

BUDAPEST DATA FORUM

Conference



A MATTER OF TIME





ABOUT ME

Dirk Lerner



MODULES



Coaching

Data
Architecture &
Data Modeling

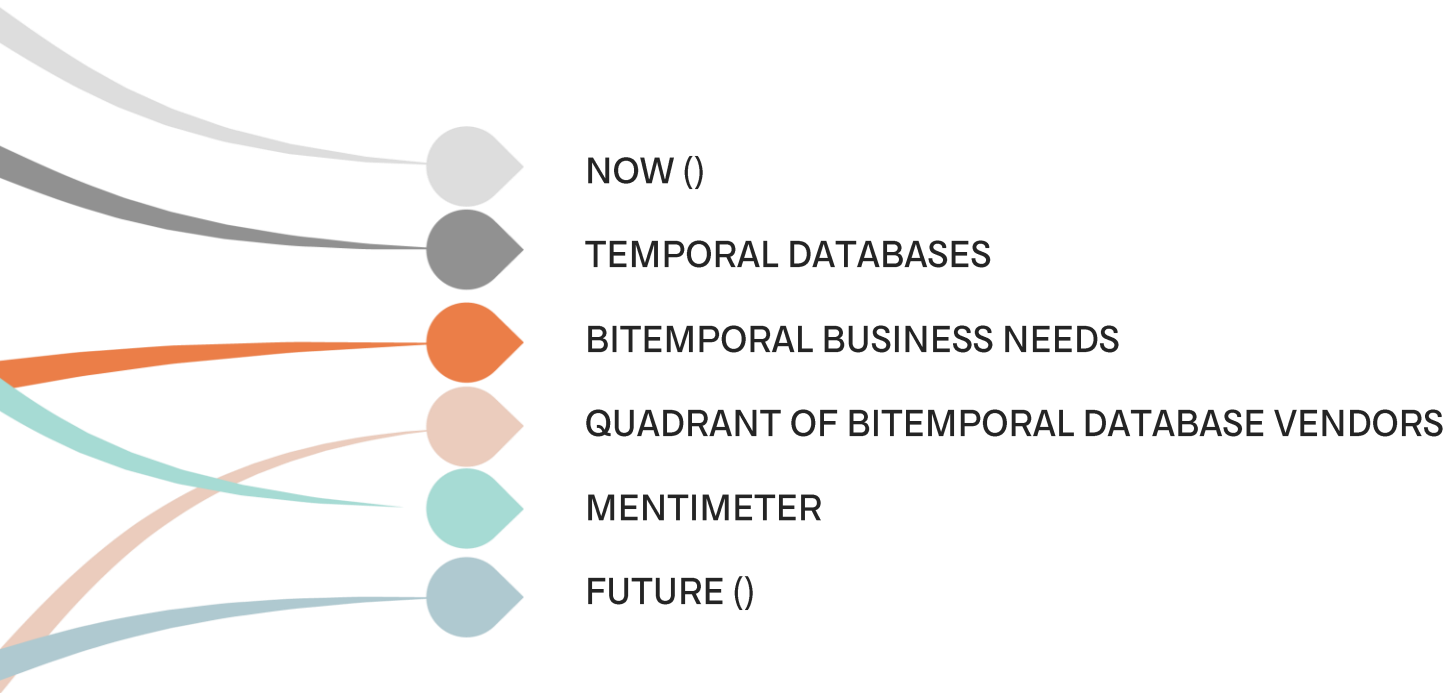
Data Model
Scorecard

Data Vault
&
FOM

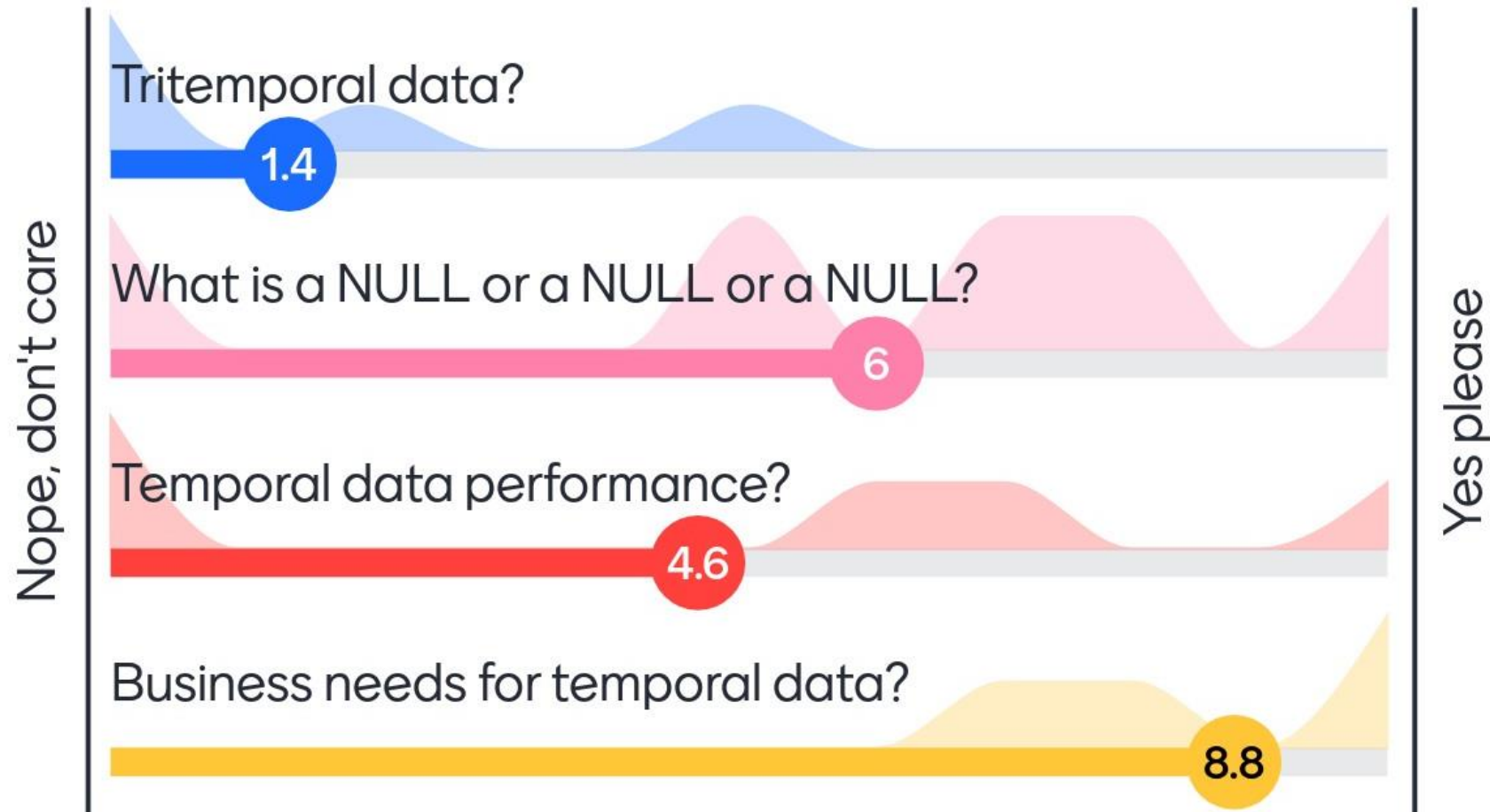
Consulting

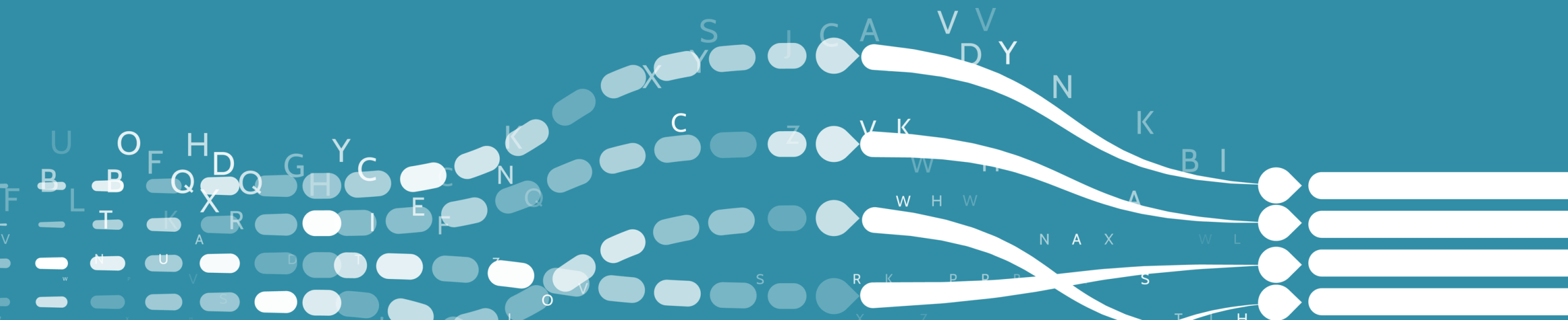
Temporal
Data

AGENDA



WHAT WOULD BE INTERESTING FOR THE NEXT SESSION?

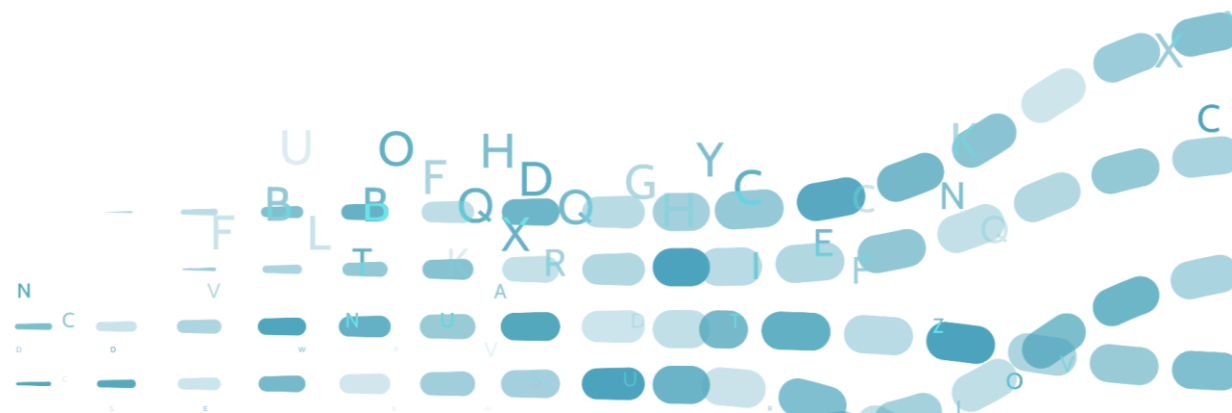




CURRENT DATABASE

A current database has **no** timeline

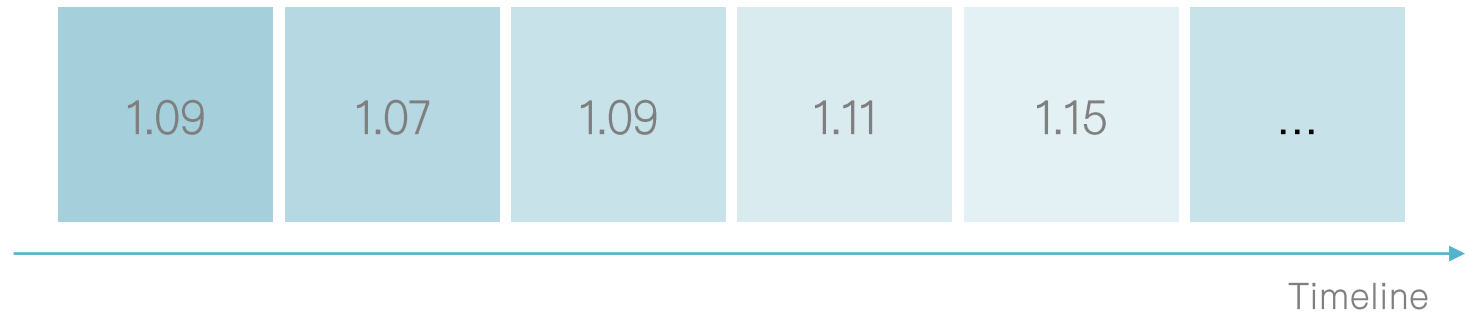
- Most common type today



UNI-TEMPORAL DATABASE

A uni-temporal database has **one** timeline

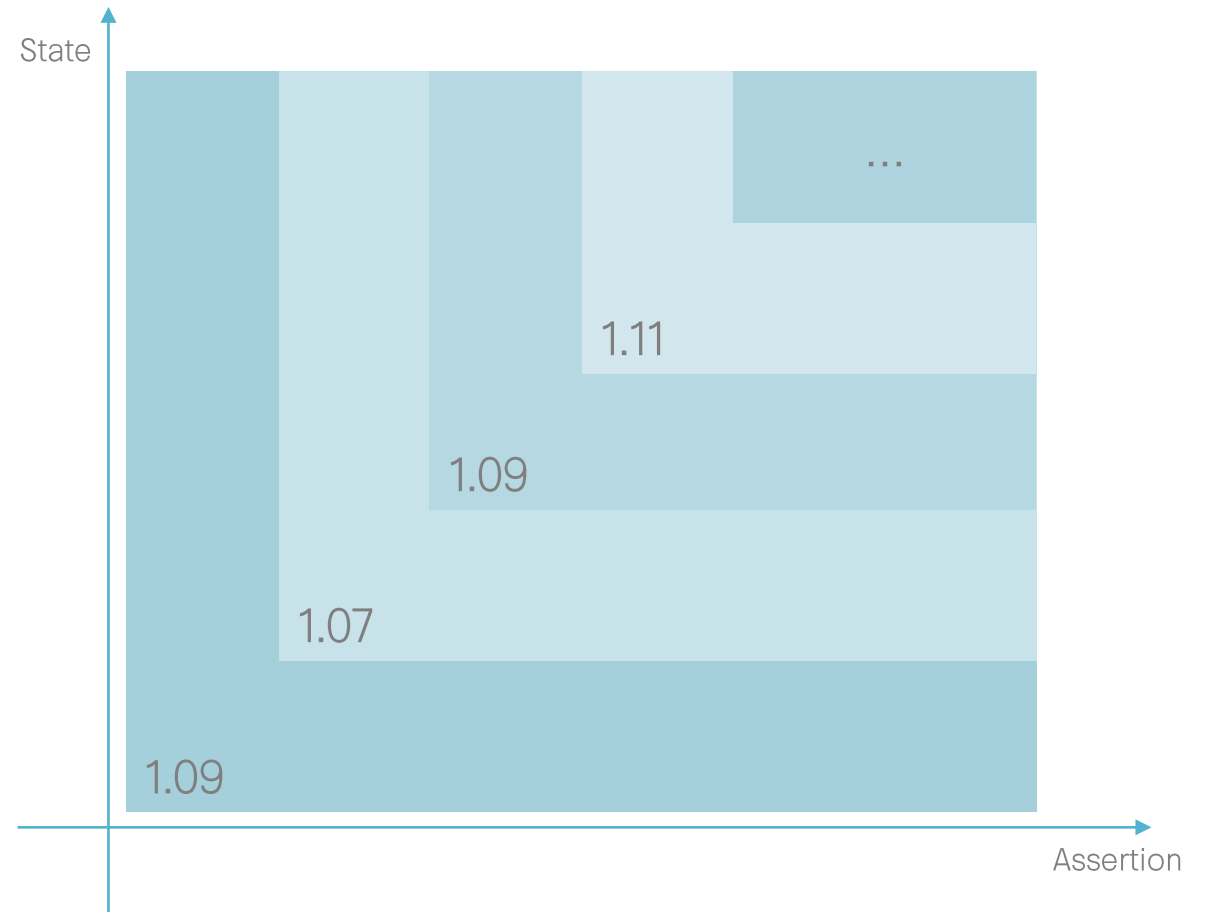
- Assertion (aka transaction) time



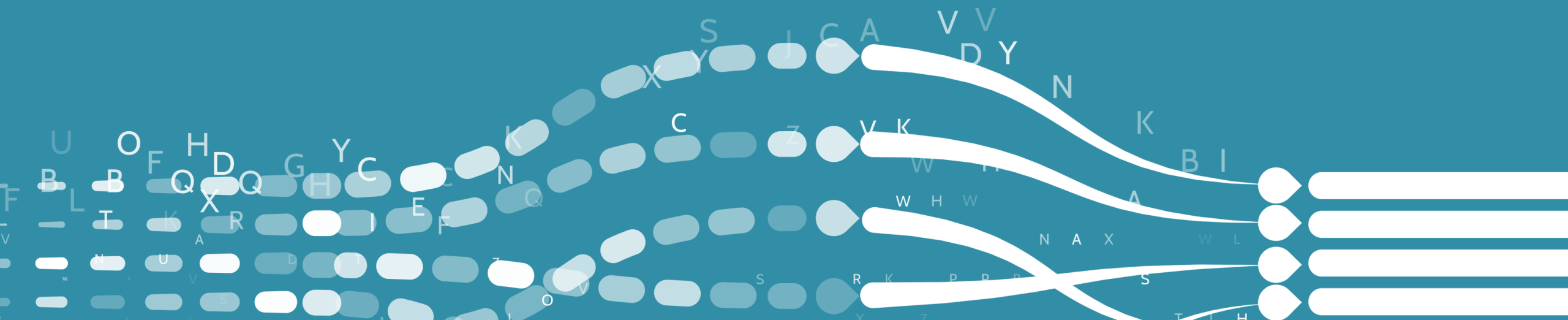
BI-TEMPORAL DATABASE

A bi-temporal database has **two** timelines

- Assertion (aka transaction) time and
- State (aka business) time

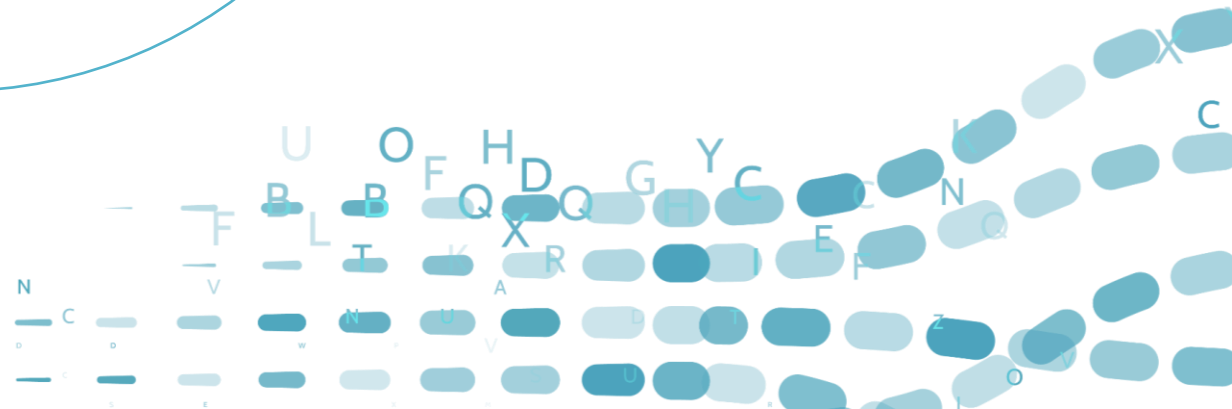


BITEMPORAL BUSINESS NEEDS



A MATTER OF TIME

What did you know?
- And -
When did you know it?



BUSINESS NEEDS

When data occasionally arrives out of order

Store reality in past, present and future

Make corrections against the past

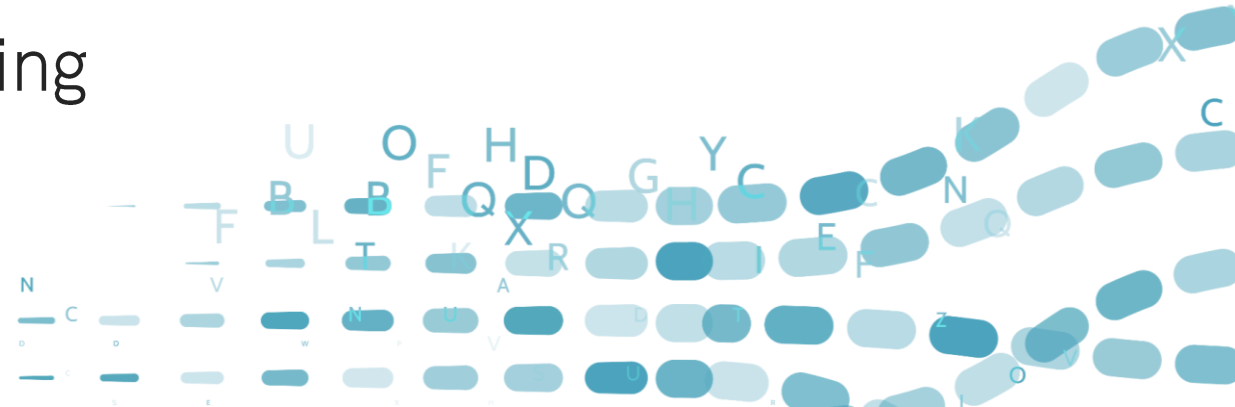
Ability to query through time

Retroactive Operations

Decision analyses

Legal regulations

Auditing



LATE ARRIVAL OF DATA



Contact e-mails changes but late arrival

Non-temporal data model

- Data arriving late overwrites the current data with outdated information.

Uni-temporal data model

- Late arrivals of data with outdated information are considered current.
- The current data is historized and is erroneously considered out of date.

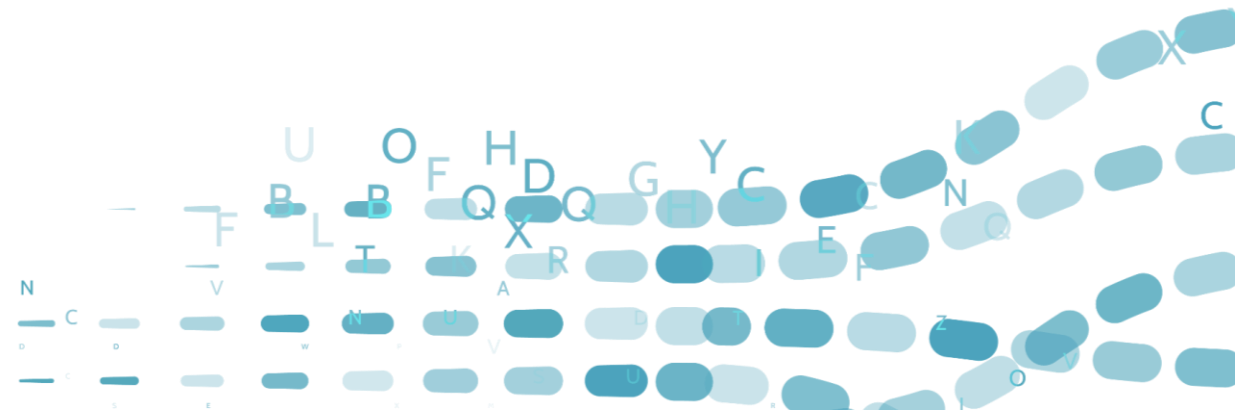
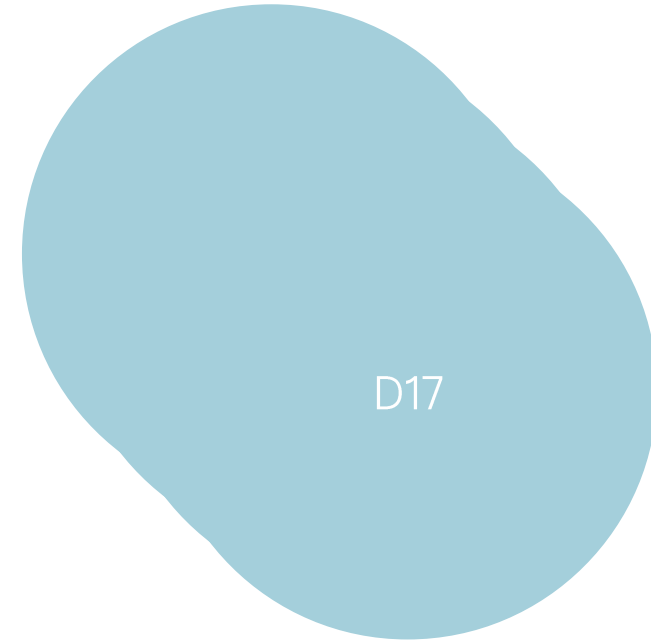
Bi-temporal data model

- Late arrivals with outdated information are correctly historized on the timeline.
- Updating the previous historized data to now correct data.
- Confidence in changes

CURRENT DATABASE

Contact e-mails changes but late arrival

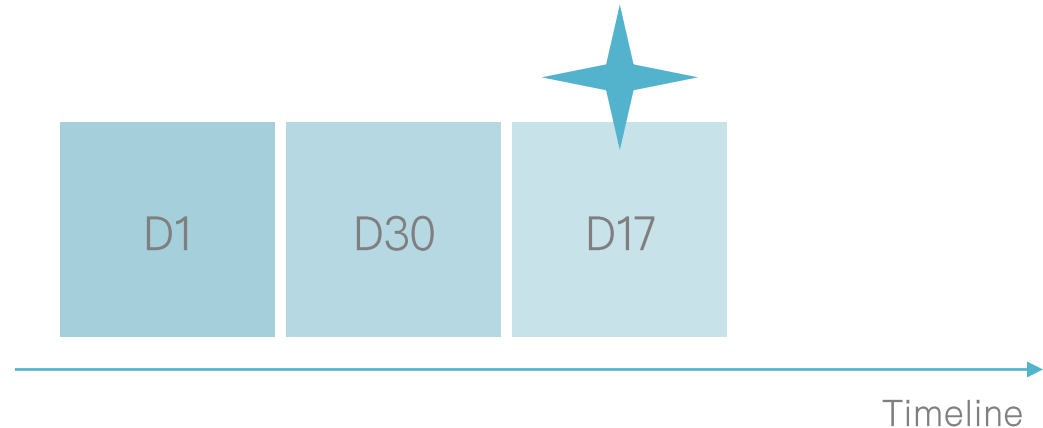
- (on D01) -> Dirk@DataVaultModeling.de
- (on D30) -> Dirk.Lerner@tedamoh.com
- (on D55) -> Dirk.Lerner@tedamoh.de (for D17 - delayed)



UNI-TEMPORAL DATABASE

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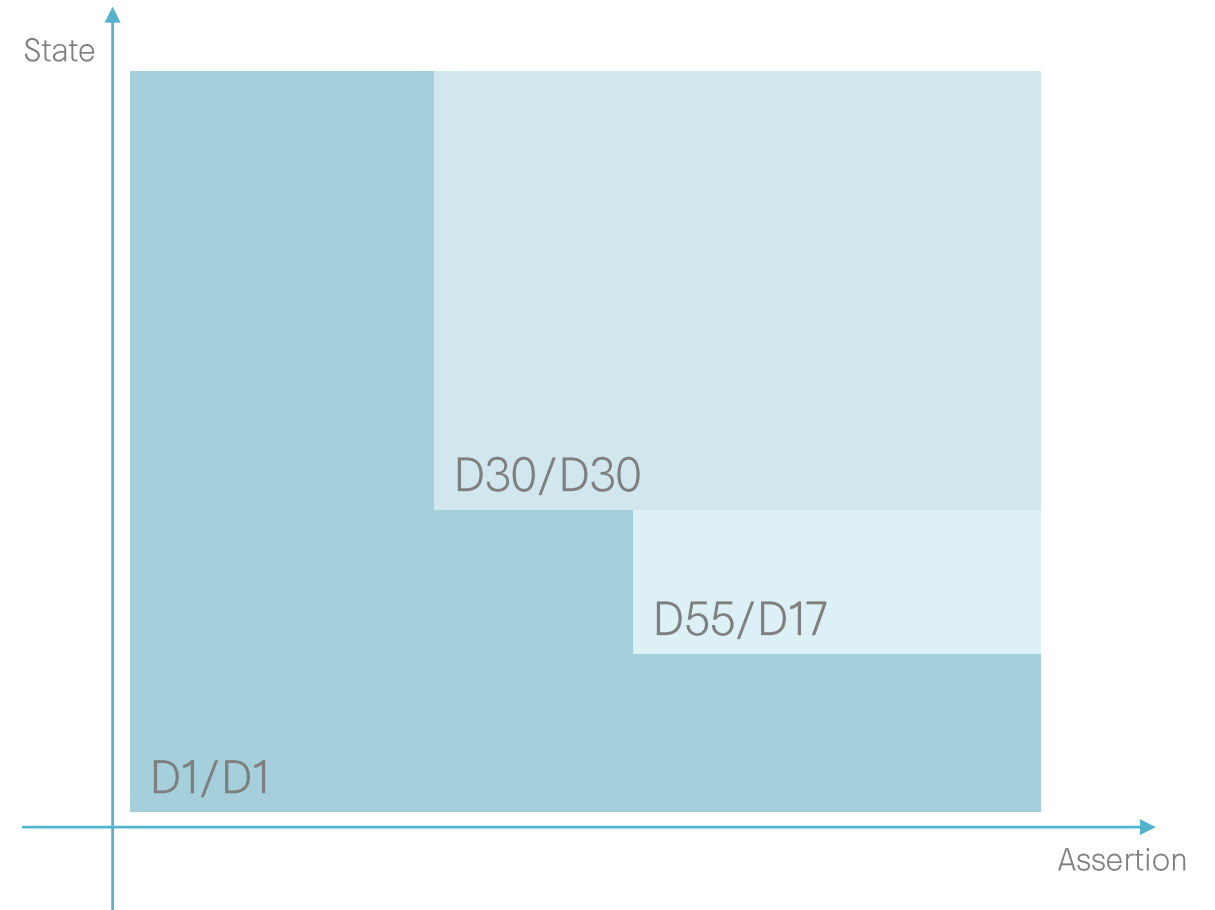
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FEDERAL REGULATIONS



Store transactional data **non-rewriteable** and **non-erasable**

Non-temporal data model

- rewrite old data

Uni-temporal data model

- history by a single time-axis
- As-Of (aka Then/Then) is not possible

Bi-temporal data model

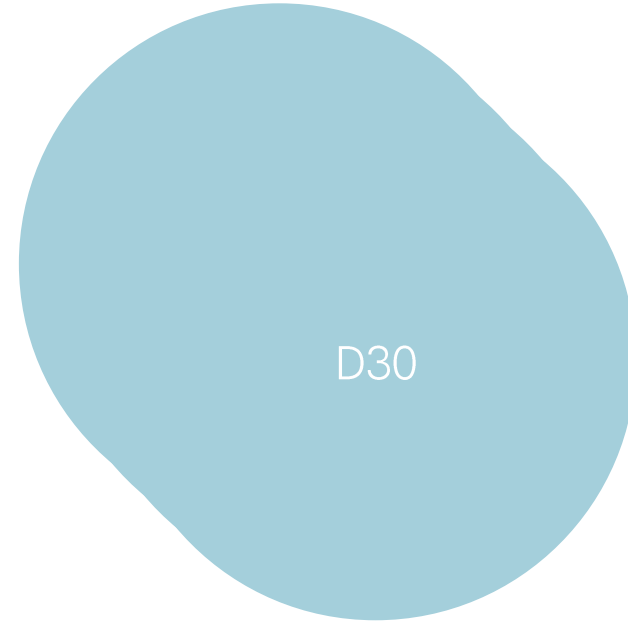
- Audit access
- Traceable data
- Confidence in changes



CURRENT DATABASE

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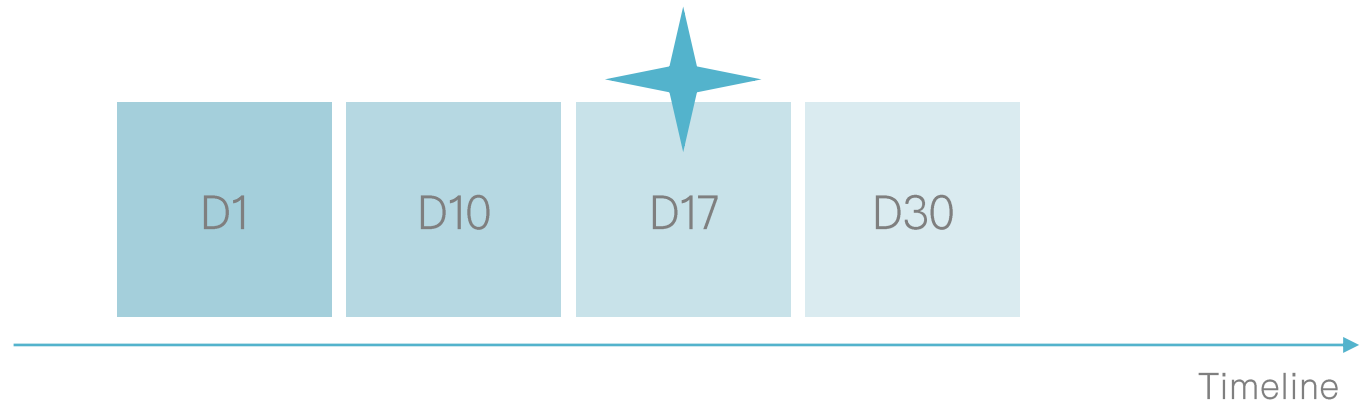
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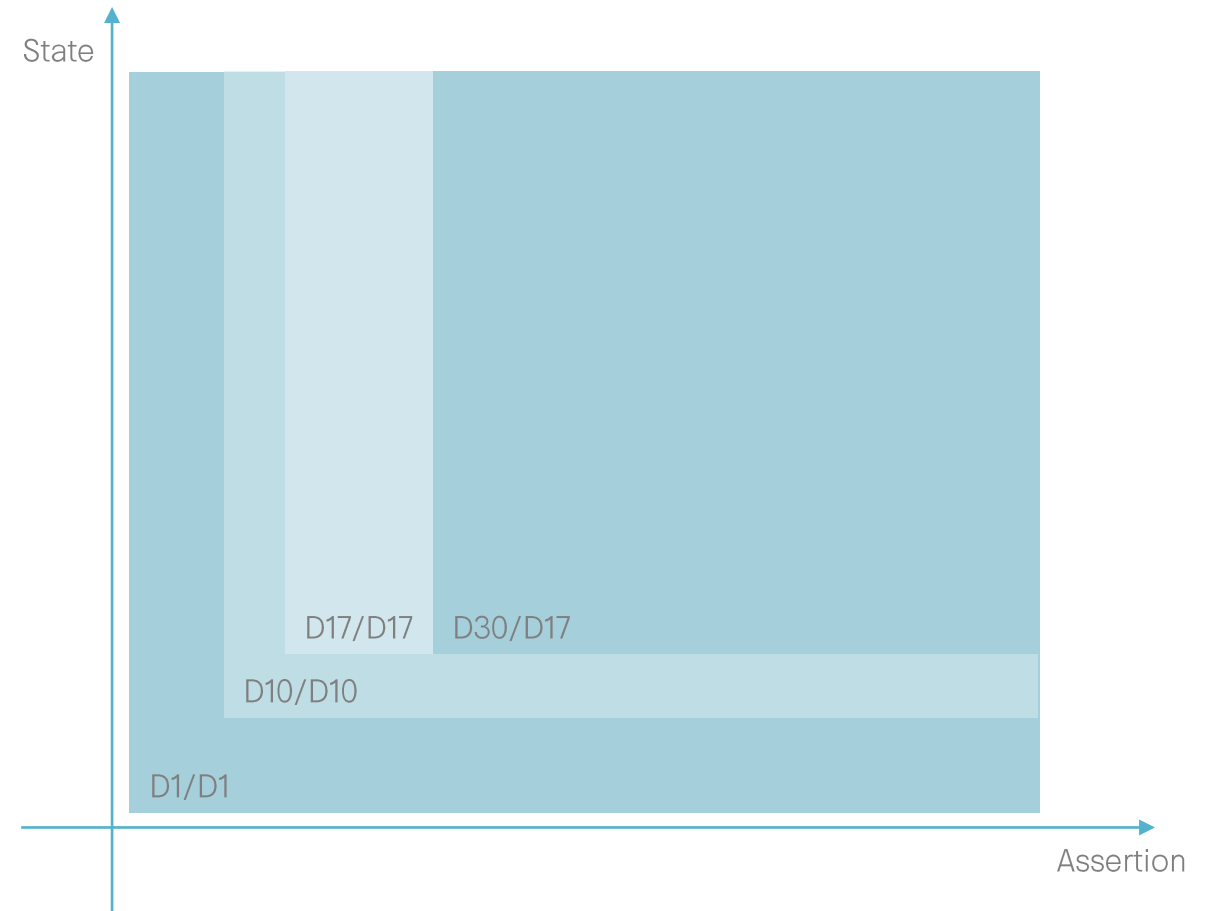
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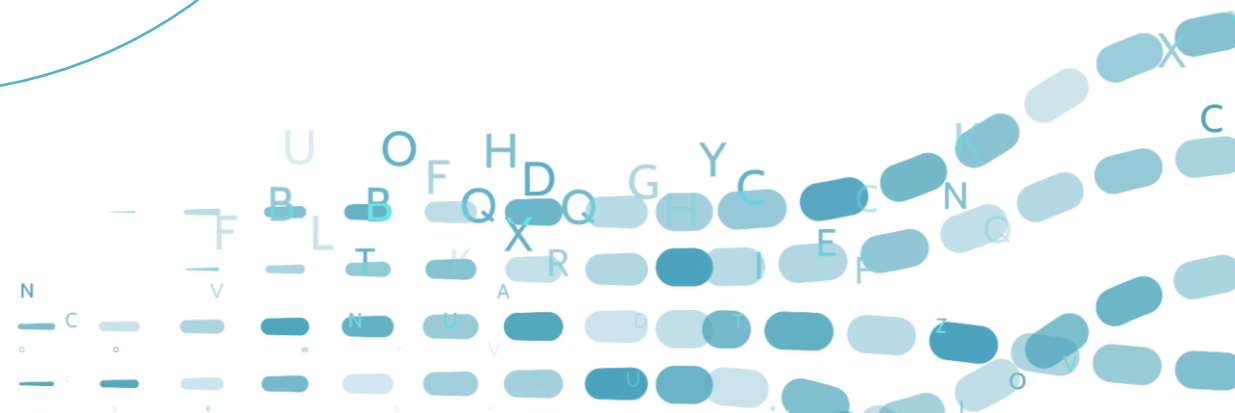
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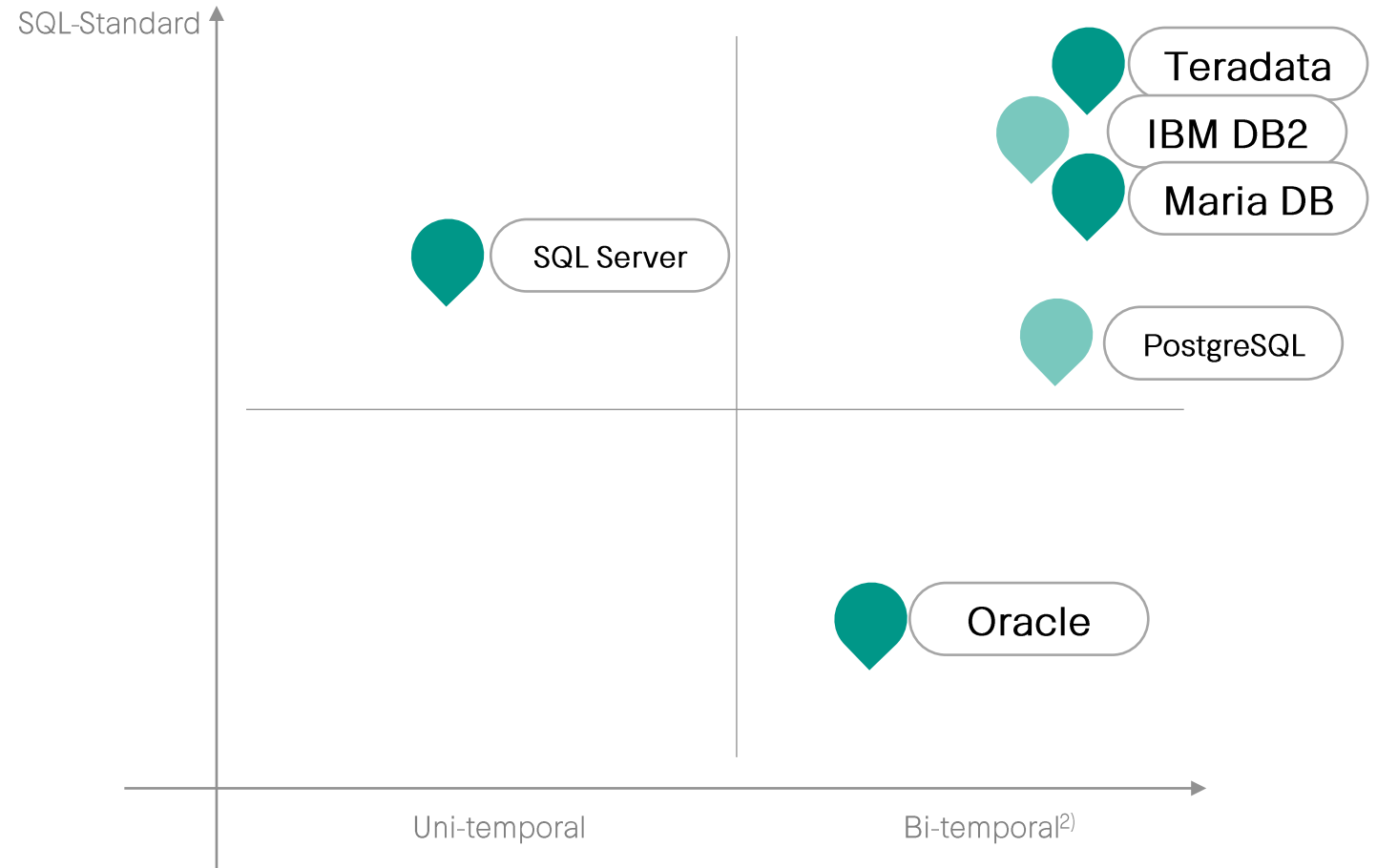
CONFIDENCE IN CHANGES!



BITEMPORAL QUADRANT OF DATABASE VENDORS

TEMPORAL DATABASE TECHNOLOGY – RDBMS QUADRANT¹⁾³⁾

- **Oracle, 10g R2**
(unknown, July 2005, with Workspace Manager)
- **Teradata, 13.10**
(TSQL2, August 2010)
- **IBM DB2, 10**
(SQL:2011, April 2012)
- **PostgreSQL, 9.2**
(SQL:2011, September 2012, additional extension)
- **SQL Server, 2016**
(SQL:2011, June 2016 – Assertion table)
- **MariaDB, 10.4**
(SQL:2011, June 2019, 10.3.4 January 2018 – Assertion table)



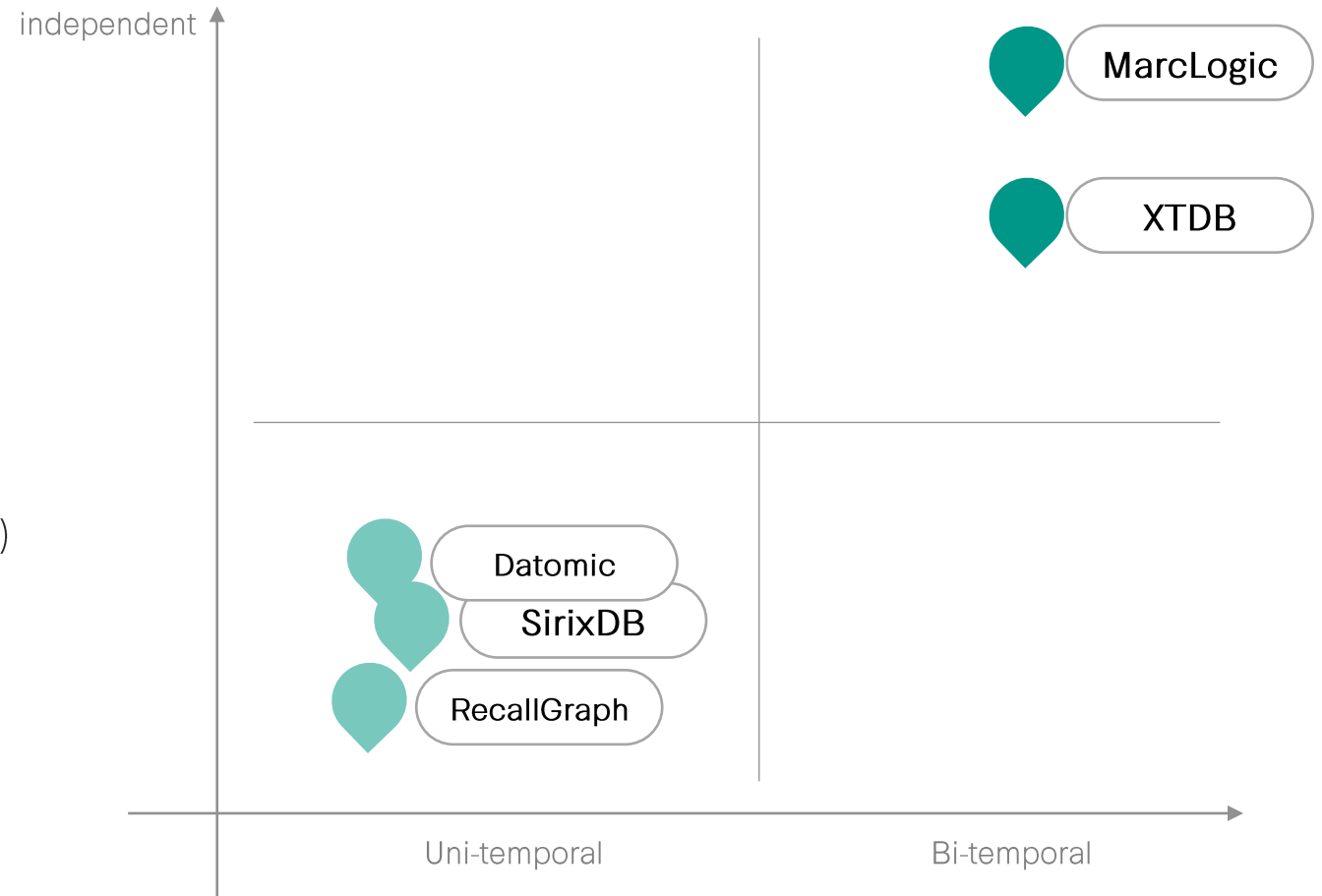
¹⁾ Initial evaluation, detailed analysis according to fixed criteria is still open.

²⁾ No RDBMS database know which supports tri-temporal data

³⁾ All other, not listed, RDBMS systems are Current Database Systems

TEMPORAL DATABASE TECHNOLOGY – NOSQL QUADRANT¹⁾²⁾

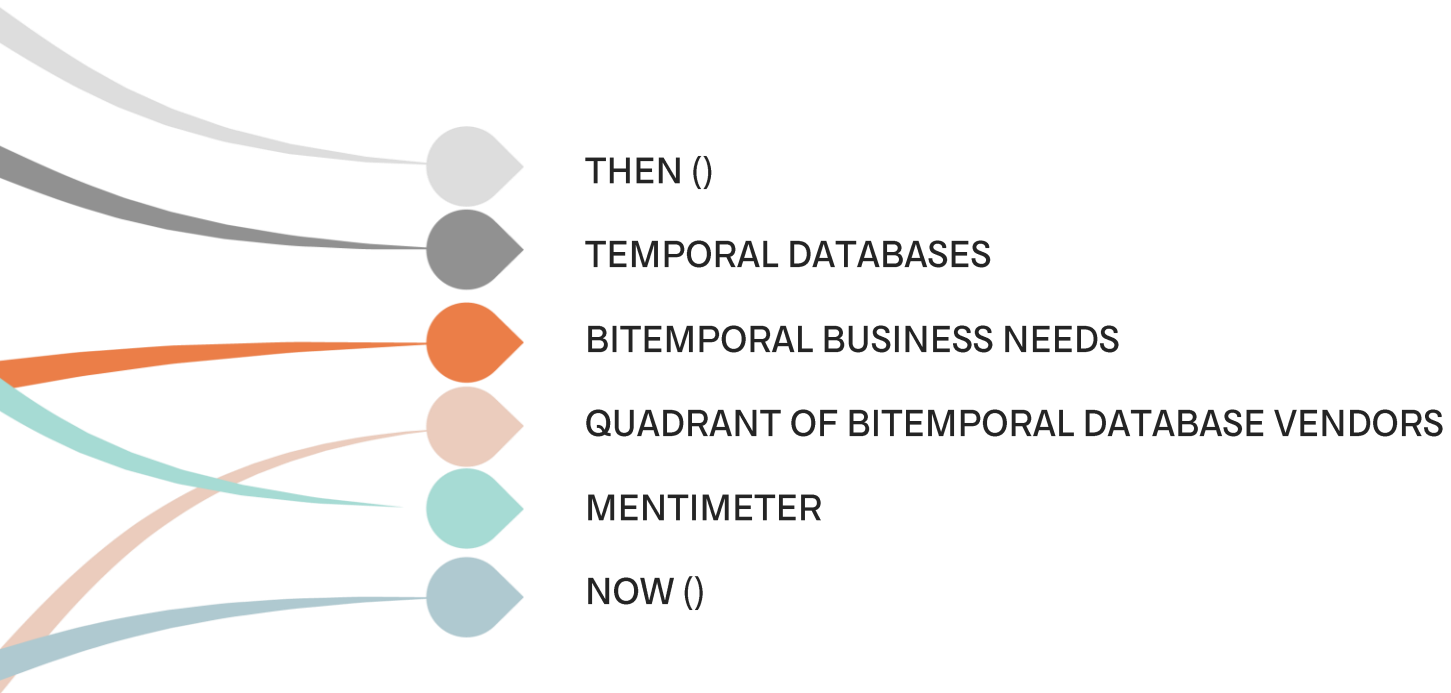
- **SirixDB, initial**
(Snapshots, 2012)
- **MarcLogic, Server 8**
(Timestamps in documents, 2015)
- **XTDB (formerly Crux), initial**
(Document DB with bitemporal graph queries, 2019)
- **RecallGraph, dependend**
(versioned-graph data store, 2019 – on top of ArrangoDB)
- **Datomic (never forget)**
(ability to query history, data is retained by default
Since 2018-01-15 initial release)



¹⁾ Initial evaluation, detailed analysis according to fixed criteria is still open.

²⁾ All other, not listed, noSQL systems are Current Systems

AGENDA





Data Modeling Training

TEMPORAL DATA IN A FAST-CHANGING WORLD

The big business man smiled.
*Time, he said, is what keeps everything
from happening at once.*

TEMPORAL DATA IN A FAST-CHANGING WORLD!

Training about methods and techniques for
handling bitemporal data in a data warehouse.

Fall 2022

Sep 22 - Sep 30, 2022

Spring 2023

Coming soon

<https://tedamoh.com/academy/training>



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BETTER DATA MODELLING.
BETTER PERFORMANCE.

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