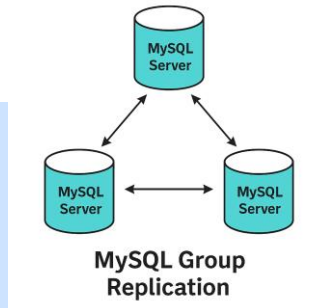




MYSQL Group Replication and Multi Master Nodes



Introduction

MySQL Group Replication is a high-availability solution that enables multiple MySQL server instances (a *group*) to synchronize data automatically, forming a fault-tolerant, distributed database system. It supports both **single-primary** and **multi-primary** modes.

Key Features

- **Synchronous replication:** Transactions are replicated to all members before commit (using a group communication system).
- **Automatic failover:** In single-primary mode, if the current primary fails, a new one is elected.
- **Conflict detection/resolution:** In multi-primary mode, it handles conflicts if two nodes try to update the same data.

Use Cases

- High availability and disaster recovery.
- Multi-datacenter deployments (with care).
- Applications needing consistency and auto failover without external tools.

Architecture

Each MySQL server (node) in the group:

- Maintains its own copy of the data.
- Communicates over the network with other members via **group communication**.
- Uses **write sets** and **certification** to ensure consistency.

Modes

1. **Single-primary mode (default)**
 - One node handles writes.
 - Others are read-only unless the primary fails.
2. **Multi-primary mode**
 - All nodes can handle writes.
 - Conflict detection is necessary.



How to Configure

S.No	IP	Name
1	192.168.179.128	mysql1
2	192.168.179.129	mysql2
3	192.168.179.130	mysql3

```
mysql> SELECT * FROM performance_schema.replication_group_members;
```

CHANNEL_NAME	MEMBER_ID	MEMBER_HOST	MEMBER_PORT	MEMBER_STATE	MEMBER_ROLE	MEMBER_VERSION	MEMBER_COMMUNICATION_STACK
group_replication_applier	860f668d-29e7-11f0-af9d-000c2937045a	mysql1	3306	ONLINE	PRIMARY	8.0.41	XCom
group_replication_applier	876683ff-29e7-11f0-928e-000c29803de0	mysql2	3306	ONLINE	SECONDARY	8.0.41	XCom
group_replication_applier	8836201d-29e7-11f0-ad95-000c2953b8a7	mysql3	3306	ONLINE	SECONDARY	8.0.41	XCom

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

```
mysql> mysql> SELECT * FROM performance_schema.replication_group_members;
```

CHANNEL_NAME	MEMBER_ID	MEMBER_HOST	MEMBER_PORT	MEMBER_STATE	MEMBER_ROLE	MEMBER_VERSION	MEMBER_COMMUNICATION_STACK
group_replication_applier	860f668d-29e7-11f0-af9d-000c2937045a	mysql1	3306	ONLINE	PRIMARY	8.0.41	XCom
group_replication_applier	876683ff-29e7-11f0-928e-000c29803de0	mysql2	3306	ONLINE	PRIMARY	8.0.41	XCom
group_replication_applier	8836201d-29e7-11f0-ad95-000c2953b8a7	mysql3	3306	ONLINE	PRIMARY	8.0.41	XCom

```
3 rows in set (0.01 sec)
```

Steps for Configure Group Replication with Multi Master Nodes

1. Install Operating System on All Nodes
2. Define IP Address for Each Node
3. Define Host Name of Each Nodes
4. Enter Host Name of All Node in each Node etc/hosts
5. Download MYSQL RPM
6. Install MYSQL RPM
7. Define Table Case sensitive in mysql Configure File
8. Start MYSQL services
9. Secure MYSQL Database
10. Create Users Required for Replication
11. Define Configure Parameter on Each Node
12. Stop Firewall
13. Disable SELINUX
14. Restart MYSQL Services
15. Define Replication Source
16. Start Group Replication on Node 1 with group_replication_bootstrap_group=ON;
17. Start Group Replication on Node 2 and Node 3
18. Enable Read Only Node on node 2 and Node 3
19. Monitor Group Replication



On Each Database Nodes

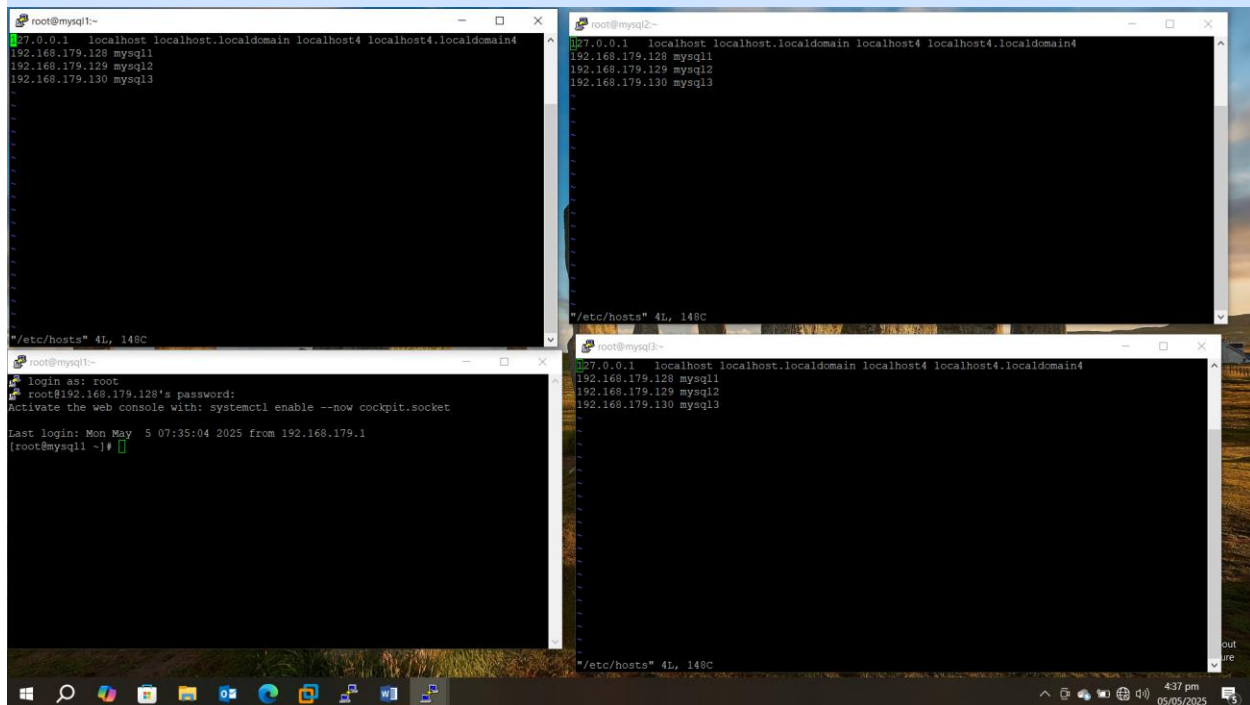
vi /etc/hosts

127.0.0.1 localhost localhost.localdomain localhost4 localhost4.localdomain4

192.168.179.128 mysql1

192.168.179.129 mysql2

192.168.179.130 mysql3



On Node1 Database

vi /etc/hostname

mysql1

On Node2 Database

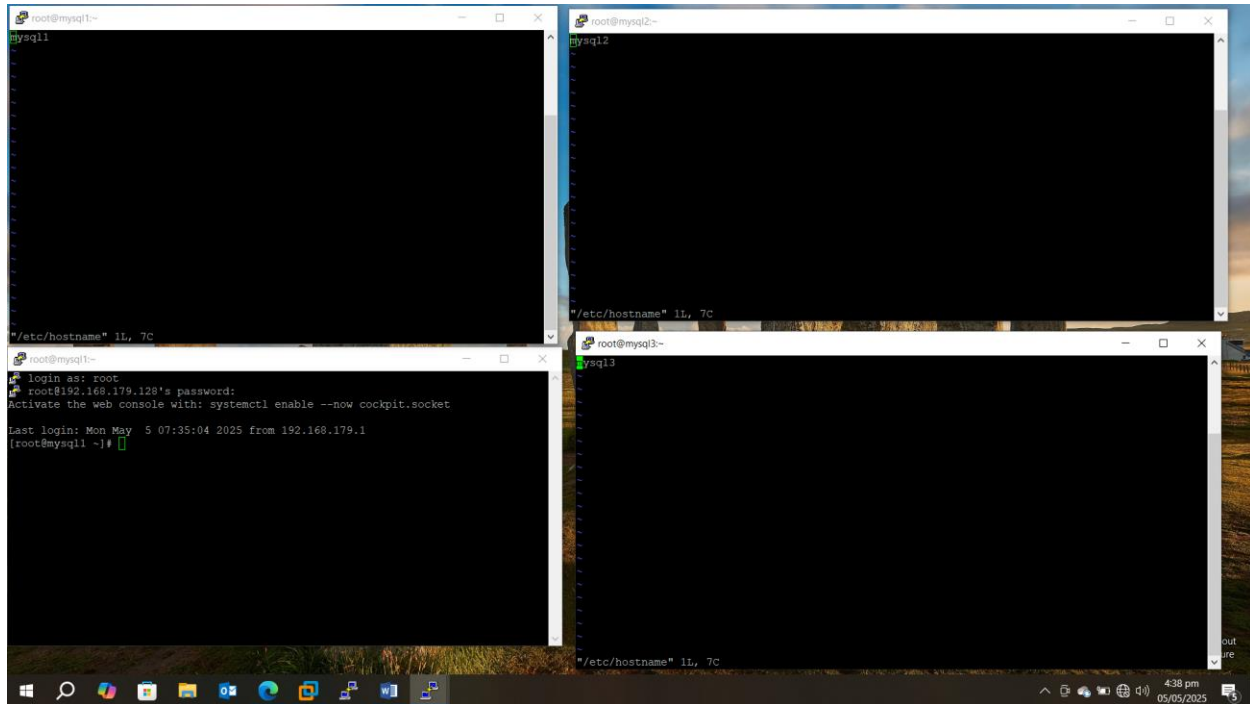
vi /etc/hostname

mysql2

On Node3 Database

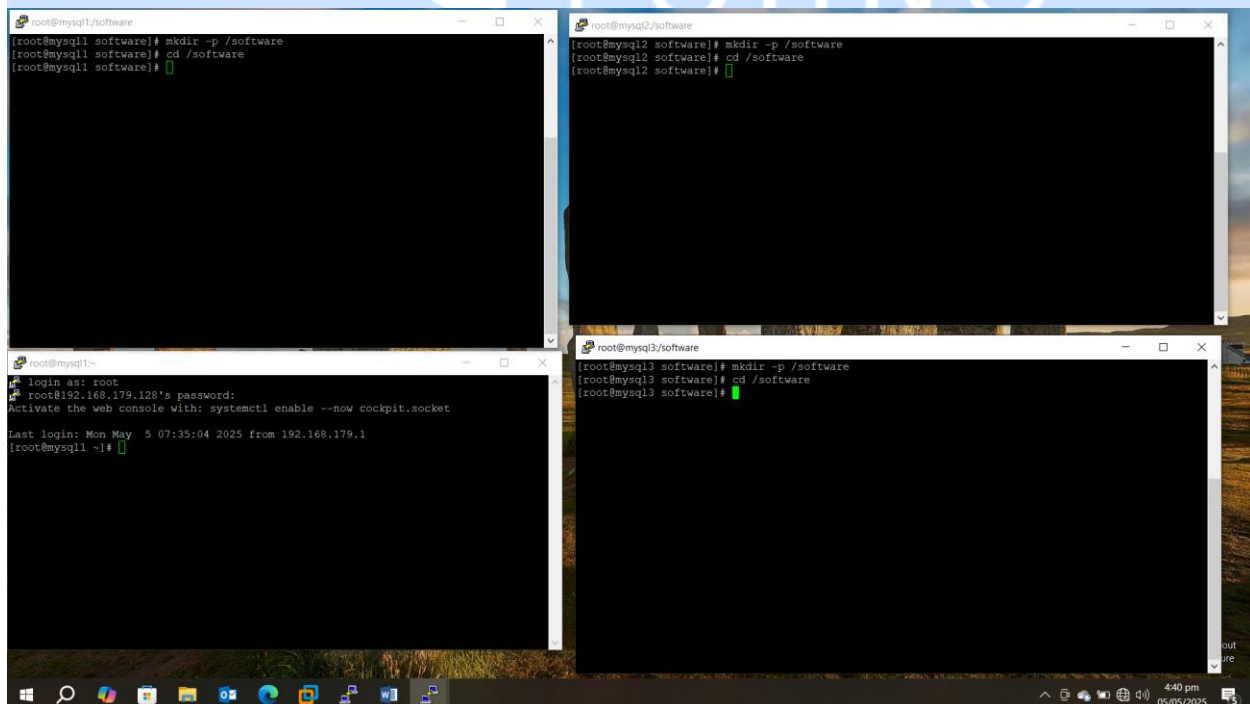
vi /etc/hostname

mysql3



On Each Database Nodes

```
mkdir -p /software
cd /software
wget https://repo.mysql.com/mysql80-community-release-el8-3.noarch.rpm
rpm -ivh mysql80-community-release-el8-3.noarch.rpm
yum install mysql-server -y
```





```
root@mysql1/software
[root@mysql1 software]# wget https://repo.mysql.com/mysql80-community-release-el8-3.noarch.rpm
--2025-05-05 07:41:14-- https://repo.mysql.com/mysql80-community-release-el8-3.noarch.rpm
Resolving repo.mysql.com (repo.mysql.com)... 23.57.194.99, 2600:1417:75:3ab::1d68, 2600:1417:75:3ab::1d68
Connecting to repo.mysql.com (repo.mysql.com)[23.57.194.99]:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 14100 (14K) [application/x-redhat-package-manager]
Saving to: 'mysql80-community-release-el8-3.noarch.rpm'

mysql80-community-re 100%[=====] 13.77K --.-KB/s in 0s

2025-05-05 07:41:20 (100 MB/s) - 'mysql80-community-release-el8-3.noarch.rpm' saved [14100/14100]

[root@mysql1 software]# rpm -ivh mysql80-community-release-el8-3.noarch.rpm
warning: mysql80-community-release-el8-3.noarch.rpm: Header V4 RSA/SHA256 Signature, key ID 3a79bd29: NOKEY
Verifying... [100%]
Preparing... [100%]
Updating / installing...
1:mysql80-community-release-el8-3 [100%]
[root@mysql1 software]#

root@mysql2/software
[root@mysql2 software]# cd /software
[root@mysql2 software]# wget https://repo.mysql.com/mysql80-community-release-el8-3.noarch.rpm
--2025-05-05 07:41:16-- https://repo.mysql.com/mysql80-community-release-el8-3.noarch.rpm
Resolving repo.mysql.com (repo.mysql.com)... 23.57.194.99, 2600:1417:75:3ab::1d68, 2600:1417:75:3ab::1d68
Connecting to repo.mysql.com (repo.mysql.com)[23.57.194.99]:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 14100 (14K) [application/x-redhat-package-manager]
Saving to: 'mysql80-community-release-el8-3.noarch.rpm'

mysql80-community-reas 100%[=====] 13.77K --.-KB/s in 0s

2025-05-05 07:41:21 (47.2 MB/s) - 'mysql80-community-release-el8-3.noarch.rpm' saved [14100/14100]

[root@mysql2 software]# rpm -ivh mysql80-community-release-el8-3.noarch.rpm
warning: mysql80-community-release-el8-3.noarch.rpm: Header V4 RSA/SHA256 Signature, key ID 3a79bd29: NOKEY
Verifying... [100%]
Preparing... [100%]
Updating / installing...
1:mysql80-community-release-el8-3 [100%]
[root@mysql2 software]#

root@mysql3/software
[root@mysql3 software]# mkdir -p /software
[root@mysql3 software]# cd /software
[root@mysql3 software]# wget https://repo.mysql.com/mysql80-community-release-el8-3.noarch.rpm
--2025-05-05 07:41:17-- https://repo.mysql.com/mysql80-community-release-el8-3.noarch.rpm
Resolving repo.mysql.com (repo.mysql.com)... 23.57.194.99, 2600:1417:75:3ab::1d68, 2600:1417:75:3ab::1d68
Connecting to repo.mysql.com (repo.mysql.com)[23.57.194.99]:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 14100 (14K) [application/x-redhat-package-manager]
Saving to: 'mysql80-community-release-el8-3.noarch.rpm'

mysql80-community-reas 100%[=====] 13.77K --.-KB/s in 0s

2025-05-05 07:41:22 (149 MB/s) - 'mysql80-community-release-el8-3.noarch.rpm' saved [14100/14100]

[root@mysql3 software]# rpm -ivh mysql80-community-release-el8-3.noarch.rpm
warning: mysql80-community-release-el8-3.noarch.rpm: Header V4 RSA/SHA256 Signature, key ID 3a79bd29: NOKEY
Verifying... [100%]
Preparing... [100%]
Updating / installing...
1:mysql80-community-release-el8-3 [100%]
[root@mysql3 software]#

root@mysql1~
login as: root
root@192.168.179.128's password:
Activate the web console with: systemctl enable --now cockpit.socket

Last login: Mon May 5 07:35:04 2025 from 192.168.179.1
root@mysql1 ~]#
```

```
root@mysql1/software
[root@mysql1 software]# yum install mysql-server -y
MySQL 8.0 Community Server [=====] 199 KB/s | 4.6 MB 00:23
MySQL Connectors Comm [=====] --- B/s | 0 B --- ETA

root@mysql2/software
[root@mysql2 software]# yum install mysql-server -y
Waiting for process with pid 2897 to finish.
MySQL 8.0 Community Server [=====] --- B/s | 0 B --- ETA

root@mysql3/software
[root@mysql3 software]# yum install mysql-server -y
MySQL 8.0 Community Server [=====] --- B/s | 0 B --- ETA
```



```
root@mysql1/software [root@mysql1 software]# yum install mysql-server -y
MySQL Connectors Community 15 kB/s | 156 kB 00:10
MySQL Tools Community 129 kB/s | 1.5 MB 00:11
Oracle Linux 8 BaseOS [ ] --- B/s | 0 B --:-- ETA

root@mysql2/software [root@mysql2 software]# yum install mysql-server -y
MySQL 8.0 Community Server 412 kB/s | 4.6 MB 00:11

root@mysql1/~ [root@mysql1 ~]# systemctl enable --now cockpit.socket
Activate the web console with: systemctl enable --now cockpit.socket

Last login: Mon May 5 07:35:04 2025 from 192.168.179.1
[root@mysql1 ~]# wget google.com
--2025-05-05 07:43:39-- http://google.com/
Resolving google.com (google.com)... failed: Name or service not known.
wget: unable to resolve host address 'google.com'
[root@mysql1 ~]# ls -lrt
total 28
-rw-r--r-- 1 root root 1034 May 2 09:03 anaconda-ks.cfg
-rw-r--r-- 1 root root 1261 May 2 09:30 initial-setup-ks.cfg
drwxr-xr-x 2 root root 6 May 5 06:28 Desktop
drwxr-xr-x 2 root root 6 May 5 06:28 Videos
drwxr-xr-x 2 root root 6 May 5 06:28 Templates
drwxr-xr-x 2 root root 6 May 5 06:28 Public
drwxr-xr-x 2 root root 6 May 5 06:28 Pictures
drwxr-xr-x 2 root root 6 May 5 06:28 Music
drwxr-xr-x 2 root root 6 May 5 06:28 Downloads
drwxr-xr-x 2 root root 6 May 5 06:28 Documents
-rw-r--r-- 1 root root 17877 May 5 06:37 index.html
[root@mysql1 ~]#
```

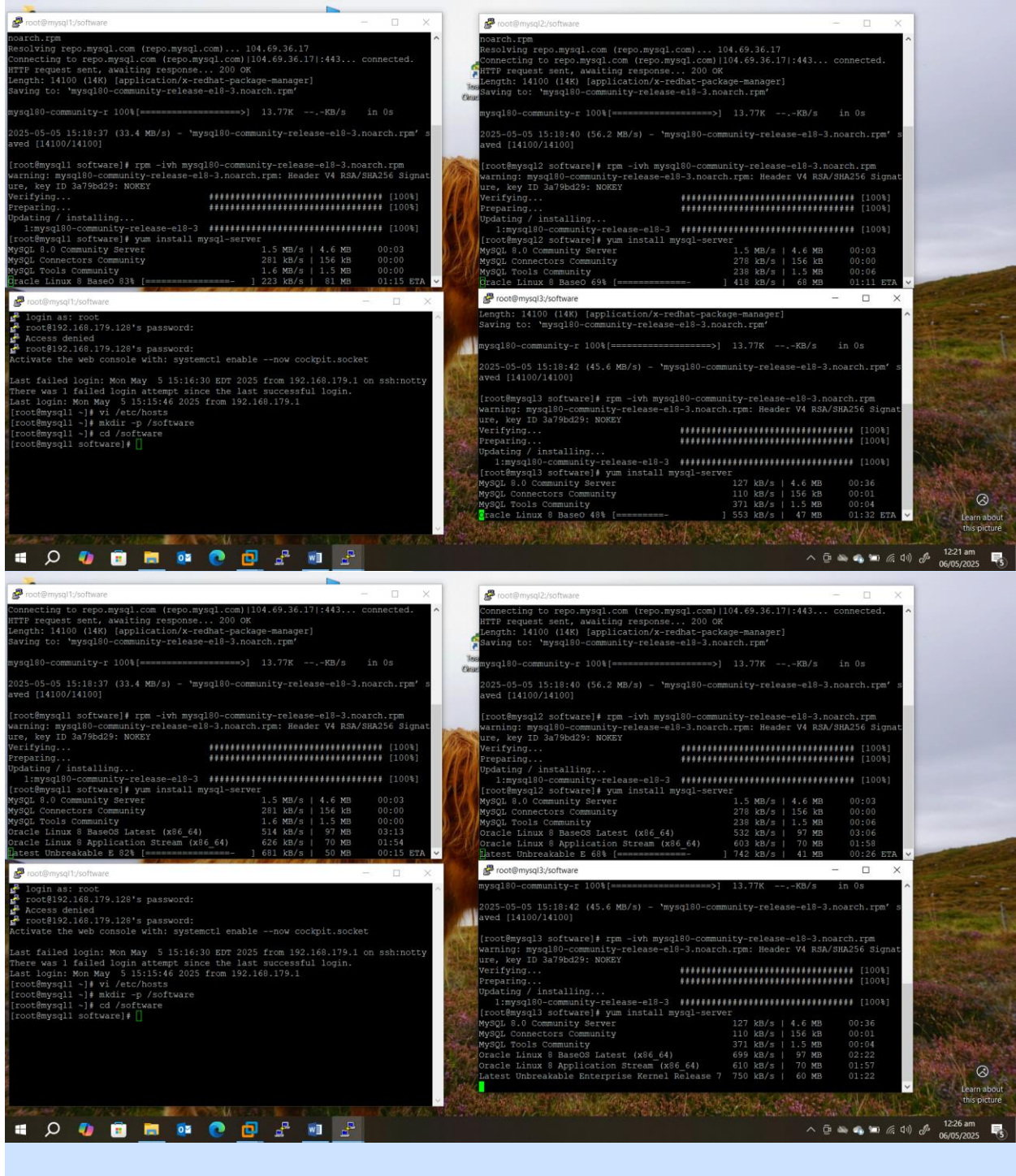
```
root@mysql1/software [root@mysql1 software]# yum install mysql-server -y
MySQL Connectors Community 15 kB/s | 156 kB 00:10
MySQL Tools Community 129 kB/s | 1.5 MB 00:11
Oracle Linux 8 BaseOS Latest (x86_64) 3.4 MB/s | 97 MB 00:28

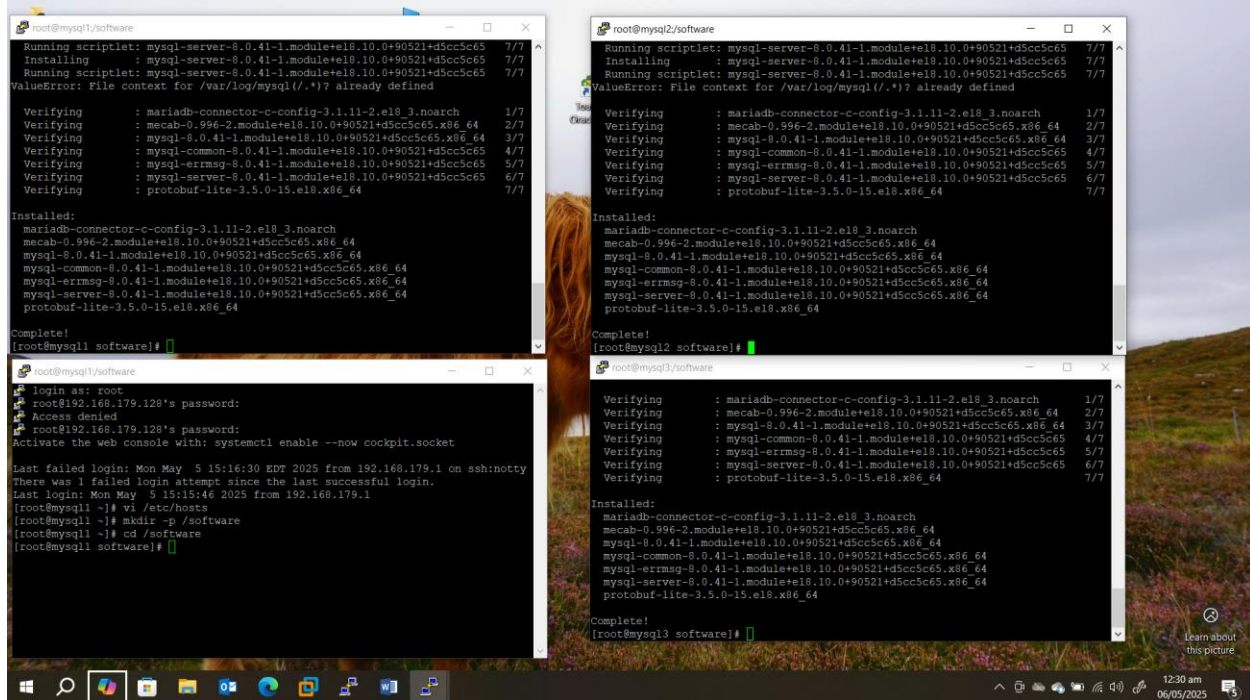
root@mysql2/software [root@mysql2 software]# yum install mysql-server -y
MySQL 8.0 Community Server 412 kB/s | 4.6 MB 00:11
MySQL Connectors Community 15 kB/s | 156 kB 00:10
MySQL Tools Community 112 kB/s | 1.5 MB 00:13
Oracle Linux 8 Application Str 32% [=====] 2.1 MB/s | 22 MB 00:22 ETA

root@mysql1/~ [root@mysql1 ~]# systemctl enable --now cockpit.socket
Activate the web console with: systemctl enable --now cockpit.socket

Last login: Mon May 5 07:35:04 2025 from 192.168.179.1
[root@mysql1 ~]# wget google.com
--2025-05-05 07:43:39-- http://google.com/
Resolving google.com (google.com)... failed: Name or service not known.
wget: unable to resolve host address 'google.com'
[root@mysql1 ~]# ls -lrt
total 28
-rw-r--r-- 1 root root 1034 May 2 09:03 anaconda-ks.cfg
-rw-r--r-- 1 root root 1261 May 2 09:30 initial-setup-ks.cfg
drwxr-xr-x 2 root root 6 May 5 06:28 Desktop
drwxr-xr-x 2 root root 6 May 5 06:28 Videos
drwxr-xr-x 2 root root 6 May 5 06:28 Templates
drwxr-xr-x 2 root root 6 May 5 06:28 Public
drwxr-xr-x 2 root root 6 May 5 06:28 Pictures
drwxr-xr-x 2 root root 6 May 5 06:28 Music
drwxr-xr-x 2 root root 6 May 5 06:28 Downloads
drwxr-xr-x 2 root root 6 May 5 06:28 Documents
-rw-r--r-- 1 root root 17877 May 5 06:37 index.html
[root@mysql1 ~]#
```







Define Table Case sensitive in mysql Configure File on Each Database Nodes

vi /etc/my.cnf

[mysqld]

lower_case_table_names = 1

systemctl start mysql

systemctl enable mysql

Secure MYSQL Database

mysql_secure_installation

Create Users Required for Replication on Each Node

mysql -uroot -pOracle123

CREATE USER 'root'@'%' IDENTIFIED BY 'Oracle123';

GRANT ALL PRIVILEGES ON *.* TO 'root'@'%' WITH GRANT OPTION;

FLUSH PRIVILEGES;

CREATE USER 'rpl_user'@'%' IDENTIFIED WITH mysql_native_password BY 'Oracle123';

GRANT REPLICATION SLAVE ON *.* TO 'rpl_user'@'%';

GRANT CONNECTION_ADMIN ON *.* TO 'rpl_user'@'%';

GRANT BACKUP_ADMIN ON *.* TO 'rpl_user'@'%';

GRANT GROUP_REPLICATION_STREAM ON *.* TO 'rpl_user'@'%';

GRANT ALL PRIVILEGES ON *.* TO 'rpl_user'@'%';

GRANT REPLICATION SLAVE, BACKUP_ADMIN, CONNECTION_ADMIN ON *.* TO 'rpl_user'@'%';

FLUSH PRIVILEGES;



Define Configure Parameter on Each Node

```
vi /etc/my.cnf
[mysqld]
lower_case_table_names = 1
disabled_storage_engines="MyISAM,BLACKHOLE,FEDERATED,ARCHIVE,MEMORY"
server_id=1 — Change on Each Node
gtid_mode=ON
enforce_gtid_consistency=ON
plugin_load_add = "group_replication.so"
group_replication_group_name="aaaaaaaa-aaaa-aaaa-aaaaaaaaaaaaaa"
group_replication_start_on_boot=OFF
group_replication_local_address= "192.168.179.128:33061" — Change on Each Node
group_replication_group_seeds= "192.168.179.128:33061,192.168.179.129:33061,192.168.179.130:33061"
group_replication_bootstrap_group=OFF
group_replication_ip_allowlist= "192.168.179.128,192.168.179.129,192.168.179.130"
group_replication_single_primary_mode = OFF -- For Multi Master Nodes
lower_case_table_names = 1
```

Stop Firewall and Disable SELINUX

```
systemctl stop firewalld
chkconfig firewalld off
setenforce 0
vi /etc/sysconfig/selinux
ELINUX=disabled
systemctl restart mysqld
```

Define Replication Source

```
mysql -uroot -pOracle123
CHANGE REPLICATION SOURCE TO SOURCE_USER='rpl_user', SOURCE_PASSWORD='Oracle123' FOR CHANNEL
'group_replication_recovery';
```

Start Group Replication on Node 1

```
mysql -uroot -pOracle123
SET GLOBAL group_replication_bootstrap_group=ON;
START GROUP_REPLICATION;
SET GLOBAL group_replication_bootstrap_group=OFF;
```

Start Group Replication on Node 2 and Node 3

```
mysql -uroot -pOracle123
START GROUP_REPLICATION;
```

Enable Read Only on Node 2 and Node 3

```
SET GLOBAL super_read_only = ON;
```

Monitor on Group Replication

```
SELECT * FROM performance_schema.replication_group_members;
```