

Lab 10 - sprawozdanie

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Przebieg ćwiczenia

Utworzono serwery publisher_db i subscriber_db

```
postgres@b266e31efaed:/usr/lib/postgresql/14/bin$ ls /tmp  
publisher_db  subscriber_db
```

Ustawiono port publisher_db na 5433 oraz wal_level na logical

```
54 #-----  
55 # CONNECTIONS AND AUTHENTICATION  
56 #-----  
57  
58 # - Connection Settings -  
59  
60 listen_addresses = '*'  
61             # comma-separated list of addresses;  
62             # defaults to 'localhost'; use '*' for all  
63             # (change requires restart)  
64 port = 5433             # (change requires restart)
```

```
199 #-----  
200 # WRITE-AHEAD LOG  
201 #-----  
202  
203 # - Settings -  
204  
205 wal_level = logical # minimal, replica, or logical
```

Ustawiono port subscriber_db na 5434

```
54 #-----  
55 # CONNECTIONS AND AUTHENTICATION  
56 #-----  
57  
58 # - Connection Settings -  
59  
60 listen_addresses = '*'  
61             # comma-separated list of addresses;  
62             # defaults to 'localhost'; use '*' for all  
63             # (change requires restart)  
64 port = 5434             # (change requires restart)
```

Uruchomiono obie instancje

```
postgres@b266e31efaed:/usr/lib/postgresql/14/bin$ pg_ctl -D /tmp/publisher_db -l /tmp/publisher_db_logfile start
waiting for server to start.... done
server started
postgres@b266e31efaed:/usr/lib/postgresql/14/bin$ pg_ctl -D /tmp/subscriber_db -l /tmp/subscriber_db_logfile start
waiting for server to start.... done
server started
```

Połączono się z serwerem publisher_db , utworzono w nim bazę pub_db , a w niej tabelę pub_tbl

```
postgres@b266e31efaed:/usr/lib/postgresql/14/bin$ psql -d postgres -p 5433
psql (14.1 (Debian 14.1-1.pgdg110+1))
Type "help" for help.

postgres=# create database pub_db;
CREATE DATABASE
postgres=# \c pub_db
You are now connected to database "pub_db" as user "postgres".
pub_db=# create table pub_tbl(id int, name varchar);
CREATE TABLE
```

Wygenerowano 10 wierszy w tabeli

```
pub_db=# insert into pub_tbl select x.*, 'data' || cast(x.* as varchar) from generate_series(1,10) x;
INSERT 0 10
```

```
Expanded display is OFF.
pub_db=# select * from pub_tbl;
 id | name
----+-----
  1 | data1
  2 | data2
  3 | data3
  4 | data4
  5 | data5
  6 | data6
  7 | data7
  8 | data8
  9 | data9
 10 | data10
(10 rows)
```

Utworzono na serwerze subscriber_db bazę sub_db

```
postgres@b266e31efaed:/usr/lib/postgresql/14/bin$ psql -d postgres -p 5434
psql (14.1 (Debian 14.1-1.pgdg110+1))
Type "help" for help.

postgres=# create database sub_db;
CREATE DATABASE
postgres=# \c sub_db
You are now connected to database "sub_db" as user "postgres".
```

Przekopiowano schemat tabeli pub_tbl do bazy sub_db

```

postgres@b266e31efaed:/usr/lib/postgresql/14/bin$ pg_dump -p 5433 -d pub_db -t pub_tbl -s | psql -p 5434 -d sub_db
SET
SET
SET
SET
SET
SET
set_config
-----

(1 row)

SET
SET
SET
SET
SET
SET
SET
CREATE TABLE
ALTER TABLE

```

```

postgres@b266e31efaed:/usr/lib/postgresql/14/bin$ psql -p 5434 -d sub_db
psql (14.1 (Debian 14.1-1.pgdg110+1))
Type "help" for help.

sub_db=# \d pub_tbl
          Table "public.pub_tbl"
  Column |          Type          | Collation | Nullable | Default
-----+-----+-----+-----+-----
 id      | integer                |           |          |
 name    | character varying      |           |          |

sub_db=# select * from pub_tbl;
 id | name
----+-----
(0 rows)

```

W bazie pub_db utworzono publikację test_publication na tabeli pub_tbl

```

pub_db=# create publication test_publication for table pub_tbl;
CREATE PUBLICATION

```

W bazie sub_db utworzono subskrypcję test_subscription na wcześniej stworzoną publikację

```

sub_db=# create subscription test_subscription connection 'port=5433 dbname=pub_db' publication test_publication;
NOTICE: created replication slot "test_subscription" on publisher
CREATE SUBSCRIPTION

```

W bazie sub_db dane w tabeli pub_tbl zostały przekopiwane

```
sub_db=# select * from pub_tbl;
 id | name
----+-----
  1 | data1
  2 | data2
  3 | data3
  4 | data4
  5 | data5
  6 | data6
  7 | data7
  8 | data8
  9 | data9
 10 | data10
(10 rows)
```

W logach publishera widać utworzenie publikacji

```
postgres@b266e31efaed:/usr/lib/postgresql/14/bin$ tail -n 16 /tmp/publisher_db_logfile
2024-05-13 17:23:19.250 UTC [389] STATEMENT:  CREATE_REPLICATION_SLOT "test_subscription" LOGICAL pgoutput NOEXPORT_SNAPSHOT
2024-05-13 17:23:19.262 UTC [391] LOG:  starting logical decoding for slot "test_subscription"
2024-05-13 17:23:19.262 UTC [391] DETAIL:  Streaming transactions committing after 0/171F218, reading WAL from 0/171F1E0
.
2024-05-13 17:23:19.262 UTC [391] STATEMENT:  START_REPLICATION SLOT "test_subscription" LOGICAL 0/0 (proto_version '2',
publication_names '"test_publication"')
2024-05-13 17:23:19.262 UTC [391] LOG:  logical decoding found consistent point at 0/171F1E0
2024-05-13 17:23:19.262 UTC [391] DETAIL:  There are no running transactions.
2024-05-13 17:23:19.262 UTC [391] STATEMENT:  START_REPLICATION SLOT "test_subscription" LOGICAL 0/0 (proto_version '2',
publication_names '"test_publication"')
2024-05-13 17:23:19.277 UTC [393] LOG:  logical decoding found consistent point at 0/171F218
2024-05-13 17:23:19.277 UTC [393] DETAIL:  There are no running transactions.
2024-05-13 17:23:19.277 UTC [393] STATEMENT:  CREATE_REPLICATION_SLOT "pg_16395_sync_16390_7368525060899668040" LOGICAL
pgoutput USE_SNAPSHOT
2024-05-13 17:23:19.283 UTC [393] LOG:  starting logical decoding for slot "pg_16395_sync_16390_7368525060899668040"
2024-05-13 17:23:19.283 UTC [393] DETAIL:  Streaming transactions committing after 0/171F250, reading WAL from 0/171F218
.
2024-05-13 17:23:19.283 UTC [393] STATEMENT:  START_REPLICATION SLOT "pg_16395_sync_16390_7368525060899668040" LOGICAL 0
/171F250 (proto_version '2', publication_names '"test_publication"')
2024-05-13 17:23:19.283 UTC [393] LOG:  logical decoding found consistent point at 0/171F218
2024-05-13 17:23:19.283 UTC [393] DETAIL:  There are no running transactions.
2024-05-13 17:23:19.283 UTC [393] STATEMENT:  START_REPLICATION SLOT "pg_16395_sync_16390_7368525060899668040" LOGICAL 0
/171F250 (proto_version '2', publication_names '"test_publication"')
postgres@b266e31efaed:/usr/lib/postgresql/14/bin$
```

W logach subscibera widać utworzenie subskrypcji

```
postgres@b266e31efaed:/usr/lib/postgresql/14/bin$ tail -n 5 /tmp/subscriber_db_logfile
2024-05-13 17:23:19.257 UTC [390] LOG:  logical replication apply worker for subscription "test_subscription" has starte
d
2024-05-13 17:23:19.265 UTC [392] LOG:  logical replication table synchronization worker for subscription "test_subscrip
tion", table "pub_tbl" has started
2024-05-13 17:23:19.285 UTC [392] LOG:  logical replication table synchronization worker for subscription "test_subscrip
tion", table "pub_tbl" has finished
2024-05-13 17:24:50.392 UTC [381] ERROR:  relation "postgres.users" does not exist at character 15
2024-05-13 17:24:50.392 UTC [381] STATEMENT:  select * from postgres.users;
postgres@b266e31efaed:/usr/lib/postgresql/14/bin$
```

Utworzenie nowych 10 rekordów w bazie pub_db w tabeli pub_tbl

```
postgres@b266e31efaed:/usr/lib/postgresql/14/bin$ psql -p 5433 pub_db
psql (14.1 (Debian 14.1-1.pgdg110+1))
Type "help" for help.

pub_db=# insert into pub_tbl select x.*, 'data' || cast(x.* as varchar) from generate_series(1,20) x;
INSERT 0 10
pub_db=# select * from pub_tbl;
 id | name
-----+-----
  1 | data1
  2 | data2
  3 | data3
  4 | data4
  5 | data5
  6 | data6
  7 | data7
  8 | data8
  9 | data9
 10 | data10
 11 | data11
 12 | data12
 13 | data13
 14 | data14
 15 | data15
 16 | data16
 17 | data17
 18 | data18
 19 | data19
 20 | data20
(20 rows)

pub_db=#
```

Rekordy zostały przekopiiowane do bazy sub_db

```
postgres@b266e31efaed:/usr/lib/postgresql/14/bin$ psql -p 5434 sub_db
psql (14.1 (Debian 14.1-1.pgdg110+1))
Type "help" for help.
```

```
sub_db=# select * from pub_tbl;
```

id	name
1	data1
2	data2
3	data3
4	data4
5	data5
6	data6
7	data7
8	data8
9	data9
10	data10
11	data11
12	data12
13	data13
14	data14
15	data15
16	data16
17	data17
18	data18
19	data19
20	data20

(20 rows)

```
sub_db=#
```

Nie udało się wykonać komendy update, otrzymaliśmy następujący komunikat o błędzie

```
pub_db=# update pub_tbl set name='roman' where id < 3;
ERROR:  cannot update table "pub_tbl" because it does not have a replica identity and publishes updates
HINT:   To enable updating the table, set REPLICA IDENTITY using ALTER TABLE.
pub_db=#
```

Według informacji które znaleźliśmy, jest to spowodowane brakiem primary key w tabeli, ale można to też obejść wykonując proponowane przez postgresa polecenie

```

pub_db=# ALTER TABLE pub_tbl REPLICA IDENTITY FULL;
ALTER TABLE
pub_db=# update pub_tbl set name='roman' where id < 3;
UPDATE 2
pub_db=# select * from pub_tbl;
 id |  name
-----+-----
  3 | data3
  4 | data4
  5 | data5
  6 | data6
  7 | data7
  8 | data8
  9 | data9
 10 | data10
 11 | data11
 12 | data12
 13 | data13
 14 | data14
 15 | data15
 16 | data16
 17 | data17
 18 | data18
 19 | data19
 20 | data20
   1 | roman
   2 | roman
(20 rows)

pub_db=#

```

Dane zostały poprawnie uaktualnione w replice

```
sub_db=# select * from pub_tbl;
```

id	name
3	data3
4	data4
5	data5
6	data6
7	data7
8	data8
9	data9
10	data10
11	data11
12	data12
13	data13
14	data14
15	data15
16	data16
17	data17
18	data18
19	data19
20	data20
1	roman
2	roman

(20 rows)

```
sub_db=#
```

Wykonano komende delete na serwerze publishera

```
pub_db=# delete from pub_tbl where id < 3;  
DELETE 2
```

Rekordy zostały usunięte również z subscribera


```
sub_db=# select * from pub_tbl;
 id | name
-----+-----
  3 | data3
  4 | data4
  5 | data5
  6 | data6
  7 | data7
  8 | data8
  9 | data9
 10 | data10
 11 | data11
 12 | data12
 13 | data13
 14 | data14
 15 | data15
 16 | data16
 17 | data17
 18 | data18
 19 | data19
 20 | data20
(18 rows)
```

Wykonano komende truncate na serwerze publishera

```
pub_db=# truncate TABLE pub_tbl;
TRUNCATE TABLE
```

Rekordy zostały usunięte również z subscribera

```
sub_db=# select * from pub_tbl;
 id | name
-----+-----
(0 rows)
```

Dodano do tabeli publishera nową kolumnę

```
pub_db=# alter table pub_tbl add email varchar;
ALTER TABLE
pub_db=# \d pub_tbl
          Table "public.pub_tbl"
  Column |          Type          | Collation | Nullable | Default
-----+-----+-----+-----+-----
 id      | integer                |           |          |
 name    | character varying      |           |          |
 email   | character varying      |           |          |
Publications:
 "test_publication"
```

Kolumna nie została zreplikowana na serwerze subscribera

```
sub_db=# \d pub_tbl
```

Table "public.pub_tbl"				
Column	Type	Collation	Nullable	Default
id	integer			
name	character varying			

Do zmodyfikowanej tabeli publishera dodano nowe rekordy

```
pub_db=# insert into pub_tbl select x.*, 'data' || cast(x.* as varchar), 'email' || cast(x.* as varchar) from
generate_series(20,23) x;
INSERT 0 4
pub_db=# select * from pub_tbl;
 id | name | email
-----+-----+-----
 20 | data20 | email20
 21 | data21 | email21
 22 | data22 | email22
 23 | data23 | email23
(4 rows)
```

Rekordy nie zostały zreplikowane do tabeli subscribera

```
sub_db=# select * from pub_tbl;
 id | name
-----+-----
(0 rows)
```

Aby naprawić replikację do tabeli subscribera dodano nową kolumnę a następnie odświeżono subskrypcję

```
sub_db=# alter table pub_tbl add email varchar;
ALTER TABLE
sub_db=# alter subscription test_subscription refresh publication;
ALTER SUBSCRIPTION
sub_db=# select * from pub_tbl;
 id | name | email
-----+-----+-----
 20 | data20 | email20
 21 | data21 | email21
 22 | data22 | email22
 23 | data23 | email23
(4 rows)
```

Do tabeli subscribera dodano nową kolumnę

```
sub_db=# alter table pub_tbl add city varchar;
ALTER TABLE
sub_db=# select * from pub_tbl;
 id | name | email | city
-----+-----+-----+-----
 20 | data20 | email20 | 
 21 | data21 | email21 | 
 22 | data22 | email22 | 
 23 | data23 | email23 | 
(4 rows)
```

Do tabeli publishera dodano nowe rekordy

```
pub_db=# insert into pub_tbl select x.*, 'data' || cast(x.* as varchar), 'email' || cast(x.* as varchar) from
generate_series(24,27) x;
INSERT 0 4
pub_db=# select * from pub_tbl;
 id |  name  | email
-----+-----+-----
 20 | data20 | email20
 21 | data21 | email21
 22 | data22 | email22
 23 | data23 | email23
 24 | data24 | email24
 25 | data25 | email25
 26 | data26 | email26
 27 | data27 | email27
(8 rows)
```

Rekordy zostały zreplikowane w tabeli subscribera, ich wartość w nowej kolumnie wynosiła null

```
sub_db=# select * from pub_tbl;
 id |  name  | email | city
-----+-----+-----+-----
 20 | data20 | email20 | 
 21 | data21 | email21 | 
 22 | data22 | email22 | 
 23 | data23 | email23 | 
 24 | data24 | email24 | 
 25 | data25 | email25 | 
 26 | data26 | email26 | 
 27 | data27 | email27 | 
(8 rows)
```

Dane replikacji z serwera publishera (tabela pg_stat_replication)

```
pub_db=# select * from pg_stat_replication;
-[ RECORD 1 ]-----+-----
pid                | 380
usesysid           | 10
username           | postgres
application_name    | test_subscription
client_addr         | 
client_hostname     | 
client_port         | -1
backend_start       | 2024-05-20 16:57:34.488743+00
backend_xmin        | 
state               | streaming
sent_lsn            | 0/172A500
write_lsn           | 0/172A500
flush_lsn           | 0/172A500
replay_lsn          | 0/172A500
write_lag           | 
flush_lag           | 
replay_lag          | 
sync_priority       | 0
sync_state          | async
reply_time          | 2024-05-20 17:04:35.791111+00
```

Na serwerze subscrybenta tabela `pg_stat_replication` jest pusta, dane replikacji są zapisane w tabeli `pg_stat_subscription`

```
sub_db=# select * from pg_stat_subscription;
-[ RECORD 1 ]-----+-----
subid          | 16395
subname        | test_subscription
pid            | 379
relid          |
received_lsn   | 0/172A500
last_msg_send_time | 2024-05-20 17:05:25.889629+00
last_msg_receipt_time | 2024-05-20 17:05:25.889726+00
latest_end_lsn  | 0/172A500
latest_end_time | 2024-05-20 17:05:25.889629+00
```

Zatrzymano subskrypcję na serwerze subscrybenta

```
sub_db=# alter subscription test_subscription disable;
ALTER SUBSCRIPTION
```

Na serwerze publishera tabela `pg_stat_replication` jest pusta

```
pub_db=# select * from pg_stat_replication;
(0 rows)
```

Ponownie uruchomiono subskrypcję

```
sub_db=# alter subscription test_subscription enable;
ALTER SUBSCRIPTION
```

Rozszerzenie konfiguracji

Utworzono 2 nowe serwery - `sub2_db` na porcie 5435 i `sub3_db` na porcie 5436

```
postgres@b266e31efaed:/$ pg_ctl -D /tmp/sub3_db -l /tmp/sub3_db_logfile start
waiting for server to start.... done
server started
postgres@b266e31efaed:/$ pg_ctl -D /tmp/sub2_db -l /tmp/sub2_db_logfile start
waiting for server to start.... done
server started
```

Utworzono na nich odpowiednio bazy `sub2_db` i `sub3_db`

```
postgres=# create database sub2_db;
CREATE DATABASE
```

```
postgres=# create database sub3_db;
CREATE DATABASE
```

Przekopiowano schemat tabeli `pub_tbl` do nowo utworzonych baz

```
postgres@b266e31efaed:/$ pg_dump -p 5433 -d pub_db -t pub_tbl -s | psql -p 5435 -d sub2_db
```

```
postgres@b266e31efaed:/$ pg_dump -p 5433 -d pub_db -t pub_tbl -s | psql -p 5436 -d sub3_db
```

```
sub2_db=# \d
          List of relations
Schema | Name   | Type  | Owner
-----+-----+-----+-----
public | pub_tbl | table | postgres
(1 row)
```

```
sub3_db=# \d
          List of relations
Schema | Name   | Type  | Owner
-----+-----+-----+-----
public | pub_tbl | table | postgres
(1 row)
```

Stworzono subskrypcję na obu bazach do bazy publishera

```
sub2_db=# create subscription test_subscription_2 connection 'port=5433 dbname=pub_db'
publication test_publication;
NOTICE:  created replication slot "test_subscription_2" on publisher
CREATE SUBSCRIPTION
```

```
sub3_db=# create subscription test_subscription_3 connection 'port=5433 dbname=pub_db'
publication test_publication;
NOTICE:  created replication slot "test_subscription_3" on publisher43
CREATE SUBSCRIPTION
```

Wszystkie 3 subskrypcje są widoczne w tabeli `pg_stat_replication` publishera

```

pub_db=# select * from pg_stat_replication;
-[ RECORD 1 ]-----+-----
pid                | 438
usesysid           | 10
username           | postgres
application_name    | test_subscription
client_addr        |
client_hostname     |
client_port        | -1
backend_start       | 2024-05-20 17:10:48.04593+00
backend_xmin        |
state              | streaming
sent_lsn            | 0/172A5E0
write_lsn           | 0/172A5E0
flush_lsn           | 0/172A5E0
replay_lsn          | 0/172A5E0
write_lag           |
flush_lag           |
replay_lag          |
sync_priority       | 0
sync_state          | async
reply_time          | 2024-05-20 17:26:43.663224+00
-[ RECORD 2 ]-----+-----
pid                | 640
usesysid           | 10
username           | postgres
application_name    | test_subscription_2
client_addr        |
client_hostname     |
client_port        | -1
backend_start       | 2024-05-20 17:24:54.248382+00
backend_xmin        |
state              | streaming
sent_lsn            | 0/172A5E0
write_lsn           | 0/172A5E0
flush_lsn           | 0/172A5E0
replay_lsn          | 0/172A5E0
write_lag           |
flush_lag           |
replay_lag          |
sync_priority       | 0
sync_state          | async
reply_time          | 2024-05-20 17:26:43.663264+00

```

```

-[ RECORD 3 ]-----+-----
pid           | 653
usesysid      | 10
username      | postgres
application_name | test_subscription_3
client_addr   |
client_hostname |
client_port   | -1
backend_start | 2024-05-20 17:25:53.538571+00
backend_xmin  |
state        | streaming
sent_lsn     | 0/172A5E0
write_lsn    | 0/172A5E0
flush_lsn    | 0/172A5E0
replay_lsn   | 0/172A5E0
write_lag    |
flush_lag    |
replay_lag   |
sync_priority | 0
sync_state    | async
reply_time   | 2024-05-20 17:26:43.663202+00

```

Dodano nowy rekord do tabeli w bazie publishera

```

pub_db=# insert into pub_tbl values (1, 'roman', 'test')
pub_db=# ;
INSERT 0 1

```

Wszystkie bazy posiadają takie same rekody w tabeli

```

pub_db=# select * from pub_tbl;
 id | name  | email
----+-----+-----
 20 | data20 | email20
 21 | data21 | email21
 22 | data22 | email22
 23 | data23 | email23
 24 | data24 | email24
 25 | data25 | email25
 26 | data26 | email26
 27 | data27 | email27
  1 | roman  | test
(9 rows)

```

```
sub_db=# select * from pub_tbl;
 id |  name  | email
-----+-----+-----
 20 | data20 | email20
 21 | data21 | email21
 22 | data22 | email22
 23 | data23 | email23
 24 | data24 | email24
 25 | data25 | email25
 26 | data26 | email26
 27 | data27 | email27
  1 | roman  | test
(9 rows)
```

```
sub2_db=# select * from pub_tbl ;
 id |  name  | email
-----+-----+-----
 20 | data20 | email20
 21 | data21 | email21
 22 | data22 | email22
 23 | data23 | email23
 24 | data24 | email24
 25 | data25 | email25
 26 | data26 | email26
 27 | data27 | email27
  1 | roman  | test
(9 rows)
```

```
sub3_db=# select * from pub_tbl;
 id |  name  | email
-----+-----+-----
 20 | data20 | email20
 21 | data21 | email21
 22 | data22 | email22
 23 | data23 | email23
 24 | data24 | email24
 25 | data25 | email25
 26 | data26 | email26
 27 | data27 | email27
  1 | roman  | test
(9 rows)
```