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PRÁCTICA 5: REPLICACIÓN DE BASES DE DATOS MYSQL

SERVIDORES WEB DE
ALTAS PRESTACIONES

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1. Crear una BD e insertar datos:

Vamos a crear una BD de ejemplo. Para ello usaremos, como root, la interfaz de líneas de comandos del MySQL.

1. Conectamos al servidor mysql, creamos BD estudiante y la seleccionamos.

```
m1-elena97om [Corriendo] - Oracle VM VirtualBox
Archivo  Máquina  Ver  Entrada  Dispositivos  Ayuda
elena97om@m1-elena97om:~$ sudo mysql -u root -p
[sudo] password for elena97om:
Enter password:
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 2
Server version: 5.7.34-0ubuntu0.18.04.1 (Ubuntu)

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owners.

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

mysql> create database estudiante;
Query OK, 1 row affected (0.00 sec)

mysql> use estudiante;
Database changed
mysql> show tables;
Empty set (0.00 sec)
```

2. Creamos la tabla datos e insertamos datos.

```
mysql> create table datos(nombre varchar(100), apellidos varchar(100), usuario varchar(100), email varchar(100));
ERROR 1064 (42000): You have an error in your SQL syntax; check the manual that corresponds to your MySQL server version for the right syntax to use near 'email varchar(100))' at line 1
mysql> create table datos(nombre varchar(100), apellidos varchar(100), usuario varchar(100), email varchar(100));
Query OK, 0 rows affected (0.01 sec)

mysql> show tables;
+-----+
| Tables_in_estudiante |
+-----+
| datos                 |
+-----+
1 row in set (0.00 sec)

mysql> insert into datos(nombre,apellidos,usuario,emalil) values ("Elena", "Ortiz Moreno", "elena97om", "elena97om@correo.ugr.es");
ERROR 1054 (42S22): Unknown column 'emalil' in 'field list'
mysql> insert into datos(nombre,apellidos,usuario,email) values ("Elena", "Ortiz Moreno", "elena97om", "elena97om@correo.ugr.es");
Query OK, 1 row affected (0.01 sec)

mysql> select * from datos;
+-----+-----+-----+-----+
| nombre | apellidos | usuario | email |
+-----+-----+-----+-----+
| Elena  | Ortiz Moreno | elena97om | elena97om@correo.ugr.es |
+-----+-----+-----+-----+
1 row in set (0.00 sec)
```

3. Ahora podemos ver los tipos de datos.

```
mysql> describe datos;
```

Field	Type	Null	Key	Default	Extra
nombre	varchar(100)	YES		NULL	
apellidos	varchar(100)	YES		NULL	
usuario	varchar(100)	YES		NULL	
email	varchar(100)	YES		NULL	

```
4 rows in set (0.00 sec)
```

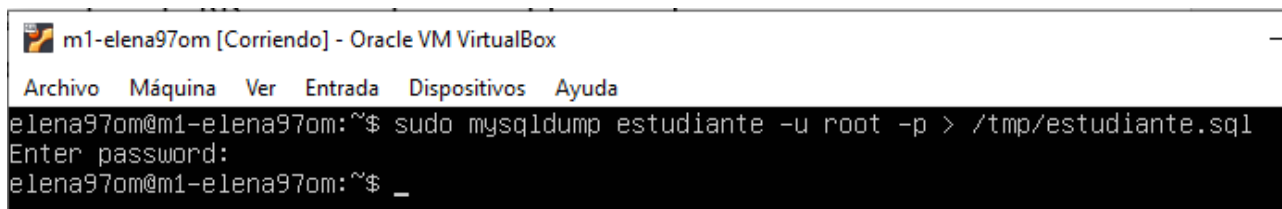
2. Replicar una BD MySQL con mysqldump

Mysqldump es una herramienta de MySQL para clonar bases de datos. Puede utilizarse para hacer copias de seguridad de las bases de datos.

Para replicar la BD primero hay que bloquearla para que no sea modificada mientras se realiza la copia de seguridad.

```
mysql> FLUSH TABLES WITH READ LOCK;
Query OK, 0 rows affected (0.00 sec)
```

Ahora hacemos la copia de la BD al archivo .sql.



```
m1-elena97om [Corriendo] - Oracle VM VirtualBox
Archivo  Máquina  Ver  Entrada  Dispositivos  Ayuda
elena97om@m1-elena97om:~$ sudo mysqldump estudiante -u root -p > /tmp/estudiante.sql
Enter password:
elena97om@m1-elena97om:~$ _
```

Y una vez hemos hecho la copia, desbloqueamos la BD.

```
mysql> UNLOCK TABLES;
Query OK, 0 rows affected (0.00 sec)
```

Una vez tenemos la copia de seguridad en el archivo .sql, tenemos que copiar este archivo en M2.

```
m1-elena97om [Corriendo] - Oracle VM VirtualBox
Archivo  Máquina  Ver  Entrada  Dispositivos  Ayuda
elena97om@m1-elena97om:~$ sudo scp /tmp/estudiante.sql elena97om@192.168.56.103:/tmp/estudiante.sql
[sudo] password for elena97om:
elena97om@192.168.56.103's password:
estudiante.sql                                100% 1991    421.1KB/s   00:00
elena97om@m1-elena97om:~$ _
```

Ahora debemos crear en M2 la tabla estudiante para después restaurarla.

```
m2-elena97om [Corriendo] - Oracle VM VirtualBox
Archivo  Máquina  Ver  Entrada  Dispositivos  Ayuda
elena97om@m2-elena97om:/$ sudo mysql -u root -p
[sudo] password for elena97om:
Enter password:
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 2
Server version: 5.7.34-0ubuntu0.18.04.1 (Ubuntu)

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owners.

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

mysql> create database estudiante;
Query OK, 1 row affected (0.00 sec)

mysql> use estudiante
```

Y restauramos la base de datos.

```
m2-elena97om [Corriendo] - Oracle VM VirtualBox
Archivo  Máquina  Ver  Entrada  Dispositivos  Ayuda
elena97om@m2-elena97om:/$ sudo mysql -u root -p estudiante < /tmp/estudiante.sql
Enter password:
elena97om@m2-elena97om:/$ _
```

Comprobamos que se haya realizado bien la restauración.

```
m2-elena97om [Corriendo] - Oracle VM VirtualBox
Archivo  Máquina  Ver  Entrada  Dispositivos  Ayuda
elena97om@m2-elena97om:/$ sudo mysql -u root -p
Enter password:
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 5
Server version: 5.7.34-0ubuntu0.18.04.1 (Ubuntu)

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owners.

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

mysql> use estudiante;
Reading table information for completion of table and column names
You can turn off this feature to get a quicker startup with -A

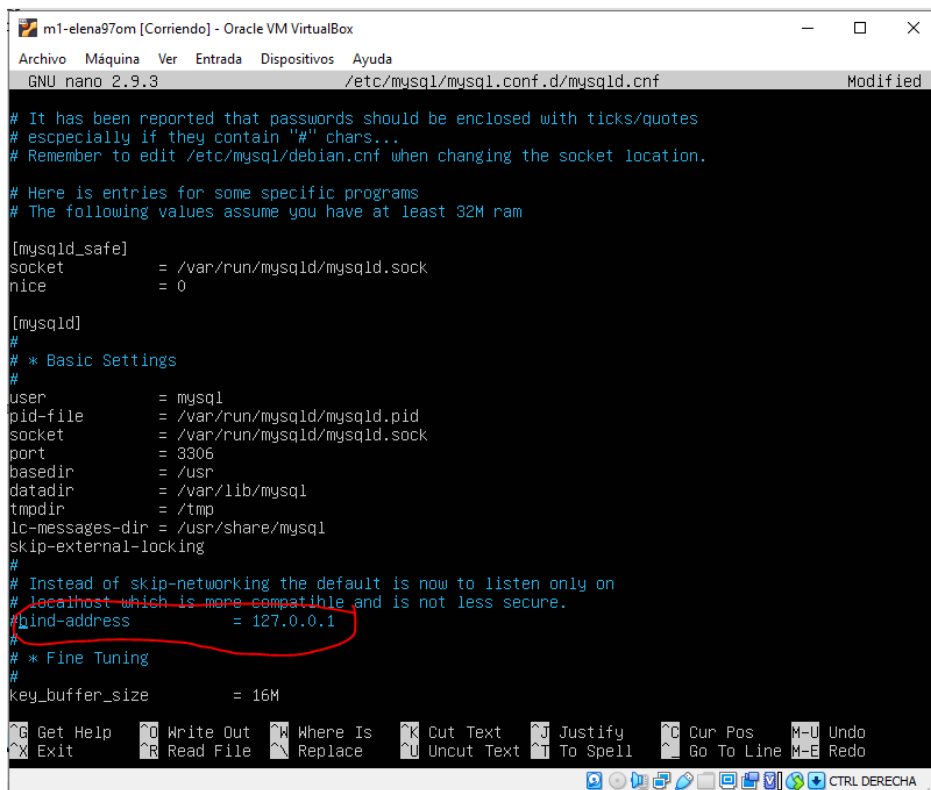
Database changed
mysql> select * from datos;
+-----+-----+-----+-----+
| nombre | apellidos | usuario | email |
+-----+-----+-----+-----+
| Elena | Ortiz Moreno | elena97om | elena97om@correo.ugr.es |
+-----+-----+-----+-----+
1 row in set (0.00 sec)
```

3. Replicar una BD mediante maestro-esclavo.

La opción anterior funciona, pero es algo que debe hacer un operador a mano. Para evitar esto, con MySQL se puede configurar un demonio para hacer la replicación de la BD sobre un esclavo a partir de los datos almacenados en el maestro. Para hacer esto, debemos configurar M1 como maestro y M2 como esclavo.

Vamos a empezar configurando M1 (maestro):

Primero comentamos el parámetro bind-address que sirve para que escuche un servidor.



```
m1-elena97om [Corriendo] - Oracle VM VirtualBox
Archivo  Máquina  Ver  Entrada  Dispositivos  Ayuda
GNU nano 2.9.3 /etc/mysql/mysql.conf.d/mysqld.cnf Modified

# It has been reported that passwords should be enclosed with ticks/quotes
# especially if they contain "#" chars...
# Remember to edit /etc/mysql/debian.cnf when changing the socket location.

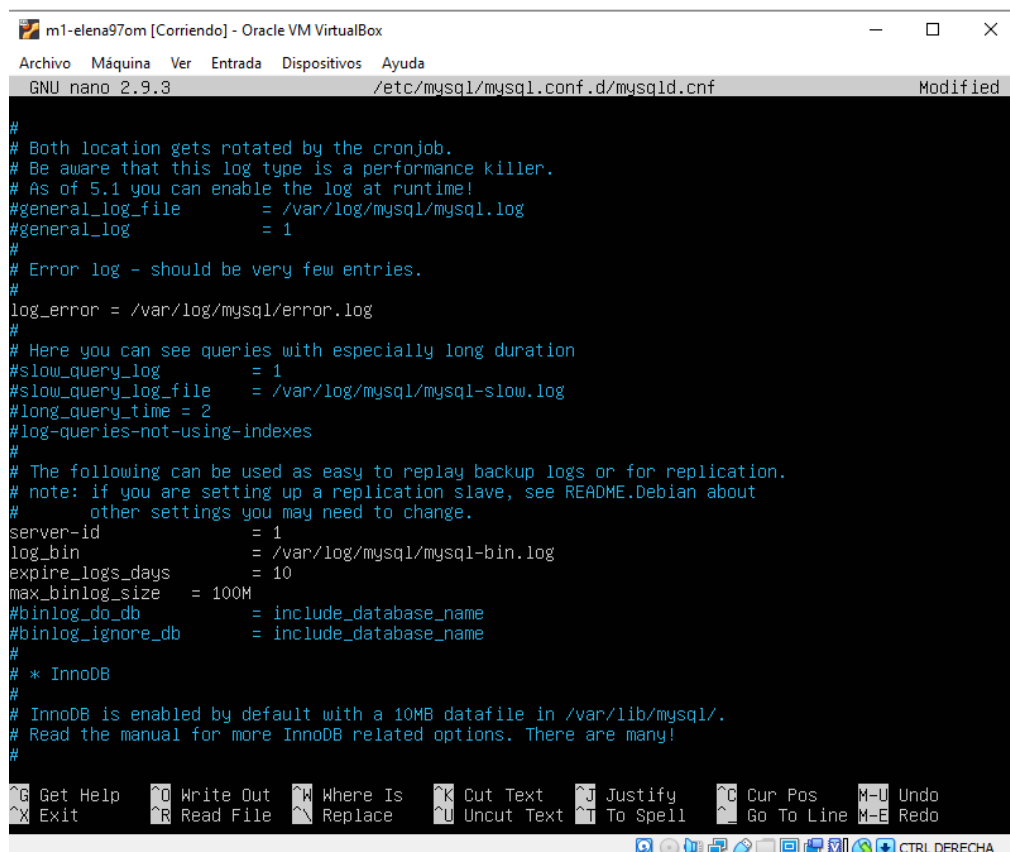
# Here is entries for some specific programs
# The following values assume you have at least 32M ram

[mysqld_safe]
socket      = /var/run/mysqld/mysqld.sock
nice        = 0

[mysqld]
#
# * Basic Settings
#
user        = mysql
pid-file     = /var/run/mysqld/mysqld.pid
socket      = /var/run/mysqld/mysqld.sock
port        = 3306
basedir     = /usr
datadir     = /var/lib/mysql
tmpdir      = /tmp
lc-messages-dir = /usr/share/mysql
skip-external-locking
#
# Instead of skip-networking the default is now to listen only on
# localhost which is more compatible and is not less secure.
#bind-address = 127.0.0.1
#
# * Fine Tuning
#
key_buffer_size = 16M

Get Help  Write Out  Where Is  Cut Text  Justify  Cur Pos  M-U Undo
Exit      Read File  Replace   Uncut Text To Spell Go To Line M-E Redo
CTRL DERECHA
```

Y después indicamos el archivo donde almacenar el log de errores, establecemos el indicador del servidor e indicamos el registro binario:



```
m1-elena97om [Corriendo] - Oracle VM VirtualBox
Archivo  Máquina  Ver  Entrada  Dispositivos  Ayuda
GNU nano 2.9.3 /etc/mysql/mysql.conf.d/mysqld.cnf Modified

#
# Both location gets rotated by the cronjob.
# Be aware that this log type is a performance killer.
# As of 5.1 you can enable the log at runtime!
#general_log_file = /var/log/mysql/mysql.log
#general_log      = 1
#
# Error log - should be very few entries.
log_error = /var/log/mysql/error.log
#
# Here you can see queries with especially long duration
#slow_query_log = 1
#slow_query_log_file = /var/log/mysql/mysql-slow.log
#long_query_time = 2
#log-queries-not-using-indexes
#
# The following can be used as easy to replay backup logs or for replication.
# note: if you are setting up a replication slave, see README.Debian about
# other settings you may need to change.
server-id      = 1
log_bin        = /var/log/mysql/mysql-bin.log
expire_logs_days = 10
max_binlog_size = 100M
#binlog_do_db  = include_database_name
#binlog_ignore_db = include_database_name
#
# * InnoDB
#
# InnoDB is enabled by default with a 10MB datafile in /var/lib/mysql/.
# Read the manual for more InnoDB related options. There are many!
#
```

Ahora reiniciamos MySQL y comprobamos que no haya errores:

```
m1-elena97om [Corriendo] - Oracle VM VirtualBox
Archivo  Máquina  Ver  Entrada  Dispositivos  Ayuda
elena97om@m1-elena97om:/$ sudo service mysql restart
elena97om@m1-elena97om:/$ sudo service mysql status
• mysql.service - MySQL Community Server
  Loaded: loaded (/lib/systemd/system/mysql.service; enabled; vendor preset: enabled)
  Active: active (running) since Mon 2021-05-24 16:28:18 UTC; 8s ago
  Process: 1445 ExecStart=/usr/sbin/mysqld --daemonize --pid-file=/run/mysqld/mysqld.pid (code=exite
  Process: 1425 ExecStartPre=/usr/share/mysql/mysql-systemd-start pre (code=exited, status=0/SUCCESS
  Main PID: 1447 (mysqld)
  Tasks: 27 (limit: 1106)
  CGroup: /system.slice/mysql.service
          └─1447 /usr/sbin/mysqld --daemonize --pid-file=/run/mysqld/mysqld.pid

May 24 16:28:17 m1-elena97om systemd[1]: Starting MySQL Community Server...
May 24 16:28:18 m1-elena97om systemd[1]: Started MySQL Community Server.
lines 1-12/12 (END)
```

Una vez configurado el maestro, pasamos a configurar M2 (esclavo):

La configuración será similar, pero cambiando el identificador del servidor a 2 en vez de a 1.

```
#      other settings you may need to change.
server-id      = 2
log_bin        = /var/log/mysql/mysql-bin.log
expire_logs_days = 10
```

```
m2-elena97om [Corriendo] - Oracle VM VirtualBox
Archivo  Máquina  Ver  Entrada  Dispositivos  Ayuda
elena97om@m2-elena97om:~$ sudo service mysql restart
elena97om@m2-elena97om:~$ sudo service mysql status
• mysql.service - MySQL Community Server
  Loaded: loaded (/lib/systemd/system/mysql.service; enabled; vendor preset: enabled)
  Active: active (running) since Mon 2021-05-24 16:40:07 UTC; 6s ago
  Process: 10141 ExecStart=/usr/sbin/mysqld --daemonize --pid-file=/run/mysqld/mysqld.pid (code=exit
  Process: 10120 ExecStartPre=/usr/share/mysql/mysql-systemd-start pre (code=exited, status=0/SUCCESS
  Main PID: 10143 (mysqld)
  Tasks: 27 (limit: 1106)
  CGroup: /system.slice/mysql.service
          └─10143 /usr/sbin/mysqld --daemonize --pid-file=/run/mysqld/mysqld.pid

May 24 16:40:07 m2-elena97om systemd[1]: Stopped MySQL Community Server.
May 24 16:40:07 m2-elena97om systemd[1]: Starting MySQL Community Server...
May 24 16:40:07 m2-elena97om systemd[1]: Started MySQL Community Server.
lines 1-13/13 (END)
```

Volvemos a M1 para seguir configurando el maestro. Esta vez creamos un usuario “esclavo” para realizar la replicación:


```
m1-elena97om [Corriendo] - Oracle VM VirtualBox
Archivo  Máquina  Ver  Entrada  Dispositivos  Ayuda

Enter password:
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 2
Server version: 5.7.34-0ubuntu0.18.04.1-log (Ubuntu)

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owners.

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

mysql> CREATE USER esclavo_elena97om IDENTIFIED BY 'esclavo_elena97om';
Query OK, 0 rows affected (0.00 sec)

mysql> GRANT REPLICATION SLAVE ON *.* TO 'esclavo_elena97om'@'%' IDENTIFIED BY 'esclavo_elena97om';
Query OK, 0 rows affected, 1 warning (0.01 sec)

mysql> FLUSH PRIVILEGES;
Query OK, 0 rows affected (0.00 sec)

mysql> FLUSH TABLES;
Query OK, 0 rows affected (0.01 sec)

mysql> FLUSH TABLES WITH READ LOCK;
Query OK, 0 rows affected (0.00 sec)

mysql> SHOW MASTER STATUS;
+-----+-----+-----+-----+-----+
| File           | Position | Binlog_Do_DB | Binlog_Ignore_DB | Executed_Gtid_Set |
+-----+-----+-----+-----+-----+
| mysql-bin.000002 |      1000 |              |                  |                  |
+-----+-----+-----+-----+-----+
1 row in set (0.00 sec)

mysql>
```

Y volvemos a M2 para darle los datos del maestro.

```
m2-elena97om [Corriendo] - Oracle VM VirtualBox
Archivo  Máquina  Ver  Entrada  Dispositivos  Ayuda

elena97om@m2-elena97om:~$ sudo mysql -u root -p
Enter password:
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 2
Server version: 5.7.34-0ubuntu0.18.04.1-log (Ubuntu)

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owners.

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

mysql> CHANGE MASTER TO MASTER_HOST='192.168.56.102',
-> MASTER_USER='esclavo_elena97om',
-> MASTER_PASSWORD='esclavo_elena97om', MASTER_LOG_FILE='mysql-bin.000002', MASTER_LOG_POS=1000,
MASTER_PORT=3306;
Query OK, 0 rows affected, 2 warnings (0.06 sec)

mysql>
```

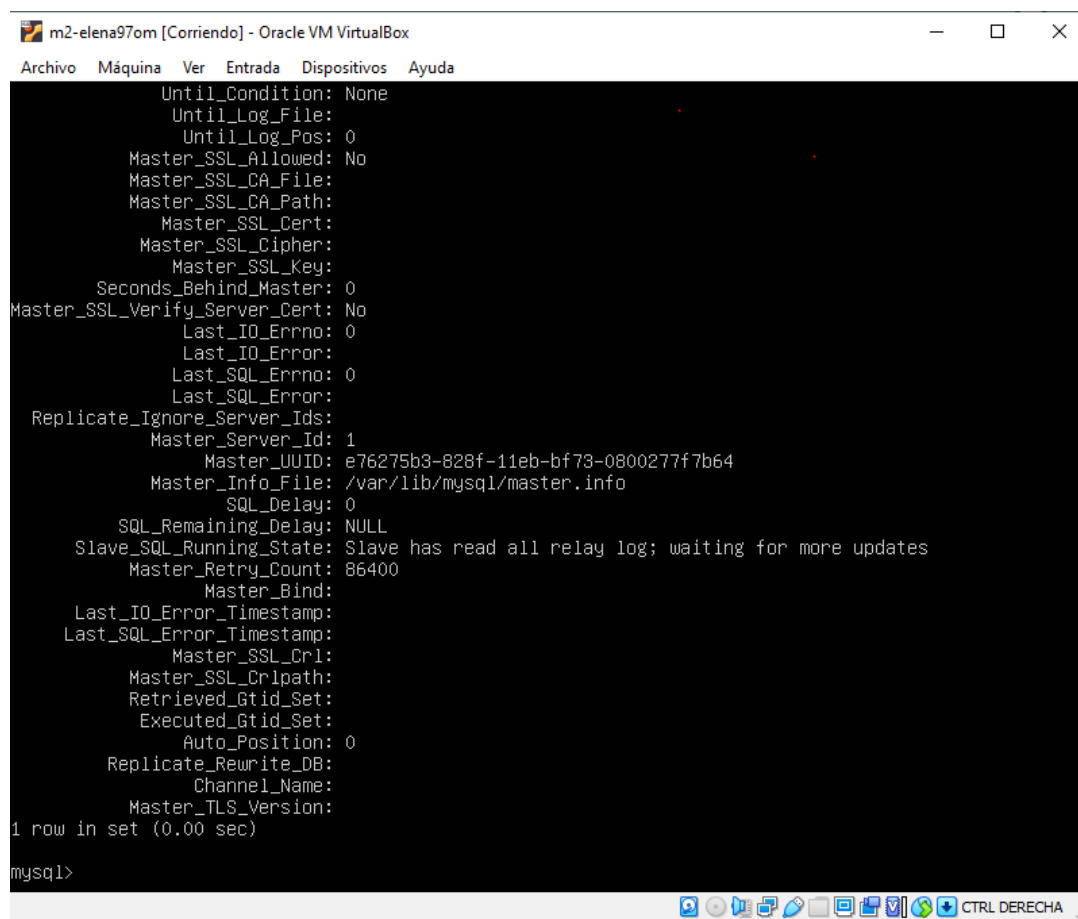
Y arrancamos el esclavo.

```
mysql> START SLAVE;  
Query OK, 0 rows affected (0.00 sec)  
  
mysql> _
```

En M1 activamos las tablas de nuevo.

```
mysql> UNLOCK TABLES;  
Query OK, 0 rows affected (0.00 sec)  
  
mysql>
```

Y en M2 comprobamos el estado del esclavo.



```
m2-elena97om [Corriendo] - Oracle VM VirtualBox  
Archivo  Máquina  Ver  Entrada  Dispositivos  Ayuda  
Until_Condition: None  
Until_Log_File:  
Until_Log_Pos: 0  
Master_SSL_Allowed: No  
Master_SSL_CA_File:  
Master_SSL_CA_Path:  
Master_SSL_Cert:  
Master_SSL_Cipher:  
Master_SSL_Key:  
Seconds_Behind_Master: 0  
Master_SSL_Verify_Server_Cert: No  
Last_IO_Errno: 0  
Last_IO_Error:  
Last_SQL_Errno: 0  
Last_SQL_Error:  
Replicate_Ignore_Server_Ids:  
Master_Server_Id: 1  
Master_UUID: e76275b3-828f-11eb-bf73-0800277f7b64  
Master_Info_File: /var/lib/mysql/master.info  
SQL_Delay: 0  
SQL_Remaining_Delay: NULL  
Slave_SQL_Running_State: Slave has read all relay log; waiting for more updates  
Master_Retry_Count: 86400  
Master_Bind:  
Last_IO_Error_Timestamp:  
Last_SQL_Error_Timestamp:  
Master_SSL_Crl:  
Master_SSL_Crlpath:  
Retrieved_Gtid_Set:  
Executed_Gtid_Set:  
Auto_Position: 0  
Replicate_Rewrite_DB:  
Channel_Name:  
Master_TLS_Version:  
1 row in set (0.00 sec)  
  
mysql>
```

Como el valor de `Seconds_Behind_Master` es distinto de null y no me da ningún error, podemos ver que todo está funcionando perfectamente.