AWS Cloud Technology and Services

AWS CLOUD TECHNOLOGY AND SERVICES CONCEPTS

Alex Kuntz
Head of Cloud Curriculum, DataCamp

Chapter 1: Compute Services

AWS EC2

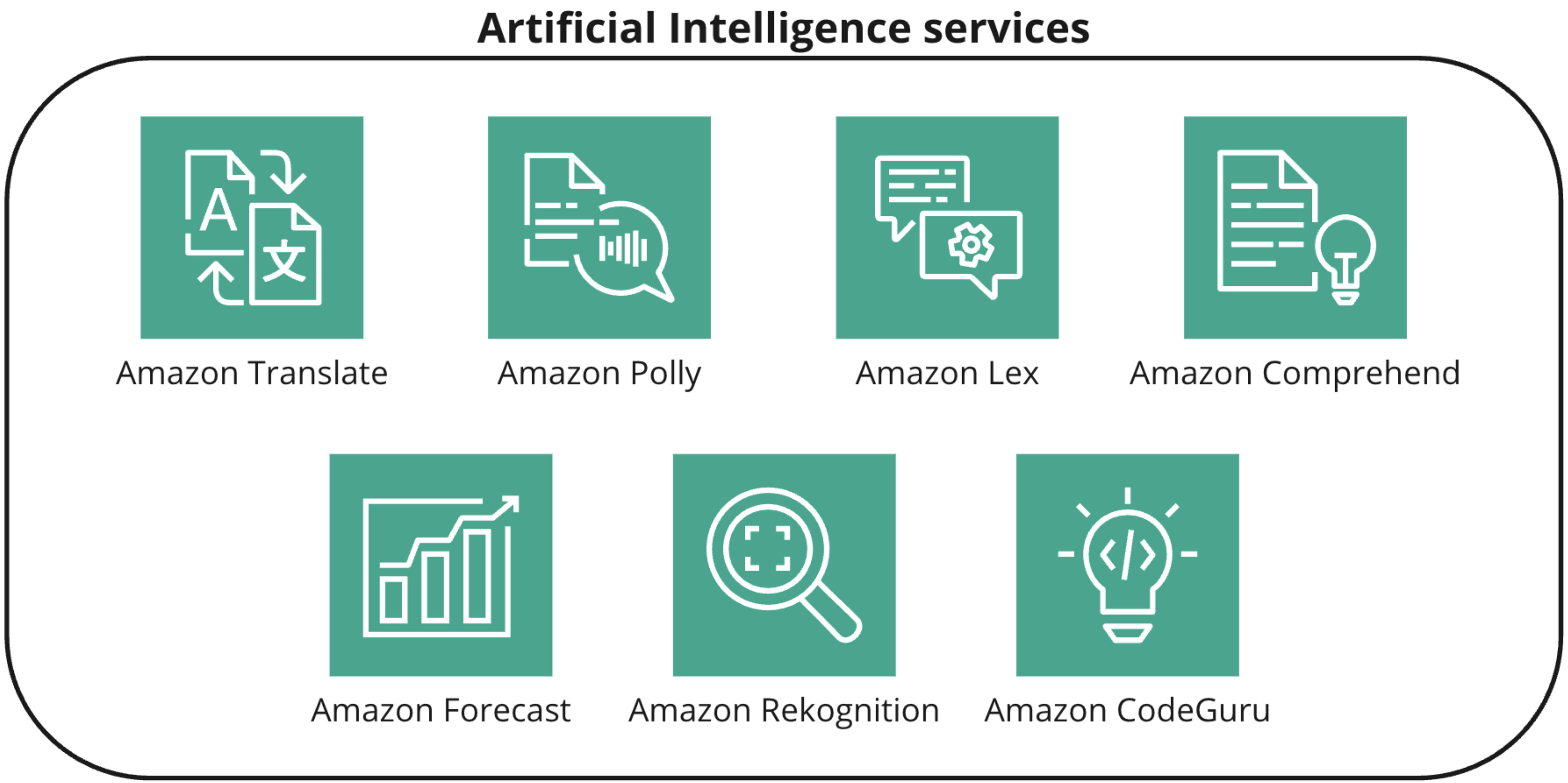
AWS Lambda

Chapter 2: Databases, networking, and storage

AWS DynamoDB

AWS S3

Chapter 3: AI, machine learning, and more



Artificial Intelligence services

Amazon Translate

Amazon Polly

Amazon Lex

Amazon Comprehend

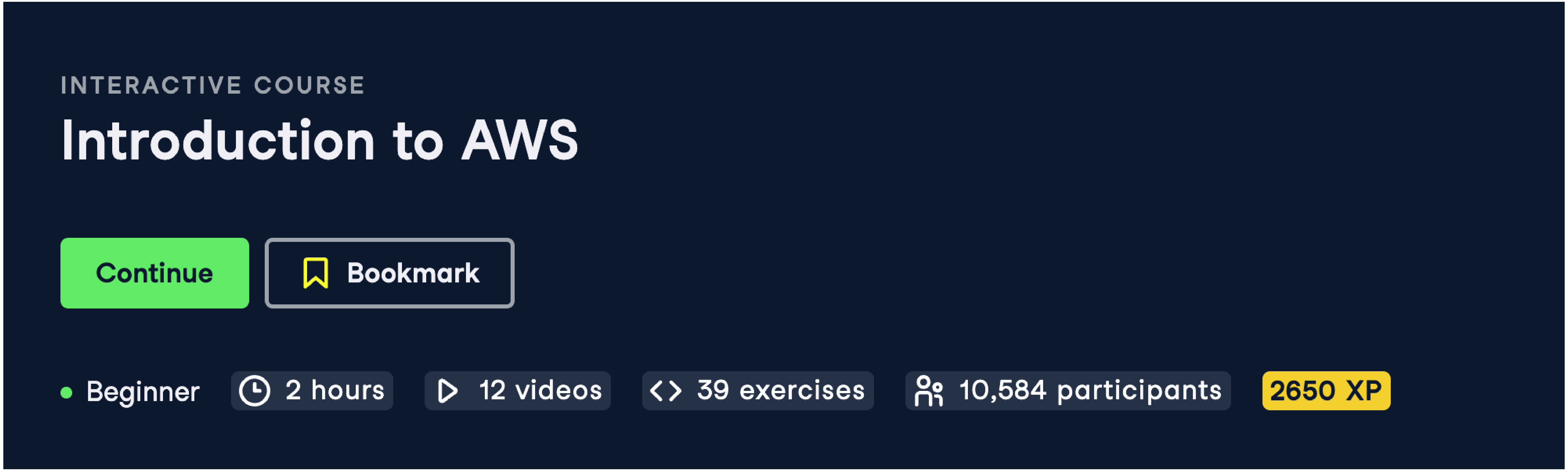
Amazon Forecast

Amazon Rekognition

Amazon CodeGuru

Prerequisites

- No technical experience needed
- A basic understanding of AWS could help

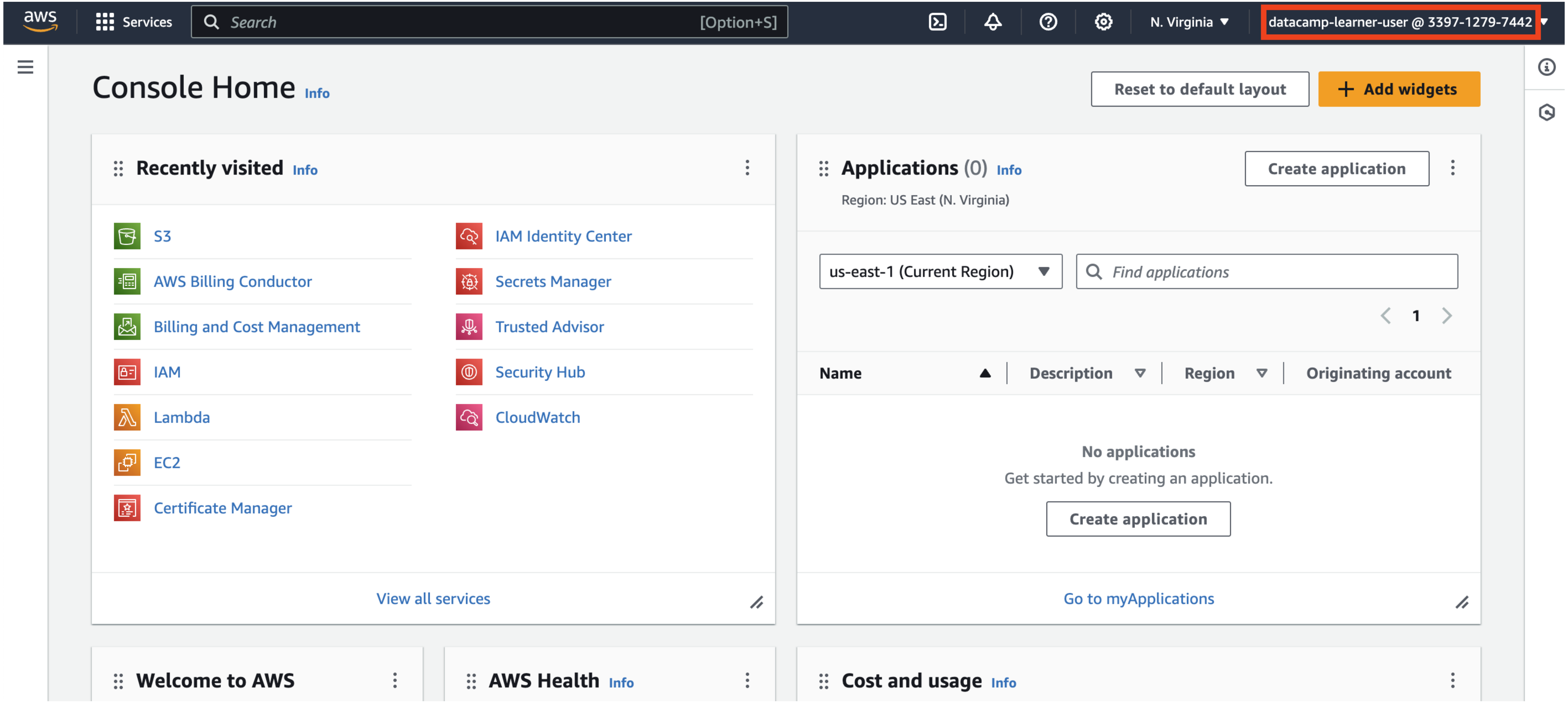


INTERACTIVE COURSE

Introduction to AWS

● Beginner 2 hours 12 videos 39 exercises 10,584 participants 2650 XP

Course format



Console Home Info

Reset to default layout

+ Add widgets

Recently visited Info

- S3
- AWS Billing Conductor
- Billing and Cost Management
- IAM
- Lambda
- EC2
- Certificate Manager
- IAM Identity Center
- Secrets Manager
- Trusted Advisor
- Security Hub
- CloudWatch

View all services

Applications (0) Info

Region: US East (N. Virginia)

Create application

us-east-1 (Current Region)

Find applications

Name	Description	Region	Originating account

No applications

Get started by creating an application.

Create application

Go to myApplications

Welcome to AWS

AWS Health Info

Cost and usage Info

Let's practice!

AWS CLOUD TECHNOLOGY AND SERVICES CONCEPTS

Amazon Elastic Compute Cloud

AWS CLOUD TECHNOLOGY AND SERVICES CONCEPTS

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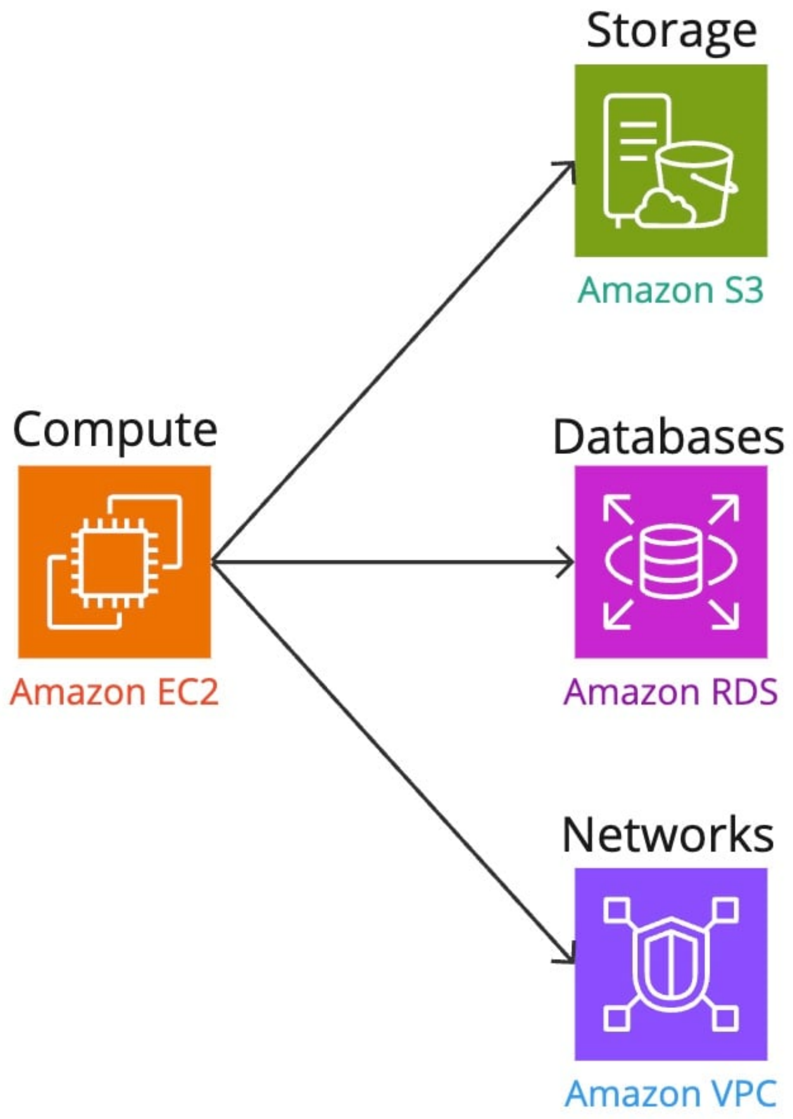
What is Amazon Elastic Compute Cloud (EC2)?

- Provides resizable compute capacity in the cloud
- Each individual EC2 machine is referred to as an instance

Key characteristics:

- Ability to scale up or down based on demand
- Availability of a varied range of instance types for specialized use cases



EC2 instance types

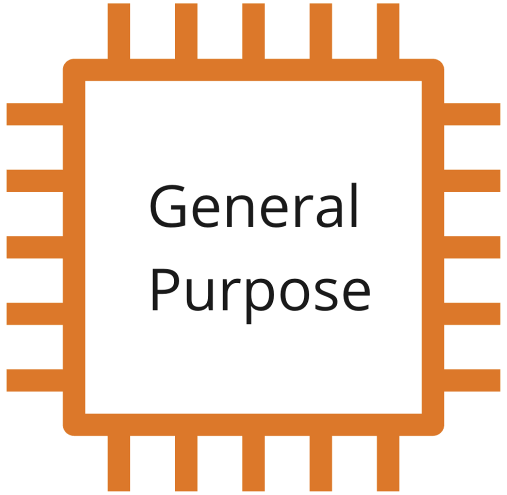
AWS offers six categories of EC2 instances for specialized workloads

- General purpose
- Compute optimized
- Memory optimized
- Storage optimized
- Accelerated computing
- High Performance Computing (HPC) optimized

General purpose and storage optimized instances

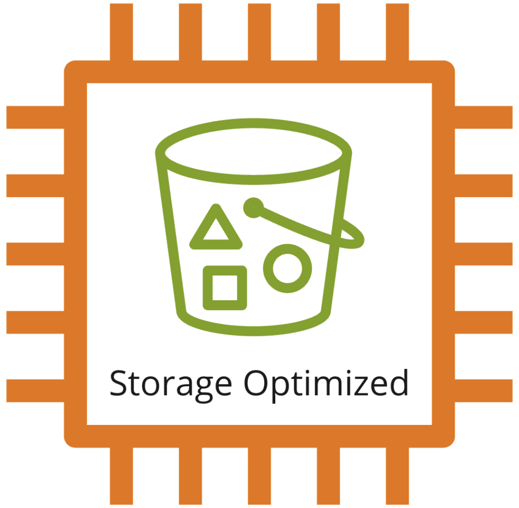
General purpose instances

- Balance of compute, memory, and networking resources
- Use cases:
  - Hosting dynamic websites
  - Maintaining code repositories



Storage optimized instances

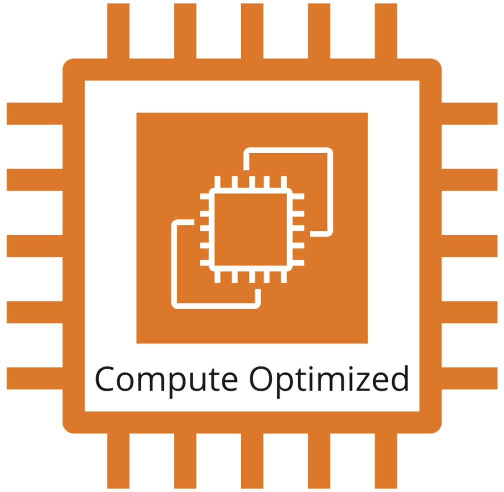
- High, sequential read and write access to large datasets
- Use cases:
  - Data warehousing
  - Refactoring large relational databases



Compute and memory optimized instances

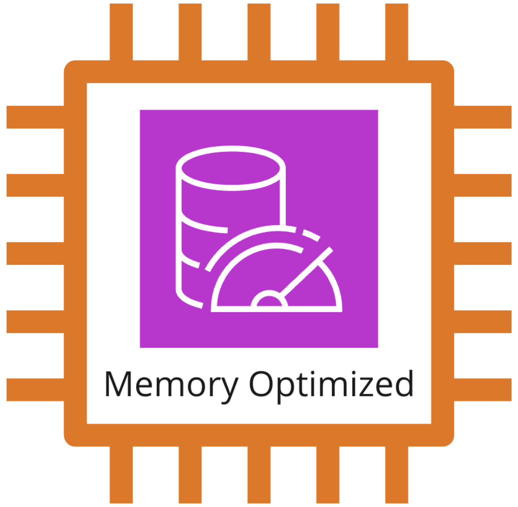
Compute optimized instances

- Compute-intensive and high-performance workloads
- Use cases:
  - Scientific simulations
  - Financial modeling



Memory optimized instances

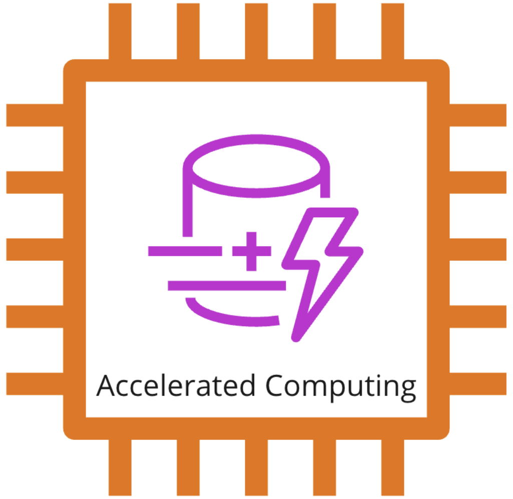
- Memory-intensive workloads not requiring high storage
- Use cases:
  - Real-time stream data analytics
  - Generating close captions



Specialized compute instances

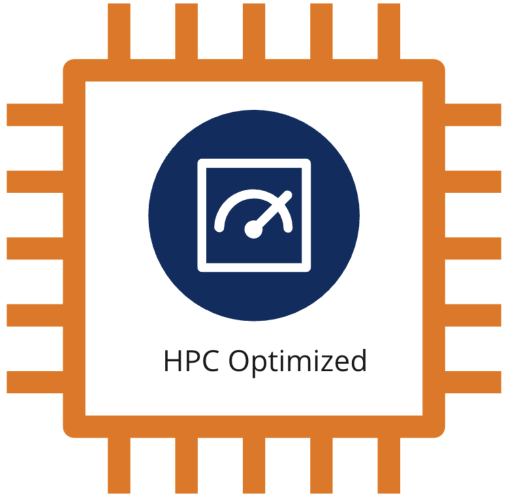
Accelerated computing instances

- Contain specialized hardware accelerators, like GPUs or FPGAs
- Use cases:
  - Deep learning
  - Rendering gaming graphics

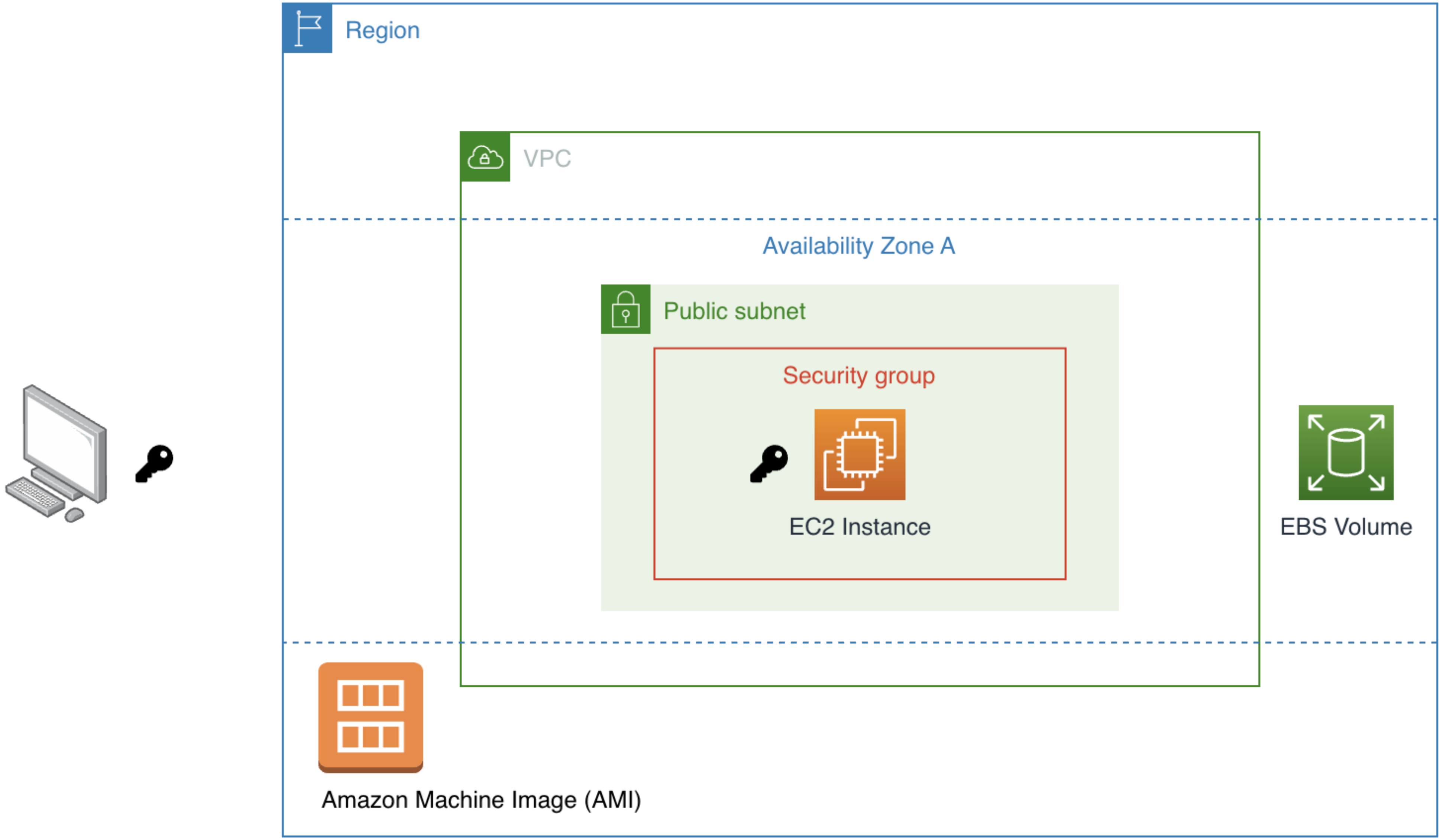


HPC optimized instances

- Best price performance for running high performance workloads at scale
- Use cases:
  - Weather forecasting
  - Crash simulations

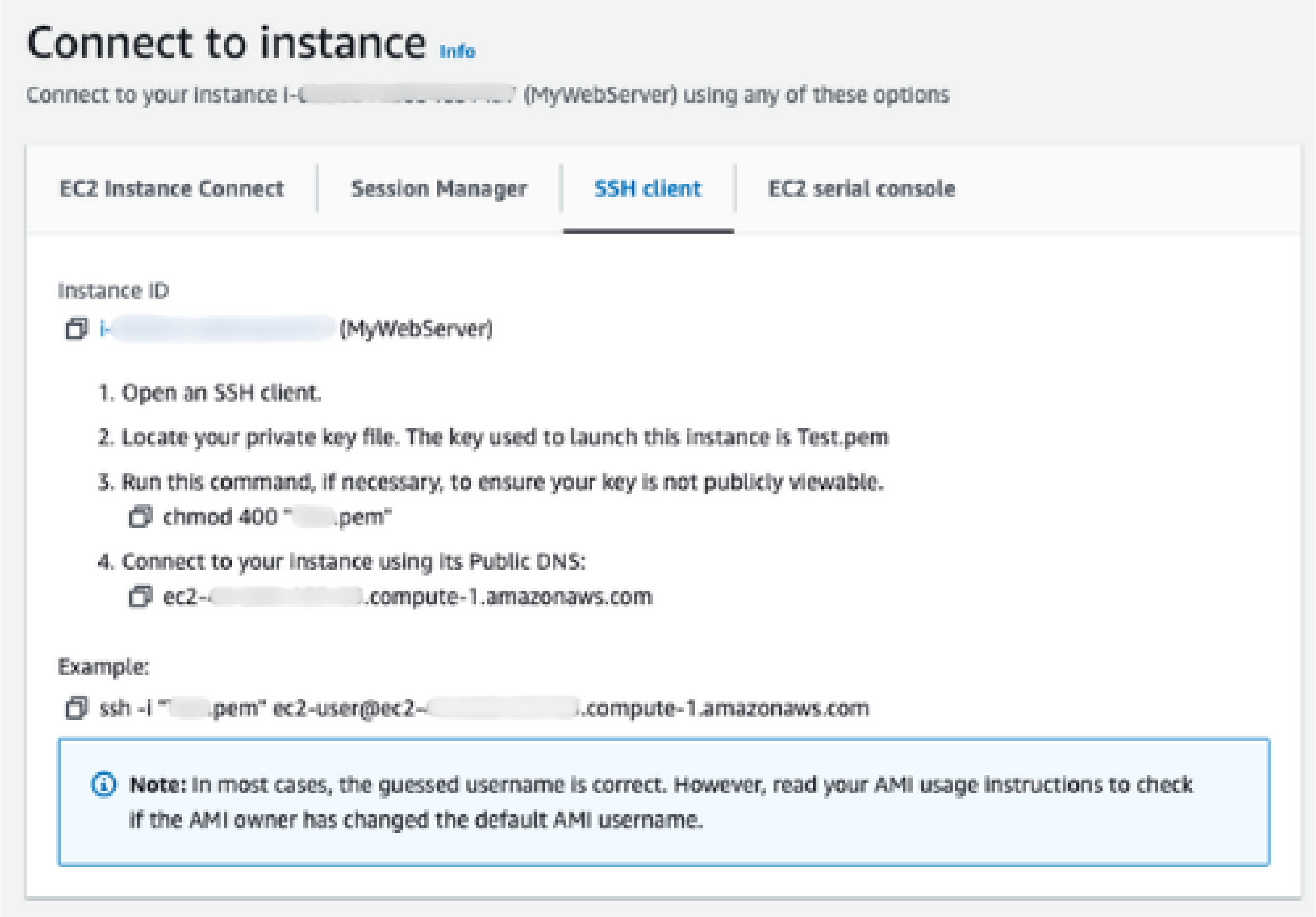


Creating your EC2 instance



Connecting to your EC2 instance: SSH Client

- SSH connects with a private key
- Those keys must be managed



Connect to instance

Connect to your instance i-[redacted] (MyWebServer) using any of these options

Instance ID

i-[redacted] (MyWebServer)

1. Open an SSH client.
2. Locate your private key file. The key used to launch this instance is Test.pem
3. Run this command, if necessary, to ensure your key is not publicly viewable.

```
chmod 400 "[redacted].pem"
```

4. Connect to your instance using its Public DNS:

```
ec2-[redacted].compute-1.amazonaws.com
```

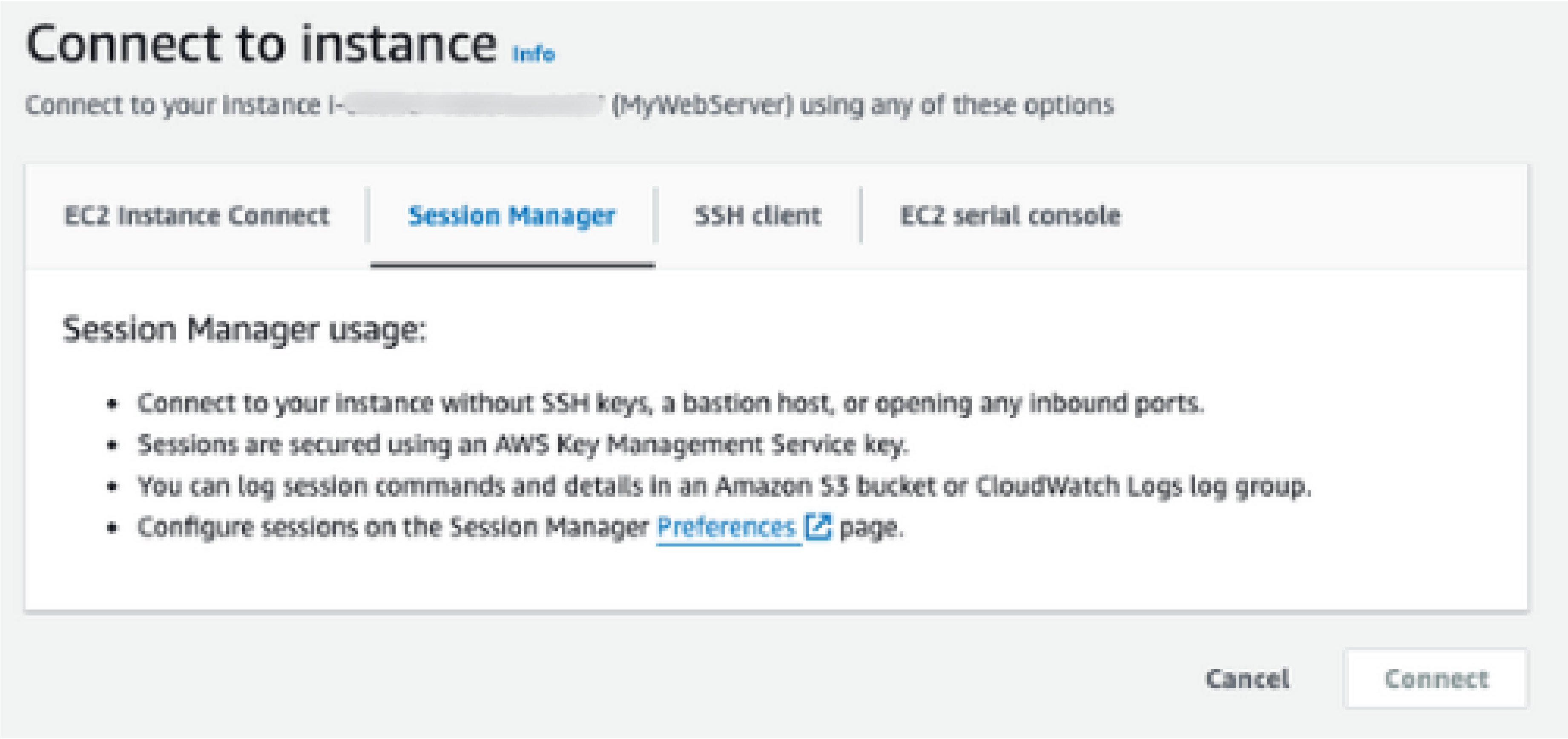
Example:

```
ssh -i "[redacted].pem" ec2-user@ec2-[redacted].compute-1.amazonaws.com
```

Note: In most cases, the guessed username is correct. However, read your AMI usage instructions to check if the AMI owner has changed the default AMI username.

Connecting to your EC2 instance: AWS Session Manager

- Keyless access via the Management Console
- Integrates with Identity and Access Management (IAM)



Connect to instance

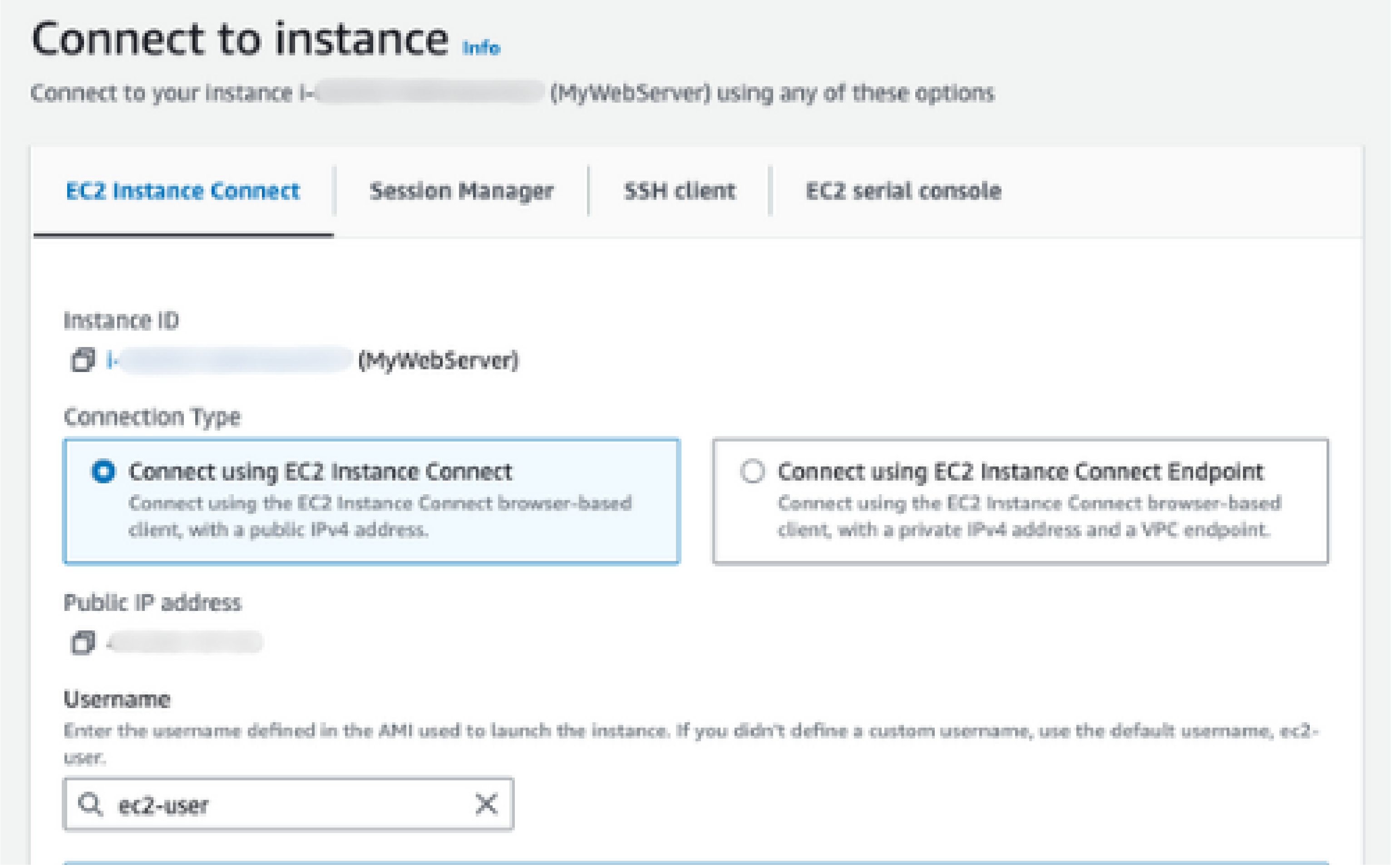
Connect to your instance i-[redacted] (MyWebServer) using any of these options

Session Manager usage:

- Connect to your instance without SSH keys, a bastion host, or opening any inbound ports.
- Sessions are secured using an AWS Key Management Service key.
- You can log session commands and details in an Amazon S3 bucket or CloudWatch Logs log group.
- Configure sessions on the Session Manager Preferences page.

Connecting to your EC2 instance: EC2 Instance Connect

- Browser-based connection
- Quick and temporary access



Connect to instance Info

Connect to your instance i-[redacted] (MyWebServer) using any of these options

Instance ID

i-[redacted] (MyWebServer)

Connection Type

● Connect using EC2 Instance Connect
Connect using the EC2 Instance Connect browser-based client, with a public IPv4 address.

○ Connect using EC2 Instance Connect Endpoint
Connect using the EC2 Instance Connect browser-based client, with a private IPv4 address and a VPC endpoint.

Public IP address

[redacted]

Username

Enter the username defined in the AMI used to launch the instance. If you didn't define a custom username, use the default username, ec2-user.

ec2-user

Let's practice!

AWS CLOUD TECHNOLOGY AND SERVICES CONCEPTS

Load Balancing and Auto-scaling

AWS CLOUD TECHNOLOGY AND SERVICES CONCEPTS

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Head of Cloud Curriculum, DataCamp

Load balancing in AWS

Load balancing ensures even distribution of incoming traffic among multiple EC2 instances, preventing overload on a single server

- Ensures high availability
- Provides horizontal scaling

Types of load balancers in AWS

Classic Load Balancer

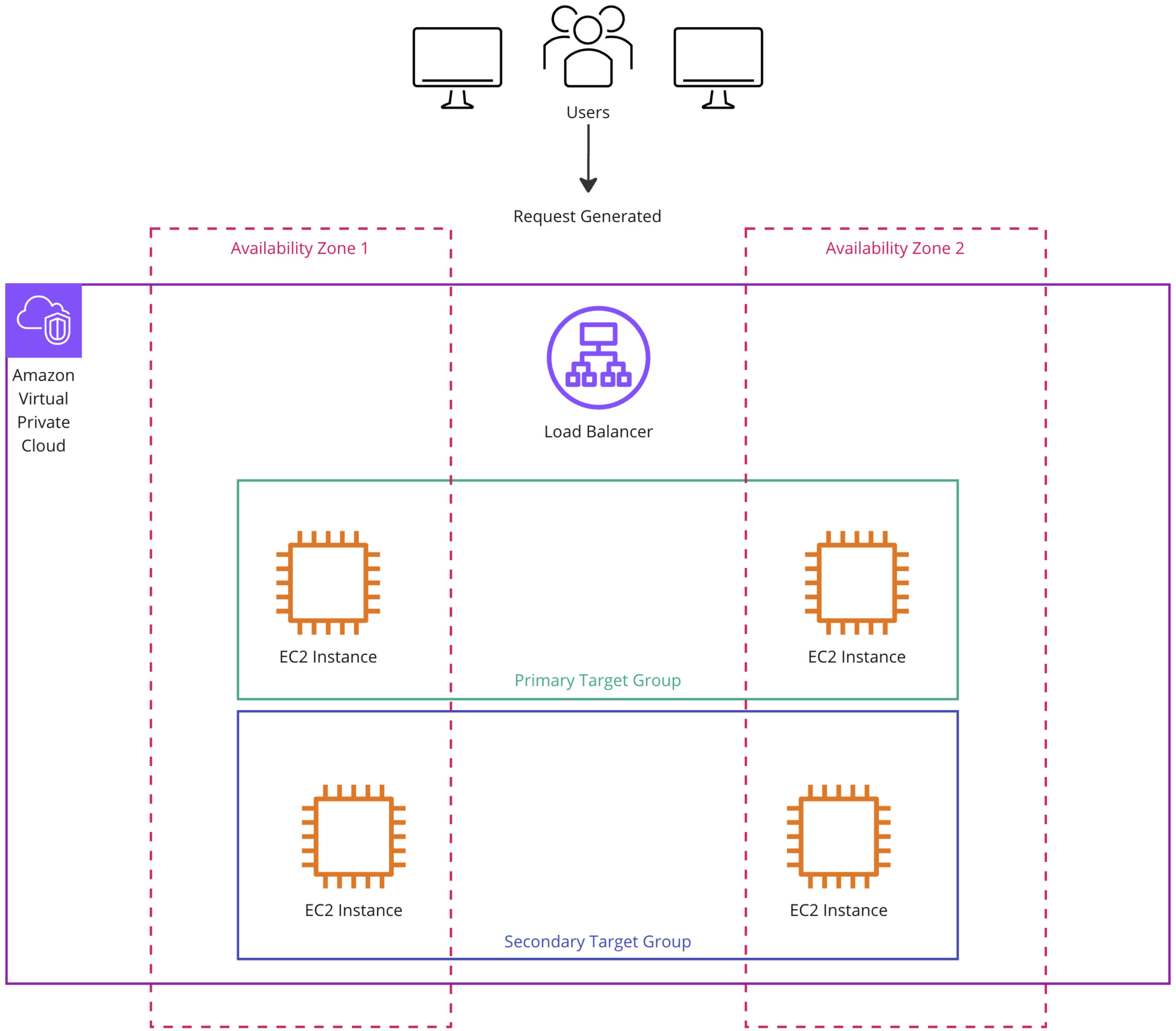
Network Load Balancer

Application Load Balancer

Gateway Load Balancer

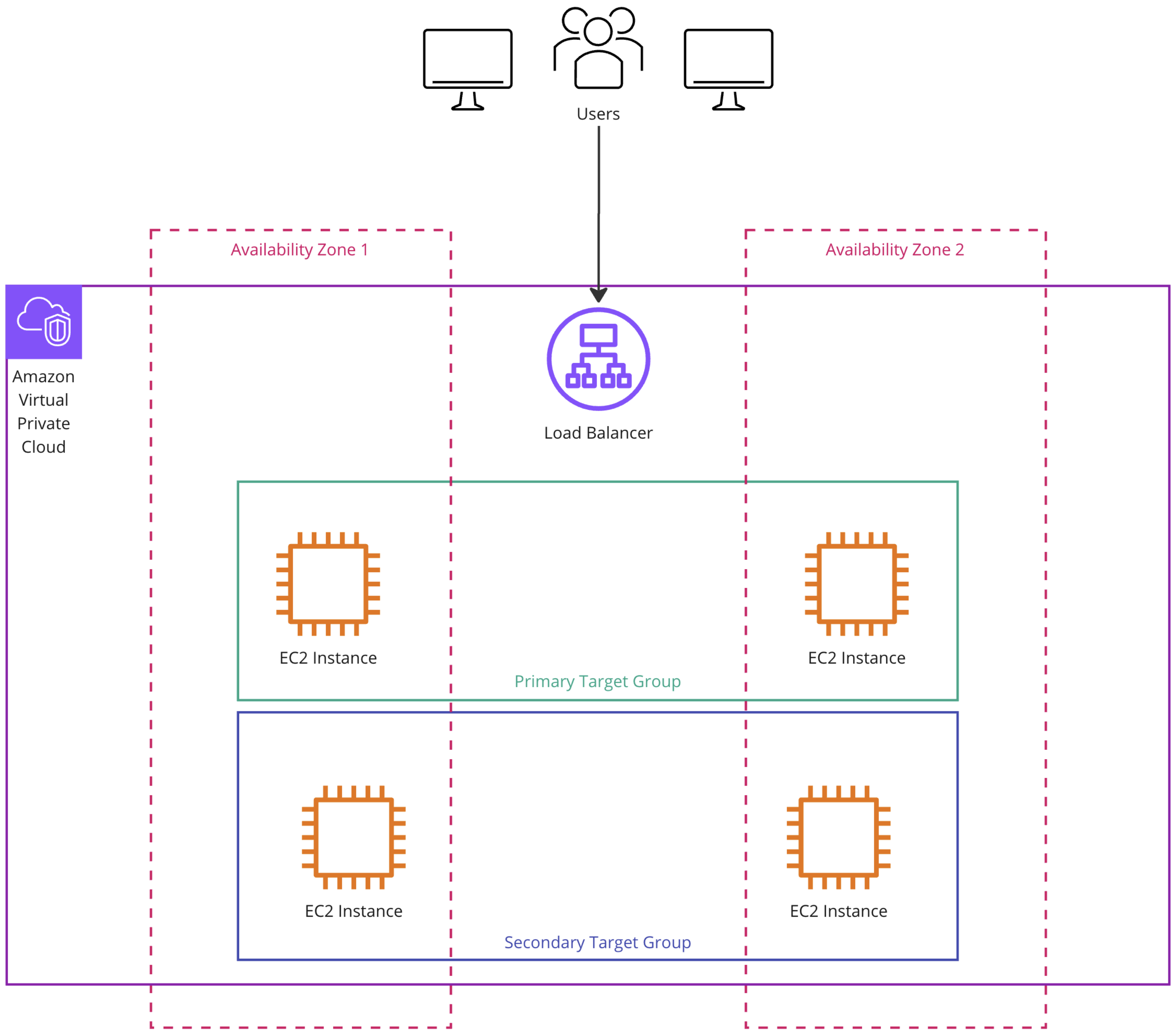
How does load balancing work?

1. Users send requests



How does load balancing work?

1. Users send requests
2. Requests hit the load balancer



How does load balancing work?

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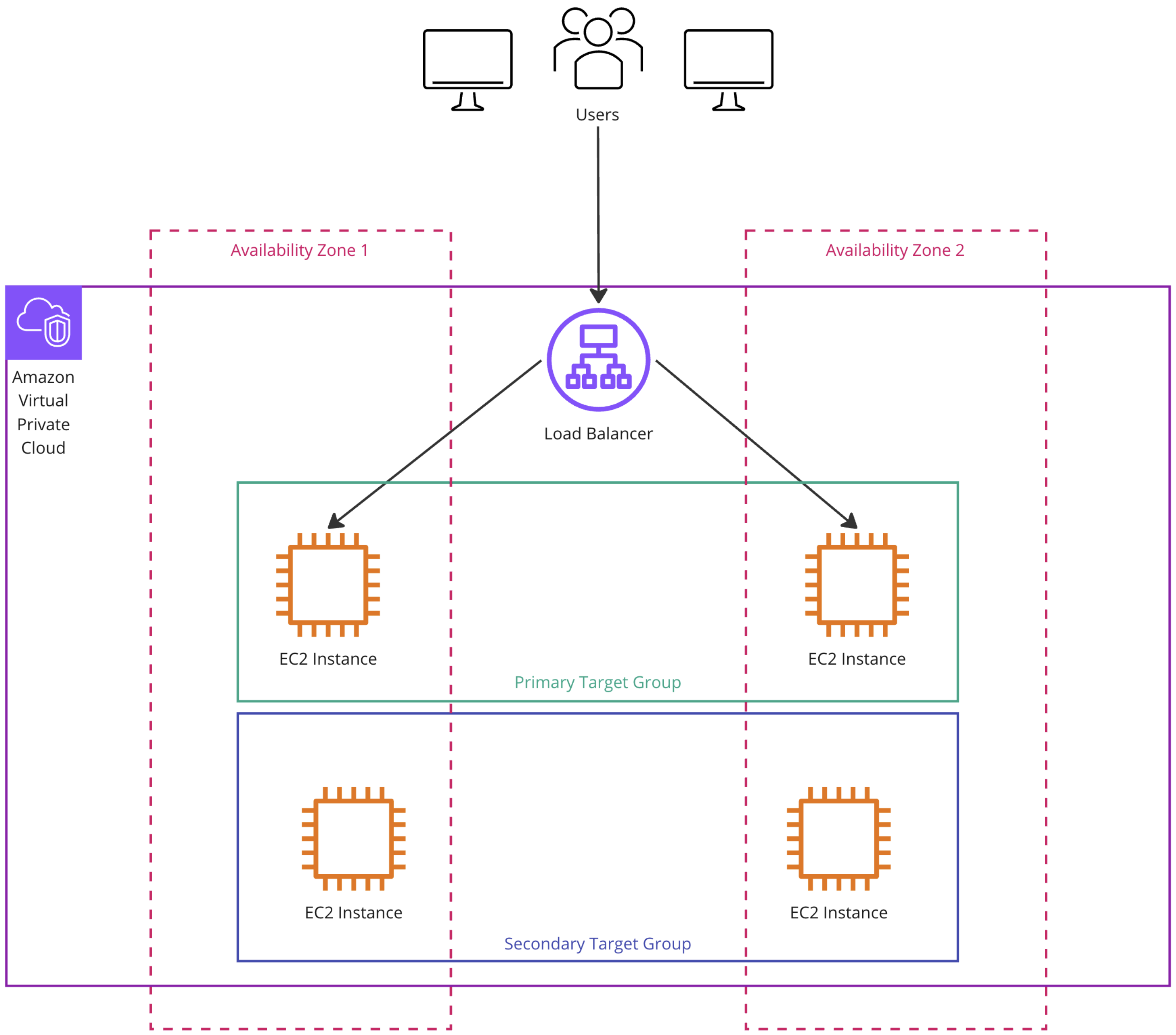
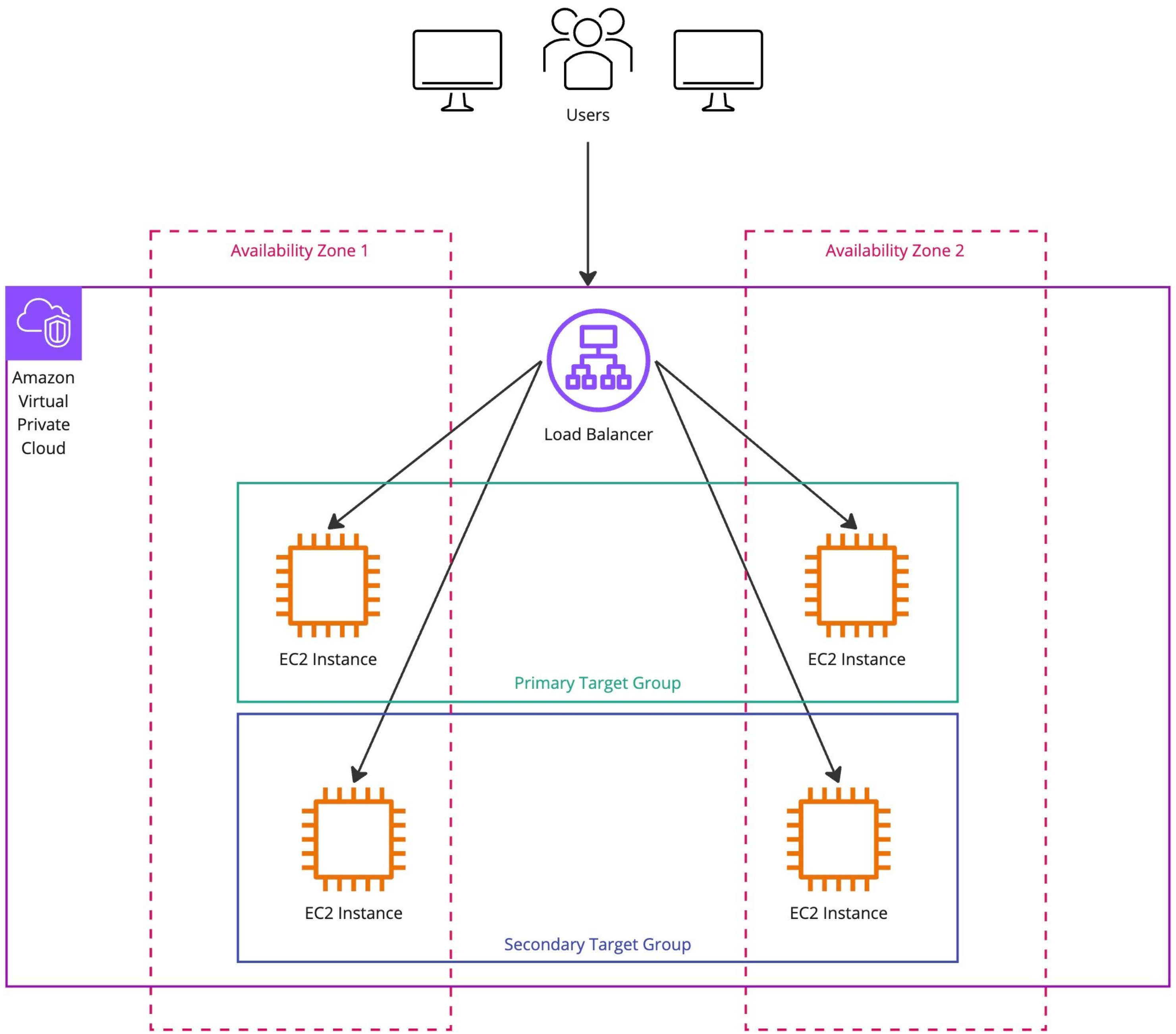
3. Primary target group is instantiated by the application load balancer first



How does load balancing work?

1. Users send requests
2. Requests hit the load balancer
3. Primary target group is instantiated by the application load balancer first
4. If demand increases, the load balancer activates the secondary target group and distributes the load across all instances



What is compute elasticity?

Elasticity ensures your system can scale up or down based on demand, providing flexibility in resource allocation

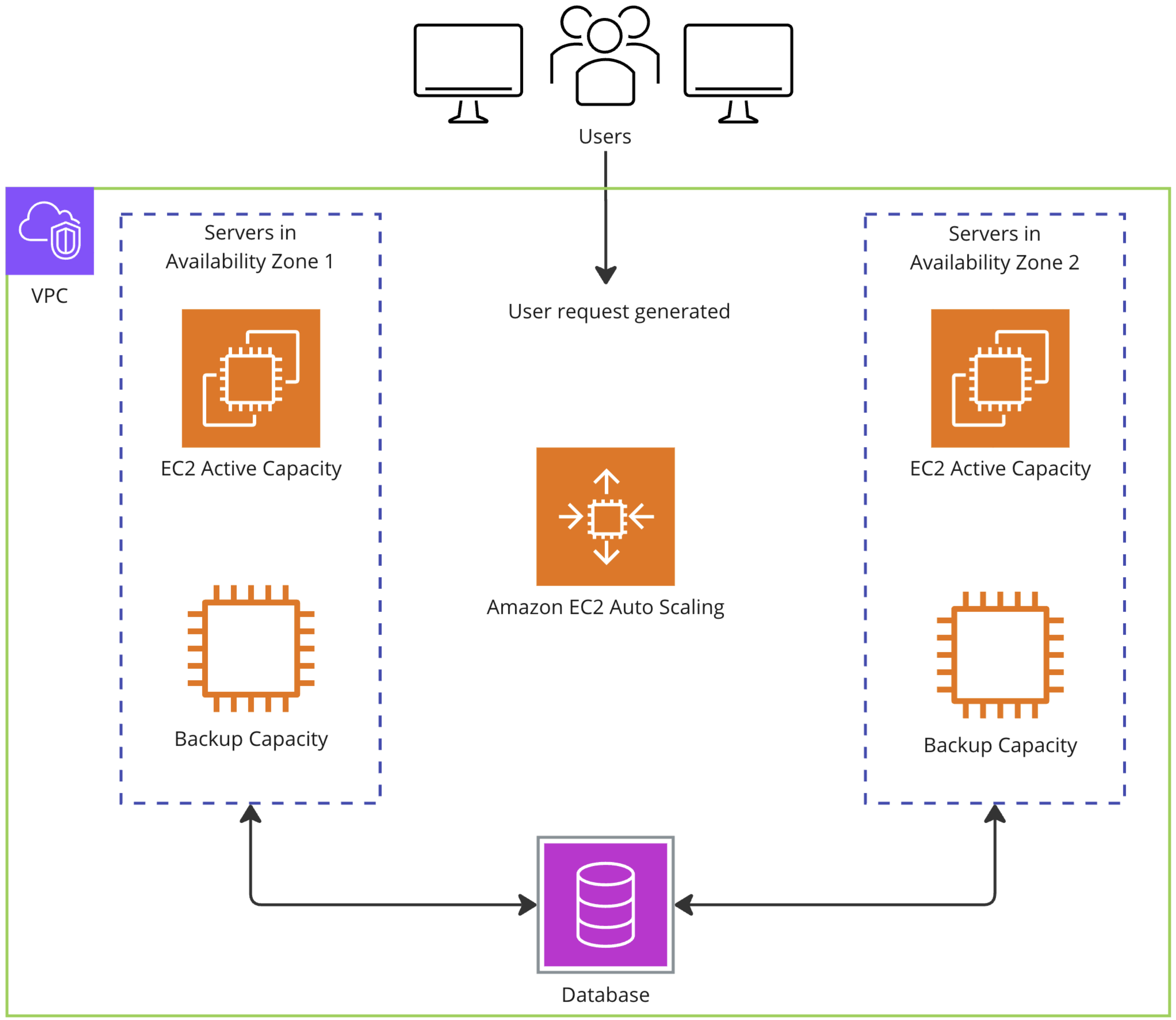
- EC2 instances achieve elasticity through EC2 Auto Scaling

What is EC2 Auto Scaling?

- Automatically adjust the number of active instances based on usage and requirement
- Optimize costs
- Prevent over-provisioning

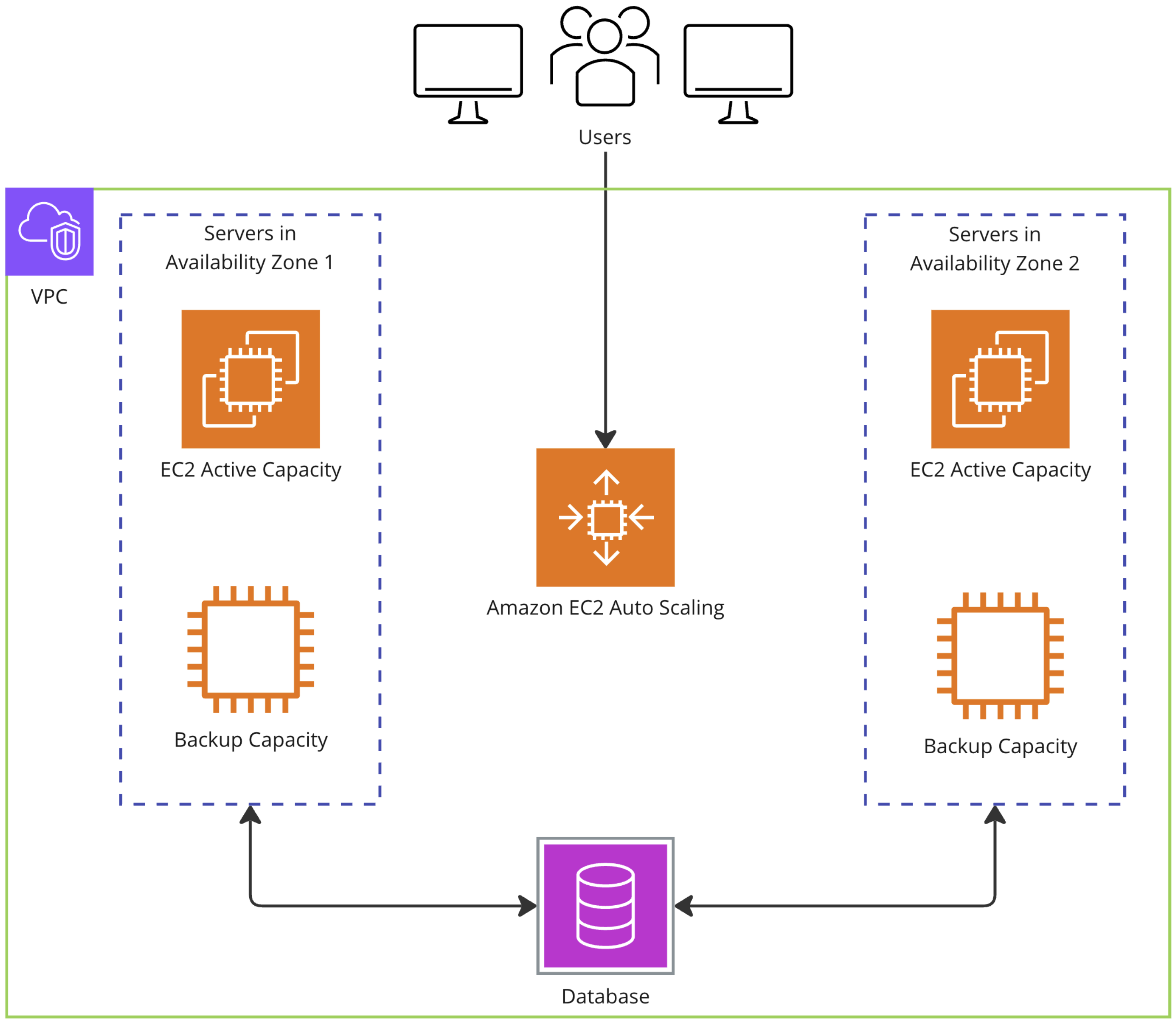
How does auto-scaling work?

1. Users send requests



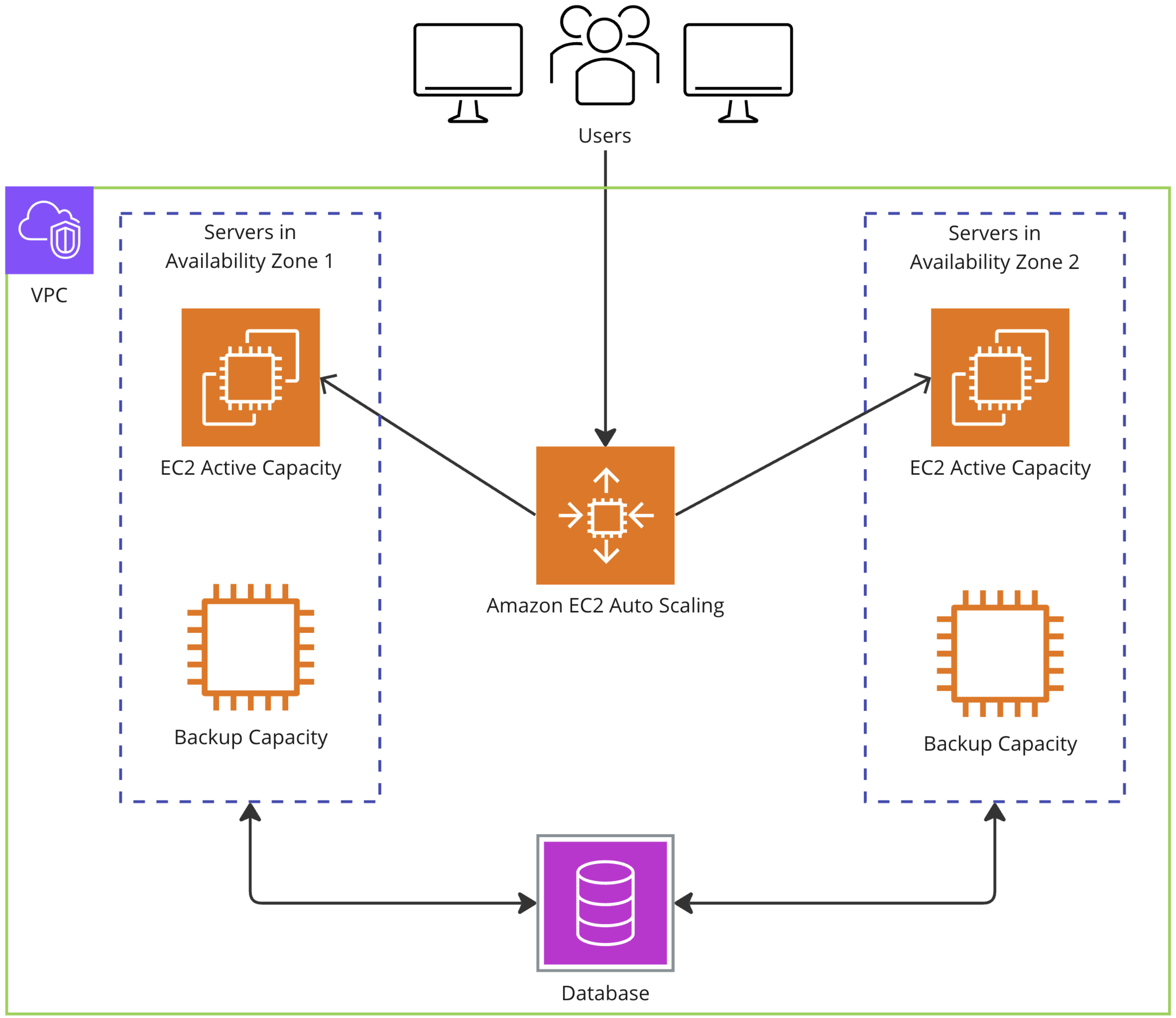
How does auto-scaling work?

1. Users send requests
2. The requests are routed to EC2 Auto Scaling service



How does auto-scaling work?

1. Users send requests
2. The requests are routed to EC2 Auto Scaling service
3. The service then routes requests to the active EC2 instances



How does auto-scaling work?

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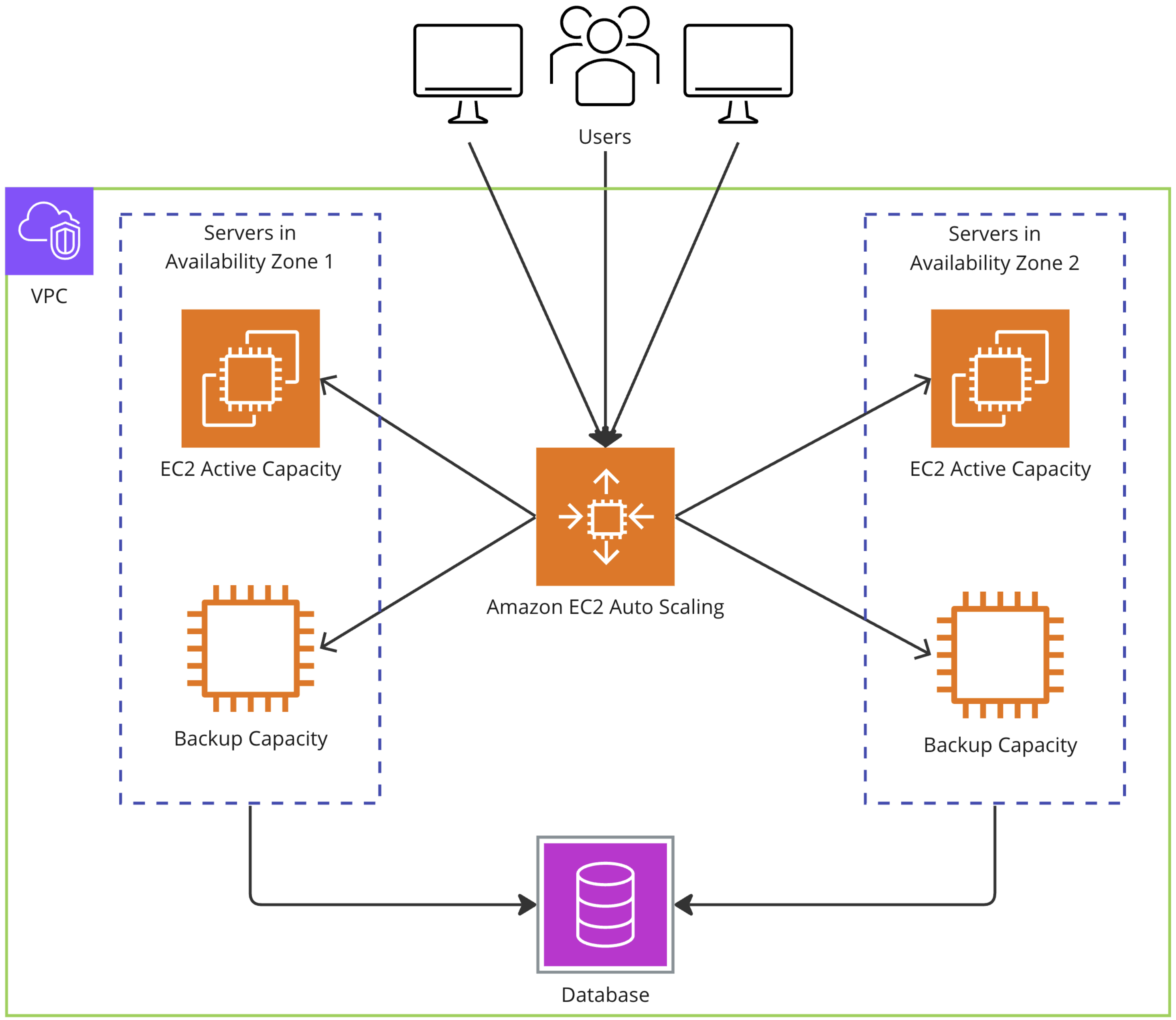
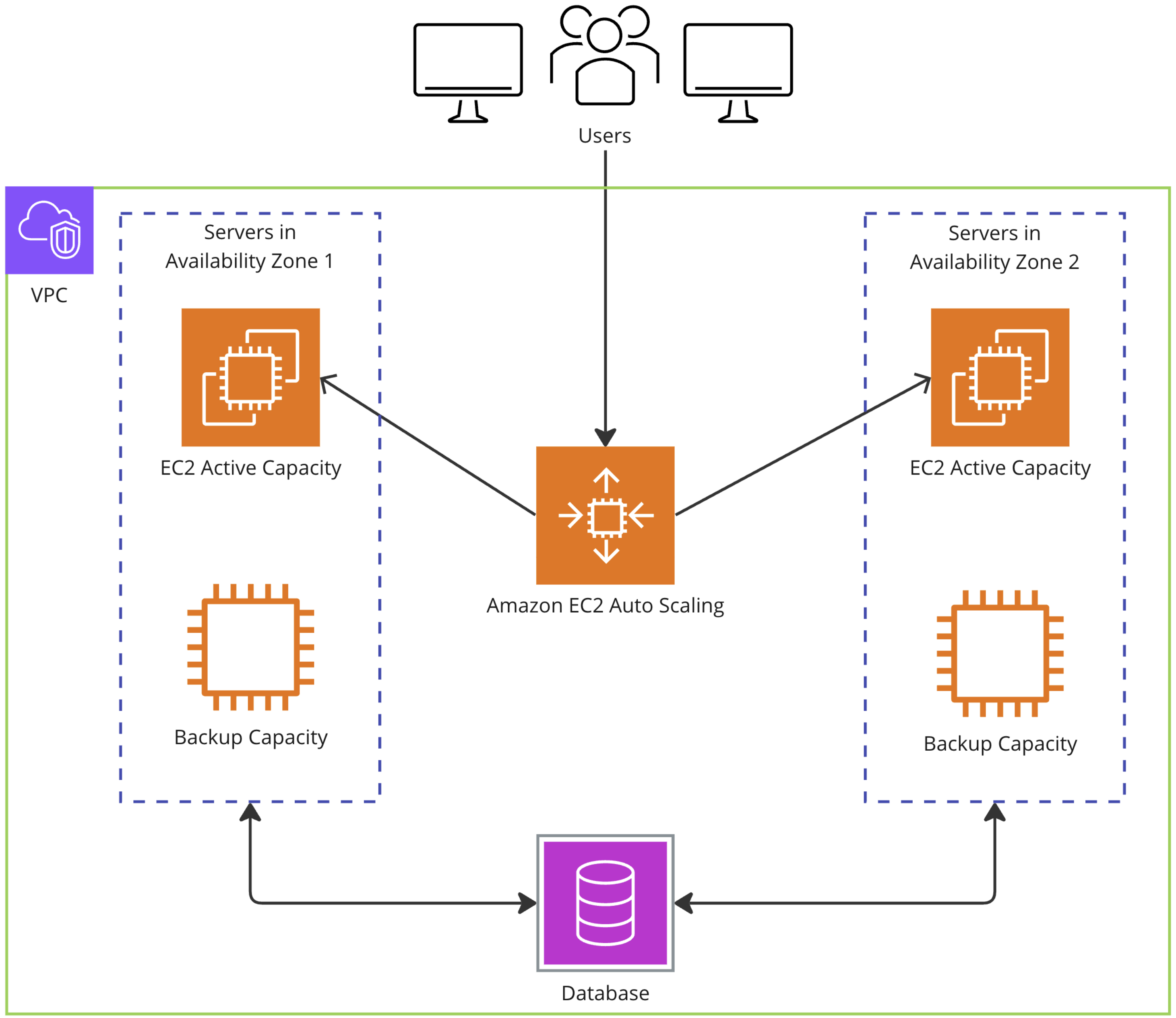
4. If demand increases, it starts adding new EC2 instances to manage the additional load



How does auto-scaling work?

1. Users send requests
2. The requests are routed to EC2 Auto Scaling service
3. The service then routes requests to the active EC2 instances
4. If demand increases, it starts adding new EC2 instances to manage the additional load
5. As demand goes down, the newly added EC2 instances are shut down



Load balancing vs. auto-scaling

Load balancing

- Route traffic evenly
- Utilize existing EC2 instances

AWS Load Balancer

Auto-scaling

- Ensure demand is always met
- Ability to add/remove EC2 instances

EC2 Auto Scaling

Let's practice!

AWS CLOUD TECHNOLOGY AND SERVICES CONCEPTS

Serverless Compute

AWS CLOUD TECHNOLOGY AND SERVICES CONCEPTS

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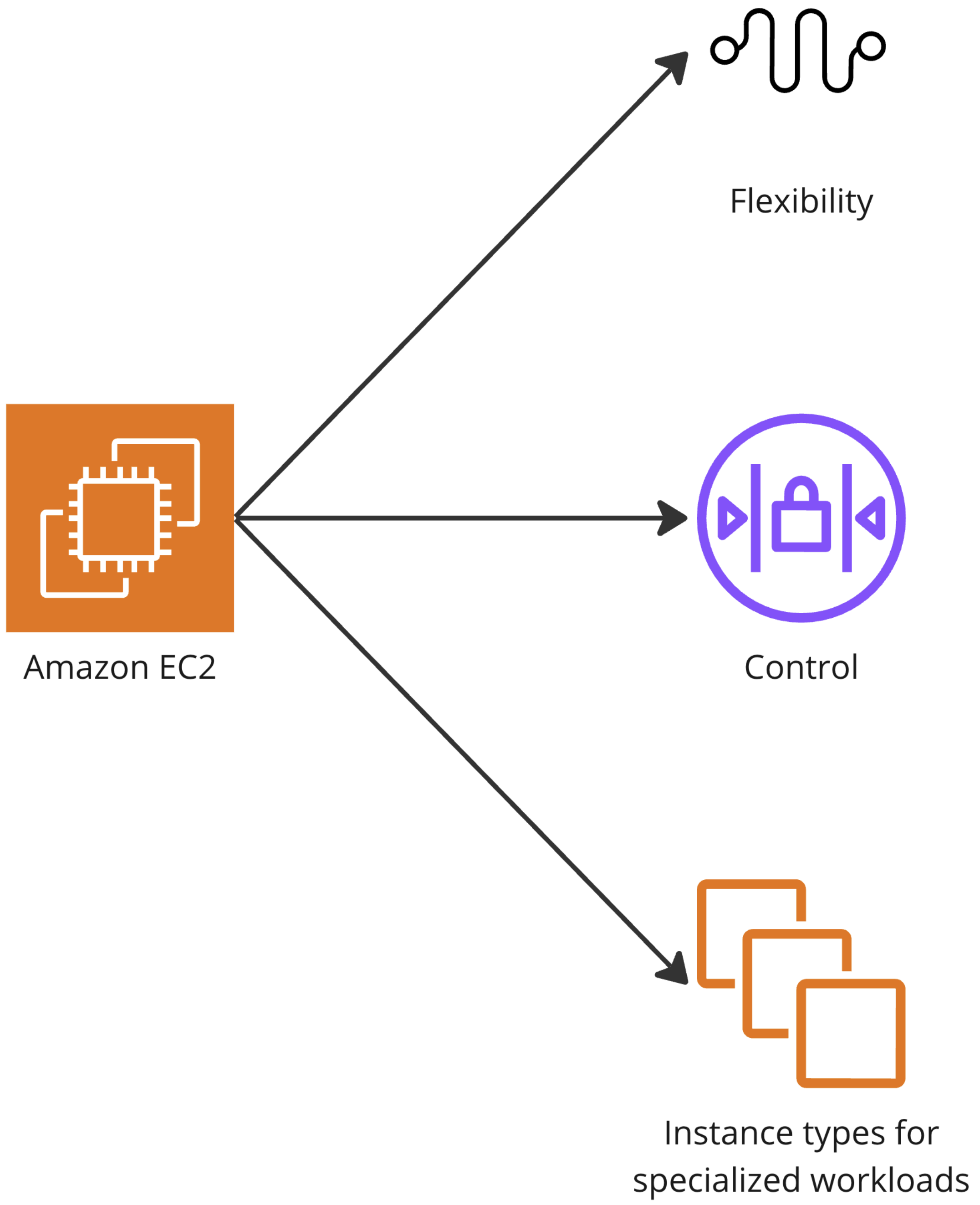
Head of Cloud Curriculum, DataCamp

Recap traditional compute

EC2 Recap:

- Amazon EC2 is a service that provides compute capacity in the AWS cloud
- Using EC2 gives higher flexibility and control
- Variety of EC2 instance types optimized for different workloads



Evolving needs: beyond traditional compute

Today's Demands:

- Need for modular, microservices architectures

Microservice architecture

Evolving needs: beyond traditional compute

Today's Demands:

- Need for modular, microservices architecture
- Rapid scaling capabilities to meet fluctuating demands

Microservice architecture

Rapid scaling

Evolving needs: beyond traditional compute

Today's Demands:

- Need for modular, microservices architecture

- Rapid scaling capabilities to meet fluctuating demands

- Automated infrastructure management setup without manual interventions

Microservice architecture

Rapid scaling

Automated infrastructure management

Containers and serverless compute

Containers

Serverless compute

What are containers?

Containers encapsulate applications and their dependencies, in lightweight singular units

Isolation

Why containers?

- Isolate applications from underlying system dependencies

What are containers?

Containers encapsulate applications and their dependencies, in lightweight singular units

Why containers?

- Isolate applications from underlying system dependencies
- Share host OS for efficient resource utilization

Isolation

Increased efficiency

What are containers?

Containers encapsulate applications and their dependencies, in lightweight singular units

Why containers?

- Isolate applications from underlying system dependencies
- Share host OS for efficient resource utilization
- Easily movable and portable across environments

Isolation

Increased efficiency

Portability

Containers in AWS

Amazon Elastic Container Service

Amazon Elastic Kubernetes Service

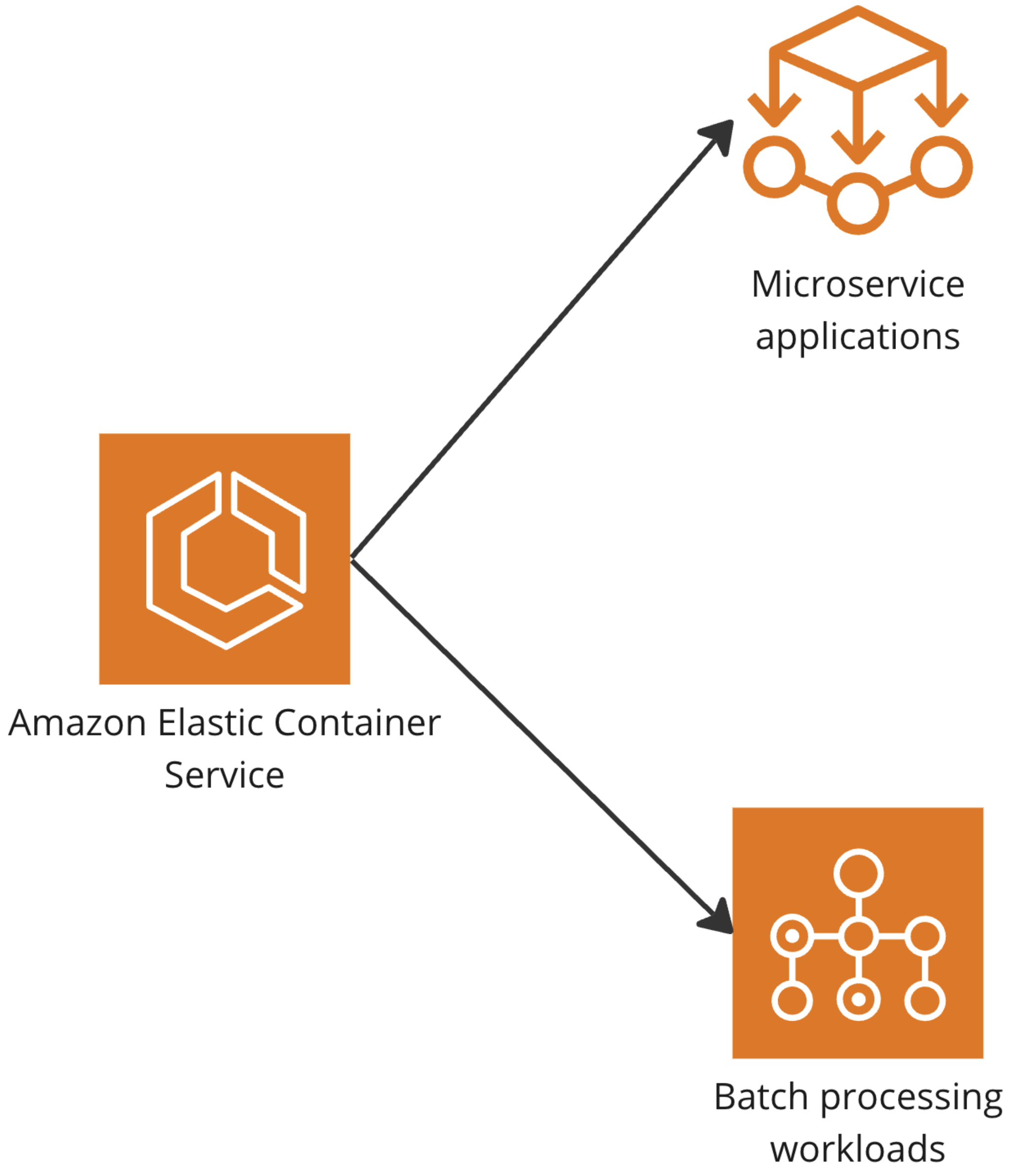
- Easily scale containerized applications up or down
- Integrate with other AWS services

Amazon ECS

Fully managed service for efficient deployment, management, and scaling of containerized applications

Use cases

- Deploying and managing microservices-based applications
- Plan, schedule, and run batch processing workloads across AWS services

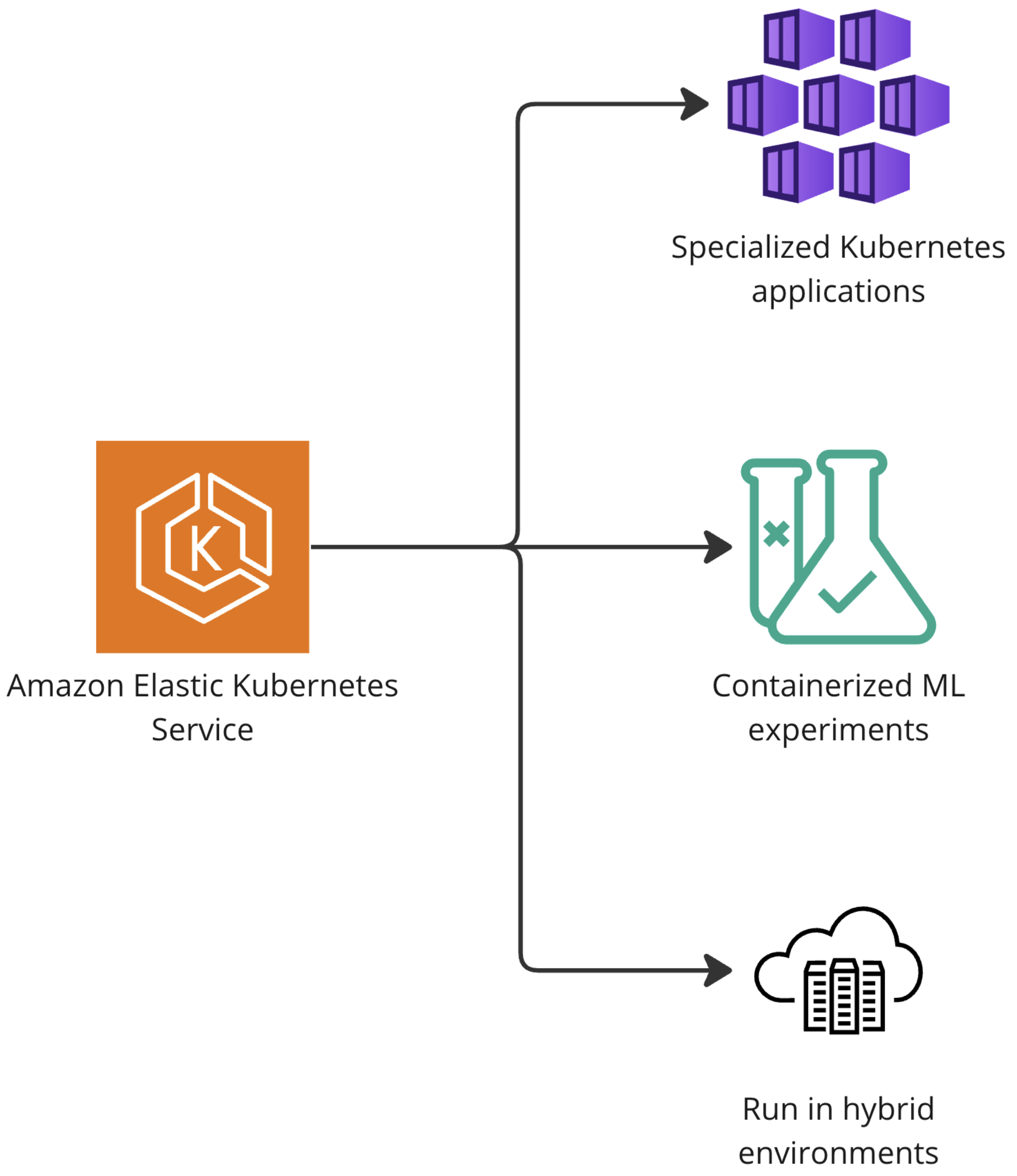

Microservice applications
Amazon Elastic Container Service
Batch processing workloads

Amazon EKS

Container orchestration service specializing in running Kubernetes-powered applications

Use cases

- Pair with EC2 accelerated computing instances to run ML containers
- Manage clusters and applications in hybrid cloud environments


Specialized Kubernetes applications
Amazon Elastic Kubernetes Service
Containerized ML experiments
Run in hybrid environments

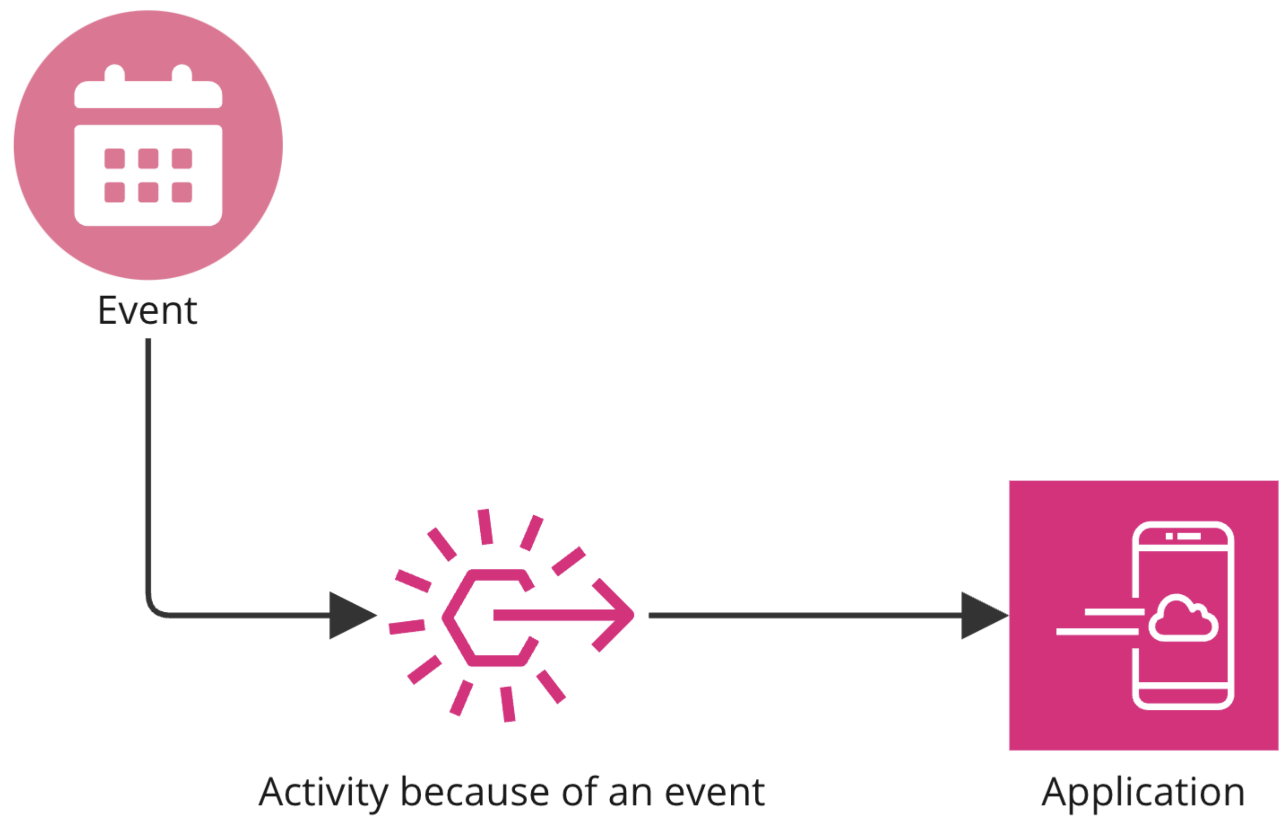
More forms of compute?

Containers

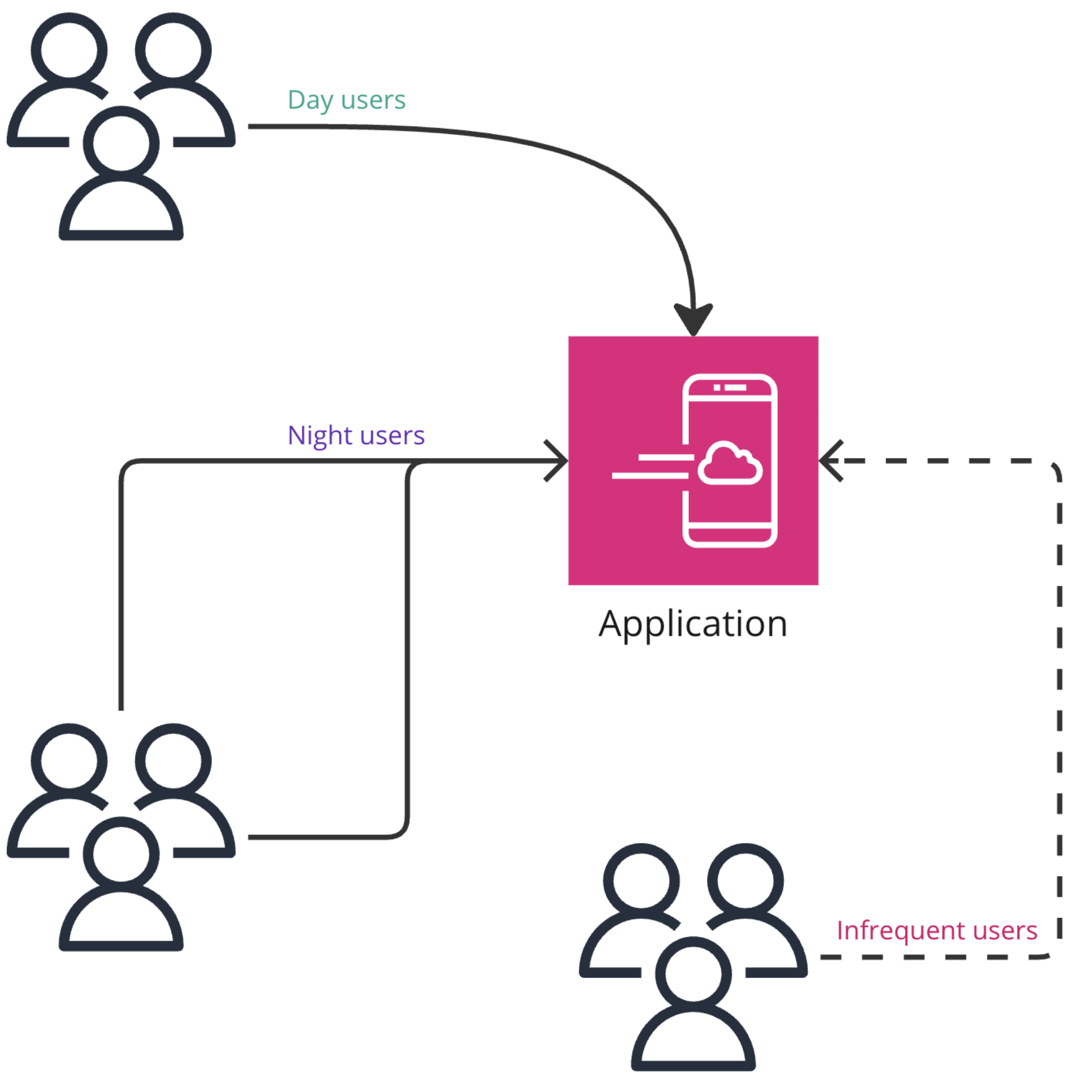
- Persistent environments
- Predictable workloads
- Resource-intensive applications

More forms of compute?

Event-based compute changes



Balancing compute for sporadic traffic loads



Serverless compute

Serverless compute

What is serverless architecture?

- No server management: forget about provisioning, scaling, or maintenance

No server management

What is serverless architecture?

- No server management: forget about provisioning, scaling, or maintenance
- Event-driven: functions triggered by events in real-time

No server management

Event-driven

What is serverless architecture?

- No server management: forget about provisioning, scaling, or maintenance
- Event-driven: functions triggered by events in real-time
- Cost-efficient: pay only for actual usage, not pre-allocated resources

No server management

Event-driven

Cost-efficient

When to use serverless compute?

- Event-driven applications
- Real-time file processing
- Uneven data bursts
- Chatbots and voice assistants

Serverless compute in AWS

AWS Lambda

AWS Fargate

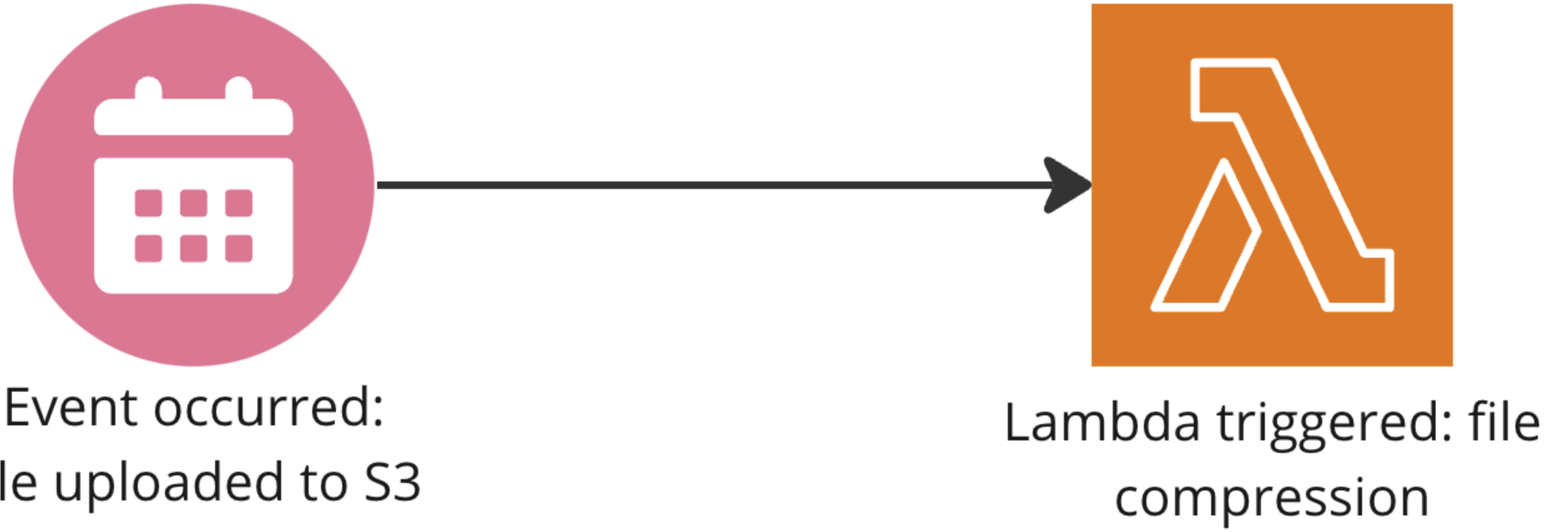
AWS Lambda

- Run code in response to events without provisioning or managing servers
- Automated compute scaling capabilities

Event occurred:
file uploaded to S3

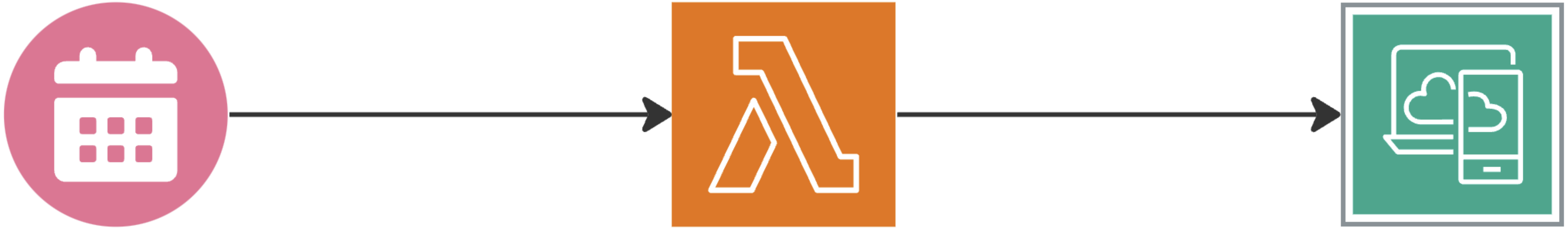
AWS Lambda

- Run code in response to events without provisioning or managing servers
- Automated compute scaling capabilities



AWS Lambda

- Run code in response to events without provisioning or managing servers
- Automated compute scaling capabilities



Event occurred:
file uploaded to S3

Lambda triggered: file compression

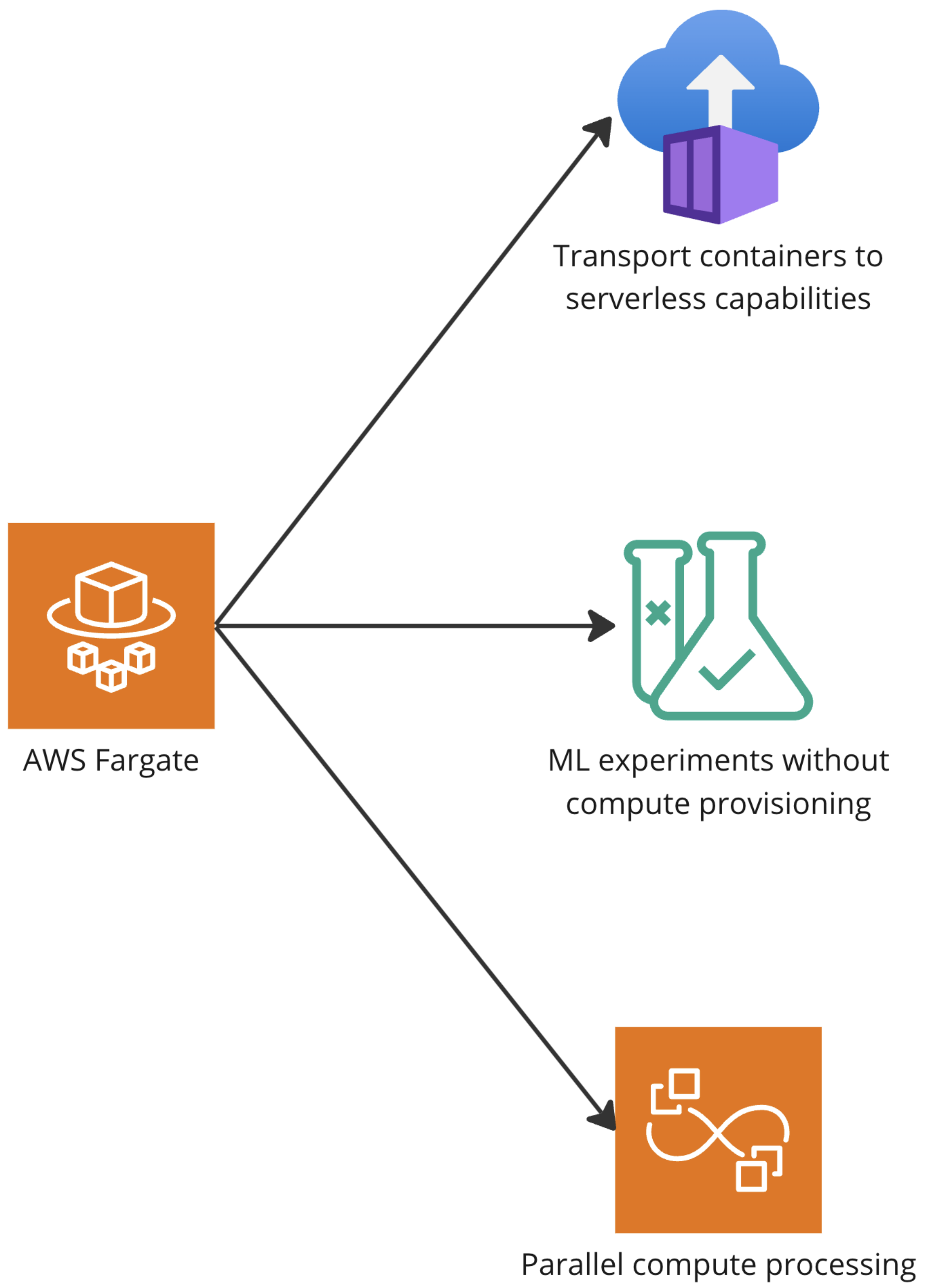
Lambda pushes compressed file to website

AWS Fargate

Streamlines application development by providing serverless compute for containers

Use cases

- Enable AI and ML applications without the need for excessive server provisioning
- Batch processing of large datasets with parallel compute capabilities


AWS Fargate
Transport containers to serverless capabilities
ML experiments without compute provisioning
Parallel compute processing

Let's practice!

AWS CLOUD TECHNOLOGY AND SERVICES CONCEPTS