

# What Time Is It?

**UK Data Vault User Group**

**2022-02-09**

# Short Introduction

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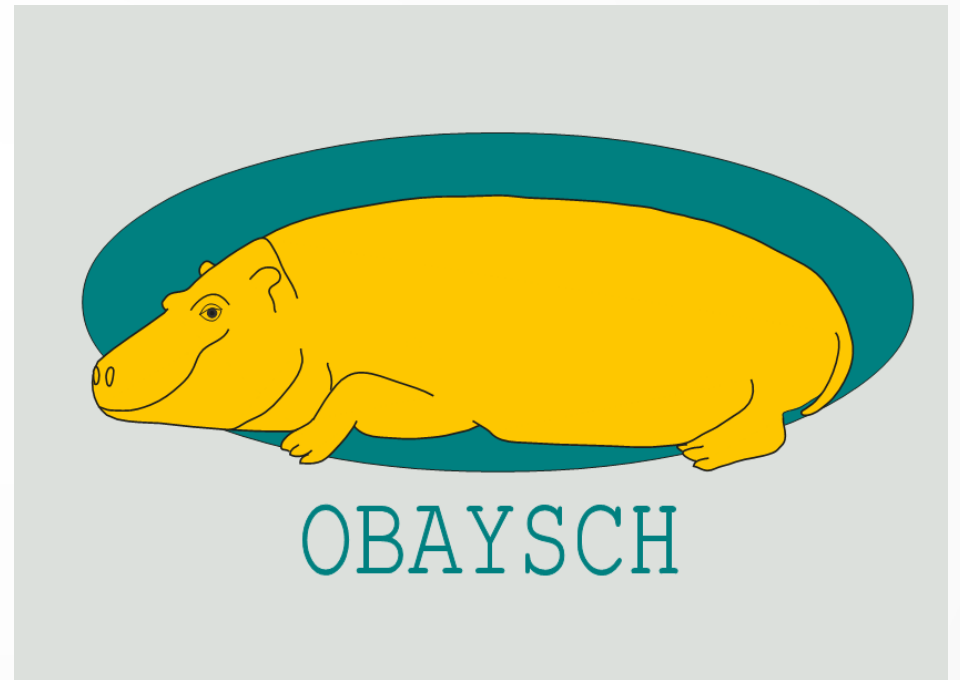
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# What Time Is It?

**Different Kinds of Time &  
How to Deal with Them**

# Content

- Who Has the Time?
- What to Do with Your Time

# Who Has the Time?

**A Brief History of Kinds of Time**

# Richard T. Snodgrass

- **Valid Time**

“capturing the history of a changing reality”

“when a fact was true in the modeled reality”

- **Transaction Time**

“capturing the sequence of states of a changing table”

“when a fact was stored in the database”

# SQL:2011

- **Application Time**

“a period whose period name is not SYSTEM\_TIME is also known as an application-time period”

- **System Time**

“a period whose period name is SYSTEM\_TIME is also known as a system-time period”

# C. J. Date, Hugh Darwen & Nikos Lorentzos

- **Stated Time**

“the stated time—sometimes currently stated time, for emphasis—for a proposition  $q$  is the set of times  $t$  such that, according to what the database currently states (which is to say, according to our current beliefs),  $q$  is, was, or will be true at time  $t$ ”

- **Logged Time**

“the logged time for a proposition  $p$  is the set of times  $t$  such that, according to what the database stated at time  $t$ ,  $p$  was true”



# Martin Fowler

- **Actual Time**
- **Record Time**

“The terminology of valid time and transaction time comes from Snodgrass, and is also used in the SQL:2011 standard. When I first started giving workshops about temporal modeling, back in the early naughts, I used these terms, but people found them confusing. So instead we started to use actual/record instead.”

# Tom Johnston Bitemporality

- **State Time**

“I will use the term ‘state time’ [instead of ‘valid time’] because it seems to me to be the least misleading term to apply to this concept.”

- **Assertion Time**

“the time during which a row of data is asserted to make a true statement”

# Tom Johnston Tritemporality

- **State Time**

[like before]

- **Speech Act Time**

assertion time “generalized to be the time between any speech act and its withdrawal [...] relativized to the source performing the speech act” (with assertion, withdrawal, assent, dissent and notice time as special cases)

- **Inscription Time**

“begins when a row [in a database table] is physically created [and] ends when a row is marked as physically deleted”

# Philipp Salvisberg

- **Valid Time**

“the period during which something in the real world is considered valid”

- **Decision Time**

“the date and time a decision has been made”

- **Transaction Time**

[time of change in database]

# Michael Brackett

- **Business Change Time**

“the point in time that the business value change actually happened in the business world”

- **Organization Notification Time**

“the point in time that the business value change was reported”

- **Organization Receipt Time**

“the point in time that the change was first received by the organization”

- **Change Entry Time**

“the point in time that the change was entered into the organization's data resource”

- **Change Availability Time**

“the point in time that the change entered into the data resource was actually available to applications and queries”

# Lars Rönnbäck (Anchor)

- **Changing Time**

“an interval defining the period of time in which its value or relation is valid in the domain of discourse being modeled”

- **Happening Time**

“the moment or interval at which an event took place in the domain of discourse being modeled”

- **Recording Time**

“The time during which values were stored in some kind of memory”

# Lars Rönnbäck (Transitional)

- **Appearance Time**

“The time when some value can be said to have appeared (or will appear) for some thing or a collection of things. Such a statement is called a posit.”

- **Assertion Time**

“The time when someone is expressing an opinion about their certainty toward a posit.”

# Petr Beles (Data Vault)

- **1d (Business Validity)**

“Valid time”

- **2d (Inscription Time)**

“Approximation for Assertion Time in the source IT system”

- **3d (Load Time)**

“Approximation [for] Assertion Time in the DWH system”



# Patrick Cuba (Data Vault)

- **Applied Time**

“the metadata package/extract date of a parcel/batch/package of applicable data”

- **Load Time**

“Timestamp of load to the data warehouse/lake”

# KsqlDB (Kafka)

- **Event Time**

“The time when a record is created by the data source.”

- **Ingestion Time**

“The time when a record is stored in a topic partition by a Kafka broker. ”

- **Processing Time**

“The time when the record is consumed by a stream processing application.”

# Summary: Dimension #1

Terms describing the point in time when a fact is true in the real world:

- Valid Time
- Application Time
- Stated Time
- Actual Time
- State Time
- Business Change Time
- Changing Time
- Happening Time
- Appearance Time
- Event Time

# Summary: Dimension #2

Terms describing the point in time when someone makes or notices a statement about some fact:

- Assertion Time
- Speech Act Time
- Withdrawal Time
- Assent Time
- Dissent Time
- Notice time
- Decision Time
- Organization Notification Time
- Organization Receipt Time

# Summary: Dimension #3

Terms describing the point in time when a statement about some fact is stored in a database (or other means of persistent storage):

- Transaction Time
- System Time
- Logged Time
- Record Time
- Inscription Time
- Change Entry Time
- Change Availability Time
- Recording Time
- Load Time
- Applied Time
- Ingestion Time
- Processing Time

# Summary: Three Dimensions of Time

#	Time Dimension	Alternative Terms	Special Cases	
1	Appearance Time	Valid Time	Happening Time	Business Change Time
		Application Time		
		Stated Time		Event Time
		Actual Time		
		State Time		
		Changing Time		
2	Assertion Time (Rönnbäck)	Speech Act Time	Assertion Time (Johnston)	Decision Time
			Withdrawal Time	Organization Notification Time
				Assent Time
				Dissent Time
				Notice Time
3	Recording Time	Transaction Time	Change Entry Time	
		System Time	Change Availability Time	Applied Time
		Logged Time		Ingestion Time
		Record Time		Load Time
		Inscription Time		Processing Time

# What to Do with Your Time

**Dealing with Different Kinds of Time**

# How Much Time Can You Have?

- Do your operational systems store ...
  - ... Appearance Time?
  - ... Assertion Time(s)?
  - ... their own Recording Time?
- If not, why not? Can that change?



# How Much Time Should You Have?

- Do your stakeholders want to know ...
  - ... Appearance Time?
  - ... Assertion Time(s)?
  - ... the operational Recording Time?
  - ... the DWH Recording Time?
- If so, why?
- If not, can that change?

# Storage vs. Presentation of Time

- Store ...
  - ... all kinds of time operational systems can deliver.
  - ... all kinds of time you need for regulatory requirements.
  - ... the DWH recording time.
- Present ...
  - ... as few kinds of time as possible.
  - ... the kinds of time users need for the given use case (not more!).
  - ... real-life kinds of time (to the extent possible; approximate if necessary).

# Name View Modes ... (1/2)

## Non-temporal Views (**Fixed-Fixed**):

- **Now-Now** (Assertion Time now, Appearance Time now; “as-is”)
- **Now-Then** (Assertion Time now, Appearance Time in the past; e. g. the situation at the end of last year as it presents itself now)
- **Then-Then** (Assertion Time & Appearance Time in the past; e. g. “as-posted” view with Assertion Time  $\approx$  Appearance Time)
- **Then-Now** (Assertion Time in the past, Appearance Time now; e. g. forecast of current month)

# Name View Modes ... (2/2)

Unitemporal views:

- **Fixed-Variable** (Assertion Time fixed, full Appearance Time history; e. g. history of real-life changes as it presents itself now)
- **Variable-Fixed** (full Assertion Time history, fixed Appearance Time; e. g. changing forecasts for the current year)

Bitemporal views (**Variable-Variable**; avoid if possible)

Tritemporal views (don't even think about it)

# ... and Then Pick the Right One

- Always make visible how current the presented information is.
- **Rule:** For each use case, use the simplest view that still works.
  - Pick **Now-Now** wherever possible (easy to understand, good enough for large majority of use cases).
  - If not possible, why not?
- **Exception:** If stakeholders want to be able to recreate past reports, make sure they can do that (or they will archive Excel exports).

# Further Reading

- Petr Beles
  - Temporality in the Data Warehouse (Parts 1, 2, 3, 4)
- Michael Brackett
  - [Data Resource Design](#) (2012)
- Tom Johnston
  - [Bitemporal Data](#) (2014)
- Christian Kaul
  - Modern Data Warehousing (Parts 2, 3)
- Lars Rönnbäck
  - [List of publications](#)
  - [Transitional Modeling](#)
  - [Temporal Dimensional Modeling](#)
  - [Anchor Modeling](#) (bitemporal)
- Richard Snodgrass
- Roelant Vos
  - [A Brief History of Time for Data Vault](#)