

In-memory database for web browser

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Background

- There are various data models - **relational, document, graph**, ...
- Multi-model data** is represented in multiple of them *at once*.
 - Combining their advantages for better efficiency.
- Websites** may contain large amounts of such data.
 - Heterogenous data in **main memory**.
 - Sometimes, the user needs to search through.
 - E.g. a scientist using a web app showing simulation results.

Implementation

- DortDB is a **TypeScript** library.
- All data is stored **in-memory** as JavaScript runtime objects.
- Data sources are registered from code.
 - Any data structure can be accessed with a suitable **data adapter**.
- Support for **secondary indices**.

Example Query

```
SELECT products.name
FROM products
JOIN (
  LANG cypher
  MATCH (p:person)-[:HAS_INTEREST]->(c:category)
  RETURN p, c.name AS category
) AS interests
ON products.category = interests.category
WHERE interests.p->'id' IN (
  LANG XQuery
  $Invoices/Invoices/Invoice.xml[
    OrderDate < '2020-12-24'
  ]/PersonId/fn:data()
)
```

Design goals

- Lightweight:** in the web browser, every byte counts.
- Modular:** let the developer include only what they need.
- Extensible:** we can't do everything ourselves.
- Fast:** no need to elaborate.

The Challenge

- How to **query** across multiple data models?
 - Conflicting paradigms, complexity...

Universal query language

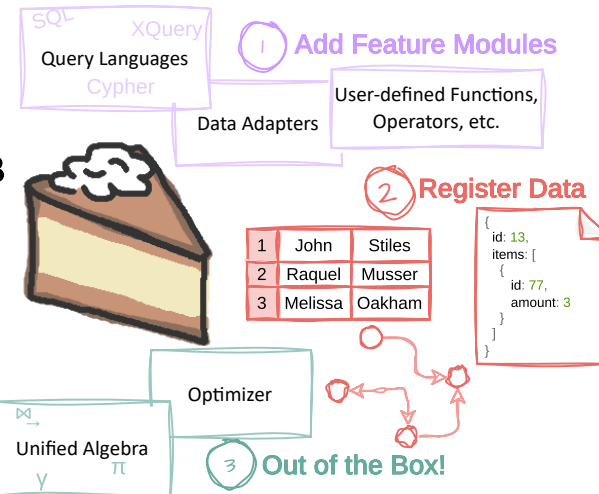


Multiple query languages

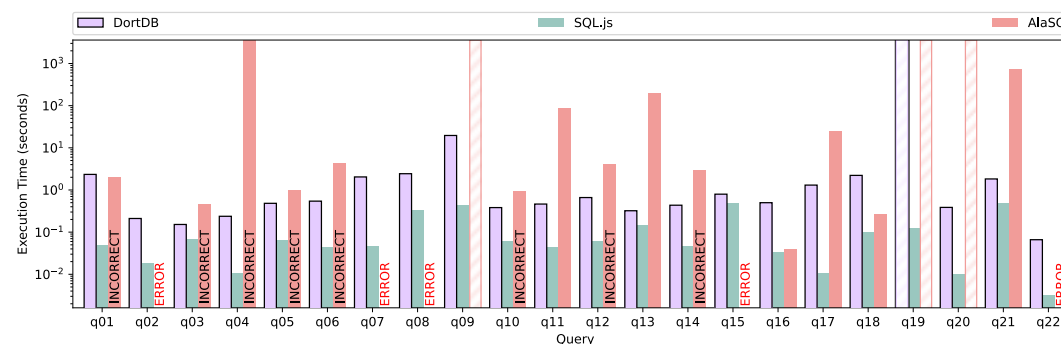
Our Approach

- Parse the query into **unified algebra** operators.
 - Currently covers **relational, document** and **graph** models.
- Allow any language with a mapping to the algebra.
 - SQL, XQuery** and **Cypher** subsets are implemented out of the box.
- Enable mixing of *multiple* languages in a *single* query.
 - A **language switch** can appear anywhere a subquery could.
- Optimize** the operator tree as a whole.

Bake your
own DortDB
instance!



TPCH Benchmark (compared with other JS SQL libraries)



Contributions

- Set of libraries published on **npm**.
 - <https://www.npmjs.com/~dortdb>
- Demo presented at **VLDB 2025**.
 - DortDB: Bridging Query Languages for Multi-Model Data Ponds*
- Journal paper currently submitted to Information Systems.
 - One Algebra to Query Them All: A Schema-Agnostic Foundation for Cross-Model Querying*

Try it out online: <https://filipjezek.github.io/dortdb/showcase>