

PostgreSQL ON LINUX

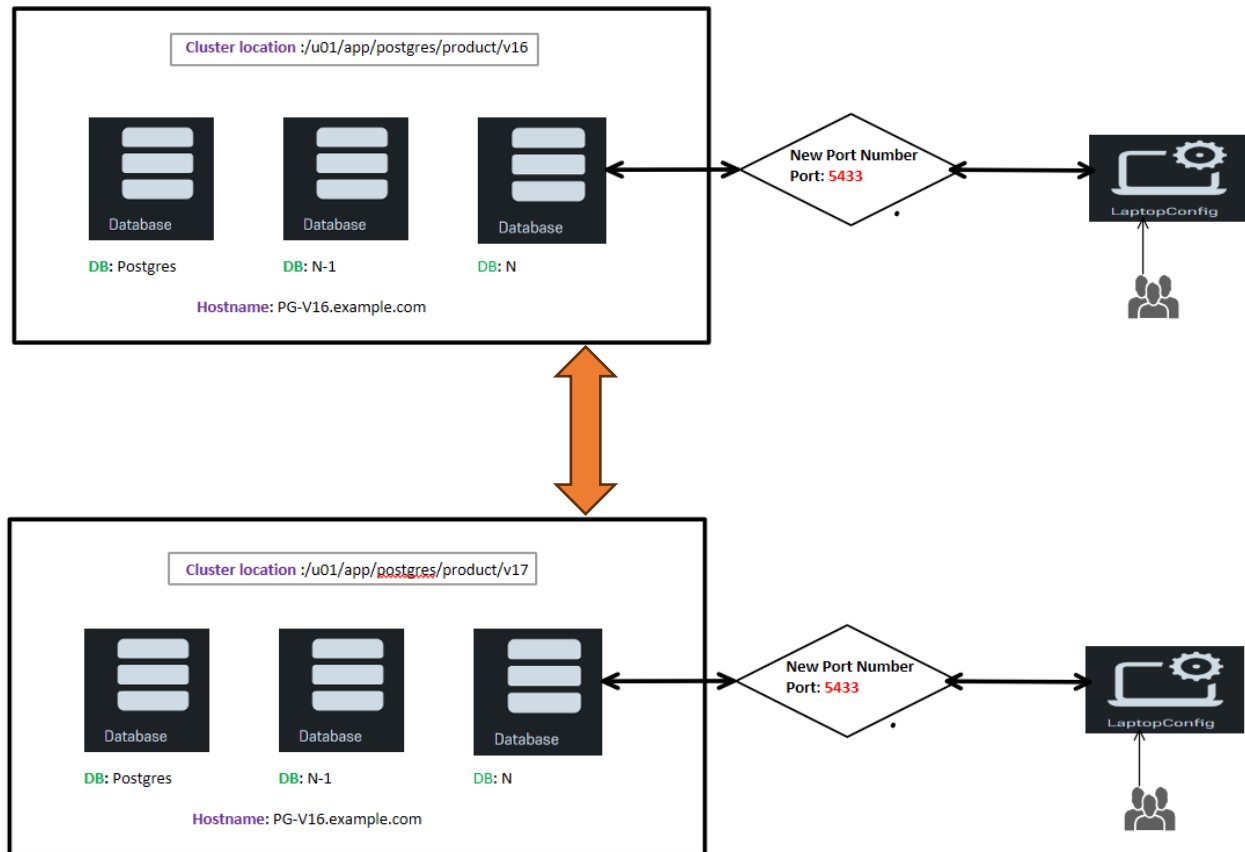
FIRST EDITION



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Topic: Upgrade the PostgreSQL major version v16 to v17

Deployment Diagram:



Infrastructure Details:

Before:

HOSTNAME: PG_V16.example.com	
OS version	Red Hat Enterprise Linux release 8.6 (Ootpa)
PG Version	PostgreSQL 16.1
Port number	5433
Cluster location	/u01/app/postgres/product/v16

After:

HOSTNAME: PG_V16.example.com	
OS version	Red Hat Enterprise Linux release 8.6 (Ootpa)
PG Version	PostgreSQL 17.2
Port number	5433
Cluster location	/u01/app/postgres/product/v17

In this QuickStart, we learn:

- Prerequisite Steps
 - Create the directory to store new cluster configuration and database files and folder
 - Provide appropriate permission to **Postgres** user on the newly created folder
 - Check the current version of the database
 - Install version 17 binaries to the server
 - Check the backup status if required take the full backup
 - Initialize the cluster
- Upgrade steps
- Validation

Phase-I Prerequisite Steps

- Create the directory to store new cluster configuration and database files and folder

```
[root@PG-V16 ~]#
[root@PG-V16 ~]# ps -ef | grep -i postgres
postgres    798      1    0 13:30 ?        00:00:00 /usr/pgsql-16/bin/postgres -D /var/lib/pgsql/16/data/
postgres    1024    798    0 13:30 ?        00:00:00 postgres: logger
postgres    1056    798    0 13:30 ?        00:00:00 postgres: checkpointer
postgres    1057    798    0 13:30 ?        00:00:00 postgres: background writer
postgres    1065      1    0 13:30 ?        00:00:00 /usr/lib/systemd/systemd --user
postgres    1068   1065    0 13:30 ?        00:00:00 (sd-pam)
postgres    1072    798    0 13:30 ?        00:00:00 postgres: walwriter
postgres    1073    798    0 13:30 ?        00:00:00 postgres: autovacuum launcher
postgres    1074    798    0 13:30 ?        00:00:00 postgres: logical replication launcher
postgres    1082      1    0 13:30 ?        00:00:00 /usr/pgsql-16/bin/postgres -D /u01/app/postgres/product/v16
postgres    1085   1082    0 13:30 ?        00:00:00 postgres: logger
postgres    1086   1082    0 13:30 ?        00:00:00 postgres: checkpointer
postgres    1087   1082    0 13:30 ?        00:00:00 postgres: background writer
postgres    1089   1082    0 13:30 ?        00:00:00 postgres: walwriter
postgres    1090   1082    0 13:30 ?        00:00:00 postgres: autovacuum launcher
postgres    1091   1082    0 13:30 ?        00:00:00 postgres: archiver last was 000000010000000000000000F
postgres    1092   1082    0 13:30 ?        00:00:00 postgres: logical replication launcher
root        1535   1484    0 13:35 pts/0    00:00:00 grep --color=auto -i postgres
[root@PG-V16 ~]#
```

Cluster v16 location

```
[root@PG-V16 ~]# sudo su - postgres
[postgres@PG-V16 ~]$ mkdir -p /u01/app/postgres/product/v17
[postgres@PG-V16 ~]$
```

- Provide appropriate permission to the **Postgres** user on the newly created folder (if you create a directory using a **Postgres** user then this step is not needed)
- **Check the current version of the database**

```
[postgres@PG-V16 ~]$ psql -p 5433
postgres=# select version();
```

```
[root@PG-V16 ~]# sudo su - postgres
[postgres@PG-V16 ~]$ psql
psql (16.3)
Type "help" for help.

postgres=# select version();
               version
-----
PostgreSQL 16.3 on x86_64-pc-linux-gnu, compiled by gcc (GCC) 8.5.0 20210514 (Red Hat 8.5.0-22), 64-bit
(1 row)

postgres=# █
```

- Install version 17 binaries to the server

```
[root@PG-V16 ~]# Install the repository RPM:
[root@PG-V16 ~]#sudo dnf install -y https://download.postgresql.org/pub/repos/yum/reporpms/EL-8-
x86_64/pgdg-redhat-repo-latest.noarch.rpm
```

```
[root@PG-V16 ~]# Disable the built-in PostgreSQL module:
[root@PG-V16 ~]# sudo dnf -qy module disable postgresql
```

```
[root@PG-V16 ~]# Install PostgreSQL:
[root@PG-V16 ~]# sudo dnf install -y postgresql17-server
[root@PG-V16 ~]# chmod 775 /usr/pgsql-17/bin
[root@PG-V16 ~]# chown -R postgres:postgres /usr/pgsql-17/bin
[root@PG-V16 ~]#
```

- Check the backup status if required take the full backup

```
[root@PG-V16 ~]# pgbackrest info
stanza: cluster
status: ok
cipher: none

db (current)
wal archive min/max (16): 00000001000000000000000006/000000010000000000000011

full backup: 20240727-144559F
timestamp start/stop: 2024-07-27 14:45:59-04 / 2024-07-27 14:46:06-04
wal start/stop: 00000001000000000000000006 / 000000010000000000000006
database size: 53.2MB, database backup size: 53.2MB
repol: backup size: 8.7MB

full backup: 20250124-134444F
timestamp start/stop: 2025-01-24 13:44:44-05 / 2025-01-24 13:44:50-05
wal start/stop: 000000010000000000000011 / 000000010000000000000011
database size: 60.5MB, database backup size: 60.5MB
repol: backup size: 9.7MB
[root@PG-V16 ~]# █
```

INFORMATION: I am case I am using pgbackrest to take the backup

- Initialize the cluster

Initially start the cluster on the newly created directory (PostgreSQL Home)

```
[postgres@PG-V16 ~]$ /usr/pgsql-17/bin/initdb -D /u01/app/postgres/product/v17
```

```
[postgres@PG-V16 bin]$ /usr/pgsql-17/bin/initdb -D /u01/app/postgres/product/v17
The files belonging to this database system will be owned by user "postgres".
This user must also own the server process.

The database cluster will be initialized with locale "en_US.UTF-8".
The default database encoding has accordingly been set to "UTF8".
The default text search configuration will be set to "english".

Data page checksums are disabled.

fixing permissions on existing directory /u01/app/postgres/product/v17 ... ok
creating subdirectories ... ok
selecting dynamic shared memory implementation ... posix
selecting default "max_connections" ... 100
selecting default "shared_buffers" ... 128MB
selecting default time zone ... America/New_York
creating configuration files ... ok
running bootstrap script ... ok
performing post-bootstrap initialization ... ok
syncing data to disk ... ok

initdb: warning: enabling "trust" authentication for local connections
initdb: hint: You can change this by editing pg_hba.conf or using the option -A, or --auth-local and --auth-host, the next time you run initdb.

Success. You can now start the database server using:

    /usr/pgsql-17/bin/pg_ctl -D /u01/app/postgres/product/v17 -l logfile start

[postgres@PG-V16 bin]$
```

Phase-II Upgrade steps

- Check the current session present in PostgreSQL DB

```
postgres=#
postgres=# select username,count(1) from pg_stat_activity group by username;
 username | count
-----+-----
 postgres |      4
 postgres |      2
(2 rows)

postgres=#
```

INFORMATION: check any Application present in the database if present then kill it or stop as per the process

- Actual upgrade database from **v16** to **V17**

Stop the cluster first

```
[postgres@PG-V16 bin]$
[postgres@PG-V16 bin]$ ./pg_ctl -D /u01/app/postgres/product/v16 stop
waiting for server to shut down.... done
server stopped
[postgres@PG-V16 bin]$
```

```
[postgres@PG-V16 bin]$ ./pg_upgrade --old-bindir /usr/pgsql-16/bin --new-bindir /usr/pgsql-17/bin --
old-datadir /u01/app/postgres/product/v16 --new-datadir /u01/app/postgres/product/v17 --link --check
```

```

[postgres@PG-V16 bin]$
[postgres@PG-V16 bin]$ ./pg_upgrade --old-bindir /usr/pgsql-16/bin --new-bindir /usr/pgsql-17/bin --old-datadir /u01/app/postgres/product/v16 --new-datadir /u01/app/postgres/product/v17 --link --check
Performing Consistency Checks
-----
Checking cluster versions                                ok
Checking database user is the install user              ok
Checking database connection settings                   ok
Checking for prepared transactions                      ok
Checking for contrib/ism with bigint-passing mismatch  ok
Checking data type usage                                ok
Checking for presence of required libraries             ok
Checking database user is the install user              ok
Checking for prepared transactions                      ok
Checking for new cluster tablespace directories         ok

*Clusters are compatible*
[postgres@PG-V16 bin]$ █

```

[postgres@PG-V16 bin]\$./pg_upgrade --old-bindir /usr/pgsql-16/bin --new-bindir /usr/pgsql-17/bin --old-datadir /u01/app/postgres/product/v16 --new-datadir /u01/app/postgres/product/v17 --link

```

[postgres@PG-V16 bin]$
[postgres@PG-V16 bin]$ ./pg_upgrade --old-bindir /usr/pgsql-16/bin --new-bindir /usr/pgsql-17/bin --old-datadir /u01/app/postgres/product/v16 --new-datadir /u01/app/postgres/product/v17 --link
Performing Consistency Checks
-----
Checking cluster versions                                ok
Checking database user is the install user              ok
Checking database connection settings                   ok
Checking for prepared transactions                      ok
Checking for contrib/ism with bigint-passing mismatch  ok
Checking data type usage                                ok
Creating dump of global objects                         ok
Creating dump of database schemas                      ok

Checking for presence of required libraries             ok
Checking database user is the install user              ok
Checking for prepared transactions                      ok
Checking for new cluster tablespace directories         ok

If pg_upgrade fails after this point, you must re-initdb the
new cluster before continuing.

Performing Upgrade
-----
Setting locale and encoding for new cluster             ok
Analyzing all rows in the new cluster                   ok
Freezing all rows in the new cluster                    ok
Deleting files from new pg_xact                         ok
Copying old pg_xact to new server                      ok
Setting oldest XID for new cluster                     ok
Setting next transaction ID and epoch for new cluster  ok
Deleting files from new pg_multixact/offsets            ok

```

```

Freezing all rows in the new cluster ok
Deleting files from new pg_xact ok
Copying old pg_xact to new server ok
Setting oldest XID for new cluster ok
Setting next transaction ID and epoch for new cluster ok
Deleting files from new pg_multixact/offsets ok
Copying old pg_multixact/offsets to new server ok
Deleting files from new pg_multixact/members ok
Copying old pg_multixact/members to new server ok
Setting next multixact ID and offset for new cluster ok
Resetting WAL archives ok
Setting frozenxid and minmxid counters in new cluster ok
Restoring global objects in the new cluster ok
Restoring database schemas in the new cluster ok

Adding ".old" suffix to old global/pg_control ok

If you want to start the old cluster, you will need to remove
the ".old" suffix from /u01/app/postgres/product/v16/global/pg_control.old.
Because "link" mode was used, the old cluster cannot be safely
started once the new cluster has been started.
Linking user relation files

```

```

Setting next OID for new cluster ok
Sync data directory to disk ok
Creating script to delete old cluster ok
Checking for extension updates ok

```

Upgrade Complete

```

-----
Optimizer statistics are not transferred by pg_upgrade.
Once you start the new server, consider running:
    /usr/pgsql-17/bin/vacuumdb --all --analyze-in-stages
Running this script will delete the old cluster's data files:
    ./delete_old_cluster.sh
[postgres@PG-V16 bin]$ █

```

- Copy the configuration files from old **PGDATA** to new **PGDATA** {depends on condition}

```
[postgres@PG-V16 v16]$ cp *.conf /u01/app/postgres/product/v17
```

- Start the cluster using new binaries

```
[postgres@PG-V16 log]$ /usr/pgsql-17/bin/pg_ctl-D /u01/app/postgres/product/v17 start
```

```

[postgres@PG-V16 log]$ /usr/pgsql-17/bin/pg_ctl -D /u01/app/postgres/product/v17 start
waiting for server to start...2025-01-17 16:11:54.965 EST [1501] LOG:  redirecting log output to logging collector process
2025-01-17 16:11:54.965 EST [1501] HINT:  Future log output will appear in directory "log".
done
server started
[postgres@PG-V16 log]$ clear

```

• Validation

```

[postgres@PG-V16 log]$ psql -p 5433
psql (17.2)
Type "help" for help.

postgres=# select version();
               version
-----
PostgreSQL 17.2 on x86_64-pc-linux-gnu, compiled by gcc (GCC) 8.5.0 20210514 (Red Hat 8.5.0-22), 64-bit
(1 row)

postgres=# SHOW data_directory;
 data_directory
-----
/u01/app/postgres/product/v17
(1 row)

postgres=# █

```