

Лабораторная работа №6

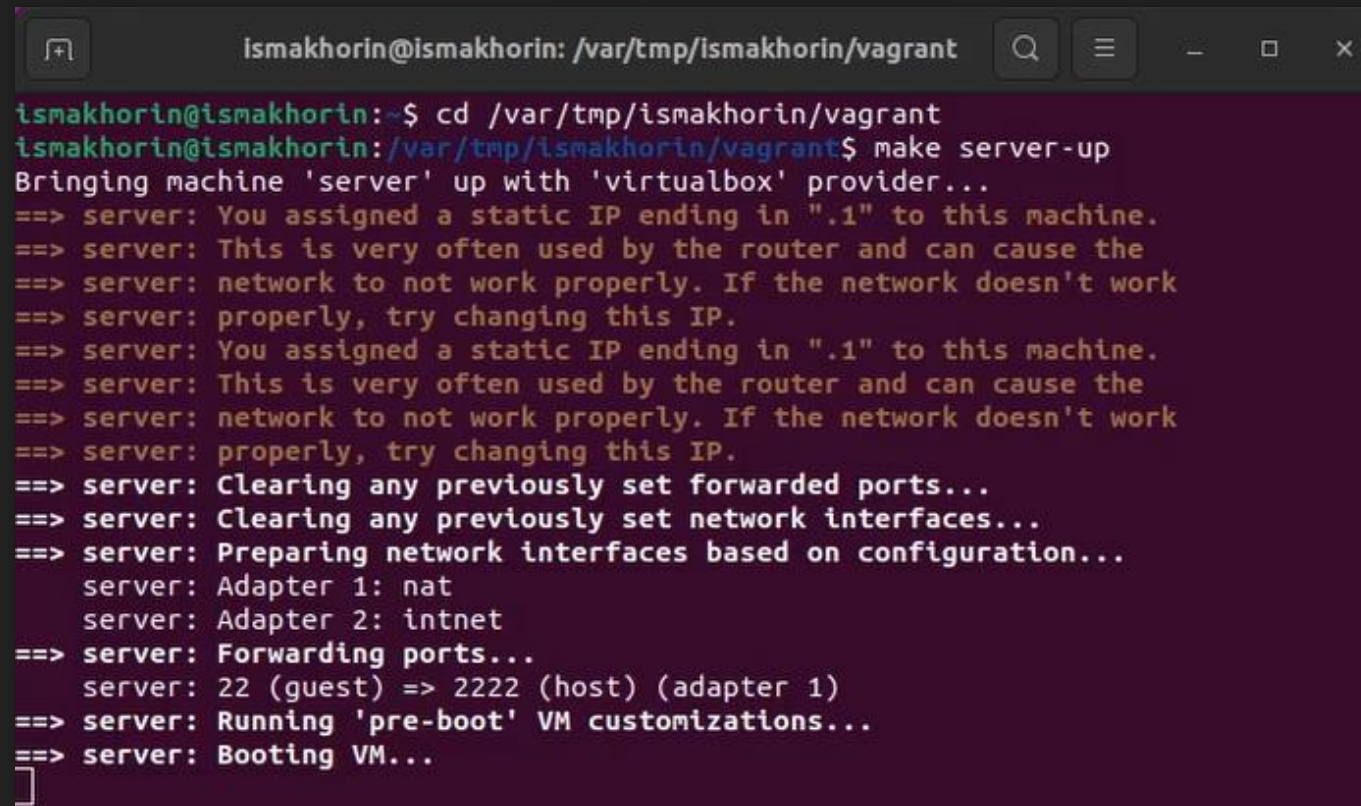
Установка и настройка системы управления базами данных
MariaDB

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Установка MariaDB



```
ismakhorin@ismakhorin: /var/tmp/ismakhorin/vagrant
ismakhorin@ismakhorin:~$ cd /var/tmp/ismakhorin/vagrant
ismakhorin@ismakhorin:/var/tmp/ismakhorin/vagrant$ make server-up
Bringing machine 'server' up with 'virtualbox' provider...
==> server: You assigned a static IP ending in ".1" to this machine.
==> server: This is very often used by the router and can cause the
==> server: network to not work properly. If the network doesn't work
==> server: properly, try changing this IP.
==> server: You assigned a static IP ending in ".1" to this machine.
==> server: This is very often used by the router and can cause the
==> server: network to not work properly. If the network doesn't work
==> server: properly, try changing this IP.
==> server: Clearing any previously set forwarded ports...
==> server: Clearing any previously set network interfaces...
==> server: Preparing network interfaces based on configuration...
server: Adapter 1: nat
server: Adapter 2: intnet
==> server: Forwarding ports...
server: 22 (guest) => 2222 (host) (adapter 1)
==> server: Running 'pre-boot' VM customizations...
==> server: Booting VM...
]
```

Рис. 1.1. Открытие рабочего каталога с проектом и запуск виртуальной машины server.

Установка MariaDB

```

root@server:~
[ismakhorin@server.ismakhorin.net ~]$ sudo -i
[sudo] password for ismakhorin:
[root@server.ismakhorin.net ~]# dnf -y install mariadb mariadb-server
Last metadata expiration check: 1:35:08 ago on Thu 16 Nov 2023 12:26:49 PM UTC.
Dependencies resolved.
=====
Package                                Architecture Version                               Repository                               Size
=====
Installing:
mariadb                                x86_64      3:10.5.22-1.el9_2                     appstream                                1.6 M
mariadb-server                          x86_64      3:10.5.22-1.el9_2                     appstream                                9.6 M
Installing dependencies:
mariadb-common                          x86_64      3:10.5.22-1.el9_2                     appstream                                27 k
mariadb-connector-c                     x86_64      3.2.6-1.el9_0                         appstream                                195 k
mariadb-connector-c-config              noarch      3.2.6-1.el9_0                         appstream                                9.8 k
mariadb-errmsg                           x86_64      3:10.5.22-1.el9_2                     appstream                                211 k
mysql-selinux                           noarch      1.0.5-1.el9_0                         appstream                                35 k
perl-DBD-MariaDB                        x86_64      1.21-16.el9_0                         appstream                                151 k
perl-Sys-Hostname                       x86_64      1.23-480.el9                          appstream                                17 k
Installing weak dependencies:
mariadb-backup                          x86_64      3:10.5.22-1.el9_2                     appstream                                6.4 M
mariadb-gssapi-server                   x86_64      3:10.5.22-1.el9_2                     appstream                                15 k
mariadb-server-utils                    x86_64      3:10.5.22-1.el9_2                     appstream                                210 k

Transaction Summary
=====
Install 12 Packages

```

Рис. 1.2. Переход в режим суперпользователя и установка необходимых для работы с базами данных пакетов.

Установка MariaDB

A terminal window titled 'root@server:/etc/my.cnf.d' with search, menu, and close icons in the top right. The terminal shows the following commands and output:

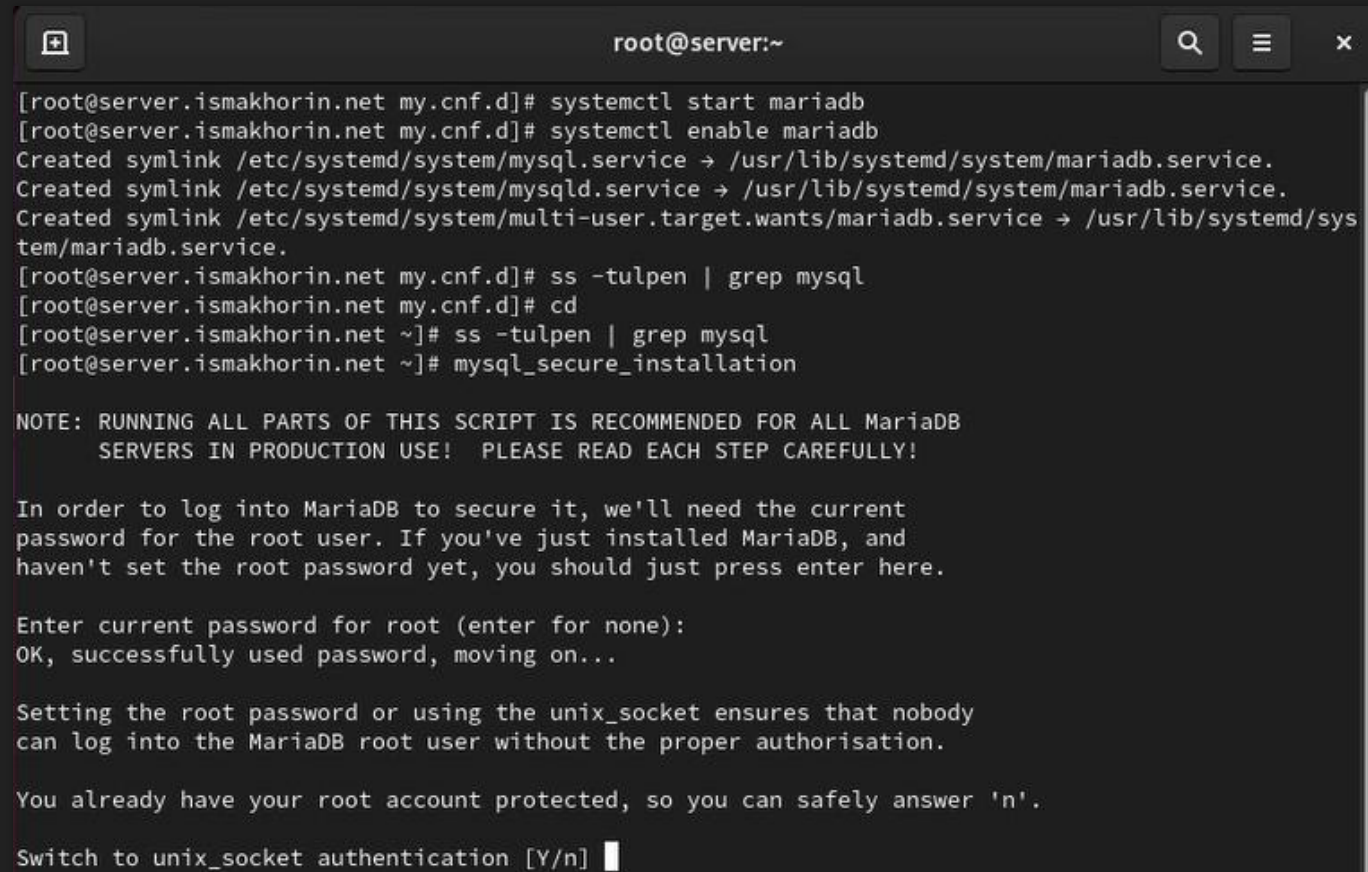
```
[root@server.ismakhorin.net etc]# cd /etc/my.cnf.d
[root@server.ismakhorin.net my.cnf.d]# ls
auth_gssapi.cnf  enable_encryption.preset  mysql-clients.cnf
client.cnf       mariadb-server.cnf        spider.cnf
[root@server.ismakhorin.net my.cnf.d]# cat /etc/my.cnf
#
# This group is read both both by the client and the server
# use it for options that affect everything
#
[client-server]

#
# include all files from the config directory
#
!includedir /etc/my.cnf.d

[root@server.ismakhorin.net my.cnf.d]#
```

Рис. 1.3. Просмотр конфигурационных файлов mariadb в каталоге /etc/my.cnf.d и в файле /etc/my.cnf.


Установка MariaDB



```
root@server:~  
[root@server.ismakhorin.net my.cnf.d]# systemctl start mariadb  
[root@server.ismakhorin.net my.cnf.d]# systemctl enable mariadb  
Created symlink /etc/systemd/system/mysql.service → /usr/lib/systemd/system/mariadb.service.  
Created symlink /etc/systemd/system/mysqld.service → /usr/lib/systemd/system/mariadb.service.  
Created symlink /etc/systemd/system/multi-user.target.wants/mariadb.service → /usr/lib/systemd/system/mariadb.service.  
[root@server.ismakhorin.net my.cnf.d]# ss -tulpen | grep mysql  
[root@server.ismakhorin.net my.cnf.d]# cd  
[root@server.ismakhorin.net ~]# ss -tulpen | grep mysql  
[root@server.ismakhorin.net ~]# mysql_secure_installation  
  
NOTE: RUNNING ALL PARTS OF THIS SCRIPT IS RECOMMENDED FOR ALL MariaDB  
SERVERS IN PRODUCTION USE! PLEASE READ EACH STEP CAREFULLY!  
  
In order to log into MariaDB to secure it, we'll need the current  
password for the root user. If you've just installed MariaDB, and  
haven't set the root password yet, you should just press enter here.  
  
Enter current password for root (enter for none):  
OK, successfully used password, moving on...  
  
Setting the root password or using the unix_socket ensures that nobody  
can log into the MariaDB root user without the proper authorisation.  
  
You already have your root account protected, so you can safely answer 'n'.  
  
Switch to unix_socket authentication [Y/n] █
```

Рис. 1.4. Запуск и включение программного обеспечения mariadb, проверка прослушивания порта, запуск скрипта конфигурации безопасности mariadb.

Установка MariaDB

A terminal window with a dark background and light text. The title bar shows 'root@server:~'. The terminal content displays the URL 'http://mariadb.org' and a list of MySQL client commands with their descriptions. The list includes commands like '?', 'clear', 'connect', 'delimiter', 'edit', 'ego', 'exit', 'go', 'help', 'nopager', 'notee', 'pager', 'print', 'prompt', 'quit', 'rehash', 'source', 'status', 'system', 'tee', 'use', 'charset', 'arsets', 'warnings', and 'nowarning'.

```
root@server:~  
http://mariadb.org  
  
List of all client commands:  
Note that all text commands must be first on line and end with ';'   
?  
?      (\?) Synonym for `help'.  
clear  (\c) Clear the current input statement.  
connect (\r) Reconnect to the server. Optional arguments are db and host.  
delimiter (\d) Set statement delimiter.  
edit    (\e) Edit command with $EDITOR.  
ego      (\G) Send command to MariaDB server, display result vertically.  
exit     (\q) Exit mysql. Same as quit.  
go       (\g) Send command to MariaDB server.  
help     (\h) Display this help.  
nopager  (\n) Disable pager, print to stdout.  
notee    (\t) Don't write into outfile.  
pager    (\P) Set PAGER [to_pager]. Print the query results via PAGER.  
print    (\p) Print current command.  
prompt   (\R) Change your mysql prompt.  
quit     (\q) Quit mysql.  
rehash   (\#) Rebuild completion hash.  
source   (\.) Execute an SQL script file. Takes a file name as an argument.  
status   (\s) Get status information from the server.  
system   (\!) Execute a system shell command.  
tee       (\T) Set outfile [to_outfile]. Append everything into given outfile.  
use      (\u) Use another database. Takes database name as argument.  
charset  (\C) Switch to another charset. Might be needed for processing binlog with multi-byte ch  
arsets.  
warnings (\W) Show warnings after every statement.  
nowarning (\w) Don't show warnings after every statement.
```

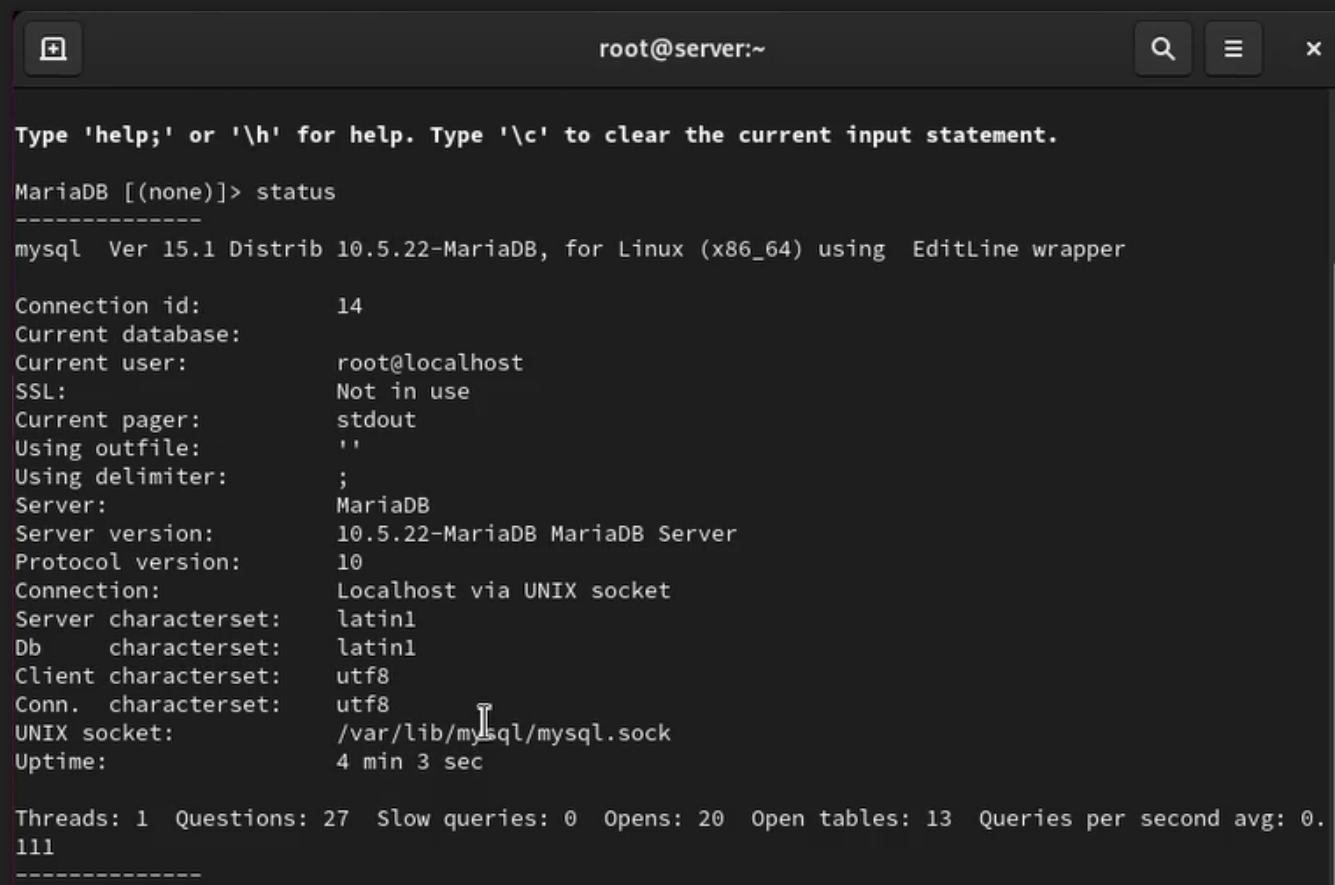
Рис. 1.5. Вход в базу данных с правами администратора базы данных и просмотр списка команд MySQL.

Установка MariaDB

```
MariaDB [(none)]> SHOW DATABASES;  
+-----+  
| Database |  
+-----+  
| information_schema |  
| mysql |  
| performance_schema |  
+-----+  
3 rows in set (0.001 sec)  
  
MariaDB [(none)]> exit;  
Bye  
[root@server.ismakhorin.net ~]#
```

Рис. 1.6. Отображение доступных в настоящее время баз данных и выход из интерфейса интерактивной оболочки MariaDB.

Конфигурация кодировки символов



```
root@server:~  
Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.  
MariaDB [(none)]> status  
-----  
mysql Ver 15.1 Distrib 10.5.22-MariaDB, for Linux (x86_64) using EditLine wrapper  
  
Connection id:          14  
Current database:  
Current user:           root@localhost  
SSL:                    Not in use  
Current pager:          stdout  
Using outfile:          ''  
Using delimiter:        ;  
Server:                 MariaDB  
Server version:         10.5.22-MariaDB MariaDB Server  
Protocol version:       10  
Connection:             Localhost via UNIX socket  
Server characterset:    latin1  
Db characterset:        latin1  
Client characterset:    utf8  
Conn. characterset:     utf8  
UNIX socket:            /var/lib/mysql/mysql.sock  
Uptime:                 4 min 3 sec  
  
Threads: 1 Questions: 27 Slow queries: 0 Opens: 20 Open tables: 13 Queries per second avg: 0.  
111  
-----
```

Рис. 2.1. Вход в базу данных с правами администратора, отображение статуса MariaDB.

Конфигурация кодировки символов

A terminal window with a dark background. The title bar shows a window icon, the text 'root@server:/etc/my.cnf.d', and search, menu, and close buttons. The terminal content shows three lines of commands and their prompts: the first line changes the directory to /etc/my.cnf.d, the second line creates a new file named utf8.cnf, and the third line shows the prompt for the new directory.

```
[root@server.ismakhorin.net ~]# cd /etc/my.cnf.d
[root@server.ismakhorin.net my.cnf.d]# touch utf8.cnf
[root@server.ismakhorin.net my.cnf.d]#
```

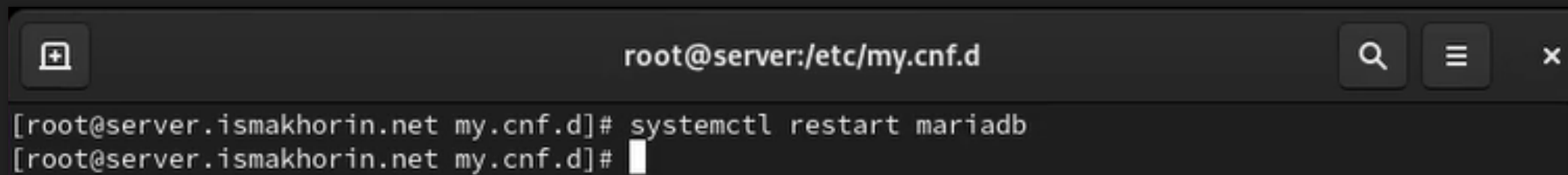
Рис. 2.2. Создание файла `utf8.cnf` в каталоге `/etc/my.cnf.d`.

Конфигурация кодировки символов



Рис. 2.3. Открытие файла на редактирование и указание в нём конфигурации.

Конфигурация кодировки символов

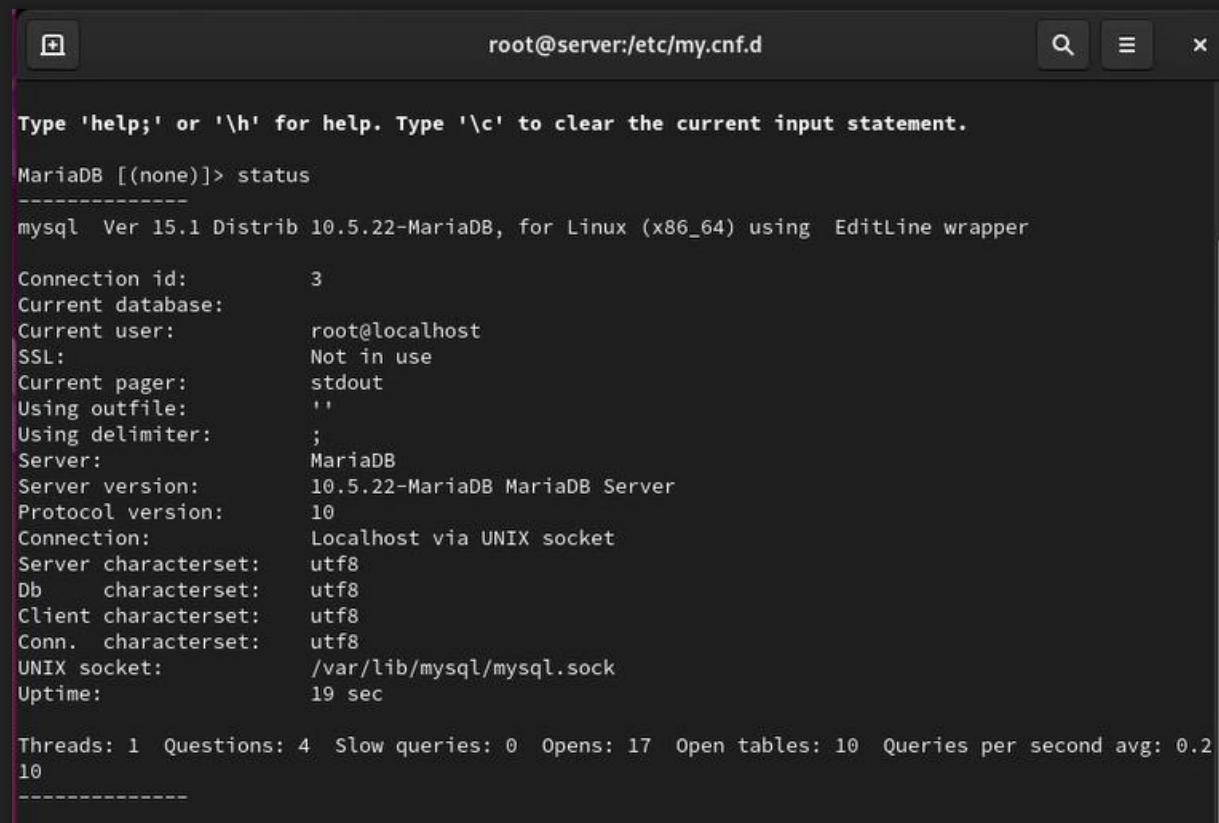


A terminal window with a dark background. The title bar at the top shows a window icon, the text 'root@server:/etc/my.cnf.d', and search, menu, and close buttons. The terminal content shows two lines: the first line is '[root@server.ismakhorin.net my.cnf.d]# systemctl restart mariadb' and the second line is '[root@server.ismakhorin.net my.cnf.d]#' followed by a cursor.

```
root@server:/etc/my.cnf.d  
[root@server.ismakhorin.net my.cnf.d]# systemctl restart mariadb  
[root@server.ismakhorin.net my.cnf.d]#
```

Рис. 2.4. Перезапуск MariaDB.

Конфигурация кодировки символов



```
root@server:/etc/my.cnf.d

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

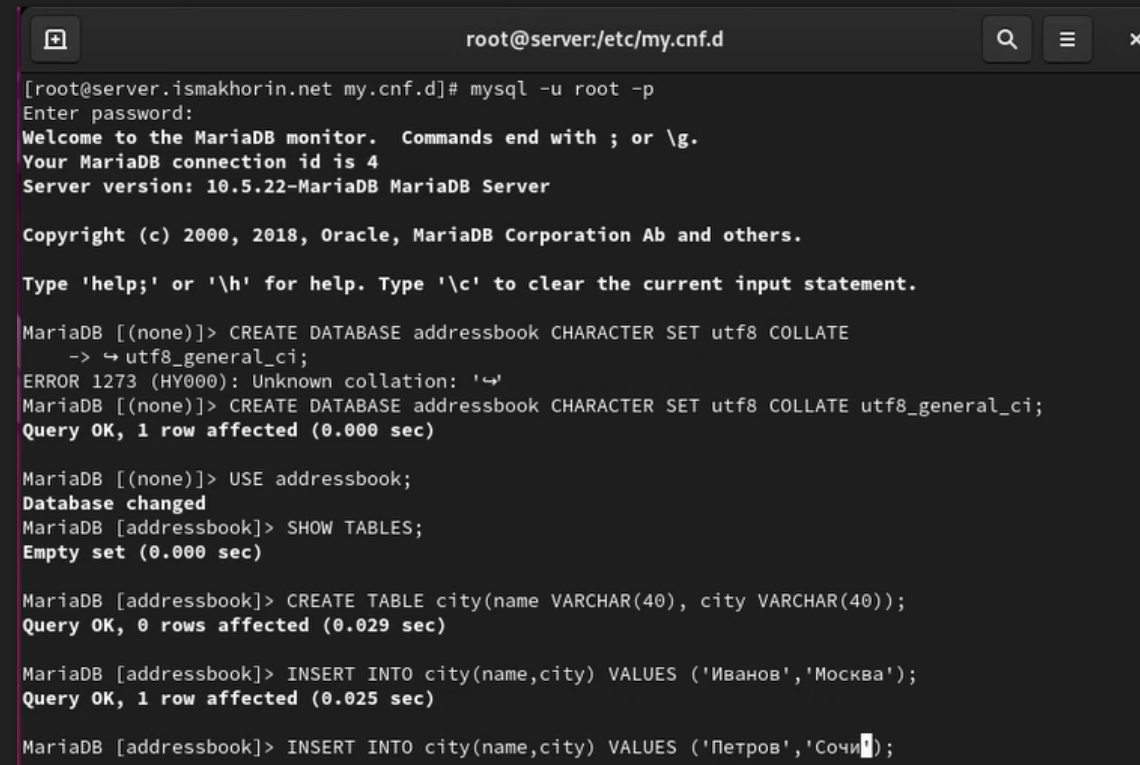
MariaDB [(none)]> status
-----
mysql  Ver 15.1 Distrib 10.5.22-MariaDB, for Linux (x86_64) using EditLine wrapper

Connection id:          3
Current database:
Current user:            root@localhost
SSL:                    Not in use
Current pager:           stdout
Using outfile:           ''
Using delimiter:        ;
Server:                 MariaDB
Server version:          10.5.22-MariaDB MariaDB Server
Protocol version:        10
Connection:             Localhost via UNIX socket
Server characterset:     utf8
Db characterset:         utf8
Client characterset:     utf8
Conn. characterset:      utf8
UNIX socket:            /var/lib/mysql/mysql.sock
Uptime:                 19 sec

Threads: 1  Questions: 4  Slow queries: 0  Opens: 17  Open tables: 10  Queries per second avg: 0.2
10
-----
```

Рис. 2.5. Вход в базу данных с правами администратора и просмотр статуса MariaDB для проверки изменений.

Создание базы данных



```
root@server:/etc/my.cnf.d

[root@server.ismakhorin.net my.cnf.d]# mysql -u root -p
Enter password:
Welcome to the MariaDB monitor.  Commands end with ; or \g.
Your MariaDB connection id is 4
Server version: 10.5.22-MariaDB MariaDB Server

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)]> CREATE DATABASE addressbook CHARACTER SET utf8 COLLATE
-> ↵ utf8_general_ci;
ERROR 1273 (HY000): Unknown collation: '↵'
MariaDB [(none)]> CREATE DATABASE addressbook CHARACTER SET utf8 COLLATE utf8_general_ci;
Query OK, 1 row affected (0.000 sec)

MariaDB [(none)]> USE addressbook;
Database changed
MariaDB [addressbook]> SHOW TABLES;
Empty set (0.000 sec)

MariaDB [addressbook]> CREATE TABLE city(name VARCHAR(40), city VARCHAR(40));
Query OK, 0 rows affected (0.029 sec)

MariaDB [addressbook]> INSERT INTO city(name,city) VALUES ('Иванов','Москва');
Query OK, 1 row affected (0.025 sec)

MariaDB [addressbook]> INSERT INTO city(name,city) VALUES ('Петров','Сочи');
```

Рис. 3.1. Вход в базу данных с правами администратора, создание базы данных с именем addressbook, открытие базы данных addressbook, отображение имеющиеся в базе данных addressbook таблицы. Создание таблицы city с полями name и city и заполнение таблицы некоторыми данными в соответствии с синтаксисом MySQL.

Создание базы данных



```
root@server:/etc/my.cnf.d

MariaDB [addressbook]> SELECT * FROM city;
+-----+-----+
| name  | city  |
+-----+-----+
| Иванов | Москва |
| Петров | Сочи  |
| Сидоров | Дубна |
+-----+-----+
3 rows in set (0.001 sec)

MariaDB [addressbook]> CREATE USER ismakhorin@%' IDENTIFIED BY '123456';
Query OK, 0 rows affected (0.022 sec)

MariaDB [addressbook]> GRANT SELECT,INSERT,UPDATE,DELETE ON addressbook.* TO ismakhorin@'%';
Query OK, 0 rows affected (0.003 sec)

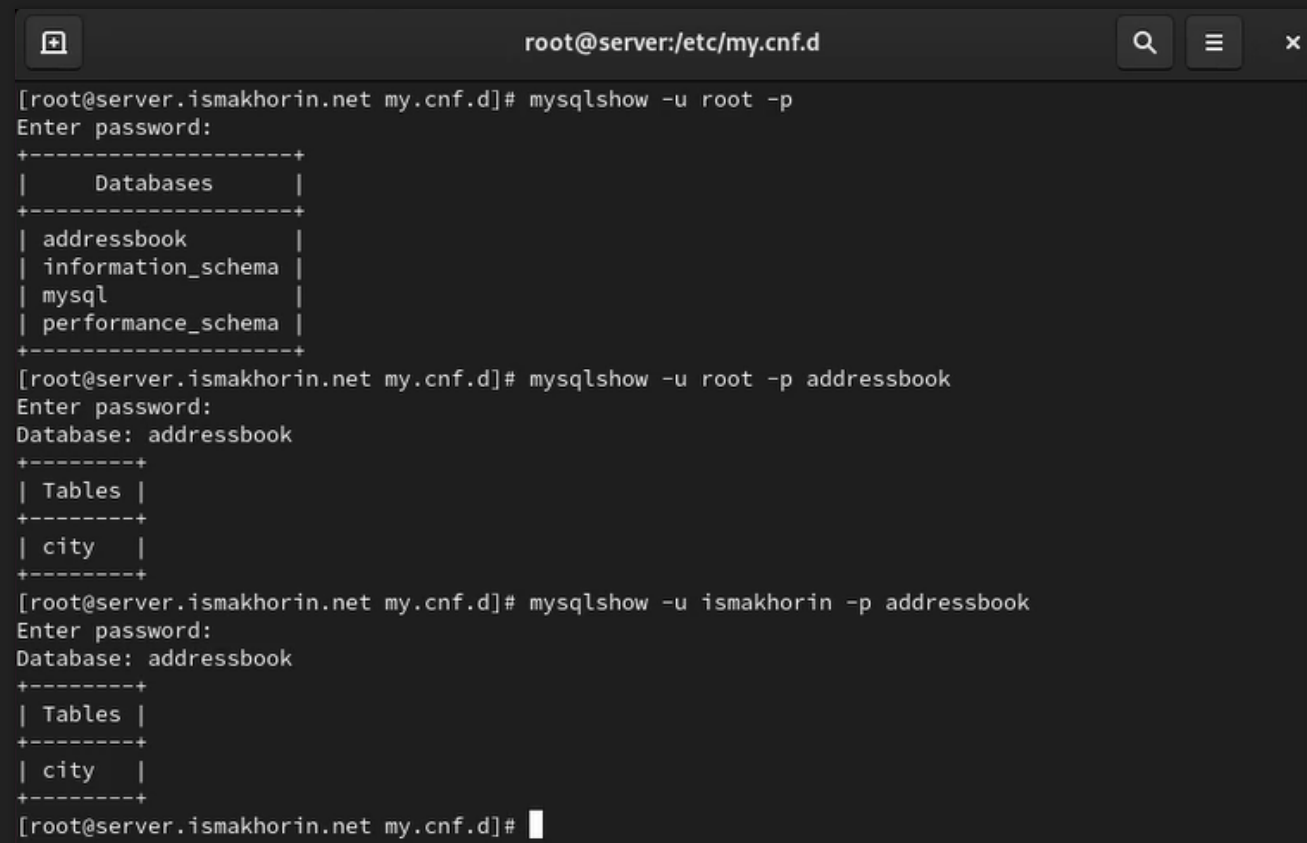
MariaDB [addressbook]> FLUSH PRIVILEGES;
Query OK, 0 rows affected (0.001 sec)

MariaDB [addressbook]> DESCRIBE city;
+-----+-----+-----+-----+-----+-----+
| Field | Type      | Null | Key | Default | Extra |
+-----+-----+-----+-----+-----+-----+
| name  | varchar(40) | YES  |     | NULL    |       |
| city  | varchar(40) | YES  |     | NULL    |       |
+-----+-----+-----+-----+-----+-----+
2 rows in set (0.002 sec)

MariaDB [addressbook]> quit
```

Рис. 3.2. MySQL-запрос, создание пользователя для работы с базой данных addressbook, предоставление прав доступа созданному пользователю ismakhorin на действия с базой данных addressbook, обновление привилегии базы данных addressbook, просмотр общей информации о таблице city базы данных addressbook и выход из окружения MariaDB.

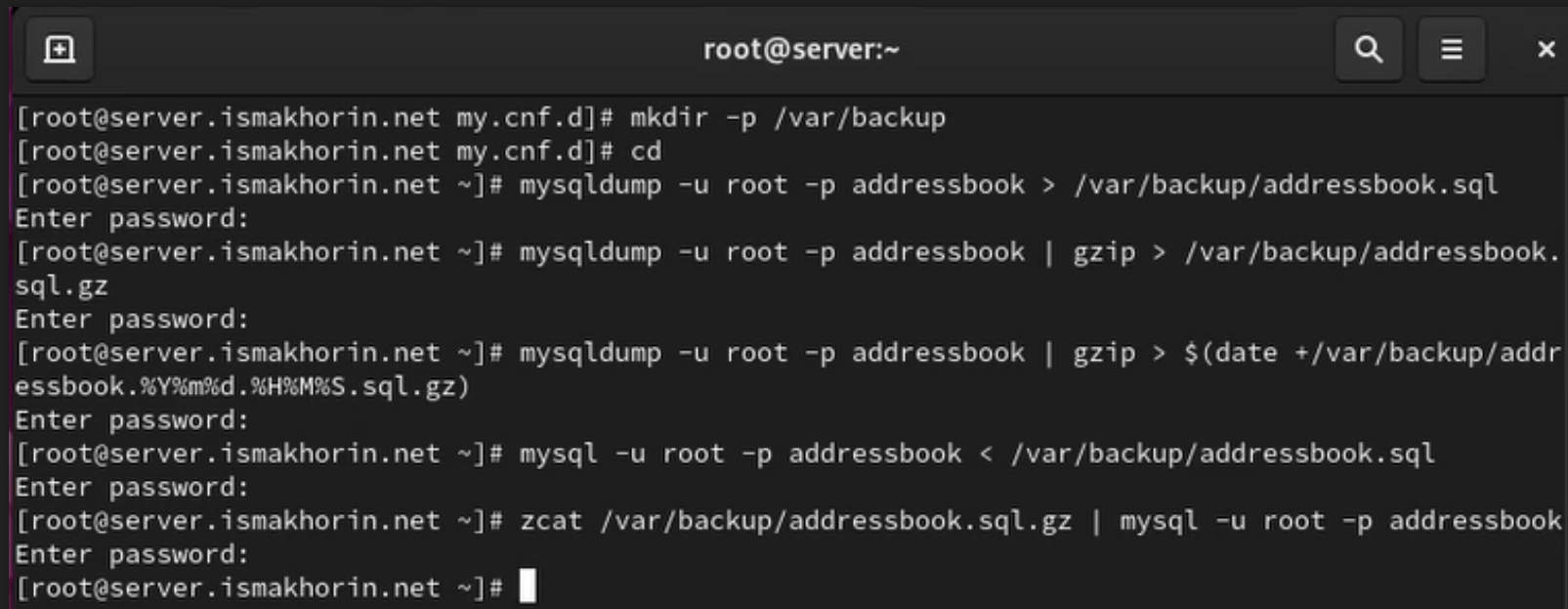
Создание базы данных



```
root@server:/etc/my.cnf.d
[root@server.ismakhorin.net my.cnf.d]# mysqlshow -u root -p
Enter password:
+-----+
| Databases |
+-----+
| addressbook |
| information_schema |
| mysql |
| performance_schema |
+-----+
[root@server.ismakhorin.net my.cnf.d]# mysqlshow -u root -p addressbook
Enter password:
Database: addressbook
+-----+
| Tables |
+-----+
| city |
+-----+
[root@server.ismakhorin.net my.cnf.d]# mysqlshow -u ismakhorin -p addressbook
Enter password:
Database: addressbook
+-----+
| Tables |
+-----+
| city |
+-----+
[root@server.ismakhorin.net my.cnf.d]#
```

Рис. 3.3. Просмотр списка баз данных и списка таблиц базы данных addressbook.

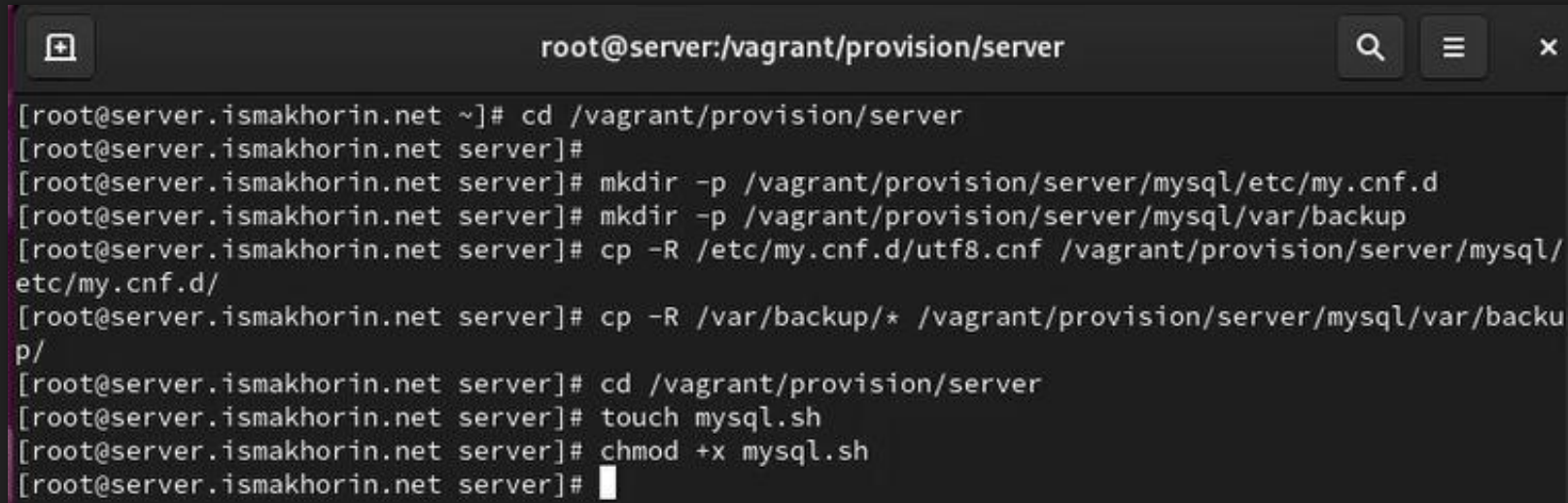
Резервные копии



```
root@server:~
[root@server.ismakhorin.net my.cnf.d]# mkdir -p /var/backup
[root@server.ismakhorin.net my.cnf.d]# cd
[root@server.ismakhorin.net ~]# mysqldump -u root -p addressbook > /var/backup/addressbook.sql
Enter password:
[root@server.ismakhorin.net ~]# mysqldump -u root -p addressbook | gzip > /var/backup/addressbook.sql.gz
Enter password:
[root@server.ismakhorin.net ~]# mysqldump -u root -p addressbook | gzip > $(date +%Y%m%d.%H%M%S).sql.gz
Enter password:
[root@server.ismakhorin.net ~]# mysql -u root -p addressbook < /var/backup/addressbook.sql
Enter password:
[root@server.ismakhorin.net ~]# zcat /var/backup/addressbook.sql.gz | mysql -u root -p addressbook
Enter password:
[root@server.ismakhorin.net ~]#
```

Рис. 4. Создание каталога для резервных копий, создание резервной копии базы данных addressbook, создание сжатой резервной копии базы данных addressbook, создание сжатой резервной копии базы данных addressbook с указанием даты создания копии, восстановление базы данных addressbook из резервной копии, восстановление базы данных addressbook из сжатой резервной копии.

Внесение изменений в настройки внутреннего окружения виртуальной машины

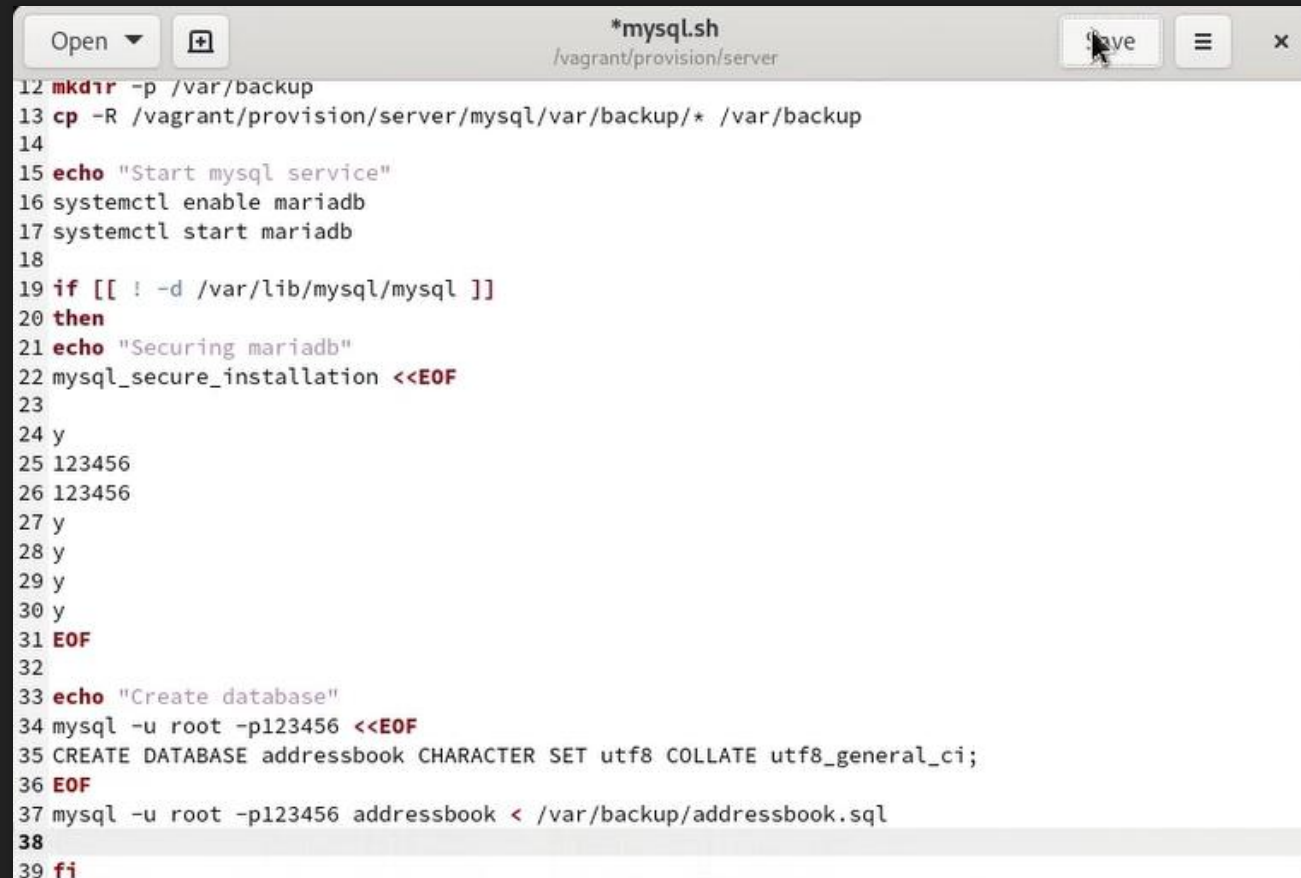
A terminal window titled 'root@server:/vagrant/provision/server' with search, menu, and close icons in the top right. The terminal shows a series of commands and their outputs. The user starts in the home directory, then navigates to '/vagrant/provision/server'. They create two subdirectories: '/vagrant/provision/server/mysql/etc/my.cnf.d' and '/vagrant/provision/server/mysql/var/backup'. Then, they copy files from the host: 'etc/my.cnf.d/utf8.cnf' to the new MySQL config directory, and '/var/backup/*' to the MySQL backup directory. Finally, they create a new file 'mysql.sh' and make it executable with 'chmod +x mysql.sh'.

```
root@server:/vagrant/provision/server

[root@server.ismakhorin.net ~]# cd /vagrant/provision/server
[root@server.ismakhorin.net server]#
[root@server.ismakhorin.net server]# mkdir -p /vagrant/provision/server/mysql/etc/my.cnf.d
[root@server.ismakhorin.net server]# mkdir -p /vagrant/provision/server/mysql/var/backup
[root@server.ismakhorin.net server]# cp -R /etc/my.cnf.d/utf8.cnf /vagrant/provision/server/mysql/
etc/my.cnf.d/
[root@server.ismakhorin.net server]# cp -R /var/backup/* /vagrant/provision/server/mysql/var/backu
p/
[root@server.ismakhorin.net server]# cd /vagrant/provision/server
[root@server.ismakhorin.net server]# touch mysql.sh
[root@server.ismakhorin.net server]# chmod +x mysql.sh
[root@server.ismakhorin.net server]#
```

Рис. 5.1. Открытие каталога для внесения изменений в настройки внутреннего окружения `/vagrant/provision/server/`, создание в нём каталога `mysql`, в который помещаем в соответствующие подкаталоги конфигурационные файлы MariaDB и резервную копию базы данных `addressbook`.
Создание в каталоге `/vagrant/provision/server` исполняемого файла `mysql.sh`.

Внесение изменений в настройки внутреннего окружения виртуальной машины

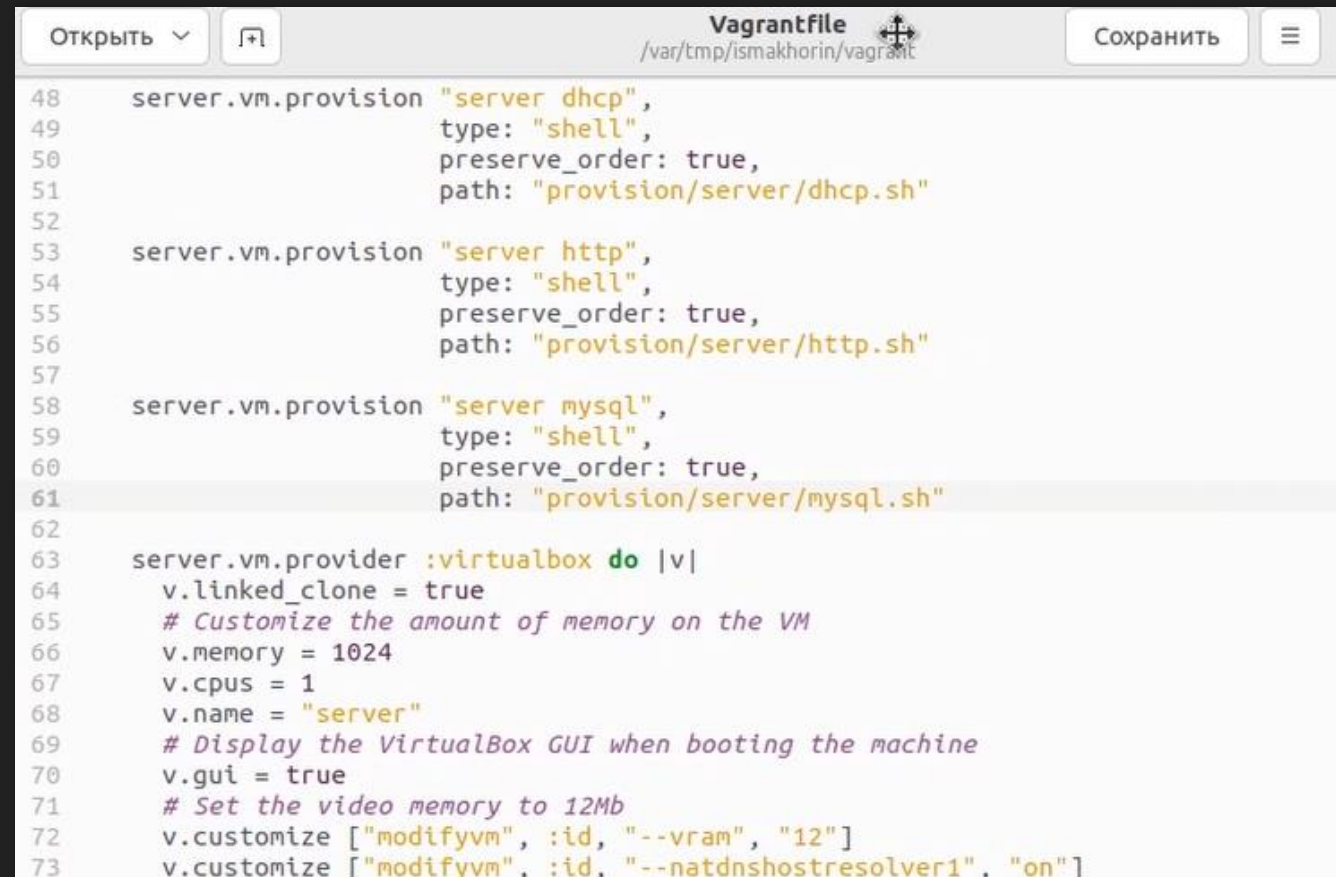


```
*mysql.sh
/vagrant/provision/server

12 mkdir -p /var/backup
13 cp -R /vagrant/provision/server/mysql/var/backup/* /var/backup
14
15 echo "Start mysql service"
16 systemctl enable mariadb
17 systemctl start mariadb
18
19 if [[ ! -d /var/lib/mysql/mysql ]]
20 then
21 echo "Securing mariadb"
22 mysql_secure_installation <<EOF
23
24 y
25 123456
26 123456
27 y
28 y
29 y
30 y
31 EOF
32
33 echo "Create database"
34 mysql -u root -p123456 <<EOF
35 CREATE DATABASE addressbook CHARACTER SET utf8 COLLATE utf8_general_ci;
36 EOF
37 mysql -u root -p123456 addressbook < /var/backup/addressbook.sql
38
39 fi
```

Рис. 5.2. Открытие исполняемого файла на редактирование и прописывание в нём скрипта.

Внесение изменений в настройки внутреннего окружения виртуальной машины



```
48  server.vm.provision "server dhcp",
49                        type: "shell",
50                        preserve_order: true,
51                        path: "provision/server/dhcp.sh"
52
53  server.vm.provision "server http",
54                      type: "shell",
55                      preserve_order: true,
56                      path: "provision/server/http.sh"
57
58  server.vm.provision "server mysql",
59                      type: "shell",
60                      preserve_order: true,
61                      path: "provision/server/mysql.sh"
62
63  server.vm.provider :virtualbox do |v|
64    v.linked_clone = true
65    # Customize the amount of memory on the VM
66    v.memory = 1024
67    v.cpus = 1
68    v.name = "server"
69    # Display the VirtualBox GUI when booting the machine
70    v.gui = true
71    # Set the video memory to 12Mb
72    v.customize ["modifyvm", :id, "--vram", "12"]
73    v.customize ["modifyvm", :id, "--natdnshostresolver1", "on"]
```

Рис. 5.3. Добавление записи в конфигурационном файле Vagrantfile.

ВЫВОД

- В ходе выполнения лабораторной работы были приобретены практические навыки по установке и конфигурированию системы управления базами данных на примере программного обеспечения MariaDB.

Спасибо за внимание!