good practice to stay up to date with the latest version of your chosen endpoint security product. We made best efforts to ensure that each product tested was the very latest version running with the most recent updates to give the best possible outcome.

For specific build numbers, see **Appendix E: Product Versions** on page 16.

Products Tested	Protection Accuracy Rating (%)	Legitimate Accuracy Rating (%)	Total Accuracy Rating (%)
Kaspersky Premium	100%	100%	100%
McAfee Total Protection	100%	100%	100%
NortonLifeLock Norton360	100%	100%	100%
Microsoft Defender Antivirus (consumer)	98%	100%	99%
Avast Free Antivirus	97%	100%	99%
Sophos Home Premium	97%	100%	99%
Scanguard Essential Antivirus	95%	100%	98%
Webroot Antivirus	92%	100%	97%
Panda Dome	87%	98%	94%
TotalAV Premium	82%	100%	93%

Products highlighted in green were the most accurate, scoring 85 per cent or more for Total Accuracy.
 Those in yellow scored less than 85 but 75 or more. Products shown in red scored less than 75 per cent.

For exact percentages, see 1.3 Total Accuracy Ratings on page 9.

• The endpoints were generally effective at handling general threats from cyber criminals...

Despite a few misses, almost all the products were capable of handling email-and web-based threats such as those used by criminals to attack Windows PCs, tricking users into running malicious files or scripts that download and run malicious files.

But targeted attacks caused problems for half of the products.

More than half of the products provided complete protection against the targeted attacks used in this test but the rest were unable to prevent such breaches. Two products had several compromises, a concerning result since it only takes a single targeted attack to breach an organisation.

• False positives were not an issue for the products.

Almost all of the products were perfectly good at correctly classifying legitimate applications and websites. Only one product blocked or restricted access to some legitimate objects.

• Which products were the most effective?

Products from Norton, McAfee and Kaspersky produced the best results due to a combination of their ability to block malicious URLs, handle exploits and classify legitimate applications and websites. These products received AAA awards as did those from Microsoft, Sophos, Avast, Scanguard and Webroot. Panda and TotalAV performed well enough to achieve AA ratings.

Security EvaluationEPS Protection Home Awards

The following products win SE Labs awards:



Kaspersky Premium

McAfee Total Protection

NortonLifeLock Norton360

Microsoft Defender Antivirus (consumer)

Sophos Home Premium

Avast Free Antivirus

Scanguard Essential Antivirus

Webroot Antivirus



Panda Dome
TotalAV Premium

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Threat Responses

Full Attack Chain: Testing Every Layer of Detection and Protection

Attackers start from a certain point and don't stop until they have either achieved their goal or have reached the end of their resources (which could be a deadline or the limit of their abilities). This means that, in a test, the tester needs to begin the attack from a realistic first position, such as sending a phishing email or setting up an infected website, and moving through many of the likely steps leading to actually stealing data or causing some other form of damage to the network.

If the test starts too far into the attack chain, such as executing malware on an endpoint, then many products will be denied opportunities to use the full extent of their protection and detection abilities. If the test concludes before any 'useful'

damage or theft has been achieved, then similarly the product may be denied a chance to demonstrate its abilities in behavioural detection and so on.

Attack Stages

The illustration (below) shows typical stages of an attack. In a test, each of these should be attempted to determine the security solution's effectiveness. This test's results record detection and protection for each of these stages.

We measure how a product responds to the first stages of the attack with a detection and/or protection rating. Sometimes products allow threats to run yet still detect them. Other times they might allow the threat to run briefly before neutralising it.

Ideally, they detect and block the threat before it has a chance to run. Products may delete threats or automatically contain them in a 'quarantine' or other safe holding mechanism for later analysis.

Should the initial attack phase succeed, we then measure post-exploitation stages, which are represented by steps two through to seven below. We broadly categorise these stages as: Access (step 2); Action (step 3); Escalation (step 4); and Post-Escalation (steps 5-6).

In figure 1. you can see a typical attack running from start to end, through various 'hacking' activities. This can be classified as a fully successful breach.

In figure 2. a product or service has interfered with the attack, allowing it to succeed only as far as stage 3, after which it was detected and neutralised. The attacker was unable to progress through stages 4 onwards.

It is possible for an attack to run in a different order with, for example, the attacker attempting to connect to other systems without needing to escalate privileges. However, it is common for password theft (see step 5) to occur before using stolen credentials to move further through the network.

How Hackers Progress

Figure 1. A typical attack starts with an initial contact and progresses through various stages, including reconnaissance, stealing data and causing damage.













Figure 2. This attack was initially successful but only able to progress as far as the reconnaissance phase.













1. Protection and Legitimate Handling Accuracy

11 Protection Details

These results break down how each product handled threats into some detail. You can see how many detected a threat and the levels of protection provided.

Products sometimes detect more threats than they protect against. This can happen when they recognise an element of the threat but aren't equipped to stop it. Products can also provide protection even if they don't detect certain threats. Some threats abort on detecting specific endpoint protection software.

1.2 Attack Types

The graph shows how each product protected against the different types of attacks used in the test

Product	Detected	Blocked	Neutralised	Compromised	Protected
Kaspersky Premium	100	100	0	0	100
McAfee Total Protection	100	100	0	0	100
NortonLifeLock Norton360	100	100	0	0	100
Microsoft Defender Antivirus (consumer)	99	99	0	1	99
Sophos Home Premium	99	99	0	1	99
Avast Free Antivirus	99	98	0	2	98
Scanguard Essential Antivirus	98	98	0	2	98
Webroot Antivirus	96	95	2	3	97
Panda Dome	94	93	1	6	94
TotalAV Premium	93	89	4	7	93

• This data shows in detail how each product handled the threats used.

Kaspersky Premium	75	25	100%
McAfee Total Protection	75	25	100%
NortonLifeLock Norton360	75	25	100%
Microsoft Defender Antivirus (consumer)	74	25	99%
Sophos Home Premium	74	25	99%
Avast Free Antivirus	74	24	98%
Scanguard Essential Antivirus	73	25	98%
Webroot Antivirus	75	22	97%
Panda Dome	73	21	94%
TotalAV Premium	69	24	93%
			-

50

75

100

General Attack
Targeted Attack

0

25

1.3. Total Accuracy Ratings

Judging the effectiveness of an endpoint security product is a subtle art, and many factors are at play when assessing how well it performs. To make things easier we've combined all the different results from this report into one easy-to-understand graph.

The graph takes into account not only each product's ability to detect and protect against threats, but also its handling of non-malicious objects such as web addresses (URLs) and applications.

Not all protections, or detections for that matter, are equal. A product might completely block a URL, which stops the threat before it can even start its intended series of malicious events. Alternatively, the product might allow a web-based exploit to execute but prevent it from downloading any further code to the target.

1.4 Protection Accuracy

To understand how we calculate these ratings, see **Appendix A: Protection Ratings** on page 12.

	7			
Kaspersky Premium			1	.,040 100%
McAfee Total Protection	n		1	.,040 100%
NortonLifeLock Norton	360		. 1	.,040 100%
Microsoft Defender An	tivirus (consumer)		. 1	L,031 99%
Sophos Home Premiur	n		. 1	L,029 99%
Avast Free Antivirus			. 1	L,027 99%
Scanguard Essential A	ntivirus		1,	020 98%
Webroot Antivirus			1,0	008 97%
Panda Dome			977	94%
TotalAV Premium			969	93%
) :	260	520	780	1,040

• Categorising how a product handles legitimate objects is complex, and you can find out how we do it in Legitimate Accuracy Ratings on page 10.

• Total Accuracy Ratings combine protection and false positives

In another case malware might run on the target for a short while before its behaviour is detected and its code is deleted or moved to a safe 'quarantine' area for future analysis. We take these outcomes into account when attributing points that form final ratings. For example, a product that completely blocks a threat is rated more highly than one that allows a threat to run for a while before eventually evicting it. Products that allow all malware infections, or that block popular legitimate applications, are penalised heavily.

:			
Kaspersky Premium		40	00 100%
McAfee Total Protection		40	00 100%
NortonLifeLock Norton360		40	00 100%
Microsoft Defender Antivirus (consumer)		39	1 98%
Sophos Home Premium		389	97%
Avast Free Antivirus		387	97%
Scanguard Essential Antivirus		380	95%
Webroot Antivirus		368 92	!%
Panda Dome		347 87%	
TotalAV Premium		329 82%	
0 100	200	300	400

 Protection Accuracy Ratings are weighted to show that how products handle threats can be subtler than just 'win' or 'lose'.

Average 95%

1.5 Protection Scores

This graph shows the overall level of protection, making no distinction between neutralised and blocked incidents.

For each product we add Blocked and Neutralised cases together to make one simple tally.

Kaspersky Premium				100 100%
McAfee Total Protection				100 100%
NortonLifeLock Norton36	0			100 100%
Microsoft Defender Antivi	rus (consumer)			99 99%
Sophos Home Premium				99 99%
Avast Free Antivirus				98 98%
Scanguard Essential Antiv	virus			98 98%
Webroot Antivirus				97 97%
Panda Dome			9	94 94%
TotalAV Premium			93	3 93%
0 25		50	75	100

 Protection Scores are a simple count of how many times a product protected the system.

1.6 Legitimate Accuracy Ratings

These ratings indicate how accurately the products classify legitimate applications and URLs, while also taking into account the interactions that each product has with the user. Ideally a product will either not classify a legitimate object or will classify it as safe. In neither case should it bother the user.

We also take into account the prevalence (popularity) of the applications and websites used in this part of the test, applying stricter penalties for when products misclassify very popular software and sites.

To understand how we calculate these ratings, see **Accuracy Ratings** on page 14.

Avast Free Antivirus			640 100%
Kaspersky Premium			640 100%
McAfee Total Protection			640 100%
Microsoft Defender Antivirus (consume	r)		640 100%
NortonLifeLock Norton360			640 100%
Scanguard Essential Antivirus			640 100%
Sophos Home Premium			640 100%
TotalAV Premium			640 100%
Webroot Antivirus			640 100%
Panda Dome			630 98%
0 160	320	480	640

 Legitimate Accuracy Ratings can indicate how well a vendor has tuned its detection engine.

2. Conclusion

Attacks in this test included threats that affect the wider public and more closely targeted individuals and organisations. You could say that we tested the products with 'public' malware and full-on hacking attacks.

We introduced the threats in a realistic way such that threats seen in the wild on websites were downloaded from those same websites, while threats caught sending email were delivered to our target systems as emails.

All the products are well-known and should do well in this test. While we do 'create' threats by using publicly available free hacking tools, we do not write unique malware so there is no technical reason why any vendor being tested should do poorly.

The results were generally strong in the way the products handled both public threats and targeted attacks with most of the products stopping almost all of the attacks. Products from Norton, McAfee and Kaspersky achieved 100% Protection Accuracy Ratings by being quick to block any detected intrusions.

The products from **Microsoft**, **Sophos**, **Avast**, **Scanguard** and **Webroot** also did very well and achieved Protection Accuracy Ratings in the 90s.

Although most of the products that were compromised by public threats only missed one or two each, this still marks a change. It reverses the trend of several years whereby endpoints would block public threats handily, then falter when tested against the more persistent targeted attacks. We would like to flag these results, particularly since the typical user for home security products is more vulnerable to the widespread threats from the web.

Public malware are downloaded from the Internet on the day that the products are tested. This type of public threat tests a product's familiarity with common threats and its ability to keep its databases current.

The products from Microsoft, Avast and Scanguard successfully blocked all of the targeted attacks but missed one or two Web download threats each. TotalAV, which only missed one

targeted attack, was compromised by six Web download threats.

The two products which bucked this trend were those from **Webroot**, which missed three targeted attacks but aced all the Web downloads; and **Panda**, which missed two targeted attacks more than it did the public threats.

Except for **Panda Dome** which scored a 98% Legitimate Accuracy Rating, the other products correctly classified all legitimate files and websites as safe.

The strongest performers namely Norton, McAfee and Kaspersky win AAA awards for achieving 100% Legitimacy, as well as 100% Protection ratings. By achieving Total Accuracy Ratings in the high 90s, products from Microsoft, Sophos, Avast, Scanguard and Webroot also win AAA awards. Panda Dome and TotalAV performed well enough to achieve AA awards.

Appendices

Appendix A: Protection Ratings

The results below indicate how effectively the products dealt with threats. Points are earned for detecting the threat and for either blocking or neutralising it.

- **Detected (+1)** If the product detects the threat with any degree of useful information, we award it one point.
- Blocked (+2) Threats that are disallowed from even starting their malicious activities are blocked. Blocking products score two points.
- Complete Remediation (+1) If, in addition to neutralising a threat, the product removes all significant traces of the attack, it gains an additional one point.
- Neutralised (+1) Products that kill all running malicious processes 'neutralise' the threat and win one point.
- Persistent Neutralisation (-2) This result occurs when a product continually blocks a persistent threat from achieving its aim, while not removing it from the system.
- Compromised (-5) If the threat compromises the system, the product loses five points. This loss may

be reduced to four points if it manages to detect the threat (see Detected, above), as this at least alerts the user, who may now take steps to secure the system.

Rating Calculations

We calculate the protection ratings using the following formula:

Protection Rating =

(1x number of Detected) +

(2x number of Blocked) +

(1x number of Neutralised) +

(1x number of Complete Remediation) + (-5x number of Compromised)

The 'Complete Remediation' number relates to cases of neutralisation in which all significant traces of the attack were removed from the target.

These ratings are based on our opinion of how important these different outcomes are. You may have a different view on how seriously you treat a 'Compromise' or 'Neutralisation without complete remediation'. If you want to create your own rating system, you can use the raw data from **1.1 Protection Details** on page 8 to roll your own set of personalised ratings.

Targeted Attack Scoring

The following scores apply only to targeted attacks and are cumulative, ranging from -1 to -5.

- Access (-1) If any command that yields information about the target system is successful this score is applied. Examples of successful commands include listing current running processes, exploring the file system and so on. If the first command is attempted and the session is terminated by the product without the command being successful the score of Neutralised (see above) will be applied.
- Action (-1) If the attacker is able to exfiltrate a document from the target's Desktop of the currently logged in user then an 'action' has been successfully taken.
- Escalation (-2) The attacker attempts to escalate privileges to NT Authority/System. If successful, an additional two points are deducted.
- Post-Escalation Action (-1) After escalation the attacker attempts actions that rely on escalated privileges. These include attempting to steal credentials, modifying the file system and recording keystrokes. If any of these actions are successful then a further penalty of one point deduction is applied.

Appendix B: Legitimate Interaction Ratings

It's crucial that anti-malware endpoint products not only stop — or at least detect — threats, but that they allow legitimate applications to install and run without misclassifying them as malware. Such an error is known as a 'false positive' (FP).

In reality, genuine FPs are quite rare in testing. In our experience it is unusual for a legitimate application to be classified as 'malware'. More often it will be classified as 'unknown', 'suspicious' or 'unwanted' (or terms that mean much the same thing).

We use a subtle system of rating an endpoint's approach to legitimate objects, which takes into account how it classifies the application and how it presents that information to the user. Sometimes

the endpoint software will pass the buck and demand that the user decide if the application is safe or not. In such cases the product may make a recommendation to allow or block. In other cases, the product will make no recommendation, which is possibly even less helpful.

If a product allows an application to install and run with no user interaction, or with simply a brief notification that the application is likely to be safe, it has achieved an optimum result. Anything else is a Non-Optimal Classification/Action (NOCA). We think that measuring NOCAs is more useful than counting the rarer FPs.

Prevalence Ratings

There is a significant difference between an

	None (allowed)	Click to Allow (default allow)	Click to Allow/ Block (no recommendation)	Click to Block (default block)	None (blocked)	
Safe	2	1.5	1	(derautt block)	(blocked)	Α
Unknown	2	1	0.5	0	-0.5	В
Not Classified	2	0.5	0	-0.5	-1	С
Suspicious	0.5	0	-0.5	-1	-1.5	D
Unwanted	0	-0.5	1	-1.5	-2	Е
Malicious				2	-2	F
	1	2	3	4	5	

Legitimate Software Prevalence Rating Modifiers

Very High Impact	5
High Impact	4
Medium Impact	3
Low Impact	2
Very Low Impact	1

endpoint product blocking a popular application such as the latest version of Microsoft Word and condemning a rare Iranian dating toolbar for Internet Explorer 6. One is very popular all over the world and its detection as malware (or something less serious but still suspicious) is a big deal. Conversely, the outdated toolbar won't have had a comparably large user base even when it was new. Detecting this application as malware may be wrong, but it is less impactful in the overall scheme of things.

With this in mind, we collected applications of varying popularity and sorted them into five separate categories, as follows:

- 1. Very High Impact
- 2. High Impact
- 3. Medium Impact
- 4. Low Impact
- 5. Very Low Impact

Incorrectly handling any legitimate application will invoke penalties, but classifying Microsoft Word as malware and blocking it without any way for the user to override this will bring far greater penalties than doing the same for an ancient niche toolbar. In order to calculate these relative penalties, we assigned each impact category with a rating modifier, as shown in the table above.

Applications were downloaded and installed during the test, but third-party download sites were avoided and original developers' URLs were used where possible. Download sites will sometimes bundle additional components into applications' install files, which may correctly cause antimalware products to flag adware. We remove

Legitimate Interaction Ratings

adware from the test set because it is often unclear how desirable this type of code is.

The prevalence for each application and URL is estimated using metrics such as third-party download sites and the data from Tranco.com's global traffic ranking system.

Accuracy Ratings

We calculate legitimate software accuracy ratings by multiplying together the interaction and prevalence ratings for each download and installation:

Accuracy rating = Interaction rating x Prevalence rating

Product None (allowed) Avast Free Antivirus 100 Kaspersky Premium 100 McAfee Total Protection 100 Microsoft Defender Antivirus (consumer) 100 NortonLifeLock Norton360 100 Panda Dome 100 Scanguard Essential Antivirus 100 Sophos Home Premium 100 Total AV Premium 100 Wehroot Antivirus 100

 Products that do not bother users and classify most applications correctly earn more points than those that ask questions and condemn legitimate applications. If a product allowed one legitimate, Medium impact application to install with zero interaction with the user, then its Accuracy rating would be calculated like this:

Accuracy rating = $2 \times 3 = 6$

This same calculation is made for each legitimate application/site in the test and the results are summed and used to populate the graph and table shown under **Legitimate Accuracy Ratings** on page 10.

Distribution of Impact Categories

Endpoint products that were most accurate in handling legitimate objects achieved the highest ratings. If all objects were of the highest prevalence, the maximum possible rating would be 1,000 (100 incidents x (2 interaction rating x 5 prevalence rating)).

In this test there was a range of applications with different levels of prevalence. The table below shows the frequency:

Legitimate Software Category Frequency

Prevalence Rating	Frequency
High Impact	41
Medium Impact	38
Low Impact	21

Appendix C: Terms Used

Compromised The attack succeeded, resulting in malware running unhindered on the target. In the case of a targeted attack, the attacker was able to take remote control of the system and carry out a variety of tasks without hindrance.

Blocked The attack was prevented from making any changes to the target.

False positive When a security product misclassifies a legitimate application or website as being malicious, it generates a 'false positive'.

Neutralised The exploit or malware payload ran on the target but was subsequently removed.

Complete Remediation If a security product removes all significant traces of an attack, it has achieved complete remediation.

Target The test system that is protected by a security product.

Threat A program or sequence of interactions with the target that is designed to take some level of unauthorised control of that target.

Update Security vendors provide information to their products in an effort to keep abreast of the latest threats. These updates may be downloaded in bulk as one or more files, or requested individually and live over the internet.

Appendix D: FAQs

What is a partner organisation? Can I become one to gain access to the threat data used in your tests?

Partner organisations benefit from our consultancy services after a test has been run. Partners may gain access to low-level data that can be useful in product improvement initiatives and have permission to use award logos, where appropriate, for marketing purposes. We do not share data on one partner with other partners. We do not partner with organisations that do not engage in our testing.

I am a security vendor and you tested my product without permission. May I access the threat data to verify that your results are accurate?

We are willing to share a certain level of test data with non-partner participants for free. The intention is to provide sufficient data to demonstrate that the results are accurate. For more in-depth data suitable for product improvement purposes we recommend becoming a partner.

A **full methodology** for this test is available from our website.

- The test was conducted between 23rd June and 26th August 2025.
- All products were configured according to each vendor's recommendations, when such recommendations were provided.
- Targeted attacks were selected and verified by SE Labs.
- Malicious emails, URLs, attachments and legitimate messages were independently located and verified by SE Labs.
- Malicious and legitimate data was provided to partner organisations once the test was complete.

Appendix E: Product Versions

The table below shows the service's name as it was being marketed at the time of the test.

Vendor	Product	Build Version (start)	Build Version (end)
Avast	Free Antivirus	Program Version: 25.5.10141a (Build 25.5.10141.762) Virus Definitions Version: 250624-4 UI Version: 1.0.839	Program version: 25.8.10387g (build 25.8.10387.947) Virus definitions version: 250829-2 UI version: 1.0.845
Kaspersky	Premium	21.21.7.384(a)	21.21.7.384(a)
McAfee	Total Protection	Version: 1.30.150	Version: 1.30.150
Microsoft	Defender Antivirus (consumer)	Antimalware Client Version: 4.18.25050.5 Engine Version: 1.1.25050.6 Antivirus Version: 1.431.445.0 Anti-spyware Version: 1.431.445.0	Antimalware Client Version: 4.18.25070.5 Engine Version: 1.1.25070.4 Antivirus Version: 1.435.466.0, Anti-spyware Version: 1.435.466.0
NortonLifeLock	Norton360	Program Version: 25.5.10141 Virus Definitions Version: 250624-4	Program Version: 25.8.10387 Virus Definitions Version: 250829-0
Panda	Dome	22.03.04	22.03.04
Scanguard	Essential Antivirus	Scanguard: v5.24.38 Virus Definition: 8.20.56.184 Remediation Definition Version: 1.0.2505.2369	Scanguard: v5.24.38 Virus Definition Version: 8.20.56.180 Remediation Definition Version: 1.0.2507.2555
Sophos	Home Premium	2023.2.3.13.0	2024.3.2.25.0
TotalAV	Premium	App Version: 6.3.371 Antivirus Engine Version: 1.0.2502.5119 Virus Definition Version: 8.20.56.180	App Version: 6.3.371 Antivirus Engine Version: 1.0.2502.5119 Virus Definition Version: 8.20.61.140
Webroot	Antivirus	9.0.39.112	9.0.39.112

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