

Logical Replication Setup between databases in the same cluster:

Creating a subscription that connects to the same database cluster (for example, to replicate between databases in the same cluster or to replicate within the same database) will only succeed if the replication slot is not created as part of the same command. Otherwise, the CREATE SUBSCRIPTION call will hang. To make this work, create the replication slot separately (using the function `pg_create_logical_replication_slot` with the plugin name `pgoutput`) and create the subscription using the parameter `create_slot = false`.

OS: Redhat Linux 9

PostgreSQL version: 15

Publication database: postgres

Subscription database: target_db

Publication name: pub1

Subscription name: sub1

1) Modify the following parameters in postgresql.conf file

`listen_addresses = '*'`

`port = 5432`

`wal_level = logical`

```
[postgres@ip-172-31-29-111 ~]$ vim $PGDATA/postgresql.conf
[postgres@ip-172-31-29-111 ~]$ cat $PGDATA/postgresql.conf |grep -iaE "listen_address|port|wal_level"
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 = logical             # minimal, replica, or logical
                                # supported by the operating system:

# REPORTING AND LOGGING
                                # %r = remote host and port
[postgres@ip-172-31-29-111 ~]$
```

2) Restart and check the status of postgresql services

`sudo systemctl restart postgresql-15`

`sudo systemctl status postgresql-15`

```
[root@ip-172-31-29-111 ec2-user]# sudo systemctl restart postgresql-15
[root@ip-172-31-29-111 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 Fri 2024-05-31 12:41:52 UTC; 9s ago
     Docs: https://www.postgresql.org/docs/15/static/
   Process: 16398 ExecStartPre=/usr/pgsql-15/bin/postgresql-15-check-db-dir $(PGDATA) (code=exited, status=0/SUCCESS)
    Main PID: 16403 (postmaster)
       Task: 7 (limit: 4329)
    Memory: 20.4M
         CPU: 42ms
    CGroup: /system.slice/postgresql-15.service
            └─16403 /usr/pgsql-15/bin/postmaster -D /var/lib/pgsql/15/data/
              └─16404 "postgres: logger "
                └─16405 "postgres: checkpointer "
                  └─16406 "postgres: background writer "
                    └─16408 "postgres: walwriter "
                      └─16409 "postgres: autovacuum launcher "
                        └─16410 "postgres: logical replication launcher "

May 31 12:41:51 ip-172-31-29-111.ec2.internal systemd[1]: postgresql-15.service: Deactivated successfully.
May 31 12:41:51 ip-172-31-29-111.ec2.internal systemd[1]: Stopped PostgreSQL 15 database server.
May 31 12:41:51 ip-172-31-29-111.ec2.internal systemd[1]: Starting PostgreSQL 15 database server...
May 31 12:41:52 ip-172-31-29-111.ec2.internal postmaster[16403]: 2024-05-31 12:41:52.029 UTC [16403] LOG:  redirecting log output to logging collector process
May 31 12:41:52 ip-172-31-29-111.ec2.internal postmaster[16403]: 2024-05-31 12:41:52.029 UTC [16403] HINT:  Future log output will appear in directory "log".
May 31 12:41:52 ip-172-31-29-111.ec2.internal systemd[1]: Started PostgreSQL 15 database server.
```

3) Create one table with primary key constraint and insert few records into the table

CREATE TABLE categories (

category_id SERIAL NOT NULL PRIMARY KEY,

category_name VARCHAR(255),

description VARCHAR(255)

);

INSERT INTO categories (category_name, description)

VALUES

('Beverages', 'Soft drinks, coffees, teas, beers, and ales'),

('Condiments', 'Sweet and savory sauces, relishes, spreads, and seasonings'),

('Confections', 'Desserts, candies, and sweet breads'),

('Dairy Products', 'Cheeses'),

('Grains/Cereals', 'Breads, crackers, pasta, and cereal'),

('Meat/Poultry', 'Prepared meats'),

('Produce', 'Dried fruit and bean curd'),

('Seafood', 'Seaweed and fish');

```
[postgres@ip-172-31-29-111 ~]$ psql
psql (15.7)
Type "help" for help.

postgres=# CREATE TABLE categories (
  category_id SERIAL NOT NULL PRIMARY KEY,
  category_name VARCHAR(255),
  description VARCHAR(255)
);
CREATE TABLE
postgres=# INSERT INTO categories (category_name, description)
VALUES
('Beverages', 'Soft drinks, coffees, teas, beers, and ales'),
('Condiments', 'Sweet and savory sauces, relishes, spreads, and seasonings'),
('Confections', 'Desserts, candies, and sweet breads'),
('Dairy Products', 'Cheeses'),
('Grains/Cereals', 'Breads, crackers, pasta, and cereal'),
('Meat/Poultry', 'Prepared meats'),
('Produce', 'Dried fruit and bean curd'),
('Seafood', 'Seaweed and fish');
INSERT 0 8
postgres=#
```

4) Create publication for table

CREATE PUBLICATION pub1 FOR TABLE categories;

\dRp --> List of publications

select * from pg_publication_tables; ----> List of publication tables

```
[postgres@ip-172-31-29-111 ~]$ psql
psql (15.7)
Type "help" for help.

postgres=# CREATE PUBLICATION publ FOR TABLE categories;
CREATE PUBLICATION
postgres=# \dRp
          List of publications
-----+-----+-----+-----+-----+-----+
Name | Owner  | All tables | Inserts | Updates | Deletes | Truncates | Via root
-----+-----+-----+-----+-----+-----+
publ | postgres | f         | t       | t       | t       | t         | f
(1 row)

postgres=# select * from pg_publication_tables;
-----+-----+-----+-----+-----+-----+
pubname | schemaname | tablename | attnames | rowfilter
-----+-----+-----+-----+-----+
publ    | public     | categories | (category_id,category_name,description) | 
(1 row)

postgres=#
```

5) Create the target database on same cluster

CREATE DATABASE target_db;

```
[postgres@ip-172-31-29-111 ~]$ psql
psql (15.7)
Type "help" for help.

postgres=# CREATE DATABASE target_db;
CREATE DATABASE
postgres=# \l+ target_db

      List of databases
  Name | Owner | Encoding | Collate | Ctype | ICU Locale | Locale Provider | Access privileges | Size | Tablespace | Description
-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----
target_db | postgres | UTF8 | en_US.UTF-8 | en_US.UTF-8 | | libc | | 7393 kB | pg_default |
(1 row)

postgres=#
```

6) Take the schema backup copy of the publication table and restore into the target_db

pg_dump -t categories -s -v > categories_schema.sql

psql -d target_db < categories_schema.sql

```
[postgres@ip-172-31-29-111 ~]$ pg_dump -t categories -s -v > categories_schema.sql
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
pg_dump: reading procedural languages
pg_dump: reading user-defined aggregate functions
pg_dump: reading user-defined operators
pg_dump: reading user-defined access methods
pg_dump: reading user-defined operator classes
pg_dump: reading user-defined operator families
pg_dump: reading user-defined text search parsers
pg_dump: reading user-defined text search templates
pg_dump: reading user-defined text search dictionaries
pg_dump: reading user-defined text search configurations
pg_dump: reading user-defined foreign-data wrappers
pg_dump: reading user-defined foreign servers
pg_dump: reading default privileges
```

```
[postgres@ip-172-31-29-111 ~]$ psql -d target_db < categories_schema.sql
SET
SET
SET
SET
SET
set_config
-----
(1 row)

SET
SET
SET
SET
SET
SET
CREATE TABLE
ALTER TABLE
CREATE SEQUENCE
ALTER TABLE
ALTER SEQUENCE
ALTER TABLE
ALTER TABLE
ALTER TABLE
[postgres@ip-172-31-29-111 ~]$
```

7) Connect to the target database and create subscription for publication

CREATE SUBSCRIPTION sub1 CONNECTION 'host=localhost dbname=postgres password=abc@123' PUBLICATION pub1 WITH (slot_name=NONE, enabled=false, create_slot=false);

\dr → List of the subscriptions

select * from pg_subscription → Subscription connections info

```
[postgres@ip-172-31-29-111 ~]$ psql -d target_db
psql (15.7)
Type "help" for help.

target_db=# \dt+

      List of relations
 Schema | Name | Type | Owner | Persistence | Access method | Size | Description
-----+-----+-----+-----+-----+-----+-----+-----
 public | categories | table | postgres | permanent | heap | 8192 bytes |
(1 row)

target_db=# CREATE SUBSCRIPTION sub1 CONNECTION 'host=localhost dbname=postgres password=abc@123' PUBLICATION pub1 WITH (slot_name=NONE, enabled=false, create_slot=false);
CREATE SUBSCRIPTION
target_db=#
```

```
[postgres@ip-172-31-29-111 ~]$ psql -d target_db
psql (15.7)
Type "help" for help.

target_db=# \dRa
List of subscriptions
Name | Owner | Enabled | Publication
-----+-----+-----+-----
sub1 | postgres | f | {pub1}
(1 row)

target_db=# \x
Expanded display is on.
target_db=# select * from pg_subscription;
-[ RECORD 1 ]-----+-----
oid          | 16412
subdbid      | 16401
subskiplsn   | 0/0
subname      | sub1
subowner     | 10
subenabled   | f
subbinary    | f
substream    | f
subtwo_phase | d
subdisableonerr | f
subconninfo  | host=localhost dbname=postgres password=abc@123
subslotname  | 
subsynccommit | off
subpublications | {pub1}

target_db=#
```

8) On the publisher, manually create a slot using any name, e.g. "myslot".

`SELECT * FROM pg_create_logical_replication_slot('myslot', 'pgoutput');`

`select * from pg_replication_slots;` → List of the replication slots

```
[postgres@ip-172-31-29-111 ~]$ psql -d target_db
psql (15.7)
Type "help" for help.

target_db=# SELECT * FROM pg_create_logical_replication_slot('myslot', 'pgoutput');
 slot_name |
-----+-----
myslot    | 0/19C0FB0
(1 row)

target_db=# \x
Expanded display is on.
target_db=# select * from pg_replication_slots;
-[ RECORD 1 ]-----+-----
slot_name      | myslot
plugin         | pgoutput
slot_type      | logical
datoid         | 16401
database       | target_db
temporary      | f
active         | f
active_pid     | 
xmin           | 
catalog_xmin   | 752
restart_lsn     | 0/19C0F78
confirmed_flush_lsn | 0/19C0FB0
wal_status     | reserved
safe_wal_size  | 
two_phase     | f

target_db=#
```

9) On the subscriber, associate the subscription with the slot name just created.

`ALTER SUBSCRIPTION sub1 SET (slot_name='myslot');`

```
[postgres@ip-172-31-29-111 ~]$ psql -d target_db
psql (15.7)
Type "help" for help.

target_db=# ALTER SUBSCRIPTION sub1 SET (slot_name='myslot');
ALTER SUBSCRIPTION
target_db=# \x
Expanded display is on.
target_db=# select * from pg_subscription;
-[ RECORD 1 ]-----+-----
oid          | 16412
subdbid      | 16401
subskiplsn   | 0/0
subname      | sub1
subowner     | 10
subenabled   | f
subbinary    | f
substream    | f
subtwo_phase | d
subdisableonerr | f
subconninfo  | host=localhost dbname=postgres password=abc@123
subslotname  | myslot
subsynccommit | off
subpublications | {pub1}

target_db=#
```

10) On the subscriber, complete the activation of the subscription. After this the tables of pub1 will start replicating.

`ALTER SUBSCRIPTION sub1 ENABLE;`

`ALTER SUBSCRIPTION sub1 REFRESH PUBLICATION;`

select * from pg_stat_replication → Replication info

```
[postgres@ip-172-31-29-111 ~]$ psql -d target_db
psql (15.7)
Type "help" for help.

target_db=# ALTER SUBSCRIPTION sub1 ENABLE;
ALTER SUBSCRIPTION
target_db=# ALTER SUBSCRIPTION sub1 REFRESH PUBLICATION;
ALTER SUBSCRIPTION
target_db=# \dt+ categories
          List of relations
Schema | Name      | Type  | Owner  | Persistence | Access method | Size  | Description
-----+-----+-----+-----+-----+-----+-----+-----
public | categories | table | postgres | permanent   | heap          | 16 kB |
(1 row)

target_db=# select * from categories;
category_id | category_name | description
-----
1 | Beverages    | Soft drinks, coffees, teas, beers, and alas
2 | Condiments  | Sweet and savory sauces, relishes, spreads, and seasonings
3 | Confections | Desserts, candies, and sweet breads
4 | Dairy Products | Cheeses
5 | Grains/Cereals | Breads, crackers, pasta, and cereal
6 | Meat/Poultry | Prepared meats
7 | Produce     | Dried fruit and bean curd
8 | Seafood     | Seaweed and fish
(8 rows)

target_db=#
```

```
[postgres@ip-172-31-29-111 ~]$ psql
psql (15.7)
Type "help" for help.

postgres=# \x
Expanded display is on.
postgres=# select * from pg_stat_replication;
-[ RECORD 1 ]-----
pid          | 1881
usesysid     | 10
username     | postgres
application_name | sub1
client_addr   | ::1
client_hostname |
client_port   | 48280
backend_start | 2024-05-31 19:22:07.923629+00
backend_xmin  |
state        | streaming
sent_lsn     | 0/19C2560
write_lsn    | 0/19C2560
flush_lsn    | 0/19C2560
replay_lsn   | 0/19C2560
write_lag    |
flush_lag    |
replay_lag   |
sync_priority | 0
sync_state   | async
reply_time   | 2024-05-31 19:23:45.254816+00
postgres=#
```

Ref:

<https://www.postgresql.org/docs/current/sql-createpublication.html>

<https://www.postgresql.org/docs/16/sql-createsubscription.html>

<https://www.postgresql.org/docs/16/logical-replication-subscription.html#LOGICAL-REPLICATION-SUBSCRIPTION-EXAMPLES-DEFERRED-SLOT>