Complete a Short Survey

Responses for informational purposes only

Proper PostgreSQL Parameters to Prevent Poor Performance

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Postgres Conference 2025

Introduction

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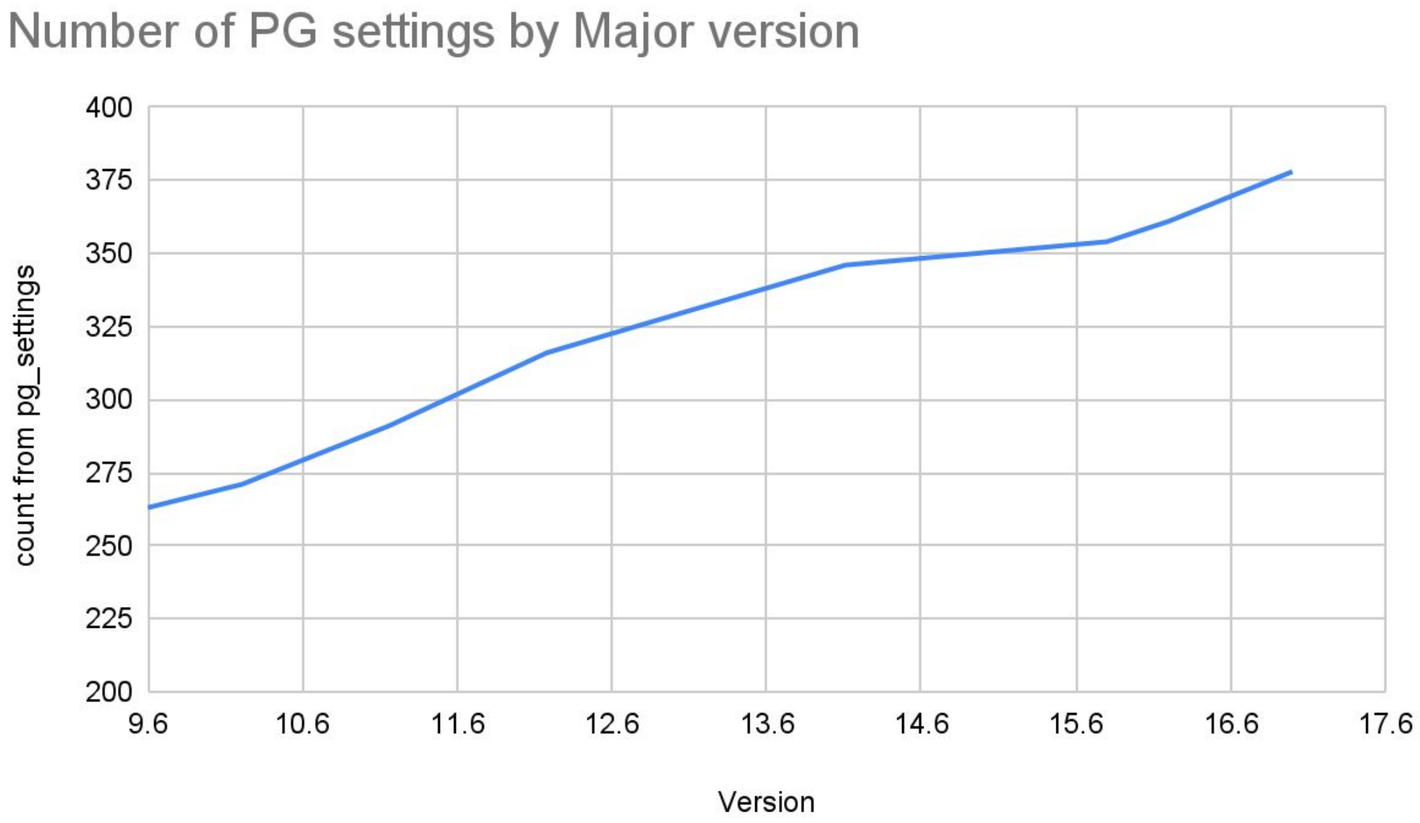
Goals

- Beginner-friendly Approach
- Trade-offs
- Understanding



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Workloads and Data

- Data
  - Size of each Row
  - Number of Rows
  - Complexity of queries
- Workloads
  - OLTP
  - OLAP
  - Data Warehouse
  - all of the above

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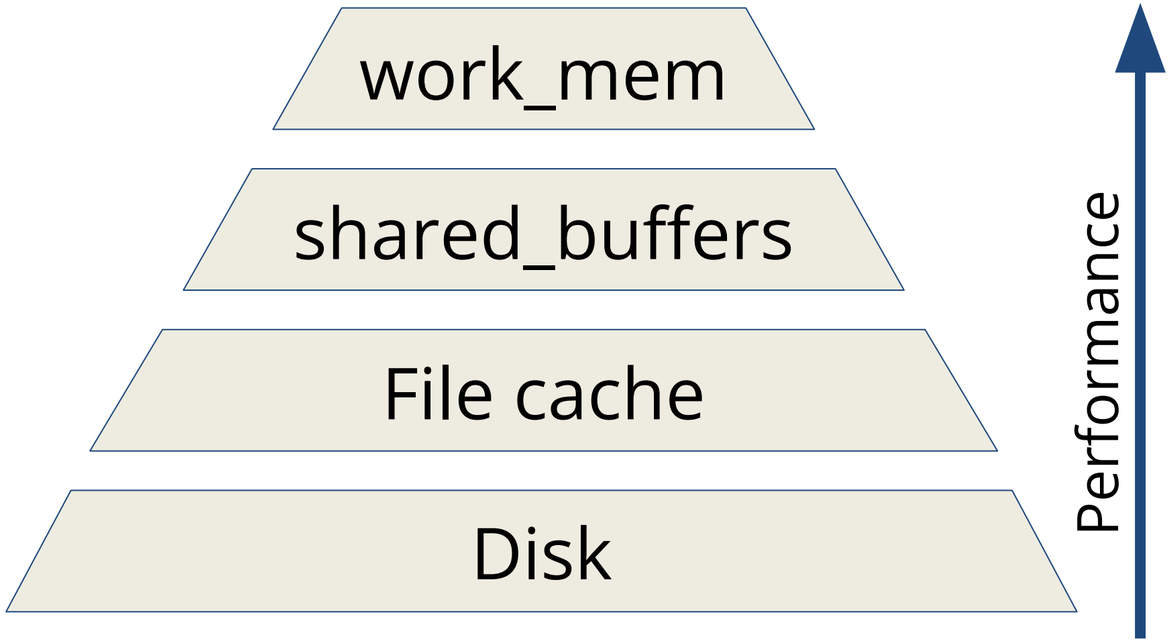
Reading of Data



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Writing of Data

- Tuple is Created
- Integrity checks
- WAL entry added to WAL buffers,
- WAL record gets sent to disk
- Background process starts updating data files

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Parameters

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Parameters

- shared_buffers
- work_mem
- max_connections
- effective_cache_size

Bonus

- *vacuum* and maintenance
- random_page_cost
- Other trade-offs

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shared_buffers

What:	Memory used for caching table data
Why:	Increase to improve query performance and reduce I/O*
When:	pg_statio_*_tables: 100% * heap_blks_hit / (heap_blks_hit + heap_blks_read)
Start:	25% - 40% of total RAM in a dedicated server

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work_mem

What:	Memory allocated to each connection*
Why:	Faster complex queries, allocated when needed.
When:	EXPLAIN ANALYZE on common queries Check for temp file creation
Start:	Start with 4MB, adjust as needed and data grows.

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max_connections

What:	How many connections are allowed
Why:	Execute more queries at the same time, but at a cost.
When:	Balance with other parameters. Monitor for queries that are waiting on CPU or locks in pg_stat_activity.
Start:	Start with 10-20 connections per available core.

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effctive_cache_size

What:	An estimate of kernel cache size
Why:	Up to encourage index usage and reduce sequential scans
When:	Examine OS Disk and I/O metrics. Goal is to smooth out large spikes. Watch out for intensive write workload.
Start:	Start at about 50% of total system RAM.

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What if?

1. What if shared_buffers is large enough to fit nearly entire DB into RAM?
2. What if shared_buffers is too small?
3. What if work_mem is too small?
4. What if connections is 200x number of CPU?
5. What if 2 x work_mem x max_connections + shared_buffers is > RAM

(Bonus) *vacuum*

- A set of parameters used to guide maintenance tasks
- If you don’t schedule your maintenance, maintenance will schedule itself. Usually when the system is most busy
- Some maintenance cannot be skipped
- AutoVacuum - Tuning and Monitoring right after this talk
- Deep Dive into PostgreSQL Vacuum Internals: Enhancements, Challenges, and Untold Stories - 2025 March 21 09:10 EDT

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(Bonus) random_page_cost

- Planner parameter that helps adjust relative cost between sequential and random access to disk.
- random_page_cost=4 was the default - meant for HDD
- SSD should use 1.1 or even 1

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Other Trade - Offs

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Indexes

- Indexes trade disk space and more work during inserts and updates for faster access to data (if they are used)
- Unused indexes are expensive (pg_stat_all_indexes)

- Indexing Strategy Guide - March 21 09:10 EDT
- Advanced Indexing Techniques in PostgreSQL: Optimizing Queries for Maximum Performance - 2025 March 21 11:10 EDT

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Connection pooling

- Better memory allocation
- Reduces overhead of frequent connection creation and teardown
- Careful about connection lifetime

Caching

- Fastest work is work you can avoid doing
- DB Query is much more expensive vs. cache lookup in Redis or similar
- Great for caching results of queries that change infrequently (or on schedule) and that are looked up many times.

SUMMARY

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Recap

- How data moves through PostgreSQL
- Best work is work you can avoid
- https://www.postgresql.org/docs/

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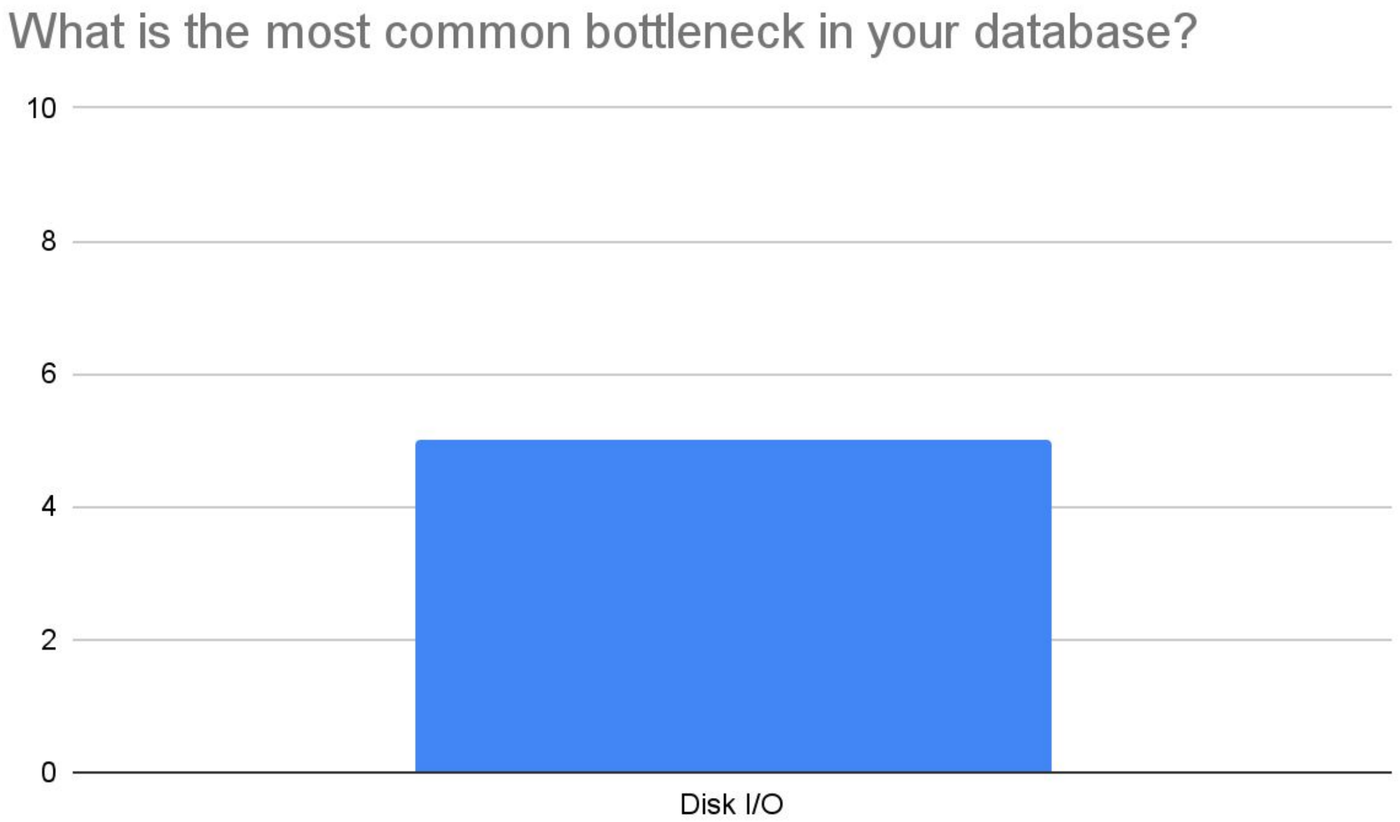
Survey Results



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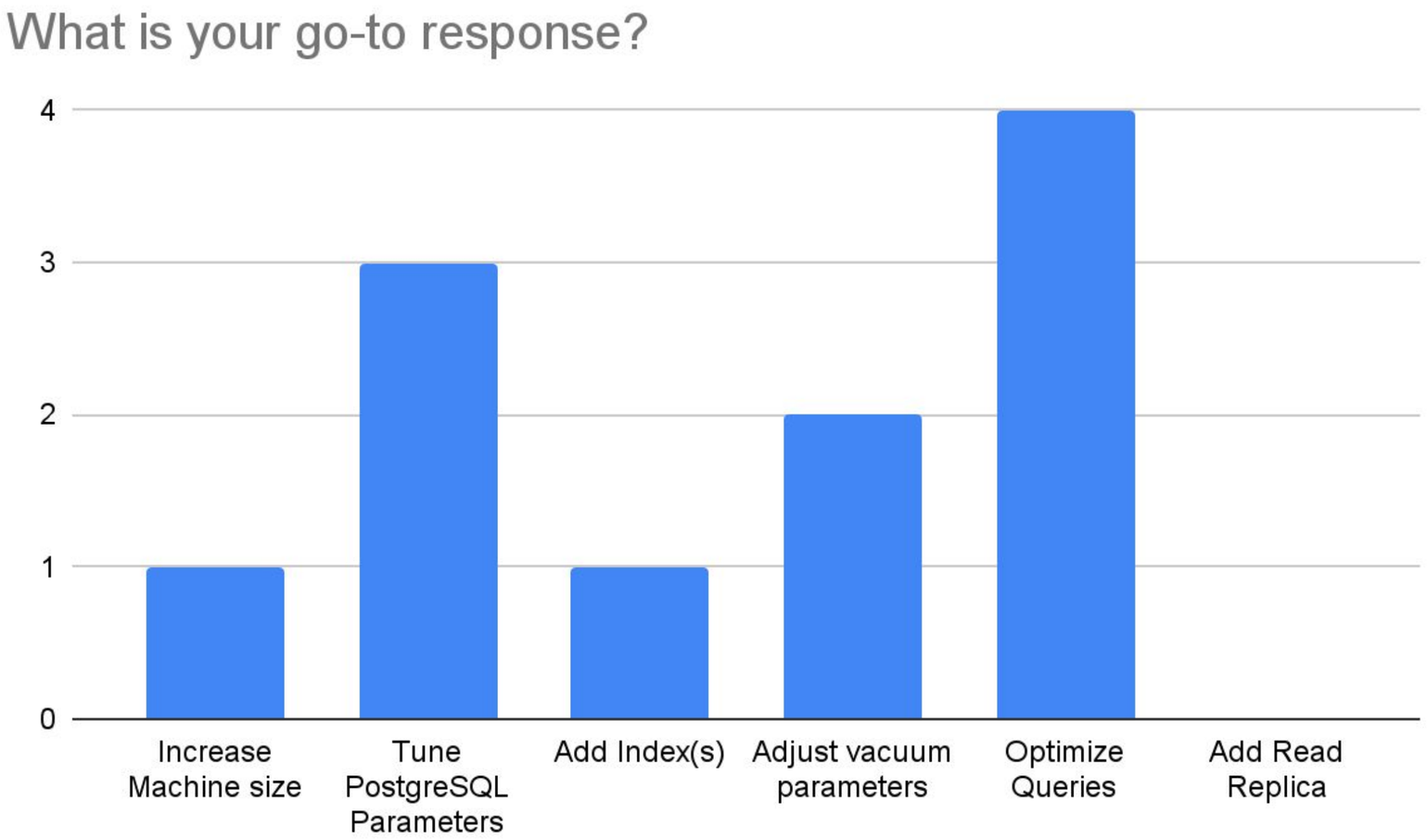
Survey Results



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Questions?

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