

Event Sourcing & CQRS

with

Axon Framework





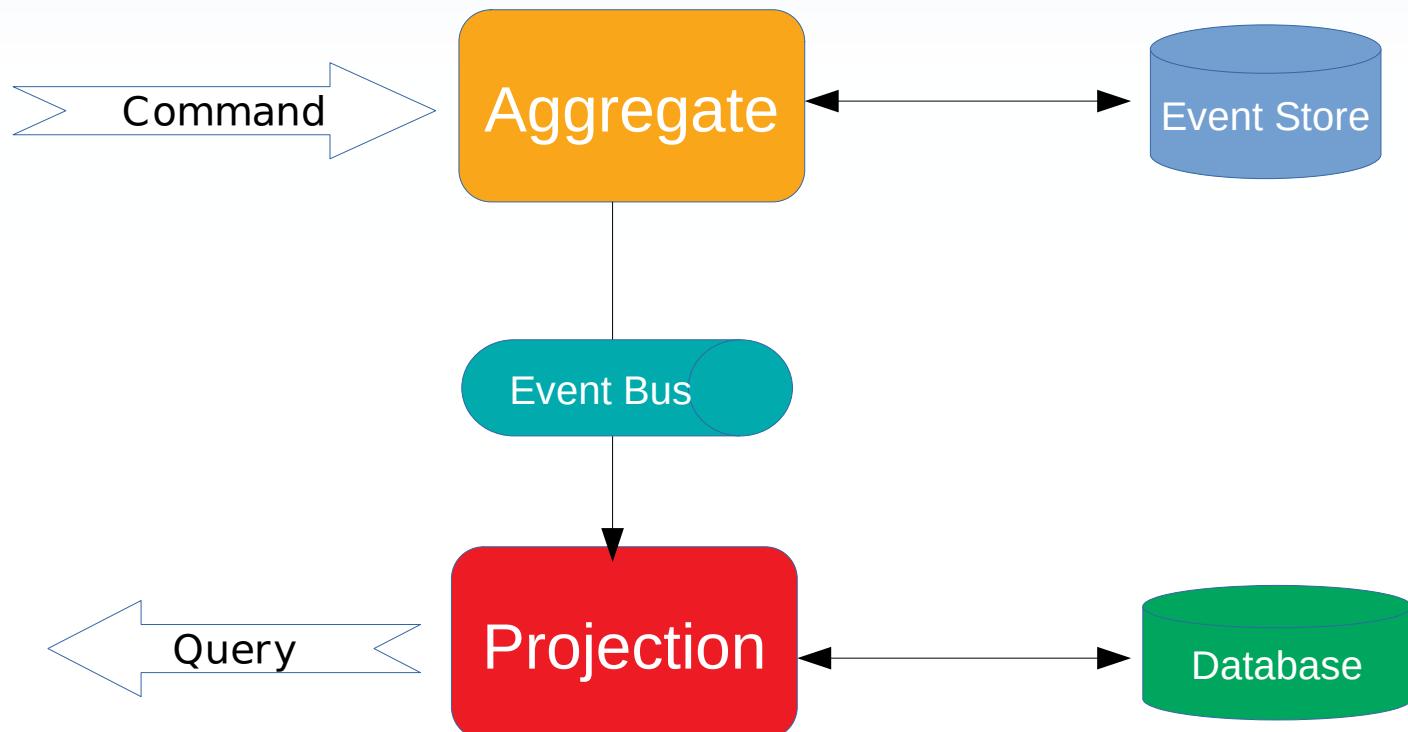
Agenda

- **Axon Framework Overview**
- **Fundamentals**
 - **DDD Concepts**
 - **Events**
 - **Domain Events**
 - **Event Sourcing**
 - **Event Store**
 - **CQRS**

Agenda

- **Deep Diving**
 - **Business Transactions (SAGA Pattern)**
 - **Eventual Consistency**
 - **Conflict Resolution**
 - **Snapshots**
 - **Event Processors & Replay**
 - **Event Revisioning**

Axon Framework





Domain Driven Design

- **Ubiquitous Language**
- **Domain & Domain Model**
- **Bounded Context**
- **Domain Objects**
 - Entities
 - Value Objects
- **Aggregate:** Cluster of domain objects
 - Aggregate Root: Entry point for an aggregate

Domain Objects & Aggregate





Domain Events

Update State

+

Publish Event

Event Sourcing



Bank Account - Example

Current State

ID	...	BALANCE
123	...	15

Events

- Account created → 0 USD
- Deposited (10 USD) → 10 USD
- Withdrawn (5 USD) → 5 USD
- Deposited (20 USD) → 25 USD
- Sent (15 USD) → 10 USD
- Received (5 USD) → 15 USD



Balance
After Event

Event Sourcing - Benefits

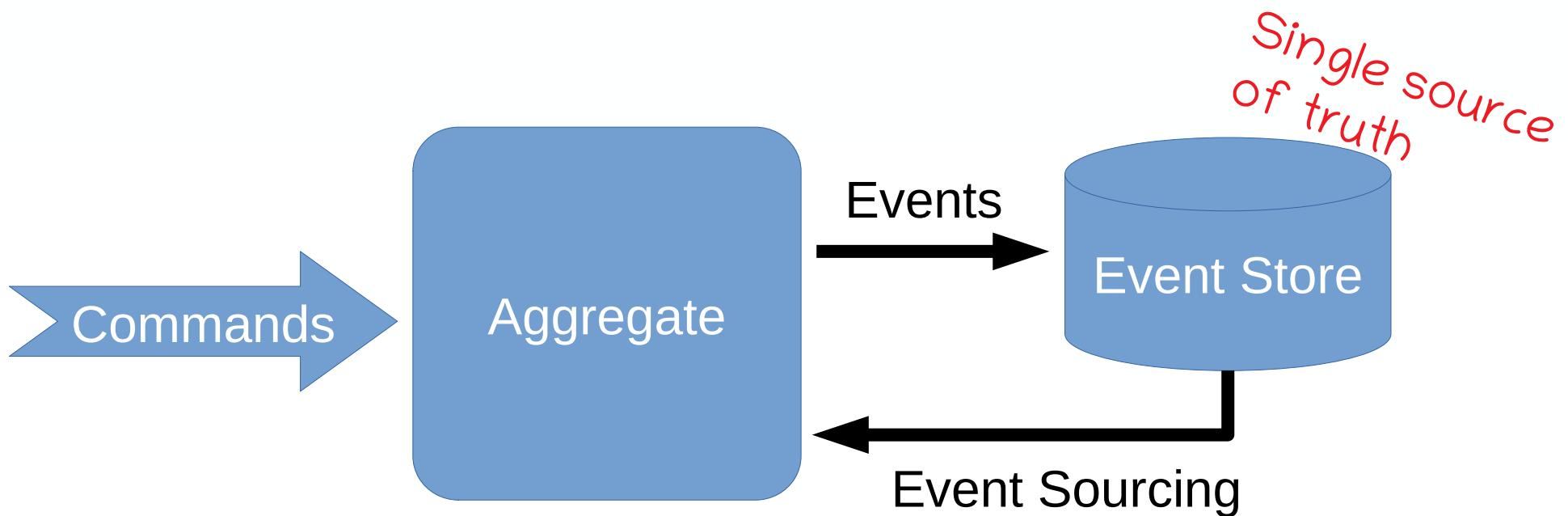
- Subscribing to changes
- Historical reads
- Analytics
- “What if” scenarios
- Undo-redo
- Correction Events
- Audit Logging

Immutable Events

- the truth
- the whole truth
- nothing but the truth



Commands & Events



Event Store

- Single source of truth
- Append only
- Preserve event order
- Query by aggregate
- Consistent write
- Optimization

CQRS

(Command Query Responsibility Segregation)

COMMAND

Create

~~**Read**~~

Update

- Activate
- Deposit
- Withdraw

Delete

QUERY

Read

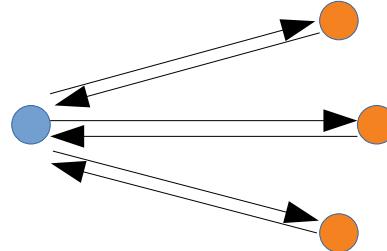
- all
- by account ID
- by customer name
- balances greater than 100
- all, order by date desc
- ...

Querying

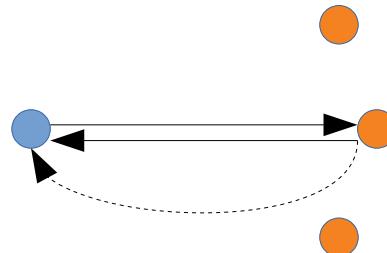
- Point-to-point Queries



-
- Scatter/Gather Queries



-
- Subscription Queries





“Talk is cheap. Show me the code.”

Linus Torvalds

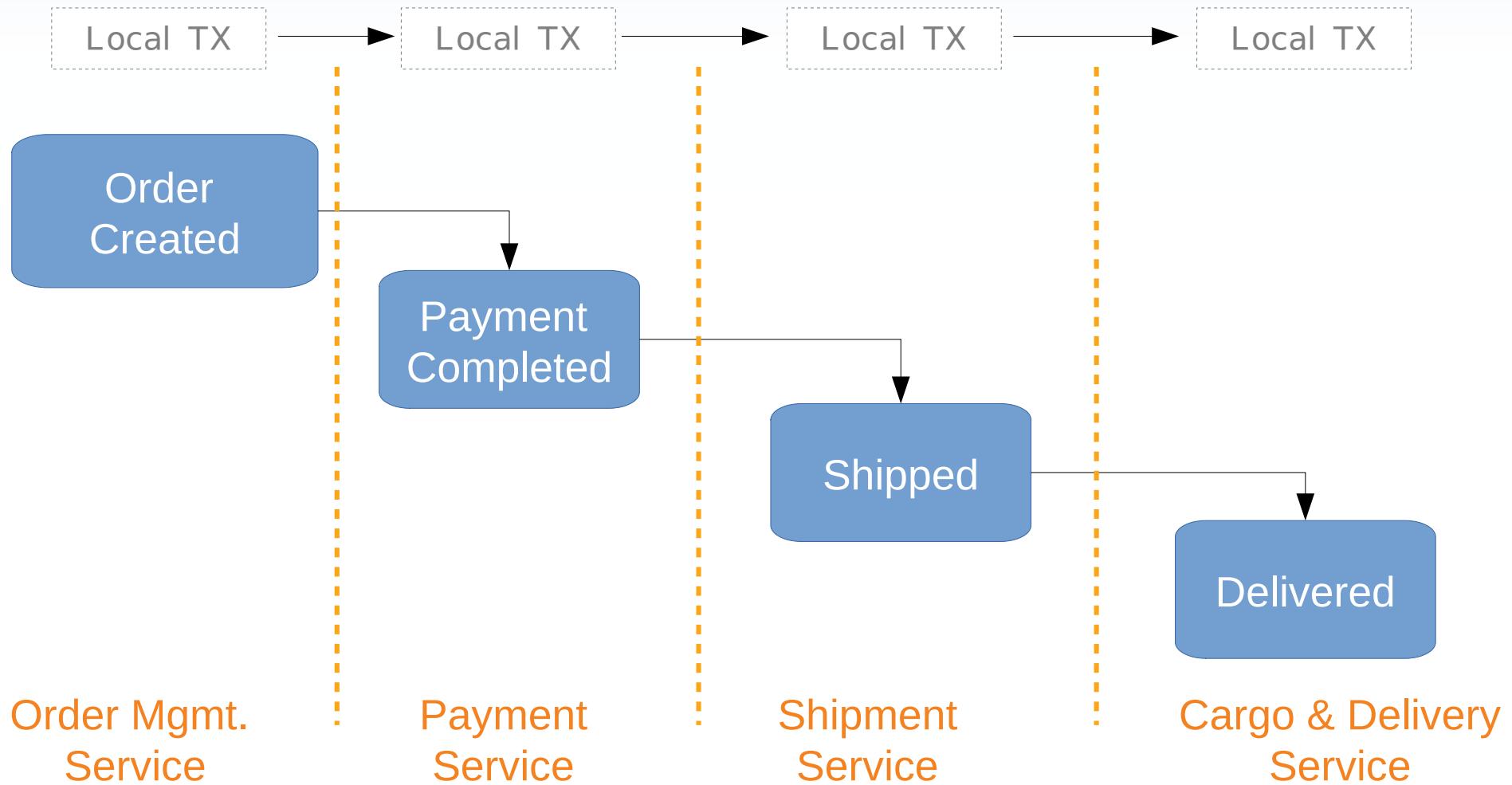
<https://github.com/muammeryucel/axon>

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Business Transactions – SAGA

(Sequence of Local Transactions)



SAGA Models

Orchestration Based



Choreography Based

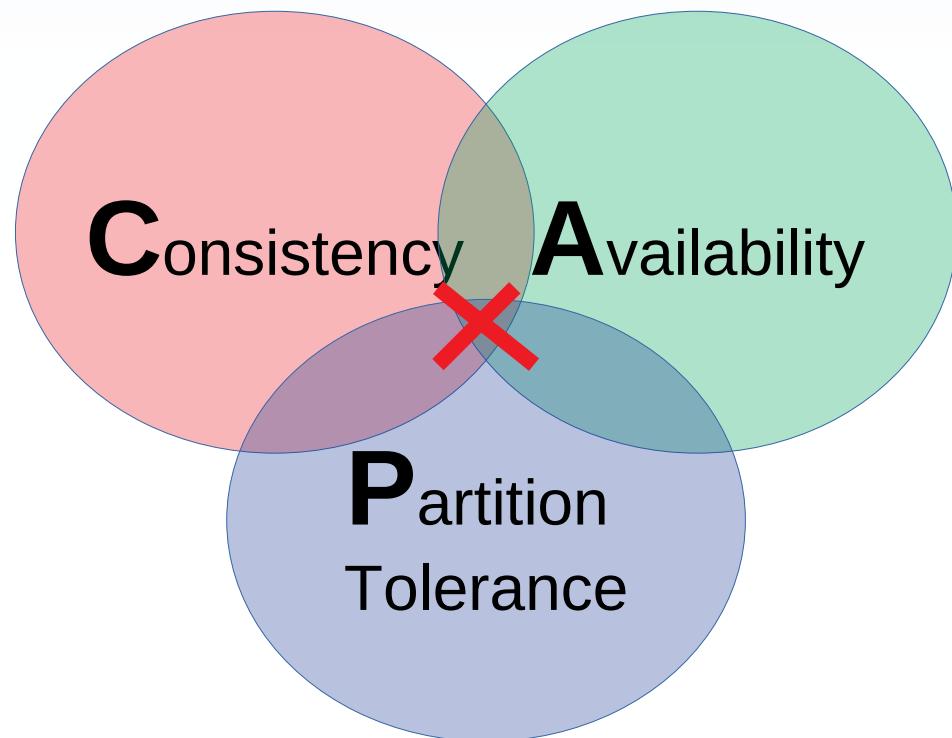




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CAP Theorem





Eventual Consistency



ACID vs BASE

Atomic
Consistent
Isolated
Durable

Basic **A**vailability
Soft-state
Eventually Consistent

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Conflict Resolution - CRUD

SELECT * FROM USER WHERE ID = 100

ID	VERSION	NAME	SURNAME
100	7	Muammer	Yucel

↓

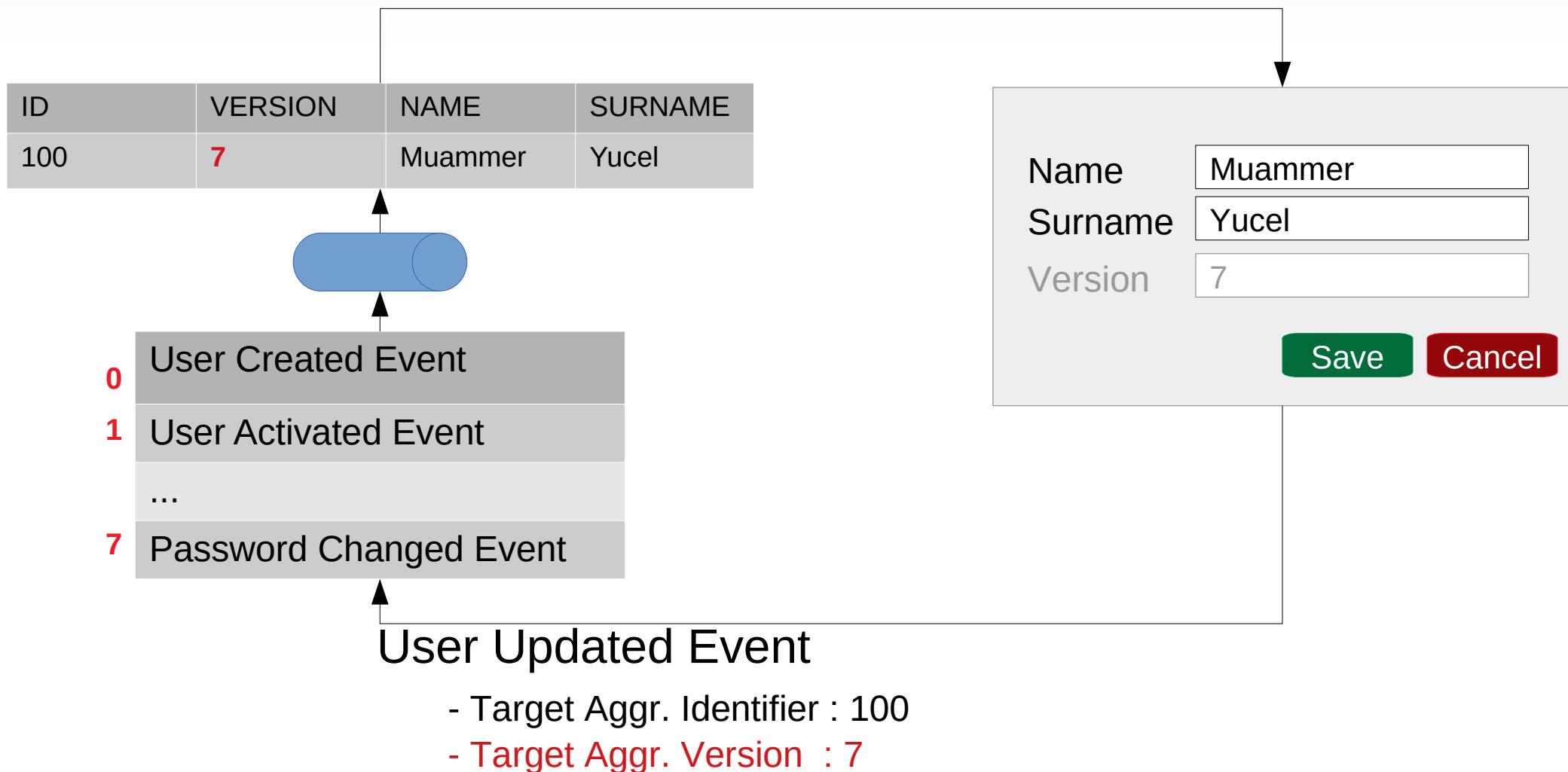
Name	<input type="text" value="Muammer"/>
Surname	<input type="text" value="Yucel"/>
Version	<input type="text" value="7"/>

Save Cancel

UPDATE USER SET NAME = 'X', SURNAME = 'Y',
VERSION = VERSION + 1 WHERE ID = 100 AND
VERSION = 7

Conflict Resolution - CQRS

`SELECT * FROM USER WHERE ID = 100`





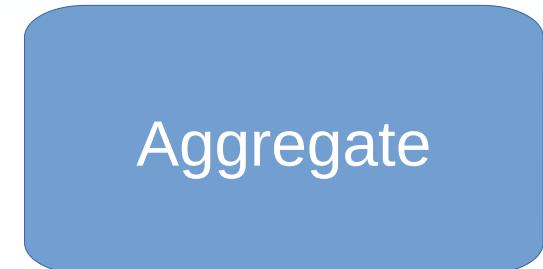
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Without Snapshots

Event Store

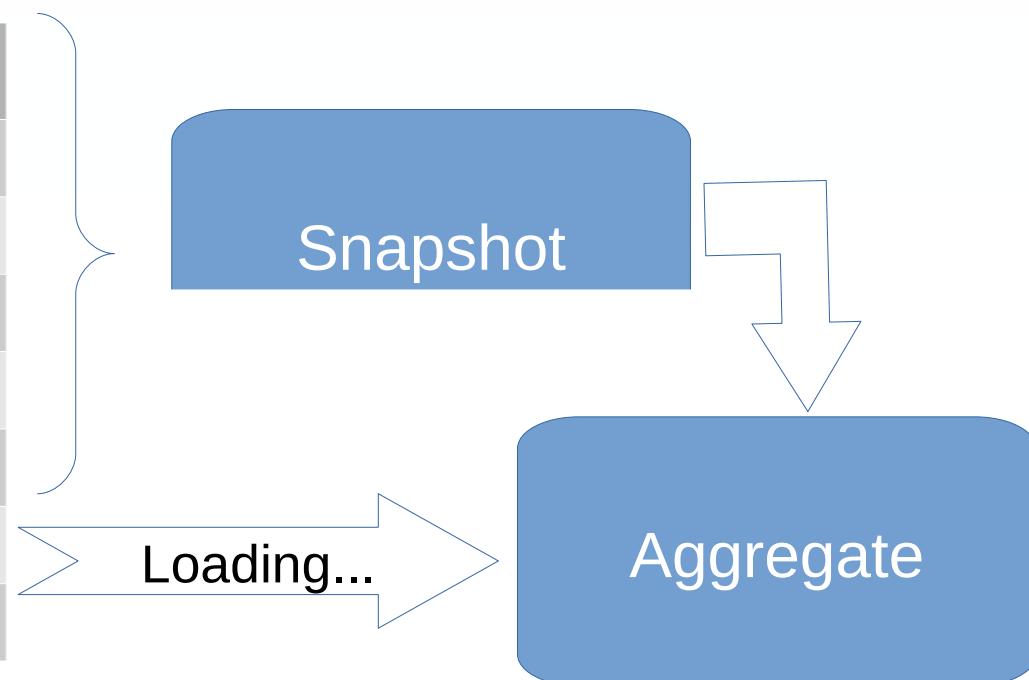
0	Account Created
1	Account Activated
2	Money Deposited
3	Money Withdrawn
...	
100	Money Sent
101	Money Deposited
102	Money Received



With Snapshots

Event Store

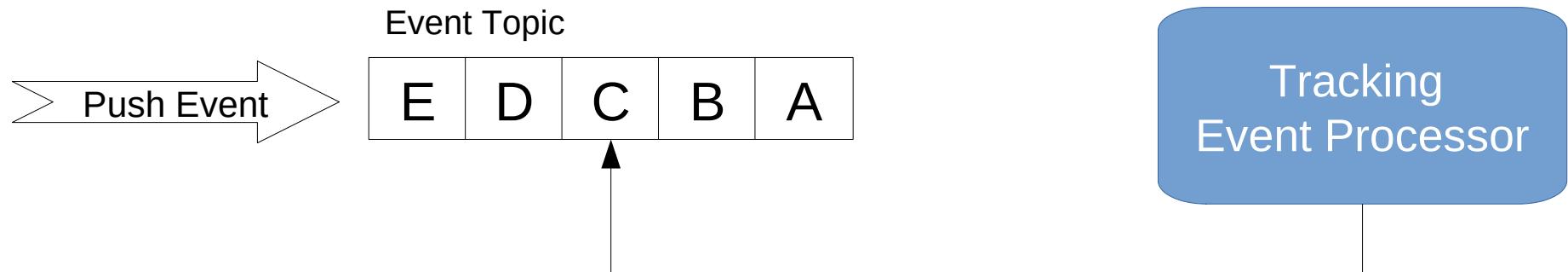
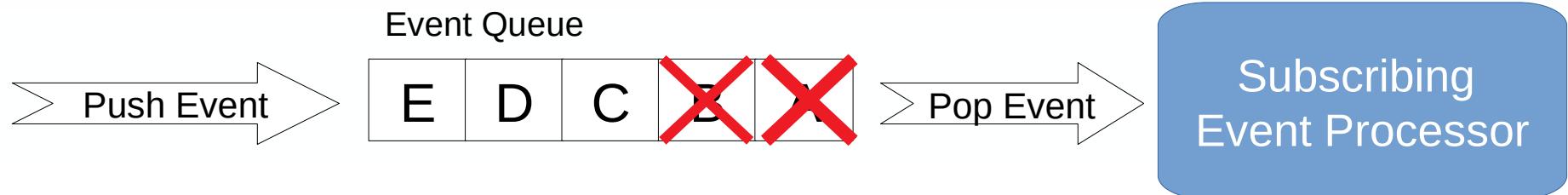
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Event Processors & Replay





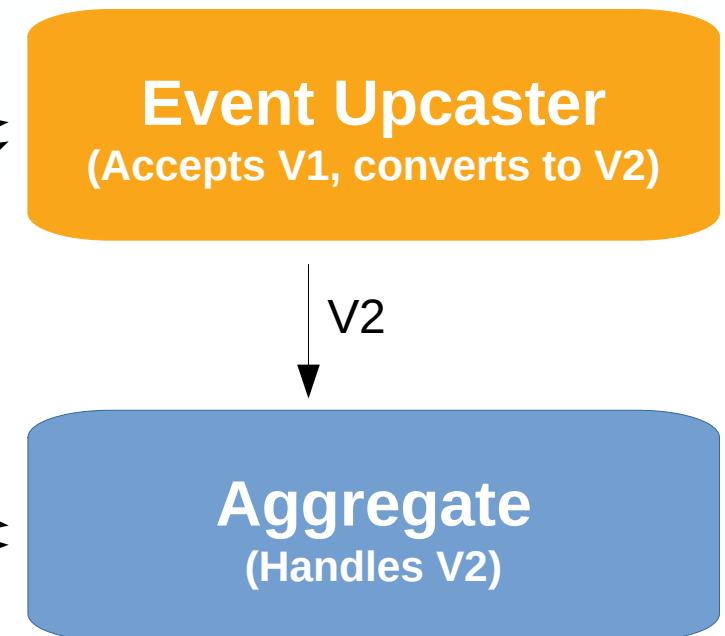
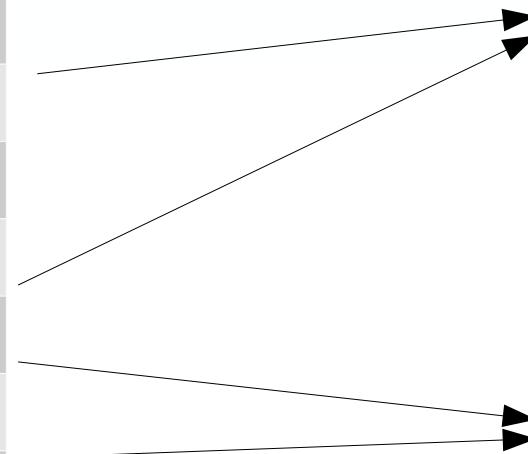
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Event Revisions

Event Store

Account Created
Account Activated
Money Deposited - V1
Money Withdrawn
...
Money Deposited - V1
Money Deposited - V2
Money Deposited - V2



Summary

