PostgreSQL Database Administration V18

Course Duration: 40 Hours (5 Days)

Course Introduction:

This comprehensive course on PostgreSQL Database Administration V18 is designed to equip learners with the essential skills required to effectively manage and maintain PostgreSQL databases. Through this course, participants will gain a deep understanding of database architecture, configuration, performance tuning, security, and advanced administrative tasks. The curriculum is structured to provide both theoretical knowledge and practical skills, ensuring a well-rounded learning experience for aspiring database administrators.

Module 1: Introduction to PostgreSQL V18

• Overview of PostgreSQL: Understand the history, evolution, and key features of PostgreSQL as a leading open-source relational database system.

• Installation and Configuration: Learn how to install PostgreSQL V18 on different operating systems and configure it for optimal performance.

Module 2: Postgres Client Server Architecture

- PostgreSQL Architecture: Explore the core components and architecture of PostgreSQL, including the server process, databases, and tablespaces.

Module 3: Getting Started

• Installation and Configuration: Learn how to install PostgreSQL V18 on different operating systems and configure it for optimal performance.

• Creating a cluster

• Running a server

• Data Types and Tables: Explore the various data types supported by PostgreSQL and learn how to create and manage tables effectively.

Module 4: Configuration of PostgreSQL V18

- Connection settings
- Resource settings
- Configuring of PostgreSQL Server
- WAL
- Error Reporting and Logging
- Auto vacuum

Module 5: Server Control

- Postgres host-based access configuration
- Multiple server installation on one machine
- Remote connection establishment

Module 6: Client and Tools

- Introduction to PSQL
- Command and parameters
- Using graphical administration tools – pgAdmin
- Binary path settings
- Remote server connection

Module 7: Creating and Managing Database

- Object Hierarchy

•Database and Schema Creation: Master the steps for creating databases and schemas and understand their importance in organizing and managing data.

- Tablespaces
- Exploring Databases

Module 8: Obtaining Metadata

- Locating the database server message log
- Locating the database system identifier
- Listing databases on this database server
- How much disk space does a table use?

• Which are my biggest tables?

Module 9: Transaction and Concurrency Control

• ACID properties (Atomicity, Consistency, Isolation, Durability)

• Transaction lifecycle (BEGIN, COMMIT, ROLLBACK)

• Auto commit behavior

• What is MVCC

• How PostgreSQL handles concurrency using MVCC

• Tuple versions (xmin, xmax)

• Visibility rules

Module 10: Database Administration

• Performing actions on many tables

• Writing a script

• Adding/removing schemas

• Moving objects between schemas

• Adding/removing tablespaces

• Moving objects between tablespaces

• Using materialized views

Module 11: Table Portioning

• Partitioning Strategies: Explore data partitioning techniques to manage large datasets efficiently and improve query performance.

• Range Partitioning

• List Partitioning

Module 12: Extensions

• Managing Extensions: Learn how to install, configure, and manage PostgreSQL extensions to extend database functionality.

Module 13: Security

• User Roles and Privileges: Understand the concepts of roles and privileges and learn how to implement access control for secure database management.

• Authentication Methods: Explore various authentication mechanisms available in PostgreSQL to protect data from unauthorized access.

• Data Encryption: Learn about encryption techniques to safeguard sensitive data both at rest and in transit.

Module 14: Monitoring and Diagnosis

• Real-time viewing using PgAdmin

• Checking whether user is connected

• Checking which queries are running

• Checking which queries are active or blocked

• Knowing who is blocking a query

• Killing a specific session

• Knowing when table is last used

• Understanding why queries slow down

• Analyzing the real time performance of your queries

Module 15: Performance and Concurrency

• Query Performance Analysis: Analyze query performance using PostgreSQL tools and techniques to identify and resolve bottlenecks.

• Index Optimization: Optimize the use of indexes to improve query execution times and overall database performance.

• Configuration Tuning: Fine-tune PostgreSQL configuration settings for enhanced performance and resource utilization.

Module 16: Regular Maintenance

• Monitoring Tools and Techniques: Familiarize yourself with tools and methods for monitoring PostgreSQL database performance and health.

• Routine Maintenance Tasks: Learn about essential maintenance tasks such as vacuuming, reindexing, and analyzing to keep databases running smoothly.

• Log Management and Analysis: Develop skills in managing PostgreSQL logs for troubleshooting and performance analysis.

Module 17: Backup and Recovery Strategies

• Backup Techniques: Discover different methods for backing up PostgreSQL databases to prevent data loss and ensure business continuity.

• Restore and Recovery: Master the process of restoring databases from backups and recovering from data corruption or system failures.

• Point-in-Time Recovery: Learn how to perform point-in-time recovery to restore the database to a specific moment in time.

Module 18: Moving Data

• Exporting / importing Data To/From a flat file

Module 19: High Availability ,Replication and Upgrade

• Replication Concepts: Understand the principles of database replication and its significance in achieving high availability.

• Setting Up Streaming Replication: Learn how to configure and manage streaming replication for real-time data synchronization.

• Failover and Load Balancing: Explore strategies for implementing failover and load balancing to ensure continuous database operation.

Upgrading PostgreSQL: Understand the process of upgrading PostgreSQL to newer versions while minimizing downtime and ensuring data integrity.

Course Conclusion:

By the end of this course, participants will have gained a comprehensive understanding of PostgreSQL Database Administration V18. Equipped with practical skills and theoretical knowledge, learners will be prepared to tackle real-world database challenges and advance in their careers as proficient PostgreSQL administrators.