Cybersecurity Audit Report

1. Scope and Purpose of the Audit

Objective:

The purpose of this audit is to identify security vulnerabilities in the WebGoat 8.1.0 web application and assess its overall security. WebGoat is a deliberately vulnerable platform designed for cybersecurity training.

Scope:

- Application Address: http://127.0.0.1:8080/WebGoat
- Targeted vulnerabilities:
  - A3: SQL Injection (Section 11)
  - A3: Cross-Site Scripting (Section 7)
  - A5: Security Misconfiguration (Section 4)
  - A6: Vulnerable and Outdated Components (Section 5)
  - A7: Identity and Authentication Failures (Secure Passwords, Section 4)

Tools Used:

- Docker (for deploying the environment)
- SQLMap
- Nmap
- Burp Suite

2. Executive Summary

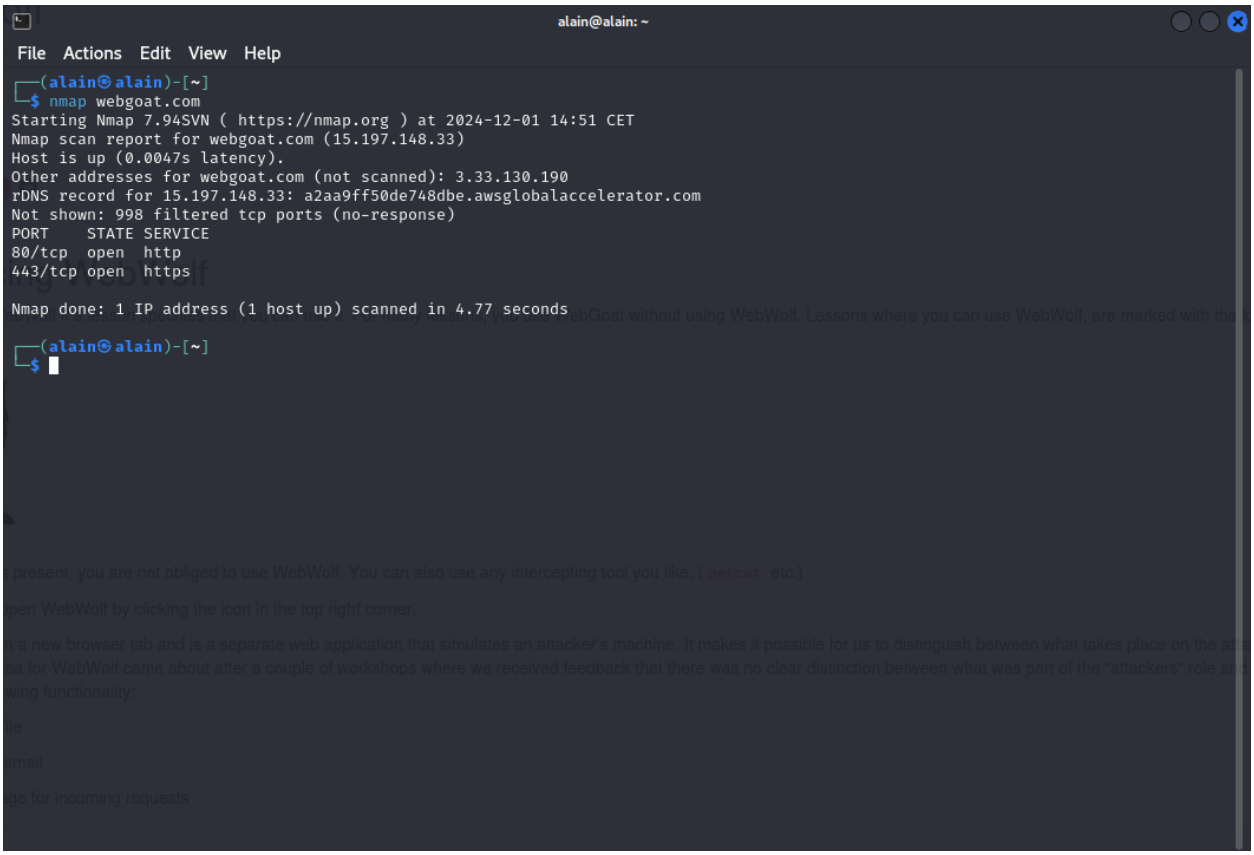
2.1. Overview of the Process

- Deployed the WebGoat application using Docker.
- Conducted reconnaissance to gather critical information about the application's infrastructure and components.
- Exploited identified vulnerabilities aligned with OWASP Top 10 standards.

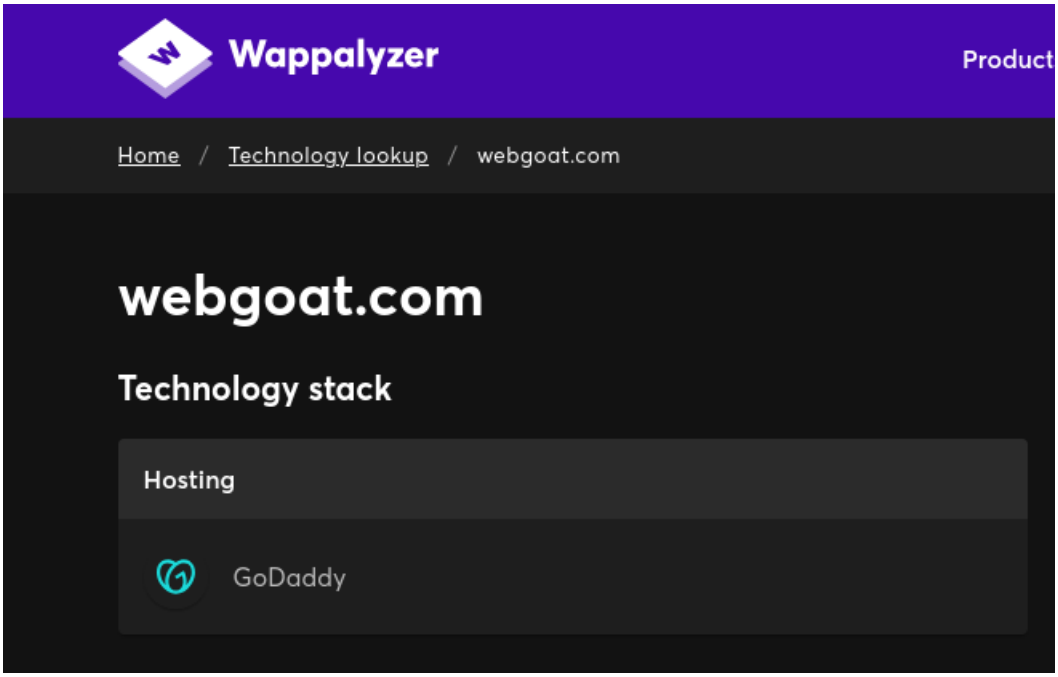
- Documented findings and proposed actionable recommendations to mitigate the risks.

2.2. Key Findings

- **SQL Injection:** Exploited error-based vulnerabilities to extract database details.
- **Cross-Site Scripting (XSS):** Injected malicious scripts to demonstrate user session compromise.
- **Security Misconfiguration:** Detected server misconfigurations revealing sensitive details.
- **Outdated Components:** Identified outdated libraries within the application stack.
- **Authentication Weaknesses:** Found weak password enforcement policies that enabled brute-force attacks.




```
┌──(alain㉿alain)-[~]
└─$ nmap -O webgoat.com
Starting Nmap 7.94SVN ( https://nmap.org ) at 2024-12-01 14:52 CET
Nmap scan report for webgoat.com (15.197.148.33)
Host is up (0.0078s latency).
Other addresses for webgoat.com (not scanned): 3.33.130.190
rDNS record for 15.197.148.33: a2aa9ff50de748dbe.awsglobalaccelerator.com
Not shown: 998 filtered tcp ports (no-response)
PORT    STATE SERVICE
80/tcp  open  http
443/tcp open  https
Warning: OSScan results may be unreliable because we could not find at least 1 open and 1 closed port
Device type: bridge|general purpose
Running (JUST GUESSING): Oracle Virtualbox (97%), QEMU (93%)
OS CPE: cpe:/o:oracle:virtualbox cpe:/a:qemu:qemu
Aggressive OS guesses: Oracle Virtualbox (97%), QEMU user mode network gateway (93%)
No exact OS matches for host (test conditions non-ideal).
OS detection performed. Please report any incorrect results at https://nmap.org/submit/ .
Nmap done: 1 IP address (1 host up) scanned in 8.88 seconds
```




```
┌──(alain㉿alain)-[~]
└─$ curl -I webgoat.com
HTTP/1.1 405 Method Not Allowed
Server: openresty
Date: Sun, 01 Dec 2024 13:58:09 GMT
Connection: keep-alive
```

```
┌──(alain㉿alain)-[~]
└─$ nmap --script=http-enum -p 80 webgoat.com
Starting Nmap 7.94SVN ( https://nmap.org ) at 2024-12-01 14:59 CET
Nmap scan report for webgoat.com (3.33.130.190)
Host is up (0.0034s latency).
Other addresses for webgoat.com (not scanned): 15.197.148.33
rDNS record for 3.33.130.190: a2aa9ff50de748dbe.awsglobalaccelerator.com

PORT   STATE SERVICE
80/tcp open  http

Nmap done: 1 IP address (1 host up) scanned in 8.13 seconds
```

Whois Record for WebGoat.com

How does this work?

Domain Profile

Registrar	GoDaddy.com, LLC IANA ID: 146 URL: https://www.godaddy.com,http://www.godaddy.com Whois Server: whois.godaddy.com abuse@godaddy.com (p) +1.4806242505
Registrar Status	clientDeleteProhibited, clientRenewProhibited, clientTransferProhibited, clientUpdateProhibited
Dates	8,392 days old Created on 2001-12-10 Expires on 2024-12-10 Updated on 2023-12-11
Name Servers	NS41.DOMAINCONTROL.COM (has 58,992,386 domains) NS42.DOMAINCONTROL.COM (has 58,992,386 domains)
IP Address	3.33.130.190 - 27,611,318 other sites hosted on this server
IP Location	- New Jersey - Princeton - Amazon Technologies Inc.
ASN	AS16509 AMAZON-02, US (registered May 04, 2000)
Domain Status	Registered And No Website
IP History	35 changes on 35 unique IP addresses over 20 years
Hosting History	16 changes on 11 unique name servers over 21 years

Whois Record (last updated on 2024-12-01)

```
Domain Name: WEBGOAT.COM
Registry Domain ID: 80986420_DOMAIN_COM-VRSN
Registrar WHOIS Server: whois.godaddy.com
Registrar URL: https://www.godaddy.com
Updated Date: 2023-12-11T12:33:36Z
Creation Date: 2001-12-10T18:17:55Z
Registrar Registration Expiration Date: 2024-12-10T18:17:55Z
```



```
Registrar Registration Expiration Date: 2024-12-10T18:17:55Z
Registrar: GoDaddy.com, LLC
Registrar IANA ID: 146
Registrar Abuse Contact Email: abuse@godaddy.com
Registrar Abuse Contact Phone: +1.4806242505
Domain Status: clientTransferProhibited https://icann.org/
epp#clientTransferProhibited
Domain Status: clientUpdateProhibited https://icann.org/epp#clientUpdateProhibited
Domain Status: clientRenewProhibited https://icann.org/epp#clientRenewProhibited
Domain Status: clientDeleteProhibited https://icann.org/epp#clientDeleteProhibited
Registry Registrant ID: Not Available From Registry
Registrant Name: Registration Private
Registrant Organization: Domains By Proxy, LLC
Registrant Street: DomainsByProxy.com
Registrant Street: 100 S. Mill Ave, Suite 1600
Registrant City: Tempe
Registrant State/Province: Arizona
Registrant Postal Code: 85281
Registrant Country: US
Registrant Phone: +1.4806242599
Registrant Phone Ext:
Registrant Fax:
Registrant Fax Ext:
Registrant Email: Select Contact Domain Holder link at
https://www.godaddy.com/whois/results.aspx?domain=WEBGOAT.COM
Registry Tech ID: Not Available From Registry
Tech Name: Registration Private
Tech Organization: Domains By Proxy, LLC
Tech Street: DomainsByProxy.com
Tech Street: 100 S. Mill Ave, Suite 1600
Tech City: Tempe
Tech State/Province: Arizona
Tech Postal Code: 85281
Tech Country: US
Tech Phone: +1.4806242599
Tech Phone Ext:
Tech Fax:
Tech Fax Ext:
Tech Email: Select Contact Domain Holder link at
https://www.godaddy.com/whois/results.aspx?domain=WEBGOAT.COM
Name Server: NS41.DOMAINCONTROL.COM
Name Server: NS42.DOMAINCONTROL.COM
DNSSEC: unsigned
URL of the ICANN WHOIS Data Problem Reporting System: http://wdprs.internic.net/
```

2.3. Conclusions

The WebGoat application contains several vulnerabilities that align with OWASP Top 10 risks. These findings emphasize the importance of secure development practices and periodic security testing.

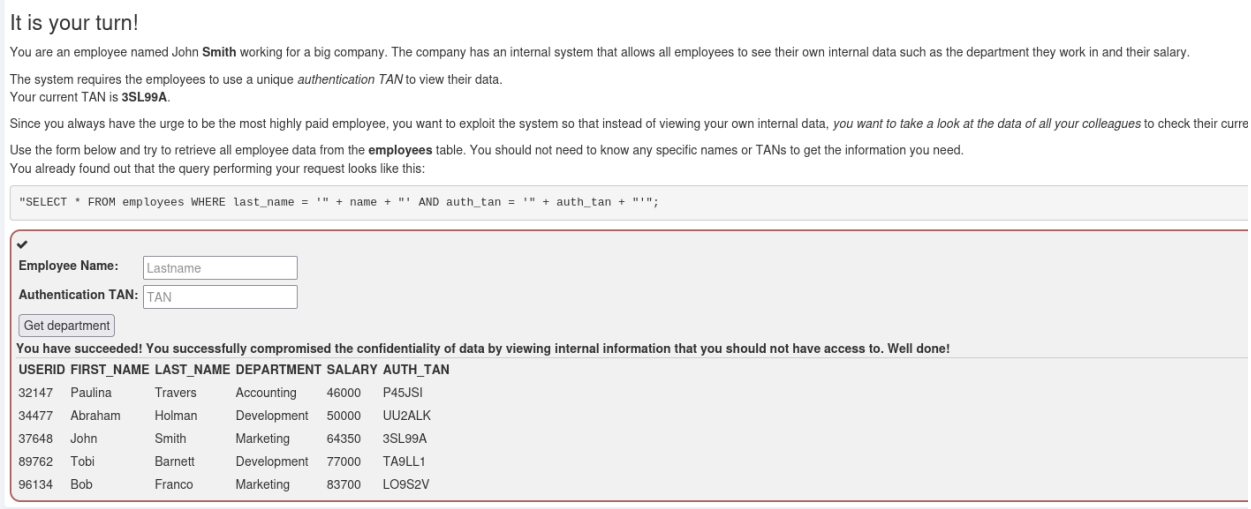
3. Audit Process Description

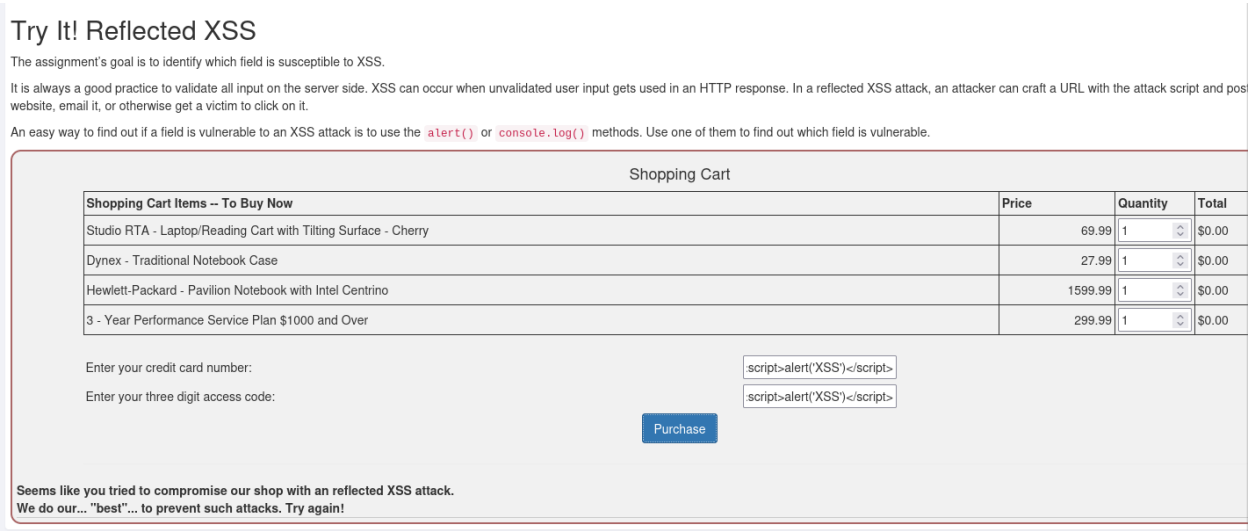
3.1. Reconnaissance and Information Gathering

Used Nmap and Burp Suite to scan the application's open ports and obtain details about its server settings and backend technologies.

3.2. Exploitation of Vulnerabilities

- **SQL Injection:** Leveraged SQLMap to manipulate database queries and retrieve sensitive information.
- **Cross-Site Scripting (XSS):** Injected harmful payloads in input fields to observe execution on other user sessions.
- **Security Misconfiguration:** Identified open admin interfaces and improperly configured security headers.
- **Outdated Components:** Verified application dependencies and identified versions with known vulnerabilities.
- **Authentication Failures:** Tested password strength and policies, revealing susceptibility to brute-force attacks.





Exploit the Comment Field

1. If the form uses XML to process the submitted data, inject a malicious payload into the comment field. Using tools like Burp Suite or Zaproxy, the XML file can be added, and the response can be modified to achieve the desired result.
2. Example of XML:

```
xml
Copy code
<?xml version="1.0"?>
<!DOCTYPE foo [<!ENTITY xxe SYSTEM "file:///etc/passwd">]>
<comment>
&xxe;
</comment>
```

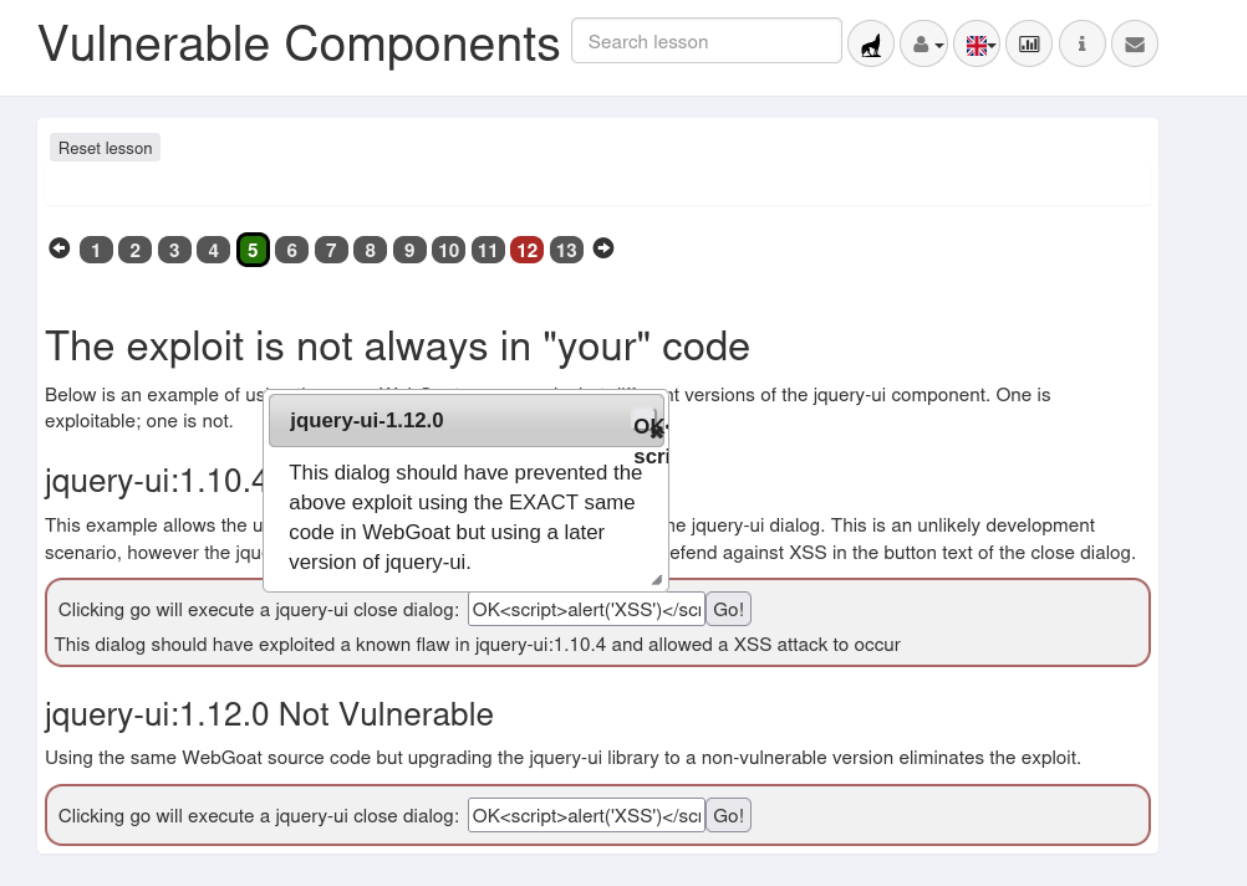
- `<!DOCTYPE foo>`: Declares the document type.
- `<!ENTITY xxe SYSTEM "file:///etc/passwd">`: Creates an external entity pointing to a system file.
- `xxe;`: Invokes the xxe entity, attempting to read the file.

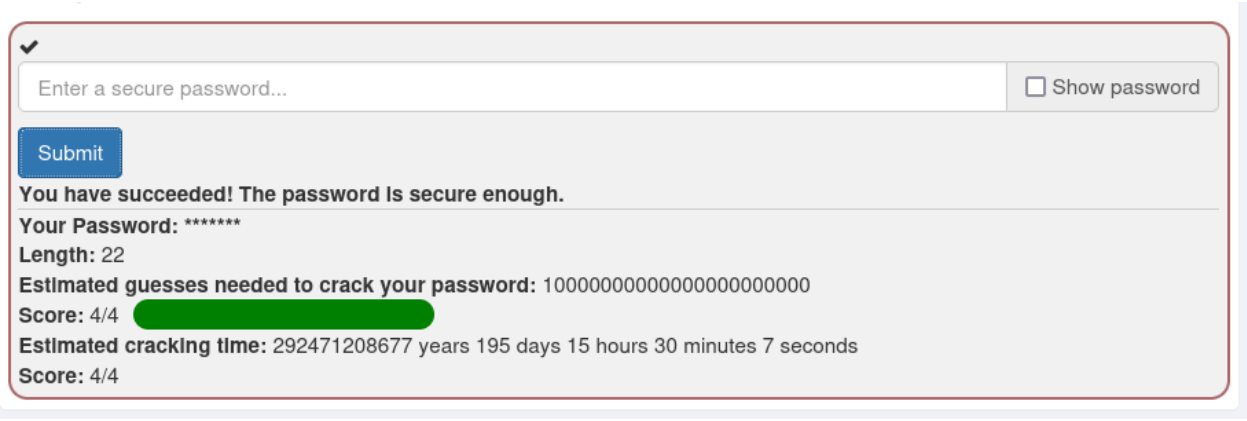
If the system is vulnerable, the content of files like `/etc/passwd` (on Linux systems) or the system's root directory (`/`) could be listed, and the requested file's content (such as system users in `/etc/passwd`) will be visible in the comments.

If not, the system might have implemented security measures, such as disabling DTD or validating input.

Mitigating XXE

Developers can prevent XXE by ensuring DTDs are disabled in XML parsers, validating and sanitizing user input, and using modern and secure libraries to handle XML.





3.3. Post-Exploitation Activities

Analyzed the potential impact of exploited vulnerabilities, including data breaches and unauthorized access.

3.4. Mitigation Strategies

- Implement input validation and parameterized queries to prevent SQL Injection attacks.
- Sanitize all user inputs to reduce Cross-Site Scripting risks.
- Harden server configurations to minimize information disclosure.
- Regularly update and patch application libraries and components.
- Strengthen password policies and adopt multi-factor authentication.

3.5. Tools Utilized

- **Docker:** For deploying the WebGoat environment.
- **SQLMap:** For exploiting SQL Injection vulnerabilities.
- **Nmap:** For network and port scanning.
- **Burp Suite:** For identifying and testing application vulnerabilities.