



The State of Postgres

For Modern, Scalable Applications

Umur Cubukcu | Citus Data | Strata Data Conference 2018

@umurc | @citusdata | citusdata.com

Citus Data Co-Founders, Left to Right
Ozgun Erdogan, Sumedh Pathak, Umur Cubukcu
Photo credit: Willy Johnson 2017



About me & Citus Data

- Umur Cubukcu, Co-Founder & CEO of Citus Data
- Citus: Distributed PostgreSQL
- Founded 2011, HQ in SOMA

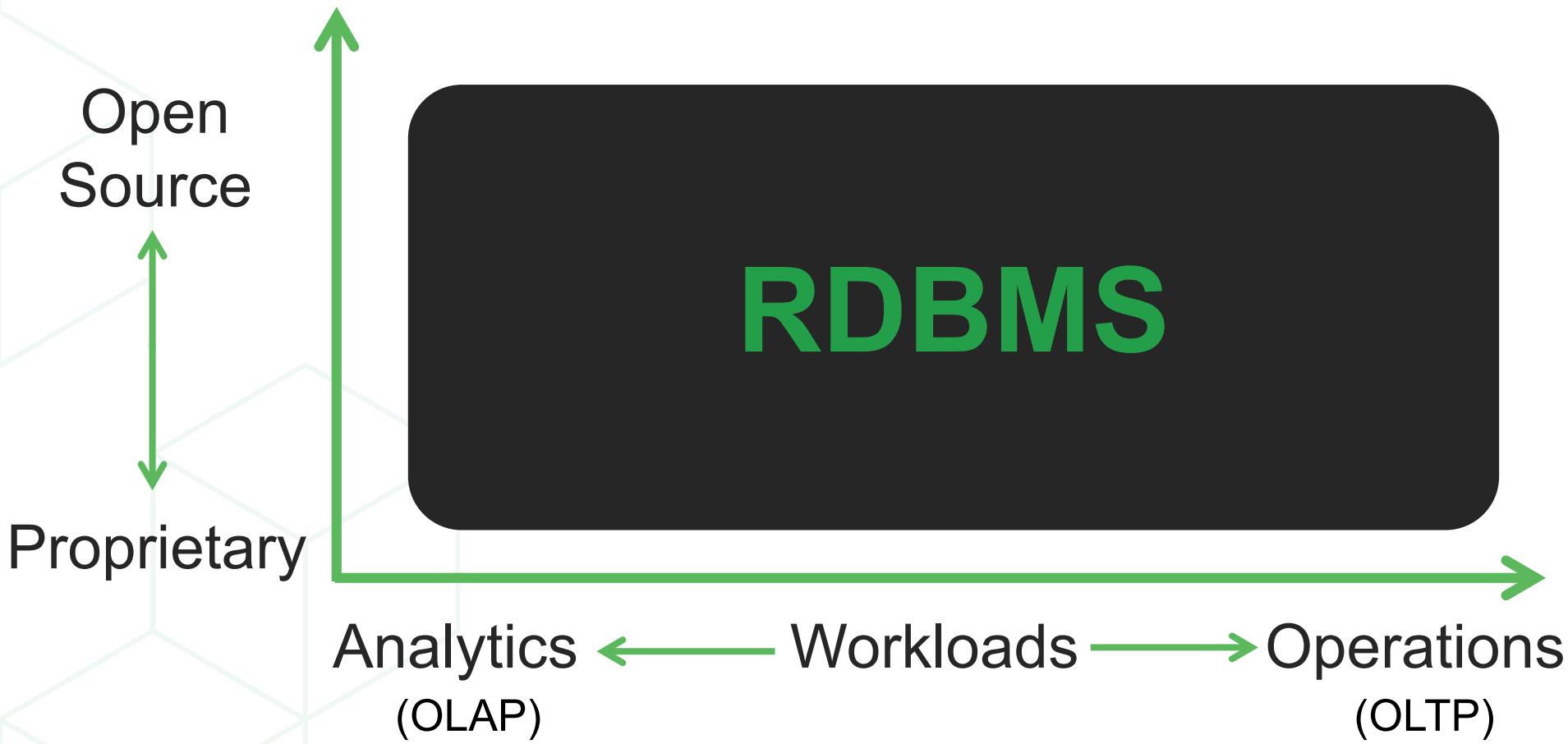


@umurc | @citusdata



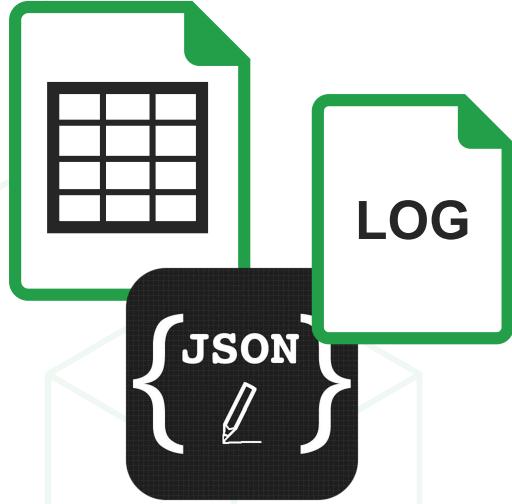
github.com/citusdata/citus

Databases used to be simple (2008)

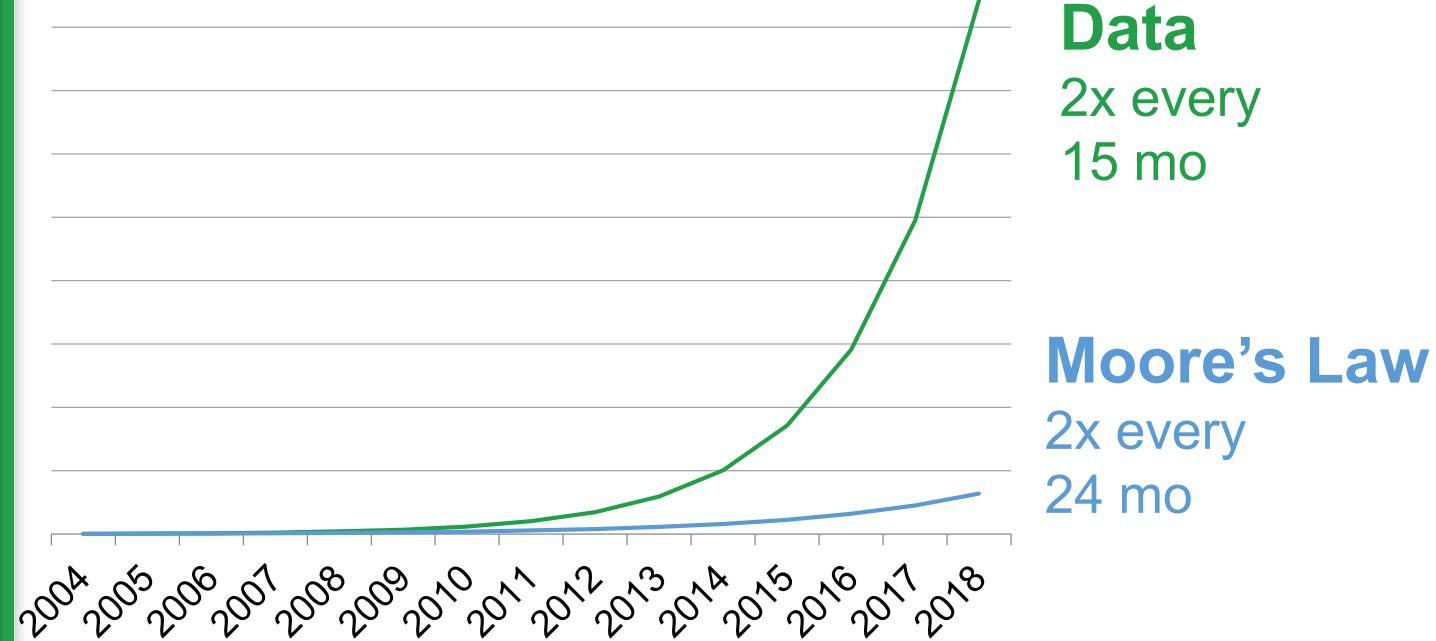


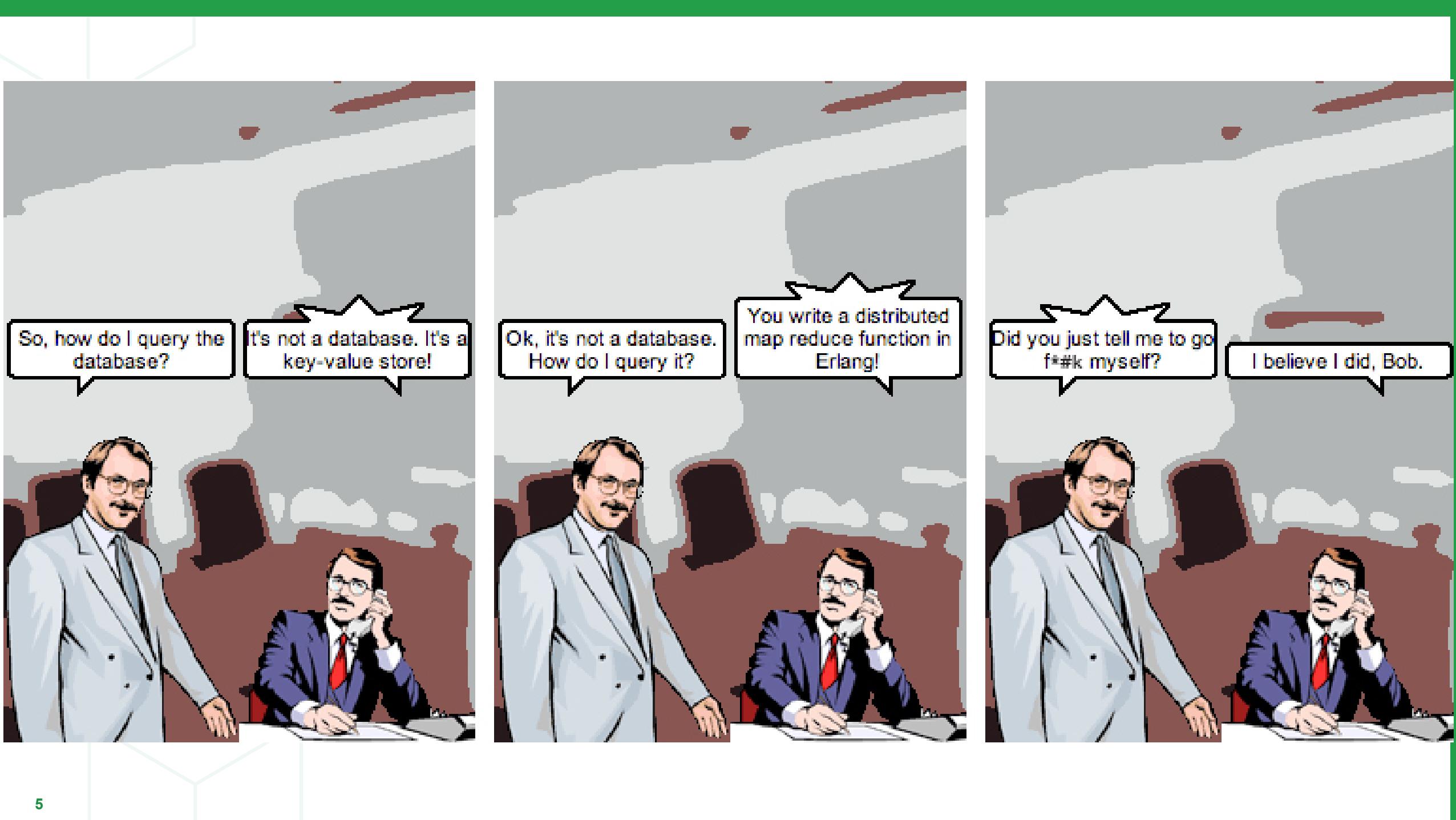
Two challenges for the relational database changed the landscape

1 Data with less structure



2 Data Growth >> Silicon Growth...



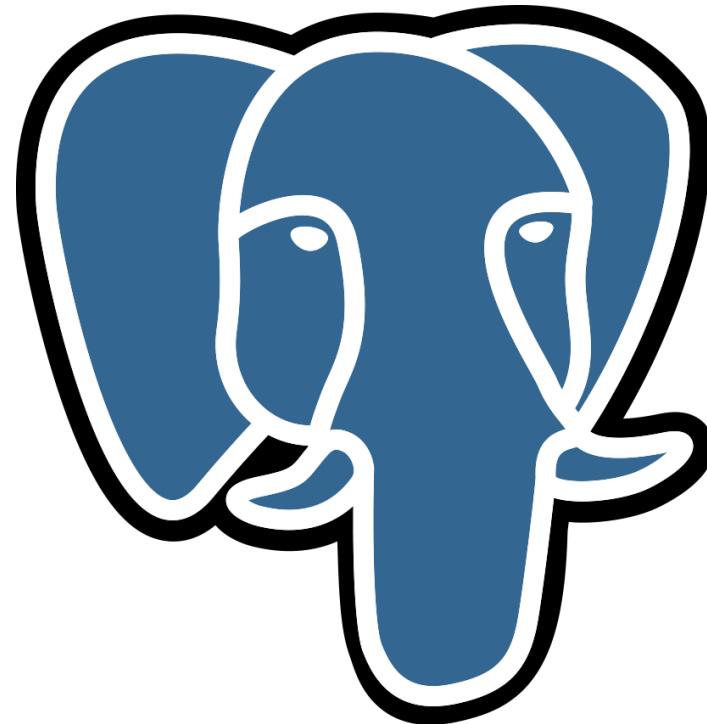


Meanwhile: Short history of Postgres

Not the first time seeing similar challenges

1 SQL or not? (1995)

- Post-Ingres
- Started life as object store
- Added SQL API in 1995



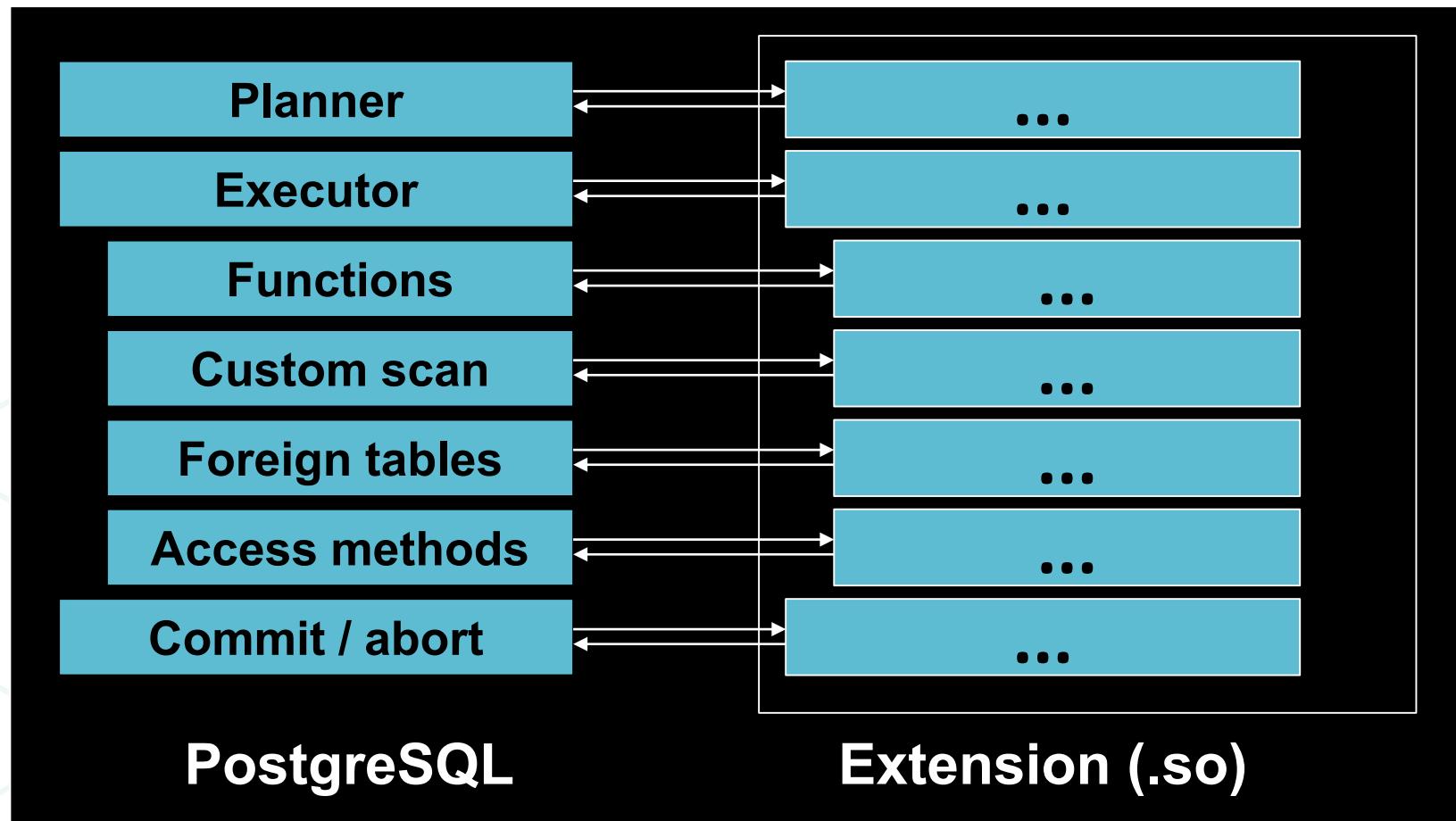
2 Scaling out to handle data growth (2005)

- For analytics only: MPPs
- So many forks! AsterData, Netezza, ParAccel (Redshift), Greenplum

Introducing PostgreSQL Extension APIs (2011)

Amplifying vs. breaking the ecosystem

CREATE EXTENSION ...



Addressing challenges to RDBMS

1 To structure, or not to structure?

2 Scaling out—compute & performance



Start from file system

- (+) Any data, any structure
- (+) 'Infinitely' scalable storage
- (+) Write fast

- (-) Pay cost at query time
- (-) Batch vs. real-time
- (-) Indexes (Append only FS)

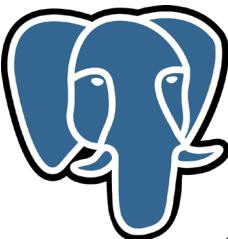


Worry about only one access pattern

Semi-structured (JSON)

- (+) Simple: Put & Get
 - (+) Scalable
-

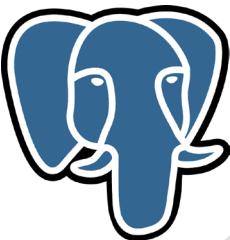
- (-) No expressiveness for analytics
- (-) No JOINS, data duplication
- (-) Enforce structure at app layer



Extend the database for JSON data

Table "public.events"

Column	Type	Sample Data
user_id	<i>bigint</i>	09288
created_at	<i>timestamp</i>	2018-03-08 00:57:12.6936+00
payload	jsonb	{ "person":{ "name":"Emma", "emails":{"west":"emma@sf.com", "east":"emma@nyc.com"}, "address":{ "street_number":12, "street_name":"15th Street", "city":"San Francisco", "state":"CA", "zip":94107 }, "phone_numbers":["6501234567","6500123456"] }, "country":"USA", "event_type":"push_notification", "device_type":"mobile" }



Leverage indexing (and other fundamentals)

B-tree indexes

GIN & GiST indexes

Secondary indexes

Full text search

Index-only scans

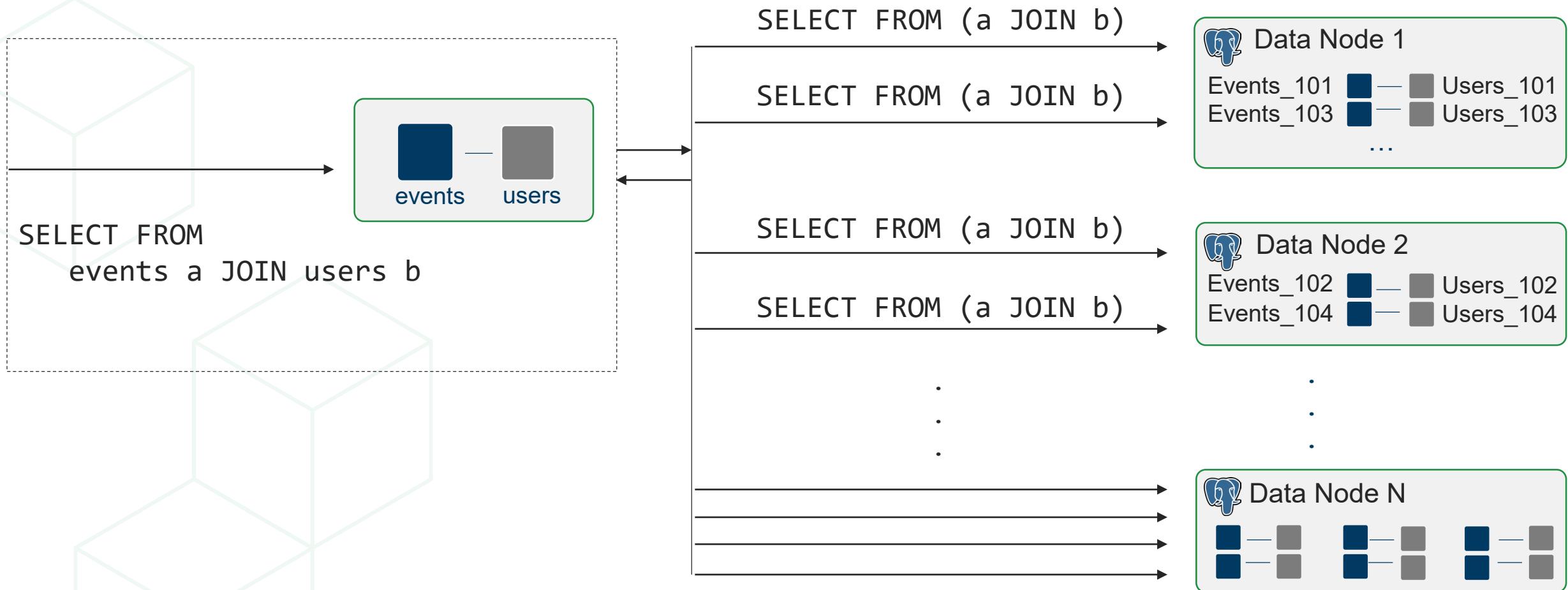
Fitting indexes into memory

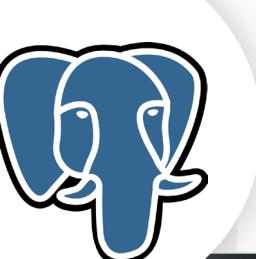
+

Not to forget: Parallel queries, MVCC, and many more.

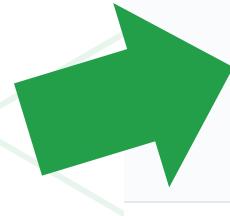


Push computations (and joins) down to many PostgreSQL instances





Extending Postgres for horizontal scale: Citus



This screenshot shows the GitHub repository page for `citusdata / citus`. The repository has 133 stars, 2,541 forks, and 175 issues. It's described as "Scalable PostgreSQL for multi-tenant and real-time workloads" with a link to <https://www.citusdata.com>. The repository has 1,734 commits, 88 branches, 36 releases, and 29 contributors. The license is AGPL-3.0. The latest commit was made 3 days ago. The repository includes topics like database, citus, multi-tenant, postgresql, scale, sharding, sql, distributed-database, and postgres.

citusdata / citus

Watch 133 Unstar 2,541 Fork 175

Code Issues 483 Pull requests 16 Projects 0 Wiki Insights Settings

Scalable PostgreSQL for multi-tenant and real-time workloads <https://www.citusdata.com>

1,734 commits 88 branches 36 releases 29 contributors AGPL-3.0

Branch: master New pull request Create new file Upload files Find file Clone or download

onerkalaci Merge pull request #2031 from citusdata/fix_immediate_shut_down_issue ... Latest commit e7b28dd 3 days ago

config Add citus_version(), analogous to PG's version() 5 months ago

src Handle failures during I/O 3 days ago

.codecov.yml Remove obsolete lines 5 months ago

.editorconfig Set tab size for GitHub display a year ago

.gitattributes Add ruleutils file for PostgreSQL 11 5 months ago

PostgreSQL: Vibrant, global ecosystem

Sample PostgreSQL Extensions

- citus
- pgcrypto
- pg_cron
- pg_partman
- postgresql-HLL
- cstore_fdw
- unaccent
- cube
- jdbc_fdw
- pg_trgm
- PostGIS
- ...

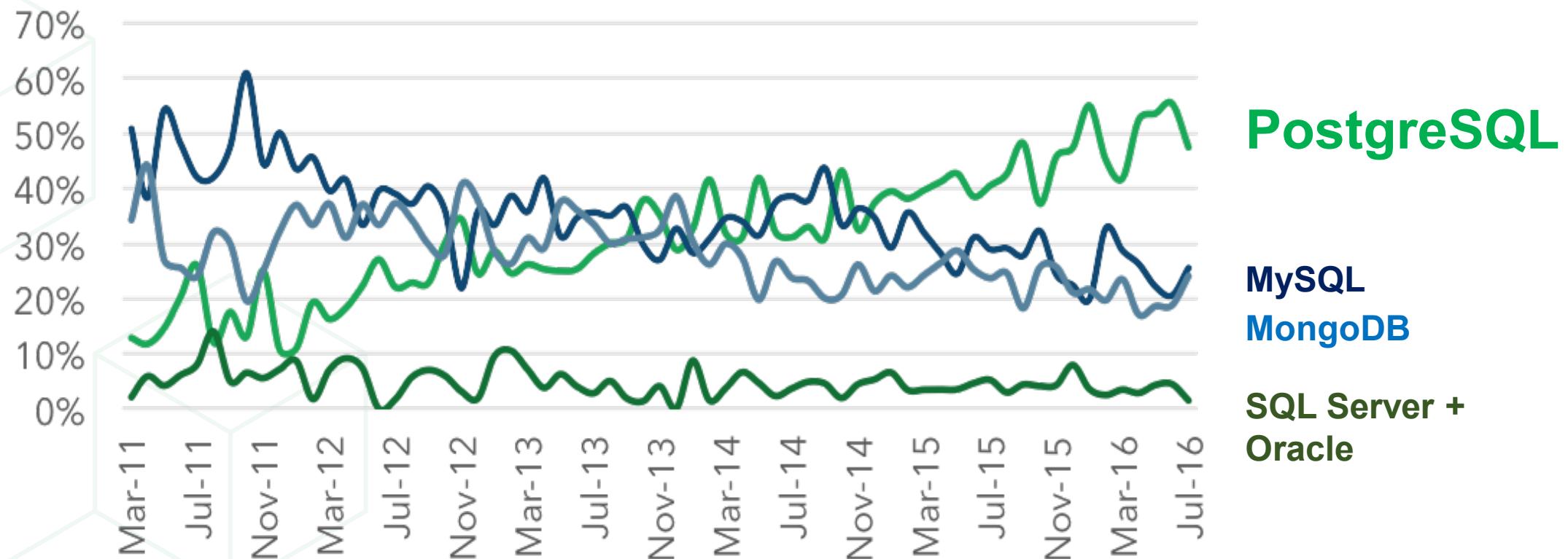
- pg_buffercache
- pg_prewarm
- btree_gin
- btree_gist
- postgis_topology
- pg_stat_statements
- postgresql-unit
- plpgsql
- plv8
- pg_telemetry
- foreign data wrappers
- ...

Integrations



PostgreSQL on fire

Database adoption among developers¹

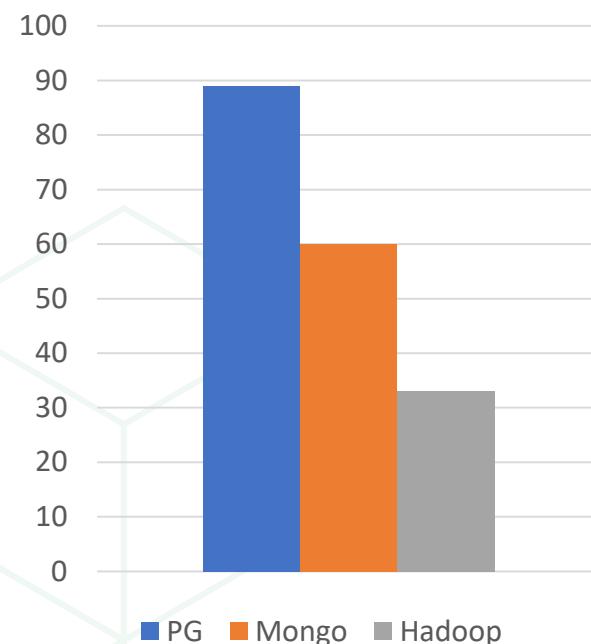


Source: % database job postings that mention each specific technology, across 20K+ job posts on Hacker News, <https://news.ycombinator.com>

Growing from already vast user base

PostgreSQL popularity =
Hadoop + Mongo combined

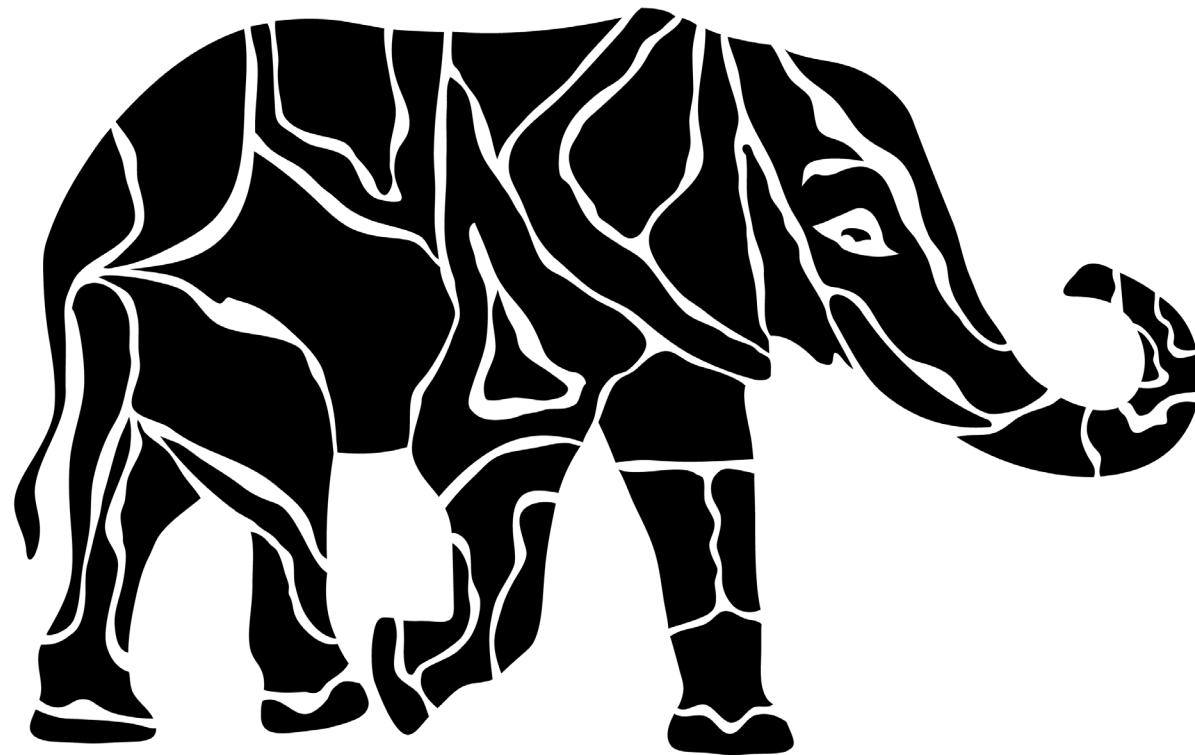
Winning Startups &
Enterprises



Source: Google Trends for the past 2 years

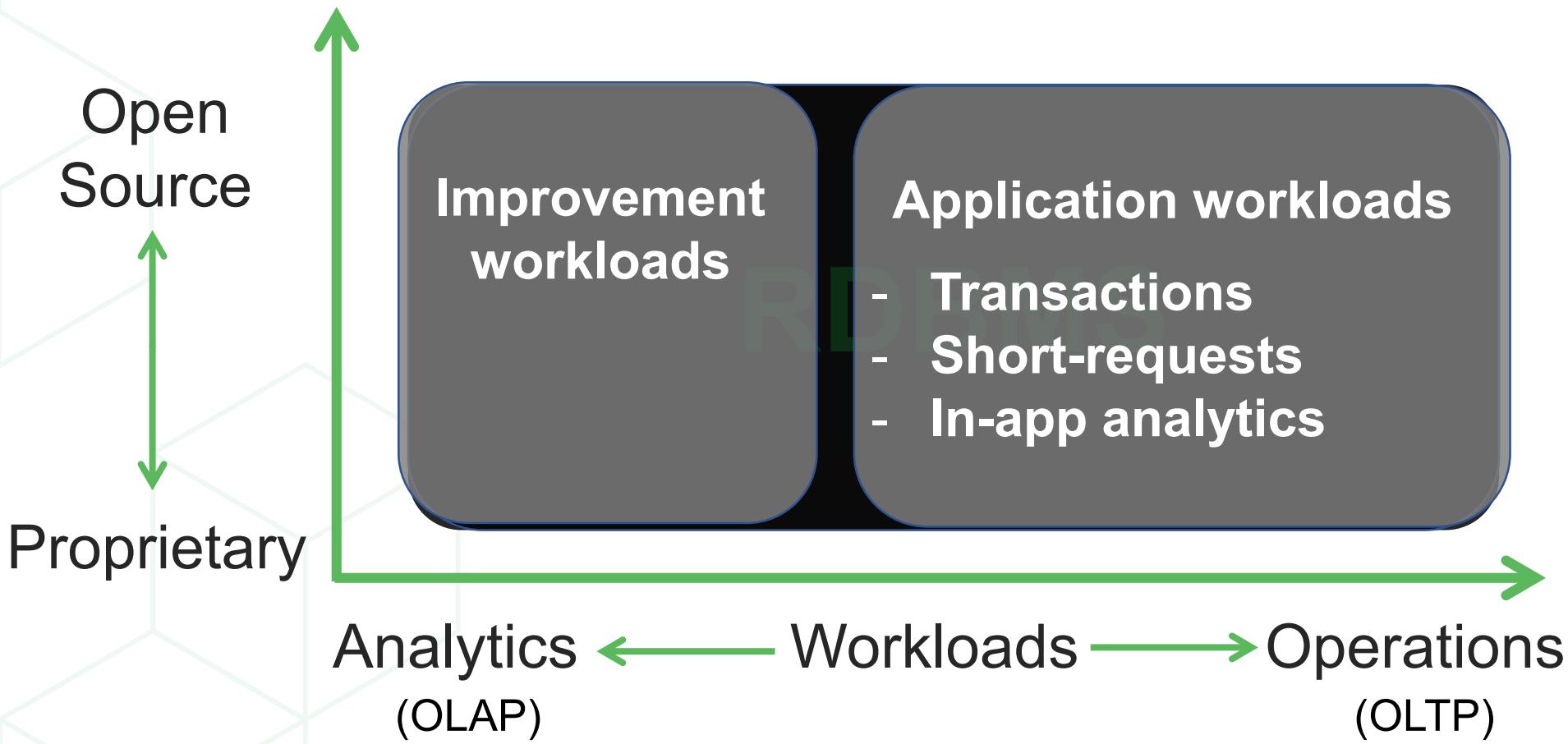


So there's an elephant in the room

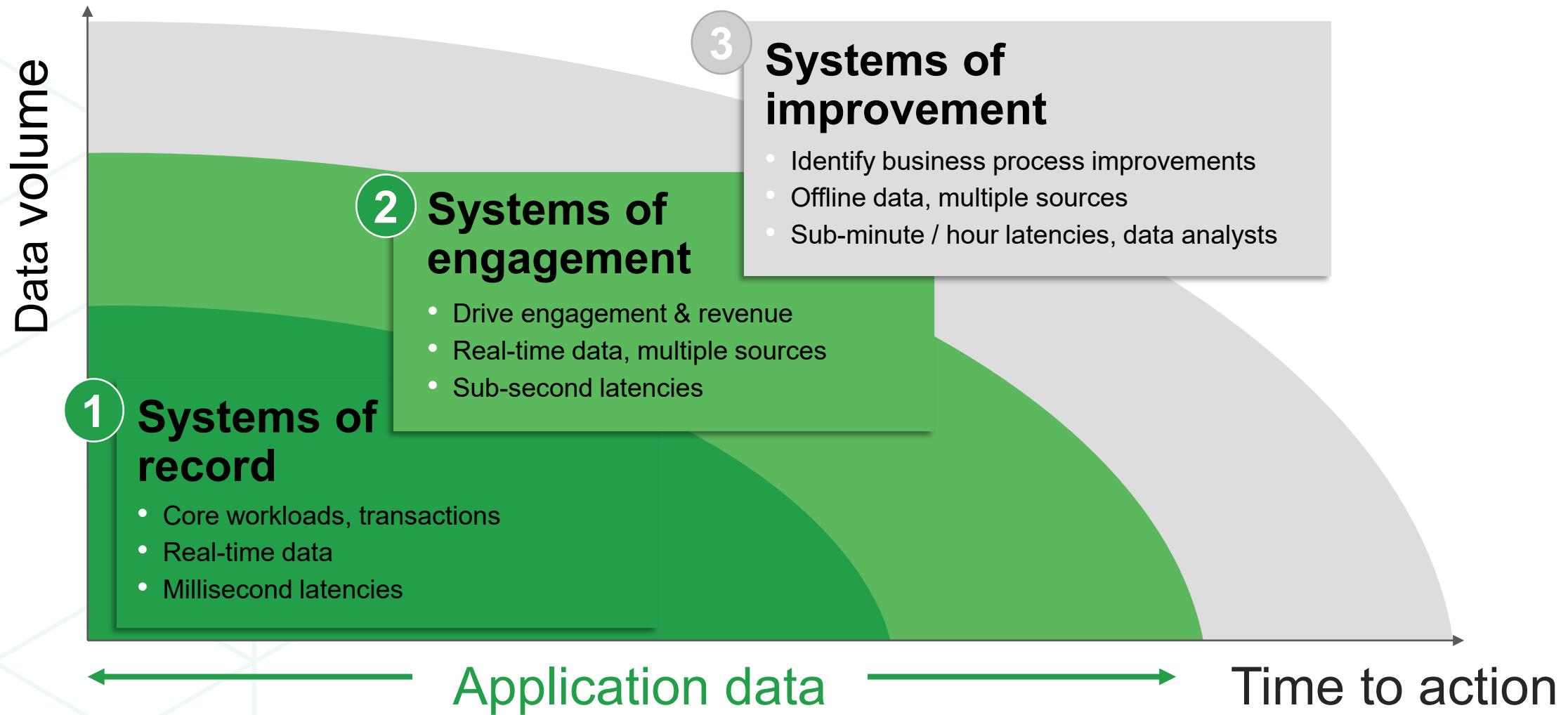


How does it all fit in with your stack?

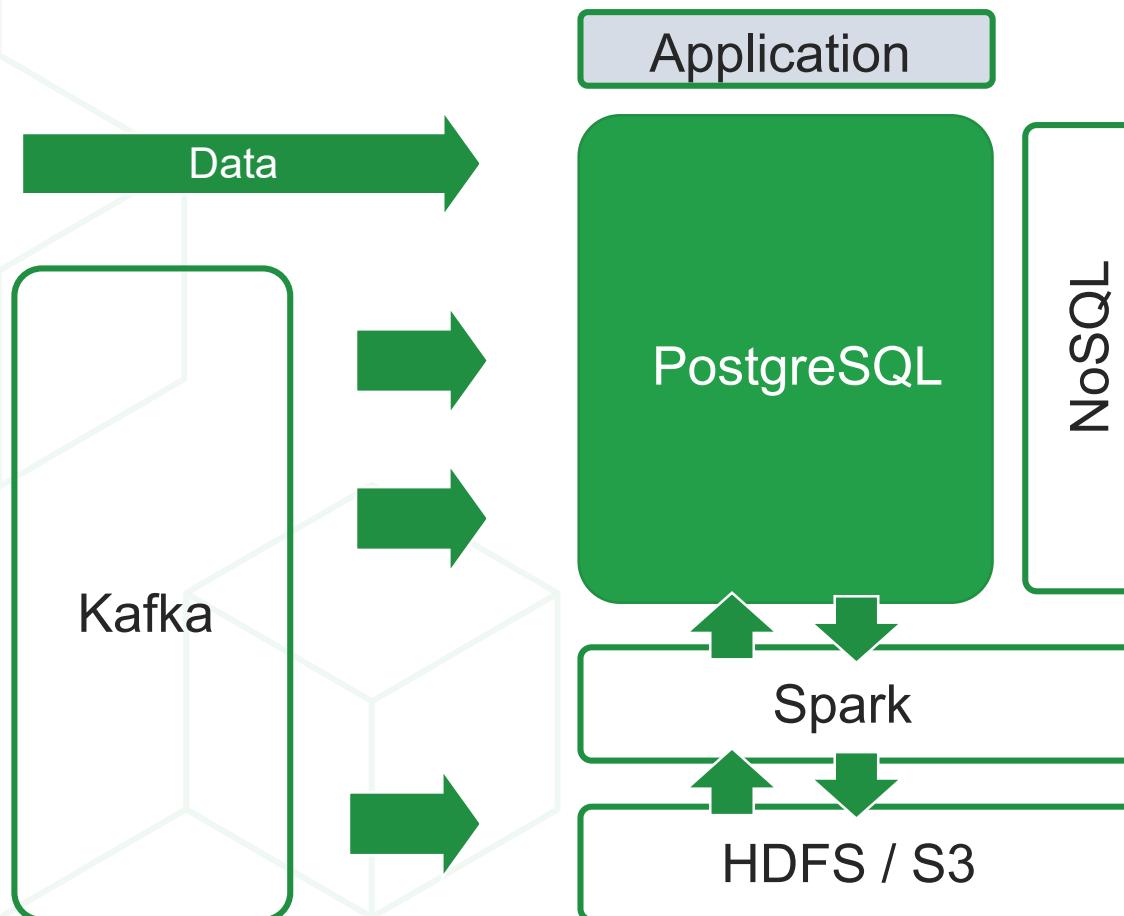
Modern workloads are evolving



Modern databases serve 3 types of apps



PostgreSQL in your infrastructure stack



- Standalone database
 - Storage
 - Compute
- Persistence layer for Kafka
- Persistence layer for Spark
- Adjacent to NoSQL

Note: Standard PostgreSQL connectors for all tools (e.g. ODBC / JDBC, PostgreSQL language bindings) available for integrations.

Scaling the tables



Rasty Turek @synopsi

Dec 21, 2016

Today one of our PostgreSQL tables surpassed half of trillion rows [over 54TB of data].

And still most of our queries run under 600ms

Parting thoughts: PostgreSQL becoming the Linux of Databases





Thank you

@umurc



@citusdata

github.com/citusdata/citus

citusdata.com/jobs

We're Hiring!