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A visual introduction to Event Sourcing and CQRS

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A couple of concepts from DDD

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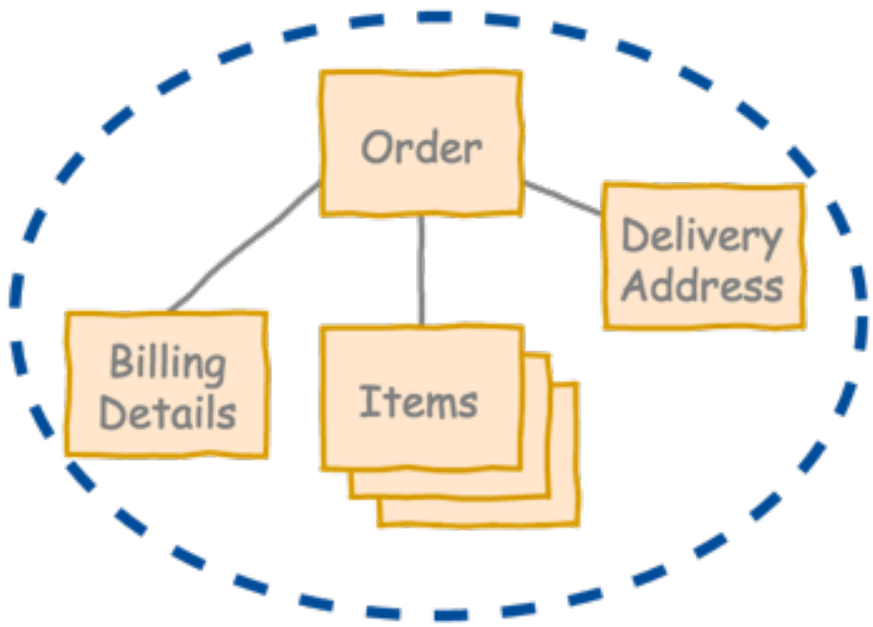
Aggregate



(Current) State of the Aggregate

Once upon a time…

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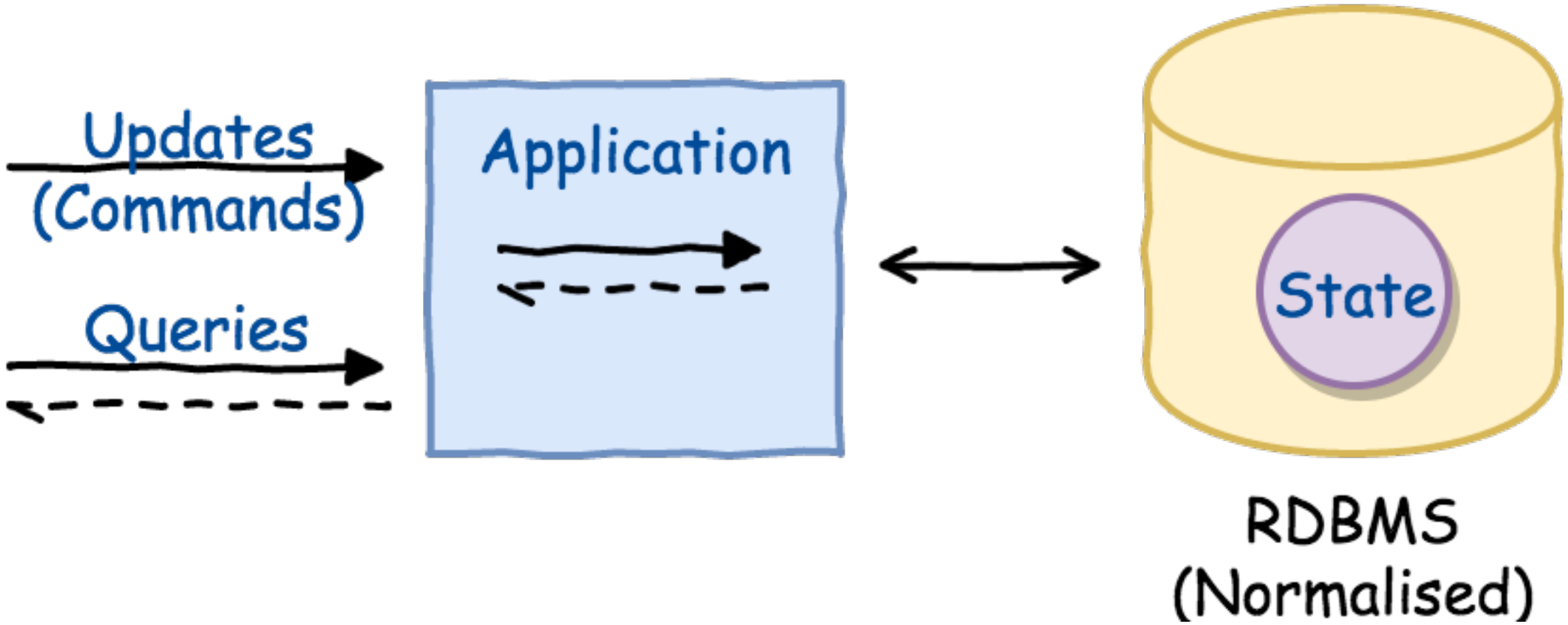
Everything
is synchronous



Request - Response

Scaling up…

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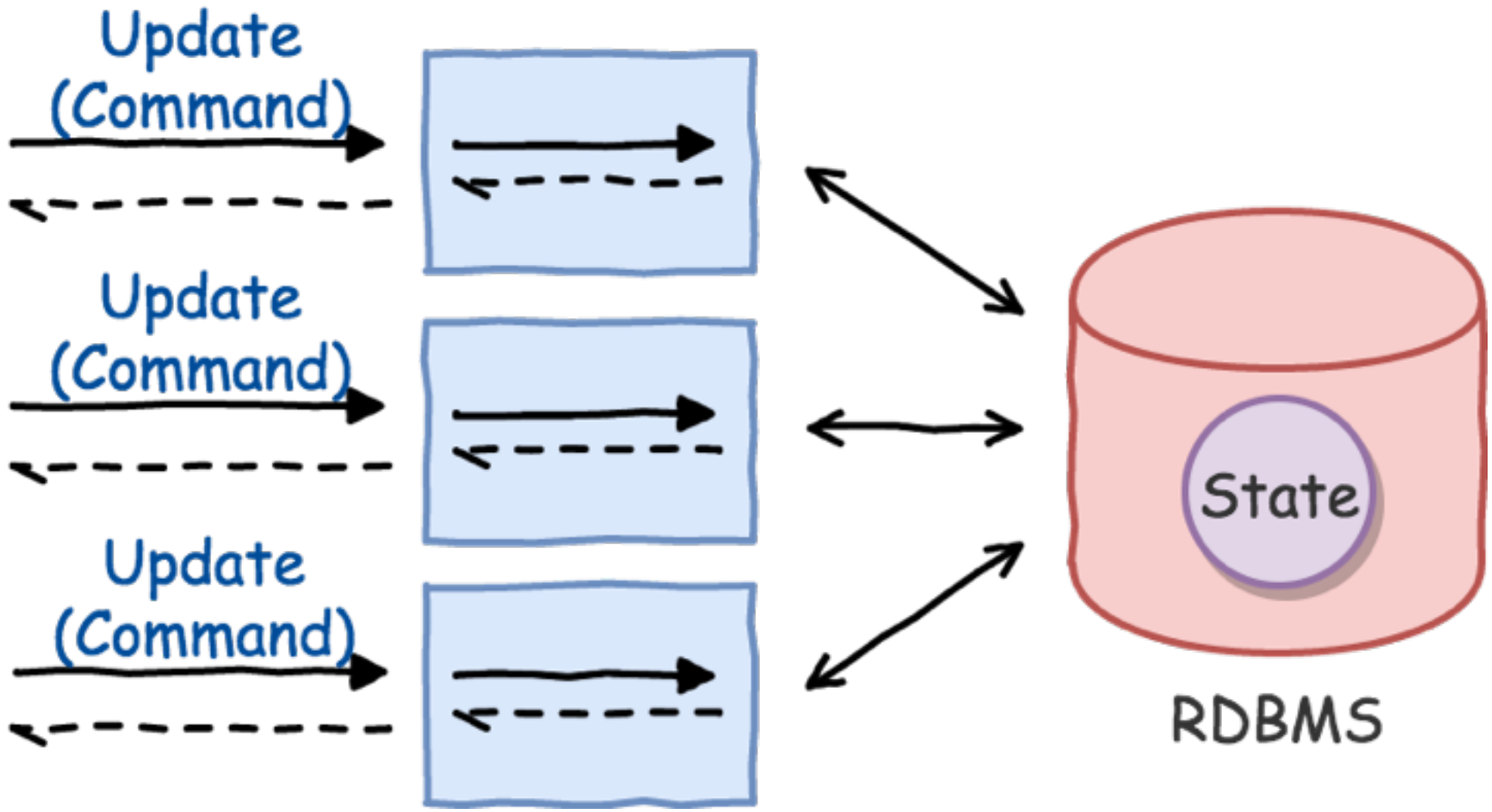

Updates -> Locks -> Contention!

<- Block <-

Let's go Asynchronous

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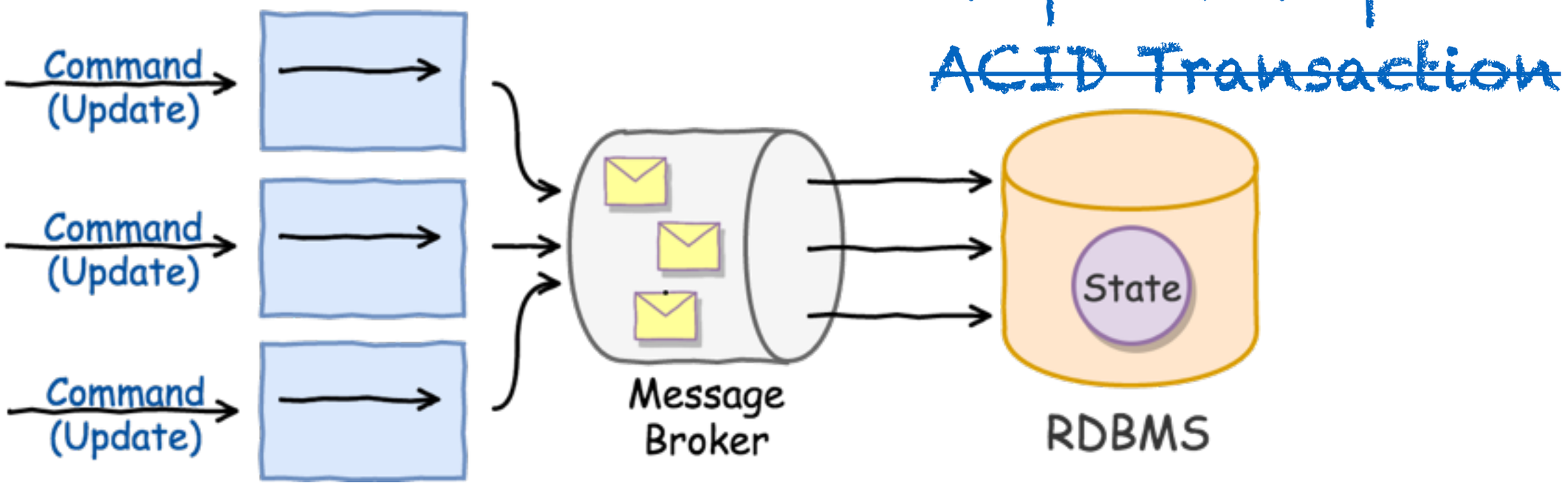
Asynchronous, Message-driven

~~Request/Response~~

~~ACID Transaction~~



Distributed, Message-based

-> No order guaranteed

Pwd -> "secret" ===> Pwd -> "secret"

Pwd -> "12345" Out of Pwd -> "54321"

Pwd -> "54321" Order Pwd -> "12345"

Command Sourcing

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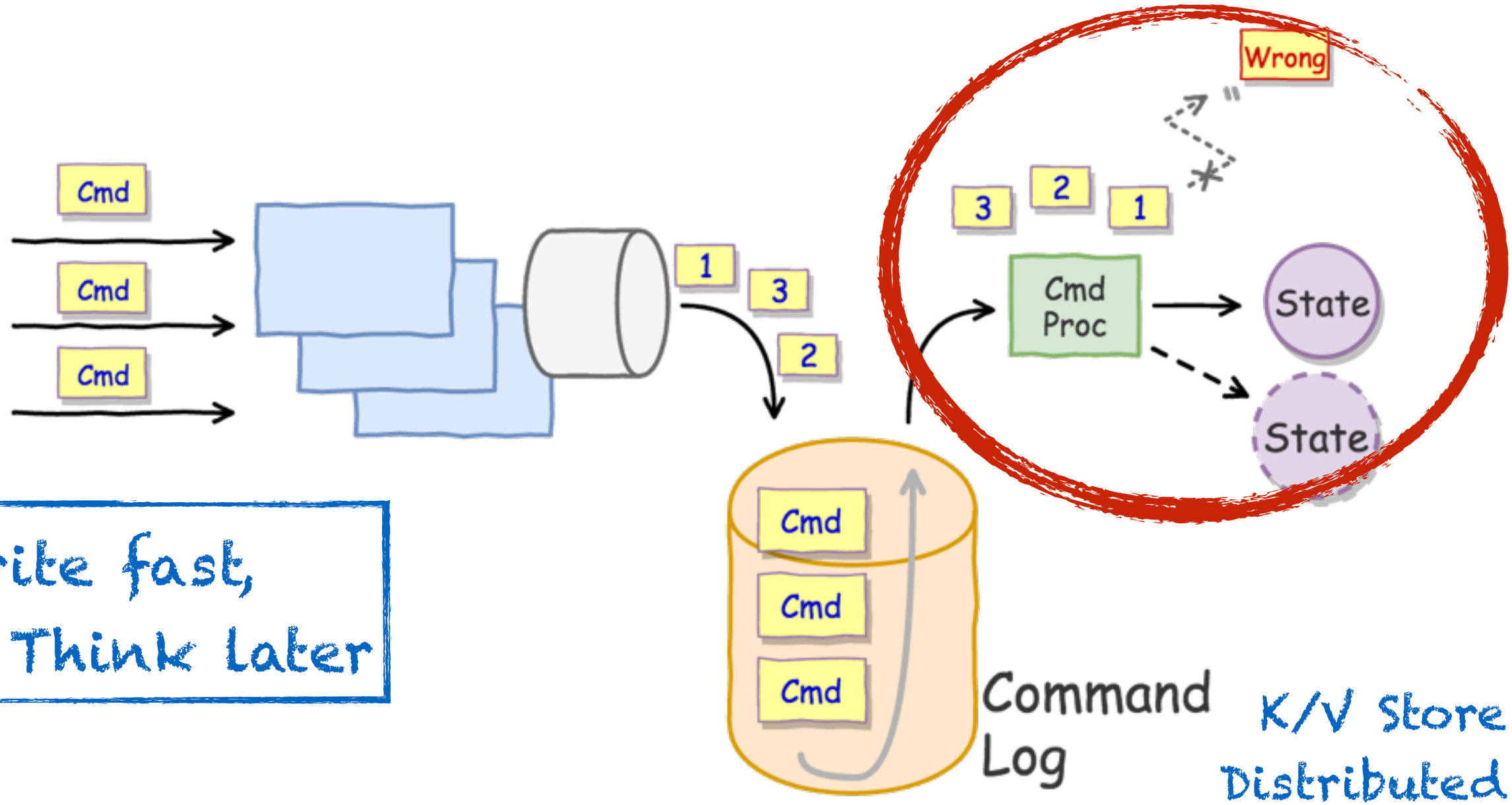

Write fast,
Think later

K/V Store
Distributed

- Append Only -> No Contention
- Build State from Command history

Commands vs Events

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Command

"Submit Order!"

-> A request (imperative sentence)

-> May fail

-> May affect multiple Aggregates

~~Rebuild Aggregate State from Commands~~

Event

"Order submitted"

-> Statement of facts (past tense)

-> Never fails

-> May affect a single Aggregate

Rebuild Aggregate State from Events

Commands to Events

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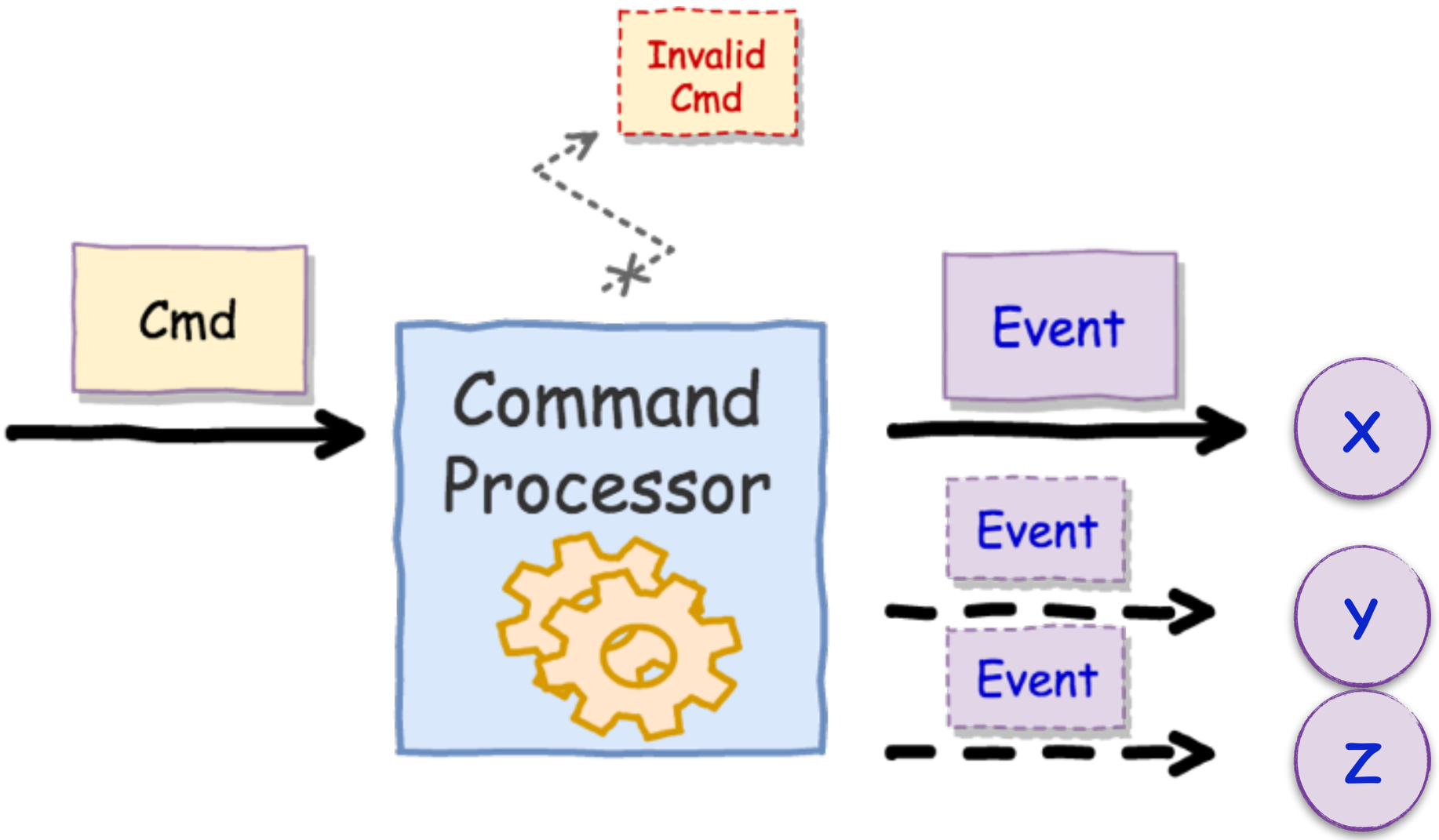

(DDD patterns: Aggregate / Process Manager)

Command > Event Sourcing

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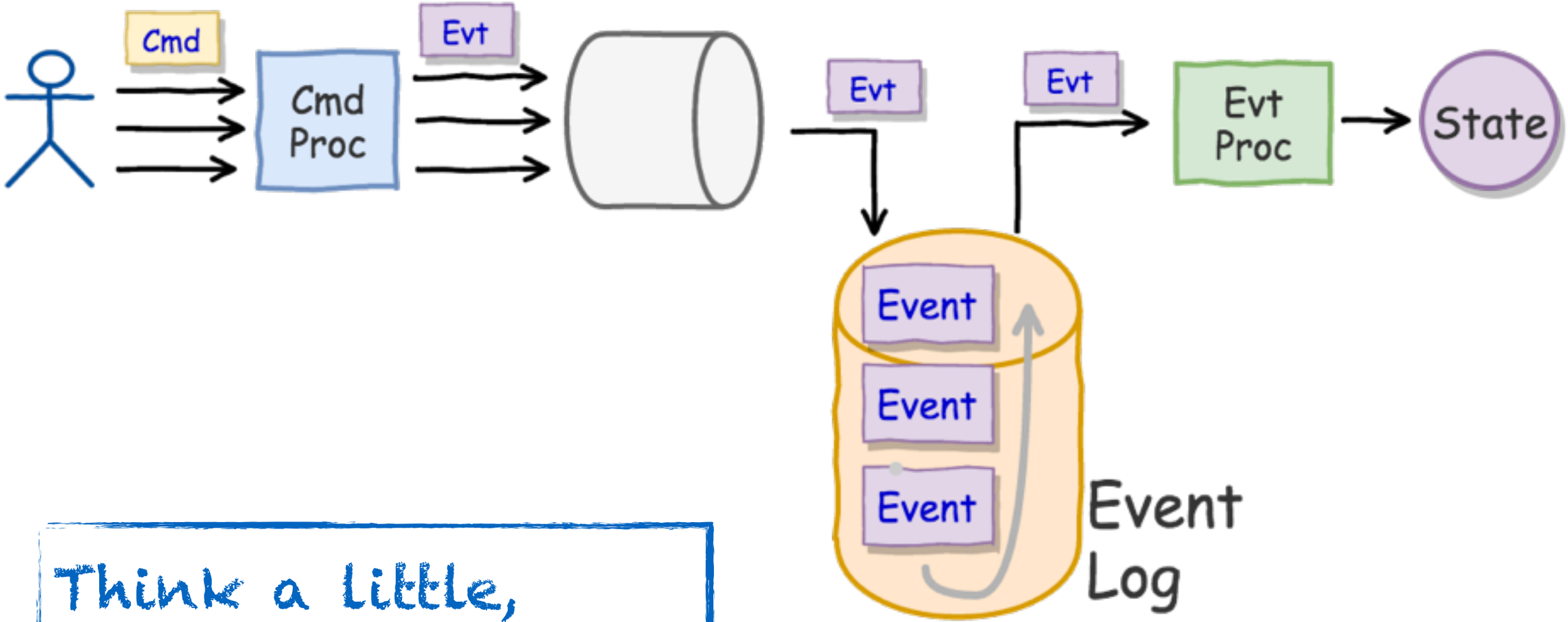

Think a little,
Write,
Think later

Event Sourcing

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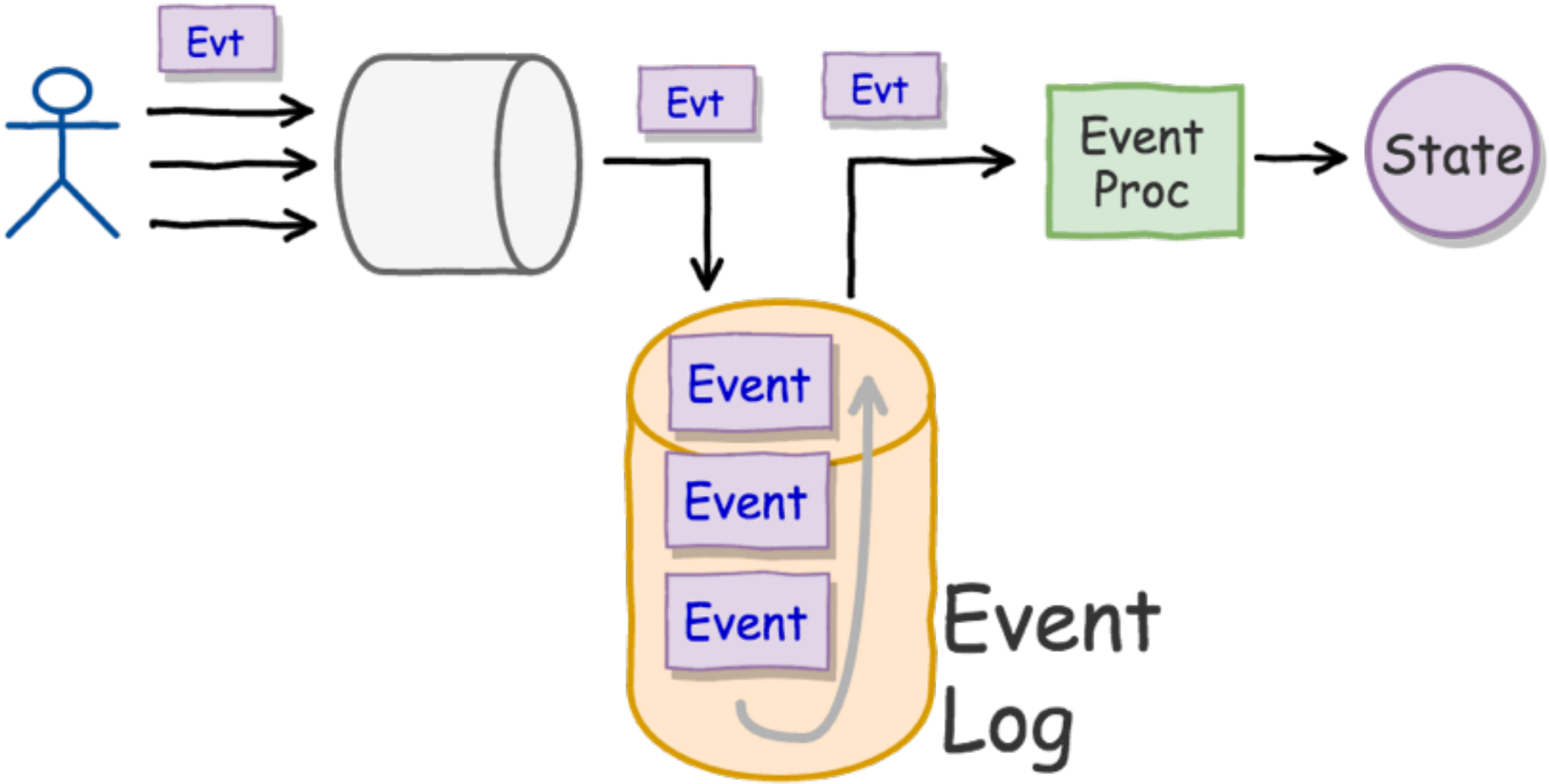

In many domains

Commands ≃ Events

Additional Benefits

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Easy
Eventual Business Consistency

-> Corrective Events

Robust to data corruption

(bugs, fat fingers...)

-> Rebuild state ignoring wrong events

Additional Benefits

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History
(for free)

Rebuild State
at a point in Time

Main Benefit

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Scalable

-> Append only

-> Fits distributed k/v stores

-> Low-latency writes

-> Allows asynchronous processing

What about reads?

Retrieving the State

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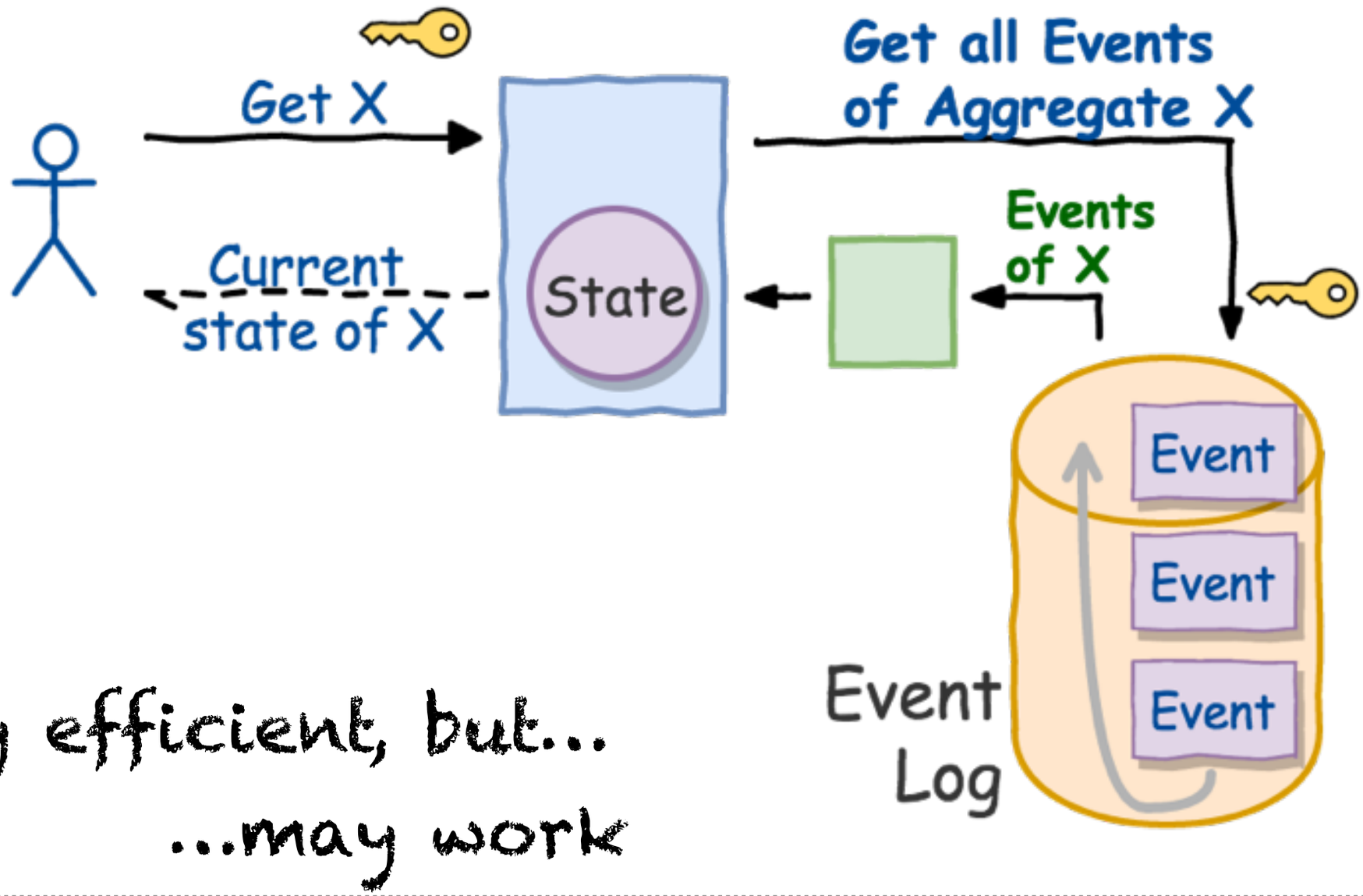
How do I retrieve the State?

"Get details of Order 'AB123'"



not very efficient, but...

...may work

Querying (Searching) the State

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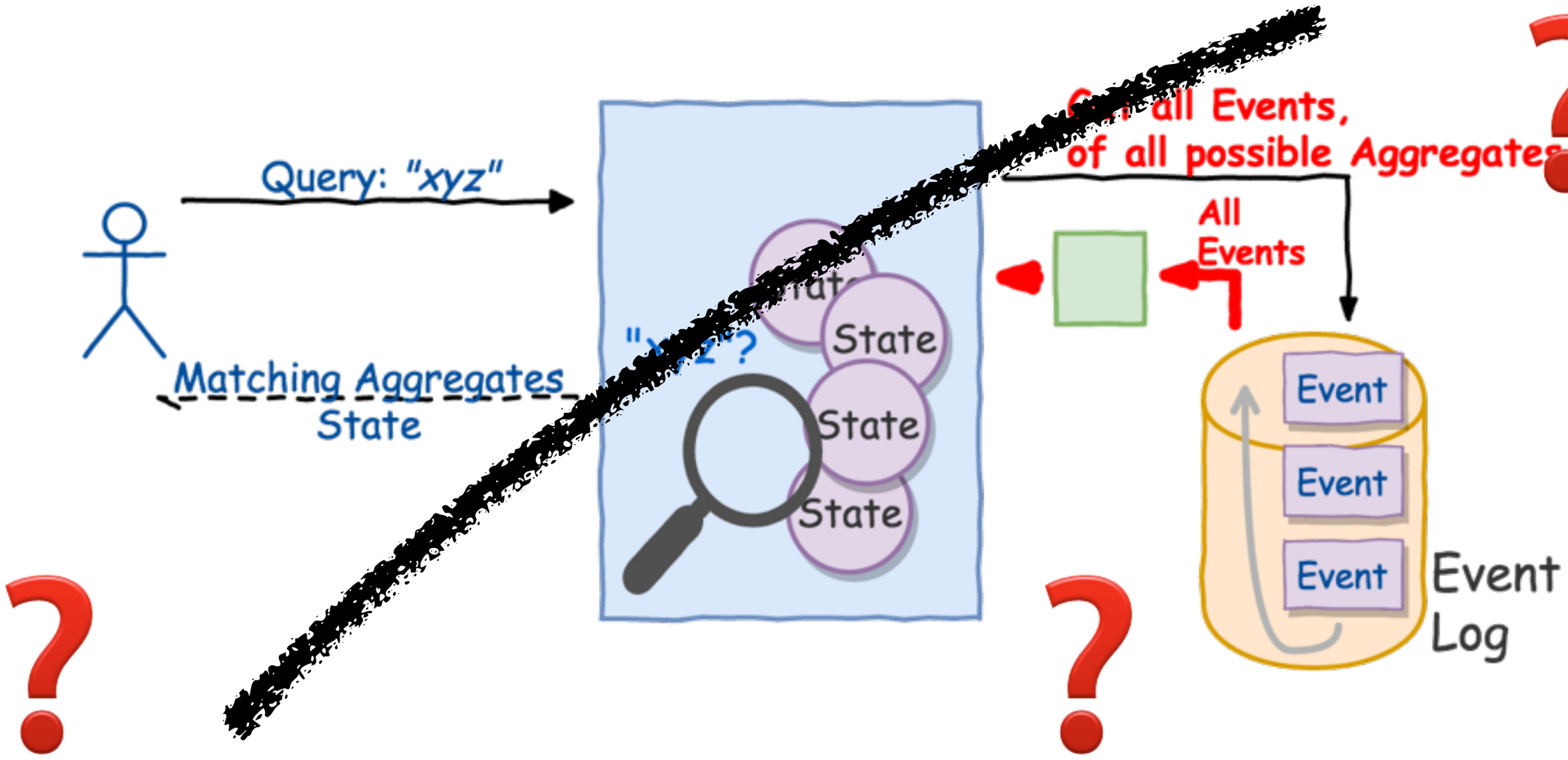
How do query the State?

"Get all Orders delivered to 'SE1 0NZ'"



CQRS

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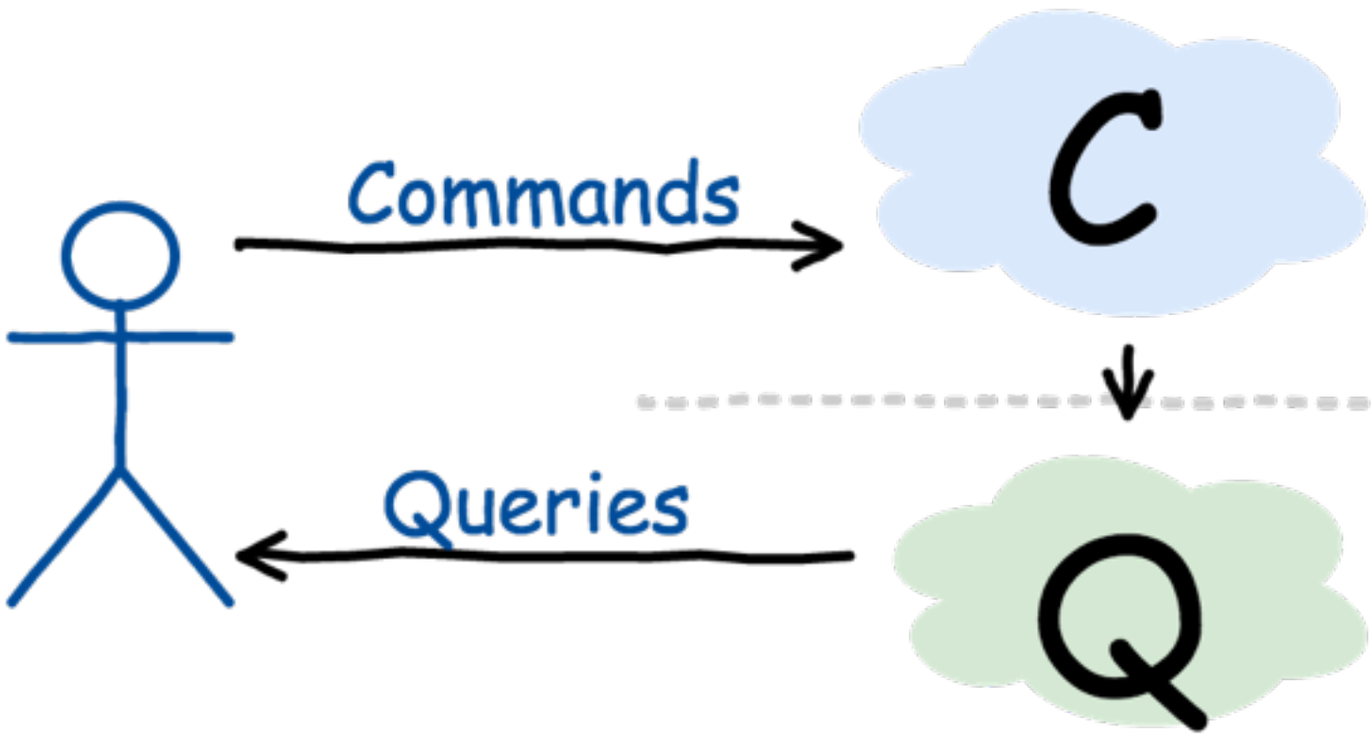

Separate
- Code
- muService
- Datastore

Command -> Update
Query —> Retrieve
Responsibility
Segregation

"Query" datastore is downstream

Not a new idea

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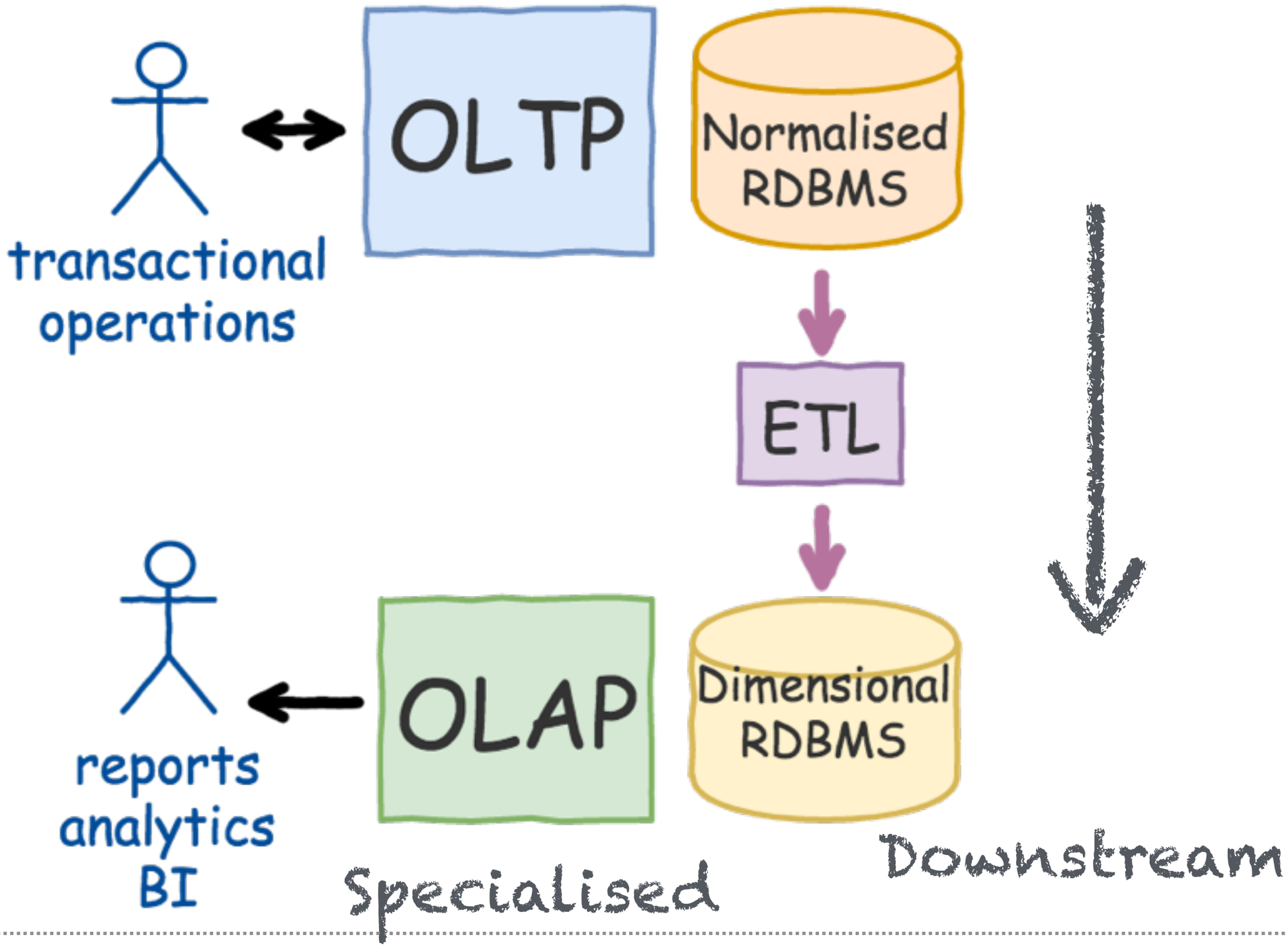

CQRS and Event Sourcing

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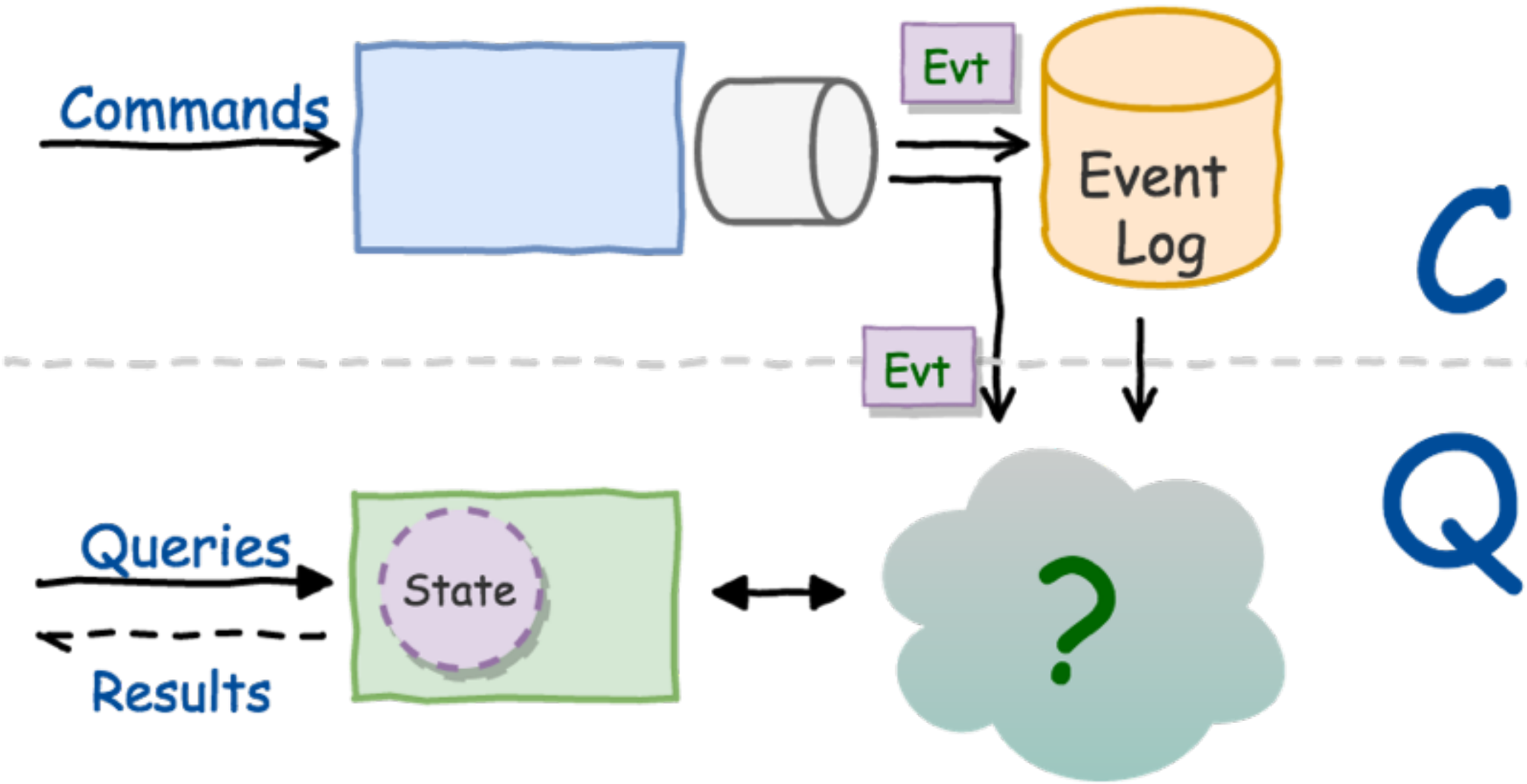

Materialised Views (of current State)

Materialised Views (of State)

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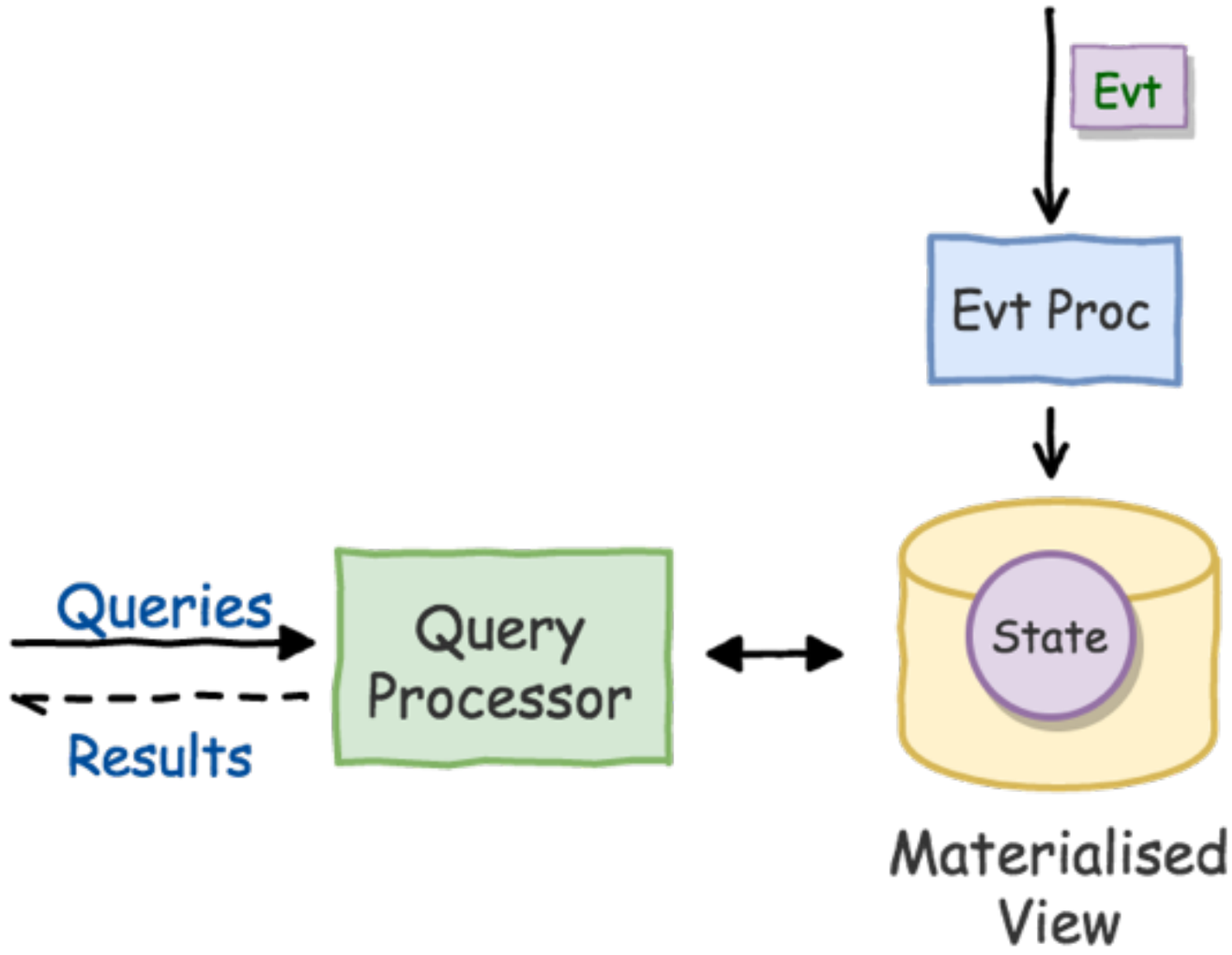

In Memory
K/V Store
Graph
...
RDBMS

(Persistent)
Rebuildable
from Events

Latest (known) State

Delayed

Materialised View of State

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Query a RDBMS?!?

Wasn't it the old way?

RDBMS is just one of our options:

easy to use, easily become a bottleneck

Materialised Views of State

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* Views are optimised for
  specific query use cases
  -> multiple Views from same Events

* Updated asynchronously, delayed
  -> to scale
  -> may reorder Events

Materialised Views of State

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* Easy to evolve or fix

  -> change or fix logic;
     rebuild view from events

Event Log
is our Source of Truth

(not the View)

* Views can be rebuilt from Events

Indexes

Indexes

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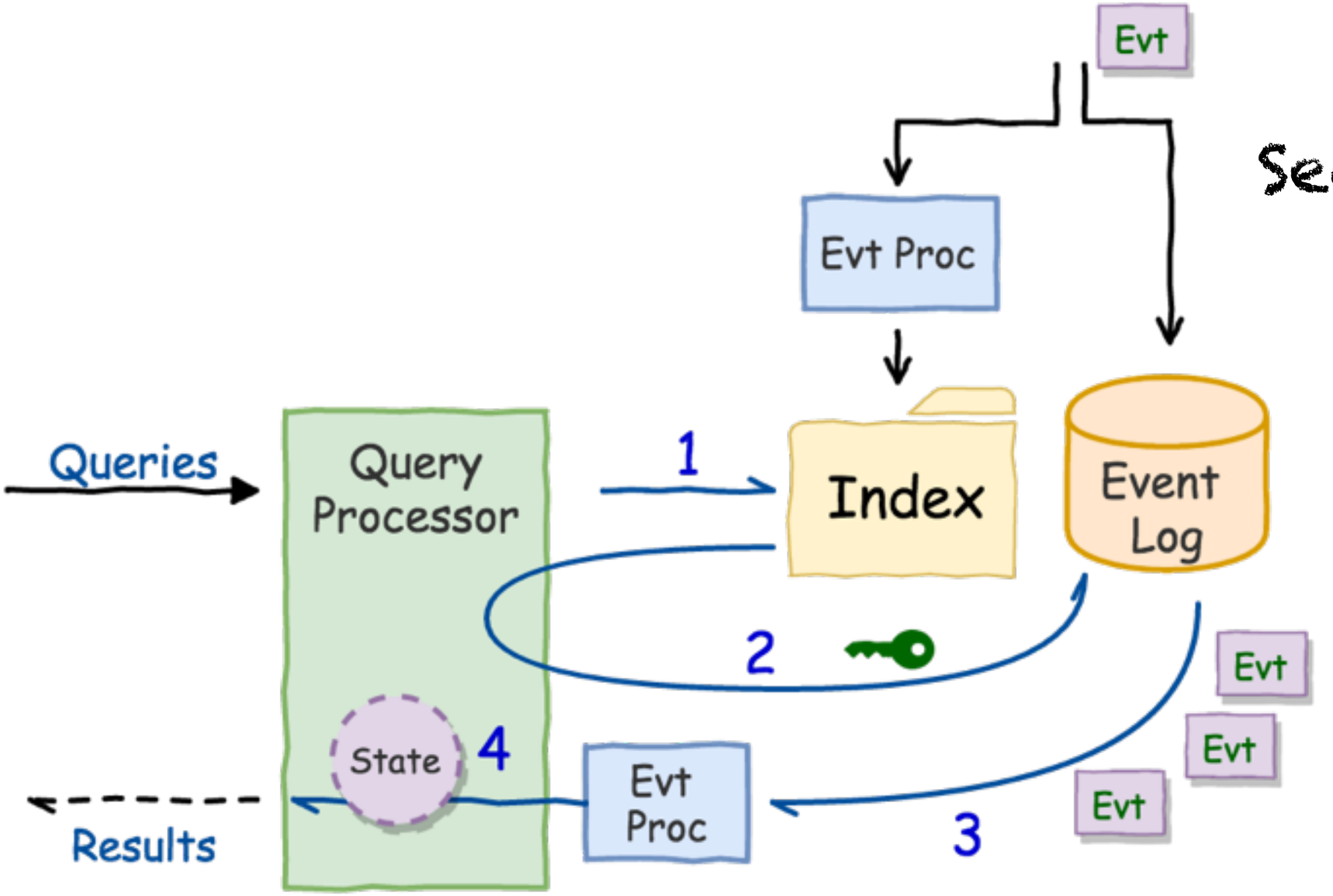

- Optimised for querying (less for retrieving)
- Latest State; rebuild on the fly

Hybrid solutions

Hybrid solutions: e.g. Snapshots

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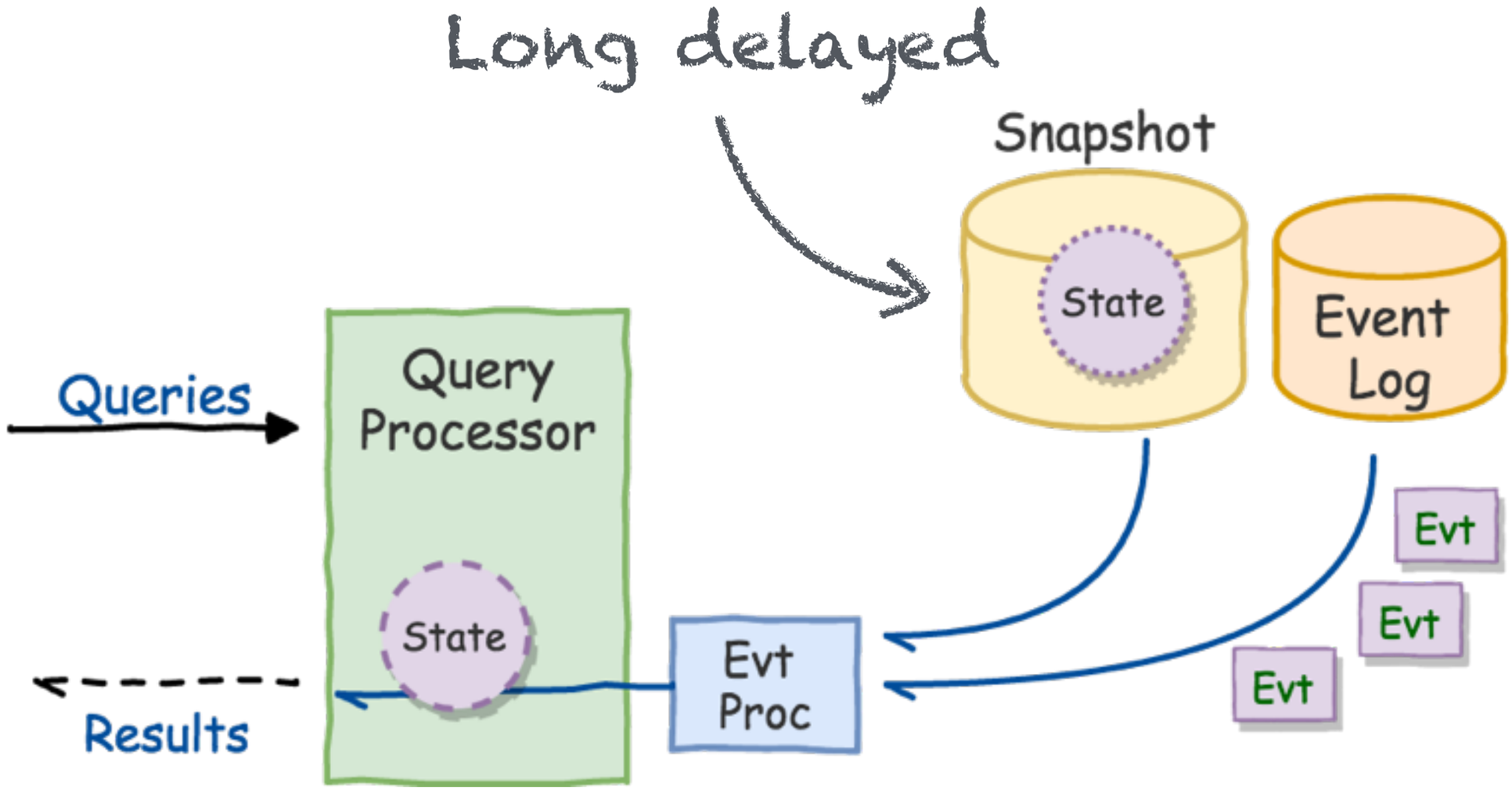
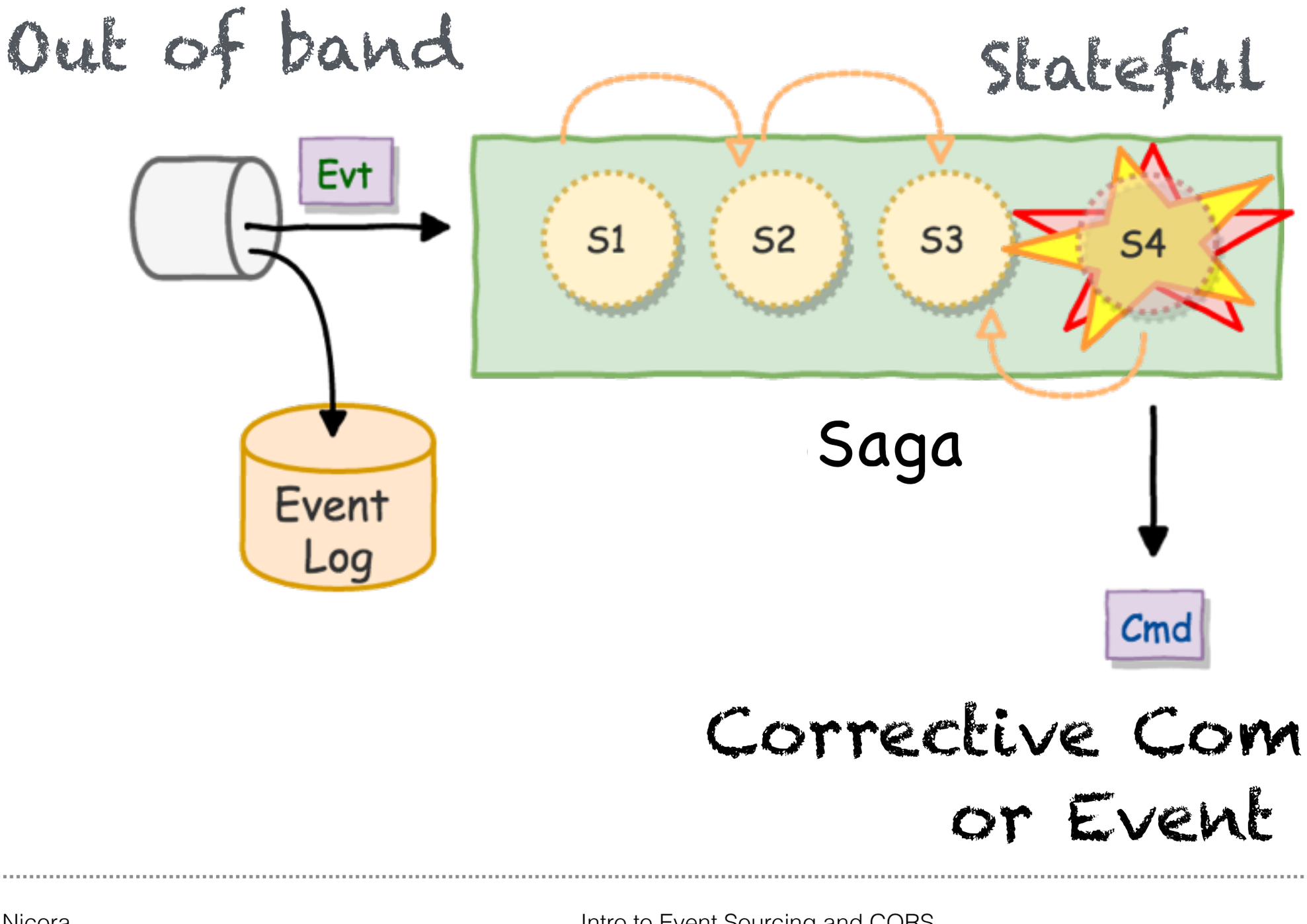


- Speed up rebuilding the current State
- Use recent Events to rebuild up-to-date

Eventual (Business) Consistency

Guess -> Apologies -> Compensate

Eventual Consistency: Sagas



Lesson from the Trenches

Lesson Learned #1

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If you put data in...

...you will eventually have to get them out!

The "Query" side is not secondary

Lessons Learned #2

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In old days:

normalising one DB

to support as many queries as possible

With CQRS:

multiple denormalised "data stores"

optimised for different queries

No single "Q" implementation

for all your queries

Lessons Learned #3

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A central, shared Event Store
may not be the best option

No Event-sourced Monolith

Prefer persistence
per Bounded-Context

+++ Summing up +++

ES/CQRS Optimal Use Cases

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Event Sourcing + CQRS

High Volume

Low Latency writes

(big data)

Out-of-order Commands/Events

(IoT)

ES/CQRS Drawbacks

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x No "One-Size-Fits-ALL"

-> Multiple "Q" implementations

x Delayed reads

x No ACID Transactions

x Additional complexity (!)

ES/CQRS Benefits

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+ No "One-Size-Fits-ALL"

  -> "Q" are optimised for use cases

+ Eventual (Business) Consistency

+ History, Temporal queries

+ Robust to data corruption

That's all, Folks!

??? Questions ???

Thanks.