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PostgreSQL Administration

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ANKIT GOYAL

- Have around 11 years of I.T. industry experience.
- Oracle GoldenGate Implementation certified professional.
- Oracle Autonomous Database certified professional.

Have rich experience in following Technologies.

1. Core database
2. Data guard
3. Rman
4. 12c architecture
5. OEM 12c Grid Control.
6. Oracle Golden Gate.
7. BMC Control-M
8. PostgreSQL Administration

Complete ITIL process understanding.

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Program Objectives

- *Describe the PostgreSQL Architecture and its components*
- *Installing and Configuring PostgreSQL Database.*
- *Controlling PostgreSQL Server*
- *Managing Tables and Data*
- *Security*
- *Managing and Administrating PostgreSQL Server and Databases*
- *Performing Backup and Recovery of Database*
- *High Availability Concepts.*
- *GoldenGate Overview*

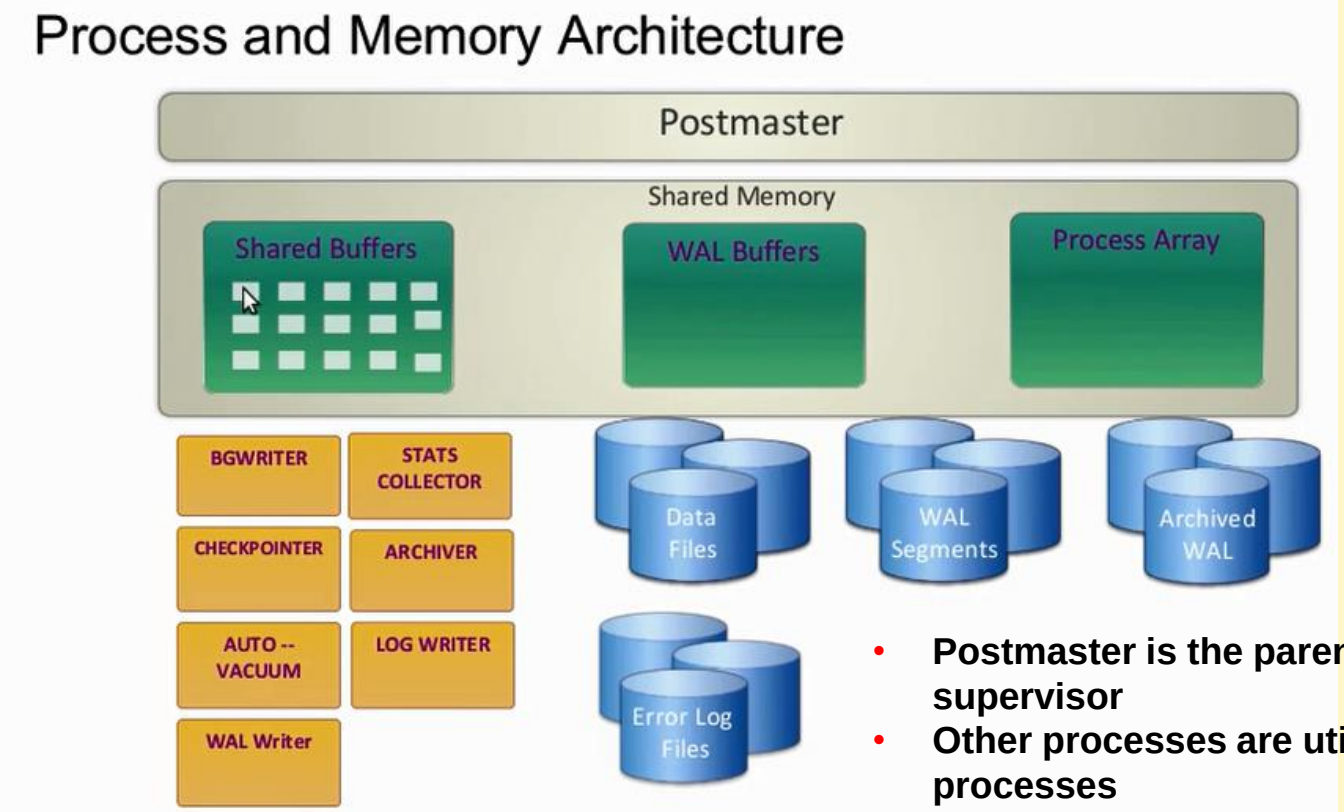
INTRODUCTION

- PostgreSQL, often simply Postgres
- It is an Object-Relational database management system (ORDBMS)
- As a database server, it's primary function is to store data securely, supporting best practices and to allow for data retrieval of other applications.
- Handle workloads from small single-machine applications to large internet-facing applications with concurrent users.
- It can handle complex SQL queries using Indexing methods
  Has updateable views and materialized views, triggers, foreign keys.
- Supports functions and stored procedures.
- Cross-platform and runs on many Operating Systems
- Free and Open-Source Software.

HISTORY

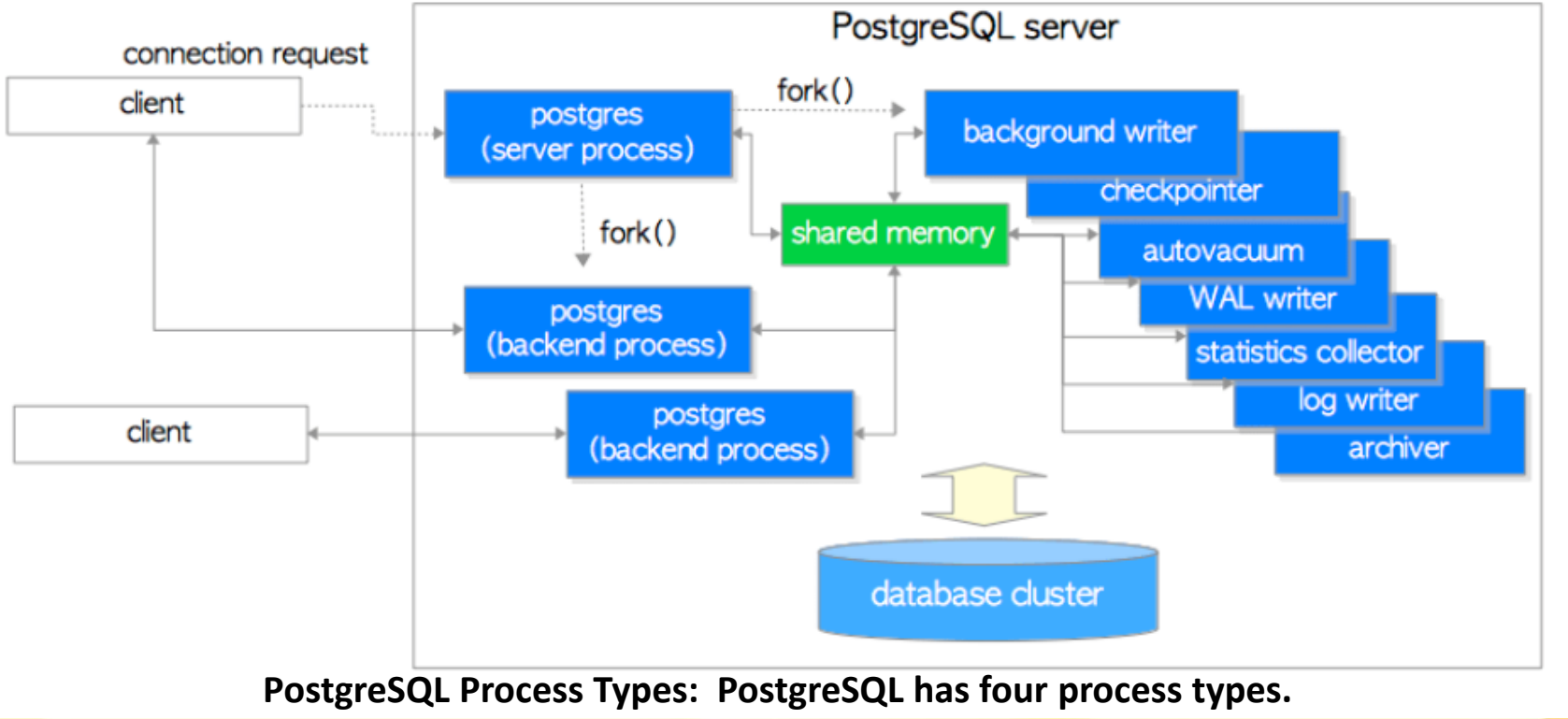
- Evolved from the Ingres project at the University of California, Berkeley.
- In 1982, Michael Stone-braker, left Berkeley to make proprietary version of Ingres.
- In 1985 returned to Berkeley and started working on Post-Ingres Project.
- In 1986 POSTGRES team published papers.
- In June 1989 released version 1 to a small number of users.
- Version 2 released in 90, V3 in 91, V4.2 on June 30, 94 with Storage Manager.
- In 95 Postquel replaced by SQL and Front-end program monitor replace by psql.
- The first open-source version was released on Aug 1st, 1996.
- The project was renamed to PostgreSQL and release formed version 6.0 in 97.
- Since then a group of developers and volunteers around the world have maintained the software as the PostgreSQL Global Development Group.
- Current version – 13.2

PostgreSQL Architecture : -



- **Postmaster is the parent process supervisor**
- **Other processes are utility processes**
- **Shared memory is inside the RAM i.e. memory allocation**

Process architecture in PostgreSQL



PostgreSQL Process Types: PostgreSQL has four process types.

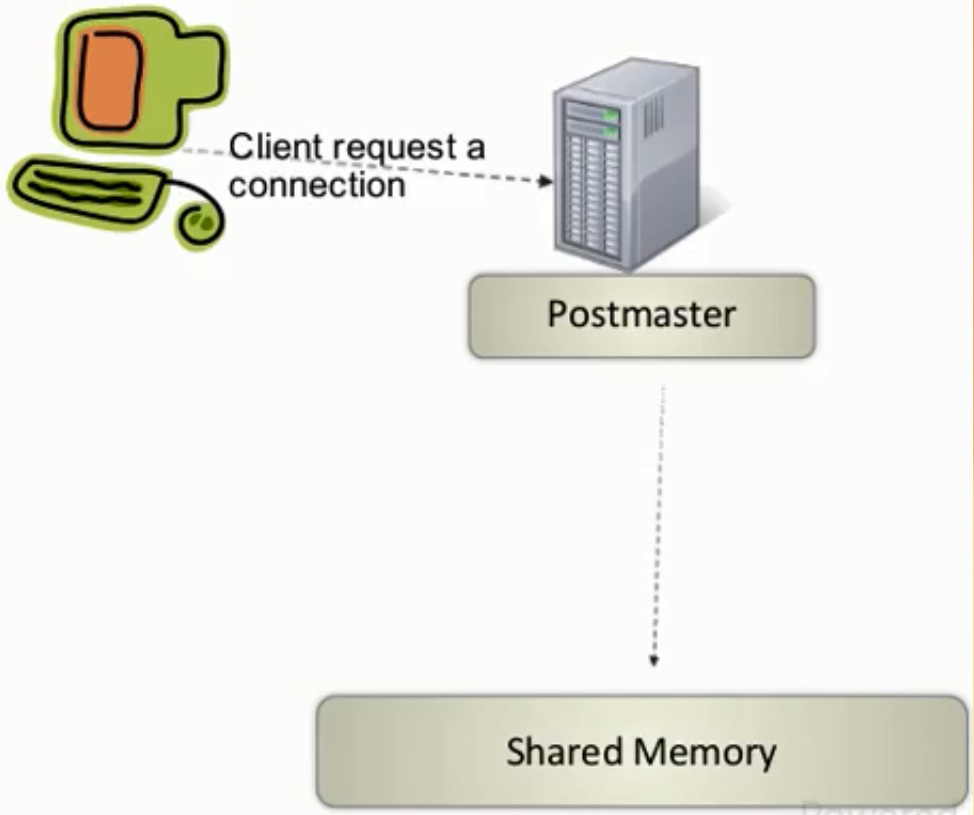
1. **Postmaster (Daemon) Process**
2. **Background Process**
3. **Backend Process**
4. **Client Process**

Background Process

Process	Role
logger	Write the error message to the log file.
checkpointer	When a checkpoint occurs, the dirty buffer is written to the file.
writer	Periodically writes the dirty buffer to a file.
wal writer	Write the WAL buffer to the WAL file.
Autovacuum launcher	Fork autovacuum worker when autovacuum is enabled.It is the responsibility of the autovacuum daemon to carry vacuum operations on bloated tables on demand
archiver	When in Archive.log mode, copy the WAL file to the specified directory.
stats collector	DBMS usage statistics such as session execution information (pg_stat_activity) and table usage statistical information (pg_stat_all_tables) are collected.

Postmaster as Listener

- Postmaster is the master process called postgres
- Listens on 1-and-only-1 tcp port
- Receives client connection request



Query Processing

- Parser
- The parser generates a parse tree from an SQL statement in plain text.

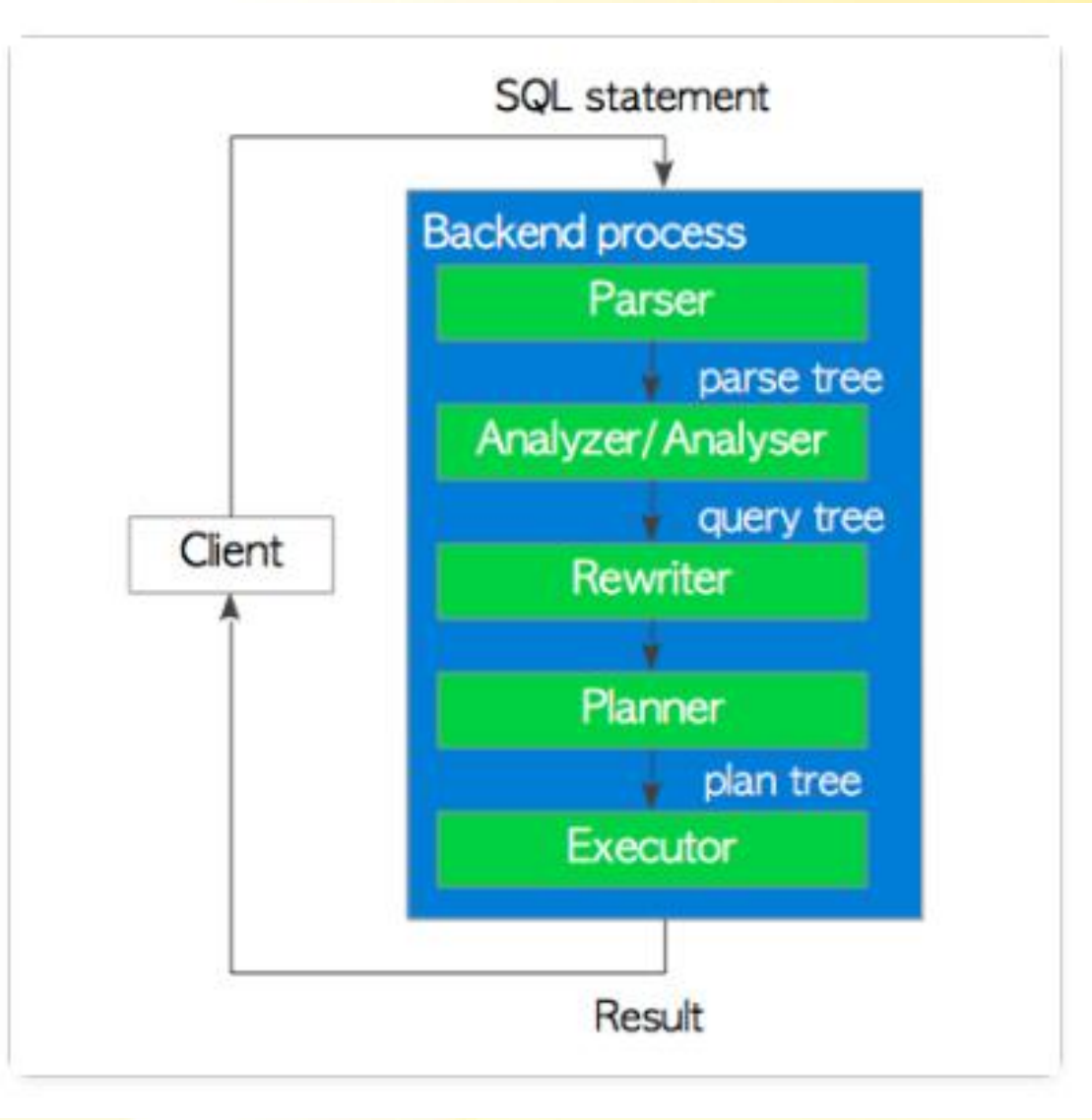
- 2. Analyzer/Analyser
- The analyzer/analyser carries out a semantic analysis of a parse tree and generates a query tree.

- 3. Rewriter
- The rewriter transforms a query tree using the rules stored in the rule system if such rules exist.

- 4.Planner
- The planner generates the plan tree that can most effectively be executed from the query tree.

- 5. Executor
- The executor executes the query via accessing the tables and indexes in the order that was created by the plan tree.

Query Processing



Comparison of Oracle Background processes and PostgreSQL Utility Processes

Listener = Postmaster

LGWR = WAL Writer

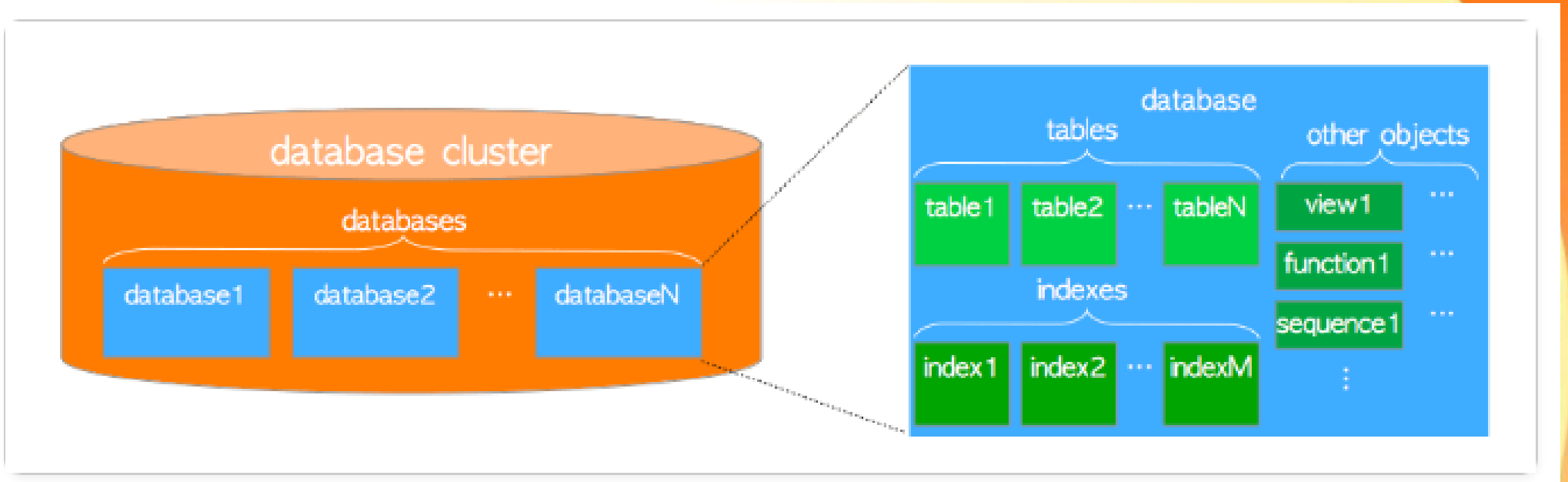
DBWR = Background Writer

CKPT = Check pointer Process

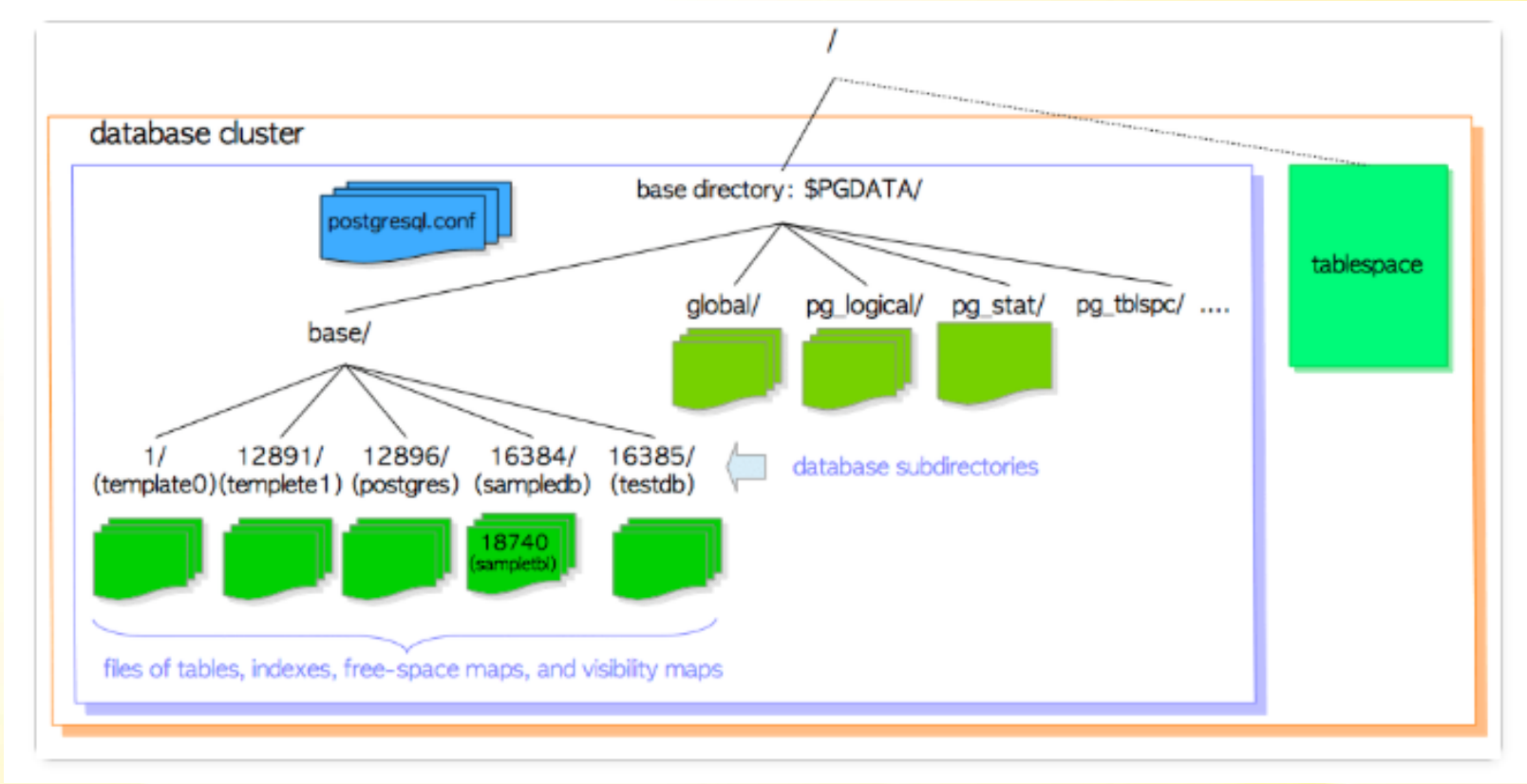
….? = Autovacuum workers

Database Cluster

- A Cluster is a collection of databases managed by a one server instance
- Each Cluster has a separate
  - Data directory
  - TCP port
  - Set of processes
- A Cluster can contain multiple databases



Logical Structure of Database Cluster



Physical Structure of Database Cluster

files	description
PG_VERSION	A file containing the major version number of PostgreSQL
pg_hba.conf	A file to control PosgreSQL's client authentication
pg_ident.conf	A file to control PostgreSQL's user name mapping
postgresql.conf	A file to set configuration parameters
postgresql.auto.conf	A file used for storing configuration parameters that are set in ALTER SYSTEM (version 9.4 or later)
postmaster.opts	A file recording the command line options the server was last started with

Layout of Database Cluster

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Thank You!

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