Go Kafka

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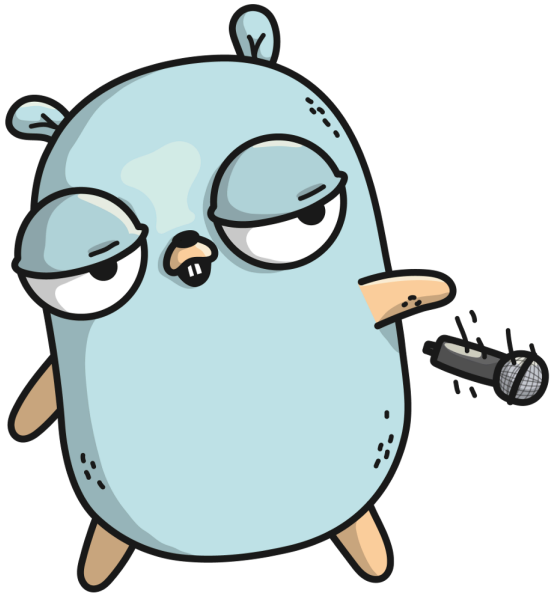
https://github.com/pallat
https://dev.to/pallat

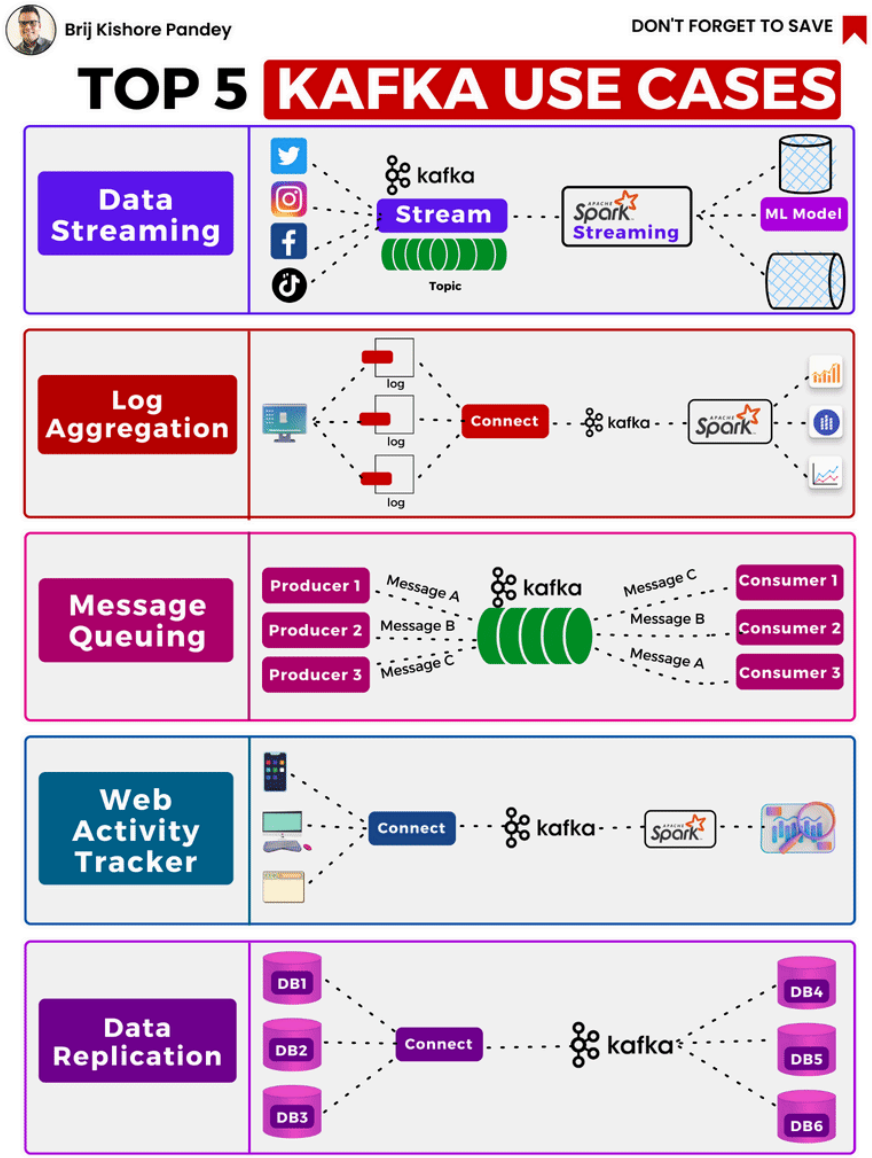
https://go.dev/tour (Thai)
https://github.com/uber-go/guide (Thai)



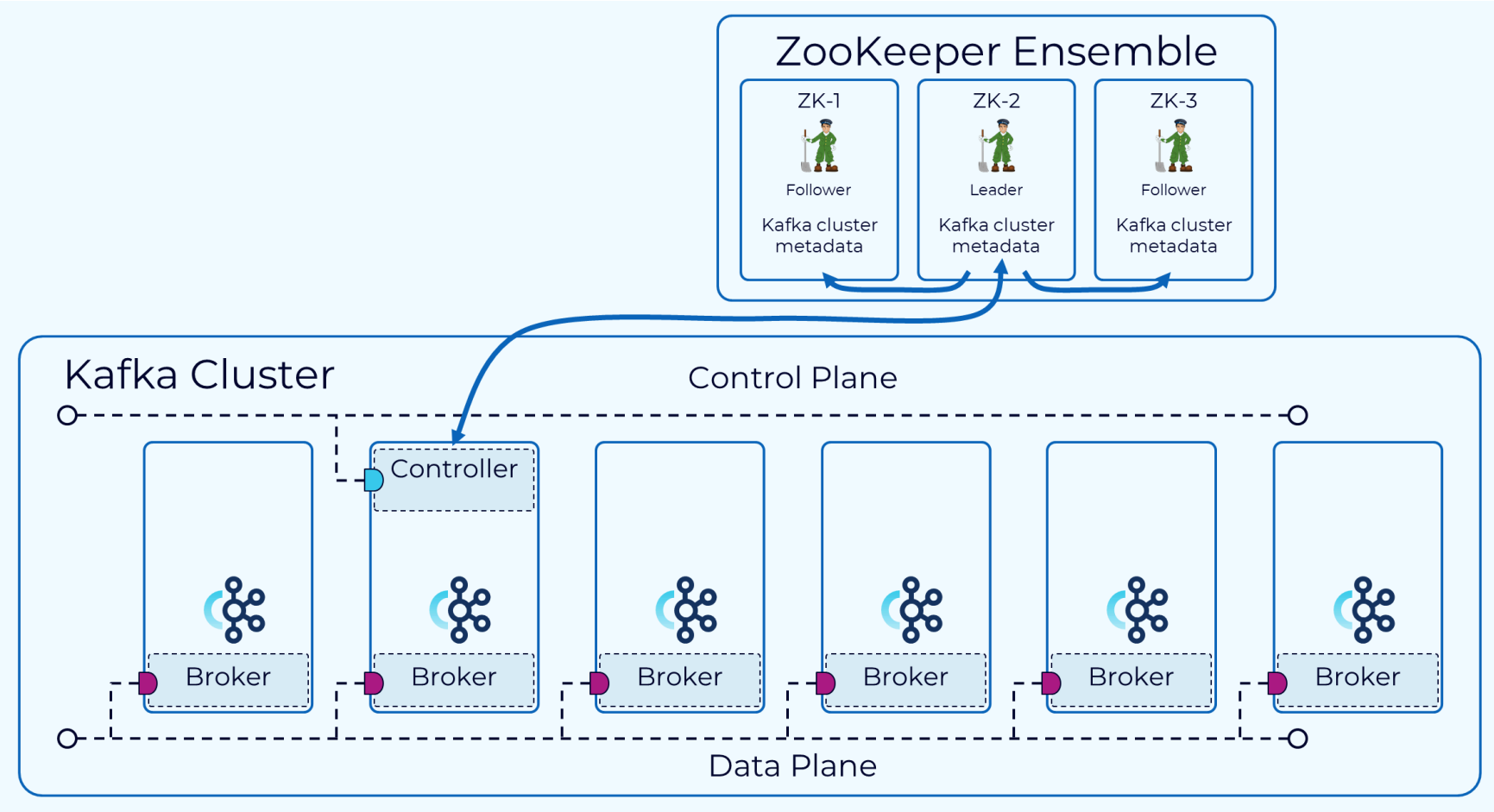
Apache Kafka

https://kafka.apache.org/
https://www.confluent.io/

Apache Kafka is an open-source distributed event streaming platform used by thousands of companies for high-performance data pipelines, streaming analytics, data integration, and mission-critical applications.

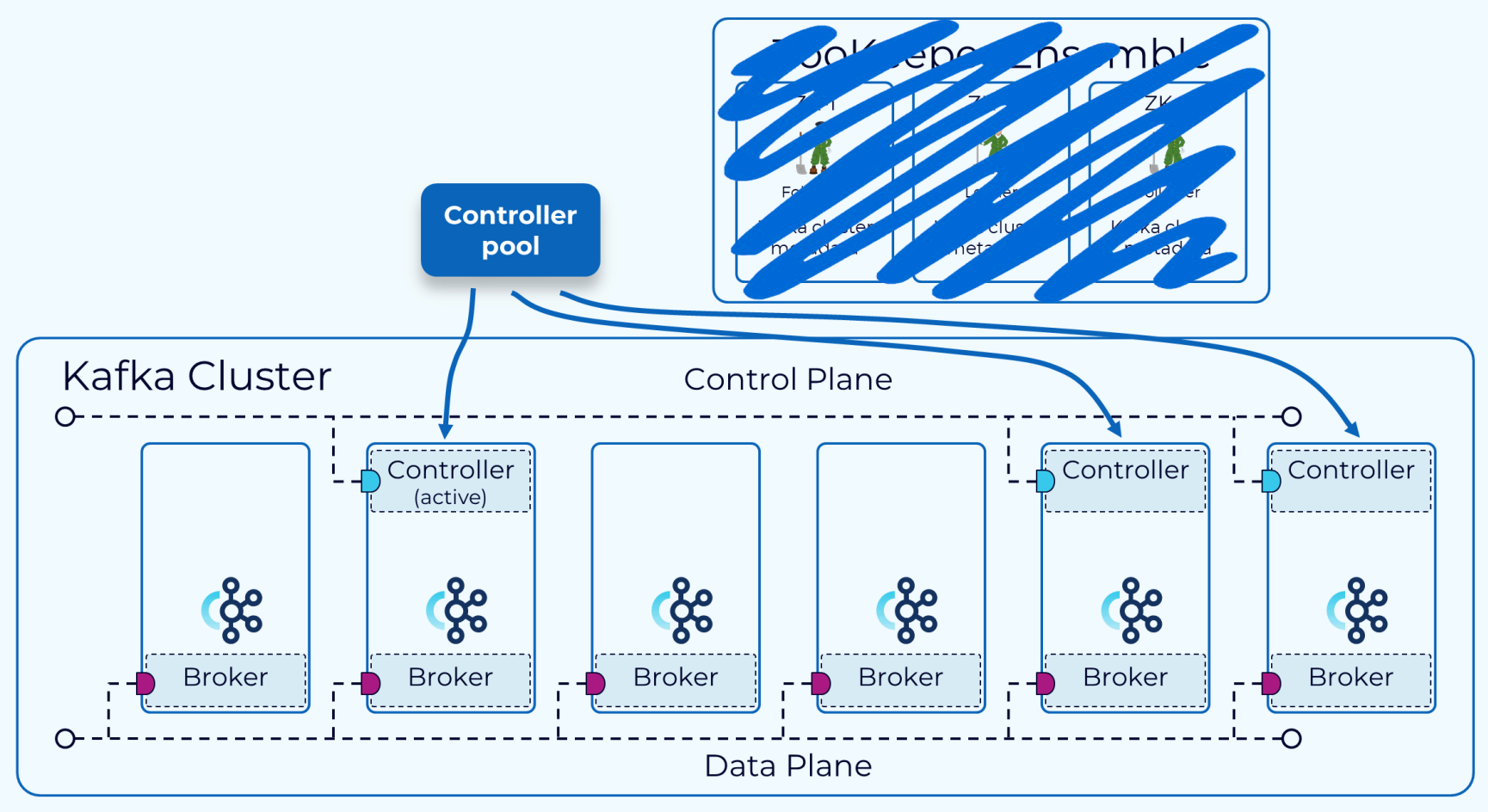

Brij Kishore Pandey
DON'T FORGET TO SAVE
TOP 5 KAFKA USE CASES
Data Streaming
kafka
Stream
Topic
Spark Streaming
ML Model
Log Aggregation
log
log
log
Connect
kafka
Spark
Message Queuing
Producer 1
Producer 2
Producer 3
Message A
Message B
Message C
kafka
Message C
Message B
Message A
Consumer 1
Consumer 2
Consumer 3
Web Activity Tracker
Connect
kafka
Spark
Data Replication
DB1
DB2
DB3
Connect
kafka
DB4
DB5
DB6

Kafka Architecture with ZooKeeper

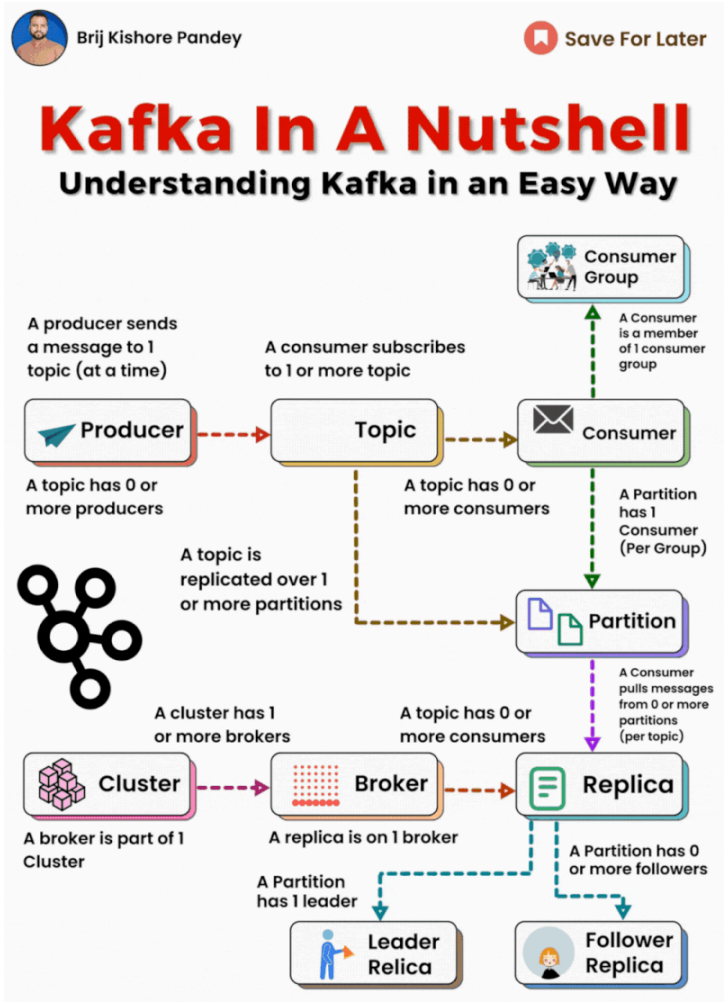


https://developer.confluent.io/courses/architecture/control-plane/

Kafka Architecture with Kraft



https://www.confluent.io/blog/what-is-kraft-and-how-do-you-use-it/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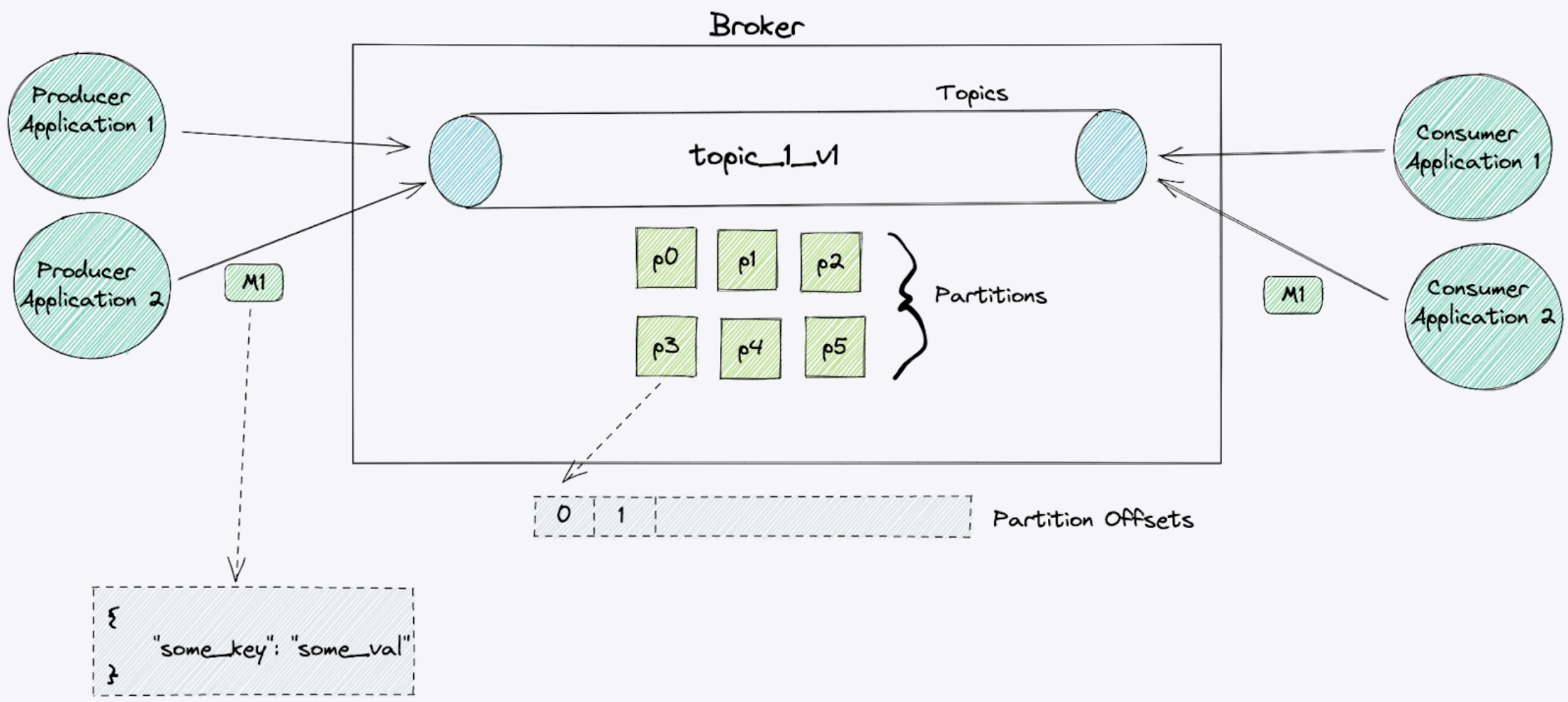
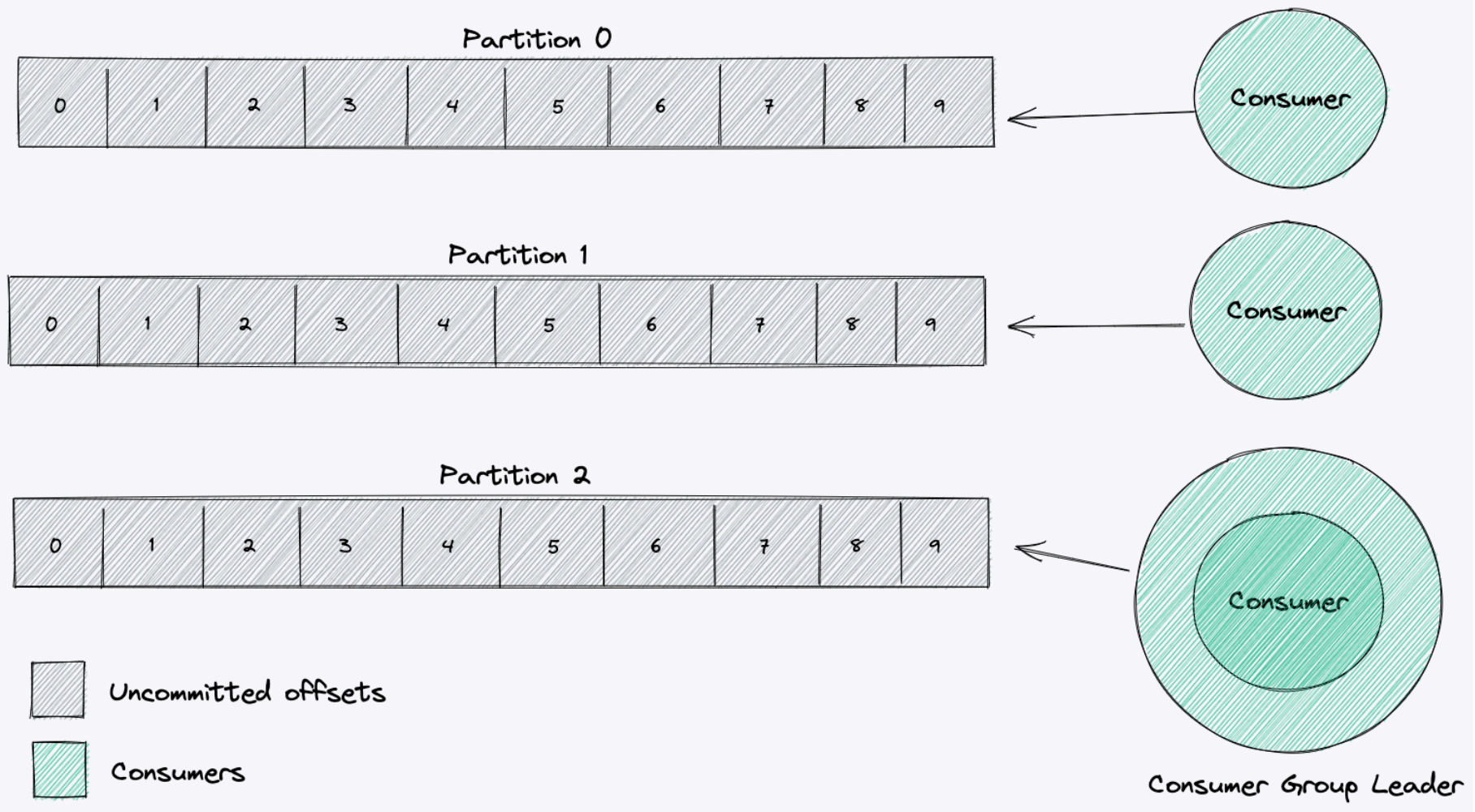
Save For Later
Kafka In A Nutshell
Understanding Kafka in an Easy Way
Consumer Group
A Consumer is a member of 1 consumer group
A producer sends a message to 1 topic (at a time)
A consumer subscribes to 1 or more topic
Producer
Topic
Consumer
A topic has 0 or more producers
A topic has 0 or more consumers
A Partition has 1 Consumer (Per Group)
A topic is replicated over 1 or more partitions
Partition
A Consumer pulls messages from 0 or more partitions (per topic)
A cluster has 1 or more brokers
A topic has 0 or more consumers
Cluster
Broker
Replica
A broker is part of 1 Cluster
A replica is on 1 broker
A Partition has 0 or more followers
A Partition has 1 leader
Leader Relica
Follower Replica

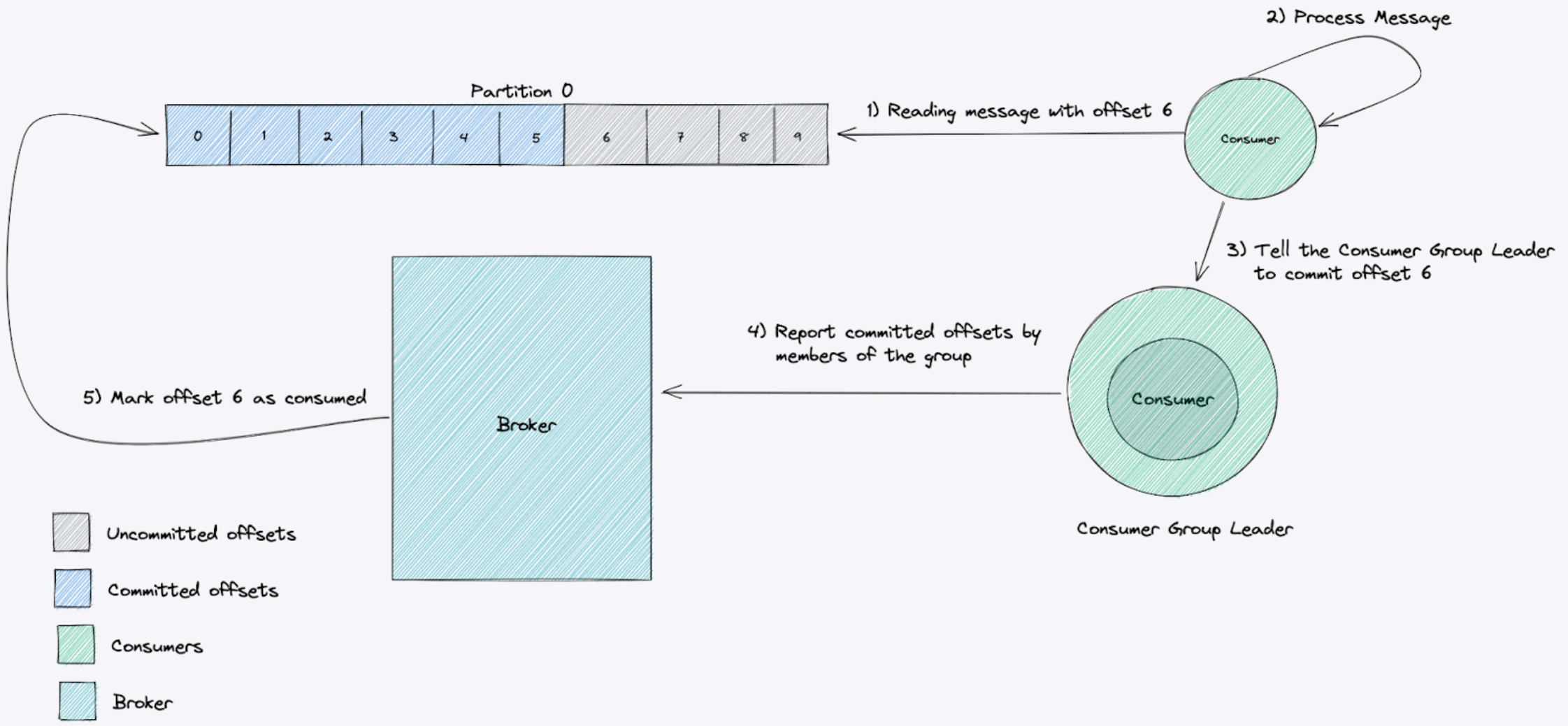
How Kafka works?



Kafka Partition

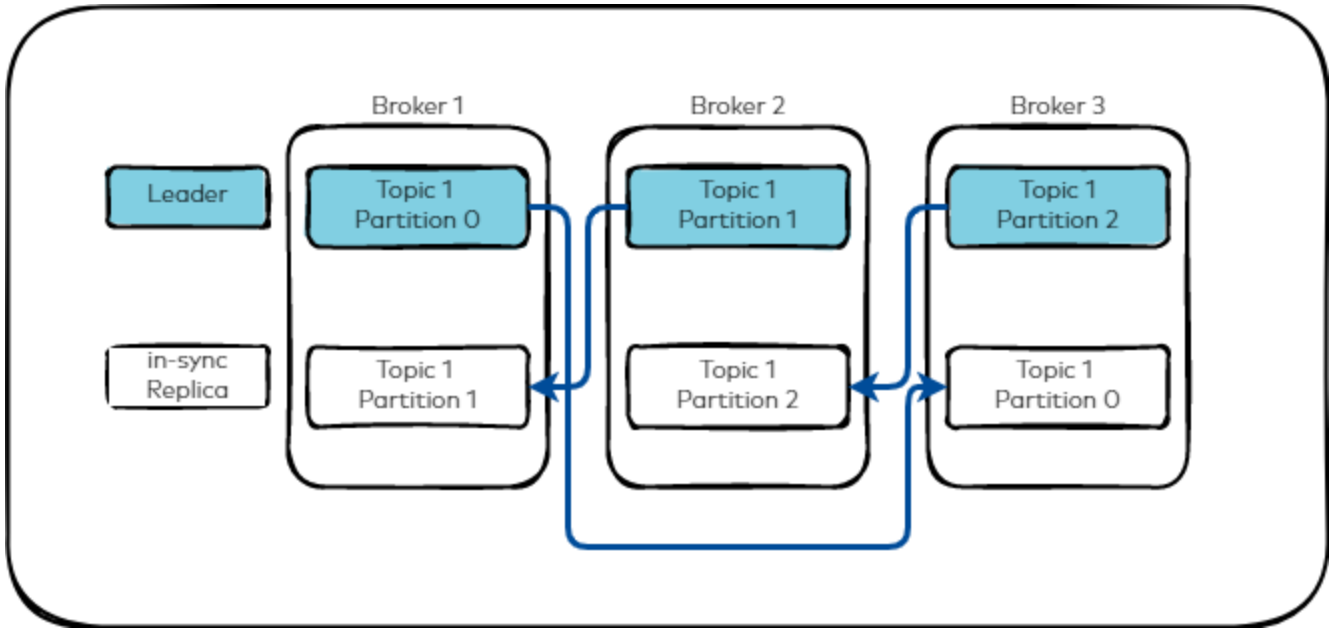


Committing


2) Process Message
Partition 0
0
1
2
3
4
5
6
7
8
9
1) Reading message with offset 6
Consumer
3) Tell the Consumer Group Leader to commit offset 6
4) Report committed offsets by members of the group
Consumer
Consumer Group Leader
5) Mark offset 6 as consumed
Broker
Uncommitted offsets
Committed offsets
Consumers
Broker

Brokers & Cluster

Replica & in-sync (ISR)



https://docs.confluent.io/kafka/design/replication.html

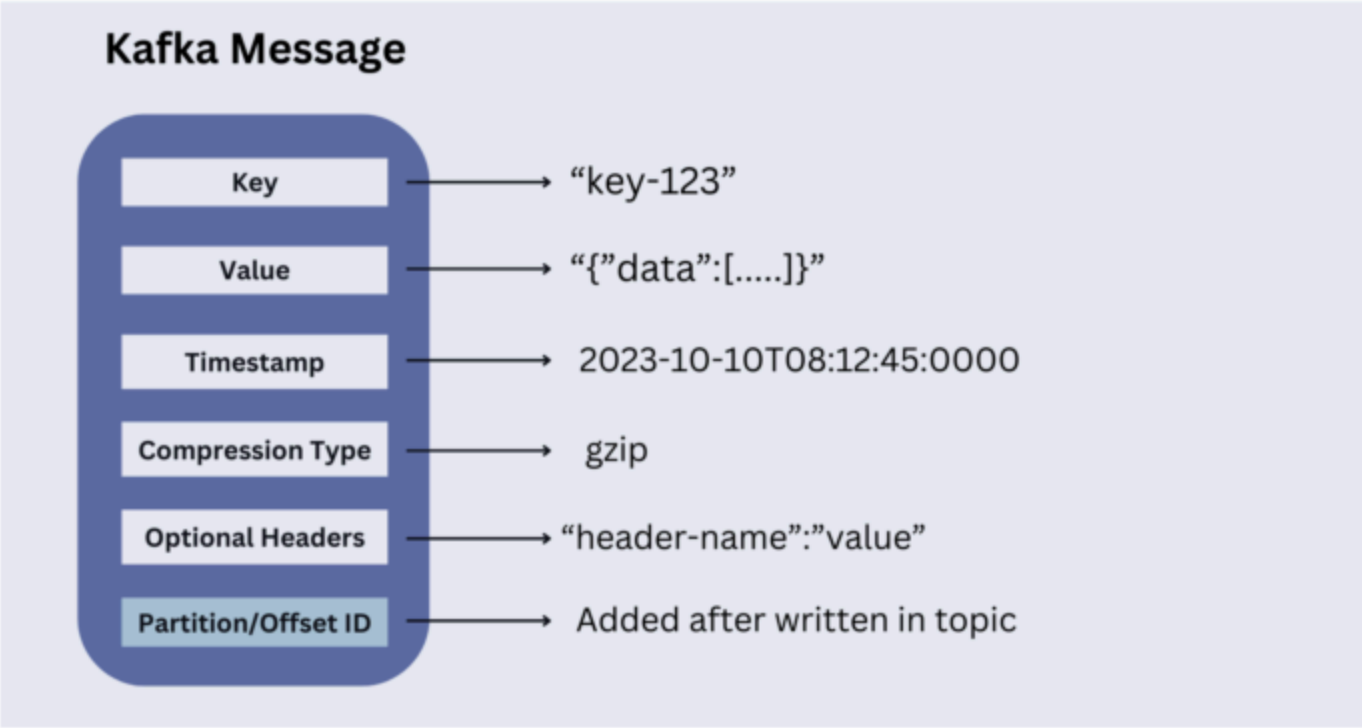
https://www.conduktor.io/kafka/kafka-topic-replication/

Kafka Topic Replication Factor

A replication factor of 1 means no replication. It is mostly used for development purposes and should be avoided in test and production Kafka clusters

A replication factor of 3 is a commonly used replication factor as it provides the right balance between broker loss and replication overhead.

Message


Kafka Message
Key
"key-123"
Value
"{"data":[.....]}"
Timestamp
2023-10-10T08:12:45:0000
Compression Type
gzip
Optional Headers
"header-name":"value"
Partition/Offset ID
Added after written in topic

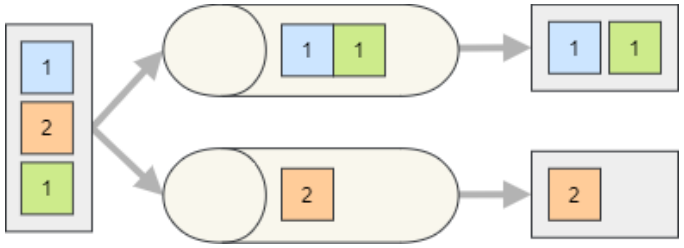
Partitioner

- Manual
- Random
- Hash
- RoundRobin

Key

Apache Kafka require a message key for different purposes, such as:

Partitioning: Kafka can guarantee ordering only inside the same partition and it is therefore important to be able to route correlated messages into the same partition. To do so you need to specify a key for each message and *Kafka will put all messages with the same key in the same partition*.



Compacting topics: A topic can be configured with cleanup.policy=compact to instruct Kafka to keep only the latest message related to a certain object, identified by the message key. In other words Kafka will retain only 1 message per each key value.

https://silverback-messaging.net/concepts/broker/kafka/kafka-partitioning.html?tabs=destination-partition-fluent%2Cenricher-fluent%2Cconcurrency-fluent%2Cassignment-fluent

Message Acknowledgments

acks = 0: ไม่รอคำตอบ

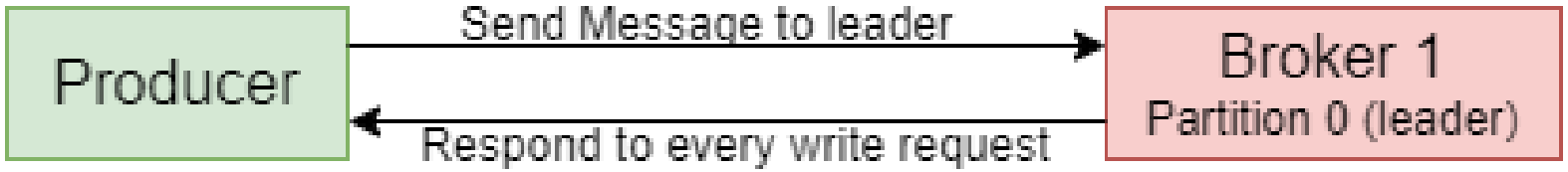
acks = 1: leader ตอบว่าได้รับ

acks = all: replica ยืนยันว่าได้รับ

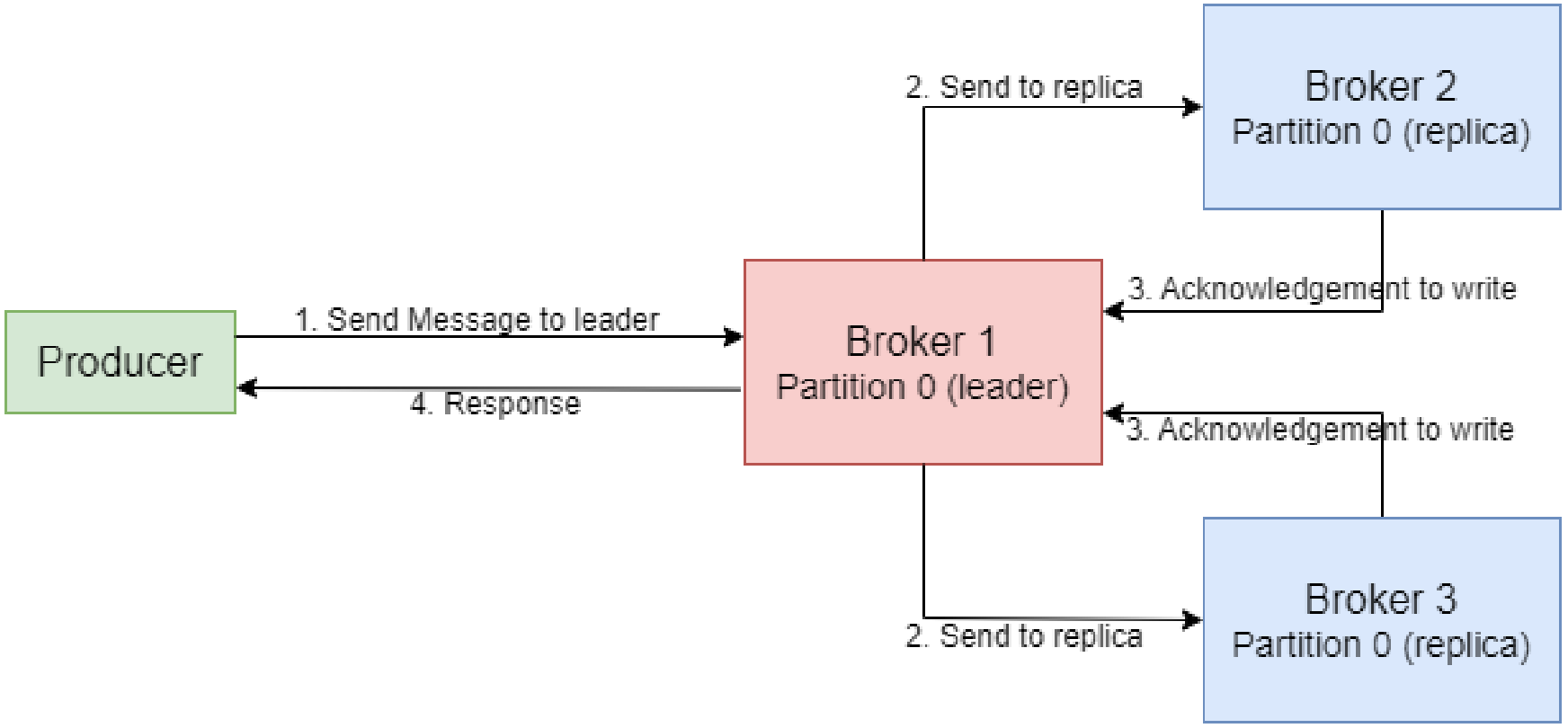
acks 0


Producer
1. Send Message to leader
Broker 1
Partition 0 (leader)

acks 1


Producer
Send Message to leader
Respond to every write request
Broker 1
Partition 0 (leader)

acks all


Producer
1. Send Message to leader
4. Response
Broker 1
Partition 0 (leader)
2. Send to replica
Broker 2
Partition 0 (replica)
3. Acknowledgement to write
2. Send to replica
Broker 3
Partition 0 (replica)
3. Acknowledgement to write

Message Delivery Guarantees

> "Kafka messaging provides a guarantee of at-least-once delivery by default.""

At most once: Messages are delivered once, and if there is a system failure, messages may be lost and are not redelivered.

At least once: This means messages are delivered one or more times. If there is a system failure, messages are never lost, but they may be delivered more than once.

Exactly once: This is the preferred behavior in that each message is delivered once and only once. Messages are never lost or read twice even if some part of the system fails.

Producers

Sync & Async

1. Sync Producer Acks = 0 (Fire and Forget)
2. Sync Producer Acks = 1 or Acks = all
3. Async Producer

Consumer rule

The rule in Kafka is a maximum of 1 consumer per partition (as each partition must only be allocated to 1 consumer), so you can only have as many consumers (in a single consumer group) as there are partitions for a topic, but you can also have less. This means that in practice consumers can process records from 1 or more partitions. The maximum throughput will be achieved with 1 consumer per partition, or as many consumers are there are partitions.

https://www.instaclustr.com/blog/kafka-parallel-consumer-part-1/

Thread Safety and Slow Consumers

Kafka consumers are not thread safe—you can't share a consumer instance among multiple threads. On the other hand, Kafka producers are thread-safe and can be shared among multiple threads.

The default Kafka consumer is only single-threaded, so it can only process records sequentially, with committing done automatically upon successful record processing. This works fine if the processing time is close to 0 but becomes a problem if the processing time is longer—so-called "slow consumers". Basically, each record has to wait in line to be processed, which increases the end-to-end latency of the records.

any problems

https://medium.com/cloud-native-daily/how-i-dealt-with-the-kafka-issue-8c8e98fa1759

Kafka library in Go

https://github.com/confluentinc/confluent-kafka-go

confluent-kafka-go is a lightweight wrapper around librdkafka, a finely tuned C client.

https://github.com/IBM/sarama

Pure Go

https://github.com/segmentio/kafka-go

Sarama

Spotify -> IBM

Compatibility and API stability

Sarama provides a "2 releases + 2 months" compatibility guarantee: we support the two latest stable releases of Kafka and Go, and we provide a two month grace period for older releases. However, older releases of Kafka are still likely to work.

Workshop

1. Sync Producer
2. Async Producer
3. Consumer Group

Pull code

```
docker-compose up
```

Kafka-UI

http://localhost:8080

Sarama Tools

https://github.com/IBM/sarama/tree/v1.43.0/tools

kafka-console-producer: a command line tool to produce a single message to your Kafka custer.
kafka-console-consumer: a command line tool to consume arbitrary partitions of a topic on your Kafka cluster.
kafka-producer-performance: a command line tool to performance test producers (sync and async) on your Kafka cluster.

Sarama Mocks

https://pkg.go.dev/github.com/IBM/sarama/mocks

Sync Producer & Simple Consumer

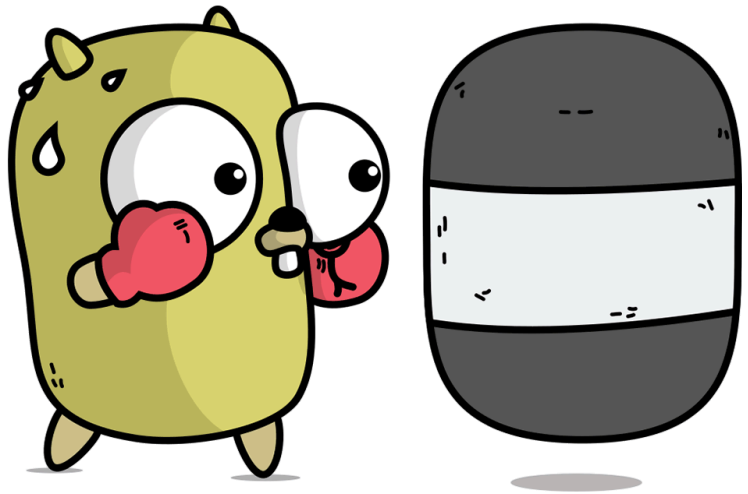
1 Broker

1 Partition

Partition

3 Brokers

1 Partion



Replica

3 Brokers

3 Partitions

Create topic via Kafka-UI

- 1 Replica
- 2 Replicas
- 3 Replicas

Consumer Group

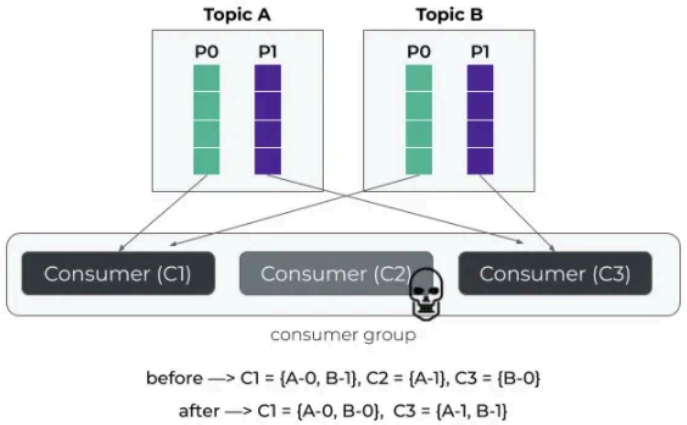
Consumer Group Rebalance GroupStrategies

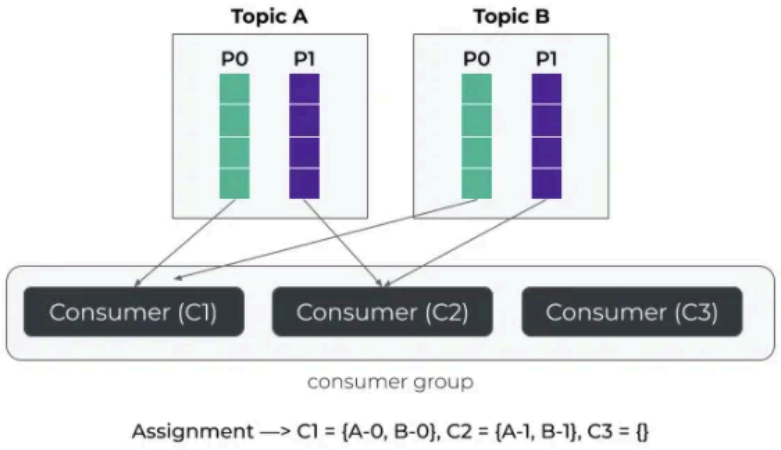
- RoundRobinAssignor Strategy
- StickyAssignor Strategy (ขยับน้อยสุด)

  C1 = {A0, B1}, C2 = {A1}, C3= {B0} -> C1 = {A0, B1}, C3= {A1, B0}

- RangeAssingor Strategy (default)

  The “Range Assignment Strategy” aims to sort topic partitions in numeric order and also sort the consumers in lexicographic order.





Rebalancing

https://medium.com/trendyol-tech/rebalance-and-partition-assignment-strategies-for-kafka-consumers-f50573e49609

https://www.linkedin.com/pulse/kafka-consumer-group-rebalance-1-2-rob-golder/

https://www.linkedin.com/pulse/kafka-consumer-group-rebalance-2-rob-golder/

Scenario

start no 1 consumer group

start no 2 consumer group

down no 1

start no 1

start no3

Graceful

Test & Mock