

Architecting and Engineering Main Memory Database Systems in Modern C



Chapter 3
*Design & Implementation
of Main Memory HTAP Data Storage*

Marcus Pinnecke, M.Sc.

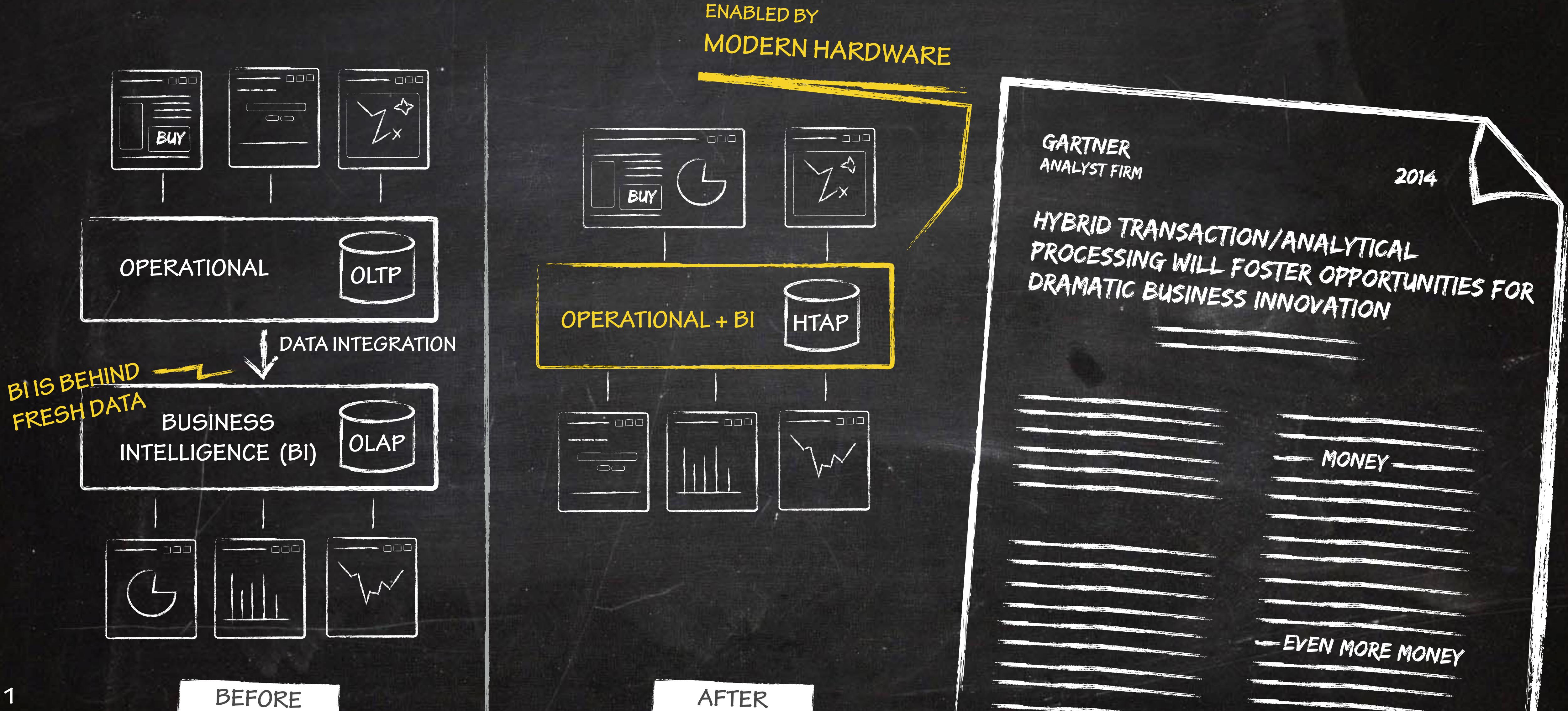
Research associate / Working Group Database & Software Engineering
Institute of Technical and Business Information Systems (ITI)



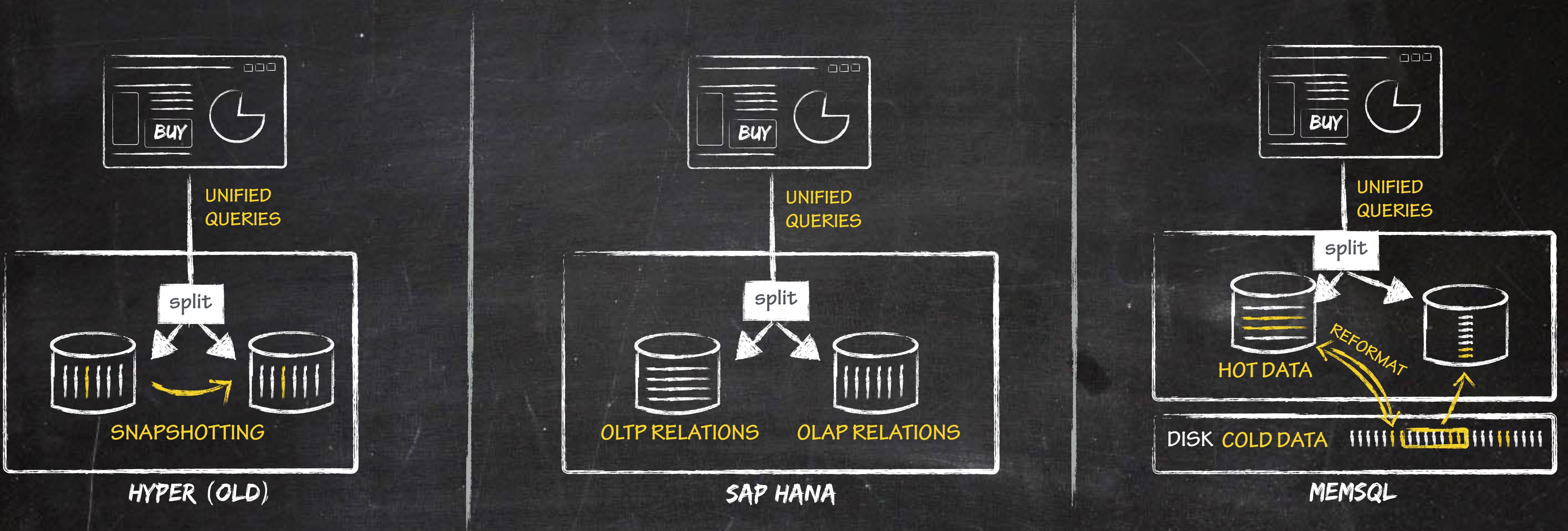
NOVEL KIND OF IN-MEMORY PLATFORM OUTPERFORMING

- ONLINE TRANSACTION PROCESSING (OLTP), AND
- ONLINE ANALYTICAL PROCESSING (OLAP)

Let's begin with a question
What's HTAP?



Let's begin with a question
What's not „true“ HTAP?



OLTP and OLAP not on same data -
OLAP is not fresh!

RECIPE FOR TRUE HTAP

ANALYTICS ON
ON OPERATIONAL DATA

FRESHNESS

ANALYTICS INSIDE
TRANSACTIONS

NO ISOLATION

TRANSACTIONS AND
ANALYTICS SHOULD
BENEFIT FROM (STORAGE,
ACCESS) OPTIMIZATIONS

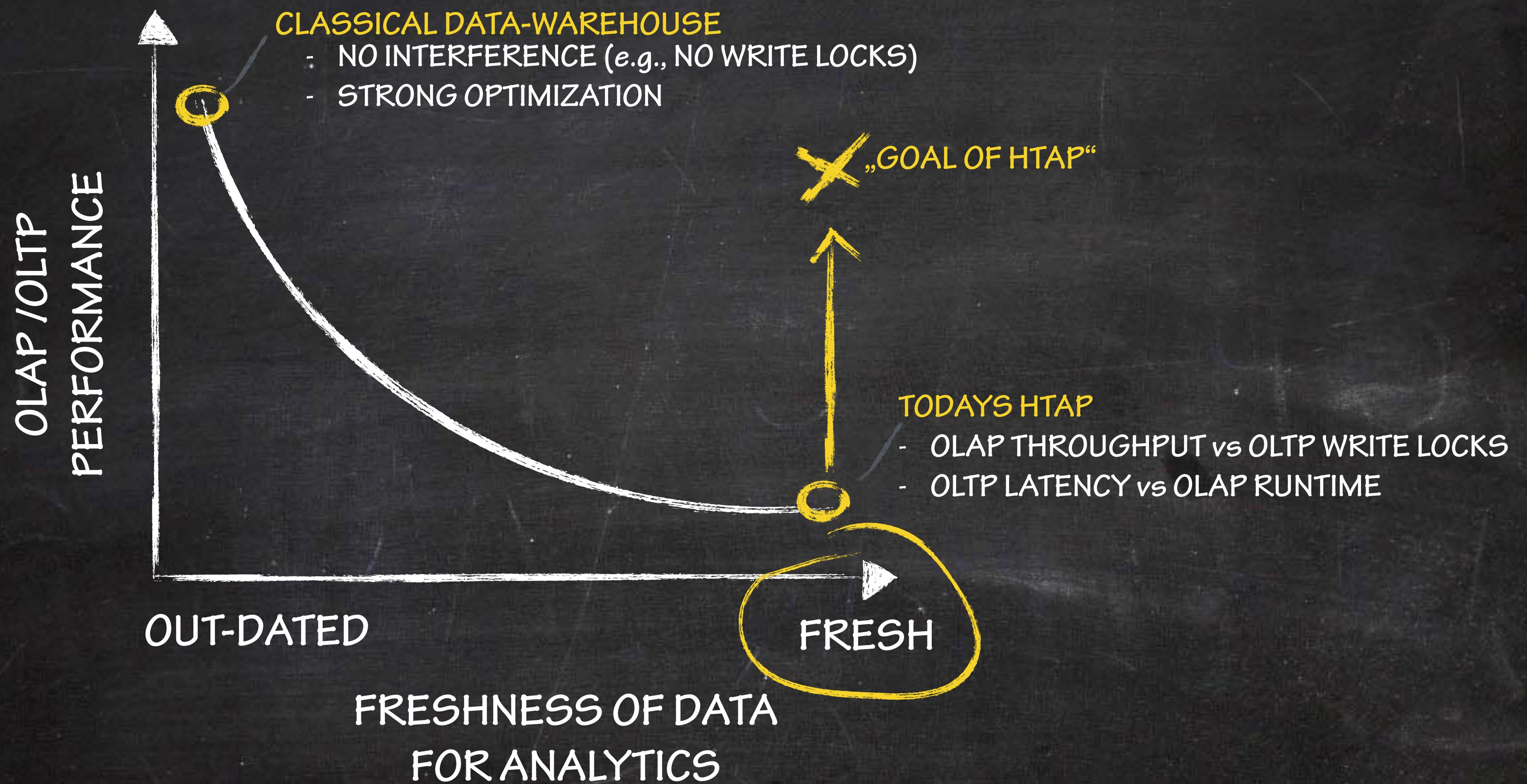
HIGH
PERFORMANCE

DATABASE (INCL.
INDEXES) SHALL NOT
BE LIMITED BY MEMORY
CAPACITY

BIG VOLUME

Some Thoughts and Observations

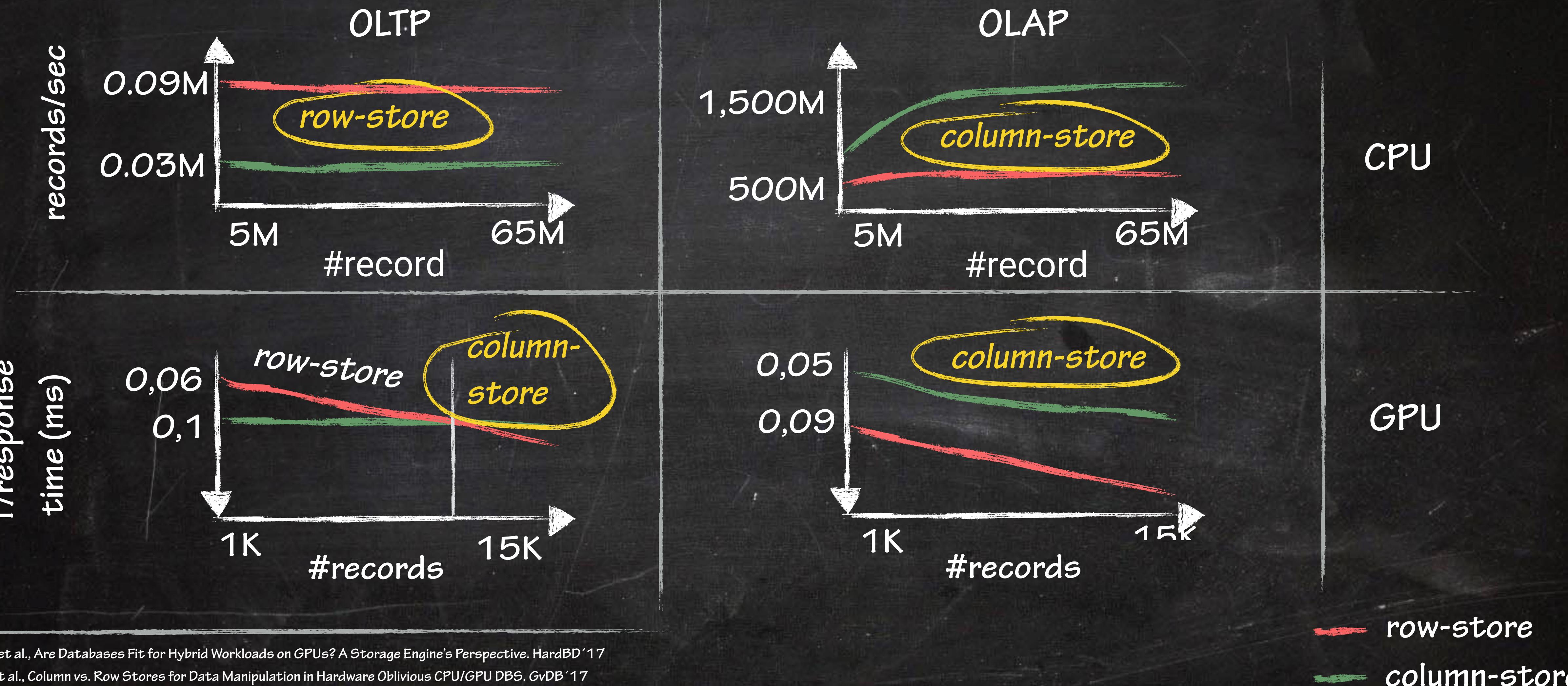
FRESHNESS
NO ISOLATION



Some Thoughts and Observations

HIGH
PERFORMANCE

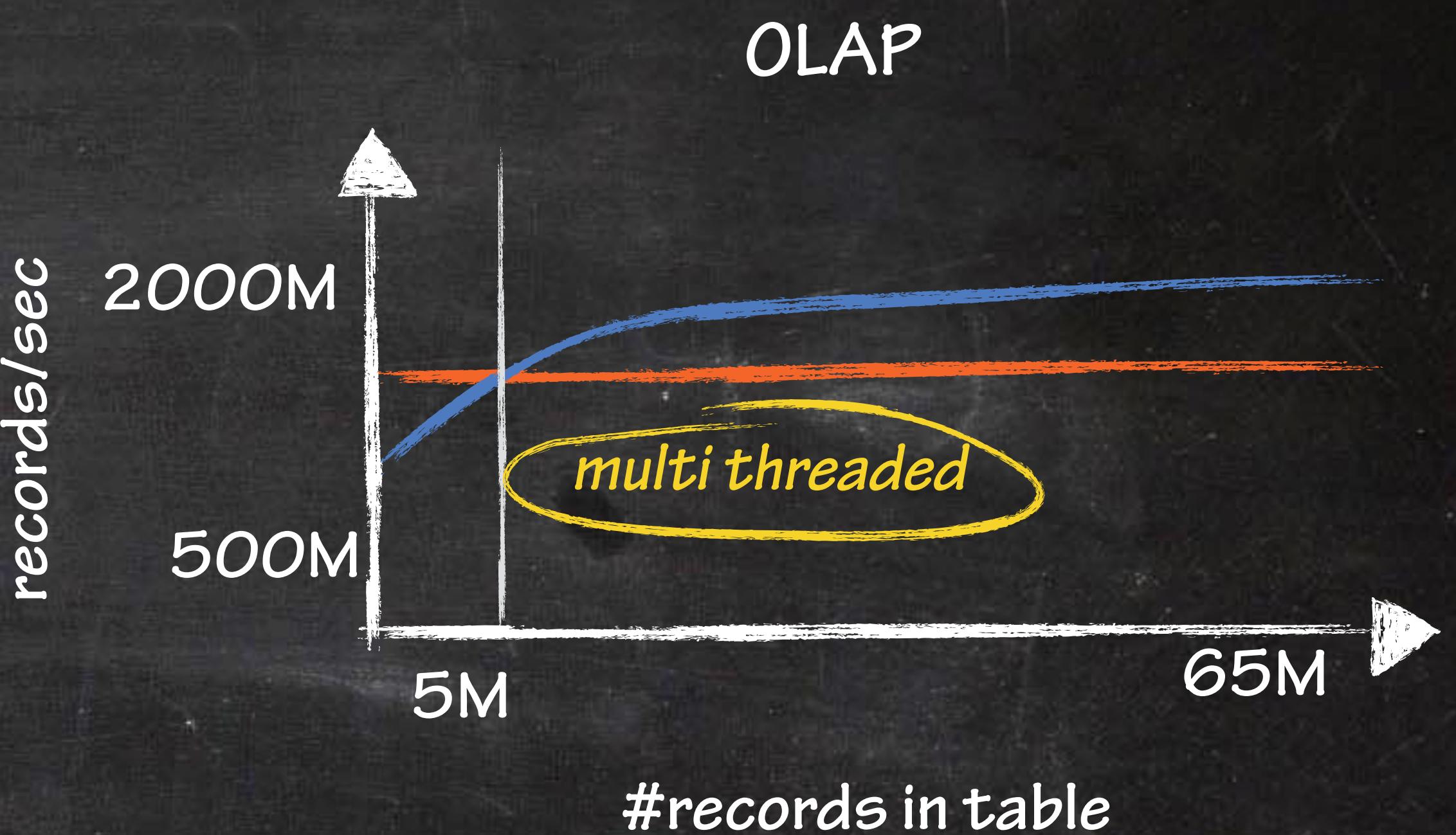
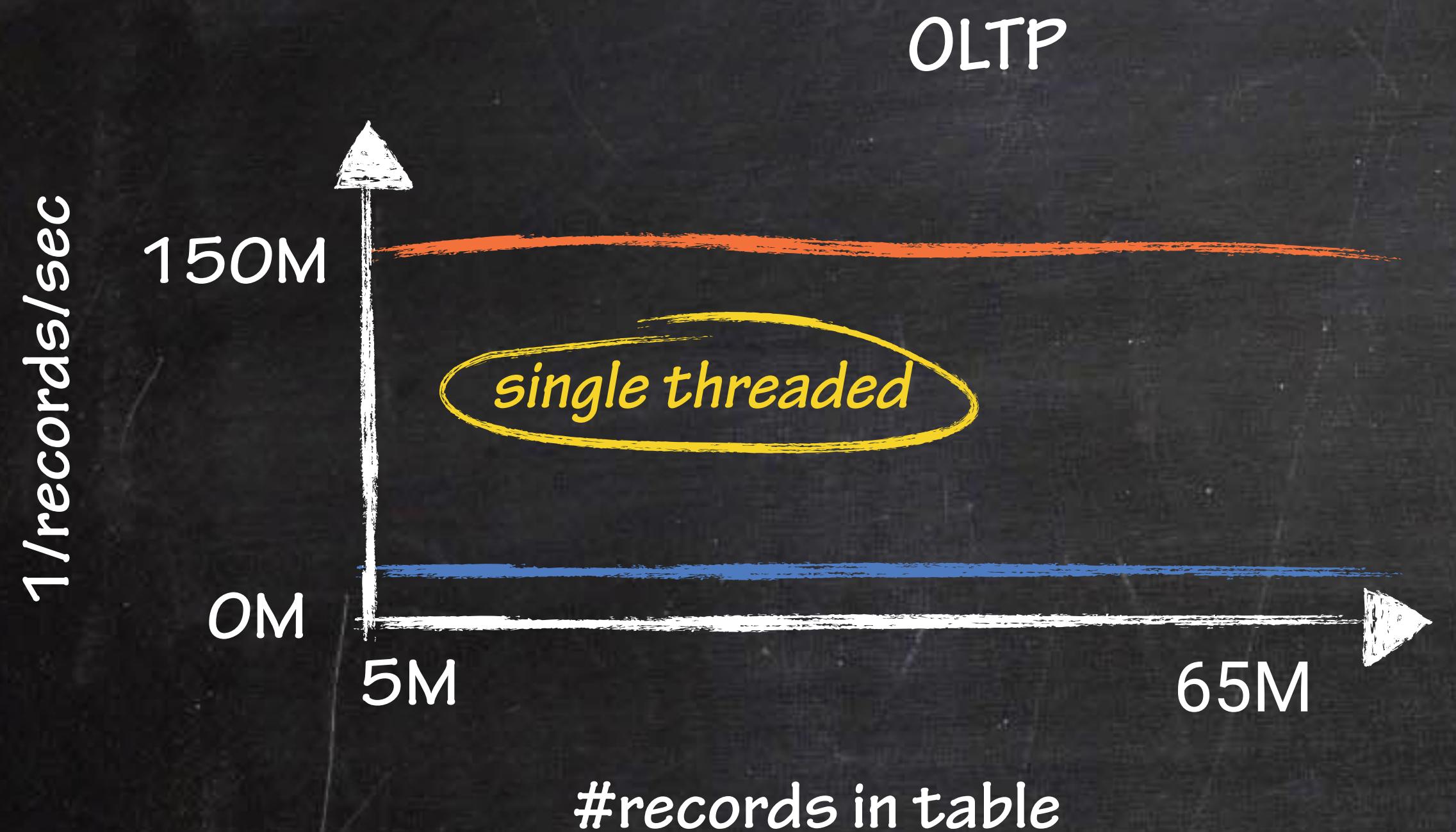
1/3



Some Thoughts and Observations

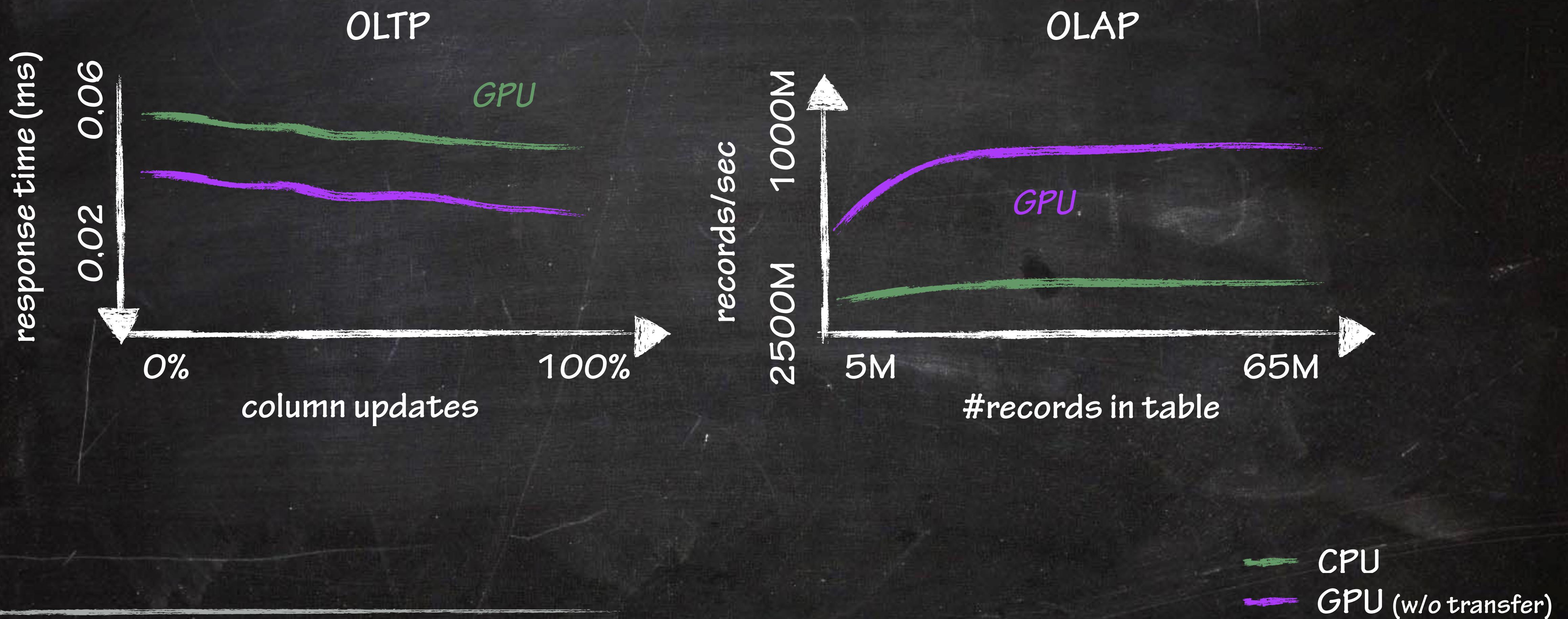
HIGH
PERFORMANCE

2/3



— single threaded
— multi threaded

Some Thoughts and Observations



PINNECKE, BRONESKE, DURAND,
AND SAAKE

2017

ARE DATABASES FIT FOR HYBRID WORKLOADS ON GPUS? A STORAGE ENGINE'S PERSPECTIVE

CONTRADICTING GOALS

STATE OF THE ART

PHYSICAL STORAGE

MAIN PROCESSOR
CO-PROCESSORS

PELOTON DB

ACCESS PATTERN

ANSWER: NOT YET

AREFEVA, BRONESKE, PINNECKE, BHATNAGAR,
AND SAAKE

2017

COLUMN VS. ROW STORES FOR DATA MANIPULATION IN HARDWARE OBLIVIOUS CPU/GPU DATABASE SYSTEMS

COLUMN STORES

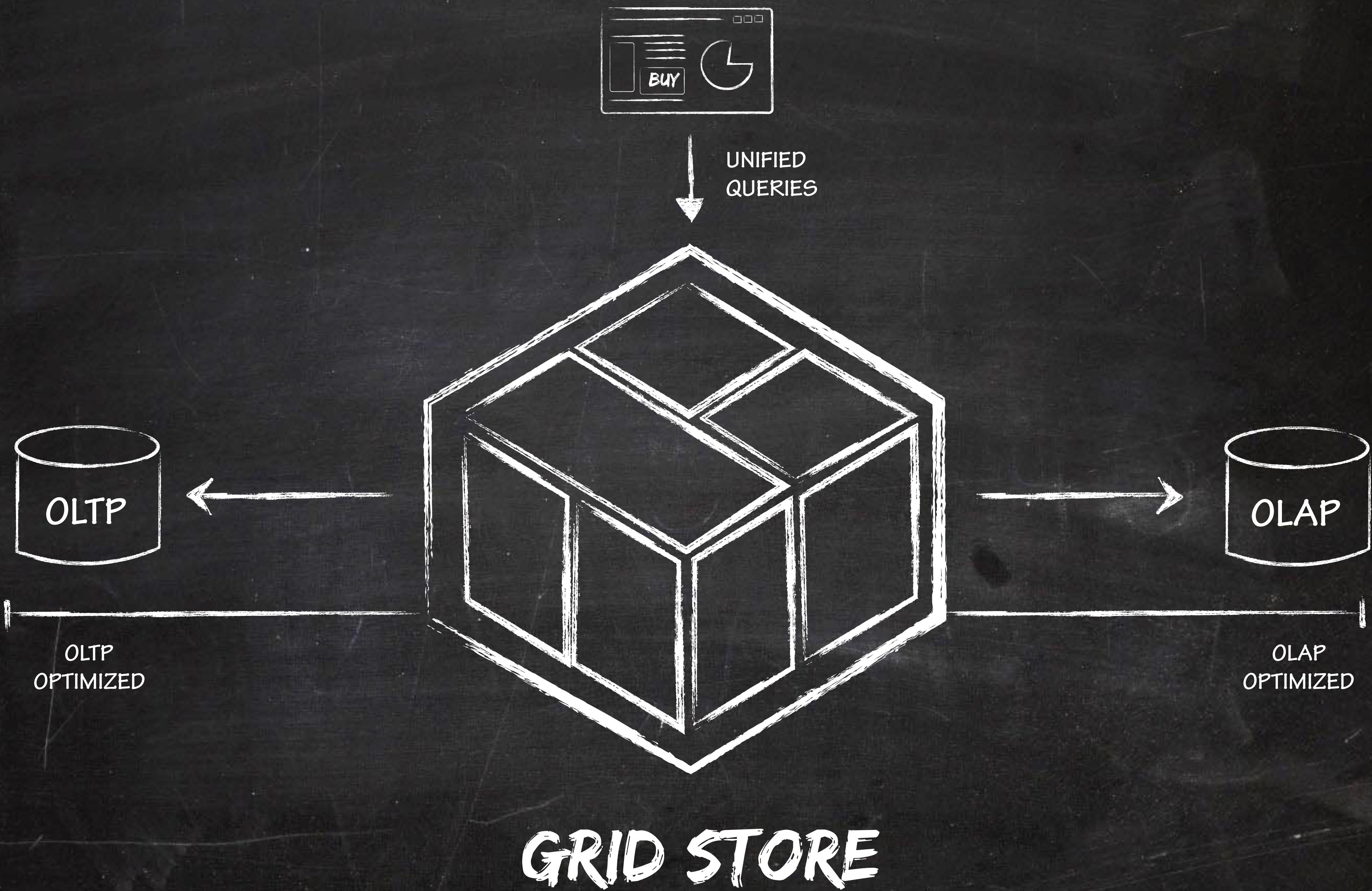
ROW STORES

ACCESS PATTERN

PRIMITIVES ON
CO-PROCESSORS

DATA TRANSFER

COLUMN STORE FOR GPU
ANALYTICS ON GPU



VISION

