
AWS
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XNT404

Scaling .NET applications with asynchronous workflows

Norm Johanson (he/him)

Senior Software Development Engineer
AWS

Ashish Bhatia (he/him)

Senior Solutions Architect
AWS

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What we will cover

Why build an event-driven architecture?

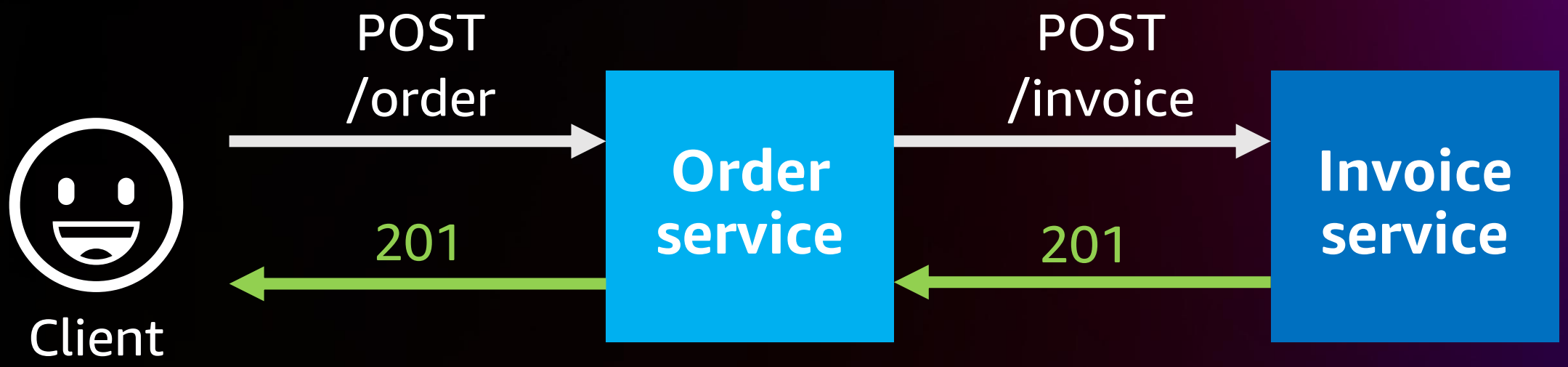
Integration patterns with Amazon SQS, Amazon SNS, and Amazon EventBridge

Observability using Amazon CloudWatch and AWS X-Ray

Lots of demos

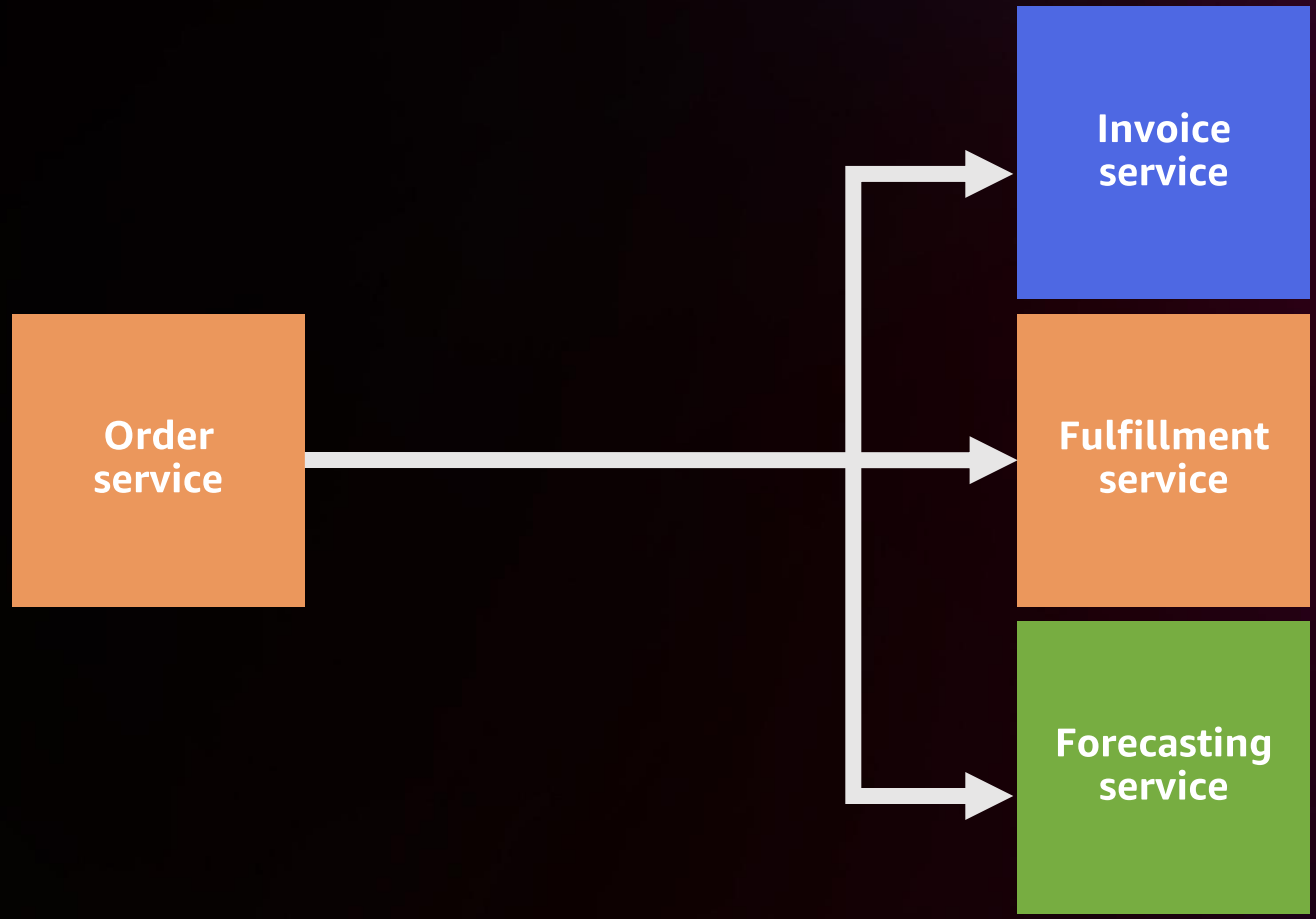
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Microservices start simple



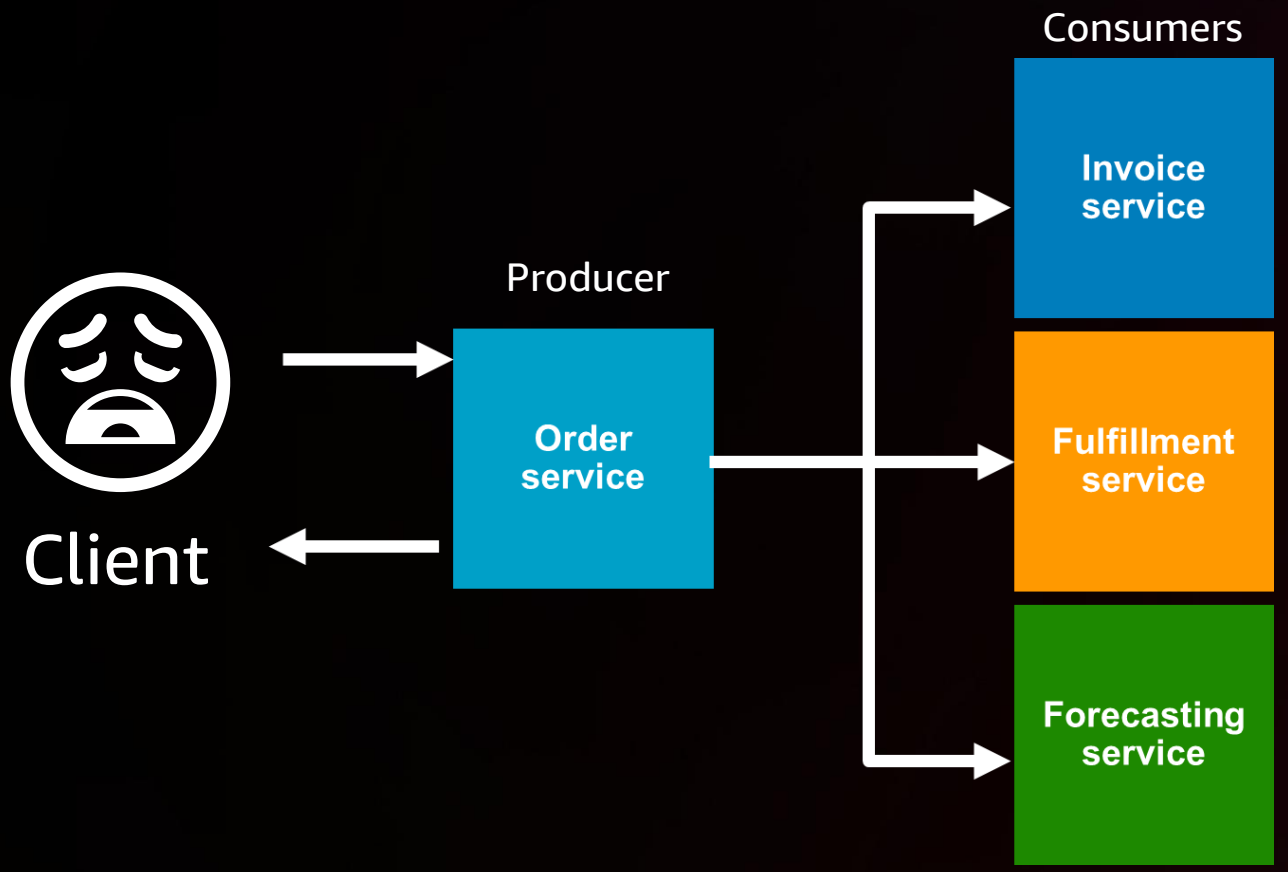
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Architecture v2



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Synchronous API challenges over time



Coupling between producers and consumers

Evolve architecture – new services

Retry logic and error handling

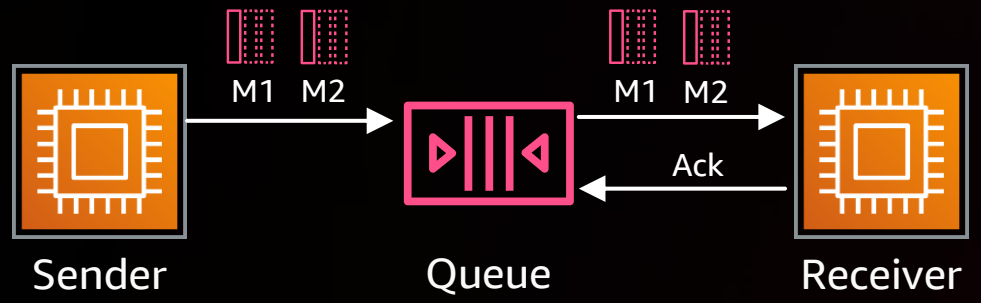
Blocking clients

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Asynchronous point-to-point model (queue)

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Asynchronous point-to-point model (queue)

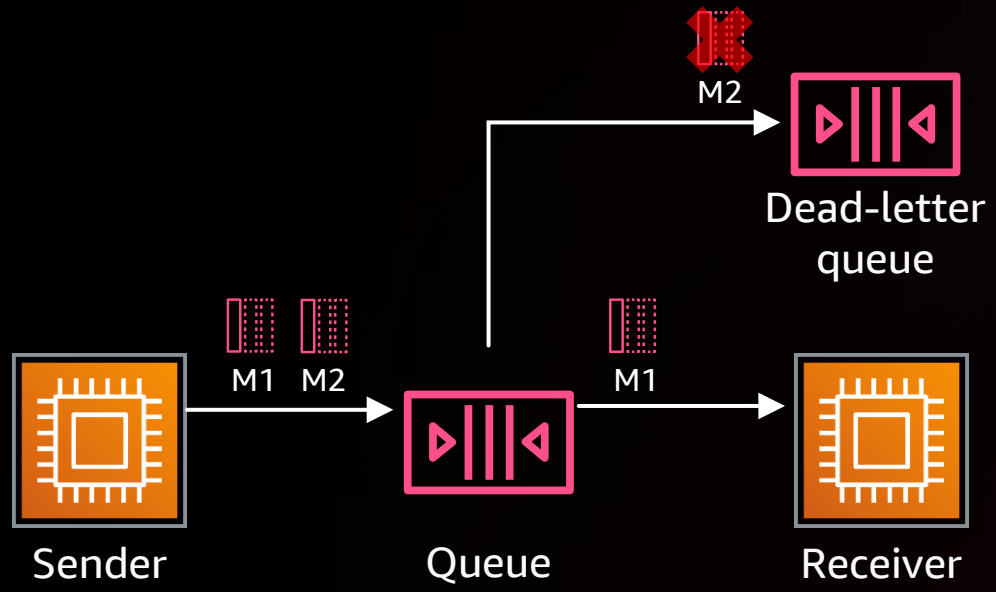


Advantages

- Decreases tight coupling
- Resilient to receiver failure

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Asynchronous point-to-point model (queue)

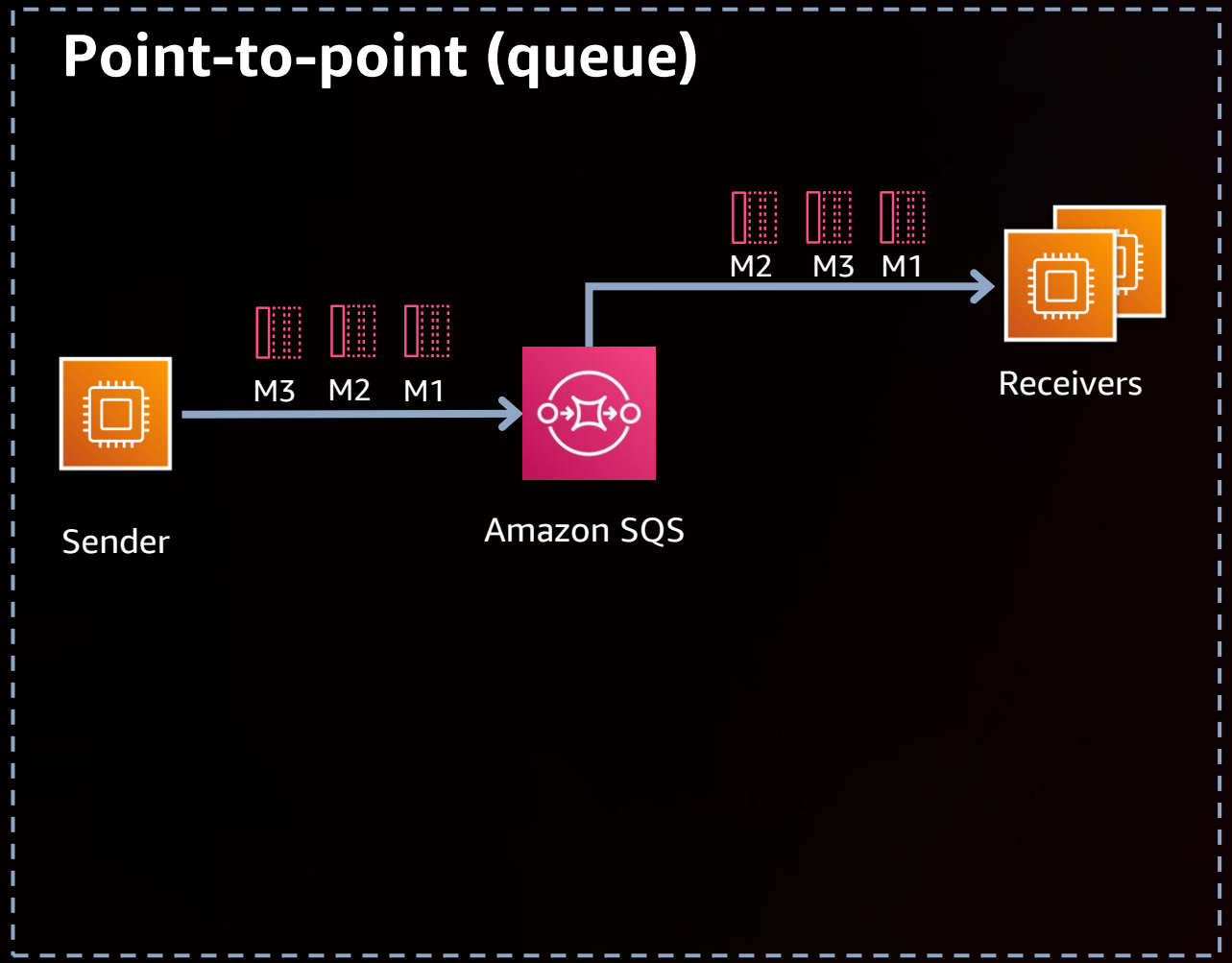


Advantages

- …
- Dead-letter queue (DLQ) for errors
- Messages in DLQ can be added back to source queues (redrive)

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AWS services: Amazon SQS



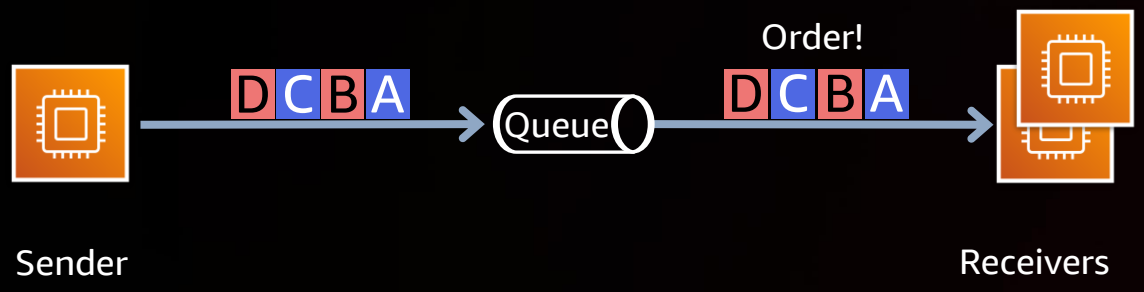
Amazon Simple Queue Service (Amazon SQS)

- Fully managed message queue
- Scales almost infinitely (standard queues)
- Simple, intuitive API
- Dead-letter queue (DLQ) support
- Standard and FIFO options

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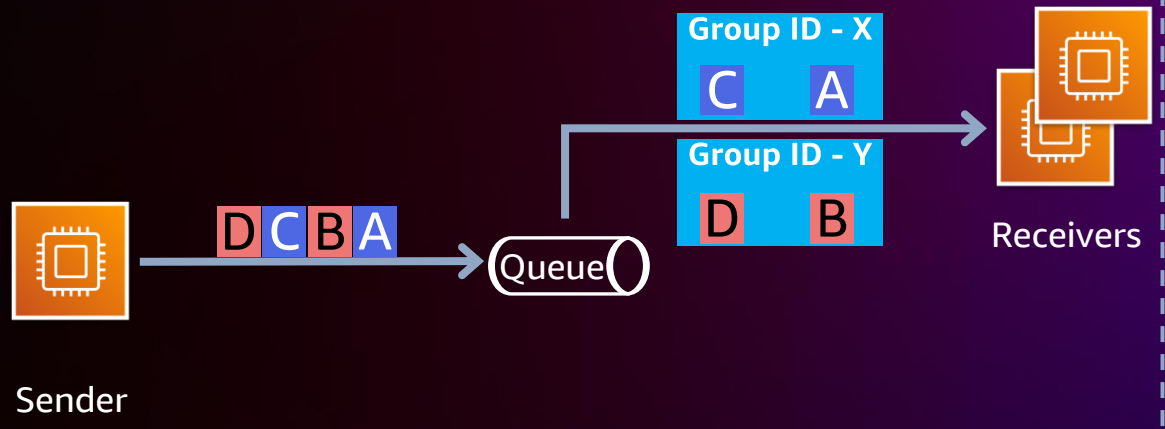
Message channels: FIFO queue

FIFO queue



Guaranteed ordering

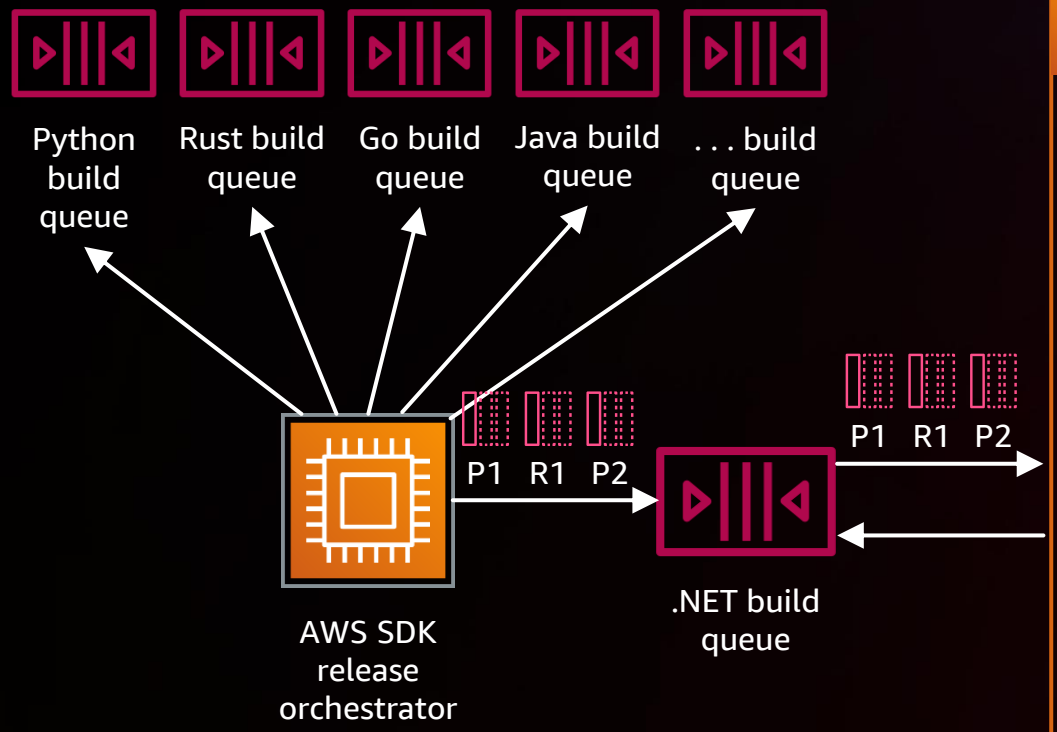
Message groups



Grouped by message group ID

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AWS SDK for .NET SDK as a service



AWS SDK for .NET SDK build service

Two types of builds

- Preview builds a single service
- Release builds all services
  - 300+ NuGet packages
  - 4 .NET targets per package

Overview of steps

- Clone repository
- Apply new service model(s)
- Run AWS SDK for .NET code generator
- Commit source changes (release only)
- Run MSBuild
- Sign artifacts
- Generate API docs (release only)
- Upload artifacts
- Push to NuGet.org (release only)

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Amazon SQS demo recap

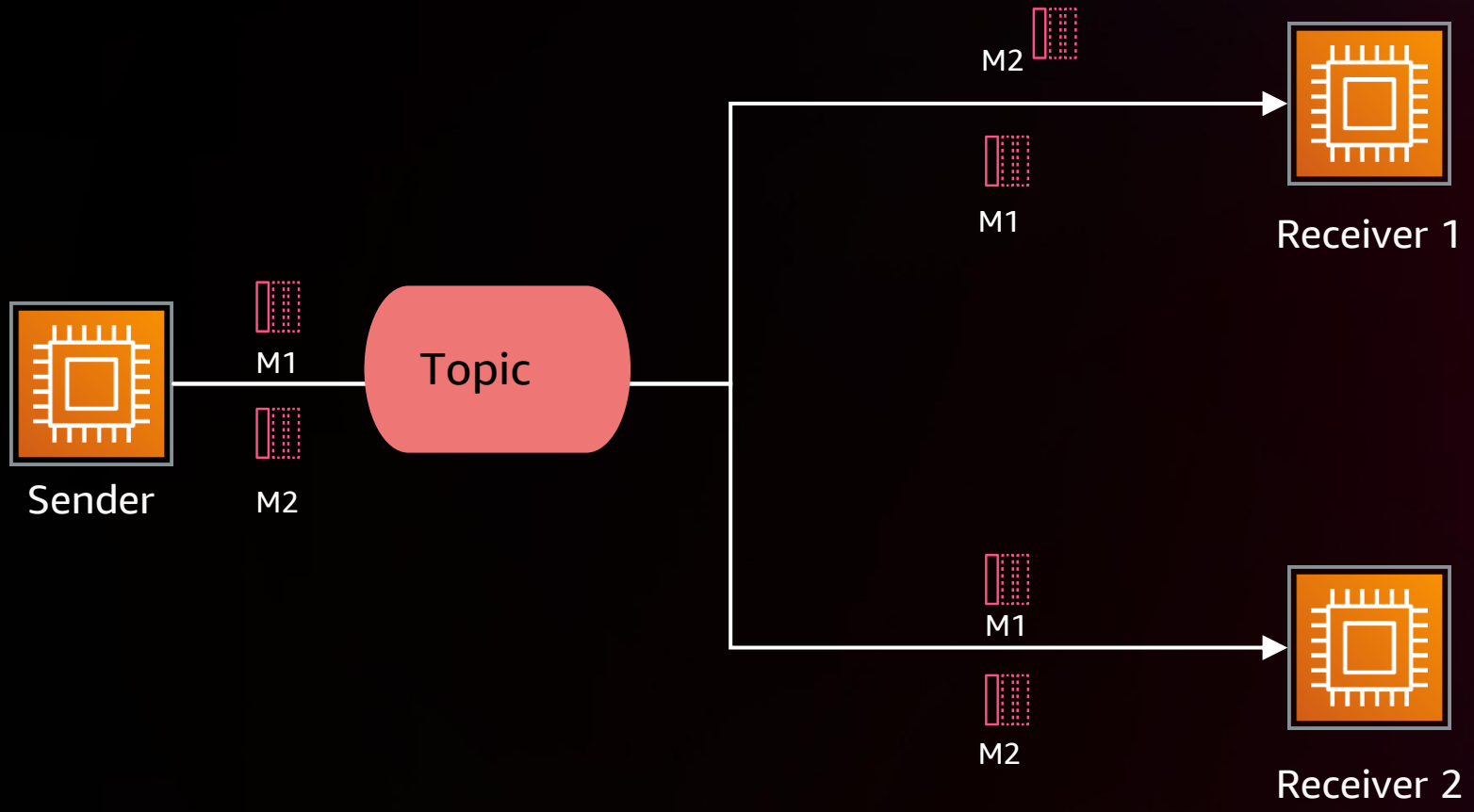
- Sending, receiving, and deleting messages
- Managing visibility of messages
- FIFO queues with message groups
- Batching

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Asynchronous point-to-point model (Pub/Sub)

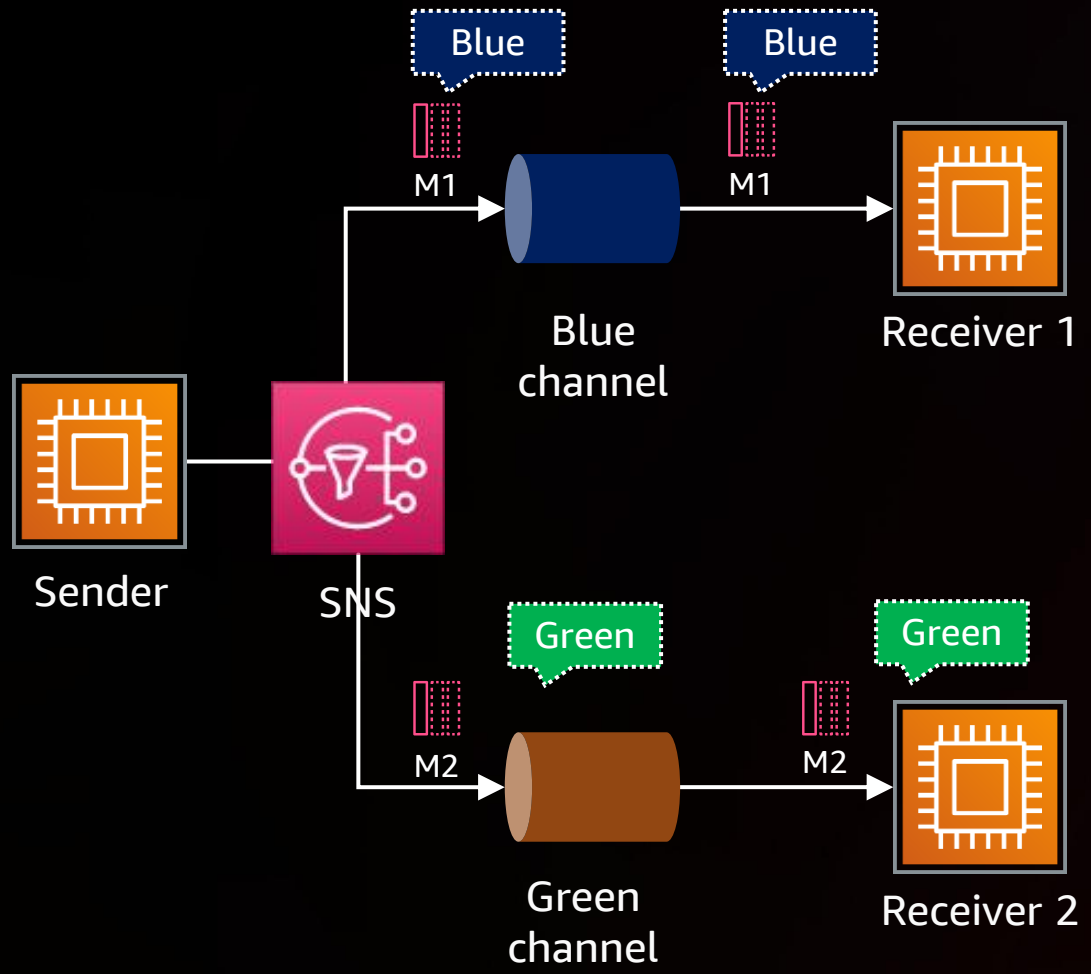
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Pub/Sub architecture



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Amazon SNS

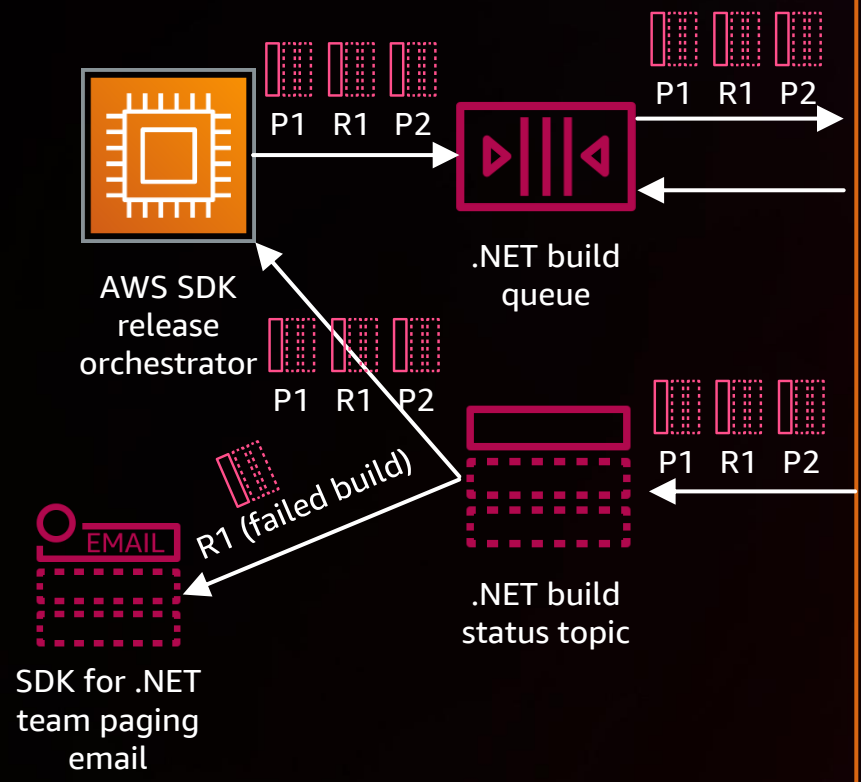


Amazon Simple Notification Service (Amazon SNS)

- Serverless pub/sub service
- Message filtering
- Messages are pushed to subscribers
- Application-to-application messaging, for example, using Amazon SQS, HTTP(S) or Lambda functions
- Application-to-person messaging by using email or SMS

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Communicating status



AWS SDK for .NET build service

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Amazon SNS demo recap

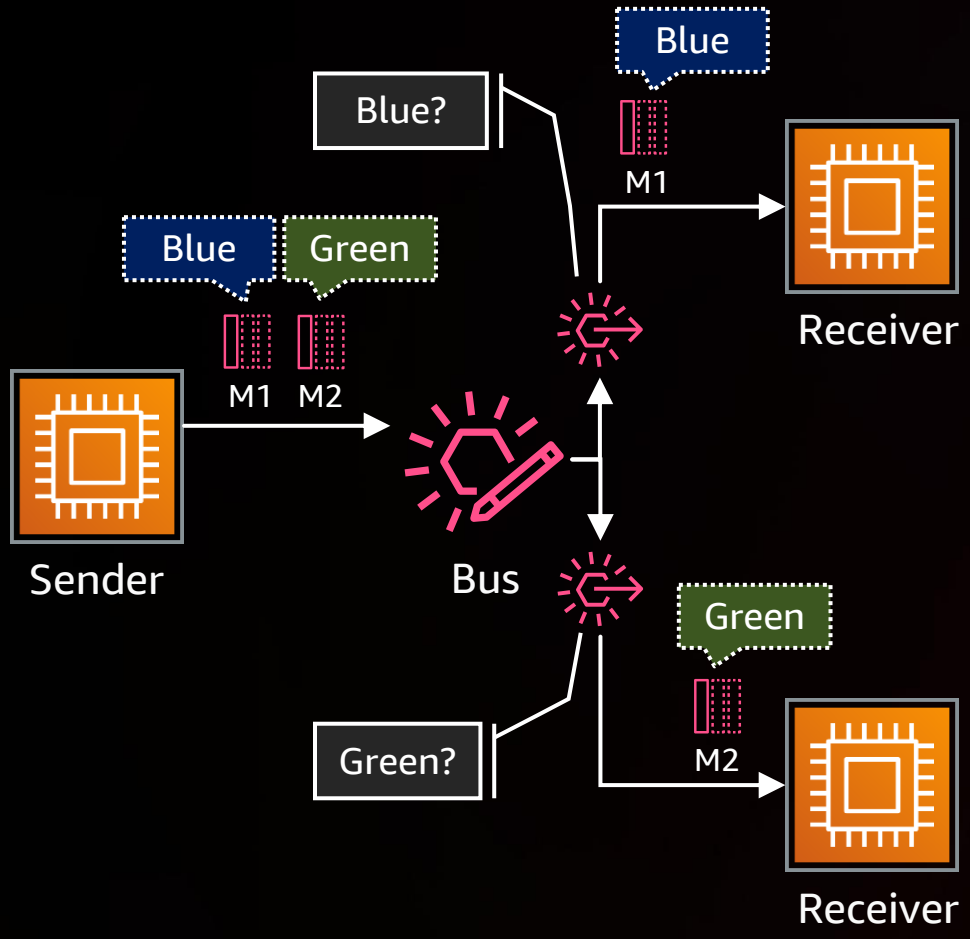
- Publishing messages
- Filtering messages
- Processing Amazon SNS messages with .NET Lambda functions

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Asynchronous message-router model (bus)

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Asynchronous message-router (bus)

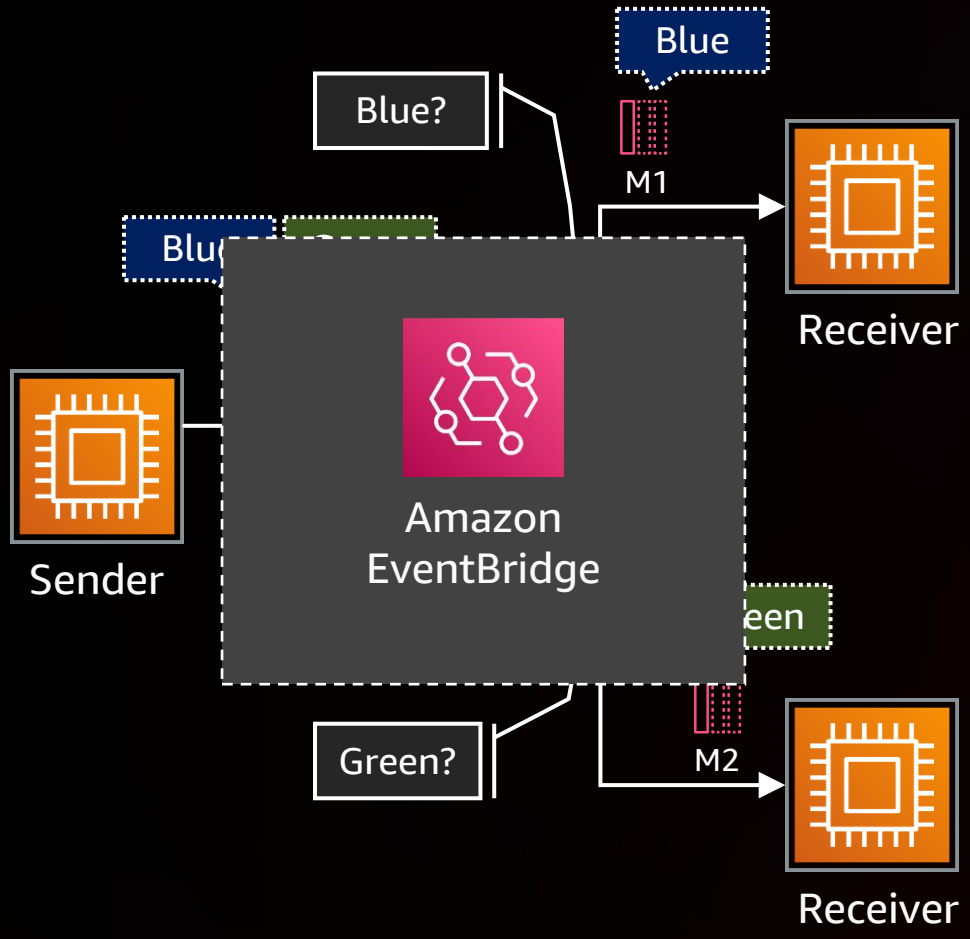


Advantages

- Decouple sender and receiver
- Centralized routing rules
- Build event-driven architecture

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Asynchronous message-router (bus)



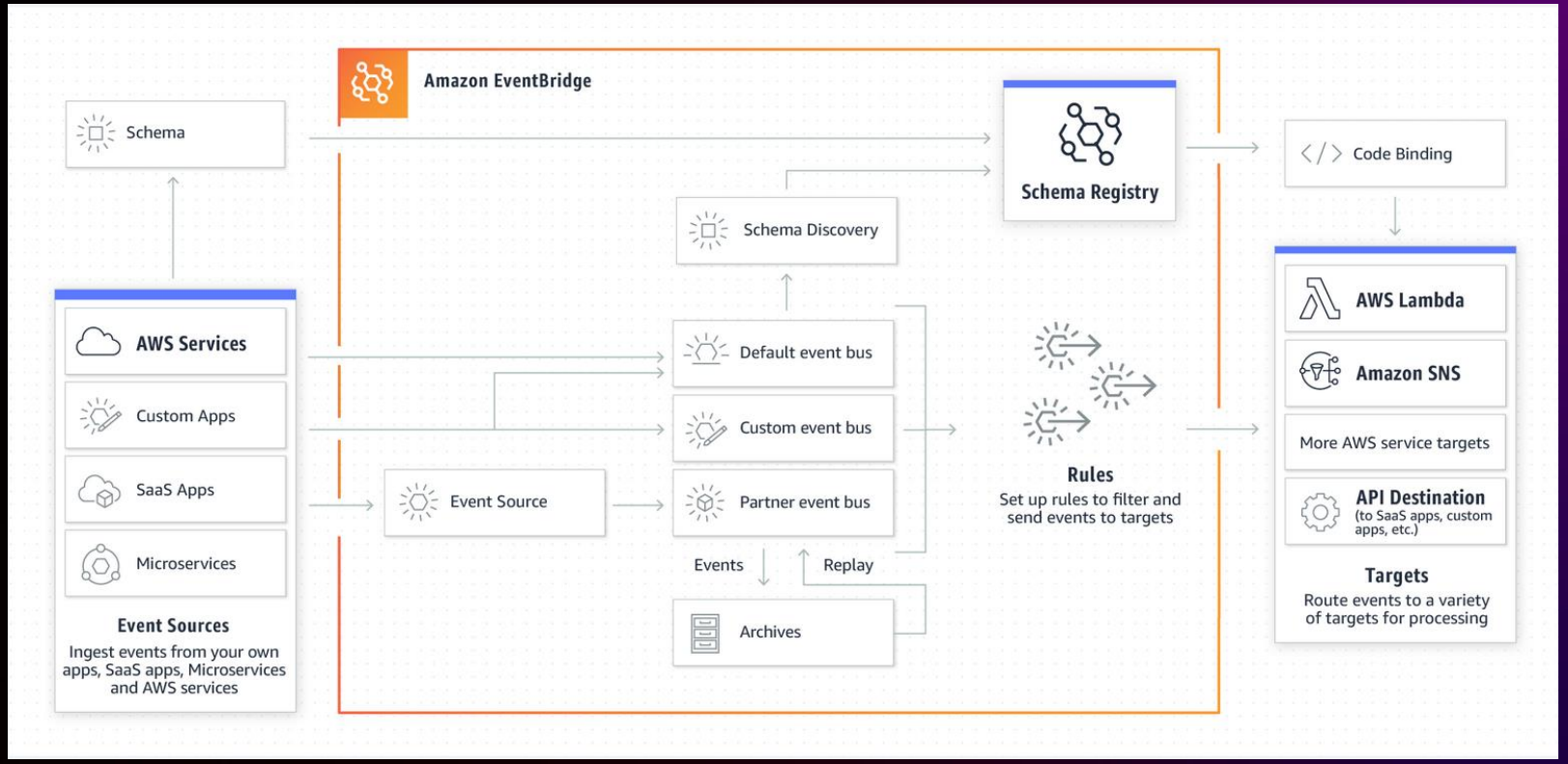
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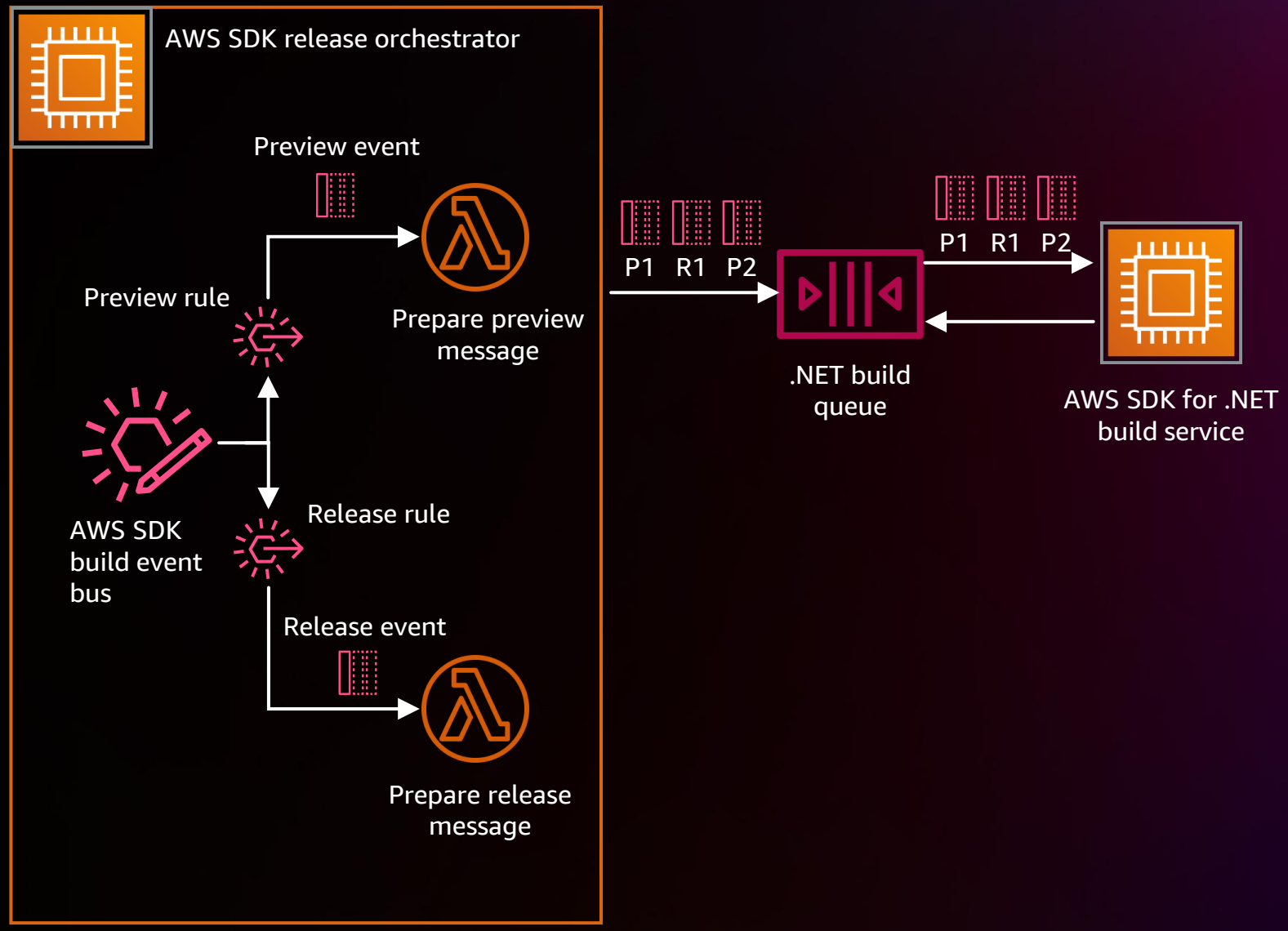
Amazon EventBridge

Amazon EventBridge is a simple, fully managed, pay-as-you-go, event bus service that makes it easy to ingest and process data from AWS services, your own applications, and SaaS applications



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AWS SDK release orchestrator



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EventBridge demo recap

- Defined EventBridge
- Created rules with content filtering
- Processed EventBridge events with .NET Lambda functions

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Observability for asynchronous workflows

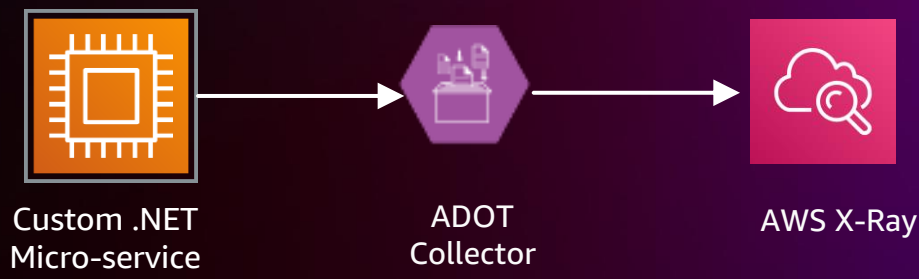
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What is OpenTelemetry?

An observability framework for cloud-native software supported in 11 languages and growing

You use it to instrument, generate, collect, and export telemetry data (metrics, logs, and traces) for analysis to understand your software's performance and behavior

Export to AWS X-Ray for analysis that’s supported using a sidecar container or Lambda layer





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AWS X-Ray

ANALYZE AND DEBUG PRODUCTION AND DISTRIBUTED APPLICATIONS

AWS X-Ray

AWS X-Ray helps you analyze, debug, and quantify impact on modern applications built using microservices and serverless architecture



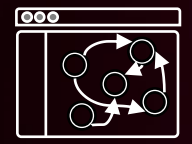
Collect traces

Collect data about the request from each underlying application service it passes through



Record traces

X-Ray combines the data gathered from each service into singular units called traces



View service map

View the service map to see trace data, such as latencies, HTTP statuses, and metadata for each service



Analyze issues

Drill into the service showing unusual behavior to identify the root issue

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Observability demo recap

- Instrumenting AWS code automatically with the AWS NuGet package
  - OpenTelemetry.Contrib.Instrumentation.AWS
- Instrumenting code manually with System.Diagnostics.Activity
  - Possible to add tags and events to activities
- Visualization using AWS X-Ray

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Links



Event-driven architecture best practices

https://aws.amazon.com/event-driven-architecture/



Digital Course: Architecting Serverless Solutions

https://bit.ly/3T652cN



Workshop: Building event-driven architectures on AWS

https://bit.ly/3h4SPYu



Proposed .NET Message Library

https://bit.ly/3DJvwem

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Thank you!

Norm Johanson
@socketnorm

Ashish Bhatia
www.linkedin.com/in/ashish-bhatia-aws



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