

# Future Postgres Challenges

BRUCE MOMJIAN



This presentation explores possible challenges to Postgres's success in the coming years.

*<https://momjian.us/presentations>*



*Creative Commons Attribution License*

*Last updated: October, 2021*

# Outline

1. Current status
2. Project challenges
3. Competitive challenges
4. Technical challenges

# 1. Current Status



<https://www.flickr.com/photos/snikologiannis/g>

# Consistent Development

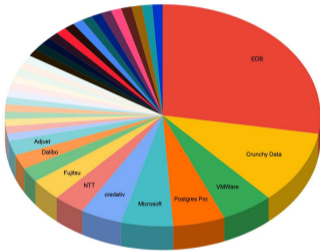
- 35+ years of development
- 25+ years of annual major releases
- ~180 features per major release
- Quarterly minor releases

# Healthy Community Structure

- BSD license guarantees software will be available forever, including for proprietary use.
- Development and leadership is diversified geographically, culturally, and is multi-company.

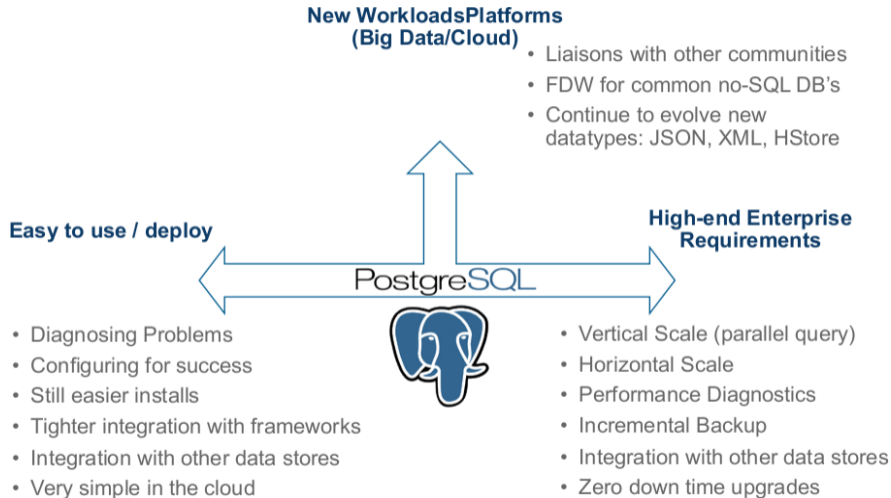
# Strong Diversified Assistance

Postgres contributors (PostgreSQL.org + PG 13 Release Notes) w.o. personal or freelancers



- EDB ● Crunchy Data ● VMWare ● Postgres Pro ● Microsoft ● credativ ● NTT ● Fujitsu
- PeopleDoc ● Dalibo ● Adjust ● Yandex ● University of Cambridge ● True Software ● Swarm64
- SRA OSS ● Rakuten ● Postgres Experts ● Playtech ● Paragon
- Open Standards Promotion Center, Japan ● Ongres ● MongoDB ● Minsait ● Iovation ● ILande
- Huawei ● HeteroDB ● Google ● Facebook ● Deriv.com ● Cybertec
- conova communications GmbH ● Brandwatch ● Basefarm AS ● Appen ● Amazon ● Afiliias

# Innovative Features



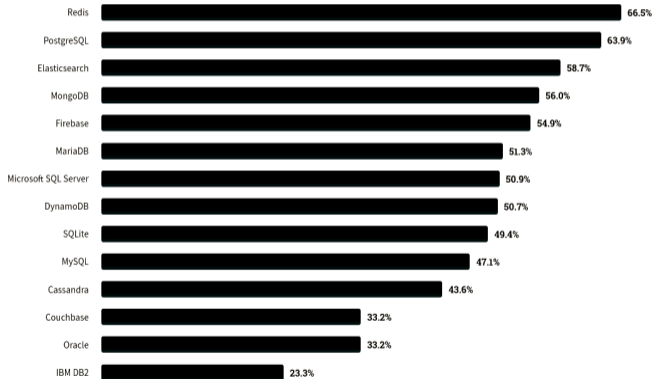
# Most Loved Relational Database in 2020

Loved

Dreaded

Wanted

% of developers who are developing with the language or technology and have expressed interest in continuing to develop with it



<https://insights.stackoverflow.com/survey/2020#technology-most-loved-dreaded-and-wanted-databases-loved4>



## 2. Project Challenges



<https://www.flickr.com/photos/croydonclicker/>

# Leadership Disruption

- Gimp was abandoned by its lead developers, later resurrected
- Red Hat took over CentOS, changed stability

# Poor Reputation

- Security flaws
- Buggy releases
- Instability
- Poor performance
- Data corruption

# Patent Attacks

- Developer with patents, Rambus
- Competitor with patents, Microsoft
- Patent trolls, Rothschild Patent Imaging LLC
- Open invention network

# Identity Challenges

- Domain name
- Website
- Trademark

# Cloud Vendor Starvation

- Cloud vendors use open source as upsell
- Already have infrastructure-as-a-service relationship with customers
- Company-controlled open source already impacted, changed licenses
- Red Hat challenged by cloud vendors

[https://momjian.us/main/blogs/pgblog/2020.html#September\\_25\\_2020](https://momjian.us/main/blogs/pgblog/2020.html#September_25_2020)

[https://momjian.us/main/blogs/pgblog/2020.html#September\\_28\\_2020](https://momjian.us/main/blogs/pgblog/2020.html#September_28_2020)

### 3. Competitive Challenges



<https://www.flickr.com/photos/oui-ennui/>

# Other Solutions

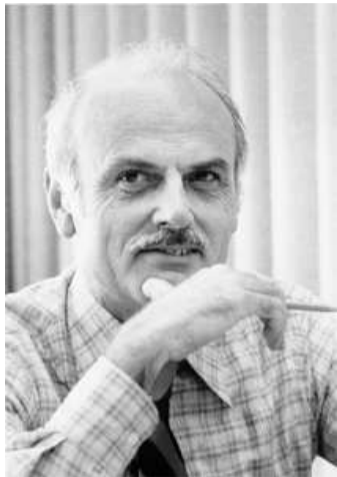
- Relational (e.g., MySQL, MariaDB)
- Embedded (SQLite)
- Document (MongoDB)
- Columnar (Cassandra)
- Data warehouse (Hadoop)
- Full text search (Elasticsearch)
- Time series (InfluxDB)





# Decline of Relational

- Relational storage was proposed by E. F. Codd in 1970
- 50+ years still in use
- Very flexible
- Resisted challenges
  - XML databases
  - Object databases
  - NoSQL



[https://en.wikipedia.org/wiki/Edgar\\_F.\\_Codd](https://en.wikipedia.org/wiki/Edgar_F._Codd)

## 4. Technical Challenges



<https://www.flickr.com/photos/afc16/>

# Write Amplification

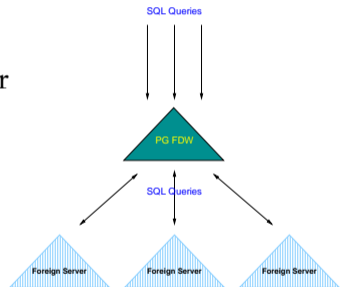
- Non-HOT updates can cause massive index updates
- Dead and old row version cleanup can become expensive for certain workloads
- Writes cause full page image and hint WAL writes
- Freezing of old transaction ids
- Incremental improvements
  - Are radical improvements needed?

# Cluster File Encryption, TDE

- Newer versions of the PCI DSS specification make storage-only encryption less acceptable
- This is a check-box requirement for many financial deployments
- Development is in progress

# Horizontal Scaling

- Allows data storage larger than possible on a single server
- Allows write scaling
- Enables large CPU and memory scaling
- Development is in progress



# Obsolete Toolchain

Difficulty replacing obsolete or abandoned:

- Programming languages
- Support libraries
- Testing frameworks

# Drastic Technology Changes

- New language, architecture, or storage that are difficult for Postgres to adopt
- Technology changes have happened before
  - SSDs, added `random_page_cost` to tablespaces
  - virtual machines, containers, cloud



# Conclusion



<https://momjian.us/presentations>

<https://www.flickr.com/photos/91451979@N00/>