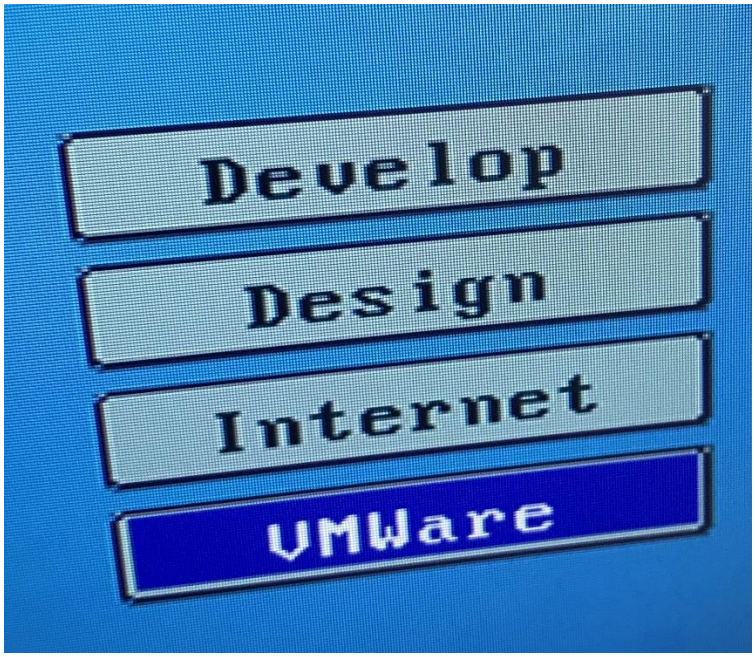
MySQL8 InnoDB Cluster 数据库集群安装教学指导书

【编写说明：聂耿青于 2022 年编写第一版（用于线上教学）；2023 年修订为第二版，主要修订内容：改用计算中心 VMware 分区的虚拟机环境，Mysql 的版本更新为 8.0.33；2025 年修订为第三版（由宋子菡、聂耿青先后修订），主要修订内容：MySQL 的版本更新为 8.4.5，细化了一些操作细节】

【实验环境说明：测试环境的实例节点可以用 Docker 容器实例或 Sandbox 实例来搭建，但生产环境通常是多台物理机或虚拟机来运行 MySQL 数据库实例。Windows 或 Mac OS 可以直接运行 MySQL，也本实验建议在其上搭建的 VMware 虚拟机 Linux（比如 CentOS）环境上安装与测试 MySQL & Innodb Cluster。Mac OS 上的 VMware 虚拟机软件可以在官网 https://www.vmware.com/products/desktop-hypervisor/workstation-and-fusion 免费下载 **VMware Fusion** 个人版 **】**

计算中心机房实验环境操作步骤（2023 年新增，2025 年修订）：

1. 开机后要选择 VMware 分区：



2. 直接从校内 FTP 服务器下载有关安装文件：用 fileZilla 或文件资源管理器

ftp://202.204.120.72 （或者从机房其他同学的电脑通过共享目录拷贝）

在 D 盘或 E 盘创建目录 D:\ngq（改为同学自己的姓名首字母，可加学号后三位，下同）、D:\ngq\sharedsk

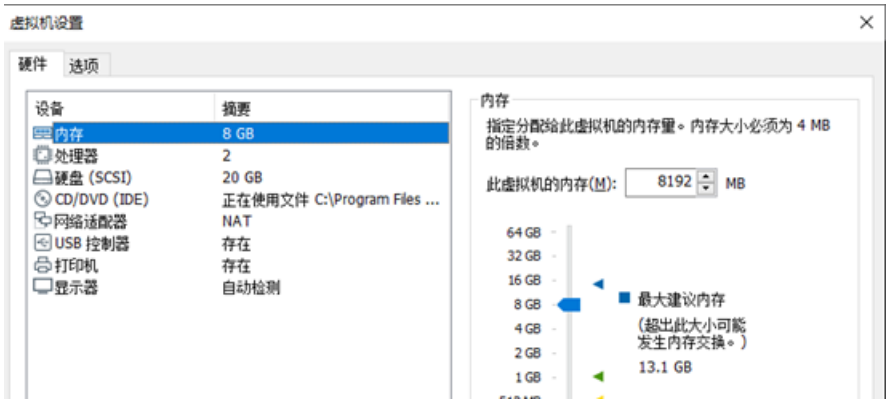
下载 MySQL/current（845LTS）目录中所有文件到 D:\ngq 中，并在 D:\ngq 目录中执行:

右击 CentOS7_DBPreinstall.zip 并解压到当前目录

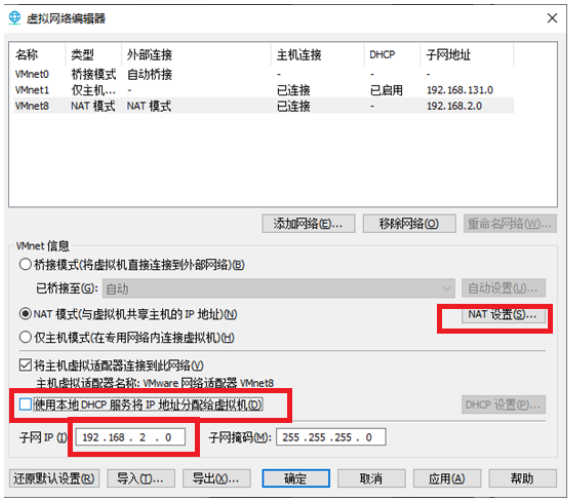
将 mysql*-8.4.5-1.el7.x86_64* （共 3 个）移动到 D:\ngq\sharedsk 目录中

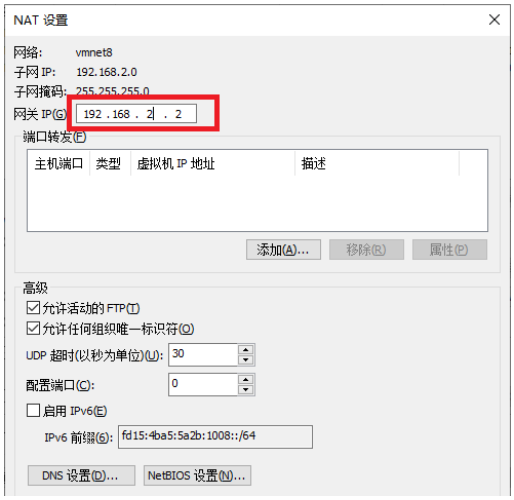
3. 用 VMware Worstation 打开 D:\ngq\CentOS7VM

在设置中修改内存到 6-8GB（如果物理内存大于 16GB）

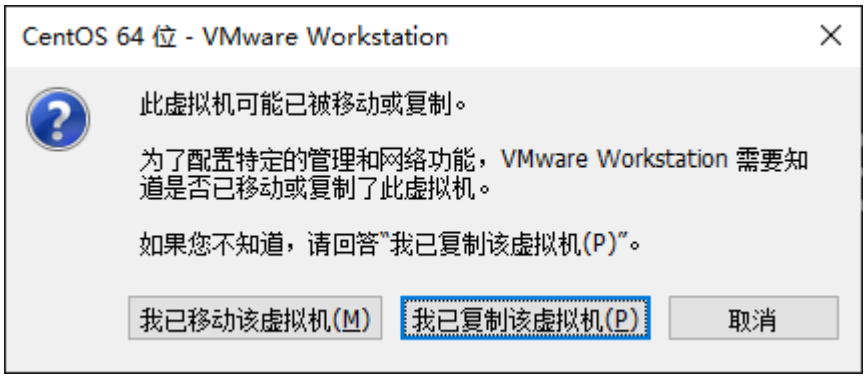


在菜单“编辑”→虚拟网络编辑器





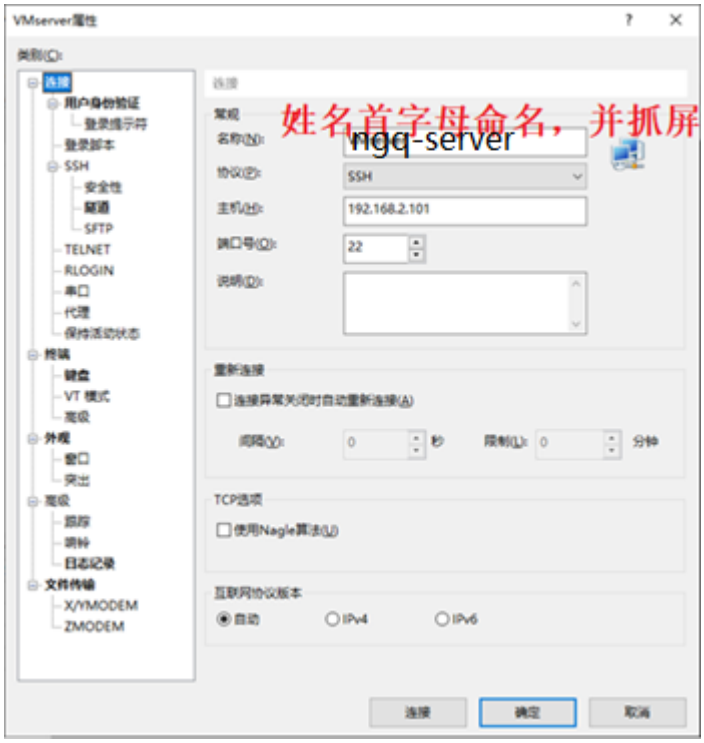
启动虚拟机：



#ping www.baidu.com

#ip addr

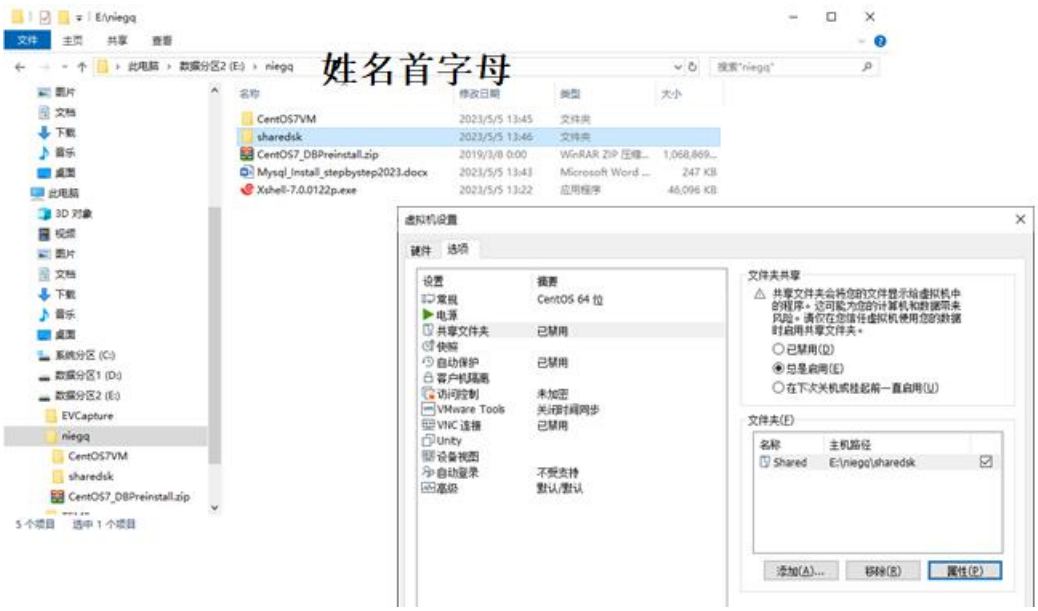
4. 在 Windows 环境下安装 Xshell



必须抓屏

5. 宿主机共享文件夹设置

将 D:\ngq\sharedsk 设置为共享目录，以便虚拟机能够读取其文件：



#ls /mnt/hgfs

#vmware-hgfsclient

#vmhgfs-fuse .host:/ /mnt/hgfs

6. 通过 yum 或 rpm 安装 MySQL8

#cd /mnt/hgfs/sharedsk

#tar xvf mysql-8.4.5-1.el7.x86_64.rpm-bundle.tar

#cd mysql-8.4.5-1.el7.x86_64.rpm-bundle-mini

#yum install mysql-community-{server,client,common,libs,icu}-*

#vi /etc/my.cnf

#port=3306

default-time-zone='+8:00'

#systemctl start mysqld

#systemctl status mysqld **此命令及其返回结果需要抓屏**

7. 防火墙

firewall-cmd --zone=public --permanent --add-port=3306/tcp

firewall-cmd --reload

8. 客户端连接 MySql Server

#cd /var/log

#grep password /var/log/mysqld.log

#mysql -uroot -p

ALTER USER root@localhost IDENTIFIED BY 'abc123!Test';

create user ngq@"%" identified by 'abc123!Test';

GRANT ALL privileges ON *.* TO "ngq"@"%";

FLUSH PRIVILEGES;

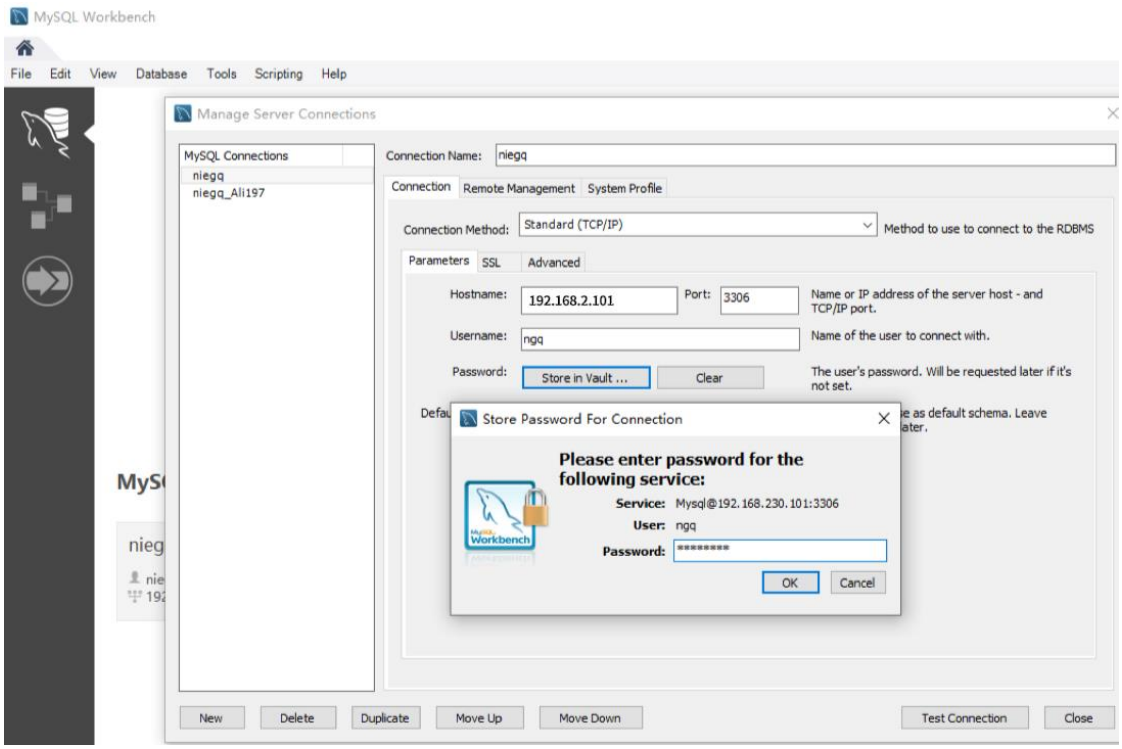
select host, user from mysql.user;

注意：以上 SQL 命令操作及其返回结果都需要抓屏

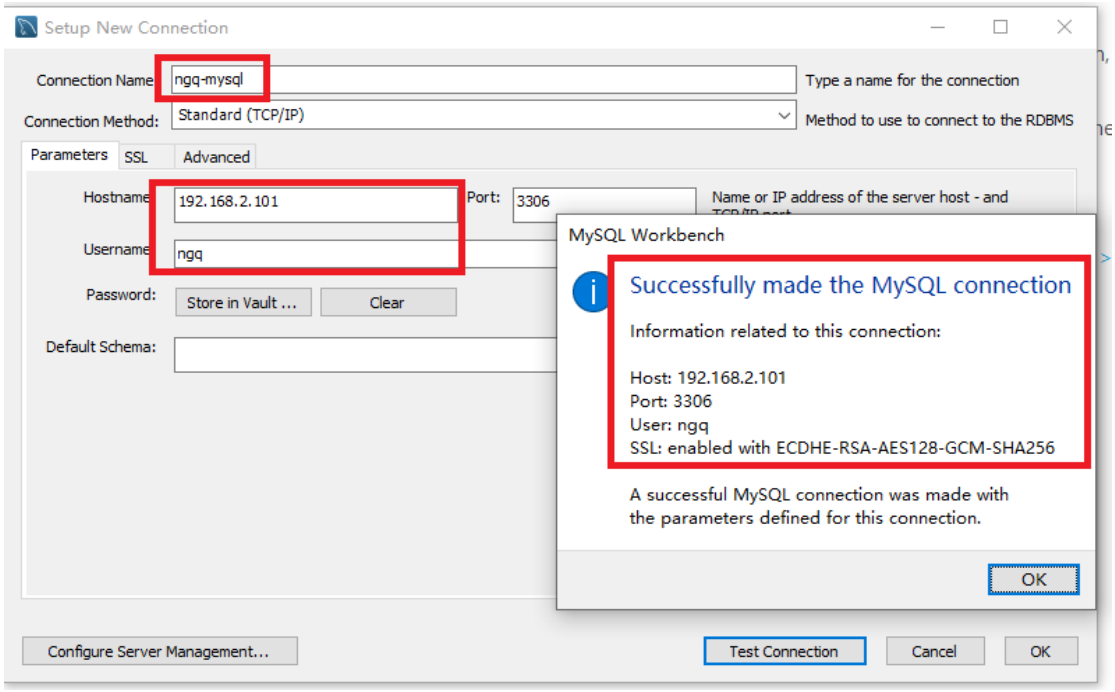
try：#mysql -uroot -p'abc123!Test'

MySQL Workbench 客户端

从 D:\ngq 中安装 MySQL Workbench，并打开：



Test Connection 操作需要此抓屏：



在客户端写点 SQL 看看（可用 Ctrl+Enter 执行 SQL 语句）：

create database ngqdb;

use ngqdb;

show databases;

show tables;

create table nietest (id INT NOT NULL AUTO_INCREMENT PRIMARY KEY, name varchar(100), create_date TIMESTAMP DEFAULT CURRENT_TIMESTAMP);

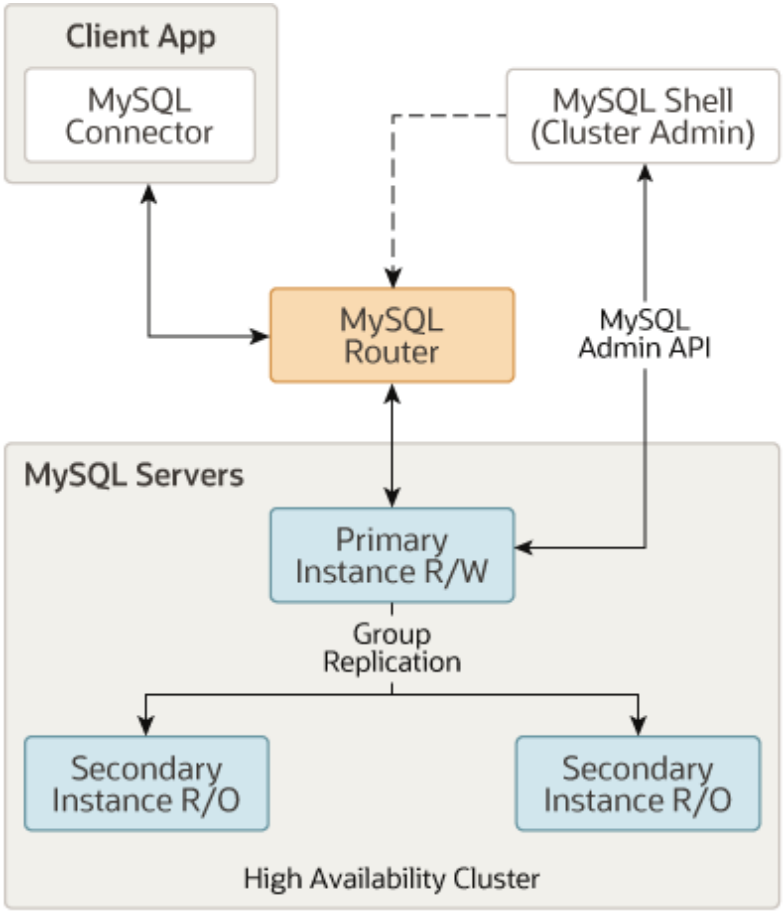
```
insert into nietest (name) values ('必须是自己的姓名');
--执行三遍
select * from nietest;
```

SQL 语句运行结果需要抓屏

至此，MySQL 单机服务器安装完毕！

下面为 MySQL 集群的安装实验：

MySQL InnoDB Cluster 集群服务器拓扑结构如下图：



9. 安装 shell 和 router

#cd /mnt/hgfs/sharedsk

#yum localinstall mysql-shell-8.4.5-1.el7.x86_64.rpm

yum localinstall mysql-router-community-8.4.5-1.el7.x86_64.rpm

需要抓屏!!

10. 创建三个沙漏实例并构建一个实验集群

mysqlsh -uroot -p'abc123!Test'

\js

dba.deploySandboxInstance(3307,{password:'abc123!Test'});

dba.deploySandboxInstance(3308,{password:'abc123!Test'});

dba.deploySandboxInstance(3309,{password:'abc123!Test'});

命令及返回结果必须抓屏！

\quit

firewall-cmd --zone=public --permanent --add-port=3307/tcp

firewall-cmd --zone=public --permanent --add-port=3308/tcp

firewall-cmd --zone=public --permanent --add-port=3309/tcp

firewall-cmd --reload

创建 InnoDB Cluster 并添加集群实例

mysqlsh -uroot -p -h127.0.0.1 -P3307

cluster=dba.createCluster("ngqcluster");

cluster.addInstance("root@127.0.0.1:3308");

cluster.addInstance("root@127.0.0.1:3308",{password:'abc123!Test'}); #以前的写法

cluster.addInstance("root@127.0.0.1:3309");

命令及返回结果必须抓屏！

mysqlsh -uroot -p -h127.0.0.1 -P3309

cluster = dba.getCluster();

cluster.status();

#显示 status:ONLINE is OK

命令及返回结果必须抓屏！

11. 在当前用户目录生成路由配置文件

#cd 回车（切换回当前用户本地目录）

mysqlrouter --bootstrap localhost:3307 -d ngqrouter --user=root

firewall-cmd --zone=public --permanent --add-port=6446/tcp

firewall-cmd --zone=public --permanent --add-port=6447/tcp

firewall-cmd --zone=public --permanent --add-port=6450/tcp

firewall-cmd --reload

mysqlrouter -c /root/ngqrouter/mysqlrouter.conf &

命令及返回结果必须抓屏！

12. Cluster 路由测试及故障转移(failover)测试：

mysqlsh -uroot -p -h127.0.0.1 -P6446

\sql

create user ngq@"%" identified by 'abc123!Test';

GRANT ALL privileges ON *.* TO ngq@"%" WITH GRANT OPTION;

FLUSH PRIVILEGES;

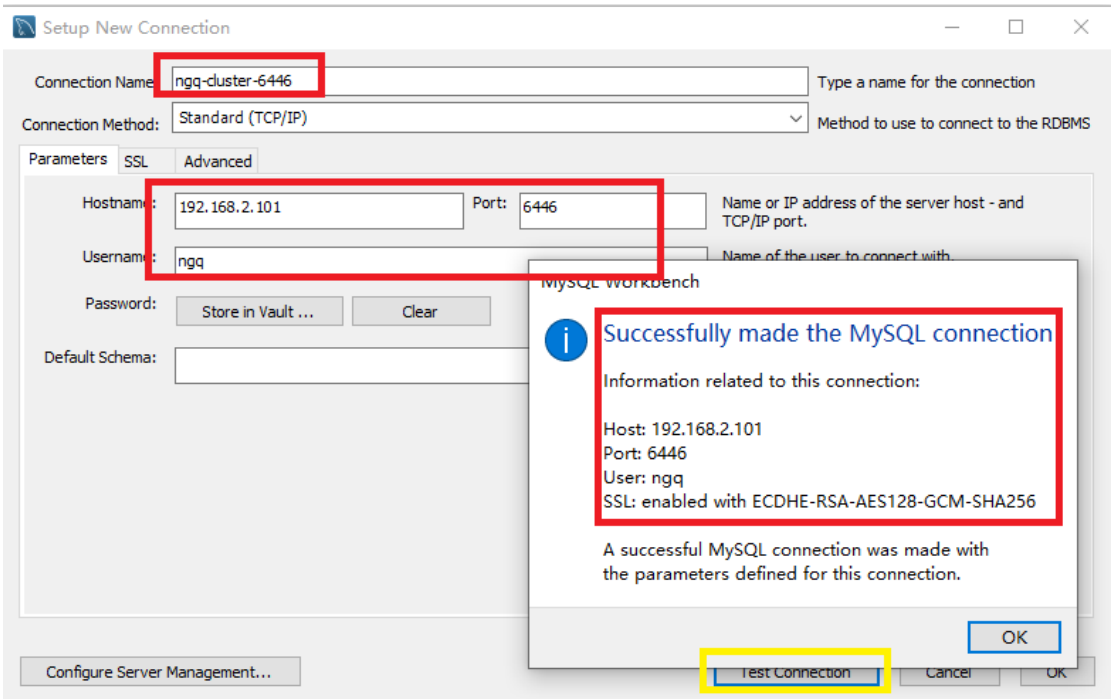
命令及返回结果必须抓屏！

mysql -ungq -p'abc123!Test' -h127.0.0.1 -P6446

进入 workbench 环境测试:

首先：新建基于端口为 6446 的连接

对如下测试连接结果要抓屏：



create database ngqdb;

use ngqdb;

```
create table ngq_tab (id INT NOT NULL AUTO_INCREMENT PRIMARY KEY
, name varchar(100) not null
, type varchar(20)
, create_date TIMESTAMP DEFAULT CURRENT_TIMESTAMP
, last_update timestamp default current_timestamp on update current_timestamp);
insert into ngq_tab (name) values (concat('test:port',@@port));
select * from ngq_tab;
```

所有 SQL 语句及返回结果必须抓屏！

```
mysql -ungq -p'abc123!Test' -h127.0.0.1 -P6447
SELECT @@PORT;

mysql -ungq -p'abc123!Test' -h127.0.0.1 -P6447 -se"select @@port\G"
```

连续运行 3-5 次上述命令，并将有不同端口的返回结果抓屏！

```
pgrep mysqld -fla
kill -9 primaryIDno
mysql -ungq -p'abc123!Test' -h127.0.0.1 -P6446 -se"select @@port\G"
mysql -ungq -p'abc123!Test' -h127.0.0.1 -P6447 -se"select @@port\G"
--连续多次，几秒后恢复
```

命令及返回结果必须抓屏！

恢复就主实例

```
mysqlsh -uroot -p -hlocalhost -P6446
mysqlsh -uroot -p -h127.0.0.1 -P6446
  \js
    cluster = dba.getCluster();
```

cluster.status()

dba.startSandboxInstance(3307);

cluster.status()

连续多次运行 status 观察 statusText 的变化，直到其变为：Cluster is ONLINE and can tolerate up to ONE failure.

上述操作及其返回结果必须抓屏！

13. 虚拟机重启（或三个沙漏实例全部关闭，相当于集群所有节点全部断电），要做如下处理才能重启集群：

pgrep mysqld -fla

kill -9 all 沙漏实例

mysqlsh -uroot -p -h127.0.0.1 -P6446

出现：Can't connect to MySQL server on '127.0.0.1:6446'

(1) 先启动所有沙漏节点的数据库实例：

mysqlsh -uroot -p

dba.startSandboxInstance(3307)

dba.startSandboxInstance(3308)

dba.startSandboxInstance(3309)

(2) 连接主节点，重启集群：

mysqlsh -uroot -p -h127.0.0.1 -P3307

cluster = dba.getCluster();

出现：error

cluster = dba.rebootClusterFromCompleteOutage()

cluster.status()

14. 其它实验（比如删除集群等操作）可以参见 2022 年的内容：

以下为 2022 年的内容（适合线上教学，在笔记本电脑操作）：

预备、服务器安装环境准备

首先确认磁盘剩余空间，如果少于 3GB，就建议先按如下指导书作磁盘扩容：

https://www.niepub.com/static/docs/exadmin/CentOS7_DiskExtend_Guide.pdf

一、采用 MySQL 数据库服务器的 Sandbox 沙漏实例来搭建集群(InnoDB Cluster)

(1) 安装数据库服务器：install mysql8.0.28 & mysqlsh

mkdir & cd Software

wget https://mirrors.ustc.edu.cn/mysql-ftp/Downloads/MySQL-8.0/mysql-8.0.28-1.el7.x86_64.rpm-bundle.tar --no-check-certificate

tar xvf mysql-8.0.28-1.el7.x86_64.rpm-bundle.tar

yum install mysql-community-{server,client,common,libs,icu-data-files}-*

systemctl start mysqld

grep password /var/log/mysqld.log

mysql -uroot -p

ALTER USER 'root'@'localhost' IDENTIFIED BY ‘abc123!Test’;

update mysql.user set host = '%' where user = 'root';

create user ngq@"%" identified by ‘abc123!Test’;

GRANT ALL privileges ON *.* TO ngq@"%" WITH GRANT OPTION;

FLUSH PRIVILEGES;

wget https://mirrors.ustc.edu.cn/mysql-ftp/Downloads/MySQL-Shell/mysql-shell-8.0.28-1.el7.x86_64.rpm --no-check-certificate

yum localinstall mysql-shell-8.0.28-1.el7.x86_64.rpm

wget https://mirrors.ustc.edu.cn/mysql-ftp/Downloads/MySQL-Router/mysql-router-community-8.0.28-1.el7.x86_64.rpm --no-check-certificate

yum localinstall mysql-router-community-8.0.28-1.el7.x86_64.rpm

firewall-cmd --zone=public --permanent --add-port=3306/tcp

firewall-cmd --zone=public --permanent --add-port=3307/tcp

firewall-cmd --zone=public --permanent --add-port=3308/tcp

firewall-cmd --zone=public --permanent --add-port=3309/tcp

firewall-cmd --reload

(2) 配置集群：Config InnoDB Cluster

创建三个沙漏实例(SandboxInstance)

mysqlsh -uroot -p

dba.deploySandboxInstance(3307,{password:'abc123!Test'});

dba.deploySandboxInstance(3308,{password:'abc123!Test'});

dba.deploySandboxInstance(3309,{password:'abc123!Test'});

创建 InnoDB Cluster 并添加集群实例

mysqlsh -uroot -p -h127.0.0.1 -P3307

cluster=dba.createCluster("ngqcluster");

#cluster=dba.getCluster("ngqcluster");

cluster.addInstance("root@127.0.0.1:3308",{password:'abc123!Test'});

cluster.addInstance("root@127.0.0.1:3309",{password:'abc123!Test'});

```
print (cluster.status(
mysqlsh -uroot -p -h127.0.0.1 -P3309
cluster = dba.getCluster();
cluster.status();
#显示 status:ONLINE is OK
```

（3）启动路由：Start MySQL Router

```
mysqlrouter --bootstrap localhost:3307 -d ngqrouter --user=root
#mysqlrouter --bootstrap localhost:3307 -d ngqrouter --user=root --force
firewall-cmd --zone=public --permanent --add-port=6446/tcp
firewall-cmd --zone=public --permanent --add-port=6447/tcp
firewall-cmd --reload
mysqlrouter -c /root/Software/ngqrouter/mysqlrouter.conf &
or ./ngqrouter/start.sh ./ngqrouter/stop.sh
lsof -i :6446
mysql -uroot -p -P6446 -h127.0.0.1
select @@group_replication_local_address\G
SELECT @@PORT;
create database ngqdb;
create table ngq_tab (id INT NOT NULL AUTO_INCREMENT PRIMARY KEY
, name varchar(100) not null
, type    varchar(20)
, create_date TIMESTAMP DEFAULT CURRENT_TIMESTAMP
, last_update timestamp default current_timestamp on update current_timestamp);
insert into ngq_tab (name) values (concat('test:port',@@port));
select * from ngq_tab;
select user();
```

mysql -uroot -p -P6447 -h127.0.0.1

SELECT @@PORT;

mysql -uroot -p -h127.0.0.1 -P6447 -se"select @@port\G"

连续连接 6447 三次看看

mysql -uroot -p -h127.0.0.1 -P3308 -se"select @@port\G select count(*) from ngq_tab;"

（4）．故障转移测试

mysqlsh -uroot -p -h127.0.0.1 -P6446

cluster = dba.getCluster();

cluster.status()

\sql

select * from performance_schema.replication_group_members\G

\js

#pgrep mysqld -fla

#kill -9 primaryInstancePID

\sql

select * from performance_schema.replication_group_members\G

\js

cluster = dba.getCluster();

cluster.status()

恢复就主实例

mysqlsh -uroot -p -h127.0.0.1 -P6446

dba.startSandboxInstance(3307);

cluster = dba.getCluster();

cluster.status()

（5）．多活与单活的转换测试

cluster.switchToMultiPrimaryMode()　多主模式:所有实例都成为主要实例。

mysql -uroot -p -h127.0.0.1 -P3309|3307|3308

cluster.switchToSinglePrimaryMode('root@127.0.0.1:3309')切换到单主模式

重启 router：./stop.sh ./start.sh

mysql -uroot -p -h127.0.0.1 -P6446|6447

（6）集群重启：所有数据库实例全部停止（或停电）后重启整个集群服务器

模拟所有节点全部断电或 shutdown

dba.stopSandboxInstance(3307)

【或者

#mysql -uroot -p -h127.0.0.1 -P3309

Mysql>**shutdown**;

】

方法一：

先启动所有节点实例 mysqlsh

dba.startSandboxInstance(3307)

mysqlsh -uroot -p -h127.0.0.1 -P3307

cluster = dba.rebootClusterFromCompleteOutage()

方法二：

Mysqlsh 先启动主节点，并运行：

#mysql -uroot -p -h127.0.0.1 -P3307

SET GLOBAL group_replication_bootstrap_group=ON;

start group_replication;

SET GLOBAL group_replication_bootstrap_group=OFF;

SELECT * FROM performance_schema.replication_group_members;

然后再依次启动所有其它节点(GTID 由大到小):

(7) （可选）删除集群及路由

mysqlsh -uroot -proot -h127.0.0.1 -P3309

dba.stopSandboxInstance(3309,{password:'abc123!Test'});

dba.stopSandboxInstance(3308,{password:' ngqpwd '});

dba.stopSandboxInstance(3307,{password:' ngqpwd '});

dba.deleteSandboxInstance(3307);

dba.deleteSandboxInstance(3308);

dba.deleteSandboxInstance(3309);

./ngqrouter/stop.sh

rm -rf ngqrouter

(8). (可选)更新身份验证方式：caching_sha2_password-->mysql_native_password

更新配置并添加以下行:

default_authentication_plugin=mysql_native_password

到所有实例（配置位于 ~$HOME/mysql-sandboxes/$PORT/my.cnf。确保更新所有 3 个节点

并 mysqlsh 中重启所有 MySQL 实例:

mysqlsh> dba.stopSandboxInstance(3307);

mysqlsh> dba.startSandboxInstance(3307);

mysqlsh> \c 'root'@127.0.0.1:3307

更新我们的“root”用户以使用旧插件

mysql> ALTER USER 'root'@'%' IDENTIFIED WITH mysql_native_password BY ‘abc123!Test’;

mysql> ALTER USER 'root'@'localhost' IDENTIFIED WITH mysql_native_password BY ‘abc123!Test’;

show global variables like 'default_authentication_plugin';

路由日志及端口等：

#ngqrouter/log/mysqlrouter.log

$ mysqlrouter -c /root/Software/ngqrouter/mysqlrouter.conf

InnoDB Cluster 'ngqcluster' can be reached by connecting to:

MySQL Classic protocol

- Read/Write Connections: localhost:6446

- Read/Only Connections: localhost:6447

MySQL X protocol

- Read/Write Connections: localhost:6448

- Read/Only Connections: localhost:6449

二、采用 MySQL 数据库服务器的 Docker 容器实例来搭建集群(InnoDB Cluster)

--先需要安装配置好 Docker 运行环境，然后下载或更新 MySQL 最新镜像

docker search mysql

#docker pull mysql/mysql-server

#docker pull mysql/mysql-router

mysql/mysql-server 8.0.28 434c35b82b08 4 weeks ago 417MB

mysql/mysql-router 8.0.28 acccea81feeb 4 weeks ago 241MB

docker images

#docker rmi hello-world

more /etc/docker/daemon.json

```
{
    "dns": ["114.114.114.114", "8.8.8.8"],
    "registry-mirrors": ["https://ldcfwmse.mirror.aliyuncs.com"]
}
```

#systemctl restart docker

-----docker Single-Node MySQL DB 单节点数据库服务器的安装配置----------

#docker rm mysqlnie

#docker run --name=mysqlnie -p 4432:3306 -d mysql/mysql-server

#docker ps -a

#重启 Server 后，需要 docker start mysqlnie 启动容器

docker exec -it mysqlnie mysql -uroot -p

semanage port -a -t mysqld_port_t -p tcp 4432

firewall-cmd --zone=public --permanent --add-port=4432/tcp

firewall-cmd --reload

ip addr |grep docker

docker inspect mysqlnie |grep IP

docker cp mysqlnie:/etc/my.cnf .

----------MySQL InnoDB Cluster 集群环境的搭建----------

--基于同一网络创建并启动三个以上的 mysql 容器

docker network create ngqclusternet

docker run -d --name=ngqsvr1 --hostname=ngqsvr1 --net=ngqclusternet -e MYSQL_ROOT_PASSWORD=rootpwd mysql/mysql-server

for N in 2 3

do docker run -d --name=ngqsvr$N --hostname=ngqsvr$N --net=ngqclusternet \

```
        -e MYSQL_ROOT_PASSWORD=rootpwd mysql/mysql-server
done
docker ps -a
```

--创建用户并授权并初始化 binlog

```
for N in 1 2 3
do docker exec -it ngqsvr$N mysql -uroot -prootpwd \
   -e "CREATE USER 'ngq'@'%' IDENTIFIED BY 'abc123!Test';" \
   -e "GRANT ALL privileges ON *.* TO 'ngq'@'%' with grant option;" \
   -e "reset master;"
done
for N in 1 2
do docker exec -it ngqsvr$N mysql -ungq -pngqpwd \
   -e "SHOW VARIABLES like 'hostname';" \
   -e "SELECT user FROM mysql.user where user = 'ngq';"
Done
```

--配置服务器

```
docker exec -it ngqsvr1 mysqlsh -uroot -prootpwd -S/var/run/mysqld/mysqlx.sock
dba.checkInstanceConfiguration("ngq@ngqsvr1:3306")
dba.configureInstance("ngq@ngqsvr1:3306")
docker start ngqsvr1
dba.configureInstance("ngq@ngqsvr2:3306")
dba.configureInstance("ngq@ngqsvr3:3306")
docker restart ngqsvr1 ngqsvr2 ngqsvr3
```

--创建集群(InnoDB Cluster)

```
docker exec -it ngqsvr1 mysqlsh -uroot -prootpwd -S/var/run/mysqld/mysqlx.sock
\c ngq@ngqsvr1:3306
cluster = dba.createCluster("ngqcluster")
cluster.addInstance("ngq@ngqsvr2:3306")
cluster.addInstance("ngq@ngqsvr3:3306",{password:'abc123!Test'})
--restart timeout
docker start ngqsvr2
cluster.rescan()
cluster.describe()
```

--路由启动器

```
docker run -d --name ngqrouter --net=ngqclusternet \
    -e MYSQL_HOST=ngqsvr1 \
    -e MYSQL_PORT=3306 \
    -e MYSQL_USER=ngq \
    -e MYSQL_PASSWORD=ngqpwd \
    -e MYSQL_INNODB_CLUSTER_MEMBERS=3 \
    mysql/mysql-router
docker logs ngqrouter
## MySQL Classic protocol
- Read/Write Connections: localhost:6446
- Read/Only Connections:    localhost:6447

docker ps
mysql/mysql-router "/run.sh mysqlrouter" 6446-6449/tcp, 8443/tcp mysql-router
mysql/mysql-server "/entrypoint.sh mysq…" 3306/tcp, 33060/tcp
```

ngqsvr3

mysql/mysql-server "/entrypoint.sh mysq…" 3306/tcp, 33060/tcp ngqsvr2

mysql/mysql-server "/entrypoint.sh mysq…" 3306/tcp, 33060/tcp ngqsvr1

--再配置一 mysql 作为路由连接用服务器

```
docker run -d --name=ngqclient --hostname=ngqclient --net=ngqclusternet \
    -e MYSQL_ROOT_PASSWORD=rootpwd mysql/mysql-server
docker exec -it ngqclient mysql -h ngqrouter -P 6446 -ungq -pngqpwd \
  -e "create database ngqdb; use ngqdb; CREATE table ngq_tab (id INT NOT NULL AUTO_INCREMENT PRIMARY KEY, name varchar(100) not null) ENGINE=InnoDB; show tables;"
docker exec -it ngqclient mysql -h ngqrouter -P 6446 -ungq -pngqpwd  \
 -e "insert into ngqdb.ngq_tab (name) values (concat('hostname:',@@hostname));" -e "select * from ngqdb.ngq_tab;"
for N in 1 2 3
do docker exec -it ngqsvr$N mysql -ungq -pngqpwd \
  -e "SHOW VARIABLES like 'hostname';" \
  -e "SELECT * FROM ngqdb.ngq_tab;"
done
```

--故障切换

```
docker stop ngqsvr1
docker exec -it ngqclient mysqlsh -h ngqrouter -P 6447 -ungq -pngqpwd
cluster = dba.getCluster()
cluster.status()
docker start ngqsvr1
```

"status": "(MISSING)"-->"RECOVERING"-->"RECOVERING"

#cluster.rescan()

#cluster.addInstance("ngq@ngqsvr1:3306",{password:'abc123!Test'})

--多活与单活的转换测试

docker exec -it ngqclient mysql -h ngqrouter -P 6446 -ungq -pngqpwd -e"select * from performance_schema.replication_group_members;"

docker exec -it ngqclient mysqlsh -h ngqrouter -P 6447 -ungq -pngqpwd

cluster = dba.getCluster()

cluster.switchToMultiPrimaryMode()

cluster.status()

docker stop ngqrouter

docker start ngqrouter

docker logs ngqrouter

docker exec -it ngqclient mysql -h ngqrouter -P 6446 -ungq -pngqpwd -e "insert into ngqdb.ngq_tab (name) values (concat('hostname:',@@hostname));" -e "select * from ngqdb.ngq_tab;"

docker exec -it ngqsvr3 mysql -ungq -pngqpwd -e "insert into ngqdb.ngq_tab (name) values (concat('hostname:',@@hostname));" -e "select * from ngqdb.ngq_tab;"

cluster.switchToSinglePrimaryMode('ngq@ngqsvr1:3306')

docker exec -it ngqclient mysql -h ngqrouter -P 6447 -ungq -pngqpwd -e "select * from ngqdb.ngq_tab; select @@hostname;"

--删除集群和测试用服务器容器

docker stop ngqsvr1 ngqsvr2 ngqsvr3 ngqrouter ngqclient

docker rm ngqsvr1 ngqsvr2 ngqsvr3 ngqrouter ngqclient

或者

docker rm -f ngqsvr1 ngqsvr2 ngqsvr3 ngqrouter ngqclient

小提示：

当我们使用 docker 的默认网络模式时，第一个安装并启动的服务 ip 为`172.17.0.2`， 第二个安装并启动的服务 ip 为`172.17.0.3`

docker exec -it ngqsvr1 bash

cat /etc/hosts

docker inspect ngqsvr1

yum --disablerepo=mysql80-server-minimal yum install net-tools

yum-config-manager --disable mysql80-server-minimal

yum install net-tools

yum-config-manager --enable mysql80-server-minimal

三、InnoDB Cluster 维护常用操作和命令

mysqlsh>dba.help();

dba.createCluster()

dba.createCluster('testCluster', {replicationAllowedHost:'192.0.2.0/24'})

replicationAllowedHost 选项意味着自动创建的所有帐户只能从允许的主机连接（8.0.28）

cluster.checkInstanceState('icadmin@ic-4:3306')可以将状态为 OK 的实例添加到集群中

cluster.addInstance('icadmin@ic-2:3306')

group_replication_local_address= "[2001:db8:85a3:8d3:1319:8a2e:370:7348]:33061"

Cluster.switchToMultiPrimaryMode()，这会将集群切换到多主模式。所有实例都成为主要实例。

Cluster.switchToSinglePrimaryMode([instance])，这会将集群切换到单主模式

cluster.removeInstance('root@localhost:3310') 从集群中删除实例

Cluster.dissolve() Cluster.dissolve({force: true}) Cluster.dissolve({interactive: true}) 解散 InnoDB 集群，需连接到读写实例

InnoDB Cluster 常用操作

常见操作	命令示例	备注
连接实例	\connect root@192.168.1.12:3306	
检测实例状态	dba.checkInstanceConfiguration('root@192.168.1.12:3306')	
自动修正实例设置	dba.configureInstance('root@192.168.1.12:3306')	
删除集群元数据	dba.dropMetadataSchema()	
创建集群	var cluster = dba.createCluster('ngqcluster')	已存在 getCluster()
向集群中添加实例	cluster.addInstance('root@192.168.1.13:3306')	密码加{password:'pwd'}
从集群中删除实例	cluster.removeInstance('root@192.168.1.13:3306')	强制加{force:true}
查看集群状态	cluster.status()|status({extended:1|2|3})	描述：cluster.describe()
重启集群	var cluster = dba.rebootClusterFromCompleteOutage() 停电重启	
解散集群	cluster.dissolve({force:true}) 删除元数据和配置关闭组复制但不删除数据	
指定新主节点	cluster.setPrimaryInstance('root@192.168.1.13:3306')	
切换到多主模式	cluster.switchToMultiPrimaryMode()	
切换到单主模式	cluster.switchToSinglePrimaryMode('root@192.168.1.12:3306')	
查看配置选项	cluster.forceQuorumUsingPartitionOf("root@192.168.1.12:3306") 仅存的节点	
查看配置选项	cluster. rejoinInstance('root@192.168.1.12:3306') 重新加入集群	
查看配置选项	cluster. options()	
更改集群设置	cluster.setOption('clusterName','nieCluster')	设置实例：.setInstanceOption

停止沙漏实例	dba.stopSandboxInstance(3309,{password:'pw'});	启动：startSandboxInstance

常见错误处理方法：

防火墙配置：3306/33061

metadata exists, instance belongs to that metadata, but GR is not active

连接到主节点，重启集群（rebootClusterFromCompleteQutage()）

或者 mysql 登录到此节点，启动此节点的 group Replication(start group_replication;必须先设置 group_replication_bootstrap_group 为 on)：

Sql>set global group_replication_bootstrap_group=on;

Sql>start group_replication;

Sql>set global group_replication_bootstrap_group=off;

metadata exists, instance does not belong to that metadata, and GR is not active

连接到错误节点删除节点元数据（dropMetadataSchema()），再重新加入集群：

参考资料

Mysql InnoDB cluster Document：

https://dev.mysql.com/doc/mysql-shell/8.0/en/mysql-innodb-cluster.html

https://dev.mysql.com/doc/mysql-shell/8.0/en/mysql-innodb-replicaset.html

https://dev.mysql.com/doc/mysql-shell/8.0/en/deploying-production-innodb-cluster.html

https://dev.mysql.com/doc/mysql-shell/8.0/en/configuring-innodb-cluster.html

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cluster.html

https://dev.mysql.com/doc/mysql-shell/8.0/en/admin-api-integrating-router.html

https://dev.mysql.com/doc/mysql-router/8.0/en/mysql-router-innodb-cluster.html

https://github.com/wagnerjfr/mysql-innodb-cluster

https://github.com/wwwted/mysql-innodb-cluster-local-sandbox

https://dev.mysql.com/doc/mysql-port-reference/en/mysql-ports-reference-tables.html#mysql-shell-ports

https://thesubtlepath.com/mysql/building-out-the-mysql-innodb-clusterset-for-high-availability-disaster-recovery-in-one-fully-supported-platform/

https://thesubtlepath.com/mysql/clusterset-router-integration-operational-details-uncovered-part2-of-a-series/