SE Labs

INTELLIGENCE-LED TESTING

www.SELabs.uk info@SELabs.uk @SELabsUK www.facebook.com/selabsuk blog.selabs.uk

SMALL BUSINESS ENDPOINT PROTECTION

JAN - MAR 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 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.

CONTENTS

Document version 1. 0. Written 7th April 2017

SIMON EDWARDS
Director

WEBSITE www.SELabs.uk
TWITTER @SELabsUK
EMAIL info@SELabs.uk
FACEBOOK www.facebook.com/selabsuk
BLOG blog.selabs.uk
PHONE 0203 875 5000
POST ONE Croydon, London, CR0 0XT

TESTING TEAM
Thomas Bean
Dimitar Dobrev
Stefan Dumitrascu
Gia Gorbold
Magdalena Jurenko
Jon Thompson
Jake Warren
Stephen Withey

IT SUPPORT
Danny King-Smith
Chris Short

PUBLICATION
Steve Haines
Colin Mackleworth

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

INTRODUCTION

Endpoint security is an important component of computer security, whether you are a home user, a small business or running a massive company. But it's just one layer.

Using multiple layers of security – including a firewall, anti-exploit technologies built into the operating system and virtual private networks (VPNs) when using third-party Wi-Fi – is important, too.

Many people don't realise that anti-malware software often contains its own layers of protection. Threats can come at you from many different angles, which is why security vendors try to block and stop them using a whole chain of approaches.

For example, consider a malicious website that will infect victims automatically when they visit the site. Such 'drive-by' threats are common and make up about one third of this test's set of attacks. You visit the site with your browser and it exploits a vulnerability on your computer, before installing malware – possibly ransomware, a type of malware that also features prominently in this test.

Here's how the layers of endpoint security can work. The URL (web link) filter might block you from visiting the dangerous site. If that works, you're safe and nothing else need be done. But say this layer of security crumbles, and the system is exposed to the exploit. Maybe the product's anti-exploit technology prevents the exploit from running or, at least, running fully? If so, great. If not, the threat will likely download the ransomware and try to run it.

At this stage file signatures may come into play. Additionally, the malware's behaviour can be analysed. Maybe it is tested in a virtual sandbox first. Different vendors use different approaches. Ultimately the threat has to move down through a series of layers of protection in all but the most basic of 'anti-virus' products.

The way we test endpoint security is realistic and allows all layers of its protection to be tested.

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.

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.

Products tested

PRODUCT	PROTECTION ACCURACY RATING	LEGITIMATE ACCURACY RATING	TOTAL ACCURACY RATING
Kaspersky Small Office Security	100%	100%	100%
Sophos Endpoint Protection	100%	100%	100%
Symantec Endpoint Protection Cloud	100%	100%	100%
ESET Endpoint Security	99%	100%	100%
Trend Micro Worry-Free Security Services	82%	100%	94%
Microsoft System Center Endpoint Protection	35%	98%	78%

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...**
Most products were capable of handling public web-based threats such as those used by criminals to attack Windows PCs and install ransomware automatically, without having to trick a user into clicking an install button.

- **...but targeted attacks posed more of a challenge**
While most of the products were also competent at blocking more targeted, exploit-based attacks, a couple were less effective. One product, from Microsoft, failed to stop eight out of the 25 targeted attacks.

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

- **Which products were the most effective?**
Kaspersky Lab, Sophos, ESET and Symantec products achieved the best 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, 7th April 2017

1. TOTAL ACCURACY RATINGS

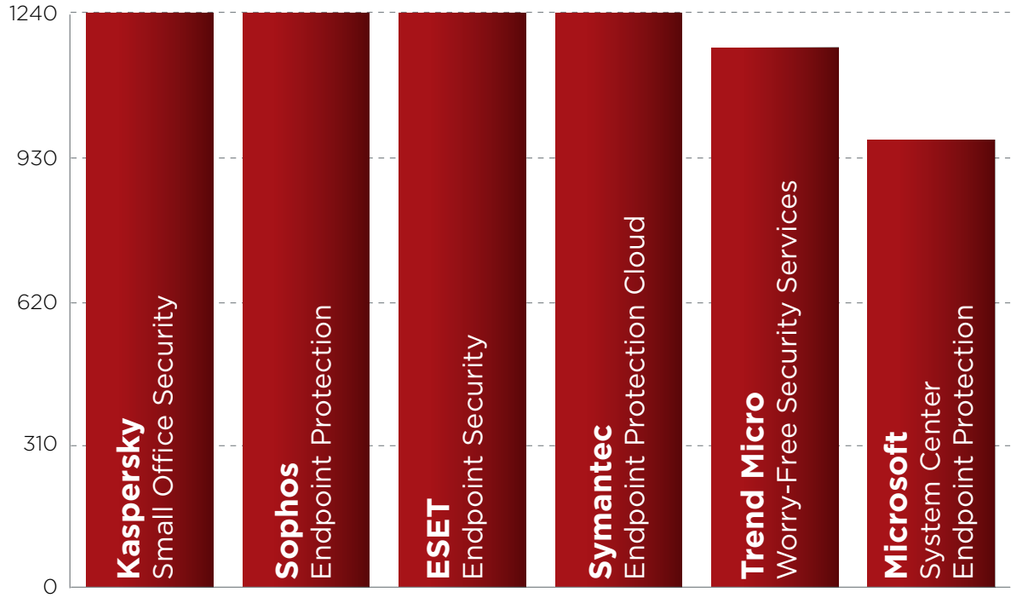
Judging the effectiveness of an endpoint security product is a subtle art, and many factors are at play when assessing how well it performs. To make things easier we've combined all the different results from this report into one easy-to-understand graph.

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:

- Kaspersky Small Office Security
- Sophos Endpoint Protection
- ESET Endpoint Security
- Symantec Endpoint Protection Cloud

- Trend Micro Worry-Free Security Services

- Microsoft System Center Endpoint Protection

TOTAL ACCURACY RATINGS

Product	Total Accuracy Rating	Total Accuracy (%)	Award
Kaspersky Small Office Security	1240	100%	AAA
Sophos Endpoint Protection	1239	100%	AAA
ESET Endpoint Security	1236	100%	AAA
Symantec Endpoint Protection Cloud	1235	100%	AAA
Trend Micro Worry-Free Security Services	1165	94%	AA
Microsoft System Center Endpoint Protection	965	78%	C

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.

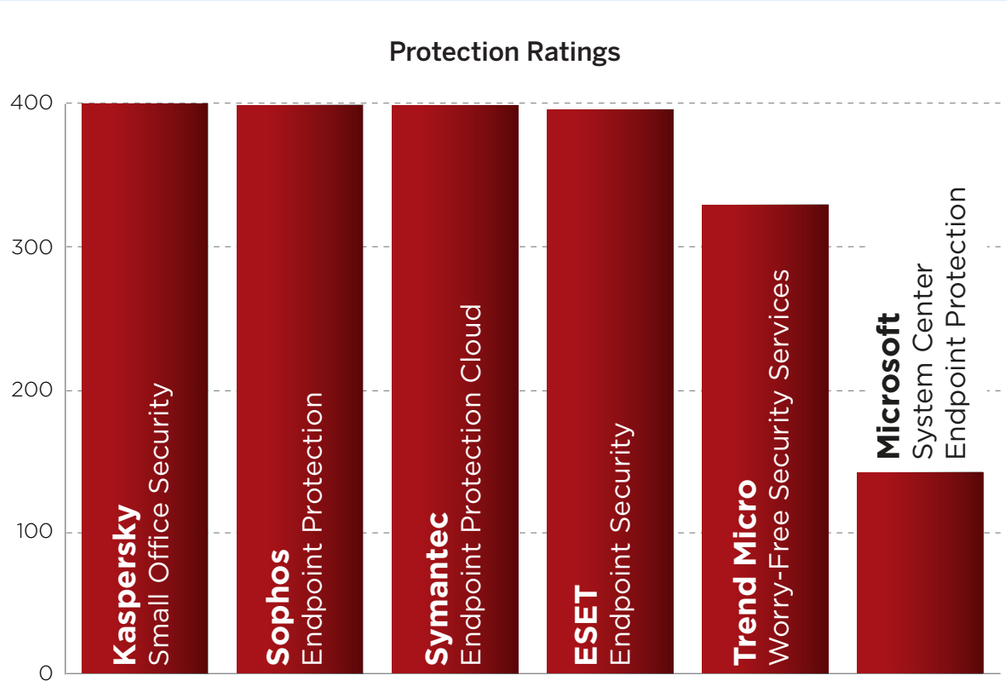
- **Detected (+1)**
If the product detected the threat with any degree of useful information, we award it one point.

- **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 compromised 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 simple and 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.

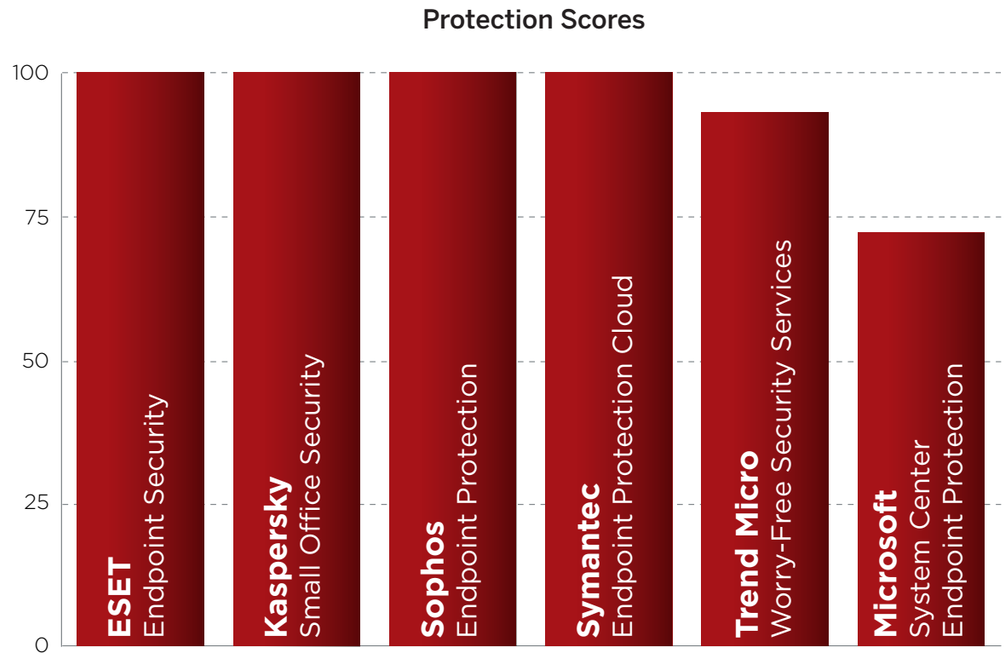
PROTECTION RATINGS		
Product	**Protection Rating**	**Protection Rating %**
Kaspersky Small Office Security	400	100%
Sophos Endpoint Protection	399	100%
Symantec Endpoint Protection Cloud	399	100%
ESET Endpoint Security	396	99%
Trend Micro Worry-Free Security Services	329	82%
Microsoft System Center Endpoint Protection	141	35%

Average: 86%

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.



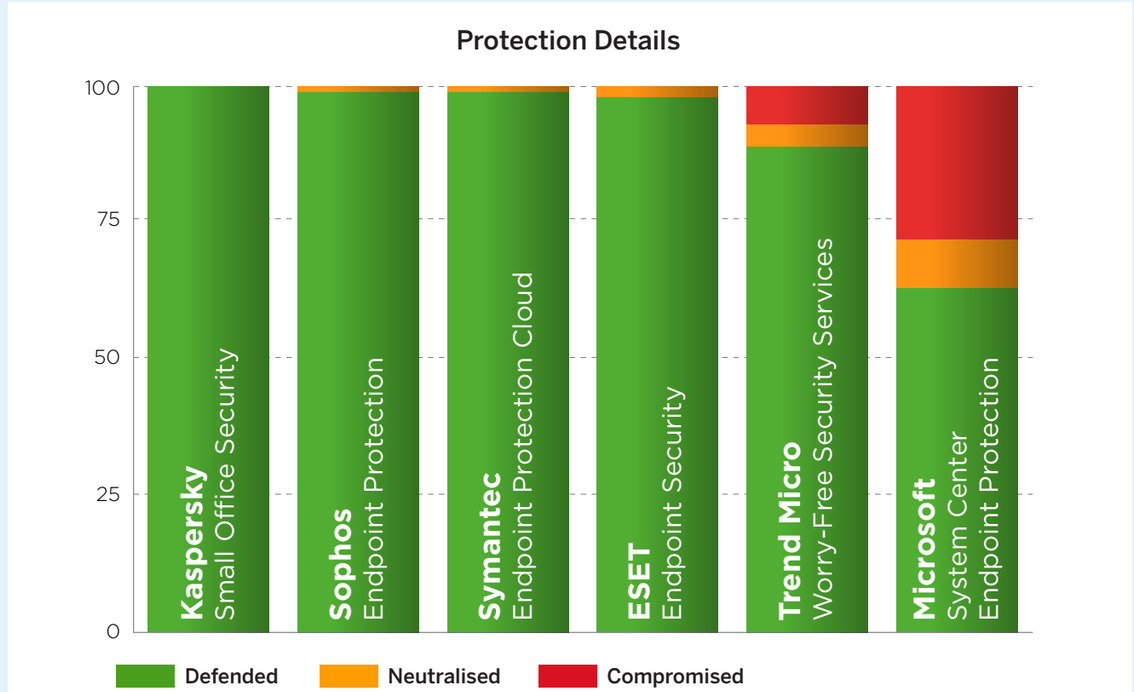
Protection Scores are a simple count of how many times a product protected the system.

PROTECTION SCORES	
Product	**Protection Score**
ESET Endpoint Security	100
Kaspersky Small Office Security	100
Sophos Endpoint Protection	100
Symantec Endpoint Protection Cloud	100
Trend Micro Worry-Free Security Services	93
Microsoft System Center Endpoint Protection	72

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 are not 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 some detail how each product handled the threats used.

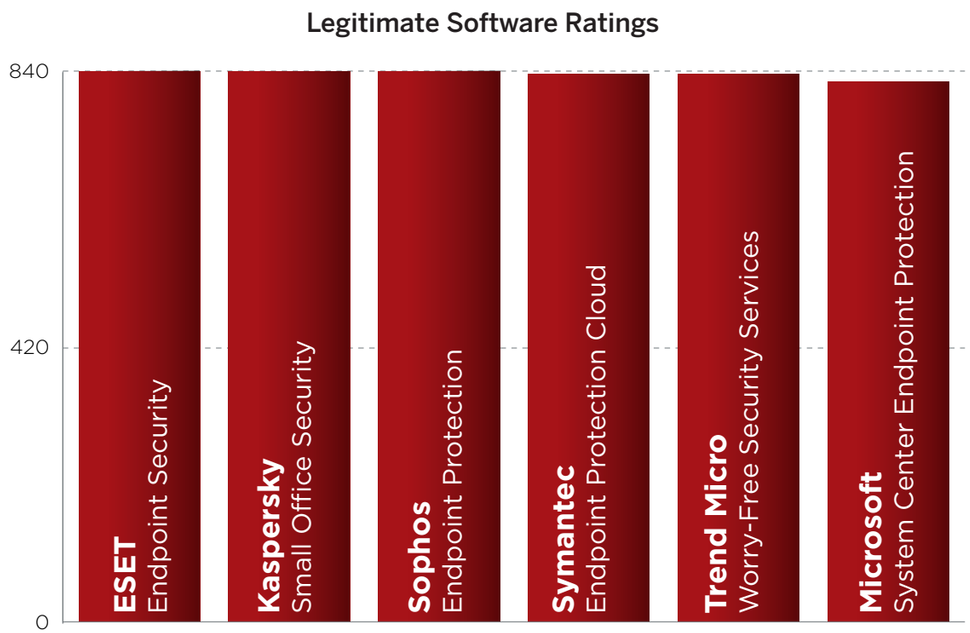
PROTECTION DETAILS					
Product	**Detected**	**Blocked**	**Neutralised**	**Compromised**	**Protected**
Kaspersky Small Office Security	100	100	0	0	100
Symantec Endpoint Protection Cloud	100	99	1	0	100
Sophos Endpoint Protection	100	99	1	0	100
ESET Endpoint Security	100	98	2	0	100
Trend Micro Worry-Free Security Services	90	89	4	7	93
Microsoft System Center Endpoint Protection	79	63	9	28	72

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

PROTECTION SCORES		
Product	**Legitimate Accuracy Rating**	**Legitimate Accuracy (%)**
ESET Endpoint Security	840	100%
Kaspersky Small Office Security	840	100%
Sophos Endpoint Protection	840	100%
Symantec Endpoint Protection Cloud	836	100%
Trend Micro Worry-Free Security Services	836	100%
Microsoft System Center Endpoint Protection	824	98%

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 with applications are quite rare in testing. In our experience it is unusual for a completely legitimate application to be classified as being '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 decides whether or not the application is safe. In such cases the product may make a recommendation to allow or block, but leave the ultimate decision to the user. 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

	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 Small Office Security	100	0	0
Sophos Endpoint Protection	100	0	0
Trend Micro Worry-Free Security Services	99	1	0
Microsoft System Center Endpoint Protection	99	0	1
Symantec Endpoint Protection Cloud	99	0	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 being 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 below.

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

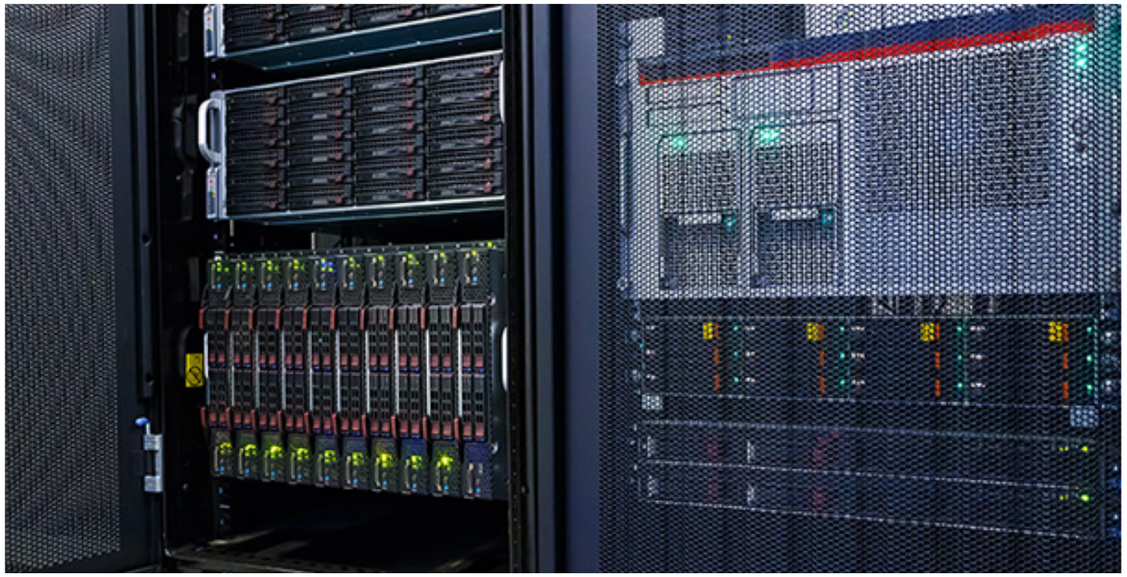
This same calculation is made for each legitimate application/site in the test, and the results are summed and used to populate the graph and table shown under 5. Legitimate Software Ratings on page 12.

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	57
High impact	24
Medium impact	8
Low impact	4
Very low impact	7
Grand total	**100**



6. CONCLUSIONS

Attacks in this test included infected websites available to the general public, including sites that automatically attack visitors and attempt to infect them without any social engineering or other interaction. Some sites relied on users being fooled into installing the malware. We also included targeted attacks, which were exploit-based attempts to gain remote control of the target systems.

When a product failed to protect its user in this test, the chances are the attack used an exploit. Most products handled web downloads very effectively. Targeted attacks caused the most problems, but one product (**Microsoft's**) struggled with the latest exploit kits out on the web.

Kaspersky Small Office Security blocked all of the public and targeted attacks. It also allowed 100 per cent the legitimate software and websites. It achieved the rare privilege of a 100 per cent total accuracy rating.

Sophos Endpoint Protection takes second place, coming in a hair's breadth away from Kaspersky. The only difference was that Sophos' product neutralised one threat. The practical difference is negligible and the table shows 100 per cent totally accuracy, a figure that is rounded up from 99.9 per cent.

ESET Endpoint Security protected against all of the threats. It neutralised one of the public web threats and one of the targeted attacks, and handled legitimate applications and websites without error.

Symantec Endpoint Protection Cloud was very effective when handling legitimate objects and blocked just one application. It was not compromised once but did neutralise one threat. It prevented all of the targeted attacks from infecting the system and blocked all of the web-based drive-by attacks, some of which were powered by criminals using exploit kits.

Trend Micro Worry-Free Security Services and **Microsoft System Center Endpoint Protection** were below average and allowed a significant number of compromises. **Trend Micro's** product failed to stop seven targeted attacks, while **Microsoft's** failed to stop eight, as well as a further 15 public drive-by attacks. Their largely accurate assessment of the legitimate applications and websites allows them to achieve a rating each.

The products from **Kaspersky Lab, Sophos, ESET** and **Symantec** win AAA awards for their strong overall performance. **Trend Micro's** product wins the AA award, while **Microsoft** achieved a C award.

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.

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 10th January and 3rd March 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 award 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		
Vendor	**Product**	**Build**
ESET	Endpoint Security	6.4.2014.0 Database: 15058
Kaspersky	Small Office Security	17.0.0.611 (c)
Microsoft	System Center Endpoint Protection	MSCEP 4.3.220.0 (Antimalware Client Version), 1.237.871.0 (Antivirus definition), 1.237.871.0 (Antispyware definition)
Sophos	Endpoint Protection	10.6.4.1150 (sophos anti-virus), 5.4.0.724 (sophos auto-update), 2.9.5 (sophos client firewall), 1.3.1 (sophos system protection)
Symantec	Endpoint Protection Cloud	22.8.1.14
Trend Micro	Worry-Free Security Services	6.0.1182/19.1.2957

APPENDIX D: ATTACK TYPES

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

ATTACK TYPES				
Product	**Targeted attack**	**Web drive-by**	**Web download**	**Protected (total)**
Symantec Endpoint Protection Cloud	25	31	44	100
Sophos Endpoint Protection	25	31	44	100
Kaspersky Small Office Security	25	31	44	100
ESET Endpoint Security	25	31	44	100
Trend Micro Worry-Free Security Services	18	31	44	93
Microsoft System Center Endpoint Protection	17	16	39	72