Leveraging Apache Kafka for Web Crawling and Data Processing

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Image: https://softwareengineeringdaily.com/wp-content/uploads/2015/08/kafka-logo-wide.png

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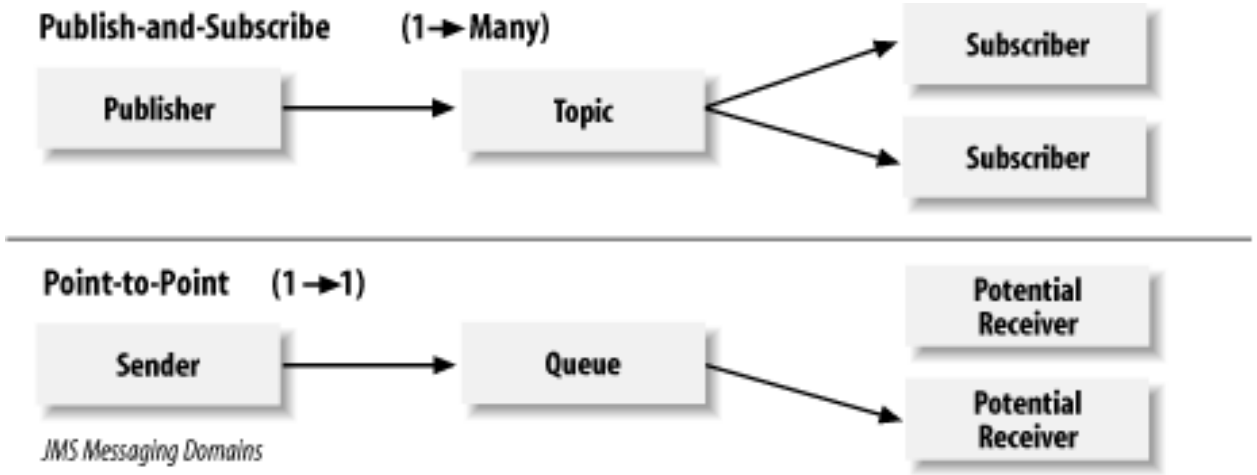
Background: Queues & PubSub

- PubSub
  - multiple subscribers
  - no scaling

- Queues
  - multiple consumers
  - single-subscriber
  - scaling, load balancing



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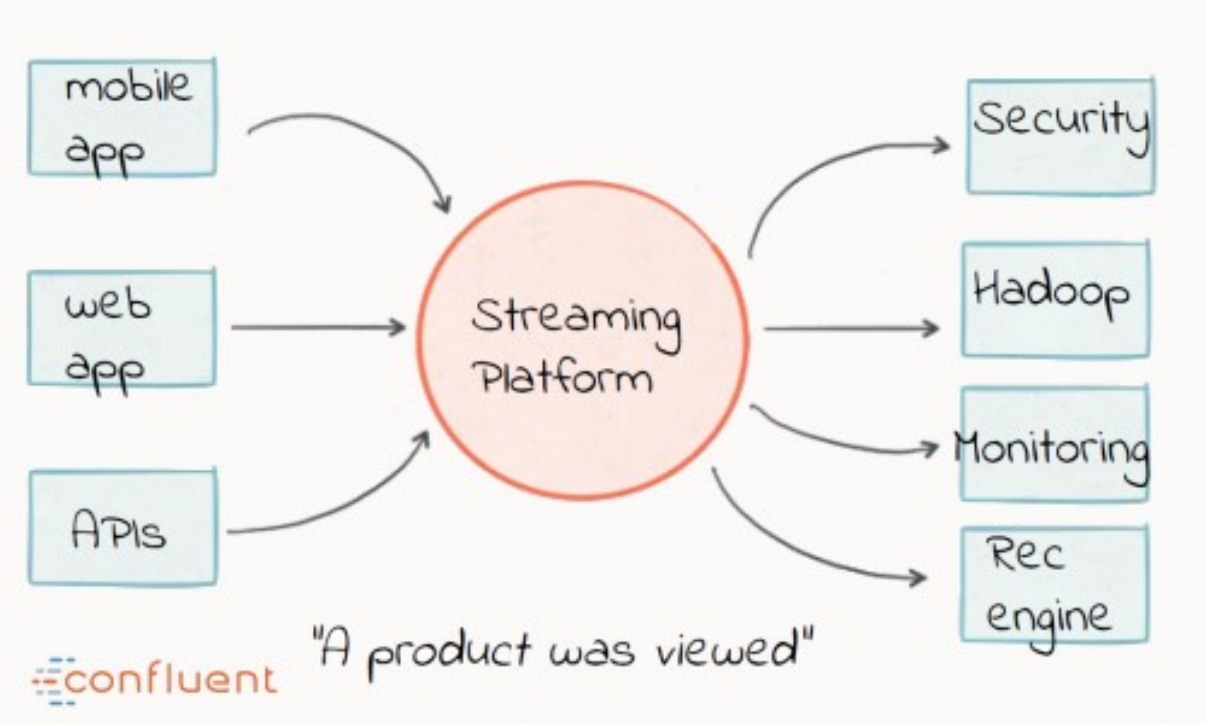
A high-throughput distributed messaging system

- Decouples Data Pipelines
- Scalable & Fault-Tolerant
- Kafka Functionalities
  - Messaging
  - Processing
  - Storing
- Performance (>100k/s)
  - Batching
  - Zero Copy I/O
  - Leverages OS Cache
- Durability



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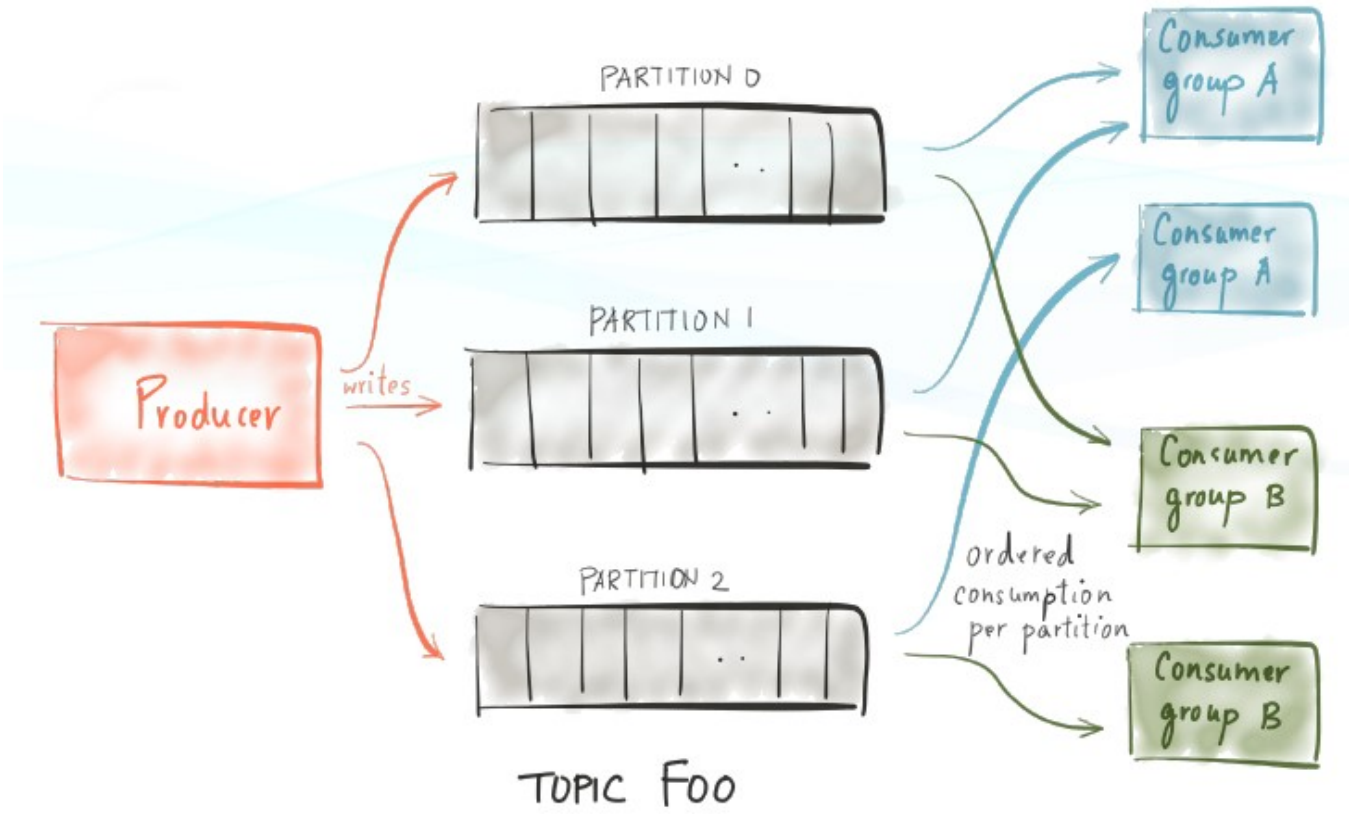
Core Concepts

- Producers
- Consumers
- Brokers
- Topics
- Zookeeper
  - Offsets
  - Broker Addresses



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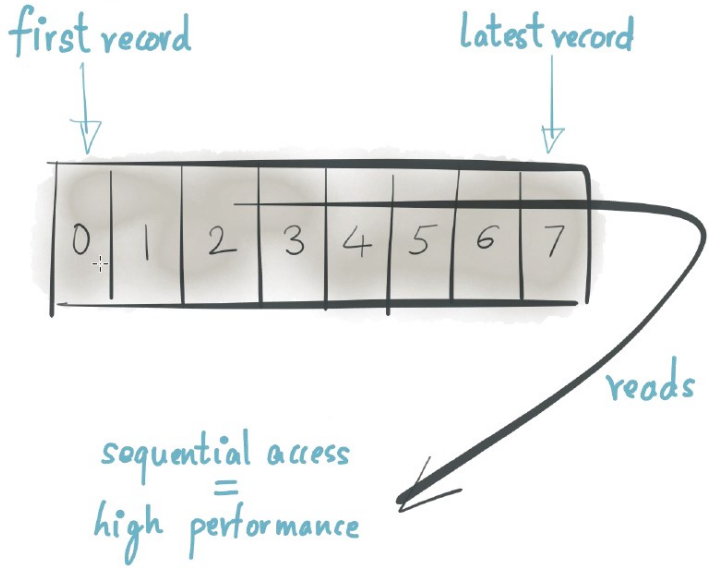
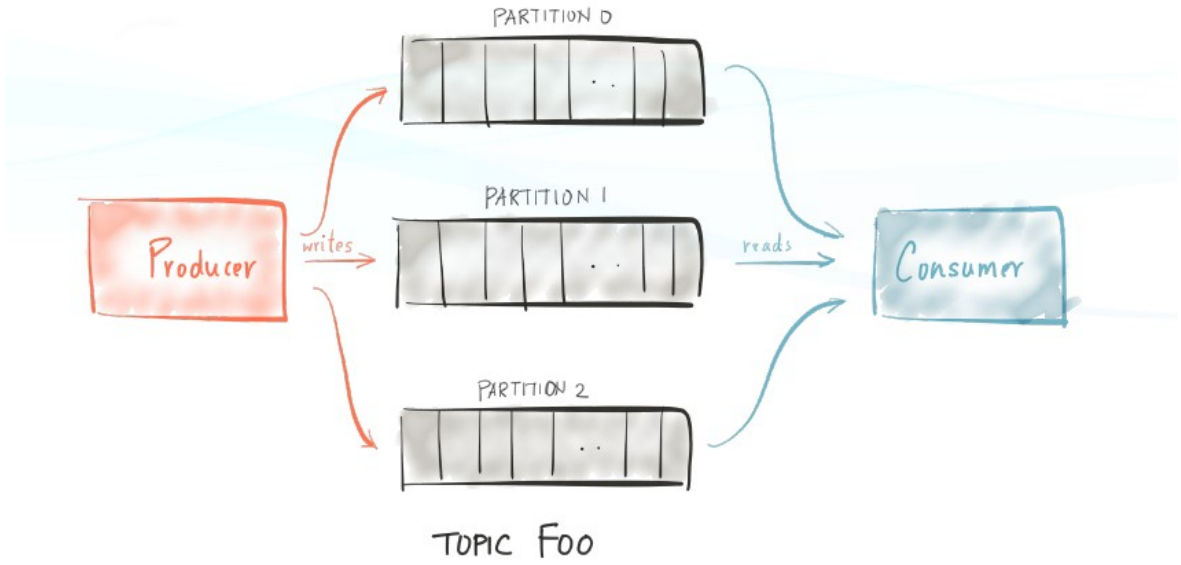
Key Idea: Partitioned Log

- Very fast, due to zero copy I/O and batching
- Uses sendfile and OS buffer cache
- Sequential writes to FS
- Order guaranteed within partition
- Scaling





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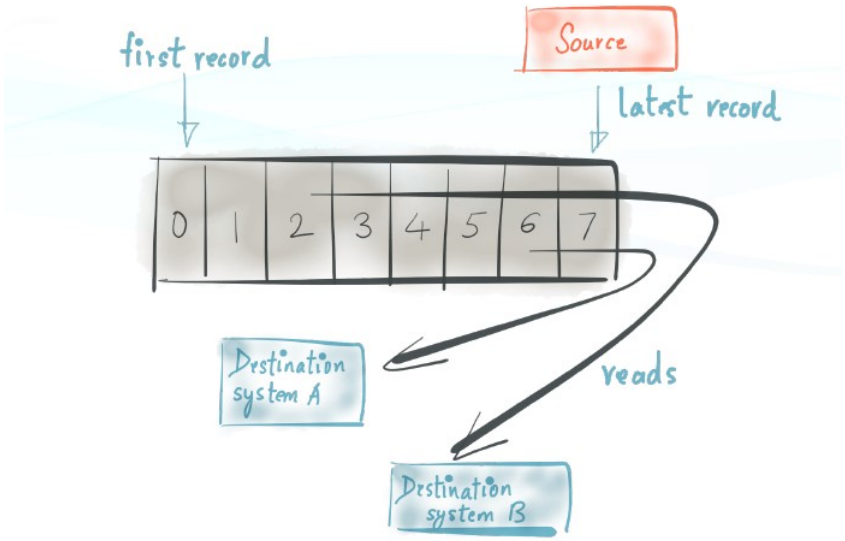
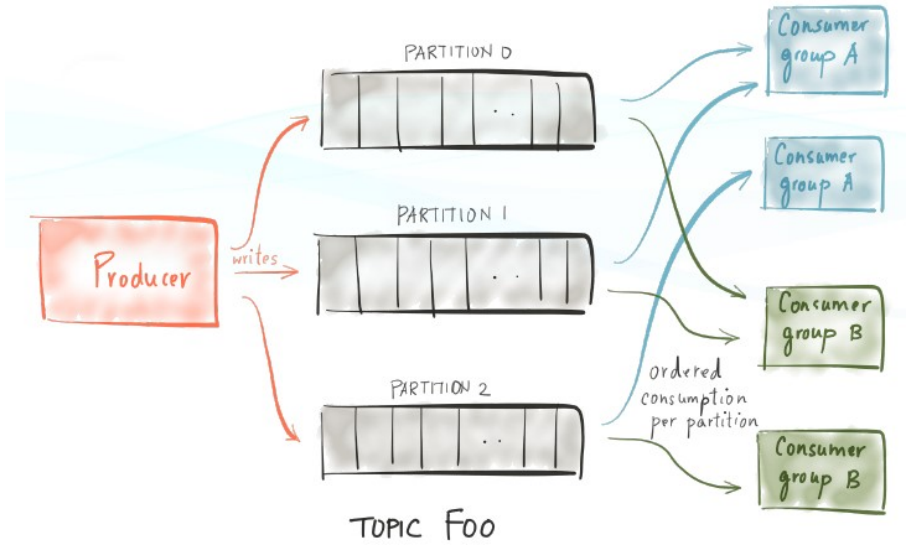
Logs & PubSub

- Consumers can be transient
- Consumer Groups
- Delivery Semantics
  - at least once (default)
  - at most once
  - exactly once
- Retention Policy
- Reprocessing





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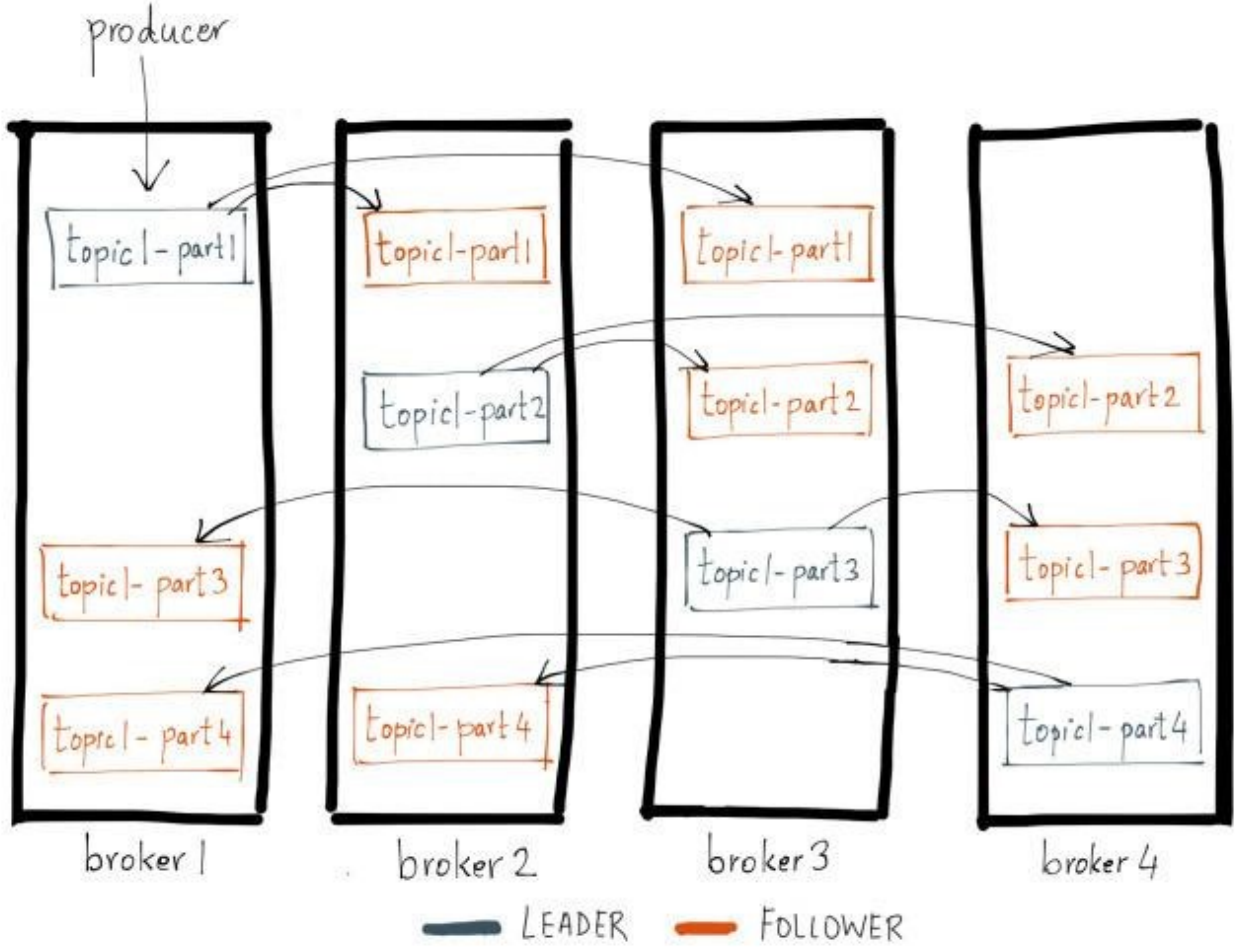
Partitions & Replication

- Partitions configurable
- Partition allocation
  - round-robin
  - semantic partition by key
- Replication
  - optional
  - 1 leader, 0 or more followers
  - sync or async
  - flush delay configurable



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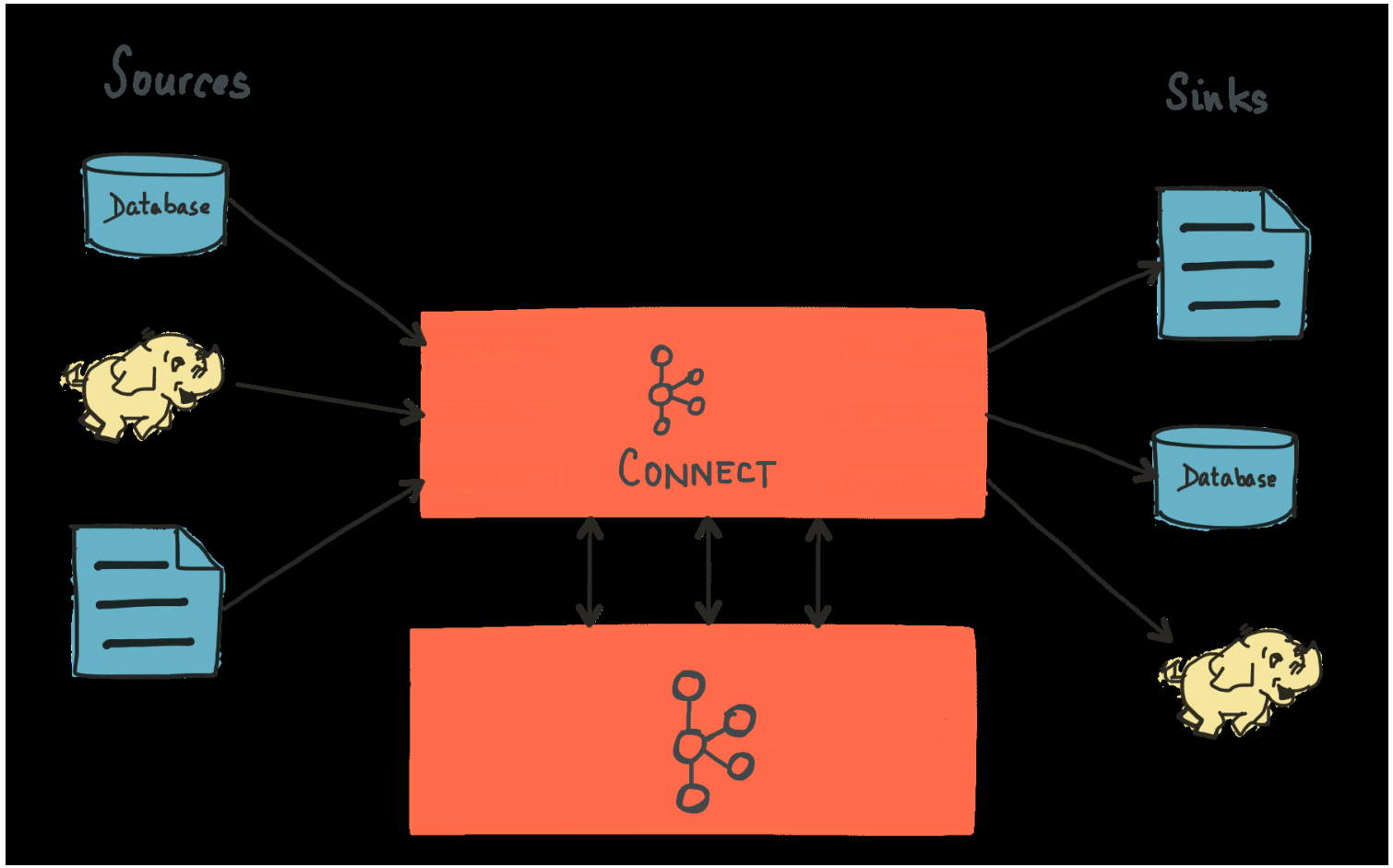
Kafka Connect



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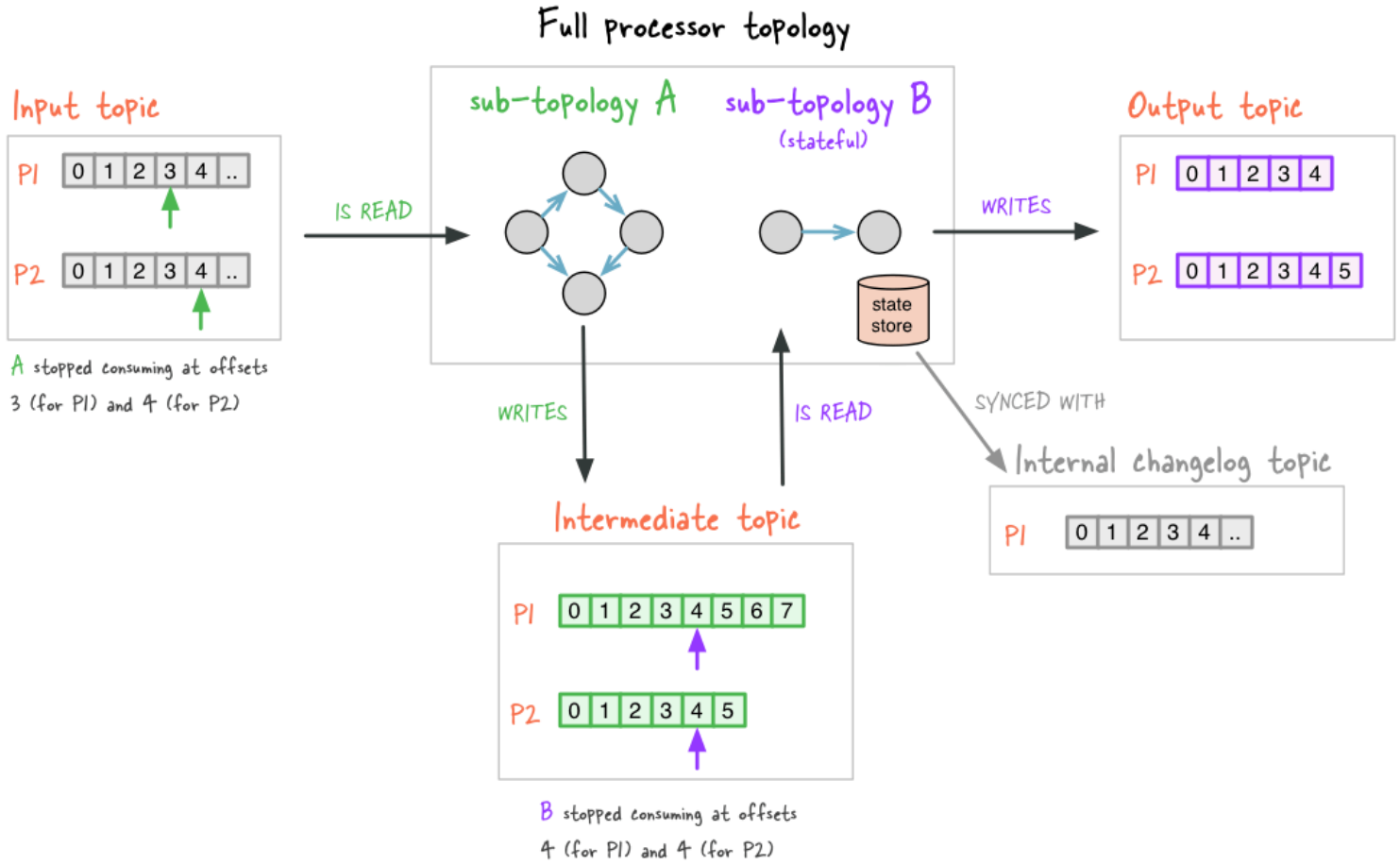
Kafka Streams

- Operations
  - filter
  - map
  - join
  - aggregate

  } stateful
- KStream
- KTable
  - manages local state
- Windows



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Summary

scalability of a **filesystem**

- hundreds of MB/s
- many TBs per server
- commodity hardware

guarantees of a **database**

- persistence
- ordering

distributed by **design**

- replication
- partitioning
- horizontal scalability
- fault tolerance

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