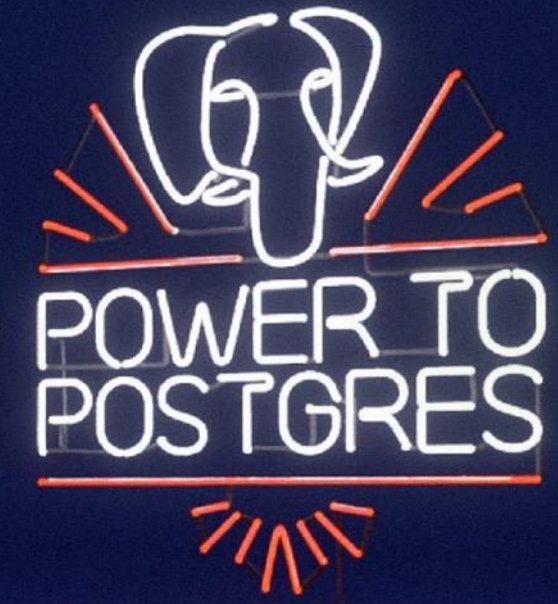
Backup and Recovery Best Practices Office Hour



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EDB

Agenda

1. Why do we need backups?
2. PostgreSQL database Backup options
3. Backup strategies
4. Backup and recovery best practices
5. Demo
6. Q &A

Why do we need backups?

- A backup is a consistent copy of the data that can be used to recover the database.
- Databases need to be backed up to avoid data loss due to:
  - User error
  - Hardware failure
  - Data corruption
- Need the ability to restore old data due to Compliance reasons
- Databases need to be quickly restored to meet the RPO and RTO requirements.
- To protect company's business and reputation

PostgreSQL database backup options

- Logical backup using pg_dump / pg_dumpall
- Physical backup using pg_basebackup, file system snapshots, or a cold backup
- EDB supported and other third party tools:
  - Barman (EDB Supported)
  - pgBackRest (EDB Supported)
  - BART (EDB Supported, but reaching EOL)
  - Veritas Netbackup (EDB partnership)
  - Other third party tools

Logical backup

pg_dump/pg_dumpall

- The pg_dump can be used to take a consistent dump of the current database.
- The pg_dumpall can be used to backup the entire cluster and all global objects.
- Dumps can be in plain-text file containing the SQL commands or in archive format.
- Command examples:
  - pg_dump –h <db host> -p <db port> -U <dbuser> -W –F <format> -f <dumpfile> [-a|-s] –d <dbname>

    (Where format can be p (plain), c (custom), d (directory), or t (tar))
  - pg_dumpall –h <db host> -p <db port> -U <dbuser> -W –f <filename> [-a|-s] [-g] –l <dbname>

Restoring logical backup

- The plain format dumps created by pg_dump can be restored in a new database, as below:

  psql –d newdb –f <dump>

- The custom, directory, or tar format dump can be restored using pg_restore utility.
- Use –clean and –create options with pg_restore to restore the backup in same database.

Physical backup

pg_basebackup utility

- It's a utility to take a base backup of running PostgreSQL cluster
- The backup can be used to do a point-in-time recovery using the WAL files
- Makes an exact copy of cluster's files
- One can view the progress of the backup using pg_stat_progress_basebackup view.
- Examples:
  - pg_basebackup –h <remote_db_server> -p <port> -D <local data dir>
  - pg_basebackup -D - -Ft –X fetch | bzip2 > backup.tar.bz2

Physical backup

File system snapshot

- If your filesystem supports it, make a frozen snapshot of the database volume
- Copy the whole directory to a backup device
- Release the frozen snapshot
- Make sure to include all WAL files in your backup to perform a crash recovery when Postgres is started using the backed up data

Physical backup

Cold backup

- Shutdown Postgres
- Copy the entire data directory:
  - e.g. tar –cf backup.tar <PGDATA>

Barman utility

Features

- Remote backup with rsync OR PostgreSQL protocol
- Management of multiple PostgreSQL/EPAS servers
- Support for file level incremental backups with rsync method
- WAL archiving and streaming
- WAL archive compression with gzip, bzip2
- Point-In-Time-Recovery (PITR)
- Support for Local and remote recovery (via SSH)
- Management of retention policies of backups
- Integrated with EDB PEM (8.4 onwards)
- Supports backup to S3, Azure Blob Storage, and GCS

pgBackRest utility

Features

- Parallel backup & restore
- Local or remote operation
- Full, incremental, and differential backups
- Retention policies
- Backup integrity
- Backup encryption
- S3, Azure, and GCS support

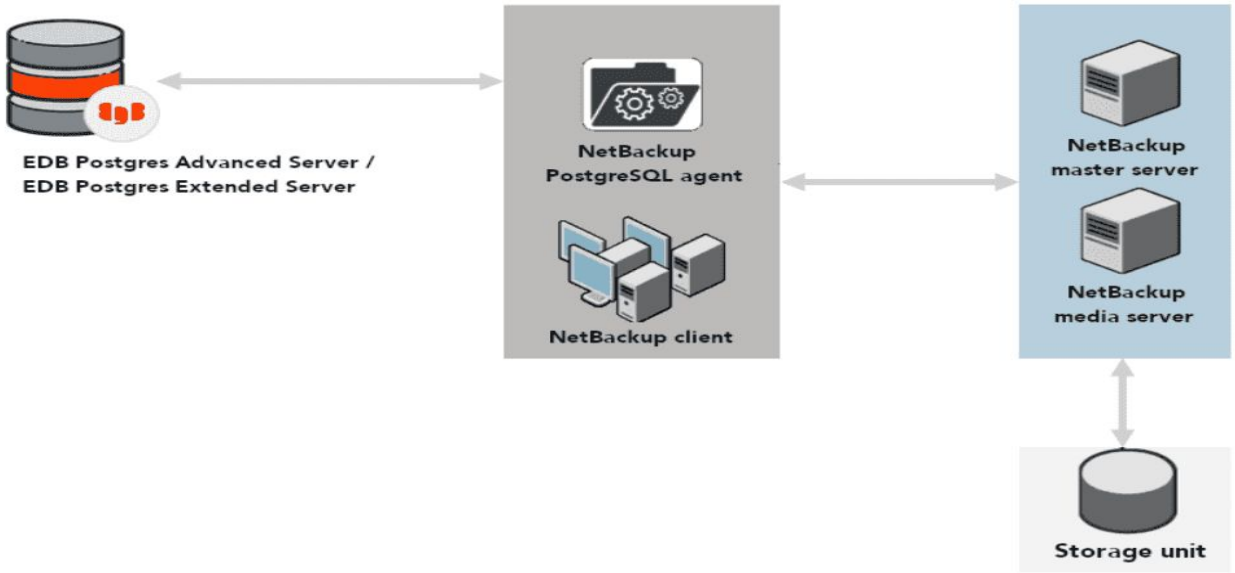
BART utility

(Reaching EOL)

- Backup and recovery management of local and remote database servers.
- Integrates with EDB Postgres Enterprise Manager
- Configurable retention policies
- Full and block-level incremental backup
- Parallel copy and restore
- Point-in-time recovery to specified transaction ID or timestamp

Veritas NetBackup

(EDB Partnership)



Feature comparison

Feature	Barman	pgBackRest	pg_basebackup
SSH Protocol	✓	✓	
PostgreSQL protocol	✓		✓
Incremental backups	✓	✓	
RPO=0	✓		
Rate limiting	✓		✓
Custom WAL sizes	✓	✓	✓
WAL archive compression	✓	✓	✓
Backup compression		✓	
Symmetric encryption		✓	
Parallel backup and restore	✓	✓	
Partial restore (slected databases)		✓	
Centralize repository	✓	✓	
Retention policy	✓	✓	
List backup	✓	✓	
S3 support	✓	✓	
Nagios integration	✓	✓	
PEM integration	✓		
No custom scripts required	✓	✓	

Backup strategies

- Depending on the backup option and database size, decide the frequency of full and incremental/differential backup.
- Setup wal archiving to keep the wals for point-in-time recovery.
- Backup strategy should meet the RTO and RPO requirements
- Adjust your backup retention policies to meet your legal/compliance requirements
- Use 3-2-1 rule and keep 3 copies of backup: 2 local copies and 1 offsite.
- Encrypt your backup

Best practices

- Make sure to have your backup and recovery policies and procedures documented
- Keeping a copy of the backup offsite or in cloud can prevent data loss during a disaster when you lose an on-prem data center.
- Perform regular tests of your backup by doing a recovery
- Monitor your backup process and get alerted when backup fails.
- When you use logical backup method, keep in mind that it’s just a snapshot of the data and the backup cannot be used for doing PITR.
- While restoring the backup, restore it in a directory other than the source data directory.

Demo

EDB

Thank you

Resources

Barman documentation:
https://www.enterprisedb.com/docs/supported-open-source/barman/

pgBackRest documentation
https://www.enterprisedb.com/docs/supported-open-source/pgbackrest/

BAR documentation:
https://www.enterprisedb.com/docs/bart/latest/

Veritas Implementation Guide:
https://www.enterprisedb.com/docs/partner_docs/VeritasGuide/

Blog on Backup and Recovery :

https://www.enterprisedb.com/postgresql-database-backup-recovery-what-works-wal-pitr

Feature comparison of various backup tools:

https://www.enterprisedb.com/products/backup-recovery-postgresql-database-auto-restore-script-tools