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# JWT WTF?

## A Look Into Common JWT Vulnerabilities

05/09/2025

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Without them, this conference couldn’t happen.

# whoami

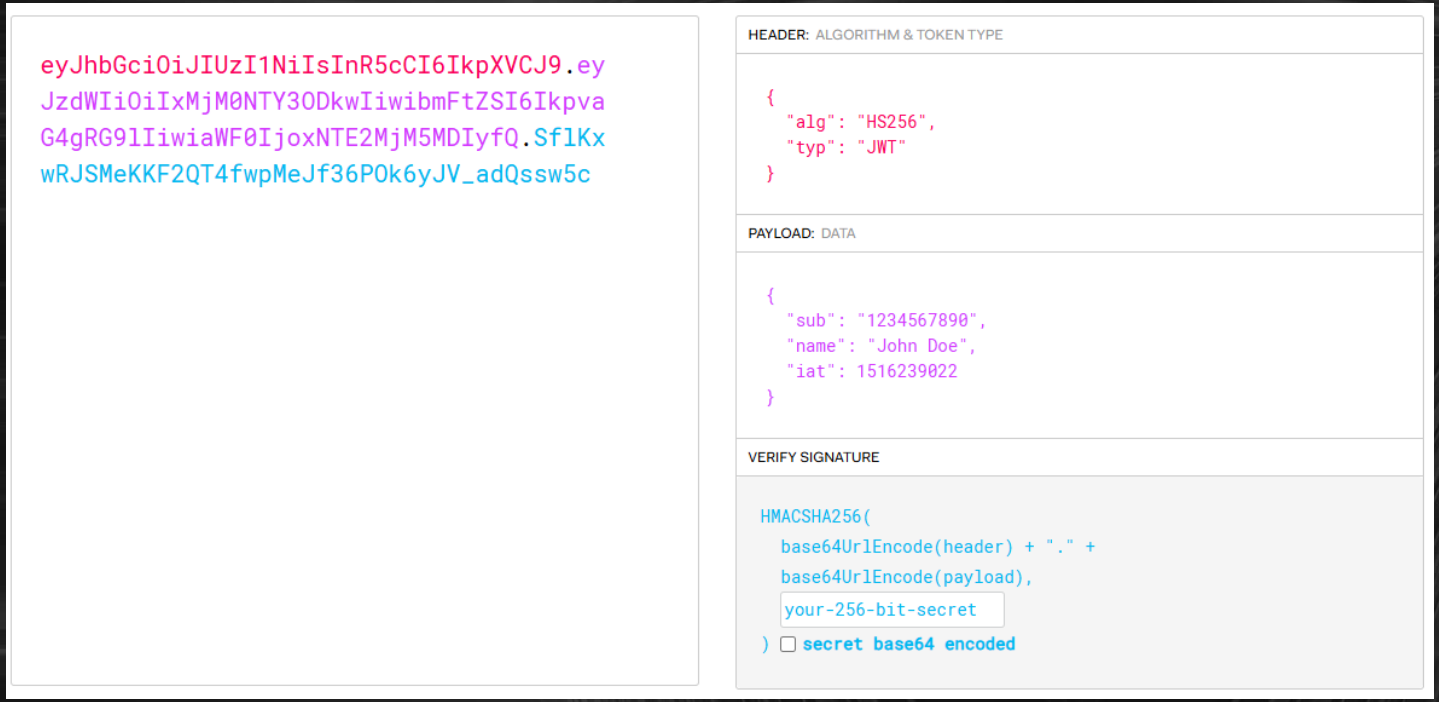
- Lead Security Consultant at Bastion Security
- Pentester for over 6 years
- Previously done internal security consultancy for a bank.

# Agenda

- What is a JWT?
- Common attacks against JWTs
- ~~Live Demo~~ Pre-Recorded Demo
- Security best practices
- Q&A

# What is a JWT?

- A way of representing information between parties
  - Commonly used for Authentication and Authorisation
- Digitally signed - trusted and verifiable
- Consists of a header, payload and signature



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eyJhbGciOiJIUzI1NiIsInR5cCI6IkpXVCJ9.ey
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G4gRG9lIiwiaWF0IjoxNTE2MjM5MDIyfQ.SflKx
wRJSMeKKF2QT4fwpMeJf36POk6yJV_adQssw5c
```

HEADER: ALGORITHM & TOKEN TYPE

```
{
  "alg": "HS256",
  "typ": "JWT"
}
```

PAYLOAD: DATA

```
{
  "sub": "1234567890",
  "name": "John Doe",
  "iat": 1516239022
}
```

VERIFY SIGNATURE

```
HMACSHA256(
  base64UrlEncode(header) + "." +
  base64UrlEncode(payload),
  your-256-bit-secret
) □ secret base64 encoded
```

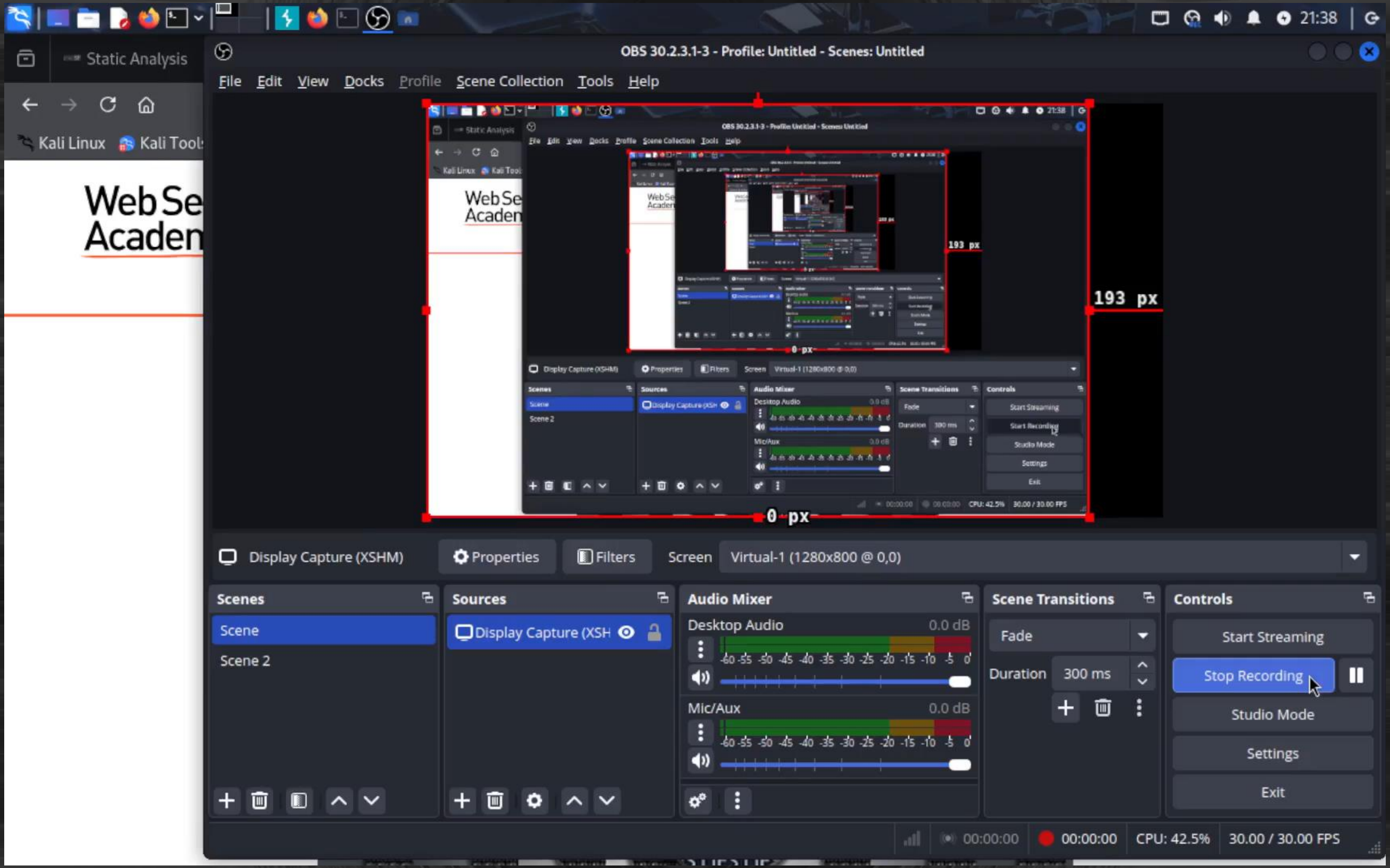
# What Can We Attack?

- Header - Algorithm
- Payload - User Claims
- Signature
- The entire token - Replay attacks

# No Verification

- Vulnerability: Server does not validate the signature at all.
- Attack: Change the JWT claim as you see fit!

# Demo



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Display Capture (XSHM)

Screen: Virtual-1 (1280x800 @ 0,0)

Scenes: Scene, Scene 2

Sources: Display Capture (XSH

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Scene Transitions: Fade

Duration: 300 ms

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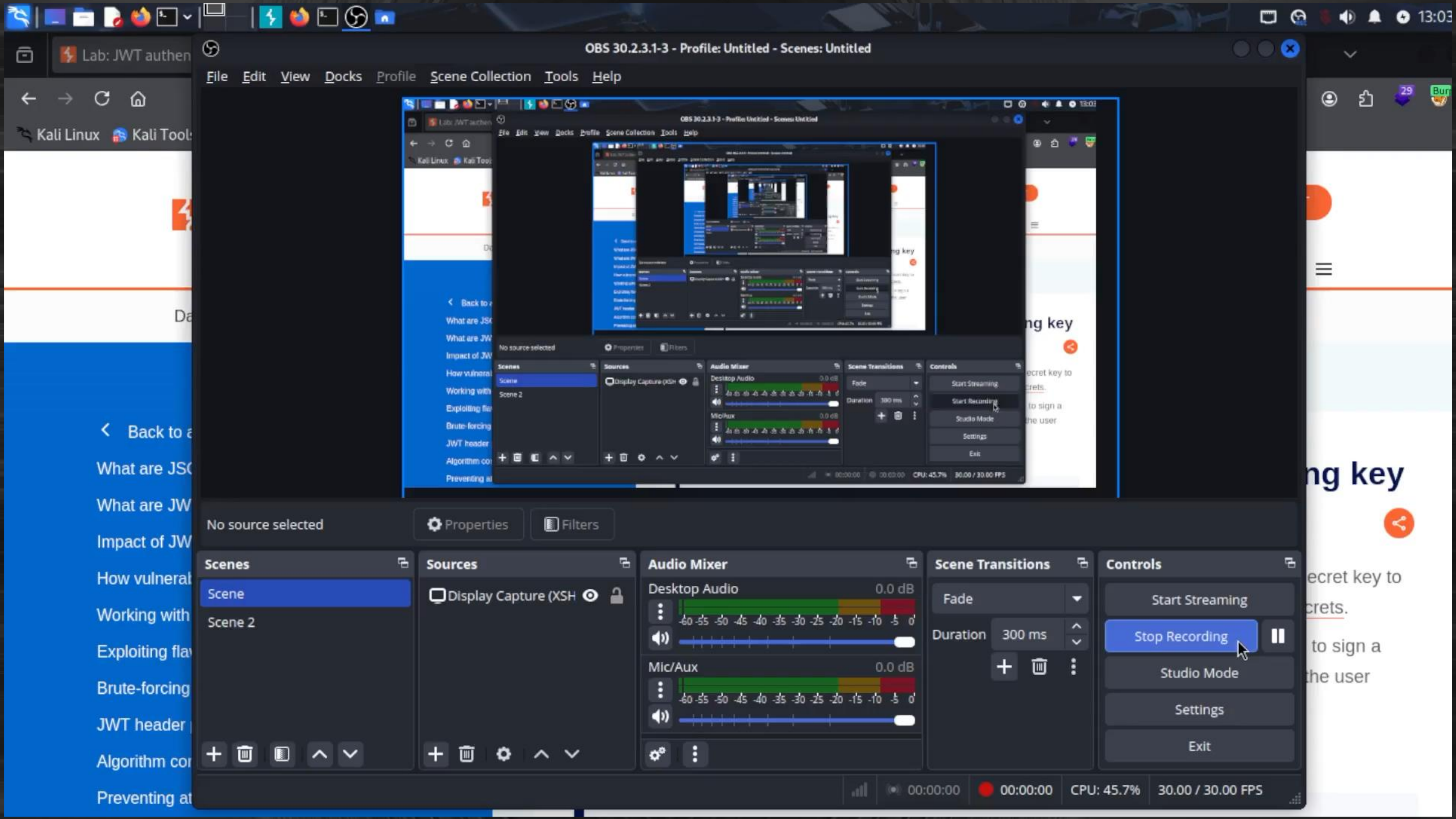
# Weak Secret Key

- Vulnerability: When the HMAC algorithm is used with a weak secret key.
- Attack: Using a valid JWT, we can bruteforce it to get the secret.
- Using this secret, we can sign our own valid tokens.

# Demo



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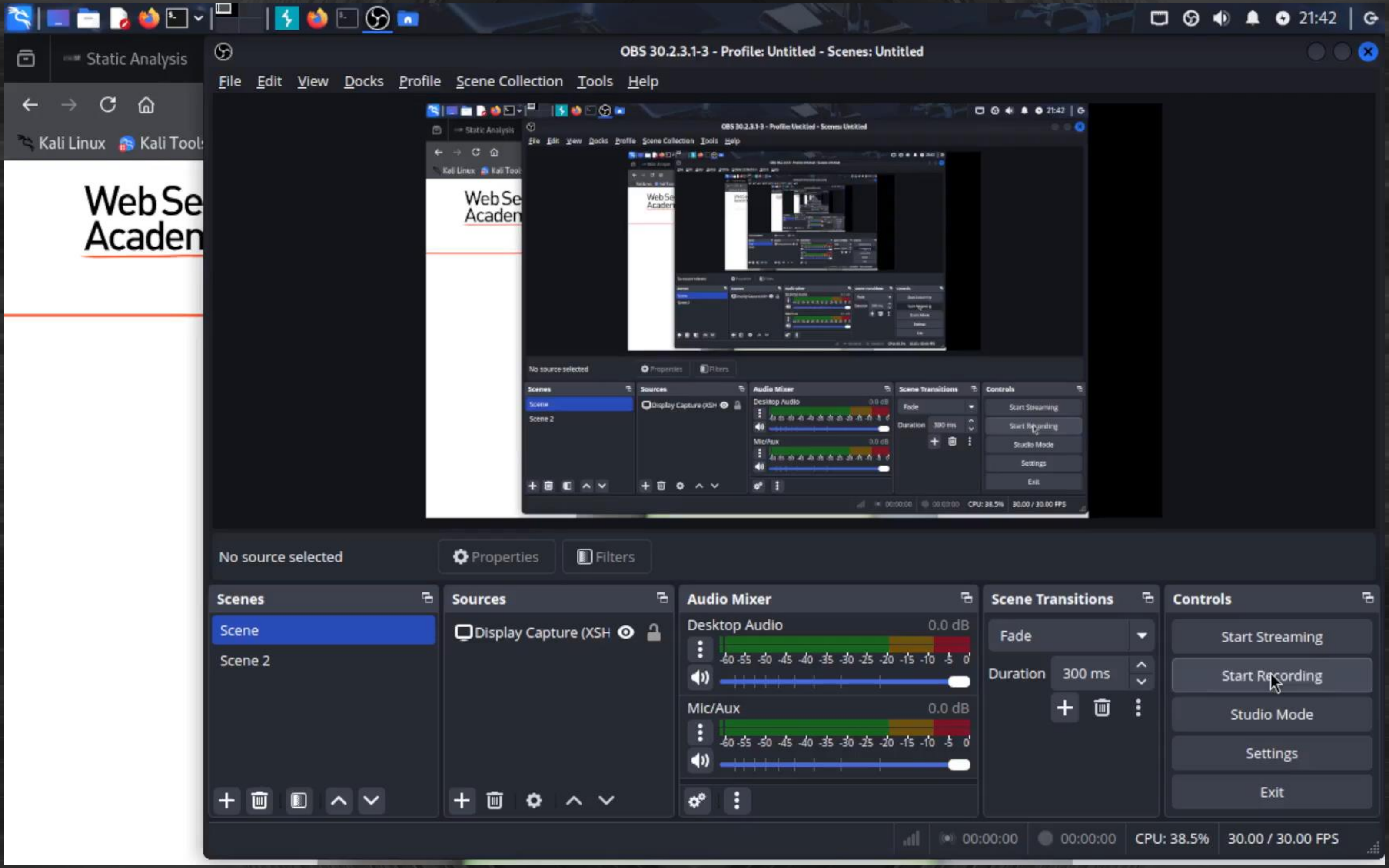
# alg: none

- Vulnerability: Server accepts unsigned tokens
- Attack: Change header to { "alg": "none" } and remove the signature
- Profit?

# Demo



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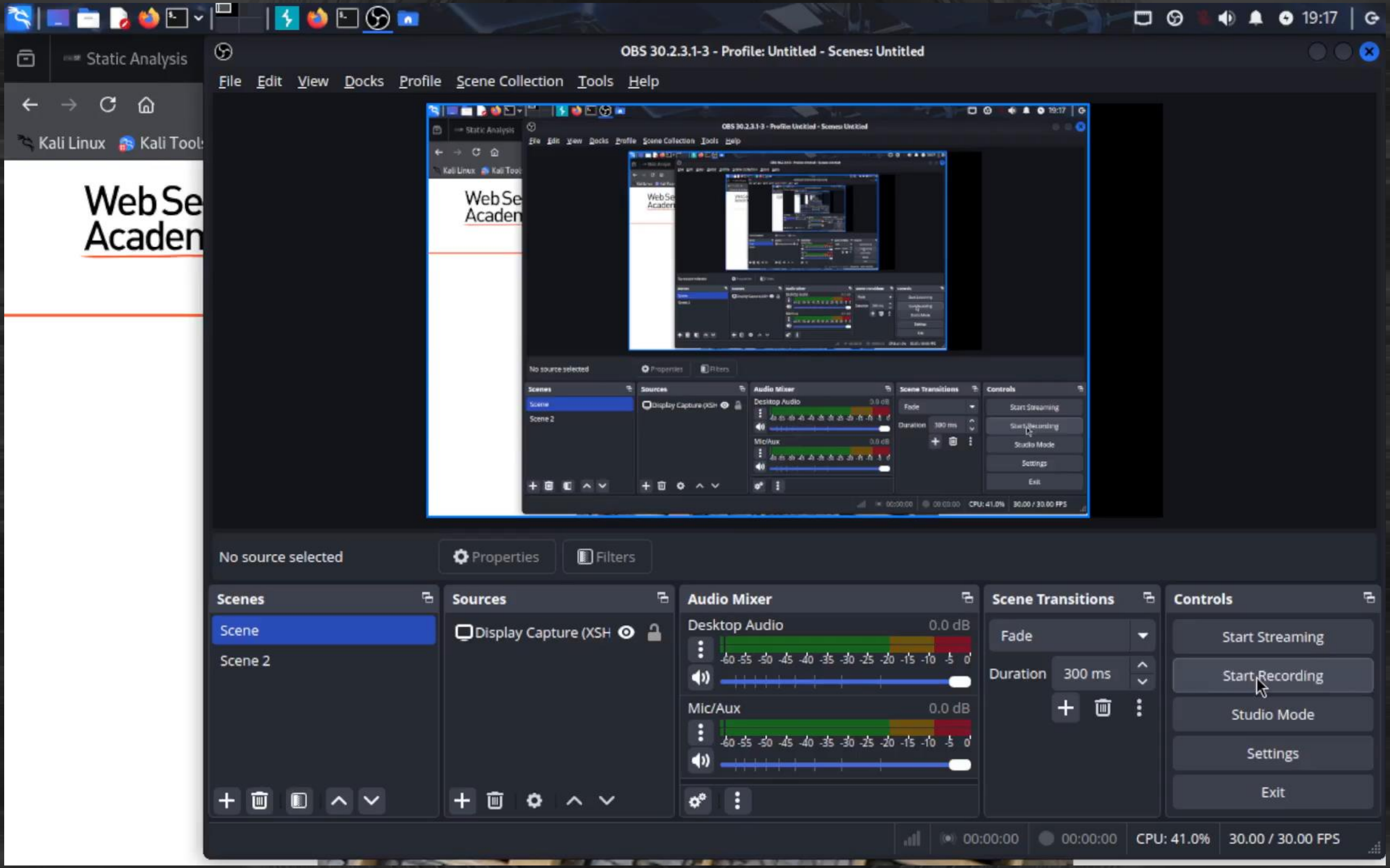
# sPoNgEbOb yOuR wAy tO vIcToRy

- Avoid denylisting - Fix the root cause.
- Auth0 - JWT Validation Bypass in Authentication API

# Key Confusion

- Arises when JWT libraries use a single method for verifying signatures.
- We can force the server to use the HMAC symmetric algorithm instead of RSA
- In a flawed implementation, we can use the server’s public key to sign JWTs.
- Since the server uses the same public key to verify the JWT, we can create valid JWTs.

# Demo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# So How To Secure?

- Use proven libraries and keep them updated
  - Stick with battle-tested libraries
- Use strong, modern algorithms such as RS256
  - Explicitly reject alg: none and all its variants - don’t rely on library defaults
- Always treat user input as untrusted
  - Validate all claims on the server-side
- Do security reviews.
  - Peer Reviews, Penetration Testing, SCA/SAST Tooling.

# Questions?

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