AWS re:Invent

NOV. 29 – DEC. 3, 2021 | LAS VEGAS, NV

API305-R2

How to select the right application integration service

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Agenda

Integration services

- Categories
- Overview
- Differentiation

Open discussion

Resources and call to action

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Integration services: Categories

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Messaging

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> “If your application is cloud-native, large-scale, or distributed and doesn’t include a messaging component, that’s probably a bug.”

Tim Bray

General-purpose internet-software geek

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Potential drawbacks of synchronous systems

Synchronous systems are inherently tightly coupled

Problems in downstream systems can have immediate impact on upstream callers

Retries from upstream callers can easily fan out and amplify problems



Photo: Dirk Fröhner

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Potential drawbacks of synchronous systems

Synchronous systems are inherently tightl

Problems in dow can have immed on upstream call

Retries from ups easily fan out an

…and some things simply take too much time to wait or are asynchronous by nature



Photo: Dirk Fröhner

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Gregor Hohpe and Bobby Woolf:

Enterprise Integration Patterns

Designing, Building, and Deploying Messaging Solutions



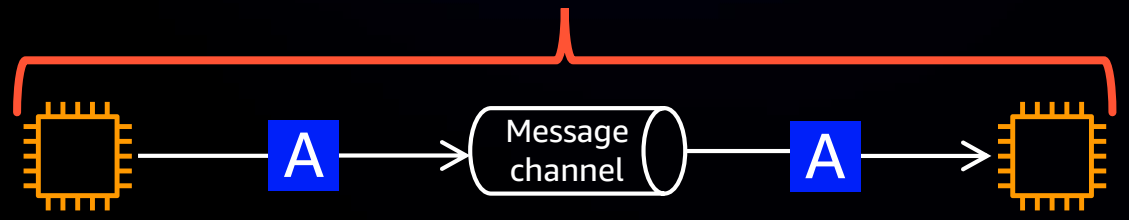
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Message exchange

Conversation pattern

One-way

Integration pattern



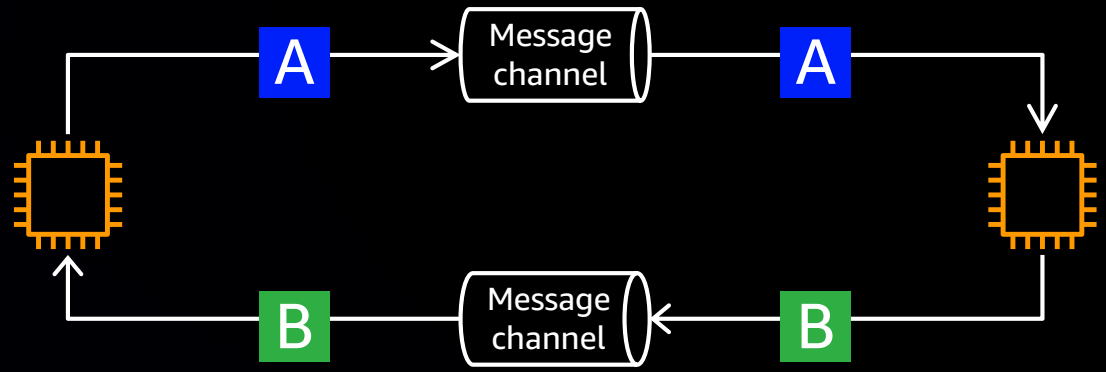
Sender

Receiver

No response expected

Message intent

Asynchronous request-response



Requester

Responder

Response expected

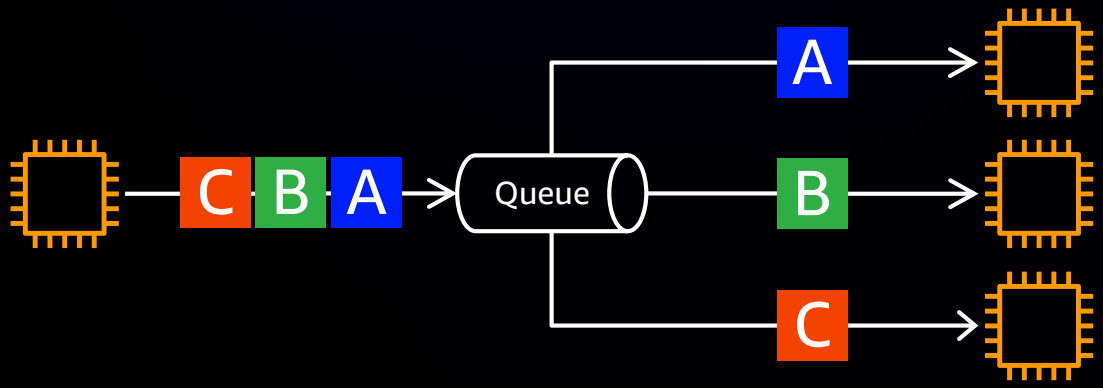
Return address

Correlation ID

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Message channels

Point-to-point (queue)

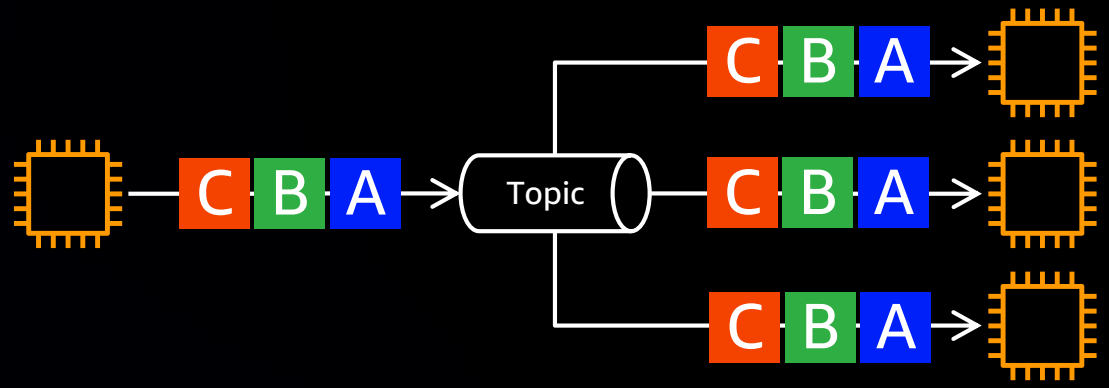


Each message consumed by one receiver

Consumers easy to scale

Buffering can flatten peak loads

Publish-subscribe (topic), aka fan out



Each message consumed by each subscriber

How to scale consumers?

Conceptually no buffering

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Messaging vs. streaming

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Excursus: Message vs. stream processing

Both messaging topics and streams are fan-out patterns

Message processing



Each individual message is a unit of work

Messages deleted after consumption

Stream processing



Batches of messages are a unit of work

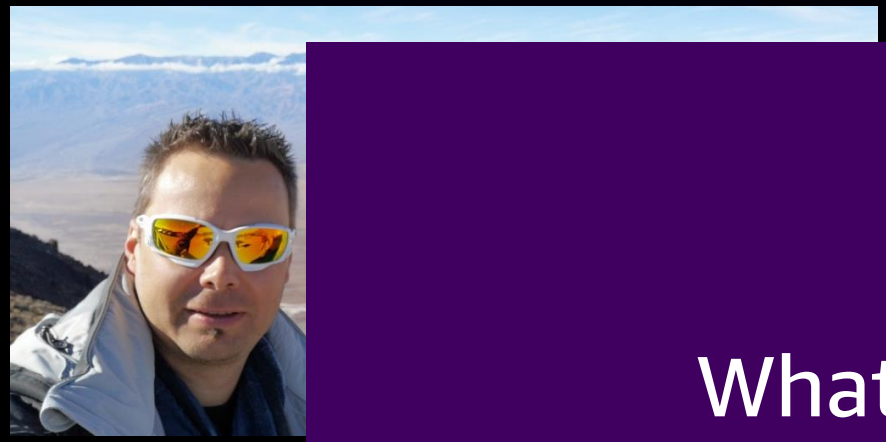
Messages retained after consumption (until expiration)

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Excursus: Message vs. stream processing

Both messaging topics and streams are fan-out patterns

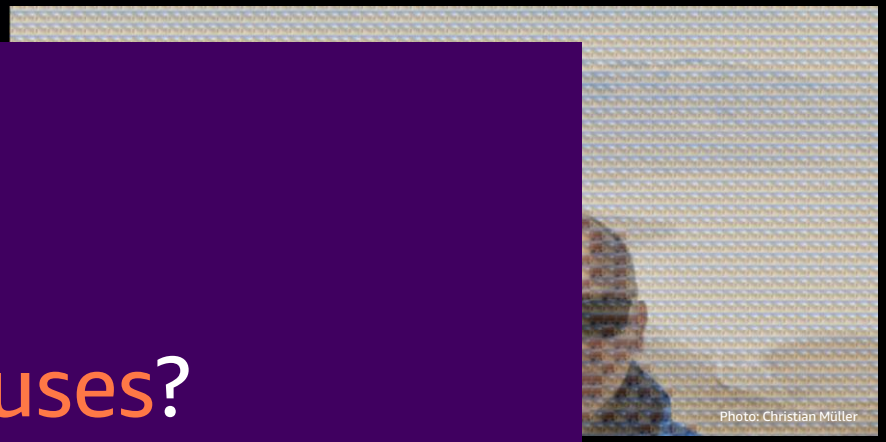
Message processing



Each individu

Messages deleted after consumption

Stream processing



unit of work

Messages retained after consumption (until expiration)

What about buses?

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Integration services: Overview

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Integration services

IoT



AWS IoT Core

Messaging



Amazon SNS



Amazon SQS

Managed



Amazon MQ



Amazon MSK



Amazon ElastiCache for Redis

Streaming



Amazon Kinesis

Events



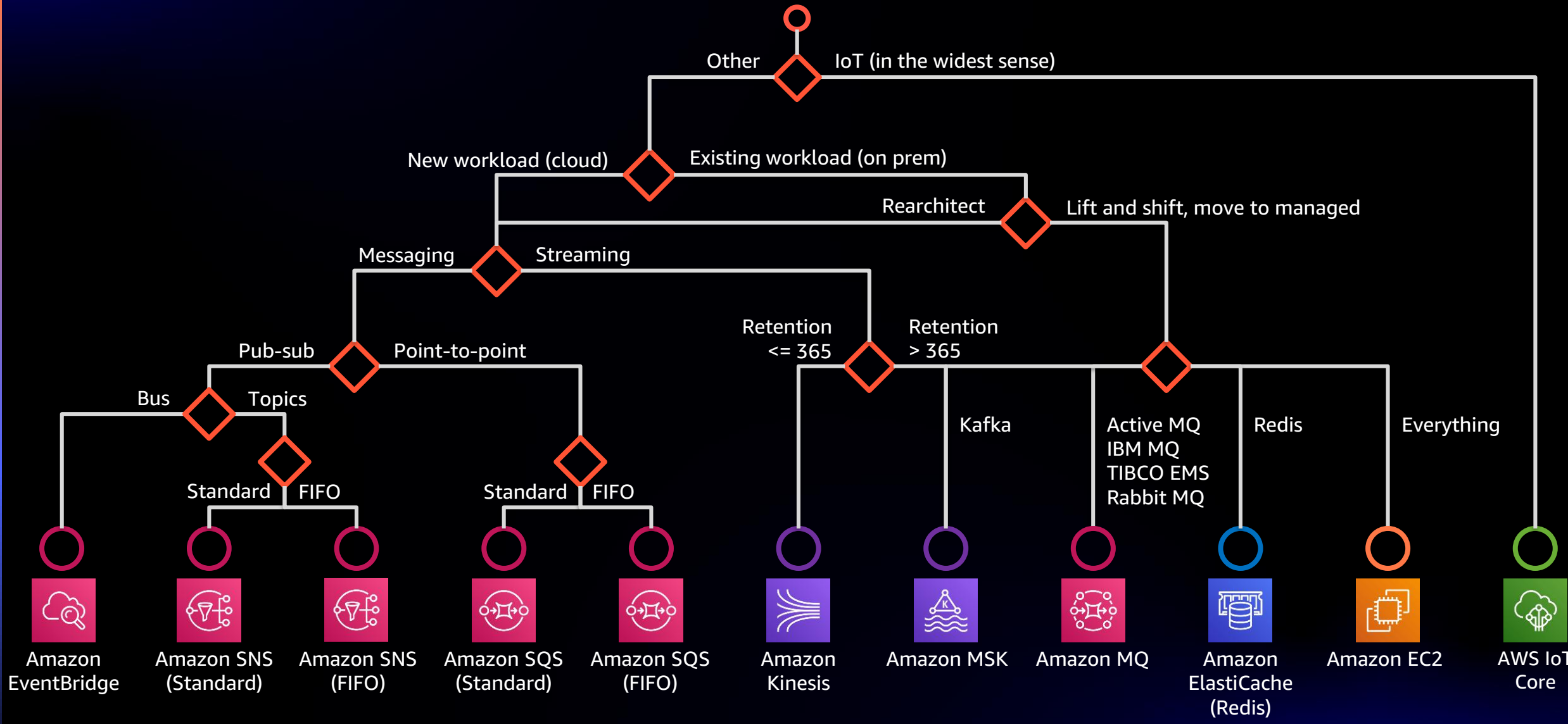
Amazon CloudWatch



Amazon EventBridge

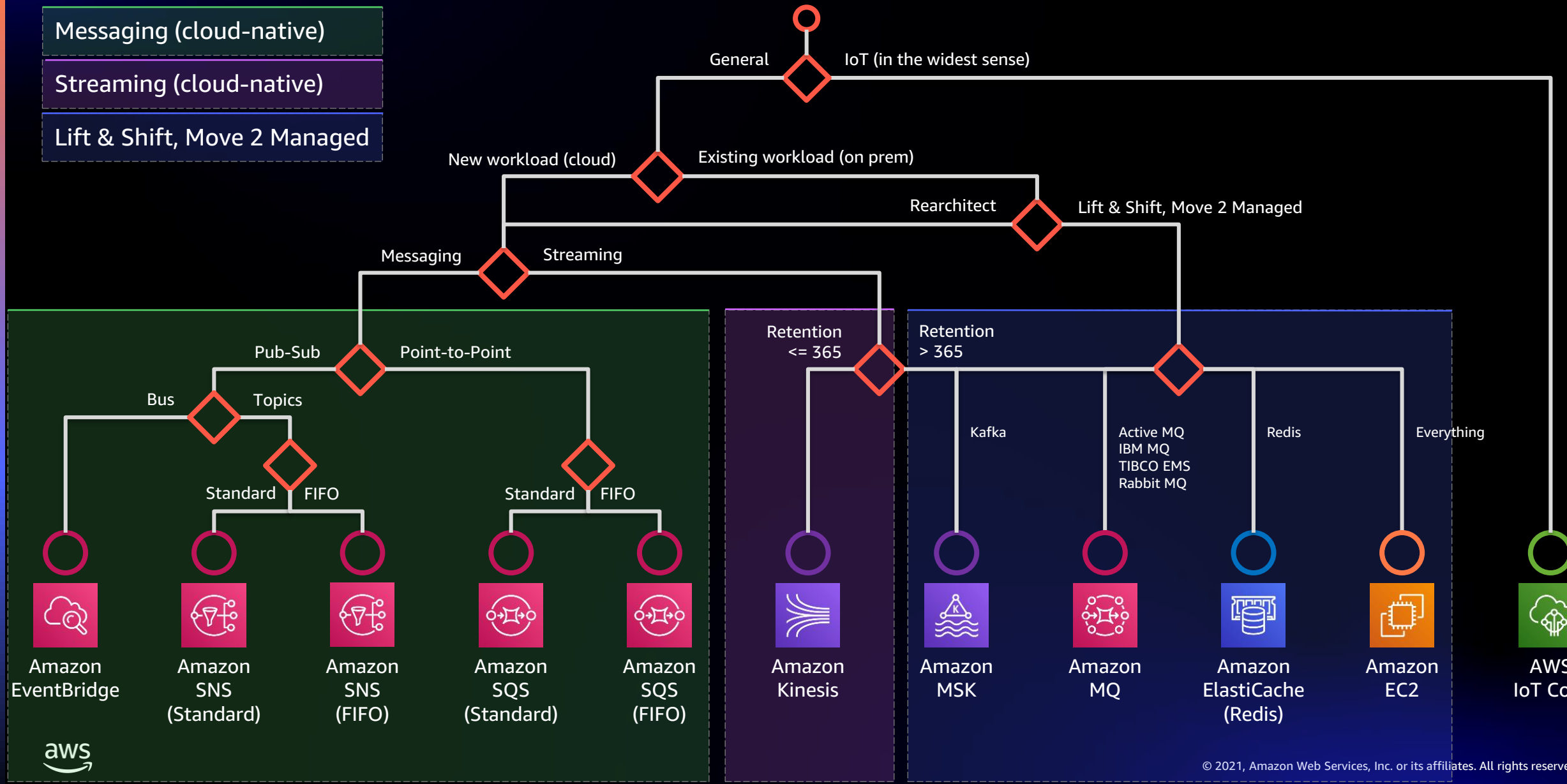
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Which service should I recommend?



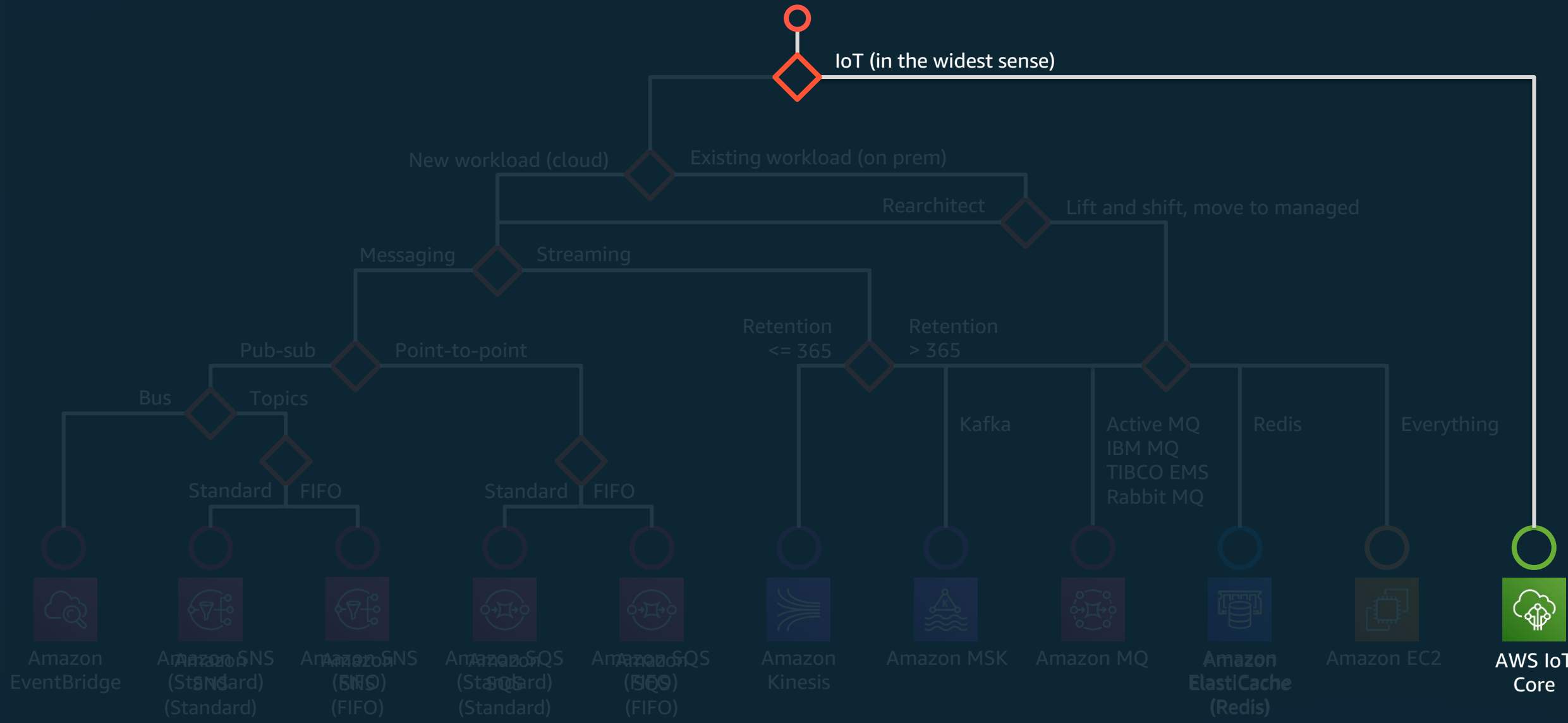
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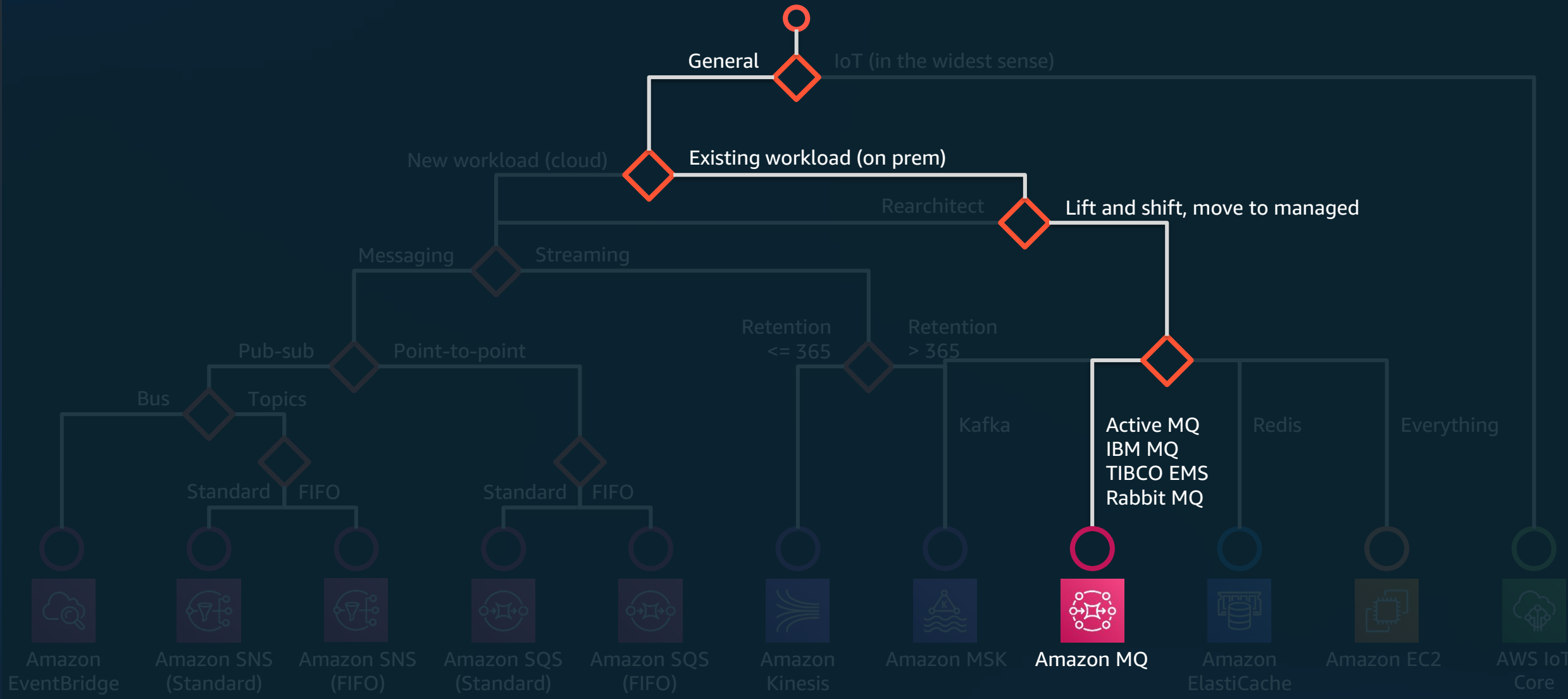


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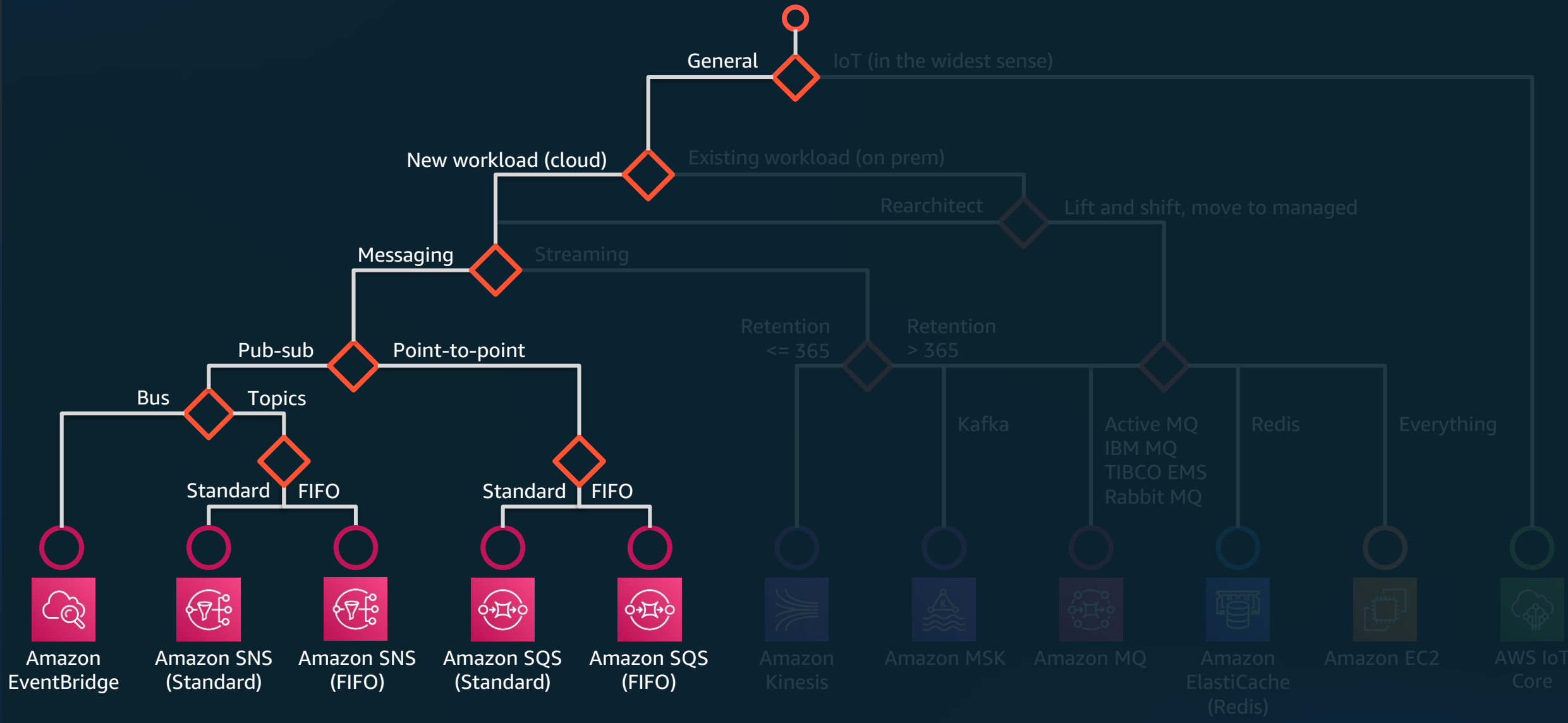


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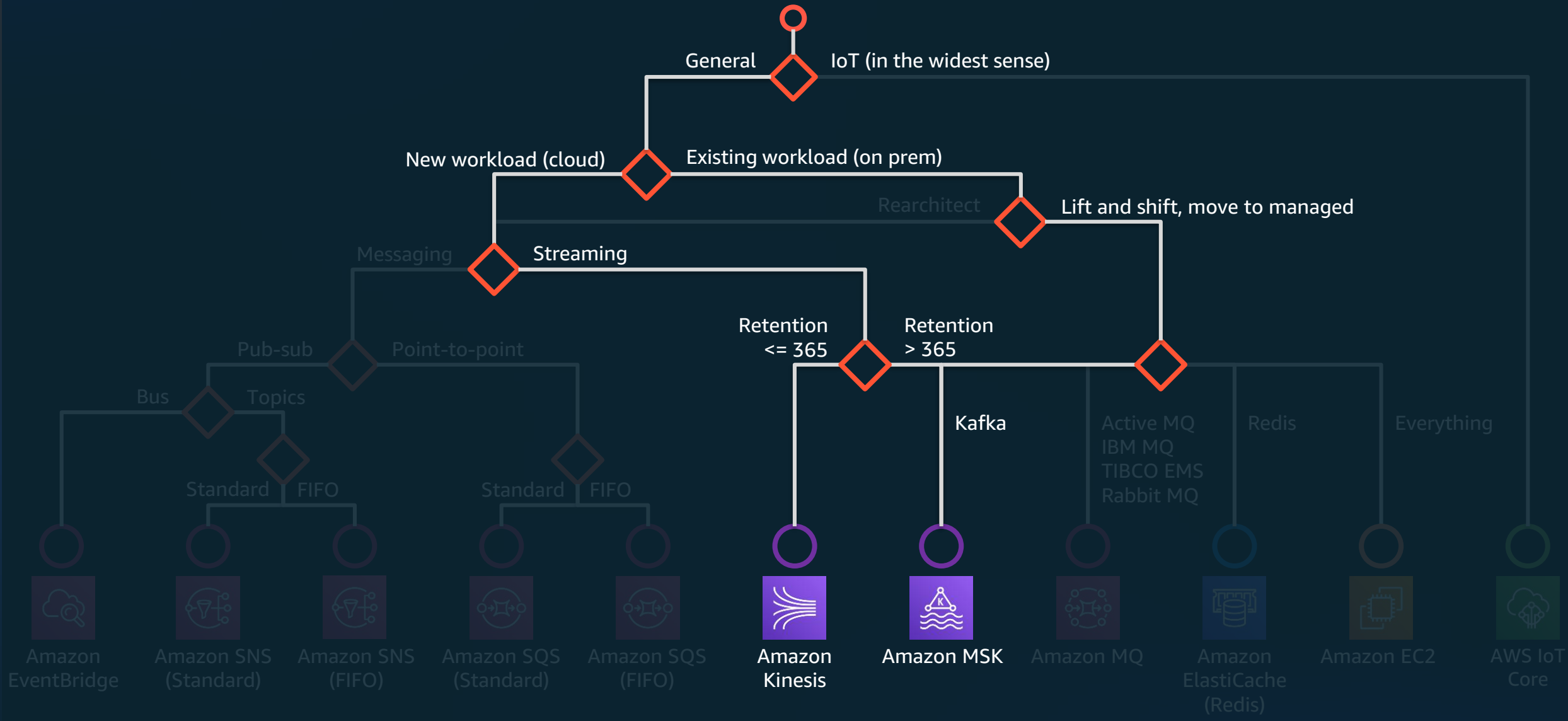
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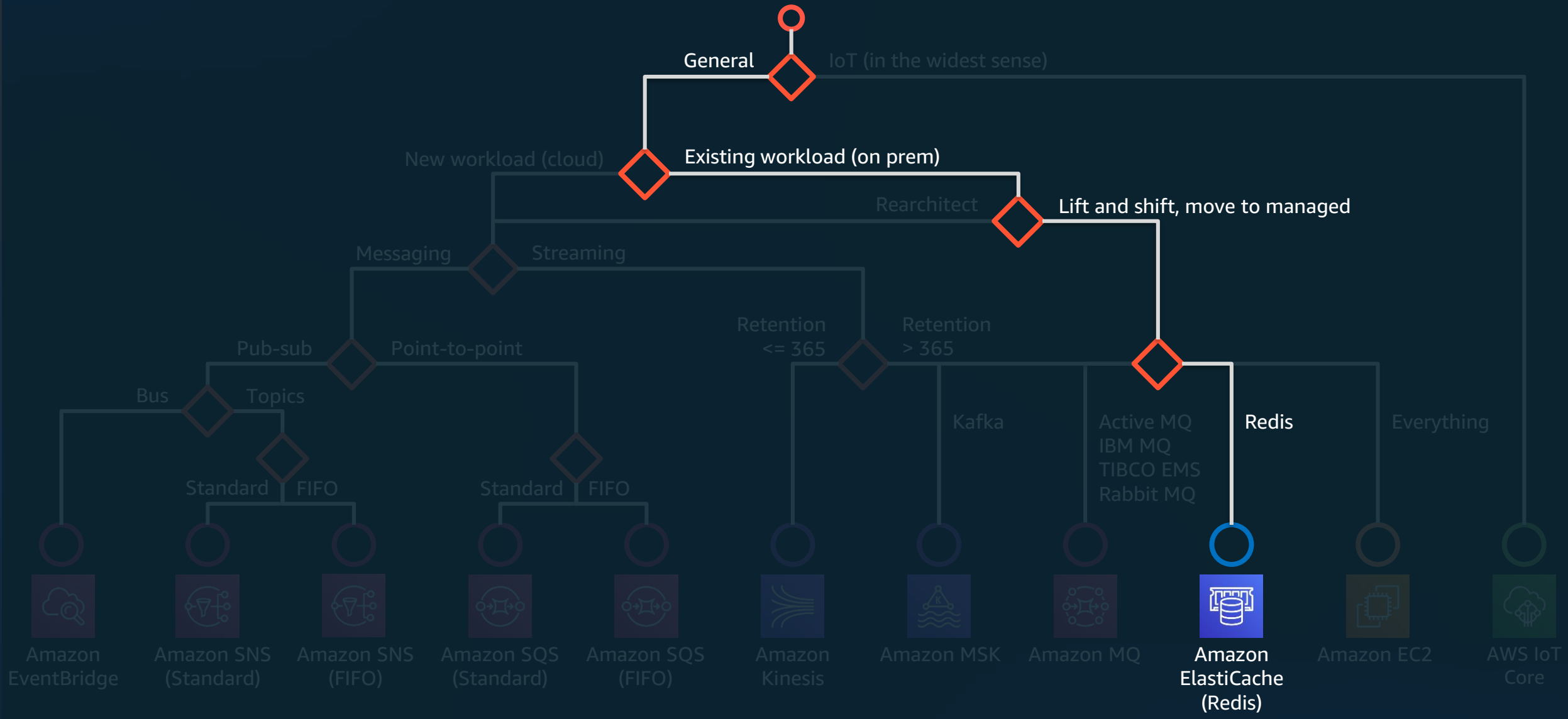
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Which service should I recommend?



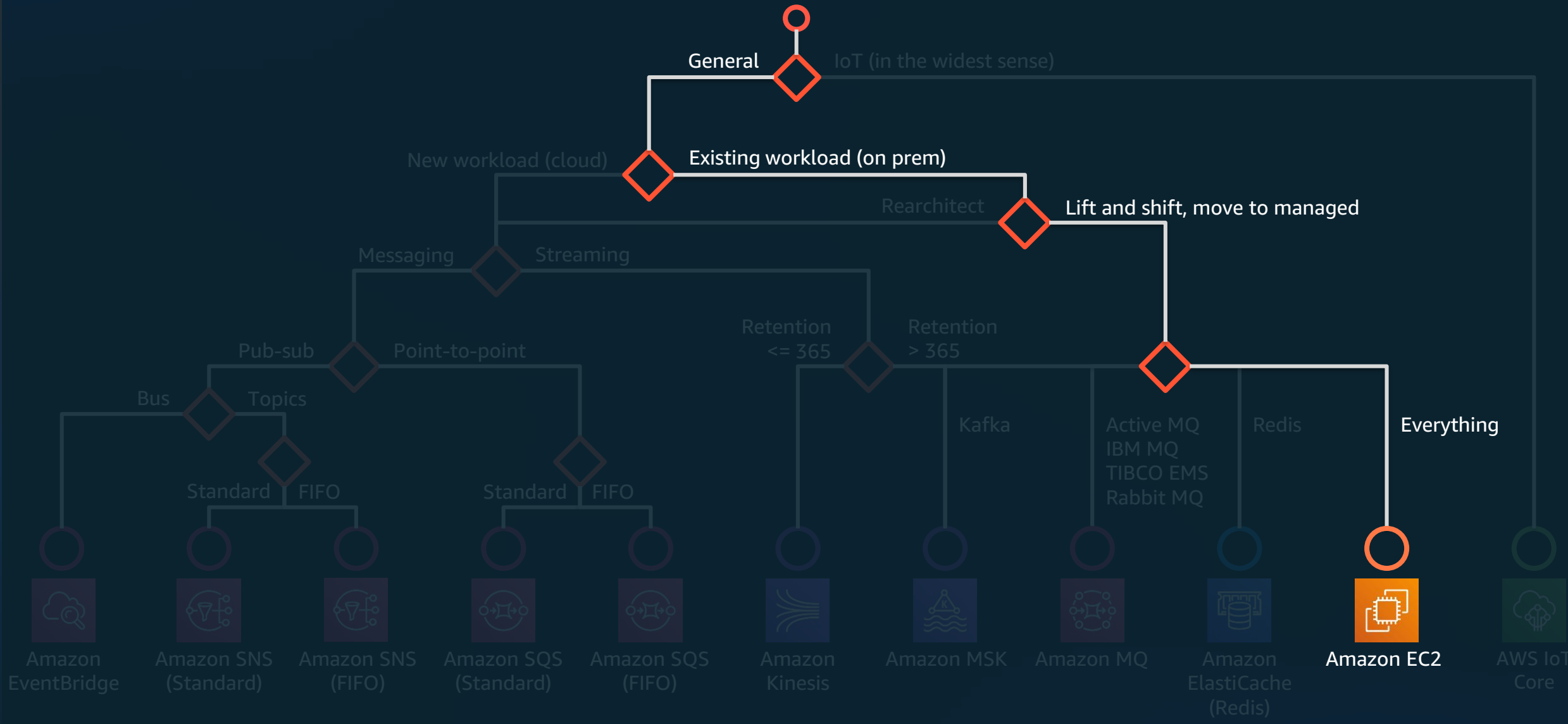
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Which service should I recommend?



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Which service should I recommend?



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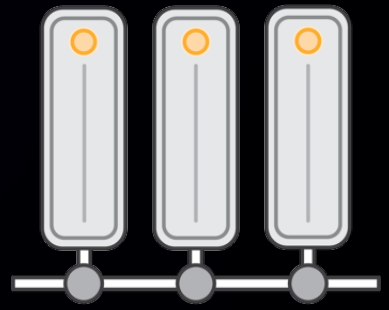
Integration services: Differentiation

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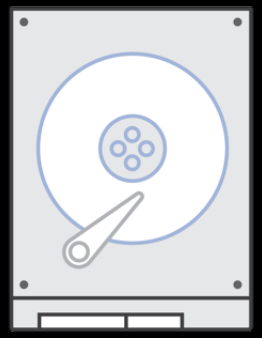
Integration services: Differentiation



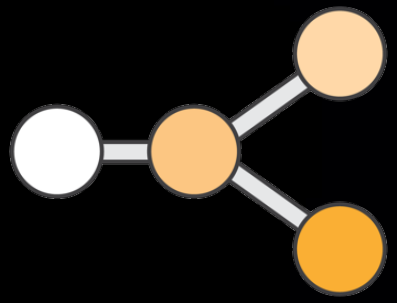
Scalability



Durability



Persistence



Consumption models



Retries



Pricing

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Scalability

Service	How to scale
Amazon SNS	Auto
Amazon EventBridge	Auto
Amazon SQS	Auto
Amazon Kinesis Data Streams	Add or remove shards to / from the stream Capacity per shard: write <= 1 MB or 1,000 ops/second; read <= 2 MB/second
Amazon MQ	Vertically: choose a larger or smaller instance type Horizontally: set up a network of brokers
Amazon Managed Streaming for Apache Kafka (MSK)	Vertically: increase storage, and change instance type Horizontally: expand cluster by adding broker nodes
AWS IoT Core Message Broker	Auto

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Durability

Service	Durability for messages in the respective channels
Amazon SNS	Replicated across multiple Availability Zones
Amazon EventBridge	Replicated across multiple Availability Zones
Amazon SQS	Replicated across multiple Availability Zones
Amazon Kinesis Data Streams	Replicated across 3 Availability Zones
Amazon MQ	Replicated across multiple Availability Zones (when using persistent messages)
Amazon Managed Streaming for Apache Kafka (MSK)	Kafka: data is replicated to multiple nodes in a cluster (default is 3) Amazon EBS: data is replicated across multiple servers in an Availability Zone
AWS IoT Core Message Broker	Replicated across multiple Availability Zones

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Persistence

Service	Persistence
Amazon SNS	No formal persistence model; delivery retries up to 23 days (different per protocol) Supports DLQs
Amazon EventBridge	No formal persistence model; delivery retry potentially up to 24 hours
Amazon SQS	Up to 14 days; default is 4 days
Amazon Kinesis Data Streams	Up to 365 days (with additional cost); default is 24 hours
Amazon MQ	Storage capacity per broker is 200 GB (20 GB for mq.t2.micro)
Amazon Managed Streaming for Apache Kafka (MSK)	As provisioned (between 1,000 GB and 16,384 GB)
AWS IoT Core Message Broker	Persistent sessions store subscription information and pending QoS 1 messages should the devices become disconnected

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Consumption

Service	Invocation model
Amazon SNS	Push-based Targets: AWS Lambda, Amazon SQS, Amazon Kinesis Data Firehose, HTTP, SMS, mobile push, SMTP
Amazon EventBridge	Push-based Targets: 28 AWS service targets, including Lambda, Amazon SQS, Amazon SNS, Amazon ECS, AWS Step Functions, and so on
Amazon SQS	Pull-based Integrated with Lambda
Amazon Kinesis Data Streams	Pull-based, clients have to maintain a checkpoint or cursor in the stream Integrated with Lambda
Amazon MQ	Pull- or push-based, typically with protocols like JMS, NMS, AMQP, or MQTT Integrated with Lambda
Amazon Managed Streaming for Apache Kafka (MSK)	Pull-based, clients have to maintain a checkpoint or cursor in the stream
AWS IoT Core Message Broker	Push-based Targets: devices, device shadows, rules engine

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Retries and failure handling

Service	Failure handling
Amazon SNS	Different retry phases (immediate, pre-backoff, backoff, post-backoff) Kinesis Data Firehose, Lambda, Amazon SQS: <= 100,015 times, over <= 23 days SMTP, SMS, mobile push: up to a total of 50 attempts, over 6 hours HTTP: custom
Amazon EventBridge	Retries for <= 24 hours and <= 185 times with exponential backoff and jitter (randomized delay) If DLQ configured: hopeless cases (e.g., no permission, target exists) directly go to DLQ
Amazon SQS	Messages remain in queue until deleted or expired
Amazon MQ	Consumer's responsibility to retry message retrieval
Amazon Kinesis Data Streams	Messages remain in stream until expired
Amazon Managed Streaming for Apache Kafka (MSK)	Consumer's responsibility to move on with checkpoint or cursor
AWS IoT Core Message Broker	AWS IoT Core retries delivery of unacknowledged quality of service 1 (QoS 1) publish requests to a client for up to 1 hour

aws

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Pricing

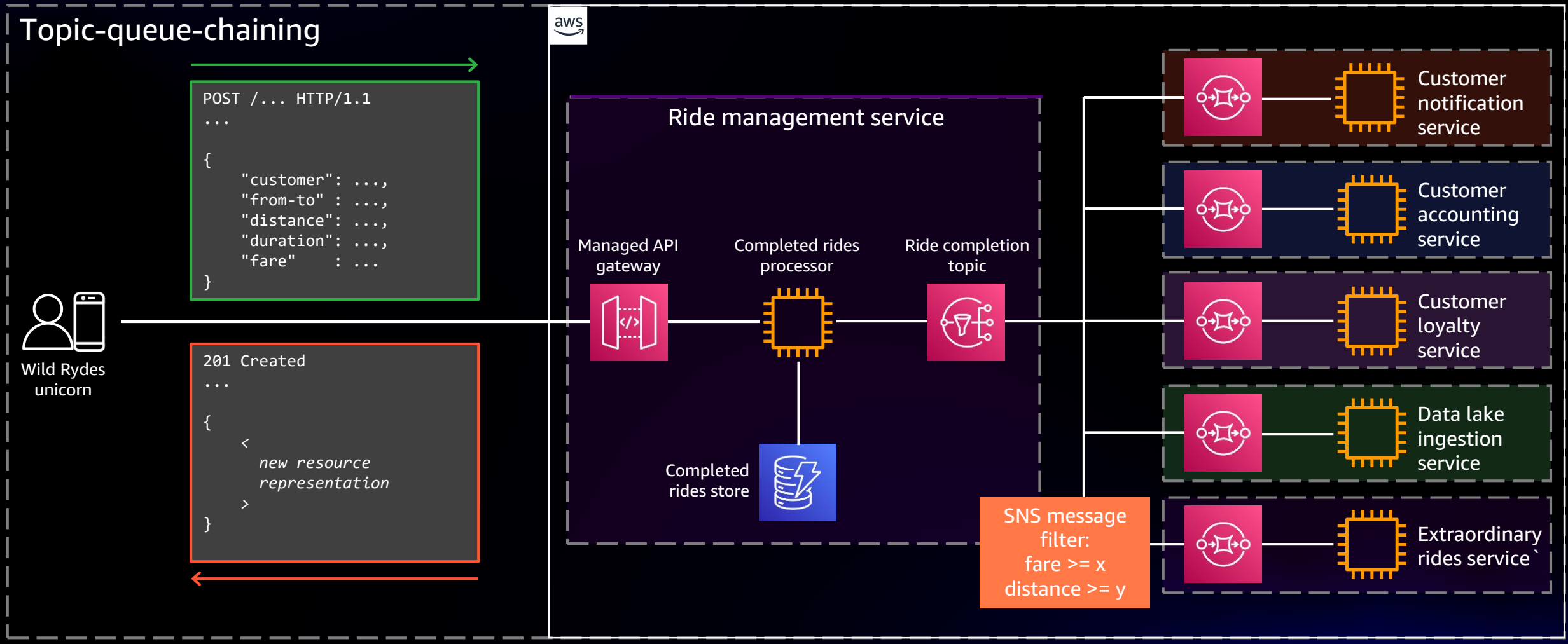
Service	Pricing model and cost (us-east-1)
Amazon SNS	Standard: per API req (pub per 64 KB chunks, topic ops, subscription ops)—$0.50/1 million FIFO: per pub API requests (any size) —$0.30/1 million and $0.017/GB of payload data
Amazon EventBridge	Per events published $1.00/million events published (64 KB chunks)—AWS service events are free
Amazon SQS	Per API requests (64 KB chunks for messages)—pricing per million requests Standard queues: <= $0.40; FIFO queues: <= $0.50
Amazon Kinesis Data Streams	Per shard hour ($0.015) and PUT payload units (256 KB chunks, 1 million units: $0.014) Additional charges for (extended or long-term) data retention and enhanced fanout
Amazon MQ	Per instance hour and monthly storage usage (for Amazon EFS: average with hourly granularity) Instance hour: $0.02704 to $2.304—storage: $0.10 (Amazon EBS) to $0.30 (Amazon EFS) per GB month
Amazon Managed Streaming for Apache Kafka (MSK)	Per instance hour and storage provisioned Instance hour: from $0.0456 to $10.08—storage provisioned: $0.10 per GB month
AWS IoT Core Message Broker	Per connected minute and per message Connectivity: $0.08 per million minutes—MQTT and HTTP messages: $1.00 per million

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Open discussion

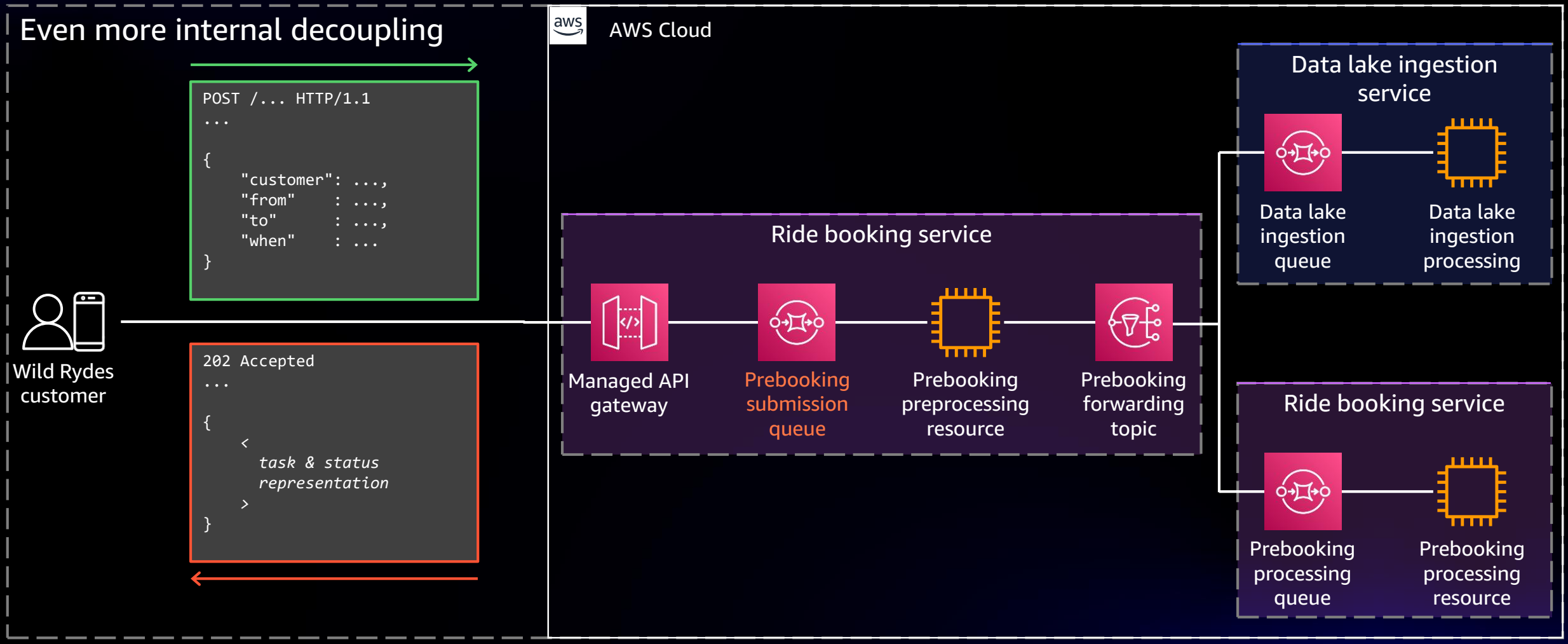
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Use case: Submit ride completion



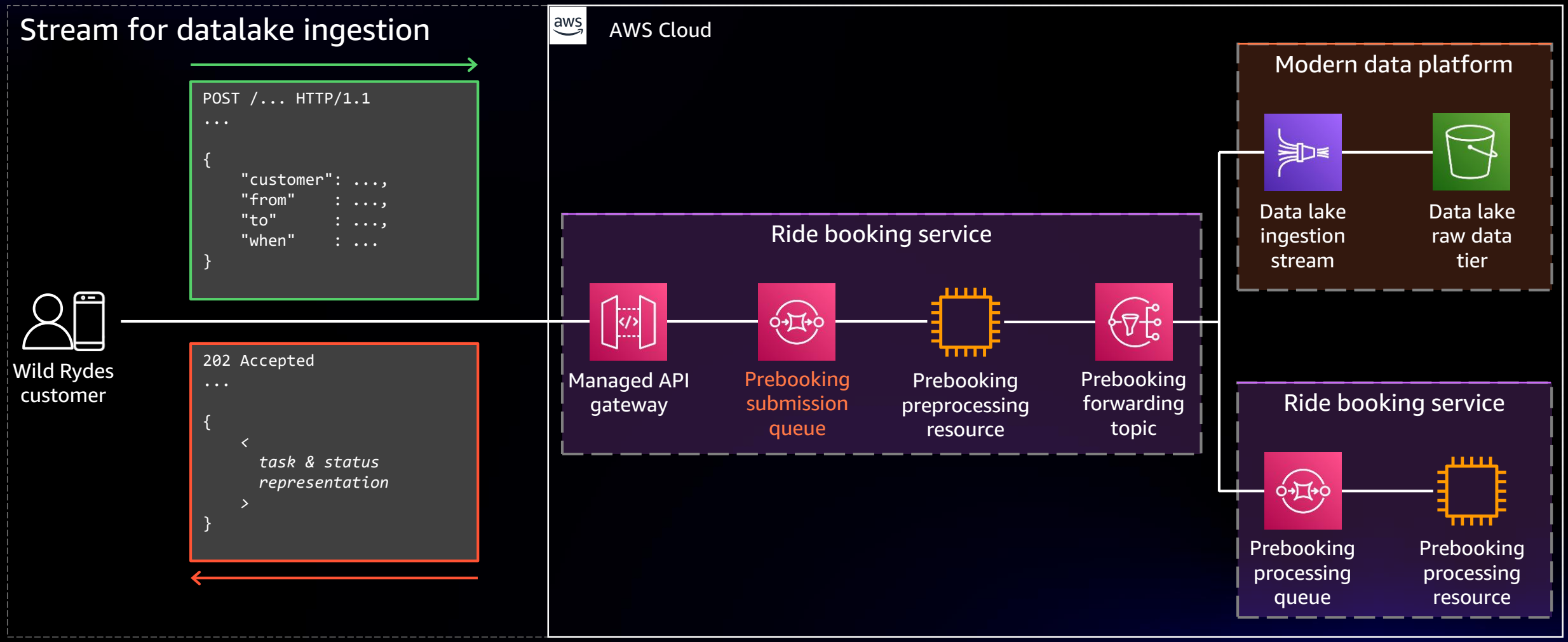
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Use case: Prebooking campaigns



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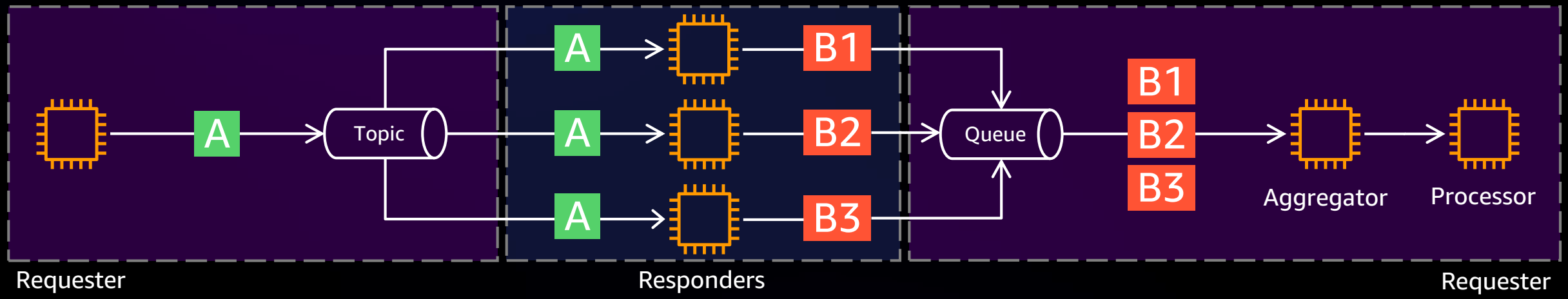
Use case: Prebooking campaigns



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Message routing

Scatter-gather

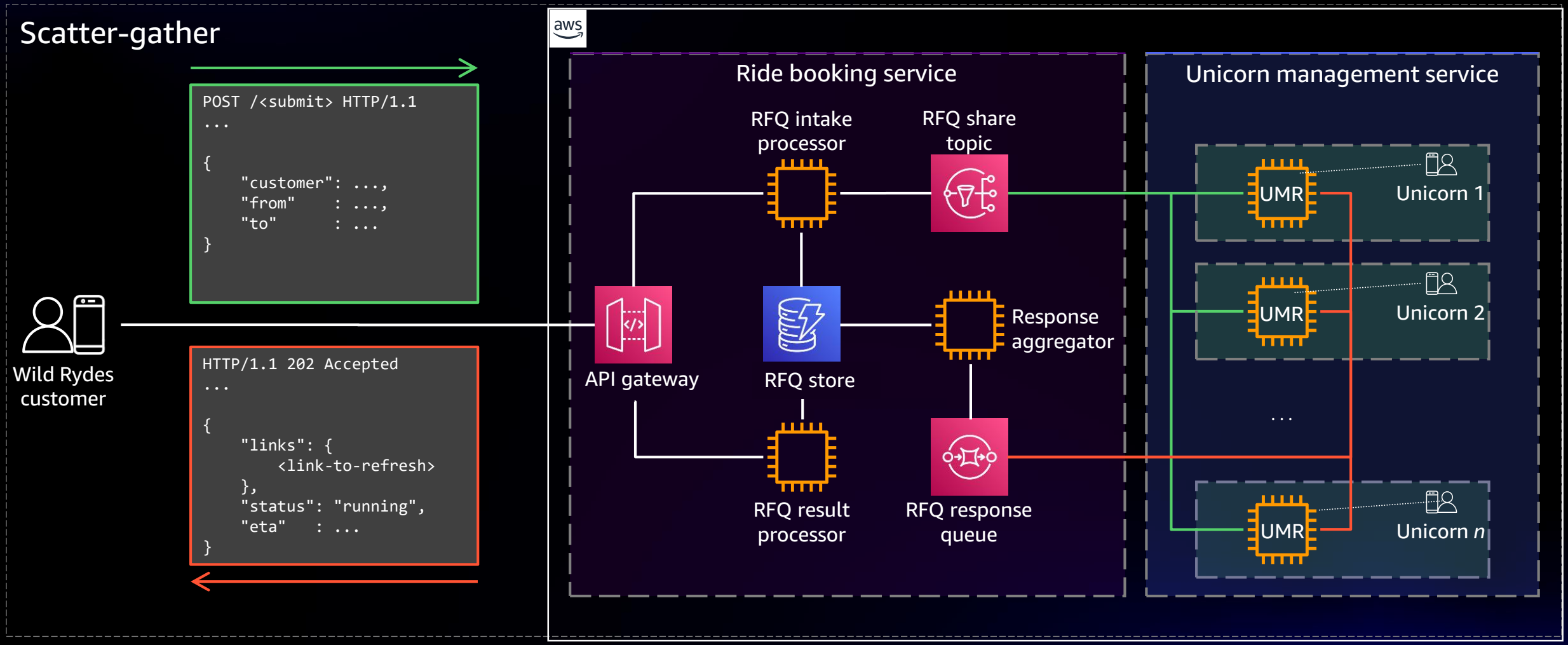


How to distribute a request to relevant/interested parties and capture their individual responses?

For election or parallel processing scenarios, that is, search for best response or accumulate responses

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Use Case: Instant ride RFQ



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Resources and call to action

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Resources and call to action

AWS blog series

About messaging-based integration patterns with use cases



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Resources and call to action

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About messaging-based integration patterns with use cases

AWS hands-on workshop

Get your hands dirty with building some integration uses cases on AWS

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and keep in mind

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Resources and call to action

AWS blog series

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and keep in mind

Loose coupling is always
better than lousy coupling

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Thank you!

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