

PostgreSQL Backup, Restore And Point-in-Time Recovery Using pgBackRest:

pgBackRest is a reliable backup and restore solution for PostgreSQL that seamlessly scales up to the largest databases and workloads.

Step1) Install pgbackrest:

#Install dependencies

sudo apt-get install postgresql-client libxml2 libssh2-1

```
root@ip-172-31-93-76:~# sudo apt-get install postgresql-client libxml2 libssh2-1
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
Note, selecting 'libssh2-1t64' instead of 'libssh2-1'
libssh2-1t64 is already the newest version (1.11.0-4.1build2).
The following NEW packages will be installed:
  libxml2 postgresql-client
0 upgraded, 2 newly installed, 0 to remove and 16 not upgraded.
Need to get 0 B/774 kB of archives.
After this operation, 2145 kB of additional disk space will be used.
Do you want to continue? [Y/n] y
Selecting previously unselected package libxml2:amd64.
(Reading database ... 101598 files and directories currently installed.)
Preparing to unpack .../libxml2_2.9.14+dfsg-1.3ubuntu3_amd64.deb ...
Unpacking libxml2:amd64 (2.9.14+dfsg-1.3ubuntu3) ...
Selecting previously unselected package postgresql-client.
Preparing to unpack .../postgresql-client_16+257build1_all.deb ...
Unpacking postgresql-client (16+257build1) ...
Setting up postgresql-client (16+257build1) ...
Setting up libxml2:amd64 (2.9.14+dfsg-1.3ubuntu3) ...
Processing triggers for libc-bin (2.39-0ubuntu8.2) ...
Scanning processes...
Scanning linux images...
```

#Install pgbackrest

sudo apt-get install pgbackrest

```
root@ip-172-31-93-76:~# sudo apt-get install pgbackrest
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  libcommon-sense-perl libjson-perl libjson-xs-perl libtypes-serialiser-perl postgresql-common ssl-cert
Suggested packages:
  pgbackrest-doc check-pgbackrest
The following NEW packages will be installed:
  libcommon-sense-perl libjson-perl libjson-xs-perl libtypes-serialiser-perl pgbackrest postgresql-common ssl-cert
0 upgraded, 7 newly installed, 0 to remove and 16 not upgraded.
Need to get 0 B/903 kB of archives.
After this operation, 2575 kB of additional disk space will be used.
Do you want to continue? [Y/n] y
Preconfiguring packages ...
Selecting previously unselected package libjson-perl.
(Reading database ... 101610 files and directories currently installed.)
Preparing to unpack .../0-libjson-perl_4.10000-1_all.deb ...
Unpacking libjson-perl (4.10000-1) ...
Selecting previously unselected package ssl-cert.
Preparing to unpack .../1-ssl-cert_1.1.2ubuntu1_all.deb ...
Unpacking ssl-cert (1.1.2ubuntu1) ...
Selecting previously unselected package postgresql-common.
Preparing to unpack .../2-postgresql-common_257build1_all.deb ...
Adding 'diversion of /usr/bin/pg_config to /usr/bin/pg_config.libpq-dev by postgresql-common'
Unpacking postgresql-common (257build1) ...
```

#Check version and options

sudo -u postgres pgbackrest

```
root@ip-172-31-93-76:~# sudo -u postgres pgbackrest
pgBackRest 2.50 - General help

Usage:
  pgbackrest [options] [command]

Commands:
  annotate      Add or modify backup annotation.
  archive-get   Get a WAL segment from the archive.
  archive-push  Push a WAL segment to the archive.
  backup        Backup a database cluster.
  check         Check the configuration.
  expire        Expire backups that exceed retention.
  help          Get help.
  info          Retrieve information about backups.
  repo-get      Get a file from a repository.
  repo-ls       List files in a repository.
  restore       Restore a database cluster.
  server        pgBackRest server.
  server-ping   Ping pgBackRest server.
  stanza-create Create the required stanza data.
  stanza-delete Delete a stanza.
  stanza-upgrade Upgrade a stanza.
  start         Allow pgBackRest processes to run.
  stop          Stop pgBackRest processes from running.
  verify        Verify contents of the repository.
  version       Get version.

Use 'pgbackrest help [command]' for more information.
```

Step2) Create repository for pgBackRest backups:

mkdir -p /db_backup/base_backup

chown postgres:postgres /db_backup/

```
root@ip-172-31-93-76:~# mkdir -p /db_backup/base_backup
chown postgres:postgres /db_backup/
root@ip-172-31-93-76:~# ls -ltrh /db_backup/
total 4.0K
drwxr-xr-x 2 postgres postgres 4.0K Jul 25 10:56 base_backup
root@ip-172-31-93-76:~#
```

Step3) Configure the pgBackRest:

Configurations:

repo1-block --> Enable block incremental backup

repo1-bundle --> Bundle files in repository

repo1-path --> Path where backups and archive are stored

repo1-retention-diff --> Number of differential backups to retain

repo1-retention-full --> Number of full backups to retain

start-fast --> Force a checkpoint to start backup quickly

compress-level --> File compression level

pg1-path --> PostgreSQL cluster data directory

pg1-socket-path --> PostgreSQL unix socket path

#Edit /etc/pgbackrest.conf file

vim /etc/pgbackrest.conf

[global]

repo1-block=y

repo1-bundle=y

repo1-path=/db_backup/base_backup

repo1-retention-diff=1

repo1-retention-full=2

start-fast=y

compress-level=6

[global:archive-push]

compress-level=6

[cluster]

pg1-path=/db_data/data

pg1-socket-path=/tmp

save&exit

```

root@ip-172-31-93-76:/db_data/data# ls -ltrh /etc/pgbackrest.conf
-rw-r----- 1 postgres postgres 772 Jul 26 11:20 /etc/pgbackrest.conf
root@ip-172-31-93-76:/db_data/data# vim /etc/pgbackrest.conf
root@ip-172-31-93-76:/db_data/data# cat /etc/pgbackrest.conf
#(global)
#repol-path=/var/lib/pgbackrest
#repol-retention-full=2
#repol-cipher-pass=...
#repol-cipher-type=aes-256-cbc

#[main]
#pgl-path=/var/lib/postgresql/13/main

[global]
repol-block=y
repol-bundle=y
repol-path=/db_backup/base_backup
repol-retention-diff=1
repol-retention-full=2
start-fast=y
compress-level=6

[global:archive-push]
compress-level=6

[cluster]
pgl-path=/db_data/data
pgl-socket-path=/tmp
root@ip-172-31-93-76:/db_data/data#

```

Step4) Configure archive settings:

#Configure below parameters in a \$PGDATA/postgresql.conf file

vim /db_data/data/postgresql.conf

listen_addresses = '*'

wal_level = replica

archive_mode = on

archive_command = 'pgbackrest --stanza=master archive-push %p'

max_wal_senders = 3

save&exit

```

root@ip-172-31-93-76:/db_data/data# vim postgresql.conf
root@ip-172-31-93-76:/db_data/data# cat postgresql.conf |grep -iE "listen_addresses|wal_level|archive_mode|archive_command|max_wal_senders"
listen_addresses = '*'          # what IP address(es) to listen on;
wal_level = replica            # minimal, replica, or logical
archive_mode = on              # enables archiving; off, on, or always
                                # (empty string indicates archive_command should
archive_command = 'pgbackrest --stanza=cluster archive-push %p' # command to use to archive a logfile segment
max_wal_senders = 10          # max number of walsender processes
root@ip-172-31-93-76:/db_data/data#

```

#Restart the PostgreSQL service

systemctl restart postgresql.service

systemctl status postgresql.service

```

root@ip-172-31-93-76:/db_data/data# systemctl restart postgresql.service
root@ip-172-31-93-76:/db_data/data# systemctl status postgresql.service
● postgresql.service - PostgreSQL database server
   Loaded: loaded (/etc/systemd/system/postgresql.service; enabled; preset: enabled)
   Active: active (running) since Fri 2024-07-26 11:26:32 UTC; 11s ago
     Docs: https://www.postgresql.org/docs/
    Process: 3730 ExecStart=/usr/local/pgsql/bin/pg_ctl start -D /db_data/data (code=waited, status=0/SUCCESS)
   Main PID: 3734 (postgres)
      Tasks: 8 (limit: 1130)
    Memory: 15.4M (peak 15.6M)
       CPU: 31ms
   CGroup: /system.slice/postgresql.service
           └─3734 /usr/local/pgsql/bin/postgres -D /db_data/data
             └─3735 "postgres: logger"
               └─3736 "postgres: checkpoint"
                 └─3737 "postgres: background writer"
                   └─3739 "postgres: walwriter"
                     └─3740 "postgres: autovacuum launcher"
                       └─3741 "postgres: archiver"
                         └─3742 "postgres: logical replication launcher"

Jul 26 11:26:32 ip-172-31-93-76 systemd[1]: Starting postgresql.service - PostgreSQL database server...
Jul 26 11:26:32 ip-172-31-93-76 pg_ctl[3730]: waiting for server to start...
Jul 26 11:26:32 ip-172-31-93-76 pg_ctl[3734]: 2024-07-26 11:26:32.086 UTC [3734] LOG: redirecting log output to logging collector process
Jul 26 11:26:32 ip-172-31-93-76 pg_ctl[3734]: 2024-07-26 11:26:32.086 UTC [3734] HINT: Future log output will appear in directory "log".
Jul 26 11:26:32 ip-172-31-93-76 pg_ctl[3730]: done
Jul 26 11:26:32 ip-172-31-93-76 pg_ctl[3730]: server started
Jul 26 11:26:32 ip-172-31-93-76 systemd[1]: Started postgresql.service - PostgreSQL database server.
root@ip-172-31-93-76:/db_data/data#

```

Step5) Create the Stanza:

#Create the Stanza

sudo -u postgres pgbackrest --stanza=cluster --log-level-console=info stanza-create

```
root@ip-172-31-93-76:/db_data/data# sudo -u postgres pgbackrest --stanza=cluster --log-level-console=info stanza-create
2024-07-26 11:37:32.887 P00 INFO: stanza-create command begin 2.50: --exec-id=3784-2e7ef4a6 --log-level-console=info --pgl-path=/db_data/data --pgl-socket-path=/tmp --repol-path=/db_backup/base_backup --stanza=cluster
2024-07-26 11:37:33.501 P00 INFO: stanza-create for stanza 'cluster' on rep1
2024-07-26 11:37:33.525 P00 INFO: stanza-create command end: completed successfully (641ms)
root@ip-172-31-93-76:/db_data/data#
```

Check the configuration

sudo -u postgres pgbackrest --stanza=cluster --log-level-console=info check

```
root@ip-172-31-93-76:/db_data/data# sudo -u postgres pgbackrest --stanza=cluster --log-level-console=info check
2024-07-26 11:42:01.877 P00 INFO: check command begin 2.50: --exec-id=3862-dd6dd20b --log-level-console=info --pgl-path=/db_data/data --pgl-socket-path=/tmp
2024-07-26 11:42:02.485 P00 INFO: check rep1 configuration (primary)
2024-07-26 11:42:02.687 P00 INFO: check rep1 archive for WAL (primary)
2024-07-26 11:42:02.988 P00 INFO: WAL segment 000000020000000000000000B successfully archived to '/db_backup/base_backup/archive/cluster/15-1/0000000200000000/00/000000020000000000000000B-15af77b92977b4d58c956c632c2c194e5ddf6fd9.gz' on rep1
2024-07-26 11:42:02.989 P00 INFO: check command end: completed successfully (1115ms)
root@ip-172-31-93-76:/db_data/data#
```

#Verify the pgBackRest repository

```
root@ip-172-31-93-76:/db_data/data# ls -ltrh /db_backup/base_backup/
total 8.0K
drwxr-x--- 3 postgres postgres 4.0K Jul 26 11:37 archive
drwxr-x--- 3 postgres postgres 4.0K Jul 26 11:37 backup
root@ip-172-31-93-76:/db_data/data# ls -ltrh /db_backup/base_backup/archive/
total 4.0K
drwxr-x--- 3 postgres postgres 4.0K Jul 26 11:41 cluster
root@ip-172-31-93-76:/db_data/data# ls -ltrh /db_backup/base_backup/archive/cluster/
total 12K
-rw-r----- 1 postgres postgres 253 Jul 26 11:37 archive.info
-rw-r----- 1 postgres postgres 253 Jul 26 11:37 archive.info.copy
drwxr-x--- 3 postgres postgres 4.0K Jul 26 11:41 15-1
root@ip-172-31-93-76:/db_data/data# ls -ltrh /db_backup/base_backup/archive/cluster/15-1/
total 4.0K
drwxr-x--- 2 postgres postgres 4.0K Jul 26 11:42 000000020000000000
root@ip-172-31-93-76:/db_data/data# ls -ltrh /db_backup/base_backup/archive/cluster/15-1/000000020000000000/
total 60K
-rw-r----- 1 postgres postgres 17K Jul 26 11:41 000000020000000000000009-f967b2908329f730c184711c8f7ede8f8678e5f1.gz
-rw-r----- 1 postgres postgres 17K Jul 26 11:41 00000002000000000000000A-cba960c93e724f18fc7ff27282059f076ad1bf2d.gz
-rw-r----- 1 postgres postgres 17K Jul 26 11:42 00000002000000000000000B-15af77b92977b4d58c956c632c2c194e5ddf6fd9.gz
root@ip-172-31-93-76:/db_data/data# ls -ltrh /db_backup/base_backup/backup/
total 4.0K
drwxr-x--- 2 postgres postgres 4.0K Jul 26 11:37 cluster
root@ip-172-31-93-76:/db_data/data# ls -ltrh /db_backup/base_backup/backup/cluster/
total 8.0K
-rw-r----- 1 postgres postgres 370 Jul 26 11:37 backup.info
-rw-r----- 1 postgres postgres 370 Jul 26 11:37 backup.info.copy
root@ip-172-31-93-76:/db_data/data#
```

Step6) Perform different types of backups:

#Perform Full backup

sudo -u postgres pgbackrest --stanza=cluster --log-level-console=info --type=full backup

```
root@ip-172-31-93-76:/home/ubuntu# sudo -u postgres pgbackrest --stanza=cluster --log-level-console=info --type=full backup
2024-07-26 11:53:52.289 P00 INFO: backup command begin 2.50: --compress-level=6 --exec-id=3986-c80f4b32 --log-level-console=info --pgl-path=/db_data/data --pgl-socket-path=/tmp --repol-block --repol-bundle --repol-path=/db_backup/base_backup --repol-retention-diff=1 --repol-retention-full=2 --stanza=cluster --start-fast --type=full
2024-07-26 11:53:52.994 P00 INFO: execute non-exclusive backup start: backup begins after the requested immediate checkpoint completes
2024-07-26 11:53:53.495 P00 INFO: backup start archive = 000000020000000000000000B, lsn = 0/D000028
2024-07-26 11:53:53.495 P00 INFO: check archive for prior segment 000000020000000000000000C
2024-07-26 11:53:56.008 P00 INFO: execute non-exclusive backup stop and wait for all WAL segments to archive
2024-07-26 11:53:56.209 P00 INFO: backup stop archive = 000000020000000000000000D, lsn = 0/D000138
2024-07-26 11:53:56.214 P00 INFO: check archive for segment(s) 00000002000000000000000D:000000020000000000000000D
2024-07-26 11:53:56.336 P00 INFO: new backup label = 20240726-115352F
2024-07-26 11:53:56.403 P00 INFO: full backup size = 21.4MB, file total = 971
2024-07-26 11:53:56.403 P00 INFO: backup command end: completed successfully (4117ms)
2024-07-26 11:53:56.404 P00 INFO: expire command begin 2.50: --exec-id=3986-c80f4b32 --log-level-console=info --repol-path=/db_backup/base_backup --repol-retention-diff=1 --repol-retention-full=2 --stanza=cluster
2024-07-26 11:53:56.415 P00 INFO: expire command end: completed successfully (11ms)
root@ip-172-31-93-76:/home/ubuntu#
```

#Perform Differential backup

sudo -u postgres pgbackrest --stanza=cluster --log-level-console=info --type=diff backup

```
root@ip-172-31-93-76:/home/ubuntu# sudo -u postgres pgbackrest --stanza=cluster --log-level-console=info --type=diff backup
2024-07-26 11:56:10.262 P00 INFO: backup command begin 2.50: --compress-level=6 --exec-id=4004-09c35af4 --log-level-console=info --pgl-path=/db_data/data --pgl-socket-path=/tmp --repol-block --repol-bundle --repol-path=/db_backup/base_backup --repol-retention-diff=1 --repol-retention-full=2 --stanza=cluster --start-fast --type=diff
2024-07-26 11:56:10.975 P00 INFO: last backup label = 20240726-115352F, version = 2.50
2024-07-26 11:56:10.975 P00 INFO: execute non-exclusive backup start: backup begins after the requested immediate checkpoint completes
2024-07-26 11:56:11.676 P00 INFO: backup start archive = 000000020000000000000000F, lsn = 0/F000028
2024-07-26 11:56:11.676 P00 INFO: check archive for prior segment 000000020000000000000000E
2024-07-26 11:56:12.230 P00 INFO: execute non-exclusive backup stop and wait for all WAL segments to archive
2024-07-26 11:56:12.431 P00 INFO: backup stop archive = 000000020000000000000000F, lsn = 0/F000100
2024-07-26 11:56:12.437 P00 INFO: check archive for segment(s) 00000002000000000000000F:000000020000000000000000F
2024-07-26 11:56:12.557 P00 INFO: new backup label = 20240726-115352F_20240726-115610D
2024-07-26 11:56:12.621 P00 INFO: diff backup size = 24.2KB, file total = 971
2024-07-26 11:56:12.621 P00 INFO: backup command end: completed successfully (2362ms)
2024-07-26 11:56:12.621 P00 INFO: expire command begin 2.50: --exec-id=4004-09c35af4 --log-level-console=info --repol-path=/db_backup/base_backup --repol-retention-diff=1 --repol-retention-full=2 --stanza=cluster
2024-07-26 11:56:12.636 P00 INFO: expire command end: completed successfully (15ms)
root@ip-172-31-93-76:/home/ubuntu#
```

#Perform Incremental backup

sudo -u postgres pgbackrest --stanza=cluster --log-level-console=info --type=incr backup

```
root@ip-172-31-93-76:/home/ubuntu# sudo -u postgres pgbackrest --stanza=cluster --log-level-console=info --type=incr backup
2024-07-26 11:56:50.648 P00 INFO: backup command begin 2.50: --compress-level=6 --exec-id=4016-44a0d96d --log-level-console=info --pg1-path=/db_data/data -
pg1-socket-path=/tmp --repol-block --repol-bundle --repol-path=/db_backup/base_backup --repol-retention-diff=1 --repol-retention-full=2 --stanza=cluster --s
tart-fast --type=incr
2024-07-26 11:56:51.362 P00 INFO: last backup label = 20240726-115352F_20240726-115610D, version = 2.50
2024-07-26 11:56:51.362 P00 INFO: execute non-exclusive backup start: backup begins after the requested immediate checkpoint completes
2024-07-26 11:56:52.064 P00 INFO: backup start archive = 00000002000000000000000011, lsn = 0/11000028
2024-07-26 11:56:52.064 P00 INFO: check archive for prior segment 00000002000000000000000010
2024-07-26 11:56:53.525 P00 INFO: execute non-exclusive backup stop and wait for all WAL segments to archive
2024-07-26 11:56:53.725 P00 INFO: backup stop archive = 00000002000000000000000011, lsn = 0/11000100
2024-07-26 11:56:53.735 P00 INFO: check archive for segment(s) 00000002000000000000000011:000000020000000000000011
2024-07-26 11:56:53.856 P00 INFO: new backup label = 20240726-115352F_20240726-115611I
2024-07-26 11:56:53.930 P00 INFO: incr backup size = 24.6KB, file total = 97L
2024-07-26 11:56:53.930 P00 INFO: backup command end: completed successfully (3295ms)
2024-07-26 11:56:53.930 P00 INFO: expire command begin 2.50: --exec-id=4016-44a0d96d --log-level-console=info --repol-path=/db_backup/base_backup --repol-r
etention-diff=1 --repol-retention-full=2 --stanza=cluster
2024-07-26 11:56:53.941 P00 INFO: expire command end: completed successfully (11ms)
root@ip-172-31-93-76:/home/ubuntu#
```

#Check backup info

sudo -u postgres pgbackrest info

```
root@ip-172-31-93-76:/home/ubuntu# sudo -u postgres pgbackrest info
stanza: cluster
status: ok
cipher: none

db (current)
wal archive min/max (15): 00000002000000000000000009/000000020000000000000011

full backup: 20240726-115352F
timestamp start/stop: 2024-07-26 11:53:52+00 / 2024-07-26 11:53:56+00
wal start/stop: 0000000200000000000000000D / 000000020000000000000000D
database size: 21.4MB, database backup size: 21.4MB
repol: backup size: 2.8MB

diff backup: 20240726-115352F_20240726-115610D
timestamp start/stop: 2024-07-26 11:56:10+00 / 2024-07-26 11:56:12+00
wal start/stop: 0000000200000000000000000F / 000000020000000000000000F
database size: 21.4MB, database backup size: 24.2KB
repol: backup size: 2.3KB
backup reference list: 20240726-115352F

incr backup: 20240726-115352F_20240726-115611I
timestamp start/stop: 2024-07-26 11:56:51+00 / 2024-07-26 11:56:53+00
wal start/stop: 00000002000000000000000011 / 000000020000000000000011
database size: 21.4MB, database backup size: 24.6KB
repol: backup size: 2.3KB
backup reference list: 20240726-115352F, 20240726-115352F_20240726-115610D
root@ip-172-31-93-76:/home/ubuntu#
```

#Verify backup directory

```
root@ip-172-31-93-76:/home/ubuntu# ls -ltrh /db_backup/base_backup/backup/
total 4.0K
drwxr-x--- 6 postgres postgres 4.0K Jul 26 11:56 cluster
root@ip-172-31-93-76:/home/ubuntu# ls -ltrh /db_backup/base_backup/backup/cluster/
total 24K
drwxr-x--- 4 postgres postgres 4.0K Jul 26 11:53 20240726-115352F
drwxr-x--- 3 postgres postgres 4.0K Jul 26 11:53 backup.history
drwxr-x--- 4 postgres postgres 4.0K Jul 26 11:56 20240726-115352F_20240726-115610D
drwxr-x--- 4 postgres postgres 4.0K Jul 26 11:56 20240726-115352F_20240726-115611I
-rwxrwxrwx 1 postgres postgres 33 Jul 26 11:56 latest -> 20240726-115352F_20240726-115611I
-rw-r----- 1 postgres postgres 2.8K Jul 26 11:56 backup.info
-rw-r----- 1 postgres postgres 2.8K Jul 26 11:56 backup.info.copy
root@ip-172-31-93-76:/home/ubuntu#
```

Step7) Restore the backup:

#Stop the PostgreSQL service

systemctl stop postgresql

systemctl status postgresql

```
root@ip-172-31-93-76:/home/ubuntu# systemctl stop postgresql
root@ip-172-31-93-76:/home/ubuntu# systemctl status postgresql
o postgresql.service - PostgreSQL database server
   Loaded: loaded (/etc/systemd/system/postgresql.service; enabled; preset: enabled)
   Active: inactive (dead) since Fri 2024-07-26 12:02:15 UTC; 2s ago
   Duration: 20min 36.924s
   Docs: https://www.postgresql.org/docs/
        Process: 3842 ExecStart=/usr/local/pgsql/bin/pg_ctl start -D /db_data/data (code=exited, status=0/SUCCESS)
        Process: 4044 ExecStop=/usr/local/pgsql/bin/pg_ctl stop -D /db_data/data (code=exited, status=0/SUCCESS)
   Main PID: 3845 (code=exited, status=0/SUCCESS)
      CPU0: 1.924s

Jul 26 11:41:38 ip-172-31-93-76 pg_ctl[3845]: 2024-07-26 11:41:38.437 UTC [3845] HINT: Future log output will appear in directory "log".
Jul 26 11:41:38 ip-172-31-93-76 pg_ctl[3842]: done
Jul 26 11:41:38 ip-172-31-93-76 pg_ctl[3842]: server started
Jul 26 11:41:38 ip-172-31-93-76 systemd[1]: Started postgresql.service - PostgreSQL database server.
Jul 26 12:02:14 ip-172-31-93-76 systemd[1]: Stopping postgresql.service - PostgreSQL database server...
Jul 26 12:02:15 ip-172-31-93-76 pg_ctl[4044]: waiting for server to shut down.... done
Jul 26 12:02:15 ip-172-31-93-76 pg_ctl[4044]: server stopped
Jul 26 12:02:15 ip-172-31-93-76 systemd[1]: postgresql.service: Deactivated successfully.
Jul 26 12:02:15 ip-172-31-93-76 systemd[1]: Stopped postgresql.service - PostgreSQL database server.
Jul 26 12:02:15 ip-172-31-93-76 systemd[1]: postgresql.service: Consumed 1.924s CPU time, 58.3M memory peak, 0B memory swap peak.
root@ip-172-31-93-76:/home/ubuntu#
```

#Remove existing files from cluster


```
cd /db_data/data
```

```
rm -rf *
```

```
root@ip-172-31-93-76:/home/ubuntu# cd /db_data/data
root@ip-172-31-93-76:/db_data/data# ls -ltrh
total 136K
-rw-r----- 1 postgres postgres 1.6K Jul 25 07:04 pg_ident.conf
-rw-r----- 1 postgres postgres 4.7K Jul 25 07:04 pg_hba.conf
-rw-r----- 1 postgres postgres   3 Jul 25 07:04 PG_VERSION
-rw-r----- 1 postgres postgres 258 Jul 25 08:39 backup_label.old
drwx----- 2 postgres postgres 4.0K Jul 25 09:02 pg_twophase
drwx----- 2 postgres postgres 4.0K Jul 25 09:02 pg_tliaps
drwx----- 2 postgres postgres 4.0K Jul 25 09:02 pg_stat_tmp
drwx----- 2 postgres postgres 4.0K Jul 25 09:02 pg_snapshots
drwx----- 2 postgres postgres 4.0K Jul 25 09:02 pg_serial
drwx----- 2 postgres postgres 4.0K Jul 25 09:02 pg_replicat
drwx----- 2 postgres postgres 4.0K Jul 25 09:02 pg_notify
drwx----- 4 postgres postgres 4.0K Jul 25 09:02 pg_multixact
drwx----- 2 postgres postgres 4.0K Jul 25 09:02 pg_dynshmem
drwx----- 2 postgres postgres 4.0K Jul 25 09:02 pg_commit_ts
drwx----- 5 postgres postgres 4.0K Jul 25 09:02 base
drwx----- 2 postgres postgres 4.0K Jul 25 09:02 pg_xact
-rw-r----- 1 postgres postgres 358 Jul 25 09:02 postgresql.auto.conf
drwx----- 2 postgres postgres 4.0K Jul 25 09:03 pg_subtrans
drwx----- 2 postgres postgres 4.0K Jul 26 07:46 log
-rw-r----- 1 postgres postgres 29K Jul 26 11:40 postgresql.conf
-rw-r----- 1 postgres postgres 38 Jul 26 11:41 current_logfiles
-rw-r----- 1 postgres postgres 51 Jul 26 11:41 postmaster.opts
drwx----- 2 postgres postgres 4.0K Jul 26 11:42 global
drwx----- 3 postgres postgres 4.0K Jul 26 12:01 pg_wal
drwx----- 4 postgres postgres 4.0K Jul 26 12:02 pg_logical
drwx----- 2 postgres postgres 4.0K Jul 26 12:02 pg_stat
root@ip-172-31-93-76:/db_data/data# rm -rf *
root@ip-172-31-93-76:/db_data/data# ls -ltrh
total 0
root@ip-172-31-93-76:/db_data/data#
```

#Restore the backup of the cluster

Note: The restore command automatically defaults to selecting the latest backup from the first repository where backups exist.

```
sudo -u postgres pgbackrest --stanza=cluster --log-level-console=info restore
```

```
root@ip-172-31-93-76:/db_data/data# sudo -u postgres pgbackrest --stanza=cluster --log-level-console=info restore
2024-07-26 12:07:02.279 P00 INFO: restore command begin 2.50: --exec-id=4062-38bacaef --log-level-console=info --pgl-path=/db_data/data --repol-path=/db_data/data
2024-07-26 12:07:02.288 P00 INFO: repol: restore backup set 20240726-115352F_20240726-115651I, recovery will start at 2024-07-26 11:56:51
2024-07-26 12:07:06.049 P00 INFO: write updated /db_data/data/postgresql.auto.conf
2024-07-26 12:07:06.059 P00 INFO: restore global/pg_control (performed last to ensure aborted restores cannot be started)
2024-07-26 12:07:06.062 P00 INFO: restore size = 31.4MB, file total = 971
2024-07-26 12:07:06.062 P00 INFO: restore command end: completed successfully (3785ms)
root@ip-172-31-93-76:/db_data/data#
```

#Start the PostgreSQL service and check the status

```
systemctl start postgresql
```

```
systemctl status postgresql
```

```
root@ip-172-31-93-76:/db_data/data# systemctl start postgresql
root@ip-172-31-93-76:/db_data/data# systemctl status postgresql
● postgresql.service - PostgreSQL database server
   Loaded: loaded (/etc/systemd/system/postgresql.service; enabled; preset: enabled)
   Active: active (running) since Fri 2024-07-26 12:09:13 UTC; 6s ago
     Docs: https://www.postgresql.org/docs/
   Process: 4067 ExecStart=/usr/local/pgsql/bin/pg_ctl start -D /db_data/data (code=exited, status=0/SUCCESS)
    Main PID: 4070 (postgres)
       Tasks: 8 (limit: 1130)
      Memory: 64.9M (peak: 67.3M)
         CPU: 324ms
    CGroup: /system.slice/postgresql.service
            └─4070 /usr/local/pgsql/bin/postgres -D /db_data/data
              └─4071 "postgres: logger"
                └─4072 "postgres: checkpoint"
                  └─4073 "postgres: background writer"
                    └─4093 "postgres: walwriter"
                      └─4094 "postgres: autovacuum launcher"
                        └─4095 "postgres: archiver last was 00000003.history"
                          └─4096 "postgres: logical replication launcher"

Jul 26 12:09:13 ip-172-31-93-76 systemd[1]: Starting postgresql.service - PostgreSQL database server...
Jul 26 12:09:13 ip-172-31-93-76 pg_ctl[4067]: waiting for server to start....
Jul 26 12:09:13 ip-172-31-93-76 pg_ctl[4070]: 2024-07-26 12:09:13.555 UTC [4070] LOG: redirecting log output to logging collector process
Jul 26 12:09:13 ip-172-31-93-76 pg_ctl[4070]: 2024-07-26 12:09:13.555 UTC [4070] HINT: Future log output will appear in directory "log".
Jul 26 12:09:13 ip-172-31-93-76 pg_ctl[4067]: done
Jul 26 12:09:13 ip-172-31-93-76 pg_ctl[4067]: server started
Jul 26 12:09:13 ip-172-31-93-76 systemd[1]: Started postgresql.service - PostgreSQL database server.
root@ip-172-31-93-76:/db_data/data# su - postgres
postgres@ip-172-31-93-76:~$ psql (15.7)
Type "help" for help.

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

Step8) Point-In-Time-Recovery:

#Perform full backup

sudo -u postgres pgbackrest --stanza=cluster --log-level-console=info --type=full backup

```
root@ip-172-31-93-76:~# sudo -u postgres pgbackrest --stanza=cluster --log-level-console=info --type=full backup
2024-07-26 17:08:46.888 P00 INFO: backup command begin 2.50: --compress-level=6 --exec-id=1027-2c3ad733 --log-level-console=info --pgl-path=/db_data/data -
pgl-socket-path=/tmp --repol-block --repol-bundle --repol-path=/db_backup/base_backup --repol-retention-diff=1 --repol-retention-full=2 --stanza=cluster --s
tart-fast --type=full
2024-07-26 17:08:47.593 P00 INFO: execute non-exclusive backup start: backup begins after the requested immediate checkpoint completes
2024-07-26 17:08:48.295 P00 INFO: backup start archive = 00000003000000000000000019, lsn = 0/19000028
2024-07-26 17:08:48.295 P00 INFO: check archive for prior segment 00000003000000000000000018
2024-07-26 17:08:48.916 P00 INFO: execute non-exclusive backup stop and wait for all WAL segments to archive
2024-07-26 17:08:50.117 P00 INFO: backup stop archive = 00000003000000000000000019, lsn = 0/19000100
2024-07-26 17:08:50.123 P00 INFO: check archive for segment(s) 00000003000000000000000019:00000003000000000000000019
2024-07-26 17:08:50.245 P00 INFO: new backup label = 20240726-170847F
2024-07-26 17:08:50.303 P00 INFO: full backup size = 21.4MB, file total = 971
2024-07-26 17:08:50.303 P00 INFO: backup command end: completed successfully (3418ms)
2024-07-26 17:08:50.303 P00 INFO: expire command begin 2.50: --exec-id=1027-2c3ad733 --log-level-console=info --repol-path=/db_backup/base_backup --repol-r
etention-diff=1 --repol-retention-full=2 --stanza=cluster
2024-07-26 17:08:50.304 P00 INFO: repol: expire full backup 20240726-115352F
2024-07-26 17:08:50.316 P00 INFO: repol: remove expired backup 20240726-115352F
2024-07-26 17:08:50.318 P00 INFO: repol: 15-1 remove archive, start = 000000020000000000, stop = 000000030000000000000016
2024-07-26 17:08:50.319 P00 INFO: expire command end: completed successfully (16ms)
```

#Check backup info

sudo -u postgres pgbackrest info

```
root@ip-172-31-93-76:~# sudo -u postgres pgbackrest info
stanza: cluster
status: ok
cipher: none

db (current)
wal archive min/max (15): 00000003000000000000000017/00000003000000000000000019

full backup: 20240726-170103F
timestamp start/stop: 2024-07-26 17:01:03+00 / 2024-07-26 17:01:05+00
wal start/stop: 00000003000000000000000017 / 00000003000000000000000017
database size: 21.4MB, database backup size: 21.4MB
repol: backup size: 2.8MB

full backup: 20240726-170847F
timestamp start/stop: 2024-07-26 17:08:47+00 / 2024-07-26 17:08:50+00
wal start/stop: 00000003000000000000000019 / 00000003000000000000000019
database size: 21.4MB, database backup size: 21.4MB
repol: backup size: 2.8MB
root@ip-172-31-93-76:~# ls -ltrh /db_backup/base_backup/backup/cluster/
total 20K
drwxr-x--- 3 postgres postgres 4.0K Jul 26 11:53 backup.history
drwxr-x--- 4 postgres postgres 4.0K Jul 26 17:01 20240726-170103F
drwxr-x--- 4 postgres postgres 4.0K Jul 26 17:08 20240726-170847F
lrwxrwxrwx 1 postgres postgres 16 Jul 26 17:08 latest -> 20240726-170847F
-rw-r----- 1 postgres postgres 1.9K Jul 26 17:08 backup.info
-rw-r----- 1 postgres postgres 1.9K Jul 26 17:08 backup.info.copy
root@ip-172-31-93-76:~#
```

#Get the time from PostgreSQL

SELECT now();

```
postgres@ip-172-31-93-76:~$ psql
psql (15.7)
Type "help" for help.

postgres=# SELECT now();
          now
-----
2024-07-26 17:11:35.727853+00
(1 row)
```

#Check the table data and perform some delete operations

SELECT * FROM categories;

DELETE FROM categories WHERE category_id =1;

DELETE FROM categories WHERE category_id =2;

DELETE FROM categories WHERE category_id =3;

```
postgres=# SELECT * FROM categories;
 category_id | category_name | description
-----
1 | Beverages    | Soft drinks, coffees, teas, beers, and ales
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)

postgres=# DELETE FROM categories WHERE category_id =1;
DELETE 1
postgres=# DELETE FROM categories WHERE category_id =2;
DELETE 1
postgres=# DELETE FROM categories WHERE category_id =3;
DELETE 1
postgres=# SELECT * FROM categories;
 category_id | category_name | description
-----
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
(5 rows)
```

#Stop the PostgreSQL service

systemctl stop postgresql.service

systemctl status postgresql.service

```
root@ip-172-31-93-76:~# systemctl stop postgresql.service
root@ip-172-31-93-76:~# systemctl status postgresql.service
○ postgresql.service - PostgreSQL database server
   Loaded: loaded (/etc/systemd/system/postgresql.service; enabled; preset: enabled)
   Active: inactive (dead) since Fri 2024-07-26 17:17:33 UTC; 10s ago
   Duration: 27min 121ms
   Docs: https://www.postgresql.org/docs/
   Process: 517 ExecStart=/usr/local/pgsql/bin/pg_ctl start -D /db_data/data (code=exited, status=0/SUCCESS)
   Process: 1088 ExecStop=/usr/local/pgsql/bin/pg_ctl stop -D /db_data/data (code=exited, status=0/SUCCESS)
   Main PID: 649 (code=exited, status=0/SUCCESS)
   CPU: 1.158s

Jul 26 16:50:33 ip-172-31-93-76 pg_ctl[649]: 2024-07-26 16:50:33.241 UTC [649] HINT: Future log output will appear in directory "log".
Jul 26 16:50:33 ip-172-31-93-76 pg_ctl[517]: done
Jul 26 16:50:33 ip-172-31-93-76 pg_ctl[517]: server started
Jul 26 16:50:33 ip-172-31-93-76 systemd[1]: Started postgresql.service - PostgreSQL database server.
Jul 26 17:17:33 ip-172-31-93-76 systemd[1]: Stopping postgresql.service - PostgreSQL database server.
Jul 26 17:17:33 ip-172-31-93-76 pg_ctl[1088]: waiting for server to shut down.... done
Jul 26 17:17:33 ip-172-31-93-76 pg_ctl[1088]: server stopped
Jul 26 17:17:33 ip-172-31-93-76 systemd[1]: postgresql.service: Deactivated successfully.
Jul 26 17:17:33 ip-172-31-93-76 systemd[1]: Stopped postgresql.service - PostgreSQL database server.
Jul 26 17:17:33 ip-172-31-93-76 systemd[1]: postgresql.service: Consumed 1.158s CPU time.
root@ip-172-31-93-76:~#
```

#Delete the existing data directory files

rm -rf /db_data/data/*

```
root@ip-172-31-93-76:~# cd /db_data/data/
root@ip-172-31-93-76:/db_data/data# ls -ltrh
total 136K
-rw-r--r-- 1 postgres postgres 1.6K Jul 25 07:04 pg_ident.conf
-rw-r--r-- 1 postgres postgres 4.7K Jul 25 07:04 pg_hba.conf
-rw-r--r-- 1 postgres postgres 3 Jul 25 07:04 PG_VERSION
-rw-r--r-- 1 postgres postgres 29K Jul 26 11:40 postgresql.conf
-rw-r--r-- 1 postgres postgres 260 Jul 26 11:56 backup_label.old
drwxr-xr-x 2 postgres postgres 4.0K Jul 26 12:07 pg_twophase
drwxr-xr-x 2 postgres postgres 4.0K Jul 26 12:07 pg_tblspc
drwxr-xr-x 2 postgres postgres 4.0K Jul 26 12:07 pg_wal
drwxr-xr-x 2 postgres postgres 4.0K Jul 26 12:07 pg_snapshots
drwxr-xr-x 2 postgres postgres 4.0K Jul 26 12:07 pg_serial
drwxr-xr-x 2 postgres postgres 4.0K Jul 26 12:07 pg_replicat
drwxr-xr-x 2 postgres postgres 4.0K Jul 26 12:07 pg_notify
drwxr-xr-x 4 postgres postgres 4.0K Jul 26 12:07 pg_multixact
drwxr-xr-x 2 postgres postgres 4.0K Jul 26 12:07 pg_dynshmem
drwxr-xr-x 2 postgres postgres 4.0K Jul 26 12:07 pg_commit_ts
drwxr-xr-x 5 postgres postgres 4.0K Jul 26 12:07 base
drwxr-xr-x 2 postgres postgres 4.0K Jul 26 12:07 log
drwxr-xr-x 2 postgres postgres 4.0K Jul 26 12:07 pg_xact
-rw-r--r-- 1 postgres postgres 673 Jul 26 12:07 postgresql.auto.conf
drwxr-xr-x 2 postgres postgres 4.0K Jul 26 12:09 pg_subtrans
-rw-r--r-- 1 postgres postgres 30 Jul 26 16:50 current_logfiles
-rw-r--r-- 1 postgres postgres 51 Jul 26 16:50 postmaster.opts
drwxr-xr-x 2 postgres postgres 4.0K Jul 26 16:51 global
drwxr-xr-x 3 postgres postgres 4.0K Jul 26 17:13 pg_wal
drwxr-xr-x 4 postgres postgres 4.0K Jul 26 17:17 pg_logical
drwxr-xr-x 2 postgres postgres 4.0K Jul 26 17:17 pg_stat
root@ip-172-31-93-76:/db_data/data# rm -rf *
root@ip-172-31-93-76:/db_data/data# ls -ltrh
total 0
root@ip-172-31-93-76:/db_data/data#
```

#Restore cluster backup

sudo -u postgres pgbackrest --stanza=cluster --log-level-console=info --type=time "--target=2024-07-26 17:11:35.727853+00" --target-action=promote restore

```
root@ip-172-31-93-76:/db_data/data# sudo -u postgres pgbackrest --stanza=cluster --log-level-console=info --type=time "--target=2024-07-26 17:11:35.727853+00" --target-action=promote restore
2024-07-26 17:21:47.304 P00 INFO: restore command begin 2.50: --exec-id=1120-02c10acc --log-level-console=info --pgl-path=/db_data/data --repol-path=/db_data/data/backup/base backup --stanza=cluster --target="2024-07-26 17:11:35.727853+00" --target-action=promote --type=time
2024-07-26 17:21:47.314 P00 INFO: repol: restore backup set 20240726-170847F, recovery will start at 2024-07-26 17:08:47
2024-07-26 17:21:50.943 P00 INFO: write updated /db_data/data/postgresql.auto.conf
2024-07-26 17:21:50.955 P00 INFO: restore global/pg_control (performed last to ensure aborted restores cannot be started)
2024-07-26 17:21:50.957 P00 INFO: restore size = 21.4MB, file total = 971
2024-07-26 17:21:50.959 P00 INFO: restore command end: completed successfully (3657ms)
```

#pgBackRest has generated the recovery settings in postgresql.auto.conf so PostgreSQL can be started immediately.

sudo -u postgres cat /db_data/data/postgresql.auto.conf

```
root@ip-172-31-93-76:/db_data/data# sudo -u postgres cat /db_data/data/postgresql.auto.conf
# Do not edit this file manually!
# It will be overwritten by the ALTER SYSTEM command.

# Recovery settings generated by pgBackRest restore on 2024-07-25 09:02:29
restore_command = 'pgbackrest --stanza=master archive-get %f "%p"'
# Removed by pgBackRest restore on 2024-07-26 12:07:06 # recovery_target_time = '2024-07-25 08:42:53.727774+00'
# Removed by pgBackRest restore on 2024-07-26 12:07:06 # recovery_target_action = 'promote'
# Removed by pgBackRest restore on 2024-07-26 12:07:06 # recovery_target_timeline = 'current'

# Recovery settings generated by pgBackRest restore on 2024-07-26 12:07:06
restore_command = 'pgbackrest --stanza=cluster archive-get %f "%p"'

# Recovery settings generated by pgBackRest restore on 2024-07-26 17:21:50
restore_command = 'pgbackrest --stanza=cluster archive-get %f "%p"'
recovery_target_time = '2024-07-26 17:11:35.727853+00'
recovery_target_action = 'promote'
root@ip-172-31-93-76:/db_data/data#
```


#Start and check PostgreSQL status

systemctl start postgresql.service

systemctl status postgresql.service

```
root@ip-172-31-93-76:/db_data/data# systemctl start postgresql.service
root@ip-172-31-93-76:/db_data/data# systemctl status postgresql.service
● postgresql.service - PostgreSQL database server
   Loaded: loaded (/etc/systemd/system/postgresql.service; enabled; preset: enabled)
   Active: active (running) since Fri 2024-07-26 17:31:18 UTC; 8s ago
     Docs: https://www.postgresql.org/docs/
    Process: 1146 ExecStart=/usr/local/pgsql/bin/pg_ctl start -D /db_data/data (code=exited, status=0/SUCCESS)
   Main PID: 1149 (postgres)
      Tasks: 8 (limit: 1130)
    Memory: 64.9M (peak: 67.4M)
       CPU: 321ms
    CGroup: /system.slice/postgresql.service
            └─1149 /usr/local/pgsql/bin/postgres -D /db_data/data
               └─1150 "postgres: logger "
                  └─1151 "postgres: checkpoint writer "
                     └─1152 "postgres: background writer "
                        └─1170 "postgres: walwriter "
                           └─1171 "postgres: autovacuum launcher "
                              └─1172 "postgres: archiver last was 00000004.history"
                                 └─1173 "postgres: logical replication launcher "
```

```
Jul 26 17:31:17 ip-172-31-93-76 systemd[1]: Starting postgresql.service - PostgreSQL database server...
Jul 26 17:31:17 ip-172-31-93-76 pg_ctl[1146]: waiting for server to start....
Jul 26 17:31:17 ip-172-31-93-76 pg_ctl[1149]: 2024-07-26 17:31:17.734 UTC [1149] LOG: redirecting log output to logging collector process
Jul 26 17:31:17 ip-172-31-93-76 pg_ctl[1149]: 2024-07-26 17:31:17.734 UTC [1149] HINT: Future log output will appear in directory "log".
Jul 26 17:31:18 ip-172-31-93-76 pg_ctl[1146]: done
Jul 26 17:31:18 ip-172-31-93-76 pg_ctl[1146]: server started
Jul 26 17:31:18 ip-172-31-93-76 systemd[1]: Started postgresql.service - PostgreSQL database server.
```

#Check the PostgreSQL logs

tail -f \$PGDATA/log/postgresql-Fri.log

```
2024-07-26 17:31:17.735 UTC [1149] LOG: starting PostgreSQL 15.7 on x86_64-pc-linux-gnu, compiled by gcc (Ubuntu 13.2.0-23ubuntu4) 13.2.0, 64-bit
2024-07-26 17:31:17.735 UTC [1149] LOG: listening on IPv4 address "0.0.0.0", port 5432
2024-07-26 17:31:17.742 UTC [1149] LOG: listening on IPv6 address ":::", port 5432
2024-07-26 17:31:17.742 UTC [1149] LOG: listening on Unix socket "/tmp/.s.PGSQL.5432"
2024-07-26 17:31:17.750 UTC [1153] LOG: database system was interrupted; last known up at 2024-07-26 17:08:47 UTC
2024-07-26 17:31:17.777 UTC [1153] LOG: starting point-in-time recovery to 2024-07-26 17:11:35.727853+00
2024-07-26 17:31:17.777 UTC [1153] LOG: starting backup recovery with redo LSN 0/19000028, checkpoint LSN 0/19000060, on timeline ID 3
2024-07-26 17:31:17.788 UTC [1153] LOG: restored log file "00000003.history" from archive
2024-07-26 17:31:17.855 UTC [1153] LOG: restored log file "00000003000000000000000019" from archive
2024-07-26 17:31:17.945 UTC [1153] LOG: redo starts at 0/19000028
2024-07-26 17:31:18.008 UTC [1153] LOG: restored log file "0000000300000000000000001A" from archive
2024-07-26 17:31:18.089 UTC [1153] LOG: completed backup recovery with redo LSN 0/19000028 and end LSN 0/19000100
2024-07-26 17:31:18.089 UTC [1153] LOG: consistent recovery state reached at 0/19000100
2024-07-26 17:31:18.090 UTC [1153] LOG: recovery stopping before commit of transaction 747, time 2024-07-26 17:12:17.107323+00
2024-07-26 17:31:18.090 UTC [1149] LOG: database system is ready to accept read-only connections
2024-07-26 17:31:18.090 UTC [1153] LOG: redo done at 0/1A000320 system usage: CPU: user: 0.00 s, system: 0.00 s, elapsed: 0.14 s
2024-07-26 17:31:18.154 UTC [1153] LOG: restored log file "0000000300000000000000001A" from archive
2024-07-26 17:31:18.241 UTC [1153] LOG: selected new timeline ID: 4
2024-07-26 17:31:18.344 UTC [1153] LOG: restored log file "00000003.history" from archive
2024-07-26 17:31:18.350 UTC [1153] LOG: archive recovery complete
2024-07-26 17:31:18.353 UTC [1151] LOG: checkpoint starting: end-of-recovery immediate wait
2024-07-26 17:31:18.380 UTC [1151] LOG: checkpoint complete: wrote 4 buffers (0.0%); 0 WAL file(s) added, 0 removed, 1 recycled; write=0.005 s, sync=0.006 s, total=0.030 s; sync files=3, longest=0.003 s, average=0.002 s; distance=16384 kB, estimate=16384 kB
2024-07-26 17:31:18.385 UTC [1149] LOG: database system is ready to accept connections
postgres@ip-172-31-93-76:/db_data/data/log$
```

#Check the table data

SELECT * FROM categories;

```
root@ip-172-31-93-76:/db_data/data# su - postgres
postgres@ip-172-31-93-76:~$ psql
psql (15.7)
Type "help" for help.

postgres=# SELECT * FROM categories;
 category_id | category_name | description
-----
1 | Beverages | Soft drinks, coffees, teas, beers, and ales
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)

postgres=#
```

Step9) Delete a Stanza:

The stanza-delete command removes data in the repository associated with a stanza.

#Shut down the PostgreSQL cluster

systemctl stop postgresql.service

systemctl status postgresql.service

```
root@ip-172-31-93-76:/db_data/data# systemctl stop postgresql.service
root@ip-172-31-93-76:/db_data/data# systemctl status postgresql.service
● postgresql.service - PostgreSQL database server
   Loaded: loaded (/etc/systemd/system/postgresql.service; enabled; preset: enabled)
   Active: inactive (dead) since Fri 2024-07-26 17:41:34 UTC; 4s ago
     Duration: 10min 15.743s
    Docs: https://www.postgresql.org/docs/
   Process: 1146 ExecStart=/usr/local/pgsql/bin/pg_ctl start -D /db_data/data (code=exited, status=0/SUCCESS)
   Process: 1234 ExecStop=/usr/local/pgsql/bin/pg_ctl stop -D /db_data/data (code=exited, status=0/SUCCESS)
   Main PID: 1149 (code=exited, status=0/SUCCESS)
      CPU: 575ms

Jul 26 17:31:17 ip-172-31-93-76 pg_ctl[1149]: 2024-07-26 17:31:17.734 UTC [1149] LOG:  redirecting log output to logging collector process
Jul 26 17:31:17 ip-172-31-93-76 pg_ctl[1149]: 2024-07-26 17:31:17.734 UTC [1149] HINT:  Future log output will appear in directory "log".
Jul 26 17:31:18 ip-172-31-93-76 pg_ctl[1146]: done
Jul 26 17:31:18 ip-172-31-93-76 pg_ctl[1146]: server started
Jul 26 17:31:18 ip-172-31-93-76 systemd[1]: Started postgresql.service - PostgreSQL database server.
Jul 26 17:41:33 ip-172-31-93-76 systemd[1]: Stopping postgresql.service - PostgreSQL database server...
Jul 26 17:41:34 ip-172-31-93-76 pg_ctl[1234]: waiting for server to shut down.... done
Jul 26 17:41:34 ip-172-31-93-76 pg_ctl[1234]: server stopped
Jul 26 17:41:34 ip-172-31-93-76 systemd[1]: postgresql.service: Deactivated successfully.
Jul 26 17:41:34 ip-172-31-93-76 systemd[1]: Stopped postgresql.service - PostgreSQL database server.
root@ip-172-31-93-76:/db_data/data#
```

#Run the stop command

sudo -u postgres pgbackrest --stanza=cluster --log-level-console=info stop

```
root@ip-172-31-93-76:/db_data/data# sudo -u postgres pgbackrest --stanza=cluster --log-level-console=info stop
2024-07-26 17:43:42.181 P00 INFO: stop command begin 2.50: --exec-id=1243-8798b2f0 --log-level-console=info --stanza=cluster
2024-07-26 17:43:42.185 P00 INFO: stop command end: completed successfully (6ms)
root@ip-172-31-93-76:/db_data/data#
```

#Run the stanza-delete command and check the status

sudo -u postgres pgbackrest --stanza=cluster --repo=1 --log-level-console=info stanza-delete

sudo -u postgres pgbackrest info

```
root@ip-172-31-93-76:/db_data/data# sudo -u postgres pgbackrest --stanza=cluster --repo=1 --log-level-console=info stanza-delete
2024-07-26 17:46:10.243 P00 INFO: stanza-delete command begin 2.50: --exec-id=1251-47498f72 --log-level-console=info --pgl-path=/db_data/data --pgl-socket-path=/tmp --repo=1 --repol-path=/db_backup/base_backup --stanza=cluster
2024-07-26 17:46:10.246 P00 INFO: stanza-delete command end: completed successfully (6ms)
root@ip-172-31-93-76:/db_data/data# sudo -u postgres pgbackrest info
No stanzas exist in the repository.
root@ip-172-31-93-76:/db_data/data#
```