

Protecting the Enterprise

OWASP API Security Top 10 Vulnerabilities 2023

The OWASP Top 10 project has for a long time been the standard list of top vulnerabilities to look for and mitigate in the world of web applications. APIs represent a significantly different set of threats, attack vectors, and security best practices for enterprises. That is why the OWASP community launched a new classification of Top 10 vulnerabilities, specific to API Security.

42Crunch offers end-to-end protection for APIs with a developer-first platform that enables continuous, automated and scalable API security. Enterprises do not have to rely on security by obscurity, manually configured rules, or hope that some anomaly detection can report an attack. With 42Crunch, our platform automatically protects your APIs from the OWASP Top 10 API Security Vulnerabilities and many additional threats.



42Crunch's ability to secure both the CI/CD pipeline & the runtime environment makes it a compelling candidate for any API security project.

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API 01. BROKEN OBJECT LEVEL AUTHORIZATION

Attacker substitutes the ID of their own resource in the API call with an ID of a resource belonging to another user. Lack of proper authorization checks allows attackers to access the specified resource. This attack is also known as IDOR (Insecure Direct Object Reference).

USE CASES

- API call parameters use IDs of the resource accessed through the API: `/api/shop1/financial_details`
- Attackers replace the IDs of their resources with a different one, which they guessed:
`/api/shop2/financial_details`
- The API does not check permissions and lets the call through
- Problem is aggravated if IDs can be enumerated:
`/api/123/financial_details`

- Implement authorization checks with user policies and hierarchy
- Don't rely on IDs sent from client. Use IDs stored in the session object instead
- Check authorization for each client request to access the database
- Use random non-guessable IDs (UUIDs)
- Implement a robust test framework to specifically test for this vulnerability type

HOW TO PREVENT

API 02. BROKEN AUTHENTICATION

Poorly implemented API authentication allowing attackers access or to assume other users' identities.

USE CASES

- Unprotected APIs that are considered "internal"
- Weak authentication not following industry best practices
- Weak API keys that are not rotated
- Passwords that are weak, plain text, encrypted, poorly hashed, shared, or default passwords
- Authentication susceptible to brute force attacks and credential stuffing
- Credentials and keys included in URLs
- Lack of access token validation (including JWT validation)
- Unsigned or weakly signed non-expiring JWTs

HOW TO PREVENT

- Check all possible ways to authenticate to all APIs
- APIs for password reset and one-time links also allow users to authenticate, and should be protected just as rigorously
- Use standard authentication, token generation, password storage, Multi-factor authentication (MFA)
- Use short-lived access tokens
- Authenticate your apps (so you know who is talking to you)
- Use stricter rate-limiting for authentication, implement logout policies and weak password checks

API 03. BROKEN OBJECT PROPERTY LEVEL AUTHORIZATION

API endpoints can be vulnerable to attacks based on their data: exposing more data than is required (excessive data exposure) or accepting and processing more data than they should (mass assignment).

USE CASES

- The API returns full data objects as stored in the database
- The client application filters the responses and only shows the data that the users really need to see
- Attackers call the API directly and retrieve sensitive data that the UI would filter out
- API works with data structures without proper filtering
- Received payload blindly transformed into an object & stored
- Attackers guess the fields by looking at the GET request data

HOW TO PREVENT

- Never rely on client to filter data
- Review all responses and adapt to what API consumers need
- Define schemas of all the API responses
- Don't forget about error responses
- Identify all the sensitive or PII info and justify its use
- Do not automatically bind incoming data to internal objects
- Explicitly define all the expected parameters and payloads
- Set `readOnly` property to `true` in object schemas for all properties retrieved through APIs that should never be modified
- Precisely define the schemas, types, and patterns you will accept in requests at design time and enforce them at runtime

API 04. UNRESTRICTED RESOURCE CONSUMPTION

API is not protected against an excessive amount of calls or payload sizes. Attackers can use this for DoS and authentication flaws like brute force attacks.

USE CASES

- Attackers send the API more requests than it can handle
- Attackers send requests at a rate exceeding the API's processing speed causing the API to drop requests
- The size of the requests exceeds what the API can process
- An attacker submits requests with excessively large payloads or complex queries causing the API to drop requests

HOW TO PREVENT

- Apply rate limiting policies to all endpoints
- Tailor rate limits specific to API methods, clients, addresses
- Configure rate limiting on different keys, e.g tokens
- Limit payload sizes, and query complexity
- Checks on compression ratios
- Limits on container resources
- Limit pagination size and page count retrieved by a query



Security the way it should be.
We use 42Crunch to improve the security posture of our APIs.

GLOBAL AUTOMOTIVE MANUFACTURER

API 05. BROKEN FUNCTION LEVEL AUTHORIZATION

API relies on the client to use user level or admin-level/privileged APIs as appropriate. Attackers figure out the “hidden” admin API methods and invoke them directly.

USE CASES

- Some administrative functions are exposed as APIs
- Sensitive operations should only be available internally
- Non-privileged users can access these functions if they know how
- Can be a matter of knowing the URL, using a different verb or parameter

```
/api/users/v1/user/myinfo  
/api/admins/v1/users/all
```

- Do not rely on the client to enforce admin/privilege access
- Apply **deny all** access by default
- Only allow operations to users based on appropriate role
- Implement properly designed and tested authorization

HOW TO PREVENT

API 06. UNRESTRICTED ACCESS TO SENSITIVE BUSINESS FLOWS

A set of APIs exposes a business flow and an attacker abuses these APIs using automated methods to achieve a malicious intent, such as exfiltrating data, or manipulating market or price data.

USE CASES

- An attacker discovers an API to buy a product online and uses automation to bulk purchase all items of a newly released product which they later re-sell
- Real-estate websites price information can be scraped over time to predict house price trends in an area
- Attackers can use automation to perform actions faster than a human user and gain an unfair advantage on auction sites or similar

- Understand business flows that could be sensitive to abuse and add extra layers of protection. Ensure authentication is required, using recommended OAuth flows
- Ensure that APIs are fully protected with robust rate-limiting in front of the API
- Monitor API access and restrict clients using either suspicious devices or originating from risky IP addresses
- Identify non-human usage patterns and insert Captcha or other human detection controls

HOW TO PREVENT

API 07. SERVER SIDE REQUEST FORGERY

Server-Side Request Forgery (SSRF) can occur when an API fetches a remote resource without validating the user-supplied URL.

USE CASES

- An API accepts a URL as a parameter for a redirection, an attacker finds that they can use this to redirect the response to a rogue site which is able to steal sensitive data.
- An attacker can force an API to load resources from a server under their control; this is the basis of a key injection attack in JWTs
- An API allows access to the local host allowing an attacker to use malformed requests to access local resources

- Precisely define the schemas, types, and patterns you will accept in requests at design time and enforce at runtime
- Prevent your API server from following HTTP redirections
- Use an **allow list** of permitted redirects or accesses
- Restrict the range of allowed URL schemes and ports
- Use a standard implementation for the library responsible for loading resources making sure it cannot access the local host, and uses sanitized URLs from a safe URL parser

HOW TO PREVENT

API 08. SECURITY MISCONFIGURATION

Poor configuration of the API servers allows attackers to exploit them.

USE CASES

- Unpatched systems
- Unprotected files and directories
- Unhardened images
- Missing, outdated, or misconfigured TLS
- Exposed storage or server management panels
- Missing CORS policy or security headers
- Error messages with stack traces
- Unnecessary features enabled

- Automate the hardening and patching processes of the full API stack (code, libraries, containers)
- Automate test to API endpoints for misconfiguration (TLS version, ciphers, bad verbs)
- Disable unnecessary features
- Restrict administrative access
- Define and enforce all outputs, including errors

HOW TO PREVENT

API 09. IMPROPER INVENTORY MANAGEMENT

Attacker finds non-production versions of the API (for example staging, testing, beta or earlier versions) that are not as well protected and uses those to launch the attack.

USE CASES

- DevOps, cloud, containers, Kubernetes make having multiple deployments easy (for example dev, test, branches, staging, earlier versions)
- Desire to maintain backward compatibility forces to leave old APIs running
- Old or non-production versions are not properly maintained but these endpoints still have access to production data
- Once authenticated with one endpoint, attackers may switch to the other, production one

HOW TO PREVENT

- Keep an up-to-date Inventory all API hosts
- Limit access to anything that should not be public
- Limit access to production data and segregate access to production and non-production data.
- Implement additional external controls such as API firewalls
- Properly retire old versions of APIs or backport security fixes to them
- Implement strict authentication, redirects, CORS, etc.

API 10. UNSAFE CONSUMPTION OF APIS

Modern API based systems tend to be highly interconnected, frequently consuming upstream APIs. Unfortunately these upstream APIs may themselves be vulnerable and put their consumers at risk.

USE CASES

- An upstream API may inadvertently store data provided to it by a consumer, thereby violating the data governance regulations of the consumer
- An upstream API provider may be attacked and compromised and then pass malicious data to its consumers due to insufficient internal controls. A typical example is an SQL injection attack

HOW TO PREVENT

- Like the case with user input, do not trust upstream API data.
- Filter and sanitize any input data regardless of origin, particularly against injection attacks.
- Ensure that upstream API providers specify their API contract, and use runtime mechanisms to enforce this contract.
- Assume upstream API providers are part of your supply chain and verify their internal development processes.
- Use a secure communication channel at all times.

ABOUT 42CRUNCH

42Crunch was founded by veterans of the security and API management industry who recognized that the traditional approach to protecting APIs was simply not scalable. APIs are the core building block of every enterprise's digital strategy, yet they are also the number one attack surface for hackers. The time is now right for a new approach to API security. Prevent today and protect tomorrow.

San Francisco - Dublin - Madrid - Montpellier - London



We are an active participant in the OWASP Foundation



We meet the most rigorous industry security standards.



We contribute to the community work on the OpenAPI specification.