Database Administration

Lecture 08: Performance Tuning.

Valeja and Gonzales.

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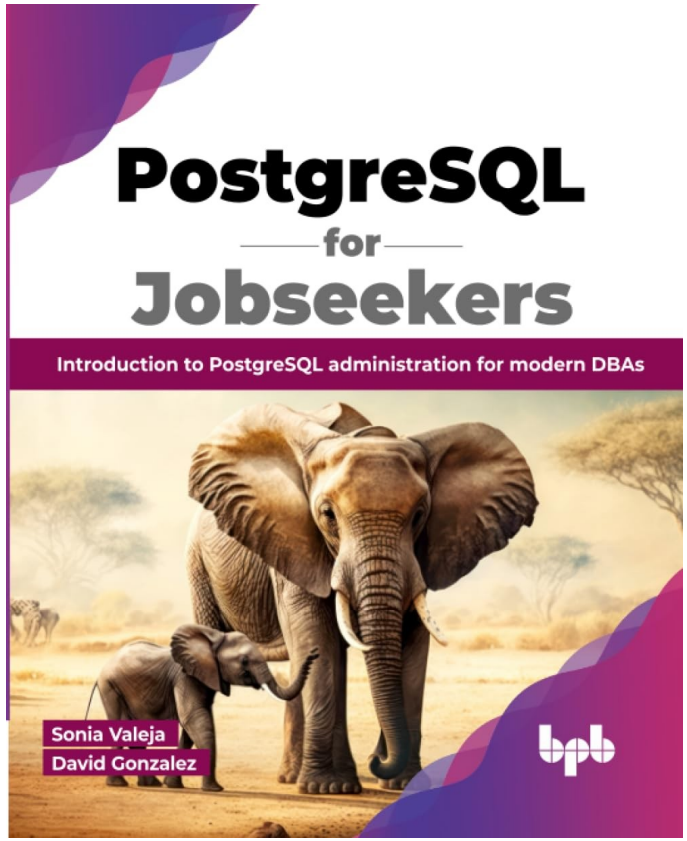
Database Administration: Performance Tuning.



Content has been extracted from *PostgreSQL for Jobseekers (Chapter 13)*, by Sonia Valeja and David Gonzales, 2023. Visit https://bpbonline.com/products/postgresql-for-jobseekers.

Introduction

- PostgreSQL aims to resolve queries as quickly as possible.
- Performance tuning is a critical aspect of database administration.
- This presentation covers key topics including indexes, statistics, query planning, and best practices.

Indexes

- Indexes help locate data efficiently, similar to a book index.
- Types of indexes:
  - B-tree (default, supports range queries)
  - Hash (optimized for equality comparisons)
  - GiST and SP-GiST (used for geometric data)
  - GIN (for arrays and full-text search)
  - BRIN (efficient for large datasets with ordered values)

Reindexing

- Rebuilding an index can help maintain performance.
- Command: `REINDEX INDEX <index-name>`
- Use `CONCURRENTLY` to rebuild without locking writes.

Statistics in PostgreSQL

- PostgreSQL collects statistics to optimize query execution.
- Key system catalogs:
  - `pg_class`: stores number of rows and disk usage.
  - `pg_stats`: contains column value distribution statistics.
  - `pg_statistics_ext_data`: extended statistics.
- Running `ANALYZE` updates statistics.

EXPLAIN PLAN

- Used to analyze query execution plans.
- Syntax: `EXPLAIN ANALYZE <query>`
- Helps identify if indexes are used or if sequential scans occur.

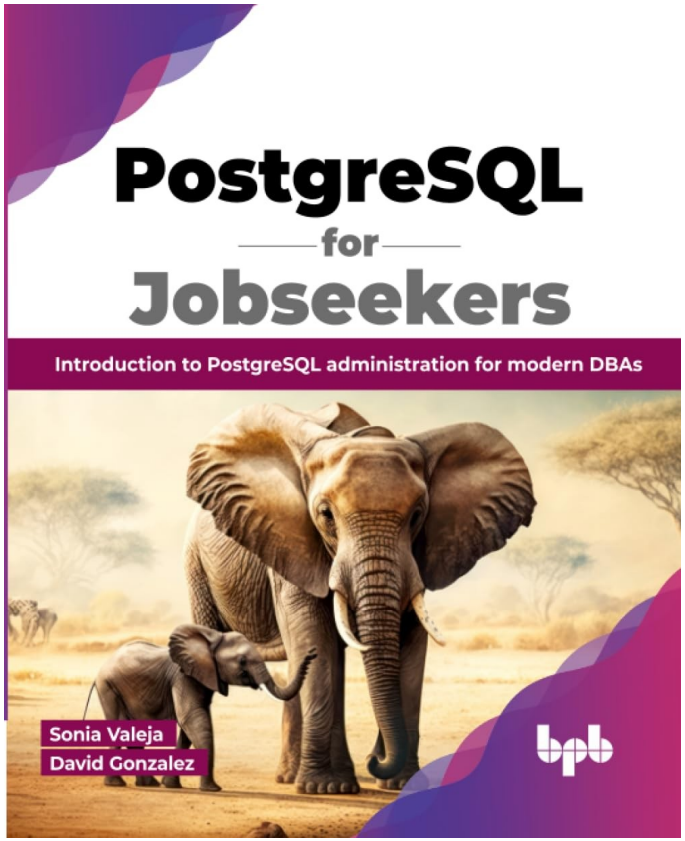
Best Practices for Performance Tuning

- Adjust key parameters in `postgresql.conf`:
  - `shared_buffers`: Set to 15-25 % of RAM.
  - `work_mem`: Allocate sufficient memory for sorting.
  - `effective_cache_size`: Set to 50-75 % of RAM.
  - `autovacuum`: Ensure it is enabled for table maintenance.
- Regularly analyze and vacuum tables.
- Use indexes strategically to avoid unnecessary overhead.

Conclusion

- Proper indexing and statistics ensure efficient queries.
- Use `EXPLAIN ANALYZE` to evaluate query performance.
- Tune PostgreSQL settings based on workload needs.

Database Administration: Backup and Restore.



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