

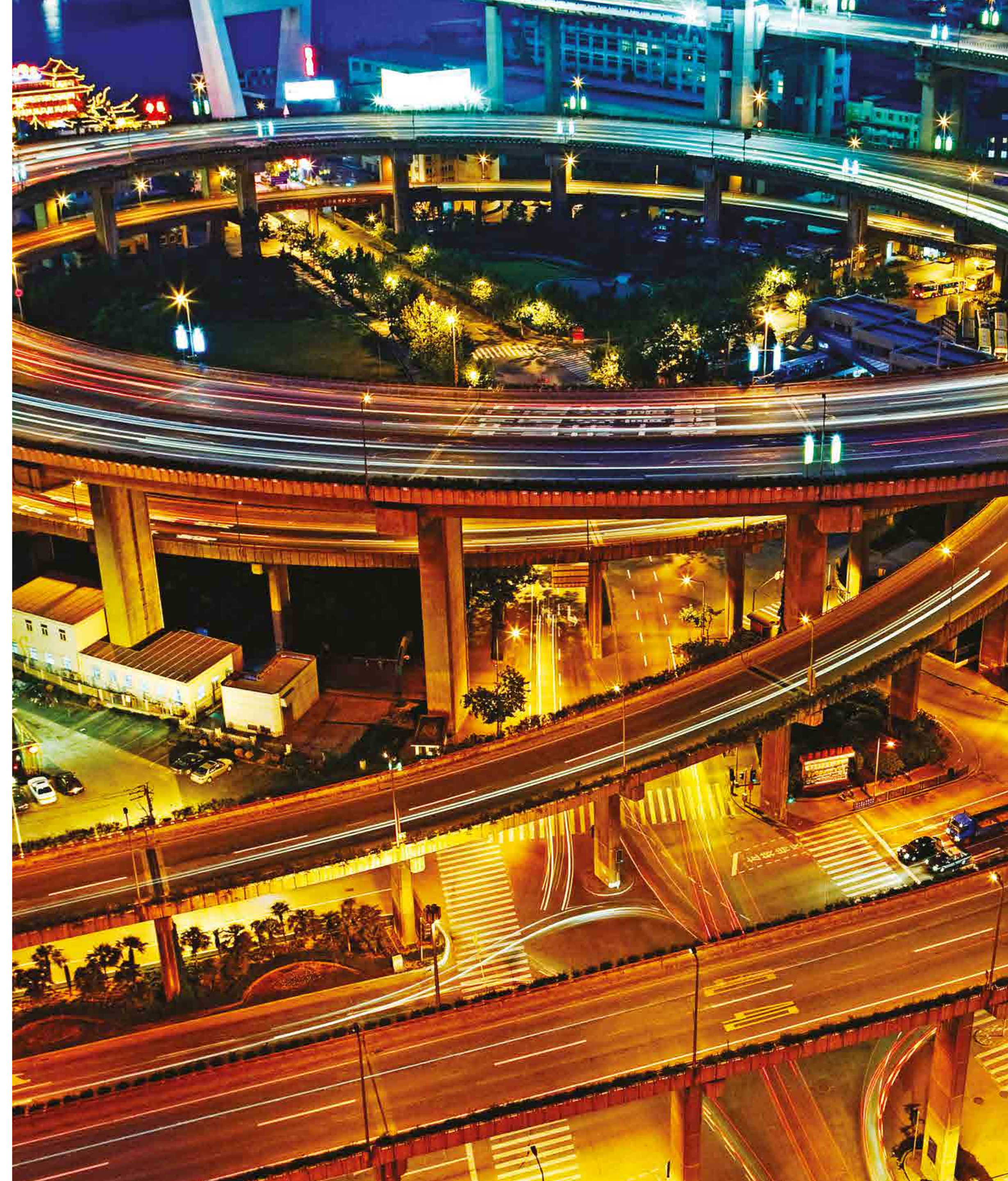
A NEW ARCHITECTURE FOR ENTERPRISE APPLICATION SOFTWARE BASED ON IN-MEMORY DATABASES

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SVP, Head of LoB Finance &
SAP Innovation Center

45th Annual Convention of the
German Informatics Society

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Large enterprise systems

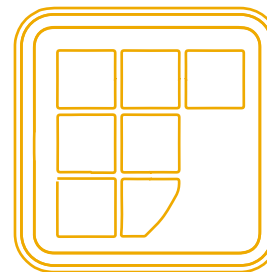
Transaction-maintained aggregates explode in complexity



~ 30,000 Functions



Aggregate Maintenance
Development Costs



~ 80,000 Tables
~ 900,000 Columns



Schema Complexity
Consistency
Redundancy



Data Footprint
of up to 150TB

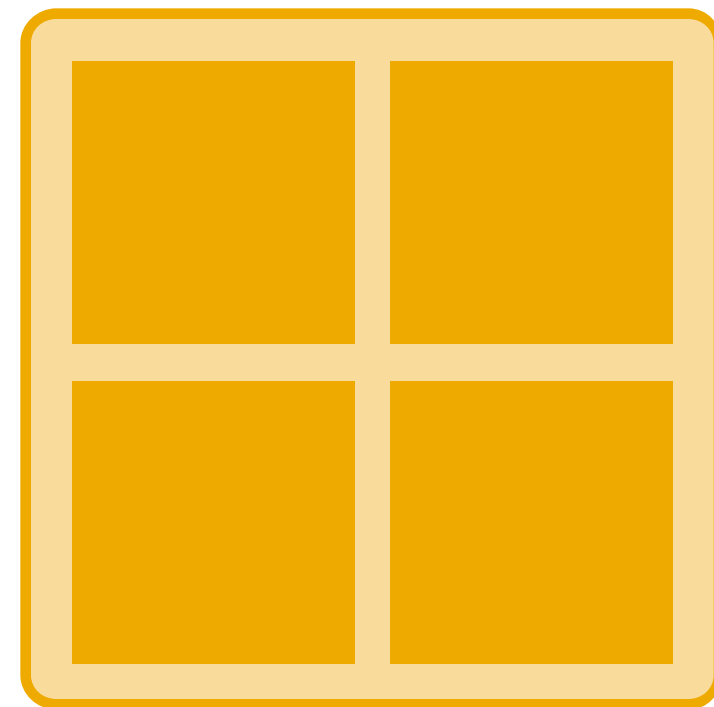


Storage Costs
Backup
Disaster Recovery

Hardware development

Enabler for a new era of business processing

20 YEARS AGO



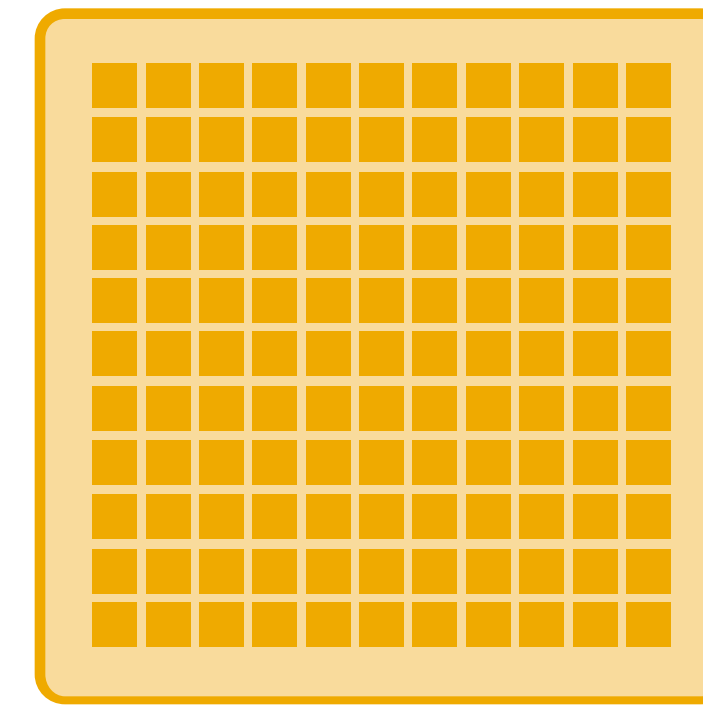
MEMORY
1 GB

CPU
4 x 50 MHz

x 6000

x 1800

TODAY



MEMORY
6 TB

CPU
120 x 3.0 GHz

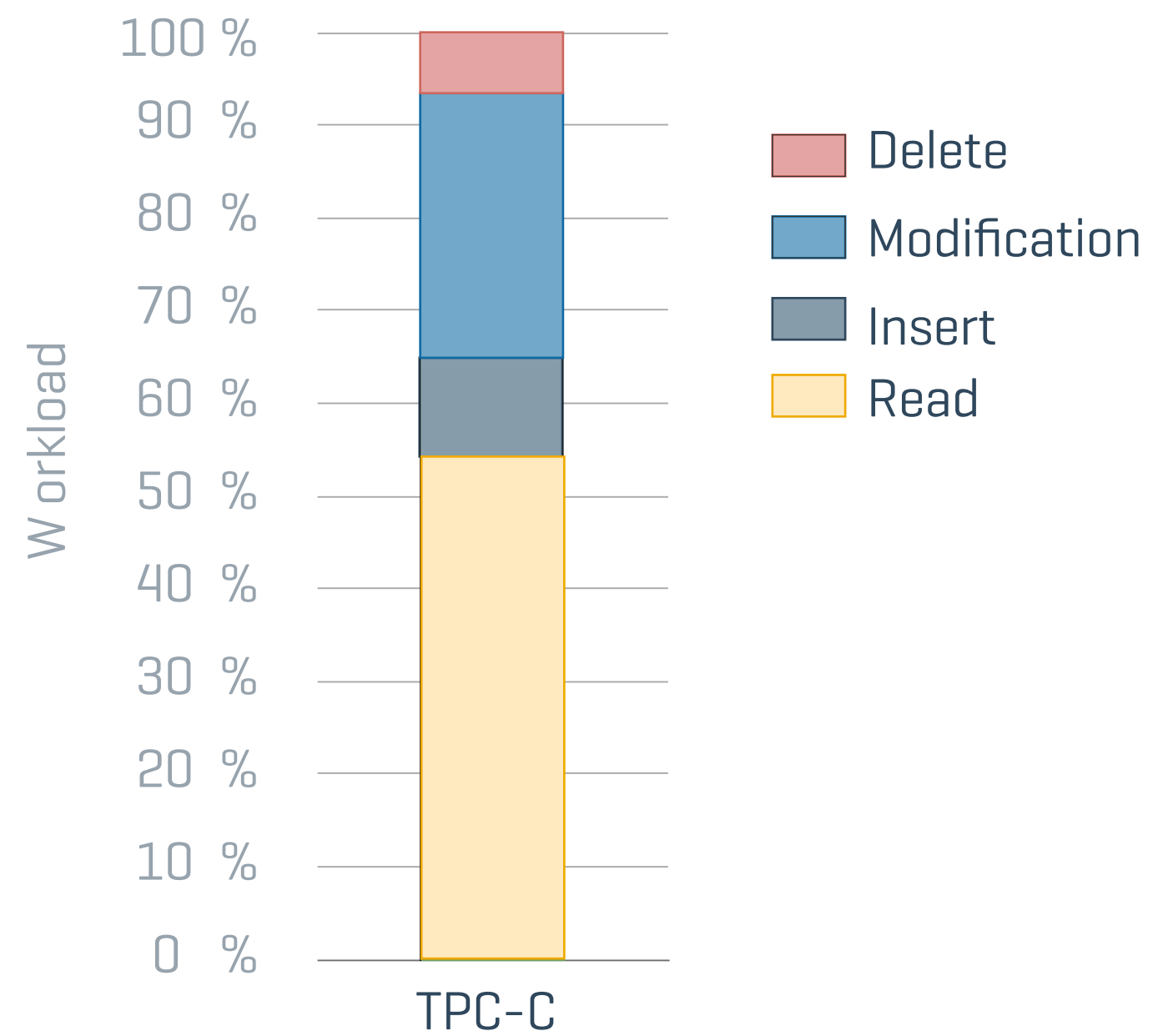
NEAR FUTURE

MEMORY
48 TB

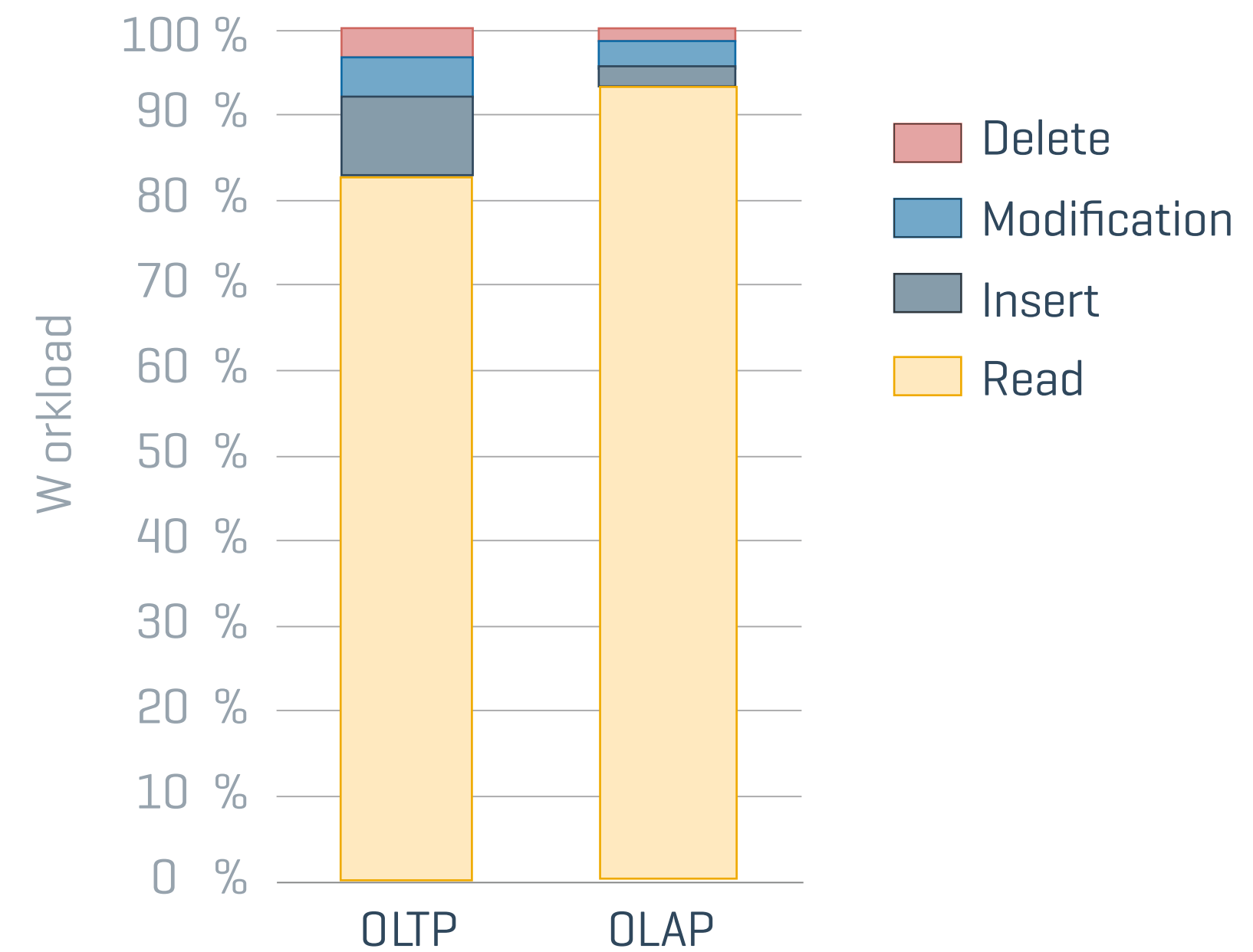
CORES
480 [8X4X15]

Workload analysis

Read-mostly applies to OLTP and OLAP



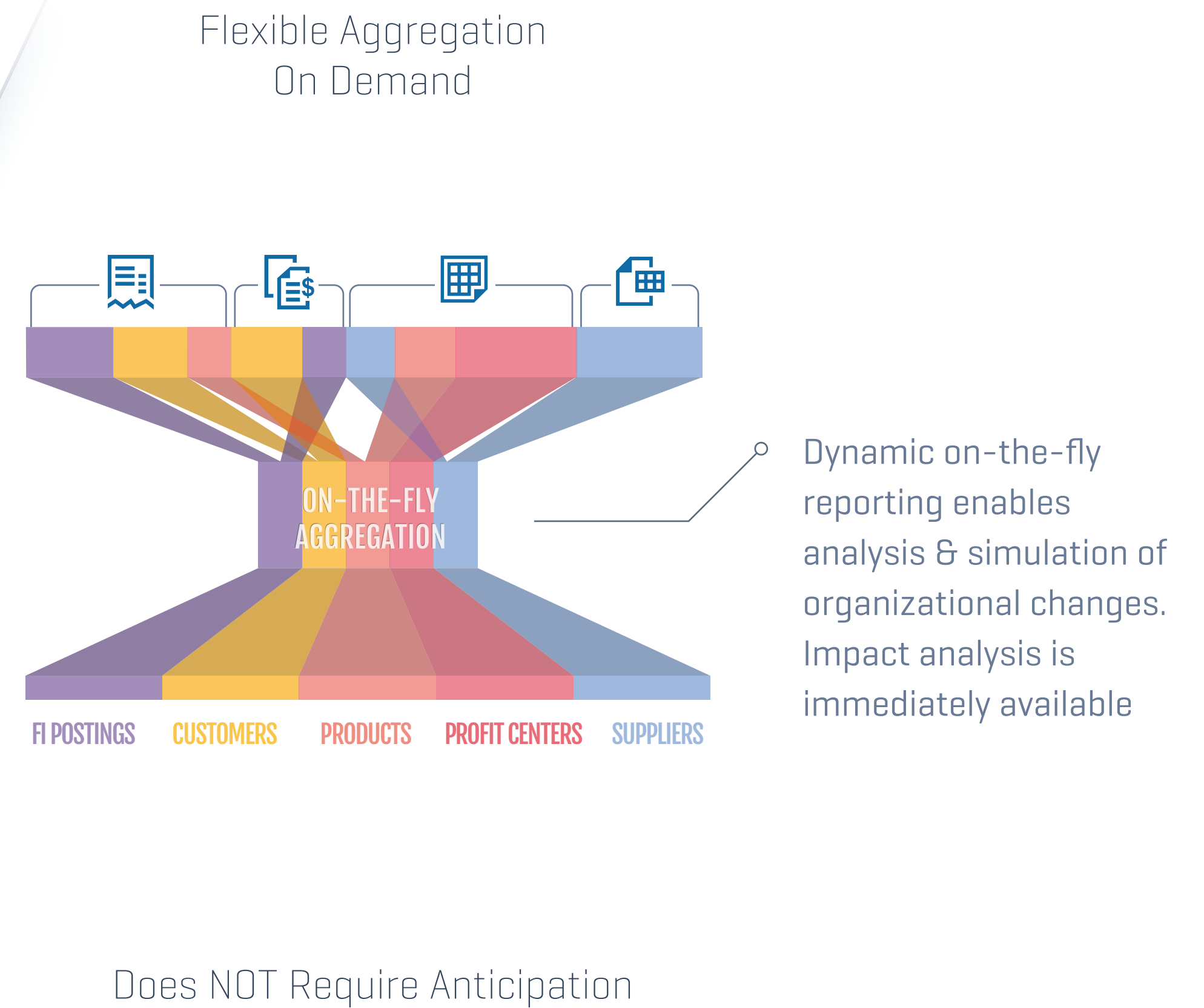
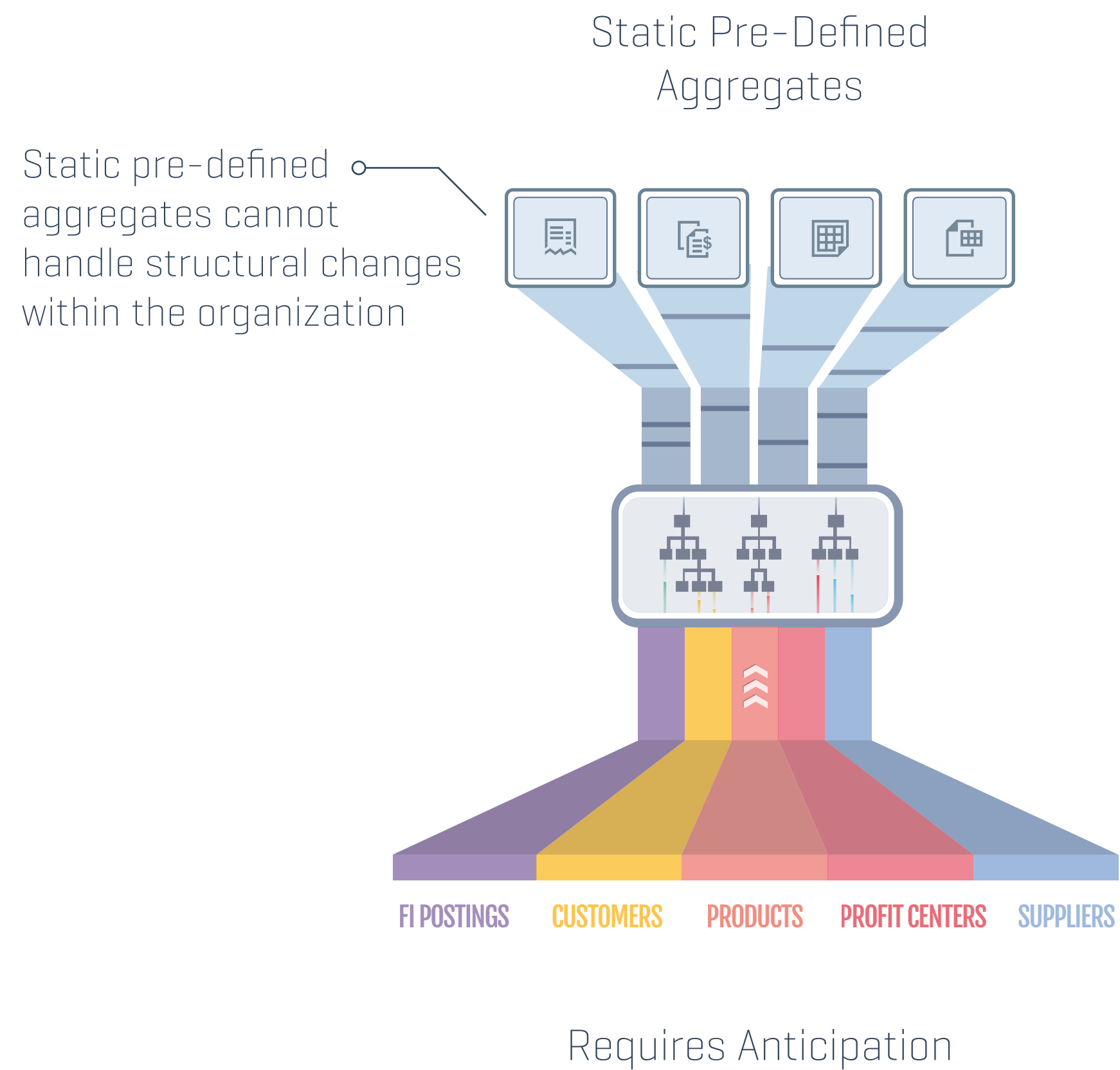
TPC-C Benchmark



Workload Analysis
Krueger et al. VLDB'11

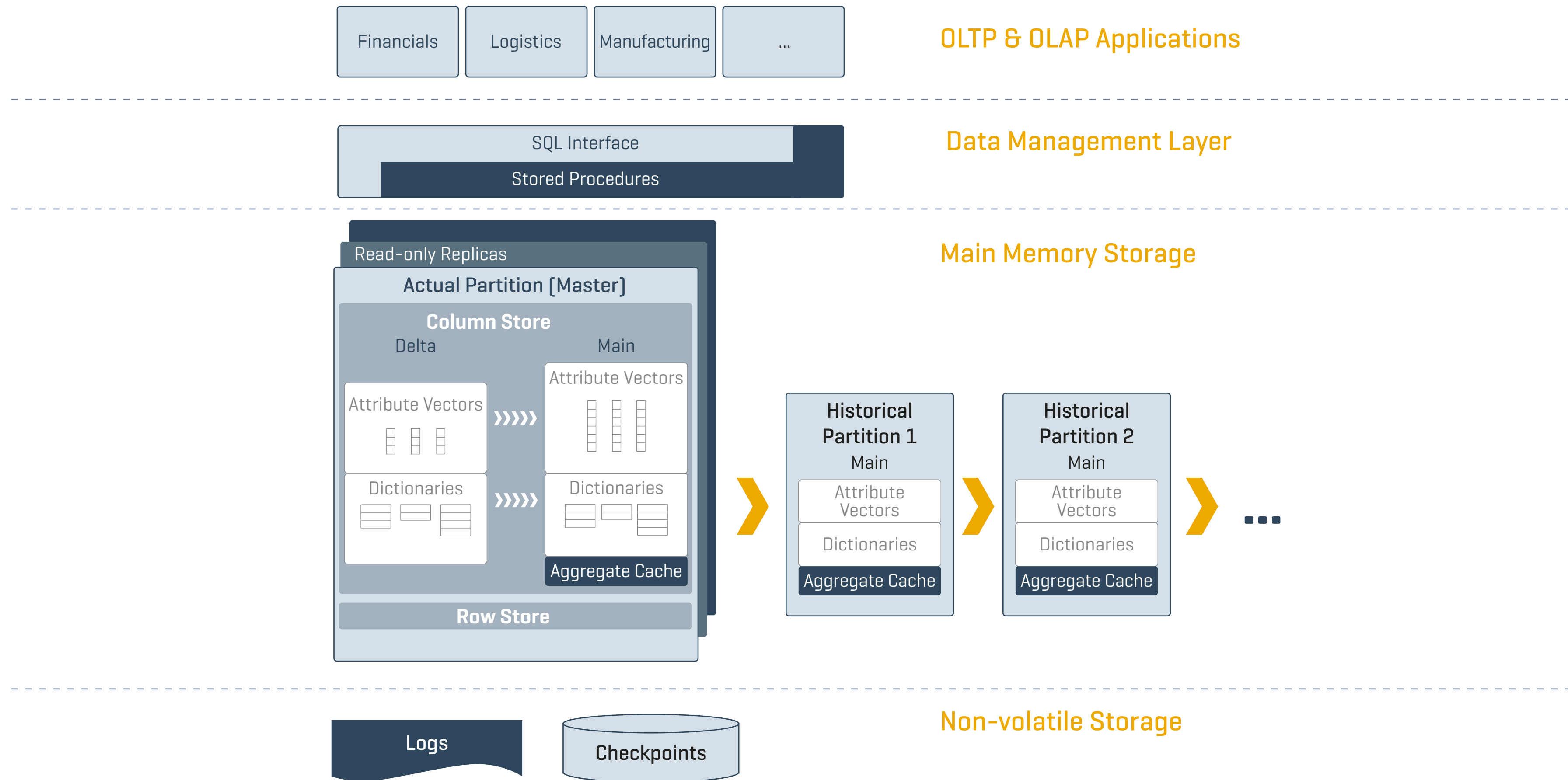
Simplification and Flexibility

By removing static pre-defined materialized aggregates



2009: A common database approach

For OLTP and OLAP using an in-memory column database



Source: SIGMOD June 2009

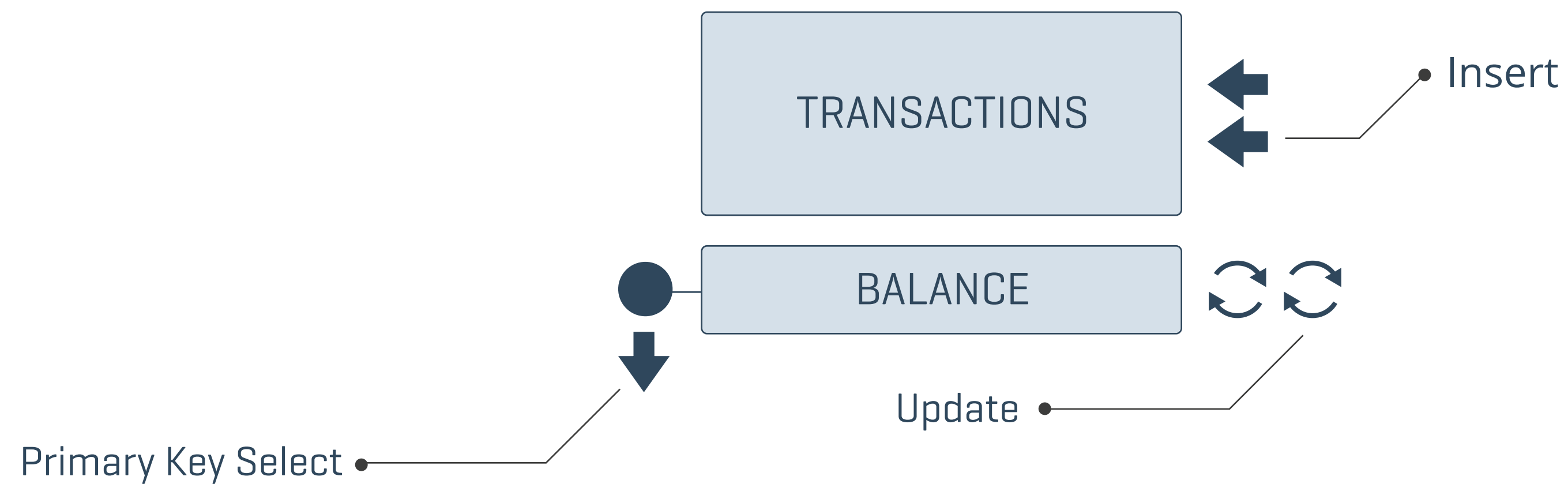
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A textbook example

Wire money from account A to account B

Accounts with Transaction-Maintained Balance



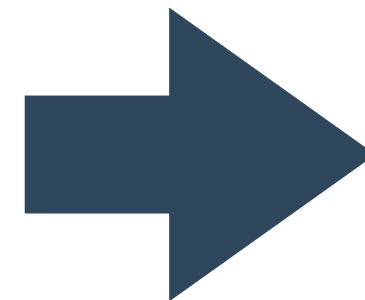
Raw Account Transactions



Example

Posting of a vendor invoice

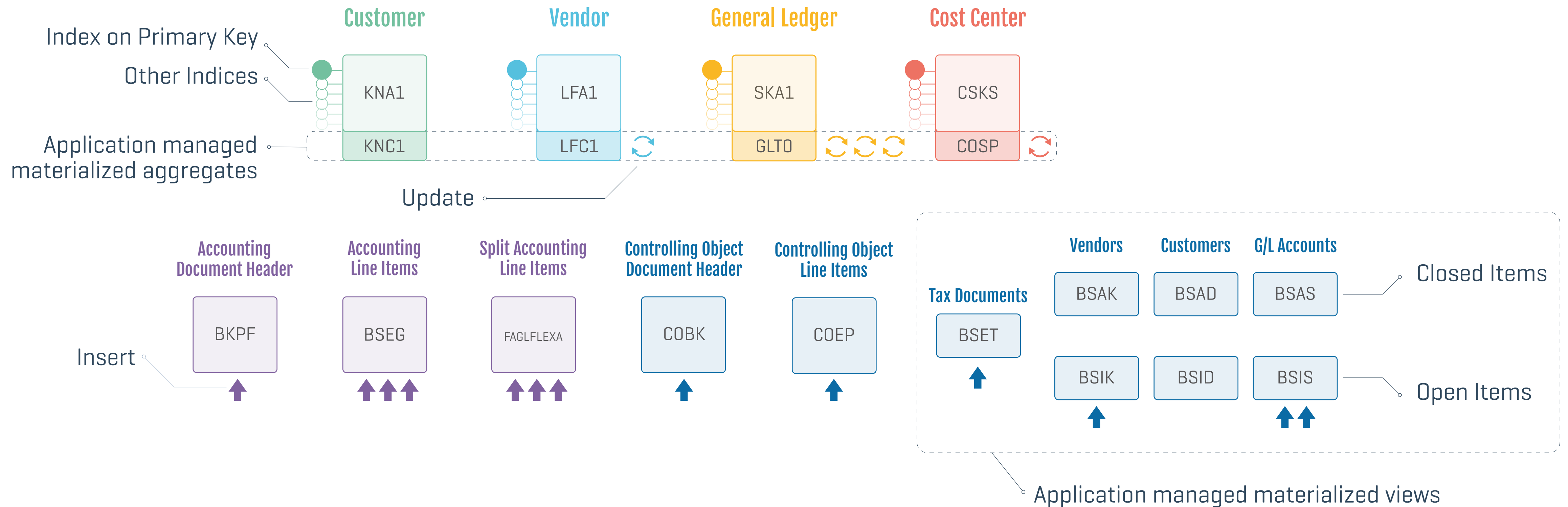
Vendor Invoice	
Row 1:	~~~~~
Tax:	~~~~~
Total:	~~~~~



Header		
<hr/>		
Account Vendor	➔	119 Credit
<hr/>		
Cost G/L Account	➔	100 Debit
<hr/>		
Tax G/L Account	➔	19 Debit

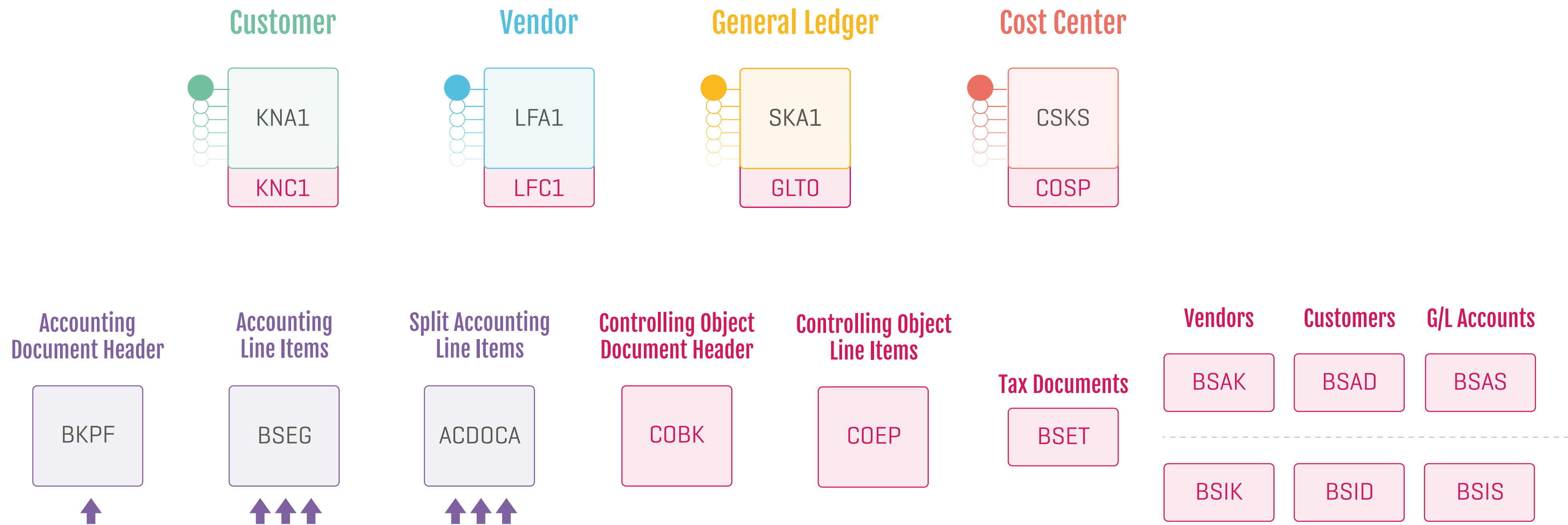
SAP Financials – Invoice Posting

Before simplification



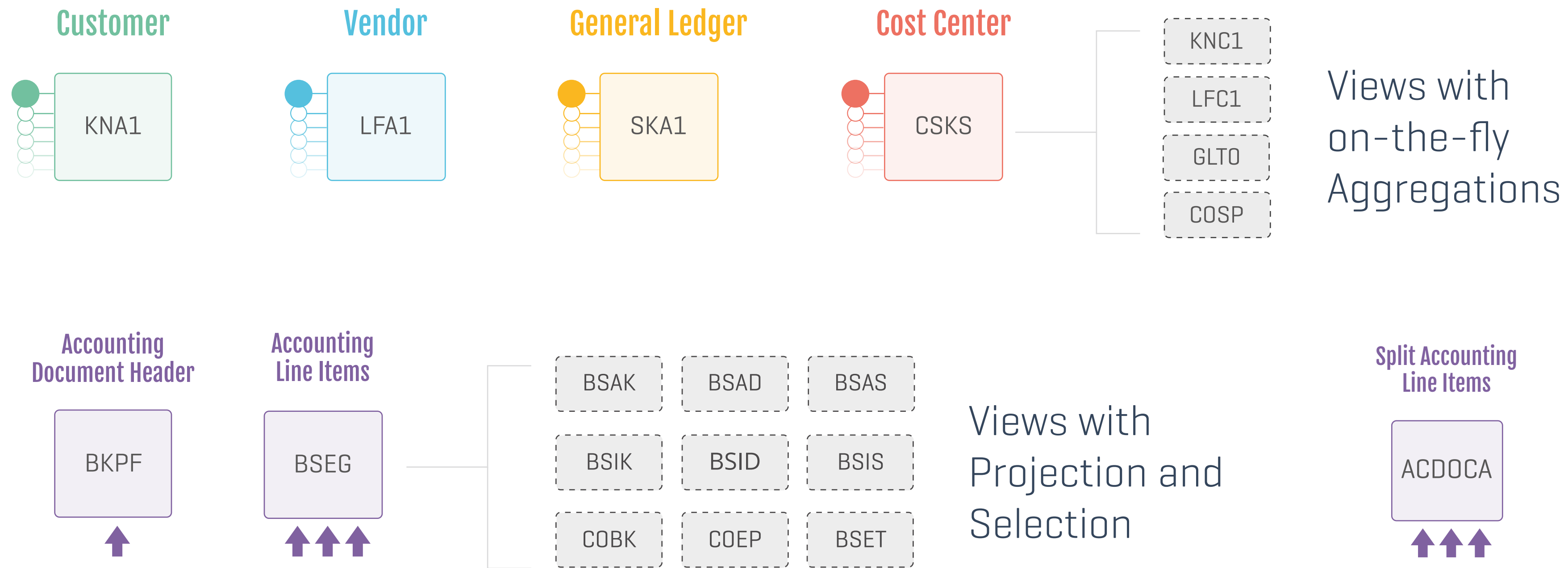
SAP Financials – Invoice Posting

Simplification



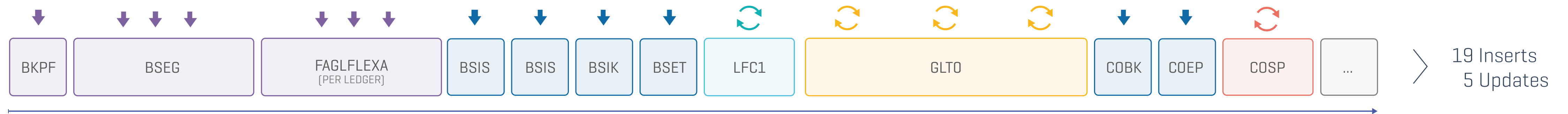
SAP Financials – Invoice Posting

After simplification with database views

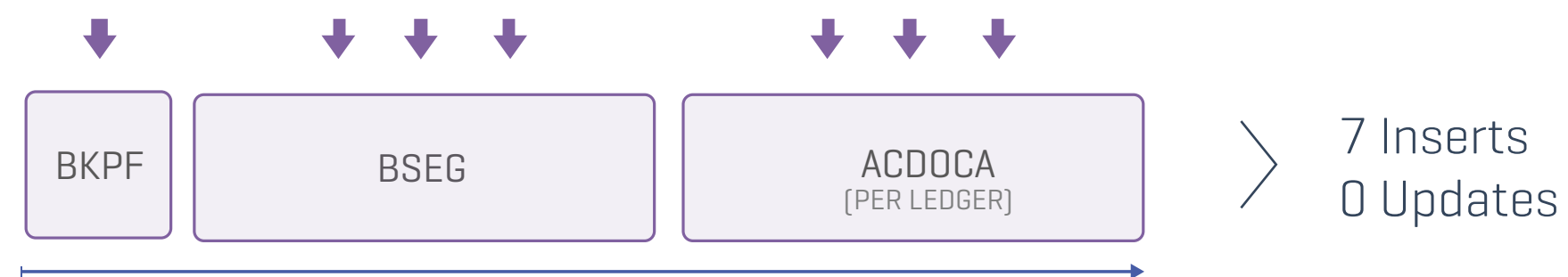


Why column-stores are better than row stores for transaction processing - theoretically...

Insert duration with and w/o transaction-maintained aggregates

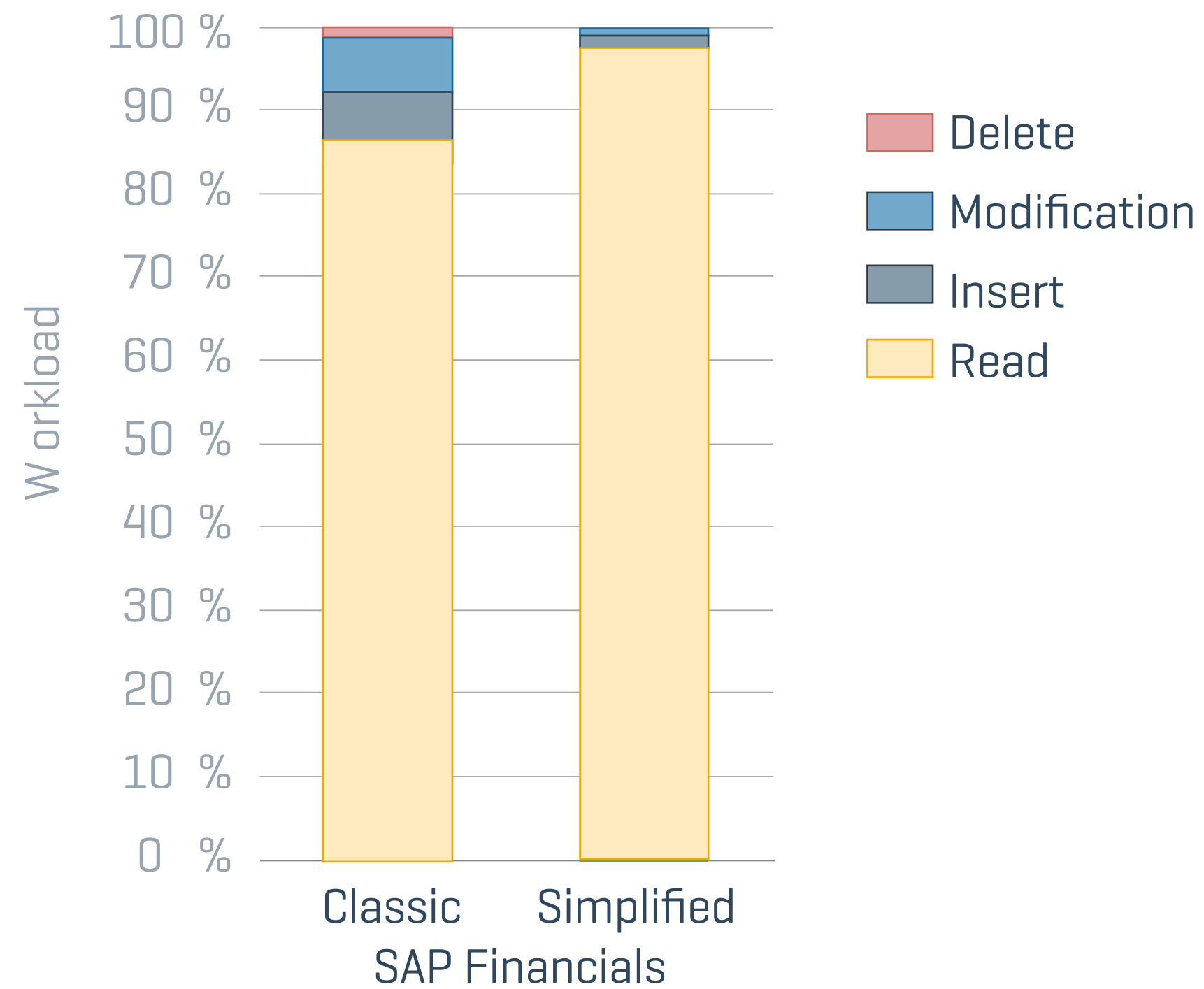


Classic SAP Financials with Transaction-Maintained Aggregates



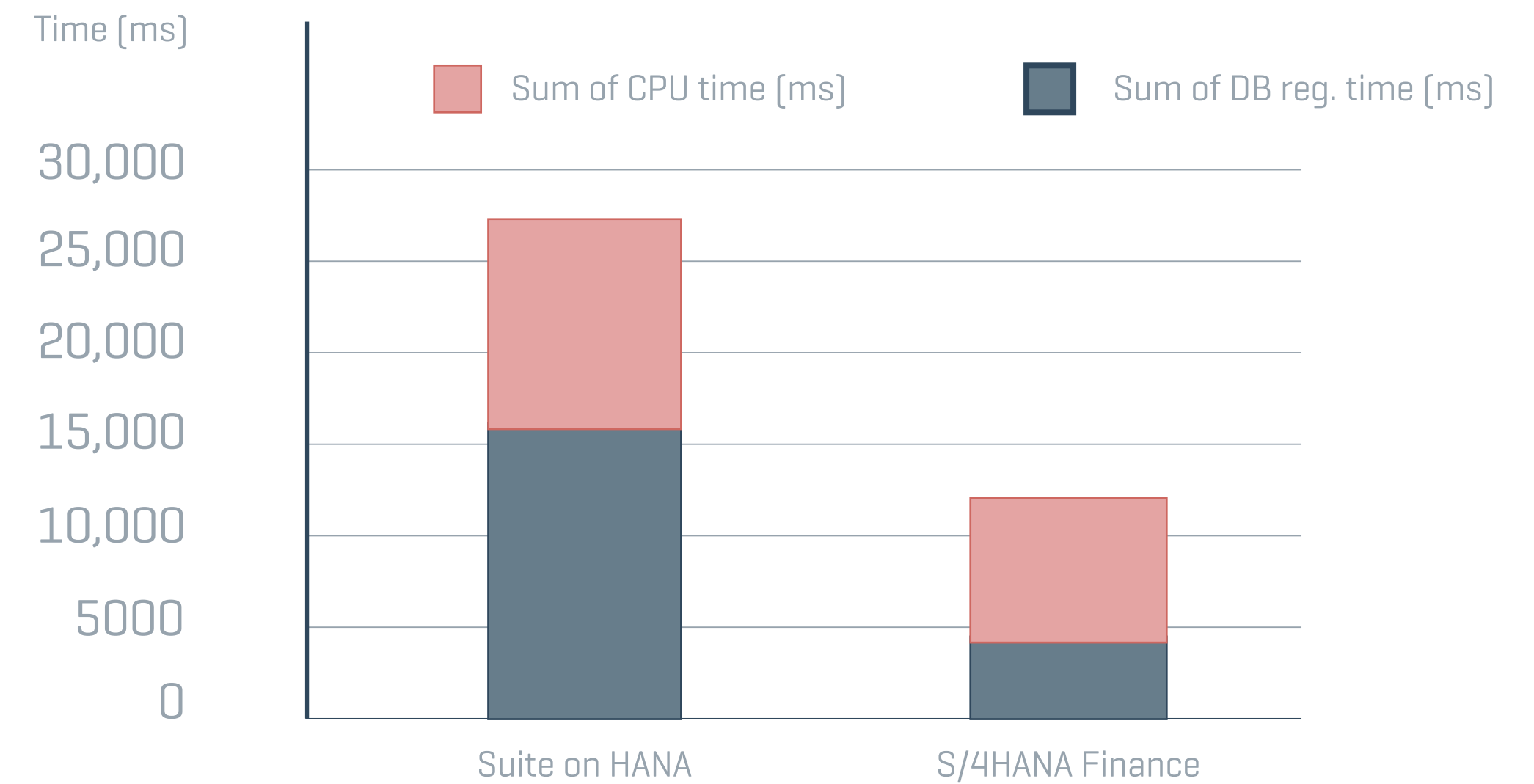
Simplified SAP Financials

...and experimentally with respect to workload and runtime



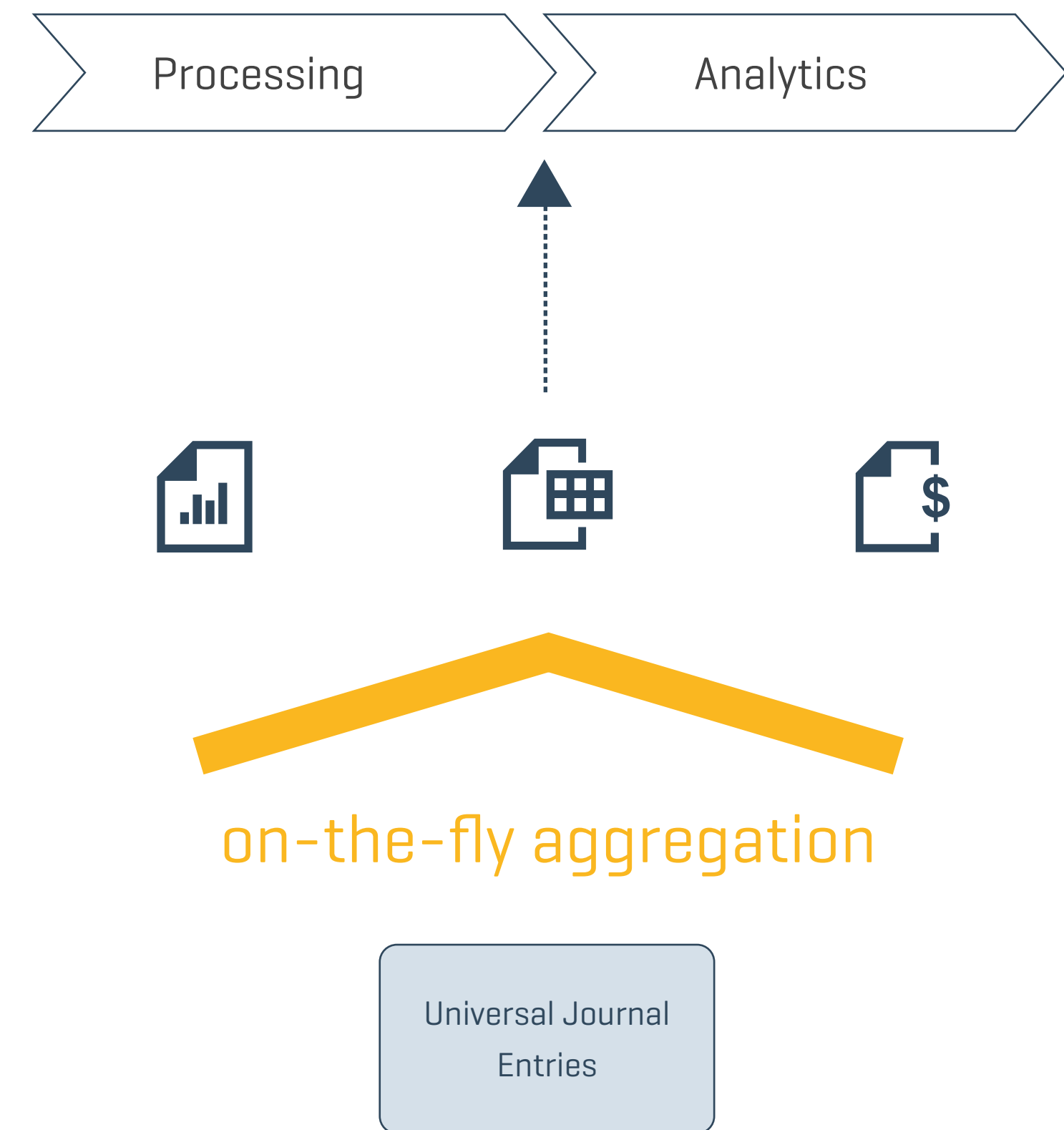
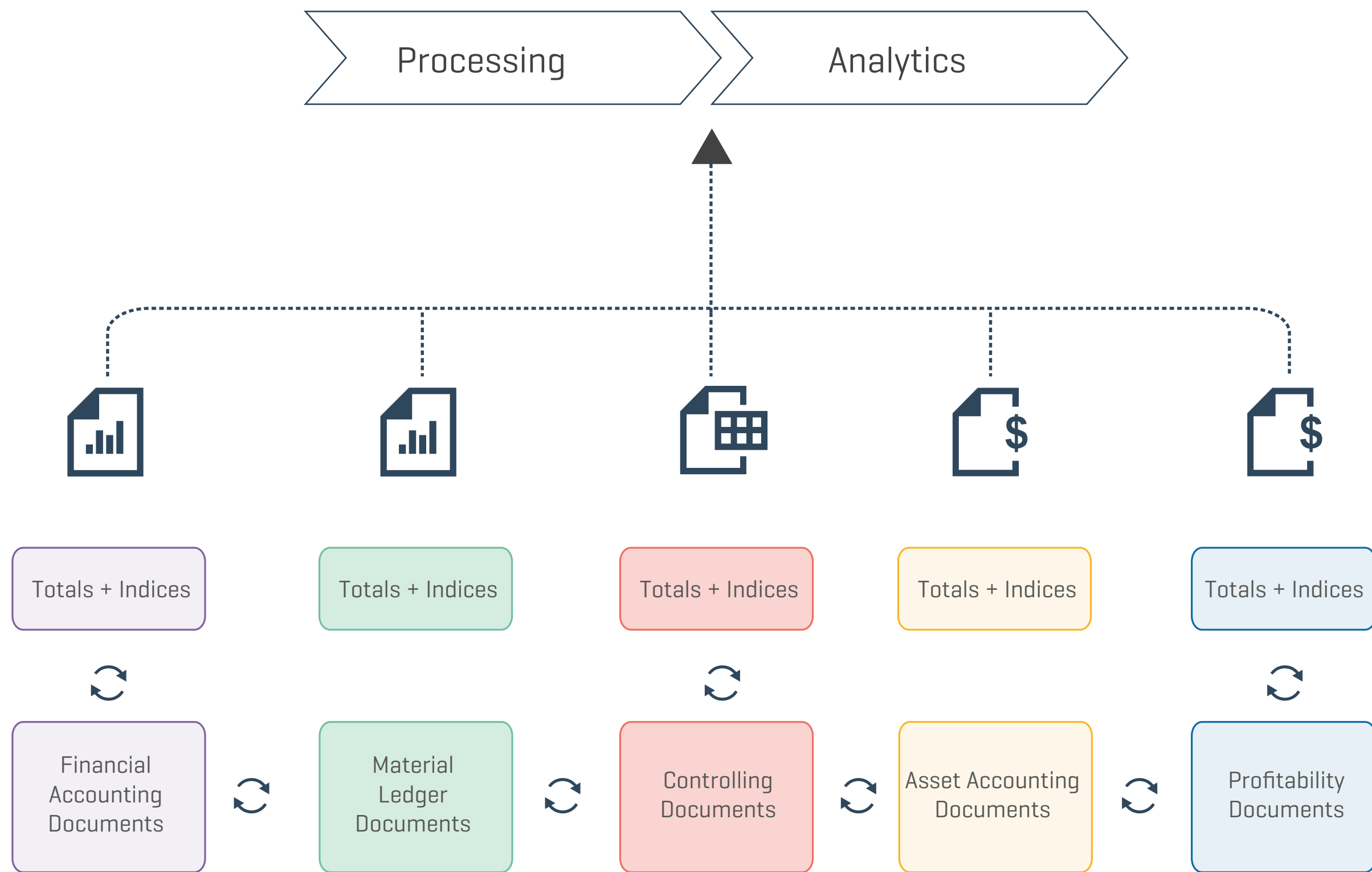
SAP Financials Workload Analysis

Document posting measured on customer data

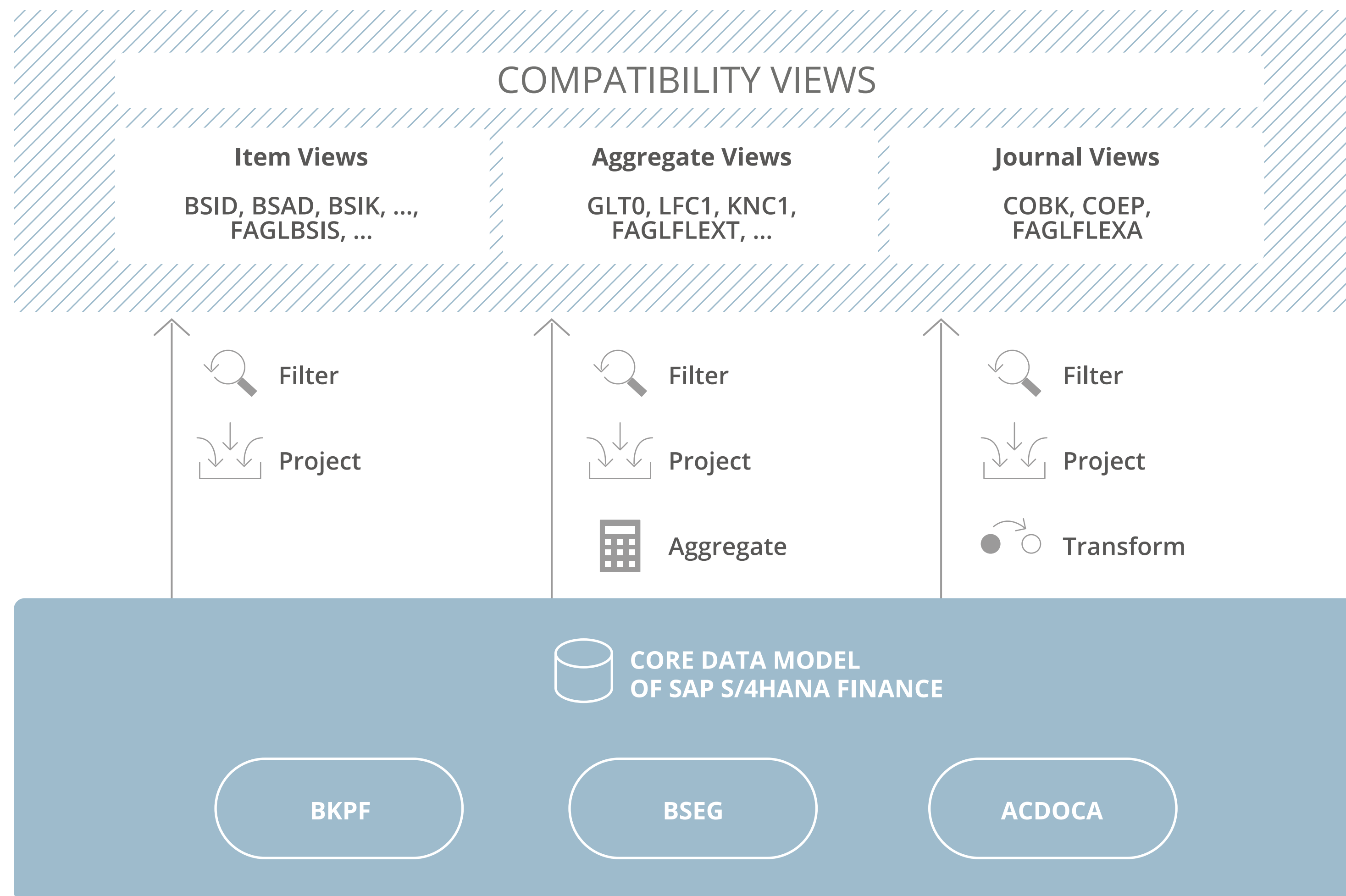


SAP Financials Runtime Analysis

Universal Journey Entries establish a single source of truth and enable a variety of new analyses



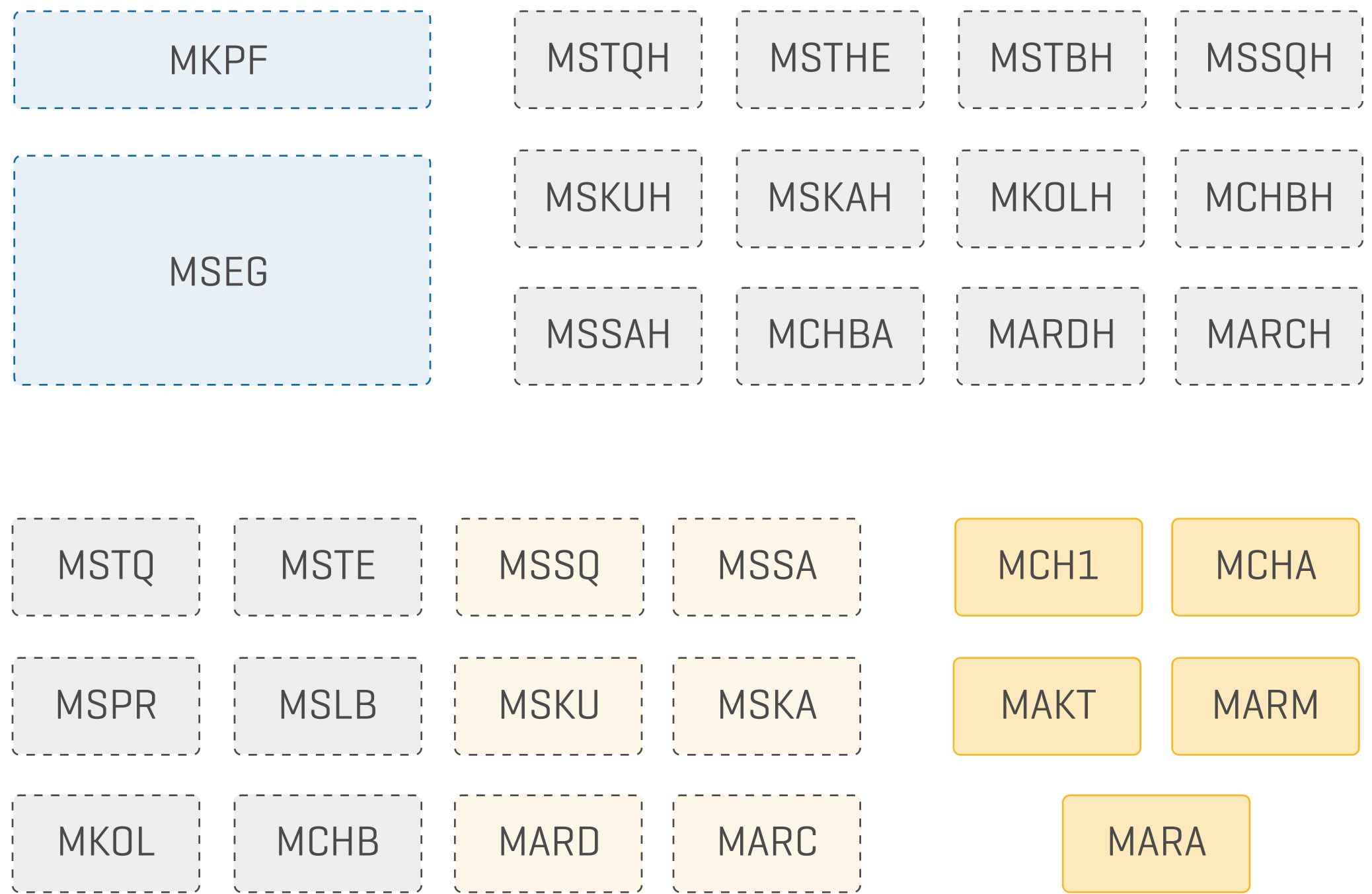
Compatibility views enable a non-disruptive adoption by redundant tables



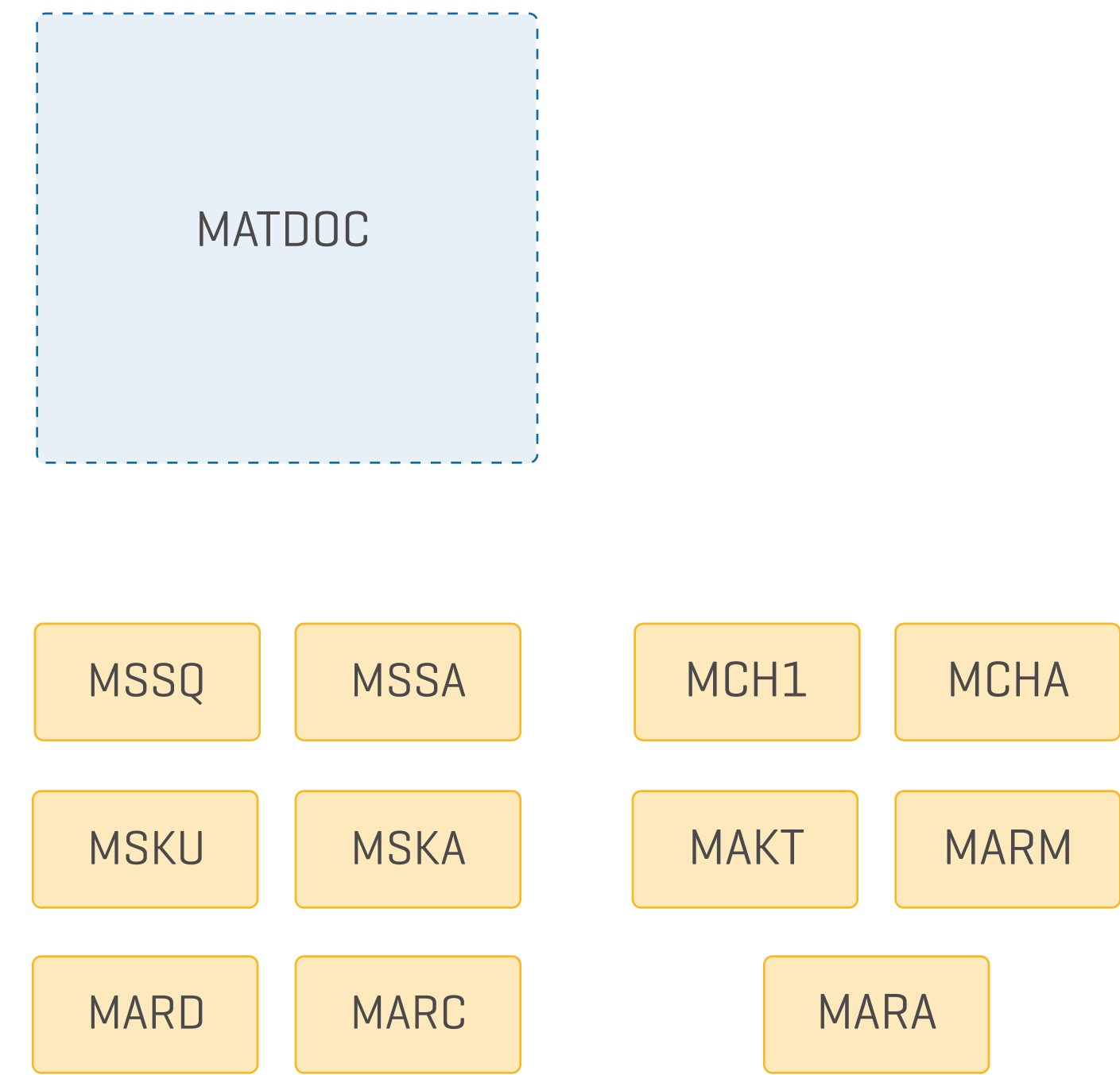
Simplified Logistics

No aggregates: on-the-fly aggregation of inventories

Classical Logistics Data Model



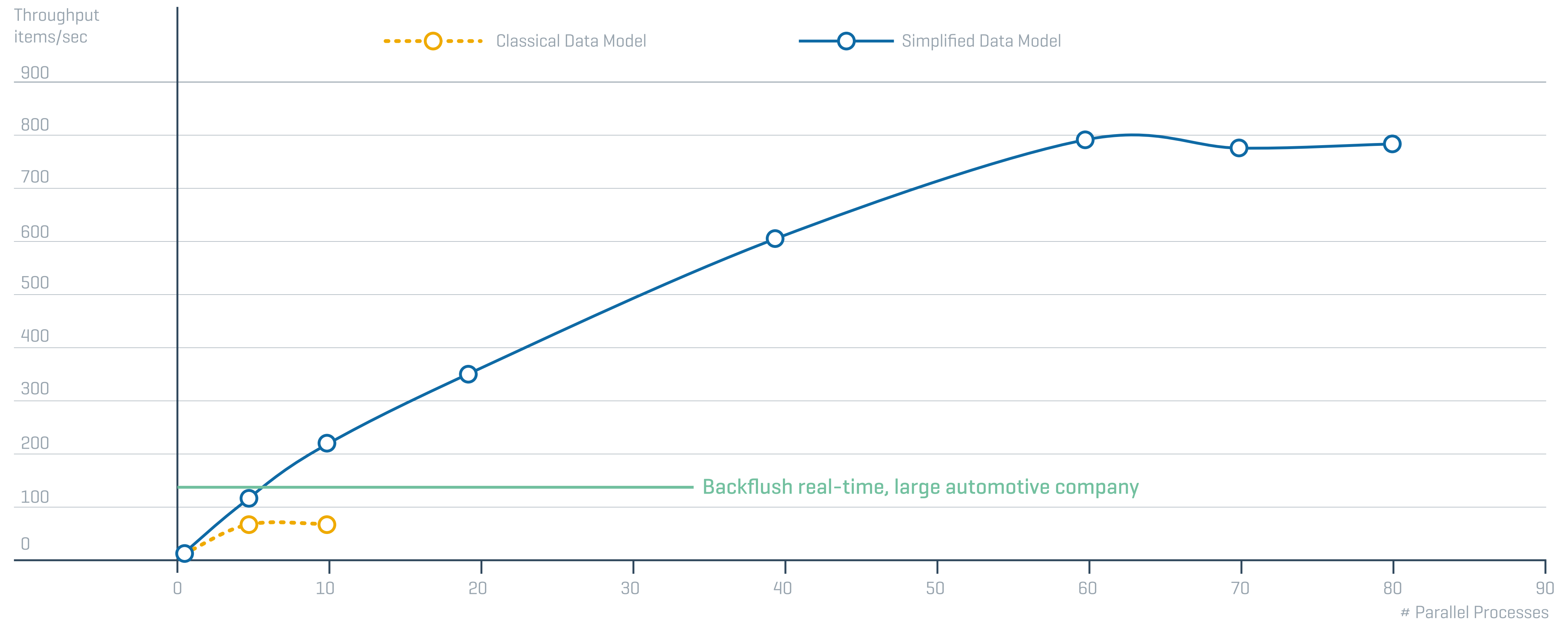
Simplified Logistics Data Model



 TRANSACTIONAL DATA
 AGGREGATED QUANTITIES
 MASTER DATA + AGGREGATED QUANTITIES
 MASTER DATA

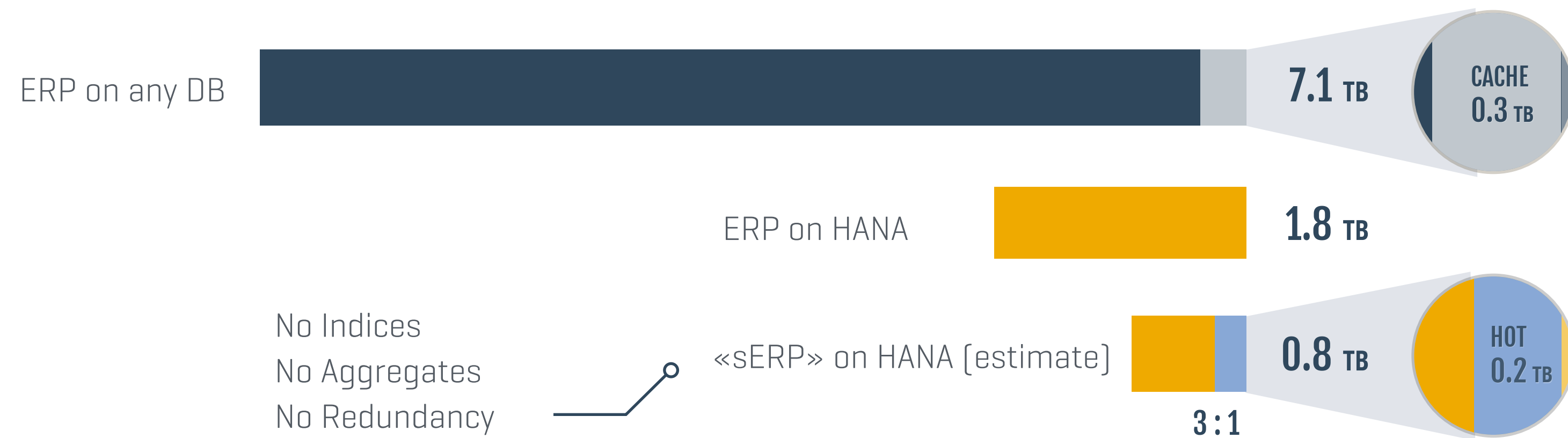
Simplified Logistics

Example case with real data from large automotive company



Database footprint reduction

With SAP HANA



BACKUP/RECOVERY

¹/35 OF ERP ON ANY DB

DEVELOPMENT SYSTEM

¹/35 OF FULL DATA

TEST SYSTEM

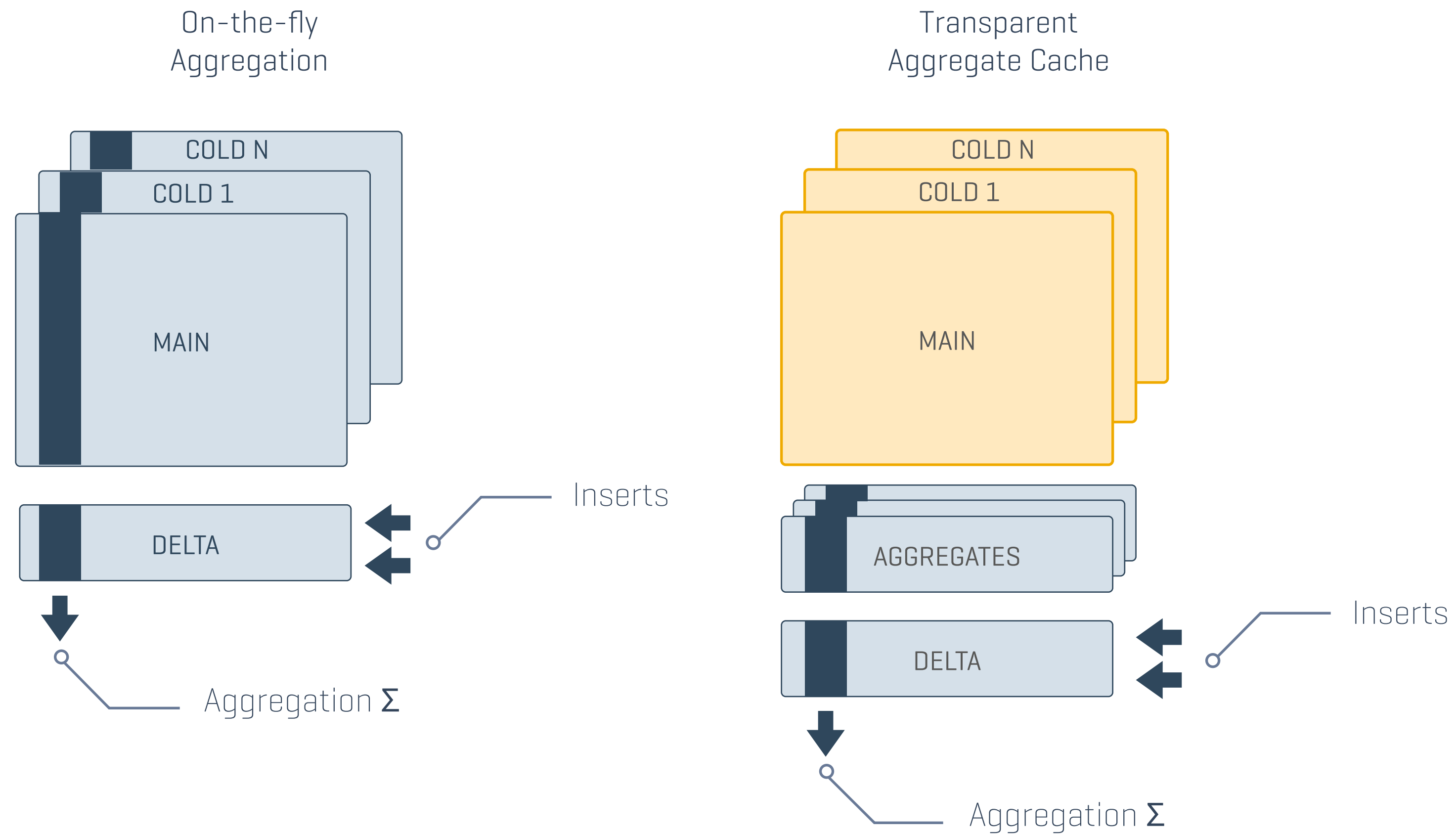
¹/35 OF FULL DATA

Hot = Actuals, status at beginning of current year + all transactions during current year to conduct business and fulfill statutory reporting

Cold = Historical, up to 10 years

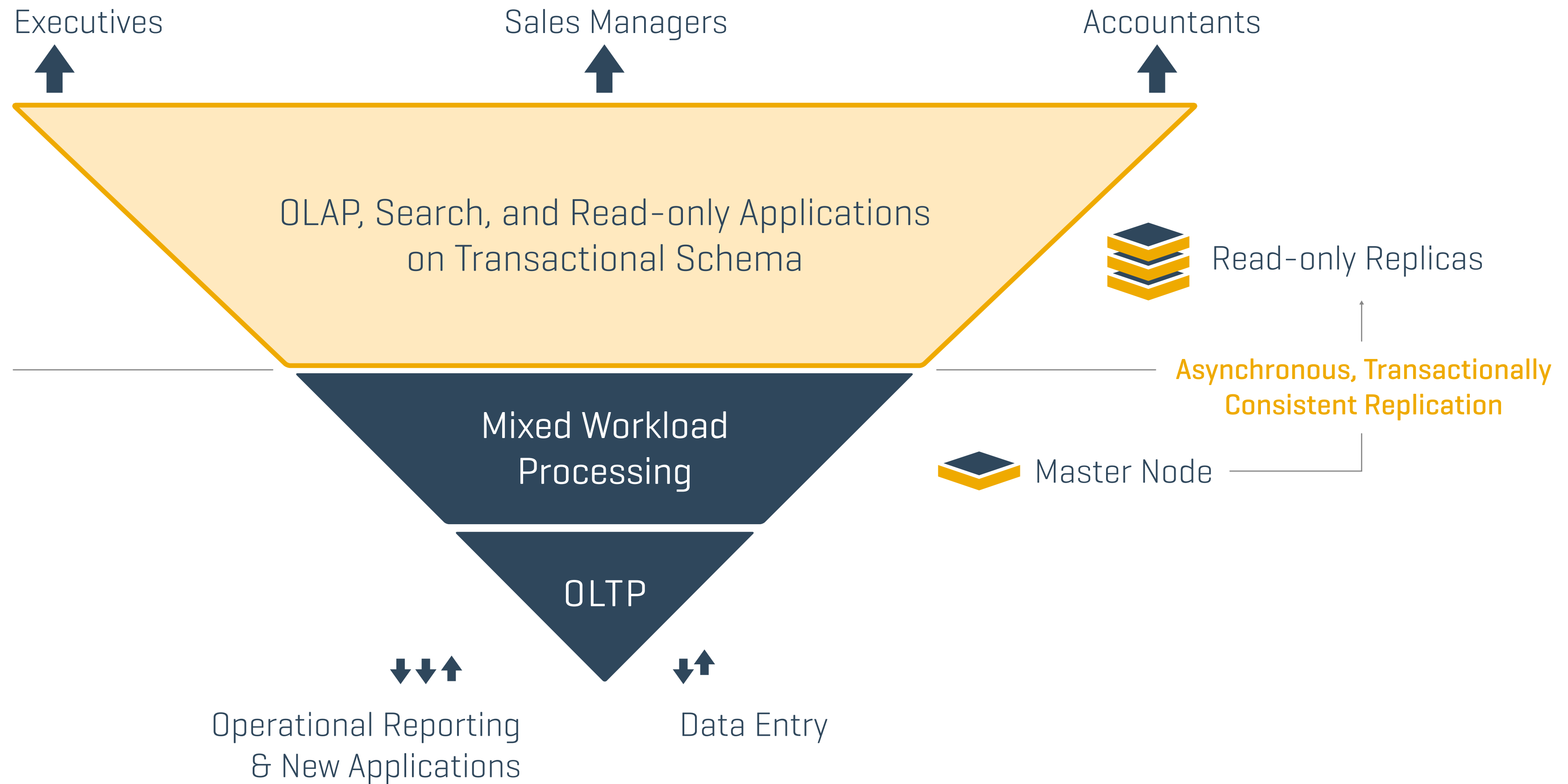
Transparent aggregate cache

Database-maintained aggregates on read-only main partition



Read-Only Replication

Leveraging business workload characteristics



Boardroom Redefined

TRENDS

Review the state of the business at any time, examining data in real-time

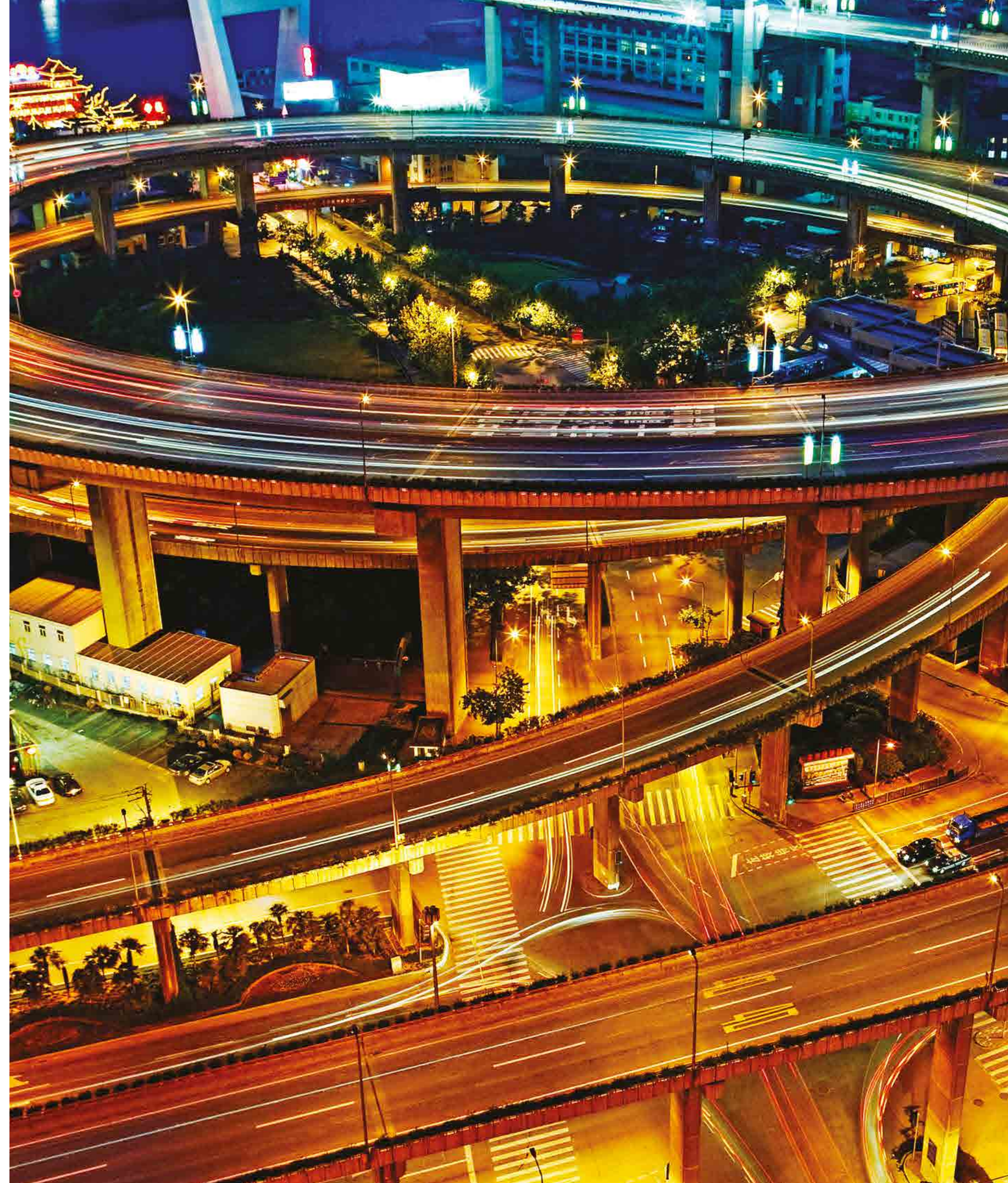
Prioritize where we spend time reviewing

Apply analytics to identify solutions

Higher speed leads to more intelligence



Thank you.



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