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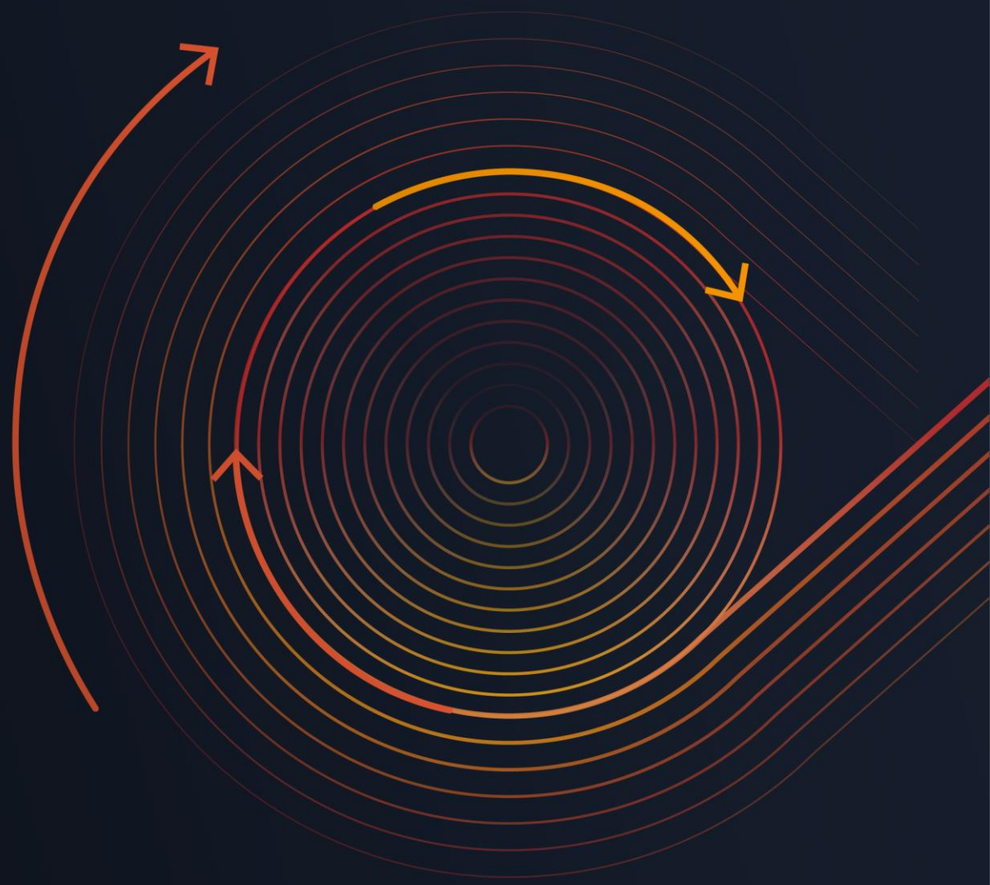
Breaking Down the Monolith

Using Containers and Serverless

Nathan Peck, Senior Developer Advocate
Heeki Park, Principal Solutions Architect

Why containers?



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Applications aren’t just code, they have dependencies

Code

Runtime

Code packages

Operating system packages

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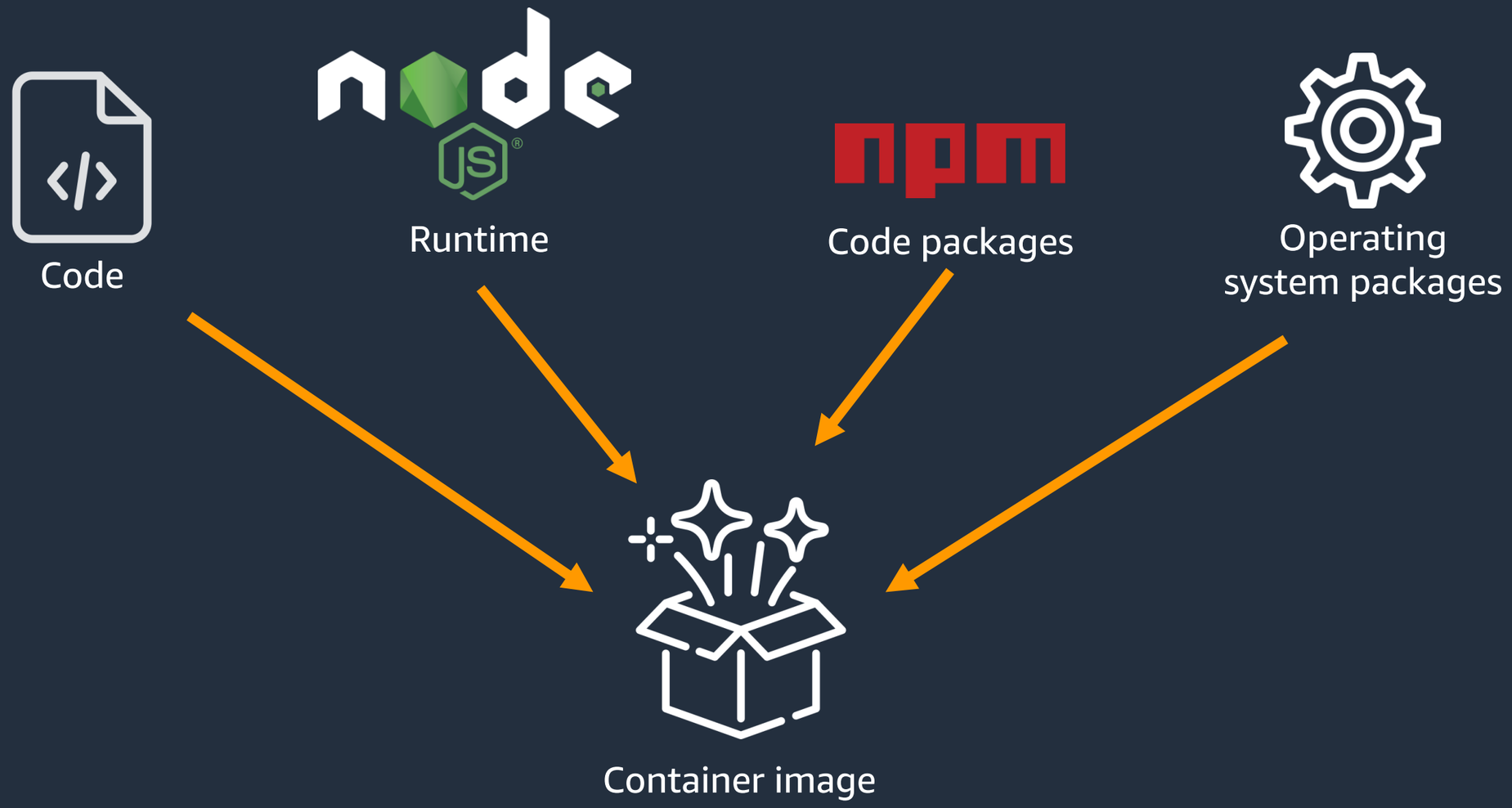
Containers turn applications into one deployable artifact



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Build

Gather the app and its dependencies. Create an immutable container image.

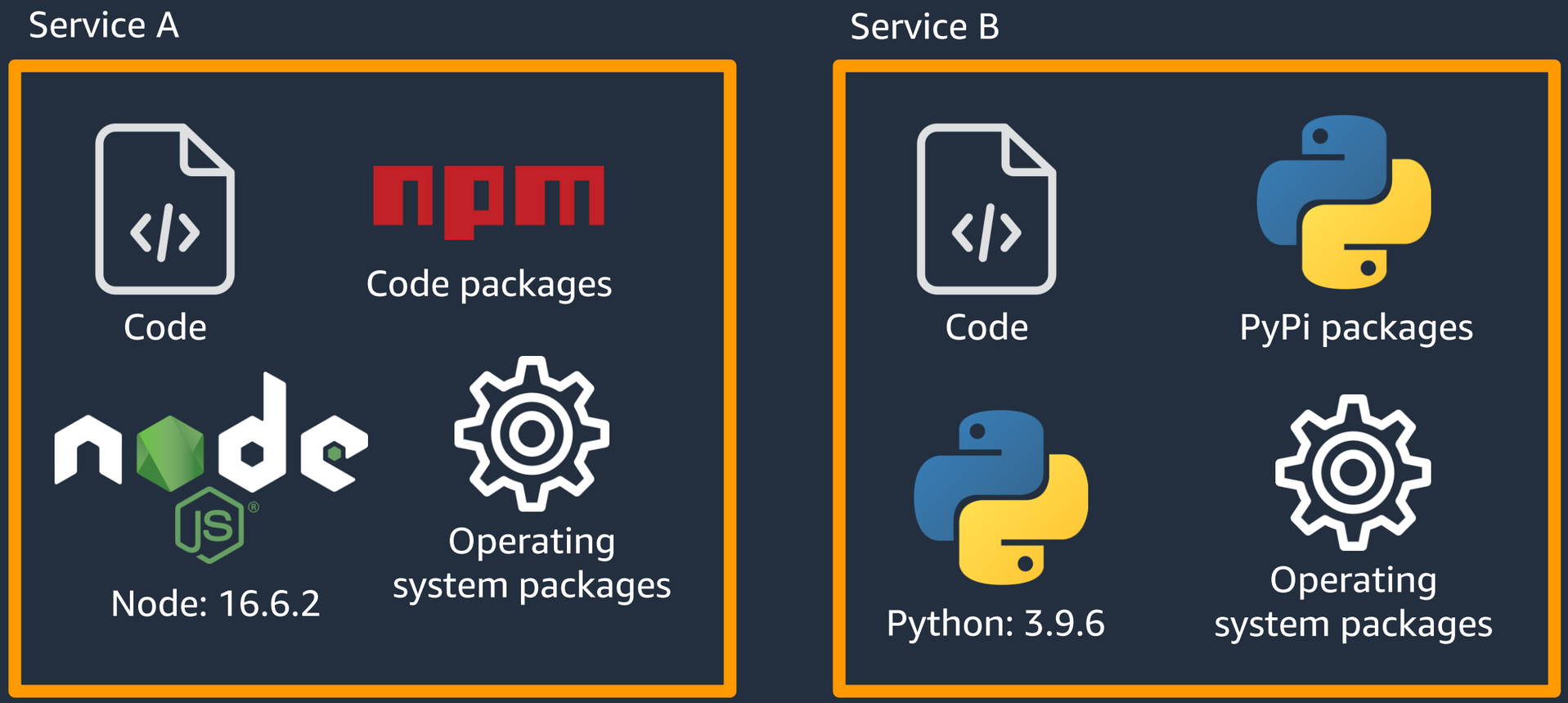
Push

Store the container image in a registry so it can be downloaded to compute

Run

Download image to compute, unpack it, and run it in an isolated environment

Breaking a monolith is scary because more services mean more dependencies



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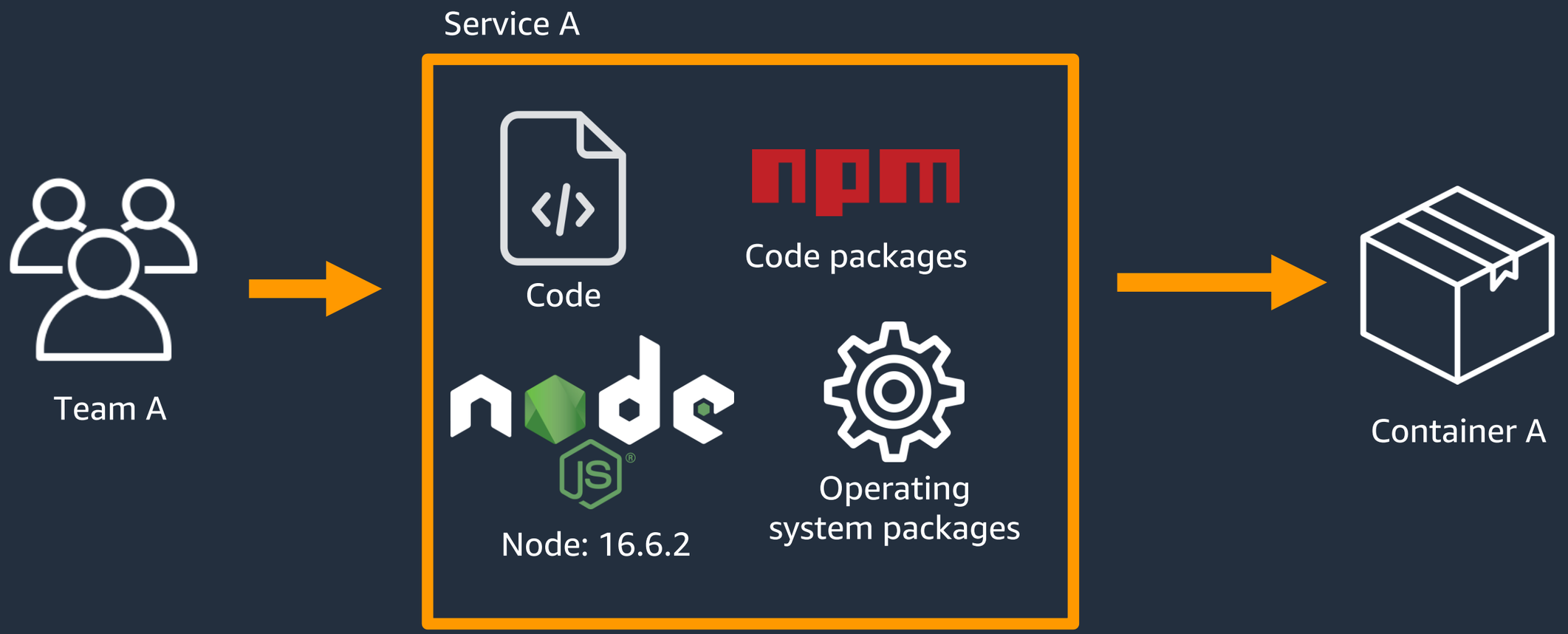
Containers make dependencies a decentralized job



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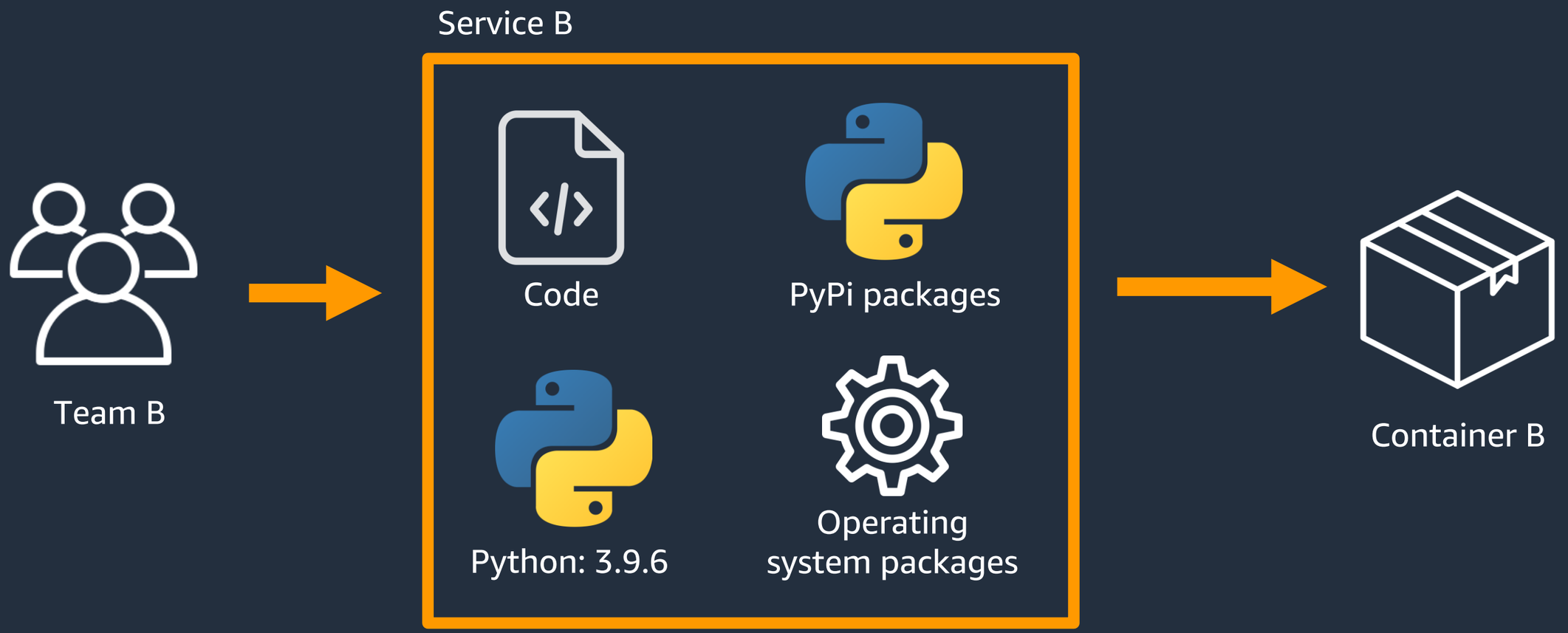
Containers make dependencies a decentralized job



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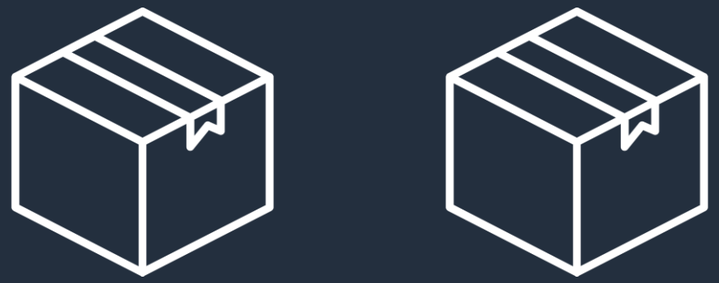
Infrastructure is now agnostic to container contents

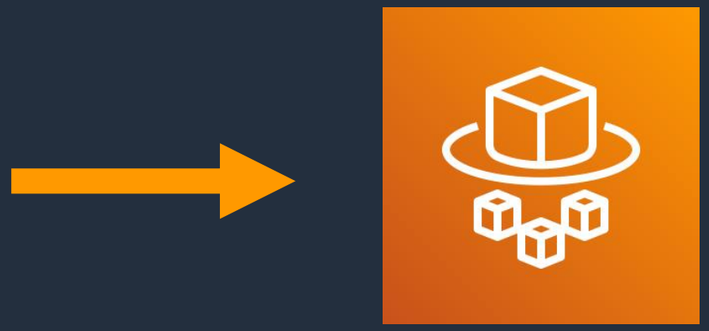


Container A

Container B

Container C

Container D



AWS Fargate

Different containers can be handled the same way using the same tooling

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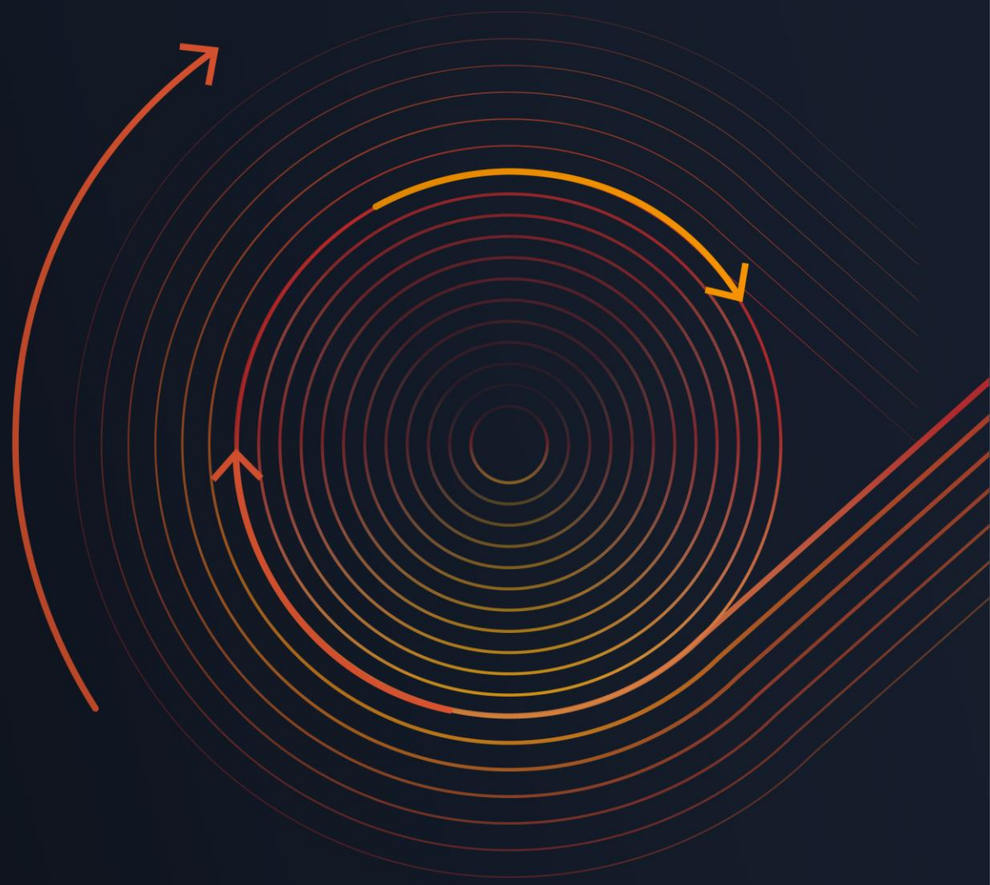
Why Serverless?



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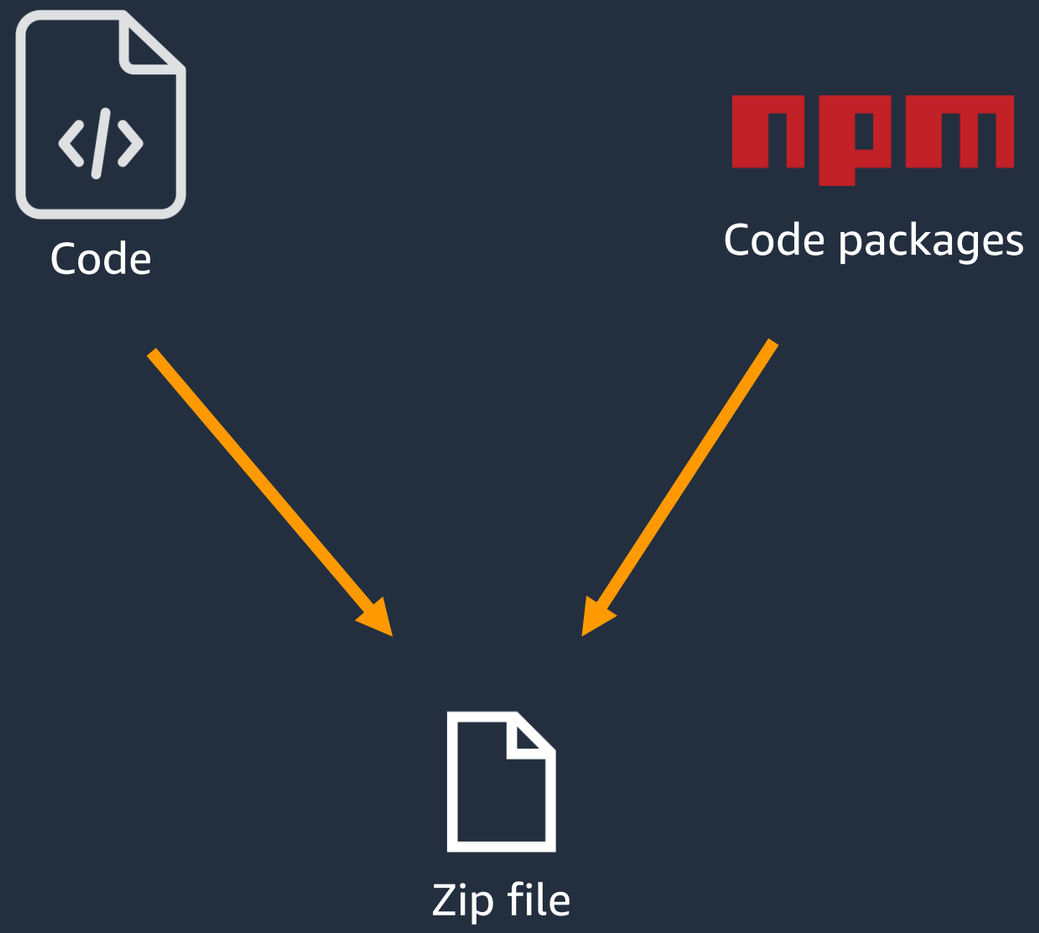
Serverless can help simplify the execution module

Applications can be packaged as a zip artifact



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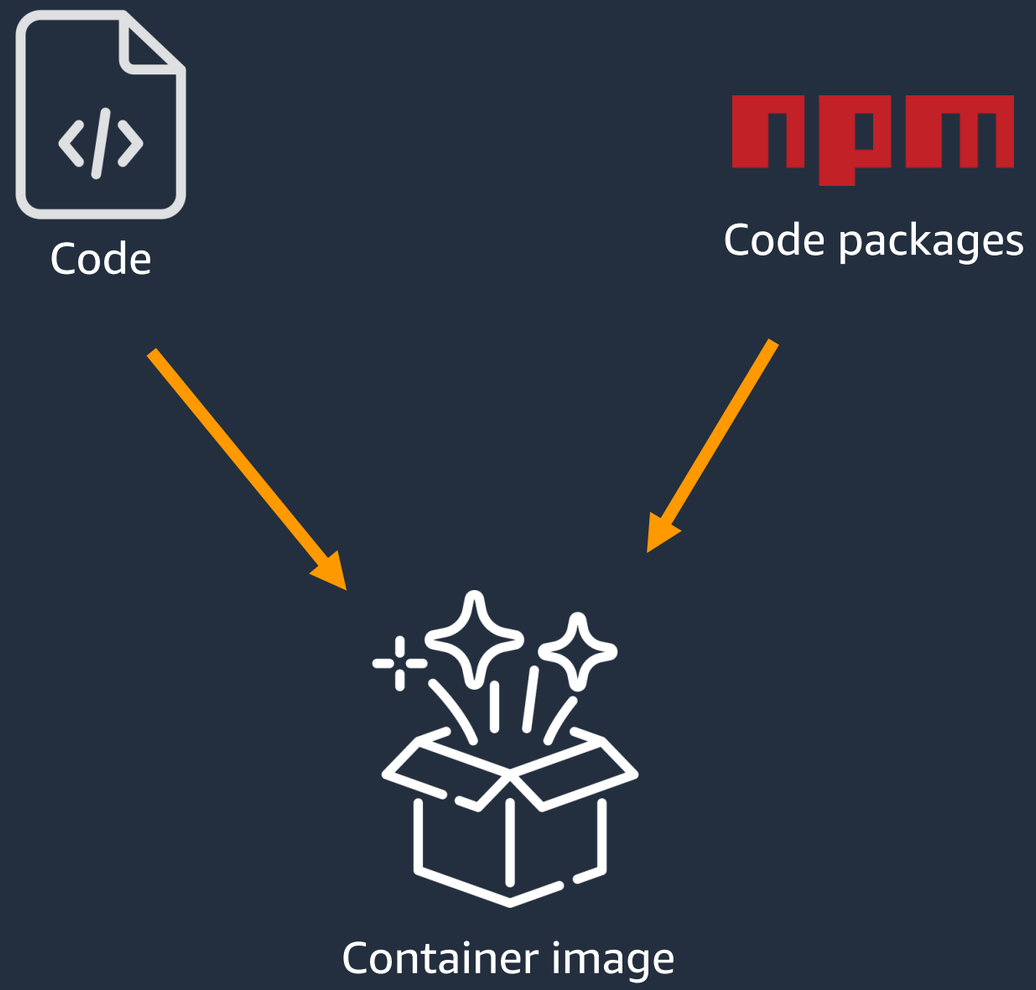
Applications can also be packaged as a container artifact



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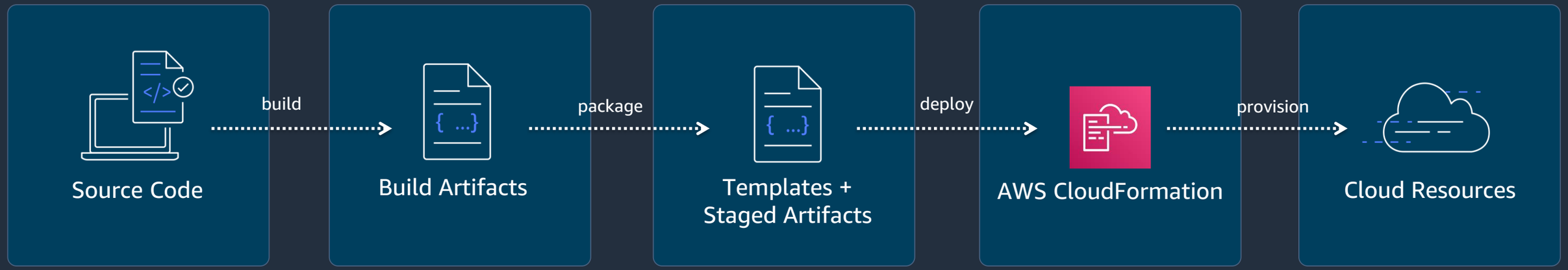
Package dependencies separately as Lambda Layers

Lets functions easily share code: Upload layer once, reference within any function

Promote separation of responsibilities, lets developers iterate faster on writing business logic

Built in support for secure sharing by ecosystem

Deploy the code as resources




```
sam init              // create new project
sam build             // build artifacts
sam package     // generate templates and stage artifacts
sam deploy            // deploy resources
```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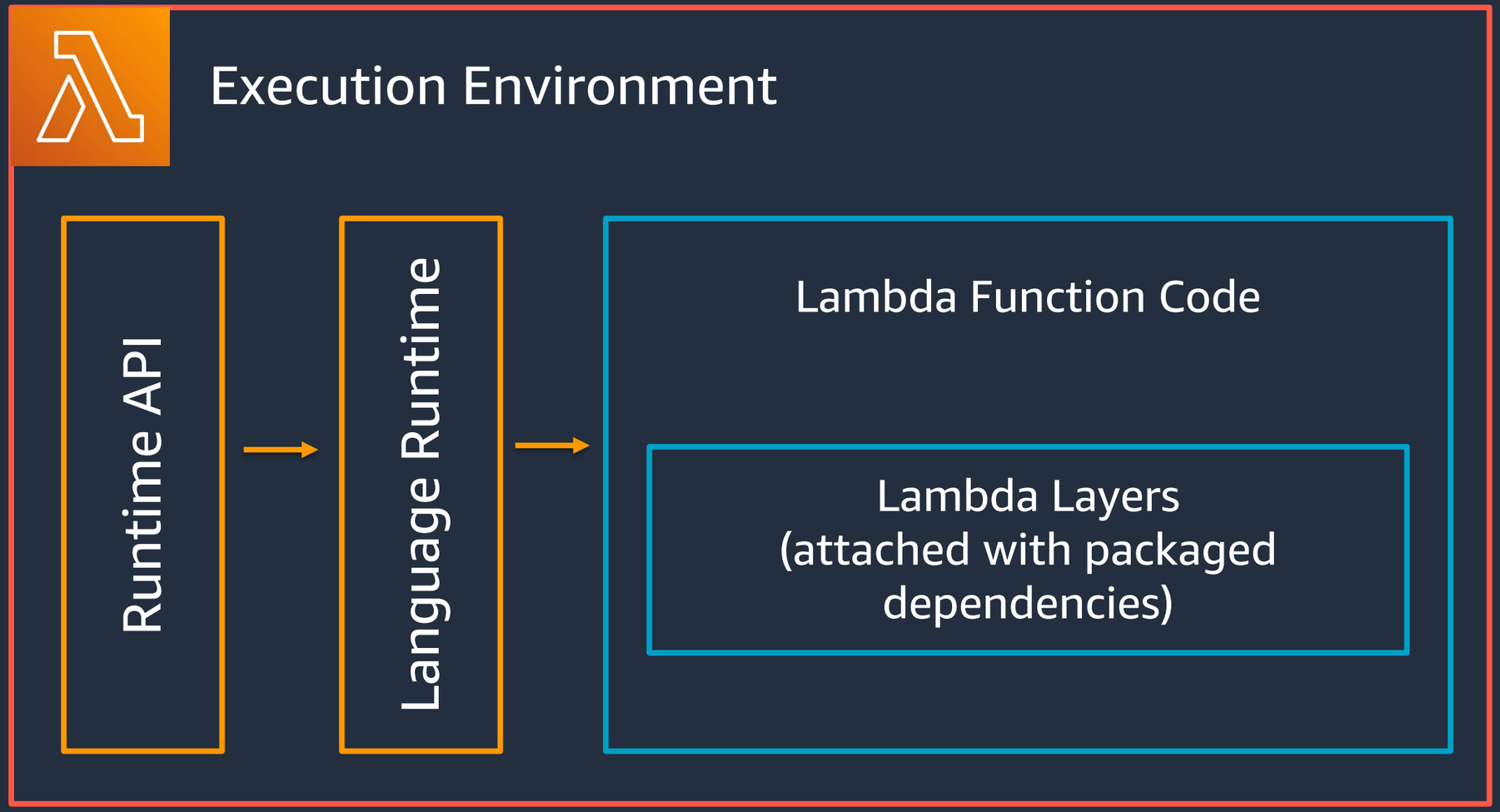
Run the code as a zip artifact



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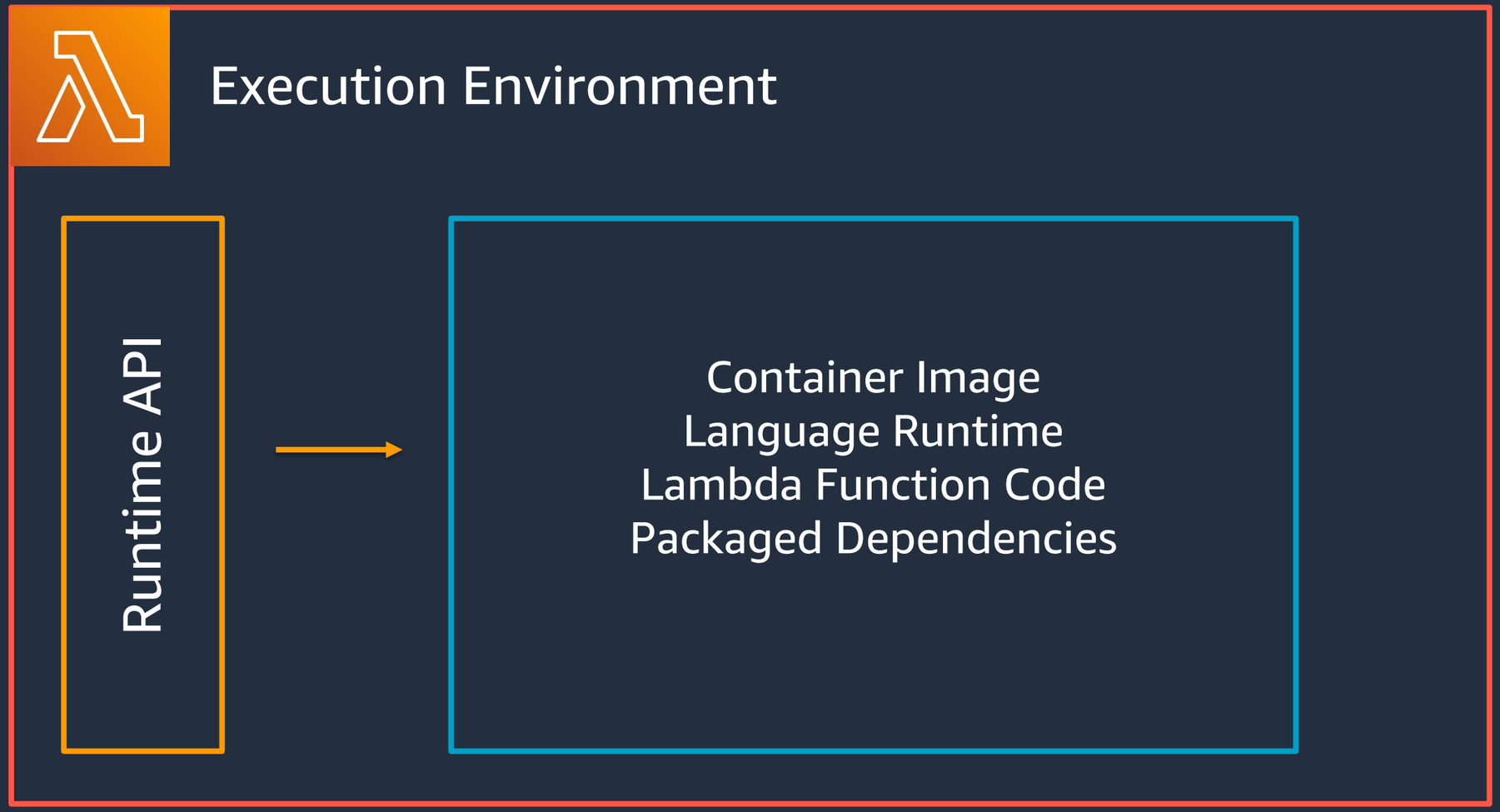
Run the code as a container image



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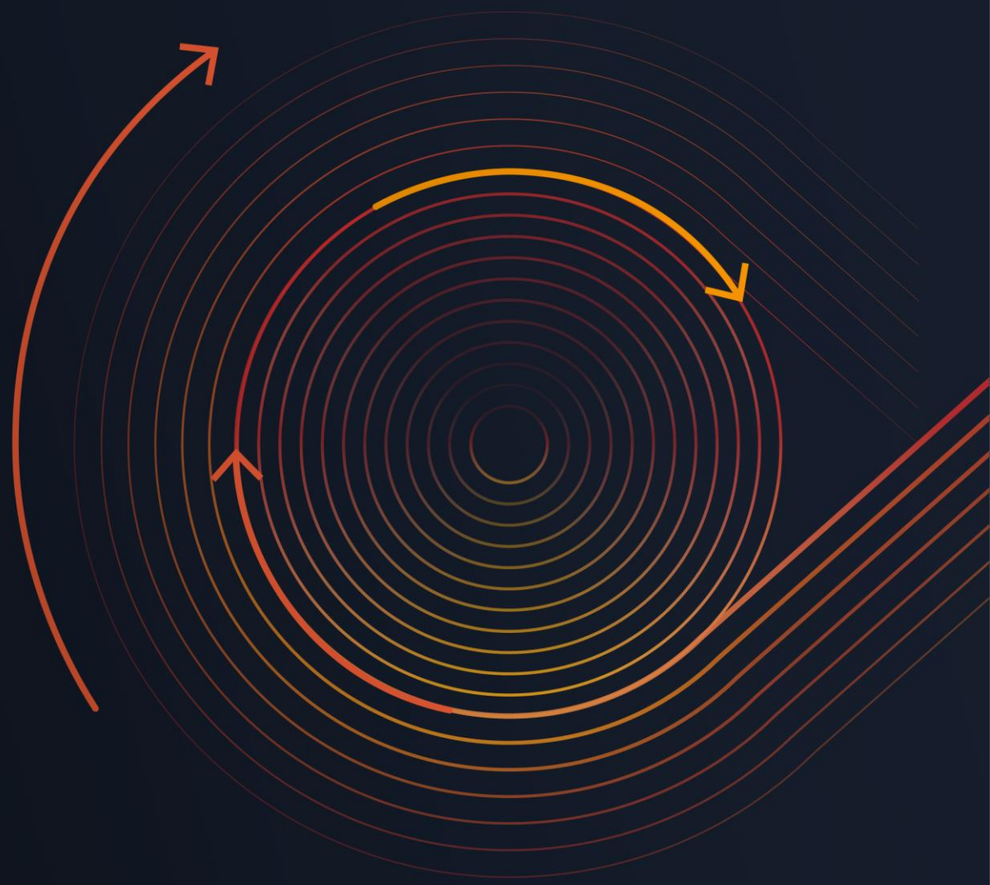
Popular Decoupling Patterns with Containers



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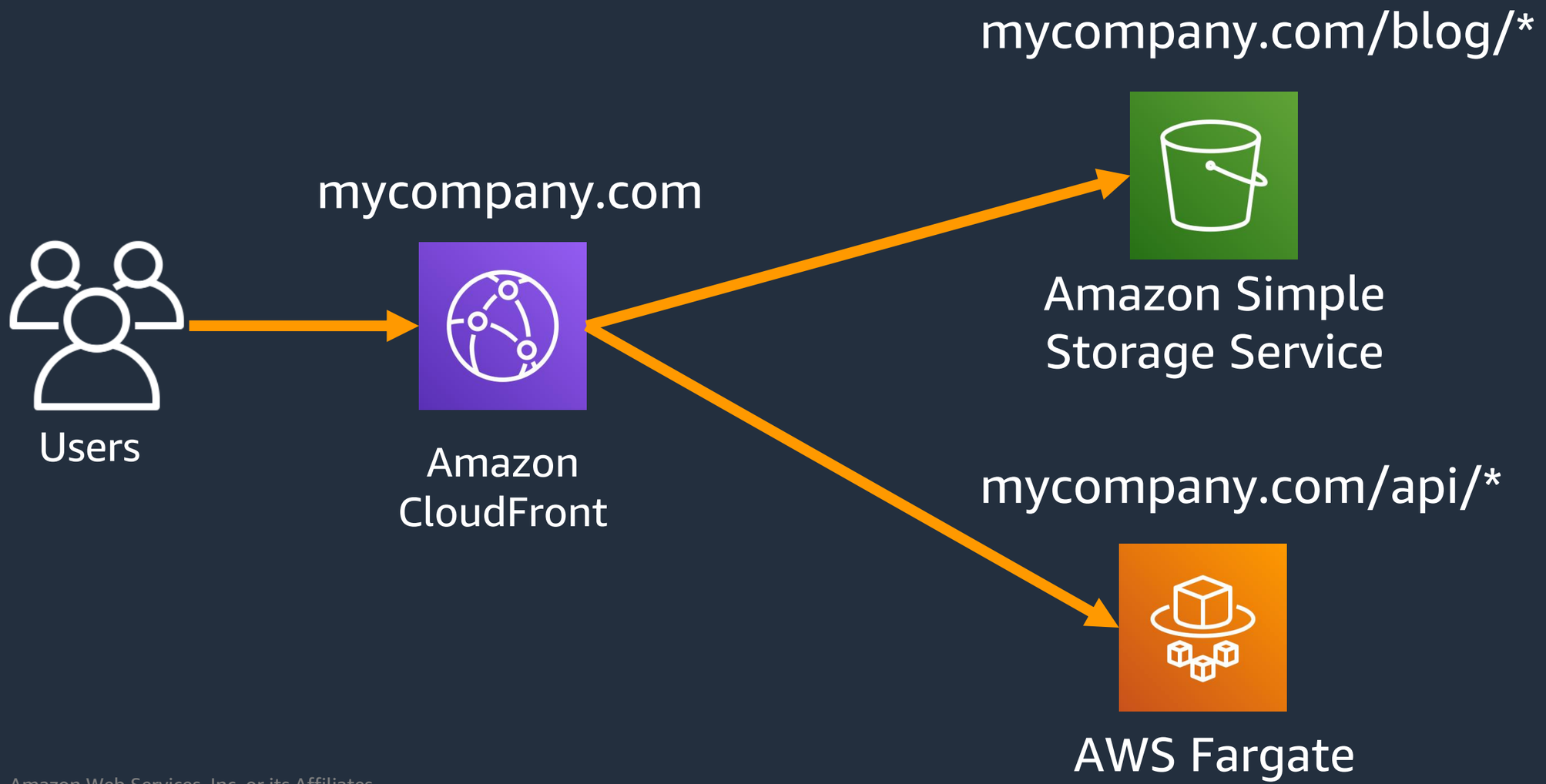
Decouple traffic: One domain, multiple services



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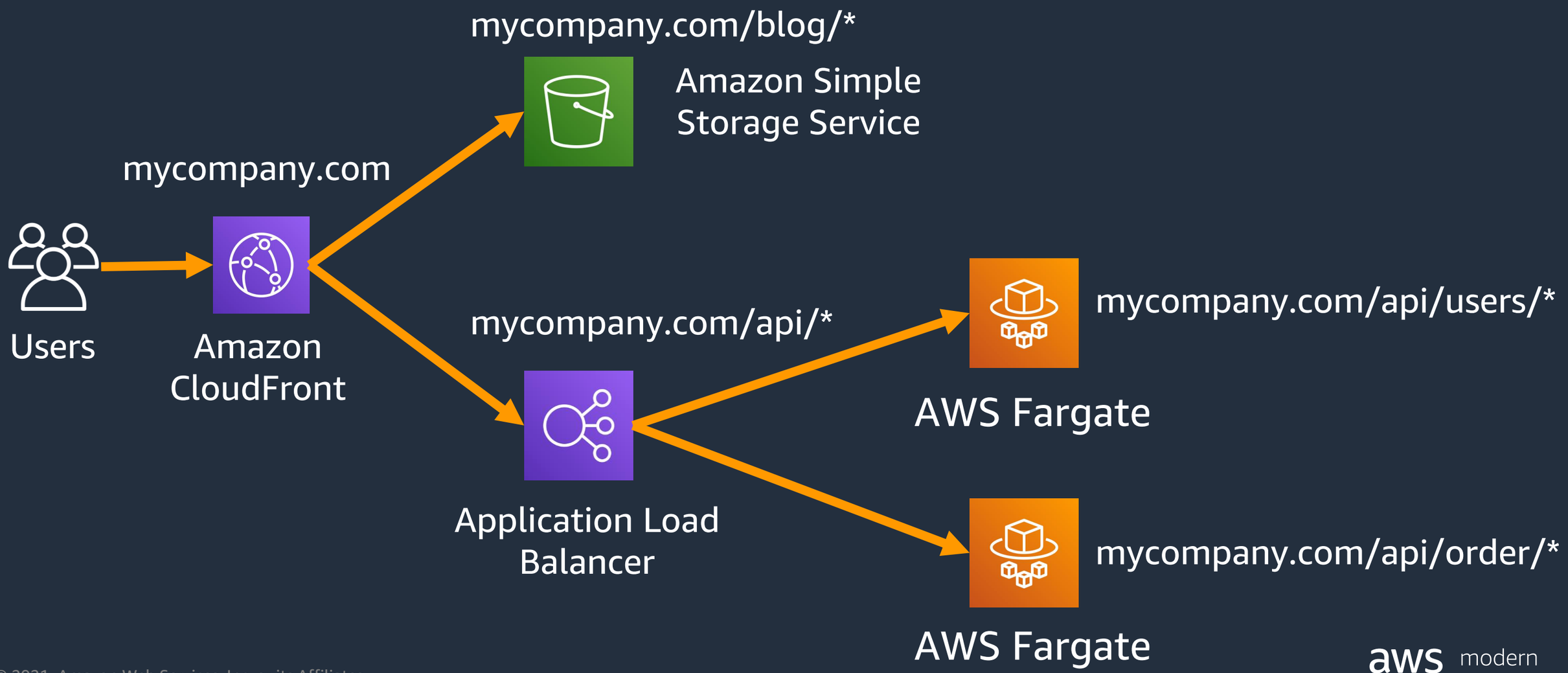
Decouple API into microservices



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Application Load Balancer

The list of targets is managed by Elastic Container Service

Amazon Elastic Container Service

Listener

Listener Rule

Target Group

Listen for traffic on port 80 and 443

Check to see if traffic matches a rule

If it does, then send it to a target from this group

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Listener Rule

Up to 100 rules

Match on host

Hostname == mycompany.com
Hostname == api.mycompany.com

Match on path

Path == /api/users
Path == /api/orders

Match on query string

?utm_source==bot

Match on header

Version == 1.0.0
User-Agent == mobile

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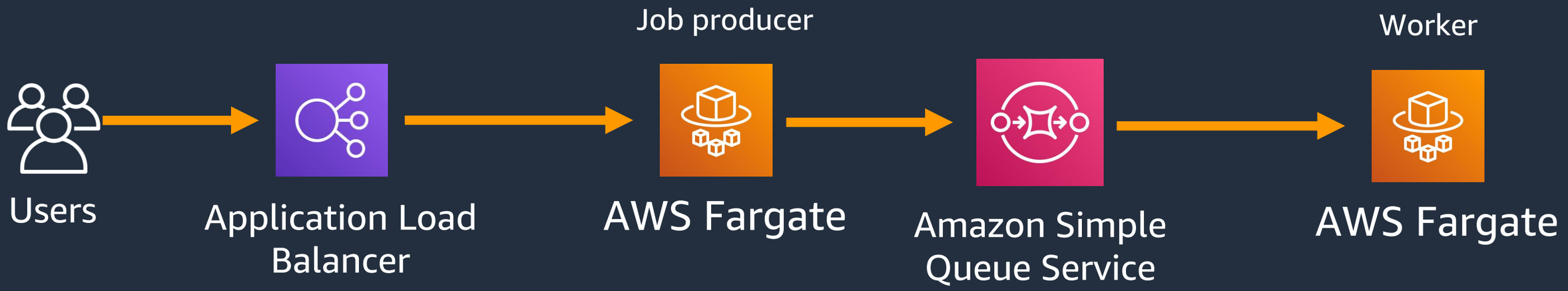
Decouple background workers



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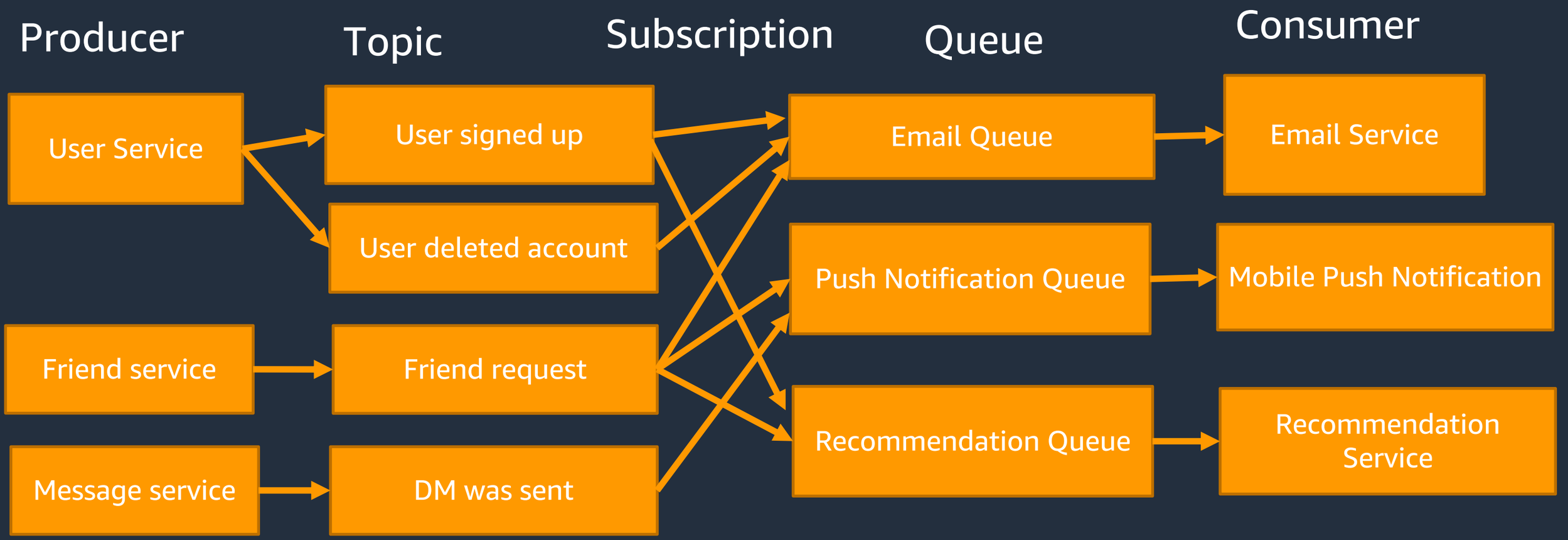
Use Topics and Queues for more complicated business logic



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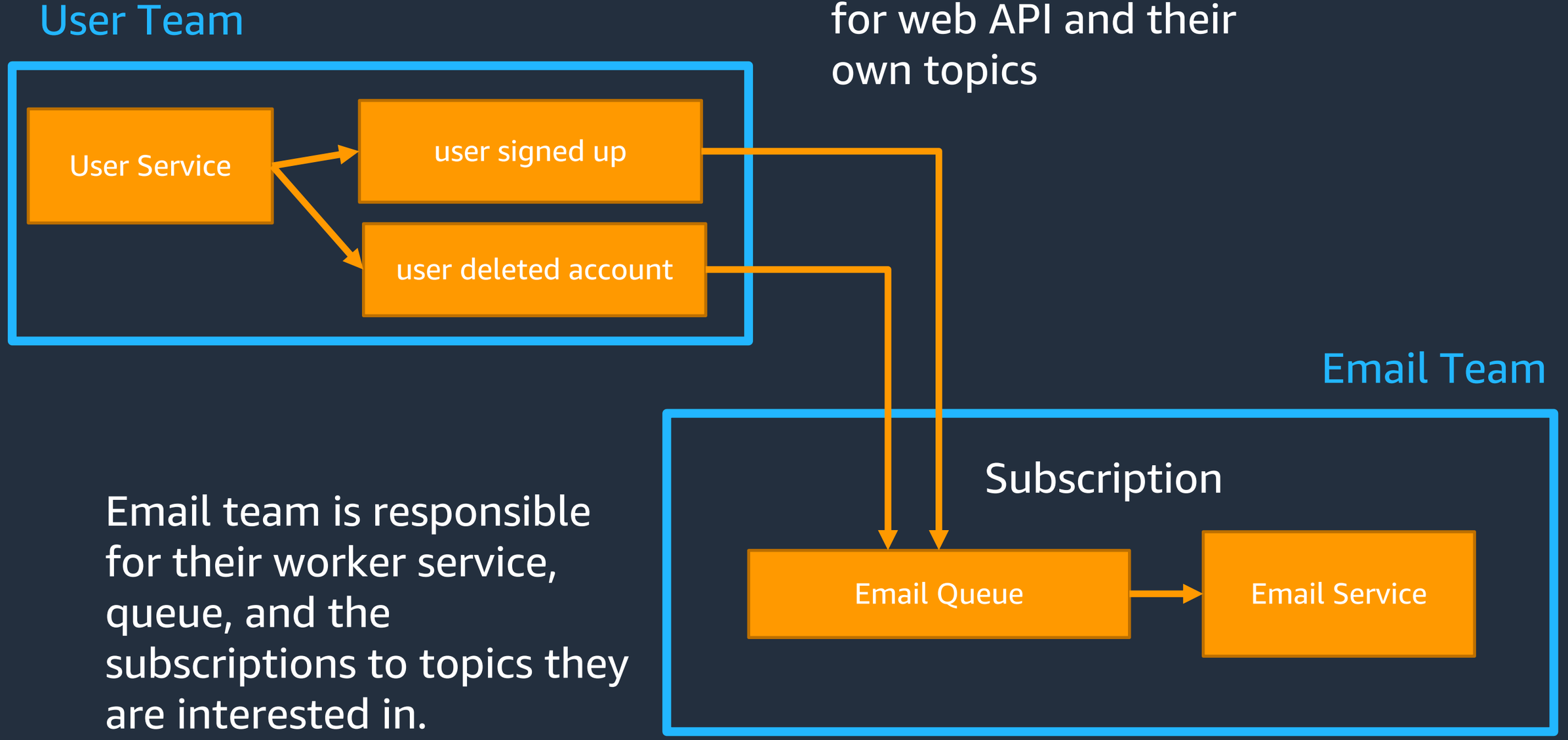
User team is responsible for web API and their own topics



Email team is responsible for their worker service, queue, and the subscriptions to topics they are interested in.

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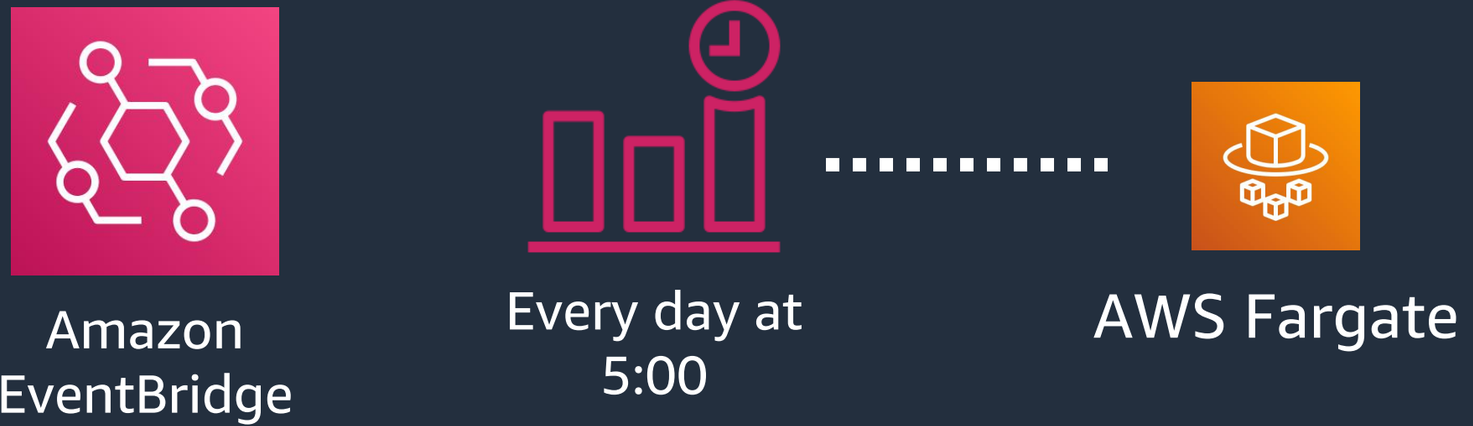
Decouple scheduled tasks from the monolith



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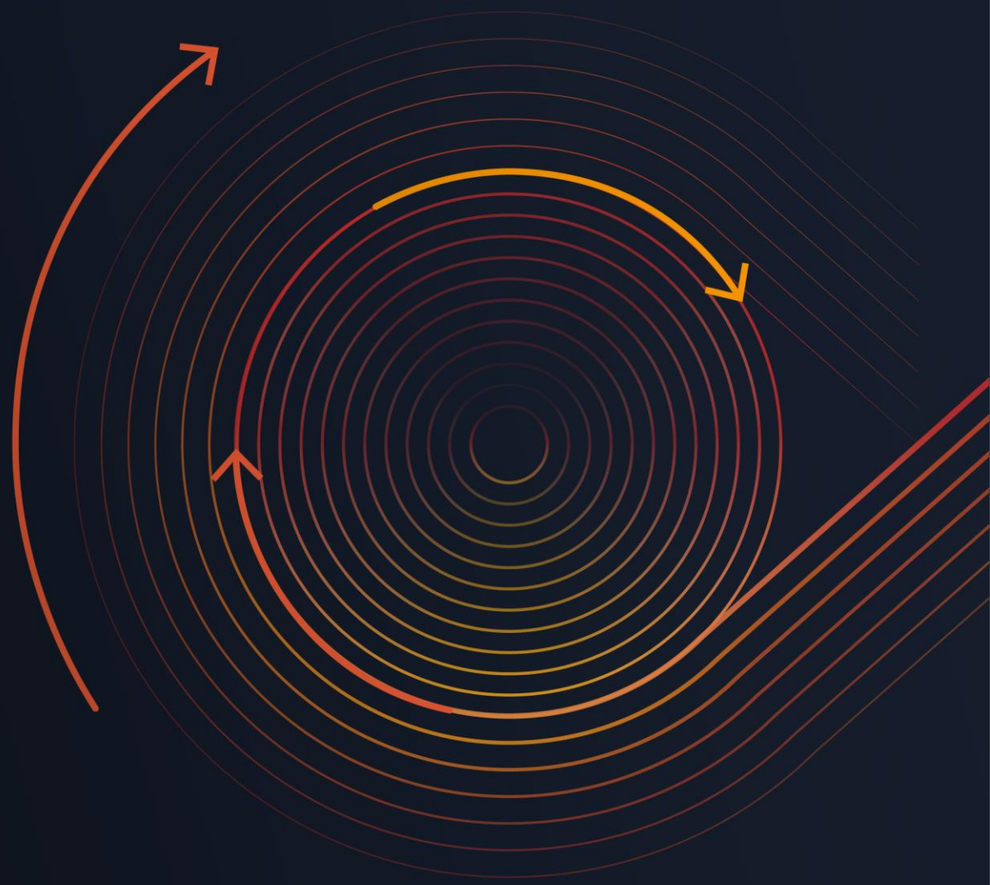
Popular Decoupling Patterns with Serverless



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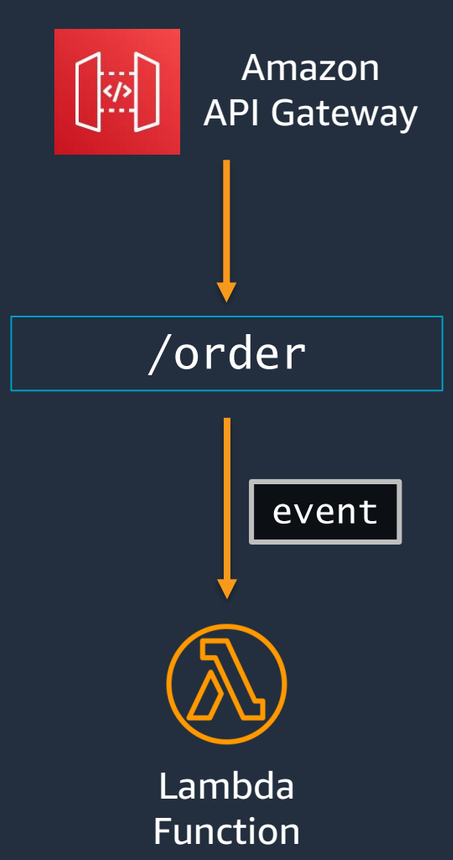
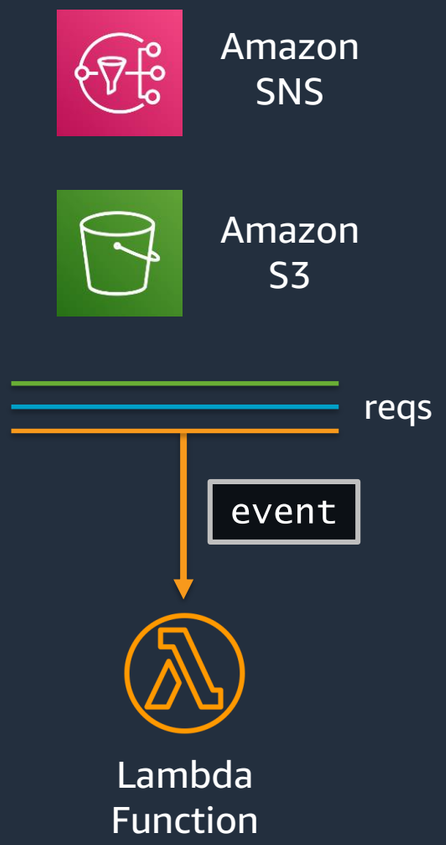
Lambda can be invoked via three different methods

All methods deliver an event payload

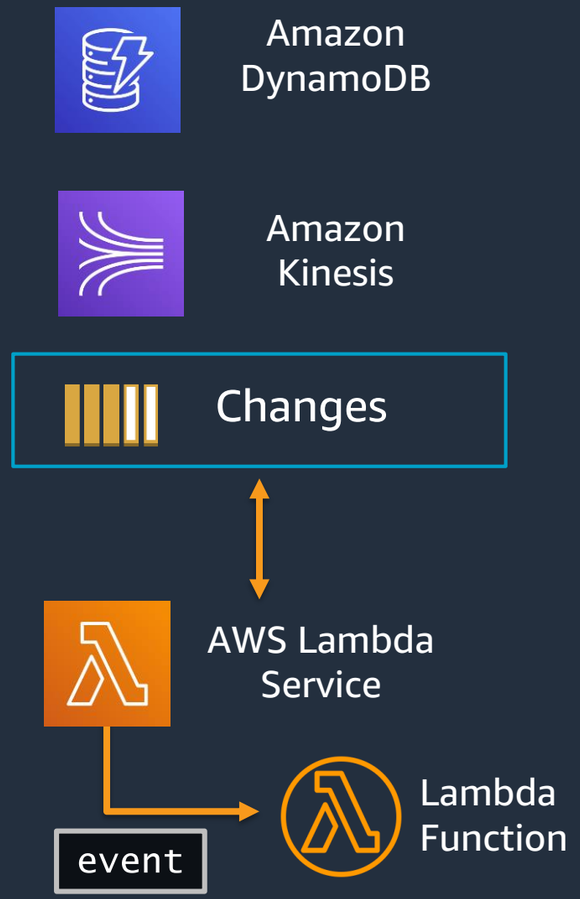
Synchronous



Asynchronous



Poll-Based



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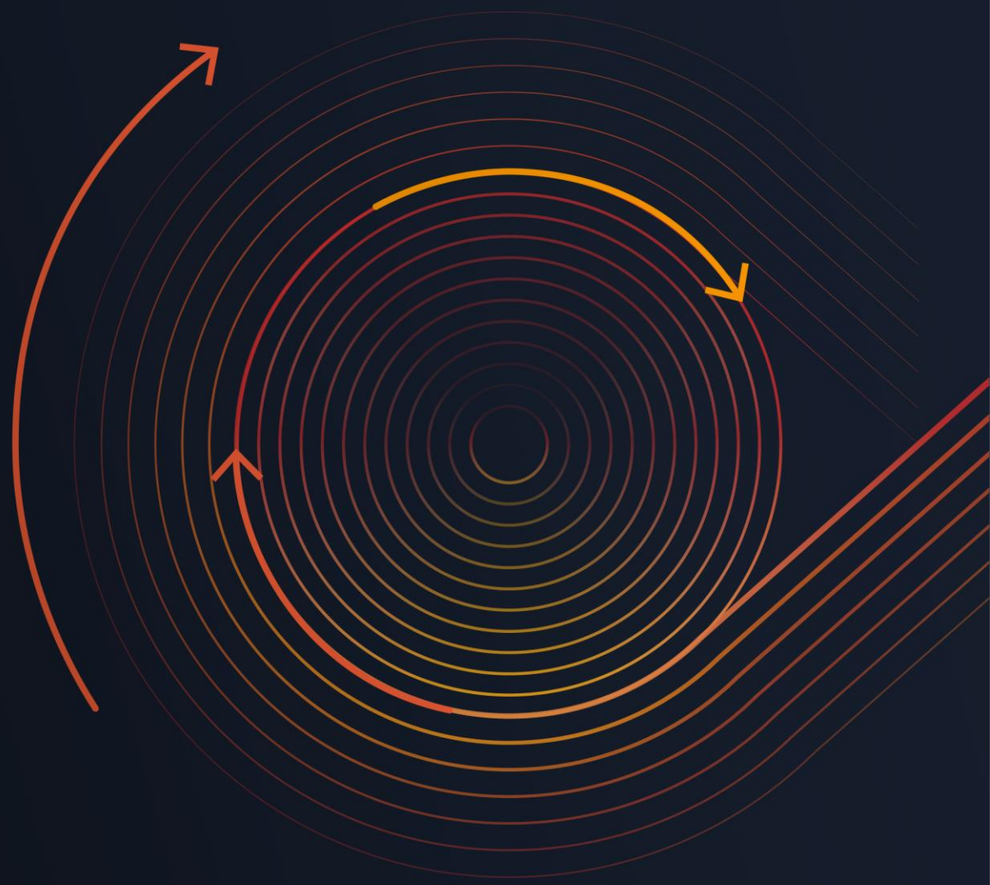
API-Driven Use Cases

Also event driven, synchronously processed



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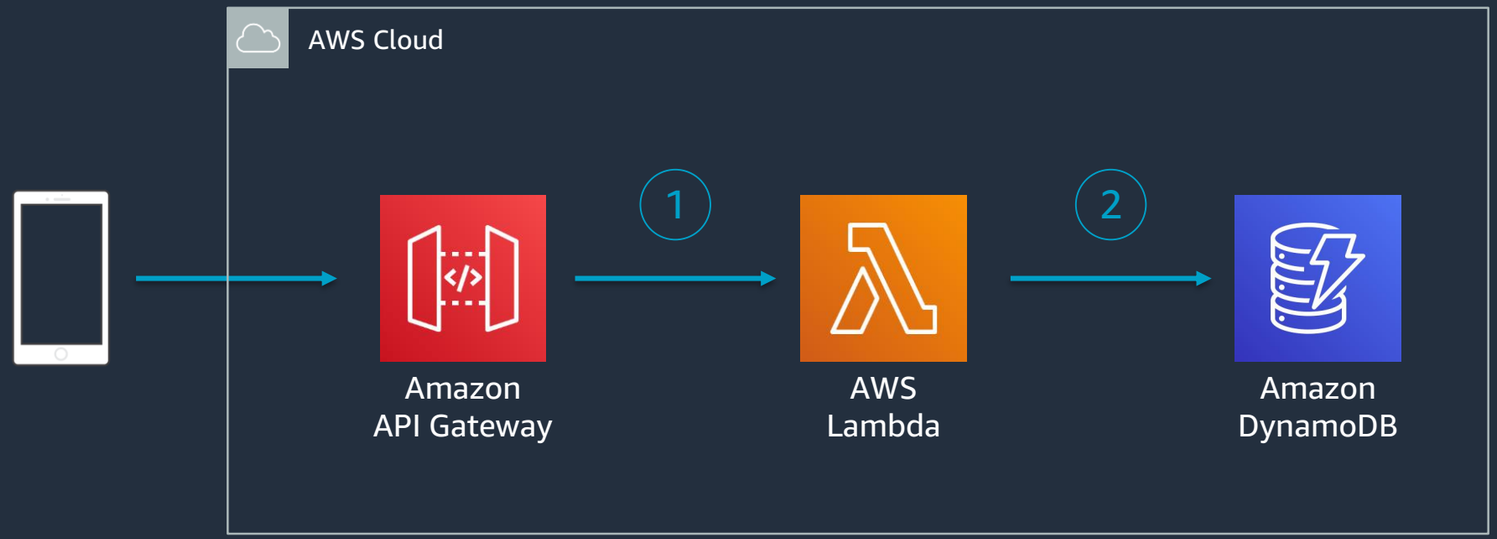
RESTful Microservices

Highly-scalable microservices



1. API Gateway “translates” incoming HTTP request to event payload
2. Lambda reads / writes data from data store

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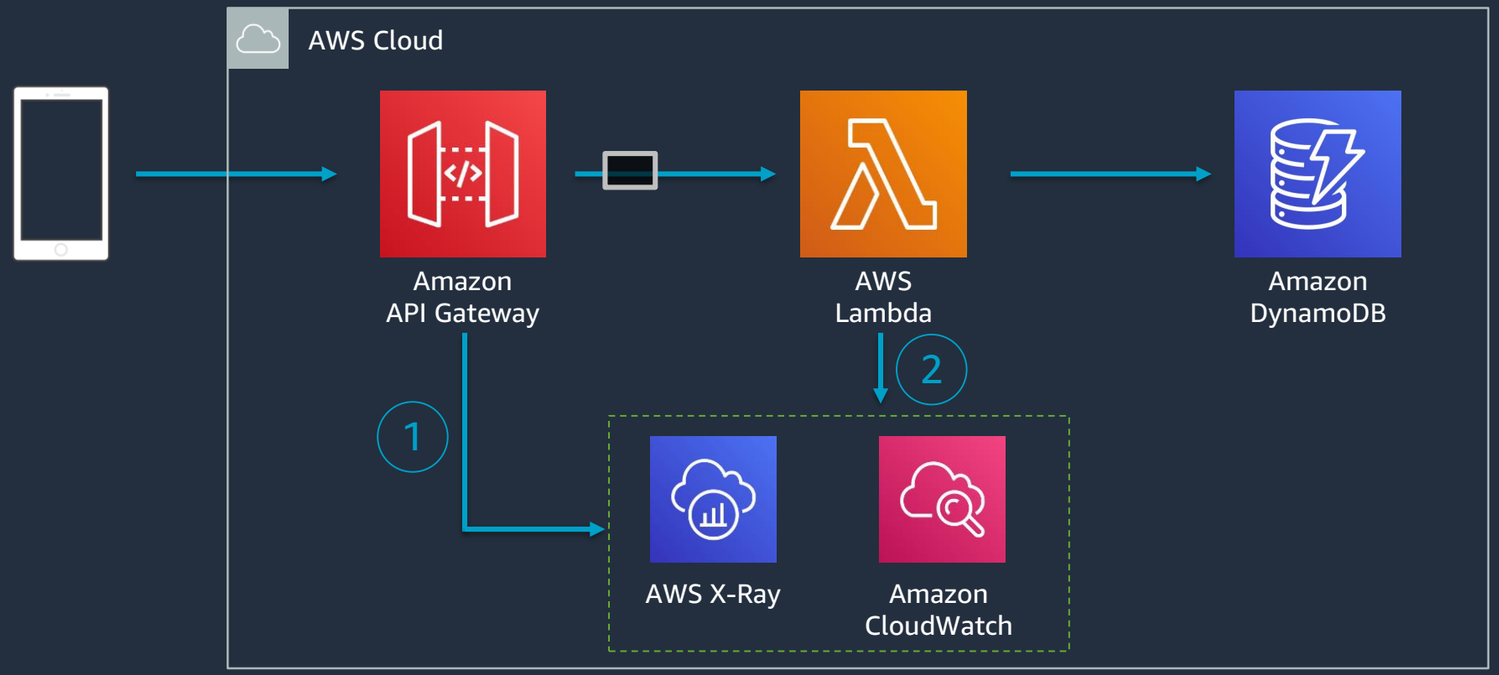
RESTful Microservices with enhanced observability

Enable access logs, structured logging, and instrument code



1. Enable access logs and tracing
2. Instrument code and create metrics asynchronously with CloudWatch Embedded Metric Format

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Event-Driven Use Cases

Streams, Topics, and Queues

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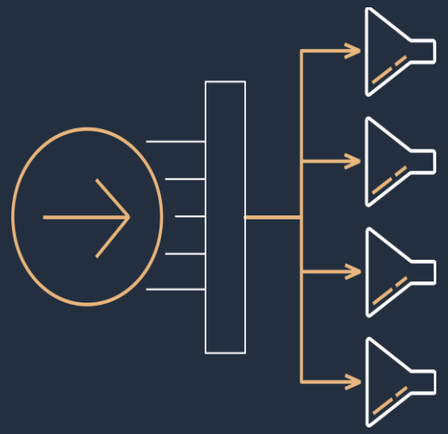
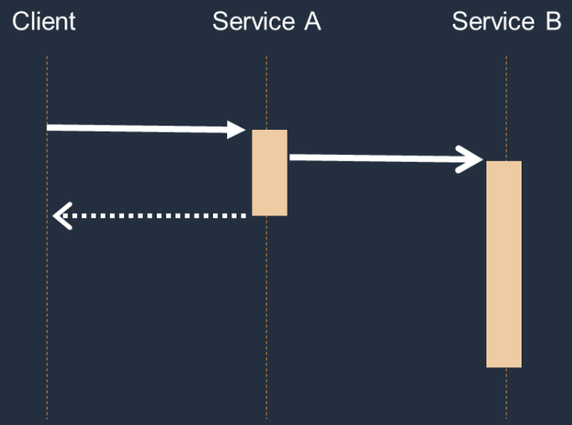
Event-driven architectures drive reliability and scalability

Event Routers



Abstract producers and consumers from each other

Asynchronous Events



Improve responsiveness and reduce dependencies

Event Stores

Buffer messages until services are available to process

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Processing file uploads

Resize photo, extract text, translate, etc.

1. Object uploaded to Amazon S3 Bucket

2. Asynchronous invoke of Lambda function, event payload includes:
   - Bucket name
   - Object key

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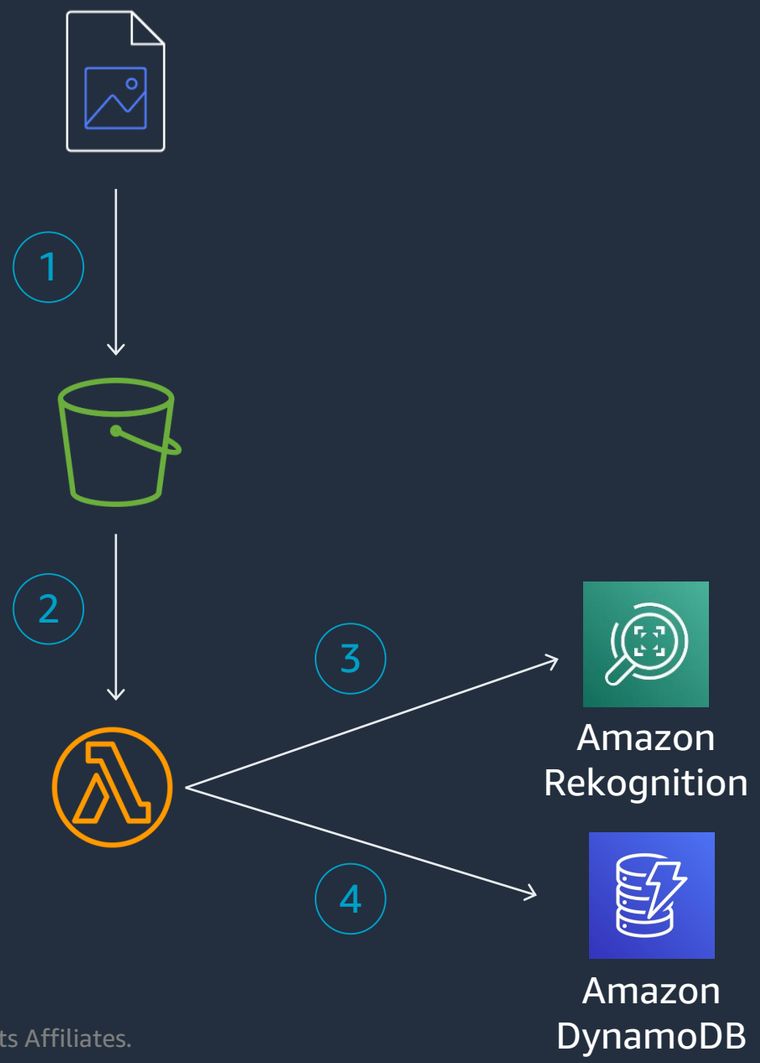
Processing file uploads, quickly add new functionality

Add image analysis and metadata storage



3. Analyze photo with Amazon Rekognition

4. Store image details and results of analysis

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Streaming data ingestion and storage

Consume, process, and store data

1. Lambda service polls Kinesis Data Stream for messages
2. Function is synchronously invoked with batches of messages
3. Function processes and/or pushes data to downstream data stores

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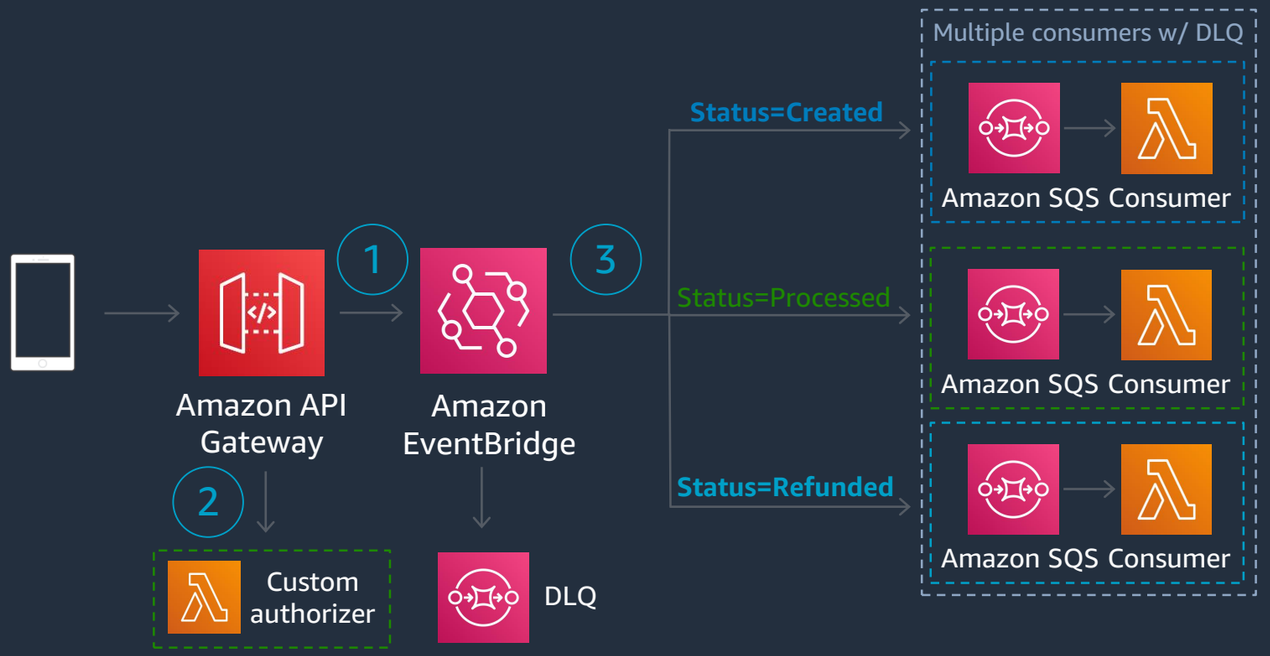
Fan out

Push updates to multiple subscribers



1. “Storage first”: integrate API Gateway directly to EventBridge
2. Enforce authorization
3. Use routing for efficient processing

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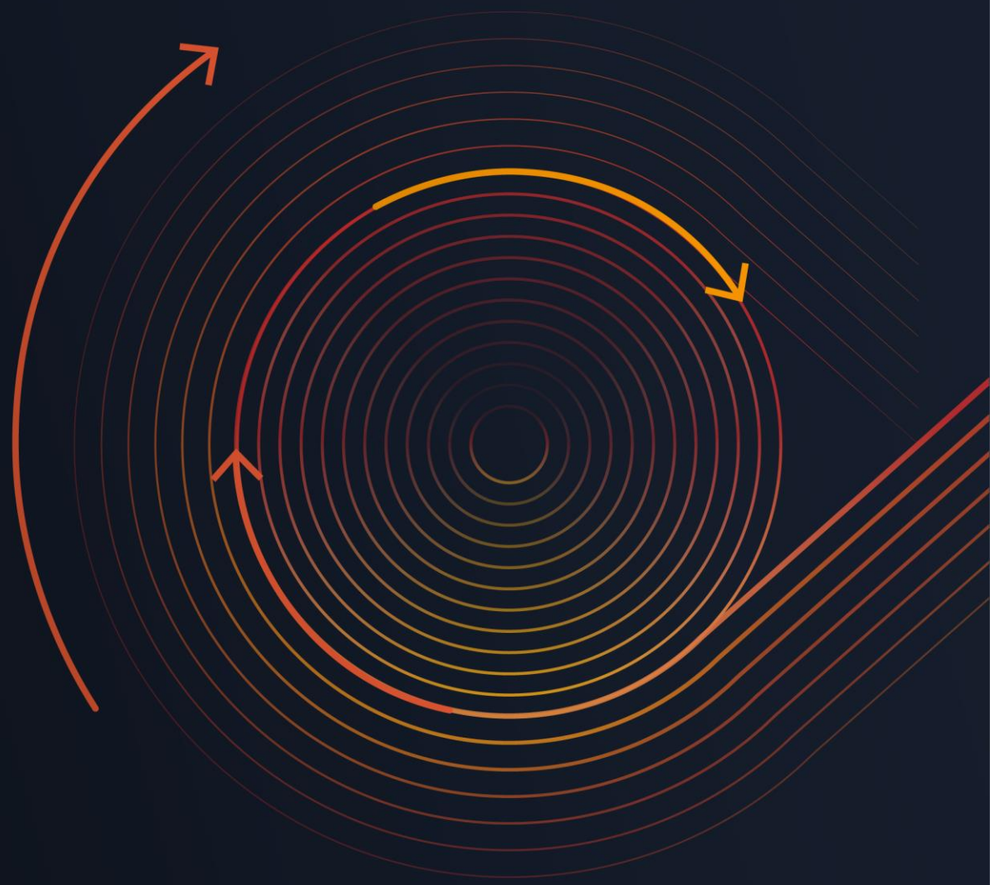
Practical Decoupling Tips



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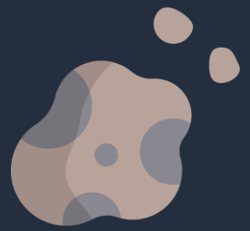
Practical decoupling: from monolith to micro

Functioning monolith

Trying to break things up too fast is a recipe for disaster

Kind of works?

Buggy service



Semi-functioning microservice

Boom!

Broken implementation

This part works great!

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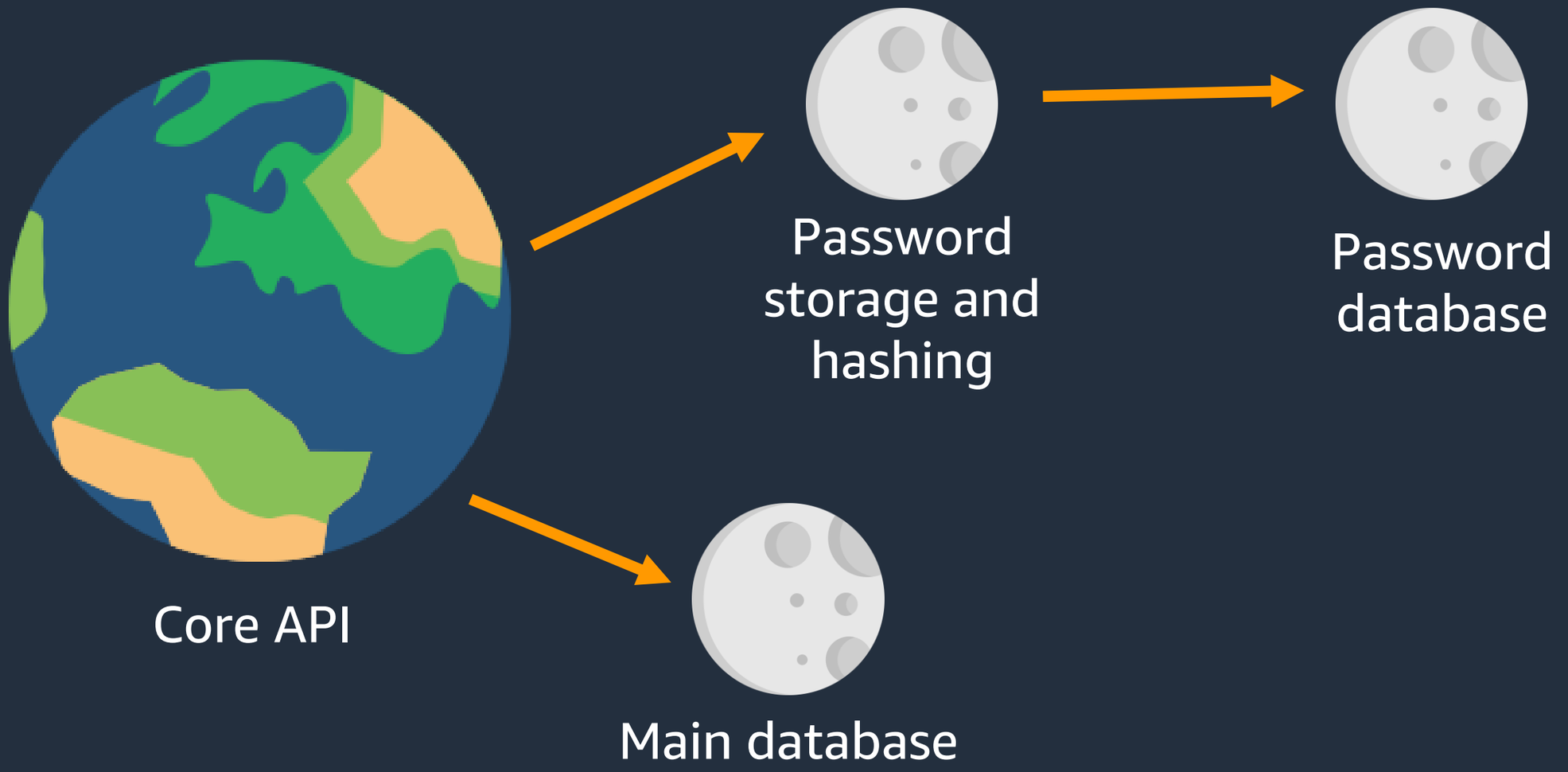
Decouple gradually, leave the central monolith for a while

Efficient microservice

Functioning monolith

Well functioning service

Some practical places to start: User signup



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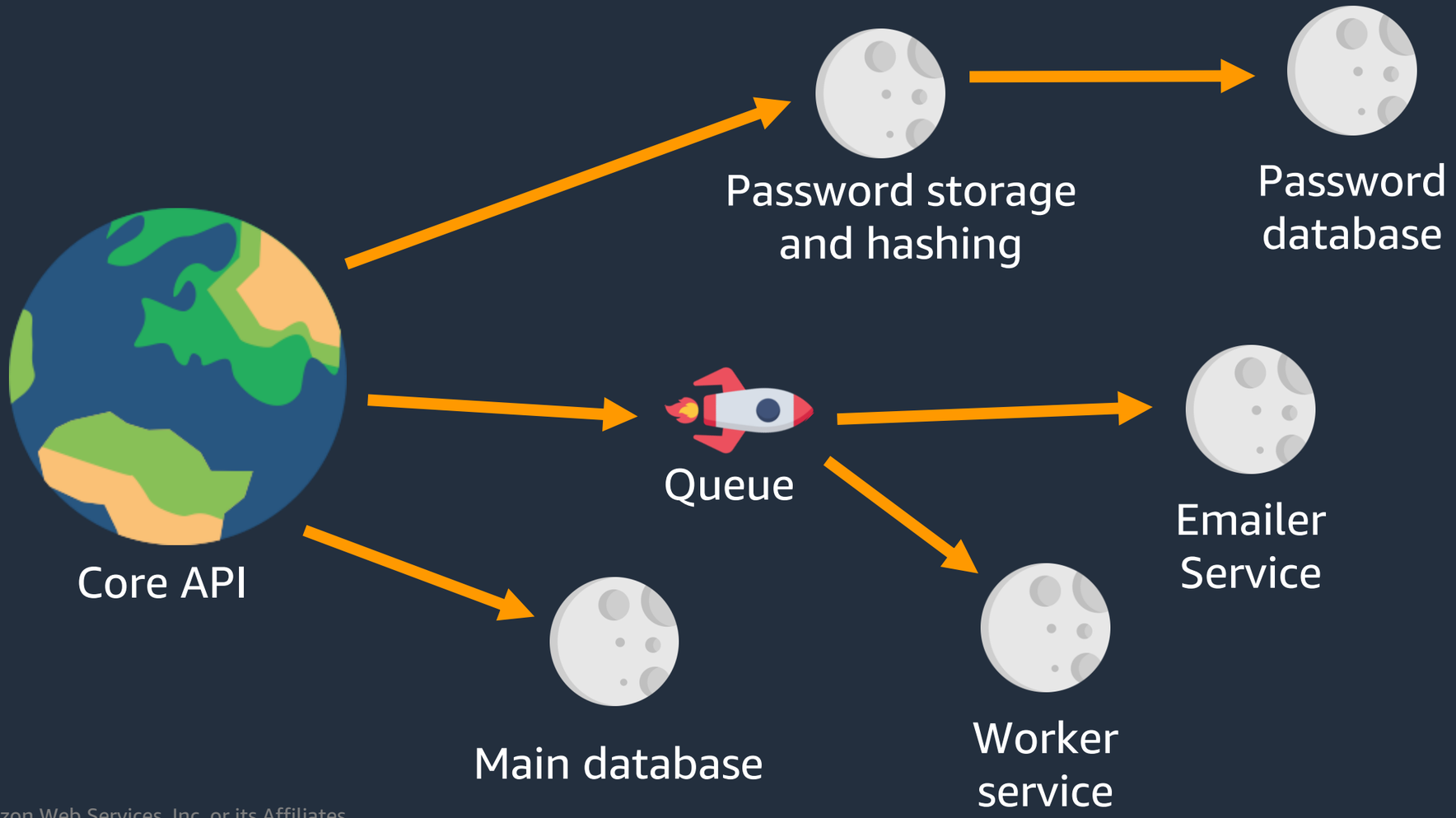

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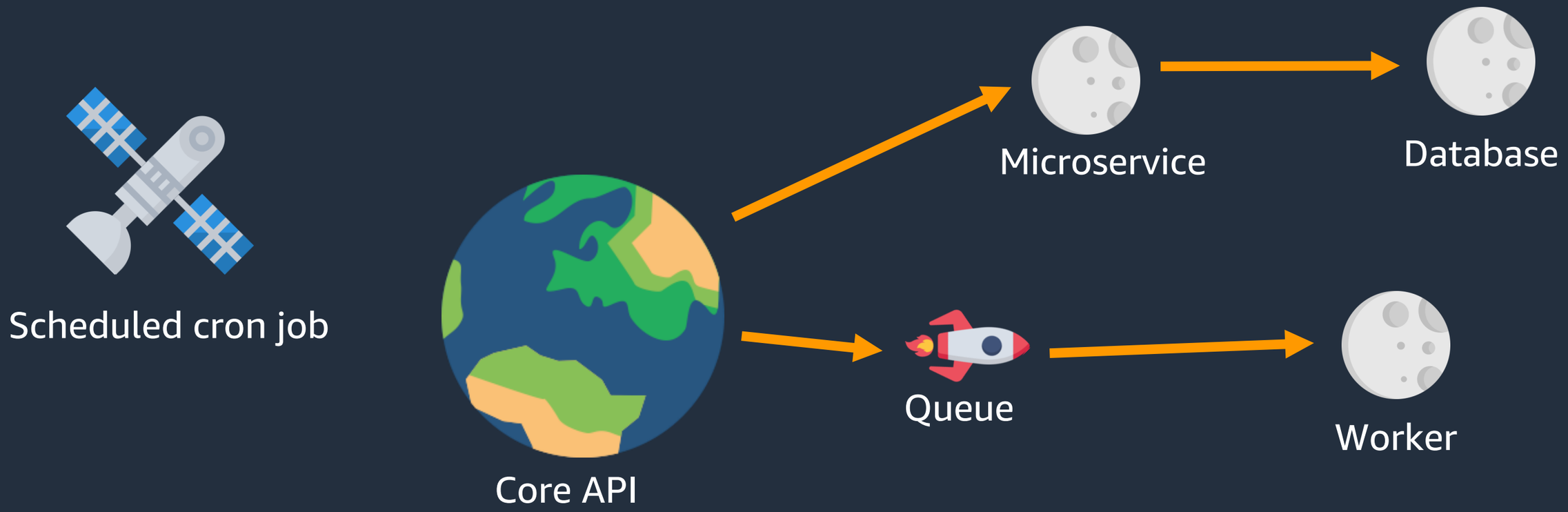
Look for transactions that have longer than average response time, or different resource needs:

- Social media application
  - Contact list upload, and server side contact matching (Big payloads)
  - Friend recommendations (Heavy queries, lots of data)

- Store
  - Product recommendation (Training models)
  - Payment processing (Need to keep payment details safe)

- Media
  - Upload processing, media transcoding (Heavy CPU, bandwidth)
  - Server side image resizing (Heavy CPU, bandwidth)

Decouple workloads responsibly - it is okay to have a central monolith



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