Web Application Authentication & Vulnerability Testing on Instagram

Contents

Executive Summary

This report presents a consolidated overview of authentication and vulnerability testing performed on Instagram using industry-grade tools: OWASP ZAP and Burp Suite.

The objective was to:

- Analyze how Instagram manages session authentication and resists session hijacking.
- Identify underlying security misconfigurations and header-related vulnerabilities.

Despite multiple attempts to hijack a session by replicating captured cookie values and headers, Instagram's layered security mechanisms successfully prevented unauthorized access. Meanwhile, automated scanning through ZAP uncovered several medium to low-level vulnerabilities, demonstrating that even well-established platforms can benefit from improved content security policies and hardened cookie settings.

Introduction

The goal of this exercise was to gain hands-on experience with web application testing tools and techniques. The focus was on understanding how session cookies work, how login sessions are maintained, and how secure platforms defend against session hijacking and unauthorized access attempts. The security posture of web applications depends not only on robust backend logic but also on how they manage user sessions and enforce browser-level protections. Instagram, as a widely used platform, served as a practical case study to assess real-world defense mechanisms against common threats such as session hijacking and insecure cookie usage.

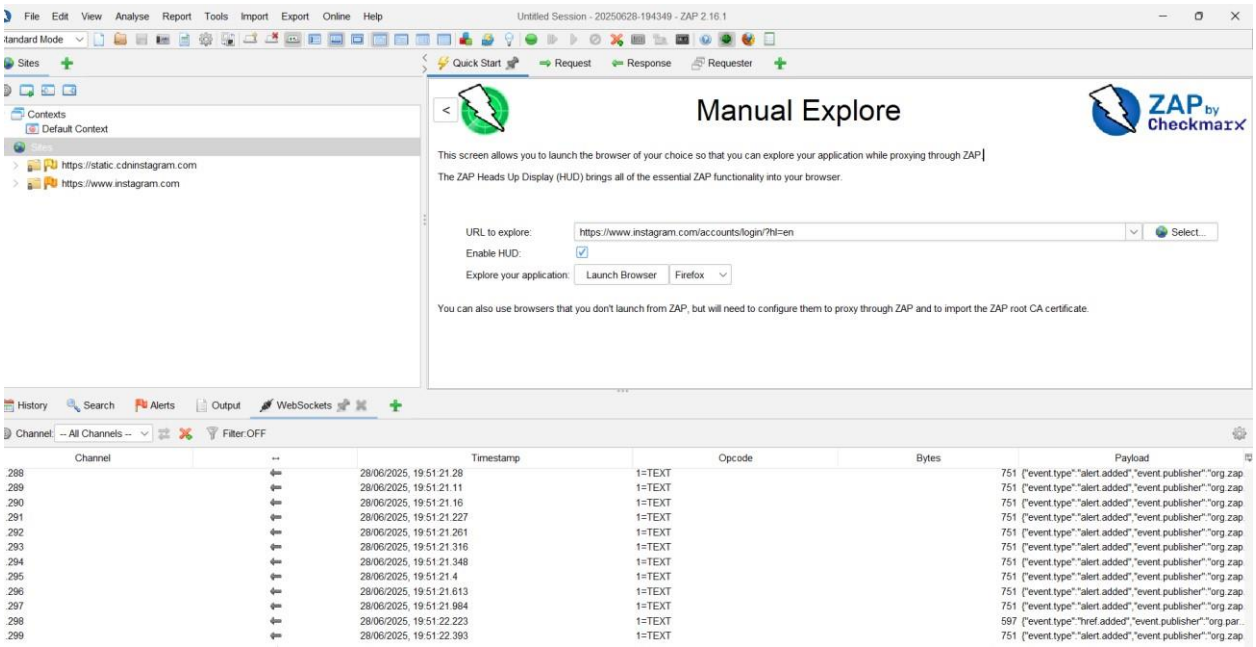
This task was divided into two major components:

- Manual **authentication testing** and **session hijack attempt** via Burp Suite.
- Automated **vulnerability scanning** of the login interface via OWASP ZAP.

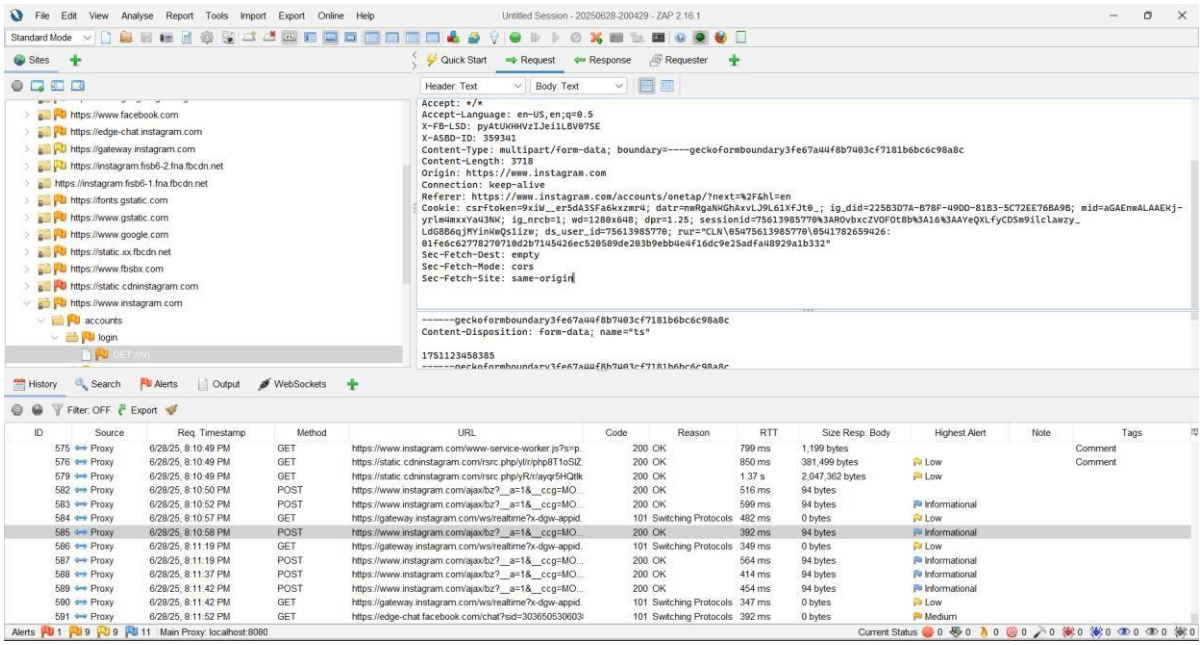
Task Details and Working

Login and Session Monitoring

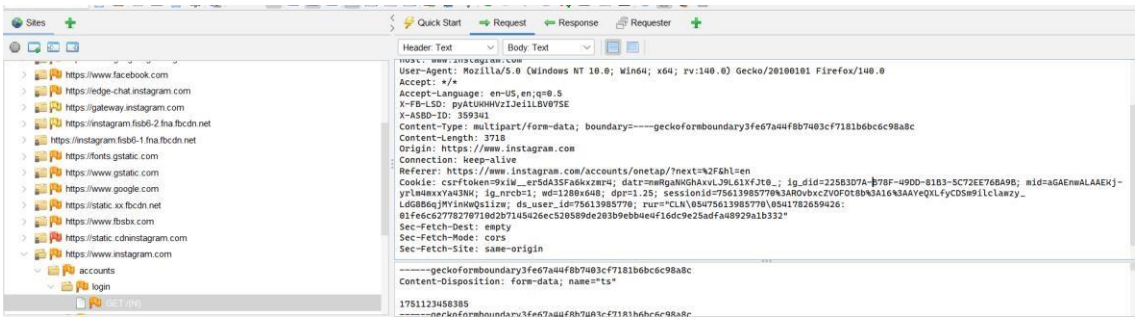
- Logged into an Instagram account using OWASP ZAP's browser.

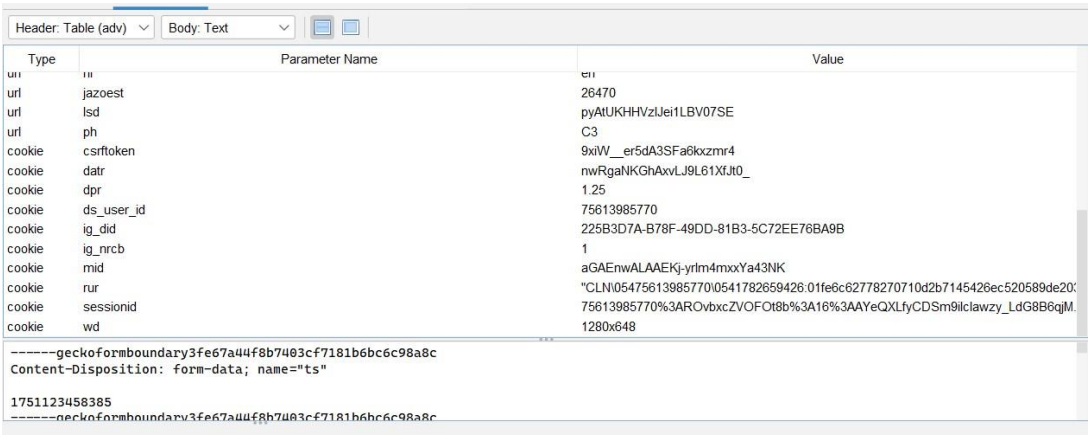


Select the post request (logged in to insta)



- Captured HTTP requests and responses, especially focusing on cookies and headers

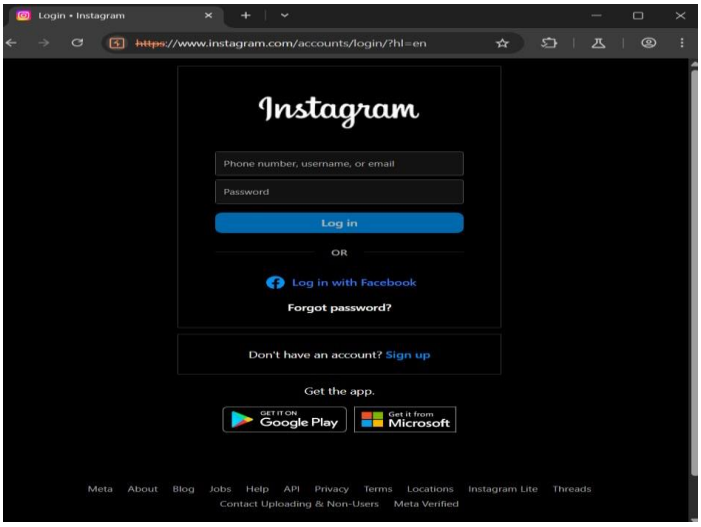




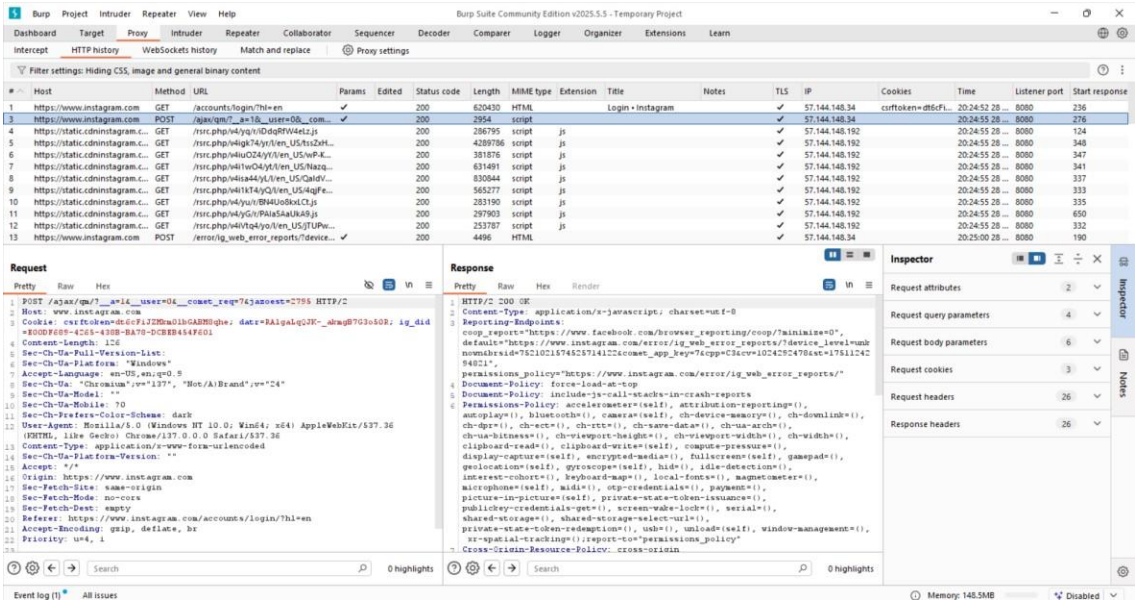
Noted down csrftoken, sessionid, ds-user-id, datr, ig_did and useragent.

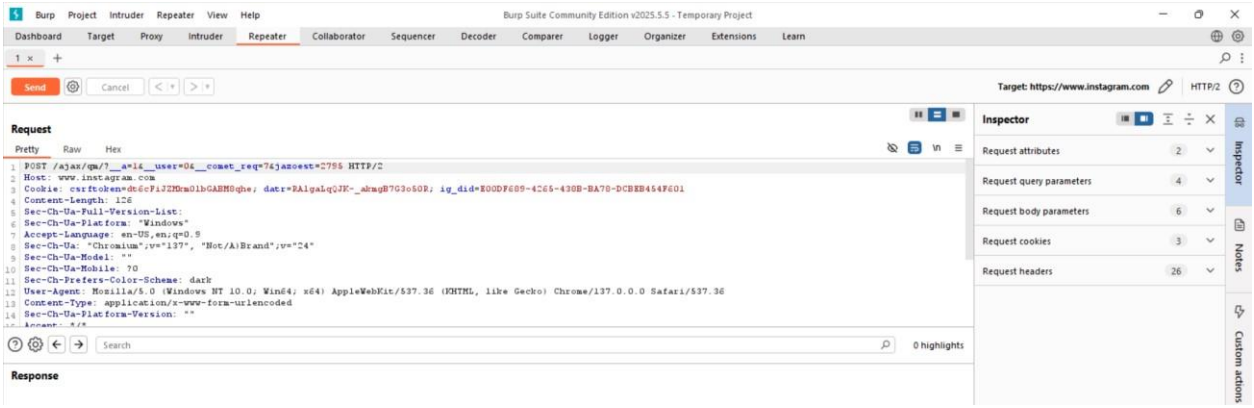
Session Cookie Injection Attempt

- Opened Burp Suite's Chromium-based browser and navigated to Instagram login page.



- Using the **Repeater** feature, a POST request was crafted to inject the captured cookies and headers.

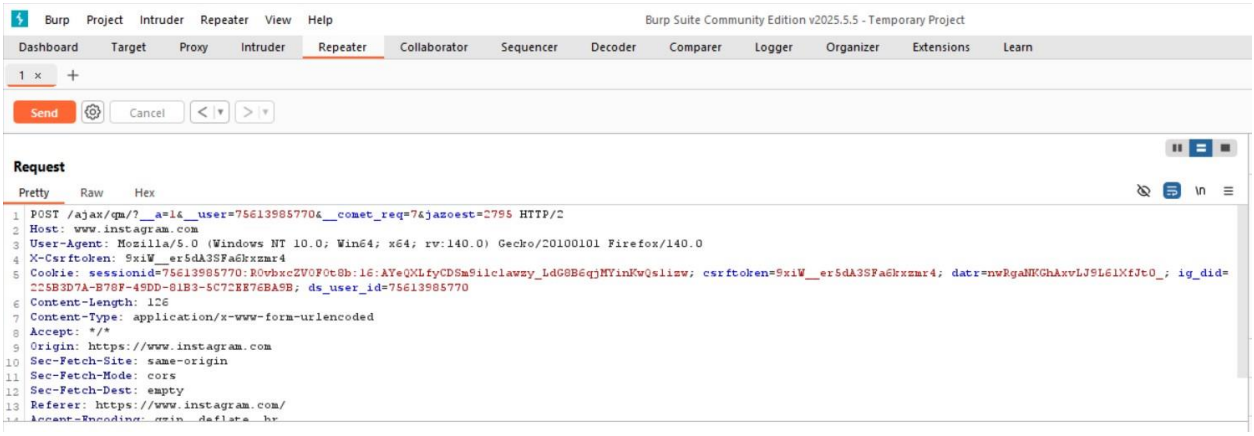




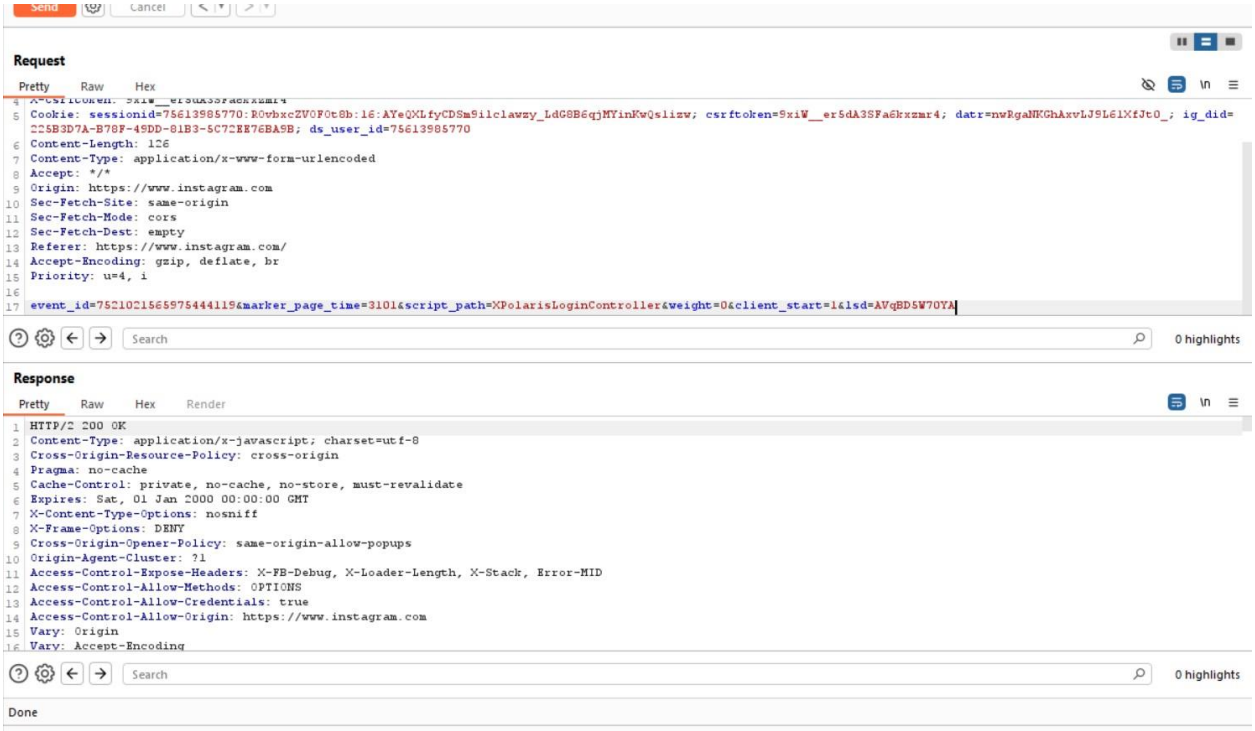
Pasted the cookies and headers into the login POST request in Burp Suite's Repeater.

- Copied cookie values
- User-Agent to match the browser used in ZAP, so it looks like the request is coming from the same device.

Response Evaluation



The response was 200ok but, No access to the authenticated session was granted.



It didn’t logged me in redirected back to login page

Root Cause Analysis

Instagram prevented session replay by implementing:

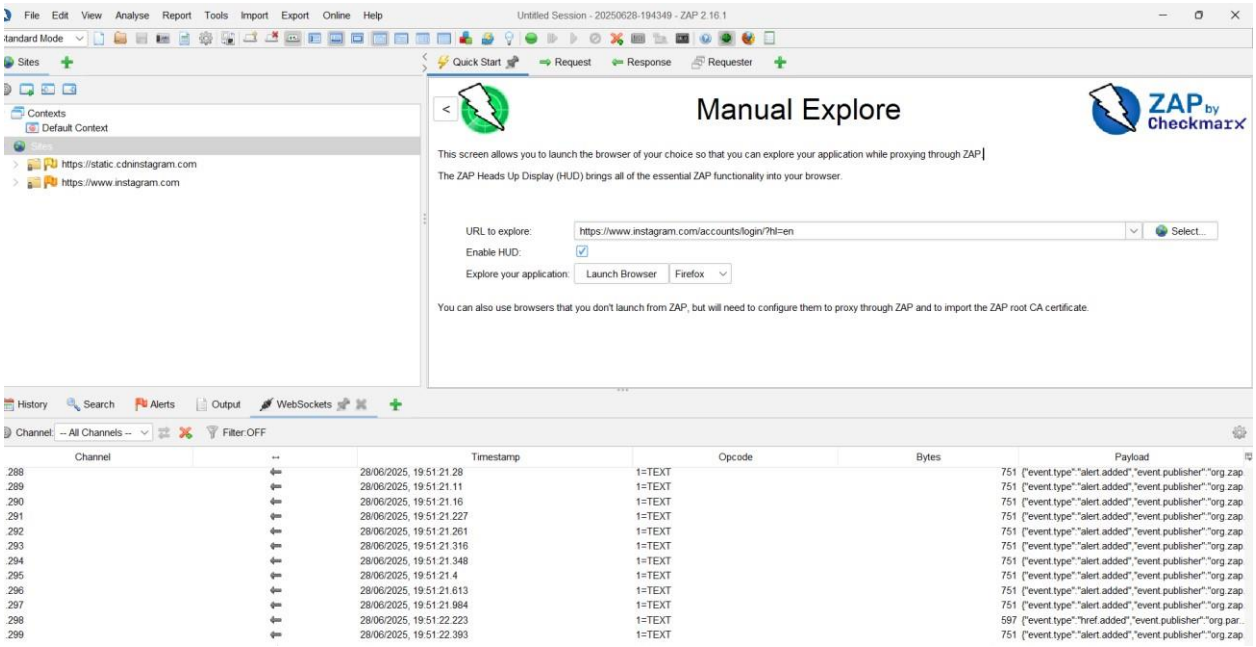
- Device/browser fingerprinting
- TLS session binding
- Token lifecycle validation
- IP address/session flow monitoring

This showed that copying cookies alone is insufficient to bypass login security on hardened platforms.

Automated Vulnerability Scanning via OWASP ZAP

1. **Scanning Phase**

- Logged into an Instagram account using OWASP ZAP's browser.


File Edit View Analyse Report Tools Import Export Online Help
Untitled Session - 20250628-194349 - ZAP 2.16.1
Sites
Quick Start
Request
Response
Requester
Contexts
Default Context
https://static.cdninstagram.com
https://www.instagram.com
Manual Explore
ZAP by Checkmarx
This screen allows you to launch the browser of your choice so that you can explore your application while proxying through ZAP.
The ZAP Heads Up Display (HUD) brings all of the essential ZAP functionality into your browser.
URL to explore:
https://www.instagram.com/accounts/login/?hl=en
Select...
Enable HUD:
Explore your application:
Launch Browser
Firefox
You can also use browsers that you don't launch from ZAP, but will need to configure them to proxy through ZAP and to import the ZAP root CA certificate.
History
Search
Alerts
Output
WebSockets
Channel: -- All Channels --
Filter:OFF
Channel
Timestamp
Opcode
Bytes
Payload
288 28/06/2025, 19:51:21.28 1=TEXT 751 {"event.type":"alert.added","event.publisher":"org.zap
289 28/06/2025, 19:51:21.11 1=TEXT 751 {"event.type":"alert.added","event.publisher":"org.zap
290 28/06/2025, 19:51:21.16 1=TEXT 751 {"event.type":"alert.added","event.publisher":"org.zap
291 28/06/2025, 19:51:21.227 1=TEXT 751 {"event.type":"alert.added","event.publisher":"org.zap
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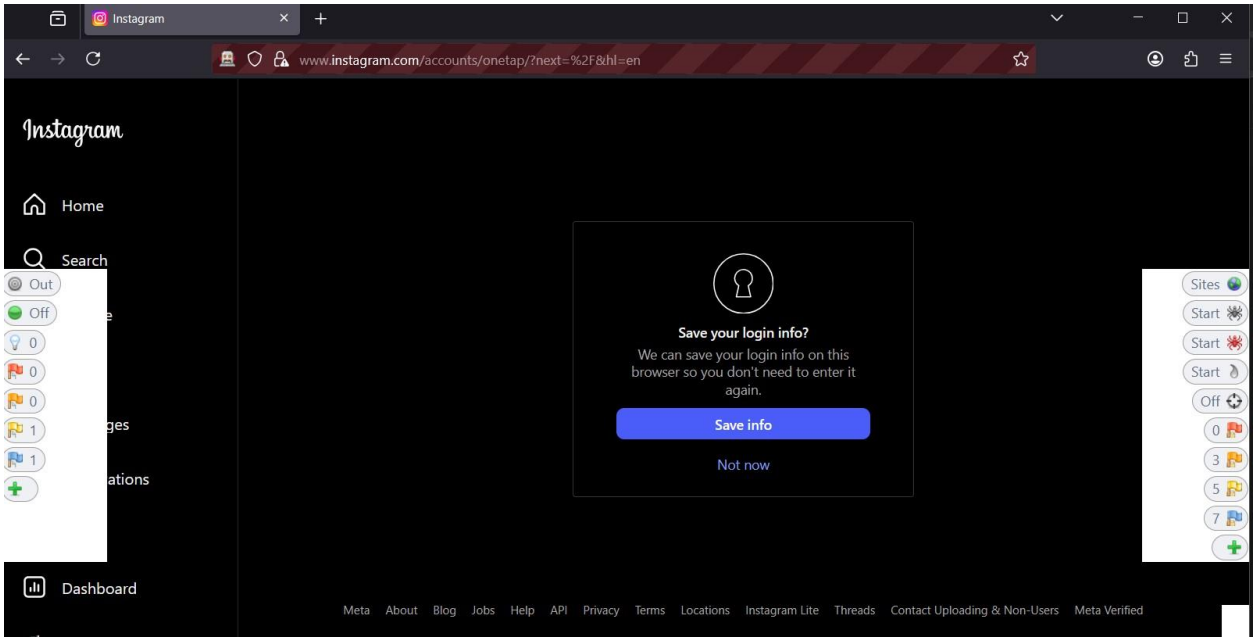
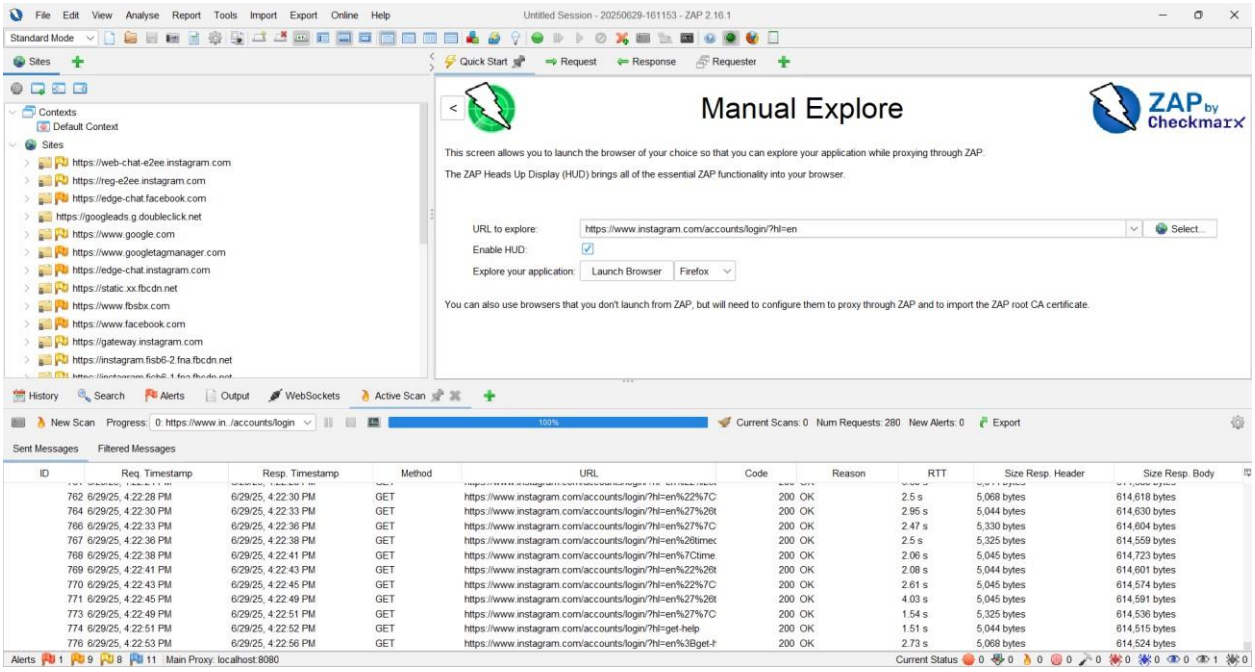
297 28/06/2025, 19:51:21.984 1=TEXT 751 {"event.type":"alert.added","event.publisher":"org.zap
298 28/06/2025, 19:51:22.223 1=TEXT 597 {"event.type":"href.added","event.publisher":"org.par
299 28/06/2025, 19:51:22.393 1=TEXT 751 {"event.type":"alert.added","event.publisher":"org.zap


Instagram
www.instagram.com/accounts/onetap/?next=%2F&hl=en
Instagram
Home
Search
Dashboard
Save your login info?
We can save your login info on this browser so you don't need to enter it again.
Save info
Not now
Meta About Blog Jobs Help API Privacy Terms Locations Instagram Lite Threads Contact Uploading & Non-Users Meta Verified
Sites
Start
Off

- Running active scan to find vulnerabilities



Alerts found are exported and analysed. Scanning targeted insecure headers, cookie attributes, and content security issues.

2. **Alert Collection and Analysis**

   - Collected scan report in detail and analyzed findings based on impact and exploitability.

Alerts

Risk=Medium, Confidence=High (4)

https://www.instagram.com (4)

CSP: Failure to Define Directive with No Fallback (1)

▶ GET https://www.instagram.com/accounts/login/?hl=en

CSP: Wildcard Directive (1)

▶ GET https://www.instagram.com/common/referer_frame.php?cb=1

CSP: script-src unsafe-inline (1)

▶ GET https://www.instagram.com/common/referer_frame.php?cb=1

CSP: style-src unsafe-inline (1)

▶ GET https://www.instagram.com/accounts/login/?hl=en

Risk=Medium, Confidence=Medium (1)

https://www.instagram.com (1)

Missing Anti-clickjacking Header (1)

▶ GET https://www.instagram.com/common/referer_frame.php?cb=1

Risk=Low, Confidence=Medium (4)

https://www.instagram.com (4)

Cookie No HttpOnly Flag (1)

▶ GET https://www.instagram.com/accounts/login/?hl=en

Cookie with SameSite Attribute None (1)

▶ GET https://www.instagram.com/accounts/login/?hl=en

Cookie without SameSite Attribute (1)

▶ GET https://www.instagram.com/api/v1/web/login_page/?hl=en

Cross-Domain JavaScript Source File Inclusion (1)

▶ GET https://www.instagram.com/accounts/login/?hl=en

Risk=Low, Confidence=Low (1)

Risk=Informational, Confidence=High (3)

https://www.instagram.com (3)

Authentication Request Identified (1)

▶ POST https://www.instagram.com/api/v1/web/accounts/login/ajax/?hl=en

Information Disclosure - Information in Browser localStorage (1)

▶ GET https://www.instagram.com/accounts/login/?hl=en

Information Disclosure - Information in Browser sessionStorage (1)

▶ GET https://www.instagram.com/accounts/login/?hl=en

Risk=Informational, Confidence=Medium (3)

https://www.instagram.com (3)

Information Disclosure - Sensitive Information in URL (1)

▶ POST https://www.instagram.com/ajax/qm/?__a=1&__user=0&__comet_req=7&jazoest=21059

Modern Web Application (1)

▶ GET https://www.instagram.com/accounts/login/?hl=en

Session Management Response Identified (1)

▶ GET https://www.instagram.com/accounts/login/?hl=en

Risk=Informational, Confidence=Low (4)

https://www.instagram.com (2)

Loosely Scoped Cookie (1)

▶ GET https://www.instagram.com/accounts/login/?hl=en

User Controllable HTML Element Attribute (Potential XSS) (1)

▶ GET https://www.instagram.com/accounts/login/?hl=en

Identified Vulnerabilities (ZAP Findings Summary)

Vulnerability	Severity	Description	Potential Risk
Content Security Policy (CSP) Not Strict	Medium	CSP allows unsafe inline scripts or external domains.	Can lead to Cross-Site Scripting)
Missing Clickjacking Protection	Medium	No X-Frame-Options or Content-Security-Policy: frame-ancestors.	Enables UI redress attacks
Weak Cookie Attributes	Medium/Low	Session cookies lack HttpOnly, Secure, or SameSite flags.	Susceptible to session theft
Missing X-Content-Type-Options Header	Low	Allows MIME sniffing by browsers.	Can bypass content-type restrictions
Missing X-XSS-Protection Header	Informational	No built-in browser XSS filter enabled.	Reduced clientside script filtering

These vulnerabilities, though not critical on their own, can be chained by attackers to craft sophisticated exploits if left unpatched.

Learning Outcomes

- Understanding Session Cookies: Learned how session cookies are used to maintain login sessions and how critical they are for user authentication.
- Real-World Web Security: Understood how major web applications like Instagram implement strong security features to prevent session hijacking.
- Limitations of Manual Session Replay: Discovered the limitations of simple cookie manipulation and the necessity of matching multiple parameters such as IP, device, and TLS fingerprints.

Conclusion

This task demonstrated how real-world platforms like Instagram implement **multi-layered security mechanisms** to safeguard against session hijacking. Despite capturing and replaying valid session cookies, Instagram's backend systems validated environment fingerprinting and session flow, resulting in **login denial**.

Additionally, the vulnerability scan revealed that while Instagram is highly secure, there are still opportunities to **enhance protection** by adopting stricter Content Security Policies, **proper cookie attributes**, and enforcing anti-clickjacking headers. These findings reinforce the importance of defense-in-depth and continual vulnerability assessments in modern web application security.