Event-Driven Enterprise

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Agenda

Why are events important to an enterprise

Event ingestion and distribution

Streaming analytics

Serverless runtimes

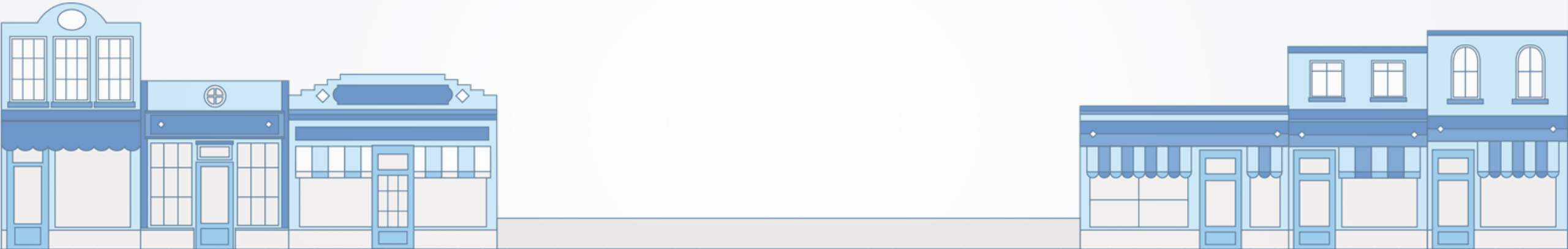
Managed event streams

Using events to provide engaging customer experiences

Phone company has existing data around customers' usage and buying preferences

Combined with events generated when phones connect to in-store wi-fi

Enables a more engaging and personal customer experience



Anatomy of a microservices application

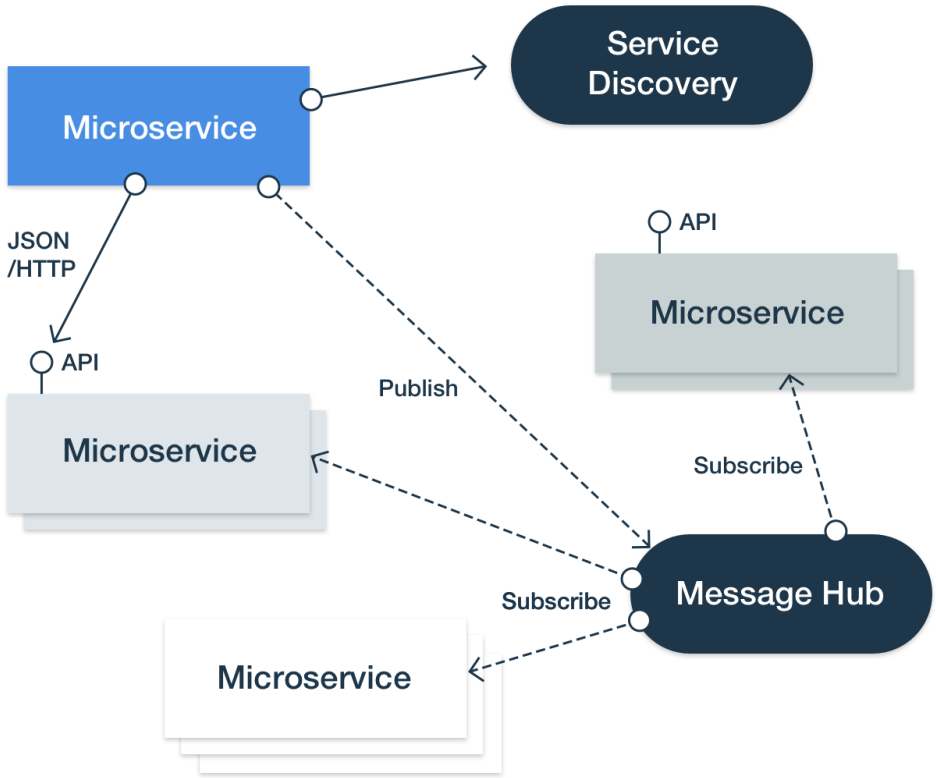
Event-driven interactions between microservices promotes decoupling for robustness and scale

Messaging where possible

- Lightweight messaging e.g. AMQP, Kafka
- Publish/subscribe
- Eventual consistency

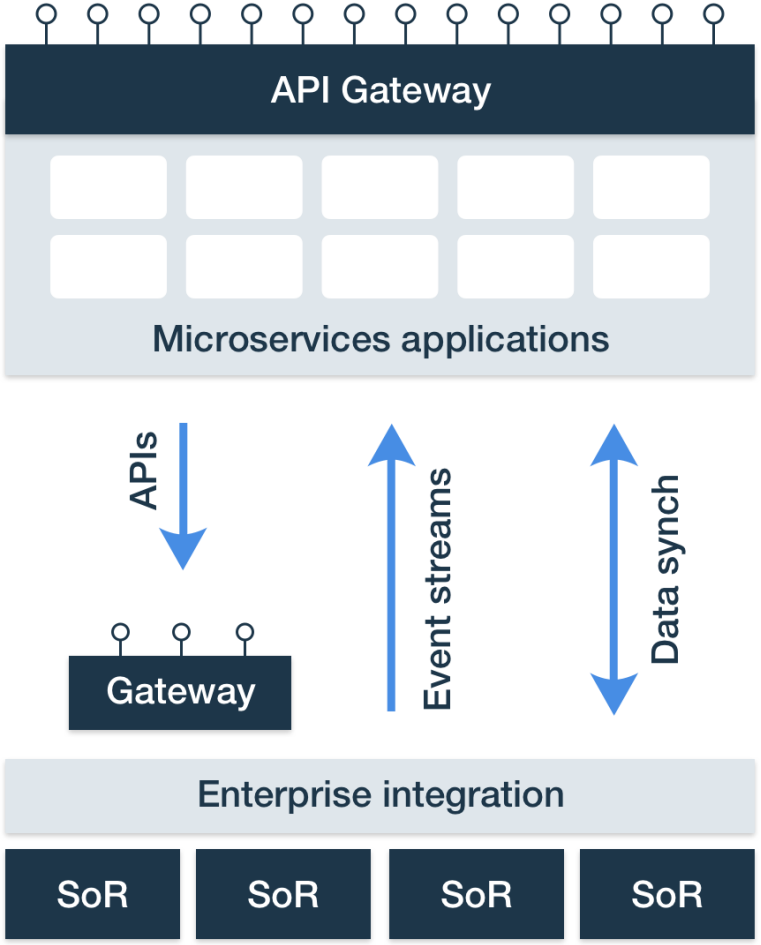
Direct calls where necessary

- Lightweight protocols e.g. JSON/HTTP
- Load balancing/scaling via service discovery
- Circuit breaker
- Caching



Microservices application

Creating truly independent digital applications



Independent microservice components enable

- Agility: Innovate rapidly without affecting other components
- Scalability: Scale only what you need, and only when you need to
- Resilience: Fail fast, return fast, without affecting other components

To provide those benefits they need to be independent of the systems of record

- APIs: Are simplest to use, but create a real-time dependency
- Event streams: Enable microservices to build views on changing data and react to situations as they occur
- Data sync: Provides a local replica of back-end system data

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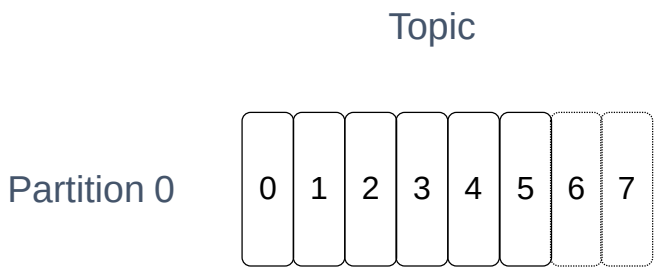
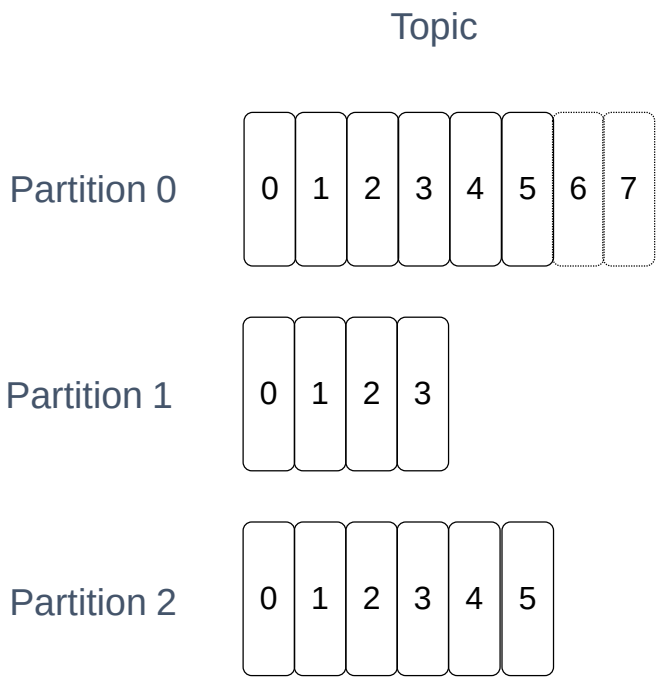
kafka

Kafka is: Built for Scale



Kafka is: Built for Scale



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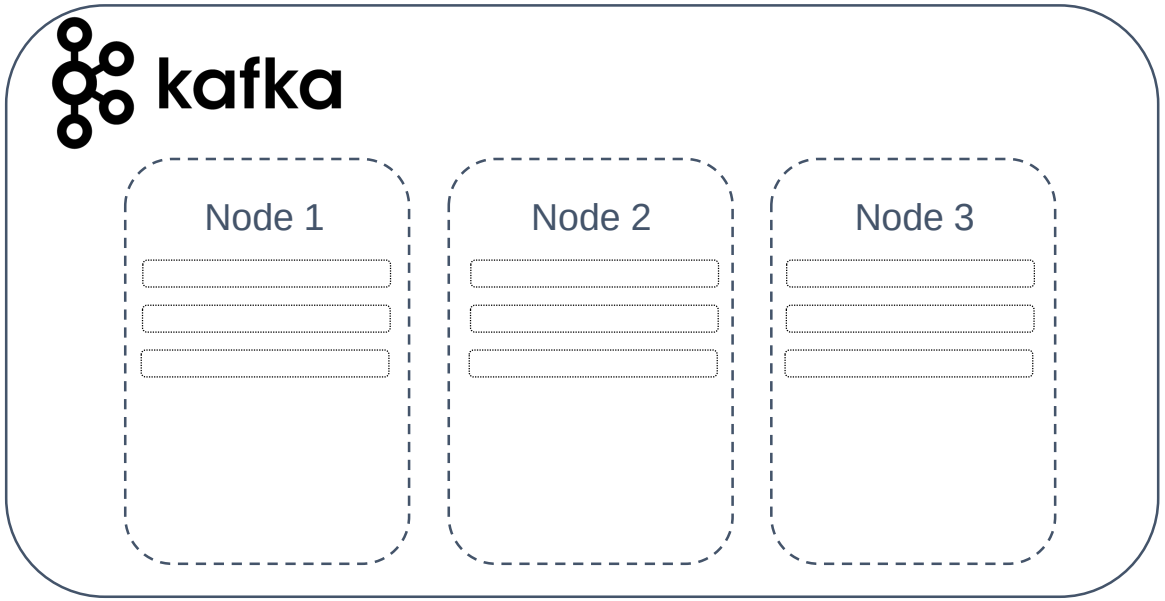

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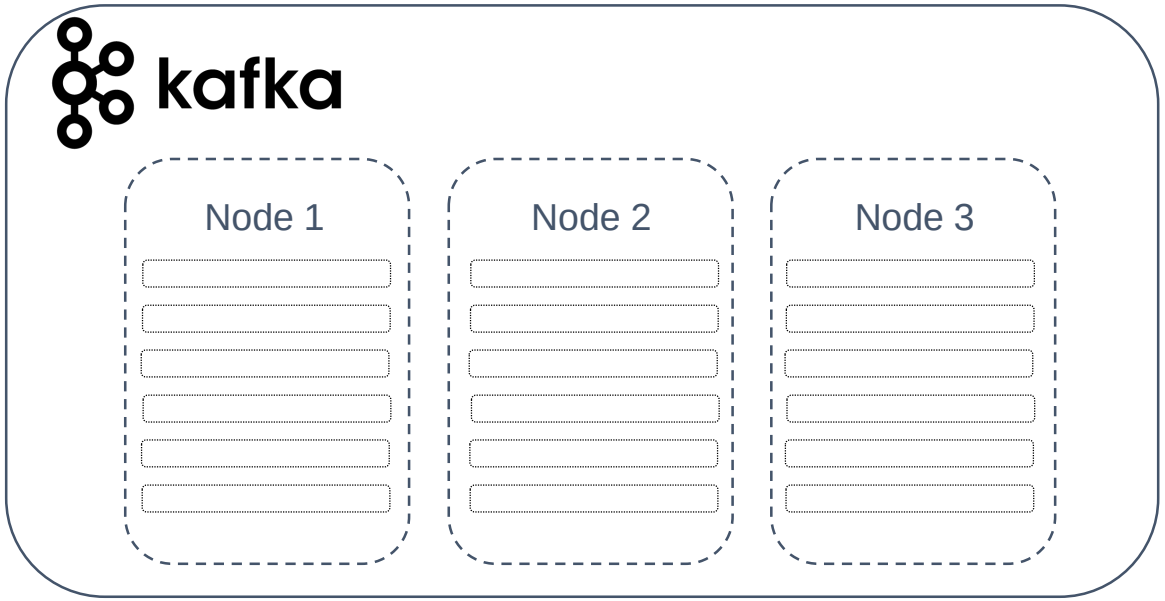

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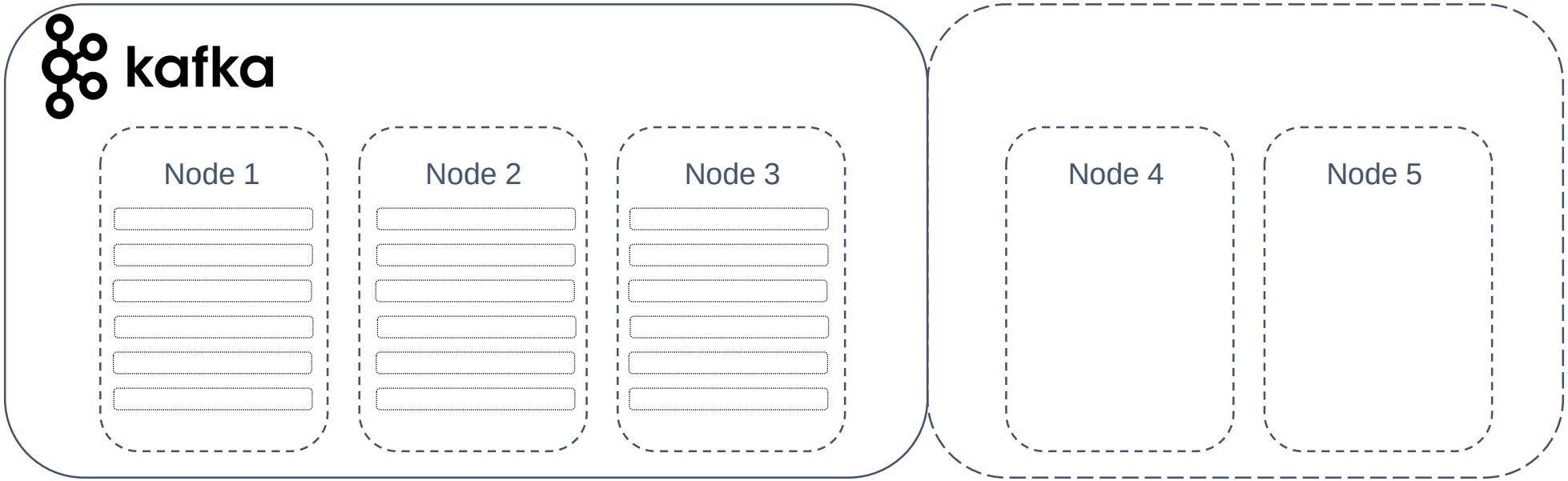

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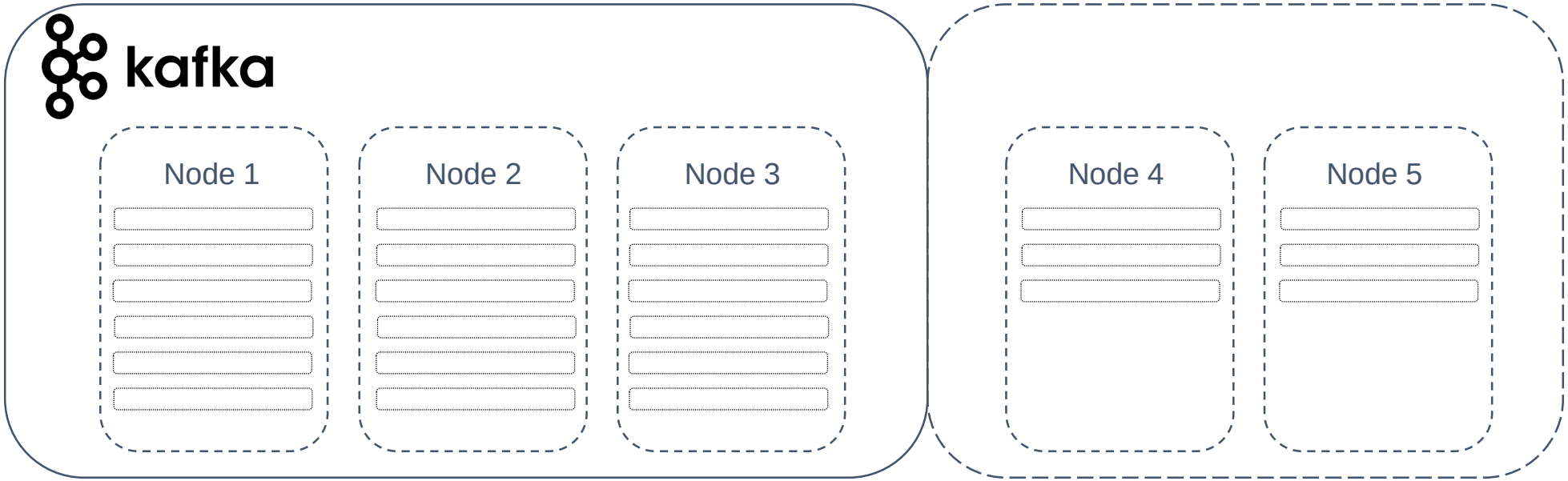
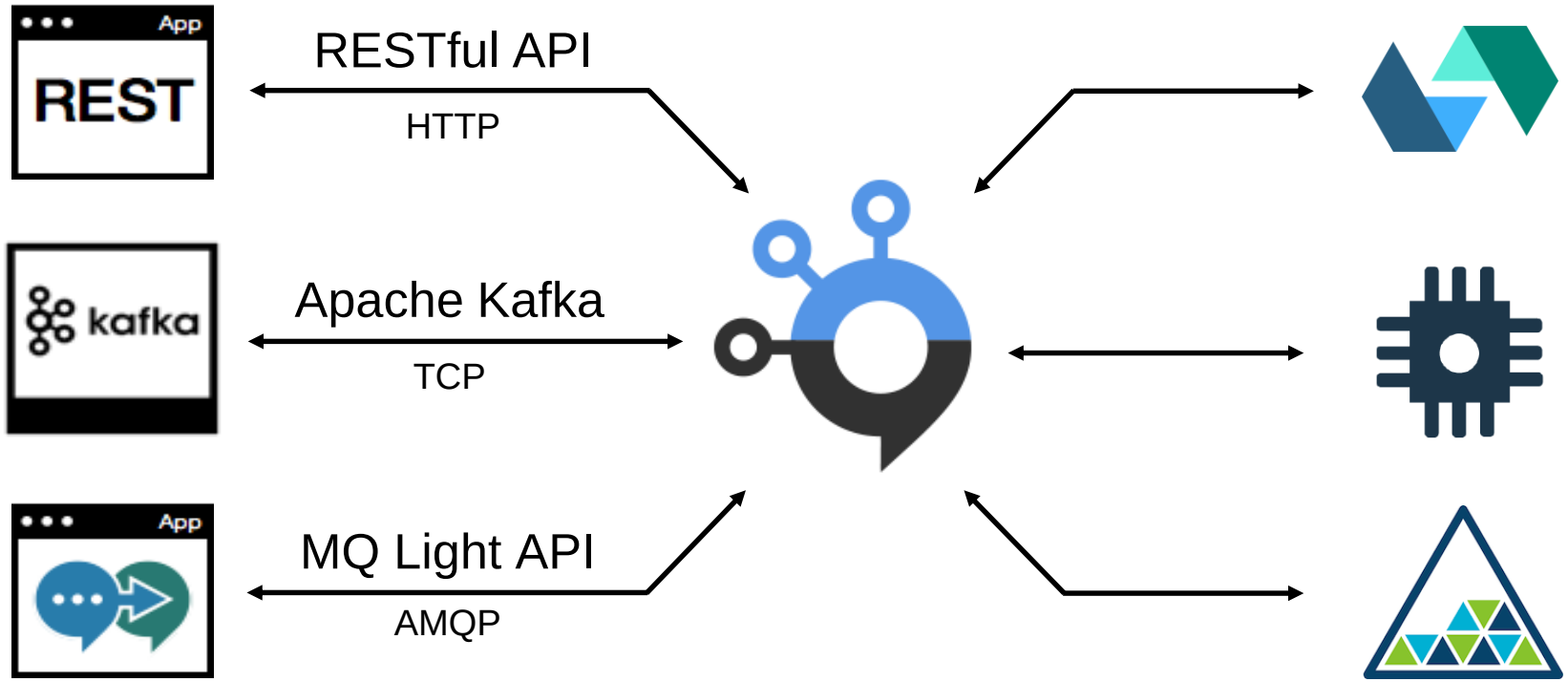
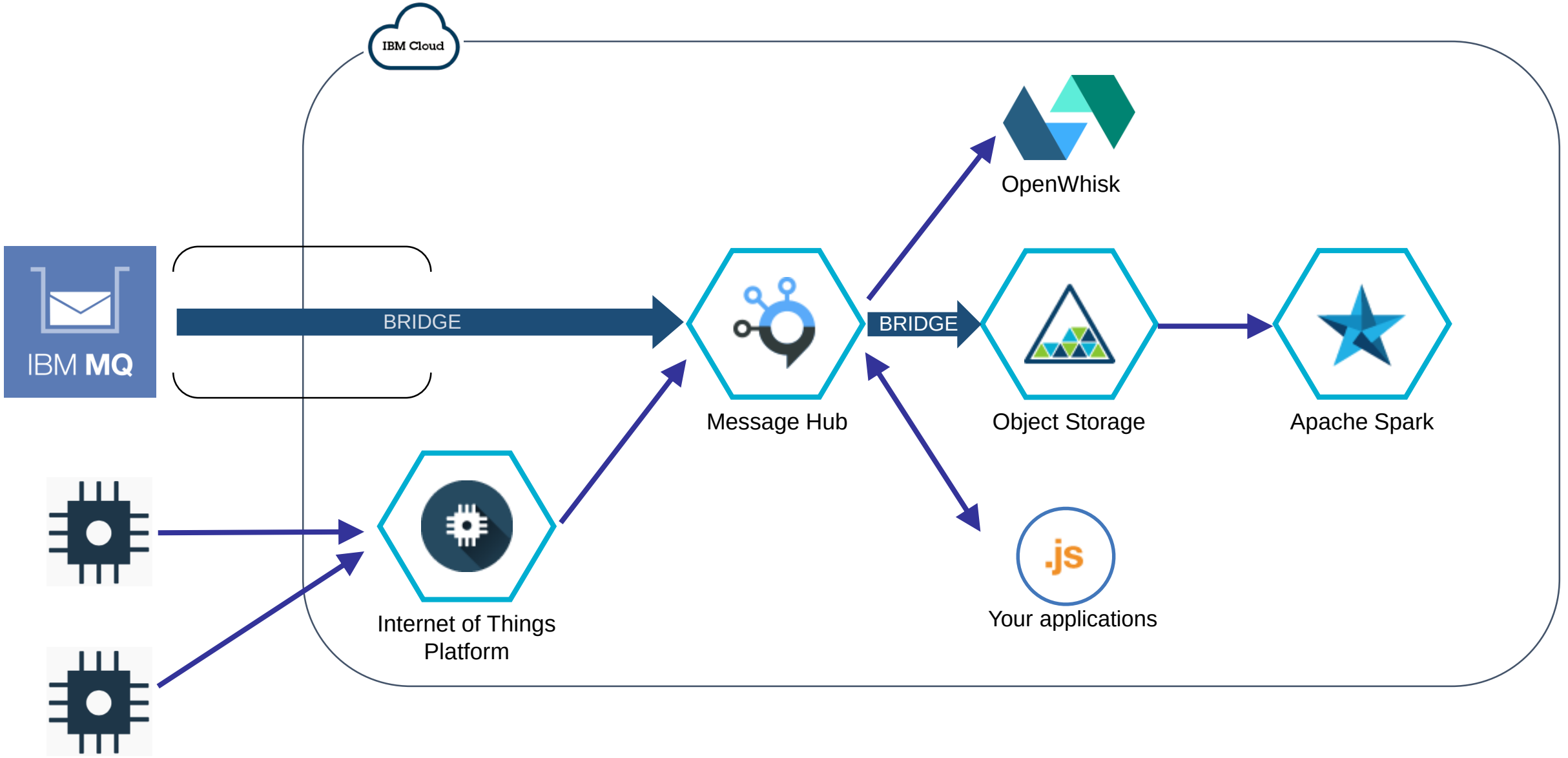


Message Hub is Apache Kafka in IBM Cloud



Event ingestion and distribution using Message Hub



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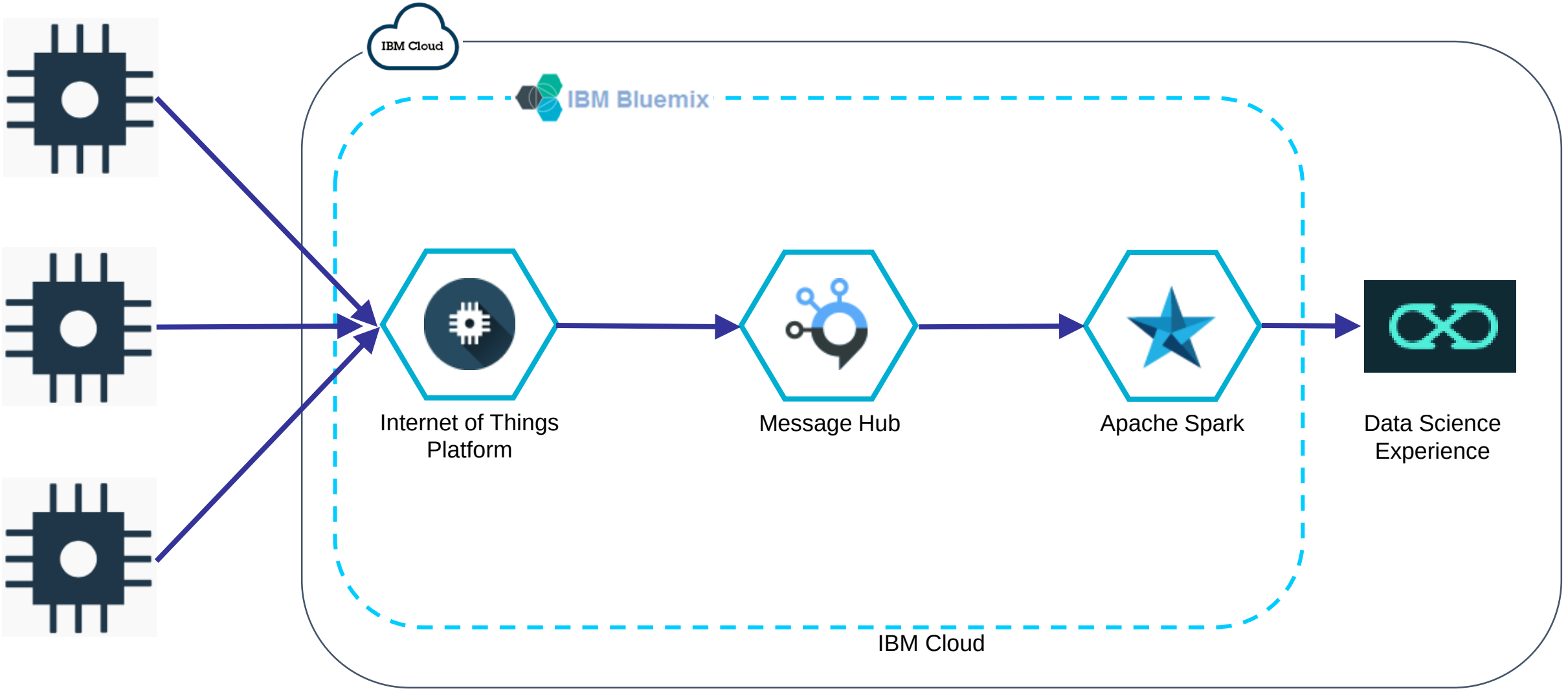
Options for stream processing

- IBM Streams
  - Advanced analytics platform for analysing data in motion
  - Extremely capable and high performance
- Apache Spark Streaming
  - An extension to the very well known Apache Spark platform
  - Integration with Kafka very straightforward
  - Not really proper streaming (uses “micro-batches”)
- Kafka Streams
  - Basic stream processing framework in Apache Kafka
  - Aimed more at developers, rather than data scientists
  - Not yet supported with IBM Message Hub
    - Watch this space ☺

Streaming Analytics using Apache Spark Streaming



In [ ]:

```
%AddDeps org.apache.spark spark-streaming-kafka-0-10_2.11 2.0.2

// The topic name for the events
val topics = Array("carevents")

def creatingFunc(sc: SparkContext): StreamingContext = {
  // Batch interval is 5 seconds
  val ssc = new StreamingContext(sc, Seconds(5))

  // Subscribe to the topic and generate a stream of messages every batch interval
  val stream = KafkaUtils.createDirectStream[String, String](
    ssc,
    PreferConsistent,
    Subscribe[String, String](topics, kafkaParams)
  )

  // Process the events to extract just one field
  val events = stream.map(record => (record.value))
  val eventsAsStrings = events.map(_.replaceAll("[{ }\"\u00A0]", ""))
  val eventsAsPerValueStrings = eventsAsStrings.map(_.split(','))
  val eventsAsSeparateStrings = eventsAsPerValueStrings.map(_.map(_.split(':')))
  val eventsAsMaps = eventsAsSeparateStrings.map(_.collect({case Array(s0,s1) => (s0,s1)}).toMap)
  val refills = eventsAsMaps.map(_("refills").toLong)

  // Accumulate the number of refills over time
  refills.foreachRDD{ (rdd: RDD[Long], time: Time) =>
      val refillsAccumulator = RefillsAccumulator.getInstance(rdd.sparkContext)
      rdd.foreach{r => refillsAccumulator.add(r)}
      println("Refills: " + refillsAccumulator.value);
  }

  ssc
}

// Start the processing
val sc = SparkContext.getOrCreate()
val ssc = StreamingContext.getActiveOrCreate(() => creatingFunc(sc))
ssc.start()
```

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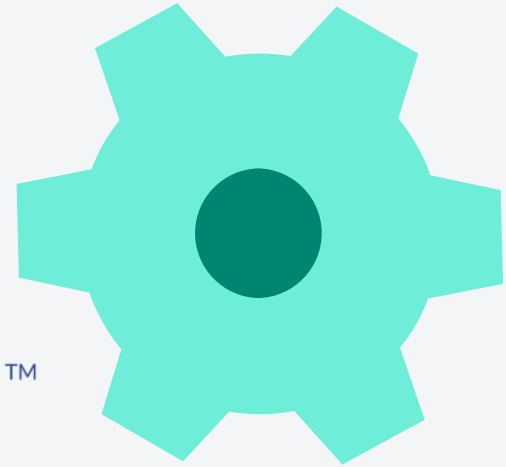
What is **IBM OpenWhisk**?

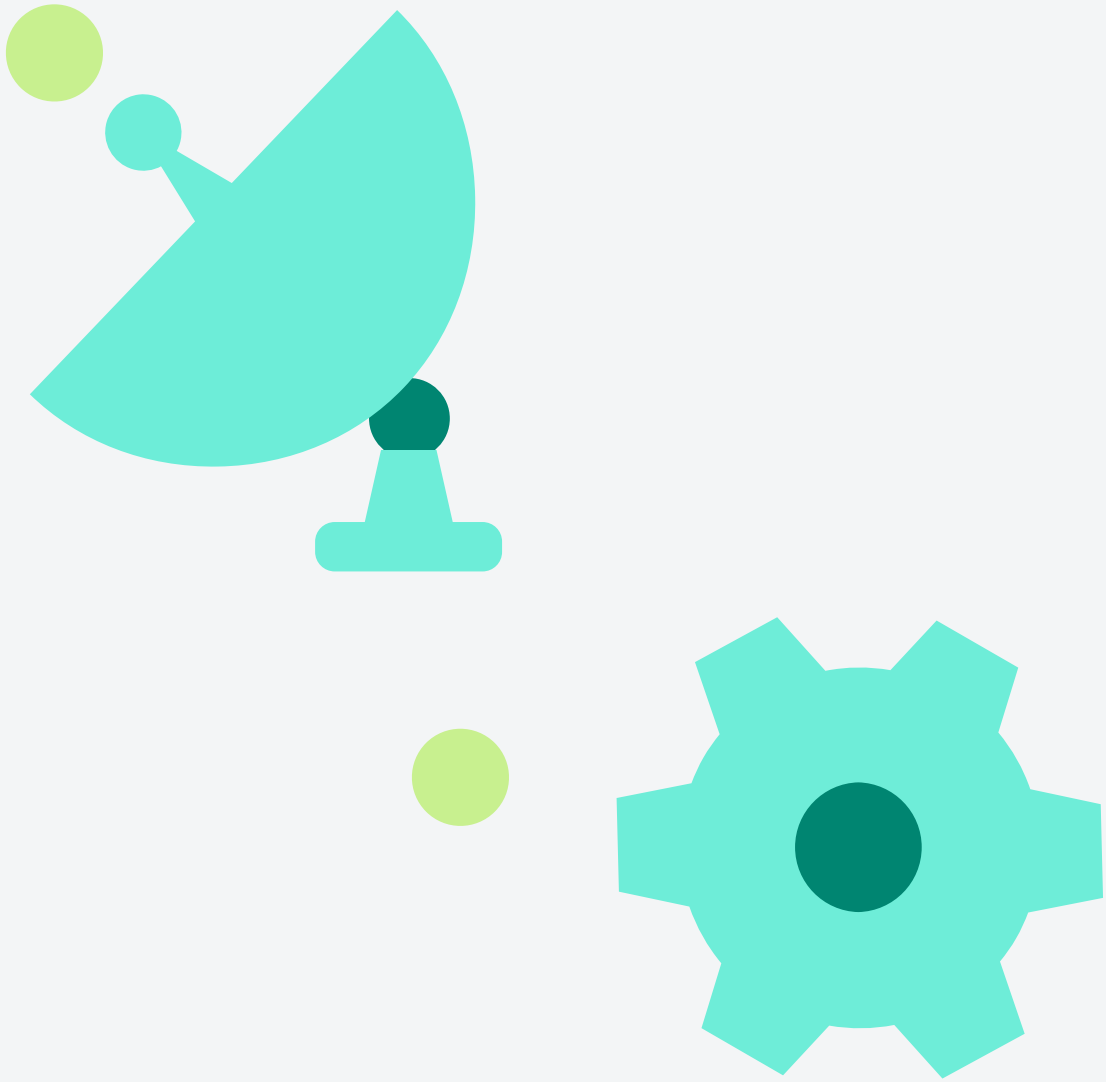
An open **serverless** platform to execute code in response to events



Delivered as open source via Apache
openwhisk.org

APACHE OpenWhisk™

Runs code **only** on-demand on a per-request basis



Runs code **only** on-demand on a per-request basis

Serverless is for compute what object storage is for storage

No servers

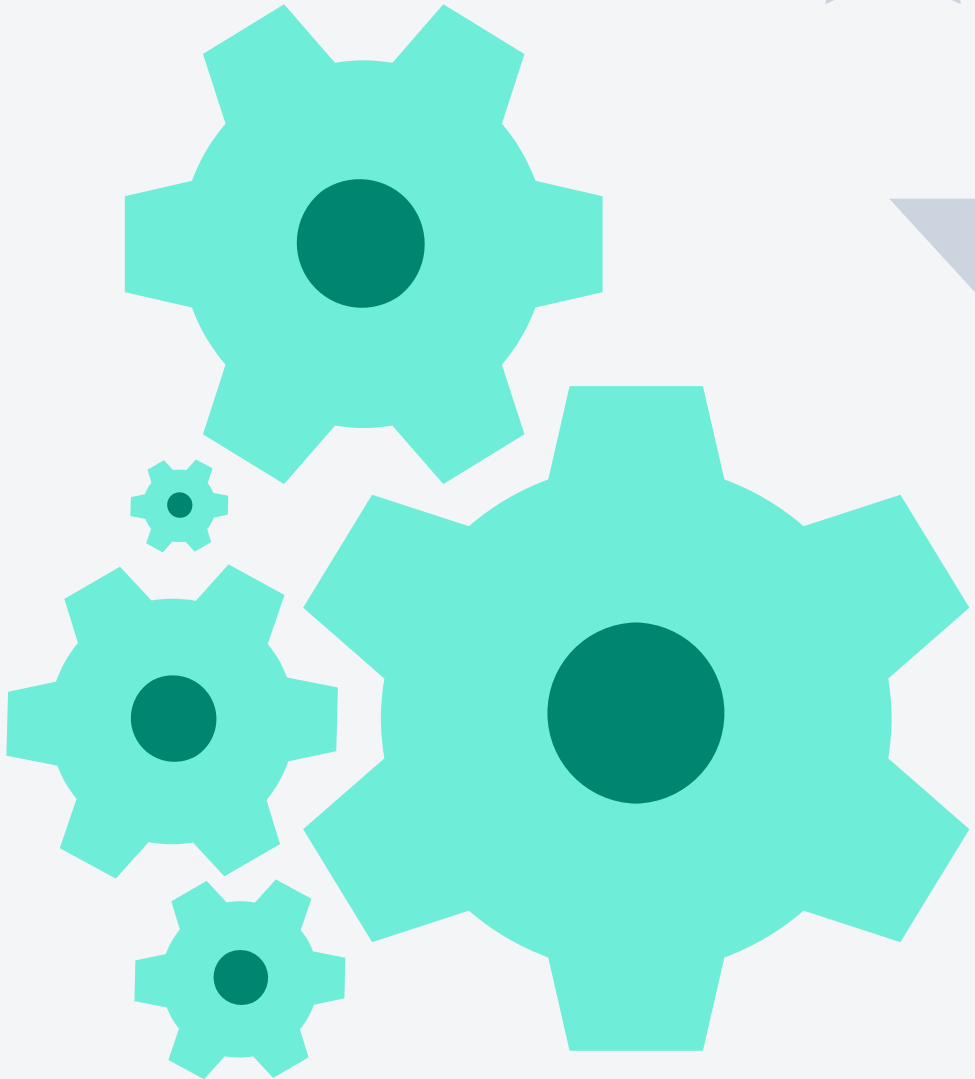
Just code

Runs code **only** on-demand, pay for what you use

Scales on a per-request basis

Price = (Time an action was running *
memory allocated to action)

$0.000017 per GBs
Free tier: 400,000 GBs



A wide array of Event Providers

Periodic

IBM **Cloudant**

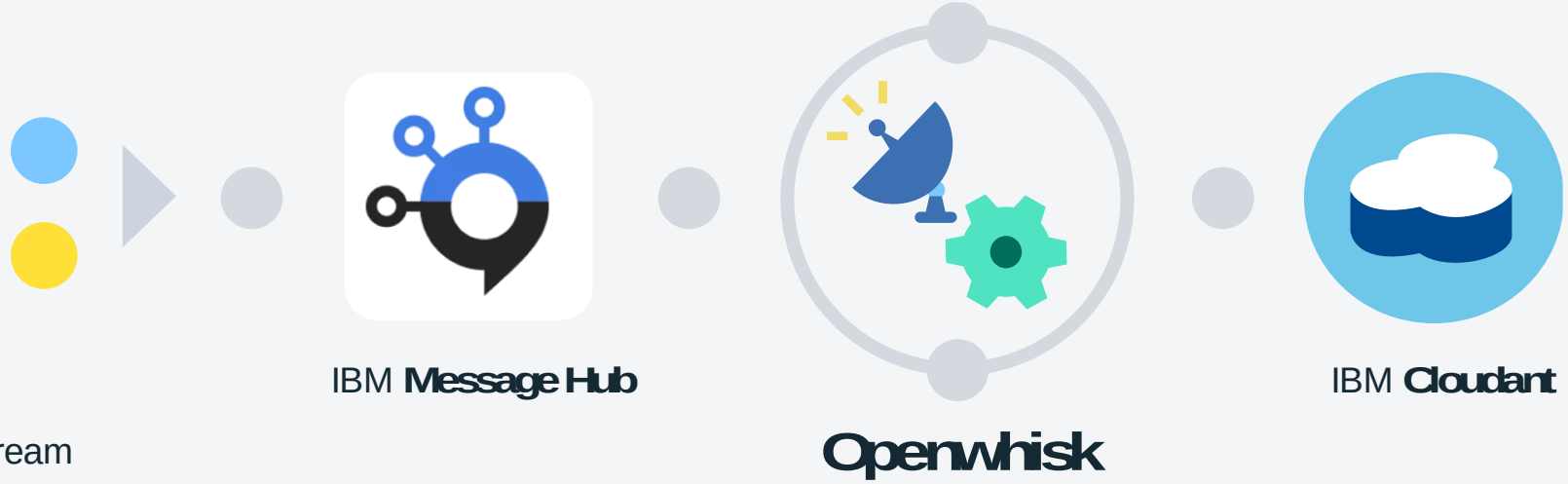
Message Hub

Mobile Push

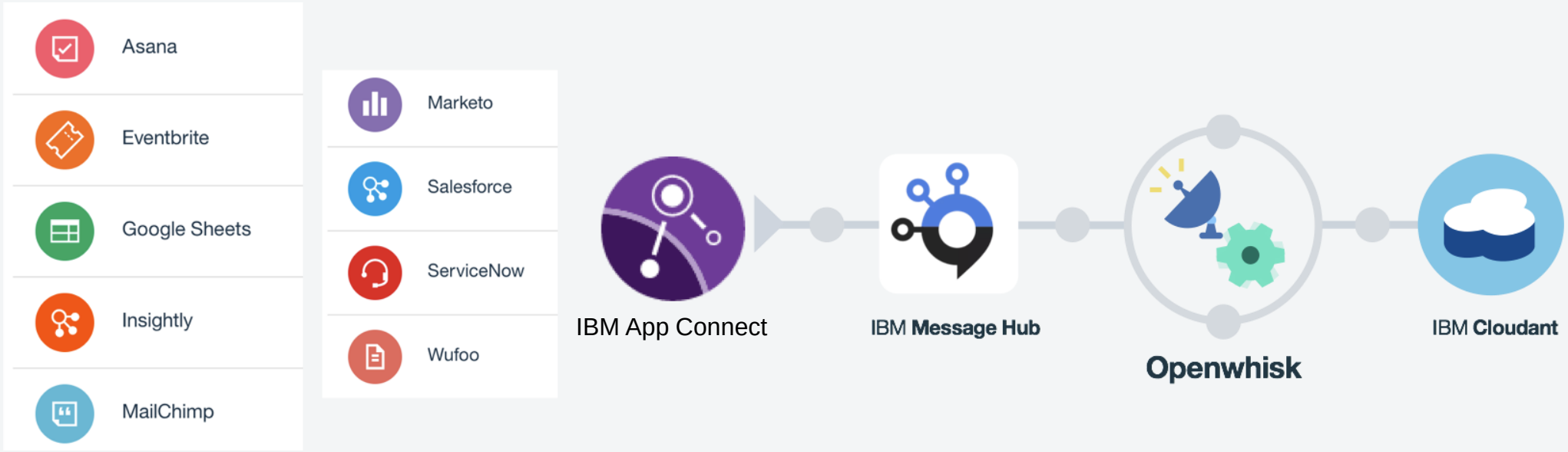
Github

IBM App Connect

Event processing with Message Hub



Event processing with App Connect



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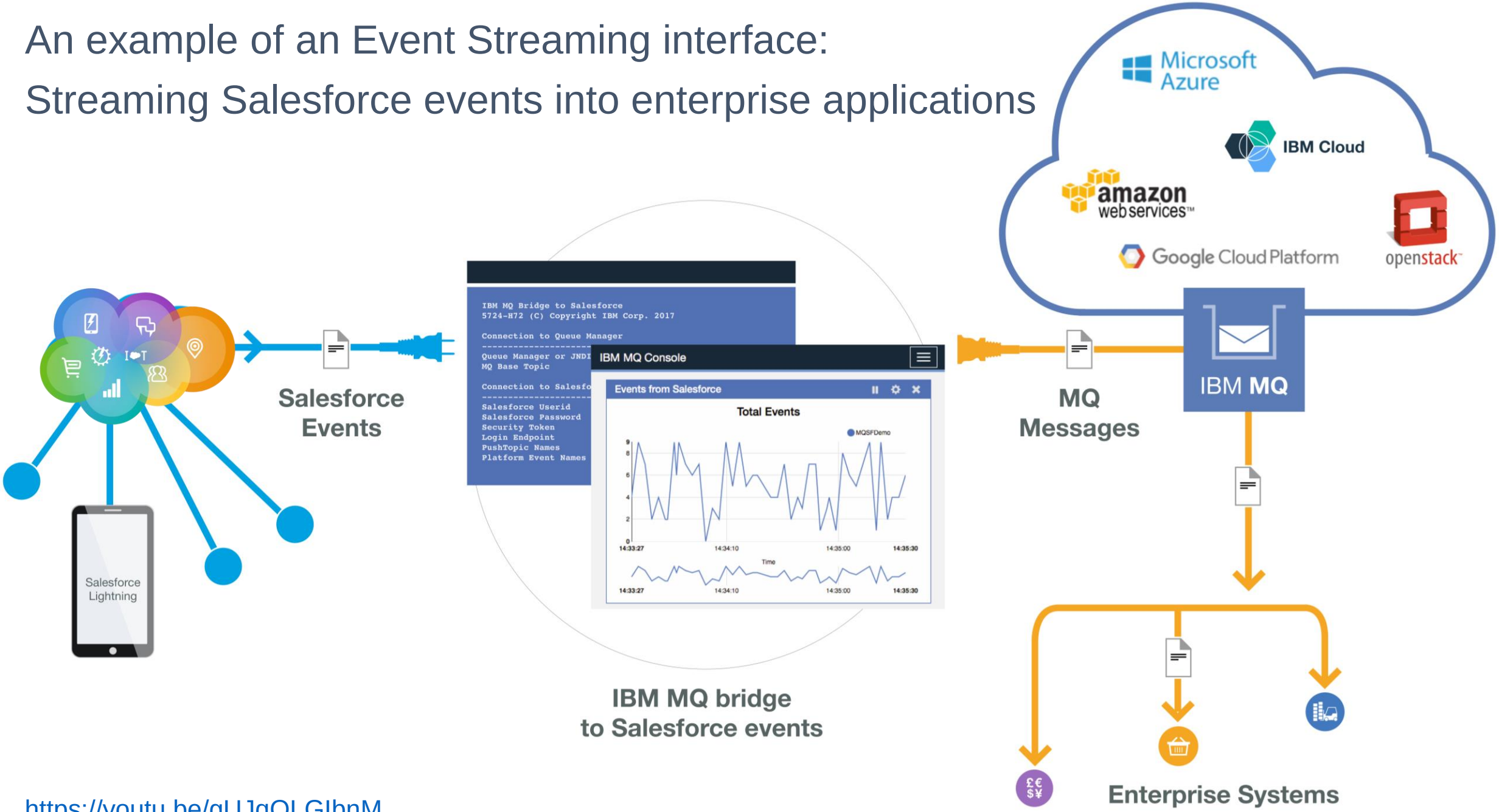
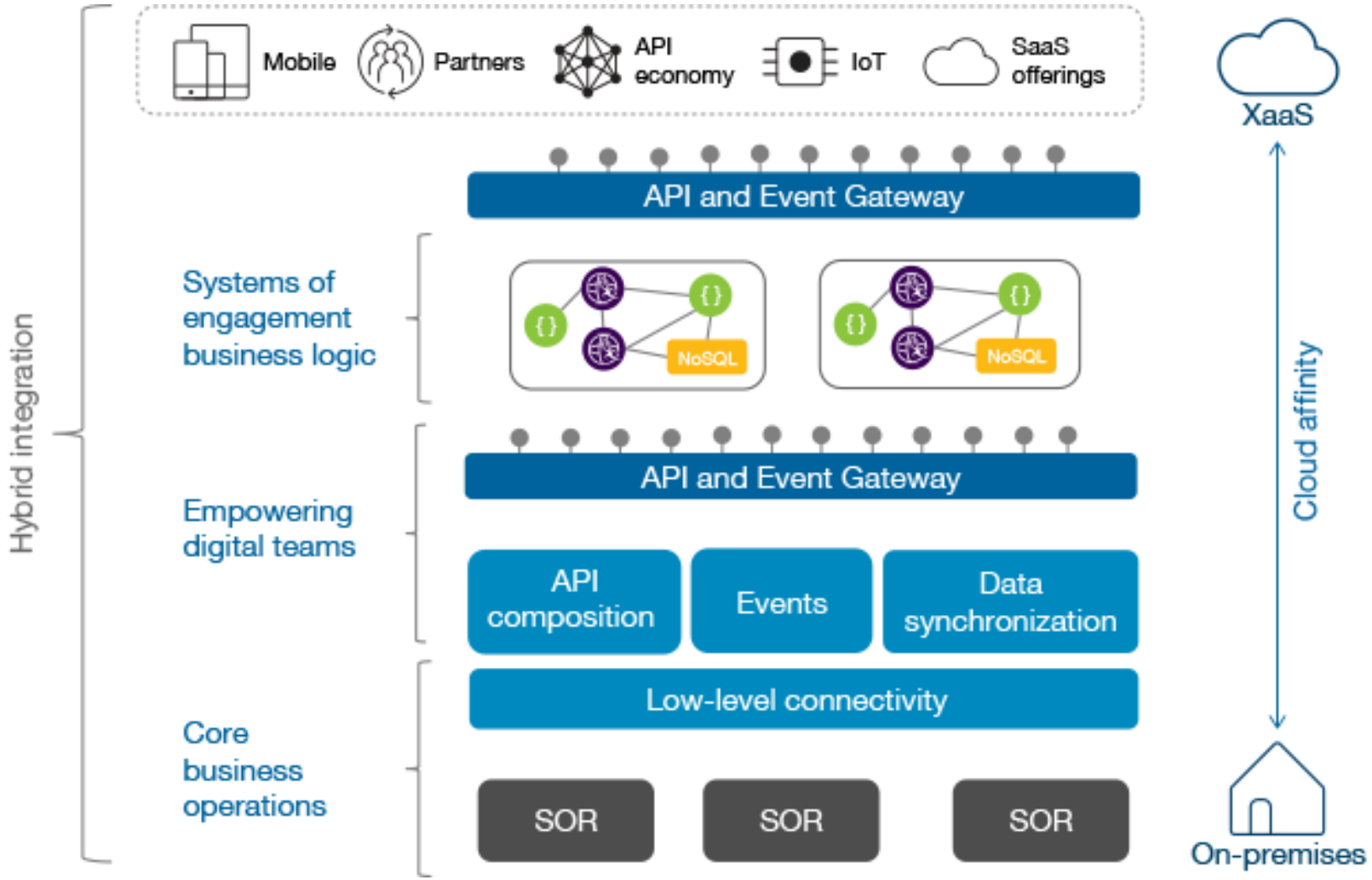
An example of an Event Streaming interface:
Streaming Salesforce events into enterprise applications



https://youtu.be/gUJqOLGIbnM

Events Are Part Of A Hybrid Integration Strategy



https://www.ibm.com/developerworks/library/mw-1606-clark-trs/index.html

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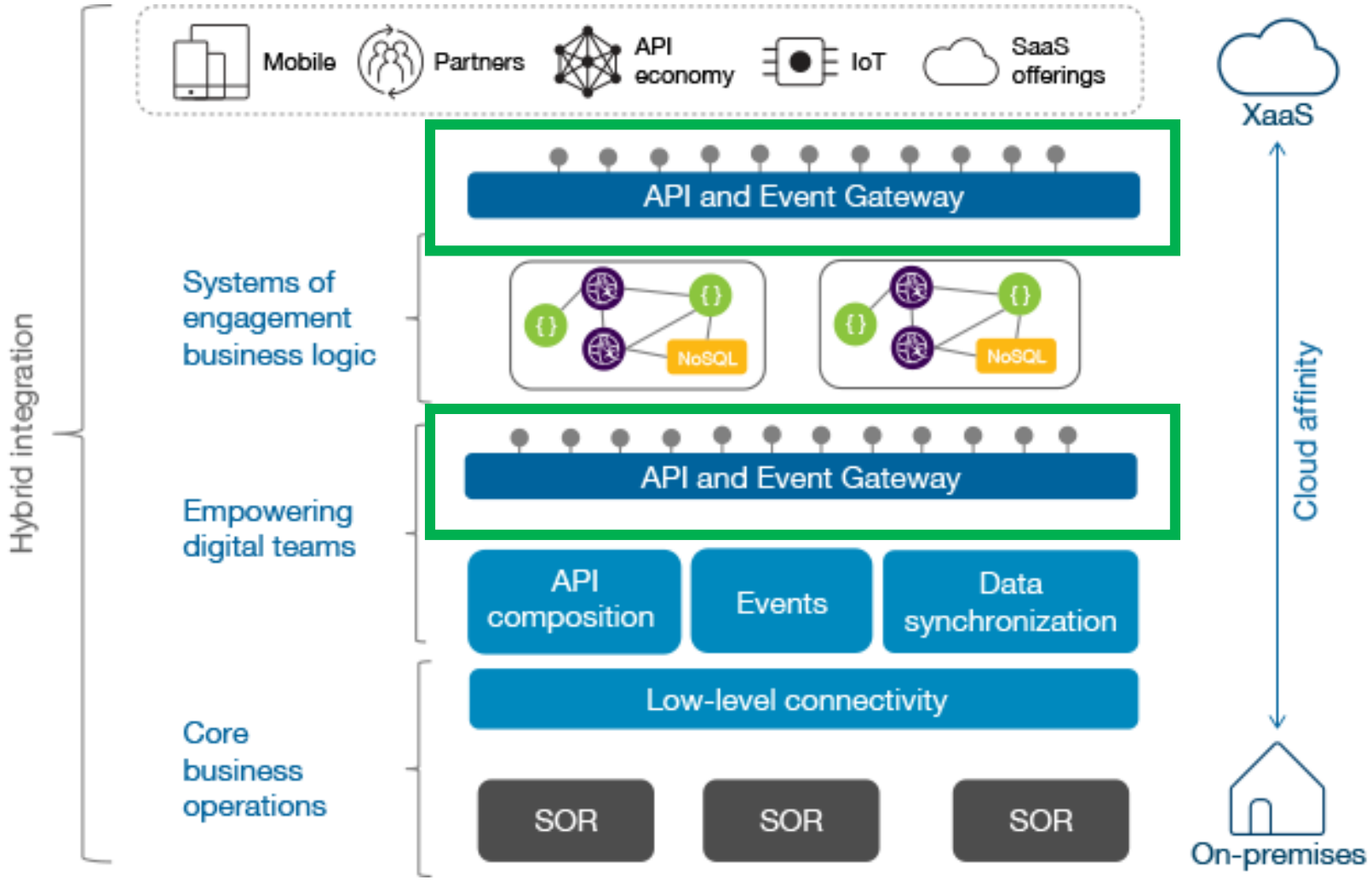

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Making Events Usable

Easily found and quickly consumed

De-coupled infrastructure

Consumed reliably by cloud applications

Delivered in time to be useful

Making Events Usable

Easily found and quickly consumed

De-coupled infrastructure

Consumed reliably by cloud applications

Delivered in time to be useful

- Innovation teams, partners and developers can discover event streams in a catalogue
- Events must be self-service consumable without human interaction

Making Events Usable

Easily found and quickly consumed

De-coupled infrastructure

Consumed reliably by cloud applications

Delivered in time to be useful

- No technology ties between producer and consumer
- No operational ties between producer and consumer

Making Events Usable

Easily found and quickly consumed

De-coupled infrastructure

Consumed reliably by cloud applications

Delivered in time to be useful

- Replay history
- Durable subscriptions, surviving disconnection and app failure
- Horizontally scalable consuming apps for increasing capacity and HA

Making Events Usable

Easily found and quickly consumed

De-coupled infrastructure

Consumed reliably by cloud applications

Delivered in time to be useful

- Latency ~ 1 second
- Delivered to an application, not polled

MQ to MQ connections

Easily found and quickly consumed

De-coupled infrastructure

Consumed reliably by cloud applications

Delivered in time to be useful

MQ ←→ MQ

Significant challenge

Requires work

Trivial

REST APIs

Easily found and quickly consumed

De-coupled infrastructure

Consumed reliably by cloud applications

Delivered in time to be useful

Rest APIs

Significant challenge

Requires work

Trivial

MQ to Message Hub

Easily found and quickly consumed

De-coupled infrastructure

Consumed reliably by cloud applications

Delivered in time to be useful

MQ to Message Hub

Significant challenge

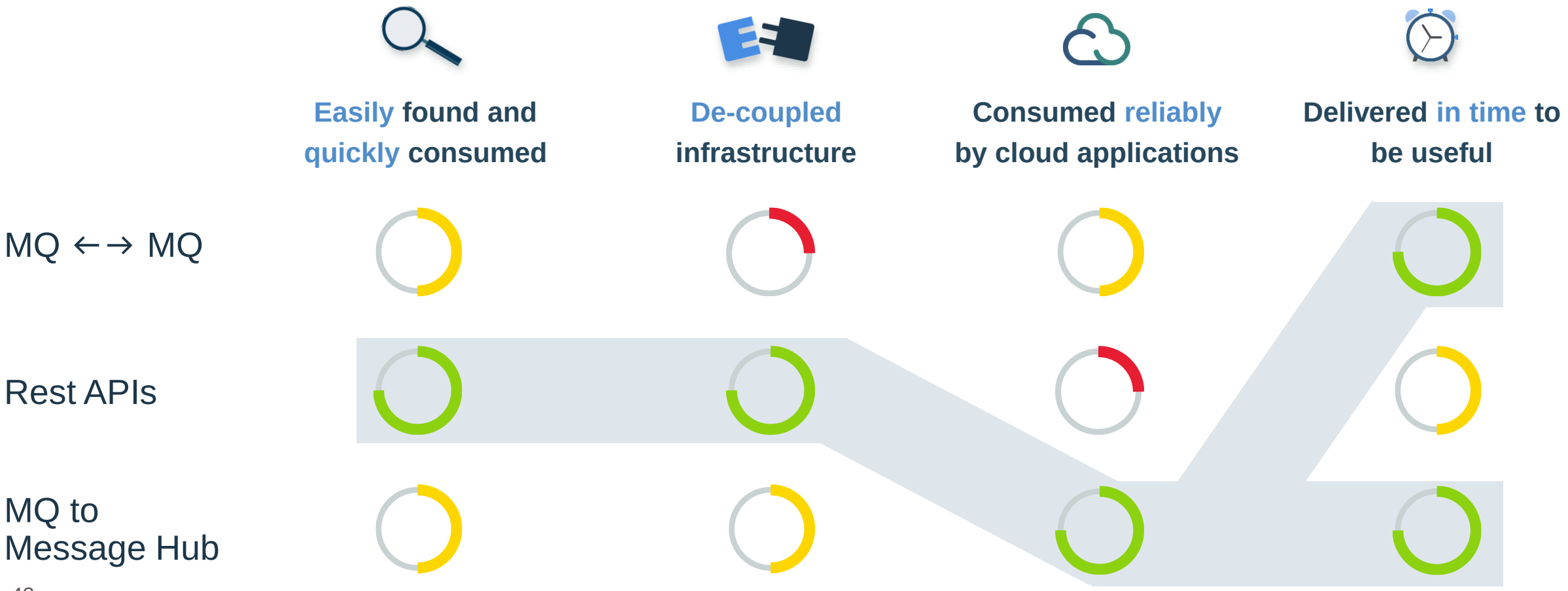
Requires work

Trivial

Summary

	 **Easily found and quickly consumed**	 **De-coupled infrastructure**	 **Consumed reliably by cloud applications**	 **Delivered in time to be useful**
MQ ←→ MQ				
Rest APIs				
MQ to Message Hub				

Every challenge has been addressed…



…waiting to be combined into one solution

Easily found and quickly consumed

De-coupled infrastructure

Consumed reliably by cloud applications

Delivered in time to be useful

Event management solution

Summary

Events are driving the key areas of innovation within the enterprise

Managing the distribution of these event streams is key to rapid innovation

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