



— Fundamentals for Apache Kafka®

Apache Kafka Architecture & Fundamentals Explained

—
Joe Desmond, Sr. Technical Trainer, Confluent

Session Schedule

- Session 1: Benefits of Stream Processing and Apache Kafka Use Cases
- **Session 2: Apache Kafka Architecture & Fundamentals Explained**
- Session 3: How Apache Kafka Works
- Session 4: Integrating Apache Kafka into your Environment

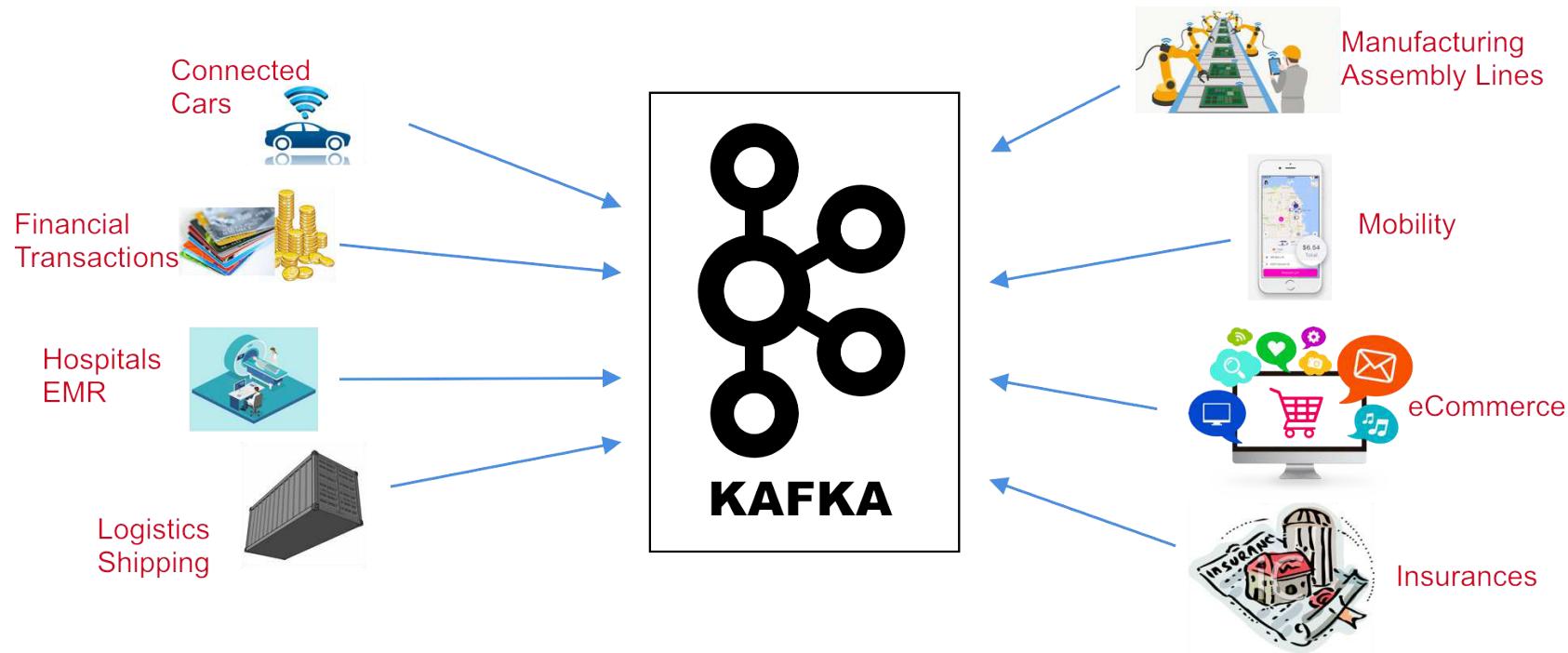
Learning Objectives

After this module you will be able to:

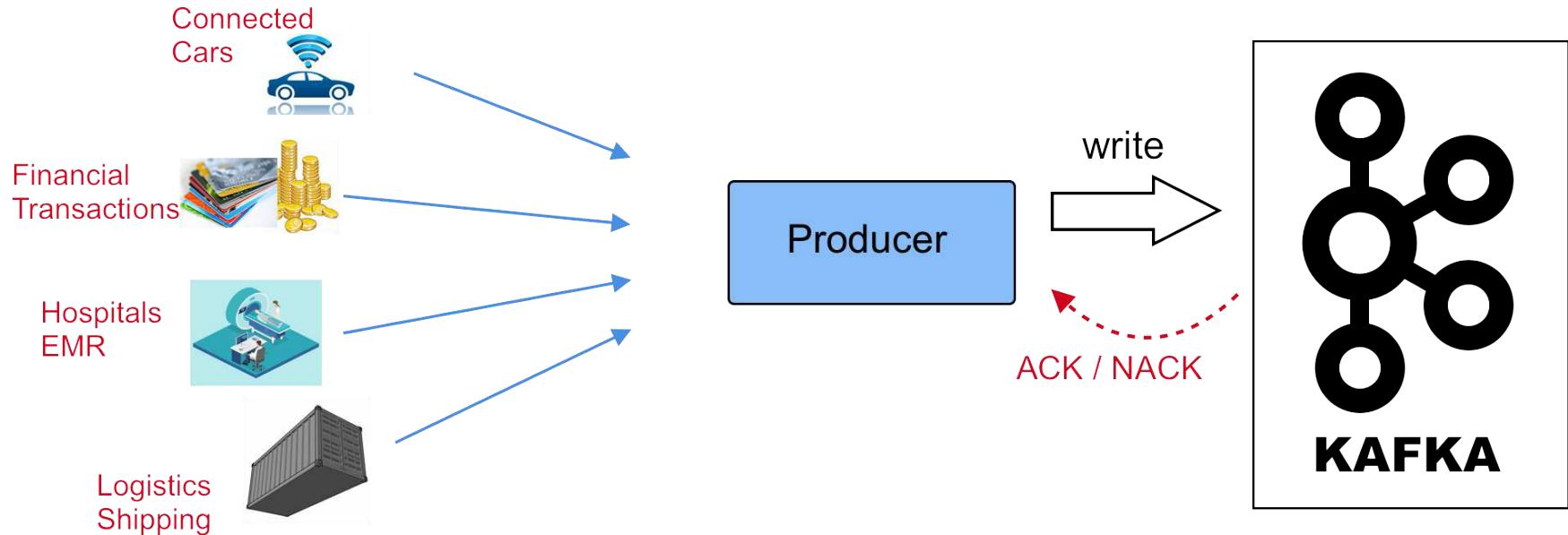


- Identify the key elements in a Kafka cluster
- Name the essential responsibilities of each key element
- Explain what a Topic is and describe its relation to Partitions and Segments

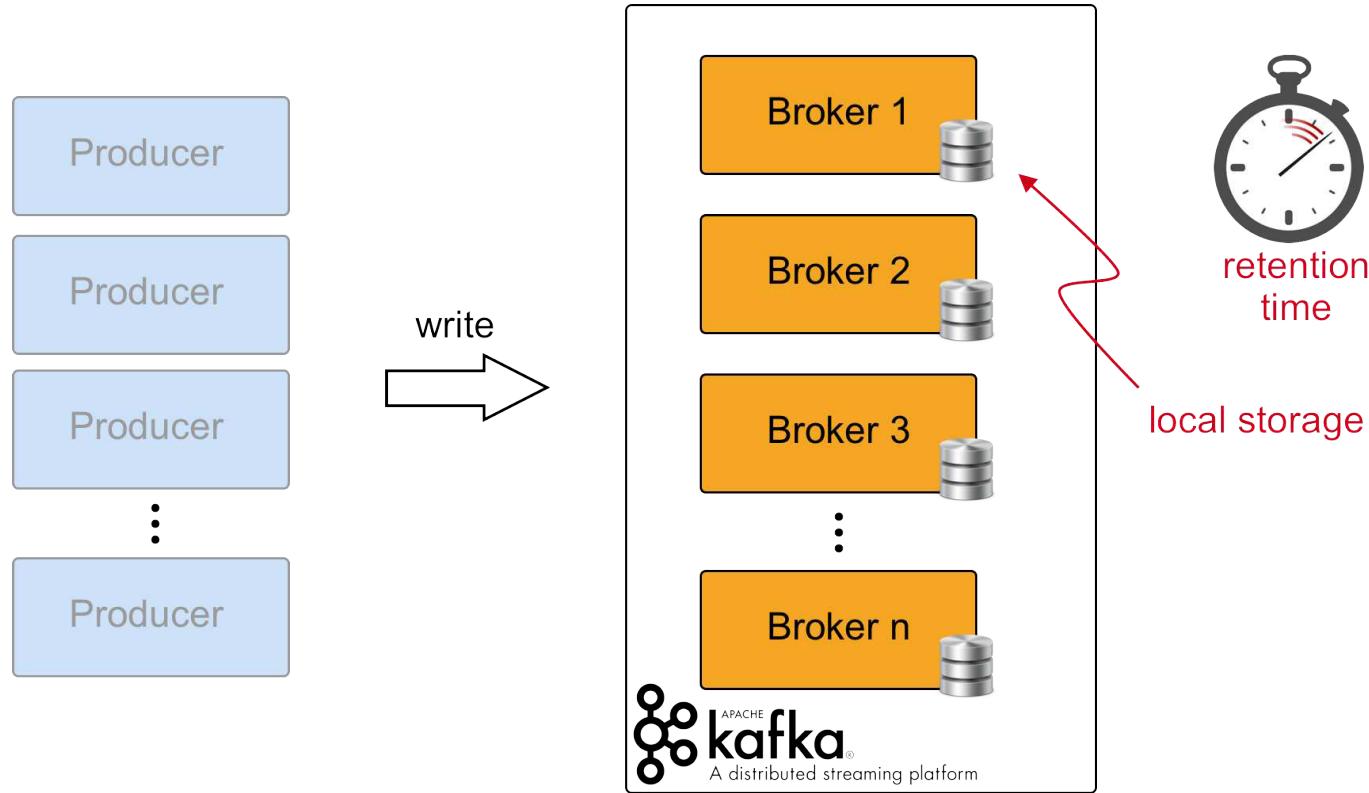
The World Produces Data



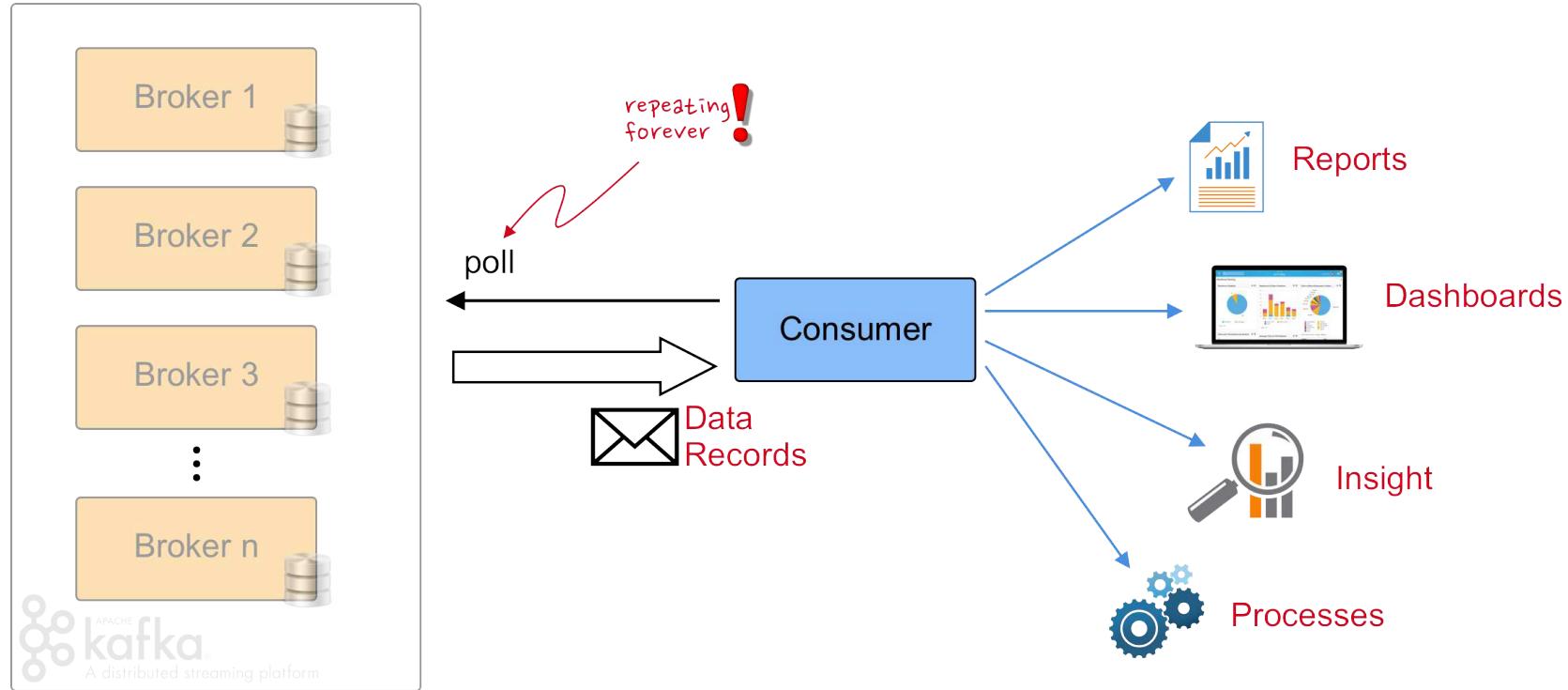
Producers



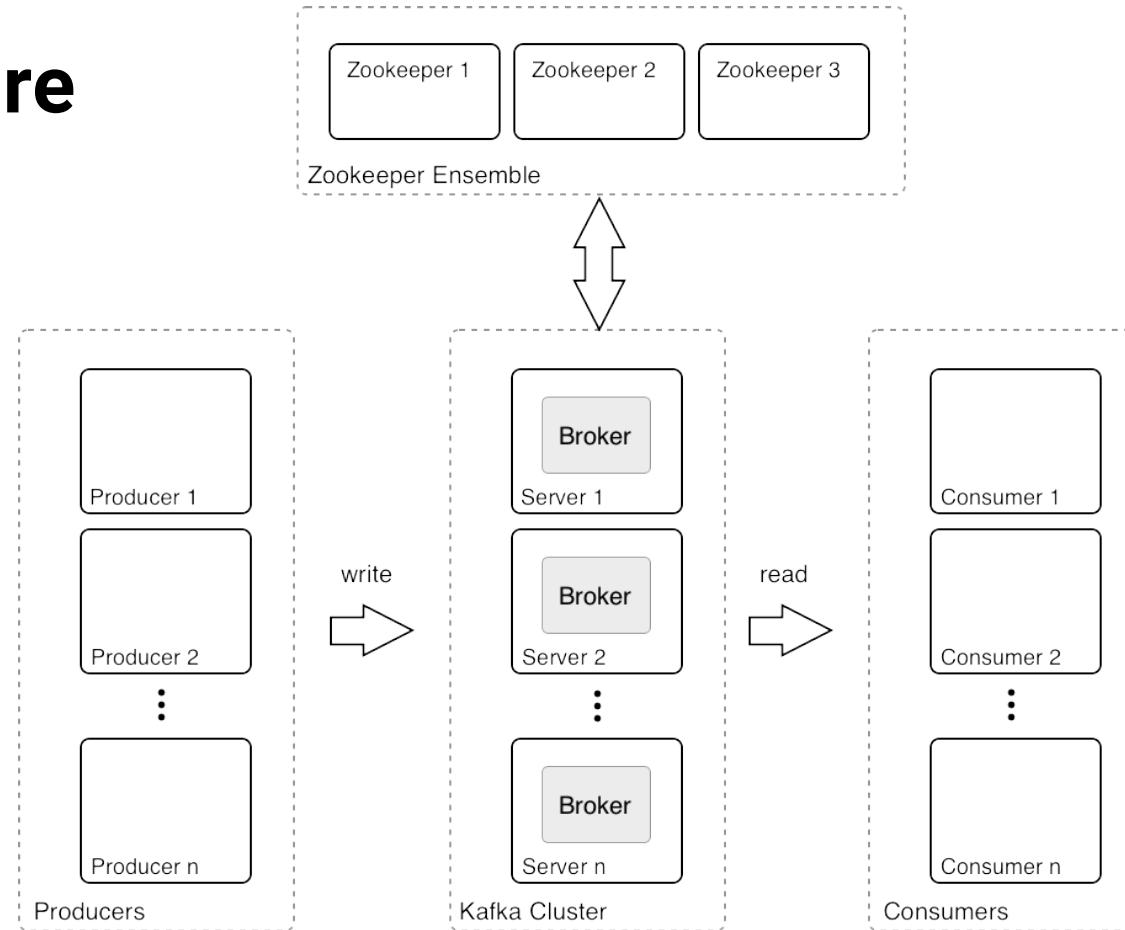
Kafka Brokers



Consumers

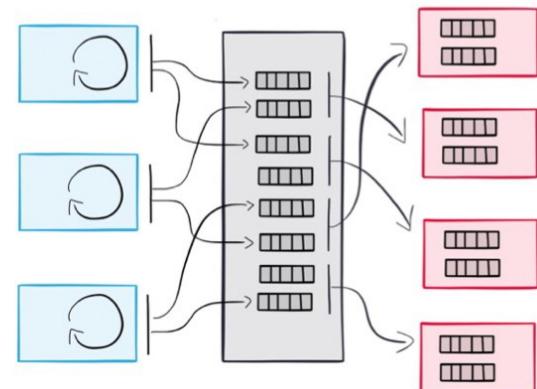


Architecture

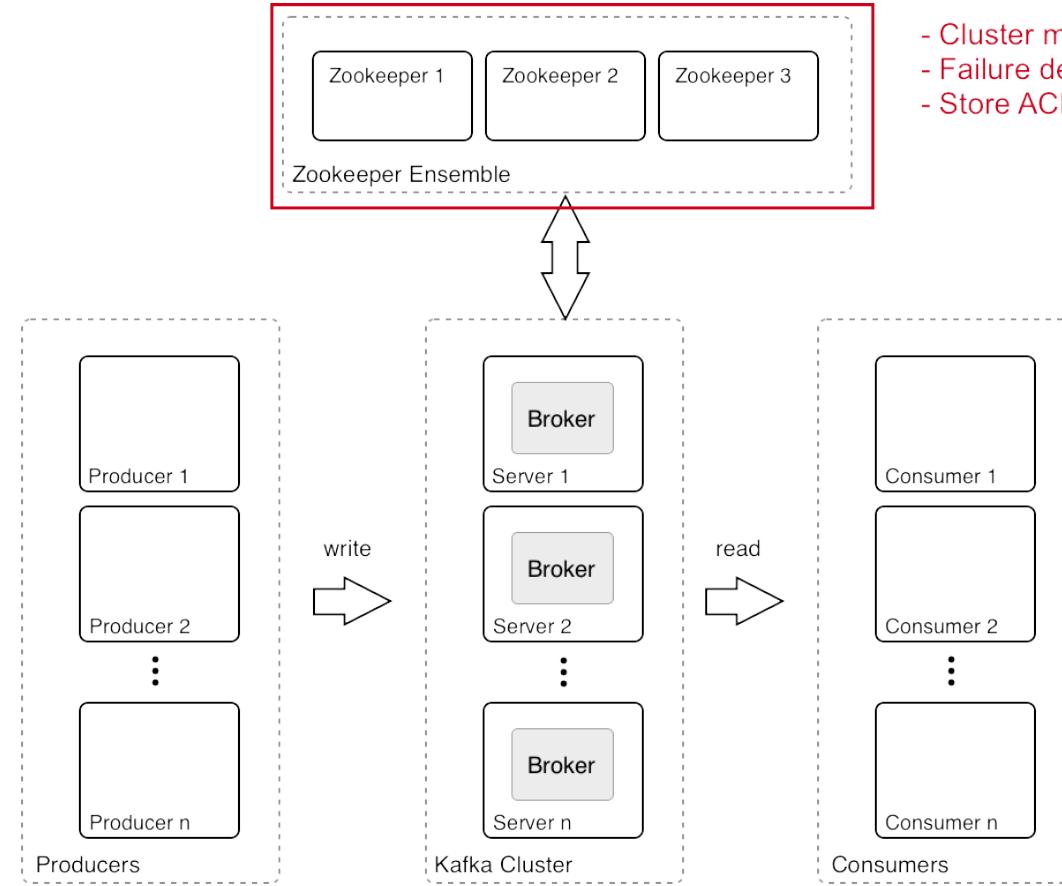


Decoupling Producers and Consumers

- Producers and Consumers are decoupled
- Slow Consumers do not affect Producers
- Add Consumers without affecting Producers
- Failure of Consumer does not affect System



How Kafka Uses ZooKeeper



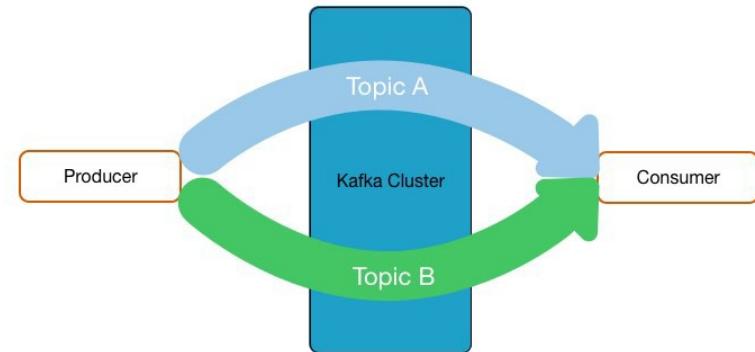
ZooKeeper Basics



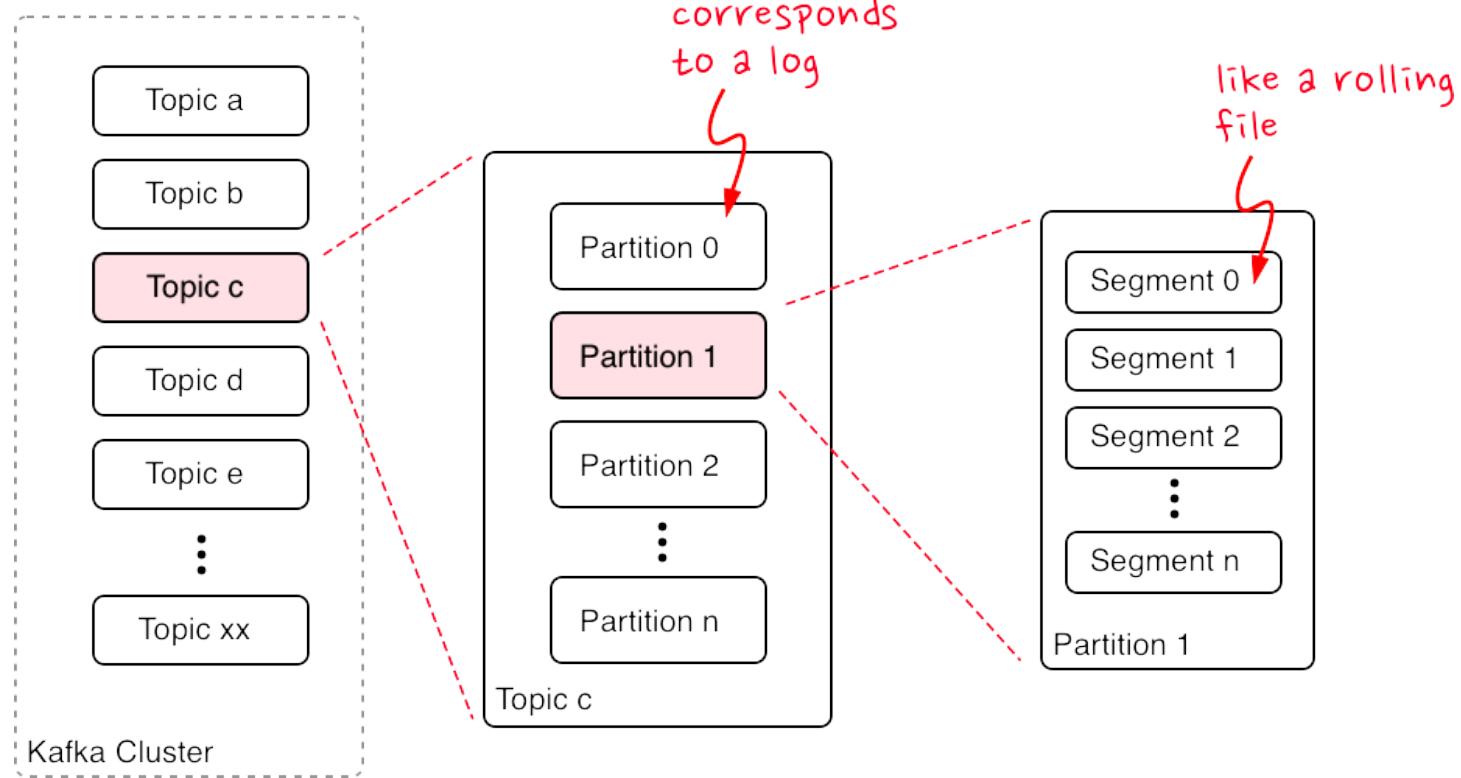
- Open Source Apache Project
- Distributed **Key Value Store**
- Maintains **configuration** information
- Stores **ACLs** and **Secrets**
- Enables highly reliable **distributed coordination**
- Provides **distributed synchronization**
- Three or five servers form an **ensemble**

Topics

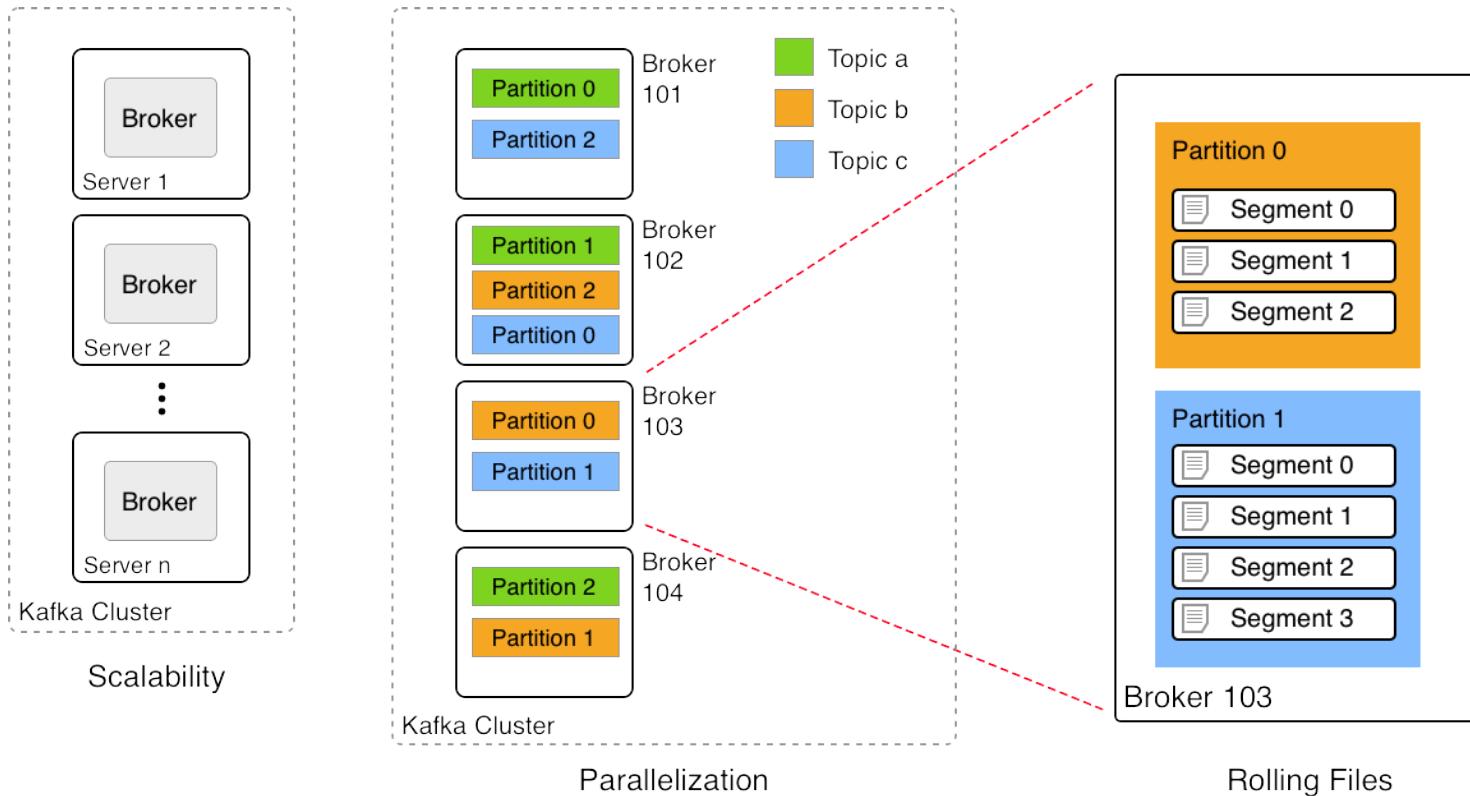
- **Topics:** Streams of “related” Messages in Kafka
 - Is a Logical Representation
 - Categorizes Messages into Groups
- Developers define Topics
- Producer ↔ Topic: N to N Relation
- Unlimited Number of Topics



Topics, Partitions, and Segments



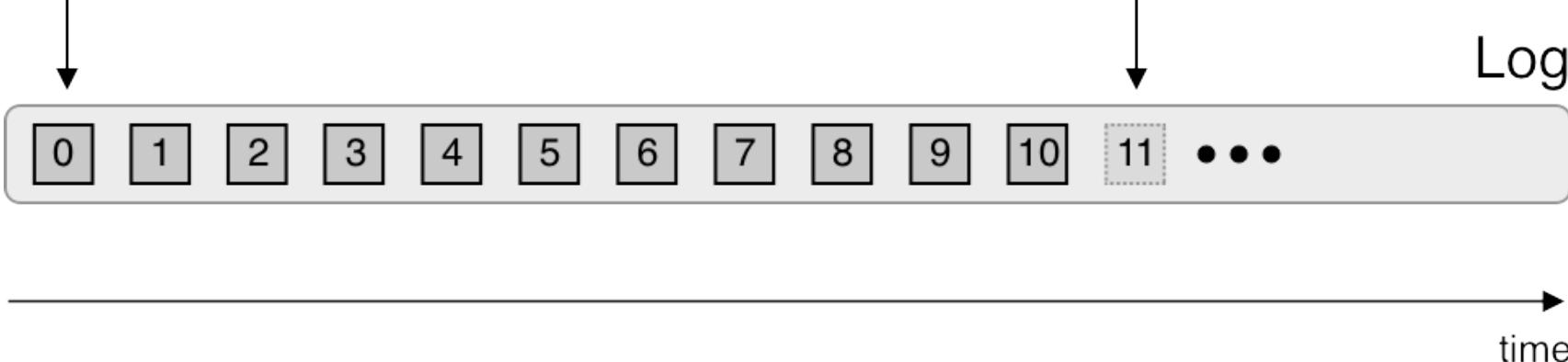
Topics, Partitions, and Segments



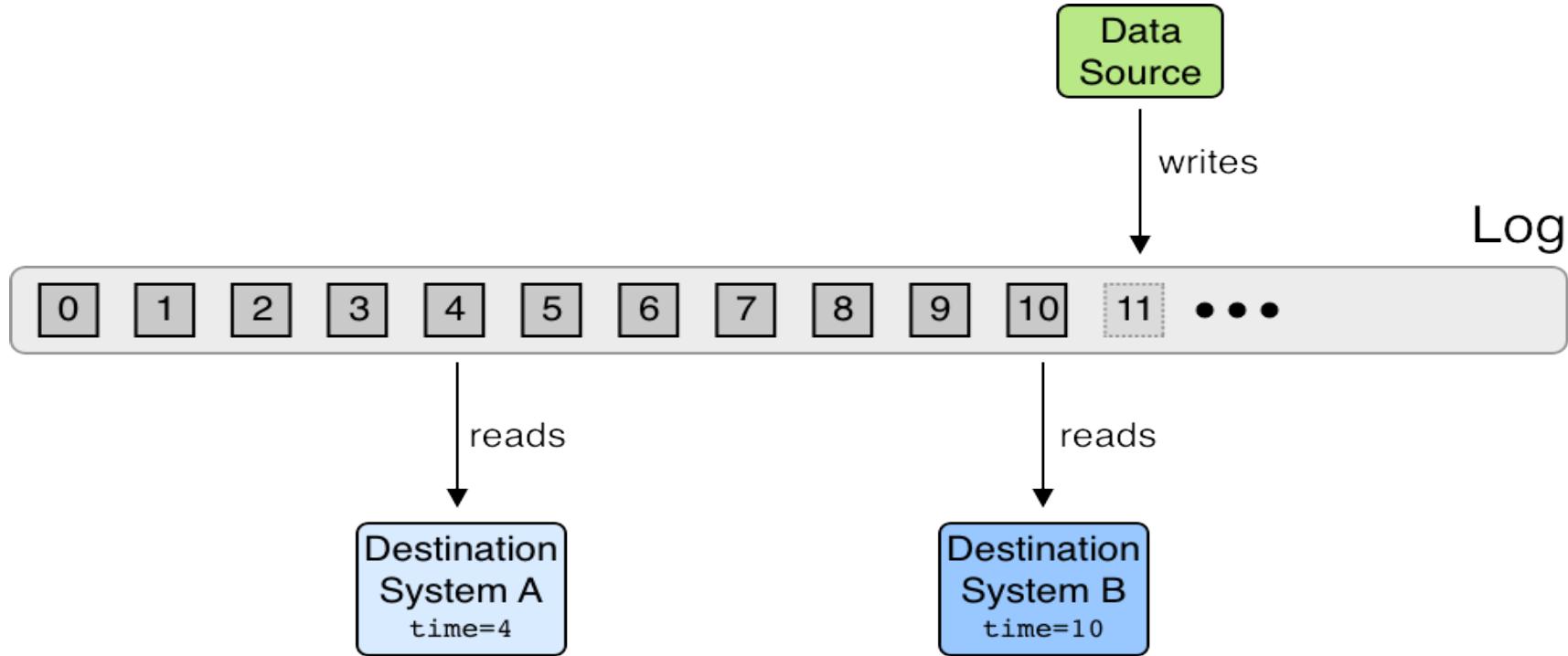
The Log

first
entry
written

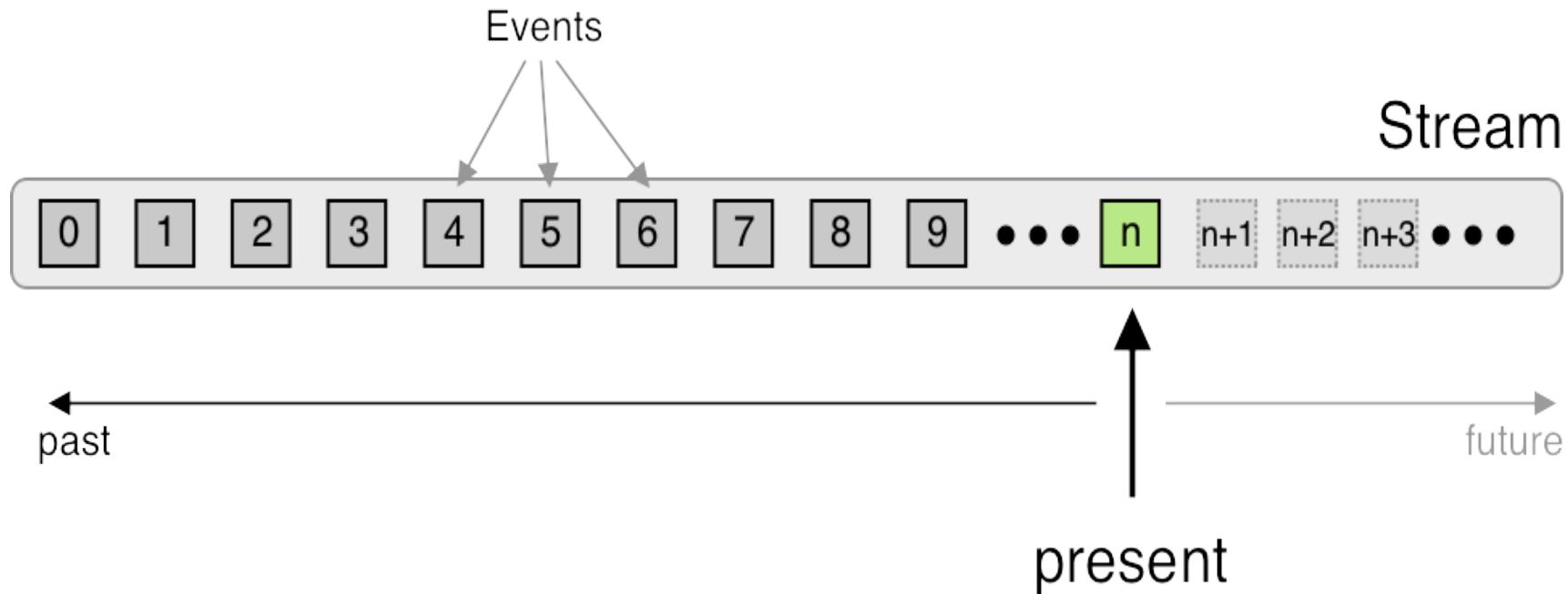
next
entry
to write



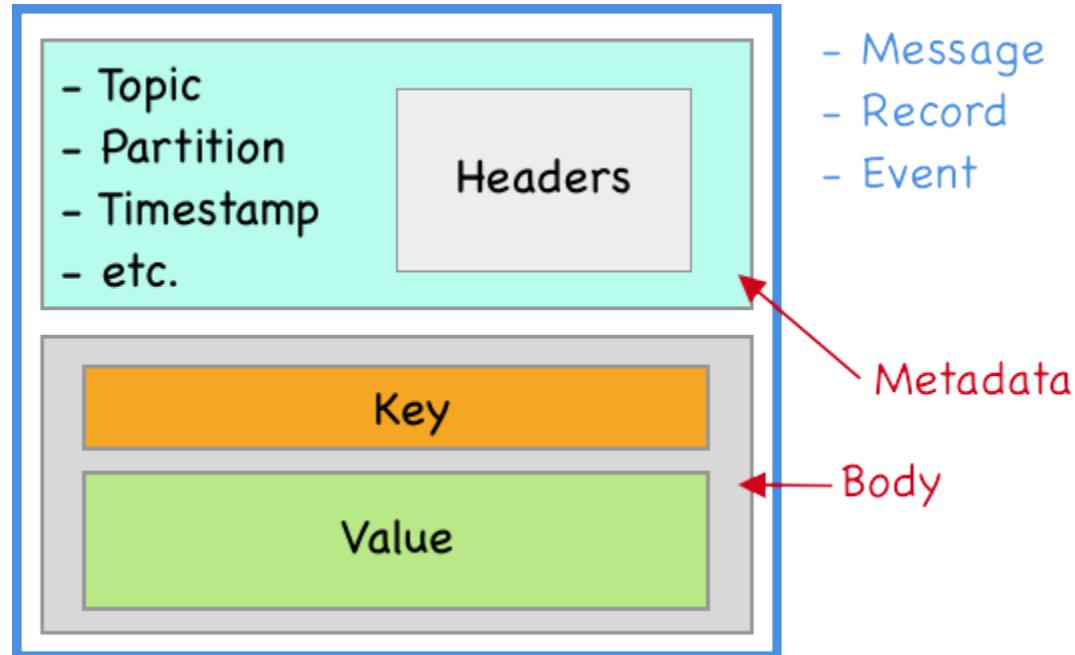
Log Structured Data Flow



The Stream



Data Elements

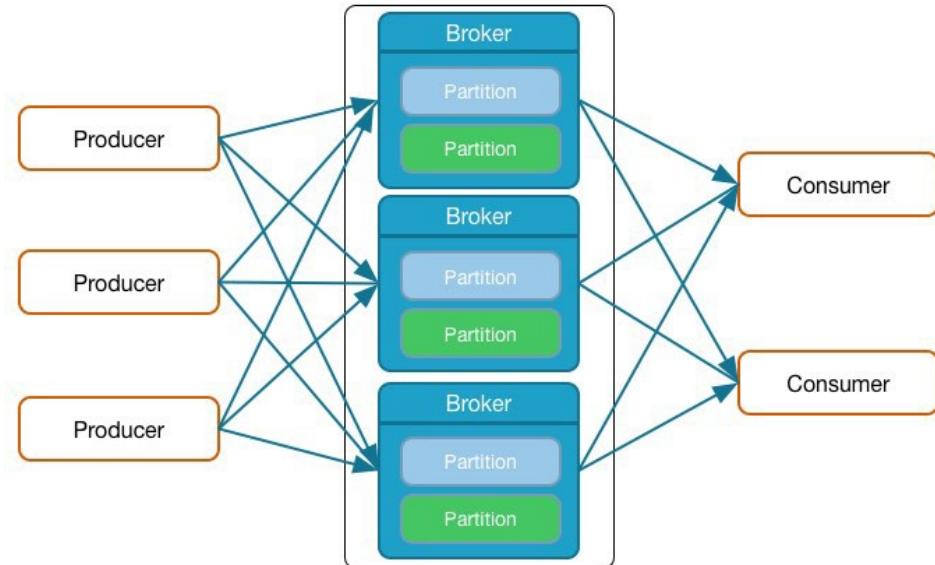


Brokers Manage Partitions

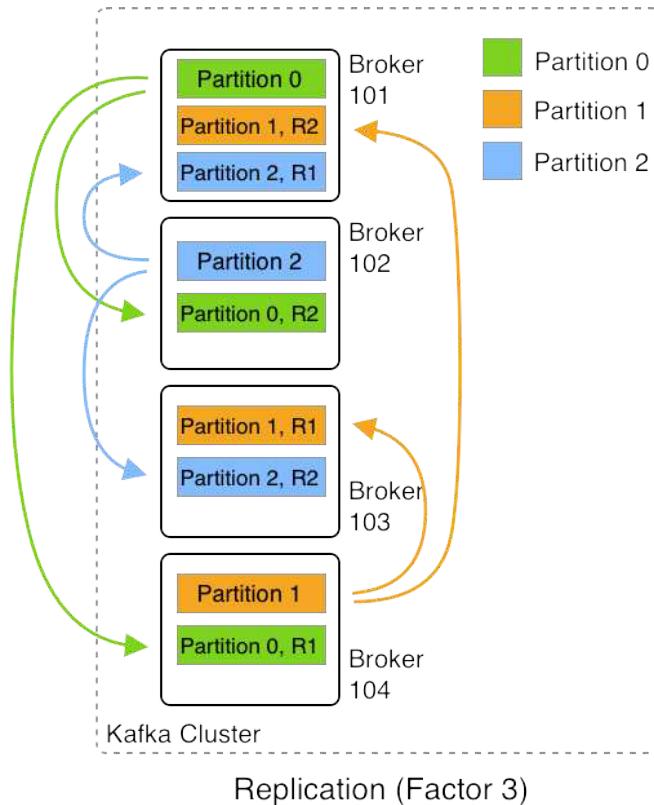
- Messages of Topic spread across Partitions
- Partitions spread across Brokers
- Each Broker handles many Partitions
- Each Partition stored on Broker's disk
- Partition: 1..n log files
- Each message in Log identified by *Offset*
- Configurable Retention Policy

Broker Basics

- Producer sends Messages to Brokers
- Brokers receive and store Messages
- A Kafka Cluster can have many Brokers
- Each Broker manages multiple Partitions



Broker Replication



Producer Basics

- Producers write Data as Messages
- Can be written in any language
 - Native: Java, C/C++, Python, Go,, .NET, JMS
 - More Languages by Community
 - REST Server for any unsupported Language
- Command Line Producer Tool

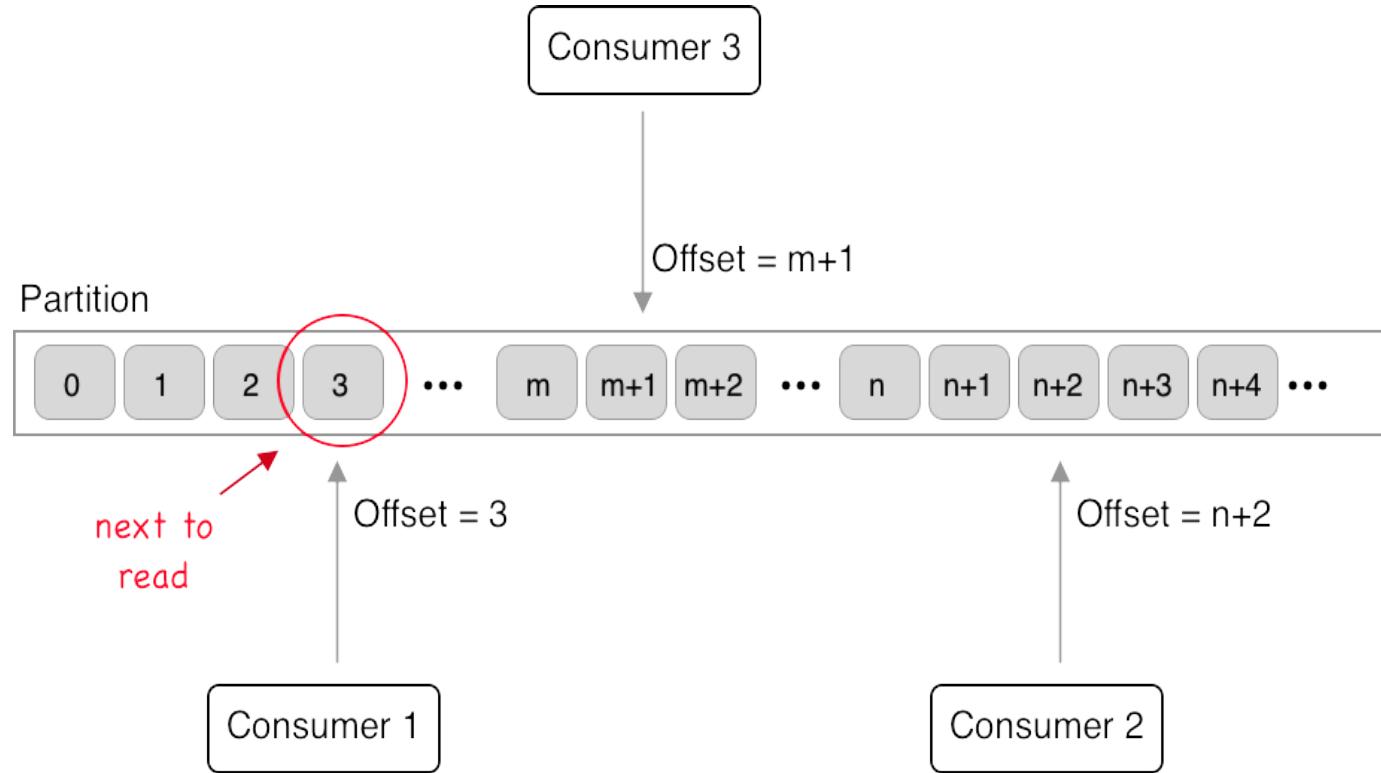
Load Balancing and Semantic Partitioning

- Producers use a Partitioning Strategy to assign each message to a Partition
- Two Purposes:
 - Load Balancing
 - Semantic Partitioning
- Partitioning Strategy specified by Producer
 - Default Strategy: `hash(key) % number_of_partitions`
 - No Key → Round-Robin
- Custom Partitioner possible

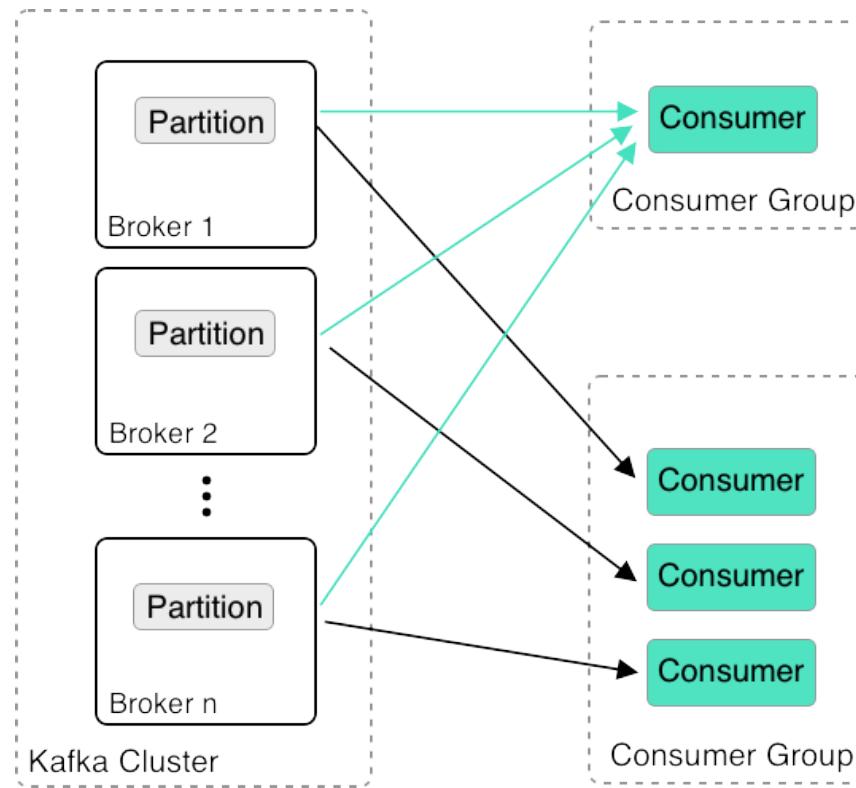
Consumer Basics

- Consumers **pull** messages from 1..n topics
- New inflowing messages are automatically retrieved
- Consumer offset
 - Keeps track of the last message read
 - Is stored in special topic
- CLI tools exist to read from cluster

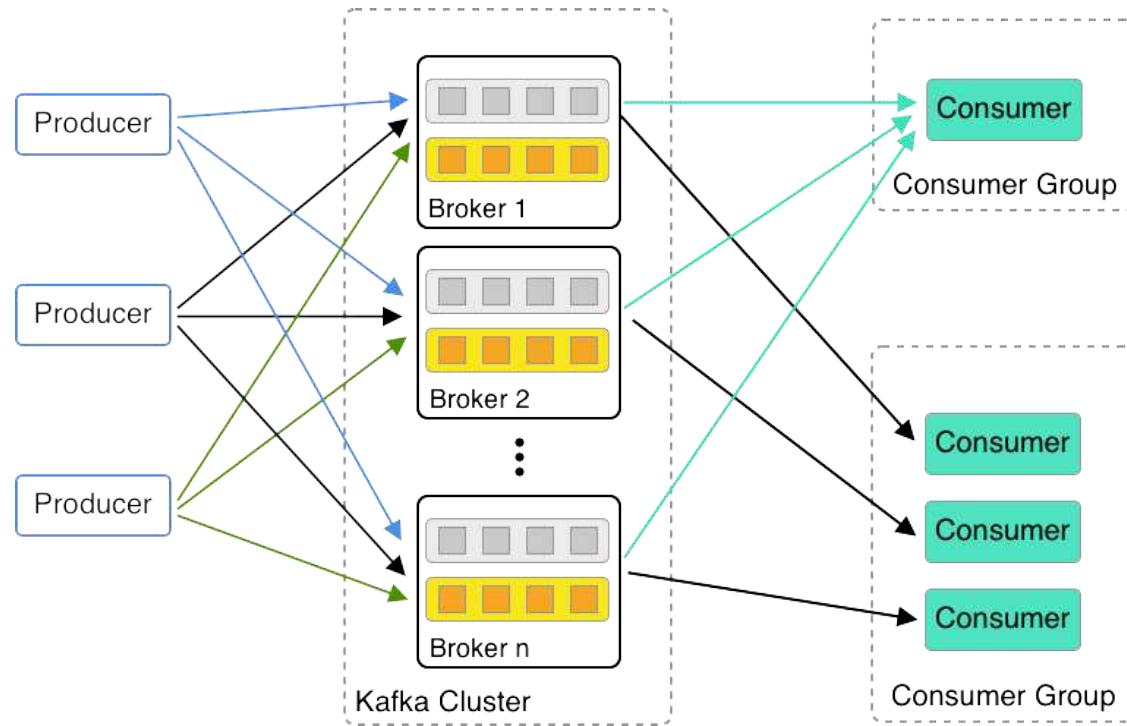
Consumer Offset



Distributed Consumption



Scalable Data Pipeline



Q&A



Questions:

- Why do we need an odd number of ZooKeeper nodes?
- How many Kafka brokers can a cluster maximally have?
- How many Kafka brokers do you minimally need for high availability?
- What is the criteria that two or more consumers form a consumer group?

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- Confluent Operations for Apache Kafka
- Confluent Developer Skills for Building Apache Kafka
- Confluent Stream Processing using Apache Kafka Streams and KSQL
- Confluent Advanced Skills for Optimizing Apache Kafka



For more details, see <http://confluent.io/training>

Certifications

Confluent Certified Developer for Apache Kafka

(aligns to *Confluent Developer Skills for Building Apache Kafka* course)

Confluent Certified Administrator for Apache Kafka

(aligns to *Confluent Operations Skills for Apache Kafka*)

What you Need to Know

- Qualifications: 6-to-9 months hands-on experience
- Duration: 90 mins
- Availability: Live, online 24/7
- Cost: \$150
- Register online:
www.confluent.io/certification



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Thank you for attending!



- Thank you for attending the session!
- Feedback to: training-admin@confluent.io



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