Logical replication basic setup

OS:Redhat Linux 9

PostgreSQL version:15

Master IP:172.31.27.179

Slave IP:172.31.23.138

On Master server:

Step1) Configure below parameters in $PGDATA/postgresql.conf file.

#Edit $PGDATA/postgresql.conf

vim $PGDATA/postgresql.conf

listen_addresses = '*'

port = 5432

wal_level = logical

save&exit

```
[postgres@ip-172-31-27-179 ~]$ psql
psql (15.6)
Type "help" for help.

postgres=# show listen_addresses;
 listen_addresses
------------------
 *
(1 row)

postgres=# show port;
 port
------
 5432
(1 row)

postgres=# show wal_level;
 wal_level
-----------
 logical
(1 row)
```

Step2) Restart postgresql service and check changes

#Restart postgresql service

sudo systemctl restart postgresql-15

```
[root@ip-172-31-27-179 ec2-user]# sudo systemctl restart postgresql-15
```

Step3) Create source database and tables.

#Create database

create database sourcedb

```
postgres=# CREATE DATABASE sourcedb;
CREATE DATABASE
```

#Connect to the database and load some data

We have created two tables with primary key constraint (Based on the logical replication limitations)

```
[postgres@ip-172-31-27-179 ~]$ psql -d sourcedb
psql (15.6)
Type "help" for help.

sourcedb=# CREATE TABLE customers (
  customer_id SERIAL NOT NULL PRIMARY KEY,
  customer_name VARCHAR(255),
  contact_name VARCHAR(255),
  address VARCHAR(255),
  city VARCHAR(255),
  postal_code VARCHAR(255),
  country VARCHAR(255)
);
INSERT INTO customers (customer_name, contact_name, address, city, postal_code, country)
VALUES
  ('Alfreds Futterkiste', 'Maria Anders', 'Obere Str. 57', 'Berlin', '12209', 'Germany'),
  ('Ana Trujillo Emparedados y helados', 'Ana Trujillo', 'Avda. de la Constitucion 2222', 'Mexico D.F.', '05021', 'Mexico'),
  ('Antonio Moreno Taquera', 'Antonio Moreno', 'Mataderos 2312', 'Mexico D.F.', '05023', 'Mexico'),
  ('Around the Horn', 'Thomas Hardy', '120 Hanover Sq.', 'London', 'WA1 1DP', 'UK');
CREATE TABLE products (
  product_id SERIAL NOT NULL PRIMARY KEY,
  product_name VARCHAR(255),
  category_id INT,
  unit VARCHAR(255),
  price DECIMAL(10, 2)
);
INSERT INTO products (product_id, product_name, category_id, unit, price)
VALUES
  (1, 'Chais', 1, '10 boxes x 20 bags', 18),
  (2, 'Chang', 1, '24 - 12 oz bottles', 19),
  (3, 'Aniseed Syrup', 2, '12 - 550 ml bottles', 10),
  (4, 'Chef Antons Cajun Seasoning', 2, '48 - 6 oz jars', 22),
  (5, 'Chef Antons Gumbo Mix', 2, '36 boxes', 21.35);
CREATE TABLE
INSERT 0 4
CREATE TABLE
INSERT 0 5
sourcedb=#
```

Step4) Connect to the database and create publication.

#Create publication

CREATE PUBLICATION alltables FOR ALL TABLES;

```
[postgres@ip-172-31-27-179 ~]$ psql -d sourcedb
psql (15.6)
Type "help" for help.

sourcedb=# \dt
            List of relations
 Schema |    Name     | Type  |  Owner
--------+-------------+-------+----------
 public | customers | table | postgres
 public | products  | table | postgres
(2 rows)

sourcedb=# CREATE PUBLICATION alltables FOR ALL TABLES;
CREATE PUBLICATION
sourcedb=#
```

#Verify

SELECT * FROM pg_publication;

SELECT * FROM pg_publication_tables;

```
[postgres@ip-172-31-27-179 ~]$ psql -d sourcedb
psql (15.6)
Type "help" for help.

sourcedb=# SELECT * FROM pg_publication;
  oid  |  pubname  | pubowner | puballtables | pubinsert | pubupdate | pubdelete | pubtruncate | pubviaroot
-------+-----------+----------+--------------+-----------+-----------+-----------+-------------+------------
 16446 | alltables |       10 | t            | t         | t         | t         | t           | f
(1 row)

sourcedb=# SELECT * FROM pg_publication_tables;
  pubname  | schemaname | tablename |                              attnames                                  | rowfilter
-----------+------------+-----------+------------------------------------------------------------------------+-----------
 alltables | public     | customers | {customer_id,customer_name,contact_name,address,city,postal_code,country} |
 alltables | public     | products  | {product_id,product_name,category_id,unit,price}                        |
(2 rows)
```

Step5) Configure slave ip address in $PGDATA/pg_hba.conf file and reload configurations.

#Edit $PGDATA/pg_hba.conf

host all all 172.31.23.138/32 md5

save&exit

#Reload configurations

psql -c "SELECT pg_reload_conf();"

```
[postgres@ip-172-31-27-179 ~]$ psql
psql (15.6)
Type "help" for help.

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

On Slave server:

Step1) Allow below parameters in $PGDATA/postgresql.conf

#Edit $PGDATA/postgresql.conf

listen_addresses = *

port = 5432

wal_levl = logical

```
[postgres@ip-172-31-23-138 ~]$ psql
psql (15.6)
Type "help" for help.

postgres=# show listen_addresses;
 listen_addresses
------------------
 *
(1 row)

postgres=# show port;
 port
------
 5432
(1 row)

postgres=# show wal_level;
 wal_level
-----------
 logical
(1 row)
```

Step2) Restart the postgresql service.

sudo systemctl restart postgresql-15

```
[root@ip-172-31-23-138 ~]# sudo systemctl restart postgresql-15
```

Step3) Create the target database.

CREATE DATABASE target_db;

```
postgres=# CREATE DATABASE targetdb;
CREATE DATABASE
```

Step4) Take source database schema backup (without data) and restore into the target database.

#Schema backup

Options:

-s=schema, -O=without owner, -x=without privileges, -v=verbose

pg_dump -h 172.31.27.179 -U postgres -d sourcedb -s -O -x -p 5432 -v > source_db_schema.sql

```
[postgres@ip-172-31-23-138 ~]$ pg_dump -h 172.31.27.179 -U postgres -d sourcedb -s -O -x -p 5432 -v > source_db_schema.sql
Password:
pg_dump: last built-in OID is 16383
pg_dump: reading extensions
pg_dump: identifying extension members
pg_dump: reading schemas
pg_dump: reading user-defined tables
pg_dump: reading user-defined functions
pg_dump: reading user-defined types
```

#Restore Schema

psql -U postgres -d targetdb -p 5432 < source_db_schema.sql

```
[postgres@ip-172-31-23-138 ~]$ psql -U postgres -d targetdb -p 5432 < source_db_schema.sql
SET
SET
SET
SET
SET
 set_config
------------
```

Step5) Connect to the database and create subscription.

#Create subscription

CREATE SUBSCRIPTION mysub CONNECTION 'host=172.31.27.179 port=5432 user=postgres dbname=sourcedb password=postgres@123' PUBLICATION alltables;

```
[postgres@ip-172-31-23-138 ~]$ psql -d targetdb
psql (15.6)
Type "help" for help.

targetdb=# \dt
          List of relations
 Schema |   Name    | Type  |  Owner
--------+-----------+-------+----------
 public | customers | table | postgres
 public | products  | table | postgres
(2 rows)

targetdb=#  CREATE SUBSCRIPTION mysub CONNECTION 'host=172.31.27.179 port=5432 user=postgres dbname=sourcedb password=postgres@123' PUBLICATION alltables;
NOTICE:  created replication slot "mysub" on publisher
CREATE SUBSCRIPTION
```

#Verify

SELECT * FROM pg_subscription;

```
[postgres@ip-172-31-23-138 ~]$ psql -d targetdb
psql (15.6)
Type "help" for help.

targetdb=# \x
Expanded display is on.
targetdb=# SELECT * FROM pg_subscription;
-[ RECORD 1 ]----+-----------------------------------------------------------------------------------
oid              | 16456
subdbid          | 16433
subskiplsn       | 0/0
subname          | mysub
subowner         | 10
subenabled       | t
subbinary        | f
substream        | f
subtwophasestate | d
subdisableonerr  | f
subconninfo      | host=172.31.27.179 port=5432 user=postgres dbname=sourcedb password=postgres@123
subslotname      | mysub
subsynccommit    | off
subpublications  | {alltables}
```

Step6) Check the logs and replication tables data.

#Check logs

tailf -f $PGDATA/log/postgresql-Sun.log

```
2024-04-21 04:05:58.232 UTC [16679] LOG:  checkpoint starting: time
2024-04-21 04:05:58.842 UTC [16679] LOG:  checkpoint complete: wrote 7 buffers (0.0%); 0 WAL file(s) added, 0 removed, 0 recycled; write=0.602 s, sync=0.003
s, total=0.610 s; sync files=7, longest=0.002 s, average=0.001 s; distance=9 kB, estimate=3865 kB
2024-04-21 04:06:02.876 UTC [17131] LOG:  logical replication apply worker for subscription "mysub" has started
2024-04-21 04:06:02.901 UTC [17132] LOG:  logical replication table synchronization worker for subscription "mysub", table "customers" has started
2024-04-21 04:06:02.917 UTC [17133] LOG:  logical replication table synchronization worker for subscription "mysub", table "products" has started
2024-04-21 04:06:02.965 UTC [17132] LOG:  logical replication table synchronization worker for subscription "mysub", table "customers" has finished
2024-04-21 04:06:02.971 UTC [17133] LOG:  logical replication table synchronization worker for subscription "mysub", table "products" has finished
```

#Check tables data

SELECT * FROM customers;

SELECT * FROM products;

```
[postgres@ip-172-31-23-138 ~]$ psql -d targetdb
psql (15.6)
Type "help" for help.

targetdb=# \dt+
                                    List of relations
 Schema |   Name    | Type  |  Owner   | Persistence | Access method | Size  | Description
--------+-----------+-------+----------+-------------+---------------+-------+-------------
 public | customers | table | postgres | permanent   | heap          | 16 kB |
 public | products  | table | postgres | permanent   | heap          | 16 kB |
(2 rows)

targetdb=# SELECT * FROM customers;
 customer_id |          customer_name           |  contact_name  |           address            |    city     | postal_code | country
-------------+----------------------------------+----------------+------------------------------+-------------+-------------+---------
           1 | Alfreds Futterkiste              | Maria Anders   | Obere Str. 57                | Berlin      | 12209       | Germany
           2 | Ana Trujillo Emparedados y helados | Ana Trujillo   | Avda. de la Constitucion 2222 | Mexico D.F. | 05021       | Mexico
           3 | Antonio Moreno Taquera           | Antonio Moreno | Mataderos 2312               | Mexico D.F. | 05023       | Mexico
           4 | Around the Horn                  | Thomas Hardy   | 120 Hanover Sq.              | London      | WA1 1DP     | UK
(4 rows)

targetdb=# SELECT * FROM products;
 product_id |       product_name         | category_id |       unit         | price
------------+----------------------------+-------------+--------------------+-------
          1 | Chais                      |           1 | 10 boxes x 20 bags | 18.00
          2 | Chang                      |           1 | 24 - 12 oz bottles | 19.00
          3 | Aniseed Syrup              |           2 | 12 - 550 ml bottles | 10.00
          4 | Chef Antons Cajun Seasoning |           2 | 48 - 6 oz jars     | 22.00
          5 | Chef Antons Gumbo Mix      |           2 | 36 boxes           | 21.35
(5 rows)

targetdb=#
```