SE Labs

INTELLIGENCE-LED TESTING

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ENTERPRISE ENDPOINT PROTECTION

OCT - DEC 2017

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 BS EN ISO 9001 : 2015 certified for The Provision of IT Security Product Testing.

SE Labs Ltd is a member of the Anti-Malware Testing Standards Organization (AMTSO)

INTRODUCTION

WILL YOUR ANTI-MALWARE PROTECT YOU FROM TARGETED ATTACKS?

The news isn't good. Discover your best options in our latest report.

Criminals routinely create ingenious scams and indiscriminate attacks designed to compromise the unlucky and, occasionally, foolish. But sometimes they focus on a specific target rather than casting a net wide in the hope of landing something interesting.

Targeted attacks can range from basic, like an email simply asking you to send some money to an account, through to extremely devious and technical. If you received an email from your accountant with an attached PDF or Excel spreadsheet would you open it? Most would and all that then stands between them and a successful hack (because the email was a trick and contained a dodgy document that gives remote control to the attacker) is the security software running on their PC.

In this test we've included indiscriminate, public attacks that come at victims from the web and via email, but we've also included some devious targeted attacks to see how well-protected potential victims would be.

We've not created any new types of threat and we've not discovered and used 'zero day' attacks. Instead we took tools that are freely distributed online and are well-known to penetration testers and criminals alike. We used these to generate threats that are realistic representations of what someone could quite easily put together to attack you or your business.

The results are extremely worrying. While a few products were excellent at detecting and protecting against these threats many more were less useful. We will continue this work and report any progress that these companies make in improving their products.

If you spot a detail in this report that you don't understand, or would like to discuss, please contact us via our Twitter or Facebook accounts.

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 Twitter.

We continue to test Microsoft and McAfee business products privately and plan to produce results in the first report of 2018.

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 C: Product versions on page 19.

EXECUTIVE SUMMARY

Products Tested	Protection Accuracy (%)	Legitimate Accuracy (%)	Total Accuracy (%)
Symantec Endpoint Security Enterprise Edition	95%	96%	96%
Kaspersky Endpoint Security	87%	100%	95%
Sophos Central Endpoint	82%	100%	93%
ESET Endpoint Security	80%	100%	93%
Trend Micro OfficeScan, Intrusion Defense Firewall	73%	98%	89%
Panda Endpoint Protection	53%	100%	83%
MalwareBytes Endpoint Security	24%	100%	73%

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. Total Accuracy Ratings on page 6.

- **The endpoints were generally effective at handling general threats from cyber criminals...**
All products were largely capable of handling public web-based threats such as those used by criminals to attack Windows PCs, tricking users into running malicious files or running scripts that download and run malicious files.

- **.. and targeted attacks were prevented in many cases.**
Many products were also competent at blocking more targeted, exploit-based attacks. However, while some did very well in this part of the test, others were very much weaker.

- **False positives were not an issue for most products**
Most of the endpoint solutions were good at correctly classifying legitimate applications and websites. The vast majority allowed all of the legitimate websites and applications.

- **Which products were the most effective?**
Symantec and **Kaspersky Lab** products achieved extremely good results due to a combination of their ability to block malicious URLs, handle exploits and correctly classify legitimate applications and websites.

Simon Edwards, SE Labs, 1st February 2018

1. TOTAL ACCURACY RATINGS

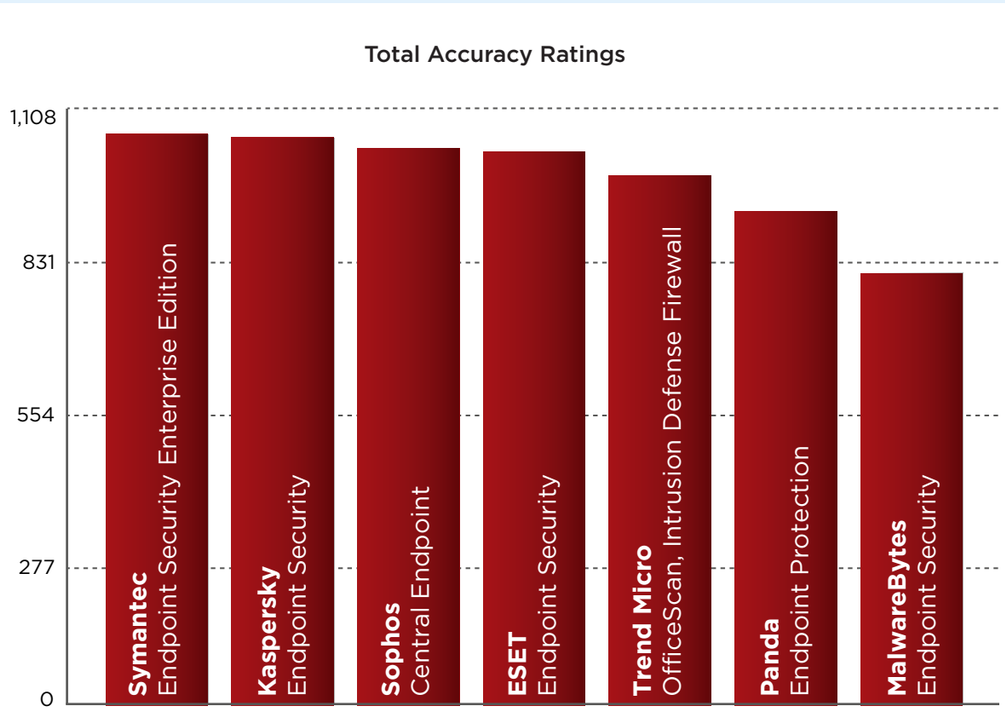
Judging the effectiveness of an endpoint security product is a subtle art, and many factors are at play when assessing how well it performs. To make things easier we've combined all the different results from this report into one easy-to-understand graph.

The graph below 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. 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.

Categorising how a product handles legitimate objects is complex, and you can find out how we do it in 5. Legitimate Software Ratings on page 12.



Total Accuracy Ratings combine protection and false positives.

AWARDS

The following products win SE Labs awards:

- Symantec Endpoint Security Enterprise Edition
- Kaspersky Endpoint Security

- Sophos Central Endpoint
- ESET Endpoint Security

- Trend Micro OfficeScan, Intrusion Defense Firewall

- Panda Endpoint Protection

TOTAL ACCURACY RATINGS

Product	Total Accuracy Rating	Total Accuracy (%)	Award
Symantec Endpoint Security Enterprise Edition	1,061	96%	AAA
Kaspersky Endpoint Security	1,055	95%	AAA
Sophos Central Endpoint	1,035	93%	AA
ESET Endpoint Security	1,028	93%	AA
Trend Micro OfficeScan, Intrusion Defense Firewall	984	89%	A
Panda Endpoint Protection	918	83%	B
MalwareBytes Endpoint Security	805	73%	

2. 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.

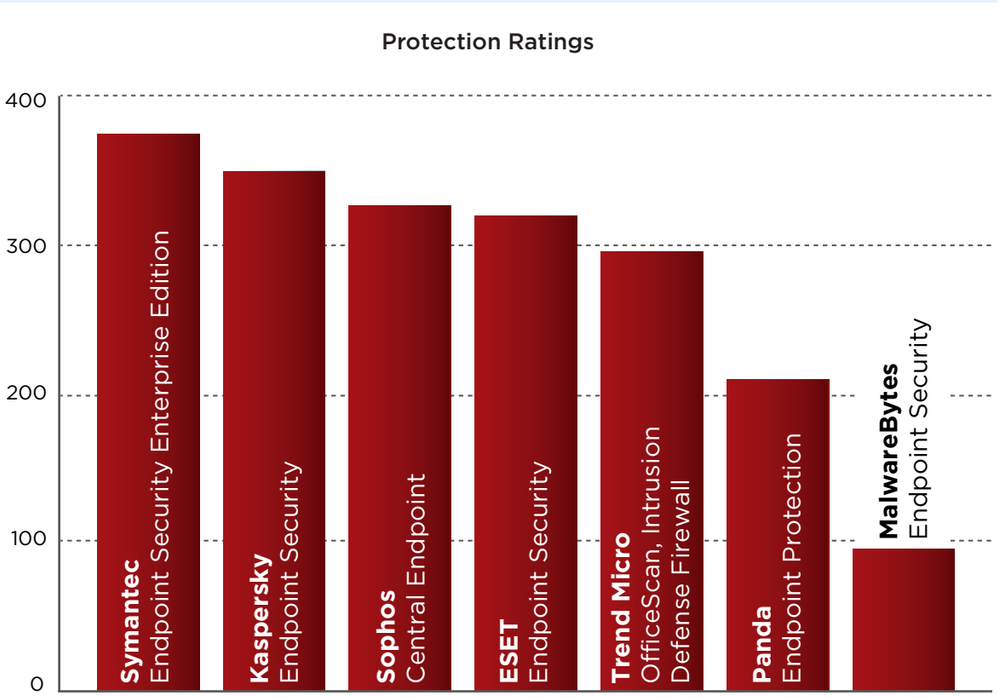
- **Detected (+1)**
If the product detects the threat with any degree of useful information, we award it one point.

- **Blocked (+2)**
Threats that are disallowed from even starting their malicious activities are blocked. Blocking products score two points.

- **Neutralised (+1)**
Products that kill all running malicious processes 'neutralise' the threat and win one point.

- **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.

- **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.



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

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. Such traces should not exist if the threat was 'Blocked' and so Blocked results imply Complete remediation.

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 4. Protection Details on page 11 to roll your own set of personalised ratings.

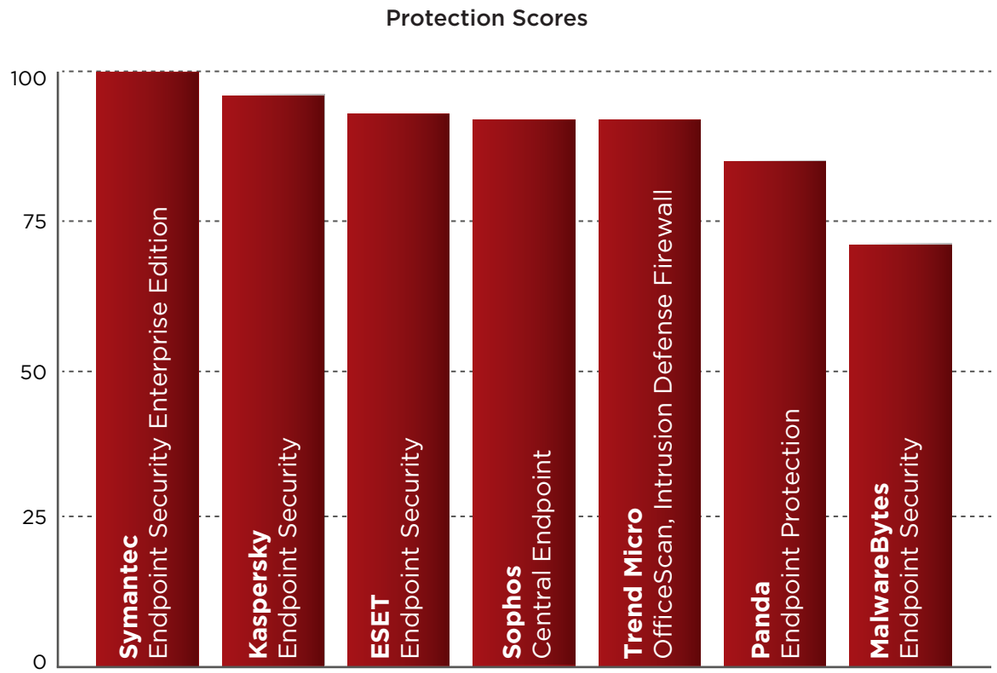
PROTECTION RATINGS		
Product	**Protection Rating**	**Protection Rating (%)**
Symantec Endpoint Security Enterprise Edition	378	95%
Kaspersky Endpoint Security	347	87%
Sophos Central Endpoint	327	82%
ESET Endpoint Security	320	80%
Trend Micro OfficeScan, Intrusion Defense Firewall	292	73%
Panda Endpoint Protection	210	53%
MalwareBytes Endpoint Security	97	24%

Average: 70%

3. 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.



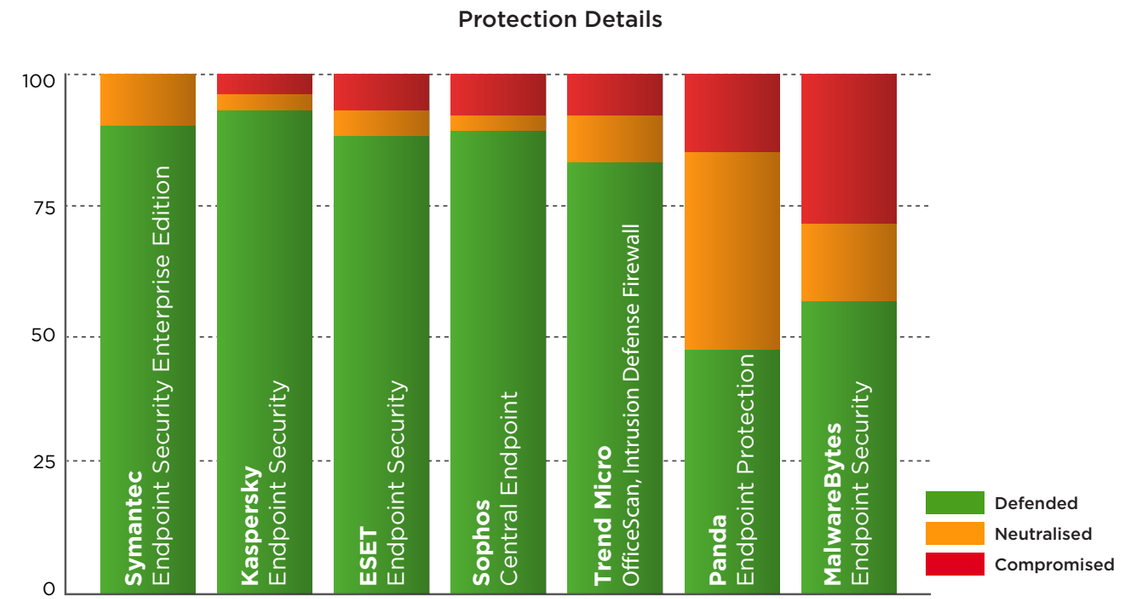
Protection Scores are a simple count of how many times a product protected the system.

PROTECTION SCORES	
Product	**Protection Score**
Symantec Endpoint Security Enterprise Edition	100
Kaspersky Endpoint Security	96
ESET Endpoint Security	93
Sophos Central Endpoint	92
Trend Micro OfficeScan, Intrusion Defense Firewall	92
Panda Endpoint Protection	85
MalwareBytes Endpoint Security	71

4. 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.



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

PROTECTION DETAILS					
Product	**Detected**	**Blocked**	**Neutralised**	**Compromised**	**Protected**
Symantec Endpoint Security Enterprise Edition	100	90	10	0	100
Kaspersky Endpoint Security	89	93	3	4	96
ESET Endpoint Security	95	88	5	7	93
Sophos Central Endpoint	99	89	3	8	92
Trend Micro OfficeScan, Intrusion Defense Firewall	93	83	9	8	92
Panda Endpoint Protection	94	47	38	15	85
MalwareBytes Endpoint Security	70	56	15	29	71

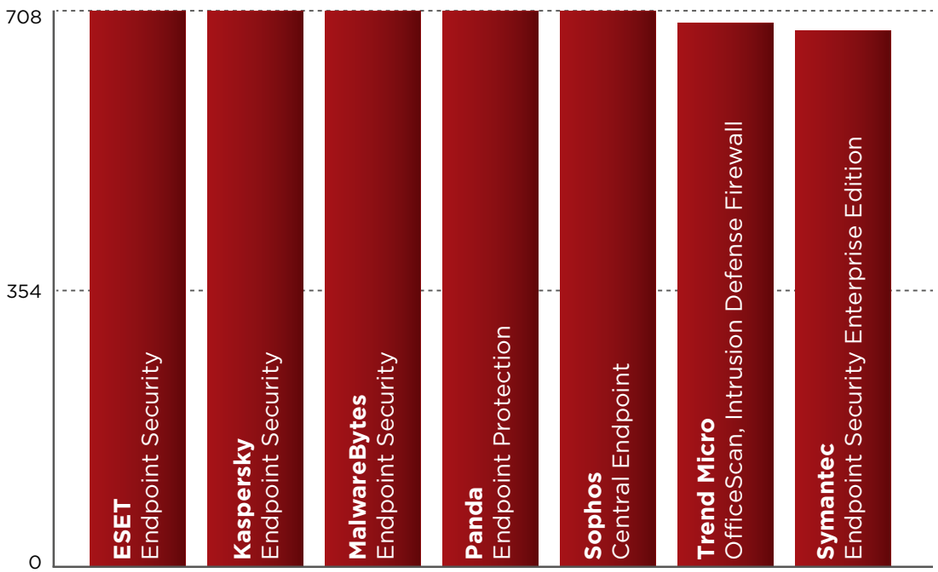
5. LEGITIMATE SOFTWARE RATINGS

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 5.3 Accuracy ratings on page 15.

Legitimate Software Ratings



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

LEGITIMATE SOFTWARE RATINGS		
Product	**Legitimate Accuracy Rating**	**Legitimate Accuracy (%)**
ESET Endpoint Security	708	100%
Kaspersky Endpoint Security	708	100%
MalwareBytes Endpoint Security	708	100%
Panda Endpoint Protection	708	100%
Sophos Central Endpoint	708	100%
Trend Micro OfficeScan, Intrusion Defense Firewall	692	98%
Symantec Endpoint Security Enterprise Edition	683	96%

5.1 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.

Interaction Ratings

	None (allowed)	Click to allow (default allow)	Click to allow/block (no recommendation)	Click to block (default block)	None (blocked)	
Object is safe	2	1.5	1			**A**
Object is unknown	2	1	0.5	0	-0.5	**B**
Object is not classified	2	0.5	0	-0.5	-1	**C**
Object is suspicious	0.5	0	-0.5	-1	-1.5	**D**
Object is unwanted	0	-0.5	-1	-1.5	-2	**E**
Object is malicious				-2	-2	**F**
	1	2	3	4	5	

Products that do not bother users and classify most applications correctly earn more points than those that ask questions and condemn legitimate applications.

INTERACTION RATINGS			
Product	**None (Allowed)**	**Click to Block (Default Block)**	**None (Blocked)**
ESET Endpoint Security	100	0	0
Kaspersky Endpoint Security	100	0	0
MalwareBytes Endpoint Security	100	0	0
Panda Endpoint Protection	100	0	0
Sophos Central Endpoint	100	0	0
Trend Micro OfficeScan, Intrusion Defense Firewall	99	0	1
Symantec Endpoint Security Enterprise Edition	96	3	1

5.2 Prevalence Ratings

There is a significant difference between an 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.

LEGITIMATE SOFTWARE PREVALENCE RATING MODIFIERS	
Impact Category	**Rating Modifier**
Very high impact	5
High impact	4
Medium impact	3
Low impact	2
Very low impact	1

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 anti-malware products to flag adware. We remove 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 Alexa.com's global traffic ranking system.

5.3 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

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 x 3 = 6

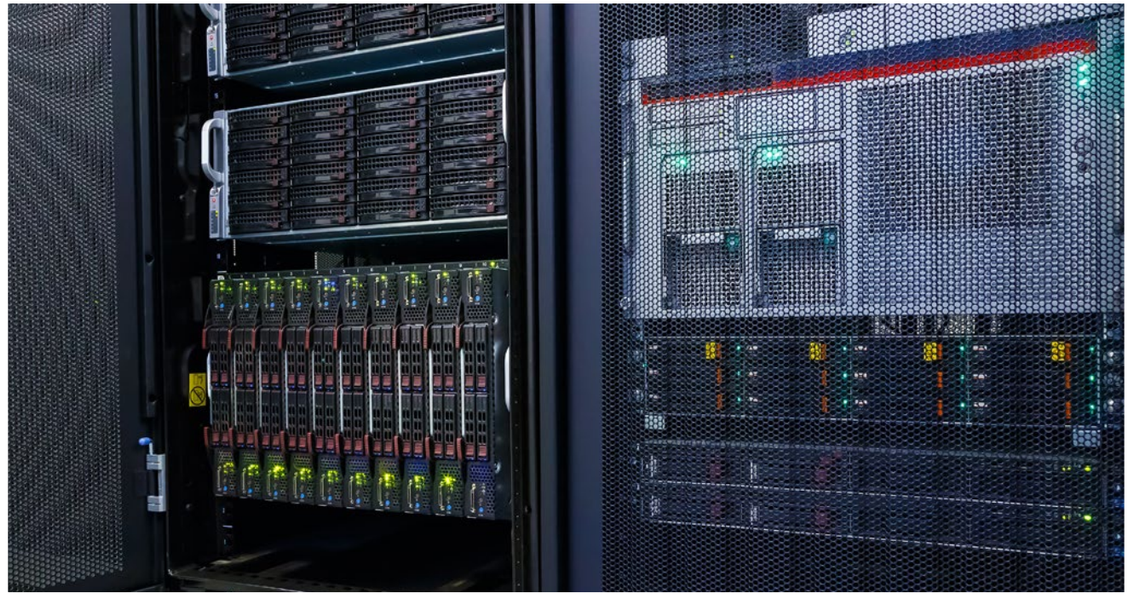
This same calculation is made for each legitimate application/site in the test and the results are summed and used to populate the graph and table shown under 5. Legitimate Software Ratings on page 12.

5.4 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**
Very high impact	23
High impact	39
Medium impact	17
Low impact	11
Very low impact	10
Grand total	**100**



6. CONCLUSIONS

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 spreading through email were delivered to our target systems as emails.

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

Consequently, it's not a shock to see all products handle the email threats very effectively.
Panda was notable in its struggle to handle these. By and large the malicious websites were also ineffective, although there were a few that evaded detection. **Malwarebytes** was particularly weak in handling these in comparison to the competition. Targeted attacks were also handled well by most but caused some significant problems for the products from **Panda** and **MalwareBytes**.

Symantec Endpoint Security blocked all of the public and targeted attacks. It blocked four legitimate applications, though, so it lost a few points – but not enough to move it from the number one spot.

Kaspersky Endpoint Security came a very close second. This is because it made no mistakes with the legitimate software and protected against 96 per cent of the threats. In the cases where it was compromised (with targeted attacks), it detected the attack and removed the threat, although we were still able to hack the system even after the initial malicious file was removed.

Sophos Central Endpoint takes third place, coming in a very slightly under the leading two products. It was compromised more often than **Kaspersky's** product but detected 99 per cent of the threats. **ESET Endpoint Security** neutralised a couple more times than **Sophos's** product so its overall accuracy rating drops slightly below, but there's little to it.

MalwareBytes scored the lowest and failed to achieve a rating. It tended to neutralise, rather than block threats, and missed most of the targeted attacks.

The leading products from **Symantec** and **Kaspersky Lab** win **AAA** awards.

APPENDICES

APPENDIX A: Terms Used

TERM	MEANING
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 B: FAQs

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

- The products chosen for this test were selected by SE Labs.
- The test was not sponsored. This means that no security vendor has control over the report's content or its publication.
- The test was conducted between 26th September and 6th December 2017
- All products had full internet access and were confirmed to have access to any required or recommended back-end systems. This was confirmed, where possible, using the Anti-Malware Testing Standards Organization (AMTSO) **Cloud Lookup Features Setting Check**.
- Malicious URLs and legitimate applications and URLs were independently located and verified by SE Labs.
- Targeted attacks were selected and verified by SE Labs. They were created and managed by Metasploit Framework Edition using default settings. The choice of exploits was advised by public information about ongoing attacks. One notable source was the **2016 Data Breach Investigations Report** from Verizon.
- Malicious and legitimate data was provided to partner organisations once the full test was complete.
- SE Labs conducted this endpoint security testing on physical PCs, not virtual machines.

Q I am a security vendor. How can I include my product in your test?

A Please contact us at info@SELabs.uk. We will be happy to arrange a phone call to discuss our methodology and the suitability of your product for inclusion.

Q I am a security vendor. Does it cost money to have my product tested?

A We do not charge directly for testing products in public tests. We do charge for private tests.

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

A Partner organisations support our tests by paying for access to test data after each test has completed but before publication. Partners can dispute results and use our awards logos for marketing purposes. We do not share data on one partner with other partners. We do not currently partner with organisations that do not engage in our testing.

Q So you don't share threat data with test participants before the test starts?

A No, this would bias the test and make the results unfair and unrealistic.

Q 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?

A We are willing to share small subsets of data with non-partner participants at our discretion. A small administration fee is applicable.

APPENDIX C: Product Versions

A product's update mechanism may upgrade the software to a new version automatically so the version used at the start of the test may be different to that used at the end.

PRODUCT VERSIONS		
Provider	**Product Name**	**Build Version**
ESET	ESET Endpoint Security	6.4.2014 , Database: 1093
Kaspersky	Kaspersky Endpoint Security	10.3.0.6294
MalwareBytes	MalwareBytes Endpoint Security	1.80.2.1012
Panda	Panda Endpoint Protection	7.70.0 Agent Version: 7.80.0
Sophos	Central Endpoint	11.5.9
Symantec	Symantec Endpoint Security Enterprise Edition	14.0.1904.0000
Trend Micro	Trend Micro OfficeScan, Intrusion Defense Firewall	12.0.1863

APPENDIX D: AttackTypes

The table below shows how each product protected against the different types of attacks used in the test.

ATTACK TYPES				
Product	**Web Download**	**Targeted Attack**	**Email Attack**	**Protected (total)**
Symantec Endpoint Security Enterprise Edition	50	25	25	100
Kaspersky Endpoint Security	50	21	25	96
ESET Endpoint Security	50	20	23	93
Sophos Central Endpoint	50	18	24	92
Trend Micro OfficeScan, Intrusion Defense Firewall	48	21	23	92
Panda Endpoint Protection	49	16	20	85
MalwareBytes Endpoint Security	42	6	23	71