Configure PostgreSQL replication and failover with repmgr:

OS: RHEL 9

PostgreSQL version: 15.7

Repmgr version: 15

Primary server IP: 172.31.87.240

Standby server IP: 172.31.36.56

On Primary server:

Step1) Install PostgreSQL

Install the repository RPM:

sudo dnf install -y https://download.postgresql.org/pub/repos/yum/reporpms/EL-9-x86_64/pgdg-redhat-repo-latest.noarch.rpm

Disable the built-in PostgreSQL module:

sudo dnf -qy module disable postgresql

Install PostgreSQL:

sudo dnf install -y postgresql15-server

```
[root@ip-172-31-87-240 ec2-user]# sudo dnf install -y postgresql15-server
Updating Subscription Management repositories.
Unable to read consumer identity

This system is not registered with an entitlement server. You can use "rhc" or "subscription-manager" to register.

Last metadata expiration check: 0:00:14 ago on Wed 03 Jul 2024 08:46:23 AM UTC.
Dependencies resolved.
================================================================================
 Package                 Architecture   Version                 Repository      Size
================================================================================
Installing:
 postgresql15-server     x86_64         15.7-1PGDG.rhel9        pgdg15         6.1 M
Installing dependencies:
 libicu                  x86_64         67.1-9.el9              rhel-9-baseos-rhui-rpms  9.6 M
 lz4                     x86_64         1.9.3-5.el9             rhel-9-baseos-rhui-rpms   62 k
 postgresql15            x86_64         15.7-1PGDG.rhel9        pgdg15         1.5 M
 postgresql15-libs       x86_64         15.7-1PGDG.rhel9        pgdg15         301 k

Transaction Summary
================================================================================
Install  5 Packages

Total download size: 18 M
Installed size: 67 M
Downloading Packages:
(1/5): postgresql15-libs-15.7-1PGDG.rhel9.x86_64.rpm      336 kB/s | 301 kB     00:00
(2/5): libicu-67.1-9.el9.x86_64.rpm                        35 MB/s | 9.6 MB     00:00
(3/5): lz4-1.9.3-5.el9.x86_64.rpm                         3.3 MB/s |  62 kB     00:00
(4/5): postgresql15-server-15.7-1PGDG.rhel9.x86_64.rpm    3.6 MB/s | 6.1 MB     00:01
(5/5): postgresql15-15.7-1PGDG.rhel9.x86_64.rpm           835 kB/s | 1.5 MB     00:01
--------------------------------------------------------------------------------
```

Optionally initialize the database and enable automatic start:

sudo /usr/pgsql-15/bin/postgresql-15-setup initdb

sudo systemctl enable postgresql-15

sudo systemctl start postgresql-15

```
[root@ip-172-31-87-240 ec2-user]# sudo /usr/pgsql-15/bin/postgresql-15-setup initdb
Initializing database ... OK

[root@ip-172-31-87-240 ec2-user]# sudo systemctl enable postgresql-15
Created symlink /etc/systemd/system/multi-user.target.wants/postgresql-15.service → /usr/lib/systemd/system/postgresql-15.service.
[root@ip-172-31-87-240 ec2-user]# sudo systemctl start postgresql-15
[root@ip-172-31-87-240 ec2-user]# sudo systemctl status postgresql-15
● postgresql-15.service - PostgreSQL 15 database server
     Loaded: loaded (/usr/lib/systemd/system/postgresql-15.service; enabled; preset: disabled)
     Active: active (running) since Wed 2024-07-03 08:48:55 UTC; 7s ago
       Docs: https://www.postgresql.org/docs/15/static/
    Process: 14801 ExecStartPre=/usr/pgsql-15/bin/postgresql-15-check-db-dir ${PGDATA} (code=exited, status=0/SUCCESS)
   Main PID: 14806 (postmaster)
      Tasks: 7 (limit: 4400)
     Memory: 17.3M
        CPU: 39ms
     CGroup: /system.slice/postgresql-15.service
             ├─14806 /usr/pgsql-15/bin/postmaster -D /var/lib/pgsql/15/data/
             ├─14807 "postgres: logger "
             ├─14808 "postgres: checkpointer "
             ├─14809 "postgres: background writer "
             ├─14811 "postgres: walwriter "
             ├─14812 "postgres: autovacuum launcher "
             └─14813 "postgres: logical replication launcher "

Jul 03 08:48:55 ip-172-31-87-240.ec2.internal systemd[1]: Starting PostgreSQL 15 database server...
Jul 03 08:48:55 ip-172-31-87-240.ec2.internal postmaster[14806]: 2024-07-03 08:48:55.346 UTC [14806] LOG:  redirecting log output to logging collector proce
Jul 03 08:48:55 ip-172-31-87-240.ec2.internal postmaster[14806]: 2024-07-03 08:48:55.346 UTC [14806] HINT:  Future log output will appear in directory "log".
Jul 03 08:48:55 ip-172-31-87-240.ec2.internal systemd[1]: Started PostgreSQL 15 database server.
```

Step2) Install repmgr

sudo yum install repmgr_15* -y

```
[root@ip-172-31-87-240 ec2-user]# sudo yum install repmgr_15* -y
Updating Subscription Management repositories.
Unable to read consumer identity

This system is not registered with an entitlement server. You can use "rhc" or "subscription-manager" to register.

Last metadata expiration check: 0:04:11 ago on Wed 03 Jul 2024 08:46:23 AM UTC.
Dependencies resolved.
================================================================================
 Package                 Architecture    Version                 Repository    Size
================================================================================
Installing:
 repmgr_15               x86_64          5.4.1-1PGDG.rhel9       pgdg15       269 k
 repmgr_15-devel         x86_64          5.4.1-1PGDG.rhel9       pgdg15       7.8 k
 repmgr_15-llvmjit       x86_64          5.4.1-1PGDG.rhel9       pgdg15        21 k
Installing dependencies:
 llvm                    x86_64          17.0.6-5.el9            rhel-9-appstream-rhui-rpms   23 M
 llvm-libs               x86_64          17.0.6-5.el9            rhel-9-appstream-rhui-rpms   25 M

Transaction Summary
================================================================================
Install  5 Packages

Total download size: 47 M
Installed size: 202 M
Downloading Packages:
(1/5): repmgr_15-devel-5.4.1-1PGDG.rhel9.x86_64.rpm          25 kB/s | 7.8 kB     00:00
(2/5): repmgr_15-llvmjit-5.4.1-1PGDG.rhel9.x86_64.rpm        47 kB/s |  21 kB     00:00
(3/5): llvm-17.0.6-5.el9.x86_64.rpm                          30 MB/s |  23 MB     00:00
(4/5): repmgr_15-5.4.1-1PGDG.rhel9.x86_64.rpm               247 kB/s | 269 kB     00:01
(5/5): llvm-libs-17.0.6-5.el9.x86_64.rpm                     19 MB/s |  25 MB     00:01
--------------------------------------------------------------------------------
Total                                                        26 MB/s |  47 MB     00:01
Running transaction check
```

Step3) Configure below parameter in $PGDATA/postgresql.conf file

vim $PGDATA/postgresql.conf

listen_addresses = '*'

wal_level = replica

archive_mode = on

archive_command = '/bin/true'

max_wal_senders = 10

max_replication_slots = 10

wal_keep_size = 1GB

hot_standby = on

shared_preload_libraries = 'repmgr'

save&exit

```
[postgres@ip-172-31-87-240 ~]$ vim $PGDATA/postgresql.conf
[postgres@ip-172-31-87-240 ~]$ cat $PGDATA/postgresql.conf |grep -iaE "listen_addresses|port|max_replication_slots|max_wal_senders|wal_level|hot_standby|arch
ive_mode|archive_command|shared_preload_libraries|wal_keep_size"
listen_addresses = '*'          # what IP address(es) to listen on;
port = 5432                             # (change requires restart)
#ssl_passphrase_command_supports_reload = off
                                        # supported by the operating system:
                                        # supported by the operating system:
wal_level = replica                     # minimal, replica, or logical
                                        # supported by the operating system:
archive_mode = on               # enables archiving; off, on, or always
                                # (empty string indicates archive_command should
archive_command = '/bin/true'           # command to use to archive a logfile segment
max_wal_senders = 10            # max number of walsender processes
max_replication_slots = 10      # max number of replication slots
wal_keep_size = 1GB             # in megabytes; 0 disables
#max_slot_wal_keep_size = -1    # in megabytes; -1 disables
hot_standby = on                        # "off" disallows queries during recovery
#hot_standby_feedback = off             # send info from standby to prevent
# REPORTING AND LOGGING
                                        #   %r = remote host and port
shared_preload_libraries = 'repmgr'     # (change requires restart)
[postgres@ip-172-31-87-240 ~]$
```

Step4) Restart and check the PostgreSQL services

sudo systemctl restart postgresql-15

sudo systemctl status postgresql-15

```
[root@ip-172-31-87-240 ec2-user]# systemctl restart postgresql-15
[root@ip-172-31-87-240 ec2-user]# systemctl status postgresql-15
● postgresql-15.service - PostgreSQL 15 database server
     Loaded: loaded (/usr/lib/systemd/system/postgresql-15.service; enabled; preset: disabled)
     Active: active (running) since Wed 2024-07-03 09:00:04 UTC; 9s ago
       Docs: https://www.postgresql.org/docs/15/static/
    Process: 15848 ExecStartPre=/usr/pgsql-15/bin/postgresql-15-check-db-dir ${PGDATA} (code=exited, status=0/SUCCESS)
   Main PID: 15854 (postmaster)
      Tasks: 8 (limit: 4400)
     Memory: 21.4M
        CPU: 43ms
     CGroup: /system.slice/postgresql-15.service
             ├─15854 /usr/pgsql-15/bin/postmaster -D /var/lib/pgsql/15/data/
             ├─15855 "postgres: logger "
             ├─15856 "postgres: checkpointer "
             ├─15857 "postgres: background writer "
             ├─15859 "postgres: walwriter "
             ├─15860 "postgres: autovacuum launcher "
             ├─15861 "postgres: archiver "
             └─15862 "postgres: logical replication launcher "

Jul 03 09:00:04 ip-172-31-87-240.ec2.internal systemd[1]: Starting PostgreSQL 15 database server...
Jul 03 09:00:04 ip-172-31-87-240.ec2.internal postmaster[15854]: 2024-07-03 09:00:04.145 UTC [15854] LOG:  redirecting log output to logging collector proce
Jul 03 09:00:04 ip-172-31-87-240.ec2.internal postmaster[15854]: 2024-07-03 09:00:04.145 UTC [15854] HINT:  Future log output will appear in directory "log"
Jul 03 09:00:04 ip-172-31-87-240.ec2.internal systemd[1]: Started PostgreSQL 15 database server.
```

Step5) Create user and database for repmgr

CREATE USER repmgr WITH SUPERUSER;

CREATE DATABASE repmgr WITH OWNER repmgr;

```
[root@ip-172-31-87-240 ec2-user]# su - postgres
Last login: Wed Jul  3 08:53:50 UTC 2024 on pts/0
[postgres@ip-172-31-87-240 ~]$ psql
psql (15.7)
Type "help" for help.

postgres=# CREATE USER repmgr WITH SUPERUSER;
CREATE ROLE
postgres=# CREATE DATABASE repmgr WITH OWNER repmgr;
CREATE DATABASE
postgres=#
```

Step6) Allow database connectivity for repmgr user

Edit $PGDATA/pg_hba.conf file

vim $PGDATA/pg_hba.conf file

##Primary_server#########################

local replication repmgr trust

host replication repmgr 127.0.0.1/32 trust

host replication repmgr 172.31.87.240/24 trust

local repmgr repmgr trust

host repmgr repmgr 127.0.0.1/32 trust

host repmgr repmgr 172.31.87.240/24 trust

#####################################Standby_server#############################

host repmgr repmgr 172.31.36.56/32 trust

host replication repmgr 172.31.36.56/32 trust

save&exit

#Reload configurations

SELECT pg_reload_conf();

#Check Connectivity

psql -d repmgr -U repmgr -h 172.31.87.240

```
[postgres@ip-172-31-87-240 ~]$ vim $PGDATA/pg_hba.conf
[postgres@ip-172-31-87-240 ~]$ cat $PGDATA/pg_hba.conf |grep repmgr
local      replication      repmgr                          trust
host       replication      repmgr        127.0.0.1/32      trust
host       replication      repmgr        172.31.87.240/24    trust
local       repmgr           repmgr                         trust
host        repmgr           repmgr         127.0.0.1/32    trust
host        repmgr           repmgr        172.31.87.240/24    trust
host        repmgr           repmgr        172.31.36.56/32   trust
host      replication      repmgr        172.31.36.56/32   trust
[postgres@ip-172-31-87-240 ~]$ psql
psql (15.7)
Type "help" for help.

postgres=# SELECT pg_reload_conf();
 pg_reload_conf
----------------
 t
(1 row)

postgres=# \q
[postgres@ip-172-31-87-240 ~]$ psql -d repmgr -U repmgr -h 172.31.87.240
psql (15.7)
Type "help" for help.

repmgr=#
```

Step7) Create a repmgr.conf on primary server with the following entries:

vim /var/lib/pgsql/repmgr.conf

cluster='failovertest'

node_id=1

node_name=node1

conninfo='host=172.31.87.240 user=repmgr dbname=repmgr connect_timeout=2'

data_directory='/var/lib/pgsql/15/data/'

failover=automatic

promote_command='/usr/pgsql-15/bin/repmgr standby promote -f /var/lib/pgsql/repmgr.conf --log-to-file'

follow_command='/usr/pgsql-12/bin/repmgr standby follow -f /var/lib/pgsql/repmgr.conf --log-to-file --upstream-node-id=%n'

save&exit

```
[postgres@ip-172-31-87-240 ~]$ vim /var/lib/pgsql/repmgr.conf
[postgres@ip-172-31-87-240 ~]$ cat /var/lib/pgsql/repmgr.conf
cluster='failovertest'
node_id=1
node_name=node1
conninfo='host=172.31.87.240 user=repmgr dbname=repmgr connect_timeout=2'
data_directory='/var/lib/pgsql/15/data/'
failover=automatic
promote_command='/usr/pgsql-15/bin/repmgr standby promote -f /var/lib/pgsql/repmgr.conf --log-to-file'
follow_command='/usr/pgsql-12/bin/repmgr standby follow -f /var/lib/pgsql/repmgr.conf --log-to-file --upstream-node-id=%n'
[postgres@ip-172-31-87-240 ~]$
```

Step8) Register the primary server with repmgr

#Register the primary server

/usr/pgsql-15/bin/repmgr -f /var/lib/pgsql/repmgr.conf primary register

#Check the status of the cluster

/usr/pgsql-15/bin/repmgr -f /var/lib/pgsql/repmgr.conf cluster show

```
[postgres@ip-172-31-87-240 ~]$ /usr/pgsql-15/bin/repmgr -f /var/lib/pgsql/repmgr.conf primary register
WARNING: the following problems were found in the configuration file:
  parameter "cluster" is deprecated and will be ignored
INFO: connecting to primary database...
NOTICE: attempting to install extension "repmgr"
NOTICE: "repmgr" extension successfully installed
NOTICE: primary node record (ID: 1) registered
[postgres@ip-172-31-87-240 ~]$ /usr/pgsql-15/bin/repmgr -f /var/lib/pgsql/repmgr.conf cluster show
WARNING: the following problems were found in the configuration file:
  parameter "cluster" is deprecated and will be ignored
 ID | Name  | Role    | Status    | Upstream | Location | Priority | Timeline | Connection string
----+-------+---------+-----------+----------+----------+----------+----------+-----------------------------------------------------------------
 1  | node1 | primary | * running |          | default  | 100      | 1        | host=172.31.87.240 user=repmgr dbname=repmgr connect_timeout=2
```

```
[postgres@ip-172-31-87-240 ~]$ psql -d repmgr -U repmgr -h 172.31.87.240
psql (15.7)
Type "help" for help.

repmgr=# \dx
                  List of installed extensions
  Name   | Version |   Schema   |            Description
---------+---------+------------+-----------------------------------
 plpgsql | 1.0     | pg_catalog | PL/pgSQL procedural language
 repmgr  | 5.4     | repmgr     | Replication manager for PostgreSQL
(2 rows)

repmgr=# \dt+
                                    List of relations
 Schema |        Name         | Type  | Owner  | Persistence | Access method |    Size    | Description
--------+---------------------+-------+--------+-------------+---------------+------------+-------------
 repmgr | events              | table | repmgr | permanent   | heap          | 16 kB      |
 repmgr | monitoring_history  | table | repmgr | permanent   | heap          | 0 bytes    |
 repmgr | nodes               | table | repmgr | permanent   | heap          | 16 kB      |
 repmgr | voting_term         | table | repmgr | permanent   | heap          | 8192 bytes |
(4 rows)

repmgr=# \x
Expanded display is on.
repmgr=# SELECT * FROM nodes;
-[ RECORD 1 ]----+-----------------------------------------------------------------
node_id          | 1
upstream_node_id |
active           | t
node_name        | node1
type             | primary
location         | default
priority         | 100
conninfo         | host=172.31.87.240 user=repmgr dbname=repmgr connect_timeout=2
repluser         | repmgr
slot_name        |
config_file      | /var/lib/pgsql/repmgr.conf

repmgr=#
```

On Standby server:

Step9) Install PostgreSQL

Install the repository RPM:

sudo dnf install -y https://download.postgresql.org/pub/repos/yum/reporpms/EL-9-x86_64/pgdg-redhat-repo-latest.noarch.rpm

Disable the built-in PostgreSQL module:

sudo dnf -qy module disable postgresql

Install PostgreSQL:

sudo dnf install -y postgresql15-server

Note: The above step of initialization of the cluster is not needed on the standby server.

```
[root@ip-172-31-36-56 ec2-user]# sudo dnf install -y postgresql15-server
Updating Subscription Management repositories.
Unable to read consumer identity

This system is not registered with an entitlement server. You can use "rhc" or "subscription-manager" to register.

Last metadata expiration check: 0:00:25 ago on Wed 03 Jul 2024 09:26:39 AM UTC.
Dependencies resolved.
================================================================================
 Package                 Architecture    Version                 Repository    Size
================================================================================
Installing:
 postgresql15-server     x86_64          15.7-1PGDG.rhel9        pgdg15       6.1 M
Installing dependencies:
 libicu                  x86_64          67.1-9.el9              rhel-9-baseos-rhui-rpms  9.6 M
 lz4                     x86_64          1.9.3-5.el9             rhel-9-baseos-rhui-rpms   62 k
 postgresql15            x86_64          15.7-1PGDG.rhel9        pgdg15       1.5 M
 postgresql15-libs       x86_64          15.7-1PGDG.rhel9        pgdg15       301 k

Transaction Summary
================================================================================
Install  5 Packages
```

Step10) Install repmgr

sudo yum install repmgr_15* -y

```
[root@ip-172-31-36-56 ec2-user]# sudo yum install repmgr_15* -y
Updating Subscription Management repositories.
Unable to read consumer identity

This system is not registered with an entitlement server. You can use "rhc" or "subscription-manager" to register.

Last metadata expiration check: 0:01:24 ago on Wed 03 Jul 2024 09:26:39 AM UTC.
Dependencies resolved.
================================================================================
 Package                 Architecture    Version                 Repository    Size
================================================================================
Installing:
 repmgr_15               x86_64          5.4.1-1PGDG.rhel9       pgdg15       269 k
 repmgr_15-devel         x86_64          5.4.1-1PGDG.rhel9       pgdg15       7.8 k
 repmgr_15-llvmjit       x86_64          5.4.1-1PGDG.rhel9       pgdg15        21 k
Installing dependencies:
```

Step11) Create a repmgr.conf on standby server with the following entries

vim /var/lib/pgsql/repmgr.conf

node_id=2

node_name=node2

conninfo='host=172.31.36.56 user=repmgr dbname=repmgr connect_timeout=2'

data_directory='/var/lib/pgsql/15/data'

failover=automatic

promote_command='/usr/pgsql-15/bin/repmgr standby promote -f /var/lib/pgsql/repmgr.conf --log-to-file'

follow_command='/usr/pgsql-15/bin/repmgr standby follow -f /var/lib/pgsql/repmgr.conf --log-to-file --upstream-node-id=%n'

save&exit

```
[postgres@ip-172-31-36-56 ~]$ cat /var/lib/pgsql/repmgr.conf
node_id=2
node_name=node2
conninfo='host=172.31.36.56 user=repmgr dbname=repmgr connect_timeout=2'
data_directory='/var/lib/pgsql/15/data'
failover=automatic
promote_command='/usr/pgsql-15/bin/repmgr standby promote -f /var/lib/pgsql/repmgr.conf --log-to-file'
follow_command='/usr/pgsql-15/bin/repmgr standby follow -f /var/lib/pgsql/repmgr.conf --log-to-file --upstream-node-id=%n'
[postgres@ip-172-31-36-56 ~]$
```

Step12) Perform the dry run and test if our configuration is correct

/usr/pgsql-15/bin/repmgr -h 172.31.87.240 -U repmgr -d repmgr -f /var/lib/pgsql/repmgr.conf standby clone --dry-run

```
[postgres@ip-172-31-36-56 ~]$ /usr/pgsql-15/bin/repmgr -h 172.31.87.240 -U repmgr -d repmgr -f /var/lib/pgsql/repmgr.conf standby clone --dry-run
NOTICE: destination directory "/var/lib/pgsql/15/data" provided
INFO: connecting to source node
DETAIL: connection string is: host=172.31.87.240 user=repmgr dbname=repmgr
DETAIL: current installation size is 29 MB
INFO: "repmgr" extension is installed in database "repmgr"
INFO: replication slot usage not requested;  no replication slot will be set up for this standby
INFO: parameter "max_wal_senders" set to 10
NOTICE: checking for available walsenders on the source node (2 required)
INFO: sufficient walsenders available on the source node
DETAIL: 2 required, 10 available
NOTICE: checking replication connections can be made to the source server (2 required)
INFO: required number of replication connections could be made to the source server
DETAIL: 2 replication connections required
WARNING: data checksums are not enabled and "wal_log_hints" is "off"
DETAIL: pg_rewind requires "wal_log_hints" to be enabled
NOTICE: standby will attach to upstream node 1
HINT: consider using the -c/--fast-checkpoint option
INFO: would execute:
  pg_basebackup -l "repmgr base backup"  -D /var/lib/pgsql/15/data -h 172.31.87.240 -p 5432 -U repmgr -X stream
INFO: all prerequisites for "standby clone" are met
[postgres@ip-172-31-36-56 ~]$
```

Step13) If there is no problem, start cloning

/usr/pgsql-15/bin/repmgr -h 172.31.87.240 -U repmgr -d repmgr -f /var/lib/pgsql/repmgr.conf standby clone

```
[postgres@ip-172-31-36-56 ~]$ /usr/pgsql-15/bin/repmgr -h 172.31.87.240 -U repmgr -d repmgr -f /var/lib/pgsql/repmgr.conf standby clone
NOTICE: destination directory "/var/lib/pgsql/15/data" provided
INFO: connecting to source node
DETAIL: connection string is: host=172.31.87.240 user=repmgr dbname=repmgr
DETAIL: current installation size is 29 MB
INFO: replication slot usage not requested;  no replication slot will be set up for this standby
NOTICE: checking for available walsenders on the source node (2 required)
NOTICE: checking replication connections can be made to the source server (2 required)
WARNING: data checksums are not enabled and "wal_log_hints" is "off"
DETAIL: pg_rewind requires "wal_log_hints" to be enabled
INFO: checking and correcting permissions on existing directory "/var/lib/pgsql/15/data"
NOTICE: starting backup (using pg_basebackup)...
HINT: this may take some time; consider using the -c/--fast-checkpoint option
INFO: executing:
  pg_basebackup -l "repmgr base backup"  -D /var/lib/pgsql/15/data -h 172.31.87.240 -p 5432 -U repmgr -X stream
NOTICE: standby clone (using pg_basebackup) complete
NOTICE: you can now start your PostgreSQL server
HINT: for example: pg_ctl -D /var/lib/pgsql/15/data start
HINT: after starting the server, you need to register this standby with "repmgr standby register"
[postgres@ip-172-31-36-56 ~]$
```

Step14) Start and check the PostgreSQL services

sudo systemctl enable postgresql-15

sudo systemctl start postgresql-15

sudo systemctl status postgresql-15

```
[root@ip-172-31-36-56 ec2-user]# sudo systemctl enable postgresql-15
Created symlink /etc/systemd/system/multi-user.target.wants/postgresql-15.service → /usr/lib/systemd/system/postgresql-15.service.
[root@ip-172-31-36-56 ec2-user]# sudo systemctl start postgresql-15
[root@ip-172-31-36-56 ec2-user]# sudo systemctl status postgresql-15
● postgresql-15.service - PostgreSQL 15 database server
     Loaded: loaded (/usr/lib/systemd/system/postgresql-15.service; enabled; preset: disabled)
     Active: active (running) since Wed 2024-07-03 09:35:05 UTC; 6s ago
       Docs: https://www.postgresql.org/docs/15/static/
    Process: 15590 ExecStartPre=/usr/pgsql-15/bin/postgresql-15-check-db-dir ${PGDATA} (code=exited, status=0/SUCCESS)
   Main PID: 15595 (postmaster)
      Tasks: 6 (limit: 4400)
     Memory: 52.7M
        CPU: 70ms
     CGroup: /system.slice/postgresql-15.service
             ├─15595 /usr/pgsql-15/bin/postmaster -D /var/lib/pgsql/15/data/
             ├─15597 "postgres: logger "
             ├─15598 "postgres: checkpointer "
             ├─15599 "postgres: background writer "
             ├─15600 "postgres: startup recovering 000000010000000000000003"
             └─15601 "postgres: walreceiver streaming 0/30001F0"

Jul 03 09:35:05 ip-172-31-36-56.ec2.internal systemd[1]: Starting PostgreSQL 15 database server...
Jul 03 09:35:05 ip-172-31-36-56.ec2.internal postmaster[15595]: 2024-07-03 09:35:05.931 UTC [15595] LOG:  redirecting log output to logging collector process
Jul 03 09:35:05 ip-172-31-36-56.ec2.internal postmaster[15595]: 2024-07-03 09:35:05.931 UTC [15595] HINT:  Future log output will appear in directory "log".
Jul 03 09:35:05 ip-172-31-36-56.ec2.internal systemd[1]: Started PostgreSQL 15 database server.
[root@ip-172-31-36-56 ec2-user]#
```

Step15) Register the standby server with repmgr

#Register the standby server

/usr/pgsql-15/bin/repmgr -f /var/lib/pgsql/repmgr.conf standby register

```
[root@ip-172-31-36-56 ec2-user]# su - postgres
Last login: Wed Jul  3 09:29:09 UTC 2024 on pts/0
[postgres@ip-172-31-36-56 ~]$ /usr/pgsql-15/bin/repmgr -f /var/lib/pgsql/repmgr.conf standby register
INFO: connecting to local node "node2" (ID: 2)
INFO: connecting to primary database
WARNING: --upstream-node-id not supplied, assuming upstream node is primary (node ID: 1)
INFO: standby registration complete
NOTICE: standby node "node2" (ID: 2) successfully registered
[postgres@ip-172-31-36-56 ~]$
```

#Check the status of the cluster

/usr/pgsql-15/bin/repmgr -f /var/lib/pgsql/repmgr.conf cluster show

```
[postgres@ip-172-31-36-56 ~]$ /usr/pgsql-15/bin/repmgr -f /var/lib/pgsql/repmgr.conf cluster show
 ID | Name  | Role    | Status    | Upstream | Location | Priority | Timeline | Connection string
----+-------+---------+-----------+----------+----------+----------+----------+-----------------------------------------------------------------
 1  | node1 | primary | * running |          | default  | 100      | 1        | host=172.31.87.240 user=repmgr dbname=repmgr connect_timeout=2
 2  | node2 | standby |   running | node1    | default  | 100      | 1        | host=172.31.36.56 user=repmgr dbname=repmgr connect_timeout=2
[postgres@ip-172-31-36-56 ~]$
```

Step16) Check the Replication is working fine or not

On Primary server:

#check replication status

SELECT * FROM pg_stat_replication;

#Create test table and insert some data

CREATE TABLE test_table(id int,name varchar);

INSERT INTO test_table(id,name) VALUES (1,'naveen'),(2,'Ram');

SELECT * FROM test_table;

```
[postgres@ip-172-31-87-240 ~]$ psql
psql (15.7)
Type "help" for help.

postgres=# \x
Expanded display is on.
postgres=# SELECT * FROM pg_stat_replication;
-[ RECORD 1 ]----+------------------------------
pid              | 16817
usesysid         | 16388
usename          | repmgr
application_name | node2
client_addr      | 172.31.36.56
client_hostname  |
client_port      | 51240
backend_start    | 2024-07-03 09:35:05.976261+00
backend_xmin     |
state            | streaming
sent_lsn         | 0/3000658
write_lsn        | 0/3000658
flush_lsn        | 0/3000658
replay_lsn       | 0/3000658
write_lag        |
flush_lag        |
replay_lag       |
sync_priority    | 0
sync_state       | async
reply_time       | 2024-07-03 09:39:07.552576+00

postgres=# \x
Expanded display is off.
postgres=# CREATE TABLE test_table(id int,name varchar);
CREATE TABLE
postgres=# INSERT INTO test_table(id,name) VALUES (1,'naveen'),(2,'Ram');
INSERT 0 2
postgres=# SELECT * FROM test_table;
 id |  name
----+--------
  1 | naveen
  2 | Ram
(2 rows)

postgres=#
```

On Standby server:

#Check wal receiver status

SELECT * FROM pg_stat_wal_receiver;

#Check test table

SELECT * FROM test_table;

```
[postgres@ip-172-31-36-56 ~]$ psql
psql (15.7)
Type "help" for help.

postgres=# \x
Expanded display is on.
postgres=# SELECT * FROM pg_stat_wal_receiver;
-[ RECORD 1 ]---------+--------------------------------------------------------------------------------------------------------------------------------------
-----------------------------------------------------------------------------------------------------------------------------------------------------------
----------------------------------------
pid                   | 15601
status                | streaming
receive_start_lsn     | 0/3000000
receive_start_tli     | 1
written_lsn           | 0/301EC90
flushed_lsn           | 0/301EC90
received_tli          | 1
last_msg_send_time    | 2024-07-03 09:41:51.378503+00
last_msg_receipt_time | 2024-07-03 09:41:51.379033+00
latest_end_lsn        | 0/301EC90
latest_end_time       | 2024-07-03 09:40:51.238701+00
slot_name             |
sender_host           | 172.31.87.240
sender_port           | 5432
conninfo              | user=repmgr passfile=/var/lib/pgsql/.pgpass channel_binding=prefer connect_timeout=2 dbname=replication host=172.31.87.240 port=5432
application_name=node2 fallback_application_name=walreceiver sslmode=prefer sslcompression=0 sslsni=1 ssl_min_protocol_version=TLSv1.2 gssencmode=prefer krbs
rvname=postgres target_session_attrs=any

postgres=# \x
Expanded display is off.
postgres=# SELECT * FROM test_table;
 id |  name
----+--------
  1 | naveen
  2 | Ram
(2 rows)

postgres=#
```

Step17) To enable the automatic failover, start the repmgrd daemon process on Master and slave server

#Start the repmgrd daemon process on both servers

/usr/pgsql-15/bin/repmgrd -f /var/lib/pgsql/repmgr.conf > /var/lib/pgsql/repmgr.log 2>&1 &

```
[postgres@ip-172-31-87-240 ~]$  /usr/pgsql-15/bin/repmgrd -f /var/lib/pgsql/repmgr.conf > /var/lib/pgsql/repmgr.log 2>&1 &
[1] 18441
[postgres@ip-172-31-87-240 ~]$ less /var/lib/pgsql/repmgr.log
[1]+  Done                    /usr/pgsql-15/bin/repmgrd -f /var/lib/pgsql/repmgr.conf > /var/lib/pgsql/repmgr.log 2>&1
```

```
[postgres@ip-172-31-36-56 ~]$ /usr/pgsql-15/bin/repmgrd -f /var/lib/pgsql/repmgr.conf > /var/lib/pgsql/repmgr.log 2>&1 &
[1] 16665
[postgres@ip-172-31-36-56 ~]$ ^C
[1]+  Done                    /usr/pgsql-15/bin/repmgrd -f /var/lib/pgsql/repmgr.conf > /var/lib/pgsql/repmgr.log 2>&1
```

#Check the status of repmgrd daemon process

/usr/pgsql-15/bin/repmgr -f /var/lib/pgsql/repmgr.conf daemon status

```
[postgres@ip-172-31-87-240 ~]$ /usr/pgsql-15/bin/repmgr -f /var/lib/pgsql/repmgr.conf daemon status
WARNING: the following problems were found in the configuration file:
  parameter "cluster" is deprecated and will be ignored
 ID | Name  | Role    | Status    | Upstream | repmgrd | PID   | Paused? | Upstream last seen
----+-------+---------+-----------+----------+---------+-------+---------+--------------------
 1  | node1 | primary | * running |          | running | 18444 | no      | n/a
 2  | node2 | standby |   running | node1    | running | 16668 | no      | 0 second(s) ago
```