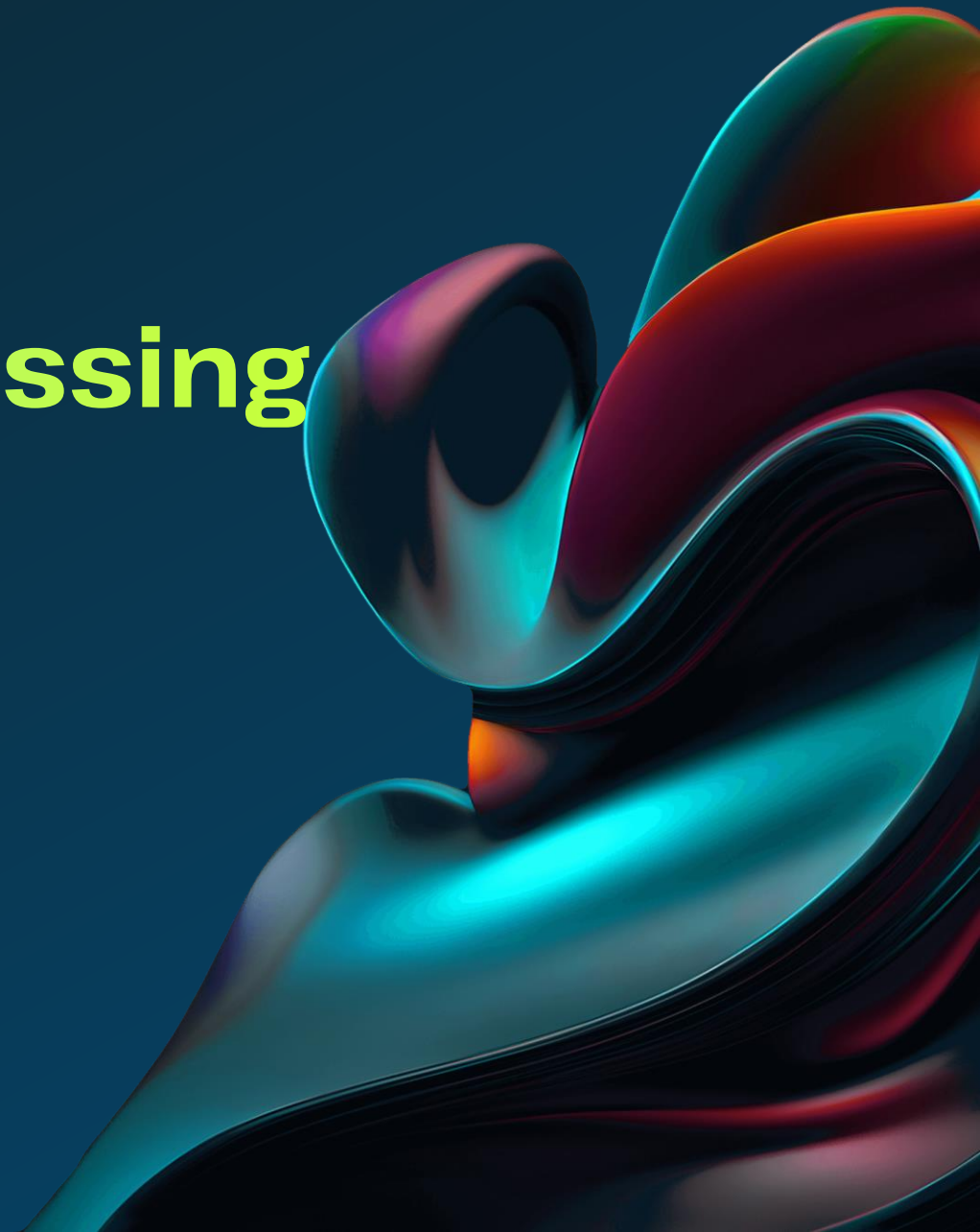
HAZELCAST

Real-time Stream Processing without Migraines



Fawaz Ghali, PhD
Principal Data Science Architect
Head of Developer Relations
@fawazghali

Scan me to win $100

Check In

Data != Context

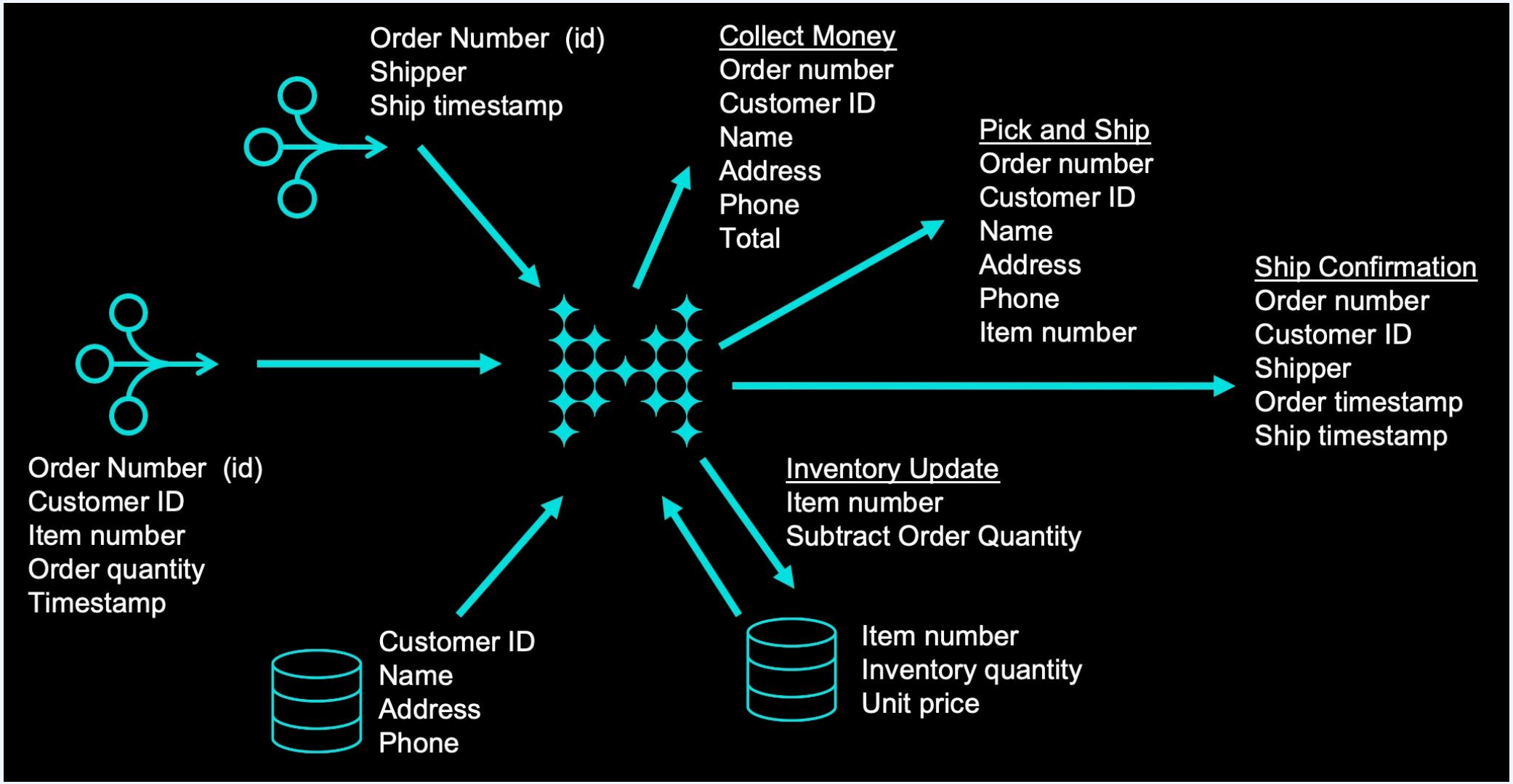
Time Decay

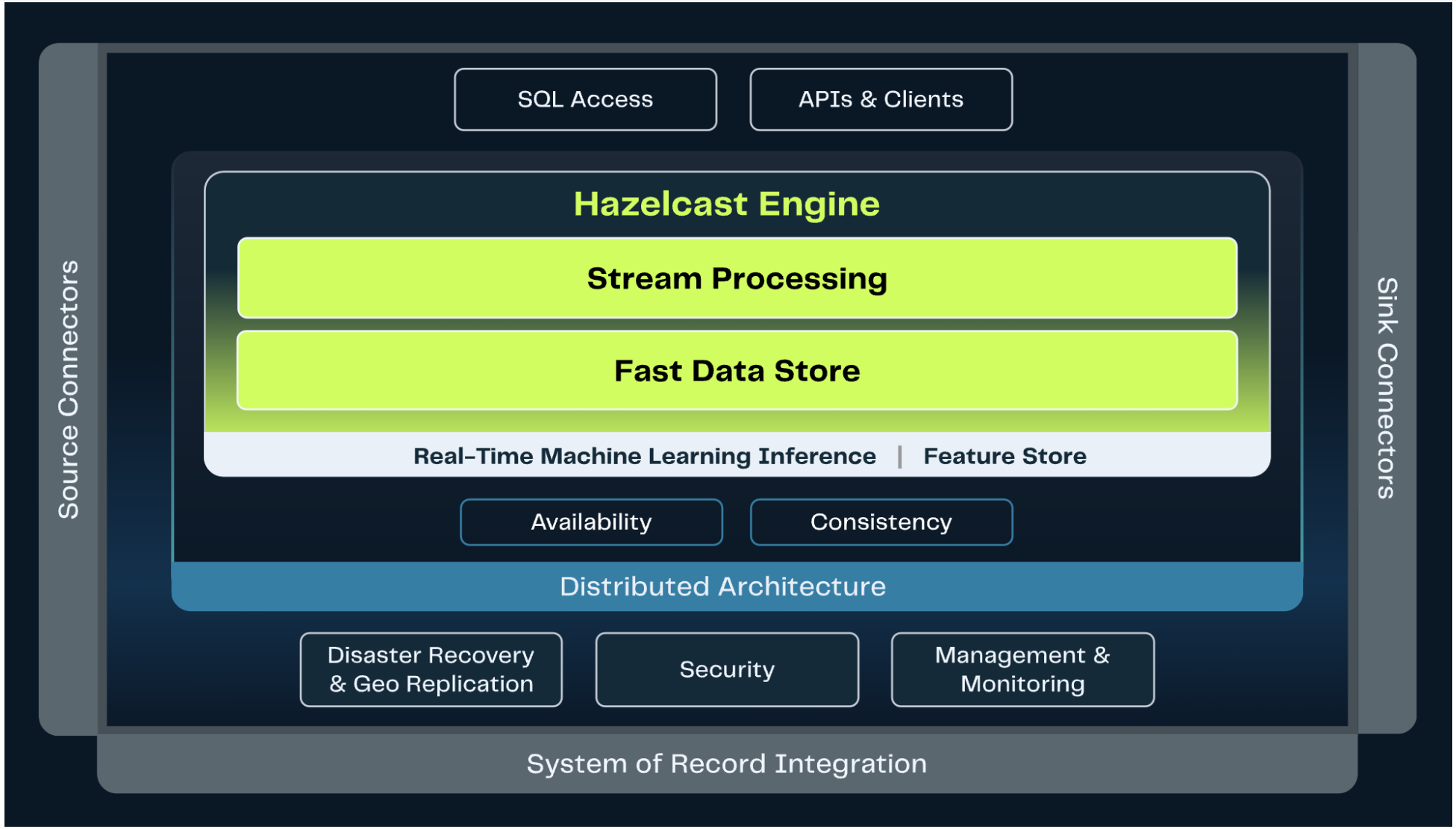
The longer you wait...

The less value the information has

How fast is too fast?

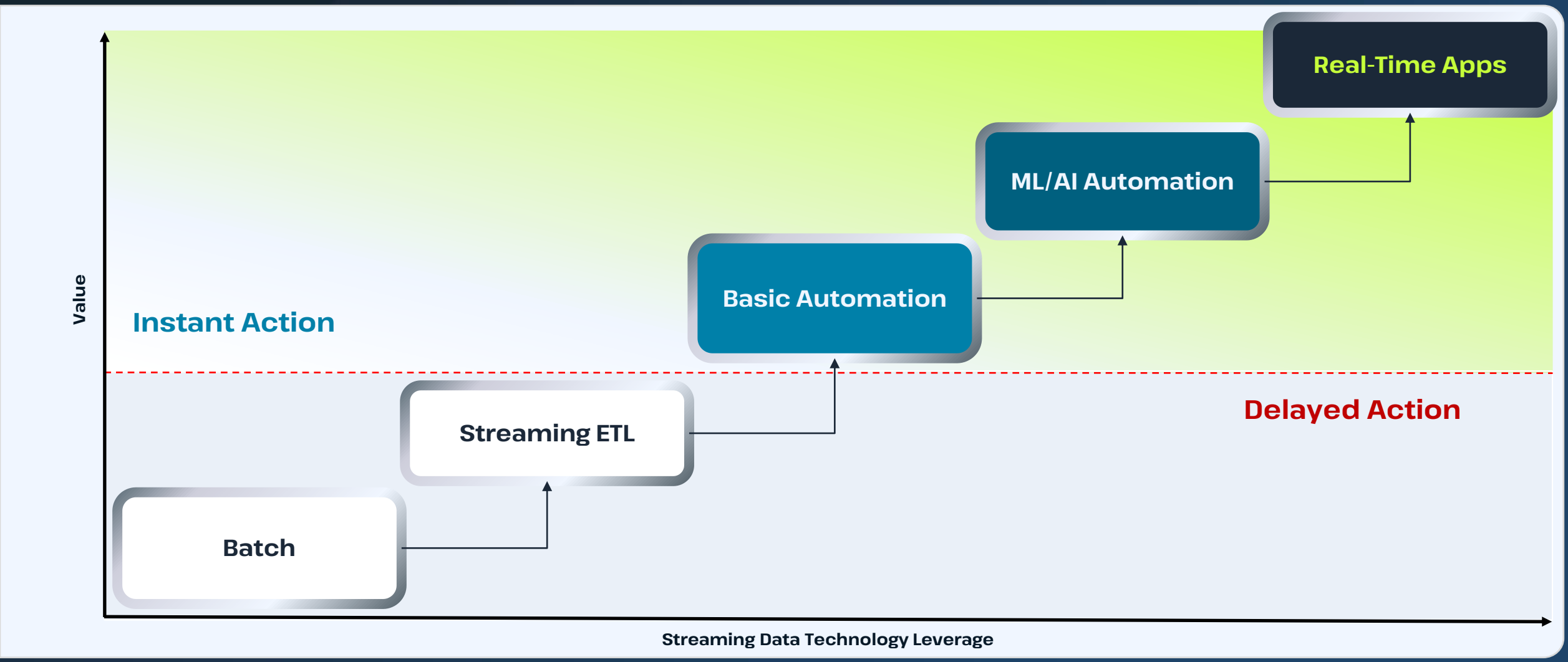
Let's build a stream-processing app!




SQL Access
APIs & Clients
Hazelcast Engine
Stream Processing
Fast Data Store
Real-Time Machine Learning Inference | Feature Store
Availability
Consistency
Distributed Architecture
Disaster Recovery & Geo Replication
Security
Management & Monitoring
Source Connectors
Sink Connectors
System of Record Integration

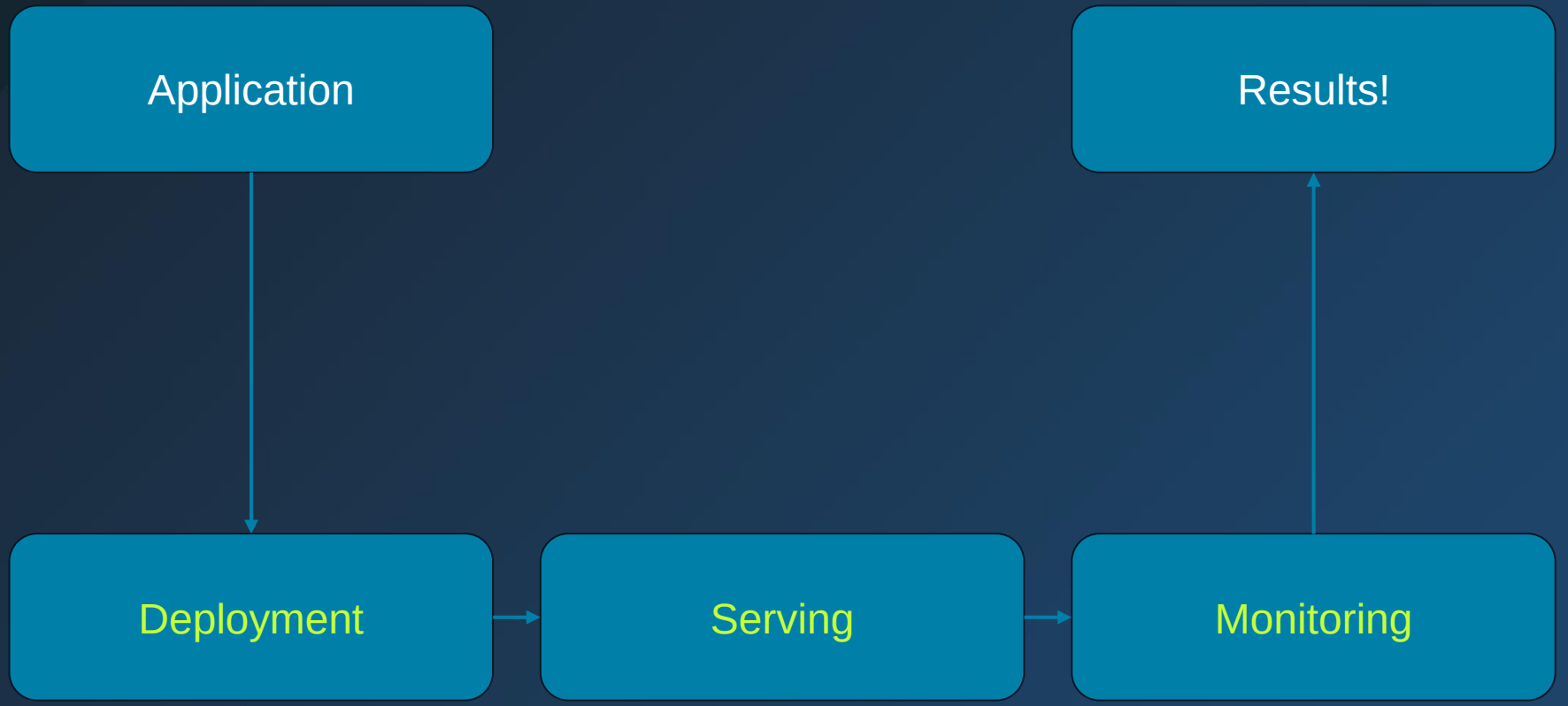
Real time is:

- **While** a customer is banking
- **When** a customer is shopping
- **During** a fraudulent event
- **Before** a process breaks
- **While** travelers are enroute


Real-Time Apps
ML/AI Automation
Basic Automation
Streaming ETL
Batch
Instant Action
Delayed Action
Value
Streaming Data Technology Leverage

I have the **perfect** application

But...


Application
Results!
Deployment
Serving
Monitoring

Where is my data?

- Data is deserialized/serialized in many places:
  - Data is written
  - Data is read
  - Data is replicated to a backup node
  - Data is saved to disk and reloaded
  - Data is rebalanced

How many serializations/ deserializations?

- V = map.put(K,V)
- Option A: 2 serializations and 1 deserialization.
- Option B: 3 serializations and 2 deserialization.

High-Performance Real-time

=

Instant computation on both

new and **historical** data

Microservices:

- Are Easier to Build and Enhance

Microservices:

- Are Easier to Build and Enhance
- Are Easier to Deploy

Microservices:

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- Are Easier to Deploy
- Are Easier to Maintain, Troubleshoot, and Extend

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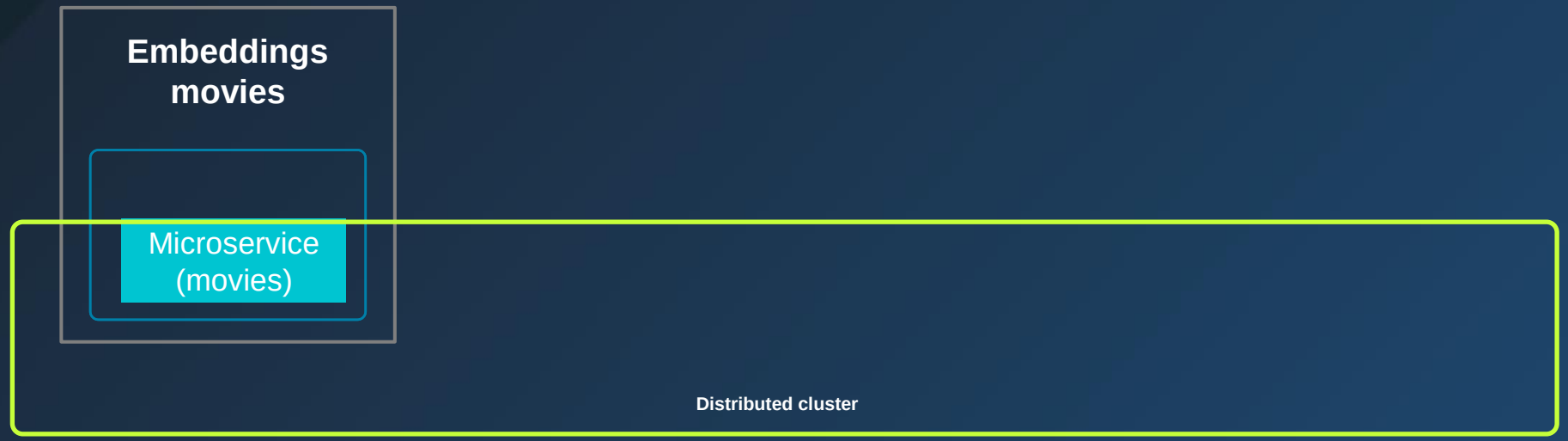
- Are Easier to Maintain, Troubleshoot, and Extend
- Deliver Performance and Scale

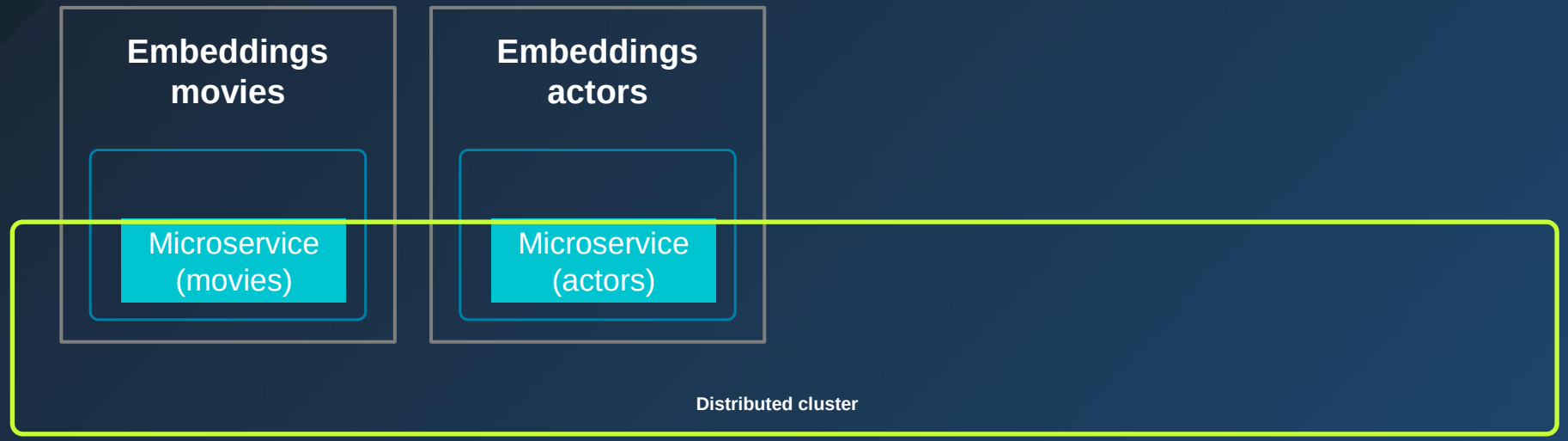
Microservices:

- Are Easier to Build and Enhance
- Are Easier to Deploy
- Are Easier to Maintain, Troubleshoot, and Extend
- Deliver Performance and Scale
- Simplify Real-Time Processing

Microservices Pattern for Similarity Search and Stream Processing



Microservices Pattern for Similarity Search and Stream Processing



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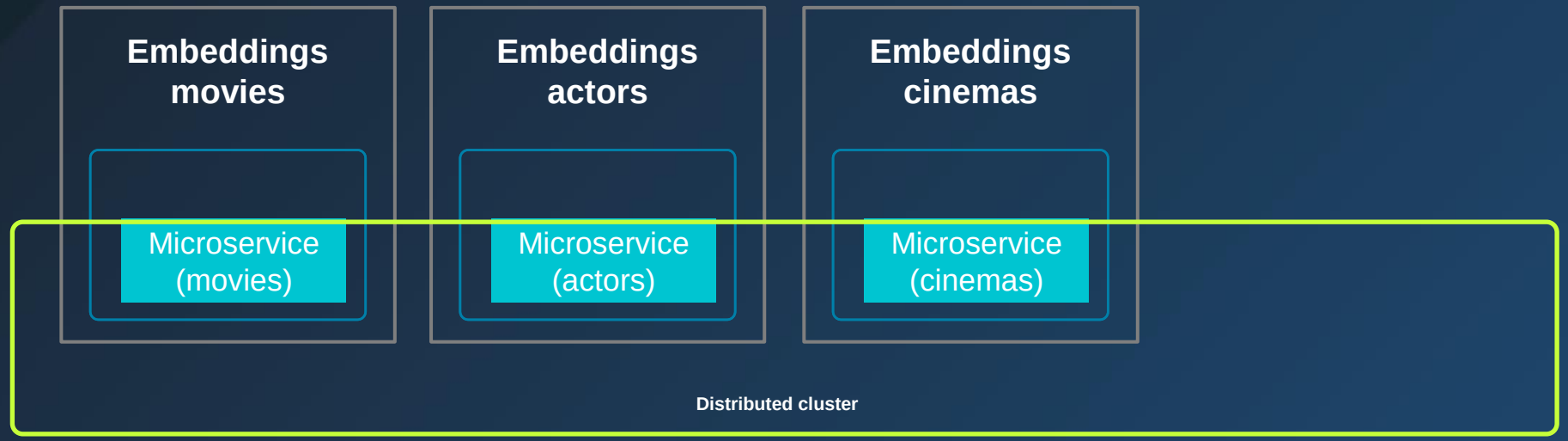

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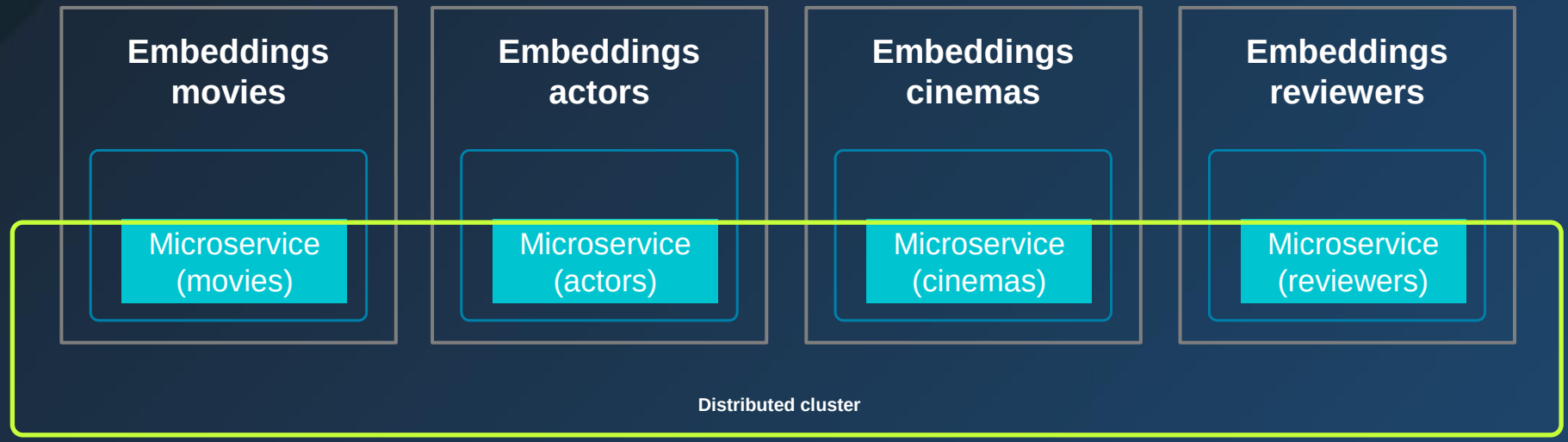

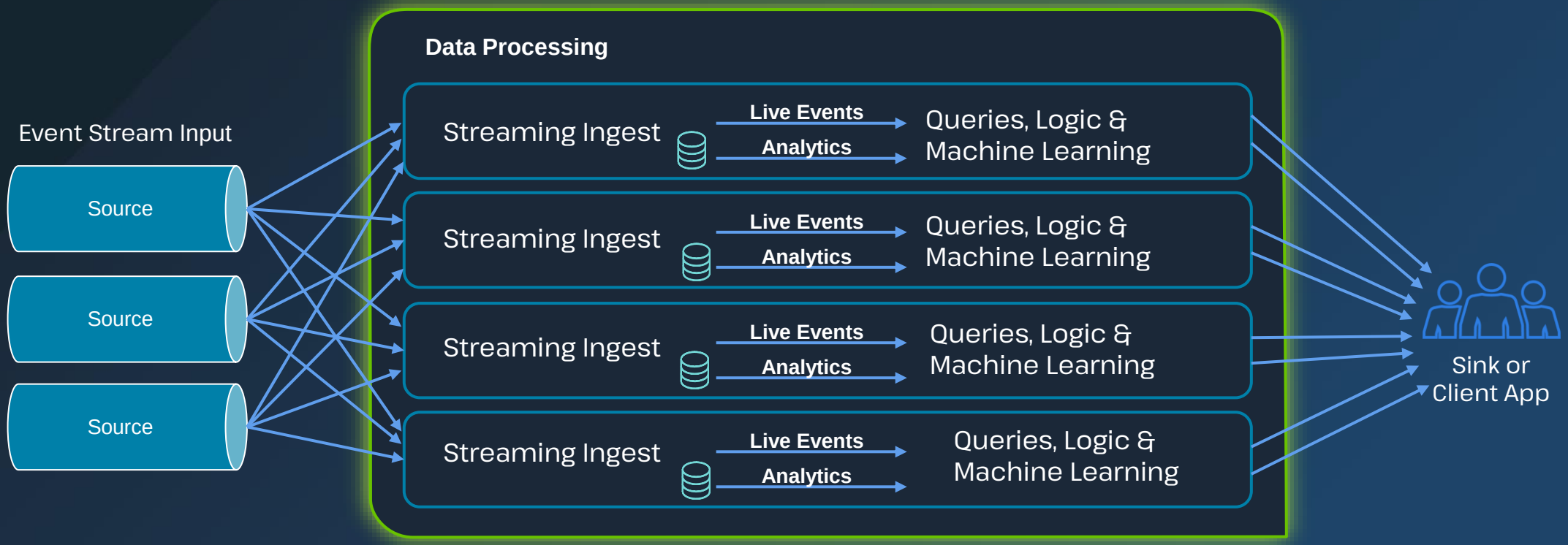
Event Stream Input
Source
Source
Source
Data Processing
Streaming Ingest
Live Events
Analytics
Queries, Logic &
Machine Learning
Streaming Ingest
Live Events
Analytics
Queries, Logic &
Machine Learning
Streaming Ingest
Live Events
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Streaming Ingest
Live Events
Analytics
Queries, Logic &
Machine Learning
Sink or
Client App

Kafka is great for:

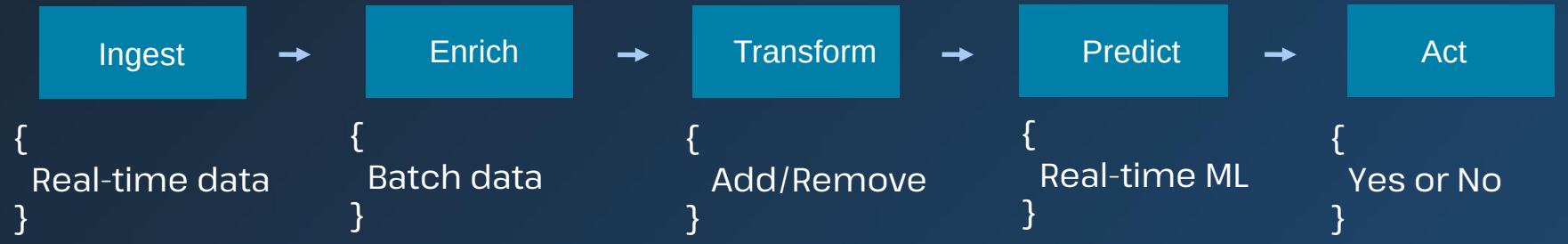
Messaging

Event sourcing

Data pipelines

Time-Based SLA

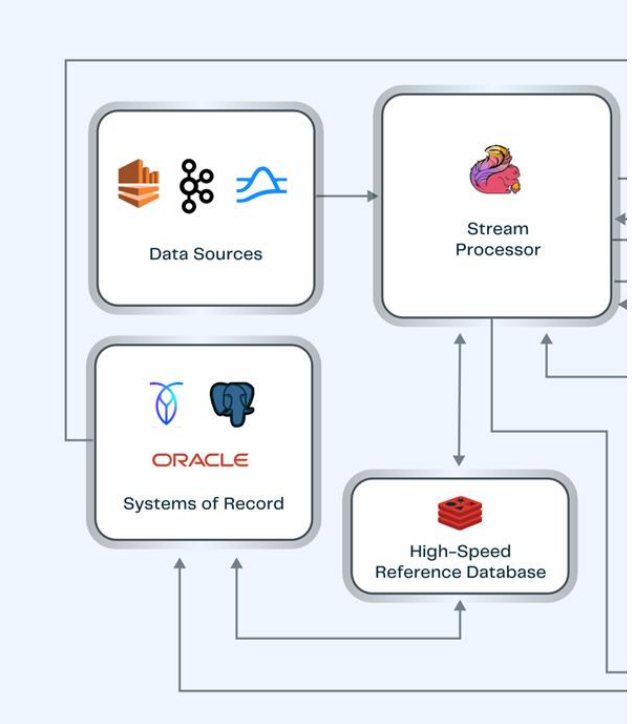
Action - milliseconds **Response**



DIY Approach

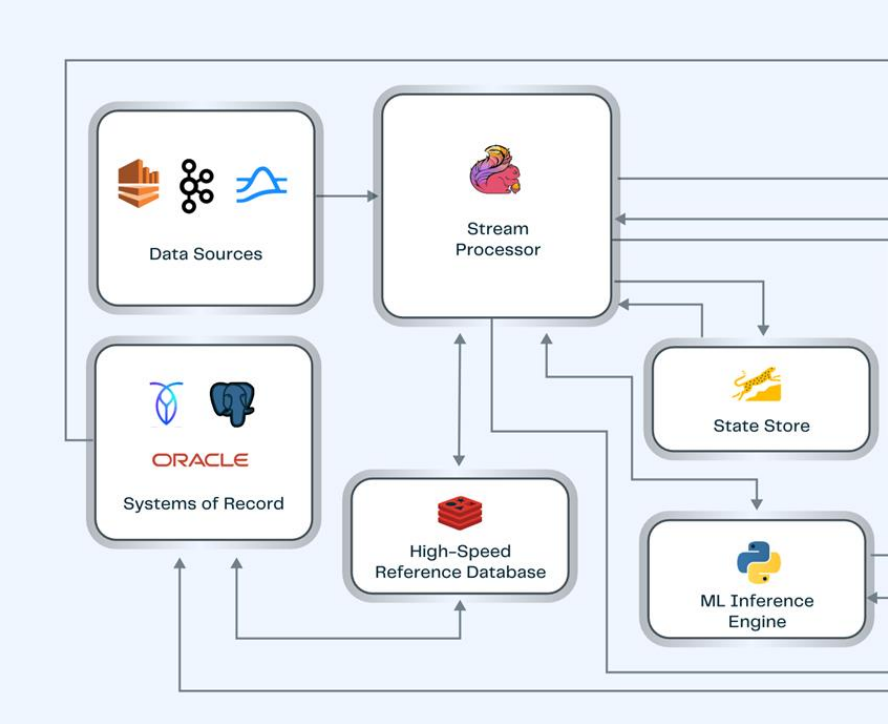
- More integration work

DIY Approach



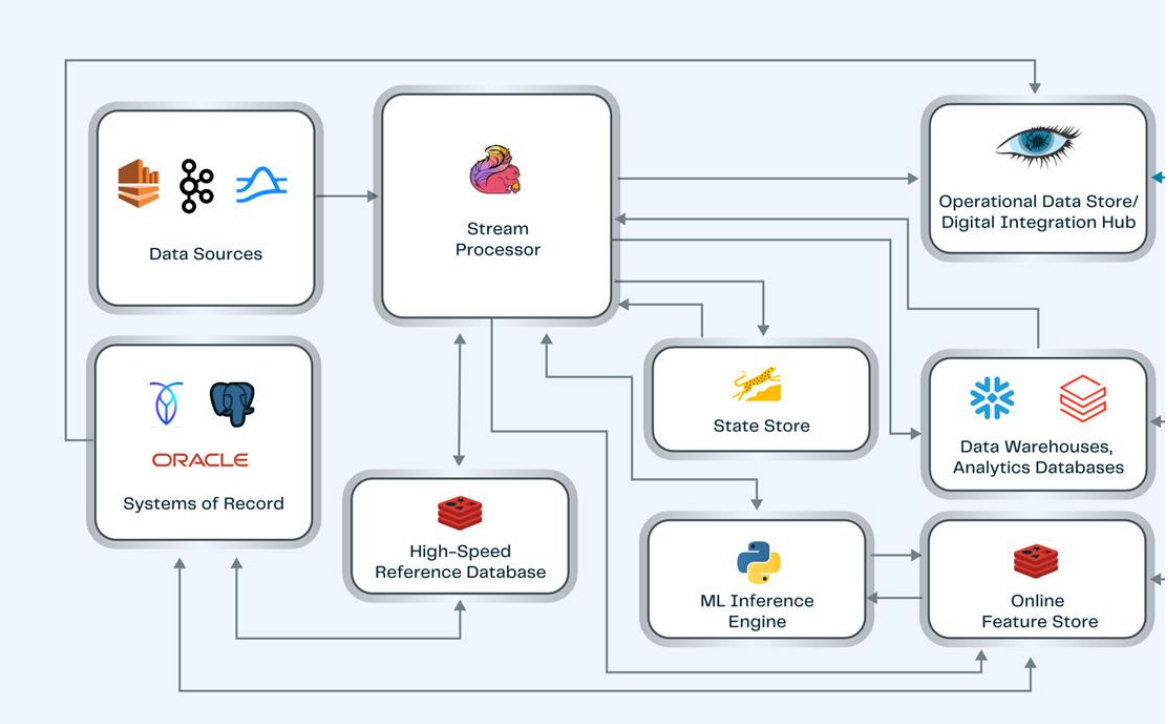
- More integration work
- Higher maintenance

DIY Approach



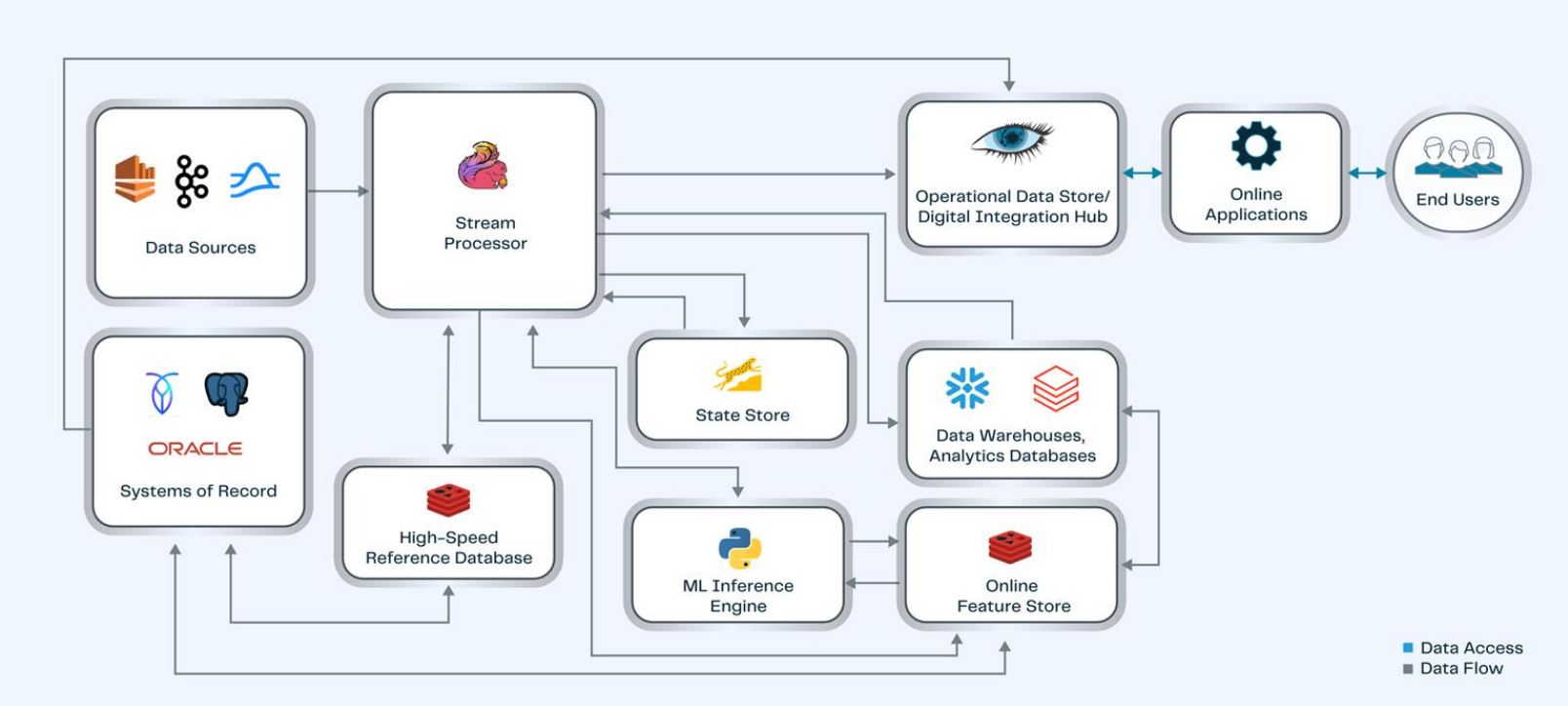
- More integration work
- Higher maintenance
- Higher operational cost

DIY Approach



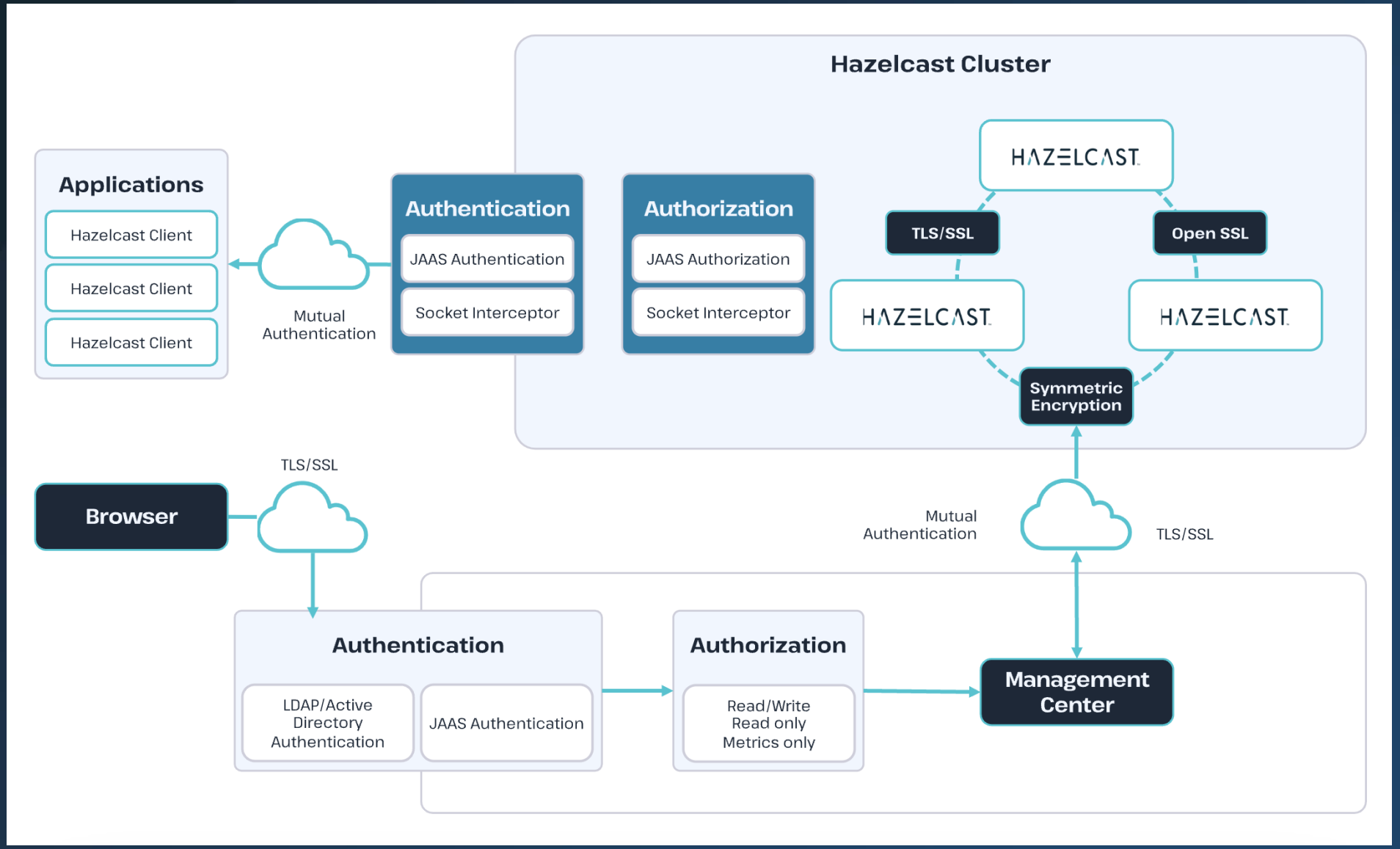
- More integration work
- Higher maintenance
- Higher operational cost
- **Higher Latency**

DIY Approach

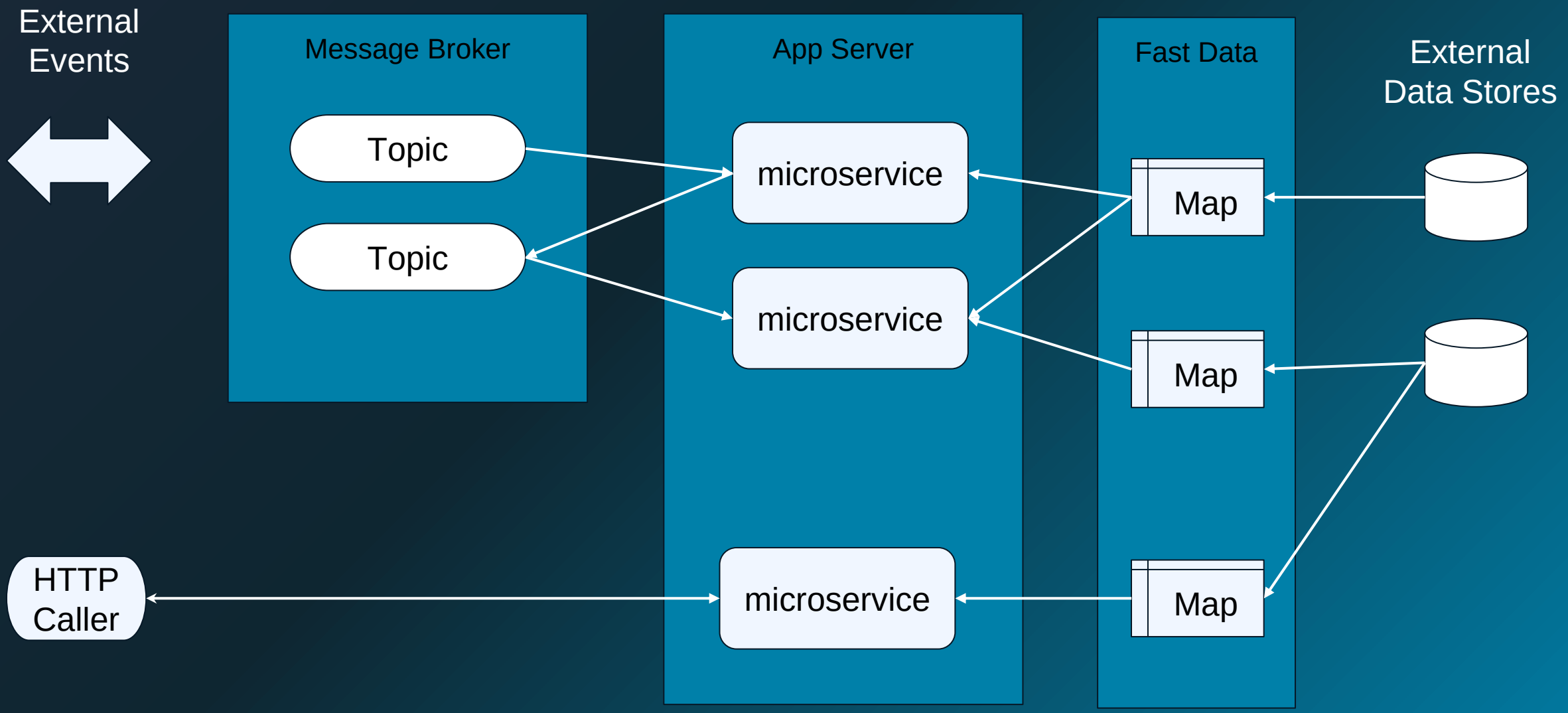


- More integration work
- Higher maintenance
- Higher operational cost
- **Higher Latency**

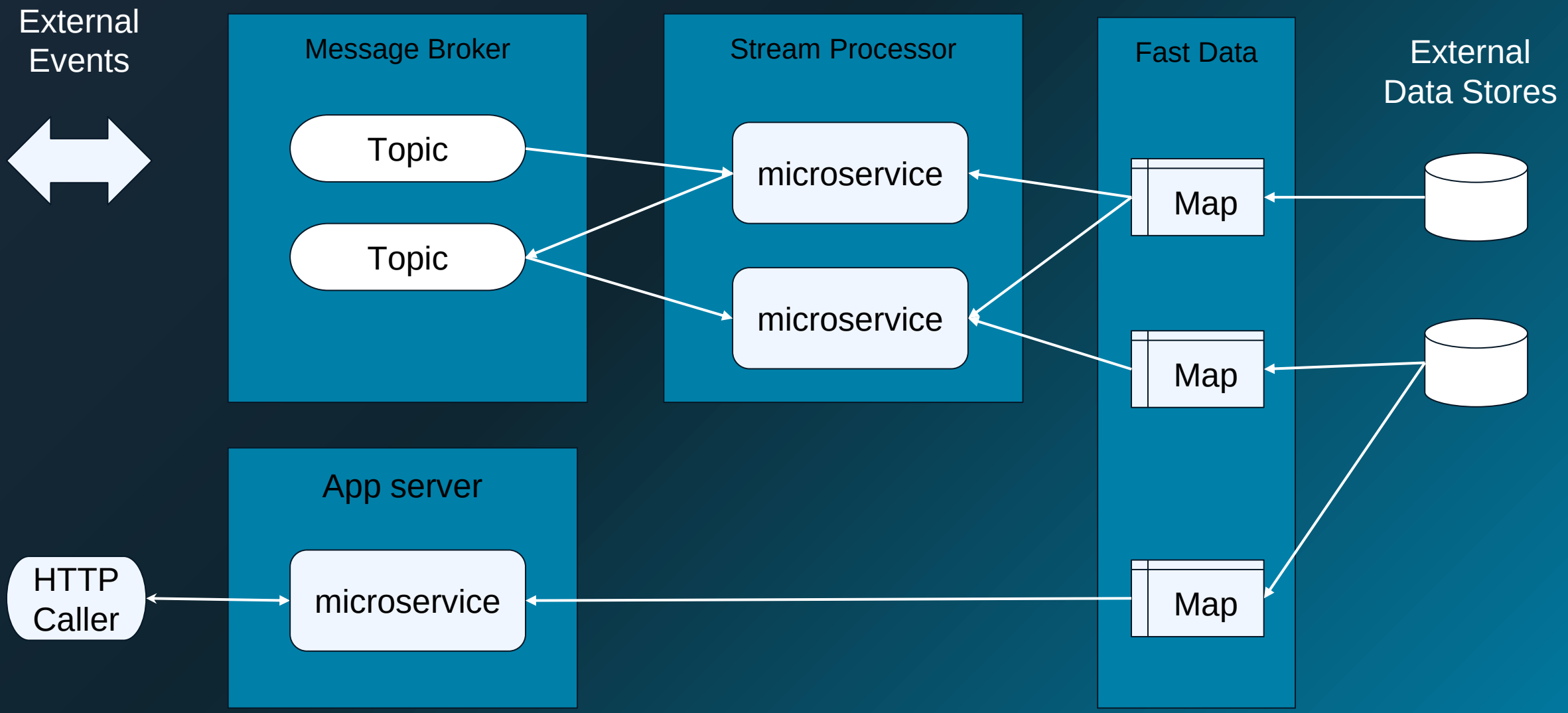
Simplified Architecture


Hazelcast Cluster
Applications
Hazelcast Client
Hazelcast Client
Hazelcast Client
Mutual Authentication
Authentication
JAAS Authentication
Socket Interceptor
Authorization
JAAS Authorization
Socket Interceptor
HAZELCAST
TLS/SSL
Open SSL
HAZELCAST
HAZELCAST
Symmetric Encryption
TLS/SSL
Browser
Mutual Authentication
TLS/SSL
Authentication
LDAP/Active Directory Authentication
JAAS Authentication
Authorization
Read/Write
Read only
Metrics only
Management Center

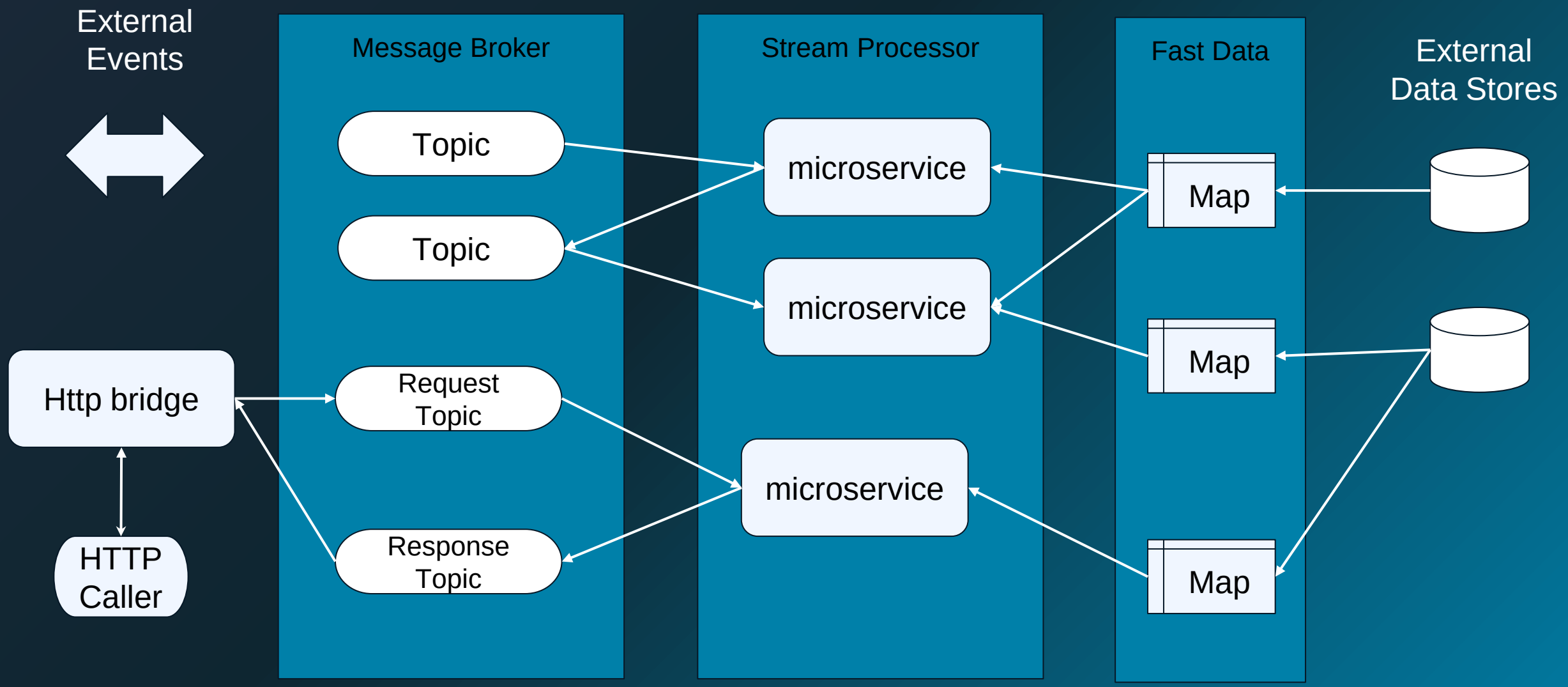
Tech Stack for Handling Events and Services: Option 1



Tech Stack for Handling Events and Services: Option 2

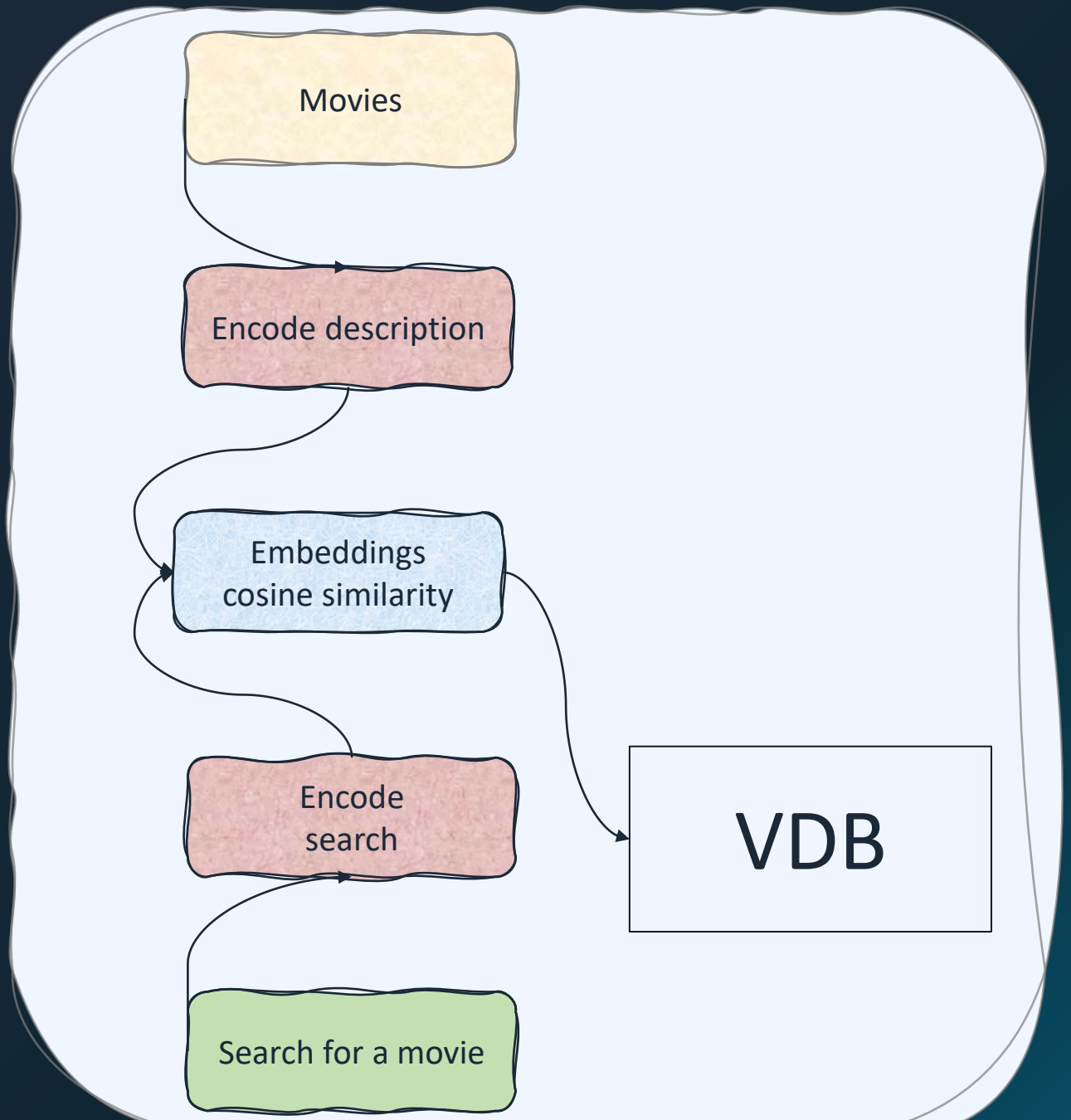


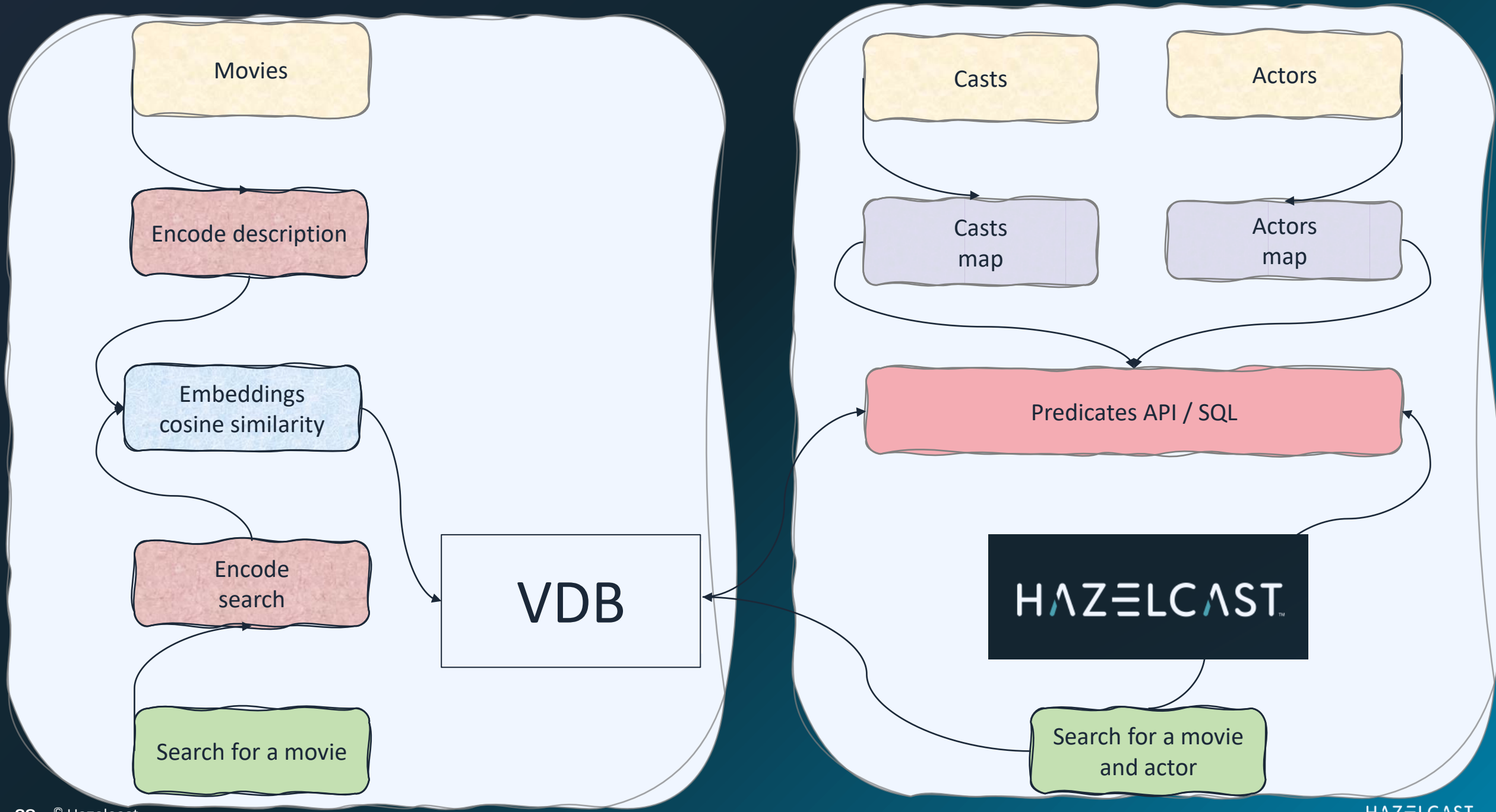
Tech Stack for Handling Events and Services: Option 3



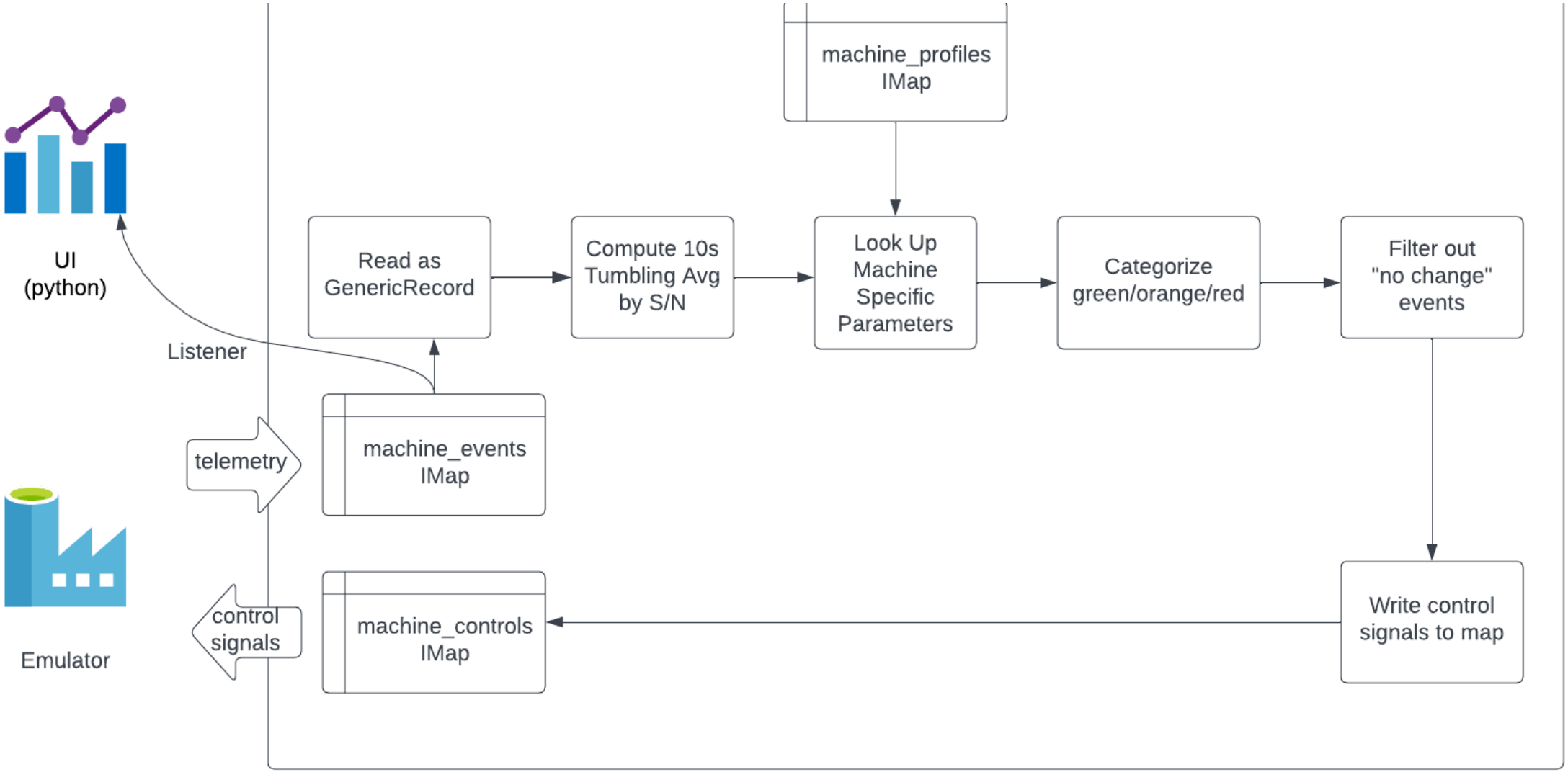
Vector Databases

VDBs lack context and many-to-many relationship representations


Movies
Encode description
Embeddings
cosine similarity
Encode
search
Search for a movie
VDB


Movies
Encode description
Embeddings
cosine similarity
Encode
search
Search for a movie
VDB
Casts
Actors
Casts
map
Actors
map
Predicates API / SQL
HAZELCAST
Search for a movie
and actor

Workflow


machine_profiles
IMap
UI
(python)
Read as
GenericRecord
Compute 10s
Tumbling Avg
by S/N
Look Up
Machine
Specific
Parameters
Categorize
green/orange/red
Filter out
"no change"
events
Listener
telemetry
machine_events
IMap
Emulator
control
signals
machine_controls
IMap
Write control
signals to map

- Access the UI at http://localhost:8050
- Open up the management center http://localhost:8080

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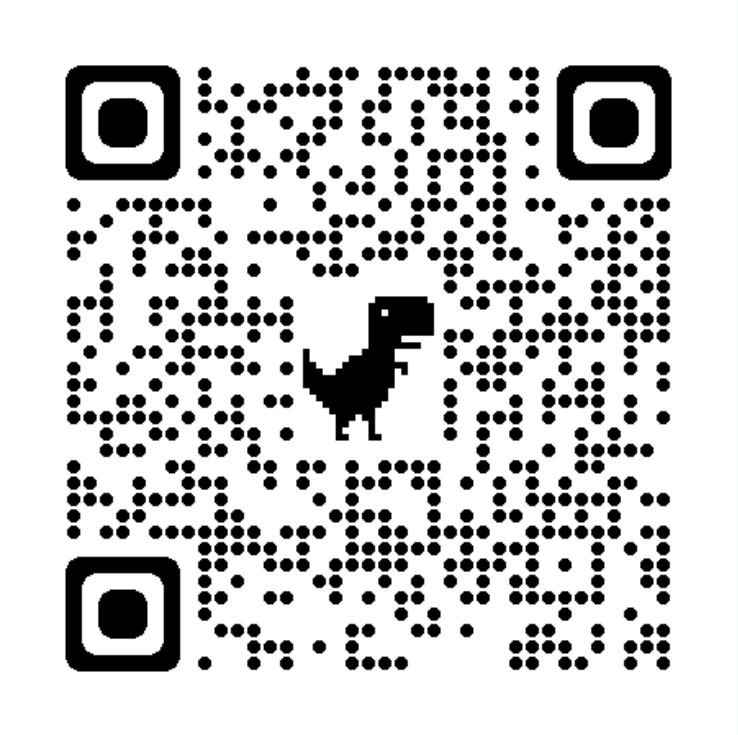
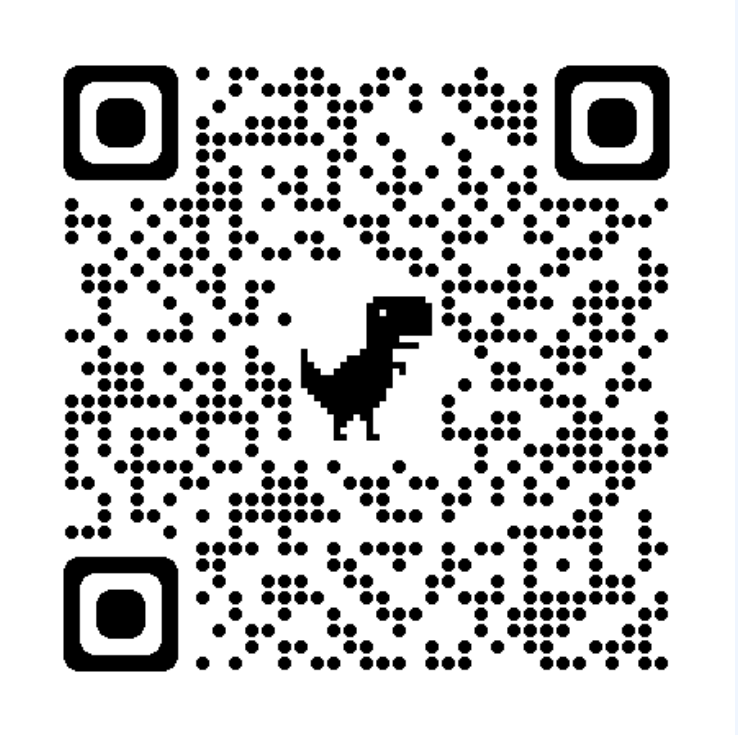
Check In

Join the Community

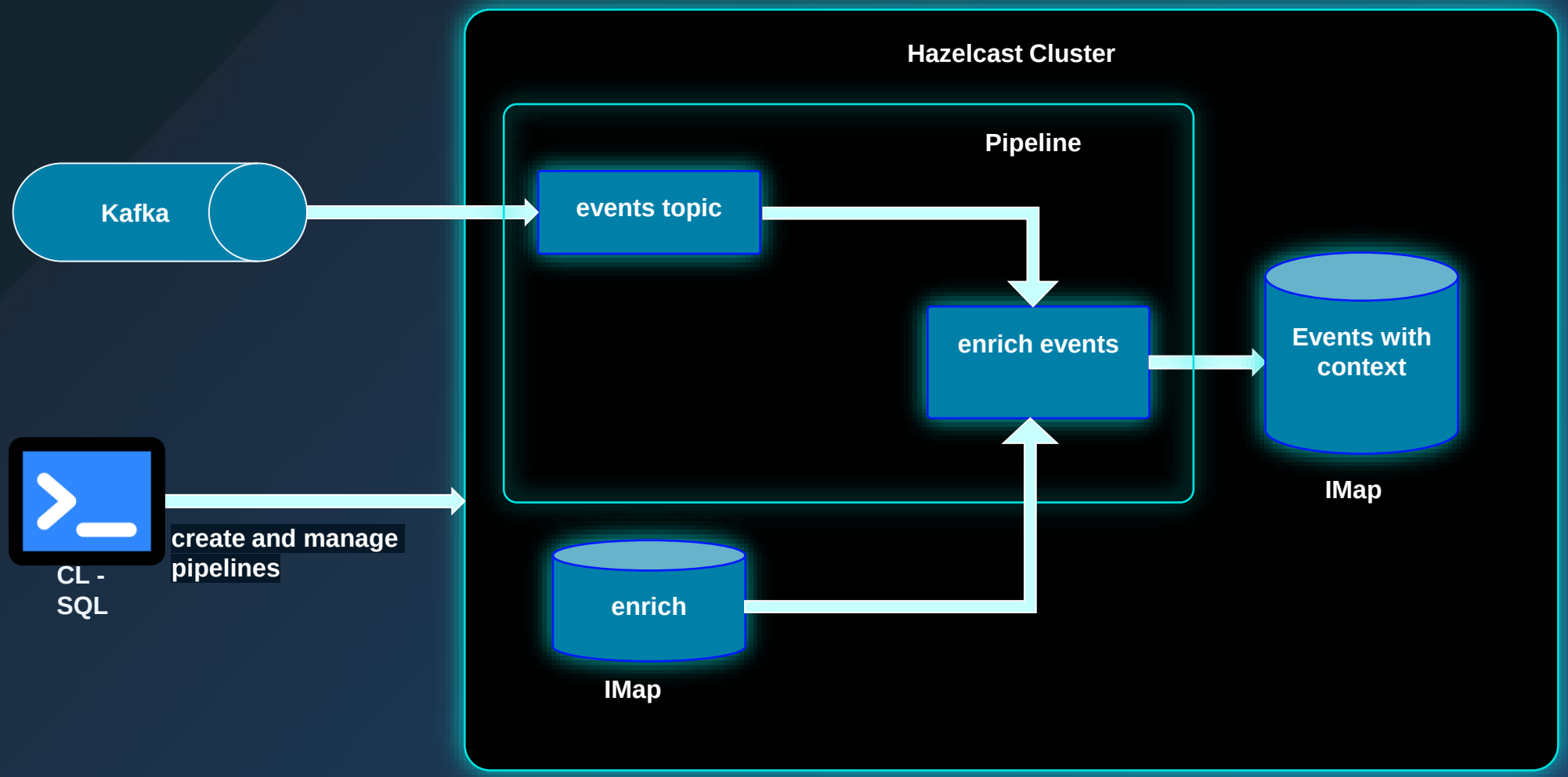


Twitch



Slack

Architecture Overview



Setup

- Install Hazelcast
  - **hz-start**
  - **hz-cli sql**
- Install Kafka
  - cd Documents/kafka_2.13-3.4.0
  - **bin/zookeeper-server-start.sh config/zookeeper.properties**
  - **bin/kafka-server-start.sh config/server.properties**
  - bin/kafka-server-stop.sh
  - bin/zookeeper-server-stop.sh