



WHITEPAPER

Sucuri Security Technical Overview

Product and Service Description

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Sucuri Security

Company Overview

Sucuri is a globally-recognized security company, specializing in providing comprehensive security to website owners. A US-based company founded in 2010, Sucuri maintains a global presence with employees in over 23 countries distributed across the major continents to ensure support is accessible 24/7/365. It provides website security services to over 500,000 customers around the world, remediates over 700 infected websites a day, monitors over 1.5 million websites and handles over 30 billion unique page views a month.

All of Sucuri's technology is proprietary, built by our team of security engineers and researchers. The technology is designed to address the growing online security threats as they emerge. Our team is dedicated to ensuring the confidentiality, integrity, and availability of every website within the Sucuri network.

At Sucuri, we care and treat every website as if it's our own. The solution we offer is built on three core pillars – protection, detection, and response. We take a defense-in-depth approach to website security, in which we employ multiple layers of security to provide the most comprehensive solution available. Combining people, process, and technology ensures that websites are protected and attacks are mitigated as quickly and efficiently as possible.

These pillars allow Sucuri to deploy a defensive solution that stop attacks before they start. This prevention solution is coupled with a continuous scanning engine designed to identify rogue elements that might prove to be indicators of a potential compromise. Sucuri provides a professional Incident Response Team (IRT) in the event of a successful attack, giving businesses peace of mind through our obsessive attention to current and emerging threats within the website security domain.

People, Process, and Technology

There is no single turnkey solution to security; instead it's a combination of people, processes, and technology that help create a dynamic and scalable approach to security posture for any organization. Sucuri's products are designed to reduce a brand's risk of a breach through the deployment of both proactive and reactive mechanisms addressing each of the elements described above. Sucuri's solution is a complementary offering that bolts onto an organization's existing security controls, satisfying a number of governance requirements while alleviating and enabling security teams to continue to focus on their core responsibilities.

Product/Service Description

Sucuri provides a comprehensive security solution for websites with the website security platform. It is comprised of four core functions designed to provide organizations a holistic end-to-end security solution for their website needs.

Monitoring

The monitoring technology is a cloud-based Software as a Service (SaaS) early warning system built on the concept of a network-based integrity monitoring system. The monitoring system is a remote and local (server-side) continuous scanning engine, providing near real-time visibility into the security state of a website.

The monitoring feature includes an alerting engine in the event an IoC (Indicator of Compromise) or malware is detected within the environment. Appropriate Security Operations Group (SOG) are then notified to take immediate action by the security IRT.

Activating monitoring requires no installation or application changes. All sites are added and configured via the Sucuri dashboard. To enable the server-side scanning, a PHP agent is required at the root of the main domain's hosting folder, allowing the environment to be scanned for credit card skimmers, malicious PHP, and other malware on the server level.

Protection

The Sucuri Firewall is a cloud-based SaaS Website Application Firewall (WAF) and Intrusion Prevention System (IPS) for websites. It functions as a reverse proxy by intercepting and inspecting all incoming Hypertext Transfer Protocol/Secure (HTTP/HTTPS) requests to a website, blocking malicious requests at the Sucuri network edge before it arrives at your server. The Sucuri Firewall includes both Virtual Patching and Virtual Hardening engines that allow for real-time mitigation of threats with no impact to the website.

Our Incidence Response Team is designed to detect multiple Indicators of Compromise (IoC), including but not limited to:

- Malware Distribution
- Blocklisting Incidents
- SEO Spam
- Phishing Lure Pages
- SSL Certificates
- DNS Changes

The Sucuri Firewall is built on a Content Distribution Network (CDN) that provides performance optimization features to a website. The CDN utilizes a proprietary approach to caching dynamic and static content across all nodes in the network, leveraging AnyCast technology to ensure optimal performance around the world.

Additionally, the Sucuri Firewall offers full Domain Name Server (DNS) services.

The Sucuri Firewall runs on a Globally Distributed Anycast Network (GDAN), built and managed by the Sucuri team. The GDAN configuration allows for high availability and redundancy in the event of any failures in the network. Sucuri currently manages twelve Points of Presence (PoP).

The firewall is supported by the Sucuri Security Operations Center (SOC) which provides 24/7/365 monitoring and response to all attacks.

Features that the Sucuri Firewall offers include:

- Mitigation of Distributed Denial of Service (DDoS) Attacks
- Prevention of Vulnerability Exploit Attempts (i.e., SQLi, XSS, RFI / LFI, etc...)
- Protection Against the OWASP Top 10 (and more)
- Access Control Attacks (i.e., Brute Force attempts)
- Performance Optimization
- Zero-Day Attack Protection
- Geo Blocking by Country
- Bad Bot Prevention

The Sucuri Firewall requires no installation or application changes. It is enabled via DNS by adding an A record.

Points of Presence

- San Jose, California
- Washington, DC
- Dallas, Texas
- Chicago, Illinois
- Miami, Florida
- London, United Kingdom
- Amsterdam, Netherlands
- Sofia, Bulgaria
- Frankfurt, Germany
- Mumbai, India
- Tokyo, Japan
- Singapore

Increased Performance with the People's CDN

The Sucuri Firewall runs on a Globally Distributed Anycast Network, built and managed by the Sucuri team. Your site benefits from high availability and redundancy in the event of network failure.

We focus on useful metrics to optimize speed, like total time, not first byte or server response time. Our growing network outperforms competitors and offers all the servers you need to get optimal speed and performance.



Response

The response system offers a professional Security Incident Response Team (IRT) to respond to all website-related security incidents identified by Sucuri and its' customers. The team is highly trained and capable of mitigating all website infections and malware-related issues.

This solution exists because of the complex nature of website security. Intrusions occur for a variety of reasons. Although our various technologies being employed to assist in the prevention of such compromises, there are elements beyond Sucuri's control. Examples include poor user/password management or creation, poor security configurations, and other similar environmental issues.

Because of these expanded attack vectors outside of Sucuri's control, the response feature is designed to provide organizations a complementary team to assist in the identification and eradication of any successful compromises. This includes analyzing the cause, assisting in the patching of the issue, and restoring the environment to operational order.

Our response solution requires no installation or application changes. However, it does require direct access to the web server / application via FTP/SFTP or SSH.

Backup

The backup system provides operation continuity in the event of an emergency. It offers storage of all website files and databases in a remote location on Sucuri's network. In the event of a disaster, website backups are available to help recover the affected environment.

Backups require no installation or application changes, only access to the hosting folder via SSH or sFTP. All sites are added and configured via the Sucuri dashboard.

Response addresses all website infections, including but not limited to:

- Server Level Malware Infections
- Website Malware Infections
- SEO Spam Injections
- Malicious User Redirects
- Website Defacements
- Removal of all Backdoors
- Removal of Website Blocklist Annotations

Exhibit A: Holistic Network Diagram (Sucuri Firewall)

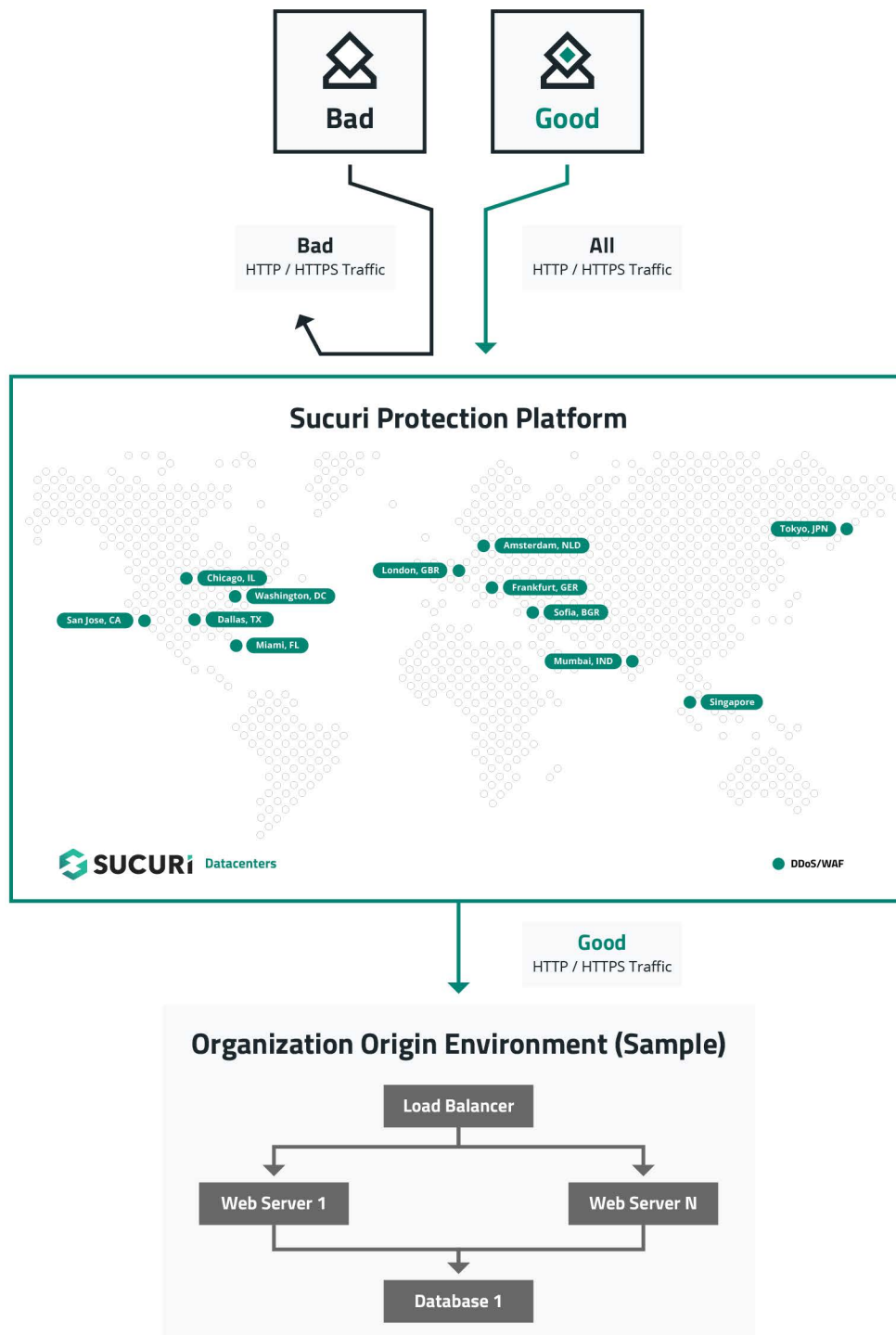


Exhibit B: DDoS Mitigation

Mitigation of Distributed Denial of Service (DDoS) attacks is a key feature the Sucuri Firewall offers its customers.

Network-Based DDoS (n-DDoS) Attacks (A.K.A Volumetric Attacks)

Sucuri's approach to mitigating network-based attacks includes investing in resources across all PoP locations. It's built on an Anycast network that allows the distribution of all inbound traffic across the network, explicitly blocking all non-HTTP/HTTPS-based traffic. The current network capacity exceeds 250 Gigabytes Per Second (GPS). Each PoP has multiple 10G and 40G ports from different providers, all designed to absorb and scale to very large inbound traffic requirements and attacks.

Application-Based DDoS (a-DDoS) Attacks

These attacks are designed to disrupt a website's availability by attacking the server resources directly. Flooding a server with requests, an attacker is able to consume local server resources to the point where the server becomes incapable of responding to legitimate requests. In these cases, the website will become unresponsive. The order of magnitude can vary; DDoS is measured in Requests Per Second (RPS) and can begin at 100/200 requests per second for many attacks

Sucuri's approach to mitigating DDoS is part technology, part human, and part artificial intelligence. The firewall employs technology that allows the team and engine to profile and analyse requests across the entire network, allowing us to accurately strip malicious requests from benign requests. Additionally, within the Sucuri network websites can support 600k + RPS per website.

Exhibit C: Exploit Prevention

The firewall prevents remote exploit attempts that try to abuse software vulnerabilities, such as those identified by the Open Web Application Security Project (OWASP). These attacks may include exploit attempts against the website directly and target things like injection (e.g., SLQI, XSS, etc.), remote code execution (RCE), security misconfiguration, remote file inclusion (RFI), and other vulnerabilities.

The Sucuri Firewall uses a proprietary multi-tiered approach to identifying and stripping malicious application requests.

Additionally, the Sucuri Firewall employs a Virtual Patching and Virtual Hardening approach to its mitigation strategy:

Tier 1	Application Profiling	The first tier uses a deny-all approach and allowlist model, where all requests that don't fit an application's profile are blocked explicitly at the edge. This profile is built dynamically on the technology/CMS a website is using. No third-party services are used.
Tier 2	Blocklist Engine	The second tier uses a custom-built blocklist signature blocking model built by the Sucuri team to account for any potential outliers or evolving threats.
Tier 3	Correlation Engine	The third tier analyzes all requests across the Sucuri network to profile attacker behavior and apply it globally to all sites protected by Sucuri. This is a learning engine that proactively applies updates to the network as the threat landscape evolves.

The effectiveness of the firewall is limited to its ability to see all incoming traffic. The most common evasion technique is for attackers to attack the origin server directly, which is why it's important that all direct traffic to the origin server is restricted to the Sucuri network.

Virtual Patching	With virtual patching, the Sucuri team is able to quickly respond to emerging threats with no impacts to a website. All patches are applied at the Sucuri edge. This is especially effective for larger organizations with strict security governance on when and how patches can be applied to a production environment. Custom rules can also be applied.
Virtual Hardening	With virtual hardening, the Sucuri team is able to apply vulnerability-agnostic patches to a website. Hardening can be specific to the CMS (i.e. WordPress, Joomla!, Drupal, etc) or more generic to a web server (i.e. Apache/IIS).

Exhibit D: HTTPS/SSL/TLS Support

The Sucuri Firewall is able to mitigate attacks by intercepting all incoming traffic and performing real-time analysis of all requests over HTTP/HTTPS protocols (i.e., Layer 7 requests). Traffic that is encrypted (i.e., utilizes HTTPS) must be inspected as well.

To achieve this, end-point termination must occur at the Sucuri edge. The firewall, by design, must intercept and analyse all traffic to be effective. All analysis is done in memory, real-time - **there is no storage of the request packets**. The only data that is stored is the metadata of a request in the form of web access logs.

Organizations have multiple options when dealing with SSL:

Option 1	Use Starfield DV certs that Sucuri will generate.
Option 2	Use a custom cert provided by the customer.

Exhibit E: Installation and Configuration

Each function has its own configuration and deployment requirements, but each is designed to be simple and require low overhead and engagement. Requirements are as follows:

Protection	<ul style="list-style-type: none">• No installation required.• A-record switch via DNS.• Time to go live is dependent on Time to Live (TTL) value.
Monitoring	<ul style="list-style-type: none">• No installation required.• Remote Scanning: Domains are loaded into the Sucuri Dashboard via API or Dashboard interface.• Server Scanning: Domain PHP agents are loaded at the root of each website directory on the web server. **Requires SFTP/FTP/SSH access to load files.• Organization can choose to load files on their own.
Response	<ul style="list-style-type: none">• No installation required.• In the event of an incident, all Malware Removal Requests are handled and managed via the Sucuri ticketing system.• Support engagement and SLA is dictated by your agreement.• Does require access to the server via SFTP/FTP/SSH. Changes might be outlined in your agreement.
Backup	<ul style="list-style-type: none">• No installation required.• Does require access to the server via SFTP/FTP/SSH. Changes might be outlined in your agreement.

Some agreements include custom support and integration services. Defer to your agreement and account manager for specifics pertaining to deployment for each function and associated responsibilities.

Exhibit F: Performance Optimization and Caching

All static content is cached on each individual regional server whenever possible. This allows for faster responses to requests (500 ms vs 10 ms) and scales (50 concurrent users vs. 200k concurrent users). Standard known CMSs like WordPress, Joomla!, Drupal and other similar CMS applications use cookies. We're aware of this and account for it in our caching logic.

The caching feature works by building a cache key. Every request that matches that key gets the same page. The cache key consists of the HTTP or HTTPS, domain, request URL, and normalized user agent (i.e. mobile, desktop, tablet, or RSS bot). This means that users of different devices (i.e. desktop vs mobile) won't see the same content.

CDN Caching Options

The CDN offers four means of caching:

Option	Description	Time
Enabled (Not Recommended For E-Commerce/ Membership Sites)	Caches entire site and only purges cache every few hours.	All - 3 hrs +
Minimal Caching	Caches entire site and purges cache every few minutes.	200 - 8 m 404 - 2 m 302 - 15 m 301 - 15 m
Site Caching (Site Headers)	Caches static content and respects site headers for dynamic website content.	200 - 180 m 404 - 10 m 302 - 180 m 301 - 180 m

**Disabled
(Use With Caution)**

Only caches static files such as images, .css, .js, .pdf, .txt, .mp3 and a few more extensions.

200 - 1 m
404 - 1 m
302 - 10 m
301 - 10 m

Clearing Cache

Clearing (purging) cache is a critical feature of the CDN. We allow cache to be cleared via the Sucuri Dashboard or the WAF API. Once initiated, the cache propagates through the network and clears all nodes within seconds.

Exhibit G: Infrastructure Security and Compliance

Every data center we operate from meets or exceeds all standards and compliance regulations:

Compliance Regulations

SSAE16 COMPLIANCE	ISO 9001:2008
OHSAS 18001:2007	ISO 14001:2004
PCIDSS PAYMENT CARD INDUSTRY STANDARD	ISO / IEC 27001:2005 AND 27001:2013
ISO CERTIFICATION	ISO 50001:2011

Network Infrastructure

Sucuri's network consists of multiple transit providers at each location that are utilized for primary traffic routing, internal traffic routing, and redundancy.

Utilizing a shared network with a primary and secondary termination for each connection prevents a single point of failure.

Operations

- Daily device vulnerability scan performed internally
- Daily vulnerability and compliance scan performed by third parties
- In-house penetration testing and third-party testing
- Documentation, practices, and continuous employee education
- Firewall change management procedures
- Data classification and ownership
- Incident management
- BCP (Business Continuity Plan) & DRP (Disaster Recovery Plan)

Management And Human Resources

- Mandatory security awareness training and review for each employee
- Strict least-privilege access practices throughout teams
- Required non-disclosure & confidentiality agreements
- Background checks and skills assessment
- Active management in all aspects of the security community



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sucuri.net | 1.888.873.0817 | sales@sucuri.net

