
AWS
re:Invent
NOV. 28 – DEC. 2, 2022 | LAS VEGAS, NV

API202-R

Decoupled microservices

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Amazon Web Services

Agenda

Motivation

Application integration patterns

Use cases: Our labs for today

Your turn: Work on the labs

Resources and call to action

Related sessions

API002	Advanced patterns with Amazon EventBridge
API303	Application integration patterns for microservices
API306	Building event-driven architectures
API307	Designing event-driven integrations using Amazon EventBridge
API308	Are you integrating or building distributed applications?
API312	How to select the right application integration service
SVS306	Serverlesspresso: Building an event-driven application from the ground up
SVS308	AWS serverless developer experience: A day in the life of a developer
SVS312	Building Serverlesspresso: Creating event-driven architectures

Motivation

Companies deal with integration scenarios

in many areas, on many layers

Photo: Adobe Stock #299286544

“In modern cloud applications, integration isn’t an afterthought.
It’s an integral part of the application architecture and the software delivery lifecycle.”

Gregor Hohpe

Author of *Enterprise Integration Patterns*, *Cloud Strategy*, and *The Software Architect Elevator*

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

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
- . . . and some things simply take **too much time to wait** or are **asynchronous by nature**

Photo: Dirk Fröhner

Application integration patterns

Applica

Gregor Hohpe and Bobby Woolf:

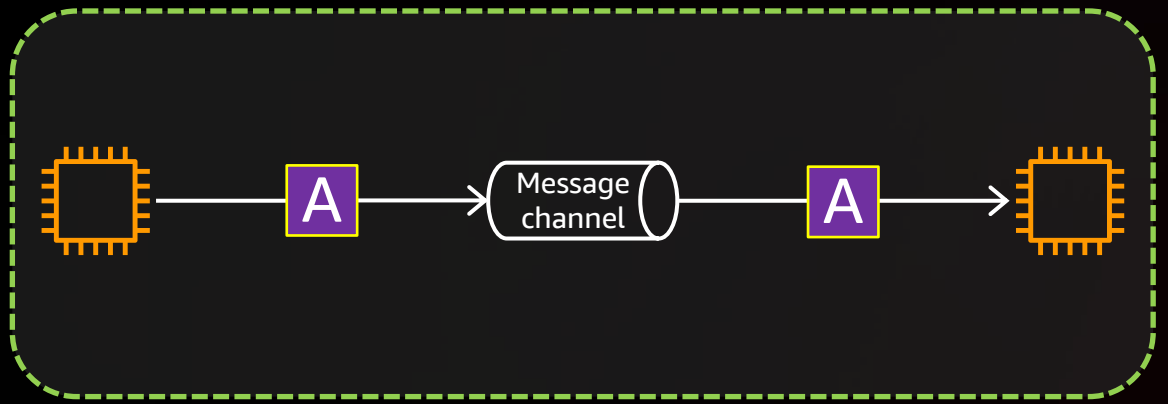
Enterprise Integration Patterns

Designing, Building, and Deploying Messaging Solutions

Message exchange

Integration pattern

One-way



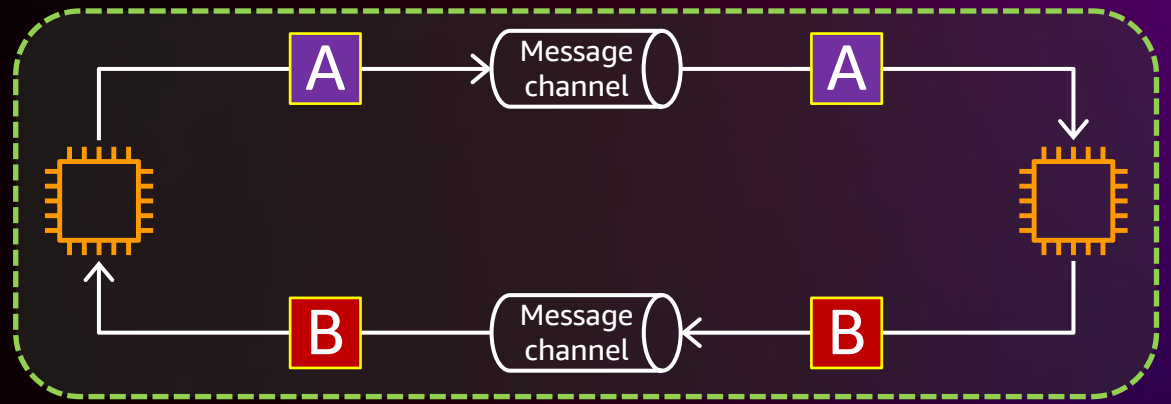
No response expected

Message channel decouples parties

Message intent: Command-, document-, event-message

Conversation pattern

Asynchronous request-response



Response expected

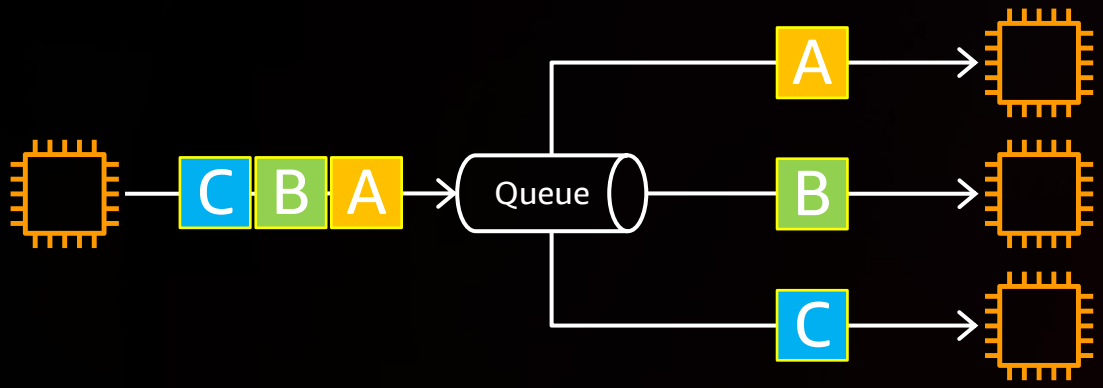
Message channels decouple parties

Return address

Correlation ID

Message channels

Point-to-point (queue)

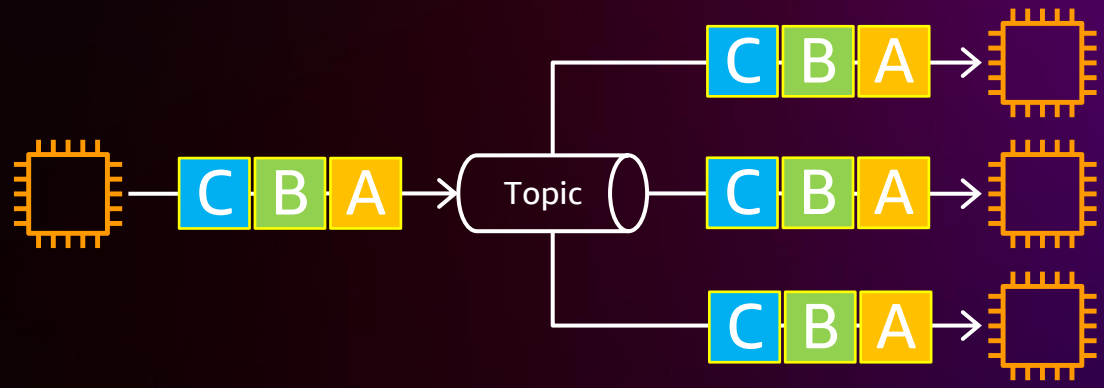


Each message consumed by one receiver

Competing consumers

Buffering load balancer

Publish-subscribe / fan-out (topic)



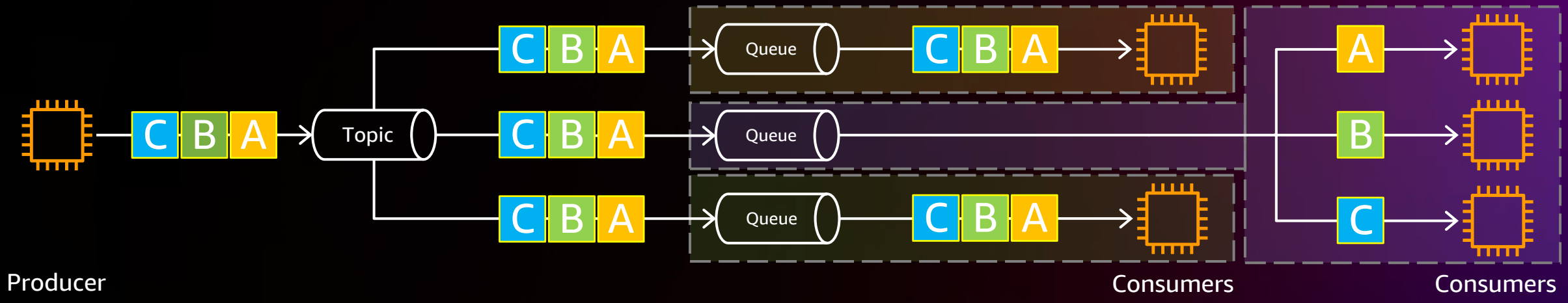
Each message consumed by each subscriber

How to scale consumers

How to not miss a message when down

Message channels

Composite pattern: Topic-queue-chaining



Durable subscriber pattern: How to avoid missing messages while not listening?

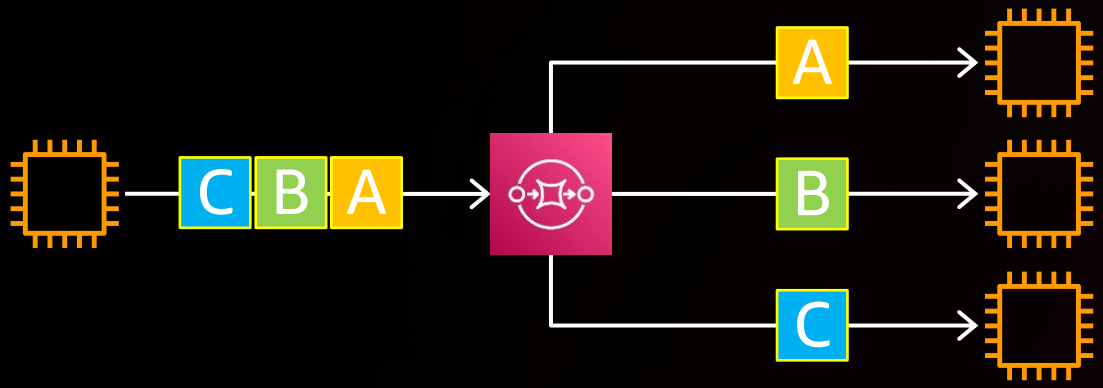
Concurrent consumer pattern: How to scale consumers of publish-subscribe channels?

Best of both worlds: fan-out and consumer scale-out and buffering load balancing all at the same time

Message channels

AWS services implementing
various message channel patterns

Point-to-point (queue)



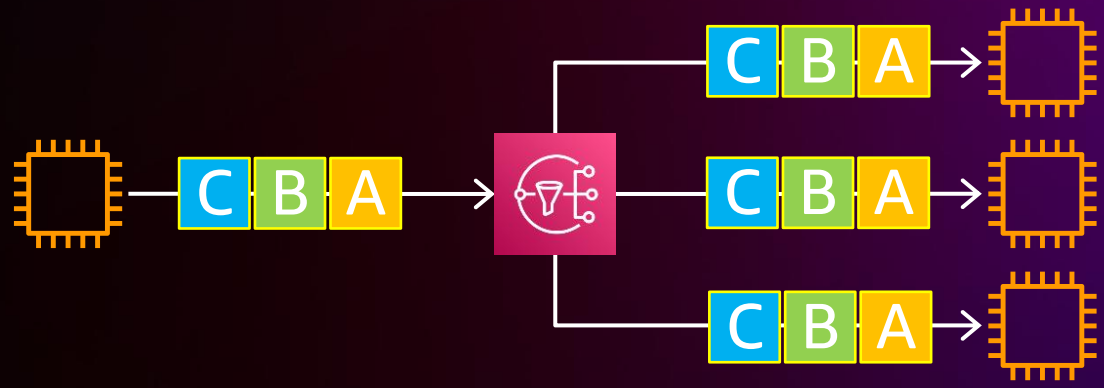
Sender(s)

Receivers

Amazon Simple Queue Service (Amazon SQS)

Cloud-native and serverless

Publish-subscribe / fan-out (topic)



Publisher(s)

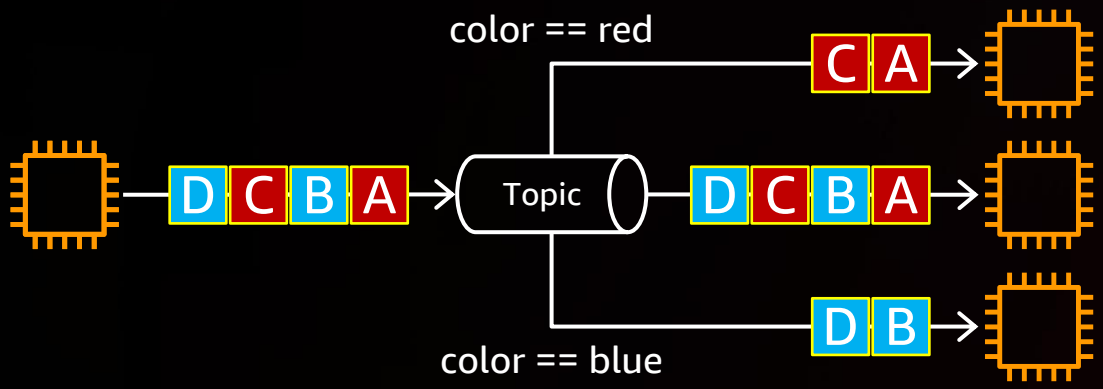
Subscribers

Amazon Simple Notification Service (Amazon SNS)

Cloud-native and serverless

Message routing

Message filter

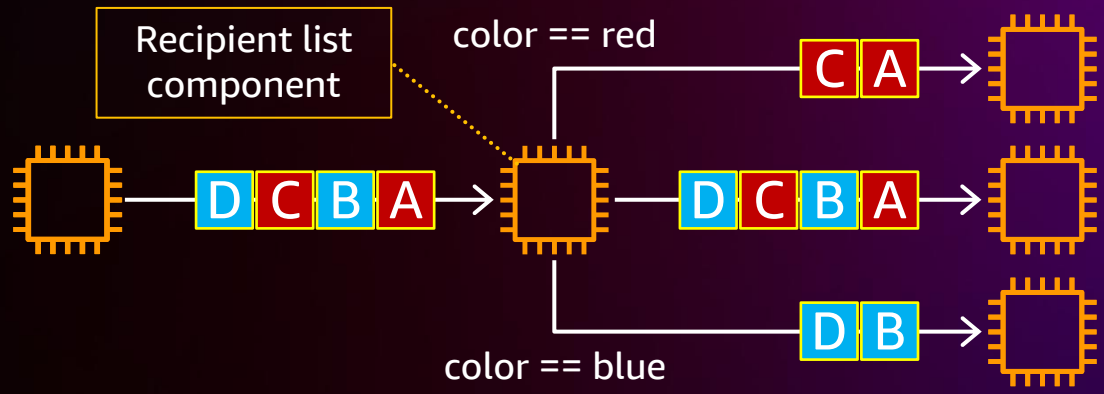


Receive only relevant subset of messages

Controlled by subscriber

Publisher remains completely unaware

Recipient list

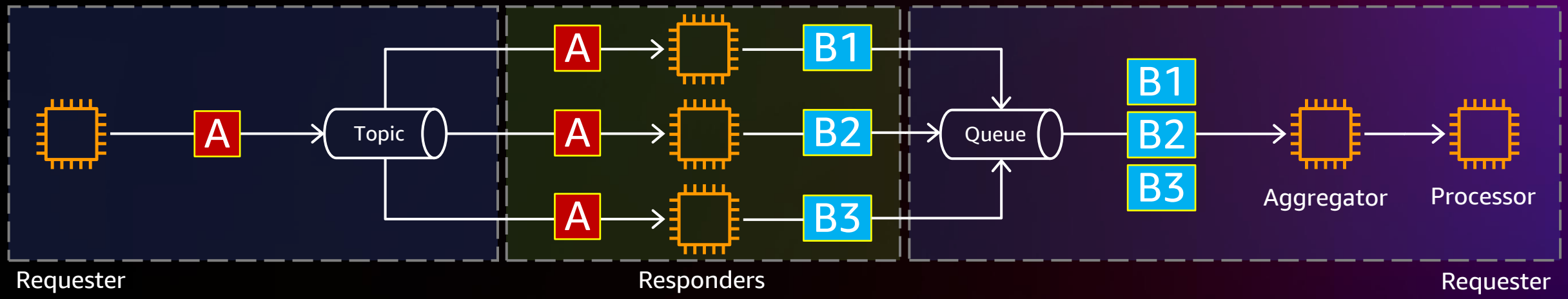


Send only relevant subset of messages to each subscriber

Controlled directly by publisher or a separate component

Message routing

Scatter-gather



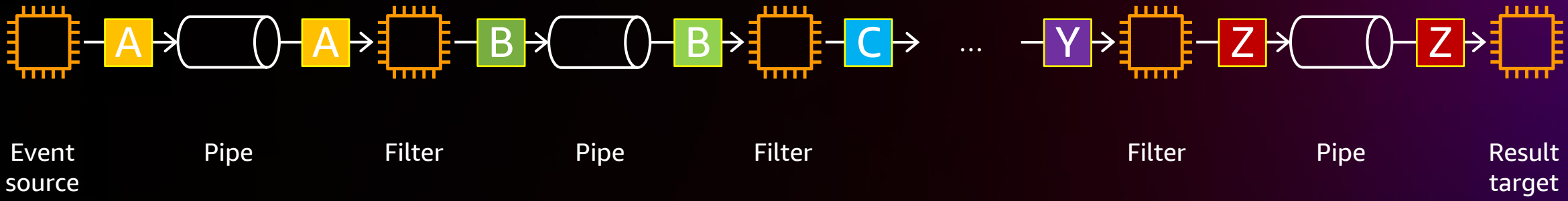
How to distribute a request to relevant/interested parties and capture their individual responses?

For election or parallel processing scenarios (i.e., search for best response or accumulate responses)

Message routing

Pipes and filters

Flow doesn't have to be linear!



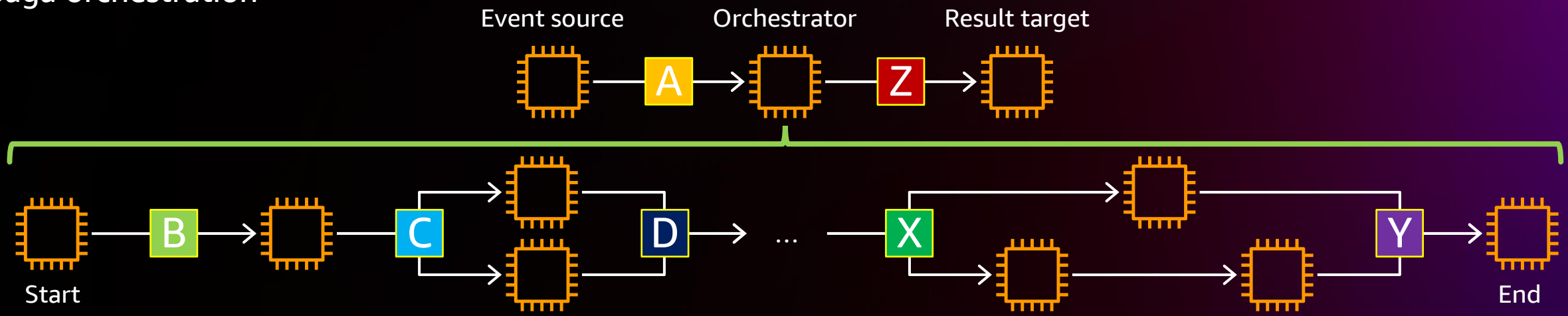
Event triggers chain of processing steps ("filters"), connected by "pipes"

Knowledge of destination or context for next step is wired into each filter

Similar patterns: chain of responsibility, processing pipeline, saga choreography

Message routing

Saga orchestration



Event triggers orchestrated workflow

Knowledge of workflow is externalized into orchestrator component

Workflow participants remain as loosely coupled as possible

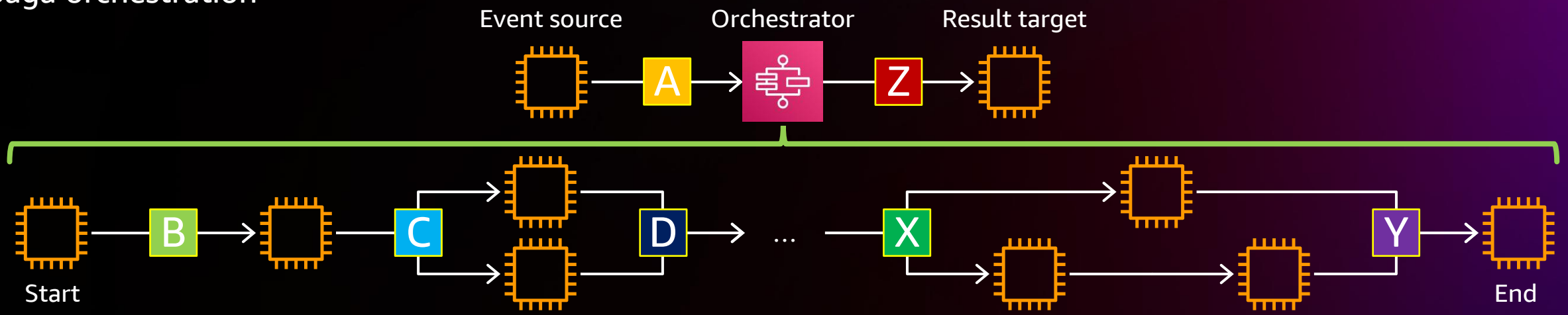
Orchestrator manages branches, retries, and rollbacks into a consistent state

Message routing

AWS service that makes it easy to implement this pattern:

AWS Step Functions

Saga orchestration



Event triggers orchestrated workflow

Knowledge of workflow is externalized into orchestrator component

Workflow participants remain as loosely coupled as possible

Orchestrator manages branches, retries, and rollbacks into a consistent state

Use cases: Our labs for today

Context: Wild Rydes, Inc.

Choose your path

We have four labs for you today, plus a common foundation lab.

After introduction of use cases, context, and patterns, you can pick the most relevant labs for you or run through all of them if time permits.

The workshop is available on a public website and you can run the labs individually with your own AWS account anytime later.

Photo: Dirk Fröhner

Choose your path

Foundation

Lab 0

Lab 1
Fan-out,
Message-filtering

Lab 2
Topic-queue-chaining,
Queues as buffering LBs

Lab 3
Scatter-gather

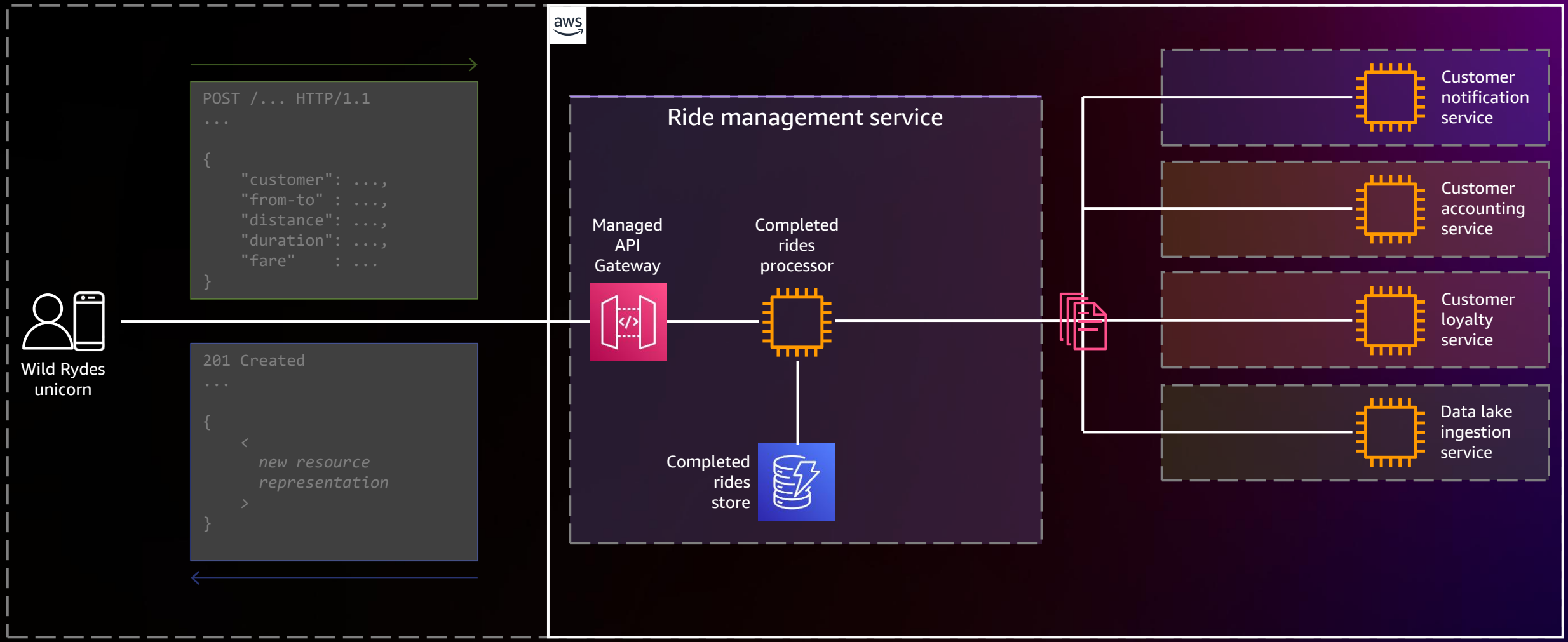
Lab 4
Saga orchestration

Photo: Dirk Fröhner

Use case: Submit a ride completion
Context for labs 1 and 2

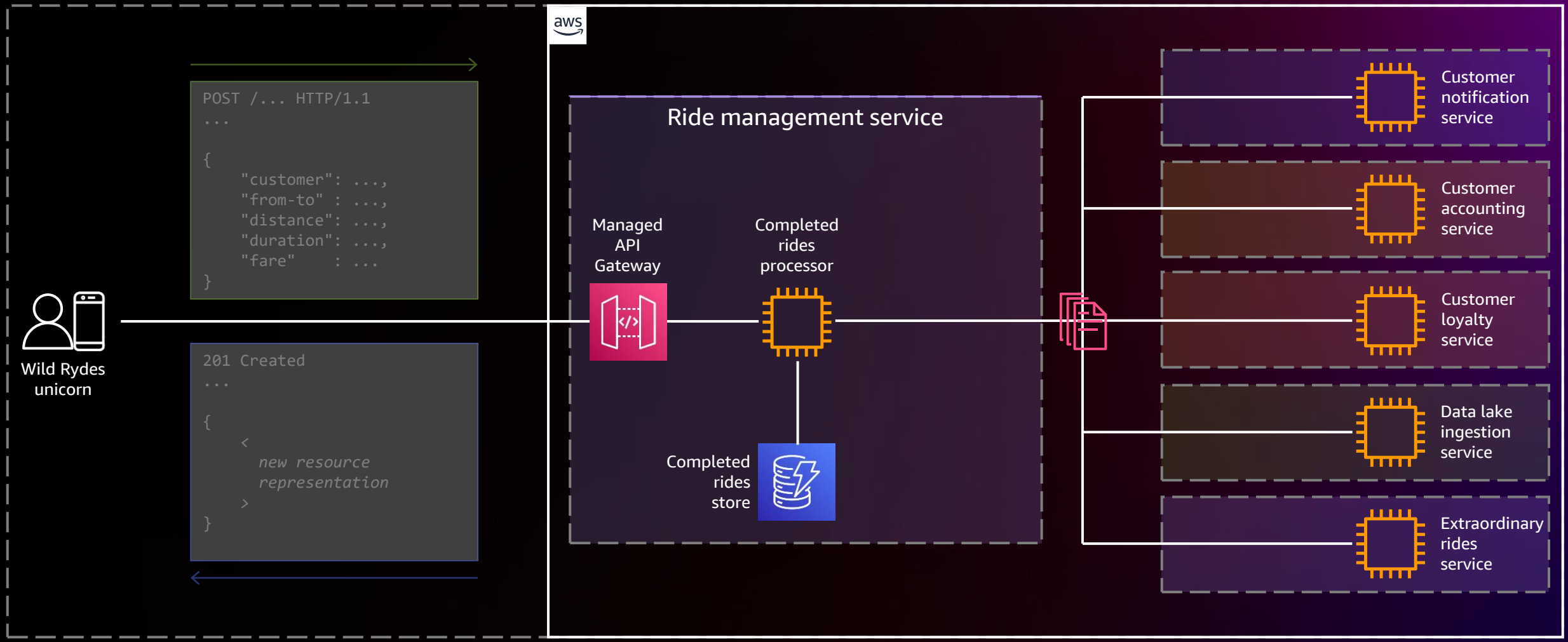
Submit ride completion

USE CASE



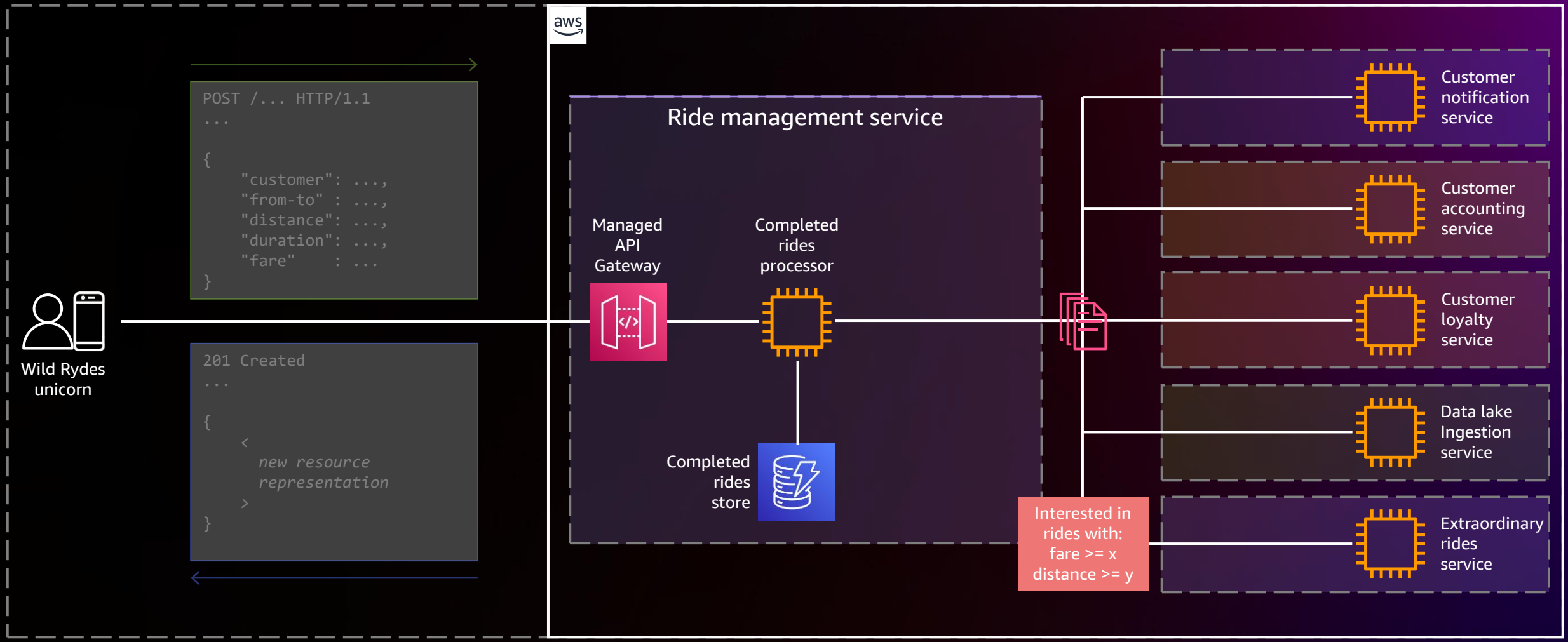
Submit ride completion

USE CASE



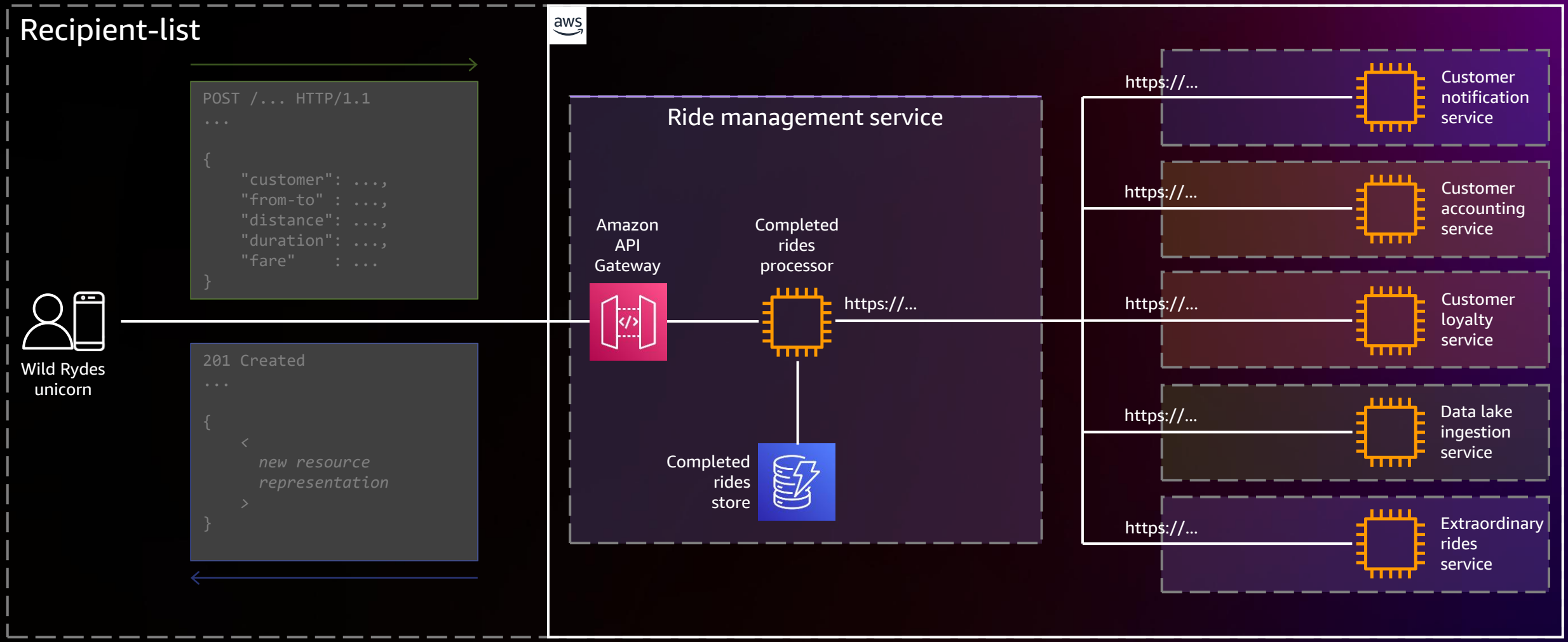
Submit ride completion

USE CASE



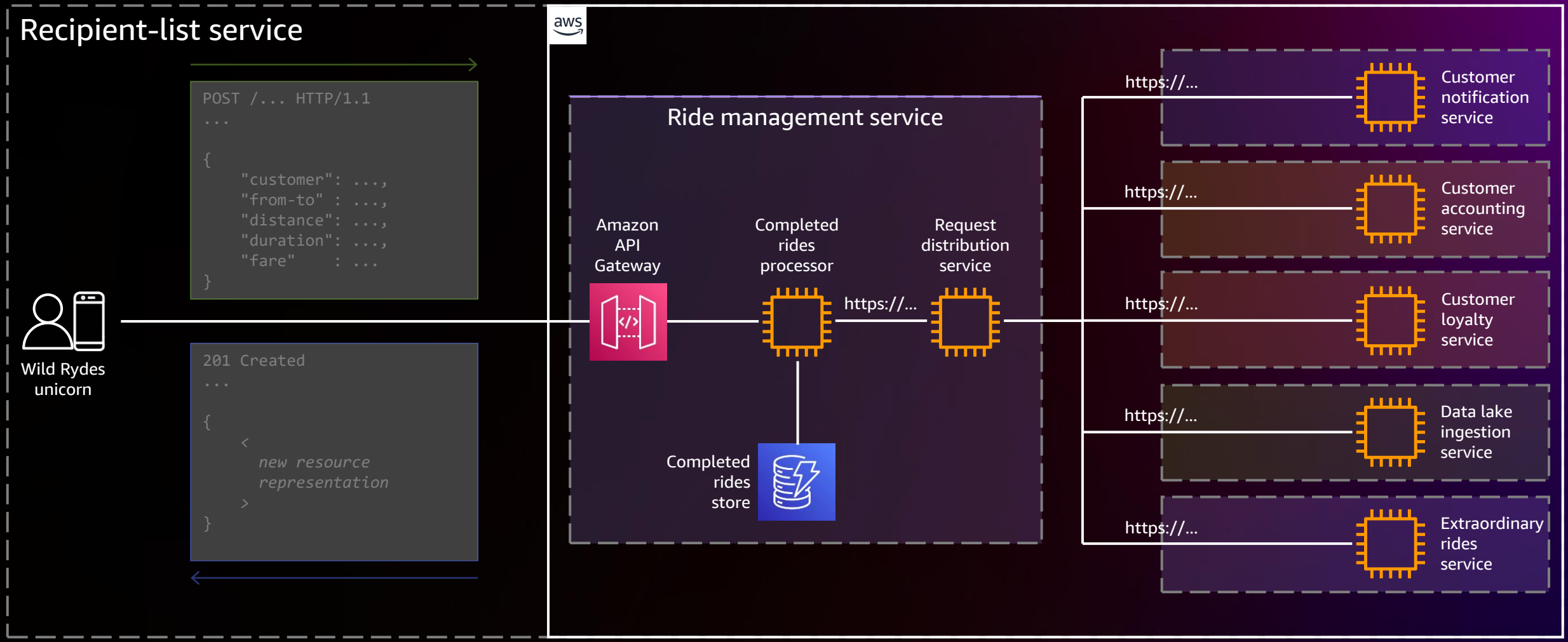
Submit ride completion

USE CASE



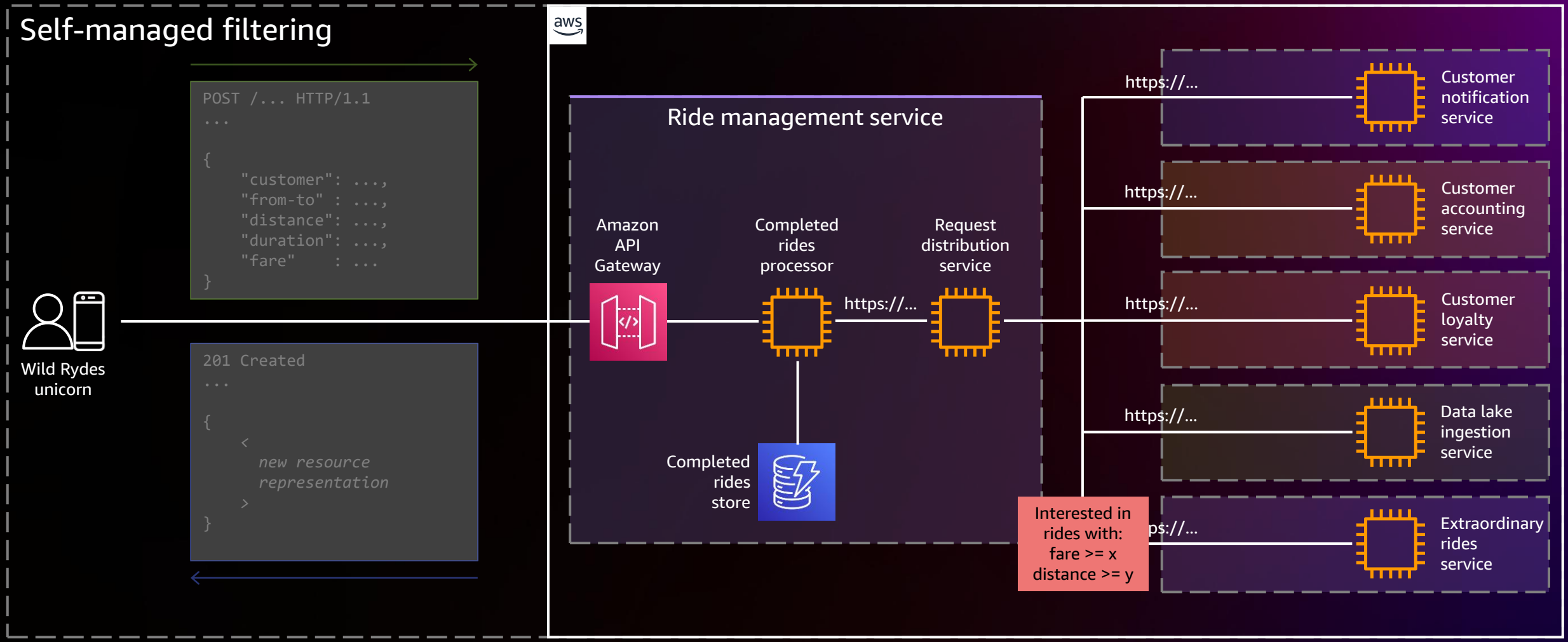
Submit ride completion

USE CASE



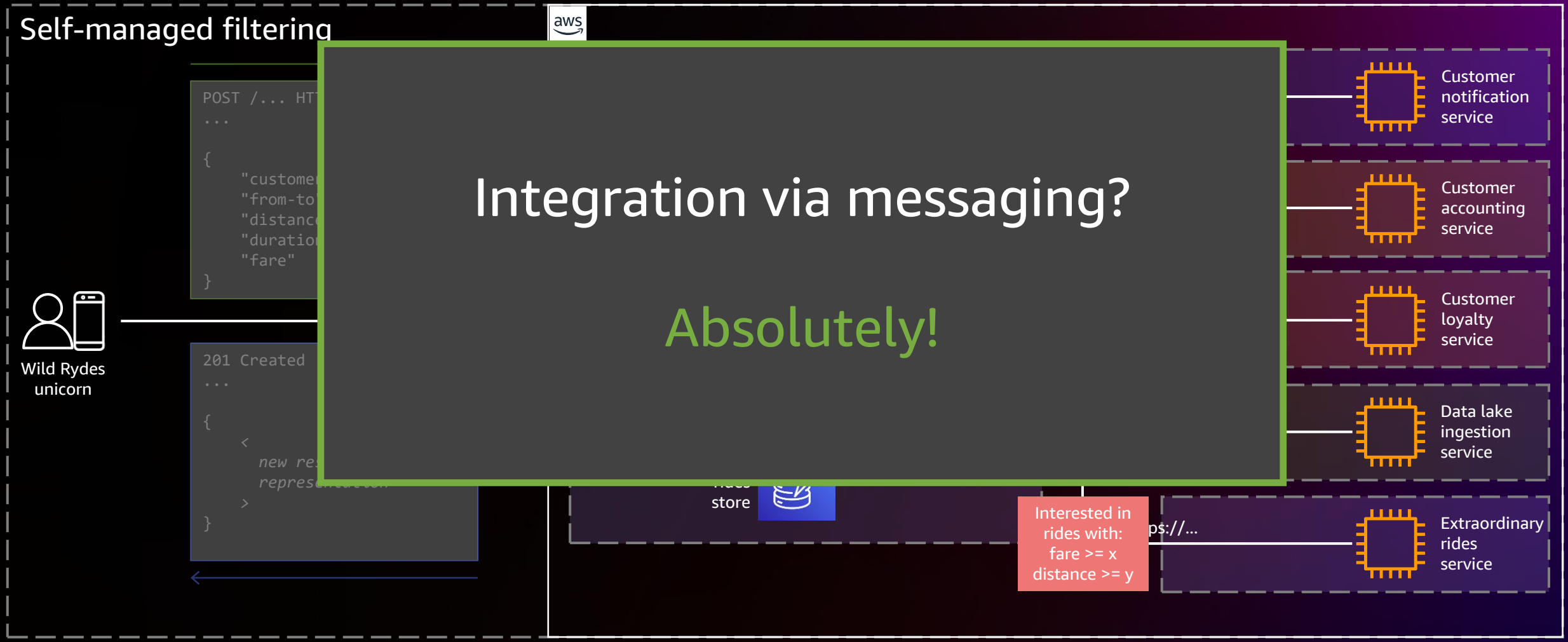
Submit ride completion

USE CASE



Submit ride completion

USE CASE



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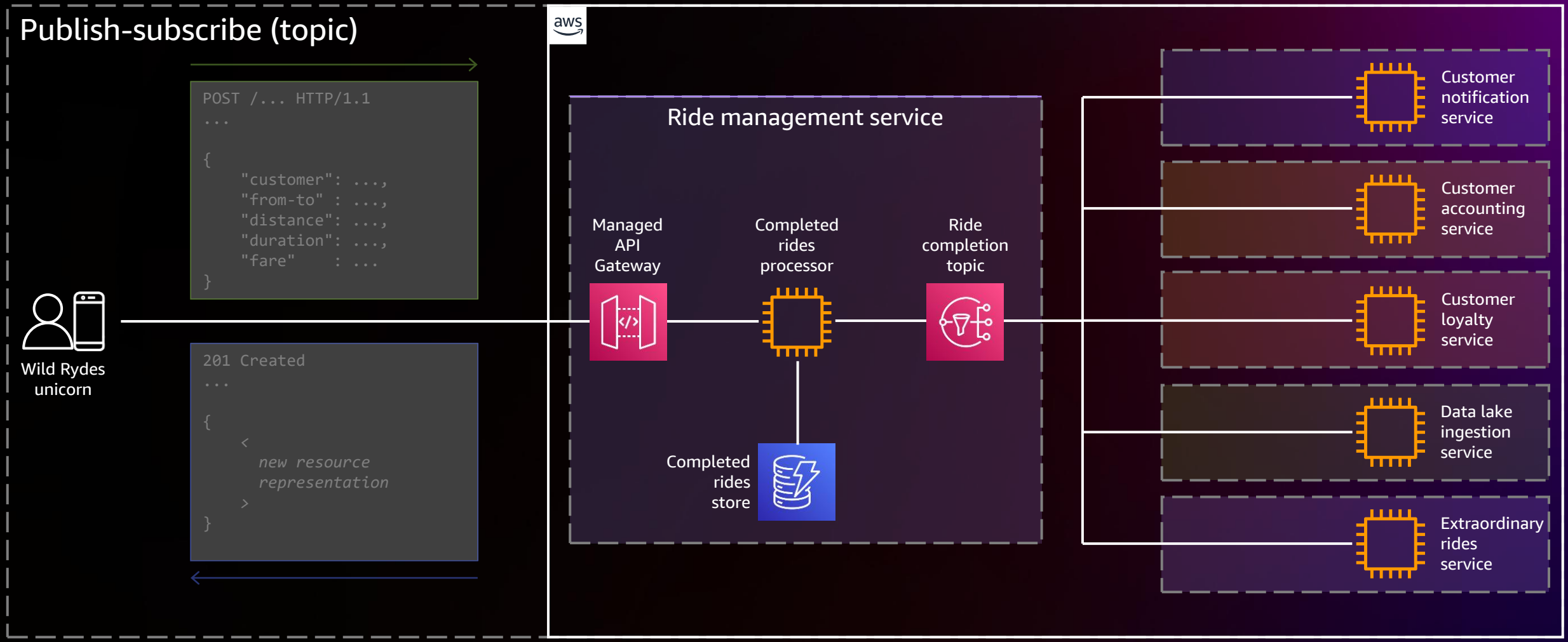

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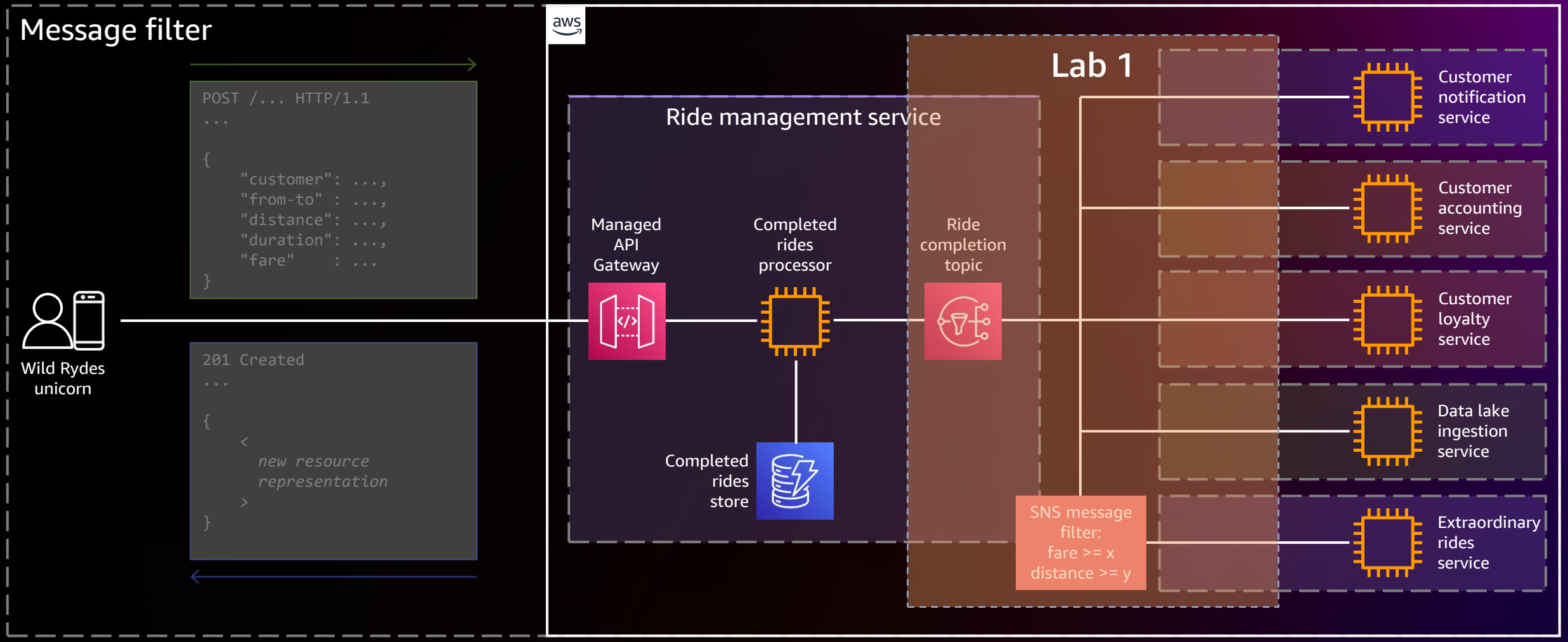
USE CASE



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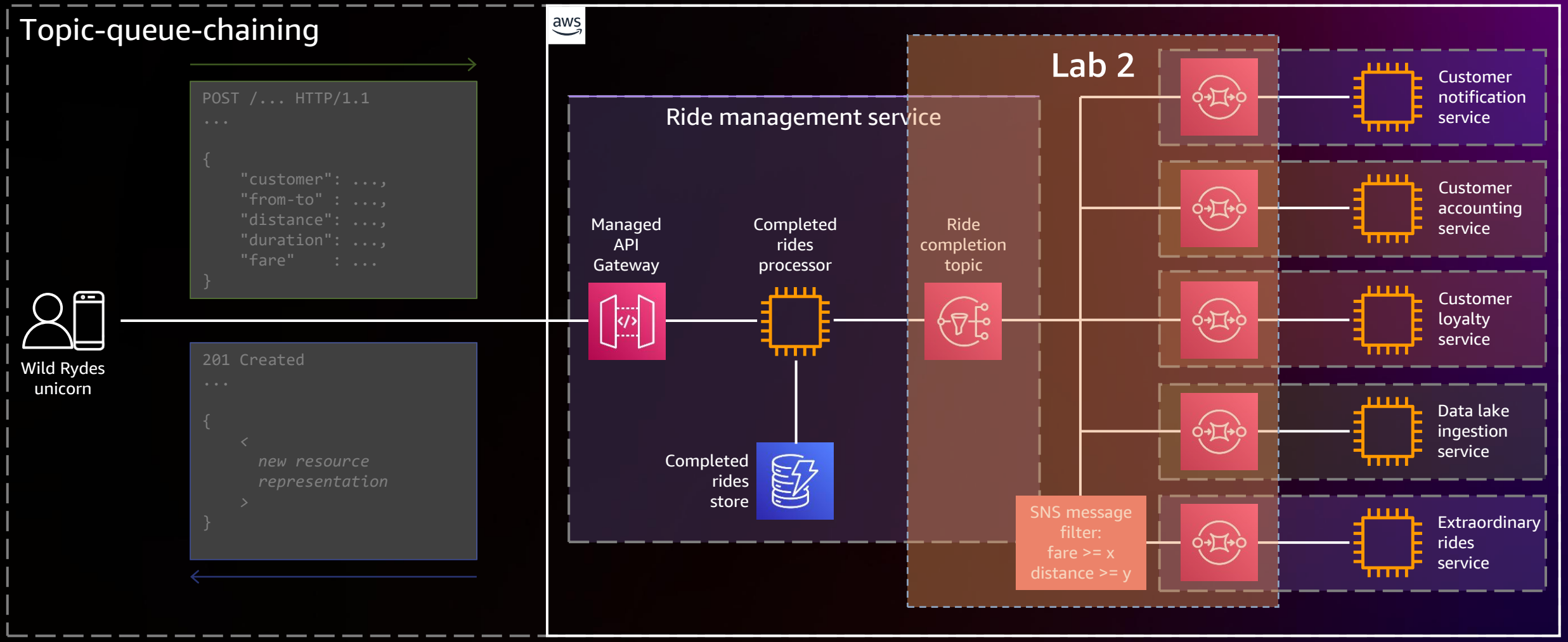
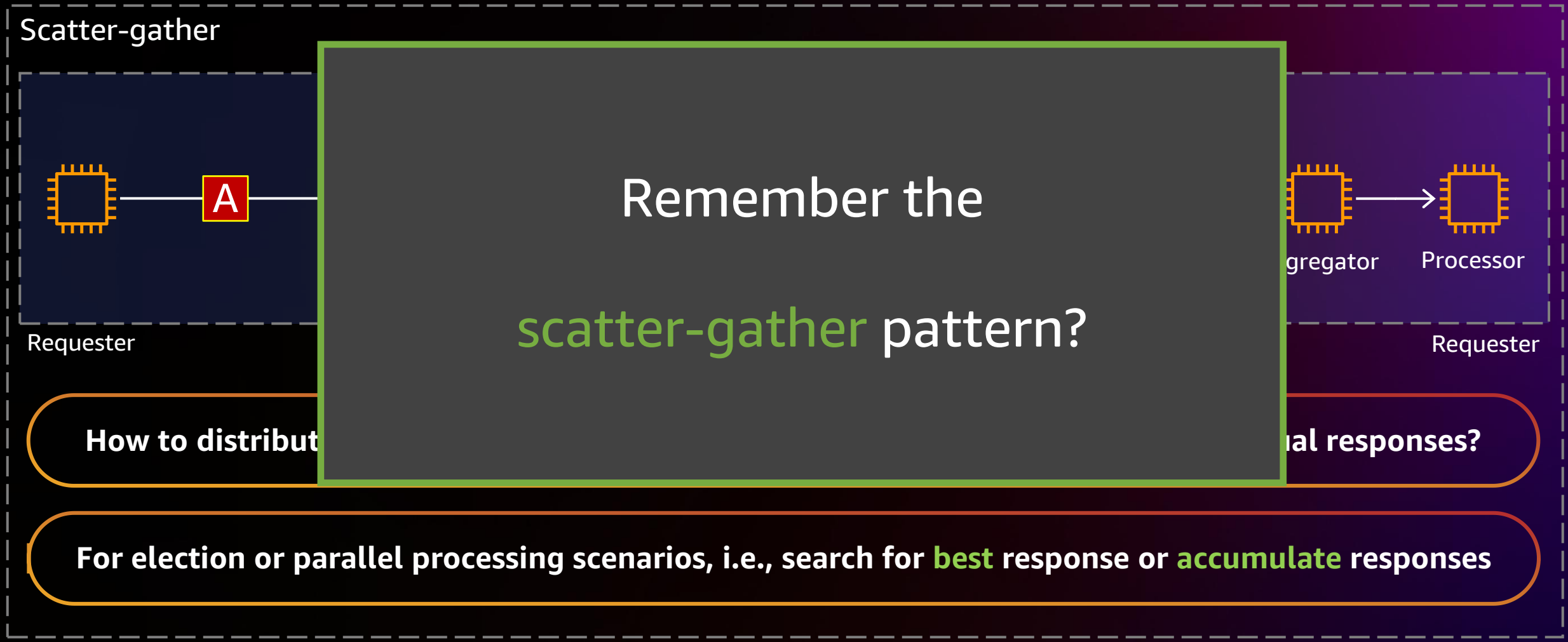
USE CASE

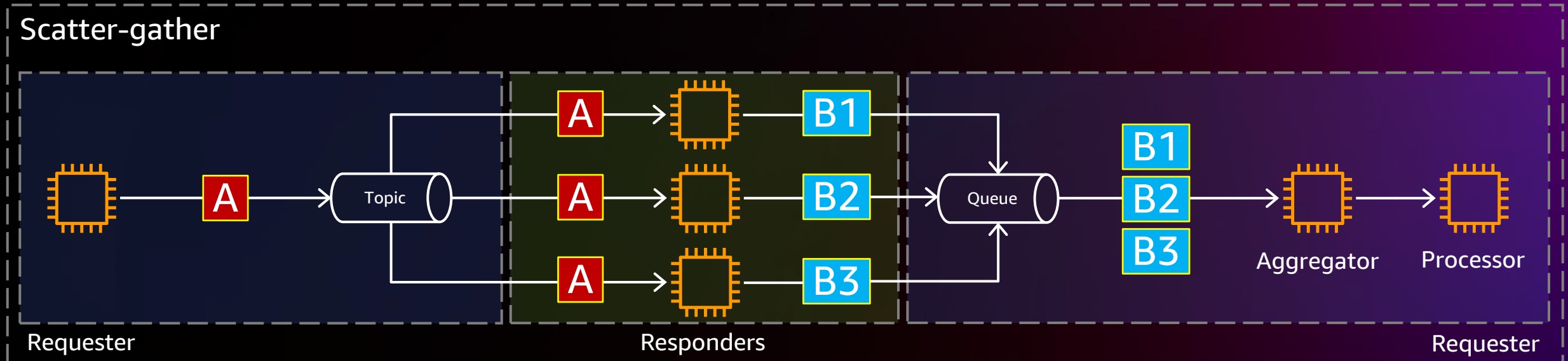


Use case: Instant ride RFQ
Context for lab 3

Message routing



Message routing



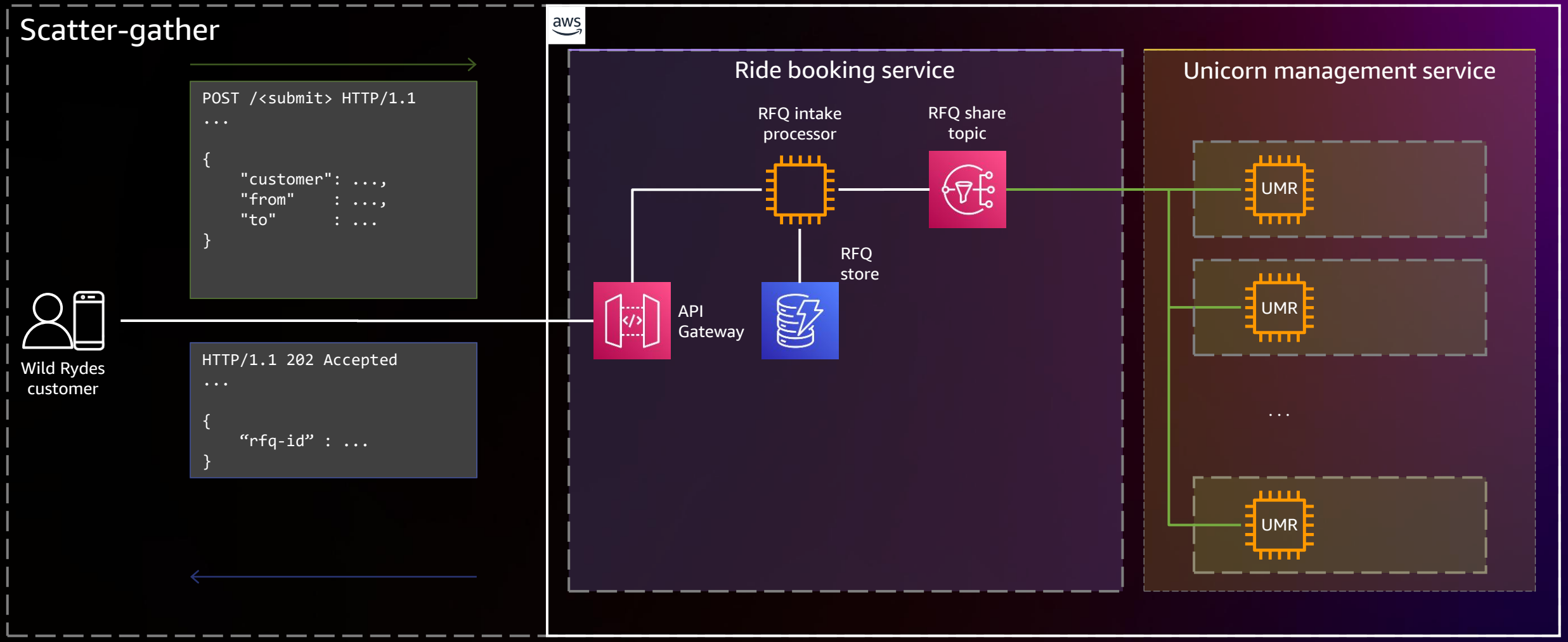
How to distribute a request to relevant/interested parties and capture their individual responses?

For election or parallel processing scenarios, i.e., search for best response or accumulate responses

Instant ride RFQ

USE CASE

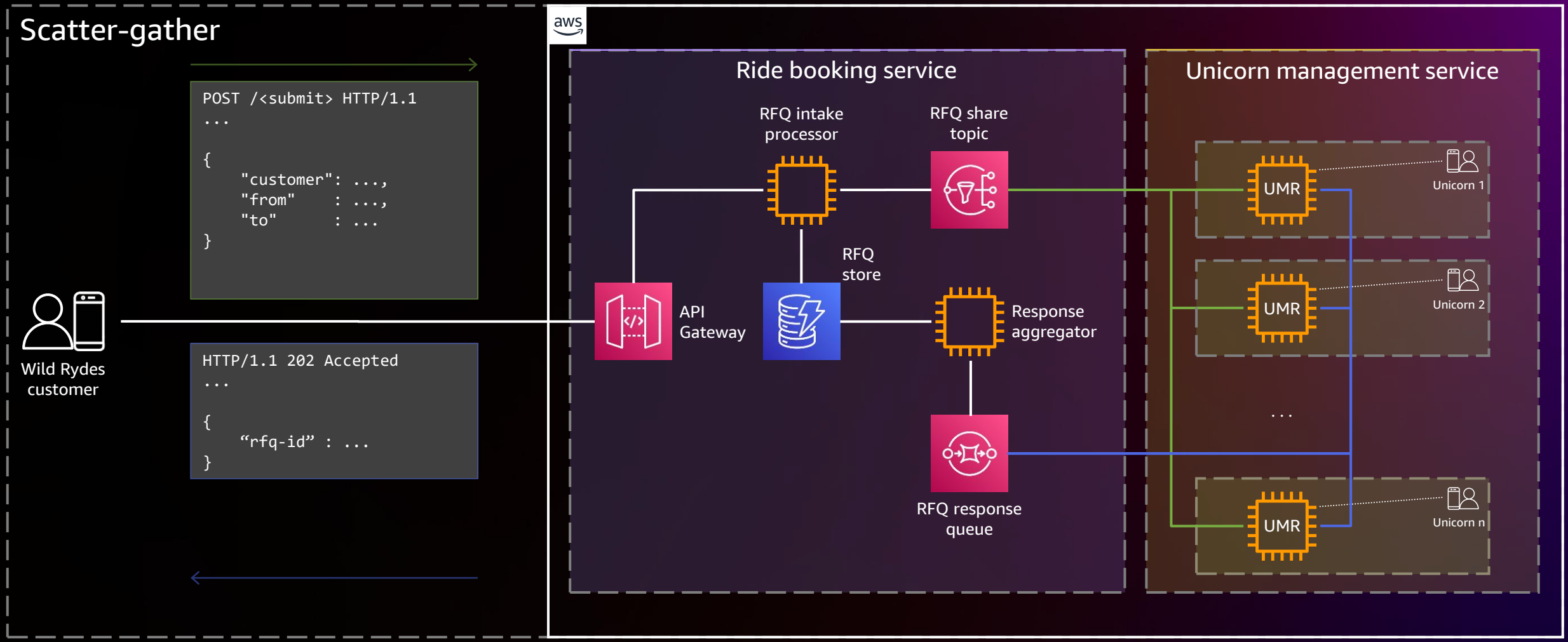
UMR: Unicorn management resource



Instant ride RFQ

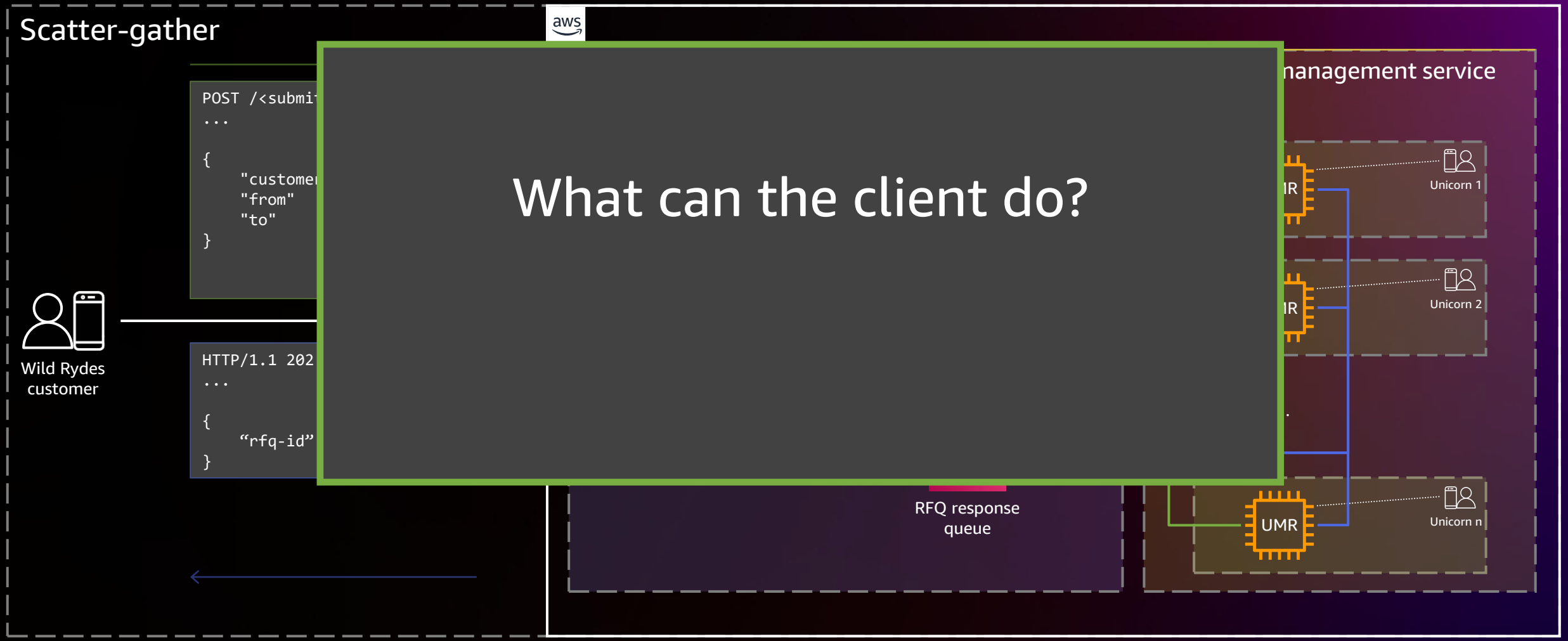
UMR: Unicorn management resource

USE CASE



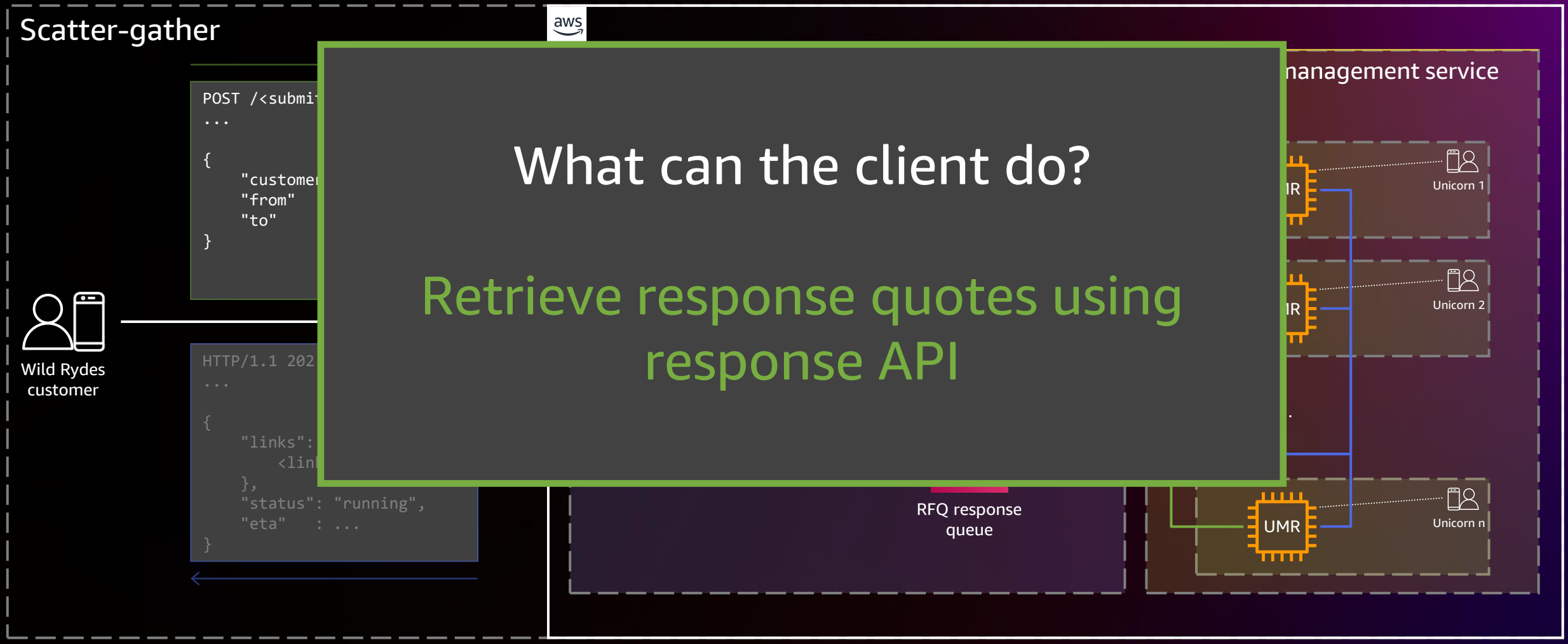
Instant ride RFQ

USE CASE



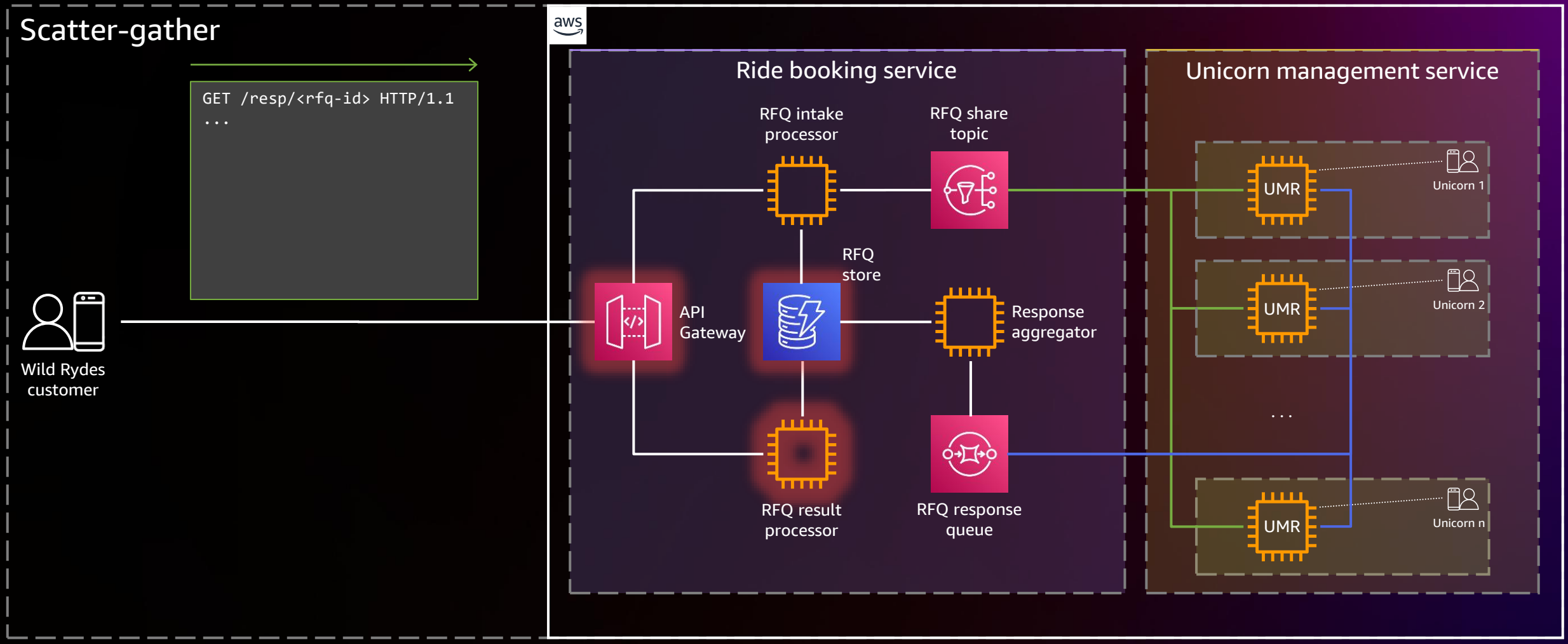
Instant ride RFQ

USE CASE



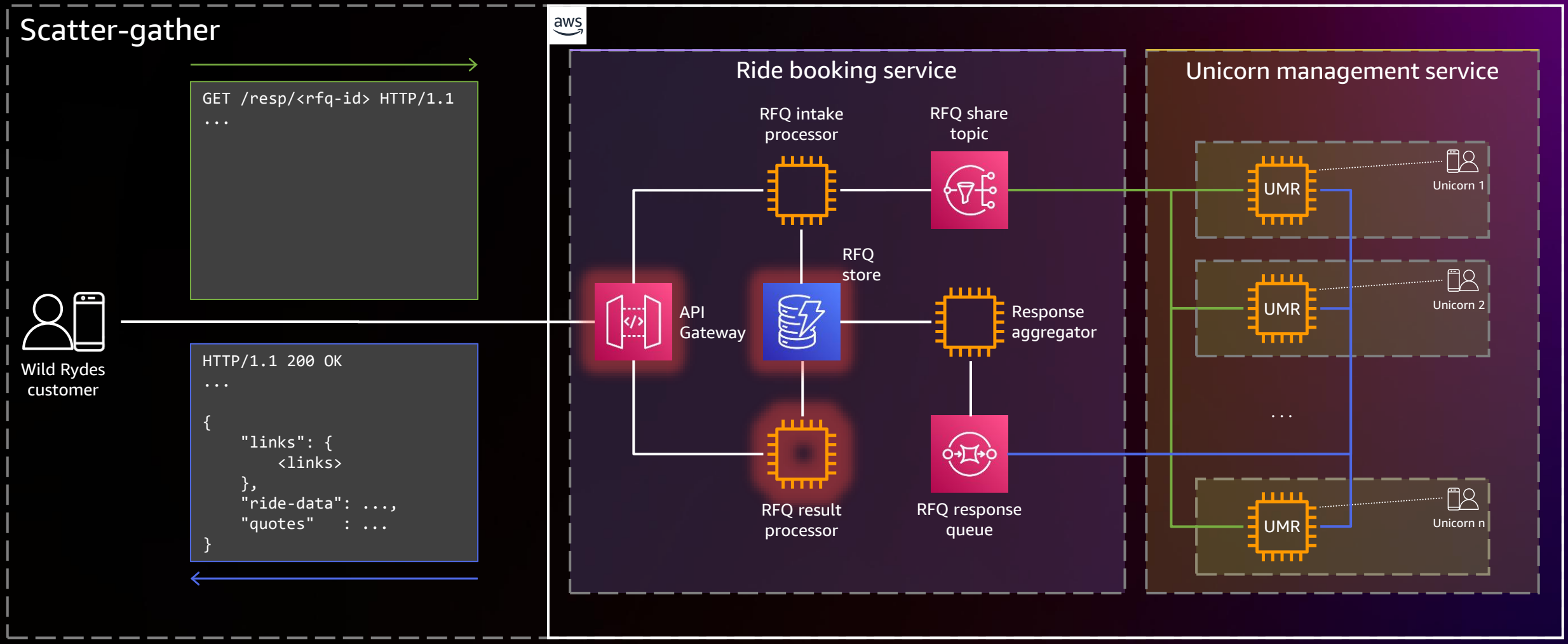
Instant ride RFQ

USE CASE



Instant ride RFQ

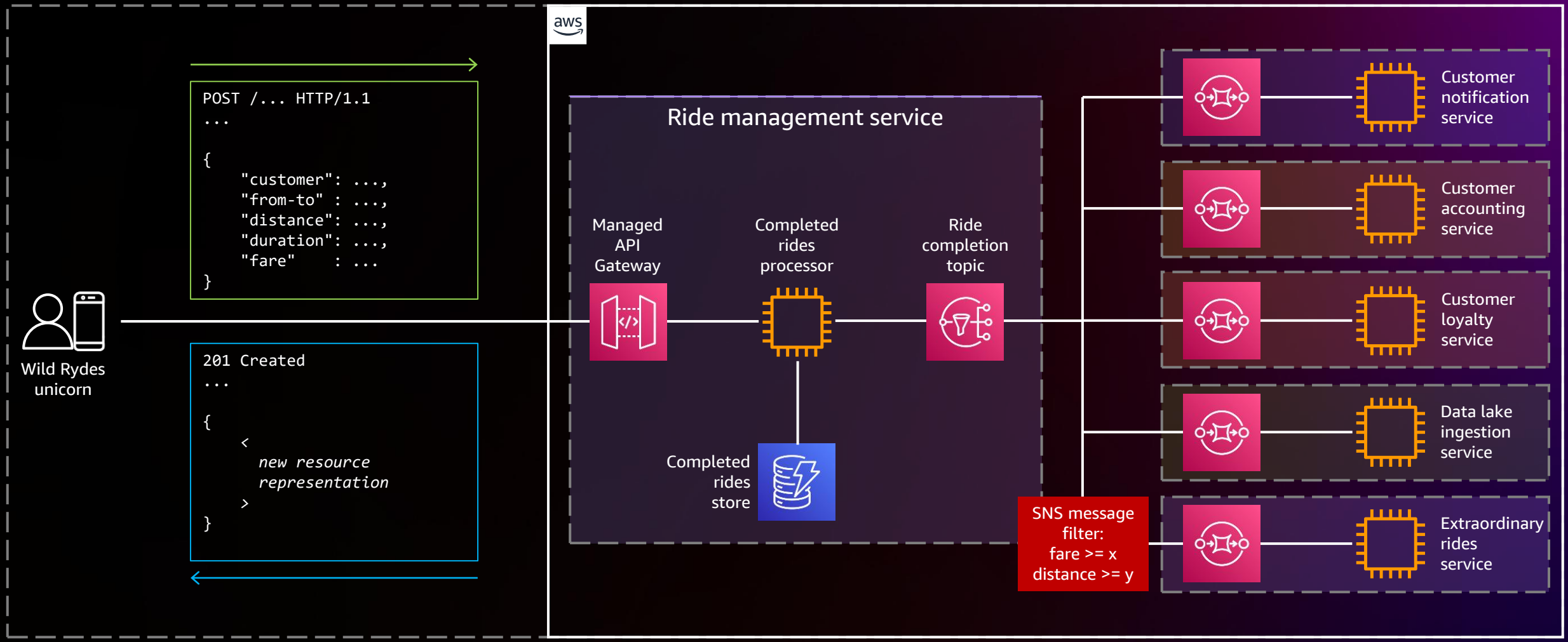
USE CASE



Use case: Fare collection
Context for lab 4

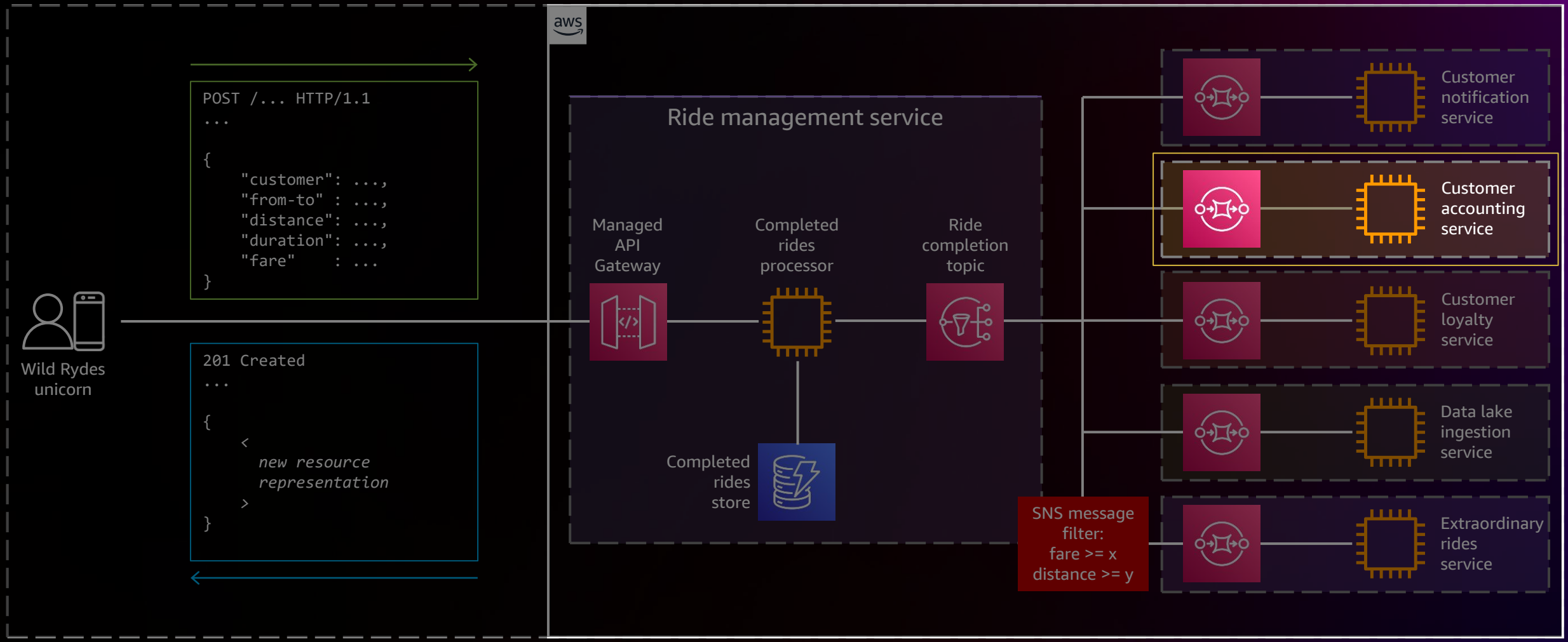
Submit ride completion

USE CASE



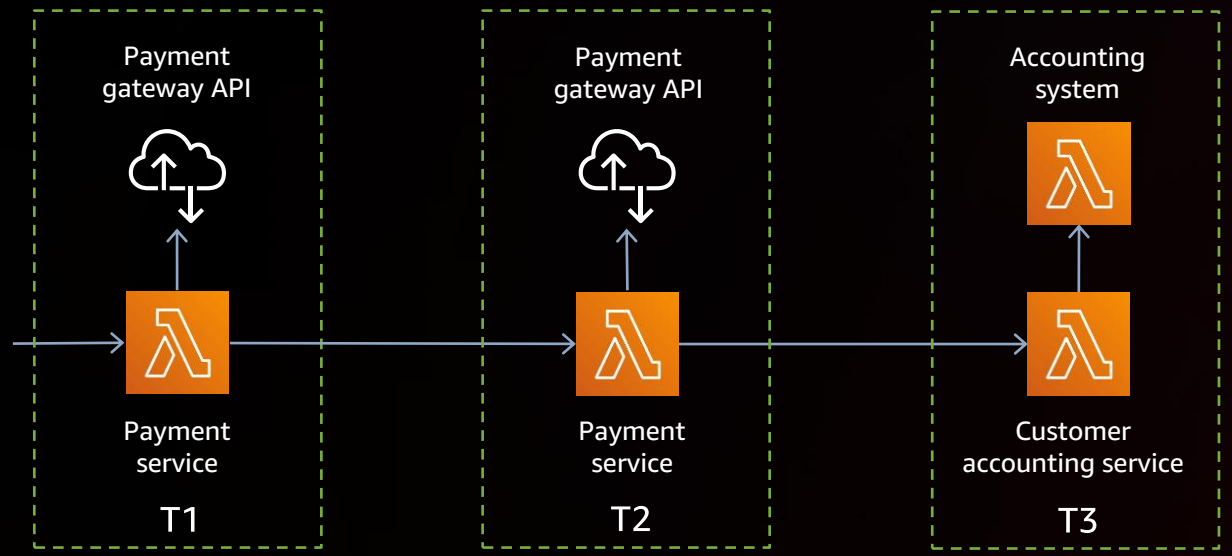
Submit ride completion

USE CASE



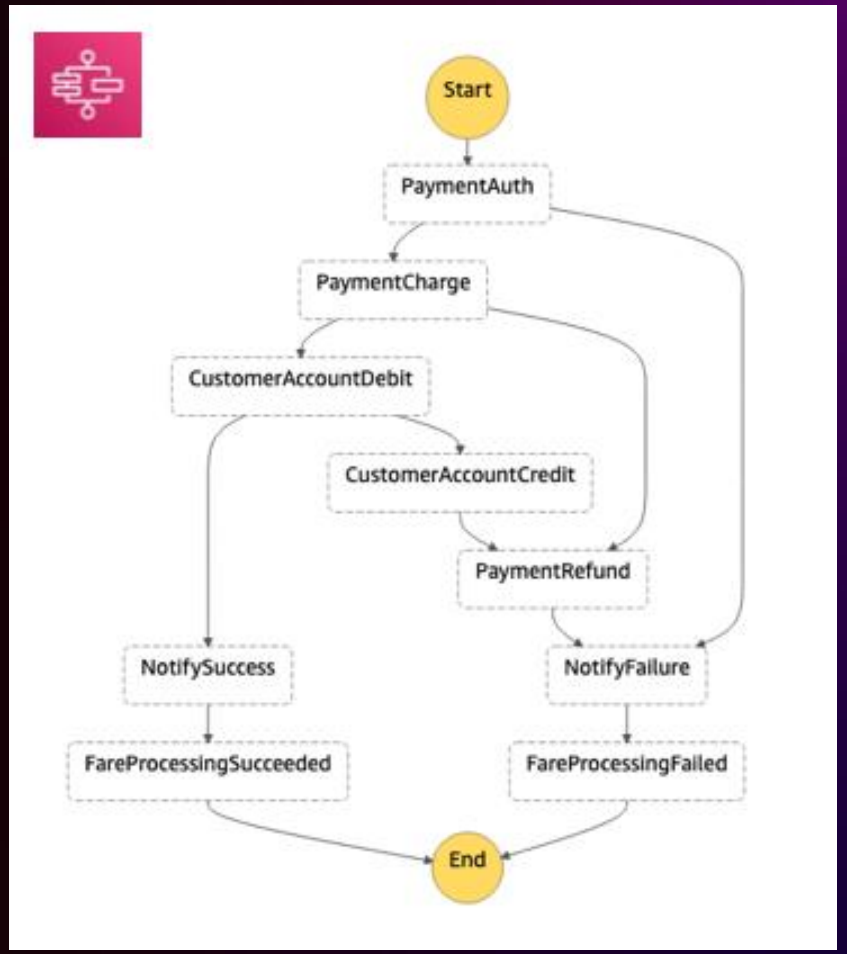
Use case: Fare collection

- Saga orchestration



1. Credit card pre-authorization
2. Charge card using pre-authorization code
3. Update customer account

To be treated as one distributed TA, and
leave the systems in a semantically consistent state

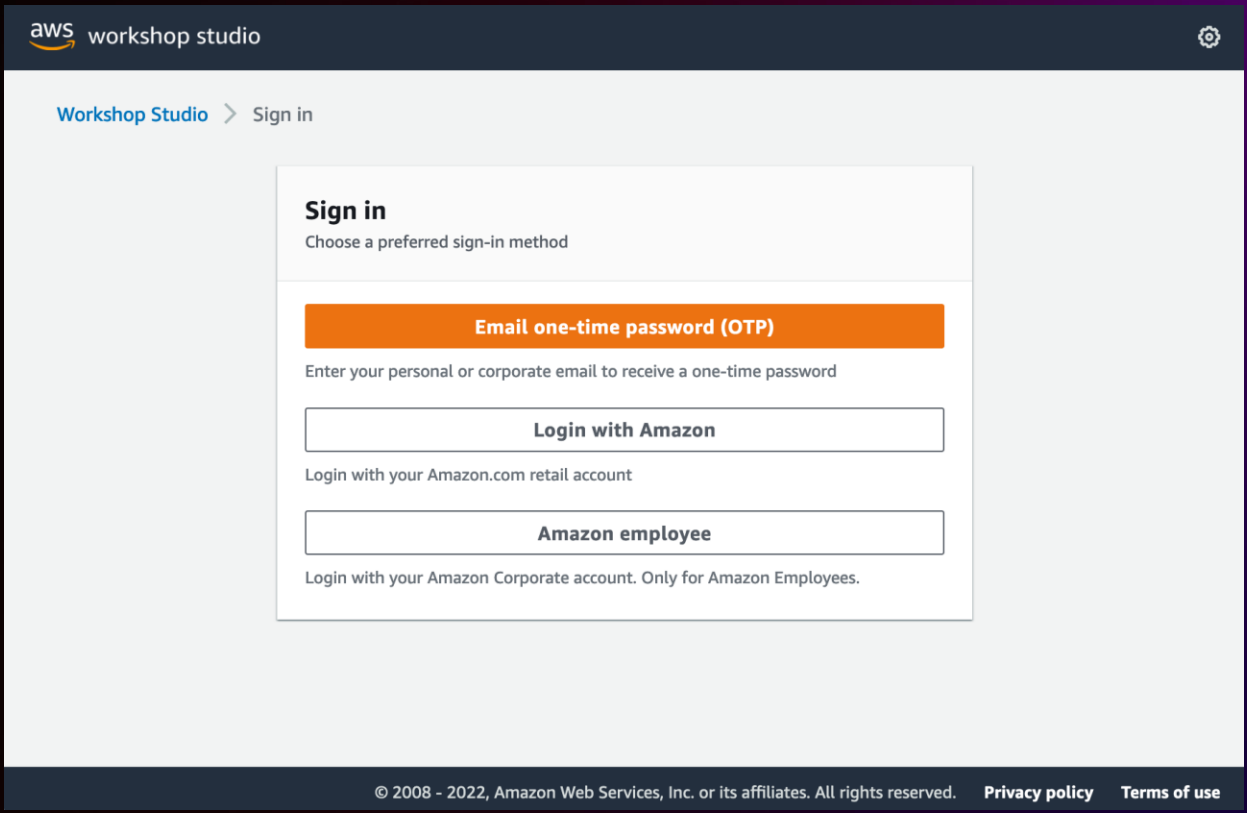


Getting started with this workshop

- As a participant, you will have access to an AWS account with any optional pre-provisioned infrastructure and IAM policies needed to complete this workshop
- The AWS account will only be available for the duration of this workshop; you will lose access to the account thereafter
- The optional pre-provisioned infrastructure will be deployed to a specific Region; check your workshop content to determine whether other regions will be used
- Be sure to review the terms and conditions of the event; do not upload any personal or confidential information in the account

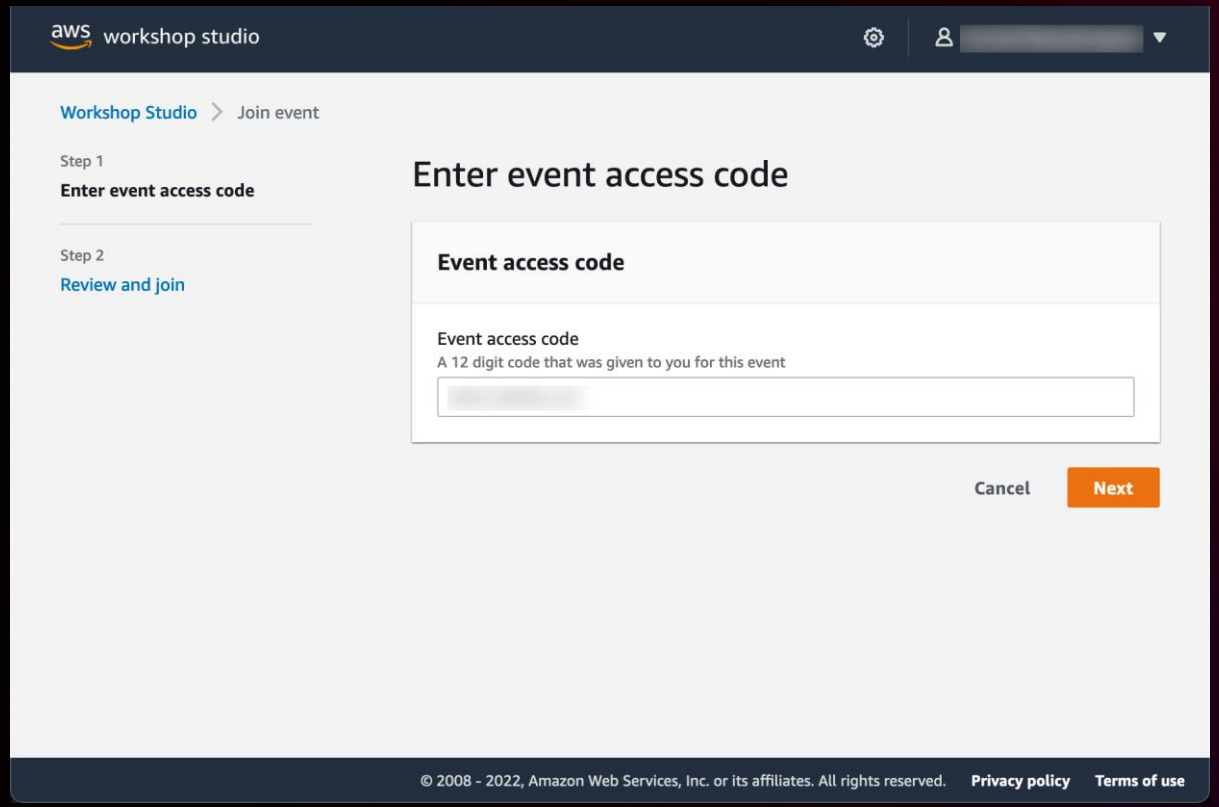
Step 1: Sign-In via your preferred method

https://catalog.workshops.aws/join

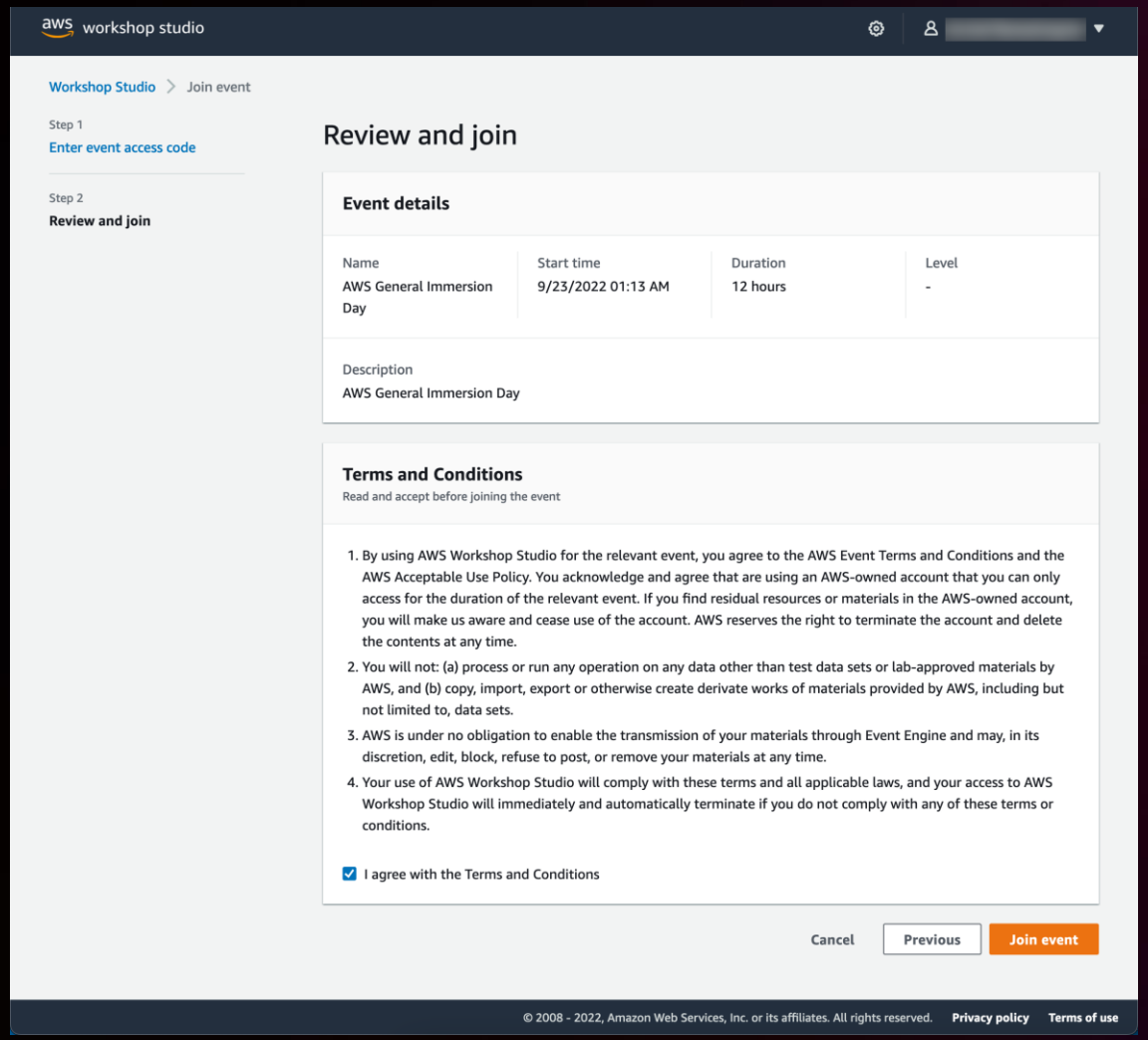


Step 2: Enter event access code

Enter 12-digit event access code: 8c2f-0e0c57-62



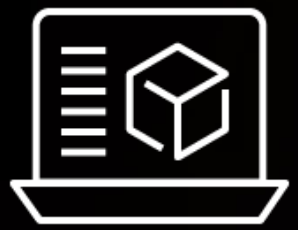
Step 3: Review terms and join event



Resources and call to action

Continue your AWS Serverless learning

Learn at your own pace



Expand your Serverless skills with our learning plan on **AWS Skill Builder**

Increase your knowledge

Use our **Ramp-Up Guides** to build your Serverless knowledge

Earn AWS Serverless badge

Demonstrate your knowledge by achieving **digital badges**

https://s12d.com/serverless-learning

Resources and call to action

AWS blog series

Read again about the use cases and patterns **from this talk** (and more):

AWS architecture blog

Various blog posts in the **application integration** category:

Reach out to your friendly
AWS solutions architect

and keep in mind

Loose coupling is **always better** than **lousy** coupling

Thank you!

Mithun Mallick

LinkedIn:

Dirk Fröhner

Twitter: @dirk_f5r

LinkedIn:

Please complete the session survey in the **mobile app**