ENDPOINT PROTECTION

FORTINET FORTICLIENT V6.2.2

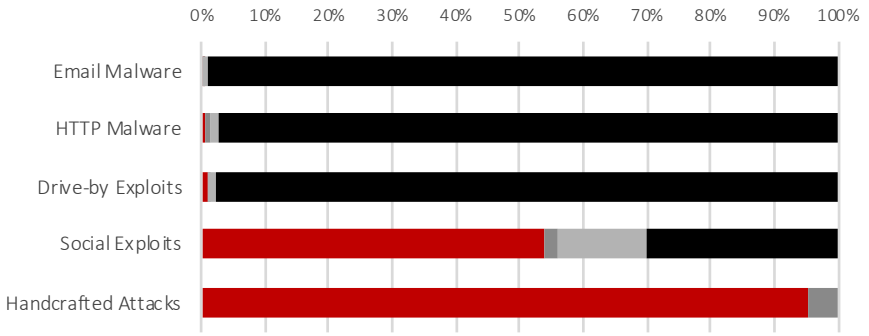
Q1 2020 PRODUCT RATING

A

Overview & Outlook

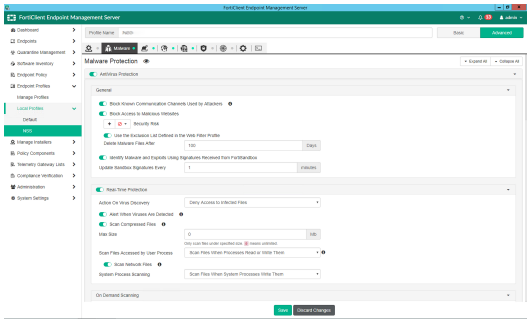
During Q1, 2020, NSS Labs performed an independent test of the Fortinet FortiClient v6.2.2.

Comprehensive, robust management. Overall protection impressive; low false positive rate; excellent resistance to evasion. Excellent malware protection; excellent drive-by exploit protection. Room for improvement defending against social exploits; poor protection against handcrafted (targeted) attacks.



Summary of Results

MANAGEMENT A



Deployment of the FortiClient was without drama and ongoing operational tasks were easy to carry out.

The management console supports role-based access control (RBAC) and comprehensive third-party authentication through Active Directory or SAML. We found it to be straightforward to define and save multiple security policies, which we then applied to groups. Policies can be created directly from the centralized management or via an XML file, and they can be modified by selecting or deselecting options. Customization of policy is limited to exclusions, (whitelisting or blacklisting files and URLs); no other customizations are available.

Inheritance (nested rules) is fully supported. Logging is robust, and the use of standardized logging and reporting formats facilitated fast and accurate consumption of data. The system provided built-in reports, including industry-standard reports for compliance, as well as the ability to generate custom reports. Alerts and logs are sent to the Enterprise Management Server (EMS) and to FortiAnalyzer.

FALSE POSITIVE RATE 4/645 (0.6%) AA

While the FortiClient's false positive rate of 0.6% is very good, it may introduce additional work for administrators in complex environments.

RESISTANCE TO EVASION 49/49 (100%) AAA

The endpoint protection was capable of detecting and blocking malware and exploits when subjected to numerous evasion techniques.

BLOCK RATE 2,222/2,282 (97.37%) A

ATTACKS	RATING	BLOCKED ON DOWNLOAD	BLOCKED ON EXECUTION	TOTAL BLOCKED	DETECTED	UNBLOCKED & UNDETECTED
Email Malware	AA	1,517	12	1,529	1	1
HTTP Malware	AA	412	6	418	3	3
Drive-by Exploits	AA	250	3	253	1	2
Social Exploits	B	15	7	22	1	27
Handcrafted Attacks	D	-	-	-	1	20
TOTAL	A	**2,194**	**28**	**2,222**	**7**	**53**
				97.37%	**0.31%**	**2.32%**

Results indicate that the product is highly capable of protecting against the vast majority of classic malware attacks and performs well against drive-by exploits. However, there was room for improvement defending against social exploits, and the product was unable to protect against handcrafted (targeted) attacks, blocking 0 of 21 attacks.

TOTAL COST OF OWNERSHIP $64,935

Expected Costs (2,500 Agents)	
Initial Purchase Price	$21,645
Annual Cost of Support/Maintenance	$0
Other Annual Cost (AV, IPS, Cloud, etc.)	$0
3-Year Total Cost of Ownership	**$64,935**
Total Cost Year 1	$21,645
Total Cost Year 2	$21,645
Total Cost Year 3	$21,645

Testing was based on the Advanced Endpoint Protection Test Methodology v4.0 (available at www.nsslabs.com)

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Security

The threat landscape is evolving constantly; attackers are refining their strategies and increasing both the volume and complexity of their attacks. Enterprises now are having to defend against everyday cybercriminal attacks as well as targeted attacks and even the rare advanced persistent threats (APTs). For this reason, we tested using multiple commercial, open-source, and proprietary tools to employ attack methods that are currently being used by cybercriminals and other threat actors. We increased the levels of difficulty as we tested, beginning with common attacks, escalating to targeted attacks, and then applying obfuscation techniques to see if we could evade defenses. We then recorded whether the endpoint protection blocked and logged threats accurately and how frequently it triggered false positives.

Tuning and False Positives

Blocked	Detected	Rating
3/645 (0.5%)	1/645 (0.2%)	AA

This test includes a varied sample of legitimate application traffic that may be falsely identified as malicious (also known as false positives). As part of the initial setup, we tuned the endpoint protection as it would be by a customer. Every effort was made to eliminate false positives while achieving optimal security effectiveness and performance, as would be the aim of a typical customer deploying the device in a live network environment. To ensure that the vendor did not deploy unrealistic (overly aggressive) security policies that blocked access to legitimate software and websites, we tested the endpoint protection against 645 false positive samples, including but not limited to the following file formats: .exe, .jar, .xls, .xlsm, .accdb, .css, .pdf, .doc, .docx, .zip, .DLL, .js, xls, .chm, .rar, .lnk, .cur, .xrc., .slk, .ppt, pptx, .iqy, .htm.

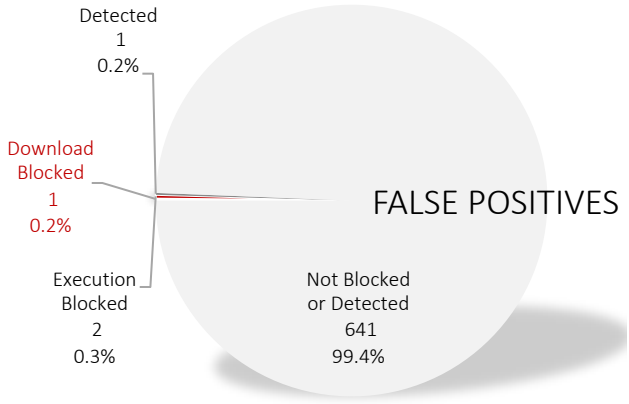


Figure 1 – False Positives

Resistance to Evasions

Blocked	Detected	Missed	Rating
49/49 (100.0%)	-	-	AAA

Threat actors apply evasion techniques to disguise and modify attacks at the point of delivery in order to avoid detection by security products. Therefore, it is imperative that endpoint protection correctly handles evasions. If an endpoint protection platform fails to detect a single form of evasion, an attack can bypass protection.

Our engineers verified that the endpoint protection was capable of detecting and blocking malware when subjected to numerous evasion techniques. To develop a baseline, we took several attacks that had previously been detected and blocked. We then applied evasion techniques to those baseline samples and tested. This ensured that any misses were due to the evasions and not the underlying (baseline) attacks.

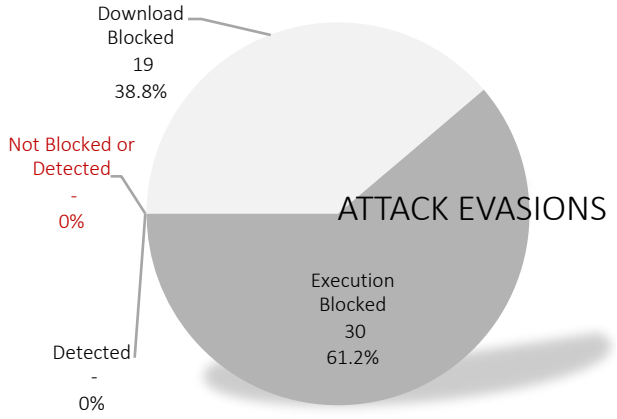


Figure 2 – Resistance to Evasions

For example, we applied an evasion technique called *process injection* where the original file is extracted from the binary and code is injected into a legitimate/trusted target process (i.e., Google Chrome). The malicious execution then occurs under the context of the target process (Chrome). Once these process injections techniques ran, we tried to further elude the detection by introducing anti-sandbox/anti-discovery evasions that employed techniques to determine whether or not the malware was on a user's machine; whether or not a security product was present; whether or not debugging or sandboxing was occurring; etc.

Malware Delivered over Email

Blocked	Detected	Missed	Rating
1,529/1,531 (99.9%)	1/1,531 (0.1%)	1/1,531 (0.1%)	AA

One of the most common ways in which users are compromised is through malware delivered over email. For several years, the use of social engineering has accounted for the bulk of cyberattacks against consumers and enterprises. Socially engineered malware attacks often use a dynamic combination of social media, hijacked email accounts, false notification of computer problems, and other deceptions to encourage users to download malware. One well-known social engineering attack method is spear phishing. Cybercriminals use hijacked email accounts to take advantage of the implicit trust between contacts and deceive victims into believing that the sender is trustworthy. The victim is tricked into opening the email attachment, which then launches the malicious malware program.

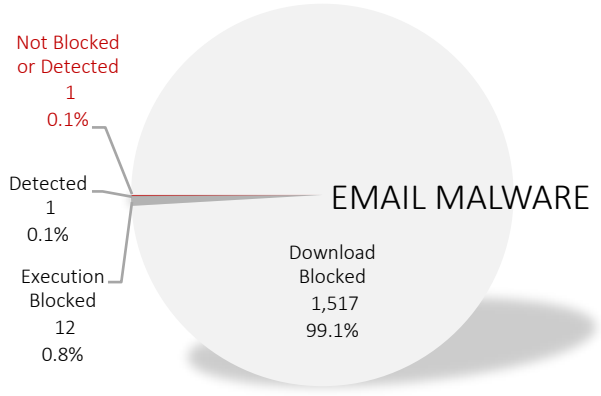


Figure 3 – Malware Delivered over Email

To test how well the endpoint protection is able to protect against this type of attack, malware was emailed to the user. The desktop client then retrieved the email and opened/executed the malware. If the malware was blocked, the corresponding time was recorded. We deployed a CentOS 7.7.1908 Linux mail store with kernel 3.10.0-957.5.1.el7.x86_64 running Dovecot v2.2.36 for IMAP as the mail server. Victim machines consisted of a combination of 32-bit and 64-bit Windows 7 endpoints and 64-bit Windows 10 endpoints.

Malware Delivered over HTTP

Blocked	Detected	Missed	Rating
418/424 (98.6%)	3/424 (0.7%)	3/424 (0.7%)	AA

One of the more widespread threats to the enterprise involves attackers using websites to deliver malware. In these web-based attacks, the user is deceived into downloading and executing malware. For example, an employee may be tricked into downloading and installing a malicious application that claims it will “speed up your PC.”

In cases where an attacker is aiming for a large number of victims, the attacker may hijack widely used reputable websites to distribute the malware. However, in cases where an attacker plans to target specific individuals, the attacker typically would use an industry-specific “watering hole” plus one or more social engineering techniques to deceive a user into unknowingly installing malware.

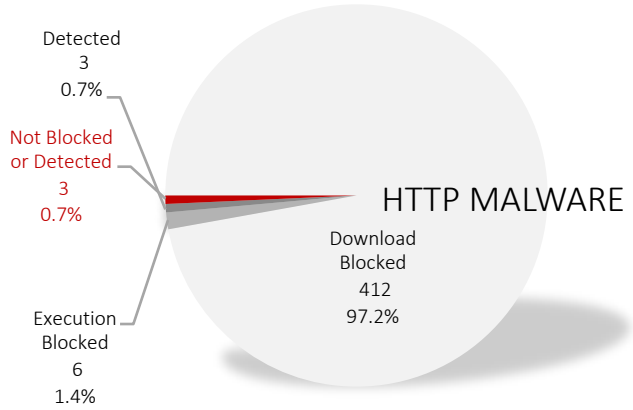


Figure 4 – Malware Delivered over HTTP

We tested the capability of the endpoint protection to protect against malware that was downloaded over HTTP and then executed (if the download was not blocked) using 424 malware samples against live victim machines running a combination of 32-bit and 64-bit Windows 7 endpoints and 64-bit Windows 10 endpoints, with various versions of Google Chrome, Mozilla Firefox, Microsoft Internet Explorer, and Microsoft Edge. Browser reputation systems were disabled so that the endpoint protection was not inadvertently credited for protection offered by a web browser.

Drive-by Exploits

Blocked	Detected	Missed	Rating
253/256 (98.8%)	1/256 (0.4%)	2/256 (0.8%)	AA

While there are millions (or hundreds of millions) of malware samples in circulation at any given point in time, they are frequently delivered by exploits that target consumer desktops known as drive-by exploits.

In a drive-by exploit, an employee visits a website containing malicious code that exploits the user's computer and installs malware without the knowledge or permission of the user. An example of this would be where an employee visits WSJ.com (Wall Street Journal), which is inadvertently hosting an advertisement that contains an exploit. Another example (that we frequently observe in the wild) is where a user navigates to a URL and then is re-directed without interaction to a web page serving malicious content. Using this technique, a single exploit can silently deliver and install millions of malware samples to unsuspecting victims' computers.

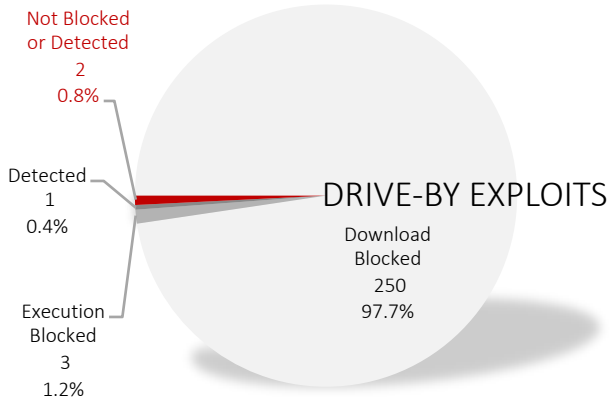


Figure 5 – Drive-by Exploits

To test how well the solution was able to protect against drive-by exploits, victim machines were deployed running 32-bit Windows 7 (version 6.1 (Build 7601: SP1) and 64-bit Microsoft Windows 10 (version 1709 (Build: 16299.15) with Microsoft Office (Office 16.0.7341.2032) and various versions of Google Chrome, Mozilla Firefox, Microsoft Internet Explorer, and Microsoft Edge. Depending on the victim machine, one or more of the following applications was installed: Java 8 Update 231, Microsoft Silverlight 5.1.20125, Adobe Flash Player 18.0.0.160, Adobe Reader DC 2017.012.20093, Adobe Reader 9.40, Java 6 Update 27, Adobe Flash Player 32.0.0.238, Java 8 Update 221, Microsoft Silverlight 5.1.50918, Adobe Flash Player 32.0.0.223, Java 8 Update 211, Adobe Flash Player 32.0.0.207, Internet Explorer 11, Internet Explorer 10, and Internet Explorer 9. Browser reputation systems were disabled so that the endpoint protection was not inadvertently credited for protection offered by a web browser.

While vulnerabilities are patched and defenses against exploits incorporated into new versions of operating systems (i.e., Windows), many organizations cannot easily upgrade due to financial, technical, or other constraints. As of January 2020, NetMarketShare[1] reports OS market share for Windows 7 (released 11 years ago in 2009) at 25.56% and for Windows 10 (released in 2015) at 57.08%.

Research has shown that oftentimes the most valuable assets have the most stringent change control to avoid business interruption. This creates a challenging dynamic whereby the most valuable assets tend to be the most difficult to defend (e.g., older OS, unpatched, etc.). Therefore, as vulnerabilities are patched and defenses against exploits are incorporated into new versions of operating systems (i.e., Windows)—which makes exploitation of computers more difficult—the value of endpoint protection is often associated with its ability to protect older, unpatched, and generally more vulnerable systems.

[1] https://netmarketshare.com

Social Exploits

Blocked	Detected	Missed	Rating
22/50 (44.0%)	1/50 (2.0%)	27/50 (54.0%)	B

Social exploits combine social engineering (manipulating people into doing what you want them to do) and exploitation (malicious code designed to take advantage of existing deficiencies in hardware or software systems, such as vulnerabilities or bugs). An example of this would be an email with "Your Bonus" as a subject line and containing a malicious spreadsheet labeled "bonus.xlsx" (which the employee opens).

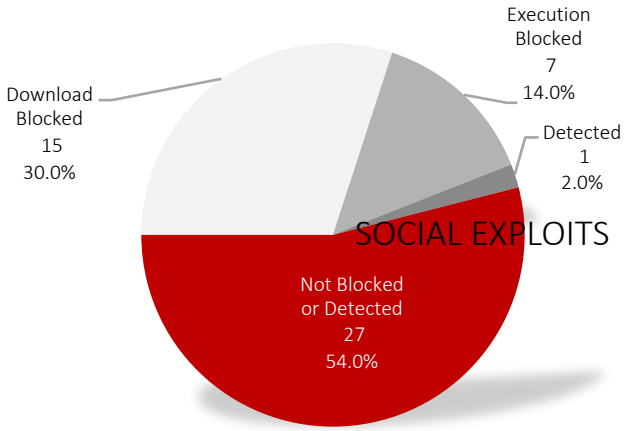


Figure 6 – Social Exploits

As with drive-by exploits, these attacks are limited to specific operating systems and/or applications. However, the exploits contained within Excel spreadsheets or Word documents may target kernel functions or common functions such as object handling, which provides attackers with a wide attack surface. As such, sending social exploits through mass email (phishing), could yield profit as the number of victims would be large, albeit smaller than in the case of malware since exploits would have technical dependencies.

To test how well the product was able to protect against social exploits, we deployed 19 victim machines. All of the machines were running Windows 10 version 1709 (OS Build 16299.15). Machines were configured with Internet Explorer 11 (version 11.15.16299.0 – Update Version 11.0.47) and Microsoft Office 2016 (version 16.0.7431.2032).

Handcrafted (Targeted) Attacks

Blocked	Detected	Missed	Rating
0/21 (0%)	1/21 (4.8%)	20/21 (95.2%)	D

The aim of this test was to see which endpoint products were able to protect customers while under adverse conditions dictated by the attacker. In this case, we wanted to find out which products could block new handcrafted (unknown) malware while being prevented from accessing cloud services.

What happens, for example, if an employee goes on a business trip to China where Internet traffic is tightly controlled? In such a scenario, access to the corporate VPN is likely blocked and the security software on the employee's laptop may not be able to receive updates or communicate in general. What happens if the employee's laptop is attacked with targeted malware?

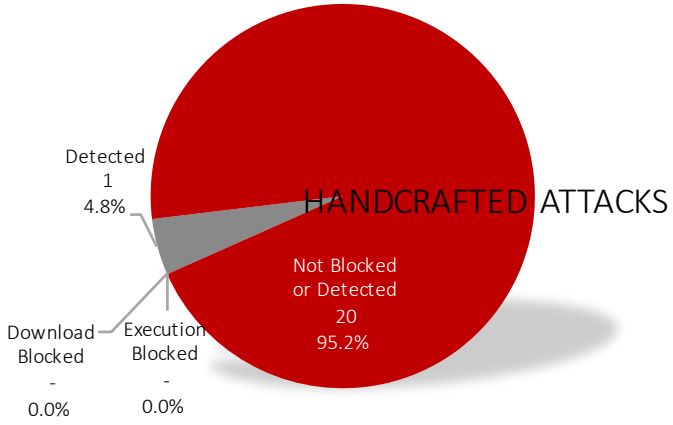


Figure 7 – Handcrafted (Targeted) Attacks

For the purposes of this test, handcrafted (targeted) malware was created by modifying the source code of keyloggers, ransomware, and destructoware, and then recompiling the binary so that it was new to the products being tested. We then attempted to infect a host (e.g., a laptop) with the malware and recorded whether or not the endpoint protection blocked the attack.

Because creating samples in this manner is a painstaking and time-consuming exercise, we tested only a handful of targeted samples; results should be viewed with this in mind.

Central Management is available using both a thick and thin client; we used the thick client for testing.

Management & Reporting Capabilities

Rating

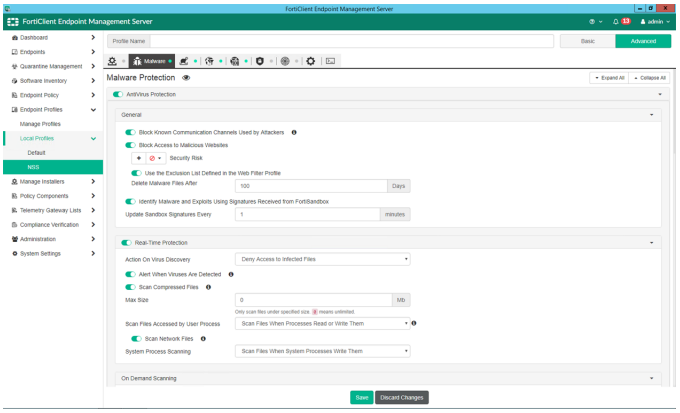
A

Authentication

The management console supports role-based access control (RBAC) with the following users: Super Administrator, Restricted Administrator, Standard Administrator, Endpoint Administrator, and Read-only Administrator. The system supports third-party authentication via Active Directory and SAML.

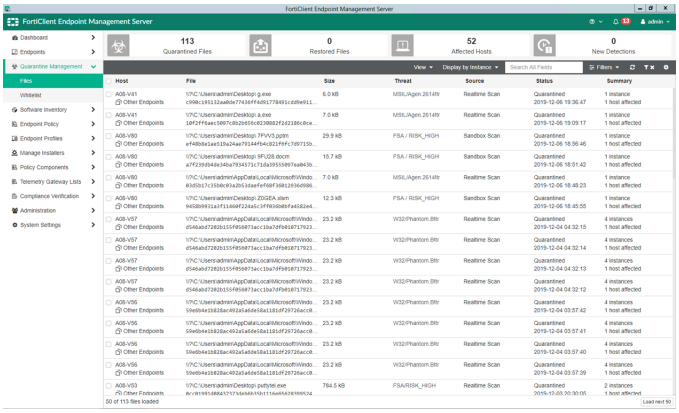
Policy

The management system supports creating and saving multiple security policies via either a basic or advanced view. Administrators then create groups and apply policies, which are easily configured from the GUI by either selecting or deselecting options. Other than exclusions, (whitelisting or blacklisting files and URLs), customizations cannot be created in the policy, and bulk operations are not supported. Policy diffs are not supported natively in the system; however, an administrator can save the XML produced when a policy is created and use that to track policy diffs.



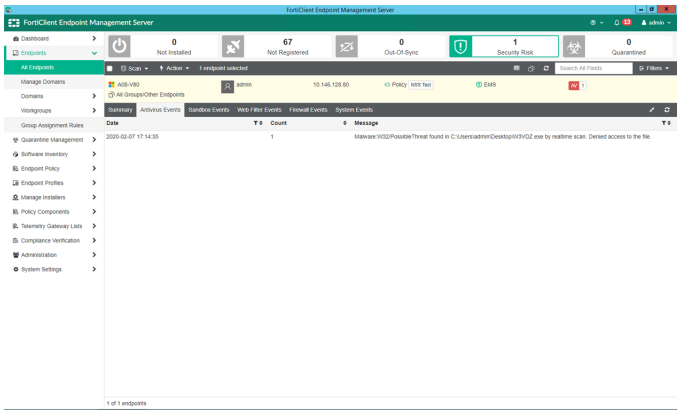
Logging

Logging is limited in the Fortinet EMS. Files that have been quarantined and whitelisted can be viewed under the Quarantine Management menu of the management server. Applications installed in the environment can be viewed in the environment at a macro level or on a per-host basis.



Alert Handling

All alerts are delivered to, and handled by, a single management console. Alerts can be viewed by selecting an endpoint and viewing alerts specific to that machine. Alert handling is minimalistic by design; the system's approach to alert handling is largely reliant on third-party tools, which can access the logging and alert handling system through different logging formats, such as syslog. Administrators are unable to group alerts or search for similar alerts across the environment via the UI; it is not possible to search for a threat via a file name or hash for example.



Reporting

FortiAnalyzer provides summary reporting on all alerts in a single central management console. It provides built-in reports covering typical requirements such as a list of top attacks, top source/destination IP addresses, top targets, top applications etc., and it supports reporting format standards such as syslog.

The system includes a report generator that provides the ability to construct complex data filters in a search form and summarize alerts on the specified search criteria to fully customize a report. Reports are exportable as PDF and can be generated on demand, scheduled for delivery, or saved for subsequent use.

Change Control

Change control, rollback, and revision history are unavailable.

Total Cost of Ownership (TCO)

Implementation of security solutions can be complex, with several factors affecting the overall cost of deployment, maintenance, and upkeep. All of the following should be considered over the course of the useful life of a product:

- Initial Purchase – The cost of acquisition
- Maintenance/Subscription – Fees paid to the vendor for ongoing use of software and access to updates
- Technical Support – Fees paid to the vendor for 24/7 support

3-Year Total Cost of Ownership

Calculations are based on vendor-provided pricing information. Where possible, the 24/7 maintenance and support option with 24-hour replacement is used, since this is the option typically selected by enterprise customers. Prices include the purchase and maintenance costs for 2,500 software agents

- Year 1 Cost is calculated by adding purchase price + first-year maintenance/support fees.
- Year 2 Cost consists only of maintenance/support fees.
- Year 3 Cost consists only of maintenance/support fees.

Expected Costs for <VENDOR> <PRODUCT> – 2,500 Agents	
Initial Purchase Price	$21,645
Annual Cost of Support/Maintenance	$0
Other Annual Cost (AV, IPS, Cloud etc.)	$0
3-Year Total Cost of Ownership	$64,935
Total Cost Year 1	$21,645
Total Cost Year 2	$21,645
Total Cost Year 3	$21,645

Figure 8 – 3-Year TCO (US$)

Test Environment

- BaitNET™ (NSS Labs Proprietary)
- 32-bit Microsoft Windows 7 (Version 6.1 (Build 7601: SP1)
- 64-bit Microsoft Windows 7 (Version 6.1 (Build 7601: SP1)
- 64-bit Microsoft Windows 10 (version 1607 (Build: 14393.0)
- 64-bit Microsoft Windows 10 (version 1709 (Build: 16299.15)
- Adobe Acrobat Reader 19.021.20061
- Adobe Flash Player 18.0.0.160
- Adobe Flash Player 32.0.0.207
- Adobe Flash Player 32.0.0.223
- Adobe Flash Player 32.0.0.238
- Adobe Reader 9.40
- Adobe Reader DC 2017.012.20093
- Google Chrome 78.0.3904.70
- Kali (Kernel release 4.19.0-kali1-amd64)
- Microsoft Internet Explorer 9.0.8112.16421
- Microsoft Internet Explorer 10.0.9200.16438
- Microsoft Internet Explorer 11.0.14393.0
- Microsoft Office Professional 2013 version 15.0.5119.1000 (Microsoft Word, Excel, PowerPoint, Access, etc.)
- Microsoft Office Professional 2016 version 16.0.7341.2032 (Microsoft Word, Excel, PowerPoint, Access, etc.)
- Microsoft Silverlight 5.1.20125
- Microsoft Silverlight 5.1.50918
- Oracle Java 6 Update 27
- Oracle Java 8 Update 181
- Oracle Java 8 Update 211
- Oracle Java 8 Update 221
- Oracle Java 8 Update 231
- Rapid7 Metasploit (v5.0.46-dev)
- VMware vCenter (Version 6.7u2 Build 6.7.0.30000)
- VMware vSphere (Version 6.7.0.30000)
- VMware ESXi (Version 6.7u3 Build 14320388)
- Wireshark version 3.0.3

Appendix

NSS LABS RATINGS	
RATING	DEFINITION
AAA	A product rated 'AAA' has the highest rating assigned by NSS Labs. The product's capacity to meet its commitments to consumers is extremely strong.
AA	A product rated 'AA' differs from the highest-rated products only to a small degree. The product's capacity to meet its commitments to consumers is very strong.
A	A product rated 'A' is somewhat more susceptible to sophisticated attacks than higher-rated categories. However, the product's capacity to meet its commitments to consumers is still strong.
BBB	A product rated 'BBB' exhibits adequate protection parameters. However, sophisticated or previously unseen attacks are more likely to negatively impact the product's capacity to meet its commitments to consumers.
	A product rated 'BB,' 'B,' 'CCC,' 'CC,' and 'C' is regarded as having significant risk characteristics. 'BB' indicates the least degree of risk and 'C' the highest. While such products will likely have some specialized capability and protective characteristics, these may be outweighed by large uncertainties or major exposure to adverse conditions.
BB	A product rated 'BB' is less susceptible to allowing a compromise than products that have received higher-risk ratings. However, the product faces major technical limitations, which could be exposed by threats that would lead to its inability to meet its commitments to consumers.
B	A product rated 'B' is more susceptible to allowing a compromise than products rated 'BB'; however, it currently has the capacity to meet its commitments to consumers. Adverse threat conditions will likely expose the product's technical limitations and expose its inability to meet its commitments to consumers.
CCC	A product rated 'CCC' is currently susceptible to allowing a compromise and is dependent upon favorable threat conditions for it to meet its commitments to consumers. In the event of adverse threat conditions, the product is not likely to have the capacity to meet its commitments to consumers.
CC	A product rated 'CC' is currently highly susceptible to allowing a compromise. The 'CC' rating is used when a failure has not yet occurred but NSS Labs considers a breach a virtual certainty, regardless of the anticipated time to breach.
C	A product rated 'C' is currently highly susceptible to allowing a compromise. The product is expected to fail to prevent a breach and to not have useful forensic information compared with products that are rated higher.
D	A product rated 'D' is actively being breached by known threats and is unable to protect consumers. For non-specialized products, the 'D' rating category is used when protecting a consumer is unattainable without a major technical overhaul. Unless NSS Labs believes that such technical fixes will be made within a stated grace period (often 30-90 calendar days), the 'D' rating also is an indicator that it is a virtual certainty that existing customers using the product have already experienced a breach—whether they know it or not—and should take immediate action.

Authors

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Test Methodology

NSS Labs Advanced Endpoint Protection (AEP) Test Methodology v4.0 is available at www.nsslabs.com.

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