

Freely Moving Between the OLTP and OLAP Worlds:

Hermes – an High-Performance OLAP Accelerator for MySQL

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From OLTP to HTAP

Starting Point:

- MySQL as Cloud OLTP (*Taurus**)

Goal:

- Efficient support for analytical queries, i.e. OLAP
- Access to fresh data

Approach:

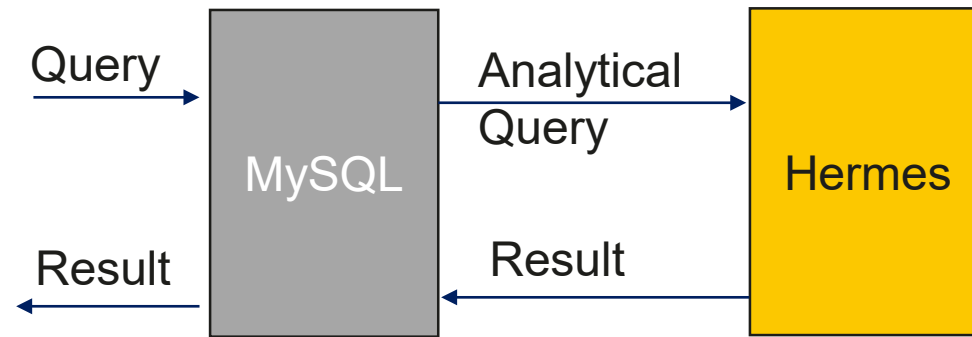
- Add Accelerator (Hermes) to MySQL

Challenges:

1. OLAP precludes OLTP
2. Integration with MySQL

* Depoutovitch et al. Taurus Database: How to be Fast, Available, and Frugal in the Cloud. SIGMOD 2020

Hermes Architecture - Query



Challenge 1: Efficient OLAP Precludes OLTP

	OLAP	OLTP
Storage	Column Store	Row Store
	Compressed	Uncompressed
Indexes	MinMax/Zonemap	B-trees
Execution	Vectorization/ Compilation	Interpreted tuple-at-a-time

Challenge 1: Efficient OLAP Precludes OLTP

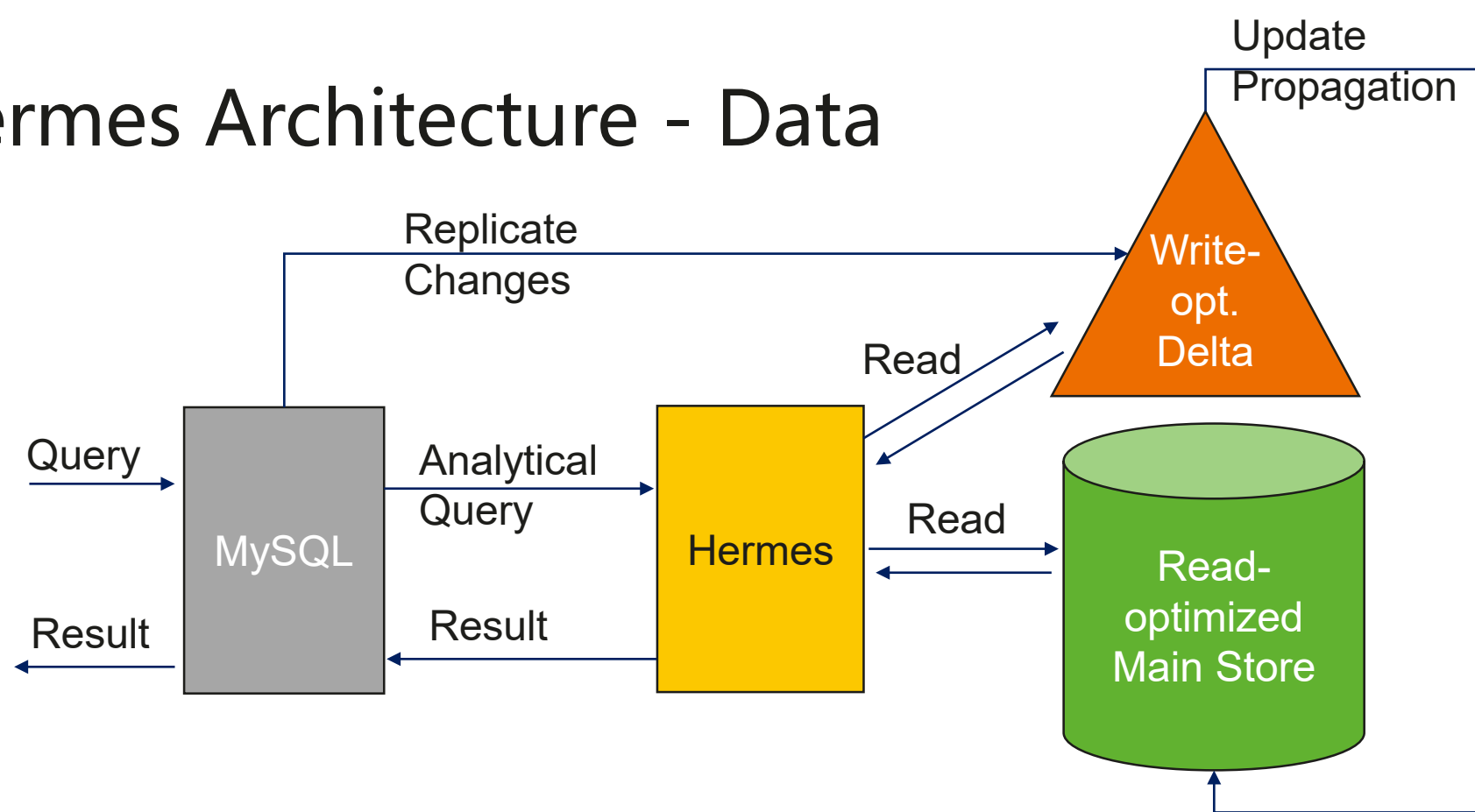
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Hermes:

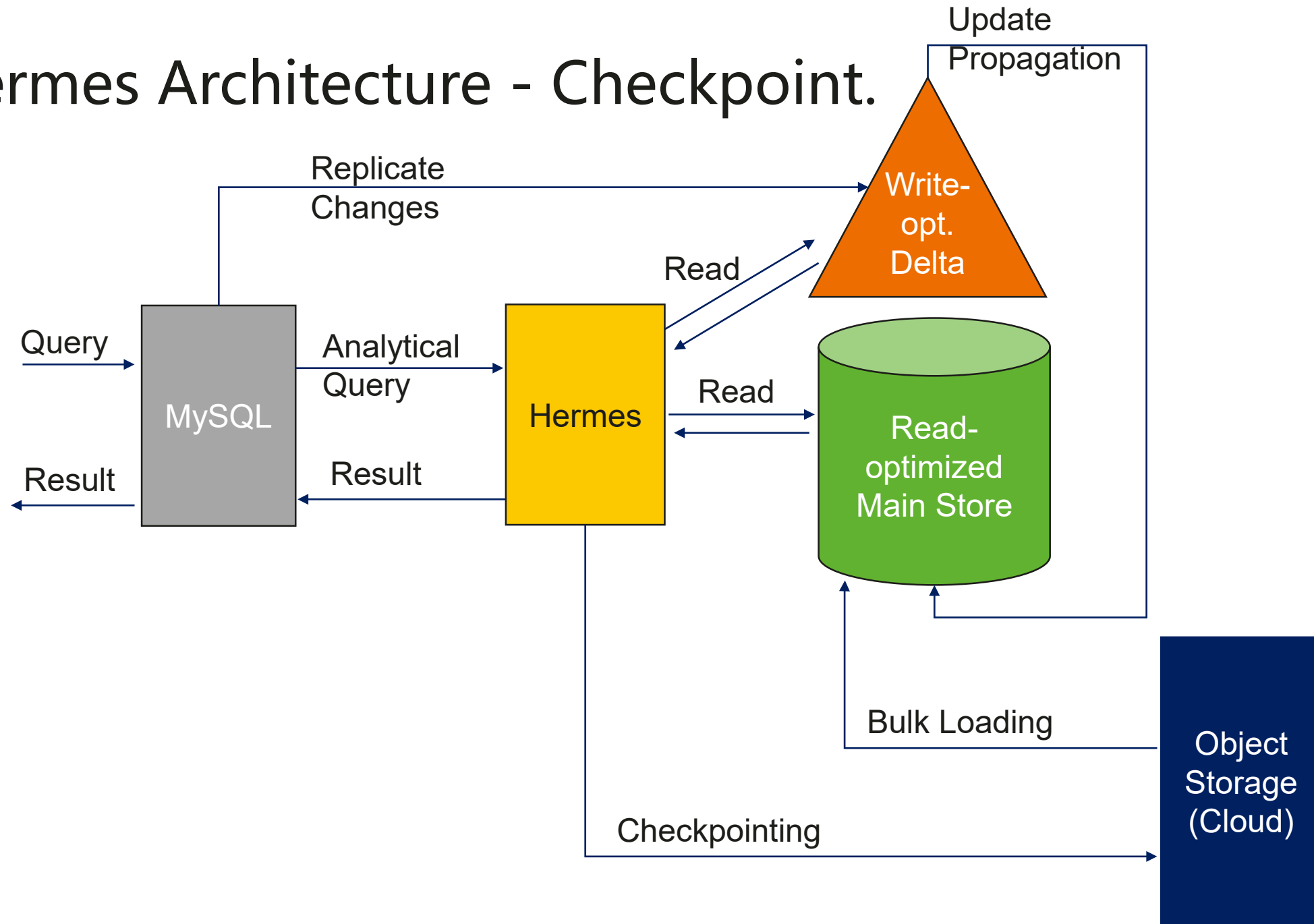
*Read-optimized
Main Store*

*Write-optimized
Delta Store*

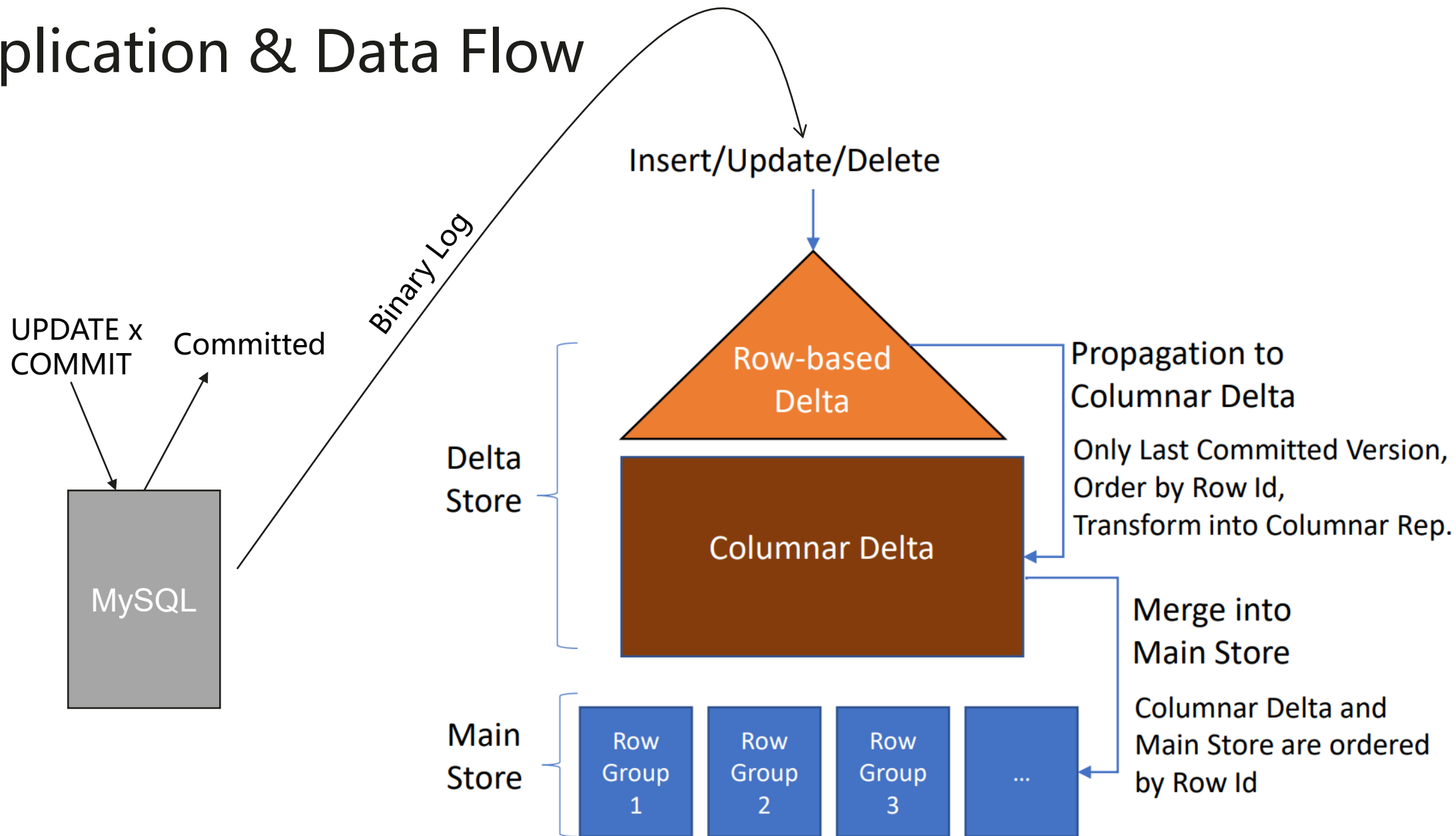
Hermes Architecture - Data



Hermes Architecture - Checkpoint.



Replication & Data Flow



Challenge 2: Integration with MySQL

1. Initial Ingestion

- Directly append to Main store

2. Change Replication

- Directly modify the Delta store

3. Consistent Snapshots

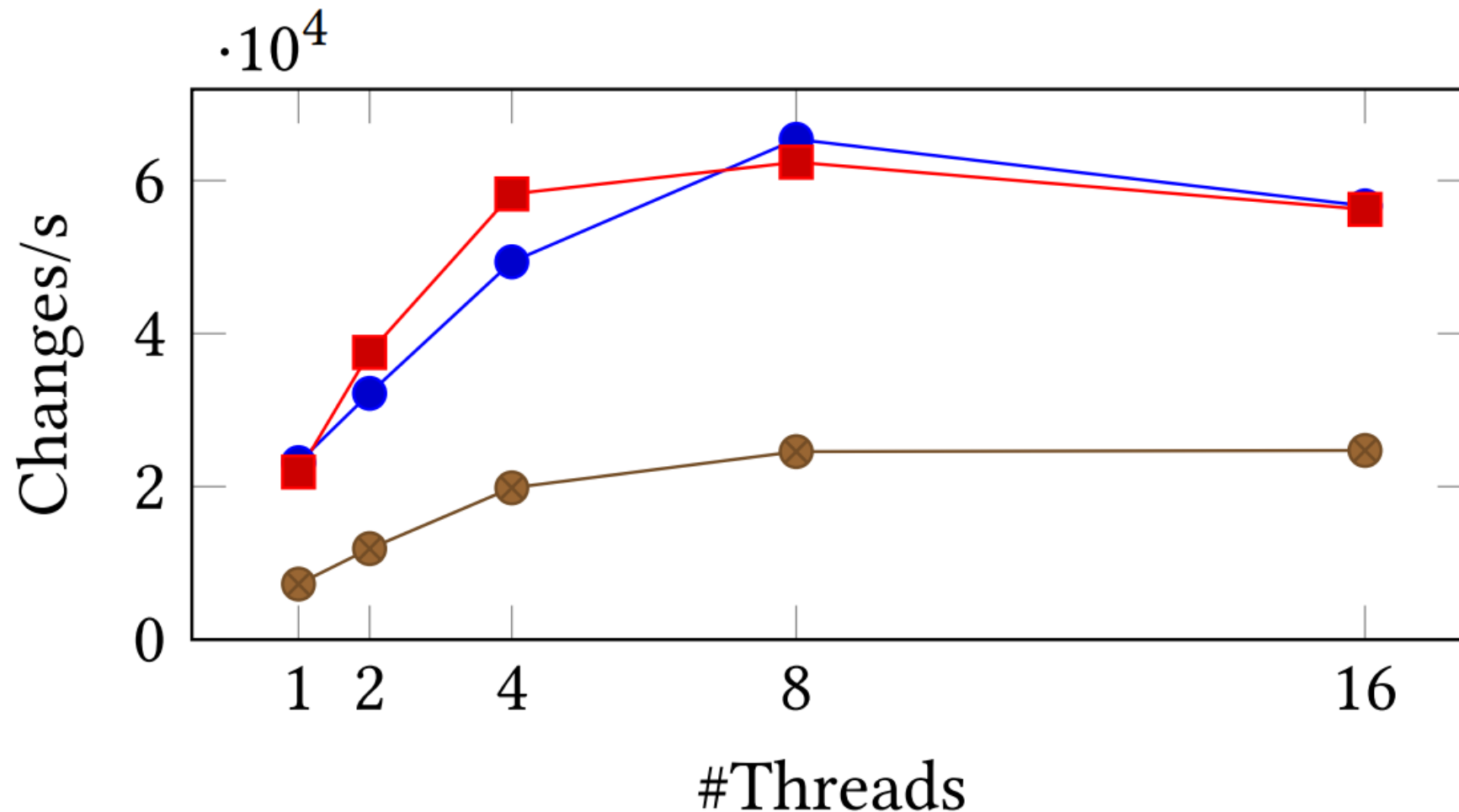
- MySQL provides a GTID (Global Transaction Identifier)
- Hermes maps GTID to internal timestamp (initial start timestamp)
- On commit: Change mapping to commit timestamp
- When a GTID is not mapped yet, wait until available

4. Functional Consistency

- Generate annotated plan
- Force casts (e.g. *'abc'* to integer)

`select 3+'abc'` Evaluates to 3

DML Performance



—●— Single INSERT —■— Single UPDATE —⊗— Compound Txn

OLAP Performance (TPC-H)

SF100

- 336x faster than MySQL
- 1.9x faster than PolarDB-IMCI (multi-node)
- 2.5x faster than PolarDB-IMCI (adjusted to single-node)
- 3.2x compression ratio

SF1000:

- 1.9x faster than PolarDB-IMCI (multi-node)
- 5.5x faster than PolarDB-IMCI (adjusted to single-node)

Summary

Hermes = OLAP accelerator for MySQL

- Fast change propagation (from MySQL to Hermes): 60k changes/sec
 - Directly into the Delta store
- Fast OLAP: 1.9x-5.5x faster than competition
 - Utilizing the read-optimized Main store

Thanks to:

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