Writing Secure APIs: A Look At the OWASP 2023 API Top 10 List

Darylynn Ross

Intro

covermymeds®

Sr. Application Security Engineer

Please don’t hold questions to the end.

Discussion is encouraged.

Overview

AWARENESS

THE API TOP 10

HOW DO I USE THIS?

AWARENESS

Everybody's Got A Story

Nov. 2022 T-Mobile: Hackers exploited an API to steal the data of 37M customers. They have had 8 data breaches in less than 5 years resulting in more than **$500M** in fines and settlements.

Sept. 2022 Optus (Australian Telecom) Attackers abused a publicly exposed endpoint that didn't require authentication. They gained highly sensitive PII rich data of 10M customers. To make it easier for attackers, the API used sequential ids. Estimated financial impact was **$140M**.

July 2022 X (formerly Twitter) exposed the PII of 5.4M user accounts. An API allowed attackers to find user accounts by providing email or phone numbers. They had to pay **$250M** in fines for the incident.

Everybody's Got A Story (From Traceable)

60% of organizations have faced an API-related breach in the last two years and **74%** of these endured three or more incidents

57% stated that traditional security solutions are unable to effectively distinguish genuine from fraudulent API activity.

61% anticipate rising API-related risks in the next two years as they deal with an average of **127 third-party API connections**, with just 33% confident in managing external API threats.

Why do you like APIs?

What’s important to developers?

Why do you like APIs?

What’s important to product owners?

Why do you like APIs?

What's important to security engineers?

Why do you like APIs?

What's important to bad actors?

Why Are Our APIs Insecure?

OWASP API Top Ten Security Risks

What is OWASP & Why an API Top Ten?

OWASP
Open Web Application Security Project

https://owasp.org/API-Security/

Awareness

Necessity

Education

We're #1

Authentication & Authorization

#1 Broken Object Level Authorization

#2 Broken Authentication

#3 Broken Object Property Level Authorization

#5 Broken Function Level Authorization

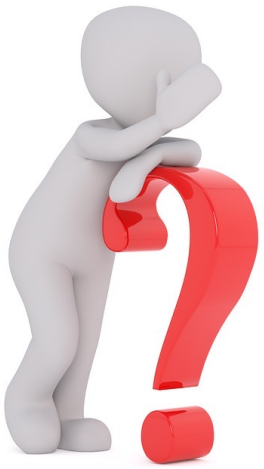
#6 Unrestricted Access to Sensitive Business Flows

Attacks on Confidentiality

Broken Authentication

Attackers can compromise passwords, keys or session tokens, user account information, and other details

Systems are unlikely to be able to distinguish attackers from legitimate users



No Brute Force Controls, Leaking Auth Details, Weak Auth Standards, Poor Validation, Weak Encryption

What can we do about it?

Broken Authentication Prevention

Know the program auth flows

Know how your auth mechanisms work

Treat recovery endpoints like login

Require re-auth for sensitive operations

Implement account lockout controls

Broken Authentication Prevention

Use Multi Factor Authentication when possible

Don’t use API Keys for user authentication

Use anti brute force /cred stuffing controls

Use strong encryption controls

Reference OWASP Authentication Cheat Sheet

Broken Authorization Symptoms

Object

Property

- Allow sensitive data to be read by the user
- Allow CRUD ops on the value of an object property

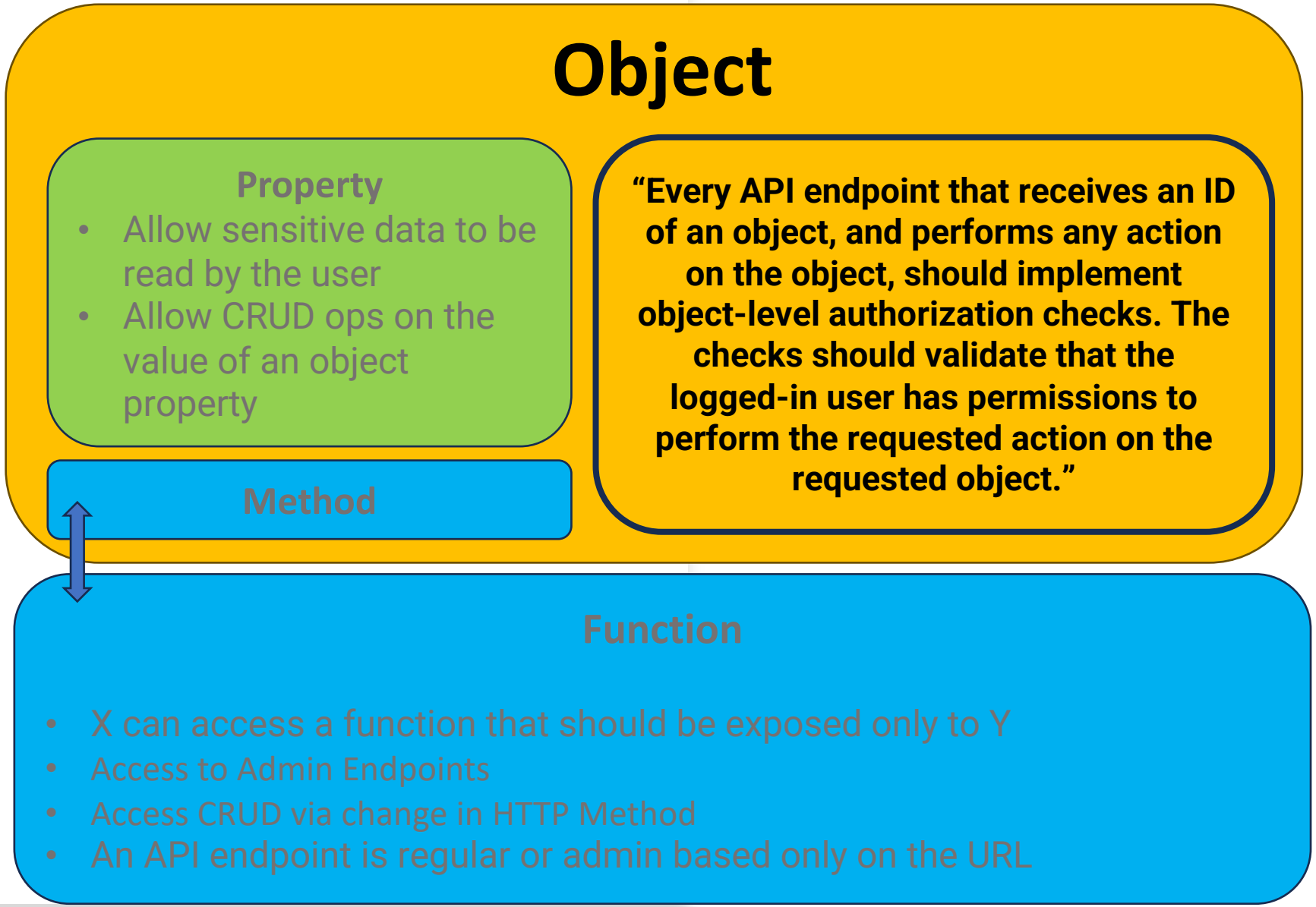
Method

"Every API endpoint that receives an ID of an object, and performs any action on the object, should implement object-level authorization checks. The checks should validate that the logged-in user has permissions to perform the requested action on the requested object."

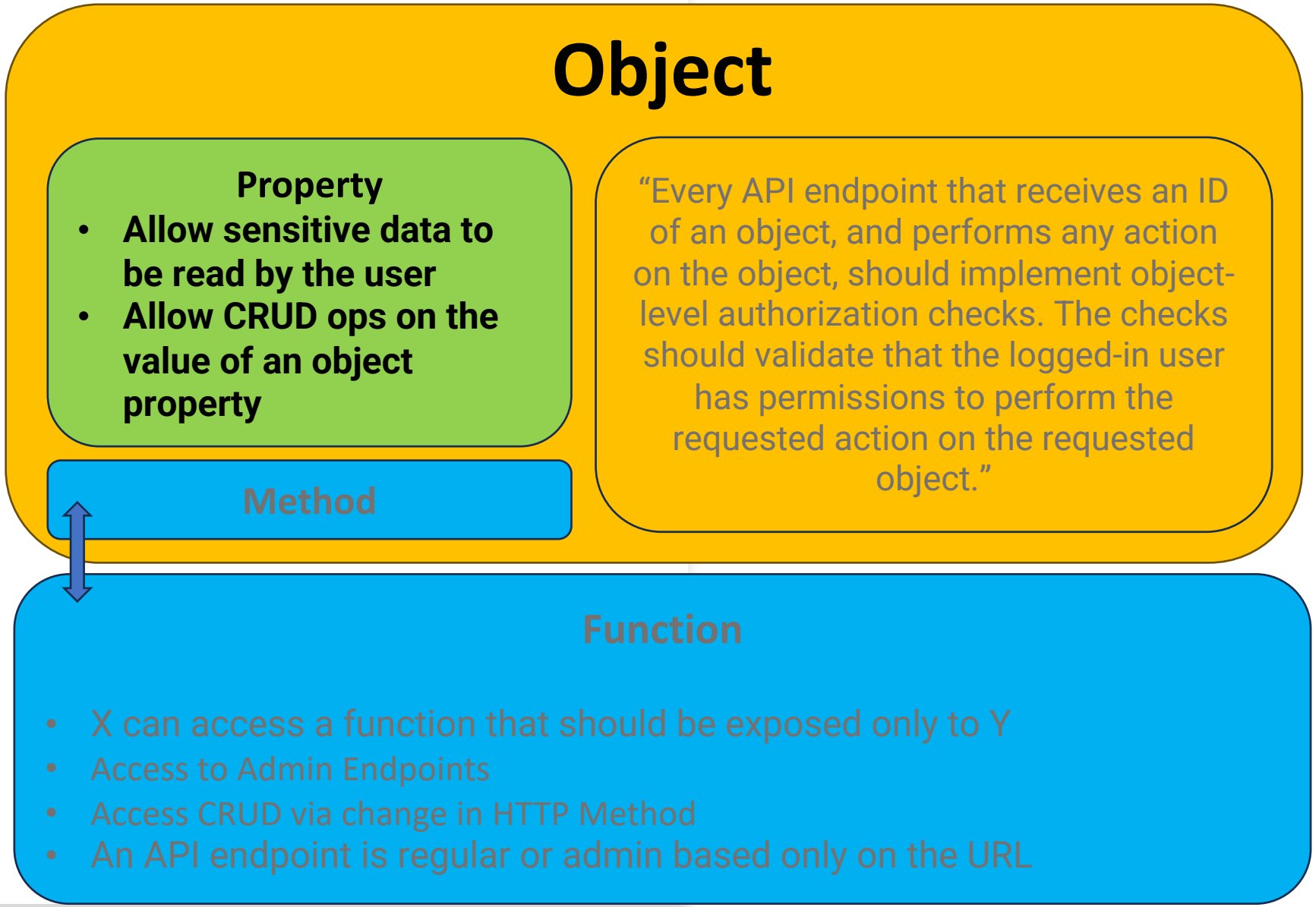
Function

- X can access a function that should be exposed only to Y
- Access to Admin Endpoints
- Access CRUD via change in HTTP Method
- An API endpoint is regular or admin based only on the URL

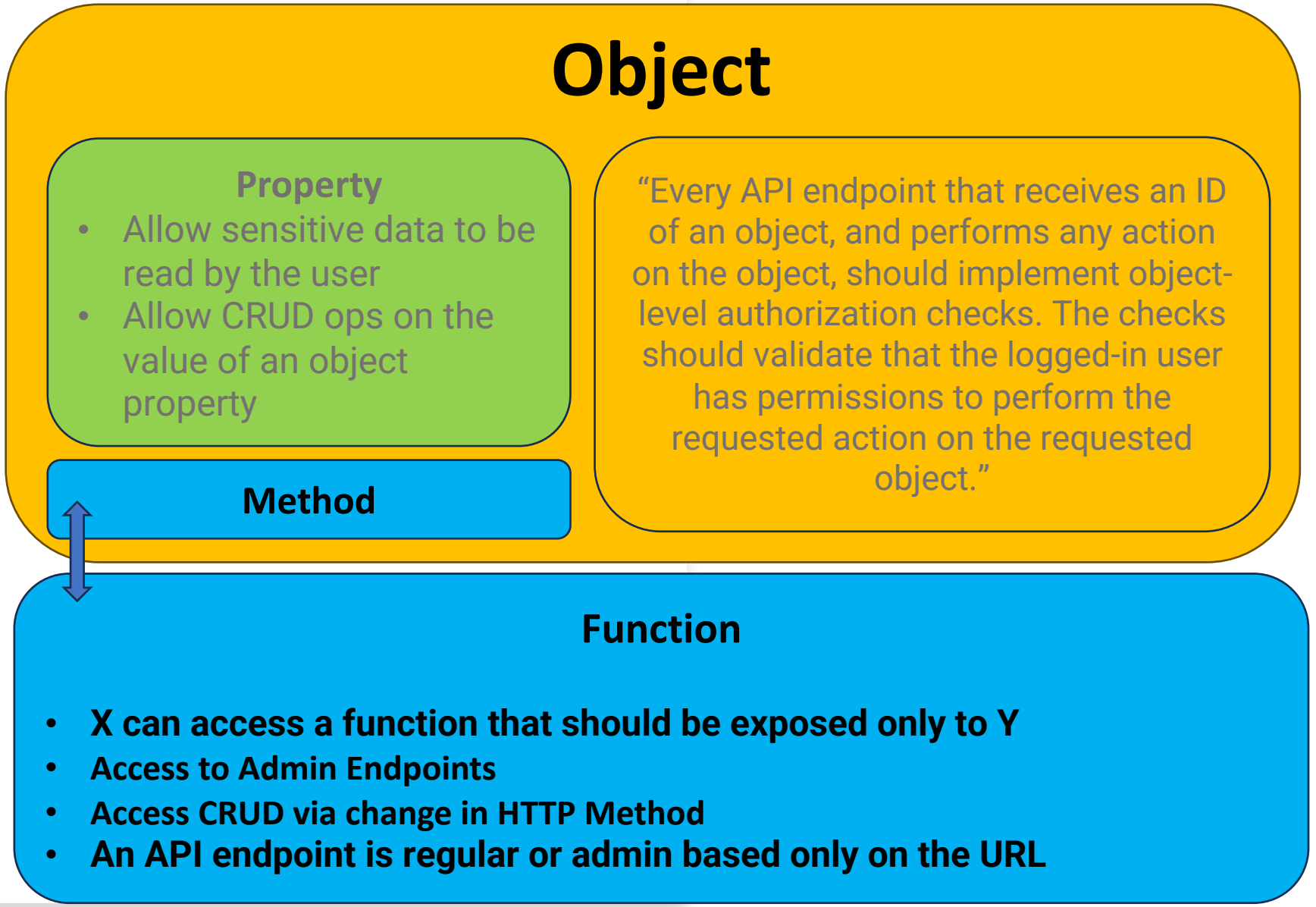
Broken Authorization Symptoms



Broken Authorization Symptoms

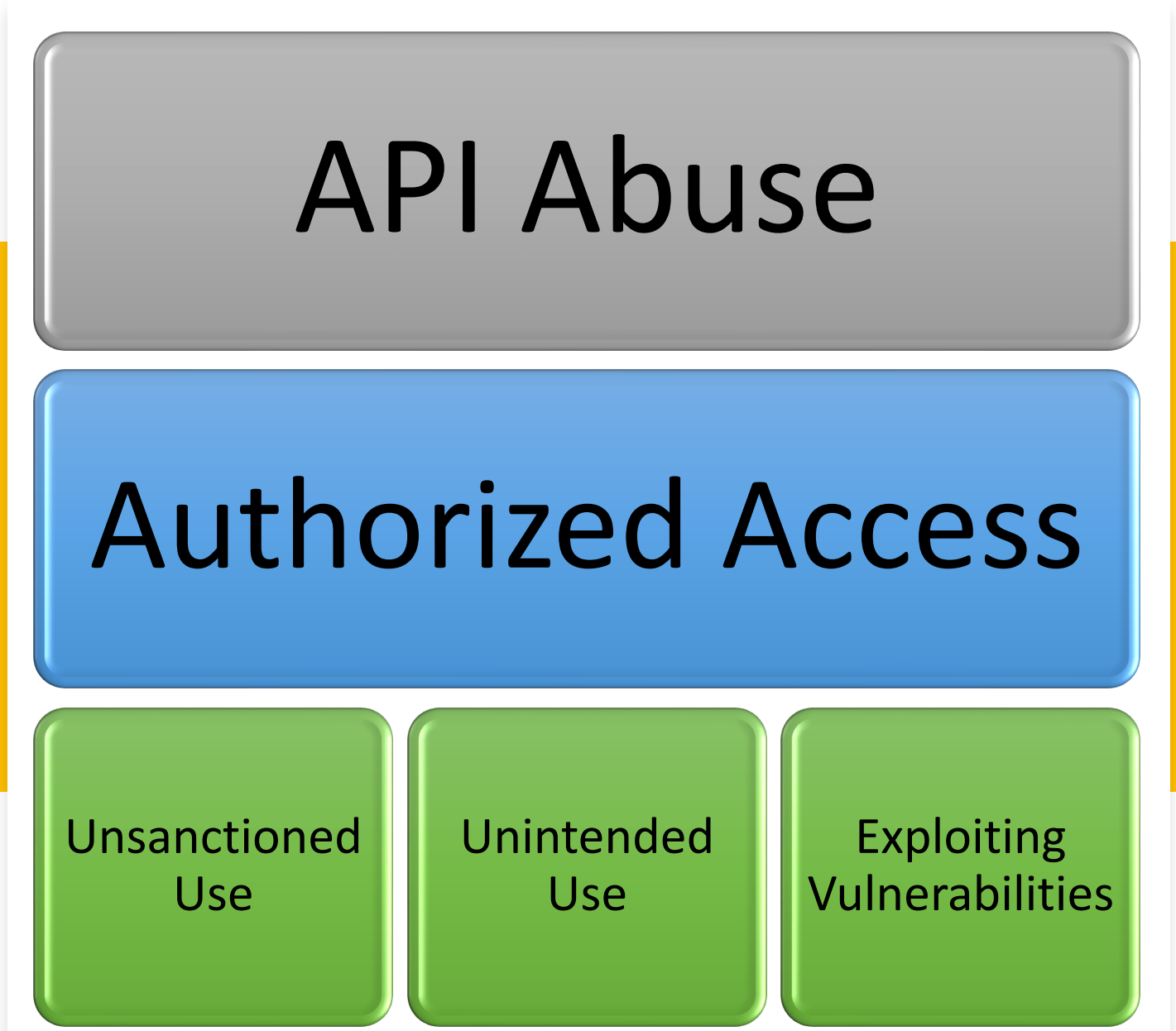


Broken Authorization Symptoms



Broken Authorization Prevention

- Use Proper Authorization Mechanisms
- Check Access for Every DB Action
- Use Random and Unpredictable GUIDS
- Test Authorization Functionality for ALL Roles
- Deny Access to Sensitive Data By Default
- Inherit Admin Authorization Checks from Abstract Controller



Unrestricted Access to Sensitive Business Flows

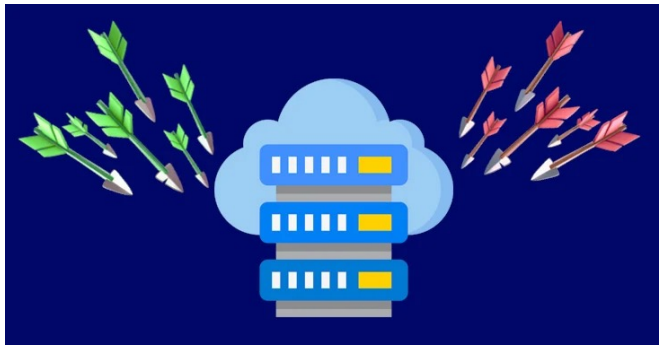
Unrestricted Access to Sensitive Business Flows

Identify the business flows that might harm the business if they are excessively used

Choose the right protection mechanisms to mitigate the business risk

Intermission

Consumption & Forgery



#4 Unrestricted Resource Consumption

#7 Server-Side Request Forgery

#10 Unsafe Consumption of APIs

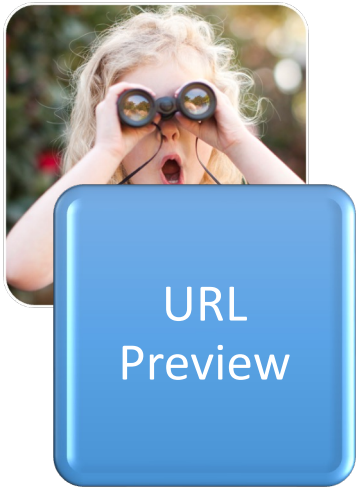
Attacks on Integrity & Availability

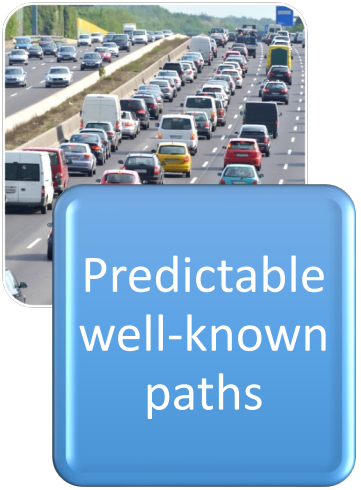
Server-Side Request Forgery

Occurs when an API is fetching a remote resource without validating the user-supplied URI.

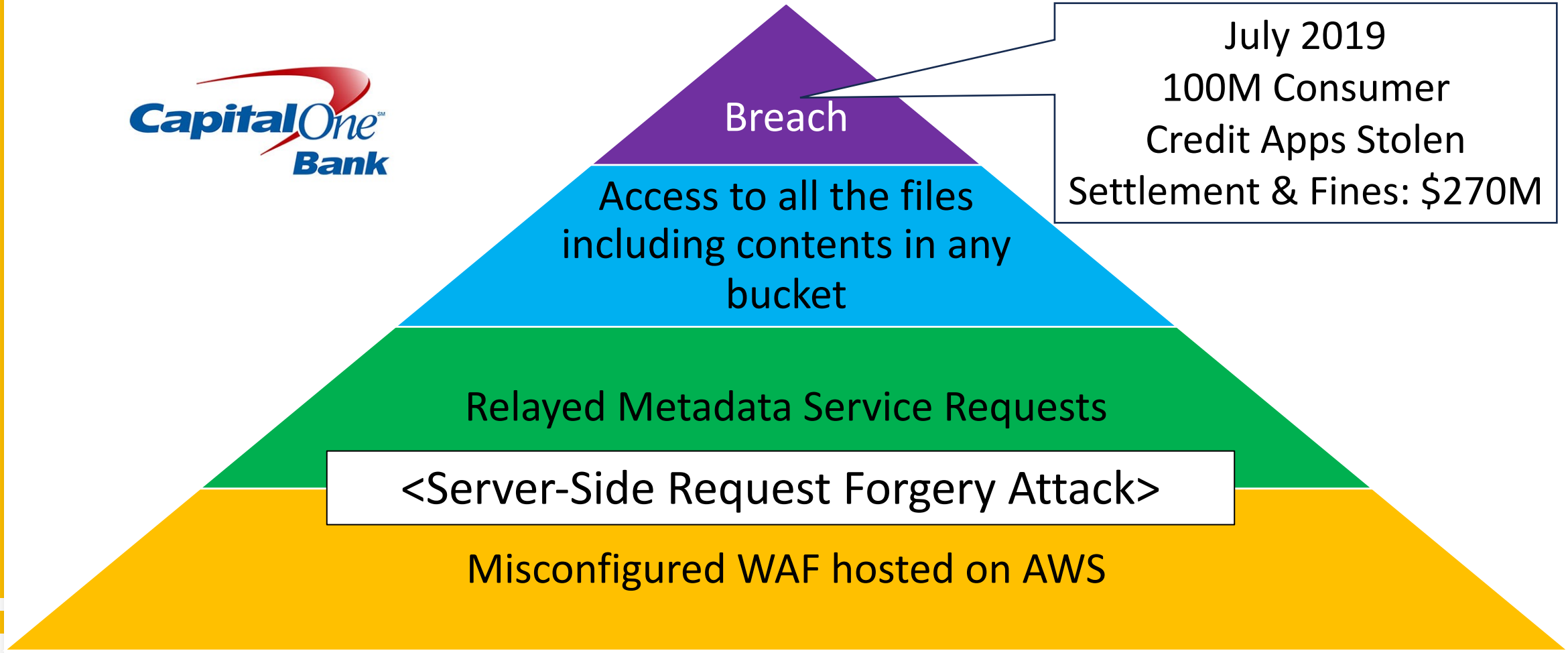
This allows an attacker to coerce the server-side application to make requests to an unintended location , regardless of WAF or VPN protections.

External Resource Access Happens Here





Server-Side Request Forgery



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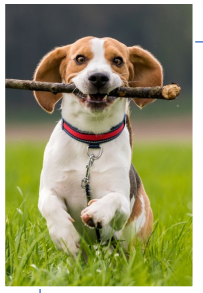
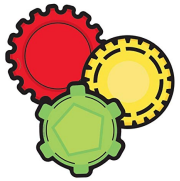


Isolate Resource Fetching

Use Allow Lists

Disable HTTP Redirects

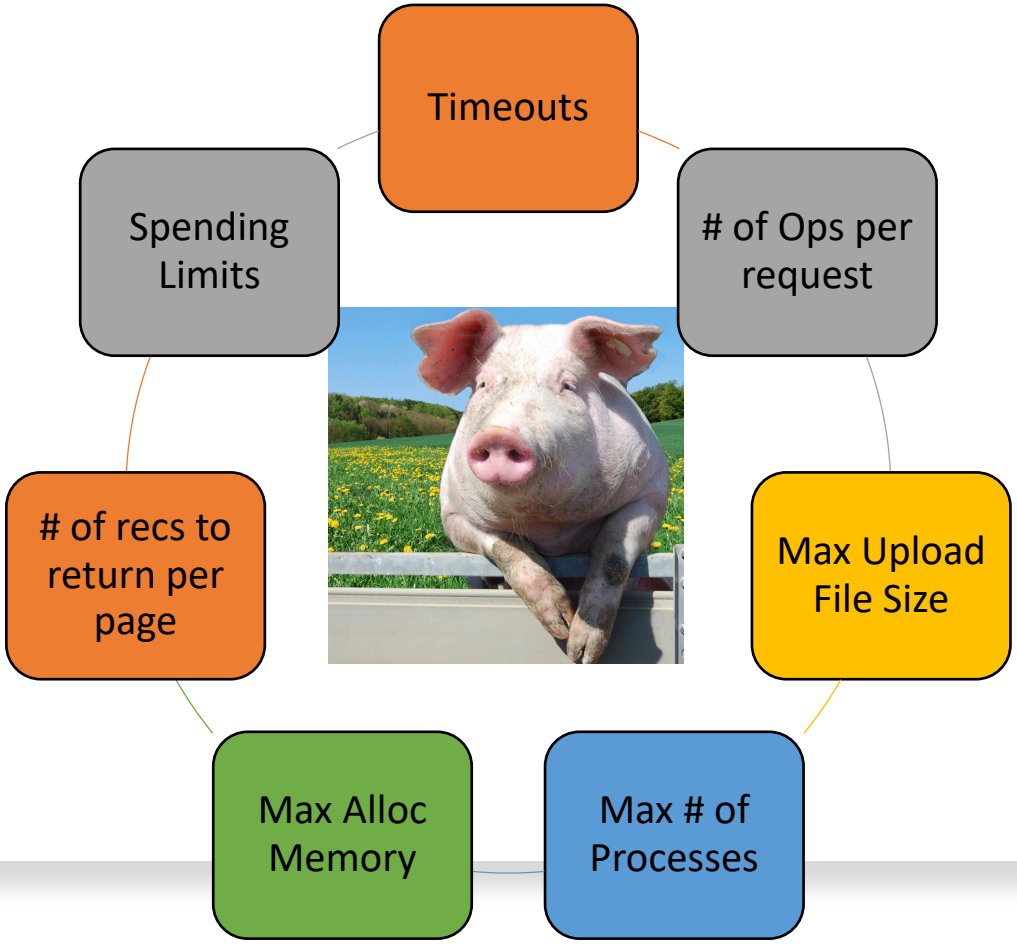


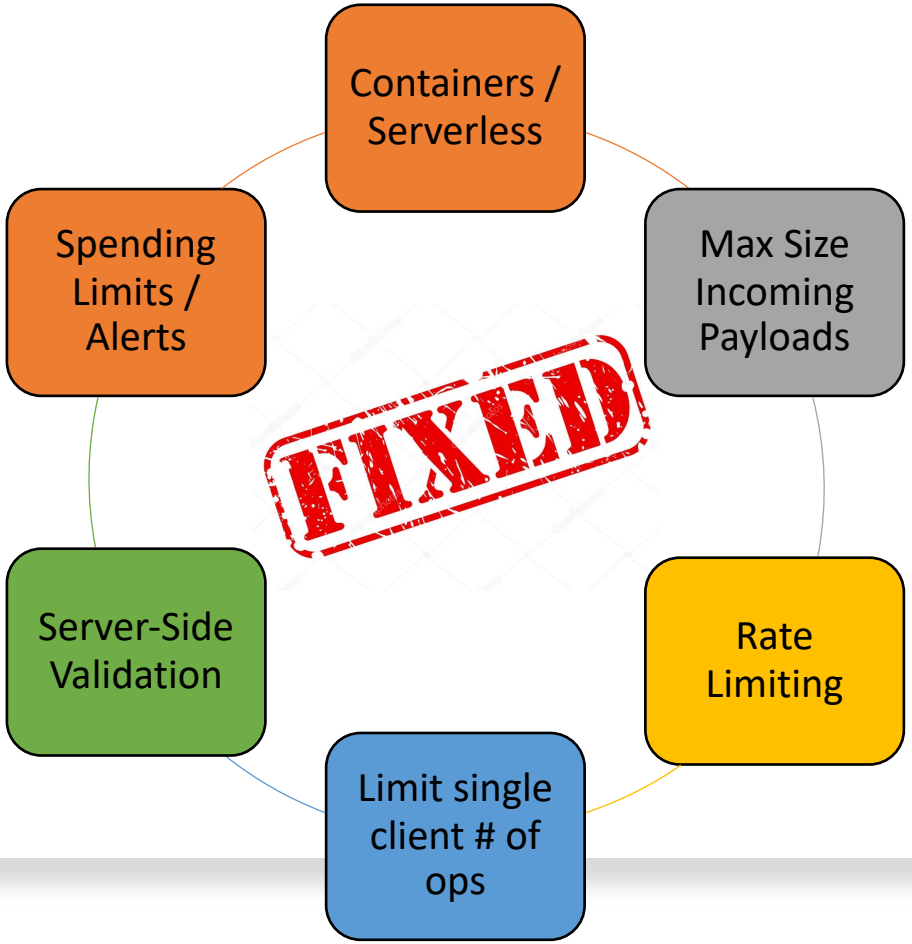
URL Parser

Validate Client Supplied Data

Don’t Forward Raw Responses

Unrestricted Resource Consumption "Here Piggy, Piggy"





Unsafe Consumption of APIs

What friends should you TRUST?

- Assess 3rd party API service providers
- Validate and sanitize data from other APIs
- Allow list any redirect URIs / don't blindly follow redirects
- Use TLS
- Limit resources available to 3rd parties

The Rest: Making Life Easier For Attackers

#8 Security Misconfiguration

#9 Improper Inventory Management

Attacks on Integrity

Security Misconfig

You might be vulnerable if ….

- Your error messages contain stack traces
- You have bonus features
- You don’t use TLS
- You aren’t keeping up on patching
- Your Cross Origin Resource Sharing (CORS) policy is missing or improperly set up
- You are clueless about configuring your cloud
- You don’t have a repeatable, automated hardening process
- You don’t use security headers

Improper Inventory Mgmt

Sensitive Data / Dataflow Blind Spots

X No business approval or justification

X No inventory or visibility

X No visibility of what data is being shared

Documentation Blind Spots

X Where it runs?

X Who has access?

X No versioning strategy?

X Old or no documentation

X Old or no inventory data

Improper Inventory Management

Prevention

- ✓ Automation
- ✓ Security Tooling
- ✓ Inventory and Documentation
- ✓ Know Sensitive Dataflows
- ✓ Be Careful with Data in Non Prod Envs
- ✓ Version Strategy

How Do I Use This?

Next Steps

Talk to Your Security Team

Assess Your Risk

Prioritize

Knock Out the Easy Stuff

Tapas (Small bites) for the Hard Stuff

Educate Yourself and Others

Join the App Sec Conversation

Questions?

Resources

Sources

- Why API attacks are increasing and how to avoid them CSOonline.com
- Firetail API Data Breach Tracker Firetail.io
- https://www.techtarget.com/searchsecurity/news/252467901/Capital-One-hack-highlights-SSRF-concerns-for-AWS Tech Target
- https://www.traceable.ai/ Traceable
- https://www.csoonline.com/article/652754/6-notable-api-security-initiatives-launched-in-2023.html
- https://portswigger.net/web-security/ssrf Portswigger on Server Side Request Forgery
- https://www.darkreading.com/cyber-risk/even-perfect-apis-can-be-abused Dark Reading on API Abuse

Resources

OWASP Resources:

- https://owasp.org/API-Security/
- https://cheatsheetseries.owasp.org/cheatsheets/Server_Side_Request_Forgery_Prevention_Cheat_Sheet.html
- https://cheatsheetseries.owasp.org/cheatsheets/Authentication_Cheat_Sheet.html
- https://owasp.org/www-project-risk-assessment-framework/