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Airlock and the OWASP Top 10 2017
The Ten Most Critical Web Application Security Risks

The following table lists the ten most critical web application security risks, as identified by OWASP in their edition of "OWASP Top 10 2017". It explains how Airlock WAF addresses each of these risks to protect web applications from these types of attacks and which features are relevant.

Vulnerability	Description	How Airlock WAF prevents an exploit	Relevant Airlock Features
A1 – Injection	Injection flaws, such as SQL, OS, and LDAP injection occur when untrusted data is sent to an interpreter as part of a command or query. The attacker's hostile data can trick the interpreter into executing unintended commands or accessing data without proper authorization.	Requests containing injections like SQL, XSS, HTML, LDAP, OS commands and others are detected and blocked by combining blacklisting and dynamic whitelisting. Additional protection like URL encryption, smart form protection and Dynamic Value Endorsement prevent any tampering with URL parameters and read-only form field values sent by the application. Attacks in headers or cookies are prevented by filtering and a cookie store. Airlock WAF protects itself against overflow and OS injection attacks by using strict security domain separation, SELinux to implement least privilege, ASLR, No-execute and strong stack protection. The ICAP interface allows checking content either with Airlock WAF add-on modules such as SOAP/XML/AMF-filters or third party malware scanners (AV). Other types of injections and protocol violations are prevented by the protocol termination and regeneration.	– Whitelist parameter Learning – Built-in blacklist filters – URL encryption – Smart Form Protection – Dynamic Value Endorsement (DyVE) – Cookie Store – CAPI interface – HTTP Protocol termination and regeneration – Add-on modules – Security domain separation – Principle of least privilege – Address-Layout-Randomization (ASLR) – No-Execute (NX) – Stack-protection (SSP)

About OWASP
The Open Web Application Security Project (OWASP) is an open community dedicated to enabling organisations to conceive, develop, acquire, operate and maintain applications that can be trusted. All of the OWASP tools, documents, forums and chapters are free and open to anyone interested in improving application security. For more information visit the homepage at www.owasp.org

About OWASP Top 10
OWASP Top 10 is published roughly every 3 years and provides a powerful tool for raising awareness regarding web application security. The 10 issues listed represent a broad consensus on what the most critical web application security topics are at this time. For more information on the OWASP Top 10, visit www.owasp.org

Vulnerability	Description	How Airlock WAF prevents an exploit	Relevant Airlock Features
A2 – Broken Authentication	Application functions related to authentication and session management are often not implemented correctly, allowing attackers to compromise passwords, keys, or session tokens, or to exploit other implementation flaws to assume other users' identities.	Airlock IAM is a specialized authentication and authorization server, proven for many years in high security environments. Airlock WAF supports upstream authentication using Airlock IAM. Policies granting access to applications and resources only to authenticated users can be enforced centrally. This includes WebSockets and SSL VPN connections. Airlock IAM supports plenty of authentication means. Using risk-based authentication, second factors for strong authentication are only required if the risk score surpasses a certain threshold. As the HTTP protocol is stateless by nature, sessions are normally bound to a session ID contained in a cookie or in a URL parameter which is passed with each call. Any session ID manipulation is prevented by encrypting all URLs or the session cookie. By default, Airlock WAF replaces all application cookies with its own session tracking (based on the SSL session ID or a secure Airlock WAF session cookie). Using Airlock client fingerprinting, events indicative for session hijacking may be penalized and result in preventive actions (e.g., termination of a suspicious session).	– Upstream authentication with Airlock IAM – Risk-based/adaptive authentication – Cookie Store – Cookie encryption – URL encryption – Secure Session Management – Airlock Client Fingerprinting – SSL VPN
A3 – Sensitive Data Exposure	Many web applications and APIs do not properly protect sensitive data, such as financial, healthcare, and PII. Attackers may steal or modify such weakly protected data to conduct credit card fraud, identity theft, or other crimes. Sensitive data deserves extra protection such as encryption at rest or in transit, as well as special precautions when exchanged with the browser.	If sensitive data is contained in the URL or in a cookie, it will get additional protection as Airlock WAF can encrypt these. Default rewrite pattern allows removing sensitive data out of responses – such as credit card numbers. Secure SSL/TLS configuration is hard. Ergon actively monitors the SSL/TLS layer technology and provides rapid fixes in code or configuration for newly discovered vulnerabilities. Airlock WAF, acting as reverse proxy between the application and the browser, can encrypt the connection using TLS. If necessary, application responses can be re-written to contain HTTPS URLs only, even if the back-end uses HTTP for performance reasons. The Strict-Transport-Security header (HSTS) is set by default. Public-key-pinning (HPKP) can be configured as a response action. Additionally, Airlock WAF forbids weak SSL/TLS ciphers by default. OCSP stapling simplifies validation of certificates. Password hashes are sensitive information, that's why they don't belong in the normal application database. Upstream Authentication solves this problem by separation.	– URL encryption – Cookie store – Cookie encryption – Response rewriting – SSL/TLS termination – Secure SSL/TLS configuration – Upstream authentication

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A4 – XML External Entities (XXE)	Many older or poorly configured XML processors evaluate external entity references within XML documents. External entities can be used to disclose internal files using the file URI handler, internal file shares, internal port scanning, remote code execution, and denial of service attacks.	With Airlock's XML Filter and SOAP Filter add-ons, a layer of protocol validation can be added to protect Web services using SOAP or native XML data streams. Those modules protect against XEE and XXE attacks - known as DTD attacks or XML bombs. The Airlock XML Filter is able to validate native XML data streams against their predefined XML schemas. Multiple XML schemas may be linked to both requests and responses. XML Filter will validate configured requests and responses against those XML schemas. The Airlock SOAP Filter is able to validate SOAP messages against their predefined WSDL files. Multiple WSDL files can be linked to one back-end Web service. Unlike SOAP web services, RESTful web services often use JSON for data transfer. Airlock WAF's integrated JSON parser allows the consistent application of security policies both to standard HTML form posts and REST calls.	– Airlock SOAP Filter add-on – Airlock XML Filter add-on
A5 – Broken Access Control	Restrictions on what authenticated users are allowed to do are often not properly enforced. Attackers can exploit these flaws to access unauthorized functionality and/or data, such as access other users' accounts, view sensitive files, modify other users' data, change access rights, etc.	As Airlock WAF enforces upstream authentication and authorization, no unauthorized external request may reach protected applications. Airlock WAF acts as a central policy enforcement point and checks whether a given user is allowed to access an API or a resource. Object keys and IDs exposed by the application can be protected against tampering using a number of techniques such as whitelist learning, URL encryption, smart form protection or Dynamic Value Endorsement (DyVE).	– Upstream authentication and authorization – Central policy enforcement point – Whitelist learning – URL encryption – Smart form protection – Dynamic Value Endorsement (DyVE)

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A6 – Security Misconfiguration	Security misconfiguration is the most commonly seen issue. This is commonly a result of insecure default configurations, incomplete or ad hoc configurations, open cloud storage, misconfigured HTTP headers, and verbose error messages containing sensitive information. Not only must all operating systems, frameworks, libraries, and applications be securely configured, but they must be patched and upgraded in a timely fashion.	Airlock WAF contains default rules which are regularly updated. The mapping-oriented configuration guides the administrator to configure access only to known applications intended to access. Error messages can be rewritten or replaced to eliminate exposure of stack traces and the like. Typical errors such as excessively permissive CORS headers or missing "secure" attributes in cookies are recognized and corrected. Configuration validators are checking the Airlock configuration and warn about common misconfigurations (Log only mode, certificate mismatches, etc.). The smart policy learning automatically generates meaningful and well-balanced configuration suggestions for easily handling detected issues. This helps guiding administrators along best practices and prevents overreaction in stressful situations.	– Secure default configuration – Built-in filters – Policy learning – URL encryption – Mapping-based configuration – Content rewriting – Error page replacement – Header rewriting – Configuration validation
A7 – Cross-Site Scripting (XSS)	XSS flaws occur whenever an application takes untrusted data and sends it to a web browser without proper validation or escaping. XSS allows attackers to execute scripts in the victim's browser which can hijack user sessions, deface web sites, or redirect the user to malicious sites.	Requests containing XSS content are detected through a combination of blacklisting and dynamic whitelisting. URL encryption, smart form protection and Dynamic Value Endorsement prevent any tampering of URL parameters and read-only form field values sent by the application. Security headers such as X-XSS-Protection are added by default. Content-security-policy headers can be added to enforce a stricter source check for various kinds of content. Adding the HttpOnly flag protects the Airlock WAF secure session cookie from being read by JavaScript code.	– Built-in blacklist filters – Cookie store – Cookie encryption – URL encryption – Smart form protection – Dynamic Value Endorsement – Airlock WAF secure session handling – Header rewriting

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A8 – Insecure Deserialization	Insecure deserialization often leads to remote code execution. Even if deserialization flaws do not result in remote code execution, they can be used to perform attacks, including replay attacks, injection attacks, and privilege escalation attacks.	In general, parameters consumed by applications need to be protected against tampering by the client. A variety of protection mechanisms on Airlock WAF can be used for this, e.g., the cookie store, whitelist learning, form protection, or cookie encryption. As an example, using the central cookie store, application state represented by serialized objects in cookies is not exposed to the client. Since coarse-grained access control decisions are made by the WAF, tampering serialized application objects with the goal of access right elevation is in vain. Protecting against platform-wide object deserialization vulnerabilities, e.g., CVE-2015-4852 for Java, is possible by deploying a virtual patch.	– Central access control – Cookie store – Cookie encryption – Whiltelist learning – HTML form protection – Dynamic Value Endorsement (DyVE) – Virtual patching
A9 – Using Components with Known Vulnerabilities	Components, such as libraries, frameworks, and other software modules, often run with full privileges. If a vulnerable component is exploited, such an attack can facilitate serious data loss or server takeover. Applications using components with known vulnerabilities may undermine application defences and enable a range of possible attacks and impacts.	The Airlock security team actively monitors and analyses new threats and vulnerabilities in web applications and provide corresponding security advisories. Virtual patches are provided if the web application is not protected by default. If required, security patches for Airlock WAF and IAM are released quickly and customers are notified. Airlock WAF protects itself against 0-day attacks with its fault tolerant architecture. Privilege separation (SELinux) enforces the request data to be handled in the correct chain. The web listener is not allowed to access session management or to craft backend request. Address-layout-randomization (ASLR), no-execute (NX) and stack-protection (SSP) are enabled on the WAF and reduce attack surface.	– Hotfixes – Virtual Patches – HTTP protocol termination – Security compartments – Address-Layout-Randomization (ASLR) – No-Execute (NX) – Stack-protection (SSP) – SELinux/Least Privilege

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A10 – Insufficient Logging & Monitoring	Insufficient logging and monitoring, coupled with missing or ineffective integration with incident response, allows attackers to further attack systems, maintain persistence, pivot to more systems, and tamper, extract, or destroy data. Most breach studies show time to detect a breach is over 200 days, typically detected by external parties rather than internal processes or monitoring.	Airlock WAF (as a web application firewall) is a highly specialized component dealing with detection and prevention of various types of attacks. Detected attacks are visible in the onboard reporting or can be forwarded to an SIEM system for further analyses and incident response. Virtual patches against attacks are quickly applicable, centrally and for all protected applications at once.	– Detection of ongoing attacks – Logging of attacks – Blocking of attacks – Event generation for notification and timely incident response – Real-time graphical reporting dashboards – Linked log entries with reports for quick root cause analysis – SIEM Integration (CEF log format, Airlock App for Splunk)

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