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Original Article

Web Application API Discovery & Protection with FortiWeb

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Abstract: *Modern-day web applications rely heavily on APIs, creating an expanded attack surface that demands some specialized security measures. In this paper, we examine FortiWeb, which is a web application firewall (WAF) from Fortinet that addresses API discovery and protection in enterprise environments. The architecture of FortiWeb combines traditional WAF defenses with machine learning-driven API discovery and schema-based protection to safeguard APIs against both known and unknown threats [8], [10], [11]. The key capabilities include the automatic detection of undocumented API endpoints, enforcement of Open API/JSON/XML schema definitions, and runtime policy controls, which together form a positive security model [11], [14]. This solution provides real-time visibility into API traffic and threats, thus allowing security teams to identify the shadow APIs and enforce granular policies without excessive manual configuration [9],[24]. We will also discuss the API attack surface in modern web applications. FortiWeb's architectural approach to API security, the mechanisms for API discovery and protection, and the operational considerations. The use case scenarios illustrate FortiWeb in action, and we will outline limitations and practical constraints. This study highlights the integration of FortiWeb's API discovery and protection capabilities that can significantly enhance the security of web application APIs while aligning with DevSecOps practices.*

Keywords: *Web Application Security, API Discovery, API Protection, FortiWeb, Web Application Firewall (WAF), API Security Management, Automated API Discovery, REST API Security, SOAP API Security, OWASP API Security Top 10, Threat Detection and Prevention, Bot Mitigation, Application Layer Security, Zero-Day Attack Protection, Machine Learning-Based Security, Traffic Inspection and Filtering, Secure DevOps (DevSecOps), Cloud Application Security, Hybrid Deployment Security, Vulnerability Mitigation.*

1. Introduction

Web APIs turned out to be the backbone of modern applications as they enable the mobile apps, single-page web frontends, and B2B integrations to communicate with the backend services. This proliferation of APIs has expanded the potential attack surface for threat actors. In 2023, hackers have exploited insecure healthcare APIs to expose the personal health data of over 41 million people. These high-profile breaches underscore the risk [5], [6]. These incidents emphasize that the APIs, when left unproductive, become a direct gateway to sensitive data and critical operations. The traditional web application security measures struggle to keep up with the pace of API-centric architectures, unlike classic web pages [2], [7].

APIs are consumed by automated clients and the mobile apps; this often surpasses the human-facing interfaces. Complex data formats are exchanged (XML, JSON, GraphQL queries), and these do not undergo the same user interface validations, which makes it easier for the attackers to inject any malicious payloads or call for unintended functions. Many organizations are unaware of all the API endpoints they expose, which include legacy or shadow APIs that are not covered by current security audits [3], [17]. The attackers routinely probe to find any undocumented endpoints and vulnerabilities like injection flaws, excessive data exposure, and injection vulnerabilities [1], [18]. Increases in API usage and insufficient visibility create an urgent need for dedicated API security measures beyond what a generic firewall may provide. FortiWeb extends the capabilities of a traditional WAF to specifically target API related threats and address these challenges [8], [11].

This integrates the machine learning (ML) and schema-driven policy enforcement to provide tailored defenses for APIs. FortiWeb can automatically learn the legitimate API structures and behaviors of the application and enforce a security model that will block anomalous API requests. It also retains the multi-layered defense, including signature-based detection of known attacks and the IP reputation filtering, this guards against OWASP top 10 vulnerabilities and bots in API traffic [1]. Through combining these approaches, FortiWeb rescues the risk of API specific attacks while minimizing the false positives and administrative overhead.

2. API Attack Surface in Modern Web Applications

In contemporary web applications, APIs facilitate the core functionality by exposing the endpoints that will exchange the data between clients, like web frontends and mobile apps, and the servers. This ubiquity of the APIs in microservices, mobile backends, and cloud applications means that a significant portion of the application's logic and data are accessible over network calls. The APIs have turned into prime targets for the attackers who are looking to exploit business logic and extract sensitive information. The API attack surface encompasses all the ways that the attackers can interfere with these API interactions that including manipulating the input data, abusing the authentication tokens, and calling the endpoints in unintended ways. A major challenge is the lack of visibility into the API endpoints in use; large organizations accumulate numerous APIs over time. Some of the endpoints can be undocumented, deprecated, but still are reachable, which are referred to as shadow APIs [3], [17]. With the lack of knowledge about which endpoints exist, the security teams cannot protect them, and this gives attackers an opening. For instance, an old API endpoint that is not covered by the newer security reviews can still accept the requests and return confidential data. The attackers actively scan for such forgotten endpoints, and the richness of the data formats increases the API attack surface and the potential vulnerabilities therein. API calls commonly send JSON and XML payloads, GraphQL queries that contain complex nested data [14], [15], [16]. If the API backend does not strictly validate these structures, adversaries can craft malicious payloads. These might insert SQL or script code into JSON fields, exploit overly permissive JSON schemas to push exceedingly large payloads, or use XML-specific attacks such as XML External Entity (XXE) injection. GraphQL APIs, when unprotected, can be abused with deeply nested queries or with queries that will exhaust the server resources [16]. Ability to customize the requests extensively, making input validation a critical concern for the API security.

Authentication and authorization are frequent pain points; APIs often rely on tokens or keys such as OAuth tokens, JSON Web Tokens, and API keys, rather than the interactive logins [19], [20]. These tokens are stolen, validated, and attackers can impersonate legitimate users or the applications. The weak API authentication schemes led to breaches where the attackers gained unauthorized access to the data. One recorded instance shows how APIs without robust authentication checks have allowed millions of sensitive records to be accessed by attackers. Even in a situation where the authentication is in place, broken object-level authentication can occur, where the API fails to enforce that a user should only be able to access their own data [21]. The attackers often exploit these flaws by simply changing an identifier in the API path or parameters to retrieve other users' information. The logical vulnerabilities are unique to the API endpoints and less visible to the network-level security tools. Volume and automation of the API traffic further expand the attack surface. Automated clients that include malicious bots can generate a high rate of API calls and probe for any weaknesses [4], [22]. The attackers often perform credential stuffing via login APIs, they attempt the denial-of-service through overwhelming an API with requests, or systematically harvest the data by iterating through object IDs. APIs are designed for automation, and they often lack the built-in rate limiting; they may not trigger the alarms when they are accessed in rapid succession. Unless external controls are imposed. APIs are specifically targeted by bots and scrapers to scrape content and perform fraudulent transactions, blending with legitimate traffic patterns. The rapid evolution of APIs in agile development practices means the attack surface is a moving target. The modern web API environments are exposed to threats that range from injection attacks in JSON/XML payloads and malicious bot abuse to exploitation of unknown endpoints and logic flaws in authentication. Addressing these requires not only identifying the API endpoints but also applying granular, context-aware defenses for each, which is a challenge that FortiWeb's API discovery and protection aims to meet.

3. Fortiweb Architecture for Api Security

FortiWeb is a web application and API firewall placed in front of the web servers to intercept the HTTP/S traffic destined for applications and their APIs [8], [9]. This can be deployed as a reverse proxy or as a transparent inspection node, both on premises or in the cloud. In these deployment options, FortiWeb applies an inline, multi-layer analysis pipeline that is intended to stop malicious requests before they reach protected API endpoints, combining the traditional WAF controls with API aware inspection.

3.1. Multi-layer detection pipeline

In the first layer, FortiWeb applies a negative security model that uses signature-based detection and threat intelligence [12], [13]. All the incoming requests are evaluated against known attack patterns, such as SQL injection, remote file inclusion, and XSS, and are checked for protocol compliance. IP reputation controls can filter the sources that are associated with malicious activity, and the basic rate controls generally help to reduce the broad denial-of-service or abuse patterns. The layer's purpose is to eliminate common exploit traffic early while limiting the noise and allowing deeper analysis to focus on subtle threats.

In the second layer, a positive security model that is supported by machine learning and heuristics is added [10]. FortiWeb learns the expected API behavior over time, the endpoints, HTTP methods, parameter formats, and the typical value patterns, and it flags any deviations as suspicious. This structure enables the detection of anomalous payloads that may not match any known signatures. Continuous learning helps the model adapt as the APIs evolve, and it reduces the reliance on slow, manual tuning approaches that are common in the older WAF deployments. Correlation of outputs from negative and positive models improves the coverage against both known attacks and novel

manipulation attempts, while keeping the false positives manageable.

3.2. API schema and content awareness

FortiWeb's API security architecture has content-aware parsing and validation. Instead of treating the request bodies as opaque strings, FortiWeb can interpret the structured API formats such as JSON and XML, and it supports the modern API styles, including GraphQL [15]. This enables fine-grained inspection of the payload structure and validates that JSON keys conform to the expected patterns, restricts the malformed XML constructs, and assesses the GraphQL query complexity before execution. The administrators can upload the Open API (Swagger) definitions, which allows FortiWeb to generate allowlist-style policies directly from the API contract [11], [14]. FortiWeb can derive an implicit schema through observing the traffic and combine it with enforcement when formal specifications are missing. This hybrid approach supports both the documented APIs and undocumented APIs

3.3. Integration with the security ecosystem

FortiWeb integrates with Fortinet's broader security ecosystem [11]. The threat intelligence services update the protections dynamically, sandbox integration can analyze any suspicious uploads that are delivered through APIs, and coordination with network layer controls can strengthen the enforcement. FortiWeb supports high availability deployments and centralized management to keep the policies consistent across multiple applications and environments [9]. This enables the organizations to scale the API security as they keep adding services across business units and cloud footprints.

3.4. API discovery mechanisms in FortiWeb

A core part of FortiWeb's API security approach consists of continuous discovery through traffic analysis. Many organizations lack full API inventories, especially in dynamic development environments. ForitWeb watches the live requests in order to infer the endpoints and input structures without requiring any prior knowledge [10], [17]. The request is analyzed, and attributes like HTTP methods, query parameters, HTTP methods, and request body structure are extracted, then cluster the similar traffic to infer the endpoint patterns and expected data formats. This produces an internal API model that records discovered endpoints, typical parameter types, and allowed methods or value characteristics [3]. The discovery is continuous, as new endpoints or parameters appear in the production traffic, the model can be updated, so that the protection is aligned with the evolving APIs.

3.5. Shadow API detection

Traffic-based discovery supports the identification of shadow or unexpected APIs [17]. The requests that fall outside the known model, such as calls to undocumented administrative routes, can be flagged as outliers and are logged in as potential exposure or reconnaissance. When it comes to stricter positive security configurations, FortiWeb can block any such request outright. The dynamic allowlist effect reduces the risk from probing and zero-day exploitation attempts that generally rely on undocumented endpoints, as the out-of-profile requests are considered suspicious even when the exploit technique is novel.

3.6. Integrating the discovery outputs with the policy

FortiWeb takes the help of the discovered models to inform the enforcement rather than treating the discovery as passive visibility. The security teams review the discovered endpoints along with the parameter structures, and they convert them into positive security rules that restrict the API usage to the approved or observed patterns. The Open API specifications are given, FortiWeb reconciles the contract definitions with observed traffic, flagging the discrepancies and filing the coverage gaps for endpoints that are not yet seen in production. This decreases the manual rule-writing burden and improves policy completeness, particularly for the legacy or poorly documented environments.

3.7. API protection capabilities in FortiWeb

After the APIs are defined or discovered, FortiWeb enforces the layered protection to keep the usage within safe limits. Strict enforcement of API contracts is done through schema-based validation and blocks requests that utilize undefined endpoints, incorrect types, unexpected fields, or unsupported methods. These controls reduce the risks, such as parameter tampering and mass assignment [11], [14]. The deep JSON/XML inspection adds structural limits that reduce the payload-based evasion and resource exhaustion attempts [15]. GraphQL, FortiWeb constrain the query complexity and restrict the introspection to reduce the schema exposure and prevent any overly expensive queries. Beyond the structural validation, ML-driven anomaly detection evaluates the parameter values and the usage patterns in order to flag out-of-profile behavior, which includes any suspicious payloads that are formally schema valid but are statistically unusual [16]. FortiWeb also inspects the responses for any sensitive data patterns, helping detect and mitigate accidental data leakages by logging, masking, or blocking any policy-violating responses. Gateway-style controls like API key verification, quota enforcement, and rate limiting reduce any unauthorized access and abuse, while the JWT validation enables the token integrity checks to strengthen mobile and web authentication flows [19], [23]. Bot mitigation complements these controls through identifying automated abuse patterns (scraping or credential stuffing), and they use behavioral signals beyond simple request rate thresholds [22]. The practical benefit of this architecture is the alignment with API lifecycle management. As the API changes, FortiWeb can ingest the updated schemas or adapt through the observed traffic and update the enforcements accordingly. Schema uploads and policy adjustments can be automated when integrated into CI/CD workflows; the protections remain synchronized with the deployment cadence, which reduces the risk of either broken releases or exposure gaps.

3.8. Runtime visibility and policy enforcement

FortiWeb's runtime value depends on blocking the attacks, along with providing actionable visibility. This logs

the policy violations, access control failures, and anomalies along with the contextual details such as endpoint and client attributes, which support the incident response and tuning [9], [24]. The logs can be exported to SIEM platforms or Fortinet analytics tools for centralized correlation, retention, and cloud deployments that can export the logs to external storage for any long-term analysis. The dashboards aggregate the telemetry to show request volumes per endpoints, distributions of the blocked attack types, and traffic sources. This enables the teams to assess the active threat conditions instantly. The enforcement is configurable and is typically rolled out in stages [13]. Deployments begin in the monitoring mode to reduce any disruption while the policies are tuned, then it transitions to blocking. The actions can be tailored per the rule type, for instance, blocking of the high confidence injections and alerting on the schema mismatches when the specifications are stale, or the throttling clients exceed the defined quotas. The inline design of FortiWeb aims to minimize the latency; this uses optimized inspection and hardware acceleration. High availability configurations help to prevent the inspection infrastructure from becoming a single point of failure, and the policies can be updated dynamically to support the rapid API evolution without any extended downtime. FortiWeb's architecture combines the signature reputation-based controls, ML-driven positive security modeling, schema-aware payload validation, and runtime monitoring for protecting the APIs in-line. The operational effectiveness depends on the appropriate deployment placement, policy maintenance, and staged enforcement, especially the schema synchronization and anomaly model tuning. This translates to security remaining strong while the legitimate API behavior continues uninterrupted.

4. Operational Considerations

Deployment of FortiWeb for API discovery and protection needs careful planning and continuous operational management to achieve strong security outcomes without disrupting application availability. Key aspects include deployment architecture, policy lifecycle management, performance sizing, and alignment with DevSecOps workflows.

4.1. Deployment Models and Integration

FortiWeb can also be deployed as a physical appliance, cloud service, container, or virtual machine, thus enabling the use across on-premises and cloud native environments [18]. The high throughput on premises applications often favors hardware appliances with SSL acceleration, the cloud and DevOps environments typically adopt FortiWeb cloud or VM-based deployments for flexibility. In all the models, FortiWeb is positioned inline in front of the web and API servers, operating either as a reverse proxy or in transparent mode. In the proxy deployments, API DNS records are sent to FortiWeb; the transparent deployments preserve the existing routing. FortiWeb is commonly placed behind a CDN in the cloud architecture to combine availability, WAF protection, and caching. Preserving the original client IP information via forwarding the headers is critical for accurate logging, rate limiting, and behavior analysis. FortiWeb is typically deployed in active-passive or clustered configurations to eliminate single points of failure and support maintenance without any downtime. TLS inspection adds operational complexity, as FortiWeb has to manage the certificates and the private keys to decrypt the traffic. The end-to-end encryption is supported, and most deployments terminate TLS at FortiWeb to enable full payload inspection, thus accepting the associated responsibility for secure key management and certificate lifecycle operations.

4.2. Performance and scalability

FortiWeb has to be sized appropriately in order to avoid introducing latency or throughput bottlenecks [11]. The capacity planning should account for the peak request rates, payload sizes, and the computational costs of the enabled inspection features, such as schema validation and anomaly detection. FortiWeb appliances and VMs are available in multiple performance tiers, and the cloud deployments are enabled to scale horizontally when configured correctly. The operational teams have to continuously monitor CPU utilization, throughput, memory consumption, and latency. The traffic growth or changes in the API behavior can require proactive scaling, while over-provisioning has to be avoided for cost efficiency. One of the recurring API specific challenges is that the schema enforcement blocks technically valid but have unusually large payloads. It is necessary to have close coordination with the development teams to define the practical limits and to tighten the thresholds gradually as normal usage patterns become well understood.

4.3. Policy maintenance and tuning

Policies of FortiWeb require iterative tuning, especially during the early deployment stages. The organizations commonly begin in the monitoring or alert-only mode to establish the traffic baselines and identify false positives. In this phase, the security teams review the logs and apply narrowly scoped exceptions where the application behavior deviates from the generic security assumptions. FortiWeb supports granular exclusions like disabling a specific signature for a specific parameter on a specific endpoint, thus allowing precision without weakening the overall protection. The expectations have to be documented to avoid any long-term policy sprawl. Machine learning based anomaly detection benefits from an initial learning period, when sufficient representative traffic is observed, anomaly alerts are best monitored rather than being enforced. Applications that have cyclical or seasonal usage patterns require additional care to ensure the model captures all the legitimate modes of operation. Following any major application changes, the teams have to closely observe anomalies or temporarily relax enforcement while the model adapts.

4.4. DevSecOps and Lifecycle Management

Integrating FortiWeb into the CI/CD pipeline is generally a recommended practice [25]. As FortiWeb supports API driven configuration, the pipelines can automatically push the updated Open API specifications or the policy changes alongside the application deployments. This avoids both over-blocking of the newly introduced endpoints and exposure caused by unsecured new

functionality. To prevent any configuration drift, emergency changes need to be made directly on FortiWeb have to be reconciled with the infrastructure as code definitions. Managing multiple API versions increases the complexity. V1 and V2 APIs coexist, and separate policies are bound to be versioned URL paths help to isolate the differences and reduce any enforcement errors. API versions that are deprecated have their corresponding WAF rules removed as part of the cycle management. FortiManager can simplify policy consistency across FortiManager can simplify policy consistency across multiple FortiWeb instances via centralized controls.

4.5. Collaboration, maintenance, and incident response:

FortiWeb is typically managed by the SecOps teams, but its effective operation depends on close collaboration with the application developers. The developers provide API specifications and advance notice of changes, while the security teams provide feedback on the intelligence about the attack patterns and anomalous inputs, which may warrant application-side hardening. The feedback loops are important for the DevSecOps practices as they require regular maintenance. Firmware updates have to be applied using HA failover to avoid service disruption, and threat intelligence updates have to remain up to date. Operational run books have to address the false positive scenarios, enable rapid diagnosis, temporary mitigation, and permanent remediation without any prolonged outages.

4.6. Privacy and data handling

As FortiWeb inspects and logs the API traffic, which may contain sensitive data, the logging policies have to align with the privacy and regulatory requirements; full request or response bodies might not be appropriate for all the endpoints. Selective logging and data masking capabilities help balance the forensic visibility along with the compliance obligations. Operating FortiWeb for API security is an ongoing process rather than a one-time deployment. The effectiveness depends on correct architectural placement, disciplined performance sizing, continuous policy tuning, and tight integration with the development workflows.

5. Use Case Scenarios

5.1. Scenario 1: Securing a legacy API with unknown endpoints

A financial services organization operates a legacy application that exposes multiple REST APIs that are added over time by different teams, with incomplete documentation. For gaining visibility and control, FortiWeb is deployed as a reverse proxy in front of the API domain. As there is no formal API specification, FortiWeb's ML-based discovery analyzes the live traffic during an initial monitoring period and identifies the active endpoints & the usage patterns. The security team has identified previously unknown endpoints during a review, and these are used for debugging and data export that are intended for public exposure. The shadow APIs are blocked externally, and then the automated probing activity targets the common administrative endpoints and submits malformed payloads. As these requests fall outside the learned API profile, FortiWeb blocks them and logs the activity as reconnaissance. Bot-like behavior is also detected, which leads to the temporary blocking of the source. The backend systems remain unaffected, and the organization gains visibility into both the undocumented exposure and active attack attempts.

5.2. Scenario 2: Enforcing Schema and preventing injection in a public API

An e-commerce company exposes a public, versioned API for third-party integrations and maintains a detailed Open API specification. FortiWeb Cloud is deployed in front of the API, and the Open API definition is imported for generating a strict positive security policy. The documented endpoints and the methods are permitted, and the requests are validated against defined schemas. When operating normally, compliant requests pass with minimal latency, while the schema violations are rejected along with clear error messages that aid the developers. The attacker, after obtaining a partner API key, attempts SQL injection by manipulating a numeric parameter; the request fails the schema validation and gets blocked immediately. Any attempts to access undocumented endpoints are rejected; all the additional protections, including the per-key rate limits and response inspection, prevent abuse and detect the accidental exposure of sensitive data. The application backend remains isolated from the malicious traffic, and the developers focus on the core functionality rather than handling incident response.

5.3. Scenario 3: Protecting a GraphQL Microservice and mobile API

A social media startup uses a GraphQL API for its mobile and web clients, and it mostly relies on JWTs for authentication. FortiWeb is deployed inline to protect the GraphQL endpoint and overall complexity. GraphQL introspection is disabled in production, and FortiWeb is configured to validate JWT signatures and expiration. Any attempts to perform schema introspection or submit overly complex queries are blocked, and the legitimate requests pass without disruption. Any requests without valid JWTs are rejected, and abnormal usage patterns that are associated with the stolen tokens can be flagged through anomaly detection. Thus, the GraphQL service remains performant and resistant to abuse, with FortiWeb providing the edge-level enforcement that reduces the need for any complex in-application safeguards.

6. Limitations

FortiWeb significantly strengthens the API security, but it also operates within the boundaries of the traffic inspection and policy enforcement [1], [7]. This cannot fully understand the application business logic, which translates to authorization flaws, such as insecure direct object references can still be exploitable through structurally valid requests. Fine-grained access control remains the responsibility of the application. Machine learning based anomaly detection needs sufficient representative traffic in order to be effective. The early deployments may experience false positives or missed attacks until the model stabilizes, which makes the

staged enforcement important. The schema-based protection depends on accurate and up-to-date API specifications; even if they are outdated or overly permissive schemas can lead to either service disruption or reduced security coverage [14], [25]. Performance is another constraint; deep inspection, TLS termination, and anomaly analysis consume a lot of resources and can introduce latency if FortiWeb is undersized or misconfigured. Handling of the encrypted traffic introduces trade-offs; the full inspection requires TLS termination and secure key management. API evolution adds complexity, especially where multiple versions can coexist, requiring careful policy versioning and coordination. FortiWeb's built-in API key and rate-limiting features are effective for many use cases, but cannot replace full API management platforms in the large partner ecosystems. The operational complexity and the expertise required should also be considered; any misconfiguration will lead to either excessive blocking or insufficient protection. The sophisticated logic level or lower-layer attacks can still bypass the WAF controls; this reinforces the need for a defense-in-depth approach [7], [12]. FortiWeb is a powerful component of the API security architecture, especially when deployed with a clear understanding of its strengths and limits. When used alongside secure application design, proper identity controls, and complementary security measures, FortiWeb provides effective protection against a wide range of API layer threats without turning into a single point of failure.

7. Conclusion

APIs have turned out to be the primary interface through which modern applications expose the data and business functions. This shift has expanded the attack surface beyond what the traditional web-only controls were designed to handle. In this paper, FortiWeb is analyzed, and it displays the reality through extending WAF capabilities into API-specific discovery, validation, and enforcement. The architecture blends negative security controls like signature-based detection, reputation filtering, baseline rate controls, and protocol checks. With a positive security model that learns the expected API structures and behaviors over time. Through combining these models along with the content-aware parsing of the JSON/XML and specialized controls for GraphQL, FortiWeb is positioned to identify both the well-known exploit patterns and the subtler deviations that indicate abuse, reconnaissance, or emerging attack techniques. The key outcome is that the API security depends on visibility and blocking. FortiWeb's continuous traffic-based discovery helps organizations to build and maintain an operational API inventory, thus bringing the shadow and legacy endpoints forward so they can be governed rather than ignored. The discovery to policy is paired with a schema-based enforcement workflow that reduces the reliance on manual rule writing while tightening the control over what the API should accept, the runtime dashboards, staged enforcement, and logging further support the practical deployment through enabling the incident response, tuning, and continuous improvement without forcing disruptive cutovers. Operational sections and use case scenarios collectively demonstrate that FortiWeb's value increases when treated as part of an API lifecycle process rather than a one-time perimeter control. Integrating the schema updates and policy changes into CI/CD pipelines, maintaining version-aware policies, and coordinating closely with the SecOps and development teams helps in keeping the protections synchronized along with rapid API evolution. At the same time, the limitation reinforces the boundary, that FortiWeb can strongly reduce the technical attack risk at the traffic and policy layer, but it cannot replace the secure application design, robust authentication and authorization logic, or broader defense in depth controls. Business logic flaws, sophisticated attacks, and object-level authorization failures, which stay within the valid-looking request patterns, remain risks that have to be handled through application hardening, identity controls, and monitoring. It is concluded that FortiWeb provides a practical, scalable approach for organizations that are seeking to improve their API security posture. This discovers what is exposed, enforces what is expected, and provides the operational visibility needed to manage the APIs safely. When deployed along with appropriate sizing, DevSecOps alignment, and disciplined policy governance, FortiWeb can materially reduce the exposure from shadow APIs, injection and payload abuse, evolving API threats, and automated attacks, while keeping the operations overheads and false positive risk manageable.

References

1. OWASP Foundation, *OWASP API Security Top 10 – 2023*, OWASP, 2023.
2. Gartner, *Market Guide for Web Application and API Protection (WAAP)*, Gartner Research, latest edition.
3. Salt Security, *The State of API Security Report*, Salt Security Labs.
4. Akamai, *API Security: Threats, Risks, and Mitigations*, Akamai Technologies.
5. Verizon, *Data Breach Investigations Report (DBIR)*, Verizon Enterprise.
6. HIPAA Journal, *Healthcare Data Breaches and API-Related Exposures*, HIPAA Journal.
7. ENISA, *Threat Landscape for Web Applications and APIs*, European Union Agency for Cybersecurity.
8. Fortinet, *FortiWeb Web Application Firewall – Product Datasheet*, Fortinet Inc.
9. Fortinet, *FortiWeb Administration Guide*, Fortinet Documentation Library.
10. Fortinet, *Machine Learning–Based Protection in FortiWeb*, Fortinet Whitepaper.
11. Fortinet, *API Security with FortiWeb*, Fortinet Technical Whitepaper.
12. NIST, *SP 800-53: Security and Privacy Controls for Information Systems and Organizations*, National Institute of Standards and Technology.
13. NIST, *SP 800-94: Guide to Intrusion Detection and Prevention Systems (IDPS)*, National Institute of Standards and Technology.
14. OpenAPI Initiative, *OpenAPI Specification Version 3.0*, Linux Foundation.
15. W3C, *XML Security Considerations*, World Wide Web Consortium.

16. GraphQL Foundation, *GraphQL Security Best Practices*, GraphQL Working Group.
17. Gartner, *Understanding and Managing Shadow APIs*, Gartner Research Note.
18. OWASP Foundation, *Automated Threats to Web Applications*, OWASP.
19. IETF, *RFC 7519: JSON Web Token (JWT)*, Internet Engineering Task Force.
20. IETF, *RFC 9126: OAuth 2.0 Security Best Current Practice*, Internet Engineering Task Force.
21. OWASP Foundation, *Broken Object Level Authorization (BOLA)*, OWASP API Security Project.
22. Imperva, *Bad Bot Report*, Imperva Research Labs.
23. Cloudflare, *API Abuse and Rate Limiting Best Practices*, Cloudflare Security Blog.
24. NIST, *SP 800-61: Computer Security Incident Handling Guide*, National Institute of Standards and Technology.
25. Google, *DevSecOps Best Practices for API Security*, Google Cloud Security Whitepaper.