

Customized PostgreSQL Database Performance tuning

Duration: 40 Hours (5 Days)

Course Syllabus:

Module 1- Installation

- Installation of PostgreSQL Server
 - Setting file permissions user roles
 - directories
 - Setting Environment Variables
- Pgtune to get configuration for a given hardware configuration
- Starting /Stopping PostgreSQL (pg_ctl)
- Creating a Cluster
- Modifying port (other than default port) and Running Server

Module 2- Configuration File

- PostgreSQL.conf
- PostgreSQL.Auto.conf
- Pg_Ident.conf

Module 3- Server Control

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

Module 4- Metadata

- Information schema
- System catalog

Module 5- Transactions & Concurrency Control

- what is Transaction
- Transaction SQL Control Statements
- ACID property

- Isolation Level
- MVCC

Module 6- Materialized View

- What is Materialized View
- Creating Materialized View
- Modifying Materialized View
- Refreshing materialized views

Module 7- Table Partitioning

- Table inheritance
- Range Partitioning
- List Partitioning

Module 8- Extensions

- Introduction to Extension
- Installing and Managing Extensions
- Accessing objects in other PostgreSQL databases
- File_fdw, hstore, citext, etc.
- pgcrypto

Module 9-Security

- User Management
- Superuser
- Roles and Users
- Groups and Access Control
- Ownership, Etc.
- Preventing Connections
- Checking secure password
- Auditing Change
- Configuring PostgreSQL for OpenSSL
 - certificate creation
 - Setting permissions
 - sign the request.
 - Checking setup status
- Different levels of SSL supported by PostgreSQL
- Encrypting your entire server PostgreSQL TDE

Module 10: Locks

- PostgreSQL locks:
- PostgreSQL Locking Hierarchy
- Lock modes:
 - ACCESS SHARE,
 - ROW EXCLUSIVE,
 - ACCESS EXCLUSIVE, etc.
- views
- pg_locks
- pg_stat_activity
- pg_blocking_pids(<blocked_pid>)
- deadlock_timeout
- log_lock_waits
- Real-time dashboards from PostgreSQL metrics
- Tools & Dashboards (Gafana)

Module 11: Diagnostics & Blocking Analysis:

Identify heavy queries that degrade performance

- pg_stat_activity
- pg_stat_statements
- Log Analysis

Module 12- Monitoring and Diagnosis

- Real-time viewing using pgAdmin
- Checking whether a 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 a table was last used
- Usage of disk space by temporary data
- Understanding why queries slow down
- Producing a daily summary of log file errors
- Analyzing the real-time performance of your queries

Module 13- Performance and Concurrency

- Find and Tune Slow Running Queries
- Collecting regular statistics from pg_stat* views
- Finding out what makes SQL slow
- Speeding up queries without rewriting them

- Discovering why a query is not using an index
- Forcing a query to use an index

Module 14- Regular Maintenance

- Controlling automatic database maintenance
- Removing issues that cause bloat
- Identifying and fixing bloated tables and indexes
- Monitoring and tuning vacuum
- Updating Table Statistics
- Vacuuming
 - Autovacuum
 - Manual vacuum
- Re-indexing

Module 15- Backup and Recovery

- Planning backups
- Backup Types
- Logical
 - Pg_dump
 - Pg_dumpall
- Physical
 - Standalone hot physical database backup
 - Hot physical backup and continuous archiving
 - PgBaseBackup
 - pgbackrest
- Restore
 - Pg_restore
 - Recovery to a point in time
 - Restore Physical Backup
 - Recovery of a dropped/damaged table
 - Recovery of a dropped/damaged database

Module 17- Replication and Upgrades

- Replication
 - Replication best practices
- Streaming Replication
 - Implement Hot Standby
 - Replication Slots
- Handling Switchover & Failover
- Logical Replication

Module 18 : Patching & Upgrades

- Upgrading - minor releases
- Upgrading - major release(pg_upgrade)