



Apache Kafka on AWS

Amazon Managed Streaming for Apache Kafka

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About me

- Software Architect / DevOps Engineer
- Technical Evangelist @ AWS
- Published an AWS book
- Containers, serverless and a sprinkle of ML & big / fast data



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- Modern Streaming Architectures
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- Apache Kafka or Amazon Kinesis?
- Q & A

Streaming Data

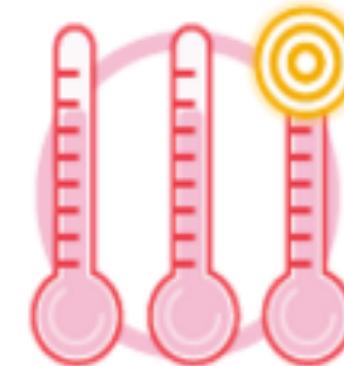


Streaming Data

Continuously generated, small size events,
low latency requirements



Web Clickstream

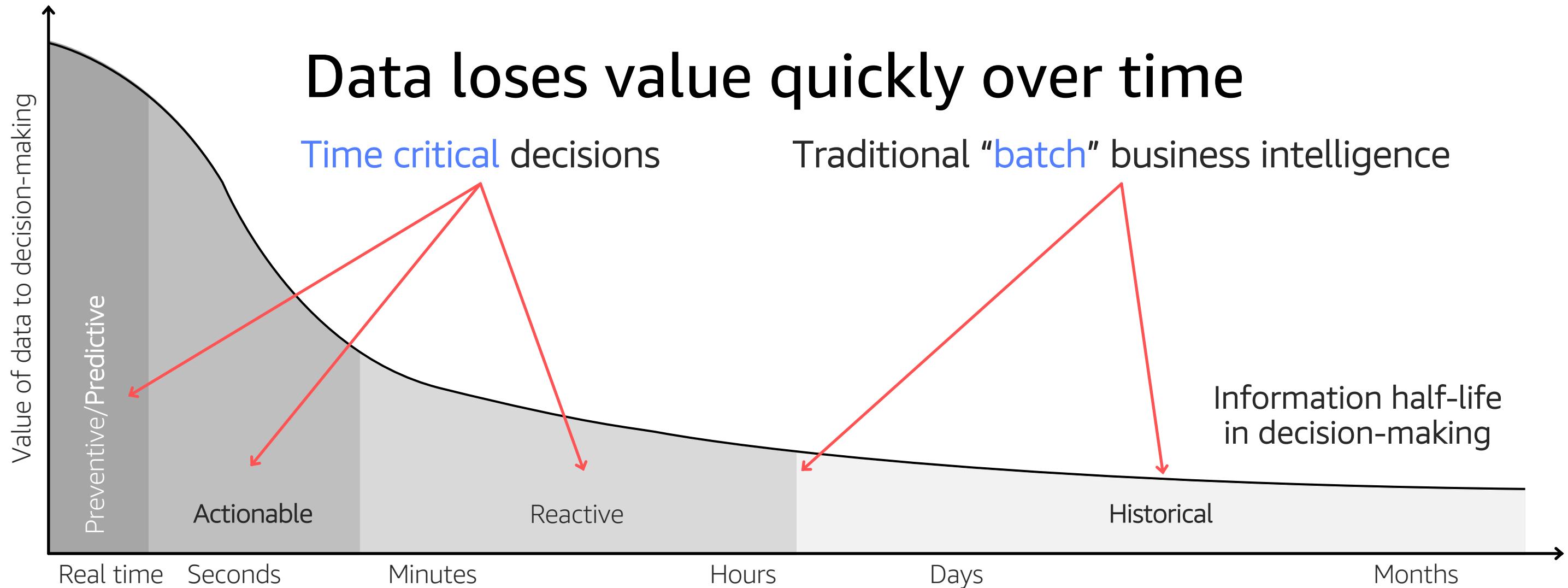


IoT Sensors

```
[Wed Oct 11 14:32:52  
2018] [error] [client  
127.0.0.1] client  
denied by server  
configuration:  
/export/home/live/ap/ht  
docs/test
```

Application Logs

Timely Decisions



Source: Perishable insights, Mike Gualtieri, Forrester

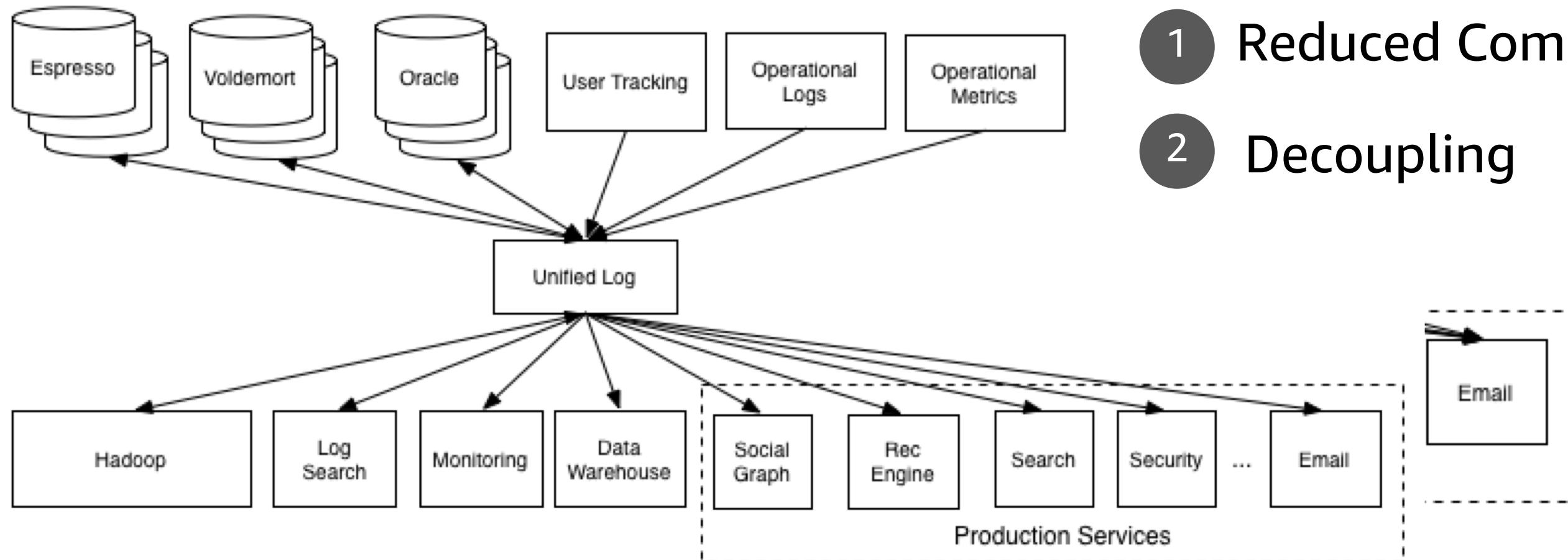
Less Surreal, Modern Architectures

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How Kafka Started: LinkedIn



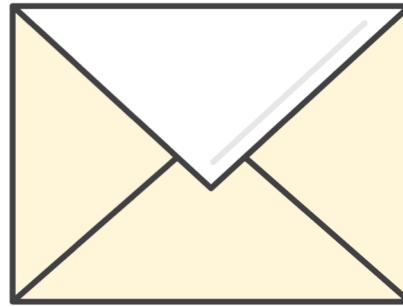
Better Decoupling: Microservices

Event Sourcing



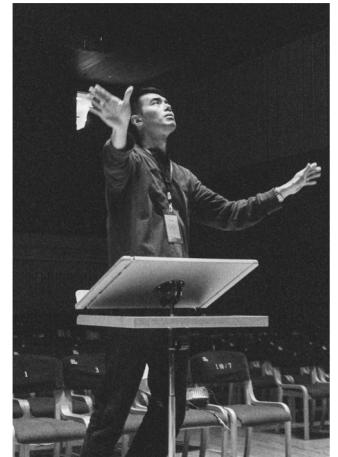
Keep **time-ordered**,
processable sequence
of **events** instead of
only state

CQRS



Separates **read** (query)
from **write** (command)
operations. Writes are
event sourced.

Choreography



Events that trigger
actions (**choreography**)
can replace a centralised
workflow (**orchestration**)

Kafka as Data or Event Store

The New York Times

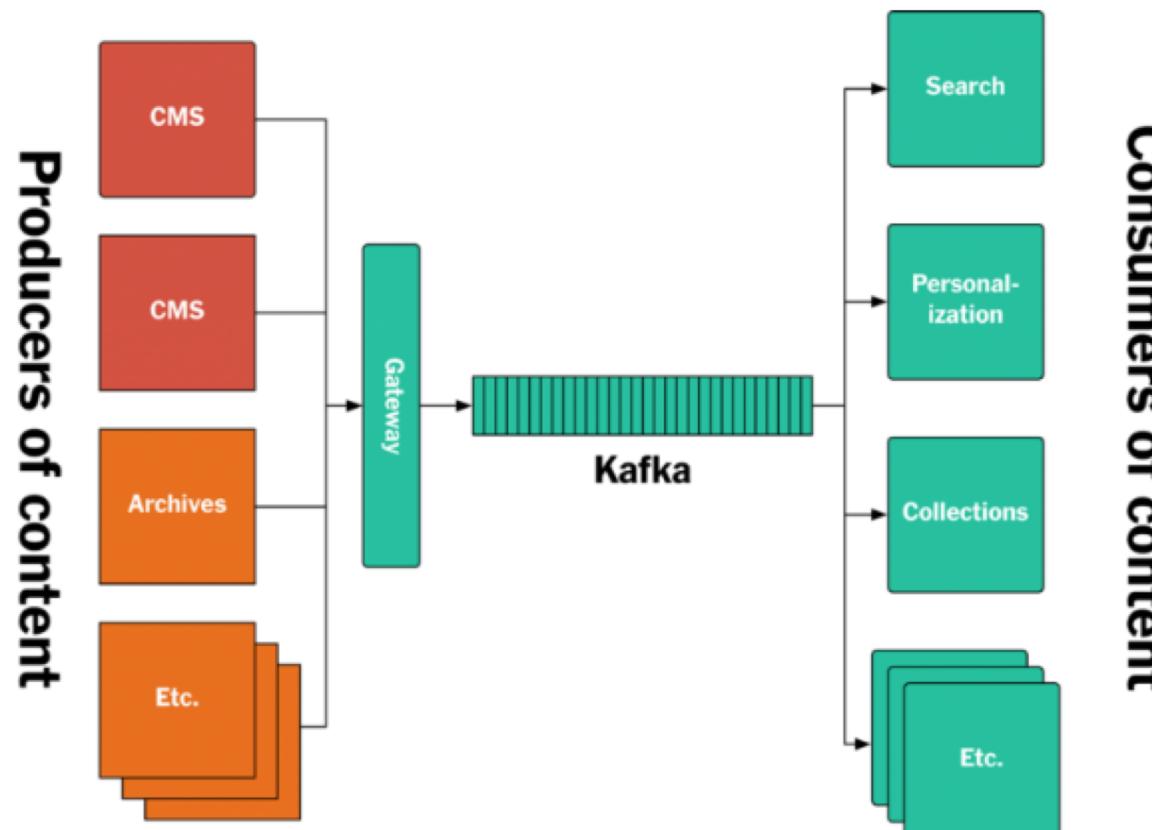


Figure 1: The new New York Times log/Kafka-based publishing architecture.

Kafka stores every article since 1851

Multiple content producers and consumers.

New consumers added without any changes in system

`log.retention.hours = -1`

<https://www.confluent.io/blog/publishing-apache-kafka-new-york-times/>

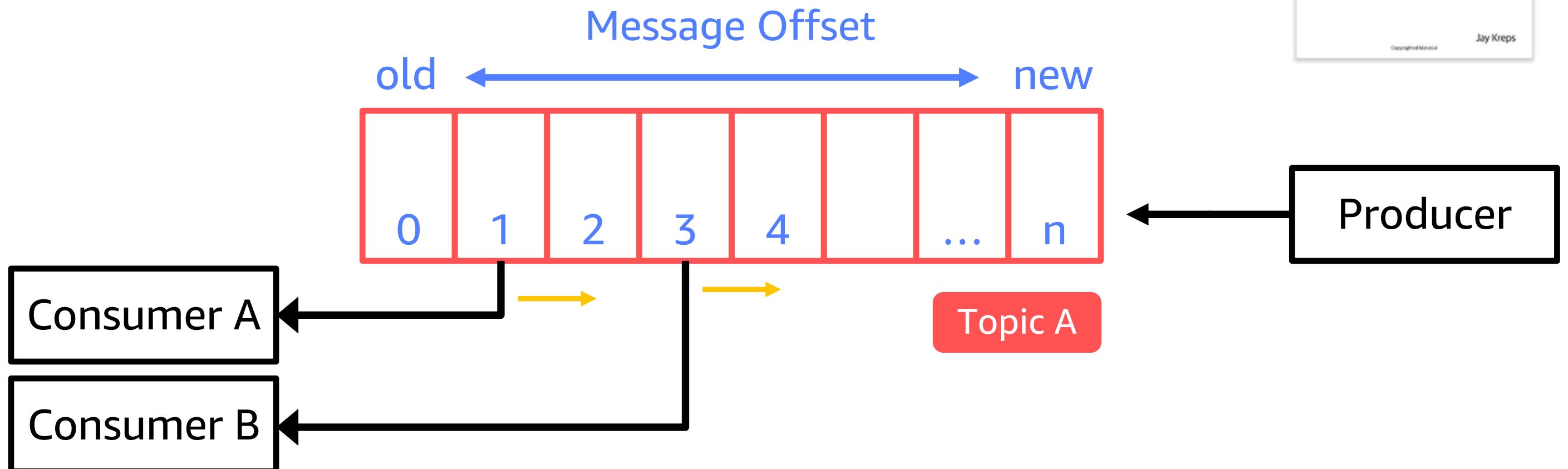
Apache Kafka



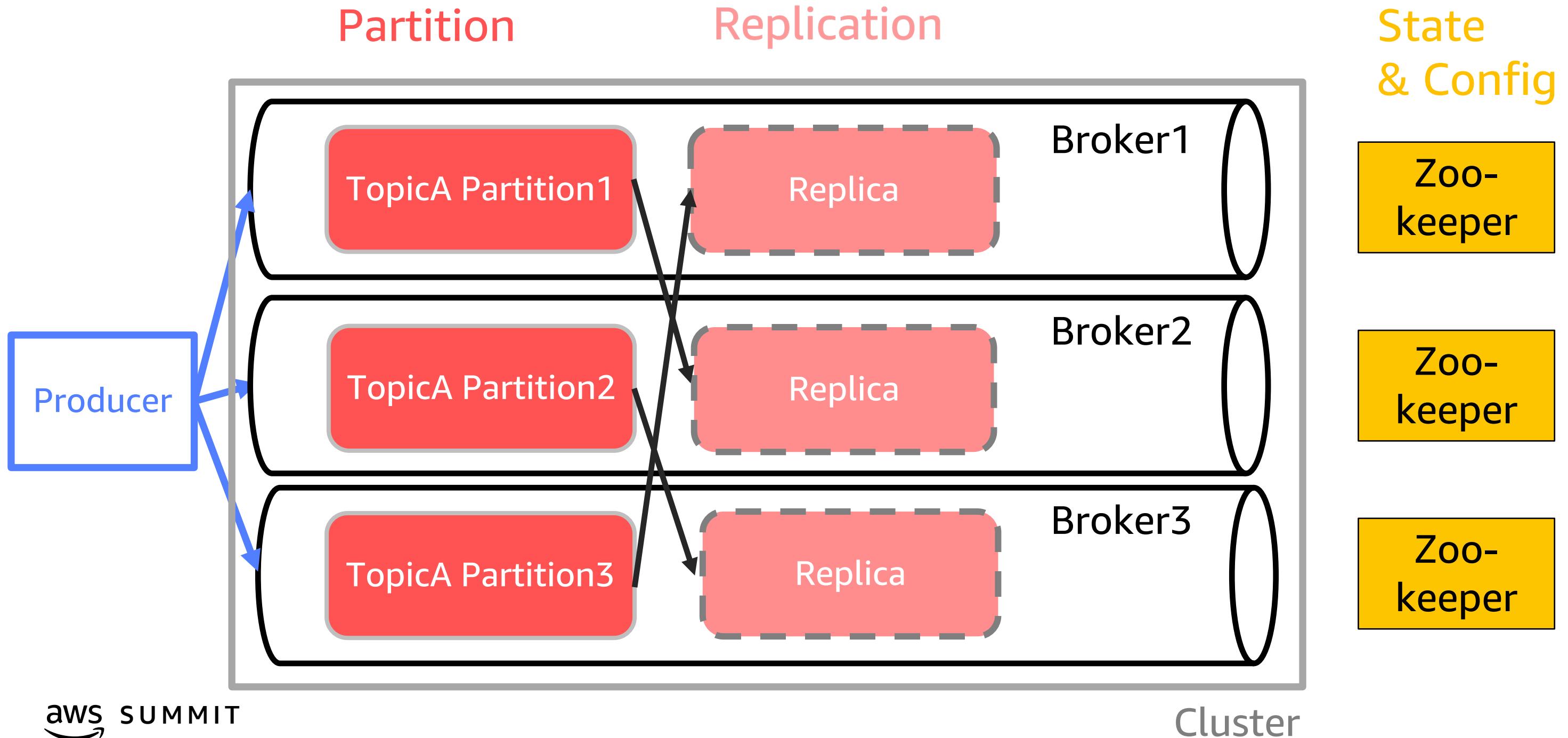
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Commit Log



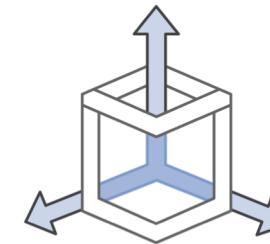
Partitioned, Replicated Commit Log



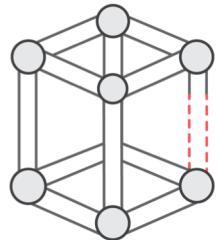
Challenges Operating Apache Kafka



Difficult to setup,
configure and operate



Tricky to scale



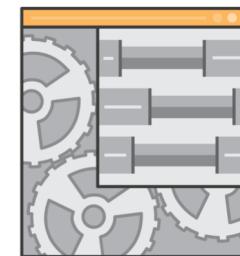
Hard to achieve high
availability



AWS integrations

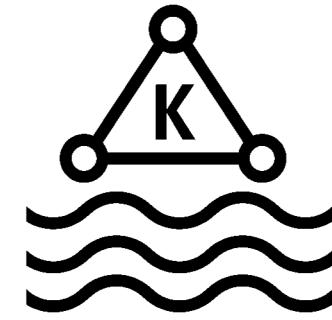
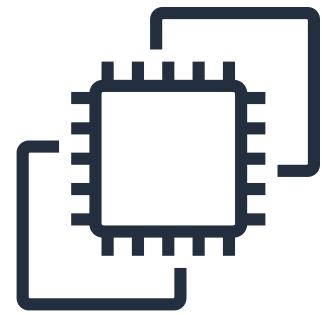


No console, no visible
metrics



Operational
experience

How to run Apache Kafka on AWS?



Self managed on EC2

On top of Kubernetes,
e.g. as K8s operator

Amazon Managed
Streaming for Kafka

(this talk!)

Amazon Managed Streaming for Apache Kafka (MSK)



Apache Zookeeper (ZK) ?



Zookeeper runs under the hood

ZK is set up highly available

No additional cost

Getting started with Amazon MSK is easy!

MSK > Clusters > Create cluster

Create Kafka cluster

General

Cluster name
You can't change it after you create the cluster.
 The name must be unique and can have a maximum of 64 characters.

VPC
Defines the virtual networking environment for this cluster. You can't change this setting after you create the cluster.

Apache Kafka version
Software version for deployed Kafka brokers.
 2.1.0
 1.1.1

Availability Zones
Specify where Kafka brokers are deployed in your VPC.

Number of Availability Zones
Specifies the number of isolated zones in which brokers are distributed. You can't decrease this number.

First Availability Zone

Availability Zone

Subnet
Brokers will be hosted in this subnet.

Advanced settings
To further customize advanced settings, use the CLI to create the cluster. [Learn more](#)

Cluster settings
 Use default settings
 Customize settings

Broker instance type

 (selected)

Apache Kafka configuration
Default

```
fmunz@aws:~$ aws kafka list-clusters --region eu-west-1

CLUSTERINFORLIST arn:aws:kafka:eu-west-1:412249827738:cluster/kafkaOne/00ae5035-ed6476882b25-2
    kafkaOne 2019-02-20T10:53:20.009Z K13V1IB3VIYZZH DEFAULT 6 ACTIVE
        172.31.4.240:2181,172.31.44.125:2181,172.31.20.136:2181

BROKERNODEGROUPINFO DEFAULT kafka.m5.xlarge
CLIENTSUBNETS subnet-c5b93aa3
CLIENTSUBNETS subnet-0f61f247
CLIENTSUBNETS subnet-3cf33e66
SECURITYGROUPS sg-b4fb0bc8
EBSSTORAGEINFO 1000
CURRENTBROKERSOFTWAREINFO 2.1.0
ENCRYPTIONATREST arn:aws:kms:eu-west-1:412249827738:key/c329b7ab-f3a4-e5f86ffdc29b
```

Security

Data is always encrypted at rest and can be encrypted in transit

Encryption

Encrypt data in transit

Use the Transport Layer Security (TLS) protocol to encrypt data as it travels between brokers within the cluster and as it travels between Apache Kafka clients and the cluster.

Within the cluster

Enable encryption within the cluster

Between clients and brokers

Only TLS encrypted traffic allowed

Both TLS encrypted and plaintext traffic allowed

Only plaintext traffic allowed

i Enabling encryption for data in transit affects streaming performance. [Learn more](#)

Encrypt data at rest

You can use AWS Key Management Service (KMS) to create and manage customer master keys (CMKs). MSK uses CMKs to encrypt your data at rest. [Learn more](#)

Use AWS managed CMK
The AWS managed CMK (aws/kafka) is a CMK in your account that is created, managed, and used on your behalf by MSK.

Use customer managed CMK
Customer managed CMKs are CMKs in your AWS account that you create, own, and manage.

Cluster Wide Storage Scaling

The screenshot shows the 'Update storage for kafkaFour' dialog box. At the top, there's a breadcrumb navigation: 'Amazon MSK > Clusters > kafkaFour > Update storage'. Below the title, a 'Storage' section contains a field for 'EBS storage volume per broker' set to '1000 GiB'. A note below the field specifies 'Minimum: 1000 GiB, maximum: 16384 GiB'. A warning message in a box states: '⚠ The amount of time required to update storage depends on the size of your cluster. No other updates can be made to the cluster while storage is being updated.' It includes a 'Learn more' link. At the bottom are 'Cancel' and 'Save changes' buttons.

```
aws kafka update-broker-storage --cluster-arn ClusterArn --current-version Current-Cluster-Version --target-broker-ebs-volume-info '{"KafkaBrokerNodeId": "All", "VolumeSizeGB": Target-Volume-in-GiB}'
```

You can increase storage after creation but not decrease it



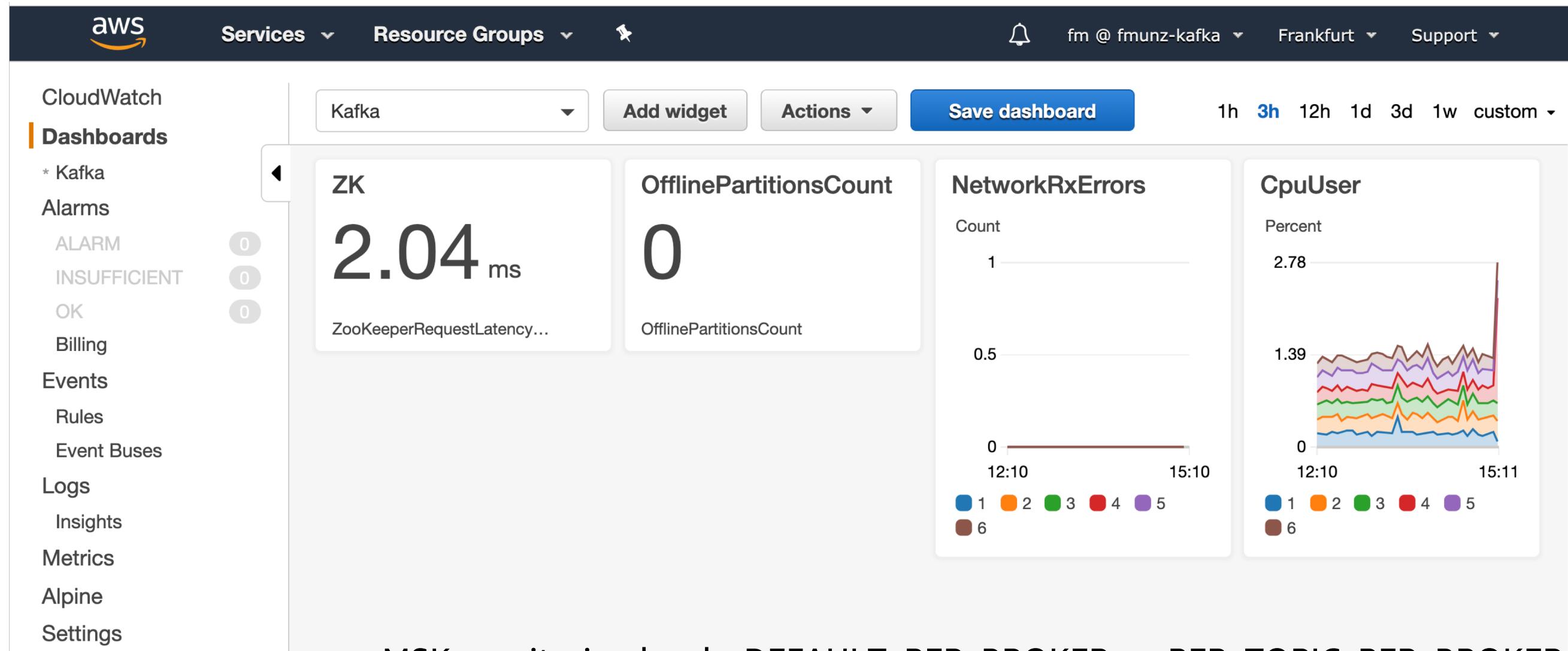
Cloud Formation Support for MSK

```
---
Description: "MSK Cluster with required properties."
Resources:
  TestCluster:
    Type: "AWS::MSK::Cluster"
    Properties:
      ClusterName: "ClusterWithRequiredProperties"
      KafkaVersion: "2.1.0"
      NumberOfBrokerNodes: 3
      BrokerNodeGroupInfo:
        InstanceType: "kafka.m5.large"
        ClientSubnets:
          - "ReplaceWithSubnetId1"
          - "ReplaceWithSubnetId2"
          - "ReplaceWithSubnetId3"
```

<https://docs.aws.amazon.com/AWSCloudFormation/latest/UserGuide/aws-resource-msk-cluster.html>



CloudWatch Integration



MSK monitoring levels: DEFAULT, PER_BROKER, or PER_TOPIC_PER_BROKER

<https://docs.aws.amazon.com/msk/latest/developerguide/monitoring.html>

Custom Configuration Option

Default configuration for brokers, topics, and Apache ZooKeeper nodes:

Default Configuration Values

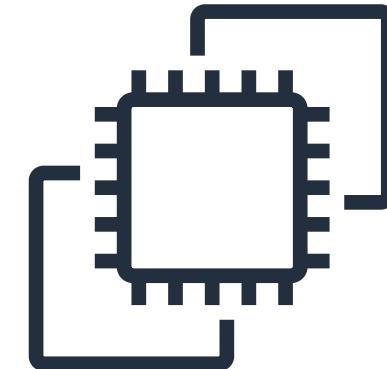
Name	Description	Default Value
num.network.threads	The number of threads that the server uses for receiving requests from the network and sending responses to the network.	5
num.io.threads	The number of threads that the server uses for processing requests, which may include disk I/O.	8L
num.replica.fetchers	Number of fetcher threads used to replicate messages from a source broker. Increasing this value can increase the degree of I/O parallelism in the follower broker.	2L
socket.send.buffer.bytes	The SO_SNDBUF buffer of the socket sever sockets. If the value is -1, the OS default will be used.	102400L
socket.receive.buffer.bytes	The SO_RCVBUF buffer of the socket sever sockets. If the value is -1, the OS default will be used.	102400L
socket.request.max.bytes	The maximum number of bytes in a socket request.	104857600L
num.partitions	The default number of log partitions per topic.	1
auto.create.topics.enable	Enable auto creation of topic on the server.	false
default.replication.factor	Default replication factors for automatically created topics.	3
min.insync.replicas	When a producer sets acks to "all" (or "-1"), min.insync.replicas specifies the minimum number of replicas that must acknowledge a write for the write to be considered successful. If this minimum cannot be met, then the producer will raise an exception (either NotEnoughReplicas or NotEnoughReplicasAfterAppend). When used together, min.insync.replicas and acks allow you to enforce greater durability guarantees. A typical scenario would be to create a topic with a replication factor of 3, set min.insync.replicas to 2, and produce with acks of "all". This will ensure that the producer raises an exception if a majority of replicas do not receive a write.	2
unclean.leader.election.enable	Indicates whether to enable replicas not in the ISR set to be elected as leader as a last resort, even though doing so may result in data loss.	true
auto.leader.rebalance.enable	Enables auto leader balancing. A background thread checks and triggers leader balance if required at regular intervals.	true
allow.everyone.if.no.acl.found	If no resource patterns match a specific resource, then the resource has no associated ACLs. In this case, if this property is set to true, everyone is allowed to access the resource, not just the super users.	true
zookeeper.set.acl	Set client to use secure ACLs.	false

You can create custom configurations and use them for cluster creation

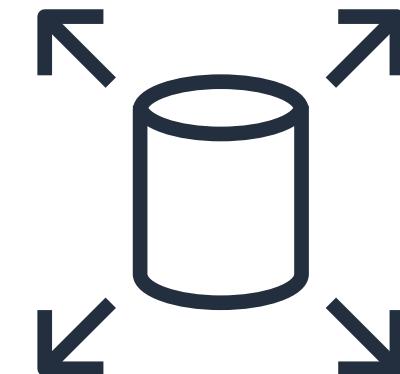


MSK Pricing

On-demand, hourly pricing for broker and storage prorated to the second:



kafka.m5.large
\$0.21/hr



\$0.10 per GB-month

You **don't pay** for the number of topics or replication traffic or ZK.

Amazon Kinesis or Managed Streaming for Apache Kafka?



Amazon Kinesis

Real-time data streaming and analytics

Easily collect, process, and analyze streams in real time

Kinesis Video Streams



Capture, process,
and store video
streams for
analytics

Kinesis Data Streams



Build custom
applications that
analyze data
streams

Kinesis Data Firehose



Load data streams
into AWS data
stores

Kinesis Data Analytics



Analyze data streams
with SQL or **Java**

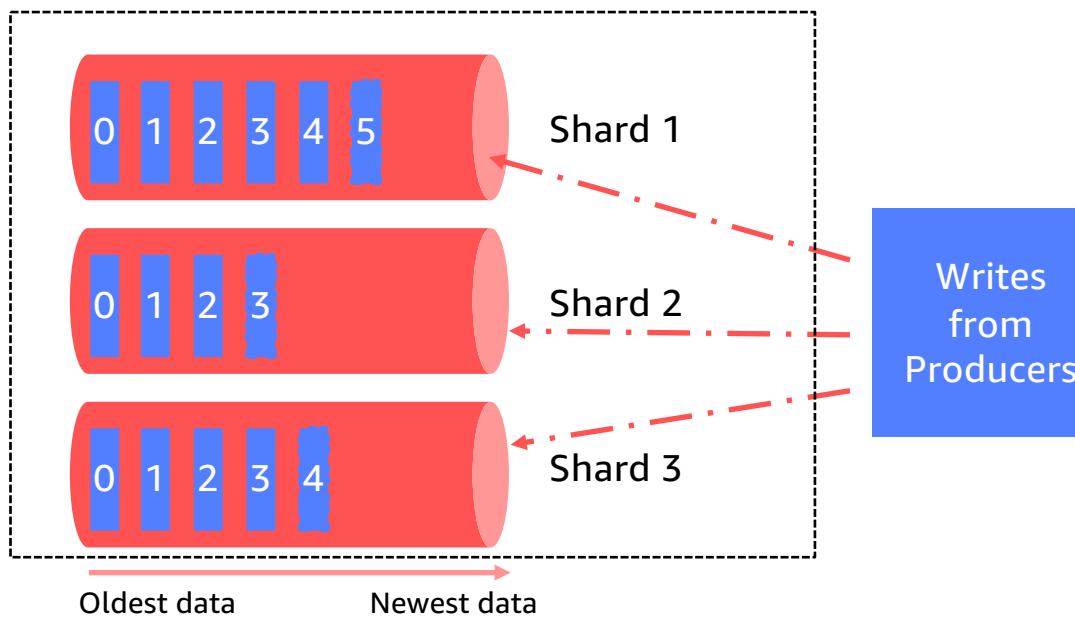
NEW!

Comparing Amazon Kinesis Data Streams to MSK



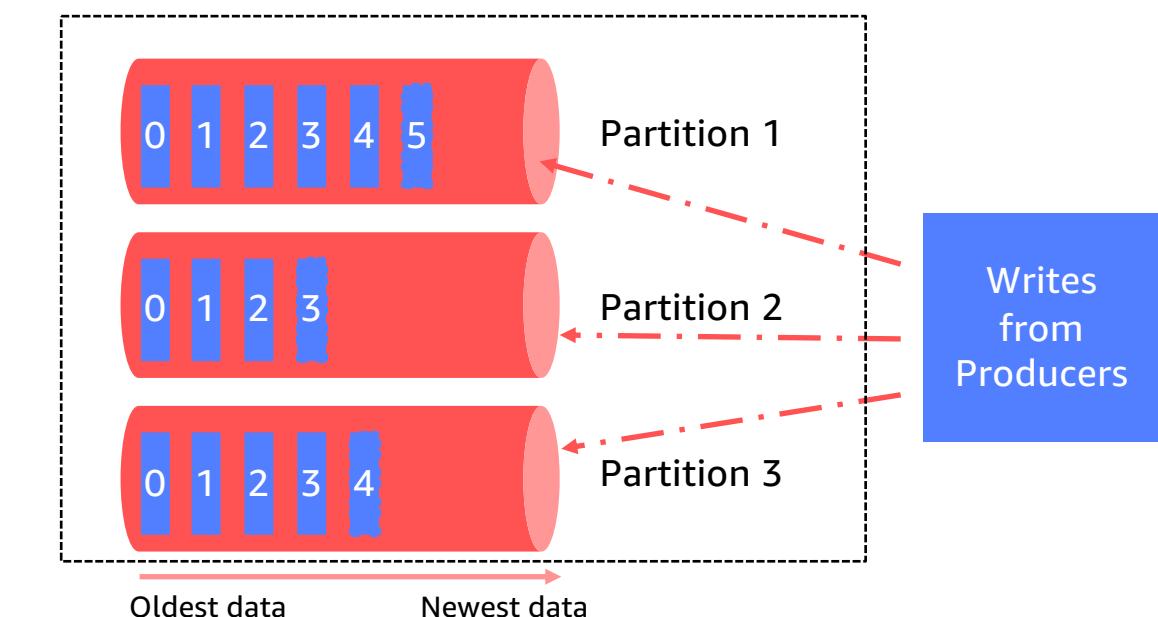
Amazon Kinesis Data Streams

Stream with 3 shards

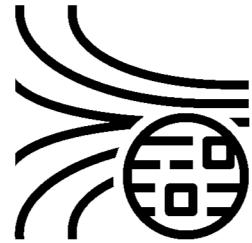


Amazon MSK

Topic with 3 partitions



Amazon Kinesis Data Streams



AWS API

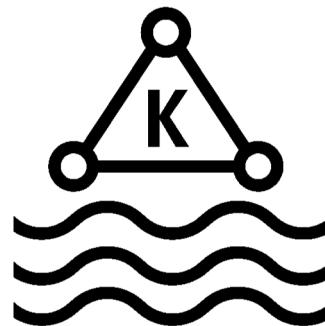
Throughput Provisioning Model

Seamless Scaling

Retention Time 1d (max 7d)

Deep AWS Integration

Apache Kafka



Open-Source

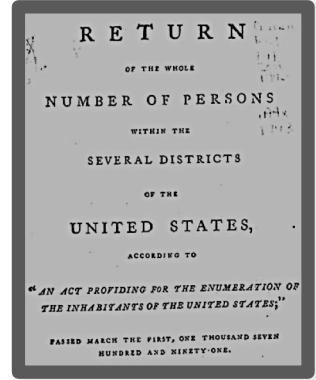
Cluster Provisioning Model

Scaling not seamless to client

Retention 7d (max is unlimitted)

Strong 3rd party tooling

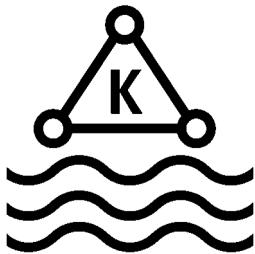
Conclusion



Streaming is about actionable data



Apache Kafka is an open-source, versatile, and popular streaming platform



Managed Streaming for Kafka (MSK):
We run Apache Kafka for you

aws SUMMIT

Go build with MSK or Kinesis

Additional Resources



bit.ly/aws-kafka

aws SUMMIT

Apache Kafka Resources



Frank Munz

Jun 27 · 1 min read

In this article I like to list some resources that you might useful when starting with Apache Kafka on AWS.

- Let's start with the Amazon MSK launch video from re:Invent 2018



- There are some newer slide sets than the one used at re:Invent available from AWS Summit presentations and some other events. It covers streaming in general, i.e. Amazon Kinesis and MSK. You can find them at [my speaker deck account](#).

Thank you!



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