SWINBURNE UNIVERSITY OF TECHNOLOGY

COS20031

Computing Technology Design Project

Week 10-11: Major-specific topics

Cybersecurity (Database)

(A) Grant and Revoke Permission

GRANT PERMISSION

- The **CREATE USER** statement creates one or more user accounts with no privileges. It means that the user accounts can log in to the MySQL Server, but cannot do anything such as selecting a database and querying data from tables.
- To allow user accounts to work with database objects, you need to grant the user accounts privileges. And the **GRANT** statement grants a user account one or more privileges.

GRANT EXAMPLE 1

The following illustrates the basic syntax of the GRANT statement:

```
GRANT privilege [,privilege],..
ON privilege_level
TO account_name;
```

This example grants the SELECT privilege on the table employees in the sample database to the user acount bob@localhost:

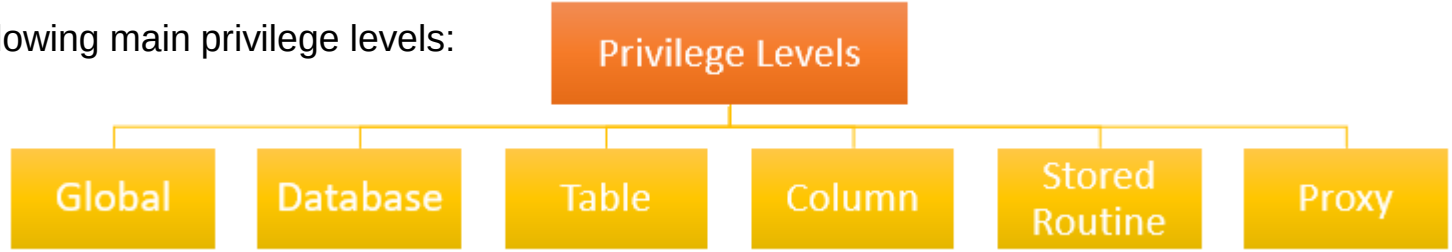
```
GRANT SELECT
ON employees
TO bob@localhost;
```

GRANT EXAMPLE 2

The following example grants UPDATE, DELETE, and INSERT privileges on the table employees to bob@localhost:

```
GRANT INSERT, UPDATE, DELETE
ON employees
TO bob@localhost;
```

The following main privilege levels:



Global privileges apply to all databases in a MySQL Server. To assign global privileges, you use the *.* syntax, for example:

```
GRANT SELECT
ON *.*
TO bob@localhost;
```

GRANT PRIVILEGES ON FUNCTIONS/PROCEDURES

When dealing with functions and procedures, you can grant users the ability to EXECUTE these functions and procedures in MySQL.

Syntax

The syntax for granting EXECUTE privileges on a function/procedure in MySQL is:

```
GRANT EXECUTE ON [ PROCEDURE | FUNCTION ] object TO user;
```

EXECUTE
The ability to execute the function or procedure.

PROCEDURE
It is used when the privilege is being granted on a procedure in MySQL.

FUNCTION
It is used when the privilege is being granted on a function in MySQL.

object
The name of the database object that you are granting privileges for. In the case of granting EXECUTE privileges on a function or procedure, this would be the function name or the procedure name.

user
The name of the user that will be granted the EXECUTE privileges.

Grant Example 2: Grant Privileges on Functions/Procedures

For example, if you had a function called *CalcIncome* and you wanted to grant EXECUTE access to the user named *smithj*, you would run the following GRANT statement:

```
GRANT EXECUTE ON FUNCTION CalcIncome TO 'smithj'@'localhost';
```

If you wanted to grant ALL users the ability to EXECUTE this function, you would run the following GRANT statement:

```
GRANT EXECUTE ON FUNCTION CalcIncome TO '*'@'localhost';
```

Example - Procedure

Let's look at some examples of how to grant EXECUTE privileges on a procedure in MySQL.

For example, if you had a procedure called *MyFirstProc* and you wanted to grant EXECUTE access to the user named *smithj*, you would run the following GRANT statement:

```
GRANT EXECUTE ON PROCEDURE MyFirstProc TO 'smithj'@'localhost';
```

REVOKE PERMISSION

- The REVOKE statement revokes one or more privileges from a user account.
- The following illustrates the basic syntax of the REVOKE statement that revokes one or more privileges from user accounts:

```
REVOKE
    privilegee [,privilege]..
ON [object_type] privilege_level
FROM user1 [, user2] ..;
```

Revoke Privileges on Table

Syntax

The syntax for revoking privileges on a table in MySQL is:

```
REVOKE privileges ON object FROM user;
```

privileges

It can be any of the following values:

Privilege	Description
SELECT	Ability to perform SELECT statements on the table.
INSERT	Ability to perform INSERT statements on the table.
UPDATE	Ability to perform UPDATE statements on the table.
DELETE	Ability to perform DELETE statements on the table.
INDEX	Ability to create an index on an existing table.
CREATE	Ability to perform CREATE TABLE statements.
ALTER	Ability to perform ALTER TABLE statements to change the table definition.
DROP	Ability to perform DROP TABLE statements.
GRANT OPTION	Allows you to grant the privileges that you possess to other users.
ALL	Grants all permissions except GRANT OPTION.

Once you have granted privileges, you may need to revoke some or all of these privileges. To do this, you can run a revoke command. You can revoke any combination of SELECT, INSERT, UPDATE, DELETE, REFERENCES, ALTER, or ALL.

REVOKE EXAMPLE 1

For example, if you wanted to revoke DELETE and UPDATE privileges on a table called *contacts* from a user named *smithj*, you would run the following REVOKE statement:

```
REVOKE DELETE, UPDATE ON contacts FROM 'smithj'@'localhost';
```

If you wanted to revoke all permissions (except GRANT OPTION) on a table for a user named *smithj*, you could use the ALL keyword as follows:

```
REVOKE ALL ON contacts FROM 'smithj'@'localhost';
```

If you had granted SELECT privileges to * (ie: all users) on the *contacts* table and you wanted to revoke these privileges, you could run the following REVOKE statement:

```
REVOKE SELECT ON contacts FROM '*'@'localhost';
```

REVOKE PRIVILEGES ON FUNCTIONS/PROCEDURES

Once you have granted EXECUTE privileges on a function or procedure, you may need to REVOKE these privileges from a user in MySQL. To do this, you can execute a REVOKE command.

Syntax

The syntax for the revoking privileges on a function or procedure in MySQL is:

```
REVOKE EXECUTE ON [ PROCEDURE | FUNCTION ] object FROM user;
```

EXECUTE
The ability to execute the function or procedure is being revoked.

PROCEDURE
It is used when the privilege is being revoked on a procedure in MySQL.

FUNCTION
It is used when the privilege is being revoked on a function in MySQL.

object
The name of the database object that you are revoking privileges for. In the case of revoking EXECUTE privileges on a function or procedure, this would be the function name or the procedure name.

user
The name of the user that will be revoked the EXECUTE privileges.

Revoke Example 2: Revoke Privileges on Functions/Procedures

If you wanted to revoke EXECUTE privileges on a function called *CalcIncome* from a user named *smithj*, you would run the following REVOKE statement:

```
REVOKE EXECUTE ON FUNCTION CalcIncome FROM 'smithj'@'localhost';
```

If you had granted EXECUTE privileges to * (all users) on the function called *CalcIncome* and you wanted to revoke these EXECUTE privileges, you could run the following REVOKE statement:

```
REVOKE EXECUTE ON FUNCTION CalcIncome FROM '*'@'localhost';
```

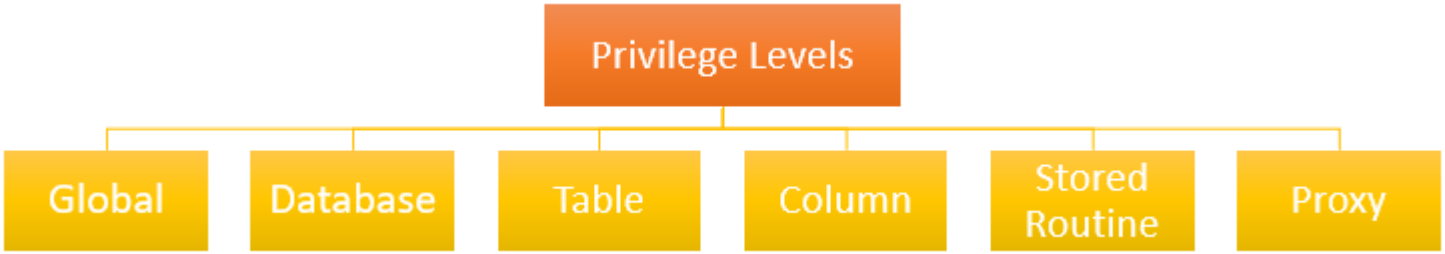
Example - Procedure

Let's look at some examples of how to revoke EXECUTE privileges on a procedure in MySQL.

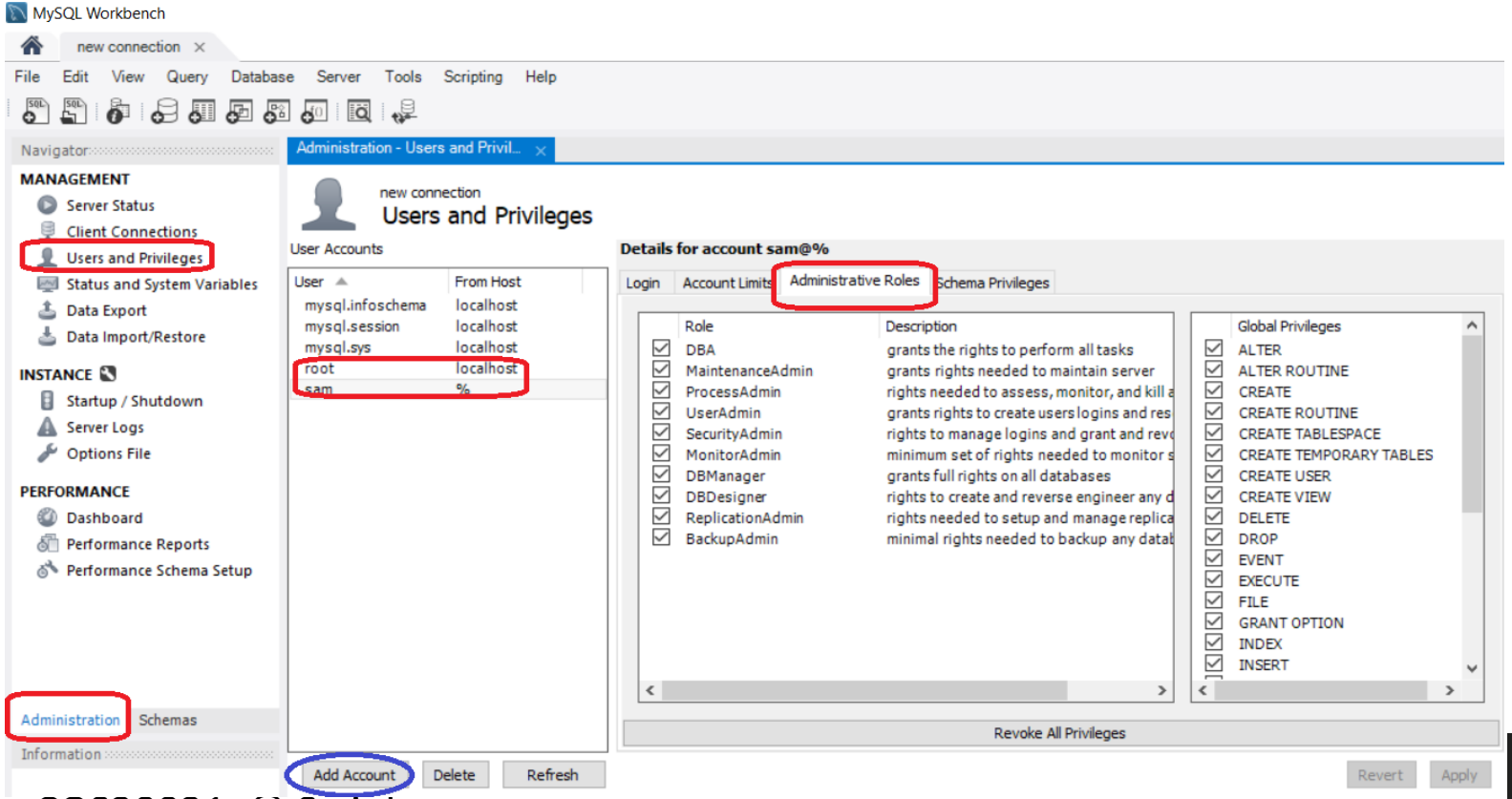
If you wanted to revoke EXECUTE privileges on a procedure called *MyFirstProc* from a user named *smithj*, you would run the following REVOKE statement:

```
REVOKE EXECUTE ON PROCEDURE MyFirstProc FROM 'smithj'@'localhost';
```

(B) Define your database users and their access privileges



Database users and their access privileges



(C) Understand SQL Injection

"Code injection is the top security threat to web applications."

— Open Web Application Security Project (OWASP)

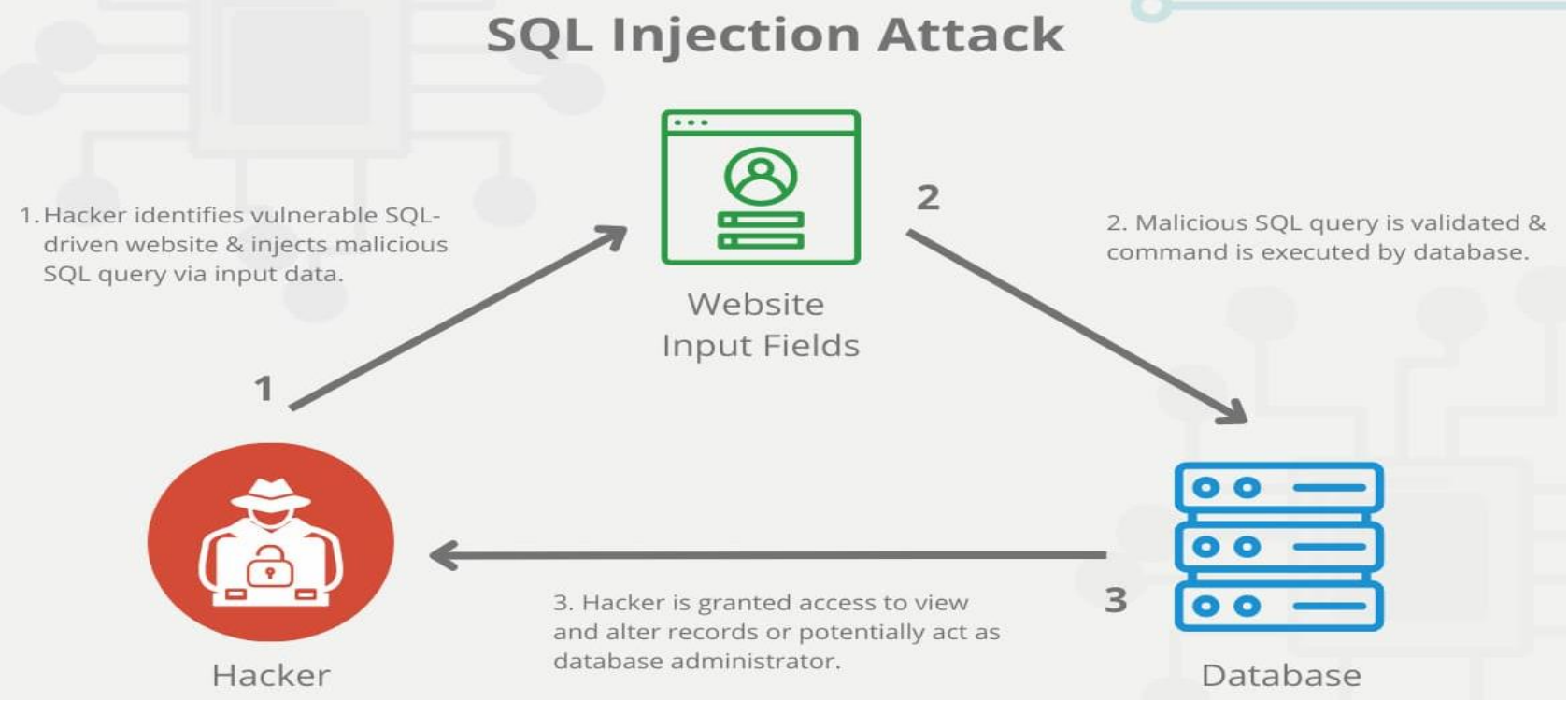
What is the SQL Injection?

SQL injection (SQLi) is a web security vulnerability that allows an attacker to interfere with the queries that an application makes to its database. This can allow an attacker to view data that they are not normally able to retrieve.

- Execute arbitrary SQL requests
- Craft string to manipulate SQL syntax and inject code
- Any query which uses dynamic-data is vulnerable
- URL parameters, form data, cookies, database data

- SQLi
- Single biggest security concern
- Ranked number one security threat by the Open Web Application Security Project (OWASP)

What is the SQL Injection Attack?



Example #1: SQL Injection for Insert Command

```
$sql = "INSERT INTO subjects ";
$sql .= "(menu_name, position, visible) ";
$sql .= "VALUES (";
$sql .= "'" . $subject['menu_name'] . "', ";
$sql .= "'" . $subject['position'] . "', ";
$sql .= "'" . $subject['visible'] . "'";
$sql .= ")";

$subject['menu_name'] = "David's Story";

"INSERT INTO subjects (menu_name, position, visible)
VALUES ('David's Story', '1', TRUE)";
```

Example #2: SQL Injection for Select/Insert Command

```
$sql = "SELECT * subjects WHERE id='" . $id . "'";

$id = "5";
"SELECT * FROM subjects WHERE id='5'"

$id = "'; INSERT INTO admins (username, password)
VALUES ('hacker', 'abcd1234'); SELECT * FROM
subjects WHERE id='5';

"SELECT * FROM subjects WHERE id='; INSERT INTO
admins (username, password) VALUES ('hacker',
'abcd1234'); SELECT * FROM subjects WHERE id='5'"
```

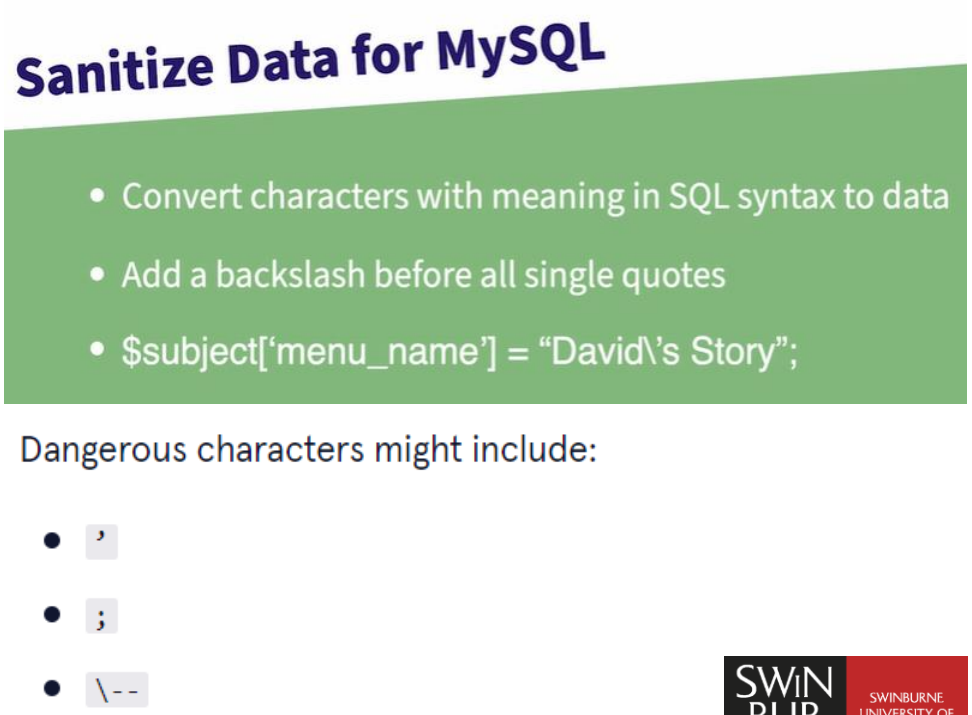
(D) Sanitize data for SQL

Mitigating SQL Injection Attacks: Input Sanitization

One way SQL injections can be mitigated is through input sanitization. Sanitization is the process of removing dangerous characters from user input.

This is important because they allow attackers to extend SQL queries to gain more information from a database.

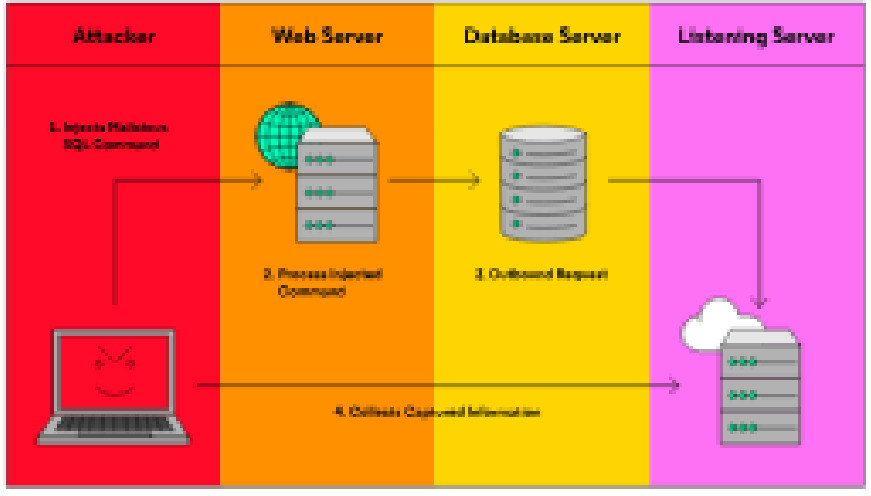
Careful, this method is not the perfect defense against SQL injections. Removing characters may have no effect in some queries and, if an attacker finds a way to bypass the sanitization process, they can easily inject data into your system.



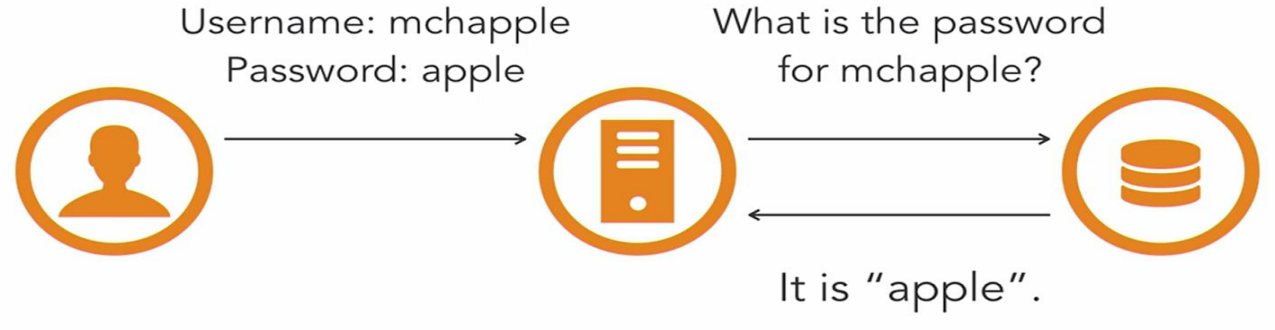
Example #1: Sanitize data for SQL

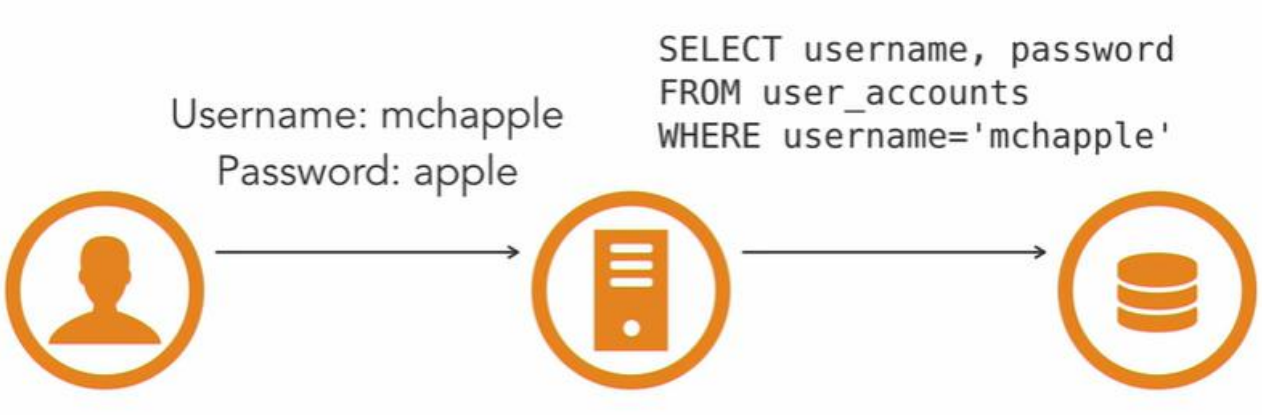
```
$sql = "SELECT * subjects ";
$sql .= "WHERE id='" . db_escape($db, $id) . "'";

$id = "'; DROP TABLE payments; --";
```

"SELECT * FROM subjects WHERE id='\' DROP TABLE payments; --')"



Preventing SQL injection





Example: Preventing SQL injection

```
SELECT username, password
FROM user_accounts
WHERE username ='mchapple';

UPDATE user_accounts
SET password='hacked'
WHERE username='mchapple';

--'
```

Tutorial & Workshop

See Canvas.