

Basic Principles and Resources

Saltzer & Schröder, IEEE CSD,
OWASP Top 10 / STG / ASVS

Rough Overview

1. Introduction
2. >> Basic Principles and Resources <<
3. Architecture & Basic Web Procedure
4. Authentication and Session Management
5. Authorization
6. Server and Backend Attacks
7. Remaining Client Attacks
8. General Topics
9. Conclusions

There are a few basic principles that
apply to almost all vulnerabilities

Economy of Mechanism

Fail-safe Defaults

Complete Mediation

Least Privilege

Least Common Mechanism

Separation of Privilege

Open Design

Psychological Acceptability

- Saltzer and Schroeder, 1975 -

http://web.cs.wpi.edu/~guttman/cs557_website/papers/saltzer1975.pdf

<https://adam.shostack.org/blog/the-security-principles-of-saltzer-and-schroeder/>

Earn or give, but never assume, trust.

Use an authentication mechanism that cannot be bypassed or tampered with.

Authorize after you authenticate

Strictly separate data and control instructions, and never process control instructions received from untrusted sources.

Define an approach that ensures all data are explicitly validated.

Use cryptography correctly.

Identify sensitive data and how they should be handled.

Always consider the user.

Understand how integrating external components changes your attack surface.

Be flexible when considering future changes to objects and actors.

- IEEE Center for Secure Design, 2014 -

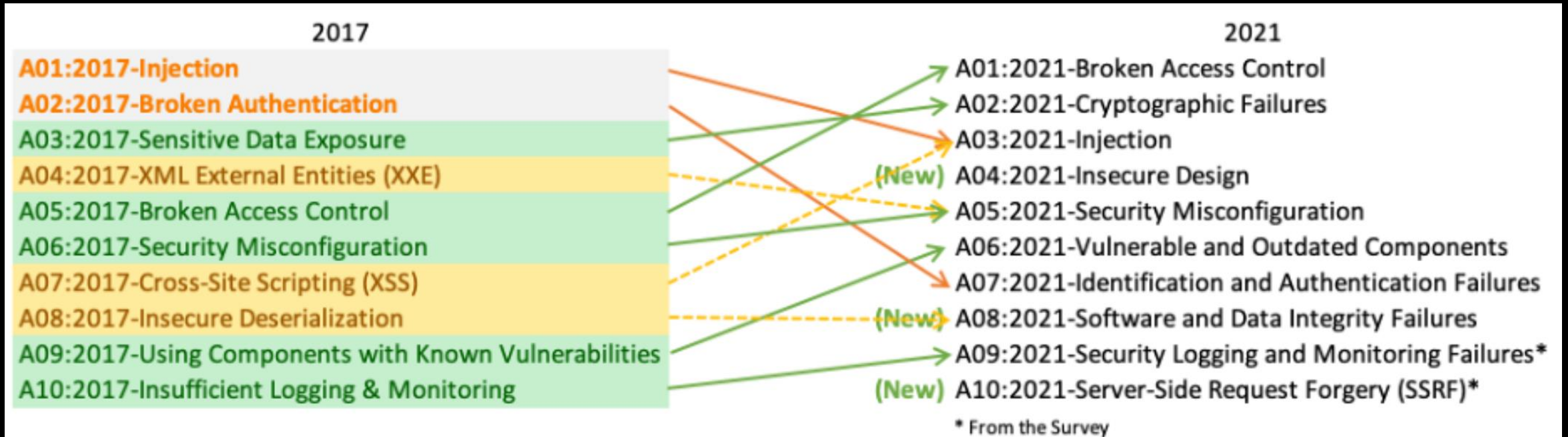
<https://ieeecs-media.computer.org/media/technical-activities/CYBSI/docs/Top-10-Flaws.pdf>

Some resources which might be
useful...

OWASP

(Open Web Application Security Project)

OWASP Top 10



<https://owasp.org/www-project-top-ten/>
<https://owasp.org/Top10>

OWASP ASVS

- V1: Architecture, Design and Threat Modeling Requirements
- V2: Authentication Verification Requirements
- V3: Session Management Verification Requirements
- V4: Access Control Verification Requirements
- V5: Validation, Sanitization and Encoding Verification Requirements
- V6: Stored Cryptography Verification Requirements
- V7: Error Handling and Logging Verification Requirements
- V8: Data Protection Verification Requirements
- V9: Communications Verification Requirements
- V10: Malicious Code Verification Requirements
- V11: Business Logic Verification Requirements
- V12: File and Resources Verification Requirements
- V13: API and Web Service Verification Requirements
- V14: Configuration Verification Requirements

V3.2 Session Binding Requirements

#	Description	L1	L2	L3	CWE	NIST §
3.2.1	Verify the application generates a new session token on user authentication. (C6)	✓	✓	✓	384	7.1
3.2.2	Verify that session tokens possess at least 64 bits of entropy. (C6)	✓	✓	✓	331	7.1
3.2.3	Verify the application only stores session tokens in the browser using secure methods such as appropriately secured cookies (see section 3.4) or HTML 5 session storage.	✓	✓	✓	539	7.1
3.2.4	Verify that session token are generated using approved cryptographic algorithms. (C6)		✓	✓	331	7.1

<https://owasp.org/www-project-application-security-verification-standard/>

OWASP Web Security Testing Guide



<https://owasp.org/www-project-web-security-testing-guide/>

Some more interesting resources

- Similar courses from other universities
 - Feross Aboukhadijeh (Stanford)
 - <https://web.stanford.edu/class/cs253/>
 - Andreas Happe (FH/Technikum Wien)
 - <https://snikt.net/WebSec.pdf>
 - Björn Kimminich
 - <https://github.com/bkimminich/it-security-lecture>
- PortSwigger Web Security Academy
 - <https://portswigger.net/web-security>
- Hacker101
 - <https://www.hacker101.com/>

Key Messages

- Sticking to a few design principles helps to avoid a lot of flaws and vulnerabilities
 - they also help to find flaws and vulnerabilities
- A lot of great resources are available when it comes to web security
- OWASP is your friend